

ASPECTS OF THE INCUBATION PERIOD OF THE KING PENGUIN *APTENODYTES*  
*PATAGONICUS* AT ARCHWAY BAY, MARION ISLAND

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In 1891 R.G. Hazard dispatched Sealing Captain J.J. Fuller with camera and film in order to obtain photographic proof of the claim that the King Penguin *Aptenodytes patagonicus* carries its egg on its feet. The resulting photographs were, for the most part, indecipherable with "...barely enough light to show a horizon line." (Hazard 1894). One plate, however, was apparently of sufficient clarity to discern the vital feature. Unfortunately Hazard had to resort to the publication of a scale drawing of the photograph in order that the existence of the King Penguin's brood pouch be "...proved beyond any question." (Hazard 1894).

Despite the shaky evidence Hazard (and Captain Fuller) were indeed correct, the King Penguin, like its congener the Emperor Penguin *A. forsteri*, does not build a nest, but incubates the single egg on the feet, enfolded by the brood pouch (Gillespie 1919). Of greater interest in more recent times is the manner in which the incubation of the egg is shared between mated birds. King Penguins have a circumpolar distribution, breeding in large colonies at seven localities (Wilson 1983). Previous information on King Penguin incubation has come from only two of these localities; South Georgia (Stonehouse 1960) and Iles Crozet (Barrat 1976).

In this note we present information on egg dimensions, incubation shifts and incubation period for King Penguins at Archway Bay, Marion Island (46 52S, 37 51E) in the Prince Edward Island group.

The study by CJdP took place during August 1988 to May 1989. Additional information on fresh egg

1984. Archway Bay, situated on the east coast of Marion Island, contains a medium-sized King Penguin colony of approximately 2 500 breeding pairs (FitzPatrick Institute unpubl. data).

A sample of 140 pairs of King Penguins was banded with numbered stainless steel flipper bands, and additionally marked with white, fibre-reinforced, plastic tags attached to the flipper bands (Eggleton 1976), onto which a number was written with a permanent marker pen. Pairs were marked either post-copulation or during site-defence in the pre-laying period, approximately November/December. The sex of partners was determined by intra-pair comparisons of culmen length (Stonehouse 1960), and/or by position during copulation.

The Archway Bay colony was monitored daily from the periphery from before egg-laying (mid-November) until the end of the incubation period (March) to determine incubation periods and shift lengths for individual pairs. Egg shells carried outside the colony by Subantarctic Skuas *Catharacta antarctica* were collected. The longitudinal and cross-sectional dimensions of sufficiently intact eggs were measured to the nearest 0.01 mm using Vernier calipers.

#### Egg dimensions

The dimensions of 14 eggs measured at Archway Bay are similar to those from previous studies (Table 1). Egg masses are given in Table 2. The cited mean egg masses show large inter-study differences, probably largely due to variation in the time after laying at which the eggs were weighed. The most

TABLE 1  
LINEAR DIMENSIONS OF KING PENGUIN *APTENODYTES PATAGONICUS* EGGS

Locality	Length (mm)		Width (mm)		N	Source
	Mean	SE	Mean	SE		
Macquarie Island	100.7	-	73.9	-	15	Wilson (1907)
South Georgia	105.0	-	76.0	-	69	Stonehouse (1960)
Iles Crozet	104.1	-	73.9	-	291	Barrat (1976)
Iles Crozet	104.2	0.8	73.8	0.4	50	Handrich (1989)
Marion Island	105.8	-	74.0	-	35	Rand (1954)
Marion Island	102.9	1.1	73.8	-	14	This study

TABLE 2  
MASS OF KING PENGUIN *APTENODYTES PATAGONICUS* EGGS

Locality	Egg Mass (g)		Timing of weighing		N	Source
	Mean	SE	Mean	Range		
South Georgia	319	-	all stages of incubation	205-440	?	Stonehouse (1960)
Iles Crozet	302	-	Unknown	235-380	186	Barrat (1976)
Iles Crozet	302.6	4.3	Unknown	-	50	Handrich (1989)
Marion Island	304	-	Unknown	243-351	16	Rand (1954)
Marion Island	322.4	-	< 48 h after laying	286-344	11	Williams (1982)
Marion Island	330.9	8.7	< 24 h after laying	281.9-383.0	13	This study

TABLE 3  
 A COMPARISON OF KING PENGUIN *APTENODYTES PATAGONICUS* INCUBATION PARAMETERS AT THREE LOCALITIES.  
 SHIFT LENGTHS ARE IN DAYS. MEANS ARE GIVEN  $\pm$  1 SD. RANGES ARE GIVEN IN PARENTHESES. F = FEMALE; M = MALE

Locality	F	M	F	M	F	M	F	M	M Total	%	F Total	%	Totals
Marion Island (This study) Incubation in 4 shifts (n = 1)	1	17	21	15					32.0 (26-36)	59.3	22.0	40.7	
Incubation in 5 shifts (n = 9)	1	16.1 $\pm$ 1.6 (14-19)	15.3 $\pm$ 3.1 (11-19)	13.9 $\pm$ 2.0 (12-17)		5.8 $\pm$ 2.4 (2-8)			30.0 (26-36)	57.6	22.1 (14-28)	42.4	
Incubation in 6 shifts (n = 5)	1	13.5 $\pm$ 0.6 (13-14)	13.8 $\pm$ 2.1 (11-16)	11.5 $\pm$ 1.3 (10-13)		12.7 $\pm$ 2.5 (10-13)		2.8 $\pm$ 2.1 (1-5)	27.8 (24-32)	50.3	26.5 (22-30)	49.7	
Overall mean (n = 29)	1	16.0 $\pm$ 2.0 (13-20)	15.0 $\pm$ 3.0 (10-21)	14.0 $\pm$ 2.0 (11-18)		8.1 $\pm$ 4.1 (2-8)		3.3 $\pm$ 2.1 (1-5)	29.4 (26-36)	55.2	23.9 (14-30)	44.8 52-56	54.4 <sup>a</sup>
(Adams 1990) (n = 8)	1	16.3 $\pm$ 2.2 (12-21)	17.6 $\pm$ 2.7 (12-23)	13.8 $\pm$ 1.7 (12-17)		8.6 $\pm$ 2.1 (5-11)		2.5 (2-3)	30.6 (28-34)	56.6	23.5 (21-26)	43.4 52-5	54.1 <sup>b</sup>
Iles Crozet (Barrat 1976) Incubation in 5 shifts (n = 11)	1	15.3 (12-20)	17.6 (14-21)	15.0 (12-20)		5.2 (1-13)			30.3 (25-35)	56.6	23.2 (17-29)	43.4	
Incubation in 4 shifts (n = 8)	1	19.0 (15-22)	19.2 (17-23)	14.5 (11-18)					33.5 (30-36)	63.5	19.2 (17-23)	36.5	
Overall mean	1	16.8 (12-22)	18.3 (14-23)	14.8 (11-20)		5.2 (1-13)			31.6 (25-36)	59.5	21.5 (17-29)	40.5	53.2 <sup>c</sup> 52-54
South Georgia (Stonehouse 1960) 53-57	1	18.6	18.8 (16-21)	12.3 (18-21)		5.3 (10-15)		(2-9)	30.5	56.0	24.0	44.0	54.5 <sup>d</sup>

a n = 17; b n = 8; c n = 20; d n = 11

Williams *et al.* (1982) who weighed eggs collected within 48 h of laying, and of this study with masses being taken within 24 h of laying (Table 2).

#### Incubation

We recorded a total of 17 complete incubation periods, from egg-laying to hatching, giving a mean incubation period of 54.4 d (SD = 1.6, range 52-56 d). King Penguin incubation at Archway Bay was completed in four (n=1), five (n=9) or six (n=5) shifts (unrelieved stints with the egg). Patterns of nest relief during incubation were characterized by an initial shift of no more than one day after laying by the female. This was followed by a male shift of 13 to 20 d, with shift length subsequently decreasing to a mean of 3.3 d (range 1-5 d) just before hatching (Table 3). Overall, males contributed more to incubation (55.2%) than did females (44.8%) (Table 3).

Incubation period and shift lengths from Marion Island in two studies (Adams 1990, this paper) are similar to those obtained from South Georgia (Stonehouse 1960) and Iles Crozet (Barrat 1976) (Table 3). Records from the Edinburgh Zoo (Gillespie 1932) give incubation periods in accordance with field measurements (mean = 53.0 d, SD = 1.8, range 51-55 d, n = 4).

Although unlikely that significant inter-locality differences in egg dimensions or incubation parameters will exist, for completeness it would be useful to obtain comparable data from breeding localities not covered in this note.

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