The productivity of Gayo buffaloes viewed from reproduction aspect in Linge Sub-District of Central Aceh District, Aceh Province of Indonesia

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Abstract. This study aimed to identify the productivity of female Gayo buffaloes in Linge Sub-District, Central Aceh District. Survey was used to obtain the primary data through direct interview techniques with buffalo owners based on a questionnaire that had been prepared previously. As many as 40 buffalo owners became the respondents in this study spread in four selected villages (Pantan Nangka, Delung Sekinel, Umang, and Gelampang Gading). The determination of respondents was done by using purposive sampling method with a minimum provision of breeders maintaining two female buffaloes that have bred at least two times and have a minimum experience of breeding for four years. The results showed that female Gayo buffalos had good reproductive productivity. Female Gayo buffalos experienced puberty at 33.8 ± 0.63 months old with the average age at first breeding was at 35.4 ± 0.67 months old, age of first calving was at 46.47 ± 4.44 months old, conception period was for 332.25 ± 26.64 days, average calving interval was at 14.82 ± 1.81 months, service period was at 3.42 ± 0.50 months, and percentage of calving rate was 67.92 %. It was concluded that female Gayo buffalos in Linge Subdistrict, Central Aceh Regency has good productivity.

1. Introduction
There are some advantages of buffalo breeding as this animal is reasonably tolerant of parasites, is common among Indonesian breeders as well as is able to thrive despite low feed quality stated by Nuraini et al., [1]. Gayo buffaloes are one of livestock that are classified into Gayo Buffaloes family through the decree of the Minister of Agriculture No. 302/Kpts/SR.120/5/2017 dated 4 May 2017. In 2015, there were 12,728 buffaloes in Central Aceh, one of districts in Aceh Province, which decreased to 12,708 in 2016 indicating a decrease in Gayo buffalo population [2]. In 2018, there were 13,372 buffaloes in this district [3]. According to Leandhanie [4], low increase in swamp buffalo population can be attributed to the reproduction rate. Other factors causing low reproduction rate is the lack of farmers’ knowledge regarding reproductive aspect. Reproductive performance can be measured by paying attention to the population balance and reproductive productivity achievement. Although Gayo buffalo has great potential to be developed, information and productivity data about Gayo buffalo have not been specifically and continuously studied. Based on the description above, research and study on Gayo buffalo productivity in Linge Sub-District, Central Aceh District focusing on reproductive aspects needs to be carried out to provide information on the potential growth of the population as one of this national animal genetic resources. This study aimed to identify the potential of reproductive productivity of female Gayo buffaloes.
2. Research method
This study was conducted in Linge Sub-District, Central Aceh District. Four villages were involved in this study, including Pantan Nangka Village, Delung Sekinel Village, Umang Village and Gelampang Gading Village. This research was conducted from 1 July to 25 July 2019. Survey was used to obtain primary data. The data were collected using direct interview with buffalo cattle owners based on a questionnaire prepared beforehand. As many as 40 buffalo cattle owners who live across the four villages were chosen using purposive sampling technique, with the condition that the breeders raised at least 2 female buffaloes that have bred at least 2 times and a minimum of 4 years breeding experience. Variables observed in this study were: the reproductive productivity of female Gayo buffaloes bred by breeders in Linge Sub-District, Central Aceh District, broken down into: (a) first estrus and service; (b) age during the first calving; (c) conception period; (e) calving interval; and (f) number of calving per year.

3. Results and discussion
The productivity performance of female Gayo buffaloes in Linge Sub-District, Central Aceh is shown in Table 1.

Table 1. Reproduction characteristic of Gayo buffalo.

| Reproduction                              | Average         |
|-------------------------------------------|-----------------|
| First Estrus (Puberty)                    | 33.9 ± 0.63 (month) |
| First Service Age                         | 35.4 ± 0.67 (month) |
| Age During the First Calving              | 46.44 ± 4.44 (month) |
| Conception Period                         | 332.25 ± 26.64 (days) |
| Calving Interval                          | 14.82 ± 1.81 (month) |
| Interval between Reservices after Calving | 3.42 ± 0.50 (month) |

3.1. First estrus (puberty)
The average age of the first estrus of Gayo buffaloes in Linge Sub-District was 33.9±0.63 months old (2.8 years old) (Table 1). The earliest buffalo puberty was at 28.4±0.63 months old, exhibited by buffaloes in Delung Sekinel Village and the tardiest buffalo puberty was at 37.2±0.68 months old, exhibited by buffaloes in Gelampang Gading Village. The puberty age of Gayo buffaloes was the same as swamp buffaloes in Kutai Kertanegara District conducted by Komariah et al., [5], which was at 2.8 years old, while compared to Nardi et al., [6] study in Johan Pahlawan Sub-District, the puberty of Gayo buffaloes in Linge Sub-District occurred earlier than the swamp buffaloes at 35.9 months old (2.9 years old). Gayo buffaloes exhibited earlier sexual maturity compared to swamp buffaloes in North Kluet Sub-District, South Aceh District, at 36.61 months old [7].

3.2. First service age
The average age of buffalo first service in Linge Sub-District was 35.4±0.67 months old in Table 1. The earliest buffalo first service age was found in Delung Sekinel Village at 30.0±0.47 months old and the tardiest was found in Pantan Nangka Village at 38.4±0.83 months old. The results of this study were much slower compared to the study conducted by Muhakka et al., [8], where average buffaloes in Pampangan, South Sumatra first mated at 2.3 years old or 27 months old. When compared with the study by Abdullah et al., [9], the average age of Gayo buffaloes first mated in Linge District with different location was 32.6 months old. Whereas, study by Sari et al [10] reported that in Wih Pesam District, the average age of first mating was 33.0 months old or 2.75 years old. The result is almost identical as the study of Leandhanie [4] which showed that in order to succeed, female buffalo should be mated at the age of 3 years old or 36 months old.

3.3 Age during the first calving
The average age of Gayo buffaloes during the first birth in Linge Sub-District was 46.47±4.44 months old or 3.87 years old (Table 1). The youngest Gayo buffalo to give birth was 45.5±6.04 years old found...
in Delung Sekinel Villages and the oldest buffalo was 47.4±4.06 years old found in Umang Villages. The results were identical with the survey conducted by Keenan [11] that the average age during the first birth was 47.7 months old. Compared to the study by Marsudi et al., [12], Gayo buffaloes in Linge Sub-District have their birth at a younger age, while swamp buffalo’s average first mating age in Lembah Napu, Central Sulawesi was 4.21 years old.

3.4 Conception period
Gestation is the time from fertilization to the birth. Based on the result of this study, Gayo buffaloes in Linge Sub-District had an average gestation period of 332.25±26.64 days (Table 1). The longest average gestation period was found in Umang Village with 345.0±29.75 days, the shortest gestation period was found in Gelampang Gading Village with 321.0±21.46 days. The gestation period of Gayo buffaloes in Linge Sub-District is in line with the result of Dwi et al., [13] study stating that the average gestation period of buffaloes in Malang District is 11-12 months which is almost identical with the gestation period of buffaloes in West Sumatera which is 11.05±0.31 months. The result was slightly different from Sari et al., [14] study, where the gestation period of Simeulue buffaloes was 314 days or 10.46 months. Meanwhile, the average gestation period of buffaloes in Tempursari Sub-District Lumajang District is 10.20±0.80 conducted by Mufidah et al., [15].

3.5 Calving interval
When buffaloes are in heat after calving, their reproductive cycle is repeated until the next conception. According to Leandhanie [4] the gap between two consecutive conceptions is known as calving interval. The calving interval of buffaloes in Linge Sub-District was 14.82±1.81 (Table 1). Umang Village was at first when it comes to the shortest calving interval with 14.6±1.37 months, while the intervals for the other three villages (Pantan Nangka, Gelampang Gading, and Delung Sekinel) were 15.0; 15.0; and 14.7 months, respectively. These results are relatively similar to study conducted by Pulungan et al., [16], stating that buffaloes in Simeulue District showed varied interval between 12-16 months with an average of 14 months. It was definitely faster compared to the result of Leandhanie [4] study, where the calving interval of swamp buffaloes in North Hulu Sungai Sub-District, South Kalimantan was 18-24 months.

3.6 Interval between reservice after calving
The average interval of the service of Gayo buffaloes in Linge Sub-District was 3.42±0.50 months (Table 1). The interval of buffalo reservice after calving was around 3.3-3.5 months, and Delung Sekinel took the crown for the shortest interval with 3.3 ±0.50 while Pantan Nangka Village and Gelampang Gading Village is tied for the longest interval with 3.5±0.53. The interval in this study (3.42±0.50 months) was shorter than the average service period after calving in study in Wih Pesam Sub-District, Bener Meriah District conducted by Keenan [10], which was 7.42 months and the result by Abdullah et al., [9] study which was 6.8 months.

3.7 Number of calving per year
The number of calf birth in Linge Sub-District was around 35-60 calves with Umang Village ranking first for the most births, which was 60 calves from 90 females, while Delung Sekinel ranks last with 35 calves from 50 females. The average calving per year in Linge Sub-District, Central Aceh District was 67.92% from around 308 females and a total 207 calves. These results are slightly lower compared to the results of buffalo study in East Kalimantan conducted by Komariah et al., [5] in Muara Muntai Sub-District while study by Pulungan et al., [16] find that Gayo buffaloes had slightly higher birth percentage (67.92%) compared to the birth percentage of Simeulue buffaloes which was 66% from 216 females.

4. Conclusion
Female Gayo buffaloes reach puberty at 33.8±0.63 months. The average age at first breeding is 35.4±0.67, the age during the first calving is 46.47±4.44 months, the conception period is 332.25±26.64 days, the average calving interval is 14.82±1.81 months, and the interval between calving to another conception is 3.42±0.50 months. Furthermore, the birth percentage is 67.92%. It was concluded that female Gayo buffaloes in Linge Subdistrict, Central Aceh Regency has good productivity.
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