

***Strongyloides* spp Distribution on Orangutans in Tanjung Putting National Park, Care Center in Pangkalanbun, and Sebangau National Park**

(DISTRIBUSI *STRONGYLOIDES* SPP PADA ORANGUTAN
TAMAN NASIONAL TANJUNG PUTING, CARE CENTER PANGKALANBUN,
DAN TAMAN NASIONAL SEBANGAU)

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ABSTRACT

Strongyloides spp is a parasitic nematode in livestock, primate and human which is considered as a danger zoonotic disease. Therefore, study about parasite distribution is very important in order to find out genetic diversity among orangutan in quarantine, zoo and nature, as an effort to explore infection pattern and life cycle of *Strongyloides* spp on orangutan. Amount of 326 orangutan feces were taken from three different habitat of orangutan in Central Borneo, Tanjung Puting National Park, Orangutan Care Center and Sebangau National Park. Samples which were collected from Tanjung Puting, Care Center and Sebangau were 75, 80 and 171 respectively. Those samples were transported to the Parasitology laboratory in Faculty of Veterinary Medicine, Gadjah Mada University, Yogyakarta for examination and detection. Prevalence of *strongyloides* in Tanjung Puting, Sebangau and Orangutan Care Center were 24%, 14,6% and 13,3% respectively. Among positive samples of *Strongyloides*, 62,5% were from male orangutans, while 37,5% were from female orangutans. *Strongyloides* in pre adult and baby orangutan were 91,6% and 4,2% respectively. Meanwhile, *Strongyloides* in adult orangutan were very rare. Orangutan habitat in Sebangau National Park is an ideal habitat for orangutan, supported by the watery condition of peat land, so that *Strongyloides* re-infection become difficult. Some factors may have important role in *Strongyloidosis*, such as behavior, physical condition, nutrition, age, body weight, sex, immunity and social status of orangutan.

Keywords: Central Kalimantan, *Strongyloidosis*, orangutans

ABSTRAK

Strongyloides spp adalah parasit nematoda yang bersifat zoonosis ditemukan menginfeksi ternak dan primata. Studi tentang persebaran parasit sangat penting dilakukan pada orang utan yang ada di dalam karantina, kebun binatang, dan di alam sebagai upaya mengeksplorasi pola infeksi dan daur hidup *Strongyloides* spp. Penelitian ini bertujuan untuk mengetahui kejadian *Strongyloides* spp pada orang utan. Sebanyak 326 contoh tinja orang utan diambil dari habitat yang berbeda di Kalimantan Tengah antara lain dari, Taman Nasional Tanjung Puting, Pusat Perawatan Orang Utan, dan Taman Nasional Sebangau. Contoh tinja sebanyak 75 berasal dari Tanjung Puting, 80 contoh dari Pusat Perawatan Orang Utan, dan 171 contoh dari Sebangau. Sampel tersebut dibawa ke Lab Parasitologi, Fakultas Kedokteran Hewan, Universitas Gadjah Mada, Jogjakarta untuk diperiksa. Rincian atau prevalensi *Strongyloides* spp di Tanjung Puting sebesar 24,0%, di Sebangau sebesar 14,6%, dan di Pusat Perawatan Orang Utan sebesar 13,3%. Di antara sampel yang positif *Strongyloides* spp sebanyak 62,5% berasal dari orang utan jantan, dan 37,5% betina. Kejadian *Strongyloides* spp pada orang utan yng menjelang dewasa sebanyak 91,6%, pada anak orang utan sebesar 4,2%, dan sangat jarang ditemukan pada betina. Habitat orang utan yang ideal adalah di Taman Nasional Sebangau karena tanah gambutnya berair, sehingga reinfeksi *Strongyloides* spp sulit terjadi. Sejumlah faktor tercatat berperan penting dalam infeksi *Strongyloides* spp, seperti perilaku, keadaan fisik, nutrisi, umur, bobot badan, jenis kelamin, dan status sosial orang utan.

Kata-kata kunci : Kalimantan Tengah, *Strongyloides* spp, orang utan.

INTRODUCTION

Indonesia is a rich country in biodiversity wildlife primates. Approximately out of 195 primates in the world, 37 species live in Indonesia. About 20 species of them, all over the world can only be found naturally in the territory of Indonesia or known primate endemic to Indonesia. Orangutan is one of endangered primate species in Indonesia.

Among the many parasitic diseases in the orangutan is a parasitic disease caused by *Strongyloides spp.* *Strongyloides spp.* is a parasite that included in phylum nematode worms often called as threads. Adult worms can be parasitic or free-living (Levine, 1978). The free-living parasite can be found with male and female with small body and powerful. The parasite can cause a mild infection of the wounds in the intestines, abdominal pain, anemia, weight loss, to severe cases such as bloody diarrhea, dehydration and death (Noble *et al.*, 1982). The study of the *Strongyloides spp.* in the orangutan has not been observed in a rehabilitation center or in nature. Warren (2001) found a prevalence of *Strongyloides fuelleborni* with up to 80% on home quarantine for rehabilitation and 60% for orangutans in the wild. In a cage in the botanical garden, the most frequently encountered parasites *Balantidium coli* is 58.0% and 78.7% of *Strongyloides spp.*

Strongyloides stercoralis is this worm can infected in dogs, cats, chimpanzees, gibbons, orangutans and humans in the duodenum and jejunum, whereas larvae in the lung and pericardium. The parasites distributed widespread throughout the world, especially in tropical countries (Flynn, 1973). The length of parasitic female from 1.7 to 2.7 mm and a diameter of 30-40 μ m, produce eggs that embryonated measuring 55-60 X 28-32 microns for fast first-stage larvae that hatch contained in the feces. The length of free-living male is 650-1000 microns and a diameter of 51-84 microns, with a pair of the same length spikulum 35-40 microns and a gubernaculum. Female worm living freely in length from 0.9 to 1.7 mm and a diameter of 51-84 microns and the thin-skinned produce embryonated eggs, size 58-84 X 40-42 microns. Prepaten period is 8-17 days or more (Levine, 1978). Life cycle vary widely and can customize the way the development to the changing needs of the surrounding environment. The period starts from the free-living eggs that developed into four stages

rabbitiform, and at last formed a female or male worms. Adult worms live freely and there is only one generation only. In humid conditions, warm and calm, there was a second type of life cycle. The worms are free-living adults mate and produce eggs that pass through two stages and one stage filariform rabbitiform. Male larvae of filariform infected to human females. Third type of life cycle of *S. stercoralis* involves autoinfection. The newly hatched larvae remain in the lumen of the intestine, develop into larvae filariform and make a hole through the mucosa into the blood vessels. The larvae are then carried to the lungs and find a way back into the intestine, as a adult worms. Filariform larvae else can crawl out through the anus and went back into the body through the skin in ways the perianal area. It is more common in monkeys with fatal infection associated with massive hiperinfection by larvae (Noble *et al.*, 1982). *S. fuellerborni* was found in the small intestine mucosa of primates, chimpanzees, baboons and humans in Africa and Asia. Embryonated eggs measuring 50-63 X 26-35 microns (Levine, 1978). The difference eggs between *S. stercoralis fuellerborni* and *S. fuellerborni* can be found in the feces of host with thin-walled, transparent and embryonated, while *S. stercoralis* larvae was always in shape when found in the feces host (Markell *et al.*, 1999). In general, the incidence of this disease can be parasiter "spill over" from domesticated animals to wild animals and humans and vice versa (Daszak *et al.*, 2000). Various kinds of *Strongyloides* in the host is widely followed in the horizontal transfer between hosts. According to Dorris *et al.*, (1999) there are few events on the evolution between the host and the genus *Strongyloides spp.* The high genetic similarity within the genus indicates the presence of a host or exchange colonization and vice versa. Three subspecies that can infect humans, two of them (*S. fuellerborni* and *S. fuellerborni kelleyi*) is suspected as the source of zoonoses (Dorris *et al.*, 2002). In the orangutan, is still unknown whether the high sensitivity, especially in young orangutans against *Strongyloides spp.* can be explained through the influence of external factors such as the density in the group or internal factors such as the immune system against *Strongyloides*.

This study aims to determine the distribution of *Strongyloides spp.* in orangutans in captivity (Orangutan Rehabilitation Centre) and in natural habitats (Tanjung Putting

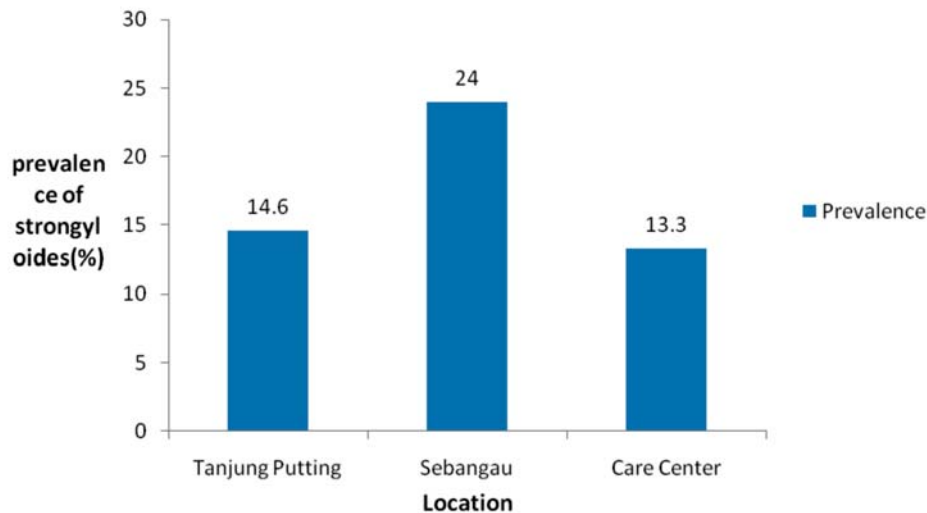


Figure 1. Prevalence Strongyloidosis the orangutans at Tanjung Puting National Park, Care Center, and Sebangau National Park.

National Park, Central Kalimantan). The research also examined the relationship between age and sex of orangutans in relation to the parameters of parasitic infection.

RESEARCH METHODS

The research was also conducted to determine the relationship between age and sex of orangutans in relation to the parameters of parasitic infection. Faeces were collected from the orangutan acquired from various locations such as special Cages of Orangutan Quarantine, natural habitat in Tanjung Putting National Park, and Sebangau National Park in Central Borneo. The data relating to the new orangutans that have come to Rehabilitation Center were collected and analyzed to determine the parameters of the population, then connected with the discovery of parasites in this study. To

identify and know the number of worm eggs, stool examined using several methods, such as the native method, centrifugal method, modification method of Parfitt and Banks, and McMaster method in the laboratory of Parasitology. The data obtained from the field and other supporting data were analyzed in an integrated manner. The data from the feces following behavior, feeding, and habitat analyzed descriptively.

RESULTS AND DISCUSSION

Samples were collected from various research sites, Tanjung Putting National Park (75 samples), Care Center (80 samples), and Sebangau National Park (171 samples). In general, parasitic metazoans in the orangutan is classified into four groups: Nematode, Cestode, Trematodes, and Acanthocephala. Nematodes that have meaning only important in primates, such as *Strongyloides spp.*, *Oesophagostomum sp*, *Trichuris trichiura*, and *Ascaris lumbricoides*. Besides *Mammonogamus laryngeus*, the respiratory tract nematodes also own a significance for the orangutan (Foitova *et al.*, 2007). The results of examination of feces collected from Tanjung Putting National Park, Sebangau National Park, and Care Center found several types of parasites that are often located in the digestive tract of the orangutan (Table 1)

Figure 1. Show that prevalence of Strongyloidosis in Tanjung Putting National Park is 24.0%, 14.6% in Sebangau, and 13.3%

Table 1. Several types of parasites are located in the digestive tract of orangutans

No	Parasites	Form
1	<i>Strongyloides stercoralis</i>	Larvated
2	<i>Strongyloides fuelleborni</i>	Larvated
3	<i>Trichuris sp</i>	Stoppered
4	<i>Oesophagostomum sp</i>	Segmented
5	<i>Trichostrongyloides sp</i>	Segmented
6	<i>Oosista koksidia</i>	Oval
7	<i>Ascaris sp.</i>	Round



Figure 2. *Strongyloides spp* eggs recovered from the feces of orangutan, in segmented form and contain larvae

in Care Center. From the results known that the incidence of *Strongyloidosis* in Tanjung Puting National Park is the highest among sites in Central Kalimantan. This is possible considering the pattern of rehabilitation and reintroduction of orangutans who performed at that location using natural patterns to be released freely, but eating hours, these orangutans are called and return to feeding sites during feeding time. Contacts between the orangutans in a tree, with fall to the ground to retrieve food is often the case, so the possibility of reinfection from the feces orangutan who suffered *Strongyloidosis* with orangutans that are still healthy may occur. The low prevalence of *Strongyloides spp* in Sebangau National Park at 14.6% is possible because the location is in the area of peat which is always watery. From observations made in these locations, the orangutan rarely comes down to the ground, only occasionally under the tree. Activity in the socialization area among orangutans in Sebangau National Park more done on the tree while hanging from one tree to another. Figure 2. shows *Strongyloides spp* eggs recovered from feces in the form larvated orangutans.

The incidence of reinfection is rare. Infections that occur may be possible if the orangutan is drinking water at the bottom or take the fruit, branches or leaves on the ground. Examination of samples collected from orangutan Care Center Pangkalanbun deliver a low of 13.3%. This occurs since orangutans in these locations is derived from orangutan that confiscated and maintained by the community, then by the Natural Resources Conservation Center before



Figure 3. *Strongyloides spp* larvae from the 3th location

submitted to the Care Center. At the time of the first on-site handling of Quarantine, orangutan has received anthelmintic. Possibility to infection is very small. The infection can still occur, when the orangutan picking up fruit that falls to the floor of the cage to eat again. Events that often happens is that orangutans eat their own feces, when the late feeding.

The presence of *Strongyloides spp* widely reported in some primates (Ashford *et al.*, 2000, Freeman *et al.*, 2004) and the high prevalence found in young primate especially *S. stercoralis* and *S. fuelleborni*. Until now, there has not been identified in detail the specific species of *Strongyloides*, because considering the identification of adult worms. *S. stercoralis* is a cosmopolitan parasite commonly found in tropical areas.

Figure 3, shows *Strongyloides spp* larvae from the third location. Parasitic female worm length from 1.7 to 2.7 mm and a diameter of 30-40 micrometers. Female parasite produce eggs that embryonated measuring 55-60 X 28-32 micrometers for fast hatch first-stage larvae that contained in the feces. Length of free-living male worm is 650-1000 micrometers and a diameter of 51-84 micrometers, with a pair of the same length of spikulum at 35-40 micrometers and a gubernaculum. The female worm living freely in length from 0.9 to 1.7 mm and a diameter of 51-84 micrometers and the thin-skinned produce embryonated eggs, with size 58-84 X 40-42 micrometers. Prepaten periode is 8-17 days or more (Levine, 1978). The difference between *S. stercoralis* and *S. fuelleborni* is the eggs of *S. fuelleborni* found in the feces with thin-walled, transparent and

embryonated, while *S. stercoralis* larvae was always in shape when found in the feces host (Markell *et al.*, 1986). These worms are commonly found in humans, causing *strongyloidosis*. Fatal *Strongyloidosis* case in primates found in gibbons (Urbain and Nouvel, 1944), chimpanzees (McClure and Guillound, 1971), and orangutan (McClure *et al.*, 1973). *Strongyloidosis* known cause of death in orangutan during reintroduction program in the region of Samarinda (Warren, 2001).

From 80 samples collected at the Orangutan Care Center, there were 62.5% in male orangutans, whereas 37.5% in female orangutan. Male orangutans are known to be active and a lot of movement compared to the female orangutan, by eating fruit that has fallen to the floor to allow the occurrence of reinfection. Of the 300 orangutans at Care Center, 326 head is a teen, 10 head of baby, 20 head of children and 7 head adults animals. While on the Figure above it appears that most of the orangutans who inhabit Care Center with *Strongyloidosis* is the age teens (91.7%), infants and children respectively 4.2% and no adults.

Interaction between host and parasite can cause serious harm to orangutan. The study of the interaction of parasite and host is important as an effort to understanding how wildlife agencies resist to parasite attacks. In this case, factor that may affect host resistance is the pathogenicity of each parasite (Frank, 1996). The complexity of interactions between different species of parasites within a host and the resulting changes can lead to separation between pathogens and parasites apatogen. During the evolution of the relationship between host and parasite, there is a development effort to balance the protection of a host to against parasitic infections, and parasites eliminated from the host body. In terms of phylogenetic, a parasite that has not been a lot of phylogenetic relationships between parasites that already existed, can be estimated more dangerous, than with a parasite that has a long phylogenetic history. This is especially important role in relation to the orangutan reintroduction program. When the orangutans will be reintroduced into the natural habitat, and infected by parasite, it will be very dangerous when in the new habitats the orangutan entrance the parasites into wild orangutans. Gradually the reintroduction of orangutan that infected by "new type" parasites will adapt well to the orangutans in their nature habitat. A good understanding of the relationship

between orangutans and parasitic in nature, can make the key to the success of reintroduction strategy and repopulation of orangutans and protect all primates in natural biodiversity.

Many important factor role in relation between primates and parasites. The most important factor are the weather, the density of orangutans, the degree of contact with humans, human activity in hunting, and cutting down forests and all the factors that important role in terms of climate change (Chapman *et al.*, 2005). Weather factors such as temperature and humidity are factors that affect the parasite's life outside the body of the orangutan. For examples, *Oesophagostomum stephanostomum*, nematodes found in chimpanzees more found in the body in the rainy season. However, this does not apply to *Trichuris trichiura* and *S. fuelleborni* (Huffman *et al.*, 1996). Orangutan population density is an important role in the incidence of infectious parasitic that allows the frequent of incidence of parasitic diseases in reinfection of orangutans. Contact with humans can result in high prevalence of parasites in chimpanzees (McGrew *et al.*, 1981). It is also observed in the orangutan population in Bukitlawang, Medan North Sumatra, with a high incidence of parasitic diseases in orangutans, given frequent contact between wild orangutans with visitors (Foitova *et al.*, 2005). Some whipworms reported infect orangutans in the area (Barus *et al.*, 2007).

Beside environmental factors, internal factors also play an important role on the incidence of parasitic diseases. These factors include the orangutan behavior, physical condition, and nutritional orangutans, age, weight, sex, immune status, and social status of orangutans. Under conditions of stress and malnutrition, immune conditions of orangutans can be decreased, thereby allowing the parasite infection into the body of the orangutan.

Incidence of parasite infection was reported in male gorillas in Africa (Barkley *et al.*, 1992). Meanwhile, in baboons, the prevalence of parasite disease is more often found in young baboons than adults, with a higher incidence rate in female children baboon than males (Muller-Graf *et al.*, 1996).

The presence of *Strongyloides spp* widely reported in some primates (Ashford *et al.*, 2000, Freeman *et al.*, 2004) and the high prevalence found mainly in the young primate infected by *S. stercoralis* and *S. fuelleborni*. Until now there has been identified in detail the specific species

of *Strongyloides* considering this research and the identification of adult worms. *S. stercoralis* is a cosmopolitan parasite commonly found in tropical areas. These worms are commonly found in humans, causing *strongyloidosis*. *Strongyloidosis* with fatal case in primates found in gibbons (Urbain and Nouvel, 1944), chimpanzees (McClure and Guillound, 1971), and orangutan (McClure *et al.*, 1973). *Strongyloidosis* reported cause of death in orangutan during reintroduction program in the region Samarinda (Warren, 2001). Related studies of population dynamics with an emphasis on geographic variation gives much hope to understand how the parasite distribution in the orangutan. It required the standardization in the collection of stool samples and data collected several study. By giving the fruiting cycles of plants and the variation of feed consumed orangutans, the only long-term observations that are used in health monitoring of orangutans. These data can be compared with the same population, the population is geographically dispersed and to determine factors that limit the range of habitat-related factors.

In recent years, research of orangutan parasites are focused on the interaction between host and parasite in their habitats in nature. The climate change in the future, is expected to be a serious threat to orangutan conservation, especially in the availability of food resources caused by abrupt disruption of the system inflorescence and tree is the source of feed because of rising temperatures and rainfall.

CONCLUSION

From the research conducted can be drawn several conclusions: Prevalence *Strongyloidosis* at Tanjung Putting National Park location (24%), Sebangau (14.6%), and Care Center (13.3%). *Strongyloidosis* of positive samples collected, there were 62.5% in male orangutans, whereas 37.5% in female orangutan. *Strongyloidosis* many cases passed on Orangutan adolescents (91.6%) and children (4.2%), whereas in adult orangutans are rarely encountered. Orangutan habitat in Sebangau National Park is an ideal habitat for the life of orangutans, because the availability of food and drink in abundance for the orangutan, supported a watery peat soil conditions making it difficult

reinfection *Strongyloides spp.* Factors that contribute to the emergence of *Strongyloidosis* case is the behavior of orangutans, physical and nutritional condition of orangutans, age, weight, sex, immune status, and social status of orangutans. Until now there has no been identified in detail the specific species of *Strongyloides*, remember to do the research necessary breeding and molecular identification of adult worms

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