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National Environmental Science Programme



Progress Report 3:

Strategic Planning for the Far Eastern Curlew

August 2018

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Front cover: Far eastern curlew habitat in Darwin Harbour showing Darwin in the background. Photo: Michael Lawrence-Taylor

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Larrakia Rangers Jessica Puntoriero and Nelson Williams-Browne undertaking monitoring of salt flats in Darwin Harbour.
Photo: Amanda Lilleyman

Project overview

The Far Eastern Curlew (FEC) is the largest migratory shorebird in the world. It is listed as Critically Endangered in Australia with numbers rapidly declining. Recent research has highlighted the importance of high quality non-breeding habitat to migratory shorebirds, but it is difficult to provide strategic guidance to developers and decision-makers because too little is known regarding the ecological requirements of the bird. Currently little is known about their exact feeding and roosting habitat needs. While coastal development can negatively impact populations, they are known to use some artificial habitat for roosting. This project will provide the knowledge needed to develop strategic guidelines for Far Eastern Curlew conservation.

Progress since last report

April	World Curlew Day community engagement event at Dripstone Cliffs in Darwin, 21st April 2018 in conjunction with Conservation Volunteers Australia and the Larrakia Rangers. Invertebrate boat survey work with the Larrakia Rangers and volunteers.
June	Met with collaborators Prof. Richard Fuller, Dr Brad Woodworth and Micha Jackson at the University of Queensland to share results and discuss future plans for collaborations across project nodes. Presented preliminary results of local movements of Curlew at the Queensland Ornithological Conference in Brisbane 24th June 2018.
Monthly	Monthly saltpan survey work by the Larrakia Rangers. Monthly shorebird monitoring at East Arm Wharf (in conjunction with Conservation Volunteers Australia).
Ongoing	Both tagged Curlew have migrated, and initial findings suggest that one bird has successfully bred on the Kamchatka Peninsula in Siberia, and the other (a sub-adult) has spent the season exploring the coastline around the Yellow Sea and Bohai Sea (China).

Preliminary results of local movements from the 2017-2018 non-breeding season

One of the main objectives within The Curlew Project is to look at how Curlew use coastal habitat so that we can manage this habitat into the future. Shorebird conservation in Australia requires an understanding of local conditions at sites where threatened birds occur. Our study on local movements by a critically endangered shorebird will enable us to prepare policy makers and developers with the appropriate information they need to make sustainable decisions when dealing with coastal development. The preliminary findings from tracking two Curlew around Darwin Harbour are already proving to be useful for our understanding of how these birds use the intertidal zone, and in particular the hypersaline environment found within mangrove forests, known as a saltpan or claypan.

Determinants of habitat use

Many factors influence how shorebirds use the intertidal zone (for a full overview, see Jackson 2017); including tide height, availability of habitat, number of other birds and competitors in the system, food and resource availability, disturbance at a site, distance to forested vegetation, distance to other sites in the network, climate, and surrounding infrastructure.

We examined the movements of the tagged Curlew in Darwin Harbour in relation to habitat classification, time of day, tide height, and temperature. We expected that the Curlew would predominantly use the intertidal mudflats (seaward side of the mangroves), and roost in saltpans and dredge ponds when mudflats were covered by the tide. We were surprised that most records from the tagged birds came from the saltpans (Figure 2 and 3). Both tagged Curlew were recorded from the large saltpan in Charles Darwin National Park, and the saltpan at the Genesee Wyoming Australia rail line site. One Curlew spent time in the saltpan along the hinterland close to Hidden Valley (Figure 1).

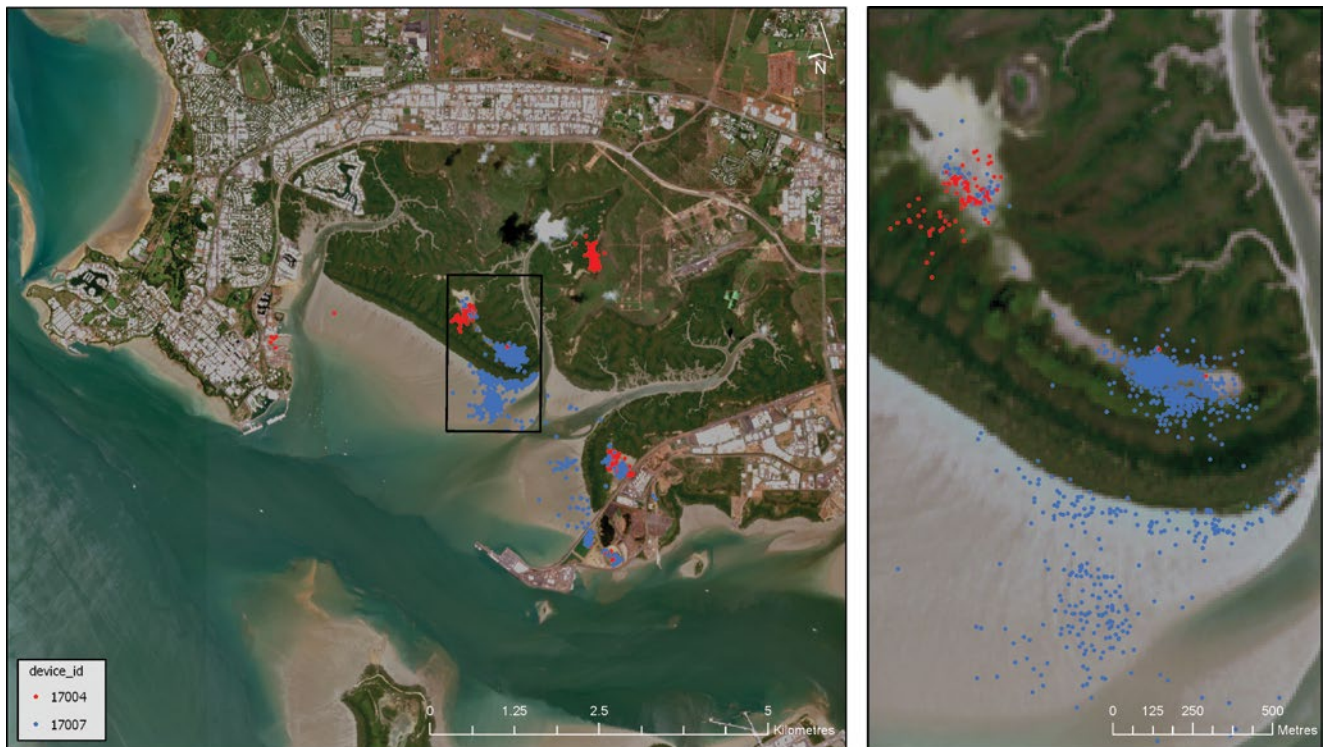


Figure 1. The GPS locations of GPS-tagged Far Eastern Curlew in Darwin Harbour from the non-breeding season of 2017-2018.



Figure 2. The GPS locations of GPS-tagged Far Eastern Curlew in Darwin Harbour by habitat classification from the non-breeding season of 2017-2018.

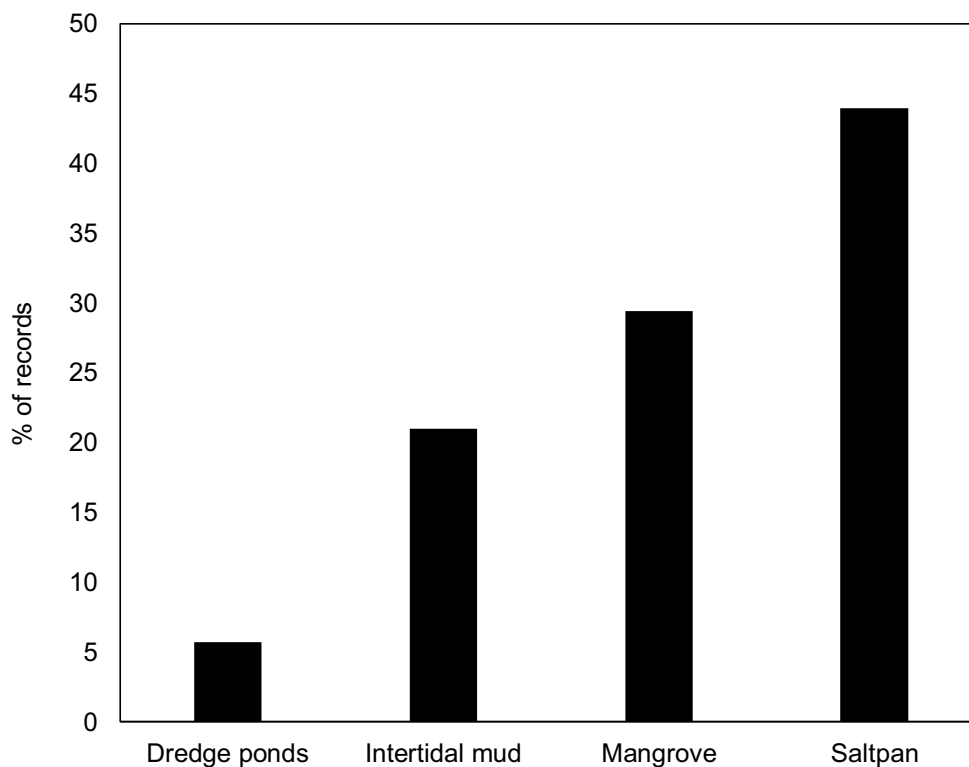


Figure 3. The percent of records of GPS-tagged Far Eastern Curlew in Darwin Harbour by habitat classification from the non-breeding season of 2017-2018.

As expected, we found that Curlew spent more time in saltpans and dredge ponds during the night than during the day, and more time spent on mudflats and within the mangrove forest during the day (Figure 4 and 5). These open areas may be more reliable nocturnal roosting sites as they are not covered from the tide most of the time, and are open areas so provide good visibility for detection of predators. Although mangrove forests would be available for birds for the night, forested areas might pose a higher risk of predation for birds.



Figure 4. The GPS locations of GPS-tagged Far Eastern Curlew in Darwin Harbour by time of day from the non-breeding season of 2017-2018.

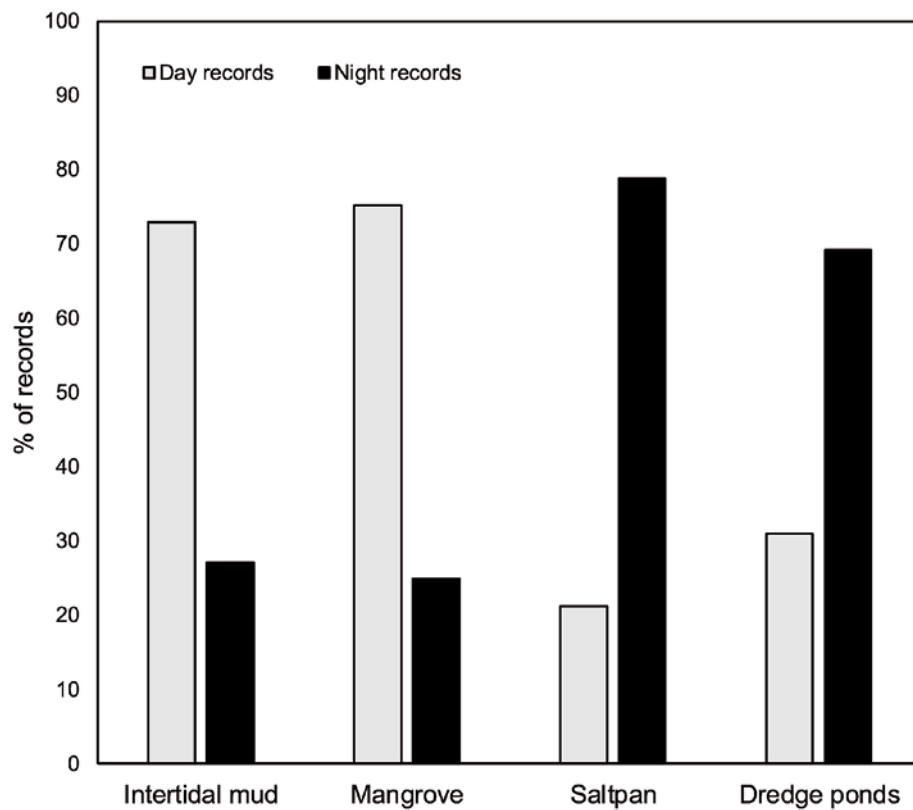


Figure 5. The percent of records of GPS-tagged Far Eastern Curlew in Darwin Harbour by time of day and habitat classification from the non-breeding season of 2017-2018.

Curlew used intertidal mudflats when the tide was lower (Figure 6), and the number of records increased in salt pans with increasing tide height (Figure 7). The use of the EAW dredge ponds by Curlew more than doubled when tides were in the range of 7 – 8 m (Figure 7). These spring tides occur on a fortnightly cycle and the use of the EAW dredge ponds by Curlew at these tide heights are further corroborated by observations of shorebirds arriving to EAW dredge ponds during spring high tides >7 m (Figure 8).

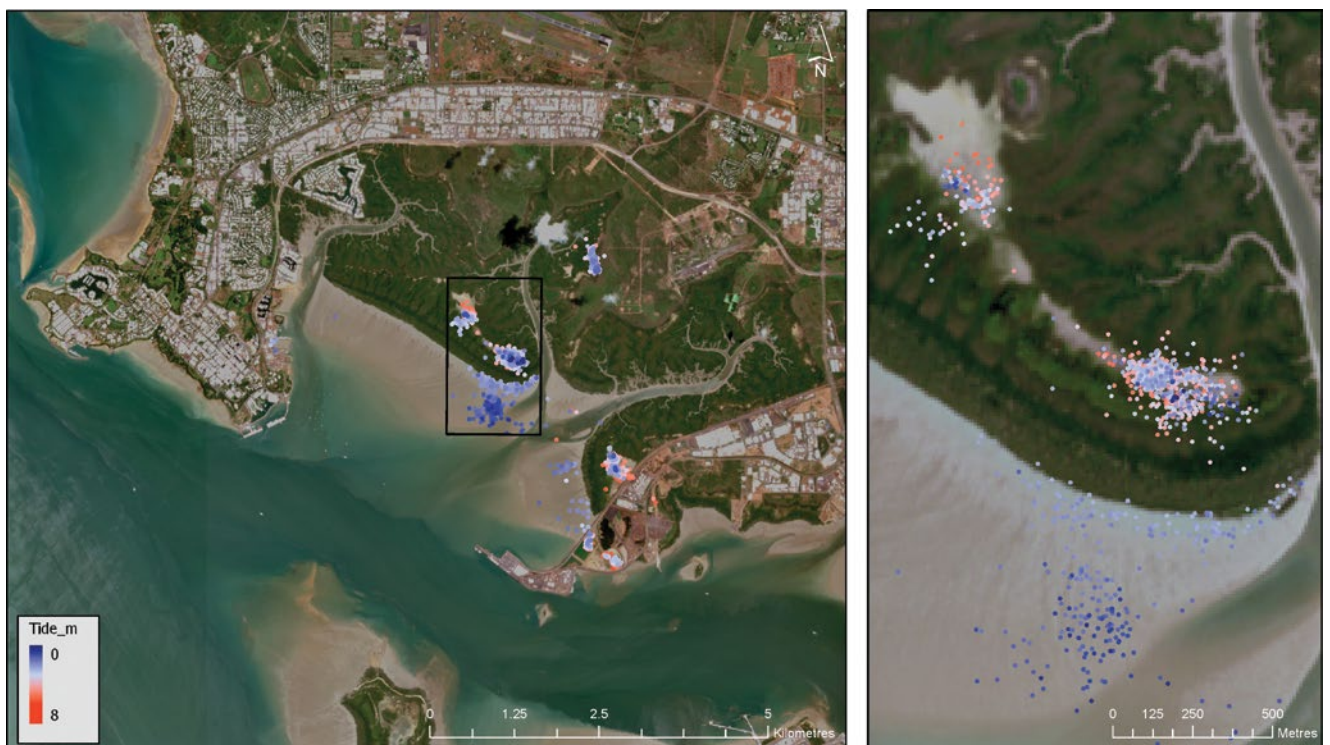


Figure 6. The GPS locations of GPS-tagged Far Eastern Curlew in Darwin Harbour by tide height from the non-breeding season of 2017-2018.

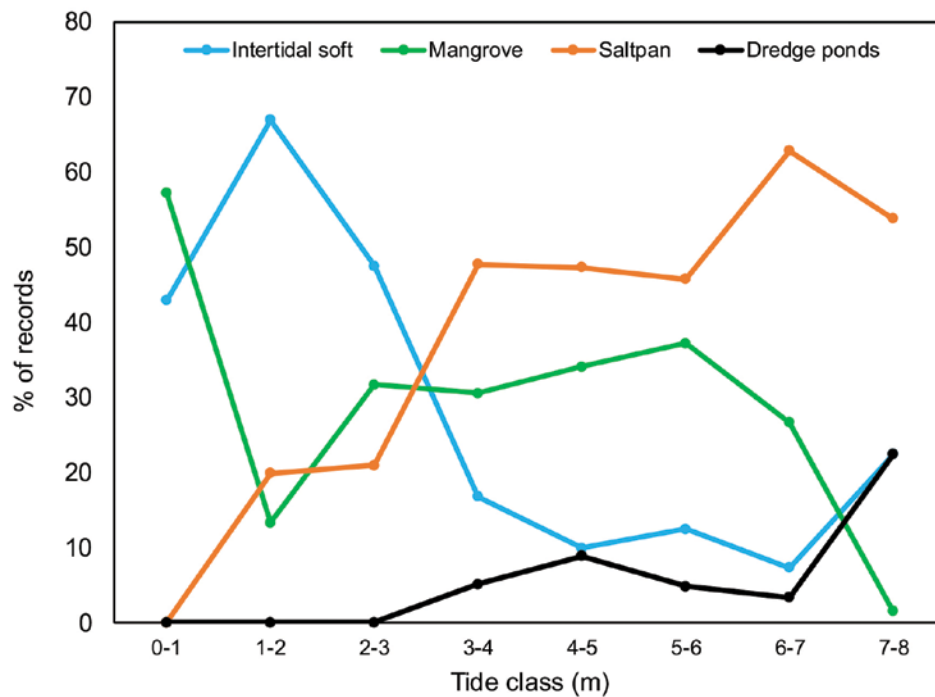


Figure 7. The percent of records of GPS-tagged Far Eastern Curlew in Darwin Harbour by tide height (height classes) from the non-breeding season of 2017-2018.

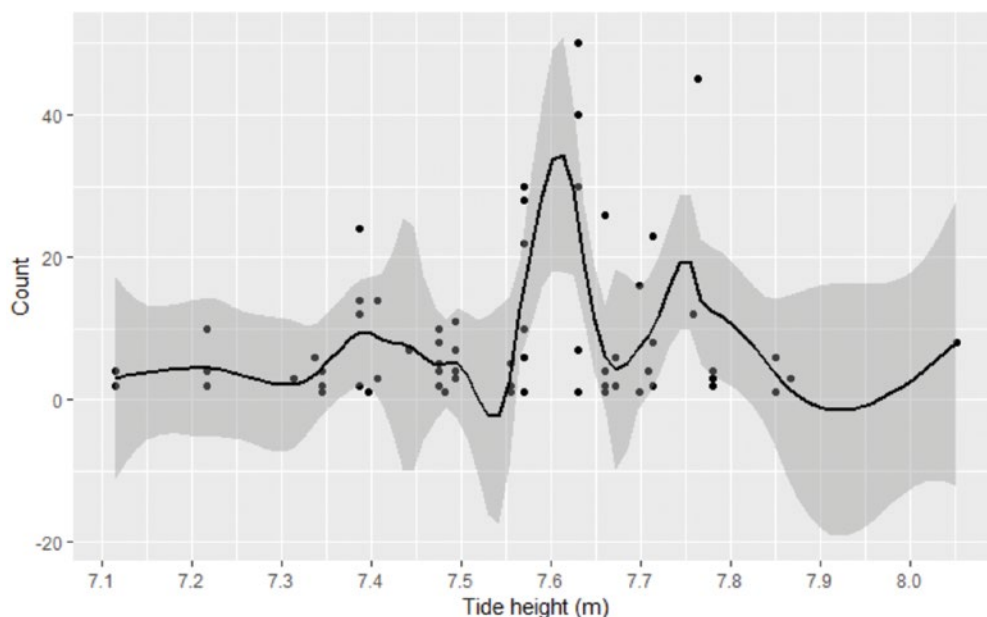


Figure 8. Count of Far Eastern Curlew arriving at East Arm Wharf dredge ponds during spring tides >7 m. The black wiggly line shows a smooth fit between the dot points and can be used to help guide the eye across the general trend.

There were higher temperatures recorded from the birds when they were on exposed mudflats, than when they were in salt pans (Figure 9). We speculate that Curlew moved out to the mudflats, away from salt pans, during hotter periods of the day. Mudflats have shallow water that help shorebirds cool off (Battley et al. 2003). Salt pans are typically barren and are only inundated by the tide during spring-tide cycles every fortnight, creating a very hot environment for shorebirds. Our preliminary results of the microclimate of salt pans show us that the substrate temperature of salt pans (despite the substrate content having an average saturation level of 52%) can be up to 42°C, compared to a beach intertidal foreshore that has a maximum substrate temperature of 34°C, which also provide some shallow water for birds to stand in to cool down. However, the EAW dredge ponds had the highest records for relative humidity, substrate temperature, and ambient temperature (measured between 1030 and 1230 h).



Figure 9. The GPS locations of GPS-tagged Far Eastern Curlew in Darwin Harbour by temperature from the non-breeding season of 2017-2018.

Strategic use of habitat by the birds

- Curlew in Darwin appear to have used the intertidal zone strategically to avoid high temperatures in salt pans, and for improved predator detection at night at safe, open roost sites. It is also possible that they only used the EAW dredge ponds during very high spring-tides above 7 m during evenings when substrate and ambient temperatures would be lower.
- Based on the local tracking, the two Curlew we tracked in Darwin had short daily commuting distances: A single commuting flight in a day would have been a maximum distance of 4 km. The daily commute would have been <10 kms per day in comparison of commuting flights with Curlews from in Moreton Bay, which were recorded moving up to ~16 kms between roosting areas (<https://www.fullerlab.org/happy-world-curlew-day/>).

Future tagging work

We plan on starting mist-netting in September 2018 at the EAW and GWA sites. Amanda will travel to Victoria in October to join the Victorian Wader Study Group for three days of cannon-netting targeting Curlew at well-known roost sites. Amanda will then attend the Australasian Shorebird Conference in Hobart, Tasmania and present recent findings from The Curlew Project.

We will run a large cannon-netting expedition in November 2018 in Darwin to target Curlew at EAW and GWA. We will also catch other non-target shorebirds during this expedition and this will build on previous capture and resighting data. Having tagged birds in the Darwin Harbour system will help us to identify the most important sites for shorebirds in Darwin Harbour.

Intertidal invertebrates

We have tested the invertebrate sampling methods from the boat in Darwin Harbour. We took 18 core samples from three sites (East Arm mud, Charles Darwin National Park mud, and Middle Arm mud) in Darwin Harbour, totalling 54 cores over three days in April. We counted 191 intertidal invertebrates from approximately 24 species and found that the average size of the animals was 15.8 mm and a maximum size of 75 mm (Table 1).

We then repeated this method in July 2017 and collected 60 core samples from Middle Arm and East Arm Wharf mud. During the July round of sampling we counted 73 intertidal invertebrates from only 20 species. The average size of the July invertebrates was 15.13 mm with a maximum size of 90 mm (Table 1).

Table 1. List of intertidal invertebrate species and their average size at each site and total count for that species from sites.

	Count of Species					Average size (mm)				
	CDNP	EAW	MA	EAW	MA	CDNP	EAW	MA	EAW	MA
Higher classification	April			July		April			July	
Amphipoda	4		1			3.5		3.0		
Amphiura	1	11	2	8	2	1.0	1.1	1.0	1.0	1.5
Anadara granosa	1		2			2.0		2.5		
Anthuridae	1			1		4.0			4.5	
Armandia sp.				2					12.0	
Bivalve	1		1			4.0		10.0		
Crab	1	1				4.0	3.0			
Diurodrilus ?				1					4.0	
Glyceridae	1	4	1	5		15.0	18.3	18.0	36.4	
Goniadidae				1					12.0	
Hermit crab				2					1.3	
Isopod	2					3.5				
Macrophthalmus				1	1				2.5	25.0
Maldanidae	13	24	25		1	19.8	20.2	19.4		42.0
Nemertea	2	1	1	2		11.0	14.0	5.5	29.5	
Nephtyidae	6	2	1	2	1	9.7	28.0	7.0	50.5	11.0
Owenidae				1					8.0	
Phoronid			21					21.4		
Phyllodoce novahollandiae				1					25.0	
Phyllodocidae	1			2		50.0			15.0	
Polychaete	3	10	7	15	4	9.3	22.6	9.1	13.3	14.5
Polynoidae			1					11.0		
Shrimp		1					24.0			
Sipunculid					1					5.0
Snail			2					3.0		
Soft-bodied	1				1	25.0				9.0
Spionidae	8	13	2	12	2	21.6	15.5	9.0	12.0	6.5
Sternaspidae			1		1			4.0		6.0
Unknown	1					20.0				
Unknown worm-like	1					22.0				
Worm-like		3	5	3			18.3	15.0	42.0	

Indigenous engagement

We continue to work with the Larrakia Rangers on The Curlew Project through monitoring trips to seven coastal sites to measure microclimate variable, including salinity, relative humidity, wind speed, wind flow, ambient temperature, substrate temperature, water content of the soil, and sediment grain size. We are measuring these environmental correlates so we can examine the possible drivers of habitat choice within intertidal systems.

We also submitted a research funding application to BirdLife Australia 'Indigenous Grant for Bird Research and Conservation' to extend our Curlew monitoring further into Shoal Bay, but we were unsuccessful. We also recently submitted an abstract to present our research findings at the Territory Natural Resource Management Conference, to be held in Darwin in November 2018.

Acknowledgements

We acknowledge the harbour's Traditional Owners, the Larrakia People, and their elders past and present. We thank our project partners Darwin Port. Thanks to the National Environmental Science Programme Threatened Species Recovery Hub for funding this project on Far Eastern Curlew (Project 5.1.1). We are grateful to Ian Leiper for providing the maps for this paper. We thank Gavin O'Brien and Damien Stanioch for their amazing volunteer efforts in the field catching Curlew. Without them, we would not have tags on birds.

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Further information:

<http://www.nespthreatenedspecies.edu.au/>

This project is supported through funding from the
Australian Government's National Environmental Science Programme.

