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The phenomenon of bat populations as a characteristic of watansoppeng city as a biology learning resource for students on ecosystem materials

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ABSTRACT

This research is a case study research using qualitative descriptive research methods. The purpose of this study is to describe the phenomenon of the Bat population in Watansoppeng City and describe the benefits of research results from the Bat population phenomenon in Watansoppeng City to be used as a source for learning Ecosystem Biology. This research was conducted at the Environmental Service of Soppeng Regency and in Botto Village, Lalabata District, Soppeng Regency. The informants of this research were 7 people, namely the Head of the Soppeng Regency Environmental Service, the Secretary of the Soppeng Regency Environmental Service and 5 people from the community. Determination of informants in this study using a purposive sampling technique. Data collection techniques used are observation, interviews and documentation by using two types of data, namely primary data and secondary data. Primary data comes from interviews and direct observations at the research site, while secondary data comes from literature review. The data analysis used is data reduction, data presentation and conclusion drawing/verification. Test the validity of the data used is triangulation. The results obtained are the phenomenon of the Bat population in Soppeng Regency which has existed for a long time due to several factors such as habitat suitability, adequate food sources, protected and preserved so that bats can live and be well preserved. Thus, the phenomenon of the Bat population as a characteristic of the city of Watansoppeng can be used as a source of learning ecosystem material biology.

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INTRODUCTION

Indonesia is a country with very high biodiversity, this is due to the vast territory of Indonesia, the uniqueness of each region, and different environmental conditions (Arsyad, 2017). According to (Medellin et al, 2000) he suggested that the equatorial tropics are the areas with the highest bat biodiversity.

According to (Takdir, 2020) one of the areas that has endemic fauna is South Sulawesi, namely Botto Village in Lalabata District, Soppeng Regency. Bats (*Pteropus vampyrus*) are a type of bat (*Chiroptera*) belonging to the Chiroptera family which is the only member of the family of the suborder *Megachiroptera*. This bat is an endemic animal that is protected and is a characteristic of the city of Watansoppeng, so Soppeng is referred to as "Kalong City". The distribution of this animal is very limited because it can only be found in one place, namely Botto Village, Lalabata District, Soppeng Regency because in that area there are still tamarind trees which are the habitat of these bats.

The large population of Bats in the city of Watansoppeng can be used in the biology learning process. According to (Septiani et al, 2020), a good learning process must connect teachers, students, learning models, conceptual learning strategies, media, and learning assessments through the learning environment. In line with the opinion (Riefani, 2019), states that educators must use learning media and the environment and learning resources creatively to achieve learning goals. Biology learning resources in the biology learning process can be obtained inside or outside school. Direct interaction of students with learning resources in the field can provide real new experiences, motivate students to learn, and add broader knowledge (Riefani, 2019).

One of the appropriate materials to provide real new experiences to students by bringing students or classes to where the learning resources are located is ecosystem materials. Ecosystem material is one of the biological materials that is easier to learn by observing objects directly in the environment, one of which is the Bat population in Watansoppeng City. The urgency of this research is the factors that influence the existence of the Bat population in the city of Watansoppeng and its use as a source of learning ecosystem material biology. The factors in question include the history of the existence of bats, the geographical location of Soppeng Regency, the behavior of the bats and the habitat of the bats.

Biology learning must be relevant to everyday life and it is difficult for students to accept biology material without concrete examples. The importance of nature as a laboratory and the availability of existing phenomena can be used as learning resources and realia media. This phenomenon certainly provides benefits for students because students will interact directly with learning resource in the field and can provide completely new experiences that motivate students to learn and add to broader knowledge.

Based on the description above, the next researcher is interested in conducting research with the title "Identification of Bat Populations as Characteristics of Watansoppeng City and Its Utilization as a Source for Learning Biology of Ecosystem Materials" (Case Study of Botto Village, Lalabata District, Soppeng Regency)".

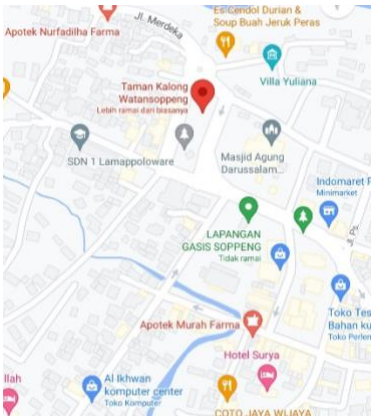
METHODS

Types of Research

This reserch is a case study research. Case study research is an empirical knowledge-seeking process to investigate and research various phenomena in real-life contexts. This is ini accordance with what the outhor has studied, namely the phenomenon of bat populations in the city of Watansoppeng. This case study research used a qualitative descriptive method. Qualitative research is research that produces descriptive data in the form of written or spoken words from the object being observed. Descriptive research is research that aims to describe or describe existing phenomena (Nana Syaodih Sukmadinata, 2007).

Location and Time of Research

This research will be carried out at the Environmental Service of Soppeng Regency and Botto Village, Lalabata District, Soppeng Regency which is an area nicknamed "Taman Kalong". The research time will be carried out for 3 (three) months, starting from April 2022 to June 2022.



Data Source

The types of data used to support the research process are primary data and secondary data. In this study, the primary data sources were obtained from observations at the research site and interviews with research informants. Determination of informants in this study using a purposive sampling technique. The informants in this study were the Head of the Soppeng Regency Environmental Service, the Secretary of the Soppeng Regency Environmental Service and the local community around the research location. Meanwhile, secondary data sources are obtained from literature studies obtained from various journals or scientific works.

Research Informant

No	Research Informan	Quantity (People)
1	Head of the Environmental Service of Soppeng Regency	1
2	Secretary of the Environmental Service of Soppeng Regency	1
3	Soppeng Regency local community	5

The informants in this study were 7 people with the following details:

a. Data Collection Technique

There are several data collection techniques carried out in this study, namely observation, interviews and documentation.

b. Research Instruments

Instruments are tools used to collect data needed when conducting research. Based on this, the tools needed in this research are cameras, stationery, interview guides and other tools. The interview guide used consisted of questions answered by the informant in accordance with the sub-focus of the research, so that the interviews conducted did not deviate from the research objectives to be achieved later.

c. Research Focus/Focus Description

This study will focus on the factors that influence the phenomenon of the Bat population in Watansoppeng city and its use as a source of learning biology on ecosystem materials. The factors that are intended in this study are everything that makes Bats inhabit the city of Watansoppeng, especially Botto Village, Lalabata District, Soppeng Regency. These factors include bat ecology, bat behavior, bat distribution and bat habitat.

d. Data Analysis Techniques and Data Validity Test

The data analysis used in this research is 1) Data reduction, reducing data means summarizing or selecting important things in order to provide a clearer picture, making it easier for researchers to carry out further data collection. 2) Data presentation, through the presentation of data, data can be organized and structured to make it easier to understand. By displaying data, researchers can more easily understand what happened and plan further work based on what researchers know. and the last is 3) drawing conclusions/verification, the initial conclusions presented are still temporary and will develop after researchers enter the field.

Meanwhile, to test the validity of the data used is triangulation, the triangulation process is carried out by checking the data that has been obtained through several data sources such as interview results

and observations or also interviewing more than one subject who is considered to have a different point of view to ensure the correctness of data.

RESULT AND DISCUSSION

a. Research Result

According to (Takdir, 2020) one of the areas that has endemic fauna is South Sulawesi, namely Botto Village in Lalabata District, Soppeng Regency. Bats (*Pteropus vampyrus*) are a type of bat (*Chiroptera*) belonging to the *Chiroptera* family which is the only member of the family of the suborder *Megachiroptera*. This is supported by the results of the interview with Mr **"EM"** which stated that:

"Species of Soppeng Bats are large fruit-eating bats". **(MAS-EM, 6-6-2022)**.

The results of the interview with Mr. **"EM"** were strengthened by the results of the interview with the Secretary of the Environment, Mr. **"MH"** who said that:

"The bats in Soppeng are large, fruit-eating bats known as bats". **(SECRETARY-MH, 6-6-2022)**.

The Bat population in Watansoppeng city has been around for decades or even hundreds of years ago. This is in accordance with the results of an interview with the Secretary of the Environmental Service of Soppeng Regency, Mr. "MH" who stated that:

"Bats have been around for a long time even hundreds of years ago in Soppeng City." **(SECRETARY-MH, 6-6-2022)**.

This statement was corroborated by what was also conveyed by the Head of the Environmental Service of Soppeng Regency, Mr. **"AA"** during the interview which stated that:

"So, bats in Soppeng have existed for a long time, namely since the Dutch era, there have been living and living in Soppeng. **(KADIS-AA, 6-6-2022)**.

The number of bats makes the sky around the city of Watansoppeng look black in the afternoon. This actually becomes its own uniqueness that actually attracts tourists to visit Kalong Park, Soppeng Regency (Ranseleleh et al., (2013). This is the same as the statement made by **"MR"** during the interview which stated that:

"It can be a place for a walk with the family. Especially when we go to Kalong Park in the afternoon the sky will look black because of the many bats flying around so it becomes a unique sight among tourists." **(MAS-MR, 6-6-2022)**.

Factors that affect the presence of bats in Watansoppeng City are because of the many sources of food and habitat that is always maintained and the protection for these animals. In addition, the presence of bats in Watansoppeng City is influenced by the temperature factor. This is supported by the results of research conducted by Duran & Centano (2002) which proves that Pteronotus quadridens bats nest in caves at a temperature of 28 ^{o}C-35 ^{o}C, and Erophylla sezekorni nests in caves with a temperature of 25 ^{o}C-28 ^{o}C. In addition, it is suspected that there are other physical and microclimate factors besides temperature that influence the selection of bat nests in Gombong Karst caves. This is supported by the results of an interview with Mr. **"MH"** as the Secretary of the Environmental Service of Soppeng Regency which stated that:

"In terms of ecology, it is because the location is suitable, there are less predators and there are many food sources in the roaming area. So, the bats in Soppeng are also protected in Regional Regulation No. 66 of 2006 concerning the Preservation of Birds and Bats in Watansoppeng City, so that the existence of these bat populations is well protected. In addition, due to the temperature factor in Soppeng, which ranges from 27 ^{o}C-30 ^{o}C. That temperature, according to the temperature needed by the bats." **(SECRETARY-MH, 6-6-2022)**.

The distribution of this animal is very limited because it can only be found in one place, namely Botto Village, Lalabata District, Soppeng Regency because in that area there are still tamarind trees which are the habitat of these bats. The megachiroptera found in the study were bats (*Pteropus vampyrus*). This type of bat is more often found nesting in trees, according to the results of research by Ruczynski et al. (2007) and Soegiharto & Kartono (2009). According to Altringham (1996), bats of the genus *Cynopterus* prefer to nest in trees because they rely on their eyesight to recognize their environment. They are more likely to choose a nest in a bright place. This is in accordance with the presence of bats in Watansoppeng City which indeed live and settle in tamarind trees and in that area also has bright light intensity. This is supported by the results of interviews with Mrs**. "RK"** and Mrs. **"SH"** who stated that:

"There are lots of bats in Kalong Park, not anywhere else. They live in tamarind trees around Taman Kalong". **(MAS-RK, 6-6-2022)**

"Only in Botto Village that I see there are still many tamarind trees while the tamarind tree is where Bats live. So, many Bats live in Botto Village". **(MAS-SH, 6-6-2022)**.

The above statement is also supported by the results of the interview with Mr **"AA"** who said that:

"Bats are scattered along the road in the Kalong Park area of Botto Village because their habitat is still well preserved there. Indeed, there have been bats in that place for a long time. So, in the old Dutch era they planted tamarind trees in the city along the road. So, the tamarind tree is very suitable for Bats because the stems are small and strong. So that it becomes a good habitat for bats." **(KADIS-AA, 6-6-2022)**.

The existence of bats in the city of Watansoppeng has many roles and benefits. Bats play an important role in society and the environment as a protector of the balance of nature. In nature, bats can help disperse seeds and pollinate flowers in various types of plants, as well as produce guano fertilizer. This is supported by statements from Mr. **"MH"** and Mr. **"MN"** who said that:

"Bats in Soppeng eat pollen, fruits and nectar which means they also help pollinate the plants they eat." **(SECRETARY-MH, 6-6-2022)**.

"As organic fertilizer, it's manure". **(MAS-MN, 6-6-2022)**.

This statement was then corroborated by the results of an interview with Mr **"AA"** who said that:

"Bats play a role in helping the process of pollinating plants. Urine and feces can be used as organic fertilizer." **(KADIS-AA, 6-6-2022)**.

b. Discussion

This research was conducted on Monday, June 6, 2022 at the Environmental Service of Soppeng Regency and in Botto Village, Lalabata District, Soppeng Regency (Taman Kalong). This study aims to describe the phenomenon of the Bat population in Watansoppeng City and the benefits of the research results from the Bat population phenomenon in Watansoppeng City to be used as a source of learning Biology on Ecosystem material.

Phenomena are things that can be witnessed with the five senses and can be explained and assessed scientifically (such as natural phenomena) or symptoms (Hendra Purba et al, 2018). Immanuel Kant in Engkus Phenomenology explains that a phenomenon is something that appears or appears by itself (the result of a synthesis between the senses and the conceptual form of the object, as it appears in itself) (Furkon, 2017).

The phenomenon of the Bat population in Watansoppeng City is a unique sight and has become the hallmark of Watansoppeng City. However, no one knows exactly when these bats started nesting in the trees. However, people believe that these Bats have been around for decades or even hundreds of years. No wonder Soppeng is nicknamed "Kalong City".

The results of a joint interview with Mr **"AA"** as the Head of the Soppeng Regency Environmental Service which stated that:

"So, the bats in Soppeng have been around for a long time, namely since the Dutch era. Bats live and inhabit the city of Watansoppeng because there Bats have habitats that are still well maintained and are not disturbed by the government and society. So, it becomes a characteristic that is owned by Watansoppeng City which is not owned by other regions". **(KADIS-AA, 6-6-2022)**.

The same thing was also expressed by Mr. **"MH"** as the Secretary of the Environmental Service of Soppeng Regency who stated that:

"Bats have been around for a long time, even hundreds of years ago in Soppeng City." **(SECRETARY-MH, 6-6-2022)**.

Likewise, Mrs. **"MR"** as one of the people in Botto Village, Lalabata District, Soppeng Regency said that:

"Bats have been around for a long time in Soppeng, even hundreds of years ago they were already there and lived in Soppeng." **(MAS-MR, 6-6-2022)**.

Based on the results of observations and interviews with research informants, it was found that they believed and believed that the Bats in the city of Watansoppeng had existed for a long time, lived and inhabited the tamarind trees around the Kalong Park.

According to (Takdir, 2020) one of the areas that has endemic fauna is South Sulawesi, namely Botto Village in Lalabata District, Soppeng Regency. Bats (*Pteropus vampyrus*) are a type of bat (*Chiroptera*) belonging to the *Chiroptera* family which is the only member of the family of the suborder *Megachiroptera*. This is supported by the results of the interview with Mr **"EM"** which stated that:

"Species of Soppeng Bats are large fruit-eating bats". **(MAS-EM, 6-6-2022)**.

The results of the interview with Mr. **"EM"** were strengthened by the results of the interview with the Secretary of the Environment, Mr. **"MH"** who said that:

"The bats in Soppeng are large, fruit-eating bats known as bats". **(SECRETARY-MH, 6-6-2022)**.

Based on the results of interviews with research informants, it was found that the bats in the city of Watansoppeng are included in the species of large fruit-eating bats called bats (*Pteropus vampyrus*). Factors that affect the presence of bats in Watansoppeng City are the many sources of food and habitat that are always maintained and the protection for these animals. This is supported by the results of the interview with Mr. **"MH"** which stated that:

> "In terms of ecology, it is because the location is suitable, there are less predators and there are many food sources in the roaming area. So, the bats in Soppeng are protected in Perda No.66 of 2006 concerning the Preservation of Birds and Bats in Watansoppeng City, so that the existence of this bat population is well protected.". **(SECRETARY-MH, 6-6-2022)**.

Then the statement from Mr. **"MH"** was corroborated by the statement from the Head of the Environmental Service of Soppeng Regency, Mr. **"AA"** in his interview he stated that:

> "Life is calm because it is not disturbed by society. The food factor, because of the abundance of food sources. Soppeng was once a highland area and was overgrown with trees that bore large fruit so that the bats tended to live and settle in Soppeng because the food sources were sufficient and there were plenty of them around it." **(KADIS-AA, 6-6-2022)**.

The distribution of this animal is very limited because it can only be found in one place, namely Botto Village, Lalabata District, Soppeng Regency because in that area there are still tamarind trees which are the habitat of these bats. This is supported by the results of an interview with Ms. **"RK"** who stated that:

> "There are lots of bats in Kalong Park, not anywhere else. They live in tamarind trees around Taman Kalong". **(MAS-RK, 6-6-2022)**.

The above statement is also supported by the results of the interview with Mr **"AA"** who said that:

> "Bats are scattered along the road in the Kalong Park area of Botto Village because their habitat is still well preserved there. Indeed, there have been bats in that place for a long time. So, in the old Dutch era they planted tamarind trees in the city along the road. So, the tamarind tree is very suitable for Bats because the stems are small and strong. So that it becomes a good habitat for bats." **(KADIS-AA, 6-6-2022)**.

Based on the results of interviews with research informants, it was found that the factors that caused the large number of bats in the city of Watansoppeng were due to the large number of food sources and habitats that were always well maintained. In addition, with the existence of Regional Regulation No. 66 of 2006 concerning the Preservation of Birds and Bats in Watansoppeng City, the existence of this bat population is well protected. In addition, the factors that influence the presence of bats in Watansoppeng City are influenced by the temperature factor. This is supported by the results of research conducted by Duran & Centano (2002) which proves that Pteronotus quadridens bats nest in caves at a temperature of 28 ºC-35 ºC, and Erophylla sezekorni nests in caves with a temperature of 25 ºC-28 ºC. The temperature in Soppeng ranges from 27 oC-30 oC. Another factor that affects the presence of bats in Soppeng is the presence of appropriate light intensity. According to Altringham (1996), bats of the genus *Cynopterus* prefer to nest in trees because they rely on their eyesight to recognize their environment. They are more likely to choose a nest in a bright place that has a high light intensity. However, the distribution of this animal is still limited because it can only be found in one place, namely in Botto Village, Lalabata District, Soppeng Regency because only in that area there are still many tamarind trees that are the habitat of these bats.

The results of this study are in line with the research conducted by Slamet Santosa, et al. (2018) with the title Biodiversity and Ecotourism Potential of Bats (*Chiroptera sp*) in Soppeng Regency, that the Bat population (*Chiroptera sp*) in Soppeng Regency has lived for a long time, is protected and preserved by the local community. However, its biodiversity is low because there is only one species of Pteropus alecto. There are many, thousands, there are puppies, young and adults with brownish black body color. Bats naturally live in caves, but the Soppeng bats live and breed in the center of Watansoppeng and live in tamarind trees. This bat population has the potential to be developed into an environment-based tourism destination (ecotourism).

Based on the results of interviews with research informants and literature mentioned above, it was found that the phenomenon of the Bat population in Soppeng Regency has existed for a long time due to several factors such as habitat suitability, adequate food sources, being protected and preserved so that

bats can live and be well preserved. Thus, the phenomenon of the Bat population as a characteristic of the city of Watansoppeng can be used as a source of learning biology. This is supported by the opinion of Marsh (Suhardi, 2010), learning resources in biology are all objects and symptoms that can be used to gain experience in solving a particular biological problem. Learning resources support and facilitate the learning process.

Utilization of biological learning resources in the biology learning process can be obtained at school or outside school. In general, there are two ways to utilize learning resources in learning in schools. First, bringing learning resources into the classroom and second, bringing the class into the field where the learning resources are (Mulyasa, 2002).

Biology learning must be relevant to everyday life and it is difficult for students to accept biology material without concrete examples. The importance of nature as a laboratory and the availability of existing phenomena can be used as learning resources and realia media. This phenomenon certainly provides benefits for students because students will interact directly with learning resource in the field and can provide completely new experiences that motivate students to learn and add to broader knowledge. So teachers are encouraged to use the potential of nature and natural phenomena to serve as learning resources, by motivating and guiding students to carry out activities such as observing, exploring, and processing the information they encounter. So that the meaning of the learning process can be seen when the information obtained can be understood and easily remembered by students.

Based on the various literatures that have been described, the data that has been collected by researchers through observation, interviews and literature review, it is found that the phenomenon of the Bat population as a characteristic of the city of Watansoppeng can be used as a source of learning biology on ecosystem materials. This is because learning biology is related to nature and the environment. So that the meaning of the learning process can be seen when the information obtained can be understood and easily remembered by students when they go directly to the field. Therefore, utilizing the existing environmental conditions is an alternative for teachers to create different learning conditions to improve student learning outcomes through a process that prioritizes student activities and skills. Through ecosystem materials, students are directly involved with their environment, foster curiosity and solve problems they find in everyday life.

CONCLUSIONS AND AUTHOR'S VIEW

Bats in the city of Watansoppeng have been around for a long time, living and inhabiting the tamarind trees around Kalong Park. This is the uniqueness of Soppeng Regency, so it is nicknamed the City of Kalong. The factors that cause the number of bats in the city of Watansoppeng are due to the many sources of food, the appropriate temperature and light intensity and the habitat that is always well maintained. In addition, with the existence of Regional Regulation No. 66 of 2006 concerning the Preservation of Birds and Bats in Watansoppeng City, the existence of this bat population is well protected. However, the distribution of this animal is still limited because it can only be found in one place, namely in Botto Village, Lalabata District, Soppeng Regency because only in that area there are still many tamarind trees that are the habitat of these bats.

The phenomenon of the Bat population as a characteristic of the city of Watansoppeng can be used as a source of learning biology on ecosystem materials. This is because learning biology is related to nature and the environment. So that the meaning of the learning process can be seen when the information obtained can be understood and easily remembered by students when they go directly to the field. Therefore, utilizing the existing environmental conditions is an alternative for teachers to create different learning conditions to improve student learning outcomes through a process that prioritizes student activities and skills. Through ecosystem materials, students are directly involved with their environment, foster curiosity and solve problems they find in everyday life.

Based on these findings, it is hoped that it can add insight and knowledge and can help educators, especially biology teachers, so that they can take advantage of local potentials such as the phenomenon of bat populations in the city of Watansoppeng to serve as a source of biology learning for students on ecosystem material.

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