Breeding biology of feral Greylag Geese in south-west Scotland

JOHN G. YOUNG

Introduction

The Greylag Goose *Anser anser* is the sole goose species indigenous to Britain. In former times, it evidently bred widely over much of the country, but by the middle of the eighteenth century had largely been exterminated as a breeding species by Man, mainly as a result of intensive drainage schemes and other alterations to the preferred habitat, but also by more direct persecution. By the 1920's, Greylag bred only in a few remote parts of north-west Scotland and the Hebrides.

About 1930, Greylag were reintroduced to south-west Scotland by the late Lord William Percy, who transferred eggs and goslings from the native colony on South Uist to the Earl of Stairs' estate at Lochinch near Stranraer, Wigtownshire (the late Lord David Stuart, pers. com.). Around the same period they were also introduced to another area in Galloway (the late Gavin Maxwell, pers. com.) whence they spread to Mochrum. The present stock is derived from these three sites. The introductions were an immediate success, the birds being afforded protection in both summer and winter by the landowners concerned.

By the mid-1950's they had increased significantly and the range had extended to central Galloway. Surveys were made in 1966, 1968 and in 1971, and in the last year at least 129 pairs bred in some thirty localities, in four counties, producing 362 goslings. In addition some 600 failed or non-breeders were found, and the total stock in late July was estimated at about 1,160 birds, the largest feral population in Britain.

A further paper will deal specifically with the historical aspect of this reintroduction and with the current distribution and status. The present paper discusses some aspects of the breeding biology, from data gathered in 1962-1971. The material presented was collected in the author's spare time, incidental to the location of breeding areas, and is therefore limited. Greylag appear very susceptible to disturbance while nesting and are thus probably unsuitable for intensive research.

Nest site location (Table I; Plate III facing p. 32)

The 476 nests examined were all adjacent to water and grazing fields, and 415 (87%) were on wooded islands on lochs, where incubating females were presumably safer from predation by foxes. Some 30 nests were round the margins of lochs, usually where there were no islands. Lochs with unwooded islets often held breeding colonies of Common Gulls *Larus canus* or more usually Black-headed Gulls *Larus ridibundus* and Greylag did not breed in association with these species. (In 1968 and in 1971 two pairs of Greylag successfully reared broods in an inland colony of Herring Gulls *Larus argentatus*, nesting on ruined buildings on an island at Mochrum.) Twenty-three nests were in vegetation near the banks of slow flowing rivers, and seven were on moorland, and one in natural woodland, up to 1,000 metres from water. Nests were usually near a feature which offered some shelter, or a screen from neighbours in areas of high nest density.

Nests

Nest building was by both sexes. Sixteen marked nests at one locality in 1971 took 3-6 days (mean 4.3) to complete. All nests were on solid ground, no floating nests in *Phragmites* were found in the extensive areas of *Phragmites communis*

Table I. Positioning of Greylag nests.

	Number
Foot of tree	184
By rock or large stone	97
By blown tree root	37
In ground vegetation: (*Calluna*, bracken, rushes, etc.)	36
By buildings or dykes	35
In secondary vegetation: (bramble, conifers, *Phragmites*, rhododendron, etc., beside fallen tree trunks)	27
Under fallen branches	12
In holes	4
On top of 2 m. tree stump	1

at some breeding localities. The mode of construction was extremely variable but simple. There is no interweaving and the nest was fragile and of various materials loosely placed on top of one another, with additions throughout incubation. Some nests gained up to 6-8 cm. in height from the laying of the first egg to hatching. No Greylag were ever seen to fly with anything in the bill, and of ten nests examined minutely, all the materials were obtainable within two square metres. Larger objects like twigs were lifted in the bill, at times carried a few steps, but usually dropped or flung with a jerking movement over the back in an apparently haphazard manner. After some initial construction or gathering in of materials, the nest was shaped from both outside and inside. In two observed cases this was done by the female prodding, lifting and laying the material with the bill. Titivation continued throughout laying and incubation. In most nests a foundation of twigs, up to 26 cm. long, was laid, to which was added dead leaves of ivy, holly, oak, birch, rhododendron sp., bracken, *Phragmites*, *Typha* and *Sphagnum* or moss species. The final lining was dead grass, usually *Molinia*, together with a variable amount of breast down increasing as incubation progressed. Nests tend to be distinctive, ranging from mere depressions in *Calluna* or rushes, to nests built completely with mosses or lichens, and large bulky structures of bracken, *Phragmites* and sticks. Forty nests on average had a circumference of 141 cm., a diameter of 41 cm., a rim of 8 cm., and a bowl depth of 6 cm.

The highest density of nests was on the 300 sq. m. Island of Inch, White Loch, Lochinch, where in 1968 there were 42 nests. The distance between the nests, measured from the centre of the bowls, ranged from 2-21 m. (average 11.1 m.), an average of approximately 1 nest per 7 square metres. The dispersal of nests over the island seemed to be regulated by the availability of suitable cover. Elsewhere nests have been found one metre apart, but generally are more widely dispersed. The nesting population is apparently dependent on the number of suitable islands per loch rather than the area of particular islands. In 1971, on Lochs Ochiltree, Dornal and Maberry, birds used all the suitable islands with not more than two nests on any, irrespective of size or vegetation cover. This has been a recent development at Ochiltree especially, where previously most of the nests were concentrated on the largest island. Since 1964 they have been subjected to increased disturbance at the nest.

Other than on Inch Island, nest density seems to be limited by the degree of tolerance of neighbours. There was no significant difference in clutch size or predation losses between high density and low density areas.

Some nest sites have been used for at least five successive seasons. This was most noticeable where nests are in holes. Apparently featureless sites are also reused. In 1968, 110 nests were marked with cedar stakes driven in to 2 cm. above ground. The following year 80 nests (72%) were within 1 metre of the 1968 site and 12 nests (11%) were within 20 cm. Even after three years 72 nests (67%) were still within 1 metre of the 1968 sites and seven nests (6%) were within 20 cm.

Eggs

The eggs are ovate, rarely elongated, fairly smooth and creamy white when laid. They become progressively stained pale to dark brown during incubation. The varying intensity of staining often made it possible to tell the last egg laid and, in smaller clutches, even the laying sequence. In clutches over nine it was possible to tell eggs laid after completion of the original clutch, probably involving two females. There was no evidence that white eggs increased the chance of predation.

The 200 eggs measured ranged from 71-98 mm. by 52-65 mm. (mean 85.4 × 59.0 mm.). This confirmed the finding (Young 1964) that Galloway eggs tend to be smaller than those from continental Europe but are indistinguishable from Icelandic eggs. The results agree very closely with those of British eggs measured by Jourdain (Witherby *et al.* 1939). The freshly laid eggs weighed from 142 to 180 grams, a mean of 165 grams. Weighed 8-10 days before peak days of hatching, the range was from 122-172 grams, a mean of 148 grams, an average weight decrease of 10.3%.

Egg laying

Data from 15 nests in 1971 indicated that usually a single egg was laid daily. Eggs were laid at any time of day with a slight preponderance towards mid-morning. In two nests there were one day gaps between the first and second egg, and in three nests before the last egg. In Galloway the peak periods of laying and hatching varied only slightly between years and there was no correlation with prevalent weather patterns. Normally the first eggs were to be seen at the large

colony at Lochinch about 4th-10th March (D. Lawson, pers. com.), while the majority of the birds laid in the last week of March and the first ten days of April. There is no evidence of earlier laying in general in an area of high density, the peak dates at Lochinch being similar to other localities. Of all the clutches examined 80% were begun within a mean of 6.5 days of each other. Similarly 67% of the clutches hatched within a mean of 7.2 days, generally in the period of the last few days of April and the first two weeks of May.

Incubation

This was commenced after the last egg was laid, and carried out by the female alone. The incubation period was exactly 29 days in 20 individual eggs whose laying and hatching dates were accurately known. Individual eggs lost during incubation were not replaced. At Lochinch where eggs were annually removed for introduction elsewhere, newly hatched goslings have been noted at the end of July, indicating replacement clutches. together to form larger assemblies, but at Lochinch, where the first clutches are generally removed, recognition of broods by gosling size is not difficult. In areas of high nest density male polygamy, which was proved on three occasions elsewhere, is perhaps regular, leading to two clutches being laid in the same nest but brooded by a single female.

Behaviour at nest during incubation

Males remain for long periods in a sentinel position, especially towards the end of incubation, either standing or swimming near the nest. Intruding humans are heralded by the male honking loudly and flying round the site, often landing clumsily on the water and immediately taking off again. Some females allow an approach of up to 3-4 metres before flying off the nest calling loudly, others leave the nest as soon as the male sounds the alarm. Most males leave the vicinity of the nest after the female has come off, and some fly to graze. Females usually remain, either flying round calling, or swimming with neck erect, sometimes

Table II. Observed clutch sizes and brood sizes of Greylag Geese in Galloway.

Year	*No. nests examined*	*No. eggs*	*Mean clutch size*	*No. broods observed in July*	*No. juvs.*	*Mean brood size*
1963	4	19	4.8	12	56	4.7
1964	10	60	6.0	22	95	4.3
1965	20	118	5.9	32	116	3.6
1966	60	352	5.9	26	107	4.1
1967	70	420	6.0	32	141	4.4
1968	120	720	6.0	81	346	4.3
1969	100	584	5.8	70	262	3.7
1970	10	67	6.7	35	139	4.0
1971	82	451	5.5	55	206	3.7
Total	476	2791	5.9	365	1468	4.0

No. in clutch or brood	1	2	3	4	5	6	7	8	9	10	11	12
Clutches			21	61	98	172	82	20	7	6	4	5
Broods	15	23	88	130	55	29	20	1	1	1	1	1

Clutch size and distribution are given in Table II and agree closely with the data of Jourdain (Witherby *et al.* 1939). The mean clutch size of 476 clutches was 5.9.

Clutches in the range of 3-9 were probably from one female. Clutches of 8 and 9 may be related to age and breeding experience, since the larger clutches were regularly at the same nest sites. The clutches of 10-12 eggs were all in areas of high nest density, mostly at Inch Island, and may be attributable to females who have lost or deserted their own clutch. One female is quite capable of covering such abnormal clutches and broods of 10, 11 and 12 have been seen with a pair of adults (Table II). Goslings often group head bowing, and with the tail erect. Following the male alarm females usually, but not always, cover the eggs by dragging down and loose material of the nest rim over the clutch. There is no evidence to suggest that the rapidity of leaving the nest or the completeness of egg-covering is related to age and breeding experience. The return may be rapid, i.e. within minutes, in other cases it takes over an hour. Occasionally if the disturbance is protracted, the female may also give up and go to feed.

At night females sleep most of the time on their nest. They defecate away from it and join other females and males to roost on other parts of the nest island or

on surrounding water. Females may feed at night to restore depleted reserves.

Hatching

Data taken from 40 eggs in eight nests during 1968 indicated that eggs hatched at all times of the day. It took 46-52 hours from the first tapping for the gosling to emerge completely. It took 24-30 hours from the first break in the outer shell surface. The complete broods hatched within a 12 hour period and the whiter eggs, presumably laid last, were not significantly later. The weather was dry and warm and the goslings were dry within 2-3 hours.

The weight of 32 goslings, within three hours of being hatched, ranged from 125-134 grams (mean 127 gm.), i.e. 79% of the mean fresh egg weight. The goslings are nidifugous and can run, swim, dive and feed within hours of drying. Five dives of a four-hour-old gosling averaged 4.7 seconds. Individuals of the same age were noted pirouetting while swimming and feeding on surface water insects.

Checks were made on the hatching success of 147 nests, by examination of the contents and condition of the remaining egg shells. Of these nests 143 (97.3%) hatched at least one egg. Of the original 873 eggs, 699 (87.6%) hatched successfully.

Predation

Greylag Geese appear to have few natural enemies, which take insignificant numbers. Eggs were seen to be predated twice by Carrion Crows *Corvus corone*, on both occasions attempting but failing to carry off an egg. Eventually the eggs were rolled out of the nest and then broken into with the bill. It is widely believed by local gamekeepers that the Carrion Crow is an important predator of the Greylags but there is very little evidence to support this.

Great Black-backed Gulls have been seen to predate eggs twice. According to a local gamekeeper, one mainland site had the whole clutch of five predated by Rat *Rattus norvegicus*. The causes of failure in 460 nests are detailed in Table III.

Greylag goslings were seen killed by feral Cat *Felis* sp. twice and were found in the guts of Pike *Esox lucius* on three occasions, one 6.4 kg. fish having taken an almost three-quarters grown gosling. Predation by Pike is reported by local fishermen to be fairly regular. Otter *Lutra lutra* is not thought to be a significant predator. Fox *Vulpes vulpes* is probably the main predator of goslings, there being 12 local reports.

On 20th June 1965, at Loch Dornal, two adult Great Black-backed Gulls landed beside a creche of 20-25 goslings attended by three flightless adults. One circled hopping round while the other made repeated darts towards the goslings, which had gathered into a tight pack. The adult geese ran towards the gulls, hissing, with the body low and the neck extended in an aggressive posture. The attack persisted for some 20 minutes before the gulls gave up without success.

The only natural predator of adult geese appears to be the fox, which has taken females on the nest, occasionally birds roosting on mainland sites and moorland, and regularly kills wounded birds during the shooting season. In 1968 a fox earth was situated on an island at Mochrum where three pairs of geese nevertheless reared goslings.

Brood survival

The sizes of broods in July of each production year are given in Table II. From an overall mean clutch size of 5.1, the mean brood size in July was 4.1. Since 1964 a second count of brood sizes was taken in late September before immigrant Greylag of Icelandic origin had arrived

Table III. Causes of nest failure of 460 Greylag nests in Galloway.

Factor	*Number of nests*
removal for hatching and introduction elsewhere	350
disturbance through fishing	57
deliberate destruction of eggs (agricultural interests)	31
moor burning and drainage	13
disturbed by dogs or cattle	2
female death (egg peritonitis)	4
killed on nest by fox	2
shot on nest	1
Total	460

Table IV. Comparison of the breeding success, by brood size, of the feral Galloway Greylag Geese and the immigrant Icelandic stock. Icelandic data from Boyd and Ogilvie (1972).

	Galloway			*Icelandic*	
Year	*Mean brood (July)*	*Juvenile % (September)*	*Mean brood*	*Juvenile % (November)*	*Mean brood*
1963	4.6	—	—	27.5	2.3
1964	4.3	18.0	3.0	27.6	3.0
1965	3.6	20.2	3.0	21.1	3.1
1966	4.1	19.4	3.5	24.9	2.6
1967	4.2	24.0	4.0	11.0	1.8
1968	4.3	22.7	3.6	6.0	1.3
1969	3.7	24.6	2.8	23.8	2.0
1970	4.4	25.0	3.2	25.1	2.4
1971	3.7	20.0	3.4	17.5	1.8
mean	4.1	mean	3.2	mean	2.2

(Table IV). This gave an overall mean brood size of 3.2, to be compared with the overall mean brood size of Icelandic birds in Scotland of 2.2 in November (unpublished data from the Wildfowl Trust). The Icelandic birds of course had to face the rigours of a harsher environment, and inevitable losses during migration and from shooting when they arrive in Britain. The much smaller fluctuations in annual production by the sedentary, feral population are very noticeable.

Acknowledgements

I am grateful to Mr. I. H. A. McKay and Mr. D. Lawson for access to the breeding islands on the Stair estates. The late Lord David and Flora Stuart allowed visits to Mochrum, and the late Sir S. Beele and Richard Beele to their estates. Mr. and Mrs. Scott of Ochiltree were especially helpful. To all of these, and to Hugh Boyd, Jim McCarthy and Malcolm Ogilvie for helpful discussions, I owe my thanks.

Summary

Greylag Geese *Anser anser* were reintroduced to south-west Scotland about 1930 and by 1971 the population was estimated at over 1,000. They prefer to nest on wooded islands in a variety of sites. Laying and hatching dates were consistent from year to year. Old nest sites are re-used and most females lay four to six eggs. Some clutches are by two females and bigamy was proved. Incubation is by the female alone and lasts 29 days. The behaviour during incubation is described. Eggs are smaller than those of Continental Greylags but indistinguishable from those collected in Iceland. They hatch at any time of day and the goslings weigh on average 127 grams. There is no significant natural predation. Repeated brood size counts indicate good gosling survival compared to the Icelandic population.

References

BOYD, H. and M. A. OGILVIE. 1972. Icelandic Greylag Geese wintering in Britain in 1960-1971. *Wildfowl* 23 : 64-82.

WITHERBY, H. F., F. C. R. JOURDAIN, N. F. TICEHURST and B. W. TUCKER. 1940. *The Handbook of British Birds*. Vol. III. London : H. F. & G. Witherby, Ltd.

YOUNG, J. G. 1964. Nests and eggs of Greylag Geese in Galloway. *Wildfowl Trust Ann. Rep.* 16 : 54-55.

J. G. Young, The Nature Conservancy, Benvannoch, Glencaple, Dumfries.