

Some Biological Correlates of Environmental Conditions Around Newfoundland During 1970-79: Harp Seals, Blue Whales and Fulmar Petrels

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Abstract

The location of whelping herds of harp seals, *Pagophilus groenlandicus*, off Labrador may be offshore, when cold northwest winds in February produce severe ice conditions and much pack ice, or inshore near the coast, when warmer easterly winds produce light ice conditions. In the Gulf of St. Lawrence, severe ice conditions result in suitable ice for whelping seals northwest of Magdalen Islands, whereas very little ice results in whelping near or on the beaches along the north coast of Prince Edward Island. The relative locations of whelping sites were highly correlated during the 1950's, 1960's and 1970's, with the most severe ice conditions in both areas during the early to mid 1970's.

The unusual stranding of one to three blue whales annually in February or March of 1974-77 along western Newfoundland probably reflects the severity of ice conditions in the area due to northwest winds. Moreover, the southward extension of the fulmar petrel, a cold-water species, to breeding sites in southern Labrador and eastern Newfoundland during 1972-77 may be related to the unusually strong flow of the Labrador Current, as indicated by lower-than-normal surface and subsurface temperatures at Station 27 off St. John's, Newfoundland, and at the Magdalen Islands during the early to mid 1970's.

Introduction

An analysis of the locations of whelping sites of harp seals on the icefields off eastern Canada from year to year over the last 3 decades (1950-81) indicated that the 1970's was a period of unusually severe ice conditions. These and other unique behavior patterns of sea mammals and sea birds in the area during the 1970's are documented here and related to marine climatic change. The location of place names mentioned in the text are shown in Fig. 1.

Results

Whelping sites of harp seals

Harp seals, *Pagophilus groenlandicus*, give birth on pack ice off eastern Canada in large concentrations (about 100,000 adult females per group) at about the time in late winter when daytime ice melting exceeds nighttime freezing of the open water leads, giving the animals entry to areas of 7/10 pack ice (Sergeant, 1965, 1976). Mass whelping in the Gulf of St. Lawrence occurs during the last few days of February and off Labrador during the first 10 days of March, with a positive skew of the distribution of births over 20-30 days.

In the Gulf of St. Lawrence, the main whelping area is generally northwest of Magdalen Islands (about 47°50'N, 60°00'W). The normal pattern of drift (Fig. 2)

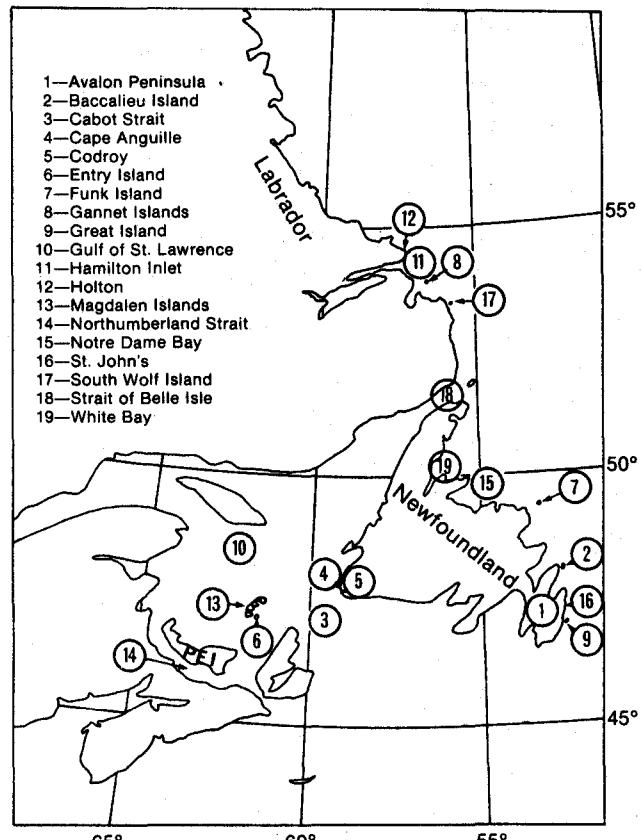


Fig. 1. Map showing the locations of place names mentioned in the text.

is eastward with the Gaspe Current north or south around the Magdalen Islands but more commonly around the north side. The duration of drift from the whelping site to ice destruction near Cabot Strait generally coincides with the period of 20–30 days during which the young seals complete their development to normal independent swimming. However, in years of abnormally restricted ice conditions, the females find no ice in the normal whelping area or thin ice that is easily compacted southward towards Prince Edward Island by northeasterly winds. Such conditions occurred in the winter of 1981 when the seals whelped on the beaches along the north coast of Prince Edward Island and also in 1969 when they whelped on the same beaches and in Northumberland Strait on any available pack or shore ice. Some mortality of pups occurred on the north coast of Prince Edward Island in 1981, perhaps due to drowning, although some young animals may have been crushed against the shore by rafting ice.

Off the Labrador coast, the largest whelping generally occurs in an area 20–80 km from the coast at about 53° 30'N (Fig. 2). The normal pattern of drift is southward with the Labrador Current into the White Bay-Notre Dame Bay area where the ice may stagnate, into the Strait of Belle Isle or eastward of Funk Island. In years of restricted ice conditions off Labrador due to northeasterly winds in February, the seals whelp at much the same latitude as usual but on available shore ice or rafted pack ice near the coast in the vicinity of South Wolf Island or Gannet Islands (53° 57'N, 56° 30'W). When ice conditions are exceptionally restricted, as in 1969 and 1981, the distribution of whelping seals extends into the outer part of Hamilton Inlet. During an aerial survey in March 1960, whelping was observed on shore ice and there were some animals in the water south of Holton (54° 30'N, 57° 20'W), but no whelping was observed on ice to the northwest despite a thorough search. This northern Labrador ice appears to be unsuitable for harp seal whelping due to the absence of open water leads between the shore ice and pack ice. The seals use such leads in seeking whelping sites seaward on pack ice, but they whelp on shore ice if pack ice is not available.

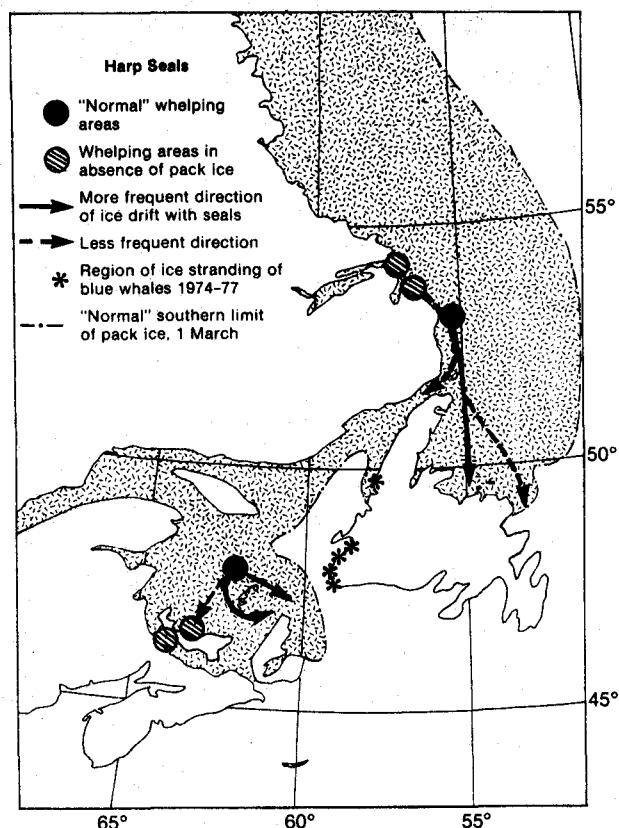


Fig. 2. Distribution of whelping sites of harp seals and their ice-drift under different weather and ice conditions, and locations of ice-strandings of blue whales during 1974–77. (Ice limits from Environmental Canada, Atmospheric Environmental Service, Ice, Summary and Analysis, Eastern Canadian Seaboard, 1964–1971.)

Classification of the major whelping sites in the Gulf of St. Lawrence and off Labrador by "offshore" and "inshore" categories during the 1950's, 1960's and 1970's (Table 1) was made from data drawn from several sources, including aerial photographic surveys, observations from sealing ships and icebreakers, aerial observations from searching flights, and helicopter-borne marking expeditions. Some judgment was necessary in a few cases when intermediate conditions existed. The analysis shows that "offshore" whelping,

TABLE 1. Frequencies of severe and light ice conditions in the Gulf of St. Lawrence (Gulf) and off Labrador (Front) during 1950–81 for years when ice conditions were known or deduced from locations of whelping herds of harp seals.

Area	Ice condition category (main whelping area)	Ice condition frequency (years)			
		1950–59	1960–69	1970–79	1980–81
Gulf	Severe (Magdalen I.)	3	3	10	1
	Light (Prince Edward I.)	2	3	0	1
	Total	5	6	10	2
	% severe	60	50	100	(50)
Front	Severe (offshore)	4	4	9	1
	Light (inshore)	3	5	1	1
	Total	7	9	10	2
	% severe	57	44	90	(50)

reflecting the prevalence of cold, high-pressure systems with northwest winds in late February and early March, was more frequent in the 1970's than in the two previous decades in both areas. In 20 of the 22 seasons for which information on whelping sites was available for both areas, the same category ("offshore" or "inshore") was assigned, reflecting a high degree of similarity of weather conditions in both areas. Most significantly, the extreme scarcity of ice in both areas in 1969 and 1981 resulted in whelping along the north shore of Prince Edward Island in the Gulf of St. Lawrence and in the entrance to Hamilton Inlet on the Labrador coast.

Ice stranding of whales

A number of cold-adapted whales usually enter Newfoundland coastal waters in early spring and may be stranded (i.e. forced to the shore) by adverse ice conditions. The species so affected include the white-beaked dolphin, *Lagenorhynchus albirostris* (Sergeant and Fisher, 1957), the killer whale, *Orcinus orca* (Dearden, 1958; Mitchell, 1976), the fin whale, *Balaenoptera physalus* (Sergeant et al., 1970), and the blue whale, *Balaenoptera musculus* (Mitchell, 1975, 1976, 1977, 1978). These strandings have occurred around the Avalon Peninsula and along the west coast of Newfoundland in early spring. The animals apparently become trapped by ice after entering a tongue of open water which extends northward around the southwest corner of Newfoundland (Fig. 2) in early spring. This phenomenon has been known since Reeks (1871) described the stranding of five blue whales near Codroy in 1868.

Strandings of blue whales in 1974-77 and killer whales in 1975 (Mitchell, 1975, 1976, 1977, 1978)

occurred along the southern part of the west coast of Newfoundland (Table 2). The whales apparently entered the Gulf of St. Lawrence on the northern (open-water) side of Cabot Strait and became stranded by ice forced against the coast by northwest winds. Most of these strandings occurred near Cape Anguille (about 48° N, 59° W) between 18 February and 18 March for animals observed alive, some of which died while others freed themselves temporarily. Some carcasses were also observed at later dates in the ice at localities in this area and northward. This unusual series of strandings seems to reflect unusually severe ice conditions in the Gulf of St. Lawrence during the mid-1970's.

Blue whales have long been known to enter the Gulf of St. Lawrence very early in the spring (Kellogg, 1929) when an abundance of spawning euphausiids, *Thysanoessa* sp. (Berkes, 1976), provides a good food supply. They have been observed in the Gulf from April (Whoriskey and Montgomery, 1981) until November (Mitchell, 1975), being rather common along the north shore during the summer months (Sears, 1980). They therefore exploit the entire open-water period in the Gulf, moving in summer to areas of water mixing with enhanced productivity. Blue whales are much less common off Labrador and eastern Newfoundland (Sergeant, 1966).

Southward extension of nesting fulmar petrels

Brown (1968, 1970) and Brown et al. (1975) have shown that fulmar petrels, *Fulmarus glacialis*, occur abundantly off eastern Newfoundland throughout most of the year except in months (July-September) of highest surface water temperatures when they are displaced northward to Canadian subarctic waters. In

TABLE 2. Observations on stranding of whales by ice in the Southwest Newfoundland area, 1974-77 (from Mitchell, 1975, 1976, 1977, 1978).

Year	Date	Type of whale	Number	Locality	Circumstances
1974	mid-Mar	Blue	3	(SW Nfld)	Trapped by ice, 2 died and 1 freed itself.
1975	23 Mar	Killer	2(male)	48° 12'N 59° 00'W	Stranded by ice, died after a few days.
	18 Apr	Blue	1	47° 52'N 59° 25'W	Long dead in ice.
1976	21 Mar	Blue	3	47° 42'N 59° 18'W	Trapped by ice, 1 died and 2 escaped.
	13 Apr	Blue	1	48° 32'N 58° 28'W	Washed up dead on the shore.
1977	22 Feb	Blue	3	Near Cape Anguille	Trapped in ice, 1 died and 2 escaped.
	18 Apr	Blue	1	49° 46'N 57° 53'W	Frozen in ice.

spite of this abundance, fulmars were not known to nest on the east coast of Labrador and Newfoundland up to and including the 1950's and 1960's, periods of good survey coverage of the coastal seabird colonies. However, nesting or its precursor, display on cliff ledges, was first discovered at Gannet Islands, Labrador ($53^{\circ} 57'N$, $56^{\circ} 32'W$), in 1972 (Nettleship and Lock, 1973), at Great Island near Witless Bay, southeast Newfoundland ($47^{\circ} 11'N$, $52^{\circ} 49'W$), in 1973 (Nettleship and Montgomery, 1974), and on Funk Island ($49^{\circ} 45'N$, $53^{\circ} 11'W$) and Baccalieu Island ($48^{\circ} 09'N$, $52^{\circ} 48'W$) by 1977 (Montevecchi et al., 1978). No fulmars were found to be nesting in the Witless Bay area when research of seabirds was being carried out there in 1967-69. All of the evidence indicates that colonization of nesting sites in southern Labrador and eastern Newfoundland began about 1972.

Conclusion

The three phenomena of the 1970's described above, i.e. increased whelping of harp seals offshore, strandings of whales at various localities in southeastern Newfoundland, and the southward extension of nesting fulmars, appears to have been related to the increased severity of ice conditions associated with colder weather patterns in the first half of the decade. This in turn may be related to increased flow of the Labrador Current and consequently reduced water temperatures both in the Gulf of St. Lawrence and off eastern Newfoundland during 1972-76, as evidenced by lower than normal surface temperatures at Entry Island, Magdalen Islands, and also at Station 27 off St. John's (Trites, 1982). Surface temperatures at Station 27 were equally low during the late 1950's (Trites, 1982), but the volume of cold water was probably less as the water temperature at 150 m was not as low as in the early to mid-1970's.

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