Chapter 15
The Mammals of Angola

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Abstract Scientific investigations on the mammals of Angola started over 150 years ago, but information remains scarce and scattered, with only one recent published account. Here we provide a synthesis of the mammals of Angola based on a thorough survey of primary and grey literature, as well as recent unpublished records. We present a short history of mammal research, and provide brief information on each species known to occur in the country. Particular attention is given to endemic and near endemic species. We also provide a zoogeographic outline and information on the conservation of Angolan mammals. We found confirmed records for 291 native species, most of which from the orders Rodentia (85), Chiroptera (73), Carnivora (39), and Cetartiodactyla (33). There is a large number of endemic and near endemic species, most of which are rodents or bats. The large diversity of species is favoured by the wide

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range of habitats with contrasting environmental conditions, while endemism tends to be associated with unique physiographic settings such as the Angolan Escarpment. The mammal fauna of Angola includes 2 Critically Endangered, 2 Endangered, 11 Vulnerable, and 14 Near-Threatened species at the global scale. There are also 12 data deficient species, most of which are endemics or near endemics to the country.

Keywords Africa · Angolan escarpment · Conservation · Endemism · History of mammalogy · Threatened species · Zoogeography

Introduction

The mammals of Africa, particularly the great apes, large herbivores, and carnivores are among the most iconic wild species in the world, catching the imagination of scientists and the general public alike (Monsarrat and Kerley 2018). These species provided the motivation in the late nineteenth and early twentieth century for some of the first efforts in wildlife conservation and sustainable use, initially with the establishment of game reserves and later with the creation of National Parks and other protected areas (Adams 2013). Today, over one hundred years later, the interest in these charismatic species has increased even further, attracting ever larger numbers of visitors each year from around the world to protected areas in Africa, and thus representing important sources of economic revenue in some African countries. This interest has also been fuelled by appreciation that many mammalian species have critical influences on the structure and functioning of African natural ecosystems (Keesing and Young 2014; Malhi et al. 2016), and that they may provide important services such as biological pest control in human-dominated landscapes (Kunz et al. 2011; Sirami et al. 2013; Taylor et al. 2018a). At the same time, however, African mammals have become involved in some of the most challenging and

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controversial conservation problems in the world, due in particular to the rapid growth of human populations, agricultural and pastoralism expansion and the associated loss of natural habitats (Laurance et al. 2014; Searchinger et al. 2015), deforestation (Hansen et al. 2013), conflicts due to crop raiding (Hoare 2015; Seiler and Robbins 2016) and predation on people and livestock (Loveridge et al. 2017; McNutt et al. 2017), and poaching for bushmeat (Wilkie et al. 2016; van Velden et al. 2018) and international trade (Biggs et al. 2013; Wasser et al. 2015; Cerling et al. 2016). Conservation of African mammals is thus at a crossroads, with a combination of multiple threats and opportunities, demanding a good understanding of species diversity and ecological requirements, and how they interact with humans in the context of complex and ever changing social-ecological systems.

In Angola, mammals have long been the focus of research and conservation efforts. Like elsewhere in Africa, albeit later than in some other countries, mammals provided the main motivation for the creation of the first Angolan Game Reserves and National Parks (NPs) in the 1930s, which were mostly located in areas with particularly important populations of large herbivores (Huntley et al. 2019). Scientific research started as early as the mid-nineteenth century, with collectors and zoologists describing the mammalian diversity of the country, including many species new to science. Research continued over the years and until the present, but it was plagued by long periods of interruption, particularly during the civil war of 1975–2002, making Angola one of the least known African countries in terms of its mammalian fauna. During this period of turmoil there were very few mammalogical studies (but see, e.g., Anstey 1991, 1993), but efforts to assess the status of the most charismatic and highly endangered species resumed soon after the situation improved in the early years of the twenty-first century (Morais et al. 2006a, b; Veríssimo 2008; Chase and Griffin 2011; Carmignani 2015; Chase and Schlossberg 2016; Fabiano et al. 2017; Overton et al. 2017; Vaz Pinto 2018; NGOWP 2018; Schlossberg et al. 2018). Scientific interest in Angolan mammals is slowly mounting again, with recent studies reporting the discovery of new species to science (Carleton et al. 2015; Svensson et al. 2017), describing important aspects of species distribution and ecology (Bersacola et al. 2015; Svensson 2017), and even using cutting-edge tools for answering complex questions related to species biogeography, phylogeography and evolution (Rodrigues et al. 2015; Vaz Pinto 2018). This renewed interest is timely, as Angola is currently striving to expand, reorganise and improve the management of its system of protected areas, in which there will once again be a strong focus on the conservation and sustainable use of mammal populations. This endeavour needs to be solidly rooted in scientific information, profiting from data that has been collected for over 150 years in the country, and promoting new studies that will help designing cost-effective conservation and management strategies.

This chapter provides a synthesis of what is known at present about the mammals of Angola. We have considered all mammalian species except cetaceans, which are treated in Weir (2019). Regarding the pinnipeds, we have only considered the Brown Fur Seal (*Arctocephalus pusillus*), which is the sole species of this group breeding in Angola. We start by presenting a short history of mammal research in the country, beginning with the studies of the pioneer Portuguese naturalist José Vicente Barbosa du Bocage, and finishing with the present-day efforts to resume mammological

research and to clarify the status of many species that have virtually vanished during and in the years following the civil war. We then present a brief description of the mammalian species recorded in Angola, which accompanies the checklist presented in Appendix. Poorly known endemics and near endemics for which Angola may be particularly relevant at the global scale are highlighted, but special attention is also given to iconic species of high conservation concern, though the charismatic Giant Sable Antelope is dealt with in more detail by Vaz Pinto (2018, 2019). The next section provides an overview on the biogeography of the mammalian fauna in Angola, based primarily on the study of Linder et al. (2012) for sub-Saharan Africa, and the study of Rodrigues et al. (2015) dealing specifically with the mammals of Angola. Finally, we provide a summary of the conservation status of Angolan mammals, largely based on the global assessments by the IUCN (IUCN 2018). We also make a brief assessment of threats and conservation opportunities for mammals, but leave the details to Huntley et al. (2019), which deals specifically with the challenges of biodiversity conservation in the country.

History of Mammal Collecting in Angola

The first truly scientific studies on the vertebrate fauna of Angola, which included the classification and characterisation of several species of mammals, date back to the end of the nineteenth century. They are mainly due to José Vicente Barbosa du Bocage (1869, 1878, 1889a, b, 1890, 1897, 1902), professor of zoology at the Polytechnic School of Lisbon, to whom the explorer José Alberto de Oliveira Anchieta regularly sent specimens he collected in various parts of western Angola ('Sertão de Loanda'; 'Sertão de Benguella', 'Sertão de Mossâmedes'), and three other scientists of the time, who exchanged correspondence and opinions with Bocage. The latter included the German WCH Peters, who published on Angolan mammals based on the observations of the botanist Frederich MJ Welwitsch (Peters 1865) and the collections made by the German Expedition to Loango-Cabinda (Peters 1879), and the British WL Sclater and JE Gray, who studied the specimens sent to the British Museum of Natural History (Gray 1868, 1869) by geologist Joachim José Monteiro, who lived in Angola at the time. Other collectors, especially at the end of the nineteenth century and the first decade of the twentieth century, also sent specimens to the Polytechnic School's Zoological Museum. Initially founded on the collections studied by Bocage, this museum later came to be known as the Bocage Museum which officially constituted the Zoology Section of the National Museum of Natural History. Unfortunately, the collections deposited in it were lost in their entirety, due to a fire that broke out in 1978. Further material was also sent to other Portuguese museums and universities, such as the specimens offered to the museum of the University of Coimbra, by Lieutenant Colonel Teodoro da Cruz, and much later studied by A.A. THEMIDO (THEMIDO, 1931, 1946).

Besides museums in Portugal and the British Museum, other institutions receiving material from Angola at that time included: the Berlin Museum, which included material obtained by the German expeditions to Loango and the northeast of Angola,

as well as the Kunene-Sambesi Expedition where the zoologist A Sokolowski collected mammals (Sokolowski 1903); the Leyden Museum, where P Van Der Kellen collected in southern Angola, and his material was studied by FA Jentink (1887, 1893, 1900, 1901); and the Tring Museum, which, along with the British Museum, received material collected by J Ansorge in various parts of Angola, largely to be studied by Thomas Oldfield (Thomas 1892, 1900, 1926, Thomas and Wroughton 1905). In 1916, Thomas would leave his name linked to the classification of *Hippotragus niger variani*, the Giant Sable Antelope (Thomas 1916), whose discovery and dispatch of specimens to the British Museum was due to the chief engineer of the Benguela Railway HF Varian. The amassing of ever larger collections of mammals from Angola and deposited at the British Museum at this time led to further publications of catalogues and other papers on Angola's mammalian fauna (Lydekker 1899, 1903, 1904; Lydekker and Blaine 1913–1916; Blaine 1922, 1925)

The 1920s and 1930s witnessed a resurgence of zoological holdings collected in Angola. Two Swiss missions by Albert Monard, curator of the Museum of Natural History of La Chaux-de-Fonds, published important contributions to the mammalian fauna of Angola (Monard 1930, 1931, 1933, 1935). Various American expeditions also carried out work in Angola during this period, including the Vernay Angola Expedition, organised by Arthur Vernay in 1925 to obtain material for the American Museum of Natural History, New York; the Gray African Expeditions, led by Prentiss Gray, who in 1929 obtained material, including specimens of *Hippotragus niger variani*, for the Philadelphia Academy of Natural Sciences; the Pulitzer Angola Expedition (1930–1931), organised by the Carnegie Museum and directed by Rudyard Boulton, who, despite being an ornithologist, collected mammalian material; and the Phipps-Bradley Expedition in 1932–1933, organised by John H Phipps, whose material was donated to the American Museum of Natural History. It was especially the material in these museums which served as the basis for the classic work of Hill and Carter (1941), *The Mammals of Angola, Africa*, published in 1941, as well as other papers (Hill 1941). Other minor expeditions included the Karl Jordan Expedition in 1934 whose material was deposited at the Tring Museum, and reported by St. Leger (1936); and the Percy Sladen and Kaffrarian Museum Expedition in 1934, organised by the Kaffrarian Museum and directed by Capt. GC Shortridge. Shortridge collected mainly in Namibia and was limited in Angola to the banks of the Cunene River. The increase in mammalian specimens collected in Angola and held in museums around the world up to this time allowed for the description of new subspecies by Hinton (1921), Matschie (1900, 1906), Zukowsky (1964) and Zukowsky and Haltenorth (1957).

Following World War II, Portuguese participation in zoological surveys became predominant in Angola. In fact, a board of overseas research was founded in Portugal as a branch office of the Ministry of the Colonies – the *Junta das Missões Geográficas e de Investigações Coloniais*. From the mid-1950s, the then-established Overseas Research Board, based in Lisbon, later becoming the Institute of Tropical Scientific Research (IICT), was the official institution in Portugal to oversee scientific missions to the Overseas Provinces at the time and, in fact, between 1957 and 1959, a zoological mission to Angola was conducted, directed by F Frade, the materials of

which were deposited at the then IICT Zoology Center. This researcher, later director of the Zoology Center, was a prolific contributor of scientific papers on Angolan mammals on topics including anatomy, taxonomy and conservation (Frade 1933, 1936, 1955, 1956, 1958, 1959a, b, 1960, 1963; Frade and Sieiro 1960). Nonetheless, the majority of these scientific initiatives were mainly from institutions that were effectively based in Angola, which, during the 1950s and 1960s, promoted zoological explorations and collections in Angola.

Of the greatest importance was the Laboratory of Biology at the Dundo Museum, in Lunda-Norte, in the extreme northeast of Angola. This museum had two sections, one for ethnographic and the other for biological studies. Directed by António de Barros Machado, it became world-renowned for its invaluable collections, as well as for its prestigious magazine, Cultural Publications of the Diamond Company of Angola. Barros Machado, in spite of his specialisation as an entomologist, made an important contribution to the mammalogy of Angola (Machado 1952, 1968, 1969). RW Hayman of the British Museum studied the mammal material housed in the Dundo Museum (Hayman 1951, 1963).

The other Angolan institution of importance to mammalogy was the former Institute of Scientific Research of Angola (IICA), specifically its Sections of Ornithology and Mammalogy, based in Lubango, Huíla. The first section was directed by AA Rosa Pinto and the second by J Crawford-Cabral. As a result of several years of fieldwork and the collaborative work of various personnel, including collectors and taxidermists, it was possible to organise, in both these Sections, an excellent repository of zoological material from Angola. Both Sections still remain in Lubango, where they are currently part of the Higher Institute of Sciences and Education (*Instituto Superior de Ciências da Educação* – ISCED). The study of the material of the Mammalogy Section has been partly published mainly by Crawford-Cabral in an extensive number of articles, initially in the Bulletin of the Institute of Scientific Research of Angola and, more recently, in the Zoology Series of the magazine *Garcia de Orta*, and elsewhere (Crawford-Cabral 1961, 1966a,b, 1967, 1968, 1969a, b, 1970a, b, 1971, 1982, 1986, 1987, 1992, 1996, 1997, 1998; Crawford-Cabral and Fernandes 2001; Crawford-Cabral and Simões 1987, 1988; Crawford-Cabral and Veríssimo 2005).

However, the interest of foreign countries in the Angolan fauna had not diminished. During the 1950s and mid-1960s important collections were made by the German explorer Gerd Heinrich, mostly deposited in the Field Museum of Natural History, Chicago; Werner Trense, who undertook a collecting expedition in Angola between 1952–1954, which were deposited at the Hamburg Institute and Zoological Museum, and studied by him (Trense 1959); and, a decade later, another expedition from this last museum, which included the museum's anatomist H Oboussier, whose collections in Angola were related with her studies on the hypophysis of antelopes (Oboussier 1962, 1963, 1964, 1965, 1966, 1972, 1976; Oboussier and Von Tyszka 1964).

In the late 1960s and until the mid-1970s the interest of South African zoologists in Angolan mammalogy was also felt. In 1969, the State Museum of Namibia organised an expedition to southwestern Angola (mainly within the Namibe Provice),

under the direction of its director, CG Coetzee, which was repeated in 1974; and, in June and July of the same year, the University of Cape Town and the Wildlife Society, undertook an expedition to the same regions (Broom et al. 1974). Worthy of reference, in this period just before independence, are the scientists who performed field work in Angola, such as Richard Estes, with his studies on the Giant Sable (Estes and Estes 1974) and the ecologist and conservationist Brian Huntley (1972a, b, 1973a, b, c, d, e, f, 1974).

Following the independence of Angola in 1975, the political situation deteriorated rapidly and soon after a civil war raged on until 2002. During this period very little was added to the knowledge of the Angolan mammalian fauna. However one should highlight the contributions of Alfred Feiler, assistant to AG Marques at the University Agostinho Neto, in Luanda, who undertook studies on mammal fauna (Feiler 1986, 1989, 1990); as well as by a short mammal survey conducted in some conservation areas (Juste and Carballo 1992); and a rapid assessment of the environmental conditions and fauna in some of the protected areas conducted by Huntley and Matos (1992).

With the end of the civil war, in 2002, the return of field work conditions and initiatives was severely hampered by the unknown status of the war legacy such as land mine fields, and the overall disruption of infrastructure and government institutions. However, the first aerial survey for large mammals in Iona NP was conducted in 2003 by a joint initiative between the government of Angola and the Namibia Ministry of Environment (Kolberg and Kilian 2003). At this same time, a concerted effort was ongoing to assess the status of the Giant Sable Antelope. This later culminated in the establishment of the Giant Sable Project with the assistance of the Kissama Foundation, which has since been in the forefront of the protection and recovery of this species Vaz Pinto (2019). The first complete historical review of the distribution of the ungulate fauna of Angola was published in 2005 (Crawford-Cabral and Verissimo 2005). Further wildlife monitoring initiatives have been developed in the southeast of the country. The first aerial surveys conducted in Cuando Cubango province were undertaken by the organisation *Elephants Without Borders* to assess the status of elephant populations, within the Luiana Partial Reserve, in 2004, 2005 and 2006, and extended in 2015 (Chase and Griffin 2011, Chase and Schlossberg 2016; Schlossberg et al. 2018). In 2007, the first systematic ground mammal survey was developed in the former Mucusso Game Reserve (Veríssimo 2008), in an effort to assist the Angolan Ministry of Environment to review the protected areas status of southeast Angola. Recent and ongoing initiatives, including a large carnivores assessment developed by the organisation *Panthera* in Cuando Cubango (see Funston et al. 2017); Huntley et al. 2019), as well as other initiatives of mammal surveys in Mupa, Bicuar and Iona NPs (Overton et al. 2017; Fabiano et al. 2017), and elsewhere (INBAC 2016), will continue to improve the knowledge of the unique mammalian fauna of Angola, and hopefully, its long term recovery and conservation. Despite these recent efforts, only a single recent publication has provided a checklist of mammals of Angola (Taylor et al. 2018c).

The Mammal Fauna

In this section we provide an overview of the mammalian fauna of Angola, giving at least a brief comment on each species recorded until now, all of which are presented in the checklist of Appendix. We also refer to some species that have never been collected in the country, but that occur very close to the border in neighbouring countries and thus are likely to occur in Angola. We have also reviewed cases of species that were once judged to occur in Angola, usually based on old records, but that have been probably misidentified and thus are no longer considered in the checklist. The section is based on a wide range of sources, including for example previous reviews focusing specifically on Angolan mammals (e.g., Hill and Carter 1941; Crawford-Cabral 1998; Crawford-Cabral and Simões 1987,1988; Crawford-Cabral and Veríssimo 2005), monographs on the mammals of Africa (e.g., Happold 2013; Happold and Happold 2013; Monadjem et al. 2010a, 2015), data from museums and historical observations available through GBIF (e.g. Bohm and Jonsson 2017; Conroy 2018; Grant and Ferguson 2018; MNHN 2018; MHNG 2018; Rodrigues et al. 2018; Taylor et al. 2018c), and unpublished data from the co-authors, among others. These sources reflect a highly uneven survey effort across Angola, as illustrated by the distribution of records in the GBIF database, and so it is likely that new mammal species for Angola are still to be discovered, particularly in less explored regions (Fig. 15.1).

In this review the higher taxonomy (i.e., family level and above) follows Kingdon et al. (2013), and the taxa are presented in alphabetical order, following the hierarchy of orders and families. The taxonomy at species and infraspecific levels is based largely on that adopted by the Red List of the IUCN (IUCN 2018), which in turn mostly follows the *3rd edition of Mammal Species of the World – A Taxonomic and Geographic Reference* (Wilson and Reeder 2005). This option was chosen because this is a generally recognised taxonomy, and because information on global conservation status is available for each of these species. In a few cases we have not followed this taxonomy, mainly when there were recent splitting of taxa treated as conspecific by the IUCN. Although they are not treated systematically, we have provided information on some particular subspecies, mainly in cases of type localities or restricted ranges in Angola, distinctive morphologies or ecologies, high conservation value, or that may warrant species status upon taxonomic revision.

Afrosoricida (Otter-shrews, Golden Moles)

The two species of Afrosoricida recorded in Angola are Congo Golden Mole (*Huetia leucorhina*) and Giant Otter-shrew (*Potamogale velox*). Little has been published on the Congo Golden Mole in the country, and the species is only known from a handful of records from northern Angola where it seems to occur in mosaics of grassland and moist forests (Hayman 1963; Crawford-Cabral and Veríssimo, unpublished

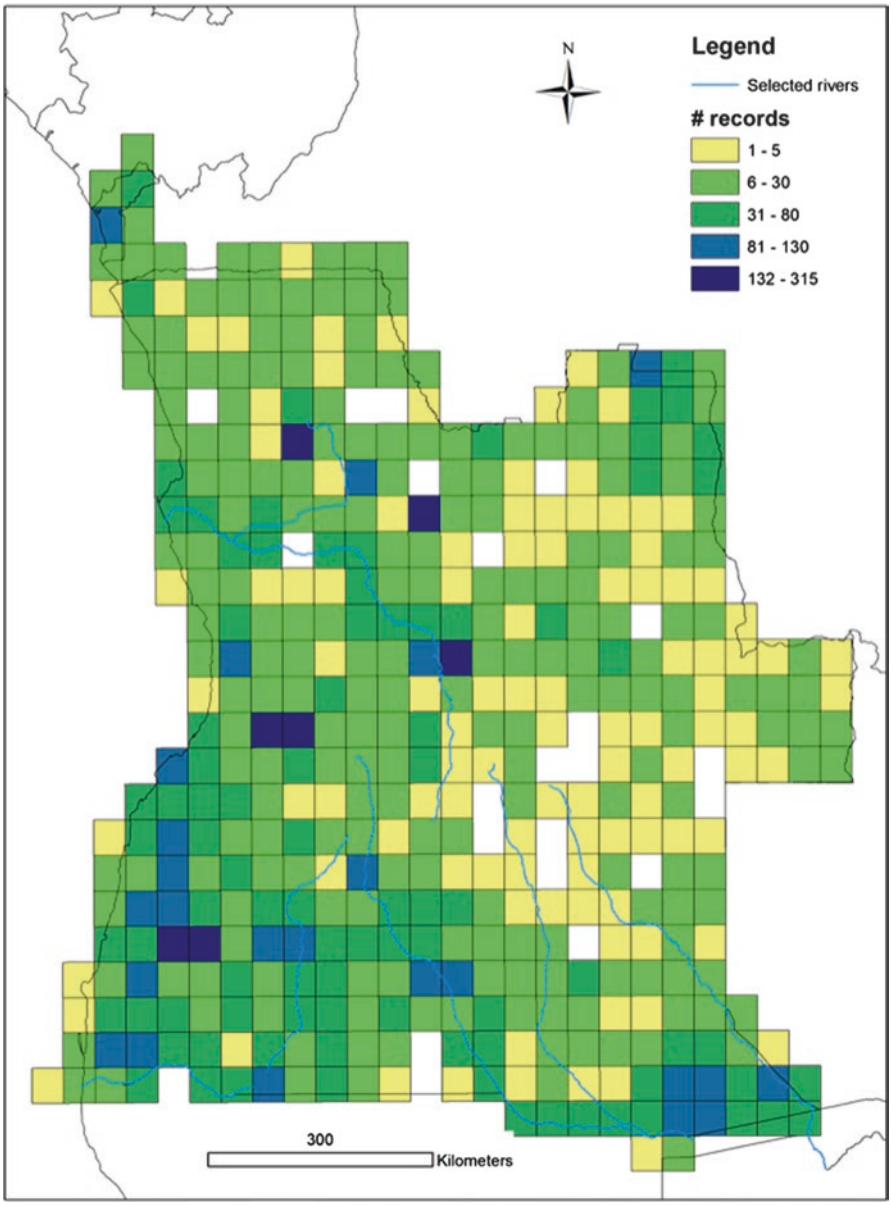

Fig. 15.1 Distribution of the number of records of species occurrences in Angola registered in the GBIF database.

data). Notably, the first record of Golden Mole in Angola was collected by Von Mechow in the Cuango river and initially attributed to the Hottentot Golden Mole (*Amblysomus hottentotus*), as *Chrysochloris albirostrus*, but was later assumed to be a mistake and has since been provisionally synonymised with *H. leucorhina* (Hill and Carter 1941; Crawford-Cabral and Veríssimo, unpublished data). The Giant Otter-shrew is known from relatively few records mostly dating from the nineteenth century and studied by Barbosa du Bocage (du Bocage 1865, 1882, 1890), or from the first half of the twentieth century (Seabra 1905; Hill and Carter 1941). This species was mainly found in small forest-lined streams in northern Angola, but a couple of records were obtained in the provinces of Bié and Huíla (Crawford-Cabral and Veríssimo, unpublished data), likely corresponding to the southernmost distribution of the species in Angola.

Carnivora (Carnivores)

The Carnivora in Angola are represented by at least 38 species within seven families, most of which belong to the family Herpestidae. Although this group is one of the most studied in Angola, there are still uncertainties regarding the occurrence of some species. For most species there is very little data on current distribution and abundance.

Family Canidae

There are at least five canid species in Angola, the most charismatic of which is the African Wild Dog (*Lycaon pictus*). This species appears to have once been widespread across Angola occurring from northeast in the province of Lunda-Norte to southwest in the Namibe province and southeast in the Cunene and Cuando Cubango province (Crawford-Cabral and Simões 1988; Huntley 1974). Although no estimates of abundance are available, some populations were probably abundant in the south, along the border with Namibia (Fabiano, unpublished data). Recent surveys indicate that the species is still resident in southern Angola, with confirmed populations at Bicuar, Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Overton et al. 2017; Fabiano et al. 2017; Funston et al. 2017; Monterroso et al., unpublished data). There may also be other populations in the Angolan section of the greater Kavango-Zambezi (KAZA) region, westwards to the Mupa NP and northwards to the Cameia NP, where wild dogs were recently confirmed as resident (INBAC 2016; Fabiano et al. 2017). Preliminary surveys recently estimated wild dog densities at 0.65 individuals/100 km^2, which is comparable to other populations in southern Africa (Overton et al. 2017). Based on spoor counts and camera trapping, Overton et al. (2017) estimated a resident population size of 40–50 individuals in Bicuar NP, distributed through numerous small packs. In the same area, a camera trapping study by Fabiano et al. (2017) suggested a minimum population size of ca. 60 individuals

in 10 different packs (2–38 individuals each), and confirmed reproduction in one wild dog pack. At the Luengue-Luiana and Mavinga NPs, Funston et al. (2017) estimated densities of 0.7 individuals/100 km^2 and a population size of 599 ± 260 individuals using camera trapping and spoor tracking.

The four species of small canids occurring in Angola are Bat-eared Fox (*Otocyon megalotis*), Cape Fox (*Vulpes chama*), Black-backed Jackal (*Canis mesomelas*), and Side-stripped Jackal (*Canis adustus*). Bat-eared Fox range based on few historical records seems to be confined to the Kaokoveld Desert, Namibian Savanna Woodlands and Angolan Mopane Woodlands, in southern Angola (Crawford-Cabral and Simões 1987). Recent surveys have confirmed its presence at Iona, Bicuar, Mupa and Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Fabiano et al. 2017; Overton et al. 2017; Funston et al. 2017). The few historical records of Cape Fox also suggest that it is confined to the Kaokoveld Desert and Namibian Savanna Woodlands in southwest Angola (Crawford-Cabral and Simões 1987). Recent surveys indicate that the species still persist at Iona and Bicuar (Overton et al. 2017; Fabiano et al., unpublished data), but it was not detected at Mupa (Overton et al. 2017). The species is probably absent from the southeast, where it was not detected in surveys carried out at Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Overton et al. 2017; Funston et al. 2017).

The historical records of the Black-backed Jackal suggest a distribution mostly restricted to the arid coastal belt within the Kaokoveld Desert, Namibian Savanna Woodlands and Angolan Mopane Woodlands (Crawford-Cabral and Simões 1987), but has been recorded recently as far north as the outskirts of Luanda and above 2000 m at the Humpata plateau (Vaz Pinto, unpublished data). Contemporary records indicate its presence in Iona NP (Fabiano et al., unpublished data), but also in Bicuar, Mupa, Luengue-Luiana and Mavinga NPs, which are dominated by the Zambezian Baikiaea Woodlands and Angolan Mopane Woodlands (Fabiano et al. 2017; Overton et al. 2017; Funston et al. 2017). The Side-stripped Jackal appears to have had a wider historical range, ranging from a few records in the Southern Congolian Forest-Savanna Mosaic in northeast Angola (Lunda-Norte province), and more records falling within the Angolan Miombo Woodlands from central northwest to central-southwest and highlands (Crawford-Cabral and Simões 1987). Recent surveys confirmed its presence in the Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Funston et al. 2017), and in Cangandala NP (Vaz Pinto, unpublished data). Surprisingly, it has also been recorded recently in dry coastal savanna in Quiçama NP (Groom et al. 2018). It may also occur in Bicuar and Mupa NPs, though it was probably overlooked in recent surveys more directed to endangered species (Overton et al. 2017; Fabiano et al. 2017).

Family Felidae

The Felidae are represented in Angola by at least seven species, including iconic and threatened species such as African Lion (*Panthera leo*), Leopard (*Panthera pardus*), and Cheetah (*Acinonyx jubatus*). Historically, lions were probably widespread,

inhabiting the Western Congolian Forest-Savanna Mosaic in the northeast, the Miombo Woodlands in central Angola, and the Savanna, Mopane and Baikiaea Woodlands in the south along the border with Namibia (Crawford-Cabral and Simões 1988; Veríssimo 2008; Huntley 1973c, 1974). The lion subspecies occurring in the country are poorly known, but recent phylogeographic studies suggest that Angola may represent a contact zone between the Central (*P. l. leo*) and Southern African (*P. l. melanochaita*) lineages (Barnett et al. 2014), and thus the genetic composition of Angolan lions could help elucidating the evolutionary history of this species in the African continent. Recent surveys indicate that lions still exist in the Luengue-Luiana and Mavinga NPs, while two recent records indicate their possible presence in the surroundings of the Cameia NP (iNaturalist.org 2018a, b). Funston et al. (2017) estimated the lion population of the Luengue-Luiana and Mavinga NPs to be about 10–30 individuals. They concluded that the very low biomass of preferred prey species was the main limiting factor for lions locally, as observed elsewhere (Bauer et al. 2015; Lindsey et al. 2017; Wolf and Ripple 2016). Recent surveys have failed to detect the species in Bicuar, Mupa and Quiçama NPs (Overton et al. 2017; Fabiano et al. 2017; Groom et al. 2018; Monterroso et al., unpublished data). However, park rangers and farmers in the vicinity of Bicuar NP have reported recent sightings of vagrant animals, suggesting that they may still occur in low numbers in the region (Fabiano, unpublished data). Recent observations of lone individuals have been obtained in Luando Reserve (Vaz Pinto, unpublished data). Other surveys, mostly relying on desktop surveys and interviews, indicate that lions might still occur in Cameia NP, and in the former Coutada do Mucusso (Veríssimo 2008; Purchase et al. 2007a, b), but these are unlikely to hold resident populations.

Cheetah historically appear to have occurred across Angola, inhabiting various habitats/ecoregions such as the Miombo Woodlands in the northeast and south-central Angola, the Angolan Scarp Savanna and Woodlands in the northwest, and in the Namibian Savanna and Mopane Woodlands as well as Zambezian Baikiaea Woodlands along the border with Namibia (Crawford-Cabral and Simões 1988; Veríssimo 2008). The subspecies represented in the country is the Southern African Cheetah (*A. j. jubatus*) (Kitchener et al. 2017). The current status of the Cheetah in Angola is poorly known, but it still occurs in some NPs (Funston et al. 2017; Kolberg and Kilian 2003; Purchase et al. 2007a, b; Fabiano, unpublished data; Álvaro Batista, personal communication). Funston et al. (2017) estimated that Cheetah occupy roughly 8% of the Luengue-Luiana and Mavinga NPs, occurring at a density of 0.2 individuals/100 km^2. Fabiano et al. (unpublished data) also using spoor counts estimated that cheetahs occupy approximately 28% of Iona's plains, at a density of 0.61 individuals/100 km^2 (0.17–1.98). This population is considered resident given the frequent report of sightings, including that of females with cubs (Bruce Bennett and Álvaro Batista, personal communication). The Iona cheetah population appears to be genetically similar to the Namibian counterpart based on a limited scat sample size ($n = 22$) genotyped at 8 loci (Fabiano et al., unpublished data). Other occasional sightings suggest cheetahs may be present in Cameia NP. Cheetahs were not detected in Bicuar and Mupa NPs (Overton et al. 2017; Fabiano et al. 2017), and

Overton et al. (2017) even suggests that they have been absent from the region for at least a decade. Recent camera-trapping detected the species in western Cuando Cubango (Stefan van Wyk, personal communication) and southern Moxico (NGOWP 2018).

African Leopard historically had a wide distribution across Angola, ranging from the northwest and the northeast, through central Angola to the southern border with Namibia. However, most historical records were from National Parks. The subspecies occurring in Angola is the African Leopard (*Panthera pardus pardus*) (Kitchener et al. 2017). The distribution range appears not to have reduced since the 1970s, as they still appear to be thriving throughout most of the country, including NPs and their surrounding areas (INBAC 2016). Using spoor counts Overton et al. (2017) estimated a density of 4.37–14.7 leopards/100 km^2 in the Bicuar NP. Camera-trapping also detected leopards in Mupa NP, though apparently at lower densities than in Bicuar (Overton et al. 2017). Based on spoor counts, Funston et al. (2017) found leopards to be widely distributed throughout Luengue-Luiana and Mavinga NPs, with an estimated population size of 518 ± 190 individuals. Their camera trapping efforts along the Cuando, Luiana and Luengue rivers allowed the detection of 120 different individuals, and estimated a density of 1.5 ± 0.14 leopards/100 km^2. Leopards are also found in the Iona NP (INBAC 2016), at a density of 1.02 (0.41–2.39) leopards/100 km^2 (Fabiano et al., unpublished data), as well as in Luando reserve, and Quiçama and Cangandala NPs (INBAC 2016; Groom et al. 2018; Fabiano, unpublished data; Vaz Pinto, unpublished data).

The other Felidae known to occur in Angola are Caracal (*Caracal caracal*), African Golden Cat (*Caracal aurata*), African Wildcat (*Felis silvestris*) and Serval (*Leptailurus serval*). Historical records indicate the presence of Caracal in the arid zone of southwestern Angola and the Miombo Woodlands of Cunene (Crawford-Cabral and Simões 1987). Recent surveys have confirmed its presence at Iona NP (Fabiano et al., unpublished data) and in Bicuar and Mupa NPs (Fabiano et al. 2017; Overton et al. 2017), and in the Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Funston et al. 2017). The occurrence in Angola of the closely related African Golden Cat (*Caracal aurata*) was only confirmed very recently from an animal photographed on a local bushmeat market in northwestern Angola (Errol de Beer, personal communication). This cat is endemic to the forests of Equatorial Africa, particularly associated to areas of riverine forests with low human disturbance, and even penetrating savanna regions (Sunquist and Sunquist 2009; Bahaa-el-din et al. 2015). From the two recognised subspecies of Golden Cat, the one probably occurring in Angola is *C. a. aurata* (Sunquist and Sunquist 2009; Bahaa-el-din et al. 2015; Kitchener et al. 2017). African Wild Cat was historically widespread, occurring across most of the country (Crawford-Cabral and Simões 1987; Crawford-Cabral and Veríssimo, unpublished data). The species was associated with Miombo Woodlands, the Scarp Savanna and Woodlands, and the Kaokoveld Desert. Recent surveys have confirmed its presence in Bicuar and Mupa NPs (Fabiano et al. 2017; Overton et al. 2017), Quiçama NP (Groom et al. 2018), and in the Luengue-Luiana and Mavinga NP (Veríssimo 2008; Funston et al. 2017). Serval has a similar historical widespread distribution, occurring particularly across the western part of the

country (Crawford-Cabral and Simões 1987). Within its range, Serval was associated with Miombo Woodlands, the Scarp Savanna and Woodlands, and the Kaokoveld Desert (Crawford-Cabral and Simões 1987). Two historical records were retrieved from northeastern Angola. Recent surveys have confirmed the presence of Serval in Bicuar and Mupa NPs (Fabiano et al. 2017; Overton et al. 2017), Quiçama NP (Groom et al. 2018), as well as in Mucusso area in Cuando Cubango (Veríssimo 2008). Additionally, it regularly surfaces as bushmeat near Luanda (Vaz Pinto, unpublished data). Black-Footed Cat (*Felis nigripes*) may occur marginally in southern Angola, but there seems to be no confirmed records (Sliwa 2013).

Family Herpestidae

The Family Herpestidae in Angola is represented by at least 12 species. The most well-known and charismatic is certainly the Meerkat (*Suricata suricatta*), a social mongoose widespread in the western parts of southern Africa (Jordan and Do Linh San 2015). Historical records suggest that in Angola it is confined to the arid southwest, including the Iona NP (Crawford-Cabral and Simões 1987), corresponding to the northwest edge of the species' range. Recent surveys suggest that meerkats still occur in this area (Fabiano et al., unpublished data; Monterroso et al., unpublished data). Crawford-Cabral (1971), proposed that the population occuring in Angola is a distinct subspecies, *Suricata suricatta iona*.

Another interesting group of species is that including the *Herpestes* mongooses, for which there are considerable taxonomic uncertainties (Taylor and Goldman 1993; Crawford-Cabral 1996; Gilchrist et al. 2009; Rapson et al. 2012; Veron et al. 2018). The three species known to occur in Angola are Kaokoveld Slender Mongoose (*Herpestes flavescens*), Egyptian Mongoose (*H. ichneumon*) and Common Slender Mongoose (*H. sanguineus*) (Crawford-Cabral 1996). Kaokoveld Slender Mongoose was described by Barbosa du Bocage from specimens collected in Angola, and is endemic to southwestern Angola and northwestern Namibia. However, there are marked variations between two subpopulations, which have been assigned to different subspecies or even species (Rathbun and Cowley 2008; Rapson et al. 2012). Individuals with tan or yellowish pelage confined to southwestern Angola are assigned to the subspecies *H. f. flavescens* (or *H. flavescens sensu stricto*), while those with very dark pelage and with a distinctive rufus tinge that occur in northwestern and northcentral Namibia have been assigned to *H. f. nigrata* (or *H. nigratus*) (Crawford-Cabral 1996; Tromp 2011; Taylor 2013). Very little is known about this species, particularly in Angola, where most assumptions on their distribution derive from habitat-interpreted satellite imagery (Rapson and Rathbun 2015). In contrast to the previous species, the Egyptian Mongoose and the Common Slender Mongoose are thought to be widespread (Crawford-Cabral and Simões 1987).

A group of five species of Herpestidae are thought to have wide distributions in Angola, though their current range and abundances are poorly known. Possibly the most widespread of these are the White-tailed Mongoose (*Ichneumia albicauda*), the Banded Mongoose (*Mungos mungo*) and the Dwarf Mongoose (*Helogale par-*

vula), as historical records report their presence throughout the country (Crawford-Cabral and Simões 1987; Trombone 2016; Figueira 2017; Grant and Ferguson 2018; Rodrigues et al. 2018). The White-tailed Mongoose has recently been confirmed in Cameia and Cangandala NPs, and the Banded Mongoose appears to be abundant in Luando Reserve and Cangandala NP (Vaz Pinto, unpublished data). The Marsh Mongoose (*Atilax paludinosus*) is associated with riparian habitats, such as swamps and streambed areas, though occurring also in estuarine and marine habitats (Gilchrist et al. 2009). Historical records of these species have mainly been from western Angola (Trombone 2016; Rodrigues et al. 2018), though it may be more widepread and has recently been confirmed in Cangandala NP (Vaz Pinto, unpublished data). The Selous Mongoose (*Paracynictis selousi*) has the northwestern edge of its range in Angola, with historical records from southern provinces (Crawford-Cabral and Simões 1987; Trombone 2016; Conroy 2018; Grant and Ferguson 2018; Rodrigues et al. 2018). Recent surveys confirmed its presence at Luengue-Luiana and Mavinga NPs (Funston et al. 2017) and Bicuar NP (Overton et al. 2017), albeit at low densities.

Finally, another three Herpestidae have very restricted or probably underestimated ranges in Angola. Ansorge's Cusimanse (*Crossarchus ansorgei*) may be more widespread than usually believed because it has a relatively wide distribution in rainforests of neighbouring regions of DRC (Angelici and Do Linh San 2015). Although in Angola it was known from a single specimen collected in 1908 north of the Cuanza River (Crawford-Cabral and Simões 1987), recent records suggest it may extend its distribution along the escarpment to Cuanza-Sul (Michael Mills, personal communication). The population in Angola is assigned to the endemic subspecies *C. a. ansorgei*. Black-legged Mongoose (*Bdeogale nigripes*) seems to be restricted in Angola to the enclave of Cabinda (Crawford-Cabral and Simões 1987). The Yellow Mongoose (*Cynictis penicillata*) only occurs in a narrow fringe in the extreme southwest of Angola (Crawford-Cabral and Simões 1987), though it is widespread elsewhere in southern Africa. We are unaware of recent records of any of these species in Angola.

Family Hyaenidae

There are three species of the family Hyaenidae recorded in Angola (Crawford-Cabral and Simões 1988). Historical and contemporary records indicate that the Brown Hyaena (*Parahyaena brunnea*) is largely confined to the arid parts of southwestern Angola, in Kaokoveld Desert and Namibian Savanna Woodlands (Huntley 1974; Fabiano et al., unpublished data). This range encompasses the Skeleton Coast Transfrontier Park between Angola and Namibia. Recent surveys indicate that it is widespread in the Iona NP (Fabiano et al., unpublished data), but it was not detected in Luengue-Luiana NP, despite its presence in the nearby Bwabwata NP of Namibia (Funston et al. 2017). Spotted hyaenas (*Crocuta crocuta*) historically were widely distributed across Angola with main populations occurring in Zambezian Baikiaea Woodlands in the south of the country, though it also appeared to have been

widespread in the west. The Spotted Hyaena is one of the few large carnivores species that shows no evidence of recent population declines throughout its African range (Bohm and Höner 2015), although the situation may not necessarily be identical in Angola. Recently, populations were estimated at 10.8–18.0 individuals/100 km^2 in Bicuar NP (Overton et al. 2017), 1.4 individuals/100 km^2 in Mupa NP (Overton et al. 2017), and 0.9 individuals/100 km^2 in Luengue-Luiana and Mavinga NPs (Funston et al. 2017). The presence of Spotted Hyaena has not been confirmed in surveys of various protected areas, and they appear to have been extirpated from Luando Reserve and Cangandala NP (Vaz Pinto, unpublished data). In Quiçama NP an active den was known to be present on the Cuanza floodplain as recently as 2013 (Vaz Pinto, unpublished data), but a recent large mammal survey could not find evidence of the species (Groom et al. 2018). Overall, the species is expected to remain widely distributed in Angola (INBAC 2016). Aardwolf (*Proteles cristata*) is the least known of the three Hyaenidae of Angola, occurring only in the south of the country (Crawford-Cabral and Veríssimo, unpublished data). Recent records from direct observations and roadkills suggest the species to be relatively common along the arid coastal plain to as far north as Benguela, and on the highlands of Humpata plateau (Vaz Pinto, unpublished data).

Family Mustelidae

The Mustelidae are represented in Angola by Honey Badger (*Mellivora capensis*), Striped Polecat (*Ictonyx striatus*), African Striped Weasel (*Poecilogale albinucha*), and three species of otters (Crawford-Cabral and Simões 1987). Historical data on Honey Badger suggest that it was more frequent in the southwest and east of the country, within the Angolan Miombo Woodlands and the Zambezian Baikiaea Woodlands (Crawford-Cabral and Simões 1987), but also occurring in the provinces of Malanje and Moxico (Trombone 2016; MHNG 2018; Rodrigues et al. 2018). Recent surveys have confirmed its presence at Iona, Bicuar, Mupa, Quiçama, Cangandala, Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Fabiano et al. 2017; Fabiano, unpublished data; Overton et al. 2017; Funston et al. 2017; Groom et al. 2018; Monterroso et al., unpublished data; Vaz Pinto, unpublished data).

The Striped Polecat is a generalist that occurs in most habitats except dense rainforests. Historically this species was recorded throughout the country (Trombone 2016; Figueira 2017; Grant and Ferguson 2018; Rodrigues et al. 2018), and is expected to maintain a wide distribution. It was detected in the recent surveys carried out in NPs of southern Angola (Veríssimo 2008; Funston et al. 2017; Monterroso et al., unpublished data). The African Striped Weasel is also a widespread habitat generalist, though it is often overlooked due to its secretive habits. Probably because of this it has a relatively small number of records in Angola, though widely distributed throughout the country (Crawford-Cabral and Simões 1987)

Little is known about the three otter species occurring in Angola, with no systematic surveys available to describe their current status (Crawford-Cabral and Simões 1987). The Congo Clawless Otter (*Aonyx congicus*) is associated with the rainforests of the Congo Basin (Jacques et al. 2015a), and so in Angola should be restricted

to Cabinda and Lunda-Norte. This species is sometimes treated as conspecifc of the African Clawless Otter (*Aonyx capensis*) (Wozencraft 2005), which in spite of the paucity of historical records is thought to have a wide distribution in the east and south of Angola (Veríssimo 2008; Jacques et al. 2015b), and has recently been recorded at the Humpata plateau (Vaz Pinto, unpublished data). The Spotted-necked Otter (*Hydrictis maculicollis*) is likely to be the most widespread otter in freshwater systems throughout Angola (Reed-Smith et al. 2015), though the historical records for the country are relatively few and scattered.

Family Nandiniidae

The African Palm Civet (*Nandinia bionotata*) is the sole representative of the family Nandiniidae (Crawford-Cabral and Simões 1987). Historical records of the species have been mainly made in the provinces of Uíge, Cuanza-Norte, and Lunda-Norte, suggesting its occurrence throughout the north of Angola. There have been no recent published records of this species in Angola, though it probably is still widespread within its former known range in the northern half of the country.

Family Otariidae

The Brown Fur Seal (*Artocephalus pusillus*) is the only pinniped breeding in Angola, with several large colonies in the island of Tigres (Meÿer 2007). This is the northern limit of the species distribution, which extends along the coast of Namibia to Algoa Bay in South Africa (Hofmeyr 2015). Other species occur occasionally along the coast of Angola, with records of for instance Sub-Antarctic Fur Seal (*Arctocephalus tropicalis*) (Carr et al. 1985) and South-Atlantic Elephant Seal (*Mirounga leonina*) (França 1967).

Family Viverridae

The Viverridae in Angola include the African Civet (*Civettictis civetta*), and three species of the genus *Genetta*. The civet was reported to occur in northern (Bengo, Cuanza-Norte and Malanje), central-west (Benguela), and southwest Angola (Namibe and Huíla province) (Crawford-Cabral and Simões 1987), mainly associated with the Western Congolian Forest-Savanna Mosaic, Angolan Scarp Savanna and Woodlands, Angolan Miombo Woodlands. Recent surveys have confirmed its presence at the Mupa, Quiçama, Cangandala, Mavinga and Luengue-Luiana NPs (Veríssimo 2008; Overton et al. 2017; Funston et al. 2017; Groom et al. 2018; Vaz Pinto, unpublished data). The three genets currently recognised in Angola are the Small Spotted Genet (*Genetta genetta*), the Large Spotted Genet (*Genetta maculata*), and the Miombo or Angola Genet (*Genetta angolensis*) (Crawford-Cabral and Simões 1987). Small Spotted Genet was identified as *G. g. felina* by Crawford-Cabral and Simões (1987). Historical records suggest that the species occurred

predominantly in southwestern Angola within the Kaokoveld Desert (Namibe) and the Angolan Mopane and Miombo Woodlands (Huíla and Cunene) (Crawford-Cabral and Simões 1987). Recent surveys have confirmed its presence in southeast Angola in Luengue-Luiana and Mavinga NPs (Funston et al. 2017). Small Spotted Genets may still occur in Bicuar and Mupa NPs, and their surrounding areas, as spotted genets (*Genetta* spp.) have been detected on cameras and roadkills, but not identified to the species level (Overton et al. 2017; Fabiano et al. 2017; Monterroso et al., unpublished data; Vaz Pinto, unpublished data). The taxonomy of the Large Spotted Genet is still to be resolved (Angelici et al. 2016), and it appears to be a 'superspecies' comprising several valid species. Large Spotted Genet was recorded as *G. m. rubiginosa* by Crawford-Cabral and Simões (1987). It appears to have had widespread distribution occurring across the western part of the country (Crawford-Cabral and Simões 1987). Recent surveys have confirmed its presence in southeast Angola in the Luengue-Luiana and Mavinga NPs (Funston et al. 2017), and in Quiçama NP (Groom et al. 2018). The Miombo Genet is considered a near-endemic of the miombo ecoregion (Timberlake and Chidumayo 2011). According to Gaubert et al. (2016), Miombo Genets' westernmost distribution range should be restricted to central Angola's miombo woodlands, as it was mainly present in central, southwest and south-central Angola (Crawford-Cabral and Simões 1987; Trombone 2016; Bohm and Jonsson 2017; Rodrigues et al. 2018). However, Huntley and Francisco (2015) suggest that the species could be widespread across Lunda-Norte province, suggesting its distribution in Angola may be underestimated. Recent surveys have confirmed its presence in Cangandala and Bicuar NPs (Overton et al. 2017; Vaz Pinto, unpublished data).

Cetartiodactyla (Pigs, Hippopotamuses, Chevrotain, Giraffes, Deer, Bovids)

The Cetartiodactyla includes 33 native species of 5 families in Angola. Most species belong to the Bovidae, which is represented by at least 27 species (Crawford-Cabral and Veríssimo 2005). Although this is one of the best-known animal groups in the country, there are many uncertainties regarding the current status and distribution of most species. Given the large number of species, information on this group is provided per family, while the bovidae are presented per tribe.

Family Bovidae

Tribe Aepycerotini

The tribe Aepycerotini comprises only one genus and one species, the Impala (*Aepyceros melampus*). Although up to six subspecies of impala have been listed, their validity was problematic and limits poorly defined (Ansell 1972; Fritz and

Bourgarel 2013). Most often only two races are recognised, the Common Impala (*A. m. melampus*) and the Black-faced Impala (*A. m. petersi*), which is also supported by molecular data (Lorenzen et al. 2006). The Black-faced Impala was described as a new species from a specimen collected at Humbe, Cunene Province (du Bocage 1879), and some authors maintained a dual-species classification (Shortridge 1934; Groves and Grubb 2011). Both taxa naturally occurred in Angola, in two disjunct and well demarcated populations (Crawford-Cabral and Veríssimo 2005). The Common Impala occurs in the southeast of the country between the Cubango and the Cuando rivers, with most historical records obtained along the former (Sokolowski 1903; Wilhelm 1933; Hill and Carter 1941; Huntley 1973c; Crawford-Cabral and Veríssimo 2005). The Common Impala was given as extirpated along the Cubango River by Veríssimo (2008), but subsequently relatively small numbers have been confirmed in the Luengue-Luiana NP (Chase and Schlossberg 2016; Funston et al. 2017). The Black-faced Impala is endemic to Kaokoland in northwestern Namibia and southwestern Angola (Fritz and Bourgarel 2013), but the bulk of its distribution used to be in Angola where it extended as far north as Benguela and mostly west of the Cunene River (Hill and Carter 1941; Swart 1967; Crawford-Cabral and Veríssimo 2005). Before 1975 the Black-faced Impala was represented in protected areas such as Iona, Bicuar and Mupa NPs (Huntley 1972c, 1973c; Crawford-Cabral and Veríssimo 2005). Currently it is likely on the verge of extinction in Angola, as recent surveys have failed to record it in Iona, Bicuar and Mupa NPs (Kolberg and Kilian 2003; Overton et al. 2017; van der Westhuizen et al. 2017). Very small numbers may still linger in eastern Iona (Álvaro Baptista, personal communication), and one single specimen was observed in 2016 near Serra da Neve in northern Namibe province (Vaz Pinto, unpublished data).

Tribe Alcelaphini

The Alcelaphini are represented in Angola by the genera *Damaliscus*, *Alcephalus* and *Connochaetes*. The earlier references mentioning the presence of Tsessebe (*Damaliscus lunatus*) in Angola are scattered (Sokolowski 1903; Monard 1935; Hill and Carter 1941; Varian 1953), but at some point the species was likely to be relatively common and widely distributed across southeastern Angola to the east of the Cunene river, and along the eastern border as far north as the upper Zambezi drainage (Newton da Silva 1970; Huntley 1973c; Crawford-Cabral and Veríssimo 2005). It was once considered common in the plains of Cameia NP and in the areas now included in Luengue-Luiana NP (Crawford-Cabral and Veríssimo 2005). Very little is known in terms of current status of the species in Angola, but it appears to have been much reduced in numbers. Veríssimo (2008) suggested their persistence in northern Luengue and Luiana based only on witness reports, but an extensive aerial survey did not record any Tsessebe in Luengue-Luiana and Mavinga NPs (Chase and Schlossberg 2016). However, the species was confirmed in the area through camera-trapping (Funston et al. 2017).

The taxonomy of the hartebeest, genus *Alcephalus*, is controversial, with some authors considering it a monospecific genus with up to eight subspecies (Flagstad et al. 2001; Gosling and Capellini 2013), while others recognise different species (e.g. Ansell 1972; Groves and Grubb 2011). Two morphologically very distinct taxa occur in Angola in disjunct populations, Red Hartebeest (*A. b. caama*) and Lichtenstein's Hartebeest (*A. b. lichtensteini*), which are often treated as full species (e.g. Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Red Hartebeest used to be widely distributed in southern Angola in the region between the Cunene and Cubango rivers (Sokolowski 1903; Monard 1935; Hill and Carter 1941; Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Red Hartebeest could be found in only one protected area, Mupa NP (Huntley 1973c; Crawford-Cabral and Veríssimo 2005), and by the 1970s the Angolan population was already much reduced and endangered (Huntley 1973c), and was feared extinct in the 1990s (Huntley and Matos 1992). Recent surveys found no evidence of Red Hartebeest in Mupa (Overton et al. 2017) and this taxon is possibly currently extinct in Angola. Lichtenstein's Hartebeest was found in eastern Angola where it was generally uncommon to rare (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Most records were obtained in Lundas and Moxico (Machado 1969), although some earlier authors reported the species in Luiana along the Cuando River, even if not fully supported (Statham 1926; Crawford-Cabral and Veríssimo 2005). Lichtenstein's Hartebeest was once present in Cameia NP, but their current status in Angola is unknown and likely extinct.

Blue Wildebeest (*Connochaetes taurinus taurinus*) used to be widespread across southern and eastern Angola, in Huíla, Cunene, Moxico and Cuando Cubango provinces (Hill and Carter 1941; Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). It was once common in the protected areas of Bicuar and Cameia NPs, and the region currently ascribed to Mavinga and to Luengue-Luiana NPs (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Wildebeest numbers in Angola must have plummeted during the war (Huntley and Matos 1992), while recent surveys and anecdotal records suggest that the species is likely extinct in the western areas of their Angolan range, such as Bicuar NP (Overton et al. 2017). Nevertheless small numbers have recently been recorded in the southeastern corner, both from camera-trapping (Funston et al. 2017) and aerial counts (Chase and Schlossberg 2016).

Tribe Antilopini

Springbok (*Antidorcas marsupialis*) is the only species of gazelle *sensu lato* occurring in Angola and southern Africa. Based on specimens collected south of Benguela, and comparing these with Springbok from South Africa, Blaine (1922) claimed enough differences to justify the description of a new species, Angolan Springbok (*A. angolensis*). It was subsequently considered as one of three subspecies of springbok, *A. m. angolensis*, and extending into Namibia (Ansell 1972; Hill and Carter 1941). However, the distinction among geographical boundaries and intergradation has led to questioning the validity of these races (Skinner 2013). In Angola,

Springbok is strongly associated with the arid coastal belt, and present in the protected areas of Chimalavera, Namibe and Iona (Huntley 1973c, 1974; Crawford-Cabral and Veríssimo 2005). Nevertheless, a few old records are also known from the region of Naulila (Monard 1935; Galvão and Montês 1943–1945; Crawford-Cabral and Veríssimo 2005). Currently it is still present along the coastal plain south of Benguela, albeit in much reduced numbers (Vaz Pinto, unpublished data). Recent aerial surveys in Iona NP have allowed population estimations, suggesting a decreasing trend with an estimated 21% reduction in total numbers between 2003 and 2017 (Kolberg and Kilian 2003; van der Westhuizen et al. 2017).

Tribe Bovini

Buffalo (*Syncerus caffer*) is the sole representative of the Bovini in Africa. Nevertheless its taxonomy remains controversial due to a marked geographical variation and the existence of intermediate forms, which has led to the recognition of several species, subspecies or variants (Grubb 1972; Prins and Sinclair 2013). In Angola at least two forms are known, the typical Cape Buffalo (*S. c. caffer*) of larger body size, dark coloration and large hook-shaped horns, and the Forest Buffalo (*S. c. nanus*) of smaller body size, reddish colour and smaller backward-pointing horns. Notwithstanding, quite a lot of variation has been observed particularly among Angolan forest buffalos, as specimens from northern Angola tend to be larger and darker than those in Cabinda (Crawford-Cabral and Veríssimo 2005). Even though Matschie (1906) has described an additional subspecies (*S. c. mayi*) based on a specimen from Luanda, it was subsequently synonymised with *S. c. nanus*. Forest Buffalo used to have a wide distribution across Cabinda and northern Angola, including in protected areas such as Quiçama NP and Luando Strict Reserve (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Cape Buffalo was mostly present in the southeast, even though an additional small population was known from Bicuar NP (Huntley 1973c) and a few other isolated pockets in Benguela, Cuanza-Sul and Lunda provinces (Crawford-Cabral and Veríssimo 2005). The buffalo populations were severely reduced during the war (Huntley and Matos 1992), but very small numbers of Forest Buffalo are still present in Quiçama NP (Groom et al. 2018), and Cangandala NP and Luando Reserve (Vaz Pinto, unpublished data). Cape Buffalo is not uncommon in Mucusso region and Luengue-Luiana NP (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017). On the other hand, smaller and isolated populations of Cape Buffalo may have been extirpated, such as that which used to occur in Bicuar NP (Overton et al. 2017).

Tribe Cephalophini

The tribe Cephalophini is represented by three genera and six species in Angola. The genus *Cephalophus* corresponds to typical forest duikers, of which four species are known for Angola: White-bellied Duiker (*C. leucogaster*), Bay Duiker (*C.*

dorsalis), Black-fronted Duiker (*C. nigrifrons*), and Yellow-backed Duiker (*C. silvicultor*). The White-bellied Duiker was reported from Cabinda based on a witness account obtained in the 1970s (Brian Huntley, personal communication), and subsequently added to the Angolan list (Crawford-Cabral and Veríssimo 2005). The species is known to occur in Maiombe forest across the border in Congo (Malbrant and Maclatchy 1949; East 1999), but further evidence of its presence in Angola is still lacking. Both Bay Duiker and Black-fronted Duiker have been recorded from moist forest habitats in the northern half of the country, including Cabinda (Huntley 1973c; Huntley and Matos 1992; Crawford-Cabral and Veríssimo 2005). Although no recent studies are available, the regular presence of both species in bushmeat markets in northwestern Angola (Vaz Pinto, unpublished data) suggest they may still be relatively common in spite of the poaching pressure. Yellow-backed Duiker is the largest of duikers and is also widely, yet discontinuously, distributed across the northern half of the country and including Cabinda (Machado 1969; Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Unlike the previous species, Yellow-backed Duiker is less dependent on moist forest habitats, being mostly an ecotone species (Kingdon and Lahm 2013). In spite of the scarcity of records, it appears well adapted to the riverine forests and thickets of central Angola, venturing into nearby well-developed miombo woodlands (Vaz Pinto and Veríssimo 2016) and present even on the Angolan highlands (Statham 1922; Hill and Carter 1941), possibly in transition to Afromontane patches. Recent observations suggest the species to be relatively common in Luando Strict Reserve, and venturing into the upper catchments of the Okavango and Zambezi drainages (Vaz Pinto and Veríssimo 2016; NGOWP 2018). Angolan Yellow-backed Duikers are assigned to the subspecies *C. s. ruficrista*, of which the type locality given is Luanda (du Bocage 1869).

Blue Duiker (*Philantomba monticola*) is especially common along the escarpment and in various types of forests and thickets along the coastal plain north of 15° latitude, and including Cabinda (Crawford-Cabral and Veríssimo 2005). On the plateau it is present north of 13° latitude but it is here less common, patchily distributed, and associated with riverine forests (Crawford-Cabral and Veríssimo 2005; Vaz Pinto, unpublished data). Blue Duiker is still abundant in Quiçama NP (Groom et al. 2018), while present in Cangandala NP (Vaz Pinto unpublished data), and has recently been photographed on the upper catchments of the Cuito River (NGOWP 2018). Three subspecies have been tentatively ascribed to Blue Duiker from Angola, but their validity remains unclear (Ansell 1972; Crawford-Cabral and Veríssimo 2005; Hart and Kingdon 2013). Under this classification, the population in Cabinda is assigned to *P. m. congicus*, and those on the plateau to *P. m. defriesi*, while the blue duikers from the escarpment and western Angola correspond to an endemic race, *P. m. anchietae* (Ansell 1972; Crawford-Cabral and Veríssimo 2005; Hart and Kingdon 2013).

Grey or Common Duiker (*Sylvicapra grimmia*) is likely the most widespread and common of all Angolan antelopes (Statham 1922; Crawford-Cabral and Veríssimo 2005). It probably still occurs in all Angolan protected areas, except Iona and Maiombe NPs, and throughout the country (Crawford-Cabral and Veríssimo 2005; Veríssimo 2008; Funston et al. 2017; Overton et al. 2017; Groom et al. 2018; NGOWP 2018; Vaz Pinto, unpublished data). Although many subspecies of Grey Duiker have been suggested, the continuous distribution of the species in sub-

Saharan Africa and the existence of local intergrading variants prevents clear delineation of boundaries (Ansell 1972; Wilson 2013). In Angola most are assigned to *S. g. splendidula*, and the race is thought to intergrade with *S. g. steinhardti* in southwestern Angola (Hill and Carter 1941; Crawford-Cabral and Veríssimo 2005; Wilson 2013).

Tribe Hippotragini

The tribe Hippotragini contains seven extant species, of which three can be found in Angola, including two representatives of the genus *Hippotragus* and one of *Oryx*. The Roan Antelope (*Hippotragus equinus*) is the most common and widely distributed large antelope in Angola, historically being absent only from Cabinda and the arid southwest (Huntley 1973c; Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). It used to be present in all existing protected areas except Iona NP and Namibe Partial Reserve (Crawford-Cabral and Veríssimo 2005), and was once considered abundant in Quiçama and Bicuar NPs (Huntley 1973c; Huntley and Matos 1992). As a result of the civil war the species has been extirpated from Quiçama NP (Huntley and Matos 1992; Groom et al. 2018; Vaz Pinto, unpublished data), but it remains relatively common in Bicuar NP (Overton et al. 2017) and Luando Strict Nature Reserve (Vaz Pinto, unpublished data), while small numbers still linger in Mupa (Overton et al. 2017) and Cangandala NPs (Vaz Pinto et al. 2016). In addition the species has also been confirmed recently in various surveys conducted across central and eastern Angola (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017; NGOWP 2018), and likely remains widespread even if in reduced numbers throughout most of the country except on the coastal plain. Roan intraspecific taxonomy is still unresolved, but the Angolan race is usually ascribed to the Zambezian region subspecies *H. e. cottoni* (Ansell 1972; Chardonnet and Crosmary 2013; Vaz Pinto 2018).

Sable Antelope (*Hippotragus niger*) had a highly fragmented distribution in Angola, with three disjunct populations corresponding to three different subspecies (Crawford-Cabral and Veríssimo 2005; Estes 2013; Vaz Pinto 2018, 2019). Giant Sable (*H. n. variani*) is an endemic and critically endangered taxon, confined to the Cuanza drainage, and being the most famous Angolan mammal is dealt with in a separate dedicated chapter (see Vaz Pinto 2019). The occurrence of Kirk's Sable (*H. n. kirkii*) in eastern Angola was confirmed by a few scattered records from Cazombo, east of the Zambezi River, and in the Lundas, on the western banks of the Cassai River (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). No records for this taxon have been obtained in Angola for over 40 years and we are unaware of any witness reports, thus suggesting the possibility of local extinction. The typical race *H. n. niger* is known from southeastern Angola to the east of the Cuito river (Hill and Carter 1941; Huntley 1973c; Crawford-Cabral and Veríssimo 2005; Vaz Pinto 2018), a region that broadly corresponds to the newly proclaimed Mavinga and Luengue-Luiana NPs. Recent surveys have confirmed typical sable to be still relatively common in the region and clearly outnumbering congeneric roan antelope (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017), and very

recently a dispersing male has been recorded as far north as southern Moxico (Kerllen Costa, personal communication)

Gemsbok (*Oryx gazelle*) in Angola is mostly associated with the Namib desert in the southwestern corner, but its distribution used to extend along the semi-arid coastal plain as far north as near Benguela (Blaine 1922; Statham 1922; Hill and Carter 1941; Crawford-Cabral and Veríssimo 2005), and in Cunene province at least as far inland as Cuamato and Chimporo (Monard 1935; Crawford-Cabral and Veríssimo 2005). Specimens from southwestern Angola have led to the description of a local endemic subspecies of gemsbok *O. g. blainei* based on facial mask differences (Blaine 1922; Hill and Carter 1941; Newton da Silva 1970). However the species is currently assumed to be monotypic (Knight 2013). Gemsbok may have been extirpated from most of its Angolan range in the second half of the twentieth century (Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005), while remaining abundant in Iona NP (Huntley 1973c). The numbers were then likely much reduced during the civil war (Huntley and Matos 1992), and although they may still be relatively common in Iona, recent surveys suggest the general trend has remained negative (Kolberg and Kilian 2003; van der Westhuizen et al. 2017).

Tribe Madoquini

The sole Madoquini in Angola is Kirk's Dik-dik (*Madoqua kirkii*). The species was first collected in Angola by Anchieta in 1878, and specimens obtained near Lobito led to the description of a new subspecies, *M. k. variani*, which was later synonymised with *M. k. damarensis* (Drake-Brockman 1909, 1930; Hill and Carter 1941; Newton da Silva 1970; Kingswood and Kumamoto 1997). Angolan dik-diks are part of a southwest African population that extends well into Namibia, ascribed to the subspecies *M. k. damarensis*, although the huge geographical gap that separates these from the populations in the horn of Africa added by some morphological characters and genetic evidence, suggest they should be best treated as full species (Kumamoto et al. 1994; Zhang and Ryder 1995; Brotherton 2013). In Angola dik-diks are associated with the semi-arid environments and particularly with Mopane (*Colophospermum mopane*) woodlands, but also extending into the southern plateau west of the Cunene River (Crawford-Cabral and Veríssimo 2005). The species is well represented in protected areas such as Chimalavera and Namibe Reserves, and Iona and Bicuar NPs (Huntley 1973c; Crawford-Cabral and Veríssimo 2005; Vaz Pinto, unpublished data).

Tribe Oreotragini

Klipspringer (*Oreotragus oreotragus*) is the only representative of the Oreotragini, but its taxonomy is one of the most hotly debated within African bovids, both in terms of the relationships with other clades and among various populations. Ansell (1972) recognised 11 subspecies, while Groves and Grubb (2011) distinguished up to 20 taxa and elevated them to full species, but the latter still lacks molecular support and the monospecific classification is still the most widely accepted. Angolan

klipspringers have been attributed to the subspecies *O. o. tyleri* described from a specimen obtained in Equimina, Benguela (Hinton 1921). They likely form part of a metapopulation that extends into Namibia (Crawford-Cabral and Veríssimo 2005; Roberts 2013), where a second subspecies *O. o. cunenensis* (Zukowsky 1924) described near Ruacana falls has been synonymised with the former (Hill and Carter 1941; Ansell 1972). Klipspringer occurs in Angola in rocky mountainous habitats, particularly in southern Angola and along the escarpment, with the northernmost population present at Pungo Andongo (Crawford-Cabral and Veríssimo 2005), and the easternmost population was reported from the region of Cassinga (Monard 1935; Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). The species used to be relatively common in Iona NP, and Chimalavera and Namibe Reserves (Huntley 1973c; Juste and Carballo 1992; Crawford-Cabral and Veríssimo 2005), and in spite of absence of recent data it is still often observed in southwestern Angola and along the southern escarpment (Vaz Pinto, unpublished data).

Tribe Ourebiini

This tribe is monospecific, comprising only the Oribi (*Ourebia ourebi*), which has a wide distribution in Africa and across southcentral and eastern Angola (Crawford-Cabral and Veríssimo 2005; Brashares and Arcese 2013). Up to 13 subspecies of Oribi have been described, but their validity remains problematic (Brashares and Arcese 2013). Two subspecies were described from specimens collected in Angola, namely *O. o. rutila* from Luando Reserve (Statham 1922), and *O. o. leucopus* (Monard 1930). The latter was subsequently synonymised with the former, and considered to extend into Caprivi, Botswana and west Zambia (Ansell 1972; Crawford-Cabral and Veríssimo 2005; Brashares and Arcese 2013). In Angola the species occurs in open savanna habitats above 1000 m, and used to be present in protected areas such as Luando Reserve, Bicuar, Mupa and Cameia NPs, and across southeastern Angola (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Two references reporting the presence of oribi on the southern coastal plain (Statham 1922; Fenykovi 1953) are dubious and may result from misidentification of Steenbok (Crawford-Cabral and Veríssimo 2005). Recent surveys have failed to record the species in Mupa and Bicuar (Overton et al. 2017) and in Mucusso (Veríssimo 2008). Anecdotal evidence suggestes its presence in the upper catchments of the Okavango (NGOWP 2018), and they were recorded by camera traps in Luengue-Luiana NP (Funston et al. 2017). Small numbers are still present and have been recently observed and photographed in Luando Reserve and Cameia NP (Vaz Pinto, unpublished data).

Tribe Raphicerini

Only one species of Raphicerini has been confirmed in Angola, the Steenbok (*Raphicerus campestris*), occurring south of 12° latitude, being most common in semi-arid habitats in the coastal plain but also present inland from Huíla to Cuando Cubango provinces (Crawford-Cabral and Veríssimo 2005). The species used to be

common and is still present in Iona, Bicuar and Mupa NPs, and in the recently designated Luengue-Luiana and Mavinga NPs (Huntley 1973c; Veríssimo 2008; Funston et al. 2017; Overton et al. 2017). A remarkable record was one specimen collected south of Namibe at Lagoa S. João do Sul, with very long hooves, suggesting an isolated population and local adaptation to muddy terrain (Simões and Crawford-Cabral 1988; Crawford-Cabral and Veríssimo 2005). Recent surveys have extended the species distribution northwards into the upper catchment of the Okavango (NGOWP 2018), adding to records from the Cuito River source and from near Cuemba (Vaz Pinto, unpublished data). Interestingly, witness accounts reported unusual behaviour displayed by the latter Steenbok, also suggesting isolation and local adaptation (Vaz Pinto, unpublished data). Several subspecies have been proposed and Ansell (1972) recognised eight races, but these remain unclear and often only two are accepted, with the nominate subspecies *R. c. campestris* being assigned to all populations in southern Africa (du Toit 2013). A congeneric species, Sharpe's Grysbok (*Raphicerus sharpei*), has never been recorded in Angola but it may well be present in the regions of Cazombo or Luiana, as it is known to occur in western Zambia and east Caprivi, very close to the Angolan border (Ansell 1972; Hoffman and Wilson 2013).

Tribe Reduncini

The tribe is represented in Angola by the genera *Redunca* and *Kobus*, comprising four species in total. Southern Reedbuck (*Redunca arudinum*) had a wide, albeit discontinuous distribution associated with grassy patches near drainage lines, and was present throughout the country except in Cabinda and the arid southwest (Newton da Silva 1970; Huntley 1973c; Crawford-Cabral and Veríssimo 2005). The species was especially common in protected areas such as Quiçama, Cangandala, Cameia and Bicuar NPs, Luando Reserve, and the southeast regions (Huntley 1973c, 1974; Crawford-Cabral and Veríssimo 2005). Although a recent camera-trap survey has failed to record the species in Bicuar and Mupa (Overton et al. 2017), they may still be present, and have been recorded on surveys conducted in Mucusso, Luengue-Luiana and Mavinga (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017). Even if in much reduced numbers, Reedbuck is also still found in Quiçama NP (Groom et al. 2018), and in Cangandala NP and Luando Strict Reserve (Vaz Pinto, unpublished data). The intraspecific taxonomy of Reedbuck is still unresolved, but often two subspecies are recognised and separated by the Zambezi River (Ansell 1972; Kingdon and Hoffmann 2013), with the Angolan populations corresponding to the typical race *R. a. arundinum*.

The genus *Kobus* comprises the remaining three species of Reduncini present in Angola. Puku (*Kobus vardonii*), is a relatively rare antelope that used to have its westernmost populations in Angola (Jenkins 2013). The species was mostly recorded in northeastern Angola, and a lot of what is known is due to the studies of Machado (1969). Puku used to occur, albeit in low numbers, in Luando Strict

Reserve (Statham 1922; Huntley 1973c), possibly corresponding to an isolated and westernmost subpopulation, but appears now to be absent (Vaz Pinto, unpublished data). An old record reported to have been obtained in Huíla province (du Bocage 1902), is generally dismissed as mistaken (Crawford-Cabral and Veríssimo 2005), and the southernmost record was obtained by Wilhelm Trense in Luiana (Crawford-Cabral and Veríssimo 2005). The species has not been recorded in Angola in over 40 years and it is thus possibly extinct. Southern Lechwe (*Kobus leche*) used to be widely distributed along river drainages in central and eastern Angola, only marginally overlapping with Puku in Luando Reserve and possibly Luiana (Crawford-Cabral and Veríssimo 2005). Angolan Lechwe was suggested by Sokolowski (1903) to constitute a separate species *Adenota* (=*Kobus*) *amboellensis*, but it was subsequently synonymised with the typical race also known as Red Lechwe *K. l. lechwe*. Red Lechwe seems to have been extirpated from a large portion of their former range in Angola, when only a relic population survived in Luando Reserve (Vaz Pinto, unpublished data), but larger populations have recently been recorded in the upper catchments of the Okavango (NGOWP 2018), and in the Luengue-Luiana and Mavinga NPs (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017).

Waterbuck (*Kobus ellipsiprymnus*) comprises two very distinct subspecies that often are considered to warrant full species status, and both have been recorded in Angola. Common Waterbuck (*K. e. ellipsiprymnus*) is very localised in the country, and only known to occur along the lower Cuando River in Luengue-Luiana NP (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Current status is unknown, as various surveys failed to record the species (Veríssimo 2008; Chase and Schlossberg 2016), though a recent survey reported finding carcasses (Funston et al. 2017). The other taxon present in Angola is currently ascribed to Defassa Waterbuck (*K. e. defassa*), as previous attempts to recognise geographical variants attributed to Angolan waterbuck such as *K. e. penricei* (Hill and Carter 1941; Ansell 1972) have been abandoned in favour of synonymy with *K. e. defassa*. Defassa Waterbuck used to be widely distributed in Angola but were usually uncommon (Huntley 1973c; Crawford-Cabral and Veríssimo 2005), and in protected areas were only represented in Cangandala, Luando and Bicuar NPs (Statham 1922; Huntley 1973c). A recent survey failed to record the species in Bicuar NP where it is feared extinct (Overton et al. 2017). Nevertheless small numbers are still present across northeasten Angola, including Cangandala and Luando (Vaz Pinto, unpublished data).

Tribe Tragelaphini

Four species of Tragelaphini are known from Angola (Crawford-Cabral and Veríssimo 2005), all currently lumped within the genus *Tragelaphus*: Kudu (*T. strepsiceros*), Bushbuck (*T. scriptus*), Sitatunga (*T. spekii*) and Common Eland (*T. oryx*). Kudus used to be widely distributed in southern Angola, and along the semi-arid coastal plain (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). Although reported previously (Huntley 1972c, 1973c), recent surveys have not recorded Kudu in Iona NP (Kolberg and Kilian 2003; van der Westhuizen et al. 2017), but they are

still relatively common in Bicuar and Mupa NPs (Overton et al. 2017) and small numbers have been confirmed in the southeastern Cuando Cubango (Veríssimo 2008; Funston et al. 2017). The distinction among Kudu subspecies has remained dubious due to variability of morphological characteristics and intergradation (Owen-Smith 2013).

Bushbuck in Angola have been ascribed to the subspecies *T. scriptus ornatus* (Crawford-Cabral and Veríssimo 2005), but the species taxonomy is highly problematic. Genetic studies have revealed two highly divergent and non-monophyletic mitochondrial clades which provided support for two species: *Tragelaphus scriptus* and *T. sylvaticus* (Moodley and Bruford 2007; Moodley et al. 2009). This however still lacks confirmation with nuclear and morphological data (Hassanin et al. 2012). Angolan animals could be important to disentangle the phylogenetic relationships within Bushbuck, as they are relatively common and widespread across central and northern Angola, where the boundary between both clades may be found. Bushbuck has remained common in northern Angola, including in protected areas such as Quiçama, Cangandala and Luando (Huntley 1973c; Groom et al. 2018; Vaz Pinto, unpublished data), and features prominently in bushmeat markets (Bersacola et al. 2014; Groom et al. 2018; Vaz Pinto, unpublished data). It was generally uncommon in the southern regions, and recent surveys have failed to detect the species in Mupa and Bicuar NPs (Overton et al. 2017). Small numbers were recorded in the Luengue-Luiana region (Veríssimo 2008; Funston et al. 2017).

Sitatunga had a relatively wide distribution in Angola, following the main river systems but excluding the coastal plain (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). The species is still present in protected areas such as Cangandala and Luando Reserve (Vaz Pinto, unpublished data) or in Luengue-Luiana (Veríssimo 2008; Funston et al. 2017). Additional records have been obtained from northern Malanje and Lunda-Norte (Huntley and Francisco 2015; Vaz Pinto, unpublished data). Traditionally two subspecies of Sitatunga have been recognised in Angola, *T. s. gratus* in northern and central Angola, and *T. s. selousi* within the Zambezi and Okavango drainages (Crawford-Cabral and Veríssimo 2005).

Common Eland used to be relatively widespread in Angola, except in the forest biomes of the northwest (Crawford-Cabral and Veríssimo 2005). It was once abundant in Quiçama NP and in the hunting concessions of southeastern Angola (Newton da Silva 1970; Huntley 1973c; Crawford-Cabral and Veríssimo 2005), while present in low numbers in Iona, Bicuar, Mupa and Cangandala NPs and Luando Reserve (Huntley 1973c; Crawford-Cabral and Veríssimo 2005). The species is now extinct in Quiçama NP (Groom et al. 2018) and Cangandala NP (Vaz Pinto, unpublished data), and has not been recorded in mammal surveys conducted in Iona and Mupa NPs (Kolberg and Kilian 2003; Overton et al. 2017; van der Westhuizen et al. 2017). A small population may still linger in Luando (Vaz Pinto, unpublished data) and Bicuar NP (Overton et al. 2017), and relatively larger numbers in Luengue-Luiana NP (Veríssimo 2008; Funston et al. 2017). Angolan Eland have often been attributed to the subspecies *T. oryx livingstoni* (Crawford-Cabral and Veríssimo 2005; Thouless 2013), but intergrading with the nominate race *T. o. oryx* in southern Angola (Ansell 1972; Crawford-Cabral and Veríssimo 2005; Thouless 2013). It has been argued

that Eland of the semi-arid biomes along the coastal plain could be ascribed to the nominate race, while the remaining could be ascribed to *T. o. livingstoni* (Crawford-Cabral and Veríssimo 2005).

Family Giraffidae

Angolan giraffes used to be ascribed to *Giraffa camelopardalis angolensis* (Lydekker 1904; Ciofolo and Le Pendu 2013), although recent molecular studies have proposed a four species classification, under which they would correspond to *G. giraffa angolensis* (Fennessy et al. 2016). Two disjunct populations were known in Angola, one in Cunene and southern Huíla provinces, and the other in Cuando Cubango east of Cuito River (Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). Once the symbol of Mupa NP, in the early 1970s the giraffe was already on the brink of extinction (Huntley 1973c), and was presumed extinct in Angola by the 1990s (Huntley and Matos 1992; Juste and Carballo 1992). Recent surveys are consistent with the species extinction in Mupa (Overton et al. 2017), but records obtained from spoor and from aerial surveys have demonstrated the persistence of pocket populations in the areas corresponding to the current Luengue-Luiana NP (Veríssimo 2008; Chase and Schlossberg 2016).

Family Hippopotamidae

The sole hippopotamus species in Angola is the Common Hippopotamus (*Hippopotamus amphibius*). This species is relatively widespread, and used to be found across most large rivers and drainage basins in the country (Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). The hippopotamus in Angola have been ascribed to *H. a. constrictus*, although subspecific taxonomy remains controversial for this species and is often ignored (Klingel 2013). Although once common, the hippopotamus has suffered from human direct persecution. In the 1970s it had become rare in the country and reduced to small pockets in larger rivers, and this situation may have deteriorated since (Huntley 1973c; Huntley and Matos 1992; Juste and Carballo 1992). Although no study has addressed specifically the hippopotamus populations in Angola, recent general surveys have reported its presence in isolated pockets along rivers such as Cuanza, Queve and Luando (Vaz Pinto, unpublished data), and in the middle to lower sections of various rivers within the Okavango and Zambezi basins (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017; NGOWP 2018). Small populations are still present in Quiçama NP and Luando Strict Reserve (Groom et al. 2018; Vaz Pinto, unpublished data), but based on recent surveys they appear to have disappeared from the southern Cunene system, namely within Iona, Mupa and Bicuar NPs (Kolberg and Kilian 2003; Overton et al. 2017; van der Westhuizen et al. 2017).

Family Suidae

Three species of wild suids occur in Angola, but no studies have yet focused on Angolan pigs. The Bushpig (*Potamochoerus larvatus*) is widespread, and possibly only naturally absent from Cabinda and the arid southwest (Crawford-Cabral and Veríssimo 2005). Data on Bushpig distribution have been reported by several authors (e.g. Statham 1922; Monard 1935; Hill and Carter 1941; Newton da Silva 1970; Huntley 1973c), but mostly refer to scattered and localised records. The species has recently been recorded in various surveys in protected areas (Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017; Overton et al. 2017; Groom et al. 2018; NGOWP 2018; Vaz Pinto, unpublished data). Two subspecies have been recognised in the past in Angola, *P. l. johnstoni* and *P. l. cottoni*, but the species displays a large amount of individual variation and both have been subsequently synonymised with *P. l. koiropotamus* (Grubb 1993; Crawford-Cabral and Veríssimo 2005; Seydack 2013). Formerly treated as conspecific with bushpigs, the Red River Hog (*Potomochoerus porcus*) in Angola is confirmed only in Cabinda, and little is known about its possible occurrence in Lunda's provinces or possible intergradation with the previous species (Crawford-Cabral and Veríssimo 2005; Leus and Vercammen 2013; Seydack 2013). Common Warthog (*Phacochoerus africanus*), were relatively widespread in Angola, and used to be locally common, even if irregularly distributed (Crawford-Cabral and Veríssimo 2005; Huntley 1973c). Recently, it has been regularly recorded in various protected areas (e.g. Funston et al. 2017; Overton et al. 2017; Groom et al. 2018; NGOWP 2018; Vaz Pinto, unpublished data). Angolan warthogs may correspond to the subspecies *P. a. sundervalli* (Cumming 2013), but geographic variation and transition among different forms remains unresolved. Some early authors (Statham 1922; Monard 1935; Varian 1953) have reported the existence of a giant pig in central Angola, based on local witness accounts, which they tentatively ascribed to the giant forest hog (*Hylochoerus meinertzhageni*), but these reports are generally dismissed, and were likely based on tales or misidentification of bushpigs (Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005).

Family Tragulidae

Water Chevrotain (*Hyemoschus aquaticus*) was first confirmed for Angola in Cabinda (Huntley 1973c), although it was also reported to occur in Lunda-Norte along the Cassai River (Crawford-Cabral and Veríssimo 2005). More recent witness accounts suggest the occurrence of the species in forest streams and nearby flooded areas in Uíge Province (Michael Mills, personal communication). It is possible that the Water Chevrotain has a wider distribution across northern Angola in forest habitats, but the elusive nature of the species and lack of studies prevent any conclusions at this stage.

Chiroptera (Bats)

With 73 species recorded, bats (Chiroptera) are the second most speciose order of mammals in Angola after the rodents. This represents about one third of the bat species known to occur in mainland Africa (Happold and Happold 2013), and almost two thirds of the species reported for the southern Africa region (Monadjem et al. 2010a). Angola is therefore a particulary rich country for bats in southern Africa, compared with other species-rich countries such as Mozambique (67 species), Zambia (65), Malawi (62) and Zimbabwe (62) (Monadjem et al. 2010b). Considering that Angola is one of the least known southern African countries with respect to bats, more species are likely to be found as new surveys are carried out throughout the country. For instance, three of the 73 species reported here have been found recently during the course of just a few weeks of fieldwork (Taylor et al. 2018c). Even new (and possibly endemic) species may be found, particularly on the western escarpment region and Afromontane forests that are high in bird endemism, and in species with restricted and fragmented distributions (Mills et al. 2011, 2013).

The inventory of Angolan bats started in the nineteenth century (e.g. Peters 1870; du Bocage 1889a, 1898; Seabra 1898a, b). A substantial number of records was added later by various authors including Thomas (1904), Hill and Carter (1941), Sanborn (1950), Hayman (1963) and finally by Crawford-Cabral (1986), who also reviewed all the information then available. Little research on bats has been done in Angola in the past few decades, and to our knowledge no studies of bat ecology have been carried out in the country. There are important taxonomic issues to be resolved in most families, and the existing records for the majority of species are old and scarce, so the descriptions of bat ranges in the following sections should be considered as provisional. Also, no recent bat surveys have been conducted in any of the remaining Afromontane forests and adjacent grasslands along the escarpment, and this must remain a critical zone for future surveys.

Family Emballonuridae

There are three species of Emballonuridae in Angola (Monadjem et al. 2010a; Happold and Happold 2013). The Mauritian Tomb Bat (*Taphozous mauritianus*) occurs widely in a variety of habitats and often roosts in buildings inhabited by people, but in Angola it is only known from scattered records. African Sheath-tailed Bat (*Coleura afra*) is a rare species in southern Africa, which in Angola is known from just two records in the coastal area near Benguela, but this species may have been overlooked. Giant Pouched Bat (*Saccolaimus peli*) is a species mainly found in the Rainforest Belt Zone of Africa, with an isolated record in eastern Angola, but it may have been overlooked in much of the northern region of the country.

Family Hipposideridae

There are five species of Hipposideridae recorded in Angola (Monadjem et al. 2010a; Happold and Happold 2013). One of these is the African Trident Bat (*Triaenops afer*), which is now included in the separate family Rhinonycteridae (Foley et al. 2015). This is a tree-roosting species with a widespread, albeit patchy distribution, with the isolated Congolese population encompassing Cabinda and the extreme northwest of the country corresponding to the subspecies *T. a. majusculus* Allen et Brosset, 1968, though this is not widely recognised (Benda and Vallo 2009). The Sundevall's Leaf-nosed Bat (*Hipposideros caffer*) is also wide ranging, but represents a complex of species and requires urgent taxonomic revision (Vallo et al. 2008). Most existing records are from western Angola, where the populations presumably belong to the form *H. caffer angolensis* Seabra, 1898 (which is currently placed in the species *H. ruber* - see below), but the species also seems to be present in the extreme east of the country, representing an edge of a much larger range in Central and East Africa (Kock et al. 2008). The Giant Leaf-nosed Bat (*Macronycteris gigas*) is mostly a lowland forest and moist savanna species, which in Angola occurs in Cabinda and penetrates southwards along the northern section of the escarpment (Monadjem et al. 2010a). The type locality of this species is in Benguela, in semi-arid savanna that is atypical regarding its habitat requirements. This species is difficult to separate from Striped Leaf-nosed Bat (*M. vittatus*), making it problematic to ascertain its actual distribution. Noack's Leaf-nosed Bat (*H. ruber*) has similar habitat affinities but may be widespread in the country. However, due to previous confusion of this species with *H. caffer* means that the distribution of *H. ruber* remains mostly unknown in Angola, which itself represents a complex of multiple species (Monadjem et al. 2013a). Finally, Striped Leaf-nosed Bat is a species forming very large cave roosting colonies, which is judged to occur mainly in southern Angola.

Family Miniopteridae

The Natal Clinging Bat (*Miniopterus natalensis*) is the only Miniopteridae judged at present to occur in Angola (Monadjem et al. 2010a; Happold and Happold 2013). However, this is a species distributed mostly in East and southern Africa, with a handful of records in western and southern Angola (e.g., Grant and Ferguson 2018; MHNG 2018). The population of Namibia and Angola appears to be largely isolated from eastern populations, but they do not appear to be phylogenetically distinct (Monadjem et al. 2013b). Some specimens collected in 1954 in the Huíla province have been identified as Black Clinging Bat (*Miniopterus fraterculus*), but this is a great distance from the known distribution of the species in the eastern parts of South Africa, suggesting that they are probably misidentifications (Monadjem et al. 2013b). The Greater Long-fingered Bat (*Miniopterus inflatus*) may occur in Angola and has probably been overlooked there (Monadjem et al. 2010a).

Family Molossidae

The Molossidae is represented by ten species in Angola. Many of these are known from only a few and scattered records in the country (Monadjem et al. 2010a), making it difficult to recognise distribution patterns. The White-bellied Free-tailed Bat (*Mops niveiventer*) seems to be one of the most widespread species. It is mostly associated with mature miombo woodland and occurs widely in Central Africa. The similar Angolan Free-tailed Bat (*M. condylurus*) is widespread in sub-Saharan Africa, but its distribution in Angola is poorly known. Some Molossidae seem to have rather isolated populations in Angola (Monadjem et al. 2010a), which may prove to be phylogenetically distinctive. Ansorge's Free-tailed Bat (*Chaerephon ansorgei*) is a species of dry woodland savanna, with a restricted population in western Angola that is isolated from the remaining known range of the species in the eastern side of southern Africa. Little Free-tailed Bat (*C. pumilus*) occurs widely in sub-Saharan Africa and is widespread and abundant in eastern parts of southern Africa, but in the west seems to be restricted to an isolated population in northwestern Angola and neighbouring DRC. Pale Free-tailed Bat (*C. chapini*) is sparsely distributed in southern Africa, occurring mainly in northern Botswana and northeastern Zimbabwe and Zambia, with records in northern Namibia, western Angola and DRC representing an isolated population.

The other Molossidae occur marginally or have only scattered records in Angola, which may reflect environmental constraints but may also be due to poor survey efforts. Roberts's Flat-headed Bat (*Sauromys petrophilus*) is an arid zone specialist for which there is an old record from Moçamedes (Crawford-Cabral 1986). Egyptian Free-tailed Bat (*Tadarida aegyptiaca*) is widespread in southern Africa, but it occurs only marginally in the south of Angola. The range of Midas Free-tailed Bat (*M. midas*) also seems to reach the south of Angola, where it was tentatively detected accoustically in a recent survey (Taylor et al. 2018c). In southern Africa the Nigerian Free-tailed Bat (*C. nigeriae*) occurs in northwestern Namibia, northern Botswana, Zimbabwe, Zambia and marginally in Angola and the DRC, though modelling of the environmental niche suggests that the species may have been overlooked in the country (Monadjem et al. 2010a). The Large-eared Free-tailed Bat (*Otomops martiensseni*) has a localised distribution in southern Africa, with scattered records from Angola, Zimbabwe, Zambia, Malawi and the DRC.

Family Nycteridae

All but one of the six Nycteridae species recorded in Angola have distributions centered in Central and/or Western Africa and the country is at the southern edge of their distribution (Monadjem et al. 2010a; Happold and Happold 2013). Dwarf Slit-faced Bat (*Nycteris nana*), Intermediate Slit-faced Bat (*N. intermedia*), and Bate's Slit-faced Bat (*N. arge*) are mostly associated with lowland rainforests with very few records in Angola, where they are probably restricted to the northern regions. Large-eared Slit-faced Bat (*N. macrotis*) is thought to prefer savannas, and although

the known records are all in northern Angola its range in Zambia and Botswana suggests that it is also present further south. Hairy Slit-faced Bat (*N. hispida*) is a species widespread in sub-Saharan Africa that uses a variety of habitats, which occurs throughout central and northern Angola. Egyptian Slit-faced Bat (*Nycteris thebaica*) is a savanna species with wide habitat tolerance and very widespread in southern Africa, though most records in Angola were obtained in the southwest (Monadjem et al. 2010a).

Family Pteropodidae

A total of 15 species of pteropid fruit bats has been reported in Angola (Monadjem et al. 2010a; Happold and Happold 2013), although the actual number of species present is likely to be greater than this. Further work may reveal the presence of additional species, particularly in the poorly surveyed Maiombe rainforest and savanna-forest mosaics of Cabinda. It is interesting to note that several of the currently recognised pteropid species have a type locality in the country. This is the case in the Angolan Soft-furred Fruit Bat (*Myonycteris angolensis*), Anchieta's Fruit Bat (*Plerotes anchietae*), Dobson's Epauletted Fruit Bat (*Epomops dobsonii*), Lesser Angolan Epauletted Fruit Bat (*Epomophorus grandis*), Hayman's Dwarf Epauletted Fruit Bat (*Micropteropus intermedius*), and Angolan Epauletted Fruit Bat (*E. angolensis*). The latter species is a near endemic, present only in Angola and northern Namibia, while Hayman's Dwarf and Lesser Angolan Epauletted Fruit Bats are only known from Angola and Congo.

The information available on the range of pteropids in Angola is insufficient to make a definitive identification of distribution patterns, but some can be provisionally suggested. Overall, species diversity declines from north to south, because most species of pteropids are dependent on well-wooded habitats and abundant fruit resources. In fact, a few rainforest species that have the centre of their range in Congo are known only in Cabinda and in some of the large pockets of moist forests in the northern provinces. Species displaying this pattern include the Woermann's Long-tongued Fruit Bat (*Megaloglossus woermanni*), Franquet's Epauletted Fruit Bat (*E. franqueti*), Angolan Soft-furred Fruit Bat, Hammer-headed Fruit Bat (*Hypsignathus monstrosus*), and Little Collared Fruit Bat (*Myonycteris torquata*). Existing data suggest that at least some of these species extend their range southward along the narrow band of forests of the Angolan Escarpment. Other species associated with moist tropical forests and savannas occur more widely, extending their range into northern Angola, as it is the case with Little Collared Fruit Bat and Peter's Dwarf Epauletted Fruit Bat (*Micropteropus pusillus*).

The most abundant pteropid in the species-poor south of Angola seems to be the Angolan Epauletted Fruit Bat. It has a broad latitudinal range, although all the records are in the western half of the country. In the drier regions it may be mostly dependent on riverine woodlands. Peters's Epauletted Fruit Bat (*E. crypturus*) has been captured in one locality in the south of Angola but its range in the neighbouring countries suggests that it may have a broad distribution in the south and east of

Angola, where only limited surveys have been conducted (Crawford-Cabral 1986). Wahlberg's Epauletted Fruit Bat (*E. wahlbergi*) and Straw-coloured Fruit Bat (*Eidolon helvum*) have not been recorded in the drier areas of southern Angola, but are present in the rest of the country. The latter occurs in Namibia and is known to make long migrations tracking fruiting patterns, so it may also occur in much of southern Angola, albeit only seasonally. Two species are only known from the central part of the country and may be associated with its highlands. This is the case of Dobson's Epauletted Fruit Bat and Anchieta's Fruit Bat, a rare or localised species. Finally, Egyptian Rousette (*Rousettus aegyptiacus*) is so far only known in the northwest of the country, which may be explained by the need to satisfy its requirements for abundant fruit resources and caves (Crawford-Cabral 1986).

Family Rhinolophidae

There are five species of Rhinolophidae currently recognised to occur in Angola (Monadjem et al. 2010a; Happold and Happold 2013). Rüppell's Horseshoe Bat (*Rhinolophus fumigatus*) is a savanna species with separate populations in the west and east of southern Africa, with the western population occupying southwest Angola and central and northern Namibia. Lander's Horseshoe Bat (*R. landeri sensu lato*) was thought until recently to have an isolated population in Angola. However, recent taxonomic work recognised populations from southern Africa as a separate species, Peters's Horseshoe Bat (*R. lobatus*), though no material from Angola was examined (Taylor et al. 2018b). Given the proximity to populations analysed it may be provisionally accepted that Peters's Horseshoe Bat is the species occurring in Angola, though it is possible that the country hosts a different species, described by Seabra (1898b) as Angola's Horseshoe Bat (*R. angolensis*) (Monadjem et al. 2010a; Taylor et al. 2018b). Damara Horseshoe Bat (*R. damarensis*) was previously treated as a subspecies of Darling's Horseshoe Bat (*R. darlingi*) (Monadjem et al. 2010a), but has been given full species status in the IUCN Red List (Monadjem et al. 2017). It is a species from arid habitats that is restricted to southwest Angola and western Namibia. Dent's Horseshoe Bat (*Rhinolophus denti*) is only known from the Ruacaná falls, on the Angola-Namibia border (Crawford-Cabral 1986), though it is widespread in Namibia and western Botswana. Eloquent Horseshoe Bat (*Rhinolophus eloquens*) has been collected from Jau, Huíla Province (Grant and Ferguson 2018), a location that is over 2000 km away from the closest records in the eastern DRC and Rwanda. These specimens from the American Museum of Natural History are worth re-examining as they may refer to a new species within the *R. eloquens*/*R. hildebrandtii* group. Further surveys are likely to record more species of this genus that are known to occur in the neighbouring countries close to the border with Angola.

Family Vespertilionidae

There are 28 species of Vespertilionidae recorded in Angola. This is a poorly known group in the country, with many species represented by just one or a few scattered and old records (Monadjem et al. 2010a). This is for instance the case of Beatrix's Butterfly Bat (*Glauconycteris beatrix*), Lesser Woolly Bat (*Kerivoula lanosa*), Dobson's Pipistrelle (*Neoromicia grandidieri*), White-bellied House Bat (*Scotophilus leucogaster*), Green House Bat (*S. viridis*), and Moloney's Flat-headed Bat (*Mimetillus moloneyi*), which are known in Angola from just one or two records. Seemingly, Silvered Woolly Bat (*K. argentata*) and Dusky Pipistrelle (*Pipistrellus hesperidus*) have been tentatively recorded at single locations based on acoustic identifications during recent surveys (Taylor et al. 2018c). Even species that are likely to be widespread and abundant in the region, and that are known to roost in houses in relatively large numbers, such as the Cape Serotine (*Neoromicia capensis*), have been scarcely recorded in the country possibly due to under-sampling.

Despite the paucity of studies, it is noteworthy that five currently recognised Vespertilionidae species have their type locality in Angola. This is the case of Anchieta's Pipistrelle (*Hypsugo anchietae*), which was collected in western Angola (Cahata) in atypical environmental conditions compared to the main range of the species, though it may be widespread in the southeast. Angolan Long-eared Bat (*Laephotis angolensis*) is an endemic to southern Africa that is known from just four specimens collected at one locality in DRC and two in central Angola, including the type locality (Tyihumbwe). Bocage's Mouse-eared Bat (*Myotis bocagii*) is widespread in tropical Africa, with just a few records in northern Angola, including the type locality. Welwitsch's Mouse-eared Bat (*M. welwitschii*) was described from northern Angola, although the great majority of the species' records are in East Africa. Angolan Hairy Bat (*Cistugo seabrae*) was described from specimens collected in Moçamedes. It is endemic to southern Africa, where it occurs from the extreme southwest of Angola through western Namibia to the extreme northwest of South Africa. Finally, it is worth mentioning Machado's Butterfly Bat (*Glauconycteris machadoi*), a species described from eastern Angola that is not retained here because it has been suggested that it may correspond to a colour phase of *G. variegata*, although this issue needs clarification (Crawford-Cabral 1986).

For several Vespertilionidae Angola is at the edge of their distribution, and so they occur marginally in the country, which may justify at least partly the scarcity of records. This is the case of species associated with rainforests and other forests of tropical Africa, which are largely restricted to Cabinda and northern Angola. Besides the above mentioned Bocage's Mouse-eared Bat, the species showing this pattern are Common Butterfly Bat (*G. argentata*), Beatrix's Butterfly Bat, White-winged Serotine (*Neoromicia tenuipinnis*), and Broad-headed Pipistrelle (*Hypsugo crassulus*). Other species have their core range in eastern and southern Africa and have isolate records in Angola, including Lesser Woolly Bat, Green House Bat, Damara Woolly Bat, and Dusky Pipistrelle. It is possible that these patterns are shaped to at least some extent by under-sampling in Angola. Finally, Long-tailed Serotine (*Eptesicus hottentotus*) is only known from southwest Angola, but it has a much wider, albeit sparse distribution in southern Africa (Monadjem et al. 2010a).

Most Vespertilionidae from woodlands and savannas have also been scarcely recorded in Angola, though climatic niche modelling suggests that many savanna species may occur more widely in the south of the country (Monadjem et al. 2010a). In contrast, only Thomas's Flat-headed Bat (*M. thomasi*) has been associated with the moist miombo belt of southcentral Africa, which occupies a large part of central Angola. Banana Bat (*Neoromicia nana*) is associated with well-wooded habitats such as riparian vegetation and forest patches, and it has been recorded in western and central Angola. Savanna and open woodland species, many of which are associated with aquatic and riparian habitats, include Variegated Butterfly Bat (*G. variegata*), Botswana Long-eared Bat (*Laephotis botswanae*), Zulu Serotine (*Neoromicia zuluensis*), Schlieffen's Twilight Bat (*Nycticeinops schlieffeni*), Rüppell's Pipistrelle (*Pipistrellus rueppellii*), Rusty Pipistrelle (*P. rusticus*), Thomas's House Bat (*Scotoecus hindei*), Yellow-bellied House Bat (*Scotophilus dinganii*), and White-bellied House Bat. The inclusion of Thomas's House Bat is tentative, because the taxonomy of this genus is still unresolved and confusion with White-bellied Lesser House Bat (*S. albigula*) is possible (Monadjem et al. 2010a). Specimens of Yellow-bellied House Bat from northern Angola, the southern DRC and northern Zambia were collected in environmental conditions considered unsuitable, and may represent a distinct species.

Erinaceopmorpha (Hedgehogs)

The Southern African Hedgehog (*Atelerix frontalis*) is the sole representative of the order Erinaceopmorpha in Angola, with a distribution restricted to the southwest of the country, in the Namibe and Huíla provinces, which extends into central Namibia (Cassola 2016b). This population is disjunct from another occurring in Zimbabwe, Botswana and South Africa (Cassola 2016b).

Hyracoidea (Hyraxes)

Four species of Hyracoidea are known from Angola. The Angolan Bush Hyrax (*Heterohyrax brucei bocagei*) is widely distributed in rocky habitats across the western half of the country, and is mostly a plateau species absent below 500 m of altitude (Gray 1869; du Bocage 1889b; Crawford-Cabral and Veríssimo 2005). Nevertheless, the Bush Hyrax may be sympatric just below the southern escarpment with the Kaokoveld Rock Hyrax (*Procavia capensis welwitschii*), the latter being mostly associated with rock outcrops in the southwest arid coastal plain (du Bocage 1889b; Hill and Carter 1941; Crawford-Cabral and Veríssimo 2005). In addition, two species of Tree Hyrax, the Southern Tree Hyrax (*Dendrohyrax arboreus* cf *braueri*) and the Western Tree Hyrax (*Dendrohyrax dorsalis nigricans*) are present in forest habitats, the former associated with gallery forests and nearby miombo in eastern Angola (Machado 1969; Crawford-Cabral and Veríssimo 2005). The

Western Tree Hyrax is only known from one confirmed record obtained in gallery forest in Cabinda (Peters 1879; Crawford-Cabral and Veríssimo 2005), but recent observations have suggested that the species' may be present on the central escarpment region (Vaz Pinto, unpublished data). The Angolan Bush Hyrax is likely an endemic taxon and the Kaokoveld Rock Hyrax has a global distribution restricted to the Namib Desert between coastal Namibia and Angola, but to date no study has specifically addressed Angolan hyraxes.

Lagomorpha (Hares)

A recent review recognises only two species of lagomorphs in Angola (Smith et al. 2018), but taxonomic uncertainties, controversial identifications and lack of recent studies in the country, have blurred the matter and it is likely that at least three species occur. The African Savanna Hare (*Lepus victoriae*) is the most widespread species, occurring throughout the country except the arid southwest and the forested northwest (Smith et al. 2018). There are also records of additional *Lepus* species, but at least some of these may refer to misidentifications and thus need further consideration. Genest-Villard (1969) recorded the presence of two species of hares based on specimens collected by Crawford-Cabral, with Cape Hare (*Lepus capensis*) occuring in semi-desertic areas and *L. crawshayi* (= *L. victoriae*) in less arid areas. Actually, hares collected in Moçâmedes were initially classified as a distinct species, *L. salai* Jentink 1880, and then ascribed to a subspecies of Cape Hare (*L. c. salai*) occurring in subdesertic areas of southwestern Angola and western Namibia (Petter and Genest 1965). In the mammal collection of IICA, currently housed in ISCED-Huíla, various skins from coastal Namibe were identified as *L. capensis* (Crawford-Cabral and Veríssimo, unpublished data), and recent field observations suggest the Cape Hare to be common in Iona NP and along the southwestern arid coastal plain into Benguela province (Vaz Pinto, unpublished data). A recent record of Cape Scrub Hare (*Lepus saxatilis*) in the Malanje province by Moraes and Putzke (2014) is probably a misidentification, as the species is a narrow endemic to the Cape province of South Africa (Smith et al. 2018). Jameson's Red Rock Hare (*Pronolagus randensis*) occurs in southern Angola, corresponding to the northern tip of a larger range extending into central Namibia, which is disjunct from another population with its core distribution in Zimbabwe, eastern Botswana and northeast South Africa (Smith et al. 2018). Interestingly, the Rock Hare in Angola appears to be present in two subpopulations segregated by altitude. One subpopulation is present in altitude on top of the escarpment, often above 2000 m in Huíla Province, and has been tentatively ascribed by Crawford-Cabral to (*P. r. waterbergensis*) (Crawford-Cabral and Veríssimo, unpublished data). The other subpopulation is found on rocky outcrops and inselbergs on the coastal plain, and distinct coloration patterns led the same author to suggest a new taxon (*P. r. moçamedensis*) (Crawford-Cabral and Veríssimo, unpublished data). No subspecies of Red Rock Hare are currently recognised (Happold 2013), but the Angolan populations and their distribution

pattern remain unresolved. There have also been claims suggesting the occurrence of Bunyoro Rabbit (*Poelagus marjorita*) in Angola (Petter 1972), but these were subsequently challenged and dismissed in recent publications, which consider the species to be restricted to relatively small disjunct populations in the Central African Republic, South Sudan, and Uganda (Happold and Wendelen 2006; Happold 2013; Smith et al. 2018). Nevertheless, a couple of museum specimens collected in 1941 on the Angolan Escarpment near Gabela and attributed to this species (RBINS 2017) are intriguing and require further verification, particularly as the region is known as an endemism hotspot (Hall 1960; Happold and Wendelen 2006; Clark et al. 2011; Svensson et al. 2017).

Macroscelidea (Sengis)

Three species of Macroscelideae have been collected in Angola (Crawford-Cabral and Veríssimo, unpublished data). Short-snouted Sengi (*Elephantulus brachyrhynchus*) is reportedly distributed across the plateau, associated with grasslands and thickets in miombo woodlands (Monard 1935; Hill and Carter 1941; Crawford-Cabral and Veríssimo, unpublished data). The species is possibly represented by three subspecies in Angola, *E. b. brachyrhynchus*, *E. b. brachyurus* and *E. b. schinzi* (Crawford-Cabral and Veríssimo, unpublished data), but a clinal variation has also been suggested and Perrin (2013) recognises no subspecies. Bushveld Sengi (*Elephantulus intufi*) is present in the semi-arid savannas of the southwest and often associated with mopane woodlands, with the subspecies *E. i. mossamedensis* occurring on the coastal plain, while *E. i. alexandri* is found inland (Hill and Carter 1941; Crawford-Cabral and Veríssimo, unpublished data). Four-toed Sengi (*Petrodromus tetradactylus tordayi*) has been collected from gallery forests in Lunda-Norte, and it is likely that the nominate race *P. t. tetradactylus* also occurs in eastern Moxico (Hayman 1963; Crawford-Cabral and Veríssimo, unpublished data; Rathbun 2013). As no studies have focused on Angolan sengis, and considering the known range of sengis in neighbouring countries, it is possible that future surveys may add new species to the country list, such as the Western Rock Sengi (*Elephantulus rupestris*) in the arid southwest region.

Perissodactyla (Rhinoceros, Zebras)

The Order Perissodactyla is represented in Angola by Black Rhinoceros (*Diceros bicornis*), and two species of zebra. Although White Rhinoceros (*Ceratotherium simum*) has occasionally been included on the Angolan mammal lists, this is not supported by any hard data. Claims referring White Rhinoceros to having been present in the southeastern regions were not based in any collected specimens, but rather on poor and indirect evidence or old unsubstantiated witness reports (Shortridge

1934; Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). Most authors agree that even if they had once occurred, which is possible but remains unproven, by the mid-twentieth century they had long been extirtpated (Hill and Carter 1941; Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005).

Family Equidae

The zebras native to Angola are Hartmann's Mountain Zebra (*Equus zebra hartmannae*) and Plains Zebra (*Equus quagga*). A zebra collected in the nineteenth century by Penrice 70 km north of Moçamedes led Oldfield Thomas to describe a new species of mountain zebra (Thomas 1900) as *E. penricei*, but these were later revaluated and synonymised with Hartmann's Zebra (Hill and Carter 1941; Crawford-Cabral and Veríssimo 2005). In Angola, Hartmann's Zebras were found in the arid southwest, mostly in Namibe Province but its distribution may have once extended north to southern Benguela (Shortridge 1934; Crawford-Cabral and Veríssimo 2005). The stronghold of the species in Angola was in Iona NP where a healthy population was present in the 1970s (Huntley 1973c), although 20 years later they were on the verge of extinction and their status remained unaltered until the end of the war (Huntley and Matos 1992; Novellie et al. 2002; Crawford-Cabral and Veríssimo 2005; Penzhorn 2013). Nevertheless a few herds survived the war in Iona NP, and aerial surveys in the park have reported an increase in estimated numbers from 263 to 434 individuals between 2003 and 2016 (Kolberg and Kilian 2003; van der Westhuizen et al. 2017). On the other hand, recent observations and circumstantial evidence strongly suggest that some herds in Iona NP may have been hybridizing with feral donkeys, as various individuals with intermediate phenotypes have been photographed in recent years (Vaz Pinto, unpublished data). Genetic confirmation of the hybridisation is lacking and the extent of the phenomenon remains unknown.

Angolan Plains Zebras have been tentatively ascribed to various subspecies, however recent molecular studies failed to distinguish among traditional subspecies (Lorenzen et al. 2008). Plains Zebra used to be relatively common and widespread in Angola across the southern half of the country and possibly also present in eastern Moxico (Newton da Silva 1970; Crawford-Cabral and Veríssimo 2005). A sixteenth century report has even suggested that zebras in those days may have extended along the coast to Ambriz, but the claim remains controversial (Crawford-Cabral and Veríssimo 2005). In the 1970s they were still numerous at least in protected areas such as Iona NP and Bicuar NP, and in the Cuando Cubango province (Huntley 1973c, 1974; Crawford-Cabral and Veríssimo 2005). It is likely that Plains Zebra were more affected by war-time poaching than most other large ungulates, and already by 1992 they were feared extinct in Angola (Huntley and Matos 1992). Some surveys after the end of the war have failed to record the species in southern Angola (Kolberg and Kilian 2003; Veríssimo 2008; van der Westhuizen et al. 2017), but recent reports suggest that a few animals may still linger in Bicuar NP (Overton et al. 2017). Small numbers were confirmed in general surveys conducted in Luengue-Luiana NP (Chase and Schlossberg 2016; Funston et al. 2017).

Family Rhinocerotidae

Black Rhinoceros were known in Angola from two disjunct populations probably corresponding to different subspecies, although the distinctions among black rhino subspecies remain controversial (Crawford-Cabral and Veríssimo 2005; Rookmaaker 2005; Emslie and Adcock 2013). A population of arid-adapted rhinos occurring in Angola to the west of the Cubango (Okavango) river, has been ascribed to *D. b. minor* (Ansell 1972; Crawford-Cabral and Veríssimo 2005), but it is now generally recognised to represent instead the former northern limit for the typical race *D. b. bicornis* (Emslie and Brooks 1999; Emslie and Adcock 2013). The other population used to extend to the east of the Cuito River in southeastern Angola, and was once considered as *D. b. chobiensis* (Ansell 1972; Crawford-Cabral and Veríssimo 2005). However, this putative race has been more often synonymised with *D. b. minor* (Emslie and Brooks 1999; Rookmaaker 2005; Emslie and Adcock 2013).

No research has specifically focused on Angolan rhinos, and the existing knowledge is based in the few specimens collected during early expeditions, scattered reports from trophy hunters and the work by ecologists in the 1970s (Hill and Carter 1941; Newton da Silva 1970; Huntley 1973c, 1974; Crawford-Cabral and Veríssimo 2005). Black Rhinoceros were likely always scarce in numbers throughout historical times (Huntley 1973c, 1974; Crawford-Cabral and Veríssimo 2005), and in the 1970s they were estimated at around 30 in Iona NP with small populations in southern Cuando Cubango (Huntley 1973c). The situation deteriorated fast during the armed conflict that followed independence, and by 1992 they were already gone or on the verge of extinction (Huntley and Matos 1992; Crawford-Cabral and Veríssimo 2005). By the turn of the millennium rhinos were considered extinct in Angola (Emslie and Brooks 1999), and have remained since, in spite of occasional unconfirmed sightings that suggest the possibility of a few scattered individuals surviving in remote locations. Recent general surveys in regions where they used to occur have consistently failed to record the species (e.g. Veríssimo 2008; Chase and Schlossberg 2016; Funston et al. 2017; Overton et al. 2017; NGOWP 2018).

Pholidota (Pangolins)

Three species of pangolins occur in Angola (Crawford-Cabral and Veríssimo, unpublished data), but no specific studies have been conducted regarding the status or ecology of these species within the country. White-bellied Pangolin (*Phataginus tricuspis*) has been recorded, and collected (Hill and Carter 1941; Trense 1959) in the provinces of Cabinda, Lunda-Norte, Zaire and Cuanza-Norte, and although assumed overall scarce, this species is expected to be widely distributed across northern Angola and the upper plateau, and likely extending south along the escarpment forests (Crawford-Cabral and Veríssimo, unpublished data). The species has also been recorded recently in Cangandala NP, Malanje Province (Vaz Pinto, unpublished data), and it has been found in Angolan bushmeat markets (Svensson et al. 2014b). Temminck's Ground Pangolin (*Smutsia temminckii*) is the most common

species of pangolin in Angola, with a wide distribution in the central and southern areas of the country. It has been recorded in the provinces of Cuanza-Sul, Benguela, Bié, Huíla and adjacent areas of Namibe, and Cuando Cubango (Crawford-Cabral and Veríssimo, unpublished data), although the only known material available in natural history collections is housed in the AMNH (Hill and Carter 1941) and ISCED (Crawford-Cabral and Veríssimo, unpublished data). Giant Ground Pangolin (*Smutsia gigantea*) is restricted to the forests of Cabinda, and its occurrence there has been known since the mid-1970s (Huntley 1973e). More recently, the species has been re-confirmed in the Maiombe region of the enclave (Ron 2005).

Primates (Monkeys, Apes, Pottos, Galagos)

Angola has a great diversity of primates, including up to 15 diurnal and possibly 8 nocturnal species. The vast majority of Angola's primate species are found in the rainforests and riverine forest-woodland mosaics in the north, including Cabinda, within the biodiversity-rich Guinea-Congolian biome (Huntley 1973e; Kuedikuenda and Xavier 2009; IUCN 2018). The montane forests/dry woodland mosaics of the Angolan Escarpment along the coast, which connect to the rainforests in the north, are also rich in primates, including at least four diurnal and four nocturnal species (Bersacola et al. 2015).

Family Cercopithecidae

The Cercopithecidae is the most speciose group of primates occurring in Angola, including two baboons, one mangabey, six guenons, two talapoin monkeys, and one colobus. The two baboons are Chacma Baboon (*Papio ursinus*), ranging in the arid southwestern regions (Benguela, Namibe, Huíla and Cunene Provinces), and Kinda Baboon (*P. kindae*), occupying the central and northeast of the country (Machado 1969). Chacma Baboon is adapted to woodland, sub-desert, savanna and montane habitats, whereas the Kinda Baboon tends to be present in miombo woodland, deciduous and semi-deciduous forests, savanna, gallery and riverine forests habitats (Kingdon 2016; Rowe and Myers 2016). Up-to-date information on baboon distribution in Angola is not available. Black Crested Mangabey (*Lophocebus aterrimus*) inhabit the tropical forests south of the River Congo. The subspecies occurring in Angola, the Southern Black Crested Mangabey (*L. a. opdenboschi*) was recorded in the gallery forests of Lunda-Norte (Machado 1969) and just on the eastern side of the Cuango River in the Lunda-Norte province (Hart et al. 2008). Little is known about the current status of this subspecies (Hart et al. 2008; Rowe and Myers 2016).

Red-tailed Monkey (*Cercopithecus ascanius*) is represented by three subspecies in Angola, namely Black-nosed Red-tailed Monkey (*Cercopithecus a. atrinasus*), Black-cheeked Red-tailed Monkey (*C. a. ascanius*), and Katanga Red-tailed Monkey (*C. a. katangae*), all ranging in the north of the country (Machado 1969;

Oates et al. 2008a, b; Rowe and Myers 2016). The existence of Black-nosed Red-tailed Monkey in Angola is based on only nine individuals collected in the 1960s (Machado 1969; Sarmiento et al. 2001; Oates et al. 2008b). Red-tailed Monkeys are typically found in a wide range of habitats, including rainforests, swamp, riverine and montane forests, and deciduous and semi-deciduous forests (Sarmiento et al. 2001; Rowe and Myers 2016). All three subspecies of Red-tailed Monkey have been known to hybridize among each other in Angola (Machado 1969; Detwiler et al. 2005). Blue Monkey (*Cercopithecus mitis*) occurs in two disjunct populations in Angola, corresponding to two subspecies. The Pluto Monkey (*Cercopithecus mitis mitis*) is endemic to Angola and ranges along the Angolan Escarpment areas in the west part of the country (Machado and Crawford-Cabral 1999; Kingdon 2008a; Lawes et al. 2013). In 2013, this was the second most commonly occurring species in a bushmeat survey (Bersacola et al. 2014). The Rump-spotted Blue Monkey (*C. mitis opisthostictus*), ranges in a small part of eastern Angola, corresponding to the edge of a much wider distribution in East Africa (Kingdon 2008b). Black-footed Crowned Monkey (*Cercopithecus pogonias nigripes*) supposedly occurs in the Cabinda Province, likely occurring in the Maiombe NP. The species uses high vegetation strata, mainly occurring in primary and lowland tropical forests, as well as savanna, gallery forests, mature secondary forests and montane forests (Zinner et al. 2013). Moustached Monkey (*Cercopithecus cephus*) was common in Cabinda (Machado 1969; Huntley 1973e). The species is mainly found in lowland tropical rainforest, but also in secondary habitats (Gautier-Hion et al. 1999). Machado (1969) also recorded Putty-nosed Monkey (*C. nictitans*) in Cabinda, a species found in lowland and montane tropical moist forests, as well as gallery and secondary forests (Oates and Groves 2008). De Brazza's Monkey (*C. neglectus*) was common in Lunda-Norte (Machado 1969). The species is mainly found in riverine forest habitats, in lowland and submontane semi-deciduous or tropical moist forest, as well as in swamp forest (Struhsaker et al. 2008). The Malbrouck Monkey (*Chlorocebus cynosuros*) occurs throughout Angola, in various habitats and elevation gradients (Huntley 1973c; Sarmiento 2013). This species is mainly present in open woodland, savanna and forest-grassland mosaic, and tends to occur close to water sources (Butynski 2008; Sarmiento 2013). However, it is also able to occupy both rural and urban environments (Butynski 2008).

The two Talapoin Monkeys of Angola are Southern Talapoin Monkey (*Miopithecus talapoin*) and Northern Talapoin Monkey (*M. ogouensis*). The first species occurs along the Angolan Escarpment, including Quiçama, Cumbira Forest, up to the Congo River (Machado 1969; Gautier-Hion 2013a; Groom et al. 2018). The second species is present in Cabinda (Gautier-Hion 2013b). The Southern Talapoin Monkey is one of Africa's least studied primates, but it is assumed to be ecologically similar to the Northern Talapoin Monkey, therefore preferring dense forest environments, such as riverine forest (Machado 1969). Sclater's Angolan Colobus (*Colobus angolensis angolensis*) was known to occur in the northeast of Angola (Malanje, Lunda-Norte; Machado 1969), where it was recorded in 2009 near Lóvua (Pedro Vaz Pinto, unpublished data) and in riverine forests in the Lagoa Carumbo area in 2011 (Huntley and Francisco 2015).

Family Galagidae

The Galagidae are represented by six species in Angola. Four of these species have been confirmed in recent surveys, namely Thick-tailed Greater Galago (*Otolemur crassicaudatus*), Southern Lesser Galago (*Galago moholi*), Demidoff's Dwarf Galago (*Galagoides demidoff*), and importantly, a new, recently-described Dwarf Galago believed to be endemic to Angola, the Angolan Dwarf Galago (*Galagoides kumbirensis*) (Bersacola et al. 2015; Svensson et al. 2017). The Angolan Dwarf Galago was named after Cumbira Forest where it was first observed (Svensson et al. 2017), but it appears to be adapted to a wide range of habitats (Bersacola et al. 2015). The geographical distribution of this new species is not yet established, though it might range as far as the Congo River in DRC (Svensson et al. 2017).

Thick-Tailed Greater Galago occurs throughout Angola, except the extreme south (Bearder 2008). It is typically associated with open woodland and savanna habitats as well as in forest edges and thickets, using mid to high strata (Bearder et al. 2003; Bearder and Svoboda 2013). Its occurrence was confirmed in semi-arid savanna environments and Cumbira Forest (Cuanza-Sul), and in miombo woodlands in Malanje Province (Bersacola et al. 2015). Southern Lesser Galago is widespread in the miombo woodlands of Angola (Huntley 1973c; Bersacola et al. 2015). It is known to use all strata in open woodland, savanna, forest edges and other semi-arid habitats (Bearder et al. 2003; Bearder et al. 2008; Pullen and Bearder 2013). Demidoff's Dwarf Galago is known to occur across central to northeastern parts of Angola, including Cuanza-Sul, Cuanza-Norte, Malanje, Lunda-Sul and Lunda-Norte Provinces (Machado 1969; Svensson 2017). The occurrence of this species in semi-arid savanna zones of the Angolan Escarpment extended the species' range c. 190 km further southwest (Svensson 2017). This is the smallest of all the galagos and is typically associated with forest habitats, including deciduous and semi-deciduous forests, evergreen and gallery forests, mainly in the edge and understory habitats (Bearder et al. 2003; Ambrose and Butynski 2013). Their relative abundance in Angola was correlated with undergrowth density, canopy cover and tree density (Bersacola et al. 2015).

Two additional species have been reported from Angola, but their current status is unknown. Thomas's Dwarf Galago (*Galagoides thomasi*) is believed to range in the northern parts of Angola, but this still needs confirmation (Bersacola et al. 2015). Bersacola et al. (2015) proposed that competitive exclusion between the Thomas's and the Angolan Dwarf Galagos could explain why the former species was not observed in the Angolan Escarpment forests. The Southern Needle-clawed Galago (*Euoticus elegantulus*) was listed as possibly occurring in Cabinda (Huntley 1973e). The species is known to occur in both primary and secondary forests at low- to medium-altitude, including in deciduous and semi-deciduous, evergreen and littoral forests (Ambrose and Butynski 2013).

Family Hominidae

The two species of the family Hominidae in Angola are the Western Lowland Gorilla (*Gorilla gorilla gorilla*) and the Central Chimpanzee (*Pan troglodytes troglodytes*), which are confined to the Cabinda Province (Maisels et al. 2016a, b). Both species were known to be present in the area currently included in the Maiombe NP, a c. 2000 km^2 area consisting of mainly tropical forest ecosystems which are part of the Guinea-Congolian biome. The landscape in Cabinda is characterised by semi-deciduous tropical forests in the northeast (including Maiombe), agroforest mosaics largely covering the south, as well as mangrove and flooded swamp forests along the coast. Western Lowland Gorilla occur in different types of forest environments (Robbins et al. 2004; Tutin and Fernandez 1984). Across their range chimpanzees occupy a great variety of habitats, from tropical rainforests to semi-arid savanna environments (Boesch and Boesch-Achermann 2000; Pruetz 2006). Chimpanzees show high socioecological flexibilities in human-dominated environment (Hockings et al. 2012; McLennan 2013; Bessa et al. 2015). Considering the high socioecological flexibility of chimpanzees across their range, this species' range in Cabinda is likely to include human-dominated areas in the south of the province. Despite the urgency for surveys highlighted previously (Tutin et al. 2005), population estimates for the two great apes in Cabinda remain unavailable. In the province, chimpanzees are likely targeted for the commercial bushmeat trade (Ron and Golan 2010), but the scale of this trade is poorly known. Huntley (2017) records that gorilla and chimpanzee were by tradition not included among bushmeat species in Cabinda in 1973, while Bersacola et al. (2014) reports on chimpanzees occuring in the pet trade in Angola that were believed to originate from Cabinda. Future studies to assess the distribution and population status of the two great apes in Cabinda, including in-depth investigation on the human-great ape interactions in this region should be considered a priority.

Family Lorisidae

Milne-Edwards's Potto (*Perodicticus edwardsi*) and Golden Angwantibos (*Arctocebus aureus*) are the two species of the family Lorisidae reported for Angola (Huntley 1973e; Bersacola et al. 2015; Svensson 2017). Milne-Edwards's Potto is the largest of the potto species, generally occurring in both primary and secondary forests, from low altitude to montane forests (Butynski and de Jong 2007; Pimley 2009; Oates 2011; Pimley and Bearder 2013). The species was reported from Cabinda by Huntley (1973e), while recent surveys confirmed its occurrence in the tall, sub-humid forests of the Cuanza-Norte Province, and for the first time it was observed in the agro-forest mosaics in Cumbira Forest (Cuanza-Sul), extending the previously known geographical range c. 320 km further south (Bersacola et al. 2015). The Golden Angwantibos was reported from Cabinda by Huntley (1973e), but no information has been obtained thereafter.

Proboscidae (Elephants)

African elephants (genus *Loxodonta*) have traditionally been considered monotypic and to comprise two subspecies, but recent genetic studies, albeit confirming hybridisation along a contact zone, have also provided compelling evidence to sustain the validity of those two forms as full species (Grubb et al. 2000; Roca et al. 2001, 2015; Palkopoulou et al. 2018), namely Savanna Elephant (*L. africana*) and Forest Elephant (*L. cyclotis*). Interestingly, the earliest morphological studies suggesting that both species should be recognised result from the efforts of Frade (1933, 1936, 1955) and were based on the analyses of specimens collected in different parts of Angola. Although the studies by Frade reflect the occurrence of both species, since then no material from Angola has been critically evaluated and records were often assumed by default to refer to Savanna Elephant. On the other hand, some authors, have distinguished among various 'types' including potential subspecies of Savanna Elephants (Hill and Carter 1941), and some hunters even suggested the occurrence in the north of a dwarf elephant (Crawford-Cabral and Veríssimo 2005), but these likely correspond to geographical variants of either species.

Forest Elephant was once likely common to abundant in moist forested habitats across northwestern Angola, and including Cabinda, and a large number of records from hunters suggest their former presence throughout the provinces of Zaire, Uíge and Cabinda (Crawford-Cabral and Veríssimo 2005; Crawford-Cabral and Veríssimo, unpublished data). Soon after the end of the civil war, Forest Elephants were still not uncommon in the Maiombe rainforest of Cabinda (Heffernan 2005) but more recent accounts are lacking. There remains little doubt that their numbers have plummeted in recent decades as a result of hunting and habitat destruction, and Forest Elephant may have been extirpated from large parts of its former range in Angola. Surprisingly, a few herds of what appear to be Forest Elephant still seem to linger in forest blocks in Cuanza-Norte and Bengo Provinces (Vaz Pinto, unpublished data). If confirmed, this pocket of Forest Elephant in Cuanza-Norte and Bengo may consist of an isolated, southernmost population of the species, which would much increase its conservation importance. The possibility of a hybrid zone in northern Angola where Savanna Elephant also used to occur (Crawford-Cabral and Veríssimo 2005) cannot be excluded, but this hypothesis remains untested. Unfortunately, and paradoxically considering the large interest and funding channelled to research and conservation of elephants in general, very little is known about the Angolan Forest Elephant, including its taxonomic status and relationships with other populations, ecology, and numbers.

Savanna Elephant used to have a wide distribution in Angola, including along the coastal plain and in the east and northeast, but the core was in the southern half of the country. An extrapolation of figures based on aerial counts suggested the population in the southeast province of Cuando Cubango to reach up to 23,000 animals (Hall-Martin and Pienaar 1992), but the ensuing civil war prevented reliable counts. Quantification of elephant populations for the whole country was also attempted in

the 1990s but based on little ground data, and yet suggesting a steep reduction in numbers from 50,000 to less than 10,000 (Anstey 1991, 1993). As a result of the armed conflict, the Savanna Elephant populations were most affected and may have disappeared completely from extensive regions, particularly along the coastal plain, while in other regions they may have survived in much reduced pockets. Following the end of the war, they may have recolonised extensive regions of the southeast, as migratory routes have been reopened, allowing the dispersal of Savanna Elephants coming from neighbouring countries, particularly Botswana (Chase and Griffin 2011), although more recent evidence suggest negative trends as a result of increased poaching pressure and human encroachment (Chase and Schlossberg 2016; Funston et al. 2017; Schlossberg et al. 2018). A small contingent of Savanna Elephant were introduced into Quiçama NP in 2000 and 2001, and these have since increased from 32 to about 90 (Carmignani 2015), but a small number of the original population may also have survived in the park (Groom et al. 2018). Much of what is currently known on the distribution and status of elephants in Angola is summarised in the IUCN African Elephant Status Report (Thouless et al. 2016).

Rodentia (Mole Rats, Mice, Dormice, Rats, Voles, Squirrels)

The rodents are a vast group with at least 85 species currently recognised to occur in Angola (Monadjem et al. 2015; Taylor, unpublished data Taylor et al. (2018c). Rodents show a high degree of endemism in Angola, with at least 13 endemic or near-endemic species. However, there are considerable uncertainties regarding the taxonomy of African rodents, and in the future it is likely that many species will be split after the development of detailed taxonomic and genetic studies, thus increasing the number of endemics or near endemics (Monadjem et al. 2015). For instance, while Taylor (2016) treats the African Marsh Rat (*Dasymys incomtus*) as a single widespread species, this may indeed be a complex of several similar species, some of which may have restricted distributions (Monadjem et al. 2015). Continued field surveys are also likely to increase the rodent list, as several species have been recorded on or close to the borders of Angola and will probably be shown to occur there in the future.

Family Anomaluridae

There are only two species of Anomaluridae in Angola, both of which are known from just a few records (Monadjem et al. 2015). Lord Derby's Scaly-tailed Squirrel (*Anomalurus derbianus*) occurs in the northern half of Angola. It is a nocturnal and arboreal species, which is mostly associated with the forest zone of tropical Africa, though it also occurs in miombo woodlands. Beecroft's Scaly-tailed Squirrel (*A. beecrofti*) is also a species from the forests of tropical Africa, which in Angola occurs mainly in Cabinda, though there are also records south of the Congo River (Happold 2013).

Family Bathyergidae

There are two species of Bathyergidae recorded in Angola (Monadjem et al. 2015). Bocage's Mole Rat (*Fukomys bocagei*) is near endemic, occurring widely in the west of Angola and extending narrowly into northern Namibia (Faulkes et al. 2016). Mechow's Mole Rat (*F. mechowi*) is a highly adaptable species often found in villages and croplands, and which occurs in central and northeast Angola. The population in western Angola seems to be separated by a large gap from those in eastern Angola, Zambia and DRC, but this may reflect the paucity of surveys. Damara Mole Rat (*F damarensis*) is known in Angola from only two specimens collected in 1964 in the southeast (Orrell and Hollowell 2018), but it has not been recorded thereafter. The presence of this species thus needs confirmation, though this is likely because it is known from neighbouring areas in Namibia and Zambia. Old records refer to the presence of African Mole Rat (*C. hottentotus* or *C. h. bocagei*) in Angola (e.g., Conroy 2018, MNHN 2018), but these were more likely Bocage's Mole Rats.

Family Gliridae

There are five Gliridae in Angola (Monadjem et al. 2015). Angolan African Dormouse (*Graphiurus angolensis*) is a near endemic savanna species, which is restricted to Angola and to a small disjunct area in western Zambia. Kellen's Dormouse (*G. kelleni*) has a range in central Angola that extends into western Zambia, but that is disjunct from other populations across the savanna zone of sub-Saharan Africa. Monard's Dormouse (*G. monardi*) is a species associated with miombo woodland, with a small distribution in northeastern Angola and northwestern Zambia. Stone Dormouse (*G. rupicola*) is a rupicolous species with its core distribution in a narrow belt along the escarpment of Namibia, and marginally into southwest Angola and South Africa. Lorrain Dormouse (*G. lorraineus*) is a forest species with a known distribution in Angola restricted to the northeast, though the species occurs in Zambia close to the border of Angola.

Family Hystricidae

Cape Porcupine (*Hystrix africaeaustralis*) is the sole Hystricidae occurring in Angola (Monadjem et al. 2015). It is an eclectic species that occurs in most habitats except dense forests, and that it is widespread throughout the country.

Family Muridae

The Muridae include 48 native species recorded in Angola, of which eight are endemic (Monadjem et al. 2015). Endemics are mainly associated with the central plateau, such as Thomas's Rock Rat (*Aethomys thomasi*), Angolan Marsh Rat

(*Dasymys nudipes*), and Angolan Vlei Rat (*Otomys anchietae*), or the western highlands, such as Angolan Multimammate Mouse (*Myomyscus angolensis*) and Cuanza Vlei Rat (*O. cuanzensis*). Coetzee's Praomys (*Praomys coetzeei*) is a species recently described that is known from just a few specimens collected in northern Angola (van der Straeten 2008). Angolan Hylomyscus (*Hylomyscus carillus*) is only known from Angola, but may also occur in neighbouring DRC. Heinrich's Hylomyscus (*H. heinrichorum*) was very recently described from specimens collected in 1954 at Mount Moco and Mount Soque (Carleton et al. 2015). Another seven species are near endemics, occurring in Angola and neighbouring countries. Bocage's Rock Rat (*A. bocagei*), Griselda's Single-striped Mouse (*Lemniscomys griselda*), Angolan Brush-furred Rat (*Lophuromys angolensis*), Callewaert's Mouse (*Mus callewaerti*), and Bell Groove-toothed Swamp Rat (*Pelomys campanae*) are restricted to Angola and DRC. Shortridge's Mastomys (*Mastomys shortridgei*) is known from just a few scattered localities in Angola, the Caprivi Strip (Namibia) and the extreme northwestern region of Botswana. Cabral's Marsh Rat (*D. cabrali*) and Setzer's Mouse (*M. setzeri*) are endemic to a narrow area in southeastern Angola, northwestern Botswana and northeastern Namibia. The latter species was only recently recorded in the Okavango source lakes region of Angola (Taylor et al. 2018c).

The Muridae species with the widest distribution in Angola are those able to thrive in association with agricultural fields and homesteads, including for instance the Natal multimammate mouse (*Mastomys natalensis*). There are also widespread species associated with the woodlands and grasslands of the central plateau, though some of these are associated with moister tropical conditions and have their distributions biased towards the north and/or the west, while others are more associated with drier savanna habitats and have their distribution biased towards the south and east. Overall, this is a large group of species including Marsh Rat (*D.* cf *incomtus*, *sensu* Monadjem et al. 2015), Savanna Gerbil (*Gerbilliscus validus*), Bushveld Gerbil (*G. leucogaster*), Woodland Thicket Rat (*Grammomys dolichurus*), Pygmy Mouse (*M. minutoides*), Gray-bellied Pygmy Mouse (*M. triton*), Thomas's Pygmy Mouse (*M. sorella*), Creek Groove-toothed Swamp Rat (*P. fallax*), Angoni Vlei Rat (*O. angoniensis*), Mesic Four-striped Grass Rat (*Rhabdomys dilectus*), and Hildegarde's Broad-headed Mouse (*Zelotomys hildegardeae*). Some of these species, however, are known from just a few scattered records, including for instance Thomas's Pygmy Mouse and Hildegarde's Broad-headed Mouse.

Some rodent species have relatively restricted distributions in Angola, because they are associated with habitats represented only marginally in the country. This is the case of species associated with rainforests and other moist tropical habitats, which occur mainly in Cabinda and/or relatively small areas in the north of the country, including African Wading Rat (*Colomys goslingi*), Shining Thicket Rat (*G. poensis*), Typical Striped Grass Mouse (*L. striatus*), Dollman's Brush-furred Rat (*L. rita*), Jackson's Soft-furred Mouse (*P. jacksoni*) and Big-eared Swamp Rat (*Malacomys longipes*). Some species largely restricted to the north may penetrate southwards along the Angolan Escarpment, as it is the case of Rufous-nosed Rat (*Oenomys hypoxanthus*). In contrast, species associated with deserts, arid and semi-

arid habitats occur mainly in the southwest of Angola, including Cape Short-eared Gerbil (*Desmodillus auricularis*), Hairy-footed Gerbil (*G. paeba*), Setzer's Gerbil (*G. setzeri*), Black-tailed Tree Rat (*Thallomys nigricauda*), and Striped Mouse (*Rhabdomys bechuanae*). Other species with marginal distributions in Angola due possibly to environmental or biogeographic constraints include Kaiser's Rock Rat (*A. kaiseri*), Nyika Rock Rat (*A. nyikae*) and Least Groove-toothed Swamp Rat (*P. minor*), in the northeast, and Red Rock Rat (*A. chrysophilus*), Highveld Gerbil (*G. brantsii*), and Woosnam's Broad-headed Mouse (*Zelotomys woosnami*), in the south. The latter species was only confirmed in recent surveys (Taylor et al. 2018c). Records of Desert Pygmy Mouse (*Mus indutus*) in southeast Angola need to be confirmed through molecular data. Namaqua Rock Rat (*Micaelamys namaquensis*) is a species widespread in southern Africa, which penetrates northwards through western Angola.

Besides native species, the rodents of Angola also include three non-native invasives, namely House Mouse (*Mus musculus*), a widespread commensal species, Brown Rat (*Rattus norvegicus*), mainly occurring in coastal cities, and Black Rat (*Rattus rattus*), widespread throughout the country. It is likely that future surveys will increase the list of native murids in the country, including tropical species that are known to occur close to the border of Cabinda and the north of Angola, such as Congo Forest Mouse (*D. ferrugineus*), Ansorge's Brush-furred Rat (*L. ansorgei*), Peter's Striped Mouse (*Hybomys univittatus*), Beaded Wood Mouse (*H. aeta*), Ansell's Wood Mouse (*H. anselli*), African Groove-toothed Rat (*Mylomys dybowskii*), Petter's Praomys (*Praomys petteri*), and Target Rat (*Stochomys longicaudatus*).

Family Nesomyidae

The Nesomyidae include 15 species recorded in Angola, of which four are endemic or near endemic to the country (Monadjem et al. 2015). Angolan Gray African Climbing Mouse (*Dendromus leucostomus*) is known only from its type locality (Caluquembe) in the highlands of Angola, but some authors treat it as conspecific with the Gray African Climbing Mouse (*D. melanotis*). Vernay's Climbing Mouse (*D. vernayi*) is only known at present from a series of specimens collected near Chitau in the central Angolan highlands. Bocage's Fat Mouse (*Steatomys bocagei*) is restricted to northern Angola and neighbouring regions of the DRC. Shortridge's Rock Mouse (*Petromyscus shortridgei*) is known only from a few scattered localities in northwestern Namibia and southwestern Angola. Another two species have largely isolated populations in Angola. Nyika Climbing Mouse (*D. nyikae*) occurs along the Angolan Escarpment, well separated from other patchy populations in Central and East Africa. Tiny Fat Mouse (*S. parvus*) occurs widely in East Africa and the northern savannas of southern Africa, but the population in southwestern Angola seems to be largely isolated.

Six Nesomyidae are associated with savanna woodlands and/or grasslands throughout their range, and are widespread in Angola. This includes Northern Giant

Pouched Rat (*Cricetomys ansorgei*), Chestnut Climbing Mouse (*D. mystacalis*), Gray African Climbing Mouse (*D. melanotis*), Southern African Pouched Mouse (*Saccostomus campestris*), Fat Mouse (*S. pratensis*), and Kreb's Fat Mouse (*S. krebsii*). In contrast to these species, the Forest Giant Pouched Rat (*Cricetomys emini*) is associated with tropical rainforests, and in Angola its presence is vouched in Cabinda by Musser and Carleton (2005) and Monadjem et al. (2015), but the species does not appear to occur as widely in northern Angola as indicated in Happold (2013). Gerbil Mouse (*Malacothrix typica*) and Pygmy Rock Mouse (*P. collinus*) are restricted to arid environments in the southwest of the country.

Banana Climbing Mouse (*D. messorius*) was recorded by three specimens from the Field Museum from Dundo in the extreme northeast Angola collected by Barros Machado in 1948 (Grant and Ferguson 2018), but there are no known records close to this (Monadjem et al. 2015). Previous comments on these specimens by Hayman (1963) suggest they may be African Climbing Mouse (*D. mystacalis*) (Taylor unpublished data). The monotypic *Dendroprionomys*, Velvet Climbing Mouse (*D. rousselotti*), is known only from the type locality Brazzaville which is close to Cabinda and may be shown to occur there.

Family Pedetidae

Spring Hare (*Pedetes capensis*) is the sole Pedetidae in Angola (Monadjem et al. 2015). It occurs throughout the country, except in the arid southwest, and in the moist and forested areas of the north.

Family Petromuridae

Dassie Rat (*Petromus typicus*) is the single species of Petromuridae. It has been recorded in a small area in southwest Angola, with its range expanding southwards through Namibia and into the Northern Cape Province of South Africa (Monadjem et al. 2015; Cassola 2016a). The species is confined to the western escarpment and adjoining mountainous areas, as well as inselbergs.

Family Sciuridae

There are nine species of Sciuridae in Angola (Monadjem et al. 2015). Rope Squirrels of the *Funisciurus* genus typically have distributions towards the north of the country, probably due to their association with moist tropical forests. Congo Rope Squirrel (*Funisciurus congicus*) is the most widespread species, ranging widely in the Congo basin, south through the western provinces of Angola and into northwestern Namibia. Ribboned Rope Squirrel (*F. lemniscatus*) occurs widely in the Lower Guinea Forest zone of Central Africa but in Angola has only been recorded in Cabinda, while Fire-footed Rope Squirrel (*F. pyrropus*) is widely

distributed in the forest zone of tropical Africa but in Angola is restricted to Cabinda and the northwest. Lunda Rope Squirrel (*F. bayonii*) is globally restricted to northern and northeastern Angola and neighbouring areas of DRC. This species is associated with moist savanna mosaics, sandy woodlands, and low to medium elevation moist forests (Thorington et al. 2012). Thomas's Rope Squirrel (*F. anerythrus*) has been recorded near the border of Cabinda and could possibly occur there, but this is yet to be confirmed.

Gambian Sun Squirrel (*Heliosciurus gambianus*) is widely distributed in moister savannas of tropical Africa, occurring in central and northeastern Angola. African Giant Squirrel (*Protoxerus stangeri*) is the largest squirrel in Africa, having a wide distribution across the rainforest belt of tropical Africa. In Angola it occurs in the northwest, penetrating to the south along the escarpment, corresponding to the endemic subspecies *P.* s. *loandae* (Happold 2013). Red-legged Sun Squirrel (*Heliosciurus rufobrachium*) is not known to occur south of the Congo River but a doubtful record from 'Raca Camele, north of Quionlungo' was attributed to a specimen from Yale Peabody Museum identified by A Heinrich. Boehm's Bush Squirrel (*Paraxerus boehmi*) has been reported for Angola based on old records from Cabinda (Wendelen and Noé 2017) and Benguela (MNHN 2018), quite far from the core of species distribution in tropical forests of Central Africa. Two other species occur in the south of the country, with Damara Ground Squirrel (*Xerus princeps*) occurring in a small area in southwest Angola, corresponding to the northern tip of a larger distribution in western Namibia, and Smith's Bush Squirrel (*Paraxerus cepapi*) occurring in southern savannas.

Family Thryonomyidae

The family Thryonomyidae is represented in Angola by the Greater Cane Rat (*Thryonomys swinderianus*), which is a habitat generalist and occurs throughout the country (Monadjem et al. 2015). There are also three old records of Lesser Cane Rat (*T. gregorianus*), but they are dubious because the species is difficult to distinguish from Greater Cane Rat and the closest known records of this species are from central DRC and western Zambia (Happold 2013; Monadjem et al. 2015). These records refer to three specimens from Mount Moco collected by GH Heinrich in 1954 (Grant and Ferguson 2018)

Sirenia (African Manatee)

The African Manatee (*Trichechus senegalensis*) occurs in Angola at the southern limit of its global distribution (Powell 1996), where it is associated with mangroves along the lower sections of large rivers in northern Angola. The species has been confirmed from Cabinda and various rivers between the Congo and the Cuanza (Hatt 1934; Crawford-Cabral and Veríssimo 2005; Morais et al. 2006a, b; Dodman

et al. 2008; Collins et al. 2011). There seems to be some uncertainty regarding its current distribution. The southernmost records have often been suggested to be the Longa or the Queve rivers (Crawford-Cabral and Veríssimo 2005), but recent surveys found no evidence of their existence south of the Cuanza (Morais et al. 2006a). It has also been suggested that they might occur throughout the Angolan coast, including in coastal lagoon systems such as Mussulo and as far south as the Cunene River (Powell 1996). However, these claims lack supporting data and the habitat present is not adequate, and so they these reports should therefore be treated with caution (Dodman et al. 2008).

Soricomorpha (Shrews)

There are 15 species of Soricomorpha thus far recognised to occur in Angola, all from the genus *Crocidura* and *Suncus* (Hill and Carter 1941; Hayman 1963, Crawford-Cabral and Veríssimo unpublished data). For many of these species, however, there are only a few old records and their occurrence in Angola needs to be confirmed. Greater Gray-brown Musk Shrew (*C. luna*) is known to occur in the northeast of Angola, although until now only validated by a single specimen from Lunda-Norte (Hayman, 1963). Reddish-gray Musk Shrew (*C. cyanea*) has a very restricted range in southwestern Angola, representing the northwestern tip of a much wider distribution in Namibia, South Africa, and elsewhere in the eastern part of southern Africa (Baxter et al. 2016). Roosvelt's Shrew (*C. roosevelti*) is a species occurring in moist savanna around the Congo Basin forest block, which in Angola seems to be restricted to the northeast (Hutterer and Peterhans 2016). Records of two additional species, Lesser Gray-brown Musk Shrew (*C. silacea*) and Dent's Shrew (*C. denti*), are either doubtful or in need of further re-identification because their known range is nowhere near Angola (Happold and Happold 2013). The only potentially valid Angolan record for the Lesser Gray-brown Musk Shrew is a specimen in alcohol in the Museum of Dundo (Lunda-Norte), identified by Heim de Balsac and quoted by Hayman (1963). However, this species was not considered in the checklist, because the location of this single record is many hundreds of kilometers from other known records, and difficulties in identification at the time may signify misidentification. Dent's Shrew record was an undated record from the Natural History Museum with no recorded locality. The endangered Ansell's Shrew (*C. ansellorum*) is known only from two locations in gallery forests of northwestern Zambia, close to the Angolan border where the species may also occur (Kennerley 2016).

Two of the *Crocidura* species recorded in Angola are endemics with restricted distributions. The Heather Shrew (*C. erica*) is a poorly known species found in Western Angola (Gerrie and Kennerley 2016), with records collected in the provinces of Cuanza-Norte, Malanje, Huambo, Benguela, Huíla (Crawford-Cabral and Veríssimo, unpublished data), while Blackish White-toothed Shrew (*C. nigricans*) occurs in the southwest (Crawford-Cabral 1987; Hutterer 2016), particularly

in localities along the mountainous western belt of the Angolan plateau (Huambo, Benguela, Huíla, Cunene) (Crawford-Cabral and Veríssimo, unpublished data). The only *Crocidura* shrew that is thought to be widespread throughout Angola is Oliver's Shrew (*C. olivieri*) (Crawford-Cabral and Veríssimo, unpublished data; Cassola 2016c) which represents a species complex and is in urgent need of revision. However, Tumultuous Shrew (*C. turba*), African Black Shrew (*C. nigrofusca*) and Swamp Musk Shrew (*C. mariquensis*) are also widespread in some regions of the north and along the Angolan Escarpment. Small-footed Shrew (*C. parvipes*) is known to occur in the provinces of Bié and Huíla (Hill and Carter 1941; Crawford-Cabral and Veríssimo, unpublished data). Other species in Angola have their distributions associated with their much wider ranges in Africa, including Lesser Red Musk Shrew (*C. hirta*) recorded from Lunda-Norte, Lunda-Sul, Cuanza-Sul, Huambo and Huíla, and may occur everywhere on the Angolan highlands, being locally rather common, and likely representing the subspecies *C. hirta luimbalensis* (Crawford-Cabral and Veríssimo, unpublished data). In the south (Huíla and Cuando Cubango) there were two specimens identified as Desert Lesser Red Shrew (*C. deserti*), which may be a subspecies of Lesser Red Musk Shrew (Cassola 2016d). Bicolored Musk Shrew (*C. fruscomurina*) has been recorded from Bengo/Luanda, Cuanza-Norte, Cuanza-Sul, Malanje, Lunda-Norte, Huambo, Huíla, Namibe and Cuando Cubango, and is thus thought to occur throughout the country (Crawford-Cabral and Veríssimo, unpublished data).

Both Greater Dwarf Shrew (*S. lixus*) and Climbing Shrew (*S. megalura*) are known to occur in Angola (Happold and Happold 2013; Crawford-Cabral and Veríssimo, unpublished data). Greater Dwarf Shrew is known to occur in the east, with records in Lunda-Norte (Heim de Balzac and Meester 1977). Climbing Shrew has only been reported in Angola from Cuanza-Sul and Lunda-Norte provinces, yet very scarcely, but it may occur throughout most of northern Angola. Recent field collections in the Okavango source lakes area in 2016 added an additional species for Angola, the Lesser Dwarf Shrew (*S. varilla*) (Taylor et al. 2018c). The species has a sparse distribution and was previously known from southeast DRC so its occurrence in central Angola is not surprising.

Tubulidentata (Aardvark)

The Aardvark (*Orycteropus afer*) is the only Tubulidentata occurring in Angola, where it seems to be widespread, although it is known from relatively few and scattered records due to its cryptic nature (Hill and Carter 1941; Crawford-Cabral and Veríssimo 2005). No studies have focused on this species, and although it is often hunted for bushmeat, it is likely not threatened due to its widespread distribution and elusive habits. The species has also been frequently reported in general mammal surveys conducted in protected areas in southern Angola (Veríssimo 2008; Funston et al. 2017; Overton et al. 2017; NGOWP 2018).

Zoogeographic Outline

A quantitative regionalisation of Africa based on plants and vertebrates was carried out by Linder et al. (2012), providing information on the biogeographic position of Angola in the context of the African continent. In the analysis based on mammals, this study located most of the country in a wide Zambezian band across south-central Africa, crossing the continent from the Atlantic coast of Angola to the Indian Ocean coasts of Tanzania and Mozambique. This band was bordered to the north by the Guinean-Congolian region, corresponding to the tropical moist forests of the Congo Basin and West Africa, which encompasses the enclave of Cabinda and a narrow fringe in north and northeast Angola. To the south, the Zambezian region was bordered by a Southern African Region, which extends into a narrow strip in southern Angola. This rather coarse regionalisation was refined in analyses using a dataset combining all plants and vertebrates. This analysis recognised a broad southern transition zone (the Shaba subregion) between the Congolian and the Zambezian regions, which forms an arc from the Angolan Atlantic coast to the southern Ugandan uplands, and that expands southwards in Angola along the coastal escarpment. Also, it split the Southern African Region in several subregions, including the small biogeographic unit of Southwest Angola. In this new analysis the Zambezian zone was bordered in the south by the Kalahari subregion.

Early efforts to undertake a zoogeographic analysis of Angola based on the mammalian fauna were made by Crawford-Cabral (1982, 1997) and Feiler (1990). More recently, the theme was revisited by Rodrigues et al. (2015), aiming to refine the broad scale analysis of Linder et al. (2012) and to understand the environmental determinants of biogeographic patterns (Fig. 15.2). The quantitative regionalisation developed by Rodrigues et al. (2015) focused solely on Angola (excluding Cabinda) and used data on ungulates (Cetartiodactyla, Perissodactyla, Hyracoidea), carnivores and small mammals available in the literature (Crawford-Cabral and Simões 1987, 1988; Crawford-Cabral 1998; Crawford-Cabral and Veríssimo 2005). The study retrieved four main biogeographical units, which were particularly clear in the analysis focusing on ungulates (Fig. 15.2): one northern region (Zaire-Lunda-Cuanza), one central region (Central Plateau) and two regions in the south (Namibe and Cunene-Cuando Cubango). This biogeographical pattern was strongly affected by environmental factors, reflecting the dominant climate gradients in this region of Africa (Le Houérou 2009), and the associated variation in soil and vegetation types. The regions identified also closely matched the strong north–south gradient in closed canopy forest cover (Hansen et al. 2013) with a progressive southwards transition to savannas (Murphy and Bowman 2012).

In the north, the Zaire-Lunda-Cuanza Region largely matched the Angolan portion of the Shaba Region (Linder et al. 2012), and was mainly characterised by indicator species that have their core range within the Congo Basin forests and reach their southern limit in Angola, such as Forest Buffalo, Yellow-backed Duiker, Blue Duiker, Black-fronted Duiker, and Bay Duiker. The Central Plateau corresponds roughly to the Zambezian region of Linder et al. (2012) and encompasses to

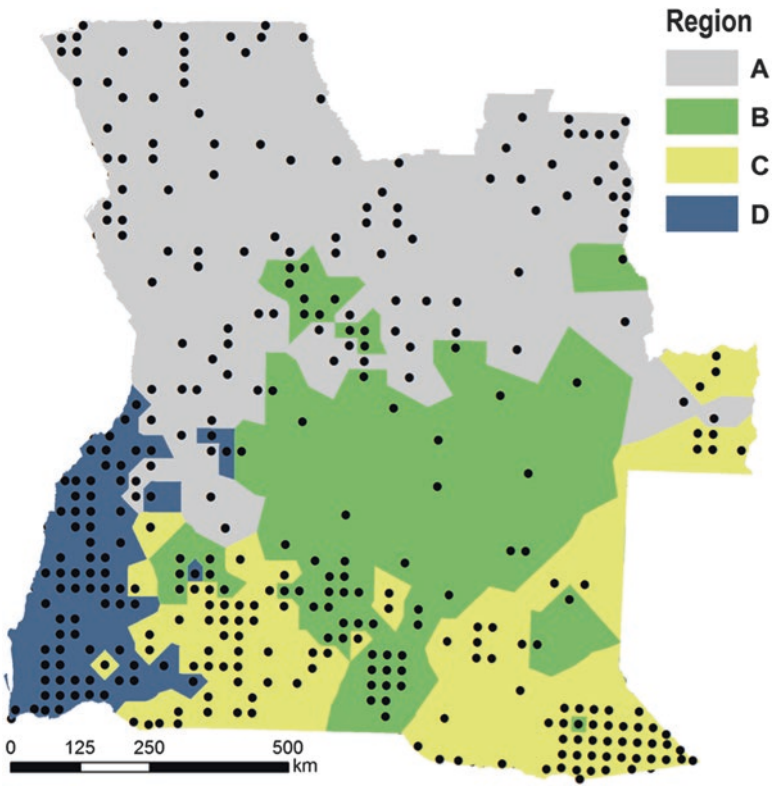

Fig. 15.2 Zoogeographic regions of Angola identified with a cluster analysis of quarter degree grid cells (approximately 25 × 25 km) characterised using the occurrences of ungulate species (Cetartiodactyla, Perissodactyla, Hyracoidea). Analysis used information documented by Crawford-Cabral and Veríssimo (2005), corresponding to data collected mainly in 1930–1980. As there was no information in many areas, grid cells were converted into a network of Thiessen polygons, each containing the centre of a single grid cell with occurrence records for five or more species (black dots). Colours are used to differentiate regions; *A* – Zaire-Lunda-Cuanza; *B* – Central Plateau; *C* – Cunene-Cuando Cubango; *D* – Namibe. (Redrawn from Rodrigues et al. (2015) and published under license by John Wiley and Sons)

a large extent the WWF Ecoregion of the Angolan miombo woodlands (Olson et al. 2001). It intergrades to some extent with the Zaire-Lunda-Cuanza region, suggesting that there is a north–south gradient in mammalian assemblages, rather than two well-defined regions. Indicator species of this region were Oribi, Roan Antelope, Eland, Common Warthog, Bush Duiker, and the local endemic Giant Sable Antelope.

In the south, the Cunene-Cuando Cubango region was clearly identified in analysis, corresponding to a savanna band running along the southern border of Angola with Namibia, eastward of the Namibe region and continuing farther north along the

border with Zambia. The region corresponds to the northern limit of the Kalahari subregion of Linder et al. (2012), though extending further north into Angola than previously recognised. It also corresponds to the Zambezian Baikiaea woodlands and the Angolan mopane woodlands defined by WWF (Olson et al. 2001). The indicators of this region are species such as Wildebeest, Giraffe, Sable Antelope, Black Rhino, Common Tsessebe, Buffalo, Hartebeest and Impala, which are widespread in savannas of southern and eastern Africa, but that have restricted distributions elsewhere in Angola. Finally, the Namibe region matches closely the south-western Angola region of Linder et al. (2012), and the WWF Ecoregion of the Kaokoveld desert (Olson et al. 2001), representing the northern part of the vast Namib Desert, and the Namibian savanna woodlands. The main indicators of this region were species such as Rock Hyrax, Yellow-spotted Rock Hyrax, Black-faced Impala, Kirk's Dik-dik, Klipspringer, Springbok, Gemsbok and Mountain Zebra.

Although this biogeographic regionalisation emerged from the analysis of occurrence data for ungulates, it is likely that similar patterns would be obtained for other groups, though a quantitative analysis was not possible due to the scarcity of information. However, the recent reviews on African bats and rodents by (Monadjem et al. 2010a, 2015), Schoeman et al. (2013) and Cooper-Bohannon et al. (2016), clearly suggest marked north-south distribution gradients, with species from Guinean and Congolian tropical forests penetrating southwards in northern Angola, species from arid areas occurring in the southwest, and savanna species occurring in a southern band. The same seems to happen with other groups such as primates.

As described in 'The Mammal Fauna' section above, Angola has a number of endemic and near endemic species, which are particularly numerous in the case of rodents. The number of endemics recognised has been growing in recent years, mainly due to the use of molecular techniques to understand phylogenetic relationships among taxa, new field surveys, and the re-examination of specimens collected several decades ago (Carleton et al. 2015; Svensson et al. 2017). In addition, there are several endemic and near endemic subspecies, though their taxonomic status is often uncertain. Finally, there are in Angola some isolated or otherwise disjunct populations, often far from the main distribution range of the corresponding species, which in the future may prove to warrant taxonomic recognition (Monadjem et al. 2010a, 2015). Despite this richness, however, there has been no systematic attempt to identify the regions or habitats where such endemisms occur in Angola, or on the phylogeographic processes that have driven their divergence from sister taxa. Nevertheless, analogies with other taxonomic groups suggest that in Angola there are well-defined regions that are centres of endemism, and thus merit further surveys and conservation attention. These are mostly concentrated along the Angolan Escarpment and Afromontane forests of western Angola, which are known to have high prevalence of plant, invertebrate and vertebrate endemisms (Hall 1960; Figueiredo et al. 2009; Clark et al. 2011; Mills et al. 2011, 2013), including mammals (Carleton et al. 2015).

Conservation

The global conservation status of 95.2% of the 290 native mammal species known to occurr in Angola has been evaluated by IUCN (2018), of which there are 2 Critically Endangered, 2 Endangered, 11 Vulnerable, 14 Near-Threatened, and 12 Data Deficient species (Appendix). The order Carnivora has the largest number of threatened species (5), but there are also threatened species in the orders Pholidota (3), Cetartiodactyla (2), Perissodactyla (2), Primates (2) and Sirenia (1). The Critically Endangered species are Black Rhinoceros, which is likely to be currently extinct in the country, and Western Gorilla, which seems to be restricted to a very small area in the Maiombe forests of Cabinda. There is also one Critically Endangered subspecies, the Giant Sable Antelope, though its parental species is considered Not Threatened. The Endangered species are the African Wild Dog, which in Angola maintains some populations that may be relevant for species conservation at the global scale (Veríssimo 2008; Overton et al. 2017; Fabiano et al. 2017; Funston et al. 2017; Monterroso et al., unpublished data), and Chimpanzee, which like the Western Gorilla is restricted to small areas in the forests of Cabinda.

The Vulnerable category includes a diverse array of species, including Cheetah, African Golden Cat, Lion, Leopard, Giraffe, Hippopotamus, Mountain Zebra, White-bellied Pangolin, Giant Ground Pangolin, Temminck's Ground Pangolin and African Manatee. Although classified as Vulnerable by IUCN, the Elephant was not considered in this group because we assumed the scientifically well-established division in two separate species, Forest and Savanna Elephants, which have hitherto not been evaluated by IUCN. Given the precipituous decline of Forest Elephant due to poaching and its very low intrinsic growth rate, the species may qualify to the Endangered or even Critically Endangered status (e.g., Cerling et al. 2016; Poulsen et al. 2017; Turkalo et al. 2017). Black-faced Impala is a subspecies considered Vulnerable, though its parental species is classified as Not Threatened. Regarding Near Threatened species, these include four carnivores (Brown Hyena, African Clawless Otter, Congo Clawless Otter, Spotted-necked Otter), six Cetartiodactyla (Bay Duiker, White-bellied Duiker, Yellow-backed Duiker, Waterbuck, Southern Lechwe, Puku), three bats (Striped leaf-nosed Bat, Large-eared Free-tailed Bat, Angolan Epauletted Fruit Bat), and one primate (Black Crested Mangabey).

There is very little information on the current status in Angola of most threatened and near-threatened species, but many of them are feared extinct or at the brink of extinction. This is mainly the case for large carnivores and herbivores, which were heavily hunted during and in the years following the civil war, and for which virtually no information on distribution and numbers has been collected for over three decades (Huntley 2017). A few recent surveys confirm this situation, showing that many species once common in Angola only persist at present in remote areas, usually having small and fragmented populations (Veríssimo 2008; Overton et al. 2017; Fabiano et al. 2017; Funston et al. 2017; Monterroso et al., unpublished data). This is illustrated for instance by the critical condition of the iconic Giant Sable Antelope, which has declined to very small numbers over the past decades (e.g., Vaz Pinto

et al. 2016 and Vaz Pinto 2019). Another iconic species, Savanna Elephant, also appeared to have declined precipitously, even after the end of the civil war (Milliken et al. 2006; Chase and Griffin 2011; Schlossberg et al. 2018), and the Forest Elephant may be on the verge of extinction in the country. Poaching and habitat destruction are likely the main threats, and a major cause of concern is the illegal trade of ivory, channelled through the capital Luanda, and which is fuelling most of the poaching activities (Milliken et al. 2006; Svensson et al. 2014b). African Manatee is another globally vulnerable species that is likely on the verge of extinction in Angola, resulting from unsustainable hunting associated with the bushmeat trade (Morais et al. 2006a, b; Collins et al. 2011). Information is even scarcer for smaller and less charismatic species, and it is noteworthy that many of the data deficient mammal taxa listed by IUCN for Angola are endemics or near-endemics to the country. These include for instance Lesser Angolan Epauletted Fruit Bat, Hayman's Dwarf Epauletted Fruit Bat, Angolan Long-eared Bat, Black-nosed Red-tailed Monkey, Pluto Monkey, Southern Black Crested Mangabey, Angolan African Dormouse, Monard's Dormouse, Angolan Shaggy Rat, Vernay's Climbing Mouse, Lunda Rope Squirrel, and Heather Shrew, all of which have rather restricted distribution and may qualify to a threatened or near-threatened category upon further investigation.

The problems affecting the conservation of biodiversity in Angola and some of their potential solutions are discussed at length in Huntley et al. (2019). The same considerations broadly apply to the mammal species. It should be noted, however, that mammals will inevitably be at the forefront of biodiversity conservation in Angola, as this group includes some of the most threatened species at the global scale, as well as some of the species that have suffered the most from decades of persecution and management neglect. Furthermore, the key threats to many of the most endangered species are likely to continue or even intensify in the country (Huntley 2017), due to a detrimental combination of factors such as commercial and illegal wildlife trade, bushmeat harvesting, and habitat destruction through deforestation, agricultural expansion, and infrastructure development. At the same time, however, there are encouraging signs for biodiversity conservation in Angola, many of which involving efforts to preserve endangered mammals. Despite multiple problems, it has been possible to secure the critically endangered populations of the Giant Sable (e.g., Vaz Pinto et al. 2016 and Vaz Pinto 2019), while new surveys have revealed the potential of recovery of other iconic species such as Lion and Wild Dog, among others (Veríssimo 2008; Overton et al. 2017; Fabiano et al. 2017; Funston et al. 2017; Monterroso et al., unpublished data). For at least some of these species, Angola may play an important role for conservation efforts, by securing relevant populations and thus reducing risks at the global scale (e.g., Riggio et al. 2013). Many of these species have persisted in areas that are now protected by national legislation, and it is expected that current conservation efforts, albeit yet modest, will help them to recover in range and numbers. It is now necessary to move forward, increasing the conservation efforts for these threatened species, at the same time that new surveys are carried out to obtain a more complete appreciation of the diversity and conservation needs of the overall mammal fauna of Angola (Fig. 15.3).

Fig. 15.3 Angolan mammals. *1* Pack of African Wild Dogs (*Lycaon pictus*) in Luando Strict Nature Reserve; *2* Herd of Forest Buffalo (*Syncerus caffer nanus*) in Quiçama National Park; *3* Yellow-backed Duiker (*Cephalophus silvicultor ruficrista*) in Luando Strict Nature Reserve; *4* Black Rhinoceros (*Diceros bicornis bicornis*) in Iona National Park; *5* Angolan Bush Hyrax (*Heterohyrax brucei bocagei*) at Serra da Neve; *6* White-bellied Pangolin (*Phataginus tricuspis*) in Cangandala National Park; *7* Angolan Dwarf Galago (*Galagoides kumbirensis*) in Cumbira Forest; *8* Pluto Monkey (*Cercopithecus mitis mitis*) in Quiçama National park. (Photo Credits: 1, 4 – Brian J. Huntley, 2 – Merle Huntley: 1970s personal archive; 3, 5, 6, 8 – Pedro Vaz Pinto; 7 – Elena Bersacola)

Appendix

Checklist of the native mammals of Angola. The table provides all species with occurrence confirmed in the country (e.g., collected specimens, photos, reliable sightings), as well as all subspecies (in grey font) confirmed in the country and that are evaluated separately in the IUCN Red List (IUCN 2018). The Order, **Family**, *Latin name* (author, date), English name, IUCN conservation status (**CS**), and key references (**Ref**) confirming species presence are provided for each taxa. Taxa are arranged by alphabetic order of Order, Family and Latin name

Species	English name	CS[a]	Ref.[b]
Afrosoricida	**Chrysochloridae**		
Huetia leucorhina (Huet, 1885)	Congo Golden Mole	DD	21
Afrosoricida	**Tenrecidae**		
Potamogale velox (Du Chaillu, 1860)	Giant Otter Shrew	LC	3-5
Carnivora	**Canidae**		
Canis adustus (Sundevall, 1847)	Side-striped Jackal	LC	12
Canis mesomelas (Schreber, 1775)	Black-backed Jackal	LC	12
Lycaon pictus (Temminck, 1820)	African Wild Dog	EN	13
Otocyon megalotis (Desmarest, 1822)	Bat-eared Fox	LC	12
Vulpes chama (A. Smith, 1833)	Cape Fox	LC	12
Carnivora	**Felidae**		
Acinonyx jubatus (Schreber, 1775)	Cheetah	VU	13
Caracal aurata (Temminck, 1827)	African Golden Cat	VU	16
Caracal caracal (Schreber, 1776)	Caracal	LC	12
Felis silvestris (Schreber, 1777)	Wild Cat	LC	12
Leptailurus serval (Schreber, 1776)	Serval	LC	12
Panthera leo (Linnaeus, 1758)	Lion	VU	13
Panthera pardus (Linnaeus, 1758)	Leopard	VU	13
Carnivora	**Herpestidae**		
Atilax paludinosus (G.[Baron] Cuvier, 1829)	Marsh Mongoose	LC	12
Bdeogale nigripes (Pucheran, 1855)	Black-legged Mongoose	LC	12
Crossarchus ansorgei (Thomas, 1910)	Ansorge's Cusimanse	LC	12
Cynictis penicillata (G.[Baron] Cuvier, 1829)	Yellow Mongoose	LC	12
Helogale parvula (Sundevall, 1847)	Common Dwarf Mongoose	LC	12
Herpestes flavescens (Bocage, 1889)	Kaokoveld Slender Mongoose	LC	10
Herpestes ichneumon (Linnaeus, 1758)	Egyptian Mongoose	LC	12
Herpestes sanguineus (Rüppell, 1835)	Common Slender Mongoose	LC	10
Ichneumia albicauda (G.[Baron] Cuvier, 1829)	White-tailed Mongoose	LC	12
Mungos mungo (Gmelin, 1788)	Banded Mongoose	LC	12
Paracynictis selousi (de Winton, 1896)	Selous's Mongoose	LC	12
Suricata suricatta (Schreber, 1776)	Meerkat	LC	12
Carnivora	**Hyaenidae**		
Crocuta crocuta (Erxleben, 1777)	Spotted Hyaena	LC	13

(continued)

Species	English name	CS[a]	Ref.[b]
Parahyaena brunnea (Thunberg, 1820)	Brown Hyaena	NT	13
Proteles cristata (Sparrman, 1783)	Aardwolf	LC	13
Carnivora	**Mustelidae**		
Aonyx capensis (Schinz, 1821)	African Clawless Otter	NT	12
Aonyx congicus (Lönnberg, 1910)	Congo Clawless Otter	NT	12
Hydrictis maculicollis (Lichtenstein, 1835)	Spotted-necked Otter	NT	12
Ictonyx striatus (Perry, 1810)	Striped Polecat	LC	12
Mellivora capensis (Schreber, 1776)	Honey Badger	LC	12
Poecilogale albinucha (Gray, 1864)	African Striped Weasel	LC	12
Carnivora	**Nandiniidae**		
Nandinia binotata (Gray, 1830)	African Palm Civet	LC	12
Carnivora	**Otariidae**		
Arctocephalus pusillus	Brown Fur Seal	LC	36
Carnivora	**Viverridae**		
Civettictis civetta (Schreber, 1776)	African Civet	LC	12
Genetta angolensis Bocage, 1882	Miombo Genet	LC	12
Genetta genetta (Linnaeus, 1758)	Common Genet	LC	12
Genetta maculata (Gray, 1830)	Large-spotted Genet	LC	12
Cetartiodactyla	**Bovidae**		
Aepyceros melampus (Lichtenstein, 1812)	Common Impala	LC	14
Aepyceros melampus ssp. *melampus* (Lichtenstein, 1812)	Common Impala	LC	14
Aepyceros melampus ssp. *petersi* (Bocage, 1879)	Black-faced Impala	VU	14
Alcelaphus buselaphus (Pallas, 1766)	Hartebeest	LC	14
Alcelaphus buselaphus ssp. *lichtensteinii* (Peers, 1849)	Lichtenstein's Hartebeest	LC	14
Alcelaphus buselaphus ssp. *caama* (É. Geoffroy Saint-Hilaire, 1803)	Red Hartebeest	LC	14
Antidorcas marsupialis (Zimmermann, 1780)	Springbok	LC	14
Cephalophus dorsalis (Gray, 1846)	Bay Duiker	NT	14
Cephalophus leucogaster (Gray, 1873)	White-bellied Duiker	NT	14
Cephalophus nigrifrons (Gray, 1871)	Black-fronted Duiker	LC	14
Cephalophus silvicultor (Afzelius, 1815)	Yellow-backed Duiker	NT	14
Connochaetes taurinus (Burchell, 1823)	Common Wildebeest	LC	14
Damaliscus lunatus (Burchell, 1823)	Topi	LC	14
Hippotragus equinus (É. Geoffroy Saint-Hilaire, 1803)	Roan Antelope	LC	14
Hippotragus niger (Harris, 1838)	Sable Antelope	LC	14
Hippotragus niger ssp. *variani* (Thomas, 1916)	Giant Sable Antelope	CR	14
Kobus ellipsiprymnus (Ogilbyi, 1833)	Waterbuck	NT	14
Kobus ellipsiprymnus ssp. *defassa* (Ruppell, 1835)	Defassa Waterbuck	NT	14
Kobus ellipsiprymnus ssp. *ellipsiprymnus* (Ogilbyi, 1833)	Common Waterbuck	LC	14
Kobus leche (Gray, 1850)	Southern Lechwe	NT	14
Kobus leche leche (Gray, 1850)	Red Lechwe	NT	14

(continued)

Species	English name	CS[a]	Ref.[b]
Kobus vardonii (Livingstone, 1857)	Puku	NT	14
Madoqua kirkii (Günther, 1880)	Kirk's Dik-dik	LC	14
Oreotragus oreotragus (Zimmermann, 1783)	Klipspringer	LC	14
Oryx gazella (Linnaeus, 1758)	Gemsbok	LC	14
Ourebia ourebi (Zimmermann, 1783)	Oribi	LC	14
Philantomba monticola (Thunberg, 1789)	Blue Duiker	LC	14
Raphicerus campestris (Thunberg, 1811)	Steenbok	LC	14
clinginRedunca arundinum (Boddaert, 1785)	Southern Reedbuck	LC	14
Sylvicapra grimmia (Linnaeus, 1758)	Common Duiker	LC	14
Syncerus caffer (Sparrman, 1779)	Forest Buffalo	LC	14
Tragelaphus oryx (Pallas, 1766)	Common Eland	LC	14
Tragelaphus scriptus (Pallas, 1766)	Bushbuck	LC	14
Tragelaphus spekii (Speke, 1863)	Sitatunga	LC	14
Tragelaphus strepsiceros (Pallas, 1766)	Greater Kudu	LC	14
Cetartiodactyla	**Giraffidae**		
Giraffa camelopardalis (Linnaeus, 1758)	Giraffe	VU	14
Cetartiodactyla	**Hippopotamidae**		
Hippopotamus amphibius (Linnaeus, 1758)	Hippopotamus	VU	14
Cetartiodactyla	**Suidae**		
Phacochoerus africanus (Gmelin, 1788)	Common Warthog	LC	14
Potamochoerus larvatus (F. Cuvier, 1822)	Bushpig	LC	14
Potamochoerus porcus (Linnaeus, 1758)	Red River Hog	LC	14
Cetartiodactyla	**Tragulidae**		
Hyemoschus aquaticus (Ogilby, 1841)	Water Chevrotain	LC	14
Chiroptera	**Emballonuridae**		
Coleura afra (Peters, 1852)	African Sheath-tailed Bat	LC	8, 29
Saccolaimus peli (Temminck 1853)	Pel's Pouched Bat	LC	8, 29
Taphozous mauritianus (E. Geoffroy, 1818)	Mauritian Tomb Bat	LC	8, 29
Chiroptera	**Hipposideridae**		
Hipposideros caffer (Sundevall, 1846)	Sundevall's Leaf-nosed Bat	LC	8, 29
Hipposideros vittatus (Peters, 1852)	Striped Leaf-nosed Bat	NT	8, 29
Hipposideros ruber (Noack, 1893)	Noack's leaf-nosed Bat	LC	8, 29
Macronycteris gigas (Wagner, 1845)	Giant Leaf-nosed Bat	LC	8, 29
Triaenops afer (Peters, 1877)	African Trident Bat	LC	20
Chiroptera	**Minipteridae**		
Miniopterus natalensis (A. Smith 1833)	Natal Long-fingered Bat	LC	8,29
Chiroptera	**Molossidae**		
Chaerephon ansorgei (Thomas, 1913)	Ansorge's Free-tailed Bat	LC	8, 29
Chaerephon chapini (J.A. Allen, 1917)	Pale Free-tailed Bat	LC	8, 29
Chaerephon nigeriae (Thomas, 1913)	Nigerian Free-tailed Bat	LC	8, 29
Chaerephon pumilus (Cretzschmar, 1826)	Little Free-tailed Bat	LC	8, 29
Mops condylurus (A. Smith, 1833)	Angolan Free-tailed Bat	LC	8, 29
Mops midas (Sundevall, 1843)	Midas Free-tailed Bat	LC	8, 29
Mops niveiventer (Cabrera and Ruxton, 1926)	White-bellied Free-tailed Bat	LC	8, 29

(continued)

Species	English name	CS[a]	Ref.[b]
Otomops martiensseni (Matschie, 1897)	Large-eared Free-tailed Bat	NT	8, 29
Sauromys petrophilus (Roberts, 1917)	Roberts's Flat-headed Bat	LC	8
Tadarida aegyptiaca (E. Geoffroy St.-Hilaire, 1818)	Egyptian Free-tailed Bat	LC	8, 29
CHIROPTERA	**Nycteridae**		
Nycteris arge (Thomas, 1903)	Bate's Slit-faced Bat	LC	8, 29
Nycteris hispida (Schreber, 1775)	Hairy Slit-faced Bat	LC	8, 29
Nycteris intermedia (Aellen, 1959)	Intermediate Slit-faced Bat	LC	8, 29
Nycteris macrotis (Dobson, 1876)	Large-eared Slit-faced Bat	LC	8, 29
Nycteris nana (K. Andersen, 1912)	Dwarf Slit-faced Bat	LC	8, 29
Nycteris thebaica (E. Geoffroy St.-Hilaire, 1818)	Egyptian Slit-faced Bat	LC	8, 29
CHIROPTERA	**Pteropodidae**		
Eidolon helvum (Kerr, 1792)	Straw-coloured Fruit Bat	LC	8, 29
Epomophorus angolensis (Gray, 1870)	Angolan Epauletted Fruit Bat	NT	8, 29
Epomophorus crypturus (Peters, 1852)	Peters's Epauletted Fruit Bat	LC	8, 29
Epomophorus grandis (Sanborn, 1950)	Lesser Angolan Epauletted Fruit Bat	DD	8, 29
Epomophorus wahlbergi (Sundevall, 1846)	Wahlberg's Epauletted Fruit Bat	LC	8, 29
Epomops dobsoni (Bocage, 1889)	Dobson's Epauletted Fruit Bat	LC	8, 29
Epomops franqueti (Tomes, 1860)	Franquet's Epauletted Fruit Bat	LC	8, 29
Hypsignathus monstrosus (H. Allen, 1862)	Hammer-headed Fruit Bat	LC	8, 29
Megaloglossus woermanni (Pagenstecher, 1885)	Woermann's Long-tongued Fruit Bat	LC	8, 29
Micropteropus intermedius (Hayman, 1963)	Hayman's Dwarf Epauletted Fruit Bat	DD	8, 29
Micropteropus pusillus (Peters, 1868)	Peters's Dwarf Epauletted Fruit Bat	LC	8, 29
Myonycteris angolensis (Bocage, 1898)	Angolan Soft-furred Fruit Bat	LC	8, 29
Myonycteris torquata (Dobson, 1878)	Little Collared Fruit Bat	LC	8, 29
Plerotes anchietae (Seabra, 1900)	Anchieta's Fruit Bat	DD	8, 29
Rousettus aegyptiacus (E. Geoffroy St.-Hilaire, 1810)	Egyptian Rousette	LC	8, 29
CHIROPTERA	**Rhinolophidae**		
Rhinolophus damarensis (Roberts, 1946)	Damara Horseshoe Bat	LC	1
Rhinolophus denti (Thomas, 1904)	Dent's Horseshoe Bat	LC	8
Rhinolophus eloquens (K. Andersen, 1905)	Eloquent Horseshoe Bat	LC	19
Rhinolophus fumigatus (Rüppell, 1842)	Rüppell's Horseshoe Bat	LC	8, 29
Rhinolophus lobatus (Peters, 1852)	Peters's Horseshoe Bat	NE	33
CHIROPTERA	**Vespertilionidae**		
Cistugo seabrai (Thomas, 1912)	Angolan Hairy Bat	LC	8, 29
Eptesicus hottentotus (A. Smith, 1833)	Long-tailed Serotine	LC	8, 29
Glauconycteris argentata (Dobson, 1875)	Common Butterfly Bat	LC	8, 29

(continued)

Species	English name	CS[a]	Ref.[b]
Glauconycteris beatrix (Thomas, 1901)	Beatrix's Butterfly Bat	LC	8, 29
Glauconycteris variegata (Tomes, 1861)	Variegated Butterfly Bat	LC	8, 29
Hypsugo anchietae (Seabra, 1900)	Anchieta's Pipistrelle	LC	8, 29
Hypsugo crassulus (Thomas, 1904)	Broad-headed Pipistrelle	LC	20
Kerivoula argentata (Tomes, 1861)	Damara Woolly Bat	LC	34
Kerivoula lanosa (A. Smith, 1847)	Lesser Woolly Bat	LC	29
Laephotis angolensis (Monard, 1935)	Angolan Long-eared Bat	DD	8, 29
Laephotis botswanae (Setzer, 1971)	Botswana Long-eared Bat	LC	26
Mimetillus moloneyi (Thomas, 1891)	Moloney's Flat-headed Bat	LC	20
Mimetillus thomasi (Hinton, 1920)	Thomas's Flat-headed Bat	NE	29
Myotis bocagii (Peters, 1870)	Bocage's Mouse-eared Bat	LC	8, 29
Myotis welwitschii (Gray, 1866)	Welwitsch's Mouse-eared Bat	LC	8, 29
Neoromicia capensis (A. Smith, 1829)	Cape Serotine	LC	8, 29
Neoromicia grandidieri (Dobson, 1876)	Dobson's Pipistrelle	DD	29
Neoromicia nana (Peters, 1852)	Banana Bat	LC	8, 29
Neoromicia tenuipinnis (Peters, 1872)	White-winged Serotine	LC	8, 29
Neoromicia zuluensis (Roberts, 1924)	Zulu Serotine	LC	29
Nycticeinops schlieffeni (Peters, 1859)	Schlieffen's Bat	LC	8, 29
Pipistrellus hesperidus (Temminck, 1840)	Dusky Pipistrelle	LC	20
Pipistrellus rueppellii (J. Fischer, 1829)	Rüppell's Pipistrelle	LC	8, 29
Pipistrellus rusticus (Tomes, 1861)	Rusty Pipistrelle	LC	34
Scotoecus hindei (Thomas, 1901)	Thomas's House Bat	NE	29
Scotophilus dinganii (A. Smith, 1833)	Yellow-bellied House Bat	LC	8, 29
Scotophilus leucogaster (Cretzschmar, 1826)	White-bellied House Bat	LC	29
Scotophilus viridis (Peters, 1852)	Green House Bat	LC	8, 29
Erinaceomorpha	**Erinaceidae**		
Atelerix frontalis (A. Smith, 1831)	Southern African Hedgehog	LC	7
Hyracoidea	**Procaviidae**		
Dendrohyrax arboreus (A. Smith, 1827)	Southern Tree Hyrax	LC	14
Dendrohyrax dorsalis (Fraser, 1855)	Western Tree Hyrax	LC	14
Heterohyrax brucei (Gray, 1868)	Bush Hyrax	LC	14
Procavia capensis (Pallas, 1766)	Kaokoveld Rock Dassie	LC	14
Lagomorpha	**Leporidae**		
Lepus capensis (Linnaeus, 1758)	Cape Hare	LC	18
Lepus victoriae (Thomas, 1893)	African Savanna Hare	LC	31
Pronolagus randensis (Jameson, 1907)	Jameson's Red Rock Hare	LC	31
Macroscelidea I	**Macroscelididae**		
Elephantulus brachyrhynchus (A. Smith, 1836)	Short-snouted Elephant-shrew	LC	15
Elephantulus intufi (A. Smith, 1836)	Bushveld Elephant-shrew	LC	15
Petrodromus tetradactylus (Peters, 1846)	Four-toed Elephant-shrew	LC	15
Perissodactyla	**Equidae**		
Equus quagga (Boddaert, 1785)	Plains Zebra	LC	14
Equus zebra (Linnaeus, 1758)	Mountain Zebra	VU	14

(continued)

Species	English name	CS[a]	Ref.[b]
Equus zebra ssp. *hartmannae* (Matschie, 1898)	Hartmann's Mountain Zebra	VU	14
PERISSODACTYLA	**Rhinocerotidae**		
Diceros bicornis (Linnaeus, 1758)	Black Rhino	CR	14
Diceros bicornis ssp. *bicornis* (Linnaeus, 1758)	South-western Black Rhino	VU	14
Diceros bicornis ssp. *minor* (Drummond, 1876)	Southern-central Black Rhino	CR	14
PHOLIDOTA	**Manidae**		
Phataginus tricuspis (Rafinesque, 1821)	White-bellied Pangolin	VU	22
Smutsia gigantea (Illiger, 1815)	Giant Ground Pangolin	VU	22
Smutsia temminckii (Smuts, 1832)	Temminck's Ground Pangolin	VU	25
PRIMATES	**Cercopithecidae**		
Cercopithecus ascanius (Audebert, 1799)	Red-tailed Monkey	LC	27
Cercopithecus ascanius ssp. *atrinasus* (Machado, 1965)	Black-nosed Red-tailed Monkey	DD	27
Cercopithecus cephus (Linnaeus, 1758)	Moustached Monkey	LC	27
Cercopithecus mitis (Wolf, 1822)	Blue Monkey	LC	28
Cercopithecus mitis ssp. *mitis* (Wolf, 1822)	Pluto Monkey	DD	28
Cercopithecus mitis ssp. *opisthostictus* (Sclater, 1894)	Rump-spotted Blue Monkey	LC	28
Cercopithecus pogonias (Bennett, 1833)	Crowned Monkey	NE	?
Cercopithecus pogonias ssp. *nigripes* (Du Chaillu, 1860)	Black-footed Crowned Monkey	LC	?
Cercopithecus neglectus (Schlegel, 1876)	De Brazza's Monkey	LC	27
Cercopithecus nictitans (Linnaeus, 1766)	Putty-nosed Monkey	LC	27
Chlorocebus cynosuros (Scopoli, 1786)	Malbrouck Monkey	LC	23
Colobus angolensis (P. Sclater, 1860)	Angola Colobus	LC	27
Colobus angolensis ssp. *angolensis* (P. Sclater, 1860)	Sclater's Angolan Colobus	LC	27
Lophocebus aterrimus (Oudemans, 1890)	Black Crested Mangabey	NT	27
Lophocebus terrimus ssp. *opdenboschi* (Schouteden, 1944)	Southern Black Crested Mangabey	DD	27
Miopithecus ogouensis (Kingdon, 1997)	Northern Talapoin Monkey	LC	17
Miopithecus talapoin (Schreber, 1774)	Southern Talapoin Monkey	LC	27
Papio kindae (Lönnberg, 1919)	Kinda Baboon	LC	27
Papio ursinus (Kerr, 1792)	Chacma Baboon	LC	27
Papio ursinus ssp. *ursinus* (Kerr, 1792)	Southern Chacma Babbon	LC	27
PRIMATES	**Galagidae**		
Euoticus elegantulus (Le Conte, 1857)	Southern Needle-clawed Galago	LC	24
Galago moholi (A. Smith, 1836)	Southern Lesser Galago	LC	2
Galagoides demidoff (G. Fischer, 1806)	Demidoff's Dwarf Galago	LC	27
Galagoides kumbirensis (Svensson et al. 2017)	Angolan Dwarf Galago	NE	32
Galagoides thomasi (Elliot, 1907)	Thomas's Dwarf Galago	LC	2
Otolemur crassicaudatus (É. Geoffroy Saint-Hilaire, 1812)	Garnett's Greater Galago	LC	2

(continued)

Species	English name	CS[a]	Ref.[b]
PRIMATES	**Hominidae**		
Gorilla gorilla (Savage, 1847)	Western Gorilla	CR	24
Gorilla gorilla ssp. *gorilla* (Savage, 1847)	Western Lowland Gorilla	CR	24
Pan troglodytes (Blumenbach, 1799)	Chimpanzee	EN	24
Pan troglodytes ssp. *troglodytes* (Blumenbach, 1799)	Central Chimpanzee	EN	24
PRIMATES	**Lorisidae**		
Arctocebus aureus de (Winton, 1902)	Golden Potto	LC	2
Perodicticus edwardsi (Bouvier, 1879)	Milne-Edwards's Potto	LC	2
PROBOSCIDEA	**Elephantidae**		
Loxodonta africana (Blumenbach, 1797)	Savanna Elephant	NE	14
Loxodonta cyclotis (Matschie, 1900)	Forest elephant	NE	14
RODENTIA	**Anomaluridae**		
Anomalurus beecrofti (Fraser, 1853)	Beecroft's Scaly-tailed Squirrel	LC	30
Anomalurus derbianus (Gray, 1842)	Lord Derby's Scaly-tailed Squirrel	LC	30
RODENTIA	**Bathyergidae**		
Fukomys bocagei (de Winton, 1897)	Bocage's Mole Rat	LC	30
Fukomys damarensis (Ogilby, 1838)	Damara Mole Rat	LC	30
RODENTIA	**Gliridae**		
Graphiurus angolensis (de Winton, 1897)	Angolan African Dormouse	DD	30
Graphiurus kelleni (Reuvens, 1890)	Kellen's Dormouse	LC	30
Graphiurus lorraineus (Dollman, 1910)	Lorrain Dormouse	LC	30
Graphiurus monardi (St. Leger, 1936)	Monard's Dormouse	DD	30
Graphiurus rupicola (Thomas & Hinton, 1925)	Stone Dormouse	LC	30
RODENTIA	**Hystricidae**		
Hystrix africaeaustralis (Peters, 1852)	Cape Porcupine	LC	30
RODENTIA	**Muridae**		
Aethomys bocagei (Thomas, 1904)	Bocage's Rock Rat	LC	11, 30
Aethomys chrysophilus (de Winton, 1897)	Red Rock Rat	LC	11, 30
Aethomys kaiseri (Noack, 1887)	Kaiser's Rock Rat	LC	11, 30
Aethomys nyikae (Thomas, 1897)	Nyika Rock Rat	LC	30
Aethomys thomasi (de Winton, 1897)	Thomas's Rock Rat	LC	11, 30
Colomys goslingi (Thomas & Wroughton, 1907)	African Wading Rat	LC	11, 30
Dasymys cabrali (Verheyen et al. 2003)	Cabral's Marsh Rat	NE	30
Dasymys cf incomtus	African Marsh Rat	LC	30
Dasymys nudipes (Peters, 1870)	Angolan Shaggy Rat	DD	11, 30

(continued)

Species	English name	CS[a]	Ref.[b]
Desmodillus auricularis (A. Smith, 1834)	Cape Short-eared Gerbil	LC	11, 30
Gerbilliscus brantsii (A. Smith, 1836)	Highveld Gerbil	LC	11, 30
Gerbilliscus leucogaster (Peters, 1852)	Bushveld Gerbil	LC	11, 30
Gerbilliscus paeba (A. Smith, 1836)	Hairy-footed Gerbil	LC	11, 30
Gerbilliscus setzeri (Schlitter, 1973)	Setzer's Hairy-footed Gerbil	LC	11, 30
Gerbilliscus validus (Bocage, 1890)	Savanna Gerbil	LC	11, 30
Grammomys dolichurus (Smuts, 1832)	Woodland Thicket Rat	LC	11, 30
Grammomys poensis (Eisentraut, 1965)	Shining Thicket Rat	NE	11, 30
Hylomyscus carillus (Thomas, 1904)	Angolan Wood Mouse	LC	11, 30
Hylomyscus heinrichorum (Carleton et al. 2015)	Heirich's Hylomyscus	NE	6
Lemniscomys griselda (Thomas, 1904)	Griselda's Striped Grass Mouse	LC	11
Lemniscomys striatus (Linnaeus, 1758)	Typical Striped Grass Mouse	LC	11, 30
Lophuromys angolensis (Verheyen et al. 2000)	Angolan's Brush-furred Rat	NE	30
Lophuromys rita (Dollman, 1910)	Dollman's Brush-furred Rat	NE	30
Malacomys longipes (Milne-Edwards, 1877)	Big-eared Swamp Rat	LC	11, 30
Mastomys natalensis (Smith, 1834)	Natal Multimammate Mouse	LC	11, 30
Mastomys shortridgei (St. Leger, 1933)	Shortridge's Multimammate Mouse	LC	11, 30
Micaelamys namaquensis (A. Smith, 1834)	Namaqua Rock Rat	LC	11,30
Mus callewaerti (Thomas, 1925)	Callewaert's Mouse	LC	11,30
Mus indutus (Thomas, 1910)	Desert Pygmy Mouse	LC	30
Mus minutoides (Smith, 1834)	Pygmy Mouse	LC	30
Mus setzeri (Petter, 1978)	Setzer's Mouse	LC	30
Mus sorella (Thomas, 1909)	Thoma's Mouse	LC	30
Mus triton (Thomas, 1909)	Gray-bellied Pygmy Mouse	LC	11, 30
Myomyscus angolensis (Bocage, 1890)	Angolan Multimammate Mouse	LC	11, 30
Oenomys hypoxanthus (Pucheran, 1855)	Rufous-nosed Rat	LC	11, 30
Otomys anchietae (Bocage, 1882)	Angolan Vlei Rat	LC	11, 30
Otomys angoniensis (Wroughton, 1906)	Angoni Vlei Rat	LC	11, 30

(continued)

Species	English name	CS[a]	Ref.[b]
Otomys cuanzensis (Hill & Carter, 1937)	Kuanza Vlei Rat	LC	30
Pelomys campanae (Huet, 1888)	Bell Groove-toothed Swamp Rat	LC	11, 30
Pelomys fallax (Peters, 1852)	Creek Groove-toothed Swamp Rat	LC	11, 30
Pelomys minor (Cabrera & Ruxton, 1926)	Least Groove-toothed Swamp Rat	LC	11, 30
Praomys coetzeei (Van der Straeten, 2008)	Coetzee Praomys	NE	30, 35
Praomys jacksoni (de Winton, 1897)	Jackson's Soft-furred Mouse	LC	11, 30
Rhabdomys bechuanae (Thomas, 1893)	Thoma's Four-striped Grass Mouse	NE	30
Rhabdomys dilectus (de Winton, 1897)	Mesic Four-striped Grass Rat	NE	11, 30
Thallomys nigricauda (Thomas, 1882)	Black-tailed Tree Rat	LC	11, 30
Zelotomys hildegardeae (Thomas, 1902)	Hildegarde's Broad-headed Mouse	LC	11, 30
Zelotomys woosnami (Schwann, 1906)	Woosnam's Broad-headed Mouse	LC	34
Rodentia	**Nesomydae**		
Cricetomys ansorgei (Thomas, 1904)	Southern Giant Pouched Rat	LC	30
Cricetomys emini (Wroughton, 1910)	Forest Giant Pouched Rat	LC	30
Dendromus leucostomus (Monard, 1933)	Gray African Climbing Mouse	LC	30
Dendromus melanotis (A. Smith, 1834)	Gray African Climbing Mouse	LC	30
Dendromus mystacalis (Heuglin, 1863)	Chestnut Climbing Mouse	LC	30
Dendromus nyikae (Wroughton, 1909)	Nyika Climbing Mouse	LC	30
Dendromus vernayi (Hill & Carter, 1937)	Vernay's Climbing Mouse	DD	30
Malacothrix typica (A. Smith, 1834)	Gerbil Mouse	LC	30
Petromyscus collinus (Thomas & Hinton, 1925)	Pygmy Rock Mouse	LC	30
Petromyscus shortridgei (Thomas, 1926)	Shortridge's Rock Mouse	LC	30
Saccostomus campestris (Peters, 1846)	Southern African Pouched Mouse	LC	30
Steatomys bocagei (Thomas, 1892)	Bocage's Fat Mouse	LC	30
Steatomys krebsii (Peters, 1852)	Kreb's Fat Mouse	LC	30
Steatomys parvus (Rhoads, 1896)	Tiny Fat Mouse	LC	30
Steatomys pratensis (Peters, 1846)	Fat Mouse	LC	30
Rodentia	**Pedetidae**		
Pedetes capensis (Forster, 1778)	Spring Hare	LC	30
Rodentia	**Petromuridae**		
Petromus typicus (A. Smith, 1831)	Dassie Rat	LC	30
Rodentia	**Sciuridae**		
Funisciurus bayonii (Bocage, 1890)	Lunda Rope Squirrel	DD	30

(continued)

Species	English name	CS[a]	Ref.[b]
Funisciurus congicus (Kuhl, 1820)	Congo Rope Squirrel	LC	30
Funisciurus lemniscatus (Le Conte, 1857)	Ribboned Rope Squirrel	LC	30
Funisciurus pyrropus (F. Cuvier, 1833)	Fire-footed Rope Squirrel	LC	30
Heliosciurus gambianus (Ogilby, 1835)	Gambian Sun Squirrel	LC	30
Paraxerus boehmi (Reichenow, 1886)	Boehm's Bush Squirrel	LC	30
Paraxerus cepapi (A. Smith, 1836)	Smith's Bush Squirrel	LC	30
Protoxerus stangeri (Waterhouse, 1842)	African Giant Squirrel	LC	30
Xerus princeps (Thomas, 1929)	Damara Ground Squirrel	LC	30
RODENTIA	**Thryonomydae**		
Thryonomys swinderianus (Temminck, 1827)	Greater Cane Rat	LC	30
SIRENIA	**Trichechidae**		
Trichechus senegalensis (Link, 1795)	African Manatee	VU	14
SORICOMORPHA	**Soricidae**		
Crocidura cyanea (Duvernoy, 1838)	Reddish-gray Musk Shrew	LC	25
Crocidura erica (Dollman, 1915)	Heather Shrew	DD	15
Crocidura fuscomurina (Heuglin, 1865)	Bicolored Musk Shrew	LC	15
Crocidura hirta (Peters, 1852)	Lesser Red Musk Shrew	LC	15
Crocidura luna (Dollman, 1910)	Greater Gray-brown Musk Shrew	LC	21
Crocidura mariquensis (A. Smith, 1844)	Swamp Musk Shrew	LC	15
Crocidura nigricans (Bocage, 1889)	Blackish White-toothed Shrew	LC	9
Crocidura nigrofusca (Matschie, 1895)	African Black Shrew	LC	15
Crocidura olivieri (Lesson, 1827)	African giant shrew	LC	15
Crocidura parvipes (Osgood, 1910)	Small-footed Shrew	LC	15
Crocidura roosevelti (Heller, 1910)	Roosvelt's Shrew	LC	25
Crocidura turba Dollman, 1910	Turbo Shrew	LC	15
Suncus lixus (Thomas, 1898)	Greater Dwarf Shrew	LC	15
Suncus megalura (Jentink, 1888)	Climbing Shrew	LC	15
Suncus varilla (Thomas, 1895)	Lesser Dwarf Shrew	LC	34
TUBULIDENTATA	**Orycteropodidae**		
Orycteropus afer (Pallas, 1766)	Aardvark	LC	14

[a]IUCN Conservation Status categories. *CR* critically endangered, *EN* endangered, *VU* vulnerable, *NT* near threatened, *LC* least concern, *DD* data deficient, *NE* not evaluated

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