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The Bankim Pigs: A Native Cameroonian Breed Assessed by Biometric Features

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Abstract

In order to study the biodiversity of Cameroon's indigenous pigs, this study was carried out from December 2017 to July 2018 in the Sudano-Guinean zone of Cameroon, precisely in the Bankim subdivision. Data on morphology and body measurements (17) were collected in eight localities from 287 randomly selected pigs of both sexes aged at least 8 months and analyzed. Diversity analyses showed that there is a significant variability in the population. Color pattern results show that Bankim pig has a multiple Coat color with a tendency of bicolor prevalence (58%). The ear orientations of pig were mainly front erected (65.50%). Body measurements were significantly ($p \leq 0.05$) different among the localities except for hair length. The major body indices indicated that the Bankim pig could be an interesting candidate for meat production in small scale farming. According to the discriminant factorial analysis, the population may consist of three genetic types. Phylogenetic analysis showed that one of the genetic types is at genetic equidistance from the two others. The observed genetic variability within the studied populations may offer opportunity for genetic improvement.

***Keywords**: Cameroon, biodiversity, Indigenous pig.*

Introduction

Pig rearing is one of the most popular socio-economic activity in the rural sector of Cameroon. It contributes to the improvement of the welfare of farmers with limited resources (FAO, 2012). These farmers mostly use local pigs (Agbokounou et *al*, 2016) based on their adaptability to the biological milieu and to the extensive farming system. Local pig thus contributes to food security.

Nevertheless, the local breeds are an endangered genetic resource due to the uncontrolled importation of exotic breeds (FAO, 2007). Efforts should therefore be channeled to their conservation. The first step for sustainable conservation is a better knowledge of the genetic resource through their phenotypic, genetic, historic, zootechnical characteristics and cultural interest (FAO, 2012). Moreover, a good understanding of the local breed's characteristics is necessary to conduct decision making on sustainable selection and breeding programmes (FAO, 2012).

Many native pig breeds exist across Africa and Cameroon in particular. Besides the common studied breeds (Bakossi, Forest long nose, Bamileke, Far North types), the Bankim pig breed in the sudano-Guinean zone of Cameroon has not been yet characterized. Hence, this work aims at contributing to the improvement of knowledge on pig breeds in Cameroon. The general objective was to describe the genetic variability of Bankim pig's populations. Specifically, we sought to describe phenotypic traits that are the Coat color and ears types, evaluate some body measurements and the main body indices and determine the genetic typology of the Bankim pigs population

Material and Methods

The study was conducted in the Bankim subdivision (L 06°03'00.8" N to L 06°27'24.5"N and L 011°23'36.8" E to L 011'33'58.9" E) of the Adamawa region of Cameroun, with vegetation type between grassy savanna and forest type, with a tableland relief. The mean elevation is about 737,307m. Bankim enjoys an equatorial climate with a mean annual rainfall of 1772 mm. The mean temperature is about 20 °C. Typical of the Adamawa region, Bankim is irrigated by many runny water and lakes (from local administration office).

A total of 287 unrelated pigs of both sexes were randomly sampled from 8 localities of the Bankim subdivision from December 2017 to January 2018. The animals were adults (>8 months) and healthy; pregnant and lactating females where discarded from the sample. The ages of animals were determined by direct inquiries to the owners.

Data on morphological and biometric traits were collected by direct observation and body measurements as established by the African Union Inter African Bureau for Animal Resources (AU-IBAR, 2015). Qualitative traits were coat color, ear shape and orientation. Seventeen quantitative characteristics were collected on each animal in centimeters. Table 1 presents the different measures taken. The number of teat pairs were counted on 183 females of the sample.

Table 1 : Biometrics traits studied

Body parts	Measure type	Abbreviation
Head	head length	HL
	ear length	EL
	snout length	SL
	Snout circumference	SC
Trunk	body length	BL
	Pelvic width	PW
	ischium width	IW
	scapular ischia length	SCI L
	chest girth	CG
	Height at whither	HW
	Height at the back	HB
	Chest depth	CD
	Hair length	HaL
	Teat pairs number's	
Members and extremities	front legs length	FLL
	back legs length	BLL
	tail length	TL
	cannon circumference	PC

Using the quantitative traits, body indices was computed by the following formulae:

$$Format\ index = \frac{body\ length}{Height\ at\ withers},$$

$$Massivity\ index = \frac{chest\ girth}{Height\ at\ withers},$$

$$Thoracic\ index = \frac{Chest\ depth}{chest\ girth}$$

$$Body\ index = \frac{scapular\ ischia\ length}{chest\ girth}$$

Statistical analyses

Descriptive statistics were used to characterize morphobiometric traits by mean and standard deviation. Analysis of Variance (ANOVA) was carried out to test the influence of localities and sexes on biometric characteristics and the Duncan multiple range test at $\alpha = 0.05$ was used for mean separation in the case of significance effect of factors.

Principal Component analysis was carried out according to Kaiser-Meyer-Olkim (KMO) index along with the test of Bartlett's sphericity to synthetize biometric data of few factors that conserve the maximum information on variability. The number of components extracted was determined through Kaiser Criteria of eigenvalues. Discriminant factorial analysis and hierarchical upward classification permitted to determine the population's structure. SPSS 21.0 (2018) and Excel (2016) software were used for those analyses.

Results

The phenotypic attributes of Bankim pigs are presented in table 2. Bankim pigs are shown in figure 1 and 2

Coat characteristics

The study showed that the Bankim pig has a predominantly a bicolored coat (57.49%). The most represented coat colors were white (33.10%), black with white spots (24.74%) and black with darker spots (17.77%). The diversity observed may be due to the uncontrolled crossbreeding to the exotic breed.

Ears characteristics

The shape and orientation of ears were front erected in most of the Bankim pigs (65.50 %). The other characteristics were front dropping (15.68 %) and half front erected (18.82 %).

Figure 1 : Coat color of Bankim pigs

Figure 2: ears shape and orientation of Bankim pig

Morphometric Characteristics

Morphometric traits considered in the present study show a significant difference ($p \leq 0.05$) among localities of the Bankim subdivision except for Ischium width (IW). The means and standards deviations of teats number pairs are summarized in tables 3 and other morphometric traits are presented in 4, 5 and 6. The study sampled a total of 183 females with a mean teats numbers pair of 5.95 ± 0.84. This result could give an appreciation of their prolificacy potential. Table 4 shows the variation of characters among the localities which can be explained by both genotypes and environment. The variation in body measurements can be partly attributed to the differences in production systems, especially the feeding system. The animals were under semi extensive system, housed at night, and strayed during the day. Feed consumed were mostly dependent on the available resources on the site.

Table 2 : Phenotypic characteristics of Bankim pig

Factors	Characteristics	Frequency (%)
Pattern		
	Simple	39.37
	Bicolor	57.49
	Tricolor	3.14
Color		
	White	33.10
	Black	4.53
	Brown	1.74
	White with brown spots	0.35
	Black with darker spots	17.77
	Brown with white spots	1.74
	Black with white spots	24.74
	Brown with black spots	9.06
	Black with brown spots	3.83
	White with black and brown spots	0.70
	Brown with white and black spots	1.39
	Black with white and black spots	1.05
Ears' shape and orientation		
	Front erected	65.50
	Front dropping	18.81
	Half front erected	15.68

Table 3: Number of teats pairs of Bankim local breed according to sites

Sites	n	Number of teats pair	
		μ ± Std	CV (%)
Bankim urbain	20	5.95 ± 0.69^{bc}	11.54
Bimao	31	5.65 ± 0.88^{ab}	15.54
Monkoing	16	6.06 ± 0.77^{bc}	12.73
New town	22	5.36 ± 0.73^{a}	13.55
Nwunchim	13	6.23 ± 0.73^{c}	11.64
Nyakong	29	6.28 ± 0.70^{c}	11.18
Somié	19	5.89 ± 0.81^{bc}	13.73
Tchim	33	6.18 ± 0.95^{bc}	15.38
Total sites	**183**	**5.95 ± 0.84**	**14.19**

μ= mean; Std= standard deviation; CV= coefficient of variation; *a, b, c: all values with the same superscript in the column are comparable (P>0.05).*

Table 4 : Body measurements of Head, snout ear, body scapular ischia lengths and snout circumference of Bankim pig according to sites

Sites	n	HL (cm)	SL (cm)	EL (cm)	BL (cm)	CD (cm)	SCI L (cm)
Bankim urbain	34	26.07 ± 3.72^{b}	12.74 ± 1.89^{ab}	17.75 ± 2.81^{bcd}	103.3 ± 24.58^{c}	$40.85 \pm 10,16^{c}$	80.32 ± 11.11^{bc}
Bimao	52	25.65 ± 4.34^{ab}	12.11 ± 2.05^{a}	18.11 ± 3.74^{bc}	92.19 ± 19.72^{b}	35.90 ± 9.99^{ab}	75.47 ± 12.36^{b}
Monkoing	37	26.62 ± 2.78^{b}	14.08 ± 1.72^{c}	19.61 ± 2.11^{d}	98.46 ± 11.20^{bc}	36.63 ± 5.43^{abc}	83.16 ± 7.07^{c}
New town	35	23.91 ± 3.77^{a}	11.71 ± 1.66^{a}	15.44 ± 3.08^{a}	81.90 ± 17.85^{a}	33.60 ± 8.03^{a}	68.67 ± 12.90^{a}
Nwunchim	18	26.58 ± 4.39^{b}	12.44 ± 2.59^{a}	16.92 ± 3.36^{ab}	95.64 ± 25.78^{bc}	39.75 ± 12.83^{bc}	76.28 ± 17.59^{b}
Nyakong	48	25.69 ± 2.69^{ab}	14.10 ± 1.68^{c}	18.92 ± 2.63^{cd}	99.54 ± 10.05^{bc}	35.62 ± 5.80^{ab}	83.04 ± 9.96^{c}
Somié	24	26.19 ± 4.67^{b}	13.75 ± 2.49^{bc}	17.60 ± 3.38^{bc}	95.06 ± 25.91^{bc}	36.79 ± 12.54^{abc}	78.25 ± 19.63^{bc}
Tchim	39	26.34 ± 3.52^{b}	13.72 ± 2.01^{bc}	18.24 ± 3.35^{bcd}	102.2 ± 14.65^{bc}	38.64 ± 5.67^{bc}	84.69 ± 11.46^{c}
Total sites	**287**	**25.83 ± 3.74**	**13.10 ± 2.14**	**17.97 ± 3.27**	**96.11 ± 19.31**	**36.94 ± 8.83**	**79.01 ± 13.27**

HL=head length; SL=snout length; EL= ear length; BL=body length; SC=Snout circumference; SCI L=scapular ischia length; *a.b.c.d : all values with the same superscript in the same line are comparable(P>0.05).*

Table 5 : Body measurements of Chest Girth, Pelvic and Ischium Width, Height at Whither, Height at the back and Hair Length of Bankim pig according to sites

Sites	n	CG (cm)	PW (cm)	IW (cm)	HW (cm)	HB (cm)	HaL (cm)
Bankim urbain	34	84.01± 17.18 ^{b}	19.46± 6.15 ^{b}	15.29± 3.96 ^{a}	57.07 ± 10.36 ^{b}	64.26± 9.93 ^{b}	6.21± 1.94 ^{bc}
Bimao	52	80.37±18.24 ^{b}	19.89 ± 4.81 ^{b}	12.99± 9.78 ^{a}	54.14± 7.55 ^{ab}	59.97± 8.20 ^{b}	6.33 ± 1.67 ^{bc}
Monkoing	37	83.13± 17.82^{b}	19.81 ± 2.99 ^{b}	11.59± 2.23 ^{a}	57.04 ± 4.51 ^{b}	64.38± 5.00 ^{b}	5.03 ± 1.25 ^{a}
New town	35	71.76^{a} ± 16.16^{a}	16.67 ± 4.73^{a}	11.00 ± 8.02^{a}	50.43 ±10.18^{a}	55.41 ± 9.83^{a}	6.90 ± 1.69^{c}
Nwunchim	18	81.64^{b} ± 21.95^{b}	18.17 ± 7.30^{ab}	10.69 ± 2.80^{a}	54.58 ±12.16^{ab}	61.11± 14.17^{b}	5.75 ± 2.14^{ab}
Nyakong	48	84.04^{b}± 10.32^{b}	18.90 ± 3.04^{ab}	10.67 ± 1.44^{a}	56.27 ± 8.83^{b}	63.35 ± 5.60^{b}	5.78 ± 1.38^{b}
Somié	24	82.18^{b}± 26.19^{b}	18.92 ± 6.01^{ab}	11.08 ± 1.86^{a}	56.02 ± 14.46^{b}	61.54±14.25^{b}	6.00 ± 1.53^{b}
Tchim	39	89.57^{b}± 14.76^{b}	20.29 ± 3.60^{b}	10.88 ± 3.00^{a}	57.72 ± 8.27^{b}	64.19 ± 8.65^{b}	6.13 ± 1.69^{bc}
Total sites	**287**	**82.20 ± 17.80**	**19.14 ± 4.77**	**11.86 ± 5.62**	**55.45 ± 9.47**	**61.85 ± 9.46**	**6.03 ± 1.70**

CG=chest girth; PW=Pelvic width; IW=ischium width; HW=Height at whither; HB=Height at the back; HaL= Hair length; *a.b.c.d: all values with the same superscript in the same line are comparable (P>0.05).*

Table 6 : Body measurements of Front legs, Back legs and tail lengths, Chest depth and Cannon circumference of Bankim pigs according to sites

Sites	**n**	FLL (cm)	BLL (cm)	TL (cm)	CD (cm)	CC (cm)
Bankim urbain	34	35.82± 5.21^{b}	43.28 ± 5.32 ^{c}	27.47± 6.63 ^{b}	30.28± 5.63 ^{bc}	13.53± 2.30 ^{bc}
Bimao	52	34.49± 4.54^{b}	40.22± 4.10 ^{ab}	26.03± 6.31 ^{b}	28.53± 6.07^{ab}	13.08± 2.25^{bc}
Monkoing	37	36.24± 2.63^{b}	43.34± 3.71 ^{c}	27.00± 3.14 ^{b}	31.66± 3.78^{c}	14.27± 1.45c
New town	35	31.61 ± 3.81^{a}	38.90 ± 4.89 ^{a}	21.70 ± 6.13^{a}	26.33 ± 4.69 ^{a}	11.80 -± 2.13 ^{a}
Nwunchim	18	35.14 ± 7.23^{b}	41.78 ± 6.75^{bc}	26.14 ± 8.34^{b}	29.08 ± 6.99 ^{bc}	13.14 ± 3.26 ^{bc}
Nyakong	48	34.30 ± 3.50^{b}	41.20± 3.49^{abc}	26.34 ± 4.44^{b}	31.27 ± 3.22 ^{bc}	13.83 ± 1.56 ^{bc}
Somié	24	35.56 ± 7.71^{b}	42.29 ± 8.61^{bc}	25.00 ± 7.98^{b}	30.4 4± 6.78 ^{bc}	12.96 ± 3.24 ^{b}
Tchim	39	36.13 ± 4.86^{b}	42.26 ± 6.43^{bc}	28.04 ± 5.61^{b}	31.53 ± 5.14^{c}	13.72± 1.87^{bc}
Total sites	**287**	**34.85 ± 4.95**	**41.54 ± 5.40**	**26.04 ± 6.17**	**29.93± 5.43**	**13.34 ± 2.27**

FLL=front legs length; BLL=back legs length; TL=tail length; CD=Chest depth; PC=cannon circumference; *a.b.c.d : all values with the same superscript in the same line are comparable(P>0.05).*

Table 7 presents the body indices of the Bankim local pigs. Bankim pigs have a format index of about 1.73 ± 0.21, massivity index of 1.48 ± 0.16 and the thoracic index of 0.45 ± 0.05. These findings may be in accordance to the small scale farming systems (with low inputs) and also, the pigs do no express weight overload (body index<1).

Table 7 : Body indices of Bankim local pig according to sites

Sites	**n**	**Format Index**	**Massivity index**	**Thoracic index**	**Boby index**
Bankim urbain	34	1.77 ± 0.19^{a}	1.55 ± 0.17^{c}	0.47±0.08^{cd}	0.88 ± 0.11 ^{a}
Bimao	52	1.71 ± 0.36^{a}	1.46 ±0.14^{ab}	0.48 ±0.04^{d}	0.94 ± 0.09 ^{b}
Monkoing	37	1.79 ± 0.15^{a}	1.57 ± 0.20^{c}	0.44±0.04^{ab}	0.96 ± 0.09 ^{bc}
New town	35	1.69 ± 0.21^{a}	1.38 ± 0.16^{a}	0.45±0.04^{bc}	1.06 ± 0.12 ^{e}
Nwunchim	18	1.70 ± 0.16^{a}	1.40 ± 0.10^{a}	0.45±0.04^{abc}	1.01 ± 0.09 ^{d}
Nyakong	48	1.72 ± 0.13^{a}	1.44± 0.09^{ab}	0.43±0.07^{ab}	1.00 ± 0.07 ^{cd}
Somié	24	1.73 ± 0.12^{a}	1.50± 0.10^{bc}	0.42±0.04 ^{a}	0.95 ± 0.09 ^{bc}
Tchim	39	1.70 ± 0.18^{a}	1.49± 0.17^{bc}	0.43±0.03^{ab}	0.98 ± 0.09^{bcd}
Total sites	**287**	**1.73 ± 0.21**	**1.48 ± 0.16**	**0.45 ± 0.05**	**0.97 ± 0.10**

a.b.c.d : all values with the same superscript in the same column are comparable(P>0.05). n= sample observed;

Correlations coefficients between biometrics variables are presented in table 8. It shows significant and positive correlation among variables except between hair length and the sixteen other variables. A perfect positive correlation (0.926) is noted between height at wither and height at the back. This result gives one element of data factorization. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.963 and the Bartlett's Test of Sphericity is highly significant (sig=0.000), thus ACP can be analyzed according to SPSS 21.0 standard requirements.

Table 9 gives the initial eigenvalues of the components. Following the Kaiser rule, axes 1 and 2 can be retained; they explain 72.52 % of the total variance.

The rotated component matrix on varimax with Kaiser Normalization method is presented in table 10. Component 1 is perfectly correlated to sixteen variables. The seventeenth variable that is the hair length is not correlated to the component 1 but to the component 2. It implies that an improvement in one of the correlated body measurement will lead to the improvement of the others.

Table 8 : Correlation between body measurements

	HL	EL	SL	SC	BL	SCI L	CG	PW	HW	IW	HB	CD	FLL	BLL	TL	PC	HaL
HL	1																
EL	0.456**	1															
SL	0.651**	0.460**	1														
SC	0.707**	0.561**	0.598**	1													
BL	0.693**	0.545**	0.569**	0.801**	1												
SCI L	0.657**	0.528**	0.603**	0.815**	0.840**	1											
CG	0.746**	0.465**	0.604**	0.846**	0.857**	0.842**	1										
PW	0.651**	0.458**	0.528**	0.737**	0.756**	0.719**	0.837**	1									
HW	0.719**	0.532**	0.644**	0.797**	0.794**	0.801**	0.854**	0.762**	1								
IW	0.590**	0.342**	0.454**	0.625**	0.649**	0.608**	0.729**	0.760**	0.692**	1							
HB	0.732**	0.538**	0.628**	0.833**	0.833**	0.833**	0.872**	0.770**	0.926**	0.707**	1						
CD	0.662**	0.392**	0.457**	0.722**	0.744**	0.680**	0.851**	0.788**	0.764**	0.704**	0.765**	1					
FLL	0.617**	0.512**	0.502**	0.695**	0.675**	0.683**	0.675**	0.585**	0.770**	0.562**	0.771**	0.593**	1				
BLL	0.554**	0.511**	0.462**	0.617**	0.633**	0.663**	0.599**	0.525**	0.705**	0.499**	0.734**	0.502**	0.773**	1			
TL	0.631**	0.578**	0.545**	0.670**	0.726**	0.725**	0.724**	0.692**	0.751**	0.630**	0.746**	0.654**	0.667**	0.589**	1		
PC	0.685**	0.531**	0.595**	0.803**	0.801**	0.810**	0.842**	0.777**	0.783**	0.688**	0.823**	0.733**	0.654**	0.631**	0.746**	1	
HaL	-0.022	-0.049	-0.058	-0.022	-0.028	0.021	-0.004	-0.032	0.008	-0.044	0.005	0.050	-0.069	-0.121*	-0.018	-0.047	1

HL=head length ; EL= ear length; SL=snout length; SC=Snout circumference; BL=body length; PW=Pelvic width; IW=ischium width; SCI L=scapular ischia length; CG=chest girth; HW=Height at whither; HB=Height at the back; HaL= Hair length; CD=Chest depth; FLL=front legs length; BLL=back legs length; TL=tail length; PC=cannon circumference;

*Correlation is significant at the 0.05 level
**Correlation is significant at the 0.01 level

:

Table 9: Initial eigenvalue of components

Component	**Initial Eigenvalues**		
	Total	% of Variance	Cumulative %
1	11.259	66.229	66.229
2	1.069	6.288	72.517
3	0.881	5.184	77.702
4	0.661	3.890	81.592
5	0.569	3.345	84.937
6	0.422	2.481	87.418
7	0.351	2.067	89.485
8	0.312	1.837	91.321
9	0.262	1.544	92.865
10	0.229	1.348	94.213
11	0.202	1.189	95.403
12	0.186	1.096	96.498
13	0.174	1.021	97.519
14	0.149	0.877	98.396
15	0.131	0.771	99.168
16	0.077	0.453	99.620
17	0.065	0.380	100.000

Table 10 : Rotated Component Matrix

Body measurements	**Components**	
	1	2
HB	0.941	0.061
CG	0.940	-0.046
HW	0.922	0.057
BL	0.896	0.049
PC	0.896	0.047
SC	0.895	0.072
SCI L	0.890	0.042
PW	0.863	-0.071
CD	0.854	-0.159
TL	0.826	0.082
HL	0.804	0.077
FLL	0.785	0.252
IW	0.781	-0.074
BLL	0.721	0.345
SL	0.683	0.182
EL	0.596	0.290
HaL	0.045	-0.877

HB=Height at the back; HW=Height at whither; BL=body length; PC=cannon circumference; SC=Snout circumference; SCI L=scapular ischia length; PW=Pelvic width; TL=tail length; CD=Chest depth HL=head length; FLL=front legs; IW=ischium width BLL=back legs length; SL=snout length; EL= ear length; CG=chest girth; HaL= Hair length;; length

Genetic typology

Factorial discriminant analysis of the sample has shown three genetic types. It can be seen in Figure 3. Table 11 gives the distribution of the sample around the genetic types. It shows that types II is less represented at 19.51% of the sampled population.

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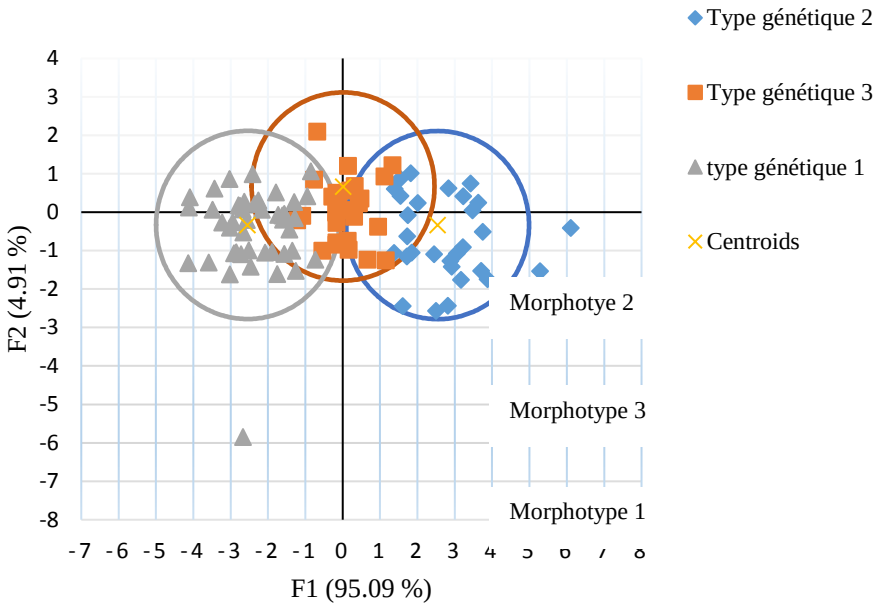

Figure 3 : Structure of the Bankim pig population

Table 11 : Number of individuals in morphotypes per sites

Sites	Morphotypes			Total
	I	II	III	
Bankim urbain	7.00	15.00	12.00	34
Bimao	30.00	12.00	10.00	52
Monkoing	8.00	9.00	20.00	37
New town	20.00	5.00	10.00	35
Nwunchim	10.00	4.00	4.00	18
Nyakong	12.00	2.00	34.00	48
Somié	1.00	4.00	19.00	24
Tchim	22.00	5.00	12.00	39
Total sites	**110.00**	**56.00**	**121.00**	**287**
Frequency (%)	**38.33**	**19.51**	**42.16**	

The morphotypes here plotted have biometric characteristics significantly different (P>0.05) except for hair length (Table 12). Genetic type II has the highest values of biometric characteristics but is also the less represented.

Table 12 : Biometrics characteristics of genetics types of Bankim local pig

Variables (cm)	Genetics types		
	I (n=110)	**II (n=56)**	**III(n=121)**
HL	23.06 ^{a}	29.95 ^{b}	26.48 ^{c}
EL	15.83 ^{a}	20.39 ^{b}	18.81 ^{c}
SL	11.67 ^{a}	14.73 ^{b}	13.66 ^{c}
SC	25.21 ^{a}	36.44 ^{b}	31.20 ^{c}
BL	78.54 ^{a}	123.19 ^{b}	99.69 ^{c}
SCI L	66.81 ^{a}	95.11 ^{b}	82.74 ^{c}
CG	67.44 ^{a}	105.59 ^{b}	85.55 ^{c}
PW	15.75 ^{a}	25.53 ^{b}	19.27 ^{c}
HW	47.65 ^{a}	66.73 ^{b}	57.76 ^{c}
IW	10.24 ^{a}	15.86 ^{b}	11.11 ^{c}
HB	53.33 ^{a}	74.11 ^{b}	64.10 ^{c}
CD	30.47 ^{a}	47.92 ^{b}	37.79 ^{c}
FLL	31.28 ^{a}	40.65 ^{b}	35.43 ^{c}
BLL	37.56 ^{a}	46.91 ^{b}	42.80 ^{c}
TL	21.02 ^{a}	33.38 ^{b}	27.26 ^{c}
PC	11.40 ^{a}	16.03 ^{b}	13.86 ^{c}

:			
HaL	6.27 [a]	6.20 [a]	5.74 [a]

HL=head length ; EL= ear length; SL=snout length; SC=Snout circumference; BL=body length; PW=Pelvic width; IW=ischium width; SCI L=scapular ischia length; CG=chest girth; HW=Height at whither; HB=Height at the back; HaL= Hair length; CD=Chest depth; FLL=front legs length; BLL=back legs length; TL=tail length; PC=cannon circumference; *a.b.c.d : all values with the same supersript in the same line are comparable (P>0.05).* n= sample size.

Hierarchical upward classification represents the genetic distance among morphotypes as considered here as genetic types (Table 13). One of the genetic type is at equidistance from the two others. It reinforce the idea of a relation between them as shown by the figure 3.

Table 13 : Genetic distance among identified types of Bankim pigs breed

Genetics types	**Genetics types**		
	I (n=110)	**II (n=56)**	**III (n=121)**
I (n=110)	0.00	77.88	38.50
II (n=56)	77.88	0.00	39.76
III (n=121)	38.50	39.76	0.00

n= sample size.

Discussion

It was found that Bankim pigs have a multiple coat colors with a tendency of bicolor being popular. Similar observations were made in pig populations of the far North region of Cameroon (Njoya *et al.,* (1996) and in pigs population of the republic of Benin (Youssao *et al*., 2008). The similarity can have a genetic explanation.

Bankim pigs have mainly (65%) front oriented erected ears, the same feature which has been observed in indigenous pigs of Africa and *Desi* pigs of India (Randriamahefa 2002; Umutoni 2012; Boro *et al*.. 2016). The presence of dropping ears (19%) and half front erected (15.68 %) ears could be explained by breeding to exotic breed with the dropping ears characteristic. These characteristics may suggest unselected genetic group of pigs as mentioned by Sonaiya (1986).

In the present study, it was found that Bankim pigs have a mean of 5.95 ± 0.84 pairs of teats (ranging from 5 to 7). It approaches the teat pair number of local pigs in Benin (5.1; Youssao *et al*.. 2008). Adeola *et al. (*2013) reported 5.75 for local pigs in Nigeria. Though, crossbreed of Nigeria has presented an average of 7 pairs of teats (Adeola *et al*.. 2013) and local pig of Naga has 10 pairs of teats (Borkotoky *et al*.. 2014). The differences are probably the effect of genotype characteristics of concerned breeds.

Body measurements have presented variability between localities (Tables 4, 5, 6). It can be explained by both genetic material (level of crossbreeding between local breed and exotic one) and rearing system. In terms of body length, Bankim pigs recorded a mean of 96.11± 19.31 cm. Lower values of 50.3 cm, have been reported in Nigeria on crossbreeds and local pigs have recorded 36.6 cm (Adeola *et al*.. 2013). Youssao *et al*.(2008) and Ritchil *et al*. (2014) respectively reported an average mean of body length of 60 cm on local pigs of Benin, and 59.4 ± 1.8 cm on local pigs of Bangladesh. However, other studies have reported higher values of body length. Mutua *et al.* (2011) reported 92 cm in Kenya and Jeyakumau *et al.* (2014) reported 84.89 ± 4.08 cm and 78.56 ± 2.77 cm for male and female local pigs of Nicobar in India.

Bankim pigs recorded a chest depth of 36.94 ± 8.83 cm. Relatively lower values have been recorded by Adeola *et al.* (2013); 21.1 cm and 22 cm respectively on crossbreeds and indigenous pigs of Nigeria though older and fed on richer resources. In general, native African pigs in sub-Saharan region share commonalities in their body conformation, all mostly reared under low inputs system.

It was found that chest girth of Bankim pigs is 82.20 ± 17.80 cm. Mutua *et al.* (2011) reported a value of 81 cm in local pigs of Kenya. Local pigs of Nigeria and crossbreed registered 38 cm and 45.5 cm respectively (Adeola *et al*., 2013). Bankim is a rich agricultural zone with variety of farm residues (corn, cassava, rice) and kitchen left overs (cassava peelings, corn chaff, fish residues from dams) for roaming pigs.

Height at whither is about 55.45 ± 9.47 cm; it is higher than 40.7 and 26.1 cm registered respectively on crossbreed and local pig of Nigeria (Adeole *et al*.. 2013).

Major body indices (format, massivity, and thoracic) indicate that Bankim pigs could be interesting candidates for meat production for small scale farm, due to their body measurements.

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Conclusion

Characterization is one step towards conservation and sustainable use of indigenous pigs in the Cameroonian's small holder production system. The current study establishes the variability of phenotypic and biometric characteristics of the Bankim local pigs among the sites of the subdivision. A total of sixteen variables considered in the study are correlated. Only the hair length stands alone. Bankim local pigs could be plotted in three different morphotypes clearly identifiable. Further investigations are needed for deeper characterization especially, molecular characterization of identified populations, including traits concerning adaptation. It also gives room to conservation of this local resource through better organization and possible genetic improvement using appropriate methods.

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