Tilt Cove Exploration Drilling Program

Chapter 6 – Biological Existing Environment

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

6.0 MARINE BIOLOGICAL ENVIRONMENT

The marine biological environment includes a wide variety of biological organisms, ranging from plankton and bacterial communities to large fish and whales. Each portion of the biological environment present within the Project Area is further described within this chapter, including fish and fish habitat, marine birds, marine mammals and sea turtles, and special areas. Species of conservation concern within each biological unit is discussed, as well as species outlined as being of Indigenous concern.

The Grand Banks of Newfoundland are a highly productive ecosystem. Two major currents, the Gulf Stream and the Labrador Current, cause mixing and upwelling that result in high productivity and diversity. Localized gyres, such as around the Flemish Cap, are particularly productive and result in important feeding and spawning grounds for fish, marine mammals, and sea birds. Many species migrate to this area, specifically to feed before returning to spawning grounds. Although they are presented separately, each portion of this chapter is related by a complex web of trophic linkages and predator-prey interactions.

The physical environment present on the Grand Banks is described in Chapter 5. This includes bottom substrate, sea ice, currents, and climate, all of which are important factors influencing the biological environment in the area.

6.1 Marine Fish and Fish Habitat

The Project Area for Marine Fish and Fish Habitat is set 40 km out from EL 1161. This area ranges from approximately 60 m to 140 m deep on the Grand Banks shelf area. This section describes fish, invertebrates, plankton, and habitat within the Project Area and Regional Assessment Area (RAA). Relevant data sources for these descriptions include:

- Environmental Assessments and Monitoring
  - Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (IAAC 2021)
  - Environmental Effects Monitoring (EEM) Programs (e.g., EMCP 2016, Suncor Energy 2017a, 2017b)
- Government Documents
  - SARA / Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report and Plans
  - Northwest Atlantic Fisheries Organization (NAFO) Scientific Council Research and Studies (e.g., NAFO 2017)
  - Canadian Science Advisory Secretariat (CSAS) reports
- Datasets
  - National Aeronautics and Space Administration (NASA) Satellite Imagery
  - Canadian Research Vessel (RV) data (2016 to 2020)
  - Ocean Biogeographic Information System (OBIS)

Demersal fish and invertebrate distribution within the RAA has been investigated through annual standardized multi-species Canadian RV surveys within the 200 nautical mile (nm) exclusive economic zone (EEZ). These Campelen trawl surveys use a random-stratified survey design and for EA purposes these data can only be used for assessing the presence of species within study areas (N. Wells, pers. comm. 2019).

6.1.1 Plankton

Plankton are small, typically microscopic, organisms that move passively in the aquatic environment (IAAC 2021). Taxa typically assigned as plankton include bacteria, viruses, fungi, phytoplankton, a variety of small invertebrates (zooplankton), and pelagic fish eggs and larvae (ichthyoplankton). Plankton are an extremely diverse and ecologically important group, often forming the base and lower levels of the marine food web. They provide important biological links to processes such as nitrogen fixation, carbon absorption, and CO_2 regulation (Petrou et al. 2019). Many species may spend only a portion of their life cycle as plankton and may play very different roles as adults.

6.1.1.1 Bacterial / Microbial Communities

Microbial communities include prokaryotic (lacking distinct cell nucleus) single-celled bacteria and archaea, some species of fungi, and viruses. They can be heterotrophs (using organic material for energy), autotrophs (deriving energy from sunlight), or photoheterotrophs (use sunlight for energy but obtain carbon from organic material) (DFO 2011a, in Husky 2018). Most microbes are secondary consumers, and their presence is heavily dictated by the presence of phytoplankton as a food source. A variety of other sources of carbon exist in the environment, including dead cells, cell contents from lysis, released organic detritus, in addition to other microbes and phytoplankton.

As phytoplankton are predominantly in the upper surface layer of the water column, microbes are typically found in similar areas. However, as not all bacteria directly feed on or use phytoplankton, species of archaea, bacteria, fungi, and viruses can be found throughout the water column. As detritus and other sources of organic matter exist on the seafloor, many species of microbes are present in sediment or near the substrate layer.

Some microbe species have adapted to remediate and utilize carbon or energy from hydrocarbons. These species are capable of breaking down hydrocarbons into CO_2, water, and other smaller compounds (American Society for Microbiology [ASM] 2011, in Husky 2018). These species are present at low levels throughout most of the water column, and can proliferate quickly in the presence of hydrocarbons (ASM 2011, in Husky 2018). Though certain compounds can be broken down by different microbes, no individual can break down all the complicated chemicals present in raw oil (e.g., polycyclic aromatic hydrocarbons, alkanes) (ASM 2011, in Husky 2018).

6.1.1.2 Phytoplankton

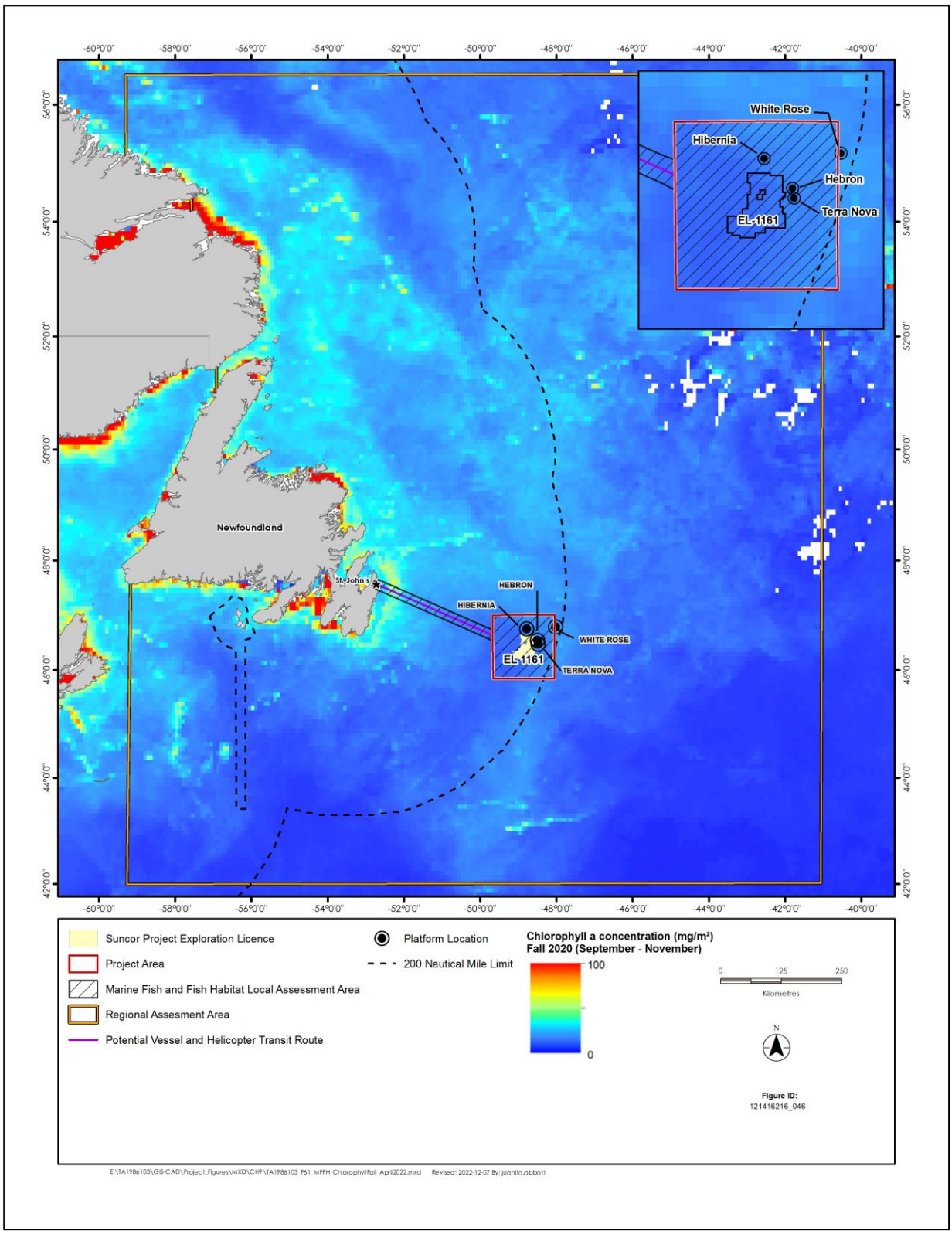
Phytoplankton are microscopic protists that fill a similar niche as terrestrial plants by photosynthesizing sunlight into sugars. They form the base of the majority of marine food webs, and derive any additional nutrients required from the surrounding sea water (Worcester and Parker 2010, in Husky 2018). These additional nutrients vary depending on the species but can include silica and calcium carbonate. A combination of increased nutrients due to upwelling, longer days, and warmer waters results in the peak phytoplankton blooms happening in Newfoundland in the spring and fall (DFO 2018a). After the spring bloom, a thermocline begins to form which blocks further nutrient upwelling. Higher winds and storms in the fall break down the thermocline and create another localized bloom (Maillet et al. 2004, in Husky 2018; Harrison et al. 2013, in Husky 2018).

Variability over the scale of years or decades in the phytoplankton blooms are due to major climate events such as the North Atlantic Oscillation (NAO). Similar to El Niño / La Niña in the southern Pacific, the NAO shifts between warmer and cooler phases that change the extent of sea ice, vertical mixing, nutrient influx, and fresher marine conditions (Harrison et al. 2013, in Husky 2018). These events are difficult to predict, and lead to declines in phytoplankton abundance in the 1970s, a resurgence, and another decline since the 1990s (Maillet et al. 2004, in Husky 2018). The intensity of these blooms directly affects the zooplankton blooms, and by extension every animal that consumes them.

The location of peaks in the bloom is driven by areas of upwelling and mixing, in addition to thermal fronts between different bodies of water. On the Grand Banks, these are typically the edges of the continental shelf and Flemish Cap, and the mixing front of the Gulf Stream and Labrador Current(Anderson and Gardner 1986; Templeman 2007, in Husky 2018). The waters of the shelf and near shore are also comparatively more productive than open ocean due to warm waters and localized nutrient sources (such as runoff). The bloom peaks are in different locations throughout the year, with one year's worth of data (fall 2020 to summer 2021) shown in Figures 6-1 to 6-4. Chlorophyll *a* intensity is relatively higher in small localized areas near shore Newfoundland and Labrador during fall 2020 and summer 2021, and nearshore Nova Scotia during winter 2020/2021 (Figure 6-1, 6-2, and 6-4). The spring bloom for 2021 was most intense over the shelf edge, Flemish Pass, and Flemish Cap (Figure 6-3).

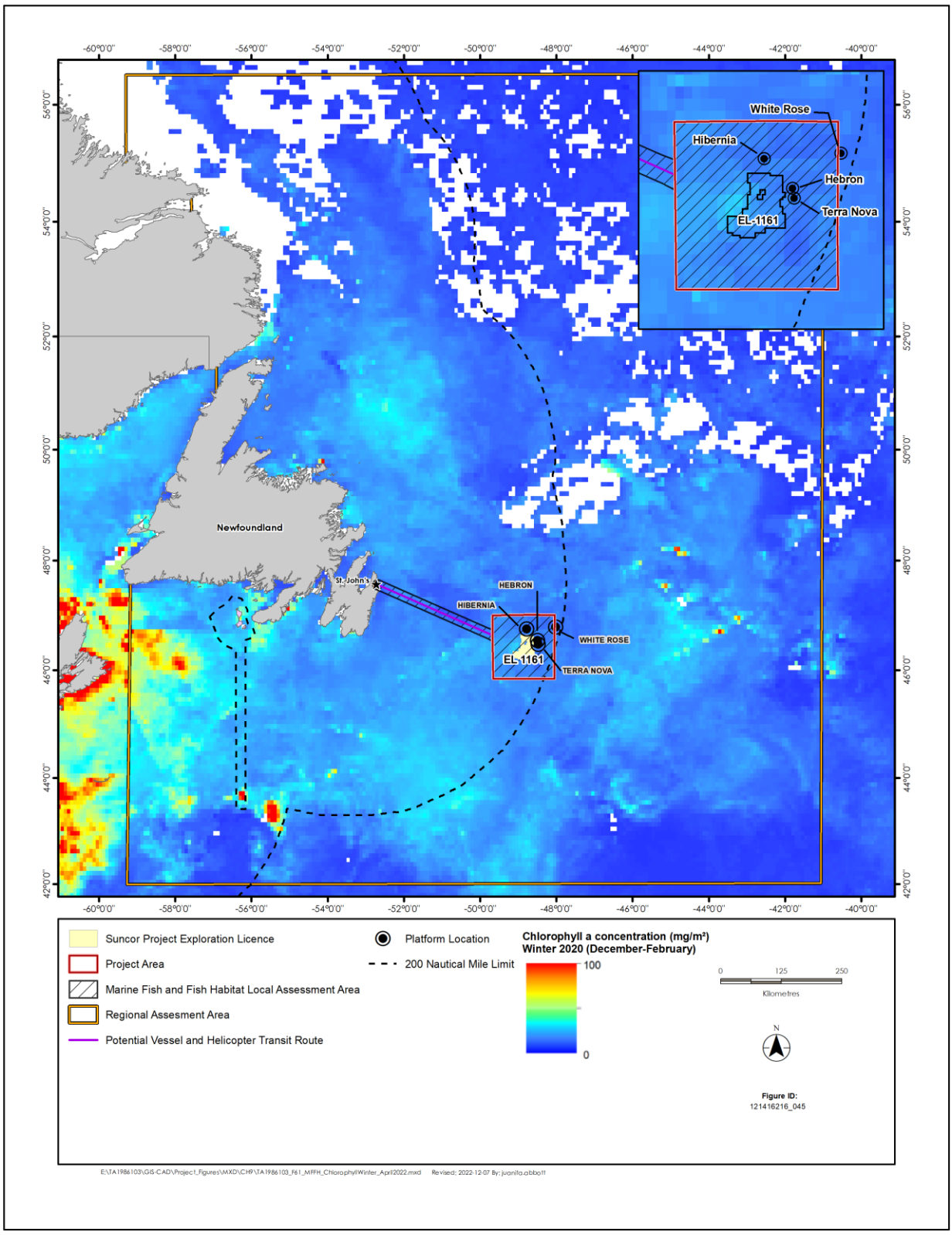
6.1.1.3 Zooplankton

Zooplankton are small animals that form the primary link between phytoplankton and larger organisms that consume zooplankton (Breeze et al. 2002, in Husky 2018). They are consumed by a wide variety of organisms, from anemones to planktivorous fish, and baleen whales. Zooplankton can be divided into three main classes based on their size: microzooplankton (0.02 to 0.2 mm), mesozooplankton (0.2 to 2 mm), and macrozooplankton (>2 mm). Typical microzooplankton include ciliates, tintinnids, and eggs and larvae of certain fish. Mesozooplankton include copepods, larvaceans, pelagic molluscs, and some larval benthic organisms. Macrozooplankton include larger or gelatinous organisms such as krill, tunicates, and salps (Husky 2018). Many organisms can grow into different phases and may be plankton throughout their entire life cycle (e.g., copepods) or mature and grow into a different phase altogether (e.g., larval sea anemones, redfish).



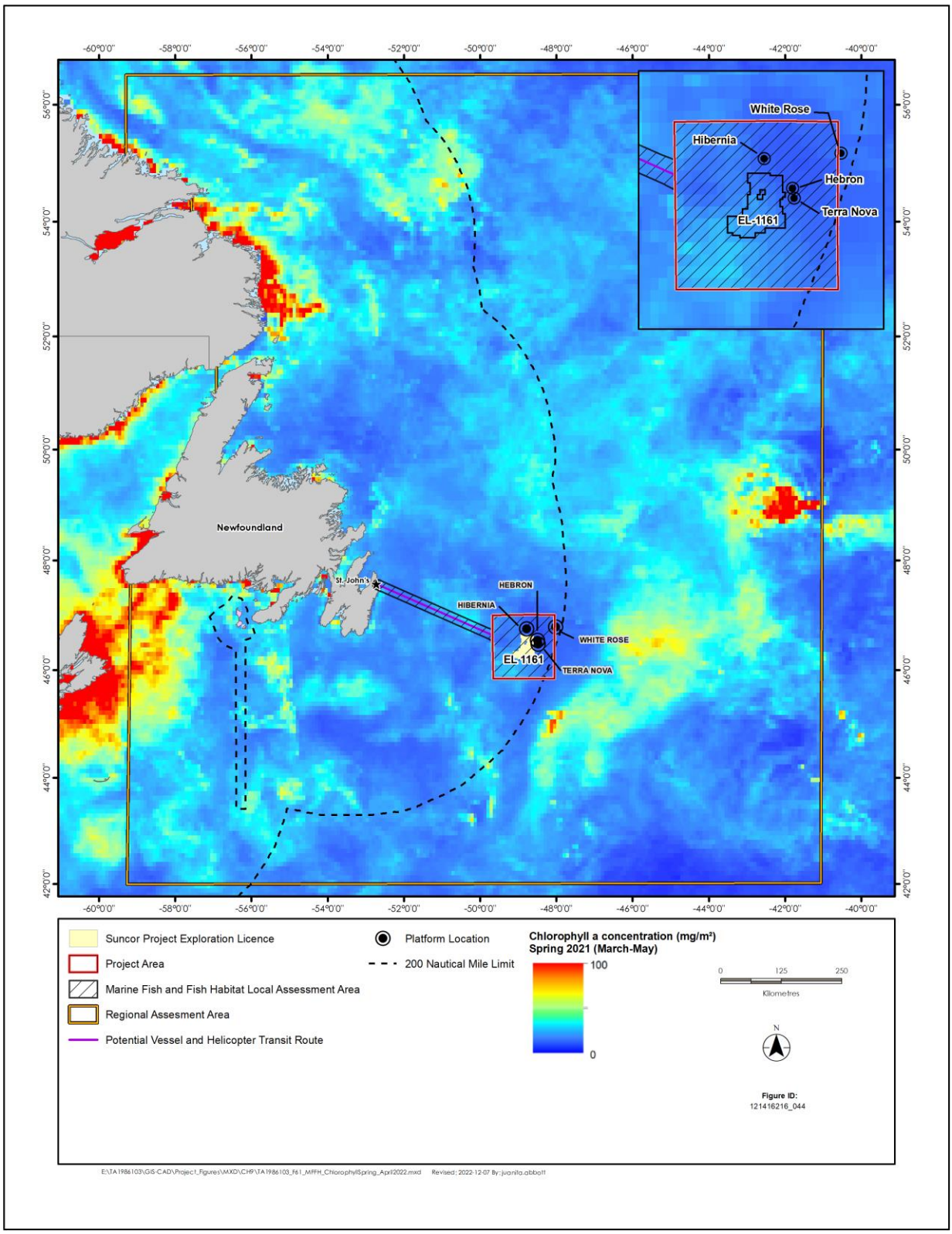
Source: NASA 2022

Figure 6-1 Chlorophyll *a* Concentration within the RAA from NASA MODIS-Aqua Satellite Imagery, Fall (Sep. to Nov.) 2020



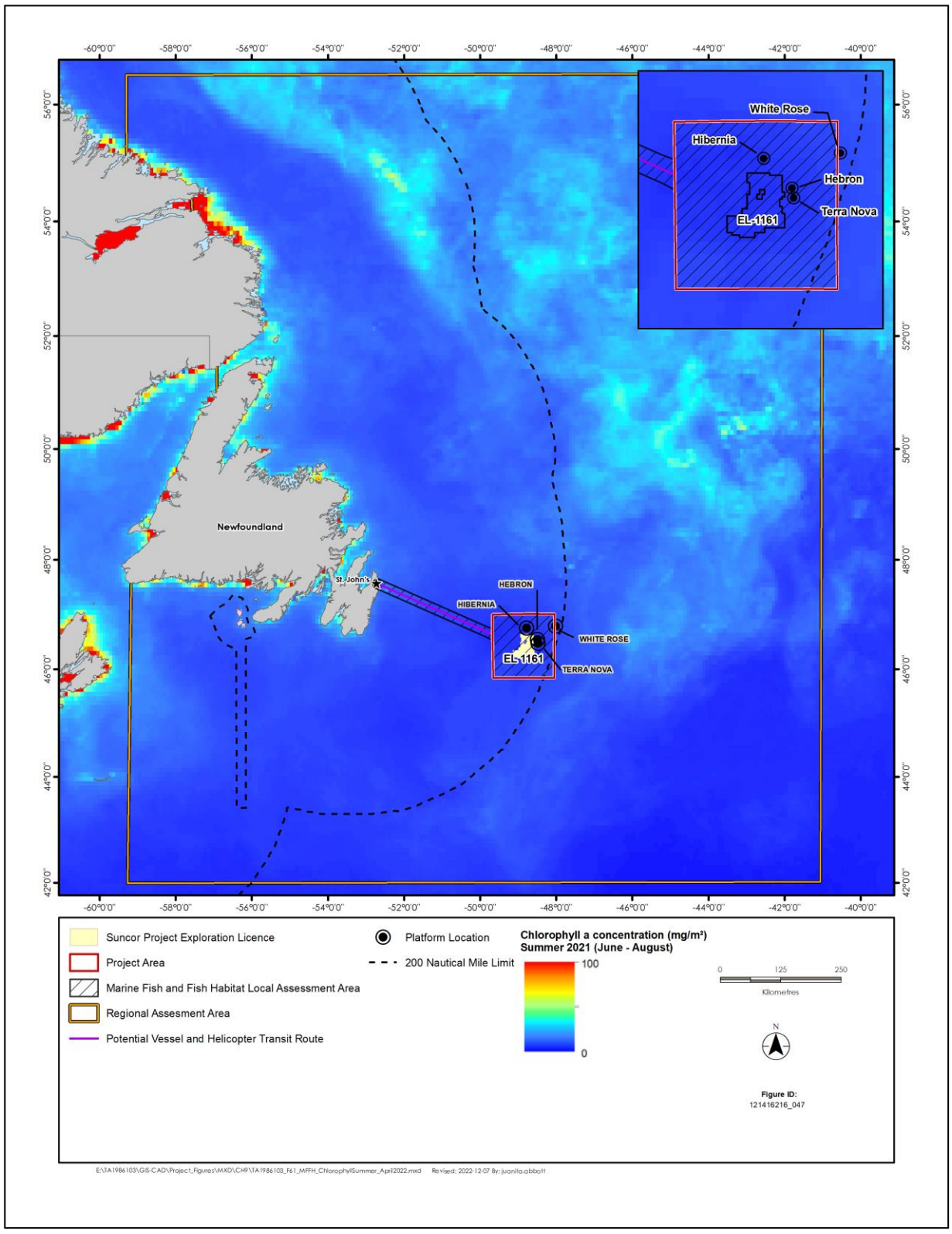
Source: NASA 2022

Figure 6-2 Chlorophyll *a* Concentration within the RAA from NASA MODIS-Aqua Satellite Imagery, Winter (Dec. to Feb.) 2020 / 2021



Source: NASA 2022

Figure 6-3 Chlorophyll *a* Concentration within the RAA from NASA MODIS-Aqua Satellite Imagery, Spring (March to May) 2021



Source: NASA 2022

Figure 6-4 Chlorophyll *a* Concentration within the RAA from NASA MODIS-Aqua Satellite Imagery, Summer (Jun. to Aug.) 2021

The density and distribution of zooplankton mirrors that of their prey, the phytoplankton. Spring and fall blooms result in high abundances of zooplankton and many species time reproduction so that their larval forms are present during these blooms. The majority of zooplankton biomass on the Grand Banks is composed of three copepod species: *Calanus glacialis, C. finmarchicus,* and *C. hyperboreus (Greenan et al. 2010)*. These species have been in decline in recent years, with warmer water species such as *Pseudocalanus* spp. and gelatinous zooplankton increasing in abundance (DFO 2018a). These changes are thought to be largely driven by climate change. Other gradients exist within a single year, with zooplankton such as copepods and krill having the highest abundances near the shelf edge and slope areas, and others such as jellyfish having higher densities near shore (Dalley and Anderson 1998, in Husky 2018). A divide between the north and south of the Grand Banks is evident as well, with different groups of zooplankton preferring the warmer Gulf Stream waters and others the colder Labrador current.

6.1.1.4 Ichthyoplankton

Ichthyoplankton are the eggs and larvae of fish species that exist as plankton for part of their life history (referred to as meroplankton). They are important consumers and prey species for larger animals, potentially including adults of the same species (NOAA 2007, in Husky 2018). Pelagic eggs and larvae are important pathways of dispersal for many invertebrate and fish species, with currents and active swimming transporting these animals long distances. Spawning in many fish species is timed so that larval forms are present in surface waters during the height of phytoplankton and zooplankton blooms. Many fish species in the waters off Newfoundland exist as ichthyoplankton for a portion of their life cycles, including Atlantic cod, sand lance, capelin, redfish, white hake, and Greenland halibut (Dalley et al. 2000, in Husky 2018).

During the 1990s, several “0-group year class” surveys were conducted to analyze assemblages of ichthyoplankton less than a year old (Dalley and Anderson 1998, in Husky 2018; Dalley et al. 2001, in Husky 2018). The most recent data (1997-1998) found that capelin accounted for 73.5% of total abundance, followed by sand lance (11.3%), lanternfish (5.9%), and Arctic cod (3.4%). Squid were also present in approximately two-thirds of all trawls and accounted for 3.1% of the total abundance. Other species that accounted for <1% of relative abundance were alligator fish, sculpins, shanny, Atlantic cod, redfish, wolffish, snailfish, American plaice, and haddock. All other species were below 0.1% relative abundance. As major shifts in benthic and pelagic fish assemblages took place in the early 1990s due to stock collapses, this is likely a very different assemblage than may have existed historically. For example, Serebryakov et al. (1987, in DFO 2014a) found that most ichthyoplankton within the RAA were redfish larvae. No major ichthyoplankton studies have been carried out since 1998, and so a data gap exists regarding the current assemblage present within the RAA.

6.1.2 Corals and Sponges

Corals and sponges are long-lived, sessile, marine benthic invertebrates found throughout the regional area (Wareham and Edinger 2007; Roberts et al. 2009; Guijarro et al. 2016; Meredyk 2017; Miles 2018; Murillo et al. 2018). These fauna provide biogenic habitat, can form dense aggregations, and are sensitive to physical and chemical damage (Hogg et al. 2010, Baker et al. 2012a, Beazley et al. 2013, Buhl-Mortensen et al. 2017). Deep-sea corals and sponges are of particular interest for science and conservation as they may provide habitat for marine fish and invertebrates (Campbell and Simms 2009, Ballion et al. 2012, 2014, Bo et al. 2012, Baker et al. 2012b, Beazley et al. 2013, Kenchington et al. 2013). Deep-sea coral and sponge taxa documented on the Grand Banks of Newfoundland include soft corals, sea pens, black corals,

gorgonians, stony corals, glass sponges, *Geodia* sponges, and stalked sponges (Wareham and Edinger 2007, Kenchington et al. 2009, 2015, Fuller 2011, Beazley et al. 2013, Guijarro et al. 2016).

Offshore Newfoundland, deep-sea corals occur in cold waters on topographic highs (e.g., seamounts) and steep-sided surfaces (e.g., continental slopes and subsea canyons) and can occur at depths greater than 200 m (Gilkinson and Edinger 2009, Edinger et al. 2011). The Grand Banks, Flemish Pass, Flemish Cap, and Newfoundland Shelf are important areas for several coral and sponge taxonomic groups including sea pens, soft corals, gorgonians, black corals, and *Geodia* sponges (Wareham and Edinger 2007, Gilkinson and Edinger 2009, Knudby et al. 2013b, 2013a). Their distributions are an ongoing area of research and are influenced by several abiotic factors such as surficial geology, geomorphology, surface productivity, and water column chemistry among other factors (Edinger et al. 2011, Bennecke and Metaxas 2017, Yesson et al. 2017).

Within the Project Area, several Canadian RV trawls have occurred between 2004 to 2021 (Figures 6-5 to 6-9). Of the RV trawls conducted within the Project Area, few had documented occurrences of corals and sponges, and these were all below the NAFO thresholds for significant concentrations of corals and sponges. Of the research trawls conducted within EL1161, there were no recorded recoveries of sea pens (Figure 6-5). There were nine trawls that recovered small gorgonians (Figure 6-7), one trawl that recovered large gorgonians (Figure 6-6), 14 trawls that recovered soft corals (Figure 6-8), and five trawls that recovered sponges (Figure 6-9).

There are several coral and sponge conservation areas along the eastern Canadian Shelf and within the RAA (Figure 6-5). DFO has identified specific areas along the eastern Canadian shelf as Significant Benthic Areas (SBAs) for deep-sea corals and sponges (DFO 2017a). There are no SBAs within EL 1161; the closest SBAs are approximately 14 km to the west of the western most edge of the EL are designated for large and small gorgonian corals (Figure 6-6, Figure 6-7). These gorgonian SBAs were designated from kernel density analysis using research trawl data (Kenchington et al. 2016). A sponge SBA is to the south of the Project Area along the southeastern shelf-edge of the Grand Banks (Figure 6-9). Other SBAs for corals (sea pens and gorgonians) in the area are located along the southeastern Newfoundland Shelf. NAFO has established several coral and sponge closures along the southern and eastern edges of the Grand Banks, within the Flemish Pass, and the slopes of the Flemish Cap but none occur within the Project Area (DFO 2015a). To determine a significant concentration of corals or sponges, NAFO applies specific thresholds of weight per tow for corals and a GIS-based analysis of recovered weight per area for sponges (Kenchington et al. 2010). See Section 6.4 for further information on Special Areas associated with coral and sponge areas. For comparison purposes DFO and NAFO trawls are displayed as presence/absence instead of weight per tow.

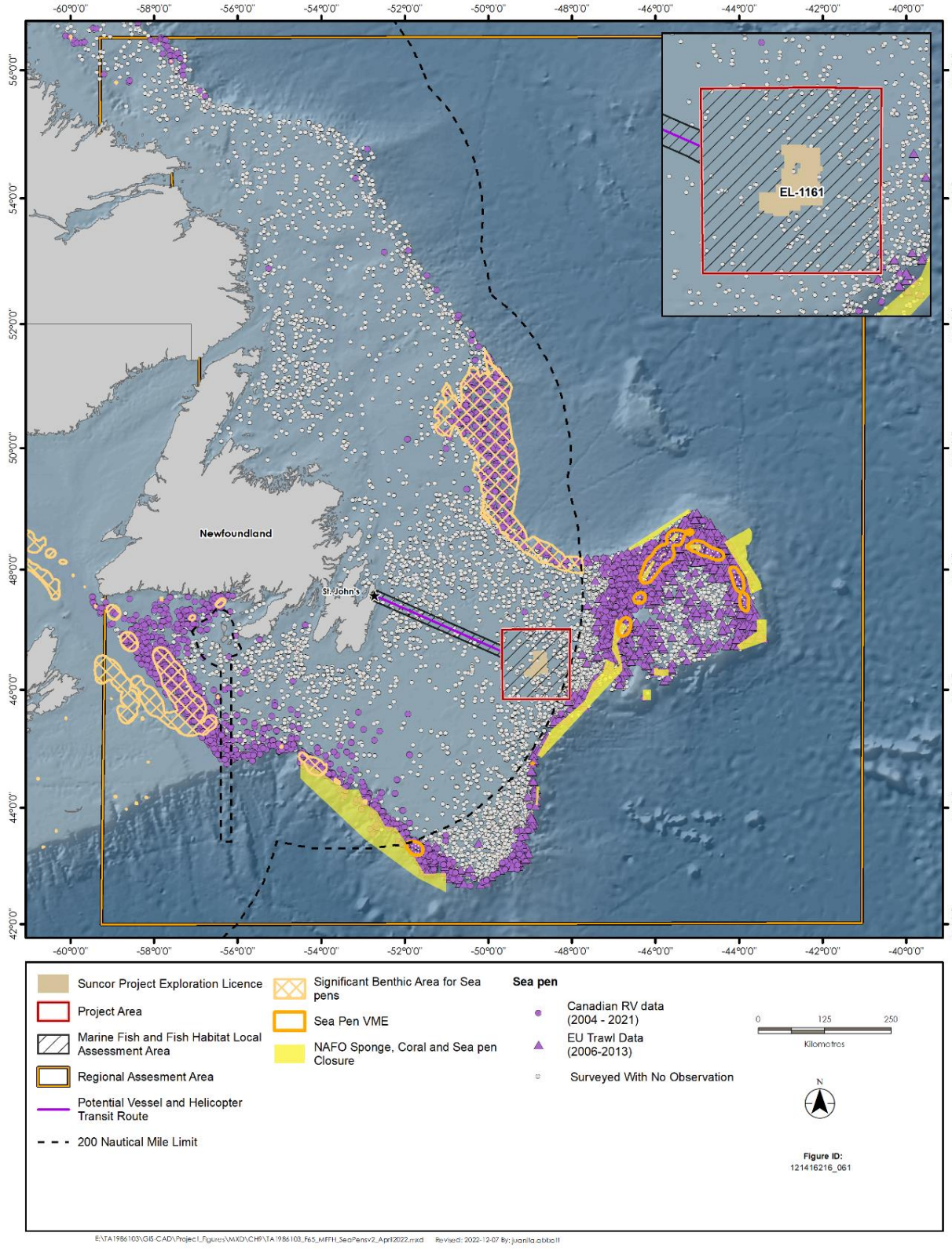


Figure 6-5 Distribution of Sea Pens within the RAA from Canadian (2004-2021) / EU (2006-2013) RV Trawl Data

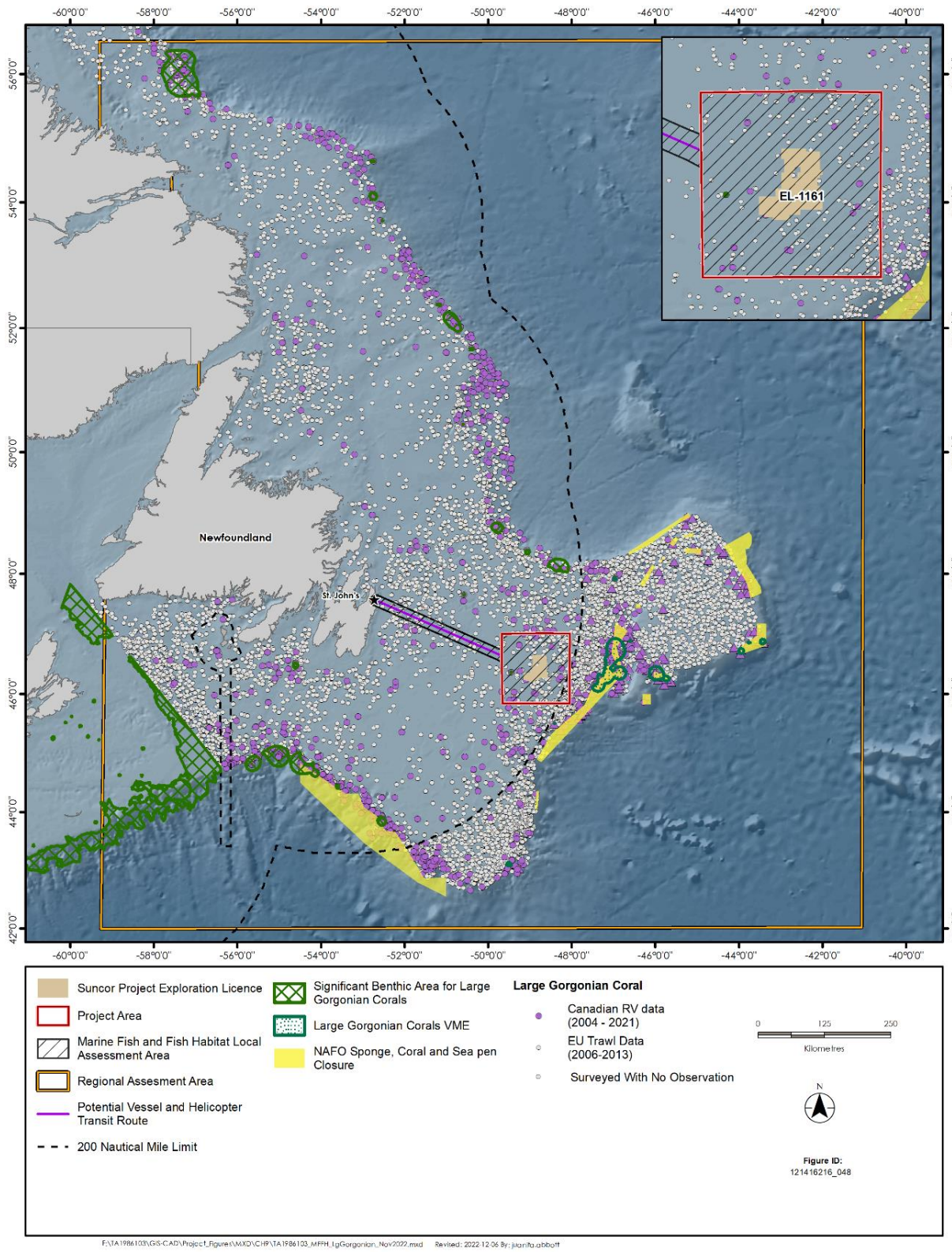


Figure 6-6 Distribution of Large Gorgonian Corals within the RAA from Canadian (2004-2021) / EU (2006-2013) RV Trawl Data

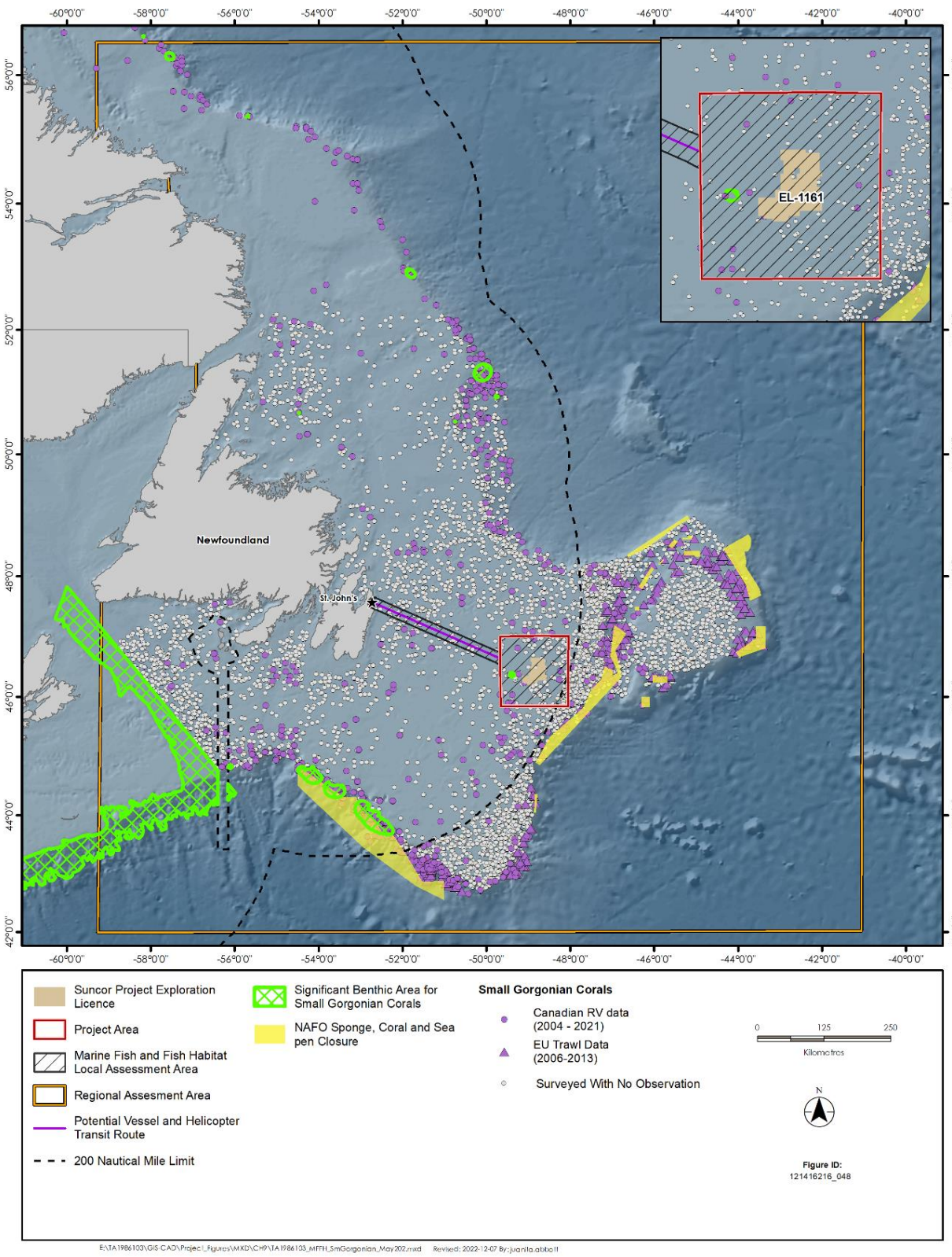


Figure 6-7 Distribution of Small Gorgonians within the RAA from Canadian (2004-2021) / EU (2006-2013) RV Trawl Data

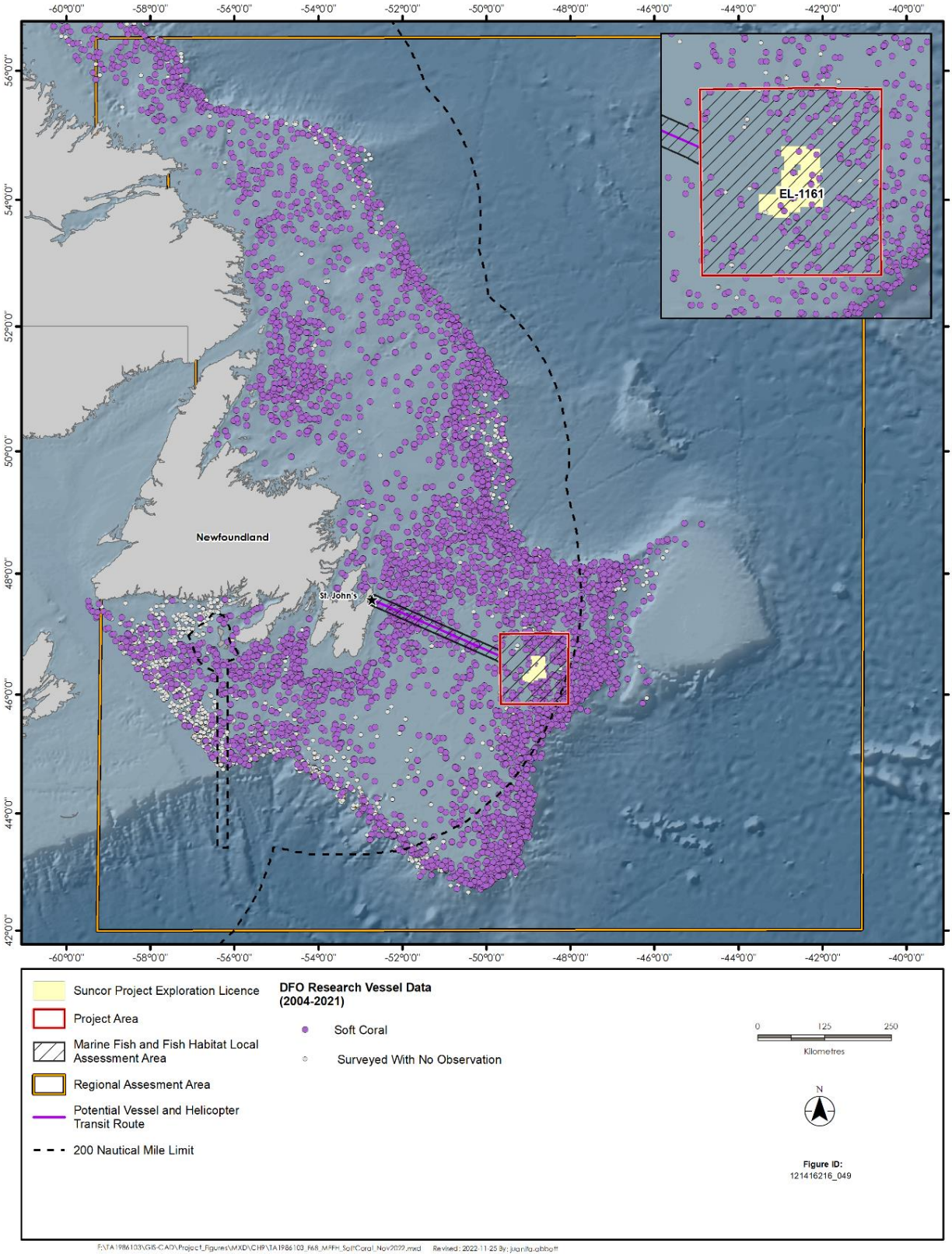


Figure 6-8 Distribution of Soft Corals within the RAA from Canadian RV Trawl Data (2004-2021)

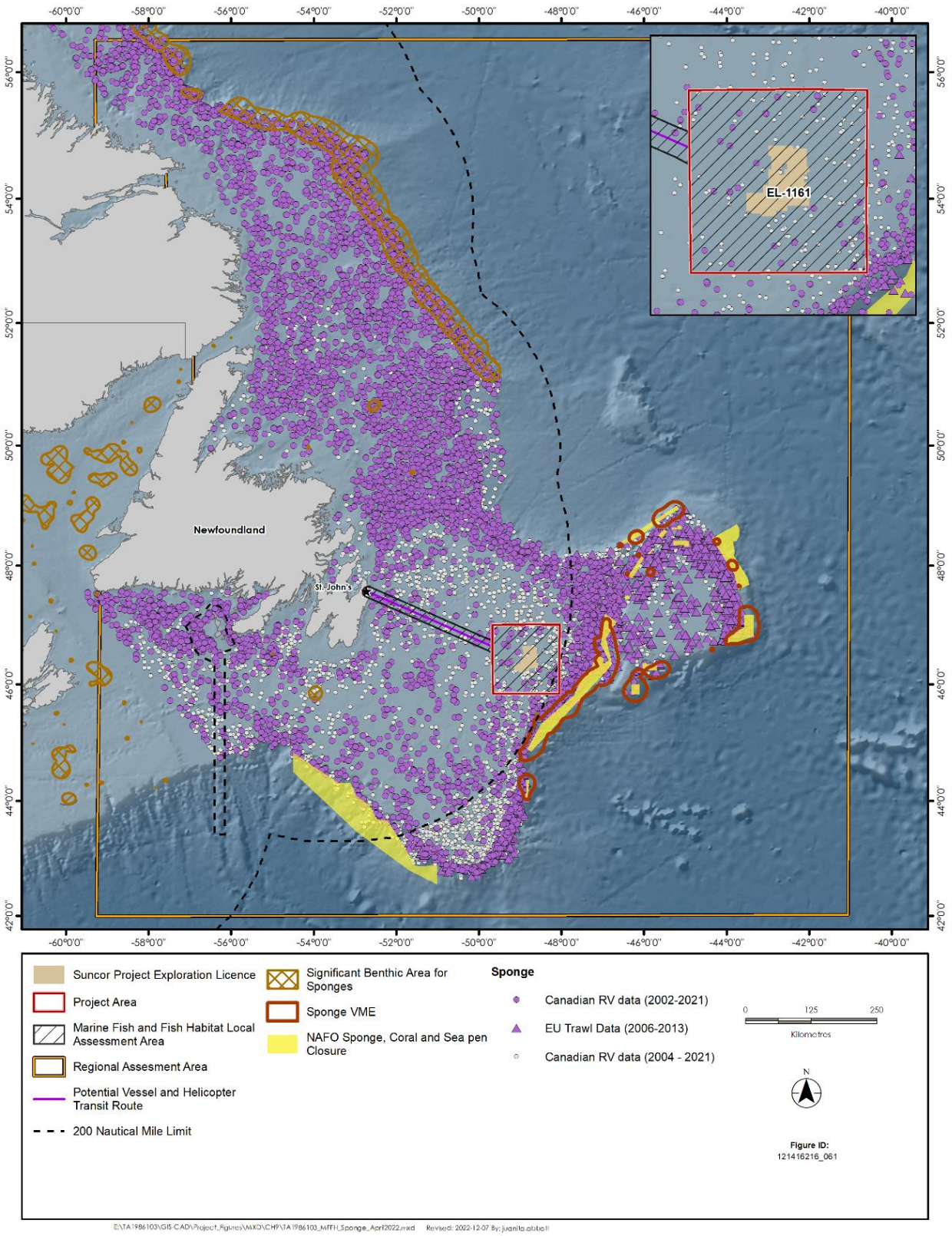


Figure 6-9 Distribution of Sponges within the RAA from Canadian (2004-2021) / EU RV (2006-2013) Trawl Data

6.1.3 Marine Fish and Invertebrates

A wide variety of demersal, benthic, and pelagic fish and invertebrate species occur within the Project Area. These species play important roles in the ecosystem ranging from zooplankton (mainly larvae), planktivores (e.g., capelin), and as large predators (e.g., white shark), with many playing different roles at different points in their life histories. Some of these species are of commercial or indigenous importance in addition to their ecological roles.

6.1.3.1 Demersal Finfish

6.1.3.1.1 Canadian RV Trawl Surveys

Between 2016 and 2020, 133 Canadian RV trawls took place in the Project Area in water depths from 55 to 140 m. Data reported for this Project are focused on species that have been consistently and reliably sampled and identified over time (DFO, pers. comm.). While other species may be captured during the survey, the data are not up to species identification standards and therefore the species are not reported in available datasets (DFO, pers. comm.). Fourteen species of finfish were caught within the boundary of the Project Area, the majority of which were demersal species. These species belong to eleven families and five functional groups. Functional groups are based on the primary feeding method of a species: benthivores (small, medium, and large sized fish) that mainly eat demersal invertebrates; piscivores that mainly eat other fish; planktivores that eat phytoplankton and/or zooplankton; and plank-piscivores that have a mixed feeding method of both plankton and other fish (Ollerhead et al. 2017, Wells et al. 2019). These groups are not exclusive but represent the predominant method of feeding for the adult of a species (e.g., Atlantic cod are piscivores, but also consume benthic and pelagic invertebrates). Species observed within the Project Area are discussed further in the context of their functional group (Table 6.1) and their distribution within the RAA (see Section 6.1.3.4). Only species found within the Project Area are included in RAA maps (e.g., medium benthivore families in Section 6.1.3.4 include only those species caught between 2016 and 2020 in the Project Area). Species at risk or of conservation concern, species of Indigenous importance, and commercial species are discussed individually (refer to Sections 6.1.3.5 and 6.1.3.6).

Table 6.1 Functional Group, Family, Conservation Status, and Existence of a Commercial Fishery for All Finfish Species Collected within the Project Area in Canadian RV Trawls (2016-2020)

Functional Group	Family	Common Name	Scientific name	SAR / SOCC	CS
Medium Benthivore	Cyclopteridae	Lumpfish	*Cyclopterus lumpus*	X	X
	Pleuronectidae	Witch flounder	*Glyptocephalus cynoglossus*		X
		Yellowtail flounder	*Limanda ferruginea*		X
Large benthivores	Anarhichadidae	Northern wolffish	*Anarhichas denticulatus*	X	
		Atlantic wolffish	*Anarhichas lupus*	X	
	Macrouridae	Roughhead grenadier	*Macrourus berglax*		X*
	Pleuronectidae	American plaice	*Hippoglossoides platessoides*	X	X*
	Rajidae	Thorny skate	*Amblyraja radiata*	X	X

Table 6.1 Functional Group, Family, Conservation Status, and Existence of a Commercial Fishery for All Finfish Species Collected within the Project Area in Canadian RV Trawls (2016-2020)

Functional Group	Family	Common Name	Scientific name	SAR / SOCC	CS
Piscivores	Gadidae	Atlantic cod	*Gadus morhua*	X	X
	Pleuronectidae	Greenland halibut	*Reinhardtius hippoglossoides*		X
Plank-piscivore	Sebastidae	Deepwater / Acadian redfish	*Sebastes mentella* / *S. fasciatus*	X	X
Planktivore	Clupeidae	Atlantic herring	*Clupea harengus*		X
	Osmeridae	Capelin	*Mallotus villosus*		X

Notes:
The list of species for the set details has been filtered for only species that have been sampled and identified consistently and reliably over time. If species are absent it does not mean they have not been caught or sampled, rather it simply means the data are not up to standard in terms of species identification and QA / QC standards (DFO, pers. comm.)
NS – non-specific, CS – commercial species, SAR – species at risk, SOCC – species of conservation concern
* Indicates species for which there is not a directed fishery but is retained as by-catch
See section 6.1.3.5 for details on SAR / SOCC
Commercial fish status is drawn from DFO (2019a) and NAFO (2022)
Source for functional groups: Ollerhead et al. (2017) and Wells et al. (2019)

6.1.3.1.2 Environmental Effects Monitoring Programs

The Project Area contains the Terra Nova, Hebron, and Hibernia production platforms, and a portion of the fisheries exclusion area for the White Rose production platform. Part of the EEM programs at each of these production facilities include bottom trawling to collect the focal species for the EEM investigations (either American plaice, snow crab, Icelandic scallop, or a combination thereof). Hebron is the newest platform in the Newfoundland offshore area with the 2015 fish characterization study taking place before any installation of infrastructure on site. As data from other platforms may be influenced by production activities, only fish data from Hebron are reported here.

As part of the 2015 fish characterization study for the Hebron Platform (EMCP 2016), trawls were conducted at the planned Hebron gravity based structure location (GBS), the planned excavated drill centre location (EDC), and two reference areas chosen for similarities to these two sites (GBS reference and EDC reference) using Campelen 1200 trawls of 15 minutes each. The EDC reference area is approximately 15 km northeast of the GBS location and is not reported here, though the GBS reference area is 15 km southwest of the GBS and is within EL 1161. Seven trawls were conducted at the planned GBS location and the GBS reference area, and eight trawls at the planned EDC location (approximately 5 km northeast of the planned GBS). Sand lance were the dominant fish species by abundance per tow (catch per unit effort (CPUE)) in all areas, followed by American plaice, capelin, and mailed sculpin (Table 6.2). These results are similar to the Canadian RV trawl data within the Project Area, with the exception that no Arctic cod were recorded during this study.

Table 6.2 Fish Species by Abundance per Tow during the 2015 Hebron Fish Characterization Study

Site	Functional Group	Common Name	Scientific Name	CPUE (# / tow)
Hebron GBS (93 m) (7 Trawls)	Planktivore	Sand Lance	*Ammodytes dubius*	132
	Large benthivore	American plaice	*Hippoglossoides platessoides*	42
	Planktivore	Capelin	*Mallotus villosus*	1
	Small benthivore	Mailed sculpin	*Triglops* sp.	1
	Small benthivore	Alligatorfish	*Aspidophoroides monopterygius*	<1
	Piscivore	Atlantic cod	*Gadus morhua*	<1
	Medium benthivore	Yellowtail flounder	*Pleuronectes ferruginea*	<1
Hebron GBS Reference Site (75-82 m) (7 trawls)	Planktivore	Sand Lance	*Ammodytes dubius*	98
	Planktivore	Capelin	*Mallotus villosus*	48
	Large benthivore	American plaice	*Hippoglossoides platessoides*	34
	Medium benthivore	Yellowtail flounder	*Pleuronectes ferruginea*	20
	Small benthivore	Mailed sculpin	*Triglops* sp.	8
	Small benthivore	Alligatorfish	*Aspidophoroides monopterygius*	2
	Piscivore	Atlantic cod	*Gadus morhua*	2
	Piscivore	Greenland halibut	*Reinhardtius hippoglossoides*	<1
	Medium benthivore	Laval's eelpout	*Lycodes lavalaei*	<1
Hebron EDC (97-99 m) (8 trawls)	Planktivore	Sand Lance	*Ammodytes dubius*	55
	Large benthivore	American plaice	*Hippoglossoides platessoides*	26
	Planktivore	Capelin	*Mallotus villosus*	13
	Small benthivore	Mailed sculpin	*Triglops* sp.	4
	Small benthivore	Alligatorfish	*Aspidophoroides monopterygius*	1
	Piscivore	Atlantic cod	*Gadus morhua*	1
	Medium benthivore	Vahl's eelpout	*Lycodes vahlii*	<1

Source: EMCP 2016
Note: Tows were 15 minutes in length using a Campelen 1200 trawl net

6.1.3.2 Pelagic Finfish

Though trawling is not a representative method of collecting data on pelagic species, several pelagic species are present in Canadian RV trawl data. These include capelin and Atlantic herring, which are deemed likely to be present in the Project Area. Other non-migratory pelagic species include Atlantic mackerel, lanternfish, and alewife (or gaspereau). Though not observed in RV trawls, these species are occasionally reported in the area and may be present (IAAC 2021).

Many pelagic species reported in the Project Area are migratory or make temporary use of the Project Area. These species do not spawn in the Project Area (or inside the RAA with the exception of Atlantic salmon in freshwater), and mainly are migrating through the area or feeding in the productive waters of the Grand Banks. Migratory species include American eel and Atlantic salmon, both of which are species at risk and are covered in detail in Sections 6.1.3.6.1. and 6.1.3.6.2, respectively. The American eel may pass through the Project Area as adults as part of their migration to the Sargasso Sea to breed, or as juveniles returning to freshwater (see Section 6.1.3.6.1). Atlantic salmon may migrate through the Project Area and LAA to feeding grounds off Labrador or may remain to the south in the East Grand Banks feeding congregation (see Section 6.1.3.6.2).

The mixing of the Gulf Stream and Labrador Current creates nutrient-rich waters on and around the Grand Banks, leading to large plankton blooms and increases in planktivorous species. Large pelagic species migrate to feed on the plankton (e.g., basking shark) or the species that subsequently increase in numbers due to the bloom such as capelin and herring. Due to the high productivity of the Grand Banks and surrounding area, several species may migrate within the Project Area and LAA to feed and may be present at certain times of the year. These include tuna (e.g., albacore, bigeye, Atlantic bluefin), sharks (e.g., blue shark, basking shark, white shark), and swordfish. Many of these are species at risk (see Section 6.1.3.5). Their most likely time of occurrence in the Project Area is in summer or fall when food is plentiful and the waters have warmed, as these are mostly warm-water species. Tuna species are further discussed in Section 6.1.3.6.4., swordfish in Section 6.1.3.6.3, and white shark in Section 6.1.3.5.2.

6.1.3.3 Invertebrates

6.1.3.3.1 Canadian RV Trawl Surveys

Canadian RV trawls found 32 species of invertebrates within the boundary of the Project Area, the majority of which were shrimp species (Table 6.3). The phylum with the greatest number of species was Arthropoda, with 16 species caught within the Project Area, most of which were shrimp. Echinodermata had 12 species in the Project Area, the majority of which were sea stars. There were four mollusc species including Icelandic shrimp and various cephalopods. Corals and sponges collected in the Project Area and LAA are discussed separately in Section 6.1.2.

Further descriptions of these species can be found in the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (IAAC 2021). Distribution of invertebrate groups are described in Section 6.1.3.4.6, as well as important commercial species within the Project Area (snow crab, pink striped and northern shrimp, and short-fin squid). There are no invertebrate species of conservation concern within the Project Area or LAA.

Table 6.3 Invertebrate Species within the Project Area and Local Assessment Area (Canadian RV surveys, 2014-2018)

Phylum	Common Name	Scientific Name	CS
Arthropoda	Arctic argid	*Argis dentata*	
	Deep-sea shrimp	*Atlantopandalus propinqvus*	
	Snow crab	*Chionoecetes opilio*	X
Arthropoda	Unnamed shrimp	*Eualus belcheri*	
	Circumpolar shrimp	*Eualus gaimardii*	
	Greenland shrimp	*Eualus macilentus*	
Arthropoda	Toad crab	*Hyas araneus*	
	Toad crab	*Hyas coarctatus*	
	Toad crab (NS)	*Hyas* sp.	
	Polar lebbeid	*Lebbeus polaris*	
	Spiny lebbeid	*Lebbeus groenlandicus*	
	Hermit crab	*Pagurus* sp.	
	Pink striped shrimp	*Pandalus montagui*	X
	Northern shrimp	*Pandalus borealis*	X
	Norwegian shrimp	*Pontophilus norvegicus*	
	Porcupine shrimp	*Sabinea hystrix*	
	Sars shrimp	*Sabinea sarsi*	
	Sevenline shrimp	*Sabinea septemcarinata*	
	Sculptured shrimp	*Sclerocrangon boreas*	
	Warrior shrimp	*Sclerocrangon ferox*	
	Friendly blade shrimp	*Spirontocaris liljeborgii*	
	Parrot shrimp	*Spirontocaris spinus*	
Echinodermata	Common seastar	*Asterias rubens*	
	Cushion star	*Ceramaster granularis*	
	Spiny sunstar	*Crossaster papposus*	
	Mud star	*Ctenodiscus crispatus*	
	Common sand dollar	*Echinarachnius parma*	
	Northern basket star	*Gorgonocephalus arcticus*	
	Unnamed blood star	*Henricia* sp.	
	Rigid cushion star	*Hippasteria phrygiana*	
	Polar seastar	*Leptasterias polaris*	
	Daisy brittle star	*Ophiopholis aculeata*	
	Unnamed brittle star	*Ophiura sarsii*	
	Smooth sunstar	*Solaster endeca*	
	Green sea urchin	*Strongylocentrotus droebachiensis*	

Table 6.3 Invertebrate Species within the Project Area and Local Assessment Area (Canadian RV surveys, 2014-2018)

Phylum	Common Name	Scientific Name	CS
Mollusca	Cephalopod (NS)	Cephalopoda (C)	
	Icelandic scallop	*Chlamys islandica*	
	Short-fin squid	*Illex illecebrosus*	X
	Octopuses	Octopoda (O)	

Notes:
CS – commercial species
Taxonomic Groups: P – Phylum, C – Class, IC – infraclass, O – Order, SO – Suborder, F – Family
Commercial fish status is drawn from DFO (2019a) and NAFO (2022)

6.1.3.3.2 Environmental Effects Monitoring Programs

Hebron

In addition to the Campelen 1200 trawls targeting American plaice (see Section 6.1.3.1.2), scallop dredges were conducted to target Icelandic scallop (EMCP 2016). Four scallop dredge tows were conducted at the planned Hebron GBS site, six tows at the planned EDC site, and four at the planned GBS reference area. However, no Icelandic scallop were caught at the GBS reference area and no results are reported here. Catch data from the planned EDC reference is not included here as detailed in Section 6.1.3.1.2.

Overall, far more invertebrates were caught using the scallop dredge compared to the Campelen 1200 trawl net (Table 6.4). The dominant invertebrate in scallop dredges at both the planned GBS and EDC locations was a sea urchin (*Strongylocentrotus* sp.), followed by the spiny sunstar and an unidentified shrimp at the GBS and the common sand dollar and unidentified barnacles at the planned EDC site. The dominant invertebrate in Campelen trawls at both areas was northern shrimp, with low abundances of toad crabs, pink striped shrimp, snow crab, hermit crabs, and other unidentified groups recorded.

Table 6.4 Invertebrate Species by Abundance per Tow (Campelen and scallop dredge) during the 2015 Hebron Fish Characterization Study

Site[1]	Phylum	Common Name	Scientific Name	CPUE (# / tow)[2, 3]	
				Dredge	Campelen
Hebron GBS (93-94 m)	Echinodermata	Sea urchin	*Strongylocentrotus* sp.	>3,333	0
	Echinodermata	Spiny sunstar	*Crossaster papposus*	66	0
	Arthropoda	Unidentified shrimp	-	16	0
	Cnidaria	Sea strawberry	*Gersemia* sp.	15	0
	Arthropoda	Toad crab	*Hyas araneus*	12	<1
	Annelida	Nereis worm	-	11	0
	Arthropoda	Barnacles	-	10	0
	Echinodermata	Orange-footed sea cucumber	*Cucumaria frondosa*	6	0
	Echinodermata	Common sand dollar	*Echinarachnius parma*	6	0
	Arthropoda	Northern shrimp	*Pandalus borealis*	1	4

Table 6.4 Invertebrate Species by Abundance per Tow (Campelen and scallop dredge) during the 2015 Hebron Fish Characterization Study

Site[1]	Phylum	Common Name	Scientific Name	CPUE (# / tow)[2, 3]	
				Dredge	Campelen
Hebron GBS (93-94 m)	Arthropoda	Snow crab	*Chionoecetes opilio*	1	0
	Echinodermata	Common seastar	*Asterias* sp.	1	0
	Mollusca	Unidentified bivalve	-	1	0
	Mollusca	Surf clam	*Spisula solidissima*	<1	0
	Arthropoda	Pink striped shrimp	*Pandalus montagui*	0	2
	Echinodermata	Unidentified	-	0	<1
	Arthropoda	Hermit crab	*Pagurus* sp.	0	<1
Hebron EDC (95-99 m)	Echinodermata	Sea urchin	*Strongylocentrotus* sp.	>583	<1
	Echinodermata	Common sand dollar	*Echinarachnius parma*	>500	0
	Arthropoda	Barnacles	-	>220	0
	Mollusca	Icelandic scallop	*Chlamys islandica*	68	0
	Arthropoda	Snow crab	*Chionoecetes opilio*	25	<1
	Arthropoda	Toad crab	*Hyas araneus*	23	<1
	Echinoderma	Polar seastar	*Lepasterias polaris*	9	0
	Cnidaria	Sea strawberry	*Gersemia* sp.	5	0
	Mollusca	Whelk	*Buccinum* sp.	4	0
	Echinodermata	Spiny sunstar	*Crossaster papposus*	2	0
	Echinodermata	Common seastar	*Asterias* sp.	2	0
	Chordata	Sea squirt	-	1	0
	Mollusca	Surf clam	*Spisula solidissima*	1	0
	Cnidaria	Sea anemone	-	1	0
	Arthropoda	Northern shrimp	*Pandalus borealis*	1	55
	Arthropoda	Hermit crab	*Pagurus* sp.	<1	0
	Annelida	Nereis worm	-	<1	0
	Mollusca	Unidentified bivalve	-	<1	0
	Annelida	Unidentified polychaete	-	<1	0
	Porifera	Sponge	-	<1	0
	Arthropoda	Unidentified shrimp	-	0	<1

Source: EMCP 2016

Notes:

[1] Seven Campelen tows were completed at the planned Hebron GBS and 8 at the planned Hebron EDC, and four scallop dredges were completed at the planned Hebron GBS and six at the planned Hebron EDC

[2] Tows were 15 minutes in length using a Campelen 1200 trawl net (Campelen) or scallop dredge (Dredge)

[3] Large values or organisms difficult to distinguish individuals are simply reported as ># (typically over 100 individuals but may be lower (e.g., barnacles)

Terra Nova

Though trawl catch species data are not reported for Terra Nova, invertebrates found in sediment cores are identified and enumerated (Suncor Energy 2017a, 2017b). Sediment cores (0.1 m^2 in area) are sieved, and the invertebrates are preserved in isopropyl alcohol. As Terra Nova has been in operation for many years, only data from 2014 for the southwest reference area (within the Project Area) located 20 km southwest of the FPSO is used here to avoid any potential contamination from operations affecting community structure. The most common infaunal species in both sediment cores from station 1SW was an unidentified marine oligochaete (Table 6.5). For core 1, the second and third most abundant species were the polychaetes *Chaetozone setosa* and *Exogone hebes*, and for core 2 the second and third most common species were the amphipod *Ampelisca macrocephala* and the polychaete *Chaetozone setosa*. These findings appear consistent with previous reports from Terra Nova for stations greater than 1.5 km from the nearest drill centre, as changes in community are noted closer to the FPSO (Paine et al. 2014).

Table 6.5 Benthic Community Identification and Abundance from Terra Nova Station 1SW in 2014

Phylum	Class	Family	Species	Station 1SW	
				Core 1 (#)	Core 2 (#)
Annelida	Polychaeta	Capitellidae	*Capitella capitata*	1	
		Cirratulidae	*Chaetozone setosa*	37	10
		Opheliidae	*Ophelia limacina*	6	3
			Travisia forbesi		1
		Orbiniidae	*Scoloplos armiger*	7	3
		Phyllodocidae	*Eteone longa*	1	
		Sabellidae	*Pseudopotamilla* sp.	2	
		Spionidae	*Polydora cornuta*	1	
			Prionospio steenstrupi	3	1
			Spio filicornis		1
		Syllidae	*Exogone hebes*	23	4
			Streptosyllis varians	1	
	Oligochaeta	-	Marine oligochaete A	94	52
			Marine oligochaete B	2	
Arthropoda	Copepoda	-	Copepoda indet	1	
	Tanaidacea	Paratanaidae	Anthuridae	3	6
	Amphipoda	Ampeliscidae	*Ampelisca macrocephala*	10	14
		Dexaminidae	*Guernea nordenskioldi*	1	
		Oedicerotidae	*Synchelidium americanum*	1	

Table 6.5 Benthic Community Identification and Abundance from Terra Nova Station 1SW in 2014

Phylum	Class	Family	Species	Station 1SW	
				Core 1 (#)	Core 2 (#)
Mollusca	Pelecypoda	Astartidae	*Astarte borealis*	4	3
		Hiatellidae	*Cyrtodaria siliqua*	4	4
		Kelleidae	*Kellia suborbicularis* *		1
		Veneridae	*Mercenaria mercenaria*	2	
		Mytilidae	*Crenella faba*	1	2
		Tellinidae	*Macoma calcarea* juvs.	2	
			Tellina sp.	1	
		Solenidae	*Siliqua costata*	1	1
Echinodermata	Echinoidea	Echinarachnidae	*Echinarachnius parma*	1	2
			Total #	210	108
			Wet weight (g)	294.57	132.54

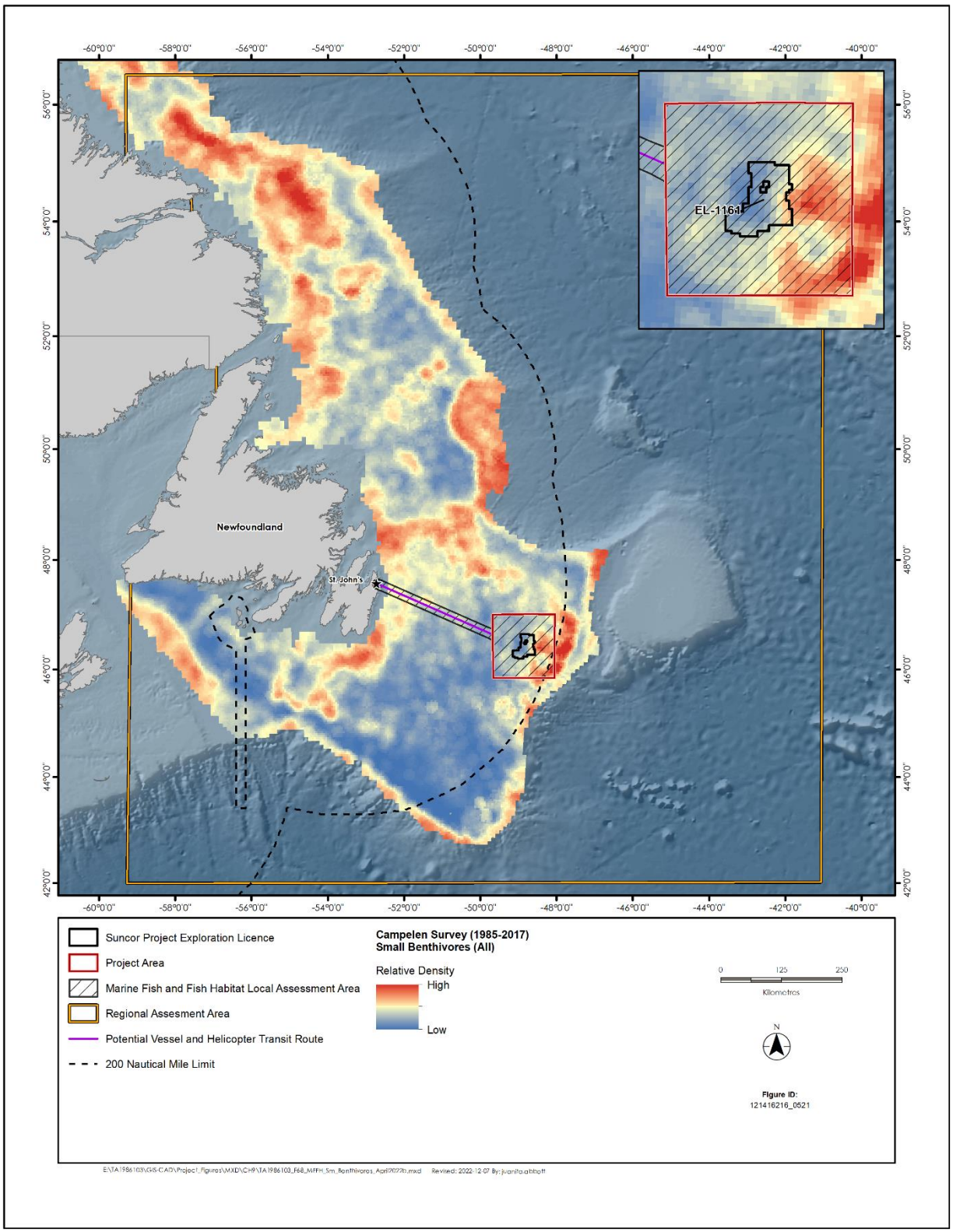
Source: Suncor Energy (2017b)
Note: *Tentative identification

6.1.3.4 Local Assessment Area Species Information

All finfish species caught in the Local Assessment Area (which includes Project Area) between 2014 and 2018 belong to one of six functional groups (see details in Section 6.1.3.1.1). Species at risk (SAR) / species of conservation concern (SOCC) and commercial finfish species are discussed in the context of their functional groups, with additional detailed descriptions included. Invertebrate species were chosen based on their commercial importance, and these species are snow crab and shrimp (northern and pink striped). Additional details for species at risk and species of Indigenous concern can be found in Sections 6.1.3.5 and 6.1.3.6, with detailed information on wolffish species (Atlantic, northern and spotted), white shark, American eel, Atlantic salmon, swordfish, and tuna species (bigeye, Atlantic bluefin, and albacore).

6.1.3.4.1 Small Benthivores

Dominant small benthivores on the Grand Banks includes alligatorfish, blacksmelt, sculpins, lumpfish, rockling, snailfish, shannys, grenadiers, blennys, and dragonfish (Wells et al. 2021). Regionally, small benthivores are typically associated with Grand Bank areas and shelf edges (Wells et al. 2021). Areas of higher density are along the eastern shelf edge in the Project Area and LAA (Figure 6-10). Along the LAA corridor to shore, small benthivore density is lower along the Grand Banks shelf and relatively higher near the coast. Trawl data on small benthivore species within the Project Area and LAA were not available. While these species are likely captured during the survey, the data are not up to species identification standards and therefore the species are not reported in available datasets. Based on Project Area depths, small benthivore species groups in the Project Area likely include alligatorfish, lumpfish, sculpins, snailfish, and shannys.



Source: Wells et al. 2021

Figure 6-10 Average Relative Density of Small Benthivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

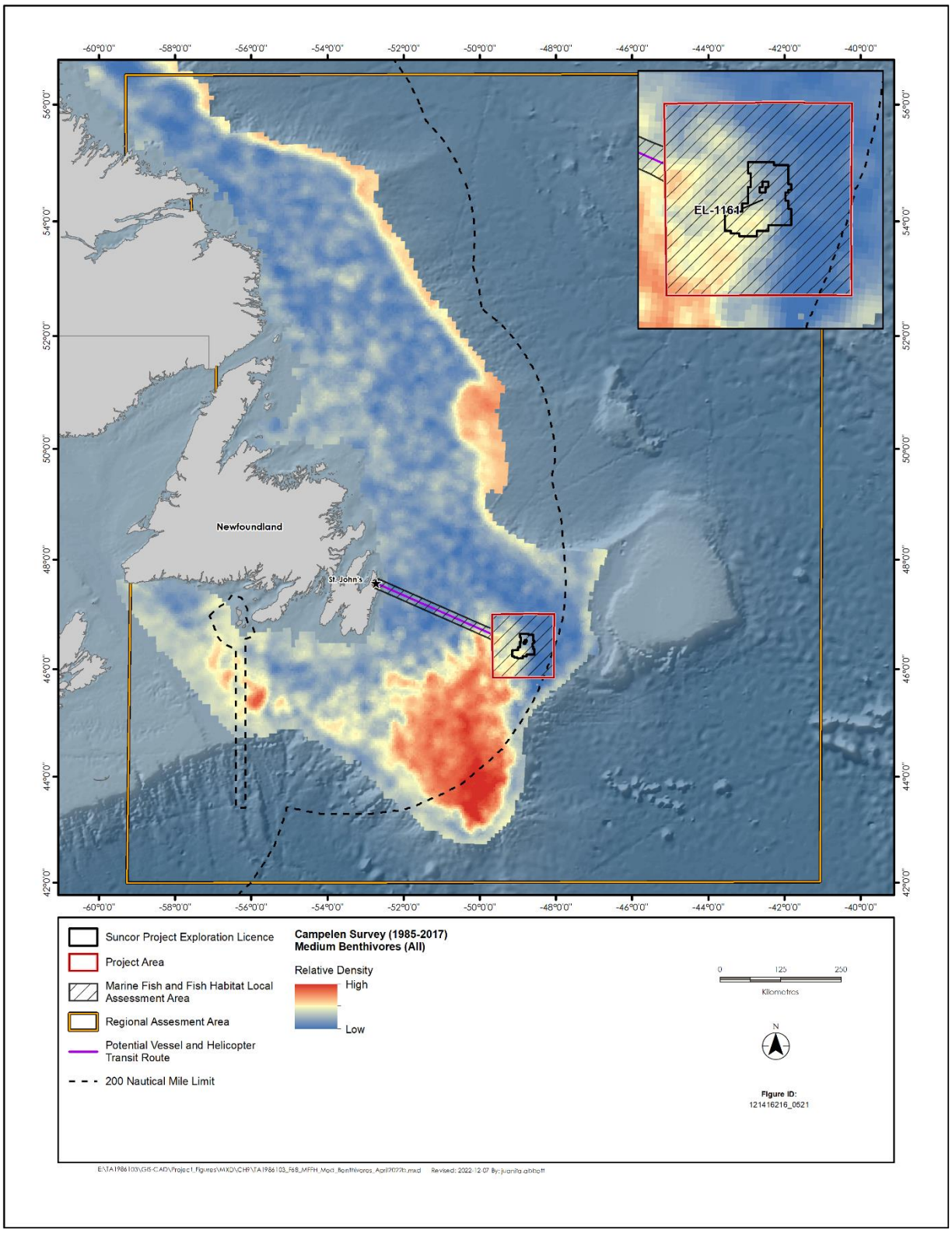
As small benthivores, these species feed mostly on demersal invertebrates. These typically include, but are not limited to, polychaetes, amphipods, crustaceans, molluscs, mysids, and cumaceans (Coad and Reist 2018). They are eaten by cod and other fish as well as seabird species and are important links in the food web between small invertebrates (typically detritivores or filter feeders) and piscivores. As these species are not of commercial importance, relatively little is known of their life histories. These species are typically found from the subtidal to approximately 100 m deep, though many can be found deeper (the gelatinous snailfish has been recorded down to 1,880 m). Species for which reproduction is known mainly lay benthic eggs, with pelagic larvae (Scott and Scott 1988; Coad and Reist 2018). Like many species on the Grand Banks with planktivorous larvae, their spawning and the release of juveniles is timed to coincide with the spring plankton bloom (Dalley et al. 2000, in Husky 2018; Coad and Reist 2018). Several sculpin species also spawn in the summer months and time their release with the fall bloom (Coad and Reist 2018). There were no small benthivore SAR / SOCC or commercial species present in the Project Area.

6.1.3.4.2 Medium Benthivores

Three species of medium benthivores in two different families were caught in Canadian RV trawl surveys within the Project Area between 2016 and 2020 (Figure 6-11). Two species of flatfish (Pleuronectidae) were caught in the Project Area and LAA, witch and yellowtail flounder, both of which are commercial species and discussed further below. Flatfishes were found along the slope edges, the Northeast Newfoundland Shelf, south of Newfoundland, and on the southern Grand Banks. One species of lumpsucker (Cyclopteridae) was recorded, the common lumpfish, which is also a commercial species and species at risk. Lumpfish were found in trawls south of Newfoundland and throughout the Northeast Newfoundland Shelf. Spatial analysis of the Canadian RV trawl surveys from 1995-2017 by Wells et al. (2021) indicate that the medium benthivores have higher average relative density on the southern Grand Banks (i.e., NAFO Divisions 3NO), mainly outside the Project Area and LAA. Southeastern areas within the Project Area and LAA have relatively higher densities of medium benthivores. The distribution on the southern Grand Banks is driven by dominant medium benthivores (top 90% biomass) including flounder (yellowtail, witch), blue hake, lumpfish, longhorn sculpin, roundnose grenadier, and smooth skate (Wells et al. 2021). Relatively higher medium benthivore density occurs in the southwest area of the Project Area.

Similar to small benthivores, medium benthivores consume benthic invertebrates such as polychaetes, crustaceans, cumaceans, echinoderms, bivalves, and mysids (Coad and Reist 2018). Many will also opportunistically consume small fish such as capelin and sand lance, with the sea raven in particular known to shadow the migrations of capelin to their spawning grounds inshore (Carscadden 1983). These fish are in turn consumed by larger predators, and as such are important food web links between small fish / invertebrates and piscivores.

The three medium benthivores are also commercial species: witch flounder, yellowtail flounder, and common lumpfish (typically harvested for roe). Lumpfish have adhesive benthic eggs and pelagic larvae, and witch and yellowtail flounder have buoyant pelagic eggs (Scott and Scott 1988, Coad and Reist 2018). These species spawn in spring and summer (lumpfish, witch flounder, yellowtail flounder). These species range from the subtidal to approximately 200 m deep, though several can be found much deeper (witch flounder have been recorded down to 1,569 m) (Coad and Reist 2018). Yellowtail flounder, witch flounder, and lumpfish are further discussed below as either commercial species and / or species at risk.



Source: Wells et al. 2021

Figure 6-11 Average Relative Density of Medium Benthivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

Witch Flounder

Witch flounder are a demersal benthivore that is distributed along the Northeast Newfoundland Shelf, slope edges of the Grand Banks, and south of Newfoundland (Figure 6-12). They are typically encountered in deeper, colder water than other flatfish species on the Grand Banks (Coad and Reist 2018). They typically consume crustaceans, polychaetes, snails, molluscs, brittle stars, and small fishes (Coad and Reist 2018). They are consumed by large piscivores such as sharks and marine mammals, and are a commercial species (Bowen et al. 2002). Dense pre-spawning aggregations are observed in the winter months in deep, relatively warmer waters. Spawning is typically in spring and early summer, with up to three million floating eggs produced (Coad and Reist 2018). Larvae are pelagic, with juveniles occupying shallower habitats than the larger adults.

Yellowtail Flounder

Yellowtail flounder are a demersal benthivore that is distributed across most of the southern Grand Banks (Figure 6-13). They typically occupy shallower habitats and warmer waters than other species of flatfish in the Newfoundland offshore area (Scott and Scott 1988). They consume small invertebrates such as polychaetes, amphipods, cumaceans, as well as small amounts of fish such as sand lance and capelin (Scott and Scott 1988). They are consumed by large predators (Bowen et al. 2002), and there is a directed commercial fishery. They are also frequently caught as by-catch in other fisheries such as for witch flounder. Reproduction takes place in spring or early summer, with pelagic eggs and larvae drifting in currents before metamorphosing into adults (Scott and Scott 1988). They were recorded in large numbers of trawls from 2014 to 2018 across the southern Grand Banks, south of Saint Pierre and Miquelon, and around the Burin Peninsula (Figure 6-13). The Southeast Shoal ecologically and biologically significant area (EBSA) on the southern Grand Banks is an important nursery area for this species (Ollerhead et al. 2017; Wells et al. 2019). Few were caught in trawls near the Flemish Pass or the northeast Newfoundland Shelf.

Common Lumpfish

Common lumpfish are a demersal benthivore with a characteristic suction cup disk on its ventral side. Adults are found near-shore during the summer months for spawning, with males remaining to guard eggs. Young common lumpfish are typically pelagic, though they become increasingly benthic as they grow. They are typically benthic as adults, though they may be benthopelagic and can live several kilometres from shore (Coad and Reist 2018). Common lumpfish typically consume crustaceans, comb jellies, arrow worms, and small fish, though they do not feed during breeding season or during egg guarding (Coad and Reist 2018). They are listed as Threatened under COSEWIC, and a small commercial fishery exists mainly for their roe (COSEWIC 2019). They are found in Canadian RV trawls throughout the Northeast Newfoundland Shelf, south of Newfoundland, and sporadically throughout the northern Grand Banks (Figure 6-14).

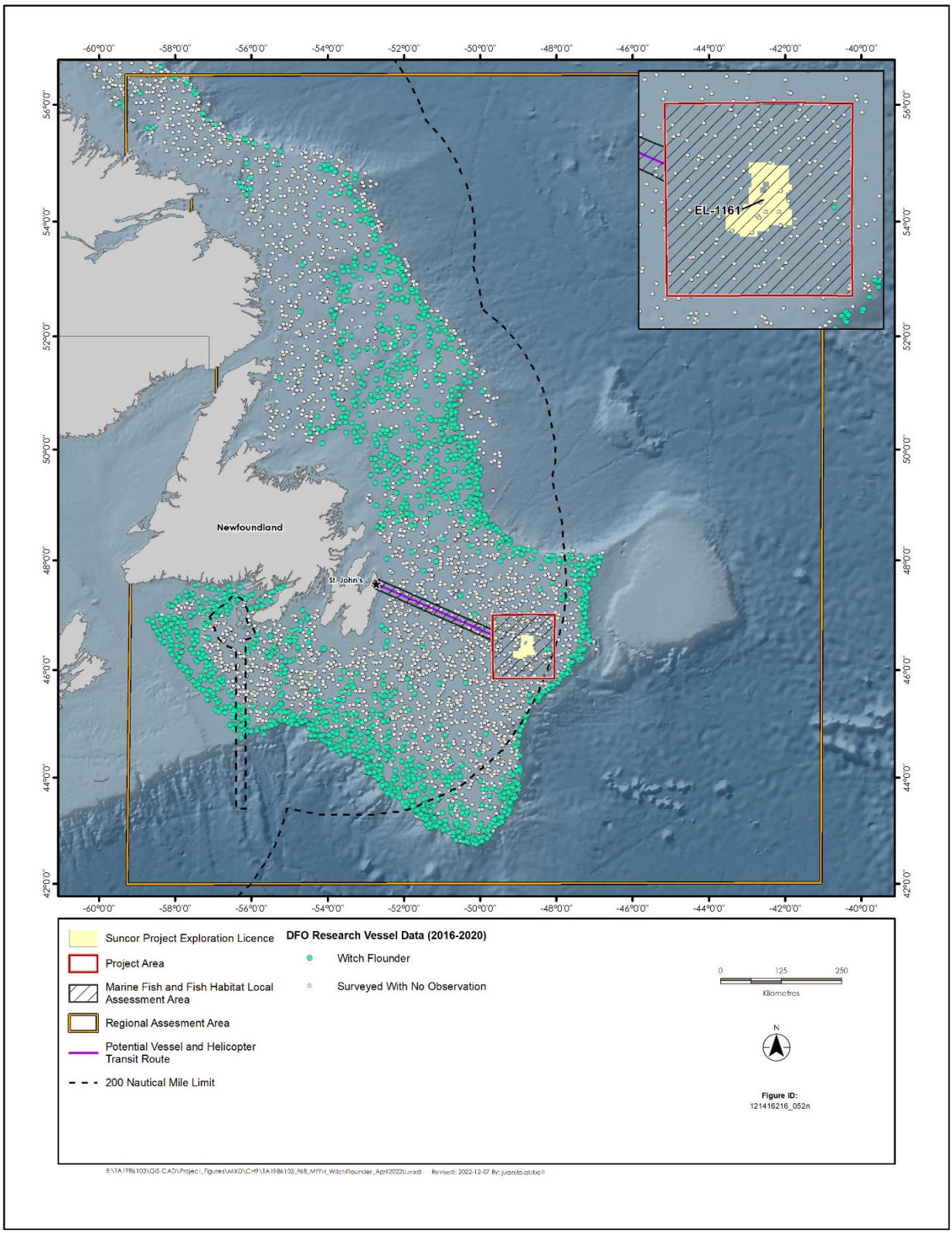


Figure 6-12 Distribution (presence / absence) of Witch Flounder within the RAA in Canadian RV Trawl Data (2016-2020)

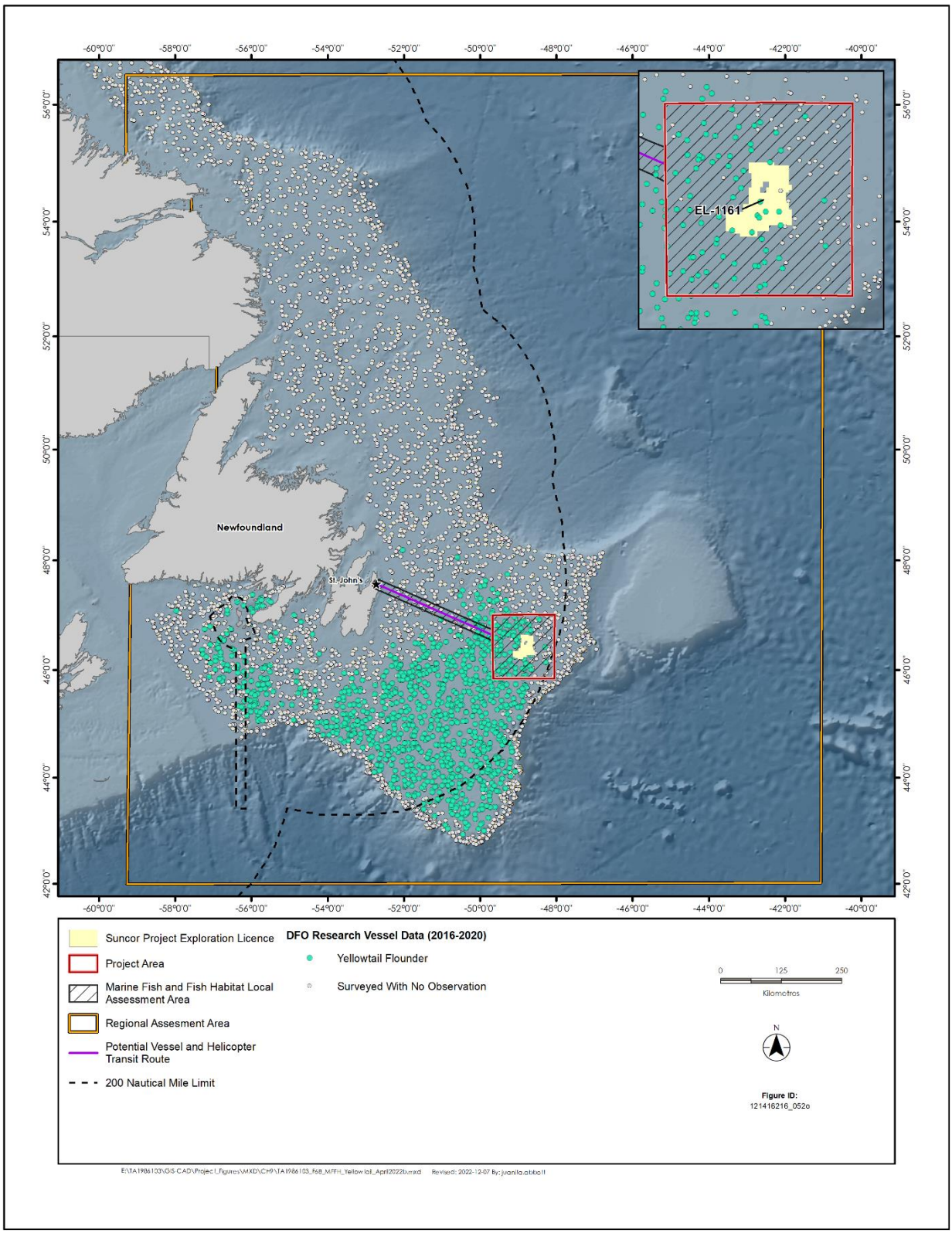


Figure 6-13 Distribution (presence / absence) of Yellowtail Flounder within the RAA in Canadian RV Trawl Data (2016-2020)

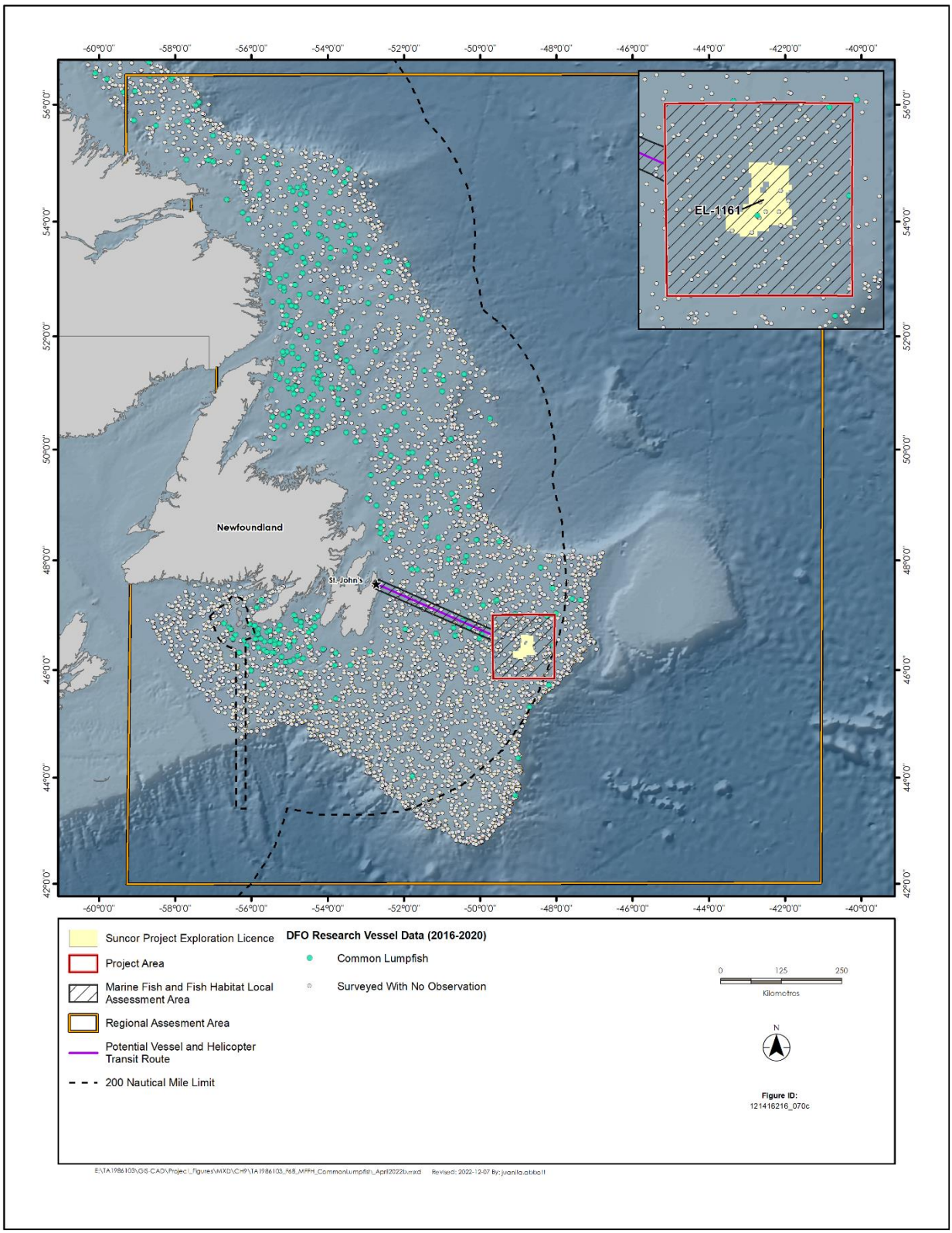
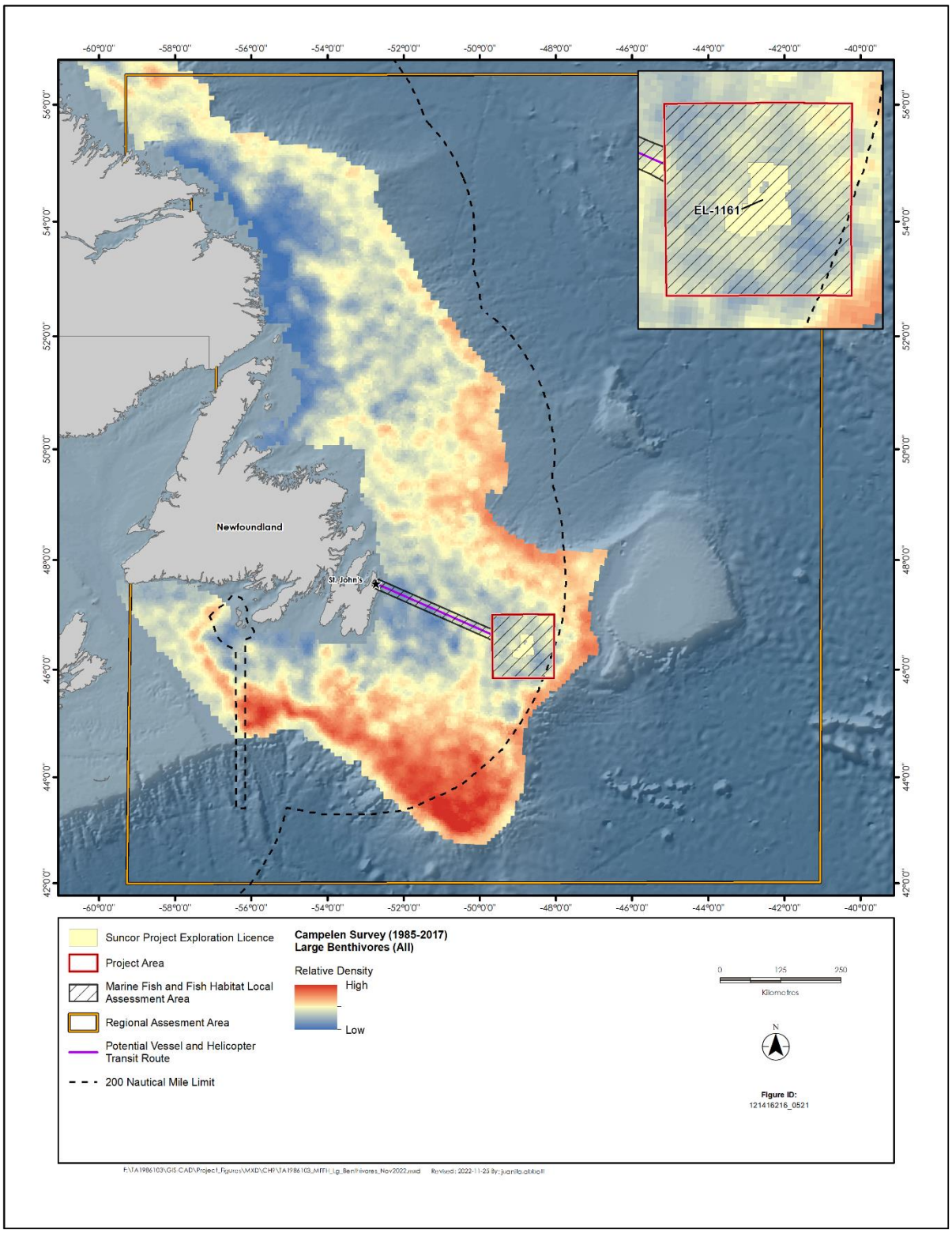


Figure 6-14 Distribution (presence / absence) of Common Lumpfish within the RAA in Canadian RV Trawl Data (2016-2020)

6.1.3.4.1 Large Benthivores

Five species of large benthivores in four different families were caught in Canadian RV trawl surveys within the Project Area and LAA between 2016 and 2020 (Figure 6-15). Two species of wolffish (Anarhichadidae) were caught in the Project Area and LAA, the northern wolffish and Atlantic wolffish. Wolffish were predominantly along the shelf edge, the Northeast Newfoundland Shelf, and throughout the southern Grand Banks. One species of grenadier (Macrouridae), the roughhead grenadier, was found in the Project Area and LAA. It was found on the slopes of the Grand Banks, in the Flemish Pass, and throughout the Northeast Newfoundland Shelf and Slopes. One species of flatfish (Pleuronectidae) was caught, American plaice. It was caught in nearly every trawl on the continental shelf in the RAA and was less common on the slopes. Large benthivores had relatively lower density in the LAA on the shelf relative to other areas of the RAA. A species of skate (Rajidae) was caught, the thorny skate. It was found in most trawls throughout the RAA, though few were caught in the central portion of the Grand Banks and inshore north of Newfoundland. American plaice, thorny skate, northern wolffish, and Atlantic wolffish are all species at risk (see Section 6.1.3.5 for details). A directed fishery exists for thorny skate, and roughhead grenadier and American plaice are retained as by-catch in other fisheries. Spatial analysis of the Canadian RV trawl surveys from 1995-2017 by Wells et al. (2021) indicate that the large benthivores are distributed throughout the Grand Banks with higher average relative density on the southern Grand Banks (i.e., NAFO Divisions 3NO). The distribution on the southern Grand Banks is driven by dominant large benthivores (top 90% biomass) including American plaice, skates (thorny, winter), roughhead grenadier, haddock and wolffish (Atlantic, spotted, northern) (Wells et al. 2021). Within the Project Area, large benthivore density is relatively low to moderate.

Large benthivores consume a variety of invertebrates including sea urchins, sea stars, polychaetes, crustaceans, snails, molluscs, and small fishes (Coad and Reist 2018). These fish are in turn consumed by piscivores, though due to their larger size many exhibit greater degrees of piscivorous feeding (e.g., the northern wolffish is considered a “fish specialist” in parts of its range) (Coad and Reist 2018). All Project Area large benthivores either commercial species or species at risk and are described further below. Thorny skates and both wolffish species have benthic eggs, while American plaice and presumably roughhead grenadier have buoyant pelagic eggs. These species all have pelagic larvae with the exception of thorny skates. Spawn time is variable, with wolffish and American plaice spawning in the late spring and summer months, roughhead grenadiers spawning throughout the late fall and winter, and the thorny skate spawning year-round. These species are typically found either on the continental shelf (American plaice, thorny skate, Atlantic wolffish), or the slopes (Atlantic wolffish, Northern wolffish, roughhead grenadier).



Source: Wells et al. 2021

Figure 6-15 Average Relative Density of Large Benthivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

American Plaice

American plaice are a demersal flatfish species distributed across shelf and slope habitats in the Northwest Atlantic (Scott and Scott 1988). They are an important link as predators and prey for larger piscivores. They feed on a variety of fish and small invertebrates, such as polychaetes and crustaceans, though wide variations exist across their range and life stages (Coad and Reist 2018). Spawning occurs in the spring, and their pelagic eggs drift in currents before hatching. Juveniles settle in shallow waters of 100 to 200 m deep on fine sediment where they can bury themselves (COSEWIC 2009). They are listed as Threatened by COSEWIC, and their main threats are overfishing and by-catch in other fisheries (COSEWIC 2009). Populations off Newfoundland have shown signs of recovery in recent decades (Nogueira et al. 2016, Pedersen et al. 2017). They are caught in trawls throughout the Grand Banks of Newfoundland to the shelf's edge (Figure 6-16). Their presence in trawls diminishes further north, though they are still found throughout the northeast Newfoundland Slope and on the Labrador Shelf.

Thorny Skate

Thorny skates are demersal benthivores that consume decapods, euphasiids, polychaetes, squid, and fish such as capelin and sand lance. They are one of the most common skate species found on the Grand Banks, and they are distributed from 18 m to 1,400 m depth on various bottom types ranging from mud to gravel (Scott and Scott 1988). Recent distribution modelling for the southern Grand Banks indicates that thorny skates prefer habitats between 38 to 200 m on low complexity substrates with sea bottom temperatures of -0.5°C to 3°C (Pennino et al. 2019). They lay demersal eggs year-round, and juveniles occupy benthic habitats as well. The occurrence of this species on the Grand Banks has declined up to 68% between the 1970s to 1990s (Pennino et al. 2019). COSEWIC lists thorny skates as special concern, with their main threat of commercial by-catch mortality (COSEWIC 2013). They were present in trawls throughout most of the RAA, with few caught in the central Grand Banks and inshore and slopes of the Northeast Newfoundland Shelf (Figure 6-17).

Roughhead Grenadier

Grenadiers are a long-lived and slow-growing species found on slopes and deep-sea abyssal habitats (COSEWIC 2018, Orlov et al. 2018). Young grenadiers are planktivores, and adults are benthivores that consume greater amounts of other fish as they age (Parzanini et al. 2017). Typical food for adults is squid, shrimp, and a variety of small fish, though a variety of other invertebrates have been reported as well (Coad and Reist 2018). Roughhead grenadier were previously listed as Special Concern by COSEWIC, though it currently has no status due to improvements in their numbers after the introduction of by-catch management plans in other fisheries (e.g., Greenland halibut). Though no directed commercial fishery exists, they are retained as by-catch as part of other fisheries. They are typically caught between 200 m and 2,000 m, with preference for depths in the middle of that range (Simpson et al. 2017, Coad and Reist 2018, COSEWIC 2018). Within the RAA they are typically caught along the slopes of the Grand Banks, Flemish Pass, and Northeast Newfoundland Shelf slopes, though further north they are also caught on the continental shelf (Figure 6-18).

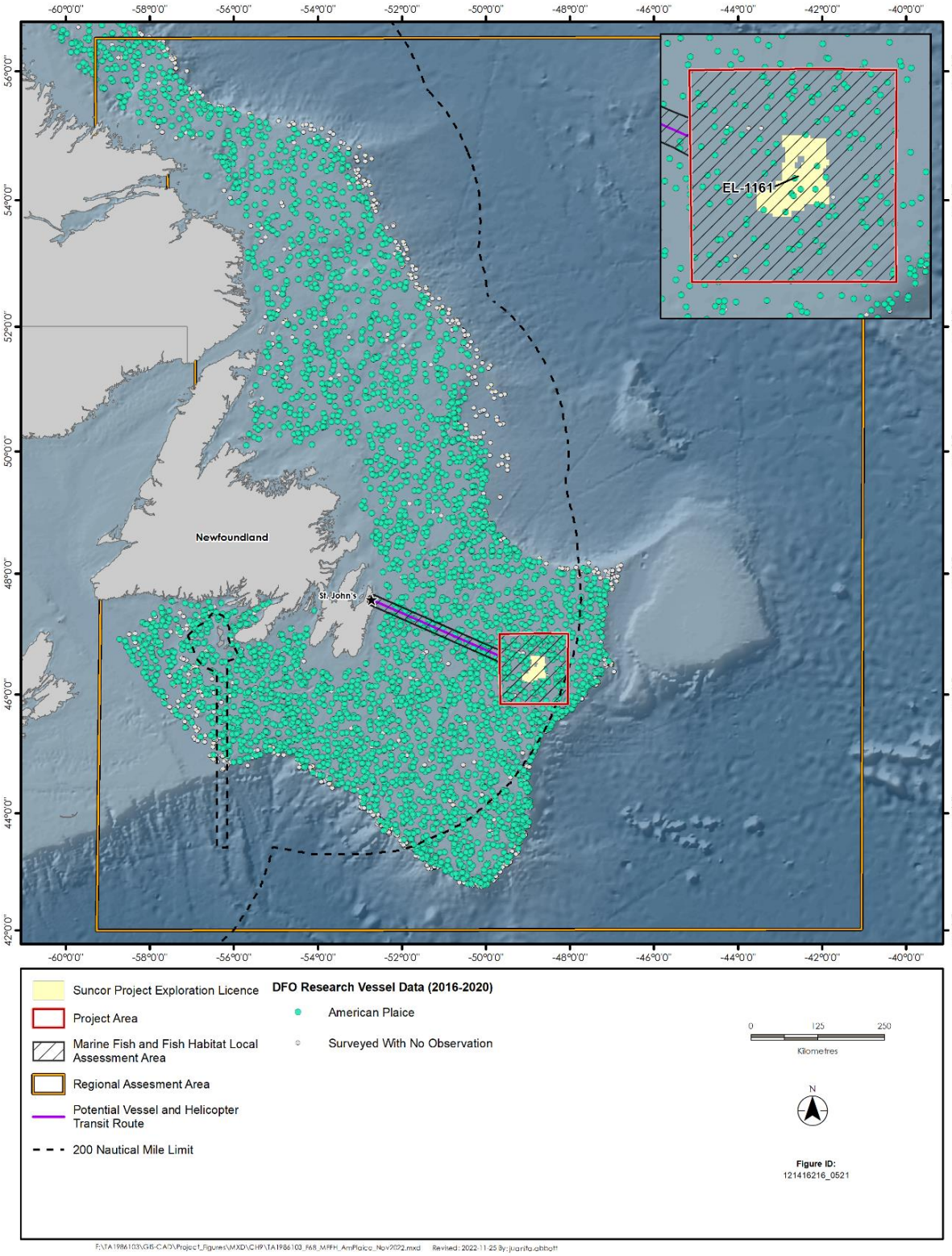


Figure 6-16 Distribution (presence / absence) of American Plaice within the RAA in Canadian RV Trawl Data (2016-2020)

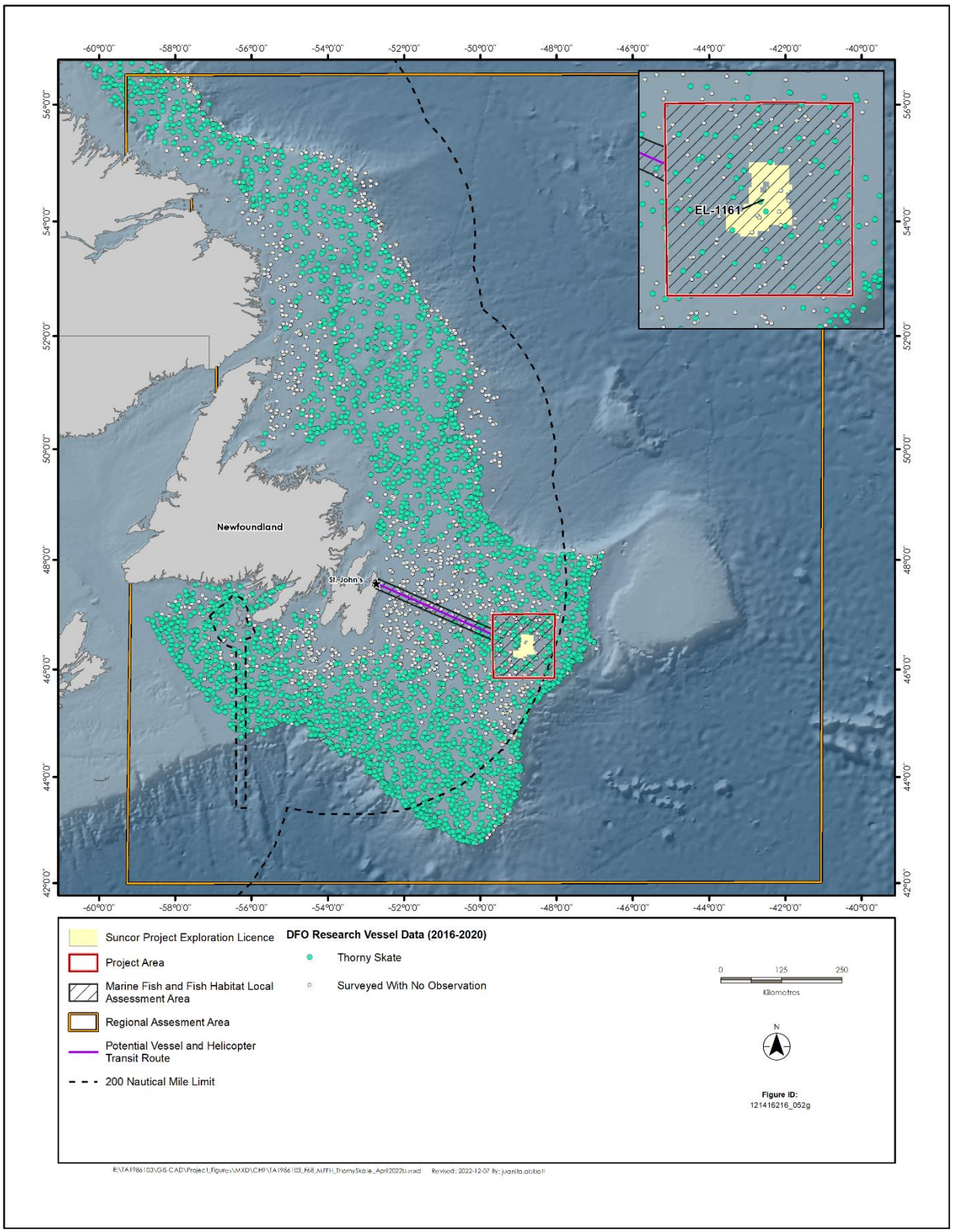


Figure 6-17 Distribution (presence / absence) of Thorny Skate within the RAA in Canadian RV Trawl Data (2016-2020)

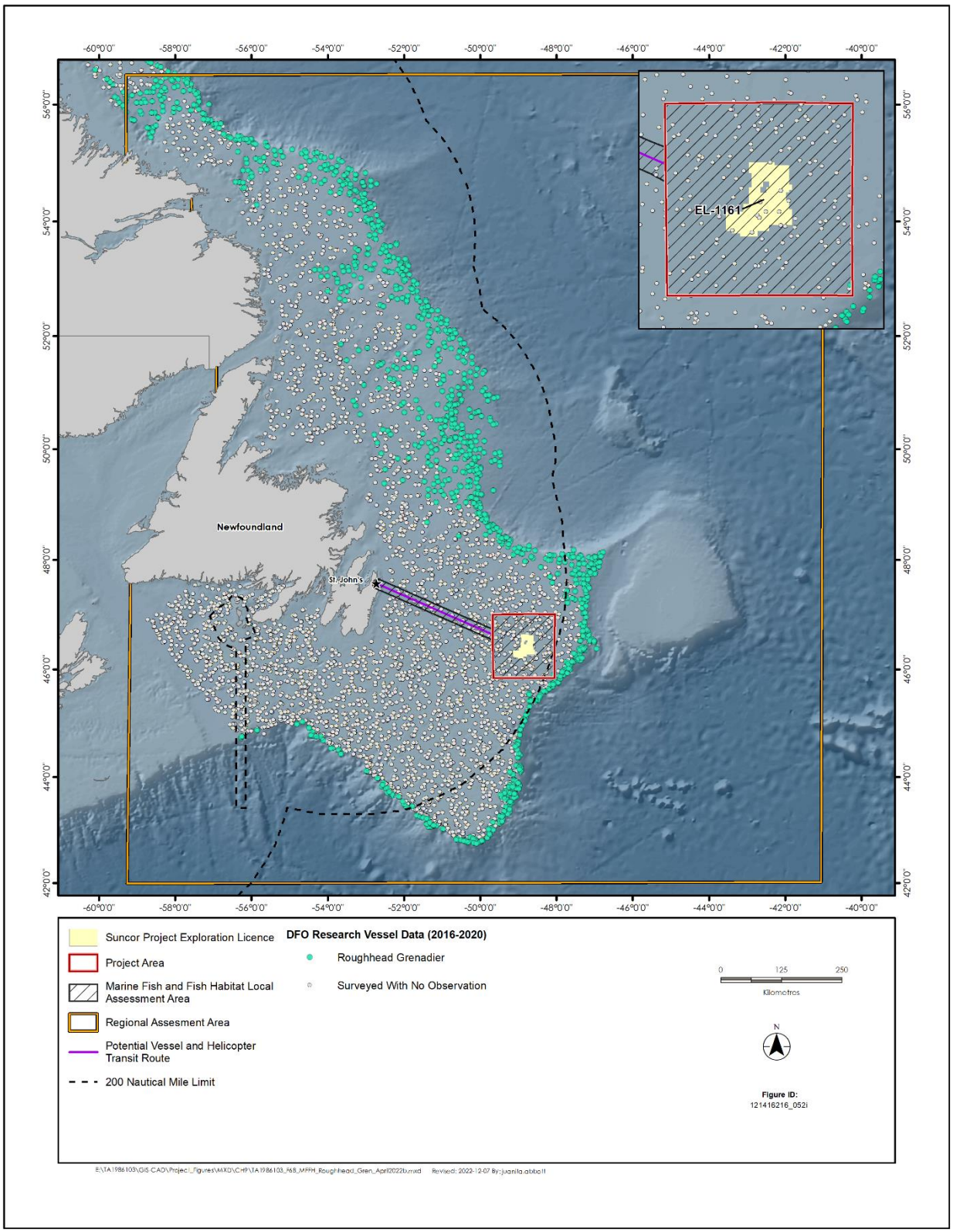


Figure 6-18 Distribution (presence / absence) of Roughhead Grenadier within the RAA in Canadian RV Trawl Data (2016-2020)

Northern Wolffish

Northern wolffish are large benthivores that are typically caught along the shelf edge and slopes in Canadian RV trawls (Figure 6-19). Further north along the Newfoundland Shelf they occupy shallower regions. They consume echinoderms, crustaceans, molluscs, and a variety of fish species (Coad and Reist 2018). They are long-lived and slow-growing, and as such are vulnerable to threats. Populations declined heavily (>85%) from the mid-1970s to the mid-1990s, with a small positive trend beginning after the mid-1990s (COSEWIC 2012a). Their main threats are by-catch from commercial fisheries as well as habitat alteration or destruction. Recovery strategies and management plans for the northern wolffish have identified critical habitat along the northern Grand Banks and Newfoundland Shelf to the north of the Project Area and LAA (Figure 6-19). These were identified based on known water depths and habitat preferences and overlap with the majority of their catches in Canadian RV trawls. These areas are known to contain features that should allow for their recovery and survival based on current knowledge (DFO 2020a).

Atlantic Wolffish

Atlantic wolffish are large benthivores found in Canadian RV trawls along the slopes and shelf of the Grand Banks and Northeast Newfoundland Shelf (Figure 6-20). Unlike spotted and northern wolffish, they are encountered more frequently on the shelf, possibly as a consequence of their migrations inshore to spawn. (including within the LAA) Eggs are laid near shore and guarded by males, and larvae are pelagic (Coad and Reist 2018). As a long-lived and slow-growing species, they are vulnerable to stressors. Due to steep declines in their populations they are listed as Special Concern by SARA and COSEWIC, though small recoveries have been noted since the 1990s (COSEWIC 2012b). Their main threats are by-catch from commercial fisheries as well as habitat alteration or destruction. Though listed under Schedule 1 of SARA, no critical habitat is established for Atlantic wolffish as it is not a requirement for species designated as Special Concern.

6.1.3.4.2 Piscivores

Two species of piscivore from two families were caught in Canadian RV trawl surveys within the Project Area between 2017 and 2021 (Figure 6-21). Nearly every trawl in the RAA caught one of these two species. Atlantic cod (Gadidae) and Greenland halibut (Pleuronectidae) were both caught within the Project Area. Atlantic cod were caught in most trawls on the continental shelf, from the south of Newfoundland to the Labrador Shelf, but were less common along the slopes. Greenland halibut were typically caught on the shelf edge and slopes of the Grand Banks, though on the Northeast Newfoundland Slope and further north they were commonly caught on the shelf. Spatial analysis of the Canadian RV trawl surveys from 1995-2017 by Wells et al. (2021) indicates that the piscivores have higher average relative density on the northern Grand Banks (i.e., NAFO Divisions 2J3K) outside the Project Area and LAA.

As they consume primarily other fish species, piscivores play important roles as large and apex predators. They exhibit top-down control on species in lower trophic levels, and their removal from an ecosystem can lead to trophic cascades (Frank et al. 2005). For example, the collapse of Atlantic cod and other groundfish stocks in the late 1980s and 1990s led, at least in part, to substantial increases in shrimp biomass due to the removal of predation pressure (Lilly et al. 2000). They are also an important food source for larger predators, such as Greenland sharks and marine mammals.

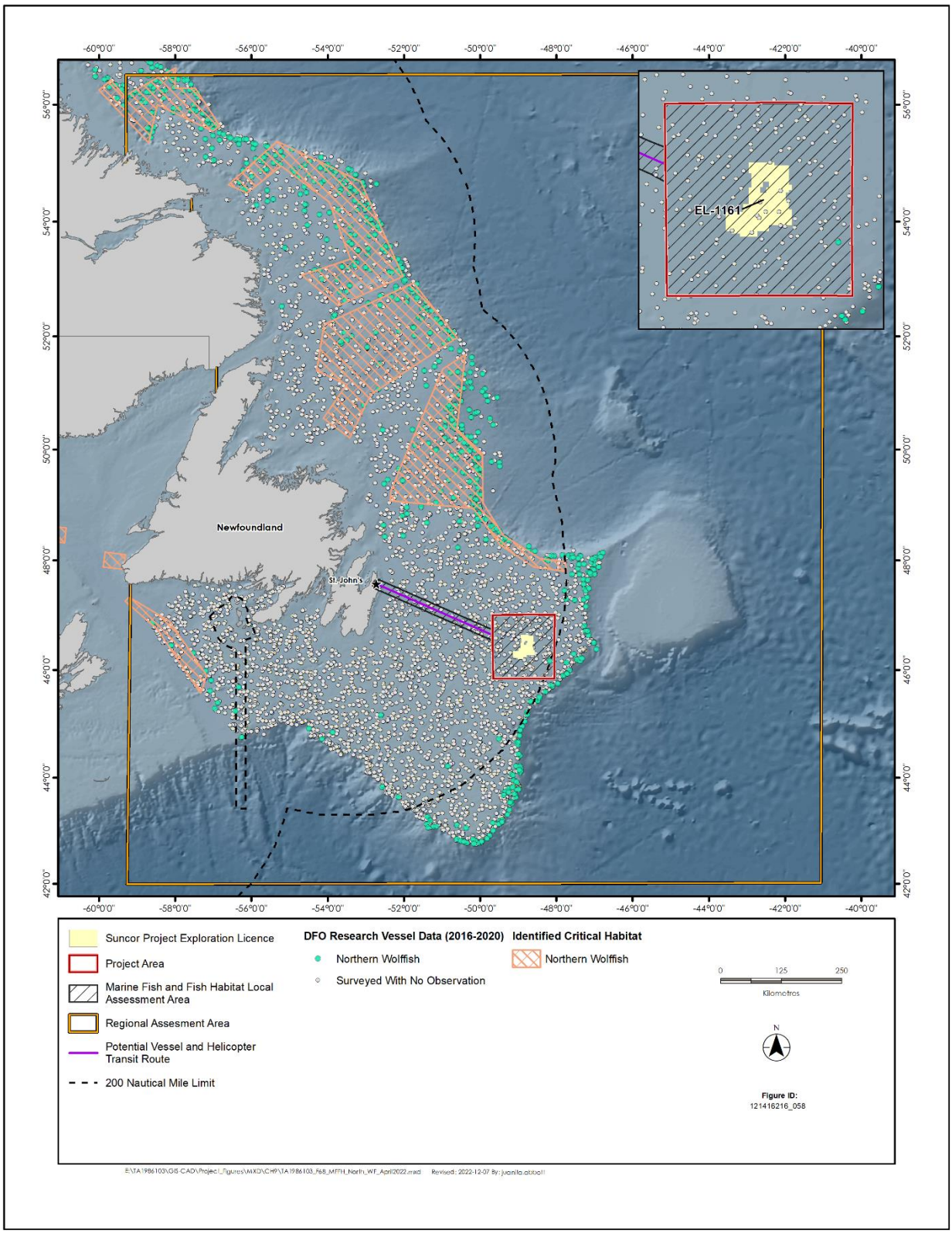


Figure 6-19 Distribution (presence / absence) of Northern Wolffish and Identified Critical Habitat within the RAA in Canadian RV Trawl Data (2016-2020)

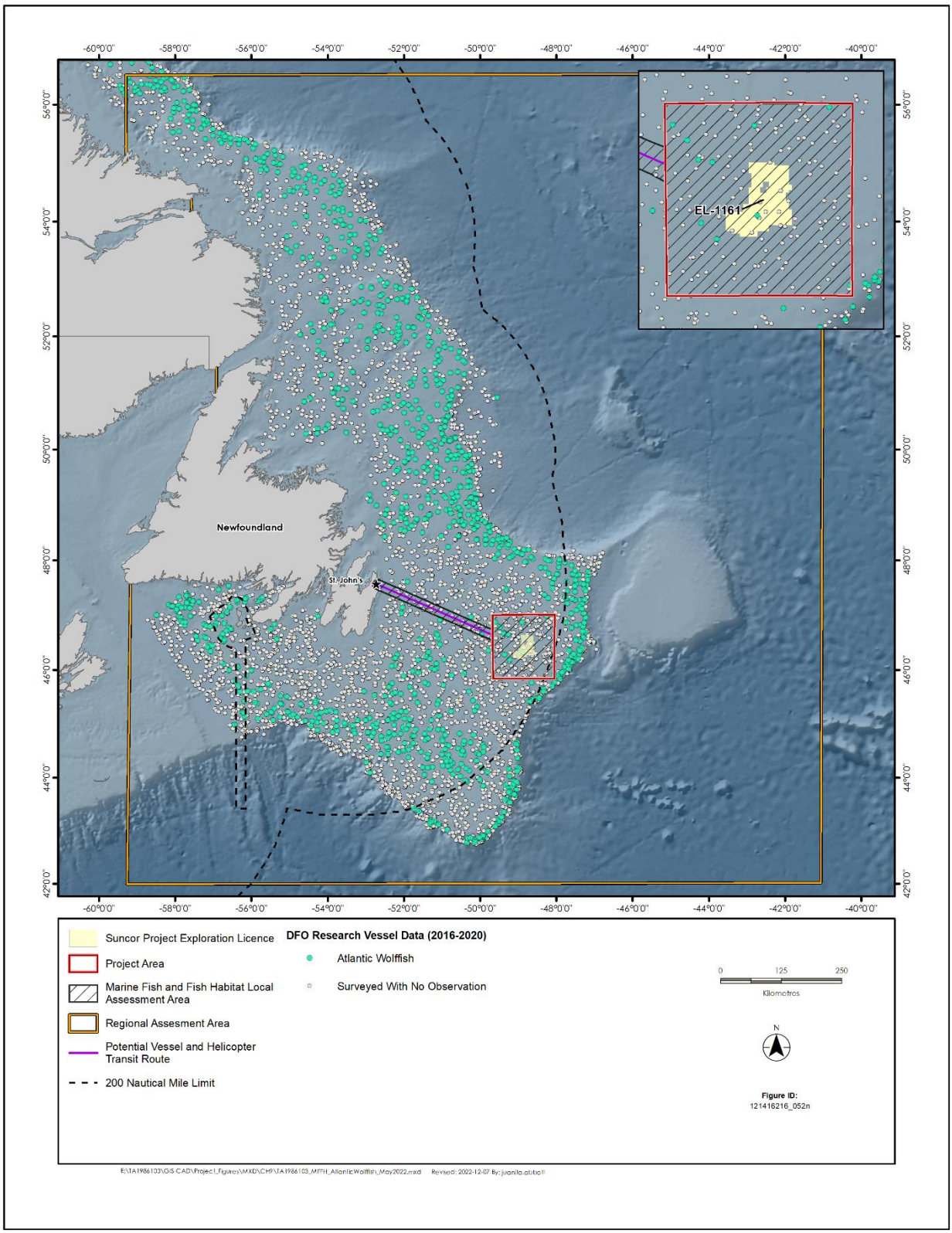
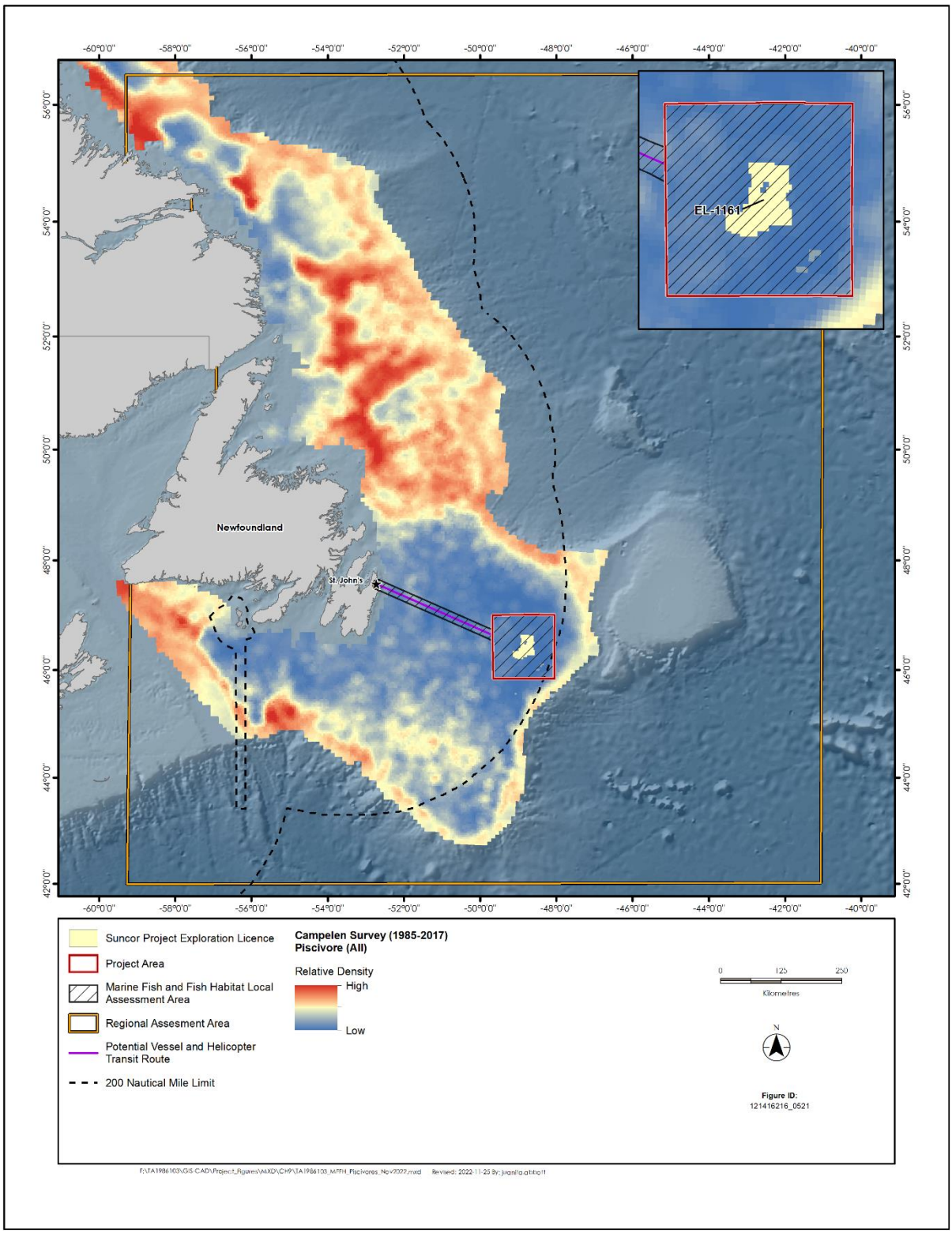


Figure 6-20 Distribution (presence / absence) of Atlantic Wolffish within the RAA in Canadian RV Trawl Data (2016-2020)



Source: Wells et al. 2021

Figure 6-21 Average Relative Density of Piscivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

Both Atlantic cod and Greenland halibut consume a variety of fish species, such as American plaice, capelin, grenadiers, redfish, hake, and young of both species, as well as a many benthic and pelagic invertebrates such as decapods, squid, and hyperiids (COSEWIC 2010a, Coad and Reist 2018). Both species are commercially caught, with Atlantic cod mostly as by-catch due to slow recovery after their collapse. Atlantic cod are also designated as Endangered by COSEWIC (see Section 6.1.3.5). Both species have pelagic eggs and larvae, and each species has distinct spawning and rearing grounds detailed below. They are benthopelagic, with younger individuals living at shallower depths than large adults (Coad and Reist 2018). Atlantic cod are found from surface waters down to 700 m, but are typically found from 150 m to 200 m, while Greenland halibut are found from 14 m to 2,000 m and are typically found from 50 to 650 m (Coad and Reist 2018).

Atlantic Cod

Atlantic cod is an iconic groundfish in the northwest Atlantic. Both a culturally and commercially important species, cod stock collapsed in the early 1990s due to poor environmental conditions and overfishing (COSEWIC 2010a). This collapse had broad ecological and socio-economic consequences (Myers and Worm 2003, Dawe et al. 2012), and today the stock is much diminished compared to historic levels (COSEWIC 2010a, DFO 2019b). Though signs of potential recovery have been noted in recent years (Koen-Alonso et al. 2010), COSEWIC lists Atlantic cod as endangered (COSEWIC 2010a, González-Troncoso et al. 2018, DFO 2019b). Atlantic cod occupy a broad range of benthic habitats and are generally found above water depths of 500 m. They consume a variety of benthic and pelagic fish and invertebrates including capelin, sand lance, redfish, squid, crab, shrimp, and polychaetes (COSEWIC 2010a). They lay pelagic eggs that are prevalent in the water column from April to November; young cod prefer areas of high complexity to reduce predation risk. Atlantic cod were caught throughout the entire Grand Banks, southern Newfoundland Shelf, northeast Newfoundland Shelf, and off Labrador (Figure 6-22). Several areas have been identified as important habitat for Atlantic cod, including the Southeast Shoal EBSA and the Virgin Rocks EBSA (Ollerhead et al. 2017; Wells et al. 2019).

Greenland Halibut

Greenland halibut are a large predatory flatfish, considered one of the top predators after the collapse of Atlantic cod stocks. Unlike most other flatfishes, they spend considerable time feeding pelagically and have secondarily evolved adaptations such as dark colouration on the lower surface and the upper eye only partially migrates (Morgan et al. 2013, Coad and Reist 2018). Longline surveys found their peak abundance from 1,300 m to 1,600 m, but they are commercially fished above 600 m (Murua and De Cárdenas 2005). They are typically found on the shelf edge and slopes of the Grand Banks, but on the Northeast Newfoundland and Labrador Shelves they are found in shallower waters (Figure 6-23). They are capable of long distance migrations from near Newfoundland to the Davis Strait, a known spawning ground (Vis et al. 1997). Their eggs and larvae can drift for months before metamorphosing and settling into nursery habitats. Young can be found near shore, with older and larger individuals living on the lower shelf or abyssal plain.

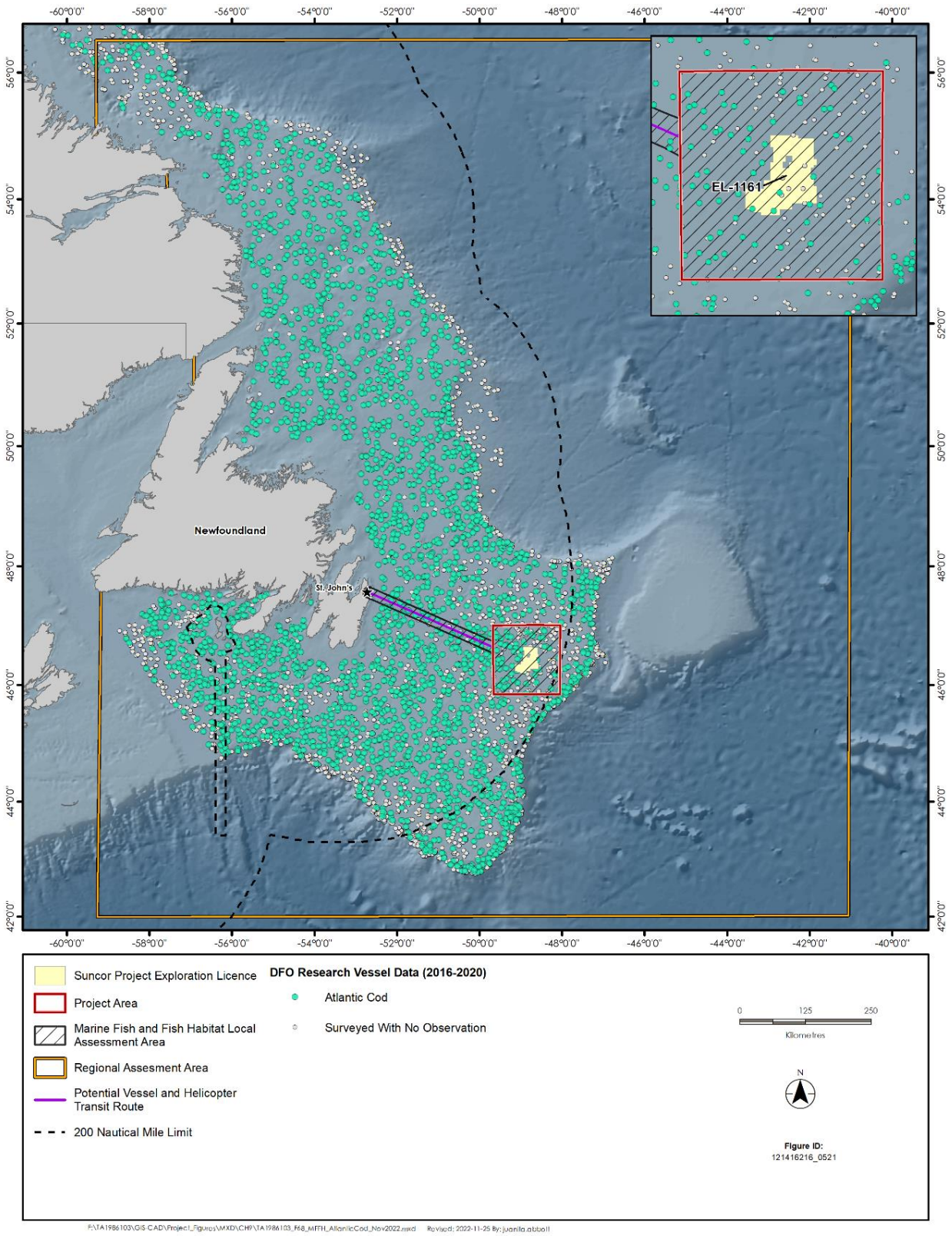


Figure 6-22 Distribution (presence / absence) of Atlantic Cod within the RAA in Canadian RV Trawl Data (2016-2020)

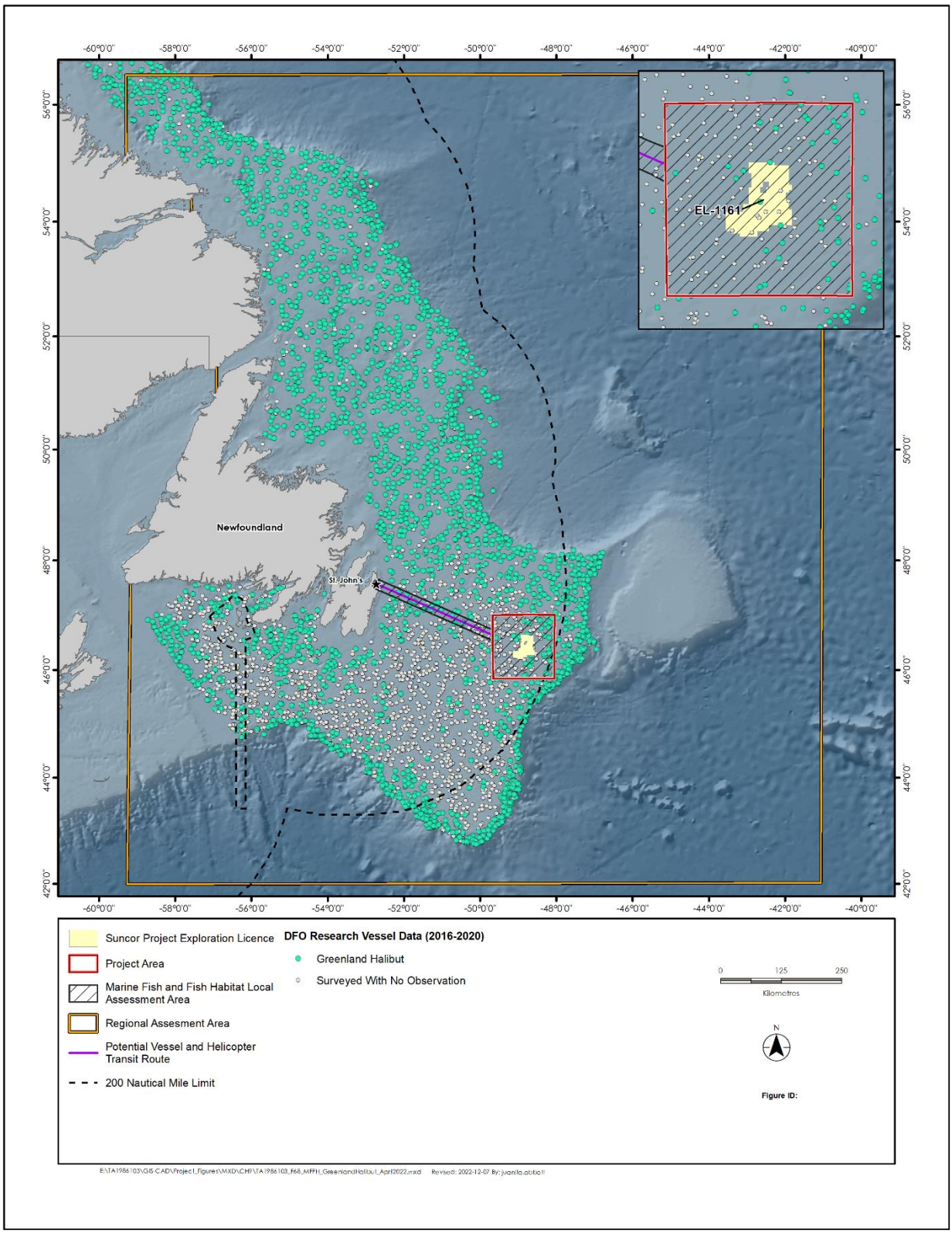


Figure 6-23 Distribution (presence / absence) of Greenland Halibut within the RAA in Canadian RV Trawl Data (2016-2020)

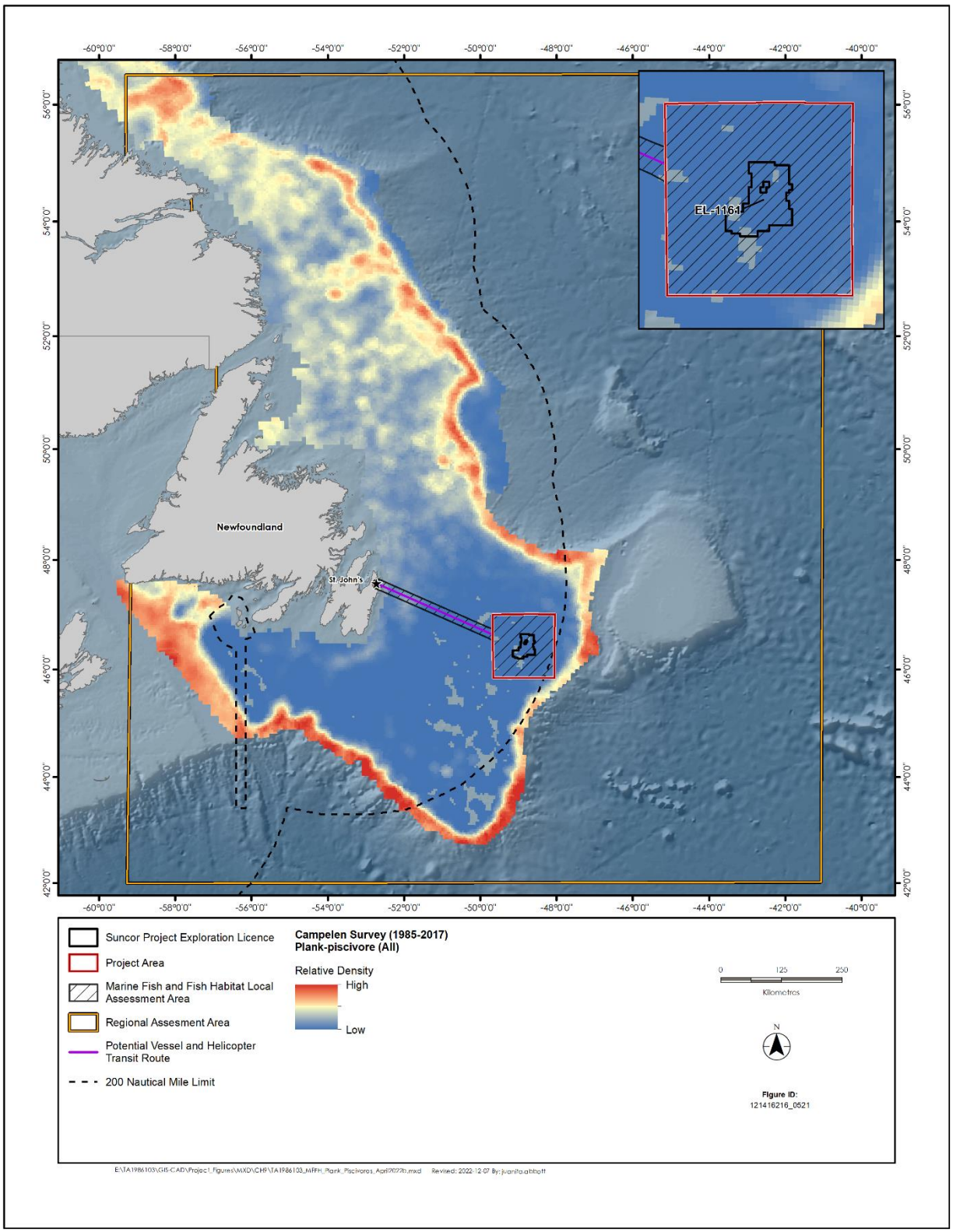
6.1.3.4.3 Plank-piscivores

Redfish species (Sebastidae, deepwater / Acadian redfish) are plank-piscivores that were caught in Canadian RV trawl surveys within the Project Area between 2017 and 2021 (Figure 6-24). Due to difficulties identifying these two species at sea, no differentiation is made between them. Plank-piscivores were caught south of Newfoundland, the shelf edge and slopes of the Grand Banks, and throughout the Northeast Newfoundland and Labrador shelves (Figure 6-24). Very low densities of this group have been observed within the Project Area and LAA relative to the RAA.

Plank-piscivores (plankton-piscivores) employ a mixed feeding type as adults, wherein they consume both plankton and other fish species. Arctic cod are mostly pelagic, and consume zooplankton such as copepods and shrimp, as well as phytoplankton, fish eggs, and fry (Coad and Reist 2018). Redfish undertake diurnal migrations to surface waters to feed, and consume pelagic zooplankton, as well as benthic invertebrates and other fish species (Coad and Reist 2018). Plank-piscivores are important as they provide the ecological services of both planktivores and piscivores, though to a lesser degree. Plank-piscivores are important prey species for larger piscivores, including marine mammals and sea birds. Redfish are typically encountered from 200 m to 700 m deep, though they can be as deep as 1,400 m. Both deepwater and Acadian redfish are designated as Threatened under COSEWIC and are caught commercially and sold under the name ocean perch (typically including the golden redfish as well) (Coad and Reist 2018). Deepwater / Acadian redfish have pelagic eggs and larvae, and typically spawn in spring or summer.

Redfish (Deepwater / Acadian)

Redfish are plank-piscivores typically associated with continental shelf, slope and edge habitats in offshore Newfoundland (Wells et al. 2021). Deepwater and Acadian redfish are difficult to distinguish visually, and are treated as a single stock throughout most of their range (Gauthier and Rose 2002). This species complex is found south of Newfoundland, along the slopes of the Grand Banks, and further north on the Northeast Newfoundland and Labrador Shelves they are found in shallower waters (Figure 6-25). They undertake diel vertical migrations to surface waters where they feed on pelagic invertebrates (Scott and Scott 1988, Gauthier and Rose 2002). Redfish do not migrate to spawn and use internal fertilization. Larvae are found in the upper 200 m of the water column from March to August, and may remain pelagic for several years in some areas (Coad and Reist 2018). Both deepwater and Acadian redfish are listed as Threatened under COSEWIC, with their primary threats being overfishing, by-catch mortality, predation, and unfavourable oceanic conditions for groundfish (COSEWIC 2010b). Redfish are a relatively recent commercial fishery (beginning in the late 1950s), and their listing under COSEWIC has led to directed fisheries closing in some areas though they are frequently caught as by-catch in shrimp fisheries (Coad and Reist 2018).



Source: Wells et al. 2021

Figure 6-24 Average Relative Density of Plank-piscivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

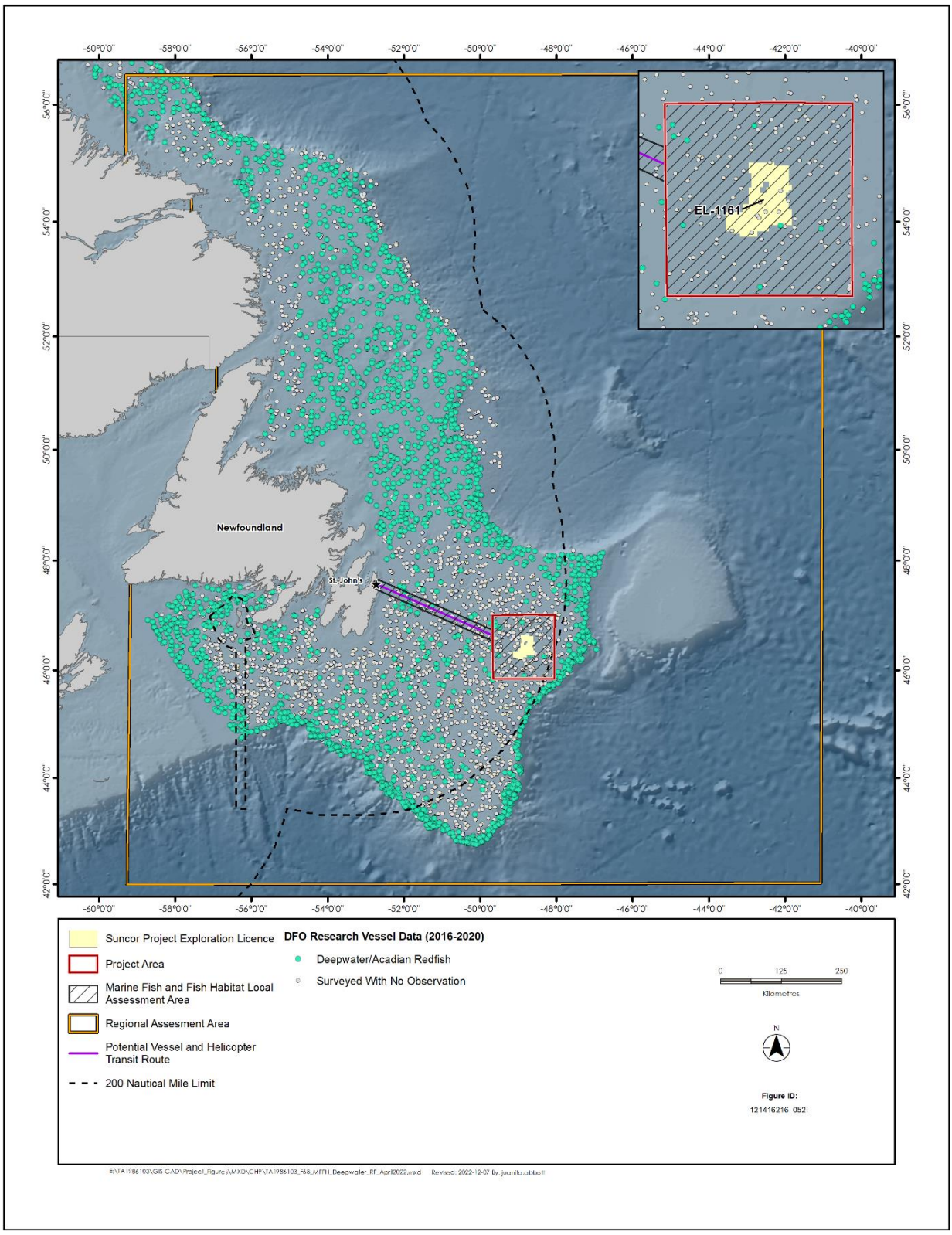


Figure 6-25 Distribution (presence / absence) of Deepwater / Acadian Redfish within the RAA in Canadian RV Trawl Data (2016-2020)

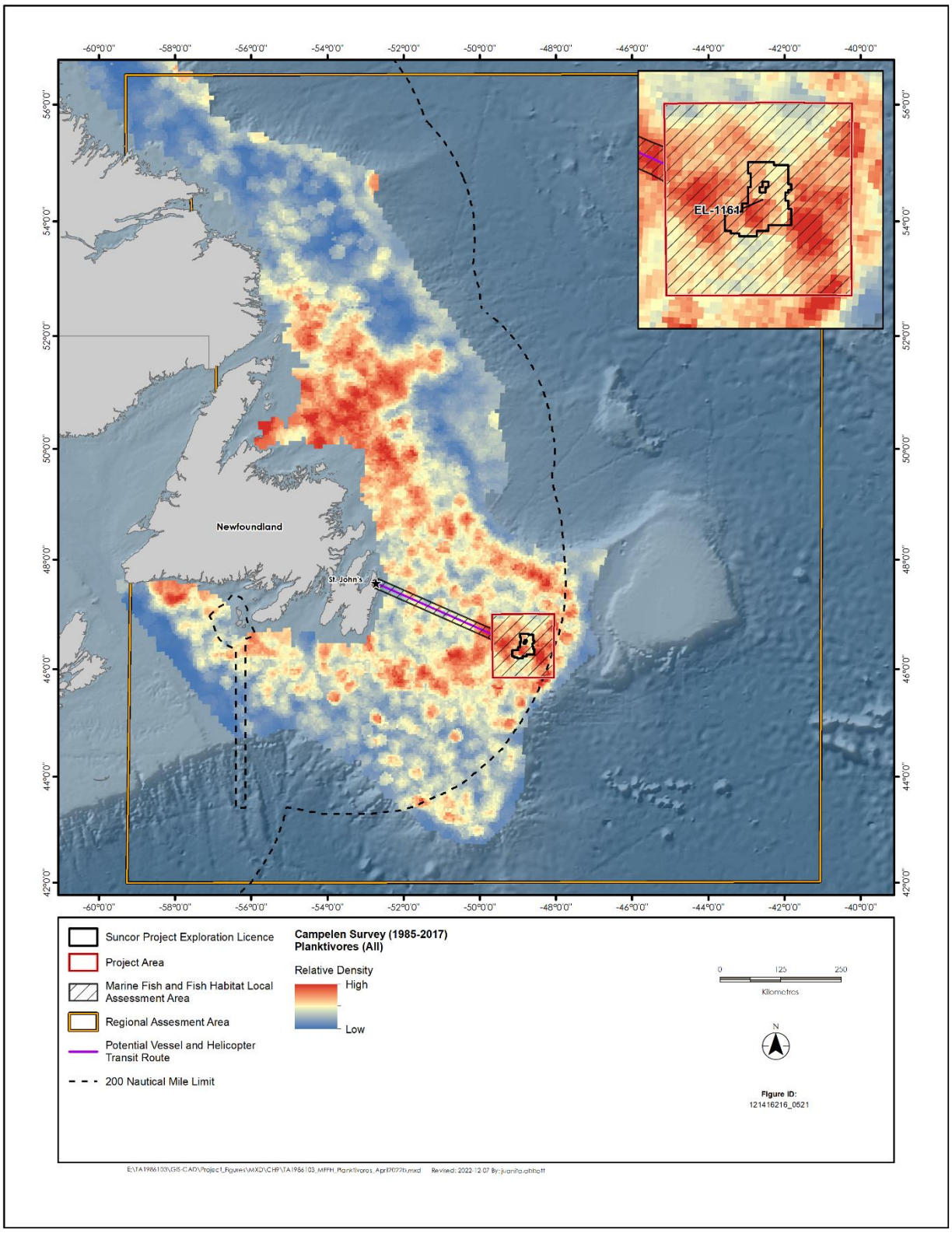
6.1.3.4.4 Planktivores

Two species of planktivores from two families were caught in the Project Area and LAA in Canadian RV trawl surveys from 2016 to 2020. These species were recorded throughout the Grand Banks and south of Newfoundland but were not present on the Northeast Newfoundland Shelf or further north (Figure 6-26). Atlantic herring was the only species in the family Clupidae caught in the Project Area and was mostly restricted to continental waters south of Newfoundland with sporadic records on the Grand Banks. Capelin were the only species in the family Osmeridae in the Project Area and were caught throughout the Grand Banks and south of Newfoundland. Although trawl surveys are not as effective as other methods (i.e., acoustic surveys) for detection of planktivorous species, the surveys do indicate their presence in the area.

Planktivores play an important ecological role as forage fish, providing the link between plankton and piscivores such as larger fish species, marine mammals, and seabirds (Davoren and Montevecchi 2003, Rose 2005). On the Grand Banks, sand lance and capelin are keystone species, and Atlantic herring play a similar role on the Scotian Shelf (Buren et al. 2014; Trenkel et al. 2014). Their primary prey is copepods, though they consume amphipods, euphausiids, and ichthyoplankton (Scott 1973, Scott and Scott 1988, Maxner et al. 2016). Stocks of Atlantic herring and capelin have been reduced or collapsed due to overfishing and unfavourable climatic conditions, and as such the abundance of sand lance has been growing since the 1950's (Winters 1983, Dawe et al. 2012). Sand lance, as their name suggests, burrow themselves into sand or gravel substrate, while Atlantic herring and capelin are typically pelagic (Coad and Reist 2018). Sand lance do not migrate, but capelin return to inshore waters to spawn and Atlantic herring undertake spawning and seasonal migrations that vary by stock (Scott and Scott 1988, Maxner et al. 2016). They are all typically encountered above 200 m depth, though capelin have been recorded in waters up to 1,000 m deep (Coad and Reist 2018). All three species migrate to shallow waters where they lay sticky benthic eggs, and after hatching larvae are pelagic planktivores (Nakashima and Wheeler 2002, Coad and Reist 2018). Sand lance typically spawn in the winter months, while capelin and herring spawn in the summer. Capelin and herring are a commercial species in Newfoundland and are further described below.

Capelin

Capelin are pelagic planktivores that can form large schools. They play an important role as forage fish (Bourne et al. 2021), and are important ecologically, commercially, and to Indigenous groups. They primarily feed on copepods, euphausiids, amphipods, and migrate vertically in the water column daily while offshore to feed (Maxner et al. 2016). They are consumed by a wide variety of animals, such as Atlantic cod, marine mammals, seabirds, and other piscivores (Davoren and Montevecchi 2003, Rose 2005). Capelin return to shallow waters to spawn in the summer months, either on beaches in characteristic "rolls" or near-shore. Eggs are externally fertilized and sticky, clinging to substrate until they hatch into pelagic larvae (Nakashima and Wheeler 2002). Capelin are found typically shallower than 200 m deep, but have been reported in waters over 1,000 m deep (Coad and Reist 2018). Within the RAA, capelin are found south of Newfoundland and throughout the Grand Banks, and were not reported to the north though they are present in the Canadian Arctic (Figure 6-27).



Source: Wells et al. 2021

Figure 6-26 Average Relative Density of Planktivores in the RAA in Canadian RV Campelen Trawl Data (1985-2017)

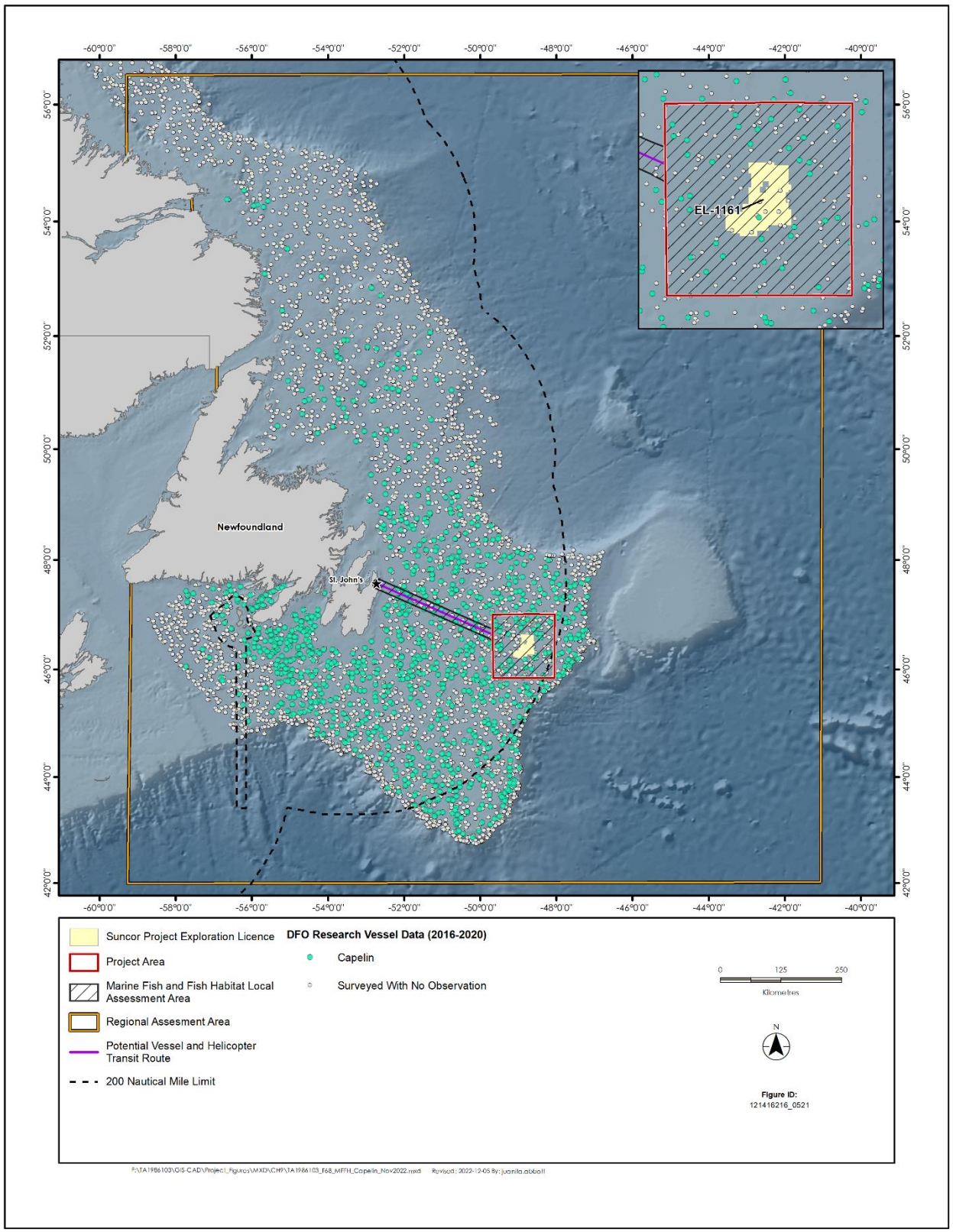


Figure 6-27 Distribution (presence / absence) of Capelin within the RAA in Canadian RV Trawl Data (2016-2020)

Herring

Herring are benthopelagic planktivores that can form large schools. This abundant and widely distributed species has ecological importance as important prey species for higher trophic levels (e.g., marine mammals, larger fish) and commercial importance in inshore and offshore fisheries (Scott and Scott 1988, DFO 2015b, Coad and Reist 2018, Kerr et al. 2019). Herring undergo diel migration patterns where they occupy surface waters at night and are deeper waters during the day (Trenkel et al. 2014, Coad and Reist 2018). Some herring stocks in the northwest Atlantic undertake long distance (>1,500 km) inter-annual migrations between summer feeding areas and overwintering areas (Trenkel et al. 2014). Herring deposit demersal eggs onto the seafloor with spawning generally occurring between April and November in Canadian waters (Trenkel et al. 2014, Coad and Reist 2018). Herring in offshore deep water areas typically spawn towards the latter part of the spawning range (Coad and Reist 2018). Spawning sites typically overlap with high productivity areas that support larval growth (Coad and Reist 2018). Within the RAA, herring are primarily found south of Newfoundland with patchy distribution throughout the Grand Banks (Figure 6-28).

6.1.3.4.5 Invertebrates

As discussed in Section 6.1.3.3, a large number of invertebrate species can be found within the Project Area (Figures 6-29 to 6-32). These range in size from zooplankton to snow crab, and live in the pelagic zone, the benthos, or as infauna.

Arthropods are typically demersal, with crabs and most shrimp living on or near the sea floor, and are typically benthivores or planktivores, consuming small invertebrates or detritus. Two species of shrimp are commercially harvested in NL (northern shrimp and pink striped shrimp) and one species of crab (snow crab). Arthropods are found throughout the continental shelf and slopes (Figure 6-29). Arthropods occurring inside the Project Area and LAA are widespread across the RAA (e.g., toad crab, *Lebbus* shrimp) or are mainly distributed outside the Project Area and LAA (e.g., Eualus shrimp, hermit crab).

Molluscs are mostly benthic and typically filter feed or consume organic detritus. However, cephalopods are benthopelagic predators that consume invertebrates and fish species. One species of mollusc in the Project Area is caught commercially, the short-fin squid. Molluscs were largely caught on the Grand Banks and the southern Grand Banks slope, including within the RAA (Figure 6-30). Icelandic scallop were associated with shelf areas whereas octopus and cephalopod species were associated with slope areas. Though these species occur within the Project Area and LAA, these species are distributed across the RAA.

Echinoderms are benthic species, with most feeding on invertebrates, detritus, or filter feeding. No echinoderm found in the Project Area is harvested commercially. Echinoderms were found throughout the continental shelf and slopes, including inside the RAA (Figures 6-31 and 6-32). Echinoderm species associated with slope areas of the Project Area and LAA including the rigid cushion star and blood star. Shelf species observed in the Project Area and LAA included sand dollar, green sea urchin, polar seastar, common seastar, spiny sunstar, and smooth sunstar. Though echinoderms occur within the Project Area and LAA, their distributions are widespread across the RAA (Gale et al. 2014).

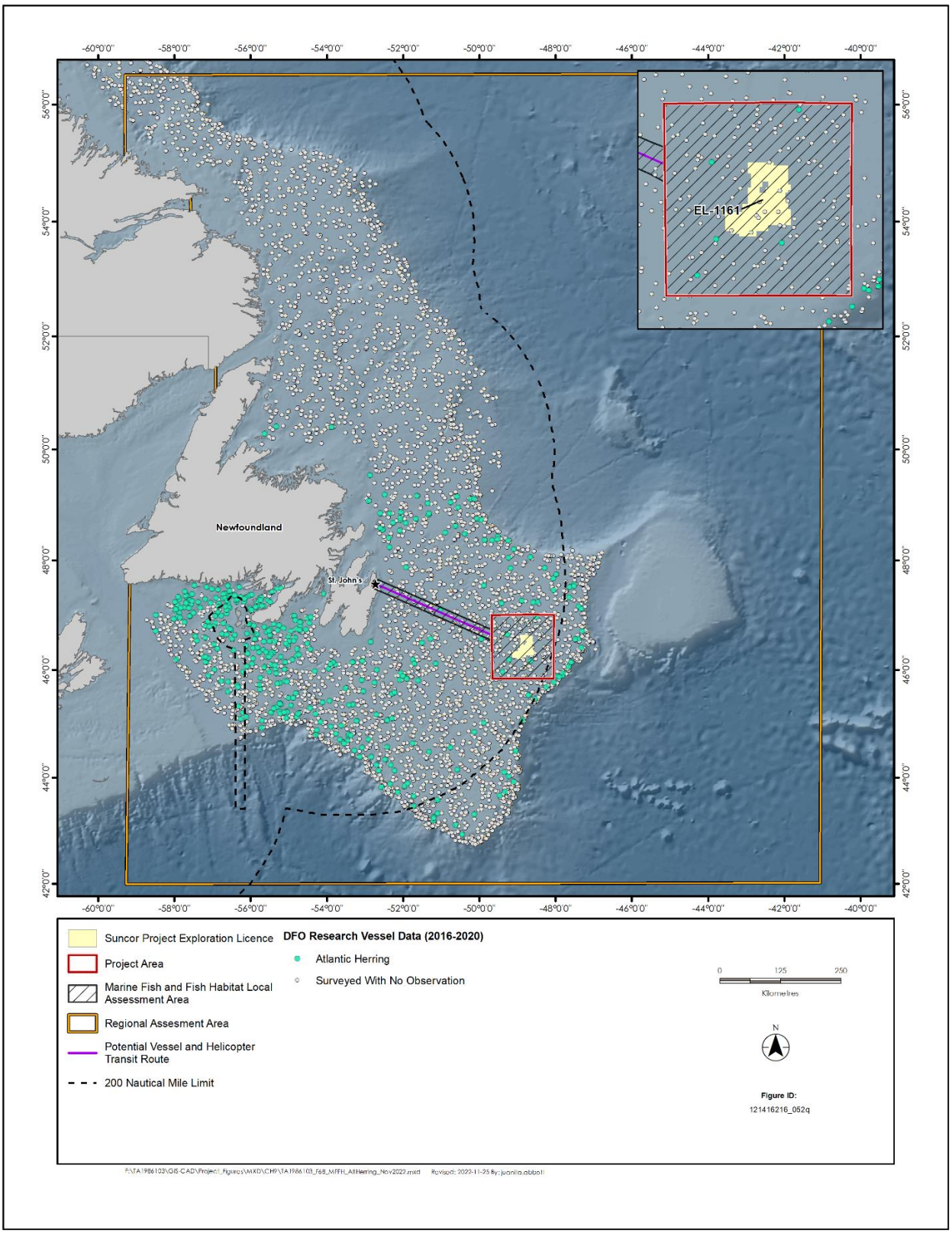


Figure 6-28 Distribution (presence / absence) of Herring within the RAA in Canadian RV Trawl Data (2016-2020)

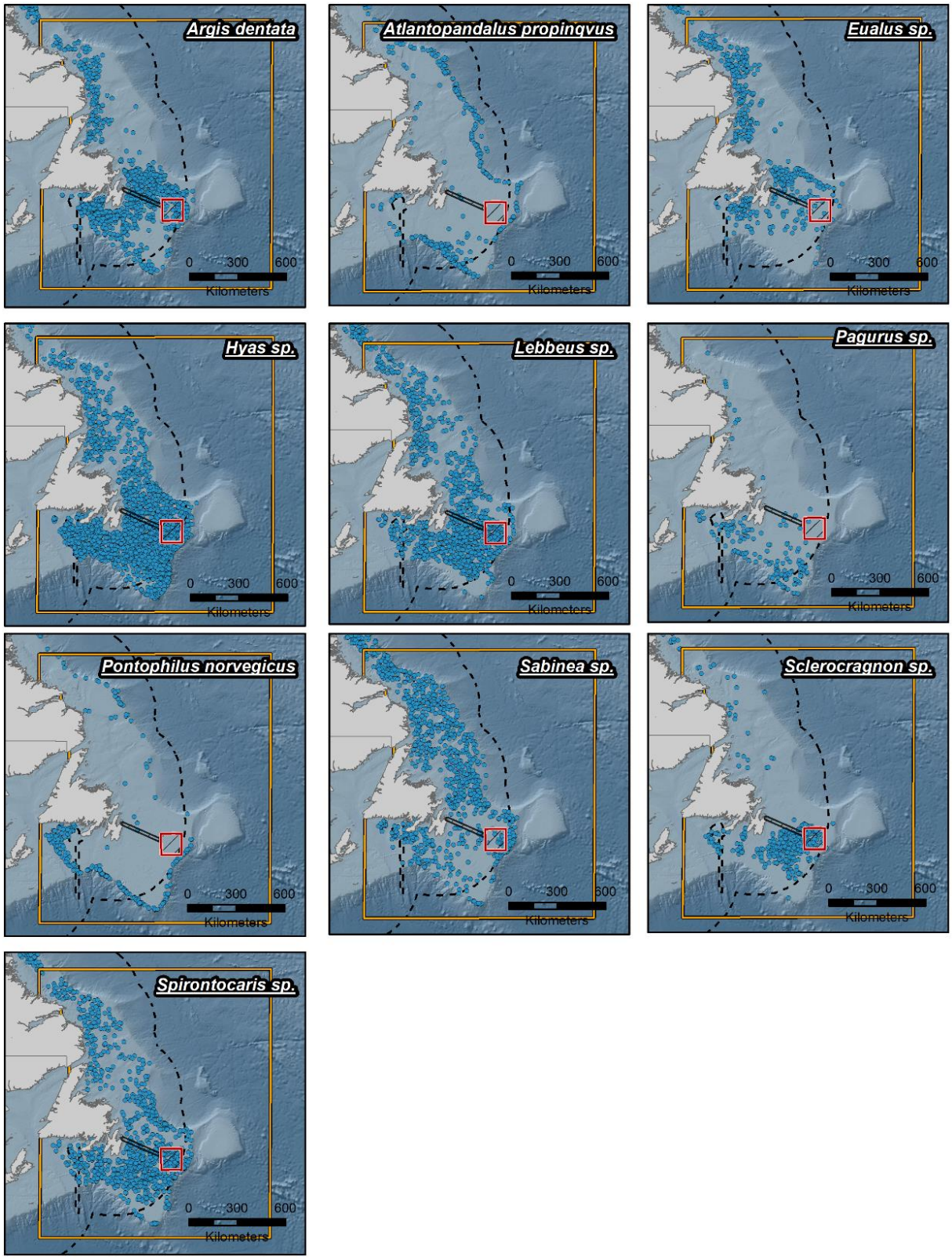


Figure 6-29 Distribution (presence / absence) of Arthropods in the RAA in Canadian RV Campelen Trawl Data (2016-2020)

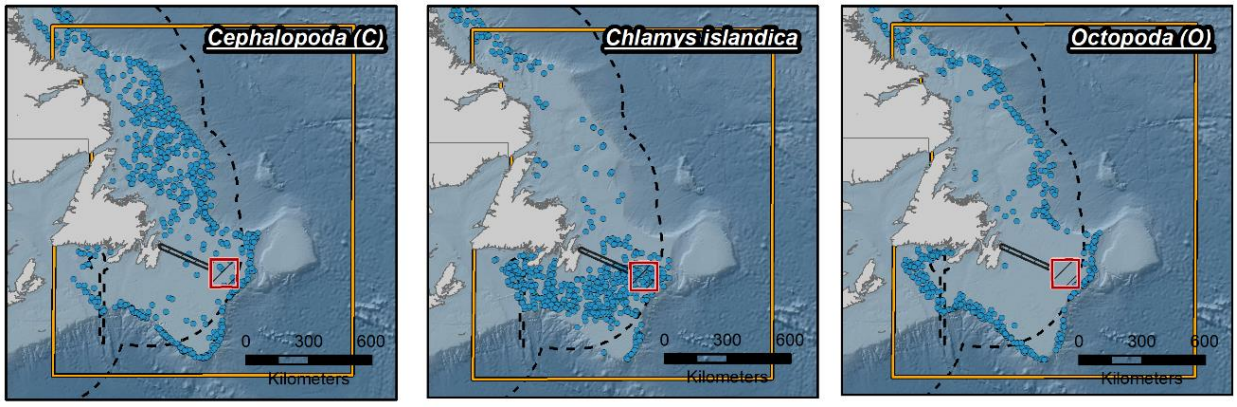


Figure 6-30 Distribution (presence / absence) of Molluscs (squid, Icelandic scallop, and octopus) in the RAA in Canadian RV Campelen Trawl Data (2016-2020)

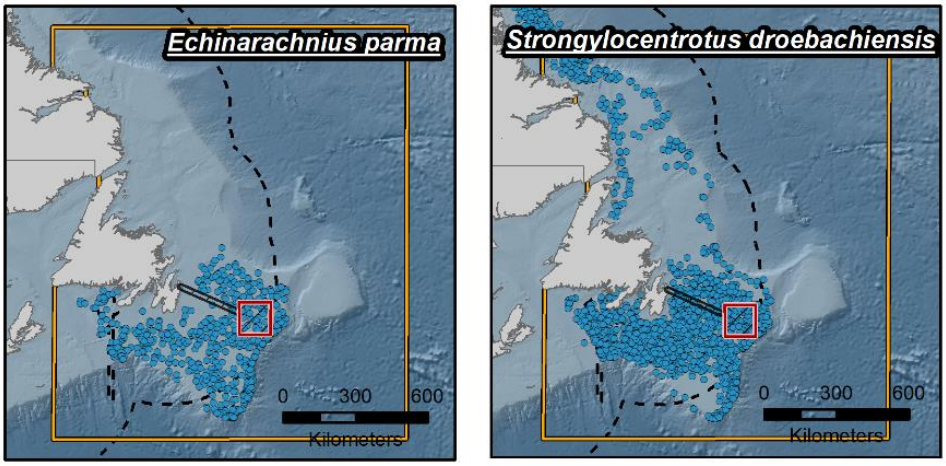


Figure 6-31 Distribution (presence / absence) of Echinoderms (sand dollar and sea urchin) in the RAA in Canadian RV Campelen Trawl Data (2016-2020)

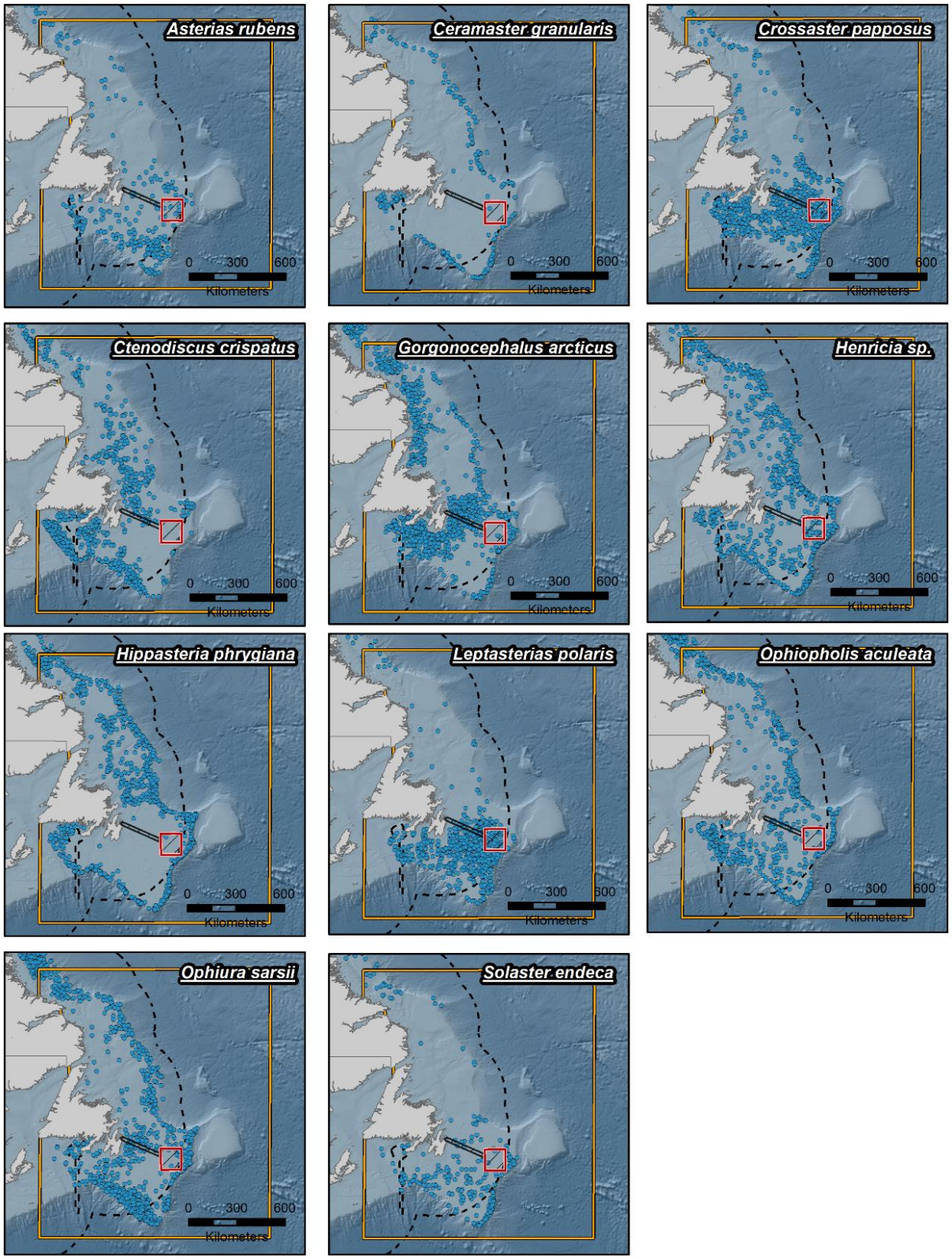


Figure 6-32 Distribution (presence / absence) of Echinoderms (seastars) in the RAA in Canadian RV Campelen Trawl Data (2016-2020)

Snow Crab

Snow crab are a large demersal decapod crustacean found throughout the Grand Banks. They have a planktonic larval phase, and after settling young crab typically live on hard substrate at shallower depths (DFO 2019c). They become mature at approximately 40 mm carapace width and migrate to deeper soft bottom habitats (Baker et al. 2021c). This process takes roughly 8 to 10 years, though may be longer in colder areas (Dawe et al. 2012). They are an important commercial species, and their numbers increased drastically after the collapse of many groundfish stocks in the early 1990s (Frank et al. 2005, DFO 2019b). Snow crab are opportunistic consumers of fish, bivalves, polychaetes, brittle stars, shrimp, and other crustaceans including other snow crab (DFO 2019c). They were reported in trawls near the shelf edge of the Grand Banks, though they were present throughout most of the shelf area and south of Newfoundland (Figure 6-33).

Shrimp (Northern and Pink Striped)

Northern and pink striped shrimp are decapod crustaceans that are commercially caught throughout the RAA. While distributed throughout the shelf, these species have higher relative densities on the northern Newfoundland Shelf (i.e., NAFO Divisions 2J3K) based on Campelen trawl surveys from 1995-2017 (Wells et al. 2021). They are an important link within the food web as they consume zooplankton, and indirectly phytoplankton, and are a food source for a variety of predators. Shrimp eggs are released to hatch at the peak of the phytoplankton and zooplankton blooms on the Grand Banks (DFO 2019c). Northern shrimp are typically found on soft or muddy substrates, while pink striped shrimp prefer hard substrates (DFO 2019d). Both are cold-water shrimp, typically caught between 1 to 6°C though pink striped shrimp are typically found at the lower edge of that range (DFO 2019d). After the collapse of many groundfish stocks in the early 1990s, shrimp populations have increased partly due to release from predation pressure (Lilly et al. 2000, Frank et al. 2005). They are an important commercial species throughout eastern Canada from the Scotian Shelf to Nunavut (DFO 2019d). Northern shrimp were not reported in the Project Area, though they were caught nearby. Pink striped shrimp are well-distributed throughout the Grand Banks shelf and northeast Newfoundland Slope, and south of Newfoundland (Figure 6-34). Northern shrimp were caught along the edges of the Grand Banks, and on the northeast Newfoundland Shelf, off Labrador, and south of the island of Newfoundland (Figure 6-34).

Short-Fin Squid

Short-fin squid are pelagic cephalopod molluscs that are commercially harvested within the RAA. Their eggs and larvae are pelagic, and drift north in the Gulf stream from their spawning grounds further south (Dawe and Hendrickson 1998). Squid are considered recruits with a mantle length over 10 cm, and generally live less than a year. Younger squid consume mostly invertebrates, but as they grow they increasingly prey on fish species such as Atlantic cod, hake, and capelin (Dawe et al. 1997). Squid in turn are preyed upon by a variety of large fish such as tunas, and whales and dolphins. During the fall, squid migrate off the continental shelf and to warmer sub-tropical waters to spawn, with juveniles returning to the shelf in the spring. Commercial harvests for short-fin squid happen during the summer and early fall along the coasts of NL, NS, and the northeastern US (Dawe and Hendrickson 1998). Within the RAA, squid are found mostly along the edge and slopes of the Grand Banks (Figure 6-35).

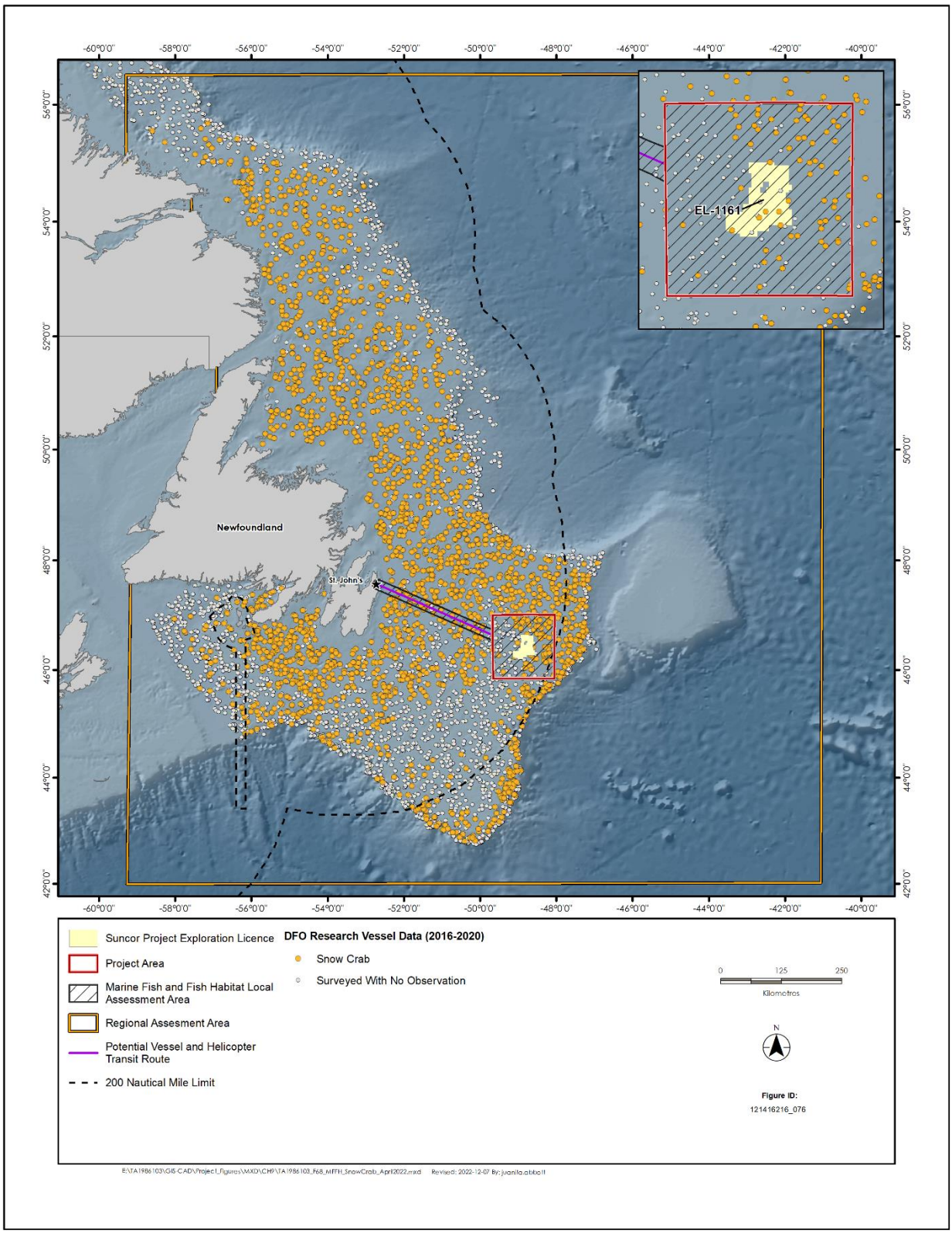


Figure 6-33 Distribution (presence / absence) of Snow Crab within the RAA in Canadian RV Trawl Data (2016-2020)

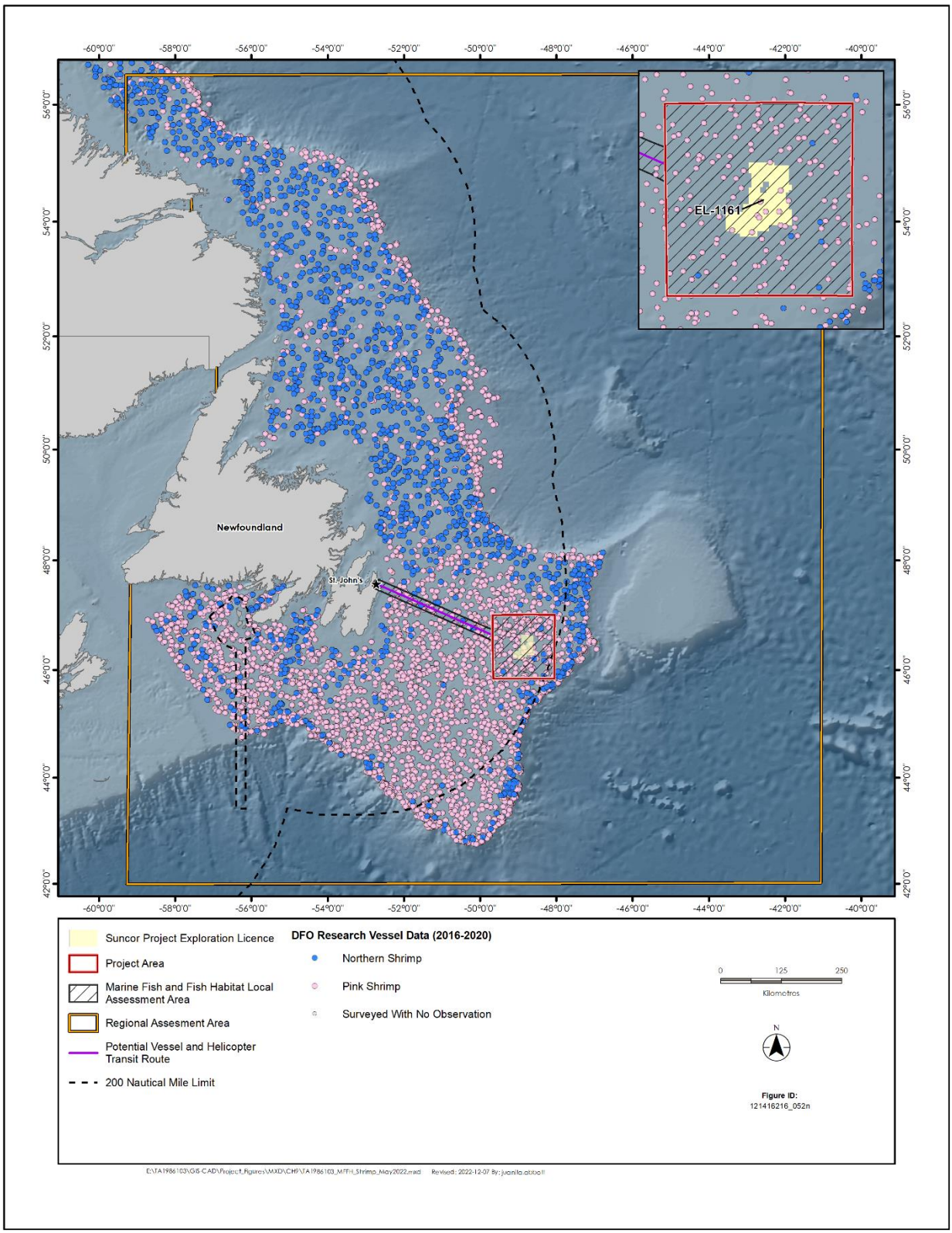


Figure 6-34 Distribution (presence / absence) of Northern and Pink Striped Shrimp within the RAA in Canadian RV Trawl Data (2016-2020)

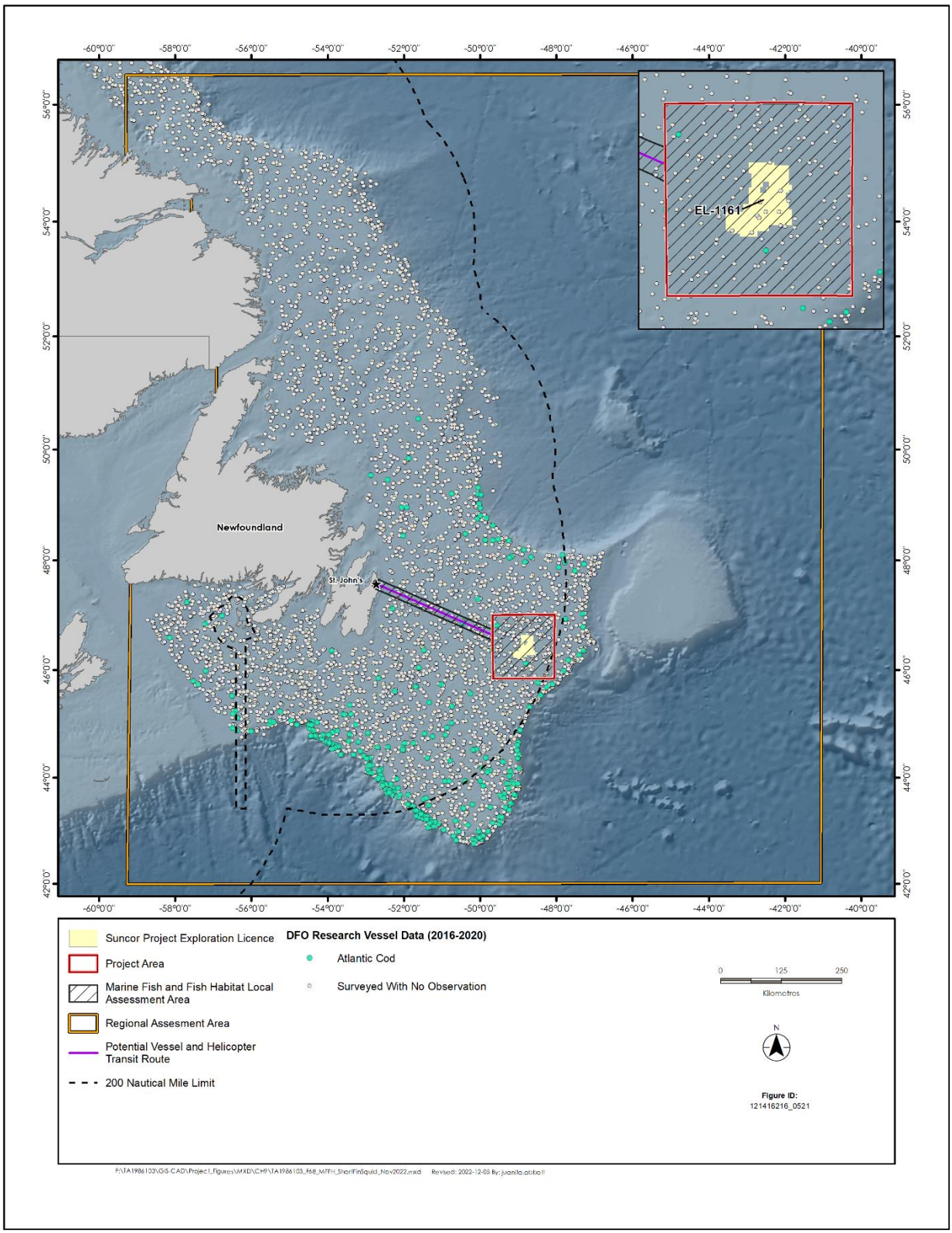


Figure 6-35 Distribution (presence / absence) of Short-fin Squid within the RAA in Canadian RV Trawl Data (2016-2020)

6.1.3.5 Fish Species at Risk and Species of Conservation Concern

Several fish SAR / SOCC are known to occur, or likely to occur, in the RAA (Table 6.6). This includes species that are formally designated by the SARA or the NL ESA, or those identified as being of conservation concern by COSEWIC. The NL ESA gives the following three categories of protection designation:

- Endangered: A species that is facing imminent extirpation or extinction
- Threatened: A species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
- Vulnerable: A species that has characteristics which make it sensitive to human activities or natural event

Table 6.6 Fish Species of Conservation Concern Potentially Occurring in the RAA

Species		Status/Designation[1, 2]			Relevant Population (Where Applicable)
Common Name	Scientific Name	NL ESA	SARA	COSEWIC	
Acadian redfish	*Sebastes fasciatus*			T	Atlantic (COSEWIC)
American eel	*Anguilla rostrata*	V		T	
American plaice	*Hippoglossoides platessoides*			T	Newfoundland and Labrador (COSEWIC)
Atlantic bluefin tuna	*Thunnus thynnus*			E	
Atlantic cod	*Gadus morhua*			E	Newfoundland and Labrador (COSEWIC)
Atlantic salmon	*Salmo salar*			T	South Newfoundland
				SC	Quebec Eastern North Shore
				SC	Quebec Western North Shore
				E	Anticosti Island
				SC	Inner St. Lawrence
				SC	Gaspe-Southern Gulf of St. Lawrence
				E	Eastern Cape Breton
				E	Nova Scotia Southern Upland
				E	Outer Bay of Fundy Population
Atlantic wolffish	*Anarhichas lupus*		SC	SC	
Basking shark	*Cetorhinus maximus*			SC	Atlantic (COSEWIC)
Cusk	*Brosme brosme*			E	
Deepwater redfish	*Sebastes mentella*			T	Northern (COSEWIC)
Lumpfish	*Cyclopterus lumpus*			T	Atlantic (COSEWIC)
Northern wolffish	*Anarhichas denticulatus*		T	T	
Porbeagle	*Lamna nasus*			E	

Table 6.6 Fish Species of Conservation Concern Potentially Occurring in the RAA

Species		Status/Designation[1, 2]			Relevant Population (Where Applicable)
Common Name	Scientific Name	NL ESA	SARA	COSEWIC	
Roundnose grenadier	*Coryphaenoides rupestris*			E	Atlantic and Arctic (COSEWIC)
Shortfin mako	*Isurus oxyrinchus*			E	Atlantic (COSEWIC)
Smooth skate	*Malacoraja senta*			E	Funk Island Deep (COSEWIC)
Spiny dogfish	*Squalus acanthias*			SC	Atlantic (COSEWIC)
Spotted wolffish	*Anarhichas minor*		T	T	
Thorny skate	*Amblyraja radiata*			SC	Canada (COSEWIC)
White hake	*Urophycis tenuis*			T	Atlantic and Northern Gulf of St. Lawrence (COSEWIC)
White shark	*Carcharodon carcharias*		E	E	Atlantic (COSEWIC/SARA)
Winter Skate	*Leucoraja ocellata*			E	Eastern Scotian Shelf – Newfoundland (COSEWIC)

Notes:
[1] Not at Risk (NR), Least Concern (LC), Vulnerable (V), Near Threatened (NT), Special Concern (SC), Threatened (T), Endangered (E), Critically Endangered (CE)
[2] Multiple designations refer to multiple populations or sub-populations.

In addition to promoting management of listed species, SARA also provides federal protection of Threatened and Endangered species. Designations under SARA are guided by the advice provided by COSEWIC. Species with formal protection under SARA are listed on Schedule 1, with the following designations:

- Extirpated: A species that no longer exists in the wild in Canada, but exists in the wild elsewhere
- Endangered: A species that is facing imminent extirpation or extinction
- Threatened: A species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
- Special Concern: A species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

The information presented here is current as of the time of writing, but species status' can be updated at any time, and so it is important to refer to the public SARA registry (www.sararegistry.gc.ca) for the most current information.

There are 22 SOCC potentially occurring within the RAA (Table 6.6). The American eel is the only species listed under the NL ESA and is listed as Vulnerable. Four species are listed under SARA: the Atlantic, spotted, and northern wolffish (Special Concern, Threatened, and Threatened, respectively), and the white shark (Endangered). The three wolffish species have ranges that overlap with the Project Area, while the white shark is a rare migratory visitor to the Grand Banks. These species are further discussed below due to their listing under SARA (see Sections 6.1.3.5.1 and 6.1.3.5.2, respectively). In addition to being SOCC, the American eel and Atlantic salmon have been identified as species of Indigenous concern due to their social, cultural, and traditional importance and as such are further discussed below (see Sections 6.1.3.6.1 and 6.1.3.6.2, respectively). Additionally, swordfish and three tuna species (bigeye, albacore, and Atlantic bluefin tuna (also a species at risk)) have also been identified as species of Indigenous concern and are discussed in Sections 6.1.3.6.3 and 6.1.3.6.4, respectively. Some species identified as being key within the Project Area (Section 6.1.3.4) are also species at risk, and are further discussed above (American plaice, Atlantic cod, and thorny skate).

6.1.3.5.1 Wolffish (Atlantic, Spotted, and Northern)

Descriptions for northern and Atlantic wolffish can be found in Section 6.1.3.4. Spotted wolffish are listed under COSEWIC and SARA as Threatened. They are large benthivores, consuming echinoderms, crustaceans, molluscs, and fish, and are considered an “echinoderm specialist” among wolffish (Coad and Reist 2018). They are long-lived and slow-growing, and as such are vulnerable to threats. Populations declined heavily from the mid-1970s to the mid-1990s, with a small positive trend beginning after the mid-1990s (COSEWIC 2012c). Their main threats are by-catch from commercial fisheries as well as habitat alteration or destruction. Recovery strategies and management plans for the spotted wolffish have identified critical habitat along the northern Grand Banks and Newfoundland Shelf to the north of the Project Area Figure 6-36). These were identified based on known water depths and habitat preferences and overlap with the majority of their catches in Canadian RV trawls. These areas are known to contain features that should allow for their recovery and survival based on current knowledge (DFO 2020a). Similar to northern wolffish, spotted wolffish are predominantly caught along the shelf edge of the Grand Banks and the Flemish Pass in Canadian RV trawls (Figure 6-36). Further north along the Newfoundland Shelf they occupy shallower regions. No spotted wolffish were recorded in Canadian RV trawls in the Project Area between 2014 and 2018.

6.1.3.5.2 White Shark

The Atlantic population of white sharks is considered Endangered by both SARA and COSEWIC. They are large pelagic carnivores, travelling to Canadian waters typically between June and February to feed on fish, other sharks, marine mammals, and squid (Bastien et al. 2020, COSEWIC 2021). Waters off Newfoundland represent the northernmost portion of their range, with higher concentrations off the east coast of the U.S. (Curtis et al. 2014). Recent tagging studies have shown that white sharks return to particular areas in Atlantic Canada including the southeastern coast of Nova Scotia and into the Bay of Fundy (Bastien et al. 2020). The same study identified a white shark hotspot on the southern coastal and offshore waters off Newfoundland; however, they were associated with a high amount of telemetry tracks by a few individual sharks (Bastien et al. 2020). These highly mobile species likely swim through the LAA, though they are not areas where white shark congregate based on available telemetry studies. They are seasonally migratory, occupying waters off the southern U.S. in the winter and ranging north in the warmer months to feed.

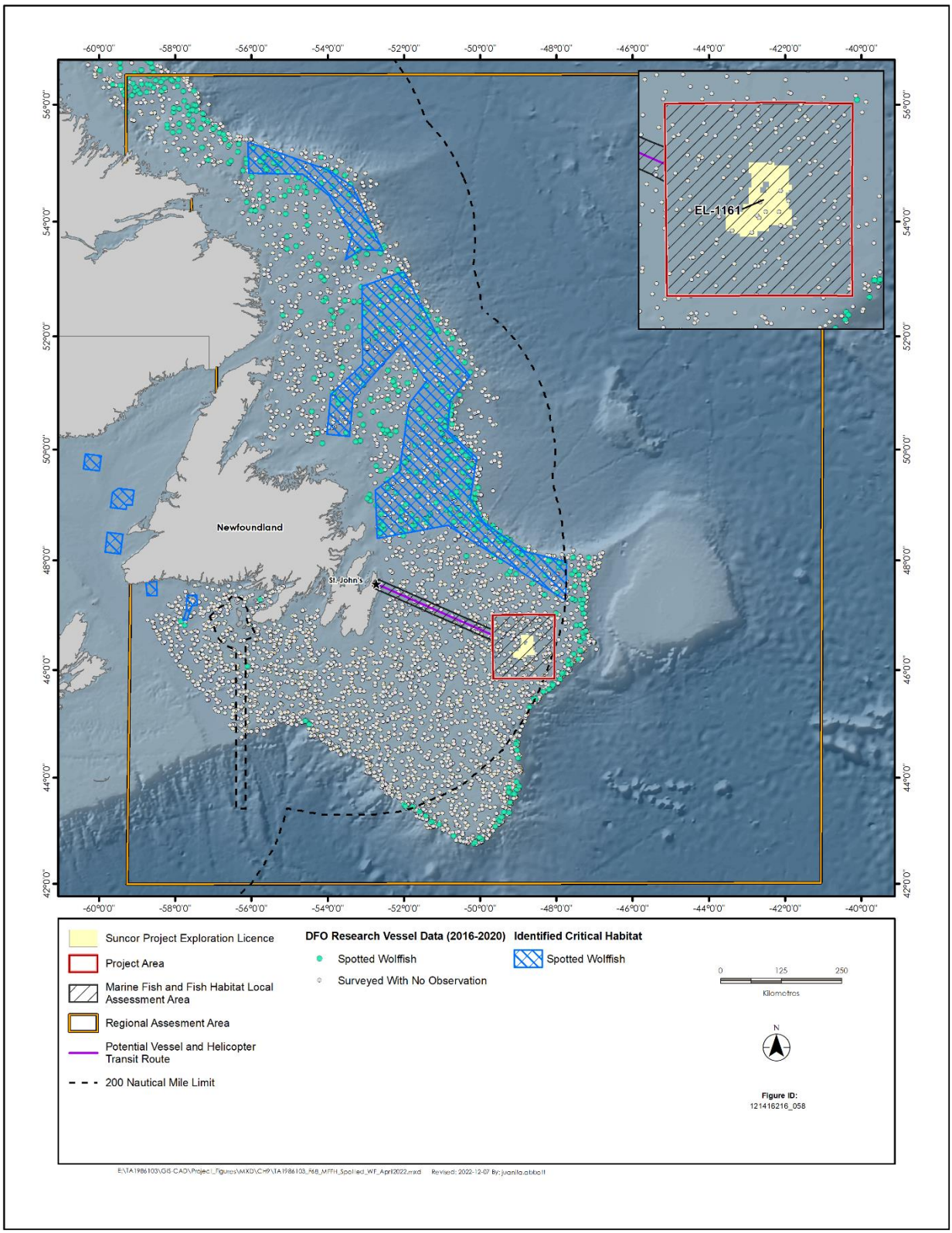


Figure 6-36 Distribution (presence / absence) of Spotted Wolffish and Identified Critical Habitat within the RAA in Canadian RV Trawl Data (2016-2020)

No critical habitat has been established in Canada for the white shark (COSEWIC 2021). While not the target of a fishery, by-catch mortality is their main threat in Canada. Ocearch (2022) has tagged several white sharks in the Atlantic Ocean and offers near-live tracking of their positions by satellite. Adult female and male sharks visit the waters south of Newfoundland in the summer months, with three individuals recorded inside the Project Area between 2013 and 2020 (Figure 6-37). Five individuals have been recorded within the RAA in the same time period, with the majority of their time spent in the deeper waters off the continental shelf.

6.1.3.6 Species of Indigenous Importance

The waters off Newfoundland and Labrador contain a variety of species commercially harvested or used for food, social, or ceremonial (FSC) purposes by Indigenous groups. Indigenous engagement has highlighted several species as being of Indigenous concern due to their importance and their status as species at risk. These include the American eel, Atlantic salmon, swordfish, and tuna. These species are all migratory, do not spawn within the LAA, and only the American eel is likely to have juveniles present in these waters. Additional details on these species as they relate to Indigenous groups can be found in Section 7.4.

6.1.3.6.1 American Eel

The American eel is a catadromous species that migrates from freshwater to saltwater to breed. They are present in nearly all freshwater rivers in Canada that have access to the Atlantic ocean as far north as Labrador (COSEWIC 2012d). All American eels form a single breeding population, with adults traveling to the Sargasso Sea to spawn (Jacoby et al. 2017). These migrations occur in the summer and fall (June to November, varies by population) in Canada, with eels travelling along the continental shelf before swimming over deeper waters to reach the Sargasso Sea (Béguer-Pon et al. 2015) (Figure 6-38). After spawning from February to April, adult eels will die and pelagic eggs drift in the currents (Cairns et al. 2014, Rypina et al. 2016). After they hatch, larvae will begin drifting and / or actively swimming north in the Gulf Stream and will eventually metamorphose into glass eels lacking pigmentation (Rypina et al. 2016). As they approach estuarine environments, they gain pigmentation and are known as yellow eels, the stage in which they become sexually differentiated (Rypina et al. 2016). After 9 to 22 years in estuarine or freshwater environments, they becomes silver eels and will return to the Sargasso Sea to breed (Westerberg et al. 2017).

The American eel is considered Vulnerable under the NL ESA and Threatened by COSEWIC. Populations across Canada have experienced broad declines since the 1950s, ranging from a decline of 7% to 96%. The greatest declines have been in Lake Ontario and the Saint Lawrence River, with eastern Canada experiencing mixed population trends (COSEWIC 2012d). As their life history stretches across freshwater, estuarine, coastal, and oceanic areas, threats to their populations are varied. These include barriers to migrations in rivers (e.g., hydroelectric operations), mortality from turbines, catch and by-catch in fisheries, bioaccumulation of contaminants, parasites, and changing environmental conditions (COSEWIC 2012d, Cairns et al. 2014).

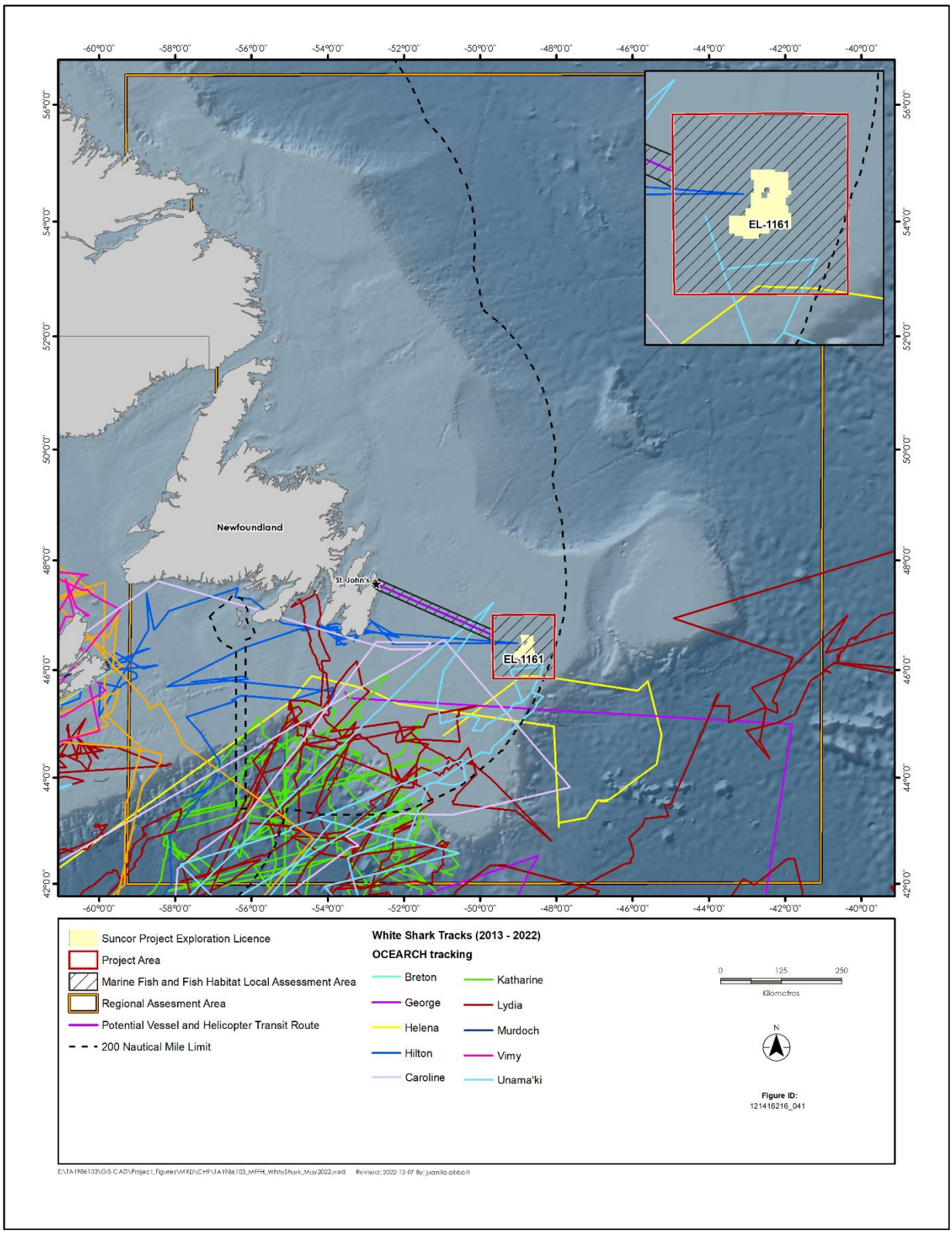
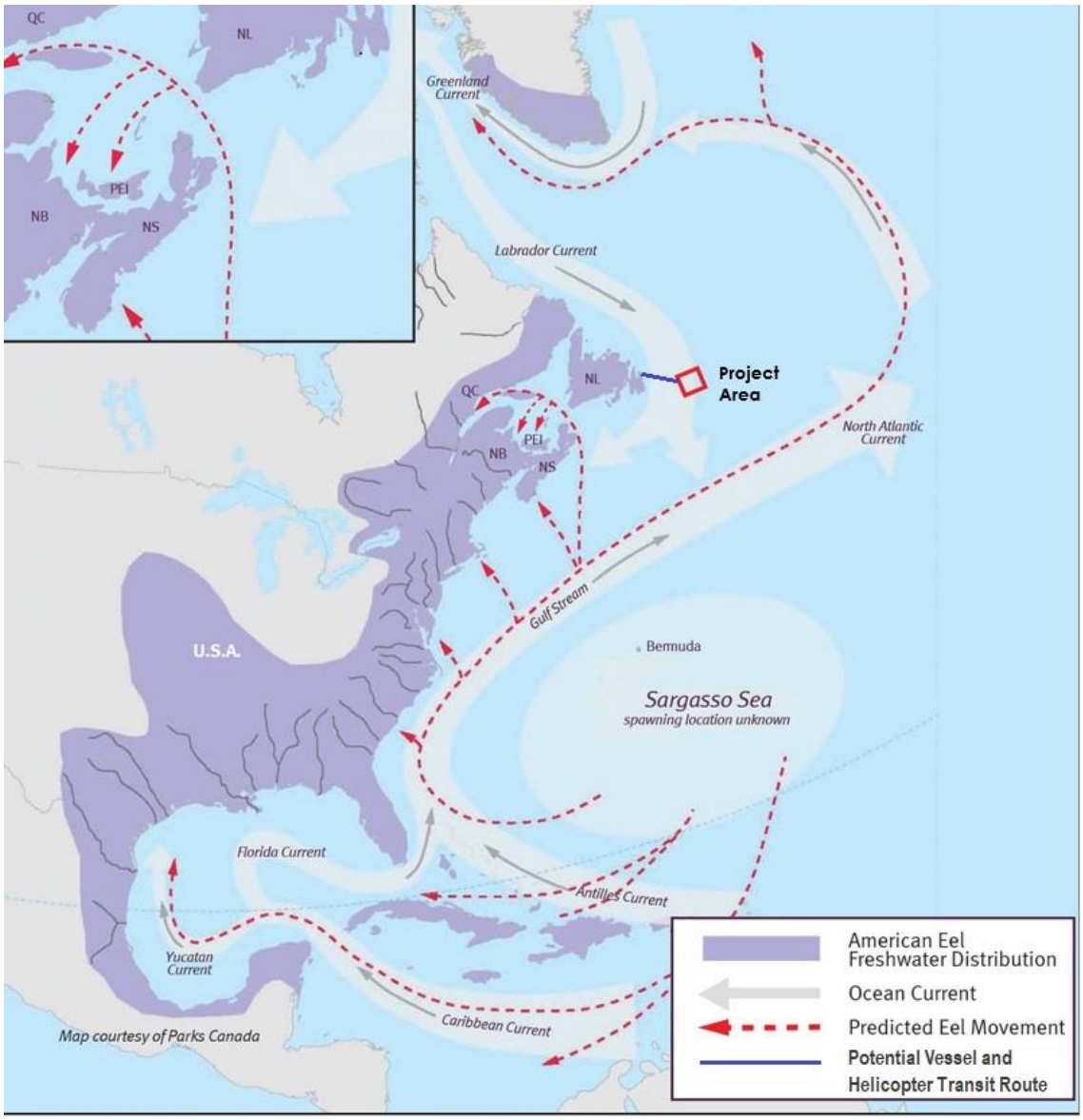


Figure 6-37 Ocearch Records of Satellite-tagged White Sharks (named individuals) Recorded within the RAA from 2013-2022



Source: DFO 2016

Figure 6-38 Predicted American Eel Migration Paths

6.1.3.6.2 Atlantic Salmon

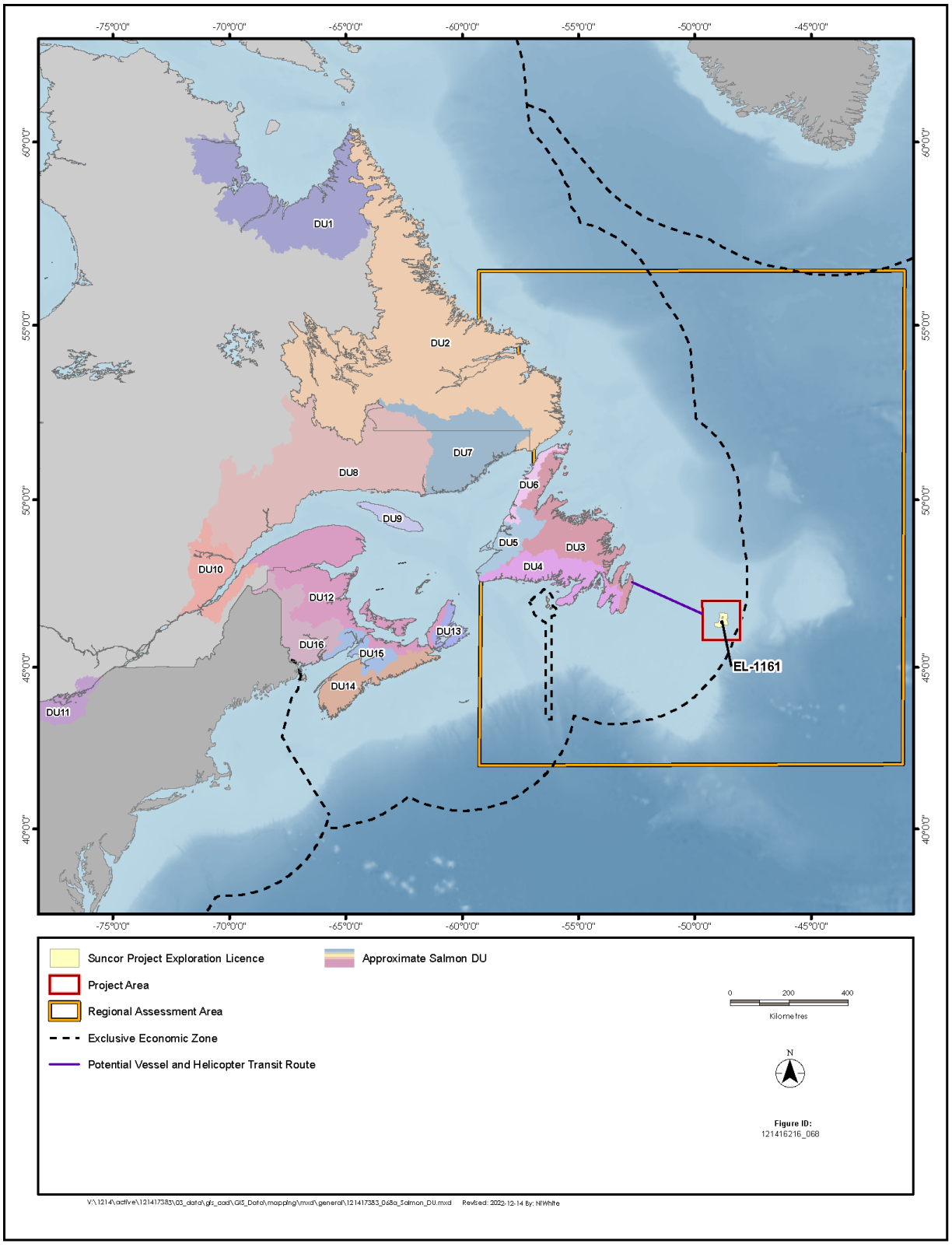
Atlantic salmon occupy freshwater, estuarine and marine environments. Some populations in Atlantic Canada are listed from Special Concern to Endangered by various organizations. Key threats and possible limiting factors to Atlantic salmon include predation, climate change, directed fisheries, by-catch mortality, obstructions to spawning areas, and aquaculture (COSEWIC 2010c, International Council for the Exploration of the Sea 2021). There have also been large declines in marine survival, but the mechanism for mortality is poorly understood. It is suggested that declines in sea survival are occurring in parallel with wide-spread changes in the North Atlantic ecosystem (COSEWIC 2010c). To date, there has not been any critical habitat established for this species; however, freshwater habitat is considered a limitation to salmon production (COSEWIC 2010c).

The 2010 COSEWIC Assessment and Status Report on Atlantic salmon outlines a total of 16 Atlantic salmon populations (COSEWIC 2010c) (Table 6.7). Each of these populations has been delineated in terms of natal river destination within Designatable Units (DU) (Figure 6-39). The general criteria used by COSEWIC to recognize DUs, and therefore populations, is groups of individuals likely exhibiting unique adaptations that are largely a component of the species' biodiversity (COSEWIC 2010c). Summary information regarding the Atlantic salmon population within each DU is provided primarily from COSEWIC (2010c) with updates since the COSEWIC assessment, where applicable.

Table 6.7 Federal Conservation Status of Canada's Atlantic Salmon Designatable Units

Region	Metapopulation (DU)	Metapopulation Name (DU)	Range	COSEWIC Status	SARA Status
Nunavik and Labrador	1	Nunavik	Quebec, Atlantic Ocean	Data Deficient	No Status
	2	Labrador	Labrador, Atlantic Ocean	Not at Risk	No Status
Insular Newfoundland	3	Northeast Newfoundland	Newfoundland, Atlantic Ocean	Not at Risk	No Status
	4	South Newfoundland	Newfoundland, Atlantic Ocean	Threatened	No Status
	5	Southwest Newfoundland	Newfoundland, Atlantic Ocean	Not at Risk	No Status
	6	Northwest Newfoundland	Newfoundland, Atlantic Ocean	Not at Risk	No Status
Gulf of St. Lawrence	7	Quebec Eastern North Shore	Quebec, Atlantic Ocean	Special Concern	No Status
	8	Quebec Western North Shore	Quebec, Atlantic Ocean	Special Concern	No Status
	9	Anticosti Island	Quebec, Atlantic Ocean	Endangered	No Status
	10	Inner St. Lawrence	Quebec, Atlantic Ocean	Special Concern	No Status
	11	Lake Ontario	NA	Extinct	No Status
	12	Gaspé-Southern St. Lawrence	Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Atlantic Ocean	Special Concern	No Status
Eastern – Southern Nova Scotia and Outer Bay of Fundy	13	Eastern Cape Breton	Nova Scotia, Atlantic Ocean	Endangered	No Status
	14	Southern Uplands	Nova Scotia, Atlantic Ocean	Endangered	No Status
	16	Outer Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	No Status
Inner Bay of Fundy	15	Inner Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	Schedule 1; Endangered

Source: DFO (2017)



Source: Reproduced from COSEWIC 2010c

Figure 6-39 Designatable Units (DU) for Atlantic Salmon in Eastern Canada

The Inner Bay of Fundy population is within DU15 and is currently considered Endangered by both COSEWIC (COSEWIC 2010c) and SARA (Species at Risk Public Registry 2017). This DU extends from Cape Split around the Inner Bay of Fundy to a point just east of the Saint John River estuary. This DU has strong genetic differentiation from nearby DUs and appears to exhibit unique migratory behaviour (within the Bay of Fundy/Gulf of Maine (COSEWIC 2010c). Over 40 million salmon of differing ages have been stocked into rivers of this region since the turn of the 20th century. Early sources of stockings are unclear, but recent stocking has been completed with Inner Bay of Fundy progeny (COSEWIC 2010c). Recent stocking events, intended to maximize exposure of salmon to wild environmental conditions are part of a captive-rearing program thought to have prevented, at least temporarily, the extinction of salmon in this DU (COSEWIC 2010c).

Atlantic salmon occur in approximately 2,500 rivers flowing into the North Atlantic Ocean and despite extensive research on the freshwater portion of their life history, less is known about their life history once they leave their natal rivers and undertake migrations in the North Atlantic Ocean (Spares et al. 2007, COSEWIC 2010c, Lefevre et al. 2012, Windsor et al. 2012, Soto et al. 2018). Anadromous Atlantic salmon typically leave their natal rivers during May / June as smolt where they spend from one to four years in the marine environment before returning to spawn as adults (Gardner 1976, COSEWIC 2010c). During their first winter at sea, young salmon are called post-smolt; after their first winter they are called adult salmon regardless of the number of subsequent winters at sea prior to returning to their home river.

Adults returning to spawn after only one year at sea are called “one sea-winter” (1SW) salmon. One sea-winter salmon may migrate back to their natal rivers to spawn the following summer or they may migrate to ocean foraging grounds and overwinter for another season. Salmon that spend more than one year at sea are called “multi sea-winter” (MSW). Fish that are successful at spawning typically overwinter in freshwater and return to the ocean the following spring. Thus, at any given time there are multiple age classes of salmon expected to be using ocean environments.

General Ocean Distribution and Migration

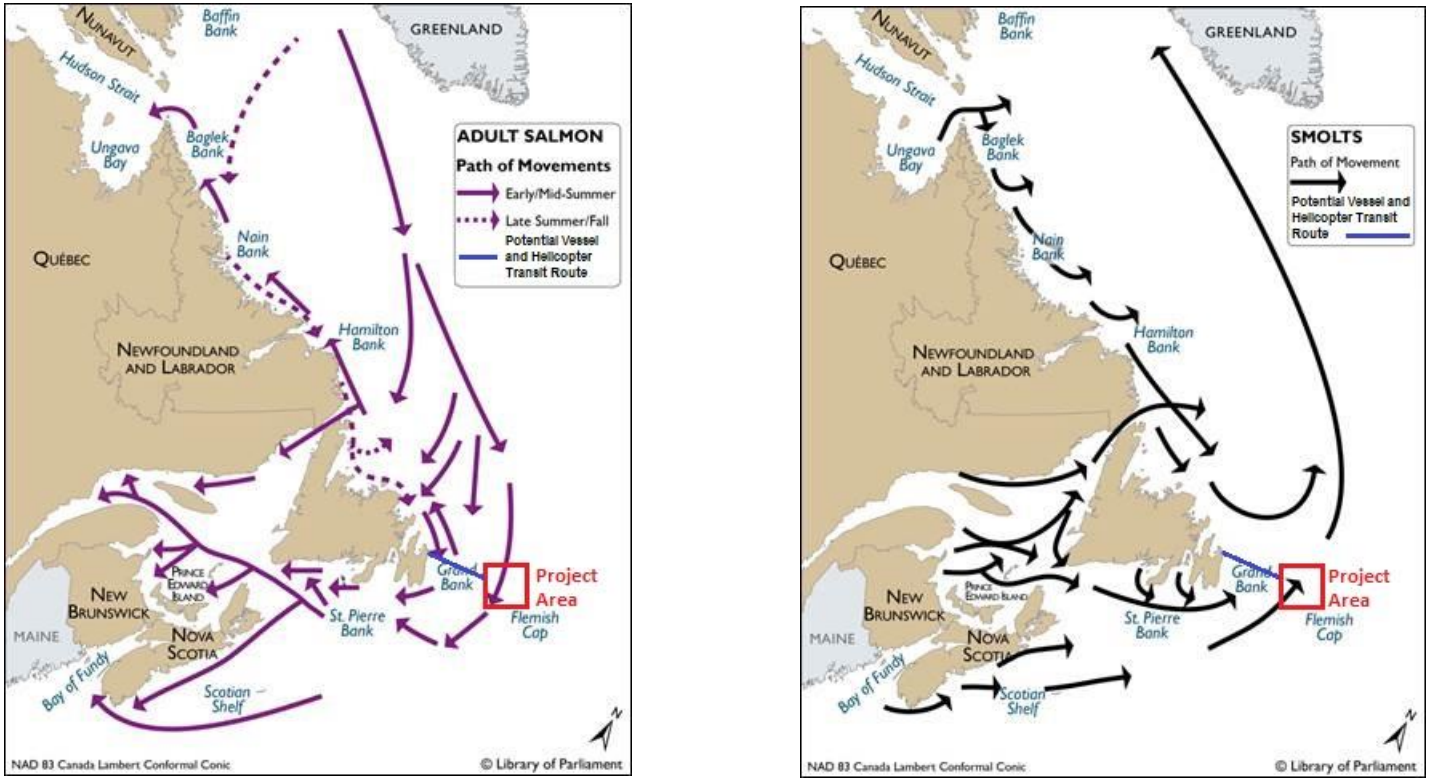
The marine distribution and habitat requirements of salmon at sea have generally been inferred from commercial catch data, research vessel surveys, telemetry studies, as well as tracer studies such as stable isotopes and Cesium 137 (Reddin 2006, Spares et al. 2007, COSEWIC 2010c, Lacroix 2013, Soto et al. 2018). While there is a general understanding of the spatial and temporal distribution of salmon at sea, the resolution of this information is low (Reddin and Friedland 1993, Reddin 2006, COSEWIC 2010c, Soto et al. 2018). The available results of past and ongoing research provide some insight to patterns of migration, food resources, distribution and abundance but also associations to environmental factors (Reddin and Shearer 1987, Reddin and Friedland 1993, Reddin 2006). This is further complicated by evidence of possible climate-induced salmon prey population changes that may be actively changing salmon distribution patterns within the North Atlantic Ocean over time (Mills et al. 2013, Renkowitz et al. 2015, Caesar et al. 2018) and possible changes in nearshore post-smolt survival (Soto et al. 2018). Although it is an active area of current research, the potential variation in ocean distribution within and among salmon DUs is not well described and it is generally thought that the open-ocean distribution of many DUs overlap (Spares et al. 2007, Bradbury et al. 2015, 2016a, 2016b).

Salmon post-smolt and adults feed opportunistically on various plankton, crustaceans, and larval fish (Lacroix and Knox 2005, Sheehan et al. 2012) in the upper water layers (Reddin and Friedland 1993). Both post-smolt and adult salmon tend to spend most of their time within the upper water layers, generally in the upper 5 m (Reddin and Shearer 1987, Reddin and Friedland 1993, Strøm et al. 2017, Hedger et al. 2017); however, recent research is indicating that adults may utilize deeper water as well (European salmon have been recorded making dives up to 900 m) (Windsor et al. 2012, Strøm et al. 2017, Hedger et al. 2017).

Atlantic salmon smolt are generally considered to be energy-deficient with low energy reserves for somatic growth upon leaving their natal river and during the early marine phase (Jonsson and Jonsson 2005). Post-smolt are therefore likely distributed according to prevailing surface currents either close to shore or in open waters and that strong currents act as transportation vectors that facilitate migration to marine feeding areas to reduce energy needs (Jonsson et al. 1993). Therefore, the migration routes of post-smolt may be determined by general ocean currents near its confluence with the ocean (Figure 6-40).

In general, there are concentrations of both post-smolt and adult salmon in the Labrador Sea throughout the year where they feed and overwinter. Reddin and Friedland (1993) indicate that post-smolt were observed in the Labrador Sea in autumn of all study years and that they were most abundant between 56° and 58°N (i.e., northern Labrador Sea area). Post-smolt in the Labrador Sea originate from rivers over much of the geographical range of salmon in North America and most post-smolt overwinter in the southern portion of the Labrador Sea (Reddin and Friedland 1993). Catch data in Reddin and Friedland (1993) indicate that post-smolt do not overwinter in the Grand Bank area during the period 23 December to 21 March. Reddin (2006) notes that post-smolt may overwinter off the Grand Banks but states that corroborative evidence from directed research or indirectly by commercial vessels fishing during the winter is lacking. It should be noted that overwintering areas have not been definitively established and some individual salmon may overwinter in other areas than those indicated above. Overwintering areas may also shift to some extent with oceanic conditions. Adult salmon, primarily MSW fish, are also found off west Greenland in the summer and fall.

Prior to their spring spawning migration to their home rivers, adult salmon have been found congregating in two general offshore locations; approximately 480 km east of the Strait of Belle Isle and slightly east of the 200 m isobath (depth contour) along the eastern edge of the Grand Banks (Reddin and Friedland 1993). Based on catch data provided in Reddin and Shearer (1987), the area of congregation on the eastern edge of the Grand Banks would be located south of the Flemish Pass.



Source: Standing Committee on Fisheries and Oceans 2017

Figure 6-40 General Ocean Distribution and Migratory Patterns of Canadian Atlantic Salmon

The physiological temperature range of Atlantic salmon is quite broad (approximately 0°C to 20°C); however, data suggest individuals are more common in waters ranging from 4°C to 12°C. Research to date provides an overview of general habitat use but also a description of suitable, preferred environmental conditions for salmon survival and growth. Changes in environmental conditions can spatially alter typical distributions and migration routes (Reddin and Shearer 1987; Soto et al. 2018) as well as marine survival (Reddin 2006). For example, catch data suggests that salmon modify movements at sea depending on sea surface temperature (SST). Reddin and Shearer (1987) and Reddin and Friedland (1993) found a significant and marked relationship between commercial catch rates and the boundary limit of the 4°C isotherm. Few salmon were located at lower temperatures and none below 3°C. The most appropriate temperature range for salmon, based on catch/abundances, has been determined to be a SST of 4°C to 12°C in the Northwest Atlantic with an optimum between 4°C to 8°C (Reddin and Friedland 1993). Reddin and Burfitt (1984) examined the relationships between salmon catch rate, SST and prey abundance and concluded that SST is the main predictor of Atlantic salmon distribution in the marine environment. Reddin and Shearer (1987) found that low SST appeared not only capable of deflecting Atlantic salmon from recognized migratory paths, but modified movements such that fish would avoid cold water even though warmer water was beyond. This avoidance behaviour was shown to affect fish habitat use during years when cold water extended south by forcing salmon to move further south as well (Reddin and Friedland 1993).

A recent study using stable isotope signatures of carbon (δ13C) in scales of returning Atlantic salmon to the Saint John River, New Brunswick over a long time-series (approximately 1980-2011) estimated marine feeding areas of 1SW and MSW adults (Soto et al. 2018). The study concluded that salmon from Saint John River were most closely correlated to feeding areas in the western North Atlantic (Irminger Sea near Iceland, southwest Greenland or Labrador / Newfoundland), the southern North Sea, and northern Norwegian Sea areas; however, they suggest the western North Atlantic region is the more likely feeding region for these fish (Figure 6-341. This area (darker green and bluish) is off the coast of Labrador and northern Newfoundland (Labrador Sea area). Spares et al. (2007) also found, using Cesium 137 (^{137}Cs) bioaccumulation, that migration of Canadian MSW salmon showed a feeding distribution in the Labrador and Irminger Seas; however, data from 1SW salmon indicated greater trans-Atlantic migrations.

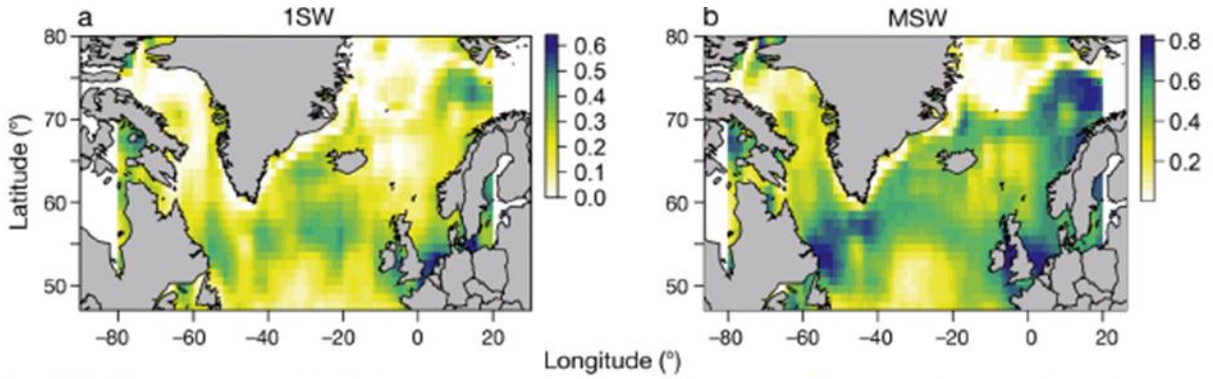


Fig. 4. Probable marine summer feeding locations derived from correlations of LOESS-fit scale $\delta^{13}C$ and yearly median sea surface temperature (SST) for Atlantic salmon after spending (a) 1 winter at sea (1SW) or (b) multiple winters at sea (MSW) and returning successfully to the St. John River during the period 1982–2011. Colours indicate the degree of correlation (R^2)

Source: Reproduced from Soto et al. 2018

Figure 6-41 Locations of Probable Marine Summer Feeding Locations of 1SW and MSW Salmon

Ocean distribution and migration information for specific Atlantic salmon DUs is limited. Where data exists, it is based on tagging studies of salmon from a limited sample of river systems (Hedger et al. 2009, Jacobs 2011, Lefevre et al. 2012, Lacroix 2013, Strøm et al. 2017, Soto et al. 2018) or it is inferred from the genetic composition of commercial fisheries catch data (Bradbury et al. 2015, 2016a, 2016b). The general information provided below related to those DUs considered Endangered under COSEWIC is inferred from the general understanding of salmon distribution and is subject to change as future studies are completed.

With respect to the Project, research vessel surveys have caught salmon within the Project Area and LAA in the spring (Reddin and Friedland 1993; Reddin 2006). There is no specific information for the Project Area and LAA with respect to salmon abundance or the relative DU composition of individuals that may inhabit the area. Likewise, there is no information with regards to salmon overwintering in relation to the Project Area and LAA.

Inner Bay of Fundy Salmon DU

The Atlantic salmon population of the inner Bay of Fundy (iBoF) have been listed as Endangered on Schedule 1 of SARA (CSAS 2016) and is the only population listed under the Act. Post-smolt from rivers in the iBoF have been observed to remain in the Bay of Fundy until late summer and while the exact overwintering location is unknown, lack of tag recoveries from distant intercept fisheries indicate the iBoF salmon do not go as far north as other salmon stocks and few are caught outside the Bay itself (COSEWIC 2010c). In 2013, DFO reviewed and evaluated the available iBoF salmon data to identify important marine and estuarine habitats needed to complete all life history stages (DFO 2013).

While the data available to determine habitat important for overwintering (November to April) for all stages is limited, overwintering is now suggested to occur off the Scotian Shelf or the southern portion of the Gulf of Maine (CSAS 2016). However, inner Bay of Fundy kelts (salmon that have returned to the ocean following spawning) seem to follow migratory patterns similar to that of post-smolts. Kelt overwintering data suggest that the majority remain in the northern Gulf of Maine through the colder winter months, with some venturing into the warmer Scotian Shelf waters (Lacroix 2013). The existing information suggests that inner Bay of Fundy salmon are not known to inhabit North Atlantic Ocean waters near the Grand Banks.

Thus, with respect to the Project Area (see Figure 6-40), the presence of inner Bay of Fundy salmon is not expected at any life history stage or season.

Outer Bay of Fundy, Southern Uplands and Eastern Cape Breton DUs

Outer Bay of Fundy metapopulation breeds in rivers along the New Brunswick shores of the Bay of Fundy, from the U.S. border to the Saint John River (DFO 2011b), with 17 rivers identified as containing (or historically containing) Atlantic salmon (Gibson et al. 2016). There have been no recreational fisheries or food, social, and ceremonial allocations in this Salmon Fishing Area since 1998. All rivers remained closed to salmon fishing in 2018 (DFO 2018b).

The Southern Uplands metapopulation breeds in rivers from northeastern mainland Nova Scotia, along the Atlantic coast and into the Bay of Fundy as far as Cape Split (DFO 2011c, 2011d), with 72 rivers identified as containing (or historically containing) Atlantic salmon (Gibson and Bowlby 2013). All rivers within Salmon Fishing Areas 20 and 21 have been closed to recreational fishing and FSC allocations since 2010 (DFO 2020b).

The Eastern Cape Breton metapopulation breeds in rivers on Cape Breton Island that drain into the Bras d'Or Lakes and Atlantic Ocean (DFO 2011d), with 46 rivers identified as containing (or historically containing) Atlantic salmon (DFO 2014b). Except for Middle River, Baddeck River, and North River, all rivers in this DU have been closed to salmon fishing since 2013. In 2018, FSC allocations were available from these three rivers; however, no FSC harvests were recorded from these three rivers in 2018 (DFO 2018b).

In terms of marine use and distribution data, the Eastern – Southern Nova Scotia and Outer Bay of Fundy Atlantic salmon populations cannot be differentiated from that of Southern Newfoundland or the Gulf of St. Lawrence populations. Post-smolt migrating to the Labrador Sea and adults returning to natal streams in the spring would follow similar patterns of movement as described above; however, there's no evidence that post-smolt would show delayed migration to the Labrador Sea like some Gulf of St. Lawrence metapopulations.

Salmon of this region would feed and overwinter in the Labrador Sea and a portion of them may congregate off the eastern edge of the Grand Banks in spring prior to completing their spring spawning migration back to natal rivers. Post-smolt from this region would not overwinter in the Flemish Pass area (Reddin and Friedland 1993). In terms of initial post-smolt migration from their natal river to feeding areas in the Labrador Sea, it would also be likely that they follow a more coastal route along the coast of Newfoundland (Reddin and Friedland 1993, CSAS 2013, Lacroix 2013). Returning adults to the Gulf of St. Lawrence in the spring would also tend to move into Newfoundland coastal waters and then move in a southerly and then westerly direction along the Newfoundland coast (Reddin and Friedland 1993).

Migration routes back to these DUs are thought to be similar to the routes out to sea. Resolution of available information does not allow the determination of whether salmon from these DUs would be commonly found. Given the available data, spring migration of adults within and near the Grand Banks and Flemish Pass is possible and therefore interaction between these populations and the Project Area and LAA would be considered possible but low.

Inner St. Lawrence, Quebec Western North Shore, Quebec Eastern North Shore, Anticosti Island, Gaspe-Southern Gulf of St. Lawrence DUs

The Inner St. Lawrence DU consists of nine known salmon rivers located along the northern and southern banks of the St. Lawrence River between the communities of Grondines and Tadoussac, Quebec. The Quebec Western North Shore DU consists of 25 known salmon rivers located approximately from the community of Tadoussac to Natashquan. The Quebec Eastern North Shore DU consists of 20 known salmon rivers located approximately from the community of Natashquan to rivers just east of Pakuashipi. Members of the Anticosti Island metapopulation originate from the 25 known salmon rivers on Anticosti Island (DFO 2017b). The Gaspe-Southern Gulf of St. Lawrence DU includes 78 known salmon rivers extending from the western Gaspe to the northern tip of Cape Breton, including Prince Edward Island (COSEWIC 2010c, DFO 2011d, 2013). There have been no Atlantic salmon commercial fishery activities since 2000. Indigenous peoples continue to fish in several salmon rivers for FSC purposes. Catch and release recreational fishing is still authorized on some rivers under restrictive conservation management restrictions.

As noted above, post-smolt are distributed according to prevailing surface currents and that strong currents act as transportation vectors that facilitate migration to marine feeding areas to reduce energy needs (Jonsson et al. 1993). This process appears to influence the migratory pathway for post-smolt within the Gulf of St. Lawrence region. For example, post-smolt from the north shore of the Gulf of St. Lawrence, as well as the Miramichi, Restigouche, and Cascapedia rivers, follow the coast eastward and use the Strait of Belle Isle as their major pathway during emigration to the North Atlantic (Lefevre et al. 2012). Post-smolt from other rivers farther south on the Gaspe Peninsula have been recaptured near both the Strait of Belle Isle and Cabot Strait.

Caron (1983) and Dutil and Coutu (1988) concluded that some Gulf of St. Lawrence stocks delayed migration from the Gulf and that at least some post-smolt remained there until late autumn. Post-smolt have been captured as by-catch in herring gear in the northern Gulf of St. Lawrence in late summer (COSEWIC 2010c, CSAS 2012) and the winter destination of these late migrations remains unknown. Post-smolt within the Gulf of St. Lawrence were also recorded as spending more time in near-shore coastal habitat than smolt from other regions, which spend very little time in or near estuary habitat (COSEWIC 2010c). Once moving to open sea, post-smolt from the Gulf tend to head in a general northward direction (COSEWIC 2010c). This information suggests that post-smolt from the Gulf of St. Lawrence travel to the Labrador Sea primarily in a northerly route through the Strait of Belle Isle and eastward around the Island of Newfoundland. They may also delay migration away from estuary habitat and the Gulf in general until late fall and may overwinter in the Gulf area for their first winter.

CSAS (2012) indicates that the west Greenland fishery has captured salmon from Gulf of St. Lawrence rivers with an estimated harvest of 3% to 10% of total sea winter salmon being from the region (2006-2011). River age data suggest that salmon migrating along the eastern edge of the Grand Banks (see Figure 6-35) would at least be partially of Gulf of St. Lawrence origin (particularly the southern portion of the Gulf of St. Lawrence).

Similar to Atlantic salmon from the Southern Newfoundland population, salmon of Gulf of St. Lawrence origin would likely feed and overwinter in the Labrador Sea and a portion of them may congregate off the eastern edge of the Grand Banks in spring prior to completing their spring spawning migration back to natal rivers. Post-smolt from this region would also be similar to those of insular Newfoundland in that they would not overwinter in the Flemish Pass area (Reddin and Friedland 1993). In terms of initial post-smolt migration from their natal river to feeding areas in the Labrador Sea, it would also be likely that they follow a generally coastal route along Newfoundland before moving offshore (Reddin and Friedland 1993; CSAS 2013). Returning adults to the Gulf of St. Lawrence in the spring would also tend to move into Newfoundland coastal waters and then move coastwise in a southerly and then westerly direction along the Newfoundland coast (Reddin and Friedland 1993; Bradbury et al. 2016a). All age groups of salmon at sea are represented in the Labrador Sea, where they also probably spend the winter.

Given the available data, spring migration of adults within and near the Grand Banks and Flemish Pass is possible and therefore interaction between these populations and the LAA would be considered possible but low.

6.1.3.6.3 Swordfish

Swordfish are a large migratory pelagic fish that is well-distributed in the Atlantic Ocean and an occasional visitor to the waters of the RAA from June to October (DFO 2010). Breeding and nursery areas for swordfish are in southern waters, including the Gulf of Mexico and the eastern shelf of the U.S. (Govoni et al. 2003). They primarily feed on squid, Atlantic mackerel, Atlantic herring, and other fish while in Canadian waters (Stillwell and Kohler 1985). They associate with thermal fronts such as the meeting of the Gulf Stream and the Labrador current off the Grand Banks (Sedberry and Loefer 2001).

Their distribution in Canadian waters is derived from fisheries catch data (longline and harpoon), satellite tagging studies, and sightings as compiled by OBIS (2019). They are primarily found in the deeper waters off the Grand Banks shelf, though records do exist within the RAA (Figure 6-42). Swordfish migrate on a daily basis, occupying surface waters during the day and deeper (>400 m) waters at night (Lerner et al. 2013). Many Indigenous groups have commercial communal licenses for swordfish, with catches primarily in NAFO subdivisions 3O and 3N to the south of the RAA.

6.1.3.6.1 Tunas (Albacore, Bigeye, Atlantic Bluefin)

Tunas are large-bodied, pelagic, migratory fish with broad distributions in the Atlantic Ocean. The three species that have been recorded in and near the RAA are albacore, bigeye, and the Atlantic bluefin tuna. Bigeye tuna is the only species to be recorded inside the RAA between 1952 and 2016 (one occurrence; Figure 6-43). Similar to swordfish, all three species are predominantly recorded in the deeper waters to the south and east of the Grand Banks (Figure 6-43). They enter Canadian waters in summer and fall, primarily to feed on Atlantic herring, Atlantic mackerel, capelin, hake species, and squid (Walli et al. 2009, COSEWIC 2011). The Atlantic bluefin tuna is listed as Endangered under COSEWIC, and to date no critical habitat has been established in Canada (COSEWIC 2011). These tuna do not spawn in Canada; Atlantic bluefin and albacore tuna spawn in sub-tropical waters and the Mediterranean, while bigeye tuna spawn in tropical and sub-tropical waters to the south (Collette et al. 2011a, 2011b, COSEWIC 2011). Primary threats to tunas are historical and current commercial fisheries (COSEWIC 2011). Similar to swordfish, many Indigenous groups hold commercial communal licenses for tuna, with catches primarily to the south of the RAA off the shelf edge.

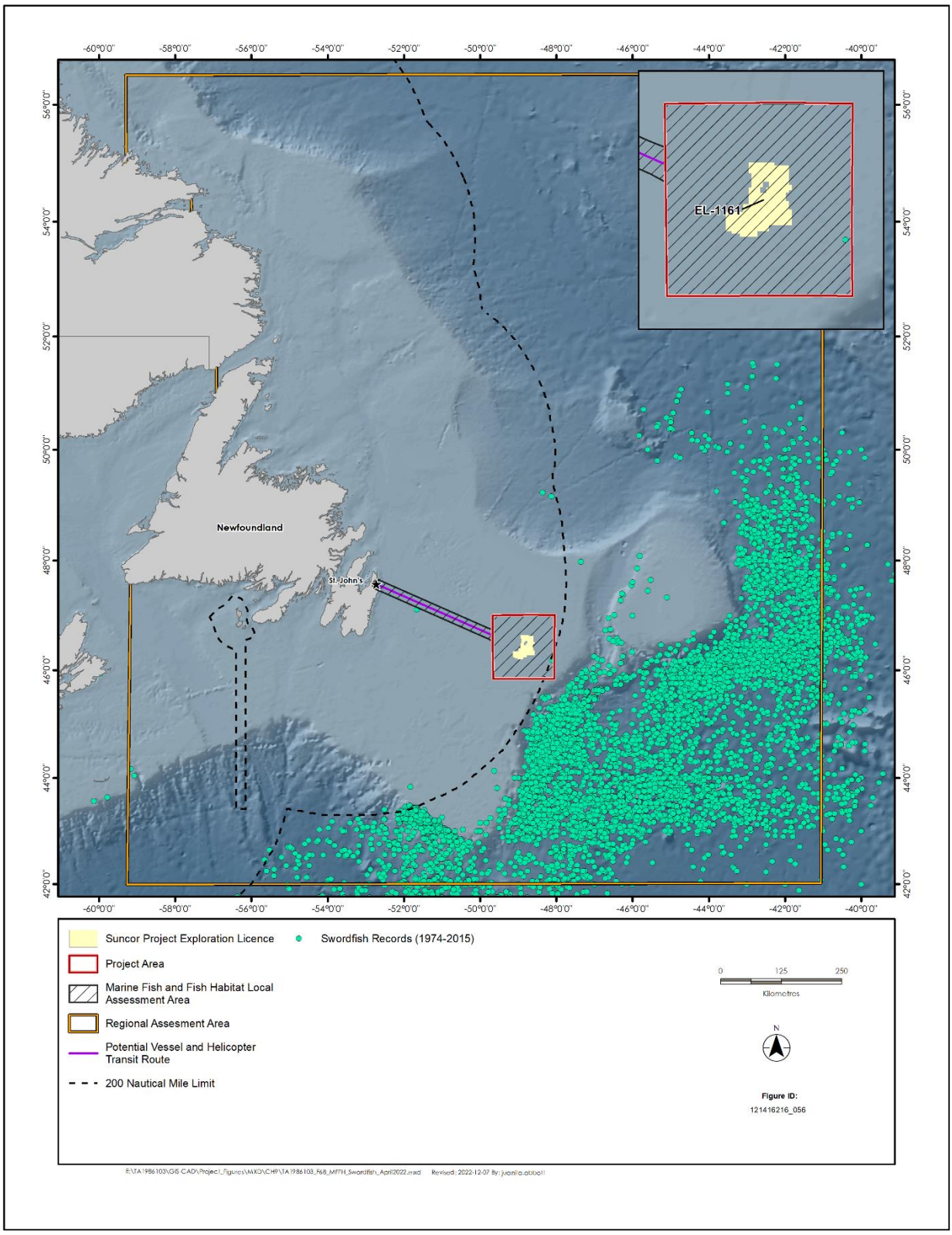


Figure 6-42 OBIS Records of Swordfish within the RAA (1974-2015)

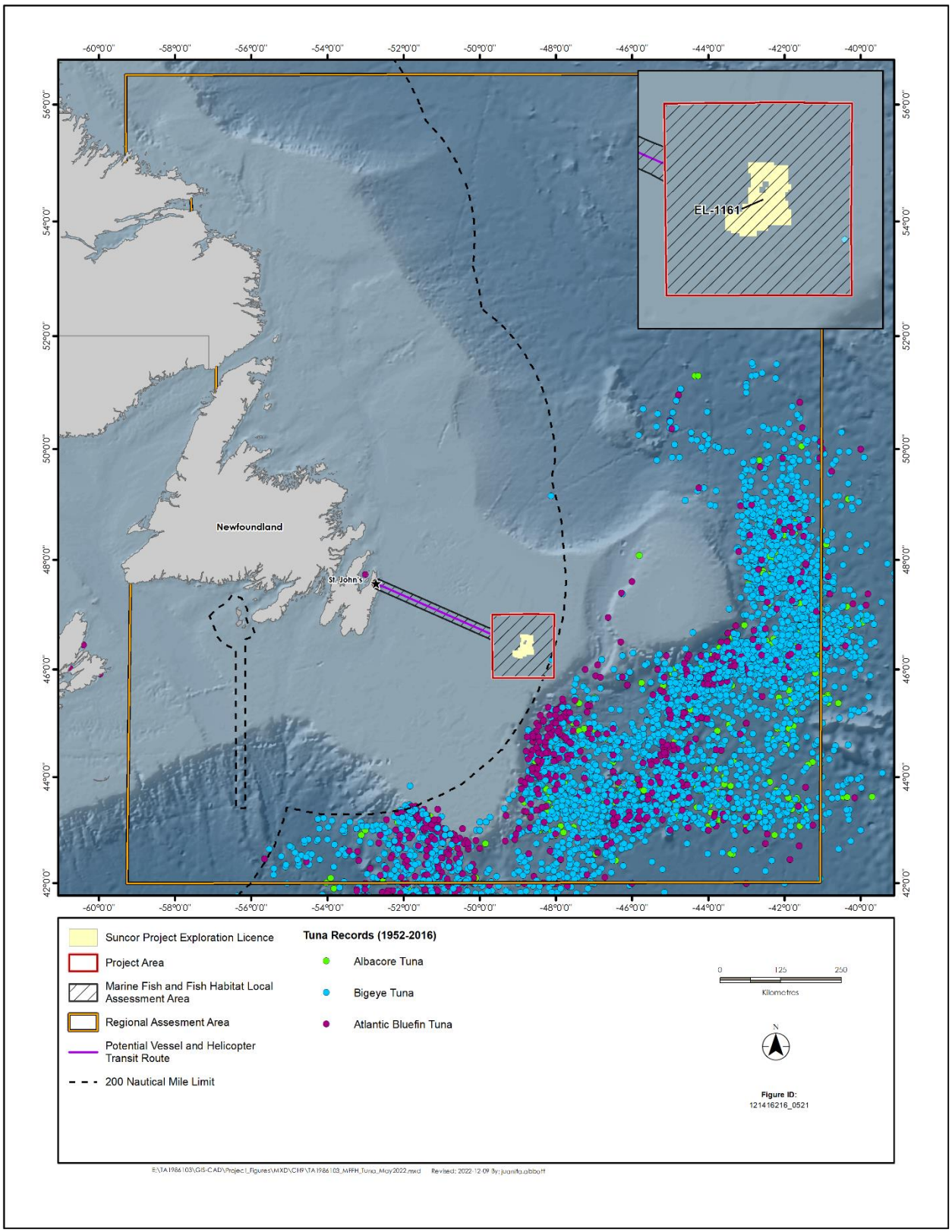


Figure 6-43 OBIS Records of Albacore, Bigeye, and Atlantic Bluefin Tuna within the RAA (1952-2016)

6.2 Marine and Migratory Birds

The marine waters off eastern Newfoundland provide a vast area of important breeding, migrating, and wintering habitat for marine-associated birds. The upwelling of the cold Labrador Current meeting the Grand Banks, the Flemish Cap and the North Atlantic Drift brings vital mineral nutrients from the ocean depths to the surface. The phytoplankton nourished by this upwelling form the basis for substantial biomass production, culminating in globally important numbers of seabirds in parts of the region in each season (Brown 1986; Lock et al. 1994; Fifield et al. 2009).

6.2.1 Approach and Key Information Sources

The distribution and abundance of seabirds in the Project Area and RAA has been characterized by various survey programs conducted by the Canadian Wildlife Service (CWS) and oil industry related seabird monitoring. From 1969-1983 and 1984-1992, data were collected by CWS through the programme intégré de recherches sur les oiseaux pélagiques (PIROP) that employed a line transect method in counting birds to unlimited distance (Brown 1986; Lock et al. 1994). From the late 1990s, the oil industry has collected data from offshore installations and supply vessels on the northeast Grand Banks (Baillie et al. 2005; Burke et al. 2005). However, few data were collected in Jeanne d'Arc Basin, the Orphan Basin, the northern slope of the Grand Banks or the Flemish Cap. Beginning in the mid-2000s, at-sea surveys were conducted by the oil and gas industry from vessels undertaking geophysical surveys within the RAA including the Jeanne d'Arc Basin, to fulfill marine bird monitoring required by the C-NLOPB (e.g., Abgrall et al. 2008a, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). These surveys were conducted using a fixed-width strip transect, which enables the determination of seabird densities based on the recommendations of a report funded by ESRF (Moulton and Mactavish 2004). Starting in 2005, CWS has again been conducting at-sea surveys with the Eastern Canadian Seabirds at Sea (ECSAS) program, partly funded by ESRF, with a mandate to improve knowledge of the abundance and distribution of seabirds at-sea in areas of oil industry activity in eastern Canada (Fifield et al. 2009; Bolduc et al. 2018; CWS, unpublished data). This program introduced the distance sampling technique into the surveys to improve the accuracy of density estimates for less detectable seabird species. In 2018, ECSAS density maps derived from data collected from 2006 to 2016 were published online ("Atlas of Seabirds at Sea in Eastern Canada") and the shapefiles were made available on an open data site (Bolduc et al. 2018). In 2021, both the Atlas and density estimates were updated using an expanded interval of 2006 to 2020. Again, intention is that updated data files will be hosted at the Government of Canada Open Data portal; however, in the interim, it was provided by CWS as unpublished data (C. Gjerdrum, pers. comm., 2022). These updated maps are used to illustrate and describe current marine bird distribution and abundance in and near the Project Area, 2006-2020. In the Atlas, the year is divided into three seasons: April-July (spring migration and nesting period of species whose young leave the nest soon after hatching [nidifugous]), August-November (moult, chick-rearing period of nidifugous species, and second half of the nesting period of species whose young remain in the nest [nidicolous]), and December-March (fall migration and wintering). Of note, there was limited survey coverage of the southern portion of the Project Area for both April-July and August-November seasonal periods with the 2006-2020 aggregate data. Several tracking studies of marine birds have been published recently and were consulted for details of bird movements between nesting colonies and wintering areas and to characterize the use of the RAA by breeding, wintering and migrating red-necked phalaropes, long-tailed jaegers, great shearwaters, northern gannet, and Leach's storm-petrels (van Bemmelen 2017;

Powers et al. 2020; Deakin et al. 2021; Krug et al. 2021; Montevecchi et al. 2021; Seyer et al. 2021; Collins et al. 2022).

Censuses of breeding pairs in seabird nesting colonies are conducted by CWS regularly in NL. Some data have been published (Wilhelm et al. 2015, 2016). Unpublished data were obtained from CWS current to the 2018 breeding season. Data published by the Important Bird Areas (IBA) in Canada program, many of which are major nesting colonies, were also consulted (Bird Studies Canada 2016). Summaries of data collected under the Atlantic Canada Shorebird Survey (ACSS) program as reported in the Statoil Canada's Flemish Pass Exploration Drilling Project EIS were also consulted (Statoil Canada Ltd. 2017).

Nomenclature and species sequence used in this EIS follow the American Ornithological Society's "Check-list of North American Birds" (Chesser et al. 2018).

6.2.2 Seabirds

Marine bird habitats in the RAA are comprised of coastal waters, continental shelf, slope, and deep waters. Concentrations of these birds sometimes occur at the upwellings at oceanographic features. Spawning capelin attract large concentrations of marine birds to coastal waters for a few weeks in summer. Millions of marine birds breed at nesting colonies in coastal southeastern Labrador and eastern Newfoundland, and forage for their young on the Grand Banks and other shelf areas during summer (Tables 6.8 and 6.9). Thousands of non-breeding seabirds occur in the RAA during the summer months. For example, most of the world's population of great shearwater and large numbers of sooty shearwater migrate to Newfoundland waters to moult and feed upon completion of their breeding period in the Southern Hemisphere. Thousands of sub-adult seabirds of species that nest north of the RAA remain in the RAA during the summer, especially northern fulmar and black-legged kittiwake. In the fall, migration of marine birds that have bred in the Arctic and subarctic regions of eastern Canada and Greenland brings them to the RAA to spend the winter. Other marine and migratory species also pass through the RAA during spring and fall migration.

Table 6.8 Number of Marine Birds Nesting at Major Colonies in the Labrador Portion on the RAA *52°N to 56°N)

Species	Quaker Hat	Northeast Groswater Bay	Gannet Islands	Bird Island
Northern Fulmar	-	-	24p[a]	-
Leach's Storm-Petrel	-	10p[a]	20p[a]	Present[a]
Herring Gull	-	220p[a]	-	-
Great Black-backed Gull	-	125p[a]	30p[a]	20p[a]
Black-legged Kittiwake	4p[a]	-	72p[a]	-
Common Murre	648p[a]	2,360p[a]	31,170p[a]	3,100p[a]
Thick-billed Murre	126p[a]	365p[a]	1,846p[a]	Present[a]
Razorbill	450p[a]	1,520p[a]	14,801p[a]	1,530p[a]
Black Guillemot	-	present	445i[a]	-
Atlantic Puffin	2,100p[a]	18,210p[a]	36,320p[a]	8,070p[a]
Total	3,328p	22,810p	84,283p, 445i	12,720p

Sources: [a] ECCC-CWS unpublished data
Notes: p = number of pairs, i = number of individuals

Table 6.9 Numbers of Marine Birds Nesting at Major Colonies in the Newfoundland Portion of the RAA (46°N to 52°N)

Species	Northern Groais Island	Wadham Islands	Coleman Island	Funk Island	Cape Freels/ Cabot Island	Bonavista Peninsula	Baccalieu Island	Witless Bay Islands	Mistaken Point	Cape St. Mary's	Middle Lawn Island	Corbin Island	Green Island	Grand Colombier Island	Miquelon Cape
Northern Fulmar	-	-	-	40p[a]	-	-	-	52p[a]	-	Present[a]	-	-	-		
Manx Shearwater	-	-	-	-	-	-	-	-	-	-	7p[f]	-	-		
Leach's Storm-Petrel	-	200p[a] -	2,906p [a]	150p[a]	8,200p[a]	60p[a]	1,950,000p[k]	314,020p[a]	-	-	8,773p[a]	100,000p[a]	48,000p[a]	363,787p[g]	
Northern Gannet	-	-	-	10.964p[a]	-	-	3,241p[a]	-	-	14,598p[a]	-	-	-		
Herring Gull	-	-	5p[a]	-	250p[a]	993i[a]	46p[a]	2,266p[a]	-	39p[a]	20p[a]	50p[a]	Present[a]	60p[h]	265p[j]
Great Black-backed Gull	-	-	-	75i[a]	14p[a]	1,000i[a]	2p[a]	15p[a]	-	Present[a]	6p[a]	25p[a]	-	10p[h]	
Black-legged Kittiwake	1,050p[b]	-	5p[a]	95p[a]	43p[a]	1,000i[a]	5,096p[a]	11,696p[a]	4,170p[e]	10,000p[a]	-	50p[a]	-	196p[h]	2,415p[j]
Arctic and Common Terns	-	22p[b]	4p[a]	-	1,420i[a]	17i[a]	-	-	-	-	-	-	Present[a]		
Common Murre	-	-	-	472,259p[b,d]	9,897p[a]	-	1,440p[a]	250,000p, 14,599i[a]	84p[a]	15,484p[a]	-	-	-	7,176p[i]	
Thick-billed Murre	-	-	-	250p[a]	-	-	73p[a]	240p[a]	-	1,000p[e]	-	-	-		
Razorbill	-	273p[c]	1,346p [a]	200p[a]	35p[a]		406p[a]	380p, 231i[a]	22p[e]	100p[a]	-	-	-	1,443p[i]	
Black Guillemot	-	50p[a]	25i [a]	1p[a]	4p[a]	25i[a]	113p[a]	1p, 13i[a]	Present[a]	Present[a]	-	-	-	95p[i]	Present[i]
Atlantic Puffin	-	6,190p[c]	12,649p[a]	2,000p[a]	755p[a]	4,870p[a]	75,000p[e]	304,042p[a,d]	79p[e]	-	-	-	-	9,543p[i]	
TOTAL	1,050p	6,735p	16,915p, 25i	485,959p, 75i	20.618p	4.930p, 3.035i	2,063,109p	882,712p, 14,843i	4,355p	41,221p	8,806p	100,125p	48,000p	382,310p	2,680p

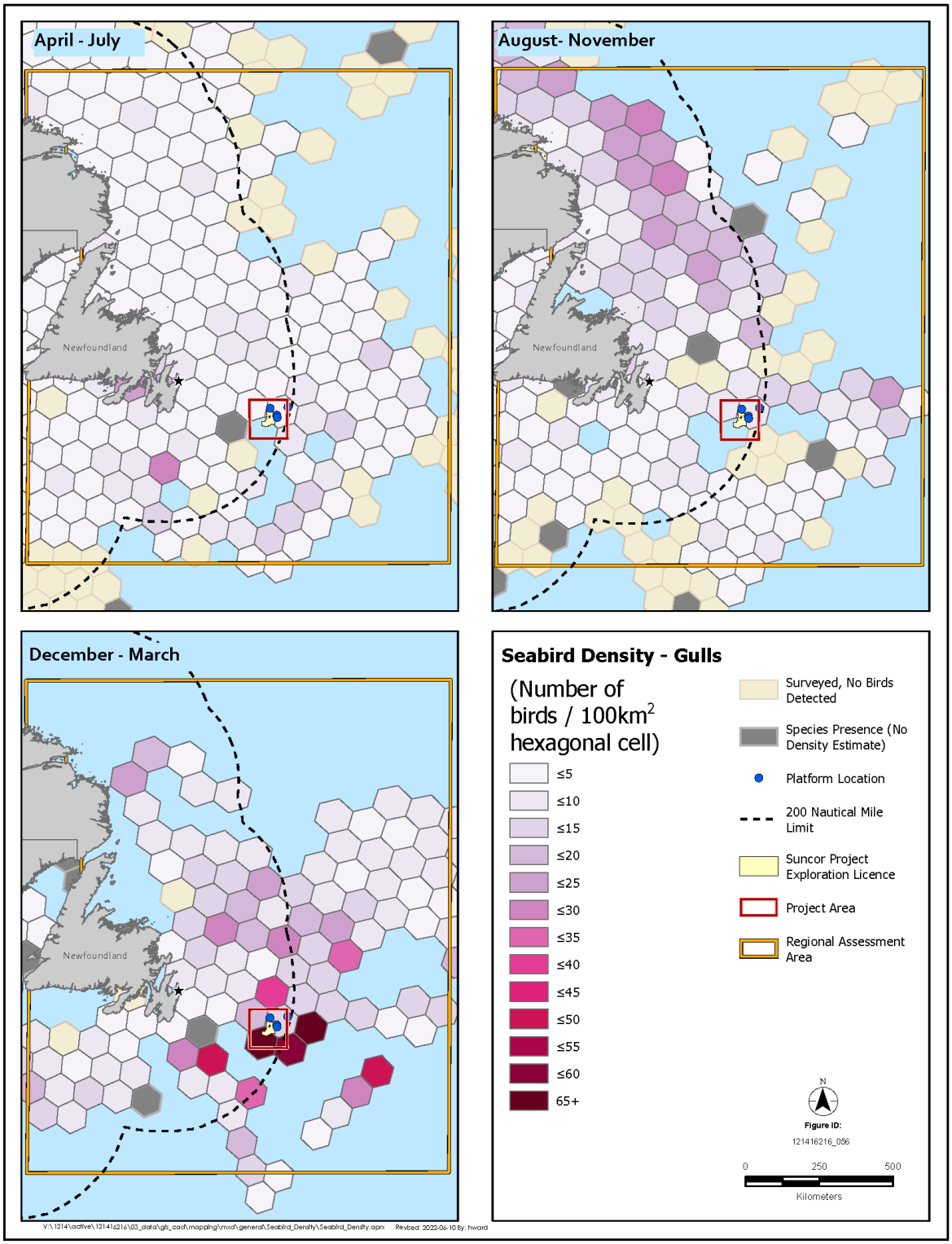
Sources: [a] ECCC-CWS unpublished data ; [b] Thomas et al. (2014a); [c] Robertson and Elliot (2002); [d] Wilhelm et al. (2015); [e] Parks and Natural Areas Division, unpublished data; [f] Fraser et al. (2013); [g] Lormée et al. (2012); [h] Lormée et al. (2008); [i] Lormée et al. (2015); [j] Cairns et al. (1989), [k] Wilhelm et al. (2019) ; Notes: p = number of pairs, i = number of individuals

6.2.2.1 Phalaropes

Both red and red-necked phalaropes nest in freshwater ponds in the Arctic and Subarctic and winter in pelagic waters of the tropics and sub-tropics. During the pelagic portion of their annual cycle these species are thought to forage primarily at areas of upwelling caused by ocean currents conflicting with shelf edges, shorelines and other currents feeding on zooplankton at the surface (Rubega et al. 2000; Tracy et al. 2002). Red-necked phalarope is designated a Species of Special Concern on Schedule 1 of SARA and is listed as Threatened under the NL ESA (see Section 6.2.4). Phalaropes occur in the RAA and Project Area as passage migrants during spring and fall (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). However, it has not been possible to calculate densities in the Project Area or the RAA because they are seldom recorded during at-sea surveys due to their low density and they are often seen only in flight (Abgrall et al. 2009; Bolduc et al. 2018). However, these species have been observed in small numbers off-transect from mid-May to early-June and during August and September (Abgrall et al. 2009). Eight red-necked phalaropes outfitted with geolocators on their nesting grounds in Greenland, Iceland, and Scotland wintered in the northern Humboldt Current in the Pacific Ocean off Central America (van Bemmelen et al. 2019). They migrated off the east coast of North America and crossed over land at Central America to reach the Pacific Ocean. Both the spring and fall migration routes took the birds through the Labrador Sea and the Grand Banks.

6.2.2.2 Gulls

Gull species are an abundant part of the avifauna off eastern Newfoundland. The primary species are herring, great black-backed and ring-billed gull and black-legged kittiwake. They nest in the RAA and, except for the ring-billed gull, also winter there. Only the black-legged kittiwake is a truly pelagic species. In Atlantic Canada, greater than two-thirds of the breeding gulls nest in Newfoundland; almost half of these birds are kittiwakes (Cotter et al. 2012). The populations of coastal gull species decreased after the closure of the groundfish fishery and the closure of municipal sanitary landfills but appear to be recovering (Cotter et al. 2012). Gulls feed primarily by picking food from the surface or plunge-diving from a low height. Arctic and subarctic breeding coastal species are common during the winter in the RAA (glaucous and Iceland gulls). The Arctic nesting pelagic species Sabine's gull is a passage migrant in the RAA whereas ivory and Ross's gulls winter in the RAA. Ivory gull is designated Endangered on Schedule 1 of SARA and the NL ESA, and Ross's gull is designated Threatened on Schedule 1 of SARA. Black-headed gull is a rare breeder in the RAA and lesser black-backed gull migrates through the RAA in small numbers. Laughing gull and mew (common) gull occur only as rare annual vagrants in the RAA (Moulton et al. 2006; Mactavish et al. 2016). Gull species other than kittiwake are found in the Project Area in densities of ≤10 birds/km² in the April-July period, ≤10 birds/km² in the August-November period, and up to 65+birds/km² in the December-March period (CWS unpublished data; Figure 6-44).



CWS, unpublished data

Figure 6-44 Seasonal Distribution and Abundance of ECSAS Gull Observations, Excluding Kittiwakes, in the Waters Off Eastern Newfoundland (2006-2020)

6.2.2.2.1 Black-legged Kittiwake

From April to August, this pelagic gull nests by the thousands in large and small colonies in eastern Newfoundland, foraging on pelagic fish that spawn in shallow, inshore waters (see Table 6.9). There are also small numbers of non-breeding sub-adult black-legged kittiwakes in offshore waters during this period (Lock et al. 1994; Abgrall et al. 2009; Bolduc et al. 2018, CWS unpublished data). However, many kittiwake nesting colonies are declining (Frederiksen et al. 2012). During April to July, densities in the Project Area were ≤5 birds/km² (Figure 6-45). Adults and fledglings abandon the colony in August and begin to arrive in the offshore parts of the RAA. During the August–November period, densities were ≤10 birds/km² (Figure 6-45). During December through March, densities were up to ≤50 birds/km² (CWS, unpublished data). Tracking kittiwakes with geolocators showed that 80% of the 4.5 million adult kittiwakes nesting in the Atlantic, including most European colonies, spend the winter from the shelf edges off Newfoundland, including the RAA, and offshore areas extending to the Mid-Atlantic Ridge and the Labrador Sea (Frederiksen et al. 2012). Black-legged kittiwake is designated Vulnerable on the International Union for Conservation of Nature's (IUCN's) Red List of globally threatened species (Birdlife International 2019).

6.2.2.2.2 Ivory Gull

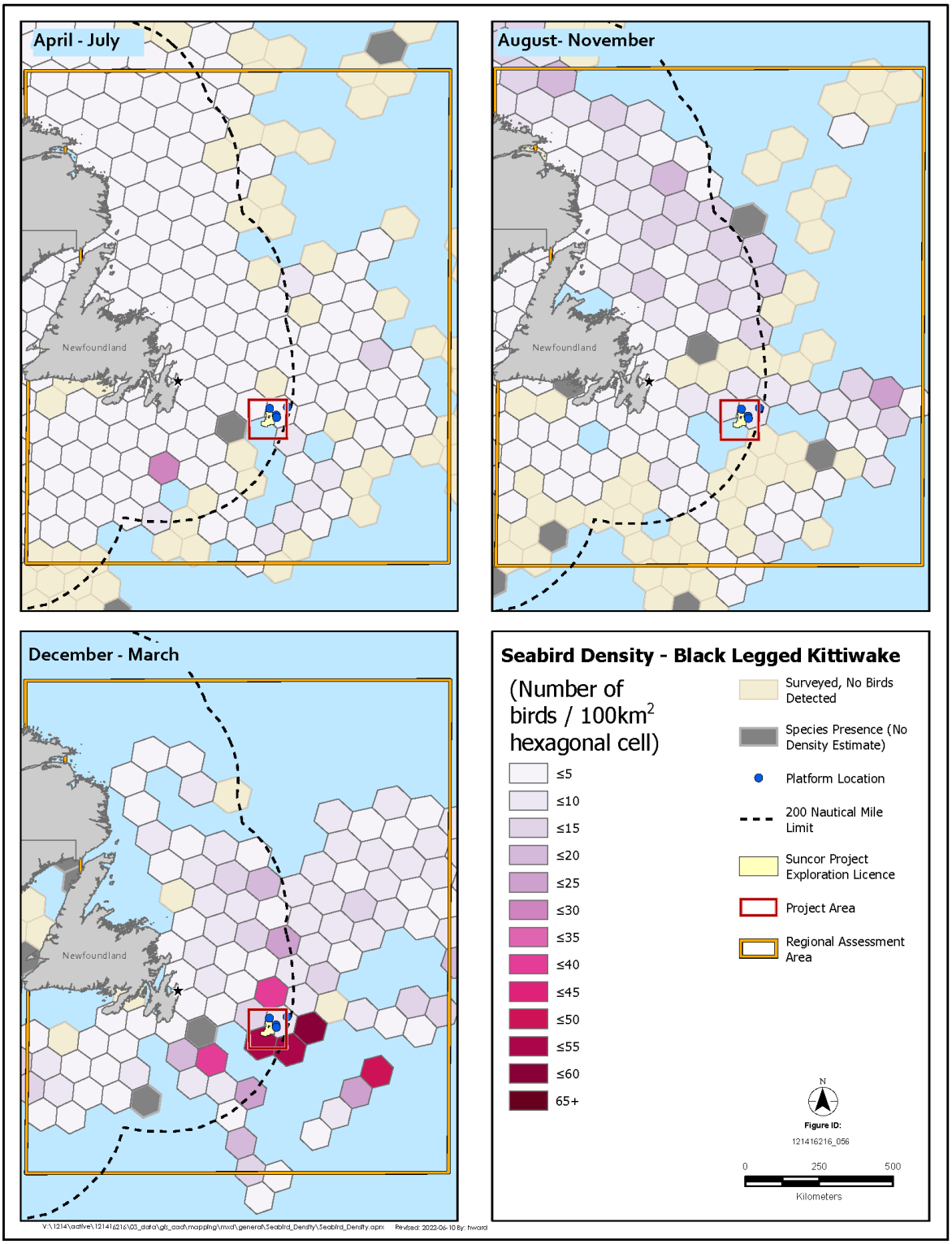
Ivory gulls forage in sea ice between breeding seasons. When the sea ice arrives in southern Labrador in winter and early spring and on the Northeast Newfoundland Shelf in late winter and early spring this species can be found in low densities in the northwest corner of the RAA (Mallory et al. 2008a; Gilg et al. 2010; Spencer et al. 2016). It occasionally occurs along the coast of the Northern Peninsula in winter and early spring (Stenhouse 2004; NLDEC 2016). Ivory gull is designated Endangered under both SARA (Schedule 1) and the NL ESA (see Section 6.2.4).

6.2.2.2.3 Small Gulls

Sabine's gull migrates through the pelagic waters of the Labrador Sea on its way between nesting grounds in the Canadian Arctic and wintering areas in the pelagic waters of the tropics (Davis et al. 2016). This species is a passage migrant in the offshore areas of the RAA. Small numbers have been observed during geophysical surveys off southeast Labrador in August and September (Beland and Mactavish 2014) and in Orphan Basin/Flemish Pass from late-May to late-September (Moulton et al. 2005, 2006; Abgrall et al. 2008a; Mactavish et al. 2012; Jones and Lang 2013; Holst and Mactavish 2014).

Ross's gull winters in very small numbers offshore from the Labrador Sea to Orphan Basin after migrating from nesting areas in the Canadian Arctic (Maftei et al. 2015). This species is designated Threatened on SARA Schedule 1 (see Section 6.2.4).

Black-headed gulls nest in the RAA at Ladle Cove in small numbers and outside the RAA (Cotter et al. 2012; B. Mactavish, pers. comm., May 2019) and winter at scattered locations along the Newfoundland coastline (B. Mactavish, pers. comm., May 2019). Although this species is primarily coastal in its distribution it has occasionally been recorded in Orphan Basin (Hauser et al. 2010). Densities of small and large gull species (except black-legged kittiwake) in the Project Area are discussed under large gulls below.



CWS, unpublished data

Figure 6-45 Seasonal Distribution and Abundance of ECSAS Black-legged Kittiwake Observations in the Waters Off Eastern Newfoundland (2006-2020)

6.2.2.2.4 Large Gulls

Great black-backed, herring and ring-billed gulls nest along the coast in the RAA. Ring-billed gulls nest in a few large colonies but great black-backed and herring gulls nest alone or in small to large colonies (Statoil Canada Ltd. 2017). Nesting populations of major nesting colonies in southeastern Labrador and eastern Newfoundland are presented in Tables 6.8 and 6.9. Great black-backed and herring gull are coastal year-round. Many of the great black-backed gulls move at least 50 km offshore after the breeding season (Good 1998). During fall, this species concentrates in numbers in the few hundreds at offshore Newfoundland oil platforms (Baillie et al. 2005; Burke et al. 2012) where those birds feed on prey attracted to the surface at night by light from the platforms (Burke et al. 2005; Montevecchi 2006). Ring-billed gull is common along the coast from April to November but is considered rare offshore having only been recorded infrequently during geophysical surveys (Moulton et al. 2006; Abgrall et al. 2008a).

Iceland gulls are numerous in the RAA during winter along the coastline and present in smaller numbers offshore (B. Mactavish, pers. comm., May 2019). Smaller number of glaucous gulls are also present in coastal and offshore areas of the RAA from November to May (B. Mactavish, pers. comm., 2019).

Lesser black-backed gull is found in the RAA in small numbers after leaving breeding colonies in southwest Greenland and migrating to wintering areas in southern Canada and the United States (Moulton et al. 2006; Abgrall et al. 2008a, 2008b; Hauser et al. 2010; Jones et al. 2012; Mactavish et al. 2012; Jones and Lang 2013; Holst and Mactavish 2014, B. Mactavish, pers. comm., May 2019).

Densities of large and small gulls (except black-legged kittiwake) in the Project Area during the April-July period was 77.2 birds/km² (CWS, unpublished data; see Figure 6-1). During the August-November period the density was 0 to 8.6 birds/km². During the December–March period, the density was 12.8 to 72.9 birds/km².

6.2.2.3 Terns

Terns occur in the waters of the RAA from late-May to mid-September. Both common and Arctic terns breed in eastern Newfoundland in numerous colonies (Statoil Canada Ltd. 2017). Caspian tern nested in the RAA on the Wadham Islands in the past (CWS, unpublished data). In the offshore portion of the RAA, Arctic tern is fairly common in small flocks or individually as a passage migrant during spring and fall (Abgrall et al. 2008a, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). Common and Caspian terns are rare offshore but have been recorded in Orphan Basin and Jeanne d'Arc Basin (Jones et al. 2012; Mactavish et al. 2012; Jones and Lang 2013). Terns were infrequently recorded on-transect during ECSAS surveys in the northeast portion of the Project Area; densities ranging from 0.1 to 0.2 birds/km² during April-July and August–November periods (CWS, unpublished data). These species capture prey by plunge-diving (Cuthbert and Wires 1999; Hatch 2002; Nisbet 2002).

6.2.2.4 Skuas and Jaegers

The three species of jaeger are passage migrants in the pelagic waters of the RAA on their way between Arctic breeding grounds and wintering areas in the pelagic waters of the tropics. They migrate individually or in small, single-species flocks. Seyer et. al (2021) documented year-round movements of adult long-tailed Jaegers between nesting sites in the Canadian Arctic at Bylot Island and Igloolik Island in Nunavut and wintering grounds in the South Atlantic. Routes of both spring and fall migrating long-tailed jaegers include the Grand Banks and waters off eastern Newfoundland and Labrador.

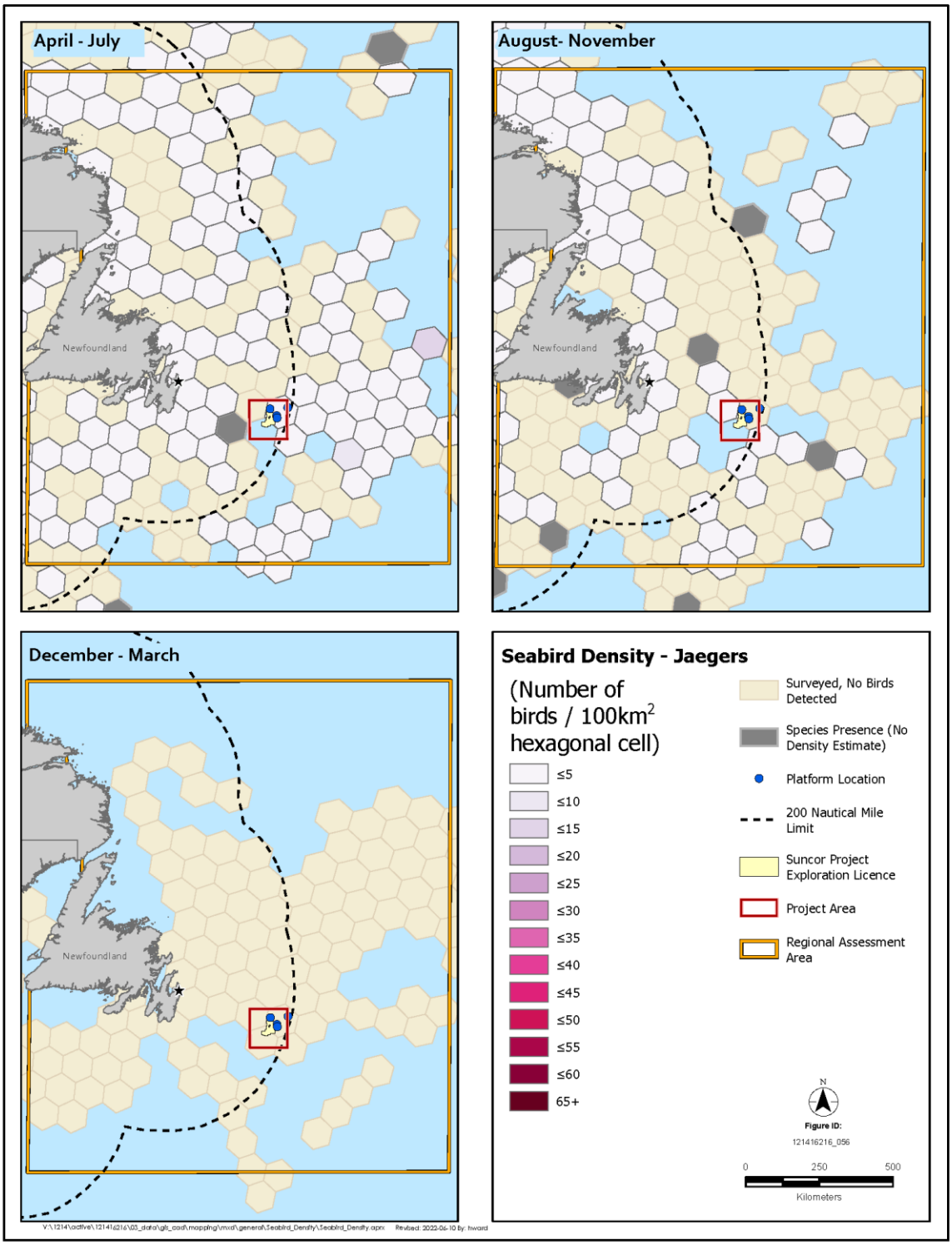
Pooled jaegers were recorded in the ECSAS surveys in the Project Area during April-July and August-November times periods, they are absent offshore Newfoundland December-March (Figure 6-46).

Great skua migrates through the RAA to and from nesting areas in northern Europe and Iceland. A large proportion of the Iceland population winters in the waters located in the southeastern quadrant of the RAA (Magnusdottir et al. 2012). South polar skua nests in the South Atlantic and spends the austral winter in the pelagic waters of the Northwest Atlantic. South polar skua was occasionally recorded from geophysical survey vessels on the Jeanne d'Arc Basin July-October (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). During migration, jaegers and skuas procure much of their food via kleptoparasitism (piracy on other seabird prey) (Wiley and Lee 1998, 1999, 2000). Skuas were recorded on the ECSAS surveys in the Project Area only during the August-November period (<0.1 birds/km^2; Figure 6-47).

6.2.2.5 Auks, Murres, Puffins, and Guillemots

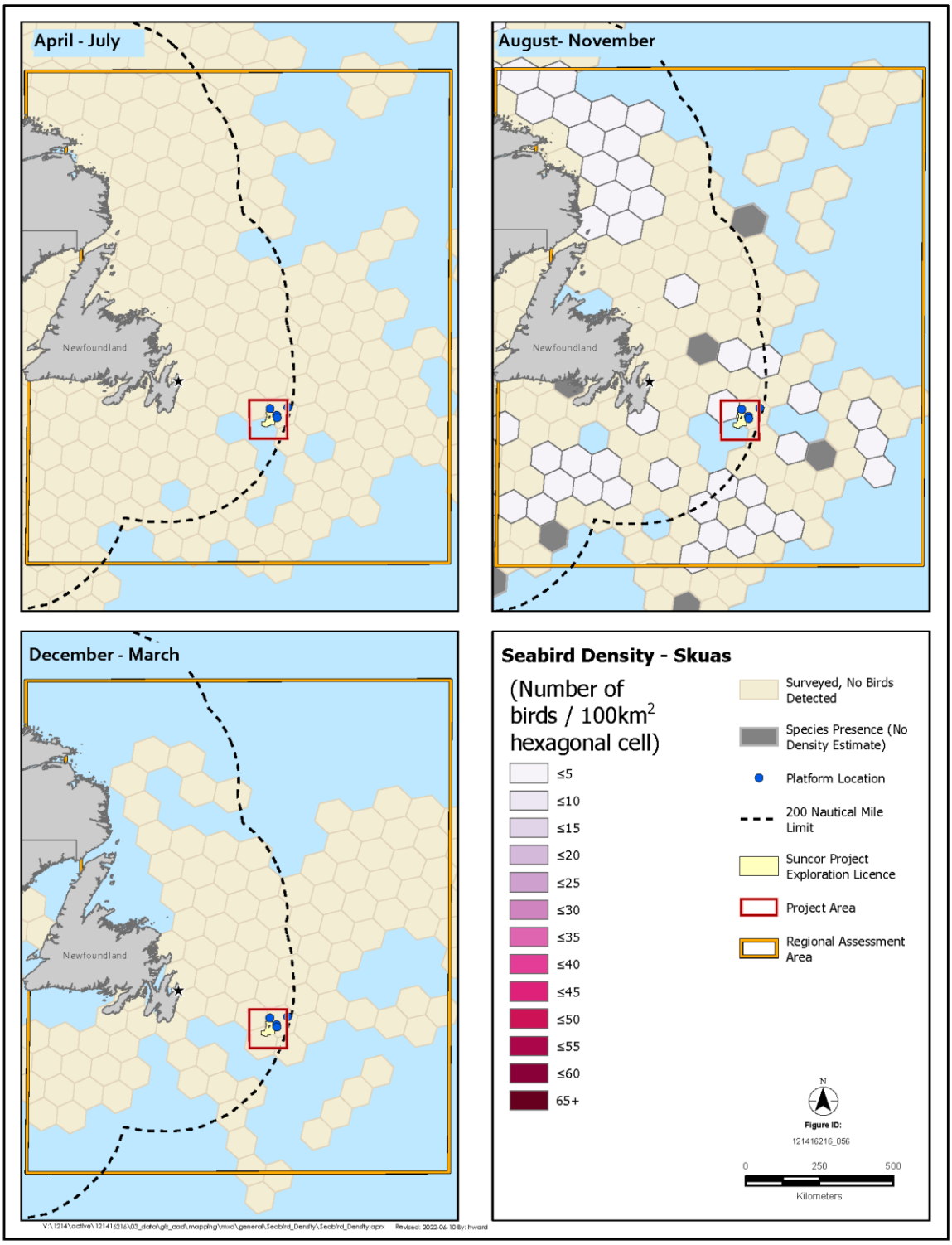
Six species of Alcidae use the RAA at some time of the year: dovekie, common murre, thick-billed murre, razorbill, Atlantic puffin, and black guillemot. Common murre nests in the RAA in large numbers and winters in the southern parts of the RAA. Dovekie winters in the RAA, migrating from Arctic nesting colonies. The remaining species nest in both the Arctic and the RAA. Thick-billed murre and black guillemot winter in the RAA, but razorbill and puffin winter mostly south of the RAA. Species that nest in the RAA arrive at nesting colonies in April and May, and generally leave them by late-August (Statoil Canada Ltd. 2017). These species forage primarily in coastal waters during the nesting period. The populations at major nesting colonies in southeastern Labrador and eastern Newfoundland are presented in Tables 6.8 and 6.9.

Alcids use pursuit diving to forage for small fish (e.g., capelin and sand lance) and invertebrates, primarily in the shelf waters of the RAA. Dovekies primarily eat copepods, predominantly *Calanus* species (Fort et al. 2012), whereas the other alcids feed primarily on fish. Alcids use their wings for propulsion during pursuit diving. As a result, their wing morphology is a compromise between underwater flight and aerial flight. Because their wings are relatively inefficient for aerial flight, alcids spend a larger proportion of their time on the sea surface than gulls and petrels and thus are considered at greater risk from oil pollution (Weise and Ryan 2003; Wilhelm et al. 2007; Fifield et al. 2009). Their vulnerability increases during the annual moult in late summer during which they are flightless for several weeks (Gaston and Hipfner 2000; Ainley et al. 2002; Montevecchi and Stenhouse 2002; Lavers et al. 2009).



CWS, unpublished data

Figure 6-46 Seasonal Distribution and Abundance of ECSAS Jaeger (Pooled Pomarine, Parasitic, Long-tailed, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2006-2020)



CWS, unpublished data

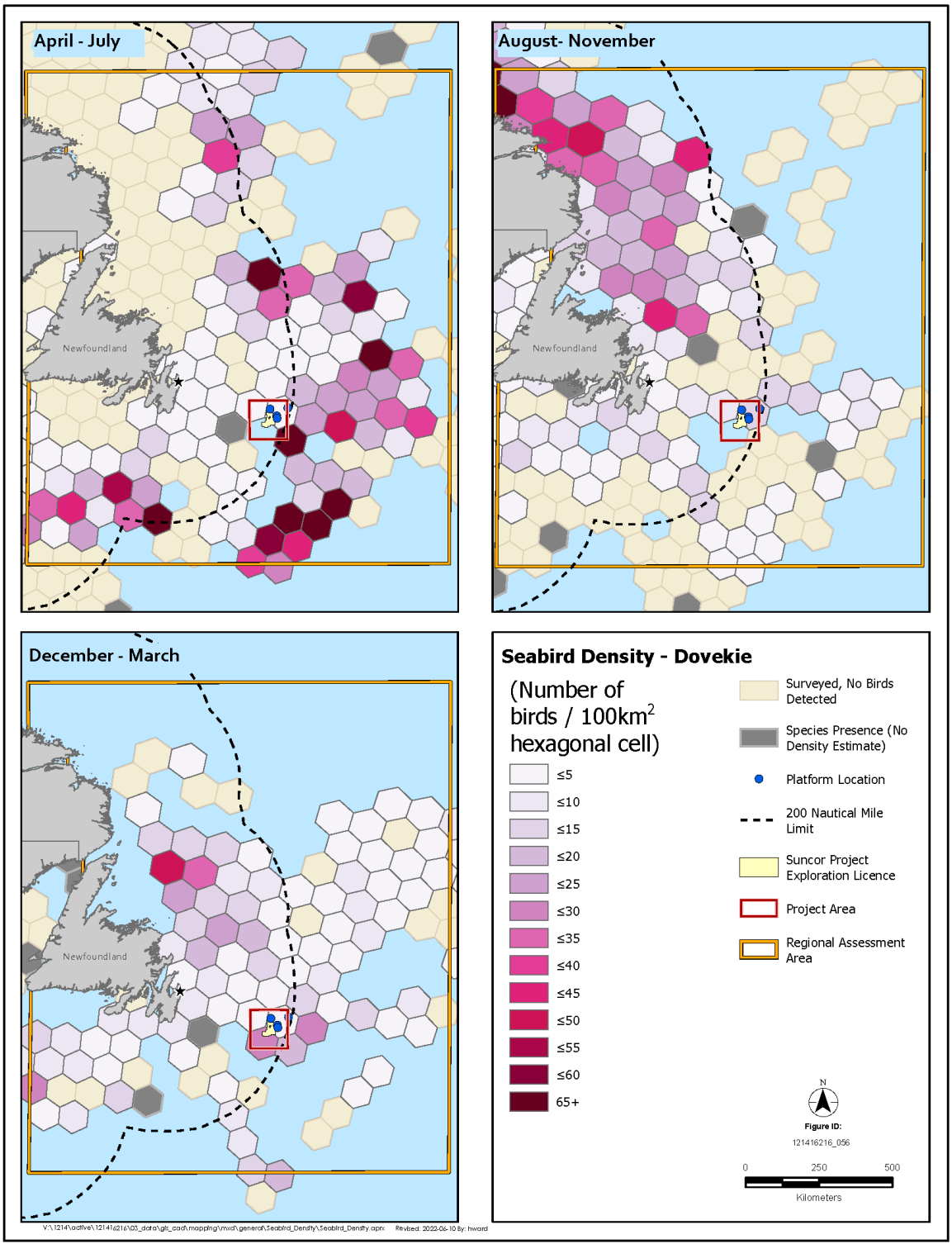
Figure 6-47 Seasonal Distribution and Abundance of ECSAS Skua (Pooled Great, South Polar and Unidentified) Observations in the Waters Off Eastern Newfoundland (2006-2020)

During winter, alcids concentrate in the RAA mostly around relatively productive areas such as the continental shelf slope of the Labrador Shelf and Grand Banks (Figures 6-48 and 6-49) (Gaston et al. 2011; Hedd et al. 2011; Montevecchi et al. 2012a). Such habitat in offshore NL waters attracts globally significant numbers of alcids during winter. During winter, the core distribution of the 30 million dovekies that nest along the west and east coasts of Greenland is off eastern Newfoundland, including the Jeanne d'Arc Basin (Fort et al. 2013). For the common murres breeding at nesting colonies in North America, offshore Newfoundland waters, including the RAA, are their core wintering area (McFarlane Tranquilla et al. 2015). Part of the winter distribution of the thick-billed murres that nest in North America also lies within the RAA, with the core wintering range being the Labrador Sea and Grand Banks, making the RAA part of one of the most important wintering areas for North Atlantic thick-billed murre breeding populations (Frederiksen et al. 2016). These wintering birds originate mostly from nesting colonies on Baffin Bay and Hudson Bay, with a minority from Spitsbergen (Norway). Following breeding, females nesting on Baffin Bay migrate rapidly to the Newfoundland-Labrador Shelf, whereas males accompanied by fledglings depart the colonies more gradually starting in mid-September. The core winter distribution of Atlantic puffins is not known because they are not seen offshore in large numbers (Fifield et al. 2009). Atlantic puffin is designated Vulnerable by IUCN due to declines in the number of birds nesting at European colonies (BirdLife International 2019). Razorbills largely congregate in the Bay of Fundy during winter (Huettman et al. 2005). Black guillemots are limited to coastal waters during the non-breeding season (Butler and Buckley 2002).

The density for dovekies during the April-July period range was ≤5 to 65+ birds/km² in the Project Area (Figure 6-48). However, they are very rare by June, having departed for Arctic nesting colonies (Abgrall et al. 2009). During the August-November period the density was ≤10 birds/km², though they likely arrive throughout the RAA in October. Dovekies arrive in the Jeanne d'Arc Basin in October, when post-breeding birds migrate to the area (Abgrall et al. 2008b, 2009). During the December-March period the density ranged from ≤5 to ≤25 birds/km².

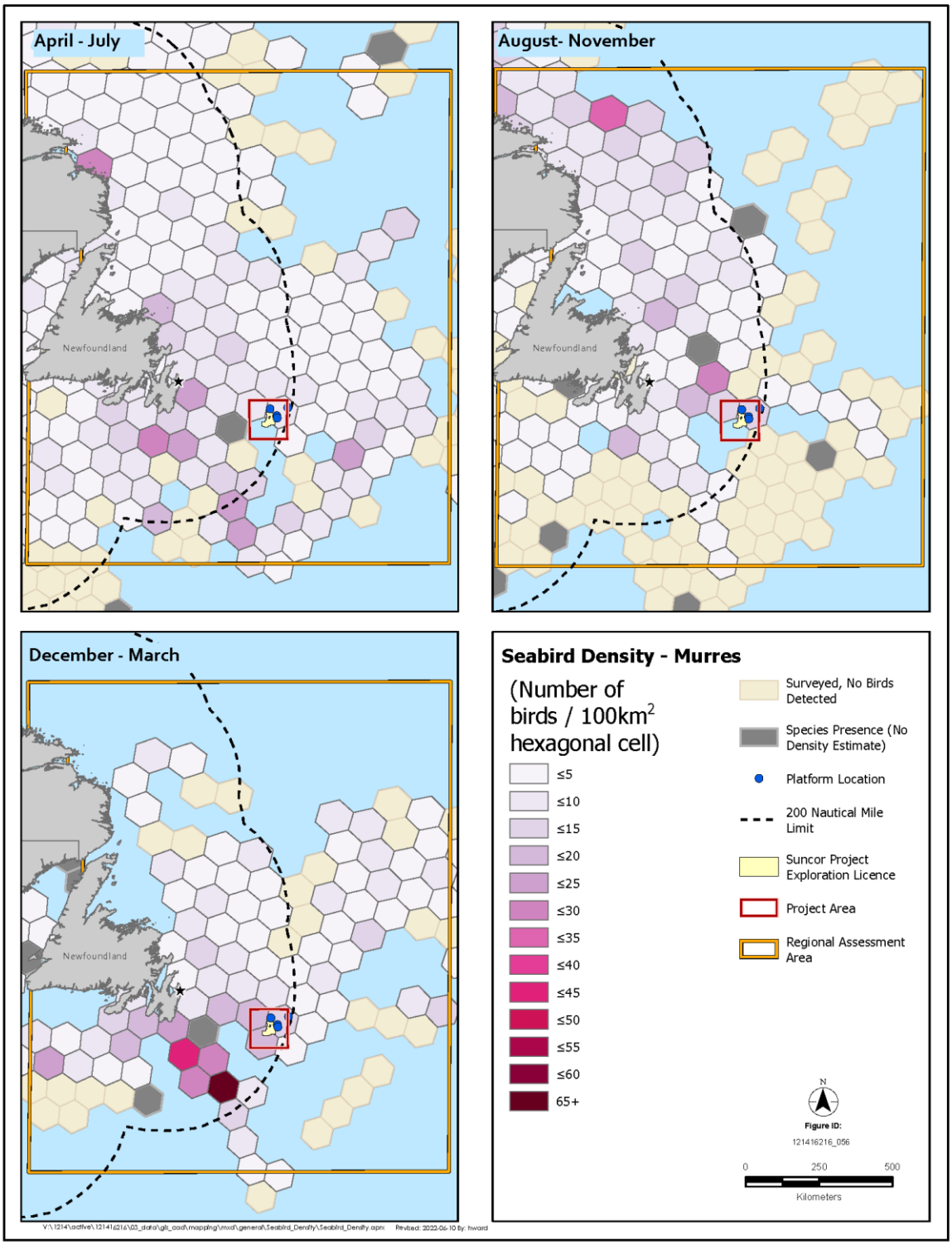
Pooled common murre and thick-billed murre densities during the April-July period showed a density in the Project Area of ≤10 birds/km² (Figure 6-49). Densities in the Project Area during August-November and December-March periods were ≤15 and ≤20 birds/km², respectively (Figure 6-6).

Migrant murres arrive in Jeanne d'Arc Basin in October (Abgrall et al. 2008b, 2009). Razorbills are an inshore species with most remaining near nesting colonies April to August (Bolduc et al. 2018; CWS, unpublished data). Razorbill was not recorded on-transect in the Project Area. Puffin was recorded on-transect during ECSAS surveys for all seasonal periods in the Project Area. Density estimates were restricted to the northern portion of the Project Area for April-July (<0.5 birds/km²) and August-November (<1.5 birds/km²). The highest density of Atlantic puffins in the Project Area occurs in the southern portion during December-March (<3.5 birds/km²; CWS, unpublished data).



CWS, unpublished data

Figure 6-48 Seasonal Distribution and Abundance of ECSAS Dovekie Observations in the Waters Off Eastern Newfoundland (2006-2020)



CWS, unpublished data

Figure 6-49 Seasonal Distribution and Abundance of ECSAS Murre (Pooled Common, Thick-billed, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2006-2020)

6.2.2.6 Fulmarine Petrels, Shearwaters, and Gadfly Petrels

Of the Procellariidae, northern fulmar and four species of shearwaters use the RAA during some portion of the year. Northern fulmar and Manx shearwater nest in NL in small numbers (see Tables 6.8 and 6.9) and non-breeding sub-adults summer offshore (Lock et al. 1994). Large numbers of fulmars from Arctic and sub-Arctic nesting colonies in Canada, Greenland, and Europe winter from the Labrador Sea to New England, including the RAA (Huetmann and Diamond 2000; Mallory et al. 2008b). Great and sooty shearwaters from nesting colonies in the Southern Hemisphere spend the austral winter in the RAA. Most of the world's population of great shearwater migrates to offshore Newfoundland waters to feed and moult their flight feathers (Brown 1986). Most of these sooty shearwaters moult in the deep, warm waters west of the Mid-Atlantic Ridge from April to early-June before moving into the cooler waters of the Grand Banks for the June-October period (Hedd et al. 2012). The Gulf of Maine, Scotian Shelf and Grand Banks appear to be important 'wintering' areas for sub adult Great Shearwaters. From 2013 to 2018, 58 Great Shearwaters were outfitted with platform terminal transmitters during their wintering season (June to November) in the southwest Gulf of Maine (Powers et al. 2020). Approximately 55% stayed within the Gulf of Maine during the wintering season and the remainder moved eastward to the Scotian Shelf and the Grand Banks off Newfoundland. Most birds (89%) were young (0-2 years) based on gonadal development and molt score. Great and sooty shearwaters are the primary bird species that consume fish on the Grand Banks at this time of year (Hedd et al. 2012). These species spend most of their time on the wing near the sea surface during migration and breeding, relying on dynamic soaring to remain aloft with little energy expenditure. However, tracking of sooty shearwaters shows that they spend most of their time on the water during their residence in the Northwest Atlantic, making them more vulnerable to oil pollution at this time of the year (Hedd et al. 2012). Great shearwaters and non-breeding, sub-adult fulmars are also more susceptible to contact with oil pollution because they undergo the annual moult of their flight feathers during the summer while in the waters of the RAA (Lock et al. 1994; Huetmann and Diamond 2000). Northern fulmars usually forage on the surface, whereas shearwaters forage by pursuit plunging to capture fish, squid, and offal (Statoil Canada Ltd. 2017).

The only confirmed North American nesting colony of Manx shearwater lies off the Burin Peninsula. The species nests in small numbers at Middle Lawn Island but has been recorded in larger numbers prospecting for nest sites (Roul 2010). Manx shearwater forages near the breeding colony during the nesting period (Onley and Scofield 2007). However, this species has been recorded in summer and fall in the Jeanne d'Arc Basin in small numbers (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). Manx shearwater is considered a widespread uncommon species on the shelf waters of Newfoundland from April to October (Mactavish et al. 2016).

Non-breeding Cory's shearwaters spend the summer off Eastern Canada (Brown 1986). They originate from nesting colonies on Berlengas, Madeira, Desertas, Salvages, Azores, and Canary Islands (Onley and Scofield 2007). They are found in small numbers in Gulf Stream waters from the edge of the Scotian Shelf to the edge of the southern Grand Banks (Brown 1986) and east of the Grand Banks (Bolduc et al. 2018).

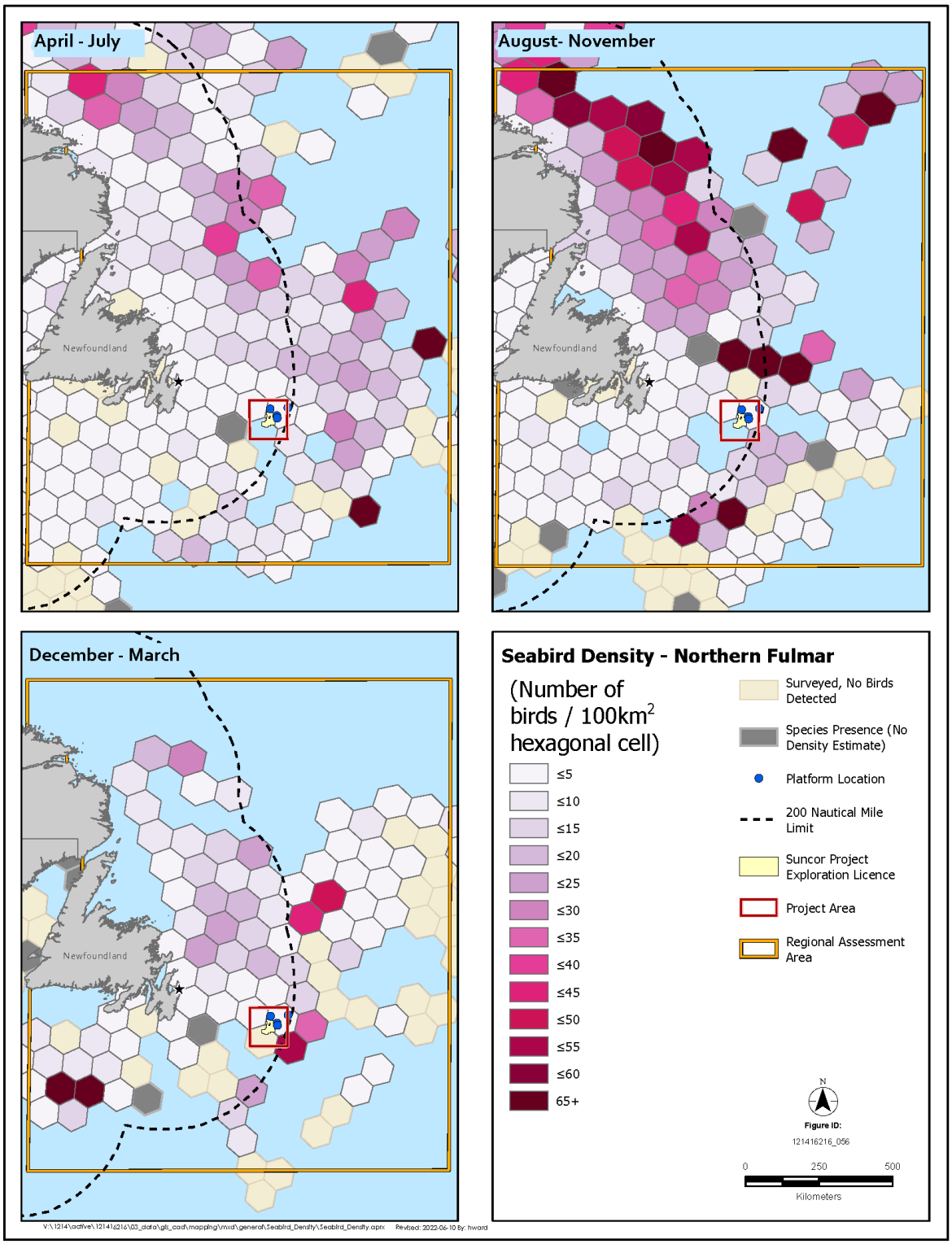
Three species of gadfly petrel (*Pterodroma* spp.), designated globally threatened on the IUCN Red List of Threatened Species, occur in the RAA during fall and winter. The three species have a low worldwide population and are at the northern limit of their range in the southern most reaches of the RAA. Bermuda petrel is designated Endangered by IUCN (BirdLife International 2019). Data loggers placed on individuals of this species have shown presence on the southern Grand Banks and to the south and east within the RAA (Madeiros et al. 2014). Zino's petrel and Desertas (Bugio) petrel have been tracked in the RAA in the warm waters off the southeast Grand Banks (Ramirez et al. 2013; Ramos et al. 2016). Zino's petrel is also designated Endangered by IUCN (BirdLife International 2019). Desertas petrel is designated Vulnerable by IUCN (BirdLife International 2019).

Northern fulmar occurs in the northern portion of the Project Area year-round in densities ≤5 birds/km² (Figure 6-50). For all seasons, highest densities were confined to the southeast corner of the Project Area with ≤20 birds/km² in August-November and ≤55 birds/km² in December-March (CWS, unpublished data). Densities are higher (>60) elsewhere in the RAA, ranging up to 64 birds/km² off eastern Labrador and between 72 and 128 birds/km² on the Orphan Knoll during August-November (CWS, unpublished data).

Shearwater densities in the Project Area during April-July and August-November range from ≤5 to ≤15 birds/km² (Figure 6-51). Higher densities are found within the Orphan Basin (22.5 birds/km²) during April-July and Sackville Spur (53.8 birds/km²) during August-November (CWS, unpublished data). The majority of shearwaters found during at-sea surveys conducted from vessels conducting geophysical surveys was from June to September (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). During the December-March period, no shearwaters were recorded on-transect during ECSAS surveys in the Project Area.

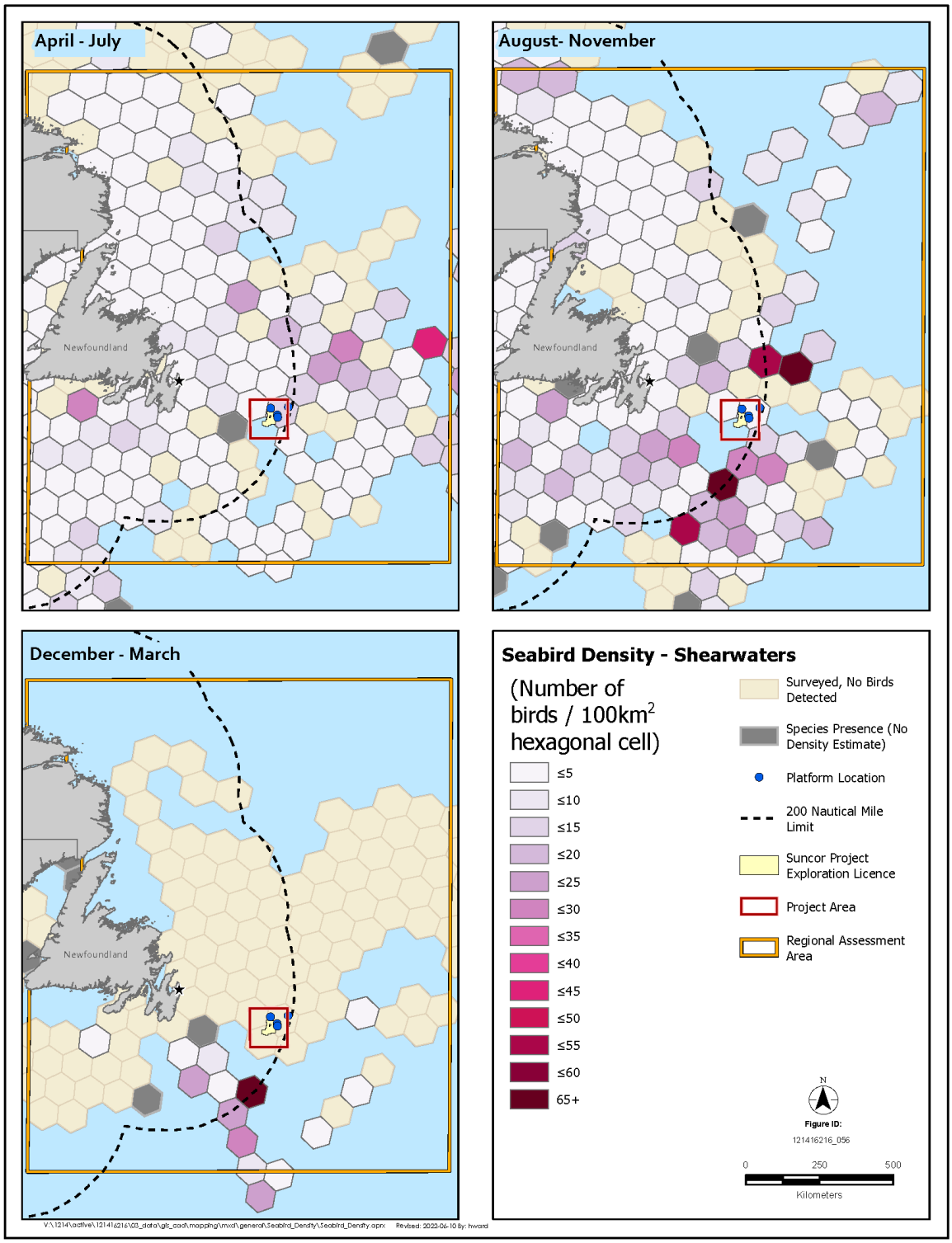
6.2.2.7 Storm-Petrels

Among the Hydrobatidae, only Leach's and Wilson's storm-petrels occur regularly in the RAA. The nesting distribution of the Leach's storm-petrel on the Atlantic Ocean includes Atlantic Canada (Nova Scotia, New Brunswick and Newfoundland), Iceland, Scotland and Norway. Leach's storm-petrels winter in pelagic waters of the tropics (Onley and Scofield 2007). Some individuals may occasionally remain in the vicinity of the RAA for the winter, as suggested by the presence of a tracked individual southeast of Newfoundland in winter (Pollet et al. 2018). Wilson's storm-petrel nests in sub-Antarctic and Antarctic regions and winters in the Northern Hemisphere up to 77°N in the North Atlantic (Onley and Scofield 2007). Leach's and Wilson's storm-petrels feed by picking food items from the surface. During the nesting season, the Leach's storm-petrel commutes from the island nesting colonies to forage in deep water beyond the shelf (Pollet et al. 2014a; Hedd et al. 2018; Collins et al. 2022). They feed on lower mesopelagic (>400 m deep) crustaceans and small fish (e.g., lantern fish) that undergo diel vertical migration to the surface at night (Steele and Montevecchi 1994; Pollet et al. 2019; Collins et al. 2022). Wilson's storm-petrel's diet while in the Northern Hemisphere is poorly known but likely includes crustaceans, small fish, molluscs, other invertebrates, and fish oil, which it picks from the surface (Brooke 2004).



CWS, unpublished data

Figure 6-50 Seasonal Distribution and Abundance of ECSAS Northern Fulmar Observations in the Waters Off Eastern Newfoundland (2006-2020)



CWS, unpublished data

Figure 6-51 Seasonal Distribution and Abundance of ECSAS Shearwater (Pooled Great, Sooty, Manx, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2006-2020)

Leach's storm-petrel is the most numerous nesting seabird in Newfoundland (see Table 6.9). In excess of two million pairs of Leach's storm-petrel nest on the Avalon Peninsula. The population size of Newfoundland's Leach's storm-petrels is undergoing a significant decline. Results from a 2013 survey of nesting Leach's storm-petrel on Baccalieu Island, the largest breeding colony of Leach's storm-petrels in the world, give an estimate of 1.95 million pairs, a decline of 42% from the previous survey in 1984 (Wilhelm et al. 2019). The drop of Leach's storm-petrels nesting in forest habitat was 70% between 1984 and 2013. The cause of this decline in the use of forest habitat and the general decrease in population of the Baccalieu Island Leach's Storm-petrels is unknown. The results of surveys of nesting Leach's storm-petrels on Gull Island in the Witless Bay Ecological Reserve indicated a 51% decline from 352,000 breeding pairs in 2001 to 180,000 pairs in 2012 (CWS, unpublished data). The number of nesting pairs at the Great Island, Witless Bay colony has declined by 55% from about 300,000 in 1979 to 134,000 in 2011 (Wilhelm et al. 2015). A 2015 population estimate update for Green Island, Fortune Bay (near St. Pierre et Miquelon) was 48,000 pairs (CWS, unpublished data), down from a previous estimate of 103,833 pairs (Russell 2008). Declines in Leach's storm-petrel at nesting colonies in Iceland and Scotland have also been detected. There was a reduction of 40% to 49% at Elliðaey Iceland between 1991 and 2018 and 34% to 83% on four of the main St Kilda Islands, Scotland between 2018/2019 and 2000 surveys (Deakin et al. 2021). The cause of the Leach's storm-petrel population decline has not yet been determined. Marine pollution may be partly responsible for the population decline of Leach's storm-petrels in the North Atlantic as evidenced by recently examined birds (Krug et al. 2021). On 11 and 12 October 2018, 100 Leach's storm-petrels were accidentally killed at two industrial sites on the Avalon Peninsula, Newfoundland during a storm and these birds were examined for plastics and hepatic total mercury. The results showed that 87.5% of the birds contained plastic and many birds already had elevated levels of total mercury even though they were recently fledged. The concentrations were below those known to lead to acute toxicity (Krug et al. 2021).

Tracking studies show that Leach's storm-petrels nesting at the Baccalieu Island and Gull Island, Witless Bay, colonies forage in the Project Area during the incubation stage of nesting (Hedd et al. 2018). Similarly, a tracking study showed Leach's storm-petrels nesting on Gull Island, Witless Bay fed largely in the deep water southeast of the Grand Banks (Collins et al. 2022). They generally transited non-stop across the Grand Banks to reach and return from their feeding destination beyond the shelf edge where they feed on mesopelagic fish that migrate to the surface at night. It is likely that millions of storm-petrels use the RAA during the April-October period. Tracking studies show an increased presence of Leach's storm-petrels in the Project Area as they begin their migration across the Atlantic in a southeast direction to their wintering grounds (Pollet et al. 2014b). This species is designated Vulnerable by IUCN (BirdLife International 2019). Wilson's storm-petrel is found in Jeanne d'Arc Basin in small numbers during summer (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). An additional species of storm-petrel, band-rumped, occasionally occurs in the RAA in warm waters southeast of the Grand Banks. It nests on East Atlantic archipelagos. From May to August, it ranges west to Gulf Stream waters as far north as the RAA (Howell 2012; BirdLife International 2019).

Leach's storm-petrel densities in the Project Area during the April-July period ranged from 0 to ≤5 birds/km² (Figure 6-52). Densities reported for the eastern portion of the Project Area were between 0.1 and 7.0 birds/km² during August-November. The species was not recorded on the ECSAS surveys in the Project Area during the December-March period. Outside of the Project Area densities were highest on the Orphan Basin at 34.3 birds/km² (Table 6-9; CWS, unpublished data). Leach's storm-petrels were found in small numbers during at-sea surveys conducted from geophysical vessels between June and October (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b).

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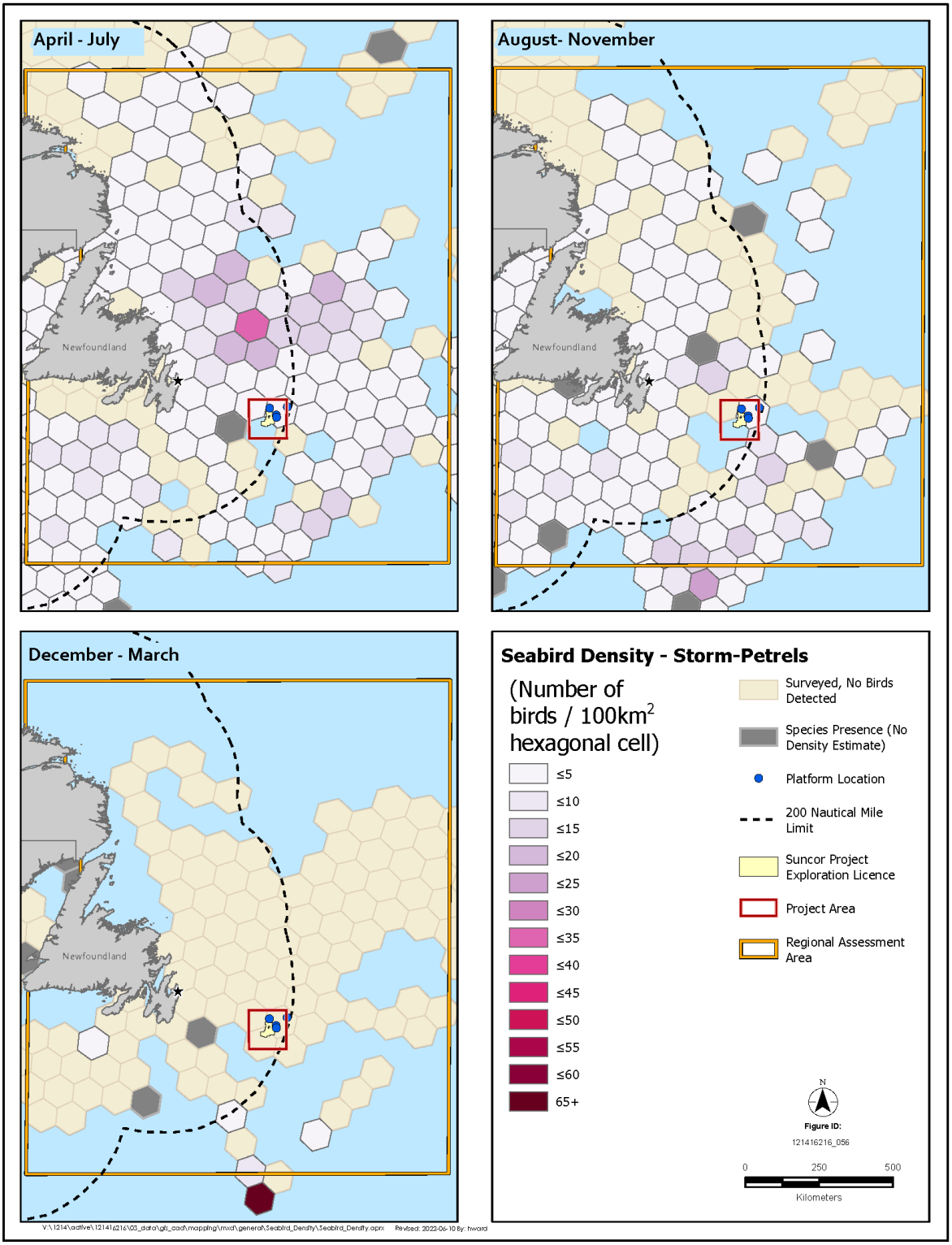


CWS, unpublished data

Figure 6-52 Seasonal Distribution and Abundance of ECSAS Leach's Storm-petrel Observations in the Waters Off Eastern Newfoundland (2006-2020)

6.2.2.8 Northern Gannet

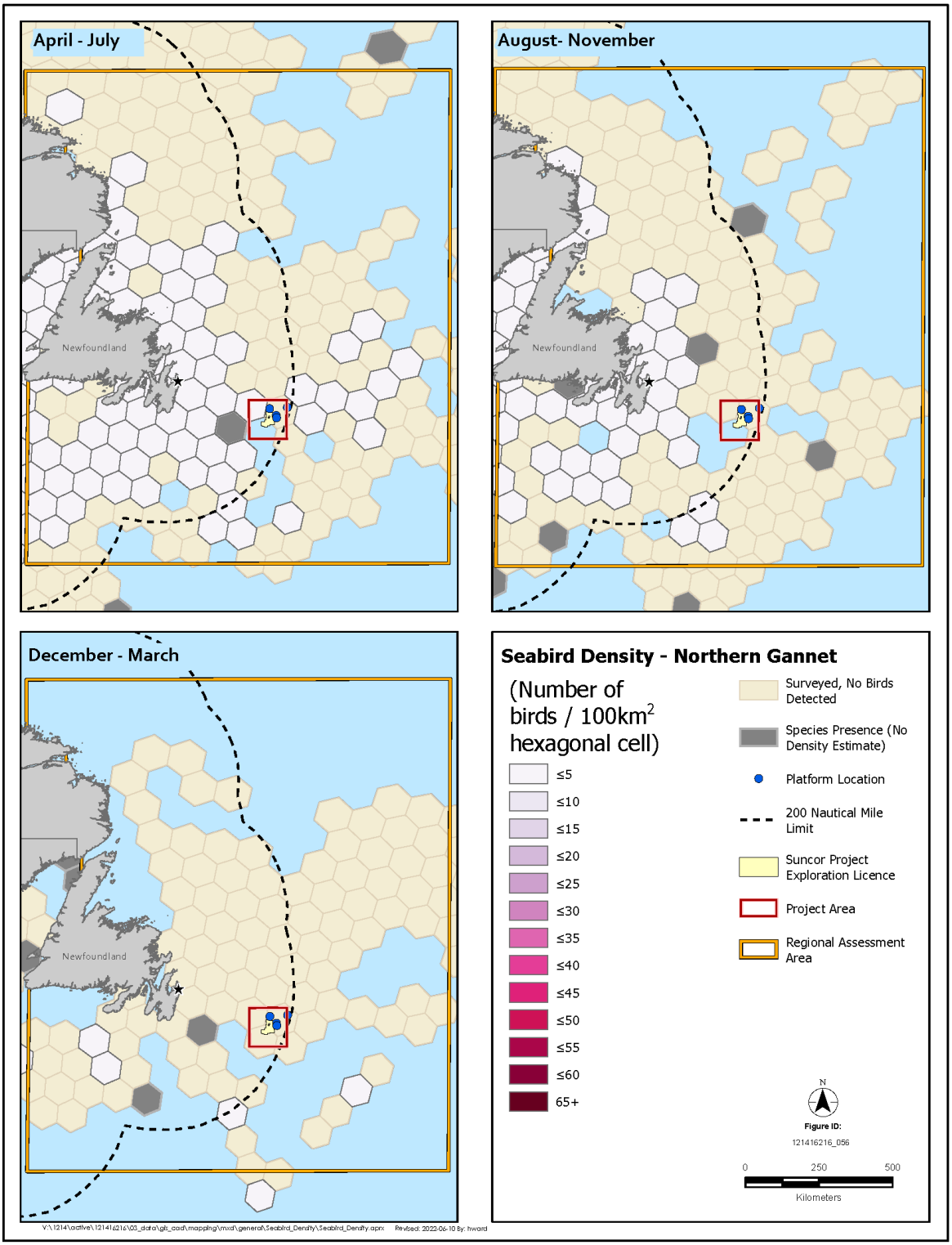
Northern gannet is found primarily in continental shelf waters (Garthe et al. 2007a; Fifield et al. 2014). It nests in large, dense colonies in the RAA (see Table 6.9). Adults return to colonies in mid-March, followed a few weeks later by sub-adults (Statoil Canada Ltd. 2017). Juveniles migrate southward in September; adults and older immature birds may travel north from the colonies to feed along the southern Labrador Coast before southward migration (Statoil Canada Ltd. 2017). Gannets feed by plunge diving from a height of 10 to 40 m above the surface, descending to depths of 15 m. They may travel over 200 km from breeding colonies like Funk Island to coastal waters to forage on pelagic fish (herring, mackerel and capelin) that spawn in the shallows (Garthe et al. 2007b). Most individuals winter along the Atlantic coast of the U.S. and Gulf of Mexico (Fifield et al. 2014). Environmental change in the ocean is having an impact on some nesting seabirds. The breeding success rate of 41% in 2012 was well below the 53.9% average during 2009-2020. The relationship between northern gannet breeding success and warming sea surface temperatures is an ongoing study (Montevecchi et al. 2021).

Gannets are most likely to be present in the RAA from March to November (Mowbray 2002; Montevecchi et al. 2012b). However, only small numbers wander to the eastern edge of the Grand Banks and the Project Area (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). Gannets were recorded at low density (0.02 birds/km^2) in the northwestern portion of the Project Area during April-July ECSAS surveys (CWS, unpublished data). Primarily, they were recorded inshore and offshore south of the Avalon Peninsula (potential passage migrants) during the April-July and August-November periods (Figure 6-53).

6.2.2.9 Cormorants

Great and double-crested cormorants both breed in coastal Newfoundland (see Table 6.9). The two species are often found in mixed colonies (Hatch et al. 2000). Cormorants are restricted to coastal areas throughout the year, except for vagrants (Hatch et al. 2000; Dorr et al. 2014). Cormorants return to the nesting colony as early as late-February (Hatch et al. 2000; Dorr et al. 2014). Most double-crested cormorants leave Newfoundland colonies and migrate southward between late-August and mid-October (Hatch et al. 2000; Dorr et al. 2014). Small numbers remain in coastal Newfoundland in winter (Mactavish et al. 2016). Great cormorant is present year-round, but some individuals migrate south (Hatch et al. 2000; Dorr et al. 2014).

Cormorants were recorded on-transect during ECSAS surveys only during the August-November period and only in the southwest corner of the RAA; this is attributable to the lack of sampling of coastal waters (Bolduc et al. 2018).



CWS, unpublished data

Figure 6-53 Seasonal Distribution and Abundance of ECSAS Northern Gannet Observations in the Waters Off Eastern Newfoundland (2006-2020)

6.2.3 Other Marine-associated Avifauna

Waterfowl nest in coastal Newfoundland in relatively small numbers but winter in large numbers (Lock et al. 1994). They are rarely observed beyond coastal waters. Some species of loons and grebes also winter in coastal Newfoundland waters. Some shorebird (plovers, turnstones, and sandpipers) species nesting in the Arctic make trans-oceanic flights during fall migration from eastern North America to South America (Williams and Williams 1978; Richardson 1979). As a result, small numbers are observed in offshore areas of the RAA.

6.2.3.1 Waterfowl, Loons, and Grebes

Waterfowl (ducks, geese and swans), loons, and grebes are susceptible to oil pollution because, like alcids, they spend most of their time feeding or resting on or under the sea. These species are rarely out of sight of the coastline. A total of 32 species have been recorded in Newfoundland (Statoil Canada Ltd. 2017), but only 24 species regularly occur in the marine waters of the RAA (Table 6.10). Two of these are species of conservation concern (harlequin duck and Barrow's goldeneye) (Section 6.2.4).

Large flocks of eiders, scoters, and long-tailed ducks winter along the coast in eastern Newfoundland (Lock et al. 1994). The largest numbers concentrate between the Cape Freels coastline and nearby Wadham Islands, and at Grates Point, Cape St. Francis, Witless Bay, Mistaken Point, Cape St. Mary's, and Placentia Bay (Bird Studies Canada 2016). IUCN designates long-tailed duck Vulnerable (BirdLife International 2019). Flock sizes of coastal waterfowl along eastern Newfoundland increase in late winter as the southeastward movement of winter sea ice forces those flocks along the north coast of the island to move in the same direction. The most abundant species is common eider. The largest concentration of the eastern population of harlequin duck wintering in Canada is found at Cape St. Mary's (Bird Studies Canada 2016). Barrow's goldeneye has wintered in small numbers at Port Blandford, Newman Sound in Terra Nova National Park, Traytown Bay, St. Mary's Bay, and Spaniard's Bay (Schmelzer 2006, in Statoil Canada Ltd. 2017).

Ducks were recorded during ECSAS surveys in coastal areas but only PIROP surveys recorded waterfowl in the RAA (August–November) (Lock et al. 1994; Bolduc et al. 2018). Individual ducks have been observed on rare occasions from geophysical survey vessels well offshore during migration (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). During ECSAS surveys, the most commonly observed species of waterfowl, loons, or grebes were, in decreasing order of abundance, common eider, long-tailed duck, loons (common and red-throated), scoters (all three species), and several other duck species (Statoil Canada Ltd. 2017).

Table 6.10 Waterfowl, Loons, and Grebes Likely to Occur in the Marine Waters of the RAA

Group	Species
Geese	Canada goose
Dabbling ducks	Eurasian wigeon
	American wigeon
	American black duck
	Mallard
	Northern pintail
	Green-winged teal
Diving ducks	Tufted duck
	Greater scaup
Sea ducks	King eider
	Common eider
	Harlequin duck*
	Surf scoter
	White-winged scoter
	Black scoter
	Long-tailed duck
	Barrow's goldeneye*
	Common goldeneye
Mergansers	Red-breasted merganser
	Common merganser
Loons	Red-throated loon
	Common loon
Grebes	Pied-billed grebe
	Red-necked grebe

Source: BP 2018;
* Species with conservation designation

6.2.3.2 Shorebirds

In total, 26 species of plovers, turnstones, and sandpipers use Newfoundland during breeding, passage migrants, or in winter (Mactavish et al. 2016; Table 6.11). Of these species, piping plover, spotted sandpiper, and willet nest along marine coastlines. Piping plover is assessed as Endangered by COSEWIC and also designated Endangered on Schedule 1 of SARA and under the NL ESA (Section 6.2.4). Piping plover and willet nest only at sites in southwestern and western Newfoundland, including Stephenville Crossing, Cheeseman Provincial Park and Burgeo, well outside the RAA (Statoil Canada Ltd. 2017), although there is a historical nesting record of piping plover from the Cape Freels coastline (Bird Studies Canada 2016). About 15 species are common during fall migration along the coastlines in the RAA (Mactavish et al. 2016). ACSS data show migration stopovers in the RAA at Witless Bay, Renews, Long Beach, St. Shotts, Spaniard's Bay, Bellevue Beach, Cape Freels, and Cape Bonavista (Environment Canada 2009; Bird Studies Canada 2016). Purple sandpipers winter (November-April) along rocky shorelines, offshore rocks, and islands along southern and eastern Newfoundland, including at Cape Spear, Witless Bay, Ferryland, Cape St. Francis, and Mistaken Point in the RAA (Environment Canada 2009; Bird

Studies Canada 2016). A small number of ruddy turnstones have overwintered at Mistaken Point, the northernmost site in this species' usual wintering range (Bird Studies Canada 2016).

Table 6.11 Shorebird Species Likely to Occur Over the Marine Waters of the RAA

Group	Species
Plovers	Black-bellied plover
	American golden-plover
	Semipalmated plover
	Piping plover, *melodus* ssp.*
Sandpipers	Whimbrel
	Hudsonian godwit
	Ruddy turnstone
	Red knot, *rufa* ssp.*
	Sanderling
	Dunlin
	Purple sandpiper
	Least sandpiper
	White-rumped sandpiper
	Buff-breasted sandpiper
	Pectoral sandpiper
	Semipalmated sandpiper
	Wilson's snipe
	Lesser yellowlegs
	Greater yellowlegs
Source: BP 2018 * Species of conservation concern (see Section 6.24)	

During fall, shorebird species such as American golden-plover, whimbrel, semipalmated sandpiper, white-rumped sandpiper, and red knot depart from staging sites in Atlantic Canada to migrate southward over the Atlantic Ocean to South America (Morrison 1984; Harrington et al. 1991; Baker et al. 2013). At least seven species of shorebirds, including red knot and buff-breasted sandpiper (Endangered and Special Concern, respectively, on Schedule 1, SARA) have been sighted in small numbers from geophysical survey and offshore supply vessels in Jeanne d'Arc Basin and adjacent areas (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). However, much of this trans-oceanic migration appears to pass to the west of the Project Area (Baker et al. 2013; Lamarre et al. 2017) and at relatively high altitudes (Burger et al. 2011). Consequently, only small numbers may be expected at sea level in the Project Area during fall migration (primarily July-October).

6.2.3.3 Landbirds

Landbirds such as raptors and songbirds associated with coastal habitats may be encountered in coastal areas of the RAA (Statoil Canada Ltd. 2017). Landbird species nesting in eastern Canada occasionally drift out to sea during migration and land on vessels in the RAA; several species have been recorded on offshore platforms and vessels (Thomas et al. 2014b; Statoil Canada Ltd. 2015b, 2015a, unpublished migratory bird salvage reports provided by Statoil). Nocturnally migrating species are often attracted to artificial lighting on vessels, especially when fog or rain sets in after the night's nocturnal migration has begun (Gauthreaux and Belser 2006). These species are most often seen during spring migration (April-June) and fall migration (August-November).

6.2.4 Species at Risk

In total, nine species designated at risk provincially or federally, or of conservation concern as assessed by COSEWIC, have the potential to occur in the RAA or the Project Area (Table 6.12). These species include two coastal waterfowl species, three shorebird species, one phalarope species, two gull species, and one raptor species. An additional eight species, while not designated provincially or federally, occur on IUCN's Red List of Threatened Species. Other shorebird and landbird species at risk in Newfoundland are not likely to occur in the RAA or Project Area.

Table 6.12 Marine and Migratory Bird Species of Conservation Interest Likely to Occur in the RAA

Species	NL ESA Status	Federal Status		IUCN Red List
		SARA Listing	COSEWIC Assessment	
Harlequin Duck (eastern pop.)	Vulnerable	Special Concern (Schedule 1)	Special Concern	None
Long-tailed Duck	None	None	None	Vulnerable
Barrow's Goldeneye (eastern pop.)	Vulnerable	Special Concern (Schedule 1)	Special Concern	None
Piping Plover (*melodus* ssp.)	Endangered	Endangered (Schedule 1)	Endangered	Near threatened
Lesser Yellowlegs	None	Under consideration for addition	Threatened	Least concern
Hudsonian Godwit	None	Under consideration for addition	Threatened	Least concern
Red Knot (*rufa* ssp., Northeastern South America wintering population)	Endangered	Under consideration for addition	Special Concern	Near threatened
Red Knot (*rufa* ssp., Southeastern USA / Gulf of Mexico/ Caribbean wintering population)	Endangered	Under consideration for addition	Endangered	Near threatened
Red Knot (*rufa* ssp., Tierra del Fuego/ Patagonia wintering population)	Endangered	Endangered (Schedule 1)	Endangered	Near threatened

Table 6.12 Marine and Migratory Bird Species of Conservation Interest Likely to Occur in the RAA

Species	NL ESA Status	Federal Status		IUCN Red List
		SARA Listing	COSEWIC Assessment	
Buff-breasted Sandpiper	None	Special Concern (Schedule 1)	Special Concern	Near threatened
Red-necked Phalarope	Threatened	Special Concern (Schedule 1)	Special Concern	None
Black-legged Kittiwake	None	None	None	Vulnerable
Ivory Gull	Endangered	Endangered (Schedule 1)	Endangered	Near threatened
Ross's Gull	None	Threatened (Schedule 1) Under consideration for status change	Endangered	None
Peregrine Falcon *anatum / tundrius*	Vulnerable	Special Concern (Schedule 1) Under consideration for status change	Not at Risk	None
Leach's Storm-petrel	None	Under consideration for addition	Threatened	Vulnerable
Bermuda Petrel	None	None	None	Endangered
Desertas Petrel	None	None	None	Vulnerable
Zino's Petrel	None	None	None	Endangered

Harlequin duck (eastern population) is designated a species of Special Concern on Schedule 1 of SARA and Vulnerable under the NL ESA. Threats to harlequin duck (eastern population) are thought to include chronic oil pollution in marine waters from illegal oil discharge; insect control programs adjacent to breeding rivers; breeding habitat loss or degradation from hydroelectric development, forestry, mineral resource extraction; gillnet bycatch on the Greenland coast (one of the wintering areas); aquaculture operations in overwintering areas; human disturbance via shipping, recreational boating and angling; and illegal hunting (Environment Canada 2007a). This species occurs in the marine waters of the RAA between its nesting seasons (on rivers inland). It disperses to rocky coastlines, subtidal ledges, and exposed headlands to moult in summer and to winter (NLDEC 2016). The harlequin duck moults along the Labrador coast at sites such as the Gannet Islands off Table Bay, Tumbledown Dick Island and Stag Islands in Groswater Bay, and St. Peter's Bay in southern Labrador (Trimper et al. 2008). The number of Harlequins moulting at the Gannet Islands increased from 180 to 248 individuals between 1999 and 2003 (Trimper et al. 2008). At Tumbledown Dick Islands and Stag Islands about 50 and 60 moulting individuals have been counted, respectively (Gilliland et al. 2002). Around the islands in St. Peter's Bay, 30 to 72 moulting individuals have been counted (Trimper et al. 2008). Cape St. Mary's is the stronghold of wintering harlequin ducks in Newfoundland where numbers have increased steadily from 242 individuals in 2005 to 636 in 2013 (Environment Canada 2013a). Some non-breeding individuals may be found year-round, making this location one of the few known moulting sites in the province (Bird Studies Canada 2016; NLDEC 2016). Small numbers are also reported from scattered locations on the Avalon Peninsula and the south coast of Newfoundland during migration and in winter (B. Mactavish, pers. comm., May 2019). This species is likely to occur in the Project Area only rarely as a vagrant during migration. A harlequin duck was seen in the Jeanne d'Arc Basin from a geophysical vessel on 31 October 2005 (Abgrall et al. 2008b).

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Barrow's goldeneye (eastern population) is designated a species of Special Concern on Schedule 1 of SARA and Vulnerable under the NL ESA. Threats to Barrow's goldeneye (eastern population) that are of a high level of concern and a medium to high causal certainty consist of logging and fish stocking, but the severity of these threats is unknown (Environment Canada 2013b). Hydrocarbon spills are of a medium level of concern and medium causal certainty, but the severity of this threat is unknown. Hunting causes a medium level of concern but low causal certainty and has an unknown severity. This species moults and winters in coastal estuaries in the Gulf of St. Lawrence, mainly in Quebec and New Brunswick, often with common goldeneye (Schmelzer 2006). A few individuals winter in the RAA along the north coast of insular Newfoundland and St. Mary's Bay (Schmelzer 2006). The eastern population of this species is susceptible to oil pollution because some wintering concentrations are in important shipping corridors (Schmelzer 2006).

Piping plover, *melodus* subspecies, is designated Endangered on Schedule 1 of SARA and Endangered under the NL ESA. Identified threats to piping plover, *melodus* subspecies, that cause a high level of concern, have a high level of severity, and a high causal certainty consist of predation of adults, eggs, and young, disturbance or harm from recreational beach use and vehicle operation on beaches, habitat loss or degradation from human disturbance, and coastal development (Environment Canada 2012). Threats causing a medium level of concern, with a moderate to high level of severity and a high causal certainty consist of habitat loss or degradation due to oil or contaminant spills, flooding and extreme weather events, and pollution due to oil spills. This species occurs in Newfoundland during the nesting season primarily along the coasts of southwestern and western portions of the island on sandy beaches (NLDEC 2016; Bird Studies Canada 2016). However, in 2013, breeding was reported at Deadman's Bay near the Cape Freels Coastline IBA in northeastern Newfoundland (Bird Studies Canada 2016). Nesting has not been reported at that location since 2013, nor has this species been recorded by the ACSS in the RAA. This species is not likely to migrate through the RAA or to be affected by typical Project activities, although accidental spills near breeding habitat could potentially be harmful (Amirault-Langlais et al. 2007; Statoil Canada Ltd. 2017).

Lesser yellowlegs is designated as Threatened and is under consideration for addition to Schedule 1 (COSEWIC 2020). Its breeding range is 80% within the boreal forest of Canada. It migrates through southern Canada, United States and the Caribbean and winters mostly within South America. The lesser yellowlegs has experienced significant declines, most recently estimated at 25% over three generations (12 years) based on the Breeding Bird Survey, and greater than 50% over 10 years based on International Shorebird Surveys. Declines are expected to continue. Key concerns include the loss of wetland and intertidal habitat used on migration and in winter, and hunting for sport and subsistence in the Caribbean and Southern America. Lesser yellowlegs occur in Newfoundland during spring and fall migration mainly in coastal habitats such as mudflats, shallow estuaries, beaches and deposits of rotting kelp on shorelines. It is a scarce migrant during May and uncommon mid-July to early October (Mactavish et al. 2016).

Hudsonian godwit is designated as Threatened and is under consideration for addition to Schedule 1 (COSEWIC 2019). The Hudsonian godwit is an Arctic-nesting shorebird nesting in three main areas discreet from each other. They are the Hudson Bay Lowlands, Mackenzie Delta, and Alaska. It is poorly monitored on its breeding grounds but both migration monitoring and winter surveys indicate there are substantial population declines over the past two to three generations. Key threats include reduced suitability of nesting habitat due to overgrazing by abundant geese in the Hudson Bay Lowlands and loss of habitat and disturbance on the wintering grounds in South America. There is speculation that climate change will cause

tundra and prairie wetlands to shrink because of warmer and drier conditions. The northward advancement of the treeline may reduce the availability of suitable nesting habitat, particularly in the Mackenzie Delta. The most recent population estimate for Hudsonian godwit is approximately 41,000 mature individuals (24,300 individuals in the Hudson Bay Lowlands, 800 in Mackenzie Delta, and 15,750 in Alaska). It uses coastal habitats such as tidal mudflats, shallow estuaries, beaches and deposits of rotting kelp on shorelines. The Hudsonian godwit is a rare but annual fall migration in eastern Newfoundland occurring late July to early November (Mactavish et al. 2016).

The red knot, *rufa* subspecies Tierra del Fuego / Patagonia wintering population, is designated Endangered on Schedule 1 of SARA and Endangered under the NL ESA. The northeastern South America wintering population of this subspecies is under consideration for addition to Schedule 1 as Endangered. The southeastern USA / Gulf of Mexico / Caribbean wintering population is under consideration for addition to Schedule 1 as Special Concern. Identified threats to red knot, *rufa* subspecies, consist of harvesting of horseshoe crab in Delaware Bay, USA, the eggs of which are critical to meet the energetic requirements of the final leg of the rufa subspecies' spring migration, and industrial and military effluents (ECCC 2017). This species occurs in Newfoundland during fall migration (1 August-30 October) on open sandy inlets, coastal mudflats, sand flats, salt marshes, sandy estuaries and areas with rotting kelp deposits (Garland and Thomas 2009; NLDEC 2016). Most of the migration takes place to the west of the RAA; however, small numbers are regular around almost the entire coast of Newfoundland (Baker et al. 2013). ACSS data indicate that this species is a regular or occasional migrant during fall migration at Bellevue Beach, Cape Freels, and the Codroy Valley Estuary, and is a rare to uncommon visitor at a number of other survey sites (Environment Canada 2009). Red knot has been sighted at-sea in the RAA (Jones and Lang 2013).

Buff-breasted sandpiper is designated a species of Special Concern on Schedule 1 of SARA. Threats to buff-breasted sandpiper include habitat loss, fragmentation and degradation on the nesting grounds due to climate change and mineral and energy resource development (COSEWIC 2012). Threats at migration staging areas and wintering grounds consist of agriculture. Other threats may include agrochemicals, changing agricultural practices, wind energy developments, more frequent and intense storms during fall migration, and more frequent and severe droughts on the Prairies resulting in decreased food availability during spring migration. This species nests in the central and western Arctic of North America. Most of the migration passes through the Great Plains, but small numbers pass through eastern Canada during fall migration (McCarty et al. 2017). It occurs in Newfoundland during fall migration and is very uncommon in the province (likely to be found annually in appropriate season/habitat) (Mactavish et al. 2016). This species is occasionally observed at Cape Race, Cape Freels and at Cape Bonavista and is reported as a rare visitor at other survey sites (ACSS data; Environment Canada 2009). It is rarely sighted at sea in the RAA in fall migration (Abgrall et al. 2008; Jones and Lang 2013).

Red-necked phalarope is designated a species of Special Concern on SARA Schedule 1 due to a large decrease in the numbers staging during fall migration in the Bay of Fundy and it was recently listed as Threatened under NL ESA (VOCM 2022). It is a surface feeder, often congregating in areas such as upwellings which are associated with higher prey densities (Statoil Canada Ltd. 2017). No recovery strategy or action plans for this species have been prepared yet. Potential threats to this species may include climate change with its associated changes to habitat and food-web (COSEWIC 2014). Threats on the Arctic nesting grounds may include build-up of contaminants, increased industrial development, and denuding of vegetation by growing snow goose populations. In the non-breeding season threats may include changes in ocean temperature, salinity, and currents due to climate change, decline in the availability of prey at

traditional staging areas and over-wintering sites, increased disturbance from shipping traffic, change in water quality, chronic oil pollution, point-source oil spills, and ingestion of microplastics. Red-necked phalarope is difficult to distinguish from red phalarope at sea. However, the former is seen in small numbers in the RAA. It is reported as a rare visitor at Cape Spear and Bonavista / Cape Bonavista ACSS sites (Environment Canada 2009). Red-necked phalaropes are observed annually during spring migration feeding in small flocks in the surf on the Avalon Peninsula at headlands like Cape Spear, Ferryland Head, Cape Race and St. Shotts (B. Mactavish, pers. comm., May 2019). A male tagged with a geolocator at its nest site in Scotland migrated in fall through the RAA on its way to its wintering area and back again in the following spring (Smith et al. 2014). This raises the possibility that the RAA may lie along the regular migration route of some nesting populations of red-necked phalarope.

Ivory gull is designated Endangered on Schedule 1 of SARA and Endangered under the NL ESA. Threats to ivory gull causing a high level of concern, high severity, and medium to high causal certainty consist of illegal shooting and predation on nests (Environment Canada 2014). Threats of a medium level of concern, medium severity, and low to medium level of certainty are industrial activities and contaminant pollution. Climate change is anticipated to become a threat to ivory gull. Tracking studies showed that ivory gulls nesting in the Canadian Arctic and Greenland and fitted with satellite transmitters wintered from Baffin Bay to the Northeast Newfoundland Shelf (Gilg et al. 2010; Spencer et al. 2016). This area has global significance for this species because individuals from these two populations make up most of the world's population. Ivory gulls were recorded twice during bird surveys at the Bay de Verde Wellsite on the Northeast Newfoundland Shelf in the winter of 2014-2015 (Statoil Canada Ltd. 2015a). Ivory gull can be expected to occur in small numbers in the portion of the RAA north of 50°N during periods when sea ice is present (i.e., late winter and early spring). It probably occurs irregularly south of 50°N among the ice pack during heavier ice years.

Ross's gull is designated Threatened on Schedule 1 of SARA but under consideration for status change, and Endangered by COSEWIC. The Ross's gulls nesting in the Canadian Arctic have been tracked to a wintering area that reaches from the Labrador Sea to Orphan Basin (Maftei et al. 2015). Threats to Ross's gull that have been identified consist of human disturbance at nests at Churchill, Manitoba, predation by gulls, jaegers, Arctic fox, weasels and polar bears, habitat loss and destruction from flooding on nesting grounds. In addition, threats identified at fall migration stopover sites include oil drilling and waste disposal (Environment Canada 2007b). Ross's gull has the potential to occur in very small numbers in the RAA and the Project Area during winter.

Peregrine falcon, *anatum* and *tundrius* subspecies, is designated a species of Special Concern on Schedule 1 of SARA but under consideration for status change and Vulnerable under the NL ESA. This species migrates along the coast of Newfoundland during the fall, including the Bonavista and Avalon peninsulas, preying on concentrations of migrating shorebirds (White et al. 2002). This species is seen regularly in small numbers well offshore during migration landing on vessels and oil drilling and production facilities (Abgrall et al. 2008b, 2009; Abgrall 2014; Holst and Lang 2014a, 2014b). This species is a strong flyer, crossing large bodies of water during migration. However, it may be attracted to vessels and platforms for the opportunity to rest or to prey on seabirds and on landbirds that seek refuge on and near those vessels and platforms during migration.

6.2.5 Summary of Key Areas and Times

The marine waters in offshore southeastern Labrador and eastern Newfoundland are important to numerous marine-associated and migratory bird species during various periods of the year (Tables 6.8 and 6.9). During summer, large numbers of seabirds are concentrated at coastal nesting colonies and the surrounding areas (Fifield et al. 2009). This includes globally important numbers of Atlantic puffin, common murre, Leach's storm-petrel, and northern gannet, and continentally important numbers of black-legged kittiwake, and smaller numbers of other species (Bird Studies Canada 2016). Most of these birds forage relatively close to their colonies on fish including some that that have migrated to the shallow waters to spawn (i.e., capelin). The exception is Leach's storm-petrel, which commutes over the continental shelf to forage for itself and its nestlings in deep waters off the shelf. The Orphan Basin and Flemish Pass are the nearest deep-water areas to the largest nesting colony in the world of Leach's storm-petrel (i.e., Baccalieu Island). Summer concentrations of non-breeding, sub-adult northern fulmars are also found in deep waters off the shelf. During summer, the Grand Banks supports species that migrate from nesting areas in the South Atlantic, including globally important numbers of great shearwater, large numbers of sooty shearwater, and smaller numbers of Wilson's storm-petrel, and south polar skua.

Many of the species that were abundant in coastal areas of the RAA during the nesting season move offshore upon completion of the nesting season. Continentally significant numbers of wintering common eider and nationally important numbers of harlequin duck (Special Concern, SARA Schedule 1) occur in coastal areas in winter (Bird Studies Canada 2016). Large numbers of other species of sea duck, and Iceland gulls also occur in coastal areas in winter. Other Arctic-breeding species arrive to winter along the continental shelf break and adjacent areas. These include globally significant numbers of black-legged kittiwake, dovekie, and thick-billed murre, and large numbers of northern fulmar. A portion of the population of Great black-backed gulls nesting in NL also move offshore. Newfoundland waters are also an important wintering area for the great skua population nesting in Iceland. In the northwest quarter of the RAA, the Northeast Newfoundland Shelf is part of a globally significant wintering area for ivory gull (Endangered, SARA Schedule 1). The ECSAS program has identified 'hotspots' in the offshore areas of the RAA where these species concentrate in winter and in fall migration. Identified hotspots include Orphan Basin and Sackville Spur, Flemish Cap and Pass, the northeast section of the Grand Banks, the northeast Newfoundland Shelf, and the Labrador Shelf/Labrador Sea (Fifield et al. 2009).

Several coastal areas have been designated as IBAs because of seabirds that concentrate to nest, stage, or winter. The program was initiated and is coordinated by BirdLife International and is administered in Canada by the Canadian Nature Federation and Bird Studies Canada. The program uses internationally standardized criteria to identify sites of national and international importance. These criteria consist of one or more of the presence of species at risk, species with restricted range, habitats holding representative species assemblages, or a congregation of a significant proportion of a species' population during one or more seasons. There are 21 IBA sites in eastern Newfoundland and 10 of these include marine waters of the RAA (Figure 6-54; Table 6.13). Some of these IBAs are also designated federal Migratory Bird Sanctuaries or provincial Seabird Ecological Reserves (Table 6.13). Seabird Ecological Reserves are protected from industrial development and other activities that can cause disturbance to breeding seabirds pursuant to the *Seabird Ecological Reserve Regulations, 2015*.

EBSAs have also been identified in the RAA (Table 6.14). The criteria for selection and ranking of EBSAs included importance to seabird biodiversity, density, reproduction, and survival.

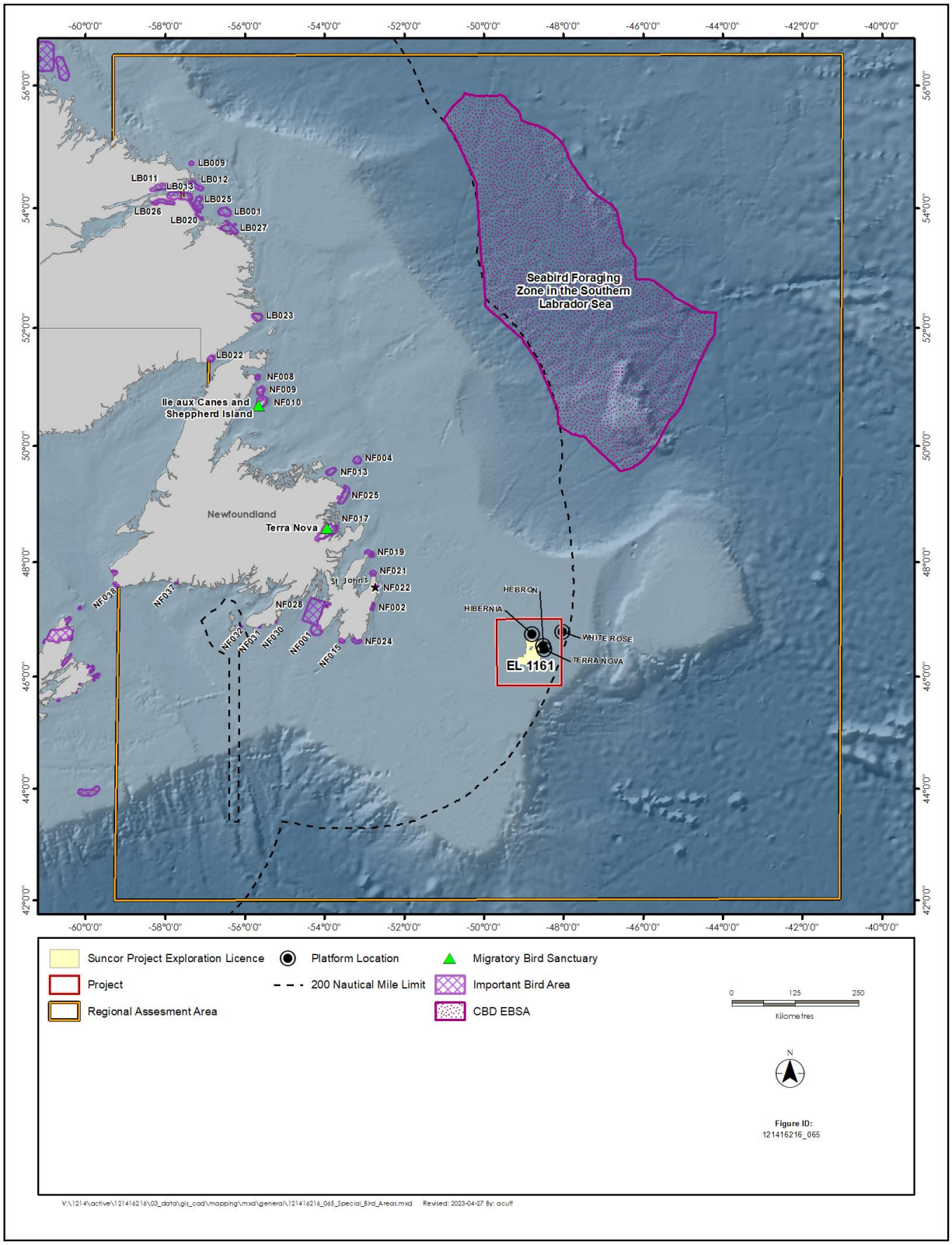


Figure 6-54 Important Bird Areas, Migratory Bird Sanctuaries, and Seabird Ecologically or Biological Significant Area Locations

Table 6.13 Important Bird Areas on Marine Waters of Eastern Newfoundland and Southeastern Labrador

IBA Name and IBA Number*	Importance to Marine and Migratory Birds
Quaker Hat Island (LB009)	Nesting razorbill[C] and nesting murres
Northeast Groswater Bay (LB012)	Nesting razorbill[C], Atlantic puffin[C] and murres
Goose Brook, Hamilton Inlet (LB011)	Staging Canada goose[C]
South Groswater Bay Coastline (LB013)	Migrating black scoter, nesting common eider
The Backway, Rigolet (LB026)	Moulting surf scoter[G,C]
Cape Porcupine (LB020)	Staging surf scoter[G,C]
Tumbledown Dick Islands and Stag Islands (LB025)	Moulting harlequin duck[N]; nesting razorbill[C]
Gannet Island (LB001)	Nesting razorbill[C] Atlantic puffin[G,C], common murre[C]; moulting harlequin duck.
Table Bay, Cartwright (LB027)	Nesting common eider.
Bird Island, Cartwright (LB019)	Nesting Atlantic puffin[C], common murre and razorbill[C].
St. Peter Bay (LB023)	Harlequin duck[S] premoulting[N]; common eider[C] major moulting area
Point Amour, Strait of Belle Isle (LB022)	Migrating Common eider[G], black guillemot[C], and razorbill[C]
Fischot Islands (NF008)	Common eider[G] wintering
Northern Groais Island (NF009)	Black-legged kittiwake[C] nesting colony; common eider wintering
Bell Island South Coast (NF010)	Common eider[C] nesting colony
Funk Island (NF004)	Nesting common murre[G], nesting northern gannet[G]; provincially protected SER[E]; overlaps Fogo Shelf EBSA[E]
Wadham Islands and adjacent Marine Area (NF013)	Wintering common eider[C]; nesting Atlantic puffin[C], nesting Leach's storm-petrel and razorbill; overlaps Fogo Shelf EBSA[E]
Cape Freels Coastline and Cabot Island (NF025)	Wintering common eider[C]; nesting black-headed gull[C]; nesting common murre, razorbill, Atlantic puffin, and common / Arctic tern; overlaps Fogo Shelf EBSA[E]
Terra Nova National Park (NF017)	Wintering black-headed gull[C]; wintering dovekie[C]; shorebirds, gulls and waterfowl on tidal flats at Big Brook and Newman Sound; large nos. nesting common / Arctic terns; federal Migratory Bird Sanctuaries
Grates Point (NF019)	Wintering common eiders[C]; wintering black-legged kittiwake, thick-billed murre, dovekie; summer use Atlantic puffin, northern Gannet
Baccalieu Island (NF003)	Nesting Leach's storm-petrel[G] and Atlantic puffin; nesting black-legged kittiwake[C], large nos. nesting northern gannet; other nesting species; SER
Cape St. Francis (NF021)	Fall migration dovekie[C]; fall migration Manx shearwater[C]; large nos. wintering common eider; wintering purple sandpiper
Quidi Vidi Lake (NF022)	Wintering great black-backed gull[G] and Iceland gull[G], black-headed gull[C]. herring gull[G]
Witless Bay Islands (NF002)	Nesting Atlantic puffin[G], common murre, razorbill, and Leach's storm-petrel; nesting black-legged kittiwake[C] and herring gull; staging waterfowl; SER; overlaps Eastern Avalon Coast EBSA[E]

Table 6.13 Important Bird Areas on Marine Waters of Eastern Newfoundland and Southeastern Labrador

IBA Name and IBA Number*	Importance to Marine and Migratory Birds
Mistaken Point (NF024)	Wintering common eider; wintering purple sandpiper[C]; nesting black-legged kittiwake, common murre and razorbill; spring, summer and fall Manx shearwater[C]; Provincial Ecological Reserve and UNESCO World Heritage Site (fossil deposits)
Cape Pine and St. Shotts Barren (NF015)	Nesting razorbill; large nos. fall staging American golden-plover and whimbrel; overlaps Placentia Bay EBSA[E]
Cape St. Mary's (NF001)	Nesting[G] northern gannet; nesting[C] black-legged kittiwake, wintering[N] and moulting harlequin duck[S]; nesting common and thick-billed murre, razorbill, black guillemot, herring and great black-backed gull, great and double-crested cormorant, wintering waterfowl; overlaps Placentia Bay EBSA[E]
Placentia Bay (NF028)	Great shearwater[G] summering; dovekie[C] wintering; Manx shearwater[C] summering; overlaps Placentia Bay EBSA[E]
Corbin Island (NF030)	Leach's storm-petrel[G] nesting; herring gull[C] nesting;
Middle Lawn Island (NF031)	Manx shearwater[C] summering; Leach's storm-petrel[G] nesting
Green Island (NF032)	Nesting Leach's storm-petrel
Big Barasway (NF037)	Nesting piping plover[C]
Grand Bay West to Cheeseman Provincial Park (NF038)	Nesting black-headed gull[C] and piping plover[C]

Notes:
[C] Continentally Significant concentration of birds (IBA criteria), [E] EBSA, [G] Globally Significant concentration, [N] Nationally Significant concentration, [P] Provincial Seabird Ecological Reserve (SER), [S] Species of Conservation Concern
* Locations illustrated in Figure 6-11

Table 6.14 Ecologically and Biologically Significant Areas of Importance to Marine Birds

EBSA	Importance to Marine Birds
Hopedale Saddle	Several species of seabirds were found here in high densities during pelagic surveys (black-legged kittiwake, dovekie, great shearwater, murres, northern fulmar, phalaropes, Atlantic puffin, razorbill, skuas and jaegers, sooty shearwater and terns) and the outer boundary was extended slightly northward to include an area where the endangered ivory gull was found in high densities (in addition to black-legged kittiwake, dovekie and phalaropes).
Labrador Slope	Black-legged Kittiwake, dovekie, great black-backed gull, great shearwater, sooty shearwater, northern gulmar, skuas and jaegers and phalaropes, frequent the area in high relative numbers for feeding.
Labrador Marginal Trough	Important feeding area for murres, black-legged kittiwake, great black-backed gull, herring gull, northern fulmar, Atlantic puffin, skuas and jaegers, sooty shearwater, and the endangered ivory gull.
Hamilton Inlet	High concentrations of nesting Atlantic puffin, murres and razorbills Important for feeding area for Canada geese, eiders and scoters. Colonies of nesting common eider, great black-backed gull and herring gull. harlequin duck (species of 'Special Concern' under *SARA*) moult within this EBSA.

Table 6.14 Ecologically and Biologically Significant Areas of Importance to Marine Birds

EBSA	Importance to Marine Birds
Southwest Shelf Edge and and Slope	Highest density of pelagic marine birds foraging within the Placentia Bay / Grand Banks Large Ocean Management Area
Placentia Bay Extension	Important foraging area for many breeding marine bird species from spring to fall. Includes IBAs: Cape Pine and St. Shotts Barren, Cape St. Mary's.
Eastern Avalon Coast	Important foraging area for many breeding marine bird species from spring to fall. Includes IBA: Witless Bay Islands.
Southeast Shoal and Tail of the Bank	Important seasonal foraging area for marine birds
Virgin Rocks	High aggregations of capelin and other spawning groundfish such as Atlantic cod, American plaice, and yellowtail flounder. Seabird feeding area.
Northeast Shelf and Slope	Seabird concentrations year-round.
Fogo Shelf	Funk Island, the largest common murre colony in the western North Atlantic and the only northern gannet breeding colony in the Newfoundland and Labrador Shelves Bioregion. Other bird species aggregations also, due to abundance of beach and sub-tidal capelin spawning areas. Includes IBAs: Cape Freels Coastline and Cabot Island, Wadham Islands and adjacent Marine Area, Funk Island.
Notre Dame Channel	Frequented by several species of seabirds.
Grey Islands	Important for waterfowl and seabirds in coastal areas and on the shelf. Common eider and harlequin duck occur in high concentrations. Important breeding colonies for great black-backed gulls, herring gulls, and terns. High diversity of seabird species that aggregate along the inner shelf area. Includes IBAs outside of the Regional Assessment Area: Fischot Islands, Northern Groais Island, Bell Island South Coast.
Labrador Marginal Trough	Important for seabirds including murres, black-backed kittiwake, great black-backed gull, herring gull, northern fulmar, Atlantic puffin, skuas, jaegers, sooty shearwater, and the SARA-listed ivory gull.
Seabird Foraging Zone, South Labrador Sea EBSAS	Important foraging area for wintering black-legged kittiwake, thick-billed murres, and breeding Leach's storm petrels.
Sources: From Templeman (2007), DFO (2012, 2016), Wells et al. (2017), Secretariat of the Convention on Biological Diversity (2014) and environmental monitoring reports (seabirds and marine mammals) of geophysical surveys (various years)	

Additional information on special areas of importance to Marine Birds (e.g., Migratory Bird Sanctuaries, EBSAs) is included in Section 6.4 (Special Areas).

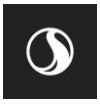
6.3 Marine Mammals and Sea Turtles

A total of 32 species of marine mammals could potentially occur in the Project Area and RAA, including 26 species of cetaceans (whales, dolphins, and porpoises) and 6 species of seals. However, seven of the cetacean species are extralimital in the region. The region likely offers important foraging habitat for many species, and most marine mammals use the area seasonally. Four sea turtle species could also occur within or near the Project Area.

6.3.1 Approach and Key Information Sources

Descriptions of marine mammals and sea turtles in the waters off eastern Newfoundland were presented in the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (IAAC 2021) as well as project-specific exploration drilling and seismic EAs for offshore waters off the east coast of Newfoundland (Section 4.5 of LGL 2015, 2016; Section 6.3 of Statoil 2017 and EMCP 2017). An overview of marine mammal and sea turtle species that are known to occur in or near the Project Area and/or LAA is presented below, based on the aforementioned documents. New information that was not included in project-specific EAs, including COSEWIC species assessments and status reports, DFO research and scientific documents, technical reports, and peer-reviewed publications, is also included below. The primary sources of information on the occurrence, distribution, and abundance of marine mammals and sea turtles within or near the Project Area are summarized below:

- The DFO cetacean and sea turtle sightings database for Newfoundland and Labrador is compiled by DFO, St. John's (J. Lawson, DFO Research Scientist, pers. comm., April 2019) from various sources. It was made available to describe sightings within the Project Area. The data do not include information on survey effort, as they are collected opportunistically. Thus, the data provide insight into what species have occurred in the Project Area / LAA at various times of the year, but they cannot reliably predict fine-scale habitat use, distribution, or abundance, of species in the area. Data from 1945 to 2015 were used for the mapping and sighting summary tables. The caveats that need to be considered when using opportunistic sightings from the DFO database were described in Section 4.5.1.1 of LGL (2015).
- Incidental sightings of marine mammals and sea turtles collected during geophysical surveys and drilling programs by Equinor Canada were compiled for 2008 to 2015. Data included those from LGL (2009, 2014), Fugro (2015), PAL (2015), and other Equinor Canada activities in the waters off eastern Newfoundland (Equinor Canada, unpublished data). Sightings were also recorded during Equinor Canada's August-October 2018 seabed survey on the Sackville Spur northeast of the Project Area (Mactavish and Penney-Belbin 2018). All sightings of marine mammals were provided to the C-NLOPB.
- The C-NLOPB database includes marine mammal and sea turtle sighting data for various geophysical surveys that took place offshore Newfoundland from 2004 to 2017. With the exception of sightings from 2016 and 2017, these records are included in the DFO cetacean and sea turtle database. Sightings of marine mammals that were recorded during two programs for Fugro (in 2017) and three programs for MKI (in 2016) are included in this database.
- Records of sea turtles from the OBIS open-access database (http://seamap.env.duke.edu/) were mapped, as they include bycatch during pelagic fisheries which are not included in the DFO cetacean and sea turtle database. Sightings of marine mammals from OBIS were not mapped, as most records are included in the DFO database. Similar to the DFO database, no information on survey effort is included in the OBIS database.
- As part of an Environmental Studies Research Fund (ESRF) study, *Acoustic Monitoring Along Canada's East Coast: August 2015 to July 2017* (Delarue et al. 2018, 2022), a total of 20 acoustic recorders were deployed between northern Labrador and the southwestern Scotian Slope to capture marine mammal vocalizations. An additional five acoustic recorders (three of which were located in the RAA) were deployed as part of a DFO study from May 2015 to November 2017 (Delarue et al. 2022). One of the 25 recorders (Stn 18) was located within the Project Area, but outside the Suncor Project Exploration License. The next closest recorder to the Project Area (Stn 17) was deployed 97 km to the



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south, and another recorder (Stn 7) was located 123 km west of the Project Area. All other recorders were situated more than 190 km from the Project Area.

- JASCO Applied Sciences deployed an acoustic recorder (CM2) during their study of *Marine Mammals and Sound Sources in the Flemish Pass* for Equinor Canada to detect marine mammal vocalizations during 2014 and 2015 (Maxner et al. 2019). It was located 158 km northeast of the Project Area in a water depth of ~1,170 m.
- During July and August 2007, the Trans North Atlantic Sightings Survey (TNASS) was a large scale megafauna survey that occurred in Newfoundland waters (Lawson and Gosselin 2009). Surveys for marine mammals and sea turtles took place between northern Labrador and the Scotian Shelf. Marine mammal sightings recorded during these surveys were used to calculate abundance estimates for the area by Lawson and Gosselin (2009), which were subsequently updated (Lawson and Gosselin 2011).

6.3.2 Overview of Species Occurrence

The seasonal occurrence and conservation status of marine mammals and sea turtles that could occur within or near the Project Area are summarized in Tables 6.15 and 6.16, respectively. Sightings in the Project Area of cetaceans, including baleen whales (mysticetes); large toothed whales, dolphins, and porpoises (odontocetes); and sea turtles are summarized in Table 6.17. All sightings within the temporal scope of the Project (year-round) are included. Some of these species listed in Tables 6.15 and 6.16 are considered extralimital in the RAA and are not considered further.

6.3.3 Mysticetes (Baleen Whales)

Excluding extralimital species, a total of six baleen whale species could occur in the Project Area (Figure 6-55). North Atlantic right whales, blue whales, and fin whales are described in Section 6.3.7 as they have status under Schedule 1 of SARA. Although baleen whales have been sighted in waters off Newfoundland year-round, most migrate to lower latitudes for the winter (IAAC 2021). Bowhead whale has been recorded in the RAA on rare occasions but has not been reported from the LAA or the Project Area, so is not considered further (Table 6.15, Figure 6-55).

6.3.3.1 Humpback Whale

The Western North Atlantic population of the humpback whale is listed as special concern under Schedule 3 of SARA (Government of Canada 2021) but is considered not at risk by COSEWIC (COSEWIC 2003a). Humpbacks that occur in the waters of Newfoundland are part of the Western North Atlantic population which is estimated at approximately 12,312 whales; individuals belonging to this stock breed in the West Indies (Bettridge et al. 2015). Lawson and Gosselin (2009) estimated an abundance of 1,427 humpbacks (95% confidence interval [CI]: 952-2,140) for Newfoundland waters; when corrected for perception and availability biases, the abundance was 3,712 individuals (Lawson and Gosselin 2011). The humpback was the most frequently sighted species of whale during the 2007 TNASS (Lawson and Gosselin 2009) and within the Project Area based on compiled sightings (367 sightings; 714 individuals). Two humpbacks were seen in the Sackville Spur region during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). Although humpback whales occur in the area year-round (Table 6.17; Figure 6-55), they are considered most common during late spring and summer.

Table 6.15 Marine Mammals that May Occur in the Project Area and Surrounding Marine Environment

Common Name	Scientific Name	SARA Schedule 1 Status [1]	COSEWIC Designation [2,3]	Potential Timing of Presence	Sources
Mysticetes (Baleen Whales)					
Blue Whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	Year-round (highest numbers from early spring through winter)	COSEWIC (2002a); Lesage et al. (2016); Hayes et al. (2020)
Fin Whale (Atlantic population)	*B. physalus*	Special Concern	Special Concern	Year-round	COSEWIC (2005); DFO (2017a); Hayes et al. (2021)
Sei Whale (Atlantic population)	*B. borealis*	Not Listed	Endangered	Seasonal (summer)	COSEWIC (2003a); Hayes et al. (2021)
Humpback Whale (Western North Atlantic population)	*Megaptera novaeangliae*	Not Listed (Special Concern on Schedule 3)	Not at Risk	Year-round (highest concentration from spring through winter)	Lawson and Gosselin (2009); Bettridge et al. (2015)
Common Minke Whale (North Atlantic subspecies)	*B. acutorostrata*	Not Listed	Not at Risk	Year-round (highest concentration spring through fall)	Risch et al. (2014); Hayes et al. (2021)
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered	Summer	COSEWIC (2013); Hayes et al. (2021)
Bowhead Whale [4] (Eastern Canada-West Greenland population)	*Balaena mysticetus*	Not Listed	Special Concern	Not likely to occur in the Project Area or LAA	Ledwell et al. (2007); COSEWIC (2009a); CBC (2014)
Odontocetes (Toothed Whales)					
Sperm Whale	*Physeter macrocephalus*	Not Listed	Not at Risk; Mid-priority Candidate	Year-round	Hayes et al. (2020)
Pygmy sperm whale [4,5]	*Kogia breviceps*	Not Listed	Not at Risk	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)
Northern Bottlenose Whale (1: Scotian Shelf population / 2: Davis Strait-Baffin Bay-Labrador Sea population)	*Hyperoodon ampullatus*	1. Endangered 2. Not Listed	1. Endangered 2. Special Concern	Year-round	COSEWIC (2011); DFO (2016a)
Sowerby's Beaked Whale	*Mesoplodon bidens*	Special Concern	Special Concern	Not likely to occur in the Project Area or LAA	COSEWIC (2006a); DFO (2017b)
Cuvier's Beaked Whale [4,5]	*Ziphius cavirostris*	Not Listed	Not at Risk; High-priority Candidate	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)

Table 6.15 Marine Mammals that May Occur in the Project Area and Surrounding Marine Environment

Common Name	Scientific Name	SARA Schedule 1 Status [1]	COSEWIC Designation [2,3]	Potential Timing of Presence	Sources
Blainville's Beaked Whale [4]	*Mesoplodon densirostris*	Not Listed	Not at Risk	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)
Killer Whale (Northwest Atlantic / Eastern Arctic population)	*Orcinus orca*	Not Listed	Special Concern	Year-round	COSEWIC (2009b); Waring et al. (2015)
False Killer Whale [4]	*Pseudorca crassidens*	Not Listed	Not Listed	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)
Long-finned Pilot Whale	*Globicephala melas*	Not Listed	Not at Risk	Year-round	Fullard et al. (2000); Hayes et al. (2020)
White-beaked Dolphin	*Lagenorhynchus albirostris*	Not Listed	Not at Risk	Year-round	Hayes et al. (2020)
Atlantic White-sided Dolphin	*L. acutus*	Not Listed	Not at Risk	Year-round	Hayes et al. (2020)
Common Dolphin (Short-beaked)	*Delphinus delphis*	Not Listed	Not at Risk	Seasonal (summer through fall)	Hayes et al. (2021)
Risso's Dolphin	*Grampus griseus*	Not Listed	Not at Risk	Year-round	Hayes et al. (2020)
Common Bottlenose Dolphin	*Tursiops truncatus*	Not Listed	Not at Risk	Seasonal (May to September)	Hayes et al. (2021)
Atlantic Spotted Dolphin	*Stenella frontalis*	Not Listed	Not Listed	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)
Spinner Dolphin [4]	*S. longirostris*	Not Listed	Not Listed	Not likely to occur in the Project Area or LAA	Hayes et al. (2020)
Striped Dolphin	*S. coeruleoalba*	Not Listed	Not at Risk	Seasonal (summer)	Hayes et al. (2020)
Harbour Porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Not Listed (Threatened on Schedule 2)	Special Concern	Year-round	COSEWIC (2006b)
Beluga Whale [4] (St. Lawrence Estuary population)	*Delphinapterus leucas*	Endangered	Endangered	Not likely to occur in the Project Area or LAA	COSEWIC (2014)
Narwhal [4]	*Monodon monoceros*	Not Listed	Special Concern	Not likely to occur in the Project Area or LAA	COSEWIC (2004)

Table 6.15 Marine Mammals that May Occur in the Project Area and Surrounding Marine Environment

Common Name	Scientific Name	SARA Schedule 1 Status [1]	COSEWIC Designation [2,3]	Potential Timing of Presence	Sources
Phocids (Seals)					
Harbour Seal (Atlantic and Eastern Arctic subspecies)	*Phoca vitulina concolor*	Not Listed	Not at Risk	Year-round	Hayes et al. (2021)
Harp Seal	*Pagophilus groenlandicus*	Not Listed	Not Listed; Low-priority Candidate	Year-round (highest concentrations in winter)	DFO (2012); IAAC (2021); Hayes et al. (2020)
Hooded Seal	*Cystophora cristata*	Not Listed	Not at Risk; Mid-priority Candidate	Seasonal (highest concentrations in winter)	Waring et al. (2007); Andersen et al. (2009, 2012, 2013, 2014)
Grey Seal	*Halichoerus grypus*	Not Listed	Not at Risk	Year-round	Lesage and Hammill (2001); Hayes et al. (2020)
Ringed Seal	*Pusa hispida*	Not Listed	Not at Risk	Year-round	Aivek Stantec Limited Partnership (2021)
Bearded Seal	*Erignathus barbatus*	Not Listed	Data Deficient; Mid-priority Candidate	Year-round	Aivek Stantec (Limited Partnership 2021)

Notes:

[1] SARA = Canadian *Species at Risk Act.*

[2] COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

[3] None of these marine mammal or sea turtle species are currently listed under the NL ESA.

[4] These species are based on one or two observations and are considered extralimital in the RAA; they are not considered further.

[5] Although no confirmed visual detections have been made near the Project Area, sightings have been made within the RAA, and these species were detected acoustically along the edges of the Grand Banks during the ESRF acoustic study (Delarue et al. 2018).

Additional Sources: Husky Energy (2012), IAAC (2021), BP (2016).

Table 6.16 Sea Turtle Species that May Occur in the Project Area and Surrounding Marine Environment

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential Timing of Presence	Sources
Leatherback Sea Turtle (Atlantic population)	*Dermochelys coriacea*	Endangered	Endangered	Seasonal (spring through fall)	COSEWIC (2012a)
Loggerhead Sea Turtle	*Caretta caretta*	Endangered	Endangered	Seasonal (spring through fall)	Brazner and McMilan (2008); COSEWIC (2010)
Green Sea Turtle	*Chelonia mydas*	Not Listed	Not Listed	Very rare; possible seasonal (summer and fall)	James et al. (2004)
Kemp's Ridley Sea Turtle [1]	*Lepidochelys kempii*	Not Listed	Not Listed	Seasonal	NMFS et al. (2011)

Notes:
[1] This species is considered extralimital in the RAA and is not considered further.
Additional Sources: Husky Energy (2012), IAAC (2021), and BP (2016).

Table 6.17 Cetacean and Sea Turtle Sightings in the Project Area and Regional Assessment Area based on all Compiled Data

Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Mysticetes (Baleen)						
Blue Whale	282	338	Feb-Nov	-	-	-
Fin Whale	4,784	7,367	Jan-Dec	84	112	May-Nov
Sei Whale	287	601	Feb, May-Dec	3	3	Jun-Jul
Humpback Whale	6,811	29,525	Jan-Dec	367	714	Jan, Apr-Nov
Minke Whale	2,353	6,582	Jan, Mar-Dec	40	45	May-Nov
North Atlantic Right Whale	10	17	Jun, Aug, Sep, Nov	-	-	-
Bowhead Whale	1	1	May	-	-	-
Fin / Sei Whale	63	99	Jan, Apr-Nov, Dec	16	22	May, Jul
Unidentified Baleen Whale	504	667	May-Dec	147	184	May-Oct
Odontocetes						
Sperm Whale	446	992	Jan-Dec	4	4	Jul-Aug, Oct-Nov
Pygmy Sperm Whale	1	2	Jun	-	-	-

Table 6.17 Cetacean and Sea Turtle Sightings in the Project Area and Regional Assessment Area based on all Compiled Data

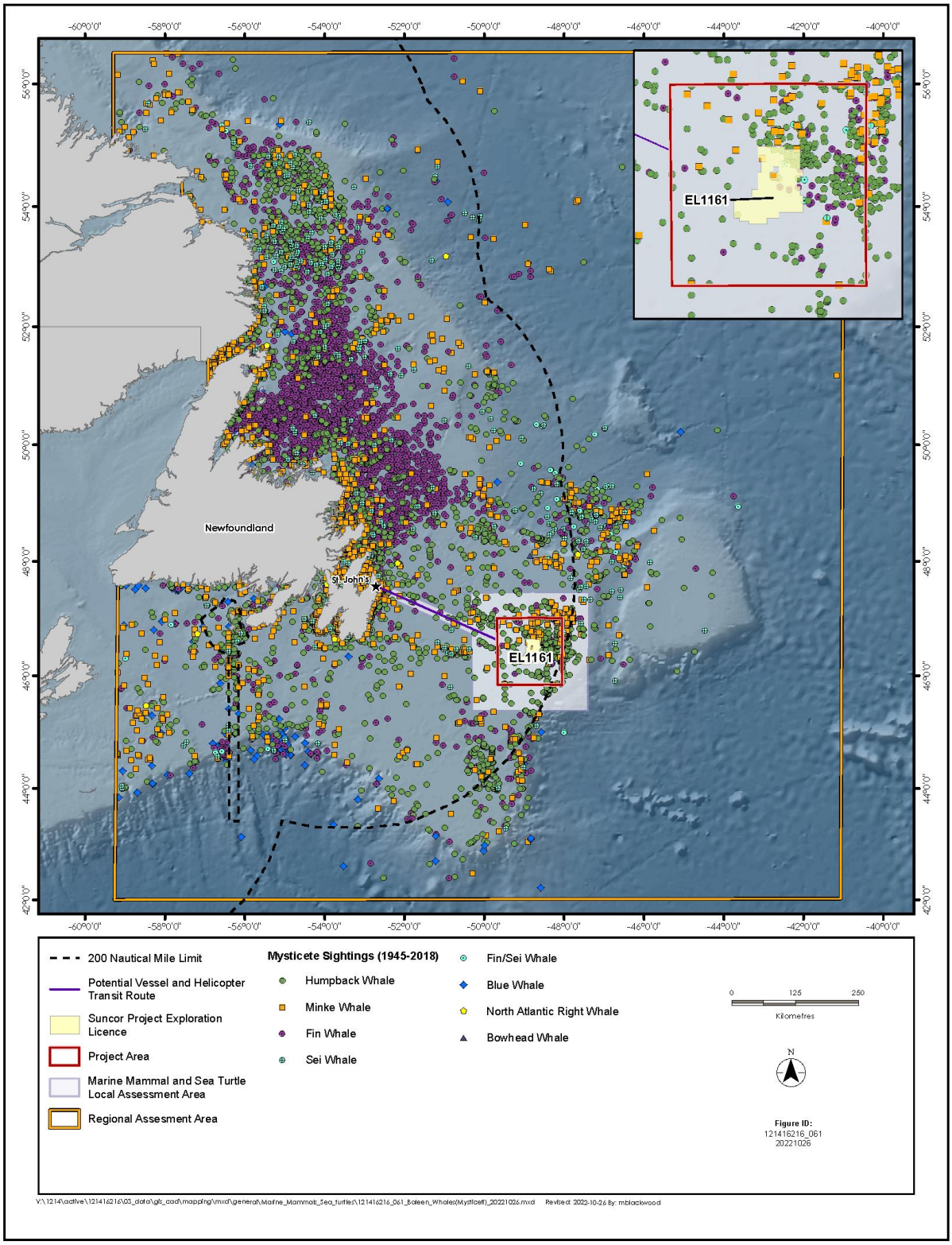
Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Northern Bottlenose Whale	356	844	Mar-Dec	2	3	May, Jun
Sowerby's Beaked Whale	3	12	Sep, Nov	-	-	-
Cuvier's Beaked Whale	2	2	Jul, Nov	-	-	-
Blainville's Beaked Whale	2	8	Sep	-	-	-
Killer Whale	649	3,823	Jan-Dec	15	71	May-Nov
False Killer Whale	1	2	Jun	-	-	-
Long-finned Pilot Whale	1,438	26,669	Jan-Dec	11	58	Mar, Jul-Sep
White-beaked Dolphin	593	5,381	Jan-Nov	49	293	Jun-Aug
Atlantic White-sided Dolphin	732	12,700	Jan-Dec	76	1,149	Jun-Aug
Short-beaked Common Dolphin	528	9,870	Jan-Dec	5	172	Jun-Jul, Sep-Oct
Risso's Dolphin	25	85	Apr, Jun-Nov	-	-	-
Common Bottlenose Dolphin	21	154	Apr-Jun, Aug-Oct	-	-	-
Atlantic Spotted Dolphin	3	14	Jun-Jul	-	-	-
Striped Dolphin	13	554	Jun, Aug, Sep	-	-	-
Harbour Porpoise	509	3,290	Feb-Dec	3	14	May, Jul
Narwhal	7	10	Jun-Jul	-	-	-
Beluga	21	2,072	Apr-Sep	-	-	-
Unidentified Dolphin	1,385	23,090	Jan-Dec	97	741	May-Aug, Oct-Nov
Unidentified Beaked Whale	4	5	Jun, Aug, Sep	-	-	-
Unidentified Toothed Whale	21	54	Jun-Sep	1	1	Aug
Others						
Unidentified Whale	22	42	May-Nov	8	12	May, Jul, Sep
Unidentified Cetacean	2,106	8,081	Jan-Dec	59	87	Feb-Dec

Table 6.17 Cetacean and Sea Turtle Sightings in the Project Area and Regional Assessment Area based on all Compiled Data

Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Sea Turtles*						
Leatherback Sea Turtle	1,320	1,424	Jan, Mar, May-Dec	1	1	Sep
Loggerhead Sea Turtle	1,229	1,250	May-Nov	-	-	-
Green Sea Turtle	57	57	May-Nov	-	-	-
Unidentified Sea Turtle	21	30	Jan-Mar, Jun, Aug-Oct	-	-	-

Note: *Sightings for sea turtles also include bycatch records.

Sources for marine mammals: Lawson and Gosselin (2009); Mactavish and Penney-Belbin (2018); C-NLOPB database, DFO database; Equinor Canada database. Sources for turtles: Halpin et al. (2009); DFO database.



Source:Lawson and Gosselin (2009); Mactavish and Penney-Belbin (2018); C-NLOPB database, DFO database; Equinor Canada database.

Figure 6-55 Baleen Whale Sightings in the Project Area and Regional Assessment Area

In the RAA, humpback whales were acoustically detected throughout the year during monitoring from May 2015 to November 2017; the highest detection rates occurred off Labrador, in the Strait of Belle Isle, and on the Grand Banks (Delarue et al. 2018, 2022). Acoustic detection rates near the Project Area on the Grand Banks were the highest during fall and winter, but detections also occurred during spring and summer (Delarue et al. 2018, 2022). No acoustic detections were made at the two recorders closest to the Project Area between April and July (Delarue et al. 2018). Delarue et al. (2022) noted that the Flemish Pass-Orphan Basin region appears to be an important area for this species. Kowarski et al. (2022) examined the breeding behaviour of singing in the waters off eastern Canada. The first day of singing was recorded as early as September in the Strait of Belle Isle, and regular singing started as early as October off Labrador. On the Grand Banks, first singing started in October, and regular singing was recorded starting in November. Photoperiod was negatively correlated to singing. Based on modelling, Mannocci et al. (2017) showed that the highest humpback whale densities are predicted to occur in the northeastern portion of the RAA during the summer; relatively high densities were also shown on the Grand Banks, including near the Project Area. Humpbacks are common in the Project Area.

6.3.3.2 Minke Whale

The minke whale has no status under SARA and is considered not at risk by COSEWIC (Government of Canada 2021). Based on surveys conducted in 2016, the abundance was estimated at 21,968 whales (coefficient variable [CV] = 0.31) for the Canadian East Coast stock (Hayes et al. 2021). The abundance estimate based on the 2007 TNASS was 4,691 whales (Lawson and Gosselin 2011). Risch et al. (2014) noted that the minke whale is common in the region from spring through fall. Based on compiled sightings, 40 sightings (45 individuals) have been made within the Project Area, with sightings mainly during late spring and summer (Table 6.17; Figure 6-55).

Minke whales were seen during opportunistic surveys of the North Atlantic Current and Evlanov Seamount candidate MPA to the east of the Flemish Cap in July 2018 (Wakefield 2018). During acoustic monitoring within the Project Area and RAA between May 2015 and November 2017, minke whales were only detected south of Newfoundland and off Nova Scotia (Delarue et al. 2018, 2022). Modeling indicated that the highest densities of minke whales in the RAA are predicted to occur on the Grand Banks near the Project Area (Mannocci et al. 2017). Minke whales are common in the Project Area.

6.3.3.3 Sei Whale

In the Canadian Atlantic, the sei whale does not have status under SARA, but the Atlantic population is under consideration for addition to Schedule 1 (Government of Canada 2021). In May 2019, COSEWIC changed the assessment status of the sei whale from data deficient to endangered, as few whales were sighted during surveys in Atlantic Canada in 2007 and 2016, and the population was estimated to number fewer than 1,000 mature individuals (Government of Canada 2021). In eastern Canada, there are likely two stocks: one on the Scotian Shelf and one in the Labrador Sea. However, there is little evidence for a Labrador Sea stock (COSEWIC 2003b). There is low divergence among North Atlantic sei whales, suggesting a single stock, but the genetic data have a high degree of uncertainty (Huijser et al. 2018). The Nova Scotia stock is currently estimated to consist of 6,292 whales (CV = 1.02) (Hayes et al. 2021). There is no abundance estimate for a potential Labrador Sea stock (COSEWIC 2003b).

Sei whales occur seasonally in the waters of Newfoundland, with an increase in numbers during summer (COSEWIC 2003b). Three sightings of individual whales have been reported in the Project Area; sightings occurred during June and July (Table 6.17; Figure 6-55). Sei whales outfitted with tags in the Azores traveled north of the Flemish Pass en route to foraging areas in the Labrador Sea (Prieto et al. 2014). Sei whales have been detected acoustically in the RAA throughout the year, with peaks in vocalizations occurring during October and a smaller peak during June (Macklin 2022). On the Grand Banks, including the Project Area and off Labrador, sei whale vocalization ceased during November-December (Delarue et al. 2018, 2022; Macklin 2022). Differences in vocalizations between sei whales detected in Nova Scotia and Newfoundland and Labrador suggest that two different populations may occur in Atlantic Canada (Macklin 2022). According to Delarue et al. (2018), sei whales appear to prefer deeper slope waters. Based on habitat-density modeling, the highest densities are predicted to occur in the northern portion of the RAA during summer, as well as along the edges of the Grand Banks, Cabot Strait, and Flemish Pass (Mannocci et al. 2017). Sei whales are likely to be uncommon in the Project Area.

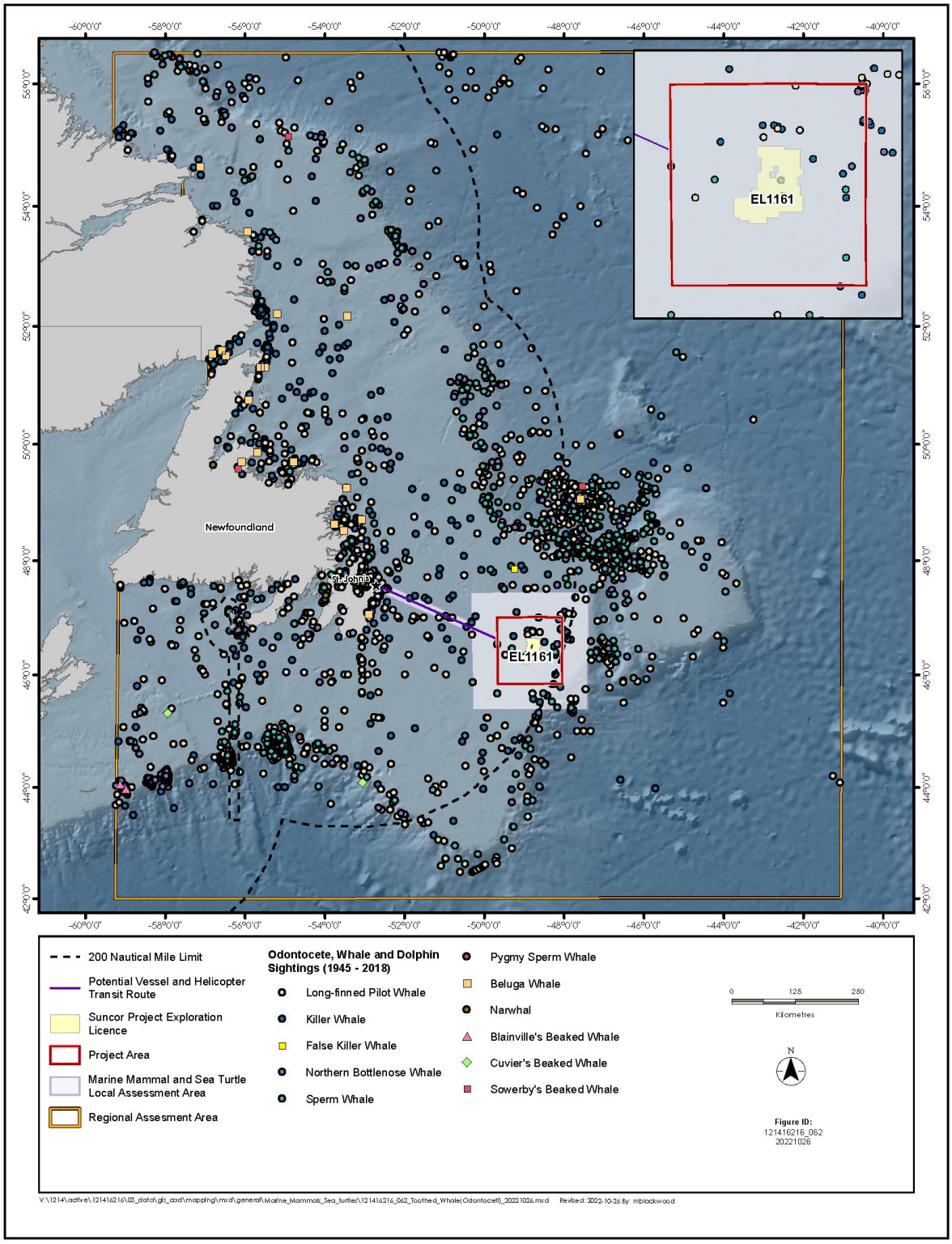
6.3.4 Odontocetes (Toothed Whales)

Excluding extralimital species, 13 toothed whale species, including 9 delphinids, could occur in the Project Area (Table 6.15; Figure 6-56). There is a paucity of information on the distribution and abundance of these species, but several only occur in the LAA and Project Area seasonally. Two different populations of northern bottlenose whales could potentially occur in the Project Area (Dalebout et al. 2006). The Scotian Shelf population is listed as endangered under Schedule 1 of SARA (profiled in Section 6.3.7); the Davis Strait-Baffin Bay-Labrador Sea population is not listed by SARA. No delphinids that occur in the Project Area are listed under SARA (Table 6.15). A total of seven species of toothed whale species, including delphinids, have been recorded in the RAA on rare occasions but have not been recorded in the LAA or the Project Area (Table 6.15, Figures 6-56 and 6-57). As a result, they are not considered further.

6.3.4.1 Sperm Whale

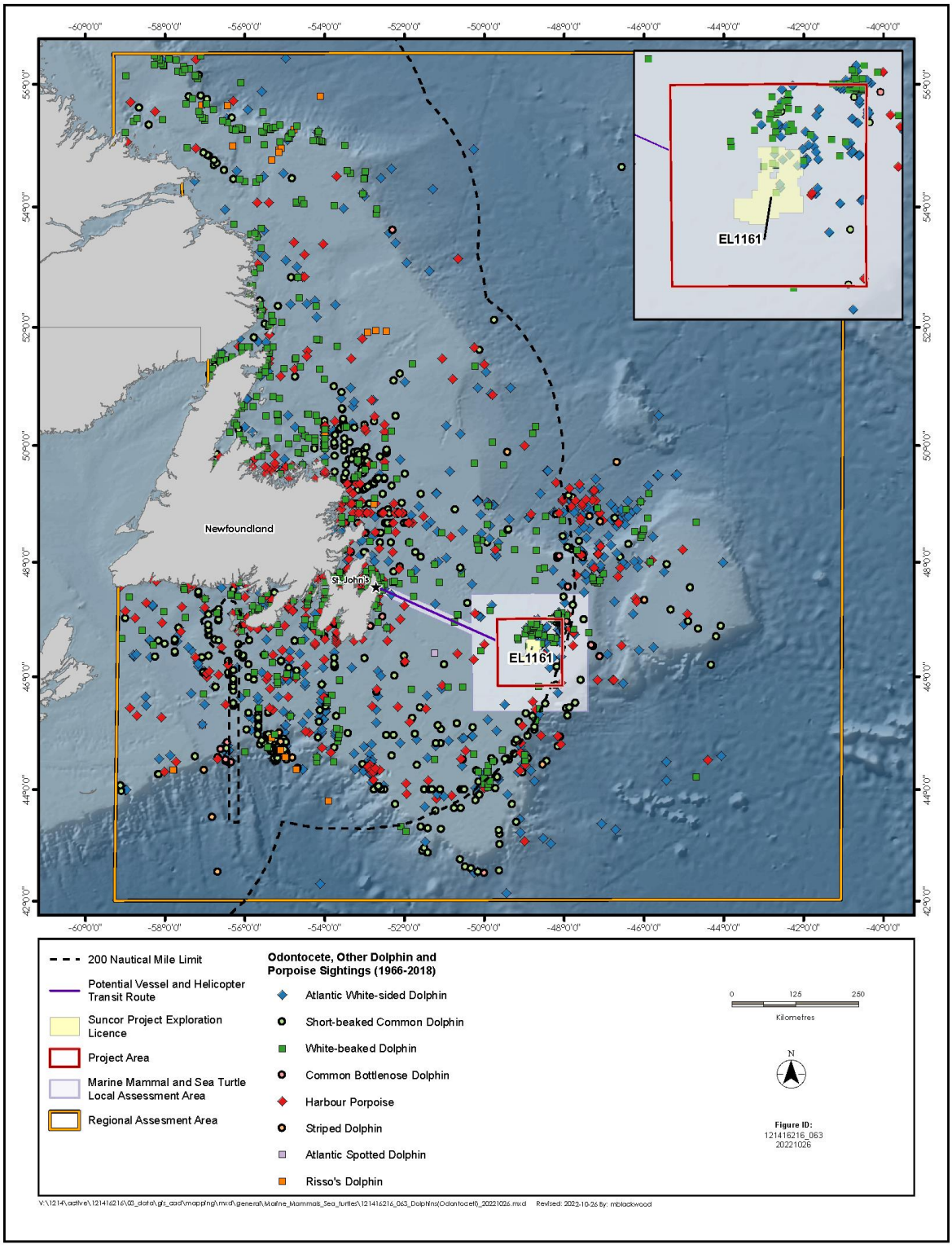
The sperm whale does not have status under SARA (Government of Canada 2021). It is designated not at risk by COSEWIC, but is considered a mid-priority candidate species (COSEWIC 2022). The abundance estimate for the North Atlantic is 4,349 individuals (CV = 0.28) (Hayes et al. 2021). Eleven sightings of sperm whales were made in the waters of Newfoundland during the summer 2007 TNASS (Lawson and Gosselin 2009). Four sightings of single individuals have been made in the Project Area from July to November; however, sightings in the RAA have been made year-round (Table 6.17; Figure 6-56).

Two sperm whale sightings were made northeast of the Project Area in early fall during Equinor Canada's 2018 Seabed Survey of the Flemish Pass (Mactavish and Penney-Belbin 2018). Sperm whale sightings were also reported within the North Atlantic Current and Evlanov Seamount candidate MPA east of the Flemish Cap in July 2013 (Wakefield 2018). During 2007, sperm whale interactions with a deep-water trawling vessel were reported along the eastern edge of the Grand Banks, just to the east of the Project Area, and at the Flemish Cap (Oyarbide et al. 2021).



Source:Lawson and Gosselin (2009); Mactavish and Penney-Belbin (2018); C-NLOPB database, DFO database; Equinor Canada database.

Figure 6-56 Toothed Whale Sightings in the Project Area and Regional Assessment Area



Source:Lawson and Gosselin (2009); Mactavish and Penney-Belbin (2018); C-NLOPB database, DFO database; Equinor Canada database.

Figure 6-57 Dolphin and Porpoise Sightings in the Project Area and Regional Assessment Area

Sperm whales were detected acoustically in the RAA and within the Project Area year-round, although detection rates were relatively low within the Project Area (Delarue et al. 2018). A seasonal decline in detection rates was apparent, except in and adjacent to the Flemish Pass which had year-round high detection rates, including recording station 17, located 97 km south of the Project Area. The high detection rates suggest that this deep-water region may be important to sperm whales. Sperm whale clicks were also detected northeast of the Project Area during acoustic monitoring from May to October (Maxner et al. 2019). Based on habitat-density modeling, year-round densities of sperm whales were predicted to be highest in deep waters of the RAA, including Flemish Pass and the Orphan Basin (Mannocci et al. 2017). Sperm whales are likely to be uncommon in the Project Area.

6.3.4.2 Northern Bottlenose Whale

The Davis Strait-Baffin Bay-Labrador Sea population has no status under SARA but is being considered for addition to Schedule 1 (Government of Canada 2021); it is considered special concern under COSEWIC (COSEWIC 2011). Currently, there is no population estimate (COSEWIC 2011). Northern bottlenose whales are likely to be uncommon in the Project Area (Table 6.17) and the LAA (Figure 6-56). Details on northern bottlenose whale distribution in general and on the Scotian Shelf population and are provided in Section 6.3.7.

6.3.4.3 Striped Dolphin

The population estimate for the western North Atlantic is 67,036 striped dolphins (CV = 0.29) (Hayes et al. 2021); an abundance estimate for Canadian waters is unavailable. No sightings have been made in the Project Area or the LAA, but sightings were reported for the southwestern portion of the RAA (Table 6.17; Figure 6-57). During July 2013, sightings were made within the North Atlantic Current and Evlanov Seamount candidate MPA east of the Flemish Cap and off the southwestern shelf edge of the Grand Banks (Wakefield 2018). According to habitat-density modeling, the highest densities are predicted to occur in deep offshore waters of the RAA, in particular in the southern portion of the RAA (Mannocci et al. 2017). Striped dolphins are likely to be rare in the Project Area.

6.3.4.4 Atlantic Spotted Dolphin

The population size for the western North Atlantic has been estimated at 39,921 dolphins (CV = 0.27) (Hayes et al. 2021); an estimate for Canadian waters is not available. There have been no sightings of Atlantic spotted dolphins in the Project Area or the LAA, but sightings have been reported for the southern portion of the RAA, including west of the Project Area (Table 6.17; Figure 6-57). Based on modeling by Mannocci et al. (2017), low densities are expected in the RAA year-round, with higher densities in deep waters of the southern portion of the RAA. Atlantic spotted dolphins are expected to be rare in the Project Area.

6.3.4.5 Short-beaked Common Dolphin

The abundance estimate for the Western North Atlantic stock of short-beaked common dolphin is 172,974 individuals, which is based on surveys conducted in 2016 (CV = 0.21; Hayes et al. 2021). For Newfoundland, the abundance was estimated at 576 individuals (95% CI: 314-1,056) based on the 2007 TNASS (Lawson and Gosselin 2009). There have been 5 sightings totaling 172 common dolphins in the

Project Area during spring, summer, and fall (Table 6.17; Figure 6-57). A sighting of 10 individuals was made northeast of the Project Area in October during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During an opportunistic survey within the North Atlantic Current and Evlanov Seamount candidate MPA in July 2013, short-beaked common dolphins were seen east of the Flemish Cap (Wakefield 2018). During 2007, short-beaked common dolphin interactions with a deep-water trawling vessel were reported along the eastern edge of the Grand Banks, just to the east of the Project Area, and at the Flemish Cap (Oyarbide et al. 2021). Based on habitat-density modeling, the highest year-round densities in the RAA are predicted to occur along the edge of the Grand Banks and Flemish Pass (Mannocci et al. 2017). The short-beaked common dolphin is expected to be common in the Project Area.

6.3.4.6 White-beaked Dolphin

The abundance for white-beaked dolphin in Newfoundland waters was estimated at 1,842 dolphins (95% CI: 1,188-2,854) (Lawson and Gosselin (2009); when corrected for perception and availability biases, the population size was 15,625 dolphins (Lawson and Gosselin 2011). A total of 49 sightings (293 individuals) have been made in the Project Area during spring and summer (Table 6.17; Figure 6-57). Two sightings totaling 12 dolphins were made in August northeast of the Project Area during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). The white-beaked dolphin is likely to be common in the Project Area.

6.3.4.7 Atlantic White-sided Dolphin

Three stocks of Atlantic white-sided dolphin occur in the Northwest Atlantic: Gulf of Maine, Gulf of St. Lawrence, and Labrador Sea (Palka et al. 1997). The population size for the Northwest Atlantic is estimated at 93,233 individuals (CV = 0.71) (Hayes et al. 2021). For Newfoundland waters, Lawson and Gosselin (2009) estimated a total of 1,507 Atlantic white-sided dolphins (95% CI: 968-2,347), which was subsequently corrected by Lawson and Gosselin (2011) for biases and estimated at 3,384 dolphins. There have been 76 sightings (1,149 individuals) of white-sided dolphins in the Project Area, with most sightings in the summer (Table 6.17; Figure 6-57). Based on habitat-density modeling, relatively high densities are likely to occur in the Project Area throughout the year (Mannocci et al. 2017). The Atlantic white-sided dolphin is likely to be common in the Project Area.

6.3.4.8 Common Bottlenose Dolphin

Two morphologically and genetically distinct stocks of common bottlenose dolphins occur in the Western North Atlantic – the coastal and offshore forms (Hoelzel et al. 1998). The abundance estimate for the offshore stock is 62,851 dolphins (CV = 0.23) (Hayes et al. 2021). No sightings of bottlenose dolphins have been reported in the Project Area, but sightings have been made in and near the LAA during spring through fall (Table 6.17; Figure 6-57). Based on habitat-density modeling, low densities are likely to occur in the RAA year-round (Mannocci et al. 2017). The common bottlenose dolphin is expected to be rare in the Project Area.

6.3.4.9 Risso's Dolphin

Risso's dolphin inhabits temperate and tropical waters around the globe. In the Northwest Atlantic, its distribution ranges from Florida to eastern Newfoundland (Hayes et al. 2020). The population size was

estimated at 35,493 individuals (CV = 0.19) (Hayes et al. 2020, 2021). There have been no sightings of Risso's dolphins in the Project Area or the LAA (Table 6.17; Figure 6-57). Based on habitat-density modeling, the highest densities in the RAA are predicted to occur in deep water along the edge of the Grand Banks (Mannocci et al. 2017). Risso's dolphin is likely to be rare in the Project Area.

6.3.4.10 Killer Whale

The Northwest Atlantic / Eastern Arctic killer whale population has no status under SARA, but it is under consideration for addition to Schedule 1 (Government of Canada 2021) as it is considered special concern by COSEWIC (COSEWIC 2008). The size of the Northwestern Atlantic / Eastern Arctic population is unknown. Based on isotope analysis with tissues from stranded individuals, Matthews et al. (2021) reported that there is not a single killer whale population in the northwest Atlantic, but rather several ecotypes with dietary and morphological differences. They noted that killer whales occur off Newfoundland and Labrador throughout the year and reported several strandings for Newfoundland, with the most recent one occurring in 2002. Killer whale sightings have increased over recent decades in NL as well as Nova Scotia which likely reflects a change in abundance and distribution (Jourdain et al. 2019). However, emerging threats include chemical pollution and anthropogenic noise (Jourdain et al. 2019). There have been 15 sightings of 71 killer whales in the Project Area from spring through fall (Table 6.17; Figure 6-56). Killer whales were most often detected acoustically during the summer and fall within the RAA during August 2015-July 2017 monitoring, including at Stn 18 within the Project Area (Delarue et al. 2018). Killer whales are expected to be uncommon in the Project Area and the LAA.

6.3.4.11 Long-finned Pilot Whale

Long-finned pilot whales are distributed throughout the North Atlantic and are abundant throughout the year in the waters of Newfoundland and Labrador (Nelson and Lien 1996). Based on surveys conducted from Virginia to the lower Bay of Fundy in 2016, the population size for the western North Atlantic is estimated at 39,215 whales (CV = 0.3; Hayes et al. 2021). The abundance estimate for the Gulf of St. Lawrence and Scotian Shelf was 6,134 individuals (95% CI: 2,774-10,573) based on the 2007 TNASS (Lawson and Gosselin 2009). There have been 11 sightings of 58 individuals in the Project Area; sightings are primarily made in the summer but have been reported in the RAA year-round (Table 6.17; Figure 6-56).

Two sightings totaling 27 long-finned pilot whales were made northeast of the Project Area in August during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During surveys of the North Atlantic Current and Evlanov Seamount candidate MPA in July 2013, pilot whales were sighted within the candidate MPA east of the Flemish Cap and off the southwestern shelf edge of the Grand Banks (Wakefield 2018). During 2007, long-finned pilot whale interactions with a deep-water trawling vessel were reported along the eastern edge of the Grand Banks, just to the east of the Project Area, and at the Flemish Cap (Oyarbide et al. 2021). Pilot whales were detected acoustically in the RAA throughout the year during the August 2015-July 2017 period, in particular along the southwestern edge of Grand Banks and off the Scotian Shelf, where detection rates were highest; however, few detections were made within the Project Area (Delarue et al. 2018). Pilot whales were typically absent during winter and spring north of the Flemish Pass (Delarue et al. 2018). Acoustic detections were also made northeast of the Project Area during monitoring from June through September (Maxner et al. 2019). Based on habitat-density modeling, densities are expected to be highest in the northeastern portion of the RAA, but also in deep water along

the edge of the Grand Banks, Cabot Strait, and Flemish Pass (Mannocci et al. 2017). Long-finned pilot whales are likely common in the Project Area.

6.3.4.12 Harbour Porpoise

In the Northwest Atlantic, the harbour porpoise is listed as threatened on Schedule 2 of SARA (Government of Canada 2021) and is designated as special concern by COSEWIC (COSEWIC 2006b). At least three populations occur in the region: eastern Newfoundland and Labrador, Gulf of St. Lawrence, and Gulf of Maine/Bay of Fundy (Palka et al. 1996). The Gulf of Maine / Bay of Fundy stock numbers 95,543 porpoises (CV = 0.31) (Hayes et al. 2021). For Newfoundland, the abundance was initially estimated at 1,195 porpoises (95% CI: 639-2,235) (Lawson and Gosselin 2009), but was later corrected for perception and availability biases to 3,326 individuals (Lawson and Gosselin 2011). Three sightings (14 individuals) of harbour porpoises have been reported in the Project Area during spring and summer (Table 6.17; Figure 6-56).

Harbour porpoises were detected acoustically year-round in the southern portions of the RAA during August 2015-July 2017, including within the LAA and Project Area on the Grand Banks (Delarue et al. 2018). The highest rates of detection were recorded in the Strait of Belle Isle and on the Scotian Shelf (Delarue et al. 2018). In general, the harbour porpoise is considered to be uncommon in the LAA and Project Area, although modeling studies predict relatively high densities on the Grand Banks (Mannocci et al. 2017).

6.3.5 Phocids (Seals)

Six species of seals could occur in the Project Area and waters of the RAA (Table 6.15), none of which are listed under SARA (Government of Canada 2021). Three species are considered candidate species by COSEWIC; the hooded and bearded seals are mid-priority candidate species, and the harp seal is a low-priority candidate species (COSEWIC 2022). All species of seals are harvested by Indigenous groups in Newfoundland and Labrador (see Section 7.3.7.3). Sealing typically occurs between late March and mid-May, but varies by species and with environmental conditions (DFO 2011).

Harp seals are likely to be common in the Project Area and the LAA, in particular during the winter. In 2019, the estimated population of Northwest Atlantic harp seal was 7.6 million, based on a population model that included pup production estimates up to 2017, annual estimates of age-specific reproductive rates and removals, and ice-related mortality up to 2019 (DFO 2020a). The population appears to have been relatively stable since the mid-1990s but has been increasing in recent years likely due to higher reproductive rates and lower removals. Inter-annual fluctuations in reproductive rates of harp seals have increased over the previous decade. This change can be explained by the population size approaching carrying capacity and ice conditions and/or prey availability affecting reproductive rates (DFO 2020a). At current low levels of harvest the Northwest Atlantic harp seal population is expected to continue to increase until the middle of the century. Climate change is having an impact on ice cover, and the Gulf of St Lawrence and the northeast Newfoundland area are expected to be ice-free by the end of the century. This will have a negative impact on harp seals unless new areas for pupping are found to the north of current whelping areas (Stenson and Hammill 2014; Hammill et al. 2021). Harp seal calls were primarily detected during February and March off Labrador during August 2015-July 2017 acoustic monitoring; they were detected within the Project Area during spring 2017 (Delarue et al. 2018).

Hooded seals are expected to be common in the Project Area. Hooded seals outfitted with data loggers from 2004 to 2008 showed movements within and near the Project Area, in particular during the spring (Andersen et al. 2012, 2013, 2014). Hooded seals appear to prefer areas with topographic and oceanographic conditions that lead to good foraging in the waters off Newfoundland (Andersen et al. 2012). During autumn / winter, males showed greater search effort in areas with complex seabed relief such as the Flemish Cap, whereas females spent more time foraging along the Labrador Shelf. Juvenile hooded seals moved between the Grand Banks and the Flemish Cap during spring.

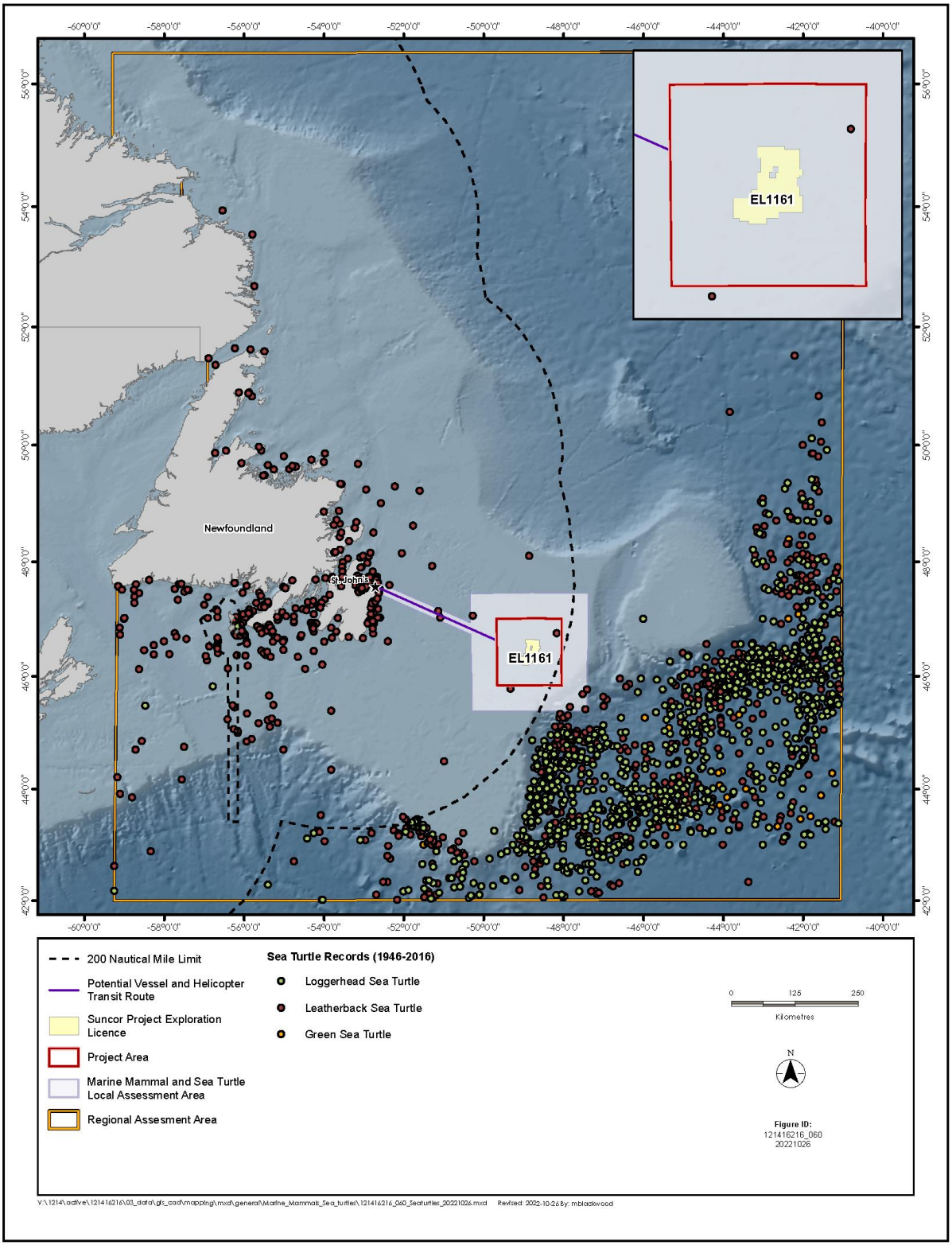
Grey and harbour seals are expected to be uncommon in the Project Area and the LAA as they prefer nearshore waters. The population size of grey seals was estimated at 505,000 individuals in 2014 (Hammill et al. 2014). The 2012 abundance estimate for harbour seals in the western North Atlantic was 75,834 individuals (CV = 0.15) (Hayes et al. 2021). Harbour seals have been reported to haul out in small numbers on the Avalon and Burin peninsulas (Templeman 2007; B. Mactavish, pers. comm., 2018). Bearded and ringed seals are likely to be uncommon in the Project Area, and the LAA as they typically do not occur south of Labrador and northern Newfoundland.

6.3.6 Sea Turtles

Four sea turtle species have been reported in the waters of Newfoundland, but only the leatherback and loggerhead sea turtles are likely to occur near the Project Area or the LAA. All four sea turtle species are likely to be rare in the Project Area, although the leatherback and loggerhead sea turtles are expected to be uncommon in the RAA. Sightings of Kemp's ridley sea turtles would be extremely rare in the RAA and have not been reported in the Project Area or LAA, so this species is not considered further (Table 6.16, Figure 6-58). Green sea turtles are rare in the RAA. Although no sightings of green sea turtles have been reported for the Project Area or the LAA, there are numerous records east and south of the Grand Banks (Figure 6-58). Information on the seasonal occurrence and conservation status for all sea turtle species near the Project Area and within the RAA is summarized in Table 6.16. Sea turtle sightings and bycatch records for the RAA are presented in Table 6.17 and Figure 6-58. The leatherback and loggerhead turtles are listed as endangered under Schedule 1 of SARA and are included in Section 6.3.7.

6.3.7 Species at Risk

Five species/populations of marine mammals and two sea turtle species that could occur in the Project Area are listed under Schedule 1 of SARA: (1) blue whale (Atlantic population); (2) fin whale; (3) North Atlantic right whale; (4) northern bottlenose whale (Scotian Shelf population); (5) Sowerby's beaked whale; (6) leatherback sea turtle; and (7) loggerhead sea turtle.



Source: Halpin et al. (2009); DFO database.

Figure 6-58 Sea Turtle Sightings and Bycatch Records in the Project Area and Regional Assessment Area

6.3.7.1 Blue Whale

The Atlantic population is listed as endangered on Schedule 1 of SARA (Government of Canada 2021) and by COSEWIC (COSEWIC 2002a, 2012b). The Action Plan for the Atlantic population reported recovery objectives intended to increase knowledge of the population, its habitat and threats, and implement measures to mitigate threats including spills, vessel collisions, and underwater sound (DFO 2020b). No critical habitat has been designated for this population.

The North Atlantic blue whale population was depleted during the industrial whaling era; densities are still low. The minimum population size for the western North Atlantic is 402 individuals (Hayes et al. 2021). Jossey et al. (2021) used whole genome sequencing to help explain the poorly understood population structure of North Atlantic blue whales. Despite the severe reduction in the population (due to whaling), North Atlantic blue whales have retained high genetic variability. The authors note that high genetic diversity within the species is promising for species recovery if low population numbers do not persist for an extended period of time. Knowledge of genetic diversity and structure is essential for developing conservation strategies for endangered species (Jossey et al. 2021).

Blue whales reach sexual maturity at 5 to 15 years and the females give birth at two- to thee-year intervals (Yochem and Leatherwood 1985, in COSEWIC 2002a). In the North Atlantic, blue whales migrate seasonally from wintering areas in equatorial latitudes to summer feeding areas in temperate and subarctic latitudes (Reeves et al. 2004, in COSEWIC 2014). However, some individuals appear to remain for the winter in waters south of Iceland, near Newfoundland, and Nova Scotia (Sears 2002, in COSEWIC 2014; Sears and Calambokidis 2002, in COSEWIC 2014). No movement corridors have been described for this species in Atlantic Canada.

The blue whale's diet is composed almost entirely of euphausiids (Yochem and Leatherwood 1985, in COSEWIC 2002a). In the North Atlantic these species consist of *Thysanoessa inermis*, *T. raschii*, *T. longicaudata*, and *Meganyctiphanes norvegica*. In temperate and polar waters, blue whales forage for these prey species along cold water upwellings from spring to early winter (Yochem and Leatherwood 1985, in COSEWIC 2002a). Seamounts and deep ocean structures along the continental shelf edge likely provide important habitat for blue whales (Lesage et al. 2016). The continental shelf edge off Nova Scotia, southern Newfoundland, and the Grand Banks are considered to be important blue whale feeding areas (Lesage et al. 2018; DFO 2018). Similarly, Moors-Murphy et al. (2019) also suggested that slope waters off the Scotian Shelf, Grand Banks, and deep water of the Laurentian Channel provide potentially important habitat. The most suitable blue whale habitats and priority areas for monitoring of blue whales on the Scotian Shelf and the shelf break off southern Newfoundland overlap with anthropogenic activities (Gomez et al. 2017). No critical habitat has been identified in Atlantic Canada for this species.

Threats to the species include entrapment in wind- and current-drive ice in late winter and early spring along the southwest coast of Newfoundland (e.g., Sergeant 1982, in COSEWIC 2002a). Other threats include vessel collisions, whale watching in the St. Lawrence estuary, noise pollution, fishing gear entanglement, chemical pollution, and changes in prey abundance (COSEWIC 2002a; Beauchamp et al. 2009). Intrinsic limiting factors include slow birth rate, late sexual maturity, and dietary specialization (Beauchamp et al. 2009).

There have been no visual sightings of blue whales reported in the Project Area, but blue whales have been sighted in the RAA throughout the year; peak numbers were reported in July and August (Table 6.17). Seasonal acoustic detections have been made in the Project Area during fall and winter, but acoustic detections have been made year-round in other parts of the RAA, including south and northeast of the Project Area (e.g., Simard et al. 2016; Delarue et al. 2018, 2022; Maxner et al. 2019; Moors-Murphy et al. 2019). Blue whale detections were more frequently recorded along the slopes of the Grand Banks that on the shelf (Delarue et al. 2022). Delarue et al. (2022) noted that the Flemish Pass-Orphan Basin region appears to be an important area for this species). Blue whales are expected to be uncommon in the Project Area.

6.3.7.2 Fin Whale

The Atlantic population of fin whale is considered to be special concern under Schedule 1 of SARA (Government of Canada 2021) and COSEWIC (COSEWIC 2005). For the Western North Atlantic, the abundance based on surveys in 2016 was estimated at 6,802 (CV = 0.24) (Hayes et al. 2021). For Newfoundland, the population size was estimated at 1,352 whales (95% CI: 821-2,226) based on 2007 TNASS (Lawson and Gosselin 2009); the corrected estimate was 1,555 whales (Lawson and Gosselin 2011). The objective of the 2017 management plan is to ensure that anthropogenic threats do not reduce the current range of distribution or cause a population decline (DFO 2017a). Delarue et al. (2014) suggested that there could be as many as four stocks of fin whales in the Northwest Atlantic based on geographic differences in vocalizations. No critical habitat has been designated for fin whales in Canadian waters.

Most of the knowledge of the fin whale's habitat and diet comes from the summer feeding grounds (COSEWIC 2019). On those feeding grounds this species is associated with oceanic fronts (Hain et al. 1992, in COSEWIC 2019; Doniol-Valcroze et al. 2007, in COSEWIC 2019). There they feed on a variety of species of small schooling fish and euphausiids (Gavrilchuk et al. 2014, in COSEWIC 2019). In Newfoundland waters their diet is dominated by capelin (*Mallotus villosus*) (e.g., Whitehead and Carscadden 1985, in COSEWIC 2019).

Fin whales reach sexual maturity in 5 to 15 years (Perry et al. 1999, in COSEWIC 2019). Females give birth a mean interval of 2.71 and have a gross annual reproductive rate of 8% in the Gulf of Main (Agler et al. 1993, in COSEWIC 2019). The natural mortality rate of adults is 4% (e.g., Ratnaswamy and Winn 1993, in COSEWIC 2019). The apparent survival rate of fin whales one year of age or older from 1990 to 2014 was 0.955 (Ramp et al. 2014, in COSEWIC 2019).

Potential threats to the fin whale include habitat degradation from contamination of prey by pollution or reduced prey abundance from fishing pressure (Clapham et al. 1999, in COSEWIC 2019), and acoustic disturbance from shipping and industrial activities (Ramp et al. 2015, in COSEWIC 2019). Threats also include whaling in Greenland and Iceland waters, fisheries bycatch, vessel strikes, disease (COSEWIC 2019). Limiting factors have been suggested to include changes in prey composition and distribution, arrival of competing species, and general habitat degradation (e.g., Ramp et al. 2015, in COSEWIC 2019).

Fin whales are the second most common recorded baleen whale in the Project Area based on compiled sightings (84 sightings; 112 individuals); most sightings were reported in the spring (Table 6.17; Figure 6-55). Edwards et al. (2015) showed that the highest densities occur in offshore waters of Newfoundland

between June and August. Habitat-density modeling predicted relatively high year-round densities in deeper water along the edge of the Grand Banks (Mannocci et al. 2017).

Three sightings of single fin whales were reported northeast of the Project Area in September during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). Fin whales were also sighted within the North Atlantic Current and Evlanov Seamount candidate MPA east of the Flemish Cap during July 2018 (Wakefield 2018). Acoustic detections of fin whales were made year-round in the RAA during the May 2015-November 2017 period, including in the Project Area, where some of the highest detection rates were reported (Delarue et al. 2018, 2022). Maxner et al. (2019) also detected fin whale calls northeast of the Project Area during late spring and summer. Delarue et al. (2022) noted that the Flemish Pass-Orphan Basin region appears to be an important area for this species. Fin whales are expected to be common in the Project Area.

6.3.7.3 North Atlantic Right Whale

The North Atlantic right whale is designated as endangered on Schedule 1 of SARA (Government of Canada 2021) and by COSEWIC (COSEWIC 2003c, 2013). The objectives of the recovery strategy for this species are to reduce mortality and injury from vessel strikes and entanglement, and increase survey effort in offshore regions such as the Flemish Pass and Flemish Cap (DFO 2019a). An action plan has been developed which describes how to achieve the population and distribution objectives outlined in the recovery strategy (DFO 2021a). Critical habitat has been designated in Canadian waters at the Grand Manan Basin in the Bay of Fundy and the Roseway Basin on the western Scotian Shelf (DFO 2014). Critical habitat has not been designated within offshore Newfoundland or the RAA.

This species migrates from spring feeding areas off Massachusetts to feed in Canadian waters from late July through mid-October (Baumgartner et al. 2003, in COSEWIC 2013). North Atlantic right whales feed primarily on calanoid copepods, and in the Bay of Fundy they feed on oil-rich developmental stages of *Calanus finmarchicus* almost exclusively (e.g., Baumgartner and Mate 2003, in COSEWIC 2013). North Atlantic right whales feed at a variety of depths. In the Grand Manan Basin they dive close to the sea floor (i.e., 150 m) to access high copepod densities (Murison and Gaskin 1989, in COSEWIC 2013). Grand Manan and Roseway basins are relatively deep areas bordering shallow water. Copepods concentrate in these areas via convergence, upwelling, or other currents (e.g., Kenney and Wishner 1995, in COSEWIC 2013). In Cape Cod Bay they spend most of their time feeding within a few metres of the surface (Parks et al. 2012, in COSEWIC 2013).

The North Atlantic right whale's limiting factors likely include its slow reproductive rate. The age at which this species becomes sexually mature is unknown, but the mean generation time is estimated to be 16.1 years (unpubl. data from Right Whale Consortium 2011, in COSEWIC 2013). The interval between calves is thought to be three to five years (Kraus et al. 2007, in COSEWIC 2013). This species' natural mortality rates are unclear (COSEWIC 2013). The primary threats to this species are vessel collisions and fishing gear entanglement (DFO 2021a). Vessel collisions and entanglements are the leading causes of mortality of the North Atlantic right whale (e.g., Sharp et al. 2019, in DFO 2021a; Bourque et al. 2020, in DFO 2021a). Other potential threats include underwater noise, which can mask their vocalizations (e.g., Parks et al. 2007, in COSEWIC 2013).

The population size of North Atlantic right whale remains low even though it received total international protection from hunting in 1937; population size has been declining since 2010 (Pace et al. 2017; Corkeron et al 2018; Pettis et al. 2022) and is currently at its lowest in nearly 20 years (New England Aquarium 2021). For 2020, the population was estimated to number 336 individuals (New England Aquarium 2021; Pettis et al. 2022), approximately 100 of which are reproductive females (Baumgartner et al. 2017; Pennisi 2017). The recovery of this population has been impeded by low calving rates and increases in human-caused mortality (Kraus et al. 2016). Low reproductive rates are likely caused by high mortality rates of adult females (Corkeron et al. 2018). However, at least 18 calves were born in 2020, which is the highest number of births since 2013 (Pettis et al. 2022). Meyer-Gutbrod et al. (2021) reported that a change in ocean circulation due to climate change has altered the habitat and foraging areas for right whales, thus reducing calving rates and increasing mortality risks that are causing declining right whale numbers.

In 2017, the U.S. National Oceanographic and Atmospheric Administration (NOAA) declared a North Atlantic right whale unusual mortality event, which is still active in 2022 (NOAA 2022). Seventeen mortalities were reported in 2017; 12 mortalities occurred in the Gulf of St. Lawrence and five in the US (NOAA 2022). A total of 12 dead right whales were reported from 6 June to 15 September 2017 in the Gulf of St. Lawrence (Daost et al. 2017; DFO 2019a). The deceased whales were 2 to 37 years old and included four females and eight males. Necropsies showed that four whales had died due to blunt trauma and two drowned because of entanglement (Daoust et al. 2017; DFO 2019a). An additional five entanglements were reported between 5 July and 28 August 2017; two whales were disentangled, one shed the gear on its own, and disentanglement was not possible for two whales (Daoust et al. 2017). In 2018 there were three mortalities, all of which were reported for the U.S., and in 2019 there were eight mortalities in Canada and one in the U.S. There were two mortalities in each of 2020 and 2021 in the U.S. As of 23 March 2022, no mortalities have been reported for 2022 (NOAA 2022). In addition to the 34 mortalities since 2017, there have been 16 seriously injured free-swimming whales reported since 2017, so NOAA considers the unusual mortality event to currently include 50 individuals (NOAA 2022).

Right whale calls have not been detected within or near the Project Area (Delarue et al. 2018, 2022; Maxner et al. 2019), although calls were recorded in slope waters off southern Newfoundland, in the Strait of Belle Isle, and to the west of the northern Laurentian Channel (Delarue et al. 2018, 2022). No sightings of right whales have been reported for the Project Area (Figure 6-55). The North Atlantic right whale is rare in the RAA.

6.3.7.4 Northern Bottlenose Whale

The Scotian Shelf population is designated as endangered under Schedule 1 of SARA (Government of Canada 2021) and COSEWIC (COSEWIC 2002b, 2011). It numbers approximately 143 individuals (O'Brien and Whitehead 2013), but there are no abundance estimates for the entire Northwest Atlantic (COSEWIC 2011). An amended recovery strategy (DFO 2016a) and an action plan included updated critical habitat measures for the Scotian Shelf population (DFO 2017c). The Gully, Shortland, and Haldimand submarine canyons at the eastern edge of the Scotian Shelf have been designated as critical habitat for this population (DFO 2016a).

The northern bottlenose whale is a deep-diving beaked whale. It inhabits waters along the continental shelf slope deeper than 500 m and in particular the area along the 1,000 m isobath, which is generally consistent with dive depths (DFO 2016a). This species' diet of deep-water fishes and squids is dominated by *Gonatus*

squids (COSEWIC 2011). Northern bottlenose whales in the Sable Gully, Nova Scotia, have relatively small home ranges compared with other cetacean species (Gowans et al. 2000, in COSEWIC 2011). It has a generation time of about 15.5 to 17.8 years (Christensen 1973, in COSEWIC 2011; Taylor et al. 2007, in COSEWIC 2011). Females give birth at intervals of two years or more (Benjaminsen and Christensen 1979, in COSEWIC 2011; H. Whitehead, unpubl. data, in COSEWIC 2011).

The primary threats to the northern bottlenose whale are considered to be entanglement in fishing gear, oil and gas activities, and acoustic disturbance (COSEWIC 2011; DFO 2017c). Tissue contaminant levels possibly related to oil and gas development activities, vessel strikes, and changes to the food supply are also a concern (COSEWIC 2011; DFO 2017c).

Year-round passive acoustic monitoring conducted in the Gully, Shortland Canyon, and Haldimand Canyon suggest that individuals move between canyons over periods of days to months and that the eastern Scotia Shelf population may be fully mixing over approximately six months without a preference for any of the three canyons (Stanistreet et al. 2021).

Individuals from the Scotian Shelf population do not migrate; there is no information on movements of the Davis Strait-Baffin Bay population (COSEWIC 2011). Based on photo-ID studies, at least 78 different individuals occurred in the Grand Banks, Flemish Pass, and Flemish Cap region during 2016-2017 (L.J. Feyrer, pers comm, 2018). Although northern bottlenose whales have been seen in that region in multiple years, no photographic matches have been made between the Scotian Shelf population and those northern bottlenose whales (Oyarbide et al. 2021; Stanistreet et al. 2021). Thus, it is uncertain whether individuals in that region were from the Scotian Shelf or Davis Strait-Baffin Bay-Labrador Sea population (L.J. Feyrer, pers comm, 2018). Feyrer et al. (2019) sequenced full mitogenomes and genotyped 37 novel microsatellites for 128 individuals from known areas of abundance in the Scotian Shelf, Northern and Southern Labrador, Davis Strait, and Iceland, and a group off Newfoundland. The Scotian Shelf population was distinct from the combined northern regions. The genetic affinity of individuals in Newfoundland was uncertain, suggesting an area of mixing with no clear population distinction for the region. Thus, it is possible that there are more than two populations of northern bottlenose whales in Atlantic Canadian waters.

Two sightings of three individuals have been reported in the Project Area during spring (Table 6.17; Figure 6-56). Another two sightings were made northeast of the Project Area in August during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). Northern bottlenose whales were observed in Orphan Basin during geophysical survey monitoring programs in 2004 (three groups of nine whales; Moulton et al. 2005) and 2005 (seven sightings of 21 individuals; Moulton et al. 2006). During 2007, northern bottlenose whale interactions with a deep-water trawling vessel were reported along the eastern edge of the Grand Banks, just to the east of the Project Area, and at the Flemish Cap (Oyarbide et al. 2021). Northern bottlenose whale clicks were reported northeast of the Project Area in deep waters from June through September (Maxner et al. 2019). During August 2015-July 2017 monitoring, northern bottlenose whales were detected acoustically throughout the year in the RAA, including north of the Project Area (Delarue et al. 2018). Most detections were made off eastern Newfoundland, with the highest detection rates north of Flemish Pass and in slope waters off Labrador (Delarue et al. 2018). Northern bottlenose whales were detected nearly daily at the "Sackville Spur" recorder site (Stn 19) to the northeast of the Project Area, and in slope waters off the mid-Labrador coast (Stn 13) (Delarue et al. 2018). Available information on acoustic recordings and sightings indicates that northern bottlenose whales regularly occur in slope waters near the Project Area, and that the Sackville Spur region may provide important habitat for

this species. Other deep-water regions off Newfoundland, including slope waters off Labrador and the Orphan Basin, may also provide important habitat for northern bottlenose whales.

Sightings in and north of Flemish Pass, as well as acoustic detections at the Sackville Spur indicate that this deep-water region is a high priority area for enhanced monitoring for northern bottlenose whales, as are the edges of the eastern Scotian Shelf and Newfoundland and Labrador shelves, canyons, and deep basins; these areas overlap with anthropogenic activities (Gomez et al. 2017).

6.3.7.5 Sowerby's Beaked Whale

Sowerby's beaked whale is designated to be of special concern under Schedule 1 of SARA (Government of Canada 2021) and COSEWIC (COSEWIC 2019). The objectives of the 2017 management plan are to maintain a stable population in Atlantic waters and measure and mitigate the effects of threats (DFO 2017b). The total population in Canadian waters is estimated to be in the hundreds or low thousands of individuals (COSEWIC 2019).

Sowerby's beaked whales appear to prefer deep waters, continental shelf edges, or slopes (Kenney and Winn 1987, in Husky 2012; COSEWIC 2019). There they feed on fish of the Myctophidae, Macrouridae, Physidae, Diremidae, and Opisthoprocitidae that inhabit mid to deep waters, and offshore squid, concentrating on the most available prey type at any given time (Ostrom et al. 1993, in COSEWIC 2019; MacLeod et al. 2003, in COSEWIC 2019; Pereira et al. 2011, in COSEWIC 2019; Wenzel et al. 2013, in COSEWIC 2019). Little is known of the species' timing and age of breeding, generation time, gestation time, lactation period, inter-birth interval, dispersal, migration, physiology or adaptability (COSEWIC 2019). Threats to the Sowerby's beaked whale in Canadian waters are uncertain but are thought to include noise pollution, ship strikes, fisheries bycatch and entanglement, and chemical and plastic pollution (COSEWIC 2019). The primary intrinsic limiting factor of the population is likely the species' low reproductive rate (Mead 1984, in COSEWIC 2019; Evans and Stirling 2001, in COSEWIC 2019).

Sowerby's beaked whales are difficult to sight, as they occur far offshore, have short surface durations, and faint blows (Hooker and Baird 1999, in Husky 2012). There is a lack of information on Sowerby's beaked whale occurrence in the waters of Newfoundland and Labrador. The available information is mostly based on stranding records (Lien and Barry 1990, in Husky 2012). Although there have been no visual sightings in the Project Area (Table 6.17), four whales were seen during a seismic survey in Orphan Basin in September 2005 (Figure 6-51; Moulton et al. 2006). Sowerby's beaked whales were detected acoustically throughout the year in the RAA during the August 2015-July 2017 monitoring period, including in slope waters of the Grand Banks near the Project Area (Delarue et al. 2018). Sowerby's beaked whale clicks were concentrated along the edge of the Scotian Shelf; high detection rates were also recorded along the shelf edge of the Grand Banks (Delarue et al. 2018). Sowerby's beaked whale is expected to be rare in the Project Area.

6.3.7.6 Leatherback Sea Turtle

The leatherback sea turtle is designated as endangered under SARA (Schedule 1; Government of Canada 2021) and COSEWIC (COSEWIC 2012a). The action plan for this species specifies measures to address threats and monitor recovery (DFO 2020c). DFO (2022b) assessed the potential recovery of the Northwest Atlantic leatherback turtle population; the recovery goal is to increase the number of leatherbacks in the

broader Northwest Atlantic subpopulation by maintaining or increasing the numbers of adult and subadult leatherbacks using Atlantic Canada waters. Progress towards this goal may be achieved by reducing human-induced interactions and mortalities in Atlantic Canada and continuing efforts to monitor leatherback spatial and temporal distributions (DFO 2022b). To achieve a goal of a long-term viable population of leatherback turtles in Atlantic Canada six objectives were identified, including: (1) identify and understand the anthropogenic threats in Atlantic Canadian waters; (2) support research and monitoring that will fill knowledge gaps concerning general organismal traits of leatherback turtles in Atlantic Canadian waters; 3) identify and protect habitat of leatherback turtles in Atlantic Canadian waters; 4) reduce risk of harm to leatherback turtles from anthropogenic activities under Canadian jurisdiction; 5) develop and implement education activities that support leatherback turtle recovery in Canada; and 6) promote international initiatives contributing to the recovery of leatherback turtles (DFO 2020c).

This species nests on tropical and sub-tropical beaches and forages as far as 71° North. The generation time of leatherback sea turtle is probably more than 30 years (COSEWIC 2012a). Females nest every two to four years (McDonald and Dutton 1996, in COSEWIC 2012a; Spotila et al. 2000, in COSEWIC 2012a).

This species' diet consists of gelatinous animals, primarily the Cnidaria, Ctenophora, and Urochordata (tunicates) (Bjorndal 1997, in COSEWIC 2012a; Dodge et al. 2011, in COSEWIC 2012a). Recordings of leatherbacks searching for, capturing, and handling prey have been made; the footage revealed that leatherback turtles find their prey visually and mainly feed during daylight hours in the top 30 m of the water column (DFO 2016b). In eastern Canada, leatherback sea turtle habitat is correlated with environmental characteristics; turtle occurrence increases in areas where sea surface temperatures are greater than 15°C, over flat bottoms, and where primary productivity is low; sea surface height was also correlated with turtle occurrence (Mosnier et al. 2019). Lower sea surface height is an indicator of oceanic fronts and eddies. Organisms with limited mobility, e.g., jellyfish, are drawn to such oceanographic features. The presence of sunfish has also been shown to be a predictor of leatherback turtle occurrence but not densities, as both species prey on gelatinous prey (Mosnier et al. 2019). The presence of jellyfish can be used to predict leatherback turtle occurrence in Atlantic Canada, especially on the Scotian Shelf (Nordstrom 2018). No critical habitat has been officially designated for leatherbacks in Atlantic Canada (ALTRT 2006), although this is expected to occur within the next two years (DFO 2022a). No critical habitat for leatherback sea turtle has been designated in Canadian waters.

The population size of leatherbacks in the North Atlantic is estimated at 34,000-94,000 adults (TEWG 2007). Thousands of turtles occur in Canadian Atlantic waters, but the number of seasonal foragers in Atlantic Canada is not known (COSEWIC 2012a).

The main threat facing leatherback sea turtles in Canadian waters is bycatch in fisheries; globally, threats include egg and meat harvesting, ship strikes, oil and gas exploration, beach developments, marine debris, and climate change (COSEWIC 2012a). Hamelin et al. (2017) reported several incidental captures of turtles in fishing gear off Newfoundland, including for the Grand Banks. Information collected from citizen science reporting networks, at-sea fishery observers, and *Species at Risk Act* logbook programs reach similar conclusions that leatherback turtles are vulnerable to entanglement in various types of fixed gear fisheries in Atlantic Canada. Fixed fishing gear with vertical lines extending to the surface and horizontal lines at or near the surface are most vulnerable to leatherback turtle entanglement. In addition, there is a substantial accidental bycatch of leatherback turtles on pelagic longlines especially along the shelf edge on the Scotian Shelf. In general, interactions between leatherback turtles and the fishery have been underestimated (DFO

2019b). The main threats as determined by DFO (2020e) to the leatherback turtle in the Northwest Atlantic are low resilience to anthropogenic threats because of their late age of maturity, long nesting intervals (two to four years), low hatching survivability, and lowest emergence success of any sea turtle. The highest rated threats were bycatch in fishing gear (high), marine pollution mainly from plastics (medium), legal and illegal harvesting (medium), and coastal development (medium) (DFO 2020e).

Information on the foraging behaviour and movements of leatherback turtles has recently been gained from studies in Atlantic Canada using satellite telemetry and camera tags (DFO 2016b). Leatherback sea turtles have been reported for waters offshore Nova Scotia and Newfoundland (Stewart et al. 2013; Dodge et al. 2014; Archibald and James 2016; Chambault et al. 2017). Mosnier et al. (2019) also reported sightings off Nova Scotia and Newfoundland (including within the RAA) from June through November; most records were reported for August and September. Most sightings were made on the shelf off southern and eastern Newfoundland, and on the Scotian Shelf. Opportunistic sightings were also made south and west of the Project Area during August and September, and south of the Flemish Cap during July (Mosnier et al. 2019). Between 1999 and 2016, Hamelin and James (2018) outfitted leatherback turtles with tags in Nova Scotia; they reported the occurrence of leatherbacks in the southern portion of the RAA, including near the Project Area. Juveniles are likely transported by currents past southern Newfoundland on their way to the eastern Atlantic (Lalire and Gaspar 2019). Canadian waters may have the highest density of foraging leatherback turtles throughout their range (Archibald and James 2016). Wallace et al. (2018) hypothesized that foraging areas off Nova Scotia are important to population growth of turtles in the Northwest Atlantic Ocean, as the area supports a large proportion of the turtle's energy budget. The Grand Banks likely also provide important habitat for leatherback sea turtles (Mosnier et al. 2019). The results of 128 leatherback turtles outfitted with satellite tags over 19 years in the northwestern Atlantic indicated two primary areas of important foraging habitat, including: (1) southeastern Gulf of St Lawrence and the adjacent Cabot Strait and Laurentian Channel, and (2) Placentia Bay and south of the Burin Peninsula. Leatherbacks enter Canadian waters during June and July and depart late September to October; peak numbers in Placentia Bay occurred in September (DFO 2020d). One leatherback sea turtle has been reported within the Project Area during September; another sighting was made along the southwestern edge of the Project Area (Figure 6-58). Leatherbacks are considered rare in the Project Area (Table 6.16).

6.3.7.7 Loggerhead Sea Turtle

The loggerhead sea turtle is designated as endangered under SARA (Schedule 1; Government of Canada 2021) and COSEWIC (COSEWIC 2010). The population size in Atlantic Canada is not known (DFO 2010). The recovery strategy for this species identifies broad strategies for research, monitoring, management, protection, engagement, stewardship, public outreach, and international collaboration (DFO 2020f). The threat assessment has identified this species' primary limiting factor to be a slow recruitment rate as a result of a late age of maturity (22.5 to 42 years), a long nesting interval (mean: 3.7 years), and a high rate of egg and hatchling mortality (Tucker 2010, in DFO 2020f; Avens et al. 2015, in DFO 2020f).

In the Northwest Atlantic, the biggest threats faced by loggerhead sea turtles include harvesting, bycatch, and artificial lights at nesting beaches (DFO 2017d).

The diet consists of salps, jellyfish, amphipods, pteropods, crabs, barnacles, sygnathid fish, squids, gastropods, and other pelagic coelenterates (COSEWIC 2010). The habitat of juvenile loggerheads consists of offshore convergence zones (e.g., *Sargassum* aggregations and driftlines) (Carr 1986, in

COSEWIC 2010; Witherington 2002, in COSEWIC 2010), preferring a sea surface temperature >21°C (Brazner and McMillan 2008, in DFO 2020; Carruthers and Neis 2011, in DFO 2020f). No critical habitat has been identified for loggerhead sea turtle in Canadian waters.

Neonate loggerhead sea turtles equipped with satellite tags at Florida beaches travelled to the southeast of Newfoundland after release (Mansfield et al. 2014). In addition, a satellite-tagged juvenile loggerhead sea turtle that was released in the Canary Islands was tracked to the waters southeast of Newfoundland (Vero-Cruz et al. 2016). Wakefield (2018) made one sighting off the southwestern shelf edge of the Grand Banks in July 2013 during an opportunistic survey. Oceanic dispersal of early juvenile life-stages of sea turtles is poorly known. Putman et al. (2019) developed a model to predict annual variation in the distribution and abundance of oceanic-stage juvenile sea turtles based on species' reproductive output, movement, and mortality, and simulated dispersal of 25 cohorts (1993-2017) of oceanic-stage juveniles by tracking the movements of virtual hatchling sea turtles released in a hindcast ocean circulation model. They used an estimate of annual hatchling production from five loggerhead turtle nesting areas in the northwestern Atlantic, including the Gulf of Mexico, Caribbean Sea, and eastern seaboard of the U.S., and their stage-specific mortality rates to weight dispersal predictions. Most of the young turtles remained in the Gulf of Mexico but the movements of loggerheads were more closely tied to migrating to the North Atlantic Subtropical Gyre. Predictions indicate some 1.5 to 3.5 year-old loggerhead turtles could occur in the deeper waters east of the Grand Banks, but higher numbers are expected in the Sargasso Sea (Putman et al. 2019).

Between 1999 and 2006, the Canadian Atlantic pelagic longline fleet reported 701 incidental captures of loggerhead sea turtles, including in the deep water along the edge of the Grand Banks (Brazner and McMilan 2008). Encounters with loggerheads in the longline fishery were reported between 2002 and 2008 in the deep waters off the Grand Banks and south of the Flemish Cap (Paul et al. 2010). Loggerhead turtles have not been sighted in the Project Area or the LAA, but sightings have been made to the east and south of the Project Area and the LAA (Figure 6-58).

6.3.8 Summary of Key Areas and Times

Important seasons and areas for marine mammals and sea turtles were summarized in the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (IAAC 2021). Although most cetaceans occur in the RAA throughout the year, they are most commonly seen in the Project Area between June and September. Summer is an important season for cetaceans and sea turtles in the waters of Newfoundland. During this time, migratory species come to forage in the region before heading to southerly latitudes for the winter. Pinnipeds are most common during winter and spring. Concentrations of marine mammals and sea turtles in certain areas at certain times may be an artifact of the survey effort that has taken place in these locations. Similarly, low sightings in other regions may be attributable to reduced survey effort. Several EBSAs, MPA, and Marine Refuges in the RAA provide important ecological functions for marine mammals and sea turtles, including important habitat for overwintering, refuge, and foraging. Overviews of the relevance of EBSAs, MPAs, and Marine Refuges to marine mammals and sea turtles are presented in Tables 6.18 to 6.20 and in Special Areas (Section 6.4).

Table 6.18 Ecologically and Biologically Significant Areas of Importance to Marine Mammals and Sea Turtles in the RAA

EBSA (Governing Body)	Importance to Marine Mammals and Sea Turtles
Hopedale Saddle (DFO)	Unique overwintering area for Eastern Hudson Bay beluga population (Endangered under COSEWIC); summer feeding area for harp seal (low-priority candidate species under COSEWIC); female / juvenile hooded seal (mid-priority candidate species under COSEWIC) present in outer portion during Aug-Feb.
Hamilton Inlet (DFO)	Main harp seal whelping concentration within RAA typically forms on pack ice; summer feeding area for harp seal; important fall / early-winter feeding area for ringed seal.
Labrador Marginal Trough (DFO)	Middle / trough portion of EBSA potential corridor for several marine mammal species and has high probability of use for whelping / summer feeding by harp seal; cetacean feeding aggregations during fall; male/female/juvenile hooded seal present during Aug-Feb.
Labrador Slope (DFO)	Feeding aggregations of harp seal, female / juvenile hooded seal, and other cetaceans.
Strait of Belle Isle (DFO)	High abundance of at least nine species of marine mammals (likely feeding on capelin); wintering area for harp seal.
Grey Islands (DFO)	Hooded seal aggregation(s); male hooded seal present Aug-Feb.
Fogo Shelf (DFO)	Important cetacean feeding area (e.g., harp seal summer feeding aggregation); deep water channels used by male hooded seal during winter.
Notre Dame Channel (DFO)	Winter feeding area for harp seal; significant cetacean feeding and migration area.
Orphan Spur (DFO)	Female hooded seal present during Aug–Sep; winter feeding area for harp seal.
Bonavista Bay (DFO)	Killer whale (Northwest Atlantic / Eastern Arctic population Special Concern under COSEWIC), mysticetes (especially humpback and minke [common North Atlantic subspecies] whales), and harbour seal present (likely feeding during summer and fall).
Smith Sound (DFO)	Important areas for killer whale and mysticetes.
Baccalieu Island (DFO)	Important areas for killer whale and mysticetes.
Northeast Slope (DFO)	Hooded seal present, mainly feeding on squid, Arctic and Atlantic cod, Greenland halibut, and redfish in the deep, shelf edge waters during winter (Dec-Feb) prior to pupping (late-April / May) and after pupping.
Slopes of the Flemish Cap and Grand Bank (CBD)	Area used by northern bottlenose whale (Scotian Shelf population Endangered under Schedule 1 of SARA and COSEWIC; Davis Strait-Baffin Bay-Labrador Sea population Special Concern under COSEWIC) and post-breeding female hooded seal (both species likely feeding on *Gonatus* squid), and Cuvier's (high-priority candidate species under COSEWIC) and Sowerby's (Special Concern under Schedule 1 of SARA and COSEWIC) beaked whales have been observed.

Table 6.18 Ecologically and Biologically Significant Areas of Importance to Marine Mammals and Sea Turtles in the RAA

EBSA (Governing Body)	Importance to Marine Mammals and Sea Turtles
Southeast Shoal and Adjacent Areas of the Tail of the Grand Banks (CBD)	Important feeding area for cetaceans (especially humpback and fin [Atlantic population Special Concern under Schedule 1 of SARA and COSEWIC] whales); high diversity of baleen whales (e.g., blue [Atlantic population Endangered under Schedule 1 of SARA and COSEWIC], humpback, fin, sei [Atlantic population Endangered under COSEWIC], and minke) and odontocetes (e.g., harbour porpoise [Northwest Atlantic population Special Concern under COSEWIC], Atlantic white-sided, white-beaked, common and bottlenose dolphins, and long-finned pilot, beaked, sperm [mid-priority candidate species under COSEWIC] and killer whales), particularly during the summer.
Eastern Avalon (DFO)	Killer whale and mysticetes frequently sighted.
Virgin Rocks (DFO)	Important area for killer whale at center.
Lilly Canyon-Carson Canyon (DFO)	Blue whale and harp seal aggregations (among key species for EBSA designation); winter feeding area for harp seal.
Southeast Shoal (DFO)	Important area for humpback whale and other cetaceans; during summer, humpbacks concentrated in central part of shoal over prey (likely spawning capelin).
Southwest Slope (DFO)	Important area for blue whale.
St. Mary's Bay (DFO)	High concentrations of mysticetes near headlands and into the Bay; hooded seal present outside the Bay during migration from Gulf of St. Lawrence to Greenland during late-May / June; contains portion of important habitat for leatherback sea turtle (Atlantic population Endangered under Schedule 1 of SARA and COSEWIC).
Placentia Bay (DFO)	Important area/habitat for leatherback sea turtle; important area for blue whale; important areas for hooded seal and mysticetes.
Laurentian Channel [NL Shelves Bioregion] (DFO)	Aggregation(s) of and important area/habitat for blue whale.
South Coast (DFO)	Important habitat for blue whale and other marine mammals; aggregations of hooded and grey seals.
Laurentian Channel [Scotian Shelf Bioregion] (DFO)	Migratory route for cetaceans and leatherback sea turtle; important summer feeding habitat for leatherback sea turtle.
St. Ann's Bank (DFO)	Migratory route for cetaceans and leatherback sea turtle; summer feeding habitat for leatherback sea turtle.
Scotian Slope (DFO)	Migratory route for cetaceans and leatherback sea turtle; important area/summer feeding habitat for leatherback sea turtle (high prey concentrations, e.g., jellyfish and salps); habitat for Sowerby's beaked whale.
Eastern Scotian Shelf Canyons (DFO)	Critical habitat for northern bottlenose whale; important habitat for ≥16 species of whales and dolphins, including blue and Sowerby's beaked whales
Sources: DFO (2007, 2019c); King et al. (2016); Wells et al. (2017, 2019); CBD (2019)	

Table 6.19 Marine Protected Areas of Importance to Marie Mammals and Sea Turtles in the RAA

MPA (Governing Body)	Importance to Marine Mammals and Sea Turtles
Gilbert Bay (DFO)	Frequented by several species of marine mammals (e.g., minke [common North Atlantic subspecies] and killer [Northwest Atlantic / Eastern Arctic population Special Concern under COSEWIC] whales, harbour porpoise [Northwest Atlantic population Special Concern under COSEWIC], and harp seal [low-priority candidate species under COSEWIC]).
Eastport Round Island/Duck Islands (DFO)	Productive waters host seals and several whale species during spring and summer.
Laurentian Channel (DFO)	Critical feeding area and migration route into/out of the Gulf of St. Lawrence for ≥20 species of whales (e.g., blue [Endangered under Schedule 1 of SARA and COSEWIC], North Atlantic right [Endangered under Schedule 1 of SARA and COSEWIC], fin [Atlantic population Special Concern under Schedule 1 of SARA and COSEWIC], beluga [St. Lawrence Estuary population Endangered under Schedule 1 of SARA and COSEWIC], and humpback) and dolphins, and leatherback sea turtle.
St. Anns Bank (DFO)	Important migration corridor for marine mammals (e.g. blue, North Atlantic right, fin, sei [Atlantic population Endangered under COSEWIC], minke [common North Atlantic subspecies], humpback, killer and pilot whales, Atlantic white-sided and common dolphins, and harbor porpoise) and leatherback sea turtles into and out of the Gulf of St. Lawrence and St. Lawrence Estuary; important summer feeding area for leatherback sea turtle.
The Gully (DFO)	Habitat for year-round northern bottlenose whale residents (Scotian Shelf population Endangered under Schedule 1 of SARA and COSEWIC); important habitat for 15 species of whales (e.g., blue, North Atlantic right, sperm [mid-priority candidate species under COSEWIC], and long-finned pilot) and dolphins (e.g., striped, common, and white-sided).
Sources: Aker et al. (2014); Lewis et al. (2016); DFO (2020g)	

Table 6.20 Marine Refuges of Importance to Marine Mammals and Sea Turtles in the RA

Marine Refuge (Governing Body)	Importance to Marine Mammals and Sea Turtles
Hopedale Saddle Closure (DFO)	Supports Eastern Hudson Bay beluga population (Endangered under COSEWIC); overlaps portions of the Labrador Slope and Hopedale Saddle EBSAs, including a potential corridor for several marine mammal species and high probability of use for whelping / summer feeding by harp seal (low-priority candidate species under COSEWIC), and feeding aggregations of harp seal, female/juvenile hooded seal (mid-priority candidate species under COSEWIC) and other cetaceans during fall, and hooded seal during Aug-Feb.
Funk Island Deep Closure (DFO)	Overlaps portions of the Notre Dame Channel and Fogo Shelf EBSAs, which are important migration and feeding areas for marine mammals (e.g., feeding aggregations of harp/hooded seals during summer / winter).
Hawke Channel Closure (DFO)	Overlaps most of the Labrador Marginal Trough EBSA, which is a potential corridor for several marine mammal species and has high probability of use for whelping / summer feeding by harp seal, hosts cetacean feeding aggregations during fall; and is used by hooded seal during Aug-Feb.
Northeast Newfoundland Slope Closure (DFO)	Overlaps a portion of the Orphan Spur EBSA, which hosts female hooded seal during Aug-Sep, and is a winter feeding area for harp seal.

Table 6.20 Marine Refuges of Importance to Marine Mammals and Sea Turtles in the RA

Marine Refuge (Governing Body)	Importance to Marine Mammals and Sea Turtles
Division 3O Coral Closure (DFO)	Overlaps a portion of the Southwest Slope EBSA, which is an important area for blue whale, and used by leatherback sea turtles (Atlantic populations of both species Endangered under Schedule 1 of SARA and COSEWIC.
Lobster Area Closures – Gander Bay; Glovers Harbour; Penguin Islands; Mouse Island; and Gooseberry Island (DFO)	Gander Bay closure overlaps the Fogo Shelf EBSA, which is an important cetacean feeding area (e.g., harp seal summer feeding aggregation), and is used by male hooded seal during winter.
Sources: DFO (2021b)	

6.4 Special Areas

This section describes and illustrates special areas within the RAA from offshore to coastal marine areas. These special areas have been identified as having ecological or socio-economic value and/or have been designated as protected by international, Canadian or provincial organizations with relevant jurisdiction, as discussed in the sections below. The following text focuses on identifying and describing those special areas within the RAA, though other special areas outside of the RAA may be included in figures for context.

This section focuses on describing those specials areas that have been identified for biological or ecological features rather than socio-cultural reasons. The information presented in this section includes those special areas identified and/or protected prior to May 30th, 2022, based on publicly available information and data. In this section of the report, approximate area measurements are provided where such information is available.

6.4.1 Special Areas under International Jurisdiction

Special areas within the RAA include areas beyond the Canadian EEZ as governed by international agencies and conventions including NAFO, the Food and Agricultural Organization (FAO) of the United Nations, United Nations Convention on Biological Diversity (CBD) and United Nations Educational, Scientific and Cultural Organization (UNESCO). In addition, BirdLife's Important Bird and Biodiversity Area (IBA) program has identified various important areas. The following sections discuss these identified or protected special areas.

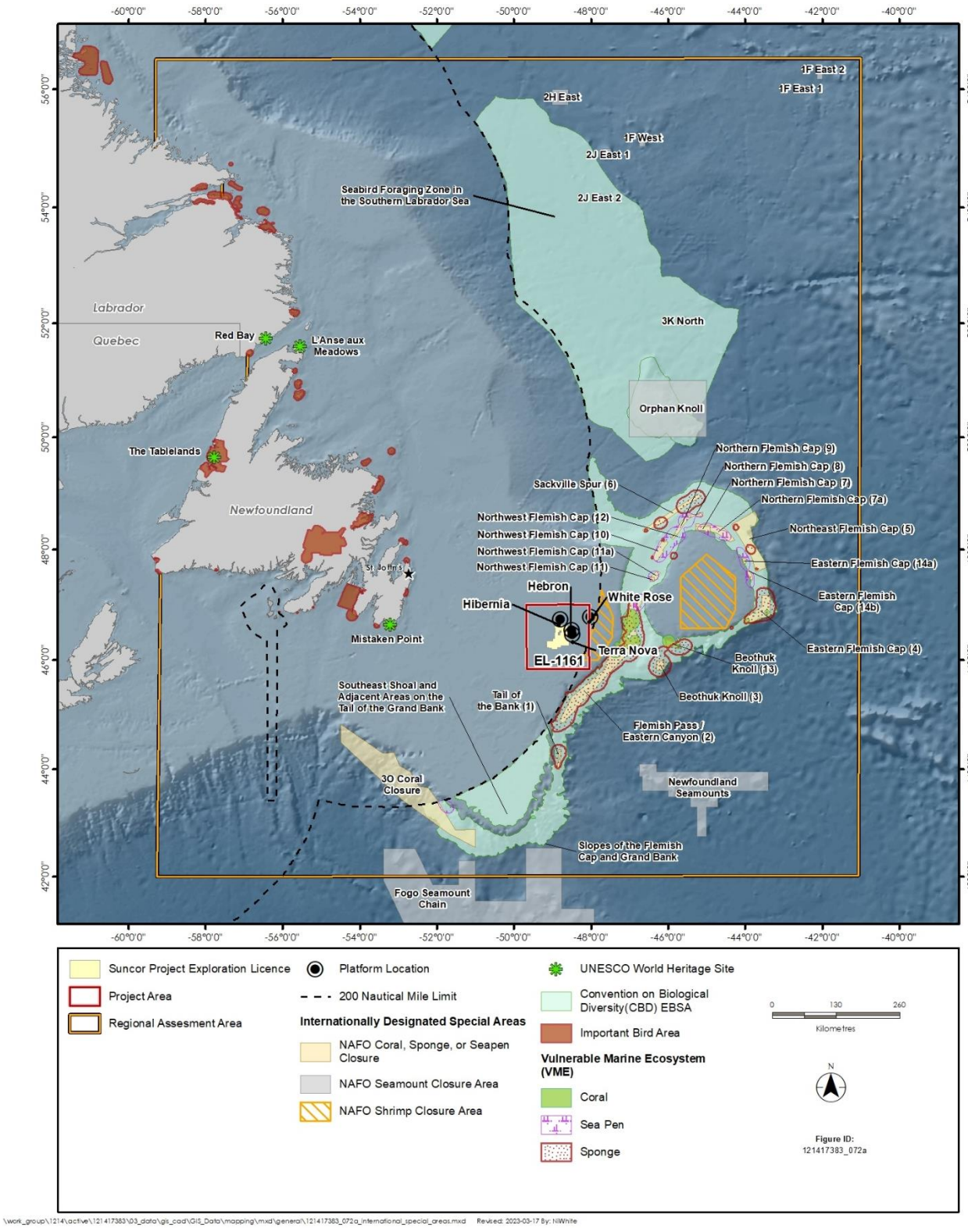
Various other special areas have been identified by international organizations for socio-cultural reasons. These include Mistaken Point, Red Bay and L'anse aux Meadows which have been recognized by UNESCO as World Heritage Sites (UNESCO 2019) (Figure 6-59). The Discovery Aspiring Geopark on the Bonavista Peninsula, which features rocks of more than half a billion years old and exceptionally preserved Ediacaran fossils, is under consideration but is not expected to include any protected marine ecosystem components (Canadian Geoparks Network 2019).

6.4.1.1 CBD Ecologically and Biologically Significant Areas

Canada is signatory to the CBD, which became effective in December 1993. The CBD identifies EBSAs as an important step towards conservation of global biodiversity, sustainable use of resources, and equitable sharing of benefits from resource use (CBD 2018). Areas of ocean habitat outside the EEZ off eastern NL have been identified by the CBD as EBSAs; these areas include important habitats for various types of marine biota including sensitive species (Table 6.21; Figure 6-59).

Table 6.21 CBD Ecologically and Biologically Significant Areas in the RAA

EBSA	Rationale for Identification / Designation	Area (km²)
Seabird Foraging Zone in the Southern Labrador Sea	Supports globally significant populations of marine vertebrates, including an estimated 40 million seabirds annually. Important foraging habitat for seabirds, including 20 populations of over-wintering black-legged kittiwakes, thick-billed murres and breeding Leach's storm-petrels. Encompasses the pelagic zone of the Orphan Basin, continental shelf, slope and offshore waters inside and outside the Canadian EEZ.	152,841
Orphan Knoll	Seamounts typically support endemic populations and unique faunal assemblages. This seamount is an island of hard substratum with uniquely complex habitats that rise from the seafloor of the surrounding deep, soft sediments of the Orphan Basin. Although close to the adjacent continental slopes, Orphan Knoll is much deeper and appears to have distinctive fauna. Fragile and long-lived corals and sponges have been observed and a Taylor Cone circulation provides a mechanism for retention of larvae.	12,742
Slopes of the Flemish Cap and Grand Bank	Contains most of the aggregations of indicator species for vulnerable marine ecosystems (VMEs) in the NAFO Regulatory Area. Includes NAFO closures to protect corals and sponges and a component of Greenland halibut fishery grounds in international waters. A high diversity of marine taxa, including Threatened and listed species, are found within the EBSA.	87,817
Southeast Shoal and Adjacent Areas on the Tail of the Grand Banks	The Southeast Shoal is a shallow, relatively warm, sandy habitat that supports an offshore capelin-spawning ground, a nursery ground for yellowtail flounder and spawning areas for depleted American plaice, depleted Atlantic cod, and striped wolffish. The Tail of the Grand Banks hosts abundant forage fish and is an important feeding area for cetaceans, including humpback and fin whales, and is frequented by large numbers of seabirds	Not Available
Labrador Sea Deep Convection Area	The only location in the North-West Atlantic where deep winter convection exchanges surface and deep ocean waters. Overwintering refuge for pre-adult *Calanus finmarchicus*, which seeds zooplankton populations on the Labrador Shelf and downstream. The central gyre changes annually.	Not Applicable
Source: CBD 2019b		



Sources: Bird Studies Canada 2019a; CBD 2019a; NAFO 2023; World Database on Protected Areas 2010

Figure 6-59 Special Areas under International Jurisdiction

6.4.1.2 Vulnerable Marine Ecosystems

The FAO identifies Vulnerable Marine Ecosystems (VMEs) as benthic environments sensitive to disturbance and slow to recover (NAFO 2016). Portions of VMEs may be closed to bottom fishing activities (Section 6-#). In 2016, VME areas in the Newfoundland offshore including areas identified for sponges, sea pens and large gorgonian corals were updated based on additional information (Figure 6-59). To date, detailed descriptions of the VME areas are not publicly available.

6.4.1.3 NAFO Fisheries Closures

Through the *Fisheries Act,* Canada manages NAFO fish conservation commitments by restricting one or more types of bottom contact fishing gear in portions of VMEs. Various closed areas to fishing are located within the RAA (Figure 6-59). These closures include areas identified for the presence of corals, sponges and seamounts (Table 6.22). In 2022, two shrimp fishing closure areas were added as a conservation measure for the northern shrimp fishery.

Table 6.22 NAFO Fisheries Closures in the RAA

Closure	Rationale for Identification / Designation	Area (km²)
Fogo Seamount Chain	Seamounts	75,448
Orphan Knoll		15,779
Newfoundland Seamounts		15,415
3O Coral Area Closure	High concentration of corals	13,995
Tail of the Bank (1)	High concentration of sponges and corals	144
Flemish Pass / Eastern Canyon (2)		5,418
Beothuk Knoll (3)		309
Eastern Flemish Cap (4)		1,563
Northeast Flemish Cap (5)		2,892
Sackville Spur (6)		992
Northern Flemish Cap (7)		259
Northern Flemish Cap (8)		98
Northern Flemish Cap (9)		128
Northwest Flemish Cap (10)		317
Northwest Flemish Cap (11)		61
Northwest Flemish Cap (12)		35
Beothuk Knoll (13)		340
Shrimp Fishing Closure	Conservation measure for northern shrimp fishery	13,141
Source: NAFO 2023; FAO 2019		

6.4.1.4 Important Bird Areas

BirdLife International has identified 597 sites in Canada as having world-wide, continental or national significance for bird habitat. These IBAs support specific groups of birds: threatened birds, large groups of birds, and/or birds restricted by range or by habitat (Bird Studies Canada 2019b). Of the 41 IBAs in Newfoundland and Labrador, 32 occur within the RAA (Figure 6-54); none occur within the Project Area. These areas are identified as nesting, moulting, foraging, resting, staging, migrating and over-wintering habitats (Table 6.23).

Table 6.23 Important Bird Areas in the RAA

IBA	Rationale for Identification / Designation	Area (km²)
Northeast Groswater Bay	Almost 28,000 pairs of nesting seabirds were estimated to be present in 1978. These included nearly 6% of the estimated North American Atlantic puffin population (as many as 16,900 pairs on Herring Island alone). Records include significant numbers of razorbills (about 1,800 pairs or up to 5% of the estimated North American population), large numbers of common murre (4,300 pairs or just below 1% of estimated eastern North American population). Other recorded nesting seabird species include: Leach's storm-petrel (>10 pairs), great black-backed gull (100 pairs), thick-billed murre (220 pairs), herring gull and black guillemot.	174
Bird Island	Supports large colony of nesting seabirds (12,770 pairs during late 1970s surveys), significant numbers of Atlantic puffin (8,070 pairs about 2.2% of the estimated North American population) and razorbills (1,530 pairs about 4.1% of the estimated North American population). Large numbers of common murres (3,100 pairs), great black-backed gull (20 pairs), Leach's storm-petrels, thick-billed murres and a nesting peregrine falcon pair have been recorded.	7
Point Amour, Strait of Belle Isle	Very large numbers of birds move through a relatively small area, although few remain for extended periods. In 1996, monitoring over a portion of spring migration recorded a total of more than 100,000 common eiders. Also, 5,465 black guillemots, approximately 2% of the world's estimated population, were recorded. A total of 43,758 larger black and white alcids (i.e., thick-billed murre, common murre, or razorbills) and lower numbers of other seaduck species (398 scoters) were recorded. Occasional seabirds and whales are recorded during summer and fall and large numbers of harp seals, during migration.	107
St. Peter Bay	In a 1994 survey, 50 North American harlequin ducks were observed (about 3.3% of the estimated eastern population). The area is a major moulting area for common eiders. In 1998, over 5,000 (approximately 6.4% of the Atlantic population) were recorded.	170
Table Bay	Important nesting area for common eiders; 2,459 pairs were recorded on the offshore islands in an early 1980s survey. The nesting population of northern borealis and more southern dresseri subspecies exceeds the combined 1% threshold for both species. The largest colonies occur on three unnamed islands with 1,440 pairs combined. Large numbers of moulting scoters have been sighted. During 1998 surveys, 1,375 pairs (mostly surf scoters) were recorded. Devils Lookout Island is known as a nesting peregrine falcon site (Falco peregrinus ssp. anatum).	306
Tumbledown Dick Islands and Stag Islands	Moulting area for nationally endangered eastern North American population of harlequin ducks; a 1998 survey recorded a total of 162 birds, almost 11% of the estimated eastern population. In addition to moulting harlequins, 975 moulting common eiders were also observed.	207

Table 6.23 Important Bird Areas in the RAA

IBA	Rationale for Identification / Designation	Area (km²)
Cape St. Mary's	Supports a large colony of breeding seabirds, including 2% of the eastern North America population of common murre, 4 to 5% of the western Atlantic breeding population of black-legged kittiwake, and up to 12% of the North American breeding population of northern gannet. Large numbers of migrant sea ducks, including the eastern population of the nationally endangered harlequin duck have been recorded.	34
Witless Bay Islands	Globally significant numbers of breeding seabirds, including more than half of the eastern North American population of Atlantic puffin and almost 10% of the global Leach's storm-petrel population. Large numbers of nesting common murre, black-legged kittiwake and herring gull have been recorded. Nesting great black-backed gull, northern fulmar, thick-billed murre, razorbill, and black guillemot have been recorded in smaller numbers. Surrounding marine area is important to sea ducks (e.g., white-winged scoter, surf scoter, long-tailed duck and common eider for fall migration.	6
Baccalieu Island	Greatest seabird abundance and diversity in eastern North America. World's largest colony of Leach's storm-petrels, including 70% of the North American population, significant numbers of breeding Atlantic puffin, black-legged kittiwake and northern gannet, smaller numbers of nesting common murre, thick-billed murre, razorbill, black guillemot, northern fulmar, herring gull and great black-backed gull have been recorded.	5
Funk Island	Major concentration of nesting seabirds including globally significant common murre population and large numbers of northern gannets. Includes a provincially designated Seabird Ecological Reserve.	14
Bell Island South Coast	Largest colony of nesting common eider duck on insular Newfoundland and a potentially significant site for harlequin ducks. Includes the Migratory Bird Sanctuaries Shepherd Island and Île aux Canes.	282
Northern Groais Island	Important coastline for breeding and overwintering birds including large numbers of black-legged kittiwake and common eider ducks.	173
Fischot Islands	Includes a large population of common eider ducks.	57
Quaker Hat Island	Home to a diverse assemblage of breeding seabirds, primarily of the auk family. Approximately 460 pairs of breeding Razorbills, representing over 1% of the estimated North American population have been recorded. Other breeding birds of the family Alcidae include 650 pairs of thick-billed murre, 650 pairs of common murre and 2,100 pairs of Atlantic puffins.	33
Wadham Islands and adjacent Marine Area	Globally significant number of wintering common eider (approximately 25,000 counted in a 1995 survey) and large numbers of nesting Atlantic puffin, Leach's storm-petrel and razorbill.	16
The Cape Pine and St. Shotts Barren	Large, possibly globally significant, numbers of American golden-plover visit during their fall migration (August to mid-October). Dozens of whimbrels also stop during fall migration.	6
Terra Nova National Park	Nesting area for numerous forest species, including two subspecies with restricted ranges: the federally-listed NL red crossbill (percna ssp.) and ovenbird (furvoir ssp.). Shorebirds, gulls and waterfowl can be seen on the tidal flats at the outlet of Big Brook, as well as Newman Sound. Area includes at least six tern colonies (common and Arctic tern), totaling between 1,000 and 1,500 pairs.	66

Table 6.23 Important Bird Areas in the RAA

IBA	Rationale for Identification / Designation	Area (km²)
Grates Point	Overwintering area of a large number of wintering common eiders (up to 12,000 individuals, but typically around 2,800) and black-legged kittiwake, thick-billed murre, and dovekie. Atlantic puffin and northern gannet are present in the summer months.	7
Cape St. Francis	Winter congregation area for common eider; up to 5,000 individuals have been recorded. Purple sandpipers are regularly observed along the rocky shoreline in the winter.	7
Quidi Vidi Lake	From late fall to early spring, the Lake is an important daytime resting site for gulls, including significant numbers of herring, great black-backed, Iceland, glaucous, and black-headed gulls. Locally rare mew gull and lesser black-backed gull are occasionally reported. Waterfowl including American black duck, mallard, and northern pintail are common here in the winter.	1
Mistaken Point	Important wintering area for up to 12,000 common eiders and continentally significant numbers of purple sandpiper (more than1% of North American population). Nesting black-legged kittiwake, common murre, and razorbill are recorded.	11
Cape Freels Coastline and Cabot Island	Up to 25,000 wintering common eiders have been reported between the Cape Freels coastline and Wadham Islands. Large numbers of nesting common murres, as well as some pairs of razorbills and historic records of breeding Atlantic puffins have been sighted.	34
Placentia Bay	Large number of shearwaters, particularly greater shearwater and Manx shearwater have been recorded. Local breeding seabirds, including northern gannet, black-legged kittiwake and common murres, nesting at Cape St. Mary's feed on capelin in Placentia Bay. Wintering common eiders often congregate around the Virgin Rocks.	1,398
Corbin Island	Likely supports a globally significant colony of Leach's storm-petrels. Large population of herring gulls recorded.	5
Middle Lawn Island	Supports the largest concentration of nesting Manx shearwaters in North America and significant nesting populations of Leach's storm-petrels. The island is part of Provincially designated Seabird Ecological Reserve.	4
Green Island	Includes an estimated total of 72,000 nesting pairs of Leach's storm-petrels, about 1.5% of the estimated western Atlantic breeding population. Other nesting seabirds include herring gulls, common terns and Arctic terns. Nesting black guillemots and Manx shearwaters are suspected. Potential for nesting Manx shearwaters, which have an extremely limited breeding distribution in North America as the largest known North American colony is located on Middle Lawn Island (40 km east).	6
Grand Bay West to Cheeseman Provincial Park	Nesting habitat for the globally vulnerable and nationally endangered piping plover. In 1996, 18 piping plovers were recorded at this site, representing 4.2% of the estimated Atlantic Canada population. Between 1995 and 1998, an average of 17 adult piping plovers was observed.	40
Gannet Islands	Hosts significant breeding populations of razorbills, Atlantic puffins and common murres. Includes largest razorbill colony in eastern North America, with approximately 5,400 pairs (over 14% of the eastern North America population), large populations of Atlantic puffins (about 50,000 pairs - approximately 13% of the eastern North America population) and common murre (about 63,000 pairs - approximately 11% of the eastern North America population). Other breeding species include thick-billed murre, black guillemot, northern fulmar, black-legged kittiwake, great black-backed gull and Leach's storm-petrel. Supports breeding populations of all auk species occurring in eastern Canada, including the most southerly colony of a substantial number of thick-billed murres (1,405 pairs). The islands also host large flocks of moulting harlequin ducks (70 to 150) from the endangered eastern population.	245

Table 6.23 Important Bird Areas in the RAA

IBA	Rationale for Identification / Designation	Area (km²)
Cape Porcupine	Globally significant site for scoters with all three species (surf, white-winged, black) recorded, though surf scoters are the vast majority. More than 10,000 scoters, mainly surf (over 1% of the estimated North American surf scoter population), have been recorded. Likely staging prior to moulting when scoters tend to accumulate in dense flocks. A moulting season survey found 4,674 scoters (mostly surf) on the Southern Porcupine Strand. Trunmore Bay, with nearly 5,000 scoters, is the second most important moulting site in the Groswater Bay area. Scoters are commonly observed feeding in the surf a few metres off the beach likely foraging on shellfish on the shallow, sandy bottom.	123
South Groswater Bay Coastline	Supports significant concentrations of nesting, moulting and staging waterfowl. At least 1,000 nesting pairs of common eiders have been recorded on coastal islands. The area includes an overlap of northern common eider (ssp. borealis) and Atlantic common eider (ssp. dresseri) habitats. This nesting colony represents about 1.25% of the estimated breeding population of the dresseri subspecies. Large numbers of scoters have been reported including a survey record of over 1,500 black scoters, which represent about 1% of the estimated eastern North American population. Coastline appears to be used by pre-moulting scoters with as many as 519 surf scoters being recorded in a survey. None were recorded in another survey though large numbers were recorded at the Backway about 30 km to the southwest.	470
Big Barasway	For a 13-year survey period, an average of 7 adult piping plovers (designated as both globally vulnerable and nationally endangered) were recorded (about 1.6% of the Atlantic Canada population. and 24% of those recorded in Newfoundland).	10
Source: Bird Studies Canada 2019b		

6.4.2 Special Areas under Canadian Jurisdiction

Various federal departments and agencies (e.g., DFO, Parks Canada, ECCC and NRCan), engage in identifying and/or protecting sensitive species, important habitats or special areas in Canada. This section focuses on special areas of ecological or biological importance in coastal and offshore marine environments.

6.4.2.1 Ecologically and Biologically Significant Areas

DFO identifies EBSAs to provide focus on marine areas with high ecological or biological activity relative to their surrounding environment. Criteria for EBSA designation include: uniqueness, aggregation and fitness consequences (DFO 2004). A total of 37 EBSAs in the Newfoundland-Labrador Shelves and Scotian Shelf Bioregions are found within the RAA; none occur within the Project Area. These EBSAs have been identified for a variety of marine species including fish, birds, mammals and sea turtles and their habitats (Table 6.24; Figure 6-60).

Table 6.24 Ecologically and Biologically Significant Areas in the RAA

EBSA	Rationale for Identification / Designation	Area (km²)
Baccalieu Island	Noted for aggregations of killer whales, capelin (spawning), shrimp, plankpiscivores, spotted wolffish and seabird functional groups as well as an important foraging area for Atlantic puffin, black-legged kittiwake and razorbill. Intersects an IBA and a Provincial Seabird Ecological Reserve.	6,906

Table 6.24 Ecologically and Biologically Significant Areas in the RAA

EBSA	Rationale for Identification / Designation	Area (km²)
Bonavista Bay	Identified for significant aggregations of eelgrass, salmon, killer whale, harbour seal, mysticetes and duck functional groups, an important area for capelin and sea lamprey spawning and significant foraging area for black-legged kittiwake and tern species.	3,139
Eastern Avalon	Location of colonies of Atlantic puffin, common murre, thick-billed murre and northern fulmar with significant aggregations of eelgrass, capelin (spawning), American plaice, killer whale, mysticetes functional group, and seabird functional groups. Important foraging area for Atlantic puffin, common murre, razorbill, thick-billed murre, black-legged kittiwake and northern fulmar.	5,932
Fogo Shelf	Includes Funk Island, the largest common murre colony in the western North Atlantic and the only northern gannet breeding colony in the NL Shelves Bioregion. Other bird species aggregations are present, including Atlantic puffin, common eider, greater shearwater and terns. Area identified for an abundance of beach and sub-tidal capelin spawning areas, importance for Atlantic salmon (migration, feeding and spawning), cetacean feeding area and presence of marine mammals.	9,403
Gilbert Bay	Identified for genetically distinct resident population of Atlantic cod, aggregations of Atlantic salmon, Arctic char, capelin, soft corals and diverse seabird species. Capelin spawning areas present.	359
Grey Islands	Identified as important for waterfowl and seabirds in coastal areas and on the shelf. Common eider and harlequin duck occur in high concentrations. Includes important breeding colonies for great black-backed gulls, herring gulls and terns. Noted for high diversity of seabird species, as well as high concentrations of soft corals and small gorgonians in the inner shelf area.	11,301
Haddock Channel Sponges	Based on DFO studies, this area includes the largest sponge sensitive benthic area on the shelf and important aggregations of capelin and American plaice.	490
Hamilton Inlet	Identified for high overall productivity including capelin spawning beaches and an area of high Atlantic salmon productivity and density. High diversity of marine bird habitat includes large Atlantic puffin and razorbill colonies, significant concentrations harlequin duck, murre, dovekie, squa, jaeger, sooty shearwater and other seabirds. The area is a winter feeding area for ringed seals as the main harp seal whelping concentration usually forms on pack ice in this EBSA.	11,038
Hopedale Saddle	Unique overwintering area for the endangered population of Eastern Hudson Bay beluga. Several other coral, fish and seabird species, including many that are rare or endangered (e.g., skates, Atlantic and spotted wolffish, roundnose grenadier, ivory gull), are found in high densities throughout this area. Sea pens, small gorgonians, and soft corals are also abundant, as are numerous species of seabirds, including ivory gull, kittiwake, dovekie, Atlantic puffin and others.	27,418
Labrador Marginal Trough	Identified for high densities of shrimp, snow crab, Greenland halibut, American plaice, witch flounder and capelin. Potential corridor for several fish and mammal species including part of the area of highest probability of use for harp seal whelping and feeding. Includes aggregations of plankton piscivores and small and medium benthivores and aggregations of cetaceans in summer and fall. Important area for seabirds including murres, black-backed kittiwake, great black-backed gull, herring gull, northern fulmar, Atlantic puffin, skuas, jaegers, sooty shearwater and the SARA-listed (Endangered) ivory gull.	16,952

Table 6.24 Ecologically and Biologically Significant Areas in the RAA

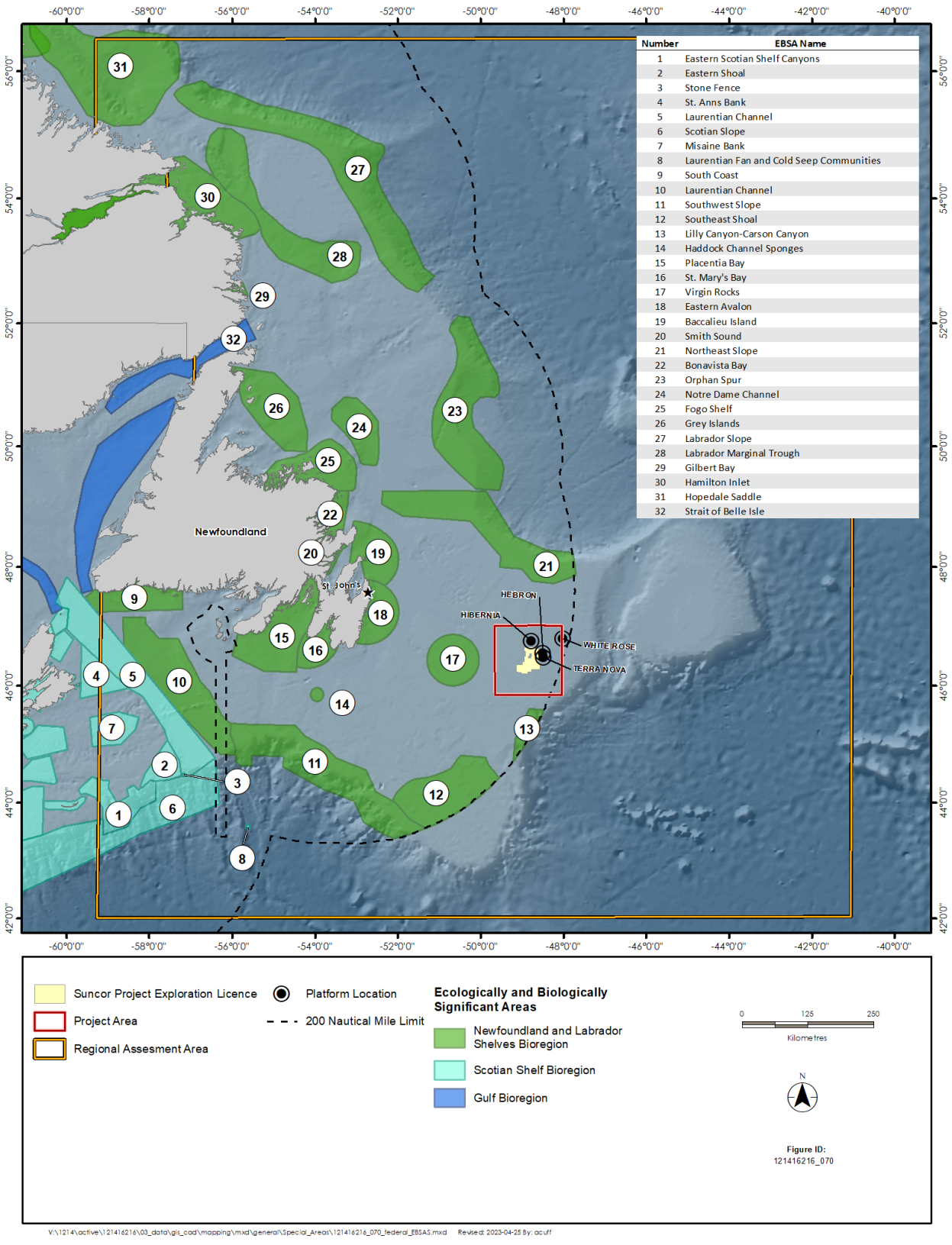
EBSA	Rationale for Identification / Designation	Area (km²)
Labrador Slope	Identified for high diversity of corals, sponges, core species and fish functional groups. Several rare or endangered species, including Atlantic, spotted and northern wolffish, roundnose grenadier and skates have significant concentrations within the area. Includes significant concentrations of northern shrimp, Greenland halibut, redfish, Atlantic cod and American plaice. Juvenile and female hooded seals, as well as a variety of cetaceans and seabirds frequent the area in high relative numbers for feeding.	29,746
Laurentian Channel (NL Shelves Bioregion)	Identified as one of only two known porbeagle mating grounds. Includes aggregations of northern wolffish and leatherback sea turtles. Serves as a critical feeding area and migration route into and out of the Gulf of St. Lawrence for whales and dolphins. Significant coral and sea pen populations represent sensitive benthic habitats. Includes the highest sea pen concentrations within the NL Shelves Bioregion.	19,655
Lilly Canyon-Carson Canyon	Identified as winter feeding and refuge area for cetaceans and pinnipeds. Includes aggregations of snow crab, Greenland halibut, American plaice, redfish, roughhead grenadier, thorny skate, small benthivores (fish), common murre, sooty shearwater, various seabirds, blue whale, harp seals, soft corals and sponges.	2,160
Northeast Slope	Diverse area with significant aggregations of shrimp, Greenland halibut, Atlantic wolffish, northern wolffish, spotted wolffish, roughhead grenadier, witch flounder, American plaice, Atlantic cod, thorny skate, smooth skate, other fish species (including piscivores, plankpiscivores and benthivores), large gorgonian corals, sea pens, black corals, soft corals, sponges, common murre, thick-billed murre and hooded seal.	19,601
Notre Dame Channel	Identified as a significant area of cetacean feeding and migration. Skates (including smooth skate and thorny skate) occur in high densities throughout the area. Frequented by several species of seabirds. Includes significant concentrations of capelin, American plaice, Greenland halibut, snow crab and shrimp. Important winter-feeding area for harp seals.	6,222
Orphan Spur	Identified as an area of high diversity with high concentrations of corals, marine mammals and seabirds, densities of sharks and species of conservation concern (e.g., northern, spotted and striped wolffish, skates, roundnose grenadier, American plaice, redfish) and aggregations of several fish functional groups.	21,569
Placentia Bay	High level of biodiversity. Supports important seabird breeding areas and a high biomass of birds and mammals. Hosts high aggregations of cetaceans and leatherback sea turtles in the spring and summer. Otters and harbour seals use area year-round. Important feeding area from spring to fall for many seabird species and cetaceans (especially humpbacks and porpoises). Important for reproduction of many seabird species, harbour seals and otters. Possible migratory path for leatherback turtles.	13,558
Smith Sound	Expansive eelgrass bed. Hosts aggregations of killer whale, mysticetes and small cetacean functional groups. Capelin spawning area; significant colonies of and foraging area for Atlantic puffin, black-legged kittiwake and tern species.	547

Table 6.24 Ecologically and Biologically Significant Areas in the RAA

EBSA	Rationale for Identification / Designation	Area (km²)
South Coast	Important habitat for the Endangered blue whale and other marine mammals. Other key features include three fish functional groups (planktivores, piscivores and plankpiscivores), two seabird functional groups (surface shallow-diving coastal piscivores and surface shallow-diving piscivores), and two seal species (hooded seals and grey seals). Atlantic cod and redfish are found in the western portion of the EBSA and shrimp in the eastern area. Sea pen and sponge sensitive benthic areas are present. Several eelgrass beds are found along the coast. Two important Common Eider colonies (<30 individuals each) are present, though small compared to others in Atlantic Canada. Provides coastal dune nesting habitat and intertidal foraging habitat for the globally Vulnerable and nationally Endangered piping plover. The Big Barasway IBA also supports a significant population of Piping Plover. A large black dogfish area identified extends into the western portion of the EBSA. A smooth skate area almost covers the entire EBSA.	6,925
Southeast Shoal	Highest benthic biomass of the Grand Banks. Spawning and/or nursery habitats for capelin, American plaice spawning and yellowtail flounder. Reproduction area for striped wolffish. Aggregations of sand lance, yellowtail flounder, witch flounder, American plaice, Atlantic cod, Atlantic wolffish, northern wolffish, thorny skate, white hake, benthivores and seabirds.	15,311
Southwest Slope	Critical to a wide variety of seabirds; high density of pelagic seabird feeding. Many marine mammals and leatherback sea turtles aggregate in summer. Includes aggregations of witch flounder, Atlantic halibut, American plaice, Atlantic cod, northern wolffish, redfish, roundnose grenadier, smooth skate, thorny skate, white hake, winter skate, benthivores, seabirds, blue whale, black corals, small and large gorgonian corals, stony cup corals, sea pens. Important spawning area for haddock, redfish and American plaice.	25,172
St. Mary's Bay	Identified for significant colonies and foraging area for common murre, northern gannet, razorbill and black-legged kittiwake. Includes aggregations of harlequin duck (species of Special Concern under SARA), salmon, capelin, common eider, mysticetes functional group, hooded seal and leatherback turtles.	3,988
Virgin Rocks	Identified for unique geomorphological features and habitat that hoset aggregations of sand lance, American plaice, capelin, sooty shearwater, thick-billed murre and killer whales.	7,252
Eastern Scotian Shelf Canyons	Encompasses the Gully, the largest submarine canyon off eastern North America, and the Shortland and Haldimand canyons; all are unique environments and ecology in the bioregion. The deeper waters of the canyons are SARA-designated critical habitat for northern bottlenose whales. The Gully provides important habitat for marine mammals, including 16 species of whales and dolphins; it is the area of highest coral diversity in Atlantic Canada with some 30 species identified. The canyons are important habitat for cod, white hake, smooth skate, redfish, as well as numerous seabird species. An area of high fish and invertebrate species richness, evenness, and biomass.	7,434
Eastern Shoal	Important habitat for American plaice, Atlantic cod, winter skate, thorny skate and sandlance. Includes abundant yellowtail flounder, silver hake, witch flounder, and redfish larvae and is considered a possible spawning and/or nursery area for these species. Supports aggregations of surf clams, scallops, and quahogs and provides important seabird habitat.	3,397

Table 6.24 Ecologically and Biologically Significant Areas in the RAA

EBSA	Rationale for Identification / Designation	Area (km²)
Laurentian Channel (Scotian Shelf Bioregion)	Important overwintering area for multiple populations of Atlantic cod as well as white hake, Dover sole, turbot (Greenland halibut), redfish, Greenland shark, plaice, witch flounder, and thorny skate. Important migration route/corridor for many fish and cetacean species. Mating area for porbeagle shark and important summer feeding habitat for leatherback turtles. Significant concentrations of sea pens; corals and sponges also present. Important aggregation area for krill and zooplankton with persistent high chlorophyll concentrations.	21,484
Laurentian Channel Cold Seep Communities	Dense chemosynthetic communities associated with cold seeps. Indications of high diversity and productivity compared to other deep-water benthic habitats in the regjon.	52
Misaine Bank	Identified as important habitat for thorny skate, American plaice, sandlance, northern shrimp, striped pink shrimp, green sea urchin, several crab species, and other invertebrates. Includes cod spawning area and important seabird habitat. Area of high fish and invertebrate species evenness and richness.	4,599
Scotian Slope	Identified as a migratory route for cetaceans and large pelagic fishes (e.g., sharks, swordfish, tuna), as well as leatherback turtle and habitat for Sowerby's beaked whale. Includes high diversity of finfish, squid, and invertebrates. Overwintering area for fishes, including halibut and mackerel, and invertebrates, including lobster. Important habitat for many demersal fish species, including cusk, redfish, white hake, thorny skate, Atlantic halibut, longfin hake and Atlantic argentine. Important habitat for many invertebrates, including red crab, northern shortfin squid, northern stone crab, American lobster and sea stars. Many rare species of coldwater corals have been identified. Multiple submarine canyons support high species diversity.	72,800
St. Anns Bank	Includes the Big Shoal herring spawning area. Important habitat for three distinct populations of Atlantic cod, as well as Atlantic wolffish and regionally significant sea pen and sponge concentrations. Important migration route for many fish and cetacean species. Includes summer feeding habitat for leatherback turtles. Important habitat for various seabird species. May encompass porbeagle shark mating areas. Area of high invertebrate, fish species and larval fish richness.	4,700
Stone Fence	The only known *Lophelia pertussa* reef structure in Atlantic Canada. Includes the Lophelia Coral Conservation Area (LCCA), which was established in 2004 to protect the reef as it has been severely damaged by fishing gear.	44
Strait of Belle Isle	Characterized by its importance to marine mammals. High concentrations of piscivorous marine mammals, large cetaceans and abundant capelin. Several species, including spiny dogfish, Atlantic herring, sand lance and capelin, feed in large aggregations. This area is also the main spawning ground for Atlantic herring (fall spawning). Very high concentrations of shrimp and benthic invertebrates. Important production and concentration area for juvenile Atlantic cod.	7,546
Sources: DFO 2019a; King et al. 2016; Wells et al. 2017		



Source: DFO 2019b

Figure 6-60 Canadian EBSAs

6.4.2.2 Significant Benthic Areas

DFO has identified four types of SBAs: aggregations of sea pens; sponges; small gorgonian corals; and large gorgonian corals that form habitat for other species. The RAA intersects with SBAs identified for high predicted presence probability of sea pens, small gorgonian corals and large gorgonian corals (Figure 6-61). These areas have been identified using data from DFO trawl surveys and kernel analysis (Kenchington et al 2016).

6.4.2.3 Marine Protected Areas

DFO has established a national network of Marine Protected Areas (MPAs) under the *Oceans Act*. MPAs promote long-term conservation in areas of high biodiversity, important habitats for marine species and unique bathymetric features such as seamounts, underwater canyons and hydrothermal vents. MPAs may also protect areas of spiritual or cultural importance, including archaeological sites, shipwrecks and areas traditionally used by Indigenous and non-Indigenous communities. Four MPAs have been established in Newfoundland and Labrador (DFO 2019c), all of which occur within the RAA (Figure 6-62). These areas have protection measures to prevent damage from human activities (Table 6.25).

6.4.2.4 Marine Refuges

DFO identifies Marine Refuges to protect portions of sensitive and productive marine habitat under the *Fisheries Act* (DFO 2019d). Ten marine refuges are within the RAA in offshore and coastal areas (Figure 6-62). Five of these marine refuges are Lobster Closure Areas that together protect important lobster spawning habitat in rocky coastal areas. Descriptions of these ten marine refuges are provided in Table 6.26.

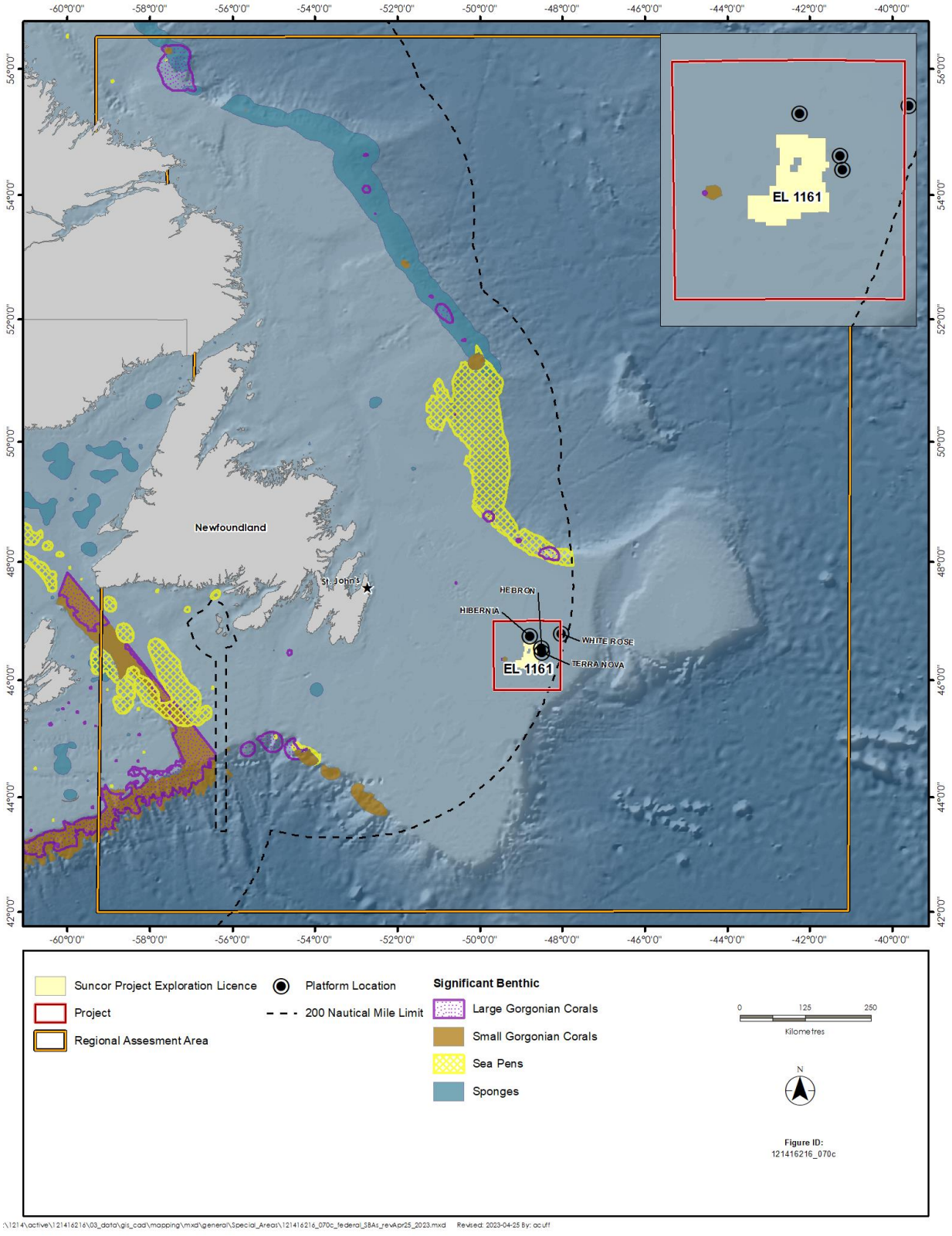
6.4.2.5 National Marine Conservation Areas

Parks Canada establishes National Marine Conservation Areas (NMCAs) under the *National Marine Conservation Areas Act, 2002*. The agency's long-term goal is to establish a network of NMCAs to protect and conserve representative ecosystems and key features within each of Canada's 29 marine regions (Parks Canada 2019a). No NMCAs have been established in the RAA.

NMCAs are established through a process in which candidate areas are identified within a marine region. Three Representative Marine Areas (RMAs) have been identified within the Grand Banks Marine Region and one will be proposed as an NMCA. All three RMAs fall within the RAA (Parks Canada 2019a) (Figure 6-62). Detailed descriptions are not yet publicly available (Table 6.27).

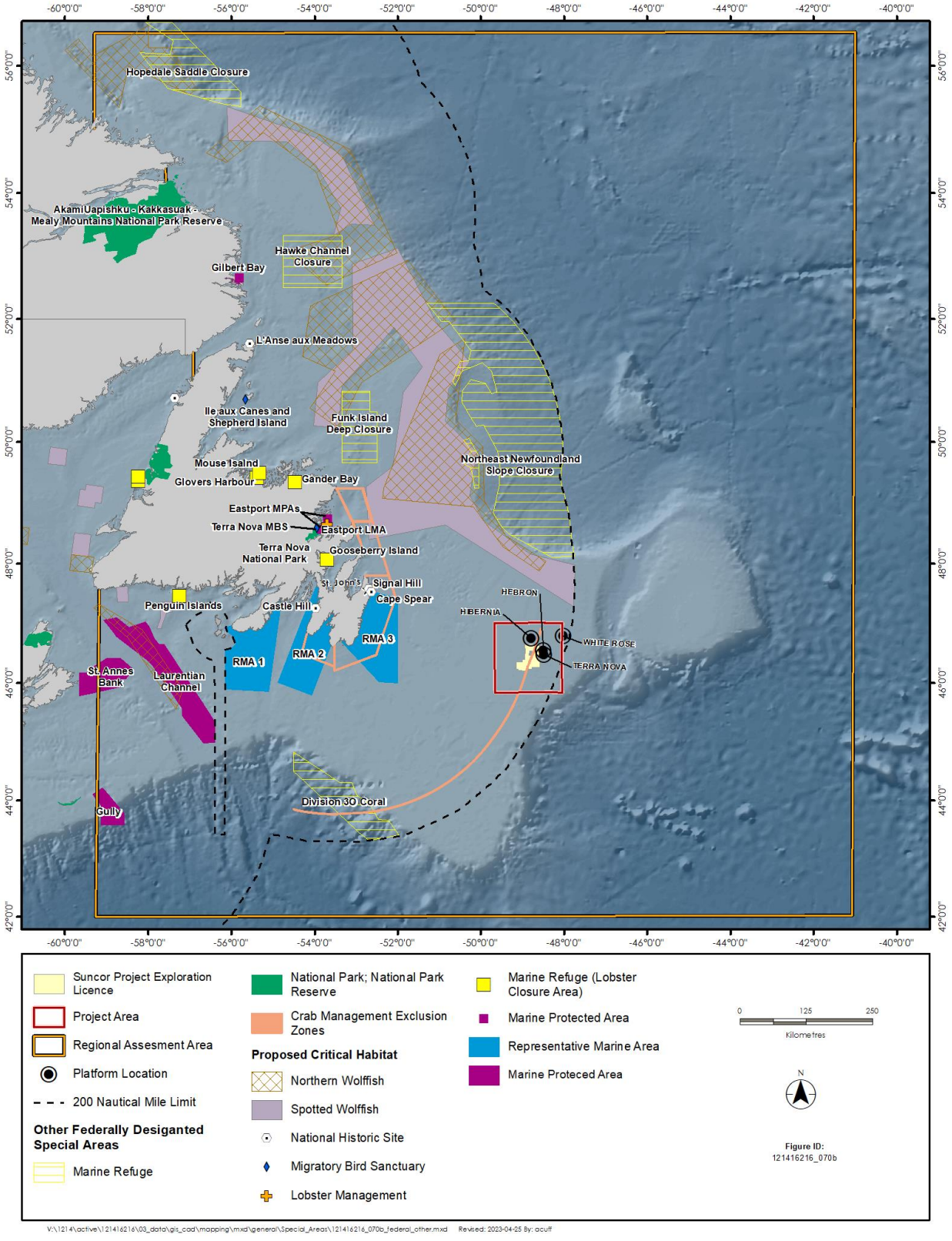
Table 6.25 Representative Marine Areas in the RAA

RMA	Rationale for Identification / Designation	Area (km²)
I- South Burin/St. Pierre Bank	Not available	10,694
II- West Avalon/Green Bank-		9,000
RMA III- East Avalon/Grand Banks		10,867
Source: Parks Canada 2019b		



Source: Kenchington et al. 2018

Figure 6-61 Significant Benthic Areas



Sources: DFO (2015, 2018a, 2019a, 2019e, 2019f); NRCan 2019; Parks Canada 2019b; World Database on Protected Areas 2014

Figure 6-62 MPAs, Marine Refuges, and Other Federal Special Areas

Table 6.26 Marine Protected Areas in the RAA

MPA	Rationale for Identification / Designation	Area (km²)
Gilbert Bay	Conserves one of the few coastal concentrations of northern cod in the Newfoundland region and indirectly protect other species and habitats.	60
Eastport Round Island	Limits fishing to maintain a viable American lobster population and protect other threatened or endangered species.	2
Eastport Duck Islands		
Laurentian Channel	High concentration of sea pens, porbeagle shark mating grounds and presence of dolphins, whales and SARA-listed species (northern wolffish and leatherback sea turtle). Recreational fishing, commercial fishing and oil and gas exploration and development are prohibited throughout the MPA. Anchoring and installation of submarine cables are prohibited in two Core Protection Zones.	11,580
St. Anns Bank	Important habitat for commercial and non-commercial species (e.g., Atlantic cod, redfish, white hake, witch flounder) and a variety of sponges, corals and sea pens. Endangered and threatened marine species (e.g., leatherback turtles, Atlantic wolffish, Atlantic cod, American plaice, redfish). Part of an important migration corridor for fish and marine mammals, including whales. Prohibition of activities that disturb, damage, or remove living marine organisms or any part of their habitat, unless the activity is listed as an exception in the Regulations.	4,364
The Gully	Home to the endangered Scotian Shelf population of Northern bottlenose whale and an important habitat for 15 other species of whales and dolphins. Plankton, fish (e.g, sharks, tuna and swordfish) and seabirds inhabit surface waters. The ocean floor supports crabs, sea pens, anemones, brittle stars and approximately 30 species of cold-water corals. Prohibition of activities that disturb, damage, destroy or remove living marine organisms or any part of their habitat, unless the activity is listed as an exception in the Regulations.	2,363
Source: DFO 2019c		

Table 6.27 Marine Refuges in the RAA

Refuge	Rationale for Identification / Designation	Area (km²)
Hopedale Saddle Closure	High density of corals and sponges. High biodiversity. Overwintering area of Eastern Hudson Bay beluga. All bottom-contact fishing activities are prohibited to protect corals and sponges and contribute to long-term biodiversity conservation.	15,411
Funk Island Deep Closure	Benthic habitat important to Atlantic cod and smooth skate Funk Island Deep population (assessed as Endangered by COSEWIC). Substantial concentrations of groundfish and other fish species. Important feeding area for mammals. Bottom trawl, gillnet and longline fishing activities are prohibited to conserve benthic habitat and Atlantic cod habitat.	7,274
Hawke Channel Closure	Benthic habitat important to Atlantic cod and Atlantic wolffish. Bottom trawl, gillnet and longline fishing activities are prohibited to conserve benthic habitat and Atlantic cod habitat.	8,837

Table 6.27 Marine Refuges in the RAA

Refuge	Rationale for Identification / Designation	Area (km²)
Northeast Newfoundland Slope Closure	High density of corals and sponges; high biodiversity. All bottom contact fishing activities are prohibited to protect corals and sponges and contribute to long-term biodiversity conservation.	55,353
Division 3O Coral Closure	Presence of large and small gorgonian corals and sea pens. Visited by leatherback sea turtles, redfish and Atlantic cod. All bottom fishing activities are prohibited to protect corals and sponges.	10,422
Gander Bay Lobster Area Closure	Key lobster spawning habitat. All lobster fishing is prohibited to increase lobster spawning and egg production.	Portions of total area of 94 km²
Glovers Harbour Lobster Area Closure		
Penguin Islands Lobster Area Closure		
Mouse Island Lobster Area Closure		
Gooseberry Island		
Source: DFO 2019d		

6.4.2.6 Species at Risk Critical Habitat

COSEWIC has designated northern and spotted wolffish as Threatened under SARA, due to declines in abundance and biomass. The DFO (2020) recovery strategy for northern and spotted wolffish has identified critical habitat within areas where these species are known to occur. Critical habitat supports important functions and features (e.g., areas for spawning, nursery, rearing, food supply, migration) necessary for survival or recovery for these species (DFO 2020). The RAA intersects with four areas of proposed critical habitat for northern wolffish and four areas of proposed critical habitat for spotted wolffish (Figure 6-62).

6.4.2.7 Fisheries Closures Areas

Fishing activities in various marine areas off eastern Newfoundland and Labrador have been restricted under the *Fisheries Act*. These Fisheries Closure Areas are intended to conserve productive fish and shellfish habitat for commercially important species and to permit ongoing monitoring and research (DFO 2013, 2015, 2019g). Various Fisheries Closure Areas intersect with the RAA (Figure 6-62). These include a Lobster Management Area and Snowcrab Stewardship Exclusion Zones (Table 6.28). Other Fisheries Closure Areas including Funk Island Deep Box, Hawke Channel along with various Lobster Area Closures were designated as Marine Refuges in 2019 (Section 6.4.2.4).

Table 6.28 Other Fisheries Closure Areas in the RAA

Fisheries Closure Area	Rationale for Identification / Designation	Area (km²)
Eastport Lobster Management Area	Fishing restrictions to protect prime lobster habitat. Two smaller areas are designated as MPAs under the *Oceans Act* (Section 6.4.2.3)	400
Snow Crab Stewardship Exclusion Zones: 5A, 6A, 6B, 8X, 9A	Snow crab fishing is prohibited in Exclusion Zones, which are 0.5 or 1.0 nautical mile-wide corridors along the length of crab fishing area boundaries to delineate fishing areas and provide a refuge area for snow crab within NAFO 3LNO.	NA
Hawke Channel Closure	No trawl / no-gillnetting area closed due to concerns about the impact of bottom trawling for shrimp on crab fishing grounds.	8,837
Funk Island Deep Box Closure	In 2002, DFO closed (through the *Fisheries Act*) an area of the Funk Island Deep to gillnetting to protect bottom habitat. DFO also closed the area to small vessel bottom trawling in 2005. The fishing industry has voluntarily closed the area to the large vessel shrimp fleet.	7,272
Lobster Closure Areas (Gander Bay, Glover's Harbour, Gooseberry Island, Penguin Islands, Mouse Island)	Snow crab fishing is prohibited in various Stewardship Exclusion Zones in inshore and mid shore crab fishing areas of NAFO 3LNO. The zones are 0.5 or 1.0 NM wide corridors along the length of crab fishing area boundaries to delineate fishing areas and provide a refuge area for snow crab.	Total 94 in 7 areas
Sources: DFO (2013, 2015, 2019g)		

6.4.2.8 Migratory Bird Sanctuaries

ECCC establishes migratory bird sanctuaries under the MBCA to protect important migratory bird habitats used for breeding, nesting or hunting. Any activities that could harm migratory birds, their nests or eggs is prohibited (Government of Canada 2019). All three migratory bird sanctuaries in Newfoundland and Labrador intersect with the RAA (Figure 6-62). These migratory bird sanctuaries include coastal environments (Table 6.29).

Table 6.29 Migratory Bird Sanctuaries in the RAA

Migratory Bird Sanctuary	Rationale for Identification / Designation	Area (km²)
Terra Nova	Protects an area adjacent to Terra Nova National Park used by approximately 30 shorebird, waterfowl and seabird species. It is an important sanctuary during fall migration. Shorebirds frequent the tidal flats during summer and early fall. Newman Sound is an important area for waterfowl species year-round.	12
Shepherd Island	Protects one of the largest breeding sites (together with Île aux Canes) for common eider in insular Newfoundland.	1
Île aux Canes	Protects nesting colonies of common eider. Together with Shepherd Island, it is one of the largest breeding sites for common eider in insular Newfoundland.	2
Source: Government of Canada 2019		

6.4.2.9 National Parks and National Historic Sites

Parks Canada establishes National Parks under the *National Parks Act* to protect representative examples of Canada's 39 National Parks Natural Regions (Parks Canada 2018). National Historic Sites are designated through the *Historic Sites and Monuments Act* (Parks Canada 2016). Terra Nova National Park and Akami-Uapishku - Kakkasuak - Mealy Mountain National Park, along with various National Historic Sites are located in coastal areas of the RAA (Table 6.30; Figure 6-62).

Table 6.30 National Parks and National Historic Sites in the RAA

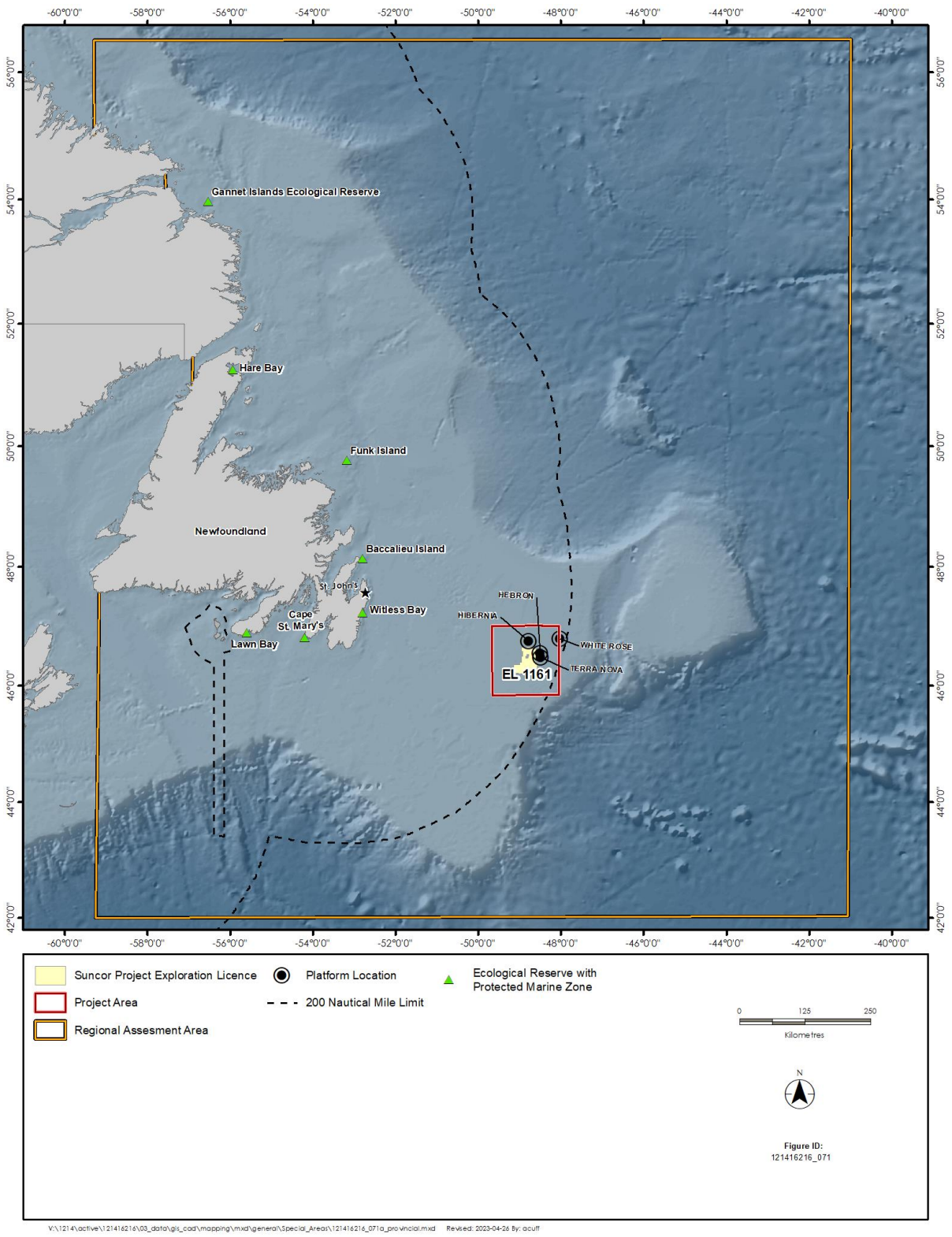
National Park / National Historic Site	Rationale for Identification / Designation
Terra Nova National Park	Boreal forest and rocky coastlines covering 403 km² are a representative example of Natural Region 35: Eastern NL Atlantic Region.
Akami–Uapishku - Kakkasuak - Mealy Mountains National Park Reserve	Pristine mountain tundra, marine coasts, boreal forests, islands and rivers covering 10,765 km² are home to numerous boreal species. Traditional territory of Innu, Inuit and other ancient cultures.
Signal Hill National Historic Site	Historic site of wireless communication and military defence of St. John's Harbour.
Cape Spear National Historic Site	Historical lighthouse and lighthouse keeper's home on most eastern point of North America.
Castle Hill National Historic Site	A stone fort established in 1662 to defend a French colony and fishing interests in Newfoundland.
L'Anse Aux Meadows National Historic Site	An 80 km² archaeological site containing 1,000 yr old timber and sod buildings believed to the earliest European presence in the Americas. Declared a UNESCO World Heritage Site in 1978.
Sources: Parks Canada (2016, 2018)	

6.4.3 Special Areas under Newfoundland and Labrador Jurisdiction

The Government of Newfoundland and Labrador has established a network of provincial parks and protected areas through the *Provincial Parks Ac*t. Wilderness and ecological reserves are established through the *Wilderness and Ecological Reserves Act*. Natural Areas are managed by the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (NLFFA) (2019). Wilderness Reserves are generally inland areas and thus not included in this discussion.

6.4.3.1 Ecological Reserves

In Newfoundland and Labrador, coastal ecological reserves have been established to protect seabird colonies and important fossil sites (NLFFA 2019). Seven Provincial Ecological Reserves with a marine biome are located within the RAA (Figure 6-63) and protect important seabird habitats (Table 6.31).



Source: NLFFA 2016

Figure 6-63 Marine Special Areas under Newfoundland and Labrador Jurisdiction

Table 6.31 Marine Ecological Reserves in the RAA

Ecological Reserve	Rationale for Identification / Designation	Area (km²)
Cape St. Mary's	A major seabird colony in Newfoundland and Labrador. During breeding season, it is home to an estimated 24,000 Northern gannets, 20,000 black-legged kittiwakes, 20,000 common murres and 2,000 thick-billed murres. Nesting areas for more than 100 pairs of razorbills, more than 60 pairs of black guillemots, double-crested and great cormorants and Northern fulmars.	64
Baccalieu Island	Largest Leach's storm-petrel colony in the world and largest protected seabird island in the province.	23
Funk Island	Largest colony of common murres (more than 1,000,000) in the western North Atlantic.	5
Hare Bay Islands	Breeding habitat of the common eider.	31
Witless Bay	Largest Atlantic puffin colony in North America and second largest Leach's storm-petrel colony in the world.	31
Gannet Islands	Largest razorbill colony in North America (10,000 breeding pairs) and the third-largest (after Witless Bay and Baccalieu Island Ecological Reserves) Atlantic puffin breeding colony in North America (more than 38,000 pairs). Hosts 36,000 breeding pairs of common murres, 1,900 breeding pairs of thick-billed murres, and large numbers of black-legged kittiwakes, great black-backed gulls, and northern fulmars. Summer staging area for harlequin ducks.	22
Lawn Bay	Only location in North America where Manx shearwaters (*Puffinus puffinus*) are known to breed. Includes Middle Lawn Island, Colombier Island and Swale Island.	4
Source: NLFFA 2019		

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