West Flemish Pass
Exploration Drilling Program

Chapter 6: Biological Existing Environment

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6.0 EXISTING BIOLOGICAL ENVIRONMENT

This chapter describes the existing marine fish and fish habitat, marine and migratory birds, marine mammals and sea turtles, and Special Areas environments in the RAA. Species at risk and species of conservation concern (SOCC) are discussed within their respective biological group. Species at risk include all species listed under SARA Schedule 1 as:

- 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

Species at risk also include all indigenous species, sub-species and populations listed under the NL *Endangered Species Act* (NL ESA) as:

- 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 events

SOCC include species assessed as endangered, threatened, or of special concern by COSEWIC, or are included in the International Union for Conservation of Nature (IUCN) Red List.

No field work was conducted as part of this EIS. As such, this description of the existing environment relies on published research. Key information sources are discussed within each section. Primary sources include the Eastern Newfoundland SEA (AMEC 2014), previous EA reports prepared for other exploration drilling projects in the Eastern Newfoundland offshore area; surveys by DFO (e.g., research vessel [RV] surveys and marine mammals surveys), surveys conducted in support of industry activities (e.g., marine mammal and seabird observations), surveys by Environment Canada's Programme intégré de recherches sur les oiseaux pélagiques (PIROP) (Lock et al. 1994); and surveys conducted for ECCC's Eastern Canadian Seabirds at Sea (ECSAS) program (Fifield et al. 2009; Bolduc et al. 2018). The ECSAS survey data also includes data reported from seabird observations recorded in offshore NL (including observations from production platforms and MODUs).

6.1 Marine Fish and Fish Habitat

The following subsections describe the existing biological environment for marine fish and fish habitat within the areas that may interact with routine Project activities or accidents and malfunctions. Details on physical aspects of fish habitat (e.g., marine geology, geomorphology, sediment, and marine water quality) are discussed in Chapter 5.

6.1.1 Approach and Key Information Sources

Existing publicly available scientific literature and environmental assessments were used to present a description of the existing biological environment for the Project; no field studies have been conducted as part of this EIS. The Project Area falls within the geographical scope of the Eastern Newfoundland SEA (AMEC 2014), which provides a regional overview of the offshore marine ecosystem that includes the Grand Banks, Flemish Cap, Orphan Basin, and adjacent slope and abyssal habitats. Life history descriptions and species ranges can be found in the Eastern Newfoundland SEA (AMEC 2014), as well as in the EAs for Statoil's Flemish Pass Exploration Drilling (Statoil 2017) and BP's Newfoundland Orphan Basin Exploration Drilling Program (BP 2018).

A list of the key information sources used to describe marine fish and fish habitat in the Project Area and RAA is provided below:

- Eastern Newfoundland SEA (AMEC 2014)
- DFO RV trawl surveys (2007 to 2018; DFO 2018a)
- National Aeronautics and Space Administration (NASA) Satellite Imagery of Chlorophyll (NASA n.d.)
- International Union for Conservation of Nature (IUCN)
- SARA / COSEWIC Species Status Reports
- Northwest Atlantic Fisheries Organization (NAFO) Reviews (e.g., Wang and Greenan 2014)

Chevron has based its assessment on desktop information and has not conducted field work for this EIS. The information sources noted above and cited throughout Chapter 6 include the results of extensive field programs conducted within the Project Area and RAA. It is also noted (Section 6.1.6) that Chevron has committed to a pre-drill imagery-based seabed survey at the proposed well sites to confirm the presence or absence of environmental sensitivities, among other constraints, within a 500-m radius from each wellsite.

6.1.2 Trophic Linkages and Community Change

Describing fish and fish habitat in terms of trophic linkages helps to understand how projects interact with fish and fish habitat. In the marine environment, phytoplankton are the primary producers and the primary food source for primary consumers such as zooplankton, planktivorous fish, and invertebrates, which are consumed by larger fish, marine mammals, and birds. The cycle is completed by detritivores, which consume dead flora and fauna and return nutrients back into the base of the food web. Widespread changes to the abundance of either predators or prey can cascade to other levels of the food web. Changes in the abundance of organisms can range from diurnal migrations within the water column to shifts in habitat characteristics or predator-prey ratios that can span decades.

Community structure within any ecosystem can be highly variable in terms of abundances, interactions, and productivity. These may change daily, annually, or occur over longer time scales. Shifts in the ecosystem of the Northwest Atlantic occurred between the mid-1980s to early 1990s, where the structure shifted and resulted in decreases in groundfish stocks. Cold water temperatures in combination with overharvesting were linked to a reduction in Northwest Atlantic groundfish species including cod and redfish (deYoung et al. 2004; Koen-Alonso et al. 2010; Dawe et al. 2012; Nogueira et al. 2017). Prey species

including sand lance, herring, shrimp, and snow crab were shown to increase in abundance during this time (Koen-Alonso et al. 2010; Templeman 2010; Dawe et al. 2012; Nogueira et al. 2017). In more recent years, rising water temperatures and restrictions on harvesting are favoring the return of a groundfish-dominated system (Koen-Alonso et al. 2010; Templeman 2010; Dawe et al. 2012; Nogueira et al. 2017). Rising water temperatures in the Northwest Atlantic suggest that the region is in the top 1% globally in terms of increasing sea-surface temperatures (Pershing et al. 2015; EPA 2016). Warming sea surface temperatures in the region have been linked to observed northward shifts in both fish species distribution and, as a result, commercial fishing industry catch (Nye et al. 2009; Pinsky and Fogarty 2012; Pershing et al. 2015).

6.1.3 Key Marine Assemblages

Marine assemblages represent a community of organisms whose physiological, morphological, and life history requirements are adapted to coexist within a specific environment in an ecosystem. Near the Project Area, NAFO (2013) recognizes three general functional units:

1. The Grand Banks / Newfoundland Shelf
2. The Flemish Cap
3. The oceanic waters beyond the shelf break

The continental slopes, which act as transition zones between each of these functional units, also represent an important habitat (Pepin et al. 2010). Functional units have characteristic processes that influence their assemblages. For example, the Flemish Cap is considered a relatively closed marine ecosystem (Perez-Rodriquez et al. 2012) that is influenced by a mix of currents, with high substrate heterogeneity, and highly oxygenated waters that are rich in nutrients (Barrio Froján et al. 2012; Altuna et al. 2013). Each of these components is thought to contribute to the elevated biodiversity found in these areas relative to the Newfoundland Shelf habitats (Altuna et al. 2013).

The Project Area sits at the confluence of these functional units in a place dominated by the cold Labrador Current (Nogueira et al. 2017). The Labrador Current is a strong influence in this area which limits the temperature-related heterogeneity found there and restricts many species that have more southern distributions and occur nearby on the Tail of the Grand Banks (southern extremity; see Figure 5-1). The primary habitat driver defining assemblages in the Project Area is depth (Murua and Cardenas 2005; Barrio Froján et al. 2012; Nogueira et al. 2017). The effect of depth on pressure, salinity, oxygen, and temperature can influence communities through physiological mechanisms, while effects on light penetration limit zones of primary productivity, which requires adaptations by many species to foraging and refuge strategies.

Key species of a given interconnected marine assemblage are often determined based on dominance (numerical abundance or biomass), or through the number and strength of its linkages to other species. For example, the Eastern Newfoundland SEA (AMEC 2014) describes capelin and corals as classic examples of taxa whose presence affects the distribution and activities of many other species. In the following sections, key species from each taxonomic group are identified, and where possible, organisms are identified to species. In most cases, such species were determined based on numerical dominance or as a result of their conservation status; however, migration for spawning and seasonality were also considered.

6.1.4 Plankton, Plants and Macroalgae

Plankton comprise the largest and most diverse ecosystem component on earth, representing the microscopic organisms that are passively distributed by currents. Organisms in this group include picoplankton (organisms between 0.2 and 2.0 µm in diameter including prokaryotes and eukaryotes), phytoplankton (microscopic plants), zooplankton (small animals) including invertebrate and vertebrate embryos and larvae, as well as viruses and phages (Legendre and Rassoulzadegan 1995; Suttle 2005). Plankton include the most basal levels of the marine food web and include photosynthetic organisms that are consumed by planktivores, who in turn are often prey items for larger organisms. Most primary plankton productivity occurs in the light-infused epipelagic zone (0-200 m water depth) (Licandro et al. 2015) but this productivity is also transferred to the benthos on the ocean's bottom through sinking biomass and waste (Legendre and Rassoulzadegan 1995).

Plankton are also the mechanism by which nitrogen and carbon are absorbed into the marine environment from the atmosphere. They create a biological pump in which CO_2 is consumed in the surface waters, resulting in a reduced partial pressure and the absorption of atmospheric CO_2, which plays a key role in climate regulation. Recent studies have also shown the importance that zooplankton play in transferring organic matter from depth to the surface (benthic-pelagic coupling) (AMEC 2014).

The following sections provide an overview of marine bacterial communities, phytoplankton, zooplankton, and ichthyoplankton in or near the Project Area.

6.1.4.1 Bacterial Communities / Microbes

Bacterial communities are composed of prokaryotes (single-celled organisms including bacteria and archaea) which make up the smallest free-living cells in any pelagic ecosystem. Bacteria can use multiple different energy sources. Some use light as their primary energy source (photoautotrophs), or as an auxiliary source (photoheterotrophs), though most bacteria use organic material as an energy source (heterotrophs) (DFO 2011a). Most bacteria are secondary producers, relying on organic material for energy, and their abundance can be correlated to the abundance of phytoplankton communities. Most bacteria rely on material derived from phytoplankton, including waste exuded from cells, cell autolysis, viral lysis, and organic material released from grazers feeding on phytoplankton (DFO 2011a).

The upper surface layer of the water column is where the densest concentrations of bacteria and the highest abundance of phytoplankton are found. Bacteria also exist throughout the water column, below the photic zone, relying on dissolved organic matter for energy.

Heterotrophic bacteria are natural microbial agents that can remediate hydrocarbon contamination in the marine environment. Crude oil can be found naturally in the marine environment from natural seeps in the ocean floor (ASM 2011). Crude oil is a naturally occurring product which has been generated by organisms millions of years ago that used photosynthesis to harness the energy of the sun as their principal energy source. Certain microbes in the marine environment have evolved enzymes that allow them to use energy contained in hydrocarbons, including crude oils (ASM 2011).

No information specific to the Project Area is available for bacterial communities and microbes.

6.1.4.2 Phytoplankton

Phytoplankton are single-celled photosynthetic organisms that are adapted to living in the upper water column of coastal and offshore regions. Although marine phytoplankton comprise less than 1% of the Earth's photosynthetic biomass, they contribute more than 45% of annual net primary production of the planet (Archambault et al. 2010). Phytoplankton form the base of the marine food web and influence the production of all higher trophic levels in the ecosystem (Worcester and Parker 2010). The majority of phytoplankton species range in size from 0.2 µm to 200 µm (Archambault et al. 2010).

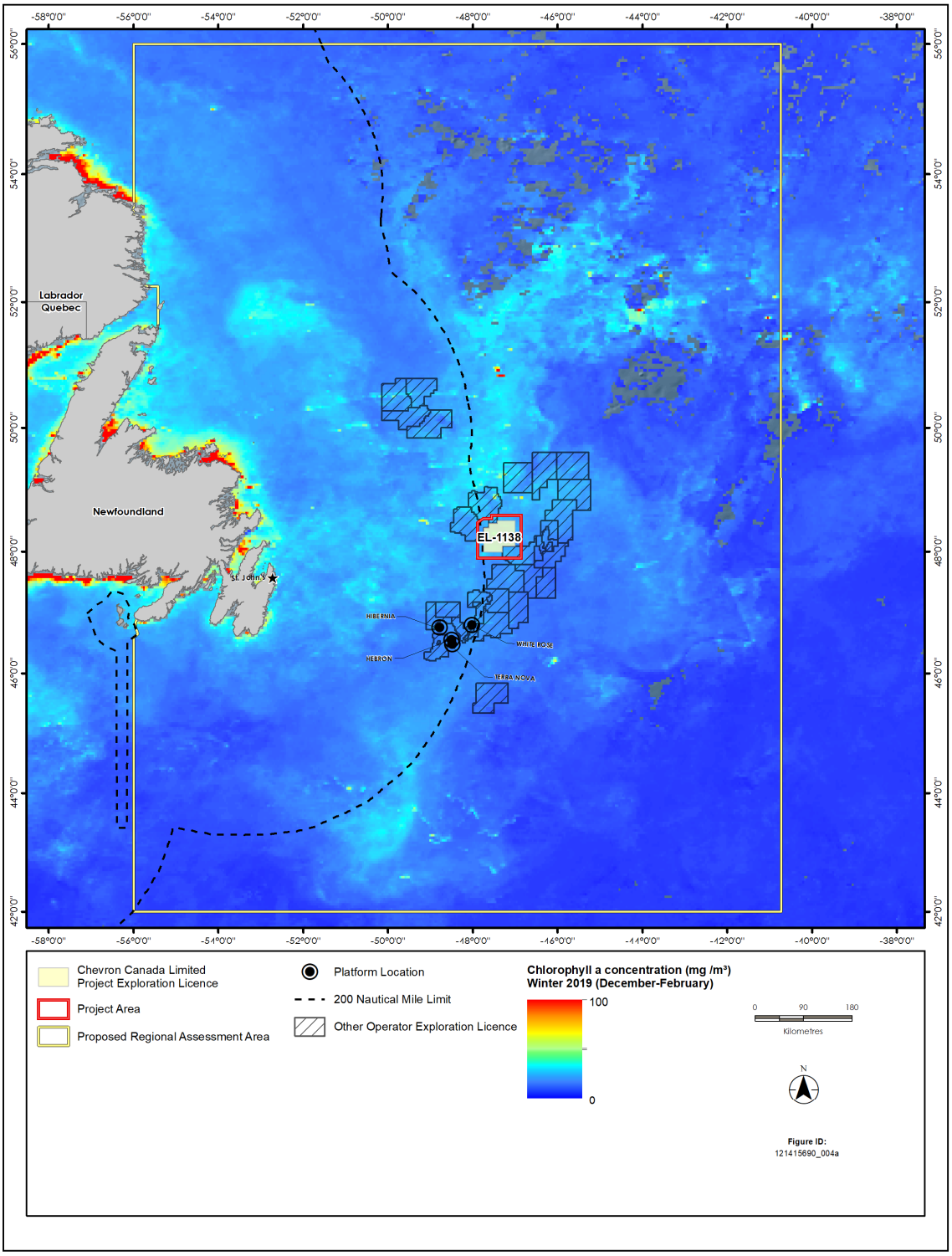
Most phytoplankton productivity occurs in the epipelagic zone (0 to 200 m water depth). Although, this productivity also extends to the benthic zone through sinking biomass and wastes (Licandro et al. 2015; Legendre and Rassoulzadegan 1995). Primary production in the North Atlantic Ocean is related to light conditions, sea surface temperatures, vertical water column stabilization, and grazing. There is also variation in primary production between shelf and deep basin regions (Melle et al. 2014).

In the Northwest Atlantic there has been an observed shift in the abundance, timing, and duration of some phytoplankton species. This shift included a decrease in overall abundance in the 1970s, a return to maximum levels in the 1990s, and a subsequent decline since that time (Maillet et al. 2004; Head and Sameoto 2007, in AMEC 2014). These changes are correlated with the North Atlantic Oscillation (Harrison et al. 2013, in AMEC 2014) whereby an intensification of northwestern atmospheric flows cause increased mixing and sea ice extent and colder, fresher ocean conditions. These conditions are also associated with increased nutrient flux, which triggers higher primary productivity, and in turn, secondary productivity (zooplankton) (Maillet et al. 2004, in AMEC 2014).

Chlorophyll irradiance in the North Atlantic was measured from NASA Satellite Imagery for all four seasons to show seasonal variation in chlorophyll *a* concentration (Figures 6-1 to 6-4). Chlorophyll *a* is a pigment used to measure photosynthetic activity (Behrenfeld and Falkowski 1997). Within the Project Area, there are relatively low chlorophyll *a* concentrations during the winter, spring, and fall (Figures 6-1, 6-2, and 6-4). Data from the summer season shows the highest chlorophyll *a* concentration in the Project Area where concentrations were 100 mg/m^3. Chlorophyll *a* concentrations in summer tend to increase with water depth and latitude.

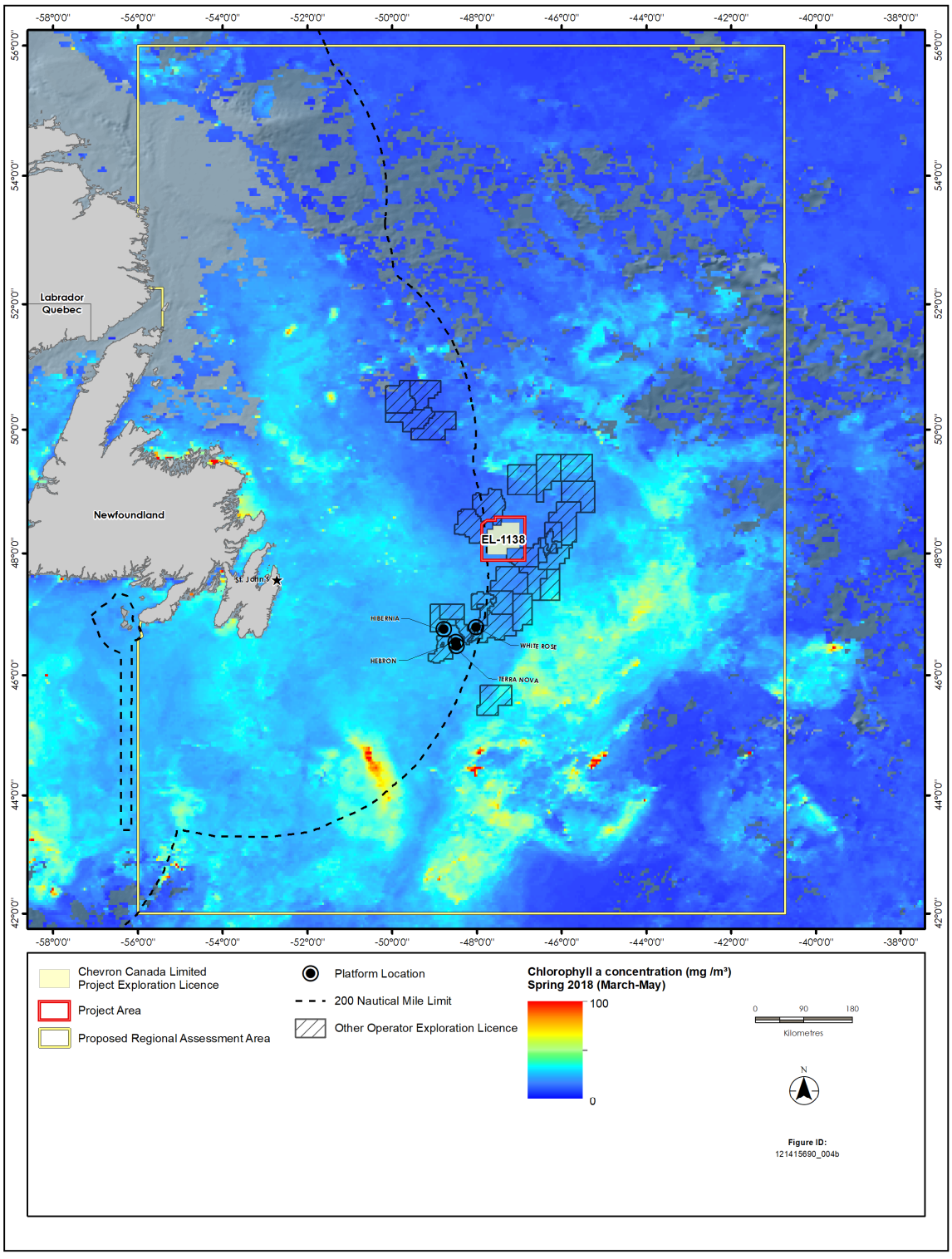
6.1.4.3 Zooplankton

Zooplankton are key elements of marine ecosystems, as they serve as the dominant conduit for the transfer of energy from phytoplankton to higher trophic levels (Archambault et al. 2010). Zooplankton are consumed by most marine species at some stage of their life cycle, from small anemones to baleen whales (Breeze et al. 2002). The distribution of zooplankton and community structure is important in predicting the distribution of predator species, such as fish, seabirds, and marine mammals (Kjellerup et al. 2015).



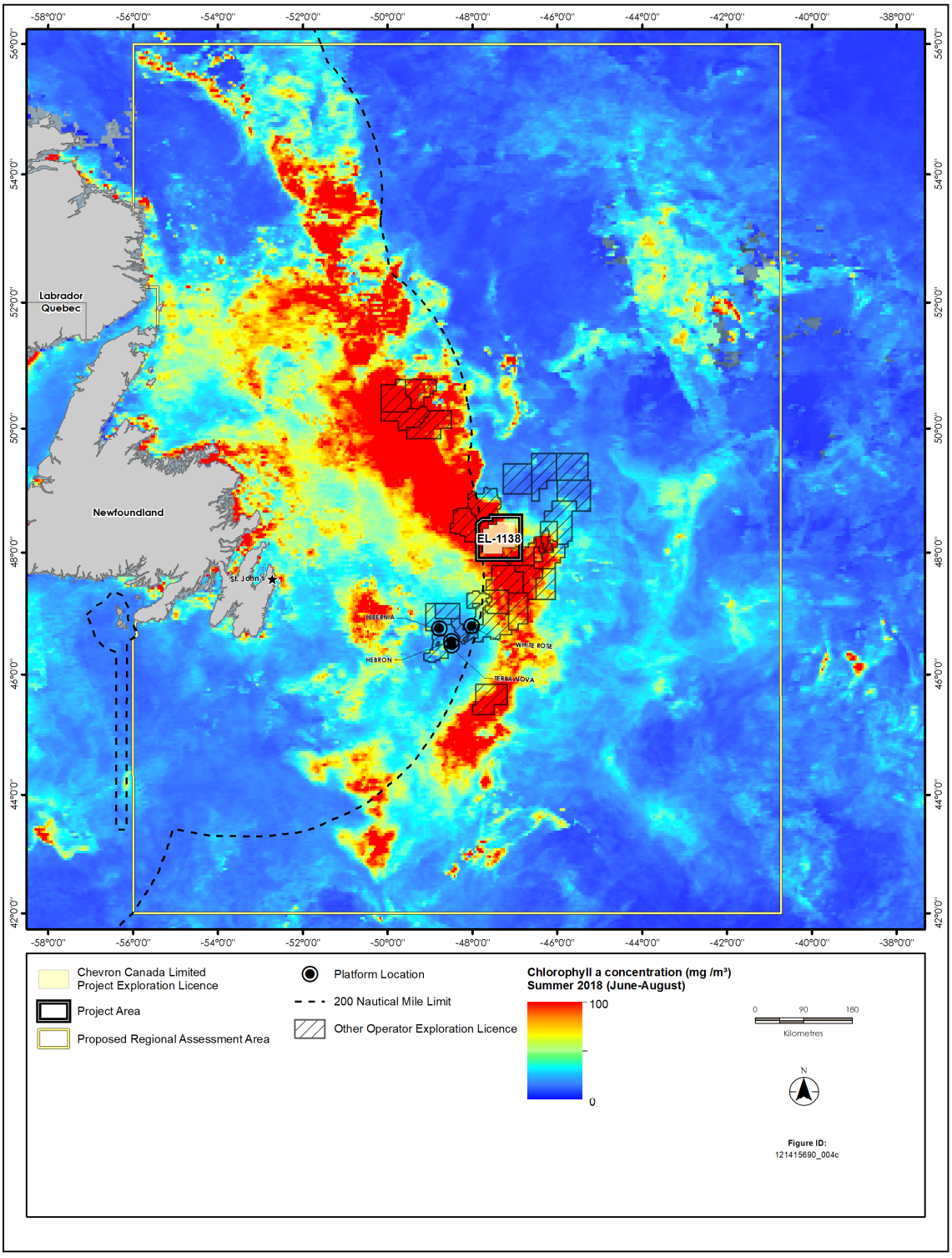
Source: NASA No Date

Figure 6-1 Distribution of Chlorophyll Irradiance Measured from NASA Satellite Imagery of the North Atlantic - Winter (December-February) 2019



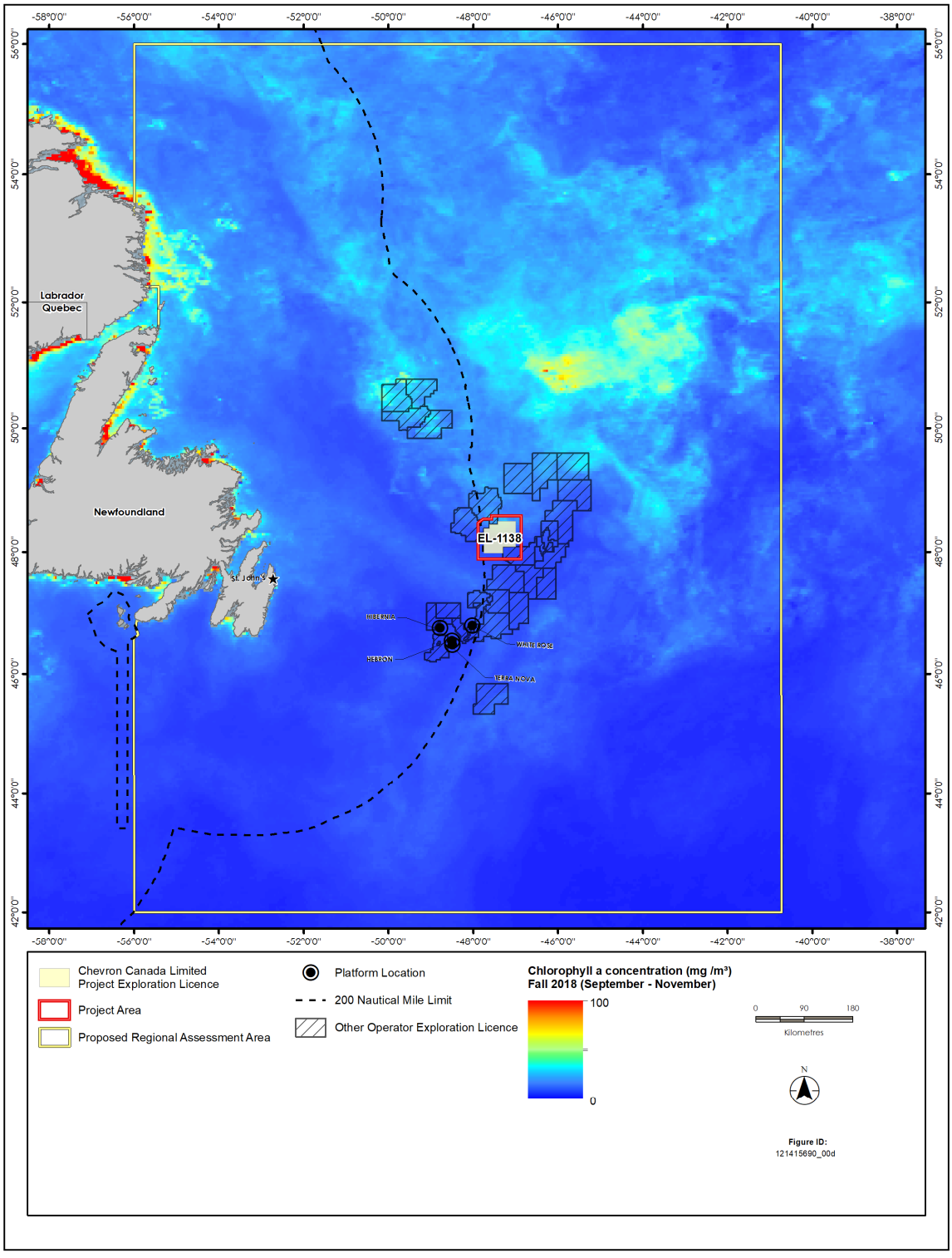
Source: NASA No Date

Figure 6-2 Distribution of Chlorophyll Irradiance Measured from NASA Satellite Imagery of the North Atlantic - Spring (March-May) 2018



Source: NASA No Date

Figure 6-3 Distribution of Chlorophyll Irradiance Measured from NASA Satellite Imagery of the North Atlantic - Summer (June-August) 2018



Source: NASA No Date

Figure 6-4 Distribution of Chlorophyll Irradiance Measured from NASA Satellite Imagery of the North Atlantic - Fall (September-November) 2018

Zooplankton are typically divided into three main categories, based on size:

- Microzooplankton (0.02 to 0.2 mm in length), includes ciliates, tintinnids, and the eggs and larvae of larger taxa
- Mesozooplankton (0.2 to 2.0 mm in length), includes copepods, larvaceans, pelagic molluscs, and larvae of benthic organisms
- Macrozooplankton (>2.0 mm), includes larger and gelatinous taxa such as euphausiids (krill), tunicates, and salps

The biomass of the zooplankton community in the vicinity of the Newfoundland Shelf region is dominated by three large species of copepod. The largest and most abundant is a boreal species *Calanus finmarchicus*, which is ubiquitous throughout the North Atlantic from the Gulf of Maine to the Barents Sea (Melle et al. 2014; Wang and Greenan 2014). Two other prevalent species, *Calanus glacialis* and *Calanus hyperboreus*, are found in association with influxes of Arctic water such as the Labrador Current (Wang and Greenan 2014). All three species spend the winter at depth in a pre-adult stage, and trillions of copepods migrate below the depth of the permanent thermocline into deep ocean basins (600 to 1,400 m) and overwinter in a state of diapause (Jónasdóttir et al. 2015). Development of *C. finmarchicus* includes 12 larval stages during their one-year life cycle, whereas the Arctic species have multi-year life cycles and spend two or more winters at depth (Wang and Greenan 2014). All three species migrate towards the surface to mature and reproduce in late winter or spring so that early larval stages can feed during optimal phytoplankton growth season. As reproduction of these organisms is coupled to spring bloom dynamics and temperature, inter-annual differences in timing or abundance of these species are also influenced by changes in these physical and biological processes (Wang and Greenan 2014).

Along the northeastern slope section of the Grand Banks, larval shrimp consume large amounts of phytoplankton, copepod eggs, and nauplii larvae during several months of development in the upper 50 metres of the water column (Stickney and Perkins 1981; Pedersen and Storm 2002; Harvey and Morrier 2003; Fuentes-Yaco et al. 2007). As development progresses, shrimp migrate towards the benthos and adults are primarily found on the benthos and consume pelagic detritus (Hopkins et al. 1993; Ramseier et al. 2000; Fuentes-Yaco et al. 2007). Adult males migrate to the surface to feed diurnally on larger larval stages of copepods (copepodites) (Fuentes-Yaco et al. 2007). Every *Pandalus borealis* shrimp develops as male, and after approximately three years, transitions to become female (i.e., protandric hermaphrodites) (Vázquez et al. 2014). Consistent with the variations in timing and abundance that are observed among the dominant Calanoid copepod species described above, there are strong correlations between the timing and intensity of the spring phytoplankton bloom with the size of young shrimp (Fuentes-Yaco et al. 2007). Since the early 1990s, shrimp size has been decreasing in many northwest Atlantic stocks. This has been hypothesized to be attributed to food limitation conditions manifesting from rising sea temperatures that increase the metabolic demand for cold-blooded organisms (such as shrimp), thereby reducing the amount of food available to adequately sustain growth (Koeller et al. 2006; Fuentes-Yaco et al. 2007). However, Fuentes-Yaco et al. (2007) also hypothesized that changes in food availability along the Newfoundland shelf, among other factors such as inter-regional variation in primary productivity, could be mediating changes in shrimp sizes both temporally and geographically in the North Atlantic.

6.1.4.4 Ichthyoplankton

Ichthyoplankton include the planktonic eggs and larvae of fish and shellfish species found mainly in the upper 200 m of the water column (NOAA 2014). Ichthyoplankton are categorized as meroplankton because they are planktonic only for a portion of their life cycle (NOAA 2014).

The planktonic life stages for these species are an important period of dispersal and represent a key stage that can affect recruitment success (Cushing 1990 in AMEC 2014). It has been shown that the abundances of eggs and larvae for several species, such as sardines and anchovies, are good indicators of the transient population size of the adults (NOAA 2014).

Spawning periods of many species are synchronized with plankton blooms to provide access to seasonal abundance of food supplies. Most taxa of ichthyoplankton exhibit passive movement, and their dispersal is dependent on oceanographic features such as gyres, upwelling zones (Bradbury et al. 2008, in AMEC 2014; Ings et al. 2008, in AMEC 2014), and thermoclines (Frank et al. 1992, in AMEC 2014).

Ichthyoplankton (redfish larvae in particular) tend to be distributed according to environmental variables such as temperature and salinity and therefore are more evenly distributed across pelagic habitats (Pepin and Anderson 1997). Likewise, Atlantic cod spawn for half the year (March to September) on the coast of Newfoundland, and developing pelagic eggs and larvae can survive the range of environmental conditions they are subjected to during that interval, although recruitment success varies (Bradbury et al. 2000). Based on their surveys of cod larval distribution across transects of the northeastern Newfoundland Shelf including the Project Area - Southern Section in May and June 1992, and drift models of egg and larval drift for Atlantic cod, Pepin and Helbig (1997) proposed a highly variable transport system that may facilitate movement of larval cod between coastal and offshore areas. This was supported by their observations that there was no substantial difference in the relative length frequency distribution of larvae between coastal and offshore areas, suggesting overall age distribution of larvae was relatively uniform across the entire shelf (Pepin and Helbig 1997). Sources of variability for transport between regions include oceanographic features such as topographically induced gyre-like circulations and other hydrodynamic features that can potentially act as retention mechanisms for eggs and larvae among the Northern Cod complex of the northwest Atlantic (NAFO Management Divisions 3KNO, and Gulf of St. Lawrence) (Ruzzante et al. 1998).

6.1.4.5 Marine Plants and Macroalgae

Macroalgae (i.e., kelps, seaweeds, coralline algae) and sea grasses serve to enhance productivity and provide habitat for marine organisms in coastal waters. Factors influencing distribution of marine plants include substrate, nutrients, sedimentation, salinity, and temperature. Sunlight is a key factor in growth and survival of macroalgae and sea grass and therefore plant distribution is limited to photic zones (less than 50 m). The Project Area is generally too deep to support macroalgae and seagrass colonization and growth. While some seaweeds can be found on the Grand Banks up to 100 m, these areas have few plant species and low biomass (AMEC 2014).

6.1.5 Pelagic Macroinvertebrates

In their review of available trawl data from the nearby Flemish Cap, Vázquez et al. (2013) compiled percentage of hauls for each species or group captured from 1977 to 2012 (biomass, seasonal timing or locations were not provided). The benthic trawl surveys did not have uniform recording criteria for invertebrates during this timeframe, and surveys were conducted as separate programs either by Canada or the European Union (EU). Depth of surveys also varied, and were limited to 730 m until 2003, when the depth range of the survey was doubled to 1,460 m (Vázquez et al. 2014).

Although sampling was variable and modified throughout this time period, the data provide a summary overview of the most prevalent pelagic species of macroinvertebrates sampled during Canadian and EU surveys (1977 to 2012) as compiled by Vázquez et al. (2013). Among collected pelagic macroinvertebrates, species such as the northern shortfin squid and northern shrimp were observed in 77% to 94% of survey trawls conducted in 2003, and the percentage of trawls capturing these species has subsequently declined to 17% and 59% respectively in 2012 (Vázquez et al. 2013).

In addition to the high proportion of small crustaceans (copepods and shrimp) that occupy the pelagic environment, a variety of gelatinous organisms can be found. For example, pelagic tunicates include salps, pyrosomes and doliolids, are gelatinous, free-floating, filter feeding animals found as single individuals or assembled into colonies. Salps and doliolids are a food source for bluefin tuna (Dragovich 1970; Fromentin and Powers 2005), sunfish (Potter and Howell 2011), and leatherback turtles (Eckert 2006; Dodge et al. 2011). There are several species of salp that live in the North Atlantic, including: *Cyclosalpa pinnata*, *Pegea bicaudata*, *P. confoederata*, *P. socia*, *Salpa cylindrica*, and *S. maxima* (Madin 1982).

Other groups of gelatinous organisms include pelagic cnidarians and ctenophores (jellyfish). Jellyfish are both active swimmers and drifting animals that acquire energy in a variety of ways. Some may contain photosynthetic symbionts (zooxanthellae), which sequester carbon as do other photosynthetic organisms such as phytoplankton. Whereas smaller developmental stages of jellyfish (such as ephyrae and small medusa) may consume small planktonic organisms. Most jellyfish are carnivorous and consume zooplankton (including larval fish and invertebrates) as well as adult fish (Gibbons and Richardson 2009). Jellyfish themselves are a food item for Atlantic bluefin tuna (Fromentin and Powers 2005), leatherback turtles (Heaslip et al. 2012), and sunfish (Potter and Howell 2011).

A review of 60-year time series data from the Continuous Plankton Recorder Survey found that in shelf areas peak jellyfish abundance in recent years occurs later in the summer, reflecting changes in sea surface temperature and advective processes that cause aggregations of these species. In contrast, peak jellyfish abundance in oceanic areas occurs earlier in the summer and is associated with peaks in phytoplankton and zooplankton abundance. In more recent years, the abundance of jellyfish has had a pronounced increase that cannot be explained by any environmental variables such as zooplankton abundance, chlorophyll index, temperature changes or the North Atlantic Oscillation. In the region, the highest abundances of jellyfish are in the southern section along the shelf of the Grand Banks and Flemish Cap, with peak seasonal abundance observed from June to August (Gibbons and Richardson 2009). Recently, Sweetman and Chapman (2015) reported that jellyfish may function as an unexpected catalyst to the biological pump process in the pelagic environment. The authors reported that accumulation of carbon (C) and nitrogen (N) on the sea floor in a Norwegian fjord due to jellyfish abundance was similar to, or exceeded,

C and N accumulation derived from the accumulation of phytoplankton detritus over the course of one year. Therefore, jellyfish may be an important contributor to biological pump processes within the Project Area and surrounding region.

Pelagic cephalopods or squid are also abundant predators that consume smaller invertebrates when they are juveniles and hunt pelagic fish and invertebrate species as they grow. Cephalopods are also an important food source to several species of pelagic vertebrates such as fish, sharks, seals, dolphins, and other toothed whales (Pauly and Trites 1998).

6.1.6 Benthic Invertebrates

Marine benthic invertebrates are comprised of a diverse group of taxa that live on the sea floor and have key roles in ocean ecosystems. Invertebrates enhance habitat complexity, influence nutrient cycling and biochemical processes, and are a critical component of the benthic food web (Barrio Froján et al. 2012; Beazley and Kenchington 2015; Murillo et al. 2016). This group of organisms occurs on the substrate surface (epifauna) or live within the substrate (infauna). Benthic invertebrate distributions are strongly influenced by environmental conditions (e.g., substrates, currents, temperature, nutrition) that allow them to thrive and conduct their feeding, growth, and reproduction activities.

Benthic invertebrates form an important link to higher trophic level organisms such as fish, birds, and marine mammals (LGL Limited 2003), and certain taxa (e.g., cold-water corals) even provide habitat for other species of invertebrates and fishes (Buhl-Mortensen and Mortensen 2005; Buhl-Mortensen et al. 2010). Cold-water corals are used by other species for feeding, shelter, and as nursery areas (LGL Limited 2003). Cold-water corals found on the continental margins provide resting, feeding, and spawning sites for other species (Buhl-Mortensen et al. 2010; Watling et al. 2011; Baillon et al. 2011).

Benthic species distributions are highly dependent on the environmental conditions associated with various depths (Nesis 1970; Knudby et al. 2013; Gale 2013; Beazley and Kenchington 2015; Buhl-Mortensen et al. 2015; Murillo et al. 2016). Benthic invertebrate distribution may also be shaped by predator-prey relationships (Gale 2013) or associations with habitat forming organisms (e.g., corals and sponges; Baker et al. 2012; Baillon et al. 2014a). Biological systems in deep seas operate at a notably slower pace than in shallow waters (Smith 1994). Many deep-sea species typically have low metabolic rates, are slow growing, and have late maturity, low levels of recruitment, and long life spans relative to their shallow water counterparts (Beazley et al. 2013; McClain and Schalcher 2015; Murillo et al. 2016). Many benthic deep-sea invertebrate species are immobile, occurring in stable environmental conditions, and therefore are sensitive to anthropogenic disturbance (Curtis et al. 2013; DeBlois et al. 2014; Barrio Froján et al. 2015; Cordes et al. 2016; Clark et al. 2016; Murillo et al. 2016). In some habitats, such as hydrothermal vents, species can re-colonize rapidly after disturbance (Van Dover et al. 2014); but in deep-sea ecosystems, recovery can be slow (William et al. 2010, Schalcher et. al. 2014; Clark et al. 2016; Van Reusel et al. 2016).

There are few existing studies of benthic community composition specifically for the Project Area and there is a considerable gap in knowledge of existing benthic communities that occur on deeper continental shelf environments and in abyssal habitats (LGL Limited 2003). Prior to drilling, Chevron will conduct an imagery-based seabed survey at the proposed well sites to confirm the presence or absence of any aggregations

of habitat-forming corals or sponges within a 500-m radius from each wellsite. The survey will provide baseline data for coral and sensitive benthic habitats that may be present.

6.1.6.1 Grand Banks Shelf

Ongoing environmental effects monitoring programs at the Terra Nova and White Rose developments on the shelf of the Grand Banks (less than 500 m depths) indicate that substrates sampled by sediment grabs are dominated by sand with lesser quantities of gravel and fines (Husky Energy 2013; Suncor Energy 2013). Polychaetes had greater than 75% relative abundance in infaunal benthic community analysis and were comprised of species in the families *Spionidae*, *Paraonidae*, *Cirratulidae*, and *Syllidae* (Husky Energy 2013; Suncor Energy 2013). Bivalves, predominantly of the family *Tellindae*, were also relatively abundant (approximately 10%) in the White Rose area (Husky Energy 2013). Other infaunal species observed with relatively low abundance (less than 10%) included amphipods, bivalves, molluscs, barnacles, and isopods.

Dominant epifaunal species have been identified by a series of experimental trawling and underwater video grabs (Prena et al. 1999; Kenchington et al. 2001) on sandy areas of the northeast Grand Banks south of the Project Area. Video grabs conducted by Kenchington et al. (2001) indicated that species with the greatest abundance included polychaetes, *Macoma* clams, and sand dollars, whereas biomass was dominated by propeller clams, sand dollars, brittle stars, *Macoma* clams, and pale sea urchins. Trawl surveys in the same location by Prena et al. (1999) captured snow crab, basket stars, and pale sea urchins in the greatest quantities. Similarly, video surveys by Schneider et al. (1987) observed brittle stars, sand dollars, Icelandic scallops, and pale sea urchins as the dominant taxa. Soft corals, whelks, and hermit crabs were also commonly captured. The available data from Canadian RV surveys are biased towards commercial invertebrate species and report snow crab mainly on the northeast shelf and slope. This species was detected at relatively low abundance (less than 1%) in comparison to total trawl catches. Shrimp species were also highly represented in the Canadian RV trawl surveys (approximately 85% total abundance). Of the species observed on the Grand Banks, sand dollars and brittle stars appear to be the dominant benthic invertebrates within the region (Table 6.1).

6.1.6.2 Grand Banks Slope

The slopes of the Grand Banks have similar species assemblages to the slopes of the Flemish Cap. The sponges *Tentorium semisuberites* and *Polymastia uberrima* are characteristic species from the continental shelf to 650 to 700 m depth along the slopes of the Grand Banks south of the Project Area. Along sandy and clay silt bottoms between 620 to 1,400 m depth there were no characteristic species because the area has been exposed to commercial trawling and exhibits relatively low species diversity. Sponge species, mainly from the order *Astrophorida*, are dominant on bottoms comprised of sand, silt and clay from 700 to 1,400 m depths and corresponds with relatively high average species richness (Table 6.2).

Table 6.1 Dominant Invertebrate (abundance and biomass) Species Representative of the Grand Banks Shelf

Depth Zone	Survey Type	Common Name	Scientific Name	Total Abundance (No./m²)	Contribution to Survey
Shelf / Slope Edge 70-100 m	Photograph Survey[1]	Brittle star	Ophiuroidea (O)	0.40	25.2%
		Sand dollar	*Echinarachnius parma*	0.39	24.6%
		Icelandic scallop	*Chlamys islandica*	0.37	23.0%
		Pale sea urchin	*Strongylocentrotus pallidus*	0.27	16.9%
		Whelk	Buccinidae (F)	0.04	2.8%
		Crab	Majidae (F)	0.04	2.5%
		Polychaete	Sabellidae (F)	0.02	1.2%
Depth Zone	**Survey Type**	**Common Name**	**Scientific Name**	**Mean Abundance (#/0.5 m²)**	**Contribution to Survey**
Shelf / Slope Edge 120-146 m	Benthic grab[2]	Polychaete	*Prionospio steenstrupi*	175	15.2%
		Polychaete	*Chaetozone setosa*	99	8.6%
		Polychaete	*Spio filicornis*	89	7.8%
		Polychaete	*Nothria conchylega*	nr	-
		Amphipod	*Priscillina armata*	nr	-
		Chalky macoma	*Macoma calcarea*	nr	-
		Sand dollar	*Echinarachnius parma*	nr	-
Depth Zone	**Survey Type**	**Common Name**	**Scientific Name**	**Mean Biomass (mg/0.5 m²)**	**Contribution to Survey**
Shelf / Slope Edge 120-146 m	Benthic grab[2]	Propeller clam	*Cyrtodaria siliqua*	nr	-
		Sand dollar	*Echinarachnius parma*	155,283	-
		Brittle star	*Ophiura sarsi*	nr	-
		Chalky macoma	*Macoma calcarea*	nr	-
		Pale sea urchin	*Strongylocentrotus pallidus*	nr	-

Table 6.1 Dominant Invertebrate (abundance and biomass) Species Representative of the Grand Banks Shelf

Depth Zone	Survey Type	Common Name	Scientific Name	Mean Biomass (g/m²)	Contribution to Survey
Shelf / Slope Edge 120-250 m	Trawl[4]	Sand dollar	*Echinarachnius parma*	257.7	65.0%
		Brittle star	*Ophiura sarsi*	74.0	18.7%
		Pale sea urchin	*Strongylocentrotus pallidus*	34.7	8.7%
		Boreal astarte	*Astarte borealis*	6.8	1.7%
		Snow crab	*Chionoecetes opilio*	7.2	1.8%
		Soft coral	*Gersemia sp.*	2.6	0.6%
Depth Zone	**Survey Type**	**Common Name**	**Scientific Name**	**No. of Trawls present**	**Contribution to Survey**
Shelf / Slope Edge 150-250 m	Trawl[3]	Sand dollar	*Echinarachnius parma*	55	31.3%
		Green sea urchin	*Strongylocentrotus droebachiensis*	34	19.3%
		Hydrozoan	*Sertularia fabricii*	20	11.4%
		Hydrozoan	*Thuiaria thuja*	14	8.0%

Notes:
Adapted from [1]Schneider et al. (1987); [2]Kenchington et al. (2001); [3]Murillo et al. (2016) and [4]Prena et al. (1999)
nr: not reported.
Number of trawls present is based on 176 trawls of the Flemish Cap and indicates presence among total number of trawls (Murillo et al. 2016).
Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey.
Taxonomic groups: Order (O), Family (F)

Table 6.2 Dominant Invertebrate Species Representative of the Slopes of the Grand Banks

Depth Zone	Survey Type	Common Name	Scientific Name	No. of Trawls present	Contribution to Survey
Shelf / Slope Edge 250-700 m	Trawl	Sponge	*Polymastia uberrima*	21	11.9%
		Sponge	*Tentorium semisuberites*	17	9.7%
Shelf / Slope Edge 700-1,400	Trawl	Sponge	*Stryphnus fortis*	20	11.4%
		Sponge	*Geodia parva-phlegraei*	10	5.7%
		Sponge	*Craniella cranium*	12	6.8%
		Sponge	*Geodia barretti*	9	5.1%
		Sponge	*Stelletta normani*	9	5.1%

Notes:
Data adapted from Murillo et al. (2016).
Number of trawls present is based on 176 trawls of the Flemish Cap and indicates presence among total number of trawls.
Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey.

6.1.6.3 Flemish Pass and Flemish Cap

Benthic community structure of the Flemish Pass and Flemish Cap, including Sackville Spur (less than 2,000 m), has been surveyed through commercial bycatch logs and NAFO scientific trawling (Murillo et al. 2012, 2016; Vàzquez et al. 2013), and the NAFO Potential Vulnerable Marine Ecosystems-Impacts of Deep-sea Fisheries (NEREIDA) research survey program using camera stations and scientific trawls (Barrio Froján et al. 2012; Beazley et al. 2013a; Beazley and Kenchington 2015; Greenan et al. 2016). Murillo et al. (2016) modelled the substrate based on box corer sediment sampling data from the area. The Flemish Cap is predominantly covered in sand and silty sand with areas of gravel, becoming increasingly covered in silty sand along the slopes (200 to 500 m). In deeper areas (500 to 2,000 m) of the Flemish Cap and Pass, the substrate is increasingly silty-clay or mud (Murillo et al. 2012; 2016).

The highest diversity of species on the Flemish Cap was observed between 500 and 1,000 m depths, with corals and sponges as the most dominant trawl-captured taxa, followed by echinoderms, arthropods, and molluscs (Vàzquez et al. 2013; Murillo et al. 2016). Nesis (1970) also observed increasing biomass with increasing depth up to 1,500 m. Comparisons of invertebrate species to environmental parameters allowed for the identification of species groupings at varying depths. At relatively shallow depths (less than 500 m) where there were relatively colder waters, widely occurring species included sponges, crustaceans, sea anemones and sea stars (Nesis 1970; Murillo et al. 2016). Along the slopes between 500 and 900 m depth, benthic assemblages were typified by a variety of coral species including black corals, cup corals, sea pens, soft corals and gorgonian corals (Table 6.3). The latter areas also had the highest average species richness of the area. Benthic assemblages along the silty-sand lower slope areas at 800 to 1,200 m depths were characterized by echinoderms and sea pens (Murillo et al. 2016). The natural communities along the northern edge of the Flemish Cap (620 to 1,400 m) could not be characterized for coral, sponge, and other deep-sea species because the area has been exposed to higher commercial trawling and exhibits relatively low species diversity. Further north along the Flemish Cap is the Sackville Spur which is a high-density area for deep-sea (1,000 to 1,700 m) sponge assemblages that are associated with high species richness and maximum bottom currents (Knudby et al. 2013; Barrio Froján et al. 2015; Beazley and Kenchington

2015; Murillo et al. 2016). Beazley and Kenchington (2015) identified 283 species in the Sackville Spur area, with sponges, echinoderms and cnidarians having the greatest diversity of species in the area. Infaunal sampling in the same areas by Barrio Froján et al. (2015) identified polychaetes, nematodes, brittle stars, sponges, and hydrozoans as characteristic species. Beazley and Kenchington (2015) noted that the benthic invertebrate community changed along the depth gradient, with the greatest changes occurring at 1,600 to 1,700 m associated with maximum abundances of structure-forming sponges.

Table 6.3 Dominant Invertebrate Species Representative of the Flemish Cap

Depth Zone	Survey Type	Common Name	Scientific Name	No. of Trawls present	Contribution to Survey
Shelf / Slope Edge <200 m	Trawl[1]	Demosponge	*Iphon piceum*	74	42.0%
		Crustacean	*Sabinea sarsii*	37	21.0%
Shelf / Slope Edge 200-340 m	Trawl[1]	Sea star	*Ceramaster granularis*	63	35.8%
		Subarctic sea anemone	*Hormathia digitata*	39	22.2%
Shelf / Slope Edge 300-500 m	Trawl[1]	Sea star	*Brisaster fragilis*	28	15.9%
		Sea star	*Ctenodiscus crispatus*	15	8.5%
Middle Slope 500-900 m	Trawl[1]	Cup coral	*Flabellum alabastrum*	43	24.4%
		Soft coral	*Heteropolypus sol*	41	23.3%
		Sea pen	*Funiculina quadrangularis*	39	22.2%
		Small gorgonian coral	*Acanella arbuscula*	29	16.5%
		Black coral	*Stauropathes artica*	23	13.1%
Middle-Deep Slope 800-1,200 m	Trawl[1]	Sea pen	*Anthoptilum grandiflorum*	75	42.6%
		Sea urchin	*Phormosoma placenta*	44	25.0%
		Sea pen	*Halipteris finmarchica*	40	22.7%
		Sea pen	*Funiculina quadrangularis*	39	22.2%
		Sea pen	*Pennatula aculeata*	25	14.2%
		Sea star	*Bathybiaster vexillifer*	15	8.5%
		Sea star	*Zoroaster fulgens*	11	6.3%
Middle-Deep Slope 700-1,400 m	Trawl[1]	Sponge	*Stryphnus fortis*	20	11.4%
		Sponge	*Geodia parva-phlegraei*	10	5.7%
		Sponge	*Craniella cranium*	12	6.8%
		Sponge	*Geodia barretti*	9	5.1%
		Sponge	*Stelletta normani*	9	5.1%

Table 6.3 Dominant Invertebrate Species Representative of the Flemish Cap

Depth Zone	Survey Type	Common Name	Scientific Name	No. of Trawls present	Contribution to Survey
Deep Slope 1,000-1,700 m	Video survey[2]	Sea cucumber	*Psolus* sp.	nr	22.4%
		Brittle star	Ophiuroidea (C)	nr	11.8%
		Brittle star	Ophiuroidea sp. 1	nr	12.8%
		Foraminiferid	Foraminiferida sp 1	nr	4.8%
		Brittle star	*Ophiacantha anomala*	nr	3.9%
		Sponge	Porifera (P)	nr	3.2%
		Demosponge	*Hexadella dedritifera*	nr	4.3%

Notes:
Adapted from [1]Murillo et al. (2016) and [2]Beazley and Kenchington (2015).
Number of trawls present is based on 176 trawls of the Flemish Cap and indicates presence among total number of trawls (Murillo et al. 2016).
Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey (nr = no trawls recorded).
Taxonomic group: Class (C); Phylum (P)

Epifaunal communities of the Flemish Pass were characterized during the NEREIDA program where Beazley and Kenchington (2015) identified 527 species from 400 to 1,400 m depths. Sponges and cnidarians represented the highest number of taxa followed by arthropods, echinoderms, and molluscs (Table 6.4, Beazley and Kenchington 2015). Murillo et al. (2011) characterized coral distributions for the Grand Banks beyond the Canadian EEZ and observed that soft corals, gorgonian corals, sea pens, and black corals were characteristic species for the Flemish Pass. For deep areas of the Flemish Pass and Flemish Cap, habitat complexity decreases with depth with higher prevalence of mud substrates. The presence of structure-forming sponges and corals is key to supporting benthic communities (Beazley et al. 2013) because they provide habitat, refuge and foraging areas for a variety of species. Echinoderms, specifically, suspension feeding brittle stars, are highly responsive to presence of structure-forming sponge grounds (Beazley et al. 2013; Beazley and Kenchington 2015). In the Flemish Pass, this is evidenced by the shift in benthic communities (between 1,000 to 1,300 m) that corresponds to a distinct change in the density of sponges.

Table 6.4 Dominant Invertebrate Species Representative of the Flemish Pass

Depth Zone	Survey Type	Common Name	Scientific Name	Total Abundance	Contribution to Survey
Middle-Deep Slope 400-1,400 m	Photograph survey	Sponges	Porifera (P)	11,091	37.2%
		Echinoderms	Echinodermata (P)	6,983	23.4%
		Cnidarians	Cnidaria (P)	3,019	10.1%
		Arthropods	Arthropoda (P)	2,152	7.2%
		Chordates	Chordata (P)	1,973	6.6%
		Annelids	Annelida (P)	1,145	3.8%
		Ectoprocts	Ectoprocta (P)	512	1.7%
		Molluscs	Mollusca (P)	483	1.6%
		Brachiopods	Brachiopoda (P)	362	1.2%
		Unidentified	Unidentified	2,072	6.9%
Middle-Deep Slope 400-1,400 m	Photograph survey	Sponges	Porifera (P)	182	34.5%
		Cnidarians	Cnidaria (P)	93	17.6%
		Arthropods	Arthropoda (P)	35	6.6%
		Echinoderms	Echinodermata (P)	34	6.5%
		Molluscs	Mollusca (P)	24	4.6%
		Chordates	Chordata (P)	12	2.3%
		Annelids	Annelida (P)	9	1.7%
		Ectoprocts	Ectoprocta (P)	8	1.5%
		Brachiopods	Brachiopoda (P)	2	0.4%
		Unidentified	Unidentified	120	22.8%

Notes:
Adapted from Beazley et al. 2013.
Total abundance is for 293 m² surveyed.
Contribution to survey: Reported percentage of total abundance, biomass, or trawl presence in the survey.
Taxonomic group: Phylum (P)

6.1.6.4 Corals and Sponges

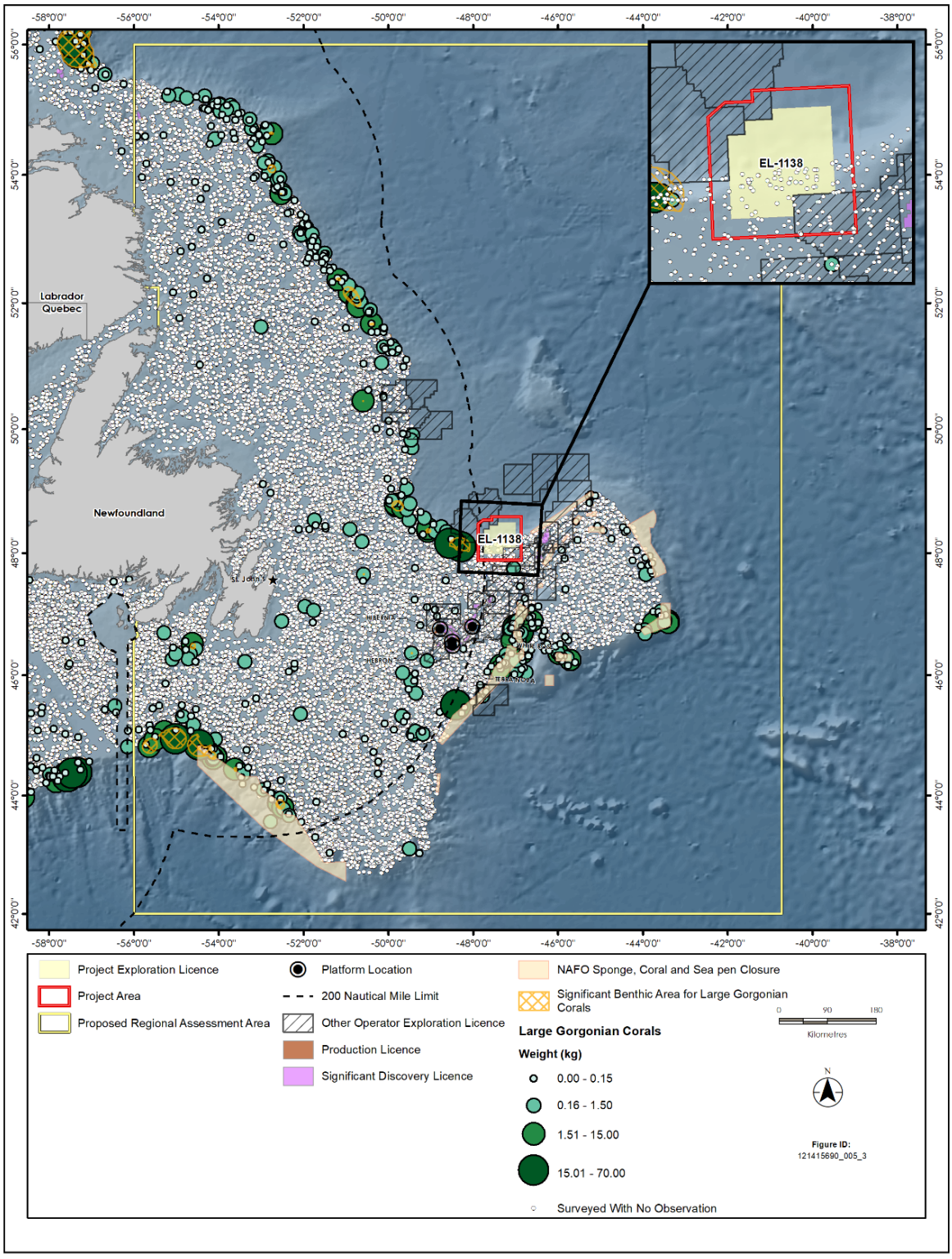
Cold-water corals and sponges are sessile benthic invertebrates that are an important component of benthic ecosystems by providing habitat for other species of invertebrates and fishes (Buhl-Mortensen and Mortensen 2005; Buhl-Mortensen et al. 2010). Studies which have looked at species interactions with cold-water corals and their associated fauna have shown evidence that cold-water corals are as ecologically important as shallow-water systems by providing structurally complex habitat for a variety of marine species (Krieger and Wing 2002; Roberts et al. 2009; Buhl-Mortensen et al. 2010; Watling et al. 2011). Cold-water corals found on continental margins provide resting, feeding, and spawning sites for other species (Costello et al. 2005; Buhl-Mortensen et al. 2010; Watling et al. 2011), including commercially important species (Baillon et al. 2012). Different species of cold-water corals provide habitats of varying physical size and life spans (Roberts et al. 2009). For example, gorgonians can grow close together and form dense forest-like

habitats, sea pens may occur in aggregations known as sea pen meadows, while other species (e.g., scleractinian cup corals) are solitary (Colpron 2016).

Due to the sessile and fragile nature of corals and sponges, they are considered vulnerable to habitat disturbances such as bottom trawling. Disturbances to the seabed may also disrupt the habitat complexity created by deceased sponge and coral structures that support other benthic invertebrate species (Barrio Froján et al. 2012). Sponges are a major component of sessile benthic communities in temperate as well as polar and tropical habitats and have several functional roles in marine ecosystems, such as filtering large quantities of water and acting as a major link between benthic and pelagic environments (Bell et al. 2008). Sponges are primarily suspension feeders and obtain most of their food and nutrients from filtering the water. As a consequence of their ecological importance and environmental sensitivity, many coral and sponge grounds are designated as Ecologically and Biologically Significant Areas (EBSA) or Vulnerable Marine Ecosystems (VMEs) and are closed to fishing activities, including areas on the Northeast Shelf and Slope EBSA, the Sackville Spur, the Flemish Cap, and the Flemish Pass (Barrio Froján et al. 2012; Guijarro et al. 2016; Murillo et al. 2016) (refer to Section 6.4 – Special Areas for more details).

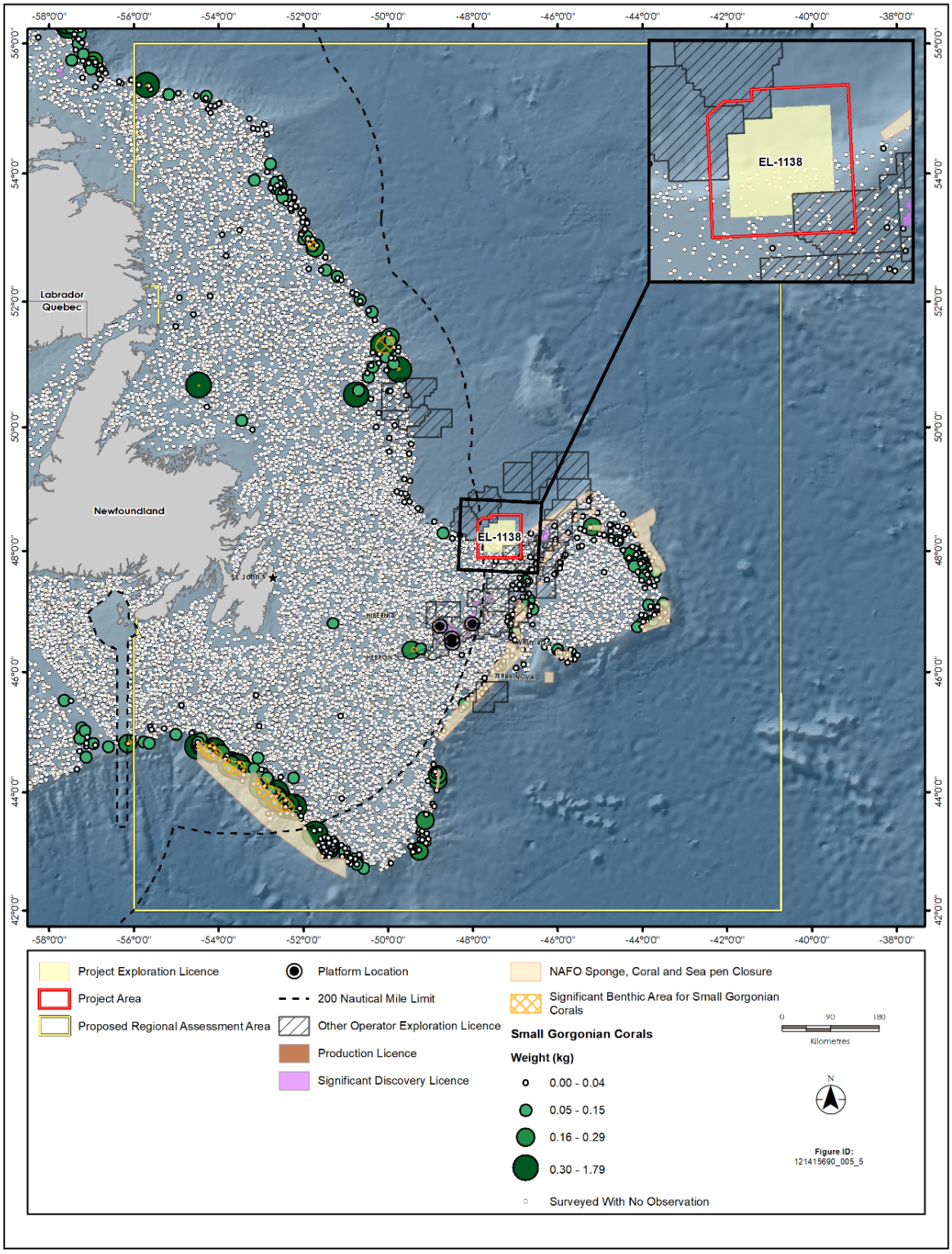
Bottom trawling and video surveys have identified over 50 species of corals and sea pens along the shelf of the Flemish Cap, Flemish Pass and northeast slope of the Grand Banks (Wareham 2009; Murillo et al. 2011; Beazley et al. 2013, Vàzquez et al. 2013; Baillon et al. 2014a, 2014b; Beazley and Kenchington 2015). Modelling of coral distributions against environmental parameters indicated that depth was the greatest predictor for coral presence (Guijarro et al. 2016). Within the Project Area, coral biomass is mainly distributed along the slopes of the Flemish Pass, Flemish Cap, and Grand Banks with fewer observations on the Grand Banks Shelf and on top of the Flemish Cap (Murillo et al. 2011). Coral biomass was highest between 600 and 900 m along the northern Flemish Cap, Flemish Pass, and northeast Grand Banks Shelf and was associated with warm, more saline waters with silty sand substrates (Murillo et al. 2011; Murillo et al. 2016). These environmental conditions may support primary production and food supply levels, which are important predictive factors of coral biomass (Guijarro et al. 2016). There have been several studies that have compared oceanographic conditions (such as temperature) to known coral distributions to assess environmental tolerances for cold water corals and predict coral distributions (Daives et al. 2008; Tittenson et al. 2009; Guinotte and Davies 2014). For example, *Lophelia pertusa* has been found in water temperatures ranging from 4°C to 12°C with a mean temperature of 6.2°C to 6.7°C. Other studies have found that *Alyconiina*, *Antipatharia*, *Calcazonia*, and *Scleractinia* corals are in water temperatures ranging from 1.5°C to 8°C (Guinotte and Davies 2014). These studies have found, however, that the most important such factor in determining habitat suitability is aragonite saturation (at least for hard corals) and oxygen concentrations (Tittenson et al. 2009).

Information on benthic community composition in and around the Project Area is derived primarily from DFO RV Surveys (inside the Canadian EEZ), and Spanish and European Union (EU) fleet RV surveys (outside the EEZ) presented in Kenchington et al. (2018). The data set indicates results (weight caught) from the RV survey trawls for 2002 to 2015 and indicate the following groups of species: large gorgonian coral, small gorgonian coral, sea pens, and sponges (see Figures 6-5 to 6-8). Significant benthic areas (SBAs) (i.e., areas where there is a high concentration of biomass) for large gorgonian corals, small gorgonian corals, and sea pens exist within the region. The Project Area contains small numbers of sea pens and sponges, but no corals were observed in the RV trawls.



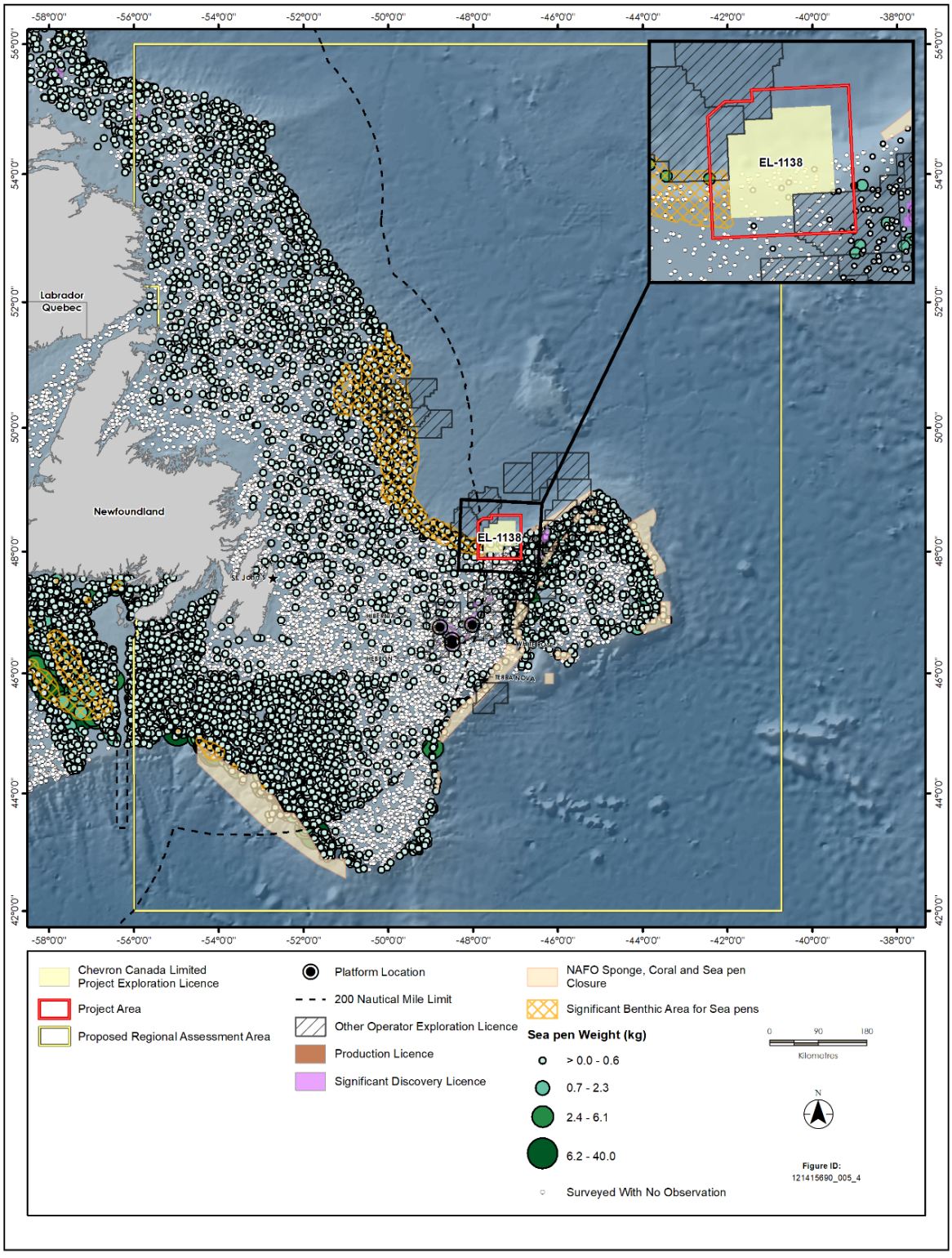
Source: Kenchington et al. (2018)

Figure 6-5 Distribution of Large Gorgonian Corals within the Project Area and RAA



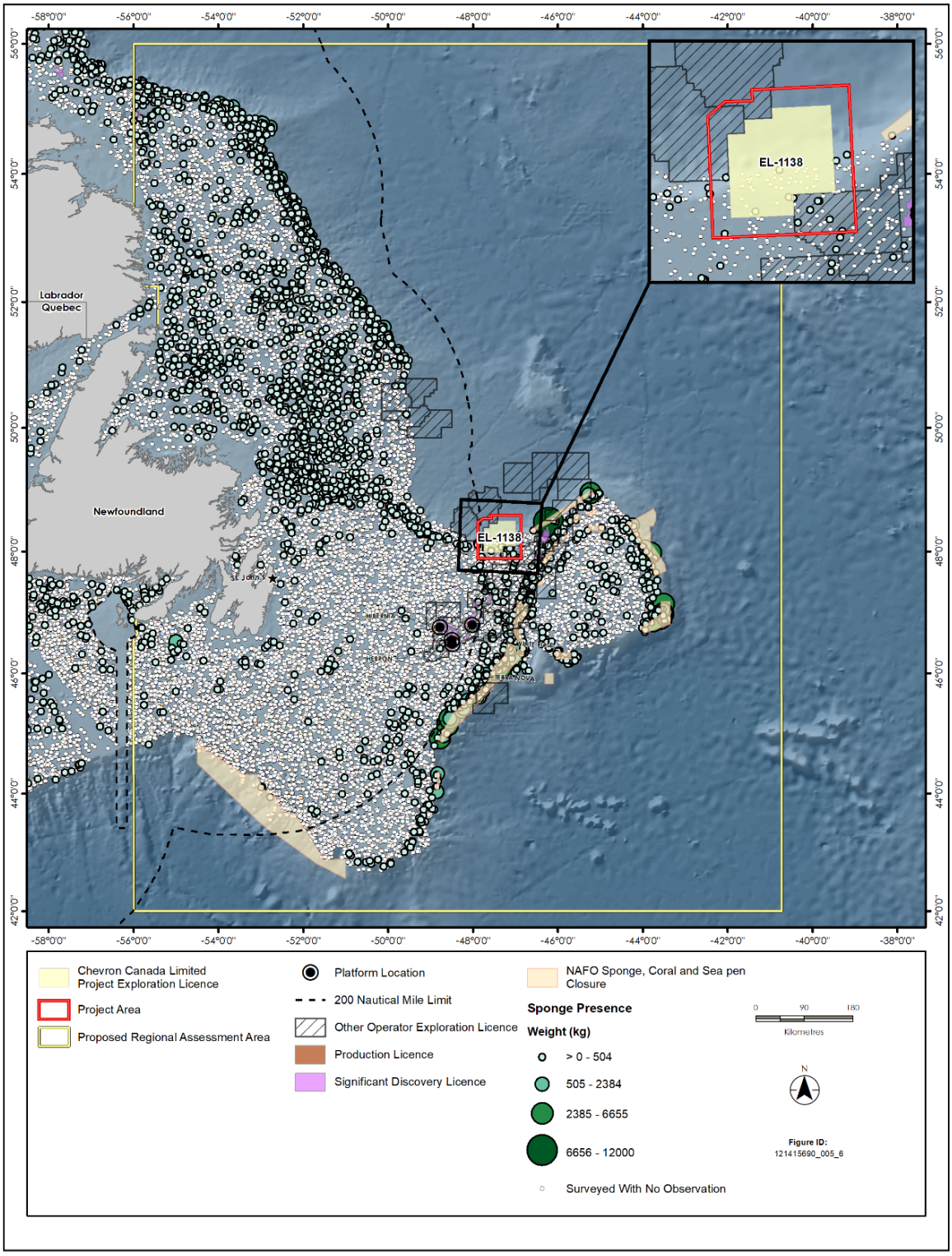
Source: Kenchington et al. (2018)

Figure 6-6 Distribution of Small Gorgonian Corals within the Project Area and RAA



Source: Kenchington et al. (2018)

Figure 6-7 Distribution of Sea Pens within the Project Area and RAA



Source: Kenchington et al. (2018)

Figure 6-8 Distribution of Sponges within the Project Area and RAA

Although coral distributions are present within the Project Area, there are few observations in deeper waters within the northern section of the Project Area (Gates et al. 2008; Beazley et al. 2013). The lower number of observations at these water depths is likely due to lack of surveys in these areas rather than low coral distribution. Modelled distributions are also not considered reliable at these depths (Guijarro et al. 2016) due to the differences in environmental parameters between shelf and deep areas and lack of observations to verify distributional model predictions. For areas where little information exists on coral distribution, the operator is committed to undertaking a pre-drill coral survey in advance of a drilling campaign, to collect data regarding corals in the areas of a potential wellsite.

6.1.7 Finfish (Demersal and Pelagic Species)

Outside Canada's EEZ, groundfish and benthic invertebrates are managed by NAFO.

The bottom or demersal species which inhabit the continental slope and abyssal habitats in the vicinity of the Project Area are not yet well studied. These species typically have life history traits of late maturation, long life-spans, low reproductive rates, and slow growth which leave them sensitive to habitat and population disturbances (Devine et al. 2006, Baker et al. 2012). Emerging continental slope fisheries for grenadier, Greenland halibut, and redfish are resulting in additional pressures for other continental slope species found within the Project Area such as blue hake, roughhead grenadier, roundnose grenadier, skate species, and synaphobranchid (cutthroat) eels (Devine et al. 2006).

Pelagic species are generally either: resident pelagic species (e.g., capelin and lanternfish) or migratory pelagic species (e.g., tunas, swordfish, and several shark species). Resident species generally complete their life histories within the cold northern waters and, in many cases, are well-represented in the DFO RV survey data. In contrast, migratory pelagics are typically large-bodied predators that seasonally migrate from temperate areas into northern waters to feed. During their northern migrations, these migratory species typically remain in the waters of the Gulf Stream (Walli et al. 2009; Vandeperre et al. 2014), and therefore would be expected to be at relatively low abundance in the Project Area.

Table 6.5 summarizes the key fish species from the 2007-2017 Canadian RV survey sets collected within the Project Area and RAA. The species list is primarily determined using the DFO RV surveys. The RV surveys include sampling for fish and invertebrates using a bottom otter trawl. These surveys are the primary data source for monitoring trends in species distribution and abundance of finfish in the region. Finfish species at risk (SAR) and species of conservation concern (SOCC) are discussed in Section 6.1.8. Figures illustrating the distribution of commercial species are presented in Section 7.2.

The 2007 to 2018 DFO RV (DFO 2018a) survey data were analyzed for the Project Area and RAA. The results of the RV survey indicate deepwater redfish, lanternfishes (not identified to species), roughhead grenadier, blue hake, common grenadier, longnose eel, Greenland halibut, and Atlantic cod make up 99.5% of the catch by count within the Project Area. High level life habitat preferences and species ecology are summarized in Table 6.5. Additional general life history, diet, and distribution information on these and other species is available in the Eastern Newfoundland SEA (AMEC 2014). Distribution of the eight most abundant fish species in the Project Area are shown in Figures 6-9 to 6-16.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Abyssal skate	*Raja bathyphila*	• Found at depths ranging from 600-2,300 m. • Oviparous species, lays paired eggs with horn-like projections on the shell. • Length of up to 90 cm.
Agassiz's slickhead	*Alepocephalus agassizii*	• Found at depths ranging from 600-2,500 m. • Approximately 70 m in length but can grow up to 120 cm. • Feeds on ctenophores, crustaceans, echinoderms, and polychaetes.
American plaice[1]	*Hippoglossoides platessoides*	• Benthic flatfish that occurs along the continental shelves on both sides of the North Atlantic. • Settled juveniles prefer depths of 100-200 m. • Adults typically prefer depths of 100-300 m, but have been found as deep as 1,400 m. • Spawning occurs on the Newfoundland Shelf in April or May. • Commercially important.
American shad	*Alosa sapidissima*	• Range in length from 38 to 48 cm. • Anadromous species, returning to freshwater streams to spawn. • They feed on plankton, copepods, mysids, and small fishes.
Atlantic argentine	*Argentina silus*	• Found at depths ranging from 140-1,440 m. • Can reach lengths of up to 70 cm. • Spawns from April to July.
Atlantic cod[1]	*Gadus morhua*	• Atlantic cod inhabit all waters overlying the continental shelves of the Northwest and the Northeast Atlantic Ocean. • Occurs in offshore waters (typically at depths less than 500 m), can also be found throughout the coastal, inshore waters. • Broadcast spawner. • Known to spawn extensively throughout the inshore, nearshore, and offshore waters from April to October. • Northeast Newfoundland Shelf cod migrate from offshore waters to inshore coastal waters in spring and may to spawn inshore. • Eggs and larvae present in the upper water column (10 to 50 m). • Mature slower in Newfoundland Shelf, eastern Labrador and Barents Sea; mature later than more southern population. • Commercial species harvested by several countries.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Atlantic hagfish	*Myxine glutinosa*	• Found at depths ranging from 20-1,200 m. • Prefer muddy bottom habitats where they bury in the mud. • Feeds predominantly on dead and dying fish.
Atlantic herring	*Clupea harengus*	• Female herring can produce 30,000 to 200,000 eggs per spawning season. • Eggs are deposited on rock, gravel, or sand substrates. They hatch in approximately 7 to 10 days. • They reach sexual maturity at age 4.
Arctic skate	*Amblyraja hyperborea*	• Found at depths ranging from 140-2,500 m. • Oviparous species, lays paired eggs with stiff pointed horns at the corners. • Feeds on benthic species.
Argentines	*Argentinidae*	• Family of approximately 27 marine fish species. • Known to form schools near the ocean floor. • Primarily feed on plankton.
Baird's slickhead	*Alepocephalus bairdii*	• Found at depths ranging from 365-1,700 m. • Can reach lengths of up to 100 cm. • Feed primarily on coelenterates as well as decapods, tunicates, and other fishes.
Barndoor skate	*Dipturus laevis*	• Can be found at depths up to 750 m. • They feed on bivalve mollusks, squid, rock crabs, lobsters, shrimps, worms, and fishes. • Oviparous species, lays paired eggs with stiff pointed horns at the corners.
Barracundinas	*Paralepididae*	• Some species may reach up to 1 m in length. • Found worldwide.
Bigelow's skate	*Rajella bigelowi*	• Found at depths ranging from 650-4,156 m. • Oviparous species, lays paired eggs with stiff pointed horns at the corners. • Can reach lengths of up to 55 cm.
Black dogfish	*Centroscyllium fabricii*	• Found at depths ranging from 275-1,600 m. • The average size is 60-75 cm with a maximum of 84 cm. • They feed primarily on cephalopods, pelagic crustaceans, jellyfish, and small redfish. • Ovoviviparous species with the fertilized eggs developing internally.
Black herring	*Bathytroctes sp.*	• Genus of deepwater marine fish species known as "slickheads". • Little information available on this genus, see Baird's slickhead for species specific details.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Blacksmelts	*Bathylagus sp.*	• Deep water species, found at depths ranging from depth range 500-3,237 m. • Both eggs and larvae are pelagic. • Blacksmelt feed on small crustaceans.
Blue hake	*Antimora rostrata*	• Blue hake are found in deep waters, sometimes at depths of approximately 3,000 m. • Females typically reach 75 cm, while males may grow to approximately half that length.
Bluntsnout slickhead	*Xenodermichthys copei*	• Found at depths ranging from 100-2,650 m. • Feeds primarily on crustaceans as well as ostracods and small cephalopods. • Can reach lengths of 31 cm.
Boa dragonfish	*Stomias boa ferox*	• Typically found at depths ranging from 20-800 m. • They are a mesopelagic species that lives at depths greater than 500 m during daylight and migrate to the upper 200 m at night. • Primarily feeds on mid-water fishes and crustaceans. • Oviparous species.
Capelin	*Mallotus villosus*	• Capelin exhibit sexual dimorphism during the spawning season. Males develop darker heads and back and their pectoral, pelvic, and anal fins are well-developed in comparison to females. Males also develop a row of elongated scales just above the lateral line on either side of the body, known as spawning ridges. • Adult capelin range from 13-20 cm in length. • Capelin can weigh up to 45 g and their life expectancy is approximately 5 years.
Catshark	*Scyliorhinidae*	• One of the largest family of sharks. • Feeds primarily on invertebrates and small fishes. • Can be found at depths greater than 2,000 m.
Chimaeras	*Chimaeriformes*	• Order of cartilaginous fish species. • Can reach lengths of up to 1.5 m.
Common grenadier	*Nezumia bairdi*	• The common grenadier feeds primarily on euphausiids, amphipods, and polychaetes. • Typically found at depths ranging from 90-700 m.
Deepwater catshark	*Apristurus profundorum*	• Found at depths ranging from 1,100-1,750 m. • Oviparous; eggs are laid in pairs.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Deepwater redfish	*Sebastes mentella*	• Generally live at depths from 350-500 m. • Larvae prefer surface waters, where they feed on copepods and fish eggs. • Slow growth and long lifespan; they can live up to 75 years. • Ovoviviparous, females keep their fertilized eggs inside their brood chamber until the larvae have hatched. • Larvae are released between the end of spring to early summer.
Deepwater skate	*Raja fyllae*	• Found at depths ranging from 170-2,050 m. • Feeds on benthic invertebrates. • Oviparous species; eggs are oblong capsules with stiff pointed horns.
Eelpout	*Lycodes sp.*	• Eel-like appearance with elongated bodies and the dorsal and anal fins continuous with the caudal fin. • Bottom-dwelling species.
Goitre blacksmelt	*Bathylagus euryops*	• Typically found at depths ranging from 500-3,237 m. • Their eggs and larvae are pelagic. • They feed primarily on crustaceans.
Greenland argentine	*Nansenia groenlandica*	• Can be found at depths up to 1,400 m. • Spawns in the spring and early summer.
Greenland halibut	*Reinhardtius hippoglossoides*	• They prefer cold temperatures and softer substrates consisting of mud and sandy mud. • They grow to more than a metre in length and weigh more than 10 kilograms, and can live more than 20 years.
Greenland shark	*Somniosus microcephalus*	• The Greenland shark typically prefers deep waters where it is commonly found at depths greater than 200 m. They can be found closer to the surface during the winter months. • They are a slow growing species, with adults ranging in length from 3.5-5 m. • The Greenland shark feeds on fish species such as capelin, char, halibut, herring, lumpfish and salmon as well as marine mammals.
Hagfishes	*Myxiniformes*	• Eel-shaped order of fishes. • Their bodies produce slime when stressed. • Jawless fish.
Jensen's skate	*Raja jenseni*	• Found at depths ranging from 165-2,550 m. • Feeds on small fishes and crustaceans. • Oviparous species; eggs have horn-like projections on the shell.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Kaup's arrowtooth eel	*Synaphobranchus kaupii*	• Typically found between 400-2,200 m. • They are a deep-water species and prefer temperature ranges between -1°C and 10°C. • They primarily feed on Decapoda, Natantia, amphipods, but also fish and cephalopods.
Knifenose chimaera	*Rhinochimaera atlantica*	• Found at depths ranging from 200-1,500 m. • Feeds on shrimp and crabs. • Forms groups according to sex and size.
Lampreys	*Petromyzontiformes*	• Jawless fish. • Adults have a toothed, funnel-like sucking mouth. • Several species in this order are considered parasitic carnivorous species.
Lanternfish	Myctophidae	• Many species of lanternfish exhibit diurnal migration. During the day they are found at depths between 300 and 1,200 m, while at night they are found between 10 and 100 m. • Common prey species for fish and marine mammals.
Large scale tapirfish	*Notacanthus nasus*	• Typically found at depths ranging from 128 to 1,000 m. • They feed primarily on sea anemones.
Little skate	*Leucoraja erinacea*	• Typically found at depths less than 111 m, although they have been found at depths up to 329 m. • Feeds primarily on decapod crustaceans and amphipods but also eats polychaetes, isopods, mollusks, and fishes. • Reaches lengths of 53-59 cm.
Longfin hake	*Urophycis chesteri*	• Typically found at depths ranging from 360-800 m. • Primarily feeds on crustaceans but also on molluscs and fish.
Longnose chimaera	*Harriotta raleighana*	• Found at depths ranging from 200-3,100 m. • Feeds predominantly on shellfish and crustaceans. • Can reach lengths of up to 120 cm.
Manta rays and devilfishes	*Mobulidae*	• Open ocean family of manta rays and devilfishes. • Range of diet including mollusks, crustaceans, and plankton. • Ovoviviparous.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Northern wolffish[1]	*Anarhichas denticulatus*	• The Northern wolffish inhabits boreal and subarctic waters on both sides of the North Atlantic and in the Arctic. • It is most abundant on the shelf off northeastern Newfoundland and in the Labrador Sea, with highest densities at temperatures between 2 and 5 °C. • Found between 38-1,504 m, but mainly between 500-1,000 m. • Spawns September through November • Larvae and young of the year are pelagic.
Portuguese shark	*Centroscymnus coelolepis*	• Found at depths ranging from 150-3,700 m. • Feeds on fish, cephalopods, and gastropods. • Ovoviviparous species.
Roughhead grenadier	*Macrourus berglax*	• Globally found along the continental shelf and slope in temperate to arctic waters of the North Atlantic. • In Canadian waters distributed along the continental slope and deep shelf; observed off Newfoundland and the Grand Banks. • In the trawl surveys off Newfoundland, densities tend to be highest at depths of about 500 – 1,500 m although they may inhabit depths between 200-2,000 m. • Spawning occurs in winter and early spring and may even extend over an entire year. • Spawning grounds are not certain, but they are thought to lie on the southern and southeastern slopes of the Grand Banks. • Eggs are reported to be pelagic.
Roundnose grenadier[1]	*Coryphaenoides rupestris*	• Globally found along the continental slope and mid-Atlantic ridge of the North Atlantic Ocean. • In Canadian waters, it is most abundant in the northern part of the range (Labrador and Northeast Newfoundland shelves, Davis Strait). • Its range extends beyond the 200-mile limit. • Has been reported at depths between 200 and 2,600 m, most abundant at depths greater than 800-1,000 m. • Spawning may occur along the northern Mid-Atlantic Ridge, developing eggs and larvae are transported by currents and the young settle on the continental slopes off Baffin Island, Labrador and eastern Newfoundland.
Scaled lancetfish	*Notolepis rissoi kroyeri*	• No species specific information available. • Part of the *Paralepididae* family (Barracundinas).
Sea lamprey	*Petromyzon marinus*	• Found at depths up to 1,499 m. • Jawless with a round sucker-like mouth and sharp teeth arranged in consecutive circular rows. • Anadromous species.

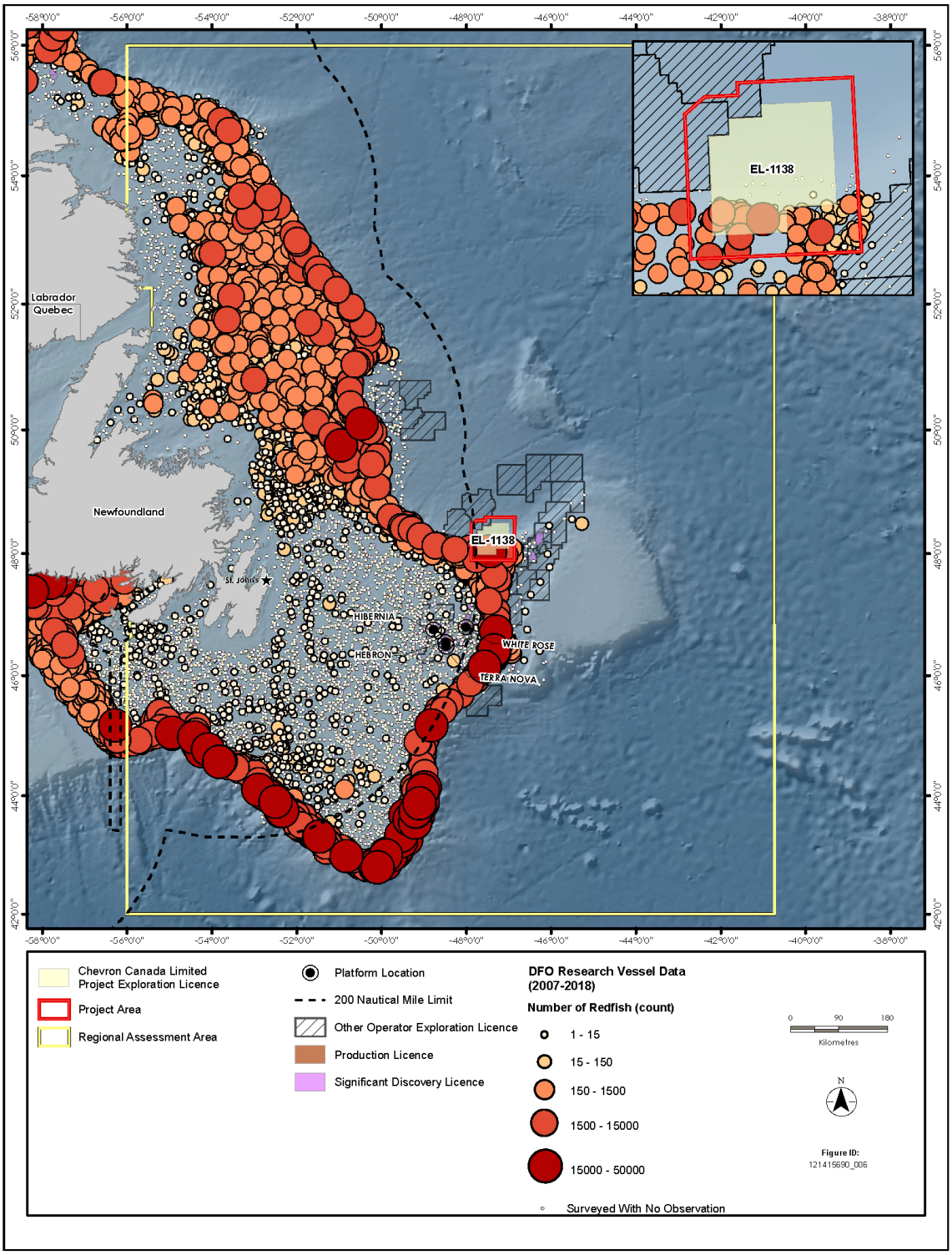
Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

Common Name	Scientific Name	Habitat and Ecology
Skate	*Rajidae*	• Family of cartilaginous fish. • Oviparous; eggs in a horny capsule with four long tips. • Feed on benthic organisms.
Slickhead	*Alepocephalidae*	• Their name comes from a lack of scales on their heads. • Deep water species, most preferring depths greater than 1,000 m.
Smalleyed rabbitfish	*Hydrolagus affinis*	• Found at depths ranging from 300-3,000 m. • Feeds on small fishes and invertebrates. • Oviparous species; egg cases are horned shells.
Smooth skate[1]	*Malacoraja senta*	• Smooth skate have been recorded at depths ranging from 25-1,436 m with, 90% of survey sets including smooth skate show occurrences between 70 and 480 m. • The densest concentrations and 90% of survey occurrences were found between 2.7 and 10°C. • Smooth skate prefer soft mud substrates consisting of silt and clay, but they have also been found on sand, shell hash, gravel, and pebble substrates.
Soft skate	*Malacoraja spinacidermis*	• In the Canadian Atlantic they have been found at depths ranging from 710-750 m. • Feeds on crustaceans. • Oviparous species.
Spiny skate	*Bathyraja spinosissima*	• Found at depths ranging from 800-2,938 m. • Oviparous; eggs in a horny capsule laid in pairs.
Spinytail skate[1]	*Bathyraja spinicauda*	• Found at depths ranging from 140-1,463 m. • Feeds on benthic organisms. • Oviparous; eggs are in oblong capsules with stiff pointed horns at the corners.
Striated argentine	*Argentina striata*	• Found at depths ranging from 100-600 m. • Prefer areas with soft substrate. • Can reach lengths of up to 24 cm.
Thorny skate[1]	*Amblyraja radiata*	• Globally found on both sides of the North Atlantic. • Distributed continuously from Baffin Bay, Davis Strait, Labrador Shelf, Grand Banks, Gulf of St. Lawrence, Scotian Shelf and Bay of Fundy to Georges Bank, over a wide range of depths. • Inhabit a wide range of depths (primarily 18-1,200 m) and typically in water temperatures of 0 to 10 °C. • Spawning appears to occur in the fall and winter. • Egg cases are often deposited on sandy or muddy flats.

Table 6.5 Key Fish Species from the 2007-2017 Canadian RV Survey Sets Collected within the Project Area and RAA

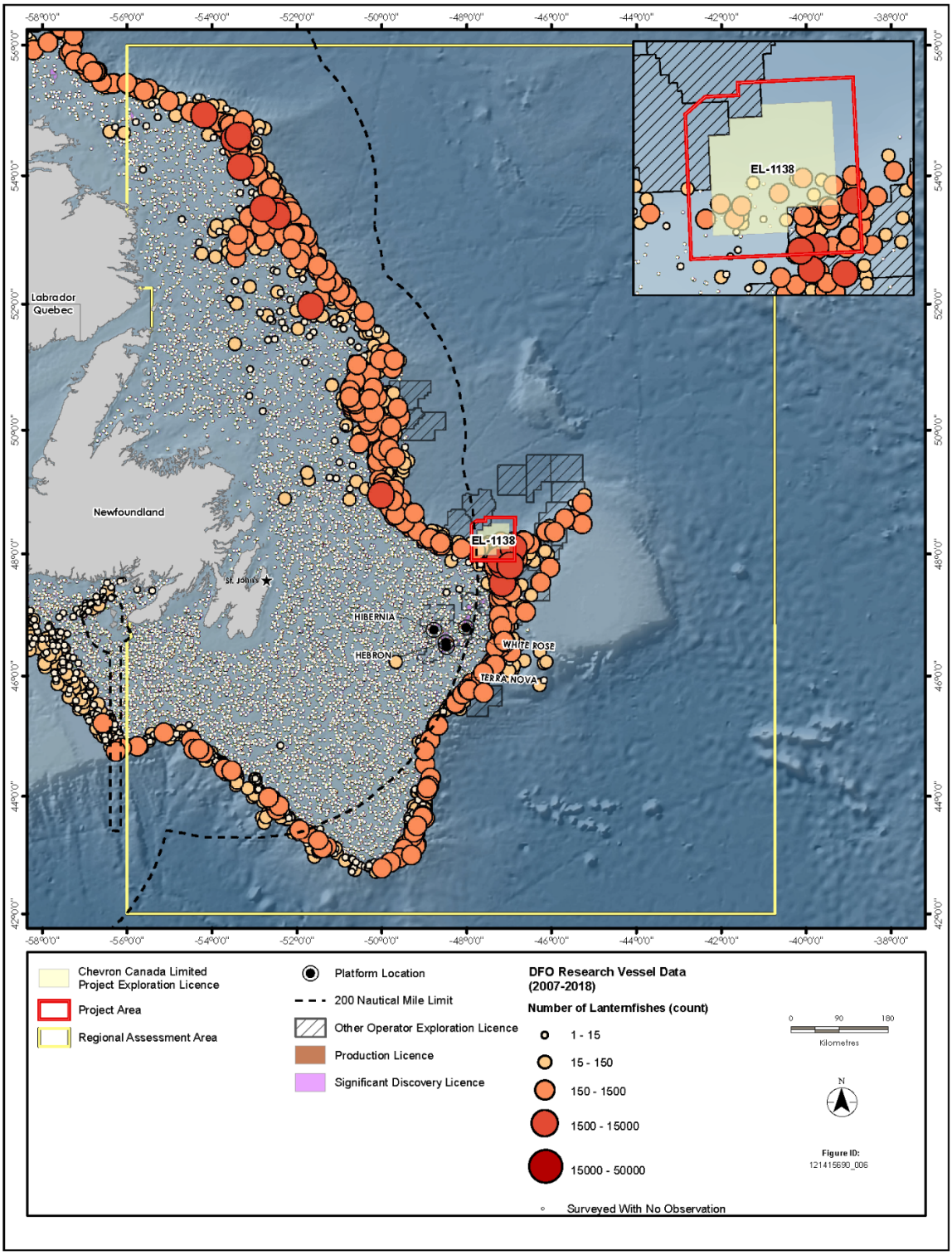
Common Name	Scientific Name	Habitat and Ecology
Threebeard rockling	*Gaidropsarus ensis*	• Found at depths up to 2,000 m. • Can reach lengths of 40 cm. • Primarily feed on crustaceans.
Thresher sharks	*Alopiidae*	• Easily recognized by their long tail. • Open ocean species, recorded at depths up to 500 m. • Feeds on pelagic schooling, squid, and cuttlefish.
Vahl's eelpout	*Lycodes vahlii*	• Deep water species; typically found between 65 and 1,200 m. • Feeds on worms, crustaceans, and molluscs.
Viperfish	*Chauliodus sloani*	• Typically found at depths between usually 494 and 1,000 m. • Feeds primarily on myctophids but also on midwater fishes and crustaceans.
White skate (Sailray)	*Raja lintea*	• Found at depths ranging from 150-1,170 m. • Feeds on benthic organisms. • Oviparous; eggs are laid in pairs.
Winter skate[1]	*Leucoraja ocellata*	• In Atlantic Canadian waters they have been recorded at lengths up to 109 cm. • Found at depths up to 371 m, though prefers depths less than 111 m. • Slow growing and late to mature.
Witch Flounder	*Glyptochepalus cynoglossus*	• Witch flounder prefer depths of 100 to 400 m, although they have at depths up to 1,600 m. • They are a bottom dwelling species and prefer soft substrates (e.g., sand, clay, mud). • Their primary food source is worms, though they do supplement with other benthic invertebrates (e.g., crustaceans, molluscs).

Sources:
AMEC 2014; Baker et al. 2012; COSEWIC 2007, 2008, 2009, 2010a, 2010b, 2010c, 2012b, 2019; DFO 2018a, 2018c; Fish Base 2019; Fossen and Bergstad. 2006.
Note:
[1]SAR or SOCC (as per NL ESA, SARA, COSEWIC or IUCN).



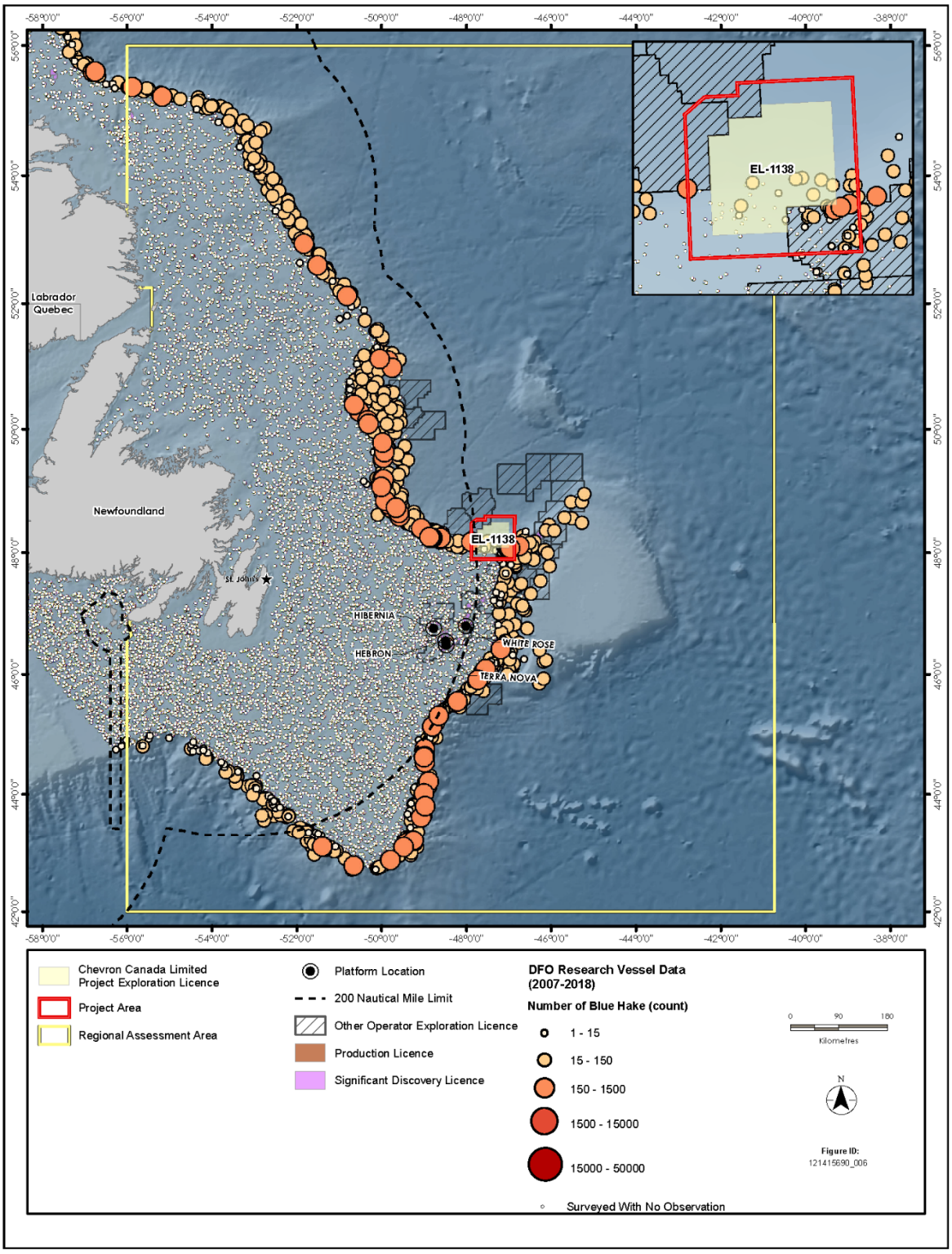
Source: 2007-2018 DFO RV Data

Figure 6-9 Redfish in the Project Area and RAA



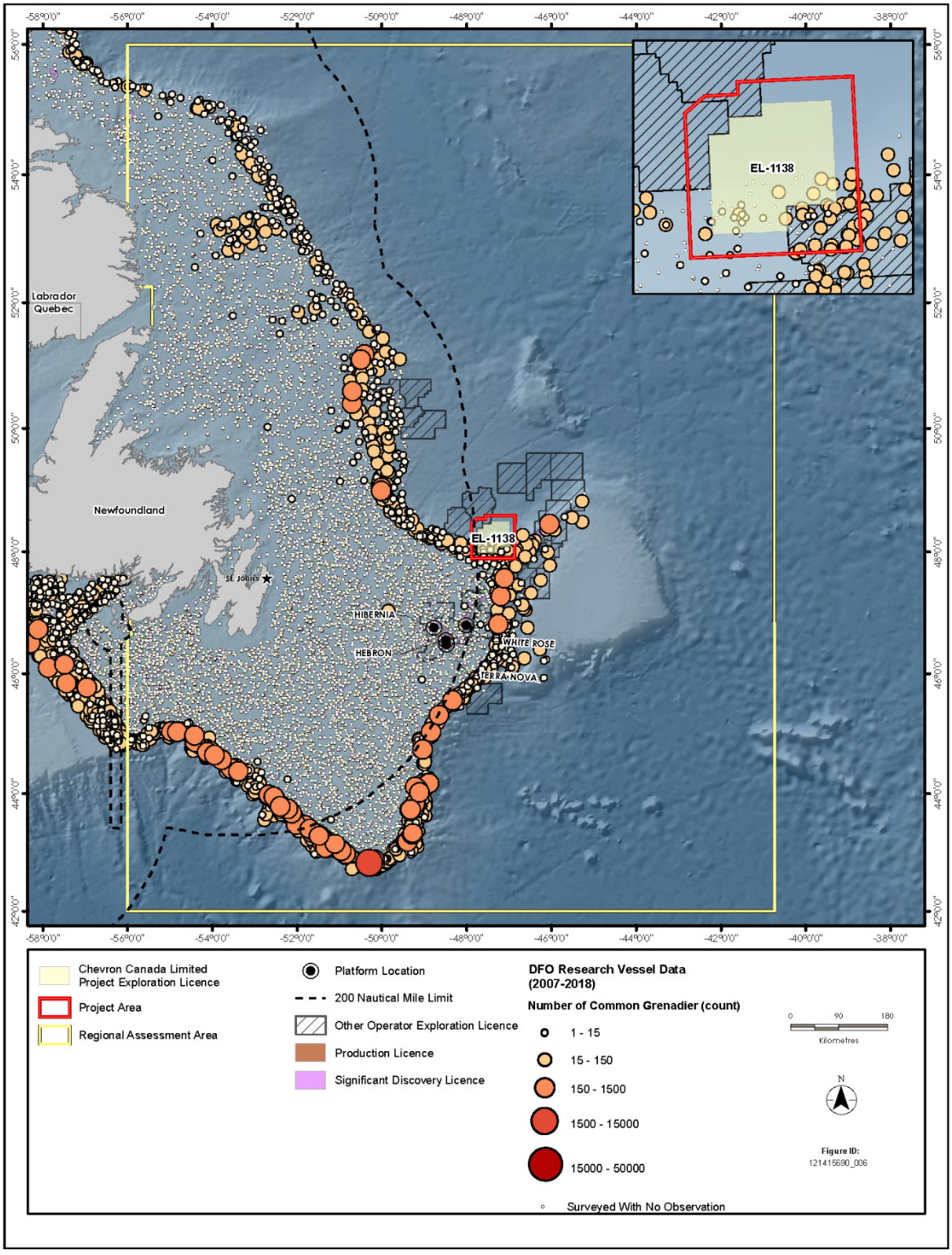
Source: 2007-2018 DFO RV Data

Figure 6-10 Lanternfishes in the Project Area and RAA



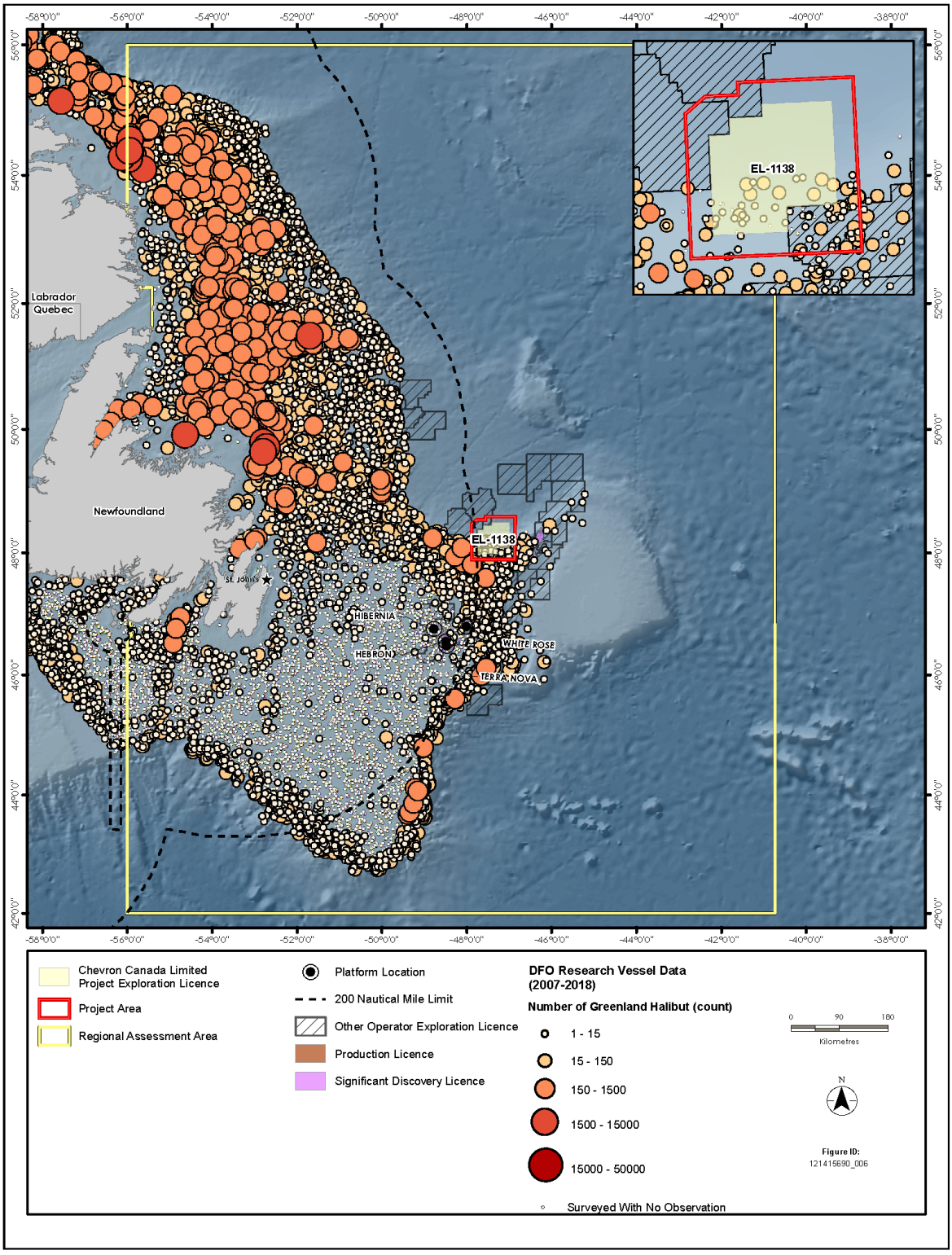
Source: 2007-2018 DFO RV Data

Figure 6-11 Blue Hake in the Project Area and RAA



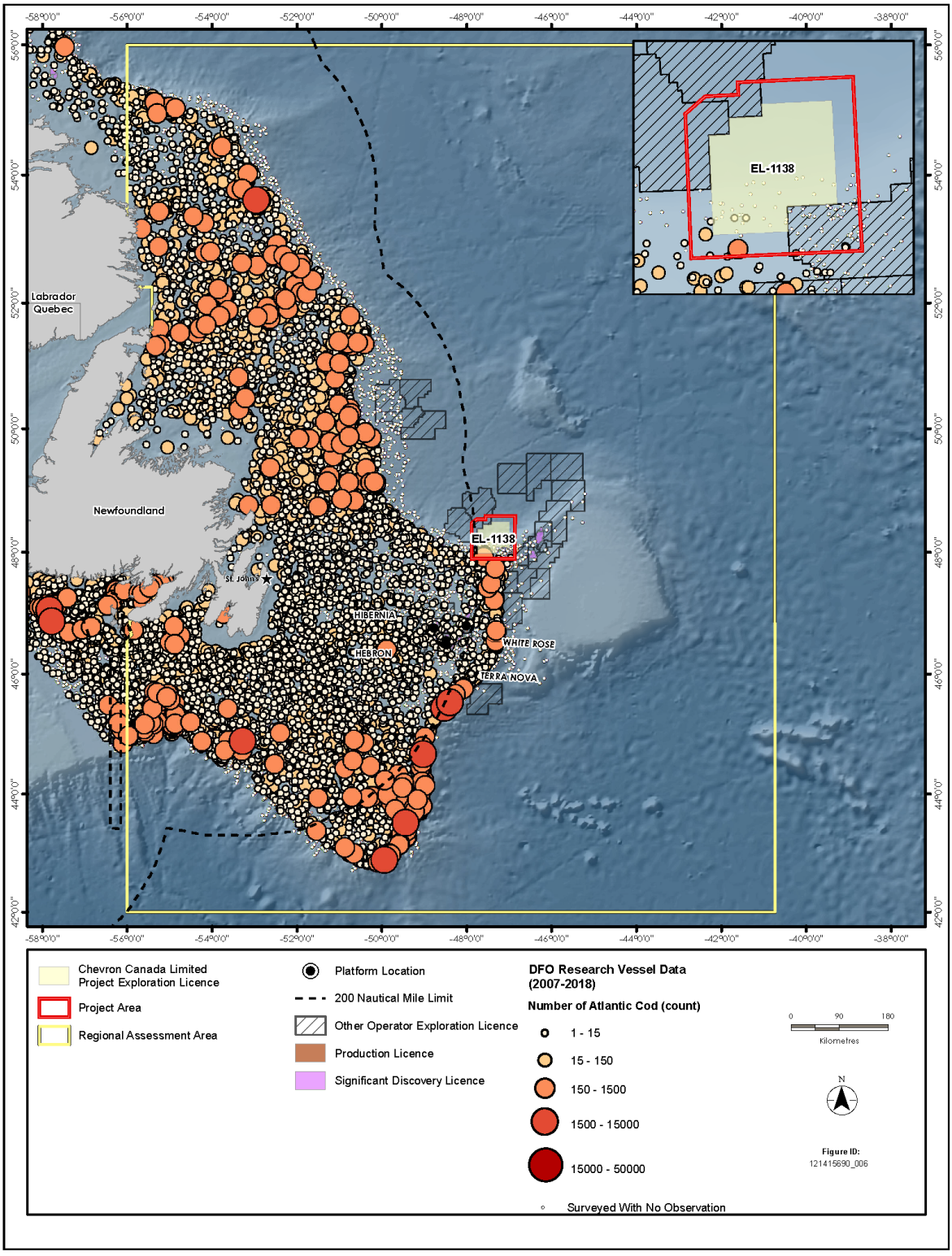
Source: 2007-2018 DFO RV Data

Figure 6-12 Common Grenadier in the Project Area and RAA



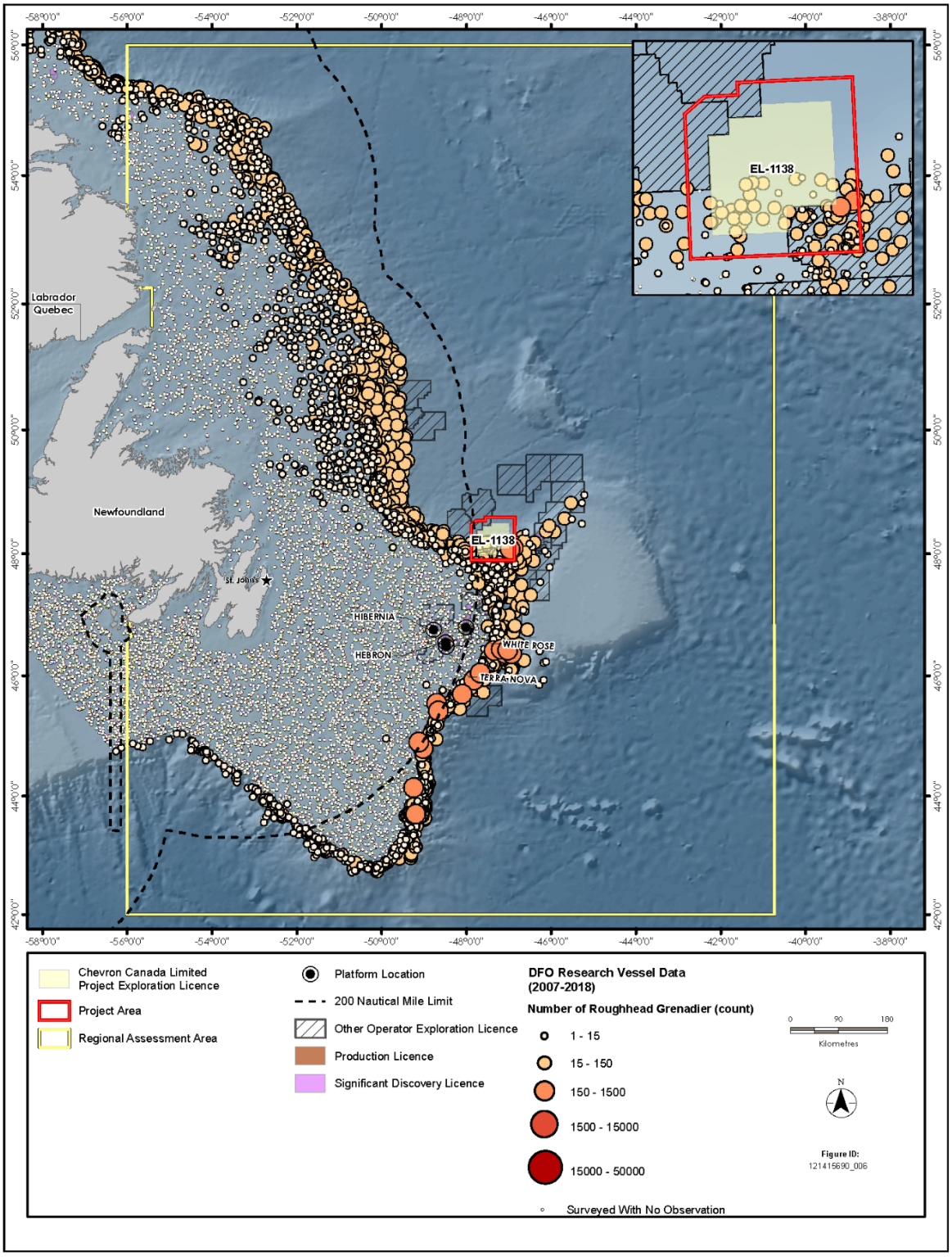
Source: 2007-2018 DFO RV Data

Figure 6-13 Greenland Halibut in the Project Area and RAA



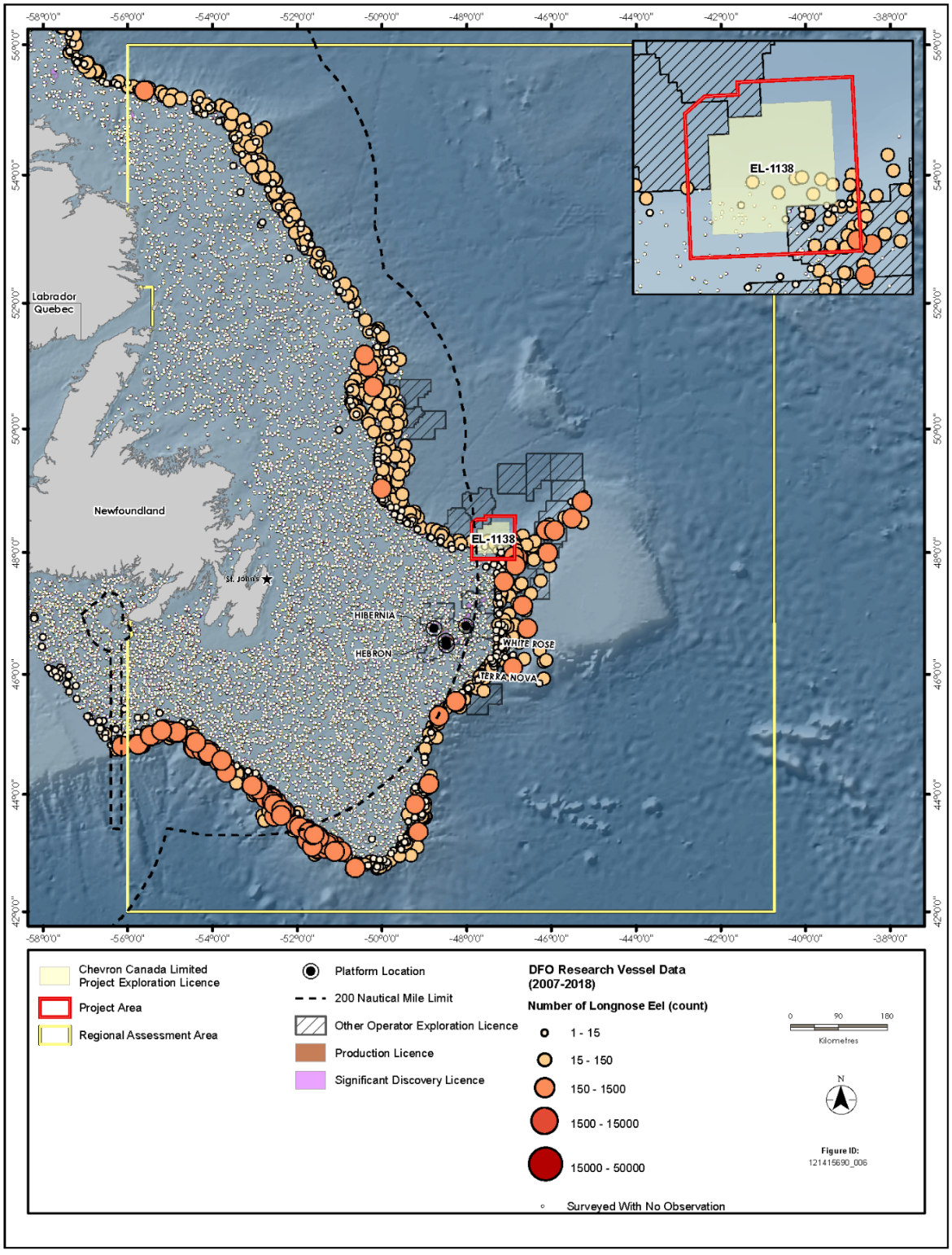
Source: 2007-2018 DFO RV Data

Figure 6-14 Atlantic Cod in the Project Area and RAA



Source: 2007-2018 DFO RV Data

Figure 6-15 Roughhead Grenadier in the Project Area and RAA



Source: 2007-2018 DFO RV Data

Figure 6-16 Longnose Eel in the Project Area and RAA

A variety of spawning strategies are pursued by fish in the Project Area, including broadcast spawning, oviparous spawning, and depositing eggs in demersal cases. Many resident benthic species spawn within and around the Project Area, though several leave the area to spawn in distant places that include freshwater rivers (e.g., Atlantic salmon discussed in Section 6.1.9.2), beaches (e.g., capelin), or warm temperate or tropical waters (e.g., large pelagics such as tunas and sharks).

6.1.8 Species at Risk

Several fish species identified as SAR or species of conservation concern (SOCC) are known to occur, or likely to occur, in the Project Area and/or RAA (Table 6.6). This includes species that are designated and formally protected under either or both provincial and federal regulation, including NL ESA and SARA, or those identified as imperiled but not formally protected by conservation bodies including the COSEWIC or the IUCN.

Table 6.6 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
American plaice (Newfoundland and Labrador population)	*Hippoglossoides platessoides*	No Status	Threatened	Not Listed	Not Assessed
Atlantic cod (Newfoundland and Labrador population); (Global - IUCN)	*Gadus morhua*	No Status	Endangered	Not Listed	Vulnerable
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened	Not Listed	Not Assessed
Roundnose grenadier (Atlantic and Arctic populations); (Global - IUCN)	*Coryphaenoides rupestris*	No Status	Endangered	Not Listed	Endangered
Smooth skate (Funk Island Deep); Global (IUCN)	*Malacoraja senta*	No Status	Special Concern	Not Listed	Endangered
Spinytail skate (Global - IUCN)	*Bathyraja spinicauda*	No Status	No Status	Not Listed	Near Threatened
Thorny skate (Canada); (Global - IUCN)	*Amblyraja radiata*	No Status	Special Concern	Not Listed	Vulnerable
Winter skate (Eastern Scotian Shelf – Newfoundland population); (Global - IUCN)	*Leucoraja ocellata*	No Status	Endangered	Not Listed	Endangered
Acadian redfish (Atlantic Population); Global - IUCN)	*Sebastes fasciatus*	No Status	Threatened	Not Listed	Endangered
Albacore tuna (Global - IUCN)	*Thunnus alalunga*	No Status		Not Listed	Near Threatened
American eel (Global - IUCN)	*Anguilla rostrata*	No Status	Threatened	Vulnerable	Endangered

Table 6.6 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
Atlantic bluefin tuna (Global - IUCN)	*Thunnus thynnus*	No Status	Endangered	Not Listed	Endangered
Atlantic halibut (Global - IUCN)	*Hippoglossus hippoglossus*	No Status	No Status	Not Listed	Endangered
Atlantic salmon (Global - IUCN)	*Salmo salar*	No Status		Not Listed	Least Concern
(South Newfoundland Population)		No Status	Threatened	Not Listed	
(Quebec Eastern Shore Population)		No Status	Special Concern	Not Listed	
(Quebec Western Shore Population)		No Status	Special Concern	Not Listed	
(Anticosti Island Population)		No Status	Endangered	Not Listed	
(Inner St. Lawrence Population)		No Status	Special Concern	Not Listed	
(Gaspé-Southern Gulf of St. Lawrence Population)		No Status	Special Concern	Not Listed	
(Eastern Cape Breton Population)		No Status	Endangered	Not Listed	
(Nova Scotia Southern Upland Population)		No Status	Endangered	Not Listed	
(Outer Bay of Fundy Population)		No Status	Endangered	Not Listed	
Atlantic wolffish	*Anarhichas lupus*	Special Concern	Special Concern	Not Listed	Not Assessed
Barndoor skate (Global - IUCN)	*Dipturus laevis*	No Status	No Status	Not Listed	Endangered
Basking shark (Atlantic Population); Global - IUCN)	*Cetorhinus maximus*	No Status	Special Concern	Not Listed	Vulnerable
Bigeye tuna (Global - IUCN)	*Thunnus obesus*	No Status	No Status	Not Listed	Vulnerable
Blue shark (Atlantic Population); Global - IUCN)	*Prionace glauca*	No Status	No Status	Not Listed	Near Threatened
Common Lumpfish (Atlantic Population)	*Cyclopterus lumpus*	No Status	Threatened	Not Listed	Not Assessed
Cusk	*Brosme brosme*	No Status	Endangered	Not Listed	Not Assessed
Deepwater redfish (Northern Population); (Global - IUCN)	*Sebastes mentella*	No Status	Threatened	Not Listed	Least Concern

Table 6.6 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
Greenland Shark (Global - IUCN)	*Somniosus microcephalus*	No Status	No Status	Not Listed	Near Threatened
Haddock (Global - IUCN)	*Melanogrammus aeglefinus*	No Status	No Status	Not Listed	Vulnerable
Little skate (Global - IUCN)	*Leucoraja erinacea*	No Status	No Status	Not Listed	Near Threatened
Porbeagle (Global - IUCN)	*Lamna nasus*	No Status	Endangered	Not Listed	Vulnerable
Shortfin mako (Atlantic Population); (Global - IUCN)	*Isurus oxyrinchus*	No Status	Endangered	Not Listed	Vulnerable
Spiny dogfish (Atlantic Population); (Global - IUCN)	*Squalus acanthias*	No Status	Special Concern	Not Listed	Vulnerable
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened	Not Listed	Not Assessed
White hake (Atlantic and Northern Gulf of St. Lawrence Population)	*Urophycis tenuis*	No Status	Threatened	Not Listed	Not Assessed
White shark (Atlantic Population); (Global - IUCN)	*Carcharodon carcharias*	Endangered	Endangered	Not Listed	Vulnerable
Data Sources: SARA/COSEWIC (www.sararegistry.gc.ca), IUCN (https://www.iucnredlist.org/), NL ESA (https://www.flr.gov.nl.ca/wildlife/endangeredspecies/index.html). A = Relevant population as determined by COSEWIC, unless identified as determined by IUCN					

Under the NL ESA the categories for protection designation of indigenous species, sub-species and populations are as follows:

- 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 events

SARA provides federal protection to facilitate the recovery of threatened and endangered species as well as promoting the management of other species to prevent them from becoming at risk in the future. Designations under SARA are guided by the advice provided by the COSEWIC. Species with formal protection are listed on Schedule 1 of SARA, with designations as follows:

- 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

Further information on these designations can be found within the Eastern Newfoundland SEA (AMEC 2014). In addition, although the information presented in this report is current at the time of writing, the designation status of species can be updated at any time, and therefore it is important to refer to the SARA Public Registry (www.sararegistry.gc.ca) for the most current information and requirements for Species at Risk in Canada.

There is one fish SAR (northern wolffish) and seven SOCC (American plaice [Newfoundland and Labrador population], Atlantic cod [Newfoundland and Labrador population], roundnose grenadier, smooth skate, spinytail skate, thorny skate, and winter skate) that may be present in the Project Area. Their protection and conservation status are provided in Table 6.6. SAR includes species that are listed as endangered, threatened, or of special concern under SARA (Schedule 1) and/or as endangered, threatened, or vulnerable under the NL ESA. SARA provides federal protection to facilitate the recovery of threatened and endangered species as well as promotes the management of other species to prevent them from becoming at risk in the future.

SOCC listed in Table 6.6 include those species identified as endangered, threatened, or of special concern under COSEWIC or those species identified as critically endangered, endangered, vulnerable, or near threatened under the IUCN Red List. These species are not formally protected by conservation bodies, including COSEWIC or IUCN. General life history, diet, and distribution information on these and other species is available in the Eastern Newfoundland SEA (AMEC 2014). A summary of the habitat, distribution and general life characteristics of the eight species of conservation interest (SAR and SOCC) that may occur in the Project Area is provided in Table 6.5.

6.1.9 Species of Significance to Indigenous People

Within the waters offshore NL, including waters within the Project Area, commercial fishing activity for several different species occurs, including species that Indigenous groups may hold commercial communal licenses to harvest. Species harvested for commercial communal purposes within the region include capelin, groundfish, herring, mackerel, seal, shrimp, snow crab, tuna, and whelk. Commercial communal fishing activity and licenses for Indigenous groups is described in Section 7.4. Species harvested by Indigenous groups for food, social, and ceremonial (FSC) purposes include, but not limited to, gaspereau, trout, Atlantic salmon, bass, mackerel, eel, shad, groundfish (e.g., flounder, halibut, pollock), Arctic char, smelt, blue shark, herring, mussel, clams, periwinkle, soft-shell clams, squid, tomcod, quahaug, razor clams, lobster, crab, and scallops. Many FSC species are harvested in the inshore and/or freshwater systems. However, some species are anadromous and can potentially migrate through the RAA and/or Project Area. Two migratory fish species have been highlighted as being of concern due to potential interaction with oil and gas activities: American eel and Atlantic salmon. The American eel has been identified as key to Aboriginal rights-based, Treaty rights-based, and commercial fisheries, particularly to the Mi'kmaq peoples (Denny and Kavanagh 2018). Atlantic salmon have traditionally been a staple food

for Indigenous peoples, although today, due to a lack of abundance and concern for local populations, it is often reserved for special occasions (Denny and Fanning 2016). These species are described below. Further discussion on these species, with more focus on significance to FSC fisheries can be found in Section 7.4.

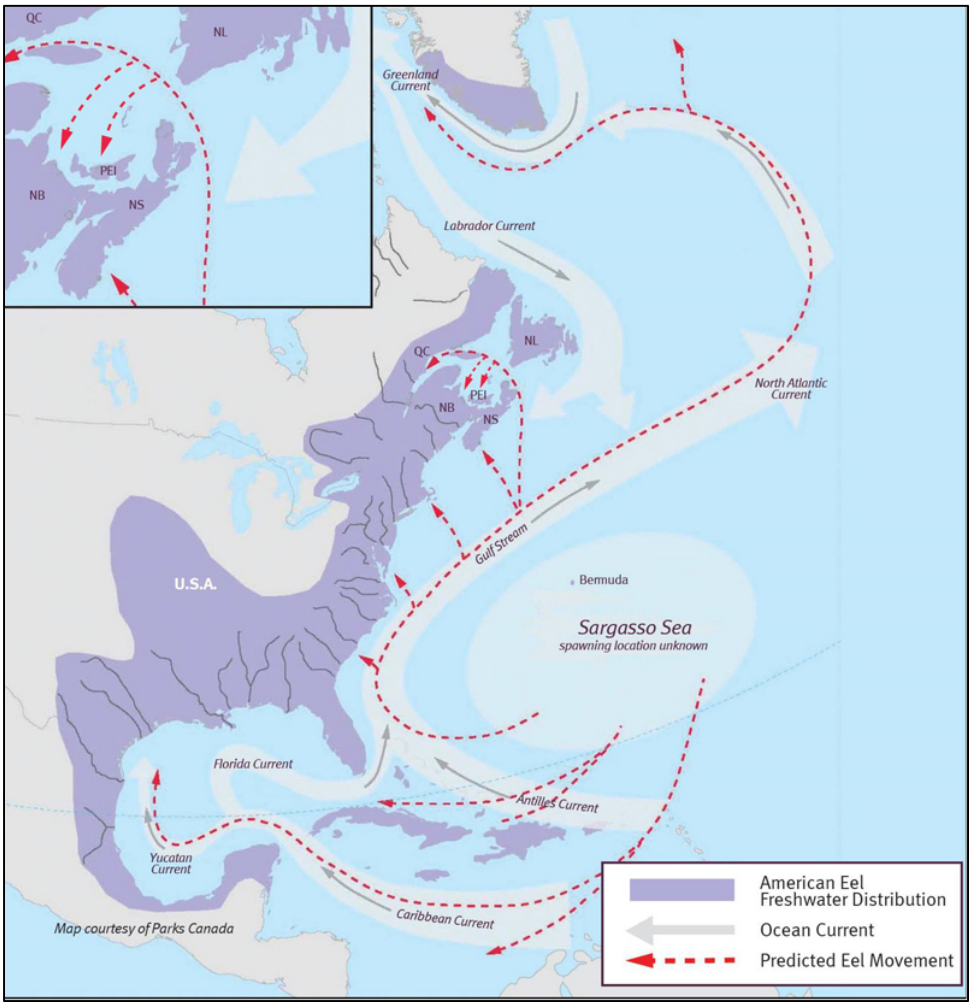
6.1.9.1 American Eel

The American eel is a catadromous fish (i.e., migrating down rivers to the sea to spawn) that lives primarily within freshwater and estuarine environments and has a broad distribution throughout the northwest Atlantic Ocean, stretching from Venezuela to Greenland and Iceland (COSEWIC 2012a). The Canadian portion of this distribution includes coastlines, freshwater habitats, estuaries, and coastal marine waters connected to Canada, up to the mid-Labrador coast.

American eels are considered a single breeding population, and all eels will travel to the Sargasso Sea, just north of Bermuda, to breed (Wildlife Division 2010; DFO 2016a). Therefore, there is no geographic heterogeneity for eels in different areas. Once eggs have hatched, the larvae (known as leptocephali) are transported northward along the currents of the Gulf Stream, toward the coastal waters of eastern North America. As larvae become larger and develop, becoming known as glass eels, they begin to make their way to coastal waters and the shore. The glass eels continue to grow and turn into elvers, which begin to move into estuarine and freshwater habitats (Wildlife Division 2010). These upriver migrations typically occur between April and August. The final stage is when elvers become pigmented and turn into yellow eels. This stage can last over 30 years for eels in some environments and is the stage when sexual differentiation occurs. Yellow eels change once more into silver eels upon preparation for migration back to the Sargasso Sea to breed (Wildlife Division 2010). Fully mature eels are presumed to die after spawning. Spawning migrations for adult American eels in Canada occur during the fall, and eels typically follow the continental shelf before travelling across open ocean to the Sargasso Sea (COSEWIC 2012a; Béguer-Pon et al. 2015). Figure 6-17 outlines general migration patterns of the American eel.

The DFO research vessel surveys for 2007 to 2018 did not identify American eel in any of the survey sets, therefore, the potential for occurrence within the Project Area is considered low. There is little information available on specific migration patterns of American eel, and if American eel were to occur within the Project Area, it is likely that they would be transported by currents on their way either to Greenland, Iceland, or to Newfoundland and Labrador.

The American eel is assessed as threatened in Canada (COSEWIC) and endangered globally (IUCN). Mi’kmaq eel fishers have observed declines in traditional fishing areas as having to fish longer to get the same amounts to feed their families and provide for cultural events (Denny et al. 2012; Wagner et al. 2004, in Denny and Kavanagh 2018).

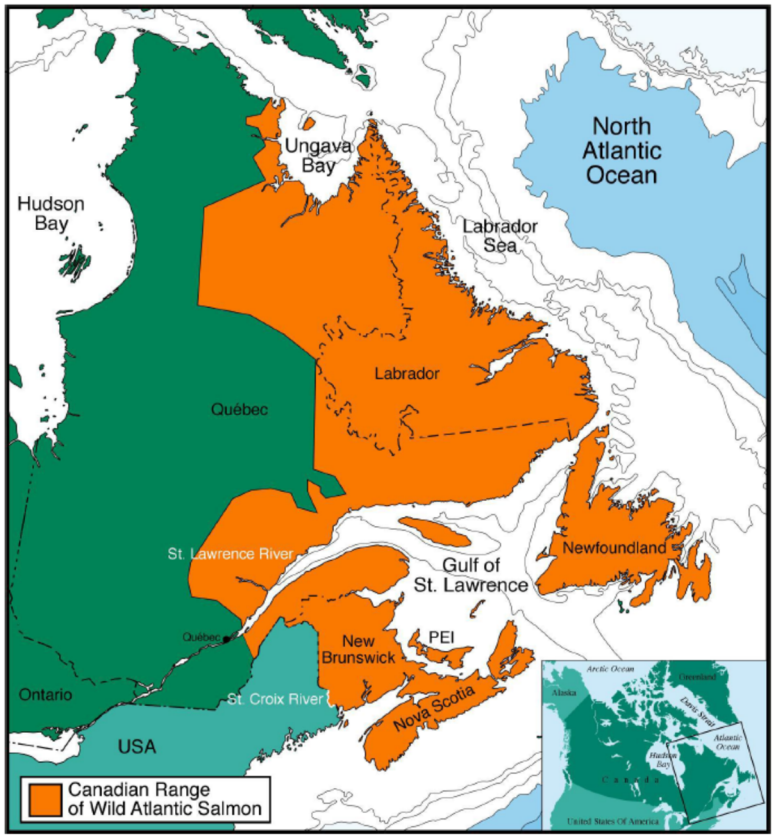


Source: DFO 2016a

Figure 6-17 Predicted Migration Pattern for American Eel

6.1.9.2 Atlantic Salmon

North American Atlantic salmon (*Salmo salar*) breed and spend the early part of their life cycle in freshwater systems throughout Atlantic Canada, eastern Quebec, and the northeastern seaboard of the United States (Figure 6-18). The genetic structure and life history traits of Atlantic salmon tend to vary among river populations. This variation among salmon rivers tends to increase with geographic distance. As a result, DFO manages groups of salmon rivers as metapopulations, called Designatable Units (DUs), based on geography and unique genetic and life history traits (COSEWIC 2010a).



Source: DFO 2017

Figure 6-18 Inland Range of Atlantic Salmon in Canada

DFO manages Atlantic salmon populations under 16 DUs (Table 6.7). Among these DUs, COSEWIC has identified five as endangered (Outer Bay of Fundy, Inner Bay of Fundy, Southern Uplands, Eastern Cape Breton, and Anticosti Island metapopulations; Table 6.7). With the exception of the Inner Bay of Fundy population, all of the listed Atlantic salmon populations have the potential to occur in the Project Area with the most likely way as a transient presence during migration. The Lake Ontario metapopulation is considered extinct.

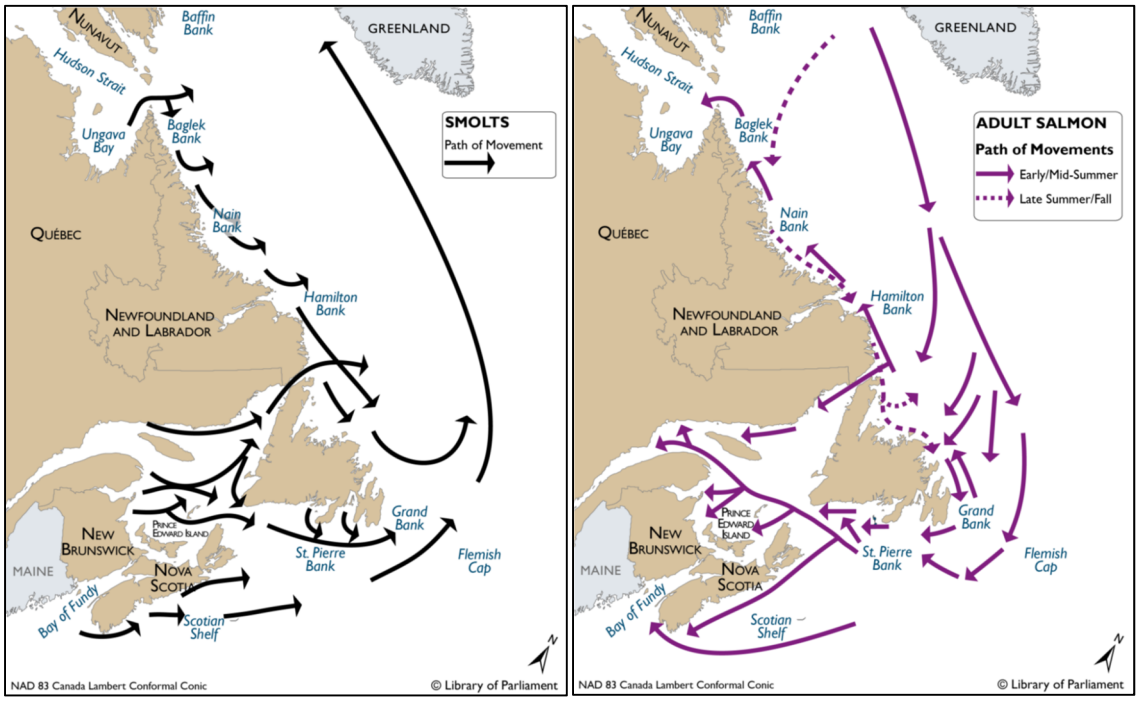
The Inner Bay of Fundy metapopulation is the only Atlantic salmon DU with legal protection as a listed species (endangered) on Schedule 1 of SARA. Consultation documents were distributed for inclusion of the Outer Bay of Fundy (DFO 2014a), Southern Uplands (DFO 2013a), Anticosti Island (DFO 2012), and Eastern Cape Breton (DFO 2014b) DUs in Schedule 1 of SARA. DFO is in the process of developing SARA listing recommendations to include Outer Bay of Fundy, Southern Uplands, and Eastern Cape Breton DUs (DFO 2016b).

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

Metapopulation No. (DU)	Metapopulation Name (DU)	Range	COSEWIC Status	SARA Status
1	Nunavik	Quebec, Newfoundland and Labrador, Atlantic Ocean	Data Deficient	No Status
2	Labrador	Quebec, Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
3	Northeast Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
4	South Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Threatened	No Status
6	Northwest Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
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	Ontario, Atlantic Ocean	Extinct	No Status
12	Gaspé-Southern St. Lawrence	Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Atlantic Ocean	Special Concern	No Status
13	Eastern Cape Breton	Nova Scotia, Atlantic Ocean	Endangered	No Status
14	Southern Uplands	Nova Scotia, Atlantic Ocean	Endangered	No Status
15	Inner Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	Schedule 1; Endangered
16	Outer Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	No Status

Source: DFO 2017

Anadromous phenotypes of Atlantic salmon leave their natal rivers of Atlantic Canada and eastern Quebec in the spring and migrate to summer / fall feeding areas in the Labrador Sea gyre, the western coast of Greenland, and the eastern Grand Banks via the Strait of Belle Isle and waters off the eastern Newfoundland Coast (Reddin 2006). Migration routes are generally thought to follow the dominant surface water currents (Figure 6-19). Overwintering distribution is not well-defined but is generally believed to encompass an area from the southern Labrador Sea, to the eastern edge of the Scotian Shelf (COSEWIC 2010a). Available literature suggests that the Labrador Sea is the primary overwintering area (Reddin 2006; DFO 2013b).



Source: Standing Committee on Fisheries and Oceans 2017

Figure 6-19 General Ocean Distribution and Migratory Patterns of Canadian Atlantic Salmon

Migration back to freshwater, in the summer and fall, generally follows ocean currents back toward coastal environments and onward to natal rivers. The distribution and migration patterns of Atlantic salmon are influenced by the age structure of the population. Salmon of various ages may be found during the ocean life cycle, and those ages influence migratory patterns so that at any given time, there are individuals in a population inhabiting ocean environments (COSEWIC 2010a). Post-smolts (salmon that have not yet spent a winter at sea) exit rivers in May / June to feed in the summer / fall and overwinter. Following their first winter, those salmon are termed 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. Those that remain are known as two sea-winter (2SW) salmon and these individuals return to spawn the following summer. 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.

The marine distribution and habitat requirements of salmon at sea have generally been inferred from commercial catch data, research vessel surveys, and telemetry studies (Reddin 2006; COSEWIC 2010a; Lacroix 2013). During spring, summer, and fall migration and foraging activities, salmon spend most of the time in the warmer surface waters, although they have been shown to enter deeper waters as well. Salmon are opportunistic foragers that will consume a variety of prey species. It is thought that abundances of energy-rich small fish species, such as capelin (*Mallotus villosus*) and sand lance (*Ammodytes dubius*), are important components of the diet. The physiological temperature range of Atlantic salmon is quite broad (approximately 0°C to 20°C); however, the catch data suggest individuals are more common in waters ranging from 4°C to 12°C. It is likely that these temperature-related observations are the result of biological

rhythms associated with prey life cycle and abundance trends. Little is known regarding the overwintering habitats of Atlantic salmon. Due to metabolic constraints, it is likely that winter is a period of reduced foraging activity where individuals are inhabiting deeper, warmer waters.

There is a general understanding of the wide-scale spatial and temporal distribution of salmon at sea; information at smaller scales does not exist (Reddin and Frieland 1993; Reddin 2006; COSEWIC 2010a). This is further complicated by evidence of 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; Renkawitz et al. 2015; Caesar 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. It is generally thought that the open-ocean distribution of many DUs overlap (Reddin 2006). While salmon populations all seem to migrate north to feeding areas, the relative incidence of individual salmon from more southerly populations is expected to decrease with increasing longitude (Reddin 2006; COSEWIC 2010a). Most individuals from a population are expected to migrate to the feeding grounds by the most direct, or energy efficient, path. Therefore, for example, DUs from the Bay of Fundy and the eastern coast of Nova Scotia are expected to have little presence in the Gulf of St. Lawrence (Bradbury et al. 2016a) and be more concentrated in the eastern Grand Banks and Labrador Sea in the spring (Reddin 2006).

Research vessel surveys have not identified salmon within the Project Area, therefore, the potential for occurrence within the Project Area is considered low. If Atlantic salmon were to occur within the Project Area, it is likely that they would be migrating through.

Ocean distribution and migration information for all Atlantic salmon DUs are provided below. The information available for specific DUs is limited. Where data do exist, it is based on tagging studies of salmon from a limited sample of river systems (Hedger et al. 2009; Jacobs 2011; Lefévre et al. 2012**;** Lacroix 2013; Strøm et al. 2017) or it is inferred from the genetic composition of commercial fisheries catch data (Bradbury et al. 2015, 2016a, 2016b). The general information provided below is inferred from the general understanding of salmon distribution when DU-specific information is not available. This information is subject to change as future studies are completed.

Labrador, Nunavik DUs

The Labrador DU includes 91 known salmon rivers extending from the northern tip of Labrador southward to the Napitipi River, Quebec. The Nunavik DU includes five known salmon rivers extending from the tip of Labrador westward into Ungava Bay, Quebec – the northwestern extent of the species' current range (COSEWIC 2010a). 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 and limited retention recreational fishing is still authorized on some rivers under restrictive conservation management restrictions.

Limited work has been conducted on the ocean distribution of salmon from the Labrador and Nunavik DUs. A high proportion of salmon from these DUs are identified in the Labrador subsistence and west Greenland fisheries (Bradbury et al. 2015, 2016b) suggesting salmon from these DUs likely feed in the Labrador Sea gyre and the western coast of Greenland, moving into the southern Labrador Sea to overwinter. Migration

routes back to these DUs are thought to be like the routes out to sea. Therefore, it is not expected that many individuals of this metapopulation would be in the immediate Project Area.

Northeast Newfoundland, Northwest Newfoundland DUs

The Northeast Newfoundland DU includes 127 known salmon rivers extending from the tip of the Northern Peninsula eastward to Cape Race on the Island of Newfoundland. The Northwest Newfoundland DU includes 34 known salmon rivers extending just north of the Bay of Islands to the tip of the Northern Peninsula (COSEWIC 2010a). 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 and limited retention recreational fishing is still authorized on some rivers under restrictive conservation management restrictions.

Limited work has been conducted on the ocean distribution of salmon from the Northeast and Northwest Newfoundland DUs. The low proportion of salmon from these DUs identified in the Labrador subsistence and west Greenland fisheries (Bradbury et al. 2015, 2016b) suggests most do not migrate to these more northwesterly feeding grounds. Therefore, salmon from these DUs may be more prevalent in Labrador Sea and eastern Grand Banks feeding areas during the summer / fall feeding season (Reddin and Frieland 1993). Migration routes back to these DUs are thought to be like the routes out to sea. Available information does not allow for the determination if salmon from these DUs would be commonly found in the Project Area. It is expected that large numbers of salmon would only occur if high concentrations of prey items circulated through the Project Area during the spring / summer feeding season. However, given the large expanse of known salmon feeding grounds, it is not expected that many individuals would be in the immediate Project Area at any given time.

South Newfoundland, Southwest Newfoundland DUs

The South Newfoundland DU includes 104 known salmon rivers extending from the southeast tip of the Avalon Peninsula westward to the south coast of Cape Ray on the Island of Newfoundland. The Southwest Newfoundland DU includes 40 known salmon rivers extending from Cape Ray northward along Newfoundland's west coast just beyond the Bay of Islands (COSEWIC 2010a). 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 and limited retention recreational fishing is still authorized on some rivers under restrictive conservation management restrictions.

Limited work has been conducted on the ocean distribution of salmon from the South and Southwest Newfoundland DUs. Based on their geographies, most salmon from the Southwest Newfoundland DU likely migrate directly through the Cabot Strait toward the eastern Grand Banks and Labrador Sea (Bradbury et al. 2016a). However, migration eastward around the Avalon Peninsula on the Island of Newfoundland is expected among many Southern Newfoundland populations (Bradbury et al. 2016a). The low proportion of salmon from these DUs identified in the Labrador subsistence and west Greenland fisheries (Bradbury et al. 2015, 2016b) suggests most do not migrate to these more northerly feeding grounds. Therefore, salmon from these DUs may be more prevalent in Labrador Sea and eastern Grand Banks feeding areas during the summer / fall feeding season (Reddin and Frieland 1993). Migration routes back to these DUs are thought to be similar to the routes out to sea. Available information does not allow for the determination if

salmon from these DUs would be commonly found in the Project Area. It is expected that large numbers of salmon would only occur if high concentrations of prey items circulated through the Project Area during the spring / summer feeding season. However, given the large expanse of known salmon feeding grounds, it is not expected that many individuals would be in the immediate Project Area at any given time.

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 9 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 2017). 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 2010a; DFO 2011b; DFO 2013b). 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.

Some research has been conducted on the ocean distribution of salmon populations originating from Québec's north shore and the Gaspé Peninsula. It is likely that most salmon from these DUs migrate toward the Labrador Sea by the most efficient geographical means. Thus, salmon populations from the more western rivers in these DUs are expected to access the Labrador Sea through the Strait of Belle Isle (Hedger et al. 2009; Jacobs et al. 2011; Lefévre et al. 2012; Strøm et al. 2017). However, the more eastern salmon populations, largely those in the southwestern Gulf of St. Lawrence, may be more apt to move eastward around the Avalon Peninsula on the Island of Newfoundland (Bradbury et al. 2016a). Salmon from these DUs likely feed in the Labrador Sea gyre and the western coast of Greenland, moving into the southern Labrador Sea to overwinter. Migration routes back to theses DUs are thought to be like the routes out to sea. All age groups of salmon at sea are represented in the Labrador Sea, where they also probably spend the winter. It is not expected that many individuals of this metapopulation would be in the immediate Project Area.

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 2011c), with 17 rivers identified as containing (or historically containing) Atlantic salmon (Gibson et al. 2016). There have been no recreational fisheries or FSC allocations in this Salmon Fishing Area since 1998. All rivers remained closed to salmon fishing in 2015 (DFO 2016b).

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 2011d, 2011e), with 72 rivers identified

as containing (or historically containing) Atlantic salmon (Gibson and Bowlby 2013). All rivers within SFA 20 and 21 have been closed to recreational fishing and FSC allocations since 2010 (DFO 2016b).

The Eastern Cape Breton metapopulation breeds in rivers on Cape Breton Island that drain into the Bras d'Or Lakes and Atlantic Ocean (DFO 2011e), with 46 rivers identified as containing (or historically containing) Atlantic salmon (DFO 2014a). Except for Middle River, Baddeck River, and North River, all rivers in this DU were closed to salmon fishing in 2015. In 2015, FSC allocations were available from these three rivers; however, no FSC harvests were recorded from these three rivers in 2015 (DFO 2016b).

Limited work has been conducted on the ocean distribution of salmon from the Outer Bay of Fundy, Southern Uplands, and Eastern Cape Breton DUs. The interpretation presented below for all three DUs is largely based on Lacroix (2013), who worked on salmon from a single tributary of the Saint John River system (n=15; Hammond River; Outer Bay of Fundy DU).

Based on their geographies, most salmon from these three DUs likely migrate directly across the Cabot Strait toward the eastern Grand Banks and Labrador Sea (Bradbury et al. 2016a; Lacroix 2013). The low proportion of salmon from these DUs identified in the Labrador subsistence and west Greenland fisheries (Bradbury et al. 2015, 2016b) suggests most do not migrate to these more northerly feeding grounds. Therefore, salmon from these DUs may be more prevalent in Labrador Sea and eastern Grand Banks feeding areas during the summer / fall feeding season (Reddin and Frieland 1993; Lacroix 2013). Recent work with salmon from the outer Bay of Fundy DU have also suggested that the Project Area may serve as a summer marine feeding area (Samways et al. unpublished data). Specifically, this study linked the stable carbon (δ13C) isotope signature of salmon caught between 1982 and 2011 with broad areas of the Northwest Atlantic Ocean, including the Project Area (Samways et al. unpublished data). Migration routes back to these DUs are thought to be similar to the routes out to sea. Available information does not allow for a determination that salmon from these DUs would be commonly found in the Project Area. It is expected that large numbers of salmon would only occur if high concentrations of prey items circulated through the Project Area during the spring / summer feeding season. However, given the large expanse of known salmon feeding grounds, it is not expected that many individuals would be in the immediate Project Area.

Inner Bay of Fundy Salmon DU

As the only Atlantic salmon DU afforded legal protection under SARA, the spatial and temporal distribution of Inner Bay of Fundy salmon are relatively well understood. Existing data suggest that the distribution of Inner Bay of Fundy salmon at sea is unique relative to other DUs. Studies tracking the movement of post-smolts, salmon that have not yet spent a full winter at sea, suggest that most of the population stays within the Northern Gulf of Maine in their first summer (Marshall 2014). It is unclear where the minority of post-smolts that do leave the northern Gulf of Maine go, and their overwintering distribution is not known. 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). With respect to the Project Area, the presence of Inner Bay of Fundy salmon is not expected at any life history stage or season.

6.1.10 Summary of Key Areas and Times

Near the Project, temporal periods of significance are often synchronized across several species in the spring / early summer period. Plankton blooms along the Newfoundland slope triggers blooms of primary productivity. These increases in primary productivity increase zooplankton growth and other secondary productivity. The resulting spike in available prey attracts migratory pelagic species from more southerly environments (e.g., sharks, tuna, swordfish) and provides optimal conditions for spawning and subsequent larval survival during the spring bloom and warm summer months.

Data from the 2007 to 2018 DFO RV surveys suggest that the greatest fish densities occur at the slope of the Grand Banks. This area supports habitat diversity, strong nutrient content, seawater mixing and typically strong primary production (AMEC 2014).

Cold-water corals and sponges are sessile benthic invertebrates that have been shown to play an important role in abyssal ecosystems by providing habitat for other species of invertebrates and fishes. Cold-water corals found on continental margins provide resting, feeding, and spawning sites for other species including commercially important species. Within the Project Area, corals and sponges were identified.

At greater depths, species and habitats are poorly understood but are considered fragile because the species that occupy these areas have life history traits that limit their resilience to perturbations. Investigations on abyssal fish assemblages determined the most diverse assemblages at depths greater than 1,500 m occurred around microhabitats, comprised of rock outcroppings, corals, and boulder fields. Each of these microhabitats produced distinct assemblages (Beazley et al 2013; Baker et al. 2012).

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 flowing upon meeting the Grand Banks, the Flemish Cap and the North Atlantic Drift brings vital mineral nutrients from the depths to the surface. The phytoplankton nourished by this upwelling form the basis for considerable 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 at-sea 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 to 1983 and 1984 to 1992 data were collected by CWS through the programme intégré de recherches sur les oiseaux pélagiques (PIROP) that employed a line transect 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 Orphan Basin, the northern slope of the Grand Banks or the Flemish Cap. Beginning in the mid-2000s, at-sea surveys were conducted from vessels conducting geophysical surveys within the RAA by the oil industry to fulfill marine bird monitoring required by the C-NLOPB (Moulton et al. 2005; Abgrall et al. 2008; Jones et al. 2010; Jones and Lang 2013; Holst and

Mactavish 2014; Lang 2016). 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 Environmental Studies Research Funds (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). 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 these data collected from 2006 to 2016 were published at the on-line "Atlas of Seabirds at Sea in Eastern Canada" and the shapefiles were made available on an open data site (Bolduc et al. 2018). These maps were used here to illustrate and describe current marine bird distribution and abundance in the Project Area. In this Atlas, the year is divided into three seasons: April to July (spring migration and nesting period of species whose young leave the nest soon after hatching [nidifugous]), August to 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 to March (fall migration and wintering).

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, common and thick-billed murres, dovekies, black-legged kittiwakes, ivory gulls, Sabine's gulls, Ross's gulls, arctic terns, great skuas, long-tailed jaegers, sooty shearwaters, and Leach's storm-petrels (Egevang et al. 2010; Gilg et al. 2010; Hedd et al. 2011; Sittler et al. 2011; Frederiksen et al. 2012; Hedd et al. 2012; Magnusdottir et al. 2012; Fort et al. 2013; McFarlane Tranquilla et al. 2013; Pollet et al. 2014; Smith et al. 2014; Maftei et al. 2015; McFarlane Tranquilla et al. 2015; Davis et al. 2016; Frederiksen et al. 2016; van Bemmelen et al. 2017; Hedd et al. 2018).

Censuses of breeding pairs in seabird nesting colonies are conducted by CWS regularly in Newfoundland and Labrador. Some data have been published (Wilhelm et al. 2015; Wilhelm et al. 2016). Unpublished data were obtained from CWS current to 2018. Data published by the Important Bird Areas in Canada program (IBA), 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 in the Statoil drilling 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 continental shelf, slope, and deep waters. These birds tend to concentrate at the upwellings at the oceanographic features and fronts. Millions of marine birds breed at nesting colonies in coastal northeastern Newfoundland, and forage for their young on the Grand Banks and adjacent areas during summer. Many thousands of non-breeding seabirds also reside 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 (Table 6.8), especially northern fulmar and black-legged kittiwake. In the fall, migration of marine birds that have bred in the Arctic and subarctic 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.

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 ocean fronts bordered by upwelling, 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 (see Section 6.2.4). Phalaropes occur in the RAA and Project Area as passage migrants during spring and fall (Moulton et al. 2006; Smith et al. 2014). 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 (Moulton et al. 2006; 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 (e.g., Moulton et al. 2006).

6.2.2.2 Gulls

Gull species are an abundant and diverse part of the avifauna off eastern Newfoundland. The primarily coastal species (i.e., herring, great black-backed, ring-billed, and black-headed gulls) and one pelagic species (i.e., black-legged kittiwake) nest in the RAA and, except for the ring-billed gull, they also winter in the RAA. 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). Coastal gulls species' populations show long-terms decreases between 1990 and 2014 that correlate with the decline in groundfish landings since 1992 and the closure of several municipal sanitary landfills over several years (Cotter et al. 2012; Wilhelm et al. 2016). Arctic and Subarctic breeding coastal species migrate through the RAA (lesser black-backed gull) or 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 *Endangered Species Act*, and Ross's gull is designated threatened on Schedule 1 of SARA. Laughing gull and mew (common) gull occur in the RAA only as accidental vagrants, occurring less than annually (Moulton et al. 2006; Mactavish et al. 2016). Gull species other than kittiwake are found in the Project Area in densities of > 0 birds/km² in the April to July period, 0 to 3.6 birds/km² in the August to November period, and 7.4 to 17.3 birds/km² in the December to March period, although there were no surveys in the western quarter of the Project Area during the latter period (Figure 6-20). Gulls feed primarily by picking food from the surface or plunge-diving from a low height.

Table 6.8 Numbers of Marine Birds Nesting at Major Colonies in 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[c]	-	-		
Leach's Storm-Petrel	-	200p[a] -	2,906p [a]	150p[a]	8,200p[a]	60p[a]	2,022,000p[a,b]	314,020p[a]	-	-	8,773p[a]	100,000p[b]	48,000p[a]	363,787p[e]	
Northern Gannet	-	-	-	10.964p[a]	-	-	3,488p[a]	-	-	14,598p[a]	-	-	-		
Herring Gull	-	-	5p	-	250p[a]	993i[a]	46p[a]	2,266p[a]	-	39p[b]	20p[b]	50p[b]	Present[b]	60p[f]	265p[d]
Great Black-backed Gull	-	-	-	75i[a]	14p[a]	1,000i[a]	2p[a]	15p[a]	-	Present[b]	6p[b]	25p[b]	-	10p[f]	
Black-legged Kittiwake	1,050p[g]	-	5p	95p[a]	43p[a]	1,000i[a]	5,096p[a]	11,696p[a]	4,170p[f]	10,000p[b]	-	50p[b]	-	196p[f]	2,415p[d]
Arctic and Common Terns	-	22p[g]	4p[a]	-	1,420i[a]	17i[a]	-	-	-	-	-	-	Present[b]		
Common Murre	-	-	-	472,259p[g,j]	9,897p[a]	-	1,440p[a]	250,000p, 14,599i[a]	84p[b]	15,484p[a]	-	-	-	7,176p[h]	
Thick-billed Murre	-	-	-	250p[a]	-	-	73p[a]	240p[a]	-	1,000p[f]	-	-	-		
Razorbill	-	273p[k]	1,346p [a]	200p[a]	35p[a]		406p[a]	380p, 231i[a]	22p[f]	100p[b]	-	-	-	1,443p[h]	
Black Guillemot	-	50p[a]	25i [a]	1p[b]	4p[a]	25i[a]	113p[a]	1p, 13i[a]	Present[b]	Present[b]	-	-	-	95p[i]	Present[d]

Table 6.8 Numbers of Marine Birds Nesting at Major Colonies in 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
Atlantic Puffin	-	6,190p[k]	12,649p[a]	2,000p[a]	755p[a]	4,870p[a]	75,000p[f]	304,042p[a,j]	79p[f]	-	-	-	-	9,543p[i]	
TOTAL	1,050p	6,735p	16,915p, 25i	485,959p, 75i	20.618p	4.930p, 3.035i	2,107,664p	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] Wilhelm et al. submitted; [c] Fraser et al. (2013); [d] Cairns et al. (1989); [e] Lormée et al. (2012);

[f] Parks and Natural Areas Division, unpublished data; [g] Thomas et al. (2014a); [h] Lormée et al. (2015); [i] Lormée (2008); [j] Wilhelm et al. (2015); [k] Robertson and Elliot (2002).

p = number of pairs

i = number of individuals

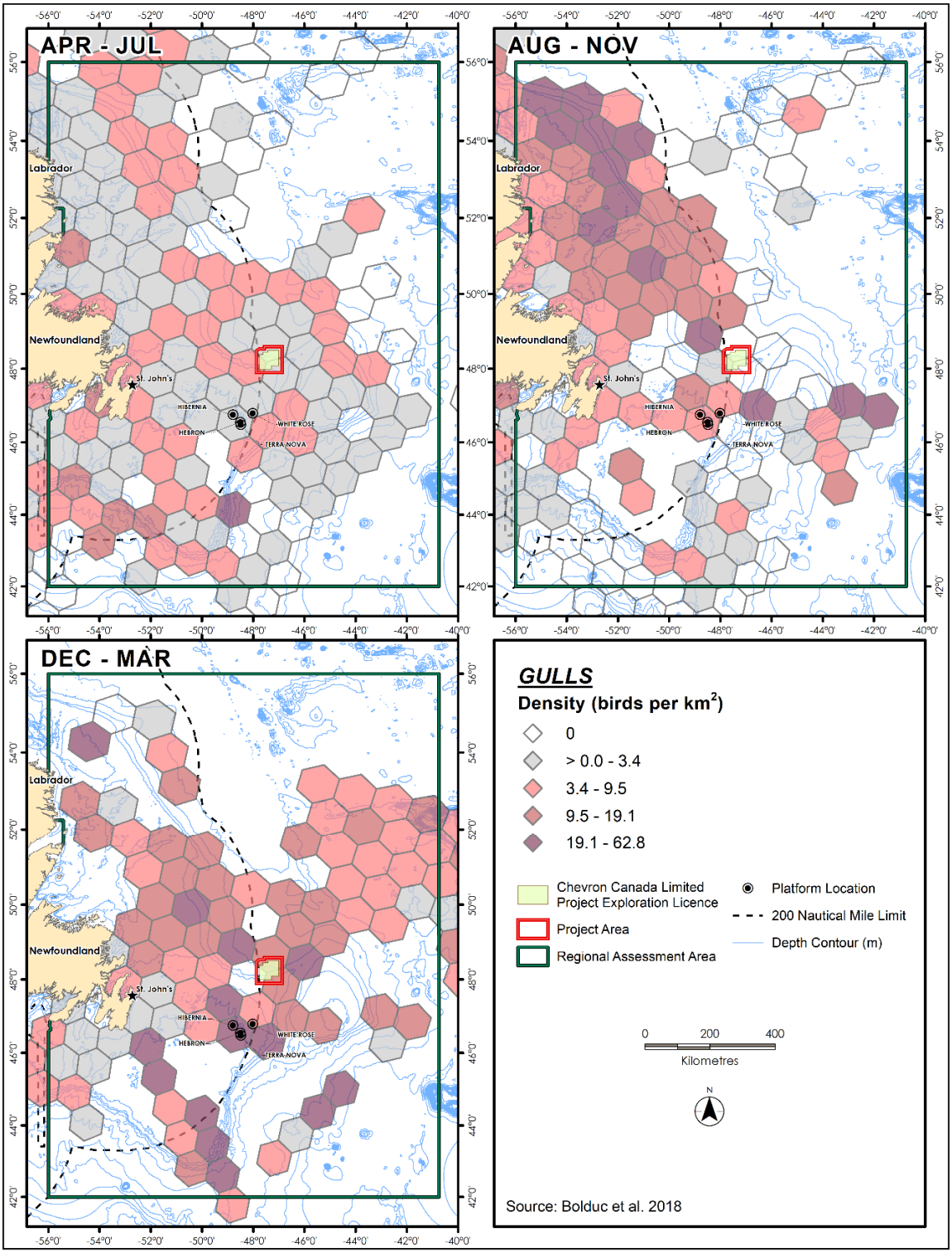


Figure 6-20 Seasonal Distribution and Abundance of ECSAS Gull Observations, Excluding Kittiwakes, in the Waters Off Eastern Newfoundland (2005-2016)

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 (Table 6.8). There are also small numbers of non-breeding sub-adult black-legged kittiwakes in offshore waters during this period (Lock et al. 1994; Holst and Mactavish 2014; Bolduc et al. 2018). Many kittiwake nesting colonies are declining (Frederiksen et al. 2012). During April to July, densities in the Project Area range from > 0 to 2.3 birds/km² (Figure 6-21; (Holst and Mactavish 2014)). Adults and fledglings abandon the colony in August and begin to arrive in the offshore parts of the RAA. During the August to November period, no kittiwakes were observed on-transect in the Project Area during a seismic monitoring program (Figure 6-21; (Holst and Mactavish 2014)). During December through March, densities range from > 0 to 10.6 birds/km² (Bolduc et al. 2018). 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 IUCN's Red List of globally threatened species (Birdlife International 2019).

6.2.2.2.2 Ivory Gull

Ivory Gull forages in sea ice between breeding seasons. When the sea ice arrives on the Northeast Newfoundland Shelf in late winter and early spring this species can be found in the northwest corner of the RAA (Gilg et al. 2010; Spencer et al. 2016). At that time, it occasionally occurs along the coast of the Northern Peninsula (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 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 in Orphan Basin from late May to late September during geophysical surveys (Moulton et al. 2005; Moulton et al. 2006; Abgrall et al. 2008; Mactavish et al. 2012; Holst and Mactavish 2014) and Flemish Pass (Jones and Lang 2013).

Ross's gulls winter 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, 2019, pers. comm.). It winters at scattered locations along the Newfoundland coastline (B. Mactavish, 2019, pers. comm.). Although it 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.

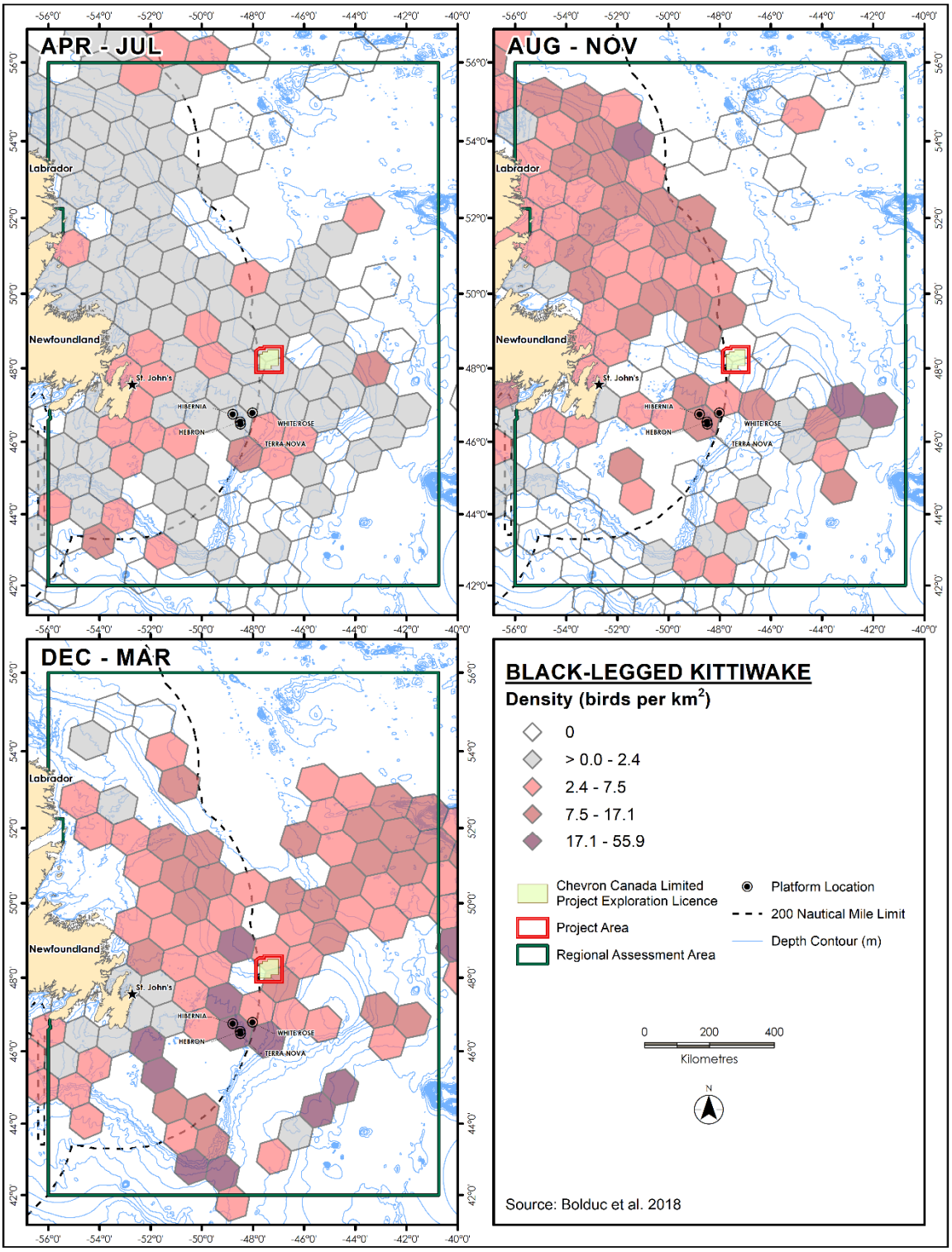


Figure 6-21 Seasonal Distribution and Abundance of ECSAS Black-legged Kittiwake Observations in the Waters Off Eastern Newfoundland (2005-2016)

6.2.2.3 Large Gulls

Great black-backed, herring and ring-billed gulls nest all along the coast in the RAA. Ring-billed gulls nest in few larger colonies but great black-backed and herring gulls nest alone or in small colonies (Statoil Canada Ltd. 2017). Nesting populations of major nesting colonies in eastern Newfoundland are presented in Table 6.8. These species are coastal year-round, except for great black-backed gull. The majority of great black-backed gulls move at least 50 km offshore after the breeding season (Good 1998). During fall, this species concentrates in large numbers 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 rare offshore but have been recorded during geophysical surveys (Moulton et al. 2006; Abgrall et al. 2008).

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

Lesser black-backed gull is found in the RAA in small numbers after abandoning breeding colonies in southwest Greenland (Moulton et al. 2006; Abgrall et al. 2008; Hauser et al. 2010; Jones et al. 2012; Mactavish et al. 2012; Jones and Lang 2013; Holst and Mactavish 2014, B. Mactavish, 2019, pers. comm.).

Densities of large and small gulls (except black-legged kittiwake) in the Project Area during the April to July period range from > 0 to 5.9 birds/km² (Figure 6-20). During the August to November period, densities range from 0 to 3.6 birds/km². During the December to March period, densities range from 7.4 to 17.3 birds/km².

6.2.2.4 Terns

Terns occur in the waters of the RAA from late May to early 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). Between nesting seasons, Arctic tern is found in pelagic waters (Hatch 2002). 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, but probably migrates across a broad front (Moulton et al. 2006; Hauser et al. 2010; Mactavish et al. 2012; Holst and Mactavish 2014). Common and Caspian terns are rare offshore but have been recorded in Orphan Basin (Jones et al. 2012; Mactavish et al. 2012; Jones and Lang 2013). Terns were not recorded on-transect during ECSAS surveys in the Project Area (Bolduc et al. 2018). These species capture prey by plunge-diving (Cuthbert and Wires 1999; Hatch 2002; Nisbet 2002).

6.2.2.5 Skuas and Jaegers

All 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. They have been recorded on ECSAS surveys in the Project Area during the April to July period in densities of 0.2 to 1.0 birds/km² in the southeast part of the Project Area but were not recorded on-transect in the remainder of the area (Figure 6-22). They were not recorded on-transect during the August to November period or the December to March period.

Great skua migrates through and winters in the RAA after arriving from nesting areas in northern Europe and Iceland. A large proportion of Iceland population winters in the waters off eastern Canada (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 recorded from geophysical survey vessels in Orphan Basin in densities ranging from 0.02 birds/km² during late August to 0.3 birds/km² during mid-August (Moulton et al. 2006; Jones et al. 2012; Jones and Lang 2013; Holst and Mactavish 2014). ECSAS surveys observed skuas in the Project Area in densities of 0 to 0.1 birds/km² during the April to July period (Figure 6-23). During the August to November period they were recorded in the western part of the Project Area in densities 0.1 to 0.4 birds/km², and in the southeast part in densities of 1.0 to 2.2 birds/km². They were not recorded on-transect in the northeast part (Figure 6-24). None were observed on-transect during the December to March period.

During geophysical surveys in Orphan Basin, both jaege skuas have been recorded off-transect during spring and fall migration (Moulton et al. 2006; Hauser et al. 2010; Jones and Lang 2013; Holst and Mactavish 2014). During the pelagic part of their annual cycle, jaegers and skuas procure much of their food via kleptoparasitism (piracy on other seabirds) (Wiley and Lee 1998, 1999, 2000).

6.2.2.6 Auks, Murres, Puffins, and Guillemots

Six species of the 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 but winters in the RAA in small numbers. 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 south of the RAA. Species that nest in the RAA arrive at nesting colonies in May to early June, and generally leave them by late August (Statoil Canada Ltd. 2017). These species forage primarily in coastal waters during this period. The populations at major nesting colonies in eastern Newfoundland are presented in Table 6.8.

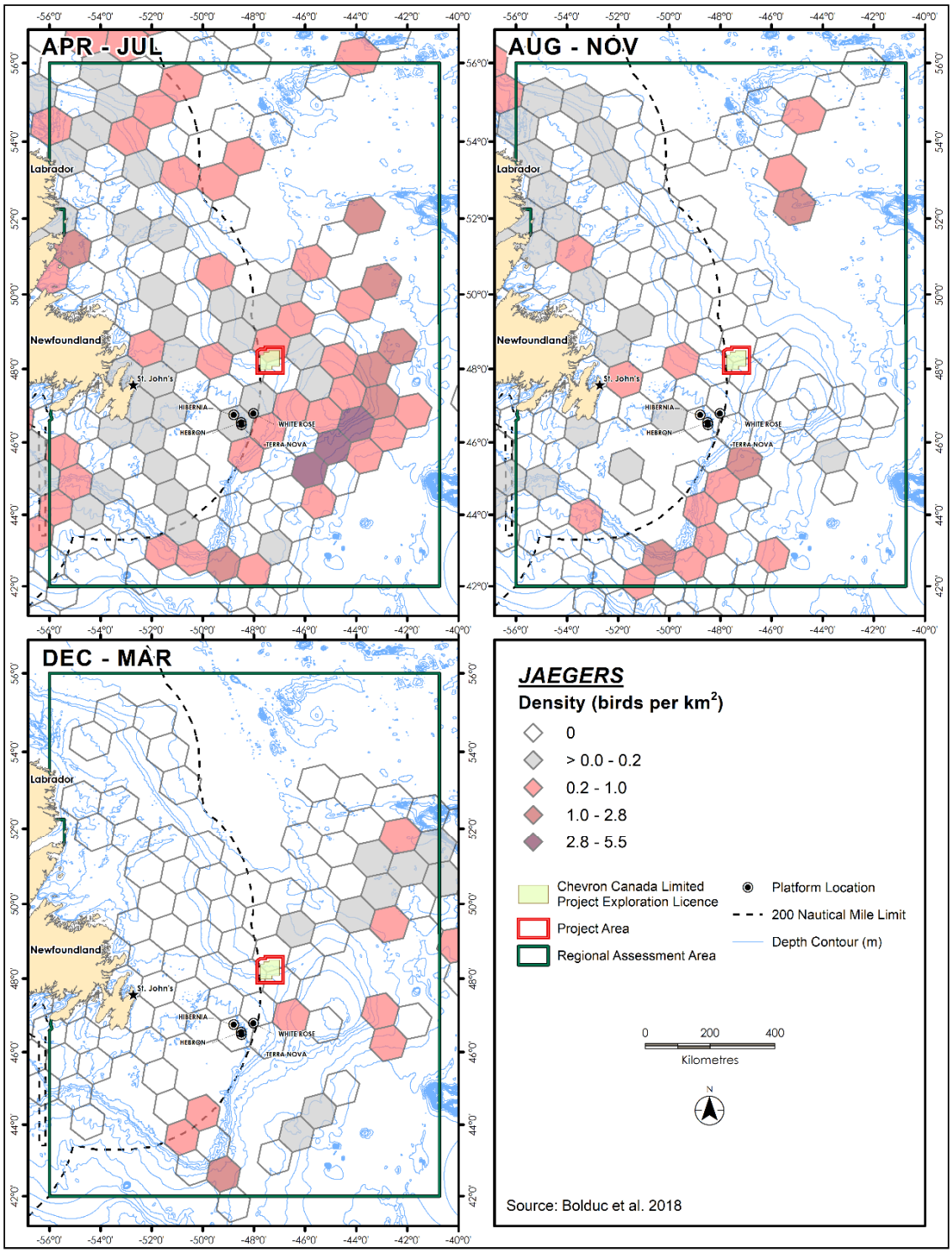


Figure 6-22 Seasonal Distribution and Abundance of ECSAS Jaeger (Pooled Pomarine, Parasitic, Long-tailed, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2005-2016)

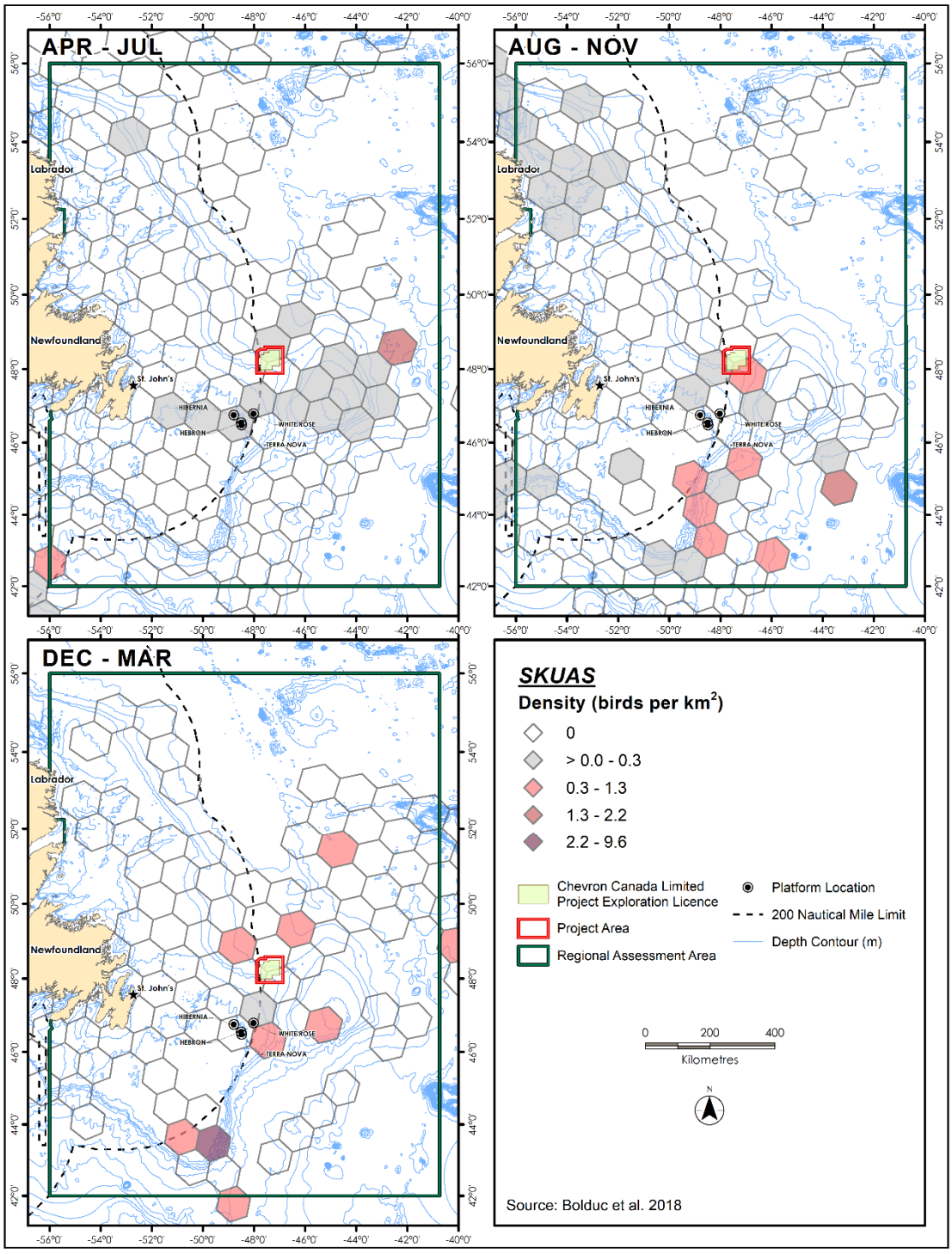


Figure 6-23 Seasonal Distribution and Abundance of ECSAS Skua (Pooled Great, South Polar and Unidentified) Observations in the Waters Off Eastern Newfoundland (2005-2016)

Alcids use pursuit diving to forage for small fish (e.g., capelin and sand lance) and invertebrates in the shallow 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 are 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).

During winter, alcids concentrate in the RAA mostly around relatively productive areas such as the continental shelf slope of the Grand Banks (Figures 6-24 and 6-25) (Gaston et al. 2011; Hedd et al. 2011; Montevecchi et al. 2012a). Such habitat in offshore NL waters attracts globally important 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 Orphan 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, although the core wintering range is in the Labrador Sea, 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. 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).

Dovekie densities during the April to July period range from 0 to 8.4 birds/km² in the Project Area (Figure 6-24). However, they are very rare by June, having departed for Arctic nesting colonies (Moulton et al. 2006). During the August to November period no birds were recorded on-transect in ECSAS surveys. Dovekies arrive in Orphan Basin in October, when post-breeding birds migrate to the area (Holst and Mactavish 2014). During the December to March period, densities in the northeast and southeast corners of the Project Area range from > 0 to 3.0 birds/km²; no ECSAS surveys were conducted in the western part of the Project Area. Densities are highest in the RAA at the southern end of Flemish Pass and the Northeast Newfoundland Shelf, where densities range up to 18.6 to 32.6 birds/km² (Figure 6-24).

Pooled common murre and thick-billed murre densities during the April to July period in the western end of the Project Area range from 5.4 to 20.0 birds/km² (Figure 6-25). In the rest of the Project Area, they range between > 0 and 5.4 birds/km². However, most thick-billed murres return to their Arctic nesting colonies by June (Holst and Mactavish 2014). During the August to November period, murres were not recorded on-transect during ECSAS surveys in the Project Area (Figure 6-25). Densities are higher on the northern Grand Banks to the southwest and on the Northeast Newfoundland Shelf to the northwest.

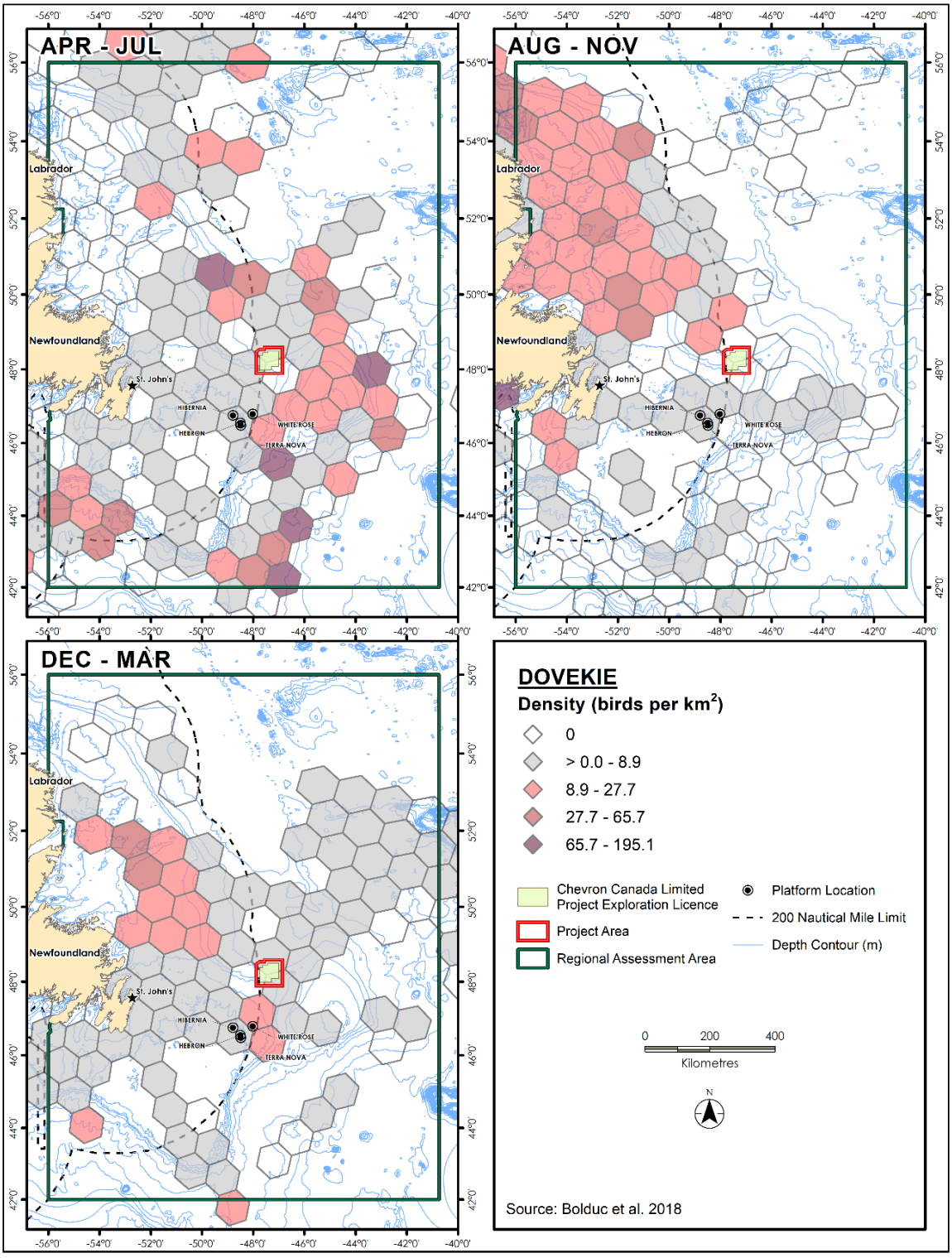


Figure 6-24 Seasonal Distribution and Abundance of ECSAS Dovekie Observations in the Waters Off Eastern Newfoundland (2005-2016)

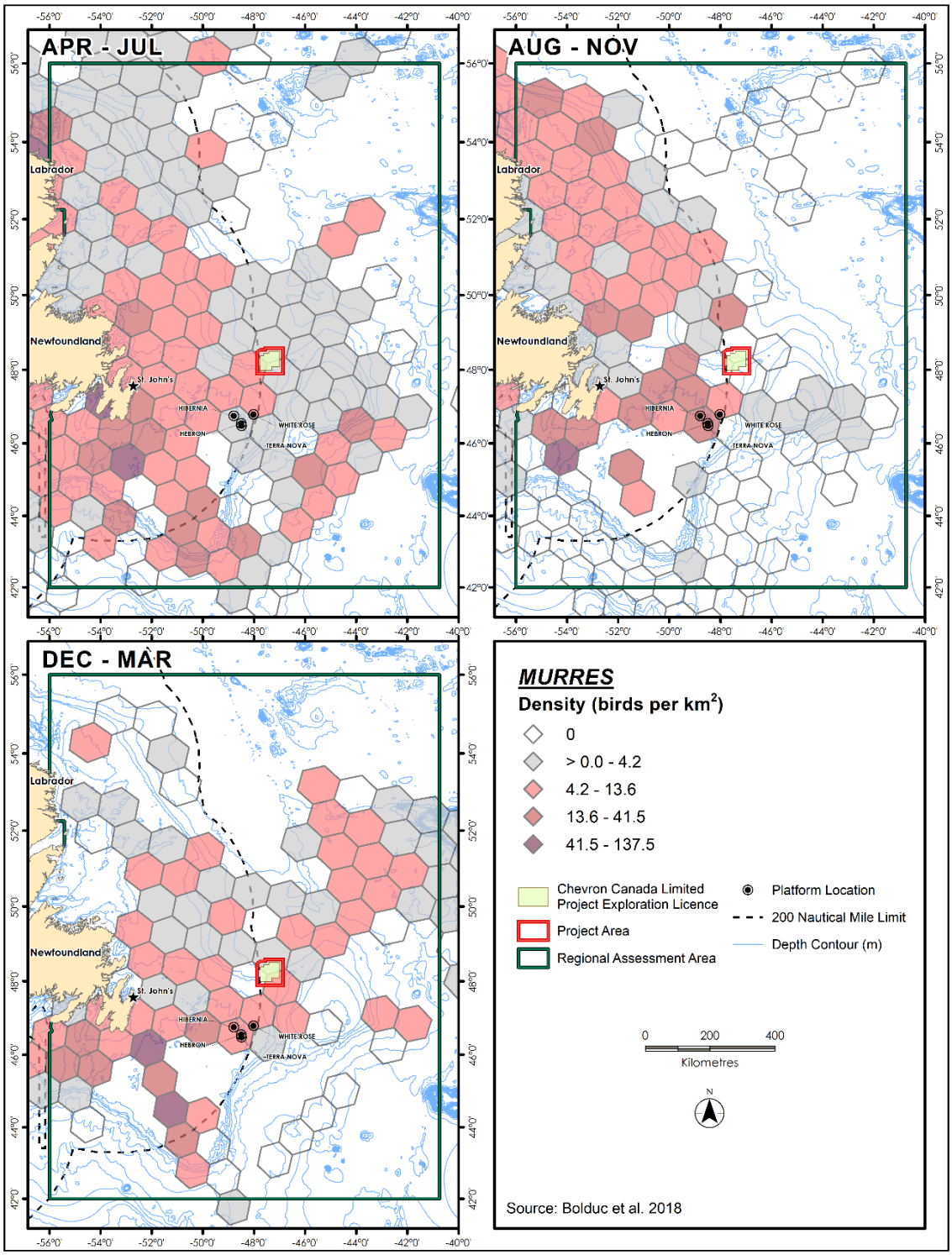


Figure 6-25 Seasonal Distribution and Abundance of ECSAS Murre (Pooled Common, Thick-billed, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2005-2016)

Migrant murres arrive in Orphan Basin in October (Holst and Mactavish 2014). During the December to March period murre densities in the Project Area range from > 0 to 11.3 birds/km². During this period, murre densities in the RAA are highest on the Grand Banks, ranging up to 41.6 to 63.5 birds/km² (Figure 6-25). During the April to July period, razorbill densities in the Project Area range from 0 to 0.3 bird/km², since most birds are inshore near nesting colonies (Bolduc et al. 2018). During the August to November period, this species has not been recorded on-transect in the Project Area and densities reach no higher than 1.7 birds/km² in the RAA. During the December to March period, Razorbill was not recorded on-transect in the Project Area and was less than 1 bird/km² in the RAA. Atlantic puffin densities in the Project Area during the April to July period range from 0 to 1.6 birds/km² as most birds are near their coastal colonies (Bolduc et al. 2018). During the August to November period, puffins were not recorded on-transect during ECSAS surveys in the Project Area but were recorded on the Grand Banks farther offshore from the colonies than during the nesting season. Similarly, during the December to March period puffins were not recorded in the Project Area, but were recorded in densities of up to 5.4 birds/km² along the southern coast of the Avalon Peninsula (Bolduc et al. 2018).

6.2.2.7 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 Newfoundland in small numbers (Table 6.8) 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. 2008). 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 (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 northern summer (Hedd et al. 2012). Great and sooty shearwaters are the primary bird species that consume of 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 coming into 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. It nests in small numbers at Middle Lawn Island but has been recorded in larger numbers prospecting for nest sites on other nearby islands (Roul 2010). Manx shearwater forages near the breeding colony during the nesting period (Onley and Scofield 2007). However, this species is seen in August in Orphan Basin in small numbers (Jones et al. 2012; Jones and Lang 2013).

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. Bermuda petrel is designated Endangered by IUCN (BirdLife International 2019). Data loggers placed on individuals of this species have shown presence on the 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 continental shelf (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 Project Area during the April to July period in densities of 6.6 to 111.5 birds/km² (Figure 6-26). However, many of these birds migrate north by June to northern nesting colonies (Moulton et al. 2006; Holst and Mactavish 2014). During the August to November period, densities in the Project Area range from > 0 to 14.2 birds/km² in the northeast part of the Project Area and from 212.7 to 399.4 birds/km² in the southeast part. However, the majority of these birds arrive in the Project Area in September or October (Moulton et al. 2006; Holst and Mactavish 2014). During the December to March period, densities in the Project Area range from 0 to 9.0 birds/km². However, densities are higher elsewhere in the RAA, ranging up to 20.8 to 50.0 birds/km² at the south end of Flemish Pass, the Tail of the Bank, Orphan Knoll, and the Northeast Newfoundland Shelf (see Figure 5-1).

Shearwater densities in the Project Area during April to July range from > 0 to 10.6 birds/km² (Figure 6-27). During August to November, densities range between 14.5 and 61.9 birds/km². However, the majority are present only from June to September (Abgrall et al. 2008; Holst and Mactavish 2014). During the December to March period, no shearwaters were recorded on-transect during ECSAS surveys in the Project Area.

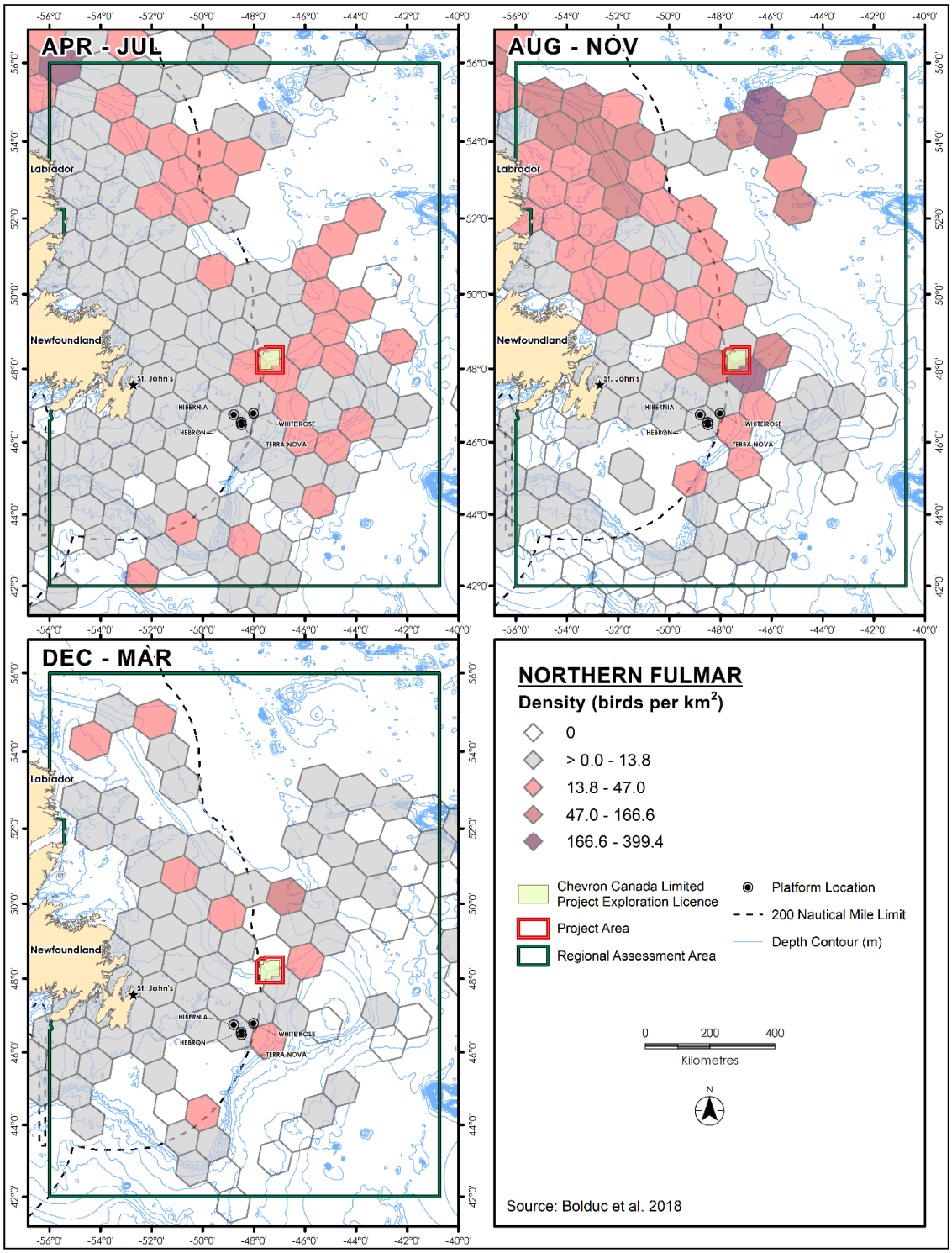


Figure 6-26 Seasonal Distribution and Abundance of ECSAS Northern Fulmar Observations in the Waters Off Eastern Newfoundland (2005-2016)

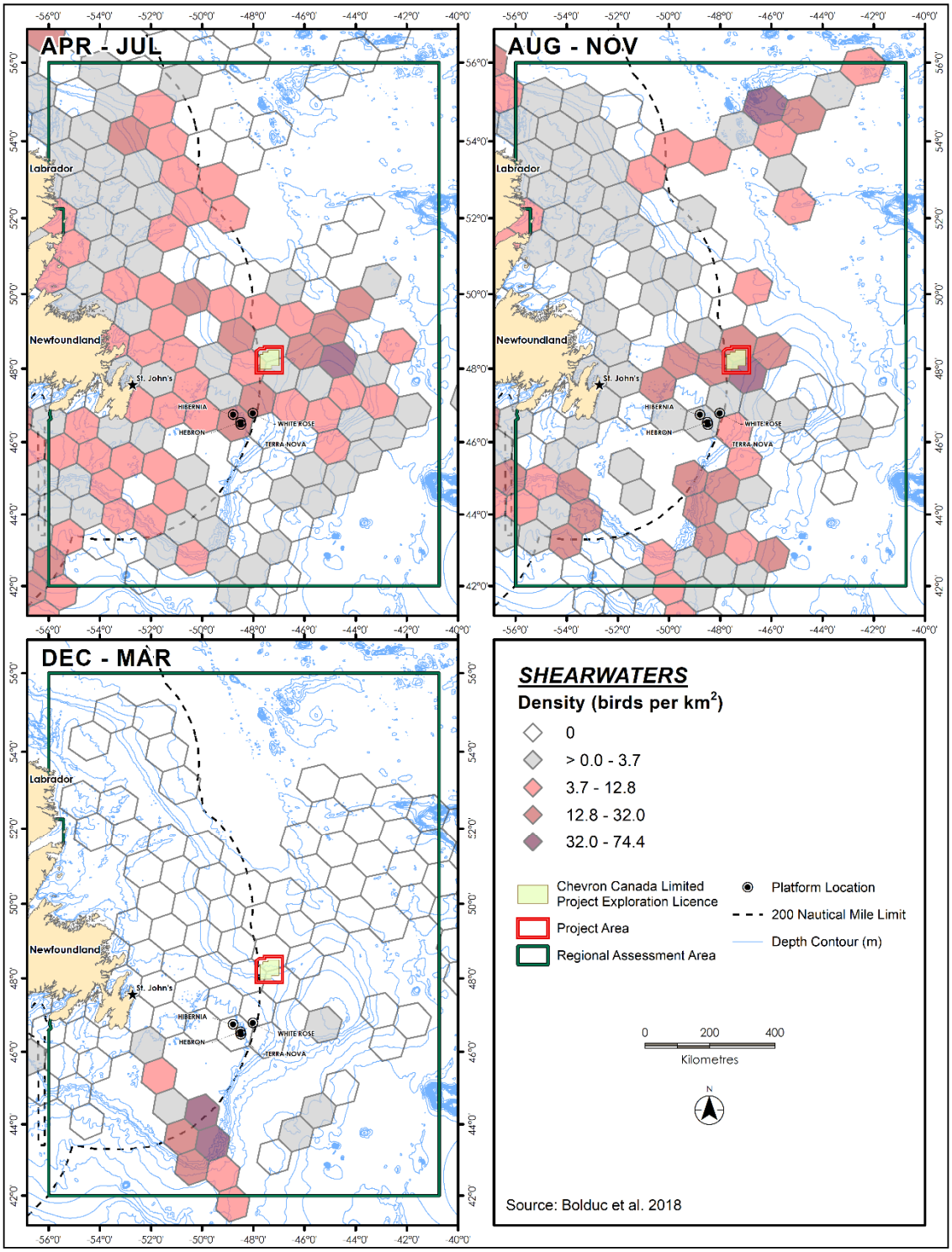


Figure 6-27 Seasonal Distribution and Abundance of ECSAS Shearwater (Pooled Great, Sooty, Manx, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2005-2016)

6.2.2.8 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 is comprised of Newfoundland, Nova Scotia, and Norway; these birds winter in pelagic waters of the tropics (Onley and Scofield 2007). Some individuals may 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 storm-petrels feed by picking food items from the surface. During the nesting season, this species commutes from the nesting colony across the continental shelf to forage in deep water off the shelf (Pollet et al. 2014; Hedd et al. 2018). 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). 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).

Leach's storm-petrel is the most numerous nesting seabird in Newfoundland (Table 6.8). In excess of two million pairs of Leach's storm-petrel nested on the Avalon Peninsula in the recent past. The population size of Newfoundland Leach's Storm-petrels is undergoing a substantial decline. Preliminary 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 just under 2 million pairs, a decline of 40% from the previous survey in 1984 (CWS unpublished data). The results of surveys of nesting Leach's storm-petrels on Gull Island in the Witless Bay Ecological Reserve indicated a decline from 352,000 breeding pairs in 2001 to 180,000 pairs in 2012, a decrease of 51% (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). The cause of the Leach's storm-petrel population decline has not yet been determined. 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). It is likely that millions of storm-petrels cross the RAA during the annual abandonment of colonies by fledglings and adults. Tracking studies confirm 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. 2014). This species is designated Vulnerable by IUCN (BirdLife International 2019). Wilson's storm-petrel is found in Orphan Basin in small numbers during summer (Moulton et al. 2006; Mactavish et al. 2012; Holst and Mactavish 2014). An additional species of storm-petrel, band-rumped, occasionally occurs in the RAA. 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).

Storm-petrel densities (pooled Leach's, Wilson's and unidentified) in the Project Area during the April to July period range from > 0 to 5.8 birds/km² (Figure 6-28). During the August to November period, densities in the Project Area range from > 0 to 5.7 birds/km². During the December to March period, densities of > 0 to 0.2 birds/km² were recorded in the northeast part of the Project Area but none were recorded on-transect in the southeast corner. No surveys were conducted in the western part of the Project Area.

Chevron

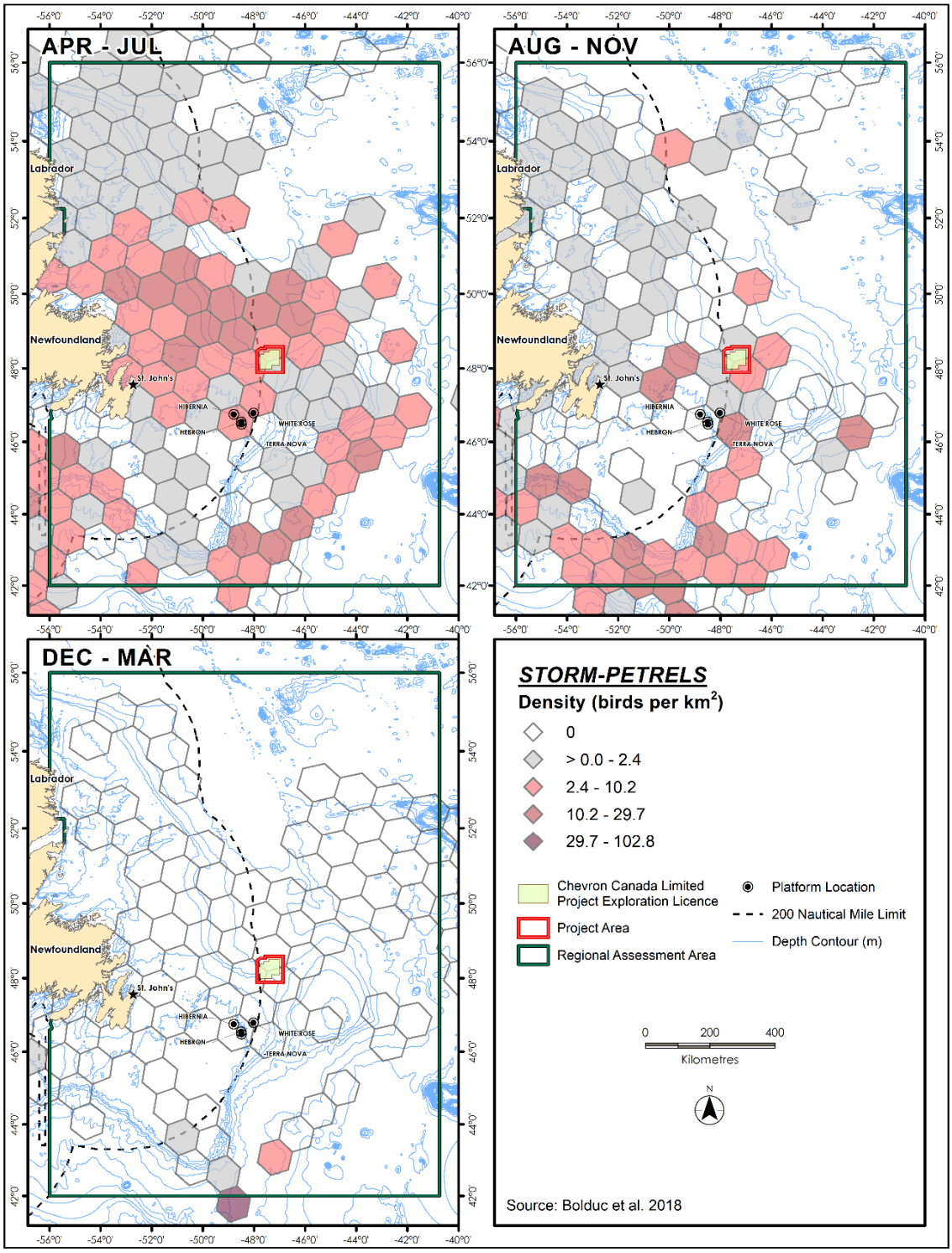


Figure 6-28 Seasonal Distribution and Abundance of ECSAS Storm-petrels (Pooled Leach's, Wilson's, and Unidentified) Observations in the Waters Off Eastern Newfoundland (2005-2016)

6.2.2.9 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 (Table 6.8). Adults return to colonies in mid-March, followed a few weeks later by sub-adults (Statoil Canada Ltd. 2007). Juveniles migrate southward in September; adults and older immature birds may travel north from the colonies to feed along the Labrador Coast before southward migration (Statoil Canada Ltd. 2007). 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). Flocks of up to a thousand gannets may congregate over shoals of fish, and invertebrates such as squid (Mowbray 2002). Most individuals winter along the Atlantic coast of the U.S. and Gulf of Mexico (Fifield et al. 2014).

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 off the continental shelf to the Project Area (Moulton et al. 2006, Abgrall et al. 2008, Holst and Mactavish 2014). Gannets were not recorded on-transect during ECSAS surveys in the Project Area but were recorded inshore and offshore south of the Avalon Peninsula (potential passage migrants) during the April to July and August to November periods Figure 6-29.

6.2.2.10 Cormorants

Great and double-crested cormorants both breed in coastal Newfoundland (Table 6.8). The two species are often found in mixed colonies (Hatch et al. 2000). Cormorants are restricted to coastal areas throughout the year, with the exception of 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 throughout the 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 to 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).

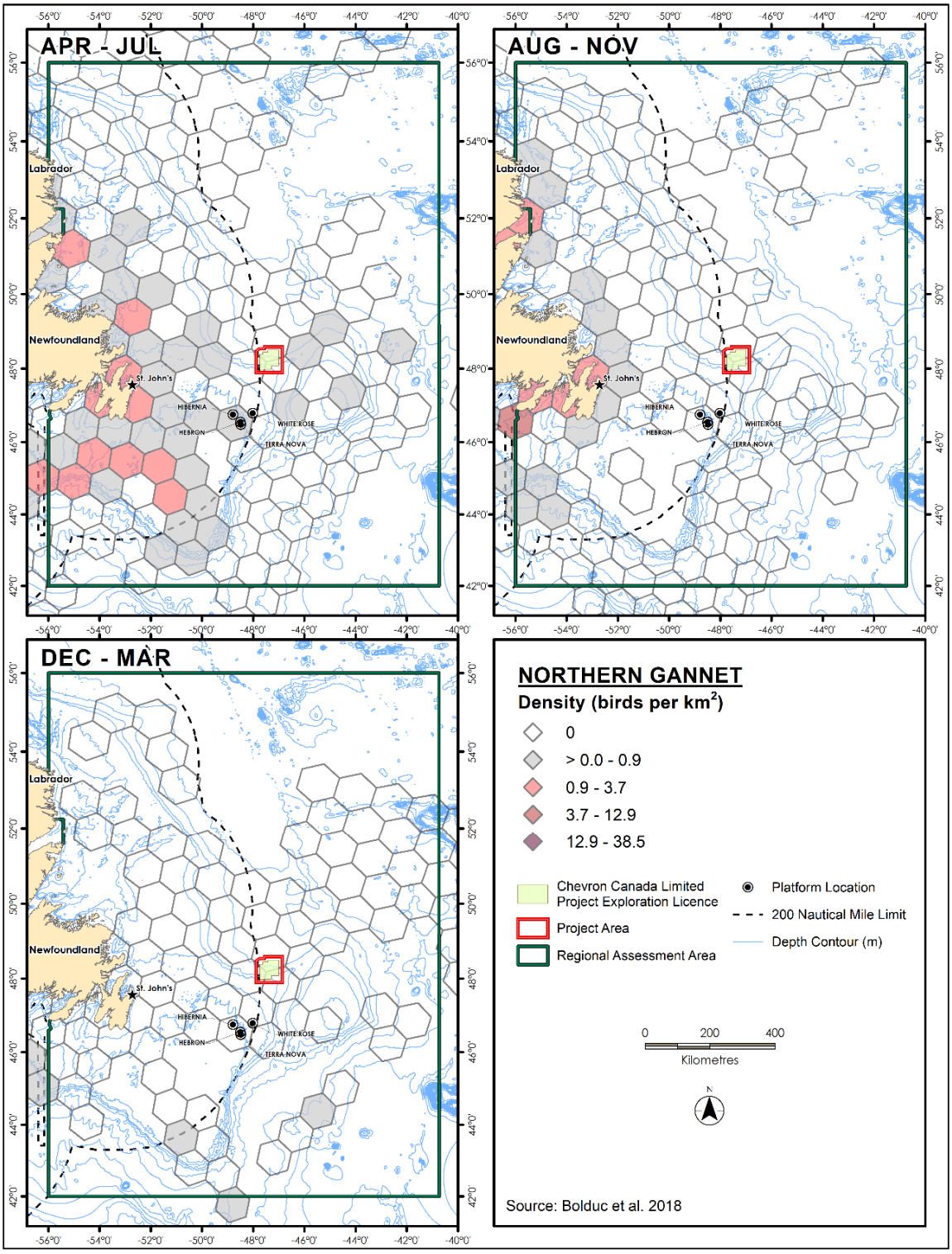


Figure 6-29 Seasonal Distribution and Abundance of ECSAS Northern Gannet Observations in the Waters Off Eastern Newfoundland (2005-2016)

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 occurred in Newfoundland (Statoil Canada Ltd. 2017), but only 24 species regularly occur in the marine waters of the RAA (Table 6.9). Two of these are species of conservation concern (harlequin duck and Barrow's goldeneye) (Section 6.2.4).

Table 6.9 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

Large flocks of eiders, scoters, and long-tailed ducks winter along the coast in (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 numerous 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 to 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. 2008; Jones and Lang 2013; Holst and Mactavish 2014). 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 a handful of other duck species (Statoil Canada Ltd. 2017).

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 6.10). Of these species piping plover, spotted sandpiper, and willet nest along marine coastlines. Piping plover is designated Endangered by COSEWIC and on Schedule 1 of SARA and under the NL ESA (Section 6.2.4). However, 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 from the Cape Freels coastline (Bird Studies Canada 2016). Several species use coastlines in the RAA during fall migration. ACSS data show migration stopovers in the RAA at Witless Bay, Renews, Long Beach, St. Shotts, Spaniard's Bay, and Bellevue Beach, Cape Freels, and Cape Bonavista (Environment Canada 2009; Bird Studies Canada 2016). Purple sandpipers winter (November to 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 6.10 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 Orphan Basin and adjacent areas (Moulton et al. 2005; Abgrall et al. 2008; Hauser et al. 2010; Jones and Lang 2013; Holst and Mactavish 2014). 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 to 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 Newfoundland, Labrador, Nunavut, and Greenland and migrating over marine waters also drift with the wind out to sea and land on vessels in the RAA; several species have been recorded on offshore platforms and vessels (Thomas et al.

2014b; Statoil 2015a, 2015b, 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 fall migration (July to 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 and/or the Project Area (Table 6.11). These birds are comprised of two coastal waterfowl species, three shorebird species, one phalarope species, two gull species, and one raptor species. An additional six species, while not designated provincially or federally, occur on IUCN's Red List of Threatened Species as Endangered, Vulnerable, or Near Threatened. Other shorebird and landbird SAR in Newfoundland are not likely to occur in the RAA or Project Area.

Table 6.11 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	Least Concern
Long-tailed Duck	None	None	None	Vulnerable
Barrow's goldeneye (eastern pop.)	Vulnerable	Special Concern (Schedule 1)	Special Concern	Least Concern
Piping plover (*melodus* ssp.)	Endangered	Endangered (Schedule 1)	Endangered	Near Threatened
Red knot (*rufa* ssp.)	Endangered	Endangered (Schedule 1)	Endangered	Near Threatened
Buff-breasted sandpiper	None	Special Concern (Schedule 1)	Special Concern	Near Threatened
Red-necked phalarope	None	Special Concern (Schedule 1)	Special Concern	Near Threatened
Black-legged Kittiwake	None	None	None	Vulnerable
Ivory gull	Endangered	Endangered (Schedule 1)	Endangered	Near Threatened
Ross's gull	None	Threatened (Schedule 1)	Threatened	Least Concern
Peregrine falcon *anatum / tundrius*	Vulnerable	Special Concern (Schedule 1)	Not at Risk	Least Concern
Leach's storm-petrel	None	None	None	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 (spent inland). It disperses to rocky coastlines, subtidal ledges, and exposed headlands to moult in summer and to winter (NLDEC 2016). In summer harlequin ducks moult 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). The largest concentration of wintering harlequin ducks along the Newfoundland is found at Cape St. Mary's 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 of wintering birds are also reported from scattered locations on the Avalon Peninsula and the south coast of Newfoundland (B. Mactavish, 2019, pers. comm.). This species is likely to occur in the Project Area only rarely as a vagrant during migration. A harlequin duck was seen in Orphan Basin from a geophysical vessel on 29 September 2016 (Lang 2016).

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 small numbers in coastal estuaries in the Gulf of St. Lawrence, mainly in Quebec and New Brunswick, often with common goldeneye (Schmelzer 2006). Small numbers have been occasionally reported wintering 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).

The red knot, *rufa* subspecies, is designated Endangered on Schedule 1 of SARA and Endangered under the NL ESA. 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 2017a). This species occurs in Newfoundland during fall migration (1 August to 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, sightings have been reported around almost the entire coast of Newfoundland, with most on the west coast (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 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. This species nests in the central and western Arctic of North America. 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 considered to be very uncommon in the province (likely to be found annually in appropriate season / habitat) (Mactavish et al. 2016). This species is occasionally observed at St. Shott's Sod Farm near the southern shore of the Avalon Peninsula and at Cape Bonavista and is reported as a rare visitor at a number of other survey sites (ACSS data; Environment Canada 2009). It is occasionally sighted in Orphan Basin 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. 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 plan for this species have been prepared to date. 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). Tracked individuals nesting in east Greenland,

Iceland, and the Shetland Isles migrated in fall through the RAA on their way to their wintering area and back again in the following spring (Smith et al. 2014; van Bemmelen et al. 2019). 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 the majority 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 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 and Threatened by COSEWIC. Threats to Ross's gull that have been identified so far consist of human disturbance at nests at Churchill, Manitoba, predation by gulls, jaegers, Arctic fox, weasels and polar bears, and 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 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). As a result, this species 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 and Vulnerable under the NL ESA. The use of organochlorine pesticides is the greatest threat to this species (high level of concern, high severity, high causal certainty) (ECCC 2017b). Use of toxic chemical products is a threat of medium concern (medium severity, medium causal certainty). The Project's routine operations would not contribute to this threat because permitted discharges do not include toxic chemicals. 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 (Moulton et al. 2006; Lang et al. 2008; Mactavish and Lang 2015). 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

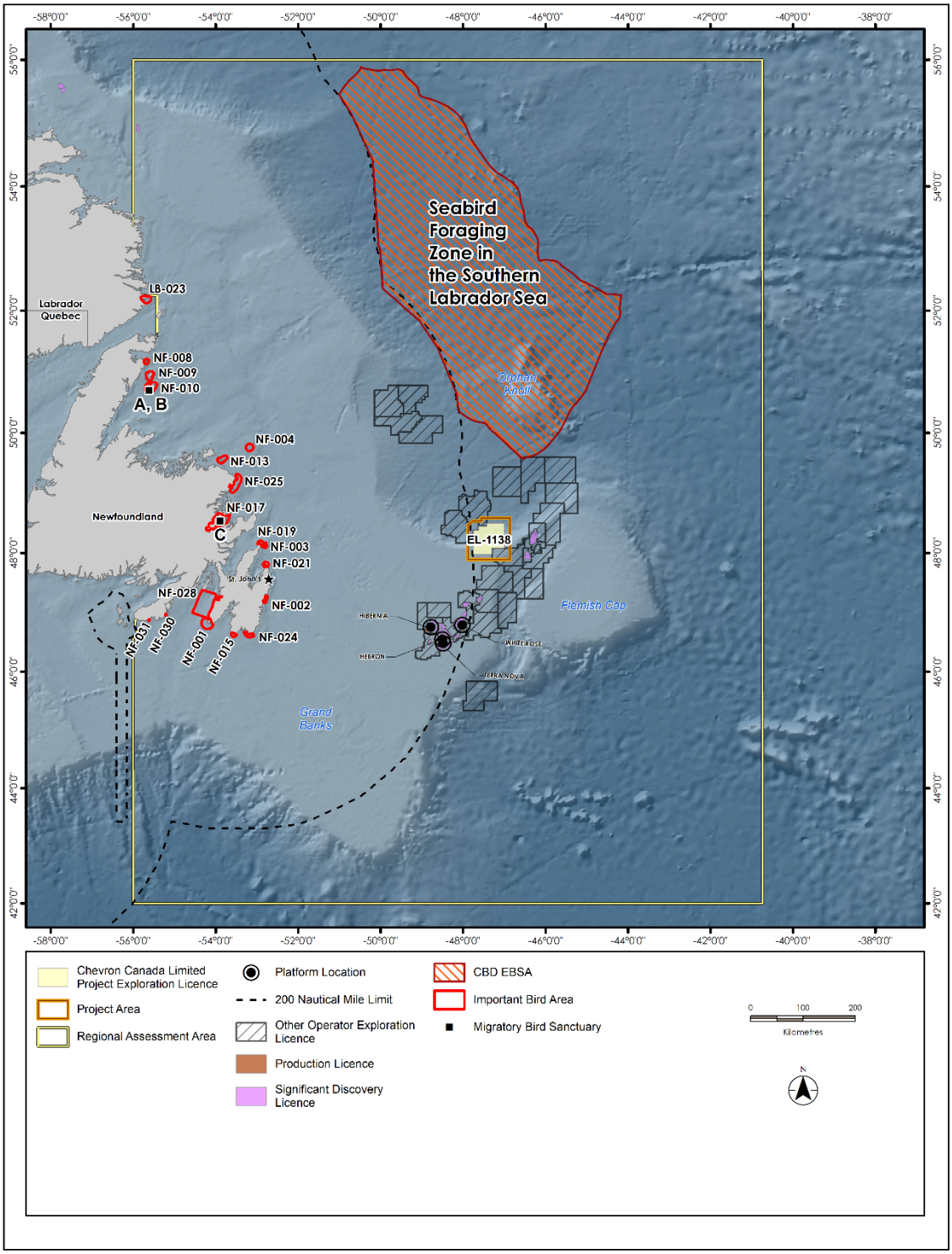
The marine waters in offshore eastern Newfoundland are important to many marine-associated and migratory bird species during some portion of the year (Table 6.8). During summer, seabirds in the RAA

are largely concentrated at nesting colonies and in the coastal areas (Fifield et al. 2009) in globally important numbers of Atlantic puffin, common murre, Leach's storm-petrel, and northern gannet, in continentally important numbers of black-legged kittiwake, and in smaller numbers of other species (Bird Studies Canada 2016). Most of these birds forage close to their colonies on pelagic fish that have migrated to the shallow waters to spawn. The exception is Leach's storm-petrel, which commutes over the continental shelf to forage for its nestlings in deep waters off the shelf, such as Orphan Basin and Flemish Pass, which is the nearest deep-water area to the largest nesting colony in the world of this species (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 also host 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.

Upon completion of nesting, the species that were abundant in coastal areas of the RAA largely move south and are replaced by "continentally significant" numbers of wintering common eider, nationally important numbers of harlequin duck (Special Concern, SARA Schedule 1), large numbers of other species of sea duck, and large numbers of Iceland gulls (Bird Studies Canada 2016). 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. Great black-backed gulls 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. These consist of: 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 an IBA 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 SAR, species with restricted range, habitats holding representative species assemblages, or a congregation of a large 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 6-30). These are summarized in Table 6.12. Some of these IBAs are also designated federal Migratory Bird Sanctuaries or provincial Seabird Ecological Reserves (Table 6.12). 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*.

As discussed above, other breeding sites for colonially nesting species are important sites and habitat for marine birds. The locations are discussed in Section 6.4.5.1. Ecologically or Biological Significant Areas (EBSA) have also been identified in the RAA (Table 6.13). The criteria for selection and ranking of EBSAs included importance to seabird biodiversity, density, reproduction, and survival.



Note: NF0XX: see Tables 6.10 and 6.11; A, B: Île aux Canes and Shepherd Is. Migratory Bird Sanctuaries; C: Terra Nova National Park Migratory Bird Sanctuary

Figure 6-30 Important Bird Areas, Migratory Bird Sanctuaries, and Seabird Convention on Biological Diversity EBSA Locations

Table 6.12 Important Bird Areas on Marine Waters of Eastern Newfoundland

IBA Name and IBA Number*	Importance to Marine and Migratory Birds
St. Peter Bay (LB023)	Harlequin duck[S] premoulting[N]; common eider major moulting area[C]
Fischot Islands (NF008)	Common eider wintering[G]
Northern Groais Island (NF009)	Black-legged kittiwake nesting colony[C]; common eider wintering
Bell Island South Coast (NF010)	Common eider nesting colony[C]
Funk Island (NF004)	Nesting[G] common murre, nesting[G] northern gannet; provincially protected SER[E]; overlaps Fogo Shelf EBSA[E]
Wadham Islands and adjacent Marine Area (NF013)	Wintering[C] common eider; nesting[C] Atlantic puffin, nesting Leach's storm-petrel and razorbill; overlaps Fogo Shelf EBSA[E]
Cape Freels Coastline and Cabot Island (NF025)	Wintering[C] common eider; nesting[C] black-headed gull; nesting common murre, razorbill, Atlantic puffin, and common / Arctic tern; overlaps Fogo Shelf EBSA[E]
Terra Nova National Park (NF017)	Wintering[C] black-headed gull; wintering[C] dovekie; 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[C] common eiders; wintering black-legged kittiwake, thick-billed murre, dovekie; summer use Atlantic puffin, northern Gannet
Baccalieu Island (NF003)	Nesting[G] Leach's storm-petrel and Atlantic puffin; nesting[C] black-legged kittiwake, large nos. nesting northern gannet; other nesting species; SER
Cape St. Francis (NF021)	Fall migration[C] dovekie; fall migration[C] Manx shearwater; large nos. wintering common eider; wintering purple sandpiper
Witless Bay Islands (NF002)	Nesting[G] Atlantic puffin, common murre, razorbill, and Leach's storm-petrel; nesting[C] black-legged kittiwake and herring gull; staging waterfowl; SER; overlaps Eastern Avalon Coast EBSA[E]
Mistaken Point (NF024)	Wintering common eider; wintering[C] purple sandpiper; nesting black-legged kittiwake, common murre and razorbill; spring[C], summer and fall Manx shearwater; 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 summering[G]; dovekie wintering[C]; Manx shearwater summering[C]; overlaps Placentia Bay EBSA[E]
Corbin Island (NF030)	Leach's storm-petrel nesting[G]; herring gull nesting[C];
Middle Lawn Island (NF031)	Manx shearwater summering[C]; Leach's storm-petrel nesting[G]

Notes:
[C] Continentally Significant concentration of birds (IBA criteria), [E] Ecologically or Biologically Significant Area, [G] Globally Significant concentration, [N] Nationally Significant concentration, [P] Provincial Seabird Ecological Reserve (SER), [S] Species of Conservation Concern
* Locations illustrated in Figure 6-39

Table 6.13 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.
Source: From Templeman (2007), DFO (2012, 2016), Wells (2017), and environmental monitoring reports (seabirds and marine mammals) of geophysical surveys (various years)	

More information on special areas of importance to Marine Birds (e.g., Migratory Bird Sanctuaries, EBSAs) is included in Section 6.4.2.3.

6.3 Marine Mammals and Sea Turtles

Thirty-two marine mammal species could potentially occur in the Project Area and RAA, including twenty-six cetaceans (whales, dolphins, and porpoises) and six phocids (true seals). The occurrence of seven of the cetacean species is atypical; however, sightings / detections have been or could be made within the RAA. Most marine mammal species use the area seasonally, and the region likely offers important foraging habitat for various marine mammals. 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 offshore area of eastern Newfoundland were presented in the Eastern Newfoundland SEA (Section 4.2.3 of AMEC 2014) as well as project-specific exploration drilling and seismic EAs off the east coast of Newfoundland (Section 4.5 of LGL 2015, 2016; Section 6.3 of Statoil 2017, ExxonMobil 2017, and BP Canada 2018). A brief overview of marine mammal and sea turtle species that occur in or near the Project Area is provided below, based on the aforementioned documents. New information that was not included in the Eastern NL SEA or project-specific EAs, as compiled in COSEWIC species assessments and status reports, DFO research and scientific documents, peer-reviewed publications, and technical reports is also provided below. The main sources of information on marine mammal and sea turtle occurrence, distribution, and abundance within or near the Project Area that were used are summarized below:

- The DFO cetacean and sea turtle sightings database for Newfoundland and Labrador waters has been compiled from various sources by DFO, St. John's (J. Lawson, 2019, pers. comm.) and was made available for describing sightings within the Project Area. The data were collected opportunistically and do not include information on survey effort. Thus, the data illustrate what species have occurred in the Project Area at various times of the year, but they cannot reliably predict species distribution, abundance, or fine-scale habitat use in the area. Data from 1945 to 2015 were used for mapping and sightings summary tables. Note that the DFO sightings database includes sightings made during Chevron's seismic monitoring programs in Orphan Basin in 2004 and 2005.
- Marine mammal and sea turtle incidental sightings collected during geophysical surveys and drilling programs by Equinor Canada were compiled for 2008 through 2015. Data were obtained from LGL (2009, 2014), Fugro (2015), PAL (2015), and incidental sightings during other Equinor Canada activities off eastern Newfoundland (Equinor Canada, unpublished data). The marine mammal sightings were provided to the C-NLOPB. Sightings were also recorded during Equinor Canada's 2018 seabed survey program, which occurred from August to October and included a portion of the Project Area (Mactavish and Penney-Belbin 2018).
- The C-NLOPB database of marine mammal and sea turtle sightings includes observational data obtained during various geophysical surveys in offshore waters of Newfoundland from 2004 to 2017. Except for data from 2016 and 2017, records are included in the DFO cetacean and sea turtle database. Marine mammal sighting data collected in or near the Project Area during two programs for Fugro (in 2017) and three programs for MKI (in 2016) are included in this database.
- Sea turtle records from OBIS, a global open-access database (http://www.iobis.org) were mapped, as they include pelagic fisheries bycatch records which are not included in the DFO cetacean and sea turtle database. However, marine mammal records from OBIS were not used, as most of those records are included in the DFO database. Like the DFO database, OBIS does not provide information on survey effort.
- As part of an ESRF study, *Acoustic Monitoring Along Canada's East Coast: August 2015 to July 2017* (Delarue et al. 2018), 20 acoustic recorders were deployed from northern Labrador to the southwestern Scotian Slope over two years to detect marine mammal vocalizations. The closest recorder (Stn 19) was deployed at Sackville Spur, 25 km to the east of the Project Area, during July 2016 to July 2017. The next closest recorders to the Project Area were located approximately 120 km to the west.

- JASCO Applied Sciences study of *Marine Mammals and Sound Sources in the Flemish Pass* for Equinor Canada (Maxner et al. 2019) used an acoustic recorder (CM2) to detect marine mammal vocalizations during 2014 and 2015. It was located approximately 40 km to the east of the Project Area.
- The Trans North Atlantic Sightings Survey (TNASS) was a large-scale survey of megafauna in Newfoundland waters during July and August 2007 (Lawson and Gosselin 2009). Surveys for marine mammals and sea turtles took place between northern Labrador and the Scotian Shelf. The surveys did not include the Project Area but surrounding waters, such as the Grand Banks. Marine mammal sightings from these surveys were used to derive abundance estimates for the region.

6.3.2 Overview of Species Occurrence

The seasonal occurrence and conservation status for marine mammals and sea turtles that could occur within or near the Project Area are summarized in Tables 6.14 and 6.15, respectively. Cetacean and sea turtle sightings in the Project Area within the year-round temporal scope of the Project are summarized in Table 6.16, based on all available sightings databases. Sightings include mysticetes (baleen whales), odontocetes (large toothed whales, dolphins, and porpoises), and sea turtles.

6.3.3 Mysticetes (Baleen Whales)

Not including atypical species, six baleen whale species could occur in the Project Area (Table 6.14). As blue whales, North Atlantic right whales, and fin whales have status under Schedule 1 of SARA, they are described in Section 6.3.7, Species at Risk. Although baleen whales do occur in offshore waters of Newfoundland and Labrador year-round, most whales migrate to lower latitudes during the winter (AMEC 2014). Figures are generated from data provided by J. Lawson (2019, pers. comm.) and in Lawson and Gosselin (2009), LGL (2009, 2014, 2015), Fugro (2015), PAL (2015), Equinor Canada (unpublished data) Delarue et al. (2018), Mactavish and Penney-Belbin (2018), Maxner et al. (2019), and the C-NLOPB marine mammal and sea turtle sightings database and OBIS a global open-access database (http://www.iobis.org) (see Section 6.3.1 for details on these information sources).

6.3.3.1 Humpback Whale

The humpback whale is listed as special concern under SARA (Schedule 3; Government of Canada 2019); it is considered not at risk by COSEWIC (COSEWIC 2003a). The humpbacks that occur in Newfoundland waters belong to the stock that breeds in the West Indies; this Western North Atlantic population is estimated to number 12,312 individuals (Bettridge et al. 2015). Based on aerial surveys, Lawson and Gosselin (2009) estimated an abundance of 1,427 humpback whales (95 percent CI: 952-2,140) for Newfoundland waters. When corrected for perception and availability biases, the abundance was estimated at 3,712 individuals (Lawson and Gosselin 2011). Humpbacks were the most frequently seen whale species during the 2007 TNASS (Lawson and Gosselin 2009). The humpback is the most commonly recorded mysticete in the Project Area based on all compiled sightings (24 sightings; 37 individuals). While humpbacks occur in the region year-round (Table 6.16; Figure 6-31), they appear to be most common during late spring and summer.

Table 6.14 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); Waring et al. (2011); Lesage et al. (2016)
Fin Whale (Atlantic population)	*B. physalus*	Special Concern	Special Concern	Year-round	COSEWIC (2005); DFO (2017a); Hayes et al. (2018)
Sei Whale (Atlantic population)	*B. borealis*	Not Listed	Endangered	Seasonal (summer)	COSEWIC (2003b); Hayes et al. (2017)
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)	Bettridge et al. (2015); Lawson and Gosselin (2009)
Common Minke Whale (North Atlantic subspecies)	*B. acutorostrata*	Not Listed	Not at Risk	Year-round (highest concentration spring through fall)	Hayes et al. (2018); Risch et al. (2014)
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered	Summer	COSEWIC (2013); Hayes et al. (2018)
Bowhead Whale [4] (Eastern Canada-West Greenland population)	*Balaena mysticetus*	Not Listed	Special Concern	Unknown	COSEWIC (2009a); Ledwell et al. (2007); The Telegram (2014)
Odontocetes (Toothed Whales)					
Sperm Whale	*Physeter macrocephalus*	Not Listed	Not at Risk; Mid-priority Candidate	Year-round	Waring et al. (2015)
Pygmy sperm whale [4,5]	*Kogia breviceps*	Not Listed	Not at Risk	Unknown	Hayes et al. (2017)
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	Unknown	COSEWIC (2006a); DFO (2017b)

Table 6.14 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
Cuvier's Beaked Whale [4,5]	*Ziphius cavirostris*	Not Listed	Not at Risk; High-priority Candidate	Unknown	Waring et al. (2014)
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	Unknown	Waring et al. (2015)
Long-finned Pilot Whale	*Globicephala melas*	Not Listed	Not at Risk	Year-round	Fullard et al. (2000); Hayes et al. (2017)
White-beaked Dolphin	*Lagenorhynchus albirostris*	Not Listed	Not at Risk	Year-round	Waring et al. (2007)
Atlantic White-sided Dolphin	*L. acutus*	Not Listed	Not at Risk	Year-round	Hayes et al. (2018)
Common Dolphin (Short-beaked)	*Delphinus delphis*	Not Listed	Not at Risk	Seasonal (summer through fall)	Hayes et al. (2018)
Risso's Dolphin	*Grampus griseus*	Not Listed	Not at Risk	Year-round	Hayes et al. (2018)
Common Bottlenose Dolphin	*Tursiops truncatus*	Not Listed	Not at Risk	Seasonal (May to September)	Hayes et al. (2017)
Atlantic Spotted Dolphin	*Stenella frontalis*	Not Listed	Not Listed	Unknown	Waring et al. (2014)
Spinner Dolphin [4]	*S. longirostris longirostris*	Not Listed	Not Listed	Unknown	Waring et al. (2014)
Striped Dolphin	*S. coeruleoalba*	Not Listed	Not at Risk	Seasonal (summer)	Waring et al. (2014)
Harbour Porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Not Listed (Threatened on Schedule 2)	Special Concern	Year-round	COSEWIC (2006b)

Table 6.14 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
Beluga Whale [4] (St. Lawrence Estuary population)	*Delphinapterus leucas*	Endangered	Endangered	Unknown	COSEWIC (2014)
Narwhal [4]	*Monodon monoceros*	Not Listed	Special Concern	Unknown	COSEWIC (2004)
Phocids (Seals)					
Harbour Seal (Atlantic and Eastern Arctic subspecies)	*Phoca vitulina concolor*	Not Listed	Not at Risk	Year-round	Hayes et al. (2018)
Harp Seal	*Pagophilus groenlandicus*	Not Listed	Not Listed; Low-priority Candidate	Year-round (highest concentrations in winter)	AMEC (2014); DFO (2012); Waring et al. (2014)
Hooded Seal	*Cystophora cristata*	Not Listed	Not at Risk; Mid-priority Candidate	Seasonal (highest concentrations in winter)	Andersen et al. (2009, 2012, 2013, 2014); Waring et al. (2007)
Grey Seal	*Halichoerus grypus*	Not Listed	Not at Risk	Year-round	Lesage and Hammill (2001); Hayes et al. (2018)
Ringed Seal	*Pusa hispida*	Not Listed	Not at Risk	Year-round	C-NLOPB (2008)
Bearded Seal	*Erignathus barbatus*	Not Listed	Data Deficient; Mid-priority Candidate	Year-round	C-NLOPB (2008)

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 considered atypical in the RAA and 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 near the Project Area during the ESRF acoustic study (Delarue et al. 2018).
Additional Sources: Husky Energy (2012), AMEC (2014), BP (2016).

Table 6.15 Sea Turtle Species that May Occur in the Project Area and Surrounding Marine Environments

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	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)

Note:
[1] This species is considered atypical in the RAA.
Additional Sources: Husky Energy (2012), AMEC (2014), and BP (2016).

Table 6.16 Cetacean and Sea Turtle Sightings / Counts in the Project Area based on all Compiled Data from 1945-2018

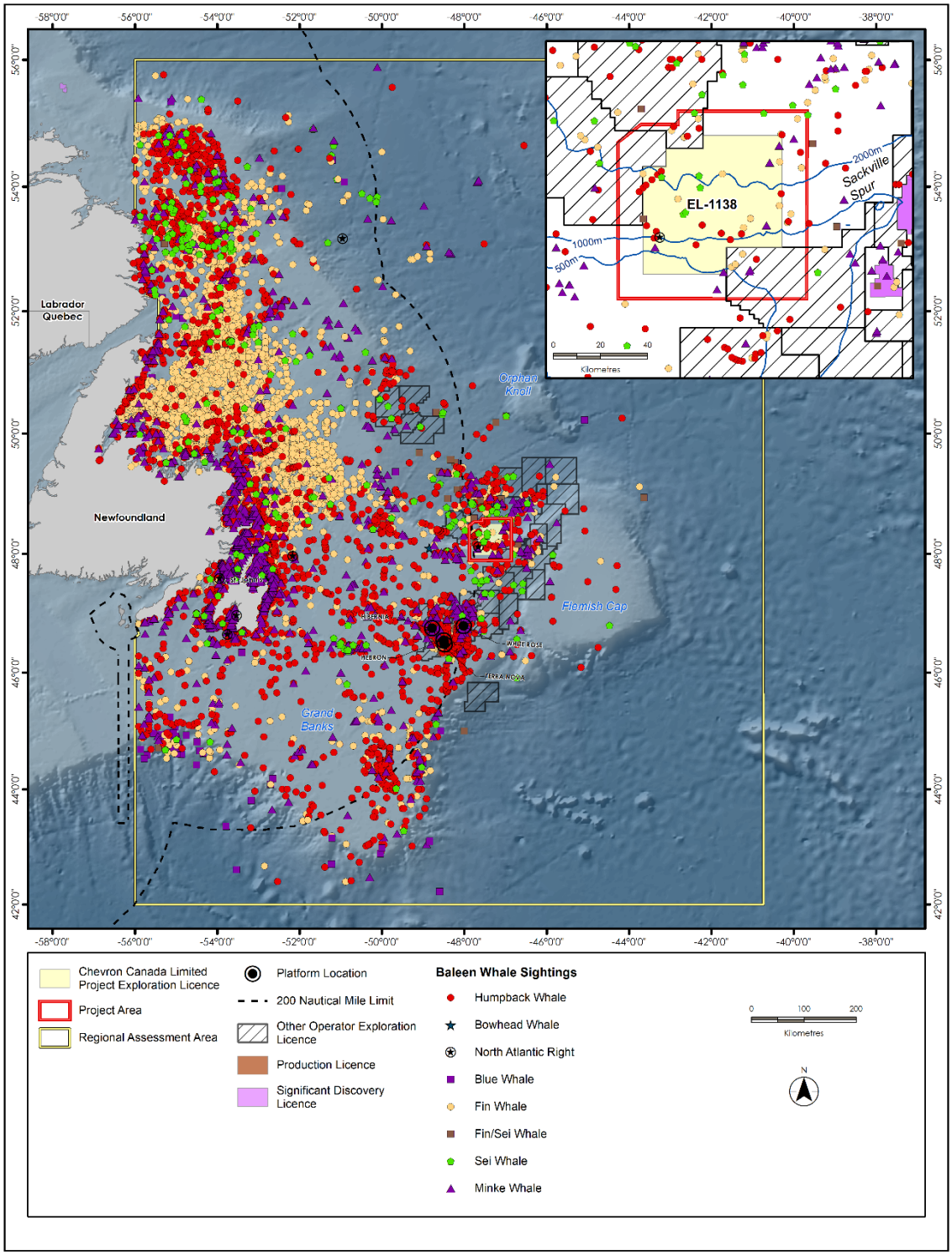
Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Mysticetes (Baleen)						
Blue Whale	210	246	Mar-Oct	0	0	–
Fin Whale	4,639	7,093	Feb-Dec	18	49	Jun-Sep
Sei Whale	287	566	Feb, May-Dec	7	12	Jun, Aug-Oct
Humpback Whale	6,255	28,441	Jan-Dec	24	37	Jan, Feb, May-Jul, Nov
Minke Whale	2,290	6,772	Jan, Mar-Dec	9	9	Jun-Aug, Nov
North Atlantic Right Whale	5	8	Jun, Aug-Sep	1	2	Jun
Bowhead Whale	1	1	May	0	0	–
Fin / Sei Whale	53	85	Apr, Oct, Dec	1	2	Sep
Unidentified Baleen Whale	448	588	May-Dec	11	16	May-Jul, Oct-Nov

Table 6.16 Cetacean and Sea Turtle Sightings / Counts in the Project Area based on all Compiled Data from 1945-2018

Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Odontocetes						
Sperm Whale	349	783	Jan-Dec	74	179	Jan-Dec
Pygmy Sperm Whale	1	2	Jun	0	0	–
Northern Bottlenose Whale	128	399	Mar-Dec	14	44	Jun-Aug, Nov
Sowerby's Beaked Whale	3	12	Sep, Nov	0	0	–
Cuvier's Beaked Whale	1	1	Jul	0	0	–
Beluga	22	4,051	Apr-Sep	0	0	–
Narwhal	7	10	Jun-Jul	0	0	–
White-beaked Dolphin	490	4,517	Jan-Dec	1	5	Nov
Atlantic White-sided Dolphin	648	11,712	Jan-Dec	22	429	Feb, Jun-Sept, Nov
Bottlenose Dolphin	13	20	Apr-Jun, Aug, Oct	1	15	Sep
Common Dolphin	422	6,350	Jan, Mar-Apr	4	50	Sep, Nov
Striped Dolphin	10	482	Aug-Sep	0	0	–
Atlantic Spotted Dolphin	2	13	Jul	0	0	–
Risso's Dolphin	19	69	Jun-Nov	0	0	–
False Killer Whale	1	2	Jun	0	0	–
Killer Whale	493	2,772	Jan, Mar-Dec	3	14	May, Jun, Oct
Long-finned Pilot Whale	1210	22,607	Jan-Dec	93	2006	May-Dec
Harbour Porpoise	457	2084	Feb-Dec	3	12	Aug-Sep
Unidentified Dolphin	1,146	19,607	Jan-Dec	60	1083	Mar-Apr, Jun-Dec
Unidentified Beaked Whale	4	5	Jun, Aug-Sep	0	0	–
Unidentified Toothed Whale	17	46	Jun-Sep	3	5	Jun

Table 6.16 Cetacean and Sea Turtle Sightings / Counts in the Project Area based on all Compiled Data from 1945-2018

Species	Regional Assessment Area			Project Area		
	Number Sightings	Number Individuals	Months Sighted	Number Sightings	Number Individuals	Months Sighted
Others						
Unidentified Whale	20	37	May-Oct	2	5	Oct-Nov
Unidentified Cetacean	1,730	7,150	Jan-Dec	66	127	Jan-Dec
Sea Turtles						
Leatherback Sea Turtle	1,252	1,308	Jan, Mar, May-Dec	0	0	–
Loggerhead Sea Turtle	1,284	1,286	May-Oct	0	0	–
Green Sea Turtle	58	58	May-Nov	0	0	–
Unidentified Sea Turtle	15	31	Jan-Mar	0	0	–
Note: One sighting can be a pod of animals (i.e., can contain multiple individual animals)						



Source: See Section 6.3.1

Figure 6-31 Baleen Whale Sightings in the Project Area and RAA based on all Compiled Data (1945-2018)

A sighting of two humpbacks was made near the Project Area in August during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). Humpback whales were detected acoustically in the RAA throughout the year during monitoring in August 2015-July 2017; the highest detection rates in the RAA occurred off Labrador during fall / winter and on the Grand Banks from summer through winter (Delarue et al. 2018). Detections were made just to the east of the Project Area during July-December 2016 as well as January-March 2017, when detection rates were highest in the area (Delarue et al. 2018). Acoustic detections were also made at stations approximately 120 km to the west of the Project Area during August-December 2015 and January-March 2016. Modeling by Mannocci et al. (2017) showed the highest densities in the northeastern portion of the RAA during the summer, with relatively high densities also occurring near the Project Area on the Grand Banks and Flemish Cap. Humpback whales are expected to be common in the Project Area.

6.3.3.2 Minke Whale

The minke whale does not have status under SARA (Government of Canada 2019); it is considered not at risk in Atlantic Canada by COSEWIC (COSEWIC 2019). The current best estimate of abundance for the Canadian East Coast stock is 2,591 individuals (CV = 0.81; Hayes et al. 2018), based on surveys conducted in 2011. The previously reported abundance estimate by Lawson and Gosselin (2011), based on the 2007 TNASS, was much greater for this stock (4,691 individuals). The estimate was derived from an initial estimate of 1,315 (95 percent CI: 855-2,046; Lawson and Gosselin 2009), which is now considered too old to be reliable (Hayes et al. 2018). Minke whales are most likely to occur in the area from spring through fall (Risch et al. 2014). The minke whale is the third most frequently recorded mysticete in the Project Area based on all compiled sightings (9 sightings of individual whales), with sightings recorded mainly during late spring and summer (see Table 6.16; Figure 6-31).

During opportunistic surveys of the North Atlantic Current and Evlanov Seamount candidate Marine Protected Area (cMPA), minke whale sightings were made within the cMPA to the east of the Flemish Cap during July 2018 (Wakefield 2018). During acoustic monitoring within the RAA and near the Project Area during August 2015-July 2017, minke whales were only detected on the southwestern edge of the Grand Banks and off Nova Scotia (Delarue et al. 2018). Modeling by Mannocci et al. (2017) showed that the highest year-round densities in the RAA occurred on the Grand Banks adjacent to the Project Area. Minke whales are likely to be common in the Project Area.

6.3.3.3 Sei Whale

The sei whale has no status under SARA in the Canadian Atlantic (Government of Canada 2019). Under COSEWIC, its status was changed recently (May 2019) from data deficient to endangered, as few whales have been seen during systematic surveys in Atlantic Canada in 2007 and 2016 (Government of Canada 2019). The population likely numbers less than 1,000 mature individuals (Government of Canada 2019). Two stocks of sei whales (one on the Scotian Shelf and one in the Labrador Sea) are considered to occur in eastern Canada, although there is limited evidence to support the definition of a Labrador Sea stock (COSEWIC 2003b). Genetic studies have shown low divergence among North Atlantic sei whales suggesting a single stock; however, the data show high uncertainty (Huijser et al. 2018). The best

abundance estimate for the Nova Scotia stock is 357 sei whales (CV = 0.52; Hayes et al. 2018). Currently, there is no abundance estimate for the Labrador Sea stock (COSEWIC 2003b).

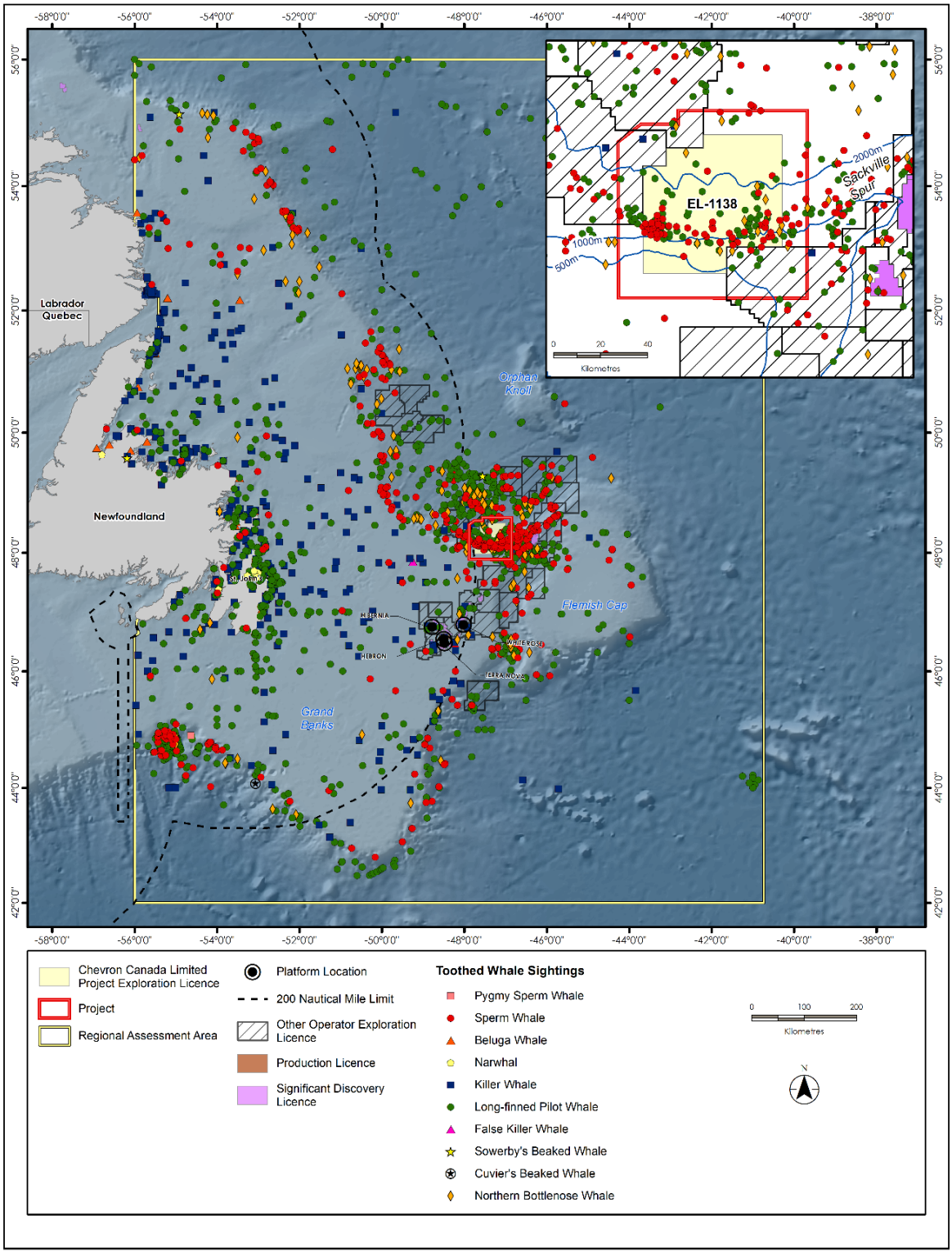
Sei whales occur seasonally off Newfoundland, with increased presence in the summer (COSEWIC 2003b). There have been at least seven sightings (12 individuals) of sei whales in the Project Area; sightings occurred from June through October (Table 6.16; Figure 6-31). Sei whales that were tagged in the Azores traveled north of the Flemish Pass en route to the Labrador Sea, where they presumably forage (Prieto et al. 2014). Sei whales were detected acoustically in the RAA throughout the year during August 2015-July 2017; however, detections near the Project Area were only made during spring, summer, and fall (Delarue et al. 2018). Based on where acoustic detections were made, sei whales appear to prefer deeper slope waters (Delarue et al. 2018). Habitat-density modeling by Mannocci et al. (2017) for the summer showed the highest densities in the northern portion of the RAA, as well as in Flemish Pass, and the southern edge of the Grand Banks. Sei whales could potentially be common in the Project Area.

6.3.4 Odontocetes (Toothed Whales)

Not including atypical species, 13 species of toothed whales could occur in the Project Area (Table 6.14), including nine species of delphinids. Several of these toothed whales only occur in the Project Area seasonally; but there is limited information about the distribution and abundance of these species. There are two different populations of northern bottlenose whales in Canada (Dalebout et al. 2006). The Scotian Shelf population is listed as endangered under Schedule 1 of SARA; it is profiled in Section 6.3.7. The Davis Strait-Baffin Bay-Labrador Sea population could also occur in the Project Area, but it does not have status under SARA. Similarly, none of the delphinids that could occur in the Project Area are listed under SARA (Table 6.14). Figures are generated from data provided by J. Lawson (2019, pers. comm.) and in Lawson and Gosselin (2009), LGL (2009, 2014, 2015), Fugro (2015), PAL (2015), Equinor Canada (unpublished data) Delarue et al. 2018), Mactavish and Penney-Belbin (2018), Maxner et al. (2019), and the C-NLOPB marine mammal and sea turtle sightings database and OBIS a global open-access database (http://www.iobis.org) (see Section 6.3.1 for details on these information sources).

6.3.4.1 Sperm Whale

The sperm whale has no status under SARA (Government of Canada 2019). It is designated not at risk by COSEWIC but is considered a mid-priority candidate species (COSEWIC 2019). The best abundance estimate for the North Atlantic is 2,288 whales (CV = 0.28; Hayes et al. 2018). Eleven sightings of single sperm whales were made in the waters off eastern and southern Newfoundland during the summer 2007 TNASS (Lawson and Gosselin 2009). The sperm whale is the second most common cetacean sighted in the Project Area, with 74 sightings of 179 individuals; sightings have been recorded year-round (Table 6.16; Figure 6-32).



Source: See Section 6.3.1

Figure 6-32 Toothed Whale Sightings in the Project Area and RAA based on all Compiled Data (1945-2018)

Two sightings of single sperm whales were made near the Project Area in early fall during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During opportunistic surveys of the North Atlantic Current and Evlanov Seamount cMPA, sperm whale sightings were made within the cMPA to the east of the Flemish Cap in July 2013 (Wakefield 2018). Sperm whales were detected acoustically in the RAA throughout the year during August 2015-July 2017, including near the Project Area (Delarue et al. 2018). However, there was a general seasonal decline in detection rates, except at sites in and adjacent to the Flemish Pass which had high rates year-round, suggesting that this area may be important to sperm whales. Maxner et al. (2019) also detected sperm whale clicks just to the east of the Project Area during acoustic monitoring from May to October. Mannocci et al. (2017) showed that year-round densities of sperm whales were highest in deep waters of the RAA, including Flemish Pass and the Orphan Basin. Sperm whales are likely common in the Project Area.

6.3.4.2 Northern Bottlenose Whale

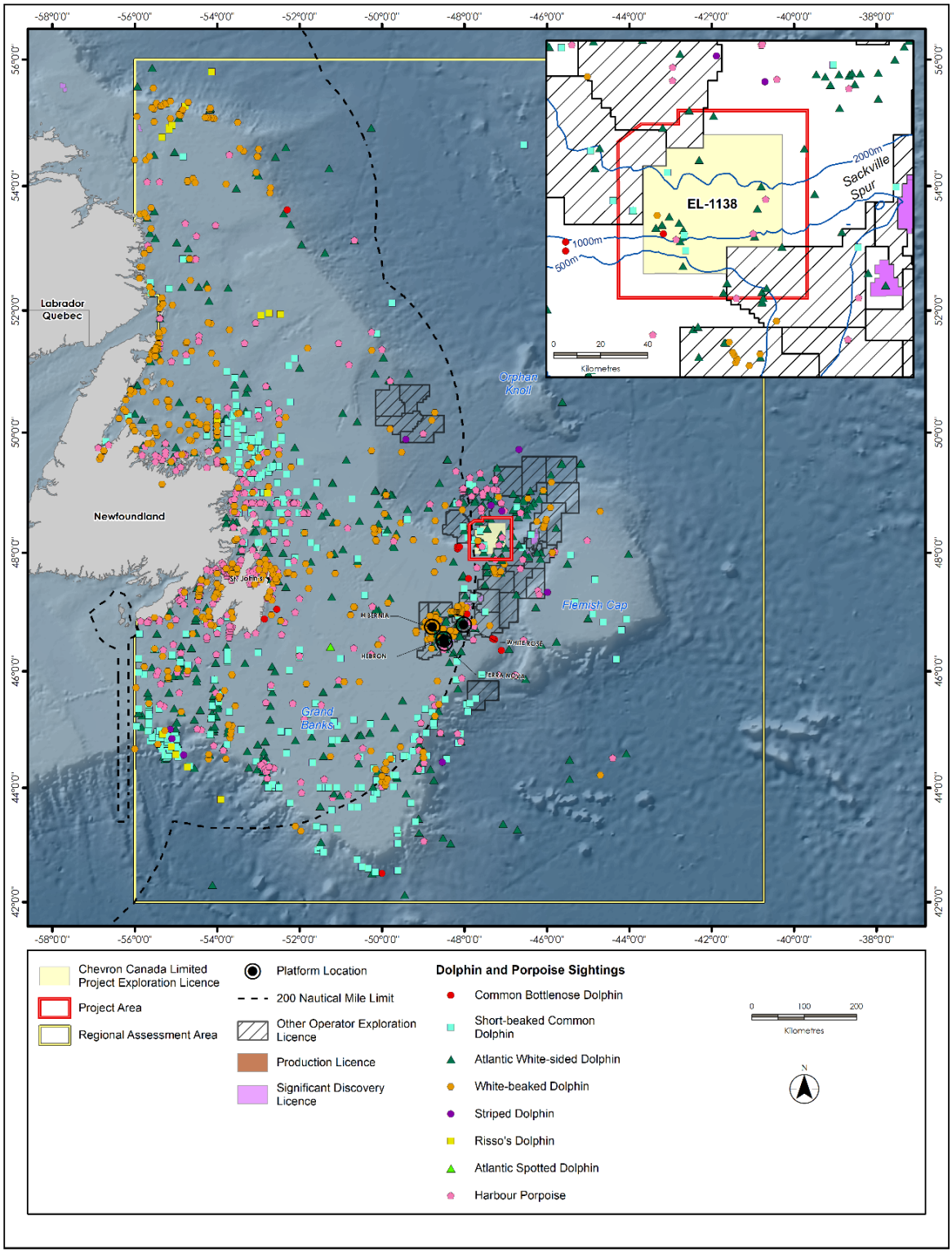
The Davis Strait-Baffin Bay-Labrador Sea population does not have status under SARA (Government of Canada 2019); it is considered special concern under COSEWIC (COSEWIC 2011). Currently, there is no reliable population estimate (COSEWIC 2011). Northern bottlenose whales are expected to occur regularly but in low numbers in the Project Area (Table 6.16). More details on the Scotian Shelf population and the distribution of northern bottlenose whales in general are provided in Section 6.3.7.4.

6.3.4.3 Striped Dolphin

The abundance estimate for the Western North Atlantic is 54,807 striped dolphins (CV = 0.3) (Hayes et al. 2018). However, no abundance estimate is available for Canadian waters. There have been no sightings in the Project Area, but 10 sightings within the RAA (Table 6.16; Figure 6-33). During opportunistic surveys of the North Atlantic Current and Evlanov Seamount cMPA, sightings were made within the cMPA to the east of the Flemish Cap during July 2013; striped dolphins were also seen along the shelf edge of the Grand Banks (Wakefield 2018). Habitat-density modeling by Mannocci et al. (2017) showed the highest densities in deep offshore water of the RAA especially in the southern portion of the RAA, including Flemish Pass. Striped dolphins are expected to be rare in the Project Area.

6.3.4.4 Atlantic Spotted Dolphin

The abundance estimate for the Western North Atlantic is 44,715 Atlantic spotted dolphins (CV = 0.43) (Hayes et al. 2018); no abundance estimate is available for Canadian waters. There have been no sightings of Atlantic spotted dolphins in the Project Area and only two sightings in the RAA (Table 6.16; Figure 6-33). Mannocci et al. (2017) estimated low densities in the RAA year-round, with higher densities occurring in deep waters in the southern portion of the RAA. Atlantic spotted dolphins are expected to be rare in the Project Area.



Source: See Section 6.3.1

Figure 6-33 Dolphin and Porpoise Sightings in the Project Area and RAA based on all Compiled Data (1945-2018)

6.3.4.5 Short-beaked Common Dolphin

The best abundance estimate currently available for the Western North Atlantic stock of short-beaked common dolphin is 70,184 animals (CV = 0.28), based on surveys conducted in 2011 (Hayes et al. 2018). The abundance estimate for Newfoundland based on the 2007 TNASS indicates a population size of 576 individuals (95 percent CI: 314-1,056) (Lawson and Gosselin 2009). There have been four sightings of 50 common dolphins in the Project Area during late summer and fall (Table 6.16; Figure 6-33). Most recently, a sighting of 10 individuals was made near the Project Area in October during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During opportunistic surveys of the North Atlantic Current and Evlanov Seamount cMPA, short-beaked common dolphins were seen within the cMPA to the east of the Flemish Cap during July 2013 (Wakefield 2018). Mannocci et al. (2017) showed the highest year-round densities in the RAA along the edge of the Grand Banks and Flemish Pass. The short-beaked common dolphin is expected to be common in the Project Area.

6.3.4.6 White-beaked Dolphin

Based on aerial surveys off the southern and eastern coasts of Newfoundland, Lawson and Gosselin (2009) estimated an abundance of 1,842 white-beaked dolphins (95 percent CI: 1,188-2,854). Corrected for perception and availability biases, the abundance was estimated at 15,625 individuals (Lawson and Gosselin 2011). One group of five white-beaked dolphins has been seen in the Project Area during November, but hundreds of sightings have been made within the RAA throughout the year (Table 6.16; Figure 6-33). Most recently, two sightings of 12 individuals were made near the Project Area in August 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

Palka et al. (1997) suggested the existence of three stocks in the Northwest Atlantic: Gulf of Maine, Gulf of St. Lawrence, and Labrador Sea; this was based on the distribution of sightings, strandings, and incidental takes. Currently, the best available abundance estimate for the Northwest Atlantic is 48,819 (CV = 0.61) (Hayes et al. 2018). For Newfoundland waters, Lawson and Gosselin (2009) estimated a total of 1,507 Atlantic white-sided dolphins (95 percent CI: 968-2,347), which was subsequently corrected for biases and estimated at 3,384 (Lawson and Gosselin 2011). There have been 22 sightings (429 individuals) of white-sided dolphins in the Project Area, with most sightings in the summer (Table 6.16; Figure 6-33). Mannocci et al. (2017) predicted relatively high densities near the Project Area throughout the year. The Atlantic white-sided dolphin is common in the Project Area.

6.3.4.8 Common Bottlenose Dolphin

Two morphologically and genetically distinct stocks of common bottlenose dolphins (the coastal and offshore forms) are currently recognized in the Western North Atlantic (Hoelzel et al. 1998). The best available abundance estimate for the offshore stock is 77,532 individuals (CV = 0.40) (Hayes et al. 2018). One group of 15 bottlenose dolphins has been reported in the Project Area during September, but 13 sightings have been made within the RAA (Table 6.16; Figure 6-33). Mannocci et al. (2017) estimated low densities in the RAA year-round. The common bottlenose dolphin is considered rare in the Project Area.

6.3.4.9 Risso's Dolphin

Risso's dolphin occurs globally in temperate and tropical waters; in the Northwest Atlantic, it is found from Florida to eastern Newfoundland (Hayes et al. 2018). The best abundance estimate for Risso's dolphin is 18,250 individuals (CV = 0.46) (Hayes et al. 2018). There have been no sightings of Risso's dolphins in the Project Area, but 19 sightings have been made in the RAA (Table 6.16; Figure 6-33). Mannocci et al. (2017) predicted the highest densities in the RAA in deep water along the edge of the Grand Banks, including near the Project Area. However, Risso's dolphin is expected to be rare in the Project Area.

6.3.4.10 Killer Whale

The Northwest Atlantic / Eastern Arctic killer whale population does not have status under SARA (Government of Canada 2019) but is considered special concern by COSEWIC (COSEWIC 2008). The size of the Northwestern Atlantic / Eastern Arctic population is unknown. There have been three sightings of 14 killer whales reported in the Project Area during the spring and fall, and hundreds within the RAA (Table 6.16; Figure 6-32). Killer whales were detected acoustically mostly during the summer and fall within the RAA during August 2015-July 2017, including southwest of the Project Area (Delarue et al. 2018). Killer whales are considered uncommon in the Project Area.

6.3.4.11 Long-finned Pilot Whale

The long-finned pilot whale occurs widely throughout the North Atlantic; it is abundant year-round in the waters of NL (Nelson and Lien 1996). Currently, the best available abundance estimate for the Western North Atlantic is 5,636 individuals (CV = 0.63), based on surveys conducted in 2011 from Virginia to the lower Bay of Fundy (Hayes et al. 2017). However, this is considered an underestimate, as the surveys did not cover the Scotian Shelf where high densities can occur (Hayes et al. 2017). Sixty-five long-finned pilot whales were seen in the Gulf of St. Lawrence and Scotian Shelf during the 2007 TNASS, yielding an abundance estimate of 6,134 individuals (95 percent CI: 2,774-10,573) (Lawson and Gosselin 2009). Long-finned pilot whales are the most commonly recorded cetacean (93 sightings; 2,006 individuals) in the Project Area with sightings reported nearly year-round, but mainly during summer (Table 6.16; Figure 6-32).

Two sightings totaling 27 long-finned pilot whales were made near the Project Area in August during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During opportunistic surveys of the North Atlantic Current and Evlanov Seamount cMPA, pilot whales were seen within the cMPA to the east of the Flemish Cap during July 2013 (Wakefield 2018); pilot whales were also seen along the shelf edge of the Grand Banks. Pilot whales were detected acoustically in the RAA throughout the year during August 2015-July 2017, including southwest of the Project Area but especially south of the Grand Banks and off the Scotian Shelf, where the highest detection rates were made (Delarue et al. 2018). Pilot whales were typically absent during winter and spring north of the Flemish Pass (Delarue et al. 2018). Maxner et al. (2019) also made acoustic detections of pilot whales just to the east of the Project Area during monitoring from June through September. Modeled year-round densities by Mannocci et al. (2017) were highest in the northeastern portion of the RAA year-round, but also in deep water along the edge of the Grand Banks and in Flemish Pass. Long-finned pilot whales are considered common in the Project Area.

6.3.4.12 Harbour Porpoise

In the Northwest Atlantic, the harbour porpoise is listed as threatened (Schedule 2) by SARA (Government of Canada 2019) and is considered special concern by COSEWIC (COSEWIC 2006b). At least three populations are recognized in the Northwest Atlantic: 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 is estimated at 79,883 harbour porpoise (CV = 0.32) (Hayes et al. 2018). For Newfoundland, Lawson and Gosselin (2009) provided an abundance estimate of 1,195 individuals (95 percent CI: 639-2,235); corrected for perception and availability biases, the abundance estimate was 3,326 porpoises (Lawson and Gosselin 2011). There have been three sightings (12 individuals) of harbour porpoises in the Project Area during spring and summer, but hundreds of sightings have been reported in the RAA (Table 6.16; Figure 6-32).

Harbour porpoise clicks were detected throughout the year in the southern portions of the RAA, including southwest of the Project Area and on the Grand Banks during August 2015-July 2017 (Delarue et al. 2018). The highest detection rates in the RAA occurred during summer and fall off the northeastern coast of Newfoundland. The occurrence of harbour porpoise is generally considered uncommon in the Project Area, although Mannocci et al. (2017) suggested relatively high densities on the Grand Banks and Flemish Cap, adjacent to the Project Area.

6.3.5 Phocids (Seals)

Six species of seals could occur in the Project Area and in adjacent waters of the RAA (Table 6.12); none are listed under SARA (Government of Canada 2019). Three species are considered candidate species by COSEWIC (COSEWIC 2019). The hooded and bearded seals are considered mid-priority candidate species, and the harp seal is a low-priority candidate species (COSEWIC 2019). Harp, grey, harbour, hooded, bearded, and ringed seals are harvested by Indigenous groups in Newfoundland and Labrador (see Section 7.4.8). Sealing typically occurs between late March and mid-May, but varies by species, and considers biological and environmental conditions (DFO 2011).

Harp seals are likely to be common in the Project Area, at least at certain times of year. The Northwest Atlantic population of the harp seal seems to have levelled off since 2008, numbering approximately 7.4 million (95 percent CI: 6,475,800-8,273,600; Hammill et al. 2015). Declines in sea ice associated with climate change could cause harp seals to whelp in areas farther to the north (Stenson and Hammill 2014). Harp seal calls were mainly detected during February and March on the northeastern edge of the Grand Banks and off Labrador during August 2015-July 2017 monitoring (Delarue et al. 2018).

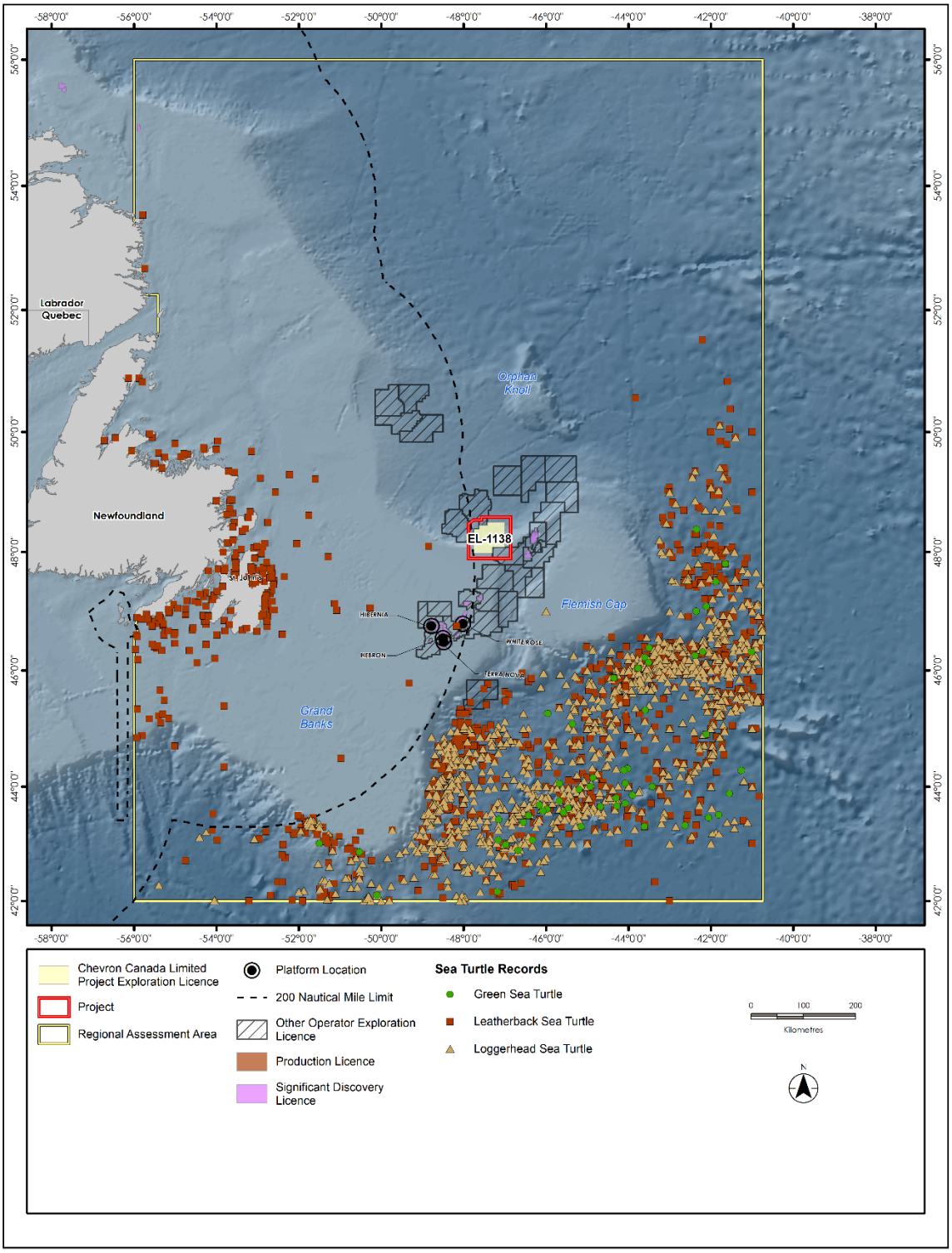
Hooded seals are also expected to be common in the Project Area. During spring and late fall / winter during 2004-2008, hooded seals outfitted with satellite relay data loggers showed movements throughout the waters near the Project Area (Andersen et al. 2012, 2013, 2014). Off the coast of Newfoundland, hooded seals likely prefer areas with topographic and oceanographic conditions that produce good feeding conditions (Andersen et al. 2012). During autumn / winter, males showed greater search effort in locations with complex seabed relief, including the Flemish Cap, and females spent more effort along the Labrador Shelf. Juveniles occurred between the Grand Banks and the Flemish Cap during spring.

Grey and harbour seals are considered uncommon in the Project Area, given their preference for nearshore waters. In 2014, the population size of grey seals was estimated at 505,000 seals (Hammill et al. 2014). In 2012, the abundance estimate for harbour seals in the Western North Atlantic was 75,834 (CV = 0.15) (Hayes et al. 2018). Harbour seals occur in small numbers at haul-out sites on the Avalon and Burin peninsulas (Templeman 2007; B. Mactavish, 2018, pers. comm.). Ringed and bearded seals typically do not occur south of Labrador and northern Newfoundland; thus, these species are expected to be uncommon in the Project Area.

6.3.6 Sea Turtles

Although four sea turtle species have been reported in Newfoundland waters, only two (leatherback and loggerhead turtles) are likely to occur near the Project Area. The occurrence of Kemp's ridley sea turtles within the RAA would be extremely rare, and green sea turtles are likely to be rare in the RAA. There are no records of green turtles in the Project Area, but there are numerous records in deep water east and south of the Flemish Cap (Figure 6-34). Information on the seasonal occurrence and conservation status for the leatherback, loggerhead, green, and Kemp's ridley sea turtles near the Project Area and within the RAA is summarized in Table 6.15. Figure 6-34 shows turtle sightings in the RAA. Figures are generated from data provided by J. Lawson (2019, pers. comm.) and in (Lawson and Gosselin (2009), LGL (2009, 2014, 2015), Fugro (2015), PAL (2015), Equinor Canada (unpublished data) Delarue et al. 2018), Mactavish and Penney-Belbin (2018), Maxner et al. (2019), and the C-NLOPB marine mammal and sea turtle sightings database and OBIS a global open-access database (http://www.iobis.org) (see Section 6.3.1 for details on these information sources).

The leatherback and loggerhead sea turtles are listed as endangered under Schedule 1 of SARA and are included in Section 6.3.7.6 and Section 6.3.7.7, respectively.



Source: See Section 6.3.1

Figure 6-34 Sea Turtle Sightings in the Project Area and RAA on all Compiled Data (1945-2018)

6.3.7 Species at Risk

Five species / populations of marine mammals and two sea turtle species that are likely to 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. These species are profiled in this section.

6.3.7.1 Blue Whale

The Atlantic population of blue whales has endangered status on Schedule 1 of SARA (Government of Canada 2019) and is also considered endangered by COSEWIC (COSEWIC 2002a, 2012b). The proposed Action Plan for the Atlantic population (DFO 2018a) noted recovery objectives intended to increase knowledge of the population, its habitat and threats, and implement measures to mitigate threats such as underwater sound, vessel collisions, and spills. No critical habitat has been defined for the Atlantic population of blue whale.

In the North Atlantic, the blue whale population became depleted during industrial whaling, and densities are still relatively low. The minimum population size for the Western North Atlantic is 440 individuals (Hayes et al. 2018). Underwater seamounts and deep ocean structures along the shelf edge may be important habitat for blue whales (Lesage et al. 2016). Lesage et al. (2018) reported that the continental shelf edge off Nova Scotia, southern Newfoundland, and the Grand Banks is an important blue whale foraging area (also see DFO 2018b). Similarly, Moors-Murphy et al. (2019) reported that slope waters off the Scotian Shelf, Grand Banks, and deep water of the Laurentian Channel are potentially important habitat areas. Using habitat models, Gomez et al. (2017) showed that the most suitable habitats and therefore priority areas for monitoring on the Scotian Shelf and the shelf break off southern Newfoundland overlap with anthropogenic activities.

There have been no reported sightings of blue whales in the Project Area (Table 6.16). In the RAA, blue whales were recorded during spring, summer, and fall, with peak numbers in July and August (Table 6.16). Year-round acoustic detections have been made south of the Project Area, and seasonal detections have been reported near the Project Area (e.g., Simard et al. 2016; Delarue et al. 2018; Moors-Murphy et al. 2019). Delarue et al. (2018) reported detections just to the east of the Project Area from August to January; the highest detection rates occurred on the western edge of the Grand Banks. Visual sightings are also concentrated along the edge of the Grand Banks (Figure 6-31). Maxner et al. (2019) detected blue whale calls just to the east of the Project Area during late summer and early fall. Blue whales are considered uncommon in the Project Area.

6.3.7.2 Fin Whale

The Atlantic population of fin whale has a special concern status under Schedule 1 of SARA (Government of Canada 2019) and COSEWIC (COSEWIC 2005). A management plan was released in 2017, the objective of which is to make certain that anthropogenic threats do not cause a population decline or reduce the current distributional range (DFO 2017a). Delarue et al. (2014) suggested four stocks in the Northwest Atlantic based on geographic differences in fin whale vocalizations. Currently, the best abundance estimate for the Western North Atlantic stock is 1,618 (CV = 0.33), based on surveys in 2011 mainly in U.S. waters

(Hayes et al. 2018). The abundance for Newfoundland was estimated at 1,352 individuals (95 percent CI: 821-2,226) based on 2007 TNASS (Lawson and Gosselin 2009); the corrected abundance estimate was 1,555 (Lawson and Gosselin 2011).

Fin whales are the second most frequently recorded mysticete in the Project Area based on compiled sightings (18 sightings; 49 individuals), with most sightings occurring during summer (Table 6.16; Figure 6-31). Similarly, according to Edwards et al. (2015), the highest densities occur in offshore waters off Newfoundland during June-August. Modeling by Mannocci et al. (2017) showed relatively high year-round densities near the Project Area along the edge of the Grand Banks and in Flemish Pass.

Three sightings of single fin whales were made near the Project Area in September during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). During opportunistic surveys of the North Atlantic Current and Evlanov Seamount cMPA, fin whale sightings were made within the cMPA to the east of the Flemish Cap during July 2018 (Wakefield 2018). Fin whales were detected acoustically in the RAA throughout the year during August 2015-July 2017, including southwest of the Project Area (Delarue et al. 2018). Maxner et al. (2019) also detected fin whale vocalizations just to the east of the Project Area during late spring and summer. Fin whales are expected to be common in the Project Area.

6.3.7.3 North Atlantic Right Whale

The North Atlantic right whale has endangered status on Schedule 1 of SARA (Government of Canada 2019) and is also considered endangered by COSEWIC (COSEWIC 2003c, 2013). An action plan has been proposed for the North Atlantic right whale, detailing tasks required to achieve the population and distribution objectives outlined in the recovery strategy for this species (DFO 2016b). The recovery strategy includes objectives for reducing mortality and injury from vessel collisions and entanglement, and increasing survey efforts in offshore regions such as the Flemish Pass and Flemish Cap (DFO 2019).

Despite having been the first whale species to receive total international protection from hunting in 1937, the size of North Atlantic right whale population remains low. The best population estimate at the end of 2017 was 411 animals (Pettis et al. 2018); the population has been declining since 2010 (Pace et al. 2017; Corkeron et al 2018; Pettis et al. 2018). It is likely that only approximately 100 reproductive females occur in the population (Baumgartner et al. 2017; Pennisi 2017); the high mortality rate of adult females is the main factor affecting reproductive rates (Corkeron et al. 2018). Decreasing calving rates (down 40% since 2010) and increases in human-caused mortality are hindering the recovery of this population (Kraus et al. 2016). In 2017, only five calves were reportedly born and in 2018, no calves were born (Pettis et al. 2018).

Seventeen mortalities were reported for the North Atlantic right whale population in 2017 and three in 2018 (Pettis et al. 2018). Of the 17 mortalities in 2017, 12 were reported for the Gulf of St. Lawrence and five for the U.S.; all three mortalities in 2018 occurred in the U.S. (NOAA 2019). As of early July, six mortalities have been reported so far for 2019 (NOAA 2019). In the Gulf of St. Lawrence, 12 dead North Atlantic right whales were reported from 6 June to 15 September 2017 (Daost et al. 2017; DFO 2019). Nine were seen floating in the southern Gulf of St. Lawrence and four washed ashore in western Newfoundland (Daoust et al. 2017). One individual that washed ashore in western Newfoundland had previously been seen floating in the Gulf of St. Lawrence. Eight of the 12 deceased whales were males and four were females; the whales ranged in age from 2 to 37 years. Necropsies conducted on seven of the whales determined the cause of

death was blunt trauma in four instances and drowning due to entanglement in two cases (Daoust et al. 2017; DFO 2019). The cause of death could not be determined for one whale which was in an advanced state of decomposition (Daoust et al. 2017). Between 5 July and 28 August 2017, another five entanglements were reported; of these, two were disentangled, one shed the gear on its own, and the other two whales could not be disentangled (Daoust et al. 2017).

No acoustic detections of northern right whales have been made within or near the Project Area (Delarue et al. 2018; Maxner et al. 2019); however, Delarue et al. (2018) reported right whale calls in slope waters off southern Newfoundland. The North Atlantic right whale is rare in the RAA. Based on all compiled sightings, one group of two right whales has been reported in the Project Area during June (Figure 6-31).

6.3.7.4 Northern Bottlenose Whale

The Scotian Shelf population is listed as endangered under Schedule 1 of SARA (Government of Canada 2019) and COSEWIC (COSEWIC 2002b, 2011); it is estimated to comprise 143 individuals (O'Brien and Whitehead 2013). There are no population estimates for the entire Northwest Atlantic (COSEWIC 2011). A recovery strategy was amended (DFO 2016a) and an action plan was released for the Scotian Shelf population, updating critical habitat measures (DFO 2017c). Critical habitat for the Scotian shelf population includes the Gully, Shortland, and Haldimand submarine canyons at the eastern edge of the Scotian Shelf (DFO 2016a). Northern bottlenose whales occur in water depths greater than 500 m, particularly near the 1,000 m isobath (DFO 2016a).

While the Scotian Shelf population does not appear to migrate, the movements of the Davis Strait-Baffin Bay population have not been studied (COSEWIC 2011). There have been 14 sightings (44 individuals) of northern bottlenose whales in the Project Area, based on compiled sightings; the majority of sightings were reported during summer (Table 6.16; Figure 6-32). Most recently, two sightings totaling three whales were made near the Project Area in August during Equinor Canada's 2018 Seabed Survey (Mactavish and Penney-Belbin 2018). Northern bottlenose whales were sighted in Orphan Basin during geophysical survey monitoring programs in 2004 (three sightings, totaling nine whales; Moulton et al. 2005) and 2005 (seven sightings, totaling 21 individuals; Moulton et al. 2006). Preliminary photo-ID work has found that at least 78 different animals occurred in the Grand Banks, Flemish Pass, and Flemish Cap area during 2016-2017 (L.J. Feyrer, pers comm, 2018). Although genetic and other tissue analyses are underway at Dalhousie University based on samples collected from those individuals, results are not yet available to indicate whether animals in that area were from the Scotian Shelf or Davis Strait-Baffin Bay-Labrador Sea populations (L.J. Feyrer, pers comm, 2018). It is also possible that there are more than two populations of this species in Atlantic Canadian waters.

Gomez et al. (2017) reported sightings in and north of the Flemish Pass; their habitat suitability modeling showed that parts of the Project Area are high priority areas for enhanced monitoring for this species. Northern bottlenose whale vocalizations were detected throughout the year in the RAA, including near the Project Area, during August 2015-July 2017; most detections occurred off the east coast of Newfoundland (with the highest detection rates at recorders near the Project Area) and off Labrador (Delarue et al. 2018). Maxner et al. (2019) also reported northern bottlenose whale clicks just to the east of the Project Area during monitoring from June through September (the extent of the recording period). These acoustic studies provide support that waters near and possibly in the Project Area are regularly used by northern bottlenose

whales—this species was detected year-round (with nearly daily detections) at the “Sackville Spur” acoustic recorder site, located 25 km to the east of the Project Area (as well as a Labrador Shelf acoustic recorder) (Delarue et al. 2018). Likewise, an acoustic recorder located in slope waters off the mid-Labrador coast (“Stn 13”, which was in 1750 m water depth) indicated that northern bottlenose whales occurred there year-round with near daily acoustic detections (Delarue et al. 2018). Available sightings and acoustic recording information indicates that northern bottlenose whales regularly occur in and near the Project Area and that the Sackville Spur area may represent important habitat for this species. It is also possible that other deep-water areas offshore Newfoundland, including slope waters off Labrador and the Orphan Basin, provide important habitat for northern bottlenose whales.

The main threats facing northern bottlenose whales include entanglement in fishing gear, oil and gas activities, and acoustic disturbance (COSEWIC 2011; DFO 2017c). There are also concerns around the levels of contaminants in whale tissues, which may be related to oil and gas development activities, vessel strikes, and changes to food supply (COSEWIC 2011; DFO 2017c). Gomez et al. (2017) found that the most suitable habitats and therefore priority areas for monitoring of northern bottlenose whales on the edges of the eastern Scotian Shelf and Newfoundland and Labrador shelves, canyons, and deep basins overlap with anthropogenic activities; the Project Area is located in a priority area.

6.3.7.5 Sowerby’s Beaked Whale

Sowerby’s beaked whale is listed as special concern under Schedule 1 of SARA (Government of Canada 2019) and COSEWIC (COSEWIC 2006a). DFO released a management plan in 2017, with the objectives to maintain a stable population in Atlantic Waters and to measure and mitigate the effects of threats (DFO 2017b). There is currently little information on the occurrence of Sowerby’s beaked whale in offshore waters of Newfoundland and Labrador. Most of the information that is available is based on stranding records (Lien and Barry 1990, in Husky 2012). Sowerby’s beaked whales are difficult to detect at sea because of their short surface durations, offshore distribution, and faint blows (Hooker and Baird 1999a, in Husky 2012). Sowerby’s beaked whales have most often been seen in deep waters, continental shelf edges, or slopes (Kenney and Winn 1987, in Husky 2012; COSEWIC 2006a). They likely dive deep to forage on squid (COSEWIC 2006a).

Although there have been no sightings of Sowerby’s beaked whales in the Project Area (Table 6.16), four whales were seen during a September 2005 seismic survey in Orphan Basin (Figure 6-32; Moulton et al. 2006) and another two sightings have been reported for the RAA (Figure 6-32). Sowerby’s beaked whales were detected acoustically throughout the year in the RAA during August 2015-July 2017; just to the east of the Project Area, detections were made from spring through fall (Delarue et al. 2018). Sowerby’s beaked whale clicks were prominent along the edge of the Scotian Shelf and were also detected at high rates along the shelf edge of the Grand Banks (Delarue et al. 2018). Although there are a few records of strandings for Newfoundland and Labrador (DFO 2017b), its occurrence is likely to be rare in the Project Area.

6.3.7.6 Leatherback Sea Turtle

The leatherback sea turtle is listed as endangered under SARA (Schedule 1; Government of Canada 2019) and by COSEWIC (COSEWIC 2012a). In 2018, an action plan for leatherback sea turtles was proposed, which outlines measures to address threats and monitor recovery (DFO 2018c). Recent studies in Atlantic

Canada using both satellite telemetry and camera tags have provided new information on the foraging behaviour and movements of leatherback, providing recordings of leatherback turtles searching for, capturing, and handling prey. The footage determined that leatherbacks find their prey by visual means and feed mostly in the top 30 m of the water column during daylight hours (DFO 2016c).

Records of leatherback turtle have been reported in the offshore waters off Nova Scotia and Newfoundland (Stewart et al. 2013; Dodge et al. 2014; Archibald and James 2016; Chambault et al. 2017). Leatherbacks tagged in Nova Scotia between 1999 and 2016 have been reported to occur in the southern portion of the RAA (Hamelin and James 2018). Mosnier et al. (2019) reported records for waters off Nova Scotia and Newfoundland (including within the RAA) from June through November, with most records for August and September. Most sightings occurred on the shelf off southern and eastern Newfoundland, and on the Scotian Shelf. Opportunistic sightings were also reported south of the Flemish Cap during July (Mosnier et al. 2019). Juvenile leatherbacks are transported via currents past southern Newfoundland en route to the eastern Atlantic (Lalire and Gaspar 2019).

There are an estimated 34,000-94,000 adult leatherbacks in the North Atlantic (TEWG 2007). Although the abundance of seasonal foragers in Atlantic Canada is unknown, sightings indicate that thousands of individuals occur in Canadian Atlantic waters (COSEWIC 2012a). Canadian waters might have the highest density of foraging leatherbacks throughout their range (Archibald and James 2016). Based on bioenergetic modeling, foraging areas off Nova Scotia are important to the growth of leatherback sea turtle populations in the Northwest Atlantic Ocean, as the region supports a large portion of the turtle's energy budget (Wallace et al. 2018). The Grand Banks may also provide important habitat for leatherback turtles (Mosnier et al. 2019). Mosnier et al. (2019) showed that leatherback sea turtle distribution in eastern Canada was correlated with environmental characteristics, with increasing turtle occurrence in regions where sea surface temperatures are greater than 15°C, over flat bottoms, and in areas where primary productivity is low. In addition, sea surface height was also correlated with sea turtle occurrence (Mosnier et al. 2019). Ocean sunfish presence was also a predictor of leatherback sea turtle occurrence, but not densities; both sunfish and leatherback turtles prey on jellyfish and other gelatinous prey (Mosnier et al. 2019). Nordstrom (2018) found that jellyfish presence can predict leatherback occurrence in Atlantic Canada, particularly on the Scotian Shelf.

Although critical habitat has not yet been designated for the leatherback turtle in Atlantic Canada (ALTRT 2006), important foraging habitat has been identified as critical habitat for leatherbacks in the proposed recovery strategy (DFO 2016d). Three critical habitat areas have been proposed: (1) Southwestern Scotian Slope Area, Gulf of St. Lawrence-Laurentian Channel Area, and Placentia Bay Area (DFO 2016d). In Canadian waters, the primary threat facing leatherbacks is bycatch in fisheries; however, globally, leatherbacks are threatened by collisions with ships, marine debris, as well as oil and gas exploration (COSEWIC 2012a). Several incidental captures of leatherbacks have been reported in fishing gear off Newfoundland, including on the Grand Banks (Hamelin et al. 2017).

There have been no reported sightings of leatherback turtles within the Project Area; however, more than a thousand records have been reported for the RAA, including just to the west of the Project Area on the Grand Banks (Table 6.16; Figure 6-34). Leatherback sea turtles are rare in the Project Area.

6.3.7.7 Loggerhead Sea Turtle

The loggerhead sea turtle is listed as endangered under SARA (Schedule 1; Government of Canada 2019) and by COSEWIC (COSEWIC 2010). There are currently no population size estimates for loggerhead sea turtles in Atlantic Canada (DFO 2010). Neonate loggerheads equipped with satellite tags at Florida beaches travelled through the waters southeast of Newfoundland after release (Mansfield et al. 2014). A satellite-tagged juvenile loggerhead released in the Canary Islands was also tracked to the waters southeast of Newfoundland (Vero-Cruz et al. 2016). A loggerhead sea turtle was sighted along the shelf edge of the Grand Banks during an opportunistic survey in July 2013 (Wakefield 2018). There have been no sightings of loggerhead turtles within the Project Area, although more than a thousand records have been reported for the RAA, most of which occurred in deep water in the southeastern part of the RAA (Table 6.16; Figure 6-34). The closest record to the Project Area has been reported to the southeast on the Flemish Cap (Figure 6-34).

The greatest threats that loggerheads face in the Northwest Atlantic include bycatch, harvesting, and artificial lights at nesting beaches (DFO 2017d). Hundreds (n = 701) of incidental captures of loggerhead sea turtles were reported by the Canadian Atlantic pelagic longline fleet between 1999 and 2006; despite considerable observer coverage in the area, none of these sightings occurred northeast of the Grand Banks (Brazner and McMilan 2008). However, loggerhead encounters in the longline fishery were reported south of the Flemish Cap for 2002-2008 (Paul et al. 2010). Loggerhead turtles are considered rare in the Project Area with recorded sightings occurring well south and east of the Project Area.

6.3.8 Summary of Key Areas and Times

A summary of important seasons and areas for marine mammals and sea turtles was included in the Eastern Newfoundland SEA (Section 4.2.3.6 of AMEC 2014). While many marine mammal species are sighted year-round in the RAA, they are more frequently observed during June-September within the Project Area. Summer is an important season for cetaceans and sea turtles in offshore waters of Newfoundland. At this time, many migratory species come to feed in the region before returning to southerly latitudes for the winter. Pinnipeds are more common during winter and spring. However, concentrations in certain areas at certain times may be an artifact of the survey effort that occurred in these regions. Similarly, low sightings in other areas may, at least in part, be attributable to reduced survey effort. Numerous EBSAs provide important ecological functions for marine mammal and sea turtle species in the RAA, including important habitat for overwintering, refuge, and foraging. An overview of the relevance of EBSAs to marine mammals and sea turtles is provided in Table 6.17 (modified from AMEC [2014]).

Table 6.17 DFO Ecologically and Biologically Significant Areas Within the RAA and their Importance to Marine Mammals

EBSA	Importance to Marine Mammals
Southeast Shoal	Important feeding area for a diverse aggregations of marine mammals, especially northern bottlenose and humpback whales
Placentia Bay	An important feeding area for humpback whales and leatherback sea turtles from spring to fall; other cetaceans (including females with calves) aggregate in high numbers in the spring and summer and harbour seals are found year round

Table 6.17 DFO Ecologically and Biologically Significant Areas Within the RAA and their Importance to Marine Mammals

EBSA	Importance to Marine Mammals
Southwest Shelf	Leatherback sea turtles and many marine mammals aggregate in this EBSA in the summer
Laurentian Channel	Migratory corridor to / from the Gulf of St. Lawrence for marine mammals
Eastern Avalon	Important feeding area for humpback whales and other marine mammals that aggregate in the summer. Leatherback sea turtles, and a variety of cetaceans and seals also feed in the area from spring to fall
Lily Canyon-Carson Canyon	Overwintering marine mammals use the area for feeding and as a refuge
Northeast Slope	Important hooded seal feeding area; other marine mammals that feed in the area include pilot whales and harp seals
Orphan Spur	Several marine mammals frequent this EBSA
Fogo Shelf	Important feeding area for cetaceans
Notre Dame Channel	Important feeding and migration area for cetaceans; feeding area for harp seals in winter
Gilbert Bay	Food source for marine mammals
Labrador Marginal Trough	Migration corridor for many marine mammals; fall feeding area for cetaceans
Labrador Slope	Supports a variety of cetaceans and female and juvenile hooded seals
Hamilton Inlet	Harp seal whelping area
Source: Excepted and modified from AMEC (2014)	

6.4 Special Areas

A variety of special areas have been designated or are currently proposed by federal, provincial or municipal governments, international organizations and special interest groups nearshore and offshore NL. These special areas are established or delineated with the intent of protecting ecologically, historically and/or socio-economically important habitat, flora and fauna. Special areas within the Project Area and surrounding RAA are presented in the following subsections.

6.4.1 Approach and Key Information Sources

This section was compiled based on the most recent available information relevant to the Project Area and RAA as of July 2019. Key information sources included SEAs, recent EIS and EA reports for the area, federal, provincial, and international governing body publications and databases, the IBA database, and personal communications from representatives within federal and provincial governmental departments (Table 6.18).

Table 6.18 Primary Information Sources Used to Describe Special Areas in the Project Area and RAA

Source	Reference
Labrador Shelf Offshore Area SEA	C-NLOPB (2008)
Southern Newfoundland SEA	C-NLOPB (2010)
Eastern Newfoundland SEA	C-NLOPB (2014)
Newfoundland Orphan Basin Exploration Drilling Program EIS	BP (2018)
EA Update (2019) of Multiklient Invest Newfoundland Offshore Seismic Program, 2018–2023	LGL (2019)
EA of the Alfred Wegener Institute's Scientific Expedition of the Labrador Shelf and Lake Melville, Summer 2019	Penney-Belbin et al. (2019)
Marine Protected Areas (MPAs) and their Regulations	DFO (2019a)
Recovery Strategy for northern wolffish (*Anarhichas denticulatus*) and spotted wolffish (*Anarhichas minor*), and Management Plan for Atlantic wolffish (*Anarhichas lupus*) in Canada [proposed]	DFO (2018b)
Recovery Strategy for the leatherback sea turtle (*Dermochelys coriacea*) in Atlantic Canada [Proposed]	DFO (2016a)
List of marine refuges	DFO (2019a, 2019b)
Identification and descriptions of Ecologically and Biologically Significant Areas [EBSAs] in the Newfoundland and Labrador Shelves Bioregion	Wells et al. (2017)
Delineation of coral and sponge SBAs in Eastern Canada using kernel density analyses and species distribution models	Kenchington et al. (2018)
National Marine Conservation Areas	Parks Canada (PC) (2019a)
National Framework Canada Lands Administrative Boundaries Level 1 – Newfoundland and Labrador	PC (2018a)
National Historic Sites	PC (2017); Tourism, Culture, Industry, and Innovation (TCII) (2018)
Protected Areas – Canada	ECCC (2018)
EBSAs Regions	Convention on Biological Diversity (CBD) (2015)
Vulnerable Marine Ecosystems (VME) Closures	NAFO (2019a)
Conservation and Enforcement Measures 2019	NAFO (2019b)
Provincial Protected Areas NL – GIS Data	Fisheries and Land Resources (FLR) (2018a)
Provincial Historic Sites	TCII (2018, 2019a)
Integrated Fisheries Management Plan – Snow Crab (*Chionoecetes opilio*) Newfoundland and Labrador Region	DFO (2017a, 2019c)
GEBCO Gazetteer	Marine Regions (2018)
Report on the NAFO Scientific Council Working Group on Ecosystem Approach to Fisheries Management (WGEAFM)	NAFO (2008)
Important Bird Areas (IBAs) of Canada Database	IBA (2009)

Table 6.18 Primary Information Sources Used to Describe Special Areas in the Project Area and RAA

Source	Reference
Revised PB-GB LOMA EBSAs	N. Wells, Biologist, Aquatic Resources Division, DFO, 2019, pers. comm.
National Marine Conservation Areas (Representative Marine Areas, Candidate National Marine Conservation Areas, Regions without Studies) – Newfoundland and Labrador	F. Mercier, PC, A/Manager, Marine Establishment, Protected Areas Establishment Branch, 2018, pers. comm. C. Pierce, Ecosystem Geomatics Technician, Protected Areas Establishment Branch, PC, 2018 pers. comm.
Stewardship Association of Municipalities (SAM) Management Units	L. King, SAM, Conservation Biologist, 2019 pers. comm.

6.4.2 Special Areas Designated by the Federal Government of Canada

The Canadian Government has established a variety of special areas, some of which are protected under federal legislation (e.g., Marine Protected Area [MPA]) and others which are designated but do not receive legislative protection (e.g., EBSA and SBA). Special areas designated by the Canadian Federal Government and relevant legislation within the Project Area and RAA are provided in Table 6.19 and Figures 6-35 and 6-36 and summarized below.

Table 6.19 Special Areas within the Project Area and RAA Designated by the Federal Government of Canada

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-35 and 6-36]	Source
EBSA	Fisheries and Oceans Canada (DFO)	N/A	[1] Labrador Slope	1,2
			[3] Labrador Marginal Trough	
			[2] Hamilton Inlet	
			[4] Gilbert Bay	
			[5] Grey Islands	
			[6] Notre Dame Channel	
			[7] Orphan Spur	
			[8] Fogo Shelf	
			[9] Bonavista Bay	
			[10] Northeast Slope	
			[11] Smith Sound	
			[12] Baccalieu Island	
			[13] Eastern Avalon	
			[14] St. Mary's Bay	
			[21] Laurentian Channel	
			[15] Placentia Bay	
			[16] Haddock Channel Sponges	
			[17] Virgin Rocks	
			[20] Southwest Slope	
			[19] Southeast Shoal	
			[18] Lilly Canyon-Carson Canyon	
MPA	DFO	*Oceans Act*, 1996, c.31	Gilbert Bay	3
			Eastport – Duck Island	
			Eastport – Round Island	
Migratory Bird Sanctuary	Environment and Climate Change Canada (ECCC) – Canada Wildlife Service (CWS)	*Canada Wildlife Act*, R.S., 1985, c.W-9 *Migratory Birds Convention Act*, 1994 *Migratory Bird Sanctuary Regulations*	[a,b] Île aux Canes	4
			[a,b] Shepherd Island	
			[c] Terra Nova	

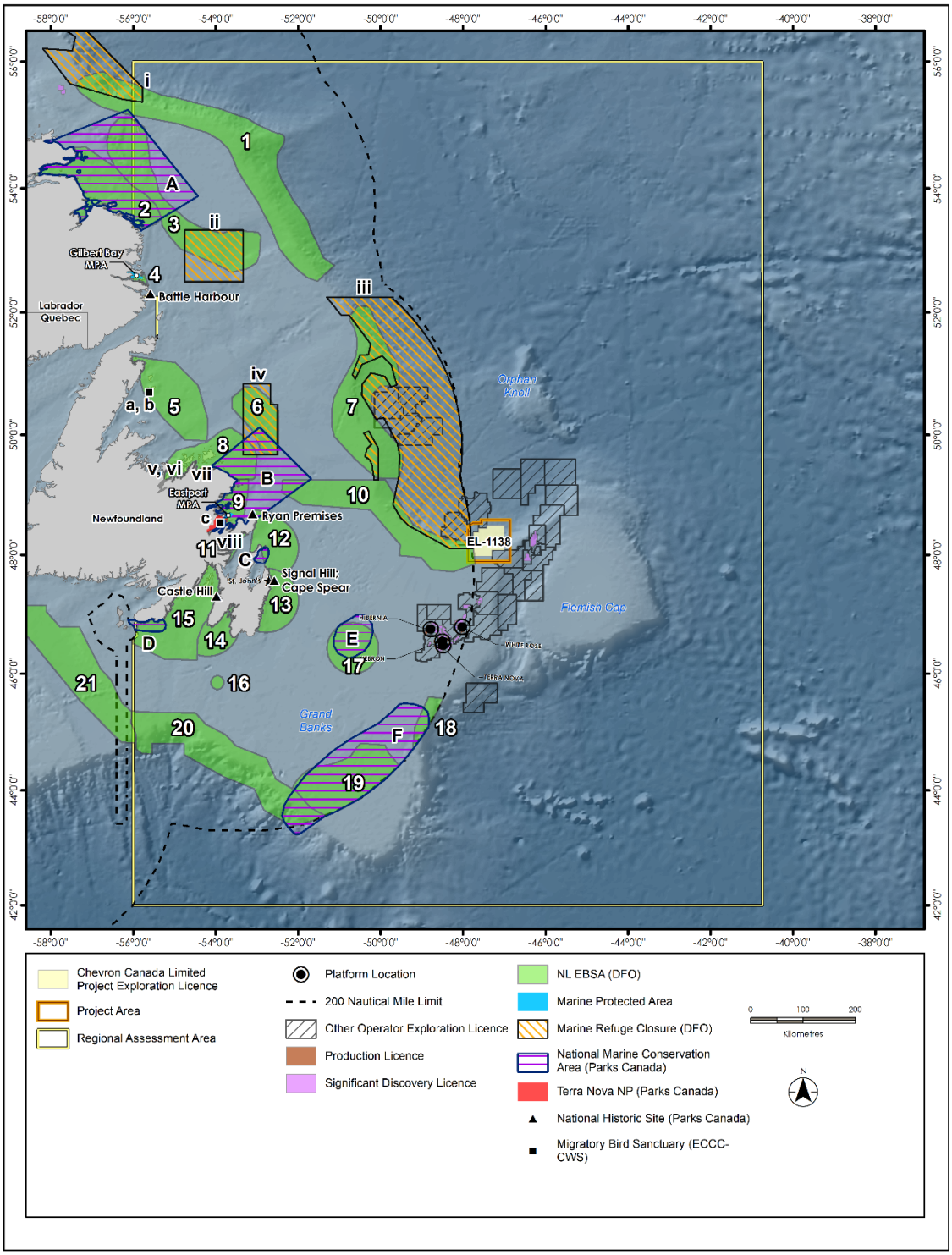
Table 6.19 Special Areas within the Project Area and RAA Designated by the Federal Government of Canada

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-35 and 6-36]	Source
Marine Refuge	DFO	*Oceans Act*, 1996, c.31 *Fisheries Act*, 1985, c.43	[iii] Northeast Newfoundland Slope Closure	5
			[i] Hopedale Saddle	
			[ii] Hawke Channel	
			[iv] Funk Island Deep	
			[v] Lobster Closure – Mouse Island	
			[v] Lobster Closure – Glover's Harbour	
			[vi] Lobster Closure – Farmer's Island	
			[vii] Lobster Closure – Gander Bay	
			[viii] Lobster Closure – Gooseberry Island	
Fisheries Closure Area – Snow Crab Conservation Exclusion Zone	DFO	*Fisheries Act*, 1985, c.43	Bonavista Bay (A) (Crab Management Area [CMA] 5A)	6,7
			Bonavista Bay (B) (CMA 5A)	
			Trinity Bay (A) (CMA 6A)	
			Trinity Bay (B) (CMA 6A)	
			Conception Bay (CMA 6B)	
			Eastern Avalon (CMA 6C)	
			Nearshore (Near Shore CMA)	
			Southern Avalon (CMA 8A)	
			8BX (CMA 8BX)	
			St. Mary's Bay (A) (CMA 9A)	
National Marine Conservation Area (NMCA)	PC	*Canada National Marine Conservation Areas Act*, 2002, c.18	[C] Representative Marine Area (RMA) – Northwestern Conception Bay	8,9
			[F] RMA – South Grand Bank Area	
			[D] RMA – Southern Coast of Burin Peninsula	
			[E] RMA – Virgin Rocks	
			[A] Candidate NMCA – Labrador Coast (B)	
			[B] Region Without Studies – Unknown 17	
National Park	PC	*Canada National Parks Act*, S.C. 2000, c.32	Terra Nova	10,11

Table 6.19 Special Areas within the Project Area and RAA Designated by the Federal Government of Canada

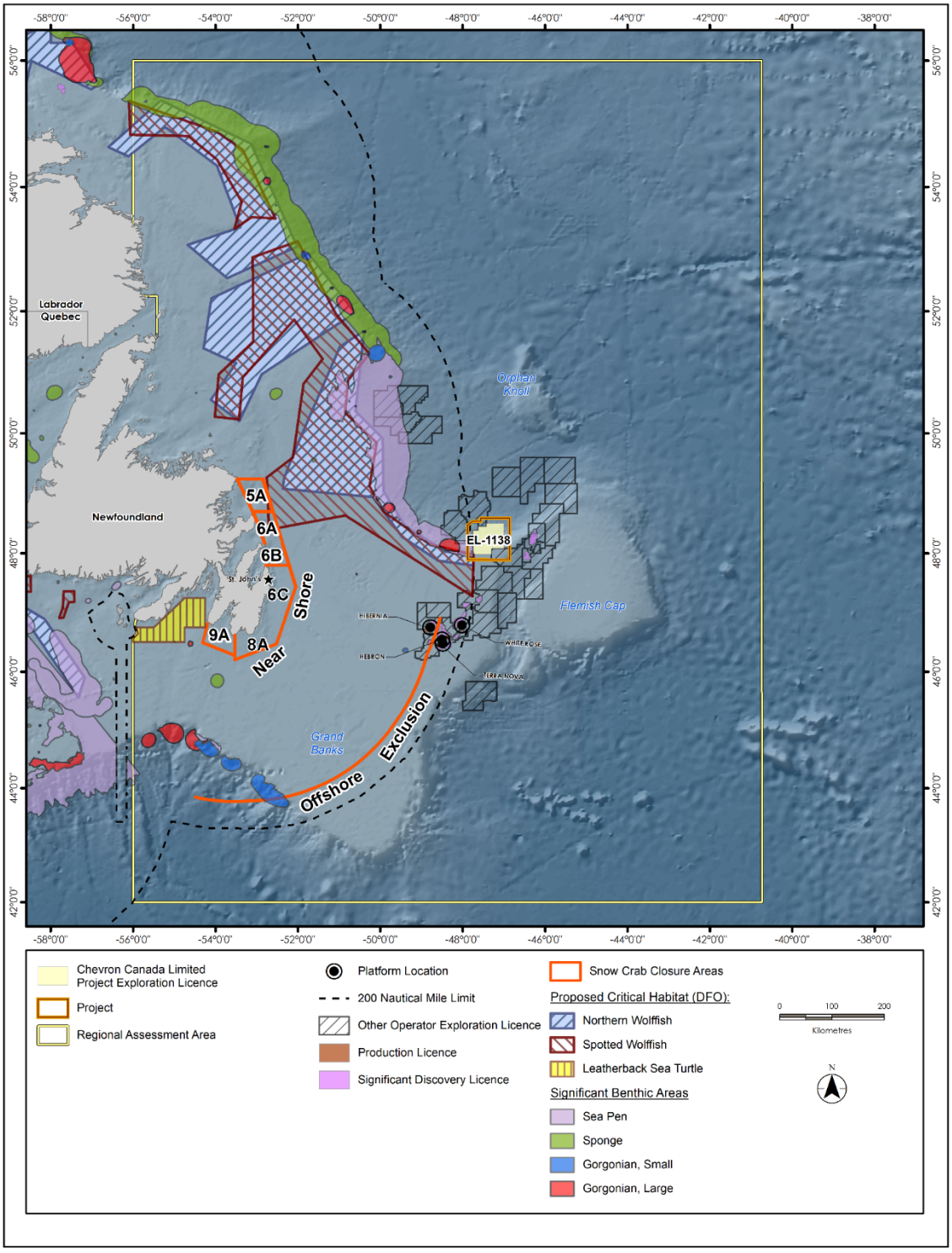
Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-35 and 6-36]	Source
National Historic Site	PC	*Canada National Parks Act*, S.C. 2000, c.32; *Historic Sites and Monuments Act*, R.S.C., 1985, c. H-4; National Historic Sites of Canada Order, 2018, C.R.C., c. 1112	Battle Harbour (National Historic District)	12,13
			Cape Spear	
			Signal Hill	
			Castle Hill	
			Ryan Premises	
Critical Habitat (proposed)	DFO, PC, ECCC	*Species at Risk Act*, 2002, c.29	Northern Wolffish	14,15
			Spotted Wolffish	
			Leatherback Sea Turtle	
SBA	DFO	N/A	Large Gorgonians	16
			Small Gorgonians	
			Sea Pens	
			Sponges	

Source:
[1] Wells et al. (2017); [2] N. Wells, 2019, pers. comm.; [3] DFO (2019a); [4] ECCC (2018); [5] DFO (2019b); [6] DFO (2017a); [7] DFO (2019c); [8] F. Mercier, 2018, pers. comm.; [9] C. Pierce, 2018, pers. comm.; [10] PC (2018a); [11] PC (2018b); [12] TCII (2018); [13] PC (2017); [14] DFO (2018b); [15] DFO (2016a); [16] Kenchington et al. (2018).



Part 1 - EBSAs, MPAs, Marine Refuges, NMCAs, National Park, National Historic Sites, and Migratory Bird Sanctuaries. (refer to Table 6.19 for alphanumeric site legend)

Figure 6-35 Special Areas within the Project Area and RAA Designated by the Federal Government of Canada – Part 1



Part 2 - Snow Crab Conservation Exclusion Zones, Critical Habitats [proposed], and SBIs (refer to Table 6.19 for alphanumeric site legend)

Figure 6-36 Special Areas within the Project Area and RAA Designated by the Federal Government of Canada – Part 2

6.4.2.1 Ecologically or Biologically Significant Areas

DFO has identified 13 bioregions within Canadian marine waters and Great Lakes, along with five Large Ocean Management Areas (LOMAs) (a subtype of Integrated Management Areas [IMAs]) (DFO 2017b, 2018b). Bioregions were mainly delineated according to oceanographic and bathymetric features (DFO 2009). Prior to this delineation, LOMAs were established by the Canadian Government to promote collaborative and integrated marine planning between the federal government, Indigenous groups and stakeholders to address environmental and economic issues (DFO 2017c). Bioregions and LOMAs are ultimately intended to facilitate ocean management decisions and assist with the establishment of Canada's network of MPAs. The RAA and western portion of the Project Area are within the NL Shelves Bioregion, and the entirety of the Project Area is within the Placentia Bay / Grand Banks (PB/GB) LOMA.

Canada is committed to identifying EBSAs within its marine waters as a component of the *Oceans Act* and DFO's *Fisheries Act* Sustainable Fisheries Framework, with the objective of maintaining marine biodiversity and biological productivity (Wells et al. 2017) and reaching its goal of conserving 10% of its coastal and marine waters by 2020 as a component of the Convention on Biological Diversity (CBD) Aichi Target 11 (DFO 2016b). EBSAs were identified within the PB/GB LOMA during 2007 (Templeman 2007) and revised during 2017, including the modification of existing EBSA boundaries and addition of newly defined EBSAs (DFO 2019d). North of the PB/GB LOMA, DFO finalized the delineation of EBSAs within the NL Shelves Bioregion during 2012 (Wells et al. 2017). Although initially developed separately, EBSAs north of and within the PB/GB LOMA boundary that are also within the NL Shelves Bioregion boundary are now collectively referred to as NL Shelves Bioregion EBSAs.

The easternmost portion of the NL Shelves Bioregion Northeast Slope EBSA overlaps the southwestern portion of the Project Area and the potential vessel route. The Eastern Avalon EBSA also overlaps the potential vessel route. An additional 19 NL Shelves Bioregion EBSAs occur partially or entirely within the RAA (Figure 6-35). Other than the newly designated EBSAs (i.e., St. Mary's Bay, Haddock Channel Sponges, Baccalieu Island, Bonavista Bay) and recently modified EBSA boundaries currently awaiting scientific document release by DFO, these EBSAs are summarized below.

6.4.2.1.1 Labrador Slope

The Labrador Slope EBSA ranges from the slope of Makkovik Bank to Belle Isle Bank, including "high bathymetric relief" in water depths between 400 and 2,000 m (Wells et al 2017). It features high densities of corals (including small and large Gorgonians), sponges, and fishes, such as wolffish, roundnose grenadier, skate, redfish, Atlantic cod, and American plaice (Wells et al. 2017). The northern and southern portions of this EBSA host high concentrations of soft corals. Black corals are abundant in the northern portion of the EBSA, and sponges abound near Hamilton Spur, in the central portion of the EBSA (Wells et al. 2017). Corals are prevalent along the shelf edge and slope, with at least 14 species identified to date (Wells et al. 2017). The Labrador Slope EBSA is an important feeding area for cetaceans, harp seals, juvenile and female hooded seals, and seabirds, such as black-legged kittiwake, dovekie, great black-backed gull, greater and sooty shearwaters, northern fulmar, terns, skuas and jaegers, phalaropes, and ivory gull (*Endangered* under Schedule 1 of SARA and by COSEWIC) (Wells et al. 2017).

6.4.2.1.2 Labrador Marginal Trough

The Labrador Marginal Trough EBSA extends from the Cartwright Saddle south to Hamilton Bank (Wells et al. 2017). It is likely that the central, trough portion of the EBSA is used as a migratory corridor by fishes and marine mammals, and at least a portion of the area is used as a whelping and summer feeding area by harp seals (Wells et al. 2017). High concentrations of marine mammals, fishes, and invertebrates occur within the northern and southern portions of this EBSA, including shrimp, snow crab, Greenland halibut, American plaice, witch flounder, and capelin (Wells et al. 2017). Cetaceans form feeding aggregations within the EBSA during the fall, along with the Hamilton Bank and Labrador Slope (Wells et al. 2017). This EBSA is used by juvenile and adult hooded seals during August to February, and it is an important area for seabirds, such as murres, black-legged kittiwake, great black-backed gull, herring gull, northern fulmar, Atlantic puffin, skuas and jaegers, sooty shearwater, and ivory gull (Wells et al. 2017).

6.4.2.1.3 Hamilton Inlet

The Hamilton Inlet EBSA consists of coastal and inner shelf habitat within the 200 m isobath extending from outside of Hamilton Inlet, to Sandwich Bay and Island of Ponds (Wells et al. 2017). This EBSA is an important area for capelin, Atlantic salmon, and seabirds and features the annual formation of ashkui, which are large, productive areas of open water surrounded by sea ice (Sable et al. 2006, in Wells et al. 2017; Wells et al. 2017). There are several capelin spawning beaches within the southern portion of this EBSA, and Paradise River, Eagle River, White Bear and North Rivers in the Sandwich Bay area are productive for Atlantic salmon (Dr. B. Dempson, DFO, pers. comm., in Wells et al. 2017). Several of the NL Shelves Bioregion's highest density Atlantic puffin and razorbill colonies occur within this EBSA. It also features high concentrations / colonies of dabbling ducks, geese, sea ducks (including common eider), great black-backed gull, herring gull, northern fulmar, Atlantic puffin, murres, northern gannet, razorbill, dovekie, skuas and jaegers, sooty shearwater, and harlequin duck (Wells et al. 2017). Pack ice within the Hamilton Inlet EBSA hosts a high concentration of whelping harp seals, and the western portion of the EBSA is used as a fall and early-winter feeding area for ringed seals (Wells et al. 2017).

6.4.2.1.4 Gilbert Bay

Gilbert Bay is comprised of basins separated by sills that form a shallow, low-gradient, subarctic fjord on Labrador's southeastern coast (Wells et al. 2017). The Gilbert Bay EBSA ranges from the head of Gilbert Bay north to the headlands of Salmon Point, including Alexis Bay and its surrounding coastal areas towards Spear Point (Wells et al. 2017). The southern portion of this EBSA is important habitat for Gilbert Bay cod (Wells et al. 2017). This EBSA hosts a genetically distinct population of Atlantic cod and serves as habitat for Atlantic Char and Atlantic salmon (Wells et al. 2017). Capelin are key species for the maintenance of the local ecology and have been known to spawn within this EBSA (Wells et al. 2017). The Gilbert Bay EBSA features aggregations of groundfish, shellfish and seabirds, and congregations of corals occur along its outer edge (Wells et al. 2017).

6.4.2.1.5 Grey Islands

The Grey Islands EBSA extends from the coastal areas of the Grey Islands, east of Newfoundland's Northern Peninsula, inshore to a portion of Hare Bay and southeast towards Fogo Island (Wells et al. 2017).

This EBSA is important for waterfowl and seabirds, hosting high concentrations of common eider and harlequin duck and colonies of great black-backed gull, herring gull and terns (Wells et al. 2017). The inner shelf portion of this EBSA is considered highly productive year-round, featuring diverse seabird species, such as common murre, black-legged kittiwake, dovekie, greater shearwater, murres, northern fulmar, northern gannet, phalaropes, Atlantic puffin, skuas and jaegers, sooty shearwater, storm-petrels, and terns (Wells et al. 2017). Also within the inner shelf area of the Grey Islands EBSA are high concentrations of soft corals and small gorgonians (Wells et al. 2017). Several small, distinct areas within the EBSA host groundfish, pelagics and shellfish, and capelin aggregations historically occurred within the inner shelf region (Wells et al 2017).

6.4.2.1.6 Notre Dame Channel

The Notre Dame Channel EBSA is a component of a channel that extends from Notre Dame Bay offshore to the Labrador Slope, and encompasses the inner edge of Funk Island Bank to the Fogo Shelf area (Wells et al. 2017). This EBSA hosts high biodiversity and aggregations of cetaceans, skate, and important commercial fisheries species, such as smooth and thorny skate (assessed by COSEWIC as *Endangered* and *Special Concern*, respectively), capelin, American plaice, Greenland halibut, snow crab and shrimp (Wells et al. 2017). Witch flounder and redfish were known to historically occur within this EBSA (Wells et al. 2017). The Notre Dame Channel EBSA was identified as an important feeding and/or migration area for cetaceans and overwintering harp seals, and is an important area for seabirds, including murres, black-legged kittiwake, great black-backed gull, northern fulmar, northern gannet, phalaropes, skuas and jaegers, sooty shearwater and storm-petrels (Wells et al. 2017).

6.4.2.1.7 Orphan Spur

The Orphan Spur EBSA extends along the Labrador Slope and outer shelf within Northwest Atlantic Fisheries Organization (NAFO) Division (Div.) 3K, including the Orphan Spur and a portion of the Trinity Trough Mouth Fan (Wells et al. 2017). Water depths within this EBSA range from 400–2,000 m in the north to approximately 1,000 m south of the Orphan Spur (Wells et al. 2017). It features high biodiversity, particularly including corals, fishes, marine mammals and seabirds. High concentrations of black corals, sea pens, small gorgonians, soft corals, and stony cup corals are located within various portions of this EBSA, with corals caught as fisheries bycatch in water depths up to 1,300 m (Wells et al. 2017). Bycatch data also indicates that this EBSA is an important area for several shark species (Wells et al. 2017). Historically, this EBSA hosted high densities of witch flounder, American plaice, Atlantic cod, redfish, spotted, northern and Atlantic wolffish, skate, and roundnose grenadier (Wells et al. 2017). This EBSA is occupied by female hooded seals during August-September and is used as a feeding area by harp seals during the winter (Wells et al. 2017). The Orphan Spur EBSA is also frequented by various seabirds, including murres, storm-petrels, black-legged kittiwake, great black-backed gull, skuas and jaegers, northern fulmar, greater and sooty shearwaters, and dovekie (Wells et al. 2017).

6.4.2.1.8 Fogo Shelf

The Fogo Shelf EBSA extends along the 200-m isobath from the headlands of the western entrance of the Bay of Exploits eastwards towards Cape Freels, including Twillingate, New World, Fogo and Funk islands and numerous other islands near the Bay of Exploits and Gander Bay (Wells et al. 2017). This EBSA is of

importance for capelin, Atlantic salmon, waterfowl and seabird species, and cetaceans, and features high diversity and species abundance (Wells et al. 2017). Spawning capelin areas are abundant within its coastal region, with the greatest concentration on North Twillingate Island and the western coast of Cape Freels (Wells et al. 2017). Aggregations of predators near deep-water forage fish spawning areas make the Fogo Shelf EBSA a biological hotspot (Wells et al. 2017). The Bay of Exploits area features the highest Atlantic salmon returns for all monitored rivers in the region and the Gander Bay area is Newfoundland's second-most productive salmon river, where several hundred thousand migrating smolts feed nearshore prior to transiting to the North Atlantic and returning adult salmon (including kelt [previous spawners]) migrate and feed (Wells et al. 2017). Funk Island hosts the Western North Atlantic's largest common murre colony and the only northern gannet breeding colony within the NL Shelves Bioregion (Wells et al. 2017). This EBSA also includes high concentrations of common eider, Atlantic puffin, great black-backed gull, greater shearwater, herring gull, northern fulmar, thick-billed murre and terns (Wells et al. 2017). The Fogo Shelf EBSA features several important feeding areas for cetaceans and concentrations of groundfish, pelagic fish, shellfish, aquatic plants, and the deep-water channels of this EBSA are used by male hooded seals during the winter (Wells et al. 2017).

6.4.2.1.9 Northeast Slope

The Northeast Slope EBSA is located within the central portion of the RAA and overlaps with the southwestern portion of the Project Area. This EBSA hosts large spring feeding aggregations of spotted wolffish and Greenland halibut during the spring (Templeman 2007; DFO 2016b). It also features feeding aggregations of several marine mammal species, such as pilot whales, and harp and hooded seals near the western and eastern portions of the Sackville Spur, respectively (Templeman 2007; DFO 2016b).

6.4.2.1.10 Smith Sound

The Smith Sound EBSA occurs along the western coast of Trinity Bay, Newfoundland. It is the largest remaining spawning area known for northern cod (FRCC 2000, in Templeman 2007), and the deeper portions of the EBSA are important wintering grounds for this species (Templeman 2007; DFO 2016b). This EBSA is also an important nursery area for northern cod larvae and possibly juveniles (Templeman 2007). There is indication that this EBSA is a staging area for fish migrating northwards out of Smith Sound during the spring and returning fish during the fall (C. Morris, DFO, pers. comm., in Templeman 2007). Dense aggregations of fish gather within the EBSA during the winter; cod that spawn along Newfoundland's northeast coast likely overwinter in Smith Sound, including large fish that may produce many eggs (R. Gregory, DFO, pers. comm., in Templeman 2007; Templeman 2007).

6.4.2.1.11 Eastern Avalon

The Eastern Avalon EBSA features high biodiversity and hosts feeding aggregations of cetaceans, leatherback sea turtles, seals, and seabirds from spring through fall (DFO 2016b). This EBSA is of particular importance as a seasonal feeding area for humpback whales, especially during the summer when their prey species are concentrated in the region (Templeman 2007).

6.4.2.1.12 Laurentian Channel

The Laurentian Channel EBSA includes the only known Canadian pupping grounds for black dogfish (Kulka 2006, in DFO 2016b) and hosts the highest concentration of black dogfish in Canadian waters, near St. Pierre Bank (Kulka 2006, in Templeman 2007). This EBSA is an important juvenile and nursery area for smooth skate (Kulka et al. 2006, in DFO 2016b) and is a migration route for cetaceans and finfish into and out of the Gulf of St. Lawrence (Templeman 2007; DFO 2016b). The Laurentian Channel EBSA features high primary and secondary production which results in aggregations of prey and predators, such as monkfish, pollock, and white hake, particularly during the spring (Kulka et al. 2003, in Templeman 2007; Templeman 2007).

6.4.2.1.13 Placentia Bay

The Placentia Bay EBSA is an important area for fish, marine mammals and seabirds, featuring high biodiversity of marine mammals and pelagic fishes, particularly near St. Lawrence, Marystown and Swift Current (Sjare et al. 2003, in DFO 2016b). Localized upwelling occurs near the southern Burin Peninsula and Cape St. Mary's headlands, resulting in high primary and secondary productivity within this EBSA (Templeman 2007). High concentrations of ichthyoplankton (e.g., cod, cunner, American plaice, capelin) occur in the western portion of Placentia Bay, and possibly the largest spawning stock of Atlantic cod in the Northwest Atlantic occurs within the western and southern portions of the Bay (DFO 2016b). This EBSA is an important feeding and/or migration area for cetaceans, sea turtles, harbour seals, and river otters (DFO 2016b). It is also used as a pupping and haul-out area by harbour seals during the mating season (DFO 2016b), and as a mating area for river otters (Templeman 2007). High concentrations of many seabird species occur within the EBSA to nest, feed and overwinter, particularly within the Eastern portion of Placentia Bay and near Cape St. Mary's, including Atlantic puffin, black-legged kittiwake, black guillemot, common murre, great black-backed gull, greater shearwater, northern fulmar, and northern gannet (Templeman 2007).

6.4.2.1.14 Virgin Rocks

The Virgin Rocks EBSA includes large, exposed or nearly exposed rocks, a unique geological feature in the middle of the Grand Banks (Templeman 2007; DFO 2016b). Seabirds are known to congregate within this EBSA to feed on capelin aggregations (DFO 2016b). Several groundfish species, such as Atlantic cod, American plaice, and yellowtail flounder, concentrate within the Virgin Rocks area to spawn, although these species also spawn over a broader, disjunct range elsewhere (Ollerhead et al. 2004, in Templeman 2007).

6.4.2.1.15 Southwest Slope

The Southwest Slope EBSA is highly productive due to upwelling along the slope edge and hosts the highest groundfish biodiversity of the Grand Banks, including Atlantic cod, monkfish, pollock, and white hake (Kulka et al. 2003, in Templeman 2007). It is a feeding and spawning hotspot for haddock, namely along the slope edge where it spawns during the spring (Ollerhead et al. 2004, in Templeman 2007; DFO 2016b). During the spring, Atlantic halibut occur along the southern slope portion of the EBSA (Kulka et al. 2003, in DFO 2016b), which is also an important spawning area for redfish (Ollerhead et al. 2004, in DFO 2016b). This EBSA is a migration route for cod (Templeman 2007) and hosts a high concentration and

diversity of cold-water corals, including structure-forming gorgonian corals (Edinger et al. 2007, in DFO 2016b and in Templeman 2007). Marine mammals and leatherback sea turtles commonly occur within this EBSA, particularly during the summer (DFO 2016b). It is a critical feeding area for the fitness, productivity, and population stability of seabirds in the area, and hosts the highest density of pelagic seabirds within the PB/GB LOMA as they feed on the abundance of prey species within the EBSA (DFO 2016b).

6.4.2.1.16 Southeast Shoal

With the warmest bottom water temperatures on the Grand Banks and a well-defined oceanic gyre, the Southeast Shoal EBSA features high primary production and the highest benthic biomass on the Banks (Walsh et al. 2001 and Fuller and Myers 2004, in Templeman 2007; DFO 2016b). It is the only shallow, sandy offshore shoal in the PG/GB LOMA (Fuller and Myers 2004, in Templeman 2007). Several finfish species spawn within this EBSA, including capelin, northern sand lance, yellowtail flounder, American plaice, and Atlantic cod, and it is host to relict populations of blue mussel and wedge clams, remnants from deglaciation of the Grand Banks (Ollerhead et al. 2004, in Templeman 2007; Fuller and Myers 2004, in DFO 2016b). This EBSA is the only known offshore spawning site for capelin in NL (Fuller and Myers 2004, in Templeman 2007; F. Mowbray, pers. comm., in Templeman 2007). Nursery areas for yellowtail flounder, NAFO Div. 3NO Atlantic cod, and American plaice occur within this EBSA, along with the densest concentrations of Atlantic (striped) wolffish and yellowtail flounder on the Grand Banks (Walsh et al. 2001, in Templeman 2007; Kulka et al. 2003, in DFO 2016b; DFO 2016b). It is the only nursery area for the entire stock of yellowtail flounder in NL (Walsh et al. 2001, in Templeman 2007). Seasonal feeding aggregations of marine mammals and seabirds occur within the EBSA, particularly humpback and northern bottlenose whales (Templeman 2007; DFO 2016b).

6.4.2.1.17 Lilly Canyon-Carson Canyon

The Lilly Canyon-Carson Canyon EBSA is an important feeding and productivity area for Iceland Scallops, although these scallops do occur elsewhere (Templeman 2007). This EBSA hosts year-round aggregations of marine mammals for feeding and/or overwintering (Templeman 2007).

6.4.2.2 Marine Protected Areas

MPAs are legally protected under Canadian federal legislation and are managed with the goal of long-term natural conservation (DFO 2019a). MPAs are a useful tool for the protection and conservation of marine species / populations, ecosystem diversity, unique marine habitats, or spiritual and cultural heritage sites, such as archaeological sites, shipwrecks, and areas traditionally used by Indigenous and non-Indigenous communities (DFO 2019a). Canada's MPA network is intended to protect vital ecological connections between important marine areas and help support sustainable harvest practices by serving as a source of young, larger and/or more abundant fish to surrounding areas (DFO 2019a).

Marine areas that may qualify for federal protection under the *Oceans Act* are initially proposed as Areas of Interest (AOIs). Upon ecological, biophysical, social, cultural and economic review and consultations, qualifying AOIs receive designated boundaries and become established as MPAs (DFO 2019a). Regulations for ocean users are developed based on their regulatory intent and published in *Canada Gazette* (DFO 2019a). With stakeholder input, an adaptive management framework is created for each

MPA, including conservation objectives, management plan, monitoring plan, compliance and enforcement, and public education and outreach (DFO 2019a).

No MPAs occur within the Project Area. Two MPAs occur within the RAA, Gilbert Bay and Eastport, which are summarized below (Figure 6-35). Unless listed as an exception or otherwise approved by the Minister, activities that disturb, harm, destroy or remove living marine organisms or their habitat are prohibited within these MPAs (DFO 2019a).

6.4.2.2.1 Gilbert Bay

The Gilbert Bay MPA is a 60-km² area that was designated in 2005 upon request by local stakeholders to protect Gilbert Bay cod, a genetically distinct resident population of golden cod (DFO 2019a). Gilbert Bay cod exhibit behavioural and physiological differences compared to northern cod, as they are localized (i.e., non-migratory) and able to survive the cold local environmental conditions that could be fatal to other cod populations (DFO 2019a). Much of the Gilbert Bay cod's life cycle occurs within the MPA, but large, commercial-sized cod move out of the MPA into Alexis Bay during June–September to feed, overlapping with Northern cod and their associated fisheries (DFO 2019a). The Gilbert Bay MPA supports diverse benthic (e.g., sea urchins, shellfishes, mussels, scallops, snails, shrimp), pelagic fish (e.g., herring, capelin, salmon, eels, smelt, Arctic char), and aquatic plant (e.g., eelgrass, kelp) species, and hosts several species of marine mammals and waterfowl, such as black duck, geese and mergansers (DFO 2019a).

6.4.2.2.2 Eastport – Duck Island and Round Island

Designated in 2005, the Eastport MPA is a 2 km² area established to protect a viable American lobster population and threatened or endangered species (DFO 2019a). Newfoundland's Eastport Peninsula is highly productive and hosts numerous groundfish, pelagic fish, shellfish, marine mammals and aquatic plants (DFO 2019a). This MPA consists of two "no-take" areas surrounding Duck Island and Round Island established during 1997 by DFO and the Eastport Peninsula Lobster Protection Committee under the *Fisheries Act*. Local lobster harvest is also limited within a 400 km² conservation area surrounding the Eastport MPA, the Eastport Peninsula Lobster Management Area (DFO 2019a).

6.4.2.3 Migratory Bird Sanctuaries

There are at least 92 Migratory Bird Sanctuaries managed by ECCC-CWS across Canada, protecting and conserving migratory birds within approximately 11.5 million hectares of terrestrial and marine migratory bird habitat (GC 2017a). Migratory Bird Sanctuaries may be located on federal, provincial or private land, and prohibit the hunting of species listed under the *Migratory Birds Convention Act* (GC 2017a). The *Migratory Bird Sanctuary Regulations* also stipulate prohibitions for taking, injuring, destroying, or molesting migratory birds or their nests within a Sanctuary (GC 2017a).

There are three Migratory Bird Sanctuaries within the RAA, Île aux Canes, Shepherd Island, and Terra Nova, which are summarized below. No Migratory Bird Sanctuaries occur within or near the Project Area (Figure 6-35).

6.4.2.3.1 Île aux Canes

The Île aux Canes (locally known as Green Island) Migratory Bird Sanctuary is located east of Newfoundland's Northern Peninsula, near the Shepherd Island Migratory Bird Sanctuary (see below). It encompasses the island and surrounding, typically shallow (<5 m) waters, including shoals, inlets and submerged rocks, and features gently sloping bedrock that serves as "ramps" that provide easy access to the water for young, flightless birds (GC 2019a). The shallow shoals surrounding the island reduce wave action, which makes it easier for young birds to feed (GC 2019a). The intertidal and subtidal zones around the island host high concentrations of prey species for Common Eider, such as blue mussels, periwinkles, whelks, and amphipods (GC 2019a). In conjunction with the Shepherd Island Sanctuary, the 150-hectare area is among the largest of Newfoundland's breeding sites for common eider, with 1,291 nests as of 2001, and is the only area that has experienced increased numbers of breeding Common Eider in recent years (GC 2019a). It is estimated that the Île aux Canes Sanctuary can support up to 5,000 Common Eider nests (GC 2019a). The Province of NL is the landowner of this Sanctuary.

6.4.2.3.2 Shepherd Island

The Shepherd Island Migratory Bird Sanctuary is located near the Île aux Canes Migratory Bird Sanctuary (see above), east of the Northern Peninsula of Newfoundland. Shepherd Island is rugged, with bedrock outcrops, steep, wave-washed shores, and patchy vegetation, and the 16-hectare Sanctuary was established in 1991 to protect an important nesting area for Common Eider (GC 2019b). The Sanctuary's common eider population has reduced considerably, from 86 nesting pairs in 1988 to two pairs in 2001; it is possible that common eider are preferentially nesting on Île aux Canes (Green Island) (GC 2019b). Recently, common eider populations on both Île aux Canes and Shepherd Island have been reduced due to predation by foxes and polar bears (GC 2019b). The Province of NL is the landowner of the Shepherd Island Sanctuary.

6.4.2.3.3 Terra Nova

The Terra Nova Migratory Bird Sanctuary is in the Bonavista Bay region, adjacent to Terra Nova National Park on Newfoundland's east coast (GC 2019c). The northern portion of the Sanctuary encompasses portions of Southwest Arm and Broad Cove, and southern portion includes the westernmost portion of Newman Sound (GC 2019c). It is comprised of shallow inlets, gravel beaches, intertidal flats, areas with large boulders, and steep cliffs (GC 2019c). The inlets are rich marine ecosystems, and Newman Sound has been recommended for designation as an Ecological Reserve under the International Biological Program (GC 2019c). This Sanctuary provides refuge to a high biodiversity of bird species, although the number of individual birds is lower than that of some other sanctuaries (GC 2019c). At least 30 species have been observed within this Sanctuary, including shorebirds, waterfowl, and seabirds (GC 2019c). Hundreds of Canada goose, American black duck, common goldeneye, and mergansers use the Sanctuary during their fall migration (GC 2019c). Shorebirds are common along the Sanctuary's tidal flats during the summer and early-fall, and the Newman Sound portion of the Sanctuary is an important area for waterfowl year-round (GC 2019c). The portion of the Southwest Arm that is within the Sanctuary freezes during the winter and is unusable for most of the area's overwintering waterfowl (GC 2019c).

6.4.2.4 Marine Refuges

Canadian Marine Refuges are effective, area-based conservation measures that serve to provide long-term protection for biodiversity, including important species and their habitats, such as unique / substantial coral and sponge aggregations (DFO 2016h, in BP 2018; DFO 2019b). Marine Refuges contribute to Canada's marine conservation targets and currently conserve nearly 300,000 km² of its coastal and offshore marine areas (approximately 5% of protected marine territory in Canada) (DFO 2019b). Permissible and prohibited activities are established for each Marine Refuge, according to the species and/or habitat intended for protection. There are nine Marine Refuges within or partially within the RAA, one of which, the Northeast Newfoundland Slope Closure, partially overlaps the northwestern portion of the Project Area (Figure 6-35). These Marine Refuges are summarized below.

6.4.2.4.1 Northeast Newfoundland Slope Closure

The 55,353-km² Northeast Newfoundland Slope Closure is in the central portion of the RAA and was established to protect high concentrations of fragile, slow-growing, structure-providing cold-water corals and sponges and contribute to the long-term protection of biodiversity (DFO 2019b). This Marine Refuge can serve as a natural refuge for marine fauna which may result in increased productivity, increasing species' abundance within and near the area (DFO 2019b). Deep-sea corals and sponges serve as spawning and reproductive grounds, nurseries and refuges for a variety of marine species (DFO 2019b). Dense aggregations of corals or sponges may provide habitat for other fauna by altering bottom currents and are positively correlated with higher ecosystem biodiversity (DFO 2019b). Portions of this Closure overlap the Orphan Spur and Northeast Slope EBSAs (see above), which feature high diversity and support SAR, such as roundnose grenadier (Endangered under COSEWIC) (DFO 2019b). All fishing activities conducted using bottom-contact gear are prohibited within this Marine Refuge, as are any human activities that would negatively impact its conservation objectives (DFO 2019b).

6.4.2.4.2 Hopedale Saddle

The southeasternmost portion of the Hopedale Saddle Marine Refuge overlaps the northwestern boundary of the RAA. This 15,411-km² area protects sensitive, cold-water corals and sponges with the goal of preserving long-term biodiversity (see Northeast Newfoundland Slope Closure, above, for a summary of the importance of conserving fragile, structure-forming deep-sea corals and sponges) (DFO 2019b). The Hopedale Saddle Marine Refuge partially overlaps the Outer Shelf Nain Bank, Hopedale Saddle and Labrador Slope EBSAs (see above). It supports high biodiversity and is an important overwintering area for the Eastern Hudson Bay population of beluga whale, which is *Endangered* under COSEWIC (DFO 2019b). All bottom-contact fishing activities or human activities that would interfere with conservation objectives are prohibited within this Marine Refuge (DFO 2019b).

6.4.2.4.3 Hawke Channel

The Hawke Channel Marine Refuge is in the northwestern portion of the RAA, east of southern Labrador. With an area of 8,837 km², the primary objectives of this Marine Refuge are the protection of Atlantic cod and its benthic habitat (DFO 2019b). Atlantic cod is a culturally important species for NL and fish from several Atlantic cod populations are caught during commercial and recreational fisheries in the province

(DFO 2019b). The Hawke Channel Marine Refuge partially overlaps the Labrador Marginal Trough EBSA (see above), and supports high concentrations of groundfish and benthos, including commercially important species such as snow crab and Greenland halibut (DFO 2019b). This Refuge also protects several SAR, including Atlantic (striped) wolffish, designated as Special Concern under SARA and by COSEWIC (DFO 2019b). Fisheries utilizing bottom trawls, gillnets, or longlines are prohibited within the Hawke Channel Marine Refuge, along with any human activities that could harm its ecological conservation objectives (DFO 2019b).

6.4.2.4.4 Funk Island Deep

The Funk Island Deep Marine Refuge is a 7,274 km² area located near the western-central portion of the RAA, northeast of Newfoundland. Like Hawke Channel, this Marine Refuge was designated to conserve Atlantic cod and its associated benthic habitat (DFO 2019b). The majority of the Funk Island Deep Marine Refuge overlaps the Notre Dame Channel EBSA and the southwestern portion overlaps the eastern portion of the Fogo Shelf EBSA (see above). This Marine Refuge supports high benthic biodiversity and is an important commercial snow crab fishing ground (DFO 2019b). It hosts high concentrations of groundfish and other fish species and serves as habitat for the Funk Island Deep population of smooth skate, which is *Endangered* under COSEWIC (DFO 2019b). This Marine Refuge is also an important feeding area for various marine mammals (DFO 2019b). Bottom trawl, gillnet, and longline fisheries and human activities counter to conservation goals are prohibited within the Funk Island Deep Marine Refuge (DFO 2019b).

6.4.2.4.5 Lobster Closures (Mouse Island, Glover's Harbour, Farmer's Island, Gander Bay, and Gooseberry Island)

Lobster Closure Marine Refuges are enacted to increase spawning and egg production of American lobster, a commercially important species (DFO 2019b). Lobster Closures encompass spawning habitat, including shallow and rocky inshore areas that are important for lobster egg production (DFO 2019b). The protection of lobsters can assist the maintenance of Newfoundland's inshore ecology, as they are important primary predators in the local food web (DFO 2019b). Lobster fishing is prohibited within Lobster Closures, as are all human activities that conflict with their conservation objectives (DFO 2019b). Four Lobster Closures, Mouse Island, Glover's Harbour, Farmer's Island and Gander Bay, are located along the north coast of Newfoundland and the Gooseberry Island Lobster Closure is in Trinity Bay. There are no Lobster Closures within the Project Area.

6.4.2.5 Fisheries Closure Areas – Snow Crab Conservation Exclusion Zones

Snow Crab Conservation Exclusion Zones are Fisheries Closure Areas for snow crab within Crab Management Areas (CMAs) off eastern Newfoundland and on the Grand Banks (DFO 2017a). These Exclusion Zones are 0.5 to 1 nautical mile -wide corridors extending the full length of one or more of a given CMA's boundaries that were established via consultation using a co-management approach amongst fleet committees representing the region's different crab management areas (DFO 2017a). The Exclusion Zones are intended to serve as refuge corridors for snow crab between the management areas, with the goal of resource conservation and protecting the long-term viability of the snow crab stock (DFO 2017a). Ten Snow Crab Conservation Exclusion Zones occur within the RAA, west and southwest of the Project Area (Figure 6-36).

6.4.2.6 National Marine Conservation Areas

In consultation with stakeholders, Parks Canada establishes National Marine Conservation Areas (NMCAs) to provide protection and conservation for Representative Marine Areas (RMAs) (Parks Canada [PC] 2019a), with the goal of representing all of Canada's 29 marine regions (BP 2018). NMCAs are intended to benefit all users, including Indigenous and other coastal communities, by maintaining ecological sustainability, creating entertaining educational experiences for visitors, and promoting environmental awareness (PC 2019a). NMCAs are designated in accordance with Canada's NMCAs Policy and System Plan, Sea to Sea to Sea (PC 1995; BP 2018). Activities such as ocean dumping, undersea mining, and oil and gas exploration / development are prohibited within NMCAs; traditional fisheries are permitted, providing they adhere to a NMCA's ecosystem conservation objectives (Parks Canada 2017, in BP 2018). Parks Canada recently concluded consultations with stakeholders and is in the process of revising NMCA policy and developing regulations under the *Canada National Marine Conservation Areas Act* to further assist in the protection of Canada's marine heritage (PC 2019a).

RMAs must be identified and reviewed before new NMCAs can be established. There are four RMAs within the RAA (west and southwest of the Project Area), Northwestern Conception Bay, South Grand Bank Area, Southern Coast of Burin Peninsula, and Virgin Rocks. A candidate NMCA is partially within the northwestern portion of the RAA and a Region Without Studies (RWS) was identified off eastern Newfoundland, including the Bonavista Bay region (F. Mercier, 2018, pers. comm.; C. Pierce, 2018, pers. comm.; Figure 6-35). As these areas have not yet been approved and designated as NMCAs, PC has not released descriptive documentation.

There are currently no NMCAs, candidate NMCAs, RMAs, or RWS' within the Project Area (C. Pierce, 2018, pers. comm.).

6.4.2.7 National Park

National Parks are a Canada-wide network of representative natural areas important for Canadians. They are protected by federal legislation and intended to be enjoyed by the public in a sustainable manner. One National Park with a marine component, Terra Nova, is within the RAA, west of the Project Area in Bonavista Bay (PC 2018a; Figure 6-35).

6.4.2.7.1 Terra Nova

Terra Nova National Park is a 400-km² area comprised of sheltered marine inlets, islands, headlands, and oceanside ponds, forests, and bogs (PC 2018b). It is defined as a "traditional [boreal forest] island wilderness" and hosts abundant terrestrial and marine wildlife, including SAR such as American marten, little brown and northern long-eared bats, red crossbill, olive sided flycatcher, rusty blackbird, short eared owl, and boreal felt and blue lichens (GNL 1997; PC 2018b, 2019b). The marine water within / near Terra Nova National Park are highly productive due to nutrient influx from the Labrador Current and host high biodiversity, including abundant subtidal fauna, seabirds, and marine mammals (CPAWS 2018). Cod, herring, capelin, and lumpfish have spawning sites within Bonavista Bay, and there are multiple seabird breeding colonies in the region, such as Leach's storm-petrel, common and Arctic terns, black-legged kittiwake, Atlantic puffin, and great black-backed, herring, and ring-billed gulls (CPAWS 2018). Common

eider historically nested in the region, but the population is only now beginning to recover from previously intense hunting pressure (CPAWS 2018). Alexander Bay is ecologically unique within Terra Nova National Park, as its high-water temperatures host marine species that do not normally occur in NL, such as seaweeds and invertebrates typically found south of Cape Cod or near Prince Edward Island (CPAWS 2018).

A management plan that provides clear directions for long-term ecological recovery and/or sustainability is required by legislation for National Parks in Canada. Parks Canada is preparing a new management plan for Terra Nova National Park, a draft of which is currently available for stakeholder and public consideration (PC 2019b).

6.4.2.8 National Historic Sites

Canadian National Historic Sites preserve and educate users about the history of Indigenous and non-Indigenous cultural communities, and may include areas such as sacred spaces, archaeological sites, battlefields, heritage houses / sites, historic districts, and sites of scientific discovery, among others (PC 2018c). There are over 970 National Historic Sites across Canada, of which 171 are administered by Parks Canada (PC 2018c), including those within NL. Parks Canada manages these sites in accordance with their National Historic Sites System Plan (PC 2019c), which includes principles and objectives for heritage conservation and presentation.

There are five National Historic Sites within coastal communities in the RAA, which are summarized below. There are no National Historic Sites within the Project Area (Figure 6-35).

6.4.2.8.1 Battle Harbour National Historic District

The Battle Harbour National Historic District is in southeastern Labrador and was designated as a National Historic Site in 1997 (GC 2017b). It is representative of 19th and early-20th century NL outport fishing communities, with traditional houses, the Grenfell Mission doctor's cottage, a Gothic-Revival style church, police detachment, cemetery, and radio tower (GC 2017b). The Site was a major port in the Labrador fishery and its mercantile complex was founded by John Slade of Poole of England during the 1770s, including still-standing large wooden buildings that served as salt, flour, and salmon stores during the 18th and 19th centuries, wharves and waterfront fish processing spaces (GC 2017b). Well-preserved fishing rooms are still occupied seasonally (GC 2017b).

6.4.2.8.2 Cape Spear

Built in 1835, the Cape Spear lighthouse is NL's oldest surviving lighthouse and was designated as historically important during 1962 (PC 2018c). The lighthouse and surrounding 49 hectares of land on Newfoundland's northeastern Avalon Peninsula were declared a National Historic Site of Canada during 1975 for both its age and architecture and its significance as a gun battery during World War II (WWII) (PC 2018c). The lighthouse was restored to its original appearance and the WWII coastal guns were conserved and mounted by Parks Canada, and the site was opened to the public during 1983 by Prince Charles and Princess Diana of Whales (PC 2018c). The Cape Spear National Historic Site is the most easterly point of Canada and offers visitors views of rare seabirds, whales and icebergs (PC 2018c). Recently, new

interpretive programs and activities have been made available for visitors, including self-guided tours enhanced by hand-held GPS devices and historic images, interviews and audio / video clips (PC 2018c).

A management plan and site development program were developed for the Cape Spear National Historic Site during the 1980s, and regular monitoring and site maintenance has continued to occur (PC 2018c). The Site's facilities are maintained and operated by four major partners, including the Historic Sites Association of Newfoundland and Labrador (on-site projects and special events), Canadian Coast Guard Agency (light tower and other on-site structures), Coast Guard Alumni Association (art gallery and school group program), and East Coast Trail Association (coastal trail system) (PC 2018c).

6.4.2.8.3 Signal Hill

The Signal Hill National Historic Site was the St. John's, NL harbour defence site from the 1640s to WWII and was where Guglielmo Marconi received the world's first transatlantic wireless signal during 1901 (PC 2018c). It was the site of the final battle of North America's Seven Years' War during 1762, provided the first direct telegraph link between Ireland, St. John's, and New York via the installation of its first transatlantic cable during 1909, and the Canadian Marconi Company transmitted the human voice 1,200 km across the Atlantic Ocean from Signal Hill via wireless telephone during 1920 (PC 2018c).

The 106-hectare Site was designated a National Historic Site in 1951 for its importance to Canada's defence and communications history (PC 2018c). It features Cabot Tower, which served as a flag signalling tower during 1900 to 1958 and was built to "commemorate the 400th anniversary of John's Cabot's 'discovery' of Newfoundland and the 60th anniversary of Queen Victoria's reign", along with historic cannon armaments and coastal hiking trails (PC 2018c). The Site also includes the portion of shoreline on the south side of the Narrows, which features its associated Fort Amherst National Historic Site and two Provincial Historic Sites, Frederick's Battery and South Castle (PC 2018c). Signal Hill and these additional sites are variably administered by Parks Canada, the Government of NL, City of St. John's, private landowners, St. John's Port Authority, Fort Amherst Small Boat Basin Corporation, and several federal agencies, including DFO and Transport Canada (PC 2018c). Site visitors may view icebergs during the spring and whales during the summer / early-fall, receive guided tours, and experience special events, such as the performances by the Signal Hill Tattoo during the summer (PC 2018c).

6.4.2.8.4 Castle Hill

The Castle Hill National Historic Site, located on a seaside bluff in Placentia, NL, features ruins of Fort Royal's earthworks, stone walls, archaeological sites, artillery batteries, six smoothbore cannons, hiking trails, and remnants of skirmish sites (PC 2018c). This 24-acre Site represents Newfoundland's British and French colonial military heritage from the 17th and 18th centuries (PC 2018c). During 1692 to 1811, it served an important role in the defence of Plaisance, Newfoundland's former French capital, and in French and British strategic interests for Atlantic Canada (PC 2018c). Castle Hill has been open to the public since 1968 and now includes a visitor centre, picnic areas, outdoor theatre, and maintenance compound (PC 2018c). In consultation with stakeholders, including Indigenous partners, the Castle Hill National Historic Site is administered by Parks Canada (PC 2018c).

6.4.2.8.5 Ryan Premises

The 2.4 hectare Ryan Premises National Historic Site features clapboard buildings from 19th- and early-20th centuries on the shore of Newfoundland's Bonavista Harbour, and includes a historic wharf and nearby beach (PC 2018c). One of Newfoundland's oldest and largest inshore fishing outports, it was designated as a National Historic Site in 1987 and is considered representative of 500 years of Canada's east coast fishery, including the inshore, Labrador, and international fisheries and the seal hunt (PC 2018c). The Ryan Premises Site is administered by Parks Canada and was opened to the public in 1997 (PC 2018c). Since then, visitors have been able to experience the area's history via on-site interpreters and the award-winning Bonavista Museum (PC 2018c).

6.4.2.9 Critical Habitats (Proposed)

Critical habitat is deemed necessary for a species' survival or recovery, and may include areas important for reproduction, nursery, rearing, feeding, migration, or other habitat aspects that are essential for life cycle completion for aquatic species, or areas previously occupied by aquatic species where they may be reintroduced (DFO 2016a). Critical habitat is identified by DFO and provided in Recovery Strategies for at-risk species designated as *Endangered* or *Threatened* under Schedule 1 of SARA. Under SARA, critical habitat must be legally protected from destruction within 180 days of being finalized within a Recovery Strategy or Action Plan (DFO 2018b).

DFO recently proposed critical habitats for leatherback sea turtles and northern and spotted wolffish within the RAA (DFO 2016a, 2018b; Figure 6-36). Portions of proposed wolffish critical habitats overlap the southwestern-most portion of the Project Area (DFO 2018b).

6.4.2.9.1 Wolffish

Northern and spotted wolffish are designated as *Threatened* under Schedule 1 of SARA and by COSEWIC. Ecological information is lacking for northern and spotted wolffish, such that their basic biology, behaviour, population dynamics, distribution, and demographics are poorly understood (DFO 2018b). Critical habitats have been proposed for northern and spotted wolffish, based on available DFO Research Survey and fisheries datasets, that partially overlap NAFO Div. 2HJ and 3KLPsPn4RS and Div. 2J and 3KLPsPn4RS, respectively (DFO 2018b). The proposed critical habitats for both species include deep channels and edges of the Grand Banks and Labrador Shelf considered necessary for their recovery and sufficient to support all stages of their life history (DFO 2018b). Because they typically undertake small-scale movements, northern and spotted wolffish may be present within their proposed critical habitats year-round (DFO 2018b).

Further research required to refine proposed wolffish critical habitats is planned to be completed by approximately 2020, including rearing and farming observations of life history aspects, field studies to determine seasonal movements, laboratory studies to analyze wolffish physiology, and otolith-based growth rate comparisons between spotted wolffish in the northern Gulf of St. Lawrence and on the Labrador Shelf and Grand Banks (DFO 2018b).

Activities that may result in the destruction of proposed critical habitats for northern and spotted wolffish in the NL region include those that change the habitat's thermal properties, destroy benthic habitat, alter habitat depth (and, subsequently, thermal properties) (DFO 2018b) or pollute the environment.

6.4.2.9.2 Leatherback Sea Turtle

The Atlantic population of leatherback sea turtles is listed as *Endangered* under Schedule 1 of SARA and assessed as *Endangered* by COSEWIC. Three critical habitats have been proposed for leatherback sea turtle in Atlantic Canada, dubbed the Southwestern Scotian Slope, Gulf of St. Lawrence-Laurentian Channel, and Placentia Bay (DFO 2016a). Of these, proposed critical habitat in the Placentia Bay area occurs within the RAA, which includes the entire water column from the surface to the seafloor within the defined area (see Figure 6-36; DFO 2016a). Critical habitat for leatherbacks host a sufficient quality and quantity of gelatinous prey to enable them to build fat stores to support their survival, migration, and reproduction (which takes place in southern waters); low anthropogenic noise such that their feeding and foraging activities are not disrupted; and water of a quality that does not cause adverse health effects (DFO 2016a). Mature and large sub-adult leatherback sea turtles are present within eastern Canadian waters during late-spring through to the fall, with satellite tagging data indicating peak proposed critical habitat use during the summer and fall, likely in positive correlation with the distribution and abundance of their prey species (DFO 2016a).

Activities that may harm or destroy proposed Canadian critical habitats for the Atlantic population of leatherback sea turtles include a reduction in their prey species (e.g., by direct / indirect fisheries harvest); increased acoustic disturbance (e.g., vessel noise, sonar, large scale industrial development / operations); and water quality degradation (e.g., marine pollution from ocean dumping, industrial developments, or persistent vessel discharges) (DFO 2016a).

6.4.2.10 Significant Benthic Areas

SBAs are "defined in DFO's Ecological Risk Assessment Framework as 'significant areas of cold-water corals and sponge dominated communities', where significance is determined 'through guidance provided by DFO-lead processes based on current knowledge of such species, communities and ecosystems'" (Kenchington et al. 2018). As an essential initial step in the identification of SBAs, DFO recently conducted updated analyses using kernel density estimation and provided distribution maps of predicted significant coral and sponge concentrations ("hotspots") in eastern Canada (Kenchington et al. 2018). The taxa used for analyses were those deemed by NAFO to be indicators for Vulnerable Marine Ecosystems (VMEs; see below), including sponges (Porifera), large and small gorgonian corals (Alcyonacea), and sea pens (Pennatulacea) (Kenchington et al. 2018). SBAs are not legally protected, but they do serve to identify the distribution of key marine species and may act as indicators for areas requiring future conservation designation (BP 2018). SBAs for sea pens, sponges, and large and small gorgonians were identified by Kenchington et al. (2018) within the western portion of the RAA (Figure 6-36).

SBAs for sea pens are in the central-western portion of the RAA, overlapping the southwestern portion of the Project Area and parts of the Labrador Slope, Orphan Spur and Northeast Slope EBSAs (see above). A sea pen SBA was also identified in the southwestern portion of the RAA, near the central portion of the Southwest Slope EBSA.

A large SBA for sponges was identified in the northwestern portion of the RAA, partially overlapping the Labrador Slope and Orphan Spur EBSAs. Smaller sponge SBAs were identified in the western and southwestern portions of the RAA, adjacent to the northeastern boundary of the Notre Dame EBSA and within the Haddock Channel Sponges EBSA.

Several SBAs for large and small gorgonians are within the northwestern, central-western, and southwestern portions of the RAA, within the Labrador Slope, Orphan Spur, Northeast Slope, and Southwest Slope EBSAs. One of the large gorgonian SBAs is immediately west of the Project Area's western boundary.

6.4.3 Special Areas Designated by the Provincial Government or Municipalities within Newfoundland and Labrador

The Government of NL and NL municipalities have designated a variety of special areas that receive provincial protection, such as Ecological Reserves, Provincial Parks and Historic Sites, and Municipal Stewardship Agreement Conservation Areas. Special areas designated by the Government of NL or Municipalities and relevant legislation within the Project Area and RAA are provided in Table 6.20 and Figure 6-37 and summarized below.

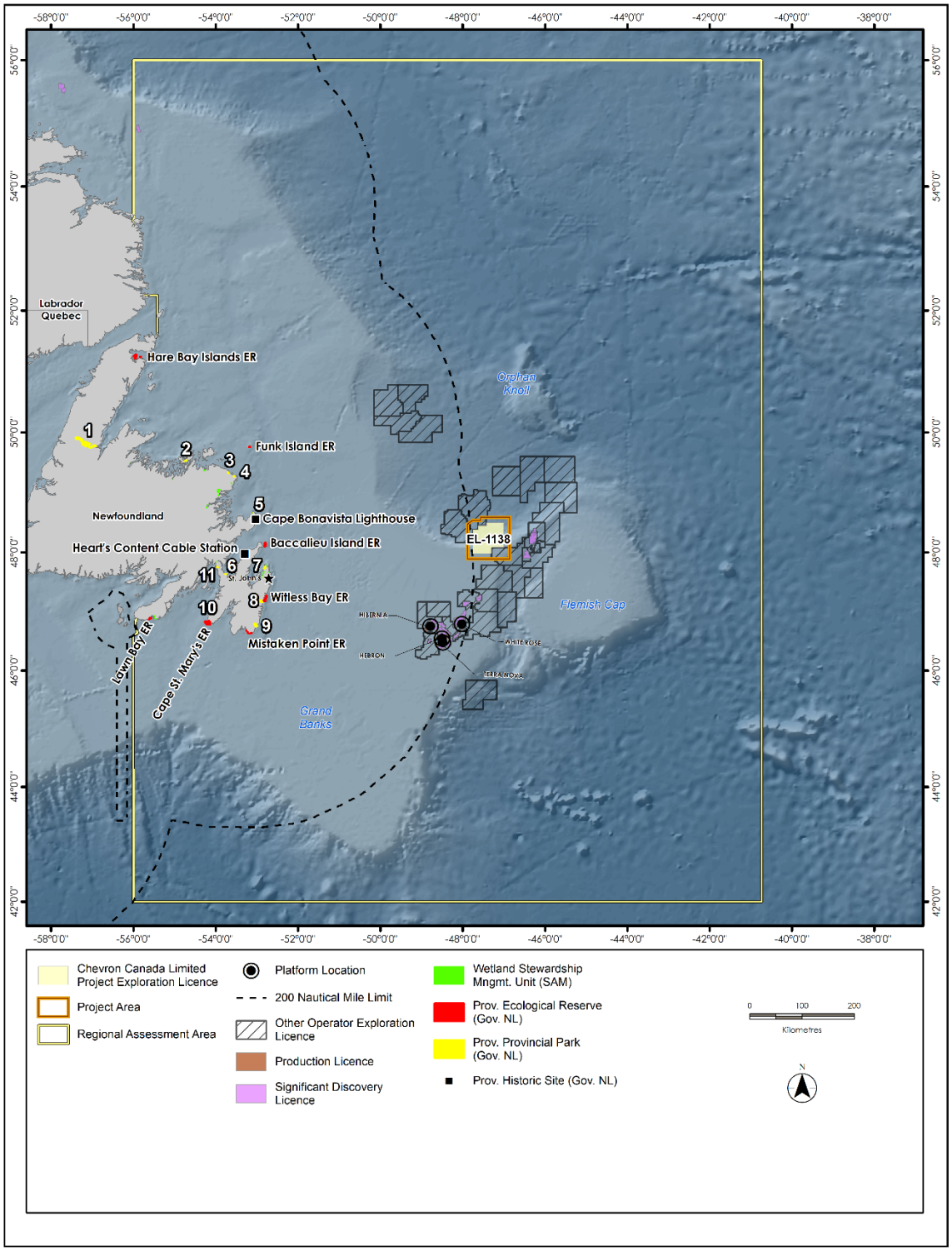
Table 6.20 Special Areas within the Project Area and RAA Designated by the Provincial Government or Municipalities within Newfoundland and Labrador

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-37]	Source
Ecological Reserve	Government (Gov.) of Newfoundland and Labrador (NL) – Parks and Natural Areas Division	*Wilderness and Ecological Reserves Act*, 1980	Mistaken Point [a]	1
			Cape St. Mary's	
			Baccalieu Island	
			Funk Island	
			Hare Bay Islands	
			Lawn Bay	
			Witless Bay	
Provincial Park	Gov. NL – Parks and Natural Areas Division	*Provincial Parks Act*, 1970	[1] Main River Waterway	1
			[10] Gooseberry Cove	
			[5] Dungeon	
			[3] Dead Man's Bay	
			[9] Chance Cove	
			[2] Dildo Run	
			[8] La Manche	
			[7] Marine Drive	
			[4] Windmill Bight	
			[11] Jack's Pond	
			[6] Bellevue Beach	

Table 6.20 Special Areas within the Project Area and RAA Designated by the Provincial Government or Municipalities within Newfoundland and Labrador

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-37]	Source
Provincial Historic Site	TCII PC	*Historic Resources Act*, 1990 *Heritage Lighthouse Protection Act*, S.C. 2008, c. 16	Heart's Content Cable Station	2
			Cape Bonavista Lighthouse	
Municipal Stewardship Agreement Conservation Area – Wetland Management Unit	SAM	Municipal Stewardship Agreement (signed by Municipalities and Gov. NL)	Indian Bay	3
			Torbay Bight Shoreline	
			Indian Brook Estuary	
			Traverse Brook	
			Middle Brook Estuary / Marsh Point	
			Gambo Bog	
			Gambo Brook Estuary	
			Come By Chance Estuary	
			Carmanville Pond	
			Middle Arm	
			Shearstown Estuary	
			Coastal MU	
			Old Day's Pond	
			Main River Gully and Western Pond	
			Blast Hole Ponds and Ocean Pond	
			Broad Cove River Gully	
			Beachy Cove Brook Gully	
			Business Pond	
			Newtown (Queen's Meade)	
			Bottom Brook Estuary	
			Northwest Pond Watershed	
			Black's Brook and Southwest Feeder Ponds	
			Coastal MUs (Otter Gulch, Gruchy Point, Strawberry Point)	
			Pigeon Island	

Source:
[1] FLR (2018a); [2] TCII (2019a); [3] L. King, 2019, pers. comm.
[a] Mistaken Point is also a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site.



Refer to Table 6.20 for numeric site legend

Figure 6-37 Special Areas within the Project Area and RAA Designated by the Provincial Government or Municipalities within Newfoundland and Labrador

6.4.3.1 Ecological Reserves

Ecological Reserves are areas <1,000 km² that serve to protect a Canadian province's representative ecosystems / ecoregions, unique or at-risk flora and fauna, or other aspects deemed important for natural heritage (FLR 2018b). Low-impact human activities, such as hiking, educational tours, and research, are permitted within Ecological Reserves (FLR 2018b). Users wishing to conduct commercial operations, educational tours, or scientific research must obtain entry permits from the province (FLR 2018b).

Seven Ecological Reserves have been designated in Newfoundland that occur within the RAA, far west of the Project Area (Figure 6-37). These areas are summarized below.

6.4.3.1.1 Mistaken Point

The 5.7-km² Mistaken Point Ecological Reserve is one of the world's most significant fossil sites and was designated as a fossil Ecological Reserve in 1987 and a World Heritage Site in 2017 (see below) (FLR 2019). The Reserve's western boundaries were extended in 2009 to protect newly discovered fossil sites (FLR 2019). It currently extends along 17 km of coastline on the southeastern tip of Newfoundland's Avalon Peninsula, between Portugal Cove South and Cape Race (FLR 2019).

Mistaken Point consists of tilted and cleaved sequences of mudstones and sandstones, over 100 of which feature fossils of the "oldest, large, complex life-forms found anywhere on Earth", from 580 to 541 million years ago during the Ediacaran period, when all life was aquatic marine (FLR 2019). The Mistaken Point Ecological Reserve encompasses the "oldest and most spectacular assemblage of these fossils", dubbed the Mistaken Point assemblage, and is the only place in the world where a 565-million-year-old sea floor can be viewed that accurately preserved ancient, deep-sea community ecology (FLR 2019). It was also the first recorded site of Ediacaran fauna in the Western Hemisphere (FLR 2019). Over 30 benthic, deep-water species are within the Mistaken Point assemblage, of which 20 occur within the Reserve; most of these species represent extinct groups otherwise unknown in the modern world (FLR 2019). The Mistaken Point fossils are also unique in that they feature imprints of soft tissues from creatures that lived millions of years before animals developed skeletons, the hard structures of which are normally preserved as fossils (FLR 2019). These soft tissues were preserved when deceased creatures were suddenly buried on the muddy seabed by "repeated influxes of ash-rich sediment" (FLR 2019).

Access to the Mistaken Point Ecological Reserve is by guided tour or permit only, and the removal / attempted removal of fossils is prohibited (FLR 2019). The Reserve is currently being monitored by cameras for research and conservation purposes (FLR 2019).

6.4.3.1.2 Cape St. Mary's

The Cape St. Mary's Ecological Reserve was established in 1983 and is one of the world's best and most accessible locations to view nesting seabirds, with thousands visible from as close as 10 m away (FLR 2019). It encompasses the southwestern tip of Newfoundland's Avalon Peninsula, including 54 km² of marine waters within the total 64 km² area, and is one of the world's most southerly expanses of sub-Arctic tundra, featuring steep cliffs, mosses, lichens, alpine wildflowers, low-growing shrubs, ponds, bogs,

and brooks (FLR 2019). The Reserve also includes an interpretation centre and a Coast Guard-operated lighthouse that was originally built in 1860 (FLR 2019).

Cape St. Mary's is an important wintering site for sea ducks, including harlequin duck, common eider, scoter, and long-tailed duck, and hosts one of NL's largest seabird colonies (FLR 2019). During the breeding season, 24,000 northern gannet, 20,000 black-legged kittiwake, 20,000 common murre, and 2,000 thick-billed murre nest within the Cape St. Mary's Ecological Reserve, along with over 100 pairs of Razorbill, 60 pairs of black guillemot, double-crested and great cormorants, and northern fulmar (FLR 2019).

6.4.3.1.3 Baccalieu Island

The 23-km² Baccalieu Island Ecological Reserve is off the northwestern tip of Newfoundland's Avalon Peninsula and includes the 5-km² island and 1 km of ocean around its coast (FLR 2019). The site was provisionally declared an Ecological Reserve in 1991 and received full status in 1995 (FLR 2019). In addition to its importance for nesting seabirds, Baccalieu Island also served an important role in NL's fishery for over 400 years, dating to at least the earliest days of European exploration of North America (FLR 2019).

As NL's largest protected seabird island, Baccalieu Island hosts the province's highest number of breeding seabird species within a colony, along with the largest Leach's storm-petrel colony in the world, with approximately 2.02 million pairs (see Section 6.2). The Baccalieu Island Ecological Reserve is North America's second-largest puffin colony, including over 75,000 nesting pairs on the island's grassy slopes and rock scree (FLR 2019). Also present within the Reserve are black-legged kittiwake, common and thick-billed murres, razorbill, and northern fulmar (FLR 2019).

Access to seabird nesting areas is only given to scientific researchers and valid access permit holders during the breeding season (1 April–30 October). Otherwise, the remainder of the Reserve may be visited at any time and does not require a permit (FLR 2019).

6.4.3.1.4 Funk Island

The Funk Island Ecological Reserve is located 60 km east of Fogo Island (FLR 2019). Initially protected in 1964 as a wildlife reserve, it was re-designated as a 5.2-km² Ecological Reserve in 1983, the majority of which is marine habitat (FLR 2019). Although it is the smallest seabird Ecological Reserve in the province, it is one of the most important for nesting seabirds (FLR 2019).

Over one million Common Murre inhabit the Funk Island Ecological Reserve, Western North Atlantic's largest Common Murre colony (FLR 2019). Other seabirds that nest on the flat, granite island include northern gannet, northern fulmar, Atlantic puffin, razorbill, thick-billed murre, black-legged kittiwake, and herring and great black-backed gulls (FLR 2019).

Historically, Funk Island was also an important nesting area for the Great Auk, a flightless bird that was hunted to extinction as people regularly travelled to the island to catch the birds and take their eggs (FLR 2019). Since designating Funk Island as an Ecological Reserve, several other seabird species have recovered from nearly being similarly extirpated from the island (FLR 2019). Now, only scientific research activities are permitted on Funk Island (FLR 2019).

6.4.3.1.5 Hare Bay Islands

The Hare Bay Islands Ecological Reserve includes Gilliat, Spring, and Brent islands, northeast of Newfoundland's Northern Peninsula and near Main Brook (FLR 2019). Previously declared a wildlife reserve in 1964, the Hare Bay Islands Ecological Reserve was established in 1983 to protect Common Eider breeding habitat (FLR 2019). The Reserve has a total area of 31 km², of which 26 km² is marine habitat (FLR 2019). Included within the Reserve are unique geological and ecological features, such "rich beds of Early and Middle Ordovician-age fossil gastropods", which are estimated to be 457 million years old (FLR 2019).

As of 2004, there were approximately 170 common eider nests on Gilliat and Spring Islands, and Hare Bay was the primary site for the 1988–1996 captive rearing Eider Duck rehabilitation program (FLR 2019). This Reserve serves as summer breeding habitat for common and Arctic terns, double-crested cormorant, and ring-billed, herring, and great black-backed gulls (FLR 2019).

6.4.3.1.6 Lawn Bay

The 384.6-hectare Lawn Bay Ecological Reserve is located off Newfoundland's Burin Peninsula, near Lawn and Lord's Cove, and includes Middle Lawn, Swale, and Colombier islands (FLR 2019). Most (approximately 371 hectares) of the Reserve's area is marine habitat (FLR 2019). Deemed a provisional reserve in 2009, it received full status in 2015 to protect thousands of nesting, feeding and fledgling seabirds and North America's only known Manx shearwater colony (FLR 2019). The islands are also host to a large Leach's storm-petrel colony, and smaller colonies of great black-backed gull, herring gull, black guillemot, black-legged kittiwake, common murre (FLR 2019). This Reserve also occasionally serves as habitat for breeding Arctic and common terns (FLR 2019).

6.4.3.1.7 Witless Bay

The Witless Bay Ecological Reserve is east of Newfoundland's Avalon Peninsula, encompassing Gull, Green, Great, and Pee Pee islands and hosting the largest Atlantic puffin colony in North America (FLR 2019). The 31 km² area, of which 29 km² is marine habitat, was originally protected as a wildlife reserve in 1964 and designated as an Ecological Reserve during 1983 (FLR 2019). Seabirds generally gather within the Reserve from May through August to nest and raise their young (FLR 2019).

During late-spring and summer, the Witless Bay Ecological Reserve serves as habitat for over 260,000 nesting pairs of Atlantic puffin, and the world's second-largest Leach's storm-petrel colony, with approximately 314,020 pairs (see Section 6.2). Thousands of black-legged kittiwake and common murre also inhabit the Reserve (FLR 2019).

Access to the islands requires a permit, including scientific research, with most public observation of the Reserve conducted from wildlife and iceberg tour boats that operate in the region seasonally (FLR 2019). All of NL's seabird reserve management is guided at least in part by research conducted within the Witless Bay Ecological Reserve by the ECCC-CWS and Memorial University of Newfoundland (FLR 2019).

6.4.3.2 Provincial Parks

Provincial Parks in NL are used for camping and outdoor recreation and are intended to protect natural features and wildlife (FLR 2018b). Of NL's 31 Provincial Parks, which protect a total area of 211 km², there are 11 that feature marine or coastal components and are within the RAA, all far west of the Project Area (Figure 6-37). These Parks are summarized below.

6.4.3.2.1 Main River Waterway

The Main River Waterway Provincial Park features untouched, old-growth boreal forest (including 200-year-old birch and spruce), lakes, slow and white waters and includes one of the province's last wilderness rivers and best white-water canoeing rivers (Tourism, Culture, Industry, and Innovation [TCII] 2019b). Initially nominated as a Canadian Heritage River in 1991, the Main River Waterway was designated as a Provincial Park in 2001 and is managed by the Parks Division of the Government of NL's TCII (TCII 2019b). The Park includes the Main River corridor (a 152-km² waterway) and a surrounding 49-km² Special Management Area within the river's watershed area (TCII 2019b).

The Park hosts Atlantic salmon, brook trout and at least 70 species of bird, waterfowl, moose, black bear, and caribou (Northern Peninsula herd), and serves as habitat for the Newfoundland population of the American marten, which is *Threatened* under Schedule 1 of SARA and by COSEWIC (TCII 2019b). Recreational activities occur year-round within the Marin River Waterway Provincial Park. In addition to white-water canoeing, this Park is popularly used for kayaking, rafting, angling, and bird and wildlife watching (TCII 2019b). There are three archeological sites within this Park, including evidence of early Inuit habitation from ~2,100 years ago, and remains of nomadic Beothuk culture and French and English fishing enterprises (TCII 2019b).

6.4.3.2.2 Gooseberry Cove

The Gooseberry Cove Provincial Park is a coastal park located on the central-eastern coast of Placentia Bay, Newfoundland. It features a grassy shore and sandy beach with high wave action (TCII 2019b). This Park is typically used for daytime picnicking (TCII 2019b).

6.4.3.2.3 Dungeon

The Dungeon Provincial Park is located near Bonavista, near the tip of Newfoundland's Bonavista Peninsula (TCII 2019b). It includes a collapsed sea cave with a sea-carved natural archway and is typically used as a picnic site (TCII 2019b).

6.4.3.2.4 Dead Man's Bay

The Dead Man's Bay Provincial Park is located near Lumsden (TCII 2019b), on Newfoundland's northeast coast. It features a fine, white sand beach and is used by visitors for picnicking and to view icebergs during early-summer (TCII 2019b).

6.4.3.2.5 Chance Cove

The Chance Cove Provincial Park is located near Trepassey, on Newfoundland's southeastern Avalon Peninsula (TCII 2019b). This Park encompasses an area of 2,086 hectares that extends from the edge of Route 10 (the Irish Loop) to the coast and includes a coastal trail that allows users to watch for whales, seabirds, and seals (TCII 2019b). There are no dedicated campsites within the Park; however, users are permitted to camp on the parking lot and in the Park's picnic area (TCII 2019b).

6.4.3.2.6 Dildo Run

The Dildo Run Provincial Park waters were historically used by Beothuk peoples for hunting and fishing, dating back to the Beaches Complex (c.1000 AD) and Little Passage (c.1500 AD), before the arrival of Europeans to Newfoundland (TCII 2019b). The 328-hectare Park, opened to the public in 1967, provides visitors with a view of New World Island and is near Twillingate, Moretons Harbour, the Fogo Island ferry and Change Islands (TCII 2019b). New World Island is connected to the Newfoundland mainland today, but it and Twillingate Island were initially separated from each other and the mainland, presenting a challenging passage for people navigating between and on the islands (TCII 2019b). The remains of a tramway that was built in the 1900s and used to travel across the area are within the southern portion of the Park (TCII 2019b).

The Dildo Run Provincial Park region features relatively shallow tidepools, a rocky coastline, rolling hills, valleys, lakes, fens, and bogs, and hosts various species of small mammals (TCII 2019b). The Park has 55 camp sites, 15 picnic sites, coastal hiking trails, and is used for kayaking and canoeing (TCII 2019b).

6.4.3.2.7 La Manche

The La Manche Provincial Park was opened to the public in 1966 and was designated to protect La Manche valley, varied habitat types (e.g., boreal forest, peat bog, marsh), and high biodiversity of bird species (TCII 2019b). The Park encompasses the remains of the abandoned La Manche filling village, Rowsells Hill Pond, La Manche Ponds, and a portion of the La Manche River (TCII 2019b). Over 50 species of birds have been identified within the park, including sea ducks, seabirds, raptors, songbirds, and shorebirds, such as red crossbill (*Threatened* in NL under Schedule 1 of SARA and by COSEWIC and *Endangered* under the Government of NL *Endangered Species Act* [*ESA*]), Gray-cheeked Thrush (*Vulnerable* under the NL ESA), and Rusty Blackbird (*Special Concern* under Schedule 1 of SARA and by COSEWIC and *Vulnerable* under the NL ESA) (TCII 2019b).

Initially used as a fishing harbour by the French, the small La Manche fishing village was settled by the English in ~1840 (TCII 2019b). During 1966, a large tidal wave driven by a severe winter storm washed away all of the village's fish flakes (used for drying fish), boats, anchors and stores, along with most of the houses and the suspension bridge that connected both sides of La Manche Harbour (TCII 2019b). There were no deaths, but with the destruction of their entire economy, residents agreed to resettlement elsewhere by the NL Government (TCII 2019b).

Today, the Park features foundation remains of the village houses and a newly constructed suspension bridge, accessible via the East Coast Trail system, along with 83 camping sites, beachside picnic / day-use

area, swimming hole, and waterfall (TCII 2019b). Visitors also use the Park for canoeing and wildlife watching (TCII 2019b).

6.4.3.2.8 Marine Drive

The Marine Drive Provincial Park is the province's newest park reserve (TCII 2019b). It protects a 6.17 km² "essential representative area of the northeastern barrens subregion" (TCII 2019b) located along the northeastern coast of Conception Bay.

6.4.3.2.9 Windmill Bight

The Windmill Bight Provincial Park is located near Lumsden, on the northeast coast of Newfoundland. It protects the area's plateau bog (TCII 2019b).

6.4.3.2.10 Jack's Pond

The Jack's Pond Provincial Park is near Arnold's Cove, Newfoundland (TCII 2019b). It preserves some of NL's rare plants and features high habitat diversity, including barren vegetation, wetlands, and a forested stream valley (TCII 2019b).

6.4.3.2.11 Bellevue Beach

The Bellevue Beach Provincial Park is located near Bellevue, Newfoundland (TCII 2019b). This Park features a long, sand and beach rock bar separating the sea and barachois, and protects a beach complex, saltmarsh, and habitat for migrating shorebirds (TCII 2019b).

6.4.3.3 Provincial Historic Sites

NL's Provincial Historic Sites are designated under the *Historic Resources Act* as important historical or architectural representations of the province's past (TCII 2019a). Under the *Act*, the removal, harm, or alteration of Provincial Historic Site-associated cultural / palaeontological items is prohibited. Most sites are open to the public, but some are exclusively closed to visitors for preservation and protection purposes (TCII 2019a). Over the next several years, the TCII will be revamping its Provincial Historic Site system with the goals of increasing local visitors, school groups, and site engagement, and expanding the breadth of interpreted stories and themes (TCII 2019a).

Of NL's ten Provincial Historic Sites, two are within coastal communities and the RAA, well beyond the Project Area (Figure 6-37). These Sites are summarized below.

6.4.3.3.1 Heart's Content Cable Station

The Heart's Content Cable Station Provincial Historic Site is located on the northwest coast of Newfoundland's Avalon Peninsula and, in 1866, was the landing site of the first successful transatlantic telegraph cable (TCII 2018) between Europe and North America. It features exhibits highlighting telegraph technology up to the 1960s, challenges related to laying oceanic cable during the late-19th century, and the lives of cable station staff (TCII 2018). The exhibits are situated within the original cable station (c.1874), including the building's 1918 extension (TCII 2018).

6.4.3.3.2 Cape Bonavista Lighthouse

The Cape Bonavista Lighthouse Provincial Historic Site is located near the northern headland on the west coast of Bonavista Bay. The Cape Bonavista Lighthouse was constructed in 1843 (TCII 2018) and receives additional protection under the *Heritage Lighthouse Protection Act*. It is furnished with interpretive materials dating up to the 1870s (TCII 2018). The Site's exhibits represent the lives of the lightkeepers and feature lighthouse technology that was used there during the 19th century, such as its original catoptric light mechanism (TCII 2018).

6.4.3.4 Municipal Stewardship Agreement Conservation Area – Wetland Management Unit

NL's Eastern Habitat Joint Venture program allows municipalities, corporations, and private landowners to cooperatively conserve important wildlife habitat throughout the province by increasing awareness of the value of these areas and enabling stakeholders to conserve and enhance them (Stewardship Association of Municipalities Inc [SAM] 2019). In support of these goals, stewardship agreements are signed by municipalities and/or other relevant parties and the Government of NL as formal conservation commitments under the Municipal Habitat Stewardship Program (SAM 2019). Habitat conservation plans are created in association with these stewardship agreements which, combined, describe the protected coastal, species at risk, or wetland habitat and outline long-term conservation strategies (SAM 2019). The SAM is "an incorporated, non-governmental organization formed by municipalities that have signed stewardship agreements" (SAM 2019).

In partnership with the Government of NL, SAM members strive to conserve and enhance important wildlife habitat within their municipal planning boundaries, known as Stewardship Zones (J. Sharpe, 2018, pers. comm.; SAM 2019). Proposed developments within Stewardship Zones do not necessary require referral to the province's Wildlife Division (L. King, 2018, pers. comm.). Within Stewardship Zones are Management Units (MUs). MUs become lawfully protected in the province as a type of Crown interest on the land, and a MU's land portion will typically be zoned for Conservation or Environmental Protection (L. King, 2018, pers. comm.). Only low-impact developments, such as trails and benches, may occur within terrestrial components of a MU, and all developments are referred to the Wildlife Division (L. King, 2018, pers. comm.). Both Stewardship Zones and MUs tend to focus on protecting birds, particularly migratory waterfowl (L. King, 2018, pers. comm.).

There are 24 Wetland MUs located along NL's coastlines within the RAA, far west of the Project Area. These areas are relatively small and could not be clearly labelled in Figure 6-37. However, these MUs and their governing SAM member are summarized below.

6.4.3.4.1 Indian Bay

The town of Indian Bay, located on Newfoundland's northeast coast, and the Government of NL signed a Wetland Habitat Stewardship Agreement (WHSA) in August 2016 which designates Indian Bay Brook as a 2,857-acre protected MU (SAM 2019). The MU features a productive forest ecosystem (including habitat for bird feeding and staging) and high biodiversity, such as brook trout (for which it is known as one of the island's best fishing areas), Newfoundland population of banded killifish (*Special Concern* under Schedule

1 of SARA and by COSEWIC and *Vulnerable* under the NL ESA), moose, and otter (SAM 2019). The region also hosts numerous bird species, including songbirds, birds of prey, and waterfowl, such as American black duck and Canada goose (SAM 2019).

6.4.3.4.2 Torbay Bight Shoreline

The town of Torbay is on Newfoundland's northeast Avalon Peninsula, north of St. John's, and features "extensive barrens and peatlands, cold summers, mild winters, frequent fog and abundant precipitation" within its coastal cliffs and rolling hills (SAM 2019). Torbay and the Government of NL signed a WHSA in October 1997, which was revised in 2015 to increase the total amount of land and MUs from 230 acres to 455 acres and two to six MUs, respectively (SAM 2019). The Torbay Bight Shoreline Stewardship Zone protects now the following MUs: Goose's Pond, Upper Three Corner Pond, The Gully, Jones Pond, Western Island Pond, and the Shoreline Conservation Area (SAM 2019). The Torbay Bight Shoreline MUs conserve habitat for waterfowl and other wildlife, including important nesting and brood rearing habitats, with prominent bird species including mallard duck, green winged teal, and American black duck (SAM 2019). The Torbay Bight Shoreline is also an important area for recreational use by locals and visitors (SAM 2019).

6.4.3.4.3 Indian Brook Estuary

The Indian Brook [Arm] Estuary MU is within the town of Springdale's Stewardship Zone, on central Newfoundland's northeast coast (SAM 2019). The Springdale Stewardship Zone features high biodiversity and is a popular salmon fishing and whale / bird watching area (SAM 2019). It also contains trails for walking, hiking, and skiing (SAM 2019). Springdale and the Government of NL signed a WHSA in September 2001 to primarily conserve numerous bird species within three MUs: Indian Brook Arm Estuary, Lower Burnt Berry Bog, and Upper Burnt Berry Bog (SAM 2019). The 248.2-acre Indian Brook Estuary is an important stopover, feeding, and intermediary site for Canada Geese, for which the number of individuals has recently been on the rise (SAM 2019).

6.4.3.4.4 Traverse Brook, Gambo Bog, Gambo Brook Estuary, and Middle Brook Estuary / Marsh Point

Gambo's Stewardship Zone is at the head of Freshwater Bay (SAM 2019). Gambo and the Government of NL signed a Municipal Habitat Stewardship Agreement (MHSA) in September 2001 to include five MUs totalling 2,082 acres: Traverse Brook, Gambo Bog, Gambo Brook Estuary, Middle Brook Estuary / Marsh Point, and Black Duck Pond (SAM 2019). These MUs consist of bogs, brooks, ponds, and shallow bay areas and provide important nesting and staging areas for waterfowl (SAM 2019). The Gambo Bog MU is of particular importance for high numbers of Canada geese that stop to feed on its abundant eel grass beds and/or nest, and as a stopover feeding site for Brant geese, a rare species for Newfoundland, during their migration to Arctic breeding grounds (SAM 2019). These five MUs also host numerous other bird species, such as bald eagle, common tern, gulls, and Newfoundland's largest double-crested cormorant colony (SAM 2019).

6.4.3.4.5 Come By Chance Estuary

The town of Come By Chance is in the northern portion of Placentia Bay, Newfoundland. In January 1995, Come By Chance and the Government of NL signed a WHSA that included three MUs totalling 469 acres: Come By Chance Estuary (extends from the Estuary to the power line north of the town), the riparian zone surrounding the Come By Chance Estuary and islands, and Gilbert's Pond (SAM 2019). The Come By Chance Estuary MU features wetlands that serve as important staging habitats for waterfowl species, such as American black duck, green-winged teal, and Canada goose (SAM 2019).

6.4.3.4.6 Carmanville Pond and Middle Arm

The town of Carmanville is in Rocky Bay, Hamilton Sound, on Newfoundland's northeastern coast in North West Arm (SAM 2019). Carmanville and the Government of NL signed a WHSA in October 1997 designating three MUs totalling 2,492 acres: Carmanville Pond, Middle Arm, and Cynthia Pond (SAM 2019). These MUs may be considered critical nesting and brood rearing habitat for waterfowl (SAM 2019). The region also supports high numbers of waterfowl, such as American black duck and Canada goose, songbirds, and other local wildlife (SAM 2019). Recreational activities within the area include sport cod fishing during the food fishery, coastal boat rides, whale watching, and walking its nature trails (SAM 2019).

6.4.3.4.7 Shearstown Estuary

The Shearstown Estuary MU is within the Bay Roberts and Spaniard's Bay Stewardship Zone on Newfoundland's Avalon Peninsula (SAM 2019). The towns of Bay Roberts and Spaniard's Bay and the Government of NL signed a MHSA in June 1997 to designate the 192-acre Shearstown Estuary MU, which includes critical and highly productive wetland habitats between the towns and the Estuary's upland (SAM 2019). The Shearstown Estuary is a semi-enclosed, coastal basin and the MU encompasses Shearstown Pond, Arnie's Pond and the inner portion of Spaniard's Bay (SAM 2019). Notable bird species within the MU include common tern, American black duck, and northern pintail (SAM 2019).

6.4.3.4.8 Coastal MU

The Coastal MU is within the St. Lawrence Stewardship Zone on Newfoundland's eastern Burin Peninsula (SAM 2019). St. Lawrence and the Government of NL signed a MHSA in 2013 to conserve a 1,542-acre, ~400-m long buffer along the St. Lawrence coastline, including Three Sticks Cove, Murphy's Cove, Little Lawn Pond, Mine Cove, Little Lawn Harbour, Spices Cove, and Chambers Cove (SAM 2019). The habitat within the Coastal MU typifies the Eastern Hyper-oceanic Barrens Ecoregion, including balsam fir tuckamore, open barrens, and bogs with common grass, fern, and shrub species (SAM 2019). The Coastal MU serves as habitat for an abundance of birds, including songbirds, shorebirds, waterfowl, and seabirds from the Lawn Islands Archipelago Reserve's nesting colonies, such as common eider, American black duck, American goldfish, and northern gannet (SAM 2019).

6.4.3.4.9 Old Day's Pond

The Old Day's Pond MU is within Bonavista's Stewardship Zone, on Newfoundland's Bonavista Peninsula (SAM 2019). Bonavista and the Government of NL signed a MHSA in July 2013, designating three MUs totalling 826 acres: Old Day's Pond, Beaver Pond, and Long Pond (SAM 2019). These MUs were identified

as critical habitat for waterfowl and other wildlife, particularly for nesting and brood rearing (SAM 2019). The protected wetlands and coastal region host several species at risk, including peregrine falcon (*Special Concern* under COSEWIC and *Vulnerable* under the NL ESA), ivory gull (*Endangered* under Schedule 1 of SARA, COSEWIC and the NL ESA), short-eared owl (*Special Concern* under Schedule 1 of SARA and COSEWIC and *Vulnerable* under the NL ESA), gray-cheeked thrush (*Vulnerable* under the NL ESA), and rusty blackbird (*Special Concern* under Schedule 1 of SARA and COSEWIC and *Vulnerable* under the NL ESA) (SAM 2019). Other species of note include northern pintail, American black duck, and ring-necked duck, which may be visible from the walking trail in the Old Day's Pond MU (SAM 2019).

6.4.3.4.10 Main River Gully and Western Pond, Blast Hole Ponds and Ocean Pond, Broad Cove River Gully, and Beachy Cove Brook Gully

The Main River Gully and Western Pond, Blast Hole Ponds and Ocean Pond, Broad Cove River Gully, and Beachy Cove Brook Gully MUs (along with the Voisey's Brook MU) are within the Portugal Cove-St. Philip's Stewardship Zone (SAM 2019), on Newfoundland's northeast Avalon Peninsula. These MUs were designated when Portugal Cove-St. Philip's and the Government of NL signed a MHSA in June 2015 protecting a total ~2,107 acres of Stewardship Zone land (SAM 2019). The Blast Hold Ponds and Ocean Pond MU is in the northwestern portion of the town and is the community's watershed, with public use limited to passive recreational activities like hiking and picnicking (SAM 2019). Otherwise, these MUs include riparian buffers (i.e., areas of "untouched vegetation between upland areas and wetlands, lakes, rivers, ponds and streams") consisting of trees, shrubs, grasses, cattails, and sedges that are important corridors for wildlife travel and provide protection from predators or inclement weather (SAM 2019). Bird species of note include red-breasted merganser, bald eagle, and boreal chickadee (SAM 2019).

6.4.3.4.11 Business Pond and Newtown (Queen's Meade)

The Business Pond and Newtown (Queen's Meade) MUs are within the New-Wes-Valley Stewardship Zone, on Newfoundland's northeast coast (SAM 2019). New-Wes-Valley and the Government of NL signed a WHSA in January 2017 to designate these MUs, which protect a total 459 hectares (SAM 2019). These MUs feature wetland, upland, and coastal habitat for waterfowl and other wildlife (SAM 2019). The Business Pond MU includes the pond and its adjacent riparian habitat, which predominantly features conifer trees (SAM 2019). The Newtown (Queen's Meade) hosts at least 38 bird species, including red knot (*rufa* subspecies occurring in NL is *Endangered* under Schedule 1 of SARA, COSEWIC, and the NL ESA) (SAM 2019). Together, these MUs are popular outdoor recreation areas in the region (SAM 2019).

6.4.3.4.12 Bottom Brook Estuary

The Bottom Brook Estuary MU is within Lewisporte's Stewardship Zone, on Newfoundland's northwest coast (SAM 2019). Lewisporte and the Government of NL signed a MHSA in October 2017 to protect the MU's 58-hectare, highly productive salt and freshwater environment (SAM 2019). This brackish MU features important wetland that serves as feeding and staging habitat for many waterfowl species (SAM 2019). Other prominent bird species include black and white warbler and Caspian tern (SAM 2019).

6.4.3.4.13 Northwest Pond Watershed and Black's Brook and Southwest Feeder Ponds

The Centreville-Wareham-Trinity Stewardship Zone is in Newfoundland's Indian Bay Region (SAM 2019). Centreville-Wareham-Trinity and the Government of NL signed MHSA in November 2017 to designate two MUs totalling 5,000 acres: Northwest Pond Watershed and Black's Brook and Southwest Feeder Ponds (SAM 2019). These MUs were established to protect important wetland habitats for waterfowl (SAM 2019). Birds of note that are found within these MUs include northern flicker and American bittern (SAM 2019).

6.4.3.4.14 Coastal MUs (Otter Gulch, Gruchy Point, Strawberry Point) and Pigeon Island

The Otter Gulch, Gruchy Point, and Strawberry Point Coastal MUs and Pigeon Island MU protect 622 acres within the Pouch Cove Stewardship Area, near St. John's (SAM 2019). Pouch Cove and the Government of NL signed a MHSA in 2017 to conserve wetland and pond habitats, unique, steep coastline and rock cliffs that serve as habitat for seabird colonies and numerous other bird species, such as Red Crossbill (Threatened under Schedule 1 of SARA and by COSEWIC and Endangered under the NL ESA), Leach's storm-petrel (Low-priority Candidate species for assessment by COSEWIC), Atlantic puffin, white-throated sparrow, and hermit thrush (SAM 2019). The Pigeon Island MU includes important habitat for Atlantic puffin, Leach's storm-petrel, and black-legged kittiwakes, among other seabird species (SAM 2019).

6.4.4 Special Areas Designated by international Organizations

Two international organizations, the United Nations (CBD) and NAFO, have designated a variety of special areas, such as CBD EBSAs, VMEs, and shrimp closure areas. NAFO-designated coral, sponge, seapen, seamount, and shrimp closures are legally protected under NAFO's annual Conservation and Enforcement Measures (NAFO 2019b). Special areas designated by the international organizations and relevant legislation within the Project Area and RAA are provided in Table 6.21 and Figure 6-38 and summarized below.

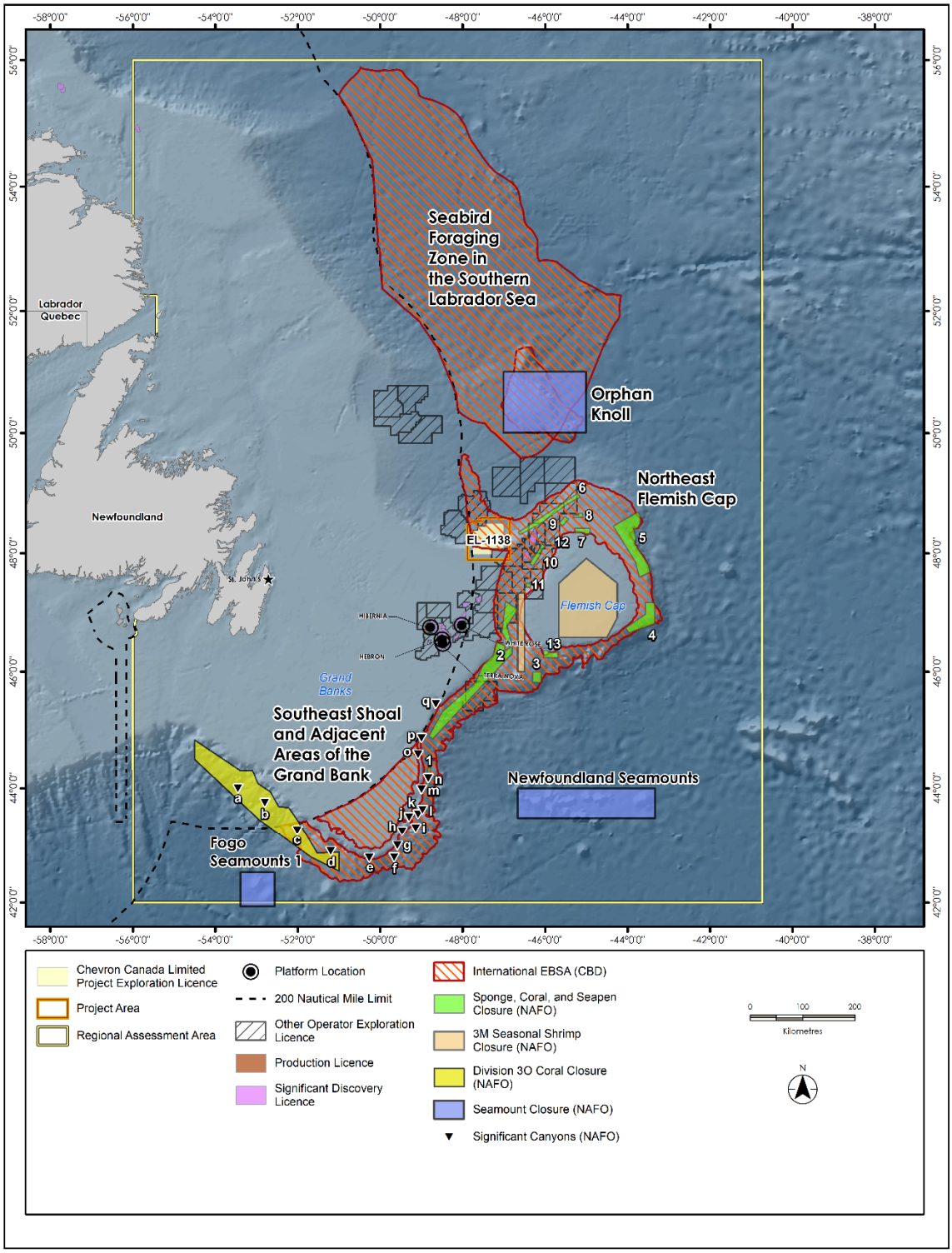
Table 6.21 Special Areas within the Project Area and RAA Designated by International Organizations

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-38]	Source
EBSA	CBD	N/A	Seabird Foraging Zone in the Southern Labrador Sea	1
			Orphan Knoll	
			Slopes of the Flemish Cap and Grand Bank	
			Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank	
VME – Sponge, Coral, and Sea pen Closures	NAFO	NAFO Conservation and Enforcement Measures	[1] Tail of the Bank (1)	2,3
			[2] Flemish Pass / Eastern Canyon (2)	
			[3] Beothuk Knoll (3)	
			[4] Eastern Flemish Cap (4)	
			[5] Northeast Flemish Cap (5)	
			[6] Sackville Spur (6)	
			[7] Northern Flemish Cap (7)	

Table 6.21 Special Areas within the Project Area and RAA Designated by International Organizations

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-38]	Source
			[8] Northern Flemish Cap (8)	
			[9] Northern Flemish Cap (9)	
			[10] Northwest Flemish Cap (10)	
			[11] Northwest Flemish Cap (11)	
			[12] Northwest Flemish Cap (12)	
			[13] Beothuk Knoll (13)	
			Division 3O Coral Closure	
VME – Seamount Closure	NAFO	NAFO Conservation and Enforcement Measures	Fogo Seamounts 1	2,3
			Newfoundland Seamounts	
			Orphan Knoll	
VME – Canyon	NAFO	N/A	[a] Denys	4,5
			[b] Cameron	
			[c] Jackman	
			[d] Guy	
			[e] Hoyles	
			[f] Kettle	
			[g] Clifford Smith	
			[h] Lilly	
			[i] Carson	
			[j] Unnamed 1	
			[k] Unnamed 2	
			[l] Unnamed 3	
			[m] Unnamed 4	
			[n] Desbarres	
			[o] Treworgie	
			[p] Jukes	
			[q] Whitbourne	
Shrimp Closure Area	NAFO	NAFO Conservation and Enforcement Measures	Division 3M (and 3L)	3

Source:
[1] CBD (2015); [2] NAFO (2019a); [3] NAFO (2019b); [4] Marine Regions (2018); [5] NAFO (2008).



Refer to Table 6.21 for alphanumeric site legend

Figure 6-38 Special Areas within the Project Area and RAA Designated by International Organizations Ecologically or Biologically Significant Areas (EBSAs)

The United Nations CBD initiative was enacted in 1993 to support growing global commitments to sustainable development. The first session of the Conference of the Parties of the CBD (CPCBD) took place in 1994 to provide guidance and support the identification of EBSAs beyond Canada's 200-nm limit in the Northwest Atlantic (CBD 2018, in LGL 2018). Four CBD EBSAs occur within the RAA, which are summarized below. A portion of one CBD EBSA (Slopes of the Flemish Cap and Grand Bank) overlaps most of the Project Area (Figure 6-38).

6.4.4.1.1 Seabird Foraging Zone in the Southern Labrador Sea

The Seabird Foraging Zone in the Southern Labrador Sea EBSA ranges through the central and northern-central portion of the RAA, north of the Project Area. The southern portion of this EBSA overlaps the CBD Orphan Knoll EBSA and NAFO Orphan Knoll Seamount Closure Area (see below). This EBSA consists of portions of Orphan Basin, the continental shelf, slope, and adjacent marine waters (CBD 2015). It is important feeding habitat for seabirds, such as breeding Leach's storm-petrels and overwintering black-legged kittiwake, thick-billed murre, common murre, and dovekie (CBD 2015). This EBSA supports "globally significant" marine vertebrate populations, including approximately 40 million seabirds representing 20 populations each year, such as breeding common murre and Atlantic puffin during the summer (CBD 2015). Millions of Atlantic puffin have been known to migrate through this EBSA as they travel northwards from colonies in the Southern Hemisphere (CBD 2015).

6.4.4.1.2 Orphan Knoll

The Orphan Knoll EBSA is near the northern-central portion of the RAA, within the southern portion of the Seabird Foraging Zone in the Southern Labrador Sea (see above) and overlapping most of the NAFO Orphan Knoll Seamount Closure Area (see below). This EBSA is highly productive, largely due to local advective processes (CBD 2015). It includes a hard substratum, sub-sea island, a complex of unique habitats arising from the seafloor ("mounds"), and the surrounding deep, soft sediments of the Orphan Basin (CBD 2015; LGL 2018). The Orphan Knoll is considerably deeper than the adjacent continental slope, ranging from 1,800 m to 4,000 m depth, and hosts unique (compared to the adjacent slopes) and/or endemic and sensitive marine fauna, such as larvae and deep-water corals and sponges (CBD 2015; LGL 2018).

6.4.4.1.3 Slopes of the Flemish Cap and Grand Bank

The Slopes of the Flemish Cap and Grand Bank EBSA is located in the central and southern portions of the RAA, including the majority of the Project Area. It overlaps NAFO's 13 Sponge, Coral and Seapen Closures, the southern portion of the 3O Coral Closure ("3O Coral Protection Zone") and overlaps or is adjacent to 17 canyons identified by NAFO in the southern portion of the RAA. The Flemish Cap portion of the EBSA is a plateau delineated by the 500-m isobath, up to 150-m depth at its centre, located east of Newfoundland's Grand Bank and adjacent to the approximately 1,200 m deep Flemish Pass (CBD 2015). This EBSA also includes a portion of international Greenland halibut fishing grounds, with most of the fishing effort occurring along the slope on the northeast side of the Flemish Cap and on the Tail of the Banks, along the southern portion of the Flemish Pass (not shown in Figure 6-38; CBD 2015).

Much of the EBSA is influenced by the Labrador Current, resulting in high biodiversity as it serves as habitat to several at-risk species (e.g., northern and spotted wolffish, northern bottlenose whale) and hosts aggregations of taxa identified by NAFO as indicative of VMEs, such as crinoids, cerianthids, and aggregations of deep-sea sponges (e.g., *Geodia* sp.) and corals (e.g., sea pens, large and small gorgonians) (CBD 2015). This EBSA hosts high abundances of numerous fish species, including commercial fishes and invertebrates, such as the previously mentioned Greenland halibut, roughhead grenadier, armed grenadier, blue antimora, smalleyed rabbitfish, black dogfish, and *Gonatus* squid (CBD 2015). Cuvier's and Sowerby's beaked whales, and post-breeding female hooded seals have also been observed within the EBSA (CBD 2015). This EBSA contains much of the Little Auk's overwintering area and is a non-breeding hotspot for Great Skua from Iceland and Norway (CBD 2015).

6.4.4.1.4 Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank

The Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank EBSA is a highly productive ecosystem in the southern portion of the RAA. The Southeast Shoal portion of the EBSA is a beach relic featuring a shallow, sandy habitat and relatively warm waters that host the only offshore spawning ground for capelin and numerous northern sand lance (CBD 2015). This EBSA is a nursery ground for yellowtail flounder (this species' only nursery in the region) and contains spawning areas for American plaice (*Threatened* under COSEWIC), Atlantic cod (Newfoundland and Labrador population is *Endangered* under COSEWIC), and Atlantic (striped) wolffish (*Special Concern* under Schedule 1 of SARA and COSEWIC) (CBD 2015). It serves as habitat for unique populations of blue mussels and wedge clams and is an important feeding area for several cetaceans, particularly during the summer, including humpback whales, fin whales (*Special Concern* under Schedule 1 of SARA and COSEWIC), blue whales (*Endangered* under Schedule 1 of SARA and COSEWIC), sei whales (*Endangered* under COSEWIC), and minke whales (CBD 2015). Harbour porpoises, Atlantic white-sided dolphins, long-finned pilot whales, and beaked whales also frequent the EBSA (CBD 2015). This EBSA is also frequented by an abundance of seabirds, including long-distance migrants from breeding sites in the South Atlantic, such as thick-billed murre, common murre, dovekie, black-legged kittiwake, puffins, gannets, and Southern Hemisphere shearwaters and storm-petrels (CBD 2015). The world's largest Leach's storm-petrel colony and North American's largest common murre colony also occur within the EBSA (CBD 2015).

6.4.4.1 Vulnerable Marine Ecosystems

VMEs are benthic areas beyond Canada's 200 nm limit sensitive to bottom-contact fishing due to the presence of fragile species (e.g., corals, sponges, sea pens) or unique features that support biodiversity (e.g., canyons, seamounts) (Food and Agriculture Organization [FAO] 2016 in BP 2018). The VME concept arose through discussions at the United Nations General Assembly and was solidified upon the release of United Nations General Assembly Resolution 61/105 (NAFO 2019a). The FAO maintains an interactive, online global database of international bottom fisheries measures enacted to prevent significant harm to VMEs that is accessible via NAFO's website (NAFO 2019a). NAFO has identified and prohibited bottom fishing within 21 VMEs within its Convention Area and regulates bottom-contact fisheries that may adversely impact VMEs within its identified fishing footprint (i.e., delineated area of existing bottom fishing activities) (NAFO 2019a).

There are 14 NAFO VME Sponge, Coral and Seapen Closures (including the 3O Coral Closure) and three NAFO VME Seamount Closures within the RAA, none of which occur within the Project Area (Figure 6-38).

6.4.4.1.1 Sponge, Coral and Seapen Closures

Thirteen Sponge, Coral and Seapen Closures occur within the eastern-central portion of the RAA (see Table 6.21). All 13 Closures occur within the CBD Slopes of the Flemish Pass and Grand Bank EBSA (see above for a description of the area).

The Tail of the Bank Closure (No. 1) occurs adjacent to the South East Shoal and Adjacent Shelf Edge / Canyons VME, where there are unique offshore capelin spawning grounds, relict populations of blue mussels and wedge clams, and populations of ecological keystone species (e.g., capelin) and currently and previously at-risk fish species, such as northern, striped, and spotted wolffish, redfish, roundnose grenadier, and black dogfish (WG-EAFM 2016 and Statoil 2017, in BP 2018). It features high concentrations of large (e.g., bamboo coral) and small gorgonians, a lesser abundance of sea pens (NAFO 2017a), and is a feeding ground for marine mammals.

The Flemish Pass / Eastern Canyon Closure (No. 2) is south of the Project Area, within the Southern Flemish Pass to Eastern Canyons VME, which features large gorgonians (e.g., bubble gum coral), high densities of sponges, and currently / previously at-risk or otherwise vulnerable fish species, such as northern wolffish, spiny tailed skate, black dogfish, and deep-sea cat shark (NAFO 2017a; WG-EAFM 2016 and Statoil 2017, in BP 2018).

Two Beothuk Knoll Closures (No. 3 and 13) are within the Beothuk Knoll VME, south of the Flemish Cap, which hosts an abundance of gorgonian corals, high sponge density, and at-risk or other vulnerable fish species, such as northern wolffish, spiny tailed skate, roundnose grenadier, deep-sea cat shark, and black dogfish (WG-EAFM 2016 and Statoil 2017, in BP 2018). A sponge new to science, *Cladorhiza kenchingtonae*, was recently found on the southern slope of the Flemish Cap (Hestetun et al. 2017,in NAFO 2017a).

The Eastern Flemish Cap Closure (No. 4) is within the Flemish Cap East VME, which features large gorgonians, sea pens, high sponge density, the at-risk smooth skate (Funk Island Deep population: *Endangered* under COSEWIC; Laurentian-Scotian population: *Special Concern* under COSEWIC), and previously at-risk black dogfish (NAFO 2017a; WG-EAFM 2016 and Statoil 2017 *in* BP 2018).

The Northeast Flemish Cap (No. 5), three Northern Flemish Cap (No. 7,8,9), and three Northwest Flemish Cap (No. 10,11,12) Closure Areas are within the Northern Flemish Cap VME, which features high densities of sea pens, soft and black corals, lesser abundances of solitary stony corals and small gorgonians, and at-risk fish species, such as northern wolffish, and spiny dogfish (Atlantic population: *Special Concern* under COSEWIC) (NAFO 2017a; WG-EAFM 2016 and Statoil 2017, in BP 2018).

The Sackville Spur Closure (No. 6) is within the Sackville Spur VME, which is notable for its high density of sponges (NAFO 2017a; WG-EAFM 2016 and Statoil 2017, in BP 2018).

The NAFO Div. 3O Coral Closure, which partially overlaps the Slopes of the CBD Slopes of the Flemish Cap and Grand Bank EBSA (see above), is within the southwestern portion of the RAA and the Division

3O Coral Closure VME (WG-EAFM 2016 and Statoil 2017, in BP 2018). It features high concentrations of corals, high densities of sea pens and solitary stony corals, and hosts at-risk or otherwise vulnerable fish species, such as white hake (Atlantic and Northern Gulf of St. Lawrence population: *Threatened* under COSEWIC), redfish, black dogfish, smooth skate, and deep-sea cat shark (WG-EAFM 2016 and Statoil 2017, in BP 2018).

No vessels are permitted to conduct bottom fishing activities within these 14 Sponge, Coral and Seapen Closures until at least 31 December 2020 (NAFO 2019b).

6.4.4.1.2 Seamount Closures

Seamounts are isolated oceanic structures that typically support endemic marine populations and unique biodiversity (CBD 2015). Some deep-sea fish species have been known to form feeding and/or spawning aggregations on seamounts, while others are less specifically associated with them (CBD 2015). Filter feeders, including corals and sponges, often attach to a seamount's associated hard substrates, and the FAO / NAFO have identified seamounts as likely to feature VMEs (CBD 2015). Seamount topography leads to water circulation characteristics that may promote high productivity via the retention of eggs and larvae and advection of organic material (CBD 2015).

There are three NAFO VME Seamount Closure Areas within the RAA, north and southeast / southwest of the Project Area. The Fogo Seamounts 1 Seamount Closure is within the southwest portion of the RAA, south of the 3O Coral Closure Area. Seamounts within this Closure are 2,000 m to ≥4,000 m depth and were deemed by NAFO as highly probable to contain VMEs (FAO 2019). Located on oceanic crust, seamounts within this Closure form a series of basaltic volcanoes that widens from northwest to southeast in a distribution pattern unique from the typical linear arrangement of seamount channels, such as the Newfoundland Seamounts (FAO 2019). The Newfoundland Seamounts Closure is north of the Project Area, and partially overlaps the CBD Orphan Knoll EBSA and southern portion of the CBD Seabird Foraging Zone in the Southern Labrador Sea EBSA (see above for a description of the area). This Closure consists of six peaks with summits ≥2,400 m depth that were volcanically active during the late-Cretaceous period (FAO 2019). The Orphan Knoll Seamount Closure features a single peak with a minimum depth of 1,800 m and several mounds ranging from 1,800 m to 2,300 m and is a boundary region for flows from the Labrador Sea and North Atlantic Current (FAO 2019). It is highly productive, and hosts concentrations of corals (including stony corals) and sponges (FAO 2019).

6.4.4.1.3 Canyons

Submarine canyons are steep-sided valleys along continental slopes that can support highly biodiverse and/or vulnerable marine communities, including sensitive, structure-forming cold-water corals and deep-sea fishes (Hecker et al. 1980, Gordon and Fenton 2002, and Rutherford and Breeze 2002, in NAFO 2008). In addition to seamounts, knolls, the Southeast Shoal, and steep flanks (>6.4°; e.g., south and southeast of the Flemish Cap), NAFO has identified canyons as a physical indicator element for VMEs, including canyons with heads >200 m and > 400 m depth, such as those found on the Tail of the Grand Bank (NAFO 2019b). Canyons located on the upper continental shelf can provide ideal habitat for coral attachment (Gullage et al. 2017). There are at least 17 canyons on the slopes of the southern Grand Bank, at least 15 of which were identified by NAFO (NAFO 2008; Marine Regions 2018; see Table 6.21 and Figure

6-38). The ecology of these canyons is poorly understood (NAFO 2008); where possible, these canyons are summarized below.

6.4.4.1.4 Denys, Cameron, Jackman, Guy, Hoyles, Kettle, and Clifford Smith

Porifera sponges have been known to occur in Denys, Cameron, Jackman, Guy, Hoyles, Kettle, Clifford Smith canyons (Vlaams Instituut Voor De Zee [VLIZ] 2019).

6.4.4.1.5 Lilly and Carson

Lilly and Carson canyons comprise the Lilly Canyon-Carson Canyon EBSA (see above), which is an important feeding and productivity area for Iceland Scallops, and hosts year-round aggregations of marine mammals for feeding and/or overwintering (Templeman 2007). The sediment within and near Carson Canyon predominantly features polychaetes, hooded shrimp, sipunculid worms, amphipods, echinoderms, isopods, and bivalves (Houston and Haedrich 1984, in C-NLOPB 2014). These canyons are highly productive and important fishing areas (C-NLOPB 2014) and have been known to host *Porifera* sponges (VLIZ 2019).

6.4.4.1.6 Desbarres

The Desbarres Canyon hosts high sea pen concentrations, with up to 622 *Pennatula* sp. observed per 10-m transect by Baker et al. (2012), and Antipatharian corals, small gorgonians, and solitary stony corals have been collected within this canyon (C-NLOPB 2010). Porifera sponges have also been known to occur there (VLIZ 2019). It was used as a redfish spawning site during July from 1998 to at least 2002 (Ollerhead et al. 2014, in C-NLOPB 2010), and a new species of sea cucumber, *Penilpidia desbarresi* sp. nov. was photographed and collected within the Canyon during July 2007 (Gebruk et al. 2013).

6.4.4.1.7 Treworgie and Jukes

Treworgie and Jukes canyons host Antipatharian corals, large and small gorgonians, solitary stony corals, sea pens (C-NLOPB 2010), and Porifera sponges (VLIZ 2019). Researchers sighted four blue whales (*Endangered* under Schedule 1 of SAR*A* and by COSEWIC) near the Treworgie Canyon during the summer (CWF 2019).

6.4.4.1.8 Whitbourne

Whitbourne Canyon features high coral species richness and abundance, including sensitive large gorgonian corals (C-NLOPB 2010), and has been known to host Porifera sponges (VLIZ 2019).

6.4.4.2 Shrimp Closure Area

As a stock management measure to “minimise harmful impacts on living marine resources and ecosystems”, NAFO implements a seasonal shrimp fishery closure within specifically delineated boundaries in NAFO Div. 3M and 3L, referred to as the 3M Seasonal Shrimp Closure Area (NAFO 2017b, 2019b). Vessels are not permitted to fish for shrimp within the Shrimp Closure Area from 1 June to 31 December (NAFO 2019b). The 3M Shrimp Closure Area is southeast of the Project Area (Figure 6-38).

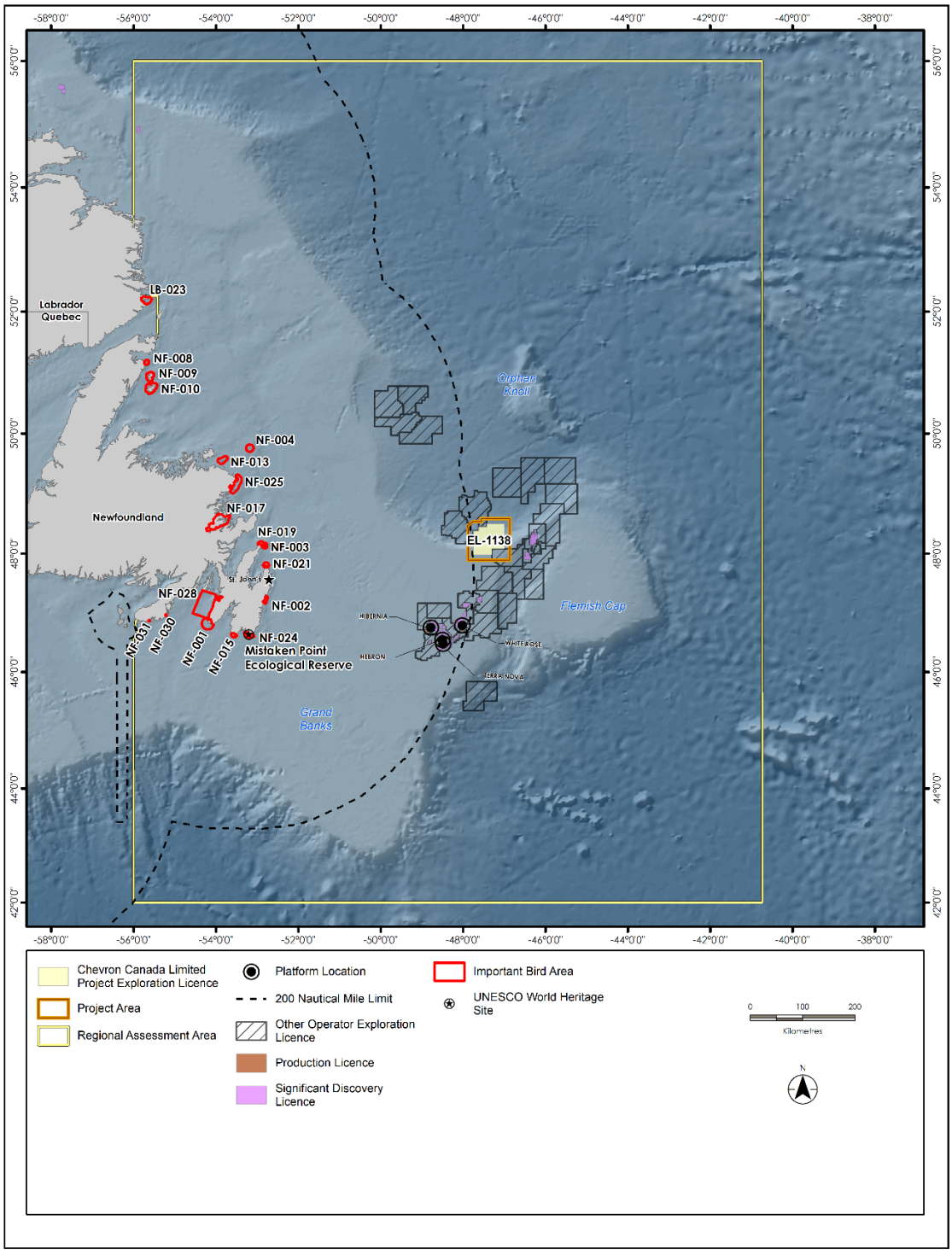
6.4.5 Special Areas Designated by Special Interest Groups

Two special interest groups, BirdLife International (with its Canadian partners, Bird Studies Canada and Nature Canada) and United Nations Educational, Scientific and Cultural Organization (UNESCO), have designated IBAs and World Heritage Sites within the RAA. IBAs are legally protected under the *Migratory Birds Convention Act*, while UNESCO World Heritage Sites are protected by the *Wilderness and Ecological Reserves Act* and 2009 Fossil Ecological Reserve Regulations of the *Lands Act*. Special areas designated by special interest groups and relevant legislation within the RAA are provided in Table 6.22 and Figure 6-39 and summarized below.

Table 6.22 Special Areas within the Project Area and RAA Designated by Special Interest Groups

Area Type	Governing Body	Legislation	Name [Reference for Site label in Figures 6-39]	Source
IBA	BirdLife International Canadian co-partners: Bird Studies Canada and Nature Canada	*Migratory Birds Convention Act, 1917, 1994* Canada's Important Bird and Biodiversity Areas Program	[LB023]St. Peter's Bay	1
			[NF001] Cape St. Mary's	
			[NF002] Witless Bay Islands	
			[NF003] Baccalieu Island	
			[NF004] Funk Island	
			[NF008] Fischot Islands	
			[NF009] Northern Groais Island	
			[NF010] Bell Island South Coast	
			[NF013] Wadham Islands and adjacent Marine Area	
			[NF015] The Cape Pine and St. Shotts Barren	
			[NF017] Terra Nova National Park	
			[NF019] Grates Point	
			[NF021] Cape St. Francis	
			[NF024] Mistaken Point	
			[NF025] Cape Freels Coastline and Cabot Island	
			[NF028] Placentia Bay	
			[NF030] Corbin Island	
			[NF031] Middle Lawn Island	
UNESCO World Heritage Site	Gov. NL – Parks and Natural Areas Division World Heritage Advisory Council	*Wilderness and Ecological Reserves Act*, 1980 *Fossil Ecological Reserve Regulations, 2009* *Lands Act*, 1991	Mistaken Point Ecological Reserve	2,3

Source:
[1] IBA (2009); [2] FLR (2018); [3] UNESCO (2019a)



Refer to Table 6.22 for alphanumeric site legend

Figure 6-39 Special Areas within the Project Area and RAA Designated by Special Interest Groups Important Bird Areas

6.4.5.1 IBAs

IBAs are important areas where seabirds congregate to nest, stage or overwinter. IBAs within the RAA are important for supporting seabird biodiversity, density, reproduction, and survival. There are 18 IBAs within the RAA, far west of the Project Area (Figure 6-39). These IBAs are summarized below.

6.4.5.1.1 St. Peter's Bay (LB023)

The St. Peter's Bay IBA is located 30 km south of Mary's Harbour on the southeast coast of Labrador and features open sea, marine inlets and coastline, and coastal cliffs / rocky shores (IBA 2009). It hosts a relatively high concentration of harlequin duck (Special Concern under Schedule 1 of SARA and COSEWIC and Vulnerable under the NL ESA) and is an important moulting area for common eider, which also breed in St. Peter's Bay (IBA 2009).

6.4.5.1.2 Cape St. Mary's (NF001)

The Cape St. Mary's IBA is located on the southwestern tip of Newfoundland's Avalon Peninsula and includes cliffs (approximately 130 m height), inland rocky shores, rocky flats, grassy barrens, and an isolated, offshore sea stack (Bird Rock) (IBA 2009). This IBA extends beyond the Cape St. Mary's Ecological Reserve (see above) to include Bull Island Point, the Bull, Cow, and Calf inlets, St. Mary's Keys (Cays), and Lance Point (IBA 2009). This IBA supports a large breeding colony consisting of thousands of seabirds (IBA 2009). Common murre and black-legged kittiwakes are the predominant species, along with northern gannet, thick-billed murre, razorbill, black guillemot, herring gull, great black-backed gull, great cormorant, and double-crested cormorant (IBA 2009). The Cape St. Mary's IBA supports a relatively high abundance of sea ducks, such as harlequin duck, oldsquaw, scoters, and eiders (IBA 2009). Dovekie, Manx shearwater, and piping plover have also been observed within this IBA (IBA 2009).

6.4.5.1.3 Witless Bay Islands (NF002)

The Witless Bay Islands IBA is located near Mobile, on the east coast of Newfoundland's Avalon Peninsula, and features coniferous forest, sedge / grass meadows, coastal cliffs, rocky shores and flats, and barrens (IBA 2009). The Site includes Green, Great, Gull, and Pee Pee islands and overlaps the Witless Bay Ecological Reserve (see above). This IBA supports a "globally significant" breeding seabird colony, including eastern North America's largest Atlantic puffin colony, Leach's storm-petrel, common murre, black-legged kittiwake, herring gull, great black-backed gull, black guillemot, thick-billed murre, razorbill, and northern fulmar (IBA 2009). The IBA's marine areas and islands are important habitat for migrating sea ducks, such as white-winged and surf scoters, oldsquaw, and common eider (IBA 2009).

6.4.5.1.4 Baccalieu Island (NF003)

The Baccalieu Island IBA is in Red Head Cove, off the northern tip of the Avalon Peninsula and overlapping the Baccalieu Island Ecological Reserve (see above), and includes tundra, coastal cliffs (≤137-m height), and rocky shore habitats with heath, grassy turf, and patchy old-growth black spruce and balsam fir forests (IBA 2009). This IBA features the highest abundance and biodiversity of seabirds in eastern North America and serves has habitat for a "globally significant" breeding Leach's storm-petrel colony, this species' largest

colony in Canada (IBA 2009). Other seabirds known to nest within the IBA include common murre, thick-billed murre, razorbill, black guillemot, northern fulmar, herring gull, and great black-backed gull (IBA 2009). This IBA supports high concentrations of Atlantic puffin, black-legged kittiwake, and northern gannet, and Manx shearwater have been observed there (IBA 2009).

6.4.5.1.5 Funk Island (NF004)

The Funk Island BMA is in Valleyfield, Newfoundland and overlaps the Funk Island Ecological Reserve (see above). The granitic island's coastal cliffs and rocky marine shores are influenced by the Labrador Current and support abundant zooplankton and fishes (IBA 2009). This IBA serves as habitat for a "globally significant" population of breeding common murre (Canada's largest), numerous breeding northern gannet, Atlantic puffin, razorbill, northern fulmar, herring gull, great black-backed gull, black-legged kittiwake, and the largest, southernmost colony of thick-billed murre (IBA 2009).

6.4.5.1.6 Fischot Islands (NF008)

The Fischot Islands IBA includes a series of small islands, isolated rocks and shoals in Croque, at the southeast head of Hare Bay on the northeast Northern Peninsula of Newfoundland, and features open sea, marine inlets / coast, coastal cliffs, and rocky shore habitats (IBA 2009). The marine component of this IBA is mostly ice-covered from late-December to early-May, although westerly winds typically maintain open water leads around the Fischot Islands (IBA 2009). This IBA is an important overwintering area for common eider and was the site of an early-1990s common eider re-introduction program (IBA 2009).

6.4.5.1.7 Northern Groais Island (NF009)

The Northern Groais Island IBA is in Conche, east of Newfoundland's Northern Peninsula, and includes open sea, high (>100 m) coastal cliffs, and rocky marine shore habitat (IBA 2009). The sea is generally ice-covered from January to April, although open leads often form around the island due to prevailing westerly winds (IBA 2009). This IBA's northern coastline is important breeding and wintering habitat for birds, such as for a nesting black-legged kittiwake colony during May to July (IBA 2009). Common eider are abundant on the island's northern shoreline during the winter, although they likely travel between this IBA, the Fischot Islands, and southern Bell Island depending on ice conditions (IBA 2009).

6.4.5.1.8 Bell Island South Coast (NF010)

The Bell Island South Coast IBA is immediately south of Northern Groais Island (which are collectively referred to as the Grey Islands) and is comprised of open sea, coastal cliffs, and marine rocky shores (IBA 2009). This island is large and forested and is typically surrounded by ice from mid-January to April, with open water leads on its eastern side due to westerly winds (IBA 2009). The southern coast of Bell Island hosts insular Newfoundland's largest nesting colony of common eider, which are also known to congregate there during the winter, depending on ice conditions (see Northern Groais Island above) (IBA 2009). Harlequin duck have been observed on the southern portion of the island during the summer, and several Manx shearwater have been observed within the IBA (IBA 2009).

6.4.5.1.9 Wadham Islands and adjacent Marine Area (NF013)

The Wadham Islands and adjacent Marine Area IBA is in Musgrave Harbour, Newfoundland, and includes seven islands (Wadham, Green, White, Copper, Duck, James, Outer Wadham) featuring sedge / grass meadows, open sea, coastal cliffs, and marine rocky shores (IBA 2009). This IBA hosts a large Atlantic puffin colony and other nesting birds, such as Leach's storm-petrel, razorbill, black guillemot, and common and Arctic terns (IBA 2009). Common eider over-winter from the Wadham Islands to the Cape Freels coastline, shifting with ice conditions and open water leads (IBA 2009).

6.4.5.1.10 The Cape Pine and St. Shotts Barren (NF015)

The Cape Pine and St. Shotts Barren IBA is on the southern tip of the Avalon Peninsula and includes open sea, rocky flat, and coastal barren habitats (IBA 2009). The area experiences cool summers and mild winters, and primarily features moss heath vegetation, including North American's only known Racomitrium barrens community (IBA 2009). The abundant black crowberry attracts whimbrel and hundreds of staging American golden-plover during their fall trans-oceanic migration to central and South America, and the Avalon Peninsula caribou herd uses the IBA as a portion of their summer range (IBA 2009). Black-headed gull, little gull, and Manx shearwater have been observed within this IBA during recent years (IBA 2009).

6.4.5.1.11 Terra Nova National Park (NF017)

Terra Nova National Park is described in Section 6.4.2.7. The Terra Nova National Park IBA includes coniferous forest, mixed woods, rivers, streams, freshwater lake, freshwater marsh, bog, marine inlets and coasts, rocky flats, and barrens (IBA 2009). This IBA has high bird species diversity, including two Newfoundland forest bird subspecies with limited ranges, red crossbill *pusilla* and ovenbird *furvoir* (IBA 2009). Mourning warbler, Wilsons warbler, and American edstart are found in association with ovenbird within the IBA (IBA 2009). Other forest birds that inhabit the IBA include at-risk and non-listed species, such as northern goshawk, boreal owl, black-backed woodpecker, gray-cheeked thrush, ruby-crowned kinglet, and olive-sided flycatcher (IBA 2009). Shorebirds, waterfowl, and alcids inhabit this IBA, including at least six tern colonies (Arctic and Common), breeding swamp sparrow, Lincoln's sparrow, Canada goose, greater yellowlegs, and black-headed gull and dovekie (IBA 2009).

6.4.5.1.12 Grates Point (NF019)

The Grates Point IBA is in Trinity Bay, Newfoundland, and includes open sea, coastal cliff (≤100 m), and marine rocky shore habitats (IBA 2009). This IBA's coast is completely exposed to the North Atlantic Ocean, from which pack ice typically flows during late-winter due to the Labrador Current and northerly winds (IBA 2009). Common Eider overwinter from the Grates Points IBA to the Baccalieu Island IBA (see above) (IBA 2009). Northern gannet and Atlantic puffin inhabit the IBA during April to October, while dovekie, thick-billed murre, and black-legged kittiwake frequent the IBA year-round (IBA 2009).

6.4.5.1.13 Cape St. Francis (NF021)

The Cape St. Francis IBA is in Pouch Cove, Newfoundland and includes open sea, coastal cliffs, and marine rocky shores (IBA 2009). Large flocks of common eider concentrate within this IBA prior to their northward

migration and purple sandpipers forage along the IBA's shoreline (IBA 2009). Dovekie and Manx shearwater have been observed within the Cape St. Francis IBA in recent years (IBA 2009).

6.4.5.1.14 Mistaken Point (NF024)

The Mistaken Point IBA overlaps the Mistaken Point Ecological Reserve (see above) and Mistaken Point UNESCO World Heritage Site (see below). This IBA consists of marine inlets, coastal features, and offshore marine waters from Drook to Cape Race (IBA 2009). Purple sandpiper over-winter within this IBA and may use it during migration (IBA 2009). Common eider have been known to occur in the area during early- to mid-winter, but sightings have decreased since the mid-1990s (IBA 2009). Several ruddy turnstone, which normally winter much farther south, regularly overwinter within this IBA, and Manx shearwater have been observed there (IBA 2009).

6.4.5.1.15 Cape Freels Coastline and Cabot Island (NF025)

The Cape Freels Coastline and Cabot Island IBA in at the northwest head of Bonavista Bay, Newfoundland and features open sea, coastal cliffs, and marine rocky shores (IBA 2009). This IBA includes small islands and shoals south of Cape Freels, along with Turrs Island, the Cobblers, the Pinchards, Pouch and Flowers islands, Stevensons Islets, and the Cabot Islands, each of which are <10 hectares in size (IBA 2009). This IBA experiences heavy ice conditions during January to April, during which Common Eider may concentrate in small open water leads, namely within the northern portion of the IBA (IBA 2009). Nesting seabirds are seasonally present within this IBA, particularly on Cabot Island, such as common murre, razorbill, Atlantic puffin, and common and Arctic terns (IBA 2009). black-headed gull, ivory gull, Manx shearwater, purple sandpiper, and various water birds have also been observed in this IBA (IBA 2009).

6.4.5.1.16 Placentia Bay (NF028)

The Placentia Bay IBA is within the Placentia Bay EBSA (see above) and encompasses the southeastern portion of Placentia Bay, ranging from Argentia to Cape St. Mary's and outwards to 25 km from shore, including islets, such as the Virgin Rocks, and open sea, inlets, and marine coastal habitats (IBA 2009). Placentia Bay is predominantly ice-free throughout the year and is a spawning site for capelin during June or July, which attracts an abundance of predatory seabirds and humpback whales (IBA 2009). Numerous shearwaters, including a "globally significant" concentration of Greater Shearwater, are known to frequent Placentia Bay to prey on spawning capelin, as are seabirds breeding within the Cape St. Mary's IBA (see above) and elsewhere, such as northern gannet, black-legged kittiwake, and common murre (IBA 2009). Abundant jaegers (pomarine and parasitic and, to a lesser extent, Long-tailed) are known to join the feeding Kittiwake flocks to steal capelin from the juveniles (IBA 2009). Common eider congregate around the virgin rocks to overwinter, and dovekie, Manx shearwater, and red crossbill have been observed within this IBA (IBA 2009).

6.4.5.1.17 Corbin Island (NF030)

The Corbin Island IBA is on the southeast Burin Peninsula, where the ~20-hectare island is ~1 km from the mainland and features rocky shores, grasses, and low shrubs (IBA 2009). This IBA likely supports a

"globally significant" Leach's storm-petrel colony and serves as habitat for a large herring gull colony and nesting black-legged kittiwake, great black-backed gull, and black guillemot (IBA 2009).

6.4.5.1.18 Middle Lawn Island (NF030)

The Middle Lawn Island IBA is within the Lawn Bay Ecological Reserve (see above) off the southern Burin Peninsula. The island features rugged hills, sedge / grass meadows, coastal cliffs, and marine rocky shores, and its southern coast is open to the Atlantic Ocean which usually prevents ice from forming there (IBA 2009). This IBA supports North America's largest and only regularly occurring concentration of nesting Manx shearwater, along with nesting Leach's storm-petrel, herring gull, greater black-backed gull, and black guillemot (IBA 2009).

6.4.5.2 UNESCO World Heritage Site

The UNESCO World Heritage Committee adopted the Convention concerning the Protection of the World Cultural and Natural Heritage in 1972, which was further refined in 1994 with the launch of their Global Strategy for a Representative, Balanced and Credible World Heritage List (UNESCO 2019a). There are currently 1,121 World Heritage Sites around the globe, of which 20 are in Canada and 4 are in NL (UNSECO 2019b).

There is one UNESCO World Heritage Site within the RAA, Mistaken Point. Mistaken Point is also an Ecological Reserve and contains the Mistaken Point IBA (see Sections 6.4.3.1 and 6.4.5.1; Figures 6-37 and 6-39). Located on the southeastern tip of Newfoundland's Avalon Peninsula, Mistaken Point was added to Canada's Tentative List of potential UNESCO World Heritage Properties during 2004 (FLR 2019). The Government of NL, in partnership with the Mistaken Point Ambassadors Inc., submitted the Mistaken Point Nomination Dossier for Inscription as a World Heritage Site in 2015, and it was successfully designated as a UNESCO World Heritage Site during 2016 (FLR 2019). It consists of 17 km of rugged coastal cliffs dating to the Ediacaran Period (580 to 560 million years ago) and contains the oldest known assemblages of large fossils in the world, representing Earth's watershed history of biologically complex organisms and ~3 billion years of "micro-dominated evolution" (UNESCO 2019b). The Mistaken Point World Heritage Site / Ecological Reserve is managed by the Natural Areas Program of the NL Government's Department of Fisheries and Land Resources (FLR 2019).

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