

# THE EFFECT OF ATTENDANCE BY THREE ADULTS UPON NEST CONTENTS AND CHICK GROWTH IN THE SOUTHERN GREAT SKUA

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## ABSTRACT

A small proportion of Southern Great Skua (*Stercorarius skua lonnbergi*<sup>1</sup>) nests at Marion Island (46°54'S 37°45'E) are attended by three adults — a trio. The contents of the trio-attended nests and the growth of the three trio-attended chicks were studied in comparison with the contents of 16 nests and the growth of 23 chicks, attended by two adults. Eggs at two of the trio nests were laid exceptionally late in the season. No other difference in nest contents was found. Trio-attended chicks grew faster and probably attained independence with more substantial body reserves than chicks attended by two adults.

## INTRODUCTION

Seabirds are essentially monogamous (Lack 1968), two parents — a duo — attending each nest. The sharing of parental duties by more than two adult seabirds has been reported in very few species. In all cases there were three birds — a trio — at the nest. Cullen (1957) reported three cases of young male Arctic Terns (*Sterna paradisaea*) forming triangular relationships with mated pairs and sharing incubation, and in one case feeding the young. Stonehouse (1960) reported a single case in which three King Penguins (*Aptenodytes patagonicus*) shared incubation and fed the chick. Plowden-Wardlaw (in Young 1978) found four trios of the Great Skua (*Stercorarius skua skua*), all of which comprised two males and a female. The only seabird in which trios appear to be common is the Southern Great Skua (*Stercorarius skua lonnbergi*).

Young (1978) has reviewed the distribution and frequency of occurrence of trios in the Southern Great Skua, to which must be added observations of trios at the Crozet Islands (Barre 1976, Derenne *et al.* 1976) and at Marion Island (this study). Young found that on temperate islands off New Zealand up to 67% of Southern Great Skua nests were attended by trios but that elsewhere the proportion of trios was very small. The sexual role of skuas in trios remains largely unknown. Evidence from South Georgia and Signy Island suggests that some trios may be polygamous (Bonner 1964, Burton 1968), but until the sexual role of birds in trios is fully established it is safer to treat trios as being formed of a mated pair with a "helper." In trios

<sup>1</sup> This is the New Zealand nomenclature. The author prefers to call the form involved the Subantarctic Skua (*Catharacta antarctica lonnbergi*)

all three adults share territorial defence (Young 1978; pers. obs.), and in at least some trios all three adults may share incubation and chick-feeding (Guthrie-Smith *in* Young 1978). The effect such sharing of duties among three adults might have upon aspects of the breeding biology, such as the timing of egg-laying and the growth of the chicks, has hitherto been unrecorded.

At Marion Island (46°54'S 37°45'E) about 400 Southern Great Skua nests are occupied annually (Williams *et al.* 1979). Three nests attended by three adults have been found, although almost certainly more occur. In the austral summer of 1976-77 I monitored the nest contents and growth of chicks at three trio nests and at 16 nests attended by duos. This paper reports the effect attendance by a trio of adults had upon the time of egg laying, egg size, egg mortality, chick growth and chick survival.

### METHODS

The nests were checked daily from before laying began until after laying ceased, and again from a few days before hatching was expected until it was completed. When first found, eggs were weighed and measured and an identifying number was written on the shell. Chicks were weighed and measured within 24 hours of hatching and were given a paint mark on the culmen to distinguish siblings. Chicks were weighed daily for the first 25 days and thereafter on every fifth day of age until they died or could escape capture by flying (from about 50 days after hatching). All weights were recorded with the egg or chick held in a bag of known weight using an appropriate Pesola spring balance. Measurements of the tarsus, manus (the unfeathered wing distal to the carpal joint), culmen and, once it had developed, the longest primary were made on every fifth day of age.

### RESULTS

In 1976 the mean date on which Southern Great Skuas at Marion Island completed their clutch was 9 November, and in two breeding seasons (1974-75 and 1976-77) 70% of all eggs were laid in the period 2 to 14 November (Williams, *in press a*). Only one trio clutch was completed in this period and at the other two trio nests the eggs were laid late in the season after all duo clutches had been completed. The territories of all skuas were searched regularly throughout the laying period and it is certain that the laying dates of trio clutches are for first clutches and are not for replacement eggs.

Eggs laid in trio nests tended to be larger and heavier than those in duo nests but the difference was not significant (Table 1). Laying, laying to hatching, and hatching intervals were similar at trio and duo nests (Table 1).

Chicks hatched at trio nests did not differ significantly in body weight or in appendage lengths from chicks at duo nests within 24 hours of hatching (Table 2).

TABLE 1 — The weight of eggs (g) and the duration of egg-period events (days) at Southern Great Skua nests at Marion Island attended by two and by three adults.

	Nests attended by two adults			Nests attended by three adults			
	n	Mean $\pm$ SD	Range	X	Y	Z	Mean $\pm$ SD
Egg weight							
First laid egg	16	111.0 $\pm$ 8.5	101-129	115	107	121	114.3 $\pm$ 7.0
Second laid egg	16	109.9 $\pm$ 9.0	99-126	118	105	113	112.0 $\pm$ 6.6
Laying date of second egg	13	9XI	23X-27XI	15XI	30XI	19XII	27XI
Laying interval	13	2.8 0.4	2-3	3	3	3	3
Laying - hatching interval							
First laid egg	8	30 $\pm$ 0.3	30-31	31	30	30	30.3 $\pm$ 0.6
Second laid egg	8	28 $\pm$ 0.7	28-30	29	30	-	29.5
Hatching interval	8	2 $\pm$ 0.7	1-3	1	3	-	2

TABLE 2 — Body weight (g) and appendage lengths (mm) of Southern Great Skua chicks of known age (days) reared by A) three adults, B) two adults and C) two adults but hatched from eggs of heavier than mean egg weight.

	At hatching <sup>1</sup>			10 days old			20 days old			30 days old			40 days old			50 days old		
	n	Mean	± SD	n	Mean	± SD	n	Mean	± SD	n	Mean	± SD	n	Mean	± SD	n	Mean	± SD
Body weight																		
A)	5	80.6	±6.1	3	408.0	±20	3	920.7	±34	3	1462	±19	3	1711	±98	3	1818	±67
B)	23	77.4	±6.2	18	322.5	±44	21	788.0	±136*	14	1198	±127**	16	1466	±141*	16	1517	±115**
C)	8	81.5	±5.5	8	354.9	±48	10	841.4	±100	7	1268	±93**	6	1537	±134	8	1483	±75**
Tarsus length																		
A)	5	26.5	±2.2	3	48.5	±4.0	3	75.3	±3.0	3	80.5	±1.0	3	79.9	±1.3	2	81.1	±2.8
B)	23	27.1	±1.3	18	46.8	±2.5	19	66.6	±4.4**	16	76.4	±3.2*	15	80.1	±1.9	14	79.1	±1.5
C)	8	27.0	±1.4	7	48.1	±2.2	8	69.5	±3.2*	6	78.6	±1.8	5	81.0	±1.9	6	79.3	±1.7
Manus length																		
A)	5	25.5	±2.3	3	45.9	±3.4	3	90.0	±2.6	3	133.0	±1.7	3	150.7	±0.6	2	150.0	±4.2
B)	23	24.2	±1.2	15	42.6	±3.8	19	82.2	±12.3	16	120.0	±8.4*	15	143.3	±6.9	10	150.4	±7.1
C)	8	24.7	±1.3	8	45.6	±3.1	8	90.4	±5.7	6	126.7	±2.5	5	145.2	±7.3	3	155.7	±7.5
Culmen length																		
A)	5	18.2	±0.5	3	28.0	±0.2	3	38.8	±1.6	3	47.9	±0.1	3	52.3	±1.9	3	53.8	±0.5
B)	17	18.1	±0.5	16	27.2	±1.0*	19	36.5	±1.8*	15	44.5	±3.2	16	49.3	±2.1	15	50.9	±1.9*
C)	8	17.9	±0.6	8	27.7	±1.0	8	37.8	±1.0	6	46.9	±1.3	5	50.2	±1.6	6	51.5	±2.4
Longest primary																		
A)	-	-	-	-	-	-	-	-	-	3	79.0	±6.0	2	141.0	±0	2	204.0	±9
B)	-	-	-	-	-	-	-	-	-	16	70.1	±1.9	12	123.5	±19	10	174.8	±20*
C)	-	-	-	-	-	-	-	-	-	7	82.1	±11	3	145.1	±9	4	174.0	±26

<sup>1</sup> Within 24 hours of hatching. Data in A:B and A:C were compared using Student's t test \* = P < 0.05

\*\* = P < 0.01

At one trio nest two chicks were reared, although only one individual was regularly caught for weighing and measuring. At the other two trio nests only one chick was reared: at one nest one egg failed to hatch; at the other, the younger chick died within three days of hatching. At duo nests the number of chicks in a brood does not affect the growth of chicks until after they are 40 days old (Williams, in press a). It was therefore considered valid to combine data from trio chicks reared in one- and two-chick broods and to compare them with similarly combined data from duo one- and two-chick broods.

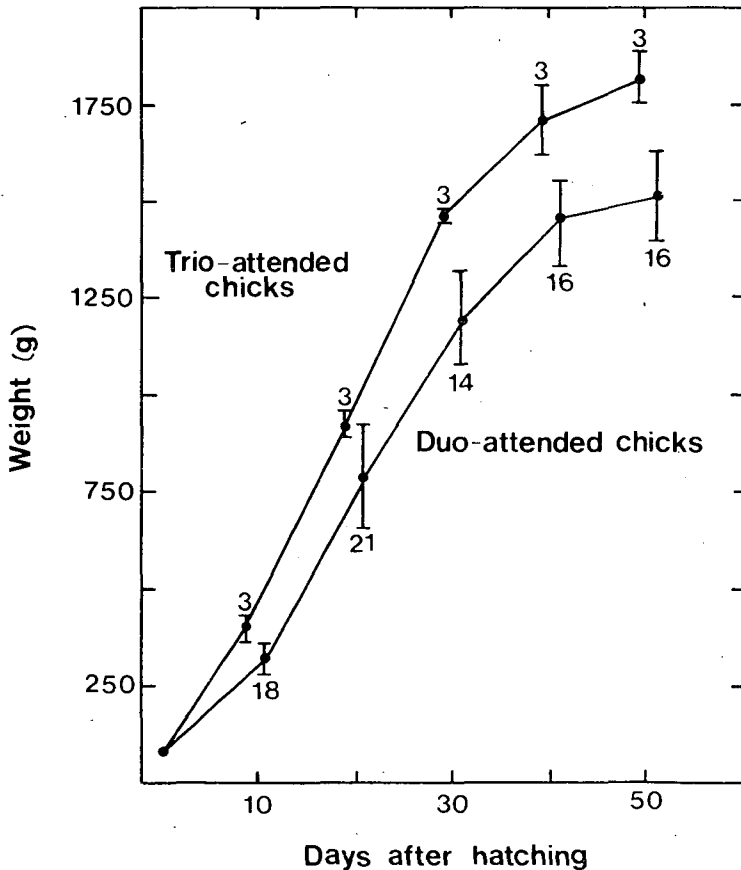


FIGURE 1 — Body weight curves for Southern Great Skua chicks attended by three and by two adults. Mean points are joined. Each bar represents one standard deviation from the mean. Numbers denote sample size. For clarity the data are displaced slightly with respect to the lower scale.

Trio chicks were significantly heavier than duo chicks at between 10 and 50 days after hatching (Fig. 1, Table 2), and the tarsus, manus and culmen measurements of trio chicks showed that these appendages were normally longer, sometimes significantly so, than those of duo chicks of the same age (Table 2). However, as skua chicks hatched from eggs heavier than the mean egg weight grow faster than those from lighter eggs (Williams, in press b), these differences might merely reflect the tendency for trio eggs to be relatively larger than duo eggs.

Growth of trio chicks was therefore also compared with that of duo chicks hatched from eggs of heavier than the mean egg weight (Table 2). This comparison showed that trio chicks were superior in weight to the duo chicks irrespective of the original egg-weight of the chicks. The difference in the weight and size of trio and duo chicks seems therefore to be directly related to the number of adults attending the chicks.

Breeding success at trio nests was not markedly different from that at duo nests: one of six trio eggs and four of 22 duo eggs failed to hatch: an egg mortality of 16.6% and 18.0%; and one of five trio chicks and three of 15 duo chicks died: a chick mortality of 20% in each case.

#### DISCUSSION

Attendance at the nest by three, rather than two, adults had a noticeable effect on only two of the studied aspects of Southern Great Skua breeding biology: the growth of the chicks and the timing of egg-laying.

The growth of chicks attended by three adults was faster than that of chicks attended by two adults, especially during the latter part of the chick-rearing period. At nests where two adults raised two chicks the chicks lost weight after they were 40 days old. At a nest attended by three adults at which two chicks were raised at least one of the chicks continued to increase in weight after it was 40 days old. Guthrie-Smith (*in* Young 1978) observed that all three adults attending a trio nest in New Zealand fed the chicks. The same situation probably applied to trio nests at Marion Island although, because the adults were not marked, this was not definitely known. Presumably, because three adults can obtain and present more food to their chicks, trio chicks receive more food and can therefore grow faster than those fed by only two adults. This difference will be most critical and so of most advantage to trio chicks in the latter stages of the chick-rearing period when the demands of the chicks are greatest and when the evidence suggests that two adults have difficulty in providing sufficient food for two chicks.

All the skua chicks whose growth was monitored and which survived until they were 40-50 days old were considered healthy and all probably attained independence. The appendage measurements suggest that there was no marked difference in size at this stage between

trio- and duo-reared chicks. The difference in weight, which was highly significant between trio and duo chicks at 50 days old (Table 2), is therefore likely to reflect body condition and food reserves rather than size. If this is so, trio-attended chicks should attain independence with considerably larger reserves and in better overall condition than those reared by two adults. This should lead to trio chicks having a better chance of survival in the period immediately following independence from the parents. The accelerated growth of the appendages of trio-reared chicks further suggests that the overall body growth is completed earlier, and that trio chicks may therefore attain independence in a shorter time than duo chicks.

Most skuas are absent from Marion Island in the winter, but adult birds return in August or September and most territories are occupied from late September onwards (Williams, in press a). Two of the trios studied reoccupied their territories at the same time as adjacent pairs. The third trio was late in occupying its territory, and eggs at this nest were the last of all eggs to be laid. The relationship between adults in trios is probably more complex than that between monogamous birds and this may result in delayed laying.

The number of trio nests studied was too small for firm conclusions to be made about the effect attendance by three adults may have upon the aspects of breeding biology studied here. The indications are that the effect may be greatest on the growth rate of the chicks. How typical this is, and the long-term effect this may have, will best be studied in the New Zealand region where the proportion of trio-attended nests is greatest.

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