



Prevalence of Gastrointestinal Endoparasites from Confiscated Long Tailed Macaque (*Macaca fascicularis*) Formerly Used as Dancing Monkey, Pet and Human Wildlife Conflict in Java Areas of Indonesia

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Abstract

The purpose of this study is to identify the type, intensity, and prevalence of intestinal helminth infection in confiscated Long-tailed macaque (*Macaca fascicularis*). Thirty samples of feces from long-tailed monkeys (18 females and 12 males), with a total of 7 Dancing Monkeys, 5 Human Wildlife Conflict groups, and 18 Pet macaque groups. West Java's Cikole Animal Hospital collected samples aseptically, labeled them, and then analyzed them in its clinical laboratory. Using the floating method, samples were evaluated to determine the intensity of infection and the identification of parasites. The incidence of endoparasites in confiscated macaques is 20 %. The prevalence of endoparasites was highest in the individual group of pet macaques, at 27.78 %, and lowest in the Dancing Monkey group, at 14.29%. The prevalence of endoparasite infection was highest in the pet macaques, at 83.33 percent, compared to 16.67% among the dancing monkeys. In the human-infection conflict group, no endoparasite infections were detected. The prevalence of endoparasites in positive infected infant samples was as high as 75%, but the prevalence in sub-adult and adult age groups was 11% and 14%, respectively. From the number of positive samples, the male individual group had the highest percentage, 66.66 %, while the female individual group had the lowest proportion, 33.33 %. In general, the pattern of infection is the same, consisting of 50% double infection types and 50% single infection types. The average intensity of helminth infection in *Strongyle spp.* was 45.50 ± 25.10 eggs per gram of feces, while in *Trichuris spp.*, it was 120.00 ± 0.00 eggs per gram of feces. *Strongyle spp.* infects 100% of the positive samples, while *Trichuris spp.* infects 50% of the samples.

Keywords: *Macaca fascicularis*, Confiscated macaque, Endoparasite, Prevalence

Introduction

Primates in Indonesia are threatened by habitat reduction and exploitation. The species *Macaca fascicularis*, also known long-tailed macaque (LTM), is one of the over exploited wild animals. The International Union for the Conservation of Nature and Natural Resources (IUCN) has observed a drop in conservation-vulnerable populations (IUCN, 2021) in the MEP region (Hansen et al., 2021). This is because the Long-tailed macaque is frequently hunted because it is regarded as a pest, exploited as a working animal in dancing monkey attractions, traded for pets to for consumption, and used as a source of medicinal ingredients.

The transfer of *Macaca fascicularis* to the Animal Rehabilitation Center for rehabilitation is one of the measures taken to uphold animal welfare principles. Free from hunger and thirst (good feeding); free from discomfort (good housing); free from pain, injury, and disease (good health); free to express natural behavior (appropriate behavior); and free from fear and depression (mental state) are the five general principles of animal welfare that must be met for animals to be released (Knicker and Bekker, 2015). The treatment of confiscated macaques health during quarantine and rehabilitation is based on one of the animal welfare principles, namely the health component.

The rehabilitation facility gets confiscated animals from government networks, including the Natural Resources Conservation Center (BKSDA), the Livestock and Animal Health Service, and other authorities. The *Macaca fascicularis* categories received include confiscated creatures deriving from former pets, confiscated dancing monkey, and animals rescued as a result of human wildlife conflict.

The long-tailed macaque rehabilitation program consists of several stages, specifically quarantine, rehabilitation, and reintroduction to their natural habitat. The quarantine stage plays a role in making decisions for animals, proceeding to the stage of determining the rehabilitation group or becoming a candidate for a group of animals as a sanctuary that is not released into the wild. This decision is a consideration so that animals can continue to get their welfare in their health condition after being confiscated and handed over to a rehabilitation center.

As an aspect of the assessment of the healthy category, endoparasite status is examined. To establish the status of individual endoparasites, identification of endoparasites and infection intensity are required.

To study zoonotic status and health threats for both animals and humans, it is vital to identify the prevalence of endoparasite status when individuals are received in the quarantine stage. This data can also be utilized to determine the status of endoparasites before an individual arrives at an animal rehabilitation center.

Materials and Methods

Time and Place Research

This study was conducted at the Dancing Monkey Rehabilitation Center of the Indonesian Animal Network Foundation (JAAN Wildlife) at the Cikole Animal Hospital in the West Bandung Regency of West Java.

Tools and Materials

The subjects of this study were 30 *Macaca fascicularis* confiscated from the Natural Resources Conservation Center (BKSDA) and housed in the Indonesian Animal Network Foundation's quarantine facility. The data for research subject categories are shown in the table below. Twelve males and eighteen tails were quarantined at the Indonesian Animal Network Foundation (JSI) Rehabilitation Center as confiscated macaque subjects. This study aims to determine the endoparasite status of confiscated macaque individuals.

This study used non-sterile gloves and plastic clips for the collection of feces samples. Morning stool samples were collected and transferred promptly to the clinical laboratory at the Cikole Animal Hospital in West Java.

Table 1. Research Subject Category

Origin Category	Gender	Total
Dancing Monkey	5 Females ; 2 Males	7
HUMAN WILDLIFE Conflict	2 Females; 3 Males	5
Pet macaque	7 Males; 11 Females	18

General Category	Total
Infant	4
Juvenile	3
Sub-Adult	9
Adult	14

Research Procedures

Determine The Endoparasite Status

The method used to determine the status of endoparasites is the saturated salt method as a float solution, with the specific gravity of the solution being more than the weight of the egg so that the eggs float to the surface. In a plastic cup, 2 grams of feces were mixed with 28 ml of a saturated salt solution until the mixture was homogenous. The precipitate is then pipetted and dropped into the McMaster glass until the two chambers are filled with liquid. The samples were then allowed to rest for five minutes before a 10x magnification microscope was used to count the number of eggs in each chamber. Using a hydrometer, a saturated salt solution was created by adding 400 g of NaCl to 1,000 mL of distilled water until a concentration of 40 percent and specific gravity of 1.18 were attained. In long-tailed monkeys, the floating method was used to identify the presence of infection and to identify helminths (Dwipayanti et al., 2014 ; Bellantari et al., 2021).

The outcomes of the examination's data analysis are compiled and displayed as tables and graphs containing the mean and standard deviation. The analysis of the data was descriptive.

Observations on the identification of gastrointestinal helminth eggs based on their morphology were made. The prevalence of gastrointestinal helminth infections in long-tailed macaque is calculated based on the findings of laboratory stool examinations, which are then incorporated into a formula. $\text{Prevalence} = (\text{number of infected samples} / \text{number of tested samples from the population}) \times 100\%$ Prevalence (P) is the number of diseases present in a specific population at a given period. Prevalence can be defined as the proportion of infected animals, but it can also

be understood as the proportion of sick animals relative to the entire population at risk. The research data is given descriptively (Bellantari et al., 2021 ; Dwipayanti et al., 2014).

Results and Discussion

Prevalence and Distribution Infection Helminth

General prevalence of the endoparasites in confiscated macaque are by 20% (6/30). Examination of 30 samples feces confiscated macaque the existing length in stages quarantine, got results existence infection helminth as many as 6 samples positive (Table 2).

The results of the 30 samples examined, group infected only originated from group origin of pet macaque and dancing monkey, with prevalence as much as 27.78% and 14.29%. Group individual from human wildlife conflict no found infected gastrointestinal parasites (Figure 1). Based on class age, prevalence positive the highest number of endoparasites infected is individu from infant group that is 75%. Whereas group adult and sub-adult age have prevalence namely 14% and 11% (Figure 2). Group individual juvenile age not infected. Based on type sex from group individual, prevalence positive infected helminth from individual manifold male have percentage 22% and female as much as 17% of the total population. Male group have percentage highest as much as 66.66%, while female group have percentage 33.33%, of the total amount sample positive.

Highest prevalence of endoparasites from positive sample is from pet macaque group is 83.33% of the 6 samples identified positive. Confiscated macaque long no general used as pet. Dwipayanti et al., 2014 in the study state that based on interview with animal trader at the wildlife market in Bali, sold *M. fascicularis* could reach 6-7 per week, so community is interested for purchase a monkey as a pet. Maintenance of long tailed macaque as pet is potential activities occur violation animal welfare principles , especially in animal health aspects (Helmayeni et al., 2014).

Based on category origin of the total sample positive, the pet macaque group had score prevalence highest that is 83.3%. The prevalence value of pet macaque in Sulawesi is also sufficient tall that is reached 59.1% (Jones-Engel et al., 2004) and monkeys traded in animal markets namely 93.3% (Dwipayanti et al., 2014).

Whereas prevalence group individual from _ of dancing monkey is 16.67 % of the 6 samples identified positive. Triani et al., (2014) mention that prevalence highest from sample positive infection from dancing monkey in Surabaya area, infected *Strongyloides stercoralis* as much as 7.85%. A total of 52% of non -human primates that are kept as working animals group, found infected positive for endoparasites as much as 52% (Choong et al., 2019).

Height prevalence in *M. fascicularis* in animals kept by humans good as pet and working animals, can caused by high contact among man owner and individual macaque, so transmission infections that occur in the pet and dancing monkey groups, can easy transmitted. Besides that management, poor nutrition and health are also main reason for transmission. Helmayeni et al. (2014) stated that condition well-being animal of the long tailed macaque kept by human, namely dancing monkey individual found very ppor animal welfare.

The human wildlife conflict group does not found infected endoparasite positive , p this could occur because of course intensity Among humans and animals no as intensive

compared maintenance. Chrisnawaty (2008) stated that prevalence endoparasites found in group population long-tailed macaque in exsitu habitat on Pulau Tinjul was found low.

Studies prevalence Gastrointestinal endoparasites considered low compared with previous study (Jones-Engel et al. , 2004 ; Choong et al., 2019 ; Lim et al., 2008 ; Triani et al. 2014 ; Chrisnawaty , 2008). Prevalence results by general concluded low compared with prevalence helminths in monkeys that are kept as pet in Sulawesi which reached 59.1% (Jones-Engel et al. , 2004) and *M. fascicularis* traded in the animal market namely 93.3% (Dwipayanti et. al ., 2014). Prevalence almost the same for individuals in ex situ habitats, where prevalence helminths in *M. fascicularis* only 26.8% (Chrisnawaty, 2008), was suspected by mainly of the diversity origin from individual animal and number sample from each group.

Table 2. Prevalence infection gastrointestinal endoparasites based on origin group the confiscated macaque

No.	Origin of The Confiscated Macaque	Σ	Prevalence
1	Pet	18	5 (27.78 %)
2	Dancing Monkey	7	1 (14.29%)
3	Human Wildlife Conflict	5	0
4	Overall total	30	6 (20%)

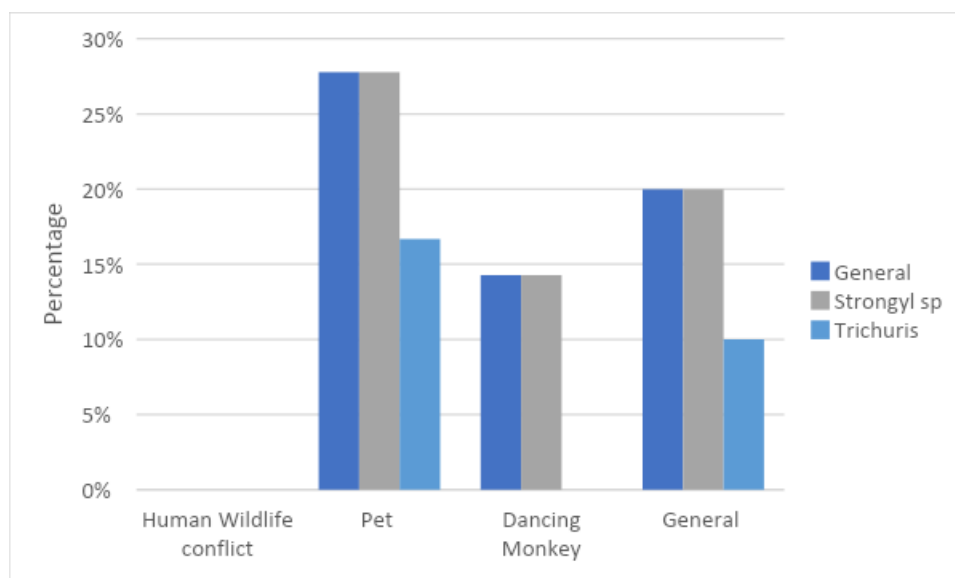


Figure 1. Graphics Prevalence Infection Endoparasite Based on Origin Group of The Confiscated *Macaca fascicularis*

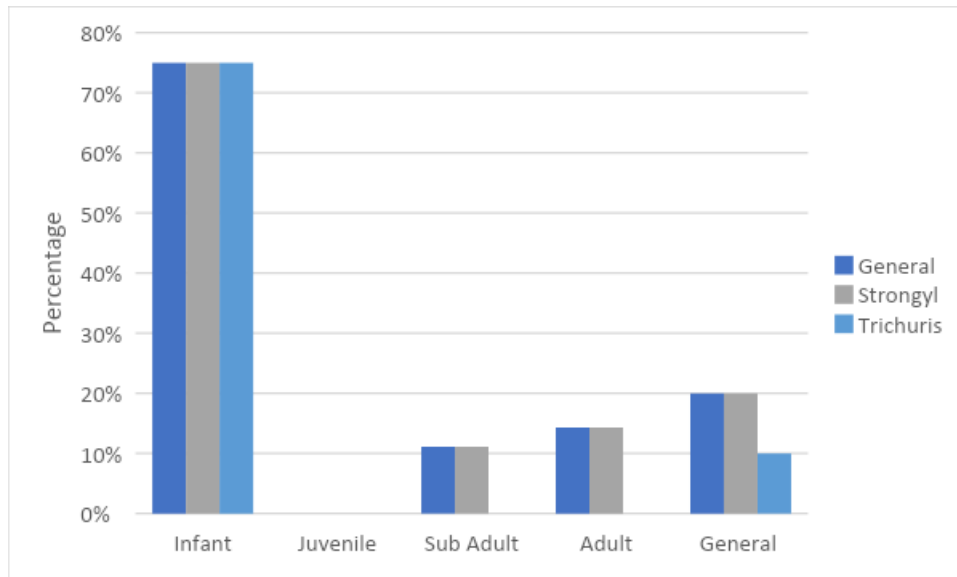


Figure 2. Graphics Prevalence Infection Endoparasite Based on Age Group of The Confiscated *Macaca fascicularis*

Overall Prevalence and Diversity of Parasites in Confiscated Macaque

Results of a total of 30 samples examined show confiscated macaques infected as many as 6 samples (20%) positive infected type helminth *Strongyle spp.* and 3 samples (10%) positive infected *Trichuris sp.* Research results showing that individual infected by gastrointestinal helminths compared to with research by Jones-Engel *et al.*, (2004) and, Lim *et al.*, (2008), where results study previously infection dominated by protozoan infections .

Helminths infestations from group *Strongyle spp.* infected 100% of the 6 identified samples positive. *Trichuris sp.* infected 50% of the total 6 positive samples infected. Infection pattern single and double infection pattern, resulted prevalence 10% each. Average intensity infection highest consequence infection by *Trichuris sp.* that is 120.00 ± 0.00 , while average intensity infection by *Strongyle spp.*, is 45.00 ± 25.10 . Double infection pattern occur only in groups age infant, with the highest prevalence of infected positive *Strongyle spp.*, and *Trichuris sp.* for 75%.

Table 3. Average of Total Eggs per Gram of Stool Helminth channel digestion *Macaca fascicularis*

Helminth Groups	Average * \pm Standard Deviation
<i>Strongyle spp.</i>	45.00 ± 25.10
<i>Trichuris sp.</i>	120.00 ± 0.00

*TTGT: total eggs per gram stool

Description : Average \pm Standard Deviation calculated based on amount individual infected type helminth *Strongyle spp.* and *Trichuris sp.*

The highest infection of egg infestation from the type *Strongyle spp.* (100%) caused by the larvae can infect *M. fascicularis* in period time, two day since the parasite egg released with the stool. Infective larval transmission model could penetrate skin and contaminate food or drinking water, while *Trichuris sp.* transmission model only through egg infective that contaminates food or

drink. *Strongyle spp.* group such as *Ancylostoma sp.* the prepatent period occur between 5-6 weeks, whereas *Trichuris sp.* could have period prepatent up to 3 months (Ash and Orihel, 1992; Onggowaluyo, 2001; Dwipayanti *et al.*, 2014).

Infection *Trichuris sp.* (50%) caused by infective *Trichuris sp.* egg is very resistant to condition environment, the eggs more durable and effective be in the enclosure. Infection *Trichuris sp.* also one infection highest in *M. fascicularis* which traded in the animal market, namely as much as 22% (Dwipayanti *et al.*, 2014).

Disease transmission occur directly on animals non- human primate influenced by the highest density from the population host, density and magnitude group size. The bigger of the amount host population, then the infection will be more likely higher, and cause the diverse infection occur (Dwipayanti *et al.*, 2014 ; Freeland, 1979; Stuart *et al.* 1993; Cote and Poulin, 1995; Arneberg *et al.*, 1998; Morand 2000; Bagge *et al.*, 2004; Poulin and Morand, 2004; Chapman *et al.*, 2005).

Possibility may occur caused by the relation of social behavior needs of the *Macaca fascicularis* (Fuentes, 2007), facilitate transmission gastrointestinal parasites, digest from one individual to other (Brown and Brown, 1986; Moller, 1993).

Our results shows that the confiscated macaque groups are mainly infested by soil transmitted helminths. These macaques are suspected of acquiring the parasitic infestations mainly through contaminated foods and contaminated environment, and constantly exposed to the helminth eggs exist in the environment as a result of the ground dwelling . The helminths reported here are of zoonotic concern, these confiscated macaques may pose as a source of infestation to their previous owners.

Conclusion

General prevalence of gastrointestinal parasites in confiscated *Macaca fascicularis* is 20%. Prevalence highest happens to the group individual pet macaques (27.78%) compared with dancing monkey group (14.29%). Prevalence helminths at the age of infant a 75%, while group adult and sub-adult age have prevalence namely 14% and 11%.

Gastrointestinal helminths were detected that infected the *Macaca fascicularis* who came from confiscated animals and in stages quarantine is *Strongyle spp.* (20%) and *Trichuris sp.* (10%). Average intensity infection helminth *Trichuris sp.* that is 120.00 ± 0.00 eggs per gram of feces, while average intensity infection by *Strongyle spp.*, is 45.00 ± 25.10 eggs per gram of feces.

Further study is needed to discover more about possibility infection of gastrointestinal parasites in *M. fascicularis*, and comparison with individual in stages rehabilitation and pre-release, as the type helminths that found is the zoonotic type of helminth. Further study is needed regarding the infection pattern in period time and other rehabilitation center.

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