

task of preparing his last book was truly remarkable. It has been said that ornithology to him was a game—the greatest and best game he played. If so, he played it like other games, to win, and none knew better than he that winners never quit.

*Field Museum of Nat. Hist., Chicago.*

---

## THE BREEDING HABITS OF THE BARNACLE GOOSE.

BY F. C. R. JOURDAIN, M. A., M. B. O. U., C. F. A. O. U.

### *Plate V.*

UNTIL the season of 1921, all that was definitely known of the breeding of the Barnacle Goose, (*Branta leucopsis* (Bechst.)), was due to the efforts of two ornithological workers, Dr. Alexander Koenig of Bonn, Germany, and Mr. A. L. Y. Manniche of Denmark. The few earlier breeding records are all of a more or less doubtful character. In 1858 a Goose and a nest of eggs were brought to the Swedish Expedition under Nordenskiöld by the harpooner of a sealing sloop from some locality near Bell Sound, Spitsbergen, but it is by no means certain that the bird was shot from the eggs and probably the eggs were found on one of the islets in the bay and belonged to *Branta b. bernicla*. A supposed case of breeding on the Lofoden Isles, Norway, in 1870–1872, was reported by Collett, but the eggs are remarkably small for this species, and the locality lies far outside the normal breeding range, so that even if no mistake was made, probably one of the birds was prevented from migrating by some injury. A nest with eggs from which the gander was shot is said to have been found by Nathorst and DeGeer in 1882 in Bell Sound, Spitsbergen, but here again there are discrepancies in the various accounts, Lieutenant Stjernspetz informing Mr. A. H. Cocks that three young were taken. In 1913, Mr. H. Noble was shown a clutch of five eggs and down which were said to have been taken in Iceland in 1912 (cf. *British Birds* (Mag.) X, p. 181).

The first really authentic information on the subject however, comes from Dr. Koenig, who gives full details of his discovery in his 'Avifauna Spitzbergensis,' p. 222–226. On June 29, 1907, he found a small breeding colony in one of the side valleys leading



NEST AND EGGS OF THE BARNACLE GOOSE.

into Advent Bay, and on the following day obtained two clutches of five and four eggs respectively, besides shooting three males and two females. In 1908 he returned to the same spot, but though about eight pairs were breeding in the valley, only one nest proved to be accessible, which contained three incubated eggs on June 15. These twelve eggs, still in Dr. Koenig's fine collection at Bonn, remained the only authentic specimens taken from wild birds until 1921. Perhaps the most curious feature about these nests which has no doubt been the principal factor in preserving them from molestation, was their unusual position. In Spitsbergen it is not uncommon to find outcrops of rock occurring at intervals along the sides of valleys, and although undergoing a slow process of disintegration, and split by frost, they still stand out from the steep hillsides in great masses, often with perpendicular sides, leading down to a talus of broken rocks below. Here it is, on these "bastions" as Koenig aptly terms them, that the Barnacle Goose elects to breed. Sometimes the nest may be found on a mossy ledge at the foot of a steep crag, with a drop of fifteen to twenty or thirty feet below. At other times a narrow rock spur, projecting out into the valley from the hillside is chosen, while in some cases birds have been seen incubating their eggs at the top of some rock pinnacle or in a hollow in the face of an overhung cliff.

In 1910, Mr. A. L. V. Manniche, who accompanied the Danish Expedition to Northeast Greenland in 1906-1908, published his ornithological and other notes in the 'Meddelelser om Grönland.' Bd. XLV. Here he describes how in June 1908, he discovered a great breeding colony on the steep face of a mountain over 1100 feet high. The birds were breeding on ledges on the upper half of a great cliff, and even at a distance of three-quarters of a mile, the noise of their notes was distinctly audible. Manniche estimated the number of breeding birds at about 150. Unfortunately he was unable to reach the nesting places or even to ascertain with certainty whether they had actually begun to breed. An interesting feature of this colony was the presence of an eyrie of Greenland Falcons among the geese.

The spring of 1921, when the Oxford University Expedition visited Spitsbergen, was a remarkably open one, and there was very much less snow than in normal years. We were, however,

rather later than we had expected to be in reaching Advent Bay and it was about 11 P. M. on the night of June 25 that a small party, consisting of Messrs. A. H. Paget Wilkes, S. Gordon and myself, set out to work one of the valleys leading down to the bay. The sun was still shining and the weather still and fine as we made our way along the side of the desolate looking valley, on the opposite side of which many snow wreaths still lay. A succession of gray bluffs half way up the long slope of the mountain side looked promising and we slowly toiled over the loose talus towards them, scanning the crags closely with the glasses in the hope of seeing the white face of the setting bird or her mate. We had not gone very far before a goose appeared flying down the valley towards us and was presently joined by a second, which must have come from one of the bluffs. Both birds seemed anxious and uttered a cackling note, and as they came near we recognized the boldly contrasting black and white plumage and the characteristic white face of the Barnacle Goose. Round they went away again up the valley, one bird finally settling on the top of a big rocky bastion. This was most encouraging, and once more the glasses were turned on the rocks ahead of us. Half way up a steep rock face perhaps a kilometre ahead there was a white speck, and as the glasses were directed to it, it seemed to move. The exact spot was hurriedly pointed out to the others and Mr. Wilkes at once set off towards it. As he gradually came nearer first the gander and then the goose left the bluff but the latter was most unwilling to desert her highly incubated eggs and sat with outstretched neck till at last her fears got the better of her. The nest contained five eggs and a plentiful supply of down and feathers, as well as a good many droppings. It was not particularly difficult to reach from above, and a short scramble was all that was needed before the eggs and down were in the collector's hands. Time was pressing as we had arranged for our ship to leave at midnight, but fortunately before turning back Mr. Wilkes decided to try another bluff still further up the valley. Here on a projecting spur of rock jutting out over the valley, some hundreds of feet below was a second nest containing four eggs in a neat down-lined hollow. Flakes of down were scattered over the rocks, while numerous droppings marked the place where the gander kept watch beside

his mate. The accompanying photograph (Plate V) is curiously deceptive. The high walls of the opposite side of the valley and the snow drifts in the gullies come out clearly and the marshy flats at the foot of the valley can also be well seen, but the rocky spur in the foreground, on which the nest is situated, might well be only a few feet above the flats below, instead of being two hundred feet or so above them.

A second visit a few days later was even more successful. On this occasion no fewer than three nests were taken, containing five, five, and three eggs respectively. All three clutches were highly incubated and many hours of painstaking toil were spent before the last bone was safely extracted. Besides these nests, there was also another breeding place in a small cave in the face of an overhung and very rotten cliff, which could only have been reached at the expense of much time and considerable risk. High up above us was a great cliff face, and here I plainly saw a goose stand up for a minute or two and then disappear again on to a ledge. Another bird settled on a mushroom shaped pinnacle of rock on which her head could just be seen silhouetted against the sky, where she is probably safe against all comers for many years to come.

It is evident that the habit of nesting on cliff faces has been adopted by the Barnacle Goose and to some extent also by the Pink-footed Goose—as a protection against the attacks of the Artic Fox. Many of the nests must be quite inaccessible, while in other cases, the mammal is at a very great disadvantage on a ledge with a drop of anything from fifteen to fifty feet below and a couple of angry geese, as much at home in the air as on land. Unlike the ducks, the Anseres have a high standard of duty on the part of the husband. Although the male takes no share in incubation, and incubation patches are only found in the females, the males spend most of their time on sentry duty beside their mates. Not only is the gander always on the watch and ready to give the alarm, but he is also prepared to take his share in defence if any occasion should arise. In every case where we found geese breeding in Spitsbergen, whether Pink-footed, Brent or Barnacle, the male bird was standing by the side of his mate. There is, however, one disadvantage of the cliff nesting habit, which would seem at first to offer almost insuperable objections. The

young of most cliff breeders remain in the nest till they have acquired the power of flight, while the young geese on the other hand are vegetable feeders and can pick up their own living almost as soon as their down is dry, but as the parents have no means of conveying food to them, they must necessarily leave the nest within a day or so, and probably within a few hours of being hatched. It seems almost incredible that goslings should survive a fall from the nest on to a talus of rough broken rocks many feet below, with the prospect of a long and toilsome journey down to the river flats below over screes and boulders. From what we saw in the case of the Pink-footed Goose, however, I am inclined to believe that this is generally the case, though it is possible that in some instances the parent birds may manage to break the fall to some extent, as otherwise it would seem almost impossible for the young to survive.

It is also clear that the same nesting places are resorted to year after year. In most cases at the bottom of the nesting hollow and below the down lining, were fragments of the broken shells of some previous brood. Even when the same nest hollow is not used one can frequently discern similar hollows within a yard or two.

Only a single brood can be reared during the season, for not only is the summer short, but about mid-July or rather later the primaries are shed and the geese for the time being are rendered incapable of flight. It would therefore be impossible for them to reach their breeding places, and for safety they resort to the lagoons and swamps in the more inaccessible valleys.

In the present paper I do not propose to deal with the question of distribution of this species during the breeding season in the Spitsbergen group, but I may state that the locality discovered by Dr. Koenig is by no means the only one now known, as we have good evidence of breeding from two or three other districts, so that unless much shot down during the moulting season, the species will probably hold its own for long to come.

As the number of authentic wild-taken eggs is so small, the following figures may prove of interest. The average size of 34 eggs (22 taken by the Oxford Expedition and 12 by Koenig and LeRoi) is  $76.37 \times 49.81$  millimeters: Maxima  $82.7 \times 46.4$  and

77.6 × 52.7: Minima 70.6 × 50 and 82.7 × 46.4. The average weight of 10 eggs is 10.252 grammes, Max. 11.42; Min. 9.49 When fresh laid they are pure white, and bear a great resemblance to eggs of the Pink-footed Goose, but are somewhat smaller. They are, however, larger than those of the Brent on the average, besides being considerably heavier. The amount of down in the various nests varied considerably: probably in some cases a certain amount remained in the nest hollow from the previous year. We found no black feathers in the nest: all were either white or had only a faint greyish tinge.

On the whole the Barnacle Goose is decidedly a sociable species, and prefers to breed in colonies. In the Greenland colony described by Manniche the nests were evidently quite close together and two of the nests seen by us, were certainly not twenty yards apart. There is also good reason to believe that a much larger breeding place exists in Spitsbergen than that described above. When flushed from the nest the birds would join together in little parties of two, three or four, or even as many as seven, and fly anxiously up and down the valley, keeping up a continual cackle. For a goose, the Barnacle is not particularly shy, and it was curious to see the gander regarding us with an inquiring air, with head upwards as we looked down on to the nesting ledge from the hillside fifty feet above him. When incubation is far advanced the goose sits very closely, and on one occasion I walked up a narrow track on to a ledge about half way up one of the bastion-like bluffs from the side, to within a few yards of a setting goose, in spite of the fact that a couple of shots had just been fired not fifty yards away and a dead bird from a neighboring nest lay on the rocks below.

*Appleton Rectory, Abingdon, Berkshire, England.*