The N.W. Australia Wader Study Expedition in March and April 1996

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INTRODUCTION

The 1996 N.W. Australia Wader Expedition was the largest and most successful of the seventeen special visits made to study wading birds in the Broome/80 Mile Beach/Port Hedland area since the first expedition in August/September 1981. Eighty-three people from 16 countries participated - with an average of 30-35 people in the field at any one time. A total of 8 512 birds (8 135 waders) were caught during the seven week period 2 March - 20 April 1996.

This brief report summarises the main results of the expedition and highlights especially where significant new developments were made and where new information was gained. A more detailed analysis of the data has now also commenced and this will be incorporated in due course into various scientific papers and other articles currently envisaged or already in preparation.

RINGING

The principal fieldwork activity was a comprehensive catching and ringing programme spanning the full period of the expedition. This was extremely successful in meeting most of its main objectives, in spite of some interference to plans by two cyclones and a tropical depression! A total of 40 cannon netting catches (39 for waders, four for terns) and five mist net catches resulted in 8 512 birds being caught. Catching was uniformly productive throughout the expedition and at each of the coastal localities visited.

Wader mist netting at Port Hedland Saltworks returned to its former productivity. A huge new intake pond has now built up its own infauna providing a special attraction to foraging waders when the nearby tidal shores are covered at high tide. Broad-billed Sandpipers *Limicola falcinellus* have now returned in good numbers (*c.* 500). However Asian Dowitchers *Limnodromus semipalmatus* (less than 10) have not yet reached former levels (*c.* 100).

There were few opportunities for mist netting at inland ephemeral wetlands on Roebuck Plains or Anna Plains. After a good early 'wet' in December many locations dried up during an unusually dry February. Those areas which became flooded after the March rains were too extensive to be suitable for mist netting. One of the consequences of this was that this is the first N.W. Australia expedition not to catch a single Sharp-tailed Sandpiper *Calidris acuminata.*

The expedition succeeded in catching good numbers of its three target species (Bar-tailed Godwit *Limosa lapponoca,* Great Knot *Calidris tenuirostrius* and Red-necked Stint *Calidris ruficollis*), numerically the top three species caught. The totals for Bar-tailed Godwit *Limosa lapponica*, Great Knot *Calidris tenuirostris* and Greater Sandplover *Charadrius leschenaultii* significantly exceeded the total for those species on any previous expedition (as did the expedition total of 8 135 waders - previous best was 6 500 in March/ April 1988). Table 1 gives a summary of the ringing data.

Of the birds caught in 1996, 1 075 (13%) already carried rings. Four of these were ringed overseas (controls), one (at least) elsewhere in Australia, and the remainder in N.W. Australia - some as long as 14 1/2 years ago, others just days earlier. The valuable data provided by these retraps will be progressively analysed in the future.

Yellow Flagging

All the birds caught in 1996 had a yellow plastic leg flag placed on their right tibia. This is to facilitate recognition that a bird is from N.W. Australia when it is seen in the field elsewhere but not caught. Such information is

particularly valuable in delineating migration routes and key stopover sites. A total of 21 489 waders have now been yellow flagged in N.W. Australia since this process was commenced in August 1992. The benefits of leg flagging, as an addition to metal ringing, are illustrated in the comparative data below. Data are for Palearctic migrant waders ringed/flagged in N.W. Australia in the 1992-95 period and recovered or sighted in the same period.

	Ringed	Recovered	
		Overseas	within Australia
	15 395	25 (0.16%)	1 (0.006%)

	Flagged	Sighted	
		Overseas	within Australia
	12 538	69 (0.55%)	8 (0.064%)
Ratio	Flag sightings / Recovery reports	3.4 times	10.7 times

Reports within Australia refer only to birds away from the N.W. Australia marking areas.

Processing

The large team size facilitated much more processing - weighing, measuring, moult and plumage recording - than previous expeditions. Overall 6 388 waders were fully processed - 75% of the total caught.

Fully processed samples of all the main species were obtained at regular intervals throughout the expedition thus facilitating a good understanding of the rate of weight build up before departure and actual departure weights. These data will complement those from previous expeditions but will be even more valuable because in so many cases weights can be judged in relation to other body size parameters rather than in isolation (in previous years weight data was often obtained without associated size data, because of manpower limitations).

A full analysis of weight and other biometric data will take some time but brief mention can be made of one or two highlights.

In the small sample of Whimbrel *Numenius phaeopus*, for example, was the recapture of a bird which had increased in weight from 520 g to 590 g between 28 March and 12 April. This is an average rate of weight gain of almost 1% per day.

Red Knot *Calidris canutus* were particularly interesting. Having been almost completely absent at 80 Mile Beach in the first week of April, there was a newly arrived flock of around 4 000 birds close to the camp site when the expedition returned on 14 April. These were mostly adults in near full breeding plumage but many had low weights (down to 97 g, with quite a few less than 120 g) when caught on 15 and 16 April. Their average weight was significantly less than that of Red Knot caught at Broome on 10 April when most birds were in the 140-160 g weight range. Thus significant proportions, if not all, of these birds were newly arrived from some other location, presumably further south. One bird had previously been ringed at Albany in the south-west of West Australia, but this cannot account for all the arrivals as the Red Knot population in that area is only about 300 birds. Another possibility is that they emanated from South Australia, where several thousand occur in summer.

There was also strong evidence of an arrival of Red Knot at Broome in mid-April. A sample of 86 was caught on 25 April; after the expedition had ended, and almost all were at 150-160 g - presumably at or close to their take off weight.

Weight Loss Experiments

An experiment examining weight during capture was carried out at 80 Mile Beach on ten Greater Sandplovers. One tentative conclusion arising from comparing the results with similar work in Victoria, was that weight loss after capture may not be significantly different between locations/ temperatures in the timescale in which processing normally takes place (1-4 hours after capture). If this is so then adjustments, if required, may be simpler and may not even be necessary when comparing samples from various catches.

PLUMAGES

The extent of breeding plumage and the level of active breast moult (for the first time) were recorded in almost all birds captured. This will help understand how energy consuming process of feather change is integrated into the other large energy demands - fat deposition prior to migration, and the migratory journey itself - at this time of year.

Considerable progress was made in using plumage data (sometimes allied with primary moult condition) to determine the age/sex/race of several species. The experience of the Russian members of the expedition provided confirmation that the Bar-tailed Godwits were all of the *menzbieri* race which breeds in the central north region of Siberia (Yakutai *etc.*). In the case of the Red Knot, the Russians were also confident that these were identical in plumage (and biometric measurements) to those which breed on the New Siberian Islands (sub-species *canutus*, but possibly classifiable as a separate race); this had been suspected from existing data.

Age

Whilst it has been possible for many years to identify the majority of birds in their first year determination of the age of other "immature" birds has been more difficult. Correct ageing of as many birds as possible is desirable in order to determine the age at which each species first breeds (a critical parameter in population dynamics assessments) and also because birds of different ages may behave differently (*e.g.* re migration). During the 1996 expedition the team gradually became more competent and confident

Table 1. Total waders caught during the 1996 N.W. Australia Expedition and in North-west Australia (August 1981 - April 1996).

Species	1996 N.W. Australia Expedition				N.W. Australia totals
	Broome	80 Mile Beach	Port Headland	Total	1981-1996
Pied Oystercatcher	3	-	-	3	102 (3)
Sooty Oystercatcher	19	-	-	19	27
Grey Plover	9 (1)	38	-	47 (1)	33 (2)
Masked Lapwing	-	-	-	-	170
Pacific Golden Plover	-	-	2	15	8
Red Kneed Dotterel	15 (3)	-	-	15 (3)	183 (18)
Lesser Sandplover	57 (21)	2	12 (1)	71 (22)	457 (87)
Greater Sandplover	564 (156)	247 (14)	1	912 (170)	5715 (594)
Oriental Plover	-	1	1	2	134
Red-capped Plover	-	1	7	8	548 (21)
Black-fronted Plover	3	-	-	3	36 (2)
Black-winged Stilt	18	8	-	26	235 (1)
Banded Stilt	-	-	-	-	90
Red-necked Avocet	-	-	3	3	132 (1)
Ruddy Turnstone	87 (26)	14 (1)	3	104 (27)	1349 (215)
Far Eastern Curlew	-	-	1	1	48 (1)
Whimbrel	38 (1)	2	1	41 (1)	73 (1)
Little Curlew	-	-	-	-	367
Wood Sandpiper	-	-	-	-	27 (3)
Grey-tailed Tattler	267 (85)	173 (10)	3	443 (95)	3447 (433)
Common Sandpiper	1	-	-	1	6
Greenshank	3	-	1	4	66
Redshank	-	-	-	-	2
Marsh Sandpiper	-	-	-	-	89 (1)
Terek Sandpiper	270 (59)	491 (28)	1	762 (87)	3862 (382)
Pin-tailed Snipe	-	-	-	-	1
Swinhoe's Snipe	-	-	-	-	1
Asiatic Dowitcher	2	-	1	3	63 (4)
Black-tailed Godwit	7	-	-	7	173
Bar-tailed Godwit	725 (112)	840 (39)	27 (2)	1592 (153)	6785 (428)
Red Knot	214 (38)	295 (6)	-	509 (44)	3208 (196)
Great Knot	611 (77)	971 (48)	-	1582 (125)	9089 (339)
Sharp-tailed Sandpiper	-	-	-	-	675 (9)
Pectoral Sandpiper	-	-	-	-	3 (1)
Little Stint	-	-	-	-	1
Red-necked Stint	937 (258)	70 (1)	347 (4)	1354 (263)	8202 (787)
Long-toed Stint	-	-	-	-	42 (4)
Curlew Sandpiper	154 (45)	206 (22)	78 (3)	438 (70)	6154 (392)
Sanderling	43	1	-	44	61
Broad-billed Sandpiper	3	-	135 (14)	138 (14)	1133 (66)

Species	1996 N.W. Australia Expedition				N.W. Australia totals
	Broome	80 Mile Beach	Port Headland	Total	1981-1996
Red-necked Phalarope	-	-	-	-	1
Australian Pratincole	-	-	-	-	4
Oriental Pratincole	1	-	-	1	89
Totals	4 051 (882)	3 460 (169)	624 (24)	8 135 (1075)	51 900 (3991)

Retrap/control numbers, in brackets, are included in all the totals. The N.W. Australian totals are waders caught during 12 major AWSG Expeditions (46 116 - 1981 to 1996), by Broome Bird Observatory (5 699 - 1990 to 1996) and by Doug Watkins (85 - 1993 to 1994). Birds were ringed at: Broome/Roebuck Plains, 80 Mile Beach/Anna Plains.

that most two-year old, and some three-year old, birds could be aged in the hand by a combination of plumage and moult characteristics. The key criteria for March/April can be generalised as -

First year

a) Retention of some unmoulted diagnostic juvenile contour feathers. Most frequently these were inner median wing coverts or tertials.

b) No primary moult (0^{10}), partial (outer) primary moult (*e.g.* $0^{5}5^{2}3^{1}0^{2}$), or less frequently a full primary moult (*e.g.* $5^{7}3^{1}1^{1}0^{1}$). In the latter case it was rarely completed before the end of April. Confusion with late moulting birds of other age categories can be eliminated by looking for unmoulted juvenile secondaries or tail feathers, as some were always retained.

Second year

a) Negligible breeding plumage, no weight gain for migration, but none of the other characteristics of first year birds.

b) Primary moult completed (5^{10}) but feathers slightly older than those of full adult birds. "Oldness" is apparent in three ways - development of slight/shading at the feathertips, slightly browner feathers (as opposed to blackish of new feathers on full adult) and very slight feather wear of the tips outermost one or two primaries. These differences have resulted from the primary moult of second year birds having started (and finished) earlier than that of fully adult birds.

Third year

This is so far only determinable on Bar-tailed Godwits. It is probable that Great Knot and Red Knot (but probably not Eastern Curlew *Numenius madagascariensis*) all go into full breeding plumage, and depart on migration, by the time they are three years old.

a) At most a partial breeding plumage is attained. No pre-migratory weight gain, but weights generally above those of first and second year birds.

b) Primary moult complete (5^{10}) and not normally separable from full adult birds because the timing of the moult is similar.

Adult

a) Assumption of full breeding plumage, with massive weight gain, from February onwards, prior to emigration.

b) Recently completed primary moult (5^{10}).

BREEDING SUCCESS

One of the key defined objectives of the 1996 expedition was to make an assessment of the productivity of the 1995 Siberian breeding season by measuring the proportion of first year birds in catches made before the northward migration of adults commenced. Of the 12 species sampled in adequate quantities, there was a remarkable consistency with nine species having between 10% and 20% first year birds in the population. Overall these data would suggest it was at least a reasonably successful year for most species and certainly not the 'bad' year which was predicted by the 'three-year predator/prey' cycle theory; this concurred with the experiences of the Russian breeding workers on the expedition.

VISIBLE MIGRATION

Another key element of the expedition programme was the daily afternoon watch for waders departing from Broome on northward migration. A total of 24 291 waders were

seen to depart, with an average flock size on most days of between 30 and 100 birds.

Overall, the early parts of the migration were rather later and more sporadic than in previous years, almost certainly due to delays and disruptions caused by unusually unsettled weather. Birds were sometimes so frustrated at being held up that they were seen departing, or trying to depart, in less than ideal conditions - conditions in which they would not have even attempted to depart in other years. By the end of the third week in April birds were back onto their normal schedule with those later-departing species 'peaking' on almost exactly the same date as in 1994 and 1995.

COUNTS

Two visits were made by hovercraft to Bush Point at the south end of Roebuck Bay. Because of its isolation this site has rarely been visited (only about ten times) even though at peak (in October) it holds over 100 000 waders and is probably the largest single high tide roosting site in the whole East Asian -Australasian flyway. Some 50 000 and 20 000 waders were counted during the two visits on the 22 March and 20 April respectively. On the latter date notable totals were 800 Sanderling *Calidris alba*, 530 Pied Oystercatchers *Haematopus longirostris* and 1 200 Little Terns *Sterna albifrons* - all concentrations rarely exceeded anywhere in Australia for these species. A count in early June by Broome Bird Observatory found 20 000 'overwintering' waders - a further indication of its unique importance. Bush Point has now been added to the regular monitoring sites because it is threatened by exploration for, and possible mining of, diamonds.

OTHER STUDIES

Stimulated by the Dutch contingent (Theunis Piersma and Petra de Goeij), several forays onto the mudflats at Roebuck Bay and 80 Mile Beach were undertaken to sample invertebrates and to make observations on foraging waders. A long term invertebrate research programme has now been initiated which will fill the void in our knowledge of why these areas of N.W. Australia are able to support such a huge number and variety of waders..

As in 1994, Prof. Allan Baker of Toronto University/ Museum of Ontario collected blood samples from a number of wader and tern species for subsequent use in DNA classification. Samples were also collected from Red Knot over an extended period to detect any genetic differences between the birds which had been present in N.W. Australia for some months and those which arrived on passage during April. By matching up the DNA patterns with those from blood samples taken from Red Knot on their breeding areas it should also be possible to gain further evidence on whether the Red Knot in N.W. Australia are predominantly from the New Siberian Islands.

A team led by John Curran (Department of Agriculture, Broome) again joined the expedition for several days in order to collect blood samples for analysis in connection with avian-borne viruses. Analysis of data from previous years has shown a very low level (less than 1%) of birds are acting as possible vectors for diseases such as Avian-Influenza and Newcastle Disease. Tests will also be carried out on the 1996 samples for Japanese encephalitis.

FUTURE PLANS

These periodic expeditions will continue to be the main means of gathering data on the huge and varied wader populations in N.W. Australia; the next is planned for July - October 1998. Meanwhile valuable supplementary data in the intervening periods and at other seasons will continue to be generated by Broome Bird Observatory.

ACKNOWLEDGEMENTS

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Cargill Saltworks were extremely kind in allowing us full access to their site at Port Hedland. A key component of all major N.W. Australia wader expeditions has been the provision of a vechicle and trailer by the W.A. Department of Conservation and Land Management. Broome Shire Council and the Department of Agriculture in Broome also kindly lent us trailers. Myer Stores very kindly shipped our cannon netting gear free-of-charge between Melbourne and Perth.

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