



## Article

# Animals Traded for Traditional Medicine Purposes in the Kumasi Central Market, Ghana: Conservation Implications

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**Abstract:** The Kumasi Central Market is the largest urban open market in Ghana and animals used for medicinal purposes are among the items that are typically displayed for sale. However, no study has been undertaken on the animal species sold for traditional medicine purposes. This study took inventory of animal species traded for medicinal purposes in the Kumasi Central Market and examined their conservation implications. The species recorded to be traded comprised 5 taxonomic classes, belonging to 20 families. Chameleons were found to be the most traded animal species. Seven (23%) of the species traded were found to be threatened under IUCN Red List, with four (13%) species listed on Appendix I of CITES, and eight (26%) species on Schedule I of Wildlife Conservation Regulations of Ghana. Wildlife regulations are not serving as a deterrent to the trade in threatened animal species. There is a need to sensitize traders about the threats faced by these animal species and provide explanations as to why these species should be protected.

**Keywords:** animal trade; traditional medicine; conservation; Ghana; West Africa



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## 1. Introduction

Markets serve as the main trading center where goods are exhibited for sale to the public. Animals used for medicinal purposes are among the merchandise that is typically displayed for sale in local markets [1–9]. Indeed, the trade in animals for medicinal purposes at local markets has become a routine practice in several countries across the globe [10–13]. The local markets serve as a place for acquiring resources for healing and function as a point for the evaluation of the exploitation of regional biodiversity [1,5,11,12,14].

The Kumasi Central Market (KCM) is the largest market in Ghana and one of the largest urban open markets in West Africa [15–17]. Nature-based therapeutic remedies are openly commercialized in this market with a whole section dedicated to the sale of plants, animals and minerals for traditional medicine purposes. Expectedly, key ethnobiological surveys conducted in Ghana selected the KCM [15,18–20] due to the aforementioned reasons. However, none of the surveys conducted at the KCM focused on trade in animals for traditional medicine purpose, except for the van Andel et al. [20] study that mentioned the sale of animal parts (hides, skulls, claws, dried birds, living and dried chameleons) without details about the specific species of whole or body parts of animals sold.

Given that zootherapy (i.e., the use of animals for medicinal purposes) is an established practice in the Kumasi Metropolitan Area [21–23], a detailed inventory of animals traded for medicinal purposes in the KCM is necessary to evaluate the impact on their conservation.

The study aimed to provide an inventory of the whole or body parts of animal traded for traditional medicinal purposes in the KCM and their conservation status.

## 2. Materials and Methods

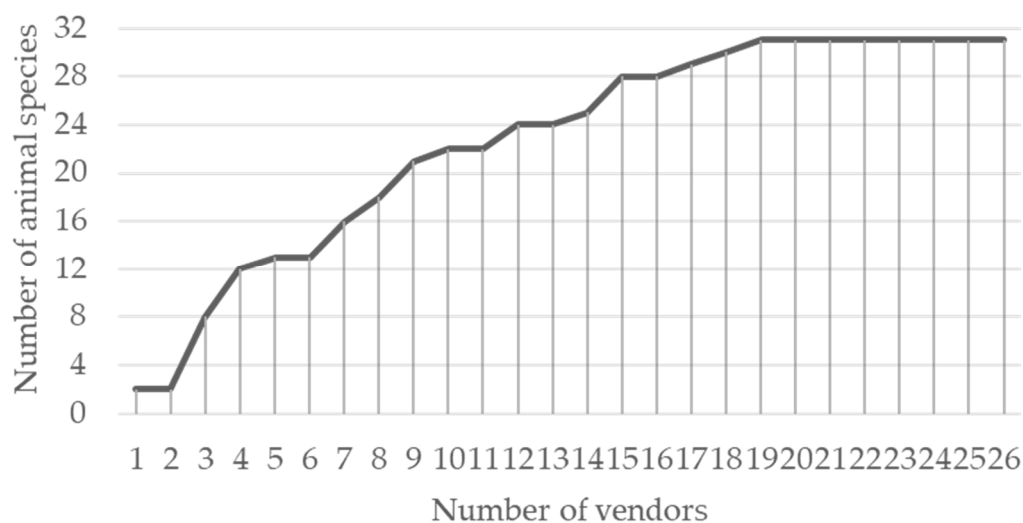
### 2.1. Study Area

The study was conducted in the Kumasi Central Market (KCM), which is situated in the Kumasi Metropolitan Area that has a total human population of >1.73 million [24]. KCM is located in the northernmost terminus of Ghana's railway line within Kumasi city. It is surrounded by a network of feeder roads that feeds the national highways. It is estimated that around 20,000 traders offer goods and services for sale to the public daily [16,17]. Virtually, any commodity that needs to be purchased can be obtained from the KCM. Obiri and Addai [15] described the KCM as a worthy source of ethnobiological information about local market trade. It is therefore not surprising that all known ethnobiological surveys in the Ashanti region have taken place in the KCM [15,18,20,25]. The KCM is arranged according to the type of product sold, with traditional medicine vendors clustered together in a lane allowing for easy accessibility.

### 2.2. Sampling Procedure and Data Collection

Animals for traditional medicine purposes inventory was carried out in the Kumasi Central Market (KCM) between November 2020 and January 2021. Permission to conduct the inventory and interviews were sought from the executives of the traders. Interviews were conducted only after obtaining participant's oral prior informed consent. No further ethics approval was required.

Similar to van Andel et al. [20] study in the same market, the data collection was reliant on vendors' willingness to participate and those that were readily approachable were recruited to be a part of the study. Information about animals traded for medicinal purposes was obtained through a semi-structured interview coupled with direct observation. For vendors, who were unresponsive to the study, direct observation was used to get an overview of the items sold as they were openly displayed in full view of the researcher. Following van Andel et al. [20] and Williams et al. [26], a species accumulation curve was used to ensure adequate sampling effort, with the number of animal species recorded as a function of the vendors sampled. The accumulation curve levelling off completely suggests that the sample size was adequate to give a representative overview of the animal species sold for traditional medicine purposes in the KCM (Figure 1).



**Figure 1.** Cumulative number of medicinal animal species sold by 26 vendors sampled in the Kumasi Central Market.

The study did not document the medicinal purposes and the ailments that these animals are used in treating based on the vendor's knowledge largely due to their reluctance to reveal their uses. Questions related to price, frequency of sale, localities from which the animals were harvested were deemed to be sensitive by the executives of the vendors and were excluded from the study. The most widely spoken language in the metropolis and the market is the Twi language, which has also been adopted by many others in the KCM as a lingua franca that was used to conduct the interviews. MKB and field assistants Osman Gaddafi and Touffic Mohammed conducted the interviews with all the participants. All of the participants interviewed were fluent in the Twi language.

### 2.3. Data Analysis

The type of animals sold for traditional medicine purposes communicated by the traders were simplified, summarized, and then categorized into short word strings. The words in the strings were hyphenated to keep them together to generate a word cloud produced by using WordItOut (<http://worditout.com>, accessed on 11 February 2021). The sizes of the words are proportional to the frequency with which the words (i.e., trade) recurred (i.e., were mentioned by traders) [3,8]. A word cloud was generated for the number of times an animal name (relating to a species) was associated with a trade, thereby indicating the animals with a high frequency of trade mentioned by the traders. The reported frequency in the word clouds reflects both the number of vendors using a particular word.

All recorded animal species were checked against the International Union for Conservation of Nature (IUCN) [27] Red List Categories and Criteria (2020 Version 3) to determine the conservation status for each species as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) or Data Deficient (DD). The species were grouped in the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) [28] Appendices I, II, and III, based on how threatened they are by international trade. The Wildlife Conservation Regulations of 1971 (LI 685) of Ghana Schedule that determines the level of protection of animals from hunting, capturing, or destroying for any purposes were used to classify the animals traded for traditional medicine purposes.

## 3. Results

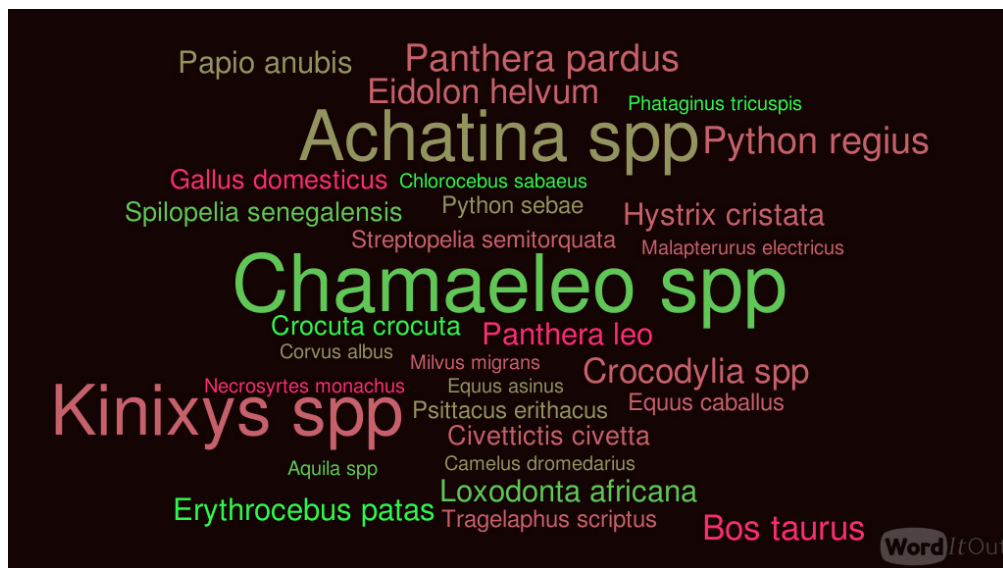
### 3.1. Animal Trade

The species recorded comprised 5 taxonomic classes, belonging to 20 families comprising of at least 32 different species (Table 1). The class with the largest numbers of medicinal animal species was mammals ( $n = 16$ ), followed in descending order by birds ( $n = 8$ ), reptiles ( $n = 5$ ), fish and gastropod ( $n = 1$  each). All medicinal animals recorded were vertebrates. Two families were composed of at least three species: Accipitridae (*Aquila* spp., *Necrosyrtes monachus*, *Milvus migrans*) and Cercopithecidae (*Chlorocebus sabaeus*, *Erythrocebus patas*, *Papio anubis*) while Bovidae (*Tragelaphus scriptus*, *Bos taurus*), Felidae (*Panthera leo*, *P. pardus*), Equidae (*Equus asinus*, *E. caballus*), Pythonidae (*Python sebae*, *P. regius*) and Columbidae (*Spilopelia senegalensis*, *Streptopelia semitorquata*) had two species each, with all the other families represented by a single species (Table 1).

The most traded animal was *Chamaeleo* spp. which recorded the highest number of mentions ( $n = 18$ ), followed in descending order by *Achatina* spp. and *Kinixys* spp. that recorded the same number of mentions ( $n = 15$  each), and *B. taurus* ( $n = 8$ ), *P. pardus* and *P. regius* ( $n = 6$  each), *Eidolon helvum*, *B. taurus* and *Crocodylia* spp. ( $n = 5$  each; Figure 2), and *Gallus domesticus* ( $n = 3$ ).

**Table 1.** Animal species and the body parts traded for traditional medicine purposes in the Kumasi Central Market with their IUCN Status, CITES Appendices and Conservation Schedule in Ghana.

Class	Family	Scientific Name	Common Name	Parts Sold	IUCN Status	CITES Appendix	Ghana Schedule
Actinopterygii	Malapteruridae	<i>Malapterurus electricus</i>	Electric fish	Skin	Least Concern	Not Listed	Not Listed
Aves	Accipitridae	<i>Aquila</i> spp.	Eagle	Head and feathers		Appendix II	I
Aves	Accipitridae	<i>Necrosyrtes monachus</i>	Hooded vulture	Head, claw, beak	Critically Endangered	Appendix II	I
Aves	Accipitridae	<i>Milvus migrans</i>	Black kite	Whole (dried)	Least Concern	Appendix II	I
Aves	Columbidae	<i>Spilopelia senegalensis</i>	Laughing dove	Whole (live)	Least Concern	Not Listed	II
Aves	Columbidae	<i>Streptopelia semitorquata</i>	Red-eyed dove	Whole (live)	Least Concern	Not Listed	II
Aves	Corvidae	<i>Corvus albus</i>	Pied crow	Beak, feathers	Least Concern	Not Listed	
Aves	Phasianidae	<i>Gallus domesticus</i>	Domestic chicken	Whole (live), eggs	Domesticated	Not Listed	
Aves	Psittacidae	<i>Psittacus erithacus</i>	African grey parrot	Whole (live)	Endangered	Appendix I	II
Gastropoda	Achatinidae	<i>Achatina</i> spp.	Giant African snail	Shell	Least Concern	Not Listed	
Reptilia	Chamaeleonidae	<i>Chamaeleon</i> spp.	Chameleon	Whole (dried)	Least Concern	Appendix II	
Reptile	Crocodylidae	<i>Crocodylia</i> spp.	Crocodile	Skin, eggs		Appendix II	I
Reptilia	Pythonidae	<i>Python sebae</i>	African Rock python	Skin, fat, bones	Least Concern	Appendix II	II
Reptilia	Pythonidae	<i>Python regius</i>	Royal (ball) Python	Skin, fat, bones	Least Concern	Appendix II	II
Reptilia	Testudinidae	<i>Kinixys</i>	Tortoise	Shell, head (dried), eggs		Appendix II	II
Mammalia	Bovidae	<i>Tragelaphus scriptus</i>	Bushbuck	Skin, horn	Least Concern	Not Listed	II
Mammalia	Bovidae	<i>Bos taurus</i>	Bull	Horn	Domesticated	Not Listed	
Mammalia	Camelidae	<i>Camelus dromedarius</i>	Camel	Skin, skull, bones	Domesticated	Not Listed	
Mammalia	Cercopithecidae	<i>Chlorocebus sabaues</i>	Green monkey	Skin	Least Concern	Appendix II	II
Mammalia	Cercopithecidae	<i>Erythrocebus patas</i>	Patas monkey	Skin	Near Threatened	Appendix II	II
Mammalia	Cercopithecidae	<i>Papio anubis</i>	Olive baboon	Skin	Least Concern	Appendix II	III
Mammalia	Civettictis	<i>Civettictis civetta</i>	African civet	Skin	Least Concern	Appendix III	II
Mammalia	Elephantidae	<i>Loxodonta africana</i>	African bush elephant	Skin, bones	Vulnerable	Appendix II	I
Mammalia	Equidae	<i>Equus asinus</i>	Donkey	Skin	Domesticated	Appendix I	
Mammalia	Equidae	<i>Equus caballus</i>	Horse	Skin, tail(hair)	Domesticated		
Mammalia	Felidae	<i>Panthera leo</i>	Lion	Skin, bones	Vulnerable	Appendix II	I
Mammalia	Felidae	<i>Panthera pardus</i>	Leopard	Skin, bones	Vulnerable	Appendix I	I
Mammalia	Herpestidae	<i>Crocuta crocuta</i>	Spotted hyena	Skin, bones	Least Concern	Not Listed	II
Mammalia	Hystrix	<i>Hystrix cristata</i>	Crested porcupine	Quill	Least Concern	Not Listed	II
Mammalia	Manidae	<i>Phataginus tricuspis</i>	White-bellied pangolin	Scales	Endangered	Appendix I	I
Mammalia	Pteropodidae	<i>Eidolon helvum</i>	Straw-coloured fruit bat	Whole (dried)	Near Threatened	Not Listed	



**Figure 2.** Word cloud of the animal species mentioned by traders as being sold for traditional medicine in the Kumasi Central Market. The size of the words is proportional to the number of times that trade was attributed to each animal. Maximum mentions are 18 for chameleon.

The same number of mentions were recorded for *Hystrix cristata*, *Loxodonta africana*, *E. helvum*, *E. patas*, and *P. anubis* ( $n = 4$  each; Figure 2). Amongst the least traded animal species were *S. semitorquata*, *N. monachus*, *C. sabaesus*, *M. migrans* and *Phataginus tricuspis*. The number of parts traded for each animal varied from one to three; however, *Chamaeleo* spp., *E. helvum*, *M. migrans*, *C. albus*, *S. senegalensis*, *S. semitorquata*, *Psittacus erithacus*, and *Gallus domesticus* were sold mainly in their entirety. Among the body parts traded, the highest numbers of mentions were for shell (mainly for *Achatina* spp. and *Kinixys* spp.), skin and bones for the mammalian species.

### 3.2. Conservation Implications

Based on the IUCN Red List of species, 3% ( $n = 1$ ) of the animal species inventoried is currently considered to be Critically Endangered (*N. monachus*), 6% ( $n = 2$ ) are Endangered (*P. erithacus* and *P. tricuspis*), 10% ( $n = 3$ ) are Vulnerable (*L. africana*, *P. leo*, *P. pardus*), 6% ( $n = 2$ ) are Near Threatened (*E. patas* and *E. helvum*), and the majority (48%) are of Least Concern ( $n = 15$ ; Table 1). Three species representing 10% were not evaluated for their international conservation status because they could not be identified to the species level and different species within the genus were placed under separate categories on the IUCN Red List. With regard to international legal trade status, four species (13%) (*P. erithacus*, *E. asinus*, *P. pardus* and *P. tricuspis*) are currently listed on CITES Appendix I, 12 species (39%) have their populations listed on Appendix II and only one species (3%) listed on Appendix III (Table 1). The majority of the animal species ( $n = 14$ ; 45%) were not listed on CITES Appendices. A total of 21 (68%) of the species traded were recorded to be listed on the Ghana Wildlife Schedule. These eight species (*Aquila* spp., *N. monachus*, *M. migrans*, *Crocodylia* spp., *L. africana*, *P. leo*, *P. pardus* and *P. tricuspis*; Table 1) representing 26% are currently listed on Schedule I that gives them absolute protection from hunting, capturing, or destroying for any purposes. 12 (39%) of the animal species are listed on Schedule II that provides partial protection by the prohibition of hunting, capturing, or destroying of any species listed here between 1st August and 1st December in any year plus killing of young ones all year and animals accompanied by the young, while only one species (3%) was listed in Schedule III.

## 4. Discussion

### 4.1. Animal Trade

The number of medicinal species listed in this study was quite smaller than in other studies in Africa [3,9,29] and was also smaller than that of a study in Ghana [30]. The relatively small number of species in this study (31) compared to the 41 recorded by Gbogbo and Daniels [30] can be attributed to the sample sizes which were seven markets in their study. Market surveys in Brazil also found differences in the number of recorded species traded for traditional medicine purposes in different markets [10,31]. The differences in recorded species in various studies can be attributed to idiosyncrasy in cultural knowledge and use of species. The aforementioned assertion is contrary to the view that regional biodiversity influences the types of zootherapeutic items sold in any given region [5]. For instance, most of the animal species recorded to be traded in the Greater Accra Region [30] are not distributed or endemic to the region and could not have been collected from the regional biome. Idiosyncrasy has been recorded to influence the choice of animal body parts used for medicinal purpose [21,22]. A peculiarity in medicinal knowledge and use of animal species by buyers may have influenced traders' choice of merchandise due to its impact on turnover, leading to restricted species being sold outside their region.

Mammals as the most common taxonomic group of animal species sold for traditional medicine purposes was consistent with other inventory studies [3,4,7,9,29,30]. The high citations of chameleons and tortoise have been recorded in other studies in Africa [3,9,30] but that of *Achatina* spp. was consistent with only that of Gbogbo and Daniels [30]. *Achatina* spp. may therefore be very useful medicinal resources in Ghana as both studies were conducted in the same country. The low citations for some species for traditional medicine in this study may not be a true reflection of their medicinal uses especially those for the pangolin and hooded vulture. According to Williams and Whiting [9], widely known and popular medicinal species are quickly sold compared to other species, and for those reasons are not always available in the market. A high use value and level of consensus on the use of pangolin and vulture body parts by traditional medicine practitioners have been recorded in Ghana [21–23] and may have accounted for their limited presence in the market. Market inventories should therefore consider the popularity of medicinal resources to the community before concluding trade levels in markets. The quick sale of popular medicinal species may have accounted for the variations in the number of species recorded in various market surveys.

This study was unable to document the medicinal uses of the animal species inventoried due to the reluctance of the respondents to reveal their uses. However, most of the uses for some of these species in Ghana have been reported in other publications [21–23,30,32]. Williams and Whiting [9] found traders' sensitivities towards disclosing information on animal usage to be due to a genuine lack of knowledge or refusal to impart knowledge. The refusal to impart knowledge may be the reason for traders' reluctance to the inclusion of questions on the medicinal use that would reveal the specific uses of medicinal animals traded.

### 4.2. Conservation Implications

The trade of several of the animal species inventoried is illegal (38%) in Ghana under the Wildlife Conservation Regulations of 1971 (LI 685). Clearly, the high number of Schedule I and II species catalogued is an indication that wildlife laws are not serving as a deterrent to hunting, capturing, or destroying of protected species for any purposes as it was intended. Boakye et al. [33] observed a lack of enforcement of conservation laws in Ghana to be contributing to the sale of a Schedule I species for bushmeat purposes even in the closed season for hunting. The lack of enforcement of conservation laws by conservation authorities may be contributing to the trade in protected species for medicinal purposes.

Ignorance of conservation laws and the status of animals by traders could be a contributing factor to the non-adherence. Djagoun et al. [34] found most traders in the Benin Republic to be unaware of the conservation status of animals sold. The traders in this

study's reluctance to divulge information about the source of the animals could be an indication that they have a general knowledge about laws prohibiting the sale of wildlife. However, until stakeholders involved in the exploitation of animal species become aware of why legal restrictions are imposed, they will be less likely enthusiastic about changing their attitudes and taking action [35]. With no known record of captive breeding or domestication facilities for wild species traded for traditional medicinal purposes, all species sold are sourced from the wild. Even in the presence of ranching, practitioners of animal-based therapeutic remedies still prefer wild animals as they believe in their efficacy more than the domesticated or ranched animals [36]. Trade in animal parts for traditional medicine needs to be properly quantified to know the actual number of species and individuals being sold. Enforcement of conservation regulations on protected species and public education on attitudinal change towards the use of protected species will help in stemming this tide. There is a need to sensitize people about the threats faced by these animal species and provide explanations as to why these species should be protected including actions required from each stakeholder.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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