

Observations of Knot migration in Iceland 1970 - 1972

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This paper describes the migration of the Knot in Iceland, based mainly on observations made during the period 1970-72. The first migrants are usually seen in the last half of April, with main arrivals taking place in early to mid May. Peak numbers are present from mid May onwards. Mass departures occur in the last few days of May and by early June very few Knots are left in Iceland. A few birds summer in Iceland, but there are no confirmed breeding records of the species in the country. The autumn passage of adults starts about mid July and peaks at the end of July and in early August. Juveniles return south from mid August onwards. Many fewer Knots are seen in the autumn compared with the spring. Totals of Knots observed on ground and aerial surveys in the 1970s are presented and compared with more recent survey results.

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INTRODUCTION

Early records of Knot migration in Iceland (for a review see Morrison 1992) indicated that large numbers of birds passed through the country, especially during spring migration, though rather few details were available and the importance of the position of Iceland in the migration system of the Knot was not clearly understood. The studies of Ingolfsson & Gardarsson (1955) at Seltjarnarnes near Reykjavik provided the first detailed account of Knot migration at a site in southwest Iceland, describing the timing and duration of both spring and autumn passages. Studies of wader migration in Iceland in the early 1970s provided much new information on Knot migration, and extended coverage to sites throughout southwestern Iceland (Morrison 1977, Morrison & Wilson 1971, Morrison *et al.* 1971, Wilson 1981). This paper brings together observations made during expeditions to Iceland in the period 1970 - 1972. It is restricted to documenting migration phenology: mass changes in spring and autumn are described by Wilson & Morrison (1992).

STUDY AREA AND METHODS

Studies in Iceland were carried out during the periods 11-27 May 1970, 21 July - 17 August

1970, 7 May - 7 June 1971 and 4 April - 4 October 1972. The main study area (Figure 1) covered most of the southwestern coastline of Iceland, extending from Stokkseyri and Eyrarbakki on the south coast, around the shores of Faxafloi, to the north coast of the Snaefells Peninsula. Studies in 1970 and 1971 were concentrated between Gardskagi and Hvalfjörður, while work in 1972 was spread throughout the area. Extensive reconnaissance was carried out by road, using Land Rovers, as far as conditions permitted, and regular visits were made to a series of sites for ringing studies. On 15 May 1972, an aerial reconnaissance was made of the coastlines of the Myrar district and around the Snaefells Peninsula to approximately Grundarfjörður. Further observations of Knot migration were made by J.R. Wilson in various years between 1973 and 1980.

RESULTS

Spring migration

Observations in 1970 and 1971 did not start until after the first arrivals of Knots had occurred. In 1970, about 5,000 Knots were seen in Hvalfjörður on 14 May, and on 16 May 1970 an estimated 14,000 were found in the fjord, many arriving at Eyri early in the morning on the falling tide, the birds feeding eagerly on the lagoon and appearing very tame. A similar



Figure 1. Principal study areas in southwest Iceland.

arrival and build-up in numbers was observed in 1971 when about 4,000 Knots were seen arriving in the fjord, flying in long low lines on 9 May 1971: 6,000 were counted at the Eyri roost on the evening tide. An albino Knot observed in the flock at Eyri from 9-27 May 1971 was again seen there in 1972. Ringing studies showed that many Knots and other shorebirds return to the same sites during spring migration in Iceland from year to year (R.I.G. Morrison & J.R. Wilson unpubl. results).

The earliest spring record of Knots in 1972 was of a flock of approximately 130 birds seen arriving to feed in Kopavogur Bay near Reykjavik on 19 April. Some of these birds did not appear to be in full summer plumage. Small numbers were observed at Skogarnes (40 birds) on the south side of the Snæfells Peninsula and at Eyri in Hvalfjörður (86 birds) on 26 April 1972. Few arrivals were noted during a period of several days with very strong northerly winds and a depression situated between Iceland and Great Britain at the end of April 1972. This was followed by relatively dull weather with southerly

winds during the first week of May. During this period large numbers of Knots arrived in Iceland. The flock at Alftanes, first seen feeding on Kopavogur Bay (approx. 130 on 19 April 1972), had grown to 700 by 29 April, and between 2 and 6 May increased to approximately 3,000. Most of the new birds arrived about 6 May (Figure 2).

On 10 May 1972, parties of c. 40 Knots were seen passing around the lighthouse at Gardskagi and heading into the western coast. The small numbers at Eyri in Hvalfjörður increased dramatically to 3,000 - 5,000 on 5 May 1972 and new arrivals between 9 and 11 May resulted in a count of 7,000 - 8,000 there on 11 May. This number rose to 10,000 on 19 May, and reached a peak of 10,000 - 12,000 during the evening high tide roost on 23 May 1972.

In 1974, the first five Knots were recorded at Alftanes on 6 April, numbers increasing to 300 on 25 April, 480 on 1 May and 2,000 on 8 May. In Hvalfjörður, 780 were counted at the Eyri roost on 28

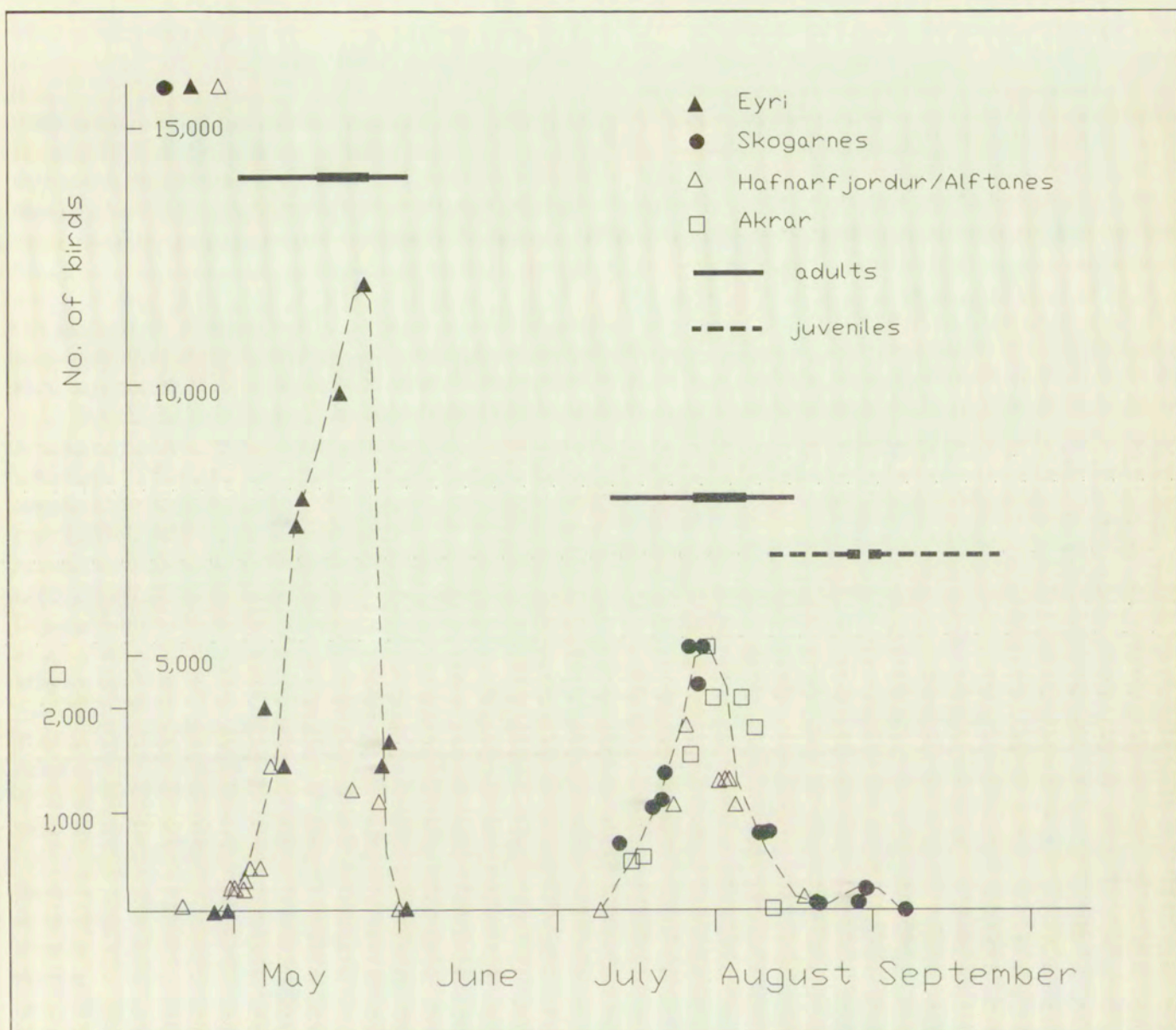


Figure 2. Migration of Knots at various sites in Iceland, April-September 1972. Horizontal bars indicate overall

(thin bar)/main (thick bar) passage periods for adults and juveniles.

April 1974, suggesting that the main arrivals had not begun. On 4-5 May 1974, 14,500 Knots were counted at Akrar and in the Myrar district, many small parties being observed flying west in the early mornings.

In 1975, cold northerly winds in late April delayed migration and numbers were much lower than in previous years, possibly reflecting the poor breeding season in 1974 (see Boyd 1992). Knots were first recorded at Alftanes on 24 April 1975, where numbers increased to 300 on 1 May. There were only 2,500 Knots at the Eyri roost in Hvalfjörður by 16 May, and only 4,000 in the Myrar district, the best area for Knots in southwest Iceland, on 25 May 1975.

In 1977, the first 20 Knots were recorded at Alftanes on 20 April. On 7 May 1977, 13,000 were counted in the Myrar district.

The centre of migrational activity appeared to be in the large bay systems to the south and north of the Snaefells Peninsula. Ground access to these areas is difficult, especially on the inner half of the peninsula, owing to lack of roads and tracks, which can become impassable during the spring. The multiplicity of small bays and islands on the inner half of the north side of the peninsula could not be surveyed from the ground or by air in 1972, although they are reported to support large populations of waders (see Skulason 1949; F. Gudmundsson pers. comm.; Gudmundsson & Gardarsson 1992). The

outer half of the northern side of the Snaefells Peninsula contains several tidal lagoons and other suitable feeding areas for shorebirds and these, and the huge bays on the south side of the peninsula which contain extensive intertidal areas, were surveyed by air on 15 May 1972, along with the coastline of the Myrar district. Major flocks observed included one of approximately 10,000 birds on a small island in the bay of Kaldaros - presumably involving birds observed feeding in nearby bays during low tide - and a flock of c. 2,500 at Kirkjuholl. On the north side of Snaefellsnes, there were flocks of 6,000+, 5,000 and 7,000, respectively, at Berserkseyri, Kolgrafafjörður, and in the tidal lagoon of Halsvadall near Grundarfjörður. The latter flock had also been observed from 17-19 May 1971, when it was estimated to contain 6,000 - 10,000 Knots.

At Skogarnes, on the south side of the peninsula, a flock of about 5,000 Knots was observed regularly during mid May in 1972, and on the evening of 14 May during exceptionally windy weather, the

numbers sheltering in the bay at this site rose to 15,000 - 17,000.

The distribution of flocks observed from mid to late May on the west coast of Iceland in May 1972 is shown in Figure 3. These limited aerial and ground surveys found a total of at least 66,750 Knots in the southwest of Iceland, with some 50,000 birds centred around the Snaefells Peninsula.

Knots have reached very high weights by the last week of May (Morrison & Wilson 1971; Morrison 1977; Wilson & Morrison 1992), and during the period of fairly settled weather which occurred between 27 May and 2 June 1972, a spectacular mass exodus of Knots and other high arctic migrant shorebirds took place from the west coast of Iceland (see Figure 3). On the evening of 27 May 1972, many of the birds in the flock at Alftanes near Reykjavik were seen departing. The birds were exceptionally restless during their roost, running about on the ground and chattering loudly, in contrast to their roosting behaviour in the middle of

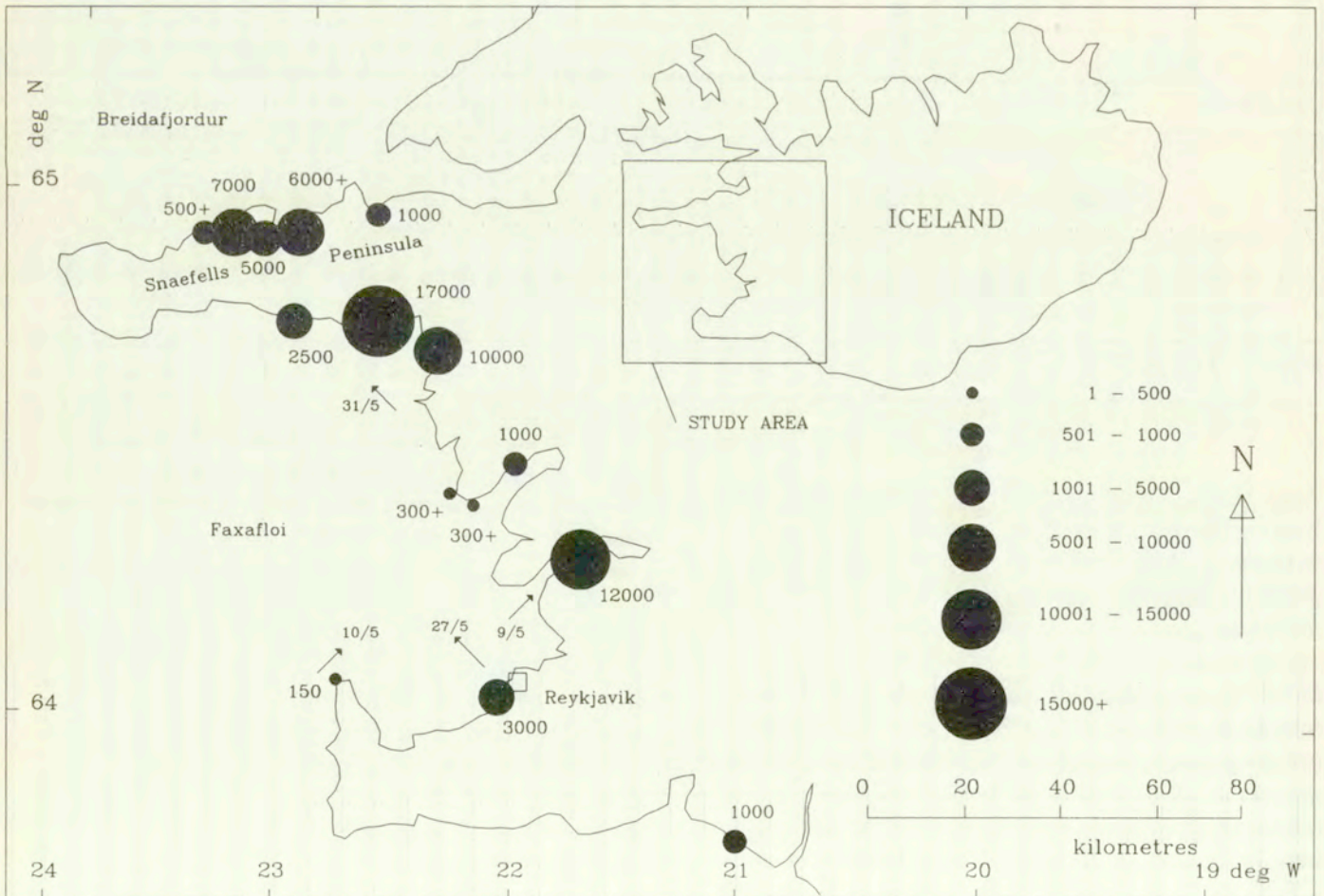


Figure 3. Observations of Knots during ground and aerial surveys in southwest Iceland, spring (April-May) 1972.

May when the birds sat quietly. Many took off in groups of up to several hundred. Such birds called loudly, and gained altitude and formed themselves into a long 'V' formation as they headed out westwards across the sea. The flock at Eyri, which had decreased to about 3,000 - 4,000 on 28 May, had disappeared by 2 June 1972 when no Knots at all were observed in Hvalfjörður. Only a handful of Knots (20 birds) was seen in a reconnaissance around the Snaefells Peninsula on 1-2 June 1972. On the south coast, numbers of Knots at Stokks-eyri/Eyrarbakki had fallen from c. 1,000+ on 24-25 May to only c. 100 on 29-30 May 1972.

A similar schedule of departures occurred in 1971, with a mass exodus of shorebirds during the final week of May. The flock at Eyri was estimated to contain over 6,000 Knots on 9 May 1971. This number was found at the site during most of May, with an estimated 5,000 present on 27 May 1971. Departures then occurred very rapidly, with no Knots at all being found at this site on 1 June 1971. On 31 May 1971, about 400 Knots were seen leaving the bay near Akrar, flying high in a loose 'V' formation. The weather was fine and the wind southeasterly, conditions which had prevailed for several days. On 4 June 1971, not one Knot was seen on the south side of Snaefellsnes.

Summer records

Small numbers of Knots were seen on the coast during June and the first half of July. Flocks seen during the early part of June probably included many late migrants, but they often contained a relatively high proportion of birds in grey non-breeding plumage compared with flocks observed during the main passage. Birds in grey plumage were probably one-year old birds and adults which may not have attained breeding plumage through lack of gonadal development (van Oordt 1931). On 3 June 1972, 40-50 Knots remained at Gardskagi, of which about 10% were in non-breeding plumage. 19 birds were seen in grey plumage at Alftanes on the same day. About 40 Knots, including several in grey plumage, were seen at Akrar on 7 June 1972 and 22 were seen at Skogarnes on 8 June 1972, including 7 in grey plumage. Other June records in 1972 included 1 at Alftanes on 14 June, 1 at Akrar and 1 (breeding plumage) at Skogarnes on 17 June, and a flock of about 50 near Grundarfjörður on 21 June. Nine Knots were found at Alftanes on 9 July 1972. Overall it seems that although some non-breeding birds reach Iceland their numbers are small.

There appear to be no authenticated breeding records of Knots in Iceland (Morrison 1992), and none of the occasional reports of their breeding in the remote areas of the country have been verified (F. Gudmundsson pers. comm.; see Watson 1952).

Autumn migration

The autumn passage in 1972 began about the middle of July. The general picture of the autumn migration through Iceland was quite different from that occurring in the spring. Far fewer large flocks were found and these were restricted to the area around the south side of the Snaefells Peninsula and the coast of the Myrar district (Figure 4).

At Skogarnes, numbers rose from about 1,200 on 13 July 1972 to about 2,000 on 19 July, and increased to a peak of about 5,000 on 26-28 July 1972. By 9-11 August, numbers had fallen to approximately 1,500 and on 20 August 1972 only 200 - 300 remained (Figure 2). A similar pattern occurred at Akrar (Utnes), where numbers rose from about 500 on 14 and 17 July through 1,500 on 26 July, to a peak of 2,000 between 28-29 July and about 6 August. Numbers at this site then fell to 1,500 on 9 August and only a few remained by 12 August 1972. Movements tended to be associated with periods of calm and clear weather. There was a period of relatively calm weather between 9 and 11 July 1972 when the first arrivals were noted (e.g. 14 at Gardar on 11 July 1972). A period of poor weather followed between about 12 and 15 July, with torrential rain and southerly winds from a depression situated off the southwest coast of Iceland. The poor weather continued, with a mixed front passing near Iceland on 17 July, bringing more heavy rain. By 20 July, however, the poor weather had cleared and a period of fine weather followed, with light westerly winds, good visibility and the country under the influence of a high pressure system to the south. During this period, numbers in flocks built up to their peaks, and ringing studies showed arrival of birds at light weights (Wilson & Morrison 1992). The passage of an occluded front brought another period of indifferent weather starting about 26 July and lasting until the end of the month. The weather cleared again in the early days of August under a high pressure system, and apart from a dull, chilly patch around 4-5 August 1972, settled into a period of fine weather from 6-10 August 1972.

Many small parties of Knots were seen moving southwards down the coast in the vicinity of Snaefellsnes and Myrar, some flying high enough to

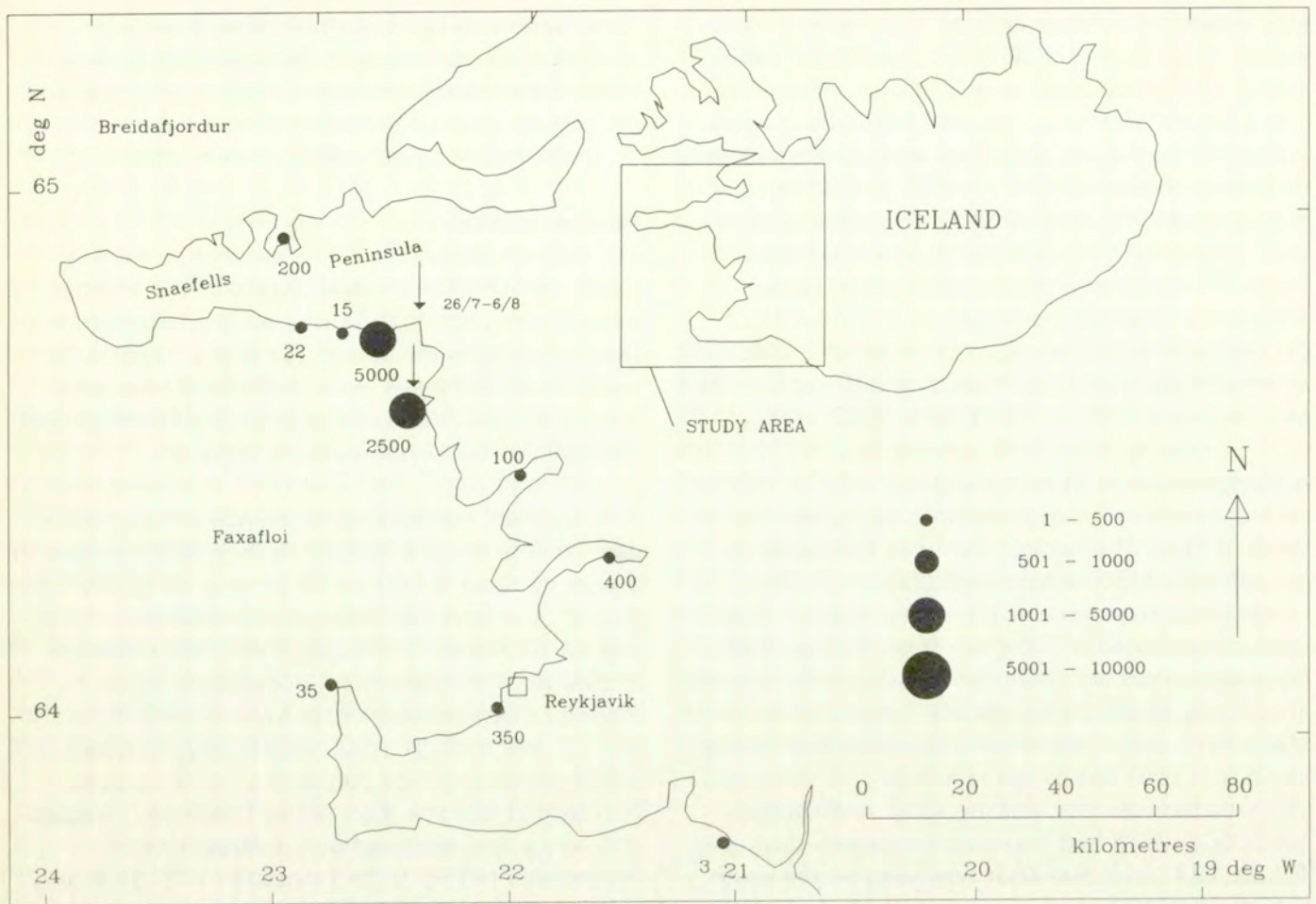


Figure 4. Observations of Knots during fieldwork in south-west Iceland, autumn (July-September) 1972.

suggest they may have flown over the mountains of the peninsula. For instance, 'clouds' of Knots were seen flying south over Akrar from Skogarnes on 28 July 1972, and small parties of up to about 30 birds were observed moving east past Akrar at high tide on 30 July 1972.

Flocks were noted as being particularly restless at Akrar on 8 August, Skogarnes on 10 August and Kolgrafafjörður on 11 August 1972, and numbers fell dramatically as the birds moved out (Figure 2). Another period of indifferent weather followed with numbers dropping still further, so that by mid August there were only relatively small numbers of Knots left at most sites. Although large flocks were found at Skogarnes and Akrar (Utnes) in the autumn, they never reached the size of those observed in the spring. The passage at other sites in the southwest of Iceland, some of which had supported large numbers in the spring, was also comparatively very light (Figure 4). In Hvalfjörður, Knots were not very common in the autumn. Whereas in the spring up to 5,000 - 12,000 had been

observed roosting at Eyri, this site was not used to any significant extent in the autumn. The centre of migrational activity in Hvalfjörður was further into the fjord at Hvammur and Hvammshöfði, where maximum counts never rose above 400 (on 5 August 1972). A similar picture was observed in 1970: approximately 5,000 Knots were present at Eyri during mid May, but the site was relatively unimportant during the autumn and the maximum numbers observed were again at Hvammur/Hvammshöfði, where there were about 300 birds between 2 and 12 August 1970. Ringing in 1970 indicated that birds using Hvalfjörður in spring tended to be found there again in autumn (Morrison *et al.* 1971), but the different distribution pattern and the exchange of one ringed bird between Hvalfjörður and Snæfellsnes in 1972 suggests that the usage of sites by Knots in the autumn may be rather more flexible than in the spring.

Whereas counts at Alftanes/Hafnarfjörður in the spring reached 3,000, numbers using these sites in the autumn never rose above about 350. The same

general pattern of migration was observed at Hafnarfjörður compared with other sites in autumn; c. 125 on 23 July, 350 on 27 July, 250 on 1-3 August, 200 on 4 August and c. 30 on 17 August 1972. On the north side of the Snaefells Peninsula, too, Knots were not observed in any great numbers at sites which had held large flocks in the spring: e.g., Kolgrafafjörður c. 5,000 on 15 May, 100+ on 11 August 1972; Halsvadall 6,000 on 15 May, only 2 seen in the autumn on 10 September 1972.

Morphometric studies showed that Knots arrived in and departed from Iceland in the autumn at considerably lower weights than in the spring, and that there was a relatively rapid turnover in the flocks on the coast (Morrison 1977; unpubl. data). Even so, fewer Knots appear to stop in Iceland in autumn than in spring, and many may fly directly back from Greenland to Europe (Salomonsen 1950-51; Davidson & Wilson 1992).

The passage of juvenile Knots, such as it was in 1972, did not begin until well after the main passage of adults. At Skogarnes, one or two grey birds were observed in the flock of summer plumage adults on 28 July 1972, though it was not possible to identify these positively as juveniles. No juveniles were seen amongst several hundred Knots at Hafnarfjörður between 1 and 4 August or amongst approximately 1,500 Knots at Akkrar (Utnes) on 8 August 1972. Only one juvenile was seen amongst the 1,500 Knots at Skogarnes on 9 August 1972. This bird was trapped, allowing positive identification.

The proportion of juveniles in the 200 - 250 Knots observed at Skogarnes between 20 and 28 August 1972 rose from an estimated one quarter to one third of the flock between those dates. Juveniles were seen regularly in small numbers during this period, usually in the company of adults. About two-thirds of the 40 Knots still remaining at Skogarnes on 7-9 September 1972 were juveniles, and most of the Knots seen after this date were juveniles. Few Knots were recorded after mid September (the only observations were of an apparently sick adult at Skogarnes on 24 September and two juveniles at Akkrar on 26-27 September 1972).

Records from 1970 and 1971 indicate a fairly similar juvenile passage. A catch of 204 Knots in Hvalfjörður on 12 August 1970 contained 7 juveniles at a time when the juvenile passage was apparently just starting. Observations made in the autumn of 1971 between 23 August and 5 September showed small

numbers of juveniles present in flocks, the greatest number recorded being 30 at Gardskagi on 5 September, apart from those in a mixed flock of 180 at Höfn on the southeast coast on 23 August 1971.

DISCUSSION

Spring departure dates from Iceland correlate well with arrival dates on the breeding grounds further north. Salomonsen (1950-51) stated that arrival in Greenland occurs at the end of May and in early June, and a similar period is given for west-central Ellesmere Island by Parmelee & MacDonald (1960). Arrival dates at Alert on northern Ellesmere Island are generally during the last few days of May or early June, with arrivals continuing into the first week in June (Davidson & Morrison 1989; Morrison & Davidson 1990). This suggests that most birds take at least several days and perhaps up to a week to reach northern Ellesmere Island from Iceland. Recent radar studies (Alerstam *et al.* 1986; Gudmundsson & Alerstam 1992) have indicated that most Knots staging in southwest Iceland in the spring are *en route* to breeding grounds in northwest Greenland and arctic Canada. At least some of the smaller numbers occurring in northeast Iceland are more likely bound for breeding grounds in northeast Greenland; Whitfield & Magnusson (1987) found that the earlier migrants in northeast Iceland tended to depart on more westerly bearings, whereas the later migrants departed more towards the north.

The autumn passage of Knots through Iceland appears to involve many fewer birds and is spread over a longer period than during the spring. Dates for the autumn passage in Iceland correlate with reported departure dates from the breeding grounds. Salomonsen (1950-51) stated that departure from Greenland occurred from mid July to mid August and departure from Ellesmere Island covered a similar period in late July and early August (Parmelee & MacDonald 1960). Departure of juveniles from these areas occurred by about mid August. Although numbers are lower in Iceland in autumn than in spring, turnover is more rapid (unpubl. results); it is possible that many birds may return directly to Europe, especially from northeast Greenland (see Davidson & Wilson 1992).

The small numbers of juveniles in Iceland in autumn 1972 may have reflected an unsuccessful breeding season, possibly as a result of poor weather (Boyd 1992); Waterston & Waterston (1972), for instance,

described 1972 as a 'catastrophic year all round' for breeding on Ellesmere Island.

Aerial and ground surveys in spring 1972 produced a total of 66,750 Knots in southwest Iceland between Stokkseyri and the north side of the Snaefells Peninsula west of Alftafjörður. Wilson (1981) estimated that there were over 200,000 Knots in western Iceland at the peak of spring migration in the early 1970s. During recent aerial surveys, Gudmundsson & Gardarsson (1990, 1992) reported 83,000 Knots in the areas covered during the 1972 work, and 217,000 in western Iceland, out of a total of 236,000 for the entire country. These figures are compared in Table 1. Considerably more birds were found around the southwest peninsula and in Hvalfjörður in 1990, but these areas were only covered on the ground in 1972. Totals were very similar in both years for Myrar, which appears to be the most significant area for Knots in southwestern Iceland, and southern Snaefellsnes, and rather more birds were found along the north coast of Snaefellsnes in 1972. It now appears that the most important spring passage areas in Iceland are around the shores of Breidafjörður, north of the Snaefells Peninsula. Allowing for differences in survey coverage and methodology, these results suggest that the numbers of Knot passing through southwest/western Iceland in 1972 and 1990 were fairly similar. Observations in the latter half of the 1970s in Iceland suggest a decline in numbers, reflecting the large general decrease that is thought to have taken place in the European population of *islandica* during the 1970s. Smit & Piersma (1989) estimated that the European winter-

ing population decreased from about 609,000 (Prater 1976) in the early 1970s to around 350,000 in the mid 1980s, a decline of some 43%.

Totals of Knots found on spring migration in Iceland and Norway are broadly compatible with the most recent estimate of 345,000 (Smit & Piersma 1989) for the European population. Current estimates for the numbers passing through Iceland (240,000: Gudmundsson & Gardarsson 1990, 1992) and northern Norway (60,000: Davidson *et al.* 1986) total 300,000, leaving 45,000, which could be accounted for by survey factors, such as incomplete coverage or counting errors, or other biological and distributional considerations, including the subadult segment of the population which summers south of the breeding range (up to 47,000 birds, see below).

Although it seems likely that fluctuations in the European wintering population would be reflected in changes in numbers of birds passing through Iceland on spring migration, the extent to which this would occur is not entirely clear. A change in the number of subadult birds in the population would not be seen immediately, since most subadult Knots do not appear to migrate north for the summer (Morrison & Wilson 1971). There are no systematic estimates currently available for numbers of summering *islandica* Knots south of the breeding grounds, although 15,000 have been reported from Britain (Prater 1981) and 32,000 (which may be *islandica* and/or *canutus*) from the Wadden Sea in June (Heldt 1968; Boere & Smit 1981; see Meltofte 1985). Changes might also involve segments of the (breeding?) population which do not use Iceland, for instance birds migrating north via northern Norway, or birds which may overfly Iceland en route to north-east Greenland. Here too the situation is unclear, since in the former case some marked individuals have been seen in Iceland and Norway in different (or even the same) years, and in the latter case the suggestion that some birds may overfly Iceland remains unsubstantiated (Davidson & Wilson 1992).

In summary, the decrease in numbers of Knots wintering in Europe in the 1970s (e.g. Davidson & Wilson 1992) appears to have been reflected in numbers of Knots observed on spring migration in Iceland. Numbers now staging in spring in Iceland (and Norway) are broadly compatible with current estimates of the European wintering population.

Table 1. Comparison of aerial and ground surveys of Knots in Iceland in May 1972 and 1990. G and A refer to ground and aerial surveys, respectively.

Region	May 1972 (present paper)	May 1990 (from Gud- mundsson & Gardarsson 1990)
southwest Iceland		
Pjorsa-Innnes	4,150 (G)	19,000 (A)
Hvalfjörður	12,000 (G)	23,000 (A)
Myrar/S. Snaefellsnes	31,100 (A/G)	30,000 (A)
Breidafjörður		
N. Snaefellsnes	19,500 (A/G)	11,000 (A)
other areas	-	132,000 (A)
All other areas	-	21,000 (A)

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