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## DARWIN SHOREBIRD CATCHING: EXPEDITION REPORT 2018

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Shorebird expeditions have been run in the Northern Territory sporadically since 1995 and have focussed on birds from five sites along the Top End coastline. Over the years, there has been 2510 shorebirds caught from 19 species from a combination of cannon netting and mist netting. From 2014 onwards, we applied engraved leg-flags to shorebirds and this has allowed for a more detailed understanding of site fidelity on the non-breeding grounds and migration pathway connectivity. Since that time, there has been more than 3403 leg-flag resightings from six countries in the East Asian-Australasian Flyway. In 2018, the objective of the expedition was to capture the critically endangered Far Eastern Curlew *Numenius madagascariensis* to attach GPS tracking devices to birds to learn about their local movements on the non-breeding grounds of Australia. One GPS tag was deployed on a Curlew during this expedition. Shorebird catching expeditions allow researchers to collect useful data on age demographics within populations, and to target species for more detailed studies such as those on movements of birds.

### INTRODUCTION

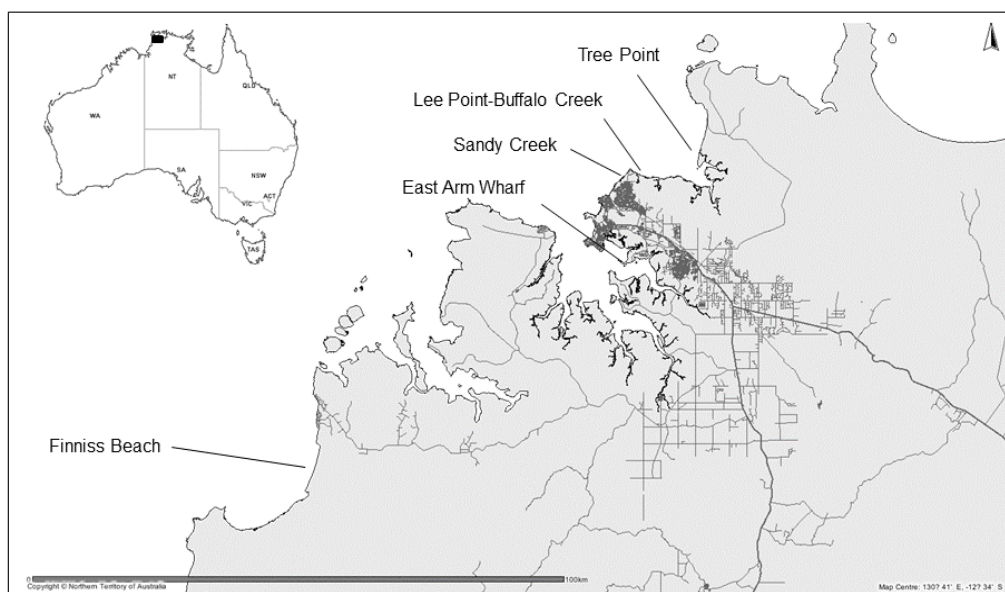
“ *The team started the expedition with the aim of catching the world’s largest shorebird, the Far Eastern Curlew, and we finished the week in the field catching the world’s smallest shorebird – the Little Stint. Dr Clive Minton* ”

A team of researchers from the Australasian Wader Studies Group (AWSG) joined Amanda Lilleyman in Darwin to cannon net Far Eastern Curlew in November 2018. The expedition was timed to maximise the chances of catching curlew and catching in November meant that adult and juvenile birds would be in Darwin for the non-breeding season of the austral summer. November is typically a humid time of the year and is characterised as the ‘build-up’ period; however, it was unseasonably wet during the catching week with rain during net-setting

times and on one occasion the team had to retreat to cars as a severe storm passed over Darwin Harbour.

The main catching site during this expedition was Darwin Port’s East Arm Wharf and the secondary catching site was Lee Point beach, in Casuarina Coastal Reserve (Fig. 1). In early November the high tides occurred during the mornings and evenings and it was a new moon spring tide period. Most of the equipment preparations occurred in the mornings and net setting occurred during the day. Most catches were made in the evenings on the incoming high tide and the very last catch on the morning high tide.

The team was made up of five interstate experts (3 Vic 1 QLD, 1 WA), one local researcher (AL), accompanied by a team of Indigenous rangers from the local Larrakia Rangers program from Larrakia Nation Aboriginal Corporation and local volunteers. A daily team of 15-25 people were involved.



**Figure 1.** Map of all expedition catching sites in the Northern Territory. Map also shows main roads and housing in the Darwin region.

## Darwin – importance of catching and banding

Darwin's geographical position creates an opportunity to explore the mixing of several subspecies of migratory shorebird. Until the 2014 and 2015 catching and flagging, there was no understanding of the proportion of the two Red Knot subspecies that occur in Australia (*rogersi* and *piersmai*). The individual engraved leg-flag marking allowed us to gain resighting data on this species and estimate the subspecies ratio for the region (Global Flyway Network, *pers. comm.*).

Darwin is a known staging site in northern Australia and while this concept was once only considered through anecdotal evidence, it has now been confirmed with resighting data from terminal sites in southern Australia and in New Zealand.

## Historical background

Researchers first caught shorebirds in the Top End of the Northern Territory in 1995, then again in 1996, 2008, 2014, 2015, 2018. These mini expeditions were led by a local Darwin researcher and team members from the Australasian Wader Studies Group and were undertaken for a range of objectives (Clive Minton, *pers. comm.*).

The main aim of the 1995 and 1996 expeditions was to catch shorebirds and waterbirds to collect blood samples to detect avian-borne diseases for the Northern Territory Quarantine and Inspection Services (now known as Northern Australia Quarantine Strategy) and to collaborate with the Conservation Commission of the Northern Territory (now known as Parks and Wildlife). Similarly, the 2008 expedition had the same aims but also set out to flag shorebirds using plain yellow over blue leg flags.

The aim of the 2014 and 2015 expeditions was to catch and flag as many shorebirds as possible to contribute to a PhD study on the movement of shorebirds in the Darwin region (Lilleyman, *in prep*). Data from these expeditions also contributed to continental-wide analysis of body condition in shorebirds. The 2014 and 2015 expeditions had advanced from previous expeditions through the application of engraved yellow over plain blue leg flags. These were placed on all shorebirds, except Red-necked Stint, that had plain yellow over blue leg flags applied.

All shorebirds were caught on beaches or wetlands along the Northern Territory coastline, in Darwin Harbour during all years, and in Fog Bay (Finniss Beach) during 1995-1996 (Fig. 1). Darwin Harbour is a mangrove-lined tropical estuary in the Northern Territory that is near-pristine in condition (Munksgaard *et al.* 2018). Darwin Harbour supports more than 10,000 migratory shorebirds during the austral summer (Chatto 2012) is also home to most of the human population in the Northern Territory. Most shorebirds in the Darwin Harbour catching sites occur in the land tenure of Casuarina Coastal Reserve, managed by Parks and Wildlife Commission of the Northern Territory (Parks and Wildlife Commission Northern Territory 2016). This area also has high human pedestrian traffic and consequently, anthropogenic disturbances to shorebirds are common at the site (Lilleyman *et al.* 2016).

Finniss Beach sits within Fog Bay to the west of Darwin Harbour and has historically supported up to 17,000 migratory shorebirds (Chatto 2012). It is at risk of increased disturbance through human visitation and increased housing at the nearby town of Dundee Beach (Chatto 2012).

## 2018 expedition objectives

The aim of the 2018 expedition was to catch the critically endangered Far Eastern Curlew to attach GPS tags to birds as part of the project 'strategic planning for the Far Eastern Curlew' under the National Environment Science Programme Threatened Species Recovery Hub (Threatened Species Recovery Hub (2020)). An additional aim was to band and flag other species of migratory shorebird and to continue taking measurements for morphometric studies.

## METHODS

### Study sites

In the 2018 expedition we cannon-netted at Lee Point-Buffalo Creek beach (130.90° E, 12.33° S) and at East Arm Wharf (130.89° E, 12.48° S). Catching happened in the first week of November on best available high tides. This month was selected because most adult and juvenile shorebirds have returned to Darwin by November and those in the region would most likely stay, rather than continuing further south.

### Field methods

All expeditions involved catching shorebirds using cannon nets, and in 2017 and 2018, the team also used mist nets to catch shorebirds. All cannon nets were set following standard methods (Australasian Wader Studies Group 2018). Mist nets were used when high tides occurred late in the night and it was not practicable to cannon net at night. We used mist nets to catch birds in 2017 and went out every month to either East Arm Wharf or a saltpan next to the EAW. We also used mist nets in 2018 when cannon netting was not practical due to high tides occurring in the night. We always mist-netted during evenings when the tide was rising. All captured shorebirds had biometrics taken: mass, wing length, head length, head-bill length, moult, age and sex (if known). Captured birds had a metal band, and from 2014 onwards had engraved yellow over plain blue leg flags applied.

## RESULTS

In 2018 there were 142 shorebirds from 11 species caught and processed during the expedition (Table 1), including two Far Eastern Curlew, with one GPS tag deployed on a male bird.

Since 1995, there has been 2510 shorebirds caught from 19 species during expeditions, across five sites in the Northern Territory (Table 2). Since the 2014 expedition and application of engraved leg-flags, there has been approximately 3403 resightings of Darwin birds from across six countries in the East Asian-Australasian Flyway (EAAF) (Table 3). Most (>97%) of the resightings came from the Northern Territory in Australia.

**Table 1.** Darwin 2018 catch totals, method used and percent juveniles for each species.

Date/ Capture Method	Site	Species	New	Total	Juv	% Juv
6/11/2018 Cannon netting	Lee Point-Buffalo Creek	Greater Sand Plover <i>Charadrius leschenaultii</i>	19	19	0	0
		Lesser Sand Plover <i>Charadrius mongolus</i>	6	6	0	0
		Great Knot <i>Calidris tenuirostris</i>	2	2	2	100
		Red-necked Stint <i>Calidris ruficollis</i>	1	2	0	0
		Sharp-tailed Sandpiper <i>Calidris acuminata</i>	1	1	1	100
		<b>Total</b>	<b>29</b>	<b>30</b>	<b>3</b>	
9/11/2018 Cannon netting	East Arm Wharf (Pond E)	Far Eastern Curlew <i>Numenius madagascariensis</i>	2	2	0	0
		<b>Total</b>	<b>2</b>	<b>2</b>	<b>0</b>	
10/11/2018 Mist netting	East Arm Wharf (Pond K)	Greater Sand Plover <i>Charadrius leschenaultii</i>	7	1	1	100
		Sharp-tailed Sandpiper <i>Calidris acuminata</i>	7	7	1	14
		Red-necked Stint <i>Calidris ruficollis</i>	3	3	0	0
		Grey-tailed Tattler <i>Tringa brevipes</i>	2	2	1	50
		Whimbrel <i>Numenius phaeopus</i>	2	2	2	100
		Great Knot <i>Calidris tenuirostris</i>	1	1	1	100
		Lesser Sand Plover <i>Charadrius mongolus</i>	1	1	1	100
		Terek Sandpiper <i>Xenus cinereus</i>	1	1	0	0
		<b>Total</b>	<b>24</b>	<b>24</b>	<b>7</b>	
		11/11/2018 Cannon netting	Lee Point-Buffalo Creek	Great Knot <i>Calidris tenuirostris</i>	40	40
Red-necked Stint <i>Calidris ruficollis</i>	32			34	5	15
Greater Sand Plover <i>Charadrius leschenaultii</i>	7			7	1	14
Lesser Sand Plover <i>Charadrius mongolus</i>	2			3	0	0
Little Stint <i>Calidris minuta</i>	1			1	1	100
Red Knot <i>Calidris canutus</i>	1			1	0	0
<b>Total</b>	<b>83</b>			<b>86</b>	<b>11</b>	
<b>TOTAL BIRDS</b>			<b>142</b>			

**Table 2.** Number of species caught during expeditions per year and site in the Northern Territory.

Common name	Scientific name	1995		1996		2008		2014		2015		2017		2018		
		Lee Point-Buffalo Creek	Finmiss Beach	Tree Point	Lee Point-Buffalo Creek	Lee Point-Buffalo Creek	Finmiss Beach	East Arm Wharf	Lee Point-Buffalo Creek	East Arm Wharf	Lee Point-Buffalo Creek	Sandy Creek	East Arm Wharf	GWA saltpan (EAW)	Lee Point-Buffalo Creek	East Arm Wharf
Bar-tailed Godwit	<i>Limosa lapponica</i>		1				2						7			
Broad-billed Sandpiper	<i>Calidris falcinellus</i>					3										
Common Greenshank	<i>Tringa nebularia</i>						13		19				7			
Common Sandpiper	<i>Actitis hypoleucos</i>														1	
Curlew Sandpiper	<i>Calidris ferruginea</i>					2				1	1					
Far Eastern Curlew	<i>Numenius madagascariensis</i>											1	1		2	
Great Knot	<i>Calidris tenuirostris</i>		391			40	1	98		229			4	44	1	
Greater Sand Plover	<i>Charadrius leschenaultii</i>	27	74	13	111	52		189		95	10		3	26	8	
Grey Plover	<i>Pluvialis squatarola</i>									3						
Grey-tailed Tattler	<i>Tringa brevipes</i>			4			6	5	6	1			14		2	
Lesser Sand Plover	<i>Charadrius mongolus</i>	9		3	21			6		4				8	2	
Little Stint	<i>Calidris minuta</i>													1		
Red Knot	<i>Calidris canutus</i>		272					2		45			1	1		
Red-necked Stint	<i>Calidris ruficollis</i>	2	16	42	209	37		73		37	2			37	3	
Ruddy Turnstone	<i>Arenaria interpres</i>	2	2	12	2			11		9						
Sanderling	<i>Calidris alba</i>	3		2	1					16	4					
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>									6			2	1	7	
Terek Sandpiper	<i>Xenus cinereus</i>		18	11		1	2	16	13				2	3	7	
Whimbrel	<i>Numenius phaeopus</i>												1	2	3	
<b>TOTAL</b>		<b>43</b>	<b>774</b>	<b>15</b>	<b>72</b>	<b>345</b>	<b>136</b>	<b>38</b>	<b>397</b>	<b>26</b>	<b>446</b>	<b>16</b>	<b>4</b>	<b>44</b>	<b>118</b>	<b>36</b>

**Table 3.** Count of resightings for each shorebird species across countries in the EAAF from 2014 onwards.

Common Name	Scientific Name	NT Aust	VIC Aust	WA Aust	China	Japan	New Zealand	Russia	South Korea
Bar-tailed Godwit	<i>Limosa lapponica</i>	32				2			
Common Greenshank	<i>Tringa nebularia</i>	38							
Curlew Sandpiper	<i>Calidris ferruginea</i>	1							
Great Knot	<i>Calidris tenuirostris</i>	1208		3	31			4	2
Greater Sand Plover	<i>Charadrius leschenaultii</i>	1478			3				
Grey Plover	<i>Pluvialis squatarola</i>	20							
Grey-tailed Tattler	<i>Tringa brevipes</i>	29							
Lesser Sand Plover	<i>Charadrius mongolus</i>	9							
Red Knot	<i>Calidris canutus</i>	51	1		36		3		
Red-necked Stint	<i>Calidris ruficollis</i>	74							
Ruddy Turnstone	<i>Arenaria interpres</i>	219			5				
Sanderling	<i>Calidris alba</i>	151			1				
Terek Sandpiper	<i>Xenus cinereus</i>	2							
<b>TOTAL</b>		<b>3312</b>	<b>1</b>	<b>3</b>	<b>76</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>2</b>

The proportion of juvenile birds to adult birds in the total catch has changed over time (Table 4), from <6% juveniles caught in the total flock in 1995 to >22% in the total flock in 2018. In 2014 juveniles made up 11% of the total flock, and then in 2015 when the catching expedition was in October, juveniles made up 28.7% of the total flock.

**Table 4.** Percentage of juvenile shorebirds and adult shorebirds in the total catch over the expedition years.

Year	Juvenile %	Adult %
1995	5.4	94.6
1996	1.4	98.6
2008	13.9	86.1
2014	11.0	89.0
2015	28.7	71.3
2017	22.9	77.1
2018	22.1	77.9

## DISCUSSION

### Summary of achievements

The Darwin expeditions have proved to be highly important in improving the understanding of migratory shorebirds in northern Australia, with some leg-flag resightings from a range of sites in the EAAF. With this information we are starting to fill a gap of where birds from the Top End go on migration, and how faithful individual birds are to the Darwin non-breeding grounds. For example, resighting data from Darwin suggests that some shorebirds within the population are site faithful to the region, returning to the site of capture year after year. Additionally, we have learned that the Darwin region is a steppingstone for some individuals within the population; for example, Red Knot that were banded in Darwin have been resighted in New Zealand, which is most likely their migration terminus.

The use of tracking devices on birds allows a detailed understanding of movement patterns and habitat use – data which are vital to the conservation of migratory shorebirds. Results from the Far Eastern Curlew tracking study have already indicated that curlew depart Darwin late in the northward migration season (April, n=2), and one of the birds nested on the Kamchatka Peninsula, which is considered very far north on their breeding grounds (Lilleyman 2018).

The expeditions have also allowed researchers to collect biometric data on all shorebirds, which will help to describe the condition of Top End shorebirds compared to birds from sites at other locations on the non-breeding grounds.

On review of the conditions and number of birds caught in the Darwin region over the years, we have decided that October is the best month to cannon net shorebirds because 1) most shorebirds (adults and juveniles) have returned to the region, 2) while it is the build-up season, October is not as humid as November, and this may influence the condition of the birds upon release after processing, and 3) October has historically provided the highest percent of juvenile birds in the total catch and this will allow for the best estimate of breeding success, if this measure was to be estimated.

### Future of catching and banding shorebirds in the Northern Territory

There is considerable interest in creating a regular shorebird catching program to allow researchers to catch, process and flag birds in the Northern Territory at least once a year. This would allow for a regular addition of marked individuals in the system and would further contribute to understanding the migration and site fidelity of shorebirds that visit or stay in the Northern Territory.

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