

The survival of broods of the Egyptian Goose in Uganda

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The Egyptian Goose *Alopochen aegyptiacus* nests in a variety of places. Mackworth-Praed & Grant (1952) stress its tree-nesting proclivities but Pitman (1965) believes that most nests are on the ground and that it is

only the prominence of the tree nests that has led to the belief that a tree is the preferred nest site. It is true that incubating birds are rarely seen except in such prominent places as the disused nests of other birds of which

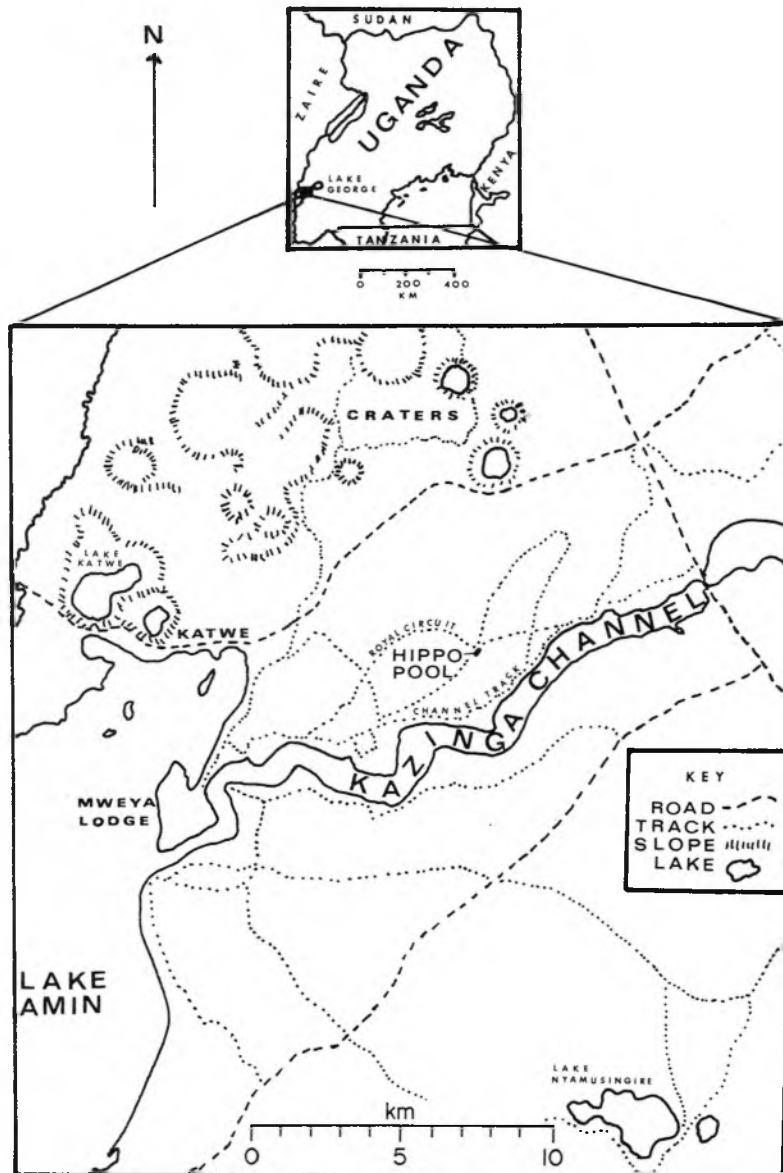


Figure 1. Map of part of the Ruwenzori National Park in western Uganda showing the location of the Hippo Pool where the study was made.

the Hammerkop *Scopus umbretta* is especially favoured, but the Egyptian Goose seems to prefer holes which are plentiful throughout its habitat. Whatever the nesting site, the young are called out of the nest by the parents soon after hatching and led to water. Both parents remain with the brood until the young birds are fully grown. During this period, the goslings are subject to considerable mortality but its extent has not previously been estimated. An opportunity to do so occurred when it was noticed that a large hippo wallow in the Ruwenzori National Park (formerly the Queen Elizabeth National Park) in western Uganda was a favoured nursery for broods of Egyptian Geese. The survival of the broods on this wallow was followed from April 1968 until June 1972. Some preliminary observations began in February 1968 to examine the feasibility of the work but the fate of the broods seen then was not followed in detail and the data have not been included in the results.

The hippo wallow in the Ruwenzori National Park is situated near the track known as the Royal Circuit at latitude $0^{\circ}09'S$ and longitude $29^{\circ}59'E$ (Figure 1). It is roughly oval in shape about 500 m long, about 230 m wide and about 0.01 km^2 in extent. The wallow carries a varying number of adult Egyptian Geese with an average population of 167 birds (Eltringham, 1973). Twelve other species of wildfowl have been recorded on the wallow but not in great numbers. Exceptionally, as many as 139 White-faced Whistling Duck *Dendrocygna viduata* and forty-eight Red-billed Pintail *Anas erythrorhynchos* have been counted on the wallow but numbers are normally very much less. During the period of study, the wallow was visited by flocks of palaeartic migrants with peaks of up to 750 Garganey *Anas querquedula* and 250 Pintail *Anas acuta* during the northern winter. In May 1972, the wallow was covered within a few weeks by floating plants of Nile Cabbage *Pistia stratiotes* so that no open water was left. The Egyptian Geese no longer brought their young to the wallow and the study was, therefore, terminated.

Methods

The wallow was visited on average about six times a month and circled in a landrover which was stopped whenever a brood was seen. On each visit between 16.00 and 17.00 hours, the location of the broods as well as the number and size of the young were re-

corded on a sketch map which was drawn from a vertical air photograph. Observations were facilitated by the use of a pair of 10×50 binoculars. The broods were easily recognized from their location and from the number and size of the goslings. No geese were marked because of the problems of catching in an area frequented by hippopotamus and other dangerous large mammals including elephant, buffalo and lion. The data given below refer to sixty-two broods which were first recorded when the goslings were very small. Partial data from a further eleven broods which appeared on the wallow after the goslings had developed beyond the newly hatched stage have not been used here because the original sizes of the broods are not known.

Results

Copulation

Copulation was observed only twice but as copulation in this species is imperfectly known (Johnsgard, 1965), it is worth recording the details. The first copulation took place at about 16.00 hours. When first seen, the birds were standing in shallow water and dipping their heads to the surface. The female crouched while still in the water and the male at once mounted and poised on the female's back for about a second before coition took place. The whole process took only 4 or 5 seconds before the male dismounted. Both birds then preened behind the wing while one, believed to be the male, chased other geese and was in turn chased by a third. The second copulation was at about the same time of day and also took place in shallow water near the shore. The female was already crouching when the pair was seen and coition took place immediately with no pause. The female began to call during copulation and the male probably did so too. As before, copulation was followed by preening behind the wing.

The number of breeding birds

The approximate location of each brood when first seen has been plotted on a map (Figure 2). It is clear that these plots are grouped. Each group presumably represents the successive progeny of a single pair, the period between the dispersal of one brood and the appearance of the next being compatible with the time required for nest building and incubation. There are a few

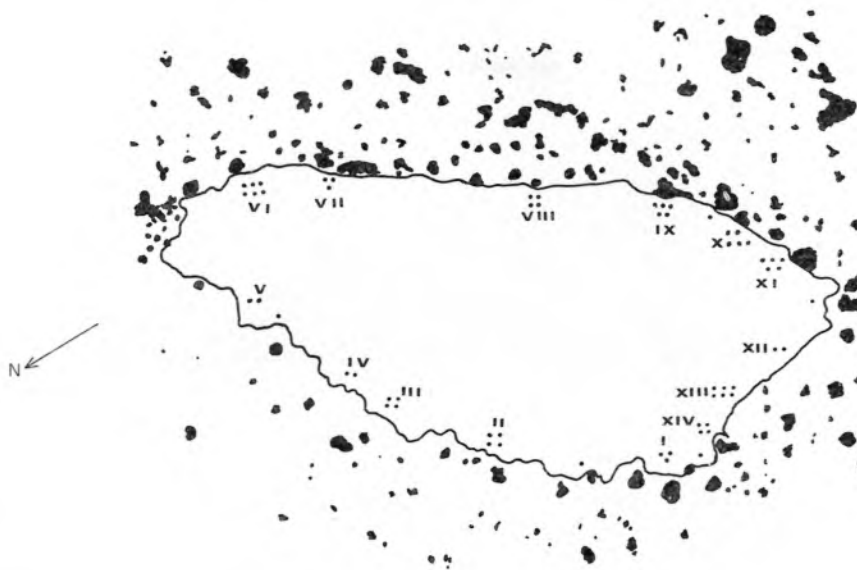


Figure 2. Map of the Hippo Pool showing the approximate location of broods of Pairs I to XIV. Each dot within the outline of the wallow represents a brood. The black shapes represent bushes. Drawn from an aerial photograph.

isolated broods which may represent pairs which took their young on to the wallow on that one occasion only. Apart from these, there appear to be fourteen resident breeding pairs, each presumably holding part of the shore line of the wallow as a territory. The pairs were spread fairly evenly along the shore but there was a marked tendency for them to concentrate in areas with the greatest cover, which affords protection against aerial predators. Only Pair V occupied an area that was relatively open. The broods spent much of their time on land and were usually some distance from the shore when sighted. They invariably rushed towards the water, accompanied by their clucking parents, whenever the land-rover approached and swam rapidly out towards the centre of the wallow for a distance of 20 or 30 m before slowing down.

On the whole, each brood was in the same area each time it was seen, but occasionally they were found some distance away from their usual haunts. For example, Pair VII was once seen with its brood on the opposite shore between Pairs IV and V. It is clear from the number of broods found with each pair over the 4 years that some geese nested twice in the year.

Brood size

The brood size at hatching is not known. There is always the possibility that some goslings were lost on the journey or before they were first seen on the wallow. The figures given here are, therefore, minimal. Details for the 5 years 1968–1972 are given in Table 1 from which it can be seen that the average brood size over the whole period

Table 1. Brood size of Egyptian Geese when first seen on Hippo Wallow

Year	Total no. of broods	Total no. of young	Average brood size	Standard deviation	Range
1968	14	80	5.7	1.841	2–12
1969	18	128	7.1	2.133	2–17
1970	13	76	5.8	1.649	1–11
1971	14	97	6.9	1.958	2–14
1972	3	21	7.0	2.550	2–12
Total	62	402	6.5	3.524	1–17

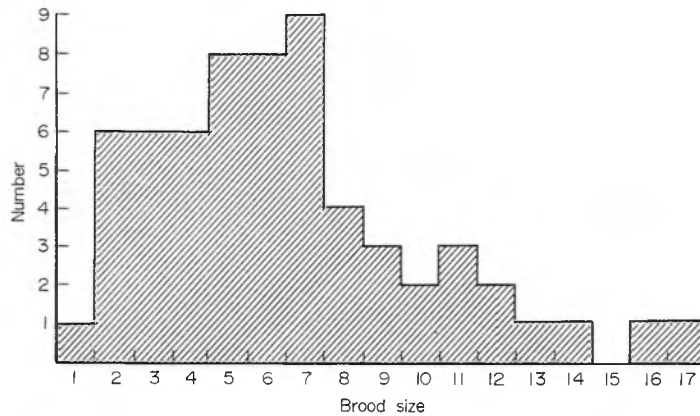


Figure 3. Frequency distribution of the brood size for sixty-two broods of the Egyptian Goose.

was 6.5 with a range of from 1 to 17. There is no significant difference between the brood sizes each year ($\chi^2 = 3.303$; $0.90 > P > 0.50$). Figure 3 shows that the brood size distribution was markedly skewed with an abrupt cut off after a brood size of seven. Only eighteen broods (29%) were larger and it is possible that some of these resulted from amalgamation of broods or multiple laying in a nest. No brood was ever with more than two adults and usually both birds, presumably a mated pair, were present. There is, therefore, no evidence of crèche formation as is seen in the closely related Common Shelduck *Tadorna tadorna*. The only evidence for amalgamation was a brood of fourteen, first seen when the young were of medium size, in which six goslings were distinctly bigger than the rest.

Brood survival

Sixty days from the first sighting the goslings are of adult size, but not necessarily weight Siegfried (1967), and some begin to take up an independent existence at this point. Consequently, Table 2 shows the survival of the

goslings up to the age of 60 days from first sighting. The overall survival was 60.4% but there were considerable variations each year which are statistically significant ($\chi^2 = 14.663$ for 1968-1971 and 29.776 for 1968-1972; $P < 0.001$ in each case). Apart from 1972, when the number of broods was too small to be significant, these differences are due to a year of poor survival in 1970 and one of good survival in 1971. For several months in 1971 the wallow dried up to a considerable extent but it is difficult to see why this should have been advantageous. There was no notable event in 1970 likely to be responsible for the poor survival. Meteorological conditions as recorded at a station about 10 km to the south west, were not markedly different each year. Rainfall, at 871 mm in 1970 and 958 mm in 1971 respectively, was only a little higher than the average of 839 mm, while sunshine hours were not very unusual at 1,887 hours in 1970 and 2,028 hours in 1972; the average being 2,095 hours. The high proportion of broods reared without loss was the factor mainly responsible for the good survival figure for 1971.

The survival at 5-day intervals is shown in

Table 2. Survival of the broods of Egyptian Geese 60 days after first sighting

Year	No. of broods	Initial no. of young	No. of young at 60 days	Survival (%)	No. of broods with no survival	No. of broods with 100% survival
1968	14	80	51	63.8%	4	2
1969	18	128	80	62.5%	4	6
1970	13	76	33	43.4%	5	1
1971	14	97	78	80.4%	1	5
1972	3	21	1	4.6%	2	0
Total	62	402	243	60.4%	16 (26%)	14 (23%)

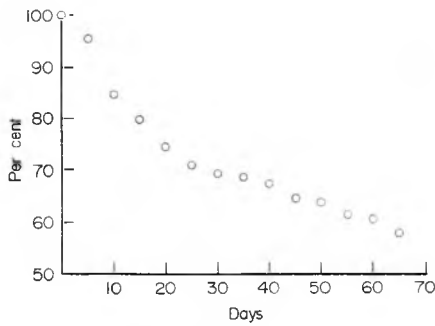


Figure 4. The percentage survival of 402 goslings of the Egyptian Goose at 5-day intervals.

Figure 4. For the first 25 days, there is a uniform mortality rate but subsequently the curve flattens out and continues again at a constant rate, until after the 60th day when there is a sudden drop. However, it is likely that this decline in brood size is due not to mortality but to dispersal of the young. The goslings are then fully grown and lack only the adult's black spot on the chest and brown colouration around the eye. Birds in this juvenile plumage were often seen in the non-breeding flocks near the wallow and had obviously just left their parents. Not all young leave the brood, however, even though they are fully independent. The average period during which at least one gosling remained with the parents was nearly 82 days for the forty-six broods which survived beyond the 60-day stage. The maximum was 145 days. About 20% of these broods remained complete throughout the time they were seen with their parents. No evidence of agonistic behaviour on the part of the parents towards the grown young was noticed and it is probable that the latter leave on their own volition. No doubt many broods of large goslings are simply abandoned when the parents leave to renest. The possibility that the survival varied according to the original size of the brood was tested. Table 3 suggests that goslings survived better in the larger broods but

Table 3. Survival in Egyptian Goose goslings in relation to the initial size of the brood

Initial brood size	Initial no. of young	No. of young at 60 days	Survival
0-3	31	17	55%
4-6	112	58	52%
7-9	122	74	61%
10-12	77	51	66%
13-15	27	21	78%
16-18	33	22	67%

the trend is not significant ($\chi^2 = 4.419$; $0.50 > P > 0.10$). The average size of the fourteen broods which suffered no losses was, at 4.8, not significantly different from the value of 5.0 for sixteen broods in which all the goslings were lost ($0.50 > P > 0.10$).

Seasonal appearance of the broods and productivity

Figure 5 shows the average number of new broods appearing on the wallow and the average number of young in these broods for

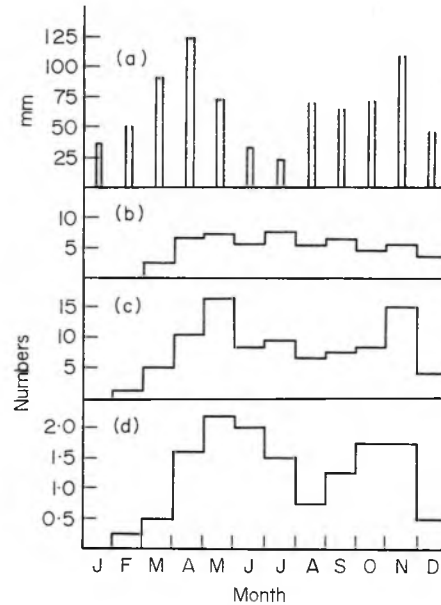


Figure 5. Productivity of the Egyptian Goose on the Hippo Pool. The figure shows (d) the average number of broods produced each month, (c) the average number of goslings hatched each month, and (b) the average number of goslings hatched each month which were reared to the 60-day stage. The average rainfall (a) at Mweya for an 8-year period up to 1971 is included.

each month of the year. The figure also includes the average number of these goslings which were successfully reared to 60 days after they were first seen. The production of broods is obviously seasonal and related to rainfall, with the period of maximum numbers of broods lagging a little behind the seasonal rise in rainfall. No broods are found in January, one of the driest months, and very few are seen in February and March. Only three of the sixty-two broods appear in the first 3 months of the year. Although there is a fall off in the

number of broods after the second dry season in June and July, the decline is not so great nor does it last for so long as it does earlier in the year. The dry season is a period of deprivation, akin to a palaeartic winter, for grazing animals such as the Egyptian Goose. Rather more rain falls in the first wet season than in the second. During the early part of a rainy season, the grass grows vigorously and is much richer in protein. It is likely that the improved quality of the food is the proximate factor that stimulates breeding. Nesting and incubation are maximal when rainfall is at its height and most broods are, therefore, brought on to the wallow towards the end of the wet season.

Fluctuations in the average number of goslings produced each month tend to follow those of the broods but the two wet season peaks are more sharply defined due to seasonal differences in the brood size. However, when the number of goslings from these broods which survived to 60 days is considered, the data lose most of their seasonality. The productivity in the sense of the number of birds joining the adult population is more or less constant after the first 3 months of the year.

Productivity of individual pairs

Table 4 shows the contribution made by each pair to the total productivity and includes the broods brought by 'casual' pairs which appeared only once on the wallow. The greatest number of broods produced

during the 4 years of the study was six from Pair VI and this pair also produced the greatest number of goslings—forty-nine—but it was less successful in rearing them. The largest number of goslings surviving to 60 days belonged to Pair III which was a very successful pair altogether. Although they only produced four broods, the average brood size was large and the survival good and their contribution to the total number of goslings reared was as high as 12%. A few pairs were not very successful. Thus Pair II produced only eighteen goslings from four broods and of these eleven (61%) did not survive. Pair VIII had much the same lack of success. Pairs with high and low productivity seem to be scattered randomly about the wallow. It is likely that the successful pairs were those which were older and more experienced in looking after the young. It is not necessarily the pairs which produced the most broods that had the highest productivity. There is not, in fact, a significant correlation between number of broods and number of young reared ($r=0.437$; $P>0.1$).

Discussion

There is not much published information on the breeding biology of the Egyptian Goose. Pitman (1965) gives some figures for the clutch size but no mean. He mentions the complement as being in the range of six to ten with one clutch of fifteen eggs of which two were infertile. He gives the brood size on reaching the water as seven to eleven

Table 4. Comparison of breeding success in individual pairs of Egyptian Geese

Pair no.	No. of broods produced	No. of broods failed	No. of broods successful	Average brood size	Initial no. of young	No. of young reared	Survival
I	3	0	1	3.7	11	8	73%
II	4	2	2	4.5	18	7	39%
	4	0	1	9.0	36	29	81%
IV	2	0	1	5.0	10	9	90%
V	2	0	1	6.0	12	7	58%
VI	6	2	1	8.2	49	23	47%
VII	3	0	2	8.0	24	23	96%
VIII	4	2	1	4.8	19	8	42%
IX	5	2	0	6.8	34	17	50%
X	5	1	0	5.0	25	12	48%
XI	5	1	1	6.2	32	21	68%
XII	2	0	0	10.0	20	16	80%
XIII	6	2	0	6.5	39	20	51%
XIV	4	1	1	6.8	27	20	74%
Casuals	7	3	2	6.6	46	23	50%
Total	62	16	14	6.5	402	243	60.4%

which is a little higher than the mean number found in the present study. Mackworth-Praed & Grant (1952) give a range of five to eight for the clutch size. No comparative data of the survival of goslings in other areas are available but the overall survival of 60.4% is not exceptional compared with other species of wildfowl. Baker (1970) reports a 56% survival in the Wood Duck or Carolina Duck *Aix sponsa* from observations of web-tagged birds in 1968 and of 52% from direct observation of seventy-seven broods in 1969. Most of the mortality (74%) occurred in the first 2 weeks after hatching. Odom (1970) found that the brood size of the same species had been reduced by nearly two-thirds at the 4-7-week age class.

The causes of mortality amongst the goslings can only be inferred as no death was ever witnessed. However, there is no shortage of potential predators in the area. Birds of prey are plentiful. It is unlikely that the large eagles would bother with small goslings and they are more likely to be taken by Black Kites *Milvus migrans*, which are particularly numerous, and other medium-sized raptors. The adult geese were several times seen to defend their broods vigorously against kites, a fact which suggests that these birds feed regularly on the goslings. Protection against aerial attack is probably the reason why breeding pairs tend to favour a shore line backed by thick bushes as these provide escape cover. Broods may well be kept off the water to a large extent as a kite could easily snatch a gosling from the surface. While on the water, the broods are also vulnerable to predation from Monitor Lizards *Varanus niloticus*. These reptiles reach a length of about 1 m in the Ruwenzori Park and are often seen at the hippo wallow both on land and in the water. Although primarily scavengers and egg stealers, the Monitor will take any small animal it can catch. The hippo wallow is too shallow and lacking in oxygen to support ordinary fish but it is possible that lung fish *Protopterus* occur and if they do, they would certainly take young goslings. The hinged tortoise also occurs in the wallow and might take some of the very small goslings as may snakes, particularly on land.

Mammalian predators are probably unimportant. Genets *Genetta tigrina*, Civets *Viverra civetta*, Ratel *Mellivora capensis* and various species of mongoose have all been seen in the region of the wallow but, with the exception of the Banded Mongoose *Mungos mungo*, these are nocturnal

predators. It is not known where the broods roost but it is probably on the bank near the shore so that they can slip into the water if disturbed.

Many species of storks and herons occur at the wallow and although the major food items appear to be frogs and insects, they would no doubt take any gosling separated from its parents.

Finally goslings may become separated from the rest of the brood and lost. Normally, the young keep close together but sometimes, while feeding on the algae or other underwater vegetation, they become rather spread out. If they were to be attacked at such times, one or more goslings might well become separated from the brood in the resulting mêlée. No direct evidence of this was obtained but sometimes the brood scattered madly when surprised by the landrover and the reaction to predators is probably similar. In 1971, a gosling of Pair VII left its brood and joined another belonging to a casual pair, remaining with it until fully grown. It is possible that the young bird had become separated from its siblings during some disturbance. Presumably the exchange took place when Pair VII, as mentioned above, crossed over the wallow to a point between Pairs IV and V. Incidentally, the geese and the hippos tended to ignore one another. It was amusing to see the tiny goslings swimming sedately through a school of these huge mammals. Only on one occasion, was a hippo seen to react when it threatened a brood by opening its mouth. The resulting tidal wave caused more consternation than the threat.

It is not possible to use the data collected in this study for a full assessment of the population dynamics of the Egyptian Goose since the birds present at the wallow probably form only a part of a wider grouping. Eltringham (1973) made regular counts of the geese at the wallow at the same time as these observations were carried out and found that an average number of 167 geese were present over the 4-year period. However, the deviations from this mean are very great. Until the home range of the geese is known, there is little point in estimating such parameters as recruitment and mortality for the population. Such data would have required more time than was available in a spare-time undertaking.

Taking the young away from the nest to water soon after hatching occurs widely in the Anatidae. Duck and geese do not take food to the young which have, therefore, to go out and get their own. However, it might seem that they could do this without going

to water yet it appears that open water is essential. The wallow lost its attraction as a nursery as soon as its surface became covered with Nile cabbage, suggesting that it is not simply a supply of drinking water that is required but sufficient water for bathing and swimming.

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Summary

Details of sixty-two broods of the Egyptian Goose *Alopochen aegyptiacus* on a hippo wallow in

western Uganda were collected over a 4-year period between 1968 and 1972. Fourteen pairs used the wallow regularly while a few other pairs appeared sporadically. The average size of the broods when first seen was 6.5 with a range of 1 to 17. Of the goslings, 60.4% survived for a period of 60 days or more after first sighting but there were significant differences between the survival in certain years. Mortality was greatest in the first 25 days. There was no significant correlation between survival and brood size. A greater number of broods appeared on the wallow during the wet seasons than during the dry but there was little seasonal variation in the number of young reared to the 60-day stage except that very few, if any, young were produced in the first 3 months of the year. Some pairs were more successful than others in producing or rearing young. Possible mortality factors are discussed and it is concluded that avian predators are probably responsible for many deaths.

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