

# 10145

## Populations, movements and wintering areas of Thick-billed Murres (*Uria lomvia*) in eastern Canada<sup>1</sup>

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### Introduction

As the most numerous seabird breeding in eastern Canada, the status of the Thick-billed Murre (*Uria lomvia*) is a key indicator of the health of seabird populations in general. There is considerable evidence to suggest that the species has suffered heavy mortality outside the breeding season as a result of factors which have either begun, or considerably increased, during the past 20 years. These factors include shooting, gill-netting and oiling (Tull *et al.* 1972, Evans and Waterston 1976, Christensen and Lear 1977, Nettleship 1977, King *et al.* 1979, Salomonsen 1979).

CWS has recently initiated a survey of murrens shot by Newfoundland-Labrador hunters to determine the approximate size of the kill. The importance of this mortality to the overall population of Thick-billed Murres in the western Atlantic depends on the size of the population wintering off Newfoundland and on what proportion this represents of the total. I shall attempt to answer these two questions as accurately as possible in the light of current knowledge.

Murres (both Thick-billed and Common *U. aalge*) are among the seabirds most vulnerable to contamination by oil at sea. Not only does their feeding behaviour dictate that they spend long periods on the surface of the water, but during their post-breeding dispersal both adults and young are flightless (or very reluctant to fly), spending almost all of their time on or in the water for a period of at least a month (Birkhead and Taylor 1977). During this time they are highly vulnerable to contamination from oil slicks present along their migration route. Because of the current offshore oil-drilling activity in southern Davis Strait, Newfoundland, and proposals further north in Lancaster Sound and vicinity, a summary of present knowledge on murre movements in eastern Canadian waters is desirable in assessing the relative vulnerability of different segments of the western Atlantic population. An analysis of banding recoveries to date, combined with information from recent colony and offshore surveys, allows a rather more detailed description than has been attempted previously. It also enables us to pinpoint more exactly the areas where our knowledge is insufficient for the basic needs of environmental impact assessment.

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### Population estimates

A previous estimate of the total population of Thick-billed Murres in the western Atlantic (Tuck 1961) suggested 10 million birds, and was apparently intended to represent only the breeding population. This number was divided equally between the eastern Canadian Arctic and the coast of West Greenland during the breeding season. More detailed figures for some colonies were generated by D. N. Nettleship in 1971-75 (see Brown *et al.* 1975), and these give an estimate of approximately 3.9 million pairs, 2.57 million in Canada and 1.33 million in Greenland. Some of the figures for the larger Canadian colonies, however, were Tuck's earlier estimates because results from the 1971-75 surveys were either incomplete or unclear at certain locations (i.e., Digges Sound; Akpatok Island; and Cape Hay, Bylot Island).

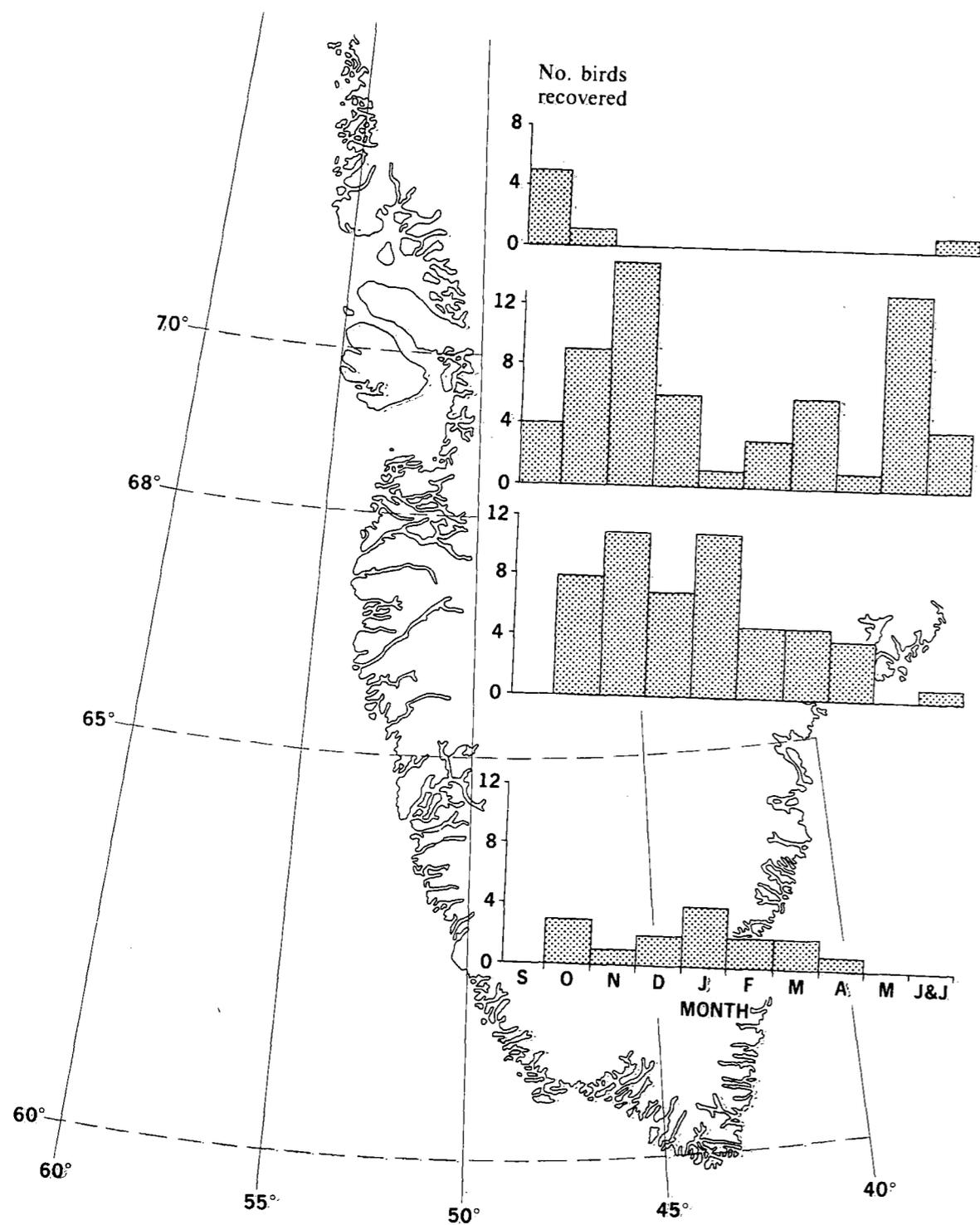
To calculate present populations I have used the figures given in Brown *et al.* (1975) with the following changes:

- (1) new estimates are incorporated for Prince Leopold Island, Coburg Island, Cape Hay and Digges Sound, as a result of surveys carried out by D.N. Nettleship and myself over the past 4 years (1976-79);
- (2) new estimates for colonies in Newfoundland and Labrador conducted by A. R. Lock and D. N. Nettleship during 1978 and 1979;
- (3) estimates given by Evans and Waterston (1976) are included for certain Greenland colonies;
- (4) where the latest available estimates were made prior to 1960, numbers have been halved—this correction is used on the assumption that changes everywhere have been of the same magnitude as those observed between Tuck's estimates for the Cape Hay (1957) and Digges Sound (1955) colonies and those made in the last 4 years;
- (5) estimates quoted in Brown *et al.* (1975) in terms of individuals (for some West Greenland colonies) have been converted to pairs by multiplying them by 0.75, a correction factor derived from recent studies at Prince Leopold Island (Gaston and Nettleship, in press).

Revised provisional estimates for breeding population are given in Table 1. The total of approximately 1.25 million pairs for the eastern Canadian Arctic is almost exactly half that derived from Brown *et al.* (1975). The total for Greenland, where most figures were more recent, is closer to the earlier estimate. Taken together, the new estimates indicate a total population of about 2.3 million pairs, of which 55% breed in Canada. The importance of very large colonies is underlined by the fact that the nine colonies of 100 000 or more pairs make up 83% of the total breeding population.

Thick-billed Murres probably begin to breed at 4-5 years old (Birkhead and Hudson 1977). Observations at Prince Leopold Island suggest that a non-breeding population equivalent to 16% of the breeding popu-

**Figure 1**  
Monthly distributions of recoveries of Thick-billed Murre, banded at Cape Hay and recovered in Greenland, for four zones of latitude.



lation occurs in the vicinity of the colony during the breeding season. This probably does not include birds in their first year (see next section). Survival of young birds to the end of their first winter is estimated at 30% (Gaston and Nettleship, in press.). If we assume a productivity similar to that recorded at Prince Leopold Island (0.7 chicks/pair/yr) this suggests a first-year population equivalent to 10% of the breeding population. To calculate the total population, therefore, I have multiplied the number of breeding pairs (Table 1) by 2.5 (Table 2), giving an overall estimate of 5.79 million individuals during the breeding season. In early winter, when birds are arriving on their wintering grounds, we can expect numbers to be at least 5% higher.

**Table 1**

Estimates of the present sizes (breeding population only) of Thick-billed Murre colonies in the western Atlantic. Only colonies of more than 10 000 pairs are specified. For derivation of estimates, see text.

Region/Colony	No. pairs ( $\times 10^3$ )
<b>Eastern Canadian Arctic</b>	
<b>Lancaster Sound</b>	
Coburg Island	160
Prince Leopold Island	86
Cape Hay, Bylot Island	140
Cape Graham Moore, Bylot Island	20
Regional total	406
<b>East Baffin</b>	
Reid Bay, Baffin Island	200
Regional total	200
<b>Hudson Strait</b>	
Hantzsch Island	50
Coats Island	15
Digges Sound (2 colonies)	300
Akpatok Island (2 colonies)	300*
Regional total	665
<b>West Greenland</b>	
Carey Island	10*
Sauders' Island	100*
Agpat	50*
Agparssuit	727
Qaersorsuaq	13
Sagdleq Island	75*
Arveprinsens Island	25*
Smaller colonies	35
Regional total	1 036
<b>Atlantic Canada</b>	
	12
<b>Total</b>	<b>2 319</b>

\*Estimate derived by halving the figure given in Brown *et al.* (1975).

**Table 2**

Regional population estimates for numbers of individuals of all ages during breeding season\*

Region	Population (individuals) ( $10^3$ )
Lancaster Sound and vicinity	1015
East Baffin	500
Hudson Strait	1662
West Greenland	2587
Atlantic Canada	30
<b>Total</b>	<b>5794</b>

\*Not including birds of year.

**Analysis of banding recoveries**

Most Thick-billed Murre that have been banded in Canada were marked on their breeding colonies by L. M. Tuck, who banded 8000 birds at Digges Sound in 1955 and 2500 at Cape Hay in 1957 (both adults and chicks were banded). Smaller numbers were banded at Coats Island in 1953 and Prince Leopold Island in 1975-78. The majority of recoveries have been reported from the wintering areas; possible biases due to different recovery methods can be ignored because more than 90% of all birds recovered were shot for food by local hunters. (The heavy losses to the Greenland net-fishing occurred after most Canadian bands had been recovered; cf. Tull *et al.* 1972.)

Recoveries of birds banded at Cape Hay have come from Greenland (79%) and Newfoundland-Labrador (21%). The distribution of recoveries by months suggests that the majority of recoveries from Greenland in middle and late winter come from south of 68°N (Fig. 1). North of this latitude most recoveries are reported in May and June or in September to November, when birds are presumably on passage. In Newfoundland, recoveries occur in November to April, with a peak during January to March. The overall recovery rate for adult birds banded at Cape Hay is 9.4% to date, and it seems unlikely that further recoveries will be reported.

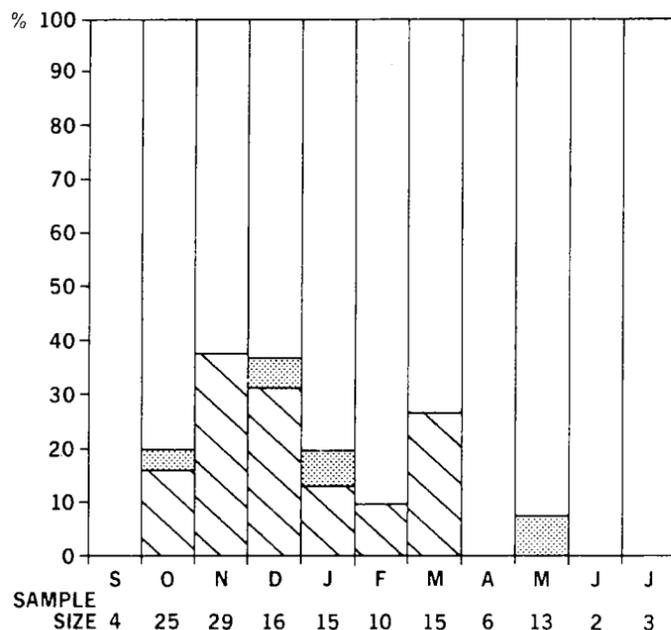
The proportions of different age classes in the recovery samples from Greenland and Newfoundland suggest that significantly fewer 2- and 3-year-old birds occur off Greenland than would be expected if recovery distribution was unrelated to age (Table 3). Most recoveries of first-year birds in Greenland occurred in October to December, and none was reported after March (Fig. 2). The peak occurring in November suggests that first-year birds, the majority of which have left Lancaster Sound by mid September (Johnson *et al.* 1976), take about 6 weeks to arrive off Greenland.

**Table 3**  
Recoveries of Thick-billed Murres banded at Cape Hay in relation to age at recovery\*

Age at recov. (years)	Area of recov.		Totals
	Greenland	Nfld.	
1st	27	13	40
2nd and 3rd	4	8	12
More than 3rd	109	27	136
Totals	140	48	188

\*Heterogeneity  $\chi^2 = 13.4$ ,  $df 2$ ,  $P < 0.005$ .

**Figure 2**  
Proportions of different age classes of Thick-billed Murres among recoveries, in Greenland, of birds banded at Cape Hay. Cross-hatching—birds less than 1 year old; stippling—second- and third-year birds; white—older birds



The sample banded at Digges Sound has yielded a recovery rate of 2.1% to date for birds banded as adults, a value significantly lower than the rate of recoveries from Cape Hay ( $\chi^2 = 91.5$ ,  $P < 0.001$ ). Considering that all recoveries from Cape Hay were reported outside the breeding season, the difference is even more striking because the recovery rate of Digges Sound birds on their wintering areas is only 1.25%. This difference does not appear to be the result of differential band-wear, since a higher proportion of

banded adults from Digges Sound was recovered more than 10 years after banding than from Cape Hay (24% vs 13%).

Recoveries of birds from Digges Sound have come from four areas:  
(1) Digges Sound and adjacent coasts (14 recoveries);  
(2) Hudson Strait, 64–65°N, 76–77°W, mainly near Cape Dorset (4);  
(3) west coast of Greenland between 64–70°N (7); and  
(4) Newfoundland (83).

The distribution of recoveries from Newfoundland waters by months (Fig. 3) suggests that during November and December birds are mainly concentrated north of 49°, but that later the bulk of the population shift further south, probably in response to ice conditions. The pattern is similar for those Cape Hay birds which have been recovered from Newfoundland, and these have been lumped with those from Digges Sound in the figure. The bulk of birds from both colonies apparently leave Newfoundland waters in late March or April, although the abrupt decline in recoveries may more likely be influenced by the termination of the legal hunting season for murres in Newfoundland on 31 March.

The proportion of young birds (1 to 3 years old) recovered is higher in northern Newfoundland than further south, but this appears to be because young birds arrive earlier, forming 82% of all recoveries in November, but falling to less than 40% in March and April (Fig. 4). The pattern is similar to that seen for Cape Hay birds recovered off Greenland, except that the proportion of birds less than 3 years old is much higher in the Newfoundland sample.

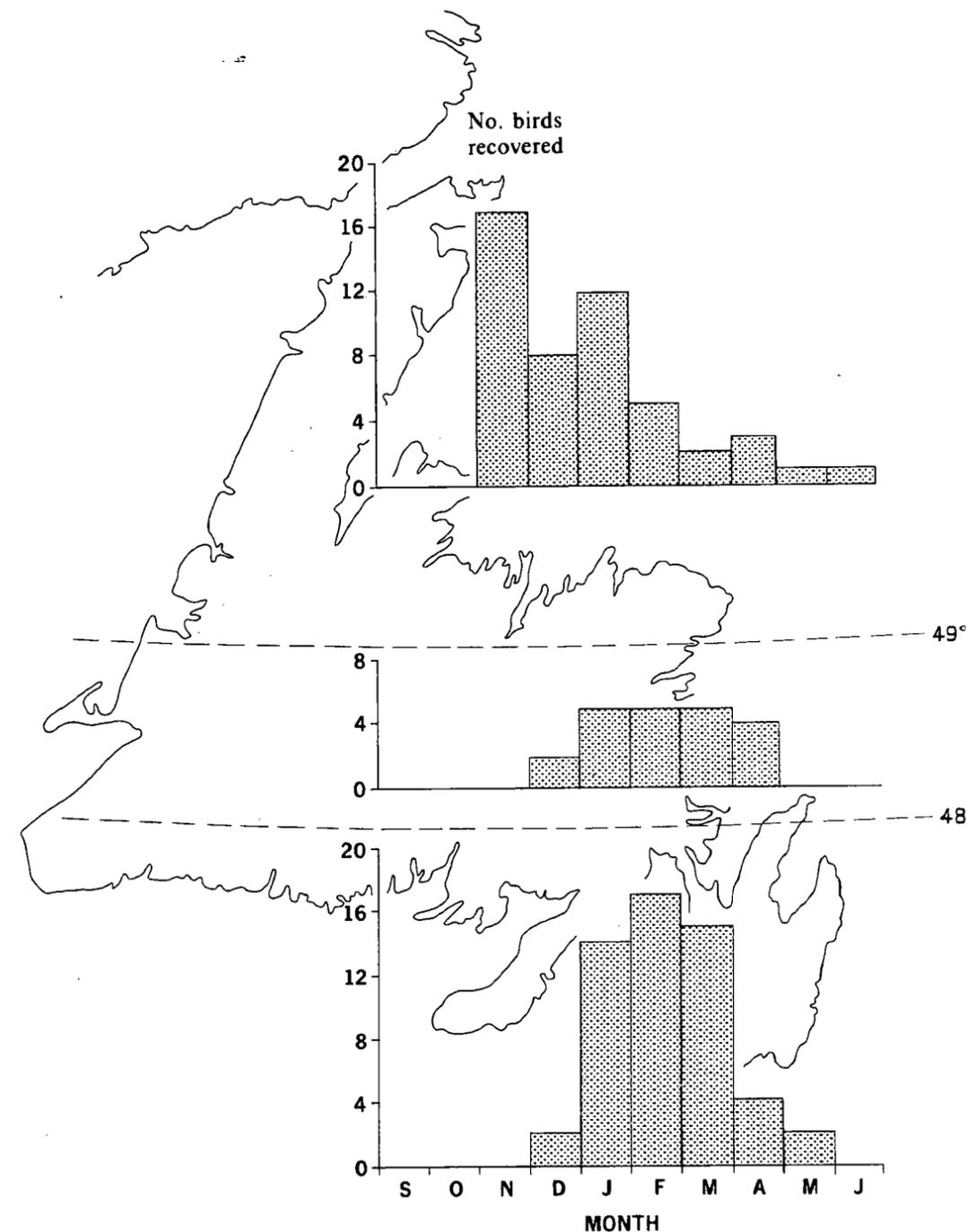
Six out of the seven recoveries of birds from Digges Sound in Greenland occurred in May and June, and four of these were of birds in their second or third years. All of these young birds were recovered north of 67°, suggesting that they followed the same route as the Lancaster Sound birds on their return migration. If these birds actually returned to Hudson Strait, there may be a regular movement from west Greenland into Hudson Strait in early summer, in addition to the direct movement up the coast of Labrador.

All recoveries in the Cape Dorset area occurred in June and July; three birds were yearlings and the other was 3 years of age. As there were no first-year recoveries off Greenland, this presumably indicates that first-year birds move directly into Hudson Strait, probably later than the older birds. Out of the 14 recoveries from the vicinity of the colony, one as late as 1966, all were of birds banded originally as breeding adults.

**Summary of information on wintering areas**

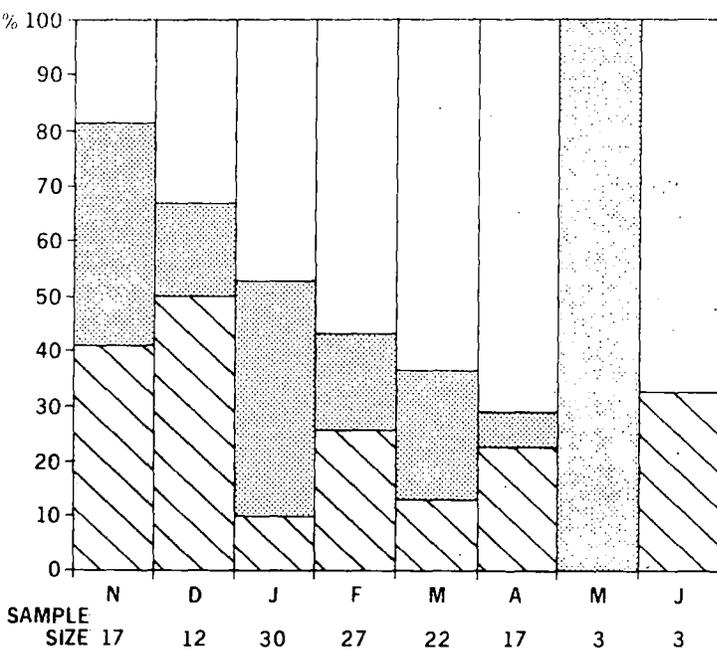
Although more birds from Cape Hay were recovered off Greenland than off Newfoundland, the proportions probably do not give an accurate idea of the relative importance of these two wintering areas. Recovery rates

**Figure 3**  
Monthly distributions of recoveries of Thick-billed Murres, banded at Cape Hay and Digges Sound and recovered in Newfoundland, for three zones of latitude



**Figure 4**

Proportions of different age classes of Thick-billed Murres among recoveries, in Newfoundland, of birds banded at Cape Hay and Digges Sound. Cross-hatching—birds less than 1 year old; stippling—second- and third-year birds; white—older birds



appear to be much higher in Greenland than in Newfoundland, due to either heavier hunting pressure and/or a better reporting rate, which will tend to exaggerate the importance of Greenland as a wintering area. The 22 adults from Cape Hay recovered off Newfoundland represent a recovery rate of 1.6%, actually higher than that for adults from Digges Sound, all of which appear to winter in the vicinity of Newfoundland. If we assume that adults from both colonies behave similarly in Newfoundland waters, then this suggests that a large proportion of the population of Cape Hay must reach Newfoundland during the winter.

The wintering area of the remaining Lancaster Sound colonies must remain a matter of speculation, in the absence of adequate recovery data, but three recoveries of birds banded on Prince Leopold Island were all from west Greenland and included two adults recovered in February. For the moment, however, it seems safest to assume that all the Lancaster Sound colonies behave like those at Cape Hay.

The wintering area of the colony near Reid Bay in east Baffin is the most problematical, as no banding or other work has been conducted at the site since its discovery by Nettleship in 1973. The colony is approximately half-way between Lancaster Sound and Hudson Strait, but with currents setting generally southward and westward in Davis Strait, it seems unlikely that

adults with flightless chicks could cross to Greenland immediately after the breeding season. I think it reasonable to assume, therefore, that the bulk of this population also winters around Newfoundland.

Although there has been practically no banding carried out at the large colonies on Akpatok Island, their position and the fact that the majority of recoveries from Digges Sound and Coats Island have been from Newfoundland strongly suggest that these birds also head south after leaving Ungava Bay. The same arguments apply to the Hantzsch Island colony.

Recoveries of birds banded by the Danish banding scheme in Greenland show that many Thick-billed Murres from West Greenland appear in winter off Newfoundland (Tuck 1971, Salomonsen 1971). According to figures given by Tuck, however, 77% (N = 163) of these were birds in their first year, significantly more than the proportion of first-years in either the Cape Hay ( $\chi^2 = 17.8$ ,  $P < 0.001$ ) or Digges Sound ( $\chi^2 = 33.9$ ,  $P < 0.001$ ) samples recovered in Newfoundland. A further 12% were in their second year. It is possible, therefore, that the bulk of the adult population does not get as far south as Newfoundland in winter. Thick-billed Murres from further east, particularly from Spitzbergen, are known to reach West Greenland in some numbers (Salomonsen 1971), but none so far has been recovered off Newfoundland, so presumably they do not normally extend that far west.

Using some of the assumptions discussed above, I obtained a crude estimate of the total numbers of Thick-billed Murres wintering off Newfoundland. The following are assumed to winter in the area:

- (1) all birds from the Hudson Strait colonies and Reid Bay;
- (2) 75% of the population of Lancaster Sound and vicinity; and
- (3) all first- and second-year birds from West Greenland and 25% of the adult population.

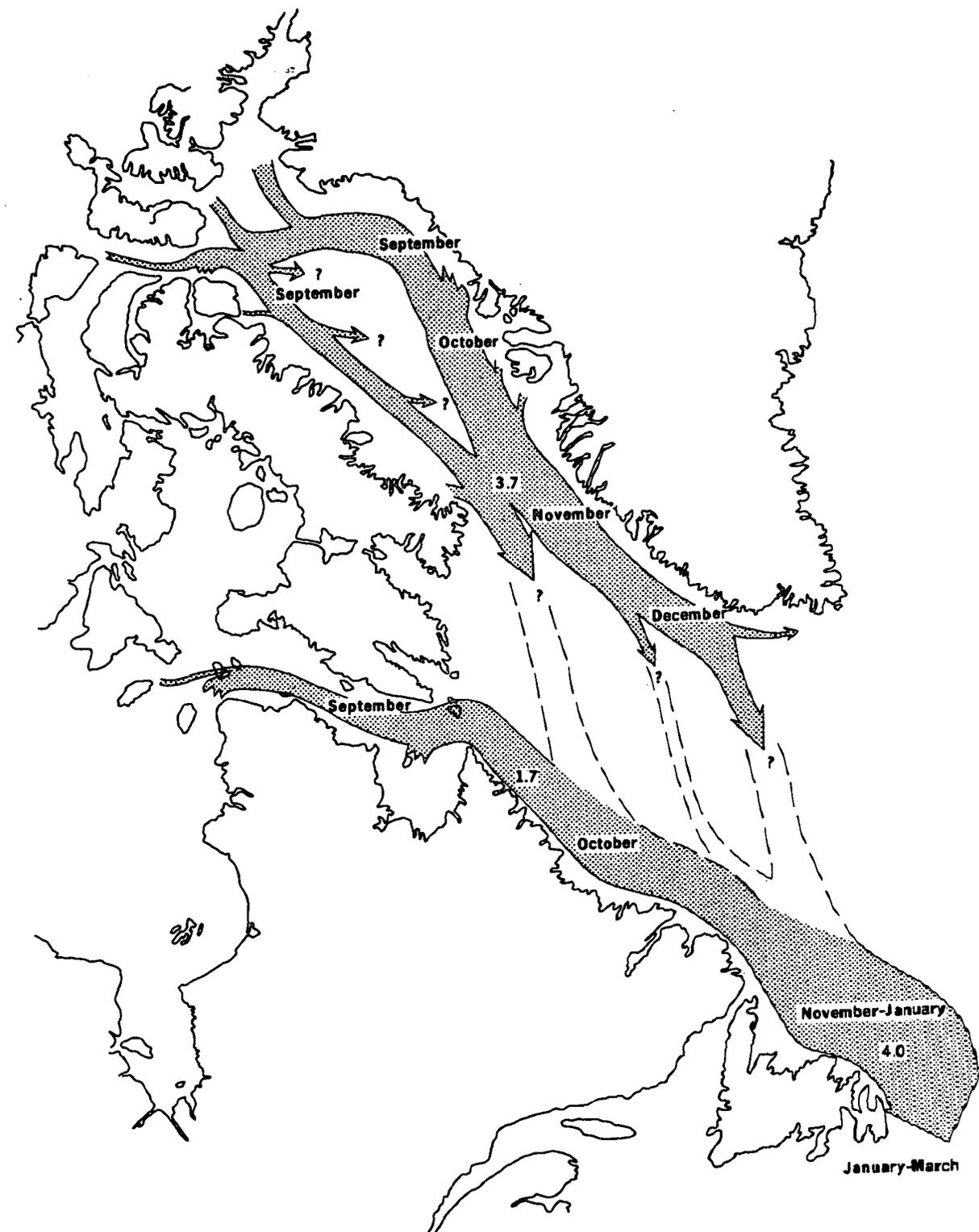
This gives an estimate of some 4 million birds altogether: 53% from Hudson Strait and east Baffin, 27% from west Greenland and 19% from Lancaster Sound. The total number is likely to vary considerably in response to the distribution of pack ice, but it can hardly be less than 3 million or more than 4.5 million in an average year.

#### Timing and route of migration

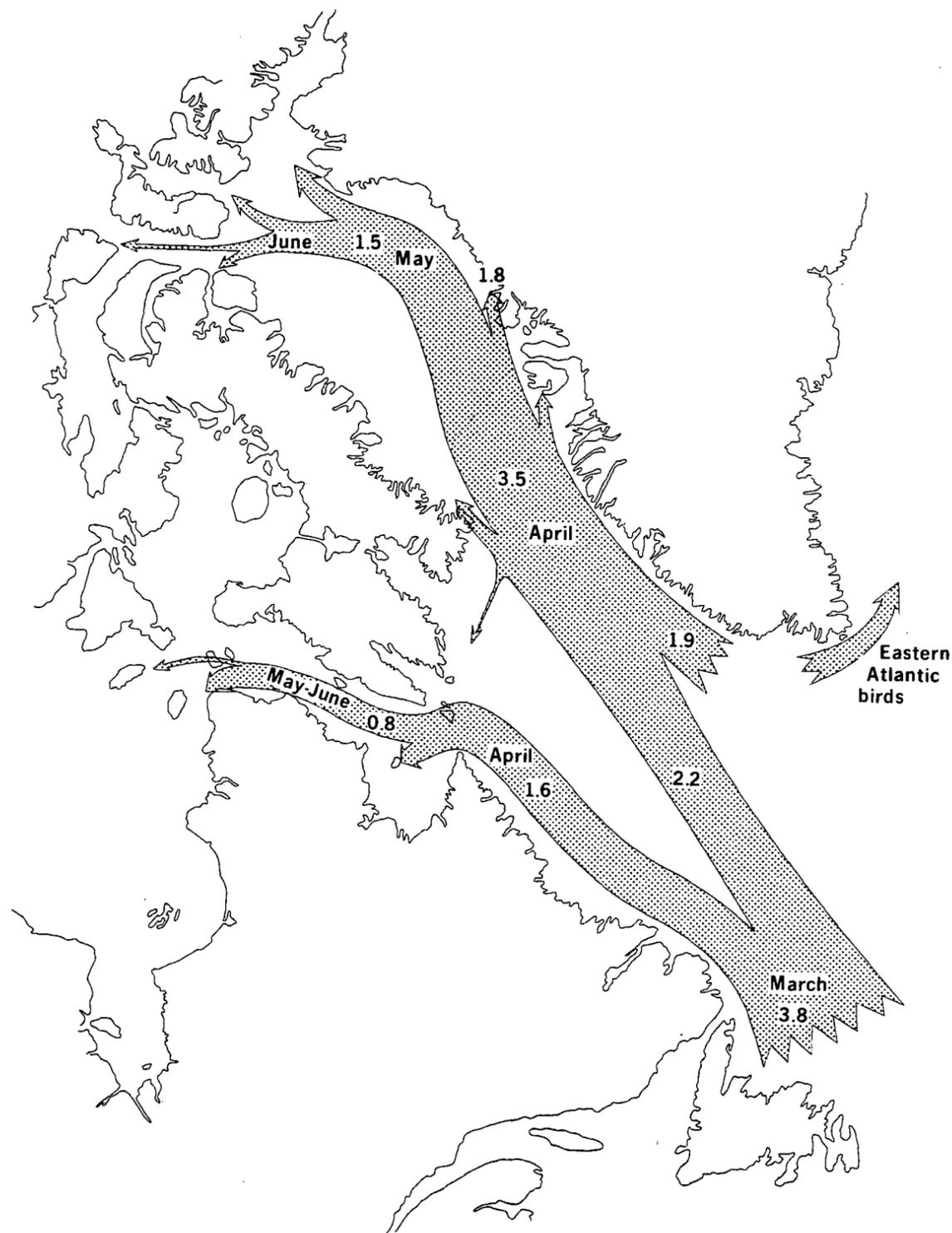
Evidence from Nettleship and Gaston (1978), Johnson *et al.* (1976) and some more recent surveys suggest that the murre population of the Lancaster Sound region leaves the vicinity very rapidly after breeding ends. By September some of these birds have reached Greenland, apparently crossing Baffin Bay north of 70° N and joining birds from the northwest Greenland colonies. Some of the population travels down the east coast of Baffin Island, however, presumably mingling with birds from Reid Bay in Davis Strait. (R.G.B.

**Figure 5**

Approximate size and direction of Thick-billed Murre movements in autumn in the western Atlantic. The widths of arrows are proportional to the numbers of birds. Numerals refer to millions of birds



**Figure 6**  
Approximate size and direction of Thick-billed Murre movements in spring in the western Atlantic. The widths of arrows are proportional to the numbers of birds. Numerals refer to millions of birds.



Brown, in prep.). South of Davis Strait it is not clear whether all birds move to the coast of Greenland or whether some move directly south to the coast of Labrador. By this stage, most of the young birds from Lancaster Sound may be capable of flying and hence independent of ocean currents. Birds from the Reid Bay area probably move south because chicks from this colony may still be very young when they pass through Davis Strait. Movements from Greenland to Newfoundland occur from November onwards, but the increasing proportion of adult birds in samples recovered off Newfoundland suggests that the movement continues until at least January, perhaps later.

Birds from the Hudson Strait colonies apparently pass out of the strait during September and early October, moving down the coast of Labrador in October and arriving off Newfoundland in November, possibly after spending some time off southeast Labrador (Brown, in prep.). The latter half of the passage out of Hudson Strait may consist of birds from Digges Sound, since chicks and parents probably take about 1 month to cover the 800 km to the mouth of the straits. Movements in autumn are summarized in Figure 5.

Return passage presumably begins in late March, and movements may be affected by year-to-year differences in the distribution of pack ice. If open water is available, birds begin to enter Hudson Strait in April and reach Digges Sound by May. Those bound for Lancaster Sound move to Greenland, large numbers being recovered north of 68° in May, and then cross to Lancaster Sound, arriving off their colonies in the second half of May or early June (Fig. 6). Assuming that the majority of birds remain off Newfoundland until late March, the spring passage to the colony areas is comparatively rapid, covering, in the case of the Lancaster Sound population, 3500 km in 6 weeks. Passage in Davis Strait probably lasts about a month and involves at least 3.5 million birds, so that rates of movement across the whole strait would be in excess of 100 000 birds a day.

#### Summary

- (1) The total summer population of Thick-billed Murres in eastern Canada and western Greenland is estimated as 5.8 million birds.
- (2) Of this total, 3.2 million breed in Canada and 3.8 million winter off Newfoundland.
- (3) Birds wintering off Newfoundland include the whole population of the Hudson Strait colonies, probably most of those from eastern Baffin and a large proportion of those from the Lancaster Sound region which were previously believed to winter mainly off Greenland.
- (4) The proportion of birds from West Greenland wintering off Newfoundland appears to be lower than previously assumed and may consist mainly of young birds.
- (5) Autumn passage takes place mainly in September and October, but adult birds apparently continue to build up off Newfoundland at least until January.

(6) Spring passage is rapid and takes place mainly in April.

#### Acknowledgements

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