Aspects of spring migration of Knot in Morecambe Bay

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During the springs of 1969, 1970 and 1971 the Morecambe Bay Wader Group have made a special study of the Knot. This short paper presents some of the results concerning weight and plumage studies and compares these results with those made in Iceland during 1970 and 1971.

There is normally a marked spring passage (late March - early May) of Knot through Morecambe Bay. The peak of the passage varies from year to year, but total numbers in the whole Bay may exceed 100,000 compared with a mid-winter population of about 70,000 birds. One of the main Knot roosts is on the West Bank Saltmarsh on the east of the Bay. Most of the Knot ringed in spring have been caught on this roost, almost all with mist nets. The spring population on this roost during the period of study is shown in Figure 1.

Summer Plumage Studies

For each bird processed the degree of summer plumage it possessed was estimated. The scale used was winter plumage, trace, $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ or full summer plumage.

Although there was some difficulty in deciding what stage certain individuals had reached, the amount of redness of the underparts does give a reasonable degree of reproducibility. Figure 2 presents the change in the percentage summer plumage during the spring. It shows that the first signs appear at the end of the third week of March and that by the end of the first week of April over half of the adults are in some stage of summer plumage. Full (or $\frac{3}{4}$) summer plumage starts to appear by about the 10th April and the percentage of birds in it increases rapidly until the end of the second week in May almost all adults are in summer plumage. A few adults do not attain any summer plumage until the beginning of May. By the time they reach Iceland (10-12th May) almost all individuals are in full summer plumage.

Weight Studies

Figure 3 summarises the mean weights of individual catches made in the spring. The confidence limits are not put in the graph because the weight range is invariably large and it would obscure the picture. Also included on this graph are the means for catches made in Iceland in 1970 (from the Cambridge -London Expedition 1970 report) and 1971 (by courtesy of Dr. Guy Morrison).

There are a number of aspects which arise from this figure which are worth considering in more detail.

1) Variation between years

At first sight the yearly variation seems very large, however if the count data (from Figure 1) is compared it can be seen that most of the differences can be explained.

1969 was an 'average' year with a quick build up at the end of March and a quick departure in the second week of May. The weights were still at their winter average in mid April, however they rose rapidly in late April and early May until on May 6th two weight groups were present: one of these with full summer plumage had a mean weight of 195.7 $\pm$ 3.1gms.; the other group were in half summer plumage and weighed 172.5 $\pm$ 6.3gms. It is clear that there was a speedy weight build up at the end and those in full summer plumage were about to migrate (weighing up to 220 gms.)

1970 In this year numbers built up well with a corresponding fairly rapid rise in weight during mid April. However after these rises there was a halt in passage and very large numbers were present for longer than any other year. The weights remained very similar and only a small further increase was noted. During the late spring of 1970 only three Knot exceeded 200gms. in weight (max 208). It seems very likely that they did not put much more weight on Morecambe Bay, although the large flock noted on the Foulney mussel beds in early May may have contained heavy birds.

1971 Unfortunately fewer counts and fewer catches were made in 1971, however a late build up in numbers in mid April and a corresponding rapid increase in weight was noted. In late April out of 67 processed birds no fewer than 29 weighed over 200gms. (up to 226gms.) and it is probable that during the next few days the departure weight was reached. The comparison with Icelandic weights will be made in a later section. Large arrivals of Knot were noted in Iceland on May 9th.

2) Rate of weight build up

1969	19th April	157.5gms.	28.5gms. in 17 days.
	6th May	186.0gms.	
			= 1.68gms./day
1970	10th April	152.8gms.	19.5gms. in 14 days.
	24th April	172.3gms.	
			= 1.39gms./day
1971	25th March	154.0gms.	43.4gms. in 33 days.
	27th April	197.4gms.	
			= 1.32gms./day

These figures for the rate of weight again are minimal because the starting point of the rise was not known and the end point may not quite have been reached. A better idea of the potential rate of increase probably can be gained from the data obtained in Iceland in 1971.

11th May	165.7gms.	41.9gms. in 14 days.
25th May	207.6gms.	
		= 2.99gms./day

The catch made on 25th May almost certainly involved birds which had just about reached their departure weight, for five days later almost no Knot were left in Iceland. Also one of the Knot trapped then weighed 229gms. the heaviest one recorded.

3) The survival value of fat deposits

Figure 3 shows that the arrival weights in Iceland are much lower than the departure weights in Morecambe Bay. No catch in Morecambe Bay was followed immediately by a massive departure, so it is reasonable to assume that the average departure weight from Britain is about 200gms. or even a little higher. The arrival weight in Iceland is about 165gms. This means that they lose a minimum of 35 to 40 grams during the flight. Taking a mean ground speed of 50 m.p.h. and a distance from Morecambe Bay to southwest Iceland as 1,000 miles, the flight time is 20 hours. Therefore they lose about 2gms. of weight per hour flying.

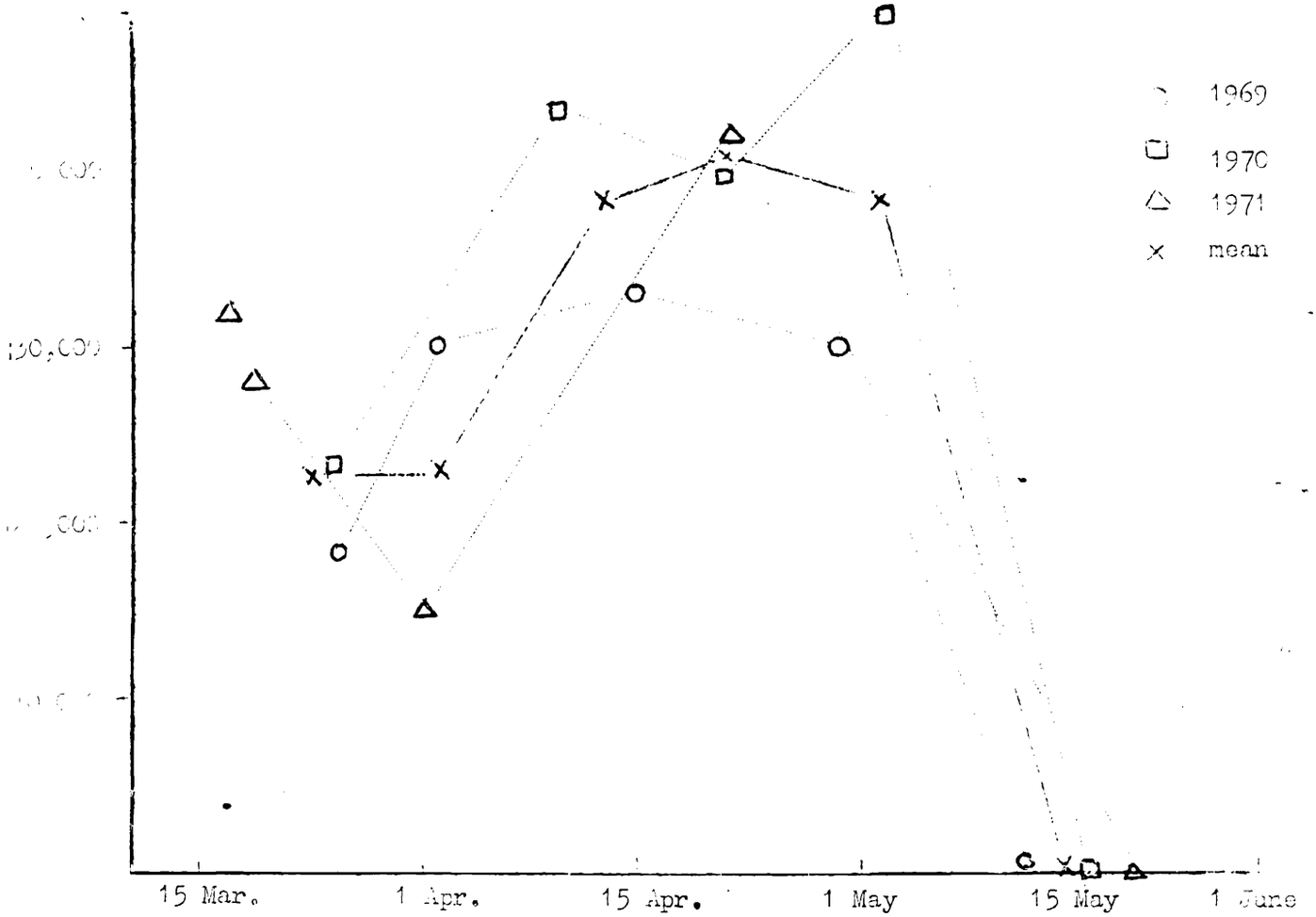

Fig. 1 The number of Knot at Hest Bank, Morecambe Bay during the spring.

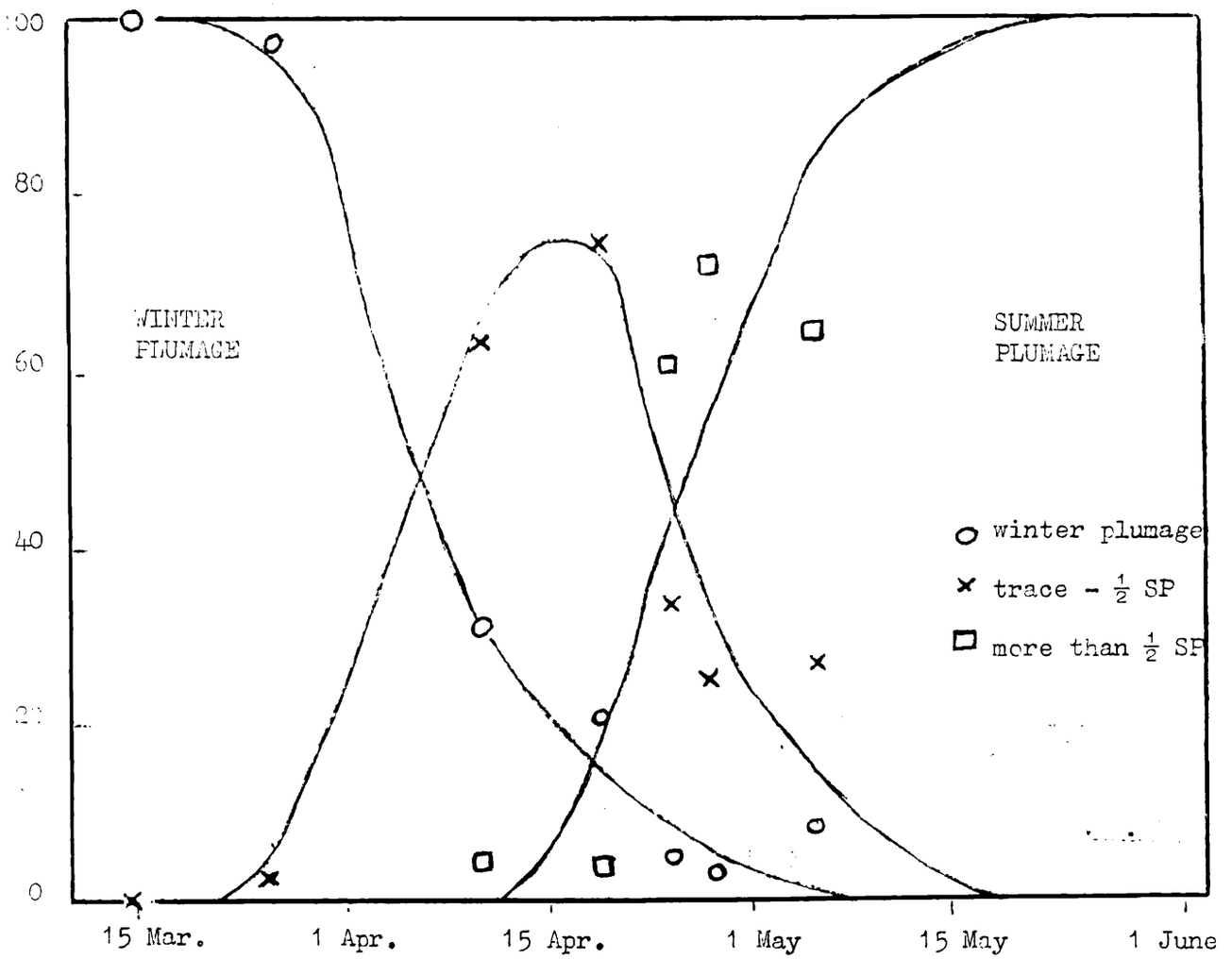

Fig. 2 Percentage of adult Knot in Morecambe Bay in summer plumage in spring.

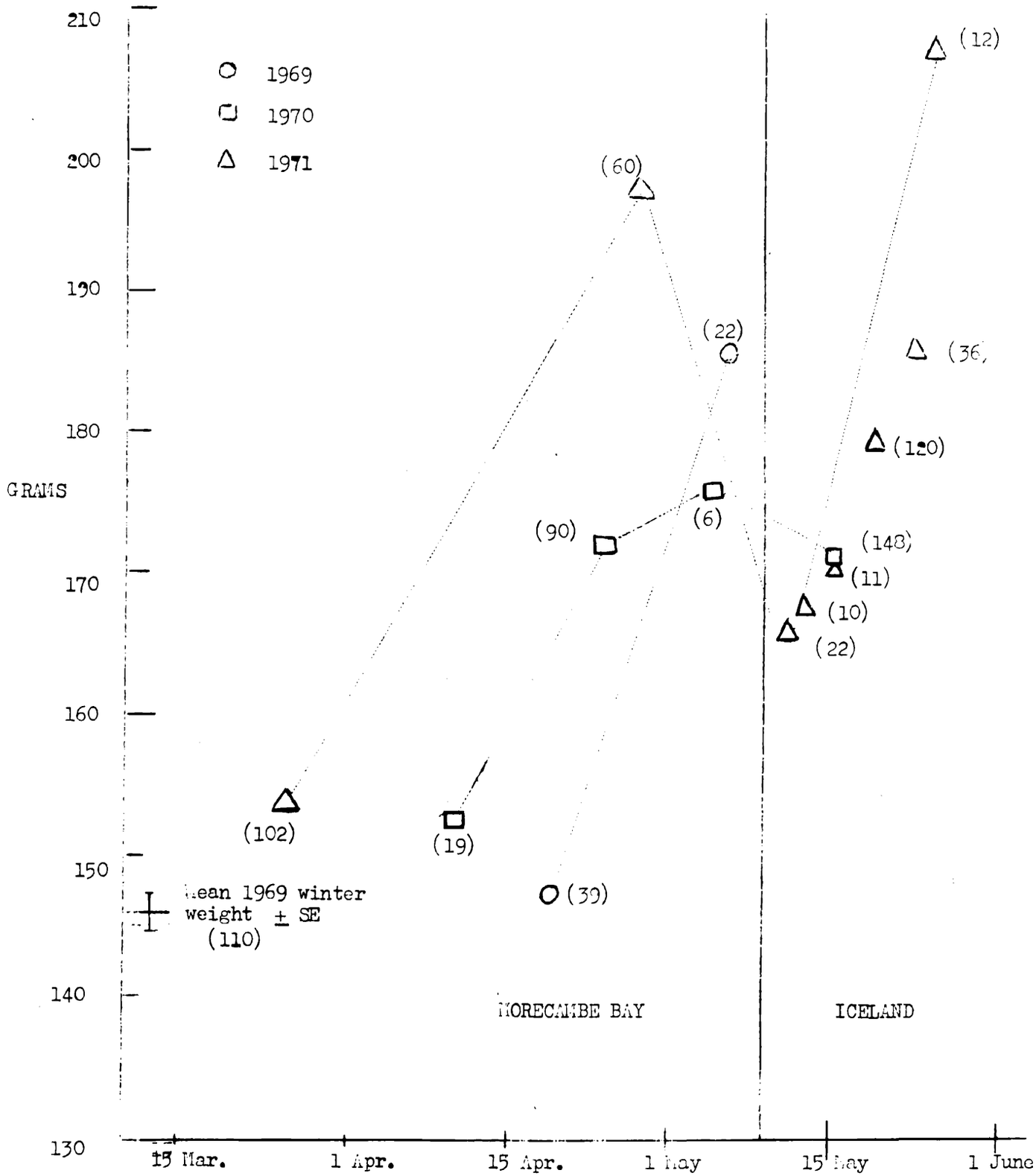

Fig. 3. Average weights of Knot in Morecambe Bay and Iceland during the spring. The sample size is included in brackets by each point.

The distance between S.W. Iceland and N.W. Greenland/Ellesmere Island is about 1400 miles. This would take about a further 28 hours flying. If the same rate of weight loss continued then a further 50 to 55 grams would be used up. Thus taking a mean starting weight of 200gms. the weights of Knot on arrival on their breeding grounds if they made a direct flight from Morecambe to Greenland would be between 105 and 115 grams. This is very close to the minimum weights recorded in Morecambe Bay and probably is only a little above the critical weight, i.e. that below which death must follow.

Although this is rather hypothetical the weight loss can be calculated theoretically and for the Morecambe Bay - Iceland flight the theoretical weight loss would be 38.17gms., almost exactly the observed weight loss.

The adaptation of Knot weight build up is clear. They would normally fly to Iceland with quite a large reserve fuel supply, where they refuel. If, due to weather conditions, they miss Iceland on their flight, they will have enough energy to reach the east and probably the west coast of Greenland. Because Greenland has relatively few good feeding areas for Knot, especially in early May, the birds overflying Iceland will be under more physical stress than others and may be expected to survive less well. The large increase in weight in Iceland is undoubtedly because the Knot cross the centre of Greenland and have to fly over the Greenland Ice cap.

Summary

1) The spring passage of Knot in Morecambe Bay occurs between late March and early May.

2) Summer plumage is attained at the same time as the passage occurs.

3) Knot increase their weight rapidly in late April, a rate of increase of 2.99gm./day has been recorded in Iceland.

4) The average departure weights lay between 200 and 210 grams. Weights of up to 226gms. have been found in Morecambe Bay and 229gms. in Iceland.

5) The weight loss from Britain to Iceland is 35-40gms. observed and 38.17gms. calculated. Weight is lost at the rate of 2gm./hr. during flight.

6) Only a small percentage of Knot could reach their N.W. Greenland breeding areas directly from Britain without refueling in Iceland.

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