

ROCKHOPPER PENGUINS *EUDYPTES CHRYSOCOME* AT TRISTAN DA CUNHA

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INTRODUCTION

The Tristan da Cunha Islands (c. 37S, 12W) are the northernmost breeding locality of the Rockhopper Penguin *Eudyptes chrysocome* and the type locality of the race *moseleyi*. Populations of these penguins remain high at Inaccessible and Nightingale but on Tristan Island, the largest and only inhabited island in the group, excessive exploitation by the islanders has led to the near eradication of Rockhopper Penguins (Hagen 1952, Elliott 1957). In 1979 the Administrator of Tristan da Cunha declared the Jews Point area of Tristan Island a wildlife reserve. This reserve incorporates three small Rockhopper Penguin colonies. Monitoring of the populations in this reserve by CS has provided new data on the breeding biology of the Rockhopper Penguin from this little studied locality. In this paper these data are compared with the known biology of the species at other more intensively studied localities.

AREA AND FREQUENCY OF OBSERVATION

Jews Point Gulch lies on the northeast coast of Tristan Island and is centred on a streambed where water flows after heavy rain. It comprises an 80 m wide zone running 500 m inland along the streambed. The reserve is a strenuous three hour walk from the settlement. Weather conditions and work commitments limited the number of visits CS made to the reserve to four between September and December 1979 and six between September 1980 and January 1981.

CLUTCH SIZE AND EGG DIMENSIONS

Eudyptes penguins characteristically lay clutches of two eggs in which the first laid (A-) egg is markedly smaller than the second laid (B-) egg, and this is the case in all studied populations of Rockhopper Penguins (Williams 1981a). Nevertheless Tristan islanders insist that 50 % or more of Rockhopper Penguin clutches laid in the Tristan da Cunha group comprise three eggs (Murphy 1936, Hagen 1952, Elliott 1957, pers.comm.). Williams (1981a) has suggested that the so-called three egg clutches at Tristan da Cunha result from the adoption of eggs, and particularly of A-eggs, displaced from adjacent nests: and that such adoption would especially result when humans collected the B-eggs which, because of their larger size, probably provide a greater tactile stimulus to the incubating bird.

At Jews Point Gulch only 4 (1 %) of the 410 clutches examined

contained three eggs. In two of these nests, one of the three eggs was markedly smaller than the other two eggs. None of these eggs was measured. Since in Rockhopper Penguins there is considerable intraspecific variation in the size of both A- and B-eggs (Williams 1980a), the possibility remains that these three-egg clutches could be the result of adoption of a third egg into a two-egg clutch. In the 1870s the Stoltenhoff brothers also found that in undisturbed colonies the normal clutch was two eggs and that nests with three eggs were rare (Murphy 1936). Thus, contrary to the opinion of the Tristan islanders, it seems that Rockhopper Penguins at the Tristan da Cunha group lay only a two-egg clutch.

Previous reports of egg dimensions from Tristan da Cunha have failed to differentiate between A- and B-eggs (Hagen 1952, Elliott 1957). The dimensions of eight two-egg clutches measured at Jews Point Gulch agree in general size with those of nominate *chrysocome* except that the B-eggs at Tristan da Cunha are markedly broader than at other localities (Table 1). Eggs at Tristan Island seem generally smaller than eggs from Gough Island (Table 1). This difference is difficult to explain and more clutches need to be measured at Tristan da Cunha.

BREEDING SEASON

In the 1980-81 season 54 % of the 410 clutches at Jews Point Gulch were complete before 19 September, and chick departure was mainly between 17 December and 8 January (Table 2). Rockhopper Penguins apparently raise only a single chick from each clutch, normally that from the B-egg (Williams 1980c, 1981b). Assuming that the chick hatched by 12 October was from a B-egg, then this egg would have been laid on or about 8 September. Elliott (1957) reports that first eggs are laid at Tristan Island between 5 and 11 September and that peak laying falls between 20 and 27 September. In 1980 most chicks hatched during the three week period between 12 October and 4 November (Table 2). Taking 19 September as an approximate mean laying date for B-eggs and a 34 day incubation period, then the mean hatching date would have been 21 October. If still present at the colony on 17 December, the first hatched chick would have been at least 66 days old and the mean age of chicks on that day would have been 57 days.

BREEDING SUCCESS

In the 1980-81 breeding season, 410 clutches were laid in the three subcolonies and 210 chicks raised to an average age of 57 days (after which there would probably be little mortality before they 'fledged'). Approximately 0,51 chicks were raised per pair (Table 3) compared with Marion Island where in two seasons 0,35 chicks were raised per pair (Williams' 1980c).

The Jews Point Gulch colony comprises three subcolonies : West, East Top and East Bottom. In 1980 hatching was earliest at East Top colony. If, as is generally assumed, the earliest birds to lay are the oldest and most experienced breeding birds, it is surprising that the overall breeding success at this subcolony was considerably lower than at the other two subcolonies (Table 3).

TABLE 1
DIMENSIONS OF ROCKHOPPER PENGUIN *EUDYPTES CHRYSOCOME* EGGS

Locality & reference	Egg type	No. eggs sampled	Length (mm)		Breadth (mm)	
			Mean \pm SD*	(Range)	Mean \pm SD*	(Range)
Tristan da Cunha (this study)	A	8	63,9		46,0	
	B	8	71,8		56,1	
Gough Island (Williams 1980b)	A	30	65,2 \pm 4,0	(51,4 - 70,8)	49,2 \pm 1,8	(45,5 - 52,8)
	B	30	73,0 \pm 2,6	(67,3 - 76,8)	55,2 \pm 1,7	(52,6 - 58,5)
Amsterdam Island (Duroselle & Tollu 1977)	A	44	63,2	-	49,7	-
	B	44	70,1	-	54,7	-
Marion Island (Williams 1981a)	A	122	62,3 \pm 2,6	(57,1 - 70,5)	46,8 \pm 1,7	(43,6 - 50,5)
	B	119	70,2 \pm 2,6	(64,4 - 78,6)	52,9 \pm 1,7	(48,1 - 56,7)
Heard Island (Gwynn 1953)	A	11	63,9 \pm 2,7	(59,0 - 68,0)	46,4 \pm 2,9	(42,2 - 57,5)
	B	11	71,9 \pm 2,0	(68,0 - 73,7)	52,9 \pm 2,5	(49,0 - 56,7)

* standard deviation

TABLE 2

NUMBER OF EGGS AND CHICKS, AND CLUTCH AND BROOD SIZE OF ROCKHOPPER PENGUINS *EUDYPTES CHRYSOCOME*
 AT JEWS POINT GULCH, TRISTAN ISLAND DURING TEN VISITS IN 1979-1981

Year & date of visit	No. occupied nest sites	No. eggs	Clutch size		No. chicks	Brood size		One egg & one chick
			One egg	Two eggs		One chick	Two chicks	
1979 Sep 25	343	549	-	-	-	-	-	-
Oct 29	266	71	49	10	213	199	6	2
Nov 24	-	-	-	-	202	(in crèches)	-	-
Dec 15	-	-	-	-	155	(in crèches)	-	-
1980 Sep 19	353	582	128	221	(4)	-	-	-
Oct 12	398	631	167	229	(2)	1	-	-
Nov 4	247	28	12	6	0	244	15	4
Nov 23	-	-	-	-	233	(in crèches)	-	-
Dec 17	-	-	-	-	210	(in crèches)	-	-
1981 Jan 8	-	-	-	-	28	(in crèches)	-	-

TABLE 3
 SIZE AND BREEDING SUCCESS OF THE THREE SUBCOLONIES OF ROCKHOPPER PENGUINS *EUDYPTES CHRYSOCOME*
 AT JEWS POINT GULCH, TRISTAN ISLAND, 1980-81

Count	Date	Colonies		
		West	East Top	East Bottom
No. clutches	19 Sep 1980	135	121	97
No. clutches	12 Oct 1980	184	109 ¹	105
No. clutches + chicks	4 Nov 1980	98	71	78
No. chicks	23 Nov 1980	101	66	66
No. chicks	17 Dec 1980	96	50	64
No. chicks	8 Jan 1981	8	4	16
Breeding success ²		52,5 %	41,3 %	61,0 %

Notes : ¹Includes 1 chick.

²No. chicks on 17 Dec. as % of maximum no. clutches assuming only one chick can be raised from each clutch.

Most of the mortality at the East Top subcolony occurred during the early egg period but the cause of this egg loss was not determined.

At Tristan Island both eggs were retained until near the end of incubation at 56 % of all nests, and two chicks were present at 6 % of all nests on 4 November when the chicks should have been approximately 14 days old. In comparison, at Marion Island both eggs are retained to hatching at only 30 % of all nests, twins hatch at only 6 % of all nests, and the longest period over which two chicks naturally survive in one nest is 12 days (Williams 1980c). That in several nests at Tristan Island twins were in healthy condition when approximately 14 days old suggests that some pairs might rear two chicks from a clutch. This could not be determined in this study since the chicks were unmarked and when next visited were gathered in crèches. Nevertheless, experimental twinning of chicks at Marion Island indicates that it is unlikely that Rockhopper Penguins at Tristan da Cunha can rear two chicks. In a Marion Island twinning experiment, two chicks were maintained for 65 days. However, although both chicks remained healthy and of similar size until the 30th day, there was a subsequent divergence in growth with one chick obtaining almost all the food and the other remaining severely undernourished (Williams 1981b). The change in growth pattern commenced when the male first brought food to the chicks and it is likely that similar preferential feeding of one twin would occur at Tristan da Cunha.

CONSERVATION

In the 1980-81 breeding season there were 55 more breeding pairs (a 15.5 % increase from 355 to 410 pairs) at the Jews Point Gulch colony than in the 1979-80 season and at least 42 more chicks reached the crèche stage. The increase in population and the high breeding success rate may together reflect an enhanced feeding situation. It is unlikely that food availability for penguins in waters adjacent to Tristan Island has greatly altered since the time when the island supported far larger penguin colonies. The small current population should therefore be able to feed nearer inshore or at least more reliably than when the population was large. If food is more readily available then it is possible that: the interval that chicks must fast between each meal might be reduced; chick growth might be faster and thus the overall chick-rearing period might be reduced compared with the situation in larger, more stable penguin populations; and it might even be possible for some pairs to raise two chicks.

Tristan islanders have traditionally collected Rockhopper Penguin eggs for human consumption and such egg collection, now mainly from Nightingale Island, is an important part of the island economy. Several points should be borne in mind when determining the harvesting of Rockhopper Penguin eggs. There is no evidence to suggest that *Eudyptes* penguins lay replacement eggs if the entire first clutch is lost (Williams 1981a) but, since from each two-egg clutch only a single chick is raised, one egg can be taken from each clutch. Normally it is the B-egg chick which is raised (Williams 1980c) and chicks from B-eggs grow faster and have a better chance of survival than A-eggs (Williams 1980a).

Therefore B-eggs should be left in the nest and only A-eggs collected. The collection of A-eggs only should have little effect upon breeding success and recruitment to the population. Although A-eggs are laid four days before B-eggs (Williams in press), there should be no difference between the suitability of A- and B-eggs for human consumption since incubation does not become effective until after the B-egg has been laid (Burger & Williams 1979).

Finally we wish to congratulate the people of Tristan da Cunha and the Administrator of the islands for their foresight in declaring the Jews Point Gulch area a nature reserve.

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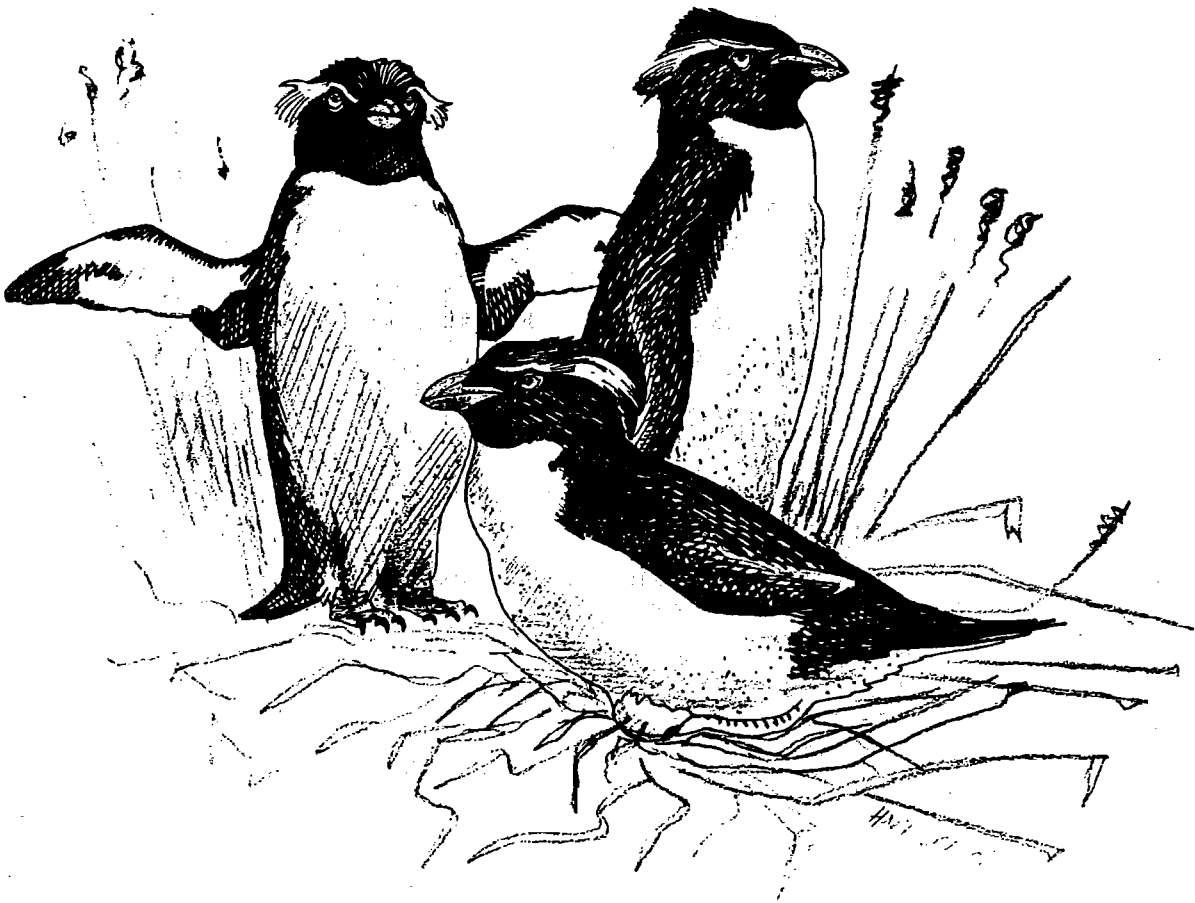
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Northern Rockhopper Penguins *Eudyptes chrysocome moseleyi*