

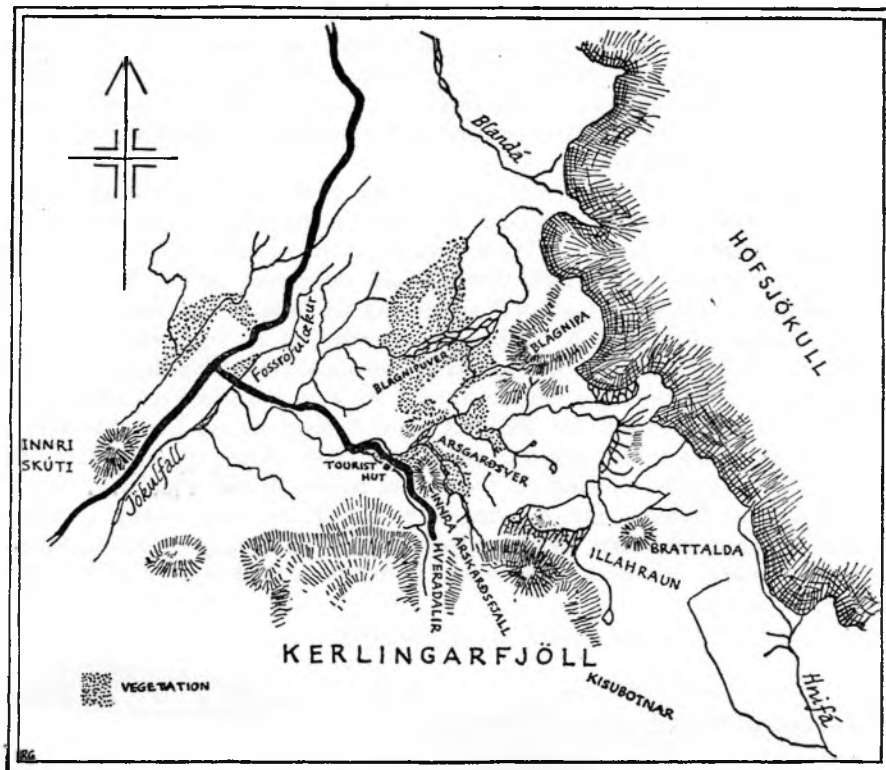
# OBSERVATIONS ON GATHERING AND DEPARTURE OF PINK-FOOTED GEESE AT ÁSGARÐ IN CENTRAL ICELAND

By N. G. Blurton Jones and Robert Gillmor

## SUMMARY

WE spent six weeks in western central Iceland during the late summer of 1954—from 20 August to 14 September—at Ásgarð on the northern edge of the Kerlingarfjöll mountains. Nearly every day the Pinkfeet in the neighbouring oasis were counted. The counts showed that Ásgarð was a gathering place for about 350 Pinkfeet, which joined together into flocks. The gathering movements are probably social rather than migratory. Breeders and their goslings seemed to arrive from outlying areas such as the colony at Kisubotnar, and after flocking left in the direction of the Þjórsárver and Þjórsá. The gathering probably retraces a dispersal in spring as the snow melts, first on lower ground, later on higher ground.

On 2 and 3 September the Ásgarð area was covered in snow. The geese left, apparently for the snow-free Þjórsá valley. Passage birds thought to be from Greenland then gathered but on 12 September snow started again. On the 13th the Ásgarð flocks left in the blizzard and geese passed through all day. The



first arrivals in Britain were on the 13th and 14th. Information on other years is summarised and compared with 1954. Departure seems to be solely a result of snow in the interior. At first the geese fly away downwind. The direction of migration is influenced by terrain and then by south-east drift in the almost invariable conditions following any depression over Iceland which causes snow high up in the interior in September. It is thought that the geese reach the north coast of Scotland mainly as a result of these conditions. The coincidental but inevitable nature of this weather migration of Pinkfeet is contrasted with that of passerine and other birds leaving Iceland.

Brood counts were made between 20 August and 1 September. There was no indication of gosling losses during this period. The mean brood-size was 3.1, substantially smaller than the mean of broods seen in Þjórðarver in July (in 1951 and 1953).

Two British-ringed and at least ten Þjórðarver-ringed Pinkfeet were seen.

### INTRODUCTION

From 5 August to 15 September, 1954, we stayed in the interior of Iceland, first at Hvítárvatn and then from 20 August to 14 September at Ásgarð between Hofsjökull and the Kerlingarfjöll. Our objects were to investigate the nature of flocking and the extent of mixing of the Pinkfoot population and, if possible, to observe the autumn migration. By studying the gathering and pre-migratory behaviour we hoped to learn something of the long-term and proximate stimuli of the autumn migration and their relative importance. In the event there proved to be no specifically pre-migratory behaviour, but by good luck we were able to watch the actual departure.

#### Hvítárvatn

After a weekend birding on the west coast with two young Icelandic bird-watchers (who showed us the nest of an isolated pair of White-tailed Eagles nesting near the sea) we went to Hvítárvatn.<sup>1</sup> From Gullfoss we hired a jeep to take us and our huge amount of food and equipment to the tourist hut by the marsh bordering the lake.

At Hvítárvatn (5-12 August) we found a flock of about 300 Greylags on the marsh. These were there all the time, fed only on the green marsh and rested on the black sand by the lake. There were no families, most of them being in pairs, the rest single, so probably one-year-old immature birds. We saw up to 30 Pinkfeet on the tundra around and above the level of the marsh. These were never seen on the marsh. When we returned on 14 September, and left on the 15th, the Hvítárvatn basin was free of snow and full of Pinkfeet (400 plus) and these were all over the marsh and tundra between the Fúlakvisl and Hvítá. Between 5 and 12 August the Pinkfeet were flushed by us from the rivers Jökulfall and Svartá to the east and spent four days on the tundra just north of the hut, apparently roosting on the gravel banks in the Fúlakvisl. They included several families but no ringed birds. There were many moulted feathers, including primaries, here and the usual old droppings. But we found no nests. However the most likely places were across the Fúlakvisl and we did not find a crossing.

<sup>1</sup>Pronounced Kwectavat (n), the final n being almost silent.



### Ásgarð

From Hvítárvatn we walked to the Ásgarð hut at Kerlingarfjöll. For this journey we had two packs each. We would carry one each for a short way and then return for the other two, so doing each stretch three times. As a result the 20 miles became 60 and took us two days. We had planned to go from here across to the Þjórsá and follow the Pinkfoot flocks down river. However, half-way across we had to camp on a very unsatisfactory surface where the tent pegs would not hold properly, and having taken some of our provisions ahead we returned soaking wet after a day of torrential rain, driven by a strong north wind, to find our tent blown down and wet through in spite of stones on the pegs and bottom of the tent, and our sleeping bags sodden. We promptly returned to the hut in the dark (a journey neither of us would like to repeat). We recovered our food, etc., during the next few days and stayed in comfort in the Ásgarð hut until 14 September. In spite of this setback we had some extremely interesting goose watching, probably more than if we had been on the move all the time, though there were only comparatively small numbers of geese. Snow fell on the evening of 2 September. Next day the ground was covered in a few inches of snow, the geese had gone and we were very worried. We had sent a letter back on 30 August asking for a vehicle to fetch us on 14 September, but we had visions of the letter not being delivered and us being snow-bound. However the weather was fine the next day and the snow all melted by the evening.

We reckoned that all the Icelandic Pinkfeet had left the area during the snow and gone over to the Þjórsá where we could see from the hill above the hut that there had not been any snow.

Then on 12 September snow began again at about 5 p.m. and by dark it was 6 in. deep. Next day it was still falling and was at least 18 in. deep nearly everywhere.

Early next morning (14th) we left and walked to Hvítárvatn. We found that only the mountains were enclosed in cloud ; we got out of it about five miles from the hut and for the first time since the 12th could see more than 200 yards. The snow covered the whole interior except for the low ground just around Hvítárvatn. On the 15th at 7 a.m. when we were trying to massage ourselves into action for the long walk to Gullfoss a Land Rover drew up outside the hut and an Icelander walked in with his breakfast. He was on his way to fetch us and so we had an easy ride back to Geysir, caught the 12 o'clock bus and arrived in Reykjavík at 4 p.m. He was unaware of the conditions at Kerlingarfjöll and would never have reached us if we had stayed there. As we had to walk it meant leaving a good deal of stuff behind. South of Bláfell we saw a few Pinkfeet as far down as the Sandá. The weather showed no signs of giving up. The snow had a thin crust of ice on it and the Ptarmigan were digging themselves in.

### AUTUMN FLOCKING AT ÁSGARÐ

With the exception of the Þjórsárver population the majority of Pinkfeet nest in colonies of less than 100 pairs, more often about 10 pairs. In Iceland these are usually in the river gorges like Krossárgil (see pp. 146-152). Kisubotnar is the only proved breeding-place near the area in which we worked. On arrival in Britain Pinkfeet are usually in large flocks. They evidently gather into flocks after nesting and before migration. The Þjórsádalur farmers saw huge flocks

in the upper Þjórsá valley in October 1951 (*Fifth Annual Report*), but these could have been the Þjórsárver breeders only; they are known to move down from the Þjórsárver in August (Moore (1951), and Taylor and Davies (1952), unpublished reports).

We did not arrive in the Ásgarð area until 14 August, too late to see moulting or nesting Pinkfeet, and we found no disused nests (probably due to our ignorance rather than the complete absence of nests). Some evidence of scattered breeding is given by the following records of families seen in outlying districts. On 14 August we saw a family of five near the bend of the Jökulfall (near a gorge) and found the remains of a juvenile, killed before it was able to fly properly. On the 16th there was only one family on the Ásgarð meadows and a flock of 33 non-breeders (mostly pairs) on another marsh nearby. Taylor and Davies saw a flock of 25 at about the same place on 15 August 1952. On the 17th we saw a family of four flying round over the Fossrófulækur oasis.

From 20th to 24th and 27th to 31st we crossed the Ásgarð meadows and a higher mossy valley to the east twice each day and every goose seen was recorded. The results are illustrated in Figure 1. It is apparent from these and it was obvious to the observers that Ásgarðsver was an important local gathering place.

Some geese were seen arriving in the area. The numbers in the mossy valley decreased as the geese gathered on the better vegetation of the Ásgarð tundra oasis. The arrivals are summarised in Table I. Notable arrivals are the

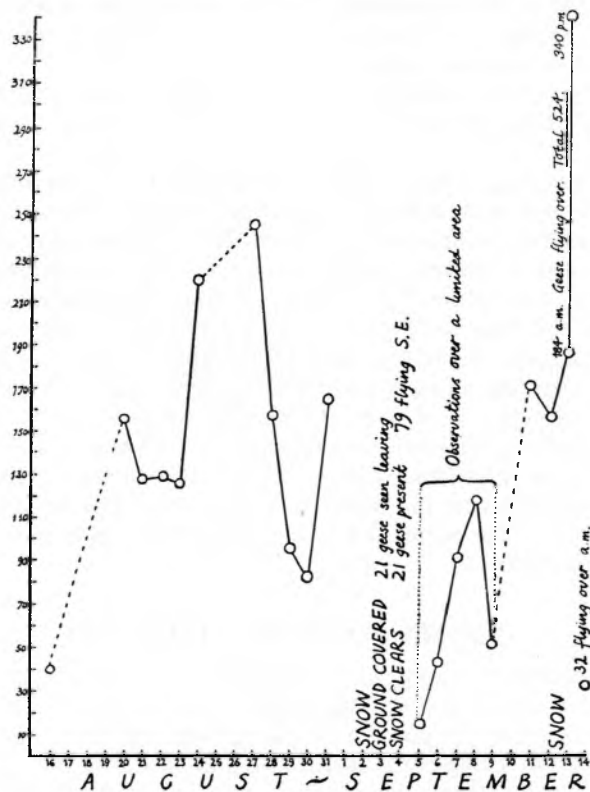


Fig. 1.—Graph of numbers of Pinkfeet at Ásgarð in August and September

families on 29th and 30th seen planing in from high over the Kerlingarfjöll, those seen at the camp by Illahraun flying from the direction of Kisubotnar towards Blágnýður, and the flock arriving from the south on 31st.

On 27 and 28 August there was a large exodus of about 170 geese. On 28th we saw 81 fly off to the east-south-east. They disappeared flying low over the hills in the direction of Þjórðarver. On 3 September in the first snow the whole flock flew off roughly south-east, i.e., towards the upper Þjórðar valley.

It looks as if this gathering ground is used largely by breeders in the river gorges on the south side of the Kerlingarfjöll. Why they should fly north to Ásgarð rather than south-east to the Þjórðar is not obvious unless the autumn gathering retraces the spring dispersal. This appears to follow the pattern of moving up the Þjórðar to the Þjórðarver as the snow melts, thence to smaller oases when they become clear (e.g. Ásgarðsver, slightly higher than Þjórðarver), and finally to the nesting places.

TABLE I

## Arrivals of Pinkfeet at Ásgarð, 23-31 August, 1954

(f = family group, including parents and goslings)

Date	Time	Place	Number of Birds	Arrived from	Subsequent movements
23 August	18.30	Illahraun	f 5	S.S.E.	Flew on N.W.
			6	S.S.E.	Flew on N.W.
24 August	19.00	Illahraun	f 6	S.E.	Flew on N.W.
	19.30	N. of Illahraun	f 4	S.	Flew on W.
25 August	09.00	Illahraun	f 9	S.S.E.	Flew on N.W.
26 August	—	Ásgarðsver	2 (pair)	?	Joined flock of 14 on ground
28 August	—	Ásgarðsver	f 5	?	Joined flock on ground
29 August	p.m.	Ásgarðsver	f 5	S.S.E.	Settled on tundra
			3	S.S.E.	Joined up, alighted together
			6	S.S.E.	
30 August	—	Ásgarðsver	23-25	N.	Settled on marsh, Jökulfall
31 August	a.m.	East of Innra-Ásgarðsfjall	57	S.	Settled on marsh, Jökulfall
31 August	a.m.	East of Innra-Ásgarðsfjall	16	S.E.	Settled on marsh, Jökulfall

TABLE II

## Estimates of Numbers of probable Greenland Pinkfeet passing to west of Hofsjökull

At Ásgarðsver after first snowfall, alighted .. .. .	170
At Ásgarðsver after first snowfall, passed over .. .. .	79
? with Barnacles before first snow .. .. .	12
Passing over Ásgarðsver during second snowfall .. .. .	376
On Hvítá .. .. .	160
At Hvítárvatn .. .. .	300
Total .. .. .	1,097



Flocking as well as gathering occurred at Ásgarð. Small flocks would join up with other flocks flying to or from the feeding and resting places or would fly up and around, apparently looking for other geese. Generally the smaller flock flew to the larger. The one large flock seen arriving did not land with other geese. Families with smallish goslings which arrived at the gathering grounds did not join up with flocks until after a few days. Single families often alighted with other birds. The single families on arrival were more susceptible to 'calling in' than other Pinkfeet. Geese seen flying about unnecessarily, unlike Yellow Wagtails (Smith, 1950) which made short flights in the direction of the migration and then return. They simply flew round and frequently landed with other geese or joined other geese which flew up, evidently because they saw geese flying over. These observations suggest that the gathering movements and flocking are purely social and are not related to migration.

On 4 September the weather was fine and clear and the snow melted. Twenty-one Pinkfeet appeared on Ásgarðsver and 14 Barnacles on the gravel of the Jökulfall river. From Innra-Ásgarðsfjall we saw that the snow had only covered the area east of the road from Hvítárvatn to Hveravellir as far east as Illahraun and north to the Blanda. But, unless Pinkfeet breed on Guðlaugstungur or the Norðlingafjót oases, the geese appearing at Ásgarð were from Greenland. This was made to look more likely by the simultaneous appearance of Barnacles. (The first Barnacle was with a party of 12 Pinkfeet on 2 September.) The numbers of Pinkfeet gradually increased. The size of the flocks increased too, although one small flock remained separate for at least two days. Another flock consisted of about 70 paired and single birds with no breeders. Possibly there is only local flocking in Greenland, families and flocks of non-breeders migrating to Iceland separately and joining up there. The number of Pinkfeet passing through the area is estimated in Table II. There is probably a fair degree of mixing of the Þjórsárver Pinkfeet with any that may breed west of the Þjórsárver and with those from Greenland before migration, but we could not tell if the Skjálfandafjót or Jökulsá-á-Fjöllum Pinkfeet gather on the Þjórsá.

There does not seem to be any special survival value in flocking at this particular time. The most important point seems to be that Pinkfeet are social birds (this presumably has its own survival value) which in many places disperse in the breeding season to find nesting sites. They return to the flocks as soon as the causes of their separation have faded. Although geese with goslings can run well and in some places march long distances they cannot possibly cross block lava like Illahraun on foot. But it must be something else which tends to keep some families independent after the goslings can fly. Taylor and Davies, and Moore, on the Þjórsárver and ourselves at Ásgarð noticed independent flying families at the gathering grounds in August. Possible advantages of flocking before migration are that the flying involved in gathering and moving



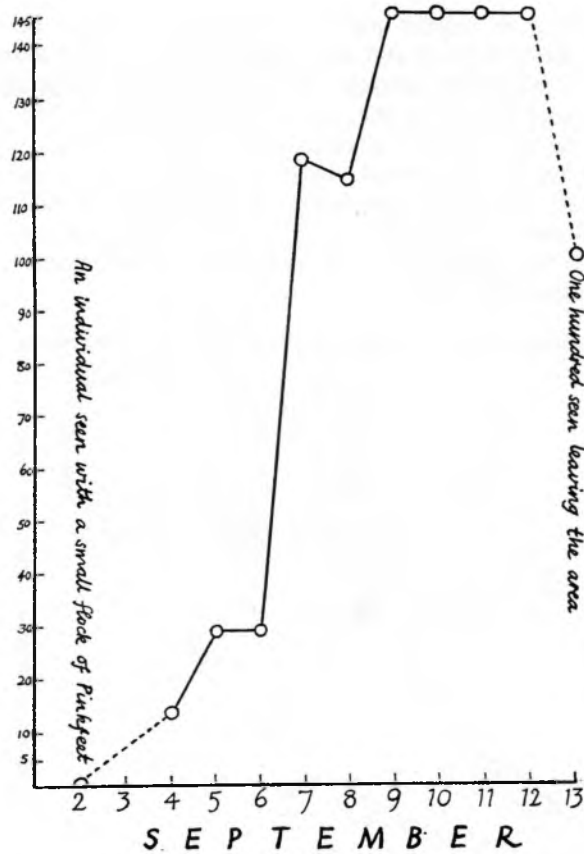


Fig. 2.—Graph of numbers of Barnacle Geese at Ásgarð in September

### Observations and Weather

The first snow (2-4 September) began falling under a strong north wind at about 17.00 hours on 2nd and covered the ground in a short time. At about 07.00 hours on 3rd many geese were heard flying over, apparently south eastwards. A few more were heard a little later. The snow was still falling and there was a north-west wind. Visibility was about 100 yards. No more geese were seen until 16.40 hours when five Pinkfeet flew west over the hut. No snow was falling but sky and land were still indistinguishable. There was a slight north-north-west wind. At 17.15 hours we flushed five Pinkfeet from by the Jökulfall. They flew away to the west. Visibility was better for a time and we could see that Innri Skúti and beyond had no snow. At 18.00 hours 11 Pinkfeet flew calling eastwards up the hut valley along the hillsides. They sheered off round the north side of Innra-Ásgarðsfjall.

The 4th was fine and clear and the snow melted quickly below 750 metres. There was a fair east wind. At 14.00 hours we saw about 20 Pinkfeet flying south high up between Langjökull and Hofsjökull, and later 12 very high in the north, calling, and going away south-east towards the Þjórarárver. In the afternoon we counted 21 on Ásgarðsver from the top of Innra-Ásgarðsfjall. In the evening there was a slight south-west wind. At 21.20 hours 47 Pinkfeet flew in from the north-west, fairly low down, calling a little, over us and up the



valley through the Hveradalir gap. Just before, and after the first snow, geese apparently moved in from Greenland (Table II, and see 'Autumn Flocking'). The information on weather in Greenland does not demonstrate any relationship between the weather and the departure from Greenland: there was little snow or wind over Greenland at the times of arrival in Iceland.

The second snow started on the evening of 12 September, when we had counted 155 Pinkfeet and about 145 Barnacles. The weather maps show a depression forming in the south-west of Iceland at that time, with calm weather at 18.00 hours in most of coastal Iceland. By then the blizzard had started at Ásgarð. This time it was more severe and continued through the next two days at least. Visibility was below 100 yards and sky and land were equally white and indistinguishable. On the morning of 13th the depression moved to south-east Iceland. From midday to 18.00 hours there was rain in north-east Iceland but no precipitation had been recorded elsewhere in the lowlands. The amount of snow actually falling decreased during the day but the sky was still obliterated by cloud and visibility kept down by drifting snow. During the 13th the



wind speed increased to force 7, at Vestmannaeyjar. It was probably rather stronger up at Ásgarð. On the morning of 13th we heard a few Pinkfeet flying at 07.00 hours. During the day we saw 524 Pinkfeet and about 100 Barnacles flying over. We probably missed very few. The records of Pinkfeet are shown on the diagrams and are transcribed from our field notebooks below.

At 10.45 hours 60 Pinkfeet flying round above us calling loudly were joined by another 60 and flew east. On coming up against the side of Innra-Ásgarðsfjall (hereafter called the hill) they worked their way round its north side and evidently continued along the north side of the mountains. Of these flocks Jones wrote in his notebook 'very puzzled, didn't know where to go.' At 10.55 hours we saw almost the complete contrast: about 60 Barnacles flying straight and fast high up going south-south-west. At 12.00 hours we heard Pinkfeet flying around just west of the hut. At 12.10 hours 64 appeared, flew north over the hut, turned west flying slowly and calling. At 12.30 they flew up again, circled round and flew away to the west. They appeared to have been repeatedly baulked by the mountains west of the gap. At 14.00 hours 80 Pinkfeet came over from the north-east (avoiding the hill) and turned south working their way up the valley and through the gap in the mountains. Then 60 from the west came up against the hill and worked round the north side. Ten from the north-west turned back from the hill in front of us and seemed to be going to land by the river but may have carried on to the east. At 17.00 hours 40 flew east-south-east and disappeared, probably going along the north side of the mountains. At 17.10 hours 65 came over from the north-west and worked round the hill. Visibility was up to 400 yards for a time. At 17.20 hours 31 Pinkfeet flew over quite high from the west-north-west and seemed to turn into the gap in the mountains. At 17.50 hours about 25 Pinkfeet

flew over high and very fast through the gap in the mountains. At 18.45 hours 40 Barnacles flew over high, fast and straight going south.

The wind directions from 18.00 hrs on 12th to 18.00 hrs on 14th were such that Pinkfeet leaving during this time would be blown south then south-east towards the northern coast of Scotland. The best wind conditions were at midday on 13th when the depression had moved across to south-east Iceland. Conditions were just suitable on 15th, evening 16th, and were very suitable on 17th, when under the influence of a depression between Iceland and Norway, and on the 20th, when there was a depression between the Faroes and Shetland.

On the morning of 14th we left Ásgarð on foot and saw a pair of Pinkfeet fly over towards the Hveradalir gap. Two hours later about 2½ miles west we saw about 30 Pinkfeet flying south-east. We saw no more geese in the blizzard or in the clear weather until we reached Hvítárvatn, where there were about 300 Pinkfeet on the tundra and on the marsh. We would probably have seen any geese flying over high up on the walk to Hvítárvatn.

When we emerged from the blizzard into fine weather at the Fossrófulækur we could see that the whole area from about 450 metres above Hvítárvatn to beyond Rjúpnafell and all the hills to the south-east were covered in snow. The Kerlingarfjöll and Höfsjokull were still covered in cloud. The previous day this cloud and the blizzard conditions in it had evidently extended all over the interior.

On the journey back to Geysir we found snow only on the Bláfell–Geldingafell pass. We saw another 110 Pinkfeet between Hvítárnes and Bláfell and 50 south of Bláfell, the last 16 being on an oasis at an altitude of 280 metres by the Sandá. There were none on the rather lowland type of vegetation just above Gullfoss at 240 metres. On this and the subsequent bus journey to Reykjavik we could see that the snow was on all the hills even beyond the Þjórsá and possibly down to the level of the higher Þjórsá valley. Presumably it did not come below 450 metres. During the three days 13th–15th, it showed no signs of melting. The places covered by this fall were probably no use to the geese again that autumn. Hvítárnes, the Hvítá meadows and Mikluöldubotnar, Skúmstungur, Fitjaskógar, and Þóristungur would have been usable until a later snowfall.

To justify any conclusions based on our observations we must attempt to show that this first departure was typical in spite of being so unusually early.

#### Arrival Records for Other Years

**1951.** Pinkfeet arrived in Britain unusually late in 1951. Huge flocks were seen on the Þjórsá from Norðurl leit down to Þjórsádalur between 5 and 14 October, by the farmers. They began to arrive in Britain about this time. If there had been much snow before this they would have been driven out. Evidently they just stayed on until it did snow, or until food got short as a result of frosts. If they had any intrinsic urge to migrate this should have asserted itself by this time unless the whole breeding rhythm was late that year, but the Trust expedition found hatching earlier in 1951 than in 1953. The British Schools Exploring Society expedition, 1951 (Moore *loc. cit.*) saw flocks forming up at the time we did in 1954 and they saw geese moving downstream from the Þjórsárver in early September.

**1953.** Cornwallis (1954) states that the first major arrivals of Pinkfeet were on 4 and 5 October in places as far apart as Fair Isle and Gibraltar Point (at the north end of the Wash). This is a normal arrival date. The weather maps

show winds blowing from Iceland south then round towards north Scotland all through 3 October and they were still favourable over the last part of the journey on the 4th. These winds followed a depression which passed north-east across Iceland on 1st, 2nd and 3rd with rain or sleet at all the lowland weather stations and snow at Scoresby Sound and in north-west Iceland. So there was probably snow in the interior on 2nd and 3rd and the geese probably left on the 3rd and were blown in to northern Scotland arriving on the 4th.

### Conclusions on Departure

The only exodus we saw when there was no snow was after the gathering flocks reached a peak on 28 August. This is considered to be an extension of the flocking movements: flocks left to find other flocks. The two departures in the two snows were forced departures. The geese which left in the first snow went south-east and probably stopped on the upper Þjórsá valley which we could see was snow free. The geese which left in the second snow were actually leaving on their migration to Britain. Some arrived the same day as they left, others the next day. The Pinkfeet, then, seem to stay in the interior of Iceland until the ground is covered in snow. They then depart for Britain, never going to the lowlands of Iceland. Temperature alone seems to have very little effect on geese. In thin snow they are able to feed by grubbing about in it but in deep snow they cannot feed, they sink up to their bellies and cannot walk about at all easily. Since they came south earlier than usual, one might expect that in normal years they were not forced out but departed under internal influences. However, the late departure of 1951 and the similarity of the weather situation at the times of migration in 1953 and 1954 make it look as if the departure we saw was typical.

The autumn departure of Pinkfeet from Iceland is, we believe, solely stimulated by the difficulties and discomforts due to deep snow and is not 'emancipated' (Tinbergen, 1952) or incorporated into the breeding cycle to any noticeable extent. In this respect it is very primitive, and little more than a weather movement. From what little we saw of them this may not apply to Barnacle Geese. They left without flying round aimlessly and flew south without being influenced by the terrain.

The reliance on external conditions accounts for the short period of migration which is normal for Pinkfeet. In theory they should all depart on the same day since whenever only a part of the interior is snowbound the flocks there could move to a free part. Evidently they do not all do this. Some leave direct from the higher oases before others leave from the lower places. This is probably because Pinkfeet forced off a high oasis such as Arskarð or Eyvafen leave downwind, going south or south eastwards, and do not pass the clear vegetation lower down the Þjórsá to the south-west.

### Comparison with other Species

Since the Pinkfoot appears to be almost purely a weather migrant in its autumn migration it may be of interest to compare it with some of the 'introvert migrants' living in the same areas in summer.

Pinkfeet differ from the passerine species breeding in the interior (Meadow Pipit and Snow Bunting) and other species breeding in Iceland (Merlin, Redwing, White Wagtail). These species have a long period during which migration occurs. In Iceland they move from mid-July to October (their migration continues after the Pinkfeet because they go to the lowlands). They move

in fine weather (Williamson, 1954) mostly before the conditions are bad. Their migration is the result of a drive motivated from within the bird, building up over a long period and being released by good flying conditions. The long period of migration is due to variation in the breeding rhythm and the need to wait for suitable weather. (See p. 166 for our observations on other species.)

#### Survival Values of the two types of Migration—why are Pinkfeet Weather Migrants?

In the breeding season Snow Buntings (Scott, Fisher, Guðmundsson, 1953) and at all times Meadow Pipits (Witherby *et al.*) are predominantly insectivorous. The numbers of insects decrease gradually in late summer and autumn as their hatching ends and the weather gets colder and wetter. If all the insectivorous birds stayed until they became even slightly short of food few would complete their migration. As Williamson has shown, small birds have to stock up with food and migrate *without delay*. There has been, and still is, strong selection for early migration in these species. An internal urge to migrate linked with the breeding rhythm allows very accurate timing of migration and ensures to some extent that the birds migrate before it is absolutely necessary (when they would be too weak anyway). Merlins feed on small birds (especially Meadow Pipits) and their departure might follow the pattern of the departure of the small birds.

The food problems do not seem to apply to larger birds. Geese can live a long time without food when at rest, e.g., when being transported in captivity. They can presumably keep up work for a long time on their food reserves even after not feeding for some hours, e.g., departing without food in the morning

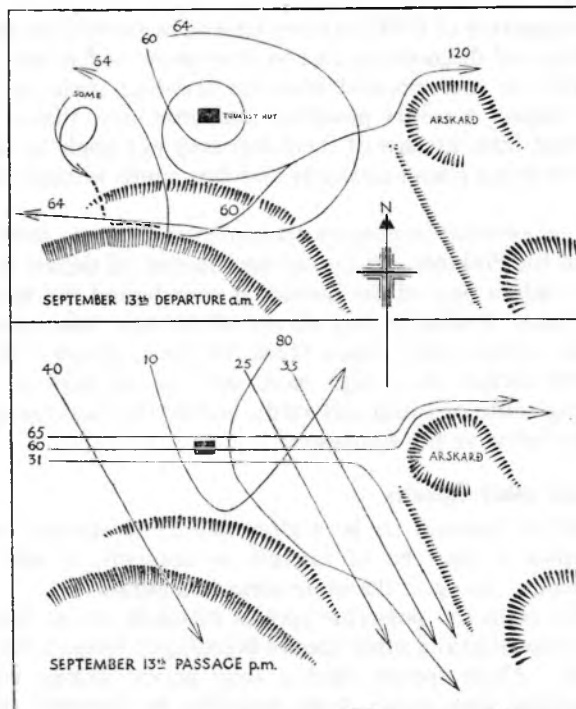
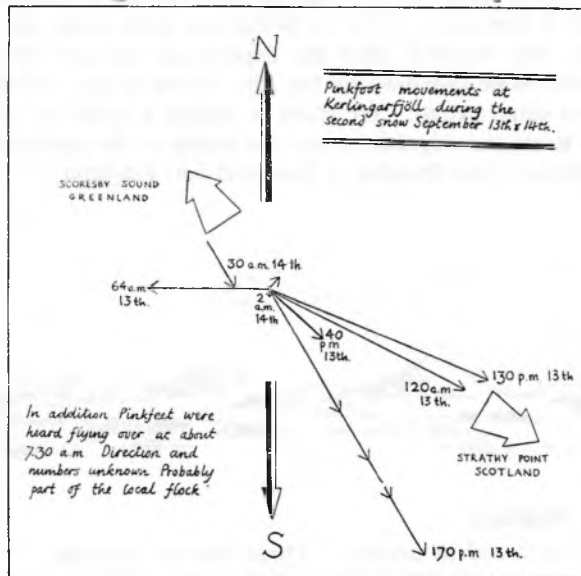


Fig. 3.—Directions taken by Pinkfeet over the hut at Åsgarð (see text)

after a night in the snow. A factor that may act selectively in favour of Pinkfeet remaining later in Iceland is the slow rate of growth of goslings. In September they are still far short of adult weight, and it may be that the later they migrate the better their chance of surviving the strenuous hazards of the southward flight.



### Orientation

The geese seen leaving Ásgarð in the second snow flew around seeming not to 'know' what to do or where to go. Their first move was to fly south, down-wind, away from the snow. They then came up against the hills in front of the hut (which flocks passing through a little higher up mostly missed), turned back, came up to Innra-Ásgarðsfjall and worked round it and away. Nearly all the geese seen took the east-south-east route, or the south-east route through the Hveradalir gap. The majority of passing flocks went through the gap. They would have carried on straight over the upper Þjórsá gathering grounds (probably snowbound). Those going east-south-east would probably have turned south round the end of the mountains.

The directions of all the Pinkfeet seen flying over in the snow could be explained merely as a result of the wind and terrain. The question arises again as to how typical of the whole migration and of other years these observations are. In fine weather the geese fly high and straight over the mountains and could orientate and keep their course by landmarks or the sun. In a blizzard the sun could not be used for orientation but we do not think its absence accounts for all the directional uncertainties we saw. Probably departing Pinkfeet always start in a blizzard and their initial course is set as a result of wind and terrain.

There are no mountains by the Þjórsá which would make the geese depart to the south-east immediately. Indeed Pinkfeet flying south from Skúmstungur would be deflected south west by the Hekla range. If they left from Stytri-Norðurleit they might be deflected to the south-east, between Vatnajökull and Myrdalsjökull, by the hills from Valafell to Hábarður. But after a depression

has passed east over Iceland causing precipitation, in this case snow, the winds flowing round it in an anti-clockwise direction will be north over the interior (also funnelled by the icecaps, see Stewart, 1952) and north-west over the sea south of Iceland by the time the depression has passed and the snow is deep. These winds would make the geese take a south-easterly course, roughly towards Scotland. The winds might carry them all the way there, as they could have done on 13 and 14 September 1954, or, when they have come out of the cloudy weather into the fine weather after the depression, already going south-east, they may keep the same direction by the sun. Even so they are bound to drift with the wind to some extent. We think it simply a result of the coincidence of snow (which starts the migration) and the winds in the associated depression that Pinkfeet migrate from Iceland to Scotland and England.



#### Notes on other Migrants

**Merlin** : Do not breed in interior. Three seen on passage. The first on 28 August a clear warm day with a light north wind. One on 31st a cloudy day but with good visibility (wind not recorded). One on 8 September was seen hunting in the morning, which was overcast. It flew off low to the west.

**White Wagtail** : Do not breed in the interior. Passage birds seen almost daily from 5 August to 5 September. Movement on 21 and 22 August (clear weather) and 4 and 5 September (fine weather after snow on high land).

**Wheatear** : Do not breed in interior. Passage birds seen nearly every day 5 August to 15 September. They all seemed to be making only very brief stops and would disappear to be replaced by different numbers next day. Passage seemed to be an almost continuous flow of odd birds, pairs, and pairs with fledglings. Many on 17 August, a fine day.

**Meadow Pipit** : Flocking seen at Mývatn 27 July and at Ásgarð on 21 August. Do breed in interior where often seen. Passage on 21 August (fine). None seen after that until 28th when three seen. In the first snow one or two stayed in the sheltered hut valley. Fluctuating numbers after that until second snow when one in hut valley. One south of Bláfell on 15 September and one at Gullfoss, and more in the rest of the lowlands.

**Snow Bunting** : Seen at odd places all over area from 8 August to 15 September nearly every day. Breed in interior but larger numbers seen than could be accounted for by local breeders. Flocking on 15 August (Dr Finnur Guðmundsson tells us that Snow Buntings flock in response to a slight drop in temperature even while nesting). Flocks seen 17 August. Passage on 21 August (also Wagtails and Meadow Pipit) and less on 22nd. 27 August few very loath to fly. Many in hut valley in blizzard on 13 September. On 14th total 180 moving north against wind in fine weather over the snow near Innri Skúti.

**Brood-Size**

Counts of the numbers of goslings in broods seen between 20 August and 1 September are summarised in Table III. Many of the broods must have been recorded more than once. There is no indication of any losses during the period, but the mean brood-size of 3.1 is much smaller than those recorded in Þjórsárver in July, in both 1951 and 1953, suggesting that losses of about one-third may have occurred between hatching and late August.

**TABLE III**

**BROOD-SIZES IN FAMILIES OF PINK-FOOTED GEESE SEEN IN ÁSGARÐ, CENTRAL ICELAND, 20 AUGUST - 1 SEPTEMBER, 1954**

Date	Number of Families seen	Distribution of Brood-sizes								Mean Brood
		1	2	3	4	5	6	7		
20 August .. ..	12	2	3	3	4	—	—	—	—	2.8
21 August .. ..	16	—	5	3	3	4	—	1	—	3.8
22 August .. ..	15	1	5	5	1	1	1	1	—	3.2
23 August .. ..	16	3	3	6	2	1	1	—	—	2.9
24 August .. ..	26	5	6	6	4	2	2	1	—	3.1
26-27 August .. ..	38	2	8	12	8	4	4	—	—	3.4
28 August .. ..	26	3	9	9	3	1	1	—	—	2.7
29 August .. ..	20	3	6	5	5	1	—	—	—	2.8
30 August-1 September	22	4	4	5	6	3	—	—	—	3.0
Totals .. ..	191	23	49	54	36	17	9	3	—	3.1

**Ringed Geese**

Pinkfeet carrying rings were seen on 13 occasions (Table IV). At least 12 individuals were involved. Two of them carried British rings, put on in October or November 1952, the remainder must have been marked in Þjórsárver in 1953 or 1951.

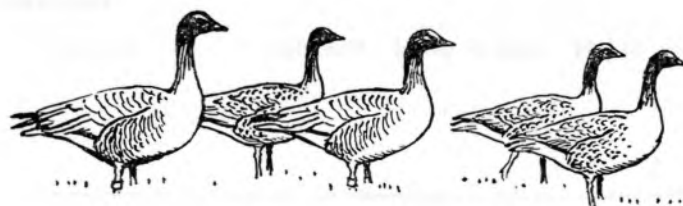


TABLE IV  
RINGED PINKFEET SEEN IN CENTRAL ICELAND, AUGUST AND  
SEPTEMBER 1954

Ring	Date	Bird	Flock	Locality
1. Silver on right	28.8.54	♂ parent with ♀ (NR) and 1 gosling	In flocks of 66	Marsh below Innra-Ásgarösfjall
2. Silver on right	29.8.54	♂ parent with ♀ (NR) and 5 goslings	Alone	On west side of Illhraun. Patch of moss by stream
3. Silver on right	31.8.54	♂ parent	} Alone	Patch of moss between Innra-Ásgarösfjall and Jökulkrokur below Lodmundur
4. Silver on right	31.8.54	♀ parent and 3 goslings		
5. Silver on right	5.9.54	♀ parent with ♂ (NR) and 3 goslings. ♀ possibly some Whitefront blood	With families of 4 and 3, a pr. and a lone gosling which followed this family	Small tundra patch between hut at Kerlingarfjöll and Jökulfall
6. Silver on right	5.9.54	♂ parent with ♀ (NR) and 2 goslings	The 4 of above group	As above
7. Silver on right	7.9.54	♂ parent	With families of 3 and 3 and a pair	As above
8. Silver on right	7.9.54	♀ parent and 2 goslings		
9. Silver on left (ringed Britain, autumn, 1952)	7.9.54	♀ parent with ♂ (NR) and 4 goslings	With families of 3 and 3 and 4 and a pair	As above
10. Silver on right	9.9.54	♂ parent with ♀ (NR) and 2 goslings	In flock of 10	As above
11. Silver on right	9.9.54	♀ parent with ♂ (NR) and 1 gosling	Same flock	As above
12. Silver on right	11.9.54	♂ paired	In flock of 70	Tundra below Innra-Ásgarösfjall
13. Silver on left (ringed Britain, autumn, 1952)	11.9.54	Single or paired	Same flock	As above

(NR) = not ringed.



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