Layout: T1 Standard SC | Book ID: 271247_1_En | Book ISBN: 978-3-642-29025-1
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Chapter 17

Wild Mammals Trade for Zootherapeutic and Mythic Purposes in Benin (West Africa): Capitalizing Species Involved, Provision Sources, and Implications or Conservation

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Abstract A common problem affecting many animal species is the soaring demand for their body parts for use in medicinal products. In Benin, in spite of intense commercial exploitation of wildlife for medicinal purposes, no official statistics on the use of animals for medicinal and magic/religious purposes are available and consequently, there is little consideration of the issue in laws, decision-making processes, and conservation strategies. The aim of this study was to list the mammal species sold on the medicinal market and the conservation implications of the use of mammal species in traditional folk medicines. Among the 87 mammal species traded on the traditional medicine market in Benin, 46 were sold by at least half of those traders surveyed; the conservation status of these animals included rare, vulnerable, and threatened species. Moreover, it was noticed that the source of animals is not limited to Benin since some species available at markets are not listed in the Benin's fauna. This study also found that rarer species were more costly and this constitutes an economic motivation for sellers to develop strategies for the availability of threatened species on their displays. Urgent conservation actions are needed to reduce the pressure that this activity sector might contribute to biodiversity loss.

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Layout: T1 Standard SC Book ID: 271247_1_En Book ISBN: 978-3-642-29025-1
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R. R. N. Alves and I. L. Rosa (eds.), Animals in Traditional Folk Medicine,
DOI: 10.1007/978-3-642-29026-8_17, _ Springer-Verlag Berlin Heidelberg 2012

Layout: T1 Standard SC | Book ID: 271247_1_En | Book ISBN: 978-3-642-29025-1
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Keywords Mammal - Traditional medicine market · Trade · Conservation

17.1 Introduction

Most Africans believe that there are some magical powers which are attached to special healing acts when wild animals' by-products are used as directed by a traditional healer (Adeola 1992; Adjakpa and Ogouvide 1998). Animals are 'therapeutic arsenals' that have been playing significant roles in the healing pro- cesses, magic rituals, and religious practices of peoples from the five continents; human societies that have a developed medical system will utilize animals as medicines (Costa-Neto and Marques 2000). The trade of animal-based medicine is becoming much more common in the majority of markets, thus increased under- standing of the use of animals' body parts as folk medicines is relevant because such use exerts additional pressure on wild populations (Lee 1999; Alves and Pereira-Filho 2007; Alves et al. 2009).

In Benin, the exploitation of wildlife as zootherapeutic resources is one of the economic diversification strategies developed by local populations. This exploitation is underpinned by the reduced capacity of populations to access modern medicine and to the socioeconomic and cultural importance of this activity. The trade of animal-based medicine is found in the majority of Benin markets but little is known about the markets of animal-based medicines. Similarly, knowledge is limited about the impact of this activity on wildlife declines and the sustainable use of zootherapeutic resources. This lack of attention to market traders is surprising given their preponderance and economic importance. Since people have been using animals for a long time, suppression of exploitation is unlikely to be a viable strategy to stave off the threat of extinction for some species. As noted by Kunin and Lawton (1996), those species directly involved in traditional medicines should be among the highest priorities for conservation.

Some authors have investigated the medicinal importance of Benin wildlife (Coubéou 1995; Adjakpa and Ogouvide 1998; Assogbadjo 2000; Akpona 2004; Djagoun 2005). A study conducted by Adjakpa and Ogouvide (1998) highlighted the diversity of birds used in animal-based medicine in Benin; however, there are no data available on the other wildlife such as mammals, which represent the most commonly exploited wildlife due to their importance for family income through hunting, artisan handicrafts, eco-tourism, and game appeal.

Within that context, the present work focused on an inventory of mammal species sold in the Benin traditional medicine market, evaluated the diversity, abundance, source of provision, and socio-economical context of the use of these animals for therapeutic purposes, and discusses the implications for sustainable biodiversity conservation.

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17.2 Methods and Survey Design

17.2.1 Study Area

The Republic of Benin is situated in West Africa between latitudes 6°100N and 12°250N and longitudes 0°450E and 3°550E, covering a land area of 112,622 km2. It is bordered by the republics of Togo in the west, Nigeria in the east, Burkina Faso and Niger in the north, and the Atlantic Ocean to the south (Fig. 17.1). The population has been estimated at 6,752,569 inhabitants with an average density of 57 inhabitants per km2 (INSAE-RGPH 2006). The mean annual rainfall varies from 900 to 1,300 mm while the mean annual temperatures range from 26 to 28°C and may exceptionally reach 35–40°C in northern localities. About 24% of the land is covered by forest, while only 22.7% of the total land area is legally protected (CENATEL 1992; FAO 2001); the vegetation in several of the protected sites has almost entirely vanished and has even been invaded by human settlements.

17.2.2 Data Collection

Benin has more than 40 cities in which we were aware of at least one important market (and several sub-markets) that contained animal-based medicine activities.

Computing existing data All available references or reports on folk remedies based on animal parts in Benin and West African countries were examined. Only taxa that could be identified to species level were included in the database. The conservation status of the animal species follows the IUCN Red List (http:// www.iucnredlist.org/); Benin's official list of endangered species (Neuenshwander et al. 2011) was also used.

Survey of animal-based medicine market Information on the use and commercialization of animals for medicinal purposes was collected through a semi-structured survey among selected animal-based medicine traders throughout the country, using a questionnaire. We surveyed 22 markets throughout the country with a total of 110 sellers (Table 17.1); 18 districts were selected for the study, from a total of 77 districts in the country (Fig. 17.1). The choice of animal- based medicine markets has a double advantage because the merchants concerned combine their profession of traditional healers with the trade of animals. Visits were also made to outdoor markets, temporary markets, and religious articles stores where products derived from wildlife are commonly sold. Markets were selected by taking into account their proximity to a protected area, their nature (local, national or international), and the ethnic groups. The animals recorded were identified by direct inspection or from photographs on the stand (Fig. 17.2) and others parameters, such as richness and abundance, frequency, provision sources were recorded through interviews with the sellers.

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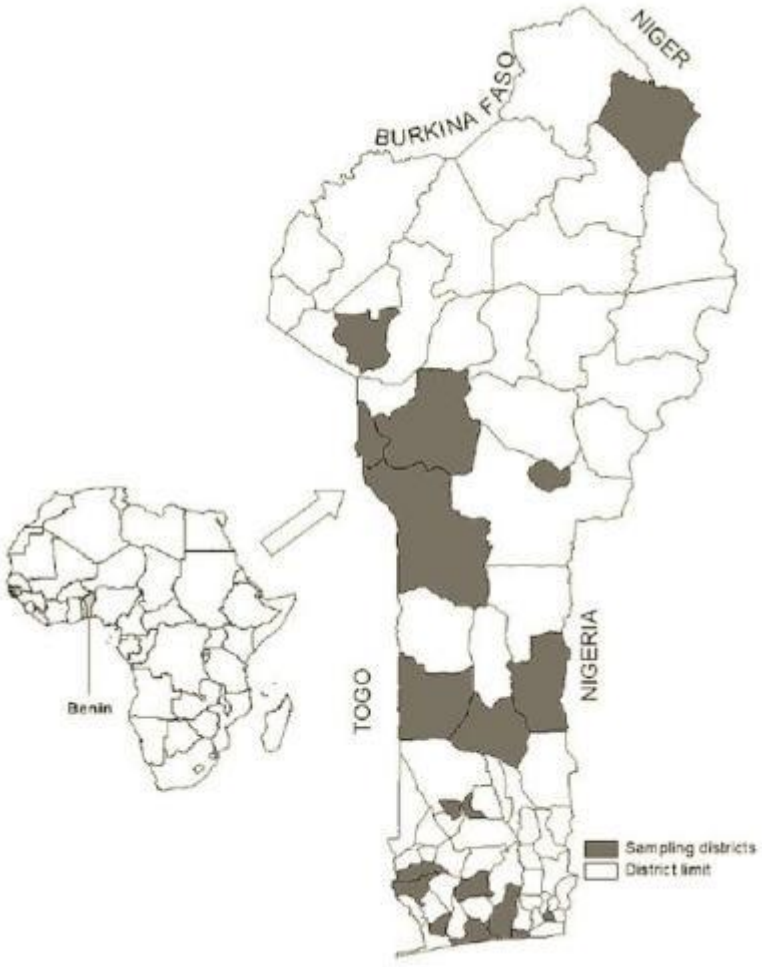

Fig. 17.1 Location of Benin and sampling districts

Table 17.1 Number of markets surveyed with the number of interviewees per zone.

Zone	Number of markets	Sample size
South	10	60
Centre	7	30
North	5	20
Total	22	110

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Fig. 17.2 Pictures taken in the traditional medicine markets surveyed: a One of the displays of the Bohicon fetish market; b The head of a zebra (Equus zebra Linnaeus, 1758), a species not present in Benin, found in a local market; c The gorilla (Gorilla gorilla Savage and Wyman, 1847) hand found in the northern Benin market whereas the distribution of this species does not extend to Benin.

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Table 17.2 Number of mammal species per order recorded in Benin traditional medicine market

Mammal order	Number of species observed[a]	Number of possible species[b]
Carnivora	20	28
Chiroptera	9	50
Primates	10	12
Erinaceomorpha	1	1
Soricomorpha	2	8
Lagomorpha	1	2
Artiodactyla	12	17
Perissodactyla	1	0
Pholidota	2	2
Proboscidea	1	1
Rodentia	25	56
Tubulidentata	1	1
Hyracoidea	2	2
Sirenia	0	1
TOTAL	87	180

[a] The number of species observed is the total number of species found at the medicinal markets

[b]The total possible species number refers to the number of species per order existing in Benin, according to the literature (Lamarque 2004; De Visser et al. 2001; Sinsin et al. 2008; Neuenshwander et al. 2011)

17.3 Results and Discussion

17.3.1 Mammals Traded at the Animal-Based Medicine Market in Benin

Excluding domestic animals, we identified 87 species of mammal traded on the animal-based medicine markets in Benin, representing 13 mammal orders (Table 17.2). From the total of 87 wild mammal species recorded, the species from the Rodentia (28.7%) were the most common in the surveyed markets. This was followed by the Carnivora (23.0%), Artiodactyla (13.8%), Primates (11.5%), Chiroptera (10.3%) and Soricomorpha, Hyracoidea, and Pholidota (2.3% each). The orders Lagomorpha, Perissodactyla, Proboscidea, and Tubulidentata were all represented by a single species. Given the known occurrence of individual species within Benin, all members of the orders Tubulidentata, Hyracoidea, Erinaceomorpha, and Pholidota were found on the traditional medicine market. No species of the order Perissodactyla was expected to be found at the market, as there are no representatives recorded in Benin. Nonetheless, we recorded one zebra species, indicating that some species are imported from outside the country by the traders. A list of all medicinal wild mammal species identified is given in Appendix A.

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17.3.2 The Common Mammal Species Traded on the Traditional Medicine Market in Benin

Table 17.3 lists the common species traded at the traditional medicine market in Benin. We defined the 'common' species as the species which were sold by more than five traders interviewed during the traditional medicine markets survey. Hence, the species sold by less than five traders from our total sample size (110 traders) were considered as 'occasional' and were not included in the list.

Overall, 46 mammal species were categorized as common; from these, 20 species were found to be sold by more than 50% of the traders interviewed. This group included ungulates (Sylvicapra grimmia (Linnaeus, 1758); Syncerus caffer (Sparrman, 1779); Ourebia ourebi (Zimmermann, 1783); Kobus kob (Erxleben, 1777); Cephalophus silvicultor (Afzelius, 1815)); rodents (Xerus erythropus (Desmarest, 1817); Cricetomys gambianus Waterhouse, 1840; Cricetomys emini Wroughton, 1910; Atherurus africanus Gray, 1842; Arvicanthis niloticus (Desmarest, 1822); Thryonomys swinderianus (Temminck, 1827)) and primates (Papio Anubis Lesson, 1827; Cercopithecus mona (Schreber, 1774); Chlorocebus aethiops (Linnaeus, 1758)). Other notable species such as Equus zebra Linnaeus, 1758; Gorilla gorilla (Savage and Wyman, 1847); Lycaon pictus (Temminck, 1820); Pan troglodytes (Blumenbach, 1775); Orycteropus afer (Pallas, 1766) were sold by less than 10% of the total traders interviewed. Generally, the abundance of species sold in the traditional medicine market followed the same trend of species abundance in their natural habitat; i.e., species listed as abundant in the traditional medicine market were also commonly recorded in the literature as abundant in their habitat (e.g., Mensah et al. 2006; Sinsin et al. 2008; Djagoun and Gaubert 2009). On the other hand, some species considered as highly threatened at national or international level were found in abundance at the market [see: Atherurus africanus Gray, 1842; Loxodonta africana (Blumenbach, 1797)]. Furthermore, several of the less represented mammal species at the traditional medicine market are also of conservation concern. In fact, most of the recorded species (4 out of 6) are on the IUCN Red List of Threatened Species.

17.3.3 Economical Importance of Rare Versus Common Traded Mammal Species

Figure 17.3 shows the relationship between the percentages of traders recorded selling each mammal species (see Table 17.3) and the mean income generated by selling the head of a given species. It should be noted that species such as Hippopotamus amphibius Linnaeus, 1758 and Loxodonta africana (Blumenbach, 1797) were considered as outliers because the high mean income attributable to these species was due to the large size of their heads. Also, exotic species such as Equus zebra Linnaeus, 1758, Pan troglodytes (Blumenbach, 1775), and Gorilla gorilla.

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Table 17.3 Percentage of traders (N = 110) recorded selling mammal species in Benin traditional medicine market, with indication of the conservation status of the traded species

Scientific names	Frequency of traders selling the species (%)	IUCN Red list[a]	Benin Red list[b]
Alcelaphus buselaphus (Pallas, 1766)	30.9	LC	VU
Acinonyx jubatus (Schreber, 1775)	8.2	VU	EN
Atelerix albiventris (Wagner, 1841)	80.9	LC	Not listed
Atherurus africanus Gray, 1842	69.1	NT	NT
Atilax paludinosus paludinosus (G.[Baron] Cuvier, 1829)	56.4	LC	VU
Arvicanthis niloticus (Desmarest, 1822)	85.5	LC	Not listed
Cephalophus silvicultor (Afzelius, 1815)	74.5	LC	DD
Cercopithecus mona (Schreber, 1774)	67.3	LC	VU
Chlorocebus aethiops (Linnaeus, 1758)	54.5	LC	LC
Civettictis civetta (Schreber, 1776)	31.8	LC	VU
Cricetomys gambianus Waterhouse, 1840	94.5	LC	Not listed
Cricetomys emini Wroughton, 1910	72.7	LC	Not listed
Crocuta crocuta (Erxleben, 1777)	17.3	LC	NT
Crossarchus obscurus F. G. Cuvier, 1825	78.2	LC	LC
Dendrohyrax arboreus (A. Smith, 1827)	23.6	DD	EN
Equus zebra Linnaeus, 1758	3.6	VU	Not listed
Erythrocebus patas (Schreber, 1775)	38.2	LC	LC
Felis silvestris Schreber, 1777	20.9	LC	VU
Genetta genetta (Linnaeus, 1758)	65.5	LC	LC
Gorilla gorilla (Savage and Wyman, 1847)	10.0	EN	Not listed
Herpestes ichneumon (Linnaeus, 1758)	35.5	LC	LC
Hippopotamus amphibius Linnaeus, 1758	35.5	VU	VU
Hippotragus equinus (Desmarest, 1804)	37.3	LC	VU
Kobus kob (Erxleben, 1777)	52.7	LC	NT
Loxodonta africana (Blumenbach, 1797)	30.6	VU	VU
Lutra maculicollis Lichtenstein, 1835	12.7	LC	VU
Lycaon pictus (Temminck, 1820)	7.3	EN	CR
Manis gigantea Illiger, 1815	14.5	VU	CR
Manis tricuspis Rafinesque, 1821	26.4	LC	VU
Orycteropus afer (Pallas, 1766)	4.5	LC	EN
Ourebia ourebi (Zimmermann, 1783)	68.2	LC	VU
Pan troglodytes (Blumenbach, 1775)	7.3	EN	Not listed
Panthera leo (Linnaeus, 1758)	13.6	VU	VU
Panthera pardus (Linnaeus, 1758)	11.8	NT	VU
Papio Anubis Lesson, 1827	80.9	LC	LC
Perodicticus potto (Müller, 1766)	44.5	LC	LC
Phacochoerus aethiopicus (Pallas, 1766)	67.3	LC	NT
Potamochoerus porcus (Linnaeus, 1758)	47.3	LC	VU
Rousettus aegyptiacus (E,Geoffrey, 1810)	49.1	LC	VU
Sylvicapra grimmia (Linnaeus, 1758)	99.1	LC	LC
Syncerus caffer (Sparrman, 1779)	82.7	LC	NT
Thryonomys swinderianus (Temminck, 1827)	77.3	LC	LC
Tragelaphus scriptus (Pallas, 1766)	37.3	LC	NT
Tragelaphus spekii P. L. Sclater, 1863	25.5	LC	EN
Vulpes pallida (Cretzschmar, 1826)	19.1	DD	VU
Xerus erythropus (Desmarest, 1817)	91.8	LC	Not listed

EN Endangered, VU Vulnerable, NT Near threatened, DD Data deficient, LC Least concern

[a] http://www.iucnredlist.org/

[b] See: Neuenshwander et al. (2011)

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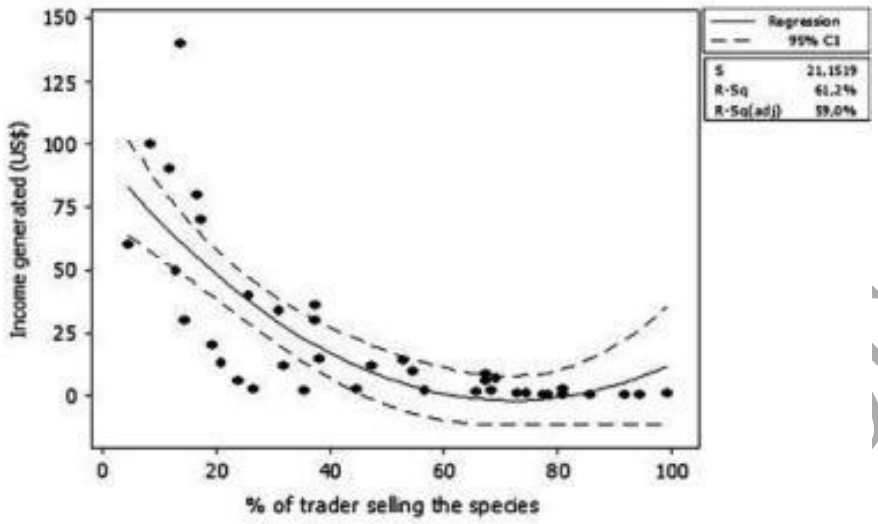

Fig. 17.3 Relationship between incomes generated and the percentage of the traders selling the given species on the market

(Savage and Wyman, 1847) were excluded from the analysis. The relationship between the percentage of traders recorded selling a mammal species and the mean income generated in selling the head of the given species fitted well with a quadratic model and was statistically significant ($p = 0.001$) with the explained variance of 61.2%. From this model we concluded that the rare species traded at the traditional medicine market attained higher economic value than the common species.

17.3.4 Source of Provision of Mammal Species Traded at the Traditional Medicine Market in Benin

According to our survey, most of the animals sold at the Benin markets come from National parks or Classified forest; we found that 68% of the mammal species sold

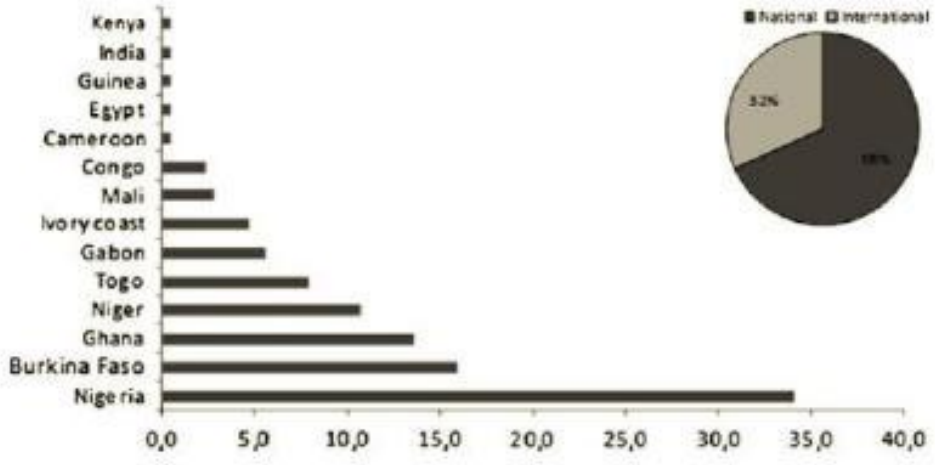

Fig. 17.4 The source of the animals provisioning the traditional medicine market according to the traders

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in the traditional medicine markets were provided locally by the hunters, while 32% came from elsewhere. Some specimens were also imported by the traders, the main source of provision being Nigeria (34.1%), followed by Burkina Faso (15.9%), Ghana (13.6%), Niger (10.7%), Togo (7.9%), Gabon (5.6%), Ivory Coast (4.7%), Mali (2.8%), and Congo (2.3%). A smaller percentage (0.5%) of specimens came from Cameroon, Egypt, Guinea, India, and Kenya (Fig. 17.4). Nigeria was quoted by most respondents (65%) as the main country supplying the traditional medicine market in Benin, and this may be related to the geographic proximity of the two countries. Some of the supplier countries are known to harbour exotic species traded in Benin, such as Equus zebra Linnaeus, 1758 (Fig. 17.2b), Pan troglodytes (Blumenbach, 1775) and Gorilla gorilla (Savage and Wyman, 1847) (Fig. 17.2).

17.3.5 Conservation Implications of Mammal Species Traded in the Benin Traditional Medicine Market

The unsustainable use of medicinal animals has been highlighted as a potential threat to many species populations (Lee et al. 1998). Although human activities such as slash and burn agriculture, goat and cattle raising, and extensive subsistence hunting are thought to be causing severe environmental impoverishment and a loss of biodiversity in Benin (Djagoun and Gaubert 2009), the medicinal use of animals creates an additional threat and must be considered in conjunction with other anthropogenic pressures. In Benin, we found that the rarest species are more costly than the commonest species, and this may be an important factor in declines of wild populations of certain species. Additionally, the supply of the rarest mammal species is inferior to the existing demand. Thus, the high price of the rare species and the continued demand for this species makes hunting pressure greater, as traders will prefer to commercialize on their stand high value, rare species. The economic value of zootherapy, as expressed by those who trade animal-based medicines, should be taken into account whenever policies and environmental measures are designed against the trade (Costa-Neo 2005). Instead of sending the practitioners of the zootherapy to prisons, or creating policies aiming to force traders to abandon such a practice, decision makers should attempt to contextualise this form of human/nature connection within its cultural dimension.

Traditional medicine based on animals and their products is of high importance to urban livelihood in Benin; in particular, the traditional medicine markets are more developed in the southern Benin, the sparsely populated part of the country. All the main cities in southern Benin have a traditional medicine market with up to 15 traders per market. Conversely, the local wildlife habitats are very patchily distributed into small forested islands and have been continuously logged for agricultural development, while sizable forest habitats can now only be found in northern Benin, where few of the traditional medicine markets exist, with an estimated number of three traders per market. Nonetheless, the paucity of the traditional medicine market and the higher number of remaining natural areas in northern Benin do not guarantee wildlife conservation in that area because the majority of the large mammals traded in the southern markets are collected in the north.

The dilemma facing all fauna species is the soaring demand for their body parts for use in medicinal products (Soewu 2008). From a biological perspective, there is a need to increase our understanding of the biology and ecology of species commonly used as remedies to better assess the impacts of harvesting them (for medicinal or other purposes) on their wild populations (Alves et al. 2007).

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Moreover, it is important to promote research which can integrate all factors (including traditional medicine) affecting the species listed in this study, in order to develop a model to assess the sustainability of the current exploitation strategies, and to propose feasible conservation measures. Medicinal species that are threatened should receive urgent attention, and efforts to tackle their habitat loss or alteration could be further supported by highlighting their present and future medicinal uses.

Acknowledgments This work was fully supported by Rufford Small Grants Foundation (RSG REFERENCE NUMBER: 8291–1). We are grateful to the traders who participated in this research. Our acknowledgments also go to the colleagues Tewogbade Jean-Didier Akpona, Chrystelle Dakpogan, and Gboja Mariano Houngbedji for their assistance during the field data collection phase.

17.4 Appendix A: List of the medicinal wild mammal species inventoried on the markets

Carnivora (20 species)

- *Atilax paludinosus* (G.[Baron] Cuvier, 1829)
- *Ichneumia albicauda* (G.[Baron] Cuvier, 1829)
- *Herpestes ichneumon* (Linnaeus, 1758)
- *Galerella sanguinea* (Rüppell, 1835)
- *Crossarchus obscurus* (F. G. Cuvier, 1825)
- *Lutra maculicollis* (Lichtenstein, 1835)
- *Mellivora capensis* (Schreber, 1776)
- *Ictonyx striatus* (Perry, 1810)
- *Genetta genetta* (Linnaeus, 1758)
- *Genetta pardina* (I. Geoffroy Saint-Hilaire, 1832)
- *Civettictis civetta* (Schreber, 1776)
- *Nandinia binotata* (Gray, 1830)
- *Caracal caracal* (Schreber, 1776)
- *Felis silvestris* (Schreber, 1777)
- *Canis adustus* (Sundevall, 1847)
- *Panthera leo* (Linnaeus, 1758)
- *Panthera pardus* (Linnaeus, 1758)
- *Acinonyx jubatus* (Schreber, 1775)
- *Crocuta crocuta* (Erxleben, 1777)
- *Lycaon pictus* (Temminck, 1820)

Chiroptera (9 species)

- *Epomophorus gambianus* (Ogilby, 1835)
- *Epomops franqueti* (Tomes, 1860)
- *Hypsignathus monstrosus* (H. Allen, 1861)
- *Megaloglossus woermanni* (Pagenstecher, 1885)
- *Eidolon helvum* (Kerr, 1792)
- *Hipposideros cyclops* (Temminck, 1853)
- *Micropteropus pusillus* (Peters, 1867)

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- *Nanonycteris veldkampi* (Jentink, 1888)
- *Epomophorus gambianus* (Ogilby, 1835)

Primates (10 species)

- *Chlorocebus aethiops* (Linnaeus, 1758)
- *Cercopithecus mona* (Schreber, 1774)
- *Erythrocebus patas* (Schreber, 1775)
- *Papio Anubis* (Lesson, 1827)
- *Colobus vellerosus* (I. Geoffroy, 1834)
- *Procolobus verus* (Van Beneden, 1838)
- *Galago senegalensis* (É. Geoffroy Saint-Hilaire, 1796)
- *Gorilla gorilla* (Savage and Wyman, 1847)
- *Pan troglodytes* (Blumenbach, 1775)
- *Perodicticus potto* (Müller, 1766)

Soricomorpha (2 species)

- *Crocidura olivieri* (Lesson, 1827)
- *Crocidura poensis* (Fraser, 1843)

Erinaceomorpha (1 species)

- *Atelerix albiventris* (Wagner, 1841)

Lagomorpha (1 species)

- *Lepus capensis* (Linnaeus, 1758)

Artiodactyla (12 species)

- *Syncerus caffer* (Sparrman, 1779)
- *Hippotragus equinus* (Desmarest, 1804)
- *Kobus ellipsiprymnus defassa*
- *Kobus kob* (Erxleben, 1777)
- *Ourebia ourebi* (Zimmermann, 1783)
- *Alcelaphus buselaphus* (Pallas, 1766)
- *Redunca redunca* (Pallas, 1767)
- *Tragelaphus scriptus* (Pallas, 1766)
- *Cephalophus rifulatus;*
- *Sylvicapra grimmia* (Linnaeus, 1758)
- *Cephalophus silvicultor* (Afzelius, 1815)
- *Tragelaphus spekii* (P. L. Sclater, 1863)

Perissodactyla (1 species)

- *Equus zebra (Linnaeus, 1758)*

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Pholidota (2 species)

- *Manis tricuspis* (Rafinesque, 1821)
- *Manis gigantea* (Illiger, 1815)

Proboscidea (1 species)

- *Loxodonta africana* (Blumenbach, 1797)

Rodentia (25 species)

- *Uranomys ruddi* (Dollman, 1909)
- *Tatera guineae* (Thomas, 1910)
- *Lemniscomys zebra* (Heuglin, 1864)
- *Funisciurus leucogenys* (Waterhouse, 1842)
- *Anomalurus derbianus* (Gray, 1842)
- *Tatera guineae* (Thomas, 1910)
- *Steatomys jacksoni* (Hayman, 1936)
- *Protoxerus stangeri* (Waterhouse, 1842)
- *Myomys derooi* (Van der Straeten and Verheyen, 1978)
- *Mus haussa* (Thomas and Hinton, 1920)
- *Malacomys longipes* (Milne-Edwards, 1877)
- *Mastomys natalensis* (Smith, 1834)
- *Lophuromys sikapusi* (Temminck, 1853)
- *Lemniscomys striatus* (Linnaeus, 1758)
- *Hylomyscus alleni* (Waterhouse, 1838)
- *Graphiurus lorraineus* (Dollman, 1910)
- *Heliosciurus gambianus* (Ogilby, 1835)
- *Funisciurus substriatus* (de Winton, 1899)
- *Arvicanthis niloticus* (Desmarest, 1822)
- *Atherurus africanus* (Gray, 1842)
- *Cricetomys emini* (Wroughton, 1910)
- *Cricetomys gambianus* (Waterhouse, 1840)
- *Thryonomys swinderianus* (Temminck, 1827)
- *Acomys cineraceus* (Heuglin, 1877)

Tubulidentata (1 species)

- *Orycteropus afer* (Pallas, 1766)

Hyracoidea (2 species)

- *Procavia capensis kerstingi* (Matschie, 1899)
- *Dendrohyrax dorsalis sylvestris* (Temminck, 1855)

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