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Types of Amphibia in Coal Mine Reclamation of PT. Bukit Asam, Tbk. Tanjung Enim, South Sumatra.

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Abstract

Coal mining activities in South Sumatra are among others carried out by PT. Bukit Asam tbk, a coal company located in Tanjung Enim. The open pit/cast mining process has a negative impact on the environment, some of the impacts are land degradation, loss of vegetation, changes in microclimate and loss of biodiversity which includes diversity of flora and fauna, one of which is amphibians. One of the efforts to maintain and preserve environmental capabilities is to reclaim former mines. In accordance with Law No. 4 of 2009 concerning Mineral and Coal Mining requires mining companies to carry out reclamation and post-mining activities over the areas they cultivate. Reclamation-revegetation activities are efforts to improve microclimate conditions, improve soil fertility conditions. The recovery of environmental conditions is expected to bring back the wildlife that has been lost. The amphibian community is believed to be a bioindicator of the recovery of environmental conditions undergoing habitat changes. The research was carried out at the Bukit Asam coal mine reclamation area, Air laya site from February to March. The aim of the study was to see the types of amphibians found in the mine reclamation area. Sampling was carried out using the VES (Visual Enconter Survey) method. From the results obtained, there were 3 species from 2 members of the Order (Anura) and 2 members of the Family (Rinidae).

Keywords : Amphibians, Fauna, diversity, Rehabilitation, South Sumatra, Reclamation-Revegetation, Coal mine.

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1. Introduction

In South Sumatra, PT. Bukit Asam, tbk has been a pioneer in environmental conservation and post-mining rehabilitation with and designing post mining areas, an area of 5,394 hectares to become a Large Plantation Forest (TAHURA), The reclamation activities that have been carried out by PT. Bukit Asam is relatively good. The provincial government through the mining and energy services can make PT. Bukit Asam as a pilot location for every mining company in South Sumatra [1]. Based on Law Number 4 of 2009 concerning Coal Mine Reclamation, every company that carries out coal mining activities is required to conduct reclamation of ex-mining excavated land, The most important goals of post coal mining land revegetation are to improve microclimate conditions, vegetation development, increase soil fertility, and revive various animals through an accurate and rapid succession process, which ultimately achieves the direction that LPTB recovery must follow. Considering that land is a combination of elements of form/landscape, geology, soil, hydrology, climate, flora and fauna, as well as their intended use, land restoration does not only concern land restoration but also involves other restorations. soil components (climate, hydrology, flora, fauna and others). utilization, then land recovery is not only concerned with land recovery [2].

Broadly speaking, amphibians are divided into 3 orders, namely Caudata (salamanders), Anura (frogs and toads) and Gymnophiona (legless amphibians) [3]. According to [4],

frogs are easily recognizable from their body that looks like a squat with four legs for jumping, an indistinct neck, and no tail. The hind legs that function for jumping are longer than the front legs which are short and slender, and are useful for jumping to find prey or escape. The eyes are very large, with horizontal and vertical pupils. In some types of frogs, the pupils are diamond-shaped or rectangular, which is typical for each group. wide lateral skin fold.

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1. Terrestrial: live on land and some distance from water except during the breeding season. The toad *Duttaphrynus melanostictus* is one such example.
2. Arboreal: groups that live in trees. Tree frogs are generally arboreal, such as *Rhacophorus reinwardtii*, *R. margaritifer*, *Nyxticalus margaritifer* and *Polypedates leucomystax.*
3. Aquatic: a group that through out its life is always around a body of water. *Phrynoidis aspera*, *Limnonectes kuhlii*, and *L. macrodon* are common species found around the waters. Fossorial: groups that live in holes in the ground. Species such as *Kaloula baleata* or *K. pulchra* usually live in holes in the ground and only come out when it rains. Cecilia are also generally fossils.
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Environmental issues in mining in the world have always been the most important issues. The main problems that arise in ex-mining areas include environmental changes which include chemical changes, physical changes and biological changes. Chemical changes have an impact on the physical presence of groundwater and surface water which result in changes in morphology and land topography. Furthermore, changes in microclimate caused by changes in wind speed, disruption of biological habitats in the form of flora and fauna, and decreased soil productivity have resulted in the soil becoming barren or barren [6], Considering that the coal mining area of PT BA comes from a forest area, it will certainly affect the fauna population, especially the amphibians that live in that habitat. However, if the rehabilitation activities are carried out properly in accordance with the predetermined success criteria, it will help accelerate the natural ecological succession process towards increasing the diversity of flora and fauna, as well as saving and utilizing potential flora species, especially the restoration of Amphibian species. in the Coal Mine Reclamation Area of PT. Bukit Asam tbk, Tanjung Enim, South Sumatra needs to be done, because we know that Amphibians are one of the indicators in determining the success of biodiversity in reclamation. land that is being ecologically restored.

Research on amphibian species in the reclamation land of the Coal Mine PT. Bukit Asam tbk, Tanjung Enim, South Sumatra aims to analyze the types of amphibians in the post-coal mining reclamation land of PT. Bukit Asam tbk, Muara Enim, South Sumatra. Benefits of research Provide academic information to the community or the surrounding community and academics about the diversity of amphibian species found in coal mine reclamation land, especially in the Tanjung Enim coal mine, South Sumatra.

2. Materials and Methods

2.1. Time and Place

This research was conducted from February to March 2020. The research location was carried out in the coal mine reclamation area of PT. Bukit Asam, tbk Tanjung Enim, South Sumatra, to be precise in the post Air Laya Tanjung Enim coal mine. Sampling was carried out at 4 points of post tabang land, especially the Air Laya mine of PT. Bukit Asam tbk, Tanjung Enim, Muara enim. Among the 4 points determined are WSP (Waste Storage Pond), MTBS, MTBU, KTU. These locations, with coordinates according to GPS, are the Marlawai River (S 3°75'26"1 E 103°73'60"6) WSP (S 3°45'07.34" E 103°44'13.76"), MTBS (S 3°44'56.50" E 103°43'57.41"), MTBU (S 3°43"56.75" E 103°45'00.02), KTU (S 3°42'48.88 E 103°47'24.00).

2.2. Tools and Materials

The tools used in this study were knives, machetes, tack, tape measure, string of raffia, gloves, cotton, collection bottles, batteries, label paper, plastic bags, plastic boxes, rubber bands, syringes, markers, digital cameras, calipers, field manual for species data sheets, shovel net, roll meter, tweezers and a set of stationery. The materials used are chloroform, syringes and 70% alcohol for anesthesia and preservation of amphibians.

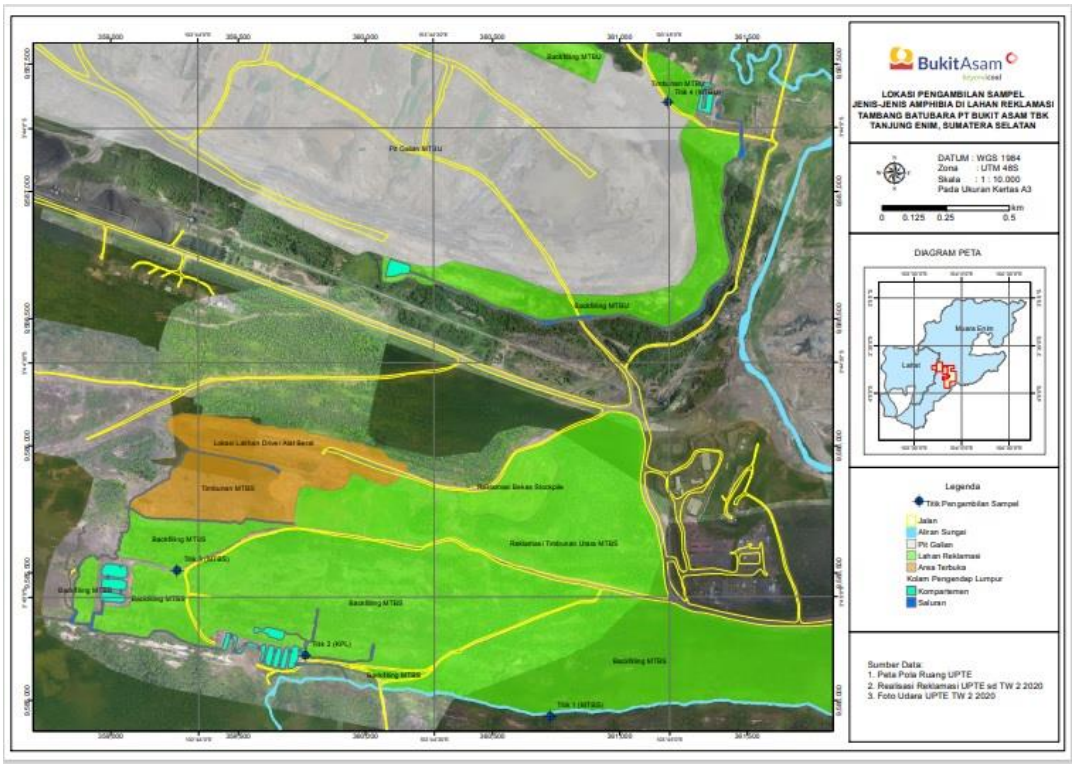

Figure 1. Map of the coal mining research area of PT. Bukit Asam Coal, Tanjung Enim, South Sumatra.

2.3. Collecting Sampling

This research uses the VES (Visual Encounter Survey) method (direct capture with a survey) or visual and exploration method of encounter and is assisted by using the trap method (Trapping), the reason for choosing the VES method is that searches are found faster because of active searches and the selection method of entrapment (trapping) is expected to be a method to help collect additional data and sample collection types are rather hard to find. Methods Visual Encounter Survey (VES) is a method where the researcher goes to an area or habitat and retrieve data from all amphibians are visible, VES can be done along the transect, in a plot, along the river, around the pool. The method (VES) can also be used to determine the species richness of an area, compile a species list and estimate the relative abundance of species. The Method *trapping* uses a glue trap in the form of a gel applied to the substrate. To obtained standard data, glue traps are usually placed on a rectangular plywood board (40 x 40 cm) or (30 x 30 cm) covered with plastic and then smeared with glue. The function of plastic is so that the board can be reused. The boards are then placed in places that are stopover locations (Yudha, 2015).

Before starting with the method Visual Encounter Survey (VES), first conduct a field orientation and exploration of the reclamation area after Tanjung Enim coal mining which will be a sampling place to determine the point of observation location, this research was conducted by determining 4 points, namely: 1) WSP, 2) MTBS, 3) MTBU, and 4) KTU located in the post-coal mining reclamation area of PT. Bukit Asam tbk, Tanjung Enim, Muara Enim. The search for amphibians was carried out around river bodies and WSP bodies located in the post-mining area of Air Laya. For WSP size, it has a length ranging from 27 m and a width of around 15 m Exploration is done by walking along a predetermined point or focused on a predetermined path. The exploration is carried out in aquatic and terrestrial habitats where it is suspected that there are many amphibians in all search microhabitats such as soil, water, and the lower part of the litter layer. The flow of travel in a habitat or area is carried out independently with the amount of time searching is adjusted to the area of the area [7].

All visible amphibians will be immediately collected by means of the amphibians being captured from the front or back which aims to make it easier to catch the amphibians and the amphibians do not jump, the samples that have been obtained are put into individual jars using gloves and then closed, then labeled and recorded data. Ecological data that support the life factors of Amphibian habitat such as temperature, humidity, habitat shape, and location of discovery. Furthermore, the sample anesthesia before the sample is analyzed and body size measured using morphometric morphological characters, anesthesia is carried out by injecting 70% alcohol into several parts of the amphibian body such as the femur, tarsus, stomach and biceps. After the sample under anesthesia looks stiff, then the sample is put back into the jar and provides a sample description on the label listed.

Search is stopped if no new species are found from the previous search and it is repeated 3 times on the same path. The guidelines used for the identification of amphibian species are a field guide book for Javanese and Balinese amphibians [4], Variation within the *Leptodactylus podicipinus-wagneri* Complex of Frogs (Amphibia: Leptodactylidae) [8], Amphibian Identification of West Java [5], and Field Guidelines for Amphibians and Reptiles in the Mawas Area of Central Kalimantan Province [9]. Meanwhile, the determination of the conservation status refers to the International Union for Nature Resources (IUCN) Red List and the regulation of the minister of Environment and Forestry

The data collected were obtained from observations of amphibians in the reclamation area of the Bukit Asam mine in the form of species, number of individual species, types of each species, measurement of morphological characters, data collection time, and position of amphibians when found in their habitat. Habitat data in the form of data collection time, location name, substrate, vegetation type and altitude, air temperature, humidity, water pH, as well as back resort data for Amphibian types in the reclamation area of PT. Bukit Asam Tbk coal mine in the last 3 years.

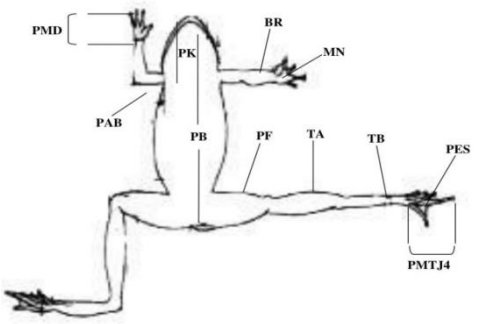

Figure 2. Amphibious morphometric measurements.

3. Results and Discussion

3.1 Composition of species

Based on research in the coal mine reclamation area of PT. Bukit Asam, tbk. Tanjung Enim, South Sumatra, has recorded 3 species of amphibians consisting of 1 Order (Anura) and 2 Families (*Ranidae* and *Bufonidae*). Anura order with as many as 2 species of the family *Ranidae*, and as many as the Order anura with the family of *Bufonidae* (1 species). Amphibian species obtained by the Visual Encounter Survey (VES) method can be seen in table 1.

Table 1. Amphibian species in the coal mine reclamation area of PT. Bukit Asam tbk, South Sumatra.

No	Family	Name of Species	Conservation Status (IUCN) 2020	Research Location			
				WSP	MTBS	MTBU	KTU
1	*Dicroglossidae*	*Fejervarya Limnocharis*	LC	X	V	V	V
2	*Dicroglossidae*	*Fejervarya cancrivora*	LC	V	V	V	V
3	*Bufonidae*	*Ingeroprhynus Bipokarpus*	LC	X	X	V	X
Total number of individuals / location				5	6	14	4
Total number of individuals				29			

The results of research through observations with the Visual Encounter Survey (VES) method show that the total individuals obtained from 4 location points on the coal mine reclamation area of PT. Bukit Asam, tbk. Tanjung Enim. South Sumatra as many as 29 amphibians from 3 types of amphibians and 2 families. *Bufonidae* family with a total of 1 individual (3.44 %) with the type *Ingerophrynus bipokarpus*. *Dicroglossidae* family with 28 individuals (96.6 %) consisting of *Fejervarya limnocharis* (44.9%), *Fejervarya cancrivora* family (44.9 %). Based on the data from the table, it shows that the *Fejervarya* species have dominated in this study, this is because the *Fejervarya* species are easily found in aquatic or swampy areas.

In this study, the trapping method was also used, but this method did not find any species apart from the three (3) species found. The reason for not finding other species in this trapping method is because the possibility of using the trapping method is less effective than the Visual Encounter Survey (VES) method for research conducted on the reclamation area of PT. Bukit Asam tbk, South Sumatra. By definition, the Visual Encounter survey (VES) method is a direct encounter survey method, which means that researchers carry out active searches in the field to directly meet and capture amphibians and know firsthand how the condition of the amphibians collected, so this method is considered more effective for selected. According to [10], the search on the Visual Encounter Survey (VES) method is carried out not only looking for animals seen above vegetation but also trying to find amphibians hidden behind fallen logs, stones, and litter.

Environmental factors in the Bukit Asam coal mine reclamation area when observing the air temperature was still within the tolerance limit in the range of 30 °C to30 °C, this is in accordance with what was stated by [11], that in the observation the air temperature is suitable for the amphibian environment,

A B C

Figure 3. (A). *Fejerfarya Limnocharis*, (B). *Fejervarya Cancrivora*, (C). *Ingerophrynus bipocarpus*.

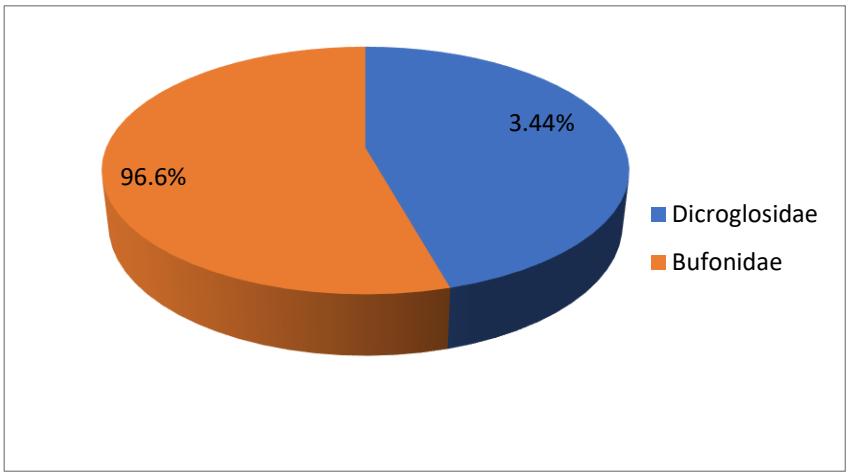

Figure 4. Amphibian Type Composition Diagram

namely 3 - 40 °C because the life of herpetofauna, especially amphibians, is significantly affected by temperature. In line with the research conducted [12] amphibians can experience optimum growth with temperatures ranging from 26 °C - 33 °C. Air temperature can affect the development of growth and development of amphibians, including when regulating the cycle of behavior and reproduction, amphibians are classified as polychothermic [13], namely animals that cannot regulate their own body temperature apart from depending on environmental conditions. A temperature that is too high will result in the eggs that hatch tend to have only one sex (male only or female only), this is what causes the sex ratio to be unbalanced and results in disturbed reproduction in the future. Warming temperatures will result in the loss of suitable habitat.

The air humidity in the research location from the test results ranged from 76 % to 98 %, this indicates high humidity due to the sampling of the rainy season. According to [4], amphibians need high enough humidity to protect the body from drought. Order anura can still be found in environments with humidity ranging from 71 - 92 %. The high humidity value in the measured coal mine reclamation area is the reason for amphibians, especially the three types that were found. We know that amphibians carry out respiratory respiration using the skin. So that the humidity factor is very influential on the external processes in the body, which functions to maintain the balance fluctuations in the body.

Table 2**.** Amphibious Microclimate Observations in the PT. Bukit Asam, tbk. Tanjung Enim, South Sumatra.

No Transect	Location	Humidity (%)	Water pH	Air Temperature (°C)
1	KPL	98	6,0	31,8-32,1
2	MTBS	94	6,5	29,7-30,2
3	MTBU	77	7,0	30,5-32,3
4	KTU	76	7,0	30,1-32

The results of water pH measurement during research in the Coal Mine Reclamation area of PT. Bukit Asam tbk, Tanjung Enim, South Sumatra showed values ranging from 6.0 - 7.0, this shows that the water conditions in Bukit Asam, there are two locations classified as acidic and two locations classified as normal pH, that there are several genera of *Rana* capable of living in a pH range of 5.8 – 7.2. According to [12], the pH range of water in the tropics is in the range of 4.3 - 7.5, this measure is a good condition for amphibian life. Amphibians are one of the fauna that make up the ecosystem and are part of the biodiversity that inhabit aquatic habitats.

According to [10] the skin in amphibians is a vital organ, amphibian skin has permeability properties, namely water and gas can go in and out. Amphibian skin also functions as a means of breathing and must be moist so it does not dry out. Therefore, amphibians have to develop adaptations that are closely related to the nature of their skin. Amphibian skin has mucus glands. Mucous secretions keep the skin moisturised, preventing the entry of bacteria and other pathogens. To reduce dry skin, adaptations include: 1) Bringing the body closer together to reduce the dry surface area; 2) Living close to water bodies; 3) Take shelter in shade plants or rock faces; 4) covering the skin with a slippery material; 5) Get into the ground.

Table 3. Position of Amphibian Species found at the time of Observation.

No	Species	Position	
		Horizontal	Vertical
1	*Fejervarya Canrivora*	Close to a body of water	On the rock, on the ground, on the waterlogged grass.
2	*fejervarya Limnovaris*	Close to a body of water	In the body of the river, on the ground, bushes and bushes of the river body are inundated with water.
3	*Ingerophrynus Bipocarpus*	Far from the body of water	On the rock between the leaves.

3.2 Ecological Distribution of Amphibian

The ecological distribution of amphibians found in the research location of PT. Bukit Asam tbk, Tanjung Enim, South Sumatra is generally described with the position of each amphibian when encountered. The position is divided into two, namely the horizontal position and the vertical position. The horizontal position is to see the horizontal distribution of frogs in a habitat (whether there is in the middle of a river, on a river bank, on a dry riverbank, etc.), while the vertical position is to see the distribution of amphibians based on height (whether in the ground, above a tree with a height of 2 m from the ground surface, on a rock with a stone diameter a few cm, above wood with a wood diameter a few cm, on grass and so on) [10].

3.3 Threats to the Existence of Amphibians

The threat to the preservation of amphibians can take the form of one or a combination of various causes such as habitat reduction, pollution, introduction of exotic species, diseases and parasites, and overfishing [5]. This is similar to the opinion [10], several factors that have caused the decline in amphibian populations worldwide, including loss and destruction of habitat; unsustainable trade and use; disease; pollution; introduced species; and climate change. According to [9], the decline or loss of a specific habitat species indicates a change in environmental quality at that location, although the changes that occur may not be very visible. Often times we ignore changes in environmental quality on a small scale and only realize when the changes have become large. Therefore, amphibians and reptiles have specific habitats which are very useful to provide early warning of environmental changes, this statement is in line with the opinion [9]. The main threat to amphibians and reptiles is habitat loss and loss. This is generally caused by forest clearing to be converted into agricultural areas, plantations and settlements. In addition, overharvesting is a major cause of population decline.

In the reclamation area of the PT. Bukit Asam tbk Tanjung Enim coal mine, South Sumatra, the threat to the existence of this type of amphibian is caused by human activities. Various mining clearing activities can have negative impacts on the environment. PT. Bukit Asam is an area from a forest area that has been converted into industrial mining land and has been reclaiming coal mines, especially the Air Laya mine since 1994. The reclamation of mine land revegetation is carried out with the aim of improving microclimate conditions, vegetation development, increasing soil fertility, and bringing back various animals through an accurate and fast succession process. Considering that land is a combination of form / landscape elements, geology, soil, hydrology, climate, flora and fauna, as well as the all location of their use, land restoration does not only concern soil restoration but also concerns the restoration of other land components (climate, hydrology, flora, fauna and others). Vegetation on mine reclamation land is classified as natural, inserts and staple plants have two main roles in the recovery process. The vegetation that grows above the ground becomes a

description of how the quality of the soil where it grows, and so on the quality of wildlife in an area can be seen from the presence of its vegetation. From this it can be concluded that land, vegetation and wildlife are three components of habitat that cannot be separated, especially when discussing the role of wildlife in the growth and distribution of many plant species, where the dependence between one another is clearly very strong [14]. According to [10], the results show that habitat loss and habitat destruction are one of the main causes of the decline in the global amphibian population. In various countries, there has been loss of wetlands which are very prominent for various purposes. Loss of wetlands, for example, will reduce the amphibian population. In addition to the loss of wetlands, changes in the quality of wetlands through eutrophication, pollution, import of foreign fish, loss of forests and surrounding fields can reduce the amphibian population. Many amphibian species require temporary wetlands that appear only during the spring or rainy season, for example puddles or puddles that occur during the rainy season in forests or gardens which play an important role in the rearing of tree frog tadpoles or other species. Thus, the management of biodiversity wealth in the PT. Bukit Asam environment is expected to be able to take into account the wealth of biodiversity contained there in before it is converted into a land for conversion of the mining industry area, in order to restore the process of succession and preservation of amphibian species in particular and species of wildlife in general.

4. Conclusion

The number of amphibians found in the reclamation area of the PT. Bukit Asam tbk, Coal mine Reclamation area, Tanjung Enim, South Sumatra, consists of 3 types of amphibians which are divided into 2 orders (Anura), and classified into 2 (Family). Types of amphibians found in the reclamation area of the coal mine of PT. Bukit Asam tbk, Tanjung Enim, South Sumatra is still classified in minimal numbers, this is caused by environmental factors, namely changes in the structure and composition of plant species that will change the composition of amphibians due to changes in the distribution and abundance of feed.

5. Acknowledgments

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