

El-Hayah

JURNAL BIOLOGI

Journal Homepage: <http://ejournal.uin-malang.ac.id/index.php/bio/index>
e-ISSN: 2460-7207, p-ISSN: 2086-0064

Original research article

Reptiles and Amphibian Diversity, Along with Potential Treat in Sumber Nyolo, Malang Regency

Berry Fakhry Hanifa ⁽¹⁾, Muhammad Asmuni Hasyim ⁽¹⁾, Bayu Agung Prahardika ⁽¹⁾ and Nurul Whika Agustin ⁽²⁾

⁽¹⁾ Laboratory of Ecology, Biology Study Program, Faculty of Science and Technology Universitas Islam Negeri Maulana Malik Ibrahim Malang

⁽²⁾ Undergraduate Student, Biology Study Program, Faculty of Science and Technology Universitas Islam Negeri Maulana Malik Ibrahim Malang

*Corresponding author

Email: berryfhanifa@uin-malang.ac.id

DOI: [10.18860/elha.v8i4.15799](https://doi.org/10.18860/elha.v8i4.15799)

Article Info

Article history:

Received 28 January 2022

Received in revised form 07

February 2022

Accepted 10 March 2022

Key Word:

Biodiversity

Reptile

Amphibian

Sumber Nyolo

Abstract

Inventory of reptiles and amphibians was carried out in the Sumber Nyolo area, Karangploso District, Malang Regency, East Java. The sampling area is at an altitude of 600-650m above sea level. Pre-survey was conducted once. The survey was conducted from June-October 2020 using the visual encounter (VES) method. A total of 167 individuals from 17 species, 10 families have been recorded, 1 of which is in Near Threatened (NT) and Vulnerable (VU) status on the IUCN Redlist namely *Ptyas korros* and *Huia masonii* respectively, which *H. masonii* also endemic to Java Island. The diversity index (H') shows a moderate value (2.099), while the dominance value (0,211) was lower than the evenness index (0.479). The species with the largest population was *Chalchorona chalchonota* (70 individuals), while *Huia masonii*, *Ptyas korros*, *Gekko gekko*, and *Xenochrophis sp.* was the fewest species found (1 individual). Threats to this area include habitat destruction due to land conversion into tourism area and religious destination as well as rice fields in the downstream and settlement area.

1. INTRODUCTION

Indonesia is located between the continents of Asia and the continents of Australia and is on the equator which has a tropical climate. This condition results in Indonesia's higher biodiversity compared to

countries with sub-tropical or polar climates including reptiles and amphibians due to the dependence of reptiles and amphibians on water and light although reptiles can survive in drier terrestrial environments, (Pough et al., 1998). In addition, Indonesia's high biodiversity is caused by the diversity of ecosystems in

Indonesia both aquatic, arboreal, terrestrial, and fossorial (Mistar, 2008).

The high potential ecosystem of Indonesia from mountains, rivers to seas provides reptiles and amphibian microhabitats as shelters and foods (Kusrini, 2020). They don't share taxonomic hierarchy up to class level, even so, based on their similar habitats, ectothermic vertebrates, and similar observation methods, reptiles and amphibians are included in the field of herpetology (Kusrini and Alfrod, 2006).

Herpetofauna research in Indonesia has not been optimal because amphibians and reptiles tend to be neglected even if they have been harvested to provide market demand, while many important locations for them in Indonesia are damaged and directly affect their presence in nature (Kusrini, 2008). This condition is very concerning because some of them act as bioindicators and have high sensitivity to environmental changes (Yudha et al., 2014). The result of habitat destruction made 7000 species of amphibians are known, 32% of which are threatened with extinction according to A 2004 global assessment (Baillie, et al., 2004).

The Sumber Nyolo is located in Ngenep Village which geographically is located at 7°21'-7°31' south latitude and 110°10'-111°40' east longitude 600-650m above sea level. Sumber Nyolo is managed by the local community's association at a reasonable rate, making Sumber Nyolo a unique and economical tourist destination for local residents. By being treated to beautiful scenery and cool air, Sumber Nyolo is able to become the main attraction for the village of Ngenep, meanwhile, at night, it is also used by residents as a place for traditional worship and other spiritual activities, especially on a certain night of lunar calendar. In the downstream, there are residential areas and rice fields. The road access to get to it is fairly easy and paved (Eva, 2019).

This study aims to determine the species, species richness, diversity and evenness index of reptiles and amphibians and the potential

threats to them at the Sumber Nyolo Nature Tourism Location, Ngenep Village, Karangploso District, Malang Regency, East Java.

2. MATERIALS AND METHODS

Study area

This research was carried out in June-October 2021 at the end of dry season up to early rainy season at the Sumber Nyolo Tourism Location, Ngenep Village, Karangploso District, Malang Regency, East Java. Pre survey carried out once in the early year. Identification and preservation of samples were carried out at the Laboratory of the Biology Study Program, Faculty of Science and Technology, State Islamic University of Maulana Malik Ibrahim Malang.

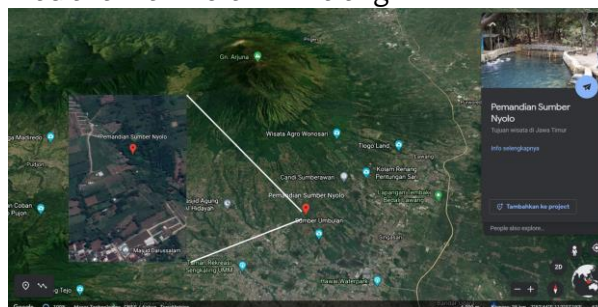


Figure 1. Study location of Sumber Nyolo

Procedures

Sub-procedures-1

The Visual Encounter Survey method was used at night within a limited time (25 hours total exploration, involving 17 surveyors, equal to). The observed areas include rivers, ponds, riverside shrubs and grass, huts and garden areas. Specimens were captured, identified, recorded capture time, collectors, and environmental variables in their habitat and then documented.

Sub-procedures-2

Voucher specimens were taken, while other specimens were released back into their habitat. The voucher specimen was then preserved in the Ecology Laboratory of the Biology Study Program, Maulana Malik Ibrahim State Islamic University, Malang. Specimen

identification based on literature (Das, 2015); (Iskandar, 1998).

Data analysis

The results of the data were analyzed using Shanon-Weiner diversity index, Simpson evenness index, Dominance index, and

Margalef species richness index using PAST 4.03 software.

3. RESULTS

The results of data analysis at the research site can be seen as follows:

Tabel 1. Reptiles and Amphibians collected from Sumber Nyolo

Herpetofauna		Habitat	IUCN	Survey					Total
Family	Species		N	Pre survey	Survey 1	Survey 2	Survey 3	Survey 4	
Gekkonidae	<i>Cosymbotus platyurus</i>	Arboreal	LC	-	1	-	3	-	4
	<i>Hemidactylus frenatus</i>	Arboreal	LC	4	-	1	-	2	7
	<i>Cyrtodactylus marmoratus</i>	Arboreal	LC	-	-	2	1	1	4
	<i>Gekko gecko</i>	Arboreal	LC	1	-	-	-	-	1
Agamidae	<i>Bronchocela jubata</i>	Arboreal	LC	3	-	-	-	-	3
Scincidae	<i>Eutropis multifasciata</i>	Terrestrial	LC	3	-	-	1	1	5
Colubridae	<i>Ptyas korros</i>	Terrestrial	NT	-	-	1	-	-	1
	<i>Xenochrophis sp.</i>	Semi-aquatic	LC	-	-	1	-	-	1
Bufonidae	<i>Duttaphrynus melanostictus</i>	Terrestrial	LC	3	2	2	6	2	15
	<i>Phrynomantis aspera</i>	Semi-aquatic	LC	-	2	-	2	1	5
Ranidae	<i>Chalcorana chalconota</i>	Semi-aquatic	LC	-	10	13	28	19	70
	<i>Odorrana hosii</i>	Semi-aquatic	LC	3	-	-	-	-	3
	<i>Huia masonii*</i>	Semi-aquatic	VU	1	-	-	-	-	1
Rhacophoridae	<i>Polypedates leucomystax</i>	Arboreal	LC	2	6	2	4	1	15
Microhylidae	<i>Microhyla achatina</i>	Semi-aquatic	LC	-	2	2	10	2	16
Dicoglossidae	<i>Fejervarya limnocharis</i>	Semi-aquatic	LC	-	-	-	2	4	6
Megophryidae	<i>Leptobranchium hasseltii</i> (larva)	Semi-aquatic	LC	10	-	-	-	-	10
									167

LC : Least Concern; VU : Vulnerable; NT : Near Threatened; IUCN: International Union for Conservation Nature. (*): Endemic

Tabel 2. Community Index Value of Reptiles and Amphibians in Sumber Nyolo

Index	Value
Shannon-wiener	2,099
Margalef	3,126
Evenness	0,479
Dominance	0,211

Based on environmental factors (Abiotic) measured from pH, air temperature, water temperature, and humidity. the influencing factors can be seen in the table below.:

Tabel 3. Abiotic factor in the study location.

No	Parameter	Value				Ave
		S1	S2	S3	S4	
Water						
1	temperature	22	22	22	20	21,5
Air						
2	Temperature	28	26	23	21	24,5
3	Humidity	79	80	83	85	81,75
4	Water pH	8	8	8	8	8

*Temperature: Celcius, Humidity: %

4. DISCUSSION

Based on the results of the Herpetofauna observation in Sumber Nyolo using the VES (Visual Encounter Survey) method at **Tabel 1**, the number of amphibians and reptiles found was 167 individuals. The most common species found in this study was *Chalcorana chalconata*. This species is often found in water areas in the natural source of Nyolo tourism and this species is classified as semi-aquatic. While *Huia masonii*, *Ptyas korros*, *Gekko gekko*, and *Xenochrophis sp.* were the fewest species found. Almost all species are classified as least concern (LC) according to IUCN red list, except for *Ptyas korros* which is classified as Near Threatened (NT), and *Huia masonii* which classified as Vulnerabel (VU) and endemic for Java Island as well. The result was similar to a study conducted by Septiadi, et al., (2018) in Ledok Amprong in terms of species number and composition. Some species could not be found in Sumber Nyolo, such *Hemiphyllodactylus typus*, *Gehyra mutilata*, *Bungarus sp.*, *Occydoziga lima*, even some species could be spotted at our location regarding their habitat preferences.

Some species need to be highlighted such *Cyrtodactylus* which is found in vary patterns and colors and is believed for further study. *Cyrtodactylus* can be found on the edge of the riverside attached to the stones wall and tree root attached to it. Other species have also shown some colour and pattern variation such *Microhyla* which can be found in the grassy area near the area entrance and side of the riverbank. A *Xenochrophis* also spotted in the

shallow water along the river by our team, unfortunately, the snakes slip fast enough to escape from our second sight, but we strongly believe it belongs to Genus *Xenochrophis* from its head shape and pattern, whether *X. melanzustus*, *X. piscator*, or *X. trianguligerus*, the third option seems to be more likely the identity because it looks vaguely has a triangular pattern on the lateral side when our member spotted it. *Fejervarya* is only found in downstream area near the padi field.

Leptobranchium hasseltii was the only spotted a tadpole and no adult was found during pre-survey to surveys. It kinds of suspicious because this species of tadpole can be sensitive to changes in the mineral composition of the waters so that the metamorphosis process is hampered (Iskandar, 1998).



Figure 2. Some species representative were collected in the location

Based on **Tabel 2**, the Shannon-Weiner diversity index in Sumber Nyolo is moderate (2.099) (Krebs, 1985), meanwhile margalef index value show 3,126. The value of diversity in Sumber Nyolo is in the medium category. this is due to many environmental factors that are not maintained. A community is said to have high species diversity if it is composed of many species, on the other hand, a community is said to have low species diversity if the community is composed of a few species or if there is a dominant species.

The evenness index value in Sumber Nyolo shows 0.479. While the dominance index shows the number of 0.211. Based on these values, the evenness of reptiles and amphibians in Sumber Nyolo can be included in the medium/moderate category, and for dominance in the low category. Evenness and

dominance values will be related to each other, where if the evenness value is higher or closer to one, then the dominance value will be lower and away from one. It can also be related to the diversity index of Shannon-weinner and Margalef. The higher the diversity index value, the higher the evenness value and the lower the dominance value, and vice versa.

Based on **Table 3**, some of the abiotic factors in Sumber Nyolo did not show significant differences in each survey. The difference can be seen in the air temperature which decreased in each survey, and also in humidity value, there is an increase in each survey. This indicates a change in air conditions from the end of the dry season to the rainy season, the fluctuation can still be tolerated by amphibians and reptiles. Amphibians can live in the range of 3°C to 41°C. While the habitat for frogs ranges from 25°C to 30°C. According to Van Hoen (1992) that reptiles are active in the temperature range between 20°C to 40°C. For the results of the measurement of humidity during the survey, it can be said that the research place in Sumber Nyolo has high humidity, which can be caused by the canopy which blocked the light from penetrating vegetation along with the wet nature of the floor (Inger, 1966). So it is suitable for the life of amphibians and reptiles.

Environmental factors are one of the keys to the existence of herpetofauna because they have a big role in the presence of reptiles and amphibians, where the landscape, habitat slope, and geographical character have an effect on meeting the food needs of reptiles and amphibians. While climate, rainfall, temperature, and humidity affect in making habitats suitable for them (Qurniawan *et al.*, 2002).

During the survey, both day and night, the authors found that several visitors performed ritual actions (showing flowers at midnight, installing incense and offerings, etc.). based on the intensity of the disturbance, the impact of visitor activities at the research site can be said insignificant, due to small number of daily

visitors. However, the bigger impact comes from habitat changes in the study area. Some changes include making artificial pools in tourist areas (for the purposes of the midnight bath ritual), parks in tourist areas including the construction of parking lots, food stalls, pavilions, etc. In addition, the research location is very close to rice fields and settlements with a distance of only about 300 meters.

5. CONCLUSION

A total of 167 individuals from 17 species, 10 families were recorded, 1 of which Near Threatened (NT) and Vulnerable (VU) status on the IUCN Redlist namely *Ptyas korros* and *Huia masonii* respectively, which *H. masonii* also endemic to Java Island. The diversity index (H') shows a moderate value (2.099), while the dominance value (0.211) was lower than the evenness index (0.479). The species with the largest population were *Chalchorona chalchonota* (70 individuals), *Huia masonii*, *Ptyas korros*, *Gekko gekko*, and *Xenochrophis sp.* is the fewest species found (1 individual). Threats to this area include habitat destruction due to land conversion into tourism areas and religious destinations as well as rice fields in the downstream and settlement area.

6. ACKNOWLEDGEMENTS

The authors would like to thank Yunita, Ainul Khatimah, Lu'lu, Amilia, Sandra, Fahmi, Mustofa, Alaika, Ara, Aslam Fadhilah, Ali Hasanuddin, Abdul Muis, Muzzammil, and other member of Maliki Herpetology Society of UIN Maulana Malik Ibrahim Malang who have shared their valuable time, energy, thought and any other resources to help complete this research

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