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

by

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Abstract

Harp seals Pagophilus groenlandicus give birth en masse on medium winter pack ice in the southern Gulf of St Lawrence in late February and off the southern Labrador coast ("Front" ice) at 53 to 54° N Lat. in early March. Location of birth sites (whelping patches) may be offshore or inshore, depending on the amount of ice, which itself depends on whether the weather pattern in February has been cold with NW winds, or warm with E winds resulting from the passage of low pressure systems through the Gulf of St. Lawrence and the NE Newfoundland -S. Labrador region. Distribution of whelping sites, offshore or inshore, is highly correlated in the two subregions in the same year. In the 1970's whelping sites were offshore in 90% of years (9/10 yrs Front, 10/10 yrs Gulf) indicating consistently severe winters, while in the 1950's and 1960's there were 40 to 60% of inshore whelping sites indicating persistent easterly winds in late February.

Large whales become caught and stranded from time to time by pack ice in SW Newfoundland in early spring as they enter the tongue of open water which extends into this region. In the 4 years 1974 - 1977, one to three blue whales Balaenoptera musculus were stranded by ice annually in this way in February or March. This unusual frequency of ice strandings probably reflects unusual severity of ice conditions with NW winds.

A southward extension of breeding of the fulmar petrel Fulmarus glacialis, a cold-water species, to breeding sites in southern Labrador and eastern Newfoundland in the period 1972 to 1977 may be related to an unusually strong flow of cold Labrador current water on this coast during the same period, as shown by low temperatures at the surface and at 150 m. at hydrographic station no. 27 off SE Newfoundland. The same low temperatures at the surface are seen at Entry I, Magdalen Is., during the early to middle 1970's.

Whelping Sites of Harp Seals

Harp seals Pagophilus groenlandicus give birth on medium winter pack ice off eastern Canada in large concentrations (ca.10^5 adult females per group) at about the time that daytime ice melting exceeds night time freezing in the leads of ice, giving the animals safe entry into ca. 7/10 pack ice (Sergeant 1965, 1976). In the Gulf of St. Lawrence mass whelping presently occurs in the last days of February and off the east coast of Labrador in the first 10 days of March, with a positive skew of distribution of births over 20 to 30 days.

Locations of whelping are relatively constant so far as ice conditions permit. In the Gulf of St. Lawrence the main whelping generally occurs NW of the Magdalen Is. at about 47° 50'N, 62° 00'W; on the Labrador coast, the largest whelping at about 53° 30'N and a variable distance, generally about 10-50 miles (20-80 km), from land.

The normal pattern of drift (Fig.1) is then: in the Gulf, for the seal patches to drift eastward in the Gaspe Current either north or south around the Magdalen Is., more commonly around the north side past Brion I. and Bird Rocks; on the Labrador coast (the "Front" ice), offshore southward in the Labrador Current to pass into the Notre Dame Bay - White Bay triangle where the ice may stagnate, into the Strait of Belle Isle, or east of Funk I. Since the position of whelping in the Gulf NW of the Magdalen Is. delays the drift eastward of the ice, so allowing the young seals to complete their 20-30 day development to normal independent swimming, this pattern of ice conditions must be considered "normal" over a relatively long evolutionary period.

However, in years of abnormally light ice conditions in the Gulf of St. Lawrence, harp seals find no ice in the normal area, or such ice is thin and easily compacted southward by northerly winds towards Prince Edward Island. Abnormally light ice conditions occurred notably in 1981, when the seals whelped on the beaches of the N coast of PEI, and in 1969 when they whelped on the same coast and in Northumberland Strait on any available pack or shore ice. In 1981 mortality of pups was noted on the PEI shore, perhaps due to drowning; however mortality can also occur close to land due to ice rafting against the rocks crushing the young animals, and this type of event also occurs when ice is restricted to close to land, as at the "Front" in 1962 and 1965.

In years of light ice conditions on the "Front" or Labrador coast, due to prevailing easterly winds in February, harp seals whelp at much the same latitude as usual but on available shore ice or rafted and frozen-together pack ice near shore, usually in the neighbourhood of South Wolf I. or the Gannet Is. (53° 57'N, 56° 30'W). Under exceptionally light ice conditions, as in 1969 and 1981, whelping distribution may extend into outer Hamilton Inlet. During an episode of whelping on shore ice observed from the air in March 1960, there were some additional animals in the water north of Holton (54° 30'N, 57° 20'W) but no whelping could be found on ice to the northwestward in spite of thorough search. This northern Labrador ice appears to be unsuitable for harp seal whelping due to absence of a flaw lead between shore and pack ice, which the searching animals use in order to seek a whelping site either seaward on pack ice, or shoreward on shore ice if no pack is available.

Table 1 shows an analysis of distribution of whelping sites through the 1950's, 1960's and 1970's in the two subareas by "offshore" and "inshore" categories. (Some intermediate conditions of course occur and judgments had to be made.) Data are drawn from many sources, including aerial photographic surveys of harp seal numbers, voyages on sealing ships and government icebreakers, government or industry survey flights, and helicopter-borne marking expeditions. The distribution shows that the "offshore" category, reflecting a prevalence of cold, high pressure systems with northwest winds in late February or early March, was more frequent in the 1970's then in the two previous decades in both areas.

An analysis shows that "offshore" and "inshore" sites are positively correlated for the two subareas in the same season in 20/22 of 90% of years, reflecting a similar set of weather conditions in both areas. Most dramatically, in both 1969 and 1981, extreme absence of ice in both areas brought about whelping at Prince Edward Island in the Gulf, and in outer Hamilton Inlet on the "Front".

Ice Stranding of Whales

A number of cold-adapted whales enter Newfoundland waters in early spring and may be stranded, i.e. forced to shore, by adverse ice conditions. Species so affected include white-beaked dolphin Lagenorhynchus albirostris (Sergeant and Fisher 1957), killer whales

Orcinus orca (Dearden 1958; Mitchell 1976), fin whales Balaenoptera musculus (Mitchell 1975, 1976, 1977, 1978). These strandings have taken place around the Avalon Peninsula and along the greater part of the west coast of Newfoundland in early spring. Notable is a tendency for ice-trapping in the tongue of open water which extends in early spring up the southwest coast of Newfoundland in early spring. The phenomenon has been known since Reeks (1871) described a stranding of 5 blue whales near Codroy in 1868.

In the four consecutive years 1974 to 1977 there were annual strandings of this kind involving from 1 to 3 blue whales (Table 2) as well as 2 adult male killer whales in 1976 (Mitchell 1975, 1976, 1977, 1978). Blue whales, entering the Gulf early in the spring by this route were apparently forced ashore by ice moved in by NW winds. The area of most of these strandings was near C. Anguille at ca. 48°N 59°W, and the period involved between 18 February and 18 March for animals observed caught alive, some of which died and others freed themselves at least temporarily. Some carcasses were also observed at later dates caught in the ice at localities in this area or to the north.

This unusual set of strandings seems to reflect unusually severe ice conditions in the Gulf of St. Lawrence in the middle of the 1970's, since the behaviour of the blue whales must be adaptive. It probably enables them to seek the early abundance of spawning euphausiids Thysanoessa spp. (Berkes 1976) in the Gulf as the ice melts. That is, the risk of ice stranding must normally be offset by the availability of a good food supply.

Blue whales have, in fact, long been known to enter the Gulf very early in the spring (Kellogg 1929). They have recently been observed in the Gulf from April (Shoriskey and Montgomery 1981) until November (Mitchell 1975), being rather common on the north shore during the summer months (Sears, 1980), and therefore exploit the entire open water season, moving in summer to regions of water mixing with enhanced productivity; they are much less common off eastern Newfoundland and on the Labrador coast (Sergeant 1966).

I relate these two phenomena of the 1970's - an increased whelping of harp seals offshore, and a series of strandings of blue whales in southwest Newfoundland - to an increased amount of pack ice associated with colder weather patterns. This in turn may be related to an increased flow of Labrador Current water bringing about reduced water temperatures both in the Gulf of St. Lawrence and off southeast Newfoundland, as shown by surface temperatures at Entry I., Magdalen Is., and at Station No. 27 off the Avalon Peninsula between about 1972 and 1976 (R. Trites, this Symposium, Fig. 22).

Southward Extension of Nesting of Fulmar Petrels

It is tempting also to relate to this phenomenon a southward extension of breeding of Fulmar Petrels Fulmarus glacialis on the coast of Labrador and Newfoundland observed during the 1970's. Brown (1968,1970) and Brown, Nettleship, Germain, Tull and Davis (1975) show that fulmars occur abundantly off eastern Newfoundland throughout most of the year but in summer - July to September, the months of warmest water temperatures, are displaced northward to the Labrador current core and Labrador Sea. In spite of this abundance fulmars were not known to nest on the east coast of Labrador and Newfoundland in the 1950's and 1960's, a period of good survey coverage of the coastal seabird colonies. Nesting, or its precursor "prospecting", was however discovered at the Gannet Is.(53° 57'N 56° 32'W), Labrador in 1972, (Nettleship and Lock 1973), at Great I., Witless Bay, SE Newfoundland (47" 11'N, 52° 49'W) by 1973 (Nettleship and Montgomery 1974), on Funk I. NE Newfoundland (49° 46'N, 54° 12'W) by 1977 (Montevecchi, Blundon, Coombes, Porter and Rice, 1978). In 1967-1969 there were no fulmars at Witless Bay when research on seabirds was being carried out at this site. The balance of the evidence suggests a colonisation of most of these sites about 1972. This would correspond with the arrival of an unusual quantity of cold Labrador Current water, as discussed above. However, if hydrographical comparisons are extended back to the 1950's for Station No. 27 (R. Trites, this Symposium, Fig. 22) an equally cold period of

surface sea temperatures is seen for the period 1954 to 1959, although temperatures at this Station at depth (150m) were not so low as in the early-mid 1970's.

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Table 1. Whelping regions of Harp seals in the Gulf of St. Lawrence and on the "Front" (Labrador) pack ice between 1950 and 1981 for years when known, and deduced frequency of severe and mild ice conditions.

a. Gulf of St. Lawrence

Decade	No. Years' Data	Magdalen Islands (severe)	Prince Edward Island (mild)	Percent severe
1950 -59	5	3	2	60
1960 -69	6	3	3	50
1970 -79	10	10	0	100
1980 - 81	2	1	1	(50)

b. Front

Decade	No. Years' Data	Offshore (severe)	Inshore (mild)	Percent severe
1950 -59	7	4	3	60
1960 -69	9	4	5	40
1970 -79	10	9	1	90
1980 -81	2	1	1	(50)

Table 2. Details of Ice Strandings of Whales in S.W. Newfoundland from 1974 to 1977 (from Mitchell 1975,1976,1977,1978)

Year	Month	Day	Species	No.	Locality	Circumstances
1974	III	before 19	Blue	3	(S.W.Nfld.)	Livetrapped by ice; 2 died, 1 freed itself
1975	III	23	Killer	2M	48°12' 59°00'	Live stranded by ice, died after a few days.
	IV	~ 18	Blue	1	47°52' 59°25'	Long dead in ice
1976	III	21	Blue	3	47°42' 59°18'	Live trapped in ice, 1 escaped, 1 freed, 1 died.
	IV	13	Blue	1	48°32' 58°29'	Washed up dead; a new animal
1977	II	22	Blue	3	near Milville	Trapped in ice, 2 escaped, 1 died
	IV	18	Blue	1	49°46' 57°53'	Frozen in ice

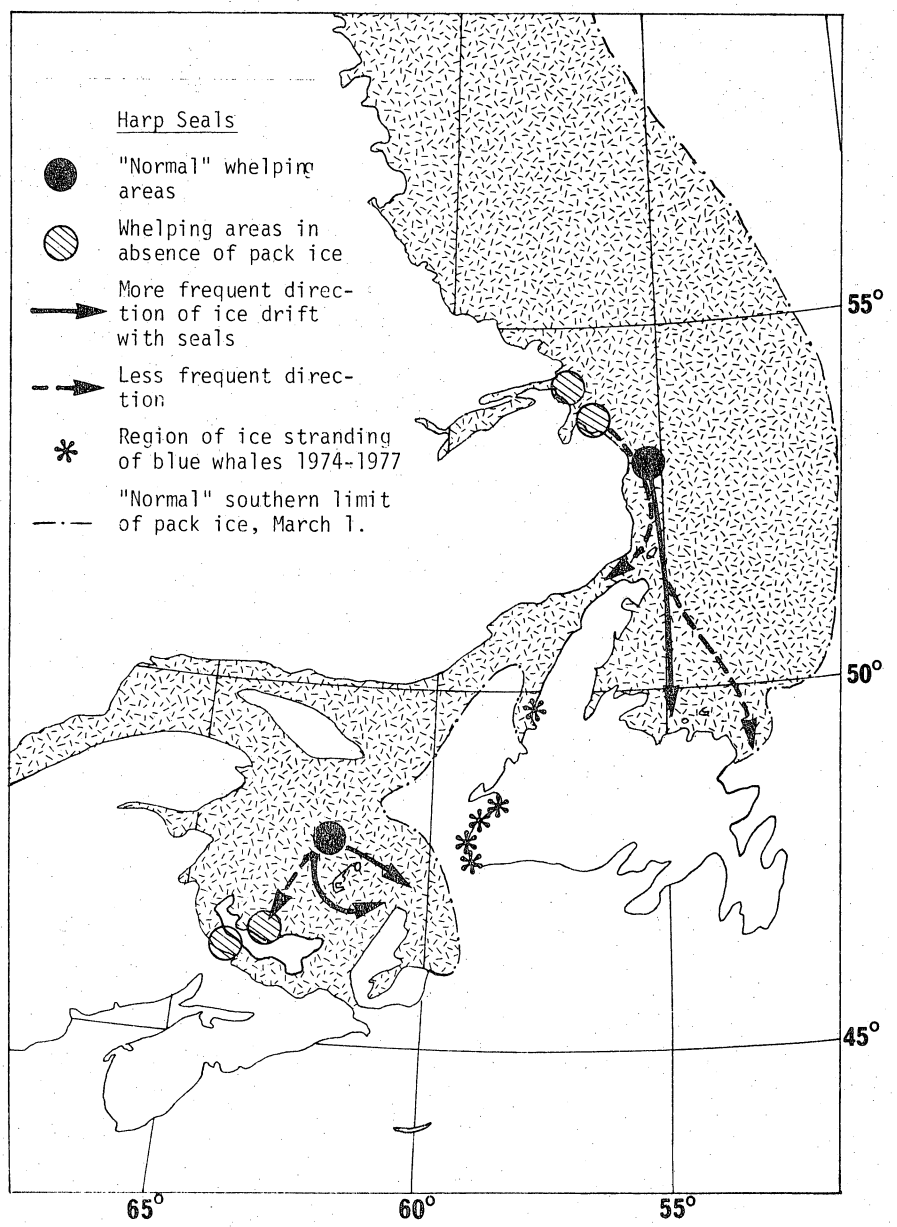

Figure 1. Distribution of whelping sites of harp seals and their ice-drift around Newfoundland under different weather and ice conditions; and locations of ice-strandings of blue whales, 1974-77. Ice limits from Environment Canada, Atmospheric Environmental Service, Ice, Summary and Analysis, Eastern Canadian Seaboard, 1964-1971.