RED KNOT *CALIDRIS CANUTUS ROGERSI* IN AUSTRALIA

Part 1: Sub-species Confirmation, Distribution and Migration*

Mark Barter, Angela Jessop & Clive Minton

Barter,M., Jessop,A. & Minton,C.D.T. 1988. Red Knot *Calidris canutus rogersi* in Australia. Part 1: Sub-species confirmation, distribution and migration. *The Stilt* 12: 29-32. (*WSG Bulletin* 54: 17-20.)

Average wing (165.3 mm) and bill (32.9 mm) length measurements taken from approximately 700 adult Red Knots caught in Australia confirmed that the subspecies present is *Calidris canutus rogersi*. It is estimated that at least 160 000 Red Knot spend the non-breeding season in Australasia with the greatest numbers being in northern Australia and New Zealand. There are 13 recorded overseas movements of banded birds linking Australia with China and New Zealand. It appears from weight measurements that Red Knots are capable of making long non-stop flights, such as between north-Western Australia and China. However, little is known about staging sites for birds migrating to and from Victoria and New Zealand.

Mark Barter, 21 Chivalry Avenue, Glen Waverley, Vic 3150, Australia;
Angela Jessop, 14 Myrtle Grove, Altona, Vic 3018, Australia;
Clive Minton, 165 Dalgetty Road, Beaumaris, Vic 3193, Australia.

INTRODUCTION

Four sub-species of Red Knot *Calidris canutus* are now widely recognised (Cramp and Simmons 1983). Separation of the sub-species can be achieved on the basis of measurements, particularly bill and wing, and breeding plumage (Cramp and Simmons 1983, Roselaar 1983, Dick *et al.* 1976, Morrison 1975, Prater *et al.* 1977, Portenko 1972, Conover 1943, Ridgeway 1919, Matthews 1913).

Summaries of sub-species wing and bill length data from various sources are given in Tables 1 and 2.

Information on the breeding and non-breeding distributions of the sub-species is given in Cramp and Simmons (1983) and Roselaar (1983). The full ranges of *rufa* and *islandica* are well known, with the former breeding in the Canadian arctic and spending the non-breeding season in Argentina and the latter nesting in the high Canadian arctic and Greenland and migrating to north-western Europe in the northern winter. The non-breeding ranges of *canutus* and *rogersi* are well defined, being West and South Africa and Australasia respectively, but the exact locations of their breeding grounds in Siberia have not yet been satisfactorily established.

North-eastern Siberia, Alaska and particularly Wrangel Island have been suggested as *rogersi* breeding areas (Portenko 1972, Flint 1972, Cramp and Simmons 1983). Roselaar (1983) disputes the claim that *rogersi* breeds on Wrangel Island and suggests that these birds and those from Alaska form a fifth population that migrates along the Pacific coast of North America to unknown non-breeding sites. More recently Tomkovich (1987) has distinguished four Siberian breeding populations from morphological differences but was unable to assign *rogersi* to any of these. He supports Roselaar's contention that Alaskan, Wrangel Island and migrant Red Knots along the American Pacific Coast are from the same population.

Information on the non-breeding distribution and numbers of Red Knots in Australasia is incomplete as few counts have been undertaken in northern Australia during the non-migratory period. Maximum numbers counted in the main arrival areas, north-Western Australia and the Gulf of Carpentaria, in August to October are 80 000 in each, but numbers have fallen to less than half in north-Western Australia by November (Lane 1987). Better information is available for non-breeding concentrations in southern Australia and New Zealand, where numbers are around 10 000 and 50 000, respectively (Lane 1987, Sagar 1986). It seems that the *rogersi* population in Australasia during the non-breeding season is at least 160 000 and could be closer to 200 000.

Estimated population sizes of the other sub-species are 400 000-500 000, for *canutus* (Dick *et al.* 1987), 430 000 for *islandica* (Cramp and Simmons 1983), and at least 160 000 for *rufa* (Harrington and Twitchell 1982).

This paper records average bill and wing-length data for approximately 1 200 Red Knot which have been caught and banded in north-Western Australia (NWA) and Victoria (in south-eastern Australia) during the period 1978 to 1987. The sample size involved is by far the largest ever achieved for the *rogersi* sub-species. The limited amount of information concerning possible migration routes which has been obtained from banding studies and counts is reviewed. A more detailed analysis of biometric and moult data within Australia is in preparation.

METHODS

Approximately 1 050 Red Knots have been caught in Victoria and 970 in NWA during the study

(* *Editor's note.* This paper is the first to be reprinted from *The Stilt*, with the agreement of the author's and editor. It is part of a reciprocal arrangement aimed at bringing interesting wader information published in *WSG Bulletin* and *The Stilt* to the attention of as many wader workers as possible worldwide. Special arrangements for WSG members to join the Australian Wader Studies Group (AWSG), whose members receive *The Stilt* twice yearly, were included in WSG Bulletin 52. Contact WSG Membership Secretary for further details.)

Table 1. Summary of Red Knot wing-length data from various sources. Data from Morrison are for live birds, others are museum specimens.

		MALE				FEMALE			
Sub-species	Source	Sample size	Mean (mm)	S.D.	Range (mm)	Sample size	Mean (mm)	S.D.	Range (mm)
canutus	Cramp	47	167	2.93	161-173	41	170	2.84	165-176
	Roselaar	59	167.3	2.86	161-173	53	170.5	2.69	165-176
islandica	Prater	29	167.9		166-176	17	170.5		167-177
	Cramp	25	169	3.18	162-173	36	173	3.69	168-181
	Roselaar	46	169.0	3.34	160-174	45	173.2	3.71	167-181
	Morrison				173.4 (n = 741)				
rufa	Roselaar	14	165.8	2.66	159-169	17	171.6	2.73	167-175
rogersi	Roselaar	17	164.4	4.31	157-172	15	168.4	3.58	164-174

Table 2. Summary of Red Knot bill-length data from various sources. Data from Morrison are for live birds, others (except where marked) are museum specimens.

		MALE				FEMALE			
Sub-species	Source	Sample size	Mean (mm)	S.D.	Range (mm)	Sample size	Mean (mm)	S.D.	Range (mm)
canutus	Prater	26	34.5	SE±0.2		17	35.9	SE±0.3	
	Cramp	48	34.7	1.35	32.8-37.2	41	36.6	1.46	33.9-40.4
	Roselaar	60	34.6	1.34	32.3-37.2	53	36.5	1.33	33.9-40.4
islandica	Prater	28	32.6		29-36	18	34.2		31-37
	Cramp	26	32.6	1.11	30.5-34.4	38	34.4	1.54	31.4-36.5
	Roselaar	48	32.2	1.19	29.8-34.6	47	34.3	1.50	31.4-36.7
	Dick *et al.*[1]	92	32.2	SE±0.2		71	34.0	SE±0.2	
	Dick *et al.*[2]	22	31.8		30-34	13	33.7		32-36
	Dick *et al.*[3]				32.5 (n=20, SE±0.3)				
	Morrison				32.7 (n=741)				
rufa	Prater	9	34.7		33-38	8	36.5		35-38
	Roselaar	14	34.8	1.08	33.3-36.4	17	36.7	1.38	35.0-40.2
rogersi	Roselaar	17	31.7	1.20	29.3-33.3	15	33.7	1.36	30.9-36.2

[1] Morecambe Bay
[2] Greenland/Ellesmere Island
[3] Greenland (live birds)

period. Biometric data was obtained from the majority of Victorian birds and from about half of the NWA Knot. Catches in Victoria have been fairly evenly spaced throughout the non-breeding season, i.e. October to March (with some first-year birds being caught in June and July), whilst NWA data has been obtained during five expeditions made in the late August/early September, late October/early November and late March/first-half April periods.

The great majority of birds have been caught by cannon-netting.

Biometric data were obtained using standard methods and birds were aged by primary feather wear and plumage pattern. The ageing convention used is that of the Australian Bird and Bat Banding Schemes.

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

It is generally possible to separate 3+ and second year birds during the October to December period. However, this cannot be done following completion of primary moult in either age group and both are then aged as 2+. Three+ and 2+ birds are often referred to as adults.

RESULTS AND DISCUSSION

Wing and bill length

Wing and bill length data for the four age-groups are given in Tables 3 and 4. Data for all birds of each age-group, from both Victoria and north-Western Australia have been combined. Wing-length measurements were taken to the nearest mm. Bill lengths were measured at various 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.

The wing length differences between 3+ and 2+ birds are not significantly different ($p>0.05$), whilst those between adults (3+ and 2+) and second-year birds, and second-years and first-years are ($p<0.005$).

The wing-length differences between the age-groups is to be expected. It is quite usual for first-year birds to have shorter wings than adults (see, for example, various data in Prater *et al.* 1977). Second-year birds may be expected to have shorter wings than first-years, due to greater feather wear, but some replace all their primary feathers during the first year (Barter *et al. in prep.*), thus raising the average wing-length above that for first-year birds.

Table 3. Wing-length averages for Red Knot in Australia.

Age	Sample size	Mean (mm)	S.D.
3+	381	165.2	4.5
2+	336	165.4	4.4
2	98	161.1	6.8
1	356	159.2	5.7

Table 4. Bill-length averages for Red Knot in Australia.

Age	Sample size	Mean (mm)	S.D.
3+	336	32.8	1.7
2+	347	33.0	1.7
2	135	32.9	1.7
1	385	32.8	1.8

The average adult wing-length of 163.5 mm (3+ and 2+ combined) agrees well with the *rogersi* data quoted by Roselaar (1983) (see Table 1) and is shorter than that given for the other sub-species.

The bill-lengths of the various age-groups are not significantly different from each other ($p>0.05$) and the overall average of 32.9 mm agrees well with Roselaar's (1983) data for *rogersi*. It is much shorter than bill-lengths given for the *canutus*, the other Siberian breeding sub-species (see Table 2).

Migration

There have been 13 reports overseas of banded Red Knots and these are summarised in Figure 1. All but one of the birds were banded in Australia with the exception being one banded in New Zealand and recovered in Australia. For full details see *The Stilt* 10: 44 and *The Stilt* 11: 61-62.

There have been eight exchanges between New Zealand and Australia (six with Victoria and one each with Queensland and Western Australia (Perth)) and five between Australia and the east coast of China (three from South Australia and one each from New South Wales and Western Australia (Broome)).

The nominate and *islandica* sub-species of Red Knot are known for their long non-stop flights during migration (Cramp and Simmons 1983, Dick *et al.* 1987) and *rogersi* appears to be no exception. Using the Summers and Waltner (1979) flight distance equation and assuming a flight speed of 75 km/h and an average fat-free weight of 100 g (lowest weights of new arrivals are in the 90-100 g range) it can be calculated that a Knot weighing 150 g can fly approximately 4 400 km on its fat reserves, one of 170 g can travel 5 800 km and at 200 g a distance of about 7 700 km can be flown. These distances are based on still-air conditions. However, it is known that waders generally start their migration under favourable wind conditions (Lane and Jessop 1985, Richardson 1979) and therefore their potential flight range may be in excess of the calculated distances.

Four Victorian-banded Red Knots caught in New Zealand at the end of February had an average weight of over 150 g (S. Davies pers. comm.) which would enable them to comfortably reach the Gulf of Carpentaria (4 000 km), a known Red Knot site. The Queensland recovery (late March) of the NZ banded birds could well have been a Knot attempting to fly this route.

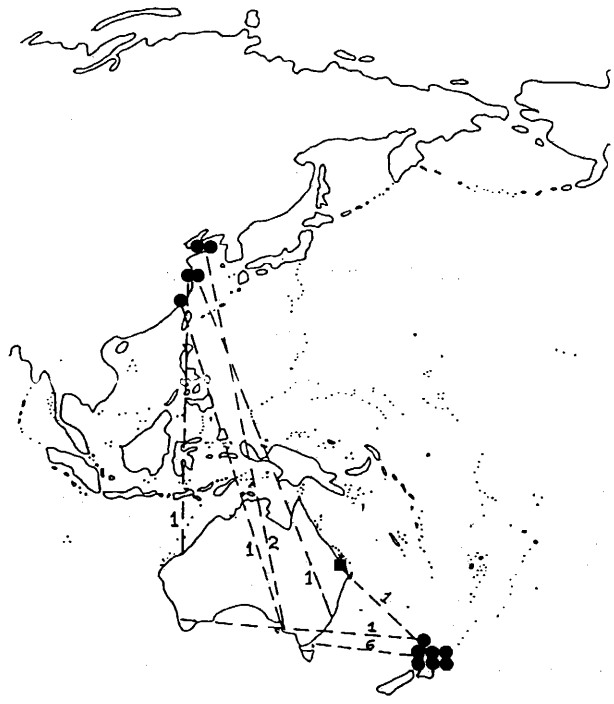

Figure 1. Long-distance movements of Red Knot banded in Australia (12 birds) and New Zealand (1 bird). ● Recovery/control site for Australian banded Red Knot; ■ recovery site for New Zealand banded Red Knot; --- joins banding and recovery/control sites.

If an average weight of 170 g could be achieved prior to departure, New Zealand Red Knots would be capable of reaching the north-Western Australian coast (5 500 km), which is another major Red Knot site.

Few Red Knots have been caught in Victoria just prior to northward migration, but a catch of 21 adult birds on 22 March 1980 ranged from 150 to 200 g in weight with an average of 175 g. The lightest bird could easily reach NWA (3 100 km) even under adverse conditions, whilst the heaviest would be theoretically capable of flying non-stop to the south-west coast of China (7 500 km). Although it seems unlikely that Red Knots would attempt such a long flight, it is interesting to note that they are rarely seen in south-east Asia (Lane 1987) and it is presumed that they overfly this region during both northward and southward migration. Red Knots flying non-stop from Victoria to China would pass over, or close to, extensive wetlands during the flight and could use these if adverse weather conditions precluded them from making a non-stop flight.

Expeditions to NWA have preceded the main departure period for Red Knots. However, some of the heavier Red Knots have reached and many are approaching the weight (i.e. at least 150 g) necessary for flying non-stop to the southern Chinese coastline (4 400 km).

On southward migration large numbers of Red Knots pass through NWA and the Gulf of Carpentaria presumably to south-eastern Australia and New Zealand. Some at least of these birds stage in Victoria on their way to New Zealand as shown by the recapture of three

adult Red Knots in New Zealand which had been bended in Victoria in the October-November period. One movement was within the same season. The flight from Queenscliff to Auckland is only 2 800 km and Red Knots would only need to reach 130 g in weight in order to fly this distance.

There have been two movements of first-year Red Knots banded in Victoria in June which were later controlled in New Zealand as 3+ birds. It is not known whether these birds spent their first non-breeding season in New Zealand and then moved to Victoria during the following southern winter or whether they stopped first in Victoria before moving on as second-year birds or adults to New Zealand.

ACKNOWLEDGEMENTS

It is our pleasure to thank members of the Australasian Wader Studies Group, the Victorian Wader Study Group and the Miranda Naturalists' Trust, New Zealand, for obtaining the data on which this paper is based. We would also like to thank William Dick and Brett Lane for their helpful comments on the first draft and Karen Barter for typing the various drafts.

REFERENCES

Conover,H.B. 1943. The races of the Knot (*Calidris canutus*). *Condor* 45: 226-228.

Cramp,S. and Simmons,K.E.L. (eds.) 1983. *The Birds of the Western Palearctic* Vol. 3 pp. 271-282. Oxford University Press.

Dick,W.J.A., Pienkowski,M.W., Waltner,M. & Minton,C.D.T. 1976. Distribution and geographical origins of Knot (*Calidris canutus*) wintering in Europe and Africa. *Ardea* 64: 22-47.

Flint,V.E. 1972. The breeding of the Knot on Vrangelya (Wrangel) Island, Siberia: comparative remarks. *Proc. West. Found. Vertebr. Zool.* 2: 27-29.

Harrington,B.A. & Twitchell,D.C. 1982. Untying the enigma of the Red Knot. *Living Bird Quarterly* 1: 4-7.

Lane,B. & Jessop,A.E. 1985. Tracking of migrating waders in north-Western Australia using Meteorological Radar. *The Stilt* 6: 17-28.

Lane,B.A. 1987. *Shorebirds in Australia*. Nelson.

Matthews,G.M. 1913. *The Birds of Australia*. Vol. III pp. 270-273. Witherby.

Morrison,R.I.G. 1975. Migration and morphometrics of European Knot and Turnstone on Ellesmere Island, Canada. *Bird-Banding* 46: 290-301.

Portenko,L.A. 1972. *Birds of the Chukchi Peninsula and Wrangel Island*. Vol. I pp. 349-353. Amerind.

Prater,A.J., Marchant,J.H. & Vuorinen,J. 1977. *Identification and Ageing of Holarctic Waders*. BTO Guide 17, Tring, U.K.

Richardson,W.J. 1979. Southeastward shorebird migration over Nova Scotia and New Brunswick in Autumn: a radar study. *Can. J. Zool.* 57: 107-124.

Ridgeway,R. 1919. The birds of North and Middle America. *U.S. Nat. Mus. Bull.* 50(8): 231-238.

Roselaar,C.S. 1983. Subspecies recognition in Knot *Calidris canutus* and occurrence of races in Western Europe. *Beaufortia* 33(7): 97-109.

Sagar,P. 1986. Wader counts in New Zealand. *The Stilt* 9: 32-33.

Summers,R.W. & Waltner,M. 1979. Seasonal variations in the mass of waders in southern Africa, with species reference to migration. *Ostrich* 50: 21-37.

Tomkovich,P.S. 1987. Preliminary data on geographic variation of Siberian Red Knots. Abstract only. *Wader Study Group Bull.* 51: 24.

THE BIRDS OF ESTUARIES ENQUIRY - SOME RESULTS FROM THE 1987/88 WINTER

R.P. Prys-Jones & J.S. Kirby

The Birds of Estuaries Enquiry (BoEE) is the United Kingdom's scheme for monitoring estuarine bird populations. It is organised by the British Trust for Ornithology (BTO) and co-sponsored by the BTO, Nature Conservancy Council, Royal Society for the Protection of Birds and the Department of the Environment for Northern Ireland. The objectives of the BoEE are to document seasonal and annual trends in shorebird populations and to synthesize this information for scientific and conservation purposes. The eighteenth consecutive season of co-ordinated counts for the BoEE took place between July 1987 and June 1988. As usual, counts were made by over 1 000 participants on selected dates near the middle of each month, timed to coincide with the best tidal conditions for censusing estuarine birds. Coverage included almost all of the 119 estuarine sites in the United Kingdom defined by Salmon et al. (1988), as well as about 40 non-estuarine coastal sites. Detailed results for the winter period (November-March) are available in Salmon *et al.* (1988) Wildfowl and Wader Counts 1987-88, available from the BTO (address below), price £1.50 (inc. p&p). Here we summarise the mainfindings for 1987/88.

A peak United Kingdom population exceeding 1.25 million waders from December 1987 to January 1988 averaged 18% higher than for the equivalent period in 1986-87. The January index (calculated only for those sites counted in both January 1987 and January 1988) showed striking increases for most species: Oystercatcher (+26%), Ringed Plover (+23%), Grey Plover (+50%), Knot (+7%), Sanderling (+21%), Dunlin (+17%), Curlew (+57%), Redshank (+45%) and Turnstone (+20%). The only species whose Janauary index decreased in 1988 was the Bar-tailed Godwit (-15%), a reverse in its trend between 1986 and 1987.

The 1987/88 winter was generally mild throughout, whereas the 1986/87 winter had an exceptionally severe cold spell in January. One result of this is that the recorded index changes for Curlew and Redshank must be interpreted with great caution. The dips in their index values between 1986 and 1987, followed by sharp increases in 1988, almost