SOME OBSERVATIONS ON WILD GEESE IN SPITSBERGEN

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(Illustrated by Robert Gillmor)

Summary

The authors spent two weeks at a nesting colony of Pink-footed Geese at De Geerdalen in Icefjord. Eighteen nests were found containing an estimated 67 eggs and producing about 30 goslings, mostly hatching unusually early, from 27 June onwards, the peak hatching date being 29 June. Females brooded eggs and goslings in the nest for very long spells. They varied in their readiness to leave the nest when disturbed. Males stayed on guard near the nest, sometimes going away to drink and bathe. They also spent much time on the alert when the family had left the nest. Goslings spent approximately one day in the nest, eventually making excursions from under the female to feed and then being led away by the female. One female deserted her goslings which were adopted by another pair. In the wild Pinkfoot goslings follow their parents poorly at first but soon improve. At first families were single and scattered, some form flocks of families and eventually they join broodless adults. Goslings can fly only a short time before the probable date of departure. Observations on relations between geese and foxes are conflicting.

Pinkfeet seem to have survived disturbance in Icefjord better than Brents and Barnacles. Forty Barnacles, including 9 goslings, were watched in Sassendalen. Twenty-eight Brent Geese, including 7 goslings, were seen in Austfjord. Surprisingly few Pinkfeet were seen in Sassendalen.

Introduction

ONE of the aims of the Reading University Zoological Expedition, Spitsbergen, 1957, was to study some aspects of the population and behaviour of Pink-footed Geese and Barnacle Geese in their breeding areas. Although Spitsbergen Pinkfeet winter on the continent and seldom reach Britain (Holgersen 1958) information on their breeding biology must shed some light on the problems facing British Pinkfeet in their Greenland and Icelandic breeding grounds.

The authors travelled to Spitsbergen ahead of the other members of the expedition in the last half of June, arriving at Longyearbyen in Icefjord early on 27 June. In the evening we were taken to De Geerdalen some 20 miles east in a hired motor boat and left there with our stores. We almost immediately found the nesting colony of Pinkfeet reported by Pennie & Andrew (1956). The first clutches had already hatched. We established ourselves in a tiny trapper's hut about 1½ miles from what we came to call "the goose gorge."

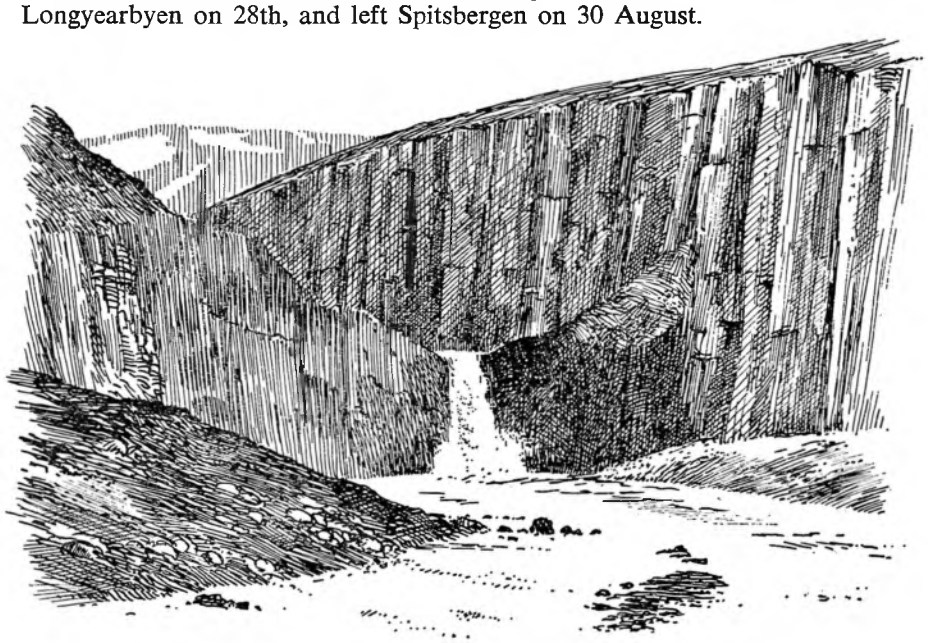
From the time of our arrival at De Geerdalen at about midnight 27-28 June until our departure on 7 July we made daily visits to the colony, either checking on nest contents or, from a distance, watching the undisturbed birds,

either at their nests or with goslings on the wide marsh between the gorge and the sea. Not only were geese and goslings extremly hard to see on the marsh but most seemed to move far away along the shore quite soon after leaving the nest, perhaps partly because of our presence in the area.

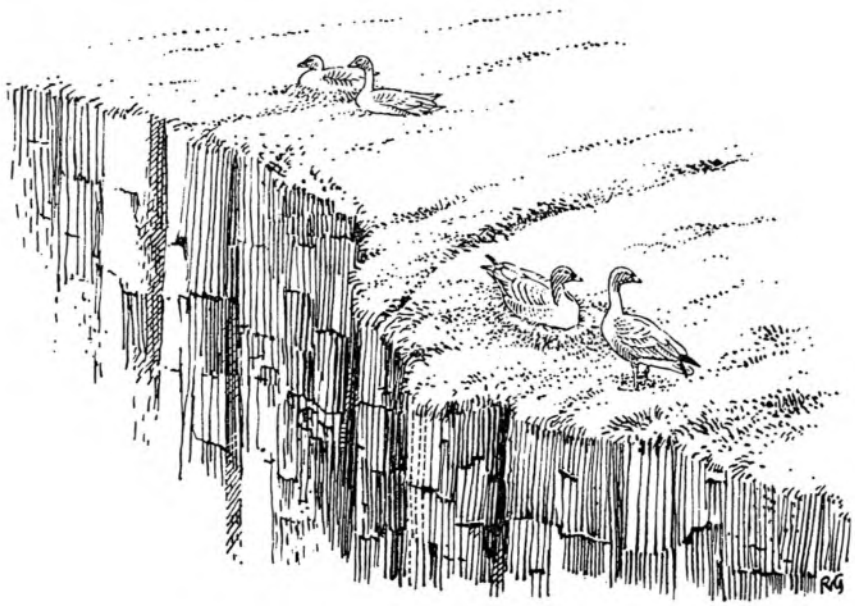
On 7 July we walked back to Longyearbyen overland to meet the other two members of the expedition, M. M. R. Freeman, the leader, and Ronald Passey. We then travelled together by boat to Sassendalen some 10 miles east of De Geerdalen where we hoped to watch Barnacles and Pinkfeet and later to catch some geese for examination for ectoparasites. R.G. returned to De Geerdalen for a week to complete a film of Arctic Skuas and other birds. He saw no geese at all after 12 July. At Sassendalen N.G.B.J. found a small flock of Barnacle Geese and watched these every day. Surprisingly we saw hardly any Pinkfeet here and none were caught.

On 29 July we left Sassendalen for Ebbadalen, 35 miles away in "Petunia Bay" at the head of Billefjorden. We travelled on the catamaran we had constructed by connecting our two 18 foot Kayak-type canoes, about three feet apart, with a Dexion angle-iron frame. The journey took some 17 hours and en route we stopped for a couple of hours at Gåsoyane (Goose Islands) before making our base camp at Ebbadalen where we had ample opportunities for finding what birds and other animals were in the area.

The purpose of the journey was twofold. Firstly, we wanted to test the catamaran and its suitability for this kind of expedition and, secondly, to cross the Mittag Glacier to explore the fauna of the southern end of Widjefjord. To do this properly a boat was almost essential and the feasibility of carrying a collapsible canoe over the ice on one of the sledges was another aspect of the technical programme that was running parallel to the scientific work. We stayed in Widjefjord between 10 and 16 August, returning from Ebbadalen to Longyearbyen on 28th, and left Spitsbergen on 30 August.



De Geerdalen—Pinkfeet nest along top edge of cliff



Along the edge of the gorge at De Geerdalen

Acknowledgements

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Distribution

In De Geerdalen 18 pairs of Pinkfeet had nests and when we arrived there were an additional 16 geese on the marsh. These left the area very soon. On 1 July five flew down the valley and away eastwards along the shore, supporting our expectation that broodless geese from such colonies would go to Sassendalen to moult. After hatching pairs with goslings scattered over a wide area around the colony in the first few days but all except two families seemed to leave the area after that. These two families stayed on the marsh and by the sea for twelve days but then disappeared. There is no reason to suppose they were any more likely to have been preyed on than that they moved away to another place. One family was observed to travel to Vindodden when the single gosling was still very small. They swam far out to sea and then eastwards, eventually swimming in towards Vindodden. This was on 6 July. On 13th a pair with one gosling was seen here by M.M.R.F. and R.G. as they passed in a canoe.

On our journey up De Geerdalen to Adventdalen and west to Longyearbyen we saw geese only in De Geerdalen up to one mile beyond the gorge where we saw 5 Pinkfeet on 7 July. There were goose droppings everywhere, especially all along De Geerdalen, but as decay is extremely slow so far north, these tell one little more than that geese have been there sometime

in the past few years. At one time Adventdalen was known as a breeding area for Pinkfeet and Barnacles but the mining and other activity there seems to have stopped this.

In passing it is interesting to note that the De Geerdalen colony was not mentioned by Conway (1897) though he visited and photographed the gorge, whereas he does describe the still-existing colony at Eskerfossan near Sassendalen. Members of the Sherborne-Cambridge expedition found nests at De Geerdalen in 1954. In 1955 Pennie and Andrew counted 14 nests here.

In Sassendalen we saw surprisingly few Pinkfeet. From the reports of Goodhart, Webbe and Wright (1955) and earlier writers we expected to find some hundreds of Pinkfeet here. In fact the largest flock we saw was 17. This and a flock of 14 were the only Pinkfeet we saw during our stay from 10 to 28 July except for about 3 family parties seen on a large pond about 3 miles from the sea on the east side of the Valley, on 21 July. We covered the valley as far as 5 miles inland and it is hard to believe that any geese were in this area unseen by us. They could easily have moved away on our arrival and would be impossible to see even with a telescope further up the valley or along the shore to the west. No recent nests were found here though M.M.R.F. and R.P. collected a piece of goose eggshell from the top of the coastal cliffs to the east of Sassendalen. This could have been taken there by a gull. On the sides of a small gorge on the east of Sassendalen about 4 miles inland N.G.B.J. found traces of 6-8 old goose nests, long disused but mostly conspicuous by the ring-shaped mound which builds up around traditional nest sites. The vegetation on these mounds was no different from the surrounding area, unlike that around occupied nests which is much more luxuriant.

On Gåsoyane, at the junction of Billefjorden and Templefjorden, on 29 July we disturbed a party of Pinkfeet at a small pond. They ran to the sea and disappeared before we could count them but there seemed to be about 6 adults and 15 goslings of various sizes, some quite large. We could find no disused nests in a fairly thorough search of the smaller island. We saw no geese at any of our stops in Templefjord or Billefjord.

In Petuniabukta we saw no geese during our first stay (30 July-3 Aug.) although we found one empty (but this year's) nest just north of Ebbadalen. On our return to the area on 18 Aug. we saw *c.* 20 goslings with *c.* 5 pairs of adult Pinkfeet on the shore at Ebbadalen. The goslings could fly, though not well. This was another observation which showed us how hard it is to see Pinkfeet with goslings. It is interesting to note that Pinkfeet still breed here where they were breeding in 1921 (Scott and Fisher 1953), despite visits by expeditions almost annually since 1949. Besides these family parties we saw a flock of 24 Pinkfeet on 25th with only 7 goslings in it. At Brucebyen on 26 August N.G.B.J. saw a few Pinkfeet, including a small flock of 15, but no goslings and no old nests. This area is often visited by shooting parties from the Russian mine at Pyramiden.

We were in Austfjord from 10 to 17 August and covered both shores as far north as 79°. We found no nests other than a long-disused one in Jaderindalen. On the eastern coast many moulted feathers were found and the rocky landscape with well vegetated valleys and ponds was judged more suitable for nesting than the west side. On 22nd at Zeipeldalen we saw 22 Pinkfeet flying south. They turned, circled and eventually flew into Zeipeldalen. Further north along the shore we saw 3 Pinkfeet flying south. We saw

Zeipeldalen

none at Hoegdalen. On 14th we saw a flock of 67 or 68 in Zeipeldalen which included no goslings. The flock was eventually flushed and parties flew about over Zeipeldalen and the coastal strip as far as Hoegdalen. Thus we have no evidence that Pinkfeet bred in Austfjord in 1957.

In Austfjord we saw some Brent Geese, including flying goslings. The first were 15 without goslings but mostly in pairs, on the shore at Zeipeldalen on 12th. A little further north along the shore, we saw a pair with five goslings. These flew off towards Gyllensköldholmane. On 14th at Zeipeldalen we saw three pairs and broods of 5 and 2 goslings. We visited Gyllensköldholmane and searched the larger island for deserted Brent nests but could find nothing distinguishable from Eider nests.

On 21st at Ebbadalen we saw 28 Brent Geese flying south from over the mountains and away past Brucebyen. These may have been this same group of birds beginning their autumn migration. In the 1930's Brents nested at Sassendalen and Gåsoyane, Dalgety et al (1931), but none were seen in Sassendalen in 1954 (Goodhart, Webbe and Wright, *loc cit.*) or in 1955 (Pennie and Andrew, *loc. cit.*) and we saw none in either place in 1957. Increased disturbance may well be the cause of their disappearance. It is to be hoped that mining never comes to the north and east coasts of Spitsbergen where birds still nest largely undisturbed. The Pinkfoot seems to have survived much better than the Brent, unless our failure to see large numbers in Sassendalen really reflects the state of the population, but it seems highly unlikely that so many geese belonging to just one area should suddenly have been exterminated.

Hatching and Fledging dates

Our observations allow us to make a fairly accurate comparison of hatching dates in 1957 with published records for other years.

We have used three methods for arriving at a mean hatching date for the colony. One depends on counting the number of nests examined each day which had females sitting. Plotting the proportion of nests being

brooded against days shows the day when half of the females had stopped brooding, and the day when most females ceased to brood. These give the median and approximate mean dates for cessation of brooding. This is likely to be later than the actual hatching date because the female broods the goslings in the nest for some time. The second method counteracts this lag. This was to count the number of goslings seen (in or out of the nests) each day. A histogram is made of the number seen as a proportion of the eventual total number of different goslings seen. For the first method the mean is 30 June and for the second 29 June. This difference roughly corresponds to the time for which the female broods the goslings in the nest. The medians are 30th and 28th.

These two methods are very approximate but allow one to fix a date on the basis of almost haphazard records made from a distance without disturbing the geese. For any future study of a Pinkfoot colony it is worth bearing in mind that one need not disturb the nests, and thereby possibly cause losses of eggs or goslings, to find hatching dates.

The third method, examination of nest contents from day to day, confirmed the other methods for eight nests. At these we could establish the dates of hatching and leaving the nest with accuracy:

Nests 1 and 4, hatching at 2300 hrs. on 27 June, still in nest 1800-2000 hrs. on 28th but gone by 1000 hrs. 29th.
Nest 2, none hatched on 27th, sitting on 28th and 29th, family seen leaving nest about 0800 hrs. on 30th.
Nest 6, dry goslings in nest late on 27th, gone by late 28th.
Nest 9, goslings seen in nest on 29th, just dry, left nest by midday of 30th.
Nests 10 and 11, dry goslings in nest on 30th, left that day.
Nest 13, sitting at midday on 30th, pair and 2 small goslings near nest on 1 July.

Goslings left 4 of these nests on 30 June, the same date as the majority of females stopped sitting. This data also gives some indication of how long goslings stay in the nest. The goslings seen newly hatched (still wet) in nests 1 and 4 stayed at least 20 hours but not more than 35 hours. Those in nest 2 were in the nest not longer than 56 hours and probably much less. Those in nest 9 stayed at least 20 hours and probably more than 5 hours more than this. So there are three records of a minimum of 20 hours, one maximum of 35 hours, another (less accurate) of 56 hours. It seems that normally goslings spend about 24 hours in the nest. Of course, once they are dry they can and do leave earlier if disturbed.

Hatching dates for other years can be obtained from published records. Lovenskiold's (1954) records suggest that most nests hatched between 7 and 15 July in 1949, between 5 and 10 July in 1952 and around 10 July in 1950. When the Sherborne-Cambridge Expedition visited Eskerfossan on 3 July, 1954, at least 4 birds were still sitting and possibly another 4, two nests were empty. This suggests that the majority hatched after 3 July. Dalgety found several clutches fresh on 20 June, most were a week or 10 days set. This would suggest a hatching date of around 10 July in 1930.

These records for other years come from a variety of localities and all show roughly similar dates. Thus it seems unlikely that De Geerdalen was

exceptional in 1957 and likely that most Spitsbergen Pinkfeet laid unusually early that year. This is supported by our observations of goslings on Gåsoyane on 29 July which were judged to be at least 3 weeks old and probably more, and by the flying goslings seen at Ebbadalen on 18 August. These must have been at least 7 weeks old (8 weeks fledging period (Dean, 1958)). This gives a hatching date of 27 June. One gosling which still could not fly on 26 August must have hatched between 1 and 7 July.

We were told by Spitsbergen residents and visiting scientists on the Norsk Polarinstitutt boat "Minna" that the winter had been exceptionally mild in Spitsbergen though they thought that the spring was not particularly early. Bearing in mind the observations of Goodhart and Wright (1958) in Greenland on the importance of snow clearing in time for geese to nest, it seems that the unusually low snowfall and high temperatures in Spitsbergen during winter allowed snow to melt earlier than usual on the Pinkfoot nest sites and the geese nested earlier in consequence. Despite a mild winter in Denmark and early gathering at the point of departure in West Jutland, Pinkfeet did not fly north any earlier in 1957 than in 1955 or in 1956 (mid-May in each year), according to Lind (1958). It is interesting to compare conditions in Spitsbergen in the summers of 1957 and 1958. In late June, 1957, there was no ice left in the fjords but at the same time in 1958 Petuniabukta and Austfjord were full of ice, the ice remaining in Austfjord until mid-July.

A superficial examination of the literature suggests that the Spitsbergen Pinkfeet begin their southward migration early in September. In 1957 ice formed on the calm water of Petuniabukta on 25 August, the sun was very low in the sky and there had been frosts at night for some time. But still on 26th we saw a flightless gosling and this was an early nesting year. If in normal years hatching is mostly about 10 July and departure 10 September, the goslings must be only just over 8 weeks old when they begin their migration. Clearly, the Pinkfoot breeding season can only just be squeezed into a Spitsbergen summer. Perhaps it is advantageous to the species not to breed at all if laying is delayed by late-lying snow for no goslings would be fledged in time to migrate south and they would presumably starve and freeze in Spitsbergen.

Breeding success

Eighteen pairs of Pinkfeet were nesting in De Geerdalen. When we arrived there were 16 more geese in the area. If they represented the survivors of the previous year's goslings, together with older birds which were not breeding, this small total would suggest that 1957 was a good year for breeding. However, we cannot be certain about this without comparing the ratio of breeders to non-breeders at De Geerdalen from year to year, because in Spitsbergen non-breeding birds seem to concentrate in areas away from the breeding colony, such as Reindalen where Goodhart, Webbe and Wright (*loc. cit.*) report predominantly non-breeding birds.

At the end of the incubation period 9 pairs whose eggs were counted had a total of 39 eggs. The clutches of another 7 pairs could be estimated from goslings seen in or out of the nest, or goslings and eggs in the nest, to amount to 28 eggs. So 16 pairs produced approximately 67 eggs, an average of 4.2 each.

The number of goslings hatched was observed in 7 pairs. They hatched 21 goslings. The number hatched was estimated for 3 pairs, and it was estimated that two of the other pairs hatched more goslings than we saw. This

CLUTCH AND BROOD SIZES OF PINKFEET

Nest number	Clutch		Goslings hatched	
	Observed	Estimated	Observed	Estimated
1	—	5	3	+1–2
2	4	—	3	—
3	6	—	—	0
4	—	3	2	+1
5	9	—	—	0
6	—	3	3	—
7	5	—	—	—
9	—	4	4	—
10	—	6	5	—
11	—	5	1	—
12	2	—	—	0
13	—	2	—	2
14	4	—	—	—
16	1	—	—	1
18	4	—	—	—
19	4	—	—	3
Totals	39	28	21	8–9
	67		29-30	

gave another 8-9 goslings and a total of 29-30 goslings from 10 pairs. Three pairs almost certainly hatched no goslings. This gives a mean of 2.3 goslings per pair. It is perhaps better to separate pairs hatching no goslings from those hatching some. This gives a mean of 2.9-3.0 goslings per brood, with 23% of pairs hatching none. Details are given in the table (p. 126).

We have much less information on the success in rearing goslings. Fourteen goslings were observed away from the nest and nine of these were seen up to the age of 2 weeks. Others were not seen, nor were their parents and they are as likely to have moved away as to have died. Our estimates of success in getting goslings away from the nest safely has a minimum of 26 and maximum of 40. The 14 goslings seen away from the nest were in 6 broods, average 2.3. The minimum estimate was for 9 broods, average 2.9 and the maximum for 13 broods, average 3.1. The broods of Pinkfeet seen in Ebbadalen in August mostly seemed to be of about 3 goslings.

In the Barnacle flock the three pairs with goslings (9 goslings) were accompanied by another pair with no young. These may have nested but failed as most broodless adults were in a separate flock of 22 birds. This suggests a low proportion of breeders among the adults even if all the previous

year's goslings had returned. The proportions of the Brent flock in Austfjord, 4 breeders, one broodless pair with them, 7 goslings, and 15 other birds, are similar.

We are uncertain of the extent of predation in De Geerdalen. There was a fox lair at the foot of the cliffs by the sea from which 3 cubs eventually appeared. But only 300 yards away on the gentle slopes was a Pinkfoot nest with 4 eggs, which presumably had survived quite a time, as had equally accessible nests at the gorge. We only saw the fox hunting in the tern colony but near its lair were the remains of several adult Pinkfeet. We found 3 pairs of wings with all the flesh eaten off the humerus and sternum but with wings quite intact and fully feathered. Does a fox only rarely find it necessary to tackle a goose at its nest but when it persists succeed in killing the adult? Or were these corpses of birds wounded by visiting hunters in the spring which the fox was easily able to catch? Some authors refer to Glaucous Gulls and Arctic Skuas as preying on eggs and goslings. We have no direct evidence about this but while we were examining nests both species appeared and flew about low overhead. We are fairly sure that they took nothing after we left as the geese returned very quickly but they certainly seemed very likely to take eggs if the geese were disturbed too often.

Nest Sites

Most of the nests at De Geerdalen were on or near cliffs at low altitude, i.e., near the sea or around the waterfall. No nests were seen on the higher cliffs on the mountains around the valley (which were, of course, very exposed). This seems to be the normal thing in Spitsbergen, Pinkfeet nesting on low cliffs where available, presumably for safety from foxes, but hardly ever on the ubiquitous higher cliffs. At De Geerdalen no nests were higher than 70 metres above sea level, most being about 40 metres.

Eight nests were on cliff tops, at the edge or up to 2 metres from it. These were all along the gorge and close together. Seven were on cliff ledges: five on the west cliffs, one at the gorge and one on the east cliffs. Three were on rocky hill sides, two of these near the gorge and one near the sea. All but one were accessible without climbing and goslings could have walked from them without falling. At the one exception they would have had to fall about 4 metres. Almost all nests were on mounds built up over the years, i.e., in traditional sites. The outlook or range of view from the nests varied. Most (7) gave a view through 360°, four had a view of 240°, 6 a view of 180°, one had a view of only 100°—the nest halfway down the side of the gorge.

The one nest we found in Ebbadalen was not on a cliff but in the open tundra with no protection other than a view in all directions. In Bellsund

C. Plowright (pers. comm.) saw three nests (eggs chipping on 30 June which confirms our hatching dates) on the tops of small cliffs formed by up-pointing strata near the shore, about 20 feet above sea level and 50 yards from the shore.

The deserted colony in Sassendalen was similar to the De Geerdalen site except that the cliffs were not of sheer rock but of more gently sloping crumbling sediment.

The nests in De Geerdalen were spaced from each other by varying distances. Eleven in the gorge were mostly within 10 to 40 metres of each other. The other eight were spaced along the cliffs running from the gorge east, and north-west to the sea and west along the shore. These were more widely spaced, five with intervals of 40 to 100 metres; three more than 100 metres apart.

Brooding and care of goslings

Our watches on brooding birds were never long enough to allow us to say anything definite on length of brooding spells except that they are very long. However, we did once or twice see females off their nests (not as a result of disturbances) and watched them return. We saw males away from the nests more often but they spent the greater part of their time near the nest, standing or sitting looking around "on guard" for long stretches of time. Most nests had a well trodden place near them covered in droppings where the gander habitually kept guard. Sometimes we saw a gander walking around feeding near the nest, and sometimes we saw one fly away to the river and drink, then return to the nest.

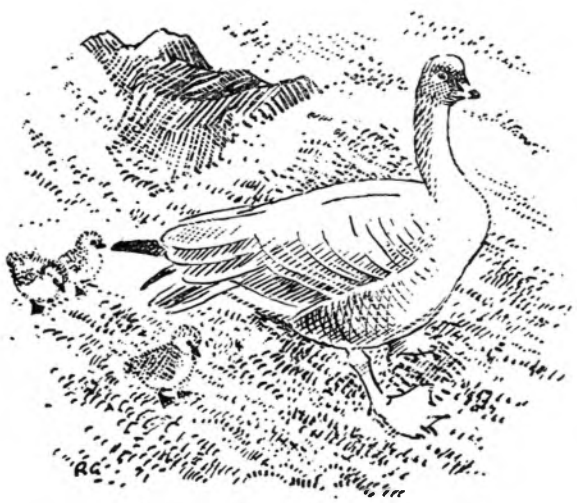
Pair at nest, female "concealing," gosling emerging from wing (from a photograph)

When we approached a nest the gander would often sit down and continue watching us, sometimes lowering his head in the concealing posture. Usually the gander flew away before the female. Ganders which adopted the concealing posture flew away suddenly, those which did not would first begin to walk away from the nest, then fly away. Most females adopted the concealing posture, then slowly stood and flew off. Females differed in their readiness to leave the nest on our approach. Some left when we were still 50 metres away,

others stayed until we were closer than 20 metres, one allowed us to get to 3 metres. This bird then stood and stepped off the nest but then sat down again before walking on and standing alert for some time before flying. These differences seemed consistent from one visit to the next, though we made too few visits to be sure of this.

A similar difference was noticed in pairs 3 and 9 in the female's attentiveness to her goslings. On 29 June when we visited nest 9 the female walked away from the nest, leaving the gander and 4 goslings standing by it. She later returned to the nest but on 30th, when the family was on the marsh, she again wandered off and the goslings became amalgamated with Pair 3's brood which had just left the nest. This desertion had been preceded by some threats and attacks between the two ganders. The actual taking over of the goslings by Pair 3 was not seen. It took place during about 10 minutes while the birds were out of sight but immediately afterwards male 9 threatened Pair 3 who retaliated and chased him off. Male 9 stood around a while with body feathers fluffed and head low (a posture sometimes seen in defeated birds) before walking off to join female 9 who was now some 100 metres away. Pair 3 kept their own and Pair 9's goslings for as long as we were at De Geerdalen (last seen 12 July).

Newly hatched goslings seemed to be brooded in the nest almost continuously. The only times we saw females get up off goslings in the nest were when we disturbed them and when the goslings left the nest permanently. We watched pairs 9 and 3 brooding goslings in the nest and in each saw goslings come out into the light. With female 9 a gosling put its head out over her wing and looked about, then came right out and sat on her wing, all this whi e the female was in the concealing posture, we being only 5 metres away. When a few minutes later the female got up and walked off, the goslings sat still for a moment, then stood and ran after her. They then stopped by the male and sat clumped together. At nest 3 the female was brooding 3 goslings and we saw them come out from under her one by one and walk around feeding near the nest. They seemed a little incapable. One feeding apart from the others ran back with waving wings (goslings often do this!) but ran straight into the



Pinkfoot leading goslings down steep side of gorge

gander, collided with him and fell over, got up and continued feeding with the others. Some minutes after all the young had started feeding the female stood up, stretched and started to feed. The goslings also fed right on the edge if the cliff, which did not provoke so strong a response in their parents as it did in us but nevertheless the gander put his head up (as in alarm) and the female, which was by then walking around, came up to the goslings near the cliff edge and did the strange low bill waving movement that adults with goslings do. A little later she began to walk along the cliff top doing the bill wiving movement and the goslings gradually followed—not keeping a constant distance or speed behind her but feeding, then rushing up to either parent or the other goslings when left behind. Travelling in this way the female led the family about 100 yards to the end of the gorge, down the slope towards the river. We lost sight of them for a while but next saw them in the river by a long shelf of snow overhanging the water. The adults got out on to the snow but the goslings did not follow. The female did more and more bill waving and got back into the water and out again. One gosling jumped out when the adults were a little way off but when the female again returned to the goslings in the river it got back into the river. They were then swept down-river followed by the adults in the water and running over the snow. Once the goslings disappeared under some snow. The adults stood looking about until the goslings reappeared further downstream when they ran off after them. Eventually the family landed on a gravel shoal, then made its way to the marsh where the goslings immediately began preening.

Goslings watched subsequently seldom preened, spending most of their time feeding or being brooded. Two broods watched about 2 days after leaving the nest were brooded about every hour for about half an hour. The beginning of brooding seemed determined by the female. Whenever she sat down the goslings stopped what they were doing and ran to her. The end of brooding came when the goslings had come out from under the female and started to feed again. The female would then get up and start feeding or preening. Gosling 2-3 days out of the nest seemed to follow their parents better than the goslings just out of the nest. Also very young goslings would follow either male or female, even rushing off after the male when he ran to attack other geese, only to get left far behind. This was not seen in slightly older goslings. Pairs with goslings on the marsh spent a lot of time "on guard," usually only one parent (mostly the male) standing still with head held high and tail low. This is almost a characteristic of Pinkfeet, other geese on guard seldom seeming to stand so erect. On seeing something, such as ourselves, they would lower their heads and walk or run away with much bill-waving, followed by the goslings. They rapidly went out of sight and if one looked away it was impossible to spot them again unless they happened to appear above the skyline.

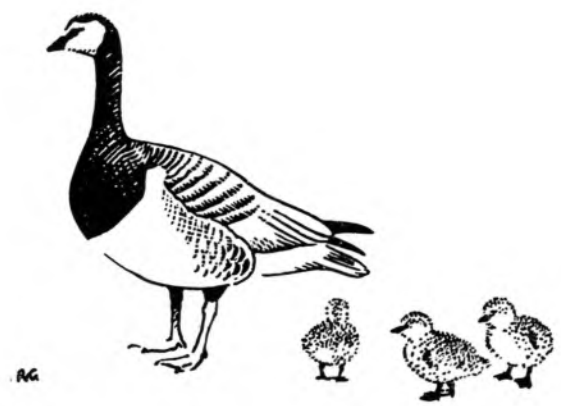
At first pairs with goslings kept to themselves but on 3 July pair 3 (with 7 goslings) were feeding near a pair with 2 goslings and they stayed together until 12 July when we last visited De Geerdalen. Other families seen at De Geerdalen were all scattered. But the pairs with goslings seen later at Gåsoyane and Ebbadalen were all together, and those in Ebbadalen were in company with broodless adults. The Barnacle families at Sassen were at first together, apart from the non-breeding flock, but joined this flock in mid-July. The same course of events seems to take place in Canada Geese in Britain (personal observation).

Moult

The moult period in Spitsbergen is from mid-July to mid-August (Lovenskiold 1954). We were in Sassendalen for part of this time. We saw two still-flying Pinkfeet on 13 July and moulted birds on 15 July and subsequently. Four non-breeding Barnacles had not dropped their primaries by 13th but all had by 21st. The parents kept their primaries until about 16th but had all lost them by 21st when their goslings were about two weeks old. The adult Pinkfeet seen at Gåsoyane had moulted; their goslings were at least 3 weeks old. We saw flying Pinkfeet in Austfjord on 12 August and subsequently. These had no goslings. On 18th we found flying Pinkfeet in Ebbadalen, with goslings. These observations are sparse but compatible with the view that non-breeders moult earlier than parents. Moulting, like hatching, seems to have been early in 1957. Lovenskiold claims that in most years many geese are still flightless after 15 August when the shooting season opens.

Ringed Geese

Two ringed geese were seen at De Geerdalen. The female of pair 9 (four goslings) had a numbered ring on her left leg and an orange colour ring on her right leg. A gander from another nest at the gorge, possibly nest 19 (4 eggs) had a blue or green colour ring on his left leg and numbered ring on his right leg. C. J. Pennycuick of the Sherborne-Cambridge 1954 expedition told us that one of these would have been ringed in Reindalen in 1954, among fully grown birds with few or no goslings and the other may have been ringed in Sassendalen in a large flock with a fair number of goslings. Similarly ringed birds were seen in Jutland in April and May 1957 by Lind.



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