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Ringed Seal, *Phoca hispida*, Breeding Habitat Survey of Bridport Inlet and Adjacent Coastal Sea Ice

T. G. Smith and M. O. Hammill

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RINGED SEAL, PHOCA HISPIDA, BREEDING HABITAT SURVEY
OF BRIDPORT INLET AND ADJACENT COASTAL SEA ICE

by

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ABSTRACT

Smith, T. G. and M. O. Hammill. 1980. Ringed seal, Phoca hispida, breeding habitat survey of Bridport Inlet and adjacent coastal ice. Can. MS Rep. Fish. Aquat. Sci. 1577: vii + 31 p.

A survey of the breeding habitat of ringed seals, Phoca hispida, was conducted at Bridport Inlet (74°55'N, 108°30'W) and along the adjacent coastline. Lair densities in the inlet itself were very low mainly because of the abundance of multi-year ice and lack of snow cover. Birth lair densities in the whole study area were only 15 percent of those seen in areas of Parry Channel further to the east. All birth lairs and most other lairs were found in two pressure ridges running west from the northern tip of Dealy Island. Birth lair densities along these ridges were slightly higher than on ridges in other arctic localities, recognized to be very productive habitats. This indicates that ridges are very important structures in this area because they are the only features accumulating snow to depths sufficient for lairs to be formed. Polar bear predation attempts were lower than in more easterly sectors of Parry Channel. However, they were frequent enough to indicate that this is an important feeding area. Fox signs on the sea ice indicate that there are more foxes in Viscount Melville Sound than in Barrow Strait or Lancaster Sound. No estimate of predation rates are available yet.

Key words: Ringed seal, breeding habitat, survey, Bridport Inlet.

RESUME

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Un recensement de l'habitat de reproduction du phoque annelé, Phoca hispida, a été effectué à l'Anse Bridport (74°55'N, 108°30'W) et le long du littoral adjacent. La densité des refuges sous-niveaux dans l'anse comme telle était très faible et principalement due à l'abondance de glace pluriannuelle et à la faible couverture nivale. Dans cette étude les densités des refuges servant à la parturition n'étaient que 15% de celles observées dans des régions situées plus à l'est du Chenal de Parry. Tous les refuges de parturition et la plupart des autres refuges se trouvaient dans deux crêtes de pression qui s'étendaient à l'ouest de la pointe septentrionale de l'Île Dealy. Les densités des refuges de parturition le long de ces crêtes étaient légèrement plus élevées que celles des crêtes d'autres régions considérées comme très productives. Ceci indique que les crêtes de pression sont importantes dans ce milieu puisque ce sont les seules structures qui permettent l'accumulation de neige en quantité suffisante à la construction de refuges. Les tentatives de prédation par l'ours polaire sont moins nombreuses que dans les régions plus à l'est du Chenal de Parry. Toutefois, leur fréquence indique que le secteur est important pour l'alimentation de l'ours. Les indices de la présence du renard sur la glace indiquent que leur population est plus grande dans le Détroit de Viscount Melville que dans les détroits de Barrow ou de Lancaster. Aucune estimation du taux de prédation n'est actuellement disponible.

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INTRODUCTION

Bridport Inlet, located on the southeastern coast of Melville Island (74°55'N, 108°30'W) borders Viscount Melville Sound, an arctic marine region about which little is known. It is proposed by Petro-Canada, as part of the Arctic Pilot Project, that a gas liquefaction plant be built at Bridport Inlet which will serve ice-breaking LNG tankers.

The present study had as its primary objective the assessment of ringed seal, Phoca hispida, breeding habitat in the ice of the inlet and along the immediately adjacent coastline. Ringed seals excavate subnivean birth lairs and give birth to their single whitecoat pup in late March and early April. Surveys of the sea ice habitat in other arctic localities have yielded valuable information on the structure of subnivean lairs (Smith and Stirling 1975); the annual variation in production of pups (Smith and Stirling 1978); the variation in lair densities over large geographical areas (Smith et al. 1979; Smith and Hammill 1980); and the strategies and effects of predators such as polar bears, Ursus maritimus, and arctic fox, Alopex lagopus (Smith 1976, 1980).

The coastlines of Viscount Melville Sound are uninhabited by Inuit and thus not thought to be densely occupied by marine mammals. Certain large bays on northern Victoria Island, such as Hadley Bay, Glenn Elge Bay and Richard Collinson Inlet, contain fair densities of ringed seals and are important polar bear feeding habitat during the spring months (Smith, unpublished data). Very little information concerning the distribution and abundance of marine mammals exists for other areas in Viscount Melville Sound, except for some data from unpublished Polar Gas reports (Finley 1976; unpublished report) and work done during the Arctic Island Pipeline Project (Smith et al. 1979). A few recent reports exist on the Bridport Inlet area itself, including some aerial surveys of birds and marine mammals (McLaren and Renaud 1977a, b; unpublished reports) on the biological oceanography of the inlet (Buchanan, Cross and Thomson 1977; unpublished report by L.G.L.) and on its physical oceanography (Lake 1978, 1979a, 1979b; unpublished reports).

DESCRIPTION OF THE AREA

The area covered by the survey was centered around Bridport Inlet, bounded on the east by Skene Bay and on the west by Cape Bounty. Searches were not made more than 19 km offshore.

The following description of the area is summarized from the Pilot of Arctic Canada (Canadian Hydrographic Service 1970). Bridport Inlet is surrounded by a low shelving shoreline which rises to a level of 304 m, 5 km inland along the western side (Fig.1). It is fed by several streams, the largest being the Meecham River located at the head of the inlet. Just inside the entrance to the inlet is a narrow sandstone spit which rises to 38 m above sea level. This spit extends in a northwest-southeast direction from the base of Palmer Point to partway across the inlet mouth. The western portion of the spit is lower and not as steep. Water depths along the approach to the inlet and within the inlet are fairly deep, except for a shoal located off the southwestern tip of Dealy Island. Dealy Island is located 3 km to the south of the eastern spit and rises to a height of 46 m. Skene Bay, located 13 km east of Bridport Inlet, extends 8 km northward into the island. It is flanked by steep rounded sides. Depths of 73 m have been found at the mouth of the bay. Beverly Inlet, located at the head of Skene Bay, penetrates another 8 km northward into the island. The inlet is less than a kilometre wide with steep sides. Water depth is believed to be fairly shallow.

Ice Conditions

In western Viscount Melville Sound a channel of open water usually appears along the southern coast of Melville Island by about 20 August. This channel usually extends from the western edge of Byam Channel to Winter Harbour. In some years it may be quite wide, or at times not form at all. In early September considerable north-south movement of the offshore ice pack occurs, which opens and closes the channel. By late October conditions stabilize, the prevailing north winds keep the pack ice offshore and ice formation occurs within the channel. In "normal" years the ice along the south coast of Melville is composed of 2/10 old ice and 8/10 new ice (Norcor 1978). The observed ridge frequency in this first year ice was 0.5 - 1.5 ridges/km, with a maximum of 3.7 ridges/km between Bridport Inlet and Winter Harbour.

MATERIALS AND METHODS

The sea ice habitat was searched for ringed seal subnivean structures with a trained Labrador bitch followed by a snowmobile, using the method outlined by Smith and Stirling (1975). In this way both inshore and offshore ice, including pressure ridges, were examined. Searches of the area east of Bridport Inlet to Skene Bay were carried out from small mobile camps. Bridport Inlet and the offshore pressure ridges were searched during daily trips from a small camp located at the Bridport Inlet airstrip.

A total of 6.3 hours of search time was accumulated over the period 30 March to 12 April. Whenever possible predator signs were recorded and fox scats were collected.

Underwater recordings were made at two sites near the mouth of Bridport Inlet using a Nagra SN tape recorder and a Ceesco LC50 hydrophone.

RESULTS

The search area was divided into seven regions (Fig.1). Ice type and total snow cover in the area covered by the searches are illustrated in Fig. 2. The type and number of subnivean structures found in each region are shown in Table 1, along with the total number of minutes of search per subnivean structure and search time per birth lair.

The western portion of Bridport Inlet consisted of 2-4/10 old ice, the remainder being first year ice. Snow cover varied from 0-8/10 with sastrugi. No birth lairs were found in this section. One of the breathing holes located was open to the surface.

The eastern section of the inlet was covered by up to 8/10 multi-year ice. Snow cover was less in this part of the bay, ranging from 0-5/10 with sastrugi. No subnivean structures were located there.

In the flat ice zone located to the west of the entrance to the inlet and extending 1-5 km to the south only one breathing hold, used by a rutting male seal, was located.

The fourth search region was located to the south of the eastern spit of Bridport Inlet and extended to the north tip of Dealy Island. Ice cover consisted of first year ice with small ice hummocks. Snow coverage was complete. No birth lairs were located in this section. Two of the three haul-out lairs had been dug into by bears. Fox signs were found on the remaining structures.

The region running from Dealy Island to Skene Bay and extending 3-6 km offshore consisted of completely snow covered first year ice. Some rough ice and low pressure ridges were present. Two birth lairs were found in this region. Both were located on pressure ridges and had been opened up by bears. Fox signs were found at both lairs. No evidence of successful predation was found.

A pressure ridge of medium height located 3-5 km offshore and extending to the west from Dealy Island was the most productive area in the survey. Snow depth there reached a maximum of 150 cm. Placental remains were found in two of seven birth lairs located, indicating that pupping had already begun in the area. Rutting males occupied 57% of the structures on this ridge. Three out of 21 structures on the ridge had been dug into by bears, but no evidence of successful predation was found. Fox signs were found at six of 21 structures.

The second pressure ridge, located 8 km offshore and running parallel to the ridge described above, was also of medium height and had a maximum snow depth of 150 cm. One birth lair was located in 20.25 minutes of search time. Both polar bear and arctic fox had dug into the lair but no evidence of successful predation was found.

Searches were not made of Skene Bay, Beverly Inlet and the zone located between Dealy Island and the eastern spit. These areas were found to be covered almost entirely by multi-year ice which is known to be extremely poor ringed seal breeding habitat.

A total of 37 minutes of recordings were made at two seal holes outside Bridport Inlet. Only three possible ringed seal noises, all a long distance from the hydrophone, were recorded at the mouth of the inlet on 10 April 1980.

No evidence was found, either during the search for subnivean lairs or during the recordings, to indicate that bearded seals, Erignathus barbatus, were present in the study area.

Signs of other terrestrial and avian wildlife were very scarce. Apart from polar bear and arctic fox predation attempts on birth lairs, the only other sign of mammals on the sea ice was the scat of a wolf, Canis lupus, found along a pressure ridge.

Twenty-two muskoxen, Ovibos moschatus, were observed in two groups on 29 March 1980; one of 19 animals was seen at 74°57'N, 107°30'W; the second group of three animals was spotted at 74°59'N, 108°03'W.

A raven, Corvus corax, was observed at the Bridport Inlet airstrip on 9 April 1980 and three arctic hares, Lepus arcticus, were also seen near there on 10 April 1980.

DISCUSSION

Ice conditions outside Bridport Inlet were "normal" for the survey area. However Bridport Inlet contained a large amount of multi-year ice. Skene Bay, Beverly Inlet and a small area located between Dealy Island and the eastern spit were covered entirely by multi-year ice. Bridport Inlet was free of ice during the summer of 1979 (R. A. Lake pers. comm.). The presence of multi-year ice in the above areas is probably the result of old ice drifting in and becoming trapped in the fall during ice formation. Similar ice conditions also appear to have occurred during the winters of 1968-69, 1972-73, and 1978-79 (Lindsay 1975; Anon. 1975-1979).

The density of subnivean lairs found in an area of sea ice is controlled by many things. Among the proximate factors are the stability of the ice; the presence or absence of hummocks or ridges which act as areas of snow accumulation; the amount of snow fall during the winter and meteorological conditions prevailing during precipitation; the presence and distribution of cracks or leads; and the age and thickness of the ice cover. Among the ultimate factors governing the number of seals occupying a region are the biological productivity of the adjacent marine areas; the availability of food organisms such as fish, squid and crustaceans; and the mortality induced by predation.

Previous searches have shown that areas containing a high proportion of multi-year ice are very low in densities of subnivean lairs (Smith et al. 1979; Smith and Hammill 1980). Bridport Inlet itself, which contained much old ice, had few subnivean lairs (Table 2).

In addition to having a large amount of old ice, the ice surface of Bridport Inlet had very little snow cover in which seals could build lairs. Average snow depth for a large number of birth lairs, haul-out lairs, and male haul-out lairs in Amundsen Gulf were 64.6 cm, 59.8 cm and 70.2 cm respectively (Smith and Stirling 1975). Snow coverage and accumulation within the Bridport Inlet area seldom reached these depths over a sufficient area to permit construction of the subnivean structures. The very low densities in Bridport Inlet thus appear to be primarily a result of the old ice and low snow cover.

Densities of subnivean lairs in the first year ice along the coastline adjacent to Bridport Inlet appear to be significantly lower than in other areas of Parry Channel and in other arctic areas such as Southeast Baffin Island (Smith and Hammill 1980) and Amundsen Gulf (Smith and Stirling 1975, 1978). Densities of birth lairs were similar to those found in Ryam Channel and Austin Channel on the east coast of Melville Island, but a much lower total density of subnivean lairs was found. The density of birth lairs found in the Bridport Inlet area was almost seven times less than found in the Barrow Strait area (Table 2).

Since most of the subnivean structures were found along pressure ridges, a comparison of search time per subnivean lair was made with search time per subnivean lair found along similar structures in Amundsen Gulf. The amount of time searching for all types of lairs was significantly shorter for the Bridport Inlet study, indicating a higher density or aggregation of lairs on pressure ridges (Table 2) and underlining the importance of such features. Although the present region appears to be much lower in overall density of lairs, the density along pressure ridges is actually higher than in an area considered to represent some of the most productive breeding habitat yet documented in the Canadian Arctic (Smith and Hammill 1980; Smith 1980). The importance of pressure ridges in the Bridport Inlet area is very likely related to the fact that they are the only ice features capable of causing sufficient snow depths necessary for the construction of subnivean lairs. All birth lairs (N=10) and 71.4% of male haul-out lairs found were located on pressure ridges.

The ratio of rutting male haul-out lairs to birth lairs on the pressure ridge 3-5 km offshore was 12:8. However, from the spatial distribution of the complexes on the ridge, this ratio was 1:1. As the ridge became lower, the ratio of male haul-out lairs to birth lairs increased to 4:1. No evidence of males entering birth lairs was found. This suggests a partitioning of the ridge habitat, with a dominant male being associated with one breeding female. Less dominant males were possibly restricted to the portion of the ridge that was lower and hence not as suitable for birth lairs. Evidence of partitioning of the breeding habitat, based on a dominant male controlling an area containing one or more breeding females, has been reported elsewhere (Smith 1976, 1980; Smith and Hammill 1980).

No evidence of successful predation by polar bears was found at lairs in our survey, although tracks and digs indicated that seven attempts had been made. One instance of a polar bear killing a seal was witnessed at the entrance of Bridport Inlet on 24 April 1980 (D. Richards and R. Cook pers. comm.). The specimen retrieved was an adult female which was apparently killed while giving birth. The bear had stripped the carcass of blubber and skin but left the foetus and viscera untouched.

Table 3 shows a comparison of the incidence of polar bear predation between the present study area, points further east in Parry Channel and southeastern Baffin Island. The lowest incidence of bear activity in Parry Channel is shown to be in the present study region. However, the predation incidence is almost as high as on southeastern Baffin Island, an area which contains a high number of polar bears (Stirling, Kiliaan, Calvert and Andriashek 1979; unpublished report). This infers that bear predation is a significant factor in the Bridport Inlet area and might also indicate, given the general low productivity of Viscount Melville Sound, that it could be one of the few good ringed seal feeding areas available to bears.

Denning has been reported to occur on Byam Martin Island, 110 km to the east of Bridport Inlet (Stirling, Schweinsburg, Calvert and Kiliaan 1979).

Fox signs were seen on 29.3% of the subnivean structures located by us, 25% of these being associated with bear digs. This is somewhat lower than the 34% marked by foxes in the Amundsen Gulf region where the arctic fox is an important predator on ringed seal pups (Smith 1976). It is a higher incidence than is found in the more easterly areas of Barrow Strait and Lancaster Sound where fox signs occurred on 12.8% (20/156) of lairs located during the 1975 searches. It thus appears that there are more foxes in Viscount Melville Sound than further east in Parry Channel. Because of the early dates of the survey, which occurred prior to and during the pupping period, foxes might not yet have turned to the marine habitat to feed themselves. It is not yet possible with the present data to comment on the importance of arctic foxes as predators of young ringed seals.

CONCLUSIONS

The very low number of ringed seals present in Bridport Inlet indicate that the proposed shore based facilities and LNG tanker docking activities will not have a significant impact on them.

At present, it is not possible to predict the effect of LNG tanker passage on the marine mammals of Parry Channel. It is hoped that the Arctic Pilot Project, because of its pilot nature and its commitment to long term environmental research, will provide the first important opportunity to evaluate and possibly mitigate the effects of disturbance in what has been, until now, a pristine environment. This can only be accomplished by a well managed multidisciplinary marine ecosystem study, designed to provide good quantitative monitoring of stock size, annual production and natural variation. This approach must be combined with baseline and experimental behavioral studies of all marine mammals and polar bears. It is only through an understanding of ecosystem processes that we shall be able to assess and mitigate the harmful effects of development in the arctic.

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TABLES

Table 1. Number and type of subnivean structures of ringed seals found during the search with a trained dog, and minutes of search time required to find them.

<u>Search areas</u> <u>(see Fig. 1)</u>	<u>Birth</u> <u>lair</u>	<u>Haul-out</u> <u>lair</u>	<u>Male</u> <u>haul-out</u> <u>lair</u>	<u>Breathing</u> <u>hole</u>	<u>Male</u> <u>breathing</u> <u>hole</u>	<u>Total</u> <u>search</u> <u>time</u> <u>(mins)</u>	<u>Search</u> <u>time per</u> <u>structure</u> <u>(mins)</u>	<u>Search</u> <u>time per</u> <u>birth lair</u> <u>(mins)</u>
(1)	-	-	1	1	2	137.0	34.2	-
(2)	-	-	-	-	-	11.5	-	-
(3)	-	-	-	-	1	46.2	46.2	-
(4)	-	3	2	1	-	33.5	5.5	-
(5)	2	1	1	1	2	71.0	10.1	35.5
(6)	7	1	7	1	5	42.4	2.0	6.0
(7)	1	-	-	1	-	20.2	10.1	20.2

Table 2. Number of subnivean lairs of different types and minutes of search time required to find them in different areas.

	<u>Birth lair</u>	<u>Haul-out lair</u>	<u>Male haul-out lair</u>	<u>Breathing hole</u>	<u>Male breathing hole</u>	<u>Total time</u>	<u>Minutes per structure</u>	<u>Minutes per birth lair</u>
<u>A. Bays</u>								
Bridport Inlet	0	0	1	1	2	148.5	37.1	-
SE Baffin I.	30	6	7	34	14	468.2	5.1	7.7
De La Beche Bay	6	5	-	3	-	44.0	3.1	7.3
Aston Bay	4	5	1	-	-	141.7	3.5	8.7
<u>B. Ice offshore</u>								
Bridport coast	2	4	3	2	2	160.7	11.6	75.4
SE Baffin I.	25	10	10	33	23	447.1	4.4	17.8
Byam Channel	1	13	4	-	-	169.9	4.1	74.6
Austin Channel	2	15	7	-	-	74.6	7.1	85.0
Barrow Strait	13	20	1	11	-	145.0	3.2	11.1
<u>C. Pressure ridges</u>								
Bridport Inlet	8	1	7	2	5	62.7	2.7	7.8
Amundsen Gulf								
(1973)	17	10	5	13	-	-	4.1	10.9
(1974)	4	3	4	1	-	-	11.1	33.3
(1975)	1	4	0	3	-	-	11.3	89.0
(1976)	2	3	5	2	-	-	4.7	27.9

Table 3. Incidence of polar bear predation attempts on subnivean lairs found in three different areas.

	<u>Total lair found</u>	<u>Number dug by bears</u>	<u>Percent predation attempts</u>
Bridport Study (1980)	41	7	17
Barrow Strait, Byam and Austin channels, Peel and Lancaster sounds (1975, 1976)	363	110	30
Southeastern Baffin Island (1978, 1979)	239	47	20

FIGURES

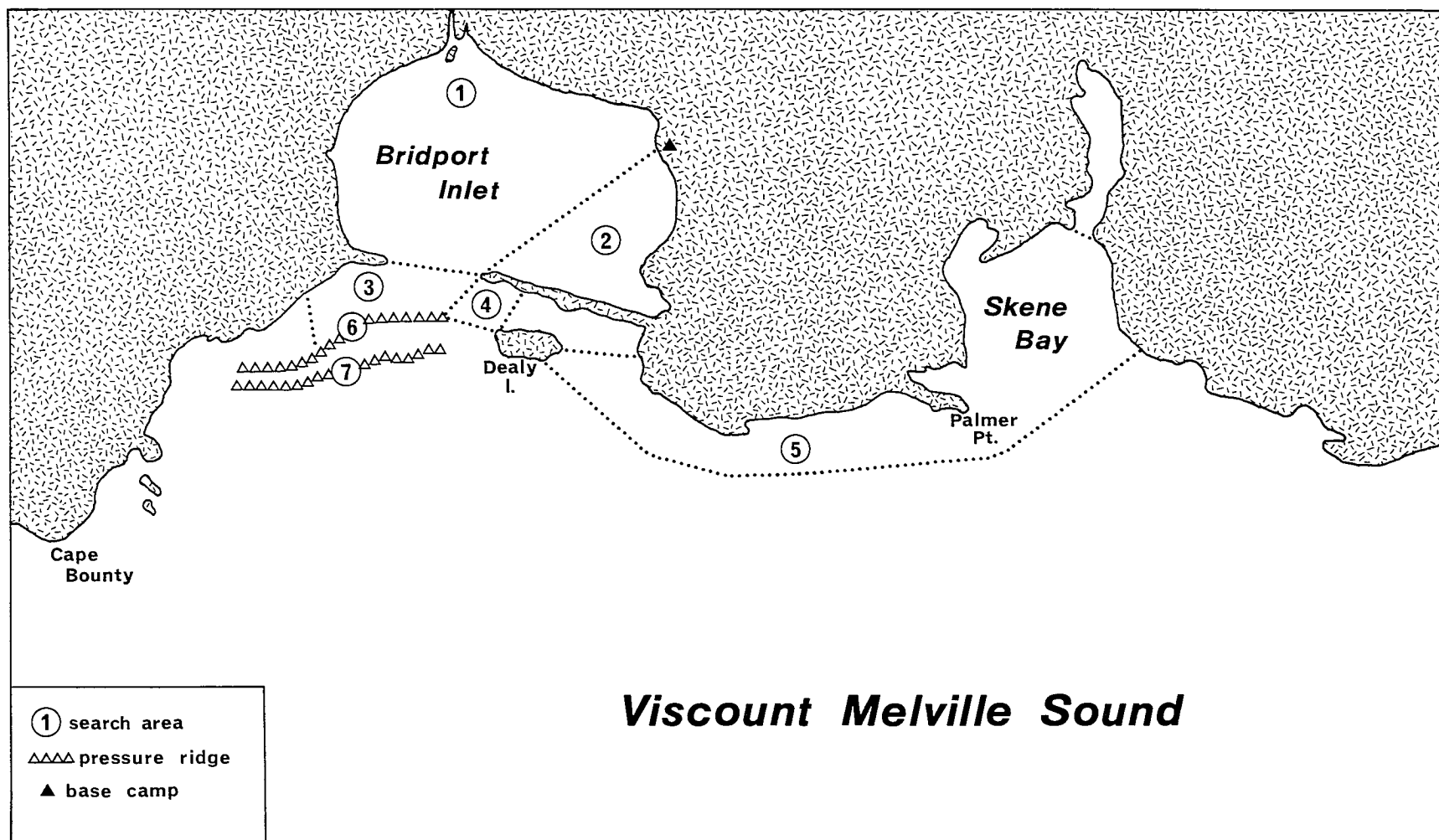


Fig. 1. The study area showing the sub-areas where searches were made for subnivean lairs.

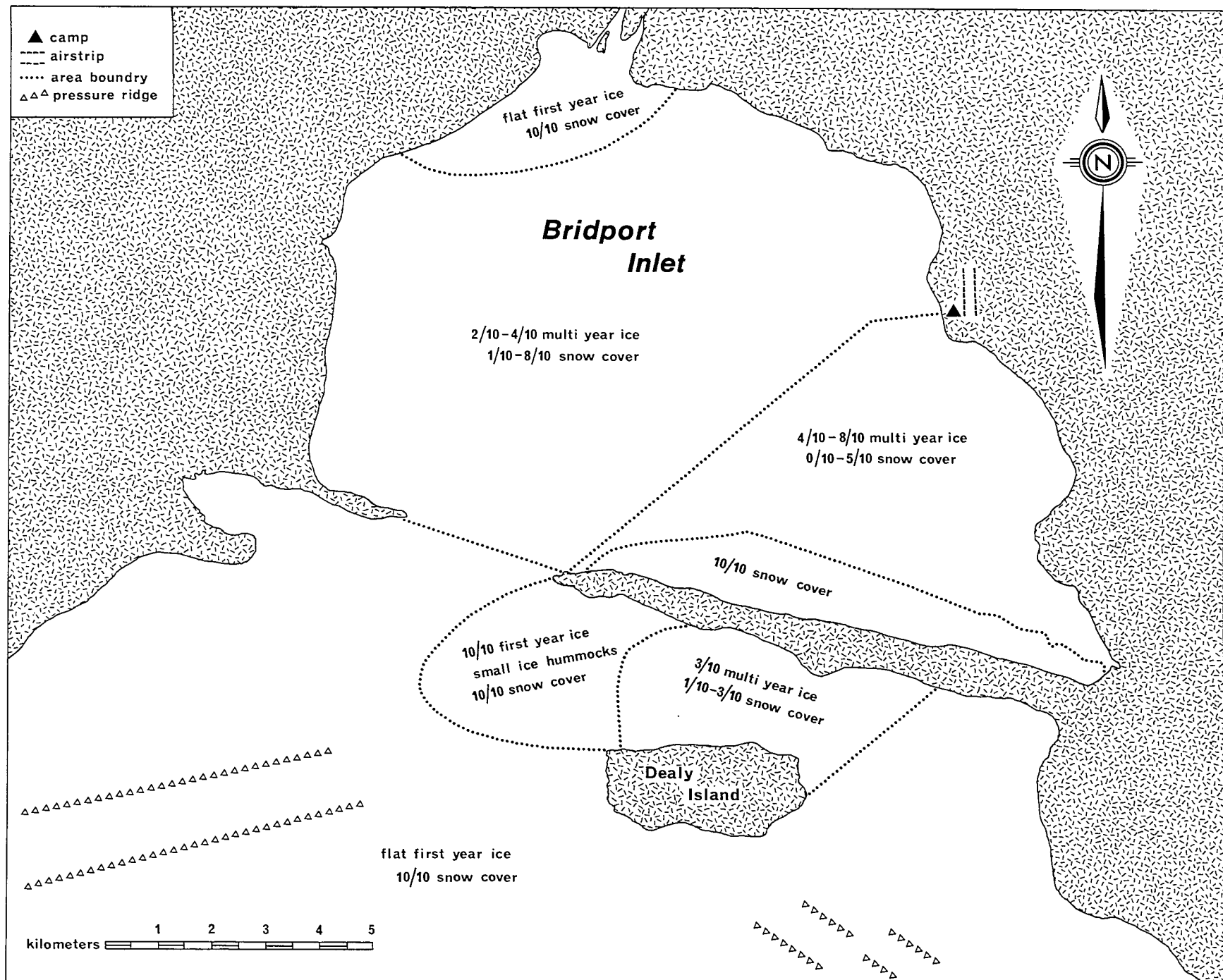


Fig. 2. Bridport Inlet and its approaches showing ice type and snow cover.

