The production and reproduction performance of horses in Parangtritis beach

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Abstract. This study aimed to determine the production and reproduction performance of horses in the coastal area of Parangtritis Beach. The research was conducted from June to October 2024 using a survey method, which involved interviews with 28 farmers using a questionnaire and taking body measurements of 43 horses. The data was analyzed using a quantitative descriptive approach to describe the production and reproduction performance of horses in the coastal area of Parangtritis Beach. The results showed that the production performance of the horses had an average age at first work of 1.9±0.3 years, with working hours of 3.8±1.1 hours on Monday to Friday and 6.8±0.6 hours on Saturday and Sunday. The reproduction performance showed an average age at first estrus of 2.0±0.4 years, age at first mating of 2.4±0.5 years, a service per conception rate of 2.6±0.7 times, a gestation period of 329.1±6.4 days, postpartum estrus of 45.1±48.8 days, postpartum mating of 75.1±52.7 days, and a foaling interval of 16.2±5.0 months. In conclusion, the production performance was good, while the reproduction performance was not optimal.

1 Introduction

Horses (*Equus caballus*) are livestock that are known to have strength and speed, so they have long been used by humans as a means of transportation and freight carrier. The development of modern transportation resulted in the reliance on horses being replaced. However, there are still breeders who use horses for recreational purposes as a livelihood.

Parangtritis Beach is located in Parangtritis Village, Kretek District, Bantul Regency, Special Region of Yogyakarta Province. Horse at Parangtritis Beach provides a ride service for tourists. As working animals, horses had production performance that was shown not only by their body weight but also by their ability to work, including pulling bendi. Their draught power was an important part of this performance because it indicated how well they could carry out their tasks as bendi horses. The coastal environment, with its hot temperatures, high humidity, and sandy surfaces, often placed additional pressure on the horses and could affect their physical condition as well as their reproductive performance.

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[1] stated that the reproductive efficiency of domestic horses was generally low. [2] further explained that reproductive performance encompassed parameters such as foaling interval, postpartum mating, and service per conception (S/C). In contrast, [3] described reproductive performance based on gestation length, age at first mating, and postpartum estrus. Supporting these descriptions, [4] reported that horses in the Boyolali region, specifically those at Eclipse Stud and Stable, had an average age at first mating of 3 years, an average age at first estrus of 15 months, an average postpartum estrus interval of 13 days, and an average gestation length of 11 months.

The condition of horses that work from morning to evening needs to be considered, as it is related to the production and reproductive performance that needs to be maintained. Research related to production performance in coastal areas is not yet available, while for reproductive performance in coastal areas is still limited to research by [2] in Bantul Regency more than 15 years ago. Therefore, research was conducted on the production and reproductive performance of horses along the Parangtritis Beach coast to obtain up to date data.

2 Materials and methods

2.1 Research methods

The research was conducted using a survey method consisting of two stages, namely pre-survey and survey. The pre-survey stage was conducted to identify the number of breeders and the location of horse stables. The survey stage was conducted by collecting data on the production and reproductive performance of horses in the coastal area of Parangtritis Beach through interviews with farmers. The method used in the study has met the requirements of the Ethics Committee of the Faculty of Veterinary Medicine, Gadjah Mada University with number 106/EC-FKH/Eks/2023.

2.2 Location and sample determination techniques

The location was determined using the purposive sampling method, as many horses were found and often visited by tourists. Sample determination for farmers is conducted by census method, while for livestock using the purposive sampling method. The criteria for selecting horse samples included breeder consent and the ability to measure the horses for body weight estimation. The total samples obtained amounted to 43 horses and 28 breeders.

2.3 Data collection techniques

Data collection was conducted by interview and observation techniques. Questionnaires based interviews were conducted to collect data on the production and reproductive performance of horses. The observation involved measurement on the body of livestock to estimate of the weight of the horse's body. The measurement technique used the Lambourne formula. [5] explained that the Lambourne formula has a percentage of deviation of 8.73% compared to the Schrool formula which has a percentage of deviation of 34.37%, so the Lambourne formula is suitable for measuring the body weight of livestock. The calculation of the body weight of livestock uses the Lambourne formula as follows:

$$BW = \frac{CC \times CC \times BL}{10840} \qquad (1)$$

Information: BW: Body Weight (kg), CC: Chest Circumference (cm), BL: Body Length (cm).

2.4 Data analysis

The collected data were analyzed using a quantitative descriptive method with Microsoft Excel Software, which aims to provide an overview of the characteristics of the data obtained.

3 Result and discussion

3.1 Characteristics of breeders

Characteristics of the breeder (age, education level, length of breeding, and employment status) are an important factor in the success of a livestock business. Data on the characteristics of horse breeders on the coast of Parangtritis Beach is presented in Table 1.

Table 1. Characteristics of horse breeders on the coast of Parangtritis Beach (n=28).

Parameter	Breeder	Percentage (%)
Age (years)		
<15	0	0
15–64	27	96.4
>64	1	3.6
Educational Background		
No Formal Schooling	3	10.7
Elementary School/Equivalent	9	32.2
Junior High School/Equivalent	5	17.8
High School/Equivalent	9	32.2
Bachelor's Degree	2	7.1
Breeding Experience (years)		
1-5	3	10.7
6-10	3	10.7
>10	22	78.6
Employment status		
Primary Job	20	71.4
Secondry Job	8	28.6

The majority of farmers on the coast of Parangtritis Beach are classified as productive age with a percentage of 96.4%. Productive age farmers have better energy than non-productive ones. Farmers who are no longer productive >64 years old can no longer work a full day, this is due to their aging age and weakened physical strength**.**

Most horse breeders along the coast of Parangtritis Beach have a basic level of education. Education level is one of the factors in determining the quality of human resources that affect business development. However, breeders on the coast of Parangtritis Beach in practice have relatively uniform horse maintenance management, That uniformity is attributed to the presence of associations that have a role as a forum for breeders to share experiences and knowledge.

The long-term grouping of livestock consists of three groups, namely beginners 1-5 years, intermediate 6-10 years, and experienced >10 years [6]. Breeders who belong to the experienced group have started breeding horses at a young age to help their parents, so they already have longer experience. The length of livestock farming has an influence on the running of the business, this happens because farmers who have longer experience can more easily face challenges and take better results.

The majority of horse breeders on the coast of Parangtritis Beach make the business of breeding and attracting bendi as the main business (71.4%). The location of the beach is considered suitable for utilizing their horses as a means of tourism. However, there are also breeders who make raising horses and pulling bendi as a side business, this is because breeders already have their main job as farmers, owners of clothing stalls, and food stalls.

3.2 Characteristics of Horse Livestock

Horse farming on the coast of Parangtritis Beach is the main object of the research. Data about horses taken include race, sex, and age. Data on bendi horse livestock on the coast of Parangtritis Beach is presented in Table 2.

3.2.1 Horse Breed

The majority of the bendi horses on the coast of Parangtritis Beach are Sandel horses, followed by Sumbawa horses and Thoroughbred breeds, and finally there are Javanese horses (Figure 1). Sandel horses are more widely used because they are considered easy to care for and docile. Sandel horses have good resistance to tropical climates, so they are easy to maintain and are not susceptible to disease.

The Sumbawa horse is one of the horses on the coast of Parangtritis Beach with a percentage of 9.3%. Sumbawa horses are used because they are considered by local breeders to have good durability in all terrains. Local breeders often refer to Sumbawa horses as "pedestal horses". The nickname was obtained because Sumbawa horses are raised in their home area by the method of grazing in the wild.

Thoroughbred Horses are also horses located on the coast of Parangtritis Beach with a percentage of 9.3%. Thoroughbred horses are native to Europe and the Thoroughbred Breeds horses that are on the coast of Parangtritis Beach are the result of crosses with local horses. Local breeders like the horse because it has a sturdy posture. [7] Argue that horses spread across Indonesia are a cross between sandal ponies and Arab, European horses or Thoroughbred horses. Thoroughbred horses on the coast of Parangtrtitis Beach are G4 (4th Generation) horses or often called Kuda Pacu Indonesia (KPI).

Javanese horses are the least popular on the coast of Parangtritis Beach with a percentage of 2.3%. Interest in this horse tends to be low because it loses competition with other horses. Breeders consider that Javanese horses have the advantage of adapting easily to the surrounding environment**.**

(a) (b)

(c) (d)

Figure 1. Horse races on the coast of Parangtritis Beach, Sandel (a), Sumbawa (b), *Thoroughbred Cross* (c), and Java (d **Table 2.** Characteristics of bendi horse livestock on the coast of Parangtritis Beach (n=43).

3.2.2 Sex

The livestock of bendi horses on the coast of Parangtritis Beach are Mare (100%). Mares are preferred because they can be used for work and can be raised for breeding purposes. [8] that mares can also be used as mothers to produce foals. Stallions are not used on the coast of Parangtritis Beach because they have aggressive nature, especially if they meet female horses.

3.2.3 Age

The majority age of bendi horses on the coast of Parangtritis Beach were ≥4 years. Some of these horses are bought when they are ready to be employed, some are cared for from birth, and some from foals and yearlings. The oldest horse on the coast of Parangtritis Beach is 23 years old and is still pulling bendi.

Table 2. Characteristics of bendi horse livestock on the coast of Parangtritis Beach (n=43).

Horse	Number of Livestock	Percentage (%)
Breed		
Sandel	34	79.1
Sumbawa	4	9.3
Thoroughbred Cross	4	9.3
Jawa	1	2.3
Sex		
Male	-	-
Female	43	100
Age (years)		
<1	-	-
1-2	1	2.3
3-4	5	11.6
>4	37	86.1

3.3 Production Performance

The production ability of horses is one of the indicators that shows the welfare of horses and their effectiveness as working animals. The production performance of working animals such as horses was not evaluated solely by their body weight, but also by work-related parameters such as working hours and the intensity of the tasks performed [9-10]. Horse performance assessments can be determined from various parameters, such as age for first time, length of working hours, and estimated body weight. Data on horse production performance on the coast of Parangtritis Beach is presented in Table 3.

The results showed that the average age of horses for the first time worked was 1.9±0.3 years. They consider that age to be trainable and horses are easy to manage. [11] said that horses trained at a young age also become more resistant to injury. The training provided is in the form of horses being taken for a walk in a controlled manner, after which the horse can be trained to pull the fluid.

The length of the horse's work is divided into two, namely Monday-Friday (*weekdays)* and Saturday-Sunday (*weekend*). The average working hours on *weekdays* is 3.8±1.1 hours/day and *weekends* are 6.8±0.6 hours/day. The length of the hour is classified as moderate on *weekdays* and heavy on *weekends*. [2] showed that horses' working hours are divided into three types, namely, light <3 hours, medium 3-5 hours, heavy >5 hours. Horses on the coast of Parangtritis Beach who work moderately are still willing to be touched and are calmer than horses that work hard when touched to become aggressive.

The estimated body weight of horses on the coast of Parangtritis Beach varies between 216.7-421.1 kg with the highest average in Thoroughbred Cross horses which is 421.1±40.6 kg. The lightest horse breed was the Java horse, with a weight of 216 kg.

Table 3. Performance of the production of bendi horses on the coast of Parangtritis Beach (n=43).

Parameter	Average±SD
Age first employed (years) (n=26)	1.9±0.3
Length of working hours (hours/day)	
Monday-Friday	3.8±1.1
Saturday-Sunday	6.8±0.6
Estimated Body Weight (kg)	
Sandel	315.2±62.9
Sumbawa	260.7±30.8
Javanese	227.4
Thoroughbred Cross	404.1±47.5

3.4 Reproductive Performance

Reproductive performance is one of the factors in the success of a farm. Reproductive performance can be determined through several parameters including the age of first estrus, the age of first mating, Service per Conception (S/C), Gestation duration, postpartum estrus (PPE), postpartum mating (PPM), and Foaling interval (FI). Data on horse reproductive performance on the coast of Parangtritis Beach is presented in Table 4.

A horse's first mating age can be a sign that the horse is sexually mature and ready to mate. The average age of the first horse on the coast of Parangtritis Beach is 2.0±0.4 years. The average result of the first passion of horses obtained is longer than the opinion of [3]. [3] said that horses experience their first lust at the age of 12-15 months or (1-1.25) years. This difference occurs because some breeders buy horses at the age of 18 months (1.5 years) which causes breeders to not know the exact time of the horse's first lust.

The first age of mating is when the horse is ready and able to produce offspring. The average age of the first horse mated on the coast of Parangtritis Beach has a range of 2.4±0.5 years. [11] said that horses were best bred for the first time after two years of age, as they were ready for sexual and somatic growth. The findings align with Blakely's statement, as the local breeders similarly consider that mares should only be bred after they reach two years of age.

The average Service per Conception (S/C) of bendi horses on the coast of Pargtritis Beach was 2.6±0.7 times with a range of 1-3 times. The ideal S/C was 1–2 times [12]. [8] showed that the more S/C, the worse the fertility of livestock, on the other hand, if the lower the S/C, the better the fertility of livestock. The results of the S/C of the bendi horse on the coast of Parangtritis Beach show that some horses have received good S/C, but some still do not meet the standard. S/C values that have not met the standards may be related to the delay of farmers in recognizing signs of heat.

The gestation duration of the bendi horse on the coast of Parangtritis Beach was 329.1±6.4 days. [13] said that the normal gestation length for horses ranges from 300-380 days. A comparison of field data and literature, it can be conveyed that coastal horses of Parangtritis Beach have a normal gestation range. Horse breeders on the coast of Parangtritis Beach still employ their horses until 10 months of gestation, after giving birth to the horses are rested for one month to recover the physical condition of the horses with a division of two weeks of rest and two weeks of retraining.

Table 4. Reproductive performance of the blessed horse on the coast of Parangtritis Beach (n=43).

Parameter	Average±SD
First age of estrus(years) (n=25)	2.0±0.4
First age of mating (years) (n=26)	2.4±0.5
Service per Conception (time) (n=34)	2.6±0.7
Gestation duration (days) (n=33)	329.1±6.4
Postpartum estrus (days) (n=33)	45.1±48.8
Postpartum mating (days) (n=32)	75.1±52.7
Foaling interval (months) (n=22)	16.2±5.0

Postpartum estrus (PPE) refers to the re-estrus of livestock after giving birth. Breeders identify their horses by observing the discharge of mucus, swelling, and redness of the vulva. Postpartum estrus kuda bendi on the coast of Parangtritis Beach ranges from 45.1±48.8 days. [3] said that PPE occurs for about 5-14 days even though her child is still actively breastfeeding. The difference between field data and literature is due to the delay of farmers in detecting the return of lust. Farmers often assumed that mares which were still nursing their foals were unable to return to estrus. [14] showed that suckling activity prolonged the postpartum anestrus period in livestock. This prolongation occurred because high prolactin levels inhibited the release of Gonadotropin Releasing Hormone (GnRH), which subsequently disrupted the estrous cycle.

Postpartum mating (PPM) is re-mating that is conducted after giving birth in order to have the next offspring. *Postpartum estrus* is very intersecting with PPE because it is necessary to wait for PPE to be able to carry out re-mating of livestock. The PPM of bendi horses on the coast of Parangtritis Beach has an average of 75.1±52.7 days. Farmers wait until the second lustful because it is considered more successful for pregnancy livestock to return. [15] that horse remarriage can be conducted in the second half after giving birth with a success rate of 92%.

The foaling interval obtained on bendi horses on the coast of Parangtritis Beach has an average of 16.2±5.0 months with a range of 11-21 months. [3] said that the normal horse foaling interval is 360-540 days (12-18 months). Field data and literature obtained show that the average FI of horses on the coast of Parangtritis Beach is still partly in accordance with the opinion of [3] and some others still do not meet the standard. Some FI values that have not met the standards are due to the withdrawal of PPE so that mating is back and foaling intervals are also backwards.

4 Conclusion

The conclusions obtained from the research of bendi horses on the coast of Parangtritis Beach include horses that work medium and heavy. The performance of horse production on the coast of Parangtritis Beach is relatively good, but the reproductive performance is still not good. This still not good reproductive performance is due to the retreat of postpartum estrus so that it produces a domino effect, namely the retreat of postpartum mating, and foaling intervals.

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