



Full Length Research Article

The Contribution Value of Conservation Institution to Animal Welfare Aspects at Serulingmas Wildlife Recreation Park, Banjarnegara

Wibiyanto Setiawan^{1,*}, Tutut Sunarminto², Burhanuddin Masy'ud²

¹ Master Program of Tropical Biodiversity Conservation, IPB University. Kampus IPB Darmaga Bogor, 16680, Bogor, Indonesia

² Departement of Forest Conservation, Faculty of Forestry and Environment, IPB University. Kampus IPB Darmaga Bogor, 16680, Bogor, Indonesia

* Corresponding author. E-mail address: wibi.setiawan@gmail.com

ARTICLE HISTORY:

Received: 29 January 2021

Peer review completed: 10 March 2021

Received in revised form: 11 April 2021

Accepted: 24 April 2021

KEYWORDS:

Animal welfare

Ex-situ conservation

Conservation institution

Wildlife conservation

ABSTRACT

The main function of conservation institutions is to control breeding and wild plants and rescue wild plants and animals while maintaining the species purity. This role requires conservation institutions to contribute to animal conservation to save and conserve wild animals *ex-situ*. This research aims to determine the contribution value of Serulingmas Wildlife Recreation Park as an implementation of animal welfare. The data was collected through interviews and field observations. The results showed that the implementation achievement of animal welfare at Serulingmas Wildlife Recreation Park was classified as good with an achievement value of 76.61. However, the contribution value of Serulingmas Wildlife Recreation Park to the animal conservation aspects was still categorized as low, which was mainly due to the low animal births. Increasing the success of animal births could be carried out through coaching on technical aspects such as improving animal health management and facilities.

© 2021 The Author(s). Published by Department of Forestry, Faculty of Agriculture, University of Lampung in collaboration with Indonesia Network for Agroforestry Education (INAFE). This is an open access article under the CC BY-NC license: <https://creativecommons.org/licenses/by-nc/4.0/>.

1. Introduction

A wildlife conservation effort can be carried out in natural habitats (*in-situ*) and outside their natural habitat (*ex-situ*). Based on the Ministry of Environment and Forestry of the Republic of Indonesia (MoEF) regulation Number 22 of 2019, conservation institutions engage in the conservation of plants and wild animals outside their habitat (*ex-situ*), both in the form of government and non-government institutions. A conservation institution can be a place for controlled breeding and rescue of wild plants and animals while maintaining the species purity. Conservation institution also has a role as a place of education, demonstration, temporary care, breeding stocks, genetic reserves to support in-situ conservation, healthy recreation facilities, and research and scientific development.

Serulingmas Wildlife Recreation Park or *Taman Rekreasi Margasatwa* (TRM) Serulingmas is a conservation institution that has a primary function in breeding the animals' population to support wildlife conservation efforts. The success of conservation institutions depends on the breeding of animals in their collection. Animal breeding requires the management of conservation institutions to apply good technical aspects. These technical aspects include preparing artificial habitats, supporting facilities, foods, health cares, management of reproductions, and breedings (Masy'ud and Ginoga 2016). *Ex-situ* habitat preparation is essential and requires a specific strategy

because *ex-situ* habitat conditions are different from natural habitat conditions. The habitats condition between natural and captive cages form a different behavior pattern from the natural pattern (Gusmalinda et al. 2018).

Animal activities affect the level of animal consumption. Types of food and environmental factors affect the level of animal feed consumption. The amount of feed consumption is the most crucial factor in determining the amount of food substances that animals get. The need for food substances will increase in line with the increase in body weight until the age limit where growth does not occur anymore (Indriyani et al. 2017). Nevertheless, the low success rate of breeding is a problem faced by most conservation institutions in Indonesia. This condition is getting worse because animal mortality is still occurring in conservation institutions. The incidence of animal deaths in several conservation institutions illustrates that the conditions of animal management are less maximized, especially in terms of animal welfare. Appleby et al. (2004) stated that welfare problems are diverse and intricate.

The five minimum standards for animal welfare as referred to in the Regulation of the Director General of Forest Protection and Nature Conservation (PHKA) of the Republic of Indonesia Number P.9 of 2011 and Appleby et al. (2004) include (1) free from hunger and thirst, (2) free from environmental discomfort, (3) free from illness, injury, and illness, (4) free from fear and distress, and (5) free to express their natural behaviors. The five standards are indicators of the adequacy of animal welfare in a conservation institution. It is expected that the success rate of animal breeding will also increase when animal welfare is fulfilled, which in turn, could support the contribution of conservation institutions as a source of breeding stocks and genetic reserves to support the *in-situ* population. The study on the implementation of animal welfare based on the standard has never been conducted at TRM Serulingmas. Consequently, the objective of this study was to evaluate and measure the contribution value of conservation institutions as an implementation of animal welfare at TRM Serulingmas. Thus, this study could give significant references for managers to meet animal welfare for sustainable conservation institutions.

2. Materials and Methods

This research was conducted from July–September 2020 at TRM Serulingmas, Banjarnegara, Central Java. The materials used were interview guides and tally sheets. Structured interviews were conducted to obtain data on animal welfare and management from managers with sufficient knowledge in this field. Direct observations of all animals at TRM Serulingmas were also conducted. The data collected were all data related to the TRM Serulingmas contribution assessment parameter to the animal conservation aspects. This includes the data on the number of taxa collected, percentage of the number of animals originating from Indonesia, percentage of protected animals according to the Environment and Forestry Ministry Regulation Number 106 of 2018, the percentage of animal births, percentage of animal deaths, and achievement value of animal welfare implementation based on animal welfare conditions with five animal welfare criteria (Table 1) according to Appleby et al. (2004).

The five standards of animal welfare criteria are indicators of the adequacy of animal welfare in a conservation institution. Poor welfare conditions will lead to the animals' diseases, which in the end will be prolonged suffering for these animals and threaten the success of conservation of species *ex-situ* managed.

Table 1. The five freedoms of animals (Appleby et al. 2004)

No.	Principles of animal welfare	Description
1	Free from hunger and thirst	The availability of clean water and food to get full strength
2	Free from environmental discomfort	Providing a suitable environment, including shelter and a comfortable resting place
3	Free from illness, injury, and diseases	The prevention or proper diagnosis and treatments
4	Free from fear and depression	Ensuring conditions and treatments by avoiding mental stress
5	Free to express normal behavior	The availability of sufficient spaces, the proper facilities, and interaction

Animal welfare assessment was carried out by filling the welfare evaluation table system. The scores of each variable are 1 = bad, 2 = poor, 3 = sufficient, 4 = good, and 5 = very good/satisfying. Weights of each welfare aspect are based on the importance of fulfilling animal welfare and assessing the overall animal conditions at TRM Serulingmas. The assessment was carried out by involving TRM Serulingmas managers, Division of Natural Resources Conservation (BKSDA) Central Java officers, and academics. The total value of each animal welfare principle was calculated into the scoring column to gather a weighted value for each parameter. The weighted value of each parameter is obtained by multiplying the weight with the average scoring (Table 2).

Table 2. The weight of the animal welfare aspect assessment (Tohir et al. 2017)

No.	Parameter	Weight	Scoring	Weighted value
1	Free from hunger and thirst	30	1-5	30-150
2	Free from environmental discomfort	20	1-5	20-100
3	Free from pain, injury, and disease	20	1-5	20-100
4	Free from fear and depression	15	1-5	15-75
5	Free to behave normally	15	1-5	15-75

The implementation achievement (*PI*) of animal welfare was calculated using equation 1, and the value of management implementation to achieve animal welfare is classified in Table 3.

$$PI = \frac{\sum \text{value of } TTP}{\sum PKS} \quad (1)$$

where *TTP* is the weighted value of each parameter and *PKS* is the number of animal welfare parameters used according to the Regulation of the Director General of PHKA No.6 of 2011 concerning Guidelines for Assessment of Conservation Institutions.

Table 3. Animal welfare assessment classification

No.	Assessment classification	Implementation achievement
1	Very good	90-100
2	Good	75-<90
3	Enough	60-<75
4	Not good	<60

The collected data were processed according to the importance of assessing conservation institution's contributions and analyzed using qualitative descriptive. The animal conservation aspects resulted in seven points, i.e., the number of taxa collected, the percentage of animals originating from Indonesia, the percentage of animals protected by the MoEF Regulation Number

106 of 2018, the achievement of animal welfare implementation, the percentage of animal births of all species, the percentage of protected born animals, and the percentage of dead animals from the total number of individuals present. Each aspect of the assessment was then scored based on the assessment indicators scoring where 1 = very low, 2 = low, 3 = sufficient, 4 = high, and 5 = very high. The weight for each aspect of the assessment was then carried out by calculating the weighted value for each aspect using the following equation:

$$\text{Weighted value} = \frac{\text{Total scoring}}{\text{Maximum scoring value}} \times 100 \quad (2)$$

The contribution level was determined into five classifications with the following value scales: very high (90-100), high (80-89.99), moderate (70-79.99), low (60-69.99), and very low (<60).

3. Results and Discussion

3.1. General Condition of TRM Serulingmas

TRM Serulingmas obtained a permit as a conservation institution from the Ministry of Forestry and Plantation of the Republic of Indonesia through Decree Number: 241/Kpts-II/1999 dated April 27, 1999. TRM Serulingmas is located in Kutabanjar Village, Banjarnegara District, Banjarnegara Regency, Central Java Province. Based on the Banjarnegara Regency Regional Regulation Number 5 of 2017, the management of the TRM Serulingmas is under the Regional Public Company (*Perumda*). TRM Serulingmas is one of the leading tourist destinations in Banjarnegara Regency in particular and the former Banyumas residency in general.

3.2. Species Conservation

The success of the conservation institution's contribution can support the *in-situ* preservation of animal populations. The results of observations and tracing showed that TRM Serulingmas met the requirements of a conservation institution by collecting at least three taxa (mammals, aves, reptiles). There are 47 species of animal collections with a total of 181 animals, consist of 34 protected species and 13 non-protected species. A conservation institution is a place for maintaining various types of animals, both native animals (endemic) and non-native animals (exotic) of Indonesia. TRM Serulingmas has 40 endemic animals and 7 exotic animals (**Fig. 1**).

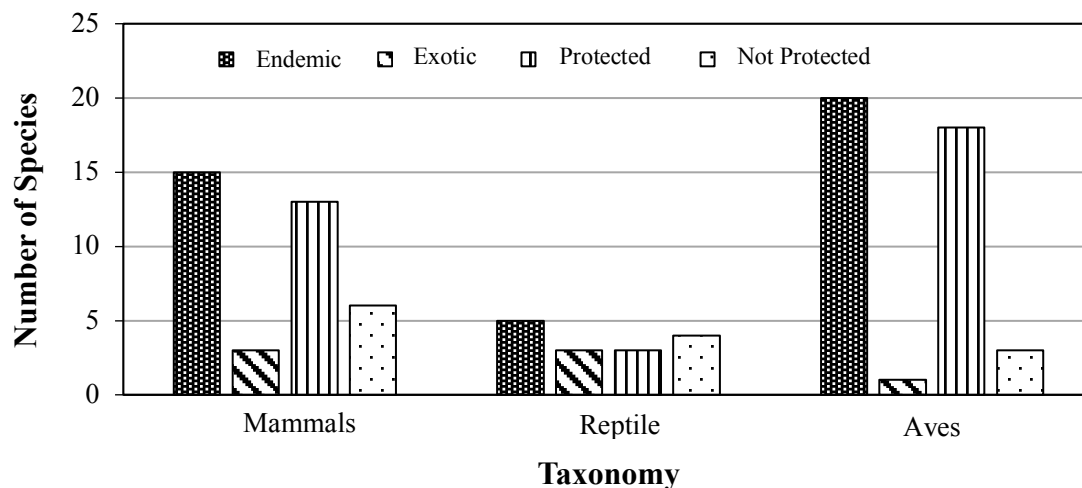


Fig. 1. The status of animal collections at TRM Serulingmas.

Fig. 1 shows that the number of endemic animals at TRM Serulingmas is higher than that of exotic animals. The high number of endemic animal collections in Indonesia shows that TRM Serulingmas is also an institution with a role to conserve Indonesian animals so that it could remain sustainable amid the increasing threat of endemic species due to habitat destruction, hunting, and illegal trade. For example, [Nandika and Agustina \(2018\)](#) stated that several factors threatening the existence of small yellow-crested cockatoos (*Cacatua sulphurea*) in the Southeast Sulawesi region are caused by fishing, trade, and habitat destruction caused by human activities. Hence it will reduce the quality and quantity of cockatoo habitat in supporting its daily activities and decreasing the types of forage trees and nests.

3.3. Animal Welfare Implementation at TRM Serulingmas

Conservation institutions are special cultural and educational facilities with four main tasks: conservation of endangered species, science and research, education, and human recreation ([Nekolny and Fialova 2018](#)). [Collins et al. \(2019\)](#) revealed that the current intervention in the world of education is an effort to reduce negative visitor behavior and improve animal welfare. The results showed that the level of animal welfare at TRM Serulingmas was 76.61. This value belongs to the classification of the assessment with a good category (**Table 4**). In general, the implementation of the animal welfare aspects at TRM Serulingmas has been good. However, the free from environmental discomfort parameter needs attention, such as the need for shade in animal cages that function as beds for particular animals such as orangutans and Javan gibbons, which is lacking. Improvements in the free from pain, injury, and disease parameter also need to be improved, for example, through routine inspection of animal feces to anticipate parasitic infections that could cause diseases.

Tabel 4. The value of animal welfare at TRM Serulingmas

Parameter of animal welfare	Weight	Score	Weighted value
Free from hunger and thirst	30	4.06	121.88
Free from environmental discomfort	20	3.40	68.00
Free from pain, injury, and disease	20	3.72	74.44
Free from fear and depression	15	4.00	60.00
Free to behave normally	15	3.92	58.75
Total	100	19.10	383.07
Implementation achievements			76.61

The animal welfare aspects are essential to be met by increasing the aspects that need to be repaired and maintaining the existing aspects. The role of conservation institutions is not only to add to the collection of animals, but the most important thing is to fulfill the welfare of the animals. Managing a zoo in existing animal welfare must receive serious attention. Apart from being a place for education, research, and conservation for endangered animals, conservation institutions have a role as places for recreation where animals are kept in an artificial environment and displayed to the public ([Miradona et al. 2013](#)). Improved management by considering the assessment based on the principles of animal welfare is useful for improving management in the aspects of feed, health, and cage enrichment ([Puspitasari et al. 2015](#)). This would make the animal's physical and psychological condition even better to support its function as demonstration animals in conservation institutions.

3.3.1. *Hunger and thirst-free aspects*

Fulfilling the need for animal feed is an obligation that must be carried out by managers of conservation institutions. Animals must be guaranteed and free from hunger and thirst. Foods that meet the needs of animals and have good quality are essential to support animal health. Dalimunthe et al. (2020) stated that the availability of quality food is a basic need for animals in the natural habitat or captivity. Results on hunger and thirst-free aspects for animals at TRM Serulingmas had a weighted value of 121.88 with an average value of 4.06, obtained from the average scoring results for the parameters of the hunger and thirst-free aspects. This value shows that the implementation of animal welfare based on the hunger and thirst-free aspects has been appropriately implemented.

The availability of food is essential for animals because the nutritional needs of the food, including quality, concentration, and the amount of food, must be able to meet the animal's needs so that the weight and health of the animals are well preserved. The concerns of food aspects include the type and amount of food. The types of food for animals at TRM Serulingmas consist of fruit, vegetables, seeds, concentrates, fish, brown rice, grass, brown sugar, chicken, and meat. The feeding menu is written on the menu list according to the time of provision, while the amount of food for each animal is compiled by a nutritionist. Feeding is conducted every day. There is a weekly fasting schedule for certain animals, such as crocodiles, Bengal tigers, lions, and snakes. In addition to feeding, the fulfillment of animal drinking needs is also concerned. TRM Serulingmas managers fulfill water needs by providing drinking water reservoirs in each cage with routine changes carried out every day. The nutritional value of various food variations must also be considered because the animals are in captivity given food that must contain high nutritional value and sufficient nutrition for their survival (Arini and Kafiar 2014). Provision of animal feed for a particular time could also reduce reactive attitudes and stressful behavior in animals, as found in *Macaca* animals (Gottlieb et al. 2013).

In addition to feeding, the fulfillment of animal drinking needs is also needed. TRM Serulingmas managers fulfill water needs by providing a drinking water reservoir in each cage with routine changes every day. EAZA (2013) stated that drinking water must be available and clean at all times and placed in a container or a special pool for drinking.

3.3.2. *Environmental discomfort-free aspects*

Most of the animals in conservation institutions are in a limited environment both inside and outside the cage. Internal factors of the cage, such as the shape of the cage design, cage size, cage material, and cage equipment, could impact animal comfort. External factors of the cage such as environmental temperature, weather, lighting could also cause stress for animals if environmental conditions are not suitable and exceed the tolerance limits of the animals. The assessment of the environmental discomfort-free aspects at TRM Serulingmas obtained an average score of 3.6. The score was obtained based on the temperature conditions, air circulation, cage lighting, cleanliness conditions, and accommodation that supports animal comfort. The management has tried to improve accommodation and support animal activities in cages with adequate cage construction and complete supporting infrastructure. Measurement of ideal and comfortable conditions for animals such as temperature, lighting, and air circulation has not been carried out by the TRM Serulingmas manager. Animal cages in conservation organizations also function to support the animal displays. The conservation institution's manager must pay attention to the supporting aspects of a healthy environment, sufficient air circulation, adequate lighting, and suitable

temperature and humidity (Karanikola et al. 2014). Maintaining the humidity in the cage is also important because it could support the success of animal reproduction. Cita et al. (2019) stated that in several cases in birds, such as the Bandung Zoo and Mega Bird and Orchid Farm (MBOF), the humidity will affect bird reproduction. This is because extreme fluctuations in humidity will reduce egg hatchability and affect breeding success so that birds will maintain body temperature to optimize biological activity.

The existence of trees around the cages also helps to reduce the sunlight even though metal roofs still construct some cages. Based on field observations, the animal cage at TRM Serulingmas requires additional shade as a place to sleep for particular animals, such as orangutans and Javan gibbons. It is also necessary to pay attention to the provision of adequate sleeping and resting cages for each individual or pair to ensure the comfort of orangutans and gibbons in cages. Prasetyo and Amelia (2013) stated that the daily activities of the Javan gibbon in their natural habitat and *ex-situ* seem relaxed and relatively immobile. These activities include sitting, standing, lying down, lying back, and leaning on wood or walls. The cage construction at TRM Serulingmas used iron, wire mesh and walls as a safety fence, metal roof, as well as partial ground and concrete floors. The use of metal roof for the cage in certain conditions could increase the temperature of the cage. The metal roofing material has a significant conduction coefficient. Some of the heat received is passed into the cage, resulting in a higher temperature in the cage than non-metal roofing materials (Astiningsih 2012). The cage floor at TRM Serulingmas is partly made of cement to facilitate cleaning the cage, especially the aves cage, while some of the cages have no-cement floors, such as the cages for tigers, Timor deer, and sambar deer. The no-cement floors at TRM Serulingmas caused the floor to become muddy, especially when it rains. A good floor has quick-dry requirements, flat but not slippery, and not rough, which will cause trauma to the feet. Recommended floor materials include wood, stone floors, and concrete (Hosey et al., 2013). Some of the cages at TRM Serulingmas have good floor conditions and make it easier to clean the cages, especially the aves cages.

3.3.3. Pain, injury, and disease-free aspects

Wildlife collections of conservation institutions have the right to health care. Various efforts must be made to create healthy animal conditions, starting from routine inspection, treatment, quarantine, and disease control. The realization of healthy animals will also affect the success of the conservation institutions' management, especially in supporting tourist attractions, so it is important to pay special attention to the managers. The results of field assessments for pain, injury, and disease-free aspects were obtained a weighted value of 74.44 with an average value of 3.72 based on the pain, injury, and disease-free aspects such as animal health conditions care and health facilities, and animal health handling. Physical and health checks on animals are carried out routinely by the TRM Serulingmas management, and 97% of the animals are in good health, even though there are animals that need treatments because they are sick but have been isolated for special care. The examinations for parasites through the faces in the TRM Serulingmas have not been routinely carried out so that infections caused by parasites are still unknown at an early stage. Facing examination is one way to determine whether or not a parasite causes an infection. Worms and protozoa are common types of parasites and are often found to infect. This type is usually found in the intestines of animals. *Hyostromylus rubidis*, *Trychostrongylus* sp., *Oesphagustomum* sp., *Trichuris* sp., *Strongyloides* sp. and *Ascaridia* sp. are the types of worms that cause parasitic

disease in primates. Observation on fresh feces is a form of diagnosis. The effects of parasitic infections are usually marked by mild to severe diarrhea symptoms, such as dysentery. The mechanism of entry of parasites into the host's body is by directly ingesting the cyst, through the intermediate host, or indirectly through penetration of the skin by blood parasites. All parasites could become pathogens when the host's immune mechanisms are failed, such as during times of stress, pregnancy, hereditary state, old age, or disease (Mul et al. 2007).

Prevention and handling of animal diseases could be conducted by vaccinating, and managers assumed that vaccination is no less important. Nowadays, TRM Serulingmas has not yet vaccinated collected animals, even though vaccination is an effort to anticipate the emergence of diseases such as tetanus and hepatitis B, which often infect animals. Tetanus and hepatitis B are the types of diseases that are often suffered by animals, so that vaccination is the first step to control these diseases, especially in newborn animals. As an effort to prevent Javan gibbon children born from sires, one or both of which are known to be positive for hepatitis B infection then must undergo vaccination from birth (Yohanna et al. 2014). Disease transmission could also occur from humans to animals or vice versa. The possibility of disease transmission is high. Therefore, the management must make early prevention efforts, such as requiring every officer or animal keeper to wear personal protective equipment (PPE), including masks, gloves, special clothes, and boots, when caring for animals or every time in the animal enclosure area. The officers at TRM Serulingmas are already used complete PPE when carrying out animal care. The management requires the officers to apply the precautionary principle of various parties, including medical personnel, management officers, and visitors, especially animals with aggressive characteristics. For example, primates were often throwing their hands between cages that could potentially injure. This condition has the potential to cause disease transmission from animals to humans (zoonotic).

3.3.4. *Fear and pressure-free aspects*

Fear and pressure for animals have adverse effects on the animal's development, both mental and physical development, hindering the animal's reproductive capacity. One of the success factors in the realization of animal welfare is free from fear and depression (EAZA 2013). Overall, for the fear and depression-free aspects, TRM Serulingmas has received an average score of 4.00, which was obtained from the average assessment of aspects such as the process of animal introduction, interaction with visitors, identification of animal behavior, and handling of animals. Seeing the results of the fear and depression-free aspects assessment, the components of the aspect of animal contact with visitors need attention even though there are TRM Serulingmas officers who supervise them. However, the numbers are not proportional to the number of visitors who come (especially holidays). Therefore, visitor supervision must have more attention. According to Koene (2018), the interactions between visitors and animals directly or indirectly impact animal welfare. Visitor behaviors such as shouting, throwing food, or taking pictures could be considered a potential threat by certain species. The animals that have just inhabited conservation institutions and are not used to the presence of large numbers of people usually experience stress. Most of the research results have been carried out, implying that visitors' presence causes the animals in a conservation institution to experience stress (Sade 2013). The process of introducing animals into new cages also plays a role in anticipating the level of stress on animals. Early introduction or introduction between animals is needed to prevent conflict. Recognition by hearing, visual, and

smell must be successful before the animals are placed in the same cage (Lombardi and O'Connor 1998).

The manager could carry out behavior enrichment as one of the management measuring stress on animals. Manipulating animal cages by creating conditions like are in their natural habitat and providing a hiding area (cover) from visitors is one example of enriching the enclosure environment. Food enrichment by providing live food or through hand-feeding by animal keepers could also reduce animals' stress levels and foster emotional relationships between animals and animal keepers. Separation of pregnant female individuals from male individuals by moving them to the quarantine room is also an action to deal with stress conditions in animals (Heap et al. 2008).

3.3.5. Normal behavior-free aspects

Free expression and normal behavior as in their natural habitat are some conditions for an animal to be prosperous. The management is obliged to facilitate the needs of animals to continue to behave like wild animals in their habitat, starting from the need for space for animals to move, rest, and socialize. The results of the TRM Serulingmas assessment for the normal behavior-free aspects were obtained a weighted value of 58.75 with an average value of 3.92 obtained from the average assessment of the normal behavior-free aspects such as availability of space and equipment, placement of animals, size and design of cages, and supporting equipment functions. The availability of space and equipment at TRM Serulingmas is already available. However, it is still necessary to add additional equipment for the activities, especially for primates with natural activities like hanging from trees. Based on observations, each cage has been given a hanging place. However, the quantity and height variations are still lacking due to the limited area of the available cage space. The height of the tool functions for hanging should not be too close to the ground because primates are an arboreal animal group that performs most of their activities in trees. Another example in mammals are deer or tigers. Deer needs trees for shelter and sharpening their antlers and tigers for sharpening their claws or nails. (Shariman and Ruppert 2017) stated that enrichment could keep zoo animals from feeling bored and depressed and stimulate both physical and psychological.

3.4. The Breeding Success

A conservation institution is functionally a place for the conservation of *ex-situ* animal development. The existence is inseparable from a variety of efforts that support the sustainability of animal conservation. The success of the conservation institution's contribution can support the preservation of animal populations *in-situ*. *In-situ* preservation is ideal, but it is necessary to support an *ex-situ* conservation effort, one of which is through conservation institutions. TRM Serulingmas has succeeded in breeding collectible animals such as orangutans, Timor deer, and Bengal tigers (Table 5). The success of animal breeding could support animal populations in natural habitats (*in-situ*) through animal release activities in the future, of course, procedures and preparation. Released activities by zoos in Indonesia and internationally are still not fully implemented due to the high costs and requirements required during the release activities. Cheyne et al. (2012) stated an example of the Javan gibbon, one of the criteria for release when the gibbons are able to move around the cage properly, and most of these movements must be conducted by the Brakhiasi method. The support of various parties is required for this effort.

Table 5. Animal birth at TRM Serulingmas

No.	Species	Year			Total
		2018	2019	2020	
1	Orangutan	1	-	-	1
2	Timor deer	5	5	7	17
3	Honey bear	1	1	-	2
4	Sambar deer	3	-	3	6
5	Bawean deer	-	1	-	1
6	Beruk	-	1	1	2
7	Bengal tiger	-	-	2	2
8	The pandan weasel	-	-	1	1
9	Long-tailed monkey	-	1	3	4
	Total	10	9	17	36

Table 5 shows 19.89% of collected animals that have been successfully bred from 2018 to 2020. The number of animals born is 21.17% which are protected according to the regulation of the Environment and Forestry Ministry Number 106 of 2018. Based on the total number of collected animals, the success of animal breeding is still low because there are still many animals that have not succeeded in breeding (only nine species out of 47 species). Several factors such as inbreeding, unfulfilled sex ratio, and unproductive age are obstacles for managers to breed collected animals. The support of various parties is very much needed to achieve the success of *ex-situ* animal management. [Saunders et al. \(2014\)](#) stated that the success of breeding animals in zoos is also influenced by the standard operating procedures used and the human resources involved in management. The success of *ex-situ* conservation is inseparable from the efforts of TRM Serulingmas managers, starting from providing for the animals and assisting officers. Support from other parties such as related agencies, academics, visitors, and the community is also essential to support the success of *ex-situ* conservation.

3.5. The Contribution Value of TRM to the Animal Conservation Aspects

The existence of TRM Serulingmas as a conservation institution could not be separated from various efforts to support the sustainability of animal conservation, the extent of TRM Serulingmas contributes to animal conservation based on species conservation, and breeding success. Based on the results of the assessment and calculation of all collected data, it was found that the contribution value of TRM Serulingmas to the animal conservation aspects is presented in **Table 6**.

The results of the analysis and calculation of the contribution value for each aspect are still low (**Table 6**), with the contribution value to the animal conservation aspects of 68.57. The predetermined level of contribution illustrates that the management of TRM Serulingmas still needs to be improved in the animal conservation aspects. The percentage of animal birth is a factor that must be increased in success to contribute more to the animal conservation aspects. Various things that caused the low percentage of births, such as inbreeding, fulfilling the sex ratio, and the productive age of animals, are the focus of management to be resolved through various efforts. To increase the success of animal birth, development on technical aspects needs to be carried out through the improvement of animal health management and facilities, application of ethics and animal welfare, controlled breeding through birth control, and animal exchange activities with other conservation organizations to avoid inbreeding. Monitoring of conditions could also be

conducted in more detail through a diary. The diary book provides detailed information about the daily activities of animals such as feeding, drinking, types of food provided, reproductive activities, and animal behavior. In addition to diary books, for animals bred in conservation institutions, it is also mandatory to have a master book/studbook. The main book provides information regarding the breeder's name, the breeding permit, the breeding location, the type of animal being bred, the animal sex, the animal birth date, the age, the animal origin, and the marking.

Table 6. The contribution value of TRM Serulingmas to the animal conservation aspects

No.	Parameter		Criteria	Indicator	Contribution value achievement	Score
1	Species conversation	1.1	Number of taxa collected	5= Collection ≥ 5 taxa 4= Collection with 4 taxa 3= Collection with 3 taxa 2= Collection with 2 taxa 1= Collection with 1 taxa	3 taxa	3
		1.2	Percentage of the animals numbers originating from Indonesia	5= 80-100 % 4= 60- <80 % 3= 40- <60 % 2= 20- <40% 1= 0- <20%	89.36%	5
		1.3	Percentage of animals protected	5= 80-100 % 4= 60- <80 % 3= 40- <60 % 2= 20- <40% 1= 0- <20%	72.34%	4
		1.4	Achievement of animal welfare implementation.	5= 80-100 4= 70- 79.99 3= 60- 69.99 2= 50- 59.99 1= <50	76.61	4
2	Breeding Success	2.1	Percentage of births of all species	5= 80-100% 4= 60- <80% 3= 40- <60% 2= 20- <40% 1= 0- <20%	19.89%	1
		2.2	Percentage of protected born animals	5= 80-100% 4= 60- <80% 3= 40- <60% 2= 20- <40% 1= 0- <20%	21.17%	2
		2.3	Percentage of dead animals from total individuals present	5= 0- <20% 4= 20- <40% 3= 40- <60% 2= 60- <80% 1= 80-100%	19.89%	5
		Total Value				24
Weighted score (total score x 100)/35 ^a				68.57		
Contribution category				Low ^b		

Notes: ^a35 = maximum score; Contribution categories to the animal conservation aspects = very high (90-100), high (80-89.99), moderate (70-79.99), low (60-69.99), and very low (<60).

The main book also explains the initial information on the animals being bred to help the manager make animal pedigrees to determine the status of the animal's generation. The results of observations at TRM Serulingmas show that animals also have a breeding permit such as Timor Deer, filling in diaries and main books have not been orderly implemented. This can cause problems because breeding animals will not be adequately monitored and recorded, especially their generation status. The cage condition has not been separated for each generation and tagged is also an essential factor that the manager must address. [Thohari and Masy'ud \(2011\)](#) explained that the purpose of marking or numbering is to find out the pedigree, age, making it easier to control and identify each individual and facilitate marriage arrangements between the desired individuals.

As a conservation institution, the administration orderly is a must for the management. Everything is well recorded and documented so that information is easy to get. All records are actually written evidence of the implementation of existing procedures. Standard verified and validated procedures guide every activity implementation before employees carry out an activity. Written procedures could be in the form of work instructions (WI) and Standard Operating Procedures (SOP). SOP is a technical guide containing a series of instructions describing the standard activities and processes that take place within a company ([Hartatik 2014](#)). Meanwhile, WI shows how an institution produces a product or provides certain services and could be a control used to ensure the quality of the product consistent with its quality standards ([Tathagati 2014](#)).

There is no written SOP at TRM Serulingmas that regulates several procedures, although the employees have not written it in accordance with oral instructions. For example, there is no written security procedure when the wild animal is released, only in the form of oral instructions. The absence of a written SOP document is very prone to the implementation in the field by employees. Every employee has a different understanding and ability to remember, so that the potential for forgetting is immense. [Hanifah et al. \(2015\)](#) explained that the impact occurs due to errors in non-standard work activities and inappropriate operations shows how vital the application of standardization is. The quality documentation system is essential because the document is a working reference and proof of implementation. There are still many standard procedures that have not been written at TRM Serulingmas, such as procedures for monitoring conditions and measuring cage temperatures, procedures for managing visitors related to activities, procedures for emergency events including first aid regulations, all of which could be reduced to work instructions for implementing employees in the field. Some of the work instructions are already in the form of documents but are still simple and not detailed. Each result of the implementation of work instructions is documented in a record (work record or daily checklist). The work instruction is a description of the SOP made so that if there is a linkage between parts, it could still run well according to standard procedures. [Hanifah et al. \(2015\)](#) explained four hierarchical levels in the quality documentation system as the quality manual, work procedures, work instructions, and recording documentation.

4. Conclusions

The contribution value of TRM Serulingmas to the animal conservation aspects was 68.57 or classified as low, although based on the aspect of the implementation of animal welfare at TRM Serulingmas, it was in a good category with an achievement value of 76.61. The percentage of animal birth is a factor that must be increased to contribute more to the animal conservation

aspects. Development on technical aspects needs to be carried out to increase the success of animal birth, including the improvement of animal health management and facilities, application of ethics and animal welfare, controlled breeding through birth control, and animal exchange activities with other conservation organizations to avoid inbreeding.

References

- Appleby, M. C., Mench, J. A., and Hughes, B. O. 2004. *Poultry Behaviour and Welfare*. CABI Publishing, Wallingford. DOI: [10.1079/9780851996677.0000](https://doi.org/10.1079/9780851996677.0000)
- Arini, D. I. D., and Kafiar, Y. 2014. Preferred Feed of Anoa (*Bubalus sp.*) at Manado Forestry Research Institute Captivity. *Jurnal Wasian* 1(2): 83-90. DOI: [10.20886/jwas.v1i2.857](https://doi.org/10.20886/jwas.v1i2.857)
- Astiningsih, N. K. 2012. Pengaruh Bahan Atap Kandang dan Strain terhadap Penampilan Ayam Pedaging. *Majalah Ilmiah Peternakan* 7(2): 1-11.
- Cheyne, S. M., Campbell, C. O., and Payne, K. L. 2012. Proposed Guidelines for Insitu Gibbon Rescue, Rehabilitation, and Reintroduction. *International Zoo Yearbook* 46: 1-17. DOI: [10.1111/j.1748-1090.2011.00149.x](https://doi.org/10.1111/j.1748-1090.2011.00149.x)
- Cita, K. D., Hernowo, J. B., and Masy'ud, B. 2019. Faktor-faktor Penentu Keberhasilan Konservasi *Ex Situ* Cendrawasih Kecil (*Paradisaea minor* Shaw, 1809). *Buletin Plasma Nutfah* 25(1): 13-24. DOI: [10.21082/blpn.v25n1.2019.p13-24](https://doi.org/10.21082/blpn.v25n1.2019.p13-24)
- Collins, C., Quirke, T., McKeown, S., Flannery, K., Kennedy, D., and Riordana, R. O. 2019. Zoological Education: Can It Change Behaviour?. *Applied Animal Behaviour Science* 220: 1-10. DOI: [10.1016/j.applanim.2019.104857](https://doi.org/10.1016/j.applanim.2019.104857)
- Dalimunthe, N. P., Alikodra, H. S., Iskandar, E., and Atmoko, S. U. 2020. Manajemen Pakan dan Pemenuhan Nutrisi Orangutan Kalimantan (*Pongo pygmaeus*) di Taman Safari Indonesia dan Taman Margasatwa Ragunan. *Jurnal Biologi Indonesia* 16(1): 57-66. DOI: [10.47349/jbi/16012020/57](https://doi.org/10.47349/jbi/16012020/57)
- EAZA. 2013. *The Modern Zoo: Foundations for Management and Development*. European Association of Zoos and Aquaria (EAZA) Executive Office, Amsterdam, The Netherlands.
- Gottlieb, D. H., Coleman, K., and McCowan, B. 2013. The Effects of Predictability in Daily Husbandry Routines on Captive Rhesus Macaques (*Macaca mulatta*). *Applied Animal and Behaviour Science* 143(2-4): 117-127. DOI: [10.1016/j.applanim.2012.10.010](https://doi.org/10.1016/j.applanim.2012.10.010)
- Gusmalinda, R., Dewi, B. S., and Masruri, N. W. 2018. Perilaku Sosial Rusa Sambar (*Cervus Unicolor*) dan Rusa Totol (*Axis Axis*) di Kandang Penangkaran PT. Gunung Madu Plantations Lampung Tengah. *Jurnal Sylva Lestari* 6(1): 74-84. DOI: [10.23960/jsl1676-85](https://doi.org/10.23960/jsl1676-85)
- Hanifah, M., Sriyanto, and Sari, D. P. 2015. Perancangan Standard Operating Procedures dan Work Instruction pada Aktivitas Produksi Area 1 PT Ebako Nusantara Semarang. *Industrial Engineering Online Journal* 4(4): 1-13.
- Hartatik, I. 2014. *Buku Pintar Membuat SOP (Standard Operating Procedure)*. Flash Books, Yogyakarta.
- Heap, C. J., Wright, L., Andrews, L., Reed-Smith, J., and Duncan, S. 2008. *Summary of Husbandry Guidelines for Asian Small-Clawed Otters in Captivity*. IUCN/SSC Otter Specialist Group, Otters in Captivity Task Force, United Kingdom.
- Hosey, G., Melfi, V., and Pankhurst, S. 2013. *Management Guidelines for the Welfare of Zoo Animals. Second Edition*. Oxford University Press, Oxford, United Kingdom.

- Indriyani, S., Dewi, B. S., and Masruri, N. W. 2017. Analisis Preferensi Pakan Drop In Rusa Sambar (*Cervus anicolor*) dan Rusa Totol (*Axis axis*) di Penangkaran PT. Gunung Madu Plantations Lampung Tengah. *Jurnal Sylva Lestari* 5(3): 22-29. DOI: [10.23960/jsl3522-29](https://doi.org/10.23960/jsl3522-29)
- Karanikola, P., Tampakis, S., Tsantopoulus, G., and Digbasani, C. 2014. The Public Zoo as Recreation and Environmental Education Area: Visitors Perceptions and Management Implications. *WSEAS Transactions on Environment and Development* 10: 81-91.
- Koene, P. 2018. *Welfare and Interactions Between Humans and Companion Animals. Encyclopedia of Animal Behavior, 2nd edition*. Elsevier, Washington, DC. DOI: [10.1016/b978-0-12-809633-8.01317-0](https://doi.org/10.1016/b978-0-12-809633-8.01317-0)
- Lombardi, D., and O'Connor, J. 1998. *Asian Small Clawed Otter (Aonyx cinereus) Husbandry Manual*. Columbus Zoological Gardens and The Asian Small Clawed Otter Species Survival Plans, Ohio.
- Masy'ud, B., and Ginoga, L. N. 2016. *Penangkaran Satwa Liar*. IPB Press, Bogor, Indonesia.
- Miradona, Y., Novarino, W., and Rizaldi. 2013. Analisis Pengelolaan untuk Meningkatkan Upaya Konservasi di Taman Margastwa dan Budaya Kinantan Kota Bukittinggi. *Jurnal Biologika* 2(1): 7-17.
- Mul, I. F., Paembonan, W., Singleton, I., Wich, S. A., and Bolhuis, H. G. 2007. Intestinal Parasites of Free-ranging, Semicaptive, and Captive *Pongo abelii* in Sumatera, Indonesia. *International Journal of Primatology* 28: 407-420. DOI: [10.1007/s10764-007-9119-7](https://doi.org/10.1007/s10764-007-9119-7)
- Nandika, D., and Agustina, D. 2018. Ecology of Lesser Sulphur Crested Cockatoo *Cacatua sulphurea* at Rawa Aopa Watumohai National Park, Southeast Sulawesi. *Jurnal Metamorfosa* 5(2): 177-188. DOI: [10.24843/metamorfosa.2018.v05.i02.p07](https://doi.org/10.24843/metamorfosa.2018.v05.i02.p07)
- Nekolny, L., and Fialova, D. 2018. Zoo Tourism: What Actually is a Zoo?. *Czech Journal of Tourism* 7(2): 153-166. DOI: [10.1515/cjot-2018-0008](https://doi.org/10.1515/cjot-2018-0008)
- Prasetyo, B., and Amelia, S. 2013. Deskripsi Tingkah Laku Owa Jawa (*Hylobates moloch* Audebert) di Taman Margasatwa Ragunan. *Jurnal Sainsmat* 2(2): 93-106. DOI: [10.35580/sainsmat228272013](https://doi.org/10.35580/sainsmat228272013)
- Puspitasari, A., Masy'ud, B., and Sunarminto, T. 2015. Keterkaitan Persepsi dan Perilaku Pengunjung Terhadap Kesejahteraan Rusa Timor di Taman Satwa Cikembulan Garut. *Media Konservasi* 20(1): 15-20. DOI: [10.29244/medkon.20.1.15-20](https://doi.org/10.29244/medkon.20.1.15-20)
- Sade, C. 2013. Visitor Effects on Zoo Animals. *The Plymouth Student Scientist* 6(1): 423-433.
- Saunders, S. P., Harris, T., Holzer, K. T., and Beck, K. G. 2014. Factors Influencing Breeding Success, Ovarian Cyclicity, and Cub Survival in Zoo-Managed Tigers (*Panthera tigris*). *Animal Reproduction Science* 144(1-2): 38-47. DOI: [10.1016/j.anireprosci.2013.11.006](https://doi.org/10.1016/j.anireprosci.2013.11.006)
- Shariman, P. S. M. A., and Ruppert, N. 2017. Effect of Environmental Enrichment on Activities of Captive Orangutans at Taiping Zoo, Malaysia. *Malayan Nature Journal* 69(4): 327-335.
- Tathagati, A. 2014. *Step by Step Membuat SOP (Standard Operating Procedure)*. Efara Publishing, Yogyakarta.
- Thohari, A. M., and Masy'ud, B. 2011. Teknis Penangkaran Rusa Timor (*Cervus timorensis*) Untuk Stok Perburuan. *Prosiding Seminar Sehari Prospek Penangkaran Rusa Timor (Cervus timorensis) Sebagai Stok Perburuan*. Institut Pertanian Bogor, Bogor, Indonesia.
- Tohir, R. K., Mustari, A. H., and Masy'ud, B. 2017. Pengelolaan dan Tingkat Kesejahteraan Gajah Sumatera (*Elephas maximus sumatranus* Temminck, 1847) di Flying Squad WWF Taman Nasional Tesso Nilo Riau. *Media Konservasi* 21(2): 152-158. DOI: [10.29244/medkon.21.2.152-158](https://doi.org/10.29244/medkon.21.2.152-158)

- Yohanna., Masy'ud, B., and Mardiasuti, A. 2014. Tingkat Kesejahteraan dan Status Kesiapan Owa Jawa di Pusat Penyelamatan dan Rehabilitasi Satwa untuk Dilepasliarkan. *Jurnal Media Konservasi* 19(3): 183-197. DOI: [10.29244/medkon.19.3.183-187](https://doi.org/10.29244/medkon.19.3.183-187)