

A new locality and range extension for the Water Mouse *Xeromys myoides*

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Abstract

The Water Mouse, *Xeromys myoides*, is confined to the coastal zone of Queensland and the Northern Territory, Australia and Papua New Guinea. There is a knowledge gap on the distribution of the species between the most northern records for the species at Airlie Beach, Queensland and East Arnhem, Northern Territory. Two sites were surveyed in Cairns with remote cameras and Elliott traps. Three cameras captured images of water mice and remains from one predated specimen were found at one of the two survey sites. This survey confirms the presence of a population of *Xeromys myoides* in Cairns, Queensland, thereby significantly extending the known distribution of the species in Queensland.

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Introduction

The Water Mouse, *Xeromys myoides*, occurs in mangrove communities and near coastal freshwater ecosystems in Queensland, the Northern Territory and Papua New Guinea (Van Dyck 1998; Ball 2004; DERM 2010). In Queensland the known distribution of *X. myoides* is from south of Brisbane to Airlie Beach (Van Dyck 1998; DERM 2010). Despite extensive mangrove systems between Airlie Beach and the Northern Territory populations, there have been no confirmed records of *X. myoides*.

In the Northern Territory, *Xeromys myoides* has been recorded in mangrove communities, swamps and sedgeland (Redhead & McKean 1975; Magnusson *et al.* 1976). In the vicinity of Mackay, surveys in 1944 (McDougall 1944) trapped five *X. myoides* about 1.5 km inland from the coast in a reed swamp consisting of long grass and *Pandanus*. More recent records for Mackay and other locations in central Queensland have been within saline mangrove systems dominated by *Ceriops tagal* and/or *Bruguiera* species (Ball 2004; Tina

Ball, personal observation). *Xeromys* has been confirmed to utilise a variety of habitats in south-east Queensland including mangrove, saltmarsh, heath, reed swamps, freshwater wetlands, lagoons (Dwyer *et al.* 1979; Smith 1981; Van Dyck & Gynther 2003; Gynther 2011), and in an area of slash pine, *Pinus elliottii* near to a stream and sedge swamp fringed with *Melaleuca* (Dwyer *et al.* 1979). On Bribie Island, north of Brisbane, *X. myoides* was captured in 1984 and 1985 in an ephemeral freshwater wetland behind a foredune (Gynther 2011). The species has not been detected at this location since 1985 though in 2010 two animals were captured elsewhere on Bribie Island 180–300 m from the ocean beach in a permanent intermittently tidal lagoon with littoral marsh habitat of sedges and reeds (Gynther 2011).

It has been suggested mangrove and saltmarsh provide optimal foraging habitat for *X. myoides* compared to non-saline habitats, and the species may move between nearby freshwater habitats as preferred mangrove and associated community

foraging zones become inaccessible due to inundation (Smith 1981; Gynther 2011).

While spotlighting in mangroves on 28 August 2017 at the Jack Barnes Bicentennial Boardwalk adjacent to Cairns Airport, a rodent was photographed, later confirmed to be *X. myoides* (Fig. 1). The photo prompted targeted surveys undertaken in the region the following week.

Methods

Two survey areas were selected in mangrove communities in Cairns (Fig. 2). Site 1 was adjacent to the Cairns Airport at the mangrove boardwalk where the original photograph of *X. myoides* was taken. Site 2 was 4 km north of the boardwalk, adjacent to Machans Beach Access Road.

Site 1 - Jack Barnes Bicentennial Boardwalk adjacent to Cairns Airport (GDA94 S 16°53'02.9" E 145°45'43.7")

Elliott A traps were set between 4–7 September 2017 (20 traps for 3 nights; 7 traps for 2 nights/74 trap-nights) spaced around 20 m apart. Traps were placed on the mangrove floor and baited with pilchards. The trapping transect started at the edge of a *Rhizophora* mangrove community and extended into tall closed *Ceriops tagal/C. australis* with occasional *Bruguiera* mangrove community. The transect started at S 16°53'04.3" E 145°45'41.9" and ended at S 16°53'01.9" E 145°45'46.0" with a total of 27 Elliott traps. A remote camera was positioned for three nights at the site where a photo was taken of *X. myoides* on 28 August 2017. Spotlight surveys were undertaken along the mangrove boardwalk for one hour on the nights 4 and 5 September 2017.



Figure 1. *Xeromys myoides* photographed next to the mangrove boardwalk, Cairns Airport, 28 August 2017. Photo: Andrew Mitchell.

Site 2 – Machans Beach Access Road (GDA94 S 16°51'35.2" E 145°44'05.7")

The second site was north of the boardwalk on unallocated state land (Lot on plan 15USL9633) (Fig. 2). The site was a tall mangrove community consisting of *Ceriops tagal/C. australis* and *Bruguiera exaristata* with occasional tall *Avicennia marina*. Four Scout Guard cameras - Infrared Digital Scouting Camera SG562-C with x1 or x2 magnifying attachment, were tied to trees <0.5 m from the ground. Each camera was positioned about 1 m from a food lure consisting of pilchards placed in a PVC canister with holes in the sides. Cameras were set to photo mode and were operated for two nights (6–7 September 2017). The site was visited during the day on 3 October 2017 to search for evidence of nests and visual feeding signs by *X. myoides*.

Results

It was a full moon during the survey period with the highest tide during the survey at 2.81 m a.s.l., 0.69 m below the 2017 H.A.T. (3.50 m). For September, the average temperature is 18.7° C – 28.1° C; 55% relative humidity (@ 3pm) and 20.5 km/hr winds (@ 3pm) predominantly from a south-easterly direction (BOM 2018).

Tall open forests of *Ceriops tagal/australis* with *Bruguiera* dominated the mangrove community and middens of intact grapsid crab carapaces were scattered on the forest floor – evidence of feeding activity by *X. myoides*.

At site 1, adjacent to Cairns Airport, 74 trap nights, three camera trap nights and two spotlighting hours did not result in any records of *X. myoides*. No other animals were trapped though two rodents, thought to be *Melomys* (A. Baker, personal communication 2018; I. Gynther, personal communication 2018) (Fig. 3), were observed in trees on several occasions during spotlighting.

A total of 135 images were taken by five remote cameras, four active for two nights and one active for three nights. Three of the four cameras captured 30 images of *X. myoides* (80% camera trap success) at site 2, Machan's Beach Access Road (Table 1; Figs. 4–6). Three other rodents were recorded on camera including a water rat *Hydromys chrysogaster* and two unidentified rodents likely to be *Rattus* and *Melomys*.



Figure 2. Survey sites, Cairns, north-east Queensland, Australia.

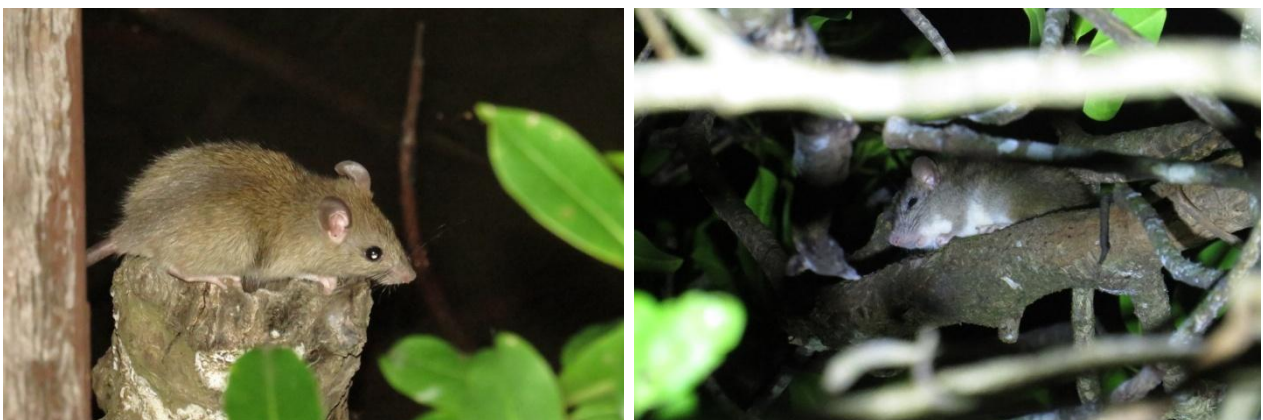


Figure 3. Two rodents, thought to be *Melomys* sp., photographed next to the mangrove boardwalk, Cairns Airport, during spotlighting 4 September 2017. Photo: Tina Ball.

Table 1. Results from remote cameras.

Site:Camera ID (no of images)	GPS location Latitude (S); Longitude (E)	Number of <i>X. myoides</i> images	Other fauna
2:1 (73)	S16°51'34.7" E 145°44'06.7"	18	rat (<i>Rattus</i> sp.)
2:2 (13)	S16°51'32.2" E 145°44'07.3"	6	NA
2:3 (25)	S16°51'31.4" E 145°44'07.5"	6	Water-rat (<i>Hydromys chrysogaster</i>), rat (<i>Rattus sp.</i>), canid
2:4 (18)	S16°51'30.6" E 145°44'06.8"	0	rodent (<i>Melomys</i> sp.)
1:5 (6)	S16°53'05.2" E 145°45'44.2"	0	NA

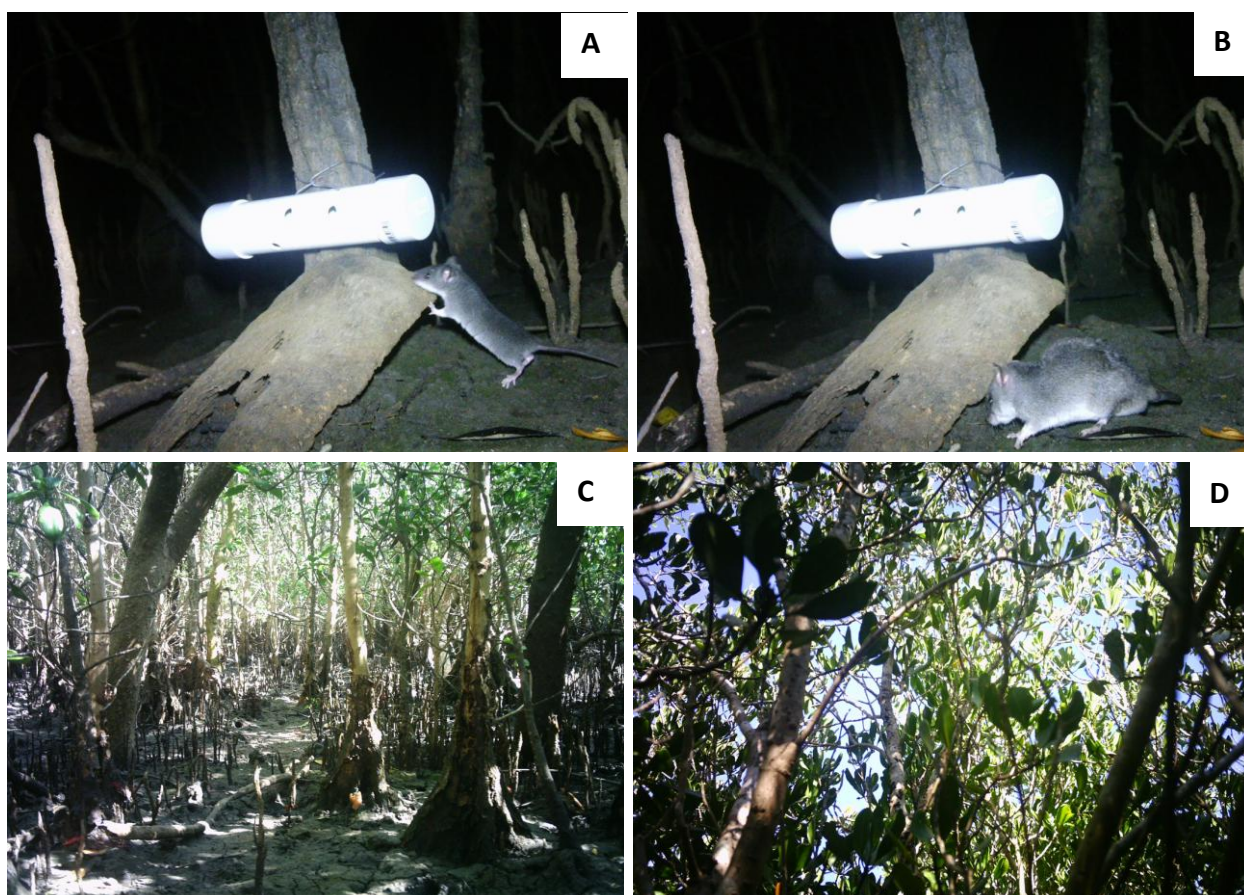


Figure 4. Images from camera 1 of *Xeromys myoides* (A,B) and habitat (C,D), site 2 Machans Beach, Cairns.

A recently decapitated *X. myoides* was found on the morning of 3 October 2017 (Fig. 7) and is lodged with the Queensland Museum, South Bank, Brisbane (QMJM21157).

Discussion

We have confirmed the presence of *Xeromys myoides* in Cairns, north Queensland, from a photo

taken by one of the authors on 28 August, from camera trap images taken during follow up targeted surveys at the beginning of September 2017, and Water Mouse remains found on the mangrove floor on 3 October 2017 (QMJM21157). This is the first published Queensland record of *X. myoides* north of Airlie Beach, an extension of range of about 600 km.

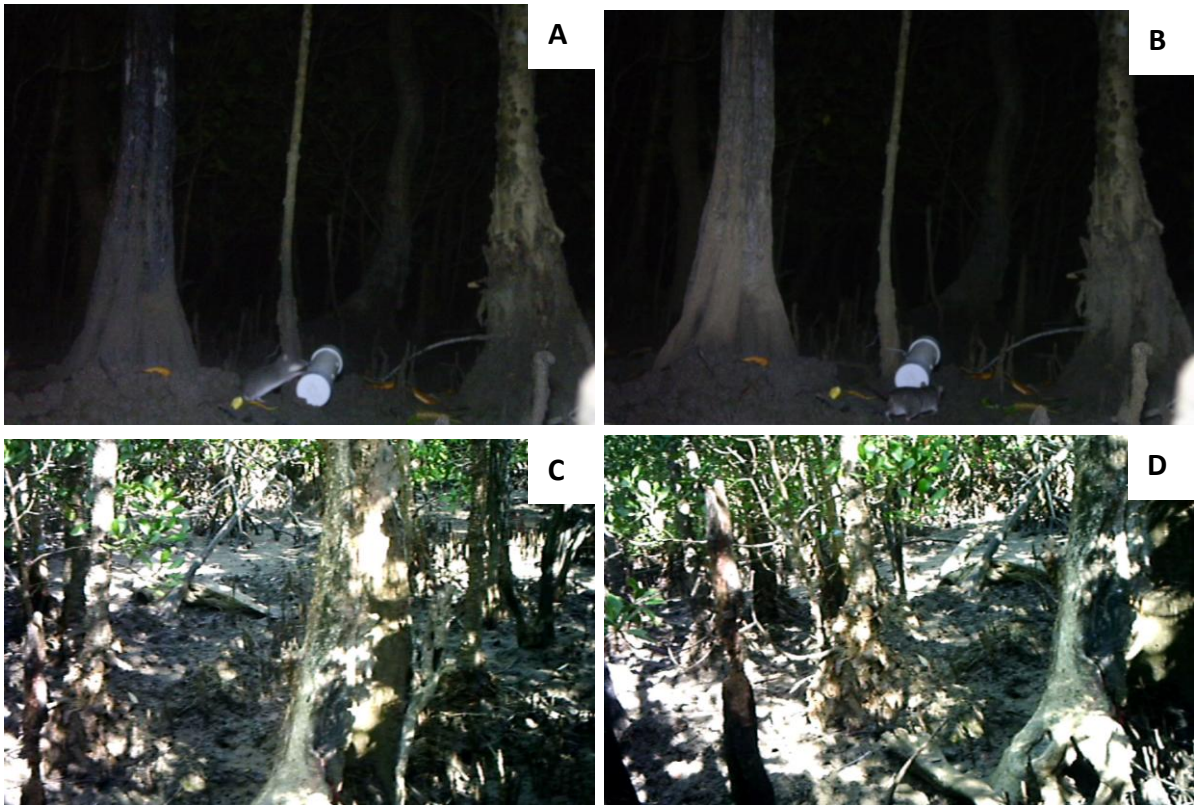


Figure 5. Images from camera 2 of *Xeromys myoides* (A,B) and habitat (C,D), site 2 Machans Beach, Cairns.

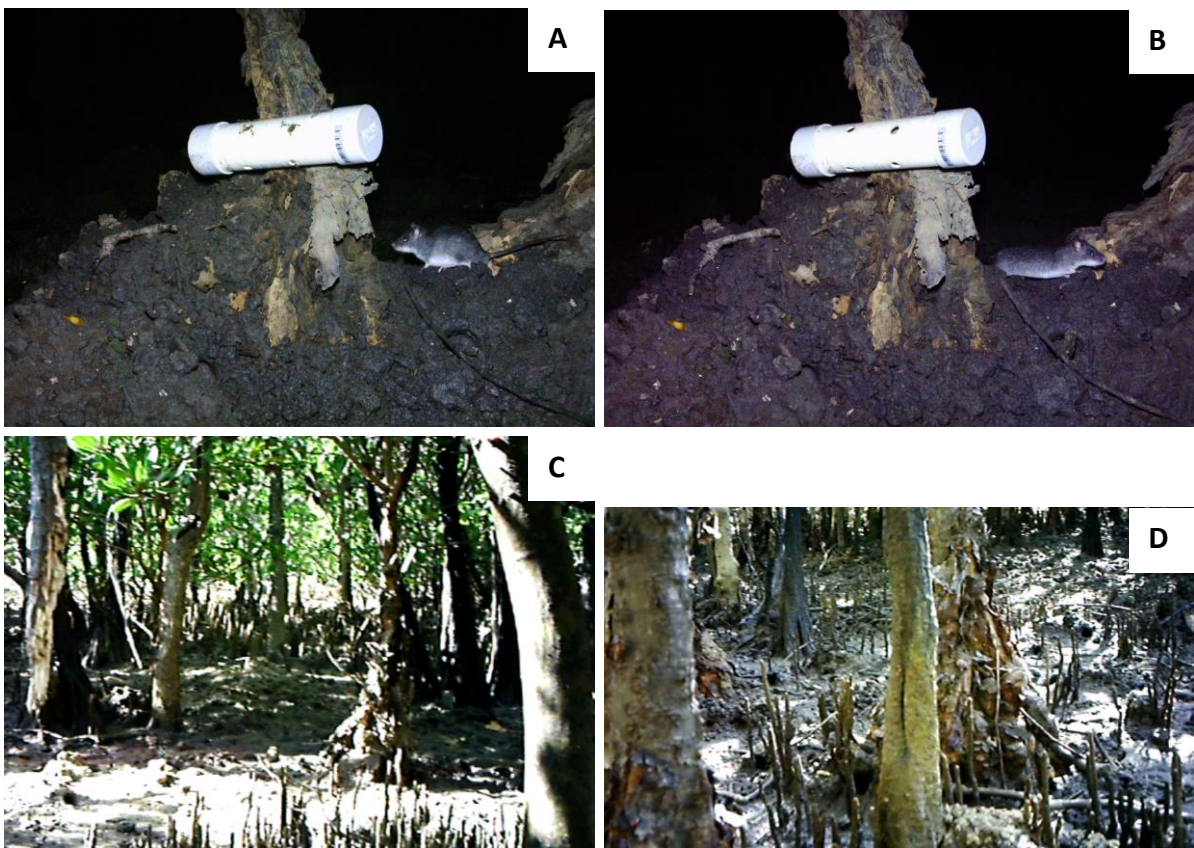


Figure 6. Images from camera 3 of *Xeromys myoides* (A,B) and habitat (C,D), site 2 Machans Beach, Cairns.



Figure 7. Predated *Xeromys myoides* found at site 2, Machans Beach, Cairns.
Photo: Andrew Mitchell.

It has also shown that remote cameras with colour night images and clip on magnification lenses are a suitable tool for the detection of *X. myoides*.

Xeromys myoides has been recorded in Queensland, the Northern Territory and Papua New Guinea. Though the species is listed as 'vulnerable' under the Nature Conservation Act (1992) and Environment Protection and Biodiversity Conservation Act (1999), little is known of the distribution and ecology of this threatened species. Effort has been focused in south-east Queensland (Van Dyck 1997; Van Dyck & Gynther 2003; Van Dyck *et al.* 2006) with recent studies extending north to the Sunshine Coast/Maryborough region (Kaluza *et al.* 2016; N. Kaluza, personal communication 2018). Research (Ball 2004; Ball *et al.* 2006) and surveys (Tina Ball, unpublished survey data 2004 - 2017) have been undertaken in the central Queensland region.

Greater survey effort is required in central and northern Queensland. Of interest in the Cairns area would be understanding spatial distribution and variables that influence the use of micro-habitat within mangrove communities. One suspected predator, the wild dog, was captured on a remote camera at site 2, Machans Beach. Dog tracks were observed at the survey site and a wild dog was sighted on the mangrove fringe. Understanding the threat of feral predators to the persistence of

X. myoides would assist in the guidance and implementation of management plans in the Cairns area.

A recent genetics study compared four *X. myoides* populations throughout Queensland and two populations in the Northern Territory (Benfer *et al.* 2014). Though this study concluded *X. myoides* is a single species throughout the known Australian geographic range, it also found the Mackay population had greater genetic diversity than south-east Queensland populations (Benfer *et al.* 2014). It would be beneficial to analyse genetic material from the Cairns populations.

The Wet Tropics region, which includes Cairns, has vast mangrove (~50 000 ha) systems that could potentially provide suitable habitat for *X. myoides*. In the Northern Territory, The Gulf has almost half a million hectares of mangroves. Both regions also have an abundance of near coastal freshwater wetlands that could support populations. The two sites at Cairns where we have confirmed *X. myoides* comprised similar mangrove species and structure to the closest known sites in the Mackay and Airlie Beach area (Ball 2004). Further studies in Cairns and the broader Wet Tropics region would prove invaluable to increasing our knowledge of the distribution and ecology of this species along the Queensland coastline.

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