

Monitoring of Physiological and Parasites Status of Bawean Deer (*Axis kuhlii*) in Its Habitat as a Baseline for Wildlife Conservation Endeavor

Monitoring Status Fisiologis dan Keberadaan Parasit Rusa Bawean (*Axis kuhlii*) pada Habitat Aslinya, sebagai Bagian dari Upaya Konservasi Hidupan Liar

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Abstrak

Suatu penelitian telah dilakukan untuk menemukan informasi dasar tentang rusa bawean pada habitat aslinya. Data dan informasi dasar tersebut merupakan masukan penting dalam melaksanakan upaya konservasi rusa tersebut, yang telah digolongkan ke dalam spesies terancam punah berdasarkan IUCN. Penelitian ini dilaksanakan di Pulau Bawean. Rusa yang terdapat pada habitat aslinya dan juga yang ada di lokasi penangkaran digunakan dalam penelitian ini. Sampel feses rusa dan juga ternak domestik yang ada pada kawasan tersebut juga diperiksa. Pemeriksaan keberadaan parasit cacing dilakukan dengan beberapa uji, yaitu metode natif, sentrifus, Parfitt and Banks, serta McMaster dilakukan di laboratorium parasitologi, Fakultas Kedokteran Hewan, UGM. Sampel darah diambil dan diperiksa di laboratorium klinik. Parasit yang ditemukan secara koproskopis adalah oosista dari koksidia, *Strongyloides spp*, *Trichuris spp*, Gastrointestinal Nematoda dan *Fasciola gigantica*. Status fisiologis berikut gambaran darah ditampilkan secara deskriptif dan *tabellaris*.

Kata kunci : rusa Bawean, konservasi, fisiologis, parasit.

Abstract

The research on physiological and reproduction status of Bawean deer (*Axis kuhlii*) in its habitat has been conducted, to understand and to find out as a basic information on Bawean deer (*Axis kuhlii*) in its habitats a baseline data for wildlife conservation efforts. The deer is categorized as an endangered animal, therefore, more attention was given toward Bawean deer conservation. Habitat changes, loss of habitat, fragmentation and illegal hunting might caused the wild animals become more marginalized and the populations have been declined. Therefore, it is needed to have research as an effort to save Bawean deer in its natural habitat. This research activity covered monitoring on physiological and reproduction status, and also the examination of deer's feces samples was parasite coprological data that serve as a basic consideration data in conservation and determination of Bawean deers health in the nature and/or conservation. The research was done in Bawean Island, Gresik and East Java, by taking faces of Bawean deers in the nature and conservation. Data gathering of physiological and reproduction status were done by examining deer's condition, either directly in conservation or in its habitat, and also by interviewing people around the forest. The data on physiological status, behavior monitoring, reproduction status, faces samples, blood, food analysis, and interview result were analyzed descriptively. Some worm eggs were found during feces examination, those were *Strongyl*, *Strongyloides sp*, *Trichuris sp*, *Fasciola gigantica* and *Oocysta coccidia*. The result showed that the same parasites were found in the cattle and goat raised by people around in the vicinity of the forest, meaning, there was an interaction between wildlife and livestock. According to the result, it is needed to monitor the physiological status of Bawean deers routinely since Bawean deers is classified as endangered species.

Keywords: Bawean deer, *Axis kuhlii*, conservation, physiology, reproduction, parasite.

Introduction

Bawean deer (*Axis Kuhlii*) to is one of the Indonesian fauna which is classified as endangered and protected animal species. In the Red Data Book of the Nature and Natural Resources, Bawean deer is classified as a rare category. Bawean deer (*Axis kuhlii*) is categorized as mamalian and also one of four Indonesian deer species. Three other species are Sambar or Menjangan (*Cervus unicolor*), Kijang deer (*Muntiacus muncak*) and Java deer (*Cervus timorensis*). Systematic taxonomy of Bawean deer is as follow: *Phylum Chordata, Class Mammalia, Ordo Artiodactyla, Sub ordo Ruminantia, Familia Cervidae, Sub familia Cervinae, Genus Hyelaphus* and *Axis kuhlii species*. The study on Bawean deer is still lacking due to the location of Bawean Island as the main habitat of this fauna is in the middle of the sea, 150 km northward of Gresik town in East Java Province.

The objective of this research was to study the physiological, and reproduction status as well as to gain information on intensity and prevalency of parasites in of Bawean deers living in its natural habitat. The results of this study can be used for policy maker, researcher and wider society in managing Bawean deers population and its habitat, since most of the habitat are separated and damaged. In wild life management, it needs to have more attention on the condition of population, such as fauna condition, success of reproduction, mortality rate, and indication of nutritional deficiencies. Physical condition is one of the parameter that issued for fauna general assessment in nature. Generally, fauna physical condition determines the future population development. In a good physical condition, the Bawean deers may perform healthy behavior such as strong, active, bright color/ not

tousled feather and not lazy. Aside from that, Bawean deers population also showed healthy condition and not affected by the diseases, all of the deers are active, either structurally as a herd or individually. The availability of food is extremely influenced by productivity and carrying capacity. Lavieren (1983) explained that the population density and the level of rivalry inter and intra specific also influence the availability of food for each individu.

Deer's physiological status is very important in conjunction with the deer health evaluation. The physiological status can be used as a basic for determining deer health status, whether the deer is in a healthy condition or sick. Since the deers are susceptible animal for stress, monitored physiological condition might have variation and it depends on the temperament, level of docility and skill in deer handling (Haigh and Hudson, 1993).

Material and Method

Material. The study was taken place in Bawean Island. Bawean deers in the conservation and/or nature were used in this study. Feces of Bawean deers, cow and goat were used for parasite analysis. Other materials used in this study were alcohol, sterile cotton, 10% formalin, 10% NaOH, Sterile Aquades, Methylene blue, saturated NaCL and saturated sugar. Plastic tube, test tube, beaker glass, microscope, centrifuge, mortars, racks, object glass, cover glass, double object glass, magnetic stirrer, syringe 1 cc and needle were also used in this study.

Method. Fecales samples were taken in Bawean Island, either coming from Bawean deer in conservation habitat area or cattle (cow, goat and sheep) existing around the area. The location was predetermined in the four areas, namely Lempeci

River, Tanjung Cina Island, Gunung Besar, and GunungTinggi. The determination of location was based on the presence of drinking water source, home range (deer cruise are), finding signs of deer's appearance such as deer's foot step, strip friction in tress, rest of food vegetation, former place of fight, and information from the people in Bawean Island. Feces samples were taken based on the determined locations. The sample was inserted into plastic tube containing 10% formalin, and then labeled according to the founding place and cattle type. It was done to minimize bias in data collection. The data about sex, age, condition, and stall on cattle are noted as well.

Blood samples. About 3 ml of blood samples were taken from the Bawean deers in conservation that were located in Bawean Island and Surabaya Zoo (KBS). Those blood samples were inserted into Venoject tube containing anticoagulant. The samples were kept temporarily in the cool box and then transferred into refrigerator. Blood examination was done in veterinary clinic, Faculty of Veterinary Medicine, UGM Yogyakarta.

Feces sample. Deer fecal samples from the field were weighed and measured to examine the length and diameter, whereas this method was used to distinguish between the fawn and adult deer. The number of worm eggs was examined identified by several methods, such as Native Method, Centrifuge Method, Parfitt and Banks Modification method, and McMaster Method in Parasitology Laboratory, Faculty of Veterinary Medicine, UGM, Yogyakarta.

Data analysis. Data collection was done accompanied by interviewing some peoples around the area. The gathered data from the field and another supporting data were inherently analyzed in a particular system, so it might resulted an accurate

information and also supported each other. The data of deers feces and blood along with movement behavior were analyzed descriptively.

Result and Discussion

Anatomical and physical monitoring of the animal were significantly needed to know its status and condition. This monitoring was needed when it was related to the health examinantion by observing physical changes that associated to the clinical symptoms. Likewise, monitoring on female and male Bawean deer was extremely needed to estimate the deer condition. The anatomical data was quite needed by observing physical anatomy size of the deer, such as size, structure and physical composition. The required data were physical weight, neck circumference, chest circumference, chest wide, abdominal circumference, horn leght, and testicular circumference.

Table 1 showed the physical data of Bawean Deer in the research. The deer body weight was about 30 kgs in female and 45 kgs in male. The weight of Bawean deer was lighter than male and female Timorensis (*Cervus timorensis*) which were 60 kgs and 50 kgs respectively. It was reported by English (1984) that weight of *Cervus timorensis* in conservation area can reach 140 kgs. As is known, the general weight of deer in conservation is relatively heavier than nature. Likewise, deer raised in the zoo seems to be fatter than deer living in the wild forest. It is related to movement and mobility of the deer in conservation and zoo which are relatively low and also the availability of food every day by giving at least twice a day. Therefore, the heaped fat of deer in conservation is much more than in nature. Next Additional to these, Lavieren (1983) explained that aside from food availability, the factors affecting

physical condition of animal are physiological changes caused by pregnancy process so that weight increases and physical condition changes caused by the process of breastfeeding. On this condition, weight loss may occurs because more energy is used for milk production, stress because of giving birth.

Physical condition and body weight were declined due to decreasing feeding activity. The activity was focused on the behavior of defending breeding territory area, diseases, injury, or morphological another damages, so that detained the feeding activity, age and sex development, where in particular age the animal would undergone nutritional loss. Sex might also affect the physical condition of the animal. The deer living in a nature has perfect physical condition, whereas the indicator are both tail and ass circumference are circle, shining and smooth feather color, the affected skin by disease and scar are almost unseen. Wild deer have abundance of food variation, so they might obtains an appropriate nutritional need. Even in the extreme

conditions, the deer will be able to adapt in stimulating immune system by active moving and selecting particular types of food. In dry condition or limited water resources, the deer might take some types of vegetation that contain a lot of water. To cope the lack of feed, in nature, the deer move to the area that has a lot of feed.

Cycle of Lust

Estrous cycle is part of the female reproduction physiology. Estrous cycle duration is when a deer showed estrous signs again after previous estrous signs in a few days before. During the pregnancy period of the deer, the estrous cycle is stopped. The length of estrous is the time when the female deer shows willing behavior to accept male deer in a variation of time. The variation of estrous depend on the season (Mylrea, 1992) and the signs of estrous behavior might stopped after copulation (Asher et al, 1990). After mating, the estrous signs are unseen.

Table 1. Body measurement of male and female bawean deer

| Parameter | Male Bawean Deer | Famale Bawean Deer |
|-------------------------------|------------------|--------------------|
| Body weight (kg) | 45 | 30 |
| Neck circumference (cm) | 43 | 31 |
| Chest circumference (cm) | 83 | 75 |
| Chest wide (cm) | 22 | 18 |
| Abdominal circumference (cm) | 90 | 88 |
| Body length (cm) | 85 | 64 |
| Horn Length (cm) | 20 | - |
| Testicular circumference (cm) | 13 | - |

Table 2. Female Bawean deer estrous cycle in a conservation

| Parameter | Explanation |
|-----------------------|-------------------------|
| Length of cycle (day) | 17-19 |
| Pro estrous | Vaginal redness |
| Estrous | Slimy and swollen Vulva |
| Met estrous | Vaginal less pale |
| Di estrous | Vaginal pale |

Estrous cycle of Bawean deer (Table 2) theoretically divided into 4 stages, those are proestrous step, estrous, metestrous, and diestrous stages. Pregnancy period of the Bawean deer is 225-230 days by one fawn. In a rare case, there are 2 fawns in a birth. The birth season usually on February up to June, nevertheless, there are also births in other months with less percentage. In conservation area, the birth may occur during the year with 9 months interval. (Blouch and Atmosoedirdjo, 1987). In newborn fawn of Bawean deer, the spots will soon disappear after a few days (Geist, 1998). It is also reported the existence of a

light color on the back of spine. In male, the horn begin to grow at 1 year of age (Stiwell, 1970)

Wildlife behavior is an activity that reflecting daily movement activity of wildlife. Activity observed was standing behavior, whereas the deer was not in sits or laid down position. The deer showed this activity since early in the morning until it reaches the peak of the morning at 09.00, and then decreased. At 12 pm (noon), most of the deer were doing sitting activity. Since the temperature was high in the afternoon, many of deers were hiding in the bushes, while at the night, that activity was decreased which indicates the resting time.

Table 3. Behaviour of female Bawean deer during estrous cycle in conservation area

| Day | Time | Behavior type | | | | Explanation |
|-----|-------|---------------|----------|-------|-------------|---------------|
| | | Nervous | Appetite | Smell | Sensitivity | |
| 11 | 06.00 | + | ++ | | | |
| | 09.00 | | ++ | | + | |
| | 12.00 | + | - | + | | |
| | 15.00 | | ++ | | + | |
| | 18.00 | | - | | | |
| 12 | 06.00 | ++ | + | | ++ | |
| | 09.00 | ++ | + | ++ | ++ | |
| | 12.00 | + | + | + | ++ | |
| | 15.00 | + | - | ++ | + | |
| | 18.00 | + | - | | + | |
| 13 | 06.00 | ++ | + | + | + | |
| | 09.00 | +++ | - | ++ | | Pink Vulva |
| | 12.00 | +++ | + | ++ | | Swollen Vulva |
| | 15.00 | +++ | - | ++ | | |
| | 18.00 | ++ | - | + | | |

Physiological status is a condition that described the deer's physiological condition, can be used as a basis for determining the health status of a deer, whether the deer is in a healthy condition. Physiological status was composed of body temperature, respiratory frequency, and heart rate. In certain condition, this physiological status could be changed, for example due to illness, stress or lack of

water and feed. Physiological status can be used as a reference for determining whether a deer is in a healthy condition or not. The deers are susceptible animal to stress, therefore, physiological condition might have variation and; it depends on the temperament, level of docility and skill in deer handling so that the stress factor on that deers are minimum (Haigh and Hudson, 1993).

Table 4. Physiological status of male and female Bawean deer in conservation area

| Physiological status | Male Deer | Female Deer |
|------------------------------------|-----------|-------------|
| Hearth rate(per minute) | 92 - 97 | 90 - 95 |
| Respiratory frequency (per minute) | 38 - 39 | 38 - 40 |
| Rectal temperature (°C) | 38 - 40 | 39 - 41 |

Table 4 showed the hearth rate status of male and female Bawean deer in conservation area were 90-97 per minute and 88- 95 per minutes respectively. The respiratory frequency of male and female was 38-40 °C. The physiological status was intended as a reference for normal physiology of healthy Bawean deer. It was very difficult to find physiological description of wild deer in nature, because it was impossible to catch and examine the deer in a close distance. Therefore, examination of

Bawean deer in conservation can be used as reference in nature whereas the range of data is in accordance with the above examination.

Hematology is a blood description that refer to the animal condition. The fundamental data of Bawean deer was substantial extremely needed to determine whether the animal is in a healthy or sick condition by looking at the level of hemoglobin, number of leukocyte and erythrocytes, packed cell volume and the total of plasma protein (table 5).

Table 5. The blood description of male and female Bawean deer in conservation

| Hematological data | Male Bawean deer | Female Bawean deer |
|-------------------------------------|------------------|--------------------|
| Haemoglobin level (gr/100 ml) | 14 | 16 |
| Total of Leucocyte (/cm3) | 3500 | 3300 |
| Total of erythrocyte (million/mm3) | 9 | 8 |
| Pack Cell Volume (%) | 41 | 43 |
| Total of Plasma Protein (gr/100 ml) | 8,3 | 9,3 |

Endoparasites Determination

A deer is a wild animal that having high resistance to awide range of unfavorable nature condition. Therefore, by an adequate availability of feed and nutrition in the nature, a deer can survive for a long period of time. Gastrointestine parasites are usually found in the domesticated and wild ruminant in

tropics area (Nurcahyo, 1999). Presence of the worm is extremely detrimental to animal because it might cause pathogenic effect, such as anemia, weight loss, decrease in appetite, and frequently, on the level of severe infection, it might result in death caused by severe anemia and diarrhea. Generally, the infection caused by gastrointestinal nematode does no't show

specific indication, however in the long term (chronic) infection, it might result in weight loss, digestion impairment in intestines and anemia due to

blood sucking activity of the worm larva (Nurcahyo, 2001).

Table 6. Types of endoparasites found during fecal examination of Bawean deer in nature

| No | Discovery Location | Type of Endoparasite | Faces Length (cm) | Faces Diameter (cm) | Faces Weight (gram) | Estimation Explanation of deer |
|----|--------------------|---------------------------|-------------------|---------------------|---------------------|--------------------------------|
| 1 | Lempiji | <i>Coccidia Oocyst</i> | 12,2 | 5,2 | 0,2 | Young |
| 2 | Lempiji | <i>Strongyloides sp</i> | 12,2 | 5,2 | 0,2 | Young |
| 3 | PulauCina | <i>Trichuris sp</i> | 11,7 | 7,5 | 0,4 | Adult |
| 4 | PulauCina | <i>Strongyl</i> | 11,6 | 7,2 | 0,4 | Adult |
| 5 | Gunung Mas | <i>Fasciola gigantica</i> | 12,1 | 5,3 | 0,3 | Adult |

The habitat of Bawean deer is getting marginalized by the increasing of agricultural activity and land clearing for settlement. Therefore, the threat of gastrointestinal parasites becomes more significant due to the frequent contact between Bawean deer and cattle owned by the people. Monitoring on physiology and anatomy of Bawean deer routinely is needed to monitor the condition of deer population which is categorized as endangered species. The management of habitat is necessary, particularly to maintain the availability of feed and drink for the deer in nature that are probably only about 300 animals left. Therefore, there should be regular monitoring by the rangers and the surrounding forest area community to ensure the preservation of Bawean deer's breeding capability.

Conclusion

Parasites were found coprologically in Bawean deer living in its natural habitat are *Coccidia oocysts*, *Strongyloides spp.*, *Trichuris spp.*, *gastrointestinal nematodes* and *Fasciola gigantica*. *Hematological and physiological data of wild deer in the captivity are very important as a basic for wild deer health status prediction.*

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