

National Environmental Science Programme



Progress Report 2: Strategic Planning for the Far Eastern Curlew

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Front cover: Amanda inspecting the wing moult of Far Eastern Curlew '01' at East Arm Wharf dredge Pond E. Photo: Gavin O'Brien

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Far Eastern Curlew '01' fitted with GPS unit at East Arm Wharf dredge Pond E. Photo: Gavin O'Brien



Mist nets set for shorebird catching in dredge Pond E at East Arm Wharf. Photo: Gavin O'Brien

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 to date

As of December 2017 we have two Far Eastern Curlew with GPS tags transmitting movement data from within Darwin Harbour. The two birds were caught with mist nets during high tide, one from the Genesee Wyoming Australia rail line saltpan and the other bird from Darwin Port East Arm Wharf Pond E (tidal dredge pond). These birds have been fitted with the OrniTrack OT-20-3G GPS tags that transmit data using the 3G GSM (phone) network. Data are received and summarised using the OrniTrack online platform, and movements are analysed using the animal tracking platform ZoaTrack (see https://zoatrack.org/projects/436 for project updates).

Initial mapping work

As part of the aerial survey performed in January 2017 we have produced a series of maps displaying the distribution of FEC at low and high tides and how this aligns with the intertidal zone.

Far Eastern Curlew were widely distributed throughout Darwin Harbour during the low tide aerial survey (Figure 1). Most FEC were recorded foraging on the mud closer to the mangroves than the mud at the lowest tide height. They were recorded in small flocks during the high tide period when they were roosting, primarily in supratidal saltpans, above the high-water mark (Figure 2). Shorebirds were forced out of these saltpans once the tide reached its peak height and birds moved to roosts on islands, in mangroves or on beaches. Some shorebirds, including Far Eastern Curlew roosted at the East Arm Wharf site, and even when perturbed at the site during the aerial survey, they returned to roost in the artificial dredge ponds.



Figure 1. Distribution of Far Eastern Curlew recorded during low tide in Darwin Harbour.



Figure 2. Distribution of Far Eastern Curlew recorded during high tide in Darwin Harbour. Legend shows count size classifications. Flocks of \geq 31 individuals represent sites considered as nationally important under the EPBC Act.



A flock of Far Eastern Curlew fly over the mist nets at East Arm Wharf. Photo: Gavin O'Brien

Movement ecology

Home Range

The two FEC (17004 and 17007) with GPS units have been using saltpans, intertidal mudflat, mangrove areas and the East Arm Wharf dredge ponds since being released from their point of capture (Figures 3 and 5). We have estimated the home range sizes for the tagged FEC using the minimum convex polygon (MCP) method in ZoaTrack. MCP is a globally accepted method to determine where an animal lives and moves on a periodic basis (Burgman and Fox 2003). Figures 4 and 6 show the MCP estimated for both tagged FEC and are bound by their use of saltpans.



Figure 3. GPS Detections for Far Eastern Curlew with tag '17004' in Darwin Harbour.



Figure 4. Minimum convex polygon for Far Eastern Curlew '17004' in Darwin Harbour.



Figure 5. GPS Detections for Far Eastern Curlew with tag '17007' from Darwin Harbour.



Figure 6. Minimum convex polygon for Far Eastern Curlew '17007' in Darwin Harbour.

Foraging movements

We used the alpha hull home range estimation method to generalise habitat use by cropping out low use areas from the polygons created in the MCP analysis. We use the alpha hull method to estimate the main movements of birds. Figure 7 shows the main areas used by the tagged FEC and demonstrate that 17004 has not been recorded on the intertidal zone, but has mostly used saltpans, mangroves and the East Arm Wharf dredge ponds. Meanwhile, 17007 has ventured out to the mudflat with records from the intertidal zone at low tide. There is some overlap in habitat used by both tagged FEC but this has only been on saltpans in Charles Darwin National Park and at the Genesee Wyoming Australia.



Figure 7. Main foraging areas used by tagged Far Eastern Curlew in Darwin Harbour. Orange = 17004, green = 17007.

Heatmap analysis

We used a heat map analysis with point intensity to visually identify the areas of high use by FEC. This method shows the areas in a colour gradient based on density of occurrence. Figure 8 shows the combined density of occurrence for both tagged FEC with the major concentration of records from a saltpan in Charles Darwin National Park, a saltpan near Genesee Wyoming Australia, a saltpan near Hidden Valley, and at the East Arm Wharf dredge ponds.



Figure 8. Heat map of habitat use for tagged Far Eastern Curlew in Darwin Harbour.

Future work

Mapping

After mapping the distribution of FEC across Darwin Harbour we discovered there was a discrepancy between the map layers for the intertidal zone (Figure 9). We plan on sourcing new map layers of the intertidal zone to re-map Darwin Harbour at the lowest tide for further spatial analysis. This will be useful for analysing movements of FEC from the GPS units. In addition to this, we plan on calculating the amount of area available to shorebirds during neap tides, with a particular interest in the habitat available during low neap tides as this part of the tide cycle may constrain shorebird feeding routines if adequate space is not available.



Figure 9. Darwin Harbour map showing intertidal zones, saltpans and mangroves. Note the discrepancy between intertidal map layers.

We will also map the available area of saltpans and saltmarsh vegetation as we know that this habitat type is of great importance to FEC. We will measure the height of surrounding vegetation in saltpans as a useful covariate in determining FEC occupancy.

Arrivals dataset

During high tide counts of shorebirds at the Darwin Port East Arm Wharf roost we have collected information of shorebirds arriving at the site and the orientation of their arrival. This will be mapped to show the routine nature of shorebirds using Darwin Harbour and the Darwin Port roost site.

Occupancy modelling using motion-sensor cameras

We are currently trialling motion-sensor cameras at sites to determine their efficacy in occupancy modelling of FEC. We plan on using this technique in addition to the GPS units deployed on birds, as this will strengthen our understanding of movements for a range of individuals in the population.

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). Thanks to Airborne Solutions for providing expert helicopter assistance during the aerial survey and to Larrakia Rangers for their involvement in the field survey. We are grateful to Ian Leiper for providing the maps for this paper. Figures 1-3 incorporate topographic map data which is © Commonwealth of Australia (Geoscience Australia) and vegetation mapping data supplied by the Department of Land Resource Management, © Northern Territory of Australia.

Appendix

Far Eastern Curlew morphometrics data

Date	Site	Species	Band number	Age	Sex	Time processed	Bill	Head- bill	Wing length	Weight (g)	Moult	Moult score	Breeding plumage (%)	GPS tag details
21/11/17	Genesee Wyoming Australia saltpan	Far Eastern Curlew	09164454	2+	М	2047	158	200	310	637	5554100000	20	5	OT-20- 3G GPS tag: 17004
4/12/17	East Arm Wharf dredge	Far Eastern Curlew	09164453	2+	М	2040	156	201	276	645	5555555100	36	0	OT-20- 3G GPS tag:

Table 1. Morphometric data for Far Eastern Curlew in Darwin Harbour.

References

pond E

Burgman, M. A., and J. C. Fox. 2003. Bias in species range estimates from minimum convex polygons: implications for conservation and options for improved planning. Animal Conservation 6:19-28.



Amanda inspecting the wing moult of Far Eastern Curlew '00' at the Genesee Wyoming Australia saltpan. Photo: Gavin O'Brien

Engraved

flag code

00

01

17007

Further information: http://www.nespthreatenedspecies.edu.au/

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