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Ethnozoological documentation of traditional vertebrate-based practices in the mountainous regions of Eastern Anatolia from Erzurum, Ardahan, Iğdır, and Kars (Turkey)

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Abstract. *Karakaya S, Kimişoğlu Z, İncekara Ü, Polat A, Sümbüllü YZ, Aksakal Ö. 2025. Ethnozoological documentation of traditional vertebrate-based practices in the mountainous regions of Eastern Anatolia from Erzurum, Ardahan, Iğdır, and Kars (Turkey). Asian J Ethnobiol 8: 57-78.* The mountainous and moorland regions of Eastern Anatolia, particularly Erzurum, Ardahan, Iğdır, and Kars, harbor a wealth of traditional knowledge regarding the medicinal and cultural use of vertebrate species. This study aims to document and analyze local ethnozoological practices, emphasizing the cultural significance of vertebrates in traditional healthcare systems shaped by Turkey's diverse ecological and socio-cultural landscape. Between 2017 and 2021, an ethnobiological field survey was conducted across 180 villages (Erzurum: 60, Ardahan: 40, Iğdır: 30, Kars: 50), involving 600 participants, including traditional healers and knowledgeable community members. Data were collected through semi-structured questionnaires, informal interviews, and participant observations and analyzed using the Fidelity Level (FL) index. A total of 28 vertebrate species from 26 genera and 23 families were recorded, yielding 249 distinct applications. These uses were categorized into culturally embedded domains: human medicine (135 uses), utilitarian practices (81), veterinary treatments (24), and plant-based remedies for animal health (9), reflecting the interwoven nature of cultural and medicinal knowledge systems. Notably, nine species exhibited high consensus in use, with FL values ranging from 94 to 98%. These results underscore the enduring relevance of animal-based remedies and the integration of zoological knowledge into local health traditions. By situating the findings within a broader ethnobiological framework, this study contributes to global discussions on biocultural heritage preservation. It supports the call for biodiversity conservation strategies informed by indigenous knowledge systems.

Keywords: Eastern Turkey, ethnozoology, traditional knowledge, vertebrate ethnomedicine zootherapy

INTRODUCTION

The historical relationship between humans and animals dates back to the origins of humanity, with animals providing essential resources such as food, medicine, and textiles. Biodiversity has been a key source of healing practices across cultures, with communities developing expertise in utilizing natural ecosystems for various needs. Approximately 60% of pharmaceutical drugs are derived from bioactive compounds found in nature, many of which stem from traditional remedies explored by different cultures (Lohani et al. 2008; Jaroli et al. 2010). Ethnozoology studies the complex interactions between humans and animals, with "zootherapy" focusing on using animals and their byproducts to treat illnesses, forming an integral part of many traditional healing systems (Jaroli et al. 2010; Yirga et al. 2011).

Currently, the examination of animal utilization within indigenous communities is conducted across diverse regions worldwide. In the contemporary era, the utilization of animals possessing medicinal attributes has become a widespread phenomenon across the globe. The utilization of animal-derived products for treating human or animal ailments seems to be widespread in specific regions globally, particularly in areas where traditional medicine holds greater significance compared to allopathic medicine. Examples of such regions are Brazil, various parts of the Middle East, Turkey, India, China, and Korea (Jaroli et al. 2010; Kim and Song 2013).

Ethnozoology, as a foundational branch of ethnobiology, explores the multifaceted perceptual, cognitive, and practical relationships between human communities and animal species (Gutiérrez-Santillán et al. 2019). While traditional ethnozoological studies have often centered on the utilitarian value of fauna, recent perspectives call for a paradigmatic shift—one that moves beyond anthropocentric frameworks and acknowledges animals not solely as resources but as co-inhabitants within shared ecosystems. This includes embracing intercultural dialogues between academic zoologies and local ontologies, thus fostering alternative epistemologies for coexistence and multispecies justice (Descola 2013; Kohn 2013). This perspective also promotes the consideration of species traditionally viewed as culturally 'insignificant,' encouraging a more inclusive

ethical framework and greater acknowledgment within ethnozoological studies (van Dooren 2014). Traditional medicine has significantly contributed to modern drug discovery, leading to the development of key pharmaceuticals like digitoxin, reserpine, tubocurarine, and ephedrine. Notably, of the 252 essential compounds recognized by the World Health Organization, approximately 8.7% are derived from animal sources (Kendie et al. 2018).

Anatolia boasts an exceptional abundance of flora and fauna, ranking among the world's top regions for biodiversity. Despite this distinction, there is a notable scarcity of comprehensive global cross-cultural studies. Over its extensive history, Anatolia has served as a melting pot for diverse civilizations, each leaving an indelible mark on its cultural landscape. The diverse knowledge systems of its inhabitants across different eras can be readily explored through the wealth of resources found within Anatolia's museums and archaeological sites (Yenmiş et al. 2018). In Turkish folk culture, research and analysis studies have been carried out on many animals, especially horses, wolves, sheep, goats, camels, snakes, and deer, and their places in folk culture have been determined (Çiçek et al. 2020).

Turkey's rich wildlife history, dating back to the Pleistocene era, includes a variety of mammals, reptiles, and birds. As a global biodiversity hotspot, Turkey has a strong connection with animals, reflected in both urban and rural life. The regions of Central and Southeastern Anatolia served as some of the earliest hubs for the domestication of livestock, including pigs, sheep, goats, and cattle. Animals also play therapeutic and symbolic roles, with species like birds of prey, wolves, bulls, horses, and scorpions symbolizing life, death, or fortune. Studying these relationships through ethnozoology and sociology enhances our understanding of Turkey's cultural heritage and human-nature dynamics (Emre 2023).

Hence, to address this gap, the present study explicitly asks: What vertebrate species are traditionally used for medicinal purposes in the provinces of Erzurum, Ardahan, Iğdır, and Kars, and what cultural meanings and therapeutic functions are attributed to these uses by local communities? This research aims to (i) document vertebrate species used in traditional medicine in these provinces; (ii) categorize their medicinal, veterinary, and symbolic roles; and (iii) analyze the cultural and ecological knowledge that shapes these uses. By articulating this research question, we aim to provide a structured contribution to the field of ethnozoology in Turkey while also situating the study within global discourses on the preservation of indigenous knowledge systems. This work not only enriches our understanding of traditional healing practices but also contributes to biodiversity conservation and the recognition of cultural heritage.

MATERIALS AND METHODS

Study area

Situated at the crossroads of Asia, Europe, and Africa, Turkey is a transcontinental nation extending between 36-42° N latitude and 26-45° E longitude. Encompassing a total area of 783,562 km², the majority of its territory (97%) lies within the Asian continent (Anatolia), while the remaining 3% is situated in Europe. Geographically, the country is categorized into seven distinct regions, each defined by unique climatic conditions, vegetation types, and agricultural practices. Among these, the Eastern Anatolia Region (EAR) stands as the largest, covering nearly 163,000 km². Iraq, Iran, Nakhichevan, Armenia, and Georgia border it. It is characterized by its high altitude, averaging 2,000 meters, and its rugged terrain, which includes extensive mountain ranges, high plateaus, and broad plains (Bakirci and Kirtiloglu 2022).

Eastern Anatolia, Turkey's largest geographical region, exhibits distinctive climatic features shaped by its topography. Encircled by coastal mountain ranges, the region is largely insulated from the tempering effects of maritime air masses. As a result, winters tend to be long and harsh, with snowfall dominating the precipitation and remaining on the ground for extended periods. The short spring season is marked by rainfall, which is soon followed by a dry and intensely hot summer (Özgökçe and Özçelik 2004). The exact location of the study area is illustrated in Figure 1.

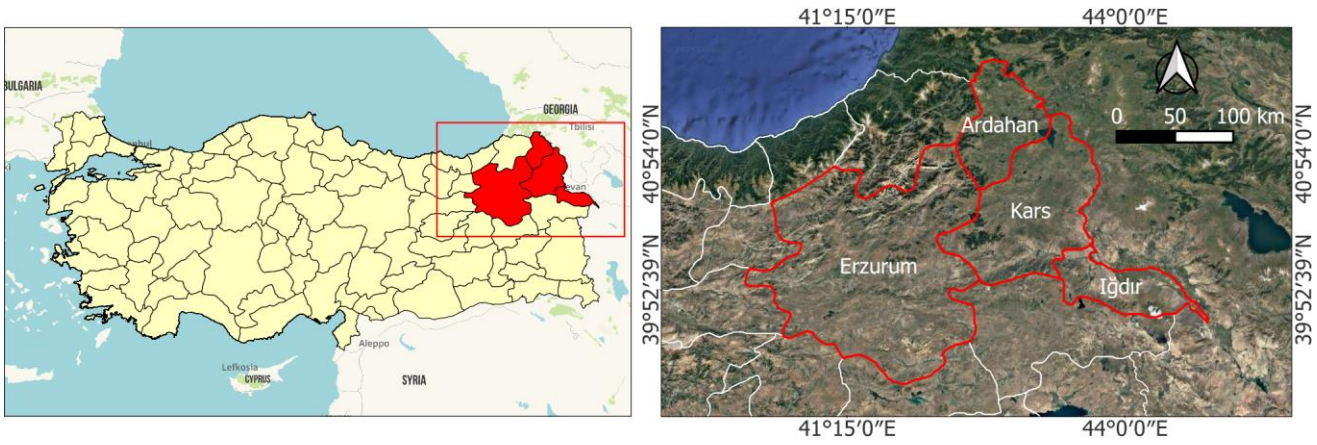


Figure 1. Study area location. The approximate coordinates of the main cities in the study region are as follows: Erzurum (39.9334° N, 41.2674° E), Ardahan (41.1100° N, 42.7028° E), Iğdır (40.3667° N, 44.0400° E), and Kars (40.6167° N, 43.1000° E) Provinces in Turkey. These coordinates indicate the general geographical positions of the cities within the Eastern Anatolia Region

Eastern Anatolia hosts 444 wild plant taxa belonging to 62 families that are traditionally utilized for medicinal purposes. Among these, the most frequently represented families are Asteraceae (93 taxa), Lamiaceae (52), Rosaceae (30), Fabaceae (27), and Boraginaceae (20). The most commonly used genera include *Achillea* and *Centaurea* (11 taxa each), followed by *Scorzonera* (9 taxa), as well as *Euphorbia*, *Salvia*, and *Alcea* (8 taxa each). Despite the region having the highest plant endemism rate in Turkey (25%), only around 8% of the medicinal taxa are endemic to this area (Altundag and Ozturk 2011). From 1927 to 2012, Turkey experienced a major shift in population dynamics, with urbanization increasing rapidly. The urban population grew from 3.3 million (24.2%) to 56.4 million (74.6%), driven by internal migration and developments in transportation and communication. A key turning point was the 1950s, after which urban growth accelerated sharply. Meanwhile, the rural population declined from 75.8% to 25.4%. This transformation reflects a broader national trend, showing that urbanization in Eastern Anatolia aligns with Turkey's overall demographic evolution (Coşkun 2013).

Data collection

The study involved a comprehensive survey across provincial centers, districts, and rural settlements in Ardahan, Iğdır, Kars, and Erzurum. An irregular survey design was adopted to allow for flexibility across diverse field conditions. Both male and female residents of the region were presented with structured questions aimed at eliciting their local zoological knowledge. The responses collected were subsequently compiled to generate a detailed ethnozoological profile of the region. An ethnozoological inventory was systematically constructed using the insights shared by participants from designated pilot regions. Prior to data collection, all participants received a detailed briefing outlining the study's objectives and procedures. Interviews were then conducted with voluntary participants, during which their traditional zoological knowledge was carefully documented. In addition to ethnozoological data, demographic information was also collected to explore potential correlations between socio-cultural factors and the transmission of local zoological knowledge. These demographic parameters, such as age, gender, education, occupation, and residency, are summarized in Table 1, providing a basis for examining socio-economic influences on ethnozoological knowledge. A sample size of 600 participants was determined based on regional population densities and the need for representative data across the 180 surveyed villages. This number was deemed adequate to ensure both demographic and cultural diversity, thereby enhancing the robustness of the findings. The fieldwork for this study was conducted within the framework of the nationally coordinated project “Recording Traditional Knowledge Based on Biodiversity”, overseen by the Ministry of Agriculture and Forestry of the Republic of Turkey. This project spans all provinces of the country, and all data collected are systematically archived in the national database known as the Traditional Knowledge Management System. The results presented in this article originate specifically from field activities carried out in the designated provinces under the responsibility of our research team. These activities were conducted in collaboration with local village headmen (muhtars) and formally communicated to the relevant provincial governorships. In accordance with the standardized national protocol applied uniformly across Turkey’s 81 provinces, no additional ethical approval was required. Numerous academic publications have emerged from this initiative, none of which necessitated separate ethical committee reviews, given that the overarching project has been officially sanctioned at the national level. To ensure both cultural sensitivity and methodological clarity, the interview forms and related instruments were pilot-tested prior to full implementation and adjusted as necessary based on feedback. After the fieldwork and face-to-face interviews were completed, participants' responses were transcribed into digital form. This allowed for the generation of individualized reports and the categorization of data based on demographic characteristics, thereby facilitating structured comparative analysis across different participant groups. In order to preserve data integrity, all interviews were recorded using digital voice recorders, following the participants' explicit verbal consent. This practice helped minimize the risk of information loss or misinterpretation during subsequent analysis. Any inconsistencies or unclear segments in the audio recordings were reviewed and resolved promptly, thus enhancing the overall accuracy and reliability of the research outcomes.

Quantitative analysis

To determine the most culturally significant animal species used in treating specific health conditions, the Fidelity Level (FL) was employed. This quantitative index helps reveal the relative therapeutic importance of each species by measuring the level of consensus among informants regarding its use. The FL reflects the percentage of participants who cited the same species for a particular ailment, thus offering insight into the specificity and reliability of its ethnomedical application. The FL was calculated using the formula:

$$FL = (Np / N) \times 100$$

Where: Np = Denotes the number of participants who mentioned the use of a species for a particular disease; N = Represents the total number of individuals who referred to that species for any medicinal purpose.

FL values range from 1 to 100%, with higher percentages indicating a strong agreement among respondents regarding the species’ use for a particular ailment. Conversely, lower FL values point to less agreement, suggesting a broader or more variable range of uses. This method has been widely adopted in ethnobiological research to assess the cultural salience of species in traditional healing practices (Friedman et al. 1986; Alexiades 1996; Jaroli et al. 2010; Kim and Song 2013).

RESULTS AND DISCUSSION

Demographic characteristics of study participants

Demographic data of the participants were obtained through in-person interviews, ensuring broad representation of the local communities throughout the study region. In total, 600 individuals participated in the study from 180 villages located in the provinces of Erzurum, Kars, Ardahan, and Iğdır. The distribution of participants by province was as follows: 202 individuals from Erzurum (111 women, 91 men), 149 from Kars (68 women, 81 men), 129 from Ardahan (52 women, 77 men), and 120 from Iğdır (46 women, 74 men). Special attention was given to selecting participants recognized by their communities for their traditional knowledge and practical experience. These included elderly women over the age of 60, midwives, shepherds, and individuals known locally as "healers" or "traditional practitioners." Their contributions enriched the dataset with deeply rooted cultural insights and traditional zoological knowledge. This broad demographic base ensured that the data reflected a wide array of cultural and ecological knowledge systems. The sample regional and gender diversity allowed for comparative analyses between different provinces and social groups, which strengthened the study's findings on the cultural transmission and preservation of ethnozoological knowledge. A detailed demographic summary, including participants' age, gender, educational level, occupation, and residency, is provided in Table 1.

Medicinal animals for humans

An extensive ethnomedicinal investigation recorded the utilization of 30 different animal species used in traditional medicine, spanning 25 genera and 22 families, and yielding a total of 135 unique therapeutic applications (Table 2). The most frequently cited therapeutic use was for hemorrhoids (6.67%), followed by rheumatism and wound treatment (each 5.93%), and eczema (5.19%). These findings emphasize the significance of animal-based remedies in addressing a broad spectrum of human health conditions within traditional medical systems. In terms of material usage, 25 different animal parts were reported. Meat emerged as the most commonly used component (40%), followed by fat (36%) and feces (32%), suggesting a strong reliance on accessible and multifunctional animal products. Key species with the highest number of citations included *Gallus gallus* f. *domesticus* (14 uses), *Capra aegagrus hircus* (12), *Erinaceus europaeus* Linnaeus, 1758 (12), *Salmo trutta* Linnaeus, 1758 (10), *Ovis aries* subsp. *aries* (9), *Bos taurus* Linnaeus, 1758 (9), and *Ursus arctos* Linnaeus, 1758 (8). These frequent mentions indicate the central role these species play in the cultural pharmacopeia of the region. The implications of these results reflect both ecological availability and deep-rooted ethnomedical traditions, which highlight the necessity of preserving local knowledge systems.

Medicinal animals for animal

A total of 19 animal species with medicinal value, belonging to 15 genera and 12 families, were documented as being used in 24 distinct ethnoveterinary treatment practices (Table 3). The most commonly reported ailments treated with these remedies were wounds and eczema, each accounting for 12.2% of all therapeutic applications. These findings underscore the continued importance of animal-based remedies in supporting livestock health and demonstrate a strong dependence on traditional veterinary knowledge in rural communities.

The survey also identified 11 different types of animal-derived materials employed in treatments. Among these, fat emerged as the most frequently used component (44.46%), followed by feces (27.27%), indicating a preference for materials that are both accessible and functionally adaptable. *Capra aegagrus hircus* (reported 5 times) and *Ovis aries* subsp. *aries* (reported 3 times) were the most frequently cited species, highlighting their prominent roles in local healing practices. Overall, the results reflect a well-established body of ethnoveterinary knowledge, illustrating how animal-based biological resources remain deeply embedded in traditional livestock care systems.

Table 1. Demographic characteristics of the participants

Localities	Erzurum	Ardahan	Iğdır	Kars
Demographic characteristics				
Age				
31-40	12	7	5	10
41-50	49	40	20	26
51-60	53	33	41	47
61-70	55	29	35	42
70 above	33	20	19	24
Gender				
Female	111	52	46	68
Male	91	77	74	81
Educational level				
Illiterate	95	45	41	61
Primary school	85	51	45	52
Secondary school	14	25	25	23
High school	6	5	7	9
University	2	3	2	4
Employment status				
Housewife	111	52	46	68
Farmer	44	46	42	47
Pensioned	33	23	23	24
Shepherd	9	6	6	8
Other jobs	5	2	3	2
Total	202	129	120	149

Medicinal plants for animals

In the context of animal healthcare, eight medicinal plant species representing eight genera and six families were documented, resulting in nine distinct ethnoveterinary treatment practices (Table 4). These plants were predominantly used in traditional practices aimed at treating animal ailments, with the most common application being for snakebite treatment and snake repellent purposes, comprising 33.3% of all reported uses. This finding underscores the perceived importance of plant-based interventions in managing venomous threats within local pastoral systems. Five different plant parts were cited in the preparations. Aerial parts were the most frequently used (44.44%), followed by leaves (22.22%), while stems, seeds, and roots were employed less often but still held medicinal relevance. Among the recorded species, *Juglans regia* L. emerged as the most frequently referenced, indicating its prominent role in ethnoveterinary knowledge. Overall, the findings emphasize the integration of botanical resources in traditional animal health strategies and reflect a nuanced understanding of local flora for veterinary purposes.

Animal species for different purposes

A comprehensive survey identified a total of 16 families, 19 genera, and 21 species of medicinal animals, yielding 81 distinct usage applications for various traditional purposes (Table 5). These animals were most commonly involved in practices embedded in relational ontologies and situated knowledge systems, with amulet-related applications representing the most frequently reported category (18.52% of all uses). Rather than reducing these uses to matters of "belief," which risks reinforcing a binary between academic knowledge and local epistemologies, this study approaches them as expressions of alternative ontological frameworks. As emphasized by Haraway (2008), Despret (2004), and Descola (2013), these practices reflect different ways of thinking with and through animals, grounded in lived experiences, affective relations, and non-anthropocentric modes of engagement. Recognizing these acts as relational and epistemic rather than symbolic or irrational allows for a more inclusive and respectful account of local knowledge systems within ethnobiology. This was followed by remedies or protections against the evil eye (11.11%), applications involving rennet (4.94%), and usage in traditional games or recreational activities (3.70%). Our analysis indicated that 24 different animal parts were utilized across these diverse purposes. Among these, leather and feces emerged as the most frequently used materials, each representing 29.17% of the total recorded applications. Bones were the second most commonly utilized part, contributing 25%, followed by fat and horns, each accounting for 16.67%. These findings underline the extensive and multifaceted use of animal-derived materials in traditional practices. The most frequently mentioned species included *B. taurus* (16 references), *C. aegagrus hircus* (10 references), and *O. aries* subsp. *aries* (12 references), highlighting their cultural and functional significance within the local community. These results reflect the deep-rooted ethnobiological knowledge and practices that incorporate animal resources for both utilitarian and symbolic purposes.

Data analysis

Fidelity Level (FL). The fidelity level is a valuable indicator for determining which species are most consistently favored by local residents in the treatment of specific ailments. In this study, FL values ranged between 12.0 and 98%. A species with an FL of 100% indicates complete consensus among informants, meaning that all use reports referred to the same therapeutic application of that particular animal (Jacobo-Salcedo et al. 2011).

Then, to ensure better accuracy, the analysis excluded animal species mentioned only once, focusing instead on those with higher Fidelity Levels (FL). The study identified a total of 13 animal species with notably high FL values: 2 species were recorded with an FL of 98%, 4 species with 96%, 3 species with 94%, and 4 species with 92% (Tables 2-5). These findings highlight the consistent reliance of the local community on a select group of species for traditional medicinal purposes, reflecting their perceived efficacy and cultural importance in addressing specific health conditions. The cream derived from the milk of *B. taurus* holds the highest fidelity level (FL) at 96%. It is traditionally applied to burns using a soft material, such as a chicken wing, for effective relief and healing. Similarly, *S. trutta* also demonstrates an FL of 96%, with its entire body being utilized in a unique traditional practice. In this method, individuals suffering from stomach ulcers swallow live specimens measuring 5-7 cm in length, reflecting the deeply rooted cultural practices and a high degree of trust placed in these animal-based remedies for specific ailments.

Among the categories, mammals were the most frequently used, accounting for 6.43% of all recorded applications. This highlights the predominant role of mammals in traditional practices, underscoring their significance in the ethnobiological knowledge of the region. Figures 2 and 3 provide photographic documentation of various traditional applications recorded in the study. These images visually illustrate the diverse uses of vertebrate species in local healthcare and cultural practices. The photographs capture key aspects of treatment methods, preparation techniques, and the specific animal-derived materials utilized by traditional healers and community members. Additionally, they highlight the socio-cultural context in which these remedies are applied, offering valuable insights into the integration of ethnozoological knowledge within daily life.

Table 2. Animal species used for medical purposes in human diseases

Category	Scientific name	Family	Turkish name	Used part	Usage	Locality	FL
Mammals	*Ovis aries* subsp. *aries*	Ovidae	Koyun	Feces	The person with hemorrhoids is made to sit directly on sheep feces.	A,E,K	28%
					A woman who cannot have children is laid lengthwise in warm sheep manure up to her neck. Her body is covered with this manure up to her neck.	E,K	52%
				Fat	Animal fat is applied to the affected area with hemorrhoids.	A	16%
					A mixture of tail fat, meteorite, clove, and cinnamon is crushed in a mortar. It is made into tablets. It is placed in the vagina of women who cannot have children.	A,E	72%
					Tail fat is wrapped directly around the finger affected by whitlow.	E	12%
					It is applied directly to cracked hands.	I	88%
				Leather	To alleviate pain in postpartum women, a freshly sheared sheep pelt is wrapped around the abdomen.	E	60%
				Lung	A piece is placed directly over the aching eye.	E	52%
				Wool	Dirty wool is wrapped around the aching lower back for one night.	A,E,I,K	88%
Reptiles	*Anguis fragilis* Linnaeus, 1758	Anguidae	Ankara, Kör kertenkele	Meat	It is cut into cubes. It is strung on a string and dried. It is turned into powder. It is fed to mothers who cannot have children or to children with developmental delays	A	20%
					It is cut into cubes and dried and fed against unreasonable weight loss (called Mattausur).	A	16%
Birds	*Gallus gallus* f. *domesticus*	Gallidae	Tavuk	Feces	It is given to children in small amounts to help with stomach aches.	A	60%
					It is diluted slightly with water and given to a child or baby experiencing cramps.	A,E	92%
					It is directly applied to the area with swelling.	A,E	52%
					It is wrapped in a cloth around the swollen ear or throat.	E	10%
				Egg	The peel is burned, then crushed into a powder. It is mixed with the egg yolk and applied to burns.	A	29%
					The peel is ground into a powder and used as a hemostatic.	E,K	52%
					The peel is ground into a powder and consumed with chicken to prevent bone loss.	I	72%
					The peel is ground into a powder. If this powder is inhaled through the nose during a nosebleed, the bleeding will stop.	I	60%
					In case of dental inflammation and pain, the yolk of an egg is boiled and placed on the affected area. This procedure is repeated 1-2 times.	I,E	88%
					The yolk is dripped 1-2 drops into the aching ear.	I	80%
					When the yolk is thoroughly roasted in a pan without oil, the resulting egg oil is applied to the burnt area until it heals.	K	
				Fat	The whole chicken is boiled, the resulting oil is applied to the burns with chicken feathers.	E,K	80%
				Gizzard	It is boiled in half a liter of water, and the water is consumed twice a day to relieve kidney pain.	A	28%
				Whole animal	The whole crushed black chicken is wrapped around the aching waist. The bandage that remains overnight is removed in the morning.	A,E,I	88%
Mammals	*Capra aegagrus hircus*	Bovidae	Keçi	Hair	In the treatment of fractures such as those in the foot or arm, if the mixture obtained by mixing egg white with goat hair is applied to the broken foot by placing it between a cloth, it is good for the fracture and accelerates healing.	E	12%
					It is mixed with egg and applied to the forehead as a fever reducer.	A	60%
					For the wounds on children's heads, whole egg white and goat hair are applied by wrapping them around the wound.	A	64%
					In the treatment of scabies, wool is soaked in salt water and applied to the body. After this process is done for a day, a bath is taken.	E	72%

				Fat	Goat fat and sheep fat are mixed and applied to the area with boils.	A	28%
					Beeswax, *Cannabis sativa* aerial part and goat body fat are mixed and brought to a paste consistency, then this mixture is kept in cold. After waiting, it is applied to women in small pieces (like suppositories) for the treatment of infertility.	E	
					Goat fat is mixed with Beeswax to make an ointment and is applied to foot wounds and cracks.	E	31%
				Milk	If you drink a glass of red hairy goat's milk every morning for 9 days, it will relieve shortness of breath.	E	88%
				Leather	A piece of freshly peeled leather is cut and tied to the area with heel spurs. It is left for 2-3 days.	E	52%
					To reduce the pain of women giving birth, freshly cut goatskin is wrapped around the abdomen.	E	16%
				Animal hide	When there are multiple bruised areas on the body, a freshly skinned animal hide is wrapped around the person’s bare body. The same method can also be applied using a sheep hide.	A,E,I,K	88%
				Horn	Its horn is burned. Its ash is applied to the skin for itching and allergies.	E	60%
Mammals	*Bubalus bubalis* (Linnaeus, 1758)	Bovidae	Camış, Manda	Horn	It is ground into powder. After it is mixed with butter and brought to a creamy consistency, it is applied to the body for eczema.	E	50%
				Feces	The foot that is frozen and gangrenous from the cold is wrapped in buffalo feces. It is opened after 1-2 hours and washed. The newly made curd is wrapped in cloth (3 times). Each time the curd remains for 1 day.	E	12%
					Buffalo feces, warmed to body temperature or fresh, is applied to the aching chest.	E	72%
					Fresh buffalo feces is applied directly to fire and water burns.	A,E,I,K	92%
				Earwax	The earwax of a water buffalo is inserted into a person's ear to relieve earache.	I	52%
Mammals	*Meles meles* (Linnaeus, 1758)	Mustelidae	Porsuk	Fat	It is applied directly to the affected area to treat eczema.	A	50%
				Meat	It is eaten boiled against leprosy.	A	16%
					It is eaten boiled against hemorrhoids.	A,K	92%
					It is eaten boiled against rheumatism.	E	80%
Birds	*Anser anser* (Linnaeus, 1758)	Anseridae	Kaz	Fat	The tallow is lightly melted and drunk against bronchitis.	A	20%
					The tallow is applied directly to the area with rheumatism.	E	88%
Reptiles	*Squamata* sp.	Dibamidae	Yılan	Meat	For the treatment of a person who has erysipelas, a snake of any kind is caught. The part of it that is 1 hand span from its head is cut off and thrown away. If the remaining part is boiled and fed to the person, he will be cured of his illness.	K	96%
				Leather	The snake's shirt is ground into powder, mixed into flour and made into buns. It is fed to a person with hemorrhoids.	E	16%
					The snake skin (shirt) is placed in enough olive oil to cover it. It is left for a week. It is mixed until it reaches a paste consistency. It is applied to the hair loss area. It helps new hair to grow.	E,I,K	80%
					If snake skin (shirt) is eaten with bread, the warts will dry up and fall off.	I,K	52%
				Bone	An ointment is obtained by mixing barley flour and cow's milk with snake bones that have been reduced to ashes in a fire. This ointment is applied to the snakebite area.	E,A,K	96%
Mammals	*Erinaceus europaeus* Linnaeus, 1758	Erinaceidae	Kirpi	Meat	It is boiled and eaten against hemorrhoids.	A,E,I,K	92%
					It is boiled and eaten against rheumatism.	E	44%
					It is boiled and its meat is fed to a person to stop coughing.	I	12%
					It is boiled and eaten against leprosy.	A	88%
					It is boiled and eaten against eczema.	A,E,I,K	75%
					It is boiled and eaten against cirrhosis.	I	52%
					It is boiled and eaten against erysipelas as a wound healer.	I	72%
					It is boiled and fed to people who have nocturnal wetting and the boiled water is given to drink.	A,E,I,K	85%
					It is boiled and eaten against syphilis.	E	16%

				Leather	It is wrapped directly for headaches.	A	88%
					It is wrapped directly on the area that has eczema.	A	32%
				Urine	1-2 drops of urine are given to a person with earache. To obtain the urine, the hedgehog is kept in a basin.	I	85%
Mammals	*Lepus europaeus* Pallas, 1778	Leporidae	Tavşan	Feces	Feces are swallowed by people who have nighttime urination.	E,I	16%
				Fat	It is applied to the thorn-bitten part to ensure easy removal and the oil is wrapped to heal that area.	A,E	17%
					It is applied directly to the rheumaticm area.	E	12%
					It is dropped in a warm melted form into the aching ear.	A,E,I	44%
					It is applied directly to the burnt area.	A,E	60%
Mammals	*Sus scrofa* Linnaeus, 1758	Suidae	Domuz	Fat	It is wrapped on the hemorrhoidal nodes for 4-5 hours a day for 5 days in a row.	A,E,K	75%
Mammals	*Equus asinus* Linnaeus, 1758	Equidae	Eşek	Blood	It is applied directly to the burned area.	A	16%
					Donkey's blood is applied to the itchy areas of a person with scabies.	E	80%
					Donkey's blood is added to water and given to the patient without their knowledge for jaundice.	E	88%
				Milk	It is drunk cold and raw as a cough suppressant.	A,E,I	85%
					It is given to tuberculosis patients.	I	72%
					A person with jaundice is given 1 glass a day on an empty stomach. It is continued for 2-3 days.	I	56%
				Urine	In case of centipede bite, donkey urine is applied to the bitten area to remove the centipede from the body.	K	16%
Reptiles	*Testudo* sp.	Testudinidae	Kaplumbağa	Shell	The shell is ground. Fresh barley grains are boiled and filtered. The pulp obtained is mixed with shell powder. This mixture is good if applied to wounds.	I	12%
					Lemon juice is mixed with tortoise shell powder. This mixture is rubbed on fishskin disease like a scraper.	I	16%
				Meat	Turtle meat is applied raw against lumps in the breast.	I	60%
Mammals	*Canis familiaris* Linnaeus, 1758	Canidae	Köpek	Bone	For mouth sores; a piece of the dog's (regardless of color or gender) hind leg bone and pomegranate peel are roasted and turned into powder and applied to the mouth sores once a day.	A,E,I,K	42%
					It is dried, turned into powder and applied to the area with ringworm.	A	16%
				Saliva	To treat a dog's elbow (sty), dip your finger into the bowl the dog ate food from and apply a few drops to the stye.	A,E,I,K	80%
Mammals	*Canis lupus* Linnaeus, 1758	Canidae	Kurt	Bone	10-15 grams of bone pieces torn from the skull are ground into powder and mixed with 100 grams of filtered flower honey and fed to lung cancer patients on an empty stomach in the morning. This process is done 3-5 times.	A	88%
					Its bone is burned and the resulting ash powder is sifted and mixed with butter to form a paste used in rheumatism.	E	31%
Mammals	*Bos taurus* Linnaeus, 1758	Bovidae	İnek, Sığır	Meat	Fresh meat is wrapped around a leg that has swollen due to a sprain.	I	20%
				Leather	If there are bruises in many areas of the body, warm cowhide (freshly peeled) is wrapped around the naked body of the person. It is left for 12 hours.	A,E,I,K	28%
				Feces	A child with a diaper rash is made to sit on cold feces ashes or this ash is passed through cheesecloth and applied to the area where the diaper rash occurs.	A,E,I,K	60%
				Spleen	In folk belief (treatment of warts), it is used as a ritual object: The spleen is cut, the blessed barley grains are placed inside and the spleen is buried somewhere. When the spleen dries, the warts also dry up.	A,E,I,K	88%
					It is boiled or roasted and fed to children who wet their bed.	E	72%
				Mucus	The wrapped finger is inserted into the cow's nose and waited for (1-2 minutes). After 5 minutes, the same process is repeated a second time.	E	18%

				Milk	The cream of the milk is applied to the burns with something soft, such as a chicken wing.	A,E,I,K	98%
				Lung	Fresh bovine lungs are wrapped to cover the sprained area. It relieves swelling and pain.	I	16%
				Urine	It is used in the treatment of scabies. A person with scabies takes a bath with cow urine that has been rested for a day.	K	52%
Mammals	*Equus caballus* Linnaeus, 1758	Equidae	At	Cleansings	To relieve pain in children, the thin membrane from the placenta of a horse that has just given birth is wrapped around the baby's belly.	A	16%
					Hug the person with diarrhea directly.	A	12%
				Feces	Fresh feces of a horse that has eaten barley is squeezed and 1 drop of the juice is added for earache.	A,K	80%
					It is applied directly to cut wounds as a hemostatic.	A,E,I,K	88%
Reptiles	*Lacerta* sp.	Lacertidae	Kertenkele	Whole animal	To get rid of the inflammation, the exact cause of which is unknown, a small live lizard is thrown into the animal's mouth.	E	16%
Mammals	*Vulpes vulpes* (Linnaeus, 1758)	Canidae	Tilki	Meat	It is fed to patients suffering from rheumatism in boiled or fried form. This process is applied 1-2 times.	E	14%
				Fat	It is used directly as a pain reliever in humans.	I	16%
Fish	*Salmo trutta* Linnaeus, 1758	Salmonidae	Alabalık	Whole animal	It is used in the softening process of broken and reconnected bones that have healed incorrectly.	A,E,I,K	88%
					People with stomach ulcers swallow live ones that are 5-7 cm in size.	A,E,I,K	98%
					In the treatment of erysipelas disease in the arms and legs, 2-3 trouts are tied directly alive.	E	60%
					In the treatment of swelling seen on the arms and legs, called "yerdeki", 2-3 live trout are wrapped directly on the relevant area.	E,K,A	96%
					The cloth is wrapped directly on the area that has back pain.	A,E,I,K	94%
					It is directly wrapped for swelling in the arms and legs due to sprains. It relieves pain and swelling.	E,K,A	72%
					In women who cannot bear children, it is placed in the uterus in raw form and left until it melts.	E,K,A,I	94%
					It is boiled with milk. One spoonful is eaten twice a day on an empty stomach against tuberculosis.	K	16%
					A few trouts, 5-10 cm in size, are placed in a bottle filled with olive oil, lemon juice is added. After waiting for a month, it is fed to people with stomach problems.	E	16%
				Egg	Its eggs are dried and turned into powder. It is blown into the eyes of people with eye pain. This process is done once.	E	12%
Birds	*Passer domesticus* (Linnaeus, 1758)	Passeridae	Serçe	Feces	The feces is mixed with breast milk and fed to babies who are in pain.	A	16%
				Meat	Sparrows are caught and their feathers are sorted out. Their meat is boiled and eaten against hemorrhoids.	E	52%
Frogs	*Rana ridibunda* Pallas, 1771	Ranidae	Kurbağa	Whole animal	*Plantago* sp. leaf is tied to anthrax wounds in humans. A frog is tied to it. As the frog dies, it renews itself. The treatment is completed when 2-3 frogs die.	A	28%
					To relieve knee pain, a live frog is placed on the knee from morning until evening.	I	80%
				Blood	Frog blood is applied directly to warts on the hands and face.	I	16%
Birds	*Columba livia* J.F.Gmelin, 1789	Columbidae	Güvercin	Lung	Cooked pigeon liver is fed to patients with chronic asthma and shortness of breath.	E	18%
				Heart	Adults and children who are afflicted with the disease of fear are made to swallow a pigeon's heart.	E,K	52%
				Bone	As a wound healer, pigeon bone and onion are crushed and mixed. It is applied directly to the affected area.	E	46%
Reptiles	*Eryx jaculus* (Linnaeus, 1758)	Boidae	Mahmuzlu yılan	Spur	The left spur is ground and mixed with milk. A cup of the mixture is given to those with stomachaches. The pain goes away immediately, or the person vomits.	E	16%
Mammals	*Ursus arctos* Linnaeus, 1758	Ursidae	Ayı	Fat	It is applied to the rheumatic area by warming it slightly.	E	36%
					It is applied to the hemorrhoid area by heating it.	A,E,I,K	94%
					It is drunk hot against asthma and bronchitis.	E,K	12%
					It is eaten slightly heated in the treatment of syphilis.	E	44%
					It is applied directly to the body against scabies.	E,A	52%

				Meat	Bear meat is eaten for hemorrhoids.	A,E,K	76%
					It is boiled and fed to rheumatism patients.	E	60%
				Feces	Dry feces are applied to the area where hair loss is seen. The feces should be softened with hot water. This application is not necessary for fresh feces. This procedure should be applied to the relevant part of the head 2-3 times, staying for 2-3 hours. With this application, it is seen that the hair becomes thicker and hair grows in places where hair did not grow.	E	88%
Mammals	*Mus musculus* Linnaeus, 1758	Muridae	Fare	Whole animal	Newborn baby mice are placed in a bowl. Pure olive oil is added to it. It is left in front of a sunny window for 5-10 days. Then it is mixed. It is applied to cuts and wounds.	E,K	16%
Mammals	*Spalax* sp.	Spalacidae	Köstü, Kös, köstebek	Home soil	A mixture of raw mole soil and yoghurt is applied to the sprained area. It is tied and waited for 3-5 hours.	E,I	52%
					The nest soil is spread on a piece of cheesecloth and wrapped around the entire body of the person with scabies.	I	80%
					The nest soil and yogurt mixture is applied to the area where the bee sting is.	E	72%
					The nest soil is applied to the area with the wart twice, one day apart.	K	60%
				Meat	It is boiled and eaten in the treatment of syphilis.	E,K	28%

Note: E: Erzurum; A: Ardahan; I: Iğdır; K: Kars

Table 3. Animal species used for medical purposes in animal diseases

Category	Scientific name	Family	Turkish name	Used part	Usage	Locality	FL
Mammals	*Ovis aries* subsp. *aries*	Ovidae	Koyun	Feces	The incense is burned and given to the hive as a bee killer.	A,E,K	72%
					Fresh sheep feces are applied to the worm-infested area. The worms pass into this feces.	I	24%
				Bone	The ankle bone is burned and crushed into powder. One spoonful is fed to cattle with diarrhea.	A	36%
Birds	*Gallus gallus* f. *domesticus*	Gallidae	Tavuk	Egg	Powdered eggs are poured onto large or small cattle with swollen ears or throats.	E,A	50%
				Fat	The whole chicken is boiled, the resulting oil is applied to the animal's burns with chicken feathers.	A	32%
Mammals	*Capra aegagrus hircus*	Bovidae	Keçi	Hair	In the treatment of animals with broken legs or arms, if the mixture obtained by mixing egg white with goat hair is applied to the broken leg by placing it between a cloth, it is good for the fracture and accelerates the healing.	E	12%
					In the treatment of large head scabies, wool is soaked in salt water and applied to the body. After this process is done for a day, a bath is taken.	E,K	64%
				Fat	It is mixed with beeswax to form an ointment and applied to animal foot wounds and cracks.	E	48%
				Leather	A piece is cut from freshly peeled skin and tied to the eczema-affected area of the animal (cattle). It is left for 2-3 days.	E	28%
				Horn	Its horn is burned. Its ashes are applied to the skin of goats, shelducks, etc. for eczema.	E,K	52%
Mammals	*Bubalus bubalis*	Bovidae	Camış, Manda	Horn	It is ground into powder, mixed with butter and applied to injured animals.	E	30%
Reptiles	*Squamata* sp.	Dibamidae	Yılan	Bone	An ointment is obtained by mixing barley flour and cow's milk with snake bones that have been reduced to ashes in a fire. This ointment is applied to animals that have been bitten by snakes.	K	24%
Mammals	*Erinaceus europaeus*	Erinaceidae	Kirpi	Leather	It is applied directly to the skin of the animal with eczema.	A	18%
Mammals	*Lepus europaeus*	Leporidae	Tavşan	Feces	Rabbit feces is fed to chickens and turkeys to make them lay eggs.	K	18%
				Fat	It is applied to the burned area of the animal.	A,E,I	80%
Mammals	*Sus scrofa*	Suidae	Domuz	Fat	Pig fat is used to wrap animal cuts.	A,E,I,K	90%
Reptiles	*Testudo* sp.	Testudinidae	Kaplumbağa	Shell	The shell is ground. Fresh barley grains are boiled and filtered. The pulp obtained is mixed with shell powder. This mixture is good if applied to animal wounds.	A	12%
Mammals	*Canis familiaris*	Canidae	Köpek	Saliva	Against wolf bites, tail fat and felt are mixed and beaten, turned into a paste, and dog saliva is added. It is wrapped around the wounded area.	A,E,K	76%
Mammals	*Bos taurus*	Bovidae	İnek, Sığır	Meat	Fresh meat is wrapped around an animal whose leg has swollen due to a sprain.	I	8%
Mammals	*Equus caballus*	Equidae	At	Feces	Fresh feces is wrapped around an animal whose leg is swollen due to a sprain.	A,E,I,K	96%
Reptiles	*Lacerta* sp.	Lacertidae	Kertenkele	Whole animal	To get rid of the inflammation, the exact cause of which is unknown, a small live lizard is thrown into the animal's mouth.	E	6%
Mammals	*Vulpes vulpes*	Canidae	Tilki	Meat	It is fed to patients suffering from rheumatism in boiled or fried form. This process is applied 1-2 times.	E	56%
				Fat	It is used directly as a pain reliever in animals.	I	10%
Fish	*Salmo trutta*	Salmonidae	Alabalık	Whole animal	Horses that are running so hard they are about to burst and have difficulty breathing are fed two or three small trout.	A	46%

Note: E: Erzurum; A: Ardahan; I: Iğdır; K: Kars

Table 4. Plant species used for animal diseases or animal bites and other uses

Category	Scientific name	Family	Turkish name	Used part	Usage	Locality	FL
Spermatophyte	*Cichorium intybus* L.	Asteraceae	Çatlankuş	Aerial part	The aerial part is boiled in a pot. The cooled water is given to cattle suffering from foot and mouth disease.	E	64%
Spermatophyte	*Artemisia arborescens* L.	Asteraceae	Yavşanotu	Aerial part	The aerial part is hung in the house and used as a snake repellent.	I	12%
Spermatophyte	*Achillea millefolium* L.	Asteraceae	Sarıçiçek	Flower	The flowers of the plant are chewed while they are fresh, placed on the snakebitten area and this process is repeated several times.	A,E	32%
Spermatophyte	*Juglans regia* L.	Juglandaceae	Ceviz	Leaf	The leaves are put in a cauldron and boiled. Flour is added to the water and dough is made. The resulting dough is prepared in the shape of marbles and used as rat poison.	E	76%
				Peel	Fresh peel is ground into powder. They are thrown into water containing fish. This powder stuns the fish and causes them to float to the surface.	A,E,K	80%
Spermatophyte	*Corylus avellana* L.	Betulaceae	Yabani fındık	Fruit	It is mixed with yogurt and applied to the snakebite area.	A	8%
Spermatophyte	*Plantago major* L.	Plantaginaceae	Bağa yaprağı	Leaf	After the leaves are crushed, they are tied to the snakebite site.	I	48%
Spermatophyte	*Hyoscyamus niger* L.	Solanaceae	Deli batbat	Aerial part	The aerial part is hung around the neck of animals to protect them from evil eyes. This is called "Dardağan"	A,E,K	24%
Spermatophyte	*Verbascum* sp.	Scrophulariaceae	Sığırkuyruğu	Aerial part	The aerial part is crushed with stones and mixed into water. Fish that come to the surface of the water due to the stunning effect of the plant sap are caught.	K	24%

Note: E: Erzurum; A: Ardahan; I: Iğdır; K: Kars

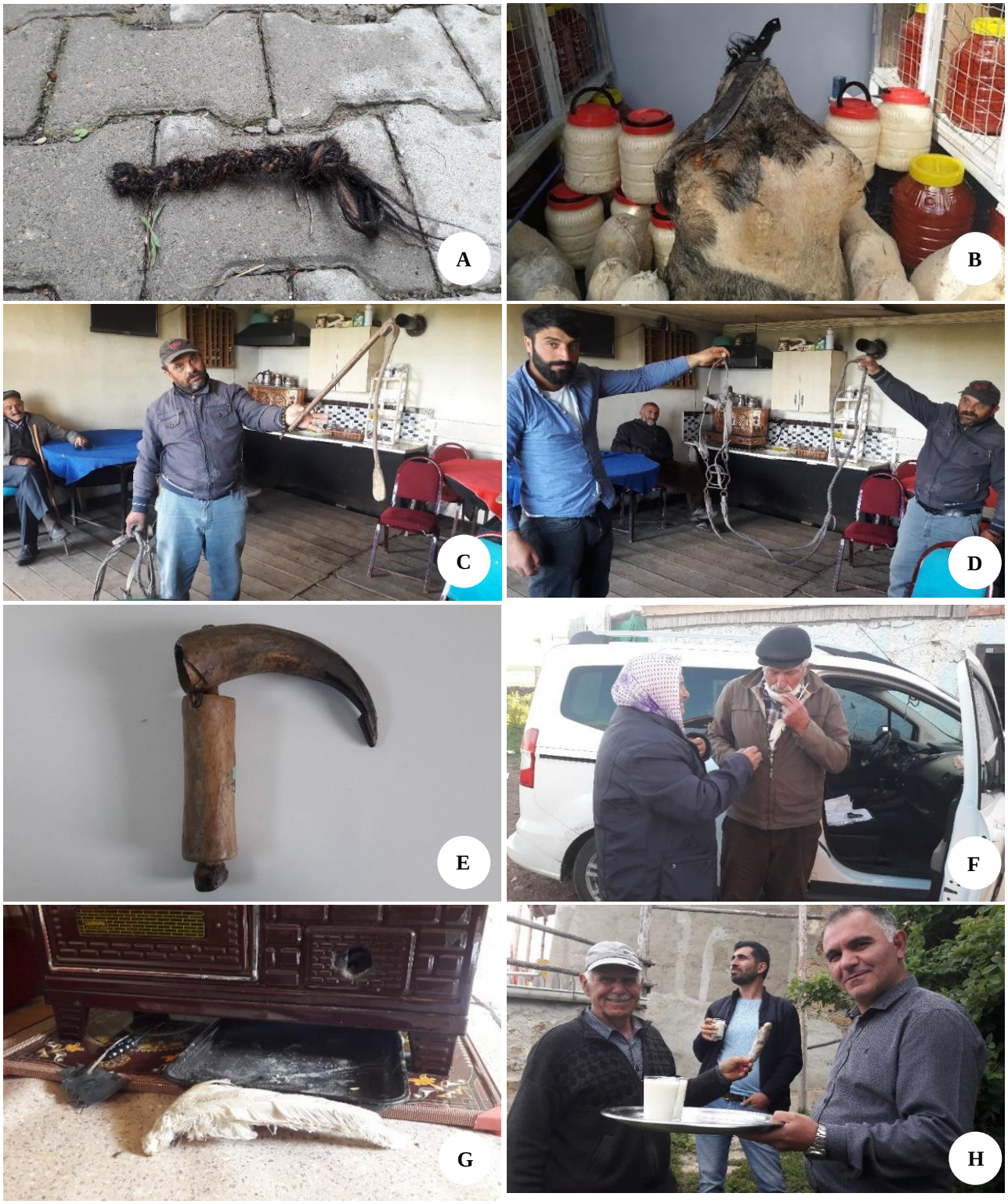
Table 5. Animal species used for different purposes in Erzurum (E), Ardahan (A), Iğdır (I), and Kars (K) in Turkey

Category	Scientific name	Family	Turkish name	Used part	Usage	Locality	FL
Mammals	*Ovis aries* subsp. *aries*	Ovidae	Koyun	Intestine	Arrow bows are made. Wool is beaten (whipped) with it.	A	64%
					It is cleaned. The first milk of the animal that gave birth and salt are added to it. It is dried in the sun and used as rennet (the same process can be done using the intestines of all large and small cattle.	A,E,I,K	48%
				Fat	It is used to lubricate snow shovels so that the snow does not stick to the shovel.	A,E	80%
					It is used as candle oil.	A,E,I,K	8%
					The fat extracted from the chest area of the sheep is used to easily ignite the fire.	I	48%
					Soap is made by adding melted oil from the above-ground parts of the *Erodium* sp. plant.	K	24%
				Leather	After the leather is made into a small bag, flour and water are put into it and after waiting for 1 week, it is used as dough yeast.	K	42%
					The musical instrument called "Def" is made.	A,E,I,K	12%
					Its leather is peeled, salted and dried. It is used as a prayer rug.	A,E,I,K	96%
					A bag-shaped toolbox is made. Tools used in construction are carried in this bag	A,E,I,K	90%
					It is used in the production of bags called tulum for the ripening and long-term storage of cheeses	A,E,I,K	12%
				Bone	Dice are made from ankle bones to play the game of "Aşık"	A,E,I,K	76%
				Tongue	The tongues, ears or eyes of animals slaughtered as offerings are dried and strung together with evil eye beads and hung in houses.	E	8%
				Horn	Hanged at the entrances of houses, garden walls, and barns as an amulet. The same applies to bear, horse, dog, and cattle skulls (F-4a,b,c).	A,E,I,K	96%
					Used in making knife handles	A,E,I,K	6%
Birds	*Gallus gallus* f. *domesticus*	Gallidae	Tavuk	Feces	It is dried, wrapped in cloth, and hung around the neck as an amulet.	A,E,I,K	56%
				Egg	To paint worn-out blackboards in schools, egg yolk, stovepipe soot and butter are mixed. Chicken feathers or rabbit legs are used as brushes to paint the board.	E,A	10%
				Feather	It is used as a brush to spread egg on pastries and cakes.	A,E,K	46%
				Bone	A piece of bone taken from the chest of a chicken or a rooster and resembling a moon is hung on the forehead and chest of large cattle or horses to protect against the evil eye and for ornamental and jewelry purposes.	E	28%
Mammals	*Capra aegagrus hircus*	Bovidae	Keçi	Hair	Incense is used around houses as a repellent against mice and snakes.	A,E,I,K	52%
					A human saddlebag made of hair is a material made in the form of a bag and used to carry items. It has a handle to hang on the shoulder or on the back of animals. Shepherds usually put their necessary items, especially food, inside when they go far away.	A,E,I,K	60%
					The hair is combed and turned into thread, and a rug called "çul" is woven. It is thrown over the animals to prevent them from getting wet. Again, since it is carrying a load, it is placed on the sweating animal after the load is lowered and it is placed on the sweaty animal.	A,E,I,K	52%
					It is made into a rope by bending, especially used to pull and drop baskets onto the tree during fruit picking.	A,E,I,K	18%
				Fat	It is melted in a pan, a "wick" is made from old cloths and used for lighting.	A,E,I,K	28%
					The soil called "Bora" is collected by sweeping. It is mixed with goat fat and boiled. It is put into molds while warm to make soap.	A,E,I,K	80%
				Leather	It is used in the production of bags called tulum for the ripening and long-term storage of cheeses.	A,E,I,K	64%
					Its leather is peeled, salted and dried. It is used as a prayer rug.	A,E,I,K	32%

				Crop	The animal's crop is washed, dried and mixed with grapes (dried) and lemon. The mouth is closed and left at room temperature for 1 month. The resulting mixture is used in cheese rennet.	A,E,I,K	6%
				Horn	It is used in making knife handles.	A,E,I,K	30%
Mammals	*Bubalus bubalis* (Linnaeus, 1758)	Bovidae	Camış, Manda	Leather	A horse whip is made by knitting	A,E,I,K	24%
					Horse halters are made by knitting	A,E,I,K	96%
				Horn	It is used in making combs. This comb is mostly used to clean nits and lice from the hair.	A,E,I,K	10%
					The grass bender called clamp (Leyden, Badok) is made from traditional agricultural tools.	A,E,I,K	12%
					The knife handle is made.	A,E,I,K	88%
					It is ground into powder, mixed with butter, and applied to the body as a cream as an emollient.	E	64%
Mammals	*Meles meles* (Linnaeus, 1758)	Mustelidae	Porsuk	Intestine	Arrow bows are made. Wool is beaten (whipped) with it.	A	48%
				Leather	It is cut into 4 cm wide pieces and hung around the necks of lambs as an amulet.	A	24%
Birds	*Anser anser* (Linnaeus, 1758)	Anseridae	Kaz	Hair	A musical instrument (whistle) is made.	A,K	48%
					It is used in pillow making.	A,E,I,K	
				Wing	Used as a household item (broom).	A,E,I,K	80%
Reptiles	*Squamata* sp.	Dibamidae	Yılan	Leather	Snake leather (shirt) is carried in a pocket or hung in the house to protect against the evil eye.	A,E,I,K	90%
				-	In order to catch a snake that has caused harm to humans or animals but has not been caught yet, yoghurt or milk is placed as a trap at the place where the snake was last seen.	A,E,I,K	12%
				Bone	It is carried as an amulet against the evil eye.	A,E,I,K	76%
					A rosary is made from the spine and hung around the neck of children to protect them from the evil eye.	I	8%
Mammals	*Erinaceus europaeus* Linnaeus, 1758	Erinaceidae	Kirpi	Leather	A muzzle is made for suckling calves to prevent them from suckling milk from their mothers.	A,E,I,K	96%
Mammals	*Lepus europaeus* Pallas, 1778	Leporidae	Tavşan	Foot	Used instead of a brush to spread egg on pastries.	A,E,I,K	6%
					Used to sweep dust from under the stove.	A	56%
					Used as a blackboard eraser in schools.	E	10%
					Hanged in the house or car as an ornament.	A	22%
				Tail	To prevent dust from entering the cleaned candlestick glass, the rabbit's tail is closed over the glass like a cork stopper.	E,K	10%
				Feces	It is applied to the eyebrow area to make eyebrows appear.	K	6%
				Fat	It is used to lubricate weapons.	A,E	28%
Birds	*Aquila chrysaetos* (Linnaeus, 1758)	Accipitridae	Kartal	Nail	Used as a necklace.	A,E,I,K	52%
					As an amulet, it is hung around the neck, car, house, or the neck or horn of an ox.	A,E,I,K	30%
Reptiles	*Testudo* sp.	Testudinidae	Kaplumbağa	Shell	It is used to make prayer beads.	A	24%
Mammals	*Canis familiaris* Linnaeus, 1758	Canidae	Köpek	Feces	It is dried and used as an amulet. It is carried in a pocket or hung in the house against the evil eye.	A,E,I,K	18%
					It is dried, wrapped in a cloth and worn on the right shoulder as an amulet.	A,E,I,K	18%
				Bone	Bone pieces found in dog feces are wrapped in cloth and hung from the neck or horns of animals such as horses and cattle towards the forehead to be used as an amulet.	A,E	28%
					It is thrown into a bowl of water and given to the person who has been hit by the evil eye to drink.	A,E,K	48%
Mammals	*Canis lupus* Linnaeus, 1758	Canidae	Kurt	Bone	The ankle bone is rubbed into the mouth of a calf that is not latching on to the udder.	A,E,I,K	60%
					The ankle bone is used as an amulet.	K	24%
				Tooth	It is hung around the neck as an amulet.	A,E,I,K	80%
				Feces	It is hung around the neck, in the house or in the barn as an amulet.	A,E,I,K	64%
				Genital organ	The female wolf's genital organ is hung around the neck or carried in a pocket as an amulet. It is also called a wolf's pucker.	A,E,I,K	86%

				Tail	It is hung on vehicles as an ornamental object.	A,E,I,K	16%
Mammals	*Bos taurus* Linnaeus, 1758	Bovidae	İnek, Sığır	Eye	The eyes of the sacrificed people are dried and carried in a pocket or hung in a house or barn to protect against the evil eye	A,E,I,K	52%
				Mamma	A sticky liquid comes out of the udders of a raw heifer that is 2-3 months away from giving birth for the first time. This liquid, called bulama, is used as an adhesive.	E,K	40%
				Hair	The hairs on the back are collected by rubbing with the hand, wetted and formed into a ball and a local game called "CİZİ TOPİ" = "Çizgi Topu" is played. Top is also called by the same name. It is a game played as a team by drawing a large circle in the middle.	E	18%
					The "Oynek" game is played with a toy made into a ball by heating the hairs taken from the back of a horse or a cow. The game is played by two teams of 4 people. A circle called a "threshing" is drawn in the middle. Everyone pretends to hide the ball in their bosom. One person tries to find the ball. It is a game similar to baseball.	E	6%
				Leather	The leather is cut to an equal width (10-20 cm), twisted and made into rope. It is used as a tow rope for animals to carry wood. This is called "Odun kayışı"	A,E,I,K	72%
					A large porous screening tool called a sieve is made to sift wheat and corn.	A,E,I,K	44%
					A wide strap called "horse trousers" or "horse trousers" is made. This strap prevents the saddle from slipping forward.	A,E,I,K	18%
					Used in the production of tinsmith bellows	A,E,I,K	16%
					It was used in the past for making sandals.	A,E,I,K	44%
				Bone	The scapula of the slaughtered animal is either buried or destroyed so that others cannot use it to perform magic or spells.	A,E,I,K	24%
				Crop	The crop of the animal is washed. White alum, powdered sugar and lemon juice are added to it. It is placed in a canister. This mixture is left to stand for 15-20 days. It is used as rennet. The same rennet can be made with a different recipe: şırdan (şirden, kırkbayır) is cleaned and placed in a casserole. Dried cranberries, gendime, salt are added to it and left in a warm place for 10-15 days.	A,E,I,K	28%
				Feces	It is dried in molds and called dung. It is used as fuel.	A,E,I,K	30%
					Incense is used as a mosquito repellent.	E	6%
					Incense is used as a bear repellent.	E	12%
				Gallbladder	The gallbladder water is drained. The remaining part is mixed with lemon salt, grapes and whey and left at room temperature for a week. It is used as rennet.	E	8%
				Horn	A chess set is made	K	42%
Mammals	*Equus caballus* Linnaeus, 1758	Equidae	At	Skull	Hanged inside barns to prevent the evil eye from hitting animals in particular. The same applies to skulls of bears, dogs, rams and cattle.	A,E,I,K	44%
				Feces	Dried ones are rolled and smoked instead of cigarettes.	A,E,I,K	56%
Mammals	*Vulpes vulpes* (Linnaeus, 1758)	Canidae	Tilki	Tail	It is hung in homes and vehicles as an ornamental object and to bring luck.	A,E,I,K	80%
					It is hung in barns as an amulet.	K	4%
				Pelt	It is hung in homes and vehicles as an ornamental object and to bring good luck.	A,E,I,K	50%
Frogs	*Rana ridibunda* Pallas, 1771	Ranidae	Kurbağa	Whole animal	A live frog is hung in a corner of the house or barn as an amulet.	A	32%
Birds	*Columba livia* J.F.Gmelin, 1789	Columbidae	Güvercin	Feces	Its fertilizer is applied as a supplement to plants, especially cabbage..	E	24%
Mammals	*Ursus arctos* Linnaeus, 1758	Ursidae	Ayı	Nail	It is hung around the necks of animals such as horses and oxen as an amulet.	E	44%
				Fat	The belt of the ox cart is greased with bear fat to make it soft. *The shovel used to clear snow is lubricated with bear fat to prevent snow from sticking.	A,E, *G	28%
Mammals	*Mus musculus* Linnaeus, 1758	Muridae	Fare	Whole animal	If mice gather together in the barn and make a piercing sound with their ears raised, this is a sign of an earthquake.	E	20%

Note: E: Erzurum; A: Ardahan; I: Iğdır; K: Kars



Figures 2. A. Rope made of goat hair; B. "Tulum" is made of goat skin for storing cheese; C. Horse whip made of buffalo leather; D. Horse halter made of buffalo leather; E. Traditional agricultural tools made from buffalo horn; F. Musical instrument (whistle) made from a goose feather; G. Goosewing used as a broom; H. A rabbit's foot is used as a brush to put eggs on pastries, a broom to sweep dust under the stove, or a blackboard eraser in schools

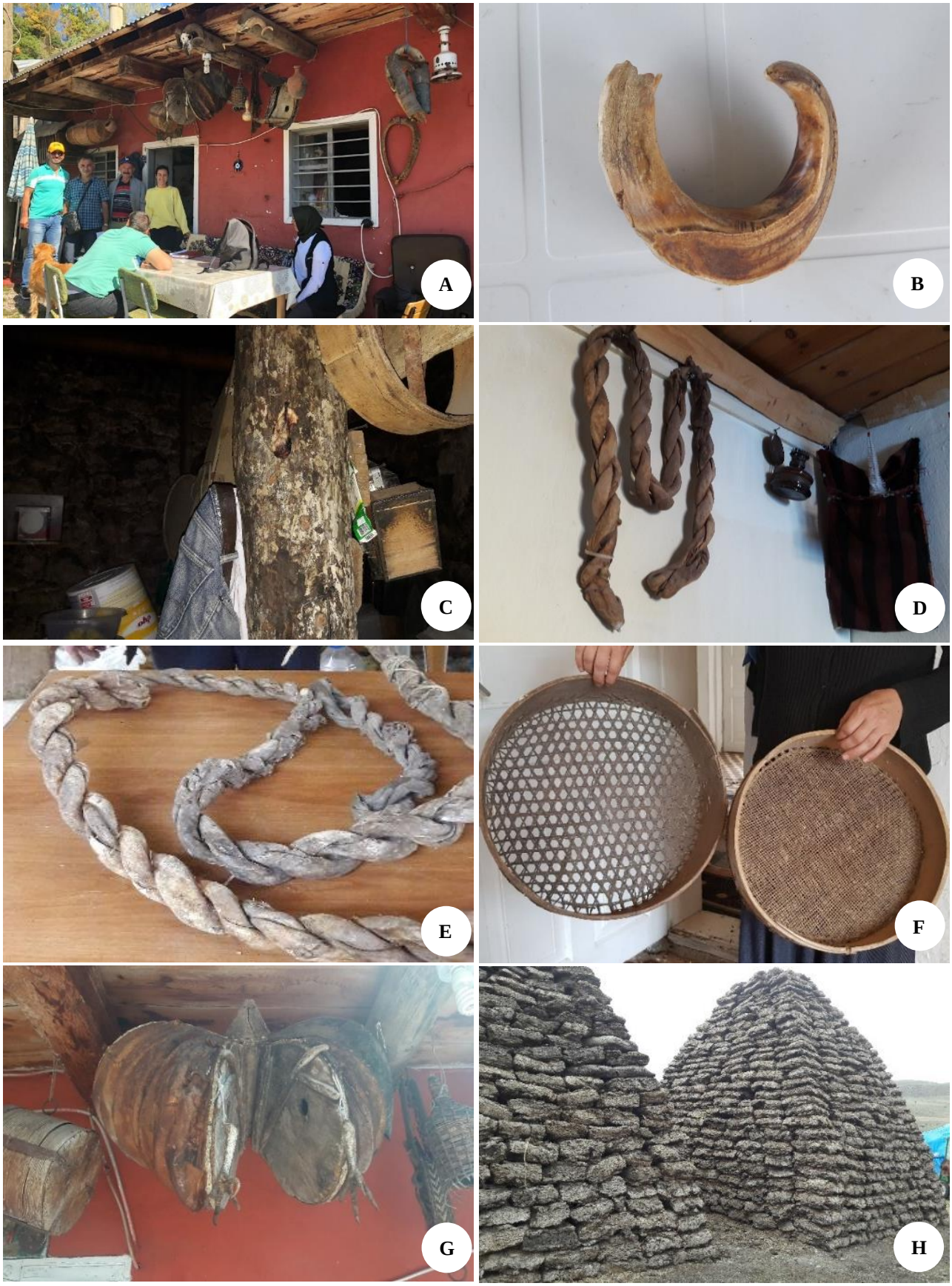


Figure 3. A. Eagle nail used as an amulet; B. Pig tooth used in the treatment of "Pig Nose" disease in cattle; C. The eye of the sacrificed cows hung in the barn to ward off the evil eye; D. "Wood belt" made from cow skin and used as a pulling rope for animals to carry wood; E. "Sifter" made of cow skin to sift wheat and corn; F. "Horse's breeches" or "Horse's trousers," which are made of cowhide and prevent the saddle from slipping forward; G. Tinsmith's Bellows are made of cowhide; H. "Dung," molded and dried cow dung for use as fuel

Discussion

Local ethnobiological knowledge is fundamental in empowering communities to sustainably manage, protect, and improve the stewardship of mangrove ecosystems (Nijamdeen et al. 2023). Ethnozoological studies in Türkiye remain limited. Notable works include research on trout (*S. trutta*) (Türker and Ergül 2022) and reviews emphasizing the need for further studies (Siddiq 2019). Yenmiş et al. (2019) highlight Anatolia's rich biodiversity and historical ethnozoological knowledge but note a scarcity of research on human-fauna interactions. Surprisingly, despite Anatolia's vast zoological diversity, its ethnozoological heritage remains underrepresented in the literature. Interestingly, the review by Yenmiş et al. (2019) does not cite a single ethnozoological study from Türkiye, whereas Siddiq (2019) presents numerous examples. This discrepancy raises concerns about the misalignment between the article's title and content and the scattered nature of ethnozoological research across various disciplines rather than dedicated ethnozoological journals. For instance, Ertürk and Şanlı (2017) provide a comprehensive ethnozoological study, but its publication in a different field limits visibility among ethnozoologists. Such fragmentation hinders recognition and accessibility, underscoring the need for more focused dissemination of ethnozoological research.

Mammals were the most frequently utilized group in the study area, a trend that can be attributed to the region's predominantly mountainous and moorland geography. These habitats provide an ideal environment for a wide range of mammalian species, making them more accessible to local communities. Mammals are not only valued for their availability but also for the multifunctionality of their parts, which are used across diverse domains of cultural expression, including healing practices. Rather than drawing a strict line between medicinal and cultural uses, this study recognizes traditional medicine as an integral component of local cultural systems. The frequent reliance on mammalian species underscores the central role of biodiversity in shaping and sustaining culturally embedded medical knowledge and practice. The use of fish in traditional medicine aligns with regional ethnobiological practices that reflect the specific therapeutic roles of local fauna. For instance, in various cultural contexts, species such as *G. gallus* f. *domesticus* on Jeju Island, Korea, have been employed to relieve earaches, demonstrating how diverse animals, including fish and birds, contribute to traditional healthcare systems.

In various regions across Asia and Africa, traditional medicinal practices have incorporated a diverse range of animal species for the treatment of both external and internal ailments. For instance, in the Mount Abu Wildlife Sanctuary in India, *B. taurus* has been traditionally used for wound healing, emphasizing its role in addressing external injuries. Amphibians, such as species from the *Rana* genus, have been employed in the Silent Valley Region of Kerala for managing skin conditions, illustrating their significance in local healing traditions. In Ethiopia, members of the *Equus* genus have been reported in the treatment of respiratory ailments in both the Kafta-Humera District (Northern Ethiopia) and Metema Woreda (Northwestern Ethiopia), highlighting their importance in treating internal disorders. Likewise, *C. aegagrus* has been utilized in Metema Woreda for wound care, reflecting its continued ethnoveterinary relevance in rural Ethiopian communities (Jaroli et al. 2010; Yirga et al. 2011; Kim and Song 2013; Vijayakumar et al. 2015; Kendie et al. 2018). A study conducted in western Granada (Andalusia, Spain) documents the traditional medicinal use of animals and animal products, examining species used, administration methods, treated ailments, and cultural significance, including magico-religious practices. Data were collected through semi-structured interviews with 42 participants across 16 municipalities, and a use-value index was applied to identify key species. The findings reveal 26 animal species used for treating 26 ailments across 10 pathological groups, contributing to 7% of the total medicinal resources, including both plants and animals. While some practices are referenced in classical and anthropological literature, most remain unpublished (Benítez 2011).

An ethnozoological study conducted in the Attappady Hills of the Western Ghats, located in the Palakkad District of India, investigated the traditional zoological knowledge of the Irula, Kurumba, and Muduga tribal communities. Data were gathered through direct interviews with local healers, and species identification was performed using indigenous names alongside references from previous ethnozoological literature and biodiversity databases, including those of the Silent Valley National Park. Limited biodiversity documentation in the area posed challenges to accurate species classification. Among the findings, ailments related to the musculoskeletal system exhibited the highest Informant Consensus Factor (ICF), while *Varanus bengalensis* (Daudin, 1802) and *Rusa unicolor* (Kerr, 1792) recorded the highest Fidelity Level (FL). The Index of Agreement on Remedies (IAR) was notably high for seven species (Rajmohan et al. 2017).

Similarly, in Southeast Anatolia, a region with a deep-rooted history of pastoralism dating back to the Neolithic period, knowledge of contemporary human-animal relationships remains limited. A recent ethnographic investigation conducted in the Ömerli District explored the intricate interactions between pastoral communities and domestic or wild animal species. The study uncovered deep emotional attachments between shepherds and specific animals, often resembling the human-animal bonds seen in urban pet ownership. Shepherds frequently assigned personal names to these animals, occasionally naming them after friends or family members. The emotional significance of these animals was further underscored by the grief experienced upon their loss or sale. Additionally, the research documented the multifunctional use of certain species, such as tortoises and hares, not only as food sources but also as providers of medicinal materials, including bone, blood, skin, and shell, all of which were incorporated into traditional healing practices (Siddiq and Şanlı 2020).

The black-boned sheep, selectively bred by the Pumi community in Northwest Yunnan, China, represent a significant genetic resource with both cultural heritage value and economic relevance. This study documents

traditional knowledge related to their breeding, forage use, and conservation strategies. Field surveys conducted between 2019 and 2021 in seven villages identified 91 forage plant species, with *Prinsepia utilis* Royle, *Rubus* L., *Berberis* L., and Yushania being the most utilized. Seasonal shortages are managed with cultivated crops. The findings highlight the deep cultural connection between the Pumi people and black-boned sheep. Conservation efforts should incorporate local knowledge, as traditional practices are crucial for their sustainable management (Fan et al. 2022).

A recent study documents 16 ingredients used in preparing hare and their health benefits. The dish combines plant materials with animal products like buffalo milk, honey, and chicken eggs. Traditionally, a young pregnant woman leads the preparation, sharing it with neighbors as a symbol of joy. However, the tradition is declining due to modernization. To preserve its cultural significance, the local government promotes hare as a traditional Batak dish, symbolizing the cosmological worldview of the Parmalim community. Future studies may focus on analyzing its nutritional profile in greater detail (Adinugraha 2024). Recently, an ethnomedical investigation reported the use of both plant and animal species in the treatment of rheumatic conditions across the provinces of Ardahan, Iğdır, and Kars. Interviews with 329 individuals revealed 15 plant species and 9 animals commonly used for treatment. *Urtica dioica* L. was the most frequently cited plant, with others from the Asteraceae and Rosaceae families also noted. Species such as *Ursus arctos* Linnaeus, 1758, *Anser anser* f. *domesticus*, and *E. europaeus* were among the animals reported to have medicinal uses. These findings emphasize the critical role of safeguarding traditional knowledge systems in the studied regions (Karakaya et al. 2024). Similarly, an ethnobotanical study conducted among the Naxi people of Southwest China examined the traditional medicinal plants and fungi documented in the Dongba Sutras, a historical source of cultural and medical wisdom. The study identified 85 species belonging to 51 botanical families, 25 of which are endemic to China.

These plants are mainly wild-collected, with some also used as food. The most common method of preparation is oral decoction, and they are primarily used for treating digestive, respiratory, musculoskeletal, and general conditions. The study highlights the localized therapeutic knowledge of the Naxi people regarding medicinal plants and fungi specific to Southwest China, emphasizing the importance of preserving this regionally rooted traditional knowledge within its ecological and cultural context (Li et al. 2021). Although not directly related to medicinal or therapeutic animal use, studies such as the one exploring the ecological and cultural dimensions of the kemençe in Turkey's Eastern Black Sea Region offer a complementary perspective. They illustrate how traditional knowledge systems, including material selection and environmental awareness, shape biocultural relationships-insights that are also reflected in local ethnozoological practices across Eastern Anatolia (Aslan and Karahasanoğlu 2021). In Swat, Pakistan, an ethnomycological investigation revealed the extensive traditional knowledge of local communities regarding wild mushrooms. Interviews with 62 participants documented the use of 34 mushroom species, primarily from the Basidiomycetes class, for both nutritional and medicinal purposes. Key species included *Morchella angusticeps* Peck, *Pleurotus* spp., and *Ganoderma lucidum* (Curtis) P.Karst., underscoring the region's potential for socio-economic growth through the domestication and commercialization of wild fungi (Hussain et al. 2023). Similarly, in Surakarta City, Central Java, an ethnobotanical study explored the Javanese ritual of *tumpeng*, highlighting the symbolic use of 19 plant and 3 animal species, such as coconut, spinach, chicken, and milkfish. Based on interviews with 60 residents, the study revealed that each ingredient conveys specific cultural meanings-chicken symbolizes gratitude, while the cone-shaped rice mound represents aspirations for prosperity and progress (Septhia et al. 2024).

In India's Northwestern Ghats, a pilot ethnzoological study captured the traditional knowledge of local healers, identifying 37 animal species used to treat 59 ailments, with mammals comprising the largest proportion (33%). Notably, the oral application of the Maharashtra zipper loach (*Paracanthocobitis mooreh*) for treating excessive salivation was reported as a novel ethnomedical use in the region (Zope et al. 2025). In another pilot study from Ethiopia, the medicinal use of animals among the Awi, Gamo, and Konta communities was examined. Data from 90 informants and 37 focus groups documented 20 animal species employed to treat 23 different human ailments. Mammals were the most commonly utilized group, and body parts such as meat, skin, and blood were frequently used. The findings not only highlight the depth of ethnozoological knowledge within these communities but also stress the need for further investigation into traditional practices and the development of conservation measures for medicinal fauna (Biru et al. 2022).

In traditional practices documented in the Assosa District of Benishangul-Gumuz, Western Ethiopia, various animals were employed to treat livestock ailments. For instance, *Hippopotamus amphibius* Linnaeus, 1758 and *Lepus fagani* Thomas, 1903 were used in remedies for donkey illnesses, while *G. gallus* was utilized to address diseases affecting both cows and donkeys. Additionally, *Iguana iguana* (Linnaeus, 1758) played a role in treating cattle wounds, highlighting the diverse application of animal resources in veterinary care (Kumera et al. 2022). Similarly, our study found that *G. gallus* was used for comparable purposes, particularly in treating diseases in cows, underscoring the widespread reliance on traditional knowledge for managing livestock health across different regions.

This study highlights the most commonly utilized plant families, parts, and preparation techniques in ethnoveterinary practices across Eastern Turkey. The frequent citation of species from the Fabaceae and Asteraceae families is particularly noteworthy, as it mirrors findings from comparable ethnoveterinary research conducted in Ethiopia and Mongolia, where these taxa were also extensively employed in animal healthcare (Makkar et al. 2009; Offiah et al. 2011). The predominance of leaf-based remedies is

indicative of both the high pharmacological potential of foliage and its sustainability, as harvesting leaves generally does not harm the plant. Although Turkey lacks a unified, nationwide ethnoveterinary inventory, earlier localized investigations (Tabata et al. 1994; Yeşilada et al. 1995; Sezik et al. 2001) affirm the persistent use of native plants in traditional animal treatments, pointing to a strong continuity of cultural knowledge and practical utility.

In addition to medicinal plant use, the region also retains important agricultural traditions, such as the use of the handmade farming implement known as "Elçek." Commonly employed in Ardahan, Erzurum, Bingöl, Bayburt, and Gümüşhane, this tool is constructed using three basic components readily available in livestock-rearing communities: an animal horn, a wooden handle, and a shaft. It plays a vital role in crafting "Kem" ropes by twisting grasses such as *Cil* into durable and flexible cords. Despite the labor-intensive nature of this practice, it remains an effective and respected method. However, the increasing availability of synthetic alternatives poses a threat to its continued use, emphasizing the importance of safeguarding such traditional techniques for the sake of agricultural sustainability and cultural preservation (İncekara et al. 2024).

Consistent with ethnobiological research conducted among the Nyishi and Galo communities of northeastern India, the present study confirms that mammals constitute the most frequently used vertebrate group in traditional medicinal practices. However, a notable distinction lies in the conservation implications: while the Indian studies report frequent use of endangered and wild fauna, the species employed in Eastern Anatolia are predominantly domestic and locally accessible, thereby presenting a lower risk to biodiversity (Chakravorty et al. 2011). Similar patterns have been observed among the Tangsa and Wancho communities, where both mammals and birds are commonly used in zootherapeutic remedies. However, unlike those studies, which encompass a broader spectrum of animal taxa including invertebrates such as insects and mollusks, this research focuses exclusively on vertebrate species (Jugli et al. 2020a).

Beyond therapeutic uses, Jugli et al. (2020b) also reported that animals in Eastern Arunachal Pradesh hold symbolic and ritual significance, featuring prominently in cultural festivals, adornments, and oral traditions. These findings underscore the importance of cultural narratives in shaping species selection and highlight the need to balance tradition with conservation efforts. Supporting this view, a study in Arba Minch Zuriya, Ethiopia, identified 20 medicinal animal species—including birds, reptiles, fish, and insects-used in 30 different remedies, with skin-related ailments being the most frequently addressed. Among these, members of the Bovidae family were the most commonly used, and bile was reported as the most frequently applied animal-derived material (Kebebew et al. 2021). Similarly, research from Southern Ethiopia documented 24 medicinal species, primarily wild mammals used in traditional healing, with cattle being the most frequently cited. Products such as honey, milk, and raw meat were commonly used in treatments (Mengistu et al. 2024). Collectively, these findings emphasize the regional specificity and cultural dimensions of zootherapeutic knowledge systems, while also reinforcing the need for integrative approaches to biodiversity protection and traditional medicine documentation.

Although Turkey possesses a rich tradition of ethnoveterinary knowledge, much of the documented literature emphasizes plant-based remedies. By comparison, our research is distinctly centered on vertebrate use in ethnoveterinary applications. While works such as Erarslan and Kültür (2019) provide valuable insight into herbal treatments, comprehensive studies centered exclusively on animal-based remedies remain limited. Our findings help address this gap by documenting culturally significant vertebrate species and their therapeutic roles, contributing to a more holistic understanding of traditional veterinary practices in Turkey. This study underscores the richness of ethnobiological knowledge embedded within the traditional practices of communities in Eastern Anatolia, particularly in their use of vertebrate species for medicinal, cultural, and spiritual purposes. The research aimed to document and interpret how animal-derived materials contribute to healthcare and socio-cultural continuity, and the findings strongly affirm this objective.

A total of 30 medicinal animal species and 8 medicinal plant species were recorded, with 135 human-related applications and 24 veterinary uses, reflecting a well-integrated system of knowledge where biodiversity and healthcare are deeply intertwined. Notably, species such as *B. taurus* and *S. trutta* demonstrated high fidelity levels (96%), indicating consistent use across respondents and strong cultural consensus on their efficacy in treating burns and stomach ulcers, respectively. These results support the hypothesis that a limited group of species is relied upon for specific therapeutic outcomes, reinforcing their perceived effectiveness and cultural embeddedness. In addition to healthcare, animal-derived materials were employed in spiritual practices, protective amulets, and artisanal expressions. The use of *Equus* genus tail hair for crafting musical instruments, observed both in this study and among the Garasiya people of Rajasthan (Jaroli et al. 2010), exemplifies the innovative and multifunctional application of biological resources, extending traditional medicine into broader realms of cultural practice. While the findings offer valuable insights, certain limitations must be acknowledged. Furthermore, due to the informal transmission of traditional knowledge, some practices may be underreported or at risk of being lost, particularly among younger generations. The lack of pharmacological validation of the claimed therapeutic effects also presents a limitation, which could be addressed in future interdisciplinary studies.

Therefore, future research should focus on (i) the pharmacological screening of high-fidelity species to verify therapeutic claims; (ii) exploring the ecological impact of harvesting animal-based remedies; and (iii) integrating ethnobiological knowledge into biodiversity conservation policies. Additionally, studies should further investigate the transmission dynamics of traditional knowledge, especially in rapidly modernizing communities, to support cultural

preservation initiatives. In conclusion, this study not only documents valuable traditional practices but also reveals the intricate relationship between cultural heritage, biodiversity, and health. It advocates for the inclusion of indigenous knowledge in sustainable development and health research frameworks, positioning ethnobiology as a crucial bridge between local wisdom and global challenges.

This study sheds light on the deeply rooted ethnozoological knowledge in the mountainous and moorland regions of Eastern Turkey, particularly within the provinces of Erzurum, Ardahan, Iğdır, and Kars. The findings reveal that vertebrate-based remedies continue to hold a significant place in local healthcare traditions, closely intertwined with cultural and utilitarian practices. Notably, the inclusion of plant-based treatments for animal ailments emphasizes the holistic nature of traditional medicine, where the boundaries between the animal and plant kingdoms are fluid and interconnected. This inseparability highlights a worldview in which healing is not limited to a single kingdom but rather arises from a dynamic interplay of biocultural relationships. Future research and conservation strategies should, therefore, consider this integrated perspective, supporting both biodiversity and the rich tapestry of traditional knowledge that sustains it.

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