MASS RINGING OF FLIGHTLESS BLUE AND LESSER SNOW GEESE IN CANADA'S EASTERN ARCTIC

By Graham Cooch, Canadian Wildlife Service

SUMMARY

THE capture of large numbers of moulting adult Snow Geese and their goslings on Southampton Island is described. The method of capture, adapted from a long-established Eskimo technique, resembles that used for catching flightless Pink-footed Geese in Iceland.

In the three summers 1952–54, 15,000 geese were ringed on Southampton Island and at a colony at Eskimo Point, North-West Territory. Over 10% have already been recovered. These recoveries, and live recaptures, have provided much information on the migration pattern of the species, on the areas in which these populations are most heavily shot, and on the extent of return to the breeding colony in succeeding years.

The third known colony of the species is on Baffin Island. It is hoped to ring geese there in the summer of 1958.

This ringing programme will make possible detailed studies of the population structure. Preliminary calculations suggest many similarities between the structure of the Snow Geese population and that of the Pink-footed Goose.

The number of Blue and Lesser Snow Geese (*Anser caerulescens*),[1] breeding in the eastern Canadian Arctic exceeds 800,000, of which about 350,000 are Blue Geese. Because of the colonial nesting of these birds and difficult travelling conditions, the location of the breeding grounds of the Blue Goose remained an enigma until 1929. In that year Mr J. Dewey Soper (1930) discovered a vast Blue Goose breeding ground at Bowman Bay, Baffin Island (see Figure 2), successfully culminating an eight-year search. The following year Dr G. M. Sutton (1931) reported a colony on Southampton Island. A third colony has

[1] Although the A.O.U. check-list retains the Snow Geese in the genus *Chen*, and treats Blue and Lesser Snow as distinct species, more recent work indicates that they are colour phases of a single species (Delacour, *Waterfowl of the World*, vol. I, 1954).

since been found south of Eskimo Point, N.W.T. (Gavin, personal communication 1955). Almost the entire eastern Arctic population of the species breeds in these three colonies. The most complete discussion published to date is that of Manning (1942).

Even though the major breeding grounds of Blue and Lesser Snow Geese have been known for more than 20 years, little had been learned of their life history. In 1952 the Arctic Institute of North America sponsored a long-term study of Blue and Lesser Snow Geese at Boas River, Southampton Island (63° 40′ N, 86° 10′ W) (Cooch 1953). An important phase of the study was the ringing of a large sample of birds on the various breeding grounds. From this sample, it was hoped to gather data on migration routes, winter range, mortality, areas of hunting pressure, and population changes.

Family groups of geese congregate in large flocks as the time of post-nuptial moult approaches. Eventually loose bands of up to 500 pairs and their progeny are to be seen scattered over the flat, featureless tundra. Although flightless, they are able to run with great speed and agility. It is possible for a man to run down individual birds, but an attempt to capture large numbers in this way would lead only to frustration. Scott and Fisher (1953) have created a vivid word picture of the futility of making a mad dash at moulting geese, even with the advantage of being mounted on horseback. The improbability of being able to make a mass capture on foot by such means is apparent.

Before the white man came, Eskimos in Arctic North America had developed an efficient method of capturing flightless geese by driving them into rude stone pens. Horing (1937), Steffanson (1929), Soper (1928), and Hantszch (1914) all refer to Eskimos rounding up geese during the post-nuptial moult. These drives were frequently made in conjunction with caribou (*Rangifer arcticus*) hunts. Since the last caribou on Southampton Island were extirpated in 1946,

thus eliminating the reason for visiting remote goose colonies, the Eskimos no longer trap geese. Evidently the same thing has happened on Baffin Island (Soper 1930). On Southampton Island knowledge of the methods used formerly is now limited to one family of Eskimos.

The Eskimo technique is simple but effective. A trapping drive is initiated by a group of men walking on a course nearly parallel to that of a large flock of geese. The birds see figures loom up through the heat haze, but, unless it becomes immediately apparent that these figures are coming directly toward them, they merely walk slowly away from the disturbance. If approached directly, many escape. The technique is to approach them indirectly, leaving a man behind from time to time to check their retreat in his direction. The drivers, still walking, try to keep the birds slowly circling in one general direction, otherwise they take fright and scatter. The process is continued until one man is left walking. It is often necessary for one driver to run quickly ahead of the flock to complete the circle. The drivers left behind from time to time remain hidden until it becomes apparent that one member has 'headed' the flock and that the geese are now starting to run back toward their original feeding area. No matter which way the geese turn, their progress is blocked by figures suddenly looming up on the horizon. They become confused and make for the largest gap between the men. Gaps are closed by running directly across the path of the geese; this is relatively easy because of the illusion of speed created by men running on the horizon. Finally the geese become completely muddled and give up. They stand in a vast milling mob, chattering so loudly that vocal communication among the drivers is difficult.

The birds are now under control. All the drivers begin to close in on the flock, except one who acts as a 'Judas Goat.' He walks off in the direction of the corral, never looking back. The birds move away from the encircling drivers and follow the one who is apparently retreating.

When the man leading the flock reaches the corral he walks through the entrance and climbs out at the end. The geese crowd into the pen.

The Eskimos made some long drives by this method. On Southampton and Baffin Islands they still tell of drives of several days' duration, which stopped when the geese were tired, and continued later until the destination was reached. It was possible, thus, to lead a small flock into a tent. This was actually accomplished in 1952 when a small flock was needed for study purposes.

The stone corrals (*kugees*) in which the Eskimos trapped their birds were not very imposing structures. Scott and Fisher (*ibid.*) have described and illustrated corrals found in Iceland, which do not differ appreciably from corrals seen by me. Maunder (1852) reports that natives in certain parts of Siberia used a similar technique in goose trapping.

Many explorers have noted the presence of stone corrals in areas far from present breeding concentration. Some have stated that perhaps these indicated that the areas were used for breeding in the past. However, this may not be a correct interpretation, as, on the basis of information given me by Eskimos on Southampton Island and corroborated by experience, the *kugees* were often built at camp sites and the geese were moved there from areas many miles away.

One method used in ringing in 1952 and 1953 (Cooch 1953) took advantage of the extensive tidal flats of the Bay of God's Mercy. Two or three men walked out on to the flats at low tide until out of sight of camp. They then walked parallel to the high-tide line until they believed a large segment of

the flock had been headed off. This party was aided by the presence of a small rocky island a few hundred yards from the high-tide line, which permitted the men to approach unobserved by the geese and provided vantage points for estimation of position and numbers of birds. A second party of two men remained at camp until it was believed that the coastal party had proceeded far enough. Then they proceeded to a pre-arranged point two miles inland. Here they divided forces. One man walked along a course parallel to that

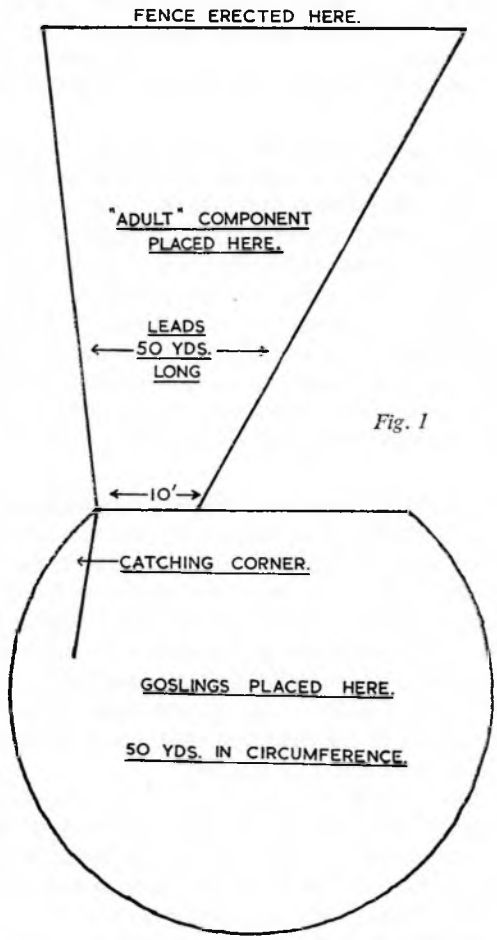

Fig. 1

taken by the coastal party, the other walked slowly in the general direction of the island. Eventually, the two parties came in sight of one another, or at least saw the geese moving away from the coastal party on the horizon. Thus the flock was trapped between the two groups almost before they sensed their presence. Vigorous running was required only in the first few minutes after the coastal party reached shore. Once the birds had been headed off, they were driven to the pen quite easily.

Results which are almost beyond belief can be obtained by using this method. On two occasions, in 1953, over 15,000 birds were surrounded. However, such large captures are not desirable and in these cases resulted accidentally from imperfect timing.

Construction of an adequate holding pen was simple (Figure 1). The corral, 50 yards in circumference, and leads 100 yards long were at first made of sections of 1-inch mesh heavy nylon netting, 4 feet high. The net was held upright by 5-feet bamboo poles, supported firmly with rocks and clay sods. Nylon netting proved completely unsatisfactory. Geese continually became enmeshed in it and were sometimes injured in their attempts to escape. Furthermore, bills and tongues of Blue and Lesser Snow Geese are sharply serrated and are quite capable of cutting through nylon. A large number of birds escaped by cutting a few strands of the netting. To combat this loss and reduce injury to trapped birds, the central receiving pen was reinforced with 1-inch mesh poultry wire, 24 inches high. A small 'V' inside the larger pen was used to trap small segments of the flock for ringing.

The trap now used is of all-wire mesh construction. Leads have been reduced to 50 feet and the bamboo poles replaced with aluminium tubing. Scott and Fisher (*ibid.*) have correctly pointed out that the leads are not necessary. They can, however, be put to other use and serve as auxiliary holding pens.

We still have much to learn about the best way to ring large numbers of geese without destroying too many in the process. Close confinement of large numbers of geese is dangerous for them. Young birds may be knocked over and trampled, become fatigued, or die of shock. The rate of loss appears to increase in geometric progression with each additional hour the birds are kept in the pen. The worst loss experienced occurred on 1 August 1952 when 78 young and 19 adults were lost from a flock estimated to be 4000 birds.

In 1953, Mr T. W. Barry and the writer devised a modification of the technique which permitted mass trapping with little or no loss (Cooch 1955A). It is based largely on flock behaviour of herded geese and applies only to the procedure used in herding the birds into the pen. Goslings have a tendency to fall to the rear as the flock is being herded along. About half a mile from the holding pen the flock is divided by a man running through it at right angles to its line of movement. The front portion, mainly adults, is held back, and the rear portion, of which about 90% are goslings, is led directly into the holding pen, and the gate is closed. The adults in the flock are then led in between the leads, which are fenced off to make a second holding pen.

By this method the goslings are protected from trampling and pecking by adults. The goslings in the main pen can be ringed and released in approximately half the time otherwise needed. Once the main pen has been cleared, additional goslings are brought in from the flock between the leads. This is possible because the goslings tend to congregate in one area in the mass of penned birds. Furthermore, they usually select the area nearest to the mass of goslings in the main holding pen. Additional gosling flocks are brought into the main holding pen several times until only adults remain to be ringed. When the goslings have been released they usually remain in the vicinity of the pen. Every time an adult female is released, one or more young follow her. In this manner the number of birds deprived of 'parental' protection is greatly reduced.

In 1953, separate captures of 1694, 1722 and 3719 birds were accomplished without the loss of a single bird in the pens. In small captures earlier in the season as many as 5% of the goslings had been casualties.

In a species such as Blue and Lesser Snow Geese, where family groups are so important to survival, it is quite right to be concerned about the effects of

breaking up families, and confining and segregating them according to age, colour phase, and sex. For three weeks before driving was attempted in 1952, a flock of 50 pairs of geese and their young was kept under constant surveillance. It was possible to positively identify every family group because of mixed mating of Blues with Snows, variation in plumage, the number of goslings per brood, and the number of Blue- or Snow-type goslings per brood. These birds were trapped and ringed on July 21 1952 between 12.00 and 14.00 hours. Fortunately, flocks of moulting geese return to the same area from which they were driven. Thus, when a check was made on the feeding birds at 08.00 July 22 1952, all family groups were reassembled. It had been interesting to watch stray young approach a family, be rejected, proceed to the next pair, and so on until finally accepted. Adults separated from their mates or progeny kept up an incessant clamour, but once the family unit was partially reassembled, calling stopped. It is not safe to assume that such complete reassembly of family units will occur when larger masses of geese are driven over long distances. However, my experience has been that at least 90% of family groups are reassembled after each drive. Then, too, goslings at this stage of development are large enough to fend for themselves and require no brooding. Unattached young band together and form self-sufficient units where rate of survival is high.

Scott *et al.* (1952), Scott and Fisher (1953), Boyd and Scott (1955), and Scott *et al.* (1955) have derived population estimates of Pink-footed Geese (*Anser brachyrhynchus*) on the basis of recapture of ringed birds during successive ringing attempts. This is not possible when dealing with Blue and Lesser Snow Geese. As mentioned previously, flocks return to their original feeding area after being released from the ringing pen, and birds driven from one area and ringed are seldom recovered in another area. Thus it is possible to capture a large sample of birds each day and get less than 1% rate of recapture.

The Trust expeditions to Iceland and Spitsbergen utilised a portable pen which was erected after the geese were under control. This is practical when some form of transportation is available but difficult under conditions such as those existing at Boas River. It has the advantage that geese are not fatigued by long walks before being confined. During some drives in 1952 and 1953, birds were driven as far as ten miles. This would have been especially hard on goslings and was therefore attempted only with flocks of non-breeding birds.

It is unfortunate that time did not permit the sexing of all the birds banded. However, all were aged and a small sample (100 each category) were sexed.

Non-breeding adults and sub-adults enter the post-nuptial moult in early July and regain their powers of flight before adults with young begin their post-nuptial moult. Thus it was possible to ring samples of sub-adults by making drives in mid-July and of breeding adults and goslings by drives in early August.

The problem of keeping records when one's assistants are Eskimos who speak little English, is difficult. To avoid confusion and reduce the length of time required for ringing, all rings were opened on the day before the drive. A maximum of four categories was available on any drive if the birds were not sexed, i.e., adult Blue, adult Lesser Snow, juvenile Blue, and juvenile Lesser Snow Geese. Drives for sub-adults required only two categories. Each Eskimo was assigned to ring birds of one category only. Any birds ringed previously or difficult to place in a category were referred to me. Birds were ringed in series of 1000 or more, but rings were not necessarily placed on the birds in

numerical sequence. At the end of the day, unused rings were subtracted from the total number of rings opened for each category. The difference represented the number of birds ringed on that day. Rings which remained unused were used first on the next drive and recorded as having been used on that day.

The use of untrained personnel has resulted in an error of identification of juveniles of one-half of 1%. Considering the number of geese which have been ringed during this project (15,000) the use of the system described above seems justifiable.

It is a happy coincidence that two research projects, one in Iceland and Spitsbergen, the other in Canada, should evolve independently a practical method of ringing large numbers of flightless geese. Since the winter of 1952, data on modification in technique and results obtained, and notes of general interest, have been freely exchanged.

Some of the results of the Trust ringing programme are already published. The study has been greatly aided by rocket trapping in Scotland and England. This is accomplished after the flight from Iceland, but prior to intensive shooting. It provides a clearer understanding of seasonal population structure, selective mortality, and local movement than is possible under North American conditions.

The difficulties involved in analysing data on North American waterfowl are many. The large number of birds involved, the vast area over which they are found, and the kill in regions where transportation is limited, all serve to confuse the interpretation. However, some obvious results of this mass trapping programme are available.

One immediate result was the discovery that birds from Southampton Island and Eskimo Point had a different migration pattern from those breeding at Bowman Bay, Baffin Island. This newly-discovered route follows the west coast of Hudson Bay to Cape Henrietta Maria. After a month of feeding along

Fig. 2

the coast, the birds fly south and south-west to Minnesota and South Dakota. They may in some seasons stop in this area but more often continue on directly to their winter range in east Texas (Cooch 1955B). The Baffin Island birds migrate through James Bay and south to Louisiana via the Mississippi River Valley.

The 1700 to 2300-mile autumn migration, from Hudson and James Bays to the Gulf of Mexico has been accomplished in 60 hours and at an altitude of 5000 feet (Cooch 1955B). However, such long flights at such great altitudes are more characteristic of the Baffin Island population than of the Southampton Island geese.

Three areas of heavy 'hunting pressure' occur along the 3000-mile flight of geese from the breeding grounds to Texas. These are on the Hudson Bay coast of Ontario and Manitoba, in South Dakota, and in east Texas. Ring recovery from the wintering area accounts for nearly 50% of total recoveries. Unfortunately, a large number of rings taken annually by the Cree Indians of northern Ontario are not turned in. A programme of education is now under way there and this, it is hoped, will lead to a higher proportion of rings being recovered in the area.

A total of 1579 rings (10.5%) have been returned since 1952. These returns, tabulated by year of ringing and recovery, are presented in Table I and Table II.

TABLE I

Recovery of Ringed Blue Geese during Hunting Season 1 September–10 January

Year of Ringing	Place Ringed	Age Class	Year Recovered			Total Recovered	Total Ringed
			1952	1953	1954		
1952	Boas R.	Adult	28	32	27	87	552
1952	Boas R.	Juvenile	73	12	15	100	1148
1953	Boas R.	Adult	—	20	22	42	813
1953	Boas R.	Sub-adult	—	16	10	26	382
1953	Boas R.	Juvenile	—	90	13	103	1010
1954	Esk. Pt.	Adult	—	—	13	13	200
1954	Esk. Pt.	Juvenile	—	—	27	27	345
Totals ..			101	170	127	398	4450

A preliminary examination of Tables I and II indicates that the breeding population is fairly stable. This conclusion has been supported by construction of a population plot, similar to that designed by Boyd and Scott (1955).

There is good evidence that birds return to their natal area in succeeding years. Eleven ringed adult females were found using the same nests in 1952 and 1953. In 1953, 2100 sub-adults were trapped, 178 of which were recaptures of birds ringed in 1952. At Eskimo Point, N.W.T., only three Boas River birds were recaptured in a total of 2800 birds caught. Blue and Lesser Snow Geese remain together in family groups from time of hatching until the next breeding season. Family groups of adults and ten-month-old young arrive on the breeding grounds as units. Indirect recoveries (recoveries made after the first year) follow the same pattern as do first-year recoveries.

TABLE II

Recovery of Ringed Lesser Snow Geese during Hunting Season 1 September–10 January

Year of Ringing	Place Ringed	Age Class	Year Recovered			Total Recovered	Total Ringed
			1952	1953	1954		
1952	Boas R.	Adult	25	19	29	73	327
1952	Boas R.	Juvenile	253	55	53	361	2973
1953	Boas R.	Adult	—	105	84	189	2224
1953	Boas R.	Sub-adult	—	46	42	88	1182
1953	Boas R.	Juvenile	—	295	60	355	2789
1954	Esk. Pt.	Adult	—	—	22	22	321
1954	Esk. Pt.	Juvenile	—	—	93	93	734
Totals ..			278	520	383	1181	10,550

The recovery data are still incomplete. The Baffin Island population, estimated to contain 350,000 birds, has not been sampled. This was attempted in July 1956, but conditions prevented the colony being reached. A further attempt will be made in the summer of 1958. Until this has been accomplished, further discussion of the available data is not desirable.

It is hoped that eventually all species of geese breeding in Canada's Arctic will be studied in as great detail as Pink-footed populations in Iceland, Spitsbergen, and the British Isles.

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