Lepus spp. – Hares

Lepus saxatilis Mariánne Golding

Regional Red List status (2016)	
Lepus capensis	**Least Concern***
Lepus saxatilis	**Least Concern***
Lepus victoriae	**Least Concern**
National Red List status (2004)	
Lepus capensis	Least Concern*
Lepus saxatilis	Least Concern*
Lepus victoriae	Not Evaluated
Reasons for change	No change
Global Red List status (2008)	
Lepus capensis	Least Concern
Lepus saxatilis	Least Concern
Lepus victoriae	Least Concern
TOPS listing (NEMBA) (2007)	None
CITES listing	None
Endemic	
Lepus capensis	No
Lepus saxatilis	Near
Lepus victoriae	No

*Watch-list Data

The genus desperately requires taxonomic resolution so as to accurately delimit geographical distributions and identify threats to endemic or near-endemic forms.

Taxonomy

Lepus capensis Linnaeus 1758

Lepus saxatilis F. Cuvier 1823

Lepus victoriae Thomas 1893

ANIMALIA - CHORDATA - MAMMALIA - LAGOMORPHA - LEPORIDAE - *Lepus*

Synonyms: *L. capensis*: 38 listed in Africa by Hoffmann and Smith (2005); *L. saxatilis*: 16 listed in (Happold 2013a). *L. victoriae*: *L. microtis* Heuglin 1965, *L. crawshayi* de Winton 1899, *L. whytei*. Fifteen listed in total (Happold 2013b).

Common names: *L. capensis*: Cape Hare, Arabian Hare, Brown Hare, Desert Hare (English), Vlakhaas (Afrikaans), Umvundla (Ndebele, Xhosa), Mofuli (Sesotho), Matshwaratsela(na), Mmutla wamatshwaratselana, Matsaatsela, Mmutla wamatsaatsela, Mmutlê wamatsaatsela, Ditshêtlhane, Moduôlô (Setswana), Logwatja (Swati), Mpfundla (Tsonga), Muvhuda, Khomu (Venda), Unogwaja (Zulu); *L. saxatilis*: Cape Scrub Hare, Savannah Hare (English), Ribbokhaas (Afrikaans), Umvundla (Ndebele, Xhosa), Mofuli (Sesotho), Moduôlô, Modiôlô (Setswana), Logwaja (Swati), Mpfundla (Tsonga), Muvhuda, Khomu (Venda), Unogwaja (Zulu); *L. victoriae*: African Savannah Hare (English)

Taxonomic status: Species

Taxonomic notes: In Africa, *Lepus* taxonomy is complex and remains considerably uncertain (Robinson & Matthee 2005) and taxonomic review of the genus is urgently needed.

Generally, Hoffmann and Smith (2005) restrict *L. capensis* to a South African distribution, citing no evidence of gene flow between the southern and northern ranges. However, Happold (2013c) shows a cross-continental distribution where many forms have been described based on its wide distribution. While some of these forms may prove to be valid species, the taxonomic limits of *L. capensis*, particularly its relationship with *L. victoriae*, are uncertain and require further research (Happold 2013c). *Lepus capensis* can be distinguished from *L. saxatilis* by its upper incisors (Robinson 1986).

The taxonomy of *L. saxatilis* has undergone extensive revision with more recent work arguing for its recognition as a South African and, more specifically, a Western and Northern Cape province endemic (Kryger et al. 2004b; Robinson & Matthee 2005; Palacios et al. 2008; Robinson *in press*). For example, Kryger (2002) examined mitochondrial DNA and microsatellite variation in Cape Hares from South Africa and Namibia, which showed two highly divergent phylogroups corresponding to the south central (SC) and northern (N) parts of the study region. These failed to correspond convincingly with previously reported *L. capensis* subspecific delimitations. Furthermore, Kryger et al. (2004b) identified three phylogeographic entities in the *L. saxatilis* of earlier taxonomies – a southwest (SW), central (C), and north (N) phylogroup. A marked discontinuity distinguished the SW group (Nei's net DA > 10 and sequence divergences over 14%). For this reason, it is suggested, based on the phylogenetic species concept, that this phylogroup warrants species status (Robinson & Matthee 2005; Robinson *in press*). If followed, its range would

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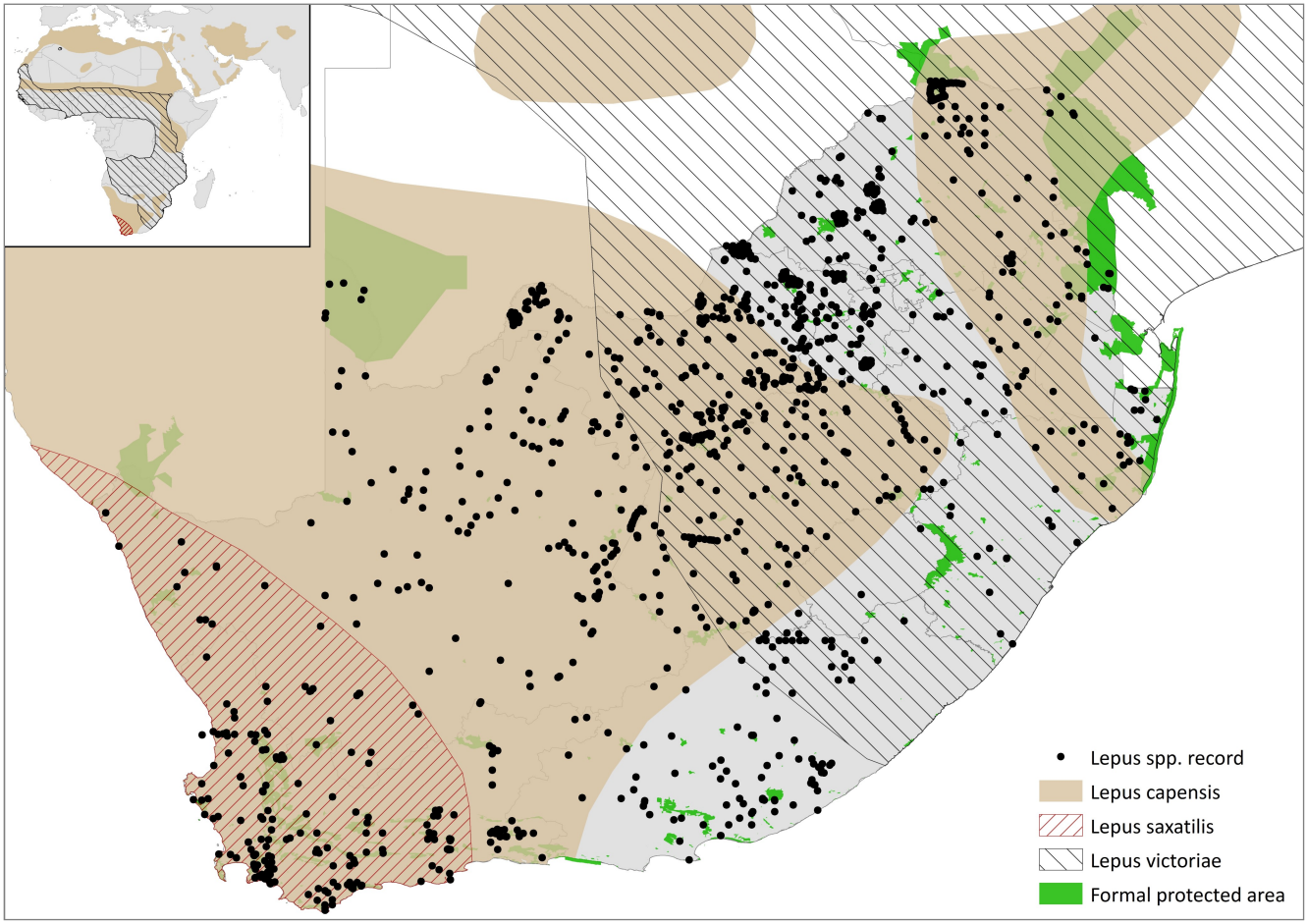

Figure 1. Distribution records for *Lepus* spp. within the assessment region

encompass the Cape Floristic region in the southwest and the Succulent Karoo areas of Namaqualand (Robinson *in press*). Similarly to above, the taxonomic relationship between this species and *L. victoriae* is uncertain (Happold 2013a).

Lepus victoriae, while formerly included in *L. saxatilis*, is now considered to be the northern allospecies of the southern *L. saxatilis* (Happold 2013b). *Lepus victoriae* is thought to comprise four recognized subspecies: *Lepus microtis angolensis*, *L. m. microtis*, *L. m. senegalensis*, and *L. m. whytei* (Hoffmann & Smith 2005). It has been classified under several different names (*saxatilis, microtis, crawshayi, whytei*, and *victoriae*) (Hoffmann & Smith 2005). However, Slimen et al. (2008) suggest that the name *Lepus victoriae* be retained and microtis considered a "*nomen dubium*", referencing Petter (1959) and Angermann (1965). Specimens of *L. saxatilis* and *L. victoriae* are almost identical (Happold 2013c).

Assessment Rationale

The *Lepus* species in South Africa occur widely within the assessment region in many habitats that are protected and/or unlikely to be extensively transformed. Ongoing molecular research is urgently required to resolve their taxonomic statuses and relationships so as to delimit their geographical ranges, and thus threat severity, more accurately. These species may require reassessment when such data are available (see above). The Cape Hare (*L. capensis*) is common in suitable habitats. For example, on Benfontein Game Farm, Kimberley, Northern Cape, density has been estimated as 16.5 individuals / km^2. Although local declines may be occurring due to overhunting for bushmeat in some areas, there is no evidence to suggest a widespread population decline. Likewise, *L. saxatilis* as here defined (*sensu stricto*) is relatively abundant in the Western and Northern Cape provinces (and in protected areas in these regions) but there is no detailed information available. Additionally, the ongoing conversion from livestock to wildlife ranching is likely providing more suitable habitat for these species in South Africa, especially for the African Savannah Hare (*L. victoriae*), which occurs widely in the northeastern regions of the assessment region. Thus, the Least Concern listing is retained for all three species until taxonomic resolution and population data suggest otherwise.

Regional population effects: Taxonomic revision is required to substantiate the geographical range limits of *Lepus* species in southern Africa.

Distribution

Lepus capensis has an extensive but scattered distribution across southern, eastern and northern Africa, occurring in Mediterranean, Coastal, Sahel, Savannah and southern African biotic zones (Ellerman & Morrison-Scott 1951; Ellerman et al. 1953; Palacios et al. 2008; Happold 2013c). However, further taxonomic delineation will improve our understanding of its geographical distribution. Currently, there is a gap in its distribution as it does not occur in Malawi, southern Tanzania, northern Zimbabwe and parts of Mozambique (Happold 2013c). It is restricted to non-forested regions (Boitani et al. 1999). There appears to be

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant (all)	Native
Lesotho		
L. capensis	Extant	Native
L. saxatilis	Presence uncertain	-
L. victoriae	Presence uncertain	-
Mozambique		
L. capensis	Extant	Native
L. saxatilis	Absent	-
L. victoriae	Presence uncertain	-
Namibia		
L. capensis	Extant	Native
L. saxatilis	Presence uncertain	-
L. victoriae	Extant	Native
South Africa	Extant (all)	Native
Swaziland		
L. capensis	Extant	Native
L. saxatilis	Presence uncertain	-
L. victoriae	Presence uncertain	-
Zimbabwe		
L. capensis	Extant	Native
L. saxatilis	Absent	-
L. victoriae	Extant	Native

an isolated population in Botswana near the Makagadikadi Pans (Boitani et al. 1999; Skinner & Chimimba 2005). Within the assessment region, the Cape Hare occurs extensively across the Northern and Western Cape, into the western North West Province, across much of the Free State, western Lesotho, Swaziland and marginally into the northwestern parts of KwaZulu-Natal and Eastern Cape provinces (Skinner & Chimimba 2005). Since this species moves into burnt areas when grasses begin to sprout, its range has expanded with increased levels of bush clearance and fires across Africa (Happold 2013c).

The distribution of *L. saxatilis* is uncertain, but is currently considered almost endemic to South Africa (and more precisely, the the extreme western and southwestern regions of the country) (Robinson & Matthee 2005; Robinson *in press*). It may extend marginally into southern Namibia (Boitani et al. 1999), but this needs further sampling to be proved. For example, numbers fall off markedly in the vicinity of Springbok northwards towards Namibia (T. Robinson unpubl. data), after which it is most likely replaced by *L. capensis*. While *L. saxatilis* (*sensu lato*) has been reported as occurring in Botswana, Swaziland, Lesotho and the central and northern interior of South Africa (Kryger et al. 2004b; Collins et al. 2008), only the southwestern population (in the Western and Northern Cape provinces) is recognised by Happold (2013a) as belonging to *L. saxatilis* (*sensu stricto*). Populations throughout the rest of South Africa, Swaziland and Lesotho are referred to as *L. cf. saxatilis* (Happold 2013a). The uncertain taxonomy undermines geographical delimitation at present. Additionally, many records remain dubious as it is difficult to distinguish between *L. saxatilis* and *L. capensis* in the field, making the northern boundary of its range uncertain (Happold 2013a). *Lepus saxatilis* and *L. victoriae* are conventionally viewed as allopatric (Happold 2013a), where *L. saxatilis* corresponds to the larger southern African form (Flux & Angermann 1990) and *L. victoria* refers to the smaller northern forms (Kryger et al. 2004b).

Lepus victoriae has an extensive African distribution, which extends along the Atlantic coast (Guinea, The Gambia, Senegal, Mauritania and Western Sahara), across the Sahel and into western Kenya and Ethiopia, southwards to South Africa, Mozambique, Zimbabwe, Botswana and Namibia (Hoffmann & Smith 2005; Smith & Johnston 2008). Additionally, an isolated population has been located in western Algeria (Flux & Angermann 1990; Hoffmann & Smith 2005). However, taxonomic uncertainty again limits confidence in geographical distribution with Happold (2013b) stating that the species is not found in southern Africa (being instead replaced by *L. saxatilis*). Currently, we assume a sympatric distribution with *L. capensis* and/or *L. cf. saxatilis* (see above) within the assessment region, where is occurs in the northeastern parts of the country, including the North West, Free State, KwaZulu-Natal, Mpumalanga, Gauteng and Limpopo provinces, as well as the easterly regions of the Eastern Cape Province.

Taxonomic resolution and vetting of museum records through molecular research is needed urgently to resolve the tentative geographical ranges presented in Figure 1.

Population

Lepus capensis is probably the most abundant *Lepus* species in Africa, with densities ranging from 4.7–24.8 hares / km^2 in South Africa alone (Happold 2013c). For example, on Benfontein Game Farm, Northern Cape, density has been estimated as 16.5 individuals / km^2 (Stenkewitz et al. 2010). No detailed population or density estimates are available for *L. saxatilis* but it is considered common in South Africa (Happold 2013a). Similarly, no detailed population or density estimates are available for *L. victoriae* but it is considered a successful and common species (Flux & Angermann 1990; Smith & Johnston 2008).

Lepus species overall generally exhibit a fast population turnover and a high rate of reproduction (Kryger et al. 2004b). While a slow decline has been predicted due to habitat loss and hunting pressure (Kryger et al. 2004a), it is expected that land conversion from livestock to wildlife may benefit *Lepus* species and counteract population declines by creating and reconnecting suitable habitat patches. However, the status of scattered subpopulations and isolated subspecies is largely unknown, and may be threatened. For example, populations are fragmented in the Western Cape Province, and within South Africa's central grassland regions.

Current population trend: Stable

Continuing decline in mature individuals: No

Number of mature individuals in population: Unknown

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: Unknown

Severely fragmented: No

Habitats and Ecology

Lepus capensis is very adaptable and lives in a wide variety of grassland and open habitat, avoiding only bushy or closed habitats (Happold 2013c). Preferring dry, open habitats (Boitani et al. 1999), *L. capensis* is widespread throughout Nama-Karoo and Succulent Karoo biomes, and occurs in parts of the Grassland and Savannah Biome in southern Mozambique (Skinner & Chimimba 2005). Cape Hares in the Free State were found to have home ranges of 6.459 ha and 8.25 ha for males and females, respectively, which are defended in some portions, but may overlap at the fringes (Wessels 1978). However, home range size is known to vary depending on habitat type (Flux & Angermann 1990). This species feeds both by browsing and grazing, and can survive successfully without a continued supply of surface water by relying on forage as a source of moisture (Skinner & Chimimba 2005). Usually preferring short, green grasses, the diet of Cape Hares in East Africa was found to consist mostly of *Digitaria* spp. and *Eragrostis* spp. (Stewart 1971). In the Karoo, however, Kerley (1990) documented Cape Hares browsing on various species, favouring *Galenia fruticose* and *Osteospermum sinuatum* and were not recorded feeding on grasses. Predominantly nocturnal, the Cape Hare is only occasionally seen during the day during overcast conditions (Skinner & Chimimba 2005). They are usually solitary, except when females are in oestrus, and although breeding can take place all year round, most births occur between July and December (Wessels 1978). The gestation period lasts approximately 42 days and females may produce between one and three young (Smithers 1971). Wessels (1978) found that they may have up to four litters per year, while Flux (1981) noted that up to eight litters per year are possible with between 1.3 and 2.0 individuals per litter.

Modified landscapes, such as those overgrazed by livestock, are suitable habitats for *Lepus capensis* (Flux & Angermann 1990). Similarly, *Lepus* species are attracted to cultivated areas and gardens (Happold 2013a). The distributional limits of *L. capensis* and *L. saxatilis* overlap somewhat (Skinner & Chimimba 2005). The former extends into arid, open regions while the latter is confined to areas of grass cover within savannah woodland and scrub habitats, and adapts easily to agricultural landscapes (Kryger et al. 2004b). Similarly, where *L. capensis* and *L. victoriae* co-occur, the latter prefers scrubbier and more montane habitats (Flux & Angermann 1990).

Typically absent from forest, desert and open grassland regions, *L. saxatilis* prefers savannah woodland and scrub habitats (Rautenbach 1982; Skinner & Chimimba 2005). This species adapts well to modified agricultural areas, occurring commonly in croplands and fallow or dilapidated lands, where some degree of bush encroachment has taken place (Skinner & Chimimba 2005). Similarly to *L. capensis*, this species is nocturnal, generally emerging at dusk to forage and continuing throughout the night (Flux & Angermann 1990). Although this species is considered solitary, females will accommodate the presence of males while in oestrus (Skinner & Chimimba 2005). Reproduction is considered aseasonal with a peak in contraception occurring during the rainy, summer period when three young are usually born (Smithers 1971; Smithers & Wilson 1979; Taylor 1998a, 1998b). All *Lepus* species have a preference for green grasses (Skinner & Chimimba 2005).


Lepus saxatilis Andre Botha

Few data are currently available regarding the general ecology of *L. victoriae* (Boitani et al. 1999), although in regions where this species occurs sympatrically with *L. capensis,* they prefer denser vegetation and higher latitudes (Flux & Angermann 1990). The diet of this species varies with habitat type, and similar to other *Lepus* species, *L. victoriae* is nocturnal, and is able to breed all year round. An average litter size of 1.6 was recorded by Flux and Angermann (1990). It is suspected that this species is able to thrive in agricultural landscapes.

Ecosystem and cultural services: *Lepus* species form a valuable prey component for small carnivores, such as Black-backed Jackals (*Canis mesomelas*; Kamler et al. 2012; Bagniewska & Kamler 2014) and Verreaux's Eagles (*Aquila verreauxii*; Cruz-Uribe & Klein 1998). Hares were found to be the dominant prey taxon for Martial Eagles (*Polemaetus bellicosus*) in the Cape region of South Africa, making up 50% of the total diet (Boshoff et al. 1990). *Lepus* species were also found to constitute a small

Table 2. Use and trade summary for the *Lepus* spp.

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Bushmeat, skin, fur for gloves, recreational hunting and traditional medicine	All	Possibly increasing
Commercial use	Yes	-	-	-
Harvest from wild population	Yes	Bushmeat, skin, fur for gloves, recreational hunting and traditional medicine	All	Possibly increasing
Harvest from ranched population	No	-	-	-
Harvest from captive population	No	-	-	-

Table 3. Threats to *Lepus spp.* ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*5.1.1 Hunting & Collecting Terrestrial Animals*: recreational hunting and subsistence hunting and poaching for sport, bushmeat and fur. Current stress *2.1 Species Mortality*.	Maliehe 1993 Ntiamoa-Baidu 1997	Review Review	National National	Increasing with settlement expansion
2	*1.1 Housing & Urban Areas*: habitat loss from settlement expansion. Current stress *2.1 Species Mortality*.	-	Anecdotal	-	Increasing with settlement expansion
3	*2.3.3 Livestock Farming & Ranching*: increased predation by domestic dogs associated with agricultural expansion. Current stress *2.1 Species Mortality*.	-	Anecdotal	-	Unknown
4	*2.2.2 Wood & Pulp Plantations*: habitat loss and fragmentation, and loss of grass cover from agricultural expansion. Current stresses *1.1 Ecosystem Conversion* and 1.*2 Ecosystem Degradation*.	-	Anecdotal	-	Unknown

component of the diet of Cape Foxes (*Vulpes chama*) in the Free State (Kamler et al. 2012).

Use and Trade

Lepus species are hunted recreationally for sport, bushmeat and fur at a subsistence level in the assessment region. However, this is not expected to have a substantial effect on the population. Both *L. capensis* and *L. saxatilis* were listed as species utilised for traditional medicine in South Africa, as they are believed to have medicinal or curative properties (Maliehe 1993; Ntiamoa-Baidu 1997).

Threats

Across their range, as well as within the assessment region, *Lepus* species are threatened by habitat loss and fragmentation as a result of urban sprawl, agricultural encroachment, commercial plantations, and infrastructure development for tourism (Drew et al. 2004; Kryger et al. 2004a). Additionally, these species are threatened by hunting pressure through both recreational sport hunting, as well as subsistence hunting for bushmeat and fur (Kryger et al. 2004a). While agricultural and urban expansion may not necessarily cause direct declines, they may increase hunting pressures. Hunting pressure is likely to cause local subpopulation declines. For example, drastic population declines have been observed in KwaZulu-Natal, specifically in Harding and Port Shepstone in southern KwaZulu-Natal (Kryger et al. 2004a). *Lepus* species may also be vulnerable to predation by domestic dogs associated with farming areas. The near-endemic *L. saxatilis* may be threatened by intensive agricultural expansion and overhunting in the Western Cape (Happold 2013a), but monitoring data are required to demonstrate this.

Current habitat trend: Stable

Conservation

Lepus species are widely distributed across the assessment region, occurring within numerous protected areas, including both formally and privately protected areas (Kryger et al. 2004a). A call for sustainable utilisation of these species is recommended (Kryger et al. 2004a), as they may constitute a low-carbon source of protein and may economically benefit local communities and landowners (Asibey 1974). The development of conservancies to protect appropriate habitats for local subspecies and forms is recommended. Taxonomic resolution at a species and subspecies level is required for the *Lepus* genus to ensure that localised or isolated populations and subspecies are conserved. Research into the ecology of *L. victoriae* is lacking and is restricted to localised regions of its distribution (Boitani et al. 1999), thus further investigations are necessary.

Recommendations for land managers and practitioners:

- This species would benefit from suitable land management: land owners should retain corridors of grassland between grazed areas and decrease stocking rates to avoid overgrazing and the loss of grass cover.

Table 4. Conservation interventions for *Lepus* spp. ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*1.2 Resource & Habitat Protection*: development of conservancies to conserve suitable habitat for *Lepus* species, and engage in sustainable utilization of these species.	-	Anecdotal	Local	-	-
2	*2.1 Site/Area Management*: encourage farmers to retain cover, and thus habitat suitability.	-	Anecdotal	-	-	-

Research priorities:

- Taxonomic revision of the *Lepus* genus, including the identification of isolated populations and localised subspecies.
- Survey studies to effectively document the distributional limits and geographical overlap of species and subspecies.
- Population size and trends.
- Effects of wildlife ranching on *Lepus* species within the assessment region.

Encouraged citizen actions:

- Landowners should create conservancies to utilise this species sustainably.
- Refrain from having too many dogs on farms.
- Report sightings of free-roaming individuals on virtual museum platforms (for example, iSpot and MammalMAP), especially outside protected areas to enhance the distribution maps.

Data Sources and Quality

Table 5. Information and interpretation qualifiers for the *Lepus* spp. assessment

Data sources	Field study (unpublished), Indirect information (literature, expert knowledge)
Data quality (max)	Inferred
Data quality (min)	Suspected
Uncertainty resolution	Expert consensus
Risk tolerance	Evidentiary

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Assessors and Reviewers

Terry Robinson[1], Claire Relton[2], Matthew F. Child[2]

[1]University of Stellenbosch, [2]Endangered Wildlife Trust

Contributors

Lizanne Roxburgh[1], Andrew Smith[2,†]

[1]Endangered Wildlife Trust, [2]Arizona State University

[†]IUCN SSC Lagomorph Specialist Group

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