Amphibian Diversity in the Waterfall of Lubuklinggau City, South Sumatra

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ABSTRACT

Temam and Sando Waterfalls are suitable habitats for amphibian life, the presence of tourist visits and additional facilities can cause disturbance to amphibians. However, amphibian data at the two locations have not been recorded. This study aims to determine diversity amphibians in the Temam and Sando Waterfall, Lubuklinggau City. The study was conducted from June to July 2020. The collection data used Visual Encounter Survey (VES) techniques and time search. The data were analyzed using relative abundance, and indexes of diversity, evenness, similarity, and dominance. 11 species of amphibians belonging to 5 families were found during the study. Odorrana hosii was found mostly during the study. Amphibian diversity in the waterfall of Temam and Sando Waterfall was categorized as low.

Introduction

Sumatra Island is one of the hotspots of Sundanese biodiversity exposure which has a level of biodiversity with endemicity (Setiawan et al., 2016). One area that has the potential to support the life of amphibians is Lubuklinggau city. Lubuklinggau City has quite a lot of habitat variations for amphibians because it still has areas in the form of secondary forests, rivers, rice fields, and waterfalls.

Teman and Sando Waterfall are waterfalls located in Lubuklinggau City. The two waterfalls are tourist destinations for people outside and around Lubuklinggau City. The Lubuklinggau City Government has built public facilities at Temam Waterfall to provide comfort for visitors who come. Meanwhile, Sando Waterfall is still natural, but it is well known and is starting to get crowded. The high intensity of visits to the two waterfalls can indirectly threaten the presence of amphibians. As we know, amphibians are very sensitive to changes in environmental quality, for example, water pollution, habitat loss, and climate change (Setiawan et al., 2019). While the existence of amphibians is very important for the ecosystem, this is because Amphibians play an important role in the food chain. Most amphibians are predators that feed on various types of insects or insect larvae. Frogs living in rice fields, for example, are known to eat various types of insects that are pests to agriculture (Irwanto et al., 2019).
Another role of amphibians in the ecosystem is to maintain the balance of nature and certain types can be used as bioindicators of environmental damage (Yani et al., 2015).

Amphibian research in Lubuklinggau City is developing well, such as research conducted by Samitra & Rozi (2020) in the area around community settlements, Rozi & Samitra (2020) in Bukit Sulap and Watervang Dam. However, research on amphibians in Temam and Sando waterfall had been conducted previously, so the research was done to determine the diversity of amphibians in Temam and Sando Waterfalls, Lubuklinggau City.

Materials and Methods

The research was conducted in two locations, namely Temam Waterfall and Sando Waterfall, Lubuklinggau City, South Sumatra. The study was conducted from June-July 2020. The collection sample used Visual Encounter Survey (VES) techniques at 07.00-10.00 PM West Indonesian Time, the study was limited to 3 hours due to team safety factors (Qurniawan et al., 2010; Yudha et al., 2015). The tools used are stationery, gloves, head flashlights, dikes, plastic bags, cameras, thermometers, hygrometers, and identification books for amphibians. Each species collected was stored in a plastic bag and given a label. The types and numbers of amphibians were obtained. If you find a sample that is difficult to identify, it will be taken to the Biology Education laboratory to be identified. Identification is carried out through morphological and meristic characters (Cahyadi & Arifin, 2019; Qurniawan & Eprilurahman, 2012). Amphibian identification was guided by Kamsi, et al. 2017, Kusirini, 2013. After the identification is complete, the sample will be returned to the research location (Samitra & Rozi, 2020).

The collected data were analyzed for ecological indexes including species abundance, diversity levels using the Shannon-Wiener Index, evenness using the Pielou Index, and species similarity using the Jaccard Index (Ariza et al., 2014; Jusmaldi et al., 2019; Rozi & Samitra, 2020). Analysis and calculations were carried out with the help of Microsoft Excel 2016.

Results and Discussion

Amphibian composition

Eleven species of amphibians belonging to 5 families were found during the study (Table 1). 8 Species were found in Temam Waterfall and 6 species were found in Sando Waterfall (Table 1). The results of this study are relatively more when compared to the results of amphibian research, at tourist sites in Lubuklinggau (Sulap Hill and Watervang Dam) (Rozi & Samitra, 2020), several waterfalls in Kediri (Utami et al., 2016).

The low results of this study, when compared to the results of research by Jusmaldi, et al (2019), due to differences in altitude, where the altitude is 129 meters above sea level, with an area of 21,000 m² and a total of 72 hours of search time. While researching Jusmaldi et al (2019) study site, reaching heights of 200 meters above sea level, with an area of research 300,000 m² and a total time of 180 hours. Research by Das et al (2007) which was conducted at an altitude of 800 masl with a total time of 1930-2000 hours obtained 55 species of amphibians. The variation in the number of species found is influenced by differences in environmental factors, vegetation, microhabitat, altitude, and geographic area (Jusmaldi et al., 2019; Samitra & Rozi, 2020). In addition, it is also caused by differences in efforts to search for amphibians, the length of time searching...
and the area of land (Kusrini, 2008; Setiawan et al., 2016).

### Table 1. Amphibians in Temam and Sando

| Family            | Species                                                                 |
|-------------------|-------------------------------------------------------------------------|
| Bufonidae         | *Duttaphrynus melanostictus*                                             |
|                   | *Phrynoidis aspera*                                                      |
| Digroclossidae    | *Fejervarya cancrivora*                                                 |
|                   | *Fejervarya limnocharis*                                                |
|                   | *Limnonectes macrodon*                                                  |
| Megophryidae      | *Megophrys nasuta*                                                       |
| Ranidae           | *Chalcorana chalconota*                                                 |
|                   | *Odorrana hosii*                                                         |
|                   | *Amnirana nicobariensis*                                                |
|                   | *Hylarana erythraea*                                                    |
| Rhacophoridae     | *Polypedates leucomystax*                                                |

The highest number of species was found in the Ranidae family with 4 species and followed by the Digroclossidae family with 3 species, while the Bufonidae and Megophryidae families were 2 species, and the Rhacophoridae family 1 species (Table 1). The most abundant individuals were *Odorrana hosii* (41.32%, Figure 1) and *Phrynoidis aspera* (14.05%, Figure 1). The number of *O. hosii* found is the same as the research of Qurniawan & Trijoko (2012), Sanhayani et al., (2019), and Utami et al., (2016). The abundance of *O. hosii* and *P. aspera* is due to these 2 species that can be found in river flows (Kamsi et al., 2017).

*O. hosii* is a species of the family Ranidae (Kamsi et al., 2017). *O. hosii* is found in the Temam Waterfall area because there is a rocky and swift river. This is following with the characteristics of *O. hosii* which can be found in clear and swift rocky rivers, in hills of primary forest, and old secondary forest (van Djik et al., 2004; Kamsi et al., 2017). The genus Odorrana currently has 59 recognized species, inhabiting mountain streams in subtropical and tropical Asia, during the 2015-2020 period, 3 new species were founded (Frost, 2020).

*P. aspera* is a species of the Bufonidae family (Kamsi et al., 2017). *P. aspera* is found in Temam in the Waterfall area because this species can be found around waterfalls or rivers (Kamsi et al., 2017). The distribution of *P. Aspera* is Sumatra, Kalimantan, Java, Malaysia, Myanmar and Thailand (IUCN SSC Amphibian Specialist Group, 2014b). Another Bufonidae family we found was *Duttaphrynus melanostictus* (5.79%, Figure 1). This species cannot be found in primary forest, but can be found in residential or plantation areas (Kamsi et al., 2017; Moore et al., 2015). The presence of this species of Temam Waterfall Area and Sando Waterfall shows that there are settlements not far from the area.

We found *Fejervarya cancrivora* (5.79%, Figure 1) and *Fejervarya limnocharis* (13.22% Figure 1). Both species belong to the Digroclossidae family, which are usually found in rice fields, and are rarely found along rivers (Kamsi et al., 2017). These species are found because there are rice fields around the location, so that during the dry season these species look for water to moisturize the body.

Two species very few were found, namely *Polypedates leucomystax* (0.83%) in the Temam Waterfall area and *Megophrys nasuta* (0.83%, Figure 1) found in the Sando Waterfall area. The findings of *P. leucomystax* are relatively the same as those of Jusmaldi et al (2019), and less when compared to research Triesita et al., (2016) which found 8 specimens. The number of *P. leucomystax* that was found during the study was of considerable concern because in the research location there were still many trees that became the habitat for *P. leucomystax*. Whereas *P. leucomystax* can be found in plants in secondary forests (Kamsi et al., 2017).
*M. nasuta* is a species of the Megophryidae family. *M. nasuta* can be found in secondary forest litter, primary forest and sometimes on garden borders (Kamsi *et al*., 2017). The distribution of *M. nasuta* is Borneo, Sumatra, Malaysia and Thailand (IUCN SSC Amphibian Specialist Group, 2014a). Another Megophrys genus that was not found at the time of the study, but was in Sumatra, namely *Megophrys paralella* (Kamsi *et al*., 2017).

![Figure 1. Amphibia composition](http://jurnal.radenfatah.ac.id/index.php/biota)

Amphibian diversity is influenced by air humidity, area and habitat variation in an area (shrubs, litter, canopy cover, and stagnant water) (Dharma & Meitiyani, 2019; Jusmaldi *et al*., 2019; Samitra & Rozi, 2020).

The environmental conditions of Temam and Sando Waterfalls are quite good with vegetation, litter. The currents at Temam Waterfall are heavy, slow and rocky, while at Sando Slow Waterfall, temperatures range from 26.1-29.1°C, humidity 80-88%, water pH, 6.1-7.4. Amphibians have a temperature tolerance between 3-41°C and can live in conditions of 91% humidity (Beljai &...
Worabai, Izza & Kurniawan, 2014). Temperature and water influence virtually every aspect of organismal biology from providing the proper conditions for biochemical reactions (Mitchell & Bergmann, 2016).

The similarity index is needed to determine the level of similarity in species composition between two habitats (Ariza et al., 2014). The results of the similarity analysis using the Jaccard index obtained 0.75, which means that high species similarity between the Temam and Sando Waterfall habitats where 3 similar species were found, namely (D. melanostictus, F. cancrlvora and F. limnocharis). There is the same habitat, which is close to the settlement for the habitat characteristics of D. melanostictus and the presence of forest areas that have been logged and the slow currents are characteristic of the habitat of F. cancrlvora and F. limnocharis.

Conclusion
Taken together, from this study results, it can be concluded that the diversity of amphibians is in the low category, the amphibian population is stable, and the species similarity in Temam and Sando Waterfalls is high.

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