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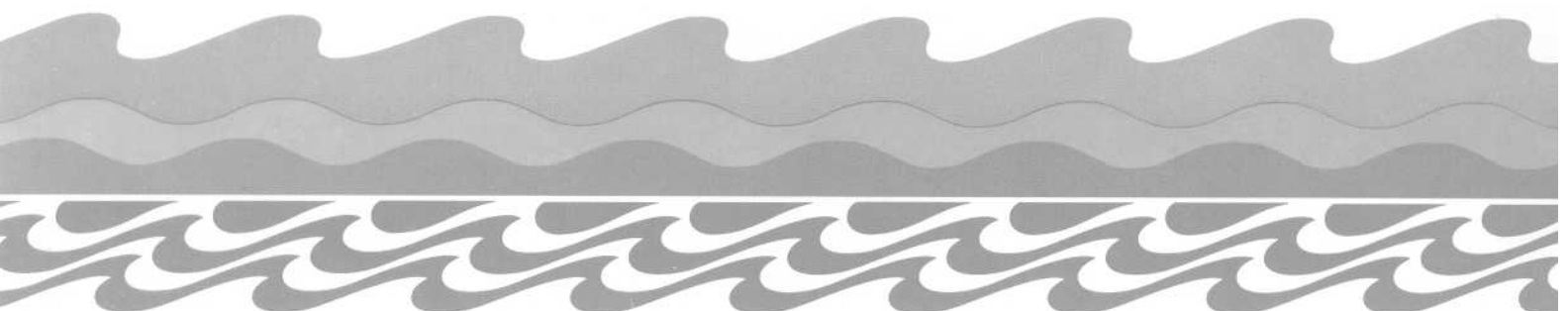
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TIMING OF EGG LAYING IN THE ROYAL ALBATROSS (*Diomedea epomophora*) AT TAIAROA HEAD 1937-1992

(Short Answers in Conservation Science)

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**TIMING OF EGG LAYING IN THE ROYAL ALBATROSS
(*Diomedea epomophora*) AT TAIAROA HEAD 1937-1992**

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INTRODUCTION.

Robertson & Richdale (1975, 1993) recorded that, prior to egg laying, both members of a Northern Royal Albatross *Diomedea epomophora sanfordi* pair returned to the breeding colony a mean of 27-31 days (female-male) before laying, with the female spending only an average of seven days at the nest site with 2-3 of these days being immediately before laying the egg. Grau (1984) found that in *D. e. sanfordi* at Taiaroa Head, yolk formation in the egg started about 40 days before laying with a period of some 10 days between yolk completion and laying. Robertson & Richdale (1993) noted that the female has a very limited number of chances for copulation, which is why the male spends about 45% of the time, between its return and egg laying, at the nest site. In most pairs the male builds the majority of the final nest structure during this period.

Richdale (1952) recorded a range of laying dates at Taiaroa Head from 31 October to 6 December and a mean laying date of 12 November. Sorensen (1950) indicated that the peak of laying in *D. e. epomophora* at Campbell Island was in the middle of the first week of December. Other observers since then (Meteorological parties, in litt.) have recorded freshly laid eggs there as early as 21 November. Robertson & Richdale (1975, 1993) recorded the range of egg laying for *sanfordi* in the Chathams during 1973, as 27 October to 30 November (mean 14 November). Accordingly there is a probable overlap of at least one week when both *sanfordi* and *epomophora* are laying eggs.

Robertson (1981, 1985) recorded the presence and inter-breeding of *D. e. epomophora* with *D. e. sanfordi* at Taiaroa Head. Subsequent to Richdale (1952), the 'Lupins' bird was identified by Stan Sharpe as a Southern Royal female. This bird (banded 'D3') continued to lay for a number of years, but was never seen associated with a mate. The removal of her two eggs from Richdale's 1952 range indicated a range for *sanfordi* in the Taiaroa Head colony, at that time, of 31 October to 24 November.

In the 1962/63 breeding season a second *epomophora* female (banded 'A3') joined the population at Taiaroa Head and bred successfully within the reserve for a number of years (4 chicks from 1962/63 to 1968/69). The progeny from this pairing have been viable, with the present breeding population containing cross-

bred individuals to 1/8 cross and one pair both of whom are of cross-bred origin. No *epomophora* males have been detected in the Taiaroa Head population.

Richdale (1952) was the first to note that individual albatrosses tended to lay in the same order each season and that there were consistently "early-layers, medium-layers and late-layers". He also noted (1952) that the time of laying could vary according to season and noted especially the 1944-45 season when all birds were late but still laid in their usual order. Robertson & Richdale (1975, 1993) recorded that in the Chathams in 1973 there was a reduction in the amount of laying when more than 3mm of rainfall was recorded during daylight hours. They also suggested that there was probably also a correlation with weather conditions at sea over the previous 2 to 3 days.

When the Taiaroa Head colony was opened to public viewing in 1972 the colony was kept closed to viewing (according to the conditions of entry set by the then NZ Wildlife Service) during the pre-egg stage and laying period until after 24 November each breeding season.

EGG LAYING 1937-1992

Though the Taiaroa Head colony has been monitored continuously since 1937, it is only since 1968 that the colony has been visited on most days (Robertson 1993). Accordingly there is a wide variation in the quantity and quality of the written record. A total of 456 eggs whose laying date (in period 1937-92) was reliably recorded, were analysed for the present study. Within this sample 32 were for *epomophora* females or *epomophora* X *sanfordi* female cross-breds.

TABLE ONE. Distribution of egg laying for Royal Albatross at Taiaroa Head 1937-92, where laying date is reliably known.

	mean	n	s.e.	earliest	latest	range
ALL EGGS	12.22 Nov.	456	0.297	27 Oct.	8 Dec.	42 days
Northern ssp only	11.45 Nov.	424	0.261	27 Oct.	28 Nov.	32 days
Southern ssp or S x N cross	22.41 Nov.	32	1.589	9 Nov.	8 Dec.	29 days
Richdale all eggs 1937-52	12.72 Nov.	57	0.77	31 Oct.	6 Dec.	36 days

The latest laying date recorded within the present Nature Reserve (where all albatross nesting at Taiaroa Head is presently occurring) is 2 December. There is a significant difference between the two sub-populations at Taiaroa Head (Northern v Southern and cross-bred) ($p < 0.001$).

Figure 1 shows the distribution of laying dates for the Taiaroa Head locality and emphasises the growing importance of the southern cross-bred population in extending the range of laying at the colony.

RANGE OF LAYING DATES FOR INDIVIDUALS

Richdale (1952) indicated that females seemed to lay at a similar time, relative to other females, within each breeding season, but showed that there was a range of up to 13 days between the earliest and latest egg for an individual. Robertson & Richdale (1975, 1993) showed that for females who had laid at least 4 eggs (1937-73) there was a marked ranking from early to consistently late layers with a correlation coefficient of .828 and $p < 0.001$.

Figure 2 plots the individual laying ranges of all females (including cross-breeds) who have laid 2 or more eggs during their breeding life (1937-92). While Robertson & Richdale (1975, 1993) found that the mean range in 1974 was nine days (s.e. 0.65), this has now increased marginally to 10.4 days (s.e. 0.67) for all females (1937-92). However, the maximum range for individual females has increased markedly from 13 days to 22 days. Some 20 percent of the sample now have a range greater than that recorded in 1974.

Figure 3 plots the earliest and latest date recorded for each individual who has laid more than 2 eggs (1937-92) and demonstrates the continuing tendency for individual females to lay at a constant part of the breeding season. There is still no conclusive evidence to dispute the assertion by Richdale (1952) that the male has no significant influence on the timing of egg laying. Females who have laid eggs (such as the *epomophora* 'D3') without associated males show the same consistent laying patterns as mated females. Even females who have changed mates do not demonstrate a significant change in their laying position within the breeding season.

DISCUSSION

There has been a demonstrated change in the laying patterns of Royal Albatrosses on at Taiaroa Head during the development of the colony under protected conditions between 1937 and 1992. The principal reason for the later laying of eggs is the development of a cross-bred sub-population of *D. e. epomophora* and *D. e. sanfordi*. Other data from Taiaroa Head indicate that individual females consistently lay at a similar time relative to other females. Significantly there seems to be a strong correlation between the egg laying 'point' for females within a family line which suggests a genetic basis for their egg laying time.

The evidence of Grau (1984), which shows that the commencement of yolk deposition by individual females starts some 10-14 days *before* the female returns to the breeding colony (Robertson & Richdale, 1975, 1993), is a further strong pointer towards the confirmation of a genetic basis for egg laying, but with

seasonal modifications caused by environmental factors such as food supply and weather. This would be consistent with the ranges in laying dates demonstrated by most individual females.

There is a growing body of evidence (Robertson, in litt. colony records) to support the presence and absence behaviour of both males and females prior to egg laying as indicated by (Robertson & Richdale 1975, 1993). This is one of the most critical times in the breeding cycle, when the successful bonding and mating of the pair is essential for the production of a viable nest and egg. Poorly bonded pairs have difficulty in choosing an agreed nest site and coordinated nest construction, while poorly synchronised pairs consistently produce infertile eggs.

The natural and viable cross-breeding of two presently classified sub-species which has been occurring at Taiaroa Head is an important process in the present climate of debate over speciation in albatrosses generally. However, it is not inconceivable that what we are seeing is the early stages of what may become a distinctive intermediate or 'Taiaroa Head' Royal Albatross.

It was clearly the intention of the NZ Wildlife Service when they set the conditions of entry for public viewing in 1972 (and agreed to by the tourist operator) that the sensitive pre-egg and egg laying stage of the Royal Albatross breeding cycle at Taiaroa Head should not be on public view. It is also clear that, with the changing range of egg laying, these conditions are no longer being met and that there will be an increasing tendency for there to be females in the colony whom we can expect to lay, at some time of their life, later than 24 November in any breeding season.

RECOMMENDATIONS

1. That the annual opening date for public viewing of the Royal Albatross colony at Taiaroa Head be changed from 24 November to 1 December to fully protect the pre-egg and egg laying stage of the breeding cycle.
2. That the opening date change commences in the 1994/95 breeding season.

ACKNOWLEDGEMENTS

I such a long term study it is important to acknowledge and thank all those unnamed persons who have contributed towards the data collection and monitoring of the Taiaroa Head colony from 1937-1992; but especially Lancelot Richdale without whose foresight the study would not have started nor the colony continued; Stan Sharpe, Alan and Connie Wright, Shirley Webb, Sandra McGrouther, Isobel Burns, Sue Guthrie and Lyndon Perriman for without their observations, assistance and advice the record would be less complete; T.O. O'Callaghan and the Hocken Library for access to the Richdale papers; the Sharpe family for access to the Sharpe papers. Critical review and advice has been provided for this analysis by M. Harrison, M.J. Imber and R.M. Sadleir.

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FIGURE 1. Distribution of Northern v Southern & crossbred Royal Albatross laying dates, Taiaroa Head, 1937-1992

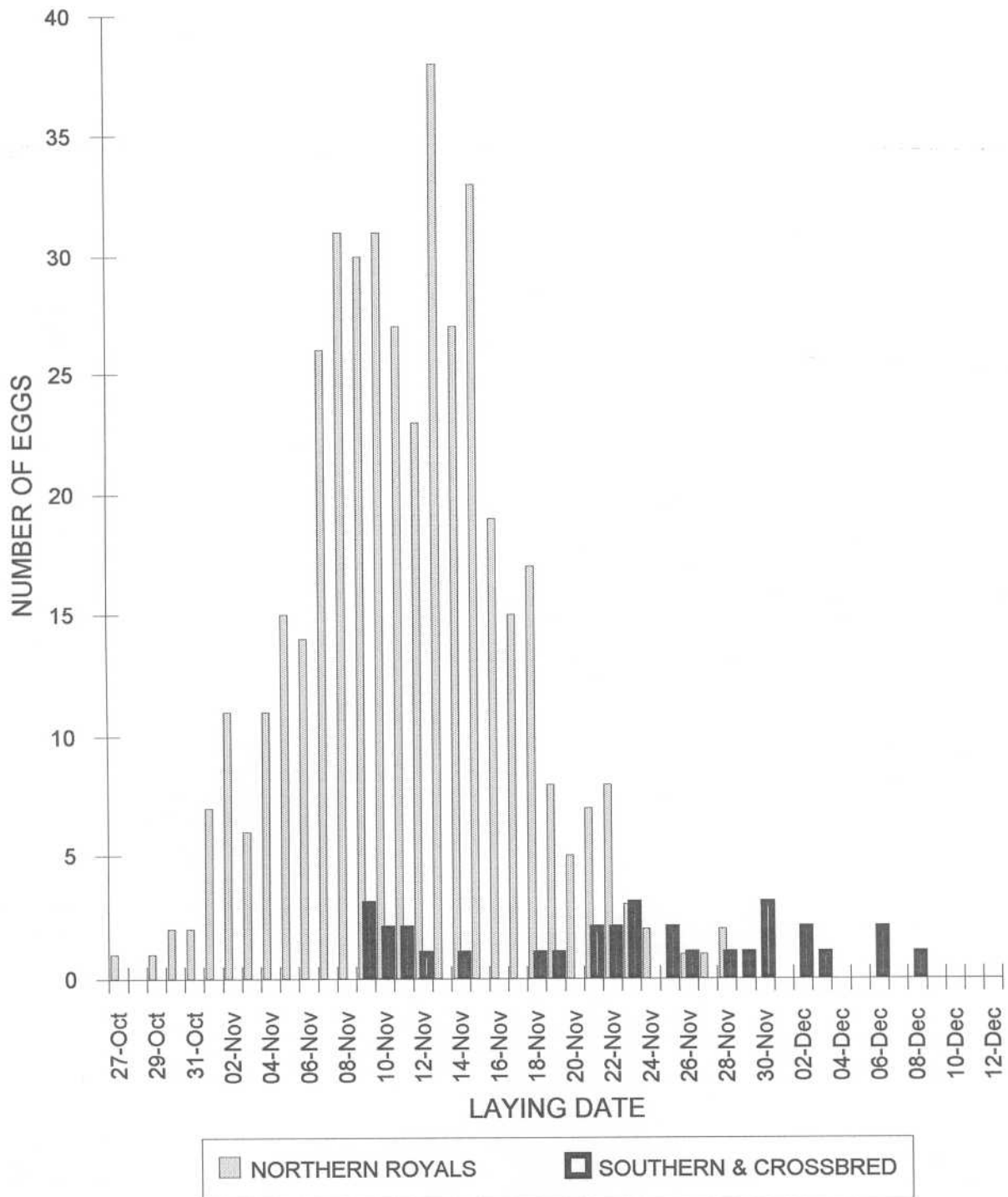


FIGURE 2. Laying date ranges for individual Royal Albatross, Taiaroa Head, 1937-1992

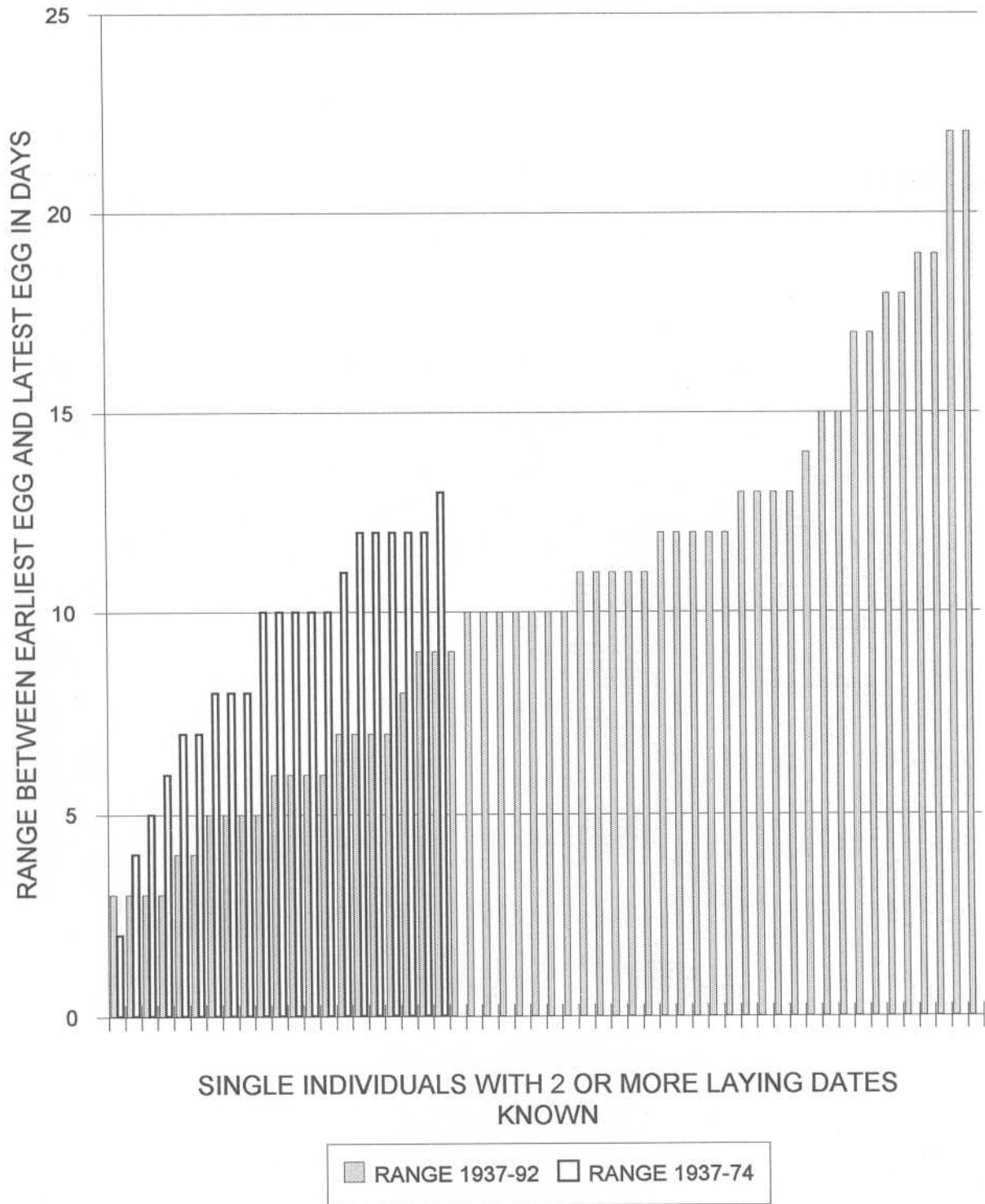


FIGURE 3. Individual distribution of the range of laying in Royal Albatross, where at least 2 eggs have been laid, Taiaroa Head, 1937-1992. (Dates shown are indices within the maximum range, where 30 is equal to 25 November)

