

# QUENDA - Our Ecosystem Engineers

## Nature Conservation Information Sheet



*Prepared by Dr Gillian Bryant on behalf of Nature Conservation Margaret River Region*

## What is a Quenda?

The quenda is a medium-sized ground dwelling marsupial of the bandicoot and bilby family (Marsupialia: Peramelemorphia) and is endemic to the south-west of Western Australia. Quenda (the local Indigenous name) are now considered genetically different to other southern-brown bandicoots (*Isodoon obselus* species) found in eastern parts of Australia and are therefore, considered to be its own unique species (*Isodoon fusciventer*) (Travouillon & Phillips, 2018).

Quenda are serious diggers! It has been estimated that a single quenda can potentially create up to 45 foraging pits a night and in the process displace ~10.74 kg soil per day (Valentine, Anderson, Hardy, & Fleming, 2013). This extrapolates to 3.9 tonnes of soil each year! They dig conical-shaped holes in search of buried food, mainly for mychorrizal fungal fruiting bodies, tubers and invertebrates (e.g. Valentine et al., 2013).

## Conservation status and current distribution

Under the Western Australian Biodiversity Conservation Act 2016, quenda are considered a Priority Four species. This means they are in the category of “**Rare, Near Threatened and other species in need of monitoring**” (Department of Justice 2019).

Like many small-to-medium sized Australian marsupials, quenda have suffered a drastic population decline post European settlement and it is estimated that their historical range distribution has contracted by 40% (Abbott, 2008).



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The main reasons for their decline include: habitat loss via land clearing for human development, altered fire regimes, predation by introduced feral pest species (red fox *Vulpes vulpes*, domestic and feral cats *Felis catus*), and competition for resources with the European rabbit (*Oryctolagus cuniculus*) (Burbidge & McKenzie, 1989; Paull, 2008).

Despite these negative influences, quenda have remained present even as their habitat has steadily become engulfed by urban development (Howard et al., 2014). Quenda are known to inhabit urban backyards, urban parklands, bush fragments, and conservation reserves, even where no predator control programs occur (Bryant, Kobryn, Hardy, & Fleming, 2017; Howard et al., 2014; Valentine et al., 2013). However, they prefer dense, understory vegetation and are found in both open forest, and dense vegetation near swamps and watercourses (Valentine et al., 2013). They are currently found in an arc along the Swan Coastal Plain with some sightings near Geraldton in the North extending past Cape Naturaliste and Cape Leeuwin to the south, through to Albany and Esperance in the south east (Figure 1).

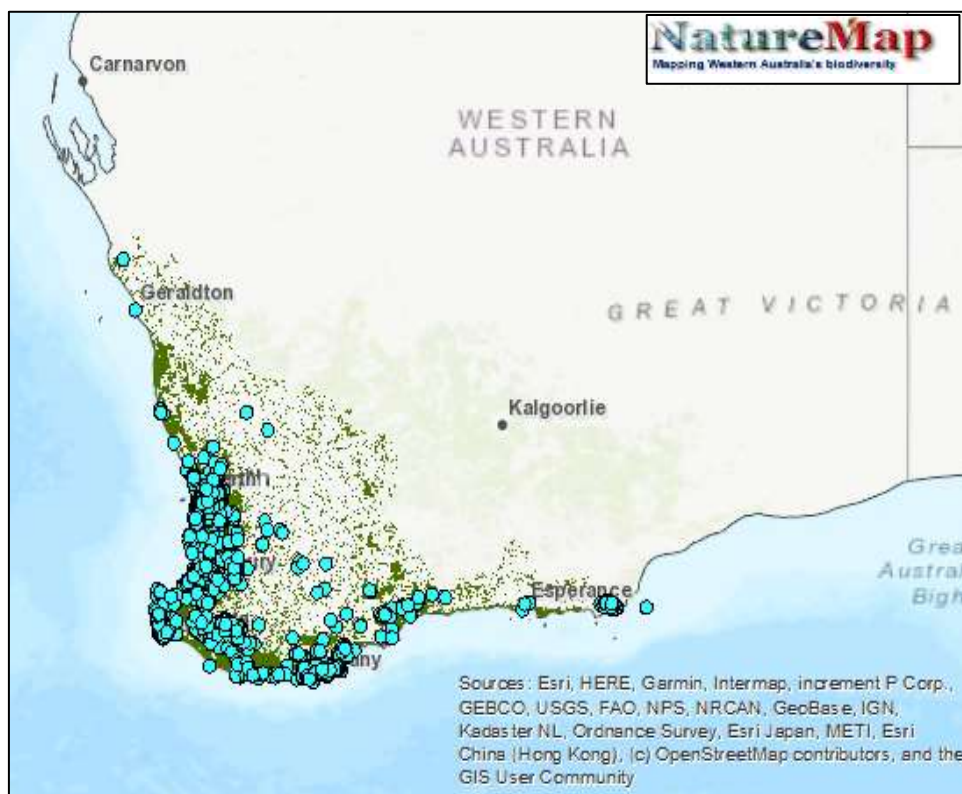


Figure 1. Current distribution of the quenda (*Isodoon fusciventer*) in Western Australia

## Brief characteristics

### Appearance

Quenda are similar in size to the introduced rabbit (*O. cuniculus*), at around 30 cm in length but usually weigh less with the majority of individuals under 1 kg (Table 1). They have a grizzled pelage of black spiny bristle hairs with soft, dark grey underfur so that they appear brown at a distance (Figure 2; Paull, 2008). The inner side of their limbs and their ventral surface is yellowish grey in colour. Quenda have conical-shaped mandibles, which gives them their identifying head-shape and associated foraging hole shape. They have small, rounded ears and black eyes. Their tail has hair covering it (as distinct from the hairless, long and slender tails of black and brown rats (*Rattus norvegicus* and *R. rattus*), which quenda are often mistaken for (Paull, 2008). Quenda tails are often short or damaged as fighting with other individuals is common and ferocious (Paull, 2008).



Table 1. Size characteristics of southern brown bandicoot (genus *Isodon*). Average values in brackets (values from Paull, 2008).

Sex	Head to body length	Mass	Tail length
Male	300-360 (330) mm	500-1850 (890) g	96-145 (124) mm
Females	280-330 (300) mm	400-1200 (620) g	90-128 (113) mm



Figure 2. Images of the quenda (*Isodon fusciventer*)

## Diet

Quenda are seasonally opportunistic omnivores, which means they forage for a range of invertebrates including Coleoptera (beetles and weevils), Hymenoptera (ants, bees, wasps), and Hemiptera (bugs, aphids and cicadas). In addition, they eat a variety of plant roots and tubers, mosses, berries, seeds and the truffle-like fruiting bodies of mycorrhizal fungi which are buried underground (Claridge & May, 1994; Dundas et al., 2018; Quin, 1985; Tay et al., 2018; Valentine et al., 2013; Valentine et al., 2018).



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## Breeding

Quenda and other southern brown bandicoots (*Isodoodon sp.*) have a rear-opening pouch to prevent dirt from entering. They have a gestation period of approximately 15 days and weaning takes around 60 days (Paull, 2008). They have eight teats, but it is usual to have only two or three pouch young at weaning (range 1-6) (Paull, 2008). Breeding has been recorded throughout the year and offspring reach sexual maturity by four or five months of age (Paull, 2008). Their lifespan in the wild is only approximately three or four years (Paull, 2008).

## Activity patterns

Quenda have a solitary behaviour and are known to be active both day and night. They have varied home-range sizes of 0.5 ha up to 5 ha, depending on habitat connectivity and suitability (Paull, 2008). Males, particularly larger individuals, forage over larger areas compared to females and smaller individuals. Territories are probably not actively defended but they are known to engage in vicious fighting when they encounter each other (Howard et al., 2014; Paull, 2008). They construct a dome-shaped nest in well-concealed dense understory vegetation for protection from predation when resting and nesting and may use burrows created by other animals e.g. rabbits for shelter (Haby, Conran, & Carthew, 2013; Paull, 2008).

## Importance as ecosystem engineers

Digging mammals (e.g. bandicoots, bettongs, potoroos and bilbies) play an important role in maintaining healthy urban bushlands and are considered **ecosystem engineers**. They create a range of disturbances in the landscape, for example, nose pokes, scratchings, shallow to deep digs, long bulldozing tracts and complex subterranean burrows (Eldridge & Mensinga, 2007). By making these disturbances, digging mammals turn over substantial volumes of soil, which **drive ecosystem processes**, making them invaluable additions to have in your backyard! There are five main ecological processes that digging mammals, like quenda contribute to, as detailed by Fleming et al., (2014):



1. **Turning over large volumes of soil:** By turning over the soil, organic matter is mixed, which increases the soil heterogeneity over the landscape. The soil density also decreases and brings buried nutrients to the surface helping plants access these nutrients.
2. **Water infiltration is increased:** Many eucalypt leaves are high in resins, waxes and aromatic oils (and are not readily eaten by herbivores). As the leaves decay, they create a hydrophobic crust-like layer on the top of the soil profile, which reduces water infiltration. Digging mammals alter the soil texture by breaking up this water repellent layer and allow an increase in the infiltration rate of rainwater. This increases the soil moisture content (water-holding content), which in-turn increases the nutrient availability to plants and encourages plant growth.
3. **Organic matter is captured:** As mammals dig, they capture leaf litter and debris and turn it over allowing soil microbes and invertebrates to continue the nutrient cycle. Fire leaf litter loads may also be reduced in this manner.
4. **Seed dispersal and plant recruitment:** Seeds may become trapped or actively cached in foraging digs or burrows across the landscape and are then protected from wind and run-off, which may help seedling recruitment.
5. **Fungal dispersal and recruitment:** There is a symbiotic tripartite relationship between quenda, plants and mycorrhizal fungi (Tay et al., 2018):
  - a) The fungi provide food for quenda and in return the fungal spores are moved around the landscape either on the quenda (e.g. claws or nose) or contained within their scats.
  - b) Plants benefit from a fungal association to help reach water and some nutrients and the plants provide fungi with photosynthates.
  - c) By digging, quenda help create all the above 'ecosystem engineer' benefits (i.e. 1-4) for plant growth and in return, plants provide quenda with shelter and food.

## Do you have quenda at your place?

### Foraging digs and nose pokes

You may be able to recognise whether you already have quenda living or visiting your property based on finding evidence of their calling cards – their unique, conical-shaped foraging dig holes (Figure 3). You may also find nose pokes in your backyard, especially on grassed areas. These are significantly smaller than foraging digs, but are still relatively conical in shape (Figure 4). The foraging digs are on average 10 cm wide and around 7 cm deep (Table 2; Valentine et al., 2013), but may be much deeper if found in very sandy soils (Figure 5).

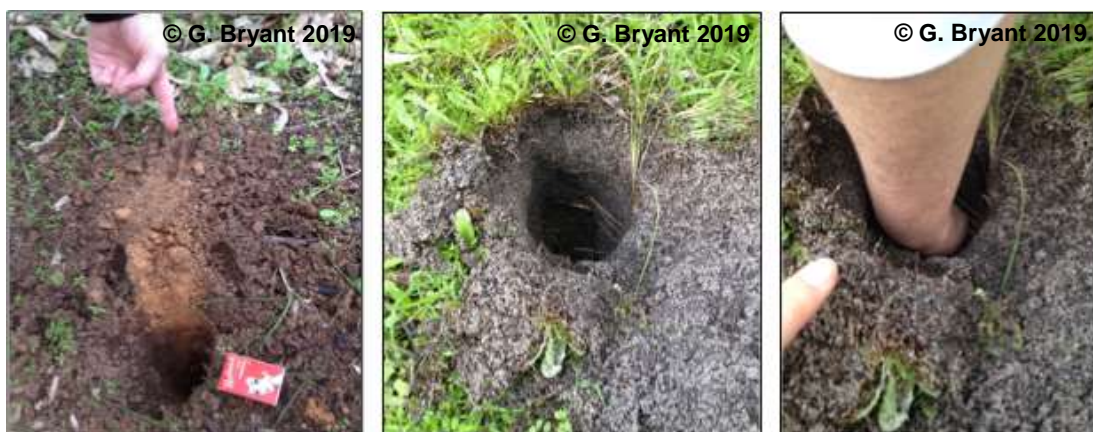


Figure 3. Images of foraging digs of the quenda.

The left image indicates the indents of the animal's hind feet and tail. The middle and right image indicates how deep and round the holes may be, as shown by an adult's hand able to fit down into the hole.

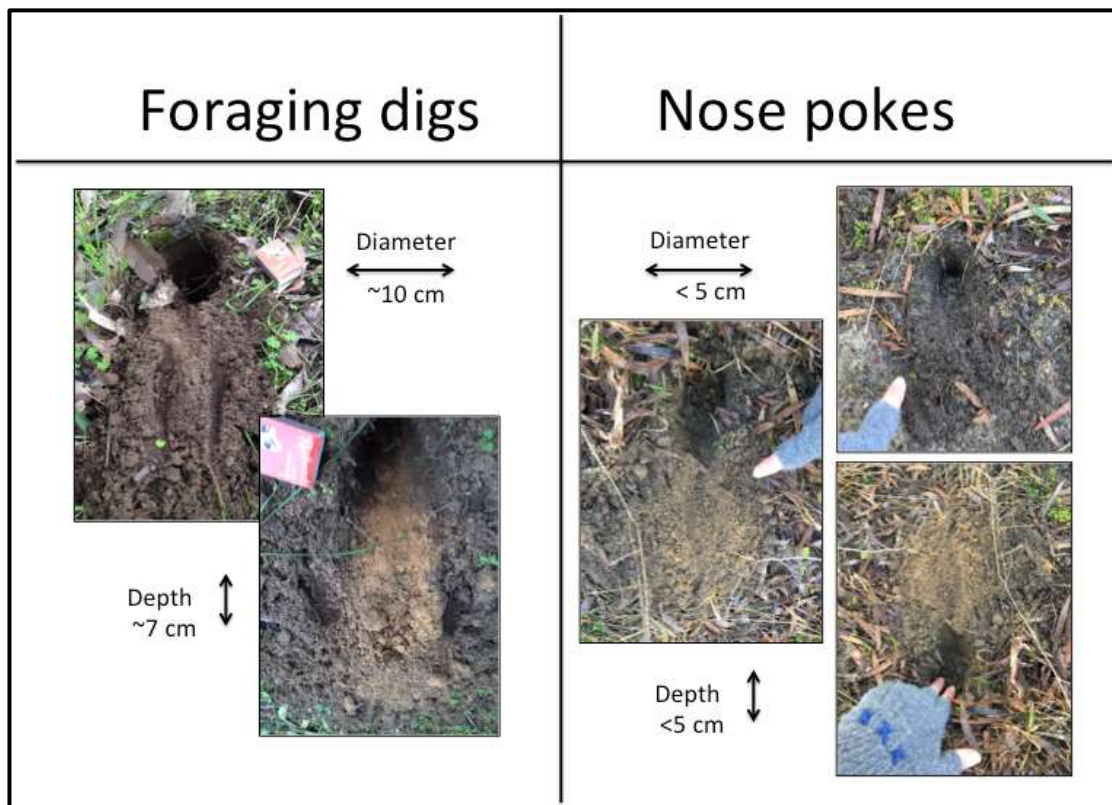


Figure 4. Outlining the size difference between a quenda foraging dig and a quenda nose-poke. © G. Bryant 2019



Figure 5. The plaster cast of a quenda foraging dig (right) and nose poke (left) obtained in very sandy soils near the Dunsborough foreshore.

Table 2. Average dimensions for quenda foraging digs (adapted from Valentine et al., 2013)

Dimension	Average size	Standard deviation
Diameter	100.9 mm	± 3.9 mm
Depth	69.6 mm	± 3.2 mm (depth range 35–135 mm)
Volume of soil	191 ml	± 15 ml

## Identifying quenda scats/poo

You may also come across their scats, especially if you have seen some foraging holes nearby. Quenda scats are firm, cylindrical pellets of approximately 25 – 50 mm long and 8-10 mm in diameter (Figure 6). There are often particles of sand and invertebrates visible, which can make the scat quite brittle and may be found already in two or more pieces.



Figure 6. Identification of quenda scats found *in situ*. Images courtesy of © N. Tay 2019

## How can you encourage quenda to your property or backyard?

A citizen science study run by the WWF within the wider Perth metropolitan area found that Quenda meet their demise by a range of factors. Unfortunately the most common cause of their deaths was found to be by vehicle strike (cars and bicycles; 44% of deaths; 168 reports), followed by predation (30% of deaths; 113 reports), drowning (16%; 62 reports) and poisoning (1%; 1 report; with 8% unknown cause of death) (Howard et al., 2014).

It is therefore important to keep quenda as safe as possible on your property. The following outline some ways this may be achieved:

### Keep quenda safe

- **Stop/reduce vehicle strikes**
  - Be aware of potential vehicle collisions, including bicycles and drive/ride cautiously along driveways (and on roads).
- **Reduce predation:**
  - Keep **cats** inside, especially at night or confined to a cat-run and make sure they wear loud bell-type collars.
  - Keep **dogs** in separate areas from quenda or train them to avoid / respect quenda.
  - Read the Nature Conservation Information Sheet '*Guide to Fox and Feral Cat Control*' to find out about fox and cat control options on your property.
- **Reduce drowning risks**
  - If you have pools, ponds or dams on your property, make sure there is a ramp out of the water that quenda could use for escape if they accidentally become trapped e.g. long and sturdy branches.

- Make sure downpipes/drainpipes (or similar) are not left sodden in pools of water that could entrap a quenda.
- **Mindful baiting/poisoning of pest species**
  - Make sure quenda cannot reach rat or snail baits. Keep/place baits in concealed containers that they would be unable to uncover as quenda are omnivorous and might be tempted to eat the baits. If using rodent bait, use First Generation Rodenticides that contain the active ingredients Warfarin (Ratsak Double Strength) and Coumatetralyl (e.g. in Racumin) to protect other native animals from secondary poisoning (refer to the Nature Conservation Information Sheet ‘*Rat Control and Native Wildlife*’).
  - The rabbit poison Pindone must not be used if you know you have quenda present.
  - It is possible that other poisons e.g. to control lawn beetles, might be toxic to quenda and should be avoided when quenda are known to be present (either by eating the poisoned beetles or the poison itself).
- **Plant lots and lots of plants**
  - The most important factor for quenda to persist happily on your property is having areas of dense and vertically diverse understory vegetation that will provide food (buried underground via fungal associations and tubers with the plants) and also habitat to protect them from predation pressures and allow nesting (Haby et al., 2013). Planting a wide variety of understory plants (e.g. bushes and ground covers), especially if planted beneath or nearby to canopy tree/s, may encourage quenda to visit and hopefully become a resident in your garden. Refer to Nature Conservation’s *Gardens for Nature Information Sheets* for additional plant and garden suggestions. Some plants to consider include:
    - Grass trees, especially with long skirts e.g. *Xanthorrhoea preissii*
    - Sheoaks e.g. *Allocasuarina* sp.
    - Cockies Tongues *Templetonia retusa*
    - Banksia species
    - Grevillea species
    - Native sedges/grasses
    - Saltbushes e.g. Coast *Atriplex isatidea*, Berry *Rhagodia baccata* and Barrier *Enchylaena tomentosa*
    - Smaller bushes like Cushion Bush *Leucophyta brownie*, Coast Boronia *Boronia alata*, Southern Diplolaena *Diplolaena dampieri* and Gooseberry-leaved Guinea Flower *Hibbertia grossulariifolia*
- **Other things you can do to help keep quenda happy include:**
  - Placing hollow logs or rockeries with hiding spots near dense vegetation may provide protection from predation and may be used by quenda for nesting sites.
  - Keep shallow water dishes topped up for a constant drinking water supply, especially during summer and hot days.
  - Apply thick mulch to garden beds and keep moist to encourage invertebrates and thereby provide food for quenda.
  - You could experiment and install a quenda “safe-house” made from a wooden or plastic pallet secured into the ground using star-pickets, and covered with numerous sticks and branches of vegetation and shade cloth. There is current research being undertaken at Murdoch University on the use and success of these “safe houses” (keep up to date on the findings via: <https://backyardbandicoots.wordpress.com/>).



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