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Phenotypic Characterization of Native Chicken in San Andres, Romblon, Philippines

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Abstract

Distinct breed populations can be determined by phenotypic characterization, which additionally evaluates their outward appearance and production traits in a particular environment. In order to promote their agricultural economies, the vast majority of developing and impoverished countries depend substantially on indigenous and local varieties of chicken. This study was conducted in San Andres, Romblon, and was primarily focused on level phenotypic characterization. A survey was used within this study's quantitative methodology to get the data. Within the community, both male and female native chickens exhibited an extensive spectrum of phenotypic traits. The study indicates that, despite the exception of body plumage, keepers choose identical morphological traits. Black, yellow, and brown are the characteristics identified as the present colors in determining female chickens. It describes that chicken characteristics are the main factor dictating keepers' selection practices. Similarly, with Kampung chickens, and other local chickens in Indonesia, the plumage of chickens have no unique color or patterns; however, this study indicates decreasing variation in the plumage color of chickens.

Keywords: Genetic material; native chicken; population distribution; phenotypic characteristics

Introduction

Native chicken scientifically known as Gallus gallus domesticus, raised in the backyards of rural households. There are several types of native poultry, namely "indigenous", "customary", "local" or "traditional" that can be distinguished easily from standard commercial and heritage breeds. Indigenous/native breeds of native chickens are playing an important role in rural economies in most of the developing and underdeveloped countries.

Discrete phenotypic features, such as plumage color and comb type, are valued the most by fancy breeders (Cabarles et al., 2012; Bejar et al., 2012). The traditional chickens have lower genetic identity considering the proximity of adjacent provinces (Roxas et al., 1996) and having the largest inventory in the country (BAS, 2011). It constitutes 72% of the total chicken population in the region. Up to 90% of the annual egg and meat production is produced by them, both for personal consumption and for sale (Nwakpu et al., 1999; Fayeye et al., 2005). Chickens are the most popular poultry worldwide irrespective of culture and region (Dessie et al. 2012). In terms of nutritional contents, chicken meat is one of the most recommended by experts to incorporate high quality proteins and nutrients into our diet. In addition, it has a low-fat content which makes it ideal for any type of diet. biological significance proteins, or those that include all nine of the essential amino acids that make up foods of animal origin, are found in chicken. Niacin, or vitamin B3, is one of the vitamins found in chicken meat mostly from the B complex and is crucial for the body's metabolism of fats and sugars as well as for maintaining healthy cells. Minerals including magnesium, potassium, phosphorus, and zinc are also present. In addition, with the

exception of the skin, it has a low cholesterol level.

Mainly from the B complex, chicken meat contains Niacin, or vitamin B3, which is essential for the body's metabolism of fats and sugars as well as for maintaining healthy cells. Minerals such as magnesium, potassium, phosphorus, and zinc are additionally present. In addition, with the exception of the skin, it possesses a low cholesterol level. 145 kilocalories are present in 100 grams of edible chicken, including the outermost layer of skin. Humans now keep chickens primarily as a source of food (consuming both their meat and eggs) and as pets. One of the most prevalent and widespread domestic animals, there were 23.7 billion chickens in the world as of 2018, up from more than 19 billion in 2011.

This study, a primarily level phenotypic characterization activity, it will be carried out in San Andres, Romblon in order to document the actual phenotypic characteristics of native chickens in the field with considerations on the characteristics describing Paraokan. Molecular characterization that could be correlated to the phenotypic characteristics it will be not carried out. The study describes the phenotypic characteristics and determines the external appearance of native chickens in San Andres, Romblon.

Location of the Study

The study focused on the phenotypic characterization of native chickens (Gallus Gallus Domesticus) in San Andres, Romblon. In this research, researchers surveyed 13 barangays and composed of 20 respondents (farmers), the native chickens raised were characterized based on their phenotypic characteristics.

Map of the Study (https://www.google.com)

Materials and Methods

The main instrument in gathering data was a survey questionnaire. The instrument was distributed to the respondents to answer the questions followed by unstructured interview. Retrieval of questionnaire was done immediately to minimize the loss of data. Upon retrieval of the questionnaire from the respondents, the data that were gathered such as the phenotypic characteristics, population structure and phenotypic of native chicken through the use of measurements and capturing images. Recording of data were done immediately.

The research materials and instruments used in the study were as follows: Camera (Model Canon, Canon Zoom Lens 5X IS 5.0-25.0 mm 1:2.8-6.9) which are needed to capture images of animals like plumage color, shank color, body weight, and feather color; measuring tape was used for linear body measurements such as body length, breast length, shank length, beak length, comb length, and egg length; sliding ruler for the chicken heights, weight scale, record book, ball pen, smartphone and laptop.

All the data gathered were summarized, computed and analyzed by means of its frequency, mean, standard deviation and percentage to determine the different phenotypic characteristics of native chicken.

Results and Discussion

The process of identifying distinctive breed populations and outlining both their individual traits and those of their production manipulates is commonly referred to as phenotypic characterization. An "advanced" characterization phase, which necessitates repeated visits, measures the productive and adaptive capacities of breeds in specific production environments. The "primary" characterization phase entails a single visit to the field for collecting measurements of the animals' morphological features, interviews with raisers, and identification of certain elements of the production environment (FAO, 2012). Improvement of the productivity of indigenous chicken resource demands characterization of the available genotypes. Native chickens usually exhibit no descriptive phenotypic characteristics (Halima, 2007; Mekonnen, 2007).

Population distribution of native chicken

Native chickens keep developing and are now the highest poultry population in the Municipality of San Andres, Romblon. It is assumed that variations in the productivity of native chickens were brought about by the different geographic and climatic conditions in different barangays, such as the high-land Mari-Sur, Mari-Norte, Jun Carlo, and low-land/coastal barangays of Poblacion, Matutuna, and Calunacon. In terms of the population distribution of native chickens, the result shows that barangay Jun Carlo heads the highest number of heads raised with a total of 9. The population of the community still being manageable and the raising of native chickens is not a visible problem (Table 1). This finding correlates with the study (Halima, 2007) that the average flock size of native chickens per rural smallholder family varied from 6 to 10 heads. In addition, according to Nigussie (2011), the average estimated number of native flocks per household is about 3-5 heads.

Barangay	*Rooster*	*Freq*	*%*	*Hen*	*Freq*	*%*	*Total*
Matutuna	2	2	5%	6	6	15%	8
Tanagan	1	1	3%	3	3	7%	4
Victoria	3	3	8%	3	3	7%	6
Mabini	3	3	8%	2	2	5%	5
Dona Trinidad	3	3	8%	2	2	5%	5
Mari-sur	1	1	3%	4	4	10%	5
Mari-norte	4	4	11%	2	2	5%	6
Jun Carlo	3	3	8%	6	6	15%	9
Pagalad	4	4	11%	2	2	5%	6
Poblacion	2	2	5%	3	3	7%	5
Calunacon	2	2	5%	3	3	7%	5
Linawan	5	5	14%	2	2	5%	7
Agpudlos	4	4	11%	3	3	7%	7
TOTAL	37	37	100%	41	41	100%	78
Mean	2.84615			3.15385			

Table 1: The population distribution of native chicken in San Andres, Romblon.

Phenotypic Characteristics

Plumage color

The study shows different plumage colors among the native chickens: red, brown, wheaten, gold, silver, barred, black, white, slate, and splash Table 2. The red color and white were observed as the dominant color in the rooster, while the brown color was in the hen. Other plumage colors were occasionally present and were mixed with the dominant plumage color but were not enough to cause

changes in the dominant red plumage color.

PLUMAGE COLOR							
Rooster	***(N)***	***Freq***	***%***	***Hen***	***(N)***	***Freq***	***%***
Red	9	9	24.3	Red	0	0	0
Brown	3	3	8.1	Brown	15	15	36.59
Wheaten	1	1	2.7	Wheaten	11	11	26.83
Gold	1	1	2.7	Gold	1	0	0
Silver	2	2	5.4	Silver	1	1	2.43
Barred	3	3	8.1	Barred	1	1	2.43
Black	4	4	10.8	Black	7	7	17.07
White	9	9	24.3	White	4	4	9.75
Slate	1	1	2.7	Slate	2	2	4.87
Splash	4	4	10.8	Splash	0	0	0
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	3.7	SD	3.020	Mean	4.2	SD	5.181

Table 2: Plumage color.

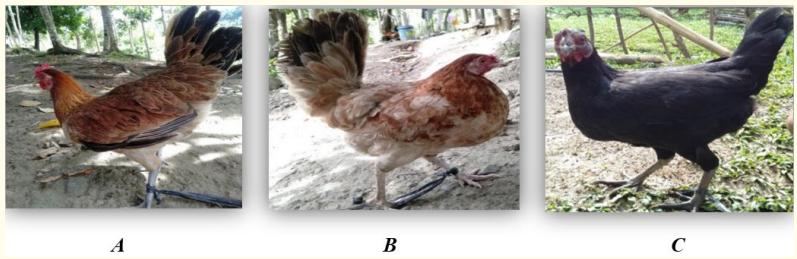

Figure 2: Plumage colors of female's native chicken. (A) Brown plumage color; (B) Wheaten plumage color; (C) Black plumage color.

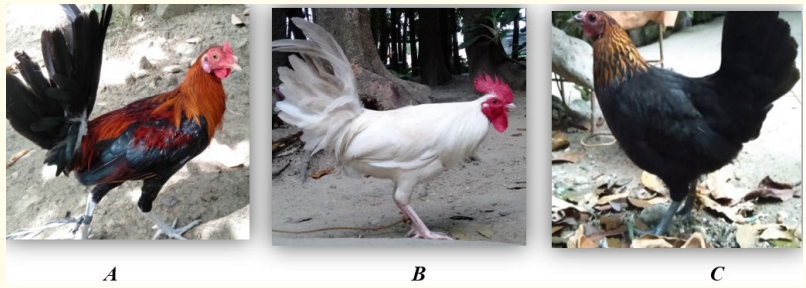

Figure 3: Plumage colors of male's native chicken. (A) Red plumage color; (B) White plumage color; (C) Black plumage color.

Plumage pattern

In Table 3 the distribution of plumage patterns among hens and roosters in the municipality and in the different barangays, the distribution of native chickens was not equal. Penciled plumage pattern was dominant in hens. Likewise, plain plumage patterns seen dominated in both sexes. Mottled were observed in hens while in roosters.

PLUMAGE PATTERN							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Plain	22	22	59.46	Plain	23	23	56.09
Laced	3	3	8.10	Laced	0	0	0
Penciled	3	3	8.10	Penciled	13	13	31.71
Barred	3	3	8.10	Barred	1	1	2.44
Mottled	2	2	5.4	Mottled	3	3	7.32
Spangled	4	4	10.81	Spangled	1	1	2.44
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	6.167	SD	7.782	Mean	6.833	SD	9.261

Table 3: Plumage pattern.

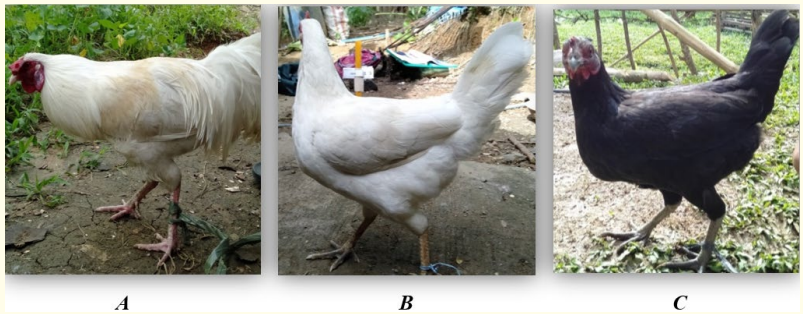

Figure 4: Plumage pattern of females and males' native chicken. (A) Male with plain white plumage pattern; (B) Female with plain white plumage pattern; (C) female with plain Black plumage pattern.

Feather morphology

Feather morphology of the four groups of native chicken are all normal. Observation that normal feather was the dominant characteristics of native chicken in the different barangay of San Andres.

FEATHER MORPHOLOGY							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Normal	37	37	100	Normal	41	41	100
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	12.33	SD	13.67	Mean	21.36	SD	23.67

Table 4: Feather morphology of native chicken.

Figure 5: Feather morphology of females and males' native chicken. (A) Male with normal morphology and distribution; (B) Female with normal feather morphology and distribution.

Feather distribution

Feather distribution of three genetic materials are all normal. However, in rooster it was observed that in Barangay Pag-alad and Jun Carlo, chickens have a muffs and beards, while rooster with crested are observed in Poblacion.

FEATHER DISTRIBUTION							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Muffs and Beards	3	3	8.1	Muffs and Beards	0	0	0
Crested	1	1	2.7	Crested	0	0	0
Normal	33	33	89.2	Normal	38	38	92.7
TOTAL	37	37	100%	TOTAL	38	38	92.7%
Mean	12.33	SD	12.67	Mean	17.93	SD	21.94

Table 5: Feather distribution of native chicken.

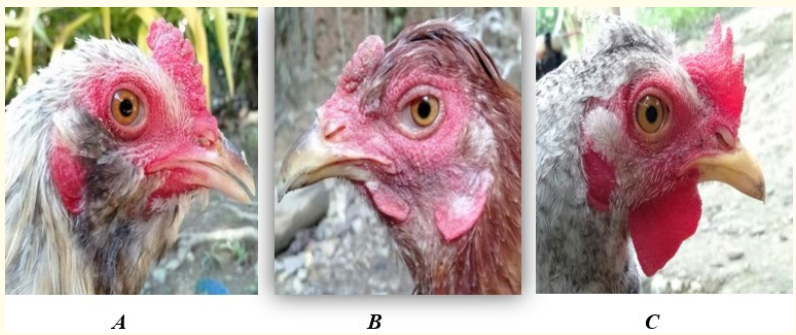

Figure 6: Feather distribution of females and males' native chicken. (A) Male had a muffs and beards; (B) Female had a crested; (C) Male had a normal feather distribution.

Earlobe color

The colors of the six earlobes have been determined to be red, white, red and white, black, red and yellow, and red and black. There were roosters and hens from all six barangays with distinct colored earlobes. On the other hand, the southern and northern regions of the municipality had hens and roosters with red and white markings. Red, red and white, and white earlobe colors were the most prevalent colors found in both sexes. The distribution of the hens' and roosters' earlobe colors in the various barangays likewise, greatly deviates from the expected equal distribution, according to frequency percentage distribution values. This result deviates from what Roxas et al. (1996), Faruque et al. (2010), and Egahi et al. (2010) observed. According to Smyth (1990), the undisguised vascularization of the epidermal cells is a contributing factor to why most chicken breeds have red earlobes.

EARLOBE COLOR							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
White	3	3	8.1	White	5	5	12.2
Red w/ White	19	19	51.4	Red w/ White	13	13	31.7
Black	0	0	0	Black	1	1	2.4
Red w/ Yellow	0	0	0	Red w/ Yellow	0	0	0
Red	15	15	40.5	Red	22	22	53.7
Red w/ Black	0	0	0	Red w/ Black	0	0	0
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	6.167	SD	8.565	Mean	6.833	SD	8.931

Table 7: Earlobe color of Native chicken.

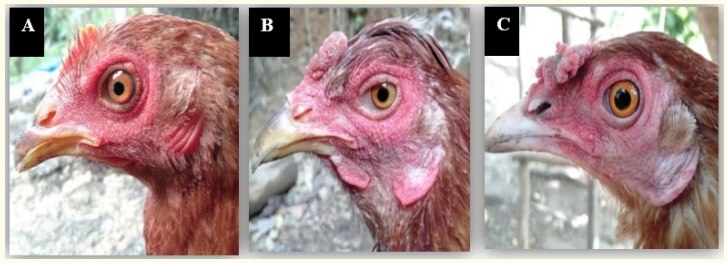

Figure 7: Earlobe colors of female. (A) Red earlobe color; (B) Red with white earlobe color; (C) White earlobe color.

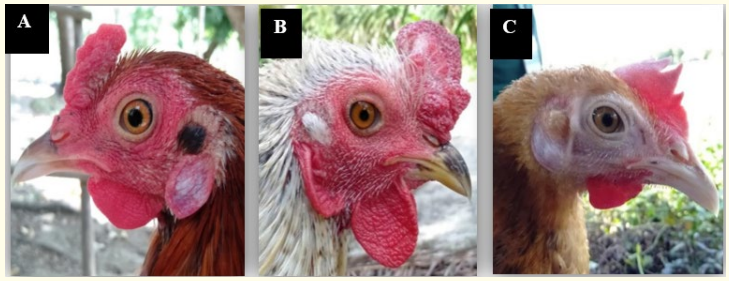

Figure 8: Earlobe colors of male. (A) Red with white earlobe color; (B) Red earlobe color; (C) White earlobe color.

Iris Color

The dominant iris color of the six genetic groups of native chicken is golden brown are the dominant color in both sexes. Pigmentation in birds including eye pigmentation is a result from the synthesis of two different types of melanin, brown/black eumelanin and yellow/red pheomelanin (Steven 1991). The colored part of chicken' eye called iris involve pigmentary cells to synthesize eumelanin or simply melanin and with the presence of chromatophores will be able to store carotenoids. The presence of carotenoids and melanin together with the varying amount of blood on iris surface produce a different color of iris and may indicate a different type of chicken breeds. The red color of iris chickens exists due to capillaries in which the blood is flowing, while golden brown color exists due to carotenoid deposit. Both color combinations are influenced by physiological factors, such as the laying period, in which chickens are susceptible to anemia, which decreases the intensity of the red color (Corti and Vogelaar, 2010).

IRIS COLOR							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Fire Red	7	7	18.9	Fire Red	0	0	0
Bronze	0	0	0	Bronze	6	6	14.6
Flame	4	4	10.8	Flame	6	6	14.6
Gold	9	9	24.3	Gold	8	8	19.5
Golden Brown	16	16	43.2	Golden Brown	21	21	51.2
Straw	1	1	2.7	Straw	0	0	0
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	4.625	SD	5.755	Mean	5.125	SD	7.240

Table 7: Iris Color of Native chicken.

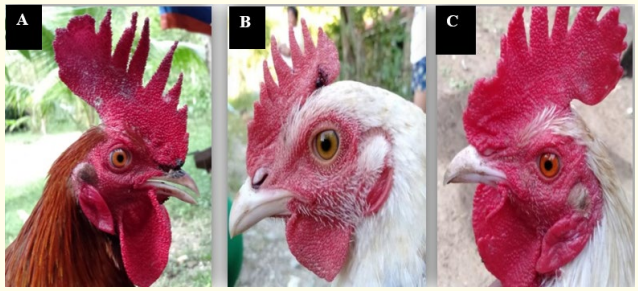

Figure 9: Eye (iris) colors of males. (A) Golden Brown eye color; (B) Gold eye color; (C) Fire red eye color.

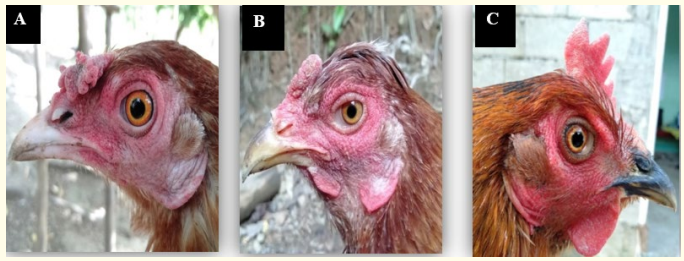

Figure 10: Eye (iris) colors of female. (A) Golden Brown eye color; (B) Gold eye color; (C) Flame eye color.

Comb type

There were four comb types observed among native hens and roosters in the different barangays in San Andres, Romblon. Single comb type was found to be dominant among the rooster and hens in the municipality. On the other hand, walnut comb type was observed among the rooster and hen. Only few hens were observed to have rose comb in the municipality. Based on statistics, the distribution of comb type among chickens in every barangay, as well as the municipality, deviates from an equal distribution. Among the roosters, rose comb was observed to be the predominant comb type in some barangay. Walnut comb type also prevailed among the roosters in other part of the municipality. It is in connection with the findings of other investigations using Paraoakan roosters (TLRI, 1991; Lambio, 2000). Single comb types dominated rose and pea comb types among native hens found in the Philippines, according to Oate (1991) and Roxas et al. (1996). Concerning Bangladesh, native chicken in Nigeria (Egahi et al., 2010) and Bangladesh (Faruque et al., 2010) have a single comb type.

COMB TYPE							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Single Comb	22	22	59.5	Single Comb	34	34	82.9
Pea Comb	6	6	16.2	Pea Comb	1	1	2.4
Rose Comb	2	2	5.4	Rose Comb	0	0	0
Walnut Comb	7	7	18.9	Walnut Comb	6	6	14.6
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	7.40	SD	8.65	Mean	8.20	SD	14.64

Table 8: Phenotypic characteristics in Comb type.

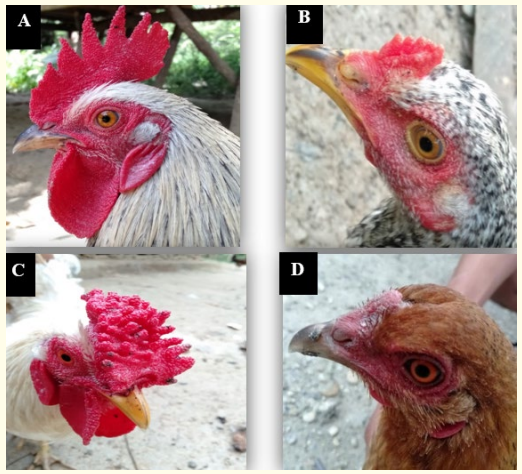

Figure 11: Comb type of native chicken. (A)Single comb; (B)Pea Comb; (C) Rose comb; (D) Walnut comb.

Shank Color

The female native chickens in the Municipality of San Andres were found to have predominantly black shanks, followed by white shanks and yellow shanks Table 9. Generally, white shanks were largely observed among the rooster and black shanks among hens in the whole Municipality. Yellow with black shank color was observed in roosters and hen in some other part of the municipality. Computed frequency percentage and mean statistics of hens and roosters indicate that the proportions significantly deviate from the expected equal distribution of the shank color among native chickens in the municipality. White shanks were predominant in the roosters in other part of barangays. Hens with black shanks were more abundant in other part of barangays. Statistics show that such distribution of shank color among roosters differ in the different barangay. The predominance could indicate that more of the hen resemble the shank of Paraoakan which are described to have yellow shanks (TLRI, 1991). Results of the study suggest that its presence influence the inheritance of the yellow shank, black and white color in the municipality. In contrast with the findings of Roxas et al. (1996), and Oñate (1991), five shank colors were identified in Palawan which include yellow, white, green, black and bluish-black. Whereas the shank variations of native chickens in the province of Camarines Sur had been found to be either yellow, black, or white, Roxas et al. (1996), found eight shank colors in the whole country. The present findings are similar with the predominant white shanks among the native chickens in Bangladesh (Faruque et al., 2010), black shanks among the Vietnamese H'mong chickens (Cuc et al., 2006) and predominant black and white shanks in Nigeria (Egahi et al., 2010) and are similar to the findings of Duguma (2006) and Dana et al. (2010) in Ethiopia and Daikwo et al. (2011) who observed that the native chickens in Dekina, Nigeria, were predominantly gold color shanks.

SHANK COLOR							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
White	17	17	45.9	White	10	10	24.4
Yellow	9	9	24.3	Yellow	10	10	24.4
Black	2	2	5.4	Black	16	16	39.0
White w/ Yellow	1	1	2.7	White w/Yellow	0	0	0
Yellow w/ Black	4	4	10.8	Yellow w/Black	3	3	7.3
White w/ Black	2	2	5.4	White w/ Black	1	1	2.4
Slate	2	2	5.4	Slate	1	1	2.4
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	5.286	SD	5.823	Mean	5.857	SD	6.149

Table 9: Shank color of native chicken.

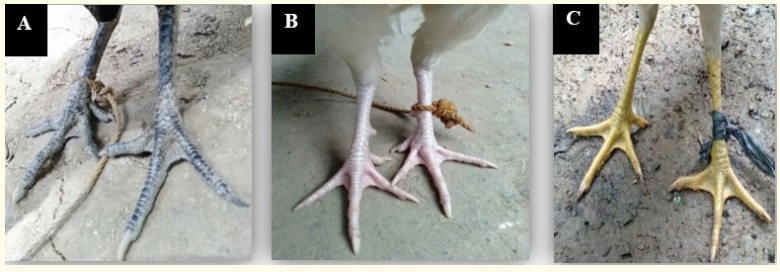

Figure 12: Shank colors of female. (A) Black shank; (B) White shank; (C) Yellow shank.

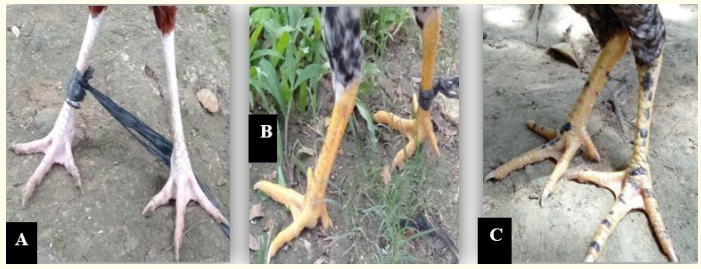

Figure 13: Shank colors of male. (A) White shank; (B) Yellow shank; (C)Yellow with black.

Head Shape

Variations were also observed in head shape. The overall mean indicated that about 18.50, 20.50 and 78.3 % of the chickens have flat head shapes, snake like heads respectively Table 10.

HEAD SHAPE							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Flat Head	29	29	78.3	Flat Head	29	29	70.7
Snake-like Head	8	9	21.6	Snake-like Head	12	12	29.3
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	18.50	SD	14.85	Mean	20.50	SD	12.02

Table 10: Head shape of native chicken.

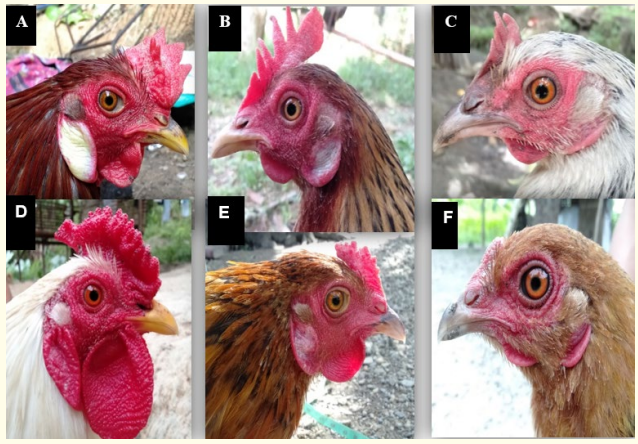

Figure 14: Head shape of females and males' native chicken. (A) male with flat head; (B) male with snake-like head; (C) female with flat head; (D) male with flat head; (E) male with flat head; and, (F) female with snake-like head.

Breast Shape

Based on these results, it can be seen that each of the native chicken lines has the same size characteristics, but the shape characteristics are different. This condition is caused by the characteristics of the size influenced by the environment, while the character of the shape is influenced by genetics. This is following the opinion of (2) that morphometric identification with principal component analysis (PCA) is to determine size traits that are influenced by environmental factors and shape traits are influenced by genetic factors (Table 11). Traits factor inherited by the rooster is the wedge shape (51.4%), while factor inherited by the hen were convex shape (75.6%), this indicate that environment and the genetic components has effect on the shape characteristics of native chicken.

BREAST SHAPE							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Convex	18	18	48.6	Convex	31	31	75.6
Wedge	19	19	51.4	Wedge	10	10	24.4
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	18.50	SD	0.71	Mean	20.50	SD	14.85

Table 11: Breast Shape of native chicken.

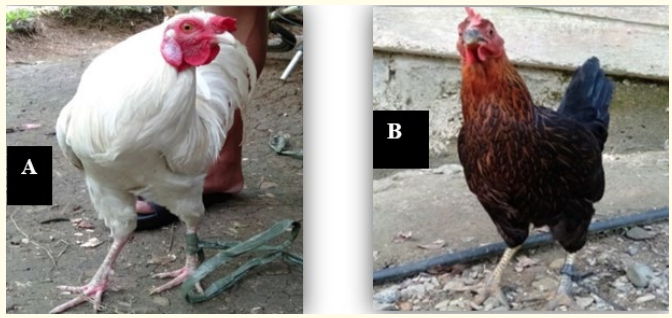

Figure 15: Breast shape of females and males' native chicken. (A) male had a wedge breast shape; (B) female had a convex breast shape.

Body shape

Traits related to the development status of the thigh have helped rank the local chicken studied in categories 1 and 2, thus form the quite wedge type to the tolerably blocky type. Indeed, approximately almost all the birds had a tolerably fleshy sternum. Subsequently, local chicken could be ranked in the category of average format and light-weight chickens whose conformation and structure were identified.

BODY SHAPE							
Rooster	***N***	***Freq***	***%***	***Hen***	***N***	***Freq***	***%***
Blocky	0	0	0	Blocky	1	1	2.4
Wedge	37	37	100	Wedge	40	40	97.6
TOTAL	37	37	100%	TOTAL	41	41	100%
Mean	18.50	SD	26.16	Mean	20.50	SD	27.58

Table 12: Body shape of native chicken.

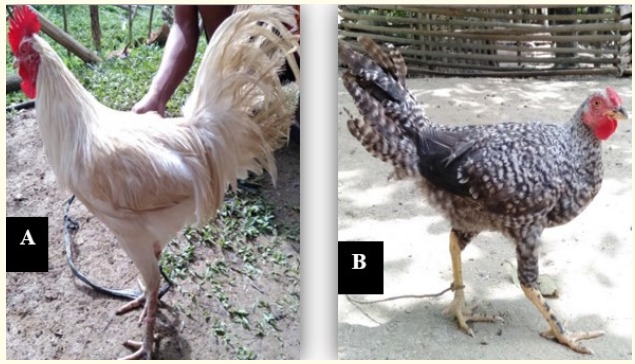

Figure 16: Body shape of females and males' native chicken. (A) male had a wedge body shape; (B) female had a wedge body shape.

Conclusion

The majority of the indigenous chickens in the Municipality of San Andres, Romblon, have a single comb, a yellow, white, and black shank, and typical feather morphology. The red jungle fowl (G. gallus), gave rise to the white leg, and the grey jungle fowl, which gave rise to the yellow leg. Additionally, the mechanism of inheritance, the hybridization of parental lineages, and mutations may all contribute to color diversity (Cabarles et al., 2012). Results from studies conducted in the western Visayas provinces (Cabarles et al., 2012), Palawan (Lopez et al., 2013), and Bohol (Salces et al., 2015), where the white and yellow skin tone is most prevalent, are comparable to those from this study. The majority of the native chicken found in the Municipality has white and golden shanks. When it comes to shank color, the results were comparable to that of research by Cabarles et al. (2012), Salces et al. (2015), and Lopez et al. (2013), where it is known that yellow and white shank colors are the most common.

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