

POLYGYNY AND SUPER-NORMAL CLUTCH SIZE IN THE
BROWN SKUA, *Catharacta skua lönnbergi* (Mathews)

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ABSTRACT. A nest containing three eggs of the brown skua was found at Bird Island, South Georgia, in December 1961. The nest was attended by three adult skuas, one cock and two hens, which shared in the incubation duties.

Details are given of the eggs and embryos and the measurements of the adults. Ten normal clutches of two eggs each were collected and described for comparison.

The situation is discussed in relation to the normal behaviour of skuas and a possible mode of formation of the trio is suggested.

DURING the course of biological investigations at Bird Island (lat. 54°00'S., long. 38°05'W.), South Georgia, the nest of a brown skua, *Catharacta skua lönnbergi* (Mathews) was discovered containing three eggs. At the time of the finding the eggs were being incubated by one skua while two others were standing a couple of yards off making the typical raised-wing threat display (Fig. 1). The nest was situated about 10 m. above sea-level at the edge of a small clearing surrounded by a dense growth of tussac grass (*Poa flabellata*). The extent of the territory was not determined but it was unlikely to have been more than some 20–30 m. in diameter owing to the presence of other nesting skuas in the neighbourhood.

The nest site was visited on three occasions, 7, 9 and 10 December 1961, and on all occasions the territory was occupied by the three adults tolerating each other's presence amicably and sharing in the duties of incubation and territory defence. Their behaviour was in all respects similar to that of normal skua pairs in South Georgia, save that besides the incubating bird two other adults were on guard in the vicinity of the nest. These very brief behavioural observations were brought to a close when the author was compelled to return to base. The clutch and the three adults were collected and later examined.

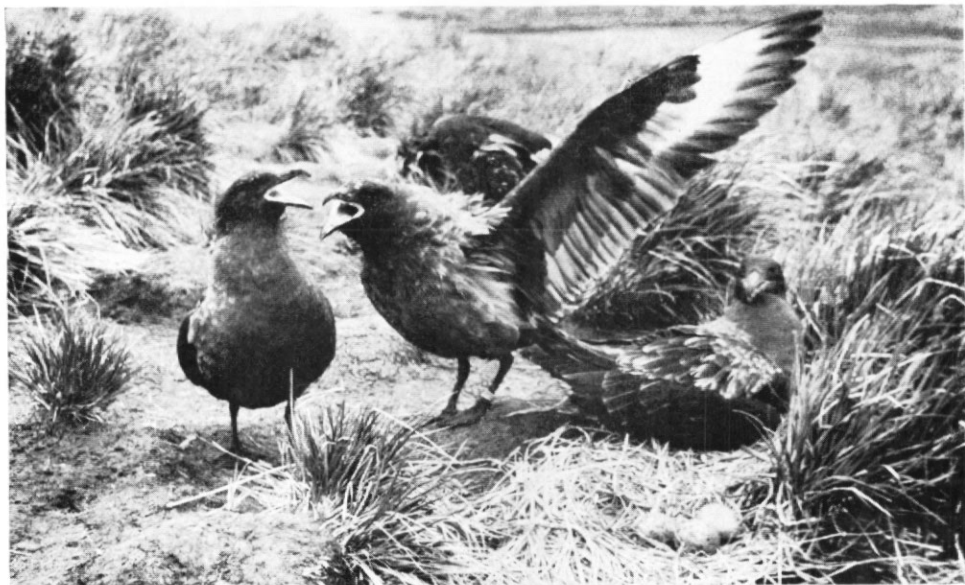


Fig. 1. The skua trio at the nest (right foreground). The bird displaying is the hen (specimen 1) and bears a plastic spiral applied in the season 1958–59. The incubating bird, on the right, has been pushed off the nest to show the eggs.

TABLE I. MEASUREMENTS OF ADULTS

	1(♀)	2(♂)	3(♀)
Weight (kg.)	1.9	1.6	2.0
Wing* (cm.)	67.5	64.5	66.9
Tail (cm.)	16.7	16.2	15.5
Culmen (mm.)	57.0	57.0	56.5
Upper mandible† (mm.)	81.0	78.0	79.5
Foot‡ (cm.)	17.8	16.7	17.8
Tarsus (mm.)	94.0	92.0	94.0

* Axilla to tip of feathering.

† Tip to gape.

‡ Tip of middle claw to proximal end of tarsus.

THE SPECIMENS

Dissection of the three adults revealed that they comprised two hens and a cock (for details of measurements see Table I). In all cases the gonads were considerably involuted. The ovaries of specimens 1 and 3 weighed 0.71 and 0.84 g., respectively, and the testes of specimen 2 weighed (right) 0.21 and (left) 0.29 g. (Table II; Fig. 2). The largest follicles in the ovaries, which were but slightly vascularized, were (1) 4.3 and (3) 5.1 mm. in diameter (Table II). The state of vascularization of the testes could not be studied as both showed great suffusion of blood from the wound where the bird was shot. The only information to be gathered from the gonads is that all showed a state of involution which could have followed a period of sexual activity. As the two ovaries were closely similar, and it can be safely assumed that at least one of the hens had contributed to the clutch found, it may be concluded that both hens had ovulated.

Externally the eggs (Fig. 3) were similar in appearance; all were of an olive tinge with rather sparse brown blotching somewhat concentrated at the blunt end and with the blotches rather larger in size than is commonly observed in skua eggs from South Georgia. One egg, A, had a greener hue than the other two but the colour difference was considerably less than is often observed in normal clutches of two. The size differences were minimal and the weights

TABLE II. SUMMARY OF GONADS

	1(♀)	2(♂)	3(♀)
<i>Ovaries</i>			
Dimensions (mm.)	25.5 × 9.5		30.8 × 8.9
Weight (g.)	0.71		0.84
Largest follicle (mm.)	4.3		5.1
<i>Testes</i>			
Right, dimensions (mm.)		12.4 × 6.6	
weight (g.)		0.21	
Left, dimensions (mm.)		13.9 × 7.1	
weight (g.)		0.29	

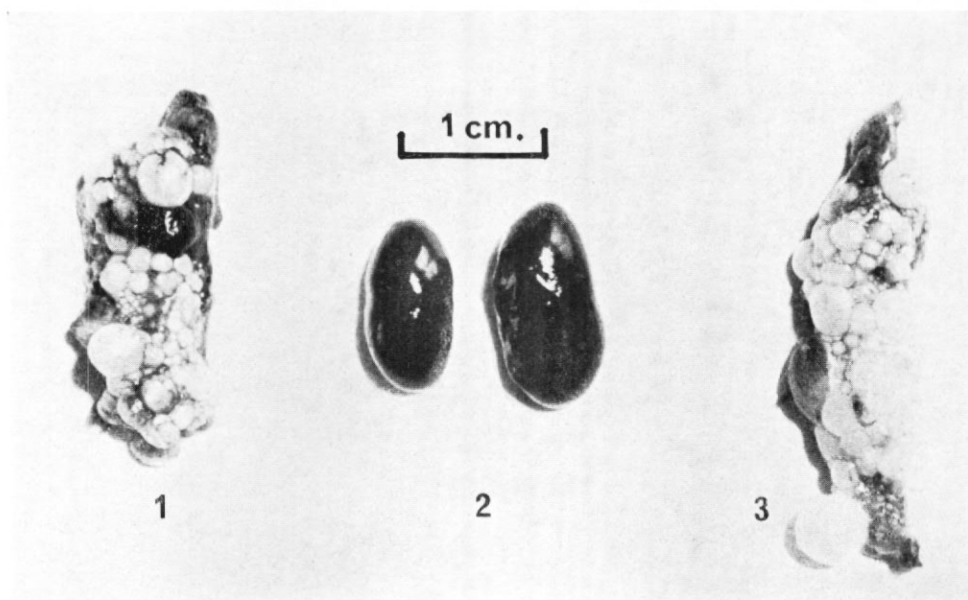


Fig. 2. The gonads from the three adults.

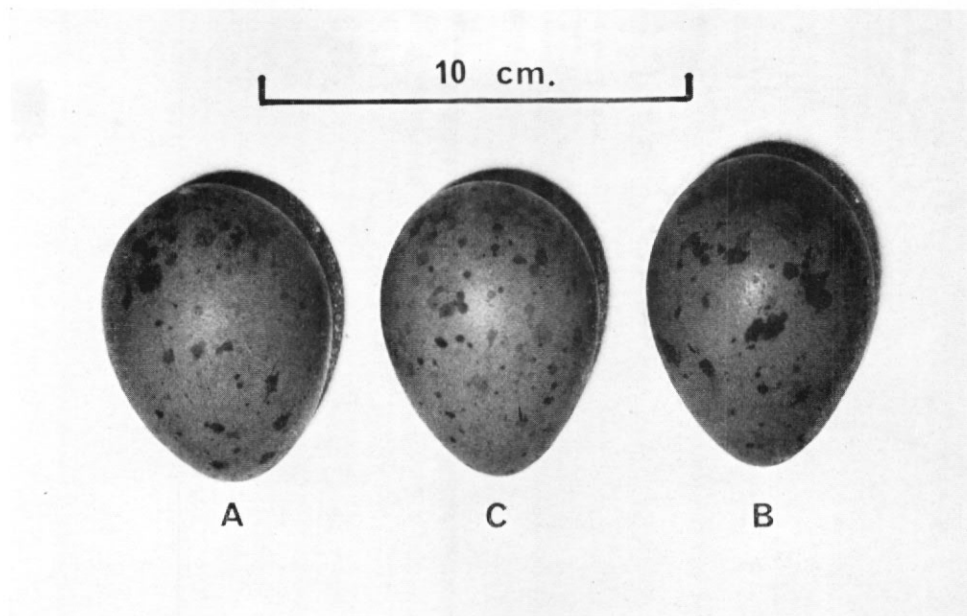


Fig. 3. The clutch of three eggs.

corresponded very closely to the measured capacity of the eggs (Table III). On opening the eggs it was apparent that there were considerable differences in the degree of incubation of the embryos (Fig. 4). The embryo from egg A weighed 12.85 g. and measured 81 mm. from the tip of the beak to the tail; embryo B weighed 19.00 g. and was 92 mm. long, and embryo C weighed 34.80 g. and was 109 mm. long (Table III). The differences in size (and,

TABLE III. SUMMARY OF EGGS AND EMBRYOS

	<i>A</i>	<i>B</i>	<i>C</i>
<i>Eggs</i>			
Colour	olive (green)	olive (brown)	olive (brown)
Dimensions (mm.)	74.1 × 53.2	78.4 × 53.0	74.2 × 51.9
Capacity (cm. ³)	100	102	94
Weight (g.)	100	103	96
<i>Embryos</i>			
Weight (g.)	12.9	19.0	34.8
Total length (mm.)	81.0	92.0	109.0
Upper mandible* (mm.)	16.5	18.5	19.0
Foot† (mm.)	23.0	28.5	37.5
Wing‡ (mm.)	34.0	37.5	41.0
Head§ (mm.)	30.0	34.0	40.5

* Tip to gape.

† Tip of middle claw to proximal end of tarsus.

‡ Axilla to tip, exclusive of feathering.

§ Tip of beak to back of cranium (maximum measurement).

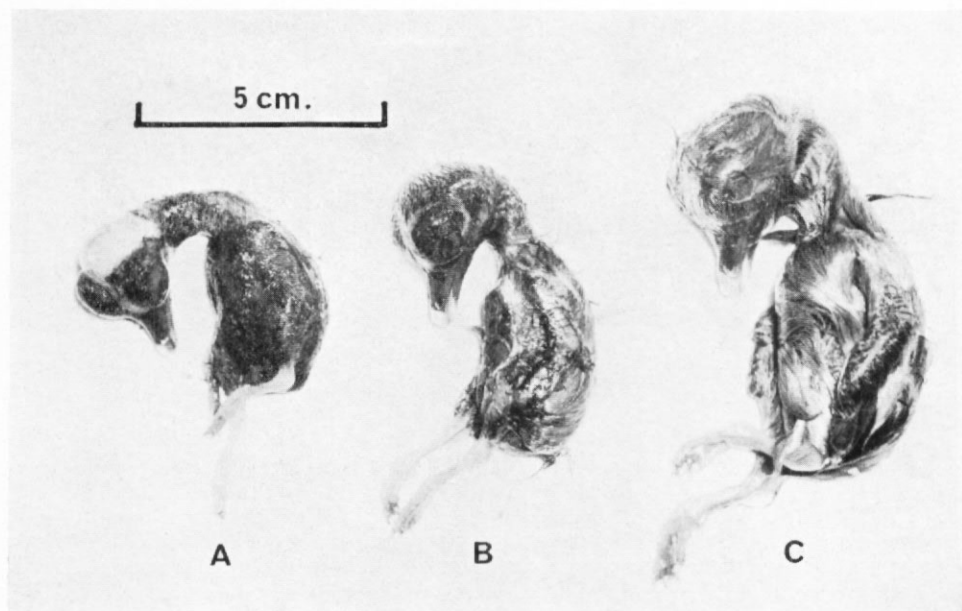


Fig. 4. The three embryos.

presumably, age) of the embryos show rather uneven stages in development, the difference between B and C being about twice as great as that between A and B.

For comparison with the clutch from the trio, ten normal clutches of two eggs each were collected in the same locality between 13 and 15 December. Details of these clutches are shown in Table IV. Of the ten clutches, three showed colour differences greater than that

TABLE IV. DETAILS OF TEN NORMAL CLUTCHES OF TWO EGGS EACH

Clutch	Egg Size			Colour
	Length (mm.)	Breadth (mm.)	Weight (g.)	
1	77.0	54.2	101.6	Dark olive, heavy spotting
	74.9	53.0	92.9	Paler olive, heavy spotting
2	76.7	52.5	96.5	Greenish, pale medium spotting
	79.7	50.9	97.2	Greenish, pale medium spotting
3	76.5	52.6	102.6	Tawny, dense large spotting
	74.1	53.0	104.6	Tawny, dense large spotting
4	73.2	48.4	84.2	Pale greenish, dense small pale spotting
	72.0	48.9	83.7	Pale greenish, dense small pale spotting
5	73.0	49.3	84.5	Pale greenish, sparse small spotting
	76.7	48.0	84.9	Pale greenish, sparse small spotting
6	78.4	52.3	108.3	Brownish, heavy apical spotting
	78.2	52.0	107.2	Pale brownish, sparser spotting
7	73.6	52.0	95.0	Brownish, dense small spotting
	73.9	50.5	90.3	Brownish (paler), paler spotting
8	72.8	52.8	100.0	Brownish, sparse large spotting
	76.1	52.5	98.7	Pale brownish, moderately dense spotting
9	74.5	54.2	96.8	Greenish, large sparse spotting
	71.0	49.0	75.5	Greener, large sparse spotting
10	71.8	49.3	82.0	Brownish, large sparse spotting
	71.0	49.6	80.0	Greenish, large sparse spotting

TABLE V. EMBRYO WEIGHTS COMPARED

Clutch	Embryo Weights (g.)		Difference (g.)	Percentage Difference
1	60.2	49.2	11.0	23.5
2	41.4	31.4	10.0	24.2
C, B	34.8	19.0	15.8	83.5
8	26.7	17.9	8.8	49.2
10	26.0	16.0	10.0	62.5
7	25.2	15.0	10.2	68.0
B, A	19.0	12.9	6.1	47.3
5	2.6	1.2	1.4	46.2

Numbers in the left-hand column refer to normal clutches; the letters refer to eggs from the clutch of three.

between egg A and eggs B and C. In three of the normal clutches either one or both of the eggs was infertile and thus only seven pairs of embryos are available for comparison. The results set out in Table V show the weights of the embryos and the percentage differences between them. The three eggs from the super-normal clutch have been divided into two pairs and included in Table V. There seems to be no very constant difference in size between embryos from the same clutch but the difference between eggs C and B is considerably greater than that between any other pair; on the other hand, eggs A and B show a smaller difference than that between the eggs of the normal clutches 10 and 7 which lie nearest to them in embryo size.

The evidence from colour and embryo size thus conflicts. From the close similarity in colour and patterning, it is tentatively assumed that one hen was responsible for egg A and the other for eggs B and C, and that the large difference in embryo size in the latter pair was due to irregularities of incubation caused by the presence of two hens.

DISCUSSION

The brown skua in South Georgia is an intensely territorial species showing no sign of colonial behaviour during the breeding phase, in contrast to its behaviour in some other parts of its range and that of the closely allied great skua (*C. skua skua*), which Jourdain (1941, p. 124) states "nests by preference in colonies, but not very close together". Pairs are usually formed within a week or two from the first arrival of one of the partners at the territory and not infrequently the pairs are composed of the same birds as in the previous season (Stonehouse, 1956). Members of a pair will individually and collectively defend the territory against newcomers and drive off other skuas.

Bird Island maintains an extremely dense breeding population of skuas, several nests frequently being found within a few yards of each other. In contrast to the situation in the Bay of Isles (South Georgia), where the skuas described by Stonehouse were feeding principally on debris from penguin and seal rookeries, at Bird Island the diet consists mainly of whale birds (*Pachyptila desolata*) and diving petrels (*Pelecanoides georgicus*), which nest in tens of thousands throughout the tussac-covered hills of the area. It may be noted here that the skuas of Bird Island generally rear both chicks from the normal clutch of two, while elsewhere on South Georgia the author has encountered only two instances of such successful rearing. Murphy (1936) considered that only one chick elicited parental care, the other being regarded as food. Stonehouse (1956), in discussing this, came to the conclusion that Murphy's suggestion implied a lack of plasticity in the behaviour, which is uncharacteristic of the species. He suggested that the rearing of one chick only might be related to feeding difficulties. In view of the conditions at Bird Island, only 45 km. distant from the population studied by Stonehouse (and Murphy), this seems almost certainly the correct explanation, two chicks being reared if sufficient food is available. Breeding whale birds are absent from the Bay of Isles in the area studied by Stonehouse and are nowhere in that locality so abundant as they are at Bird Island. Both records of two chicks being reared come from an area where breeding whale birds abound.

Murphy (1936) states that the eggs usually number two, but sometimes only one and still more rarely three. Matthews (1929) says of the eggs "usually two, sometimes three". Perhaps both these authors were influenced by Lönnberg's (1906, p. 60) statement that Sörling, a biologist who was stationed at South Georgia in 1904-05, found usually two eggs, sometimes three but more seldom only one. No actual examples or details of the frequency of clutches of three eggs are given by these authors and the instance under discussion is the only case known to the present author from many hundreds of skua nests. In view of the presence of two hens at the nest, it seems almost certain that both contributed to the clutch; the state of the ovaries is consistent with this view but no definite support can be obtained from the appearance of either the eggs or the embryos. If this is so, and had laying followed a normal pattern, four eggs might have been expected, though the possibility that once three eggs reposed in the nest both hens might be stimulated to incubate, rather than continue laying, should be considered; alternatively, four eggs might have been laid and one lost.

It is not known which, if either, sex establishes the territory at the beginning of the

breeding season. Stonehouse's account from the Bay of Isles indicates that it is probably the female, though his records are rather few and the sexes given are only provisional. As a general rule the skua is a summer visitor to South Georgia though at least part of the summer population is resident throughout the year. It is thus remotely possible that the smaller hen (specimen 3) may have been a chick of the other hen and the cock the previous year and had kept company with them during the winter, and was tolerated in the territory and on the nest for that reason. It is not thought that this is a likely explanation, however, as it is highly improbable that skuas breed in their first year and, as stated above, it is believed that both hens contributed to the clutch.

It is tentatively suggested that the formation of the breeding trio observed might have been on the following lines. One of the hens arrived first and established a territory where she was joined by the cock, which in the previous season had bred in or near the same territory. Soon after this the mate of the cock in the previous season arrived and was accepted by the cock. In the initial stages of courtship and nest-building the two hens became habituated to each other through the intermediary of the cock which had formed an attachment with them both. When one hen laid in the final nest the other was stimulated by the sight of the eggs to lay there also, and once the clutch had been completed and incubation started the change-overs, which involve little ceremony, were made with whichever partner first presented itself.

Stonehouse (1956) quotes unpublished observations by Richdale on the skuas of Stewart Island and neighbouring islands off New Zealand. Richdale reported having seen three adults, of unknown sex, in one territory on more than one occasion. Richdale (personal communication) has estimated that about two-thirds of the nests he had studied were attended by three adults, all of which would defend the nest. The clutch was invariably two eggs and he assumed that the three adults comprised two cocks and a hen. It would seem that the circumstances described by Richdale in New Zealand are not similar to the case in South Georgia. Jourdain (1941, p. 124) states of the great skua that the eggs are usually two, sometimes only one, and occasionally three, perhaps due to two females, but as Bannerman (1963, p. 11) pointed out, in Iceland (the stronghold of this sub-species) clutches of three had never been recorded.

With the exception of the reference by Jourdain, it would seem that the case at Bird Island is the first record of polygyny in the brown skua. Where further examples of clutches of three are observed it would be useful to check the birds attending at the nest to determine whether the clutch represents hyperovulation in one female of polygyny as in this case.

It is greatly to be regretted that further behavioural observations could not have been made on this interesting three-sided association in what has previously been regarded as a strictly monogamous species in South Georgia.

ACKNOWLEDGEMENTS

My thanks are due to Mr. R. W. Vaughan for drawing my attention to this nest and finally collecting the specimens for me, and to Mr. Vaughan and Mr. D. Bashford for collecting the normal clutch series.

MS. received 28 February 1964

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