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Flock Composition, Effective Population Size and Inbreeding Rate of *Kokok balenggek* Chicken Breed under In-Situ Conservation

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Abstract: The present study was aimed to calculate flock composition, effective population size and inbreeding rate of *Kokok balenggek* chicken (KBC) under in-situ conservation area in tigo lurah district, Solok Regency, West Sumatera Province, Indonesia. A semi-structured questionnaire was administered to 55 selected households engaged in KBC farming in the study area. The results showed that total number of KBC at in-situ conservation area was 938 heads. Chicken flock composition of KBC was chick (50.31%), chicken grower (26.03%) and adult chicken (23.66%). A low male: female ratio (Nm/Nf) of 1:1.7 was observed in the KBC breed. Number of effective population size (Ne) was 206 heads. The rate of inbreeding (ΔF) calculated for the indigenous KBC flock considering the existing flock size and management practice was 0.0024 (0.24%) indicating that the KBC breed was not at the risk of extinction. It is concluded that inbreeding rate in KBC population in tigo lurah district at in-situ conservation area is not found.

Key words: KBC, flock composition, effective population size, inbreeding rate, West Sumatera-Indonesia

INTRODUCTION

The value of animal genetic resources conservation is generally underestimated, as the current indirect values are often neglected (Philipsson *et al*., 2006). Indigenous chickens are a vital reservoir of gene resources and their conservation has a technical role related to the future development of the productive system as well as a social-cultural role (Camacho-Escobar, 2008; Ajayi, 2012). Lariviere and Leroy (2007) stated that genetic diversity in chickens is needed to avoid inbreeding in the chicken population. Awareness of the need to conserve such resources has led to initiate an integrated strategy for conserving chicken genetic resources. Population size has a major impact on the dynamics of a population, the smaller the population the higher the tendency to be depressed in its reproductive potentials due to inbreeding (Klemetsdal, 1998).

KBC is a genetic resources from West Sumatra Province, Indonesia, well-known as song fowl (Rusfidra, 2004; Rusfidra *et al*., 2014a; Rusfidra *et al*., 2014b; Rusfidra and Arlina, 2014). This study was aimed to calculate chicken flock composition and inbreeding rates in KBC breed population at in-situ conservation in Tigo Lurah District, Solok Regency, Indonesia.

MATERIALS AND METHODS

A survey was carried out in two villages at in-situ conservation area of KBC; *Tanjuang baliak sumiso* village and Garabak data village. A semi-structured questionnaire was administered to 55 selected households. All the selected households owned KBC that were reared through the extensive system of production. Although farmers did not control breeding or keep records of their KBC due to scavenging nature of production, they selected them at household level using their own indigenous knowledge, experience and performance history of the KBC.

Data on flock 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 (Lariviere *et al*., 2011).

RESULTS AND DISCUSSION

The mean flock composition in household farmer in the study area, estimated Ne, Ne/Na and Nm/Nf is given in Table 1. The present value on male: female ratio (1: 1.7) fell within the range of 1:3 reported for KBC ex-situ

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Table 1: Number of breeding males (Nm) and females (Nf), male:female ratio (Nm/Nf), actual population size (Na), effective population sizes (Ne), Ne/Na and rates of inbreeding per generation (ΔF) of KBC in tigo lurah district

Village (Nagari)	Nm	Nf	Nm/Nf (%)	Na	Ne	Ne/Na (%)	ΔF (%)
Tanjuang balik sumiso village	52	87	59.77	139	131	94	0.38
Garabak data village	29	54	53.70	83	75	90	0.66
Tigo lurah district	81	141	57.45	222	206	92.79	0.24

conservation area in KBBF (Rusfidra *et al*., 2014b). Flock structure and dynamics help in the identification of the age and number of animals to be maintained within the breeding population (Okeno *et al*., 2012). The proportion of mature hens in a flock is used to estimate egg and poultry production (Yakubu, 2010). The low sex ratio on the farms studied is an indication that the breeding system is not controlled by the farmers (Zahraddeen *et al*., 2011).

The Ne/Na and Nm/Nf ratio on KBC were 92.79 and 57.45% (1:1.7), respectively. This finding was relative similar to what had been found in research of KBC under ex-situ conservation of *Kinantan bagombak* Breeding Farm (KBBF) conducted by Rusfidra *et al*. (2014b). Ne/Na and Nm/Nf ratio on KBC in KBBF were 75.35 and 33.54%, respectively. When it is compared to what is found by Lariviere *et al*. (2011), the Ne/Na and Nm/Nf ratios of forty traditional Belgian chicken were ranging from 57-89% and from 23-51%, respectively. Meuwissen and Wooliams (1994) suggested that Ne between 30 and 250 is needed for natural selection to prevent inbreeding depression.

The effective population size (Ne) and the rate of inbreeding (ΔF) calculated for the indigenous KBC flock considering the existing flock size and management practice were 206 heads and 0.0024 (0.24%), respectively. Ne is a measure of genetic variability within a population where large values of Ne indicate more variability and small values of Ne indicate less genetic variability (Maiwashe *et al*., 2006; Cervantes *et al*., 2008). When the inbreeding rate of KBC in this study was 0.24% per generation, it is assumed that 0.24% of heterozygosity is lost in one generation. Inbreeding is also an indication for the probability that two alleles at any locus in an individual are identical by descent relative to a base population (Falconer and MacKay, 1996). The rate of inbreeding in the free-range KBC population was low. The low value of ΔF is an indication that the KBC population is not at the risk of extinction. However, a balanced breeding programme through the introduction of blood from more superior indigenous KBC from neighbouring communities or other ecotypes in the country may be a step in the right direction in attenuating inbreeding rate (Lariviere *et al*., 2011).

Conclusion:

1: Flock composition of KBC population under in-situ conservation area was chick (50.31%), chicken grower (26.03%) and adult chicken (23.66%). Male and female ratio (Nm/Nf) was 57.45% (1:1.7). Number of effective population size (Ne) was 206 heads.

2: The inbreeding rate of KBC population was 0.24%. The low rate of inbreeding in the indigenous KBC flock is an indication that the population is not at the risk of extinction.

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