Mellivora capensis – Honey Badger

Emmanuel Do Linh San

Regional Red List status (2016)	**Least Concern***
National Red List status (2004)	Near Threatened C
Reasons for change	Genuine change: Threat mitigation
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA) (2007)	Protected
CITES listing (1978)	Appendix III (Botswana, Ghana)
Endemic	No

*Watch-list Data

Despite its name, the Honey Badger is omnivorous, feeding primarily on rodents (Photo 1), small reptiles and arthropods (Begg et al. 2003a).

Taxonomy

Mellivora capensis (Schreber 1776)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - *Mellivora* - *capensis*

Common names: Honey Badger (English), Ratel (Afrikaans), Ulinda (Ndebele), Matshwane, Magôgô, Magôgwê, Magogwe, Magwagwê (Setswana), Sere, Tsere (Shona), Insele (Swati, Zulu), Xidzidzi (Tsonga), Tshiselele (Venda)

Taxonomic status: Species

Taxonomic notes: Coetzee (1977) described 10 subspecies for Africa based primarily on size and pelage (mantle) variation, with only *M. c. capensis* present in the assessment region. However, no DNA investigation of subspecies has been completed so far and, therefore, subspecies denoted only by morphometrics, or pelage colour and pattern, are of dubious validity. There may even be a large variation in pelage pattern (length and size of white stripe) within populations and in size between localities within the same geographical areas (for example between Kalahari, a semi-arid environment, and the Zambezi Valley, a mesic environment) (C.M. Begg & K.S. Begg pers. obs. 1994–1999). This perceived variation may also be biased by lumping sexes, despite the fact that Honey Badgers are significantly sexually size-dimorphic, with males at least one-third larger than females (Begg 2001a).

Assessment Rationale

This species has a wide habitat tolerance, a catholic diet and a large area of occupancy (AOO) in the assessment region. A range expansion has been recorded over the past 10 years in at least one South African province. Although persecution – both direct for beehive damage and poultry losses, and incidental as bycatch in damage-causing animal controls – is ongoing and suspected to be resulting in localised declines, such threats can and are being mitigated by active and successful conservation projects and education programmes. Hence, there is no evidence for, nor any reason to suspect an overall population decline, and at least one threat has lessened. The estimated population size ranges from a minimum of 741 (which is improbable due to their wide occurrence on protected areas and game farms) to a likely 13,200 mature individuals, which exceeds the threshold for criterion D. In view of the above, we down-list this species to Least Concern, but caution that the species may warrant re-assessment and listing in a threatened category if evidence of a decline or of increasing threat level is produced.

Regional population effects: There is a broad front on South Africa's northern borders of Namibia, Botswana, Zimbabwe and Mozambique, from whence there is likely to be contiguous populations with all these countries. The species is contiguous with the Botswana population and sightings are frequent along the Nossob riverbed in Kgalagadi Transfrontier Park (KTP). It is suspected that there is immigration from neighbouring countries into the assessment region, especially as the dispersal ability is good and Honey Badgers cover large daily distances in search of food (Begg et al. 2005b). This is not solid enough evidence to warrant a strong rescue effect, but it is of moderate significance.

Distribution

The Honey Badger has an extensive historical range which extends through most of sub-Saharan Africa from the Western Cape, South Africa, to southern Morocco and southwestern Algeria, and outside of Africa through Arabia, Iran and western Asia to Middle Asia and the Indian peninsula (Proulx et al. 2016).

Within the assessment region, the species occurs in South Africa and the Lowveld regions of Swaziland (Monadjem 1998), but is absent from Lesotho (Lynch 1994; Proulx et al. 2016). In South Africa, Honey Badgers historically occurred in all provinces except the Free State (Lynch 1983) (Figure 1). The reason for the absence of badgers in

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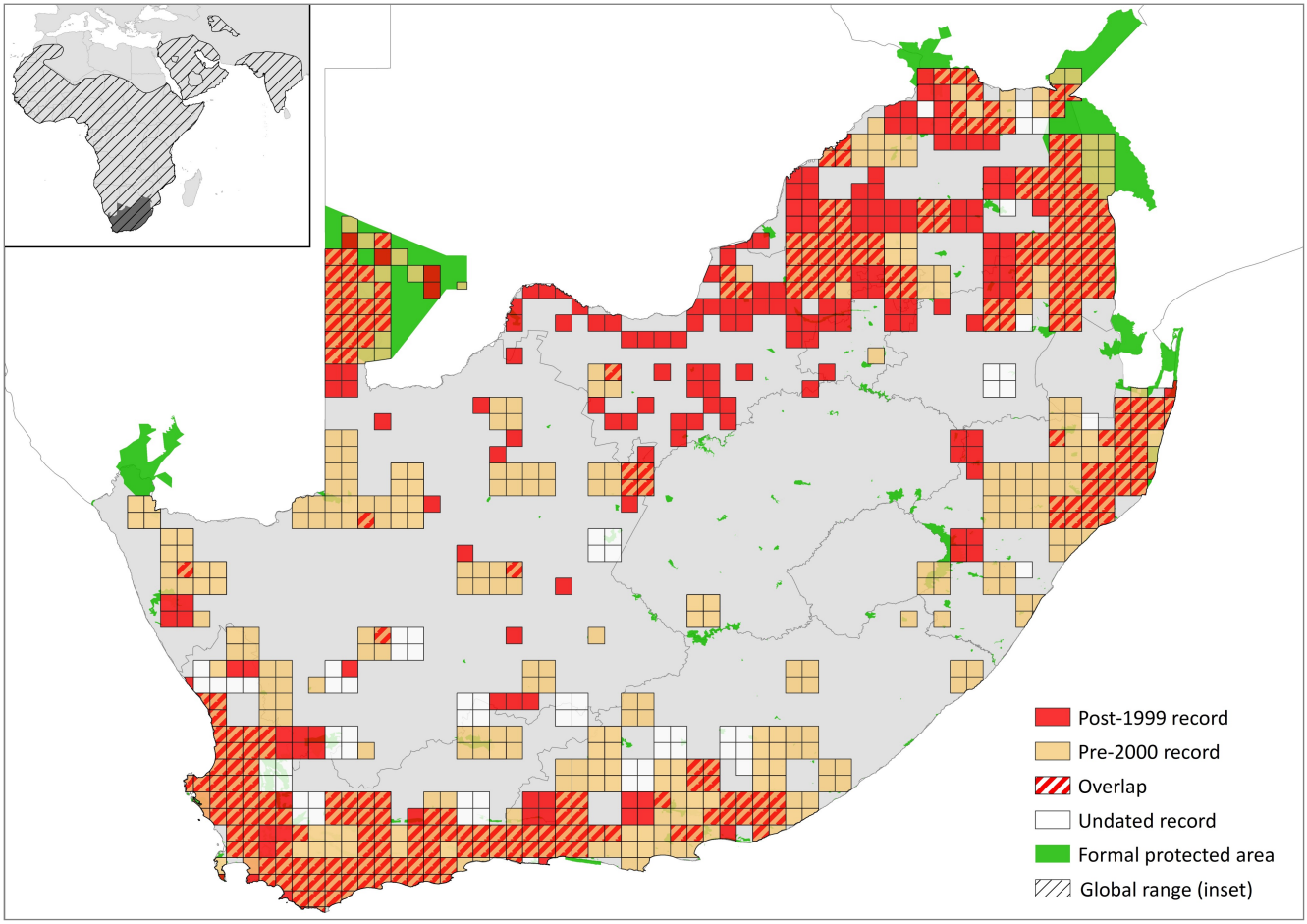

Figure 1. Distribution records for Honey Badger (*Mellivora capensis*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant	Native
Lesotho	Absent	-
Mozambique	Extant	Native
Namibia	Extant	Native
South Africa	Extant	Native
Swaziland	Extant	Native
Zimbabwe	Extant	Native

this area remains unknown, but it is speculated that either this is a result of localised extinctions from hunting or, more likely, that badgers have never occurred in these parts of the country because of the suboptimal, open-steppe nature of this region (Begg 2001b). A single record was received from the eastern border of the Free State during a critical assessment of the Badger Friendly Labelling (BFL) Project (Irlich & Davies-Mostert 2009), but it remains unclear whether this represents range expansion, lack of surveying in the area, or spill-over from suitable habitats in the KwaZulu-Natal Province across the Drakensberg range.

However, there appears to have been a range expansion throughout the North West Province, largely onto the Highveld grasslands, to the north of the Free State (Power 2014). Honey Badgers were absent from the southern Highveld grasslands during the 1970s (Rautenbach 1982), and even early 2000s (Friedmann & Daly 2004; Skinner & Chimimba 2005). Based on camera-trapping evidence, they have since been found to occur in this area (Power 2014). This suggests either an increase in abundance or re-colonisation of areas, although another explanation is that observer effort might have increased due to the use of camera-trapping. One cub was found near Ventersdorp, and this thus suggests that breeding has occurred too (Power 2014). The species was recorded at the SA Lombard Nature Reserve in 2012 (see Power 2013), a reserve which has had extensive carnivore-related research and trapping done on it before 1994, with no mention of this species. In the arid western parts of the North West Province, farmer questionnaire reports of the same administrative districts (Vryburg & Mafikeng) suggest an increase from *c.* 8% occurrence during the 1970s (Lloyd & Millar 1983) to 40% in 2012 (Power 2013). It has been hypothesised that increased woody cover, due to climate change-induced bush encroachment onto the Grassland Biome, has facilitated the greater occurrence of this species (Power 2014). Because Honey Badgers are known to be able to swim (Kingdon 1997), it remains to be seen whether they ever have forded the Vaal River to enter the Free State.

Honey Badgers have recently been recorded from the Cradle of Humankind in Gauteng (Kuhn 2014). In the Northern Cape, there appears to have been range stability since the 1970s, while the old Transkei (eastern parts of the Eastern Cape) always had a low prevalence of this species (see Stuart 1981; Lloyd & Millar 1983). For example, there is only one record from Lynch (1989) in the northeastern Eastern Cape from the Jamestown District. This is still reflected currently, as even in protected areas of the old Transkei, a mammalian survey carried out in

Table 2. Status of the Honey Badger (*Mellivora capensis*) in 19 different South African National Parks based on information provided by SANParks Scientific Services (modified and updated from Irlich & Davies-Mostert 2009). Data were collected using CyberTracker. Citizen Science refers to cases where the public confirmed the presence of the species.

Province	National Park	Ranger Status	Citizen Science	Area (km^2)
Free State	Golden Gate Highlands	Unknown		116
Eastern Cape	Addo Elephant	Unknown	Present	1,642
Eastern Cape	Camdeboo	Absent		194
Eastern Cape	Garden Route	Present	Present	1,570
Eastern Cape	Mountain Zebra	Present		284
Limpopo	Mapungubwe	Present		54
Limpopo	Marakele	Present		507
Limpopo/Mpumalanga	Kruger	Present	Present	19,624
Northern Cape	Augrabies Falls	Present		417
Northern Cape	Kgalagadi	Present	Present	9,591
Northern Cape	Mokala	Present		196
Northern Cape	Namaqua	Absent	Uncertain	1,350
Northern Cape	Richtersveld	Present		1,624
Western Cape/Northern Cape	Tankwa Karoo	Present		1,216
Western Cape	Agulhas	Present	Present	57
Western Cape	Bontebok	Present		28
Western Cape	Karoo	Unknown		831
Western Cape	Table Mountain	Present		243
Western Cape	West Coast	Present	Present	363
Total minimum area present:				**37,416**

2003 showed no evidence for this species' occurrence (Hayward et al. 2005). Similarly, since the last assessment (Rowe-Rowe 1992; Friedmann & Daly 2004), there seems to be a decline in occurrence of the species in southern KwaZulu-Natal, which may be genuine or an artefact of no recent records being available. If the former, this could be cause for concern. Begg (2001b) reported that the badger populations in Mpumalanga and Limpopo, the Kalahari in the Northern Cape as well as the Western Cape's coastal lowlands support the largest concentrations of Honey Badgers in South Africa, which was corroborated by Irlich and Davies-Mostert (2009).

Population

Honey Badgers are considered to be rare or to exist at low densities across most of their range (Begg et al. 2013). Densities based on night counts have been estimated at 0.1 individual / km^2 in the Serengeti National Park, Tanzania (Waser 1980) and 0.03 adult / km^2 in the Kgalagadi Transfrontier Park (KTP) (Begg 2001a). There is unfortunately no density data from the mesic savannahs, such as Kruger National Park (KNP), and it is unknown at this stage as to which areas have higher densities, i.e. KNP vs KTP. Given these density estimates (0.10–0.03 individual / km^2), and an estimated 200,000 km^2 total AOO across the assessment region, the overall population is between 6,000 and 20,000 individuals, which is likely to be comprised of 3,960–13,200 mature (assuming that 66% of the population is mature, *sensu* Friedmann & Daly 2004). At the very minimum, the AOO is 37,416 km^2 based on confirmed presence in national parks across South Africa (Table 2), which yields a population size of 1,122–3,742 individuals (741–2,470 mature). Thus, the estimated population size ranges from a minimum of 741 to a more likely 13,200 mature individuals. This range encompasses the previous assessment estimate of 4,000 individuals (2,600 mature) using the same area estimate and assuming a 50 km^2 home range for breeding pairs (Friedmann & Daly 2004). Further density estimates, both inside and outside protected areas, are required to more systematically estimate population size.

We suspect that the population is stable or increasing given the stable or increasing AOO of the species since the last assessment. Additionally, retaliatory killings from beekeepers have declined since 2001 (Irlich & Davies-Mostert 2009; EWT unpubl. data). Although Honey Badgers may be experiencing local declines outside of protected areas due to accidental persecution or from roads, in some cases the reverse is true. For example, SANParks has found more animals outside of the Agulhas National Park than inside. It is thought that there may be better scavenging opportunities on farms than in the park.

Current population trend: Probably stable due to wide habitat tolerance, large area of occupancy and active and successful conservation projects and education programmes.

Continuing decline in mature individuals: Probably not

Number of mature individuals in population: 741–13,200

Photo 1. A Honey Badger (*Mellivora capensis*) eating a Hairy-footed Gerbil (*Gerbillurus paeba*) (Keith S. Begg and Colleen M. Begg)

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: It is not currently possible to determine the extent or number of subpopulations.

Severely fragmented: No. They have a broad habitat tolerance and can exist in at least some agricultural and rural landscapes.

Habitats and Ecology

Honey Badgers live in a wide variety of habitat types within the assessment region. However, they are generally absent from the more open and central parts of the Grassland and Nama Karoo biomes, which suggests cover to be important. They are opportunistic, generalist carnivores (Begg et al. 2003a), and feed on a range of prey items varying in size from small insect larvae to the young of ungulates. All mammalian carnivores smaller than Honey Badgers are considered prey items, as are the young of medium-sized carnivores (Begg et al. *in press*). Although they are primarily hunters of their own food, they may pirate food from other carnivores and will also scavenge from the kills of larger animals (Begg et al. 2013). They do kill small livestock on occasions (Stuart 1981) and can cause damage to domestic poultry or take food from camp kitchens and bins (Bird & Mateke 2013). Large carnivores such as Lion (*Panthera leo*) and Leopard (*Panthera pardus*) prey on Honey Badger adults and cubs, while cubs are also killed by Black-backed Jackals (*Canis mesomelas*) (Begg et al. *in press*).

Honey Badgers are essentially nocturnal, but they may be active during the day in areas where there is little human disturbance, and during seasons when day temperatures are cooler (Begg et al. 2016a). Honey Badgers are primarily solitary, with a non-territorial polygynous or promiscuous mating system (Begg et al. 2005a). Males may range over areas as large as 500 km^2, and scent-marking plays an important role in communication (Begg et al. 2003b).

In the Kalahari, Begg et al. (*in press*) recorded foraging associations between Honey Badgers and seven other species (two mammals, five birds). Commensalistic interactions between badgers and Pale Chanting-goshawks (*Melierax canorus*) and Black-backed Jackals were most common. Goshawks and jackals experienced increased hunting opportunities and intake rate, and therefore benefited from the association through facilitation. Honey Badgers, in contrast, did not show any significant differences in capture success, intake rate or predator vigilance when foraging in association compared to foraging alone.

Honey Badgers seem to have some immunity to bee stings, but they are cautious and can be killed by bees as seen when badgers are caught in gin traps around commercial beehives and when badgers break into wild hives (C.M. Begg and K.S. Begg pers. obs. 2000). They also have developed some immunity to snake venom which is thought to be the result of numerous minor envenomation events from bees, scorpions and smaller snakes. When interacting with larger carnivores, they have a formidable display of a rattling roar, rushing at predators and the release of scent that dissuades many opponents at close contact; and when fighting is inevitable, their coarse, loosely-fitted skin and thick sub-cutaneous fat deposits have an important protection function.

Ecosystem and cultural services: Since they feed extensively on rodents and arthropods (Smithers 1971; Begg et al. 2003a), which are agricultural pests, Honey Badgers can serve a useful role in the agriculture industry.

The species is well known for its ferocity and antics of unprovoked attacks on other larger species, including man (Smithers 1971; Mills 1997; Skinner & Chimimba 2005), and notwithstanding its small size (Skinner & Chimimba 2005), the character of bravery, irascibility and courage emerge, which are naturally immortalised in western culture.

Honey Badgers are believed to have a mutualistic association with the Greater Honeyguide (*Indicator indicator*); the latter would lead a badger to the beehives, where the badger would break open the hive and feed on the bee larvae (not the honey; Photo 2) and leave scraps for the bird (Friedmann 1955). There is significant anecdotal evidence of this across Africa (Kingdon 1997), and although not scientifically proven, there is a real possibility that badgers do actually engage in such behaviour. However, one should also consider that this association might have been misinterpreted due to the real guiding behaviour that honeyguides provide for people. Honey Badgers can easily find hives themselves, and C.M. Begg and K.S. Begg (pers. obs. 2004) have seen honeyguides arrive at a hive once a badger was already breaking in. As for Pale Chanting-goshawks, Ant-eating Chats (*Myrmecocichla formicivora*) or Crimson-breasted Shrikes (*Laniarius atrococcineus*), observations to date seem to suggest that the honeyguide may rather opportunistically follow the Honey Badger (C.M. Begg and K.S. Begg pers. obs. 1996–1999).

Use and Trade

Honey Badger body parts (particularly paws, skin and organs) are commonly used locally in traditional medicine because of the species' reputation for fearlessness and tenacity, which may be a particular problem in KwaZulu-Natal (Ngwenya 2001). Honey Badgers may be increasingly used in the bushmeat trade due to the decline in other more favoured bushmeat species (Colyn et al. 2004; Begg et al. 2013).

They are also hunted as trophy animals (average of 16 ± 6 per year exported from South Africa between 2002 and 2012; CITES trade database) because they are seen as tenacious and tough animals to hunt. Interest in trophy hunting this species has come to the fore in the Limpopo

Table 3. Use and trade summary for the Honey Badger (*Mellivora capensis*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Used locally and opportunistically as bushmeat.	Minimal	Unknown, probably stable.
Commercial use	Yes	Local commercial use in traditional medicine trade.	Minimal	Unknown, probably stable.
Harvest from wild population	Yes	Trophy hunting. Individuals opportunistically harvested for sale as muthi/bushmeat.	Unknown	Possibly increasing with rural settlement expansion.
Harvest from ranched population	No	-	-	-
Harvest from captive population	No	-	-	-

Table 4. Possible net effects of wildlife ranching on the Honey Badger (*Mellivora capensis*) and subsequent management recommendations

Net effect	Positive
Data quality	Inferred
Rationale	Increased AOO in the North West Province indicates a positive contribution from game farms and ranches to the conservation of this species.
Management recommendation	Commercial and domestic use beehives need to be raised above ground, and all poultry and juvenile livestock need protection. Fence permeability (for example, swing gates, creeping access below trip wires) may be required between adjacent game farms. The use of poisons on farm borders is discouraged.

Province where a number of permits have been requested for this purpose. One permit has been issued to hunt this species in the North West Province in 2015 (R.J. Power unpubl. data), and there has been a surge in interest to hunt similar small carnivores, so this trend may increase, but needs to be highly regulated.

In the western parts of the North West Province, the increase in game ranches (Power 2014), has seen a 32% increase in occurrence there based on farmer questionnaires (Power 2013), which points to the benefit of habitat availability in this venture. However, more research needs to be conducted to determine the net effect of wildlife ranches and game farms on this species, as they may still be persecuted indirectly as part of damage-causing animal controls (Stuart 1981; Irlich & Davies-Mostert 2009; Lindsey et al. 2009; EWT unpubl. data). There is no actual ranching of the species itself.

Threats

As their scientific name suggests (*melis* means honey and *voro* means devour), conflict has occurred between Honey Badgers and beekeepers as they share a common interest. Beehive damage by Honey Badgers is a significant threat to beekeeping productivity, particularly around protected areas. Honey Badgers have been persecuted by farmers since the early 1800s as they were classified as “vermin” or problem animals. Begg (2001b) found that Honey Badgers were directly causing in excess of R500,000 worth of damage per annum in the Western Cape and Mpumalanga alone. Thus, the main threat to Honey Badgers is direct persecution through the use of, for example, steel-jawed traps and poisons, by apiculturists and small livestock farmers throughout their range. They are also indirectly killed by non-selective

Table 5. Threats to the Honey Badger (*Mellivora capensis*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*5.1.3 Persecution/Control*: direct persecution (hunting, trapping, and poisoning), especially targeting “beehive raiders”.	Begg 2001b	Empirical	Regional	Decreasing due to active mitigation measures to protect beehives.
		Irlich & Davies-Mostert 2009	Empirical	National	
2	*5.1.2 Hunting & Collecting Terrestrial Animals*: indirect persecution as part of DCA control, especially poisoning.	Power 2014	Empirical	Regional	Stable
3	*5.1.1 Hunting & Collecting Terrestrial Animals*: hunting for traditional medicine (muthi), bushmeat and trophy trades.	Ngwenya 2001	Empirical	Regional	Low incidences but increasing (suspected for bushmeat hunting and observed for trophy hunting).
		Power 2014	Empirical	Regional	
4	*4.1 Roads & Railroads*: road collisions.	W. Collinson unpubl. data	Empirical	National	Increasing with road construction and habitat fragmentation.

Photo 2. Honey Badger (*Mellivora capensis*) extracting and eating bee larvae from a honey comb (Keith S. Begg and Colleen M. Begg)

control programmes targeting other species, such as Black-backed Jackal and Caracal (*Caracal caracal*) (Begg et al. 2013). Considering that Honey Badgers are scavengers as well, they are likely to become victims of poisoning. There is evidence to suggest that they have gone locally extinct in many areas due to poisoning (C.M. Begg & K.S. Begg pers. obs. 2006). This type of anthropogenic mortality may not necessarily be counteracted by natural recolonisation as they have a slow recolonisation rate and currently only a small percentage of South African nature reserves are large enough to sustain viable subpopulations of these animals, leaving the larger part of South Africa's Honey Badger population unprotected (Begg 2001b; Table 2). Compounding this, Honey Badgers also have low natural reproduction rates. There is generally only one cub per litter which reaches independence at the age of 12–16 months, and cub mortality is 47% (Begg 2001a; Begg et al. 2005a), This, together with large home range sizes (e.g. Begg et al. 2005b) suggest that these mustelids live at low densities and are therefore vulnerable to even modest levels of persecution. A minor threat to this species is collisions on roads (W. Collinson unpubl. data), especially while scavenging on other roadkill.

Current habitat trend: Stable. If anything, there has been an improvement in habitat as far as woody cover is concerned, which may be linked to climate change induced effects (see Power 2014). Similarly, available habitat has effectively increased as Honey Badgers are increasingly tolerated by beekeepers (Irlich & Davies-Mostert 2009; EWT unpubl. data).

Conservation

Honey Badgers are found in many protected areas throughout the assessment region (Table 2). In the North West Province alone, Honey Badgers occur in 7–8 protected areas (confirmation required for the 8th protected area), within a total area of 1,390–1,700 km^2 (Power 2014).

However, Honey Badgers are persecuted by apiculturists for the damage caused to commercial honey production. The South African beekeeping industry contributes an estimated R3.2 billion to South Africa's agricultural economy through pollination alone, with an additional R100 million through honey and bee products and creates direct employment for about 3,000 people and indirectly for 300,000 to 500,000 people (Begg 2001b; Allsopp et al. 2008; NAMC 2008). Begg (2001b) and Begg and Begg (2002) showed that hive damage could be reduced from 24% to 1% with the help of hive-protection methods; for example, by securing beehives 1 m or more above the ground on a stand or trestle, thereby minimizing conflicts between Honey Badgers and apiculturists. Begg (2001b) also highlighted that it was economically more viable for beekeepers to be "Badger Friendly".

Thus, the Badger–Beekeeper Extension Programme (BBEP) was established in 2002 to educate beekeepers on effective beehive protection measures and Honey Badger conservation, as well as public awareness on the topic (Isham et al. 2005). As part of the project, a "Badger Friendly Label" (BFL) was developed. The purpose of this project is to assist South African beekeepers in preventing damage by Honey Badgers to beehives by the use of initiatives that prevent Honey Badgers from damaging hives – a non-lethal control method. This prevents the use of other lethal control methods such as poison, gin traps and killer traps that have a negative impact on Honey Badger and other carnivore populations. This is a long-term solution that secures valuable habitat for Honey Badger populations on farmland in South Africa. Hence, the label was a voluntary incentive to be used only by beekeepers that effectively protected their beehives and thus removed the need to harm Honey Badgers. Furthermore, this label was used to indicate to the public which honey products were produced by Badger Friendly practices and thus provided leverage for consumers to put pressure on the beekeeping industry to change their ways. The labels were sold at a small cost to beekeepers that had signed a declaration copy and which after an inspection of their apiary sites were accredited with

Photo 3. A hive in good condition and securely strapped to a stand of at least 1 m significantly reduces the chance of Honey Badger (*Mellivora capensis*) access (Derek van der Merwe)

Table 6. Conservation interventions for the Honey Badger (*Mellivora capensis*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*2.1 Site/Area Management*: reduction in persecution through development of effective and economically viable hive protection methods.	Begg 2001b	Empirical	Regional	Reduction of beehive damage from 24% to 1%.	Badger–Beekeeper Extension Programme (BBEP), Endangered Wildlife Trust
		Begg & Begg 2002	Empirical	Regional		
		Isham et al. 2005	Empirical	National		
		Ilrich & Davies-Mostert 2009	Empirical	National		
		EWT unpubl. data	Empirical	National		
2	*4.2 Training*: training beekeepers and land owners to reduce persecution through the use of beehive protection measures.	Isham et al. 2005	Empirical	National	A large majority of beekeepers are now using adequate beehive protection measures.	Badger–Beekeeper Extension Programme (BBEP) and Badger Friendly Label (BFL), Endangered Wildlife Trust
		Ilrich & Davies-Mostert 2009				
		EWT unpubl. data				
3	*6.3 Market Forces:* use green labelling to link badger friendly practices with consumer behaviours.	Ilrich & Davies-Mostert 2009	Empirical	National	Only 2.8% of consumers bought honey based on BFL.	Badger–Beekeeper Extension Programme (BBEP), Endangered Wildlife Trust
4	*4.3 Awareness & Communications*: use of social marketing and awareness to increase consumer demand for BFL products to provide incentive for change in beehive protection methods.	-	Anecdotal	-	-	Badger Friendly Label (BFL), Endangered Wildlife Trust
5	*6.2 Substitution*: provision of alternative products for local communities using Badgers for traditional medicine/bushmeat.	-	Anecdotal	-	-	-

"Badger Friendly Status" (Isham et al. 2005). The BFL Project has been running since 2003, and it has become routine for many South African citizens to purchase such labelled products.

Isham et al. (2005) found that of the protection methods implemented, approximately 90% of the beekeepers protecting their hives made use of methods that raised the hives off the ground, while only about 10% used on-ground protection methods. It was confirmed that a hive in good condition, securely strapped to a stand of at least 1 m (Photo 3) reduced the chance of badger access significantly.

During a critical assessment of the BFL project (Irlich & Davies-Mostert 2009), a total of 46 records of hive damage caused by badgers, making up 26 Quarter Degree Grid (QDGs) squares, were collected. This is significantly fewer when compared to a total of 179 records of hive damage in 70 QDGs collected by Begg (2001b). According to the beekeepers, badgers are not the most severe threat to honey production anymore. Instead, vandalism and theft are the most severe threats, as they indirectly decrease the number of available sites where beekeepers can keep their beehives. The threat of direct persecution for beehive depredation is thus inferred to have lessened over the past decade. Reports of beehive damage have declined between 2001 and 2009, by an estimated 66% through the work of conservationists in promoting hive protection methods (Begg 2001b; Irlich & Davies-Mostert 2009). Of the 62 beekeepers audited by Irlich and Davies-Mostert (2009), only 16 sustained hive damage from Honey Badgers, while 46 did not sustain any damage since protecting their hives despite high badger activity in the regions. Similarly, while 64% of beekeepers listed badgers as the top threat to productivity in Begg's (2001b) report, only 12% did so in 2009. Of those who listed badgers as a threat, 85% said that the impact of these mustelids was negligible compared to only 33% in 2001 (Begg 2001b; Irlich & Davies-Mostert 2009). During the course of this assessment (2008–2009) only a single report was received of a badger being killed by beekeepers in Mpumalanga (Irlich & Davies-Mostert 2009). Thus, the overall consensus was that the problem of Honey Badgers raiding beehives is decreasing in intensity or, at worst, staying constant, with no beekeepers mentioning that the conflict was increasing in intensity or frequency of hive damage. This is likely due to the effective protection methods being implemented by beekeepers across the country (Irlich & Davies-Mostert 2009). It is possible that a few beekeepers are still killing badgers without reporting these cases. However, the beekeeping community is a small one and beekeepers are very aware of what fellow beekeepers are doing, and therefore a majority of incidences are likely to have been reported.

More recently, a 2016 Badger Friendly Audit was conducted by D. van der Merwe who is the Carnivore Conflict Mitigation Officer of the Endangered Wildlife Trust. The audits took place during March and April 2016 at a number of beekeepers' properties in Gauteng, Northern

Cape, Eastern Cape, Western Cape and Limpopo provinces. A total of 27 beekeepers were audited and 26 of them complied with the criteria in order to obtain the BFL (EWT unpubl. data). The project has been a success in that the majority of the beekeepers who were audited and who suffer damage due to Honey Badgers are still protecting their hives effectively against badgers, even if the beekeepers are not making use of the BFL. In areas of high conflict between beekeepers and Honey Badgers it is financially more beneficial to protect hives rather than persecute Honey Badgers. According to the lack of reports of badgers being persecuted by beekeepers, it can thus be interpreted that the project has continued to be effective in mitigating badger killing by beekeepers since 2009. Many of the beekeepers are using their own methods to prevent damage, which includes putting the hives into large cages and modifying the standard raised platforms. The beekeepers in the Western Cape and Limpopo seem to be having the largest amount of damage, while some of the honey farmers in the Northern Cape audited have never seen or have never had damage from Honey Badgers at all. One of the most interesting findings during this audit was the apparition and increase of badger–beekeeper conflict in the Oudtshoorn area. Over the last three years, all beekeepers in the area have had to protect their hives as it was becoming financially unviable to farm with bees (EWT unpubl. data). Overall, the 2016 audit confirms that the BFL project has decreased the number of Honey Badgers being killed by beekeepers as a result of effective hive protection methods, and can thus be considered a genuine conservation success.

However, more work needs to be done to increase consumer awareness of Badger Friendly products and thus to incentivise beekeepers to continue with the project. In 2009, only 2.8% of consumers said that their first choice was whether the honey displayed a Badger Friendly label and the number of stickers sold to retailers declined from 2005 to 2008 (Irlich & Davies-Mostert 2009). Clearly, more work needs to be done to raise the public profile of the label and increase consumer buy-in. The retail of Badger Friendly honey is an intervention similar to "green labelling" that holds sway at the level of the consumer. To increase the number of consumers buying Badger Friendly honey, additional intensive consumer awareness should be undertaken. It would be beneficial to involve members of the public nationally in using consumer power to support the initiative, as well as contributing their data on Honey Badger sightings and become engaged with badger conservation in general. This could be carried out in conjunction with more public awareness and social marketing on badgers and the BFL project.

Recommendations for land managers and practitioners:

- Monitoring should be established to measure local subpopulation trends. For example, North West Province intends to monitor subpopulations of this species through camera-trapping (see Power 2014).
- Continue to encourage beehive protection methods. The average cost of beehive damage is R950, while beekeepers protecting their hives against badgers can expect to pay anywhere in the range of R1 up to R650 per hive (Isham et al. 2005). Beekeepers must be informed via the media and popular magazines (for example, *Farmers Weekly*) of the most reliable and cost-effective measures for protecting beehives.
- All apiaries situated within biosphere reserves or along the borders of protected areas must be adequately protected, as conflict with Honey Badgers is inevitable. This should be mandatory.

Research priorities:

- Intensive research into the current distribution of Honey Badgers, together with possible estimates of their abundance (both inside and outside of protected areas) is required to successfully address distributional changes in the future. To carry out such an investigation will prove to be time-consuming, and thus citizen science schemes (for example, through social media) should be established to aid with data collection.
- Quantifying long-term population trends in different biomes and land-use areas.
- Trends in the numbers of animals killed by farmers.
- Trends in the numbers of animals accidentally killed in traps intended for other target species.
- Home range size for different vegetation types (particularly Fynbos, Karoo and Renosterveld types) so as to be able to evaluate space requirements for viable populations at the local scale.

A wealth of information has been obtained from one particular ecosystem, the arid Kalahari savannahs (see Mills 1997; Begg 2001a; Begg et al. 2003a,b, 2005a,b, 2016a,b, *in press*), in the western part of South Africa. The following biogeographical areas need to be focussed on, should there be such a further need:

- Spatial and population ecology in mesic savannah ecosystems.
- Spatial and population ecology in Fynbos ecosystems.

Encouraged citizen actions:

- Report sightings on virtual museum platforms (for example, iSpot and MammalMAP). Priority areas include southern KwaZulu-Natal and the far Eastern Cape Province. Camera-trappers should strategically deploy their camera traps in pursuit of this species and upload their records to *bona fide* data repositories.
- Only purchase Badger Friendly honey. Contact the Endangered Wildlife Trust (ewt@ewt.org.za) for further information.

Data Sources and Quality

Table 7. Information and interpretation qualifiers for the Honey Badger (*Mellivora capensis*) assessment

Data sources	Field study (literature, unpublished), indirect information (literature, unpublished)
Data quality (max)	Estimated
Data quality (min)	Inferred
Uncertainty resolution	Best estimate
Risk tolerance	Evidentiary

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*