

Phenotypic Characterization, Production Performance and Adaptive Traits of the Indigenous Non-Descript Sundarbani Duck (*Anas platyrhynchos domesticus*) of the Sundarban Delta, West Bengal, India

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ABSTRACT

The Sundarbani Duck (*Anas platyrhynchos domesticus*) is an indigenous duck population traditionally reared under extensive backyard scavenging systems in the Sundarban delta of West Bengal, India. The present study, conducted during 2023–2026 under the Network Project on Animal Genetic Resources of West Bengal funded by the ICAR–National Bureau of Animal Genetic Resources (ICAR–NBAGR), Karnal, aimed to characterize its phenotypic, productive, reproductive, and adaptive traits. Field investigations were carried out in the native tract covering the South 24 Parganas and North 24 Parganas districts using household surveys, field observations, and morphometric measurements following ICAR–NBAGR and FAO descriptors. The Sundarbani Duck was found to be predominantly distributed in the coastal wetland ecosystem and maintained under traditional scavenging systems, with an average household flock size of 7.39 birds comprising 21.4% drakes, 61.4% adult ducks, and 17.2% ducklings. This duck exhibited medium body size, compact conformation, predominantly dark plumage, strong webbed feet, and distinct sexual dimorphism. Average adult body weight was 1.335 kg in males and 1.265 kg in females. Ducks attained sexual maturity at 6.12 months and produced approximately 140 eggs annually, while hatchability under natural incubation averaged 80%. Mortality declined from 10% during the first week after hatching to about 1% after eight weeks, indicating high survivability under village conditions. This duck also demonstrated excellent adaptation to the saline coastal wetland ecosystem through efficient scavenging ability, strong broodiness, disease tolerance, and resilience to seasonal flooding and fluctuating salinity. These findings establish the Sundarbani Duck as a distinct and valuable indigenous duck genetic resource and provide a scientific basis for its recognition, conservation, and genetic improvement for sustainable, climate-resilient duck production.

Keywords: Sundarbani Duck, phenotypic characterization, Adaptive traits, backyard scavenging system, duck genetic resources, production performance, Subdarban wetland ecosystem, West Bengal.

Running Title: Phenotypic Characterization of the Indigenous Sundarbani Duck

INTRODUCTION

Indigenous ducks are important components of rural farming systems in Asia, particularly in wetland ecosystems where they contribute to household nutrition, livelihood security, and climate-resilient livestock production

through their efficient scavenging ability, disease tolerance, and adaptation to low-input management. India possesses diverse indigenous duck populations that have evolved under varied agro-climatic conditions; however, many remain inadequately characterized and are increasingly threatened by crossbreeding, habitat degradation, and changing production systems. Scientific characterization is therefore essential for their recognition, conservation, and genetic improvement.

West Bengal, with approximately 3.35 million ducks (20th Livestock Census, 2019), is one of the major duck-producing states in India. The Sundarban delta, characterized by estuarine wetlands, tidal creeks, mangrove forests, canals, ponds, and seasonally inundated paddy fields, provides an ideal habitat for traditional scavenging duck production. The indigenous Sundarbani Duck (locally known as *Pati*) has evolved under these unique ecological conditions through natural and farmer-led selection, resulting in a hardy population with good scavenging ability, reproductive efficiency, survivability, and adaptation to seasonal flooding and fluctuating salinity. Despite its socio-economic importance in supporting integrated rice–fish farming and the livelihoods of smallholder farmers, comprehensive scientific information on this duck remains limited.

Therefore, the present study was undertaken to characterize the Sundarbani Duck with respect to its native tract, phenotypic and morphometric characteristics, production and reproductive performance, adaptive traits, and socio-economic importance. The findings provide baseline information to support its recognition as a distinct indigenous duck genetic resource and facilitate its conservation, genetic improvement, and registration with the ICAR–National Bureau of Animal Genetic Resources (ICAR–NBAGR).

MATERIALS AND METHODS

Study Area

The present investigation was conducted between 2023 and 2026 under the Network Project on Animal Genetic Resources of West Bengal, funded by the ICAR–National Bureau of Animal Genetic Resources (ICAR–NBAGR), Karnal, Haryana, India. The study was undertaken in the native tract of the indigenous Sundarbani Duck located in the Sundarban delta of West Bengal, encompassing representative duck-rearing villages of South 24 Parganas and North 24 Parganas districts.

The study area lies between 21.25°–23.30° N latitude and 88.00°–89.10° E longitude and is characterized by a humid tropical monsoon climate with an average annual rainfall exceeding 1,700 mm, relative humidity ranging from 70 to 95%, and temperatures varying between 12°C and 38°C. The landscape comprises an extensive network of tidal estuaries, rivers, canals, marshes, ponds, floodplains, mangrove ecosystems, and seasonally inundated paddy fields, providing an ideal ecological niche for traditional duck rearing under extensive scavenging systems.

Field investigations were conducted in Basanti, Gosaba, and Canning blocks of South 24 Parganas and Hingalganj, Hasnabad, Minakhan, and Sandeshkhali blocks of North 24 Parganas, representing the principal native tract of the Sundarbani Duck.

Survey Design and Sampling

A multistage stratified field survey was conducted following the ICAR–NBAGR guidelines for the phenotypic characterization of indigenous duck genetic resources. The native breeding tract of the Sundarbani Duck was first delineated through reconnaissance surveys and consultations with livestock development officers, veterinary professionals, and experienced duck farmers. Based on the distribution and density of the indigenous duck population and the prevalence of traditional duck-rearing practices, at least two representative blocks were selected from each of the two districts, followed by the selection of five villages within each block. Duck-rearing households were then chosen by random sampling, and approximately 200 households were surveyed to obtain information on flock structure, breeding and management practices, feeding systems, production and reproductive performance, adaptive characteristics, geographical distribution, and socio-economic importance of the breed.

Phenotypic characterization was carried out on a total of 1,500 ducks, comprising approximately 750 birds from each district. The sampled population included 1,000 adult ducks (>5 months of age) and 500 young ducks (<5 months of age), with adult males representing approximately 20% of the adult population, consistent with the natural village production system.

The sampling strategy was designed to capture the phenotypic diversity of the native population while ensuring adequate representation of different age and sex groups in accordance with ICAR–NBAGR recommendations. Morphometric measurements and qualitative traits were recorded for all sampled birds, while production and reproductive performance data were collected from at least 500 ducks. Egg quality characteristics were evaluated in more than 100 ducks, and carcass traits were assessed in at least 100 representative ducks to provide a comprehensive characterization of the Sundarbani Duck.

Data Collection

Primary data were collected through structured questionnaires, personal interviews with duck owners, direct field observations, and on-farm measurements. Information was recorded on native breeding tract, geographical distribution, flock size and structure, breeding practices, feeding and scavenging behaviour, housing, healthcare management, production and reproductive performance, adaptive characteristics, and socio-economic significance.

Secondary information relating to duck population and distribution was obtained from the 20th Livestock Census (2019), district livestock offices, and other official records to complement field observations.

Phenotypic and Morphometric Characterization

Phenotypic characterization was carried out following the descriptors recommended by ICAR–NBAGR and the Food and Agriculture Organization (FAO) for the characterization of animal genetic resources.

Qualitative traits recorded included plumage colour and pattern, body conformation, head profile, bill colour, eye colour, skin colour, shank colour, web colour, tail characteristics, body carriage, and sexual dimorphism. Since ducks do not possess combs or wattles, these traits were not considered during characterization.

Morphometric measurements were recorded from representative adult birds using standard procedures. The measurements included body weight, body length, keel length, chest girth, wingspan, neck length, bill length, bill width, head length, head width, shank length, and shank circumference. All linear measurements were recorded using a flexible measuring tape or digital vernier caliper, while body weight was measured using a calibrated electronic balance.

Production Performance

Production performance was evaluated using farmer-maintained records, farmer recall, and direct field observations. Body weight was recorded at hatch and at 8, 12, 24, and 52 weeks of age for both sexes.

Egg production parameters included age at first egg, annual egg production, clutch size, clutch interval, laying period, and age at culling. Egg quality traits were assessed using representative eggs collected from surveyed households and included egg weight, shell colour, shell thickness, shape index, yolk colour, and consumer preference.

Reproductive Performance

Reproductive performance was assessed under traditional village production systems by recording age at sexual maturity, broodiness, fertility, hatchability, incubation period, and natural flock replacement. Information on natural incubation practices and hatchability was obtained through household surveys and verified using farmer-maintained records wherever available.

Mortality Assessment

Mortality data were recorded for three age groups: 0–1 week, 1–8 weeks, and 8–20 weeks. Information regarding mortality rate and probable causes, including disease outbreaks, predation, adverse weather conditions, nutritional deficiencies, and management-related factors, was obtained through farmer interviews and field observations.

Statistical Analysis

The data generated during the investigation were compiled, validated, coded, and analysed using IBM SPSS Statistics Version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistical analyses were performed to estimate means, standard errors, standard deviations, frequencies, percentages, and ranges. Quantitative traits are presented as mean $\pm$ standard error (SE), whereas qualitative characteristics are expressed as frequencies and percentages. The results were summarized using appropriate tables and graphical representations wherever applicable.

Results



Origin and Development of the Sundarbani Duck

The Sundarbani Duck is an indigenous duck genetic resource that originated and evolved in the coastal ecosystem of the Sundarban delta of West Bengal, particularly in the North and South 24 Parganas districts. The breed has developed through long-term natural selection and traditional farmer selection under the humid tropical climate, saline environment, tidal wetlands, and frequent flooding characteristic of the region. Reared predominantly under extensive scavenging systems, the ducks utilize natural feed resources available in wetlands and harvested paddy fields. Over generations, selection for adaptability, scavenging ability, disease tolerance, reproductive efficiency, and egg production has resulted in a hardy and well-adapted population. The geographical isolation of the Sundarban islands and limited introduction of exotic germplasm have further contributed to the maintenance of the breed's distinct phenotypic characteristics and genetic identity.

Native Tract, Distribution and Population Status

The present investigation confirmed that the native breeding tract of the Sundarbani Duck is confined to the South 24 Parganas and North 24 Parganas districts of the Sundarban delta in West Bengal. The highest population density was recorded in the Basanti, Gosaba, and Canning blocks of South 24 Parganas and the Hingalganj,

Hasnabad, Minakhan, and Sandeshkhali blocks of North 24 Parganas, where duck rearing is traditionally integrated with rice cultivation, fisheries, and other wetland-based farming activities.

The population was predominantly distributed in estuarine and freshwater wetland ecosystems comprising tidal creeks, rivers, canals, marshes, ponds, floodplains, and seasonally inundated paddy fields. These habitats provide abundant natural aquatic feed resources throughout most of the year.

According to the 20th Livestock Census (2019), West Bengal has approximately 3.35 million ducks, with a substantial proportion occurring in the Sundarban region. Household surveys revealed an average flock size of 7.39 birds, comprising 21.4% drakes, 61.4% adult ducks, and 17.2% ducklings, indicating a self-sustaining village production system.

Traditional Management Practices

The Sundarbani Duck is maintained predominantly under extensive backyard scavenging and semi-scavenging production systems. Ducks are allowed to forage freely during the day in ponds, rivers, canals, marshes, fisheries, and seasonally inundated paddy fields before returning to simple night shelters in the evening.

The feeding regime depends largely on natural aquatic feed resources, including aquatic vegetation, insects, earthworms, snails, molluscs, crustaceans, fish fry, and spilled grains. Limited supplementary feeding in the form of broken rice, rice bran, kitchen waste, and locally available agricultural by-products is provided, particularly during periods of feed scarcity. Housing facilities are simple, healthcare inputs are minimal, and natural brooding remains the principal method of incubation and flock replacement.

Phenotypic Characteristics

The Sundarbani Duck is a medium-sized indigenous duck possessing a compact, sturdy body with well-developed legs and webbed feet. Plumage colour exhibited moderate variation, ranging from blackish-brown and greyish-brown to white and mixed colour combinations, with darker plumage predominating. Skin colour varied from blackish to yellowish, while bill colour ranged from yellowish and olive-yellow to brown or grey. Shanks were predominantly yellowish-orange, and the eyes were uniformly dark brown to black.

Distinct sexual dimorphism was observed. Adult drakes were larger and heavier than females and were characterized by a glossy greenish-black head, a narrow white neck ring, chestnut breast, greyish-brown wings with black and white markings, a dark tail, and a yellowish to olive-yellow bill. Females possessed mottled brown plumage with dense black streaking, a distinct dark eye stripe, a bluish-grey bill, a bluish wing speculum bordered by white feathers, and dull orange webbed feet. These phenotypic features enabled consistent field identification of the Sundarbani Duck.

Growth Performance

The Sundarbani Duck exhibited moderate growth under traditional scavenging conditions (Table No. 1). Average hatch weight was 55 g, with values ranging from 45 to 85 g. Male ducklings attained an average body weight of 350 g at eight weeks compared with 304 g in females. At 24 weeks, average body weight increased to 910 g in males and 830 g in females. Adult males attained an average body weight of 1.335 kg, whereas females averaged 1.265 kg at 52 weeks of age. Although growth rate varied according to seasonal feed availability and supplementary feeding practices, the birds maintained satisfactory body weight under low-input village conditions.

Table No.1. Growth performance

Age	Male – Average	Male – Range	N	Female – Average	Female – Range	N
Hatch weight (g)	55 ± 0.09 g Range 45-85 g					83
8 weeks (g)	350 ± 0.17	310–385	64	304 ± 0.12	267-345	33
12 weeks (g)	550 ± 0.11	687–792	127	510 ± 0.17	656–710	97

Adult weight (g) 24 Weeks	910 ± 1.26	780-1010	205	830 ± 2.01	730-934	267
52 Weeks (g)	1335 ± 3.67	1125–1650	250	1265 ± 2.78	1110–1450	378

Egg Production Performance

The Sundarbani Duck demonstrated satisfactory laying performance under traditional backyard production systems (Table No. 2). The average age at sexual maturity was 6.12 months, with birds commencing egg laying between six and seven and a half months of age.

Average annual egg production was 140 eggs, ranging from 120 to 175 eggs depending upon nutritional status and management practices. Birds produced an average clutch size of 14 eggs, followed by a clutch interval of approximately 10 days. The laying cycle extended for approximately twelve months, after which birds were generally retained for breeding or culled between twelve and twenty-five months of age.

Table No. 2 Egg Production Performance

Trait	Average	Range	N
Age at first egg (months)	6.12 ± 0.98	6–7.5	305
Annual egg production (numbers)	140 ± 2.09	120–175	212
Clutch size (days)	14 ± 0.84	10–18	152
Clutch interval (days)	10 ± 0.37	10-15	152
Laying cycle(months)	12 ± 0.21	9-13	210
Age at culling (months)	18 ± 0.83	12-25	278

Egg Quality Characteristics

The Sundarbani Duck produces medium-sized eggs with white to cream-coloured shells. The eggs are highly preferred by consumers because of their characteristic flavour, firm albumen, and rich yolk. They serve as an important source of household nutrition and provide supplementary income to rural families through local market sales. The shell quality is generally good, with low incidence of breakage during handling and transportation. The rich yolk colour and desirable taste make the eggs popular for traditional culinary preparations. These characteristics enhance the market acceptability and economic value of the breed in rural production systems.

Reproductive Performance

The Sundarbani Duck exhibits good reproductive efficiency under traditional village production systems. Strong broodiness enables natural incubation and flock replacement without the need for artificial hatcheries. The average hatchability on a total egg set basis is approximately 80%, while fertility and hatchability are influenced mainly by the breeding season, nutritional status, and the availability of healthy breeding drakes. Female ducks exhibit good maternal behaviour and effectively brood and rear their ducklings under backyard conditions. Natural mating and incubation ensure sustainable flock maintenance with minimal management inputs. These reproductive attributes contribute to the long-term conservation and continuity of the breed in its native tract.

Mortality Pattern

Mortality is highest during the first week after hatching, averaging about 10%, primarily due to poor brooding, exposure to adverse weather, predation, and inadequate shelter (Table No.3). Mortality subsequently declines to about 4% during 1–8 weeks and further to around 1% during 8–20 weeks, indicating the excellent adaptability, hardiness, and survivability of the Sundarbani Duck under traditional scavenging production systems. Adult mortality is generally low under normal village management conditions. The birds exhibit good resistance to common environmental stresses and perform well under extensive wetland production systems. Appropriate

brooding management, balanced nutrition, and timely healthcare can further reduce early-age mortality and improve flock productivity.

Table No. 3 Mortality Pattern

Age group	Average (%)	Range (%)	N
0–1 week	10 ± 1.02	7–15	253
1–8 weeks	4 ± 0.18	3–6	117
8–20 weeks	1 ± 0.11	1–3	97

Adaptive Characteristics

Field observations indicated that the Sundarbani Duck is well adapted to the ecological conditions of the Sundarban delta. Birds were regularly maintained under conditions of high humidity, seasonal flooding, prolonged waterlogging, and fluctuating salinity. They exhibited efficient scavenging behaviour and utilized a wide range of natural aquatic feed resources, including aquatic vegetation, insects, molluscs, snails, crustaceans, and residual grains. Strong swimming ability, well-developed webbed feet, broodiness, and apparent tolerance to prevailing saline environmental conditions were consistently observed across the native breeding tract.

Socio-Economic Importance

The Sundarbani Duck plays a vital role in the livelihood of smallholder, marginal and landless farming households of the Sundarban region. The breed provides regular income through sale of eggs and meat while simultaneously improving household nutritional security.

Integration of ducks with rice cultivation and fisheries contributes to biological pest control, weed suppression and nutrient recycling, thereby enhancing the sustainability of traditional wetland farming systems. Owing to its low maintenance requirements and efficient utilization of natural feed resources, the Sundarbani Duck remains an economically important indigenous genetic resource for climate-resilient livestock production in eastern India.

DISCUSSION

The present investigation provides the first comprehensive phenotypic characterization of the indigenous Sundarbani Duck inhabiting the Sundarban delta of West Bengal. The findings demonstrate that this duck population possesses distinct phenotypic features, satisfactory production performance, good reproductive efficiency, and remarkable adaptation to the estuarine wetland ecosystem. These characteristics collectively indicate that the Sundarbani Duck represents a valuable indigenous genetic resource deserving scientific recognition and conservation.

Native Tract, Distribution, Ecological Adaptation and Traditional Management

The present investigation confirmed that the Sundarbani Duck is indigenous to the South 24 Parganas and North 24 Parganas districts of the Sundarban delta of West Bengal, where it is traditionally reared under extensive scavenging systems integrated with rice cultivation and fisheries. The average household flock size of 7.39 birds is comparable with the 2–9 birds reported for indigenous duck production systems in India (Kamal et al., 2023), indicating the predominance of smallholder backyard farming. Similar low-input production systems have been described for indigenous ducks in eastern and northeastern India (Naik et al., 2022; Kamal et al., 2023).

The flock structure, comprising over 60% laying females and approximately 21% breeding drakes, suggests deliberate farmer selection to maximize egg production while ensuring adequate natural mating. Ducks rely primarily on naturally available aquatic vegetation, insects, snails, molluscs, crustaceans, fish fry, and spilled grains, with only limited supplementation of rice bran, broken rice, and household kitchen waste. This feeding strategy minimizes production costs and enhances the profitability of backyard duck farming.

The estuarine ecosystem of the Sundarbans, characterized by tidal creeks, mangrove wetlands, canals, ponds, and seasonally inundated paddy fields, provides abundant natural feed resources and has favoured the evolution of efficient scavenging behaviour and environmental resilience. Although similar wetland adaptation has been reported in indigenous ducks of Assam and Kerala (Naik et al., 2022; Kamal et al., 2023), the Sundarbani Duck is uniquely adapted to saline coastal wetlands with tidal inundation, fluctuating salinity, and prolonged waterlogging. Furthermore, its integration with rice cultivation and fisheries promotes nutrient recycling, biological pest control, and efficient utilization of wetland resources, underscoring its importance as a climate-resilient indigenous duck genetic resource.

Morphological Characteristics and Breed Identity

The Sundarbani Duck exhibited a relatively uniform body conformation despite variation in plumage colour, indicating the influence of long-term natural and farmer selection under the unique ecological conditions of the Sundarban delta. The breed is characterized by medium body size, compact muscular conformation, strong legs, well-developed webbed feet, predominantly dark plumage, and pronounced sexual dimorphism. Similar phenotypic variation in plumage, bill, shank colour, and body measurements has been reported in indigenous ducks of Odisha by Kamal et al. (2019), while Banerjee (2013) documented considerable morphological diversity among indigenous ducks of West Bengal.

The predominance of darker plumage may provide camouflage in mangrove vegetation and represent an adaptive response to extensive scavenging under humid coastal conditions. The glossy greenish-black head, white neck ring, and chestnut breast of drakes, together with the cryptic mottled plumage of females, facilitate field identification and may enhance nesting success through improved camouflage. Comparable sexual dimorphism has been reported in other indigenous duck populations of India and Southeast Asia.

Although the Sundarbani Duck shares certain phenotypic features with other indigenous ducks of eastern India, the combined expression of its distinctive morphology, adaptation to saline estuarine wetlands, and traditional low-input production system supports its recognition as a unique indigenous duck genetic resource of the Sundarban delta.

Growth Performance



The Sundarbani Duck exhibited moderate growth under traditional scavenging conditions, attaining an average adult body weight of 1.335 kg in males and 1.265 kg in females. These values are lower than those reported for the Desi duck of Odisha (1.80 kg in drakes and 1.41 kg in ducks) by Kamal et al. (2019) and substantially below those of improved meat-type breeds such as Pekin. However, they are comparable with several indigenous duck populations reared under extensive village production systems in eastern India (Kamal et al., 2022). The comparatively lower body weight is likely attributable to dependence on natural scavenging, seasonal variation in feed availability, and the absence of systematic genetic improvement. Nevertheless, this duck maintained

satisfactory growth under low-input management, demonstrating efficient utilization of natural aquatic feed resources and good adaptation to the wetland ecosystem.

Egg Production Performance

The Sundarbani Duck attained sexual maturity at an average age of 6.12 months and produced approximately 140 eggs annually under traditional village conditions. This performance compares favourably with that of many indigenous duck populations of eastern and northeastern India, where age at first egg generally ranges from 145 to 223 days and egg production is influenced by genotype, nutrition, and management (Kamal et al., 2022; Padhi & Giri, 2024). Although egg production is lower than that of specialized commercial layer breeds such as Khaki Campbell, it is satisfactory for an indigenous duck maintained under extensive scavenging systems.

The relatively delayed sexual maturity compared with commercial strains is primarily attributable to natural growth under low-input management and limited nutritional supplementation rather than poor genetic potential. The satisfactory laying performance observed under backyard conditions is likely supported by the year-round availability of aquatic feed resources in the Sundarban wetlands, highlighting the breed's adaptation and productive efficiency in its native ecosystem.

Reproductive Performance



The Sundarbani Duck exhibited strong broodiness and an average hatchability of approximately 80%, reflecting the good reproductive efficiency typical of indigenous ducks reared under backyard production systems. Similar observations have been reported by Kamal et al. (2022), who noted that natural incubation remains the principal method of flock replacement in indigenous duck populations, while Naik et al. (2022) emphasized the importance of broodiness and maternal behaviour for sustaining village duck production.

Unlike commercial duck strains, where broodiness has been largely reduced through intensive selection, the Sundarbani Duck has retained excellent natural incubation and maternal instincts. The continued preference of farmers for broody females has likely helped preserve these valuable reproductive traits through traditional selection. Consequently, efficient natural incubation and maternal care reduce dependence on artificial hatcheries and ensure sustainable flock replacement under low-input village conditions.

Mortality Pattern

Mortality was highest during the first week after hatching (10%) and declined progressively to 4% during 1–8 weeks and approximately 1% after eight weeks of age, indicating high survivability under traditional village conditions. A similar age-related mortality pattern has been reported in indigenous duck production systems, where early duckling losses are mainly attributed to inadequate brooding, adverse weather, predation, nutritional deficiencies, and disease (Kamal et al., 2022). The low mortality observed beyond the brooding period reflects the inherent hardiness, disease tolerance, and environmental adaptability of the Sundarbani Duck, highlighting its suitability for low-input scavenging production systems.

Adaptive Characteristics

A key finding of the present study is the exceptional ecological adaptation of the Sundarbani Duck to the estuarine environment of the Sundarban delta. The birds maintained satisfactory performance under high humidity, seasonal flooding, prolonged waterlogging, and fluctuating salinity while efficiently utilizing naturally available aquatic vegetation, insects, molluscs, snails, crustaceans, and spilled grains. Similar adaptive attributes, including efficient scavenging ability, disease tolerance, and environmental resilience, have been reported for indigenous duck populations in India by Kamal et al. (2022) and Naik et al. (2022). However, the ability of the Sundarbani Duck to thrive in saline mangrove wetlands distinguishes it from most other indigenous duck populations and highlights its importance as a unique climate-resilient genetic resource.

CONCLUSION

Recent reviews by Banerjee (2013) and Padhi and Giri (2024) highlighted the rich yet inadequately characterized indigenous duck genetic resources of West Bengal and emphasized the need for their systematic documentation, conservation, and genetic improvement. In this context, the present study provides the first comprehensive phenotypic characterization of the indigenous Sundarbani Duck of the Sundarban delta. The breed exhibited distinct morphological characteristics, satisfactory growth and egg production, strong broodiness, good hatchability, low mortality, and exceptional adaptation to the saline coastal wetland ecosystem under traditional low-input scavenging systems. Its important role in supporting rural livelihoods, nutritional security, and integrated rice–fish farming further underscores its socio-economic significance. Collectively, these findings provide strong scientific evidence for recognizing the Sundarbani Duck as a distinct indigenous duck genetic resource and support its registration with ICAR–National Bureau of Animal Genetic Resources (ICAR–NBAGR), alongside community-based conservation, molecular characterization, and genetic improvement programmes.

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Author Contributions

Subhash Taraphder: Conceptualization, methodology, field investigation, data curation, formal analysis, interpretation of results, manuscript writing (original draft), review and editing, project administration, and corresponding author.

Kesab Chandra Dhara: Conceptualization, supervision, review and editing of the manuscript, and institutional support.

Sanjoy Datta: Field investigation, data collection, morphometric measurements, data validation, and manuscript review.

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Uttam Sarkar: Field investigation, data collection, coordination of field activities, and manuscript review.

Rajesh Paul: Data interpretation, manuscript review and editing, and critical revision of the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

Ethical Statement

The study involved field observations and non-invasive phenotypic characterization of ducks maintained under farmers' production systems. No experimental procedures causing stress or harm to animals were undertaken. Data were collected with prior consent of the participating farmers.

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