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Learning Bats Handling for Oral Swab Sampling

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Abstract:
Background. The only flying mammals, bats play an essential role in their natural habitat. Based on the type of food, bats can be divided into two groups: fruit-eating bats and insect-eating bats. Bats rank second-highest in species diversity, with 1,439 worldwide and 239 in Indonesia. Known as reservoirs of viruses, including coronaviruses. Bats are suspected to be related to COVID-19.
Aims. Under the Research Innovation and Collaboration Program - Higher Education for Technology and Innovation Project (HETI) University of Lampung 2024-2025, and in collaboration with the Lampung Disease Investigation Centre, learning the procedures for handling bats properly so as not to physically harm bats in oral swab sampling and species recognition in Braja Harjosari, directly next to Way Kambas National Park was done. The life-trapping technique uses a mist net.
Methods. Bat handling for taking an oral swab was carried out using the pinch grip method, holding both bat arms backwards with the thumb and middle finger, with the bat positioned facing upwards.
Conclusion. The bat's mouth is then blown open, and a cotton swab is gently inserted into the bat's mouth. Afterwards, the bat is rested and given a drink/water and released into nature. Oral swab samples from 10 individual bats, fruit-eating bats, Cynopterus brachyotis (n = 8), Cynopterus horsfieldii (n = 1), and an insect-eating bat, *Scotophilus kuhlii* (n = 1).

Keywords: Bats handling, Braja Harjosari, mist net, oral swab, coronaviruses

INTRODUCTION

Bats are the only mammals that can fly and are an essential component of biodiversity. Ecologically, bats play an important role in pollination, seed dispersal, and pest control in their natural habitats (Santoso *et al.,* 2020). Based on the type of food, bats can be divided into two groups, namely Megachiroptera (fruit eaters) and Microchiroptera (insect eaters). Megachiroptera are generally herbivorous, eating fruit, nectar, and pollen, with a relatively large body size and body weight of 10-1500 grams (Nowak, 1994). While Microchiroptera generally have relatively small bodies and are insectivores. Insectivorous bats have a better echolocation system than frugivorous bats. Echolocation is the special ability of bats to capture reflected vibrations that come from the ultrasonic sounds they make to identify nearby objects. Most bats use short waves of constant frequency for echolocation signals. Although each sound frequency emitted by bats lasts only a very short time, the frequency is constant between 25 KHz and 150 KHz (Komarudin *et al*., 2018).

The habitat of fruit-eating bats is usually in large trees to hang, while insect-eating bats prefer places with small holes, tree trunks, bamboo gaps, dead trees, and house ceilings as their sleeping places (Prasetyo *et al.,* 2011). Bats rank second in species diversity after Rodentia, with 1,439 species worldwide and 239 in Indonesia, including 81 Megachiroptera and 158 Microchiroptera (Maryanto *et al*., 2019).

Bats have a wide distribution to settlements supported by their flying ability. The adaptability of bats to residential environments such as houses, barns, agricultural fields, and gardens is very high, making these environments suitable for breeding (Platto *et al*., 2021). Bats are potential zoonotic pathogens and sylvatic disease reservoirs, including coronaviruses, which also cause Covid-19. Zoonoses are often caused by viruses that have long adapted to their natural hosts. Activities that bring wildlife and humans into contact with each other, such as trade, contribute to the spread of the virus. Wildlife trade is a key factor in the increase of viral infectious diseases (Piret & Boivin, 2021). The wildlife trade is one of the gateways for the spread of zoonotic viruses that have the potential to be transmitted. Thus, the interaction between human activities and bats is unavoidable and can trigger ecological infections.

Braja Harjosari is one of the settlements, buffer villages directly adjacent to Way Kambas National Park (WKNP). Given the village's landscape, the potential diversity of bats there will be even higher. In this study, preliminary surveys (life trapping), capture with mist nets, identification, and oral swab sampling were conducted. In taking oral swab samples, good and correct bat handling procedures are required to facilitate the sampling process. In addition, proper handling of bats during sampling is important because it must still prioritize animal welfare principles, ensuring that animals do not experience pain or fear, meet their food and water needs, and continue to behave normally after handling (Susanti & Widarto, 2020).

Research on bats (Chiroptera) over the past two decades has grown rapidly, especially in the context of ecology, species diversity, and its role as a reservoir of zoonotic pathogens, including coronaviruses. Previous studies have generally focused on:

1. Inventory and diversity of bat species. Many studies have documented the composition of bat species across various ecosystems in Indonesia, particularly in forest areas, agroforestry areas, and national park buffer zones.
2. The ecological role of bats. Bats play an important role in pollination, seed dispersal, and insect control, so they are often used as indicators of ecosystem health.
3. Bats as a reservoir of zoonotic diseases. In the wake of the COVID-19 pandemic, global research is increasingly highlighting bats as natural hosts of various viruses, with a focus on surveillance for pathogens and potential human transmission.
4. Capture and identification techniques. The *life trapping* method using a mist net and morphological identification is a commonly used approach in bat studies.

However, most previous studies have emphasized biological and epidemiological outcomes, while the technical aspects of learning and practicing ethical, safe handling of bats in the field have rarely been systematically and contextually studied.

LITERATURE REVIEW

Based on the study of this article and related literature, there are several research gaps that are still open:

1. Limited evaluation of the impact of handling on bat physiological stressThe study has not measured stress indicators (e.g. corticosterone hormone or post-release behavioral changes).
2. There is no comparison of handling methods. The study only used the pinch grip method without comparing it with other techniques (e.g. palm grip) in terms of effectiveness, safety, and animal welfare.
3. The sample scale is still limited. The number of individuals and species captured is relatively small, so it does not comprehensively represent the diversity of bats in the Way Kambas buffer area.
4. It has not been integrated with advanced virology analysis. Oral swabs have been taken, but this study has not linked the handling procedure to the results of virus detection or characterization.
5. Lack of standardized training models. This research opens up opportunities for the development of bat handling training modules or protocols that can be replicated by researchers, students, and field officers.

METHODS

This research was conducted in Braja Harjosari, Braja Selebah, East Lampung, under the Research Innovation and Collaboration Program of the Higher Education for Technology and Innovation (HETI) Project at the University of Lampung, in collaboration with the Lampung Disease Investigation Centre. Mist net, calico bag, caliper, pesola, and identification book were applied for life trapping. Masks, rubber gloves, cotton swabs, alcohol, cotton, and water were for oral swab sampling.

This research was conducted using a direct observation method through two stages.

Preliminary survey

A preliminary survey was conducted to determine the natural habitat of bats (Figure 1). Site selection was based on the potential presence of bats, shade vegetation, and food and water availability, as well as secondary signs such as droppings, food scraps, and bat feces.

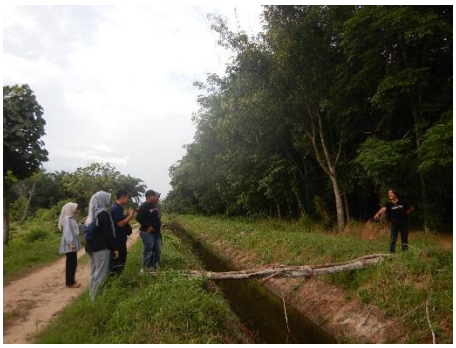

Figure 1. Site Survey at Braja Harjosari

Data Collection

Life trapping was carried out by setting mist nets stretched between the two poles installed in late afternoon (17.00), and the nets were checked every 15 minutes. The mist net was installed in the gap between two trees (Figure 2), where bats might pass during foraging. If a bat was found to be trapped, it was immediately released from the net. Bats caught in the mist net need to be handled carefully and immediately placed into calico bags, with each bag containing one bat. Captured bats were identified using the book Field Guide to Bats in Indonesia by Suyanto (2001). Following species identification, oral swab samples were collected using proper handling procedures.

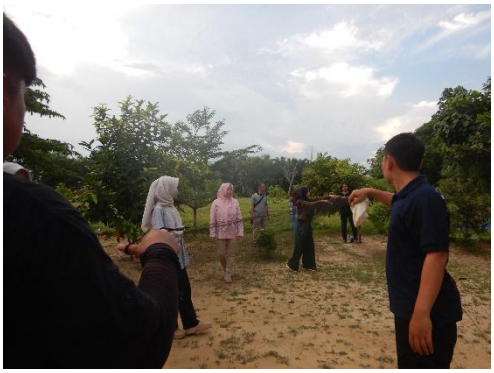

Figure 2. Mist net setting

DISCUSSION

The main novelty of this article lies in the following aspects:

1. Focus on learning (learning-based approach). This study not only documents the sampling results, but emphasizes the *learning* process of handling bats for oral swab collection correctly, safely, and ethically.

2. Integration of the principles of animal welfare. This article explicitly links handling procedures to animal welfare principles, including stress reduction, injury prevention, and release back into the natural habitat.
3. Practical and applicable approach in the buffer zone area**.** The study was conducted in a buffer village that is directly adjacent to the conservation area, making it relevant to the context of real human-wildlife interactions.
4. Technical documentation of pinch grip for oral swabs. This article provides a clear operational description of the use of the pinch grip method in oral swab collection, which is rarely described in detail in the local literature.

Thus, the novelty of this research is not in the discovery of new species or advanced virological analysis, but in the standardization and education of bat handling practices in the field.

The life trapping of bats using mist nets was installed in 2 locations, in the settlement area and in the border of rubber plantations with settlements, and obtained 10 individuals consisting of 3 bat species *Cynopterus brachyotis* (n = 8), *Cynopterus horsfieldii* (n = 1), and *Scotophillus kuhlii* (n = 1) **(Table 1).**

Table 1: Types of bats in Braja Harjosari

No.	**Family**	**Species**		**(n)**
		Local Name	**Scientific Name**	
1.	Pteropodidae	Codot Krawar	*Cynopterus brachyotis*	8
2.	Pteropodidae	Codot Horsfield	*Cynopterus horsfieldii*	1
3.	Vespertilionidae	-	*Scotophilus kuhlii*	1
Total				**10**

Handling procedures involve physically blocking and reducing bats' movement. Field techniques for interacting with mammals for good, safe, and correct handling need to be applied.

Good safety standards apply to mammals and individuals with animal welfare as a priority (Chapman, 2018). This category of obstructing and reducing the physical actions of mammals uses manual techniques, such as touching, grasping, or hand manipulation, to manage each animal. Animal welfare principles must remain a reference in every mammal handling procedure (Susanti & Widarto, 2020). The stages of handling bats for oral swab sampling include preparation, implementation, and post-implementation.

Preparation

Individual bats that have been identified are then briefly rested, either by holding them or putting them in a calico bag. After that, the bats were slowly removed from the calico bag (Figure 3).

Figure 3. Bat removed from calico bag

Implementation Process

The bat-handling technique is performed using two methods: the pinch grip and the palm grip (Prastianingrum, 2008). In this study, the pinch grip method was used (Figure 4), which is holding both arms of the bat towards the back using the thumb and middle finger with the bat positioned facing up so that the face is visible, which makes it easier when taking oral swab samples (Figure 5).

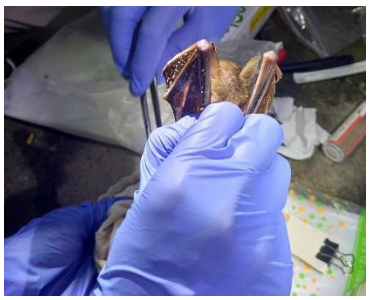

Figure 4. Pinch Grip Method, Rear View

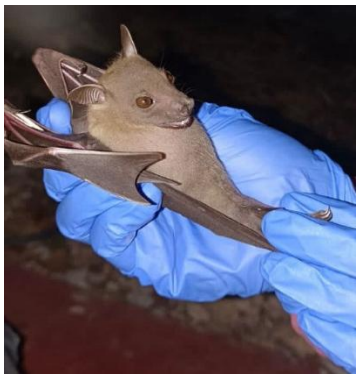

Figure 5. Pinch Grip Method, Front View

Then the bat's mouth was gently blown open, and a cotton swab was inserted approximately 2 cm deep into the bat's mouth by gently swabbing along the bat's mouth (Figure 6). After that, it was inserted into the VTM tube, the cotton swab was cut, and the VTM tube was closed again.

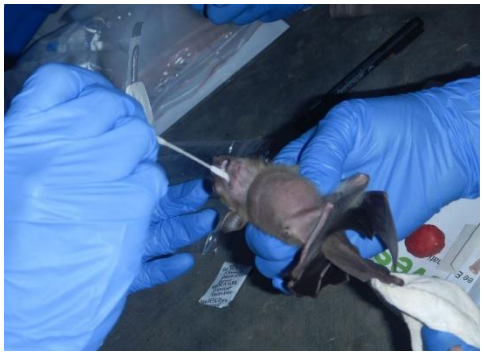

Figure 6. Oral Swab Sampling

Post Implementation

After obtaining the bat oral swab sample, the bat was rested for a few minutes and given drops of water carefully to keep the bat from experiencing post-handling stress. The bats were then released back to their natural habitat.

CONCLUSIONS

Oral swab from 10 individual bats *Cynopterus brachyotis* (n = 8), *Cynopterus horsfieldii* (n = 1) and *Scotophilus kuhlii* (n = 1) was successfully done by grip methods.

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