Identification of endoparasites in Spotted deer (*Axis axis*) gastrointestinal tract conserved in Hasanuddin University entrance park, Makassar

Z B Gandong¹, D K Sari¹, H P Wirawan², and A Ris¹

¹Veterinary Medicine Study Program, Faculty of Medicine, Hasanuddin University, Jl. Perintis Kemerdekaan Km. 10, Makassar, 90245, South Sulawesi, Indonesia
²Disease Investigation Center, Maros, South Sulawesi, Indonesia

E-mail: zubasrul@gmail.com

Abstract. The objective of this study was to identify endoparasite in the Spotted deers’ (*Axis axis*) gastrointestinal tract conserved in Taman Pintu Satu (Park entrance) Hasanuddin University, Makassar. The study was conducted from October to December 2014 and continued in February 2015. Thirty-three samples were collected randomly and examined by the fluid method. Results showed that endoparasites were found in one of 25 samples in the dry season and three of eight samples in the wet season. The endoparasites were identified as *Oesophagostomum* spp, *Haemonchus* sp, *Eimeria* spp. The season, geographical location, and temperature were considered as the most critical factors of the occurrence of parasites in one place. This finding indicates that some factors could lead to the occurrence of endoparasites in animals, especially in Spotted deer.

1. Introduction

Wildlife animal is an animal which lives freely [1]. Spotted deer (*Axis axis*) counted as one of the wildlife animals. Spotted deer in Makassar came from Bogor, West Java Province, on Tuesday, January 31st, 2012. The total population for the first time was 21 deer. Post of their arrival date, numerous cases occurred, for instance, tympani or bloat and transport issues, which caused the death of some of the spotted deer. After two years of spending their days in their new habitat, the spotted deer counted by the researcher was around 25 deer, begin to cope with their new environment. The spotted deer also indirectly attracted people to visit their enclosure in the afternoon. People usually gave the spotted deer some foods such as carrot, and sometimes touch the spotted deer with their hands.

As a newcomer in Hasanuddin University, the spotted deer frankly did not free from diseases especially from bacterial, virus, protozoa, or worms, which described as an organism which exists on and inside of the other organism as a host or commonly called parasites [2]. The effect of the parasites is unnoticeable in the animals, but animals will display a clinical sign or parasitotic if there is an unbalance condition between host and parasite [3]. Also, diseases which documented in wildlife animals could make the animals starving, poisoned, or infected. Furthermore, the disease could be transmitted by numerous medias such as water or directly from humans [1]. To note, at the end of the 20th century, more than 75% of new disease was predicted to come from wild animals [4]. Since spotted deer was considered as a newcomer in their novel habitat, moreover, there was a lack of any reports regarding their parasitic history; therefore, this study aimed to fill the gap. All in all, this study
was aimed to document the endoparasites that could present in the gastrointestinal tract of the spotted deer in Hasanuddin University’s park entrance.

Some of the literature already documented some endoparasites in deer, *Cappilaria bovis* in Roe deer (*Capreolus pygargus*), Red deer (*Cervus elaphus*) [5], and White-tailed deer (*Odocoileus virginianus*) [6]. Then, *Haemoncus contortus* in Roe deer and Red deer [5]. Further, *Oesophagostomum venulosum* reported found in White-tailed deer [7], *Ostertagia leptospicularis* in Roe deer (*Cepreolus pygargus*) [8], and *Ostertagia spiculoptera*, which documented in Red deer [9]. *Cysticercus tenuicollis* found in White-tailed deer [10], *Moniezia* sp was documented in Pampas deer (*Ozotocercus bezoarticus celer*) [11], and also *Eimeria* spp in Grey Brocket deer (*Mazama gouazoubira*) [12].

The climate change suggested correlating with the infestation of the parasite. The occurrence of such seasonal changes led to changes in temperature and humidity environment and resulted in the presence of animal and vector displacement [13]. The condition is hugely impacted against either pathogen agent life changes, e.g., virus, bacteria, and or parasite [14], that indirectly will have an impact on the increase of cases of zoonotic and non-zoonotic diseases [15].

2. Materials and methods

2.1. Time and place of study

The study was conducted in two seasonal times, the dry season (October – December 2014) and the rainy season (February 2015). The stool samples were taken from spotted deer conserved in Hasanuddin University’s Park Entrance, Makassar, then further examined at Disease Investigation Center, Maros.

2.2. Work procedures

The study was conducted from October to November 2014 and continued in February 2015. Twenty-five samples were taken from the dry season and eight samples for the wet season. Random purposive sampling technique was applied to get the stool samples from the deer. A 3-4 cm long and 1 cm wide stool was taken as a sample from each deer. The stool samples then kept in plastic clips and stored at a temperature of 4°C to maintain the shape and structure of the worm up to 72 hours [3]. It is advisable to avoid freezing the samples due to the change in the shape of the egg [16].

The fluid method was applied for endoparasite identification. This method was based on the principle of a parasite on the stool, which will float upward due to the pressure of the liquid, both saturated sugar or saturated salt. The samples were homogenized with distilled water. Then the homogenized sample was put on a centrifuge tube in a centrifuge tube several times (200 rpm for 5 minutes and repeated for two times). After three to five minutes, a cover glass was put on above the centrifuge tube. In this case, the floating eggs will attach in the cover glass. Lastly, the microscope with 100×10 magnification was used to identify the eggs after putting the cover glass in the object-glass [22].

3. Results and discussion

The most appropriate sampling time was in the morning (08:00–09:00) when the stool was soft and moist enough. During the day (11:00–12:30), the stool was slightly dry because already exposed to the sunlight. Hence, the noon sampling stool could display an inaccurate result of the endoparasites. In the afternoon (16:30–18:00) was another precise time for sampling. However, it was difficult to directly examine the stool for afternoon sampling due to the time limit at the laboratory. The stool should be examined within 3–4 hours after the samples taken from the field to get an accurate result [3]. The sampling areas were located in numerous places like the deer’s feeding and drinking place, which exposed directly by the sun. The other location was on the left side of the main lake and the gathering place for the spotted deer.

The study showed that the spotted deer were infested with three types of endoparasites, e.g., the protozoa *Eimeria* spp, *Haemoncus* sp, and *Oesophagostomum* sp. From the total 25 samples taken in
the dry season, only one sample allegedly contained protozoa *Eimeria* spp. In comparison, from the eight samples taken in the rainy season, three were found infested by nematodes.

### 3.1. *Eimeria* spp

Based on the observations using the microscope with fluid methods, the study found a species of *Eimeria* spp. The *Eimeria* spp size was 12–45 microns length [16] and it has a thin wall [17], oval-shaped and the oocyte contains a single cell [16] (figure 1). The *Eimeria* spp. was easy to obtain using the fluid method. However, it was challenging to determine the specific species. It is important to know that *Eimeria* spp found in the stool does not lead to coccidiosis, except when the animals and the environment have a brief history and diarrhea symptoms.

![Figure 1. Eimeria spp. (40×10 magnification) with oval shaped and colourless](image)

### 3.2. *Haemonchus* sp and *Oesophagostomum*

The finding of nematodes eggs, order Strongylida, has many similarities from one species to the other species. The species belonging to this group were *Ostertagia, Trichostrongylus, Cooperia, Haemoncus, Teladorsagia, Bunostomum, Oesophagostomum, Mecistocirrus, Camelostongylus, and Lamanema*. The egg size was around 65–100µm×34–50µm, which can be detected using the floating method. *Strongylida* eggs in the stool of ruminants were unidentifiable to species or genus, either directly [17]. The eggs of these groups have similarities in morphology, so methods of culturing or identification on the three-stage larvae have to be done further [16]. The overall length and the length of the tail sheath larvae should be recorded for the distinction between species [2].

The fundamental difference used as a reference was by inspecting at the size of an egg on each species. The genus *Haemonchus* spp are known to have 11 types, and the egg size was 62–90 µm × 39–50 µm in average. Whereas the genus *Oesophagostomum* has about 50 types of worm egg, with a diameter of 85-105 µm × 74-57 µm [2]. The egg shape and size were an early reference to distinguish the types of eggs of the order *Strongylida*. Figure 2 and figure 3 showed the size of eggs of the *Haemonchus* sp and *Oesophagostomum* spp. The *Oesophagostomum* spp eggs had a greater diameter than the *Haemonchus* sp.

![Figure 2. Haemonchus sp (40×10 magnification) with diameter 62-90×39-50 microns transparent, colored, oval-shaped, thin-walled](image)

![Figure 3. Oesophagostomum sp eggs (40×10 magnification) with diameter 85-105×74-57 microns, oval, colorless transparent, thin-walled with morula in each egg.](image)
3.3. Parasitic disease and environment
The parasitic disease in an area was influenced by some factors like topography, population density, temperature, and health management [18]. The ecology notion could affect the high prevalence and increase infestations of the parasite due to system maintenance so the animals can be infected by the parasites [19]. Other factors included weather and climate, which were related to the life cycle of the worm. Not to mention in Indonesia, the land strongly supports the development of gastrointestinal Nematode, especially in the rainy season and the transition seasons where the worm can complete their life cycle within the next four weeks [20].

By the fluid method for stool examination, the infection of the endoparasites was grouped into three levels; mild infections when 3,000 adult worms were found, moderate infection when 5,000–10,000 adult worms, and severe infection with 5,000–30,000 adult worms [21].

4. Conclusion
The endoparasites of the spotted deer conserved in the Hasanuddin University’s Entrance Park were identified as three types, e.g., the protozoa Eimeria spp, Haemoncus sp, and Oesophagostomum sp. The study suggested that sanitation and maintenance of the environment should be taken into account to prevent the development of the parasites in the environment. A regular stool examination should be done to prohibit any parasites in the spotted deer. Vitamin by oral or injected should be done to support the spotted deer in adapting their novel habitat. Also, to have regular documentation of the health status of individual deer to make it easier for the management and researchers to gather some information for the future study.

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References
[1] Alikodra and Hadi S 2010 Konsep Pengelolaan Satwa Liar (Bogor: IPB Press)
[2] Levine N D s 1990 Parasitologi Veteriner (Yogyakarta: Gajah Mada University Press)
[3] Subronto 2006 Penyakit Infeksi Parasit dan Mikroba pada Anjing dan Kucing (Yogyakarta: Gadjah Mada University Press)
[4] Chomel B B, Belotto A and Meslin F X 2007 Wildlife, exotic pets, and emerging zoonoses Emerg. Infect. Dis. 13 6–11
[5] Pilarczyk B, Balicka-Ramisz A and Lachowska 2005 The occurrence of intestinal parasites of roe deer and red deer in the Western Pomerania voivodeship Wiadomości Parazytol. 51 307–10
[6] Pursglove S R, Prestwood A K, Nettles V F and Hayes F A 1976 Intestinal nematodes of White-tailed deer in Southeastern United States J. Am. Vet. Med. Assoc. 169 896–900
[7] Prestwood, Annie K, Pursglove, Samuel R, Hayes and Frank A 1976 Parasitism among white-tailed deer and domestic sheep on common range J. Wildl. Dis. 12 380–5
[8] Sharhuu G and Sharkhuu T 2004 The helminth fauna of wild and domestic ruminants in Mongolia- A Review Eur. J. Wildl. Res. 50 150–6
[9] Lora G, Rickard E P, Hoberg N M, Allen G L, Zimmerman T M and Craig 1993 Spiculopteragia spiculoptera and S. asimetrica (Nematoda : trichostrongyloidea) from Red Deer (Cervus elaphus) in Texas J. Wildl. Dis. 29 512–5
[10] Schurr K, Raballais F and Terwillinger W 1988 Cysticercus tenuicollis : a New State Record for Ohio Ohio J. Sci. 104–105 104–5
[11] Marcela M, Uhart A R, Vila M S, Beade A, B B W and Karesh 2003 Health evaluation of Pamas Deer (Ozotoceros bezoarticus celer) at Campos del Tuyu Wildlife Reserve, Argentina J. Wildl. Dis. 39 887–883
[12] Deem S L, Noss A J, Villaroel R, Uhart M M and Karesh W B 2004 Disease survey of free-ranging grey brocket deer (*Mazama gouazoubira*) in the Gran Chaco, Bolivia *J. Wildl. Dis.* 40 92–8

[13] Epstein P 2007 Chikungunya Fever resurgence and global warming *Am. J. Trop. Med. Hyg.* 76 403–4

[14] Mc Michael A J and Woodruff R E 2008 Climate change and infectious diseases *The social ecology of infectious diseases* ed K H Meyer and H F Pize (London: Academic Press Elsevier) pp 378–407

[15] Bahri S and Syafriati T 2011 Anticipating the emerging of some strategical infectious animal diseases in Indonesia related to the effect of global warming and climate change *Indones. Bull. Anim. Vet. Sci.* 21

[16] Zajac, Anne M, Conboy and Gary A 2012 *Veterinary Clinical Parasitology* (UK: Blackwell publishing)

[17] Dwight D, Bowman H M, Charles L S, Davia B C and Stephen 2002 *Feline Clinical Parasitology* (USA: Iowa States University Press)

[18] Bhattachryya D K and Ahmed K 2005 Prevalence of helmintic infection in cattle and buffaloes *Indian Vet. J.* 8 900–1

[19] Putratama R 2009 *Hubungan Kecacingan pada Ternak Sapi di Sekitar Taman Nasional Way Kambas dengan Kemungkinan Kejadian Kecacingan pada Badak Sumatera (Dicerorhinus Sumatrensis) di Suaka Rhino Sumatera [Skripsi]* (Bogor: Fakultas Kedokteran Hewan Institut Pertanian Bogor)

[20] Brotowidjoyo M D 1986 *Epidemiologi Penyakit Parasit* (Yogyakarta: Kaliwangi Offset)

[21] Schock E J L 1981 Nematode infection in food animal *Current Veterinary therapy* (Philadelphia: Saunders Comp) pp 924–31

[22] Soulsby E J L 1982 *Helminths, Arthropods, and Protozoa of Domesticated Animals* (London: Bailliere Tindall)