Managing Seabird Burrows Impacted by East Coast Low Coastal Wave Inundation on Big Island in New South Wales, Australia

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Introduction

Island coastal geomorphology provides unique habitats for burrowing seabirds. Big Island is located 450 metres off the mainland at Port Kembla in New South Wales, Australia (34°29'24" S, 150°55'42" E) covering an area of 17.5 ha (Fig. 1). Seabird habitat on Big Island is threatened by invasive weeds and coastal processes including the June 2016 East Coast Low. Aim of this research was to monitor and assess the potential damage to seabird burrows caused by human disturbance and natural coastal processes.

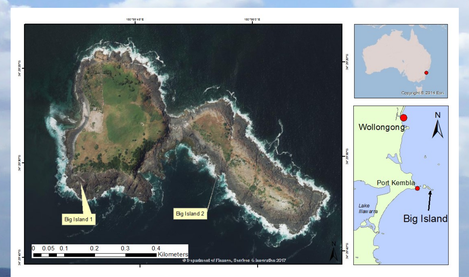


Figure 1 : Location map of Big Island, Five Islands Nature Reserve, Australia

Background

Burrowing seabirds nest between August and May each year in the rocky outcrops and guano-rich soils developed above latite bedrock. The soil and rock burrows vary in size and location depending on the type of seabird using the nest and the available depth of the soil profile. Burrowing seabirds on Big Island include Little Penguins *Eudyptula minor (Fig. 2)*, Wedge-tailed Shearwater *Ardenna pacifica* and Short-tailed Shearwater *Ardenna tenuirostris (*Carlile *et. al.* 2017*)*. Migratory shearwaters are protected under international bilateral agreements. Kikuyu grass *Cenchrus clandestinum* and Coastal morning glory *Ipomoea cairica* were sprayed to prevent seabirds being entangled in weeds or trapped in their burrows.


(a)


(b)


(c)

Figure 2 : (a) Little Penguin (b) Little penguin chicks (c) shearwater chick


(a)

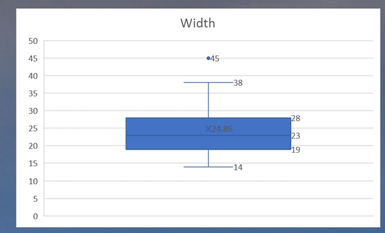

(b)

(c)

Figure 3 : (a) Soil burrow with ground cover (b) Rocky burrow (c) Soil burrow under shrubs

Methods

Rehabilitation work commenced in 2014 to remove the weeds. Shearwater and Little Penguin burrow locations were mapped using GPS. Little Penguin burrows were further monitored over a 2-year period by collecting data on the width, height, depth and condition of the burrow. Eroded areas following the East Coast Low were mapped and analysed in relation to the impact on seabird burrows. Areas of exposed soil were monitored following the treatment of weeds.



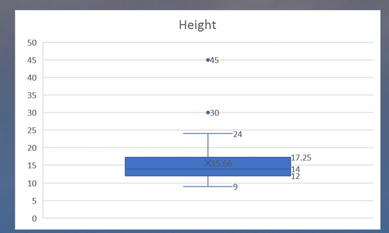
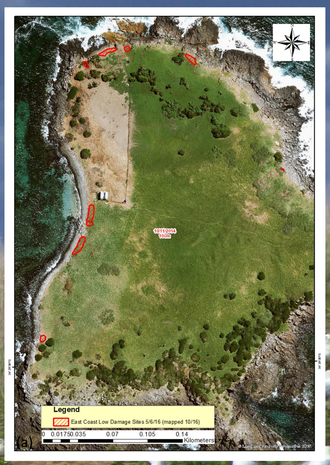


Figure 4: Box and whisker plot of Little Penguin burrow entrance dimensions



(a)


(b)


(c)

Figure 5 : (a) East coast low erosion scars after the June 2016 storm. (b) Before the storm [taken 18/01/2016] (c) After the June 2016 storm [taken 7/10/2016]

Results

Of the 58 Little Penguin burrows measured three distinct types were recorded including soil burrows with ground cover (Figure 3a), rocky burrows (Figure 3b) and soil burrows under shrub canopy (Figure 3c). Little Penguin burrows were within 65 metres of the shoreline whereas shearwaters used the whole island. Penguin entrances (Fig. 4) for soil burrows were a parabola shape with on average 25 cm floor width by 16 cm roof height with depths generally 70 cm. Little Penguins preferred soil burrows as indicated by 86 % nesting in soil whereas 14 % nested in rocky burrows. The dimension of shearwater burrows were not measured to avoid any detrimental impact on the burrows however it can be noted it was substantially longer than Little Penguin burrows often reaching well over 1 m. Trampling damage to the burrows was especially noted on slopes over 5 degrees, along regularly walked pathways and areas of bare soil. Leaving the weeds to mulch after treatment reduced the occurrence of bare soil. The June 2016 East Coast Low eroded 0.2% of the island over 8 different areas impacting over 49 burrows within 8 m of the vegetated coastline.

Discussion/Conclusion

Seabird burrows are potentially damaged by both human disturbance and natural causes. Weed removal creates the potential for erosion and loss of skeletal soil horizons critical to the burrowing seabirds. Trial areas sprayed during non-breeding seasons show that surface erosion was not an issue due to the cover provided by the mulching dead weed layer. To prevent trampling damage avoidance is the best method followed by a detailed briefing to ensure personal avoid areas with slopes greater than 5 degrees and bare soil areas. Built raised walkways would minimise the trampling damage caused by regularly walked pathways. Spatial mapping of the wave erosion damage caused by June 2016 East Coast Low highlighted the vulnerability of burrows located within 8 m of the vegetated coastline and up to ~3 m above sea-level. Coastal island management needs to ensure there are suitable protected nesting habitats beyond the potential impact zone of these East Coast low destructive storm events and future sea level rise.

Reference: N. Carlile, C. Lloyd, R. Morris, H. Battam and L. Smith: (2017) Big Island, Five Islands Group, NSW, *Corella*, 41: 57-62

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