IDENTIFICATION OF ENDOPARASITES IN SUMATERA ELEPHANTS *(Elephas maximus sumatranus .)* AT THE ELEPHANT TRAINING CENTER (PLG) PARK NATIONAL WAY KAMBAS (TNWK) EAST LAMPUNG, LAMPUNG PROVINCE

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ABSTRACT

The aim of this study is to identify the types of endoparasites present in Sumatran elephants at the Elephant Training Center (PLG) Way Kambas National Park (TNWK) East Lampung, and to conduct a thorough examination of endoparasites in Sumatran elephants (*Elephas maximus sumatranus*). The study involved analyzing 15 samples of Sumatran elephant feces using native, floating, and sedimentation methods using magnification 100x. The data collected were analyzed descriptively and presented in tabular form. The findings revealed that 75% of the samples tested positive for *Paramphistomum sp* (12/15), 10% tested positive for *Strongyloides* worms (1/15), and none tested positive for protozoa (0/15). In the Sumatran Elephant (*Elephas maximus sumatranus*), one type of worm egg and one type of larva were discovered among the 15 samples. *Strongyloides* larvae were present in the Elephant, and the eggs identified belonged to the worm *Paramphistomum sp*. Endoparasites can be attributed to a variety of factors, such as environmental conditions, particularly the wet weather during the rainy season in Way Kambas.

Say key : Sumatran Elephant (*Elephas maximus sumtranus*) , Endoparasites, Way Kambas, Lampung, Indonesia

INTRODUCTION

Indonesia possesses a significant amount of biodiversity, which includes a wide variety of mammals. Mammals, characterized by features like hair and mammary glands, belong to the class of vertebrate animals. These creatures are found in various habitats across the globe, spanning from polar to equatorial regions and from oceans to land (Nurul, 2016). Mammals, in total, encompass 19 orders, 122 families, and 1017 genera, totaling approximately 12,000 species, which display remarkable diversity. Indonesia legally protects about 130 mammal species as stipulated in Regulation No. 7 of 1999. The island of Sumatra is home to unique animals, including the elephant, which is the largest mammal in Indonesia.

In Indonesia, Asian elephants (*Elephas maximus*) can only be found in Sumatra (*Elephas maximus sumatranus*) and eastern Kalimantan (*Elephas maximus borneensis*).

The Sumatran elephant is a protected species according to Government Regulation Number 7 of 1999 and is listed as endangered in the IUCN (International Union for Conservation of Nature) red list.According to the IUCN (2013), Way Kambas National Park is a crucial remaining forest area in Sumatra and is highly suitable for conserving the endangered elephants.

Educational and scientific purposes make elephants interesting subjects. Due to their rarity and uniqueness, Sumatran elephants have the potential to draw both

domestic and international tourists. In Indonesia, there are conservation institutions that follow the national ideology as a way to conserve elephants, with one example being the Way Kambas National Park Elephant Conservation Center (PKG TNWK). The Way Kambas National Park Elephant Conservation Center (PKG TNWK) is the first and largest Sumatran Elephant conservation center in Indonesia and is the sole National Park located entirely in Lampung province. The Director General of Natural Resources and Ecosystem Conservation issued Decision No. 39 of 2020, which outlines urgent measures to protect the Sumatran elephant (*Elephas maximus sumatranus*) population.

Diseases caused by parasites must be taken into account when managing captive breeding facilities such as national parks or zoos. The health of elephants is significantly impacted by gastrointestinal parasites, posing a threat to both ex-situ and in-situ conservation efforts. Elephants living in open conservation areas are particularly susceptible to parasitic infections due to unfavorable environmental conditions (Rahmah, 2013). According to Tauhidnursa's (2014) study, Strongylodes sp, Strongyle, and Fasciola sp worm eggs were identified as the types of parasite species, with Strongylodes sp having the highest prevalence at 48%, followed by Strongyle at 17%, and Fasciola sp at 9%.

In a separate study, it was reported that out of 10 elephant samples from Way Kambas National Park in Lampung, the prevalence of *Fasciola sp*, *Paramphistomum sp*, and *Triplumria* was identified (Assyafa et al. 2023). The findings indicated the presence of *Fasciola sp* at 0%, *Paramphistomum sp* at 100%, and *Triplumria* at 70%. In a study by Candra et al. in 2016, worm parasites were detected in the form of *Paramphistomum sp*, *Strongyle*, and *Strongyloides sp*, with the prevalence of *Paramphistomum sp* at 67% in 16 samples, Strongyle at 4% in 1 sample, and Strongyloides spp at 8% in 2 samples.

The Sumatran elephant feces contain Protozoa such as *Entamoeba, Crytosporidium, Balantidium, Spirodinium*, and genera from the Buetschliidae family, the Cycloposthidae family, and the Ophryoscolecidae family (Octalia, 2007). In the digestive tract of African elephants (Loxodonta Africana), Protozoa include Crytosporidium from the phylum *Apicomplexa, Blepharconus, Blepharosphaera, Endoralim, Leviella, Cyclosposthium, Prototapirella,* and *Triplumaria* from the phylum Cillophora (Fowler and Mikota, 2006).

The surveillance of internal parasites in elephants is essential to prevent the transmission of parasites among elephants. Parasites are a significant factor affecting the long-term survival of Sumatran elephants (Amir, 2017). Based on the previously mentioned case study, the study aimed to detect internal parasites in Sumatran elephants at Way Kambas National Park, East Lampung. This initial step is crucial for preventing diseases caused by internal parasites in elephants and ensuring the continued existence of Sumatran elephants in Indonesia.

MATERIAL AND METHOD

The research was conducted at the Elephant Training Center (PLG) in Way Kambas National Park (TNWK) in East Lampung, Lampung. The research was conducted at the Elephant Hospital (RSG) by Prof. Dr. Ir. H. Rubini Atmawidjaya and the Elephant Training Center (PLG). Research activities took place from January 22^{nel} to February 1st.

The research utilized clear plastic zip lock bags, dark plastic bags, identification labels, writing instruments, insulated containers, dropper pipettes, microscopes,

paper towels, slides, cover slips, tea strainers, stirrers, spatulas, cameras, masks, gloves, and a centrifuge.

The materials utilized include formalin, plastic sample containers, concentrated sugar, concentrated salt, and sterile distilled water.

Method Study

Exploring methods in the laboratory to detect endoparasitic worms in elephants in Sumatra's Way Kambas National Park in East Lampung, Lampung, were utilized. The sampling method involved purposive sampling of both male and female elephants, considering the gender and age (adults aged 2 to 25 years) of the tame elephants.

How to Collect Data

The samples taken in this study were 15 fresh fecal samples using 3 laboratory methods, namely the native method, sediment method, floating method, which was then identified based on the characteristics of worm eggs and gastrointestinal protozoa in Sumatran elephants and the data was presented in tabulated form and described.

Research Flow

15 fresh feces samples from Sumatran elephants at the Elephant Training Center (PLG) Way Kambas National Park (TNWK) East Lampung were collected, preserved in plastic containers, and inspected using three traditional methods - sedimentation and flotation. The characteristics of 15 fecal samples were observed for endoparasites using a microscope with 10X magnification, followed by an analysis of positive and negative results and data interpretation.

RESULTS AND DISCUSSION

The study focused on examining Sumatran elephants *(Elephas maximus sumatranus*) over a period of one month, with bi-weekly examinations using native, floating, and sediment methods. The research findings revealed the presence of worm eggs, specifically *Paramphistomum sp*. and larvae of *Strongyloides sp*. in Sumatran Elephants (*Elephas maximus sumatranus).*

The egg worm inspection was conducted using three methods: the float method, the native method, and the sediment method. When the native method was used for inspection, eggs of *Paramphistomum sp* were found. The buoyant method did not yield any findings of worm eggs. Upon examination using the sediment method, both *Strongyloides larvae sp* and eggs of worm *Paramphistomum sp* were found.

The purpose of fecal examination is to assess the digestive tract health of elephants. It also helps in comparing current results with previous examinations. Accurate recording of health issues allows for analysis and finding the most suitable solutions. This was highlighted in a study by Wulang and Talib in 2012.

Data on the identification of endoparasites in Sumatran elephants was collected using three methods: native, pumice, and sediment in the feces of 15 Sumatran elephants (Elephas maximus sumatranus) at the Elephant Training Center (PLG) Way Kambas National Park (TNWK) East Lampung.

No	FEATURE SAMPLE		METHOD			TYPE OF EGG FOUND
	Date		Floating	Native	Sediment	
1.	Sogol	01-25-2024	-	-	+	- *Paramphistomum sp*
2.	Verdi	01-26-2024	+	-	+	
3.	Denis	01-26-2024	+	-	+	- *Paramphistomum sp*
4.	Robi	01-29-2024	+	-	-	- *Paramphistomum sp*
5.	Gadar	01-29-2024	-	-	-	-
6.	Suli	01-30-2024	+	-	+	- *Paramphistomum sp*
7.	Poniyem	01-30-2024	+	-	+	- *Paramphistomum sp*
8.	Nice	01-31-2024	+	-	-	- *Paramphistomum sp*
9.	Plenary	01-31-2024	+	-	-	- *Paramphistomum sp*
10.	Nunik	01-31-2024	+	-	-	- *Paramphistomum sp*
11.	Indra	02-02-2024	-	-	-	-
12.	Patra	02-05-2024	+	-	-	- *Paramphistomum sp*
13.	Milo	02-05-2024	-	-	-	-
14.	Julia	02-05-2024	-	-	+	- *Paramphistomum sp*
15.	Salmon	02-06-2024	+	-	-	- *Paramphistomum sp* - *Strongylodes sp. worms*

The calculation yielded 12 positive samples for Paramphistomum sp (0.8%) and 1 sample tested positive for Strongylodes sp larvae (0.06%). According to the observations in Table 4.1, which were based on the fecal samples of the Sumatran Elephant (Elephas maximus sumatranus) using the native method, 10 samples tested positive (75%), while the findings of The floating method research yielded 0 positive samples, representing 0%, while the sediment method research showed 6 positive samples, accounting for 30%. Paramphistomum sp. eggs and Strongyloides sp. larvae were identified from the obtained results.

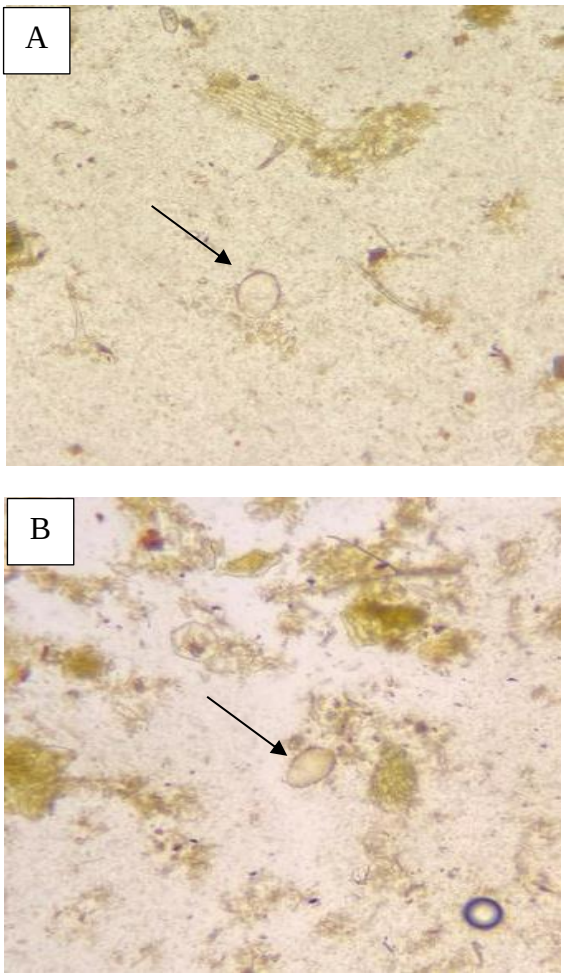

Figure 4. 1 using magnification 10x samples of Sumatran elephant (*Elephas maximus sumatranus*) revealed worm eggs of *Paramphistomum sp* in two different methods: native method (Denis) shown by blue arrow (A) and sediment method (Verdi) shown by blue arrow (B). This documentation is for personal reference.

(Figure 4.1), *Paramphistomum sp*. worm eggs were retrieved, displaying their distinctively flat and thick shape, with transparent cells and clear walls. These eggs are larger than those of fasciola sp and have a thin yellow shell, which does not completely fill the egg.

Paramphistomum sp. is characterized by its thin-shelled, yellow blastomeres, similar to the eggs of fasciola sp worms. This worm's body is thick and cone-shaped, with a single sucker encircling the mouth (Birhanu et al, 2015).

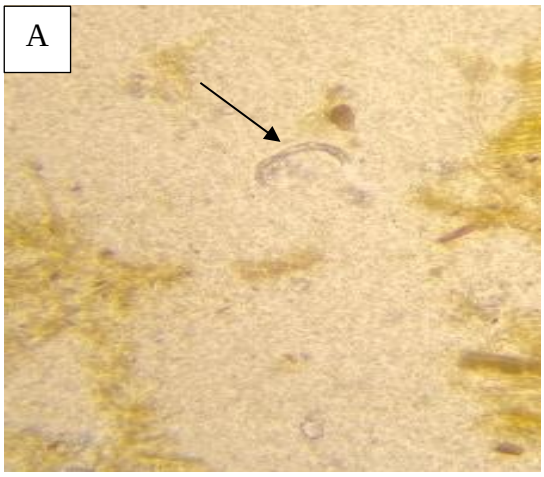

Figure 4.2 Microscopic analysis of fecal samples from the Sumatran elephant (*Elephas maximus sumatranus*) (Salmon) revealed strongylodes sp larvae at 10x magnification. The presence of the larvae was indicated by the blue arrows. This documentation is personal.

In Picture 4.2, *Strongylodes sp* larvae are depicted, showcasing their characteristic fine thread shape and a long, slender, cylindrical, and translucent esophagus. The life cycle of the *Strongyloides sp* worm commences with an egg, which later develops into larva 1, followed by larva 2 and larva 3, existing freely in the environment. Subsequently, larva 4 matures into an adult within the host's digestive system (Rober et al., 2013).

The results of the examination carried out did not find protozoa in the feces of Sumatran Elephants (*Elephas maximus sumatranus*) at the Elephant Training Center (PLG) because protozoa can appear in environments that have overcrowded enclosures, poor sanitation, accumulated feces and water tanks. drinking water contaminated by protozoa (China *et al* ., 2009). Limited facilities in the form of a damaged microscope (100 x-400 x) make it difficult to identify worm eggs, protozoa and larvae.

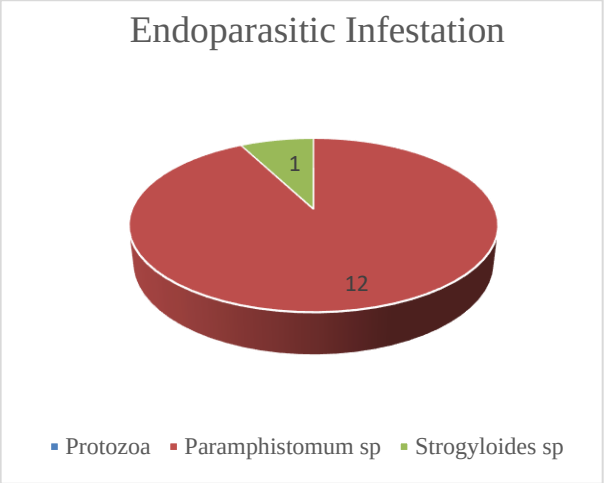

Figure 4.3 Observation of endoparasites in Sumatran elephants (*Elephas maximus sumatranus*) was conducted at the Elephant Training Center (PLG) in Way Kambas National Park (TNWKS) located in East Lampung. The presence data resulted from this observation.

Protozoa presence in elephants can lead to health issues, particularly gastrointestinal problems and worms. After analyzing 15 elephant feces samples using floating, sediment, and native methods, it was found that none of the samples contained endoparasites. This may be attributed to the fact that the elephants were still in the Elephant Training Center (PLG) area. The Sumatran elephants included in the study were not in the forest but were still close to the PLG. Furthermore, the cleanliness and health of Sumatran elephants are still considered to be very satisfactory.

The presence of protozoa in Sumatran elephants can be affected by inadequate environmental conditions, including poor sanitation, and by drinking water from specific sources like puddles and rivers. Additionally, the tropical climate in areas like Indonesia can also impact the presence of protozoa, as Indonesia experiences tropical and sub-tropical climate conditions (Gopala et al., 2011).

Fecal examination results of Sumatran Elephants (*Elephas maximus sumatranus*) at the Elephant Training Center (PLG) in Way Kambas National Park (TNWK) in East Lampung indicate the presence of several elephants testing positive using native and sediment methods. A positive sample revealed the presence of the trematode worm class, specifically *Paramphistomum sp*. The native method showed 75% prevalence of *Paramphistomum sp* eggs (see Picture 4.4). No worm eggs were found using the float method (0%), but positive results were obtained using the sediment method, showing 45% prevalence of *Paramphistomum sp* eggs and 10% prevalence of *Strongylodes sp* worms.

The graph's observations (Figure 4.4) indicate that the highest prevalence of *Paramphistomum sp* (75%) was achieved using the native method, as this method is more effective in detecting worm eggs, particularly larvae and mature worms, compared to pumice and sediment Hal. This is evident from the results obtained, showing that the native method is more effective in detecting a greater number of worm eggs and larvae (Hernasari, 2011). The data chart (Picture 4.4) reveals that the prevalence of *Paramphistomum sp* eggs is significantly higher compared to Strongylodes sp worms.

Endoparasites are found in feces due to factors such as cage cleanliness, environmental conditions, weather, and the quality of the feed. The feces may contain eggs of worms and protozoa, which develop into larvae in the soil. These parasites then enter the elephant's body when they are ingested along with the food they eat (Mulyadi, 2017).

One of the most crucial factors to assess the presence of parasites or eggs is the cleanliness of the pen. The pen should be cleaned by removing feces from the open area, bathing the elephant in the afternoon, and providing chalk in the elephant's pen. The sanitation of the pen comprises five main components: the technical requirements for building the

enclosure, the location of the cage, the direction the enclosure faces, the management of animal waste defecation, and the cleanliness of the cage (Permatasari, 2018).

The research by Phuangkum et al. (2005) emphasizes the significance of enclosure covers in elephant care. The type of enclosure, whether in-situ or semi-open, and the closure of ex-situ pens can impact the presence and number of egg worms, especially after elephants defecate. At the Elephant Training Center (PLG) in Way Kambas National Park (TNWK), the cages are predominantly semi-open, with the first cage being particularly in-situ for conservation purposes. In-situ conservation involves preserving fauna, flora, and ecosystems in their natural habitat to maintain their integrity and natural processes (Team Teaching, 2012).

Figure 4. 6 (A) Large Open Enclosure at Elephant Training Center (PLG)

The Elephant Training Center (PLG) enclosure at Way Kambas National Park (TNWK) in Lampung, East Lampung, consists of 2 semi-open cages. One of the cages is larger than the other, with the dominant male elephants utilizing the 200 x 200 m semi-open cage, which contains a total of 99 poles for tying. The area pen for elephants is open, and it is small in size. The dominant female elephants are housed in a small pen measuring 75 x 75 meters, and there are 16 poles available for tying them. As per Biaza (2006), the minimum area required for a single male elephant is 500 square meters while for a female elephant it is 200 square meters. Therefore, the open area pen for elephants at the Elephant Training Center (PLG) in East Lampung Way Kambas National Park (TNWK) adheres to the recommended standards. Regular monitoring ensures that the large pen is kept clean and maintains the elephants' health while preventing diseases and parasites.

Ensuring proper feeding is a crucial aspect when dealing with the presence of endoparasites in elephant feces within conservation parks. The type of feeding and grazing in each national park may have an impact on the presence of endoparasites in elephant feces. In the training center for Sumatran elephants, the elephants are fed a mixture of midrib coconut, hump coconut, midrib palm, hump palm oil, and wild grass in the morning and afternoon. The feeding schedule for the elephants in the training center is from 8:00 in the morning to 4:00 in the afternoon. At 5:00 in the afternoon, the elephants are given their food, which includes palm fronds and coconut.

Maintaining proper nutrition is crucial for the health of elephants, and providing feed plays a significant role in meeting their nutritional needs.

Elephants can obtain their necessary nutrition from the feed they receive on a daily basis.Elephants that forage for food will find grass in areas such as swamps and forests, where species like Imperata cylindrica (alang-alang), Brachiaria sp (Blembeman), and Symplocos stenosepala (Rice) are prevalent. Additional feeding for Sumatran Elephants (Elephas maximus sumatranus) is done daily at 17:00, including 10-20 kg of palm weevils and coconut weevils.

Figure 4. 7 (A) Sumatran Elephant Feed (Direct Feed)

Figure 4. 8 (B) Sumatran Elephant Feed (Indirect Feed)

Wild animals that do not live freely in nature require care for their welfare. Managers must ensure the quality of all feed, as stated by Mootnick in 1997. Elephants are also given supplemental feeding to maintain their health. Proper maintenance of elephant feed is crucial, considering aspects such as quality, concentration, and quantity to meet their nutritional needs. Storage, timing, feeding methods, and the type of additional feed are also essential factors to consider.

The presence of parasites or their life cycle can be influenced by environmental factors around the cage and the weather. The goal of cleaning the environment around the cage is to create a safe environment and prevent the presence of pests or other wild animals that can serve as intermediary hosts for certain diseases attacking animals. For instance, trematode worms like *Paramphistomum sp*. Metacercariae can typically survive in grass for as long as 12 weeks based on environmental conditions (Javed et al, 2006).

Paramphistomum sp eggs need around 4 weeks at a temperature of about 17ºC to develop into miracidium and then seek out a suitable snail as an intermediate host (Lloyd et al. 2007). During the research conducted at the Elephant Training Center (PLG) Way Kambas National Park (TNWK) East Lampung, Lampung, the uncertain season in January-February brought hot sun from morning to noon, and relatively high rainfall in the afternoon to evening.

The cage staff continue to sanitize the cage even in unpredictable weather to prevent worm infestation. The transformation of worm eggs into infectious larvae relies on the surroundings.

In conditions of high humidity and temperature, the development process will last approximately 7-10 days (Putratama, 2009).

The appearance of helminthiasis on the Sumatran Elephant (*Elephas maximus sumatranus*) can be influenced by the environment. Parasites may be transmitted to the elephants indirectly from the surrounding environment. The transmission of infections or parasitic diseases in Sumatran elephants can occur through water flow or direct contact with humans (*zoonosis*). Weather and habitat are factors that influence the emergence of infections or parasitic disorders in Sumatran elephants (Joesoef et al, 2018). Routine environmental cleaning takes place at the East Lampung Elephant Training Center (PLG) from 11.00 AM to 1.00 PM. Sumatran elephants are more susceptible to developing parasitic worms in swamps and humid soil climates

(Bellantari et al, 2021). The height of rainfall in the East Lampung Way Kambas National Park (TNWK) during the research period in January and February indicates the rainy season, which supports the rapid growth of infective worm eggs.

The Elephant Hospital (RSG) at the Prof. Dr. Ir. H. Rubini Atmawidjaya Elephant Training Center (PLG) in Way Kambas National Park (TNWK) administers deworming medication to the Sumatran Elephants (*Elephas maximus sumatranus*) every 3 months or in case of an identified infection to prevent helminthiasis.

To prevent endoparasite infestation in the elephants, the life cycle of worms is disrupted by regularly cleaning the pens of remaining feces and clearing leftover feed from palm fronds and coconut fronds at 17.00.

Applying lime to the cage area is expected to help prevent parasites. One way to balance the soil's pH levels is by using lime. Lime has the potential to raise the soil's pH, enhance base saturation and calcium levels, and reduce aluminum levels (Anitasari, et al., 2015). At the Elephant Training Center (PLG), lime is applied in both the large and small enclosure areas for a duration of 1 month. Approximately 8-10 kg of lime is provided per elephant point in the elephant area, with a total of 33 elephant points receiving the lime treatment.

Keeping the drinking tank area clean every 2 days in both large drums and small cages can help prevent this issue. Maintaining good sanitation is crucial for preventing endoparasites and microorganisms that may impact the health of elephants. According to Mulyantini (2010), ensuring good sanitation is a critical aspect of managing and preventing helminthiasis.

Figure 4.9 (A) Deworming Program

Figure 4. 9 (B) Chalk White in Field

The administration of drugs is crucial in preventing the transmission of worms to animals (Murtala, 2014). Evaluating and examining eggs is necessary to determine the extent of worm infection and the specific type of worms involved, which is essential in selecting the appropriate deworming medication (Purnama et al, 2021). This applies to Sumatran elephants (*Elephas maximus sumatranus*) as well. The Elephant Training Center (PLG) at Way Kambas National Park (TNWK) in East Lampung typically administers Albendazole, a deworming drug, to elephants weighing 2,500 kg. According to Young (2015), Albendazole is 100% effective at reducing worm egg counts in smaller doses. The calculation for weight loss involves the formula BB : LD 2 x TB x Constanta / 10,000, which is used to determine the

dosage of the medication. The formula includes information on constants for different elephants: 1 for calves, 0.98 for females, and 0.93 for males. The medication dosage is calculated using the formula BW x 10 mg kg/ 2,500 mg.

CONCLUSION

Conclusion

The research concludes that 75% of the endoparasites identified in Sumatran elephants (Elephas maximus sumatranus) were *Paramphistomum sp*, 10% were *Strongylodes sp*, and 0% were Protozoa using the native, sediment, and floating methods.

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