

Captivity Study of the Bat *Pteropus alecto*

by Triltje Ransalele 8

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Emerging Infectious Diseases: An Interdisciplinary Practical Approach

September 3, 2020

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Captivity Study of the Bat *Pteropus alecto*

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Abstract. Bats are important animals in the global ecosystem, although they are reported as zoonotic reservoirs that can infect humans. Understanding of the biological, physiological, and immune systems of bats is closely related to the spread and transmission of zoonoses and biomedical research, which in turn is the basis of science for developing strategies to prevent the spread and transmission of bats. Many studies run into obstacles because bats are wild animals. Therefore, studies have been carried out on captivity of bats since 2011. The bats *Pteropus alecto* obtained from Manado Bersehati Market were bred in a cage made of wood and wire grid wall. The feed intake was given in the form of fruits, such as bananas, papayas, mangoes, guava, and fruits according to the available seasons. Feeding was done in the late afternoon. The method used is direct observation in captivity. The data obtained were interpreted through narration. The results showed that the females became pregnant a year after being bred. The length of pregnancy was 6 months, and each birth produced 1 bat. Females were able to produce young once a year, and weaning after four to five months. This study provides information that the *P. alecto* bat can be bred in captivity.

Keywords: bat; *Pteropus alecto*; breeding; captivity

Introduction

Bats are wildlife reported as the zoonotic reservoir of the Ebola virus [1, 2], Nipah virus [3], and coronavirus [4] which infect humans. On the other hand, bats have an ecological role in maintaining diversity in the forest, because of their function as seed dispersers and plant pollinators [5-8]. *Pteropus alecto* is a group of fruit-eating bats in the suborder Megachiroptera that are used as animal models for cancer research, because they have a low incidence of cancer, although the phenomenon is still elusive [9]. Bat meat is also used by some people as food [10-13], because it is believed to have properties for stamina and drugs to cure asthma [14-16]. The understanding of the biological, physiological, and immune systems of bats is the basis of science for the prevention of spread and transmission by bats, as well as research in the fields of medicine and pharmacy. Many studies run into obstacles because bats are wild animals. To facilitate research, it is necessary to do bat breeding in captivity. Therefore, a captive study has been conducted to determine the biology and reproductive cycle of bats.

Materials and Methods

There were 7 bats that were bred, consisting of 4 males and 3 females, which are purchased from the Bersehati Market in Manado, North Sulawesi, Indonesia. All bats were put in a cage measuring 1.75 x 1 x 2 meters for captivity. The cage is made of wood and wire grid wall (Figure 1). Bats are given food in the form of fruits at night to suit their activities, which is every day, between 15.00 - 19.00. The types of feed given were papaya, banana, watermelon, and cucumber which were purchased from traditional markets, as well as other types of fruit available according to the season such as guava, mango, lansium, and rambutan. The way of giving fruit is by hanging it on a wire grid wall, then cut into pieces and spread in the cage. The cage is cleaned in the morning using a hose. Bats were bathed every morning by spraying

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them with water. Direct observations were made every day of the preferred type of feed. The behavior and activities shown by the bats in the cage were observed. The collected data were described descriptively and interpreted through a narrative.



Figure 1. Model and type of bat breeding cages.

Results and Discussions

Types of Fruit Preferred by Pteropus alecto

Based on preliminary observations, the bats took and ate the type of fruit that was first found in the cage. After chewing several times, the bats returned to take the fruit by bringing their nose closer to the existing fruit while moving around and picking up other types of fruit available in the cage. The types of fruit that are often not eaten and left in the cage until the next day were watermelon and cucumber. Based on the results of initial observations, the types of fruit that were given continuously were bananas and papayas. Among the types of fruit, papaya and ripe banana are given in equal quantities and given simultaneously, then ripe papaya fruit first eaten up followed by bananas, even until the morning the bananas were sometimes still left in the cage. Furthermore, the distribution of fruit types was changed, that is, not given simultaneously, but alternately. The results showed that the bat's favorite fruit was papaya. Feeding method of ripe papaya fruit to bats can be seen in Figure 2 and ripe bananas in Figure 3.



Figure 2. Papaya fruit that *P. alecto* likes to eat every day



Figure 3. Banana fruit that *P. alecto* likes to eat every day

During the fruit season, bats were given the type of fruit according to the season, and were not given papaya and banana fruit. The types of seasonal fruit that bats eat are mango (Figure 4) and guava fruits (Figure 5).



Figure 4. Mango fruit that the bat *P. alecto* likes according to the season



Figure 5. Guava fruit that the bat *P. alecto* likes according to the season

The feeding the fruits was done at night, according to the activity of the bats. Although the types of fruit are not as varied as those in the wild, the types of fruit consumed and preferred by the bats in the cage are the types of fruit consumed in nature. Fleming and Kress [17] reported that all bats of the family Pteropodidae are fruit-eaters, and seek ripe fruit at night [18]. Aziz et al. [19] reported that the types of fruit that the bats of the Pteropus genus feed include mango, papaya, banana, water apple / rose-apple, rambutan, and lansium.

Activities in the cage

The daily activity of bats during the day is generally perched by wrapping their wings around the body while the toes are attached to the wire grid wall of the cage. Occasionally they lifted their heads and opened their eyes and moved when there was interference from outside the cage. Sometimes they also licked the whole body and like scratching with their claws on certain parts of the body. When the temperature in the cage is above 29 °C, the bats spread and wagged their wings (Figure 6).

In the late afternoon, most of their activities were eating while chasing each other (Figure 7). During the breeding season, male bats chased and scratched the nursing bats until they are released from their mothers. Bats that were not separated from their mothers would continue to be chased by males until they are helpless and died. Bat mating activities were carried out at night as well as during the day.



Figure 6. Activities of the bats during the day



Figure 7. Bat activity at night

The activity of *P. alecto* in cages is not different from their activity in nature. Markus and Blackshaw [20] stated that the activities of *P. alecto* during the day were fighting, grooming, sleeping and other social activities, although the bats were awake for some time throughout the day by opening their eyes and reacting to the disturbances around them. During the day, the wings were spread out and waved, and this activity would stop when the ambient temperature became cold.

Reproductive Cycle

The breeding activity of *P. alecto* in cages took place from late December to March. During the mating season, male bats would chase female bats until pregnancy occurred (Figure 8).



Figure 8. Male bats chased female bats and mated

Pregnant bats would give birth around July to September. Length of pregnancy was about 6 months, and length of breastfeeding was 4 to 5 months. The number of children per birth was 1 head. Productive female bats gave birth once a year. The mother bat who just gave birth would chew the newborn's umbilical cord until the umbilical cord broke. Based on observations to date, female bats could get pregnant and gave birth in cages (Figure 9).

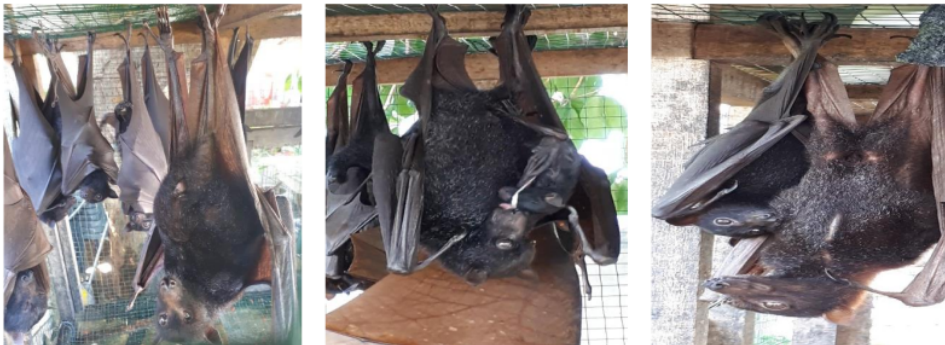


Figure 9. Pregnant bats could become pregnant, then gave birth, then breastfed in the cage

Female bats that have never given birth will give birth for ²⁸ first time at about 22-24 months. They began sexual maturity when they were about 1 year old. The ratio of males and females in a cage was 1:1 or 1:2, meaning one male and one female, or 1 male and two female. Excess number of males in the cage would cause clawing and fighting between males, so that weak males would be injured until they became weak and died. Based on observations in August 2017, a female bat gave birth to a female bat, so this child was the second generation. In 2019, the second generation of female bats gave birth to male bats in the cage, so that until now the bats in the cage have been three generations (Figure 10).



Figure 10. Three generations of bats in a cage

The mating and calving seasons for bats in cages are different from those reported by Markus and Blackshaw [20], that the breeding season for *P. alecto* bats ranged from October to March, and peaked around October to December, while the mating season ranged from February to April. Sugita et al. [21] reported that monsoons, temperature and weather affect the breeding and calving seasons of bats. Furthermore, it was said that *P. pselaphon* in Ogasawara Islands, Japan showed seasonal mating behavior in cages in winter, February to March, and the breeding season in May-October. Vardon and Tidelman [22] reported that the reproductive season for *P. alecto* in northern Australia ranged from January to March, while in eastern Australia it ranged from October to November.

The reproductive cycle of bats in cages is almost the same as that reported by McIlwee and Martin [23], the length of gestation was around 6 months, the number of children born was 1, the duration of breastfeeding was 3-4 months, and the first time for the bat to give birth was around 2 years. Although the time for feeding bats in the cage was longer, which was 4-5 months, even until the mother bats were pregnant again, sometimes the young were still carried, breastfed and slept wrapped with the mother, which resulted in fights between the male and the young bats in the cage.

Conclusion

Based on direct observation in the cage, it can be concluded that *P. alecto* can live and adapt to the environment and breed in captivity.

Conflict of interest

"Conflict of interest: none."



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