RED KNOT *CALIDRIS CANUTUS ROGERSI* IN AUSTRALIA

Part 2. Biometrics and moult in Victoria and North-western Australia

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Data obtained from approximately 1 450 Red Knot caught in north-western Australia (NWA) and Victoria from 1978 to 1988 have been analysed with respect to biometrics, primary feather and breeding plumage moult, age structure, longevity and site fidelity. On average, adults have wing-lengths of about 166 mm and first-years of 150 mm. Bill (*c.* 33 mm) and total-head lengths (*c.* 61 mm) vary little according to age. Victorian adults and second-year birds weigh, on average, about 117 g and first-years 110 g. All age groups in NWA are approximately 6 g lighter than those in Victoria. Weights of both adult and first-year birds are variable throughout the non-breeding season in Victoria, and this is probably caused by the presence of birds on passage to and from New Zealand. Adult primary moult in Victoria has a duration of about four months which is similar to that of Curlew Sandpipers (125 days) and Red-necked Stints (130 days). Primary moult in adult birds in NWA commences in the second half of August and is six to seven weeks in advance of the same age groups in Victoria. Second-years are completing moult at both sites at the same time as adults are beginning. A majority of first-year birds undergo some degree of primary moult during the January/April period although only a proportion appear to achieve a complete moult. The primary moult situation in Victoria in October/November is complex with adults and second years falling into three categories - moulting, non-moulting and suspended moult. It is suggested that the latter two categories could contain passage migrants on their way to New Zealand. Adult Red Knot commence moult into breeding plumage before departure and still have retained breeding plumage upon return. Data on breeding success, which is based on the percentage of first-years in catches, is limited but agrees with count data and 1985 was confirmed as a good breeding year for Red Knot. The longest interval between original banding and recapture is eight years, this record being for a first-year bird. Red Knot exhibit high non-breeding site fidelity in both NWA and Victoria, with any movements being of short distance and confined generally to first-year birds in Victoria. More information is needed on moult and weight of aged birds in order that the moult and migration strategies of Red Knot in Australia can be better understood.

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INTRODUCTION AND METHODS

Part 1 of this paper (Barter *et al.* 1988) covered sub-species confirmation and the distribution and migration of Red Knot spending the non-breeding season in Australia. It was confirmed that Red Knot in Australia are of the *rogersi* sub-species and estimated that at least 160 000 individuals spend the non-breeding season in Australasia, with the majority being located in northern Australia and New Zealand. There have been thirteen movements of banded birds linking Australia with China and New Zealand. North-western Australian Red Knot appear to be capable of flying non-stop from there to China, however little is known about the migration strategies of birds which spend the non-breeding season in Victoria and New Zealand.

Since Part 1 was written a further 722 Red Knot have been caught in north-western Australia (NWA) during the March/April 1988 Australasian Wader Studies Group Expedition and data from these birds have been included in the current analysis, which covers birds caught in NWA and Victoria during the 1978 to 1988 period.

Methods are as described in Part 1. The ageing convention is:

3+ - in third year or older,
2+ - in second year or older,
2 - in second year,
1 - in first year.

3+ and 2+ birds are also referred to as adults and first-years as juveniles. First-year birds become second-years on 1 August.

RESULTS AND DISCUSSION

Wing, bill and total-head length measurements

Average data by age group are given in Tables 1-6. Wing-length measurements were taken to the nearest whole mm and total-head lengths to the nearest 0.1 mm. Bill-lengths were measured, at different times, to accuracies of 0.1, 0.5 and 1.0 mm. The results obtained using the different accuracies were not significantly different ($p > 0.05$) and have been combined.

Average adult (3+ and 2+) wing lengths in

Table 1. Wing-length (mm) data for different age groups of Victorian Red Knot

Age	Sample Size	Mean	sd	Range
3+	250	165.7	4.4	149-177
2+	130	165.2	4.4	153-176
2	63	161.4	7.4	143-174
1	312	158.8	5.6	146-174

Table 2. Wing-length (mm) data for different age groups of NWA Red Knot.

Age	Sample Size	Mean	sd	Range
3+	131	164.3	4.5	148-176
2+	439	166.3	4.3	156-177
2	35	160.6	5.6	145-170
1	68	160.1	6.3	146-168

Victoria and NWA are similar (*c.* 166 mm) and are about 7 mm longer than those of first-year birds (*c.* 159 mm) (see Tables 1 and 2).

Average wing-lengths of second-year birds are longer than those of first-years due to the fact that a proportion of first-years undergo a complete primary moult in the January/April period (see Primary Feather Moult) and replace old and worn outer primaries with new and longer feathers of similar length to those of adults. For example, a June catch of eleven-month old birds in Victoria gave a significantly longer average wing-length ($p<0.005$) for those with new outer primaries (166.2 mm) compared to those with old (158.4 mm).

The average bill-length of adult (3+ and 2+) birds in both NWA and Victoria are similar, *i.e.* 32.8 mm, whilst those of second-years in Victoria (32.9 mm) and first-years in both NWA and Victoria (32.5 mm and 32.8 mm, respectively) are either the same as or not significantly different to the adult average ($p>0.05$).

Table 3. Bill-length (mm) data for different age groups of Victorian Red Knot.

Age	Sample Size	Mean	sd	Range
3+	277	32.7	1.6	28.5-39.4
2+	166	33.1	1.8	27.1-38.8
2	135	32.9	1.7	27.0-37.5
1	371	32.8	1.8	28.3-37.9

Table 4. Bill-length (mm) data for different age groups of NWA Red Knot. Only 3 second-year birds were measured and have not been included.

Age	Sample Size	Mean	sd	Range
3+	59	33.1	1.9	29.0-38.5
2+	373	32.8	1.6	29.0-37.0
1	45	32.5	1.4	29.7-35.6

The similarity of the total-head length measurements for the different age groups and sites (*c.* 61 mm - see Tables 5 and 6) indicates that this measurement is probably more consistent, and thus more reliable, than either wing or bill-length.

Table 5. Total head-length (mm) data for different age groups of Victorian Red Knot.

Age	Sample Size	Mean	sd	Range
3+	72	61.0	2.0	55.8-64.5
2+	133	61.0	2.3	55.1-66.0
2	10	60.7	2.2	56.9-63.7
1	139	60.9	2.1	57.3-68.5

Table 6. Total head-length (mm) data for different age groups of NWA Red Knot.

Age	Sample Size	Mean	sd	Range
3+	70	61.1	2.0	56.2-65.3
2+	188	60.8	2.1	55.1-66.0
2	29	60.3	2.2	57.4-64.0
1	20	61.1	1.0	58.6-62.6

Weight

The average weight data by region, age group and month are given in Tables 7 and 8, with the results being shown graphically in Figure 1. Weight comparisons for re-trapped adults (different years) and first-year birds in Victoria are shown in Figures 2a and 2b.

Victorian adult Red Knot appear to be about 6 g heavier, on average, than their NWA counterparts, *i.e.* 117/118 g *vs.* 110/112 g, during the October/November period. Great Knot *Calidris tenuirostris* were also found to be heavier in Victoria than in NWA (Barter 1987). The weights of second year birds in the two regions are similar to those of adults.

Victorian first-years are also heavier, on average, than those in NWA although the absolute difference is difficult to determine due to the high weight variability of Victorian birds. Disregarding obvious peaks in weight, Victorian first-years average between 106 and 115 g whilst NWA birds of the same age vary from 100 to 105 g.

Similar latitudinal weight differences have been found in the European-African non-breeding area (Dick & Pienkowski 1979), where Red Knot in England were found to be up to 23% (adults) and 66% (first-years) heavier than their counterparts in north-west Africa during the September/November period. Dick & Pienkowski (1979) suggest that the weight differences are due to the need for birds in the colder non-breeding areas to have fat reserves in order to withstand the harsher conditions and the higher probability of low prey availability. They further suggest that where adverse conditions are infrequent, "the cost of storing and carrying reserves are likely to exceed the benefits". The weight differences are less within Australia (6-7% for each of the three age groups) and this is probably due to the much milder conditions which exist during the non-breeding season in Victoria than in England.

Table 7. Victorian weight (g) data by age and month.

Age	Month	Sample Size	Mean	sd	Range
3+-2+	Oct	186	117.9	11.4	95-142
	Nov	79	116.6	12.0	92-150
	Dec	27	122.6	7.2	110-140
	Feb	20	127.5	9.4	110-142
	Mar 1st half	4	127.3	13.2	116-146
	Mar 2nd half	21	175.1	13.2	150-200
2	Oct	43	119.2	13.9	90-155
	Nov	88	114.8	11.7	89-141
1	Oct	21	106.1	13.0	88-140
	Nov	65	114.8	12.9	89-143
	Dec	77	126.6	13.6	86-168
	Jan	32	117.0	8.2	98-130
	Feb	37	115.1	7.6	102-131
	Mar 1st half	17	110.3	9.3	100-122
	Mar 2nd half	9	128.4	20.1	87-158
	Apr	31	126.1	14.7	100-168
	Jun	31	128.7	15.8	104-162
	Jul	70	114.8	9.4	95-141

Table 8. NWA weight (g) data by age and months.

Age	Months	Sample Size	Mean	sd	Range
3+-2+	Aug-Sept	83	110.2	7.7	91-128
	Oct-Nov	81	111.8	8.1	95-152
	3rd week Mar	119	128.4	15.2	100-166
	4th week Mar	399	138.1	16.7	100-187
	1st week Apr	190	142.1	15.1	94-179
	2nd week Apr	148	119.7	12.3	95-136
	3rd week Apr	67	125.3	14.4	97-153
2	Aug-Sept	34	108.7	8.8	96-121
	Oct-Nov	13	109.2	7.9	92-122
1	Oct-Nov	30	100.5	10.5	81-119
	3rd week Mar	30	101.3	10.1	86-130
	4th week Mar	30	100.7	6.8	91-117
	1st week Apr	26	99.1	7.3	85-112
	2nd week Apr	2	108.0		108
	3rd week Apr	20	104.5	12.1	80-124

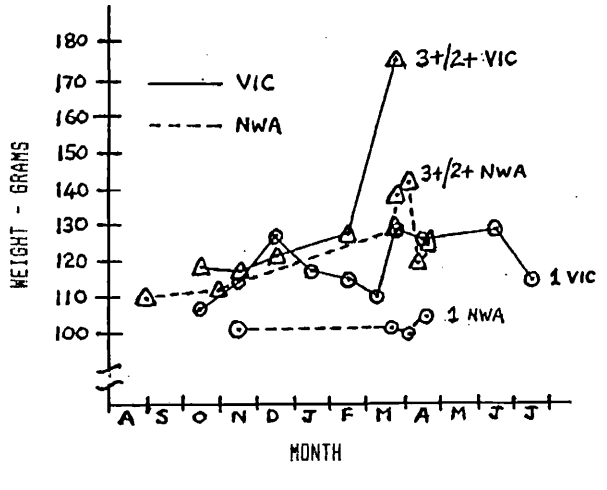

Figure 1. Red Knot weights in Victoria and north-western Australia. See Tables 7 & 8 for sample sizes and standard deviations.

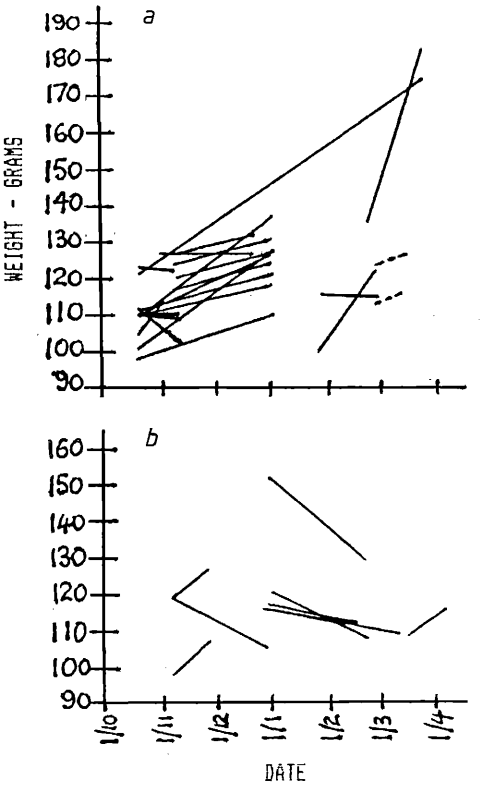

Figure 2. Weights of a). adult (age 3+ and 2+ years) and b). first-year Red Knots retrapped in Victoria.

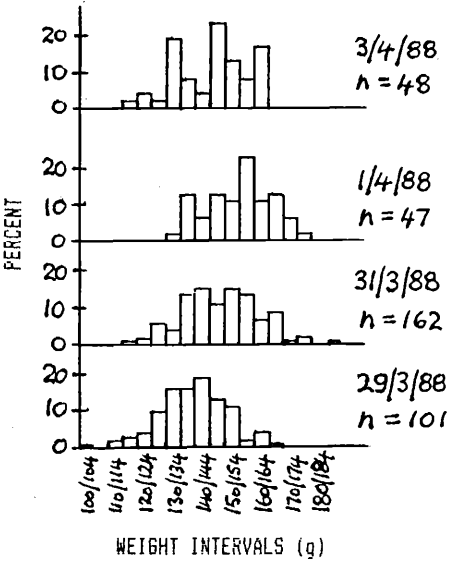

Figure 3. Histograms of the weights of four successive catches of adult Red Knots in north-western Australia, with major departures occurring on 1 April 1988.

The average weights of both Victorian adult and first-year birds is quite variable throughout the non-breeding season. It is known that birds pass through Victoria to New Zealand on southward migration (Barter *et al.* 1988) and, thus, the weight variations may be due to pre-migratory fattening of passage birds.

The variation in average weekly weights of adults in NWA during the March/April period, as detailed in Table 8, indicates that migration turnover is occurring. This is shown more clearly in Figure 3 in which weight histograms for four successive catches at Anna Plains are shown (*i.e.* 29 and 31 March, 1 and 3 April 1988). Migration was observed, by use of radar, to occur on 25 and 26 March and 1 April (Murlis *et al.* 1988). Weights increased steadily from 29 March to 1 April and then declined sharply following the departure of the heavier birds, *i.e.* those above about 165 g.

Primary Feather Moult

Primary feather moult data are shown graphically in Figures 4 to 8.

On average, Victorian adult Red Knot commence moulting during the second-half of October and complete moult in late February/early March (Figure 4). The moult duration of about four months is similar to that previously recorded of 125 days for Curlew Sandpiper *Calidris ferruginea* in Tasmania (Barter 1986a) and 130 days for Red-necked Stint *C. ruficollis* in Victoria (Paton & Wykes 1978). However, more data are required, especially in the January/February period, in order to allow a more accurate definition of the moult period to be obtained. Data from retraps, all in different years, are shown in Figure 5 and are consistent with a moult duration of approximately 120 days.

In Victoria, primary moult in second-year birds commences at the innermost primary and is about two months ahead of that of adults (Figure 6), *i.e.* Median Primary Moult Score (MPMS) = 30 reached in mid-October by second-years and mid-December by 3+ birds. Second-years start to complete moult in October, which is about the same time that adults are commencing moult. This moult is completely separate to the primary moult undergone by some first-year birds. Often, feathers of three different ages are found in the same wing, *i.e.* juvenile, first-year moult (February/April) and active second-year moult.

Adults in NWA start primary moult in the second-half of August and have reached MPMS 30 by end October/early November (Figure 7). Thus, they are six to seven weeks ahead of Victorian birds of the same age. NWA second-year birds have a MPMS of 40 to 50 by the end of August and, as with Victorian second-years, are completing moult as adults are commencing.

The timing of primary moult in Red Knot in both NWA and Victoria is consistent with the general observation (although there are exceptions) that waders which breed in the Palearctic and spend the non-breeding season in the southern hemisphere do not commence primary moult until they reach their non-breeding destinations (see, for example, Pearson 1981, 1984, Elliot *et al.* 1976, Barter 1986a, 1986b, 1987).

Differences in the timing of primary moult in the two regions and between the two age groups may be explained by the earlier arrival of adults in NWA compared to Victoria (*i.e.* mid-August *vs.* early October) and the fact that

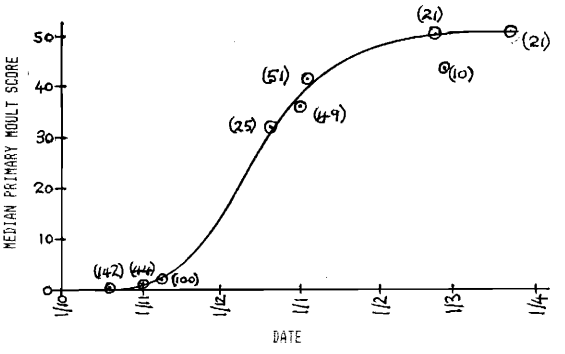

Figure 4. Victorian adult (3+ and 2+) Red Knot primary moult scores.

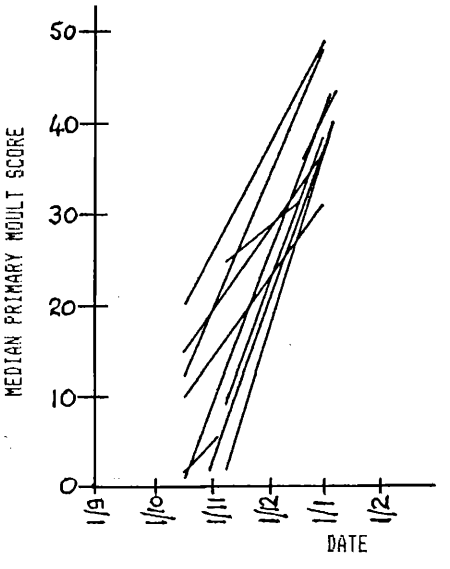

Figure 5. Moult scores of individual Victorian adult Red Knots retrapped in different years.

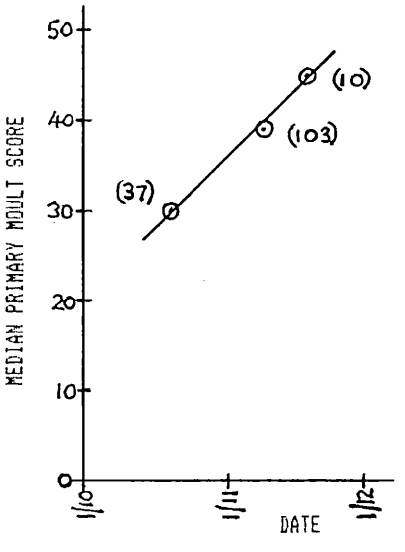

Figure 6. Victorian second-year Red Knot primary moult scores.

many, if not all, first year birds spend the non-breeding season near, or at, the non-breeding sites, thus allowing them to commence primary moult, as second-years, before the returning adults.

Analysis of primary moult data for adult and second-year birds in Victoria is complicated by the through-passage in the October/November period of Red Knot bound for New Zealand. Data from three adults banded in Victoria during this period, and subsequently controlled in New Zealand, shows that none of the birds was in primary moult and all were heavier than the flock averages, although not significantly so ($p>0.05$). However, a number of other birds, which had also not commenced primary moult at the same time as the subsequent New Zealand controls, were caught later in Victoria and, therefore, the presence or absence of primary feather moult cannot alone be used to separate passage birds from those which choose to remain in Victoria.

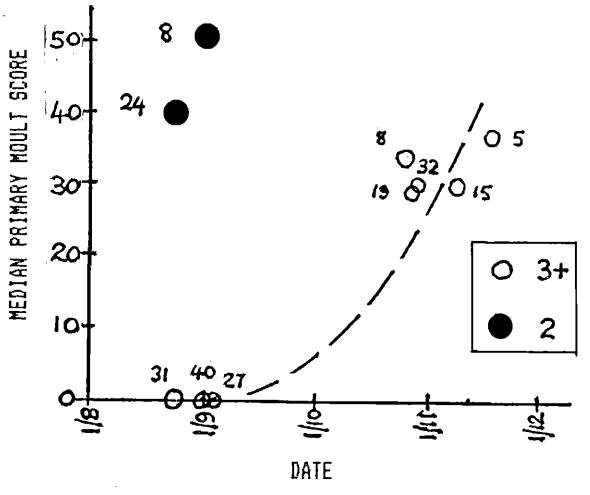

Figure 7. North-western Australia 3+ and second-year Red Knot primary moult scores.

A substantial portion of both 3+ and second-year birds caught in the October/November period are in suspended moult (see Table 9), with the inner group of feathers being the newest. 3+ birds in suspended moult are far more advanced in moult score than those adults in active moult (*i.e.* MPMS 20 *vs.* 2 on 19 October 85, 30 *vs.* 9 on 8 November 86), whereas second-year birds are behind (*i.e.* MPMS 30 *vs.* 43 and 35 *vs.* 39, respectively). The sites at which moult commences for those adults and second-years which are in suspended moult is not known. However, they could be NWA in the case of adults and Queenscliff for second-year birds.

The average weight of 3+ and second-year birds in the three moult categories, "non-moulting", "suspended moult" and "moulting", are given in Table 9 for three Queenscliff catches during the October/November period. It can be seen that non-moulting 3+ birds are lighter than moulting birds in mid-October, but by early November they are significantly heavier ($p=0.01$). The standard deviation of weight is

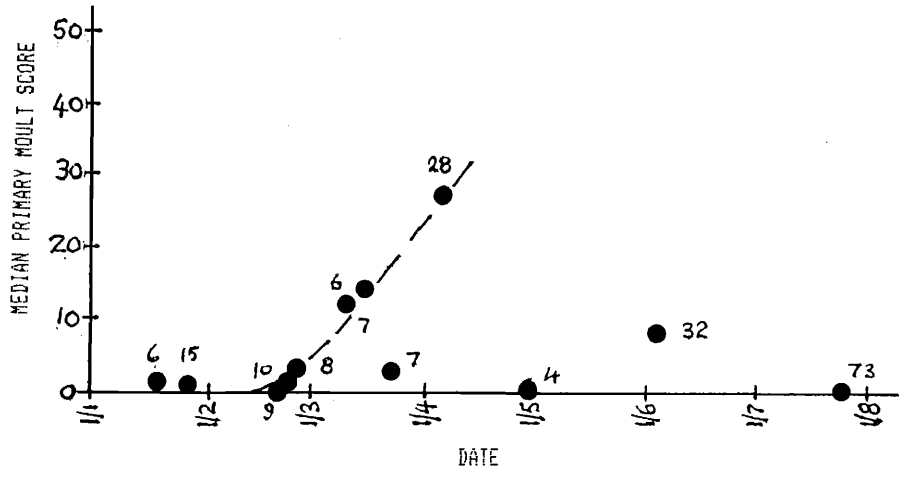

Figure 8. Victorian first-year Red Knot primary moult scores.

Table 9. Weight data for Victorian 3+ and second-year birds in different moult categories.

Age	Date	Non-Moulting			Suspended Moult			Moulting		
		Sample Size	Mean	sd	Sample Size	Mean	sd	Sample Size	Mean	sd
3+	19 Oct 85	111	116.4	11.8	20	116.5	15.0	14	120.2	8.1
	31 Oct 82	14	121.4	8.6				29	121.1	8.2
	8 Nov 86	35	120.7	13.0	10	115.1	15.6	28	114.2	7.0
2	19 Oct 85				16	125.6	13.4	13	111.8	12.9
	8 Nov 86	5	115.4	13.0	16	120.3	12.3	51	112.4	10.4

Table 10. Percentage of 3+ Red Knot weighing more than 130 g on three dates during their potential passage period to New Zealand. ( ) = Sample Size.

Date	Non-Moulting	Suspended Moult	Moulting
19 Oct 85	20 (106)	33 (21)	14 (14)
31 Oct 82	21 (14)		10 (30)
9 Nov 86	24 (38)	10 (10)	0 (28)

Table 11. Percentage of second-year Red Knot weighing more than 130 g on two dates during potential passage period to New Zealand. ( ) = Sample Size.

Date	Non-Moulting	Suspended Moult	Moulting
19 Oct 85		43 (14)	17 (12)
9 Nov 86		24 (17)	8 (48)

greater for non-moulting than moulting birds in all catches. The average weight of adults in suspended moult do not vary over the period, and are not significantly different from those of either non-moulting or moulting birds ($p>0.05$). However, the standard deviations of weight of those birds in suspended moult are much greater than those of birds in the other two moult categories, indicating the possible presence of passage birds.

Second-year birds in suspended moult are significantly heavier than non-moulting birds in both the October and November catches ($p<0.01$ and $p<0.001$ respectively). Standard deviations of weight are also higher for the former than the latter.

The average Red Knot would need to weigh about 130 g or more in order to migrate successfully to New Zealand (Barter *et al.* 1988). The percentages of the two age groups, by moult category, which weigh 130 g or more are given in Tables 10 and 11. It can be seen that, in all cases, a smaller percentage of birds in active wing moult have reached the theoretical migration weight than in the other two categories, *i.e.* non-moulting and suspended moult.

The weight data (average weight, standard deviation and percentage greater than 130 g) indicates that some, at least, of the non-moulting or suspended moult 3+ and second-year birds are using Queenscliff as a staging site before migrating further to New Zealand. A more complete understanding of the migration strategy of the two age groups will require additional moult and weight data, especially from birds caught more than once in the same season.

Many first-year birds undergo a partial or complete primary feather moult. Data for Victorian birds are shown in Figure 8 and for NWA birds in Table 12. Some Victorian first-years commence moulting their primaries as early as January, with the MPMS increasing sharply from late February (1-3) through to early April (27). The percentage of first-years in primary moult in Victoria also increases to between 50 and 100% of a catch by March/April. However, in two good-sized catches of Red Knot in June and July, *i.e.* of first-years remaining in Australia during the breeding season, the MPMS values had decreased to 8 and 0, respectively, with 59 and 38% of the birds having commenced moult and only 9 and 4% respectively, having completed a full primary moult. The results suggest that many of the birds that have commenced primary moult in Victoria in the January to April period leave for more northerly latitudes during the southern winter and that those that do not moult, or do so late, together with, perhaps, first-years from New Zealand remain in Victoria during the breeding season.

The percentage of first-years which undergo a full primary moult is unknown, although less than 10% of those remaining during the southern winter have replaced all their feathers. In north-western Australia, it seems probable that more than 20% complete primary moult, and in late-March and mid-April MPMS values in this region are similar to those for Victorian birds (see Table 12).

The symmetry and starting point of moult in first-year birds is highly variable. In Victoria, out of a total of 76 birds analysed, 56% had the same moult score for both wings whilst 31% differed by more than 5 points. For those birds in which the starting point(s) for moult could be determined, 42% had commenced at the innermost feathers, 31% amongst the outer feathers, 19% were moulting in both regions and 8% had started moulting from the centre.

Breeding Plumage

In some of the catches the amount of breeding plumage was assessed subjectively for each bird and catch averages for Victorian and NWA are given in Tables 13 and 14. The degree of breeding plumage is given as a decimal fraction, *e.g.* 1.0=100%.

In Victoria, adult Red Knot commence moult into breeding plumage in February and, on average, have attained around 60% breeding plumage prior to departure in late March/early April. Some still retain a small amount of breeding plumage at the beginning of November. Interestingly, 70-80% of the first-year birds spending the non-breeding season in Victoria gain traces of breeding plumage.

In NWA, breeding plumage levels are variable in the March/April period and were noticeably

Table 12. Primary moult data for first-year Red Knot in NWA. MPMS = Median Primary Moult Score.

Date	Sample Size	MPMS	% Moulting	% Completed
24-26 Mar 85	35	25	69	3
23-26 Mar 88	22	0	41	0
04-06 Apr 88	24	0	67	0
19 Apr 85	19	25	63	21

Table 13. Breeding plumage levels for 3+/2+ and first-year Red Knot in Victoria.

Age	Date	Sample Size	Breeding Plumage
3+/2+	31 Oct 82	44	0.06
	8 Nov 86	76	0.11
	21 Feb 87	20	0.21
	22 Mar 80	21	0.60
	3 Jun 84	31	0.20
1	24 July 83	69	0.18

Table 14. Breeding plumage levels for 3+/2+ and second-year Red Knot in NWA.

Age	Date	Sample Size	Breeding Plumage
3+/2+	24 Aug 82	29	0.42
	2 Sept 82	7	0.32
	23 Mar 88	72	0.84
	24 Mar 85	43	0.52
	25 Mar 85	35	0.53
	25 Mar 88	34	0.73
	26 Mar 85	35	0.53
	29 Mar 88	183	0.87
	31 Mar 88	163	0.83
	1 Apr 88	46	0.87
	3 Apr 88	50	0.86
	6 Apr 88	58	0.83
	13 Apr 85	149	0.66
	17 Apr 85	56	0.58
2	24 Aug 82	23	0.08

Table 15. Age-structure of Red Knot at three Victorian sites during November to March in the 1978/87 period.

Site	No. of Adults	No. of 2s	No. of 1s	% 1s
Werribee	27	3	128	81
Yallock Creek	1		20	95
Queenscliff	283	109	104	21

higher in 1988 (compared to 1985) when lengthy adverse weather conditions delayed departures. Average catch weights were also much higher in 1988. The reason for the difference in breeding plumage levels between years is not clear but it could be due to the enforced late departure in well-developed breeding plumage in 1988 of Red Knot which had spent the non-breeding season in NWA. In 1985 these birds had left by late March and had then been replaced by Knot with less-well developed breeding plumage from south-eastern Australia and New Zealand.

Adult Red Knot arriving in NWA in late August/early September still retain 30-40% breeding plumage.

Breeding Success

Determination of breeding success is complicated by the obvious preference of first-year Victorian birds for Werribee and Yallock Creek, when compared to Queenscliff. Details of population and structure are given in Table 15, which contains the accumulated data for the three sites during November/March in the 1978-1987 period. It can be seen that the percentage of first-years ranges from 81-95% at Werribee and Yallock Creek, but is only 21% at Queenscliff.

Catches at all three sites have been fairly evenly distributed over the ten year period, although larger numbers have been caught at Queenscliff during the latter years. Whilst catches were made with mist-nets in the earlier years at Werribee, comparison with cannon-net results at the same site in later years shows that the difference in proportion of first-years caught by the two methods is not significant ($p>0.05$).

Details of the ages of birds caught annually at Queenscliff in the November/March period are given in Table 16. The data on their own are too limited to allow any definite conclusions to be drawn concerning annual differences in breeding success, except that the high proportion of second-year birds in 1986/87 (37%) is consistent with the high percentage of first years in the previous season (32%), thus confirming that the 1985 breeding season was successful for Red Knot. Although the data is limited, it is in fact consistent with breeding success results obtained from count data, in which the numbers of first-years remaining in Australia during the breeding season are compared with the total numbers of Red Knot present during the previous non-breeding season (Hewish 1987).

Longevity

There is insufficient data available to allow an estimation of the average life of Red Knot to be made. So far, however, the greatest interval between banding and retrap date for an individual bird is 8 years and 2 days, which closely approximates the duration of the catching programme in Victoria. This particular bird was in its first-year when originally caught. Two other birds have intervals of approximately 7 years between banding and recapture. As all of these birds were caught in the 1986/87 season (the latest season for which data is available), there is a good chance that older birds will be recaptured in future years.

Table 16. Age-structure of Red Knot caught during the November/March period at Queenscliff. * = essentially one catch, as others were of single birds. N.B. No data for 1982/83.

Season	No. of Adults	No. of 2s	No. of 1s	% 1s	No. of catches
1979/80	23		7	23	3*
1980/81	2		7		1
1981/82	28	3	7	18	2*
1983/84			1		1
1984/85	51		7	12	1
1985/86	50		24	32	1
1986/87	129	106	51	18	2

Despite these retraps being well above average age for Red Knot in Australia, they have a long way to go in order to emulate the Red Knot which was recently caught in England twenty three years after being first banded (C.D.T. Minton pers. comm.).

Site Fidelity

Only nine birds out of 83 retrapped in Victoria had changed site, with all of these being movements from Werribee to Queenscliff, a distance of 27 kilometres. Seven of the birds were first-years when banded and thus provide further evidence that Werribee is the site used by juveniles which have been out-competed by adults in Queenscliff.

All retraps in NWA occurred at the original banding site.

FURTHER WORK

Wing, bill and total-head lengths of the different age groups of Red Knot in Australia have been well defined and there does not appear to be any reason to continue collecting such data.

However, it is still necessary to obtain wing moult and weight data for aged birds, especially in the November to February period in Victoria, in order to improve our understanding of the moult and migration strategies of Red Knot within Australasia.

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