Overview of the traditional Indonesian knowledge on the use of reptiles

Ani Mardiastuti1*, Burhanuddin Masy'ud1, Lin N Ginoga1, Hafiyyan Sastranegara1 and Sutopo1

1 Department of Forest Resources Conservation and Ecotourism, Faculty of Forestry and Environment, IPB University, Bogor, 16680, Indonesia

* anipb@indo.net.id

Abstract. Local people in many parts of Indonesia have long utilized reptiles (snakes, turtles, lizards) and their products for various purposes. Nation-wide data on the species and its use by local people, however, is still lacking. This paper aimed to provide an overview of the nation-wide traditional use of reptiles by the local people. The data were collected and collated from 42 relevant papers published in the last twenty years (2001-2019). Of the available data from 19 provinces, 59 reptile species have been recorded being used by local people, categorized into indigenous/folk medicine (47 species), food/protein source (20 species), part of traditional and culture (11 species), subsistent income generation (10 species), ecological reasons (6 species), venom extraction (2 species), and pet (1 species). In general, reptiles were mostly used as a remedy for skin diseases, while large-sized species were commonly used for subsistent income generation and or as a protein source. The reptiles could also be used as part of the traditional and culture (e.g., ritual ceremony, good omen/charm, and bad sign). Although Indonesia consists of many islands, there are many common or similar traditional knowledge of the local people resided on different islands.

1. Introduction

Traditional knowledge commonly refers to “the knowledge, innovations and practices of indigenous and local communities related to genetic resources, which has been developed through the experiences of communities over centuries, adapted to local needs, cultures and environments and passed down from generation to generation” [1]. For various everyday purposes, the local communities rely on biological resources around them. In return, the traditional knowledge has helped maintain and preserve biodiversity, at least surrounding their homes or villages.

Traditional knowledge is closely linked to ethnobiology. Based on the research object, ethnobiology can be divided into ethnobotany and ethnozoology. Ethnozoology is defined as “the study seeks to understand how humans have perceived and interacted with faunal resources throughout history” [2]. Within the ethnozoology, there is a topic that plays a significant role in the daily practice of the local people, namely the use of local species as traditional medicine. Traditional medicine is defined as the knowledge and practices used in the diagnosis, prevention and elimination of various sickness (either physical, mental or social imbalances) and relying on practical experience and observation that passing down from generation to generation [3]. This system of health care of the local people verbally is known as ethnomedicine, indigenous medicine, or folk medicine [4].
Among the vertebrates, reptiles are among the wildlife species most frequently used in traditional ethnomedicine worldwide [5]; [6]; [7]. Until now, there was no information related to the traditional knowledge on the use of reptiles in the nation-wide scale. Some research has been conducted in small-scale sites, but of course, these research need to be collected and analyzed accordingly to get national data. This paper aimed to provide an overview of the national-wide traditional use of reptiles by the local people of Indonesia. In the future, this information can be used as a base for further research related to the sustainable use of wildlife resources and bioprospecting.

2. Method

2.1. Data collection and analysis

Data and information were collected from the 42 published papers, in English and Indonesian language. The location of the study sites, however, was not evenly distributed within the Indonesia’s biogeographic regions. Most data were from the western part of Indonesia (Oriental Realm): Java (n=13, e.g. [8]; [9]; [10]; [11]), followed by Sumatra (n=11, e.g. [12]; [13]; [14]; [15]), and Kalimantan (n=10, e.g. [16]; [17]; [18]; [19]). Very few data were reported from Papua (n=3), Sulawesi (n=1), Maluku (n=1), and even none from Nusa Tenggara. Three other papers were across region (e.g. [20]).

The data were organized on a database and analyzed accordingly (Figure 1). The database contained the location of the data collection, reptile species and its respective grouping, as well as the use of reptiles. Reptile species were grouped based on its respective taxonomic grouping: snakes (Serpentes), lizards and geckos (Varanids and Geckos), turtles (freshwater turtles and tortoises, sea turtles; Testudines), and a crocodile (Crocodilia). Some taxa that were not able to be identified to species level were identified at the genus level, making sure that there was no possible overlap with its corresponding species level.

The number of species used by the local people compared to the total number of respective group in Indonesia. Considering that there was no reference book for the number of groups within Reptilia Class in Indonesia, the number was accessed from an online reptile database (reptile-database.reptarium.cz) [21]. Traditional knowledge of the use of reptiles by the local people was grouped into seven categories, namely traditional medicine (also known as indigenous/folk medicine), source of economic income, food (mainly as additional protein, also known as bushmeat), kept as a pet, venom extraction, linked to culture and belief, and linked to ecology.

![Figure 1](image-url)
3. Results and discussion

3.1. Results
All over Indonesia, 59 reptile species have been used by the local people (Table 1), dominated by snakes (40.7%), both venomous and non-venomous snakes. Lizard-like reptiles, either large-sized (lizard group) or a small size (gecko group) were also used quite intensively by the local people. Turtles of all varieties, including sea turtles, freshwater turtles, land tortoise, and soft-shelled turtles, were extracted from the wild for various use. The local people surprisingly use large and dangerous crocodiles as well.

The local people have a rich knowledge of the reptile use for various purposes in their daily life. Overall, the use of reptiles as traditional medicine was dominant (79.6%) and stood out among other uses. A certain reptile species very often have multiple medicinal values and thus can be used to treat more than one sickness. Likewise, different species of reptiles can be used to treat the same illnesses. The knowledge that particular reptile species has medicinal purposes is essential for the local people, considering that many of the local people live in remote areas and, thus, may be quite far from the formal health facilities.

The second rank of the common use of reptiles was for food, mainly large-sized turtles and snakes, followed by for culture, income, and ecology. Further, two snake species (i.e. King Cobra and Wagler's Pit Viper) were extracted for their venom, while one tortoise species was reported to be kept as a pet.

Based on taxon, almost all snakes (87.5%) were used for medicinal purposes, while some species linked to the culture and ecological service. Lizards and geckos were also used mostly for traditional medicine. Turtles were mainly harvested for food, as well as traditional medicine. As for crocodiles, despite their large size, surprisingly they were used mostly for traditional medicine, although the Saltwater Crocodile was also reported being harvested for food as well.

Traditional knowledge of Indonesia people that have been identified from this research revealed that nine species considered as multi-purpose species, as they have diverse use for the local people (Table 2). These species were represented from all for four groupings, indicated that the taxa of reptiles were essential for the everyday use of the local people. Among the nine species that categorized as multi-purpose reptiles, King Cobra has the most diverse use among all (Table 3). This species has been used as a medicine, source of income, food, venom source, link to culture, and beneficial for ecological services. There was no record of this species as a pet from the published papers/report, although this venomous snake could be kept as a pet as well.

Concerning culture, reptiles played essential roles to the local people in Indonesia, including for various ceremonies, as good omen/charms, or signs of bad events. The local people also understand well that snakes have ecological roles as pest control, by preying some unwanted species such as mice and rats in rice fields. Besides, snake venoms in some areas were extracted and used by the local people to poison their traditional darts for hunting (Table 4).

Table 1. Diversity of reptiles used by the local people based on categories (black dots).

| No | Species Latin Name                  | Medicine | Income | Food | Pet | Venom | Culture | Ecology |
|----|------------------------------------|----------|--------|------|-----|-------|---------|---------|
| 1  | Little File Snake *Acrochordus granulatus* | ●        | ○      | ○    | ○   | ○     | ○       | ○       |
| 2  | Javan File Snake *Acrochordus javanicus* | ●        | ○      | ○    | ○   | ○     | ○       | ○       |
| 3  | Gold-ringed Cat Snake *Boiga dendrophila* | ●        | ○      | ○    | ○   | ○     | ○       | ○       |
| 4  | Radiated Ratsnake *Coelognathus radiate* | ●        | ○      | ○    | ○   | ○     | ○       | ●       |
| 5  | Chinese Ratsnake *Ptyas korros*       | ●        | ○      | ○    | ○   | ○     | ○       | ●       |
| 6  | Oriental Ratsnake *Ptyas mucosus*     | ●        | ○      | ○    | ○   | ○     | ○       | ○       |
| 7  | Banded Keelback *Xenochrophis vittatus* | ○        | ○      | ○    | ○   | ○     | ○       | ●       |
| No | Species Latin Name                                      | Medicine | Income | Food | Pet | Venom | Culture | Ecology |
|----|--------------------------------------------------------|----------|--------|------|-----|-------|---------|---------|
| 8  | Blue Krait *Bungarus candidus*                          | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 9  | Banded Krait *Bungarus fasciatus*                       | ●        | ○      | ○    | ●   | ○     | ●       | ○       |
| 10 | Blue Malaysian Coral Snake *Calliophis bivirgatus*      | ●        | ○      | ○    | ○   | ○     | ●       | ○       |
| 11 | Spitting Cobras *Naja sp.*                              | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 12 | Indonesian Cobra *Naja sputatrix*                      | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 13 | Equatorial Spitting Cobra *Naja sumatranana*            | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 14 | King Cobra *Ophiophagus hannah*                         | ●        | ●      | ○    | ○   | ●     | ○       | ●       |
| 15 | Line's Water Snake *Homalopsis bucca*                    | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 16 | Sumatra Python *Python curtus*                           | ●        | ○      | ●    | ○   | ●     | ○       | ○       |
| 17 | Indian Rock Python *Python molurus*                      | ●        | ●      | ○    | ○   | ●     | ○       | ○       |
| 18 | Reticulated Python *Malayopython reticulatus*           | ●        | ●      | ○    | ○   | ●     | ○       | ○       |
| 19 | Python Snake *Python sp.*                                | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 20 | Flowerpot Snake *Rhamphotyphlops braminus*              | ○        | ○      | ○    | ○   | ●     | ○       | ○       |
| 21 | Malayan Pit Viper *Calloselasma rhodostoma*             | ●        | ○      | ●    | ○   | ●     | ○       | ○       |
| 22 | Pit Viper Snakes *Trimeresurus sp.*                     | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 23 | Wagler's Pit Viper *Tropidolaemus wagleri*             | ○        | ○      | ●    | ○   | ●     | ○       | ○       |
| 24 | Sunbeam Snake *Xenopeltis unicolor*                     | ●        | ○      | ○    | ○   | ●     | ○       | ○       |

**Lizards and Geckos**

| No | Species Latin Name                                      | Medicine | Income | Food | Pet | Venom | Culture | Ecology |
|----|--------------------------------------------------------|----------|--------|------|-----|-------|---------|---------|
| 25 | Lizards *Bronchocela sp.*                               | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 26 | Flying Lizards *Draco sp.*                              | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 27 | Common Flying Dragon *Draco volans*                     | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 28 | Peter's Forest Dragon *Gonocephalus doriae*             | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 29 | Tropical Forest Dragon *Gonocephalus liogaster*        | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 30 | Weber's Sailfin Lizard *Hydrosaurus weberi*             | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 31 | Tokay Gecko *Gekko gecko*                               | ●        | ○      | ●    | ○   | ●     | ○       | ●       |
| 32 | Common House Gecko *Hemidactylus frenatus*              | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 33 | Flat-tailed House Gecko *Hemidactylus platyurus*        | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 34 | House Gecko *Hemidactylus sp.*                         | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 35 | Lizards *Lacertidae sp.*                                | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 36 | Asian Grass Lizard *Takydromus sexlineatus*             | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 37 | Borneo Skink *Apterygodon vittatum*                     | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 38 | Olive Tree Skink *Dasia olivacea*                       | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 39 | Common Sun Skink *Eutropis multifasciata*               | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 40 | Skink Lizard *Eutropis sp.*                             | ●        | ○      | ○    | ○   | ●     | ○       | ●       |
| 41 | Rough Mabuya *Mabuya rudis*                             | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 42 | Dumeril Monitor *Varanus dumerilii*                     | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 43 | Roughneck Monitor *Varanus radicolli*                   | ○        | ○      | ●    | ○   | ●     | ○       | ●       |
| 44 | Common Water Monitor *Varanus salvator*                 | ●        | ●      | ○    | ○   | ●     | ○       | ●       |
| 45 | Monitor Lizard *Varanus sp.*                            | ●        | ●      | ○    | ○   | ●     | ○       | ●       |

**Turtles**

| No | Species Latin Name                                      | Medicine | Income | Food | Pet | Venom | Culture | Ecology |
|----|--------------------------------------------------------|----------|--------|------|-----|-------|---------|---------|
| 46 | Green Sea Turtle *Chelonia mydas*                       | ●        | ○      | ○    | ○   | ○     | ○       | ○       |
| 47 | Sea Turtles *Cheloniiidae*                              | ○        | ●      | ○    | ○   | ●     | ○       | ○       |
| 48 | Painted Terrapin *Batagur borneoensis*                  | ●        | ○      | ○    | ○   | ●     | ○       | ○       |
| 49 | Asian Leaf Turtle *Cyclemys dentata*                    | ●        | ●      | ○    | ○   | ●     | ○       | ○       |
| 50 | Turtles *Geoemydidae sp.*                               | ●        | ●      | ○    | ○   | ●     | ○       | ○       |
| 51 | Malayan Flat-shelled Turtle *Notochelys platynota*      | ○        | ○      | ●    | ○   | ●     | ○       | ○       |
Table 2. Percentage of the use of reptiles, based on reptile grouping.

| Use Category | Snakes | Lizards | Turtles | Crocodiles | Reptiles | Percentage |
|--------------|--------|---------|---------|------------|----------|------------|
| Medicine     | 21     | 15      | 8       | 3          | 47       | 79.7       |
| Income       | 3      | 3       | 3       | 1          | 10       | 16.9       |
| Food         | 4      | 7       | 8       | 1          | 20       | 33.9       |
| Pet          | 0      | 0       | 0       | 0          | 1        | 1.7        |
| Venom        | 2      | 0       | 0       | 0          | 2        | 3.4        |
| Culture      | 3      | 5       | 2       | 1          | 11       | 18.6       |
| Ecology      | 5      | 1       | 0       | 0          | 6        | 10.2       |

Number of species being used on each use: 47, 10, 20, 1, 2, 11, 6. Percentage: 79.6, 16.9, 33.9, 1.7, 6.9, 18.6, 10.2.

Total species used: 24, 21, 11, 3, 59. Total species in Indonesia: 363, 370, 34, 4, 771. Percentage: 6.6, 5.7, 32.4, 75.0, 7.7.

Table 3. List of species that considered as multi-purpose species (i.e. has at least three out of seven use categories).

| Species | Use Category |
|---------|--------------|
| King Cobra *Ophiophagus hannah* | Medicine, income, food, venom, culture, ecology |
| Reticulated Python *Malayopython reticulatus* | Medicine, income, food |
| Tokay Gecko *Gekko gecko* | Medicine, income, ecology |
| Common Water Monitor *Varanus salvator* | Medicine, income, food |
| Monitor Lizard *Varanus sp.* | Medicine, income, food, culture |
| Sea Turtles *Cheloniidae sp.* | Income, food, culture |
| Turtles *Geoemydidae sp.* | Medicine, income, food |
| Tortoises *Testudo sp.* | Medicine, food, pet |
| Saltwater Crocodile *Crocodylus porosus* | Medicine, income, food |
Table 4. Cultural and ecological values of reptiles

| Values       | Examples                                                                 |
|--------------|---------------------------------------------------------------------------|
| Cultural     | ● End of the year ceremony, welcoming new year ceremony, and traditional marriage ceremony (Weber's Sailfin Lizard, Monitor Lizard) |
|              | ● Magical ritual and ceremony (Monitor Lizard, Sea Turtle)                |
|              | ● Good omen/charm (Sunda Gavial, Flat-tailed House Gecko, Common House Gecko, Dumeril Monitor, Monitor Lizard) |
|              | ● Bad sign/charm (Malayan Flat-shelled Turtle, Flat-tailed House Gecko, Blue Malaysian Coral Snake, Malayan Pit Viper) |
| Ecological   | ● Pest control - prey on agriculture pests (Radiated Ratsnake, Chinese Ratsnake, Banded Keelback, King Cobra, Flowerpot Snake, Tokay Gecko) |
| Venom        | ● Venom could be used as dart poison (King Cobra, Wagler's Pit Viper)      |

3.2. Discussion

Taxonomically, reptiles are diverse, encompass snakes, skinks, small-sized lizards, large-sized lizards, sea turtles, freshwater turtles, soft-shelled turtles, tortoises, and crocodiles. Furthermore, reptiles also can be easily found near local people’s vicinity. Some species even were easy can be found surrounding the local people’s house, including tokay gecko [20]; [22] and house gecko [11]. There is no doubt that reptiles were popular amongst the local people in Indonesia, as well as worldwide, to be used for various daily purposes. Among the use, this study showed that traditional medicines were dominant, amounted about 80% for local Indonesian people.

Research on the medicinal reptiles worldwide [23] unveiled that there were 284 reptile species used in traditional medicine, making these taxa as the most used wildlife species among other taxa. Based on countries, reptiles were widely used many parts of the world, especially in the countries where traditional people are dominant, including in Brazil [5], India [6]; [24], Cambodia [25], and Ethiopia [26]. The term ‘herpeto-medicine’ (e.g., [23]) even has been used to denotes the use of herpetofauna as traditional medicines.

Traditional medicine - as well as traditional knowledge in general - on the use of specific biological resources can be passed down to the next generation verbally or in writing [3]. In Indonesia, written information on traditional medicine is exceptionally lacking, leading to an assumption that the knowledge has been transferred inter-generation through verbal means. Published popular book (e.g. [20]; [27]; [28]) were available, explaining the use of various animal species (including insects and other non-vertebrates) as traditional medicine. Reptile species listed in those books were minimal, for example, Asiatic Softshell Turtle, Common Sun Skink, Tokay Gecko, House Geckos, and King Cobra. The collective knowledge within the traditional people all around Indonesia was much more intensive and so far was not adequately written for public knowledge. In Indonesia, the published studies on this subject were relatively small. The number of medicinal reptiles species used may be much greater than that were recorded here.

Beside for traditional medicine, about 34% of reptile species were used as food, mainly large-sized species such as Asiatic Softshell Turtle, Reticulated Python, and Common Water Monitor. Asiatic Softshell Turtle even has been known to be profitable exported products due to their meat [29]. Reticulated Phytons also very popular for their skins, to be used for various products. In this research, there was no data on the use of reptiles for skins, although the export data on Reticulated Python [30] and Common Water Monitor [31] were considerably high. There is a possibility that the local people in the sampled study were not involved in the intensive harvest for the export destination.

As for the Common Water Monitor, a study in West Java [32] reported that the monitor was consumed because of its meat novelty, health or medical benefit, and perceived as aphrodisiacs. This research indicated that local people have adequate knowledge that some reptiles had many uses. The multiple-use of a certain reptile species would be beneficial for the local people, as long as the harvest
was for subsistence only. When the commercial harvest is involved, indeed the harvest has to be strictly managed or controlled to ensure its sustainability.

Indonesia consists of many islands within its seven bioregions. There were many common or similar traditional knowledge of the local people residing in different islands. This fact indicated that the traditional benefit gained from the reptiles, specifically for herpeto-medicine, was universal within the Indonesian Archipelago. There could be some kind of chemical substances that were indeed a remedy for a particular illness. Further scientific research is needed in the future in order to utilize our biodiversity resources in an optimum way under the sustainable harvest concept.

4. Conclusion
This study concluded that there was a strong traditional knowledge on the use of reptiles by local people in Indonesia, mostly (almost 80%) for traditional medicine, followed by for food/protein source (about 34%). Of all 59 commonly used reptile species, King Cobra had the most diverse uses. Further research should focus on how to use the reptiles as alternative medicine by studying the chemical substance as a remedy of a particular illness, and also for bioprospecting in the future.

Acknowledgements
This research was funded by the Ministry of Research and Technology/National Research and Innovation Agency, the Government of Indonesia, contract number 2519/IT3.L1/PN/2020 and 4004/IT3.L1/PN/2020 (Amendments; under the scheme of PDUPT (Penelitian Dasar Unggulan Perguruan Perguruan Tinggi) fiscal year 2020).

References
[1] [CBD] Convention on Biological Diversity 2011 Traditional Knowledge (Montreal: Convention on Biological Diversity)
[2] Alves R R N 2017 Ethnozoology (New Jersey: John Wiley & Sons Inc) doi:10.1002/9781119179313.wbprim0166
[3] [WHO] World Health Organization 2013 WHO Traditional Medicine Strategy 2014-2023 (Geneva: WHO)
[4] Belay J 2016 Ethnobotanical Study of Traditional Medicinal Plants Used by Indigenous People of Jigjiga Woreda, Somali Regional State. Ethiopia (Ethiopia: Haramaya University)
[5] Alves R R N and Alves H N 2011 The faunal drugstore: animal-based remedies used in traditional medicines in Latin America J. Ethnobiol. Ethnomed. 7(9)
[6] Mahawar M M and Jaroli D P 2008 Traditional zootherapeutic studies in India: a review J. Ethnobiol. Ethnomed. 4
[7] Zhou Z and Jiang Z 2004 International trade status and crisis for snake species in China Conserv. Biol. 18 1386-1394
[8] Kartikasari D 2008 Keanekaragaman Jenis dan Nilai Ekonomi Satwa Liar yang Digunakan sebagai Obat di Jawa Tengah (Bogor: Institut Pertanian Bogor)
[9] Sudardi B 2011 Deskripsi antropologi medis: manfaat binatang dalam tradisi pengobatan Jawa Jumantara 2 57-79
[10] Partasasmita R, Iskandar J and Malone N 2016 Karangwangi’s people (South Cianjur, West Java, Indonesia) local knowledge of species, forest utilization, and wildlife conservation Biodiversitas 17 154-161
[11] Husain F and Wahidah B F 2019 Identification of medicinal animals in traditional medicine in rural Central Java: a preliminary result of ethno-zootherapeutical study International Conf. on Rural Studies in Asia: Advances in Social Science, Education and Humanities Research 313
[12] Hamdani R, Tjong D H and Herwina H 2013 Potensi herpetofauna dalam pengobatan tradisional di Sumatera Barat J. Bio. UA. 2 110-117 ISSN:2303-2162
[13] Afriyansyah B, Hidayati N A and Aprizan H 2016 Pemanfaatan hewan sebagai obat tradisional oleh Etnik Lom di Bangka J. Penelitian Sains 18 66-74
[14] Masyithah, Hariyadi B and Kartika W D 2016 Kajian etnozoologi hewan yang dikonsumsi pada komunitas Orang Rimba di Taman Nasional Bukit Duabelas Kabupaten Sarolangun Bio-site 2(2) 10-18 ISSN:2502-5243

[15] Nukraheni Y N, Afriyansyah B and Ilhsan M 2019 Etnozoologi masyarakat Suku Jerieng dalam memanfaatkan hewan sebagai obat tradisional yang halal J. Halal Prod. Res. 2 60-67 e-ISSN:2654-9778

[16] Puri R K 2001 Bulungan Ethnobiology Handbook (Bogor: Center for International Research)

[17] Putra Y A E, Masy'ud B and Ulfah M 2008 Keanekegaraman satwa berkhasiat obat di Taman Nasional Betung Kerihun, Kalimantan Barat, Indonesia Media Konservasi 13 8-15

[18] Dewin V L, Anwari S and Prayogo H 2017 Kajian etnozoologi masyarakat Dayak Seberuang di Desa Gunung Mali Kecamatan Tempunak Kabupaten Sintang J. Hutan Lestari 5 978-986

[19] Heningsih M, Anwari M S and Yani A 2018 Kajian etnozoologi untuk obat-obatan masyarakat Dayak Belangin di Desa Mu'un Kecamatan Ngabang Kabupaten Landak J. Hutan Lestari 6 647-653

[20] Wheindrata H S 2012 Rahasia Satwa Berkhasiat Obat untuk Penyakit Ringan hingga Berat (Yogyakarta: Rapha Publishing)

[21] Uetz P 2020 The Reptile Database http://www.reptile-database.org/ accessed September 18th, 2020

[22] Janiawati I A A, Kusrini M D and Mardiastuti A 2015 Structure and composition of reptile communities in human modified landscape in Gianyar Regency, Bali HAYATI J. Biosci. 23 85-91

[23] Alves R R N, Vieira W L S, Santana G G, Vieira K S and Montenegro P F G P 2013 Herpetofauna used in traditional folk medicine: conservation implications pp 109-133 In: Editors, Alves R R N and Rosa I L Animals in Traditional Folk Medicine: Implication for Conservation 1 (Berlin Heidelberg: Springer-Verlag)

[24] Kakati L N, Bendang A and Doulo V 2006 Indigenous knowledge of zootherapeutic use of vertebrate origin by the Ao tribes of Nagaland J. Human Ecol. 19 163-167

[25] Ashwell D and Walston N 2008 An Overview of The Use and Trade of Plants and Animals in Traditional Medicine Systems in Cambodia (Ha Noi: TRAFFIC Southeast Asia, Greater Mekong Programme)

[26] Kendie F A, Mekuriaw S A and Dagnew M A 2018 Ethnozoological study of traditional medicinal appreciation of animals and their products among the indigenous people of Metema Woreda, North-Western Ethiopia J. Ethnobiol. Ethnomed. 14 1-12

[27] Tilong A D 2012 Obat-obat Cespleng Tak Lazim di Sekitar Kita (Yogyakarta: BukuBiru)

[28] Widjyawati V 2019 Seabrek Obat Tak Lazim dan Jorok, Namun Tokcer (Yogyakarta: Laksana)

[29] Kusrini M D, Mardiastuti A, Mumpuni, Rianto A, Ginting S M and Badijah 2014 Asiatic Soft-shell Turtle Amyda cartilaginea in Indonesia: a review of its natural history and harvest J. Indones. Nat. His. 2 26-34

[30] Wahab D A, Maulany R I, Nasri and Nirsawiyta 2020 Hunting and trading activities of reticulated python (Python reticulatus) in South Sulawesi, Indonesia: a report from the field IOP Conf. Ser.: Earth Environ. Sci. 486 12-29

[31] Setyawatiningsih S C 2018 The Indonesia's water monitor (Varanus salvator, Varanidae) trading J. Phys.: Conf. Ser. 1116 52-59

[32] Nijman V 2016 Perception of Sundanese men towards the consumption of water monitor lizard meat in West Java, Indonesia Biawak 10 22-25