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Population Structure and Management of Bayang Ducks, Kamang Ducks, Pitalah Ducks and Sikumbang Jonti Ducks in the Sittu Area as Local Ducks of West Sumatra

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ABSTRACT

West Sumatra, Indonesia, has four local duck species: Bayang ducks, Pitalah ducks, Kamang ducks, and Sikumbang Jonti ducks. This study aims to obtain primary data on population structure and management of the Four West Sumatra duck in in-situ areas. The respondents of this study were twenty-eight farmers who kept four West Sumatra ducks. The method employed was a survey, and purposive sampling was used to select the respondents. The observed variables were breeder profile, maintenance management, and number of ducks, actual population (Na), effective population (Ne), and inbreeding rate. The result showed that the total population of local ducks in the Sittu area is 50 Sikumbang Jonti ducks, 2428 kamang ducks, 6783 Bayang ducks, and 3870 pitalah ducks. The actual population of Bayang ducks is the highest compared to other local duck species of West Sumatra, namely 2888 heads with an effective population of 1148 heads. Local duck farmers in West Sumatra primarily raise ducks intensively at 53.57%, then 35.71% extensively or traditionally, and 10.71% semi-intensively. The inbreeding rate of Payakumbuh ducks reached 2.08%. It concluded that there was a decrease in the population of local West Sumatran ducks in the In Sittu area.

Keywords: Population Structure, Bayang Duck, Pitalah Duck, Kamang Duck, Sikumbang Jonti Duck

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INTRODUCTION

West Sumatra, Indonesia, has four local duck species: Bayang ducks, Pitalah ducks, Kamang ducks, and Sikumbang Jonti ducks. Duck names are based on where the duck comes from. Bayang ducks come from Bayang sub-district, Pesisir Selatan district. Pitalah ducks come from Pitalah village, Batipuh sub-district, Tanah Datar district. Kamang ducks come from kamang sub-district, Agam district. Sikumbang Jonti ducks come from Payakumbuh city and Lima Puluh Kota district. The phenotypic appearance of the four duck breeds is different and has its characteristics (Andini, 2024). Bayang ducks have been designated West Sumatra germplasm since 2012 with No. 2835/Kpts/LB.430/8/2012 (Kepmentan, 2012) and Pitalah ducks since 2011 with No. 2923/Kpts/OT.140/6/2011 (Kepmentan, 2011). While the other two types of ducks, namely Kamang and Sikumbang Jonti ducks, have not yet been established.

West Sumatra's local duck population is currently declining. The decline in population numbers is due to farmers switching to breeding other local ducks outside West Sumatra, which have higher productivity than local West Sumatra ducks. Superior livestock can increase production and profits for farmers (Priyanti and Chasanah, 2022; Ibraheem, 2023; Dash et al., 2024). The reality, Pitalah ducks and Bayang ducks have a peak production of 85% (Kepmentan, 2011; Kepmentan, 2012). The 24-week-old Sikumbang Jonti duck raised intensively had a body weight of 1399.75±124.70g in males and 1392±235.35g in females (Husmaini et al., 2024). Body weight of Bayang duck is 1480.80±120.78g in male and 1448.02±145.01g in females (Suhartati et al., 2024). Whereas Mojosari ducks have a production peak of 90-95% (Kepmentan, 2012a) and Ratu ducks have a production peak of 94% with an average egg production of 265 eggs/year and an egg production period of 10-12 months without molting (Kementan, 2022).

Ningsih (2023) reported that the types of ducks raised in Batu Balang village, Harau sub-district, Lima Puluh Kota district are Mojosari, Raja-Ratu, and Hibrida ducks. Putra (2023) reported that only three local West Sumatran ducks were found in Situjuah Limo Nagari District, Lima Puluh Kota Regency. Farmers prefer to raise Mojosari ducks

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54.45% and Raja-Ratu ducks 45.55% (Putra, 2023). The development of ducks in Sumatera Barat raises several significant obstacles, one of which is the difficulty of obtaining superior quality and available ducks. It is feared that this obstacle will cause the local duck population in Sumatera Barat, which has unique genetic characteristics and appearance, to become extinct (Rafian et al., 2023). The low performance of local ducks can significantly impact duck populations, particularly through reduced survival rates and reproductive success (Wiegers et al., 2022; Kadurumba et al., 2023). The decline in livestock diversity is driven by factors such as changing consumer demands, farm mechanization and climate change, which have led to the loss of breeds that once played crucial roles in agriculture (McIntosh, 2022). Kim et al. (2022) state that native chicken populations are at risk due to factors such as habitat loss, industrial farming practices, and genetic dilution from crossbreeding with commercial breeds.

Population structure in livestock refers to composition and distribution of different types of livestock within a specific area the age distribution and sex ratio within a population, essential for predicting future trends (Worku, 2017; Jabir, 2023). Livestock population structure influences genetic diversity, breeding strategies, and ecosystem dynamics (Kim et al., 2023). The shift in the type of duck livestock raised by farmers has resulted in a declining local duck population in West Sumatra. It is necessary to collect data on the population structure of local ducks in West Sumatra, especially in the in situ area, to map population conditions and further strategies in increasing the population and productivity of local ducks as an effort to maintain and preserve Indonesia's livestock genetic resources.

MATERIALS & METHODS

Respondents of this study were 28 farmers consisting of 10 Bayang duck farmers in the Bayang sub-district area, 8 Pitalah duck farmers in Pitalah sub-district, 8 Kamang duck farmers in Kamang sub-district, and 2 Payakumbuh duck farmers in Payakumbuh City.

The method used was a survey. Researchers collected information from respondents using a questionnaire by the study. Determination of the research area was carried out by purposive sampling based on the area of origin of the ducks. The variables observed were farmer profile, duck husbandry management, number of male and female ducks aged >20 weeks, number of male and young female ducks aged 8-20 weeks, number of ducks aged 0-8 weeks, actual population, effective population, inbreeding rate, and sex ratio.

RESULTS & DISCUSSION

Profile of Local Duck Farmers in West Sumatra

The profile of local duck farmers in West Sumatra can be seen in Table 1. 89.29% of local duck farmers in West Sumatra have an age range of 25-50 years. Almost all farmers are at a productive age. The age of farmers significantly influences their productivity, with varying effects observed across different age groups. Research indicates that productivity tends to peak among middle-aged farmers, particularly those aged 35 to 44, who exhibit higher efficiency and returns to scale compared to younger cohorts. Conversely, older farmers, especially those over 65, demonstrate a notable decline in productivity, attributed primarily to technological adaptation rather than efficiency loss (Tauer, 1995; Fried & Tauer, 2016). Farmer motivation is critical in increasing the productivity and sustainability of livestock businesses, especially in rural areas. The level of farmer motivation is influenced by age and farming experience (Baharuddin et al., 2024).

Table 1: Profile of local duck farmers in West Sumatra

No	Variables	*Range*	n	Percentage
1	Age	< 25 years	0	0.00
		25 – 50 years	25	89.29
		> 50 years	3	10.71
2	Education	No school	0	0.00
		Primary school	4	14.29
		Junior high school	8	28.57
		Senior high school	14	50.00
		Bachelor	2	7.14
3	Farming experience	< 5 years	3	10.71
		5 – 10 years	13	46.43
		10 > years	12	42.86
4	Distribution of West Sumatra Local Duck Breeders in the In situ Area	Payakumbuh ducks	2	7.14
		Kamang ducks	8	28.57
		Pitalah ducks	8	28.57
		Bayang ducks	10	35.71
5	Business status	Main job	25	89.29
		Side job	3	10.71

Education level of local duck farmers in West Sumatra is highest at senior high school by 50%, and at bachelor's only 7.14%. The education level of farmers significantly influences various aspects of agricultural productivity, innovation, and resource management. Higher education enhances farmers' ability to adopt modern farming techniques, manage resources efficiently, and improve profitability. Education increases farmers' capacity to adopt innovative practices, such as contract farming, by reducing risk aversion and increasing willingness to use new technologies (Verma, 2024).

Farming experience directly impacts production variables, affecting income (Fathoni et al., 2024). The average experience of raising local West Sumatra ducks in the in situ area of 5-10 years was 46.43%, and above 10 years was 42.86%. However, A study in Wanggar District found that the experience of raising ducks did not significantly influence the labor output of farmers (Mawarni et al., 2024). Conversely, the number of ducks owned was shown to significantly affect labor output, suggesting that while experience may not directly impact productivity, the scale of operation does (Mawarni et al., 2024). Distribution of West Sumatra Local Duck Breeders in the in situ Area is 35.71% Bayang ducks, 28.57% pitalah ducks, 28.57% kamang ducks, and the least is Payakumbuh ducks at 7.14%. This shows a decreasing interest of duck farmers in breeding Payakumbuh ducks in Payakumbuh

City. The status of the business as the primary job is 89.29%, while 10.71% is a side business.

Management of Raising Local West Sumatran Ducks

57.58% of the purpose of raising ducks is for laying eggs for consumption, 27.27% as a provider of duck breeding, and 15.15% as meat-type ducks (Table 2). Duck eggs are hatched at the breeder, and then the DOD or Pullet duck is sold to other farmers. As many as 53.57% of local West Sumatra duck farmers raised ducks in the pullet period and 46.43% raised ducks since DOD. This is by raising ducks, namely lay or meat-type ducks. Generally, duck farmers raise ducks in the pullet period. Gopinathan et al. (2015) state that duck farmers raised ducks in three stages: brooding (0-4 weeks), grower (5-16 weeks), and layer (above 16 weeks).

Table 2: Management of raising local West Sumatran ducks

No	Variables	Types	Total	Percentage
1	Purpose of rearing	Meat-Type	5	15.15
		Duck breed provider	9	27.27
		Layer	19	57.58
2	Duck rearing period	DOD	13	46.43
		Pullet duck	15	53.57
3	Rearing system	intensive	15	53.57
		semi intensive	3	10.71
		extensive	10	35.71
4	Cage types	No cage	3	10.71
		Wooden cage	16	57.14
		Tarps	9	32.14
5	Source of duck breed	Own	7	25.00
		Purchased	21	75.00
6	Source of feed	Feed mill	8	28.57
		Self-mixing feed	10	35.71
		Foraging in the rice field	10	35.71

Local duck farmers in West Sumatra mostly raise ducks intensively at 53.57%, then 35.71% extensively or traditionally, and 10.71% semi-intensively. Duck rearing systems significantly influence growth performance, meat quality, and productivity. Various systems, including intensive, semi-intensive, and backyard methods, cater to different production goals and environmental conditions. The choice of rearing system can optimize outcomes based on specific objectives, such as meat yield or egg production. Ducks raised in cages show higher final body weight and feed efficiency, making them suitable for meat production (Wang et al., 2023). While intensive systems can maximize production efficiency, they can also lead to higher operational costs and potential welfare issues. In contrast, backyard systems promote sustainability and biodiversity, but may result in lower production levels.

The type of cage used by local duck farmers in West Sumatra is 57.14% in wooden cages, 32.14% use tarpaulins, and 10.71% do not use cages. Wooden cages are generally used for intensive duck rearing systems, because they are more sturdy and safe, while tarpaulin cages are used for semi-intensive and extensive rearing systems. Ducks are herded in the rice fields and collected in the afternoon in tarpaulin cages. Tarpaulin cages are easier to move from one place to another, depending on where the ducks are grazed. Ducks are grazed in rice fields that have been harvested; ducks can eat the remains of rice, snails, and worms in the fields.

Population Structure of Local West Sumatran Ducks in the In-sittu Area

Population structure of local West Sumatran ducks in the in-sittu area can be seen in Table 3. The total population of local ducks in the Sittu area is 50 Sikumbang Jonti ducks, 2428 kamang ducks, 6783 Bayang ducks, and 3870 pitalah ducks. Sikumbang Jonti ducks have the least population. Because duck farmers in Payakumbuh and Lima Puluh Kota Regency prefer to breed other types of ducks that have higher productivity, as noted by Ningsih (2023) and Putra (2023), namely, Mojosari ducks, Raja-Ratu ducks, and Hibrida ducks. Payakumbuh is one of the livestock centers in West Sumatra Province. Their breeding is the primary job, and the priority of breeding for business. Therefore, farmers prefer livestock species with higher productivity, such as Mojosari ducks and Ratu ducks, so Sikumbang Jonti ducks are increasingly not developing. There needs to be an effort to increase the productivity of Sikumbang Jonti ducks through breeding programs.

Table 3: Population structure of local West Sumatran ducks in the in-sittu area

NO	Type of Duck	Adult		Young		DOD	TOTAL
		Male	Female	Male	Female		
1	Sikumbang Jonti duck	7	43	0	0	0	50
2	Kamang duck	59	931	380	58	1000	2428
3	Bayang duck	323	2565	958	978	1959	6783
4	Pitalah duck	10	270	530	430	2630	3870
TOTAL		399	3809	1868	1466	5589	13131
Percentage		3.04	29.01	14.23	11.16	42.56	

Nurliza (2016) stated that the population of Bayang ducks in Lengayang District, Pesisir Selatan District was 9,156 ducks. Yalti (2012) reported that the total population of Bayang ducks in Bayang District was 28,244 ducks. Based on these data there was a considerable decrease in population. Actual Population (Na), Effective Population (Ne) and Inbreeding Rate of local West Sumatran ducks in the in-sittu area can be seen in Table 4.

Table 4: Actual Population (Na), Effective Population (Ne) and Inbreeding Rate of local West Sumatran ducks in the in-sittu area

NO	Variables	Sikumbang Jonti duck	Kamang duck	Bayang duck	Pitalah duck	Total
1	Male (Nm)	7	59	323	10	399
2	Female (Nf)	43	931	2565	270	3809
Actual Population (Na)		50	990	2888	280	4208
Effective Population (Ne)		24	222	1148	39	1445
Inbreeding rate (%)		2.08	0.23	0.04	1.30	0.03
Sex Ratio		1:6	1:16	1:8	1:27	

The actual population of Bayang ducks is the highest compared to other local duck species of West Sumatra, namely 2888 heads with an effective population of 1148 heads. Effective population (Ne) is the number of adult males and females used to produce breeding stock and continue the population. The relationship between adequate population size (Ne) and the increase in inbreeding per generation is critical in understanding genetic diversity and population viability. Ne is a key indicator of genetic drift and inbreeding rates, with smaller Ne leading to higher inbreeding levels. This relationship is influenced by various factors, including population structure and reproductive success (Waples, 2013). The

inbreeding rate of Payakumbuh ducks reached 2.08%. Population can be tolerant if the inbreeding rate per generation is less than or equal to 1%. Doekes et al. (2024) stated that A meta-analysis revealed that a 1% increase in pedigree inbreeding correlates with a median decrease of 0.13% in phenotypic values across traits. Ablondi et al. (2023) and Mugambe et al. (2024) stated that a 1% increase in the inbreeding rate per generation will reduce production and cause a decrease in performance traits in livestock.

Conclusion

There was a decrease in the population of local West Sumatran ducks in the In Sittu area. The low effective population resulted in a high rate of inbreeding in Payakumbuh ducks and Pitalah ducks. It is necessary to observe West Sumatra Local ducks' population structure in their distribution areas, strategies for conservation, including the establishment of breeding programs that focus on maintaining genetic purity, improve genetic quality and promoting sustainable farming practices.

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