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Full Length Research Paper

Biodiversity conservation in inhabited area; what can helmeted guinea fowl *(Numida meleagris:* Numididae*)* domestication offer in socio-economic development and wildlife conservation

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The world has been experiencing growing pressure on biodiversity resources by destruction, over-exploitation, development and climate change. There is a need for alternatives of conserving wildlife species in inhabited area. Domestication of Helmeted Guinea fowl (HG) in Tanita-Kibaha Municipal, Tanzania is seen as both way of conserving biological resources in inhabited areas and socio-economic development of the community. This study aimed at determining the potential of HG for domestication over other domestic birds (chicken, ducks). Also the attitude of HG's keepers was evaluated. The body size was determined by measuring height and length of birds and tested using Mann-Whitney U test statistic. While attitude on HG was determined using Likert's scaling and tested using Kruskal-Wallis Test Statistic. The growth rate was significantly higher in HG than chicken. The attitude was significant positive for HG when compared with chicken and ducks. However few HG are kept due to newness of the business, lack of knowledge and support. It was advised on provision of education to the community. The government and other stakeholders were recommended to support the venture as it has potentials in domestic and commercial purposes.

Key words: Biodiversity, inhabited, helmeted guinea fowl, domestication, wildlife.

INTRODUCTION

Pressure of urbanization in Tanzania is increasing in many areas including Kibaha municipal. Natural biodiversity resources including Helmeted Guinea fowls (HG) (*Numida meleagris* Linnaeus, 1764) are diminishing. For instance, researches done in Tanita-Kibaha, revealed that urbanization has potential of eliminating the native wildlife species and the socio-economic activities such as agriculture, quarrying, charcoal production, gardening and construction were observed to decrease significantly the abundance of ants (Ngongolo and Mtoka, 2013). This calls upon finding other alternative of ensuring existence of wildlife species in urbanized areas. The alternative means of conservation wildlife species in urban should be in win-win situation (Brand, 2012). HG keeping is among the best alternatives to be considered however its benefits need to be evaluated.

Animal domestication in inhabited areas especially in urban places of Tanzania has been observed to be a challenging case, however domestication of poultry including HG in urban is economically cost effective compared to other animals (Mvena, 1999). Some findings have showed that, there are several advantages in raising HG such as high meat quality, high demand in the market, resistance to diseases, low production costs, greater capacity to utilize green feeds, control of insects, ticks and other pests, better ability to protect itself against predators and high reproduction rate (Moreki, 2009). In Tanita Kibaha people domesticate HG, however the assess-

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ment on their potential benefits over other domestic birds like chicken and ducks have not been evaluated.

A study done in Nigeria showed that HG eggs command premium prices because of their gamey flavour and can be better stored than chicken eggs, as their eggshells do not break easily due to their thickness (Ikani and Dafwang, 2004). In Botswana, HG eggs are not sold as table eggs but as hatching eggs and are only sold to permit holders. HG eggs are believed to enhance virility and sexual potency, and it has been reported that HG meat also commands a premium price (Moreki, 2009).

Like in other African countries, HG farming is still a new venture in Tanzania; hence the population of farmed HG is unknown as well as their contribution to human nutrition, economic and conservation at large. A study from Botswana reported that, production occurs mainly at subsistence level and women appear to dominate the industry (Moreki and Seabo, 2012). Regardless of their vast benefits, most studies have shown that, HG in Tanzania is known to exist in the wild while little information is known for their domestication (Cooper, 1996). This study contributed to the information of their existence as domestication.

This finding is beneficial to people involved in domesticating birds to realize alternatives to which the HG can do if were to be compared with other wild birds. Also the findings provide profound information on the use of HG as means of conserving biodiversity in the inhabited areas. Not only that, but also, the results will guide the policy makers on alleviating poverty through using HG for community income and employment. As far as community involvement in wildlife conservation is concerned in the country, the findings help to contribute recommendations to local communities adjacent to the protected areas to domesticate HG for income and protein sources. This may increase the income and protein sources to local communities around the protected area hence decreasing wildlife poaching and human-wildlife conflicts through improved HG keeping.

We hypothesized that, if the growth rate of HGs would be positively different from that of the chicken, the local communities would have positive attitude towards HG domestication over other domestic birds. In addition, HG with their higher performance with respect to the domestic chicken will provide better alternative management, local production and promote local conservation efforts.

The study aimed at determining the potential of HG as means for biological conservation in the inhabited areas. The specific objectives were: to determine the abundance of HG from current keepers, to compare the body size in terms of length and height between HG keets and chicken chicks, and to determine and compare the attitude of HG, chicken and ducks keepers.

MATERIALS AND METHODS

The study was conducted in Tanita street, Tanita Ward for three months from February to June 2013. Tanita is located in Kibaha municipal near TANITA cashew-nut processing factory. This area was preferred due to presence of many people being involved in poultry keeping in three systems namely free ranging, semi-intensive and intensive systems. Kibaha, with more than 23,050 inhabitants, is located near Dar-es Salaam city, in eastern Tanzania. It is the capital of Pwani Region. Tanita is located in Kibaha District, which is among 6 districts of the Pwani Region.

Six households that had domesticated HG were selected randomly. In each house hold the number of HG was counted and categorized in three groups namely Roster, Hen and keets.

Two cohorts (one for HG keets and another for chicken chicks) each of 2 months old with 10 individuals were selected randomly. Both cohort classes were raised in semi-intensive system with similar feed staff. In each member of the cohort, length (from tip of beak to the tip of tail) and height (cm) (from the tip of the claw to the top of the back) were measured using a tape measure.

Semi structured interview using Likert's scaling (1-5 Scale, where 1=strongly disagree and 5=strongly agree) as suggested by Kothari (2004) and Bertram (2007), was used to determine the attitude for the six HG keepers on the potential of HG over chicken and ducks in terms of benefits like price, market demand, resistance to diseases, management cost and preference by customers. The questionnaire was replicated into 8 questions to give 48 samples for 6 respondents.

The correlation between length and heights of chicks was analyzed using Spearman's post correlation index (Kothari, 2004**)**. Mann-Whitney U test statistic was used to determine the difference in length and height for chicken chick and HG keets at α=0.05 by using SYSTAT version 10 (SPSS Inc, 2000). Data collected through Likert scaling were analyzed using descriptive statistic (Bertram, 2007; Kothari, 2004).

Kruskal-Wallis test statistic at α=0.05 using SYSTAT version 10 (SPSS Inc, 2000) was used to analyze the variation of HG categories (Rooster, Hen and Keets) for the six farmers at α=0.05.

RESULTS

Abundance of Helmeted Guineafowls

Different HG keepers varied in owning numbers. The second fowl keeper owned the highest number (41.67%) followed by the sixth keeper (18.75%) while the third had the least number (7.29%), this is illustrated in figure1. About 96 HG were counted, to which hens (Mean=7.667± 2.716, S.D= 6.653) were the highest in number followed by keets (Mean= 6.000±5.657, S.D=2.000) and roosters (Mean=2.333±0.615, S.D= 1.506) scored the least (Figure 2). However, the difference was statistically insignificant

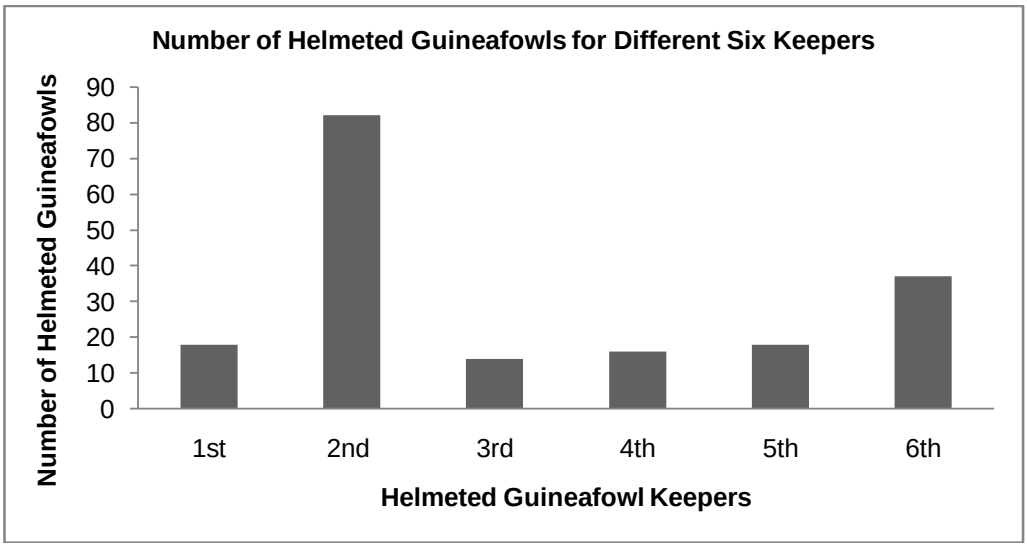

Figure 1. The number of Helmeted guinea fowls owned by six different keepers.

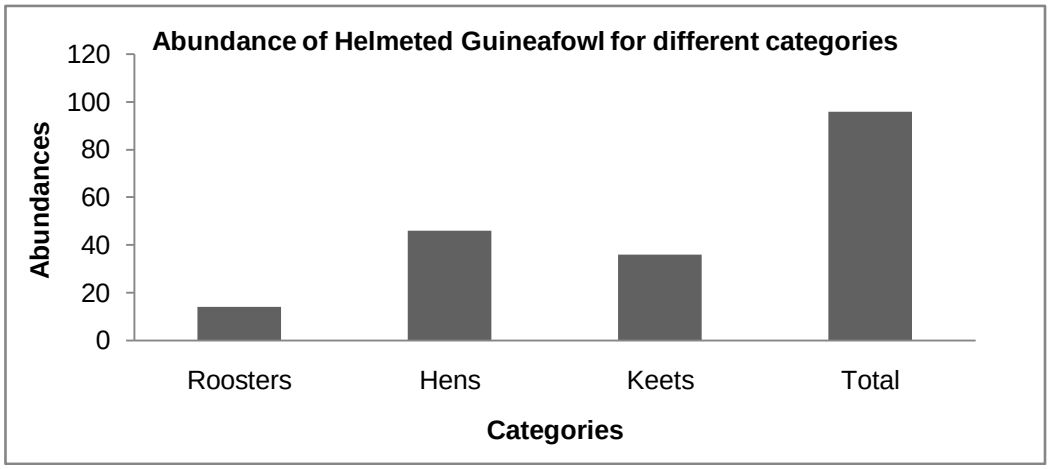

Figure 2. The abundance of Helmeted guineafowls encountered during sampling for different categories.

(Kruskal-Wallis Test Statistic = 5.000, P= 0.416).

Body size for Helmeted Guineafowl and Chicken

There was variation in length and height of the birds measured. The length (Mean= 23.850± 1.335, S.D= 5.972) was longer than height (Mean= 15.240± 1.324, S.D= 5.922). The relationship between the length and the height was positive correlated (r=0.898 r^2=0.806,). The Spearman's post correlation index showed that the relation was significantly (P<0.05) (Figure 3). Mann-Whitney U test statistic showed that, the difference between length and height was statistically significant (Mann-Whitney U test statistic = 17.000, P<0.05).

Different types of chicks showed variation in length and height. For instance the length in both chicks (Mean=19.211±.4467, S.D=1.340) and Keets (Mean=27.6454±1.6815, S.D= 5.577) were longer than their height (Mean=9.833±0.3, S.D= 0.900 for chicks; and Mean=19.663± 1.284, S.D= 4.262, respectively). The diffe-

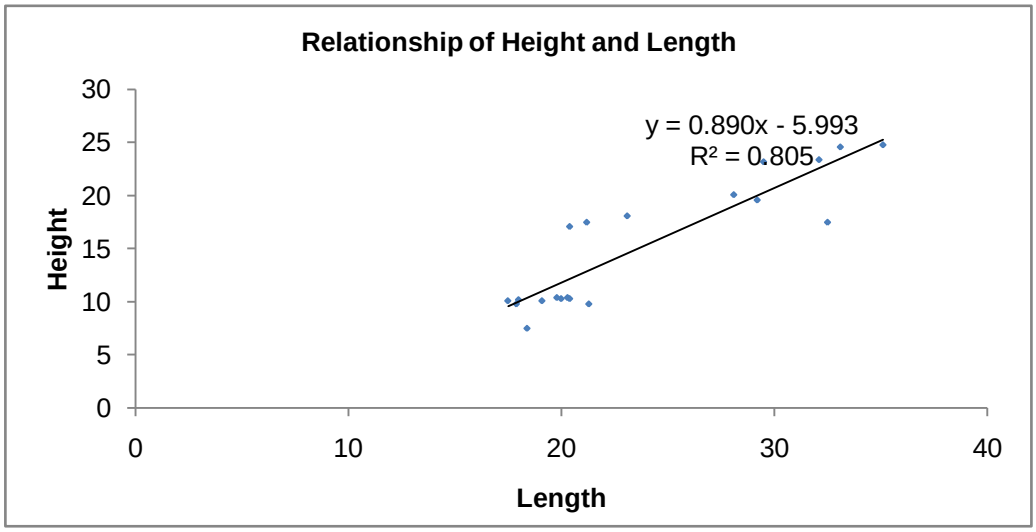

Figure 3. The relationship of body height and length.

Table 1. Mann-Whitney U test statistic for length and height between the Cohorts and between lengths within the Cohorts. Where U= Mann-Whitney U test statistic, P=Probability value, *=Not Significant, **=Significant, ***=Extremely Significant, L=length, H=Height.

Variable to test	U	P	Conclusion
L vz H in Chicken chicks	0.000	<0.05	***
L vz H in Helmeted Guineafowl keets	17.00	<0.05	**
L of Chicken chicks vz L of Helmeted Guineafowl keets	2.500	<0.05	***
H of Chicken chicks vz H of Helmeted Guineafowl keets	0.000	<0.05	***
H of Chicken Chick vz L of Helmeted Guineafowl keets	0.500	<0.05	***
L of Chicken Chick vz H of Helmeted Guineafowl keets	36	>0.05	*

rence in length and height within and between chicks and keets showed significant variation, except to the difference between length of chicks and height of keets (Table 1).

Attitude of People on Helmeted Guineafowl Domestication in Comparison with Ducks and Chicken

The overall score reveled that, HG had highest mean score followed by ducks while chicken being the least (Table 2). The difference was statistically significance (Kruskal-Wallis Test Statistic = 65.037, P<0.05). Measuring parameters varied significantly in total score (Kruskal-Wallis Test Statistic =17.297, P<0.05) for instance, Meat Preference scored highly while resistance to diseases scored least (Figure 4).

DISCUSSION

Preamble to Helmeted Guineafowls in Kibaha

HGs have shown to be superior over chicken and ducks production although the essence of domestication to many people is unknown. For instance their resistance to disease, high priced and demand have attracted these few farmers in Kibaha to engage serious on this business. A finding by Jacob et al. (2011), showed that, people are attracted to domesticate HG for income generation, farm yard ‘watch dog’, insect control, rodent control, source of protein and employment. However this venture in Kibaha Tanzania is still in adolescent stage.

Abundance of Helmeted Guineafowls

The number of HG among keepers varied significantly.

Table 2. Descriptive statistics for scores of Ducks, Helmeted Guineafowl and Chickens as obtained through Likert scaling.

	Ducks	Helmeted Guineafowl	Chicken
Mean	3.62	4.81	2.90
sample variance	0.53	0.16	1.45
sample standard deviation	0.73	0.40	1.21
minimum	2	4	1
maximum	5	5	5
Range	3	1	4
standard error of the mean	0.11	0.06	0.19
skewness	-0.83	-1.64	0.19
kurtosis	0.41	0.71	-0.49
coefficient of variation (CV)	20.20%	8.26%	41.51%
1st quartile	3.00	5.00	2.00
Median	4.00	5.00	3.00
3rd quartile	4.00	5.00	3.00
interquartile range	1.00	0.00	1.00
Mode	4.00	5.00	3.00

This can be attributed by difference in economic level of the owner, variation in knowledge of fowl domestication, availability of stock and newness of the industry in this area. The same scenario has been observed in Nigeria where few people have engaged in the business regardless of high demand of their products. Also the abundance of domesticated HG has observed to be very low when compared to other domestic birds –in this case chicken and ducks (Ikani and Dafwang, 2004). For instance the same findings from Nigeria showed that, HG constitutes only 25% of all domesticated poultry in Nigeria (Ikani and Dafwang, 2004). This has been explained to be caused by lack of knowledge for the domestication of the HG regardless of the benefits accrued.

Growth rate for Helmeted Guineafowls and Chicken

There was a difference in body size in terms of length and height between the HG and chicken. This suggests that, HGs grow faster than the chicken. The variation in growth rate can be attributed to genetic makeup of the HG, high resistance to disease, coping with harsh environment easily than chicken and high conversion rate of food to protein. A study done in Kainji Nigeria found that, helmeted guineafowl can utilize diverse food with high conversion rate (Ayeni, 1983). In addition, the study by Jacob et al. (2011), showed that, Guinea fowl has capacity to resist many diseases unlike chicken which have great implication in terms of growth rate. Finding from Nigeria reveled that, guinea fowl are capable of adapting to harsh environment unlike chicken. This suggests that, with harsh environment the growth of chickens is highly affected while that of guinea fowl being less affected (Ikani and Dafwang, 2004).

Attitude of People on Helmeted Guineafowl Domestication in Comparison with Ducks and Chicken

The attitude of the farmers to these three types of birds (Helmeted guineafowl, Ducks and chicken) varied significantly. The variation has been noticed to be due to the farmer's positive attitude towards HG. The people interviewed said that, HG have low risk of diseases, high price and demand of their products (meat, eggs, chicks and live birds), accepted by many people from different religious denomination, For instance, ducks are not accepted

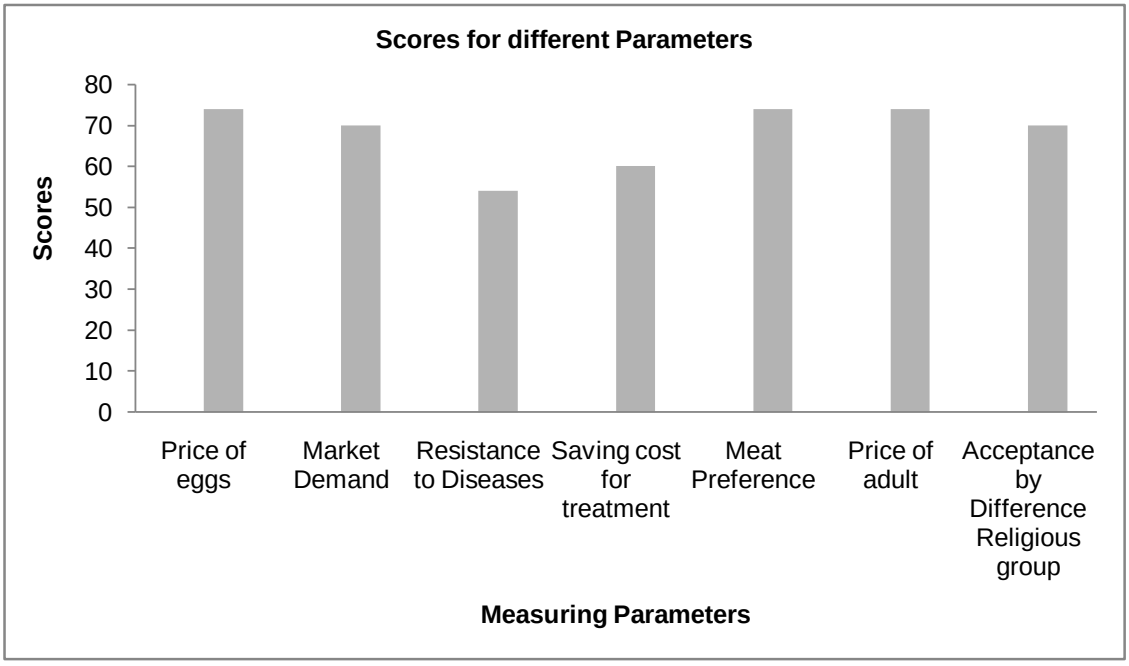

Figure 4. Scores for different Measuring Parameters on the attitude of people.

by Seven Days Adventists while HG are accepted to all religious denomination followers. They suggested that, though the demand for HG products is high, still more education is needed on the best way of producing them not only for domestic use but also for commercial purpose. Similar trends on attitude has been observed in Nigeria, where HG eggs are believed to virility and sexual potency, source of income, high flavor of eggs and their capacity to cop in different weather condition (Ikani and Dafwang, 2004; Moreki, 2009).

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

HG domestication in Kibaha has been observed to be potential source of income and improvement of biodiversity in the inhabited areas. In comparison with other domestic birds, HG scored highest compared to chicken and ducks. However the local communities are not aware of the business. Also even the few who are involved in the keeping HG are lacking the proper knowledge on keeping for domestic and commercial purposes.

Recommendations

The local communities should be provided with education on best way of keeping the HG for domestic use as well as commercial purposes.

- The domestication of HG should be tried to verify if when used as alternative way of reducing pressure from local communities around the protected area can work. For this is anticipated to reduce poaching by providing local communities with income, protein source and employment.
- The governments, policy maker and other stake holders should think beyond HG as only wild-domesticated bird but also as potential means of poverty alleviation. This can be achieved by providing support for those people involving in the venture.

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