5.7 Marine Birds

The highly productive Grand Banks support large numbers of marine birds (seabirds) at all seasons. Marine birds are not spread evenly over the ocean but tend to be concentrated over anomalies such as shelf edges and along currents. Mixing in the water column at these edges creates a productive environment for zooplankton. Part of the Study Area is located on the edge of the Grand Banks where it begins to slope into the deep waters beyond the continental shelf. A branch of the Labrador Current flows south along the shelf edge off eastern Newfoundland including the Grand Banks. The combination of shelf edge and Labrador Current are prime conditions for high productivity of plankton, which is the base of marine food chains.

The Grand Banks shelf and slope have been identified as areas rich in abundance and diversity of seabirds (Brown 1986; Lock et al. 1994). Table 5.8 lists the species and months of occurrence and abundance expected in the Study Area. Seabird observations from this area are few but significantly more than areas beyond the Continental Shelf (Lock et al. 1994). Most of the information available has been collected by the Canadian Wildlife Service (CWS) through PIROP (Programme intégré de recherches sur les oiseaux pélagiques). These data have been published for 1969-1983 (Brown 1986) and up to the early 1990s (Lock et al. 1994) and is summarized for eastern Newfoundland in Figure 5.33. Additional seabird observations have been collected on the northeast Grand Banks by the offshore oil and gas industry. These data have been analyzed for the period 1999-2002 (Ballie et al. 2005).

Seabird observations were made aboard the CCGS *Hudson* Research Expedition in June and July 2004 (Lang and Moulton 2004). Northern Fulmars and Greater Shearwaters were observed along the slope in NAFO Unit Area 3Lt in the southern Flemish Pass and in Unit Areas 3Nbd in the vicinity of Salar Basin. Sooty Shearwaters were also observed in the southern part of the Flemish Pass. Unspecified species of jaegers and murres were also noted at the southern Flemish Pass and Salar Basin locations.

Additional seabird distributional data were collected during Husky's 2005 3-D seismic program in Wildrose, immediately north of the drill centre Project Area (Lang et al. 2006). Of the twenty-three species of seabird that were observed during the 1 October to 8 November period, ten were categorized as either common or uncommon, and the other 13 were considered scarce or very scarce. The five most numerous species included Northern Fulmar, Black-legged Kittiwake, Dovekie, Thick-billed Murre, and Greater Shearwater. More than 100 Leach's Storm-Petrels stranded aboard the seismic vessel, about three-quarters of which were released in good condition.

In both 2004 and 2005, seismic programs were conducted just north of the Grand Banks in the Orphan Basin area for Chevron Canada Resources, ExxonMobil Canada Ltd., and Imperial Oil Resources Ventures Limited. LGL seabird observers were aboard during both programs. In September 2004, Northern Fulmars and Leach's Storm-Petrels were observed in the northern

Table 5.8. Bird Species Occurring in Study Area and Monthly Abundance.

Common Name	Scientific Name	Monthly Abundance											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Procellariidae													
Northern Fulmar	*Fulmarus glacialis*	C	C	C	C	C	C	C	C	C	C	C	C
Cory's Shearwater	*Calonectris diomedea*							R	R	R			
Greater Shearwater	*Puffinus gravis*					C	C	C	C	C	C	U	
Sooty Shearwater						S	U	U	U	U	U	S	
Manx Shearwater	*Puffinus puffinus*					S	S	S	S	S	S		
Hydrobatidae													
Wilson's Storm-Petrel	*Oceanites oceanicus*						S	S	S	S			
Leach's Storm-Petrel	*Oceanodroma leucorhoa*				C	C	C	C	C	C	C	R	
Northern Gannet	*Sula bassanus*				S	S	S	S	S	S	S		
Red Phalarope	*Phalaropus fulicaria*					S	S	S	S	S	S		
Red-necked Phalarope						S	S	S	S	S			
Laridae													
Great Skua	*Catharacta skua*					R	R	R	R	R	R		
South Polar Skua	*Catharacta maccormicki*					R	R	R	R	R	R		
Pomarine Jaeger	*Stercorarius pomarinus*				S	S	S	S	S	S	S		
Parasitic Jaeger	*Stercorarius parasiticus*					S	S	S	S	S	S		
Long-tailed Jaeger	*Stercorarius longicaudus*					S	S	S	S	S	S		
Herring Gull	*Larus argentatus*	S	S	S	S	S	S	S	S	S	S	S	S
Iceland Gull	*Larus glaucoides*	R	R	R	R							R	R
Glaucous Gull	*Larus hyperboreus*	R	R	R	R							R	R
Great Black-backed Gull	*Larus marinus*	U	U	R	R	R	R	R	R	U	U	U	U
Ivory Gull	*Pagophila eburnea*		R	R									
Black-legged Kittiwake	*Rissa tridactyla*	C	C	C	C	C	S	S	S	S	C	C	C
Arctic Tern	*Sterna paradisaea*					S	S	S	S	S			
Alcidae													
Dovekie	*Alle alle*	U	U	U	U	R					U	U	U
Common Murre	*Uria aalge*	S	S	S	S	S	S	S	S	S	S	S	S
Thick-billed Murre	*Uria lomvia*	U	U	U	U	S					U	U	U
Razorbill	*Alca torda*				U	U	S	S	S	U	U	U	
Atlantic Puffin	*Fratercula arctica*				S	S	S	S	S	S	S	S	

Source: Brown (1986); Lock et al. (1994).

C = Common, U = Uncommon, S = Scarce, R = Rare occurrence.
Shaded months indicate most likely time for seismic exploration.

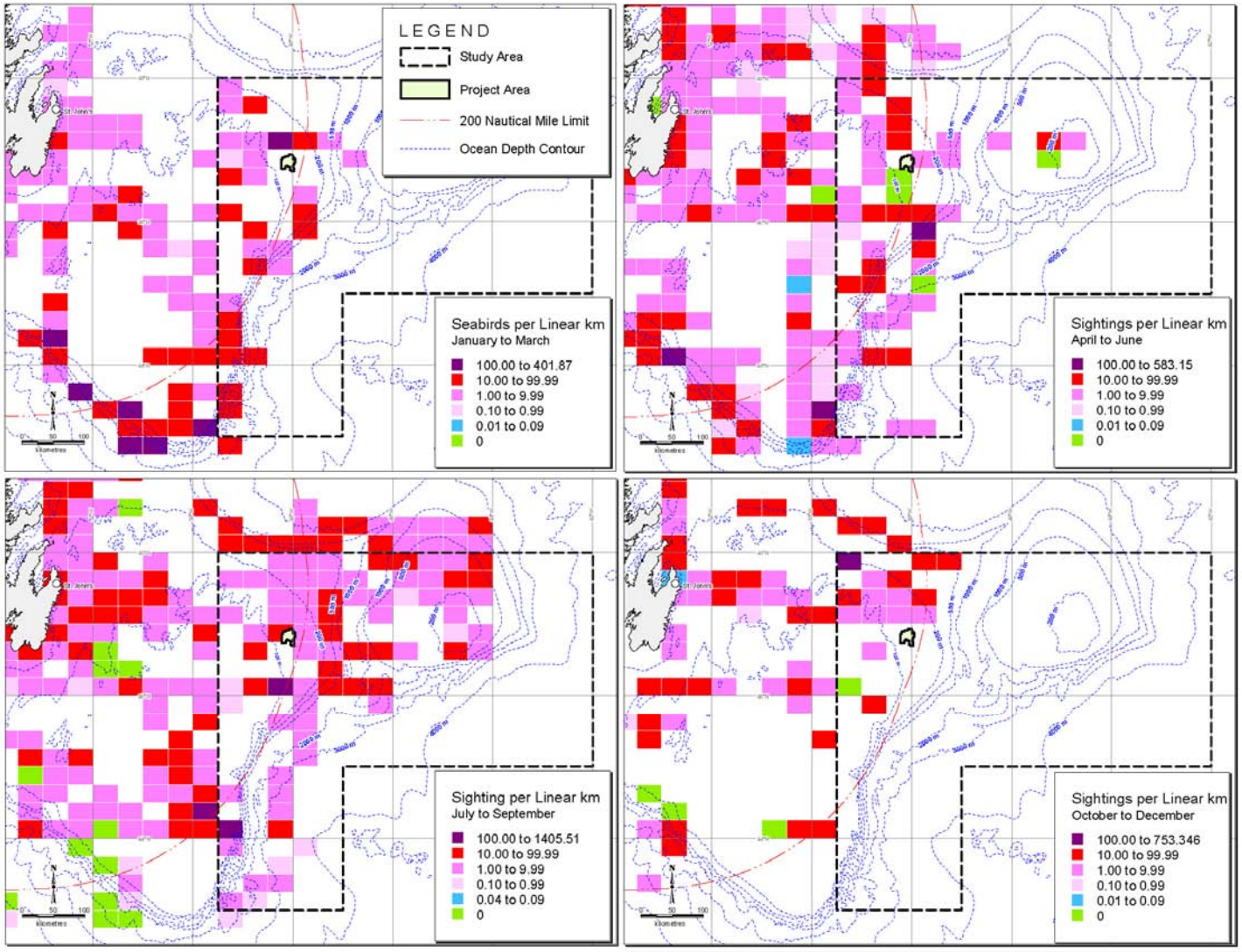

Figure 5.33. Geographic and Seasonal Distributions of Seabirds in Eastern Newfoundland.

part of Unit Area 3Li (i.e., northwest corner of the drill centre Study Area) (Moulton et al. 2005). Between May and July 2005, these same species as well as Greater Shearwaters were observed in portions of Unit Areas 3Li, 3Lt and 3Ma that occur in the Flemish Pass (i.e., west-central portion of the drill centre Study Area) (Moulton et al. 2006).

There is a pattern of increased bird numbers along the Continental Shelf edge on the northern and northeastern Grand Banks in the July to September period (Brown 1986; Lock et al. 1994) (Figure 5.33). During this period, birds are at their peak numbers on the Grand Banks. Data from other seasons are incomplete but the shelf edge is probably important during all seasons.

The enormous numbers of nesting seabirds on the Avalon Peninsula illustrate the richness of the Grand Banks for seabirds. The seabird breeding colonies on Baccalieu Island, the Witless Bay Islands and Cape St. Mary's are among the largest in Atlantic Canada. More than 4.6 million pairs nest at these three locations (Table 5.9 and Figure 5.1). This includes the largest Atlantic Canada colonies of Leach's Storm-Petrel (3,336,000 pair on Baccalieu Island), Black-legged Kittiwake (43,927 pair on Witless Bay Islands), Thick-billed Murre (1,000 pair at Cape St. Mary's) and Atlantic Puffin (216,000 pair Witless Bay Islands). All these birds feed on the Grand Banks during the nesting season May to September. In addition, Funk Island located 150 km northwest of the Grand Banks supports the largest colony of Common Murre in Atlantic Canada. Many of these birds would reach the northern Grand Banks during the breeding season.

There are nine seabird nesting sites on the southeast coast of Newfoundland from Cape Freels to the Burin Peninsula meeting the criteria for an Important Bird Area (IBA) (Figure 5.1 and Table 5.10). A grand total of 5.2 million pairs of birds breed at these sites. The Study Area is well beyond the foraging range of breeding birds during the breeding season, approximately May to August. At Witless Bay, Common Murres forage up to 200 km from the breeding site but usually only 50-100 km (Cairns et al. 1990, *in* Gaston and Jones 1998). However, during post-breeding dispersal the Study Area is within range of all seabirds breeding in eastern Newfoundland and Labrador. In addition, Grates Point, Mistaken Point and Placentia Bay qualify as IBAs because of significant wintering populations of Common Eider. An IBA is a site that provides essential habitat for one or more species of breeding or non-breeding birds.

In addition to local breeding birds, there are many non-breeding seabirds on the Grand Banks during the summer months. Most of the world's population of Greater Shearwater is thought to migrate to the Grand Banks and eastern Newfoundland to moult and feed during summer months after completion of nesting in the Southern Hemisphere. All species of seabirds require more than a single year to become sexually mature. Many non-breeding sub-adult seabirds, especially Northern Fulmar and Black-legged Kittiwake, are present on the Grand Banks year-round.

Table 5.9. Number of Pairs of Seabirds Nesting at Important Bird Sites (IBA) in Eastern Newfoundland.

Species	Wadham Islands	Funk Island	Cape Freels and Cabot Island	Baccalieu Island	Witless Bay Islands/ Tors Cove	Cape St. Mary's	Middle Lawn Island	Corbin Island	Green Island
Procellariidae									
Northern Fulmar		13		20	21	U			
Manx Shearwater					?		100		
Hydrobatidae									
Leach's Storm-Petrel	10,000	?	250	3,336,000	870,020	?	26,313	100,000	72,000
Sulidae									
Northern Gannet		6,075		677	?	5,485			?
Laridae									
Herring Gull		500		U	4,150	U	20	5,000	
Great Black-backed Gull		100		U	163	U	6	25	
Black-legged Kittiwake		810		12,975	43,927	10,000		50	
Arctic and Common Terns	376		250						
Alcidae									
Common Murre		396,461	2,600	4,000	74,687	10,000			
Thick-billed Murre		250		181	600	1,000			
Razorbill	30	200	25	100	230	100			?
Black Guillemot	25	1		100	20+	U			
Atlantic Puffin	15,950	2,000	20	30,000	216,000				
TOTALS	**26,332**	**406,410**	**3,145**	**3,384,053**	**1,209,818**	**26,585**	**26,413**	**105,075**	**72,000**

Source: www.ibacanada.com

'?' indicates possibility of nesting activity
'U' indicates definite nesting activity but numbers of nesting pairs unknown

Other seabirds (jaegers, terns and phalaropes) migrate north in spring and south in autumn over the Grand Banks between breeding sites in the low Arctic to wintering areas in the more southern latitudes. Large numbers of Arctic breeding Thick-billed Murre, Dovekie, Northern Fulmar and Black-legged Kittiwake migrate to eastern Newfoundland, including the Grand Banks, for the winter.

The only species of eastern offshore seabird that is listed under *SARA* is the Ivory Gull. It is currently listed as a 'species of concern' on Schedule 1. It would likely be a rare and less than annual occurrence in the Study Area.

5.7.1 Seasonal Abundance of Seabirds in the Study Area

The world range and seasonal occurrence and abundance of seabirds in the Study Area are described in this section. Table 5.8 summarizes the abundance status for each species monthly. Information was derived from Brown (1986), Lock et al. (1994) and Ballie et al. (2005).

5.7.1.1 Procellariidae (fulmars and shearwaters)

5.7.1.1.1 Northern Fulmar

The Northern Fulmar breeds in the north Atlantic, north Pacific and Arctic oceans. In Atlantic Ocean it winters south to North Carolina and southern Europe. It is common all year in ice-free waters off eastern Newfoundland (Brown 1986; Lock et al. 1994). Through band recoveries it is known that most individuals in Newfoundland water are from Arctic breeding colonies. Adults and sub-adult birds are present in the winter with sub-adults remaining through the summer. There are fewer than 100 pairs breeding in eastern Newfoundland (Cairns et al. 1989). Found to be most numerous during spring and autumn on the northeast Grand Banks 1999-2002, based on observations from drill rigs (Ballie et al. 2005).

Northern Fulmar is common in the Study Area all year.

5.7.1.1.2 Cory's Shearwater

Cory's Shearwater is a subtropical species breeding in the eastern Atlantic Ocean on the Azores Island and Cape Verdes Islands, the Mediterranean and western Indian Ocean. In late summer small numbers reach the waters off southern Nova Scotia. A few occur in southern Newfoundland waters, including the Grand Banks. Cory's Shearwater was recorded from drill platforms on the northeast Grand Banks, but due to similarity in appearance to the abundant Greater Shearwater, the actual numbers observed remains unconfirmed (Ballie et al. 2005).

Cory's Shearwater is rare in the Study Area during the July to September period.

5.7.1.1.3 Greater Shearwater

The Greater Shearwater breeds on the Tristan de Cunha Islands in south Atlantic Ocean. It spends non-breeding season in north Atlantic. Greater Shearwater has a significant presence on the Grand Banks. A considerable portion of the entire population of about five million migrate from Southern Hemisphere breeding sites to feed and moult on the Grand Banks and eastern Newfoundland in June and July (Lock et al. 1994). After moulting birds remain in the area until early November. Greater Shearwater was the most numerous bird observed from drill platforms on the northeast Grand Banks 1999-2002 (Ballie et al. 2005). Numbers increased though the summer to a peak in September then decreased rapidly with stragglers into November. Median flock size was usually <50 but occasionally up to 1,200.

Greater Shearwater is common in the Study Area from May to early November.

5.7.1.1.4 Sooty Shearwater

Sooty Shearwater breeds in the south Atlantic and south Pacific Oceans. It spends most of the non-breeding season in Northern Hemisphere. Some Sooty Shearwaters follow the same migration pattern as Greater Shearwater by migrating north to Canadian waters in spring. Sooty Shearwater is usually outnumbered by Greater Shearwater in eastern Canada (Brown 1986). Numbers peaked at 2.5 birds/day at one drill platform on the northeast Grand Banks 2000 and 2001 (Ballie et al. 2005).

Sooty Shearwater is uncommon in the Study Area from May to October.

5.7.1.1.5 Manx Shearwater

Manx Shearwater breeds in northeast Atlantic Ocean. It is uncommon in the northwest Atlantic. Manx Shearwater is a recent colonizer of North America. The only known established breeding colony in North America is at Middle Lawn Island off the Burin Peninsula, Newfoundland where <100 pairs breed (Cairns et al 1989). Other nest sites in Newfoundland have not been confirmed. Most observed in North American waters are probably non-breeding sub-adults and post-breeding birds from European breeding colonies. Manx Shearwater winters in middle latitudes of Atlantic Ocean. A total of 39 were observed on drill platforms on the northeast Grand Banks 1999-2002 (Ballie et al. 2005). This represents <0.1% of all the birds recorded.

Manx Shearwater is scarce in the Study Area during the May to October period.

5.7.1.2 Hydropbatidae (storm-petrels)

5.7.1.2.1 Leach's Storm-Petrel

Leach's Storm-Petrel breeds in the north Pacific and north Atlantic Oceans. It winters at the middle latitudes and south of equator in both oceans. It is an abundant breeder in eastern Newfoundland with more than four million pairs nesting on islands off the eastern Avalon Peninsula (Table 5.9). The largest breeding colony in the world is at Baccalieu Island on the northeast Avalon Peninsula, where over 3.3 million pairs nest (Lock et al. 1994). They range far from breeding colonies to feed. Many non-breeding sub-adults remain at sea through the breeding season. An average of <1 Leach's Storm-Petrel per day was recorded from the drill platforms on the northeast Grand Banks 1999-2002 (Ballie et al. 2005). The low number may have been a result of the height of observers off the water and the lack of persistent use of binoculars for scanning. Storm-petrels are difficult to see because they are dark and fly very low over the water.

Leach's Storm-Petrel is common in the Study Area between April and early November.

5.7.1.2.2 Wilson's Storm-Petrel

The Wilson's Storm-Petrel breeds in south Atlantic Ocean and Antarctic. In the non-breeding season (May to October) they migrant north to waters off southern Nova Scotia and Newfoundland. It is uncommon in Newfoundland waters June to September (Brown 1986).

Wilson's Storm-Petrel is scarce in the Study Area between June and September.

5.7.1.3 Sulidae (gannets)

5.7.1.3.1 Northern Gannet

The Northern Gannet breeds in north Atlantic from Canada to Iceland and the British Isles. They winter at sea south of breeding range but north of the equator. About 12,000 pair nest on three colonies in the eastern Newfoundland (Table 5.9). Gannets are common near shore and scarce beyond 100 km from shore. The Study Area is farther off shore than the range of most Northern Gannets.

Northern Gannet is scarce in the Study Area between April and October.

5.7.1.4 Phalaropodinae (phalaropes)

5.7.1.4.1 Red Phalarope and Red-necked Phalarope

There are two species of phalaropes that occur at sea. They are the Red Phalarope and Red-necked Phalarope. Both breed in the Arctic to sub-Arctic of North America and Eurasia. They winter at sea mostly in the Southern Hemisphere. They migrate and feed offshore, including Newfoundland waters in spring and autumn migrations. The two phalaropes are often difficult to distinguish at sea. Red Phalarope usually outnumbers Red-necked Phalarope in Newfoundland waters (Brown 1986). Phalaropes seek out areas of upwelling and convergence where rich sources of zooplankton are found. They are locally common especially along the shelf edges off Newfoundland and Labrador.

These phalarope species are scarce in the Study Area during the May to October period.

5.7.1.5 Laridae (skuas, jaegers, gulls and terns)

5.7.1.5.1 Great Skua and South Polar Skua

The Great Skua breeds in the North Hemisphere in Iceland and northwestern Europe. The South Polar Skua breeds in the Southern Hemisphere and migrates to the Northern Hemisphere for the non-breeding season. Both species occur in Newfoundland waters May to October. Identifying skuas to species is very difficult at sea. Skuas are kleptoparasites usually occurring where other seabirds are numerous particularly along shelf edges.

These skua species are scarce in the Study Area during the May to October period.

5.7.1.5.2 Pomarine Jaeger, Parasitic Jaeger and Long-tailed Jaeger

All three species of jaeger nest in the sub-Arctic to Arctic in North America and Eurasia. They winter at sea in the Pacific Ocean and Atlantic Ocean. Pomarine and Parasitic Jaegers winter mainly south of 35°N and Long-tailed Jaeger mainly south of the equator. The three species of jaeger are relatively easy to identify in adult plumage but very difficult in sub-adult plumages. As a group their habits are very similar. Adults migrate through Newfoundland waters in spring and fall while sub-adults often migrate only part way to the breeding grounds and are often present in Newfoundland waters all summer. Like skuas they are kleptoparasites preying chiefly on Black-legged Kittiwakes and Arctic Terns. Densities of jaegers, like most predators, are relatively low. Peak numbers occur during migration in May to early June and September to October.

These jaeger species are scarce in the Study Area during the May to October period.

5.7.1.5.3 Herring, Great Black-backed, Iceland, and Glaucous Gull

Herring Gull breeds in northern North America, Europe and northeast Russia and winters in the southern part of its breeding range. Great Black-backed Gull is restricted to north Atlantic breeding and winters in coastal Canada and Europe. Iceland Gull breeds in northeast Canadian Arctic and Greenland and winters on open coastal waters south to New England States. Glaucous Gull breeds in sub-Arctic and Arctic in North America, Greenland and Eurasia and winters within its breeding range and south. The large gulls are generally rare to scarce far from shore on the Grand Banks. The exception is Great Black-backed Gull.

On drill platforms on the northeast Grand Banks 1999-2002, Great Black-backed Gull was common September to February and nearly absent March to August (Ballie et al. 2005). Herring Gulls were present in consistent numbers throughout the year but in lower numbers than Great Black-backed Gulls.

Herring Gull is scarce in the Study Area throughout the year, Great Black-backed Gull is uncommon in the Study Area between September and February, and rare between March and August, and Glaucous Gull and Iceland Gull are rare in the Study Area between November and April.

5.7.1.5.4 Black-legged Kittiwake

The Black-legged Kittiwake has a circumpolar breeding range. In Canada, it breeds from the Arctic south to Nova Scotia, and it winters at sea in the northern Pacific Ocean and northern Atlantic Ocean. Black-legged Kittiwake is an abundant seabird off the Newfoundland coast. Breeding colonies on the Avalon Peninsula and north east coast of Newfoundland total 77,398 pairs (Cairns et al. 1989). Many of the four million pairs that breed in the North Atlantic Ocean spend some time off the east coast of Newfoundland (Brown 1986; Lock et al. 1994). Black-legged Kittiwake is present in all months of the year on the Grand Banks. Observations from the drill platforms on the northeast Grand Banks 1999-2002 showed Black-legged Kittiwakes were present October to May but were most prevalent November to December (Ballie et al. 2005).

Black-legged Kittiwake is common in the Study Area during the October to May period, and scarce between June and September.

5.7.1.5.5 Arctic Tern

The Arctic Tern breeds in sub-Arctic to Arctic regions of North America and Eurasia. In the western Atlantic, it breeds south to Nova Scotia and winters at sea in the Southern Hemisphere. Arctic Terns are migrants at sea through Newfoundland and Labrador waters in spring and autumn.

Arctic Tern is scarce in the Study Area between May and September.

5.7.1.6 Alcidae (Dovekie, murres, Black Guillemot, Razorbill and Atlantic Puffin)

5.7.1.6.1 Dovekie

Dovekies breed in the North Atlantic, primarily in Greenland and east Nova Zemlya, Jan Mayen and Franz Josef Land in northern Russia. This species winters at sea south to 35°N. The Dovekie is a very abundant bird with a world population estimated at 30 million (Brown 1986). A large percentage of the Greenland breeding Dovekies winters in the western Atlantic, mainly off Newfoundland (Brown 1986). The low numbers of Dovekies observed from the drill platforms on the northeast Grand Banks 1999-2002 was attributed to the difficulty in seeing the small birds from the observation posts (Ballie et al. 2005).

Dovekie is uncommon in the Study Area between October and April.

5.7.1.6.2 Common Murre

The Common Murre breeds in the north Pacific Ocean and north Atlantic Ocean. In the western Atlantic, it winters from southern Newfoundland to Massachusetts. It is an abundant breeder in eastern Newfoundland with nearly half a million pairs, with 80% of those on Funk Island (Table 5.9). During breeding season, the Study Area is probably too far from breeding sites to be used regularly for foraging. In the non-breeding season between August and March, Common Murres are likely to occur on the northern Grand Banks. Due to low density and high difficultly in detecting murres at sea, surveys generally underestimate their numbers.

Common Murre is scarce in the Study Area throughout the year.

5.7.1.6.3 Thick-billed Murre

Thick-billed Murres breed in sub-Arctic and Arctic areas in North America and Eurasia. In Atlantic Canada, they breed as far south as Newfoundland, and winters in open water within the breeding range and in the western Atlantic south to New Jersey.

The Thick-billed Murre is the winter murre in eastern Newfoundland. Many of the more than two million Arctic Canada and Greenland breeders winter in Newfoundland and Labrador waters. The Grand Banks has been identified as an important wintering area for Thick-billed Murres (Brown 1986; Lock et al. 1994). Relatively small numbers (~2,000) breed in eastern Newfoundland (Table 5.9). In eastern Newfoundland waters including the Study Area, the Thick-billed Murre is common from October to May and scarce between June and September.

Thick-billed Murre is uncommon in the Study Area between October and April.

5.7.1.6.4 Razorbill

Razorbills breed in the north Atlantic Ocean in Maine, eastern Canada, Greenland, Iceland, and Great Britain. They typically winter south to North Carolina and France. Razorbills are relatively scarce compared to the murres. Most of the 20,000 pairs of breeding in Atlantic Canada are in southeast Labrador (Brown 1986). About 710 pairs breed in eastern Newfoundland (Table 5.9).

Razorbills, for the most part, winter south of Newfoundland from Nova Scotia to North Carolina. They are probably rare or uncommon on the northeastern Grand Banks as a migrant. Observations of Razorbills at sea are often obscured because of the difficultly in differentiating them from the murres.

Razorbill is rare in the Study Area between April and November.

5.7.1.6.5 Atlantic Puffin

The Atlantic Puffin breeds in the north Atlantic in Maine, Nova Scotia, Newfoundland and Labrador, Greenland, Iceland and northwest Europe. Atlantic Puffins are abundant in the North Atlantic with about 12 million pairs (Brown 1986). About 320,000 pairs nest in Atlantic Canada, mostly in southeast Newfoundland (Brown 1986). In North America, Atlantic Puffins are thought to winter from southern Newfoundland to southern Nova Scotia.

The Study Area is probably east of the breeding sites used as foraging areas in the summer. Migrants and post-breeders may use the northern Grand Banks in late summer and early autumn. Only one was observed from the drill platforms on the northeast Grand Banks 1999-2002 (Ballie et al. 2005). This was at least partly due difficultly in detecting them at sea.

Atlantic Puffin is scarce in the Study Area between April and November.

5.7.2 Prey and Foraging Habits

Marine birds in the Study Area consume a variety of prey ranging from small fish to zooplankton. Different methods for capturing food range from plunge diving from a height of 30 m above the water surface, feeding at surface, and diving from surface.

5.7.2.1 Procellariidae (fulmar and shearwaters)

Northern Fulmar and the four species of shearwaters that are expected to occur in the area feed on a variety of invertebrates, fish and zooplankton at or very near the surface. Caplin is an important food source for shearwaters. Shearwaters secure their prey by swimming on the surface and picking at items on the surface, or dipping their heads under the water. Shearwaters

are also capable of diving a short distance under the surface, probably no more than a meter or so. They may do this by flying low over the water and then plunging into the water with enough force to get them below the surface for a few seconds, or dive from a sitting position.

5.7.2.2 Hydrobatidae (storm-petrels)

Leach's and Wilson's Storm-Petrels feed on small crustaceans, various small invertebrates, and zooplankton. These storm-petrels usually feed while on the wing, picking small food items from the surface.

5.7.2.3 Sulidae (Northern Gannet)

Northern Gannets feed on cephalopods and small fish including capelin, mackerel, herring and Atlantic saury. They secure prey in spectacular fashion by plunging from a height of up to 30 m above the water and reaching depths of up to 10 m. They pop back to the surface within a few seconds of entering the water.

5.7.2.4 Phalaropodinae (phalaropes)

Red-necked and Red Phalaropes eat zooplankton at the surface of the water. They secure food by swimming and rapidly picking at the surface of the water. Their heads probably rarely go beneath the surface.

5.7.2.5 Laridae (skuas, jaegers, gulls, terns)

Skuas and jaegers feed by chasing other species of birds until they either drop food or disgorge the contents of their stomachs. This method of securing food is called kleptoparasitism. The Long-tailed Jaeger, the smallest member of this group, also feeds on small invertebrates and fish which it catches by dipping to the surface of the water while remaining on the wing.

5.7.3 Profiles of *SARA*- and COSEWIC-Listed Marine Birds

5.7.3.1 Ivory Gull

The Ivory Gull is currently listed on Schedule 1 of *SARA* as a species of 'special concern'.

The Ivory Gull breeds in high Arctic Canada, Greenland and northern Eurasian, and winters among the sea ice within its breeding range and slightly farther south, particularly on the northwestern Atlantic. Gilchrist and Mallory (2005) quote a revised global population of <14,000 breeding pairs of Ivory Gulls. Surveys of historic breeding sites in the Canadian Arctic in 2002 and 2003 showed an 80% decline in the numbers of nesting Ivory Gulls. Considering that changes to the breeding environment have been insignificant, causes for the observed decline are likely related to factors occurring during migration or on the wintering grounds.

Ivory Gulls may occur in small numbers in the Study Area when pack ice reaches the northern Grand Banks in late winter. The thirty-year median of ice concentration shows ice extending into the northern edge of the Grand Banks east to 48°W during late February to late March. More information on the Ivory Gull can be found in the Species at Risk section.

The Ivory Gull likely rarely reaches the Study Area. In unusually heavy ice years, ice may be more prevalent within the Study Area at which time a few Ivory Gulls could be present in February to April period. The total of 21 Ivory Gulls reported from drill platforms on the northeast Grand Banks, 1999-2002, is likely too high, especially considering that most sightings were reported during ice-free periods.

Ivory Gull is rare in the Study Area (less than annual) between January and March.

5.8 Marine Mammals

At least 20 species (Table 5.10) of marine mammals may occur in the Study Area including 16 species of cetaceans (whales and dolphins) and three species of seals. Additional marine mammal species may occur rarely. As reviewed in Mobil (1985), Petro-Canada (1996a,b), and more recently in Husky (2000) and LGL (2005a), most marine mammals are seasonal inhabitants, the waters of the Grand Banks and surrounding areas being important feeding grounds for many of them. This section summarizes information on marine mammals that may occur in the Study Area and updates information on marine mammals that has become available since Husky (2000).

Marine mammal species considered at risk by COSEWIC and *SARA* are described in more detail in Section 5.8.4 of this report. Population estimates of some of the marine mammal species that occur within the Study Area are provided in Table 5.11.

Primary sources of new information on marine mammal distribution and abundance in and near the Study Area include the results of environmental monitoring programs conducted in Jeanne d'Arc Basin and north of the Study Area in Orphan Basin (Table 5.12). The monitoring programs included:

1. Husky's 3D seismic program in Jeanne d'Arc Basin (Lang et al. 2006) where marine mammal observers (MMOs) conducted ~371 hours of observation along
2. 2,859-km trackline from the M/V *Western Neptune* from 1 October to 8 November 2005. Most observations were made north of the Project Area (see Husky Seismic Area 2005 in Figure 5.34) as the seismic ship conducted its surveys primarily in EL1067, with the vessel making turns in EL 1066 and 1089 (Figure 5.34). A total of 170 marine mammal sightings were made, totaling 530 individuals.

Table 5.10. Marine Mammals that are Known or Expected to Occur in the Study Area.

Common Name	Scientific Name	COSEWIC Status (*SARA* listing/status)
Baleen Whales	**Mysticetes**	
Blue Whale	*Balaenoptera musculus*	Endangered (Schedule 1)
Fin Whale	*Balaenoptera physalus*	Special Concern (No status; under consideration for addition to Schedule 1)
Sei Whale	*Balaenoptera borealis*	Data Deficient (not listed)
Humpback Whale	*Megaptera novaeangliae*	Not At Risk (not listed)
Minke Whale [a]	*Balaenoptera acutorostrata*	Not Considered (not listed)
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered (Schedule 1)
Toothed Whales	**Odontocetes**	
Sperm Whale	*Physeter macrocephalus*	Not At Risk (not listed)
Northern Bottlenose Whale	*Hyperoodon ampullatus*	Not At Risk—Davis Strait Population (not listed)
Sowerby's Beaked Whale	*Mesoplodon bidens*	Special Concern (Schedule 3)
Bottlenose Dolphin	*Tursiops truncatus*	Not At Risk (not listed)
Killer Whale	*Orcinus orca*	Data Deficient (not listed)
Long-finned Pilot Whale	*Globicephala melas*	Not At Risk (not listed)
Common Dolphin	*Delphinus delphis*	Not At Risk (not listed)
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	Not At Risk (not listed)
White-beaked Dolphin	*Lagenorhynchus albirostris*	Not At Risk (not listed)
Risso's Dolphin	*Grampus griseus*	Not At Risk (not listed)
Striped Dolphin	*Stenella coeruleoalba*	Not At Risk (not listed)
Harbour Porpoise	*Phocoena phocoena*	Special Concern (no status or schedule; referred back to COSEWIC)
True Seals	**Phocids**	
Grey Seal	*Halichoerus grypus*	Not At Risk (not listed)
Harp Seal	*Phoca groenlandica*	Not Considered (not listed)
Hooded Seal	*Cystophora cristata*	Not At Risk (not listed)

[a] A COSEWIC status report was prepared and is being reviewed (S. Dufault, pers. comm.).

Table 5.11. Population Estimates of Marine Mammals that Occur in the Study Area.

Species	Northwest Atlantic (NW) Population Size	Population Occurring in the Study Area		
	Estimated Number	Stock	Estimated Number	Source of Updated Information
Baleen Whales				
North Atlantic Right Whale	322	Northwest Atlantic	Unknown	Krauss et al. (2001)
Humpback Whale	5,505 (11,570 in North Atlantic; CV=0.069)	NF/Labrador	1,700-3,200	Whitehead (1982); Katona and Beard (1990); Baird (2003)
Blue Whale	308 [a] (600-1500 in North Atlantic)	Northwest Atlantic	Unknown	Waring et al. (2004: Appendix III); Sears and Calambokidis (2002)
Fin Whale	2,814 [b] (CV=0.21)	Can. E. Coast	Unknown	Waring et al. (2004)
Sei Whale	Unknown	Nova Scotia	Unknown	COSEWIC (2003a); Waring et al. (2004)
Minke Whale	4,018 [c] (CV=0.16)	Can. E. Coast	Unknown	Waring et al. (2004)
Toothed Whales				
Sperm Whale	4,702 [d] (CV=0.36)	North Atlantic	Unknown	Reeves and Whitehead (1997); Waring et al. (2004)
Northern Bottlenose Whale	Tens of thousands?	North Atlantic	Unknown	Reeves et al. (1993); Waring et al. (2004)
Sowerby's Beaked Whale	Unknown			Katona et al. (1993)
Bottlenose Dolphin (offshore stock)	29,774 (CV=0.25)	Northwest Atlantic	Unknown	Waring et al. (2004)
Risso's Dolphin	29,110 (CV=0.29)	US East Coast	Unknown	Reeves et al. (2002); Waring et al. (2004)
Killer Whale	Unavailable		Unknown	Lien et al. (1988); Waring et al. (2004)
Long-finned Pilot Whale	14,524 (CV=0.30)	Northwest Atlantic	Abundant	Nelson and Lien (1996); Waring et al. (2004)
Short-beaked Common Dolphin	30,768 (CV=0.32)	Northwest Atlantic	Unknown	Katona et al. (1993); Waring et al. (2004)
Atlantic White-sided Dolphin	51,640 [e] (CV=0.38)	Northwest Atlantic	Unknown	Palka et al. (1997); Waring et al. (2004)
White-beaked Dolphin	Unknown	Northwest Atlantic	Unknown	Waring et al. (2004)
Striped Dolphin	94,462 [f] (CV=0.40)	Unknown	Unknown	Waring et al. (2004)
Harbour Porpoise	Unknown	Newfoundland	Unknown	Wang et al. (1996); COSEWIC (2003b); Waring et al. (2004)
Seals				
Harp Seal	5.2 (±1.2) million	Northwest Atlantic	Unknown	DFO (2000)
Hooded Seal	400,000-450,000	Northwest Atlantic	Unknown	Stenson et al. (1997)
Grey Seal	154,000	E. Canada	Unknown	Mohn and Bowen (1996)

[a] Based on surveys from the Gulf of St. Lawrence. This estimate deemed unsuitable for abundance estimation.
[b] Based on surveys from George's Bank to the mouth of the Gulf of St. Lawrence.
[c] Based on surveys from George's Bank to the mouth of the Gulf of St. Lawrence plus a survey in the Gulf of St. Lawrence.
[d] Based on surveys from Florida to the Gulf of St. Lawrence.
[e] Gulf of Maine Stock.
[f] Considers range as Nova Scotia south to Jamaica. However, there have been recent sightings in Orphan Basin.

Table 5.12. Numbers of Marine Mammal Sightings Made during Monitoring in the Orphan Basin (2004, 2005) and Jeanne d'Arc Basin (2004, 2005).

	No. of Sightings (individuals)			
Species	**Jeanne d'Arc Basin, Fall 2005**	**Jeanne d'Arc Basin (Husky Study Area), early summer 2004 [a]**	**Orphan Basin, summer 2004 [b]**	**Orphan Basin, late spring-early fall 2005 [d]**
Baleen Whales				
Humpback Whale	59 (79)	0	13 (30)	36 (111)
Blue Whale	0	0	0	0
Fin Whale	16 (22)	0	9 (16) [c]	16(24)
Sei Whale	0	0	6 (9) [c]	15(24)
Minke Whale	9 (9)	0	6 (6)	8(8)
Toothed Whales				
Sperm Whale	0	0	5 (5)	32(47)
Northern Bottlenose Whale	0	0	3 (9)	7(21)
Sowerby's Beaked Whale	0	0	0	1(4)
Bottlenose Dolphin	0	0	0	1 (15)
Killer Whale	1 (6)	0	0	0
Long-finned Pilot Whale	2 (16)	1 (16)	43 (597)	101 (1713)
Short-beaked Common Dolphin	4 (61)	0	0	9 (88)
Atlantic White-sided Dolphin	6 (128)	1 (6)	4 (70)	18 (304)
White-beaked Dolphin	2 (23)	0	1 (5)	6 (52)
Harbour Porpoise	1 (2)	0	1 (2)	9(24)
Risso's Dolphin	0	0	0	0
Striped Dolphin	0	0	1(4)	2 (15)
True Seals				
Harp Seal	0	0	1 (2)	5(603)
Hooded Seal	0	0	0	0
Grey Seal	0	0	0	0

[a] Sightings (systematic and incidental) in the Husky Study Area (see Lang and Moulton 2004).
[b] Sightings during systematic watches in 'Overall Area' (see Moulton et al. 2005).
[c] There were 12 sightings (18 individuals) of whales that were either fin or sei whales that are not included here.
[d] There were 15 sightings (24 individuals) of whales that were either fin or sei whales that are not included here.

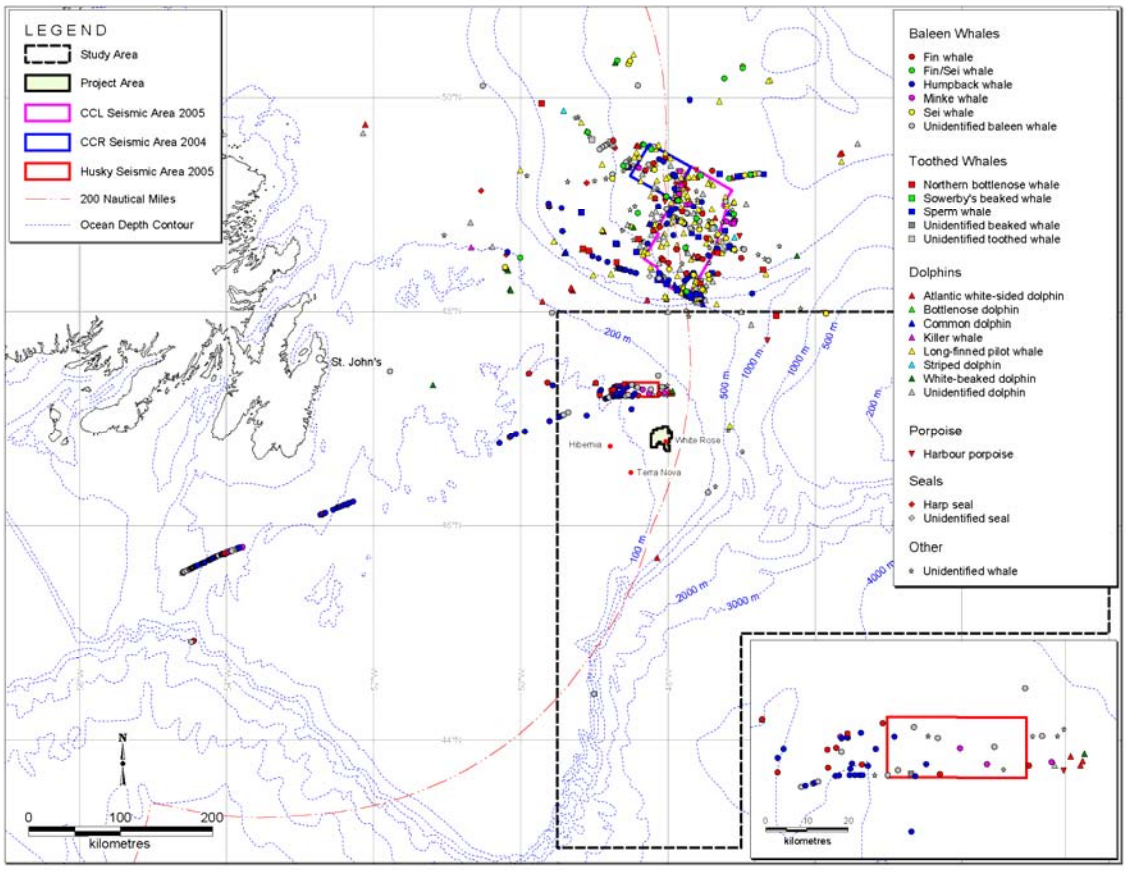

Figure 5.34. Marine Mammal Sightings made during Recent Monitoring Programs in and near Husky's Study Area.

3. Observations conducted by a biologist aboard the CCGS *Hudson* as it sailed from Dartmouth, NS along the Scotian Shelf and the southern Grand Banks to the Orphan Basin (Lang and Moulton 2004). In total there were 61.7 h of observations along 485 km during 24 June to 7 July 2004. Of this effort, 25.5 h and 36.2 h occurred when the ship was stationary and moving, respectively. In total, there were 20 sightings of 116 marine mammals during systematic watches and incidentally.
4. Chevron Canada Resource's 3D seismic program in Orphan Basin where MMOs conducted 1,198 h of observation along 10,541 km from the SR/V *Veritas Vantage* from 26 June to 18 September 2004 (Moulton et al. 2005). In total, there were 151 sightings of 1,397 marine mammals during systematic watches from the Vantage.
5. Chevron Canada Limited's 3D seismic program in Orphan Basin where MMOs conducted 2,656 h of observation along 22,664 km from two seismic vessels (M/V *Geco Diamond* and *Western Patriot*) from 12 May to 10 October 2005 (Moulton et al. 2006b). In total, there were 409 sightings of 3,554 marine mammals during systematic watches.

Of these sources of information, the most relevant source is the seismic monitoring conducted in Jeanne d'Arc Basin in fall 2005. Unfortunately, these data are of limited seasonal scope[2]. Marine mammal data acquired in Orphan Basin, where water depths greatly exceed those in the Project Area, are most relevant to deep water portions of the Study Area.

5.8.1 Mysticetes

Five species of mysticetes or baleen whales that are known or suspected to occur in the Study Area include the blue, fin, sei, humpback and minke whale (Table 5.10). It is possible, but highly unlikely, that a North Atlantic right whale may occur in the Project Area. Although nearly all of these species experienced depletion due to whaling, it is likely that many are experiencing some recovery (Best 1993). Humpback, fin and minke whales commonly occur in Jeanne d'Arc Basin during summer and early fall (Parsons and Brownlie 1981; Lang et al. 2006) with fewer occurrences during winter and early spring. Blue whales have not been identified in the Project Area but have been sighted in the southern portion of the Study Area and at the Tail of the Grand Banks (DFO, unpubl. data; Parsons and Brownlie 1981). More information about blue whales is provided in Section 5.8.4.1.

Sightings of baleen whales made during monitoring programs in 2004 and 2005 in and near the Study Area are shown in Figure 5.35.

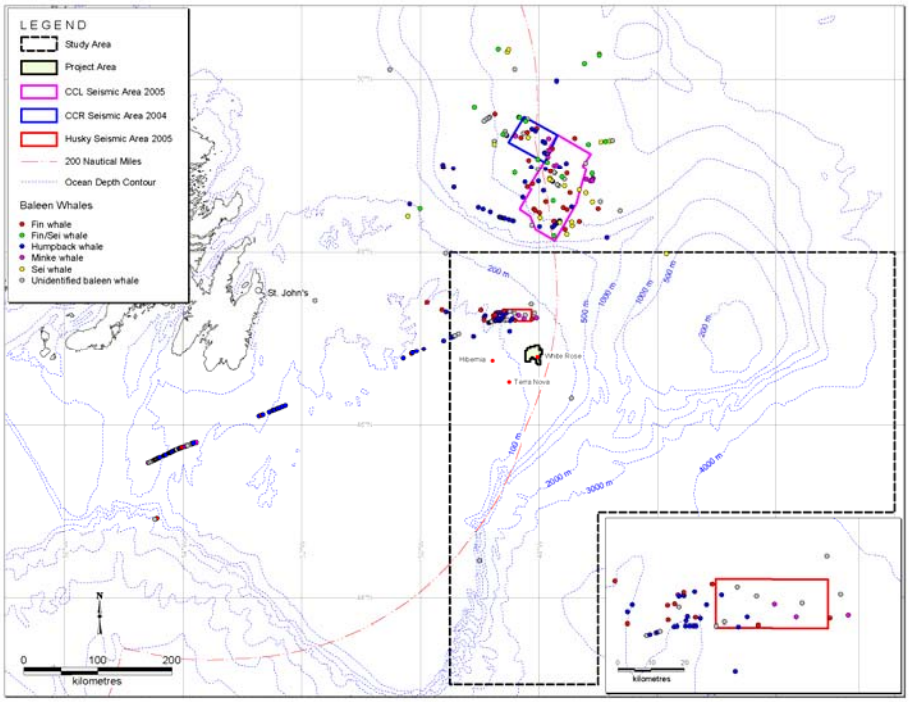

Figure 5.35. Baleen Whale Sightings made during Recent Monitoring Programs in and near Husky's Study Area.

[2] An environmental monitoring program for Husky's 2006 seismic survey in Jeanne d'Arc Basin will provide marine mammal data for the summer period.

5.8.2 Odontocetes

At least 12 species of odontocetes or toothed cetaceans are known or suspected to occur in the Study Area (Table 5.10), including dolphins and larger toothed whales.

The most common odontocete in and near the Study Area is the long-finned pilot whale which likely occurs year-round (Parsons and Brownlie 1981; Moulton et al. 2004, 2005; Lang et al. 2006). Common, Atlantic white-sided, and white-beaked dolphins also occur regularly in the Study Area and available data suggests they are most abundant during summer months (Parsons and Brownlie 1981) but there have been few surveys outside of this time period. In recent years, striped dolphins have been observed north of the Study Area in Orphan Basin and bottlenose dolphins have been observed in the Study Area (Table 5.12; Figure 5.36); both species likely occur in low numbers. Killer whales are thought to occur in relatively small numbers year-round in the Study Area (Lien et al. 1988). A recent sighting was made in Jeanne d'Arc Basin in June 2006 near White Rose (T. Lang, LGL Ltd., pers. comm.). Although Risso's dolphins have not been identified during recent monitoring programs in and near the Study Area; however, they may occur in low numbers.

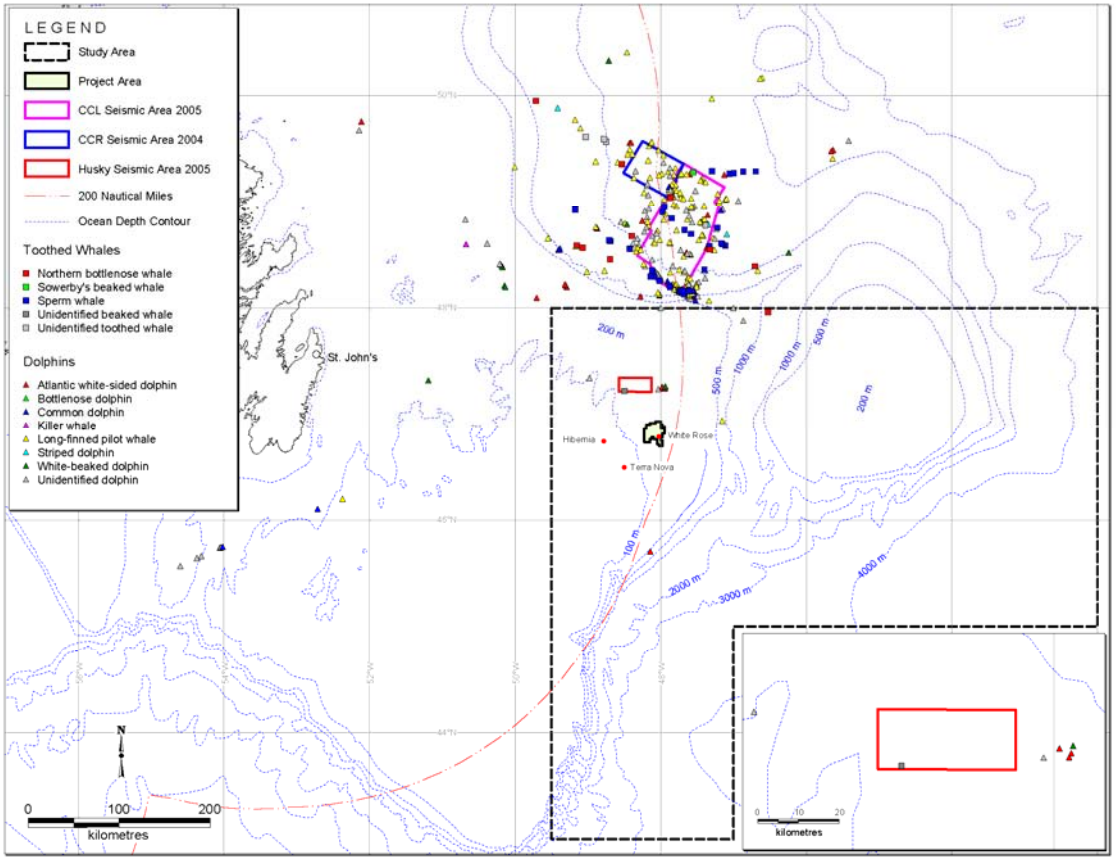

Figure 5.36. Toothed Whale Sightings made during Recent Monitoring Programs in and near Husky's Study Area.

Sperm whales have been observed during summer and early fall just north of the Study Area in the slope waters adjacent to Orphan Basin and in the deeper waters of Orphan Basin (Moulton et al. 2005, 2006b). This species likely occurs in the deeper waters of the Study Area but is unlikely to occur in the Project Area given its shallower water depths. Similarly, the beaked whale species northern bottlenose whale and Sowerby's beaked whale have been observed deep waters (>1000 m) in and near the Study Area, but in much lower numbers than the sperm whale (Table 5.12). Harbour porpoise occur in and near the Study Area and have recently been sighted during summer months in Orphan Basin (Moulton et al. 2005, 2006b) and Jeanne d'Arc Basin (Lang et al. 2006). However, they seem to occur in low numbers (Table 5.12).

5.8.3 Phocids

Three species of seals are known or suspected to occur in the Study Area including harp, hooded, and grey seals (Table 5.10). Other seal species (ringed, harbour, and bearded) may occur rarely. Harp seals are likely the most common phocid in the Study Area as the Grand Banks may be an important wintering area (Stenson and Kavanagh 1994; Stenson and Sjare 1997). Several harp seal sightings (including several large groups) were observed in Orphan Basin during the summers of 2004 and 2005 (Moulton et al. 2005, 2006b). Hooded seals occur periodically in the Study Area and the Grand Banks is suspected to be an over-wintering area for this species (Stenson and Kavanagh 1994); no hooded seals were identified during recent seismic monitoring programs (Table 5.12). Grey seals may occur in the Study Area but the number that occurs there is believed to be low.

5.8.4 Profiles of *SARA*- and COSEWIC-Listed Marine Mammals

5.8.4.1 Blue Whale

The blue whale is a cosmopolitan baleen whale species with separate populations (and subspecies) in the North Atlantic (*B.m. musculus*), North Pacific (*B.m. brevicauda)*, and Southern Hemisphere (*B.m. intermedia*). The global population is thought to range from 5,000-12,000 individuals but a recent and reliable estimate is not available. Blue whale abundance in the North Atlantic is currently thought to range from 600 to 1,500 individuals, although more reliable and wide-ranging surveys are required for better estimates (Sears and Calambokis 2002). Blue whales concentrate in areas with large seasonal concentrations of euphausiids, its main prey (Yochem and Leatherwood 1985). Little is known about the distribution and abundance of blue whales in the northwest Atlantic—especially the waters off eastern Newfoundland. One area of blue whale concentration is the Gulf of St. Lawrence where 350 individuals have been catalogued photographically (Sears 2002).

There are insufficient data to determine population trends of the blue whale in the northwest Atlantic. The blue whale is considered endangered by COSEWIC (COSEWIC 2002) and is listed as such on Schedule 1 of the *SARA*. Accordingly, a Recovery Strategy is being developed under *SARA* and is likely due for release in the near future (J. Lawson, DFO, pers. comm.) On a

global level, the IUCN—World Conservation Union, also considers the blue whale endangered (www.redlist.org). The original population was reduced due to whaling and now their biggest threats are thought to be from ship strikes, disturbance from increasing whale watching tours, entanglement in fishing gear, and pollution (Sears and Calambokidis 2002).

Blue whales have a coastal and pelagic distribution and they are known to frequent areas of the Gulf of St. Lawrence, the lower Estuary part of the St. Lawrence, and to a lesser extent the west and southwest coasts of Newfoundland. Most sighting effort and sightings of blue whales have been made along the Quebec North Shore from the Mingan and Anticosti islands region, off the Gaspé Peninsula, and west into the St. Lawrence Estuary to the Saguenay River (Sears and Calambokidis 2002). Little survey effort has been expended in other regions of the Gulf or elsewhere in the northwest Atlantic, especially outside of the summer period. Information on the distribution of blue whales in winter is lacking. Some blue whales become entrapped by ice (during heavy ice years) near the southwest coast of Newfoundland (Stenson et al. 2003). Records of entrapped blue whales date back to 1868 and 41 individual blue whales (23 entrapment events) have been recorded since then. All entrapments with available date information occurred during March and April and based on morphometric analyses most whales were adults and one whale was a pregnant female (Stenson et al. 2003). There have been no confirmed sightings of blue whales in or near the Husky Project Area (Figure 5.37) based upon available data provided by DFO. However, there was a sighting in the Study Area made in June 1993, approximately 270 km south of the Project Area. Based upon the DFO sighting database, most sightings of blue whales in Newfoundland have occurred near the coast, which may, in part, be related to the lack of dedicated marine mammal surveys in offshore waters. Blue whales were regularly sighted in offshore waters (~100-3,000 m deep) of the Laurentian sub-basin area during a recent seismic monitoring program in June to September 2005. In fact, blue whales were the most frequently sighted baleen whale species. Sighting rate of blue whales was highest in water depths ranging from 2,000-2,500 m (Moulton et al. 2006c). However, no blue whales were sighted in the deep waters of the Orphan Basin during seismic monitoring programs conducted during the summers of 2004 (Moulton et al. 2005) and 2005 (Moulton et al. 2006b). No blue whales were sighted during a seismic monitoring program in the Jeanne d'Arc Basin in October and November 2005 (Lang et al. 2006); baleen whales are typically less abundant on the Grand Banks in late fall vs. summer. It is possible that blue whales may occur in and near the Husky Project Area but numbers are expected to be low.

In the Northern Hemisphere, blue whales mate and calve from late fall to mid-winter and become sexually mature at the ages of 5-15 (Yochem and Leatherwood 1985). Blue whales are thought to live for 70-80 years and potentially longer (Yochem and Leatherwood 1985).

Blue whales feed almost exclusively on euphausiids (krill) such as Thysanoessa raschii and Meganyctiphanes norvegica (Yochem and Leatherwood 1985). Blue whales also feed on copepods (e.g., *Temora longicornis*) and some fish species (Kawamura 1980; Reeves et al. 1998). Areas where blue whales are known to occur correspond to areas where their prey aggregate in great abundance (Simard and Lavoie 1999).

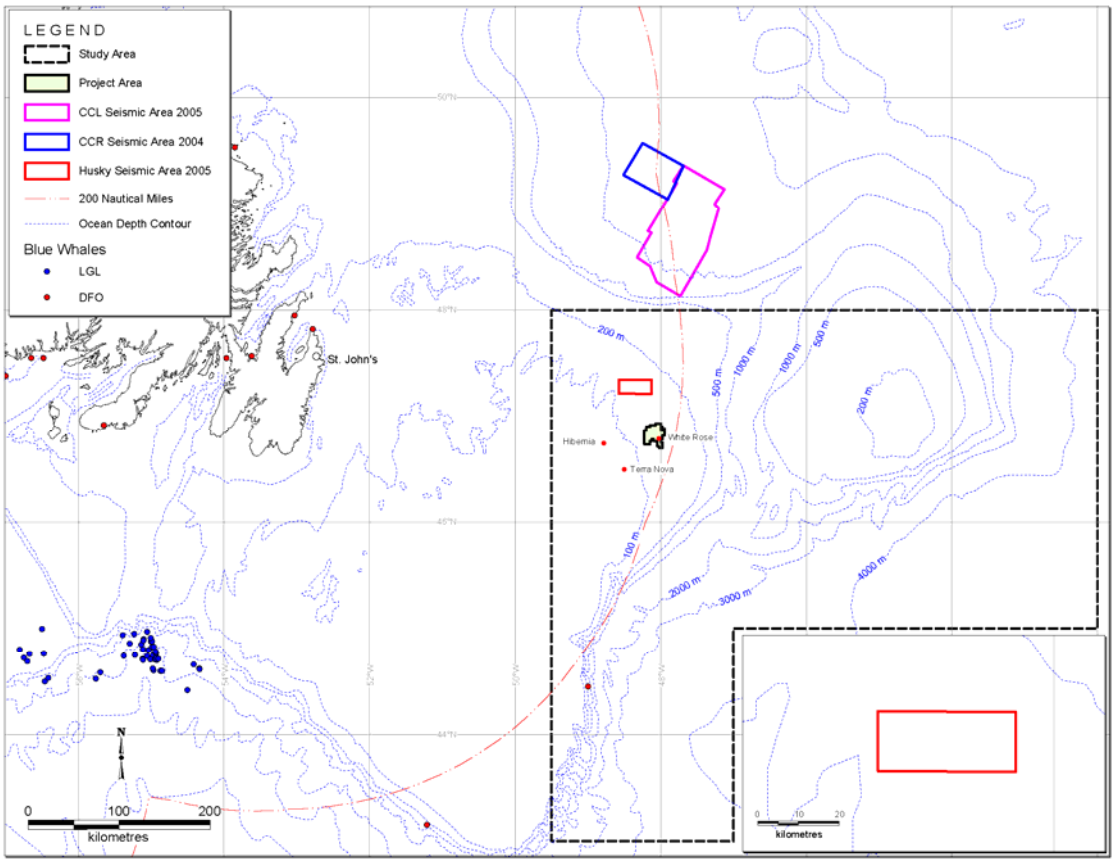

Figure 5.37. Location of Blue Whale Sightings Relative to Husky's Project and Study Areas (data from DFO marine mammal database and Moulton et al. 2006a).

5.8.4.2 Fin Whale

The Atlantic population of fin whale was recently reassessed as special concern by COSEWIC (COSEWIC 2005) and is has no status under *SARA* but is under consideration for addition to Schedule 1. On a global level, the IUCN—World Conservation Union, considers the fin whale endangered (www.redlist.org). The original population was greatly reduced due to whaling and now one of their biggest threats is from ship strikes (Laist et al. 2001).

The fin whale is a cosmopolitan baleen cetacean with separate populations (and subspecies) in the Northern Hemisphere (*B. physalus physalus*) and Southern Hemisphere (*B. physalus quoyi*) (Aguilar 2002). Fin whales in the North Atlantic are thought to be divided into several subpopulations (Bérubé et al. 1998). Genetic studies indicate that fin whale populations that summer in Nova Scotia, Newfoundland and Labrador, and Iceland may be genetically distinct from each other (Arnason 1995). Fin whale abundance in the western North Atlantic is currently thought to be 2,814 individuals (CV = 0.21). Surveys used to derive this estimate are based on areas between Georges Bank and the mouth of the Gulf of St. Lawrence and it is acknowledged that more reliable and wide ranging surveys are required for better estimates (Waring et al.

2004). There are no reliable estimates for the number of fin whales in the NL stock. There is insufficient data to determine population trends of the fin whale in the northwest Atlantic, including the NL stock.

Fin whale migration is assumed to occur between foraging grounds in high latitudes and calving/breeding grounds in lower latitudes but little is known about their wintering and calving/breeding grounds (Reeves et al. 2002). Like the blue whale, little is known about fin whale distribution in the offshore waters of northwest Atlantic, including the Study Area. On the Grand Banks, the fin whale is associated with the presence of capelin, their predominant prey item in these waters (Piatt et al. 1989; Whitehead and Carscadden 1985). According to the DFO cetacean sightings database, these common visitors to the Study Area have been sighted most often inside the EEZ in both Divisions 3K and 3L, particularly 3L. In 2004 and 2005, fin whales were commonly sighted in the deep waters (typically >2,000 m) of Orphan Basin, north of the Study Area during summer months, most commonly in July and August (Moulton et al. 2005, 2006b). Fin whales were commonly sighted in the Study Area near the "Husky Seismic Area 2005" (Figure 5.35) during a monitoring program in October and November 2005. They were sighted in water depths ranging from 73-140 m and were the second most abundant mysticete (humpback whales were most common) observed. It is likely that fin whales commonly occur in the Study Area at least during late spring to fall. Little is known about their winter distribution although fin whales were observed incidentally during aerial surveys for seabirds during December and January on the Grand Banks (Brownlie and Parsons 1981).

Fin whales become sexually mature at 5-15 years old and physically mature at about 25 years old. Conception and calving are thought to occur in the winter at low latitudes. The gestation period is 11-12 months and calves are weaned after about six months (COSEWIC 2005).

Fin whales have a varied diet and are known to feed on euphausiids and schooling fish such as capelin, herring, and sand lance (Edds and Macfarlane 1987; Borobia et al. 1995; COSEWIC 2005).

5.8.4.3 Sowerby's Beaked Whale

Sowerby's beaked whales are considered of 'special concern' by COSEWIC and are listed as such on Schedule 3 of *SARA*. The COSEWIC status report published in 1989 is under review.

Sowerby's beaked whale is also known as the North Sea beaked whale because its distribution appears to be centered there, based on numbers of strandings. In the 1980s, two mass strandings were recorded on the northeast coast of Newfoundland. One involved three animals and the other involved six (Katona et al. 1993). The Husky Study Area lies within the known range of the Sowerby's beaked whale. This beaked whale is also a deep-sea diver that occurs mainly in areas where water depth is 1000 m or more. The life history of the Sowerby's beaked whale is not well understood and most Newfoundland records of it involve carcasses washed ashore.

Mesoplodont whales, like the Sowerby's beaked whale, are thought to only rarely stray over the continental shelf (Pitman 2002). Based on stomach contents of stranded mesoplodont whales, it is thought that they feed primarily on mesopelagic squid (e.g., Gonatus spp.; Pitman 2002).

No Sowerby's beaked whales were observed during the 2004 monitoring program in Orphan Basin (Moulton et al. 2005) or during the Hudson cruise in and near the Study Area (Lang and Moulton 2004). Sowerby's beaked whales were also not identified during the fall 2005 seismic monitoring program in Jeanne d'Arc Basin (Lang et al. 2006). During the 2005 seismic monitoring program in Orphan Basin, overall (2,656 h of observations), there was one sighting of four Sowerby's beaked whale in September. It occurred in 2500 m of water (Figure 5.36).

5.8.4.4 Harbour Porpoise

The northwest Atlantic population of harbour porpoise was designated by COSEWIC as 'threatened' in April 1990 and in May 2003, it was downlisted to 'special concern' (COSEWIC 2003). The harbour porpoise is widely distributed throughout temperate waters of the Northern Hemisphere, but its population size in Newfoundland waters is unknown (Gaskin 1992b). Harbour porpoises that occur in Newfoundland waters are believed to belong to a separate stock from those in the Gulf of St. Lawrence and Bay of Fundy/Gulf of Maine regions. This is supported by differences in organochlorine contaminant levels, which are lower in Newfoundland animals (Westgate and Tolley 1999), and by differences in mitochondrial DNA haplotype frequencies (Wang et al. 1996). There are estimates of harbour porpoise population size that encompasses their complete range in eastern Canada and there no abundance estimates for NL (DFO 2001).

Harbour porpoises are known to occur in the Study Area (e.g., Lang et al. 2006) but overall, distributional data for harbour porpoises in NL is limited (COSEWIC 2003). During the seismic monitoring program for Husky in fall 2005, there was one sighting of harbour porpoise (two individuals) in Jeanne d'Arc Basin (Figure 5.34) just north of the Project Area in a water depth of 165 m. Harbour porpoise have also been sighted in deep waters of Orphan Basin, north of the Study Area. During the 2005 monitoring program in Orphan Basin, overall (2,656 h of observations), they were nine sightings consisting of 24 individuals in water depth ranging from 787 to 2,633 m (Figure 5.34). Seven out nine of sightings occurred in July.

Harbour porpoise become sexually mature at around three years old. Conception and calving occur in late spring or early summer. The gestation period is 10-11 months and calves are weaned after about eight months (COSEWIC 2003).

The diet of harbour porpoises in Newfoundland (determined from by-caught porpoises) consisted primarily of capelin, Atlantic herring, sand lance and horned lantern fish (COSEWIC 2003).

5.9 Sea Turtles

Sea turtles are probably not common in the Project or Study Area but are important to consider given that they are considered at risk, both nationally and internationally. The three species of sea turtle that may occur in the Study Area includes the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and Kemp's ridley (*Lepidochelys kempi*) turtle (Ernst et al. 1994). Of these three species, the leatherback turtle is most likely to occur in the Study Area. This species is listed under Schedule 1 of *SARA* as endangered and is discussed in more detail below.

5.9.1 Profiles of *SARA*- and COSEWIC-Listed Sea Turtles

5.9.1.1 Leatherback Sea Turtle

Leatherback sea turtles are considered endangered by COSEWIC and are listed as such on Schedule 1 of *SARA*. A proposed Recovery Strategy was released by DFO in June 2006 (ALTRT 2006). The leatherback is the largest living turtle (2.2 m in length and over 900-kg (Morgan 1989)) and it also may be the most widely distributed reptile, as it ranges throughout the Atlantic, Pacific, and Indian oceans and into the Mediterranean Sea (Ernst et al. 1994). Adults engage in routine migrations between temperate and tropical waters, presumably to optimize both foraging and nesting opportunities.

The worldwide population of leatherbacks is currently estimated at between 26,000 and 43,000 nesting females (Spotila et al. 1996). The current population is thought to be declining as major nesting colonies have declined in the last 20 years, although an increase in leatherbacks nesting in Florida has been reported in the last few years (Dutton et al. 1999). Despite its patchy worldwide distribution and in contrast to other sea turtles, adult leatherbacks are regularly sighted in the waters off Nova Scotia and Newfoundland from June to November (with peak abundance in August), where they likely come to feed on jellyfish, their primary prey (Bleakney 1965; Cook 1981). The scattered nature of the data makes estimating the number of turtles in the Canadian Atlantic difficult. However, the North Atlantic Leatherback Turtle Working Group (NALTWG), created in 1997, is currently conducting research on the distribution and abundance of the leatherback. More leatherbacks visit waters near the Study Area than was once believed.

Leatherbacks, both adults and juveniles, undergo annual migrations that include areas off southern Newfoundland (James et al. 2005). The analysis of satellite telemetry, morphometric and fishing entanglement data identified areas of high-use habitat of leatherbacks in Northwest Atlantic waters. It was shown that leatherbacks do not migrate along specific routes but that they utilize broad areas of the Atlantic. Leatherback sea turtles did exhibit foraging site fidelity to shelf and slope waters off Canada and the northeastern United States (James et al. 2005). Satellite-tagged leatherbacks (caught off Cape Breton) mostly occurred well southwest of the Project Area during June to October (although some southward migrations did not begin until December; James et al. 2005). It is possible that leatherbacks may occur in the Project Area. However, to date, no sea turtles have been reported in the near the Terra Nova Development by

observers on various platforms (U. Williams, Petro-Canada, pers. comm.). Also, no leatherbacks were sighted during Chevron's seismic monitoring program in the Orphan Basin in 2004 and 2005 and during Husky's seismic monitoring program in Jeanne d'Arc Basin in fall 2005 (Moulton et al. 2005, 2006b; Lang et al. 2006).

Data from the US pelagic longline fishery observer program have also added to the knowledge of leatherback distribution off Newfoundland (Witzell 1999). Nearly half of the leatherbacks (593 captures) caught incidentally by this fishery between 1992 and 1995 from the Caribbean to Labrador were captured in waters on and east of the 200 m isobath off the Grand Banks (Witzell 1999). Animals were caught in this region during all months from June to November, with the bulk of captures from July to September. Not surprisingly, leatherback captures within these waters corresponded closely with fishing effort, both clustered near the 200 m isobath.

The apparent common northerly occurrence of this species compared to other sea turtles may be attributed to an ability to maintain body temperatures of 25ºC in sea water as much as 18ºC cooler. An adult was even observed by fishermen in Trinity Bay, Newfoundland swimming amongst ice (Goff and Lien 1988). Twenty leatherbacks were reported off Newfoundland between 1976 to 1985, 14 were entangled in fishing gear (Goff and Lien 1988).

Little is known about the biology of the leatherback. It nests from April through November in the tropics along sandy beaches. Females deposit an average of five to seven nests per year, with clutch size averages varying geographically (Plotkin 1995). Nothing is known about the behaviour or survivorship of post-hatchlings. Loss of nesting habitat due to development and erosion, predation by animals, and poaching of adults and eggs for consumption inhibit the recovery of this species. Ingestion of plastic materials, which leatherbacks presumably mistake for jellyfish is common and can be fatal. The loss of individuals (primarily through net entanglement) in the Canadian Atlantic is not known to critically contribute to population decline (Cook 1981).