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Thick-billed Murre Studies on Coats Island, 1985

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## INTRODUCTION

Coats Island was visited from 27 July to 11 August 1985 to continue the long-term thick-billed murre banding, population and breeding studies begun in 1984 (Elliot and Gaston 1984). The main objectives in 1985 were (i) to band large numbers of chicks and adults with year- and age-class combinations in order to help determine age at first breeding, juvenile and adult survival rates, and age structure of the harvested population, (ii) to set up and monitor count plots to determine year-to-year variation in the size of the breeding population, (iii) to record the occurrence and behaviour at the colony of 4-year-old banded birds, and (iv) to collect information on breeding biology parameters including hatching dates, chick growth rates, and the type of food fed to chicks.

## METHODS

The field team of Richard Elliot (RDE), David Noble (DGN), Tony Erskine (AJE) and Steve Wendt (JSW) camped at the site used in 1981 (Gaston 1981), less than a ten-minute walk west of the main (west) murre colony. We landed by Twin-Otter on the raised beach 500 m west of the camp-site. Our proximity to the colony made working trips much more efficient than in 1984 when we camped 5 km farther west.

Four wooden blinds stored at Digges Island were transferred by the Canadian Coast Guard to Coats Island, arriving there on 29 July. We set up three of these at the cliff-top on 30 July, and used them subsequently for counting and behavioural observations.

I selected eight count plots in the banding area north of the Fox Gully, and three to the south, in representative locations at various heights on the breeding cliffs (Figure 1). Murres on the plots were counted daily

between 1730 and 1930 h from viewpoints near the top of the cliff, without disturbing the birds.

The count plots were photographed on 10 August with 6 x 7 cm (large format) black-and-white film to provide specific plot photos. Both the west and east murre colonies were photographed from the water on 29 July, with black-and-white and colour film, to provide sharp photographs from which to count murrees present on the cliffs.

We banded chicks as in previous years by climbing down the cliffs to breeding ledges north of Fox Gully, using 11 mm ropes and jumar ascenders. Most adults were captured by hand and banded on these ledges (117), although we caught 17 with dip-nets from the cliff-top at 'B' (Figure 1). While we were on the ledges, we recorded all fish carried by adult murrees seen at close range, and collected all those we found dropped on the ledges.

We recorded the weights and wing-lengths of a sample of chicks just north of 'B' to determine the timing of breeding in 1985. A sample of the adults we banded was measured and weighed, as were 26 murrees collected away from the colony between 28 July and 6 August. The latter provided biometric data for birds of known sex.

Murre chicks had been banded here in 1981 with metal bands only, and in 1984 with white Darvic above metal. We searched banding areas for these birds, to see whether they were present at the colony, and had acquired potential breeding sites. We recorded the bands seen, the bird's location, its general behaviour, and whether it occupied a site and was incubating or brooding. We also recorded the presence and behaviour of birds banded as adults in 1984, (colour-marked with green Darvic above metal, and white on other leg), and recaptured as many of these as possible for future calculations of adult survival rates.

## RESULTS

The weather during our visit was similar to that recorded in 1984 (Elliot and Gaston 1984), with stormy conditions affecting field-work on four days (Appendix 1). A summary of the birds and mammals recorded is presented in Appendix 2. On 28 July RDE, DGN and JSW visited the gull colony 7 km south of Cape Pembroke, reported by Smith (1966) to be occupied by Thayer's and Iceland (= Kumlien's) Gulls in 1960. We estimated that 18 pairs of Iceland and 9 pairs of Glaucous Gulls nested there in 1985 (Appendix 3).

### Thick-billed murre plot counts

Plots were counted by DGN and RDE from 31 July to 10 August, beginning about eight days after the median hatching date (Table 1). The total numbers present appeared to increase during the first half of the count period and then decrease (Figure 2), with a marked drop on 7 August during a period of stormy weather with rain, strong south winds, and low barometric pressure (Appendix 1). Mean counts with 7 August omitted as possibly unrepresentative are also included in Table 1.

### Banding operations

We banded 1619 chicks from 3-11 August 1985 in the same area of the west colony as in 1984 (Appendices 4, 5). The chicks were younger than those banded in 1984, and as a result we estimate that less than 5% fledged prematurely due to our presence on the cliffs. Our disturbance effect was reduced further by using canvas bags to hold the chicks during banding operations.

Chicks were banded with a 1985-year-class yellow Darvic band on the right leg, held in place by the metal band below it. Half the chicks on each

ledge were banded with standard #5 F.W.S. metal bands (approx. internal measurements: 8.8 x 7.1 mm, n = 791), and half with special British "Guillemot" D-shaped bands (12.8 x 6.0 mm, n = 828).. The latter took only slightly longer to put on, and retained the colour band more effectively. They were somewhat loose on the tarsus, and may rotate on the chick's leg to end up reversed on the full-grown leg.

We banded 134 adults from 3-11 August in the same area (Appendix 5), recording the presence and amount of regression of the brood patch for 117, and body measurements for 37 birds. Each was banded on the right leg with a special "Guillemot" band which shows the entire number when the banded bird's leg is viewed from either side. All had the pale green Darvic adult band on the right leg, and the yellow 1985 band on the left. We also re-captured three birds at the cliff-top that had been banded as adults in 1984, and eight on breeding ledges (Appendix 6). An additional banded bird was collected at sea on 2 August.

Seven of the twelve 1984 birds had lost the single white Darvic band, probably by slipping over the adult's tarsus. The green bands were apparently somewhat smaller as all were still present, although on two captured birds, and one observed by AJE, the green band had slid below the metal #5 band (Appendix 6). We hope the yellow bands we reduced in diameter this year (at great cost in time and fingers) will suffer lower loss rates, particularly when held in place by the special band on chicks.

#### Chick biometrics and timing of breeding

The ages of 101 chicks measured on 4-5 August were inferred from their wing-lengths, based on length-to-age relationships derived for the Prince Leopold Island colony (Gaston and Nettleship 1981, Elliot and Gaston

1984). The resulting composite growth curve is similar to those calculated for Coats Island in 1981 and 1984 (Figure 3), although there is no indication that pre-fledging weights level off at about 340 g as in 1984.

The distribution of 1984 laying dates calculated from the ages of 12 eggs and 101 chicks measured on the plot, assuming a 32 day incubation period, is similar to that for 1984 (Figure 4). Laying in these years occurred about 5-6 days earlier than in 1981. Hatching dates at the Coats Island colony are among the earliest in the eastern Canadian Arctic, and those for 1985 are the earliest yet recorded in the region (Table 2).

#### Adult biometrics and the presence of brood patches

We recorded weight, wing-length, tarsus, culmen, bill-length from anterior end of nostril to bill tip (= nostril), bill depth, and external inter-orbital width (= ElW) for all collected adults, and for a sample of those banded at the colony (Table 3). Measurements are similar to those recorded in 1984 (Elliot and Gaston 1984), but the live birds were significantly lighter than those we collected, whereas the former sample had greater tarsus, nostril and bill depth measurements (Table 3). The difference in weights is not unexpected, as these varied markedly over the sample period, but reasons for the differences in measurements are unclear, as most were taken by RDE for both samples.

We hoped to collect about equal numbers of each sex, by collecting in both morning and late afternoon, but females predominated in all three samples, and made up 65% of the 26 murrelets taken. As Gaston et al. (1984) found at the Digges, Hantzsch and Akpatok colonies, measurements of females tended to be smaller, with significant differences between the sexes at Coats in tarsus, culmen and nostril measurements (Table 4). The high proportion of

the smaller females in our collected sample may thus have contributed to the difference with the sample of live birds, particularly if the latter included a preponderance of males.

External inter-orbital widths of males and females were virtually identical (Table 4), which contributes to the effectiveness of this measurement as an aging criterion for thick-billed murres. The narrowest EIW recorded at Coats in 1985 was 14.7 mm, for birds with brood patches present or regressed. This is appreciably wider than the maximum width of 12.0 mm of known (i.e. banded) and suspected first-year birds examined in the winter of 1984-85 (Elliot in prep.). One murre without a brood patch had an EIW of 12.6 mm, and was probably 2-3 years old, and the known four year old measured 15.8 mm. These data indicate that EIW is useful for aging pre-breeding murres in both winter and the breeding season.

We recorded the presence, size and proportion of down cover of brood patches of banded and collected adults, and where possible we estimated the age of chicks or eggs with which birds were associated. Brood patch condition was then assigned to one of five classes reflecting the degree of regression from bare vascularized skin to a complete down covering (Table 5). Overall, 61% of murres checked had full brood patches, although significantly fewer from the live sample had entire brood patches than from the shot sample (Table 5; Man-Whitney  $w = 7359$ ,  $P < 0.05$ ). This probably reflects the earlier dates at which the collected sample was measured, as the amount of regression of brood patches was significantly correlated with date (Spearman corr.  $r_s = 0.375$ , d.f. = 60,  $P < 0.01$ ), indicating that regression occurred during chick-rearing. The known 4-year-old bird had a regressing brood patch (class 4) which suggests that it may have attempted unsuccessfully to breed. Three

murres, probably 2-3 years old, showed no sign of having had a brood patch, as the entire ventral region was fully feathered (Table 5).

#### Observations of banded murres

We checked areas of cliff where murres had been banded in 1981 and 1984, to record the presence, location and behaviour of banded birds. None of the 1454 murres banded as chicks in 1984 were seen, although I estimate 700-1000 were still alive. This is consistent with Birkhead and Hudson's (1977) conclusions that first-year common murres do not return to the vicinity of the colony.

We made 55 sightings of birds with metal bands only\*. We consider that these were 4 year olds surviving from 1584 chicks banded in 1981, although 14 adults were also banded that year, none with colour bands. We assume that adults banded in 1984 would retain at least one colour band and would not be confused with four year olds.

One murre with a metal band only was brooding a chick on a large ledge south of 'B'. However, adults in this area could easily be captured and I suspect that this bird may have been banded as an adult (although we were unable to catch it). Only one other banded bird appeared to be associating with a breeding adult. One-third of the assumed four year olds were in non-breeding areas, and one-third were on peripheral edges of breeding ledges (Table 6). The distribution of behaviours and locations was intermediate between those for 3 and 5 year olds observed in July 1985 at Digges Island (Elliot 1985), and supports the conclusion that thick-billed murres rarely breed, at least successfully, at 4 years old.

\*Details of these observations were too voluminous for an appendix; copies are on file at CWS offices in St. John's and Ottawa.



We also made 28 observations of murre banded as adults in 1984, and captured a further 11 (Appendix 6). About 45% of a sample of 20 individuals were definitely breeding (associating with an egg, chick or breeding adult), 15% were probably breeding, 20% were definitely not breeding, and we were unsure of the status of the final 20%. However, as both non-breeding loafing birds on peripheral ledges and breeders lower on the cliff were banded in 1984, it is difficult to interpret these observations further.

#### Chick food

We recorded food delivered to murre chicks by direct observation (49%) and by collecting specimens dropped on breeding ledges (51%). Arctic cod Boreogadus saida was the most important species numerically, and accounted for about two-thirds of the food delivered by weight (Table 7). Blennies (Blenioidea) and capelin Mallotus villosus were the next most important taxa in terms of weight and number, respectively. These three taxa were also the most numerous in 1981 and 1984, except that sculpins (Cottidae) were more important than blennies, both numerically and by weight in 1984 (Table 8).

The average meal size in 1985 was somewhat greater than in either previous year at Coats Island, and is close to the highest recorded in eastern Arctic colonies (Table 9). Meal size at Coats was consistently higher than at the much larger colony at Digges Island, where food availability may limit chick growth (Gaston et al. 1985).

#### Discussion

We met all our objectives at Coats Island in 1985, which appears to have been a normal year in terms of colony attendance, time of breeding, chick

growth rates, and type and size of food items delivered to chicks.

Our observations of adults banded in 1984 showed that many had lost the colour year-class band, as had many first-year birds shot in Newfoundland in 1985 (Elliot in prep.). Care must be taken to reduce these losses to avoid the problems now being encountered at Digges Island (Elliot 1985). If many murrelets from the 1984 cohort return in 1986 and 1987 without colour bands, we will be unable to collect further clear data on the 1981 cohort marked with metal bands only. However, I believe that the new "Guillemot" bands will reduce the likelihood of Darvic band loss for chicks from 1985 on.

Measurements of the ElW of Coats Island murrelets suggest that inter-sex differences will not complicate its use as an age criterion, and comparisons of brood patch condition show that ElW could be useful in separating first- and second-year birds from older murrelets. The presence and condition of the brood patch may also help to separate those birds that have not bred from murrelets that attempted successfully or unsuccessfully to do so. Additional observations of brood patch conditions seem warranted, particularly earlier in the breeding season and in winter.

Conclusions from the few data presented here on the age at first breeding of thick-billed murrelets are consistent with those from Digges Island (Elliot 1985). Of particular interest is the four-year-old female collected on 2 August which had a regressing brood patch, an 'adult' ElW, and a large ovary (13 x 23 mm). I conclude that she was physiologically capable of breeding in 1985, and may have attempted to do so.

Together with observations of murrelets on the breeding cliffs, these results indicate that we should be able to determine the distribution of ages of first breeding at Coats Island over the next few years, especially if observers are present over a longer portion of the breeding season.

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Table 1. The mean number of thick-billed murres counted on eleven plots at Coats Island, 31 July - 10 August 1985 inclusive.

| Plot   | <u>All counts</u> |       | <u>Excluding 7 Aug. counts +</u> |       |
|--------|-------------------|-------|----------------------------------|-------|
|        | Mean              | S.D.  | Mean                             | S.D.  |
| E      | 267.3             | 44.8  | 275.6                            | 37.2  |
| F      | 256.6             | 44.4  | 270.3                            | 35.7  |
| K      | 151.8             | 42.3  | 159.0                            | 36.8  |
| L      | 115.7             | 18.6  | 119.6                            | 14.2  |
| M      | 106.0             | 18.9  | 110.0                            | 14.1  |
| G      | 99.4              | 17.0  | 101.6                            | 16.1  |
| H      | 203.2             | 39.3  | 210.9                            | 31.5  |
| I*     | 106.7             | 12.4  | 109.5                            | 9.3   |
| J*     | 113.4             | 14.5  | 116.0                            | 12.7  |
| C*     | 276.6             | 56.7  | 285.8                            | 51.6  |
| D*     | 147.4             | 12.5  | 149.9                            | 10.3  |
| Total* | 1861.9            | 278.7 | 1927.7                           | 196.7 |

\*counts conducted from 1-10 August only

+stormy weather on 7 August markedly reduced the number present (see Fig. 2)

Table 2. Hatching dates at thick-billed murre colonies in the eastern Canadian Arctic

| Colony               | Hatching Date |         |            | Reference                      |
|----------------------|---------------|---------|------------|--------------------------------|
|                      | Year          | First   | Median     |                                |
| Prince Leopold I.    | 1975          | 24 July | 29 July    | Gaston & Nettleship 1981       |
|                      | 1976          | 20 July | 31 July    | Gaston & Nettleship 1981       |
|                      | 1977          | 23 July | 5 Aug.     | Gaston & Nettleship 1981       |
|                      | 1978          | 5 Aug.  | 19 Aug.    | Nettleship et al. unpubl.      |
|                      | 1984          | 29 July | 10 Aug.    | Gaston unpubl.                 |
| Coburg I.            | 1979          | 27 July | 3 Aug.     | Birkhead & Nettleship 1982     |
|                      | 1981          | 21 July | 4 Aug.     | Nettleship unpubl.             |
| Cape Hay, Bylot I.   | 1979          | 28 July | 7 Aug.     | Birkhead & Nettleship 1982     |
| The Minarets         | 1985          | 18 July | 24-27 July | Gaston unpubl.                 |
| Hantzch I.           | 1982          | -       | 6 Aug.     | Gaston unpubl.                 |
| Akpatok I.-S. colony | 1981          | 2 Aug.  | 10 Aug.    | Chapdelaine & Brosseau unpubl. |
|                      | 1982          | -       | 11 Aug.    | " " "                          |
| Akpatok I.-N. colony | 1983          | 3 Aug.  | -          | Gaston unpubl.                 |
| Digges I.            | 1979          | -       | c. 1 Aug.  | Gaston unpubl.                 |
|                      | 1980          | 20 July | 28 July    | Gaston et al. 1985             |

Table 2. Hatching dates at thick-billed murre colonies in the eastern Canadian Arctic (Cont'd)

| Colony   | Hatching Date |         |         | Reference               |
|----------|---------------|---------|---------|-------------------------|
|          | Year          | First   | Median  |                         |
| 1981     | 26 July       |         | 31 July | Gaston et al. 1985      |
|          | 1982          | 20 July | 4 Aug.  | Gaston et al. 1985      |
|          | 1985          | 19 July | 30 July | Ellot & Gaston unpubl.  |
| Coats I. | 1981          | 18 July | 27 July | Gaston unpubl.          |
|          | 1984          | 17 July | 24 July | Elliot & Gaston unpubl. |
|          | 1985          | 14 July | 23 July | This report             |

Table 3. Measurements of living and dead adult thick-billed murres at Coats Island in 1983.

|                 |       | $\bar{x}$ | S.D. | n  | P*        |
|-----------------|-------|-----------|------|----|-----------|
| Weight (g)      | Live  | 937       | 73   | 18 | P < 0.01  |
|                 | Dead  | 1002      | 73   | 26 |           |
|                 | Total | 975       | 79   | 44 |           |
| Wing-length(mm) | Live  | 220.3     | 5.2  | 18 | NS        |
|                 | Dead  | 220.0     | 5.6  | 26 |           |
|                 | Total | 220.1     | 5.4  | 44 |           |
| Tarsus (mm)     | Live  | 42.1      | 4.4  | 18 | P < 0.01  |
|                 | Dead  | 38.8      | 1.7  | 26 |           |
|                 | Total | 40.1      | 3.4  | 44 |           |
| Culmen(mm)      | Live  | 36.0      | 2.1  | 36 | NS        |
|                 | Dead  | 35.1      | 1.8  | 24 |           |
|                 | Total | 35.7      | 2.0  | 60 |           |
| Nostril (mm)    | Live  | 29.3      | 1.8  | 36 | P < 0.01  |
|                 | Dead  | 28.1      | 1.7  | 24 |           |
|                 | Total | 28.8      | 1.9  | 60 |           |
| Depth (mm)      | Live  | 14.8      | 1.1  | 37 | P < 0.001 |
|                 | Dead  | 14.0      | 0.8  | 26 |           |
|                 | Total | 14.5      | 1.0  | 63 |           |
| E.l.W. (mm)     | Live  | 16.8      | 1.0  | 37 | NS        |
|                 | Dead  | 16.2      | 1.7  | 26 |           |
|                 | Total | 16.6      | 1.4  | 63 |           |

\*differences between samples of live and dead murres compared with two-sample T-test



Table 4. Measurements of adult female and male thick-billed murre collected at Coats Island in 1985.

|                  | Sex | $\bar{x}$ | S.D. | n  | P*     |
|------------------|-----|-----------|------|----|--------|
| Weight (g)       | F   | 999.9     | 78.5 | 17 | NS     |
|                  | M   | 1006.1    | 64.2 | 9  |        |
| Wing-length (mm) | F   | 220.1     | 6.7  | 17 | NS     |
|                  | M   | 219.7     | 2.7  | 9  |        |
| Tarsus (mm)      | F   | 38.2      | 1.2  | 17 | P<0.05 |
|                  | M   | 39.9      | 2.0  | 9  |        |
| Culmen (mm)      | F   | 34.5      | 1.6  | 15 | P<0.05 |
|                  | M   | 36.1      | 1.8  | 9  |        |
| Nostril (mm)     | F   | 27.5      | 1.9  | 15 | P<0.05 |
|                  | M   | 29.0      | 1.0  | 9  |        |
| Depth (mm)       | F   | 13.9      | 0.6  | 17 | NS     |
|                  | M   | 14.2      | 1.1  | 9  |        |
| E.l.W.           | F   | 16.2      | 1.8  | 17 | NS     |
|                  | M   | 16.3      | 1.8  | 9  |        |

\*differences compared with two-sample T-test

Table 5. Brood patch condition of live and dead thick-billed murres recorded at Coats Island in 1985.

|           |                                   | Percentage recorded |        |         |
|-----------|-----------------------------------|---------------------|--------|---------|
| Condition |                                   | Alive               | Dead   | Total   |
| Class     | Brood patch description           | (n=112)             | (n=26) | (n=138) |
| 5         | Full - unfeathered, vascularized  | 55                  | 84     | 61      |
| 4         | Regressing-slight peripheral down | 14                  | 4      | 12      |
| 3         | Regressing-half down covered      | 11                  | 8      | 10      |
| 2         | Regressing-small unfeathered area | 7                   | 0      | 6       |
| 1         | Regressed - all down covered      | 11                  | 0      | 9       |
| 0         | Not present - feather covered     | 2                   | 4      | 2       |

Table 6. Summary of behaviour of probable 4-year old murrelets at Coats Island in 1985.

| Behaviour                                | Number | % of total (n=55) |
|--|--------|-------------------|
| Loafing in non-breeding areas            | 19     | 35%               |
| Loafing at outer edge of breeding ledges | 18     | 33%               |
| Moving among breeding birds              | 2      | 4%                |
| Loafing in breeding areas                | 5      | 9%                |
| Aggressive interaction with non-breeder  | 3      | 6%                |
| Possible site but not incubating         | 2      | 4%                |
| Possibly associating with breeder        | 1      | 2%                |
| Brooding a chick (see text)              | 1      | 2%                |
| Others (e.g. in air)                     | 4      | 7%                |

Table 7. Details of individual fish delivered to thick-billed murre chicks at Coats Island, from 29 July to 11 August 1985.

| Taxon                    | Numbers        |                 |       | Weight (g) |       |    |             |
|--------------------------|----------------|-----------------|-------|------------|-------|----|-------------|
|                          | Seen delivered | Found on ledges | Total | $\bar{x}$  | S.D.  | n. | % by weight |
| <u>Mallotus villosus</u> | 16             | 9               | 25    | 4.79       | 4.00  | 9  | 5.5%        |
| <u>Boreogadus saida</u>  | 26             | 32              | 58    | 15.88      | 10.54 | 32 | 64.7%       |
| Blenny spp.              | 10             | 9               | 19    | 14.98      | 7.20  | 9  | 17.2%       |
| <u>Ammodytes</u> spp.    | 3              | 5               | 8     | 5.02       | 3.77  | 5  | 3.2%        |
| Sculpin spp.             | 7              | 9 <sup>2</sup>  | 16    | 8.21       | 4.01  | 8  | 8.4%        |
| Lumpsucker spp.          | 2              | 1               | 3     | 8.0        | -     | 1  | 1.0%        |
| Crustacea                | 1 <sup>1</sup> | 2 <sup>2</sup>  | 3     | 0.3        | -     | 1  | <0.1%       |

Notes: <sup>1</sup> meal of several individual crustacea

<sup>2</sup> one meal including one small sculpin and two crustacea

Table 8. Comparison (% of numbers) of fish species delivered to thick-billed murre chicks at Coats Island in three years, combining individual fish seen delivered with those found on ledges

| Taxon                              | 1981(n=51) | 1984(n=180) | 1985(n=132) |
|------------------------------------|------------|-------------|-------------|
|                                    | %          | %           | %           |
| <u>Mallotus villosus</u>           | 14         | 29          | 19          |
| <u>Boreogadus saida</u>            | 47         | 32          | 44          |
| Blenny spp.                        | 12         | 14          | 15          |
| <u>Ammodytes</u> spp.              | 6          | 0           | 6           |
| Sculpin spp.                       | 2          | 23          | 12          |
| <u>Liparis fabricii</u>            | 0          | 0.5         | 0           |
| <u>Reinhardtius hippoglosoides</u> | 2          | 0           | 0           |
| Lumpsucker spp.                    | 0          | 0           | 2           |
| Unident. fish                      | 0          | 0.5         | 0           |
| Squid                              | 0          | 1           | 0           |
| Crustacea                          | 0          | 1           | 2           |

Table 9. Comparison of average size of meals delivered to thick-billed murre chicks at eastern Arctic colonies.

| Colony                | Meal size (g) | Year    | Reference                |
|-----------------------|---------------|---------|--------------------------|
| Coats Island          | 11.5          | 1981    | Gaston unpubl.           |
|                       | 10.1          | 1984    | Elliot and Gaston 1984   |
|                       | 12.3          | 1985    | this study               |
| Digges Island         | 8.7           | 1980    | Gaston et al. 1985       |
|                       | 8.6           | 1981    | Gaston et al. 1985       |
|                       | 5.7           | 1982    | Gaston et al. 1985       |
| Hantzch Island        | 10.1          | 1982    | Gaston unpubl.           |
| Prince Leopold Island | 12.5          | 1975-77 | Gaston & Nettleship 1981 |

Appendix 1. Weather conditions recorded between 1900-2000 hrs at Coast Island  
in 1985, from the camp-site

| Date     | Max.          | Min.          | Precip.<br>(mm) | Pressure<br>(mB)   | Wind             |              | Cloud<br>Cover | Visib.<br>(km) |
|----------|---------------|---------------|-----------------|--------------------|------------------|--------------|----------------|----------------|
|          | Temp.<br>(°C) | Temp.<br>(°C) |                 |                    | Speed<br>(km/hr) | Wind<br>Dir. |                |                |
| 28 July  | 19°           | 2°            | 0               | 1016               | 5                | NW           | 1/10           | > 25           |
| 29       | 12°           | 5°            | 0               | 1016               | 14               | W            | 1/10           | > 25           |
| 30       | 19°           | 9°            | T               | 1016               | 18               | WSW          | 0/10           | > 25           |
| 31       | 10°           | 5°            | 8.8             | 1017               | 18               | ENE          | 3/10           | > 10           |
| 1 August | 8°            | 2°            | T               | 1006               | 12               | SSE          | 10/10          | 3              |
| 2        | 8°            | 4°            | 16.7            | 1007               | 10               | NE           | 9/10           | > 10           |
| 3        | 8°            | 2°            | 0               | 1013               | 19               | WSW          | 2/10           | > 25           |
| 4        | 12°           | 5°            | 2.5             | 1008               | 10               | NW           | 7/10           | > 25           |
| 5        | 10°           | 4°            | 0               | 1019               | 16               | W            | 2/10           | > 25           |
| 6        | 12°           | 3°            | 0               | 1018               | 0                | -            | 10/10          | > 25           |
| 7        | 10°           | 6°            | 7.4             | 997                | 25               | S            | 10/10          | 2              |
| 8        | 9°            | 4°            | 4.0             | <sup>993</sup> 997 | 13               | S            | 10/10          | > 25           |
| 9        | 8°            | 2°            | 5.9             | <sup>995</sup> 999 | 4                | NW           | 6/10           | > 25           |
| 10       | 10°           | 2°            | T               | 1011               | 0                | -            | 1/10           | > 25           |
| 11       | 14°           | 2°            | 0               | 1017               | 0                | -            | 0/10           | > 25           |

Appendix 2. Birds and mammals observed on Coats Island from 27 July to 11 August 1985. (note: p = pairs, f = family/brood, h = heard)

| Species                  | July |    |    |    |    | August |   |   |   |   |   |   |   |    |      |    |
|--------------------------|------|----|----|----|----|--------|---|---|---|---|---|---|---|----|------|----|
|                          | 27   | 28 | 29 | 30 | 31 | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10   | 11 |
| Red-throated Loon        | 1    | 2  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Arctic Loon              |      |    |    |    |    |        |   |   |   |   | 1 |   |   |    |      |    |
| Snow Goose               |      |    |    |    |    |        |   |   |   |   |   |   |   | 21 | + 85 |    |
| Canada Goose             | 18   |    |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Common Eider             |      | +  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| King Eider               |      | +  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Eider sp.                | +    |    | +  |    |    | +      |   |   |   | + |   |   |   | 2  |      |    |
| Oldsquaw                 |      | f  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Peregrine Falcon         | p    | 3p | +  | +  | +  | +      | + | + | + | + | + | + | + | +  | +    | +  |
| Semipalmated Plover      |      | f? |    |    |    |        |   | h |   |   |   |   |   |    |      |    |
| Baird's Sandpiper        |      | 1  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Herring Gull             |      | ?  |    |    |    | +      |   |   |   |   |   |   |   |    |      |    |
| Thayer's Gull            |      | +  |    |    |    | +      |   |   |   |   |   |   |   |    |      |    |
| Iceland (Kumlien's) Gull | +    | +  | +  | +  | +  | +      | + | + | + | + |   |   |   | +  |      |    |
| Glaucous Gull            | +    | +  | +  | +  | +  | +      | + | + | + | + | + | + | + | +  | +    | +  |
| Thick-billed Murre       | +    | +  | +  | +  | +  | +      | + | + | + | + | + | + | + | +  | +    | +  |
| Black Guillemot          | +    | +  | +  |    |    | +      | + |   |   |   | + |   |   |    |      |    |
| Horned Lark              |      | f  |    |    |    |        |   |   |   |   |   |   |   |    |      |    |
| Water Pipit              |      | +  | +  | +  |    | +      | + | + | + | + | + | + | + | +  | +    | +  |
| Pine Siskin              |      |    |    |    |    |        |   |   |   |   | h |   |   |    |      |    |



Appendix 2. Birds and mammals observed on Coats Island from 27 July to 11 August 1985. (note: p = pairs, f = family/brood, h = heard)  
(Cont'd)

| Species          | July |    |    |    |    | August |   |   |   |   |   |   |   |   |    |    |
|------------------|------|----|----|----|----|--------|---|---|---|---|---|---|---|---|----|----|
|                  | 27   | 28 | 29 | 30 | 31 | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Snow Bunting     | +    | +  | +  | +  | +  | +      | + | + | + | + | + | + | + | + | +  | +  |
| Lapland Longspur |      | +  | +  | +  | +  | +      | + | + | + |   |   | + | + | + | +  | +  |
| Caribou          |      |    |    |    |    |        |   |   |   | 2 |   |   |   |   |    |    |
| Arctic Fox       | 2    | h  | h  |    |    | h      | h | h | 2 |   |   |   |   | + | +  | +  |
| Polar Bear       |      | 1  | 1  |    |    |        |   | 1 |   |   |   |   |   |   |    |    |
| Walrus           | +    | +  | +  | +  | +  | +      |   | + |   | + | + |   |   |   | +  | +  |

## Appendix 2 (continued)

Summary of Predators (and Geese!)

Peregrine Falcon - 3 pairs - nest with 3 chicks est approximately 1 month old above fox gully to north (11 Aug.); a second pair defending tenaciously over 1984 comp-site (28 July) and a third pair defending a site at the gull colony south of Cape Pembroke (28 July).

Snow Geese - flock on 9 August had 5 white and 7 blue phase, flock on 11 August had 20 white and 5 blue

Polar Bear - in addition to singles, Germaine Tremblay (from CCG Pierre Radisson) saw 4-5 between Cape Pembroke and the marker beacon on 29 July. None seen near the colony.

Arctic Fox - a family occupied a scree pile 200 m inland from 1985 camp, with 2 cubs and one adult seen. Check of area on 31 July showed 42 carcasses of TBM well-cleaned, apparently all from 1985, as well as 4-5 TBM egg-shells, wings from one female, one male (common?) eiders, and hoof from a caribou calf. Two TBM skulls measured were both adults, and mean wing-lengths were: R=  $221.3 \pm 4.5$  mm (n=8), L=  $219.7 \pm 4.8$  mm (n=9).

Appendix 3. Results of Cape Pembroke gull colony census.

Cape Pembroke, Coats Island (62°53.5'N, 81°57'W)

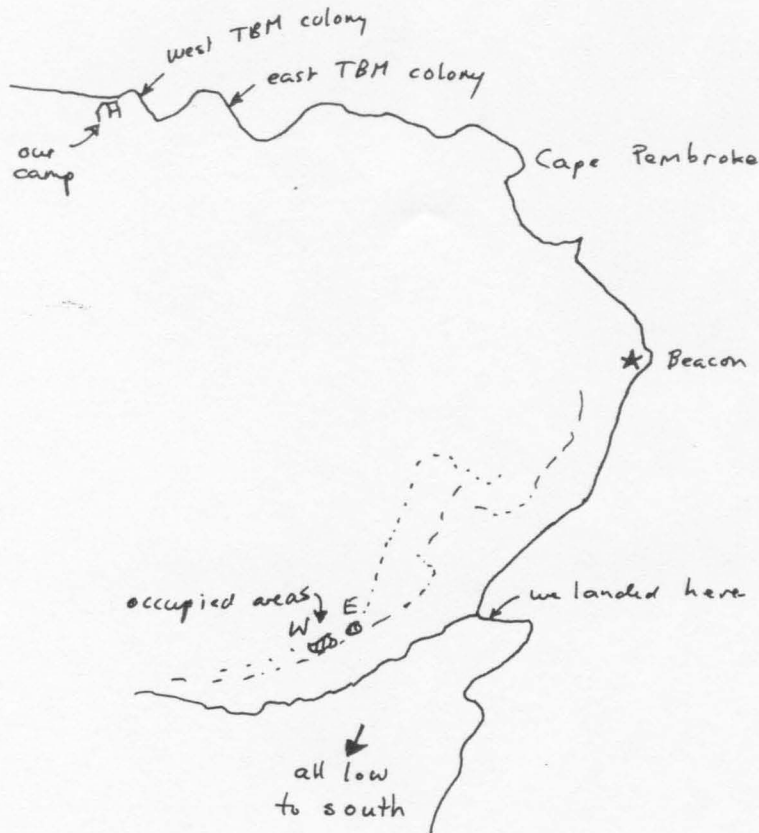
Date Surveyed: 1530-1640, 28 July 1985

Surveyed by: R. D. Elliot, D. G. Noble, J. S. Wendt

Survey Conditions: clear, 15°C, no wind

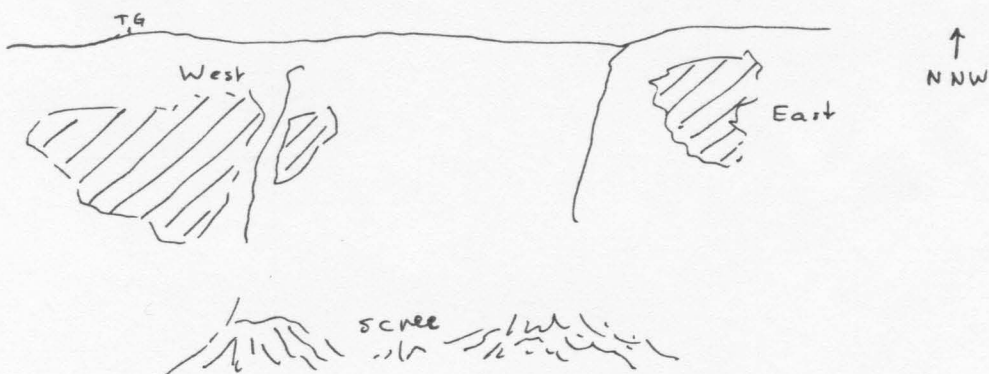
Colony Location: This colony was checked by N.G. Smith (apparently) on 3 or 4 Sept. 1960, although his coordinates were erroneously given as 62°85'N, 81°80'W (Smith, 1966: 9) probably typo error for 62°55'N, 81°50'W, probably too late late for accurate checking (chicks probably all fledged). Graham Cooch, CWS-HQ, gave A. J. Erskine the following location, probably based on Smith's pers. comm.: "about 5 miles south of Cape Pembroke, about a mile inland across a beach, on a cliff".

We found the colony at a site fitting the description exactly, on the last high cliff going south from the Cape. The beach is on a small bay 5.5 km south of Cape Pembroke, and 3.0 km SW of the navigation beacon. The occupied area of cliff is 2100 of my (RDE's) paces inland, est. = 1.6 km (or 1 mile!)



Cape Pembroke, Coats Island (Gulls - cont'd)

Colony Description: The gulls all nested on cliffs, apparently inaccessible to foxes, which had been used for many years on about the same area, as all on areas were covered with coprophilous lichens. Cliffs looked about 50-75 m in height above the scree slopes, facing SSE overlooking a broad valley. They occupied two separate areas, separated by approx. 50 m of bare rock.



Species Descriptions: Only Kumlien's (Iceland) Gulls and Glaucous Gulls were confirmed on breeding at this colony. The following counts were made by RDE and DGN together, with identifications based on wing + wing-tip colour, overall size, head shape and bill size, and eye colour - e.g. yellow for glaucous, dark for Kumlien's.

We recorded total individuals seen, pairs (assumed on the basis of two together on suitable ledge, or one with nest/chicks, or chicks alone), and nests (with chicks seen, or inc adult, does not account for nests already lost).

|             | Kumlien's |      |       | Glaucous |      |       |
|-------------|-----------|------|-------|----------|------|-------|
|             | East      | West | Total | East     | West | Total |
| Individuals | 4         | 37   | 41    | 6        | 9    | 15    |
| Pairs       | 2         | 16   | 18    | 4        | 5    | 9     |
| Nests       | 1         | 11   | 12    | 3        | 4    | 7     |

Both KG and GG chicks were quite large, est 1-3 weeks, with KG only slightly behind GG, probably only by a few days, rather than weeks as at Digges Island - 1982

Mean chick count for KG was 1.5 (SD = .53, n = 8) and for GG was 1.75 (SD = .5, n = 4)

Other Species

- Thayer's Gull - one adult was present in the second half of the count period, loafing at the very top of the cliff (TG on drawing), identified by dark back, black wing-tips and very dark eye (all obs. with 40x telescope).

- no indication of any breeding by TG, except 2 flying (1 year old?) imm. gulls circling over the colony (never seen to land) which had darkish-brown body and pale outer halves to secondaries and primaries.
- however scattered similar birds occur with KG and GG along the beaches here in loafing spots and may be from colonies far afield. - I certainly doubt very much they were fledged from this colony.
- Peregrine Falcon - 2 (= 1 pr) on same cliff 1/3 of way back E to bay, screaming and swooping (but not low), may well have been breeding, as habitat is good, but rather close to pairs at west TBM colony and 1984 campsite 5 km further west, both present in July 1985.

#### Photographs

- colour slides taken showing distribution of nests on cliffs from the meadow below by RDE

#### Map

- 1:250,000 topographic 45J, edition 1 MCE, series A501

## Appendix 4. Numbers of #5 metal bands used on chicks on Coats Island in 1985

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| Band numbers    | n   |
|-----------------|-----|
| 785-59051 - 100 | 50  |
| 59101 - 200     | 100 |
| 59201 - 250     | 50  |
| 59301 - 400     | 100 |
| 59401 - 500     | 100 |
| 59501 - 600     | 100 |
| 59601 - 700     | 100 |
| 59701 - 710     | 10  |
| 59751 - 800     | 50  |
| 59801 - 900     | 100 |
| 59930 - 960     | 31  |
| Total           | 791 |

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Appendix 5. Numbers of species "Guillemot" bands used on chick and adult thick-billed murres on Coats Island in 1985

| a) chicks    | n          | b) adults        | n          |
|--------------|------------|------------------|------------|
| 1011-1034    | 24         | 1001-1010        | 10         |
| 1044-1088    | 45         | 1035-1043        | 9          |
| 1101-1113    | 13         | 1089-1100        | 12         |
| 1116-1117    | 2          | 1114-1115        | 2          |
| 1124-1200    | 77         | 1118-1122        | 5          |
| 1201-1299    | 99         | 1300             | 1          |
| 1301-1315    | 15         | 1394-1400        | 7          |
| 1317-1393    | 77         | 1441-1450        | 10         |
| 1401-1440    | 40         | 1541-1548        | 8          |
| 1451-1500    | 50         | 1689, 1691, 1693 | 3          |
| 1501-1540    | 40         | 1864-1870        | 7          |
| 1551-1600    | 50         | 1941-2000        | 60         |
| 1601-1688    | 88         |                  |            |
| 1690, 1692   | 2          |                  |            |
| 1694-1697    | 4          |                  |            |
| 1701-1800    | 100        |                  |            |
| 1801-1328    | 28         |                  |            |
| 1830-1863    | 34         |                  |            |
| 1901-1940    | 40         |                  |            |
| <b>Total</b> | <b>828</b> | <b>Total</b>     | <b>134</b> |

Appendix 6. Band numbers recorded in 1985 for murrelets banded at Coats Island in 1981 (as a chick) and 1984 (as adults).

| Banding Year | Band Number | Location                 | Bird's status         | Band condition                                 |
|--------------|-------------|--------------------------|-----------------------|--|
| 1981         | 785-45665   | 1-2 km NW of west colony | - collected 2 Aug./85 | - band loose                                   |
|              |             | (all in west colony)     |                       |  |
| 1984         | 785-42085   | 'B' - south              | - no brood patch      | - band loose                                   |
|              | 785-42084   | 'B' - south              | - uncertain           | - white band gone                              |
|              | 785-42096   | 'B' - south              | - uncertain           | - O.K  |
|              | 785-58684   | 'N' - ledge l            | - br. chick           | - white gone, green slid over very tight metal |
|              | 785-58685   | 'N' - ledge j            | - br. chick           | - green slid over very tight metal             |
|              | 846-55015   | 'N' - ledge f            | - br. chick           | - white band gone                              |
|              | 846-55026   | 'N' - ledge j            | - br. chick           | - white band gone                              |
|              | 846-55031   | 'N' - ledge c            | - br. chick           | - white band gone                              |
|              | 846-55033   | 'N' - ledge d            | - regressed B.P.      | - white band gone                              |
|              | 846-55040   | 'N' - ledge k            | - br. chick           | - O.K  |
|              | 846-55048   | 'N' - ledge k            | - br. chick           | - white band gone                              |



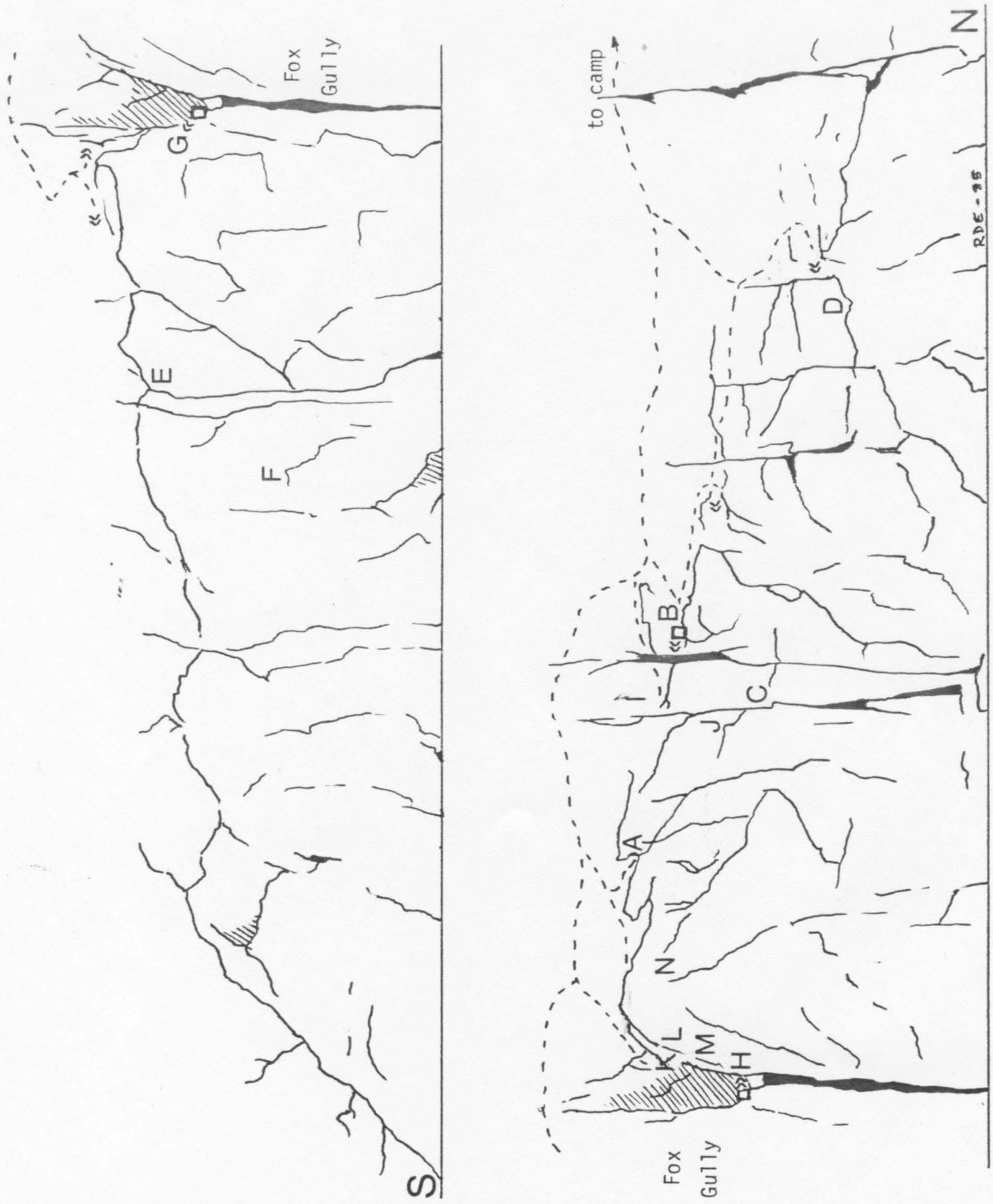


Figure 1. Plan of the west Coats Island murre colony, showing the study plots, the count sites (»), the blinds (□), and the trails (-----).

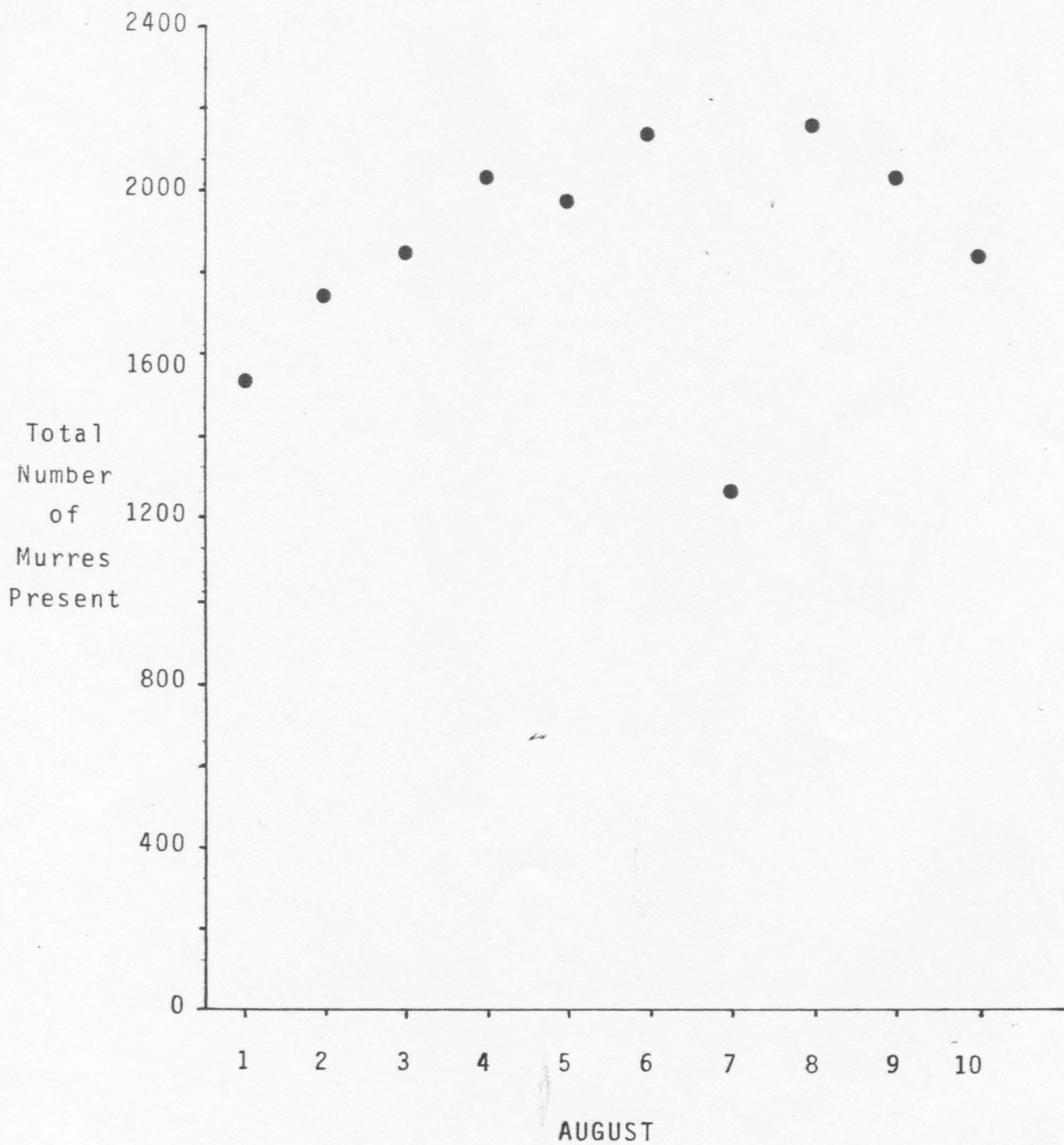


Figure 2. The total number of adult thick-billed murrelets present on the count plots on Coats Island from 1 to 10 August 1985.

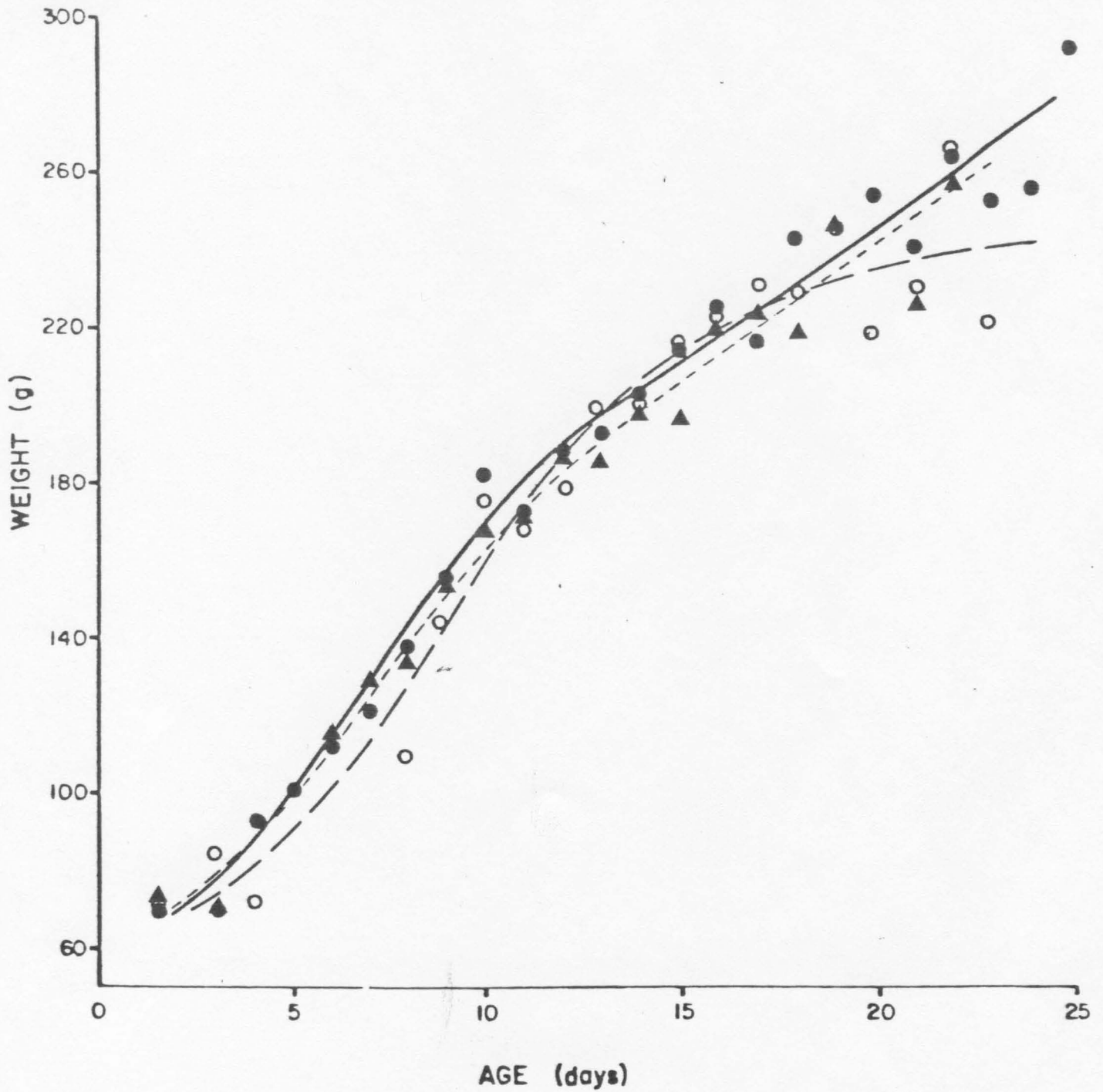


Figure 3. Composite growth curves for Coats Island chicks measured and weighed on 12-14 August 1981 (—●—), 8-9 August 1984 (—○—), and 4-5 August 1985 (—▲—). (Curves fitted by eye).

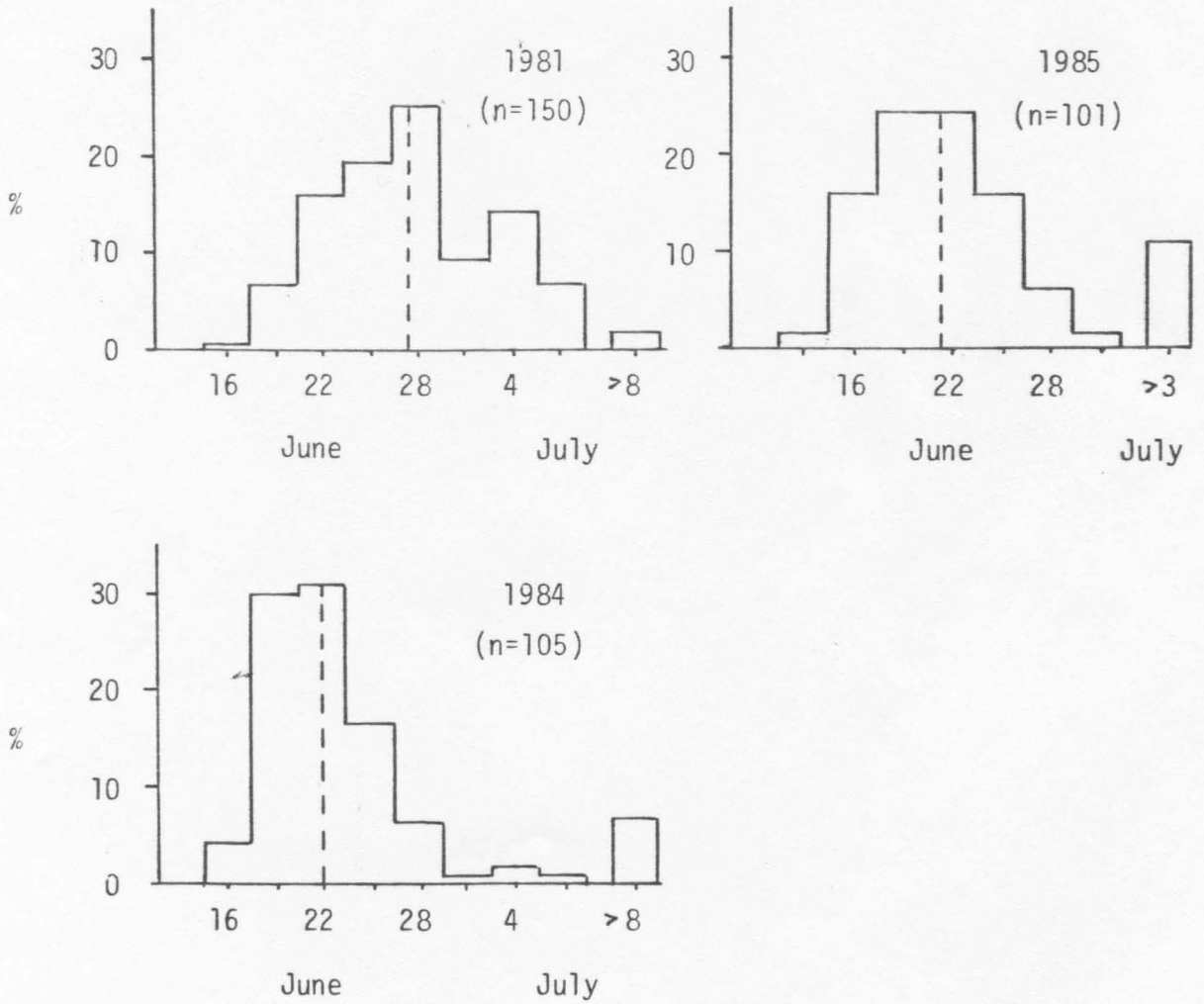


Figure 4. Distribution of estimated laying dates of thick-billed murres at Coats Island in 1981, 1984 and 1985, grouped by three-day periods. Dashed lines represent approximate mean laying dates.

CANADIAN WILDLIFE SERVICE  
P. O. BOX 1590  
SACKVILLE, N. B.  
EOA 3C0

QL  
696.C42  
E46  
1985

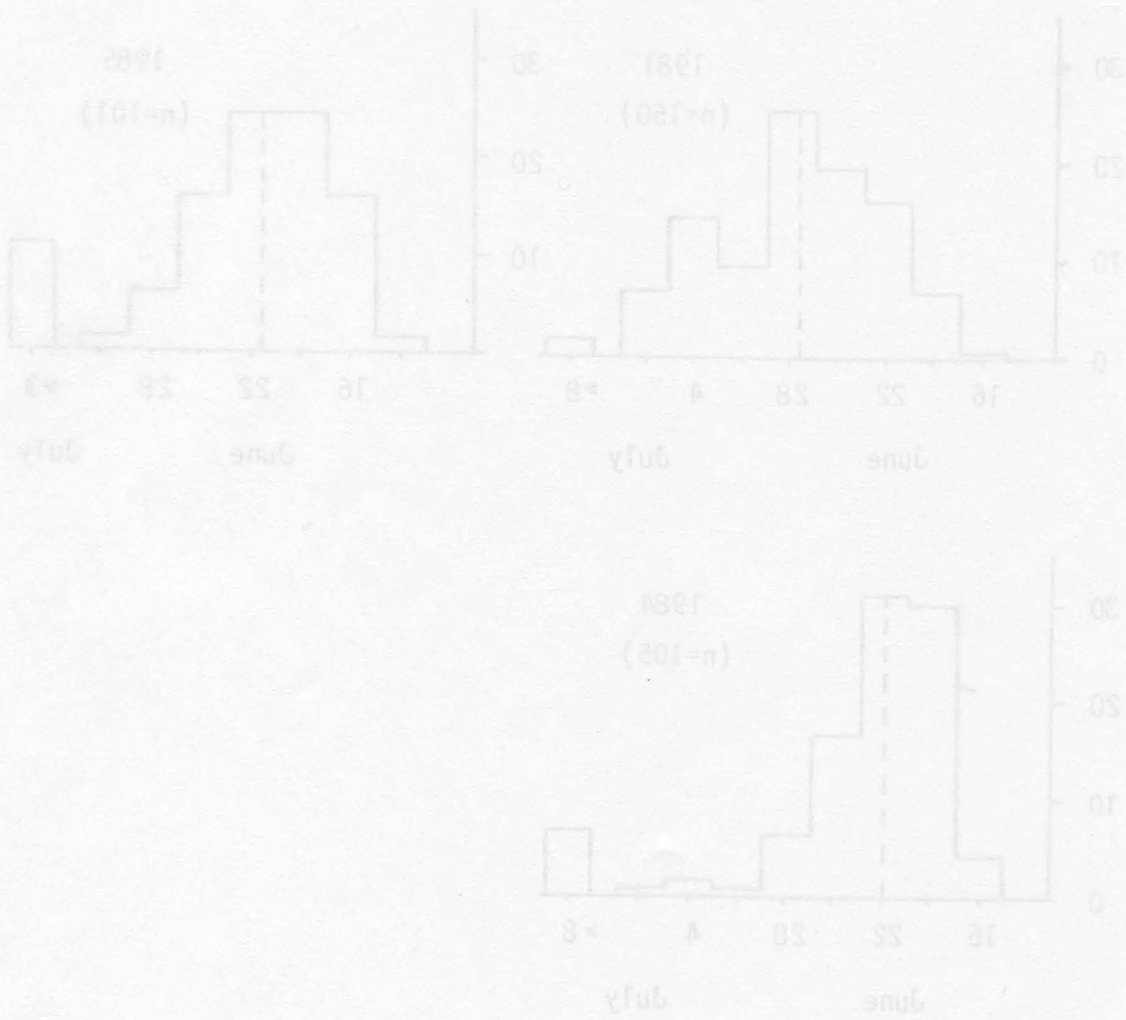


Figure A. Distribution of estimated laying dates of thick-billed waders at Costa Island in 1981, 1984 and 1985, grouped by three-day periods. Dashed lines represent approximate mean laying dates.