Greater Bilby (*Macrotis lagotis*) burrows, diggings and scats in the Pilbara

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Abstract

The greater bilby (*Macrotis lagotis*) is a conservation significant species because of a contraction in its geographic range and is now only found in a few locations in Australian sandy deserts and the Pilbara of Western Australia. We report on the presence of eight burrows and 605 diggings and scratchings in an area of about 9 ha for a small group of greater bilbies in the Pilbara. We describe burrows that were located adjacent to or under rocks, under an old termite mound and in mature spinifex. Most of the activity area, which had been burnt six months earlier, contained diggings and scratchings that we divided into three categories: nose cone diggings, scratchings and circular holes. Numerous scratchings contained the characteristic scats which can be used to identify the presence of greater bilby in an area. This paper provides information on the evidence that can be used to determine the presence of greater bilby in the Pilbara.

Keywords: Fauna Surveys, Conservation Significant Species, Pilbara, Dalgyte

Introduction

Greater bilbies (*Macrotis lagotis*) are listed as vulnerable under the Environment Protection and Biodiversity Conservation Act (1999) and as a Schedule 1 species under the Western Australian Wildlife Conservation Act (1950). If greater bilbies are potentially present in an area designated for development, then the government regulators would expect the developer to determine whether they were present. Given that they are nocturnal and unlikely to be seen during daytime searches, evidence from burrows, diggings and scats is particularly useful.

Greater bilbies typically use two to three burrows each night (Lavery & Kirkpatrick 1997) and live in small groups of two to four individuals. They dig a burrow system that may be up to 3 m long and 1.8 m deep (Johnson 2000). They feed on insects, seeds, bulbs, fruit and fungi (Smyth & Philpott 1968; Southgate & Carthew 2006) and often leave a characteristic excavation of up to 10 cm deep with the soil scattered in all directions or a 'pot-hole' in the ground (James & Eldridge 2007). Female greater bilbies reintroduced to a protective environment had a home range of 0.2 km^2 and males 3.2 km^2 (Moseby & O'Donnell 2003). Males can grow to 2.5 kg, but females are much smaller with a maximum weight of around 1.1 kg (Johnson 2000).

Smyth & Philpott (1968) provided a description of burrows, diggings and scratchings of the greater bilby near the Warburton Ranges in a variety of habitat types, but most of the burrows were located in mulga-tussock scrub and mulga-spinifex scrub. There are no data on the surface signs of greater bilbies for the Pilbara region of Western Australia.

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It is our experience that the diggings, scratchings and burrows of greater bilbies are occasionally being confused with that of other species. As this species is listed as being of conservation significant with both the state and commonwealth governments, a false positive presence can cause delays or unnecessary costs for developers. In contrast with the habitat utilised by Bilbies in the Warburton Ranges, this paper describes one aggregation of greater bilby burrows and evidence of foraging in a burnt spinifex meadow on red sandy soil that may assist others in identifying the presence of greater bilbies during fauna surveys in the Pilbara.

Methods

A single burrow with four entrances was initially located (21° 25'S, 118° 55'E) adjacent to an existing gravel track that was to be used to haul equipment and materials to a Fortescue Metals Group construction site in the Pilbara of Western Australia. In late May – early June of 2007 we searched the area on foot to about 100 m beyond all located diggings and scratchings. The location of all burrows, scratchings and diggings were recorded with a GPS. The size of each scratching, circular hole and nose cone digging was estimated and recorded.

Results

A gravel track runs north-south adjacent to the four entrance burrow that was initially located (Figure 1). East of this track the area was mostly vegetated with mature spinifex (Figure 2A). West of the gravel track most of the area had been burnt in November 2006 (Figure 2B). There was a small patch of unburnt spinifex (≈ 60 m by 50 m) west of the gravel track. A total of eight burrows and 605 diggings and scratchings were identified in an area of about 9 ha (Figure 1). Two of these burrows were central

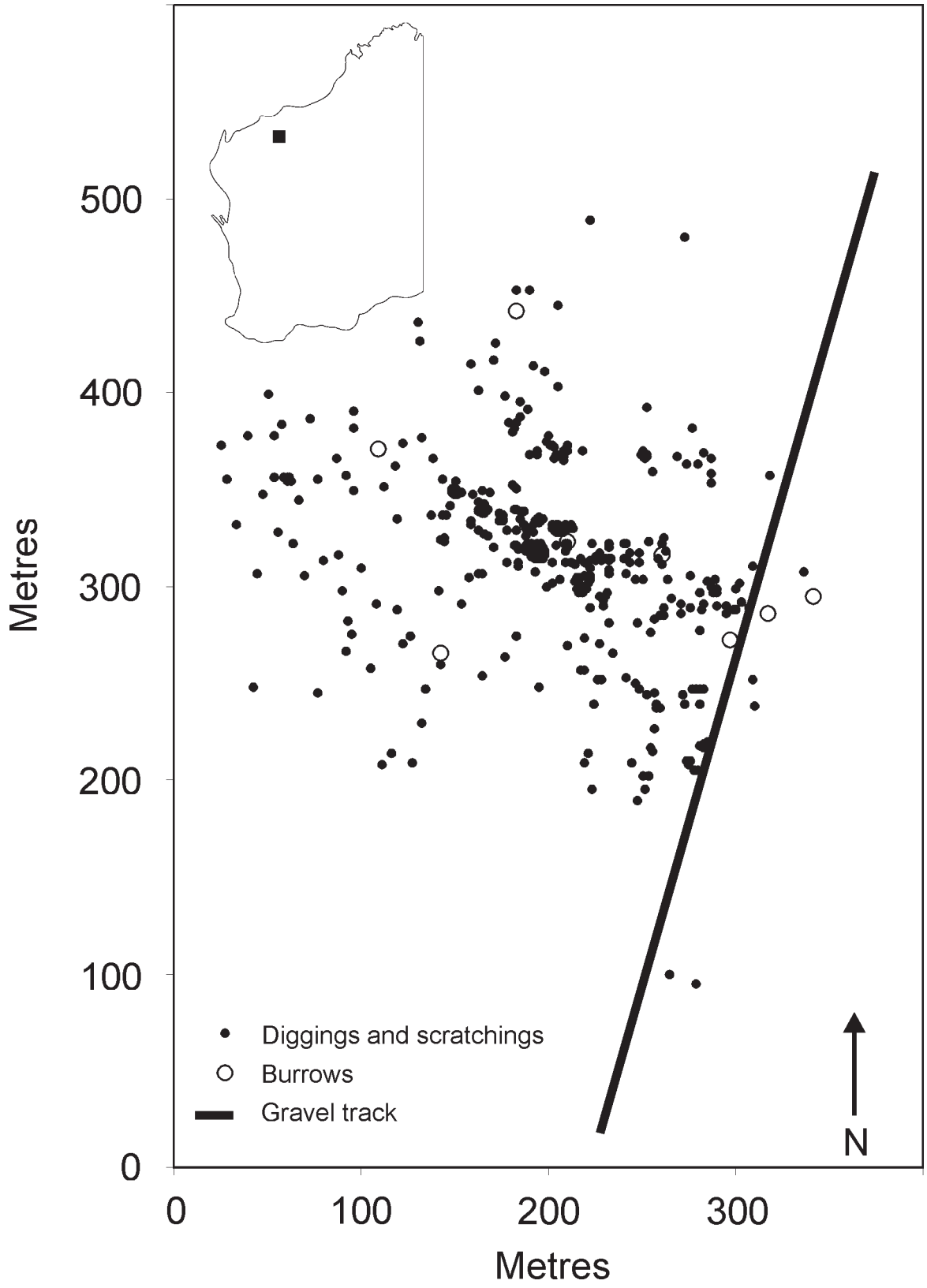

Figure 1. Distribution of burrows, diggings and scratchings of *Macrotis lagotis*

Figure 2. Greater bilby burrow entrances, diggings and scratchings. A – mature spinifex area, B – burnt area, C – nose cone digging, D – scratchings, E – circular hole, F – scats, G – burrow under rocks, H – burrow under rocks, I – burrow under rocks, J – burrow in spinifex, K – burrow in the open, L – burrow under a termite mound, M – scratchings, N – burrow under rocks, O – scratchings.

to the diggings and scratchings, the other six were towards the periphery. All burrows showed signs of being recently active. Burrows were judged to have been recently active if there was fresh soil around the entrance and footprints in the soil. Some of the scratchings and diggings had been present for sometime as leaf litter had accumulated in the depressions and there were spider webs in a few of the deeper circular holes.

Two burrows were located adjacent to or under rocks (Figure 2G, H, I and N), and one was located under an old termite mound (Figure 2L). The burrow with four entrances was located in mature spinifex (Figure 2J) and the remainder were in the open burnt area (Figure 2K). Burrow entrances were about 300 mm high and 250 mm wide. One burrow with four entrances was within a couple of metres of the gravel track on the eastern side and one burrow with two entrances under rocks was within a couple of metres of the western edge of the track (Figure 2G and I). The piles of soil at the entrance to burrows adjacent to the rocks and in the spinifex were about 250 mm high, but those in the open were much smaller. The burrows located were similar to those described by Smyth & Philpott (1968), being slightly oval with a flattened based (Figure 2J and H). The mound of soil at the entrance was semi-circular and spread up to 1.5 m from the burrow entrance (Figure 2K and N). Tracks were found on the burrow entrances, but they were not evident in the surrounding area, probably because the soil was too hard to make an imprint that would last.

Diggings and scratchings could be grouped into three categories: nose cone diggings, scratchings and circular holes. Nose cone diggings were mostly 'V' shaped with the deepest section at the apex (Figure 2C). Nose cone diggings were mostly 100–150 mm deep. Scratchings were mostly shallow (to a depth of about 100 mm) and scattered over an area of between 200 by 200 mm to 1200 by 500 mm, but mostly 300 by 300 mm (Figure 2D, M and O). Sometimes, a scratching contained one or more nose cone diggings. Circular holes were mostly about 200 mm in diameter and ranged in depth from 200 to 400 mm, but were mostly about 250 mm (Figure 2E). Circular holes were mostly by themselves, but occasionally in twos and threes. The density of scratchings and diggings in the areas vegetated with mature spinifex was much less than in the burnt area, and there was a higher density of diggings and scratchings in the centre of the activity area. The ratio of scratchings:nose cone diggings:circular holes was very close to 2:2:1.

Forty three sets of scats were found, mostly on scratchings [greater bilby scats are distinctive; being pellet shaped and varied in diameter (8 – 13 mm) and between 10 and 30 mm in length (Figure 2F)]. A set of scats consisted of 3 to 8 pellets of about the same size and age, based on their colour and state of decomposition. However, it was likely that we missed many of the scats, as they could have been covered by soil displaced during greater bilby digging activity. As scats fade with time, it was evident that some scats had been placed on some scratchings on a number of occasions.

We revisited this site again in September 2007 and the burrows were still active, indicating that greater bilbies can remain in areas with limited vegetation cover. During the grid search of the Fortescue Metals Group railway line corridor in July 2006, in an area about 7 km to the north of this site, a number of greater bilby burrows were located and multiple scratchings and diggings were found in the vicinity of these burrows in a similar pattern to that described above. This area was densely vegetated with mature spinifex and scattered trees when initially searched. This area was burnt during November 2006, and when it was searched again in December 2006 there was no longer any evidence of greater bilbies in the area. We presumed that they had moved due to a lack of vegetation or an inadequate food supply.

Discussion

Greater bilby activity reported here is for a burnt area and we could find no reports of greater bilbies remaining in burnt areas, however, this may simply reflect the paucity of information on their existing habitats. It was unknown how many greater bilbies foraged in this area, or how long these burrows had been utilised. However, it was apparent that the foraging area was confined to about 9 ha around the burrows. Most of the burrows, diggings and scatchings were located in the area that had been burnt.

Scratchings and diggings that we report here are similar to those described by Smyth & Philpott (1968), being either circular holes or more irregular shapes with lots of shallow diggings into the topsoil only. Smyth & Philpott (1968) also reported diggings were never more than 180 m from a burrow which again is the same for our case study (Figure 1).

It is possible to confuse the diggings and burrows of other animals with those of bilbies. For example, goanna (*Varanus panoptes* and *V. gouldii*) and rabbit diggings, scratchings and sometimes their burrows can be confused with those of greater bilbies. A feature of many goanna diggings deeper than 50 mm, is that they are often adjacent to a vertical spider burrow and the digging slopes into the spider burrow, and can therefore easily be distinguished from greater bilby holes. However, weathered goanna diggings can be confused with those of greater bilbies. Greater bilby scratchings and diggings are often concentrated around burrows, whereas goanna diggings are much less dense and are not always located in close proximity to a burrow. Smyth & Philpott (1968) suggested that the opening to greater bilby pits were generally wider (140 mm) than those of goannas (90 mm). The circular pits dug by greater bilbies at the site we examined were a little wider (≈ 200 mm), and although we have not measured those of goannas, our observations are that they vary appreciably and the width is influenced by the depth of the digging and probably the size of the goanna that dug the hole.

Greater bilby burrow entrances are generally much larger than those of goannas and most other mammals that use holes in the Pilbara. The burrowing bettong (*Bettongia lesueur*), which once lived in the Pilbara, but is now thought to be extinct in the region on the mainland, is the only other mammal with a similar sized burrow. Greater bilby burrows are also generally higher than they are wide, which distinguishes them from goanna burrows, which are typically a flattened 'D'

shape with a horizontal base. However, goannas may also enter active and inactive greater bilby burrows, and in these circumstances their tracks may be obvious around the entrance.

Rabbit (*Oryctolagus cuniculus*) burrows and warrens can be similar, but smaller, than those of greater bilbies, but their scats (ie circular pellets, ~ 6mm dia, with a lot deposited in close proximity) and diggings are very different and difficult to confuse with those of greater bilby scratchings which are generally deeper and wider than those of rabbits.

The presence of greater bilby scats on some of the scratchings and diggings is useful for determining whether the scratchings and diggings belong to greater bilbies or another reptile or mammal. Southgate (2005) demonstrated the relationship between greater bilby scat diameter and animal size, with heavier animals producing larger scats. As the scats we found varied in size, for example, those shown in Figure 2F ranged from 8.5 – 12.5 mm, this suggests that different sized greater bilbies were utilising this area.

In summary, the presence of greater bilbies can be determined by an abundance of their characteristic diggings in a confined area, the near circular diggings that are about 200 mm in diameter and ranged in depth from 200 to 400 mm, and burrows within the diggings that have an entrance that is about 300 mm high and 250 mm wide.

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