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Herpetofauna diversity and distribution based on the elevational range in West Java, Indonesia

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Abstract. *Erawan TS, Jauhan J, Husodo T, Wulandari I, Fauzi DA, Megantara EN, Shanida SS. 2021. Herpetofauna diversity and distribution based on the elevational range in West Java, Indonesia. Biodiversitas 22: 4308-4319.* The herpetofauna discovery in West Java is still low and has not yet described the herpetofauna community's species diversity entirely and thoroughly in West Java. It experiences high anthropogenic impacts both from infrastructure and tourism activities. If left further, herpetofauna species will become extinct locally because of anthropogenic factors. Therefore, it is essential to reveal the diversity and distribution of herpetofauna species. This study aimed to show diversity and distribution based on the elevational range in West Java. Visual Encounter Survey in combination with the Auditory Encounter Survey was applied in this study. We found 74 species where the Colubridae family were found most commonly in the study sites. Of 74 species, four species have high conservation status, including *Rhacophorus reinwardtii, Ophiophagus hannah, Varanus salvator*, and *Malayopython reticulatus*. Besides, ten species were found to be endemic to Java and Java-Bali. Based on elevation, herpetofauna is mainly located at elevations < 1000 m asl. The higher the height, the fewer the number of species found. In Amphibians, the highest number of species tend to be found at 400-1200 m asl and 1400-1700 m asl, while reptiles tend to be located at 400-900 m asl.

Keywords: Amphibians, auditory encounter survey, reptiles

INTRODUCTION

Amphibian diversity on Java Island has currently recorded 43 species of Amphibians (Riyanto 2014). The diversity of Amphibians in the ecoregions of the western part of the mountainous rainforests of Java is 26 species (Das and van Dijk 2013) or 60.5% of all species on Java, while reptiles in the ecoregion of western Java mountain rainforests are 81 species (Das and van Dijk 2013) or 47.4% of 171 species of reptiles on Java (Uetz et al. 2018).

Amphibians can indicate biodiversity and local pressure on the environment because amphibians are sensitive to environmental changes, e.g., water pollution (Burlibaşa and Gavrilă 2011; Carlsson and Tydén 2018; Priambodo et al. 2019). Herpetofauna has declined in abundance, diversity, and some species are even threatened with extinction because of rapid urbanization and agriculture intensification, leading to the invasion of alien species and habitat loss (Carpio et al. 2015; Cassani et al. 2015), and over-exploitation of herpetofauna for industry, consumption, and pet trading (Natusch and Lyons 2012; Shaney et al. 2017).

In South and Southeast Asia, amphibians and reptiles research has not received much attention in terms of ecological aspects. Moreover, intensive field surveys are rarely conducted and published (Karthik et al. 2018). Knowledge of herpetofauna diversity is essential because these animals: (i) play a vital role in maintaining the sustainability of ecosystems, (ii) aid human socio-economics through utilization as tourism objects (Riyanto et al. 2019a), (iii) act as a pest controller (rat and insect eaters), and (iv) provide germplasm (Cahyadi and Arifin 2019).

The herpetofauna discovery in West Java is still low and has not yet described the herpetofauna community's species diversity entirely and thoroughly in West Java. The region experiences high anthropogenic impacts both from infrastructure and tourism activities. Research on amphi-bians and reptiles in Java that had been conducted, e.g., Riyanto et al. (2014); Riyanto and Kurniati (2014); Riyanto et al. (2015); Hartmann et al. (2016); Kieckbusch et al. (2016); Hamidy et al. (2018); Riyanto et al. (2019b); and Cahyadi and Arifin (2019) had revealed that amphibian and reptile diversity in the region is still underestimated. Therefore, it is essential to show the diversity of herpetofauna species to support conservation efforts.

The general trend shows that herpetofauna species richness decreases as elevation increases (Scott 1976). In Monteverde, species at lower elevations are significantly higher than at higher elevations (Hayes et al. 1989). Stevens (1992) revealed that species richness is lower at higher elevations as highland species are more specialized and lower tolerance to biotic and abiotic conditions changes. Populations at higher elevations are put at

increased risk for extinction because geographic range size decreases as elevation increases (Pounds et al. 2006).

This study aims to reveal herpetofauna diversity and distribution based on the elevational range in West Java. This study was carried out in non-conservation areas such as Cisokan, Ciletuh, and Darajat. In contrast, Kamojang and Gunung Salak were carried out both in the conservation and non-conservation areas. According to Samitra and Rozi (2020), herpetofauna research had been conducted primarily on conservation areas; therefore, research on the herpetofauna diversity outside conservation areas is needed.

MATERIALS AND METHODS

Study area

The study was conducted in five locations in West Java Province, Indonesia in 2017-2018, including Cisokan in West Bandung District (February 2017), Ciletuh in Sukabumi District (March 2017), Kamojang in Garut District (July 2017), Darajat in Garut District (May 2018), and Gunung Salak between Sukabumi and Bogor District (July 2018), West Java (Figure 1).

West Java Province is divided into steep mountainous regions in the South with an altitude of more than 1500 m asl, the area of the hillsides in the middle part of West Java with a height of 100-1500 m asl, in the North with a height of 0-10 m asl. West Java is located between 5˚50 '-7˚50 'SL and 104˚48'-108˚48 'EL. The area of West Java is 35,377.76 km^2. The Java Sea borders the Northern part of West Java Province. The Indian Ocean borders the Southern part. Banten Province and DKI Jakarta border the Western region. Central Java Province borders the Eastern part.

Procedures

The study's time varied, such as Cisokan conducted for 21 days, while other locations were carried out for eight days. Herpetofauna sampling was carried out during the day and night using the Visual Encounter Survey/ VES time-constrained method. At least two observers carry out VES by walking slowly and carefully following the existing transect paths, both footpaths or streams, to find the species on the surface of the ground, the surface of the rock, or perch on leaves and twigs. VES is carried out with five hours during the day (07.00 a.m.-10 a.m.; 02.00 p.m.-04.00 p.m.) and three hours at night (08.00 p.m.-11.00 p.m.) on each transect. Boruah et al. (2016) revealed that a survey covered forest paths, woodlands, plantations, stream edges, agricultural fields, and bushes. For amphibians and nocturnal snakes, surveys were done thoroughly in all suitable habitats such as village roads, ponds, drains, and surroundings of old buildings, bushes near streams, under rocks and logs, other water bodies, and arboreal habitats with the help of lights.

Figure 1. Study areas in West Java, Indonesia; Cisokan (48 M 746030.02 m E 9231551.58 m S); Ciletuh (48 M 661159.73 m E 9198069.84 m S); Darajat (48 M 800811.68 m E 9200549.76 m S); Kamojang (48 M 808381.73 m E 9209763.04 m S); and Gunung Salak (48 M 683756.00 m E 9255797.00 m S).

VES is combined with opportunistic exploration methods (Riyanto 2011), and auditory encounter survey/audio strip transects to detect herpetofauna, especially those fossorial or small and hidden. Herpetofauna was identified and documented in situ. Voice recording is also carried out to support the identification process, primarily small or hidden species. Vega-Trejo et al. (2013) said that voice recording is also used to support the identification process, especially for small or hidden species. The recording is carried out on the surrounding environmental conditions, especially threats that harm herpetofauna. Pictures were taken for identification purposes.

Secondary data were also collected by taking interviews with the local people. Notes were made to observe each species' habitats, road kills, anthropogenic activities in the area, threats to the herpetofauna, the interaction between humans and snakes, etc. (Boruah et al. 2016). Herpetofauna was identified using the herpetofauna guidebook. Conservation status is referred to by the National Regulation of the Republic of Indonesia, IUCN (International Union for Conservation of Nature) RedList, and CITES (Convention on International Trade of Endangered Species).

Data analysis

Data was analyzed qualitatively. We recorded the number of species per locations and per elevation ranges.

RESULTS AND DISCUSSION

Diversity of herpetofauna

Seventy-four species of herpetofauna in West Java, especially Ciletuh, Cisokan, Kamojang, Darajat, and Gunung Salak, were found (Table 3; Figure 2). There were 24 amphibian species and 50 reptile species. Based on the number of species, the order Squamata is most commonly found in the sites. Of the 74 species, several species have a high conservation status, such as Reinwardti's Frog (*Rhacophorus reinwardtii*) with Near Threatened status, King Cobra (*Ophiophagus hannah*) with Vulnerable and Appendix II status, Javan Torrent Frog (*Huia masonii*) with Vulnerable status, Indonesian Bubble-nest Frog (*Philautus vittiger*) with Near Threatened status, Common Water Monitor (*Varanus salvator*), and Reticulated Python (*Malayopython reticulatus*) with status Appendix II (IUCN 2021; UNEP-WCMC (Comps.) 2021). In addition to conservation status, three species are also known as endemic to Java and Bali Island. The species that are endemic only to Java Island are ten species (see Table 1).

Herpetofauna distribution based on elevational

We found herpetofauna range from 0-2300 m asl where at an elevation of 400-900 m asl mainly found as many as 51 species, while at the highest height ranging from 1600-2300 m asl was found 16 species (Table 1). Various species were found at varying elevations. We can see in Table 4 that the species are more often found at elevations below <1000 m asl. Besides, Table 4 can show several species that are only found at elevations ≥ 2000 m asl.

Table 1. Total number of species in West Java

Sublocations	Elevation (m asl)	Number of amphibians species	Number of reptiles species
Ciletuh	0-500	11	24
Cisokan	400-900	18	33
Gunung Salak	700-1500	18	11
Kamojang	1400-1700	10	6
Darajat	1600-2300	20	17

Source: Primary Data (2017-2018)

Table 2. Total number of species based on mountain forest subzone

Elevation range (m asl)	Number of amphibians species	Number of reptiles species
< 1000	22	45
1000-1500	22	19
1500-2400	18	13

Sources: van Steenis (2006), Primary Data (2017-2018)

Based on the mountain forest subzone by van Steenis (2006), 41 species were found at an elevation of 1000-1500 m asl (submontane) and a height of 1500-2400 m asl (montane), found 31 species (Table 2). At an elevation <1000 m asl, 67 species were found to be the most common.

Discussion

In amphibians, the Dicroglossidae family had the highest species diversity (six species), while in reptiles, the Colubridae family had the highest species diversity (16 species) than other families. Of all amphibians and reptiles, Colubridae had the highest species diversity. The species of herpetofauna that have the most chance to be found continuously and increase the number of the herpetofauna species in West Java come from snake groups, considering that this group has the highest diversity among lower case for reptile groups in Java (Uetz et al. 2018).

The discovery varied in each location. Seven species were found in the five study sites, including *Duttaphrynus melanostictus*, *Microhyla achatina*, *Chalcorana chalconota*, *Chalcorana rufipes*, *Polypedates leucomystax*, *Hemidactylus frenatus*, and *Eutropis multifasciata*. Additionally, 11 species were found in only one of the five study sites. *Dutaphyrnus melanoticus* is a species of the family of Bufonidae that can be found in the human environment. *Polypedates leucomystax* can be found in areas with plants, such as forests, and even close to human settlements because this species needs light to prey on insects (Rozi and Samitra 2020).

Table 3. Diversity of herpetofauna in West Java, Indonesia

Class | Order | Family | Species	Common name	CLT	CSK	KMJ	DRJ	GS	Conservation Stat. IUCN	CITES
AMPHIBIANS								
ANURA								
Bufonidae								
Duttaphrynus melanostictus (Schneider, 1799)	Black-spectacled Toad	+	+	+	+	+	LC	
Ingerophrynus biporcatus (Gravenhorst, 1829)	Indonesian Toad		+				LC	
Phrynoidis aspera (Gravenhorst, 1829)	Java Toad	+	+			+	LC	
Megophryidae								
Megophrys montana (Kuhl and van Hasselt, 1822)[1]	Asian Spadefoot Toad				+	+	LC	
Leptobrachium hasseltii (Tschudi, 1838)[2]	Java Spadefoot Toad		+	+		+	LC	
Microhylidae								
Microhyla achatina (Tschudi, 1838)[1]	Javan Chorus Frog	+	+	+	+	+	LC	
Microhyla palmipes (Boulenger, 1897)	Pengalengan Rice Frog			+	+	+	LC	
Kaloula baleata (Muller, 1836)[1]	Brown Bullfrog	+		+			LC	
Dicroglossidae								
Fejervarya cancrivora (Gravenhorst, 1829)	Asian Brackish Frog	+	+			+	LC	
Fejervarya limnocharis (Gravenhorst, 1829)	Asian Grass Frog	+	+	+			LC	
Limnonectes kuhlii (Tschudi, 1838)[1]	Large-headed Frog	+	+	+		+	LC	
Limnonectes macrodon (Dumeril and Bibron, 1841)	Malayan Wart Frog	+	+	+		+	LC	
Limnonectes microdiscus (Boettger, 1892)	Indonesian Wart Frog		+	+		+	LC	
Occidozyga sumatrana (Peters, 1877)	Puddle Frog		+				LC	
Ranidae								
Amnirana nicobariensis (Stoliczka, 1870)	Nicobar Island Frog		+	+	+	+	LC	
Chalcorana chalconota (Schlegel, 1837)	Schlegel's Frog	+	+	+	+	+	LC	
Chalcorana rufipes (Inger, Stuart & Iskandar, 2009)		+	+	+	+	+	LC	
Huia masonii (Boulenger, 1884)[1]	Javan Torrent Frog		+	+	+	+	VU	
Odorrana hosii (Boulenger, 1891)	Hose's Frog		+	+		+	LC	
Rhacophoridae								
Philautus vittiger (Boulenger, 1897)[1]	Indonesian Bubble-nest Frog					+	NT	
Philautus aurifasciatus (Schlegel, 1837)[1]	Java Bubble-nest Frog			+	+	+	LC	
Polypedates leucomystax (Gravenhorst, 1829)	White-lipped Tree Frog	+	+	+	+	+	LC	
Rhacophorus margaritifer (Schlegel, 1837)[1]	Java Flying Frog			+		+	LC	
Rhacophorus reinwardtii (Schlegel, 1840)[1]	Reinwardti's Frog		+	+		+	NT	
REPTILE								
TESTUDINES								
Trionychidae								
Dogania subplana (Geoffroy Saint-Hilaire, 1809)	Malayan Soft-shelled Turtle					+	LC	

SQUAMATA								
Agamidae								
Bronchocela cristatella (Kuhl, 1820)	Green Crested Lizard	+	+	+		+		
Bronchocela jubata (Dumeril & Bibron, 1837)	Great Crested Canopy Lizard	+	+	+		+	LC	
Draco fimbriatus (Kuhl, 1820)	Fringed Flying Dragon		+				LC	
Draco volans (Common Flying Dragon)[2]	Common Flying Dragon	+	+				LC	
Gonocephalus chamaeleontinus (Laurenti, 1768)	Chameleon Forest Dragon		+					
Gonocephalus kuhlii (Schlegel, 1851)	Kuhl's Anglehead Lizard			+		+		
Pseudocalotes tympanistriga (Gray, 1831)[1]	Indonesian False Bloodsucker			+		+		
Gekkonidae								
Cyrtodactylus marmoratus (Griffith and Pidgeon, 1831)[2]	Marbled Bow-fingered Gecko	+	+	+		+	LC	
Cyrtodactylus sp. (Gray, 1827)	Bow-fingered Gecko	+						
Gehyra mutilata (Wiegmann, 1834)	Common Four-clawed Gecko		+			+		
Gekko gecko (Linnaeus, 1758)	Tokay Gecko	+	+				LC	
Hemidactylus frenatus (Dumeril & Bibron, 1836)	Common House Gecko	+	+	+	+	+	LC	
Hemidactylus garnotii (Dumeril & Bibron, 1836)	Indo-pacific Gecko	+						
Hemidactylus platyurus (Schneider, 1797)	Asian House Gecko	+				+		
Lacertidae								
Takydromus sexlineatus (Daudin, 1802)	Asian Grass Lizard		+	+			LC	
Scincidae								
Eutropis multifasciata (Kuhl, 1820)	Common Mabuya	+	+	+	+	+	LC	
Lygosoma bowringii (Gunther, 1864)	Bowring's Supple Skink			+	+			
Sphenomorphus sanctus (Dumeril & Bibron, 1839)	Java Forest Skink	+	+				LC	
Varanidae								
Varanus salvator (Laurenti, 1768)	Common Water Monitor	+	+				LC	II
Pythonidae								
Malayopython reticulatus (Schneider, 1801)	Reticulated Python	+	+				LC	II
Colubridae								
Ahaetulla mycterizans (Linnaeus, 1758)	Malayan Vine Snake					+	LC	
Ahaetulla prasina (Boie, 1827)	Gunther's Whip Snake	+	+			+	LC	
Coelognathus flavolineatus (Schlegel, 1837)	Yellow-striped Trinket Snake	+					LC	
Calamaria linnaei (Boie, 1827)	Linnaeus's Reed Snake		+				LC	
Calamaria lumbricoidea (H. Boie in F. Boie, 1827)	Variable Reed Snake		+				LC	
Calamaria modesta (Dumeril, Bibron & Dumeril, 1854)	Yellow-spotted Reed Snake				+		LC	
Calamaria schlegeli (Dumeril, Bibron & Dumeril, 1854)	Red-headed Reed Snake					+	LC	
Calamaria virgulata (Dumeril, Bibron & Dumeril, 1854)	Short-tailed Reed Snake				+		LC	
Dendrelaphis pictus (Gmelin, 1789)	Common Bronze-back	+	+				LC	
Dendrelaphis subocularis (Boulenger, 1888)	Mountain Bronzeback Tree Snake	+					LC	
Gongylosoma baliodeirus (Boie, 1827)	Orange-bellied Snake	+	+				LC	
Gonyosoma oxycephalum (Boie, 1827)	Red-tailed Racer		+				LC	
Lycodon subcinctus (Boie, 1827)	White-banded Wolf Snake		+				LC	
Ptyas carinata (Guther, 1858)	Keeled Rat Snake		+				LC	
Ptyas korros (Schlegel, 1837)	Ular koros/Oray sawah		+					
Oligodon purpurascens (Schlegel, 1837)	Purple Kukri Snake		+				LC	

Viperidae								
Trimeresurus puniceus (Boie, 1827)	Javanese Pit Viper		+				LC	
Elapidae								
Calliophis bivirgatus (Boie, 1827)	Blue Coral Snake					+		
Bungarus candidus (Linnaeus, 1758)	Malayan Krait	+	+				LC	
Calliophis intestinalis (Laurenti, 1768)	Banded Malaysian Coral Snake	+				+	LC	
Naja sputatrix (Boie, 1827)	Southern Indonesian Spitting Cobra	+					LC	
Ophiophagus hannah (Cantor, 1836)	King Cobra	+	+				VU	II
Natricidae								
Enhydris plumbea (Boie, 1827)	Rice Paddy Snake		+				LC	
Psammodynastes pulverulentus (Boie, 1827)	Common Mock Viper			+				
Rhabdophis chrysargos (Schlegel, 1837)	Speckle-bellied Keelback		+	+	+	+	LC	
Rhabdophis subminiatus (Schlegel, 1837)	Red-necked Keelback	+	+				LC	
Xenochrophis trianguligerus (Boie, 1827)	Red-sided Keelback Water Snake	+	+			+	LC	
Pareatidae								
Pareas carinatus (Boie, 1828)	Keeled Slug-eating Snake		+				LC	
Typhlopidae								
Ramphotyphlops lineatus (Schlegel, 1839)	Lined Blind Snake		+				LC	
	Total	35	51	29	16	37		

Note: CLT: Ciletuh (2017), CSK: Cisokan (2018), KMJ: Kamojang (2017), DRJ: Darajat (2018), GS: Gunung Salak (2018)
Notes: [1]Endemic species to Java Island, [2] Endemic species to Java-Bali Island

Table 4. Herpetofauna distribution based on elevational range

Class | Order | Family | Species	Elevation Range (0-2300 m asl)																						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
AMPHIBIANS																								
ANURA																								
Bufonidae																								
Duttaphrynus melanostictus (Schneider, 1799)																								
Ingerophrynus biporcatus (Gravenhorst, 1829)																								
Phrynoidis aspera (Gravenhorst, 1829)																								
Megophryidae																								
Megophrys montana (Kuhl and van Hasselt, 1822)[1]																								
Leptobrachium hasseltii (Tschudi, 1838)[2]																								
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Microhyla palmipes (Boulenger, 1897)																								
Kaloula baleata (Muller, 1836)[1]																								
Dicroglossidae																								
Fejervarya cancrivora (Gravenhorst, 1829)																								
Fejervarya limnocharis (Gravenhorst, 1829)																								
Limnonectes kuhlii (Tschudi, 1838)*i*[1]																								
Limnonectes macrodon (Dumeril and Bibron, 1841)																								
Limnonectes microdiscus (Boettger, 1892)																								
Occidozyga sumatrana (Peters, 1877)																								
Ranidae																								
Amnirana nicobariensis (Stoliczka, 1870)																								
Chalcorana chalconota (Schlegel, 1837)																								
Chalcorana rufipes (Inger, Stuart & Iskandar, 2009)																								
Huia masonii (Boulenger, 1884)[1]																								
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Rhacophorus margaritifer (Schlegel, 1837)[1]																								
Rhacophorus reinwardtii (Schlegel, 1840)[1]																								
REPTILE																								
TESTUDINES																								
Trionychidae																								
Dogania subplana (Geoffroy Saint-Hilaire, 1809)																								

SQUAMATA

Agamidae

Bronchocela cristatella (Kuhl, 1820)
Bronchocela jubata (Dumeril & Bibron, 1837)
Draco fimbriatus (Kuhl, 1820)
Draco volans (Common Flying Dragon)[2]
Gonocephalus chamaeleontinus (Laurenti, 1768)
Gonocephalus kuhlii (Schlegel, 1851)
Pseudocalotes tympanistriga (Gray, 1831)[1]

Gekkonidae

Cyrtodactylus marmoratus (Griffith and Pidgeon, 1831)[2]
Cyrtodactylus sp. (Gray, 1827)
Gehyra mutilata (Wiegmann, 1834)
Gekko gecko (Linnaeus, 1758)
Hemidactylus frenatus (Dumeril & Bibron, 1836)
Hemidactylus garnotii (Dumeril & Bibron, 1836)
Hemidactylus platyurus (Schneider, 1797)

Lacertidae

Takydromus sexlineatus (Daudin, 1802)

Scincidae

Eutropis multifasciata (Kuhl, 1820)
Lygosoma bowringii (Gunther, 1864)
Sphenomorphus sanctus (Dumeril & Bibron, 1839)

Varanidae

Varanus salvator (Laurenti, 1768)

Pythonidae

Malayopython reticulatus (Schneider, 1801)

Colubridae

Ahaetulla mycterizans (Linnaeus, 1758)
Ahaetulla prasina (Boie, 1827)
Coelognathus flavolineatus (Schlegel, 1837)
Calamaria linnaei (Boie, 1827)
Calamaria lumbricoidea (H. Boie in F. Boie, 1827)
Calamaria modesta (Dumeril, Bibron & Dumeril, 1854)
Calamaria schlegeli (Dumeril, Bibron & Dumeril, 1854)
Calamaria virgulata (Dumeril, Bibron & Dumeril, 1854)
Dendrelaphis pictus (Gmelin, 1789)
Dendrelaphis subocularis (Boulenger, 1888)
Gongylosoma baliodeirus (Boie, 1827)
Gonyosoma oxycephalum (Boie, 1827)
Lycodon subcinctus (Boie, 1827)
Ptyas carinata (Guther, 1858)
Ptyas korros (Schlegel, 1837)
Oligodon purpurascens (Schlegel, 1837)

Viperidae
Trimeresurus puniceus (Boie, 1827)
Elapidae
Bungarus bivirgatus
Bungarus candidus (Linnaeus, 1758)
Calliophis intestinalis (Laurenti, 1768)
Naja sputatrix (Boie, 1827)
Ophiophagus hannah (Cantor, 1836)
Natricidae
Enhydris plumbea (Boie, 1827)
Psammodynastes pulverulentus (Boie, 1827)
Rhabdophis chrysargos (Schlegel, 1837)
Rhabdophis subminiatus (Schlegel, 1837)
Xenochrophis trianguligerus (Boie, 1827)
Pareatidae
Pareas carinatus (Boie, 1828)
Typhlopidae
Ramphotyphlops lineatus (Schlegel, 1839)

Source: Primary Data (2017-2018); note: 0-23 = elevation range (x100)

Figure 2. Documentation of herpetofauna species; A. *Rhacophorus margaritifer*, B. *Limnonectes macrodon*, C. *Rhacophorus reinwardtii*, D. *Huia masonii*, E. *Xenochrophis trianguligerus*, F. *Dogania subplana*, G. *Ahaetulla prasina*, H. *Ahaetulla mycterizans*

Amphibians were most commonly found at 400-1200 m asl and 1400-1700 m asl. Reptiles were most commonly found in 400-900 m asl. Based on the elevation of the mountain forest subzone, herpetofauna is more commonly found at elevations <1000 m asl than at higher elevations (1500-2400 m asl), which indicates that the higher the elevation, the fewer species are found (Table 2).

Liem (1971) stated that the higher the altitude of a place, the rarer species. Table 4 shows certain species found at an altitude of ≥ 1900 m asl, including *Megophrys montana, Microhyla palmipes, Huia masonii, Philautus aurifasciatus, Eutropis multifasciata, Lygosoma bowringii, Calamaria modesta, Calamaria schlegeli*, and *Rhabdophis chrysargos*. The differences in the richness and abundance in each region were predicted to affect environmental conditions and the surrounding vegetation (Riyanto and Trilaksono 2012). Water has an essential role in maintaining the humidity that benefits several herpetofauna species, such as amphibians. According to Wanger et al. (2011) and Kwatrina et al. (2019), the moist microhabitat, due to the tight canopy cover and lots of litter, becomes an influential factor on herpetofauna, especially for amphibians.

Species with high conservation status (based on IUCN and CITES), such as *Rhacophorus reinwardtii*, were located in Cisokan, Kamojang, and Gunung Salak at 400-1700 m asl. *Huia masonii* was found in all locations except Ciletuh at an altitude of 900-1200 m asl, 1400-1700 m asl, and 1900-2000 m asl. *Philautus vittiger* was only located on Gunung Salak at an altitude of 1000-1500 m asl. *Varanus salvator* was located in Cisokan and Ciletuh at an altitude of 0-900 m asl. *Malayophyton reticulatus* was found in Cisokan and Ciletuh at an altitude of 0-700 m asl.

According to Vega-Trejo et al. (2013), the vegetation type was directly associated with elevation. We often observed the same species of amphibians and reptiles in vegetation types at similar elevations. However, the composition and abundance at lower elevations in pine-oak or oak-pine mixed forests and riparian vegetation differed substantially from higher elevations in coniferous and broadleaf forests. Pike et al. (2011) said that higher sites have more canopy cover, providing lower solar radiation that may affect reptile abundance.

Community structure was similar among vegetation types at the same elevation, although the distance between sites was considerable, and sites were separated either by fragmented landscapes or urban areas. Although it seems that elevation was the most important factor, some species were restricted to particular vegetation types (Vega-Trejo et al. 2013).

In the submontane zone, there are 41 species. According to Brilliant et al. (2012), the lower montane forest area is also known as one of the hotspots of biodiversity. Biodiversity hotspots are areas with relatively intact natural ecosystems and rich biodiversity, and high levels of endemism.

In conclusion, this study demonstrated that the diversity and distribution of amphibians and reptiles in West Java are still underestimated. Not only in conservation areas, amphibians and reptiles also have high species diversity in non-conservation areas. Besides, species diversity depends on land cover and characteristics in a study location, so further studies are needed to support herpetofauna conservation. About the distribution of herpetofauna, the higher the elevation, the less diversity of species is found, so it is necessary to study the factors that influence herpetofauna's distribution.

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