PRIMARY MOULT IN BLACK-BROWED AND SHY MOLLYMAWKS

By DAVID S. MELVILLE

Every year thousands of dead seabirds are found on beaches around New Zealand. Since 1960, the OSNZ Beach Patrol Scheme has received details of over 200 000 birds (Powlesland & Imber 1988), of which over 2400 were albatrosses (Powlesland 1985). Some are measured by the finder and others kept as skins in museum collections, but very few are examined for moult, despite the Moult Record Scheme. Information on moult can be filed on either OSNZ Beach Patrol Specimen Cards or OSNZ Moult Cards. Details of moult are known for few New Zealand birds, especially seabirds (Robertson 1985), and beach patrollers are in a position to make important contributions to our knowledge.

This note reports the state of the primaries of 57 Black-browed Mollymawks (*Diomedea melanophrys*) and 72 Shy Mollymawks (*D. cauta*) collected in New Zealand and in Victoria, Australia. Many of these were beach-washed specimens.

Because of the pelagic habits of albatrosses and mollymawks, their moult is hard to study. Stresemann & Stresemann (1966) suggested that primary moult in albatrosses was a *Staffelmauser,* that is, had a periodic stepwise or wave form, called "serially descendant" by Cramp & Simmons (1977). In serially descendant moult, more than one moult season is needed to replace all of the feathers in any tract. Thus, moult is interrupted ('suspended' *sensu* King 1972) at some point. During the following season moult resumes at the next feather in sequence. A second 'wave' of moult may start at the inner primary before the first wave has reached the outermost primary. Thus in birds more than 1 year old, several generations of feathers, representing different moult waves, may be present in the same wing. In the most detailed study yet made of moult in any albatross, Furness (1988) noted that breeding Yellow-nosed Mollymawks (*D. chlororhychos*) showed up to four moult foci, though most showed only one (two feather generations) or two (three feather generations). Figure 1 shows how such moult patterns might appear.

Brooke (1981) and Furness & Brooke (1982) examined mollymawks collected off South Africa and reported three Black-browed Mollymawks in which primary moult was ascendant (that is, starting from the outermost primary) rather than descendant – the usual mode of primary moult in most birds, including albatrosses (Stresemann & Stresemann 1966, Harris 1973, Furness 1988).

MATERIAL AND METHODS

Museum skins were examined in the Canterbury Museum, Christchurch (CM), the National Museum of New Zealand, Wellington (NMMZ), the Auckland Institute and Museum (AIM), and the National Museum of Victoria – NMV(W). The last collection also houses the H.L. White collection

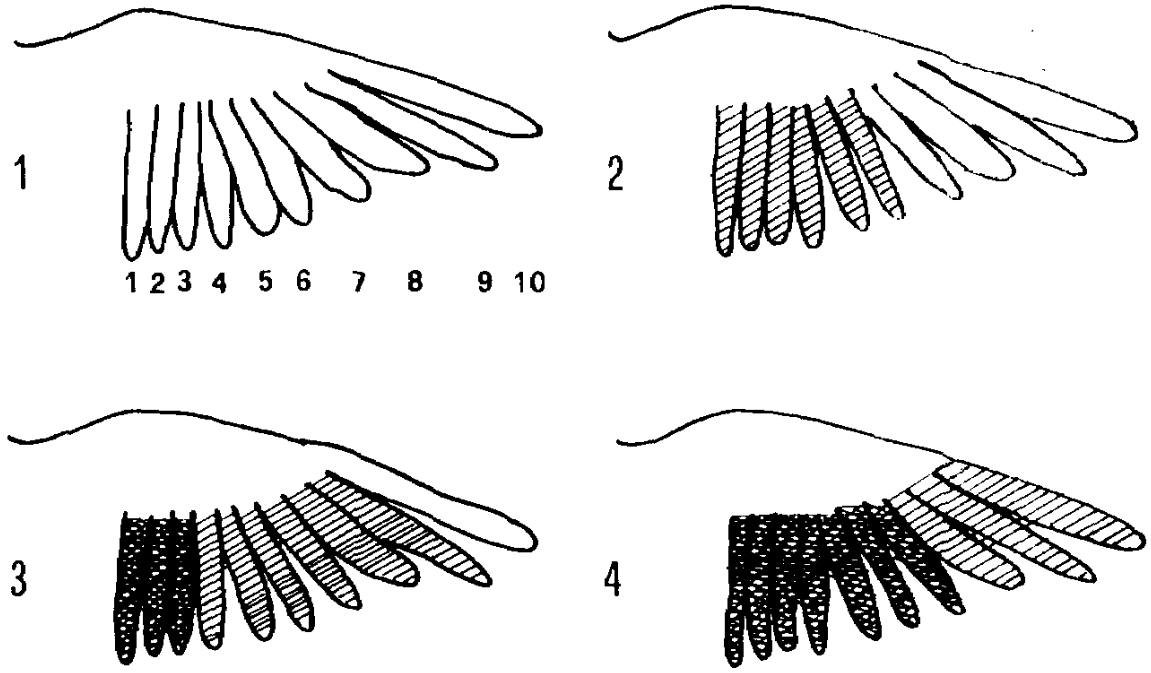

FIGURE 1 — A hypothetical example of the development of 'serially descendant' primary moult.
1. Juvenile. All primaries the same age, feather generation A.
2. After first moult. Primaries 1-6 new, feather generation B. Primaries 7-10 feather generation A, now worn.
3. After second moult. Primaries 1-3 new, feather generation C. Primaries 4-6 generation B, worn, *Primary 10 generation A, very worn.*
4. After third moult. Primaries 1-3 generation C, worn. Primaries 4-7 generation C, new. Primaries 8-9 generation B, worn. Primary 10 generation B, new.

– NMV(W).Primaries were examined and scored on a scale of 0-5, where 0 is old, 5 is new, and 1-4 are intermediate stages of feather growth (see Ginn & Melville 1983). The 10 large primaries were recorded. The 11th (outermost) primary is very much reduced and was ignored. Both left and right wings of all birds in the CM and most in the AIM were examined. Only the right wing was examined for most NMNZ and all NMV specimens. In some skins the wings were set very tight and so I could examine the outer primaries only.

I tried to classify the state of feather wear of the fully grown feathers, using three broad categories, 'slight', 'moderate' and 'very', based on Prater *et al.* (1977). Because mollymawks apparently take more than 1 year to replace their primaries, and the outer primaries are subject to more wear than the inners, a bird can have primaries of similar age at the inner and outer parts of the wing with the outer primaries looking older (more worn) than the inners. The long time between replacements of an individual feather also makes the definition of 'new'(5) and 'old' (0) difficult. In some it was possible to distinguish between 'fresh, new' and 'slightly worn, new', which with further wear became 'slighty worn, old', Notwithstanding these considerations, I have tried to record feather wear (Tables 1 and 2) because wear can be used to estimate the number of feather generations in a wing even when the bird is not in active moult.

Age terminologies of different museums vary. Juvenile birds are those in recognisable 'first year' plumage even if labelled as 'immature'. Birds not in juvenile plumage were usually recorded as 'adult', but whenever they were noted as 'immature' or 'subadult' on the museum label I retained the terminology. Many specimens had been beach wrecked. Although their moult might not be representative of the population as a whole, this is unlikely because a single moult cycle often takes more than a year. Birds collected at or near the breeding grounds are noted. Sexes and racial determinations are taken from museum labels.

RESULTS

Details of Black-browed Mollymawks are given in Table 1. Juveniles of the New Zealand subspecies (*D. m. impavida*) fledge in March – April (Robertson 1985, p.61). Mean age of first breeding in the subspecies *D. m. melanophrys* is 8.9 years at Kerguelen (Weimerskirch *et al.* 1987), but non-breeding birds are present at colonies in South Georgia from their second year onward (Tickell 1969).

Only three birds are in active moult. NMNZ1302 is undergoing descendant moult, as is AIM150.11. NMNZ8499 has only one feather growing and so the direction of moult cannot be determined. Seventeen birds have 'new' inner primaries and 3-5 'old' outer primaries. In these the difference between old outers and the adjacent new feathers is marked, and so these birds probably had undergone descendant moult. If they had undergone ascendant moult, we would expect the outermost 'new' primaries to be the most worn. NMNZ17631 could have undergone ascendant moult but the pattern noted is equally consistent with descendant moult. Bird NMNZ19244, banded as a pullus on Campbell Island on 7 April 1967, was in its eighth year when collected. The pattern of wear in this bird shows that it had undergone descendant moult.

NMV4342 shows two apparent ages of primaries in different 'waves', whereas AIM150.7 shows one older feather remaining between two blocks of feathers of apparently the same age. AIM150.8 shows a complex of old and new, as does AIM150.12. None of these birds is in active moult, and the patterns of old and new feathers and the amount of wear indicate that two or more generations of feathers are present.

Details of Shy Mollymawks are given in Table 2. New Zealand and Australian populations of White-capped Mollymawks (*D. cauta cauta*) breed at different times and should be treated as different subspecies (C.J.R. Robertson *in* Powlesland 1985). The name *D. cauta steadi* Falla 1933 is available for New Zealand birds, whereas *D. cauta* Gould 1841 is said to be based on a Bass Strait bird (Jouanin & Mougin 1979). Details of subspecies given in Table 2 are taken from the museum labels and have not been checked. Thus some specimens labelled as *D.c. cauta* may be *D. c. steadi*.

Bass Strait birds (Albatross Island) fledge in April (Johnstone *et al.* 1975), whereas Auckland Island birds fledge in August (Robertson 1985, p.65). Young of the subspecies *D.c. salvini*, which breeds on the Bounty and Snares Islands, fledge in April as do young of *D. c. eremita* of the Chatham Islands (Robertson 1985, p.65).

Five birds are in active moult: NMNZ13382, NMNZ13445 and CM2294 (all *cauta)* are undergoing descendant moult, and NMNZ13332 (*cauta*) and NMNZ11447 (race unknown) have only one feather growing. As with the Black-browed Mollymawk, descendant moult also is suggested by birds with old outer primaries and new inners. Ascendant moult could have occurred in NMNZ13381 and NMNZ21379, although the extra wear experienced by the outer primaries could also account for the pattern found if the birds had undergone descendant moult. Note that Kinsky's (1968) references to specimens of *salvini* in heavy moult in February do not relate to moult of the primaries (I examined four of his five specimens in the study, finding none in primary moult).

DISCUSSION

There is thus no strong evidence of ascendant primary moult in either the Black-browed or the Shy Mollymawk in Australasian waters. Murphy(1936) noted several Peruvian specimens of *salvini* in May and June and one 'yearling' Black-browed Mollymawk from Chile collected in February replacing the primaries. No mention is made of the sequence of moult, but as ascendant moult is rare, we can assume that it was descendant. Stresemann & Stresemann (1966) described one March specimen of *salvini* from Peru in descendant primary moult with two active moult centres. Thus the records of Brooke & Furness (1982) of ascendant moult in the Black-browed Mollymawk seem to be the only examples of this unusual pattern in any albatross.

This study shows that primary moult in both Black-browed and Shy Mollymawks in Australasian waters takes more than 1 year to complete, contradicting standard references such as Palmer (1962), Watson (1975) and Cramp & Simmons (1977), who stated that the Black-browed Mollymawk has a complete moult from January to July. However, Croxall (1984) noted that complete plumage replacement in the Black-browed Mollymawk 'certainly takes more than one year', and Brooke (1981) also recorded periodic stepwise moult in specimens from South Africa. The only previous information on moult in *cauta* seems to be the bird described by Stresemann & Stresemann (1966).

My study suffers from having too few specimens of known age and breeding status. Although beach-washed specimens can yield valuable insight into the timing and patterns of moult, and certainly should be examined, there is a need for studies of known individuals at breeding sites over several years. Relationships between breeding activity and the extent of primary moult have been demonstrated in the Yellow-nosed Mollymawk (Furness 1988) and the Waved Albatross (*D. irrorata*) (Harris 1973). (Successful breeders replaced fewer primaries than failed or non-breeders, apparently because less time was available between breeding attempts.) Much remains to be learnt, however, especially for other species.

I note Warham's (1987) caution against handling breeding birds but suggest that it should be possible to determine age/wear of primaries when handling breeding birds to check band numbers. If a colour photograph were taken of the open wing (primaries), it would record the pattern of wear and moult. I have found no evidence of primary moult in either Black-browed or Shy Mollymawks at breeding colonies, and this has not been recorded for other species (Harris 1973), although Furness (1988) did note several Yellow-nosed Mollymawks with stage 4 feathers at the start of the breeding season. Although Tickell & Pinder (1975) recorded 'moult' in Black-browed Mollymawks during the breeding season at Bird Island, South Georgia, they did not say whether this moult included primary moult. Croxall (1984) thought that they meant only body moult.

The study of actively moulting birds away from the breeding grounds will remain difficult. However, the ability to follow feather replacement 'remotely' by noting annual changes in patterns of feather age and wear of marked birds at the breeding grounds should allow accumulation of data quite quickly. In addition to providing information on moult, such a study also might result in some useful insight into feeding conditions at sea, e.g. through differences in the number of feathers replaced each year by birds of similar breeding status. A comparison of feather replacement patterns in different populations also would be of considerable interest. Beach patrollers can continue to make important contributions to our knowledge by recording moult of birds collected.

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TABLE 1
Explanatory notes

AIM = Auckland Institute and Museum, CM = Canterbury Museum, NMNZ = National Museum of New Zealand, NMV = National Museum of Victoria, NMV(W) = H.L. White collection at NMV.

i = *melanophrys impavida*, m = *melanophrys melanophrys*

A = Campbell Island, B = Macquarie Island, C = Heard Island, D = Antipodes Islands, E = Auckland Islands

1 = feather missing or in pin, 2 = up to 1/3 grown, 3 = 1/3 - 2/3 grown,
4 = 2/3 to fully grown, wax sheath at base, 5 = fully grown new feather,
8 = fully grown, age uncertain

f = fresh, s = slightly worn, v = very worn, * = oldest feather(s) in wing, b = brown feather(inner primary which is not especially worn but which differs from other primaries by colour, probably older)

Underlining denotes that all feathers are of the same wear category

TABLE 2
Explanatory notes –
For explanation see Table 1.

In Race column: c = *cauta cauta* (steadi), s = *cauta salvini*

In Locality column: A = Albatross Island, Bass Strait, B = Auckland Islands, C = County Island

TABLE 1 — Age and moult status of the primaries of Black-browed Mollymawks collected in New Zealand and Victoria

.	Date	Age	Sex	Race	Inner -- Primaries -- Outer	Locality
00	21 Mar	J	M	i	5 5 5 5 5 5 5 5 5 5 f	A
75	6 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5	A
46	13 Apr	J	F	i	5 5 5 5 5 5 5 5 5 5	
	15 Apr	J	F		5 5 5 5 5 5 5 5 5 5	
44	15 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5	A
43	17 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5	A
78	17 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5	
48	20 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5	A
14	25 Apr	J	M	i	5 5 5 5 5 5 5 5 5 5 s	
	3 May	im	M		5 5 5 5 5 5 5 5 5 5 s	
	6 May	im	?		5 5 5 5 5 5 5 5 5 5 s m	
4	11 Jun	J	M		5 5 5 5 5 5 5 5 5 5	
5	17 Jun	J	?		5 5 5 5 5 5 5 5 5 5	
33	19 Jun	J	M	i	5 5 5 5 5 5 5 5 5 5 s	
34	20 Jun	J	F	i	5 5 5 5 5 5 5 5 5 5	
193	2 Sep	J	M	m	5 5 5 5 5 5 5 5 5 5	
53	11 Jan	A	M	i	5 5 5 0 5 5 0 0 0 0 s s m v	
54	11 Jan	A	F	i	0 5 5 0 0 0 0 0 0 0 b * s	
6	12 Jan	A	?		5 0 0 0 0 0 0 5 5 5 s s	B
	23 Feb	A	M		5 5 5 5 5 5 5 0 0 0 s * m	C
	23 Feb	A	?		5 5 5 5 5 5 0 0 5 5 s * s	C
1	27 Feb	im	F	m	5 5 5 5 5 0 0 0 0 0 *	
	23 Mar	A	F		R 5 5 5 0 0 0 0 5 5 5 s * L 5 5 5 0 8 8 0 5 5 5 *	B
13	- Mar	A	F	i	5 5 5 5 5 5 5 0 0 0 out fresher than in	near B
14	8 Mar	A	M		5 0 0 5 5 5 0 5 5 5 f m s m s	
!	21 Apr	A	F	m	0 0 5 5 8 0 0 4 3 2	
0	27 May	A	F	m	5 5 5 5 5 0 0 5 5 5 s	
1	27 May	im	M	m	0 0 0 0 0 0 0 5 5 5 *	
5	18 Jun	A	M	m	0 5 0 0 0 0 0 5 5 5	
	13 Aug	A	F		5 5 5 5 5 0 0 5 5 5 s m s	

Ref. No.	Date	Age	Sex	Race	Inner -- Primaries -- Outer	Locality
CM150	13 Aug	im	F		0 0 0 0 0 0 0 0 0 0 outer 3 slightly more worn, rectrices new	
CM151	13 Aug	A	F		5 5 5 5 5 5 5 0 0 0	
CM152	13 Aug	A	M		R 0 0 0 5 5 5 5 0 0 0 L 5 0 0 5 5 5 5 0 0 0	
CM1217	14 Aug	im	M		5 5 5 5 5 5 0 0 0 0	
CM1214	14 Aug	A	M		R 5 5 5 5 5 5 0 0 0 0 L 5 5 5 5 5 5 5 0 0 0	
CM1215	14 Aug	A	M		5 5 5 5 0 0 0 0 0 0 v	
NMNZ8499	15 Aug	A	M	m	5 5 0 5 5 5 0 0 0 4 * s	
NMNZ11925	26 Aug	A	M	m	0 0 0 5 5 5 5 0 0 0 b	
NMNZ16256	12 Sep	A	F	m	0 0 5 5 5 5 5 0 0 5 s *	
NMV4342	13 Sep	A	M		5 5 0 0 5 5 5 0 0 0 s s	
NMV8130	6 Oct	A	?		8 8 8 8 8 8 8 8 8 8 all ± similar age	B
NMNZ12947	19 Oct	A	M	i	0 0 0 5 5 5 0 0 0 0 v	A
NMNZ14541	30 Oct	A	M	i	0 0 0 0 0 5 5 0 0 0 s v	A
NMNZ14542	30 Oct	A	F	i	8 5 5 5 5 5 5 0 0 0 v	A
AIM150.7	26 Nov	A	M		5 5 5 5 5 5 0 5 5 5 s m s	
NMNZ21198	27 Nov	A	M	m	5 5 5 5 5 5 5 0 0 0	D
NMNZ21197	27 Nov	A	F	m	5 5 5 5 5 0 0 5 5 5	D
NMV(W)4894	- Nov	A	F		5 5 5 5 5 5 5 0 0 0 *	
NMNZ19244	2 Dec	A	M	i	5 5 5 0 0 0 0 5 5 5 * s	A
NMNZ19245	2 Dec	A	F	i	5 5 5 0 0 0 0 0 0 0 s	A
AIM150.8	21 Dec	A	M		5 5 5 5 5 5 5 0 0 0 f s f s f v	
CM2304	27 Dec	A	F		•5 0 5 0 5 0 0 5 5 5 s	
AIM150.3	- Dec	im	M		0 0 0 0 0 0 0 0 0 0 s m v	
CM1219	- -	A	M		5 0 0 5 5 5 5 0 0 0	
AIM122	- -	A	-		0 0 0 0 0 0 0 0 0· 0 s m v	
AIM150.12	- -	im	-		5 0 0 5 5 5 5 0 0 0 v f m v	
AIM150.11	- -	A	-		R 5 5 5 5 5 5 5 4 2 0 s f s f s v L 5 5 5 5 5 5 5 4 2 2 s f s	

TABLE 2 — Age and moult status of the primaries of Shy Mollymawks collected in New Zealand and Victoria

Ref. No.	Date	Age	Sex	Race	Inner -- Primaries -- Outer	Locality
NMV4341	20 Aug	J	M	?	5 5 5 5 5 5 5 5 5 5	
NMNZ9245	28 Sep	J	F	c	5 5 5 5 5 5 5 5 5 5	
NMNZ8401	5 Jan	A	F	s	5 5 5 5 5 5 5 0 0 0 s s	
NMNZ22275	16 Jan	im	F	c	5 5 0 5 5 5 5 0 0 0 b s v	A
NMNZ22276	16 Jan	A	M	c	5 5 5 5 5 5 0 0 0 0 s v	A
NMNZ17632	20 Jan	A	M	c	0 0 0 0 5 5 5 0 0 0 v	
NMNZ5588	26 Jan	A	F	c	8 5 5 5 5 0 0 0 0 0 s	
NMNZ17007	10 Feb	A	F	c	5 5 5 5 5 5 5 0 0 0 s f v	
NMNZ17282	15 Feb	A	M	c	5 5 5 5 5 5 0 0 0 0 s v	B
NMNZ17283	15 Feb	A	F	c	5 5 5 5 5 5 5 5 5 5 all + similar age	B
NMNZ17385	15 Feb	A	F	c	5 5 5 0 0 0 0 5 5 5 s m s	B
NMNZ12301	17 Feb	A	F	s	5 5 0 5 5 5 5 0 0 0 m s m v	
NMNZ1310	17 Feb	A	M	s	5 5 5 5 5 5 5 5 0 0 s s v	
NMNZ1309	18 Feb	A	M	s	5 5 5 5 5 5 5 0 0 0 s v	
NMNZ17387	21 Feb	A	M	c	5 5 5 5 0 0 0 0 0 0 f s v	B
NMNZ17386	21 Feb	A	M	c	5 5 5 5 5 5 0 5 5 5 s m s	B
NMNZ1313	27 Feb	A	F	s	5 5 5 5 5 5 5 0 0 0 f s v	B
NMNZ9893	- Feb	A	M	s	5 5 5 5 5 5 5 0 0 0 s v	
NMV1824	27 Feb	A	?	?	5 5 5 5 5 5 5 0 0 0 s v	A
NMNZ5583	7 Apr	A	F	c	0 0 0 0 0 0 0 0 0 0 s v	
NMNZ14566	7 Apr	A	M	c	5 5 5 5 5 5 5 5 5 5 all + similar age, outer 6 more worn than inner 4	
NMNZ13332	11 Apr	A	M	c	0 0 0 0 0 0 0 2 0 0 s	
NMNZ13382	14 Apr	im	F	c	5 5 5 0 0 0 0 0 4 2 s	
NMNZ13381	14 Apr	A	M	c	5 5 5 5 5 5 0 0 0 0 s m v	
AIM153.8	15 Apr	A	M	c	5 5 5 5 5 5 5 5 5 5 all + similar age	
NMNZ13445	17 Apr	A	F	c	5 5 0 0 0 0 0 4 2 1	
AIM923.2	26 Apr	im	?	e	5 5 5 5 5 5 5 5 5 5 s	
NMV11447	7 Jun	A	M	?	- - - 0 4 0 5 0 0 0 *	
CM2294	- Jun	A	F	c	0 0 0 0 0 0 0 5 4 2	
NMNZ15522	- Jun	A	F	s	5 5 5 5 5 5 5 0 0 0 s v	
AIM128/24	- Jun	A	M	c	5 5 5 5 5 5 0 0 8 8 s m s m v	
NMNZ5587	9 Jul	A	?	c	5 5 5 0 5 0 0 0 0 0 *	
NMNZ7630	11 Jul	A	F	c	0 0 0 0 0 0 0 0 0 0 m s v	
AIM153.6	27 Aug	A	M	c	5 5 5 5 5 5 5 0 0 0 f s v	
AIM991.5	27 Aug	A	M	s	5 5 5 5 5 5 5 0 0 0 f s f v	
NMNZ7803	2 Sep	A	M	s	5 5 5 5 5 5 0 5 5 5 f m f	
NMNZ1314	18 Sep	A	M	s	5 5 0 0 0 0 0 0 5 5	
NMV228	21 Sep	A	M	?	5 5 5 5 0 0 0 0 0 0 * s	
NMV4783	27 Sep	A	M	?	5 5 5 5 5 5 5 0 0 0 v	
NMV230	28 Sep	A	F	?	- - - - 0 0 0 5 5 5 * s	
NMNZ13714	29 Sep	A	M	s	5 5 5 5 5 5 5 5 5 5 f m f	
NMNZ1316	- Sep	A	?	s	0 0 0 0 0 0 0 5 5 5 s m v s	
NMNZ1315	- Sep	A	?	s	0 0 0 0 0 0 0 0 0 0 s m s	
NMV231	15 Oct	A	F	?	0 0 0 0 0 0 0 0 0 0 alll + similar age	
NMNZ21379	- Oct	im	F	c	0 0 0 0 0 0 0 0 0 0 s m v	
NMV283	4 Nov	A	?	?	- - 5 5 5 5 5 0 0 0 v	
NMNZ1321	11 Nov	A	F	s	5 5 5 5 5 5 0 5 5 5 m	
NMNZ16414	17 Nov	A	M	s	5 5 5 5 5 5 5 5 5 5 f s f	
NMNZ21367	19 Nov	A	M	s	5 5 5 5 5 5 5 5 5 5 m	
NMNZ21368	19 Nov	A	M	s	5 5 5 5 5 5 5 0 0 0 m/v	
NMNZ21369	19 Nov	A	M	s	5 5 5 5 5 5 5 5 5 5 *	
NMNZ21364	19 Nov	A	F	s	5 5 5 5 5 5 5 0 0 0 f v	
NMNZ21366	19 Nov	A	F	s	5 5 5 5 5 5 5 0 0 0 f v	
NMNZ21365	19 Nov	A	F	s	5 5 5 5 5 5 0 5 5 5	

	Date	Age	Sex	Race	Inner -- Primaries -- Outer	Locality
5	20 Nov	A	F	s	5 5 5 5 5 5 5 5 5 5 *	
	21 Nov	A	F	s	5 5 5 5 5 5 5 0 0 0 s m v	
	21 Nov	A	M	s	0 5 0 0 0 0 0 5 5 5 m m	
1	22 Nov	A	F	c	5 5 0 5 0 0 0 0 0 0 b *	A
0	22 Nov	A	M	c	5 5 5 5 5 5 0 0 0 0 s * s	A
	4 Dec	A	M	c	R 5 5 5 0 5 5 5 0 0 0 s v L 5 5 5 5 0 0 0 0 0 0 m v	
	4 Dec	A	M	c	5 5 5 5 5 5 5 0 0 0 s f m	
	9 Dec	A	?	c	5 5 5 5 5 5 5 0 0 0	
8	9 Dec	A	M	c	- - - - - - 5 0 0 0	B

Ref. No.	Date	Age	Sex	Race	Inner -- Primaries -- Outer	Locality
AIM153.15	10 Dec	A	M	s	5 5 5 5 5 5 5 0 0 0 s v v	
CM16139	14 Dec	A	M	c	5 5 5 0 0 0 0 5 5 5 s	
NMNZ17388	21 Déc	A	F	c	5 5 5 5 0 5 0 0 0 0 s s * m	B
CM155	- Dec	A	F	c	R 5 5 5 5 5 5 0 5 5 5 s L 5 5 5 5 5 0 0 5 0 5 *	
CM156	- Dec	A	M	c	R 5 5 5 5 5 5 5 0 0 0 s L 5 5 5 5 5 5 0 0 0 0	
AIM153.39	- Dec	A	M	c	5 5 5 5 5 5 5 0 5 5	
AIM99104	- Dec	A	?	s	5 5 5 5 5 5 5 5 5 5 s	
AIM991.3	- Dec	A	M	s	5 5 5 5 5 5 5 5 5 5 s f m s m f s	
AIM991.2	- -	A	M	s	5 5 5 5 5 5 5 5 5 5 s m s	

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SHORT NOTE

Variation in leg colour of Black-winged Petrels

During 1988-89 visits to Macauley and Curtis Islands, in the Kermadec group, we examined the legs of over 500 Black-winged Petrels (*Pterodroma nigripennis*). The ends of the webs and toes and all of the outer toe were black on each bird examined. However, there was considerable variation in the coloration of the remainder of the feet and tarsus. Most birds had mauve or pink legs but extremes were from very pale flesh coloured or almost white to distinctly pale blue.

Seventy *et al.* (1971, *Handbook of Australian Sea-birds*) noted that most Black-winged Petrels' legs were largely flesh coloured but occasional individuals had blue legs. They referred to a specimen taken on Norfolk Island and others that had been collected at sea with blue legs. The presence of Black-winged Petrels with blue legs on Macauley and Curtis Islands clearly demonstrates that this colouring is not confined to birds from one colony. Moreover, rather than there being two distinct colour phases, our findings show that flesh and blue are extremes of considerable colour variation.

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