Aspects of animal welfare on Rusa Timor (Cervus timorensis) in Bumi Marina Captive Breeding Facility in Manokwari

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Abstract. A conservation program of timor deer (Cervus timorensis) is carried out through its breeding approaches in captivity. This study aims to examine the welfare aspects of timor deer (Cervus timorensis) in Bumi Marina captivity based on the principles of animal welfare. This research uses a descriptive method and observation techniques in the captivity. Variables observed in this study are (1) free from hunger and thirst, and (2) free from pain, injury and diseases. The result indicates that the implementation of two welfare aspects of timor deer (Cervus timorensis) kept in the captivity has a 86 point based on the criteria used in this study, and categorised as very good, or grade A. This means that these two welfare components of the timor deer (Cervus timorensis) have fully met the criteria determined by the regulation of Directorate General of Forest Protection and Nature Conservation No. P.9 / IV-SET / 2011 regarding ethical guidelines and animal welfare in the captivity.

1. Introduction
Wildlife breeding is an activity to reproduce wild animals, aiming to increase the population while maintaining pure genetic animals and utilizing them optimally [1]. Increasing interest on the breeding program of deer species is not supported by good management practices. A captive breeding program of deer is currently becoming popular for tourist attraction, especially when human resources are available supported by the implementation of good management practices [2]. The captive breeding of timor deer in Papua is prosperous in terms of food sources, as the natural food sources are plenty and available. However, special attention should be given in terms of management and health requirements. In fact, health and feed are the main key success of the survival of timor deer in captivity [3]. Lack of better understanding on the tree aspects of good husbandry practices - breeding, feeding and management may have an impact on the development of animals kept in the captivity. Thus, it is necessary to increase the caretakers’ knowledge in order to achieve the animal welfare in captivity.

Timor deer breeding efforts in Manokwari have been carried out in order to maintain its population. Although timor deer have been adapted easily in the various nature conditions, feed and health management are often been neglected. Meanwhile, these aspects are closely related to the animal welfare aspects, which, in turn can affect the productivity of the animals. Human intervention through domestication and captive breeding, is one of the main purposes of preserving natural resources including the protection of ecological processes. These are important to support the preservation of species diversity and genetic resources and the utilization of natural resources [4]. Management and development of deer breeding program is conducted to produce healthy animals and the achievement of deer captive breeding sustainability. The breeding program of wildlife populations in captivity is very much determined by the success of effective management aspects [5]. Regulation of the Director
General of Forest Protection and Nature Conservation number P.9 / IV-SET / 2011 article 1 paragraph 2, states that animal welfare is the survival of animals that need to be considered by the managers so that animals keep healthy, have enough food, can express normal behaviour, grow and reproduce properly in a safe and comfortable environment. However, the animal health aspect has been far from the keeper’s or managers’ attention. The minimum standards for animal welfare principles as cited in Article 6 paragraph 3 include (1) Free from hunger and thirst, (2) Free from environmental discomfort, (3) Free from pain, injury, and disease, (4) Free from fear and depression, (5) Free to behave naturally. These five standards are the criteria and indicators of the adequacy of the welfare of animals within a captive breeding condition.

The timor deer captive breeding facility in Bumi Marina, Manokwari is managed privately. So far, this facility plays important roles in supporting teaching and research of students and lecturers from the Faculty of Animal Science Universitas Papua. Many aspects of captive breeding condition have been studied, however, research on the management of deer welfare in captivity is less studied. Therefore, this research is conducted to study the welfare management of timor deer in Bumi Marina captivity, Manokwari.

According to Law Number 18, 2009, animal welfare is including aspects that relate to the physical and mental state of animals based on their natural behaviour. These situations are being applied in order to protect the animals from improper treatment by humans. Animal welfare is very concerned on the care and treatment of humans on animals, to improve the quality of life of the animals.

The development of the timor deer (Cervus timorensis) captive breeding program is an alternative to raise deer outside its natural habitat. In the transition from their behaviour of roaming freely in their habitat, to the restricted movement atmosphere in captivity, the aspect of animal welfare is very urgent aspect that raised people’s concerned. Animals with a high standard of welfare aspects in captivity responded positively to their development in captivity. Therefore, this research is conducted to study the condition of the timor deer kept in the captive breeding facility. This is important to support sustainable deer breeding program with suitable of the welfare aspects requirements. Thus, this research aims to assess the welfare aspects - free from hunger and thirsty, and free from pain, injury and diseases of Timor deer (Cervus timorensis) in Bumi Marina captive breeding facility in Manokwari.

2. Methodology
This research was conducted at the timor deer (Cervus timorensis) captive breeding facility, ARO-M in Bumi Marina, Manokwari, from November to December 2020. Ten individuals of timor deer (Cervus timorensis) consisted of 6 adult females, 1 fawn female and 3 adult males were observed. Digital clocks, thermometer and hygrometer were used to measure the temperature and humidity. Camera DSLR Canon1200EOS is used for documentation in the field. We also supported with questionnaires to interview the caretaker.

2.1. Methods
This research used descriptive method with observation and survey techniques including interview to the caretaker of the captivity. The collected data was the welfare components that being assessed. Supporting literature and related information on deer captive breeding are gathered to complete the results from observations.

2.2. Variables and analysis
In this study, we focused only on two among five aspects of animal welfare: (1) free from hunger and thirst, and (2) free from pain, injury and diseases. The component of free from hunger and thirst included (a) type of feed, (b) quantity of feed, (c) time of feeding, (d) quantity of drinking water, and (e) time of drinking. The components of free from pain, injury and disease was (a) animal condition, (b) cleanliness of the feed and drinking places, and (c) medical examination.

All components are assessed with specific criterion that scored following the Regulation of the Director General of Forest Protection and Nature Conservation - PHKA No.6 of 2011. The score of
each component (Table 1), was based on the categories provided are added up to get an average value of each aspect. Calculation of the assessment score is described based on the final value of each component. The scoring formula refers to the total score for each of the component being assessed.

Table 1. Description of the score based on the Regulation of the Director General of Forest Protection and Nature Conservation No.6 / 2011.

| Score | Description   |
|-------|---------------|
| 1     | Very poor     |
| 2     | Poor          |
| 3     | Fair          |
| 4     | Good          |
| 5     | Excellent     |

The final value of the implementation is adjusted to the assessment (Table 2) based on the Regulation of the Director General of Forest Protection and Nature Conservation No. P.9 / IV SET / 2011 about the Guidelines for the Assessment of Conservation Institutions.

Table 2. Classification of animal welfare assessment (Regulation of the Director General of Forest Protection and Nature Conservation No. P.9 / IV SET / 2011).

| Score Rating | Classification |
|--------------|----------------|
| Excellent (A)| 80.00-100      |
| Good (B)     | 70.00-79       |
| Fair (C)     | 60.00-69       |
| Poor (D)     | < 60.00        |

Results from the survey and observation in the field was used to carry out the assessment. Each parameter is entered into the scoring column in (Table 3). According to Puhun et al (2017), weighted value obtained by the calculation as follows: Weighted Score = Weight x score.

Table 3. Weight of animal welfare parameter (Regulation of the Director General of Forest Protection and Nature Conservation No.6 / 2011).

| No | Components                                      | Weight | Score | Weighted score (W x S) |
|----|------------------------------------------------|--------|-------|------------------------|
| 1  | Free from hunger and thirsty                    | 30     | 1-5   | 30-150                 |
| 2  | Free from discomfort                            | 20     | 1-5   | 20-100                 |
| 3  | Free from pain, disease and injury              | 20     | 1-5   | 20-100                 |
| 4  | Free from fear and pressure                     | 15     | 1-5   | 15-75                  |
| 5  | Free to express natural behavior                | 15     | 1-5   | 15-75                  |
|    | Total                                           | 100    |       | 100-500                |

The final score to assess the animal welfare aspects used the following formula [5]:

\[ \text{Score} = \frac{\text{Sum of weighted scores}}{5} \]

3. Results
The captive breeding facility of timor deer is located in Bumi Marina, Manokwari. This facility is constructed d outside of deer natural habitat in 2015, within 167.01 m². Shelter with 5.2m length, width 5.7m and height 2.2m are provided in the facility, while the rest of the area is covered by sandy soil (Figure 1).
Ten individuals of deer are raised in the facility, consist of 3 adult male, 6 adult female, and 1 young deer. Deer are kept semi-intensively, being caged and herded, while most of the requirements such as space, food, water, shelter, health and breeding management is controlled by the caretakers.

3.1. Free of hunger and thirst
The results of the assessment on free from hunger and thirst are presented in Table 4.

| Aspects               | Score | Description                                                                 |
|-----------------------|-------|-----------------------------------------------------------------------------|
| Type of Feed Provided | 4     | The types of feed given are fruit, legumes, grass, other forages and non-feed forages. |
| Quantity of Feed      | 3     | Available all the time but sometimes insufficient and sometimes insufficient |
| Time of Feeding       | 4     | Given three times a day                                                     |
| Quantity of Water     | 5     | Available at any time and in excess                                         |
| Provided              |       |                                                                             |
| Time of Drinking      | 5     | Given continuously                                                          |
| Average               | 4.2   | Good                                                                        |

Feed given to timor deer, comes from the surroundings in fresh based. Types of feed include grass, field grass, Bengal grass (Megathyrsus maximum), nut grass (Cyperus rotundus) and alang-alang (Imperata cylindrica). While legumes provided for the animals including ketul / kastroli (Bidens pilosa) and gamal (Gli ricidia sepium) leaves. Other forages that also given are spinach leaves (Amaranthus) and papaya (Carica papaya) leaves. Non-feed forages, are also given such as Kapok (Ceiba pentandra) leaves, banana (Musa paradisiaca) leaves, cassava (Manihot esculenta) leaves, dragon fruit stems and papaya stems. Some fruits such as papaya (Carica papaya), star fruit (Averrhoa carambola) and dragon fruit (Hylocereus polyrhizus) also provide as source of food.

Pasture is not available within the facility, thus food are supplied from outside and provided to meet the requirements. Food are given by placing them in the feeding corner. Unfortunately, the corner has no shelter, so it is wet and muddy during the rainy seasons. The quantity of food for 10 individuals of deer ranges from 2.5 to 7.1 kg / individual / day, with an average of 4.2 ± 1.31 kg. Williamson and Payne (1993) explained that ruminants require 10 percent fresh weight of feed from their body weight per day. Our finding shows that the quantity of feed supplied to the animals in the facility not exactly 10% of the body weight per day. The quantity of food provided to deer varies every day, and not reach 10% of the
body weight on average, thus it has to be added to meet the requirements. The feed is not weighed before it is given to the animals. The management provides feed that suits in 20 or 50kg sacks. For example, in the morning ± 1 sack measuring 20 or 50 kg, in the afternoon ± 1 sack with the same measurement, and in the afternoon ± 1 sack also given per day. Weight and type of the forage varies between sacks.

Feeding is provided 3 times a day - at 08.00 in the morning, at 12.00 during the day and at 16.00 in the afternoon. However, during the study, feeding frequency sometimes less than three times per day. During our study, the rainfall is quite high from noon to late in the evening. In the rainy day, the caretaker could not provide food for the deer in the captivity.

Drinking water in the facility is sufficient because water is continuously available. Drinking water is always provided (ad libitum). We did not observe a shortage of drinking water in the facility, although we noticed, deer are rarely drink during our study. This might happened as fresh fodder are provided to the animals, so the need of water has been available and supplied from fresh food.

Based on the calculation we performed, the component free of hunger and thirst (Table 4), gets a score of 4.2, which categorised as 'Good'. In general, the components of free of hunger and thirst in the facility in Bumi Marina is well managed. Special attention should be given to the the quantity of feed provided to the deer, because they are often meet a daily feed requirements for the animals in captivity.

3.2. Free from sick, injury and diseases

Sick, injury and disease are unavoidable parts of animal raised in the captivity [5]. The welfare condition of Timor deer in the captivity based on the breakdown of components free from pain, disease and injury is described in Table 5.

| Aspects                        | Score | Description                                |
|--------------------------------|-------|--------------------------------------------|
| Animal condition               | 4     | Healthy and active                         |
| Cleanliness of food and drink containers | 2     | Partially cleaned, but dirt or dirt appears |
| Medical examination            | 1     | Never done                                 |
| Average                        | 2.3   | The component of free from pain, injury and disease categorised as 'Poor' |

In general, the condition of the timor deer in the facility is good. Visually, the health condition expressed through active performance and the movement of deer in the facility. We have been informed that one deer had a deformed leg that was happened, when deer is moved from the old to the new facilities. The rope used to control their movement was tightly tied to the leg. The bond was released too late, resulted cuts, bruises and fractures on its leg. According to Puhun et al. (2017), the presence of wounds and diseases is unavoidable part of the management of a captivity so that it is require more attention.

We also found, that the feeding corner areas - places for feeding and drinking are rarely cleaned (Figure 2 A, B). The duties of only one caretaker are overload to control all facilities. This condition may have an effect on his responsible to clean and the feeding and drinking corners. He focuses on providing food and drink, but does not pay full attention on the cleanliness of the corners.
Health management is necessary to prevent the animals from diseases that can cause mortality. Therefore, it is necessary to have a veterinarian in the facility, so they can help, supervise, examine and treat a sick or injured deer. The calculation scores this component 2.3, which categorized Poor. This result is lower than the research of Puhun et al (2017), that scoring 3.4 and categorized as Fair. The cleanliness of feeding and drinking corners, as well as aspects of health management are things that still need to be improved. This is important, so deer in the captivity may free from illness, injuries and diseases.

The implementation of the five principles on timor deer welfare refers to Regulation of the Director General of Forest Protection and Nature Conservation No.6 / 2011 especially on the aspects that observed in this study is presented in Table 6.

Table 6. The achievement of the two principles observed in this study.

| No | Component                                         | Weight | Scoring | Weight value  |
|----|---------------------------------------------------|--------|---------|---------------|
| 1  | Free from hunger and thirst                       | 30     | 4,2     | 126 (A-Excellent) |
| 3  | Free from pain, disease and injury                | 20     | 2,3     | 46 (D-Poor)    |
|    | Total                                             |        |         | 172            |
|    | Average                                           |        |         | 86             |
|    | Score                                             |        |         | A - Excellent  |

4. Discussions

Type of forages in captivity more or less is similar to the timor deer raised in back yard in Manokwari [7]; [8]. According to Semiadi & Nugraha (2004) small ruminants such as deer generally consume grasses, leaf shoots, young plants, concentrates, vegetables, tubers, agricultural waste and restaurant waste.

The facility like our study site is maintained semi-intensively, where all requirements for deer in captivity such as: space, food, drink, shelter, health, including breeding are controlled by humans [10]. Good feed management in captivity can maintain the sustainability of the captive deer. Kwatraina et al (2011) explained that feed consumption for adult female deer was 6.39 kg / individual / day, adult male deer 8.16 kg / individual / day, young female deer 5.28 kg / individual / day and young male deer 5.76 kg / individual / day with an average of 6.40 kg / individual / day. Similar to the research of [12], they also found that the average consumption rate of deer is 5.8 kg / individual / day.

In this study adult male was provided 7.59 kg / individual / day, adult female 5.42kg, and 0.45 kg / individual / day for young female with an average of 4.48 kg / individual / day. According to Takandjandji (2011), in the captivity, feeding is supplied twice or three times a day, especially in the morning and evening.
A report of Semiadi & Nugraha (2004) shows that, timor deer kept in captive breeding facility in Eastern Indonesia consume around 1.0-2.5 litters water per day. In the natural habitat, timor deer are reported to be able to consume up to 5 litters / day. Deer are rarely drink because water is available from the fresh feed they consumed [14]. Therefore, only 75% of back yard deer practitioners in Manokwari provide drinking water for their animals [7]; [8]. The free from hunger and thirst component in this study are relatively similar to the study of [5], where the scoring on this component are 4.1 and categorized as 'Good'.

The characteristics of a healthy animal include regular desire period, strong legs, and agile, standing ears, not fat or thin, always ruminate when resting, has a good appetite and is somewhat greedy, bright, clear and sharp eyes and a clean nose [15]. Based on Riney's method in [16], deer in good or healthy condition are characterized by stocky with tails that are rounded form.

According to Rosviani (2018), cleanliness of the food and drinking places is an aspect that should be paid attention. Water or feed mixed with faces or urine can be a source of Salmonella bacteria [9]. Therefore, the place for feeding and drinking must always be cleaned so that the feed and water given to the deer remain healthy and hygienic. Actions to maintain the health of the animals through cleanliness of both animals and pens is urgently required, so that the livestock are free from infection.

The health is one of the aspects that support the success of breeding because the disease can affect animal’s life [17]. The captive breeding facility in Bumi Marina does not have a veterinarian. The deer in captivity never have health examination, as well as treatment if any deer are injured or sick. Bismark et al (2011) stated that treatment and supervision of animals must be carried out routinely because fighting, the environmental problems, and stress due to handling can cause death.

5. Conclusions
Free from hunger and thirst are categorised “Very Good”, while free from pain, injury and diseases are categorised “Need to be fixed”. In general, based on these two aspects, the welfare of rusa timor in Bumi Marina Captive Breeding is “Very Good”.

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