

Knowledge and perception of wild animal diversity by the local community in Mount Merbabu, Central Java, Indonesia

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Department of Environmental Sciences, Faculty of Mathematics and Natural Sciences, Sebelas Maret University. Jl. Ir. Sutami 36A Surakarta 57126, Central Java, Indonesia. Tel./fax.: +62-271-663375, *email: volatileoils@gmail.com

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Abstract. *Khawarizmi IA, Sari IP, Riswari IA, Sani MF, Izdihar RS, Indrawan M, Setyawan AD. 2024. Knowledge and perception of wild animal diversity by the local community in Mount Merbabu, Central Java, Indonesia. Asian J For 8: 98-105.* Local people view wild animals based on their ecological, social, and economic advantages or disadvantages. The interactions and conflicts between humans and wildlife can be identified from the knowledge and perception of wildlife by the local community, which can be used to inform conservation strategies. Biodiversity on Mount Merbabu, Central Java Province, Indonesia, plays an important role in maintaining ecosystem balance, but people still have little understanding of wildlife. This study aims to document the knowledge and perception of wild animal diversity by the local community living on the eastern slopes of Mount Merbabu to increase community awareness and conservation potential. The research was conducted in three villages on the slopes, administratively located in Ampel Sub-district, Boyolali District, Central Java Province, Indonesia, i.e., Ngagrong, Candisari, and Ngargoloka, using a combination of interviews, observation and questionnaire techniques. The results show that the demographic characteristics of the respondents mostly have a limited level of education, where 60% of respondents are elementary school graduates, with the most occupation being farmers (80%). The respondents mentioned 42 species of wild mammals (14 sp.), aves (24 sp.) and herpetofauna (4 sp.). The respondents perceive wild animals based on ecological, social, and economic aspects. Some species are perceived to have positive impacts (benefits), while others are perceived negatively (disadvantages), resulting in conflicts between humans and wild animals. Ecologically, some species are useful for pest control and seed dispersal. Some species play a social role as signs of the season and traditional beliefs. Economically, some species are commercial goods and traditional medicine. There is conflict between the respondents and monkeys (Javan fuscous langur (*Presbytis comata* subsp. *fredericae*) and Long-tailed macaque (*Macaca fascicularis*), which often invades agricultural land in the dry season. Meanwhile, attempts to catch wild animals were prevented by National Park officers, causing disappointment among some respondents. People knowledge about the ecological, social and economic role of wildlife needs to be increased. Collaboration between the government, educational institutions, and conservation organizations is needed to increase public understanding of wildlife diversity and encourage active participation in nature conservation endeavors.

Keywords: Animal, community knowledge, conservation, eastern slope of Mount Merbabu, wildlife

INTRODUCTION

Indonesia is known for its rich biological diversity, both for flora and fauna. The high biodiversity in Indonesia is related to variations in geography and climate (Fikriyanti et al. 2018), as well as various types and large extent of tropical forests. These forests are important repositories of biological diversity because they contain more than 25,000 species of flowering plants and 400,000 terrestrial animals (Nugroho 2017). According to Arini et al. (2018), the rich diversity of flora and fauna in Indonesia is a potential capital for national development. Therefore, it is important to be documented and studied. This potential might also be useful for future generations. Protecting and preserving biodiversity is one of the most important steps to be taken to mitigate the environmental impacts that might lead to biodiversity decline and extinction (Zamzami et al. 2020).

Wild animals are fauna that still have wild characteristics and live freely in nature. Wildlife is an irreplaceable part of the earth's natural system that must be

protected for present and future generations (Rajagukguk 2014). In the context of the utilization of wild animals, there is a need to balance between their existing population and exploitation in the natural habitat (Hanim et al. 2020). In Indonesia, the utilization of wild animals is regulated through Government Regulation Number 8 of 1999 concerning the Use of Wild Plant and Animal Species. This law regulates the procedures for utilizing protected species for certain activities with conditions and requirements permitted by the Ministry of Environment and Forestry.

The unavoidable interactions between humans and wildlife can lead to human-wildlife conflict with negative consequences for both parties (Sugianto et al. 2023). This happens because many humans lack knowledge and awareness about wildlife and its role in maintaining the balance and sustainability of the ecosystem (Handziko et al. 2021). Conservation ignorance can lead to wildlife extinction (Selni et al. 2021). Therefore, the perception and attitude of a local community toward wildlife are important for conservation, especially in the context of protected area

management (Rumimpunu 2020). This situation is well-presented on the eastern slope of Mount Merbabu National Park.

Mount Merbabu National Park (MMbNP) is a national park located in Central Java Province, Indonesia. This park was established on May 6, 2014, through the Decree of the Minister of Forestry Number SK.3623/Menhut-VII/KUH/2014. The park has an extent of 5.820,49 hectares with altitudes ranging from ± 600 to 3.142 m above sea level. The national park has various fauna species including Javan fuscous langur (*Presbytis comata* subsp. *fredericae* (Sody, 1930), Javan lutung (*Trachypithecus auratus* (É.Geoffroy Saint-Hilaire, 1812), Long-tailed macaque (*Macaca fascicularis* (Raffles, 1821), and other wild animals (Gunawati 2017). Mount Merbabu, where MMbNP is situated, is threatened by several factors, but fires are the most imminent threat due to the drought, which also impacted the surrounding community and wildlife (Putranto et al. 2020). For example, a forest fire occurred in Mount Merbabu in 2023, burning more than 400 hectares of land. This disaster can directly impact wildlife, including the death of several animals, and also indirect impacts, including the destruction of wildlife habitat and decreased food availability (Hidayat et al. 2016).

The community living around a conservation area might serve as the buffer and protector of biological natural resources (Rusiani 2018). However, many people still do not care about wildlife and ecosystem conservation due to a lack of understanding and knowledge (Sabrina et al. 2023). Therefore, this research was performed to document local people's knowledge of wild animals in the eastern slope area of Mount Merbabu National Park. The data resulting from this study might contribute to enriching the information on wildlife species, including habitat conditions, population levels, and distribution in the MMbNP area. This study might help the management of MMbNP since they are constrained by the limited quality

and quantity of human resources managing Mount Merbabu National Park.

MATERIALS AND METHODS

Study area and period

Administratively, MMbNP encompasses three districts in Central Java Province, Indonesia, namely Boyolali, Magelang and Semarang. Geographically, Mount Merbabu National Park is located between 110°26'22" E and 7°27'13" S. This research was conducted on the eastern slope of Mount Merbabu at the border area of the Mount Merbabu National Park from October to November 2023. Data collection was performed in 3 villages in Ampel Sub-district, Boyolali District, namely Ngagrong (7°27'28.5"S, 110°29'42.0"E), Candisari (7°27'26.6"S, 110°29'47.1"E), and Ngargoloka (7°26'39.3"S, 110°29'38.8"E) (Figure 1). The study sites are all located around 1,000 masl altitude with a temperature of 24–30°C. Most of the people in the studied area work in farming and animal husbandry and use the land resources for their daily needs. Therefore, they are very concerned about the sustainability of the natural environment.

Data collection

This research used a combination of qualitative and quantitative methods. The qualitative method was performed through interviews and observations. Interviews were conducted with people living in the study location. The respondents were determined by snowball sampling to identify key figures until the data was balanced or saturated (Putri et al. 2017). The snowball method was used in this research with the rationale that informants are known and can provide information according to research needs. Thus, if the information on research needs has been obtained, the information collection is complete (Damaywanti 2013).

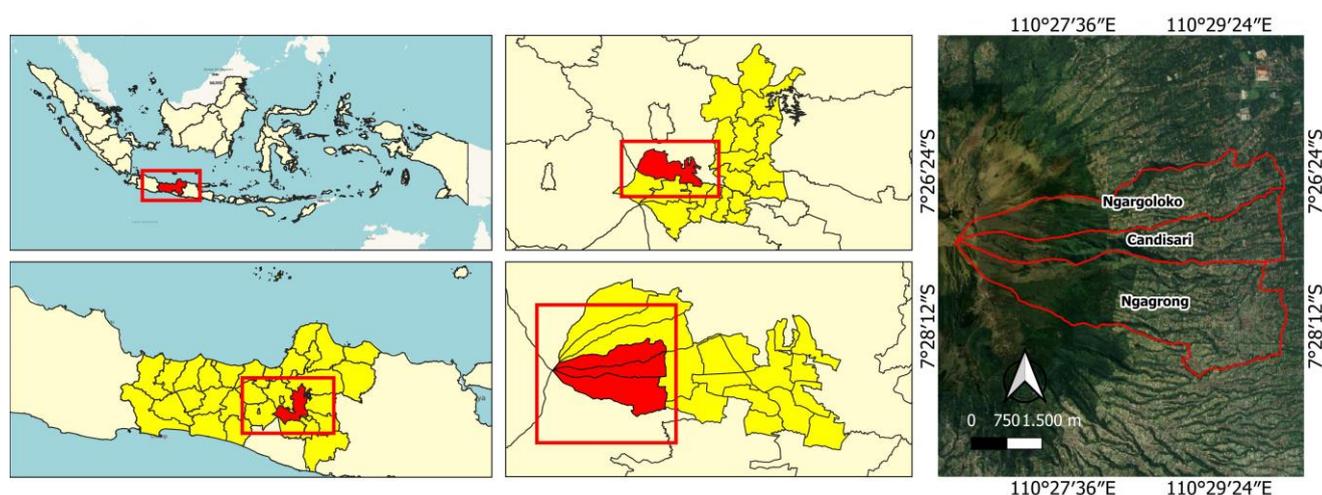


Figure 1. Map of the study area in Ngagrong, Candisari and Ngargoloka Villages, Ampel Sub-district, Boyolali District, Central Java Province, Indonesia

The interviews were done with 65 informants consisting of 30 male and 35 female. The informants included the village head, village officials, farmers, breeders, traders, and factory workers. While conducting interviews, observations were also carried out by directly observing the diversity of wildlife in each village. The quantitative method was conducted by administering questionnaires to 65 respondents. The respondents were selected using a simple random regardless of their strata in society. In this technique, every member of the population has the same opportunity to be selected as a study subject (Firmansyah and Dede 2022).

Data analysis

The data collected was then analyzed and validated using existing literature. Animals were identified by matching their vernacular name with common names. After that, the scientific name was added by matching their name and morphology based on reliable references, such as iNaturalist (<https://www.inaturalist.org>) and GBIF (<https://www.gbif.org>). The ecological, social, and economic functions were described based on knowledge and perspective from the local community. Meanwhile, the collected quantitative data is analyzed by calculating the percentage to explain the data descriptively (Newing et al. 2010).

RESULTS AND DISCUSSION

Biodiversity on the eastern slope of Mount Merbabu plays an important role in maintaining the balance of the ecosystem. However, there are significant challenges related to community knowledge of wildlife diversity. Therefore, the community knowledge on wildlife diversity was collected from 65 respondents in Nganggrong, Candisari and Ngaragoka Villages, with demographic data presented in Table 1.

There were 30 male and 35 female informants, most of whom were aged 26-35 years old (24.6%). Respondents had various occupations, but most of them were farmers (80%), 13.8% laborers, 4.6% merchants, and 1.5% civil servants. According to Makabori and Tapi (2019), occupation shows a strong connection with the agricultural sector in each village. The lower percentage of non-farming professions, such as traders, entrepreneurs, teachers, or civil servants, shows economic activities that focus more on the agricultural sector. The result of this study indicates that most people in these villages are strongly linked to agriculture, which may not always have an adequate understanding of wildlife diversity.

Sixty percent of the respondents had an elementary school education, 9.2% had a high school education, 27.7% had a senior high school education, and 3.1% had a university education. This diversity shows the complexity of the community's understanding of environmental issues. Therefore, there is a need for extension and education strategies tailored to the demographic characteristics of each village, emphasizing the participation of underrepresented groups and lower levels of education (Managanta et al. 2018). Secondary and higher education levels were only represented by a few respondents, creating an imbalance in the distribution of potential knowledge on wildlife diversity in the community (Garekae et al. 2017).

Geographical factors, lack of education, and limited access to information may be the main causes of this lack of awareness of the importance of maintaining biodiversity (Abdullah et al. 2022). Improving the local community's understanding of wildlife can increase appreciation of the natural environment and encourage more effective preservation and conservation efforts in the Merbabu area (Muchrodji et al. 2017). Collaboration between the government, educational institutions, and conservation organizations is needed to provide educational and information programs to increase public awareness of wildlife diversity and encourage active participation in nature conservation efforts (Afriza et al. 2018).

Wildlife diversity of fauna

Table 2 provides a comprehensive overview of the wildlife diversity of fauna in Ngagrong, Candisari and Ngargoloka Villages, highlighting the wide variety of species inhabiting this region. There were 42 fauna species documented across different categories, including mammals, birds, and herpetofauna. There were 14 species of wild mammals from 10 families, namely Cercopithecidae, Cervidae, Felidae, Hystricidae, Manidae, Muridae, Sciuridae, Tupaiidae, Vespertilionidae, and Viverridae. The family with the most species was the Cercopithecidae which consisted of monkeys such as Long-tailed macaque (*M. fascicularis*), Javan surili (*P. c. ssp. comata*), Javan fuscous langur (*P. c. ssp. fredericae*), and Javan Lutung (*Trachypithecus auratus* (É. Geoffroy Saint-Hilaire, 1812)). Among the notable mammalian species, Small-toothed palm civet (*Arctogalidia trivirgata* (Gray, 1832)) and Asian leopard cat (*Prionailurus bengalensis* (Kerr, 1792)) are recognized for their ecological function as pest control. The presence of Sunda pangolin (*Manis javanica* Desmarest, 1822) and Sunda porcupine (*Hystrix javanica* (F. Cuvier, 1823)), locally known as *Landak Jawa*, suggests the significance of these species in traditional medicine and trading practices. *Musang Luwak* (*Paradoxurus musangus* (Raffles, 1821) ssp. *javanicus*) plays a crucial role in seed dispersal through its feeding habits.

Table 1. Socio-demographic of the respondents in Nganggrong, Candisari and Ngaragoka Villages, Ampel Sub-district, Boyolali District, Central Java Province, Indonesia

Category	Description	Total (n)	Percentage (%)
Gender	Male	30	46.2
	Female	35	53.8
Age (years)	16-25	4	6.2
	26-35	16	24.6
	36-45	10	15.4
	46-55	13	20.0
	56-65	13	20.0
	> 66	9	13.8
Occupation	Farmer	52	80.0
	Merchant	3	4.6
	Laborer	9	13.8
	Civil servant	1	1.5
Education	Elementary School	39	60.0
	Junior High School	6	9.2
	Senior High School	18	27.7
	College	2	3.1

Table 2. Wildlife diversity of fauna in Ngagrang, Candisari and Ngargoloka Villages, Ampel Sub-district, Boyolali District, Central Java Province, Indonesia

Scientific name	Local name	Common name	Family	Role-based on respondent's knowledge		
				Ecological function	Social function	Economic function
Mammals						
<i>Arctogalidia trivirgata</i>	<i>Musang</i>	Small-toothed palm civet	Viverridae	-	-	-
<i>Bandicota bengalensis</i>	<i>Tikus wirok</i>	Lesser bandicoot-rat	Muridae	-	-	-
<i>Callosciurus notatus</i>	<i>Bajing</i>	Plantain squirrel	Sciuridae	-	-	-
<i>Hystrix javanica</i>	<i>Landak jawa</i>	Sunda porcupine	Hystricidae	-	Traditional beliefs	Commercial, traditional medicine
<i>Macaca fascicularis</i>	<i>Monyet ekor panjang</i>	Long-tailed macaque	Cercopithecidae	-	Sign of the season	-
<i>Manis javanica</i>	<i>Trenggiling</i>	Sunda pangolin	Manidae	-	-	-
<i>Muntiacus muntjak</i>	<i>Kijang</i>	Southern red muntjac	Cervidae	-	-	-
<i>Paradoxurus musangus</i> ssp. <i>javanicus</i>	<i>Musang luwak</i>	Javan palm civet	Viverridae	Seed dispersal	-	-
<i>Pipistrellus javanicus</i>	<i>Kelelawar</i>	Javan pipistrelle	Vespertilionidae	-	-	-
<i>Presbytis comata</i> ssp. <i>comata</i>	<i>Surili</i>	Javan surili	Cercopithecidae	-	-	-
<i>Presbytis comata</i> ssp. <i>fredericae</i>	<i>Rekrekan</i>	Javan fuscous langur	Cercopithecidae	-	-	-
<i>Prionailurus bengalensis</i>	<i>Blacan</i>	Asian leopard cat	Felidae	-	-	-
<i>Trachypithecus auratus</i>	<i>Lutung budeng</i>	Javan lutung	Cercopithecidae	-	-	-
<i>Tupaia javanica</i>	<i>Tupai</i>	Horsfield's treeshrew	Tupaiaidae	-	-	-
Aves						
<i>Acridotheres javanicus</i>	<i>Jalak kerbau</i>	Javan myna	Sturnidae	Seed dispersal	Traditional beliefs	Commercial
<i>Copsychus saularis</i>	<i>Kacer</i>	Oriental magpie-robin	Muscicapidae	-	-	Commercial
<i>Corvus enca</i>	<i>Gagak hutan</i>	Slender-billed crow	Corvidae	-	Traditional beliefs	-
<i>Cyornis banyumas</i>	<i>Sulingan</i>	Javan blue-flycatcher	Muscicapidae	-	-	Commercial
<i>Dicrurus macrocercus</i>	<i>Srigunting</i>	Black drongo	Dicruridae	Pest control	-	-
<i>Eumyias indigo</i>	<i>Sikatan ninon</i>	Indigo flycatcher	Muscicapidae	-	-	Commercial
<i>Falco peregrinus</i>	<i>Alap-alap kawah</i>	Peregrine falcon	Falconidae	Seed dispersal	-	-
<i>Geopelia striata</i>	<i>Perkutut jawa</i>	Zebra dove	Columbidae	Pest control	Traditional beliefs	Commercial
<i>Ictinaetus malayensis</i>	<i>Elang hitam</i>	Black eagle	Accipitridae	Pest control	-	-
<i>Lanius schach</i>	<i>Pentet</i>	Long-tailed shrike	Laniidae	Pest control	Traditional beliefs	-
<i>Lonchura punctulata</i>	<i>Bondol peking</i>	Scaly-breasted munia	Estrildidae	Seed dispersal	-	-
<i>Macropygia unchall</i>	<i>Uncal loreng</i>	Barred cuckoo-dove	Columbidae	-	-	-
<i>Nisaetus bartelsi</i>	<i>Elang jawa</i>	Javan hawk-eagle	Accipitridae	Pest control	-	-
<i>Otus angelinae</i>	<i>Celepuk jawa</i>	Javan scops-owl	Strigidae	Seed dispersal	-	-
<i>Pernis ptilorhynchus</i>	<i>Sikep-madu asia</i>	Crested honey buzzard	Accipitridae	Seed dispersal	-	-
<i>Prinia familiaris</i>	<i>Perenjak jawa</i>	Bar-winged prinia	Cisticolidae	Pest control	Traditional beliefs	Commercial
<i>Psittacula alexandri</i>	<i>Betet</i>	Red-breasted parakeet	Psittaculidae	-	-	Commercial, traditional medicine
<i>Pycnonotus aurigaster</i>	<i>Kutilang</i>	Sooty-headed bulbul	Pycnonotidae	Pest control	Traditional beliefs	Commercial
<i>Rhipidura phoenicura</i>	<i>Kipasan ekor merah</i>	Rufous-tailed fantail	Rhipiduridae	Seed dispersal	-	-
<i>Serinus canaria</i>	<i>Kenari</i>	Canary	Fringillidae	Pest control	-	Commercial
<i>Spilornis cheela</i>	<i>Elang ular bido</i>	Crested Serpent Eagle	Accipitridae	Pest control	-	-
<i>Sturnus contra</i>	<i>Jalak suren</i>	Asian Pied Starling	Sturnidae	-	-	Commercial
<i>Tyto alba</i>	<i>Burung hantu</i>	Barn owl	Tytonidae	Pest control	-	-
<i>Zosterops flavus</i>	<i>Pleci</i>	Oriental White-Eye	Zosteropidae	Seed dispersal	-	Commercial

Herpetofauna						
<i>Chalcorana chalconota</i>	<i>Kongkang kolam</i>	Javan white-lipped frog	Ranidae	Pest control	-	-
<i>Gekko gekko</i>	<i>Tokok</i>	Tokay gecko	Gekkonidae	-	-	Traditional medicine
<i>Naja sputatrix</i>	<i>Ular kobra jawa</i>	Javan spitting cobra	Elapidae	Pest control	-	-
<i>Polypedates leucomystax</i>	<i>Katak pohon bergaris</i>	Striped Tree Frog	Rhacophoridae	Pest control	-	-

There were 24 species of Aves belonging to 17 families dominated by the Accipitridae family. *Elang Hitam* (*ctinaetus malayensis* (Temminck, 1822) and *Alap-Alap Kawah* (*Falco peregrinus* Tunstall, 1771) are the species that contribute to seed dispersal. The avian diversity also included species like the Oriental white-eye, known as *Pleci* (*Zosterops flavus* (Horsfield, 1821) and Rufous-tailed fantail (*Rhipidura phoenicura* S.Muller, 1843), known for their seed dispersal function.

In the herpetofauna category, there were 4 species from 4 families, namely Ranidae, Gekkonidae, Elapidae, and Rhacophoridae. Ranidae and Rhacophoridae are family of frogs such as Javan white-lipped frog (*Chalcorana chalconota* (Schlegel, 1837) and Striped tree frog (*Polypedates leucomystax* (Gravenhorst, 1829), while the species found from Gekkonidae family was Tokay gecko (*Gekko gekko* (Linnaeus, 1758) and species from Elapidae family was Javan spitting cobra (*Naja sputatrix* Boie, 1827). Javan spitting cobra, locally known as *Ular Kobra Jawa*, stands out for its pest control role. Our results underscore the importance of preserving the diverse wildlife in villages for ecological balance and potential economic benefits.

Research on wildlife diversity in Ngagrang, Candisari and Ngargoloka Villages, as revealed in Table 2, is strengthened by similar findings from previous studies in other areas. For example, research by Gunawan et al. (2022) in Ciharang Kehati Park, Bogor, West Java, highlights the importance of understanding the diversity of wildlife in Indonesia. Their findings, which recorded 137 animal species, including 61 bird species, 30 mammal species, and 46 amphibian and reptile species, provide a perspective that aligns with the research results expressed in Table 2. This similarity confirms that Indonesia has geographical conditions as an archipelagic country; diverse, it is indeed home to an extraordinary diversity of wildlife. The importance of wildlife diversity in maintaining ecosystem balance and providing economic and social benefits to society has been confirmed by various studies. Therefore, conservation efforts are a must. Public education, regular patrols to prevent poaching, and the creation of protected areas are concrete actions to protect biodiversity, which is a valuable asset for Indonesia.

Local community knowledge of wildlife animals based on ecological function

The main occupations of the people in the eastern slopes of Merbabu National Park, Ampel sub-district, Boyolali District are farming and livestock raising, so

agriculture is the primary livelihood for the community. According to the local community perception, animal wildlife has several functions that can be grouped into ecological, socio-cultural, and economic. Wildlife animals have three ecological functions: pest control and seed dispersal. Disturbances to wildlife in Mount Merbabu National Park, which act as pest control, might result in reduced yields and even crop failure in the surrounding agricultural land. On the other hand, some wild animal species might encroach on cultivated crops when food supplies in the national park are reduced due to disturbances in their habitat. Monkeys are the natural enemies of plantations (forest gardens) from nursery to harvest, so people must spend extra energy and time protecting the farm (Tamia and Zafia 2022).

Respondents were generally unfamiliar with the monkey types, and they often identified them based on their fur color. Therefore, based on their characteristics, two monkey types can be identified, namely Javan fuscous langur (*P. c. subsp. fredericae*) and Long-tailed macaque (*M. fascicularis*) that often damage people's farms. These monkeys come in groups of up to hundreds and often encroach the farmland when food supplies are insufficient during the dry season or when disasters such as fires occur in their habitat. The monkeys usually ate and damaged fruit and vegetable crops such as bananas and corn. Until now, there has been no effective way to solve the problem. When the monkeys come down and damage the farm, the community just leaves them because they fear being attacked by the monkeys. However, some communities have also tried to prevent monkey attacks from their farm with dogs. Besides monkeys, several mammals, such as Horsfield's treeshrew (*Tupaia javanica* (Horsfield, 1822) and Lesser bandicoot-rat (*Bandicota indica* (Bechstein, 1800)), are also considered as farm pests. These animals often eat seeds, fruits, vegetables, and plant roots. It can also damage plants by tearing and digging them up.

Various species of Aves or birds, such as Javan hawk-eagle (*Nisaetus bartelsi* (Stresemann, 1924), Black drongo (*Dicrurus macrocercus* Vieillot, 1817), Sooty-headed bulbul (*Pycnonotus aurigaster* (Vieillot, 1818), Long-tailed shrike (*Lanius schach* Linnaeus, 1758), Turtle dove (*Geopelia striata* (Linnaeus, 1766), Black eagle (*Ictinaetus malayensis* (Temminck, 1822), and Canary (*Serinus canaria* (Linnaeus, 1758), are considered as pest control by eating insects in the farm (Schupp et al. 2019). Canaries are native to Madeira, the Canary Islands and surrounding areas, but have been found wild in Java. This species is known in Europe as an invasive bird (GBIF Secretariat 2023). The birds prey on various insect pests, damaging

crops, such as caterpillars, aphids, and grasshoppers. Not only Aves, herpetofauna such as Javan white-lipped frog (*C. chalconota*), Striped tree frog (*P. leucomystax*), and Javan spitting cobra (*N. sputatrix*), also known for its benefits as pest control by the local community. Not only as pest control, frogs are also herpetofauna, which consume many insects known to be important vectors of zoonotic diseases (Khatiwada et al. 2016). Therefore, frogs are one of the important biological pest controllers. Javan spitting cobra is a snake that has a predatory role in the ecosystem. Snakes are the animals that control the rat or mouse, which are considered as pests (Kholis et al. 2021). Although snakes can be dangerous, these animals also positively impact farmers because they help reduce farm rat pests.

According to the respondents, wildlife animals that are useful in ecology because of its ability to maintain the sustainability of ecosystems and the preservation of species are Javan palm civet (*P. musangus* ssp. *javanicus*), Javan myna (*Acridotheres javanicus* Cabanis, 1851), Peregrine falcon (*F. peregrinus*), Scaly-breasted munia (*Lonchura punctulata* (Linnaeus, 1758), Javan scops-owl (*Otus angelinae* (Finsch, 1912), Crested honey buzzard (*Pernis ptilorhynchus* (Temminck, 1821), Rufous-tailed fantail (*R. phoenicurus*), and Oriental white-eye (*Z. flavus*). These animals can disperse seeds after eating them through their feces (García-Rodríguez et al. 2021).

The community still recognizes quite a lot of wildlife. Still, they do not understand their function in ecology, such as the Asian leopard cat (*P. bengalensis*), Sunda porcupine (*H. javanica*), Sunda pangolin (*M. javanica*), and others. Several herpetofauna species from reptiles and amphibians are not widely known and recognized by the community. Only a small number of respondents knew the existence and ecological function of the herpetofauna, such as Striped tree frog (*P. leucomystax*), Tokay gecko (*G. gecko*), and Javan spitting cobra (*N. sputatrix*). Imron et al. (2021) state that herpetofauna are important animals in the food chain to maintain the ecosystem balance, and they have responded well to environmental changes.

Local community knowledge of wildlife animals based on social function

People living on the eastern slopes of Mount Merbabu encounter a lot of wildlife animals daily. However, people's knowledge of wildlife can certainly be observed from its social function, such as signs of seasonal changes, traditional beliefs, or even rituals. Long-tailed macaques (*M. fascicularis*) that creep into residential areas and invade people's plantations (forest gardens) occur during the dry season. Long-tailed macaques will enter residential areas because the food in the forest has become scarce, so they will go into human areas to search for food (Widiyanti 2001). Therefore, almost every day during the dry season, many Long-tailed macaques come to residential areas to find food in people's plantations. However, if the monkeys are chased away or caught by residents, usually the next day, the monkeys will come back in greater numbers for revenge. Therefore, residents think that it is better to let the Long-tailed macaques take a little of the plantation products and not forcefully expel them to avoid greater

damage and losses. Sharing kindness and not hurting animals are believed to be good deeds, and those attitudes benefit humans (Maharani et al. 2023).

The presence of some animals is believed to be a sign of seasonal changes, which is associated with local myths and traditional beliefs, such as the crows. In Indonesia, Slender-billed Crow (*Corvus enca* (Horsfield, 1822)) are often associated with mystical stories and bad luck because they are a symbol of the arrival of heavenly creatures and a messenger or death signal. Many people believe that the myth of the death-messenger crow is true, although scientifically, it does not make sense (Dwi et al. 2022). If the crows caw continuously around them, people believe that it is a sign that someone will die in the village. However, if the crow lands on a house, it is a sign that the house is being sent by witchcraft or occult, and someone in the house might die. The myth about crows not only occurs in Ngagrang, Candisari, and Ngargoloka Villages but also other areas; many still believe in this myth. In Java, crows flying around a house are always associated with someone dying soon (Suprayitno 2022). Perhaps, this belief is rooted in the Koran (Al-Maidah 5: 31), where the crow provides an example of the first burial of a corpse on earth.

Local community knowledge of wildlife animals based on economic function

Local communities living around forest areas have various interactions with wild animals, both directly and indirectly (Asri and Yanuwadi 2017). These interactions can include utilization, management, protection, and conflict. Based on the interviews with the respondents in the eastern slopes of Mount Merbabu, Ampel sub-district, Boyolaly District, they have positive and negative perceptions of wildlife animals in terms of economic aspects. Positive perception arises because wildlife provides economic benefits to local communities for commercial and traditional medicine purposes. Local communities derive many commercial benefits from wildlife, such as a source of protein and income through agriculture, trade, and tourism. Wild animals such as monkeys, birds, butterflies, and insects can attract visitors who want to see biodiversity in the Mount Merbabu National Park area. Local communities said these animals also help pollinate wild and cultivated plants, increasing agricultural productivity.

Not only for commercial purposes, the local community on the eastern slopes of Mount Merbabu also uses wild animals as traditional medicine. According to Lusma (2015), 27 species of animals are used as traditional medicine by the Lom, Bugis, Tionghoa, and Malay tribes. Communities around the eastern slopes of Mount Merbabu use Sunda porcupine (*H. javanica*), Red-breasted parakeet (*Psittacula alexandri* (Linnaeus, 1758), and gecko (*G. gecko*) for medical purposes. According to Farida (2012), porcupine liver contains amino acids, such as aspartic acid, glutamic acid, histidine, leucine, and phenylalanine, higher than beef, duck, tuna, and chicken liver. With its high amino acid content, porcupine liver can speed up the healing process of disease. In Senggul Village, Silat Hilir Sub-district, Kapuas Hulu District, local people use

porcupine thorns and *Geliga* to treat jaundice, liver, and back pain by drinking dried and brewed *Geliga* and applying the burnt tips of the thorns as an external medicine (Krisyanto et al. 2019). *Geliga* is a collection of undigested organic and inorganic materials from porcupine food mixed with other substances in the digestive tract or blood that clump together and form spheres like stones (Syahputri 2020). The *P. alexandri* gall has benefits for treating food poisoning when ingested immediately following the onset of the acute symptoms (Dimaer 1986). Geckos can be a traditional medicine for asthma (Liu et al. 2008) and can also be used to treat stomach ulcers where the part used is the liver (Pakaenoni et al. 2023).

The community living on the eastern slope of Mount Merbabu also has a negative perception of wild animals due to economic losses caused by such animals, such as destroying crops, disturbing livestock, disease vectors, and causing conflict. On the eastern slopes of Mount Merbabu, monkeys often encroach and destroy residents' farms, and Long-tailed macaques are the type most likely to do that (Maula et al. 2017). Wild animals can also be a source of conflict between the community and conservation area managers, especially if there is illegal hunting or land encroachment.

Local community knowledge of wildlife based on economic function is heterogeneous and complex. This knowledge is influenced by the perceived benefits and disadvantages, as well as other factors related to culture and environment. Therefore, the function of wild animals in the economic sector in the studied area must be managed well so that they can provide maximum benefits and reduce negative impacts. This management involves collaboration between the community, government and conservation area managers so that common goals can be achieved and on target (Abdullah et al. 2022). Some efforts that can be made are providing education and outreach about the importance of wild animal conservation, developing the potential for wild animal-based tourism, providing incentives and assistance to farmers who are experiencing losses due to wild animal pests, implementing health and safety protocols for visitors and the public, and enforcing laws against perpetrators of illegal poaching or land encroachment.

In conclusion, local people living on the eastern slopes of Mount Merbabu still maintain knowledge of wildlife diversity and conservation with diverse perceptions of ecological, social, and economic aspects. However, there is a lack of understanding about wildlife in the community, especially regarding environmental issues and human-wildlife conflict. Therefore, socialization and education strategies tailored to the demographic characteristics of each village are needed, as well as cooperation between the government, educational institutions, and conservation organizations to improve community understanding of wildlife diversity and encourage active participation in natural conservation. In addition, it is also necessary to increase the awareness and participation of local communities in wildlife conservation and reduce human-wildlife conflict in a mutually beneficial approach.

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