Research

Morphometric, Morphology and Body Weights of Kudu Duck Found in Mayurbhanj District of Odisha

S.K. Bhanja*, M.K. Padhi, S.K. Sahoo, Dhirendra Kumar, Rajalaxmi Behera and S.C. Giri

Regional Station, ICAR-Directorate of Poultry Research, Bhubaneswar, Odisha-751003, India

ABSTRACT

A comprehensive scientific survey was conducted across four sub-divisions encompassing 18 blocks of the Mayurbhanj district, Odisha, to assess the morphological features, body conformation traits, and body weights of native ducks. A total of 2,190 ducks were evaluated, representing 204 farming families. Data collection focused on body coloration and morphometric traits in both sexes. The average flock size of Kudu ducks was 10.74 birds, comprising 2.91 drakes (27.09%), 5.24 ducks (48.79%), and 2.59 ducklings (24.12%). The mean adult body weight at 12 months of age was 1.292 ± 0.017 kg for drakes and 1.231 ± 0.015 kg for ducks, with drakes being significantly heavier (P<0.01). There was considerable variation in the coloration of most body parts across individuals and sexes, with no uniform colour pattern identified. Common colours included black, light brown, and grey, often in combination. However, some consistent traits were observed: all ducks had light pink skin and black eyes. Black head coloration was predominant in drakes (59.65%) but observed in only 13.89% of females. A white neck ring was present in more than 50% of both sexes. A mosaic plumage pattern was the most prevalent across both sexes. Metallic green bills were more commonly found in drakes (41.23%), while females displayed a broader range of bill colours (9.03%–22.22%). Orange shanks and feet were observed in over 70% of individuals regardless of sex. Drakes exhibited significantly greater values in bill length and width, head width, neck length, breast length, body length, wingspan, and body circumference. Interestingly, ducks had a significantly wider head (P<0.01) compared to drakes. The study concludes that native ducks of Mayurbhanj are relatively small-sized birds, with their body weight and conformation traits suggesting a better suitability for egg production rather than meat. Despite the wide variability in colour patterns, key distinguishing features-such as the white neck ring, mosaic plumage, and the presence of light brown feathers in females-make these ducks distinct within the local population.

Key words: Body weight, Conformation traits, Colour pattern, Kudu duck, Mayurbhanj

*Corresponding author: subratcari@gmail.com

Received: July 3, 2025
Accepted: July 23, 2025

INTRODUCTION

The duck (*Anas platyrhynchos*) is an important poultry species in India, valued for both egg and meat production. However, despite the rapid growth of the Indian poultry sector, duck farming remains a relatively neglected component. According to the 20th Livestock Census (2019), India's duck population stands at 33.51 million, constituting approximately 4.0% of the total poultry population. Duck distribution is primarily concentrated in the eastern (64.5%), northeastern (16.02%), and southern (12.60%) regions of the country. The top ten states in terms of duck population include: West Bengal (37.87%), Assam (35.95%), Kerala (5.30%), Manipur (5.13%), Jharkhand (5.09%), Tripura (2.55%), Bihar (2.05%), Andhra Pradesh (1.07%), Odisha (1.05%) and Uttar Pradesh (0.65%).

Duck farming in India primarily involves indigenous breeds reared under backyard systems for generations. Exotic breeds, introduced during the 1970s and 1980s, are also used by farmers in limited areas (Padhi and Giri, 2024). According to Bhat *et al.,* (1980) and Bhat (1981), India has around 20 recognized duck breeds and 34 varieties. Among indigenous breeds, notable examples include the Indian Runner (white and fawn varieties), Sylhet Meta (light brown with black-tipped feathers and yellow beak), and White-breasted Nageswari (black body with white breast and throat). However, a comprehensive survey and characterization of these indigenous breeds is still lacking. These native ducks are region-specific and have adapted to local agro-climatic conditions. Their popularity in certain regions is influenced by local food habits, favorable environmental conditions, the presence of water bodies, affordable feed inputs, and the entrepreneurial nature of duck-keeping communities (Kamal *et al.*, 2020b, Kamal *et al.,* 2023).

In India, duck farming is predominantly practiced under extensive, low-input systems. As per the 2019

livestock census, 96.9% (32.5 million) of ducks were reared under backyard systems, with only 3.1% (1.01 million) raised on farms. Household flock sizes typically range from 2 to 9 birds (Das, 2024). Ducks are often integrated into mixed farming systems, contributing to household food security and sustainable livelihoods. Indigenous ducks, due to their disease resistance and adaptability, are promising candidates for low-input poultry production. As per the Basic Animal Husbandry Statistics (BAHS, 2022), desi layer ducks (9.60 million) account for over 87% of India's total layer duck population (10.76 million), primarily under backyard systems. Their average annual egg production is 116.87 eggs in backyard systems and 168.19 eggs under farm conditions. Improved ducks, by contrast, yield 179.54 eggs in backyard and 209.65 eggs in commercial systems. The wide variation in productivity among desi ducks indicates significant scope for genetic and managemental improvement (Padhi and Giri, 2024). Some of the native duck breeds like Pati duck, which is most commonly reared by rural people of Assam , were recognized by ICAR-NBAGR (Accession number INDIA_DUCK_0200_PATI_11001). These ducks are mainly used for meat, eggs, and ritual sacrifice. Similarly, the Maithili duck breed is mostly found in the middle Gangetic plain of Bihar and is registered by ICAR-NBAGR (INDIA_DUCK_0300_MAITHILI_11002), however, egg production in the Maithili duck was 54.6 eggs per year (Kamal *et al.,* 2020a).

In Odisha, the duck population as per the 2019 census was 3.51 lakh, with Mayurbhanj district alone accounting for approximately 64,000 ducks- the highest in the state. Given the significant duck population in this district, the present study was designed to conduct a detailed survey of native duck breeds in Mayurbhanj. The objective was to record their morphological, morphometric, and growth performance characteristics directly at the farmer level.

MATERIALS AND METHODS

Survey Site

The Mayurbhanj district of Odisha is located between 20° 89′39″–22° 56′69″ N latitude and 85° 56′93″–87° 24′03″ E longitude, covering an area of approximately 10,418 sq. km. The district comprises four subdivisions-Bamanghaty, Baripada, Kaptipada, and Pachpir, with a total of 26 administrative blocks. In this study, around 18 blocks with a higher duck population were selected for the survey. Efforts were made to include the maximum number of gram panchayats and villages where native ducks are reared by local farmers.

Morphological Parameters

The survey was conducted from July to September 2024 to collect data on native Kudu ducks. The survey aimed to include over 200 duck farmers and a total of approximately 2000 ducks across the district. During the visits, data were recorded on the flock size, including adult male ducks (drakes, >12 months), adult female ducks, and ducklings (up to two months of age). The proportion of each category was calculated as a percentage of the total flock size using the formula:

(Number of drakes/ducks/ducklings × 100) / Total number of ducks.

Body weight measurements were taken for each category using a digital balance (APP-TECH, India model: ATT Class-II) with a precision of 0.05g. Feather color and pattern were observed visually for various body parts—head, neck, belly, wings, and tail—in both male and female ducks. The percentage of birds exhibiting each feather color for a given body part was calculated as:

(Number of ducks showing a particular color × 100) / Total number of birds observed.

The morphometric parameters like bill length (distance from tip of beak to base of beak) and width (over the point of nostrils), head length (distance from base of beak to condyle occipital or the atlanto-axial joint) and width, and the length of shank (distance between hock joint and feet, the tarso-metatarsus) were measured using a slide caliper (MitutoyoCorp., Japan, Model: CD-8" CSK) and expressed in cm. Whereas, the length of neck (distance between first and last cervical vertebrae), length of body (distance between tip of beak and end of tail), length of breast (length of keel bone), wing span (distance between tips, extremity of the terminal phalangx of both the wings when extended), circumference of the body (under the wing through the anterior border of the breast bone crest and the central thoracic vertebrae)were measured using measuring tape and expressed in cm.

To record the mortality pattern in Kudu ducks, the farmers were asked about the number of birds that died at specified ages (0-1 week, 1-8 weeks, 8-20 weeks, and 6-12 months) and expressed as a percentage.

Statistical Analysis

The collected data were subjected to statistical analysis using SPSS software (version 2021). Descriptive statistics such as mean, standard error, and range were computed. For morphometric parameters, one-way ANOVA was performed to assess differences between male and female ducks. The significance of mean differences was evaluated using Duncan's Multiple

Range Test (Duncan, 1955), with significance levels set at p<0.05 and p<0.01.

RESULTS AND DISCUSSION

Flock Size

The native duck survey was conducted in Mayurbhanj district, Odisha, covering a total of 204 farming households. Data were collected from 2,190 individual birds, including 594 drakes, 1,070 ducks, and 529 ducklings. The average flock size of Kudu ducks was 10.74 birds, comprising 2.91 drakes (27.09%), 5.24 ducks (48.79%), and 2.59 ducklings (24.12%) per household (Table 1). Mayurbhanj, a predominantly tribal area, is characterized by small-scale duck farming, with a preference for a higher proportion of females to optimize egg production. Das (2024) similarly reported native duck flock sizes in Odisha typically ranging between 2 to 9 birds.

Table 1: The flock size and proportion of drakes, ducks and ducklings reared by the duck farmer in Mayurbhanj district

Age group of ducks	Average number*	Range	Percentage (%)
Flock size	10.74±0.91	2-127	100.0
Drakes	2.91±0.40	1-70	27.09
Ducks	5.24±0.48	1-57	48.79
Ducklings	2.59±0.38	0-28	24.12

*Values are mean ±SE of 204 observations

Body Weight

Ducklings had an average body weight of 34.78 ± 0.36 g at hatch, which increased to 799.4 ± 10.12 g by 8 weeks of age. At six months, they weighed approximately 1.087 ± 0.018 kg. By 12 months, the average body weight reached 1.292 ± 0.017 kg in drakes and 1.231 ± 0.015 kg in ducks. Drakes were significantly heavier than ducks (P<0.01) (Table 2). Padhi *et al.,* (2009) reported a lower duckling weight of 32.83 g in desi ducks of Odisha; however, these ducks attained a relatively high body weight of 1.085 kg by 8 weeks of age. In a separate study, Padhi *et al.,* (2022a,b) observed that Kuzi, another native duck breed of Odisha, exhibited higher 8-week body weights (ranging from 1.231 to 1.388 kg) compared to Kudu ducks. This difference may be attributed to the intensive management and rearing practices adopted on farms. Furthermore, Padhi (2010) reported higher adult body weights in indigenous ducks, reinforcing the impact of rearing conditions on growth performance.

Table 2: Body weights of Kudu duck at different ages

Body weight at	Average*	Range	N
Hatching (g)	34.78±0.36	28.00-44.60	100
4 weeks (g)	411.0±12.10	290.0-532.0	100
8 weeks (g)	799.4±10.12	509.0-1007.0	100
12 weeks (g)	888.3±15.85	676.0-1078.0	100
6 months (kg)	1.087±0.018	0.725-1.217	100
8 months (kg)	1.147±0.005	1.050-1.300	100
12 months (kg)	1.292±0.017[a]	0.850-1.944	150
Adult – Male (kg)	1.231±0.015[b]	0.897-1.882	150
Adult - Female (kg)	SEm: 0.012		
	Sig Level: P<0.01		

*Values are mean ±SE of 100 observations up to 8 months of age and 150 observations each for male and female at 12 months of age. Means bearing different superscripts differ significantly (P<0.05).

Morphological Characteristics

Feather coloration among Kudu ducks showed notable trends. The majority of males (35.09%) and females (50.69%) had light brown plumage. In males, the head was predominantly black (59.65%), whereas only 13.89% of females had black heads. Although coloration across the neck, back, wings, and belly was variable with no strong sex-linked patterns, the presence of peacock green on the head and neck was observed exclusively in males. Most ducks exhibited a distinctive white ring around the neck, and a mosaic plumage pattern was the most common in both sexes (Table 3).

Bill color in males was most frequently metallic green (36.36%), followed by yellow (23.68%) and grey (16.67%). Females displayed a broader range of bill colors, each occurring in 9.03% to 22.22% of individuals. Orange-colored shanks and feet were predominant in both sexes, found in 78.95% and 72.81% of drakes and 70.14% and 68.75% of ducks, respectively. All ducks exhibited consistent skin and eye characteristics—light pink skin and black eyes (Table 4).

Several indigenous duck color variants have been recorded in Odisha, consistent with earlier observations (Padhi, 2010; Padhi, 2014). It is reported that native layer ducks in India exhibit morphological and productive characteristics similar to those of the Indian Runner breed. The Andaman local drake typically shows plumage ranging from grey-brown to blackish-brown, complemented by an orange bill and bright orange feet (Senani *et al.*, 2005). Sujatha *et al.,* (2021) further described Andaman local ducks as having grey, black, and chocolate-colored plumage, often with a distinct white neck band.

Table 3: Percentage (%) of feather colour and feather pattern in male and female of Kudu ducks (n=150)

Body parts	**Male**	**%**	**Female**	**%**
Whole Plumage Colour	Black	21.93	Black	11.11
	Light Brown	35.09	Light Brown	50.69
	Grey	19.3	Grey	20.14
	White	1.75	White	4.17
	Mixture of black, grey, brown, and White	21.93	Mixture of black, grey, brown, and white	13.89
Head	Male	%	Female	%
	Black	59.65	Black	13.89
	Light Brown	11.4	Light Brown	36.81
	Grey	7.02	Grey	21.53
	White	2.63	White	6.94
	Peacock green	3.51	Peacock green	0
	Mixture of black, grey, brown, and white	15.79	Mixture of black, grey, brown, and white	20.83
Neck	Male	%	Female	%
	Black	5.26	Black	2.78
	Light Brown	14.91	Light Brown	24.31
	Grey	11.4	Grey	14.58
	Peacock green	6.14	Peacock green	0
	Presence of White ring	49.31	Presence of White ring	58.33
Back	Male	%	Female	%
	Black	10.53	Black	2.78
	Light Brown	26.32	Light Brown	38.89
	Grey	25.44	Grey	16.67
	White	7.02	White	5.56
	Mixture of black, grey, brown, and white	30.7	Mixture of black, grey, brown, and white	36.11
Wing	Male	%	Female	%
	Black	8.77	Black	3.47
	Light Brown	21.05	Light Brown	29.86
	Grey	17.54	Grey	10.42
	White	5.26	White	4.17
	Mixture of black, grey, brown, and white	47.37	Mixture of black, grey, brown, and white	52.08

Table 4: Percentage (%) of bill, shank, feet, skin, and eye colour in male and female Kudu ducks (n=150)

Body parts	**Male**	**%**	**Female**	**%**
Bill Colour	Black	3.51	Black	10.42
	Brown	1.75	Brown	9.03
	Grey	16.67	Grey	13.89
	Metallic green	41.23	Metallic green	15.97
	Orange	4.39	Orange	13.89
	Pink	8.77	Pink	14.58
	Yellow	23.68	Yellow	22.22
Shank Color	Black	6.14	Black	6.25
	Brown	1.75	Brown	9.72
	Grey	0	Grey	6.25
	Orange	78.95	Orange	70.14

	Pink	1.75	Pink	4.17
	Yellow	11.4	Yellow	4.17
Feet/Web Colour	Black	6.14	Black	6.25
	Brown	0.88	Brown	10.42
	Grey	4.86	Grey	6.25
	Orange	72.81	Orange	68.75
	Pink	3.51	Pink	4.17
	Yellow	10.53	Yellow	4.17
Skin Colour	Light Pink	1	Light Pink	1
Eye Colour	Black	1	Black	1

In contrast, Pati drakes are characterized by dark brown plumage with a greyish-black head and black-and-white tail feathers, while the females are uniformly brown. A white neck ring may or may not be present in either sex. Their bills, shanks, and feet are predominantly yellow (Kaushik *et al.,* 2021). Dutta *et al.,* (2022) reported that the bill color in Pati ducks ranged from yellow to orange in both sexes; however, in khaki-colored females, the bill appeared somewhat brown. The feet of both drakes and ducks were consistently orange. Additionally, a typical greenish marking on the head was observed in males of the blackish-brown group, a trait absent in females. Similarly, in Kudu ducks, drakes exhibited either black or peacock-green coloration on the head, distinguishing them from the females, who lacked this feature.

Morphometry

The body parts measurement data revealed that drakes had significantly higher (P<0.01) measurements compared to ducks, except for head width. The bill length and width, head length and width, neck length, breast length, body length, wing span, body circumference, and shank were 6.03±0.050; 2.44±0.018, 6.10±0.050; 2.69±0.022, 17.47±0.101, 11.99±0.094, 32.96±0.21, 81.73±0.44, 33.42±0.17, and 5.88±0.033 cm, respectively. Corresponding measurements in ducks were 5.74±0.039; 2.40±0.016, 5.67±0.039; 2.85±0.019, 16.69±0.083, 11.64±0.073, 31.33±0.15, 79.33±0.46, 32.60±0.16, 5.77±0.040 cm, respectively (Table 5).

Table 5: Body measurements (cm) in Kudu drakes (n=150) and ducks (n=150)

Body parts	Male*	Female*	SEm	Sig. level
Bill length	6.03±0.050^{a}	5.74±0.039^{b}	0.033	P<0.01
Bill width	2.44±0.018^{a}	2.40±0.016^{b}	0.032	P<0.01
Head length	6.10±0.050	5.67±0.039	0.012	NS
Head width	2.69±0.022^{b}	2.85±0.019^{a}	0.034	P<0.01
Neck length	17.47±0.101^{a}	16.69±0.083^{b}	0.015	P<0.01
Breast length	11.99±0.094^{a}	11.64±0.073^{b}	0.069	P<0.01
Body length	32.96±0.21^{a}	31.33±0.15^{b}	0.133	P<0.01
Wing span	81.73±0.44^{a}	79.33±0.46^{b}	0.118	P<0.01
Body circumference	33.42±0.17^{a}	32.60±0.16^{b}	0.330	P<0.01
Shank length	5.88±0.033^{a}	5.77±0.040^{b}	0.059	P<0.01

*Values are mean±SE of 150 observations. Means bearing different superscripts differ significantly (P<0.05).

Padhi and Sahoo (2012) reported that desi ducks exhibited a comparatively higher shank length, approximately 6.0 cm, but a lower keel length than Kudu ducks. In an earlier study, Padhi *et al.,* (2009) observed that the bill length in desi ducks was similar to that of Kudu ducks, measuring around 6.0 cm.

Duck Mortality

The native Kudu ducks had very good survivability with average mortality ranging from 1.38±0.09 to 2.80+0.06 % during the growing and laying period. However, during the early duckling period (0-1 wk age) and late duckling period (1-8 wk age) there was about 6.22±0.20 and 4.34±0.10 % mortality (Table 6). Padhi (2014) reported a lower mortality rate of 7.65% during the 0–8 week age period in desi ducks reared under farm conditions, while mortality during the 8–20 week period remained comparable to other groups. Similarly, Padhi *et al.,* (2022b) observed reduced mortality rates

across all stages-duckling, grower, and layer-when birds were raised under farm management systems.

Table 6: Mortality percentage of kudu ducks (n=204) during 0-12 months of age

Age	Average*	Range
0-1 week	6.22±0.20	0.0-10.0
1-8 weeks	4.34±0.10	0.0-5.0
8-20 weeks	1.38±0.09	0.0-5.0
6- 12 months	2.80+0.06	2.0-5.0

*Values are mean ±SE of 204 observations

CONCLUSION

The study concluded that native ducks are smaller in size, with conformation traits and body weight indicating their suitability for egg production. They also exhibit a diverse range of colours across different body parts, but the presence of a white ring around the neck, the mosaic pattern, and light brown feathers in females are some of the distinct features across the Kudu duck population.

ACKNOWLEDGEMENT

The authors are thankful to the Director, ICAR-Directorate of Poultry Research, Hyderabad, for providing the necessary financial support to carry out the Survey work.

REFERENCES

Basic Animal Husbandry Statistics. 2022. Government of India, Ministry of FAHD, Department of AHD, New Delhi.

Bhat PN. 1981. Conservation of Animal genetic resources in India. Proceedings of FAO/UNEP technical consultation on animal Genetic resources conservation and management. *FAO of the United Nation, Rome*. www.fao.org/3/x6526e/X6526E//htm.

Bhat PN, Bhat PP, Khan BU, Goswami OB, and Singh B. 1980. Animal genetic resources in India. *Proceeding of workshop of the Society for the Advancement of Breeding Researches in Asia and Oceania (SABRO) on Animal Genetic Resources in Asia and Oceania. University of Tsukuba, Tsukuba Science city*. pp.119-88.

Das K. 2024. Duck Sector India 2040- A Pro-poor Vision. E book: http://korneldas.com.

Duncan DB. 1955. Multiple range and multiple F tests. *Biometrics,*11:1-42.

Dutta D, DuttaI B, Kaushik P, Bora M, Deka RJ, Bhattacharyya BN, and Kalita KB. 2022. Morphological Characteristics of Pati Duck. *Indian Journal of Animal Research,*https://doi.org/10.18805/IJAR.B-4819.

Kamal R, Chandra PC, Dey A, and Bhatt BP. 2020a. Characterization of Maithili duck in middle Gangetic plain of Bihar. *Indian Journal of Animal Sciences,*90: 1018-1023.

Kamal R, Chandran PC, Dey A, Ray PK, Kumari R, and Bhatt BP. 2020b. Characterization of domestic duck production system in eastem region of India. *International Journal of Livestock Research,*10(10): 118-125.

Kamal R, Chandran PC, Dey A, Sarma K, Padhi MK, Giri SC, and Bhatt, B. P. 2023. Status of indigenous duck and duck production system in India-a review. *Tropical Animal Health and Production,*55: 15. https://doi.org/10.10007/s11250-022-03401-6.

Kaushik P, Saikia J, Kalita K, and Deka R. 2021. Morphology and morphometry characteristics of Pati duck. *International Journal of Chemical Studies,*9: 351–354.

Padhi MK, and Sahoo SK. 2012. Performance evaluation and crossbreeding effect for body weight and conformation traits in different breeds of ducks. *Indian Journal of Animal Sciences,*82: 1372–76.

Padhi M K, Giri SC, and Sahoo SK. 2022b. Genetic characterization for growth traits and evaluation of production performance of Kuzi ducks selected for higher eight week body weight. *Indian Journal of Poultry Sciences,*57: 215–223.

Padhi MK, Panda BK, and Sahoo SK. 2009. Body measurements traits in three purebred ducks and their crosses. *Indian Veterinary Journal,*86: 835–837.

Padhi MK, and Giri SC. 2024. Status of duck breeding in India. *The Indian Journal of Animal Sciences,*94(1): 3–10. https://doi.org/10.56093/ijans.v94.i1.141689.

Padhi MK. 2010. Production benefits of the crossbreeding of indigenous and non-indigenous ducks-growing and laying period body weight and production performance. *Tropical Animal Health and Production,*42: 1395–1403.

Padhi MK. 2014. Evaluation of indigenous ducks of Odisha, India. *World's Poultry Science Journal,*70: 617–626.

Padhi MK, Giri SC, Sastry KVH, Sahoo SK, Bais RKS, and Saxena VK. 2022a. Genetic and phenotypic characterization of Kuzi ducks of Odisha and evaluation of carcass quality. Indian *Journal of Animal Sciences,*92: 196–201.

Senani S, Rai RB, Jalaludeen A, Sunder J, Chatterjee RN, Kundu A, and Jeyakumar S. 2005. Morphometric characteristics and production performance of local ducks of Andaman. *Indian Journal of Animal Sciences,*75(10): 1189–90.

Sujatha T, Lal SV, Mohammad N, De AK, Alyethodi RR, Sunder J, and Bhattacharya D. 2021. Qualitative and quantitative characteristics of Andaman local duck. *Indian Journal of Poultry Science,*56(1): 31-35.