



Martu knowledge of mankarr (greater bilby): distribution, habitat, management

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Front cover image: KJ Jigalong rangers pointing out an active mankarr burrow in mulga and claypan habitat. Jigalong rangers have been working to monitor and protect this population of mankarr. Photo: Anja Skroblin

About this Report

Martu who shared knowledge

Many Martu shared their knowledge about mankarr. This report relies most heavily on knowledge shared by community members in Parnngurr: Muuki Taylor, Ngamaru Bidu, Waka Taylor, Karnu Taylor, Leah Robinson and Carol Williams; Punmu: Minyawu Miller, Nganjapayi Chapman, Mulyatingki Marney, Carl Marney, Gladys Bidu, Jakayu Biljabu, Levina Biljabu; Jigalong: Pamela Jeffries, Heather Samson and Phillipa Charles.

Background

This report contains a compilation of Martu knowledge that was recorded during the project where KJ was working together with the University of Melbourne and The Nature Conservancy to re-design the monitoring program that rangers use to assess the status of mankarr. The information was recorded during 2016 and 2017 in Parnngurr, Punmu, Jigalong and Kunawarritji.

Martu have detailed and complex knowledge of mankarr and many other aspects of country. Here we present the knowledge shared with us. The contents of this report are biased towards spatial information because we were mainly asking questions about: where mankarr are, what type of habitat mankarr like, and how to care for mankarr. We stress that Martu knowledge extends well beyond what is recorded here; we do not present information on Jukurpa (Dreaming and Law), or describe how mankarr may relate to Martu culture and identity. Other Indigenous groups are likely to have similarly in depth knowledge relating to mankarr and other wildlife.

Acknowledgements

We are grateful to all the people who shared their knowledge and time with us, especially the ninti (knowledgeable) KJ Martu rangers and ranger coordinators. This work was made possible by funding and support from Australian Government's National Environmental Science Programme's Threatened Species Recovery Hub, The Nature Conservancy, BHP and Kanyirninpa Jukurpa. Photos were taken by Anja Skroblin unless indicated.



Figure 1. Anja Skroblin talking with Karnu and Ngamaru © KJ.

Tracy Carboon talking with Parnngurr women Rangers. Photo: Anja Skroblin



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Figure 2. Punmu rangers search for mankarr near the salt lakes. Photo: Anja Skroblin.

Martu connection to mankarr

Mankarr, Mankarrpa, Kulkawarlu: Greater Bilby (*Macrotis lagotis*)



Figure 3. Martu holding mankarr that were dug up as part of a radio-tracking project with Rachel Paltridge in Punmu and Parngurr 2008. © R. Paltridge

The Martu people

The Martu people have been living on and caring for their country for many thousands of years (Veth 2005). They are the traditional owners of a large extent of the western deserts (Great Sandy, Little Sandy and Gibson Deserts) in central Western Australia. Martu are among the last of Australia's Indigenous peoples to come into contact with European Australians; some Martu did not meet European Australians until the 1960s (Davenport et al. 2005). The old people have first-hand experience of traditional living in the deserts, and Martu have extensive knowledge of their country.

| | |
|---------------|---|
| Pujiman times | when Martu were living on country before contact with European Australians |
| 1920s – 1960s | Martu migrate from desert lands to neighbouring pastoral stations and missions |
| 1969 | Jigalong handed over to Martu people |
| 1980s | Parngurr and Punmu communities established when people decided to move to homelands |
| 2002 | Awarded rights to Martu Native Title Determination (13.6 million hectares) |

Why work to protect the bilby?

Mankarr is a special animal for many Australians including Martu and other Aboriginal people. Martu have expressed it is important to look after mankarr for various reasons including the obligation to look after country, to teach children, and care for mankarr itself. At the Ninu Festival in 2016 other Indigenous groups similarly expressed the need to look after the bilby (Walsh Fiona and custodians of the Bilby 2016).

We need to do this work to look after mankarr and the other animals because my father told me we need to look after them (Heather Samson Jigalong 10/5/2017).

It's important for us to take kids out and show them the animals, to sit down and share stories (Pamela Jefferies Jigalong 10/5/2017).

We found a mankarr burrow. Some ladies had never seen one. I showed them the mankarr and they were really happy! (Carol Williams Parngurr 29/5/2017).

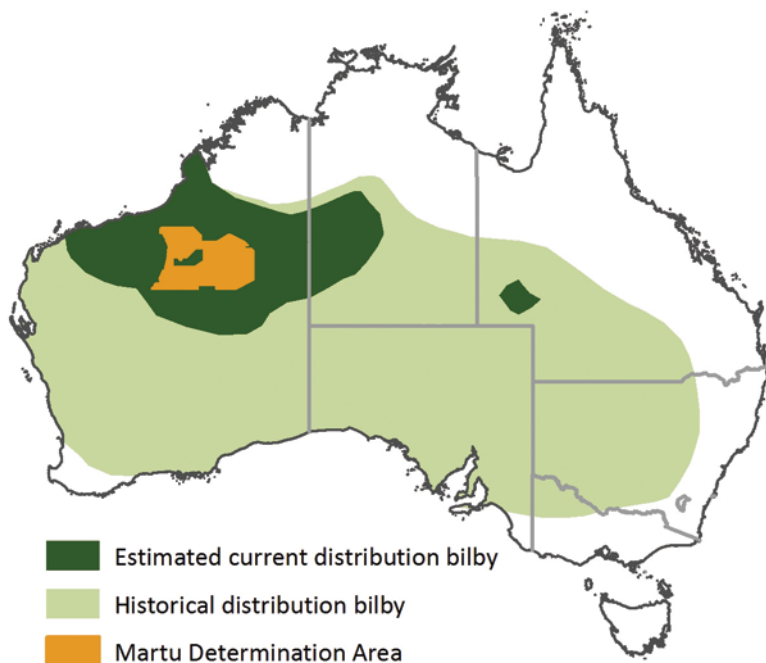


Figure 4. Martu country sits in the heart of the estimated remaining distribution of the greater bilby. Image: Anja Skroblin modified from Bradley et al. 2015

Importance of mankarr

Martu used to hunt and eat mankarr back in Pujiman times, but do not do so anymore. Elders mentioned that although mankarr were eaten, other animals, such as mala and golden bandicoot, were a more prized food source.

They didn't worry about mankarr, they were going for other bush meat. Mankarr are hard to dig up, they are too far down. That [digging them up] was before white-fella (Nganjapayi Chapman interpreted by Carl Marney 23/9/2016).

It is unclear how important mankarr were in the Martu diet during Pujiman times. But hunting of mankarr has been mentioned in interviews elsewhere (Walsh 2008). The presence of mankarr may also be used to provide indicators about the country.

Mankarr dig underneath lunki trees after they burn, that tells us the plant is still alive (Carol Williams 29/5/2017).

Mankarr are important parts of the ecosystem. Their burrows are used by other native animals like snakes and hopping mice, but sometimes also by cats and rabbits. Other cultural uses or Jukurpa connections were not recorded.

Sand goanna and snakes go into mankarr hole, we've got to be careful that the snakes not still in there [when doing surveys to see if mankarr are present] (Heather Samson 10/5/2017).

So many mammals are already gone!

Many mammals have disappeared from Martu country including the golden bandicoot, mala, and brush-tailed possum. The mankarr is the last of the desert bandicoots to exist in Australia, and is one of the several mammals that are now less common on Martu country (including the northern quoll and warru/black-flanked rock-wallaby). Some Martu see these declines as related to Martu moving off their lands in the 1960s and 70s and the cessation of traditional practices over this time.

When we were cooking up food in the mission [in Jigalong], there was no one cooking up food for all the animals. When we came back, all the animals were gone (Nganjapayi Chapman 23/9/2016).

The old people feel a large sense of loss for the animals that are now gone. The sense of nostalgia for these animals is strong and makes holding onto the mankarr even more important.

We need to look after mankarr because it's the only one left, those other animals they are all gone. Martu, we know where mankarr are, and how to look after them (Gladys Bidu 29/6/2017).

Back in Pujiman times, too much mankarr, everywhere too much. Now 'paki', they've gone. I don't know where? Rangers got to look after mankarr and make sure they stay strong (Karnu Taylor Parnngurr 27/8/2016).



Figure 5. Mankarr captured on KJ camera trap. © KJ.

Martu know where mankarr are

We know places that bilbies live. We look at country, explore, know that this isn't the place bilbies come. We know. (Heather Samson 10/5/2017).

Tracking and reading signs

Martu know where mankarr are by reading signs mankarr leave behind (jina, jawarnu, ngurra, kuna). Martu can tell whether mankarr are down within burrows, and can tell how old mankarr sign is (last few days, last week etc.). This knowledge is passed on through generations and built upon by personal experience. 'Ninti' (knowledgeable) Martu can teach others how to read these signs.

Jina (tracks)



Jawarnu (diggings)



Ngurra (burrows)



Kuna (scats)



Figure 6. Mankarr sign Martu look for. Photos: Anja Skroblin.



Figure 7. Jigalong rangers followed mankarr tracks to find this newly excavated burrow. The burrow has fresh tracks leading into it, but not out again, which tells the rangers it is occupied. Photo: Anja Skroblin.

Making maps of where mankarr are

With direction from Elders we made maps of the places where mankarr have been seen on Martu country from back in Pujiman times (when Martu were living traditional lifestyles) until the present day. Elders have knowledge of mankarr from the places they visited, which includes water places and along songlines. Today people have knowledge from near roads and communities, and where ranger work and return to country trips take place.

When people were walking country they followed the waterholes and the edge of the lake (Nganjapayi Chapman via Carl Marney 23/9/2016 talking about where people walked near the Percival Lakes back in Pujiman times).

Martu know of populations of mankarr along the edges of the salt lakes near Punmu, including on the eastern and southern side of Lake Dora, and along the Percival Lakes. Mankarr distribution along the lake edges is patchy.

They do not live all along the lake edge; they only live where they want to (Gladys Bidu 24/9/2016).

Near Parnngurr, mankarr are found in sandplain country to the east, and were seen in country south of the Karlamilyi until recently. Martu indicate that they don't know all the places where mankarr currently occur, but suggest that they can use their knowledge of country and habitat associations to suggest places to survey.

When Muuki Taylor walked to Punmu [from Parnngurr in the 1980s] to make the road there was too much mankarr, everywhere too much. They could still be there. (Karnu Taylor 27/8/2016).

Mankarr like mulga, they might be in the mulga and sand dunes near Wantili. (Carol Williams 30/5/17).

Mankarr seem uncommon around Jigalong. A population of mankarr were found living in patchy mulga woodlands growing around claypans to the west of the community in 2016. Tracks have been sighted in sandplain country further to the east but community members don't report seeing sign very often.

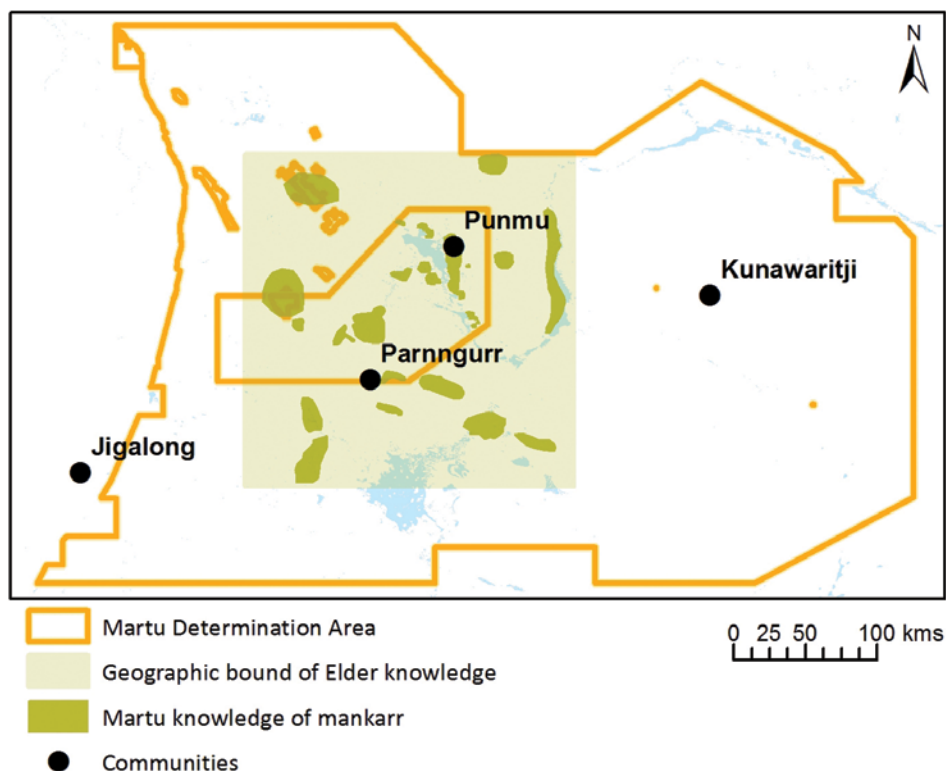


Figure 8. The places Elders spoke of encountering mankarr in green. The grey shading is the "geographic bound of Elder knowledge"; the geographic area in which we gathered sightings during interviews in 2016.

There are less mankarr now

Bilbies were once prevalent across much of Australia. They are now largely restricted to Indigenous lands in the north-west of their former range. There is evidence that the overall range is still contracting, and that declines are also happening locally within their distribution (Woinarski et al. 2014).

Elders speak of a large decline in mankarr populations around Parnngurr community and to the north of the community and towards the Karlamilyi. Martu suggest that mankarr have disappeared from this area because "there are too many people living in the community" (Waka, Karnu and Ngamaru 2016) and "because it used to be a green country and now brown country; dry country" (Karnu Taylor 2016). These insights may point towards ecological changes that have occurred due to changes in land use and/or rainfall patterns. They may also reflect a dryness of country associated with 'kurrurmpa'; a dryness of spirit within plants and people that is associated with poor health (Walsh 2008). Younger people generally say they don't see much mankarr.

We mainly see turkey, kangaroo and sand-goanna, we never see this one (mankarr). It's good to have sand goanna and 'kipara' [bustard]. We are always looking for those tracks (Leoma Kadibil 30/5/2017 talking about hunting near Parnngurr).



Figure 9. Nyanjapayi Chapman checking to see if mankarr is in a burrow under a termite mound. Photo: Anja Skroblin.

Elders remember seeing lots of mankarr and other small mammals when walking the country.

In Pujiman times mulyamiji [great desert skink] and mankarr everywhere walking around, little baby ones everywhere (Nyanjapayi Chapman 23/9/2016 talking about the area around the Percival Lakes).

When she was a young woman, before she had children, she saw plenty of Mankarrpa, at and around certain water places that were close by and further from where Punmu community is. She saw plenty of mala and mitirra [golden bandicoot] (Carl Marney interpreting for Mulyatingki Marney 22/9/2016).

In some places mankarr populations appear to remain strong, for instance in the country on the edges of the salt lakes around Punmu.

There are lots of little mankarr around Punmu (Gladys Bidu 20/9/2016).

For other parts of Martu country people are unsure whether there has been recent change, but suggest that there are generally less mankarr now than before.



Figure 10. Jigalong rangers out searching for mankarr © KJ.

Mankarr behaviour

Mankarr like to move around the landscape

Martu recognize that there are some places where mankarr populations may be more permanent, and other places where mankarr move around the landscape tracking resources (such as on the sandplains).

Martu say that mankarr dig and use many burrows in an area. They go into more than one burrow in a night, and use different burrows over different nights. Sometimes they leave a burrow for a long time before returning.

No mankarr here [pointing at burrow within a mankarr territory], but after time away mankarr come back to the hole (Heather Samson 10/5/2017).

Martu say mankarr move a lot around the country. They move away from places if there has been a large fire, or when spinifex has grown up and there is no longer food plants growing. They can move back if conditions improve.

Mankarr comes back a few years after fire (Minyawu Miller 20/9/2016).



Figure 11. Minyawu Miller holding mankarr baby captured during the radio-tracking project.
© R. Partridge

Breeding

Martu can tell the ages of mankarr by looking at the size of footprints. There is excitement when juveniles (babies) are found at a site, people are happy to see that mankarr are breeding.

When it's cool in the winter mankarr have babies like the dingo, and parnajalpa [sand goanna] and every animal (Gladys Bidu 29/6/2017).

Mankarr are thought to generally have two or sometimes three babies. The babies are known not to venture far from the burrow entrance when they are small as their tracks are just close to the burrow entrance. Over time the babies go further from the burrow entrance, but often young ones walk around with their mother until they are independent. Sometimes Martu find places with just juvenile mankarr. Martu were interested in knowing more about how mankarr families work.

What sort of country does mankarr like?

Martu recognize several types of country where mankarr occur (Figure 12). We've been told, these country types all have the right type of ground for mankarr to create burrows. Where the soil is too soft, you won't find mankarr because the burrows would collapse. Likewise, mankarr can't live where the ground is too hard to dig.

Mankarr are not south of the community [Parnngurr] where it is too rocky. (Waka and Karnu Taylor 27/8/16).

Warla (salt lakes)



Wintamarra (mulga)



Rirra (laterite)



Pararra (sandplain)



Linyji (claypan)



Tuwa (dune field)



Figure 12. Country types where mankarr may be found. Photos: Anja Skroblin and KJ.

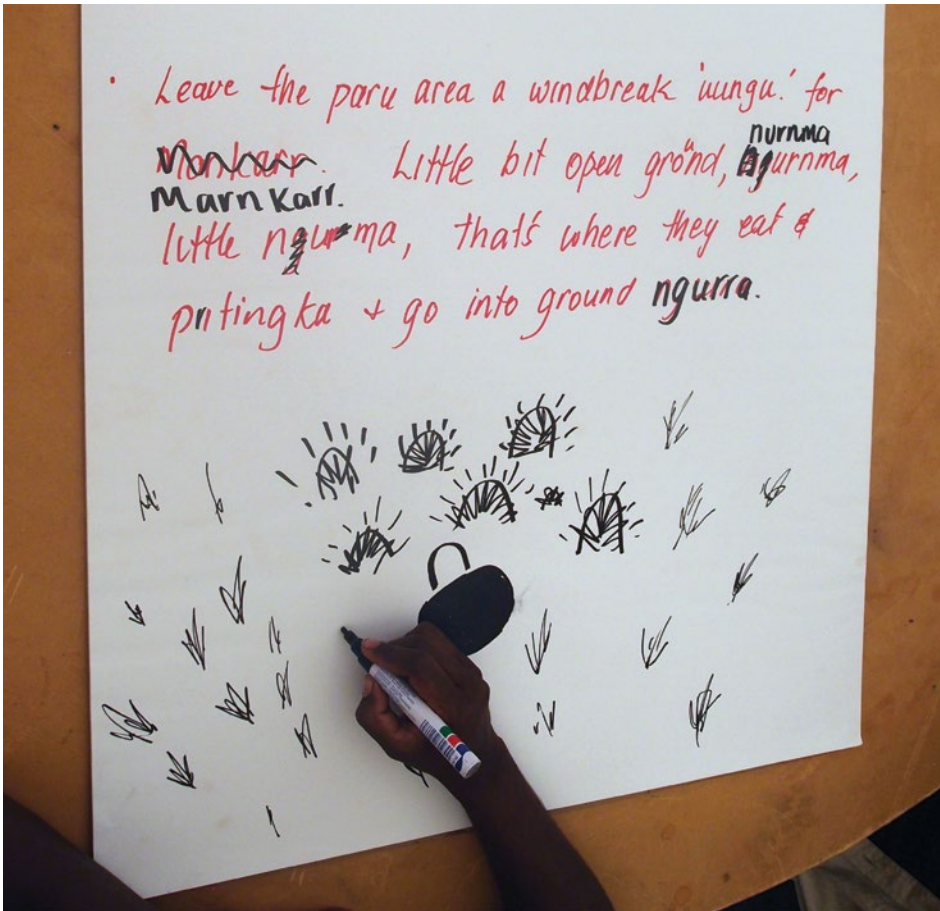
These country types also provide the foods that mankarr like to eat. But the right management needs to happen (right combination of waru and rain etc) to make sure that these foods are available. Even if the country provides the right resources (soil, food and cover), mankarr may not occur there when there are too many predators, such as along creek lines where cats and foxes go to drink.

There are no mankarr down at the creek [south of the road just before getting to Jigalong], there are too many cats (Heather Samson 10/5/2017).

Each of these country types needs different types of management to stay healthy. We collected some descriptions of the waru and rain/water that are needed for each.

| Mankarr ngurra (home) | What waru is needed | Food resources |
|--------------------------------------|---------------------|--|
| Tuwa (sand dune) | Not too much waru | Lunki, wilyki, mirrka |
| Rirra, wiltu (little rocks/laterite) | Not too much waru | |
| Pararra (sand plain) | Waru Martu way* | Food few years after fire |
| Wintamarra (mulga) | No hot waru | Permanent food, lunki other insects |
| Warla (edge of salt lake) | No waru | Minyarra (doesn't need fire), wilyki, mirrka |
| Karrul (creek) | Waru on side sands | Wilyki, minyarra, mirrka |
| Linyji (claypan) | Waru Martu way | Manyjurrpa (termite) |
| Yapulyukurru (rocky country) | Not too much waru | |

* See section on waru for mankarr



"Leave the paru area a windbreak (uungu) for mankarr. Little bit open ground, nyurnma, little nyurnma, that's where they eat and pritingka and go into ground ngurra."

Figure 13. Women rangers' wisdom for caring for mankarr: to leave a spinifex windbreak for mankarr when burning, and to make fires small. The burnt areas provide food. Photo: Anja Skroblin.

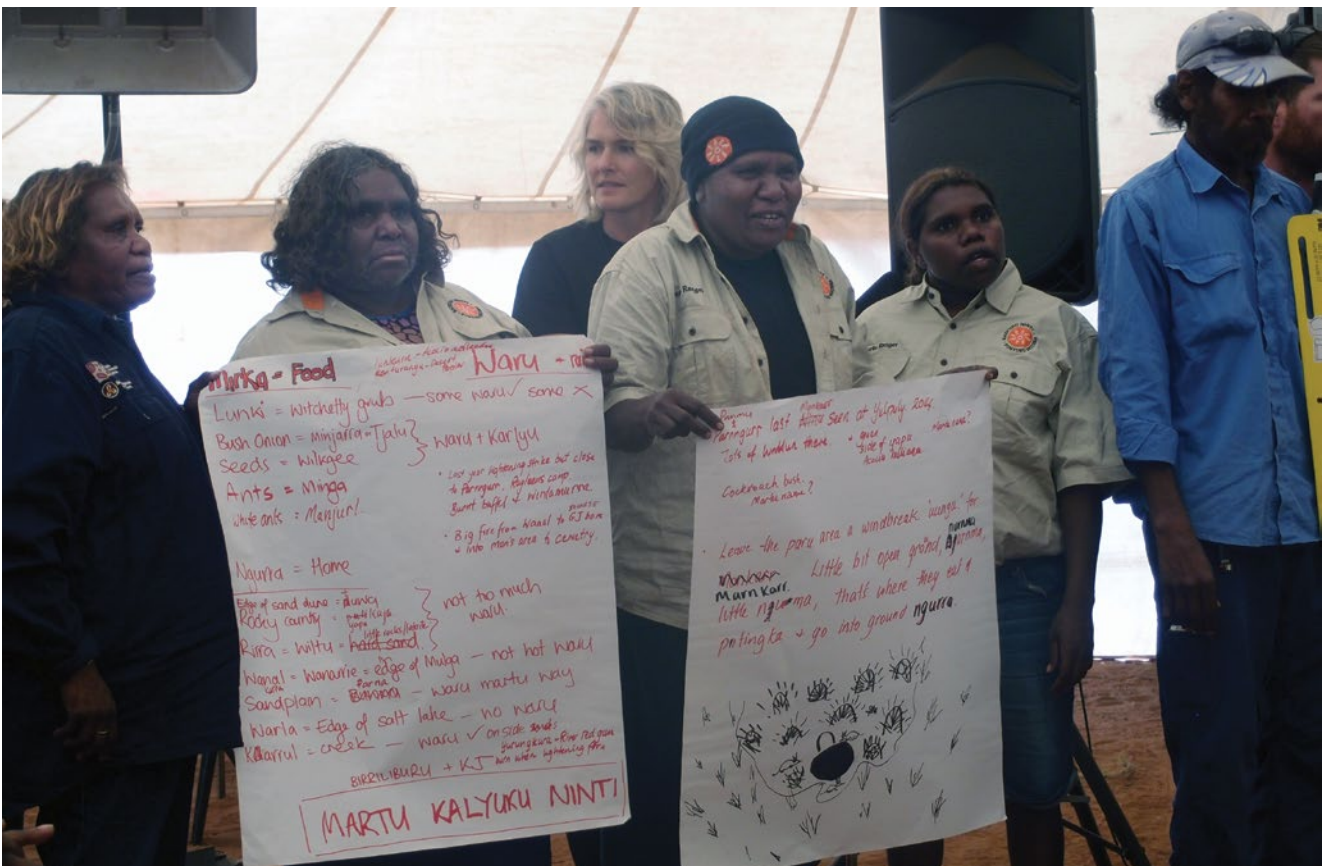


Figure 14. Martu rangers share their knowledge of mankarr habitat at the Indigenous Bilby Festival, held in Kiwirrkurra 2016. Photo: Anja Skroblin.

Waru Martu way is best for mankarr

Martu use waru in many ways (for instance hunting, cultural purposes, cleaning up country). Waru needs to be applied in the right way to maintain habitat for mankarr. Different country types need different waru. In some parts of the landscape fire should be avoided to protect flora (for instance in wintamarra/mulga woodlands, on the edges of salt lakes, or rocky hills). In other places, like sandplains, waru is needed to keep those places healthy by encouraging the regrowth of plants that are important foods for Martu and animals.

In sandplain country, small patchy burns, such as those instigated when Martu hunt, are important to create habitat for mankarr. These burns create a patchwork of small fires and break up old vegetation, which makes different seral stages available. There are patches of various food resources that need different intensities of fire, and patches of older growth spinifex that provide protection from predators.

A balance needs to be found between too much fire, and not enough fire. Martu told us that mankarr go away if there is too much fire (too large or too frequent), but also that you won't find mankarr on sandplains that haven't been burnt for a long time as there is too much spinifex and not enough food. Fires that burn big areas at one time should be avoided.



Figure 15. KJ rangers carrying out Martu style burning. Photos: Anja Skroblin.

What do mankarr do when there is waru?

Mankarr survive the initial fire event.

Mankarr goes underground if there is a fire (Gladys Bidu 20/9/2016).

Following the fire, mankarr avoid areas that were recently burnt (nyurnma), and may leave an area if fire was too extensive.

Mankarr moved after the fire started by the helicopter (Nganjapayi Chapman 23/9/2016 talking about area to the south-east of Punmu).

They were there when we first worked with KJ. Then 2 to 3 years ago we went back. They weren't there. They shifted to the other side of the tuwa, north side over tuwa because it (that place) burnt just before we visited (Gladys Bidu 24/9/2016 talking about an area near Punmu).

Bilbies move away or get eaten after fire [we don't see sign anymore after fire] (Nola Taylor, Sheena Robinson, Rebekka and Briana Booth from Parnngurr Ranger team 12/5/2016).

Following rains, the herbaceous plants and annual grasses regenerate to provide plentiful food sources (waru-waru).

Mankarr comes back a few years after fire (Minyawu Miller 20/9/2016).

But it is important to retain old growth spinifex as cover from predators.

Spinifex [around the mankarr burrow] protects from cats, it stops the cats going down the hole, and makes the mankarr safe (Heather Samson 10/5/2017).

Mankarr like it where there is more old vegetation to give them cover (Nola, Sheena, Rebekka and Briana from Parnngurr Ranger team 12/5/2016).

If fire is too frequent, or too large, mankarr may disappear from an area altogether.

Yulpu this side – no mankarr because there was a big fire (Carol Williams 29/5/2017).

You need to have small fires to look after mankarr (Karnu Taylor 27/8/2016).

Martu have a holistic approach to using waru to look after mankarr (Figure 16 & 17).

Waka made a burn. Not round the mankarr burrow, but nearly, so that there will be food for the mankarr. When you make big fire where mankarr is, they move a bit further (pointing away). When its little fires they come back (pointing in). I notice that every time.

On the sandplain, a little patch burnt with old spinifex on both sides - that's the right habitat for mankarr. In the burn is nothing – no food for mankarr - but still plenty of goanna to hunt. When the plants grow up there will be mankarr tracks all through there. (Carol Williams 30/5/2017).



Figure 16. Patchy hunting burns (background) leave areas of old spinifex in sandplain country to the north of Punmu. The old spinifex creates a barrier around a recently excavated mankarr burrow (foreground) and makes it harder for predators to hunt mankarr at the burrow entrance. Following rains, the burnt areas will regenerate to provide food resources for mankarr. Photo: Anja Skroblin.

Mankarr mirrka: the foods that mankarr eat

Mankarr eat a variety of foods that include seeds, tubers, lunki (moth larvae) and other insects. Many of these foods are also prized by Martu.

Mankarr eat the same as Martu (Waka Taylor 22/8/2016).

Martu understand where these different food resources occur, plus the type of waru and kalyu (rain/water) that encourages their growth. The presence of these foods is seen an indicator that an area may be suitable habitat for mankarr. Some places are not considered suitable because Martu can't see any food for mankarr there. Martu can identify what foods mankarr are eating at a site by looking at where mankarr are digging.

Lunki (grubs nd larvae)



Kiddirpa (mulga)



Jinyjiwirriypa (Solanum central)



Manjurl (termites)



Yuwinji (Eragostis eriopoda)



Minyarra (bush onion)



Figure 17. Some of the foods Martu recognize mankarr to eat. Photos: Anja Skroblin and KJ.

Martu wish to record the presence of mankarr mirrka when carrying out surveys for mankarr, as mirrka is an indicator of whether the site has suitable resources. The presence or absence of different mirrka can tell Martu about the waru that happened in the area, and help them make decisions on how to manage.

Growing conditions required for mankarr mirrka

| | Mankarr mirka (food) | Importance of fire and rain | Where you find them |
|---|---|--|--|
| Plants with lunki | Lunki (witchetty grub) | Waru varies depending on species of plant. | Generally sand plain country. Main Acacia species: Acacia hilliana, Acacia dictyophleba & Acacia kempeana and Codonocarpus cotinifolius (Karntarangu/ desert poplar). Mulga. |
| Wilyki Seeds | Kirtilpa (<i>Yakirra australiensis</i>) | Needs waru and kalyu | Sand plain, sand dune, mulga |
| | Yuwinji (<i>Eragostis eriopoda</i>) | Needs waru and kalyu | Sand plain, sand dune, mulga |
| Mirrka/Mayi Food plants that have fruits or roots to eat | Jinyjiwirrilypa (bush tomato; <i>Solanum central</i>) | Needs waru and kalyu | Sand plain |
| | Minyarra (bush onion; <i>Cyperus bulbosus</i>) | Waru intolerant, needs kalyu | Near drainages or salt lakes |
| Insects | Manjurl (termites) | | |
| | Minga (ants) | | |
| | Wuukarta (honey ants, <i>Camponotus</i> spp.) (<i>Acacia aneura</i>) | Waru intolerant, needs Kalyu | Mulga habitat |



Figure 18. Carol Williams showing how to find the lunki that mankarr and Martu like to eat. Photo: Anja Skroblin.

What threatens mankarr?

There are three main threats that need to be managed to keep mankarr populations healthy: wrong way waru, predation by feral cats and foxes, plus competition from rabbits.

Feral cats

Martu agree that feral cats are a threat to mankarr, and that mankarr do not live in places where there are too many cats. When conducting surveys, people often said it was a bad sign when cat tracks were found in places with bilby sign. They worried that the cat would eat the mankarr. People remember cats being present in Pujiman times also.

There are no mankarr down at the creek [south of the road just before getting to Jigalong], there are too many cats (Heather Samson, 10/5/2017).

Cats may also use mankarr burrows. This is a problem for the mankarr.

When it's very hot, cat goes into Ninu hole. Frightens Ninu away (Gladys Bidu 23/9/2016).

Many of the rangers suggested that it is very important to undertake cat control to protect mankarr.

We need to get rid of cats to protect mankarr and those other animals (Phillipa Charles 10/5/2017).

Foxes

Foxes pose a significant threat to mankarr. Several people mentioned that foxes are a worse threat to mankarr than cats.

Fox eats more mankarr than the cat, because the fox goes into the mankarr hole (Minyawu Miller 23/9/2016).

Several people have indicated that they see less evidence of foxes than of cats, but that doesn't make foxes less of a threat.

Foxes do more damage than cats, but there are less foxes around (Minyawu Miller 23/9/2016).

Not many foxes around Punmu, but too many pussycats (Gladys Bidu 20/9/2016).

The distribution of foxes is not well known on Martu lands. Some people have suggested there are more foxes around Parngurr than around Punmu.



Figure 19. Karnu points out tracks from juvenile mankarr that have been hopping along runways between the mature spinifex. The proliferation of tracks suggests they have been using this site to the north-east of Parngurr for some time. We wondered where the mummy and daddy mankarr were. Karnu had seen dingo prints, and was worried that the dingos would eat the mankarr. Photo: Anja Skroblin.

Right-way waru and protects from predators!

Martu indicate that good fire management can protect mankarr from being eaten by predators. The right type of waru: one that is patchy and leaves clumps of old spinifex, can protect mankarr from being hunted (while ensuring fresh foods grows up). These clumps of old vegetation slow down the predators, and make it easier for mankarr to escape down their burrows.

Spinifex [around the mankarr burrow] protects from cats, it stops the cats going down the hole, and makes the mankarr safe (Heather Samson 10/5/2017).

Mankarr like it where there is more old vegetation to give them cover [from predators] (Nola, Sheena, Rebekka and Briana from Parnngurr Ranger team 12/5/2016).

Fires that open-up the ground cover vegetation can make it easier for predators to hunt mankarr; just like they help Martu to hunt goannas.

Bilbies move away or get eaten after fire (Nola, Sheena, Rebekka and Briana Parnngurr ranger team 12/5/2016).

Some people suggest that foxes manage better than cats in areas where there are big hot fires that remove all ground vegetation. This is because foxes can dig their own burrows, and therefore less exposed than cats.

Foxes do alright [better than cats] in burnt areas because they live down burrows (Nola, Sheena, Rebekka, Briana (12/5/2016).

Rabbits

Rabbits have been present on Martu lands for some time; however, their distribution appears to be mainly limited to salt lakes east of Punmu. Rangers suggest that the rabbits should be controlled. In some places on the salt lakes, rabbits have been observed to take over mankarr burrows, and the mankarr has disappeared.

Rabbits have been here long time (Nganjapayi Chapman 23/9/2016)

Perenties and large snakes (woma python) are also natural predators of the mankarr, and should not be forgotten as a threat to mankarr populations.

Martu ways that help mankarr to stay strong

We know places that bilbies live. We look at country, explore, know that this isn't the place bilbies come. We know. (Heather Samson 10/5/2017 telling us that Martu knowledge should be used when deciding where to do surveys).

Martu have knowledge that helps with caring for country and mankarr, as well as carrying out monitoring to check that populations are healthy. Martu knowledge can help mankarr in the following ways:

- Knowing which country to look to find mankarr
- Tracking skills to find where mankarr are
- Carrying out surveys to record data on bilby tracks, diggings, burrows, scats
- Remembering whether mankarr populations and habitat has changed
- Making small hunting fires that reduce large hot wildfires and encourage foods to grow
- Cat hunting to reduce predation pressure



Figure 20. KJ Martu ranger carrying out mankarr survey. Photo: Anja Skroblin.

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Appendix: Martu words used

| Martu word | English translation |
|---------------|---|
| Mankarr | Greater bilby (<i>Macrotis lagotis</i>) |
| Jukurrpa | Dreaming and Law |
| Pujiman | A person living before contact with European Australians |
| Pujiman times | When Martu were living on country before contact with European Australians |
| Lunki | Larvae of moths and beetles that live in the roots of trees (witchetty grubs) |
| Lunki trees | Trees that have lunki living in the roots |
| Paki | Nothing; all gone |
| Kipara | Bush turkey / Australian Bustard |
| Mulyamiji | Great desert skink |
| Mitirra | Golden bandicoot |
| Ninti | Knowledgeable |
| Ninu | Greater bilby in Pintupi / sometimes used by Martu |
| Nyurnma | Fire seral stage just after an area is burnt; charcoal is visible |
| Waru | Fire |
| Waru-waru | Fire seral stage when green pick is growing up following fire |
| Parnajalpa | Sand goanna |

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