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Jonathan Johnny
Department of Wildlife Management and Conservation, School of Natural Resources Management, Njala University, Sierra Leone

Alhassan Bangura
Department of Biological Sciences, School of Environmental Sciences, Nala University, Sierra Leone

Corresponding Author:
Jonathan Johnny
Department of Wildlife Management and Conservation, School of Natural Resources Management, Njala University, Sierra Leone

Traditional medicines containing animal parts: Use in Kowa and Dasse chiefdoms, Southern Sierra Leone

Jonathan Johnny and Alhassan Bangura

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Abstract
The use of animals in traditional remedies is a prevalent practice in rural Sierra Leone, although it lacks sufficient research. The research seeks to record the utilisation of animals in the management of human diseases, by identifying the specific species involved and assessing their conservation status. The data for the study was collected using Participatory Rural Appraisal (PRA) procedures, which involved 40 key informants. Results indicate that local communities employ 45 species from diverse genera and families to address 40 distinct health conditions. Reptiles are the most frequently utilised taxonomic group, followed by amphibians, mammals, primates, birds, and insects. *S. regularis* exhibited the highest use value, with *A. mellifera, A. marginata, C. civetta, and R. aegyptiacus* respectively. There are seven species (*C. diana, P. tricuspis, O. tetrapsi, K. belliana, C. senegalensis, C. zebra* and *P. sebae*) that are internationally recognised as being in need of conservation efforts. This study emphasis the incorporation of indigenous knowledge into the management of these resources and the establishment of efficient administrative structures to ensure the responsible utilisation of restorative animals.

Keywords: Traditional medicine, animal parts, communities, medicinal animals, rural sierra leone, species composition

Introduction
Human interaction with nature, especially with other animals, is one of the oldest cultural heritages in human history. Through this interaction, communities use animals for healing practices that are integrated into various belief systems and indigenous practices. Animals and their products are the alternative sources of folk medicine [1]. Animal products have formed an important part of dermatological treatment arsenal in various cultures for centuries. This is known as animal therapy [2] and still plays an important role in medicine in today's world.

The engagement of humans with nature, particularly with other living creatures, is one of the most ancient cultural legacies in the annals of human civilization. Communities include animals into therapeutic procedures as part of their belief systems and indigenous traditions. Folk medicine often relies on animals and their products as alternate sources [1]. Animal products have long been utilised as a significant component of dermatological treatment methods in several societies throughout history. Animal therapy, also referred to as zootherapy, continues to hold a significant position in modern medicine [2].

Traditional medicine dominates the health care systems available to millions of people and continues to be the primary, if not the only, source of health care for the majority of people in developing countries [3-5]. Animal therapy is an integral part of traditional African medicine in both rural and urban areas. An estimated 80% of the continent's population relies on traditional medicine for healthcare [4, 6].

Traditional medicine is the predominant form of healthcare for millions of people, and it remains the main or only source of healthcare for most individuals in underdeveloped nations [3-5]. Animal therapy is a fundamental component of conventional African medicine, practiced in both rural and urban regions. Approximately 80% of the population in the continent depends on traditional medicine for healthcare [4, 6].

Traditional medicine practitioners extensively depend on biodiversity, using wild animals, plants species, and mineral resources to make curative remedies for their patients [3, 7, 8]. Animals have long been recorded as a reservoir of medicinal substances throughout the course of human history. Historically, animal medications have consistently been utilised, as indicated by [9-13]. Many Africans believe that wild animals and their by-products utilised in traditional medicine have the ability to heal [14,15].

A significant proportion of Sierra Leone's population relies on traditional medicine to meet their healthcare requirements [16, 17]. Around 90% of births that occur within the community are overseen by traditional birth attendants, who play a crucial role in the practice of traditional medicine. [16, 18] discovered that in the Northern Province of Sierra Leone, a staggering 90% of individuals suffering from mental health issues sought therapy from traditional healers. Traditional medicine is typically the primary point of access for many Sierra Leoneans, primarily because of insufficient healthcare resources and limited price. There is a scarcity of information regarding the risks, applications, and variety of medicinal animal species in Sierra Leone. The laboratory and museum collections play a vital role in comprehending the geographical distribution of species, both historical and current, these collections are severely insufficient, and a significant portion of the material is still not accessible on a national level, despite the advancements in computer technology. Examining patterns in the variety of animal species throughout the country is challenging since there is a scarcity of comprehensive evaluations of wildlife at a national level.

Documentation of traditional medical treatments for fauna is limited, both regionally and nationally, and lacks cohesion. This study is necessary due to the absence of understanding about animal-based therapeutic practices in Sierra Leone. The aim of this study is to record the utilisation of animals in the management of human illnesses, by identifying the specific species involved and assessing their conservation status.

Material and Method

Study Area

The research was carried out in the communities surrounding the Kowa and Dasse chiefdoms. The collection of field data for this project took place between March and July of 2023. Kowa and Dasse are chiefdoms situated in the Moyamba area in Southern Sierra Leone. Their location is situated at distances of nine and seven miles respectively from the highway that leads to Bo city. The Kowa (8°2'57" N and 12°4'46) and Dasse (8°2'56" N and 12°4'44" W) chiefdoms have sparsely populated communities, except for four communities that are densely populated, with a combined population of 23,658 [19]. Regarding religious affiliation, Muslims constitute the majority, with Christians and individuals of other faiths following suit. From an administrative standpoint, Kowa and Dasse are governed by Paramount chiefs who serve as the heads of the administration. Bush-fallow farming is the primary occupation of the population living outside the forest and is the major sector of the economies in these chiefdoms. It supports the lives of over 80% of the communities in these areas [20]. The villages cultivate various crops, such as cereals (rice, maize, sorghum, and millet), starchy food crops (yam, cassava, and sweet potato), and a variety of vegetables and spices like okra, pepper, and ginger. Additionally, they grow fruits like pineapple and sugarcane. Some residents engage in small-scale trading within and beyond these communities, but formal employment opportunities are restricted to teachers, police officers, and healthcare staff.

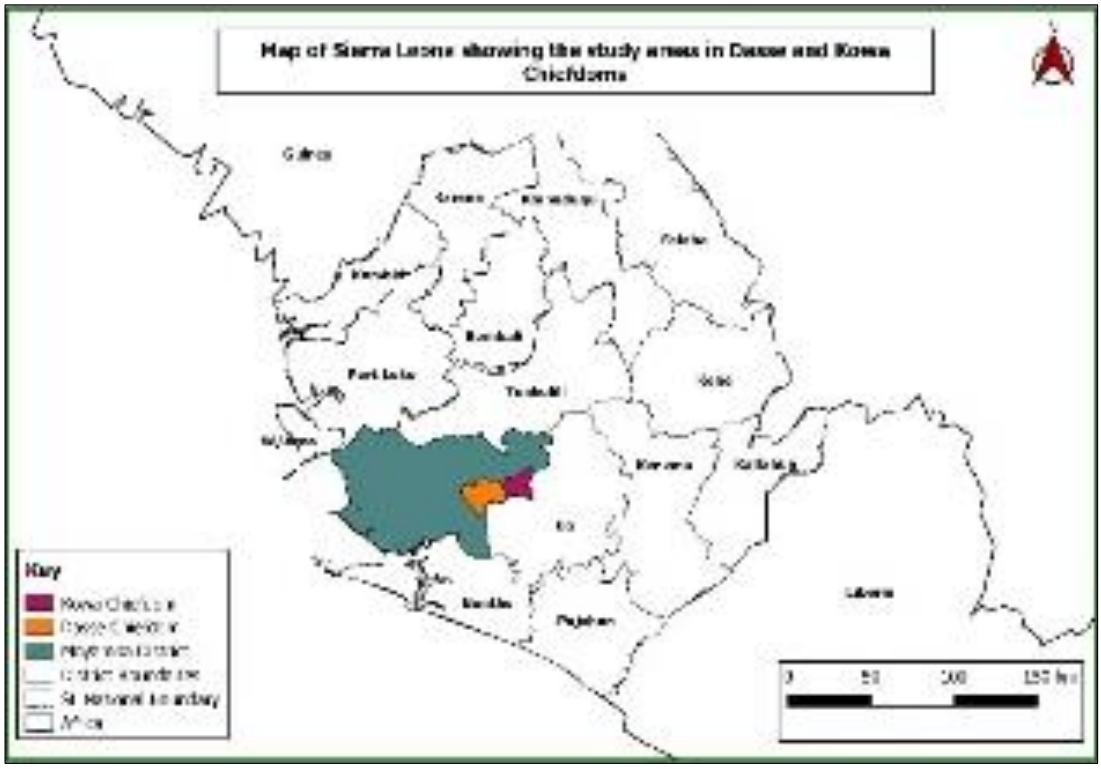

Fig 1: Map Showing Location of Study Area

Informant consensus

Throughout the investigation, every participant willingly took part in the research without any type of compulsion or manipulation. The informants were visited on four separate occasions to verify the dependability of the ethno zoological information. As a result, the responses of an informant that were inconsistent with each other were disregarded due to being deemed unreliable information.

Sampling design and species identification

The data collection strategy employed is mostly based on Participatory Rural Appraisal (PRA). Information on the medical use of animals was gathered using both qualitative and quantitative methods. The qualitative methods employed were informal talks, semi-structured interviews, field excursions, and visits to patients and treatment regions. The quantitative methods utilised were Frequency of citation, Use

Value, Fidelity Level (FL), Preference ranking, and Frequency index. We collaborated with conventional herbalists, who were selected through consultative gatherings conducted within the community, where the village, section, and paramount chiefs resided. During the inception meetings, the community stakeholders identified individuals who are recognized locally as herbalists (H), traditional medicinal practitioners (TMP), fetish priests (FP), and traditional birth attendants (TBA) in each of the communities. Forty traditional healers were interviewed in all. The parts utilised and, whenever feasible, the disease(s) treated were documented for each of the mentioned animals. An interview was done with the informants in each community or village to gather knowledge about the local fauna. Additionally, the traditional healer who practices zoo medicine supplied information on the therapeutic uses of each species. During the inventory, the informant shared details about the indigenous names, practical applications, specific plant parts used, as well as the techniques for collecting and preparing the species. For every informant, we collected or photographed voucher specimens of the animals. The Department of Wildlife Management and Conservation at the School of Natural Resources Management, Njala University, classified animal species and their corresponding scientific names. Voucher specimens were also stored at the department. The recorded species' status has been confirmed in accordance with the International Union for Conservation of Nature and Natural Resources (IUCN).

Calculation of indices

The importance of each animal was calculated based on five attributes:

Frequency of citation (FC) [21]

FC = 100 * NS / NT (1)

Where:
NS = Number of times a particular species was mentioned

NT = Number of times that all species were mentioned) × 100.

Use value (UV).

UV = ΣU/n, (2)

where:
U = number of citations per species;
n = number of informants

Fidelity level (FL) [22]

FL = Ni/ N × 100 (3)

Where;
Ni = number of informants mentioning the use of species for a particular disease category;

N = number of informants citing the usage of that species for any disease category;
Frequency index (FI) [23]

FI = FC/ N * 100 (4)

Where;
FI = Frequency index
FC = Number of informants who cited the use of a particular animal specie

N = Total number of informants interviewed in the study area

Preference index (PI) [24]

Preference Index = Sum (Preference level * No. of respondent / Total no of respondents) (5)

Results

Demography and knowledge variation

Gender

Men had more knowledge about animals (average known species = 5.53; average cited uses = 7.42) than women (average known species = 3.98; average cited uses = 5.15), t-test of p-value = 0.023 indicated a statistically significant difference.

Age the middle aged (40 to 60 years) were more knowledgeable than the old and the young

Religion

Muslims were slightly more likely than Christians to use traditional medicines (50% compared to 47.5%)

Education

Study shows that 42.5% of respondents attained secondary school level, 42.5% with no formal education, 12.5% at the primary level, 2.5% at teachers training college, and none of the respondents reaching tertiary institutions. Very low formal educational levels in the study area might have increase the chances of traditional medicinal utilization in these communities. On the other hand, “high” level of knowledge regarding traditional medicine was observed among the healers. They are knowledgeable enough on traditional medicine the fact that they heard it many times already. Most of them emphasized that they learned their skills on traditional medicine from their ancestors.

Marital status

Result revealed that 50% of the respondents are married contrast to15% single,15% separated,15% divorced and 5% widow/widower. Indicating that married people are more concerned with the health of their family members, since they owned more dependents than all other classes

Thirty of the forty practitioners reported traditional medicine as their primary source of income and those that were willing to report on this, estimated their income for this business to be between Le 50,000 ($2,120) and Le 100,000 ($4,230) per annum (compared to an average of a salaried employee of $2,900). Participants reported practicing traditional medicine between one and 50 years (four participants 1 year, six participants 11 years, thirty participants approximately 30 years and ten participants approximately 50 years).

Composition and Diversity of fauna

Medicinal animals of the study area

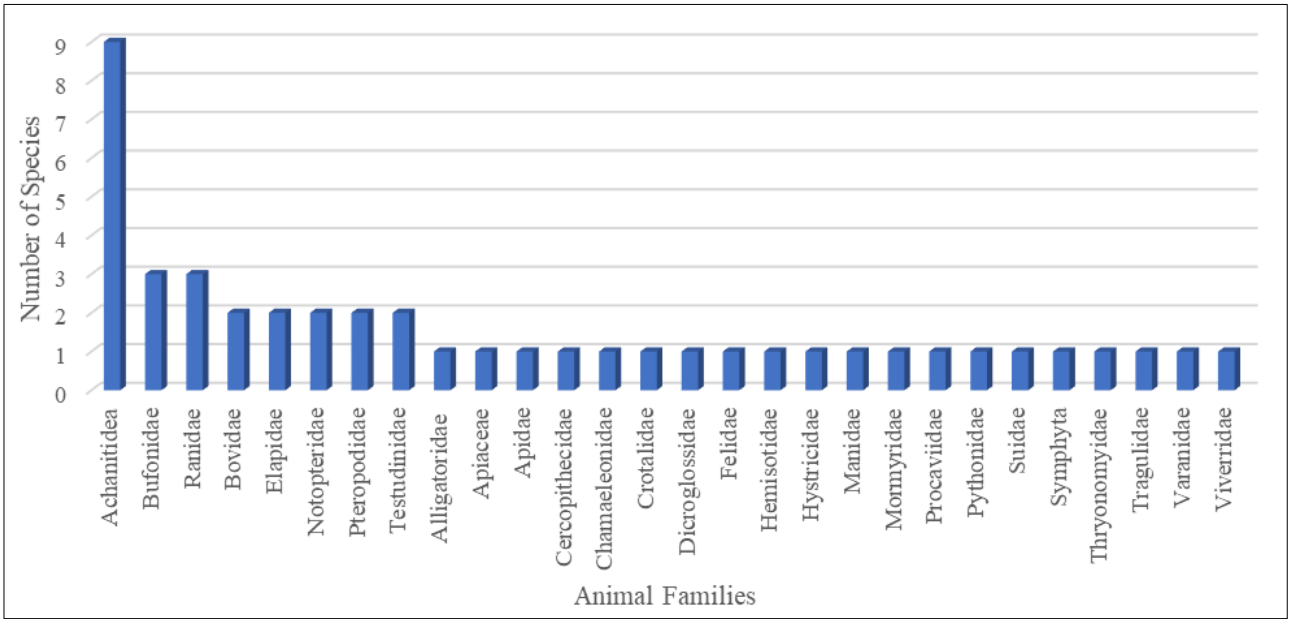

Fig 1: Families and species of medicinal importance (Frequency)

A total of 45 medicinal animal species belonging to 38 genera and 28 families were used by the local communities to treat 40 human ailments (Table 2). Achatinidae was the leading family with nine species (10.38%), followed by Bufonidae and Ranidae with three species each respectively while Bovidae, Elapidae and Notopteridae had 2 species each (Figure 1)

Category of animals

Table 1: Category of animals used in traditional medicine in the study area

Category	Frequency	% Frequency
Reptiles	13	32.5
Amphibians	7	17.5
Molluscs	6	15
Mammals, excluding primates	5	12.5
Primates	4	10
Birds	3	7.5
Insects	2	5

Table 1 revealed that reptiles and amphibians are the most widely use animals' category utilized in traditional medicine in study area. Reptiles is considered the most use category of animals (32.5%) followed by amphibians (17.5%), Molluscs (15%), Mammals (12.5%), primates (10%), birds (7.5%) and insects (5%).

Table 2: Ethno zoological uses of species reported by herbalists in study area and their IUCN Status

Scientific Name	Family	Local names	Parts used	Ethnobotanical uses	IUCN Status	No of citations	Use value
Sclerophrys regularis Reuss (1833)	Bufonidae (toads)	Nduvuii mavonyei,	Skin, meat	Cough (Hopping and dry), Asthma, Fetish	LC	32	0.8
Apis mellifera (Linnaeus, 1761),	*Apidae* (Honey bee),	Honey bee,	Honey, Sting bees wax	piles, eczema, asthma, throat infections, Indigestion, Diarrhea with vomiting,	NA,	28	0.7
Archchatina marginata (Swainson, 1821)	*Achatinidae (Snail)*	Yoyoi	Shell, meat	Wound, diarrhea, malnutrition, pile	NA	27	0.68
Civetticis civetta (Schreber, 1776)	Viverridae *(Snake)*	Gogna	Tail, skin, Tooth, bones	Madness, Fever, Pain, Asthma	NA	27	0.68
Rousettus aegyptiacus (Geoffroy, 1810)	Pteropodidae (Bat)	Tajay	Faeces, bones, Meat	Fertility, Male, Sexual Performance	LC	26	0.65
*Osteolaemus tetraspi (*Cope, 1861)	Alligatoridae (Alligator)	Dambai	Skin, meat, bones	Night Blindness, fetish	Vu	25	0.63
Hypsignathus monstrosus (H. Allen, 1861)	Pteropodidae (Bat)	Tajay	Meat, bones, heart	Affection, Chest Ailment, Paralysis	LC	24	0.6
Achatina achatina (Linnaeus, 1758)	*Achatinidae (Snail)*	Fafakondi	Shell, slim, meat	Tuberculosis, Asthma, skin burn, malnutrition	NA	24	0.6
Phataginus tricuspis (Rafinesque, 1821)	*Manidae*	Pangolin	Skin, oil, meat head, tail	impotence, infertility, broken ribs, skin diseases, knee pain, skin scars witchcraft,	EN	24	0.6
Cercopithecus diana (Linnaeus, 1758)	Cercopithecidae (Monkey)	Dopa	Meat, skin, bone, intestine	Stunted children, Rib pain	EN	23	0.58
Phacochoerus africanus (Gmelin, 1788)	*Suidae*	Dondna	Tooth, bones, tongue, liver	chest pain, Protecting against poison	LC	22	0.55

Varanus niloticus (Linnaeus, 1766)	Varanidae (lizard)	Pamie	Skin, meat	Scorpion, wasp, spider and insect bite, mystic	LC	22	0.55
Sclerophrys togoensis (Ahl, 1924).	Bufonidae (toads)	Nduvuii	Meat, skin	Scorpions sting, Male society, Depression Naming ceremony	LC	21	0.53
Sclerophrys maculatus (Hallowell, 1854)	Bufonidae (toads)	Nduvuii	Skin, meat	Asthma, Fertility in women, Fetish	LC	18	0.45
Tragelaphus scriptus (Pallas, 1766)	*Bovidae (Mammal)*	Dopa	Horn, skin, hooves, bones	Pain, Diarrhea	LC	18	0.45
Chamaeleo gracilis (Hallowell, 1844)	Chamaeleonidae (chamaelon)	Duqui	Skin, meat, intestine	Retentive memory, mystic	LC	18	0.45
Amnirana galamensis (Duméril and Bibron, 1841)	Ranidae (frogs)	Kpegbei	Meat, bone	Hernia, Aphrodisiac	LC	17	0.43
Thryonomys swinderianus	Thryonomyidae (Small mammal)		Teeth, skin, intestines, meat, heart, liver	Stomach aches, breast pain, dizziness, Coughing	LC	17	0.43
Python sebae (Gmelin 1789)	Pythonidae (Snake)	Ndelie	Skin, meat, Feaces	Urine problem, mystic, Treat back pain	NT	16	0.4
Hystrix cristata Linnaeus, 1758)	Hystricidae (Small mammal)	Crested Porcupine	Spine, Fats, Faecal pellets, Skin	Prevent and treat bleeding nose Increase appetite, Treat painful breast, Chest pain treatment, Relieve neck pains, Treat painful breast	LC	16	0.4
Hoplobatrachus occipitalis (Günther, 1858)	Dicroglossidae (frogs)	Ngebel	Meat	Fertility in women	LC	15	0.38
Lissachatina fulica Bowdich, 1822	*Achatinidae (Snail)*	Kolie	Shell, slim, meat	Wound, Gonorrhea, syphilis, skin burn, split head, pile	NA	15	0.38
Cephalophus zebra (Gray, 1838)	*Bovidae (Mammal)*	Dopa	Teeth, liver, horn, bile	stomach ulcers, Wounds, dizziness	Vu	15	0.38
Limicolaria feline	Felidae (Snail)	Kolie	Shell	Fetish, Night, Blindness	Na	15	0.38
Limicolaria flammulata (Pfeiffer, 1847)	Achatinidae (Snail)	Kolie	Shell and intestines	Convulsion	NA	14	0.35
Papyrocranus afer (Günther, 1868)	Notopteridae (Fish)	Makondo	Eggs, bone, scales, meat	Protective charm, restore fertility in women	LC	14	0.35
Naja melanoleuca (Hallowell, 1857)	Elapidae (Snake)	Ngulie	Bone, meat skin	Small pox, fetish	LC	14	0.35
*Hyemoschus Aquaticus (*Ogilby, 1841)	Tragulidae (Mammal)	Dopa	Bone, pellets, intestines, meat	Stomach aches, breast pain, dizziness	LC	13	0.33
Procavi acapensis (Pallas, 1766)	Procaviidae (Mammal)	African rock hyrax	Faecal pellets	Cure convulsions, Body pain	LC	13	0.33
Limicolaria zebra Pilsbry	Achatinidae (Snail)	Kolie	Intestines, shell	Fetish, burial ceremony	NA	12	0.3
Kinixys belliana (Gray, 1831)	Testudinidae	Haa quie	Shell	Curing leprosy, fetish	VU	11	0.28
Pefrocephalus simus (Sauvage, 1879)	Mormyridae (Fish)	Niene	Meat, scales, bones	For vitality, fetish, eye issues	NA	11	0.28
Amnirana occidentalis (Perret, 1960)	Ranidae (frogs)	Ndomorwaii	Meat	Bedwetting (enuresis). Fetish,	LC	10	0.25
Hodotermes mossambicus	Symphyta (Termite)	Termite	Meat, wings	Asthma, bronchits, flu, whopping cough, sore throat, sinusitis, tonsillitis	NA	10	0.25
Subulona pattalus	Achanitidea (Snail)	Kolie	Shell	Cramp, bone fracture	NA	10	0.25
Cyclanorbis senegalensis (Duméril and Bibron 1835)	Testudinidae	Haa quie	Shell, meat	Sexual potency, fetish, Joint pain	VU	10	0.25
Hemisus marmoratus (Peters, 1854).	Hemisotidae (frogs)	Gbuttie	Meat	Aphrodisiac	LC	9	0.23
Xenomysfus nigri (Günther, 1868).	Notopteridae (Fish)	Niene	Scales, bones, fins	Healing of stroke patient	NA	9	0.23
Thapsia insula (Preston, 1910)	Apiaceae (Snail)	Kolie	Shell	Boil	NA	9	0.23
Lignus intertictus (Gould, 1843)	Achatinidae (Snail)	Kolie	Shell	Fetish, Eyesight	NA	9	0.23
Stiosubulina striatella (Rang, 1831).	Achatinidae (Snail)	Kolie	Shell	Throat pain	NA	9	0.23
Dendroaspis viridis (Hallowell, 1844)	Elapidae (Snake)	Kegigulii	Skin, meat	Sacrifice, fetish	LC	8	0.2
Achatina balteata (Reeve, 1849)	Achatinidae (Snail)	Kolie	Meat, slim	Fetish, fertility in women	NA	8	0.2
Ptychadena mascareniensis (Duméril and Bibron 1841)	Ranidae (frogs)	Kpegbei	Meat	Appendicitis	LC	7	0.18

This study documents the utilisation of body parts from a total of 45 animal species. Various body parts, such as skin, flesh, bone, gut, shell, wings, head, tail, spine, fats, heart, teeth, liver, tongue, horn, and hooves, are utilised. Animal-based traditional medicines are utilised to treat a wide range of ailments, such as asthma, infertility, enuresis, hernia, aphrodisiac, depression, appendicitis, scorpion, wasp, spider and insect bites and stings, mystic conditions, urinary issues, back pain, night blindness, smallpox, liver disease, leprosy, joint pain, stroke, bronchitis, influenza, pertussis, sore throat,

sinusitis, tonsillitis, fractured ribs, skin diseases, scars, epistaxis, mastalgia, chest pain, neck pain, convulsions, tuberculosis, burns, malnutrition, diarrhoea, haemorrhoids, gonorrhoea, syphilis, cranial injury, pharyngeal pain, boils, cramps, paralysis, mental illness, fever, stomachaches, dizziness, gastric ulcers, rib pain, and growth retardation in children. Furthermore, several medications were employed to enhance conditions such as female fertility, memory retention, sexual potency, vision, and malnutrition. Traditional healers in the research area utilised certain medicines and their corresponding components in secret societies, both male and female, as well as in naming ceremonies.

Conservation status of the animals used

From the 45 animals and their respective parts used as medicine in the study area 2 species (*Cercopithecus diana* and *phataginus tricuspis*) are considered endangered species, 4 species (*osteolaemus tetrapsi, kinixys belliana and cyclanorbis senegalensis, cephalophus zebra*) are considered vulnerable species, 1 species (*Python sebae*) is considered Near threatened, 21 species are considered "least concern", while 16 species are data deficient or not yet evaluated. (Table 2).

Method and condition of animal species preparations

Internal organs were most used (42.5%) followed by whole body (35%) and external body forms (22.5%). The study revealed that most of the animals or their products are utilized by direct use (36.3%) without adding other ingredients or without any further modification of the natural resources. Several modes of preparation are employed drying is the most common (21.3%), followed by powdering (10%), cooking raw/fresh (8.8%), roasting (5%) and mixing other ingredients (2.5%). Most remedies (81.67%) in the study area were prepared exclusively from fresh parts, with a few made from previously prepared and stored material (18.33%). Two-thirds (59.7%) of remedies consist of a single species, the remaining are a mixture of two or more animal and or plants species.

Sources of knowledge about medicinal animals/ inheritance of healing wisdom: Traditional medicinal knowledge is passed down orally from one generation to the next, after been gathered over a significant period of time. The majority of respondents indicated that parents and grandparents serve as the primary custodians of traditional knowledge, which they transmit to their offspring. The informants reported receiving instruction on medicinal animals primarily from their fathers (47%), followed by their grandfathers and brothers (14.5%), and their moms (10.8%). Merely 12% of the respondents acquired the ancestral knowledge of animals from acquaintances or members of their society, while the remaining 15.7% of the respondents declined to disclose their sources of learning. Informants perceive their information as valuable and believe it should be transmitted to future generations (94%). However, they express uncertainty towards "outsiders" and only a small percentage (14.5%) are willing to share specific expertise with researchers or other interested individuals. It also presented an alternative perspective on the formation of social constructs and how individuals gain knowledge via this process. The primary source of information regarding traditional medicines and healing systems, as well as all other aspects of healing and treatment with traditional medicines, is the ancestral spirits of healing. All other factors are considered secondary to the influence and strength of these ancestral spirits. Dreams also serve as a means of acquiring knowledge in the field of traditional medicine and healing. Healing spirits might appear in dreams, providing instructions to herbalists or healers on acquiring certain animals or body parts to be used in treating patients.

Use Value

The use values suggest that certain species are more extensively utilised than others. *Sclerophrys regularis* had the highest use value (0.8) in this study, followed by the *Apis mellifera* (0.7), *Archchatina marginata* (0.68), *Civetticis civetta* (0.68), *Rousettus aegyptiacus* (0.65), *Osteolaemus tetraspi* (0.63), *Achatina achatina*, *Hypsignathus monstrosus*, and *Phataginus tricuspis* (0.6) respectively, as shown in Table 2. Species having high use values, meaning they are primarily utilised by local groups, are more likely to be overexploited and so face increased risk of its extinction.

Fidelity Level (FL)

The fidelity level is the proportion of informants who report using a certain animal species for the same primary purpose. The fidelity level (FL) represents the upper limit of species use, ranging from 0 to 100. One requirement for selecting species is that they must be quoted at least 10 times in a single use and have several uses. The species exhibiting the highest fidelity rate of 100%, were *S. regularis*, *A. mellifera, C. civetta, A. marginata, and R. aegyptiacus*. The fidelity levels for *C. diana, V. niloticus*, and *S. togoensis* were 77%, 69%, and 66% respectively, with *P. africanus* having the lowest fidelity level at 39%. The efficacy of *A. achatina* and *C. civetta* in treating asthma was determined to be 100% for both species.

Preference ranking

Diverse animal species are utilised for the treatment of various illnesses. Indigenous people in such instances have a predilection for animal species depending on their curative efficacy against a certain ailment. A preference ranking was utilised to evaluate six medicinal animal species that are employed in the treatment of asthma. The species *S. regularis* and *S. maculatus* were put in the top position, followed by *C. civetta* and *H. mossambicus*. According to informants, the most effective way to use *S. regularis* is by combining it with the roots and leaves of *Anisophyllea laurina.*

Frequency index

The species with high frequency citation which implies high utilization level of the species compares to other species were the *Sclerophrys regularis* (80%), *Apis mellifera* (70%), *Archchatina marginata* (67.5%), *Civetticis civetta* (67.5%), *Rousettus aegyptiacus* (65%), *Osteolaemus tetraspi* (62.5%), *Achatina achatina* (60%), *Hypsignathus monstrosus* (60%), *Phataginus tricuspis* (60%), (Figure 2).

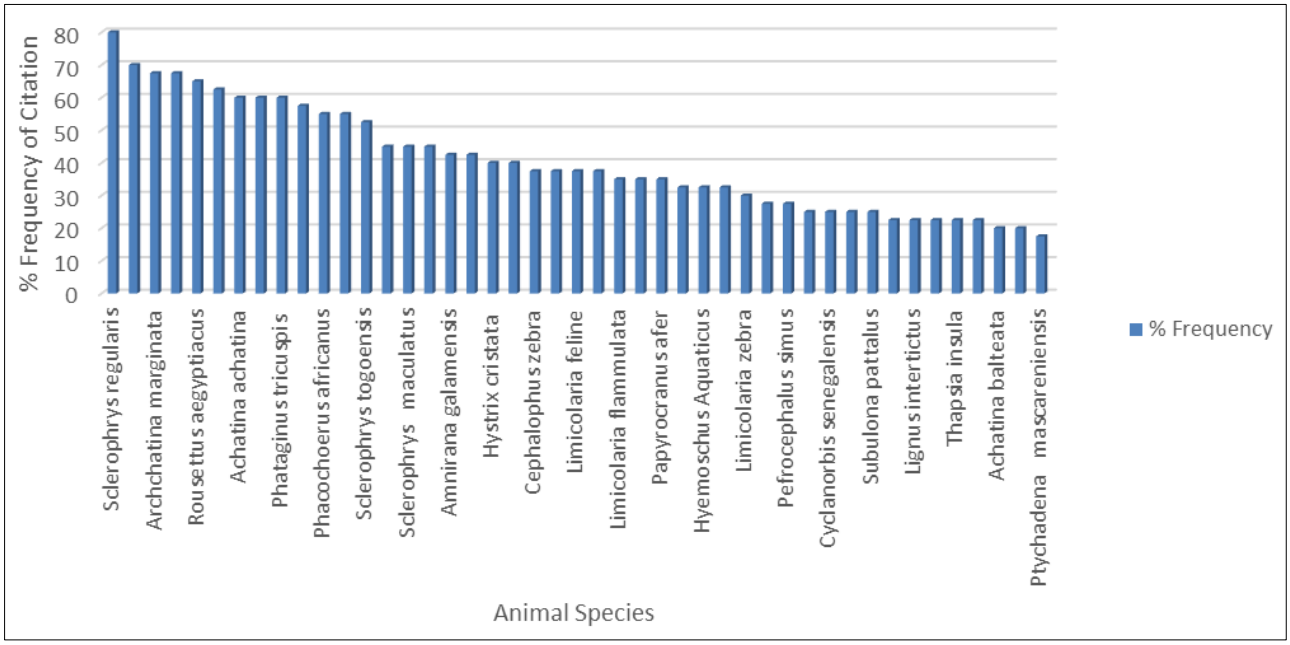

Fig 2: The frequency citation of each species

Mode of Administration

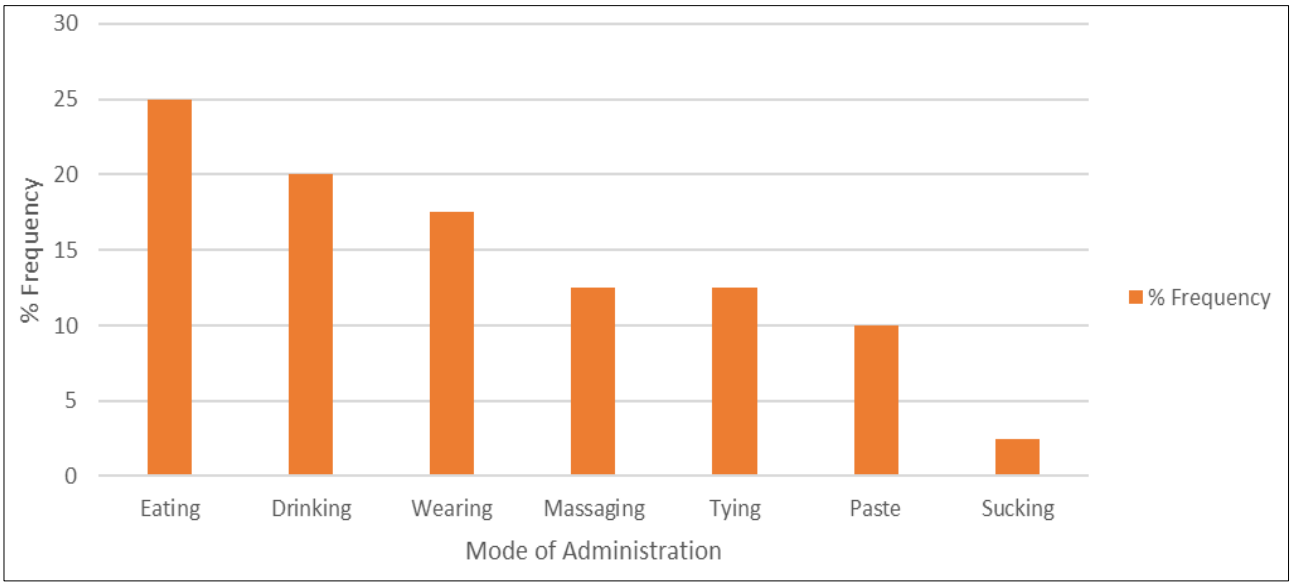

Fig 3: Mode of administration of medicinal formulation

Result from (Figure 3) revealed the mode of administration. Eating as a mode of administration with the highest percent frequency 10 (25%) followed by drinking 8(20%), wearing 7 (17.5%), massaging, tying 5 (12.5%), paste 4 (10%) and sucking 1(2.5%).

Discussion

The predominant treatment modality among the local population in the research area is traditional medicine. There is a lack of published research on animal-derived medicines in the communities of Southern Sierra Leone. The objective of this study was to contribute to the existing literature on ethno medicine practices in the southern region of Sierra Leone. Rural residents exhibit a higher inclination towards religiosity and a preference for traditional medicine [25]. All informants possessed a profound understanding of the applications of ethno medicine. The study revealed a gender disparity in wildlife exploitation, with men exhibiting greater awareness compared to women. Men's extensive understanding of traditional utilisation of wild animals may be shaped by African civilizations that delineate distinct responsibilities for males and females.

Typically, men engage in activities like as constructing traps, placing them, monitoring them, hunting, and preparing meat, while women remain at home and perform domestic tasks like cooking. They are given pre-prepared meat and cook it alongside the man, without prior notification of their involvement. This finding aligns with the study conducted by [26], which revealed that the majority of men had greater awareness of diverse ethno zoological activities. According to a study conducted by [27], the majority of individuals who use animal recipes are women. The predominant factor contributing to a large percentage of individuals aged 40 years or above was mostly linked to the utilisation of ethno medicine.

Prior research conducted in Nepal [25], Ethiopia [28], India [29], and Pakistan [30] has also identified a similar pattern, indicating that older participants possess greater knowledge and expertise in ethno medicine. The majority of the participants asserted that they acquired the information from their older relatives. This study documented 45 species of vertebrates and invertebrates that are utilised in traditional therapeutic practices. The study area primarily utilised reptiles as the most frequently employed taxonomic group. Unlike prior ethno zoological research conducted in South Africa [31-34], mammals were the predominant taxonomic category, accounting for 73% of the total and belonging to 11 different classes. Research carried out in Latin America has revealed that traditional medical practices place equal or even more importance on invertebrates, reptiles, and bird species compared to mammals [35-36]. The study conducted by [37] revealed that individuals residing in rural regions of Central Java consume animals from several animal categories for medicinal purposes. Overall, a greater number of insects and animals were utilised compared to the group that was most commonly used. A study conducted among the Degu tribes in the Tigray region of Ethiopia revealed that traditional medicine utilising 23 animals demonstrated potential for treating 30 diseases [38]. Additionally, in the Kafta-Humera region of northern Ethiopia, researchers identified and utilised 16 species of animals to treat 18 distinct human health disorders [39]. According to the study conducted by [29], there are around 40 distinct diseases that can be treated using a combination of 44 different animal species [29]. In Ethiopia and Mauritius, the local population utilised 51 and 32 animal species, respectively, for the treatment of 36 and 38 distinct ailments [28]. Furthermore, the utilisation of animals in ethno medicine has been recorded in European countries, alongside Asia and Africa [40-41]. The study conducted by [28] examined the use of 51 animal species and their derivatives in the management or prevention of around 36 distinct illnesses [28].

Prior research has indicated that animals, both wild and domestic, as well as their various body parts such as bones, hooves, feathers, skin, and teeth, play a significant role in the creation of therapeutic, defensive, and preventative medicine in animal therapy [42-43]. The authors [44] and [45] have explained that the type of animal medicines used varies depending on the specific condition and disease being treated. These methods may involve pressing or direct application, crushing or grinding, burning, boiling, packing, grinding, or drying [45, 44]. *Sclerophrys regularis* had the highest use value in this investigation, with *Apis mellifera* and *Archchatina marginata* following closely behind. Pangolin body parts are frequently utilised in traditional medicine and possess significant therapeutic value, as indicated by their high usage values and patients did receive therapy from local traditional healers [46-47]. The significant use of pangolin scales suggests that traditional healers place great importance on them. [48] contends that a UV value exceeding 1 signifies that community people or traditional medical practitioners (TMPs) utilize this resource for various medical conditions.

In this study, the route of administration with the highest percentage frequency is eating, followed by drinking, dressing, massaging, tying, sticking, and sucking. [1] discovered that boiling, juicing, powdering, frying, making into a paste, and smoking are often used techniques for preparing ethno medicinal remedies. Typically, animal parts and products, such as meat, are cooked thoroughly before consumption, as the consumption of raw animal parts is considered haram (prohibited) in the Islamic faith. In Nepal, a comparable pattern was noted, with the utilisation of 12 distinct recipes and the frequent inclusion of cooked meat and other animal components [25]. Conversely, the direct ingestion of animals and animal parts has been a prevalent method of obtaining animals-based medicines in India and Korea [49, 50, 29]. Nevertheless, the consumption of uncooked meat can heighten the likelihood of human transmission of diverse parasites and diseases [51].

Conclusion

Medicines that contain animal components are a significant medical alternative for nearby communities. A total of forty-five animals were used in the Kowa and Dasse communities for the purpose of treating forty different human diseases. Seven of the creatures utilised are formally classified as "endangered" in the [52]. This study additionally demonstrates that the local populace has a plethora of folklore and traditional knowledge pertaining to the utilisation of various animals. There is a pressing requirement for accurate documentation in order to record ethno medicinal information regarding animal products and their therapeutic applications. Further investigation is required to scientifically validate the medical benefits of these products and to integrate this information into strategies for the conservation and management of animal resources. Animals serve as a source of raw material for the treatment of physical and /or mental diseases. The interaction between humans and wildlife, specifically in the context of animal healing practices, is not only influenced by cultural factors but also by the social and economic dynamics among humans. In regions such as Africa, where the majority of the population does not have access to conventional medicine, the use of local medicinal animals and plant therapeutic systems is crucial. Communities opt for traditional medicine due to its affordable cost and the intricacy of contemporary healthcare services. Nevertheless, the appeal and inherent worth of zootherapy do not solely stem from the absence of contemporary medical treatments. Even in urban areas where advanced healthcare is readily available and specialized, a significant number of individuals still seek the services of traditional healers, demonstrating the cultural acceptance of these practices. Additionally, it can contribute to increasing awareness regarding the imperative to protect, safeguard, and responsibly utilise biodiversity prior to it becoming irreversibly threatened. Anthropogenic activities, such as agricultural development, hunting, and overexploitation of animal resources, are currently posing a threat to the availability of therapeutic animals. Furthermore, indigenous knowledge faces numerous risks, including the practice of keeping it secret, the reliance on oral transmission, the unwillingness of younger generations to acquire this knowledge, the rarity of certain species, the impact of modern education, and the absorption of foreign cultures.

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