

Ethnozoological knowledge of diversity, folk taxonomy, and animal hunting among the Baduy in Banten, Indonesia

BUDIAWATI SUPANGKAT ISKANDAR^{1,2,✉}, JOHAN ISKANDAR^{2,3,4}, DEDE MULYANTO^{1,3},
JATNA SUPRIATNA⁵

¹Department of Anthropology, Faculty of Social and Political Sciences, Universitas Padjadjaran. Jl. Raya Bandung-Sumedang Km 21, Jatinangor, Sumedang 45363, West Java, Indonesia. Tel./fax.: +62-22-7797712, ✉email: budiawati.supangkat@unpad.ac.id

²Center for Environmental and Sustainability Sciences, Universitas Padjadjaran. Jl. Sekeloa Selatan No. 1, Bandung 40132, West Java, Indonesia

³Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran. Jl. Raya Bandung-Sumedang Km 21, Jatinangor, Sumedang 45363, West Java, Indonesia

⁴Department of Environmental Science, Graduate School, Universitas Padjadjaran. Jl. Dipati Ukur No. 35, Bandung 40135, West Java, Indonesia

⁵Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia. Jl. Prof. Dr. Mahar Mardjono, Kampus UI, Depok 16424, West Java, Indonesia

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Abstract. Iskandar BS, Iskandar J, Mulyanto D, Supriatna J. 2024. *Ethnozoological knowledge of diversity, folk taxonomy, and animal hunting among the Baduy in Banten, Indonesia. Biodiversitas 25: 5031-5045.* Presently, biocultural systems, an emergent ecosystem, are experiencing significant growth in traditional villages due to the presence of natural resources. Baduy, a sacred community rich in natural and environmental resources, has a high diversity of animals, which needs to be managed based on their unique Traditional Ecological Knowledge (TEK) and beliefs. Therefore, this research focused on the TEK of the community on animal diversity, folk taxonomy, and wildlife hunting. The qualitative with an ethnozoological method was used with data collected from field observation, semi-structured interviews with informants, and participant observation. We found 90 species of birds, 16 mammals, 14 fishes, 10 insects, and 9 reptiles known by the Baduy in Banten, Indonesia and at least 3 taxa levels of Baduy zoological classification. The primary, secondary, and third taxa represented life forms, species, and races or sub-species. Animals can be classified based on their distinctive morphological characteristics, specific behavior, time activity, special habitat, and functions. The hunting of animals carried out by the Inner Baduy community was in accordance with customary rules supervised by informal Baduy leaders. However, unlike the Inner Baduy, Outer Baduy has hunted wild animals for semi-commercial purposes instead of subsistence purposes. In conclusion, safeguarding the Baduy people's land, language, and culture plays an important role in conserving animals in the rural ecosystem of the traditional communities.

Keywords: Baduy, ethnozoology, hunting, traditional ecological knowledge, wild animal

INTRODUCTION

The biocultural system, a unique blend of biological and cultural influences, governs the allocation of resources in traditional and local communities over time. These systems, such as animals' habitats, are anthropogenic, shaped by both biological and cultural dynamics (Franco and Knudsen 2022; Iskandar and Iskandar 2023). The management of landscapes and natural resources, including animals in the rural ecosystem, is primarily the responsibility of local communities, who use their Traditional Ecological Knowledge (TEK) and cultural beliefs to guide their actions. This underscores the significant role that people and their cultures play in animal conservation (Estrada et al. 2022).

Based on this perspective, the hunting of wild animals is a common practice in many countries across the world, including Indonesia (Knudsen et al. 2011; Nasi and Taber 2011; Farida and Jumari 2014; Lohe 2014; Santos-Fita et al. 2015; Da Silva Neto et al. 2017; Permana et al. 2019; Shokirov and Backhaus 2020; Loke and Lim 2020; Prado et al. 2020; Mulyanto et al. 2021; Jose de Paula et al. 2022; Sawaki et al. 2022; Yuda and Kusriani 2022). In the past, it

was considered an essential source of animal protein, traditional medicine, pets, ornamental accessories, rituals, and hobbies (Farida and Jumari 2014; Pattiselanno and Lubis 2014; Partasasmita et al. 2016; Kayat et al. 2017; Rusmiati and Anwari 2018; Laatung et al. 2019; Nukraheni and Afriyansah 2019; Van Vlett et al. 2019; Lee et al. 2020; Rambey et al. 2020; Yuniati et al. 2020; Arobaya et al. 2021; Hendra et al. 2023; Nikmatila and Kurnia 2023). The hunting of wild animals firmly depended on TEK, rooted in cultural beliefs or cosmos (Farida and Jumari 2014; Nijman and Nekaris 2014; Iskandar 2018; Ramadiana and Anwari 2018; Permana et al. 2019).

Due to the rapid increase in population, the advancement of technology, and the extensive penetration of markets into rural areas, the hunting and use of various wild animals have escalated for commercial rather than domestic purposes. This has led to the overexploitation of some animals, resulting in a decline in their populations in various areas (Iskandar 2014; Harrison et al. 2016; Iskandar et al. 2016; Benitez-Lopez et al. 2017; Weyah and Keiluhu 2018; Van Vlett et al. 2019; Hakim et al. 2020; Suroso et al. 2023). The situation is urgent and requires immediate attention.

The research on Local Knowledge (LK) or TEK of the hunting and use of wild animals is crucial, as changes in species populations are primarily driven by human behavior. It is essential to consider the ecological, socioeconomic, and cultural factors of local communities to conserve the wild effectively rather than focusing solely on biophysical aspects (Camino et al. 2016; Benett et al. 2016; Manfredo et al. 2020; Dawson et al. 2021; Manfredo et al. 2021; Pimid et al. 2022).

Ethnozoological methods have been proposed to understand the complex interaction between the socioeconomic and cultural aspects of local people, the local environment, and wild animals. This discipline examines the relationships between humans and animals. Ethnobiological and ethnozoological research has demonstrated that the natives or local populations possess a profound knowledge of nature and the biological resources they exploit (Barbosa and Aguiar 2018; Iskandar 2018). Therefore, there is an urgent need to integrate traditional ecological and modern scientific knowledge into nature conservation programs for the sustainability of wild animals (Nyawengso 2018). This research aimed to explore the Baduy community's TEK regarding animal diversity, folk taxonomy, and wildlife hunting in Banten, Indonesia.

MATERIALS AND METHODS

Study area

This research was carried out in both Inner Baduy and Outer Baduy areas of Kanekes Village, Leuwidamar Sub-district, Lebak District, province of Banten, Indonesia (Figure 1). The Baduy area of Kanekes Village is located at approximately latitude $6^{\circ}27'27''$ - $6^{\circ}30'$ North and longitude $106^{\circ}3'9''$ - $106^{\circ}4'5''$ East. The main river flowing through the area is the Ciujung. The upstream is located in the forest area of Gunung Kendeng, South Cikeusik hamlet, Inner

Baduy, a sacred place called *Arca Domas*. The river flows in a northerly direction from Cikeusik, passing the Outer Baduy hamlets downstream to Rangkasbitung, Serang, and eventually into the north Java Sea.

The research location has a total area of approximately 5,136.58 hectares, and in accordance with the local regulation (*Perda*) of Lebak District No.32, 2001, it was defined as *Ulayat* land (*tanah ulayat*). The status was strengthened by decree (*SK Bupati Lebak*) No.590/Kep.233/Huk/2002 concerning the setting of *Hak Ulayat* boundaries on July 16, 2002. Based on the Lebak District decree, approximately 5,136.58 hectares of Baduy area are devoted to forest protection (3,000 hectares), agricultural land and settlement (2,136.58 hectares) (Iskandar and Iskandar 2021). According to tradition, the community was divided into two groups: Inner (*Baduy Dalam*) and Outer Baduy (*Baduy Luar*). Furthermore, the inner community comprised three hamlets: Cibeo, Cikartawarna, and Cikeusik. The outer region consisted of over 50 hamlets, including Kaduketug, Kadujukung, Gajeboh, Cisaban, Batara, and others predominantly located in the northern area of Kanekes Village (Figure 1). The Baduy's sustainable land use practices, as evidenced by their devotion to forest protection, are truly impressive and deserving of support.

The total population of Baduy in 2018 was 11,710 people, consisting of 3,414 households, the Outer region, and 17% of the Inner area (Iskandar and Iskandar 2021). Swidden cultivation (*ngahuma*) is the main source of income, an obligation that arose from the religious practice of Sunda Wiwitan or Agama Baduy. The people tried to preserve the original culture, with daily activities regulated by many prohibitions. This included the cultivation of rice in wet fields (*sawah*), growing monoculture commercial crops, and poisoning wild animals and fish. Baduy's dedication to preserving their culture, despite the challenges, is truly admirable.

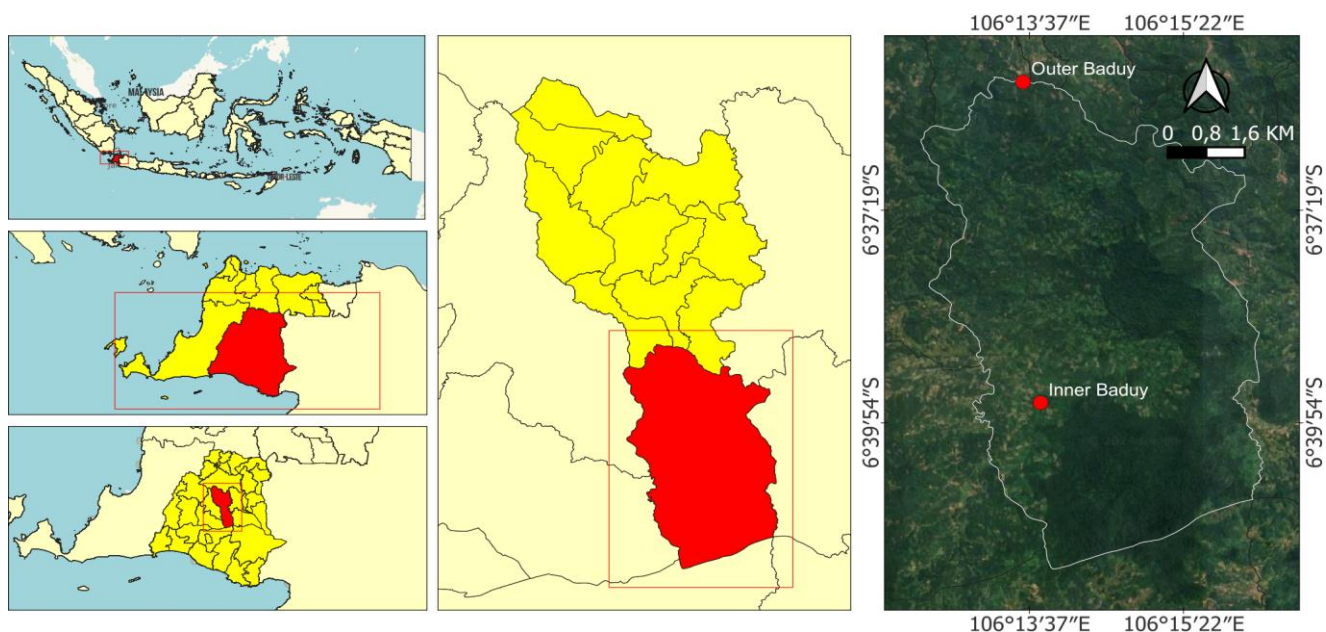


Figure 1. Map of research location at Baduy area of Kanekes Village, Leuwidamar Sub-district, Lebak District, Banten, Indonesia

Procedures

Field research was initially conducted in 1996, and between 2017 and 2018, Baduy village was revisited to carry out a possible investigation. This qualitative research adopted an ethnozoological method during data collection (Viera et al. 2014). A consent letter approved by the Universitas Padjadjaran, West Java, Indonesia and the regional government of Lebak District, Banten Province, Indonesia, was delivered to the community. In addition, the selected informants willingly participated during the interview sessions. Prior to carrying out the research, the numerous hamlets (*kampung*) in Kanekes Village were visited. The village leader (*jaro pamarentah*), and all staff (village secretary or *Carik Desa*) were paid a visit, which presented the opportunity to discuss the aim of the research in the area.

Competent informants purposively selected participated in both semi-structured and deep interviews. The informants comprised the formal village leader (*jaro pamarentah*), secretary (*carik desa*), informal leaders of Inner and Outer Baduy, Puun staff (*jaro tangtu, tangkesan, jaro tanggungan 12, jaro dangka*), and several old people. Furthermore, the deep interview sessions held with informants were conducted both in respective residences and farmhouses (*saung huma*).

The field data was acquired through non-participant and participant observations (Albuquerque et al. 2014). The non-participant observation focused on the conditions of the hamlet and various animals' habitats, including the forest village (*leuweung kolot*), swidden field (*huma*), swidden fallowed land of secondary forest (*reuma*), *mature leuweung kolot* or traditional protected forest, and Ciujung River. For the participant observation, an informant who engaged in the hunting of animals with locally made traps was monitored. The following animals *leuweung lembur, huma, reuma, leuweung kolot*, and *Sungai Ciujung* were closely examined early mornings and late afternoons. Direct observation was carried out using a pair of binoculars to identify all animals in the field guide while holding discussions with other informants.

Data analysis

The data obtained from the deep and semi-structured interviews, observation, and participation were analyzed in several stages, including cross-checking, summarizing, synthesizing, and building up a narrative account (Iskandar 2018). These were cross-checked to validate the data, which were further summarized and synthesized, with a narrative account prepared using descriptive analysis.

Animals recorded based on direct survey and information obtained from the informants were identified using the field guide. Additionally, these included reptiles (Das 2015), fishes (Kartamihardja 2019), birds (Eaton et al. 2021), and Mammals (Maryanto et al. 2019; Supriatna 2022).

RESULTS AND DISCUSSION

Diversity of animal species and their perceived function

Baduy community was traditionally considered a sacred land (*tanah suci*) that must be conserved due to the high diversity of wild animals. We found 90 91 species of birds, 16 mammals, 14 fishes, 10 insects, and 9 reptiles known by the Baduy people (Table 1). Among the various species, some species were categorized as protected by Indonesian law. The protected animals were not allowed to be hunted, killed, kept, or traded. Typical examples comprised certain bird species, such as *Aethopyga mystacalis*, *Chloropsis cochinchinensis*, *Crypsirina timia*, *Falco moluccensis*, *Gracula religiosa*, *Ictinaetus malaiensis*, *Megalema (Psilopogon) javensis*, *Rhipidura javanica*, *Spilornis cheela*. The following mammals, *Hylobates moloch*, *Hystrix javanica*, *Manis javanica*, *Muntiacus muntjak*, *Nycticebus javanicus*, *Trachypithecus auratus*, and *Tragulus javanicus*, were also protected.

Some animal species were internationally categorized as Critically Endangered, Endangered, and Vulnerable based on the IUCN (The International Union for Conservation of Nature) red list categories and must be strongly conserved. Certain birds, for example, *Alophoixus bres* and *C. cochinchinensis*, were grouped as Endangered species, while *Eurylaimus javanicus* and *Prinia familiaris* were categorized as Near Threatened. The following mammals, *M. javanica*, *T. auratus*, *Presbytis comata*, *H. moloch*, *N. javanensis*, and *Amblonyx cinerea*, were categorized as Critically Endangered, Vulnerable, Endangered, Endangered, Critically Endangered, and Vulnerable, respectively. However, *T. auratus* and *A. cinerea* were grouped as Vulnerable, implying these species possessed a high risk of extinction. This was due to the rapid decline in population of relatively 30-50% in the past 10 years (or three generations), and the current size of less than 1,000, caused by anthropogenic factors, namely forest degradation and illegal hunting.

Table 1 shows the documentation of animal diversity in the Baduy area, comprising 90 bird species belonging to 32 families. In Karangwangi Village, South Cianjur and Cijambu, Sumedang, West Java, recorded 41 species (Iskandar et al. 2016), and 67 species belonging to 27 families and 39 families (Suroso et al. 2023), respectively. The high bird diversity in the Baduy area was caused by the sustenance of large-sized mature traditional protected forests, particularly in Inner Baduy. Moreover, the existence of protected forests as a relict village rainforest in Banten, traditionally managed by the Baduy community, played an important role in the habitat of various primate animals, including *T. auratus*, *P. comata*, *H. moloch*, and *N. javanensis*. Despite being managed by various indigenous ethnic groups, these forests have positively impacted primate animals from extinction in the ecosystem (Estrada et al. 2022).

Table 1. List of animals known by the Baduy people in Banten, Indonesia

Taxa	Vernacular name	Can be found in					Locally perceived function(s)			IUCN status
		A	B	C	D	E	Economic	Cultural	Ecological	
Birds										
<i>Acridotheres javanicus</i> (Cabanis, 1850), Sturnidae	<i>Jalak</i>	-	●	-	-	-	Commodity	Pet	Pollinator	VU
<i>Aegithina tiphia</i> (Linnaeus, 1758), Aegithinidae	<i>Cipeuw</i>	●	●	●	●	-	Commodity	Pet	x	LC
<i>Aethopyga mystacalis</i> (Temminck, 1822), Nectariniidae	<i>Cécéd gunung</i>	●	●	-	●	-	x	x	Honey-eater	LC
<i>Alcedo maninting</i> (Horsfield, 1821), Alcedinidae	<i>Manuk hurang</i>	-	●	-	-	●	x	x	Fish-eater	LC
<i>Alcippe pyrrhoptera</i> (Bonaparte, 1850), Timaliidae	<i>Wareugan</i>	-	●	-	-	-	x	x	Insectivorous	LC
<i>Alophoixus bres</i> (Lesson, 1831), Pycnonotidae	<i>Korés</i>	●	●	-	●	-	Commodity	Pet	x	EN
<i>Anthreptes malacensis</i> (Scopoli, 1786), Nectariniidae	<i>Cécéd kalapa</i>	-	●	●	-	-	Commodity	Pet	x	LC
<i>Aplonis panayensis</i> (Scopoli, 1786), Sturnidae	<i>Pecang péor</i>	-	-	-	●	-	x	x	Fruit eater	LC
<i>Arachnothera affinis</i> (Horsfield, 1821), Nectariniidae	<i>Manyeuseup</i>	●	-	-	-	-	x	x	Honey-sucker	LC
<i>Arachnothera longirostra</i> (Latham, 1790), Nectariniidae	<i>Manyeuseup</i>	●	●	-	●	-	x	x	Honey-sucker	LC
<i>Cacomantis merulinus</i> (Scopoli, 1756), Cuculidae	<i>Aéh-aéh</i>	●	●	●	-	-	x	Bad omen	x	LC
<i>Cacomantis sepulchralis</i> (Müller, 1843), Cuculidae	<i>Aéh-aéh</i>	●	●	●	-	-	x	Bad omen	x	LC
<i>Centropus bengalensis</i> (Gmelin, 1788), Cuculidae	<i>Dudut</i>	-	●	-	-	-	x	Folklore	Insectivorous	LC
<i>Ceyx rufidorsa</i> (Strickland, 1847), Alcedinidae	<i>Manuk hurang</i>	-	●	-	-	●	x	x	Fish-eater	LC
<i>Chloropsis cochinchinensis</i> (Gmelin, 1789), Chloropeidae	<i>Manuk daun</i>	-	-	-	●	-	Commodity	Pet	x	EN
<i>Cinnyris jugularis</i> (Linnaeus, 1766), Nectariniidae	<i>Cécéd</i>	-	●	●	●	-	x	x	Honey-sucker	LC
<i>Collocalia linchi</i> (Horsfield & Moore, 1854), Apodidae	<i>Lawét</i>	●	●	-	●	-	x	Rain sign	x	LC
<i>Copsychus saularis</i> (Linnaeus, 1758), Turdidae	<i>Haur luhur</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Corvus enca</i> (Horsfield, 1821), Corvidae	<i>Ga'ak</i>	-	●	-	●	-	x	Bad omen	x	LC
<i>Crypsirina timia</i> (Daudin, 1800), Dicruridae	<i>Cérong</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Cuculus micropterus</i> (Gould, 1873), Cuculidae	<i>Kangkangkot</i>	-	-	-	●	-	x	Rain sign	x	LC
<i>Culicicapa ceylonensis</i> (Sawinson, 1820), Muscipapidae	<i>Sikatan</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Cyornis banyumas</i> (Horsfield, 1821), Muscipapidae	<i>Anis awi</i>	-	-	-	●	-	x	x	Insectivorous	EN
<i>Dendrocopos macei</i> (Vieillot, 1818), Picidae	<i>Caladi simeut</i>	●	●	-	-	-	x	x	Insectivorous	LC
<i>Dicaeum trigonostigma</i> (Scopoli, 1786), Decidae	<i>Cécéd</i>	-	●	●	●	-	Commodity	Pet	x	LC
<i>Dicaeum trochileum</i> (Sparman, 1789), Decidae	<i>Cécéd</i>	-	●	●	-	-	x	x	Seed-disperser	LC
<i>Dicrurus leucophaeus</i> (Vieillot, 1817), Dicruridae	<i>Saéran hawu</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Dicrurus macrocerceus</i> (Vieillot, 1817), Dicruridae	<i>Saéran hideung</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Dicrurus paradiseus</i> (Linnaeus, 1766), Dicruridae	<i>Saéran batu</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Dicrurus ramifer</i> (Temminck, 1823), Dicruridae	<i>Saéran gunting</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Dinopium javanense</i> (Ljugh, 1797), Picidae	<i>Caladi bawang</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Ducula lacermulata</i> (Temminck, 1822), Columbidae	<i>Limbukeun</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Enicurus leshenaultia</i> (Vieillot, 1818), Turdidae	<i>Manintin</i>	-	-	-	-	●	x	x	Fish-eater	LC
<i>Eurylaimus javanicus</i> (Horsfield, 1821), Picidae	<i>Boroboy</i>	●	●	-	●	-	x	Rain sign	x	NE
<i>Falco moluccensis</i> (Bonaparte, 1850), Falconidae	<i>Alap kotok</i>	●	●	-	-	-	x	x	Carvivorous	LC
<i>Gallus varius</i> (Shaw, 1798), Phasianidae	<i>Cangélgar</i>	-	-	-	●	-	x	x	x	LC
<i>Geopelia striata</i> (Linnaeus, 1766), Columbidae	<i>Perukutut</i>	●	●	-	-	-	Food, commodity	Pet	x	LC
<i>Gracula religiosa</i> (Lesson, 1831), Sturnidae	<i>Béo</i>	-	-	-	●	-	Commodity	Pet	x	LC
<i>Halcyon cyanoventris</i> (Vieillot, 1818), Alcedinidae	<i>Cangkéhér</i>	-	●	-	●	●	x	x	Fish-eater	LC

<i>Hemipus hirundinaceus</i> (Temminck, 1822), Campephagidae	<i>Jingjing teureup</i>	●	●	-	●	-	x	x	Insectivorous	LC
<i>Hemiprocne longipennis</i> (Rafinesque, 1802), Hemiprocnidae	<i>Walét</i>	-	-	-	●	-	x	Rain sign	x	LC
<i>Hirundo daurica</i> (Laxman, 1769), Hirundinidae	<i>Manuk hujan</i>	●	●	-	-	-	x	Rain sign	x	LC
<i>Hirundo tahitiica</i> (Gmelin, 1789), Hirundinidae	<i>Kapinis</i>	●	●	-	●	-	x	Rain sign	x	LC
<i>Hypothymis azurea</i> (Boddaert, 1783), Muscicapidae	<i>Kelicap</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Ictinaetus malaiensis</i> (Temminck, 1822), Accipitridae	<i>Heulang hideung</i>	●	●	-	●	-	x	x	Carvivorous	LC
<i>Lalage nigra</i> (J.R.Foster, 1781), Campephagidae	<i>Manuk muncang</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Lanius cristatus</i> (Linnaeus, 1758), Laniidae	<i>Toéd</i>	●	●	-	●	-	Medicine	x	x	LC
<i>Lanius schach</i> (Linnaeus, 1758), Laniidae	<i>Toéd</i>	●	●	-	●	-	Medicine	x	x	LC
<i>Lonchura ferruginosa</i> (Sparman, 1789), Ploceidae	<i>Piit haji</i>	●	●	-	-	-	Food	x	Pest	LC
<i>Lonchura leucogastroides</i> (Horsfield & Moore, 1858), Ploceidae	<i>Piit</i>	●	●	-	-	-	Food	x	Pest	LC
<i>Lonchura punctulata</i> (Linnaeus, 1758), Ploceidae	<i>Paking</i>	●	●	-	-	-	Food	-	Pest	LC
<i>Macropygia ruficeps</i> (Temminck, 1835), Columbidae	<i>Manuk uncal</i>	-	-	-	●	-	Food	x	Fruit-eater	LC
<i>Malacocincla sepiaria</i> (Horsfield, 1821), Timaliidae	<i>Kancilan</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Megalaima australis</i> (Horsfield, 1821), Megalaimidae	<i>Ungkut-ungkut</i>	-	-	-	●	-	x	x	Fruit-eater	LC
<i>Megalaima lineata</i> (Vieillot, 1816), Megalaimidae	<i>Bultok</i>	-	-	-	●	-	x	x	Fruit-eater	LC
<i>Megalaima javensis</i> (Horsfield, 1821), Megalaimidae	<i>Tulung tumpuk</i>	-	-	-	●	-	x	x	Fruit-eater	LC
<i>Megalurus palustris</i> (Horsfield, 1821), Sylviidae	<i>Tékték réyod</i>	-	●	-	-	-	x	x	Insectivorous	LC
<i>Myophonus caeruleus</i> (Scopoli, 1786), Turdidae	<i>Ciung</i>	-	-	-	-	●	x	x	Insectivorous	LC
<i>Ninox scutulata</i> (Raffles, 1822), Strigidae	<i>Rongrong</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Oriolus chinensis</i> (Linnaeus, 1766), Oriolidae	<i>Bincarung</i>	-	●	-	●	-	Commodity	Pet	x	LC
<i>Oriolus xanthomus</i> (Linnaeus, 1758), Oriolidae	<i>Bincarung</i>	-	-	-	●	-	Commodity	Pet	x	LC
<i>Orthotomus ruficeps</i> (Horsfield, 1821), Sylviidae	<i>Tékték téong</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Orthotomus satorius</i> (Pennant, 1769), Sylviidae	<i>Tékték téong</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Otus lempiji</i> (Horsfield, 1821), Strigidae	<i>Bueuk</i>	-	●	-	-	-	x	x	Carvivorous	LC
<i>Parus major</i> Linnaeus, 1758, Paridae	<i>Jingjing latak, Gelatik batu</i>	-	-	-	-	●	Commodity	Pet	Insectivorous	LC
<i>Pelloneum capistratum</i> (Temminck, 1823), Timaliidae	<i>Manuk peucang</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Pericrocutus flameus</i> (J.R.Foster, 1781), Campephagidae	<i>Manuk seupah</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Phaenicophaeus curvirostris</i> (Shaw, 1810), Cuculidae	<i>Lantok</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Pitta guajana</i> (P.L.S.Müller, 1776), Pittidae	<i>Paok</i>	-	-	-	●	-	x	x	Insectivorous	LC
<i>Ploceus manyar</i> (Horsfield, 1821), Ploceidae	<i>Manyar</i>	●	●	-	-	-	Food	x	Pest	LC
<i>Prinia familiaris</i> (Horsfield, 1821), Cisticolidae	<i>Pacikrak</i>	-	●	-	-	-	Food	x	Pest	LC
<i>Prinia flaviventris</i> (Dellesert, 1840), Cisticolidae	<i>Pacikrak</i>	●	●	-	-	-	x	x	Insectivorous	LC
<i>Pycnonotus atriceps</i> (Temminck, 1822), Pycnonotidae	<i>Angkuricam</i>	-	●	-	●	-	x	x	Fruit-eater	LC
<i>Pycnonotus aurigaster</i> (Jardine & Selby, 1837), Pycnonotidae	<i>Angkurileung</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Pycnonotus goiavier</i> (Scopoli, 1786), Pycnonotidae	<i>Jogjog</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Pycnonotus melanicterus</i> (Gmelin, 1789), Pycnonotidae	<i>Trenggoleng</i>	-	●	-	●	-	Commodity	Pet	x	LC
<i>Pycnonotus plumous</i> (Blyth, 1845), Pycnonotidae	<i>Corok-corok</i>	-	●	-	●	-	Commodity	Pet	x	LC
<i>Rhaphidura leucopygialis</i> (Blyth, 1849), Apodidae	<i>Kapinis</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Rhipidura javanica</i> (Sparman, 1788), Rhipiduridae	<i>Manuk sapu</i>	●	●	-	●	-	x	x	Insectivorous	LC
<i>Sitta frontalis</i> (Swainson, 1820), Sittidae	<i>Salésér</i>	●	●	-	●	-	Commodity	Pet	x	LC
<i>Spilornis cheela</i> (Latham, 1790), Accipitridae	<i>Heulang ruyuk</i>	●	●	-	●	-	x	x	Carvivorous	LC
<i>Spizaetus cirhatus</i> (Gmeli, 1788), Accipitridae	<i>Heulang borontok</i>	-	-	-	●	-	x	x	Carvivorous	LC
<i>Stachyris melanothorax</i> (Temminck, 1823), Timaliidae	<i>Tepus</i>	-	●	-	●	-	x	x	Insectivorous	LC
<i>Streptopelia chinensis</i> (Scopoli, 1786), Columbidae	<i>Tikukur</i>	●	●	-	-	-	Food, commodity	x	Pest	LC

Insects

<i>Apis dorsata</i> (Fabricius, 1793), Apidae	<i>Odéng</i>	●	●	●	●	-	Food, commodity	x	Honey-maker	NE
<i>Apis cerana indica</i> (Fabricius, 1798), Apidae	<i>Nyiruan</i>	●	●	●	●	-	Food, commodity	x	Honey-maker	NE
<i>Tarbinskiellus portentosus</i> (Lichtenstein, 1796), Gryllidae	<i>Kasir</i>	●	●	●	●	-	x	Medicine	x	NE
<i>Culex vismii</i> (Theobald, 1901), Culicidae	<i>Reungit</i>	●	-	●	-	●	x	x	Pest	NE
<i>Exopholis hypoleuca</i> (Wiedemann, 1819), Scarabeidae	<i>Légé</i>	●	-	-	-	-	x	x	Pest	NE
<i>Gryllotalpa africana</i> (Palisot de Beauvois, 1805), Gryllidae	<i>Ga'ang</i>	●	-	-	-	-	x	x	Pest	NE
<i>Leptocoris oratorius</i> (Fabricius, 1793), Coreidae	<i>Kungkang</i>	●	-	-	-	-	x	x	Pest	NE
<i>Mecopoda elongata</i> (Linnaeus, 1758), Tettigoniidae	<i>Caricangkak</i>	-	-	●	-	-	x	Bad omen	x	NE
<i>Orseolia oryzae</i> (Wood-Mason, 1889), Cecidomyiidae	<i>Ganjur</i>	●	-	-	-	-	x	x	Pest	NE
<i>Musca domestica</i> (Linnaeus, 1758), Muscidae	<i>Laleur</i>	-	-	-	-	●	x	x	Pest	NE

Reptile

<i>Bronchocela jubata</i> (A.M.C.Duméril & Bibron, 1837), Agamidae	<i>Londok</i>	-	●	●	-	-	x	x	Insectivorous	LC
<i>Bungarus fasciatus</i> (Schneider, 1801), Elapidae	<i>Oray welang</i>	-	-	-	-	●	x	x	Danger	LC
<i>Calloselasma rhodostoma</i> (Kuhl, 1824), Viperidae	<i>Oray taneuh</i>	-	●	●	-	-	x	x	Danger	LC
<i>Draco volans</i> (Linnaeus, 1758), Agamidae	<i>Haphap</i>	-	●	●	-	-	x	x	Insectivorous	LC
<i>Eutropis multifasciata</i> (Kuhl, 1820), Scincidae	<i>Kadal</i>	-	●	●	-	-	x	Medicine	x	LC
<i>Gekko gecko</i> (Linnaeus, 1758), Geckonidae	<i>Tokké</i>	-	●	●	-	●	x	Medicine	x	LC
<i>Naja sputatrix</i> (Boie, 1827), Elapidae	<i>Oray séndok</i>	-	-	●	●	-	x	x	Danger	LC
<i>Python molurus</i> (Linnaeus, 1758), Pythonidae	<i>Oray sanca</i>	-	-	●	●	-	x	x	Danger	LC
<i>Varanus salvator</i> (Laurenti, 1768), Varanidae	<i>Bayawak</i>	-	-	●	●	●	Food	Medicine	x	LC

Note: A: Swidden field; b: Secondary forest; c: Hamlet forest/agroforest; d: Mature forest; e: Waterway; ●: Present, -: Absent, x: Considered to be non

Folk taxonomy

Baduy community generally referred to domestic animals as *ingon-ingon* or livestock. This term is also popularly used in Javanese (Nugraha 2019), derived from the root word *ingu* or *ingu-inguan* meaning to keep animals. This can be distinguished between pets and livestock. Keeping animals as pets is called *ingu* or *ningu* (keeping) while raising them as livestock was referred to as *miara* or *miara ingon-ingon*. The main pet and livestock traditionally raised by the people was a dog (*anjing*) and local chickens (*kotok lokal*) or hamlet chickens (*kotok kampung*), respectively. However, livestock such as goats, sheep, cows, and buffalo were prohibited, and in Sundanese, a chicken called *kotok* in Baduy was commonly known as *hayam* or *ayam* in Indonesian.

Non-domesticated animals, including livestock and pet animals, were called *sato* or *binatang* in Baduy and Indonesian. A variety of animals is commonly referred to as *sasatoan* or *jenis-jenis binatang* in Indonesian. The people from Baduy tend to distinguish between various insects, commonly called *geremet*, and vertebrate animals. Based on zoological taxonomy, *sato* or animals were divided into five main groups, similar to the phylum vertebrate. This includes *sasatoan nyusuan* or various mammals (Mammal), *sasatoan manuk* or *rupa-rupa manuk* showing several kinds of birds (Aves), *sasatoan ngarayap* or different Reptiles, and *sasatoan lauk* or *rupa rupa lauk* implying diverse Fishes. *Sasatoan nyusuan* consisted of barking deer, wild pigs, pangolin, etc., while *Sasatoan manuk* comprised various birds, namely doves, bulbuls, and munias. *Sasatoan ngarayap* and *rupa-rupa lauk* include snakes, lizards, tokay geckos, snakes, carp, eels, and catfish.

The folk taxonomy (Iskandar et al. 2016) recognized three taxa levels of Baduy zoological classification, as shown in Table 2. Typical examples of the primary and secondary taxa are *sasatoan* and the intriguing Javan Slow Loris (*N. javanicus*), belonging to the mammal class, respectively. This mammal is also called *muka* or *kukang Jawa* in Indonesian (Supriatna 2022). According to the perception of the people, *muka* can be divided into two variations (sub-species in terms of Biological taxonomy), namely *muka geni* and *muka kapas*, characterized by distinctive reddish and whitish coloration hair.

Table 2 shows that the people, including those from Sundanese village and Karangwangi, South Cianjur, have the zoological classification of the three taxonomic levels, namely life-forms, genera or species, and sub-species (Iskandar and Iskandar 2016). These animals were categorized based on distinctive morphological characteristics, behavior, time activity, special habitat, and functions.

Morphological characteristics

Animals were categorized based on many factors, including distinctive morphological characteristics. *Naja sputatrix* or *oray sendok*, commonly referred to as spoon snake, is the scientific name for cobra. This poisonous reptile raises the head and neck, expanding like a spoon (*sendok*), when disturbed ready to spit poison from the mouth. Another poisonous snake is *oray welang* (*Bungarus fasciatus*), characterized by a body with striped colors (*welang*), black and white. The bird species *R. javanica* is known as *manuk sapu*, distinguished by a tail shaped like a broom. The taxonomy for *Dicrurus macrocerceus* is *saeran hideung* (*saeran*: drongo, and *hideung*: black, meaning black drongo). Similarly, the species *Ictinaetus malayensis* is commonly known as *elang hideung* or black eagle.

Distinctive behavior

Some animals have local names based on respective distinctive behavior, such as a specific sound. For example, the reptile *Gekko gekko* is called *toké* due to the loud sound made *toké-toke-toke*. Similarly, certain birds, including *dudut* (*Centropus bengalensis*), are distinguished by the following distinctive sound: *dut-dut-dut*. The *ga'ak* (*Corvus enca*) and *kangkangkot* (*Cuculus micropterus*) species make the sound *gaak-gaak-gaak*, and *kangkangkot-kangkangkot-kangkangkot*, respectively. The following bird species *cécéd* (*Dicaeum trochileum*), *toéd* (*Lanius schach*), *piit* (*Lonchura leucogastroides*), *paking* (*Lonchura punctulata*), *bultok* (*Megalaima lineata/Psilopogon lineatus*), *rong-rong* (*Ninox scutulata*), *bueuk* (*Otus lempiji*), *jog-jog* (*Pycnonotus goiavier*), *tikukur* (*Streptopelia chinensis*), and *cekahkéh* (*Todiramphus chloris*) were distinguished by their calls or onomatopoeia. A primate species of *kueung* (*H. moloch*) is also characterized by its call. In addition, *Sitta frontalis*, or *salésér*, is characterized by the creepy (*salessér*) nature of moving to and fro from tree branches and trunks. Other bird species belonging to the Family Nectariniidae, including *Arachnothera affinis* and *A. longirostra*, are commonly called *manuk manyeuseup*, with *manuk* showing bird, while *manyeuseup* or *seuseup* literally means suck up. Ecologically, birds belonging to this Family usually visit inflorescence plants to suck up (*nyeuseup*) honey.

Time activity

Various animals can be classified into two groups based on time activity. Some are active in the day (diurnal) and night time (nocturnal). Most species in Baduy are categorized as diurnal animals (*sato biasa liar peuting*), including birds, namely *O. lempiji*, and the following mammals: *N. javanensis*, *A. cinerea*, and *Paradoxurus hermaphroditus*.

Table 2. The three taxonomic levels of Baduy zoological classification

Level	Class	Common name	English equivalent (Ranking)
0	<i>Sato</i>	Animal	
1	<i>Sasatoan nyusuan</i>	Mammals	Life-forms (primary taxa)
2	<i>Muka</i>	Slow loris	Genera/species (secondary taxa)
3	<i>-Muka geni</i>	Reddish body coloration of slow loris	Sub-species (tertiary taxa)
	<i>-Muka kapas</i>	Whites body coloration of slow loris	

Special habitat

Animals were categorized based on their respective habitat and divided into two groups, namely terrestrial (*sato darat*) and aquatic animals (*sato cai*). In addition, the habitat of the terrestrial animals was divided into three sub-groups, namely forest animals (*sato leweung*, *sato*: animal, and *leuweung*: forest), hamlet animals (*sato*: animal, hamlet: *kampung*), and *sato huma* (*sato*: animal, *huma*: swidden). The following *H. moloch*, *P. comata*, and *G. religiosa* were categorized as forest animals. Bird species such as *L. leucogastroides*, *L. punctulata*, *S. chinensis*, and *Geopelia striata* resided in the swidden field (*huma*). The following species, *Anthreptes malacensis*, *D. trochileum*, and *Orthotomus ruficeps*, were found in the hamlet forest (*leweung lembur*) and can be categorized as hamlet animals. The aquatic animals consisted of several fishes in the Ciujung River, including *Channa gachua*, *Clarias batrachus*, and *Puntius binotatus*.

Functions

Based on the perception of the people, animals (*sato*) may be classified with respect to their diverse ecological, socioeconomic and cultural functions. Considering ecological functions, some animals, such as *L. leucogastroides*, *L. punctulata*, *G. striata*, and *S. chinensis*, are rice pests (rice seed feeder) in swidden farming and are considered as harmful. However, *Apis dorsata* and *A. cerana indica* were considered beneficial because they played an important role as pollinators. Several primates, including *N. javanicus*, *P. comata*, and *H. moloch*, were also regarded as beneficial due to their significant ability to disperse seeds.

In accordance with the socioeconomic functions, certain birds were hunted for consumption and traded to obtain cash, particularly in Outer Baduy. Some birds, including the myth of *Cacomantis* spp., exhibited sociocultural

functions, regarded as an omen. The frequent call of these birds showed accident or disaster, namely a village fire and the death of a hamlet member. Certain primates, namely *T. auratus* and *Macaca fascicularis*, were used as traditional medicine. Meanwhile, other animals, including *T. javanicus*, *M. muntjak*, *Callosciurus notatus*, *Tor douronensis*, *Labobarbus doureionensis*, and *Rasbora lateristriata*, were annually caught for ritual purposes of *kawalu* in Inner Baduy as shown in Table 1.

Hunting animals of Inner Baduy

The Inner Baduy community is known for hunting wildlife and fishing to meet the daily needs of protein sources, as well as for their traditional ceremonies. One such ceremony, the *kawalu* ceremony, is a significant part of their culture, usually celebrated annually. This ceremony is always held after the *huma* rice harvest, according to the traditional calendar of the Baduy people, is a time of great importance, as shown in Table 3.

Hunting for wildlife was carried out based on the Traditional Ecological Knowledge (TEK) deeply rooted in the culture of the Inner Baduy community. The various tools used to hunt wildlife were not purchased from outside Baduy village but made by the people using several materials collected from diverse landscape types, such as mature (*leuweung kolot*) and secondary forests (*reuma*), including swidden fields (*huma*). The hunting of wildlife by the Inner Baduy community was dependent on the adoption of customary rule (*pikukuh*). For example, to determine where to hunt for wild animals, the appropriate day, time, location, and place were calculated using *kolényér*. This wooden divining device was used to determine auspicious directions for engaging in special work (front) and directions (back), as shown in Figures 2.A and 2.B (Iskandar et al. 2019).

Table 3. Annual cycle of swidden rice farming in Inner Baduy of Kanekes Village, Leuwidamar Sub-district, Lebak District, province of Banten, Indonesia

Month	Swidden activities	Ritual
<i>Kasa</i> (January-February)	Harvesting rice of sacred swidden rice (<i>panen huma serang</i>)	First <i>kawalu</i> Ritual (<i>kawalu kahiji</i>)
<i>Karo</i> (February-March)	Harvesting rice of informal leader (<i>panen huma puun</i>)	Second <i>kawalu</i> ritual (<i>kawalu tengah</i>)
<i>Katiga</i> (March-April)	Maintain land of <i>huma serang</i> and harvest of swidden of each household of Inner and Outer Baduy community.	Third <i>kawalu</i> ritual (<i>kawalu tutug</i>).
<i>Sapar</i> (April-May)	Cutting underbrush	Ritual offering swidden product to secular leader (<i>seba</i>)
<i>Kalima</i> (May-June)	Felling & pruning trees	Big ceremony ritual (<i>hajatan</i>); Ascetic ritual (<i>ziarah</i>) conducted at the sacred forest of <i>Sasaka Pusaka Buana</i> upstream of Ciujung and <i>Sasaka Domas</i> upstream of Ciparahiang river.
<i>Kanem</i> (June-July)	Burning vegetation	
<i>Kapitu</i> (July-August)	Re-burning and planting rice	Ritual of sowing rice of sacred swidden field (<i>ngaseuk huma serang</i>).
<i>Kadalapan</i> (August-September)	First weeding	Ritual of <i>ngirab sawan</i>
<i>Kasalapan</i> (September-October)	Second weeding	Ritual of medicinal rice (<i>ngubaran pare</i>)
<i>Kasapuluh</i> (October-November)	Rice season	
<i>Hapit lemah</i> (November-December)	Rice season	
<i>Hapit kayu</i> (December-January)	Rice season	

The specific day for hunting was determined based on day, date, and name *naptu*; for example, *kolényér* is used for providing guidelines to find auspices for time. Furthermore, a day is divided into five periods, namely *isuk isuk* (5.00 to 9.00), *tengah naék* (9.00 to 12.00), *tangangé* (12.00 to 13.00), *lingsir* (13.00 to 14.00), and *burit* (14.00 to 16.00) as shown in Figure 2. The auspicious directions for arriving and leaving a certain area were divided into eight: North (*kalér*), south (*kidul*), west (*barat*), east (*wétan*), South East (*timur kidul*), southwest (*barat daya*), northwest (*barat kalér*), and north East (*kalé wétan*) as in Figure 2. If someone intends to hunt animals on Sunday, the auspicious time must be selected in the afternoon, during *tangangé* and *burit*. Based on the *kolényér*, these times were considered to be more auspicious; the direction of arrival on a Sunday should be from the west, East, and south, while departure must tend towards the north and northeast.

Considering the various calculations and guidelines of the *kolényér*, the hunting of wild animals was carefully carried out by the people. In addition, the exercise was conducted at a specific time and place. This was regarded as traditional wisdom to ensure the sustainability of biodiversity sources, particularly various wild animals. Several traditional hunting tools commonly used by the Inner Baduy community served as toys for children, namely *kancung manuk*, *kancung gedé*, *pitondok*, *pikeplok*, *pipatar*, and *budéng*. The *kancung manuk* and *kancung gedé* were mainly used to catch birds and squirrels,

respectively, as shown in Figure 3 (Iskandar et al. 2019). *Pitondok* and *pikeplok* were used to trap terrestrial animals, while *pipatar* and *budéng* aided in the catching of birds and fish, respectively. During huma rice season, the people intensively engaged in catching seed eater birds, to control damages. Several birds, including *L. leucogastroides*, *L. punctulata*, *G. striata*, and *S. chinensis*, were usually found around the swidden fields. As a result, the people of the Inner Baduy demonstrated their proactive approach to protecting the huma rice fields by installing nets (*pipatar*) around swidden plots shown in Figure 4, inspiring us with their resourcefulness and commitment to their way of life.

The procedure for installing the *papatar* was carried out in several stages, first, prepare the wooden or bamboo poles used to tie the net. Second, put the poles into the ground or tie them to wooden trees. The net is then tied to wooden or bamboo poles, spread across locations around *huma* plots. The area selected to install the net is where the birds usually pass to visit the *huma* plot. Third, after the net had been laid, the people waited at the farm shelter (*saung huma*), watching if any bird would be trapped. Fourth, when a bird is caught, the people waiting at the *saung huma* take it out by lowering the net, pulling out the wooden or bamboo poles, and then tilting the position. Fifth, the birds caught were slaughtered because the people were not used to keeping birds in cages. Therefore, these birds are slaughtered, cooked, grilled, or fried to meet protein needs.

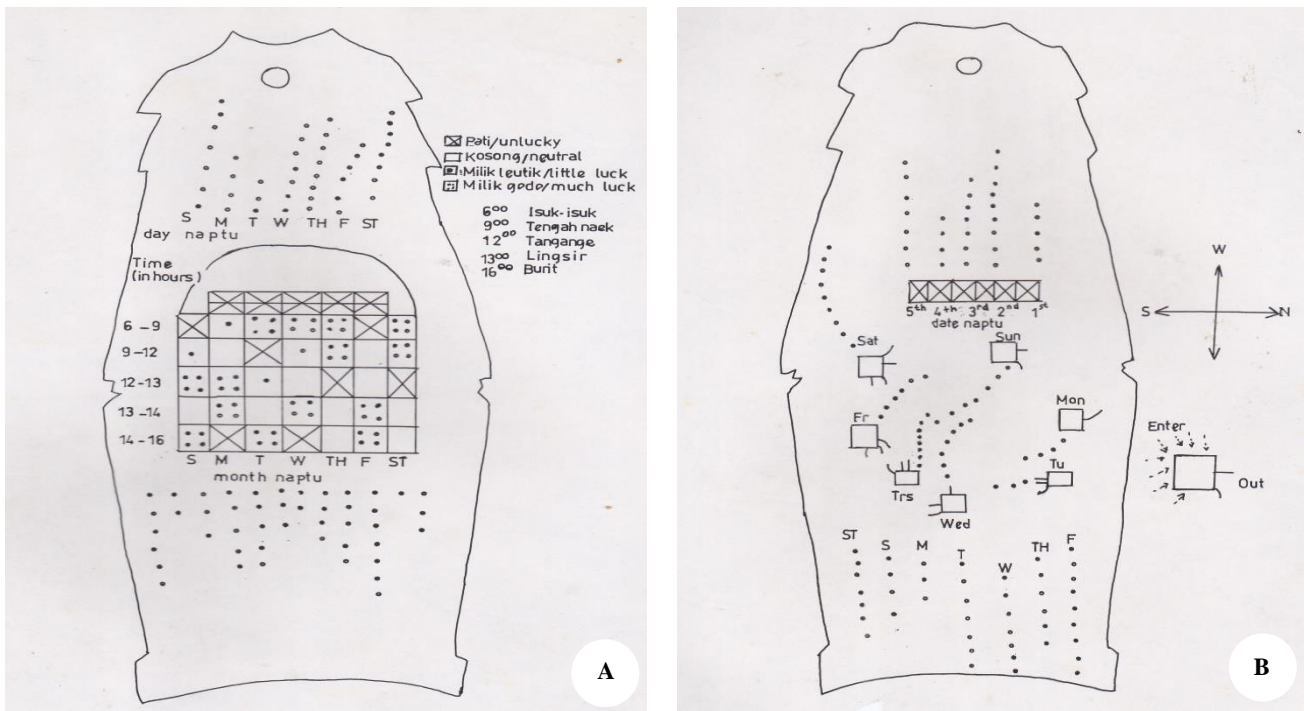


Figure 2. Kolényér made of wood, a divining device used to locate auspicious for engaging in special work A. front and B. back



Figure 3. The *kancung manuk* is being made by a man of the Inner Baduy in the swidden farmhouse (*saung huma*)



Figure 4. Bird net (*papatar*) is installed at the edge of the swidden plot (*huma*) to catch rice-eating birds in the swidden farming

The Inner Baduy community caught fish using bare hands by groping for it under rocks or in holes on river banks (*kokodok*). In certain cases, the people dive (*teuleum*) into the deep river (*leuwi*) to catch fish using bare hands. However, some species of fish were caught with traditional traps, such as *budéng*. This trap containing food such as *sesame seeds/wijen* or *watu* (*Sesamum indicum*) is kept in locations on the river where a lot of fish gather. The *budéng* is placed in a river and sprinkled with sesame seeds, then left for a day or night. The next day, the *budéng* was inspected, and if any fish was caught, it was removed from the buds. After removal, the *budéng* is put back in the river and inspected again the next day.

Inner Baduy people hunt wild animals and fish using various simple tools constructed from materials found in diverse local ecosystems. For example, *Gigantochloa apus*, *Artocarpus elasticus*, *Gnetum latifolium*, *Epipremnum pinnatum*, and *Artocarpus heterophyllus*, including *Hevea brasiliensis* were predominantly fabricated from materials found in various land use types, such as mature (*leuweung kolot* or *leuweung titipan*), secondary (*reuma*), swidden field (*huma*) and hamlet forests (*leuweung lembur* or *dukuh lembur*). *Karet* or para rubber trees were rarely found in the Baduy area. This commercial timber was culturally prohibited in the community (Iskandar et al. 2019). However, para rubber trees were predominantly found in neighboring areas, where the people visited to collect.

The use of local resources to construct various tools for hunting wild animals and fish is regarded as ecological wisdom. All materials were locally available, and the bioresources were continuously used if properly managed. The construction of various traditional hunting tools using local bio-resources was a significant way of conveying TEK to intergenerations. In accordance with Baduy tradition, children learn to make equipment for catching various wildlife and fish from an early stage. This was because in the community, particularly Inner Baduy, the tools served as toys and were mainly considered children's work (*pagawean barudak*) (Alif 2016). Therefore, the

participation of children in making hunting tools played a significant role in the learning process. TEK was conveyed from one generation to another (Franco et al. 2015; Iskandar 2018; Waluya et al. 2023).

The conveyance of TEK in the rural community was conducted in three phases: parental, peer, and individual learning based on gender (Pam et al. 2018). Parental learning is the teaching of children by parents, a process passed from one generation to another or vertical cultural transmission. Both parents impacted knowledge; the girls and boys were taught by the mothers and fathers, respectively. Peer learning is the sharing of knowledge among teenage groups, also termed horizontal cultural transmission. This process of peer learning emphasizes the sense of community and the importance of shared knowledge. The socialization process was realized through individual adults; hence, the intensive participation of the children in constructing and using various hunting tools was regarded as a process of instilling the relevant skills for preparation for adulthood. For example, the ability of the children to construct and install *pipatar* in the swidden field (*huma*) represented the impacted knowledge of using various plants as tools and understanding bird species and behaviors, including biotic components, namely wind direction, and climate.

Hunting animals for *kawalu* ritual

Based on Baduy tradition, there are six main obligations of daily activities in the middle world (*buana tengah*) (Iskandar and Iskandar 2023). This included, (i) to ensure the sacred *Sasaka Pusaka Buana*; (ii) *Sasaka Domas* were located upstream of the Cijung and Ciparahiang Rivers, Inner Baduy, respectively; (iii) to protect the King, Sultan, or President and noble families; (iv) conduct ascetic rituals for thirty-three hamlets, sixty-five rivers, and twenty-five regions; (v) hunt animals and fish for the *kawalu* ritual; (vi) burn incense during ascetic, *kawalu* and *ngalaksa* rituals.

Swidden farming, the *kawalu* ceremony, as well as hunting of wild animals and fishing after harvesting, was

considered an obligation of Baduy community. Therefore, each Inner and Outer Baduy household worked in their respective fields annually, following the traditional calendar. After the harvest, the *kawalu* ceremony was celebrated in Cibeo, Cikertawarna, and Cikeusik hamlets as an offering to the ancestors. The *kawalu* ritual was annually conducted in the month of *kasa* (january to february), *karo* (february to march), and *katiga* (march to april) based on baduy calendar, after harvesting rice from the sacred swidden field (*huma serang*), by the informal leader (*huma puun*), and each household in both communities, as shown in Table 3.

The first (*kawalu kahiji*) and second *kawalu* (*kawalu kadua*) were attended by some people from the outer baduy community. However, all household representatives needed to attend the third *kawalu* (*kawalu tutug*). Each household must bring the prepared harvested rice, a symbol of our unity and hard work, eaten together to break the fasting, a tradition that holds deep cultural significance.

In the Inner Baduy community, a sense of unity prevails as several preparations were made ten days before *kawalu*, including hunting animals using a net constructed from bark fiber of *teureup* (*A. elasticus*) three times. Furthermore, in Cibeo, men hunt mouse deer (*peucang-T. javanicus*) and squirrel (*buut-C. notatus*) on days 8, 9, and 10 of the months of *kawalu* under the directive of the informal leader (*Puun*), using a special tightly woven bark cloth net (*lanjak kerep*). On day 11, hunting ceased, and a survey of the secondary forest (*ngalasan*) for the footprints of barking deer (*mencek-M. muntjak*) was conducted. Barking deer is hunted on days 12, 13, and 14, using a large net (*lanjak carang*) similar to those used in catching squirrel and mouse deer. For the final exercise, on days 15 and 16, squirrel and mouse deer were hunted again. In addition, various fish species from Ciujung River, namely sosoro or kancra (*L. doureonensis*), paray (*R. lateristriata*), and shrimp (*hurang-Crustaceae*) were caught for *kawalu* ritual.

Hunting of wild animals for performing *kawalu* rituals was carefully conducted, with time, location, and place calculated using *kolenyer*. This wooden divining device was used to determine auspicious directions for engaging in special work (front) and locations (back), as shown in Figures 2.A and 2.B. Since the hunting of wildlife was conducted based on the TEK, rooted in culture, the population of these animals had not dramatically decreased in Inner Baduy forest ecosystems.

Changes in animal hunting in Outer Baduy

Baduy community considered the diverse bird species as the protein source, environmental indicator, the inspiration for folk stories and mystical activities. Some that predominantly visited swidden fields to eat rice seeds during the harvesting season were caught with *pipatar*, killed, and consumed as a source of protein. Meanwhile, certain bird species were used as indicators of seasonal changes and natural human disasters. For example, the frequent sound of Indian cuckoo (*kangkangkot-C. micropterus*) predicted the transition from dry to wet season, including the *gedé paré* or rice season in Inner Baduy. The people also believed that a village fire and the

death of a hamlet member were predicted by the frequent call of Plaintive cuckoo (*aéh-aéh*, *Cacomantis merulinus*). The *lok-lok* sound made by an owl was believed to be possessed by an evil spirit and, therefore, feared.

The increasingly dense population, intensive market penetration, and advanced technology for hunting wild animals changed the perception of the people significantly, specifically the Outer Baduy community, regarding wildlife. For example, the use of traditional tools, including those purchased outside the village. Presently, birds are caught in the Outer Baduy forest area, with adhesive sap from *teureup* (*A. elasticus*), jackfruit (*A. heterophyllus*), and rubber trees (*H. brasiliensis*), as well as the use of nylon netting. These nets were purchased at shops selling fishing equipment in the district capital, Rangkasbitung City. Various species of birds were caught by taking the chicks from the nest, using adhesive sap from plants (*dileugeut*), and nylon netting. These birds were either consumed or kept in cages hung at homes. In addition, the birds were not kept as pets, and rather these were sold to generate income for the household.

The Outer Baduy people specialized in hunting birds for sale to generate income for their household. The bird hunters use nylon netting (*jaring nilon*) containing adhesive gum (*leugeut*). The species caught were stored in cages and hung in front of the house. When a sufficient number was caught, the birds were sold to the village middlemen (*pengepul*), non-Baduy residing in neighboring Kanekes Village. Furthermore, these were resold in the village or at the bird market in the district capital, Rangkasbitung City. The custom of both Outer and Inner Baduy differs, with many people from the Outer Baduy keeping birds in cages.

Discussion

Initially, several birds were kept in cages by taking chicks from nests in the secondary forest (*reuma*) and swidden fields (*huma*) or by making purchases. Due to the increase in demand for live birds in non-Baduy areas, the price was higher. Consequently, some Outer Baduy people caught birds for the sole purpose of making purchases. For example, some people in Kaduketug were known to sell these birds to generate cash income. The birds were caught using plant sap (*leugeut*), including *teureup* (*A. elasticus*), and mist net made of nylon. The various species were sold to the middlemen in neighboring Baduy villages, including Leuwidahu and Bojongmenteng. The prices were between Rp 50.000 and Rp 500.000 in 2017, depending on the species. Table 1 shows that the species purchased by Outer Baduy include *Copsychus saularis*, *Zosterops palpebrosus*, *Aegithina tiphia*, *A. bres*, *Parus major*, *A. malacensis*, *Oriolus chinensis*, *C. cochinchinensis*, *Pycnonotus melanicterus*, and *P. atriceps*.

Several species are currently being caught, and the rural people have taken to the hobby of bird keeping and contest of the songs in urban areas of Indonesia (Iskandar 2017). Due to the alarming increase in demand, the prices are higher, and consequently, some rural people tend to engage in bird catching. It was predicted that the illegal bird catching in Outer Baduy would increase if the informal

leaders (*puun*) and staff did not prohibit, supervise and severely punish the perpetrators in the area.

In the Inner Baduy community, the hunting of wild animals was strongly based on customary law. For example, before engaging in the art, the suitability of time, date, and place must be considered. The process cannot be freely carried out at any place and time. The customary rules provide an opportunity for the population of animal species to increase in rural ecosystems due to the lack of exhaustive hunting. The process does not exceed the regeneration rate, while the population stock decreases slightly (Iskandar et al. 2019). This is due to a delicate balance between the rate of birth or regeneration and death due to natural causes or hunting, underscoring the importance of maintaining this equilibrium.

Lack of hunting regulations with respect to place, day, and time, as commonly practiced by non-Baduy hunters, led to a significant decrease in animal population. This was because the rate of output from the population stock in the form of natural death or due to hunting was higher compared to the regeneration or breeding process. The hunting of various wild animals in the Inner Baduy community is not intensive because the purpose was mainly for subsistence economic needs, daily consumption, traditional ceremonies, and as an effort to control rice pests in *huma*. However, the tradition of keeping wild animals, including bird species, is not common practice in the Inner Baduy community. The people tend to capture a few wild animals, considering the use of traditional tools instead of modern implements. Consequently, the catching of fish with bare hands is reasonable compared to using modern hunting tools (Iskandar et al. 2019; Yuda and Kusri 2022). The traditional zoological knowledge of Baduy to use a tool to capture a variety of wild animals sustainably is in line with the concept of nature conservation, highlighting the community's balanced approach to hunting and conservation (Ulicsni et al. 2019; Dawson et al. 2021).

The Outer Baduy community is located in a less sacred area compared to Inner Baduy. The people interact intensively with non-Baduy residents, and the market economy system has a stronger influence. Consequently, the hunting system differed; for example, the procedure for determining the places, days, and hours for hunting wild animals was no longer adopted. The purpose of capturing various species is for consumption, pets, and trading commodities. In addition, both traditional and modern hunting tools were adopted. The outcome of hunting diverse bird species is for subsistence economic system, commercial purposes, and to generate income for the household. The adopted market economy has changed the perception concerning the hunting activity, purpose, and use of many equipment (Permana et al. 2019; Yuda and Kusri 2022); socioeconomic factors also impacted these changes in Baduy communities. Additionally, many people from West Papua have adopted new ways of hunting animals in recent years using advanced equipment, the participation of new actors, and the frequency of the process (Sawaki et al. 2022; Fatem et al. 2023).

The hunting procedures adopted by the Outer and Inner Baduy communities differed. Meanwhile, a contributing

factor is the change from the purpose of hunting various wild animals for the benefit of subsistence to the market economy system. The impact can lead to the exhaustive exploitation of various wild animals and a significant decrease in population. Therefore, in order to conserve the diversity of wildlife in the Outer Baduy area, the customary rules must be seriously enforced with the supervision of the traditional leaders (*Puun*) and staff.

The research on the TEK of diverse animals, folk classification, and hunting exercises conducted by Baduy community using an ethnozoological method enabled the understanding of existing ecological processes and problems. It was also discovered that the community had diverse fauna. Since animals, cultural, and linguistic diversities were strongly correlated, the people had a rich knowledge of diversity and folk taxonomy. Additionally, there are three taxa levels of Baduy zoological classification, namely primary, or life form, secondary, or species, and the third taxa categorized as race or subspecies. Animals were classified based on distinctive morphological characteristics, specific behavior, time activity, special habitat, and functions. This showed the hidden reality, as well as the ecological wisdom in managing the environment and economic system, specifically in relation to animal hunting. Based on tradition, some wildlife and fish were used to perform annual rituals after harvesting rice and consumed as a protein source. Several traditional tools and methods were commonly adopted for hunting wild animals. All tools were constructed from materials obtained from the local ecosystems, including mature forest (*leuweung kolot*), secondary forest (*reuma*), swidden field (*huma*), and hamlet forests (*leuweung lembur* or *dukuh lembur*).

Based on recent developments, the Outer Baduy community has encountered significant socioeconomic and cultural changes. In comparison, the majority of the Inner Baduy people hunted wildlife in line with processes strongly rooted in culture. Time, location, and hunting methods were traditionally calculated, and the captured animals were mainly used for subsistence. The traditional custom of hunting animals, considering time, location, and appropriate methods, was rarely adhered to by some Outer Baduy due to external influence. Currently, the hunted animals, particularly birds are sold. Economic changes also affected household income and production, including material and moral ethics in daily interaction with the environment, as well as usage patterns of wildlife biodiversity. This has led to the need to consider sustainable bioresource usage and nature conservation, both biophysically and socioeconomically. It is not just a suggestion but a responsibility that we must uphold. Furthermore, the integration of TEK and Scientific Western knowledge for appropriate nature conservation is crucial (Hoagland 2016; Kadykalo et al. 2020; Lauter 2023; Sampson et al. 2024).

In conclusion, we can say that the Baduy area has high animal diversity because it has various animal habitats, including hamlet forest, secondary forest, swidden, traditionally protected mature forest, and river. In addition, traditional animal hunting, particularly in Inner Baduy, has

been mainly used for economic subsistence, pest control in swidden farming, and ritual purposes. We recorded 90 species of birds, 16 mammals, 14 fishes, 10 insects, and 9 reptiles known by the Baduy. Regarding the animal folk taxonomy, the Baduy community has knowledge at least three taxonomic levels, including life forms, genera/species or secondary taxa, and species/sub-species or tertiary taxa. The Baduy wildlife hunting has traditionally been based on Traditional Ecological Knowledge and beliefs. Consequently, the Baduy wildlife animals have traditionally been conserved. In general, the traditional people of Baduy have an important role in the conservation of wildlife. Recently, however, due to the changing sociocultural of the Outer Baduy, including the intensive market economic penetrations, some birds have been hunted for trading to get additional household cash income. As a result, to conserve wildlife, the economic, sociocultural, and ecological aspects must be considered holistically.

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