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RESEARCH ARTICLE

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Characteristics of the population and habitat of *Chairophon plicatus* in Lowo Cave, Gresik Regency

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Abstract

Bats are the only mammals that have the ability to fly. Bats are one of the animals that have great environmental services. The ability of bats in environmental services is not balanced with environmental sustainability as the habitat of the bats themselves. Habitat destruction is one of the reasons for the reduction in the number of bats. the study of the habitat and population of bats is important considering the damaged habitat. Analysis related to the characteristics of bat habitat is very important as a reference for handling the environment, especially bat habitat. This research was conducted by using the caving technique and sex comparison analysis. These cave-dwelling bats occupy a humid location, lack of light and temperatures ranging from 34°C. cave-dwelling bats are dominated by females.

Keywords: Bat, Cave, Habitat

Introduction

Caves have very diverse meanings, the meaning of this cave is based on the scientific field of experts. Pera ecologists also have their own definition of the Cave. Ecologists define caves as gaps or holes that are naturally formed and have environmental conditions that support the life of living things[1]. Caves have unique and specific characteristics. The uniqueness of this cave is the dark environment or drinking light and this makes plants unable to live in the cave. Conditions like this do not make the cave an environment without life[2].

Caves have a function as a habitat for various living things ranging from insects to mammals. One of the cave-dwelling mammals is the bat. Bats are animals that have an important role in the balance of the ecosystem. Bats have enormous environmental services. One of the functions of bats is to control insect populations around the cave environment[1].

Bats have the second highest diversity after rodents. In general, bats are divided into two major groups, namely the suborder Megachiroptera and also microchiroptera. The suborder Megachiroptera usually feeds on fruit or flower nectar, uses its eyes large enough to determine their direction, ear margins form a continuous ring along the ear, has claws on the second finger except for Eonycteris, uses claws and feet to hold on, often climbs through trees, the skin membrane between the thighs is underdeveloped or narrow, and the tail is short or absent[3]. Microchiroptera, is a suborder of chiroptera

that eat insects, have eyes but are usually small, determine direction by an echolocation mechanism, the ear margins begin and end on the head[4].

According to[5], the sub-order insectivores (Microchiroptera) with sixteen families are Rhinopomatidae, Nycteridae, Megadermatidae, Rhinolopidae, Hipposideridae, Mizopopodidae, Mystacinidae, Noctilionidae, Phyllostomidae, Desmodontidae, Natalidae, Furipteridae, Thyropteridae, Mosballonidae, Vesperonidae. with 145 genera and 788 species[6]. According to there are 205 species of bats found in Indonesia consisting of nine families, namely Pteropodidae, Megadermatidae, Hipposideridae, Vespertilionidae, Nyteridae, Rhinolopidae, Emballonuridae, Rhinopomatide, and Molossidae.

Bats are the only mammals that can fly and play an important role in insect control. Bats have a very wide roaming range, this is very helpful in covering a very wide scope[7]. Bats also have a fairly high ability to eat, because this is what makes bats play an important role in controlling insect populations. One type of bat that lives in Lowo Cave in Gresik Regency is *Chairophon plicatus*. The study of the population and habitat of this bat species helps in the process of conserving the habitat of bats[8].

In the area outside the cave bats also play a role in pollination and also seed dispersal. Fruit-eating bats in the vegetation community are very important because in one hectare of land 13.7% of them depend on bats[9]. In the tropics there are 300 plants whose fertilization depends on bats and it is estimated that 95% of fruit regeneration is carried out by fruit or honey-eating bats. And supported by the ability to fly far, causing bats to have far grain scattering power. Plant species that have the potential to be scattered by bats include eggplant, sandalwood, banyan, rubber, keluwih, guava, duwet, sapodilla, sugar apple, and walnuts[10]. In addition to the dispersal seed potency, Bats also have an important role in pollinating the flowers of various plants, including plants of high economic value such as durian, petai, sugar palm, calliandra, banana, mangrove, and kapok. Megachiroptera bats, especially the pteropus family, play an important role in pollination and seed dispersal[11]. Bats also play a role in controlling insect populations, especially insects that are active at night such as mosquitoes, moths, beetles, and so on[1].

The lack of studies on bats in Indonesia creates a threat to bats. These threats include habitat loss and reduced population of bats. Therefore, researchers want to study the characteristics of bats, especially *Chairophon plicatus*.

Materials and methods

Study area

The research was conducted in Lowo Cave, Melirang Village, Gresik Regency.

Procedures

Identification of habitat characteristics

The cave method is carried outwhich starts enterace to the end of the cave. This exploratory activity uses cave tools in the form of a cover all, helmet, headlamp, camera, thermometer, lux meter, hygrometer[12]. Parameters measured include air temperature, humidity and light intensity. This parameter was measured from the mouth of the cave to the end of the cave at each bat-roosting site[4].

Identify population characteristics

The method used is to determine the sex ratio of the estimated population. This estimation method is by direct capture. Each individual captured was immediately identified and gender observed.identification following the indonesia bat book[6].

Data analysis

The data obtained in the research were processed in an exploratory descriptive way.

Results

Environmental physical parameters

Table 1. Lowo Cave characteristics

Cave zone	Temperature (°C)	Humidity	Light(Lux)
Bright	34	66%	80
dim	34.5	76%	10
Dark	34	86%	0

Sex ratio

Table 2. *Chairophon plicatus* sex ratio

Number of Males	Number of Females	Sex Comparison
34	187	1/5
66	160	2/5
55	183	1/3

Discussion

Environmental physical parameters

The dark and humid environment of the cave is one of the locations used by bats to roost[13]. In addition to the bat cave, you can also find rolls of banana leaves, roofs of houses, tree branches, rock crevices, and so on. The bats found in the Lowo Desa Melirang cave are found in all cave zones. These physical parameters indicate the characteristics of the environment inhabited by *C. plicatus* bats[14]. *Chairophon plicatus* in this study in the Lowo cave, Melirang village, inhabits all zoans in the cave[15]. The average temperature of the cave environment occupied by these bats is 34°C, with humidity ranging from 66-86% with an average humidity of 76%. Characteristics of the vertical cave mouth, making the difference in light intensity in the bright to dim zone is very different. This cave has a light intensity ranging from 0-80 lux. In the bright zone the light intensity reaches 80 lux while in the dim zone it is only about 10 lux[15].

Research conducted[16] species *C. plicatus* was found in the Petruk cave. Petruk Cave has an average humidity of 90% with temperatures reaching 28.4°C. Petruk Cave also has a light intensity of 0.1 lux. The species found in Petruk Cave are dominated by *C. plicatus* species. Lowo Cave in Melirang Village is also only inhabited by two species of bats which are also dominated by *C. plicatus*. The formation of the distribution pattern of bats in the cave passages is thought to be closely related to the microclimate in the cave. Studies conducted in the gombong karst have an average of ±28.25°C and the average humidity ranges at ±91.25%[14]. While in this study *C. plicatus* lived in an environment with temperatures ranging from ±34°C with humidity ranging from 76%, in the dark cave zone it could reach 86% [15].

*Chairophon plicatus*is a known species with a large population. Research conducted by (Asriadi, 2010) in the Gombong Karst, precisely in the Petruk cave, is dominated by *C. plicatus* species, about 13.93% of the seven existing species. This species has a home range that is not too wide compared to other species[17]. Another study conducted (Srilopan, 2018) in Thailand found that the *C. plicatus* species in this population contained about eight million individuals in one area in Thailand. This population covers a large area and maintains most of Thailand's territory protecting agricultural land[18]. In addition to preying on insects in some cases they also eat other invertebrates[18].

As the name implies, *C. plicatus*, this species is a species of bat that has the characteristics of having pursed lips with a free-tail or a free tail. This species is similar to *Tadarida aegyptiaca*[14]. However, this species has fine, dense hair and is also very short. On the outside of the back, usually has a dark brown color, on the underside the color is slightly pale with grayish hair color. The upper lip has a fold, and the nostrils protrude forward, the ears are medium, thick and round [10]. The upper jaw in this bat consists of one or two incisors with two canines. Has 4 premoral teeth and 6 molars[6]. The dental formula of this species is:

I 1/2, C 1/1, P 2/2, M 3/3.

Bats of this species before entering the genus as it is today, included in *Vespertilio plicatus*[19]. Later this species was reclassified into *Tadaria* (*Chaerephon*) *plicata*, *Chaerephon plicata* and *C. plicatus*[20]. *C. plicata* or commonly known as the wrinkle-lip bat is a species that belongs to the family of Molossidae. The Molossidae family is a type of bat which is also called free-tailed bat, this name is because the special feature of this species is the underdeveloped membrane between the thighs. Poor development like only a tail covered with a membrane between the thighs [6]. The Molossidae family in the world has 16 genera with 86 species, while in Indonesia there are eleven species of the Molossidae family. Species in the Molossidae family can fly high and can also crawl on the ground or on plants.

C. plicatus located in the Lowo cave, Melirang Village, Gresik Regency, is one of the cave dwellers in the Lowo cave, Melirang Village. In addition to this species, there are also other bat species such as Rousetus amplecxicaudatus, this species is a fruit-eating bat species. This wrinkle-lip bat species is found in almost all zones in the Lowo cave, Melirang Village.

Sex ratio

The sex ratio in this species is dominated by female bats over males. This fairly high difference between males and females also occurred in a study conducted by[2] in this study that male individuals were taller than females. This happens from childhood to adulthood. The difference in the number between male and female individuals is influenced by the ability of the survival of the individual itself. So it can be interpreted that female individuals have higher survival rates than male individuals in the case study in Lowo Cave, Melirang Village, Gresik Regency[21].

Conclusions

The population of this bat is also dominated by female species. *C. plicatus* found in this cave lives in Lowo Cave which has relatively stable temperature conditions around 34 °C with humidity at 66-86% with light intensity 0-80 Lux.

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Conflicts of Interest

There are not potential conflicts of interest.

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