

**ECTO AND ENDOPARASITES ON SUMATRA ELEPHANT POPULATION
AT SEBLAT ELEPHANT TRAINING CENTER, BENGKULU PROVINCE,
INDONESIA**

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Received-25-07-2017

Accepted-14-11-2017

Published-01-01-2018

ABSTRACT: The deaths of 19 individuals of Sumatran elephants (*Elephas maximus sumatranus*) at Seblat Elephant Training Center (SETC) in the last 24 years are still disputed but the large alleged deaths are due to complications of illnesses that begin with ecto and endoparasite sucks on their body. Ectoparasites were collected directly from left and right ear organs, two leg folds and elephant tail during the study period while endoparasites were extracted from fresh fecal of 21 individual elephants scouted by SETC mahouts using floatation and precipitation methods. Ectoparasite on elephant bodies was found only one species of *Culicoides fulvus* (Class: Insect) that sucks blood and is a filariasis transmitting vector as well as *Leuco cytzoonosis* commonly found in the left or right ear rather than the folds of the leg and tail. By sex, ectoparasites are more common in female elephants than in adult males. Endoparasites were found to be oocysts of three genera of parasite worms such as *Toxocara*, *Oxyuris* and *Fasciola* but not found in adult worms. SETC elephants were contracted by endoparasites of *Toxocara* (33,035 eggs/100 gr fecal/individual) and *Oxyuris* (32,865 eggs/100gr fecal/individual) while individual suffered from *Fasciola* (98,800 eggs/100gr fecal/individual).

KEYWORDS: *Ectoparasite, Endoparasite, Sumatran elephants.*

INTRODUCTION

Seblat Elephant Training Center (SETC) in North Bengkulu District was established in 1992 and serves as a taming facility for the wild Sumatera elephants *Elephas maximus sumatranus*⁵. At the beginning of its establishment, SETC manages 40 individuals of wild elephants from several provinces in Sumatra, probably because of mismanagement, many elephants were dead. In December 2014, the numbers of individual elephants scouted with were only 21 individuals remaining. Thus over the span of 24 years, individual elephants died as many as 19 individuals. The cause of death is

unknown but most of the dead elephant individuals are indicated with skin lesions, abdominal bloating and severe diarrhea. Based on these indications, it is suspected that the disease that attacks the scouted elephant population may have related to the existence of ectoparasites on their skin bodies and endoparasites in the digestive tract⁶.

Ectoparasites are vector-borne animals of sedentary and temporal living on the surface of the skin and/or in the body hair of host animals such as livestock, large mammals, pets, laboratory animals and fish¹⁸. For survival, ectoparasites suck the host's blood when it is needed. The presence of

ectoparasites is very detrimental because it can cause stress and anxiety so that the eating activity of host animals is disrupted, which affects on anemia, irritation, dermatitis, decreasing body weight, reproductive ability, daily activity and endurance that eventually leads to disease complications^{3,18}. In general, ectoparasites that attack large mammals come from the Insect and Arachnid classes. The four orders of the Insects are Homoptera, Siphonoptera, Hemiptera and Diptera¹⁹ and the Arachnid class consists of the orders of Acariformes and Parasitiformes^{13,18}.

Dwiyani's study¹⁰ was stated that on ectoparasites attacking the body of several large mammals in Semarang Zoo, Central Java, found six species of *Stomoxys* sp, *Chrysomya megacephala*, *Haematobia* sp, *Tabanus* sp, *Muscadomestica* (Order: Diptera) and *Linognathus* sp. (Order: Anoplura).

The death of large mammals can also come from endoparasites that live in the body that cause disease in the gastrointestinal tract. Endoparasites such as Nematodes and Trematods worms are found in elephant individuals who die because of illness in some countries. The two-year-old of Asian Elephants (*Elephas maximus*) at the Perth Zoo of Australia is found dead from a digestive system disorder. In its fecal, parasitic worms found was Cestoda *Anoplocephala* sp.²⁴. Trematoda worms of *Fasciola jacksoni* was also found in the bile ducts of a dead adult Asian elephant⁷. The same case was found in Asian female elephants in India reported to be affected by the Nematodes of *Strongyloides elephantis*¹². At Perak Zoo Malaysia, 11 Bornean elephants of *Elephas maximus hirsutus* contracted with *Quiloniatravancra* and 14 individuals suffered with Nematodes of

*Bathmostomumsangeri*⁸. At the Belgrade Zoo, Serbia, elephants were found dead from being contracted from parasitic nematod worms of *Trichonema* and *Strongylus*²¹. A recent study from the Elephant Training Center in Way Kambas National Park in Lampung, Sumatra found parasitic worms of *Toxocara*; *Fasciola*, *Oxyuris (Enterobius)* and *Strongyloides* attacking the scouted elephant population. One individual elephant in this place is allegedly dead because of the existence of parasitic worms²⁰.

The death of 19 elephant individuals at SETC in North Bengkulu regency is still not known the cause because there is no publication related to the case yet. This study was conducted as a concern for the health of the scouted elephant population remaining, especially about the type of animal ecto and endoparasites that attack so that death of elephant individuals can be minimized.

MATERIALS AND METHODS

The study was conducted at Seblat Elephant Training Center (SETC), North Bengkulu Regency from October to December 2014. Administratively, the area is included Seblat Natural Park in Putri Hijau Sub district, North Bengkulu Regency under the management of Natural Resource Conservation Board at Region I of Rejang Lebong Regency, the Province of Bengkulu. Geographically, SETC area is located at 101° 39' 18" - 101° 44' 50" BT and 03° 03' 12" - 03° 09' 24" LS⁶.

Collection of ecto and endoparasite samples

Ecto and endoparasite samples were collected from 21 elephant individuals scouted in Seblat Natural Park consisting of 5 males, 15 adult females and 1 juvenile female. Ectoparasites were collected directly on the

left and right ear organs, two folds of legs and tail during the study period using a plastic bottle trap with 8 cm in diameter. Tweezers and small plastic bottles were used to collect entangled and / or easily flying parasites which are further inserted in labeled sample bottles containing 70% alcoholic liquids as preservatives. In the Biology laboratory of Bengkulu University, samples of collected ectoparasites were identified and counted.

Endoparasite animals were obtained from fecal collection of 21 elephant individuals using a combination of flotation and sedimentation methods^{1,4}. 100 grams of fresh fecal samples from each individual in the field were fed into a 250 ml glass vessel containing 10% formalin solution and were labeled. In the laboratory, each 100 gram sample was added 50 ml of distilled water, stirred homogeneously and filtered. The extracted solution was poured into a beaker glass and then 100 ml water was added and allowed to stand for 60 minutes. Then the supernatant is sliced carefully so that the sediment is not wasted. This cleaning process is repeated several times until the sediment solution becomes clean. Then the sediment solution was observed under a 40 × 10 magnification microscope, the observed endoparasitic worms were identified and counted²².

RESULTS AND DISCUSSION

Elephant Ectoparasites

Ectoparasites of 21 elephant individuals in SETC were found only one species of *Culicoides fulvus* (Local name: Agas /Merutu) from Class of insects and no other ectoparasitic species that often attacks other large Indonesian mammals such as Homoptera, Siphonoptera, Hemiptera and

Diptera (Insect) and Acariformes and Parasitiformes (Arachni *Culicoidesfulvus* (Diptera: Ceratopogonidae) is an ectoparasitic flying insect commonly found in mammals in Indonesia that suck blood on the skin and between feathers that cause irritation, itching, inflammation, scabies, myasis, or various forms of allergic reactions¹³. The adult *Culicoides* are very small (1.5 - 5.0 mm), the thorax is slightly bent and protruding over the head. Its wings are narrow with little venation without wing, clear and smooth-haired scales, in some species have spots. Eggs size 350-450 um, oval shaped placed one by one. The larvae are shaped like a white worm, have a head, and thorax consisting of three segments, as well as an abdomen with 9 segments. Its sized 2-4 mm, oval-shaped with a pair of respiratory funnels in the thorax area. Females of *Culicoides* bite and attack mammals during the evening and quiet night¹⁴. Egg and larva habitats are aquatic or semi-aquatic. Eggs are placed on plants or plant materials in shallow water such as pond edges and tree holes, rotted materials such as papaya stems, banana root stem, and even in holes where large mammal droppings such as cattle, buffalo and others. This larval period lasts for 1-12 months, after which it turns into a pupa. Adult flies out of pupa within 3 to 5 days. Only the female flies suck blood (0.139-0.410 µl), while the males suck the liquid plants¹⁵. *Culicoides* is a very disturbing blood-sucking ectoparasite and as a filariasis transmitting vector^{11,15} and *Leucocytozoonosis* in mammals and poultry¹³. Types of Acariformes, Parasitiformes and some other ectoparasitic insects are not found because the Sumatran elephant body trained at SETC is always cleaned daily. From observation, the mahout always bathed all the

elephants twice daily by brushing the entire body skin.

Table 1. Number of Ectoparasites of *Culicoides fulvus* (individual /trap) on elephants at SETC

No	Sex	Parts of bodies sucked			
		Left Ears	Right Ears	Leg Folds	Tails
1	Adult Males	14.4 ± 4.16	14.2 ± 5.67	-	-
2	Females	28.4 ± 4.82	22.0 ± 10.19	-	-
3	Juvenile female	19.0 ± 0.00	25.0 ± 0.00	-	-
Total		61.8±8,98	61.2± 16,86	-	-



Figure 1. Ectoparasite of *Culicoides fulvus* in the elephant population in SETC

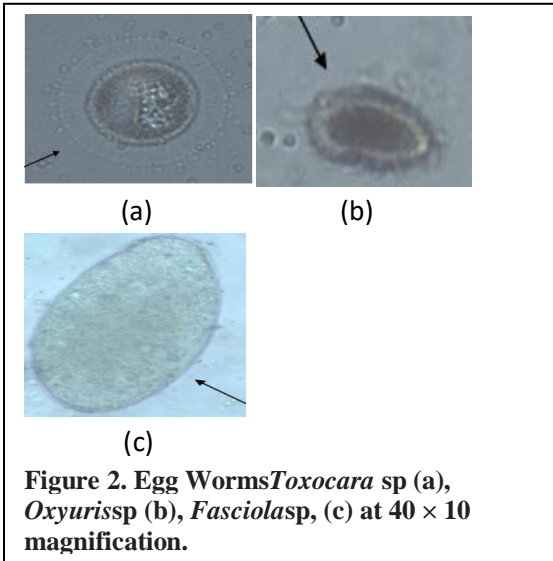


Figure 2. Egg Worms *Toxocara* sp (a), *Oxyuris* sp (b), *Fasciola* sp (c) at 40 × 10 magnification.

Table 2. Number of eggs of endoparasitic worms in elephant population in SETC

No	Genera	∑ Elephant Individuals	∑ averages of Eggs (100 gr fecal/individual)
1	<i>Toxocara</i>	21	33,800 ± 2285.832
2	<i>Oxyuris</i>	21	32,865 ± 2687.631
3	<i>Fasciola</i>	1	98,800 ± 0.0

From the four parts of the elephant body observed, ectoparasites of *Culicoides fulvus* suck blood only on the left ear and right ear while the folds of the legs and tail are not obtained. This may be because the ear organs have thin skin and contain many capillary blood vessels. In hot weather, blood is passed to the ear organs and elephants fan his ears so that blood temperature can be lowered as a system to lower body temperature. The ear is an important organ that contributes to lower 8% of body temperature²⁵. Unlike humans, elephants do not have sweat glands so the rise in body temperature should be offset by some activities to lower body temperature for instance, through bathing activities in aquatic bodies, wallowing mud, bathing soil or fanning the ears².

Based on sex, females and adolescent elephant were bitten more by ectoparasites than male elephants (Table 1). Placement of individual cage locations for female elephants and teenagers to rest may be the cause of why more ectoparasites bite them. The female and teenage elephant enclosures are around swampy secondary forests with muddy puddles mixed with elephant dung. In the mornings and afternoons *Culicoides fulvus* and flies gather on the edge of the marshes and moist soil of the breeding ground that she loves. While the male elephant is placed close

to the Elephant Training Center base camp is a wide field and near the river that allows the elephant bath to expel ectoparasites.

Elephant Endoparasites

The identification result only found the eggs of three genera of parasitic worms on elephant at SETC, namely *Toxocara* and *Oxyuris* while *Fasciola* was found only on one elephant individual. There were no adult worms found on all elephants.

Worm Eggs of *Toxocara* has the following morphological features, the egg is round-shaped like a ball, with the outer wall resembling lace and spotted smooth. Hadidjaja¹⁶ states that the eggs *Toxocara*. Has a shell with an outer layer of lace and measuring ± 80 × 70 µm. While *Oxyuris* has a thick wall of cilia and is asymmetrical in shape. *Oxyuris* eggs, generally sized ± 55 × 25 microns and contains larvae. *Oxyuris* females are able to contain 11,000-15,000 eggs and immigrate to perianal areas to lay eggs by means of uterine contractions and elephant vagina. Female worms die after laying. The eggs mature within 6 hours of removal and the eggs can live up to 13 days in a humid state²³. Egg morphology *Fasciola* is oval shape with transparent walls and yellow, sized ± 140 × 80 microns. The egg wall is very smooth and thin, small

operculum, contains morula and is very permeable¹⁶.

The discovery of three types of endoparasitic worms in the gastrointestinal tract of SETC elephants indicate that the health of the elephant population in this place is not good and should be a concern for the managers in order not to happen elephant individual deaths in the future. The health of elephant populations in ETC in Way Kambas National Park, Lampung Province, Indonesia seems much better than the health of SETC elephant population. Muryani²⁰ found that from 19 individuals studied, there was only one individual in ETC in Way Kambas National Park suffered from *Toxocara* eggs while egg species of *Oxyuris* and *Fasciola* were not detected. Regular periodic supply of helminths is an important factor in the health of the elephant's digestive tract in ETC in Way Kambas National Park.

All elephant individuals at SETC suffered with parasitic worms of *Toxocara* (33,035 eggs/100gr fecal/ individual), and *Oxyuris* (32,865 eggs / 100gr fecal/individual). Among them, one individual suffered *Fasciola* (98,800 eggs/100gr/individual). Muryani²⁰ stated that numbers of 300 eggs/gr fecal/individual from endoparasitic *Toxocara* and *Oxyuris* are not harmful to the elephants, because the elephants generally do not show clinical symptoms²⁰. Attack of parasitic worms of *Toxocara* and *Oxyuris* in cattles and buffaloes is classified into 3 levels: mild 5,000 eggs/gr, moderate 5,000-10,000 eggs/gr, and severe attacks of more than 10,000 eggs / gram. *Toxocara* attack in cattles and buffaloes have clinical symptoms such as diarrhea which leads to weight loss and no appetite, if individual suffers with severe it can occur death⁹.

One individual elephant suffered from *Fasciola* with an average number of 98,800 eggs/100gr fecal/individual. From the observation, the elephant looked sick, thin-bodied and its fecals were liquid-shaped with a blackish brown color. This elephant was alienated from another elephants because this disease can be contagious. Fasciolosis is caused by the liver worms of *F. gigantica* and *F. hepatica* which cause many problems in the field of animal husbandry. Fasciolosis leads to liver parenchymal damage which subsequently leads to impaired metabolism of fats, proteins and carbohydrates, which can disrupt growth, decrease body weight, anemia and can cause death. Cattles often suffer from these liver worms included cows, buffaloes, sheeps, goats and another ruminants¹⁷. Contamination of parasitic worms can also occur due to drinking water and eating foods containing metacercaria.

Toxocara, *Oxyuris* and *Fasciola* worms in SETC elephants likely come from several sources such as wild boar, cows and buffaloes feces belonging to local people who often gather and wallow around the scouted elephant population. In addition, it can also come from food intake contaminated with endoparasitic worms given mahout such as leaf midrib of oil palm, elephant grass, and sugar cane.

ACKNOWLEDGEMENTS

During the research in the field, the authors have been assisted by various parties. The authors wish to thank the leaders and employees of the Natural Resources Conservation Agency of Bengkulu Province in particular to speed up the administrative permit to enter the area of Seblat Elephant Training Center (SETC) and facilitate to use SETC base. Thanks also to the staffs and

mahouts at SETC who have helped authors to collect samples and provide important information related to SETC elephant health and their daily activities.

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