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# Comparison of Quantitative and Qualitative Characteristics of Polled Bali Cattle in Bone and Barru Regencies

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***ABSTRACT.*** *Polled Bali cattle (PBC) are Bali cattle that do not naturally have horns. This study aims to compare quantitative and qualitative characteristics of PBC found in Bone and Barru Regencies, South Sulawesi. This study was conducted from June 2024 to March 2025. The number of samples aged 12 - 24 months, for quantitative characteristics using 80 heads each in Bone (40 heads) and Barru (40 heads), with a ratio of 20 males and 20 females. The qualitative characteristics used in PBC in Bone (62 heads), and in Barru (39 heads). This study used an independent sample t-test for quantitative traits and descriptive analysis for qualitative traits. The results showed that there are several differences in the quantitative and qualitative traits of PBC in Bone and Barru Regencies. In morphometric quantitative traits, PBC males from Bone Regency were found to be larger than those from Barru Regency ($p<0.05$). In qualitative traits, similar characteristics were observed in eyelid colour, ear hair colour, lip edge colour, mouth lashes, leg colour, dewlap size, hoof colour and horn. However, differences were found in coat colour, body colour pattern, backline, dewlap size and tail length, which were influenced by location (Chi-square test, $p<0.05$). These results provide useful information regarding the differences in body dimensions of PBC in both regions, which can be the basis for planning more effective breeding and maintenance strategies.*

*Keywords: PBC, morphometrics, light brown, dewlap size, backline.*

## INTRODUCTION

The selection of polled cattle is of particular in contemporary livestock management (Sonjaya et al. 2023; Grobler et al., 2021). Polled cattle are defined as those whose horns do not grow naturally. These polled Bali cattle (PBC) possess distinct advantages, including ease of maintenance. The development of PBC has been shown to provide several advantages, including ease of handling in maintenance management and a reduction in the risk of injury during maintenance, which is particularly beneficial to farmers. PBC development is underway in Indonesia, focusing on South Sulawesi, Bone Regency, and Barru Regency. Polled cattle farming is an attempt to remove horns by avoiding injuries such as dehorning. Furthermore, the practice of removing horns has become increasingly common in some countries when it comes to both dairy and beef cattle.

A phenomenon has been observed in the development of Bali cattle: the presence of hornless cattle (polled). The Bali cattle population from which the PBC originated was developed at PT BULI (Berdikari United Livestock) in Sidrap Regency during the 1990s. It is documented that PBC calves were subsequently born and raised for breeding. Until around the 2000s, the PBC were isolated from the initial population to be bred at the Livestock Farm of the Faculty of Animal Science,

Pattallasang District, Gowa Regency (Baco et al., 2020). The selection of PBC bulls was conducted for the purpose of serving as studs for straw production. The resulting PBC straw was then artificially inseminated (AI) into horned Bali breeding cows in Barru and Bone regencies to produce early progeny (F1) of PBC cattle.

The productivity of PBC can be determined through morphometric analysis. As Crisdayanti et al. (2020) asserted, morphometrics constitutes a quantitative measurement of an organism's external morphology employed for classification purposes. Morphometric characteristics (quantitative traits) have been demonstrated to serve as reliable indicators for the assessment of livestock, exhibiting a substantial correlation with their physical characteristics. Specifically, morphometric characteristics are positively correlated with body weight. The correlation between body size and morphometric characteristics is positive, as demonstrated by Zafitra et al. (2020; Meghelli et al. (2020).

In addition to quantitative traits, there are also qualitative traits that have a role in identifying PBC. Qualitative traits are often governed by one or a few genes, which suggests that they are inherited. This trait is usually only controlled by a pair of genes and is not influenced by environmental factors. Qualitative traits have the benefit of being the main visual characteristics of livestock. Based on the description above, this study was conducted to determine the comparison of quantitative traits and qualitative traits of PBC in Bone Regency and Barru Regency.

## MATERIALS AND METHODS

This study was conducted in Bone and Barru regencies, South Sulawesi province, from June 2024 to March 2025. The research material used PBC aged 12 - 24 months. The average age for males was 13.9 months. For females it was 15.8 months. For quantitative and qualitative traits using PBC as many as 80 heads each in Bone Regency as many as 40 heads and Barru Regency with as many as 40 heads, with a ratio of 20 males and 20 females.

PBC has an intensive farmers group management system in Barru and Bone Regencies. The feed ration consisted of elephant grass (*Pennisetum purpureum*) and nut grass (*Cyperus rotundus*) with water ad libitum. The farm's method of artificial insemination (AI) is the use of PBC straw. The tools used in this research are a measuring stick made of stainless steel and has a maximum length of 220 cm. It is equipped with a water pass to measure how straight the stick is when upright on the ground. A Rondo brand tape measure and a wooden pinch cage.

This research is a comparative study that aims to compare the quantitative and qualitative traits of PBC between two regencies, Bone and Barru Regencies. Quantitative traits relate to the size of the cattle's body dimensions (withers height, body length, and heart girth), and qualitative traits (ear hair color, lip edge color at the edge, mouth lash color, horns status, backline, legs (stocking), rump and tail color).

The data used is primary data where this data is obtained directly from the results of measurements and observations made during research at the two locations. Data analysis using the Microsoft Excel program.

Quantitative data obtained will be analyzed using the T-test (Independent samples t-test). In contrast, qualitative data were analyzed using a chi-square test. The Independent T-test formula is as follows.

$$T = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 + n_2) - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

T = tested parameters

$\bar{X}_1$ = average body dimensions of cattle from Bone Regency;

$\bar{X}_2$ = average body dimensions of cattle from Barru Regency;
$n_1$ = the number of samples from Bone Regency;
$n_2$ = the number of samples from Barru Regency;
$S_1^2$ = variance of the Bone Regency sample;
$S_2^2$ = variance of the Barru Regency sample.

The Indonesian National Standard (SNI 7651-4:2020) was used to compare the standardisation of cattle as beef cattle (Table 1).

## RESULT AND DISCUSSION

### Quantitative Characteristics

Table 2 presents the results of measuring the quantitative traits of PBC in Bone and Barru Regencies. The measurement of withers height in male PBC in Bone and Barru Regencies showed that the average value of PBC in Bone Regency was higher than that of PBC in Barru Regency ($p<0.05$). The measurement of withers height in female PBC did not show a significant difference ($p>0.05$) (Table 2).

The results of body length measurements on male PBC in Bone and Barru Regencies showed that the average value of PBC in Bone Regency was higher than that of male PBC found in Barru Regency ($p<0.05$). While the results of body length measurements on female PBC were not significantly different ($p>0.05$). Chest circumference measurements on male and female PBC in Bone and Barru Regencies did not show significant differences ($p>0.05$) for males and ($p>0.05$) for females (Table 2).

The mean values of withers height, body length, and heart girth of male PBC found in Bone and Barru regencies fall into category I according to the minimum requirements of the Indonesian National Standard (SNI 7651-4:2020) (Table 1). In the case of female cattle, however, these values fall into category III. The Bali cattle standard was utilized as a reference due to the absence of the PBC standard.

Although there is a slight size variation between males and females in both regencies, the withers height of the PBC still meets the good-quality standard set out in SNI 7651-4:2020. Therefore, both regencies are ideal for the growth and development of PBC. This finding underscores the conclusion that, despite the observed disparities in size between the two regions, both exhibit cattle with comparable physical quality, and both meet the National beef standard. Statistical analysis indicates that the mean withers height of PBC in Bone Regency exceeds that of PBC in Barru Regency. This discrepancy suggests potential variations in body size between regions, which may be attributable to several interacting factors. As Nafiu (2024); Patke et al. (2020) have demonstrated livestock body size can vary depending on location, with each region exhibiting distinct environmental characteristics.

These environmental factors significantly influence the level of adaptation of cattle, especially in terms of temperature, humidity, and the availability of adequate natural feed. In addition to environmental factors, the breed of cattle being raised also plays an important role in determining body size. For instance, certain breeds of cattle may possess the genetic capacity to attain larger or smaller body sizes, contingent on their breed or variety. The judicious selection of breeds that are well-suited to the environment and have optimal physical qualities is a critical component of effective livestock management, as it ensures the optimal body size of the offspring. The husbandry system exerted a significant influence on the growth of cattle. The provision of comfortable and clean cages, adequate health care, and effective husbandry management can facilitate maximum physical growth. Nutritious feeding, incorporating quality forage and balanced concentrates, is also vital.

**Qualitative Characteristics**

Qualitative traits are defined as the primary visually observable characteristics of livestock. Observations of qualitative traits encompass coat color, back line, sock color, and rump color. The results of observations on the qualitative characteristics of PBC can be seen in Table 3. An analysis of the results presented in Table 3 indicates that five traits or characteristics influence location differences. These traits include coat colour, backline, dewlap size, and tail length (Chi-square test, $p<0.05$). Meanwhile, the traits of eyelid color, ear hair color, lip edge color, mouth lashes, leg color, dewlap size, hoof color, and horn were not affected by location differences and showed similar characteristics (Chi-square test, $p<0.05$).

Table 1. The minimum quantitative requirements for Bali cattle breeds Based on Indonesian National Standard (SNI 7651-4:2020)

| Aged | Sex | Parameters | Unit | Measurements (Minimum) | | |
|---|---|---|---|---|---|---|
| | | | | Category I | Category II | Category III |
| 12 months | Male | Withers height | cm | 102 | 98 | 94 |
| | | Body length | cm | 96 | 92 | 87 |
| | | Heart girth | cm | 127 | 122 | 117 |
| 18 months | Female | Withers height | cm | 108 | 105 | 102 |
| | | Body length | cm | 109 | 106 | 102 |
| | | Heart girth | cm | 144 | 138 | 133 |

Table 2. Mean PBC quantitative trait measurements in Bone and Barru regencies.

| Sex | Variables | Regencies | |
|---|---|---|---|
| | | Bone | Barru |
| Male | Withers height | 107.05±4.79[a] | 105.55±9.27[b] |
| | Body length | 103.32±6.39[a] | 100.80±10.26[b] |
| | Heart girth | 136.20±13.85 | 133.75±13.34 |
| Female | Withers height | 102.55±5.35 | 100.20±5.89 |
| | Body length | 99.65±6.92 | 96.60±8.97 |
| | Heart girth | 135.55±14.24 | 130.95±14.11 |

Notes: [a,b]Different superscripts in rows within the same parameter indicate significant differences ($P<0.05$).

The coat colour of the PBC male varied from light brown to reddish-brown, mixed black and black. Location differences had no effect (Chi-square, $p<0.05$). In contrast, the coat colour of the PBC female was influenced by regional differences (Chi-square, $p>0.05$). The Bone regency showed a light brown and yellowish-brown colour, while the Barru regency showed a light brown and reddish-brown colour. The color pattern of PBC is influenced by factors such as age, environmental conditions, genes, and dietary intake. This observation aligns with the findings reported by Rajab. (2021), who stated that the presence of a brick-red coloration is typically observed in both male and female cattle. However, the coat color of males undergoes a transition from brick red to dark brown or black following the attainment of sexual maturity at 1.5 years of age, subsequently acquiring a smooth black appearance at 3 years.

Table 3. Qualitative characteristics of male and female PBC in Bone and Barru regencies.

| Parameters | Bone Regency | | | | Barru Regency | | | |
|---|---|---|---|---|---|---|---|---|
| | Male (%) | | Female (%) | | Male (%) | | Female (%) | |
| | Obs | Exp | Obs | Exp | Obs | Exp | Obs | Exp |
| Coat color | | | | | | | | |
| Reddish-brown | 5.00 | 5.88 | 0.00 | 0.00 | 5.00 | 5.00 | 23.81* | 18.52* |
| Light brown | 35.00 | 47.06 | 35.00* | 62.86* | 45.00 | 40.00 | 76.19* | 81.48* |
| Yellowish-brown | 25.00 | 17.65 | 65.00* | 37.14* | 0.00 | 0.00 | 0.00 | 0.00 |
| Pale-brown | | | | | | | | |
| Dark brown | 5.00 | 5.88 | 0.00 | 0.00 | 5.00 | 5.00 | 0.00 | 0.00 |
| Black | 0.00 | 0.00 | 0.00 | 0.00 | 30.00 | 15.00 | 0.00 | 0.00 |
| Reddish-brown Mixed Black | 30.00 | 23.53 | 0.00 | 0.00 | 10.00 | 20.00 | 0.00 | 0.00 |
| Eyelid | | | | | | | | |
| Black | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Ear Hair Color | | | | | | | | |
| White | 0.90 | 0.80 | 0.95 | 0.93 | 0.70 | 0.80 | 0.90 | 0.93 |
| Brown | 0.10 | 0.20 | 0.05 | 0.08 | 0.30 | 0.20 | 0.10 | 0.08 |
| Lip Edge Color | | | | | | | | |
| White on the Edge | 0.95 | 0.95 | 1.00 | 0.95 | 0.95 | 0.95 | 0.90 | 0.95 |
| Circular White | 0.05 | 0.05 | 0.00 | 0.05 | 0.05 | 0.05 | 0.10 | 0.05 |
| Mouth lash | | | | | | | | |
| Black | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Rump patch | | | | | | | | |
| White, Firm Borders | 0.95 | 0.85 | 0.55 | 0.73 | 0.75 | 0.85 | 0.90 | 0.73 |
| White, Undefined Boundaries | 0.05 | 0.15 | 0.45 | 0.28 | 0.25 | 0.15 | 0.10 | 0.28 |
| Legs (stocking) | | | | | | | | |
| White, Firm Borders | 0.80 | 0.85 | 0.70 | 0.83 | 0.89 | 0.85 | 0.95 | 0.83 |
| White, Undefined Boundaries | 0.15 | 0.13 | 0.25 | 0.15 | 0.11 | 0.13 | 0.05 | 0.15 |
| Not Shape Sock Color | 0.05 | 0.03 | 0.05 | 0.03 | 0.00 | 0.03 | 0.00 | 0.03 |
| Hoof | | | | | | | | |
| Black | 0.90 | 0.93 | 0.95 | 0.98 | 0.95 | 0.93 | 1.00 | 0.98 |
| Gray | 0.05 | 0.05 | 0.05 | 0.03 | 0.05 | 0.05 | 0.00 | 0.03 |
| Striped (Black-grey) | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 |
| Backline | | | | | | | | |
| Thin line | 0.05** | 0.03** | 0.00 | 0.05* | 0.00 | 0.03** | 0.10* | 0.05* |
| Medium line | 0.10** | 0.25** | 0.00 | 0.15* | 0.40** | 0.25** | 0.30* | 0.15* |
| Thick line | 0.85** | 0.73** | 1.00* | 0.80* | 0.60** | 0.73** | 0.60* | 0.80* |
| Dewlap size | | | | | | | | |
| Large | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Medium | 0.05 | 0.03 | 0.05 | 0.03 | 0.00 | 0.03 | 0.00 | 0.03 |
| Small | 0.95 | 0.98 | 0.95 | 0.98 | 1.00 | 0.98 | 1.00 | 0.98 |
| Tail length | | | | | | | | |
| Short | 0.05** | 0.03** | 0.00 | 0.00 | 0.00 | 0.03** | 0.00 | 0.00 |
| Medium | 0.10** | 0.35** | 0.10 | 0.18 | 0.60** | 0.35** | 0.25 | 0.18 |
| Long | 0.85** | 0.63** | 0.90 | 0.83 | 0.40** | 0.63** | 0.75 | 0.83 |
| Horn | | | | | | | | |
| Polled | 0.65 | 0.68 | 0.85 | 0.88 | 0.70 | 0.68 | 0.90 | 0.88 |
| Scurs | 0.35 | 0.33 | 0.15 | 0.13 | 0.30 | 0.33 | 0.10 | 0.13 |

Notes: *Different superscripts in rows and columns within the same parameter indicate significant differences (P<0.05). **Different superscripts in rows and columns within the same parameter indicate significant differences (P<0.01).

From a visual standpoint, the tail length of PBCs was influenced by differences in location (Chi-square, p>0.01), particularly among males (Table 3). The tail length of male PBC from Barru regency varied from medium to long. No differences were found in the dominant tail

length of female PBC. Tails must exhibit variability in size and position. Some cattle possess tails that extend below the knee, while others possess tails that extend above the knee. The tail's length is a key factor of superior Bali cattle breeds (Rusdin et al., 2025). Research indicates that a long tail (below the knee) is indicative of superior judgement in the selection, in contrast to a short tail (above the knee) (Khairina et al., 2021).

The backline colouration of PBC males and females in the Bone regency is characterised by thick lines, in contrast to the Barru regency, where variations in thick and medium lines are evident. Differences in the backline colouration of PBC are strongly influenced by location (Chi-square test, $p>0.01$) in males and (Chi-square test, $p>0.05$) in females. The backline is one of the characteristics of Bali cattle. The backline in female PBC was found to have no deviations, and all female cattle were found to be black with thick stripes. Domili et al. (2021) and Warman et al. (2024) observed that sagging was prevalent among male Bali cattle, characterized by black and thick striped backlines. The sagging observed in PBC is predominantly of reduced size in both male and female subjects in the Bone and Barru regencies.

The black color may revert to brick red when castrated due to the influence of hormone testosterone. Martojo (2012) also stated that the color of male Bali cattle is reddish brown and changes to black at the age of 12-18 months and becomes darker as the body matures. The brown color in Bali cattle is regulated pigment where when the tyrosinase enzyme content is low, the phaeomelanin pigment content will be high, but when the tyrosinase enzyme content is high, eumelanin is produced, changing the brown and red colors. Black color in bulls is influenced by the phaeomelanin pi testosterone hormone (Baharun et al., 2017; El-Sherbiny et al., 2023).

## CONCLUSION

Based on the results of the study, there are several differences in the quantitative and qualitative traits of PBC in Bone and Barru Regencies. In morphometric quantitative traits, PBC males from Bone Regency were found to be larger than those from Barru Regency ($p<0.05$). In qualitative traits, similar characteristics were observed in eyelid colour, ear hair colour, lip edge colour, mouth lashes, leg colour, dewlap size, hoof colour and horn. However, differences were found in coat colour, backline, dewlap size and tail length, which were influenced by location (Chi-square test, $p<0.05$).

## CONFLICT OF INTEREST

This research has been approved by all authors and there is no conflict of interest either in data or other matters concerning the interests of researchers.

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## REFERENCES

Baco, S., Zulkharnain, R. Malaka, & G. R Moekti. 2020. Polled Bali Cattle and potentials for the development of breeding industry in Indonesia. Hasanuddin Journal of Animal Science. 2(1): 23–33.

Baharun, A., H. L. Belli, & T. M. Hine,. 2017. Characteristics of Bali Cattle young bull under traditional livestock system in Merbaun Village Regency of Kupang. Jurnal Peternakan Nusantara. 3(1): 11-16.

Crisdayanti, S., Depison, Gushairiyanto & S. Erina. 2020. Identification of Bali cattle and Brahman cross cattle morphometric characteristics in

Pamenang Barat sub-district Merangin district. Jurnal Peternakan Sriwijaya. 9(2): 11-20.

Domili, A., N. K. Laya, , S. Dako, F. Datau, & S. Fathan. 2021. Qualitative characteristics and body size correlation analysis of Male Bali Cattle. Jambura Journal of Animal Science. 4(1): 46-52.

El-Sherbiny, H.R., Hashem, N.M. & Abdelnaby, E.A. Coat color affects the resilience against heat stress impacts on testicular hemodynamics, reproductive hormones, and semen quality in Baladi goats. *BMC Vet Res* 19, 107 (2023). https://doi.org/10.1186/s12917-023-03653-w

Grobler, R., E. van Marle-Koster, & C. Visser. 2021. Challenges in selection and breeding of polled and scur phenotypes in beef cattle. Livestock Science. Volume 47, May 2021, 104479

Khairina, D. M., I. C. Pramukti H. R. Hatta, & S. Maharani. 2021. Model of decision making for selection of superior seeds in Bali Cattle using weighted product method. Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK). 8(5): 879-886.

Indonesian National Standard. 2020. Bibit sapi potong - Bagian 4: Bali. SNI 7651-4:2020. Badan Standar Nasional.

Martojo, H. 2012. Indigenous Bali Cattle are most suitable for sustainable small farming in Indonesia. Reproduction in Domestic Animals. 47(1): 10–14.

Meghelli, I., Z. Kaouadji., O. Yilmaz., İ. Cemal., O. Karaca, & S. B. S. Gaouar. 2020. Morphometric characterization and estimating body weight of two Algerian camel breeds using morphometric measurements Tropical Animal Health and Production https://doi.org/10.1007/s11250-020-02204-x

Nafiu, I. H. L. O. 2024. Beef Cattle Breeding. CV. Azka Pustaka. Kendari.

Patke, A., M. W., Young, & S. Axelrod. 2020. Molecular mechanisms and physiological importance of circadian rhythms. *Nat Rev Mol Cell Biol* 21, 67–84. https://doi.org/10.1038/s41580-019-0179-2

Rusdin, M., Nafiu, L. O., Aku, A. S., & Sahaba, L. O. (2025). The markers of body size and shape of Bali Cattle and its crosses with exotic Bulls. *Jurnal Penelitian Pendidikan IPA*, *11*(1), 867–875. https://doi.org/10.29303/jppipa.v11i1.9266

Sonjaya, H., S. Firmiaty dan S. Syarifuddin. 2023. Differences in body size for male polled Bali cattle and non polled Bali cattle. Jurnal Agrisistem. 19(2): 68-74.

Warman, A.T., Panjono., G. T. Fadhilah., B. A. Atmoko, S. Bintara., T. S. M Widi., E. Baliarti, & Z. N. Jannah. 2024. The difference between Bali cattle and Limousine-Bali (Limbal) crossed cattle concerning their qualitative characteristics in Lombok Tengah District, Indonesia.Nusantara Bioscience 16: 104-110.

Zafitra. A., H. Gushairiyanto., H. Ediyanto & Depison. 2020. Characterization of morphometric and body weight Bali Cattle and Simbal in Bangko Merangin District. Majalah ilmiah peternakan. 23(2): 66-71.