POPULATION STRUCTURE AND INBREEDING RATE OF INDIGENOUS PIG IN SOME COMMUNITIES OF NASARAWA STATE

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ABSTRACT

The study was carried out in some selected communities of Nasarawa state, north central Nigeria to characterize the population structure and to identify inbreeding rate among indigenous pig herds. Data were gathered through survey and direct count. The pigs were classified into sex, age, state of maturity and physiological status. The effective population size (Ne) and rate of inbreeding (ΔF) were calculated from the counted population structure data. The population structure was dominated by younger age group with male piglet having the highest number on the average per household. The effective population size varies between 54.1 to 106.2 while the inbreeding rate for the populations were between 0.002 to 0.018. Inbreeding rate was at a low level and the effective population size was also small an indication of threat in the genetic diversity of the population and possible decline in performance, thus the need for effective breeding and conservation programme to sustain the diversity and increase population size.

Keywords: Indigenous pig, effective population size, inbreeding, diversity.

INTRODUCTION

Understanding the diversity, distribution, and the current status of a country's animal genetics resources is essential for their efficient and sustainable use, development and conservation (FAO, 2007). In the recent past, effective breeding has emphasized on a few specialized stocks (Simianer *et al.*, 2003); however, breeds that have been less studied have been at risk of population decline because of neglect of their genetic potential, lack of protection of their genetic diversity and uncontrolled crossing (Mao *et al.*, 2006). One of those breeds of animals that have received less attention in Nigeria is the indigenous pigs. Indigenous pigs are a vital reservoir of genetic resources and their conservation has a technical role related to the future development of the productive system as well as a social-cultural role. Local pigs have been documented by several authors as important assets because they improve livelihoods of rural farmers (Mhlanga, 2002.). Local pig breeds are mainly confined to smallholder production systems among rural farmers, their production and growth is influenced by demand and the socio-cultural practices of the owners thus their population growth is at a very low level in most part of Nigeria. There are no recent information on population and breeding structure of this indigenous breed. Because of the small herd size of most of their population, they are prone to intense inbreeding thereby affecting their performance through inbreeding depression. The aim of this study was to evaluate the population structure and inbreeding rate of indigenous pig with a view to knowing their conservation status.

MATERIALS AND METHODS

Study area, sampling technique, data collection and analysis.

The study was carried out in some selected communities in the three senatorial zones of Nasarawa State, Odu, Udege,Kuvo, Akwanga, Nasarawa Eggon, Wamba and Lafia, where good number of pigs are found after a preliminary visitation and assessment. These area falls within the Guinea Savannah zone of North Central Nigeria and is located between latitudes 07. 52^0 N and 08.56^{0}N and longitudes 07. 25^{0}E and 09.31^0 E respectively, with annual rainfall ranging from 952-1988 mm, and a mean monthly precipitation of 150 mm. Its minimum and maximum daily temperatures average 20-37^{0}C. The mean relative humidity at noon varying between 14 and 74%. It has two distinct seasons; the wet season covering late April to

October and dry season covering November to early April.

The population structure was counted by classifying the pigs by sex (male and female) and age of piglets, lactating gilts, pregnant and open gilts in each of the sampling locality. Data on herd composition were estimated using the mean procedure of statistic using SPSS (2010). Furthermore, rate of inbreeding was calculated in the population. Effective population size (Ne) for a randomly mated population was calculated as Ne = (4NmNf)/(Nm+Nf) where Ne = effective population size, Nm = number of breeding males in the flock and Nf = number of breeding females in the flock. The rate of inbreeding ΔF was calculated from Ne as)ΔF = 1/2Ne (Falconer and MacKay, 1996). The ratio of the effective population size to actual population size Ne/Na) is an indicator of the extent of genetic variation expected in a population. Male: female ratio (Nm/Nf) is defined as the number of breeding males upon the number of breeding females in a population (Hedrick and Kalinowski, 2000).

RESULTS AND DISCUSSION

Herd structure

Pig herd structure by age and production stage is presented in Table 1.Average herd size of pig population of the communities studied was 31.11±1.68 while average litter size per sow was 11.11±0.23. Karimuribo *et al.* (2011) and Kambashi *et al.*(2014) from Tanzania and Congo reported lower rate of an average herd size of 17.9±0.9but consistent with the report of (Ajala *et al.*, 2007)Herd size is influence by the acceptability and market of pig and pig products also likely to be related to availability of land in some locality (Katongole *et al.*, 2012).

The average number of pigs born alive was consistent with what was observed in other developing countries for native breeds (Mutua *et al.*, 2011; Ocampo *et al.*, 2005) but lower than that for improved breeds raised on well balanced diets in open-air stables in the tropics (Suriyasomboon *et al.*, 2006; Tantasuparuk *et al.*, 2000). The small litter size can be attributed to poor diets and inbreeding because inbreeding negatively affects litter size (Karimuribo *et al.*, 2011)

Table 2 present effective population size and rate of inbreeding by location, the effective population size ranges between 54.1 for Kuvo to 106.2 for Odu populations while the rate of inbreeding ranges between 0.002 to 0.018. The calculated effective population size was similar to what Monleon *et al.* (2010) reported in Philippines suggesting that indigenous pig population are at the category of endangered status (FAO, 1992). Endangered means that the population is in danger of extinction because Ne is too small to prevent genetic loss through inbreeding which will result in reduction of viability of the population. The immediate programme to save the indigenous pig is to expand the population as quickly as possible to maximize the effective population size above 500 to enhance variability within the population, through equalizing sex ratio, standardizing the litter size, standardizing the longevity and keeping inbreeding at minimum rate (FAO, 1992).The estimated rate of inbreeding in all the locations were low conforming with what was suggested by FAO (1992) 1% to 4% , suggesting that though the effective population size are low the breed is not in danger of immediate extinction. The pigs in this areas are at advantage compared to what Katongole *et al.* (2012)who reported population size of local pigs in a community in Uganda and placed the local pigs at risk of inbreeding and disappearance. The variation might be socio- cultural, breeding method and market demand of pork and other pig products.

CONCLUSION

The result of the study show that the population of the indigenous pigs in this zone are threatened with declining in effective population size which will hitherto affect performance of the indigenous breed. There is an urgent need to for effective breeding and conservation programme for the indigenous pig in this zone to increase size and diversity.

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Table 1: Herd Structure of the studied populations

Trait	Mean±SE	Minimum	Maximum
. Average herd size	31.11 ± 1.68	27.78	34.45
. Average litter size	11.11 ± 0.23	11.49	12.42
. Average breeding male	1.97 ± 0.90	1.79	2.15
. Average breeding female	3.47 ± 018	3.11	3.82
. Average pregnant Pig	1.19 ± 0.10	0.99	1.40
. Average lactating Pig	1.14 ± 0.08	0.98	1.30
. Average open Gilt Pig	1.05 ± 0.11	0.84	1.26
. Average male Piglet	16.75 ± 1.02	14.72	18.78
. Average female Piglet	9.10 ± 0.50	8.10	10.10

Table 2: Effective population size and rate of inbreeding of the pig population

Location	Nm	Nf	Nm/Nf	Na	Ne	Ne/Na	ΔF
. Odu	40	79	0.51	119	106.2	0.89	0.009
. Udege	22	37	0.59	59	55.2	0.94	0.002
Kuvo	21	38	0.55	59	54.1	0.92	0.018
Akwanga	26	46	0.57	72	66.4	0.92	0.015
N/Eggon	23	37	0.62	60	56.7	0.95	0.018
Wamba	23	41	0.56	64	58.9	0.95	0017
Lafia	36	58	0.62	94	88.9	0.95	0.011

Nm =number of male, Nf =number of females, Ne= effective population size, ΔF=rate of inbreeding