Report on the conflict between beekeepers and honey badgers *Mellivora capensis*, with reference to their conservation status and distribution in South Africa

Keith Begg
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Summary

Until recently the honey badger (*Mellivora capensis),* a “red data” species, has remained one of South Africa’s least studied carnivores. Their conservation status and distribution have remained largely unknown due to their solitary and secretive nature. Hence, the recent escalation of honey badger damage to apiaries resulting in their heavy persecution over the past decade by beekeepers, is of grave concern to conservationists.

This report sets out to document the significance of the conflict both from the point of view of the beekeeping industry and honey badger conservation.

During the course of the study 82 beekeepers were interviewed regarding this conflict. This included 50 beekeepers maintaining more than 24 000 hives in the Western Cape. Of the Western Cape beekeeper sample, 82% acknowledged that they experienced problems with badgers and 50% of these beekeepers admitted to killing badgers at some time, although all were aware of the legal protection afforded to this vulnerable species. While 78% of the beekeepers had undertaken some form of hive protection, 22% continued to kill badgers and other non-target species. These badgers were killed despite the high annual costs involved and the availability of cost effective, long-term solutions.

Conventional domestic beehives can be, and have been, cost effectively protected from honey badger depredation for decades. Simple procedures for protecting hives are discussed and recommendations made for their wider use within both beekeeping and farming communities. In some cases beekeepers that had protected their hives actually expressed satisfaction that badgers were visiting their apiaries, but were unable to cause any damage. On occasions when a beehive was damaged, the beekeeper took responsibility and acknowledged that the job had not been well done, or that a hive was in particularly poor condition. Often the less commercially successful beekeepers simply refused to accept that their colleagues had found viable and most importantly cheaper alternatives to killing badgers. Fortunately many beekeepers have made commendable efforts to protect their beehives and it is hoped that peer pressure from within the beekeeping industry will influence those members that continue to kill badgers.

The report suggests that official pressure should also be placed on the beekeeping industry to utilize environmentally responsible practices and all apiaries should be adequately protected when situated proximal to habitats conducive to the support of honey badgers. Only 30% of National Parks and 28% of the Western Cape’s Provincial Nature Reserves may currently support viable populations of honey badgers. In the central region of South Africa the species appears to exist in very low numbers. Consequently, the population of badgers that currently exists in the coastal lowlands of the Western Cape is a vitally important refuge for this species in South Africa.

Nature conservation authorities need to be made aware of the significance of the honey badger / beekeeper conflict. Due to the large areas required to sustain viable honey badger populations, it is essential that beekeepers in the communities

surrounding protected areas be informed of protective measures and that their apiaries are randomly checked. Unfortunately, as long as gin traps are readily available in retail outlets their incorrect and inhumane use will continue.

It is concluded that beekeepers are a significant threat to the conservation of honey badgers (particularly in the Western Cape) and badgers are being needlessly persecuted in a most inhumane way.

2.0 Introduction

2.1 Motivation

Following requests for information on honey badgers published in local magazines (Begg & Begg 2000 a, b, c & e), two independent reports were received of badgers being killed by beekeepers in the Western Cape. It was reported that, despite their legal protection, between one to two hundred badgers were being killed each year by South African beekeepers. Nature conservation authorities were contacted in this regard but, in the most part, were unaware of the conflict or its extent.

A few beekeepers voiced the opinion that preventing honey badgers from raiding beehives was not economically viable and that they were so common in the Western Cape's coastal lowlands that the area could be considered overpopulated. They maintained that badgers should be declared a problem animal and in extreme cases, beekeepers should be compensated for the damage they caused. Some beekeepers claimed to be losing more than R100 000 in damage annually, directly attributable to honey badgers. Conversely, many reserve managers and conservationists regarded the badger as "rare" and their presence was seldom recorded in the very same areas where beekeepers are experiencing serious problems. Not surprisingly, reserve managers asked how an animal that appeared to be so rare could be causing such a major problem for beekeepers?

In 1985 reports from two Beekeeping Associations whose members were experiencing problems with badgers prompted the Mammal Research Institute (Skinner, 1985) to initiate a project aimed at addressing some of the very same issues dealt with in the current report. Unfortunately, after publishing a request for information in the *South African Bee Journal*, nothing came of this early initiative and the few responses received were based on hearsay (Skinner pers. comm.).
In addition to raiding apiaries, honey badgers are also widely blamed for depredations on small domestic stock (Smithers 1986), are killed for traditional medicine and for use as protective charms or as charms for hunting dogs (Cunningham & Zondi 1991). Their pelts are sometimes sold to taxidermists (pers. obs.) and appear for sale in traditional markets in Swaziland and Zimbabwe (Monadjem 1998 and pers. obs.). It is commonly thought that there have been population declines with local extinctions in areas where badgers are persecuted (Comrie-Grieg 1985). Smithers (1983) states that honey badgers are "relentlessly destroyed in the Northern Cape Province by the use of gin traps, hunting by various means and the laying of poisonous baits".

At present honey badgers are officially listed as "vulnerable" (i.e. the species may become endangered if the casual factors for their decline continue) in the South African Red Data book (Smithers 1986) and they appear on Appendix III of the CITES agreement (Schouter 1992). In the Cape provinces badgers are a schedule 2 protected wild animal (Anon 1974) but they are essentially unprotected outside of game reserves and national parks in other provinces (Rowe-Rowe 1992). They are thought to be absent from large portions of the North West, Free State, Gauteng, Mpumalanga, southern Kwazulu Natal and areas of the northern and eastern Cape provinces (Rowe-Rowe 1992; Skinner & Smithers 1990; Smithers 1986; Rautenbach 1982; Coetzee 1977; Pringle 1977).

In December 1999 a three and a half year field study of honey badgers was completed in the Kalahari Gemsbok National Park (Begg *et. al* in prep.). This study provided the first detailed knowledge of badger behaviour in the wild and results suggested that honey badgers might be particularly vulnerable to high levels of persecution. Honey badgers utilised unusually large areas and due to their small litter size and long time to independence, had a slow recruitment rate into the population. The small size of many of South Africa's protected areas suggest that they may be inadequate in conserving viable populations if neighbouring areas do not co-operate with their conservation.

2.2 Objectives

The goal of this study was to assess the significance of the conflict between honey badgers and beekeepers in South Africa and to investigate the historic and current distribution and conservation status of this species.

The objectives of this survey were to:

- Re-examine the historic and current distribution and conservation status of badgers in South Africa.
- Determine the approximate numbers of badgers being exterminated by beekeepers in South Africa and identify areas where badgers are coming into direct conflict with beekeepers.
- Evaluate potential methods for protecting apiaries from badger depredations.
- Assess the level of threat posed by honey badgers to the South African beekeeping industry and evaluate the economic impact of badger damage.

2.3 Overview of beekeeping industry in South Africa

Beekeeping is a vital but little-appreciated component of South Africa's agricultural industry and a significant contributor to the country's economy. Honey and other bee products realise about R100 million of value in South Africa per annum (Langenhoven pers. comm.), but the primary importance of beekeeping and commercial honeybees is in the value that they add to numerous crop plants by virtue of their managed optimum

pollination of these crops. The added value of commercial pollination from these commercial honeybees in South Africa is estimated to be approximately R3.2 billion per annum (Allsopp 2000a), and is responsible for some 100 000 jobs (Allsopp pers. comm. quoting Deciduous Fruit Producers Trust estimates).

Within the Western Cape alone the retail value of honey is estimated to be R29 million per annum and a further R4.4 million is derived from providing essential pollination services to the fruit farmers in the region. The value adding from honeybees to the deciduous fruit industry in the Western Cape is approximately R1 billion per annum (Turpie 1999).

There has been a decline in South African beekeeping, the primary reasons for this is the destruction of habitat and forage necessary to sustain honeybees, increased human populations and urbanization, and the effect of pesticides and pollutants. Beekeepers are particularly vulnerable to socio-economic changes as in most instances beekeepers do not own the land on which their beehives are kept, and are at the mercy of landowners. Most beekeepers reside in urban areas and may keep bees hundreds of kilometers away. They frequently move with their hives in search of flowering plants or to pollinate farmer's crops and orchards. As suitable bee forage becomes more and more scarce, and industrial and economic pollution becomes more severe, beekeepers are forced to move further and further to find sufficient forage to sustain their colonies, making beekeeping ever more expensive (Allsopp pers comm.).

Beekeeping in South Africa faces numerous problems, and may be said at present to be in a state of crisis. Foremost amongst the challenges presently facing beekeepers in South Africa are the following:

- Massive colony and production losses resulting from theft and vandalism in particular, and recently also fire and flooding. Uncontrolled vandalism has practically resulted in the cessation of beekeeping in some areas of the country.

- The Capensis Problem caused by the human-assisted movement of the Cape honeybee, *Apis mellifera capensis,* into the rest of South Africa in 1990. In brief, *A. m. capensis* bees have the potential to invade the *A. m. scutellata* colonies found throughout the rest of the country, in most cases resulting in the dwindling and death of the colony. At least 300 000 commercial honeybee colonies have died as a result of the Capensis Problem, beekeeping in provinces outside of the Western Cape has been greatly reduced, and to this day beekeepers struggle to maintain a honeybee colony for much more than 12 months (Allsopp 1999).

- The recent arrival in South Africa and subsequent rapid spread of the parasitic mite *Varroa destructor.* This ectoparasitic mite has inflicted massive damage to both commercial and wild honeybee populations almost worldwide, with honeybee colonies only being able to be maintained with the frequent use of expensive varroacides. Varroa is likely to be as disastrous in South Africa as it has been in other parts of the world, which means the almost complete loss of the wild honeybee population and a commercial honeybee population maintained by pesticides. Varroa could have a devastating influence on the fruit industry requiring commercial honeybees, and on populations of wild honeybees that play an

essential role in the pollination of 40 to 70% of indigenous flowering plants (Allsopp pers. comm.)

- The likely accelerated loss of suitable bee forage resulting from the national "working for water" (WFW) programme plans which involve the large-scale eradication of certain invasive alien plants (e.g. *Eucalyptus* spp) that are of great value to. The eucalypts, in particular, are the most important bee plants in South Africa, with nearly all varieties producing good nectar and pollen (Allsopp 2000b) and are responsible for about 80% of the honey produced in the country. The substantial loss of eucalypt trees would undoubtedly reduce the number of commercial honeybee colonies that could be sustained in South Africa. It is partly as a result of the impending eucalypt removal that beekeepers in the Western Cape have sought permission to maintain their colonies in provincial nature reserves. This has been denied on the grounds that competition created by an overabundance of domestic honeybees could negatively affect the survival of other pollinators and the complex pollination processes of certain fynbos plants (Allsopp & Lloyd pers. comm.)

- Reduced nectar flows in many parts of the country resulting from a multitude of factors including acid rain, the selective breeding of trees for apical growth (fewer side branches, resulting in less flowers), competition from the nectar fly (which resides inside Eucalyptus flowers) and Argentine ant (which exploits some 80% of nectar during the night), and the destruction of natural habitat.

- A host of pests and diseases, all of which can cause substantial colony and production losses. These include the Argentine ant, the Banded Bee Pirate, Fork Tailed Drongos, Honey badgers, European Foulbrood, and most recently, Chalkbrood.

Beekeepers and beekeeping in South Africa therefore have a formidable array of challenges and problems if their industry is to be sustained. It must be noted, however, that beekeepers in South Africa have failed to organise themselves sufficiently to address their problems. It is estimated that there may be as many as 8000 beekeepers within South Africa (Marchand pers. comm.). The vast majority of these are informal "hobbyists" with just 1 to 5 hives. Beekeepers who have more than 50 hives are generally accepted as being in the "commercial" category (Heydenrych 1999). In December 1998 the registration of all South African Beekeepers became compulsory (Anon 1998 & 1999). All beekeepers are required to display their federation number, which is branded on each beehive. Yet, in February 2000 it was reported that only 12% of the 893 beekeepers on record had actually registered (du Toit 2000) and at present 340 have registered, which is suggested to be 10 to 20% of all beekeepers in South Africa (Allsopp 2000e). In the Western Cape it is estimated that there are 50 commercial beekeepers and perhaps 1000 hobbyists, yet only 130 belong to the province's Bee Industry Association. Very few members are commercial operators and 30% are fruit producers, not beekeepers (Le Grange & Langenhoven pers. comm.).

Part of this reluctance to register may stem from the fact that the majority of beekeepers keep bees to supplement their income and may, for tax reasons, not be

keen to draw attention to their activities. This has unfortunately resulted in very little information being available regarding the industry as a whole.

That being said, it is clear that honeybees and beekeepers have an economic importance to South Africa far in excess of the value that they themselves derive from honeybees. Secondly, it is equally clear that honeybees and beekeepers in South Africa face problems more severe than ever in the past, and that the industry is extremely vulnerable.

2.4 Factors relevant to honey badger conservation

While the actual status of honey badgers in many parts of South Africa is unknown, they are considered to be rare or existing at low densities throughout the country (Smithers 1986; Kruuk & Mills 1983). Badgers are particularly difficult to locate during conventional mammal surveys and, as a result, only coarse estimates are available of their distribution and abundance. Their relatively small size, frequently solitary and nocturnal behaviour make them difficult to record even in areas where they are well represented. In the southern Kalahari and Mana Pools National Park conventional survey techniques (night counts and day transects) were poor indicators of honey badger density (pers. obs.). However, using these techniques Waser (1980) estimated honey badger density in the Serengeti National Park (Tanzania) as <0.1 individuals per square kilometer and, after 106 hours (1419km) of night driving in the Niokolo-Koba National Park (Senegal), Sillero-Zubiri & Marino (1997) estimated the badger density to be 0.07 per hundred kilometers (or 0.01 per hour). In the Hluhluwe and Umfolozi Game Reserves (South Africa) Whateley & Brooks (1985) recorded only two sightings in 3381km of night counts. In addition, badgers are not often dazzled by vehicle headlights or killed on roads (pers. obs.). Siegfried (1965) recorded only 3 instances of badger road mortalities from a total 3,306 mammal casualties in the Cape Province. As could be expected 70% of all these mammals killed were nocturnal species. Therefore, the contrasting information supplied by beekeepers was considered to be a possible means of re-examining the present distribution and conservation status of badgers in South Africa.

In the Kalahari badgers were capable of moving 40 kilometers in a single foraging period and their home ranges were not mutually exclusive, with males showing extensive overlap and covering ranges that averaged 638km^2 (Begg *et. al.* in prep). Females were more sedentary with less overlap between neighbouring females. Their average home range was 139km^2 and varied greatly in accordance with the age of offspring. Adult females were never recorded together and avoided each other temporally. The unusually large ranges of males were not only a feature of the arid Kalahari, but also the Zambezi Valley (Begg 1995).

While honey badgers are frequently reported to have litters of more than two cubs (Neal & Cheeseman 1996; Estes 1992) there is no evidence to substantiate these claims. In the Kalahari only one cub was raised at a time, though badgers have been recorded with two offspring on occasion (Johnstone-Scott 1981; Skinner & Smithers 1990; Rosevear 1974; Fourie pers. comm.). Juveniles spent an unusually long time with their mothers (14 - 18 months). This explains why there has been confusion regarding sightings of "pairs", as male offspring can reach almost twice the size of their

mothers before independence. Recruitment into the adult population is thus considered to be slow when compared with other similar sized carnivores and problem animals (e.g. black-backed jackal, caracal).

2.5 Overview of interactions between honey badgers and honeybees

The earliest records of honey badgers (Sparrman 1786; Hodgson *et. al* 1791; Wood 1876, Bryden 1900) mention their predilection for honey and both their scientific name (*Mellivora*; *mel* being Latin for honey and *voro* meaning to devour) and common name reflect this. Apart from man, badgers are considered the most destructive mammalian predators of honeybees in Africa (Hepburn & Radloff, 1998) and are capable of destroying more than twenty hives in a single night (Guy 1972). Kingdon (1989) showed that despite the precautions taken by traditional beekeepers in Tanzania, 2700 hives out of 24 000 (11.25%) were damaged in a single year and he concluded that commercial beekeepers would not be prepared to lose 10% or more of its production to these animals. Reports of badgers raiding apiaries have been recorded from South Africa, Botswana, Angola, Zimbabwe, Malawi, Mozambique, Tanzania, Zaire, Kenya, Uganda, Senegal, Togo-Benin, Nigeria, Ethiopia and Somalia (Hepburn & Radloff 1998). The African honeybee is more versatile than many other bee races and will frequently establish hives on the ground, in rock crevices and caves. Badgers have been recorded digging out hives from tree roots in the Knysna forests and amongst limestone crevices in the Western Cape's coastal lowlands (Fourie pers. comm.).

There is an abundance of anecdotal and frequently misleading literature about honey badgers and many myths persist to this day. Many of these accounts relate to the so called importance of honey in the diet of badgers. Attenborough (1998) states that "at certain times of the year it lives on little else (honey and bee grubs)" and Hancox (1989 & 1993) suggests that in central Africa, honey badger births coincide with both the maximum availability of honey and the rainy season, and that mating may be sparked off by the availability of honey. Others have suggested that the badgers "excessive energy is induced by honey and outbursts of temper" (Johnson, 1969; Roedelberger & Groschoff, 1963) while captive badgers are said to have gone into a frenzy when offered bottled honey (Black 1988 a & b).

In contrast, honey brood represented only 14% of the food items in the stomachs of seven badgers from Zimbabwe and Botswana (Smithers 1983) and constituted a very small part of their diet in the southern Kalahari where rodents and reptiles, particularly snakes were their staple prey (Begg *et. al*, in prep.). They are generalist carnivores and have been reported to kill a wide variety of prey from insects to juvenile klipspringer, kudu and bushbuck (Johnson 1982, Coetzee 1977 & Radloff pers. comm.) and black-backed jackal (Begg & Begg 2000). They do kill small livestock on occasions and can cause considerable damage to domestic poultry (Happold 1987; Smithers 1960; Fleetwood 1958).

Some authors have suggested that badgers are poor climbers (Cornish 1916; Bryden 1900; Wood 1876) and are therefore unable to reach wild beehives (Dean 1985). However, provided that the surface is rough and wide enough to grasp, adults are competent climbers and in the southern Kalahari they have been seen to remove a variety of raptor chicks from their nests (Begg & Begg 2000a) and to break into

beehives high up in trees (Hughes pers. comm.). In addition, they are highly ingenious and dextrous and in captivity quickly learn to open containers or remove lids (e.g. coffee tins) with their claws (Mendelssohn & Yom-Tov 1987). One account mentions that when a badger could not reach a high place, it rolled objects to the desired position and used the structure as a ladder (Mendelssohn & Yom-Tov 1987).

It is often suggested that badgers release scent from their anal glands to subdue bees or cause them to vacate the hive (Attenborough 1998; Kingdon 1989). The anal secretion is said to be "unendurable" and acts "like an anaesthetic, causing some bees to flee and others to become moribund" (Neal & Cheeseman 1996). Kigatiira (1984) suggests that honey badgers empty a hive by repeatedly holding their tail in front of the entrance. The disturbed bees attach themselves to the tail, whereupon the badger transports them away and returns to the unguarded honey. African honey hunters also say that badgers perform handstands while fumigating the hive (Kingdon 1989).

Honey badgers were observed to visit beehives on at least 41 occasions in the southern Kalahari (Hughes pers. comm.; pers. obs.) and were never seen to display either of these behaviours. Badgers are reputed to be impervious to bee stings due to their coarse, loosely fitting skin and thick sub-cutaneous fat deposits providing some protection (Scott & Scott 1997, Nowak 1991; Cubitt & Nicol 1986; Botha 1970; Smithers 1960; Astley Maberly 1951, Cornish 1916). Kigatirra (1984) suggests that badgers protect themselves from stings by rolling in mud, which then bakes hard in the sun. In Mana Pools National Park (Zimbabwe) a most determined female badger was observed breaking into a beehive in the hollow of a fallen tree. The badger showed no concern for the bees and after 21 minutes finally broke its way into the hive and completely disappeared inside (pers. obs.). In the Kalahari, badgers did appear cautious about raiding certain beehives and quickly vacated a hive when the swarm became defensive (Hughes pers. comm. and pers. obs.). Bees from other hives in the same area appeared to be of little consequence to the badger as they raided the hive despite being covered in bees and stung repeatedly. Generally the badger returned to the same hive over a number of days until all the available brood was eaten (Hughes pers. comm.) and each day the swarm became less capable of defending itself.

There is some evidence to suggest that, like other mustelids and viverrids (e.g. mongooses, hog-nosed skunks), badgers are less sensitive to venoms than many other mammals (pers obs.). However, there are records of badgers being stung to death by honeybees, particularly when caught in apiary traps (Kingdon 1989; pers. comm.).

By far the most fascinating and well-publicised aspect of the badger's feeding ecology is its reported association with the greater honey guide, *Indicator indicator* (Attenborough 1998; Neal & Cheeseman 1996; Macdonald 1992; Estes 1992; Friedmann 1955; Sparrman 1786). Honey guides are reported to lead badgers to beehives, whereupon the badger breaks open the hive and after feeding, leaves scraps for the bird. This relationship continues to be a contentious issue amongst ornithologists and has never been comprehensively documented (Dean 1983; Dean *et. al.* 1990; Macdonald 1994). Badgers have also been said to locate beehives by ascertaining the flight paths of bees and following them back to the hive (Wood 1876,

Hodgson *et. al.* 1791, Sparrman 1786). However, no evidence for this was recorded in the southern Kalahari or Mana Pools National Park.

3.0 Methods

To establish the historic distribution and current status of honey badgers in South Africa, an extensive literature search was conducted by reviewing information contained in a wide variety of published and unpublished sources. The review included both scientific and government publications, as well as anecdotal sources and museum records (both local and international). Telephone interviews were held with the relevant personnel from all South African National Parks and Western Cape Provincial Nature Reserves; direct contact was made with local conservationists, zoologists, vermin hunters and beekeepers and requests for information about honey badgers from members of the public were aired in local publications and at talks.

All point distribution records were located on 1:500 000 topographical maps and entered into a database at a quarter degree square resolution (15' x 15'). Using an ArcView Desktop Geographical Information System (GIS) software package, Dr AT Lombard (Conservation Systems) undertook the manipulation and visualisation of the data.

For financial and logistical reasons field excursions to meet with beekeepers were confined to the Western Cape. From initial reports it was established that badgers were causing considerable damage to the beekeeping industry and, as a result, honey badgers were being heavily persecuted in the Western Cape. 50 commercial beekeepers were interviewed during the course of this study and numerous visits made to apiaries to personally inspect hive damage, badger protection methods and general beekeeping operations. A copy of the questionnaire is included in Appendix 9.3.

During the study period (April 2000 to January 2001) regular contact and visits were made to three neighbouring beekeepers operating on the Agulhas plain in the Bredasdorp district. These particular beekeepers had expressed severe problems with badgers and co-operated fully throughout the survey by regularly reporting any matters relating to honey badgers. This detailed information was treated as a specific case study of the badger and beekeeper problem and incorporated in the following report as section 4.5.

Telephone interviews were conducted with 28 beekeepers from the remaining eight South Africa provinces, many of which were connected to Beekeeper Associations and Co-operatives within South Africa (see Appendix 9.1). Two apiculture experts (M. Allsopp of Plant Protection Research Institute's Honeybee Research Section and Prof. R. Hepburn of Rhodes University's Apiculture Section) were contacted for their opinions, as well as to gather background information on the ecology of honeybees (*Apis mellifera* spp.) and the beekeeping industry.

The Plant Protection Research Institute's Honeybee Research Section has established a number of test apiaries in the Kogelberg Biosphere Reserve and Mr A. Schofield of

the Endangered Wildlife Trust's Poison Working Group is currently evaluating hive protection methods and honey badger behaviour when raiding conventional beehives.

Following an article published in the *South African Bee Journal* (Allsopp & Begg 2000) a country wide postal survey was also initiated.

Numerous honey badger specimens were collected to add to current research initiatives (C. & K. Begg, Mammal Research Institute & Carnivore Conservation Group, E.W.T). A large amount of morphometric data were collected and 20 badger skeletons prepared were donated to the Natural History Museum, Cape Town. A variety of genetic material, tissue samples and ectoparasites were collected for the Wildlife Breeding Resource Centre and the University of Pretoria's Faculty of Veterinary Science (Prof. M. van Vuuren, Prof I. Horak and Dr. E Lane).

As a result of the sensitive and sometimes illegal nature of information divulged, all information provided by beekeepers was kept strictly confidential and no names are cited.

4.0 Results

4.1 Historical distribution of the honey badger in South Africa

The distribution of honey badgers in South Africa was last described by Smithers (1986) in the South African Red Data Book - Terrestrial Mammals. With the exception of the Northern Province, badgers were indicated to be absent from large portions of all other provinces and had never been recorded in the Free State and Lesotho. Interestingly, badgers were also indicated to be absent from a major portion of the Western Cape's coastal lowlands and along the lower Orange River in the Northern Cape.

In order to re-examine the question of honey badger distribution in South Africa, data were drawn from seven different sources of historical information. These were:

- Scientific literature.
- Museum records.
- Government gazettes.
- Geographical place names.
- Sightings in national parks and provincial nature reserves.
- Annual reports of the Director of Nature and Environmental Conservation, Cape Provincial Administration.
- Hunt diaries of the Suurbron Jag Klub.
- Personal communications.

A total of 497 honey badger records were obtained from museums, literature and personal communications. Some 84 South African honey badger specimens exist in African museums holdings (Appendix 9.2) but, of these, 9 specimens did not contain

suitable locality data. 22 of these specimens were collected during the current survey (killed by beekeepers) and donated to the Natural History Museum in Cape Town.

Historically there are 41 place names in South Africa that refer to “Ratel”, all of which are located within the Cape and North West provinces (Vernon, pers. comm.).

The historical record also revealed that, as predators, honey badgers have been persecuted by farming communities in South Africa since the early 1800’s. Rowe-Rowe (1992) stated that badgers were “apparently incorrectly accused of killing livestock”. However, there are numerous authenticated records of them killing or maiming livestock, but their impact on livestock farming is considered to be negligible, particularly in comparison to caracal and jackal depredation (Fourie & Stuart pers. comm.). Honey badgers will also kill poultry when the latter are not well protected. In addition to killing lambs and kids, Shortridge (1934) blamed badgers for destroying ostrich chicks and farmers in the Karoo and North West province have accused badgers of breaking ostrich eggs. (Malan and Erasmus pers. comm.). Rowe-Rowe (pers. comm.) says that due to the somewhat mythical reputation of honey badgers, farmers in Natal blame them for all sorts of unexplained livestock losses. Some farmers have resorted to killing them because of their fierce reputation and fear that they may be attacked whilst the animal is being released from a trap. Honey badgers can be particularly difficult to kill compared with similar sized animals and, when a firearm is not available, some farmers resort to burning them or driving over them in a vehicle. Hunt clubs have also been known to kill badgers due to the potential danger of them mauling their hunt packs. Honey badgers continue to be killed “accidentally” by hunt dogs (Fierrera pers. comm.).

Point data for the Cape Provinces were extracted from Fitzsimons (1919), Millar & Lloyd (1976), Coetzee (1977), Stuart (1972, 1980, 1981), Skead (1980 & 1987) and Lawson (1982). Stuart *et. al* (1978) recorded the presence of badgers in only 5 of the 16 reserves surveyed in the Cape Province. In all five of these reserves badgers were considered to be uncommon or rare. Honey badgers were declared vermin in the Cape Provinces for more than half a century, and a reward of 10 shillings was issued for each animal killed. The historical record from 27 districts of the Cape Province (Table 1) contains evidence to suggest that over a period of 23 years 744 badgers were killed and large numbers of badgers were killed in the Riversdale, Humansdorp and Bredasdorp districts.

Table 1: District records of honey badgers destroyed as vermin over the period 1892 – 1955 (Source: Agricultural journal (1892) and Cape of Good Hope Government Gazette's (1931 to 1955, 1933 excluded).

District	1892	1931-39	1940-49	1950-55	Total
Alexandria	3	-	-	-	3
Bedford	4	-	-	-	4
Bredasdorp	-	10	51	29	90
Caledon	-	0	2	4	6
Calvinia	-	0	18	19	37
De Aar	-	0	1	0	1
Fort Beaufort	4	-	-	-	4
Graaff Reinet	5	-	-	-	5
Hanover	3	-	-	-	3
Heidelberg	-	12	15	9	36
Humansdorp	-	0	88	74	162
Indwe	-	0	15	0	15
Jansenville	3	-	-	-	3
Lady Grey	1	-	-	-	1
Matatiele	-	0	0	8	8
Mossel Bay	-	0	1	7	8
Mount Currie	-	8	9	2	19
Riversdale	-	80	80	17	177
Robertson	10	-	-	-	10
Somerset East	6	-	-	-	6
Steytlerville	14	-	-	-	14
Sutherland	-	0	18	20	38
Swellendam	-	22	33	12	67
Uitenhage	3	-	-	-	3
Uniondale	-	0	1	18	19
Willowmore	4	-	-	-	4
Worcester	1	-	-	-	1
TOTAL	**61**	**132**	**332**	**219**	**744**

From extensive farm surveys conducted by Lloyd and Millar (1976 & 1983), comprising questionnaires from some 44 000 landowners, honey badgers were found to be widespread through all 91 divisional council districts. The highest concentrations were recorded in the arid Namaqualand, Calvinia and Williston districts (Northern Cape). Relatively high concentrations were also recorded along southern Cape coastal region, particularly the in the vicinity of the adjoining divisions of Knysna and Uniondale. Very low densities were reported for the West coast (e.g. Piketberg, Vredenburg, Hopefield, Malmesbury districts) where badgers are presently considered to be a substantial problem by beekeepers (Section 4.3). One National Park and one provincial Nature Reserve (out of 6 and 20 surveyed respectively) in the three Cape Provinces were reported to contain honey badgers. Stuart (1981) described the species to be widespread, but nowhere common, although Stuart (1980) mentions that farmers at the south of the Riviersonderend Mountains had reported an increase in the honey badger population. The majority of animals killed during predator control programmes were taken in the southern coastal regions of Caledon, Bredasdorp, Riversdale and Mosselbay. In the North-eastern Cape, Lynch (1989) found only one unconfirmed report from the Jamestown district. Hence it is considered noteworthy that 15 badgers were killed as vermin in the Indwe district during the 1940's (Table 1). In the Eastern Cape, Skead (1987) considered badgers to occur throughout the area, but their status was uncertain and potentially critical. In the Albany district, honey badgers were considered "very rare", favouring wooded habitats and noticeably absent from open grassveld and Karoo. Traps and dogs were responsible for the serious decline in this district (Coetzee 1977). Of interest are seven confirmed records of albinism from the Western and Eastern Cape provinces (Fitzsimons 1919, Stuart, Fourie, Hiseman, Martin and Radloff pers. comm.).

Between the years 1944 to 1977 no mention was made of honey badgers in the annual reports of the Director of Nature and Environmental Conservation (Cape Province). The total number of badgers caught or killed by the Department's Problem Animal Control staff is summarized in Table 2. Unfortunately, much of the information gathered by the problem animal control station at Vrolijheid appears to have been lost when the station was closed in the mid 1990's (e.g. specimens from Stuart 1977). Mr. C.H. Radloff of the Suurbron Jag Klub (Humansdorp district) kindly made available his hunt diaries for the period 1959 to 1999. During the 40 year period concerned, a minimum of 82 badgers were trapped using the standard "Rooikat" foothold trap. Approximately 6 (7%) of these badgers were considered target animals, having killed a minimum of eight sheep. During 1990 nature conservation authorities translocated four badgers after being specifically trapped in cage traps. When added to the data presented in table 1, this would account for at least 244 badgers killed in the Humansdorp district during a 50 year period.

Table 2: The number of honey badgers killed in the Cape provinces between 1977 and 1986 by the Department of Nature Conservation's Problem Animal Control. The methods used are also indicated (Source: Annual Reports of the Director of Nature and Environmental Conservation).

YEAR	HUNT DOGS	COYOTE GETTERS	TRAPS	TOTAL
1977-1978	**4**	**0**	**4**	**8**
1978-1979	**4**	**13**	**6**	**23**
1979-1980	**3**	**1**	**0**	**4**
1980-1981	**0**	**6**	**1**	**7**
1981-1982	**-**	**-**	**-**	**No info.**
1982-1983	**3**	**0**	**0**	**3**
1983-1984	**0**	**0**	**0**	**0**
1984-1985	**2**	**0**	**0**	**2**
1985-1986	**0**	**0**	**0**	**0**
	16	20	11	47

In the former Transvaal (now Northern Province, Gauteng, Mpumalanga and a portion of North West Province) distribution records have been recorded by Pienaar (1964), Rautenbach (1978 & 1982), Henschel (1986) Grimbeek (1992) and Bailey (1993). Records occur throughout the wooded (bushveld) regions north of the Magaliesberg, across the Waterberg and along the eastern Lowveld (Rautenbach 1982, Marais 1990). Pienaar (1964) recorded badgers in all areas of the Kruger National Park and between the years 1903 and 1927 at least 87 were killed in the park (then the Sabi and Shingwidzi Game Reserves) as part of the Government's predator control programme (Smuts 1982). During the 1980's an estimated 40 badgers were destroyed or occasionally translocated by veterinarians and rangers after raiding fridges and dustbins inside Satara rest camp in the Kruger National Park (Draagt & Whitfield pers. comm.). Badgers were not recorded in the southern regions of Mpumalanga (highveld grasslands) and were considered to be rare and/ or endangered outside of the Kruger National Park (Rautenbach 1982). In neighbouring Swaziland, honey badgers are at risk of stochastic extinction (Monadjem 1998).

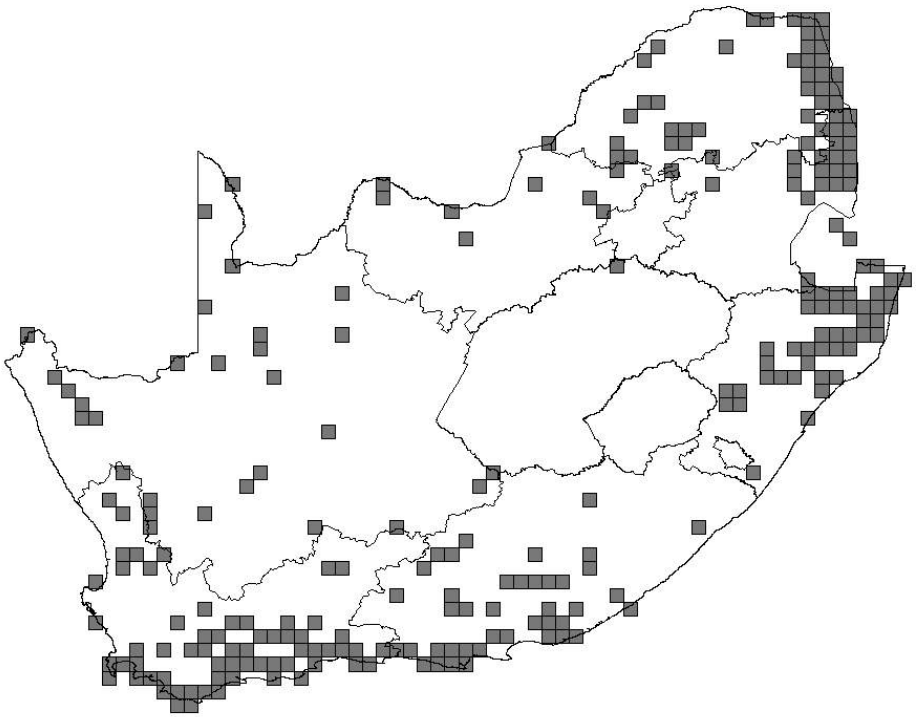

Figure 1: Historical records of the honey badger in South Africa, dating from 1776 to 1989 (n=497 records).

In Kwazulu-Natal honey badgers are unprotected outside of reserves and widely considered to be rare. Distribution data has been published by Dixon (1964, 1966), Bourquin *et. al.* (1971), Rowe-Rowe (1975 & 1978), Pringle (1977), Bruton (1978), Rautenbach *et. al.* (1981) and Whateley & Brooks (1985). The majority of records occur in the north and honey badgers were rarely encountered south of the latitude 29^0 S (Smithers 1986). Rowe-Rowe (1975) and Pringle (1977) mention records from the Drakensberg (Giants Castle and Loteni) and Oribi Gorge reserves. During periods of prolonged drought their distribution is said to extend into the wetter regions of the province (Rowe-Rowe pers. comm.). Vermin records from the Mount Currie district (Table 1) confirm that badgers also had a presence in the southern reaches of the province of Kwazulu Natal.

No confirmed reports of honey badgers exist from the Free State. Lynch (1983) conducted extensive surveys from 70 localities in the province and obtained information from 5440 questionnaires distributed amongst landowners. Records from the "vermin" control body Oranjejag were also accumulated, but no evidence suggested that badgers ever existed in the province. One unconfirmed report was received of a honey badger having been seen raiding a beehive on a farm north east of Parys and an Amathole museum record card mentions a Bushmen in 1839 with a "Ratel skin cap" near Bethany in the Free State. Similarly, no badgers have been recorded in neighbouring Lesotho (Lynch 1994).

4.2 Present distribution of honey badgers in South Africa (past decade)

Few distribution records for honey badgers have been published or lodged with museums during the past decade (1990 to 2001). Rowe-Rowe (1992) who reviewed their status in Kwazulu Natal, provides the sole source of such information. Consequently, the majority of the 398 records extracted for the purposes of the present study were accumulated from personal communications and observations during the past six years (Figure 2).

During the course of the survey 28 Parks personnel from all 20 National Parks and 35 nature conservation officials from 28 Western Cape provincial reserves were interviewed to establish the perceived status of badgers inside national parks and provincial nature reserves.

The results suggest that although badgers were recorded in 15 (75%) national parks, they were considered scarce in 4 (20%). It appeared that they are no longer present in the Bontebok and Cape Peninsula National Parks. Badgers were well represented in only 6 (30%) of South Africa's National Parks (Table 3). With respect to the Western Cape provincial nature reserves, badgers were recorded in 17 (60%) nature reserves,

but only 8 (28%) of these reserves were considered to contain potentially viable populations (Table 4).

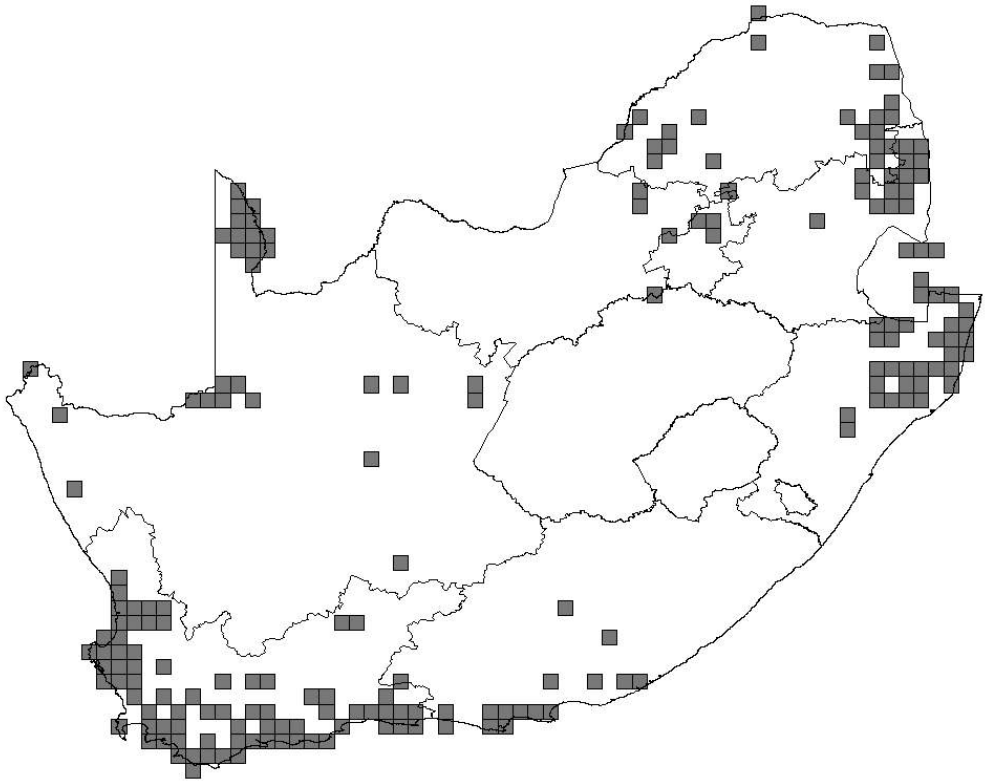

Figure 2: Current distribution of honey badgers in South Africa based on the accumulation of 398 records over the period 1990 to 2001.

Table 3: Current status of honey badgers in 20 different South African National Parks based on information provided by ecologists, park managers, section rangers and field staff.

Absent = no records Scarce = < 2 records since 1998 Present = regularly recorded

	S. A. NATIONAL PARK	STATUS	COMMENTS
1	Addo Elephant	Scarce	1 sight record in 1997, 2 in 1992, 1 trapped - farm
2	Agulhas	Present	Regular records, pop. threatened by beekeepers
3	Augrabies Falls	Absent	No records, 3 released, 1 trapped on border 1996
4	Bontebok	Scarce	1 possible record of signs in 1996
5	Cape Peninsula	Scarce	1 road kill in 1995 and 1 trapped 1988
6	Golden Gate Highlands	Absent	No known records from this region
7	Kalahari Gemsbok	Present	Large resident population, regular sightings
8	Karoo	Scarce	Rare sightings and some signs
9	Knysna	Absent	No suitable habitat (estuary / wetland)
10	Kruger	Present	Large resident population, regular sightings
11	Limpopo Valley	Present	Recent sightings and signs
12	Marakele	Present	2 sightings 1999 and 1998 and regular signs
13	Mountain Zebra	Absent	No records from this area for the past 60 years
14	Namaqua	Present	No sight records, recent signs, farmers trapping.
15	Richtersveld	Scarce	1 sight record and signs from 1997
16	Tankwa Karoo	Absent	No known records
17	Tsitsikamma	Present	Regular sightings and signs recorded
18	Vaalbos	Present	1 sighting 1999, road kill park border 2000
19	West Coast	Present	1 trapped 1989, 1 sighting of 3, raiding bins 1999
20	Wilderness	Present	Regular sightings, 1 released into park 2000

Table 4: Current status of honey badgers in 28 Western Cape Nature Reserves, as reported by reserve managers and field staff. Where Absent = no records and present = regularly recorded.

	NATURE RESERVE	STATUS	COMMENTS
1	Cederberg	Present	Regular sightings and signs
2	Matjiesrivier	Absent	No known records
3	Verlorenvlei	Absent	No known records, 1 released in 1995
4	Rocherpan	Absent	No known records
5	Grootwinterhoek	Present	Regular sightings and signs
6	Kogelberg	Present	Regular sightings and signs, beekeeper complaints
7	Jonkershoek	Present	No recent records, 1 road kill in 1974, raiding hives
8	Assegaaibosch	Present	No recent records, raiding hives
9	Limietberg	Absent	No known records
10	Hottentots Holland	Present	2 recent sightings near main gate
11	Walker Bay	Present	Regular sightings and signs
12	Salmonsdam	Absent	No known records
13	De Mond	Present	Regular sightings and signs
14	De Hoop	Present	Regular sightings and signs
15	Vrolijheid	Absent	1 trapped on border 1998 and in 1987
16	Marloth	Absent	No known records
17	Grootvadersbosch	Absent	No known records
18	Boosmansbos	Absent	No known records
19	Anysberg	Present	1 sighting 1995, 1 trapped 1986, albino 1989
20	Towerkop	Absent	No known records, farmer complaints
21	Gamkapoort	Present	No sightings, signs reported
22	Gamkaberg	Present	No recent signs, 2 specimens, 1 released 1990
23	Swartberg	Present	No sightings, signs reported
24	Outeniqua	Absent	No known records, but presumed present?
25	Goukamma	Present	1 sighting, 3 road-kills, Albino trapped, 2 released
26	Kammanassie	Present	No sightings, signs reported
27	Keurbooms River	Present	Recent sightings and signs recorded
28	Robberg	Present	Recent sightings and signs recorded

Whilst acknowledging the limited scope of the present study and the obvious collecting bias that exists for the Western Cape, it was concluded that badgers still occur throughout most of their former range. The populations in the eastern Lowveld (Mpumalanga and Northern Provinces), the Kalahari (Northern Cape) and the Cape coastal lowlands appear to support the largest and most important remaining concentrations of honey badgers in South Africa.

It is worth noting that the data on honey badger distribution, as shown in figure 2, reflect a wider distribution than that indicated in the South African Red Data book (Smithers 1986). This is likely to be the result of increased sampling effort rather than an expansion of the species range. There is little doubt that their densities are lower, particularly in the central regions of the country (e.g. the Karoo). Habitat loss and persecution, particularly from small livestock farmers during the past two centuries have contributed significantly to this decline. While honey badgers are seldom a specific target species, they are susceptible to baited traps (e.g. Coyote getters) and, as carnivores, are routinely killed (Comrie-Grieg 1985, Smithers 1986).

4.3 Location of beekeeper and badger conflict

Of the 82 beekeepers interviewed during this survey, 52 (63%) were from the Western Cape province, the primary focus of the survey. Of the 179 reports received regarding apiary damage from honey badgers during the period 1960 to 2000 (Figure 3), only 14 reports were from damage sustained prior to 1990. This suggests that the problem has escalated, however, it is reasonable that an incident occurring long ago in the past is most likely to be forgotten and this may be affecting the results.

A total of 28 commercial beekeepers from eight South African provinces (excluding the Western Cape) were interviewed.

Conflict with honey badgers was widely reported to occur in the Mpumalanga Lowveld, particularly in the White River district. Most of these problems occurred in eucalyptus plantations near the towns of Graskop and Sabie. To counter these problems beekeepers strapped their hives and apiaries were often located within fenced camps. In addition at least one beekeeper admitted to using poison (Temic) on a regular basis to kill badgers.

In the Gauteng province, repeated problems with honey badgers were reported in the Pretoria, Wonderboom and Cullinan districts. In the neighbouring district of Warmbad in the Northern Province regular badger damage has occurred since the 1970's in the Rust de Winter area. Beehives are moved to Rust de Winter from July to September for the flowering of the exceptional bee plant *Aloe doviana*. Isolated incidents were also reported in the Rustenburg (North West Province) and Thabazimbi (Northern Province) districts.

Beekeepers in Kwazulu Natal were mostly unaffected by honey badgers, although two beekeepers reported isolated incidents of beehive damage near Richards Bay and Mkuzi.

In the Eastern Cape badgers were only reported to be a problem in the Humansdorp and Port Elizabeth districts situated along the coast. Honey badgers were not considered to be a problem for beekeepers in the Northern Cape, although there is one record of beehive damage near Augrabies National Park (Van der Walt pers. comm.).

No confirmed reports of honey badger damage were recorded for the Orange Free State.

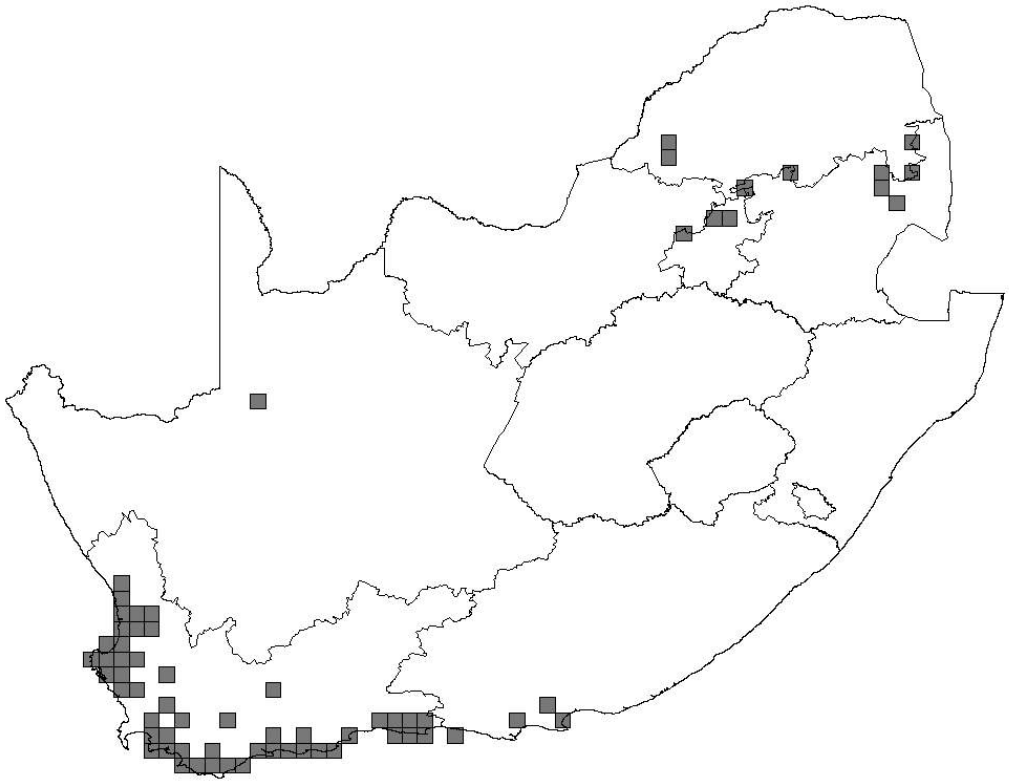

Figure 3: Distribution of apiaries in South Africa where damage has been sustained by honey badgers since 1960 (n=179 records).

4.4 Western Cape beekeeper survey

Beekeeping has been practised in the Western Cape for the past two centuries. Early in the 1900's beehives were commonly made from disused 4-gallon petrol and paraffin tins or occasionally early frame hives ("plat kaste" and "patent korwe"). Beekeepers considered these early hive designs to be extremely prone to damage, yet badgers were never considered to be much of a threat to beekeeping. Wild beehives were common throughout the indigenous forests (e.g. George and Grootvadersbos) and particularly the limestone coastal fynbos. The human inhabitants of these forests routinely followed the greater honeyguide (*Indicator indicator)*, in order to locate wild beehives and were all familiar with honey badgers (Moodie, 2000 and pers. comm.).

Most commercial beekeeping in the Western Cape is conducted within the Fynbos biome in which the Cape Honeybee (*Apis mellifera capensis)* is endemic. No accurate figures of the extent of the beekeeping industry in the Western Cape presently exist. Turpie (1999) conservatively estimated that there were at least 58 000 beehives maintained within the Fynbos biome and suggested that 50% of the honey produced is directly attributed to bees foraging on indigenous vegetation. The wide diversity of flowering plants, which provide nectar at different times of the year are of indispensable benefit to beekeepers. During winter the honeybees build up food reserves and colony size. Later (during September and October) they are moved out to canola fields, *Eucalyptus* plantations and prepared for transported to orchards for professional pollination services.

The first description of honey badgers originated in 1776 from the Western Cape (Schreber 1776) and has been regularly associated with this region ever since. Mentzel (1787, in Skead 1980) gives a good account of a honey badger on the Bottelaryberg near Stellenbosch and Wood (1876) mentions that badgers where in "great profusion at the Cape of Good Hope". The first records of badgers raiding conventional beehives were reported during the 1950's and, even at this early stage, beekeepers in the Piketberg district had devised effective methods of protecting their hives from badgers by securing them onto timber stands. Badgers were reported to have raided hives near Bonnievale during the 1970's (van Deventer pers. comm.) yet today they are not considered to be a problem in this area. Conversely, one hundred beehives reportedly kept at Potberg (now De Hoop Nature Reserve) after 1974 were left undisturbed by badgers until the mid 1980's (Moodie pers. comm.)

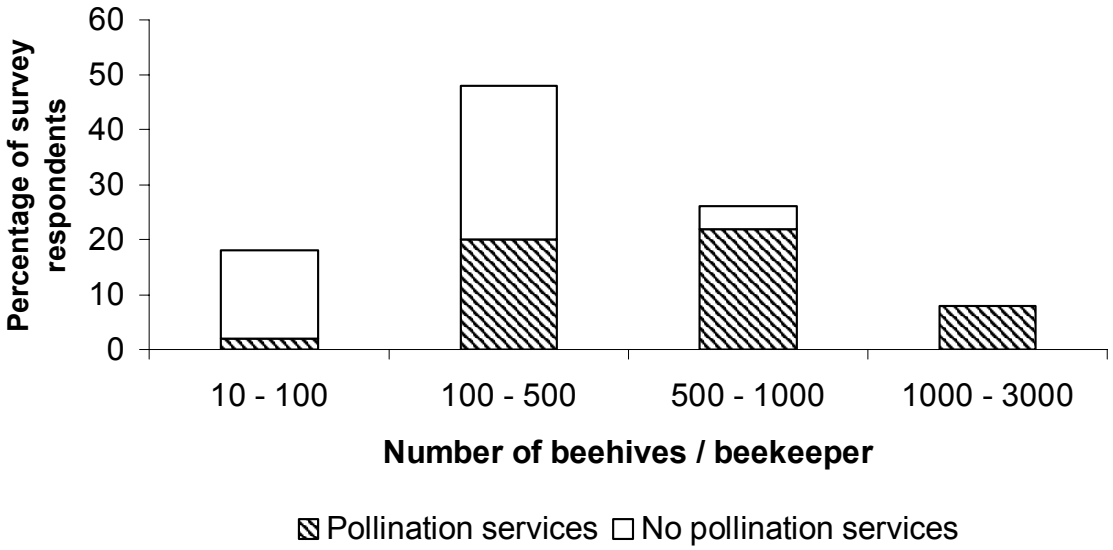

Figure 4: Number of hives maintained by survey respondents in the Western Cape and the proportion of these beekeepers engaged in pollination services (number of beehives = 24659; number of beekeepers = 50).

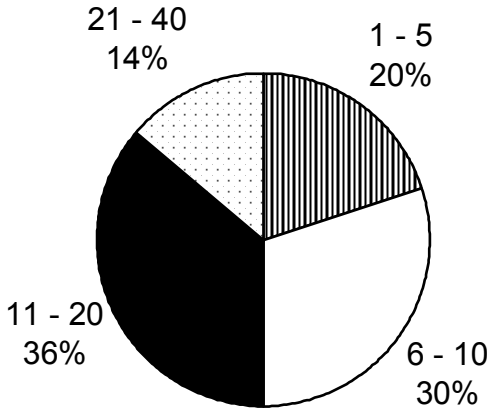

Figure 5: Number of years survey respondents had been in business in the Western Cape (N = 50).

During this survey, 50 beekeepers, accounting for a total of 24 659 beehives (i.e. 42% of the total number of beehives in Fynbos estimated by Turpie 1999) were interviewed. An average of 493 beehives were maintained by each beekeeper (figure 4) and 50% of the beekeepers interviewed had been keeping bees commercially for less than 10 years (Figure 5) with 52% of beekeepers involved in providing professional pollination services.

82% of the beekeepers acknowledged that they had or were currently experiencing problems with badgers. Of these beekeepers, 66% considered the badger problem to have increased significantly over the past five to ten years and many considered the past year (2000) to have been the worst year ever experienced (Figure 6).

The reasons suggested for this perceived increase in the badger conflict included:

- The protected status of honey badgers, the disintegration of subsidised hunt clubs (especially in the past few years) and the disbanding of organised problem animal control services by various regional councils. These factors are thought to have resulted in an increase in the number of predators and some farmers have subsequently returned to using poison (van Deventer pers. comm.). Although badgers were not a specifically targeted they were persecuted during the past century (section 4.1) and have continued to be killed by farmers when caught inadvertently in cage traps set for caracal.

- A decrease in wild swarms of bees, with the result that badgers have begun to rely on domestic beehives for honey. Beekeepers speculated that it was currently more difficult to find feral swarms, and that their yields from catch box hives were lower. The decreased number of wild honeybees could be attributed to monoculture, habitat transformation and the widespread use of harmful chemicals.

- The establishment of protected areas where badgers can proliferate. An example given by beekeepers was the West Coast National Park, which was proclaimed in 1985 and has subsequently purchased additional farms over the past decade (Nel & Sieben pers. comm.). One beekeeper reported never having experienced badger problems in the early 1980's on the very same farms that are now incorporated into the West Coast National Park. Other beekeepers blamed the managers of these conservation areas for having introduced the species.

- The past four years of drought (figure 7) and fires could well have contributed to the recent upsurge in badger conflict as their natural prey (e.g. rodents) are not abundant. Beekeepers and crop farmers mentioned the number of large trees that were dying; the increased number of trees being ring barked by porcupine and vastly reduced harvests (e.g. reduction in yields of honey from 15 to 6 tons and of grain from 13 000 to 800 tons per annum).

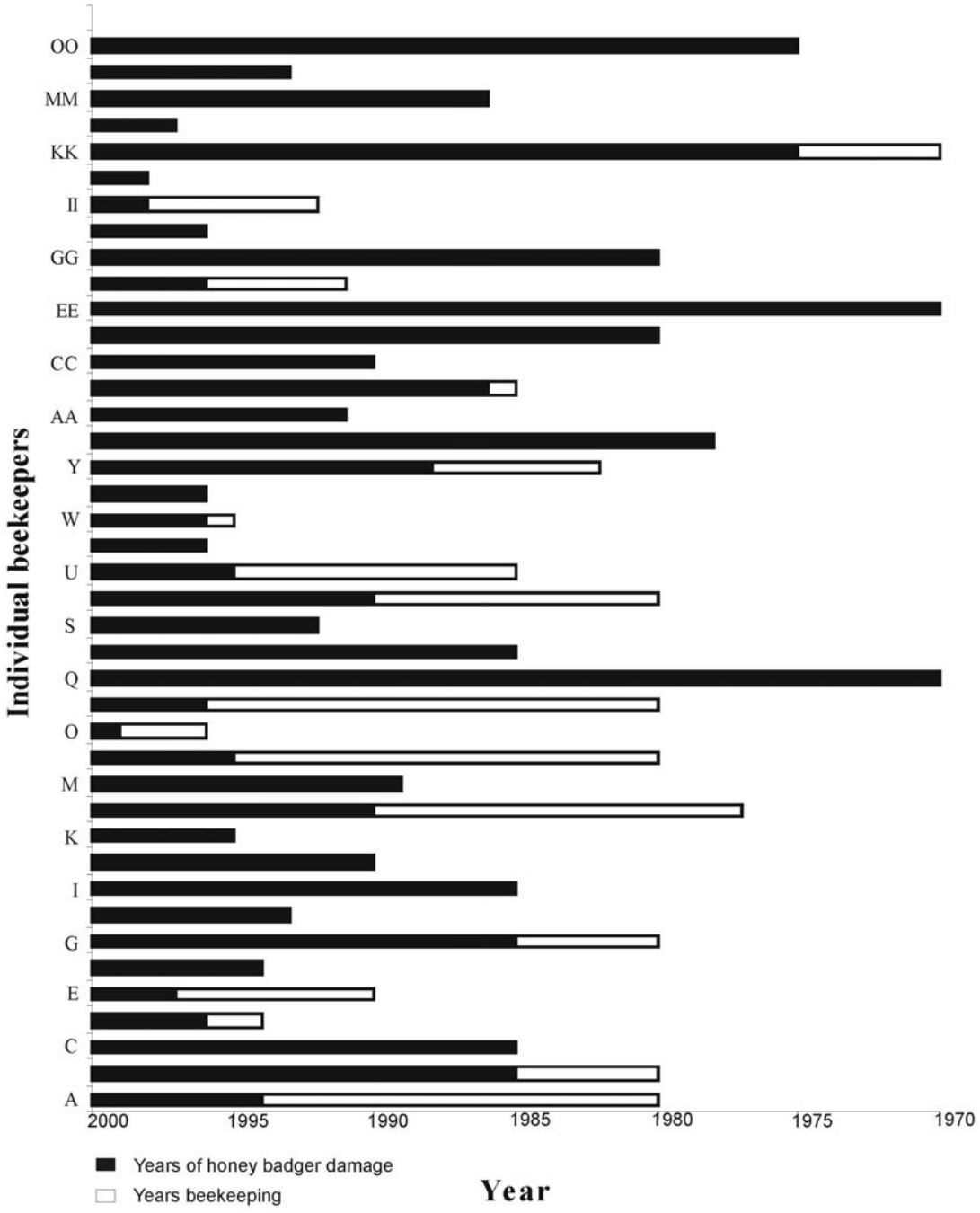

Figure 6: The number of years during which commercial beekeepers in the Western Cape had been experiencing problems with honey badgers (N=41).

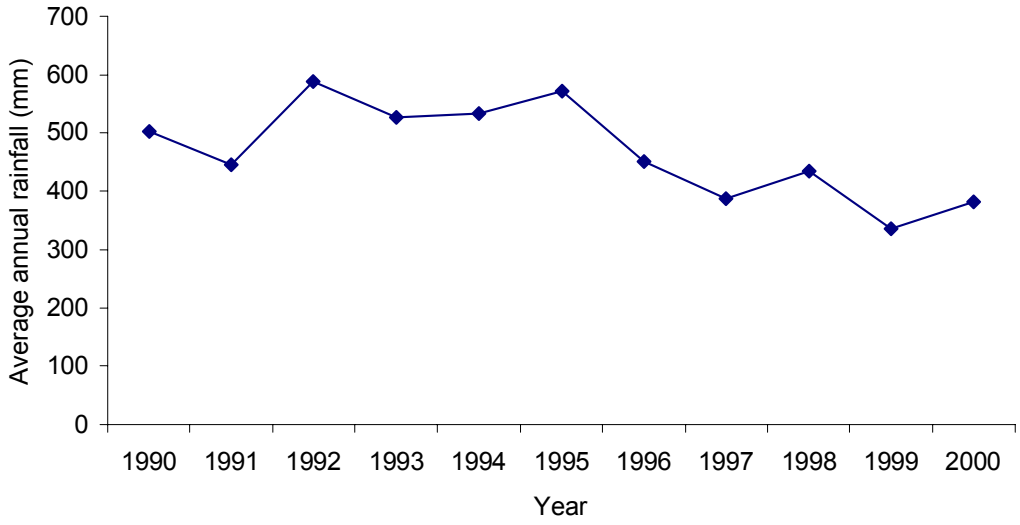

Figure 7: Average annual rainfall for the past decade from five towns spread across the Western Cape (Vredenburg, Worcester, De Mond, Riversdale, Knysna). Source: S. A. Weather Bureau.

- The loss of suitable badger habitat through habitat transformation. However, this transformation is not considered to have increased substantially over the past decade (D. Richardson pers. comm.).

- Climatic change had accounted for higher numbers of badgers in the coastal lowlands. Some beekeepers maintained that badgers (and other species like leopard) had moved down from the mountain habitats. It does appear that species such as bat eared fox (*Otocyon megalotis*), Cape fox (*Vulpes chama*) and aardwolf (*Proteles cristatus*) were now more common in the south western Cape (Lloyd pers. comm.)

- The business and method of beekeeping has changed considerably over the past three decades. Originally each farmer maintained a few beehives in the backyard and many were kept in semi-urban environments. Today, fewer hives are kept near habitation because of the dissenting attitude of many landowners and municipalities to bees and the potential threat of beestings. In addition, the problem of theft and vandalism has forced beekeepers to place apiaries in remote and often secluded areas where badgers commonly occur. The net result is that more hives are kept in Fynbos where badgers can easily exploit them.

- A substantial increase in the number of beehives kept in the Western Cape with badgers learning that domestic hives provide a ready source of food. Opinions varied widely about the number of beekeepers and beehives in the province over the past decade or more. In the 1970's few beekeepers would manage more than 80 hives. Today's beekeepers operate as many as 3000 hives, spurred on by the lucrative business of professional pollination services. However, they tend to spend less time monitoring and managing each swarm. There is an ever-increasing demand for suitable bee habitat that is situated away from habitation and cultivated lands where pesticides and herbicides are in use, and competition between beekeepers can be intense.

All of the beekeepers experiencing badger problems in the western Cape kept a large proportion of their beehives on the coastal lowlands (Section 4.3). The remaining 18% who had no problems kept their hives in the Boland region (i.e. Wellington, Worcester and Robertson districts). When asked about their perception of the severity of the problem, 42% of beekeepers experiencing problems considered badgers to be a serious threat to productivity, 25% considered badgers to be a moderate threat and 33% considered them to be a moderate or negligible threat. This same group of beekeepers was asked to rank the importance of five potential factors that could decrease productivity, these being badgers, theft & vandalism, baboons, ants and Varroa mite. The results (Table 5) showed that badgers and theft and vandalism were the two greatest threats to the productivity of beekeepers in the Western Cape. These are of course the most obvious problems, whereas ants and mites might actually be more of a threat, but more insidious.

Table 5: Results of ranking 5 potential threats by beekeepers in the Western Cape.

Potential threat to productivity	Rank 1 (%) N=41	Rank 2 (%) N=37
Honey badger	64	14
Theft & vandalism	29	32
Ants	5	35
Baboon	0	14
Varroa mite	2	5

Of the beekeepers that had experienced badger problems, 50% admitted to having resorted to killing badgers at one time or another. The earliest accounts of honey badgers being killed because of apiary damage was in the 1950's. The steel-jawed trap used by 67% of beekeepers, was regarded as the easiest method for killing badgers with cage traps commonly used by stock farmers to trap caracal a viable alternative. Only two beekeepers admitted to using poison (i.e. Organo Phosphate like Diazanon) baits in the past.

As a legally protected species, beekeepers were very cautious of divulging information regarding the number of badgers killed. Nevertheless, a minimum of 248 badgers were killed by (average of 12 badgers each) with at least 231 of these badgers killed in the past 15 years (i.e. 15 badgers per year). 25% of these beekeepers continued to trap badgers. Of these beekeepers 85% admitted to having killed between 1 and 10 individuals, while the remaining 15% estimated that they had killed 30 to 90 badgers each. The average number of badgers killed by each beekeeper per annum was 3,8 (standard deviation 2,7), but this figure varied widely. One beekeeper maintained that 22 individuals were trapped at one apiary site during a single year (section 4.5) and the landowner confirmed this. The two beekeepers responsible for having killed 64% of these badgers both maintained that males were the most commonly trapped culprits, and estimated a ratio of 10 males for every female killed. A minimum of 26 badgers were killed during the course of the present survey (10 males, 6 females, 2 juveniles and 8 unknown). Non-target species trapped in apiaries included striped polecat, porcupine and large grey mongoose.

83% of all the badgers killed were by beekeepers that were not prepared to make any effort to protect their hives. Only 6% of beekeepers that had begun protecting their hives continued to trap after such action was taken. These beekeepers were not yet convinced that the hive protection methods adopted were adequate and had not protected all their hives.

In some districts the farming community was encouraged to kill badgers because of the damage sustained by beekeepers. A minimum of 18 badgers were reported to have been killed by neighbouring farmers in support of beekeepers and the potential threat to small livestock.

Only one permit (issued in 2000) was reported to have been issued by the Permit Office (Western Cape Nature Conservation) for the removal of a honey badger

(Hignett, van der Merwe, Basson pers. comm.). However, badgers were translocated without permits on a number of occasions (van Deventer pers. comm.). Conservation authorities say that they will not sanction the trapping of badgers unless a reasonable effort has been made to adequately protect beehives (Palmer pers. comm.). However, in the case cited above, no investigation was made and the beekeeper had not protected his hives in any way. The first prosecution for a beekeeper having trapped a badger was made in late 2000 (Appendix 9.4 and 9.5). The original R1000 fine was reduced by the public prosecutor to R650 (Hiseman pers. comm.). In August 2000 during a routine South African Police search (for Perlemoen) in the Hermanus district, a vehicle was discovered with 2 newly killed honey badgers concealed in the rear. The possession of these carcasses was not queried and nor local nature conservation officers contacted.

Heavy losses from theft were considered to be characteristic of beekeeping in southern Africa (Guy, 1972). Theft and vandalism was the second most pressing issue for beekeepers in the Western Cape (Table 5). Some beekeepers went to the extent of fencing off apiaries with electric fences and razor wire. For example, in the Eastern Cape at least one beekeeper was secured beehives inside shipping containers and even this extreme measure was no longer effective (Taylor 2000 and pers. comm.). In Zimbabwe beekeepers built brick-walled enclosures with steel doors and roofs to guard against theft (Stuart pers. comm.). At least two beekeepers closed their businesses due to persistent large-scale theft. On some occasions as many as 80 hives were stolen over the December festive period (young bee brood is highly sought after for home made alcohol). In a few cases beekeepers blamed other colleagues for stealing hives, or removing honey from competitors hives and vandalism by children breaking hives was common.

No reports of honey badgers raiding beehives located in fruit orchards or other intensive forms of cultivation were reported, although in Zimbabwe badgers were raiding hives in apple orchards during pollination (Stuart pers. comm.). It was notable that beehives could be kept safely in a canola field or plantation that lay within a mere kilometer from where badger problems were being experienced in natural vegetation. This suggests that badgers avoid foraging in open cultivated fields for fear of detection. It could also take a few months for badgers to locate and begin raiding a newly established apiary. Beekeepers mentioned that badgers often raided hives shortly after the beekeepers themselves had been working in their apiaries, which suggests that smell may have played an important role in the badger's ability to locate the hives.

Of those beekeepers experiencing badger problems 41% considered the winter months to be the worst for honey badger damage and many referred to badgers targeting hives that contained young or weak swarms. It was suggested that the swarms that were repeatedly raided became less and less capable of defence and became progressively weaker. Most beekeepers considered that the badger's preference was for the honeybee brood located in the brood box and not necessarily the honey located in the super box.

Fig. 8: Extensive badger damage to an apiary in the Bredasdorp district. This beekeeper had already attempted to raise his hives, but the stand design was not sufficiently stable and was consequently knocked over.

Fig. 9: A female badger caught in an apiary by two steel-jawed traps.

Badgers often dug around or below hives and on rare occasions, these hives became partially buried. Badgers could break through a weak bottom board, and were thought to gain enough leverage to roll hives by digging underneath them.
Four reports were received of badgers being stung to death by bees in cage traps. Whilst held by steel-jawed traps, they would still attempt to dig a pit and bury their head in the hole to avoid the bees. In one instance, 228 beestings were individually counted on the body of a 6,2kg female that was removed alive from a steel-jawed trap (figure 9). It was estimated that this particular badger had received a minimum of 340 beestings whilst held captive in the steel-jawed trap. A male badger trapped in the Caledon district had been stung by more than 1500 beestings.

4.5 Agulhas plain case study

The lowland fynbos of the Agulhas plain in the Bredasdorp district provides a habitat that is essential to many beekeeping operations, particularly during the winter months. Numerous place names throughout the district refer to both badgers and honeybees (e.g. “Ratel rivier”, “Heuningberg”, “Heuningnes rivier”). Historically badgers were persecuted in the district by hunt clubs since the 1930’s (table 1) and beekeepers have reported problems with badgers in this district since the early 1970’s when hives were raised on tall stands (Stuart pers. comm.).

Honey badgers are regularly seen in both the De Hoop Nature Reserve (36 000 ha.) and the adjoining Overberg Test Range located in the eastern area of the Bredasdorp district. Together these protected areas provide one of the most important refuges for honey badgers in the Western Cape, and indeed South Africa. Conservationists have recorded badgers raiding wild beehives in the limestone outcrops that occur throughout this area (Fourie pers. comm.).

The Cape Action Plan for the Environment (CAPE) project has identified the Agulhas plain as an area of great importance for the conservation of lowland Fynbos communities and Renoster Shrubland (Cowling et al. 1998). An estimated 39% of the Agulhas plain has been transformed by alien plant infestation, agriculture and urban development (Lombard, pers. comm.). Six small conservation areas (<1000 ha.) are situated along the Agulhas plain, and many of these may be incorporated into the Agulhas National Park (proclaimed in 2000).

Heydenrych (1999) and Turpie (1999) estimated there were between 10 345 and 15 000 commercial beehives located on the Agulhas plain. These represented 18% to 25% of the beehives maintained in Western Cape Fynbos. Some 56% of landowners reported having hives on their properties, but only 27% had their own hives (Heydenrych, 2000). During the present survey a total of 8 beekeepers, maintaining an estimated 2600 hives on the Agulhas plain were interviewed. All 8 beekeepers reported an increase in beehive raids by badgers in the past few years.
The activities of three neighbouring beekeepers, operating in an area of 234km^2, were closely recorded during the year 2000 (figure 9). Beekeeper “A” had been keeping bees in the study area since 1980 but, between them, the 3 beekeepers had an accumulated experience of 37 years. At least 41% (96 km^2) of the fynbos within the study area had been transformed by urbanisation, cultivation and alien vegetation (e.g. *Eucalyptus* and *Acacia* spp.). Approximately 21 apiaries comprising as many as 650 beehives were situated within the study area. None of the 3 beekeepers owned the property on which their apiaries were situated. The beekeepers co-operated throughout the study by reporting all hive damage and trapped badgers. Seven field excursions were made to inspect apiary damage, collect trapped badgers and observe beekeeping activities.

Beehives were kept in the study area throughout the year, except during the two months (September and October) when hives were used for pollination services. Most

badger activity was reported to occur during late winter and the majority of the badgers trapped during the past 15 years were reported to have been males.

On the 25 June 2000 a trial site was established to test the effectiveness of various hive protection measures at an old apiary site. A total of 12 hives were tested where a total of 22 badgers had reportedly been killed over a four-month period, a few years earlier. Unfortunately no badgers returned to the site during the following five months that the hives were in operation. This may have been due to the fact that 13 badgers had recently been killed in the immediate surrounds and that the apiary site selected for the trial had not been used during the past year.

Only beekeeper "C" had begun protecting 50% of his hives by raising them onto stands. These immediately proved successful in preventing badger damage and had the added benefit of reducing losses during a recent veld fire. In November 2000 beekeeper "B" started securing 50% of his hives with wire and screws (see section 4.6). The action taken proved effective except in situations where the hives were in bad condition. Despite the protection measures taken, both beekeepers continued to trap badgers.

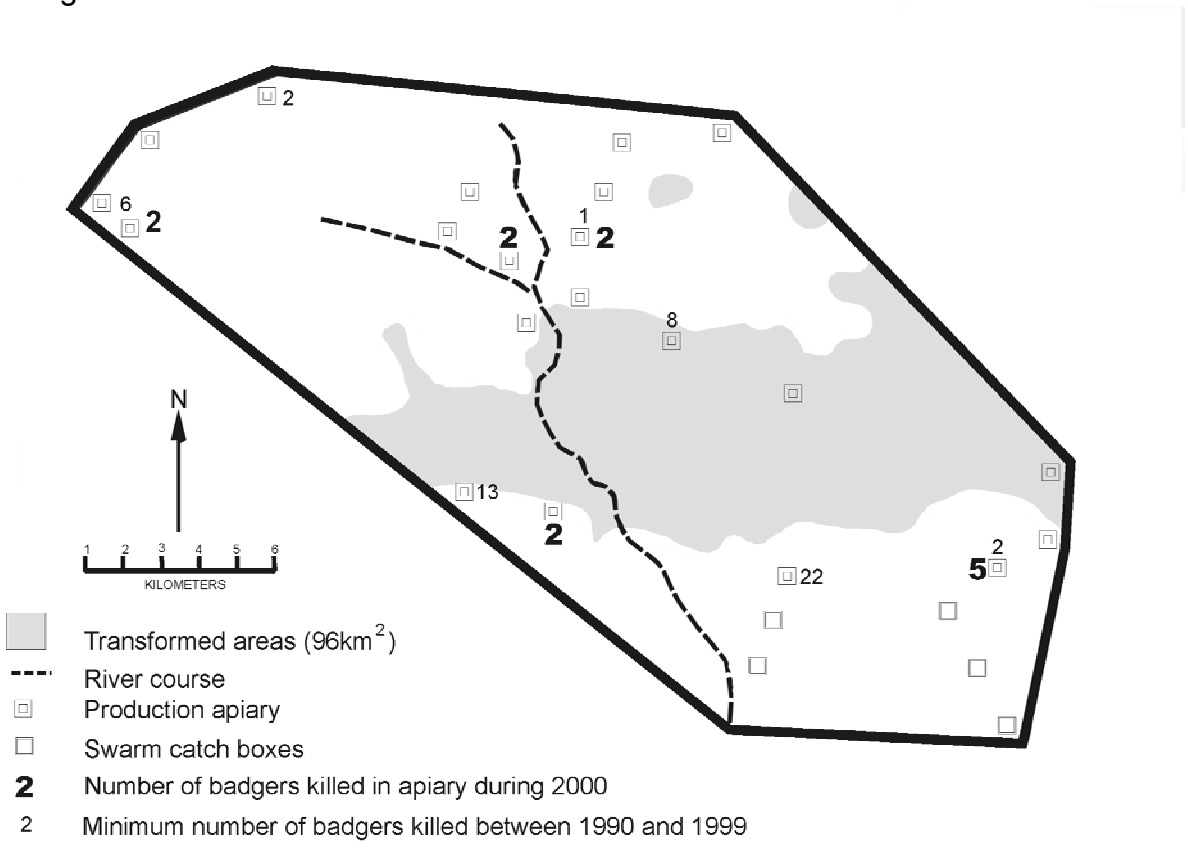

Figure 9: The Agulhas plain case study area (extent =234km2) showing the locations at which 13 honey badgers were killed by 3 beekeepers during a 9-month period in 2000. Also shown is the location of 54 of the estimated 86 badgers killed in the area and the distribution of apiaries in relation to transformed habitats.

All three beekeepers continued to use steel-jawed traps normally used to catch leopards to eliminate badgers. More than twenty foothold traps were set on a

permanent basis in apiaries wherever badgers were currently raiding hives. In a typical situation, four gin traps were set surrounding a hive that had recently been raided.

Traps were attached to a stake by means of a two-meter long chain or wire (see frontispiece). Concrete blocks were occasionally placed on and around the hive to guide the badger onto the trap positions. A badger could be caught in more than one gin trap at a time (figure 10).

Table 6: Damage caused by badgers amongst the 3 beekeeping operations constituting the Agulhas plain case study.

	Number of hives	Hives raided by badgers	Badgers killed in 2000	Badgers killed before 2000
Beekeeper A	300	42	9	80
Beekeeper B	200	25	2	0
Beekeeper C	150	23	2	6
TOTAL	**650**	**90**	**13**	**86**

Table 7: The age, sex and months during which 13 honey badgers were trapped in the Agulhas plain case study area, during the year 2000.

Collector No.	Age	Sex	Month
WC - 7	Juvenile	Female?	May
WC - 8	Adult	Female	May
WC - 9	Adult	Female	June
WC - 10	Adult	Male	June
WC - 12	Adult	Male	May
WC - 13	Adult	Male	May
WC - 14	Adult	Male	April
WC - 15	Adult	Male	May
WC - 21	Adult	Male	June
WC - 22	Juvenile	Female	August
WC - 23	Adult	Female	August
WC - 24	Adult	Male	December
WC - 25	Adult	Female?	October

A total of 13 badgers were killed in the study area during the year 2000 (table 6). These included 7 adult males, 4 adult females and 2 juveniles. An additional 13 honey badger skeletons were found in the vicinity of apiaries or produced by the beekeepers.

Traps were seldom checked at intervals shorter than one week. As a result, trapped individuals were rarely discovered alive, having died from a combination of blood loss, bee venom, exhaustion and associated trauma. This outcome is primarily due to the incorrect and inhumane use of steel-jawed traps. The sizes of the foothold traps used in the study area were designed for much larger predators (e.g. leopard) and were clearly far too large for use on badgers. The traps were neither padded nor modified (Rowe-Rowe & Green 1981, McKenzie, 1989) and retained the spikes along the inside edge of the trap jaws. Consequently, the jaws often closed higher up the limb and the excessive force shattered the bone on impact, lacerating flesh and nerves. The badger would chew off and ingest the lower portion of the limb (confirmed from post mortem) but, in most cases remained caught.

Beekeepers reported that on some occasions individuals escaped minus a limb. In August 2000 an adult female was trapped (along with a juvenile) with the right foreleg already missing (figure 10). The healed wound was consistent with an injury caused by a steel-jawed trap and in all likelihood it was the same badger that was reported to have escaped from a trap set two years previously, some 1,5 kilometers away.

Figure 10: Adult female (left) with juvenile female. Note the adults' missing forelimb from an earlier encounter and the position of the steel-jawed trap on the juveniles back.

During the study period the 3 beekeepers in the Agulhas plain case study lost 14% of their hives to badgers, despite having killed 13 individuals (table 7). The monetary loss sustained during the year 2000 directly attributable to badgers amounted to at least of R63 000 (section 4.7). However, for an outlay of R24 000 it is estimated that all 650 hives could have been adequately protected for many years by using raised stands (section 4.6).

Beekeeper A suggested that badgers should be removed from their special protection status and declared a problem animal. He also stated that the R1000 fine for trapping badgers was of no consequence when the high losses incurred by badgers each year were taken into consideration. Despite the intensive use of steel-jawed traps during the past decade, the problem remains and this method provided only an immediate but inhumane short-term solution to the problem. It is noteworthy that despite more than 90 badgers having been killed in the Agulhas plain study area and the considerable effort expended each year purchasing (each trap costs R80) and setting traps and the regular apiary checks that have to be made every two weeks, beekeepers continued to incur substantial financial losses directly due to badger damage.

In conclusion, it is clear that killing badgers is an expensive and ineffectual means of preventing the destruction of beehives by honey badgers. The fact that two of the beekeepers in the Agulhas plain case study were prepared to spend R12 000 per annum on chemically treating their hives because of the potential, but as yet undetermined threat of Varroa mite, suggested that the beekeeper and badger conflict is purely a question of priorities and a reluctance amongst certain beekeepers to look seriously at viable alternatives. Their attitude seems all the more inexplicable when an interview conducted with another commercial beekeeper (operating 1500 hives)

revealed that he had effectively solved all his badger problems with stands in the same area of the Agulhas Plain.

4.6 Review of Western Cape beehive protection measures

For thousands of years Africa's traditional beekeepers have had to contend with honey badgers raiding their beehives. The fixing and suspension of hollowed log and basket hives in the upper branches of tall trees to protect against both theft and badgers is commonplace (Fichtl 1995; Kigatiira 1984; Robinson 1982; Rosevear 1974). Satisfactory results have also been obtained using wire stands and it was suggested that hives far from habitation should be placed on a trestle 1,5 meters above the ground with an overlapping platform (Kingdon 1989; Clauss & Clauss 1991). In Zambia and Tanzania guards and thorn bush barriers are sometimes constructed round a tree trunk to prevent badgers from climbing up to hives (Ansell 1960; Kingdon 1989). In Tanzania it has been shown that preventative measures, including chemical deterrents, can be effective and by suspending beehives by wires from trees, attacks can be avoided. (Neal & Cheeseman 1996; Neal 1986). In Israel beekeepers stake down beehives to prevent the badgers from toppling them over (Mendelssohn & Yom-Tov 1987). In Europe various smell and taste (consisting primarily of aluminium ammonium phosphate) repellents have been marketed for European badgers (*Meles meles*). However, none of these products are very effective and electric fencing has proved the most effective way of deterring European badgers (Cheeseman pers. comm.).

Some beekeepers in the Western Cape resorted to extreme measures to protect their hives, including attaching treble fishing hooks to hives and the use of trap guns. 78% of the beekeepers surveyed in the Western Cape who were experiencing problems with honey badgers had protected their hives in one form or another. After hive protection, badger damage was reduced from 21.8% to 6%. While most beekeepers sustained negligible damage after protection, those that made no such effort continued to sustain high losses of between 10% to 75%.

Beekeepers (N=20) that could provide figures before and after hive protection were able to show that hive damage dropped from 23,8% to 1% once suitable protection was incorporated. In monetary terms this equates to a saving of R79 072 per annum (Section 4.7 refers) for the average beekeeper. 70% of these beekeepers reported no further damage after protecting their hives.

The cost of protecting hives ranged widely from an estimated R3 to R150 per beehive. Of the 19 beekeepers that provided cost estimates for building stands (the most expensive form of protection), the average cost was R37 per hive. This means that each beekeeper (who owns on average 493 hives) would have to outlay approximately R18 241 to protect all hives for many years from badger damage. This is significantly less than the annual outlay of R13 370 that the same beekeeper has to incur to chemically treat hives against the potential threat of the parasitic Varroa mite (S. Algera, Zilex International pers. comm.).

The raiding of domestic beehives by honey badgers can be considered to be a learnt behaviour. Therefore, the sooner a beekeeper adopts some sort of hive protection measures the less effort he will need to expend in the future. While each beekeeper had different designs and costs, there were two recurring themes when protecting hives from badgers. Hives were either protected while still on the ground or they were raised well above ground level on a stand or trestle.

The first protective measure was to ensure that the beehive itself was in good condition and of sturdy construction. Botha (1970) mentioned that he had never known a badger to "rob well constructed hives". This action was the approach adopted by 19% of the beekeepers surveyed. Badgers typically rolled the hive over and then ripped the super or lid from the brood box, particularly if the bottom board and lid were weakened due to moisture and the resulting wood rot. To prevent the badger from succeeding, the various sections of the hive must be fastened together. Simply wrapping baling wire (2,4mm) around the entire hive is effective, but could involve an excessive amount of wire and wastage. In addition, badgers were often strong enough to shift the lid or super sufficiently to gain purchase and ripped the box and frames apart.

A more effective technique, at a cost of R1 per hive, was to insert 3 screws placed triangularly across each section of the hive (Figure 11). The "Pozi-drive" chipboard screw (size 8x50mm) was found to be ideal for this purpose. A short piece of baling wire could then be wrapped around the protruding head of each screw. This enabled the hive to be inspected easily and the same piece of wire reused. To prevent badgers rolling the hive, half (70cm) of a standard fence dropper was used to peg two opposing sides of the hive and a section of wire attached to the protruding eye of the dropper and wrapped around a Pozi-drive screw set at each corner of the bottom board. Pegging the hive in such a manner costs approximately R7 per hive.

Fig. 11: This hive's lid has been secured to the brood box with binding wire wrapped around 3 "pozi-drive" screws. The bottom board is fastened in a similar fashion to a half section of standard dropper pegged on both sides.

An alternative to wire was the use of industrial steel straps but the initial cash outlay was high. The two tools necessary for crimping and tensioning each strap together cost approximately R2000. A bulk roll of strapping along with attachment clips cost R1400 and an extra labourer needs to be employed to release or fasten each hive. The same section of steel strap could be reused for one season only. Steel was preferred over galvanised straps as they are cheaper and biodegraded faster once abandoned. To return rolled hives to their correct position, hives were routinely checked every 3 to 4 weeks. Bees seldom absconded from hives that had
been rolled.

Figure 12: This hive's lid and bottom board is constructed from thick timber and secured to the brood box with a metal tab. The strap securing the hive with clip costs +-R1 per hive. A badger can roll the hive but cannot break in.

Hives were often placed inside or between bushes to prevent them being rolled. To improve the hives structural strength 50mm Pozi-drive screws were preferred over nails. Steel tabs or large staples were used to ensure that a hives super or lid was fastened securely to the brood box. A standard hive tool was used to quickly remove the staples, and one beekeeper carried a cordless electric screwdriver to speed up the process of removing screws and steel tabs. Hive bottom boards and roofs were constructed with "Panelite" or 20mm solid wood and joined together with epoxy and screws.

The alternative method of protecting hives, particularly hives in poor condition, was to raise them onto stands or trestle tables. Some 81% of beekeepers surveyed had opted to protect their hives using for this method. Many of them mentioned that hives on stands were easier to work with, offered protection against baboons, helped keep the hive dry and last longer, aided in avoiding ants and stopped undergrowth covering the entrance to the hive. Typically hives were raised between 0,8 to 1,5 meters above the ground. It was essential that the stand was secure and that the hive was fastened to the stand by some means. While a badger could often reach the hive by standing on it's hind legs, providing it had been properly secured it seemed to lack the leverage or power to topple the hive or stand if correctly secured. With some designs the badger was capable of climbing up the stand, but could not break in if correctly secured.

Figure 13: This hive is situated within a 5 x 5 meter diamond mesh fenced perimeter. Diamond mesh was buried in trench with earth and packed with rocks. A trestle made from old tar drums and scrap pipes was covered in razor wire at R10/m.

Many beekeepers visited scrap yards and municipal dumps to salvage steel and wire for constructing hives. Old fence poles, 200 litre drums and used car tyres (figures 13, 14 & 15) were often obtained free of charge to create a trestle. In these instances it was considered important that tyres and drums were filled with sand and stone to secure them properly.

Figure 14: Old car tyres were regularly used to raise hives. The tyres must be packed with stone and gravel and secured together with baling wire. While inexpensive to erect, tyres were prone to fire and labour intensive to move again.

Figure 15: This apiary was located in a private nature reserve and was aesthetically pleasing. Discarded fence posts were treated. Each post must be at least 20cm. higher than the crossbars to prevent the secured hive from being pushed off badgers.

Figure 16: This platform was erected for less than R10 per hive. The platform was welded together from scrap metal and nailed to the upright pole. The eucalyptus pole was self felled and buried approximately 40cm into the earth. These stands were reported to have fared well during recent fires.

Steel stands, while relatively more expensive, often looked better than drums or tires and were expected to last longer.

Figure 18: These steel stands cost R150 each and were cemented into the ground. The stand's low height means that it was essential that hive be well constructed. The bottom board bolts directly onto the stand.

Figure 19: This robust, easily moved hive stand cost R76. Badgers have never been known to damage hives protected in this manner. The steel platform can be easily removed from the dropper when needed in other apiaries.

Two concerns were raised by beekeepers about raising hives onto stands. The first was that when elevated above surrounding vegetation the Western Cape's prevailing winds (particularly along the coastal lowlands) lowered the temperature inside hives and this decreased honey production. The second concern was that bees would not readily return to the hive if the beekeeper used the technique of "stamping" the super onto the ground during honey harvesting. This was done to remove the bees from the super and normally the bees congregate on the ground and many walk back to the hive.

Opinions vary but Hepburn & Radloff (1998) drew attention to the rule of thumb that "the higher the hive, the higher the occupation rate", suggesting that bees may indeed prefer being off the ground. Many beekeepers mentioned that bees do not like damp conditions and preferred being off the ground (this is borne out by the location of hives in the wild). The fact remains that many beekeepers successfully keep their hives on

stands, and that any small decrease in production is far out weighed by substantial losses incurred by badgers should hives remain on the ground.

Beekeepers in the Piketberg district used timber stands successfully for more than 50 years, and at least one of these stands was currently still in use. Many commercially successful beekeepers, operating more than 1000 beehives each were using stands with excellent results. Some beekeepers found it beneficial to buy old second hand hives and protect them on well-made stands. A summary of beehive protection methods is listed below (table 7).

Table 7: Hive protection options with estimated costs and associated materials.

PROTECTION METHOD		RAW MATERIALS	COST / HIVE (R.)	COMMENTS
On ground	Wire wrapping	Pozi drive screws, baling wire, fence droppers and staples.	1 - 15	Hives must be maintained and kept in very good condition. Strengthen lid & bottom board
	Steel strapping	Steel strapping, crimp and tensioning tools.	1 – 3	Expensive tools and very labour intensive to check hive.
Above ground	Timber poles	Treated gum poles or old fence posts.	<10	Aesthetically pleasing, must be well treated in coastal regions.
	Old car tyre	Tyres, baling wire and gravel & rocks.	<10	Susceptible to fires, difficult to relocate, not very aesthetic.
	Steel drums	Old oil or tar drums, with gravels & rocks.	<10	Not aesthetically pleasing
	Steel pipes	Old irrigation or scrap pipes, angle iron and cement	15 – 150	Expensive, but long lasting and professional. Aesthetically pleasing

Mr A Schofield (Poison Working Group, Endangered Wildlife Trust) is currently conducting experimental trials to assess the hive raiding capabilities of a captive male honey badger that was trapped by a beekeeper in the Riversdale district. Hives containing brood and a single super box were placed unsecured onto two types of steel stands at varying heights. The first stand type was constructed from a single steel fence pole with two cross bars welded above (costing R12 from scrap materials) while in the second type the hive rested on a square platform attached to four angle iron legs (costing R41 from of new materials). Preliminary results from the ongoing trails showed that the badger's ability to break into hives improved considerably over time. The badger easily removed unfastened hives that were raised less than 80cm above the ground. At 90 cm the badger took six hours to topple the hive, but at 1 meter the badger was not able to remove the hive after 18 days of effort.

The Plant Protection Research Institute's Honeybee Research Section secured three test beehives on 50cm high stands in the Kogelberg Biosphere Reserve. These hives remained untouched for three months, but once located have been visited by at least two badgers on a regular basis (Allsopp pers. comm. & Pers. obs.).

4.7 Economic implications of the badger conflict

Beekeepers in Mpumalanga and the Western Cape suggested that honey badgers directly caused losses to the apiculture industry in excess of R500 000 per annum. In

the western Cape these losses were attributed to direct damage to hives, production losses and the costs associated with the protection and maintenance of beehives (Figure 20).

Figure 20: Extensive damage to a beehive after an unstable stand has been knocked over. Note that frames from both the brood and super boxes and the corner of the brood box have been damaged.

The present retail price of a conventional hive, assembled with all the basic components is in the order of R460 (Marchand pers. com.). However, most commercial beekeepers manufacture their own hives and the prices of these hives ranged from as little as R200 to R350. To buy a swarm of bees cost approximately R60 to R100. In most cases beekeepers relied on empty “catch boxes” to attract a feral swarm, but it took a considerable amount of time to establish a productive new colony. A healthy colony of bees can be expected to remain in a hive for as long as three or more years (Allsopp pers. comm.).

Turpie (1999) calculated that beehives in the Western Cape yield on average 20kg of honey per year. This fetches a wholesale price of R10/kg, and retails at approximately R25/kg. During 2000 the official cost per unit (one beehive for a two week period) for pollination services was set at R178. Typically a beekeeper could expect to use the same hive two or more times during the pollination period (September and October). Some beekeepers reported being paid as much as R225 per unit during the pollination period just past.
Normally beehives were left unattended for a several months (e.g. March to July) each year. However, the increased threat from badgers in recent years has meant that beekeepers now need to regularly check their hives. To try and prevent colonies from absconding after a badger raid, some beekeepers checked their hives once every two weeks. This often entailed travelling between 100 to 300 kilometers, and resulted in substantially higher fuel and labour costs.

Beekeepers estimated that typically one third to one half of the beehive was damaged during a badger raid. Frames containing the honeycomb were the most susceptible and it was necessary to repair, rewire and reimbed the wax foundation. Wax foundation sheets cost between R5 to R8 each and it could take three months or more for the comb to be drawn out by the swarm. Furthermore, damage was also sustained to the bottom board, queen excluder and lid. Honey badgers would frequently tear off the aluminium sheeting covering the roof. The accumulated costs from a single beehive raid amounted to an estimated R706 (table 8).

Table 8: The estimated costs (in Rand) associated with a single beehive after being raided a honey badger.

Item	Details	Cost
Structural damage to hive	Frames, wax foundation, lids etc.	120
Loss in pollination services	2 units @ R178 each	356
Loss in honey production	10kg @ R15/kg	150
Swarm replacement	R60 to R100	80
TOTAL		**706**

Beekeepers on the West coast estimated that they devote one complete day each week to dealing with honey badger problems. Those beekeepers that continued to kill badgers estimated spending at least two days attempting to catch each problem badger. When calculating the costs of traps (R80 each), labour and vehicle costs (AA approved rate of R1, 30/km.), beekeepers on the Agulhas plain estimated spending as much as R1000 per day. This means that the cost of catching the 13 badgers trapped during the Agulhas Plain case study (section 4.5) amounted to R26 000. Bearing in mind that these beekeepers continued to lose 13,8% of their
hives the total cost amounted to R63 540.

The costs paid by beekeepers in protecting their apiaries ranged from less than R10 to as much as R150 per hive. As discussed in section 4.6, the average hive stand cost R37 per hive or less. One beekeeper spent as much as R75 000 in 1999 manufacturing steel hive stands and others had built fenced camps at great expense.

Some beekeepers have begun to chemically treat their hives for the Varroa mite by using “Bayvarol” strips (Bayer AG), which are placed inside each hive. Four strips are required for a single 10-frame hive and each strip costs R6, 78 (Algera pers. comm.). For the average beekeeper (with 493 hives) protection against Varroa mite amounted to an estimated cost of R13 370 per annum. Badger damage to Varroa protected beehives added further costs due to the wastage of such chemicals.

According to Turpie (1999) half of the Western Cape’s 58 000 beehives were currently kept in Fynbos. Theoretically, if none of these hives were protected, 21,8% (6 322) of the hives would be damaged each year (section 4.6) and the average annual damage bill would amount to R446 330. This rough estimate lends support to the views of some beekeepers voiced at the outset of this survey. However, since 78% of the beekeepers had already found their own solutions (i.e. robust stands) and were protecting their beehives, this figure is substantially reduced, and for most beekeepers is considered negligible.

It is worth noting that beekeepers in Africa are not alone in having to take precautions against problem animals. In the Pearce valley of Alberta (North America) for example the American black bear (*Ursus americanus*), was responsible for an estimated economic loss to beekeepers of US $200 000 in a single year (Lynch 2000). In many countries beekeepers have had to raise their hives to avoid problem animals.

5.0 Discussion

This study was undertaken due to reports of escalating damage to apiaries resulting from honey badgers, the inability to contain the problem and the alarming number of badgers being killed.

It is apparent that badgers still occur throughout much of their former range. However, at present their numbers are undoubtedly lower, particularly in the central regions of the country. Honey badger populations have declined due to habitat loss and the persecution from livestock farmers and apiarists. While honey badgers have always been a potential threat to beekeepers, the recent increase in direct persecution of badgers, regardless of their legal protection or vulnerable status, is of great concern. The widespread and increased killing of badgers by beekeepers during the past decade makes it even more important that their Red Data status is maintained. The unusually large spatial requirements and slow population turn over of honey badgers suggests that, even under ideal conditions, they occur in low densities compared with other similar sized carnivores.

Few of South Africa's National Parks or the Western Cape's Provincial Reserves are considered to contain viable populations. In many instances the limited size of these protected areas are inadequate. It is considered essential therefore that neighbouring farming communities co-operate with reserve managers in their attempts to conserve the species. A case of honey badgers being "out of sight, out of mind" has prevailed for too long and for many people it is difficult to believe that a species that has in the past kept such a low profile can be causing such a problem. In the majority of cases, conservationists and authorities interviewed during the course of this survey were unaware of the present conflict or threat posed to badgers by beekeepers. Regarded as a surprisingly ubiquitous species, honey badgers were excluded from a recent major study in the Western Cape on the basis that they were considered successfully conserved.

The difficulty in determining accurate densities for this species has meant that they could become critically endangered or locally extinct in areas with conservationists oblivious of the situation. The fact that their conflict with beekeepers has escalated over the past decade suggests that a critical factor in their environment may have changed. This pressure has resulted in badgers becoming notable problem animals and, if left unchecked, they cause considerable damage.

While a viable badger population appears to be present over much of the Western Cape's coastal lowlands, the fact that some beekeepers remain convinced that it is necessary to kill badgers in this region, often neighbouring National Parks and provincial reserves, is alarming. The permit system and special protection laws that prohibit the killing of badgers have to date not deterred beekeepers. Steel-jawed traps are easily obtained, regardless of whether they are used appropriately, and a R1000 fine was considered to be of little consequence when compared to the damage caused by honey badgers.

In addition, the Western Cape's comparatively impoverished and subsequently less charismatic fauna, coupled with an exceptionally diverse flora has resulted in a situation where a great deal of effort has been expended on the conservation of the cape floristic region. However, in the case of medium sized carnivores (e.g. honey badgers), it should not be assumed that these species are necessarily adequately conserved along with their associated habitat. Very little research has been conducted on the Fynbos' smaller mammal communities. The Fynbos biome has suffered a major invasion of alien trees over much of the region. The effect of these invasive alien plant communities on small mammal populations is unknown.

The social learning ability of some problem animals to actually avoid traps and coyote getters, as exemplified by the black backed jackal *Canis mesomelas*, (Brand & Nel pers. com.) does not seem to be the case with a solitary species like badgers. Despite the determined trapping efforts of farmers the problem has certainly not been solved and other individuals simply moved in to replace the vacuum that was created within the population. With such a paucity of accurate information being available regarding most aspects of this conflict, the exact reasons for the increase in badger conflict will remain mere speculation. Even under ideal circumstances it remains difficult to establish the true densities of these solitary and elusive carnivores.

What is abundantly clear is that the unabated killing of honey badgers must not be allowed to continue. Through their own initiatives several enterprising beekeepers have developed practical and cost effective solutions to the honey badger problem. When the relatively small cost of protecting beehives is placed in perspective and compared to the high environmental costs associated with the ongoing slaughter of badgers a rational solution must, and can be, found.

In conclusion, if nature conservation organisations currently do not have the resources to effectively monitor or police the problem, then the beekeeping industry and landowners should come to the fore to ensure that responsible and environmentally friendly practices are encouraged. Many successful commercial beekeepers do not want to be associated with the killing of badgers. It is predicted that the beekeeping industry in South Africa will be adversely affected should it become common knowledge that a specially protected, Red Data species is being killed using particularly inhumane methods.

6.0 Recommendations

From the information compiled in this report it is strongly recommended that the following actions be taken:

- Beekeepers need to be informed via the media (e.g. Landbou Weekblad; Die Boer; South African Bee Journal; Farmers Weekly) of the most reliable and cost effective measures for protecting their beehives.

- A “Z” fold pamphlet providing solutions to the badger conflict and outlining the importance and benefits of conserving badgers must be distributed to beekeepers.

- Nature conservation and law enforcement authorities need to be reminded that badgers are a protected species; made aware that badgers are regularly being killed by beekeepers and take immediate steps to reduce the slaughter.

- All apiaries situated within biosphere reserves or along the borders of protected areas must be adequately protected, as conflict with honey badgers is inevitable.

- The unregulated sale of foothold traps should be outlawed as this leads to gross misuse and inhumane practices.

- All beehives should, as required by law, display the beekeepers registration number. This would enable national beekeeping organisations to track industry trends and aid Nature Conservation authorities in identifying legitimate beekeepers operating adjacent to protected areas.

- Permits sanctioning the removal or destruction of problem honey badgers must only be issued when sufficient evidence has been provided that the beekeeper has already protected his beehives by raising and securing them.

- Honey badgers in South Africa must be granted legal protection through the biodiversity legislation which is to be included in the National Environmental Management Act.

- Beekeepers that have made a concerted effort to develop and implement apiary protection methods should be publicly acknowledged and commended. A “badger friendly” logo could be developed to identify products that are derived from environmentally conscious beekeeping practices.

A copy of this report can be downloaded directly from the Internet at
www.honeybadger.com

7.0 Acknowledgments

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9.0 Appendices

9.1 Beekeeper Associations and Federations in South Africa

a) Eastern Province Beekeepers' Association
Secretary: Mr Graham Lennie, P.O. Box 502, Port Elizabeth, 6000

b) Eastern Highveld Beekeepers' Association
Secretary: Mr Peter Clark, P.O. Box 295, Springs 1560

c) Free State Beekeepers' Association
Secretary: Mr Bob Lichenstein, P. O. Box 576, Bloemfontein, 9300

d) Natal Beekeepers' Association
Secretary: Oliver Bernhard, P.O. Box 675, Richmond, 3780

e) North West Bee-Farmers' Association
Secretary: Mrs Elze van den Berg, P.O. Box 332, Rustenberg, 0300

f) Southerns Beekeepers' Association
Secretary: Mrs Jenny Hugill, P.O. Box 685, Rand-en-dal, 1751

g) Western Cape Bee Industry Association
Secretary: Mr Theo le Grange, P.O. Box 1200, Bellville, 7530

h) Lowveld Beekeepers' Association
Secretary: Mr Fred Bence, P.O. Box 2726, White River 1240

i) Federation of South African Bee-Farmers' Associations
Chairman: Mr Nico Langenhoven, 6 Kaapsedraai, Suider-Paarl, 7646

j) SA Professional Bee-farmers' Co-Operative Ltd
Manager: Mr Mike Schoenfeld, P.O. Box 811, Cullinan 1000

k) Pollination Services Association (North)
Secretary: Mr Mike Schoenfeld, P.O. Box 811, Cullinan, 1000

9.2 Summary of honey badger specimen collections from Africa

INSTITUTION NAME	TOTAL SPECIMENS	SOUTH AFRICAN SPECIMENS	TOTAL SKULLS	TOTAL SKINS	OTHER AFRICAN COUNTRIES	UNKNOWN SOURCES
S.A. Museum, Cape Town	31[a]	28[a]	26	1+?	3 (2)	3
Transvaal M, Pretoria	21	15	17	6	3 (3)	3
Amathole M, K.W. Town	40	27	29	14	8 (2)	4
Durban Nat. Science Mus.	5	5	4	1	0	1
Bloemfontein Nat. Hist. Mus.	3	0	3	2	1 (1)	2
East London Museum	2	2	0	2	0	0
McGregor Mus	1	1	1	0	0	0

Kimberley						
Kruger N Park	2	2	1	2	0	0
Sci. Services						
Jonkershoek	2	2	2	0	0	0
Sci. Services						
Bulawayo M.	52	1	29	38	51 (5)	0
Zimbabwe						
Nairobi M.	18	0	16	11	0	9
Kenya						
London Nat.	55	?	?	?	?	?
History M.						
Powell Cotton	3	?	?	?	?	?
U.K.						
Smithsonian	12	1	9	11	11 (8)	0
Institute						
Karlsruhe Mus	3	0	?	?	3 (?)	?
Germany						
Los Angeles N.	4	1	4	0	3 (1)	0
Hist. Museum						
M.V. State M.	6	0	2	4	4 (2)	2
Germany						
Tervuren	9	0	6	7	9 (2)	0
Museum						
TOTAL SPECIMENS	**268**	**84**	**148**	**99**	**93**	**24**

[a] Includes 22 specimens collected during this survey in 2000.