Small Ruminant Research 149 (2017) 115–120

Contents lists available at ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Influence of genotype and topography on the goat predation challenge under communal production systems

Charity Durawo, Titus Jairus Zindove, Michael Chimonyo *

Animal and Poultry Science, School of Agricultural, Earth and Environmental Sciences, University of KwaZulu-Natal, P. Bag X01, Scottsville 3209, Pietermaritzburg, South Africa

A R T I C L E I N F O

Article history:
Received 10 July 2016
Received in revised form 26 January 2017
Accepted 31 January 2017
Available online 1 February 2017

Keywords:
Flatlands
Predation
Mountainous areas
Nguni goats
Non-descript goats

A B S T R A C T

The objective of the study was to compare incidence of predation of goats in flat lands and mountainous areas. It was hypothesized that the predation challenge is affected by the genotype of goats and the topography in which they are kept. Data were collected from 195 goat owning households using structured questionnaires; 100 households from the mountainous areas and 95 households from the flat areas. An average of eight goats was reported per household. Diseases and theft, followed by predation were ranked as the major causes of goat losses in both areas. Jackals (*Canis aureus* L.), caracal (*Felis caracal*), wild dogs (*Lycaon pictus*) and leopards *(Panthera pardus)* were the common predators specially during the hot wet season. Farmers owning non- descript crossed goat genotypes were five times more likely to experience predation problems than farmers owning the indigenous Nguni goats. Farmers staying in mountainous areas were 2.3 times more likely to experience predation challenges than farmers in the flat land. Kids were the major class of goat targeted by predators. Predation largely occurred in the veld and drinking areas. The main means to prevent and control predation are discussed. The use of guard dogs, night penning and fences is identified to prevent predation and the use of more adapted Nguni genotypes rather than non-descript crossed animals is recommended.

1. Introduction

Goats play an important role in household food security world wide. Due to their grazing habits, and adaptability to varying climates and nutritional regimes, they are able to strive in harsh environmental conditions. Of the 200 million goats in the Sub-Saharan Africa, about 65% are kept in communal production systems under semi-arid conditions (Department of Agriculture, Fisheries and Forestry, 2011). These goats are owned by resource-poor communal farmers, mainly for household food security, rituals, ceremonial functions and risk aversion (Msangi, 2014). In other parts of the world such as Central America and Asia goat production also constitute an integral part of the livestock industry where they are mainly kept for meat, milk, skin, fibre and manure production (Dubeuf et al., 2004).

Despite their adaptability and abundance, optimum productivity is hampered by large losses from mortality. Kid mortality in extensive got production systems often exceeds 50% (Pandey et al., 1994). Major causes of goat mortality include persistent droughts, extreme temperatures, high prevalence of diseases and predation. There have been several efforts to solve these challenges. Indigenous goats in the Sub-Saharan region can strive the persistent droughts, extreme temperatures, high prevalence of diseases (Rumosa-Gwaze et al., 2010). Whilst there have been extensive studies on ways to reduce goat losses to diseases, parasites, feed and water shortages, there is no data on the extent of goat predation. Predator-driven mortality is still a huge drawback to goat production (van Niekerk et al., 2013).

Due to its increasing threat to goat production, predation has recently been given attention as a challenge to livestock production. For example, in South Africa, the growing concerns over goat losses to predation triggered major organizations such as the National Wool Growers' Association of South Africa, the South African Mohair Growers' Association, the Red Meat Producers Organization and Wildlife Ranching South Africa to form the predation management forum in 2009. Meissner et al. (2013) reported that predation accounts for between 2 and 6% of livestock losses. About 3% of sheep and goat losses in the Northern Cape Province of South Africa are due to predation (van Niekerk et al., 2013). Predation can lead to animals that are in good condition being lost. As high as 10% of goat populations in mountainous environments can be lost due to predation (van Niekerk et al., 2013). Types of livestock preda-

* Corresponding author.
E-mail address: chimonyo@ukzn.ac.za (M. Chimonyo).

http://dx.doi.org/10.1016/j.smallrumres.2017.01.015

tors vary with geographical location. For example, coyotes (*Canis latrans*) and bobby cats (*Lynx rufus*) are the prominent small stock predators in parts of the USA and Canada (Windberg et al., 1997; Conner et al., 1998) whilst in Nepal the snow leopard (*Panthera uncia*) is the most common predator for goats (Jackson et al., 1996). In the Sub-Saharan Africa, major losses are predominantly due to black-backed jackal (*Canis mesomelas*) and secondly to caracal (*Felis caracal*) (Blaum et al., 2009).

Despite its threat to goat production, there is little information on preventing goat losses through predation. Studies on predation shed new light on an important aspect that has received very little attention from researchers and a basis from which practical applications can be derived. No one method of control will completely reduce predation of the goat flock, therefore, the need for farmers to implement an Integrated Predator Management (IPM) strategy. The first step is to identify common goat predators and strategies communal farmers put in place to control predation.

Goat production in communal areas in is generally characterized by free ranging and herding (Rumosa-Gwaze et al., 2009; Hossaina et al., 2015). Goats are herded during the day and penned at night in enclosures usually made with tree branches, a mud wall or other fencing (Sebei et al., 2004). Free ranging is usually practiced during the post-harvest season and goats are penned only at night. As a result, goats might travel long distances in search of better feed sources. In the communal production systems of Southern Africa, different breeds are mixed together as one flock, with household flock sizes ranging from 7 to 20 goats (Mahanjana and Cronjé 2000; Rumosa-Gwaze et al., 2009). Flocks from different households usually graze as one unit of about 120 goats throughout the day (Webb et al., 2003).

Most livestock development policies in Sub-Saharan Africa encourage farmers to keep the exotic or mixed goat genotypes which are fast growing and large-framed compared to the indigenous genotypes. The Nguni, which is the common genotype in communal production systems of Southern Africa, is a small framed genotype that has been reported to be hardy and to thrive under local production conditions (Bakare and Chimonyo, 2011). The mixed genotypes are non- descript crossbreds from mating the exotic Boer, Kalahari Red or the Savannah goat genotypes with indigenous genotypes. It is important to understand that most of the communal farmers occupy the less arable mountainous areas whilst the flat lands are mostly used in commercial farming systems. Occupation of mountainous areas has historical origins, where farmers were displaced from flat fertile lands during colonization. Consequently, rapid population growth rates have forced people to occupy mountainous areas, thus exposing them to predators.

The objective of the study was to determine the challenge of predation on goats in flat and mountainous areas and to identify possible actions to prevent it.

2. Materials and methods

2.1. Study site

The study was conducted in Bergville local municipality in KwaZulu-Natal province, South Africa. Bergville local municipality is situated in UThukela district (28°44′S 29°22′E). The area is situated on the foothills of the Drakensburg Mountains. The southern part of Bergville is fairly flat with scattered kopjes and hills. The area experiences a sub-humid climate with hot-dry and cool-wet seasons. Annual rainfall averages 550 mm. The vegetation type is mainly dense bush veld and foothill wooded grasslands (Nel and Sumner, 2006). The area was chosen based on its distinct differences intopography and the numbers of goats kept. About 65% of the area is mountainous and 35% is flat land. Key informant interviews had indicated high predator challenge in the area.

2.2. Sampling of households

A total of 195 households that owned goats were interviewed; 100 households from the mountainous area and 95 households from the flat area.The respondents were selected and identified with the assistance of local leadership and key informants. Farmers who owned at least three goats for at least a period of three years were selected.

2.3. Data collection

Farmers were interviewed at their homesteads using a pre-tested structured questionnaire. The interviews were conducted in the Zulu vernacular by five trained enumerators. Data collected included household demographics, number and type of livestock kept, goat flock composition and the genotype of goats kept. The Nguni goat genotype was identified using the phenotypic characteristics described by Epstein (1971). The indigenous Nguni goats are multi-coloured goats with a small frame size and small to medium semi- pendulous ears. Goats which did not show distinct phenotypic characteristics as the Nguni, the Savanna or the Boer goats were classified as non-descript. Each farmer was asked to rank grazing area of goats in each season, causes of goat losses, known predators and season they usually attack, classes of goats usually targeted by the predators and strategies used to control goat predators.

2.4. Statistical analyses

All data were analyzed using SAS 9.2 (2008). Mean rank scores for causes of goat losses, areas where predation normally occurs and predators common in each season for each area (flat land or mountainous) were determined using PROC MEANS of SAS (2008). To determine the predictors to predation challenges, an ordinal logistic regression (PROC LOGISTIC) was used to estimate the probability of a household experiencing predator problem. The logit model fitted predictors, area (mountain versus flat), penning frequency (occasionally versus every day) and genotype of goats (non-descript versus Nguni). The logit model was:

$$\mathrm{Ln}[P/1\text{-}P] = \beta_0+\beta_1 X_1+\beta_2 X_2 \ldots + \beta_t X_t + \varepsilon$$

Where:

P = probability of household experiencing predator challenges
$[P/1\text{-}P]$ = odds of household experiencing predator challenges
β_0 = intercept;
$\beta_1 X_{1\ldots}\beta_t X_t$ = regression coefficients of predictors
ε = random residual error

When computed for each predictor ($\beta_1 \ldots \beta t$), the odds ratio was interpreted as the proportion of households experiencing predator challenges versus those that did not experience any predator challenges.

3. Results

3.1. Livestock species kept

Mean herd/flock sizes of livestock species kept by households and goat flock composition are shown in Table 1. In addition to goats, the households kept cattle, sheep, pigs and chickens. The average herd size of cattle, and flock size of sheep were the same in both areas ($P > 0.05$). Flat lands had larger pig herds, goat and