The diet of helmeted guineafowl (*Numida meleagris*) in the Riemland of the north-eastern Free State, South Africa

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This study was conducted to determine the diet of helmeted guineafowl (*Numida meleagris*) in the Riemland and to establish the effects that these gamebirds may be having on cash crop yield. In the Riemland farming community many farmers complain of harvest losses suffered to guineafowl. It was found that the main dietary items during all seasons are corms of weed plants, primarily *Cyperus* spp. Helmeted guineafowl rely to a large degree on waste maize and germinating wheat during winter when natural food is difficult to find. Although they do not pose any problems with regard to maize farming, this is not necessarily true for wheat farming.

Key words: diet, helmeted guineafowl, Riemland.

INTRODUCTION

In Zambia the diet of the helmeted guineafowl (*Numida meleagris*) consists mainly of plant matter during the dry season and animal matter during the rainy season (Farkas 1965). In the Luangwa Valley, these guineafowl do not cause crop damage: to the contrary, their primary diet consists of insects that predate crops and associated surrounding vegetation. Only after the harvest, will they glean waste maize or other crop residues that are available on the soil surface. This gamebird should therefore be an asset to farmers (Farkas 1965). In South Africa, during the winter, the helmeted guineafowl feeds largely on the underground storage organs (corms or 'uintjies') of a range of plants, the green leaves of some pasture plants and a small percentage of invertebrates; whereas during summer insects make up much of the diet (Grafton 1970; Mentis *et al.* 1975).

As in Zambia, most of the agricultural seeds taken in KwaZulu-Natal are from waste grain post harvest (Mentis 1972). Little *et al.* (1995) studied the diet of guineafowl in the Western Cape and found that they consume corms, tubers and seeds, particularly of agricultural weeds, as well as various agricultural crop spillages during the non-breeding (winter) season. During the breeding season (summer), large quantities of arthropods, particularly beetles, were consumed, with the proportion of insects in the diet often exceeding 80% (Little *et al.* 1995).

The aims of this study were to quantify the diet of helmeted guineafowl in the northern Free State province, examine the seasonal variations occurring in dietary patterns and establish if the diet of helmeted guineafowl poses a threat to agronomy.

STUDY AREA

Location

The study area is situated between the towns of Heilbron (27°20′00″S, 27°57′00″E) to the north, Petrus Steyn (27°39′00″S, 28°08′00″E) to the south, Frankfort (27°16′30″S, 28°30′00″E) to the east and Hoogte (27°25′00″S, 28°03′00″E) to the west.

Climate and vegetation

The Riemland is classified by Acocks (1988) as the southern variation of the pure grassland type, *Cymbopogon–Themeda* veld (veld type 48a). It is an undulating area with altitude ranging from 1350 m to 2000 m above sea level (Acocks 1988). Rainfall varies from 450 to 750 mm per annum and winters are subject to severe frost (Acocks 1988). Climax areas consist of mixed to sour grassveld, much of it ploughed for agriculture, and the sandy soil is beginning to break down into sand in many places (Acocks 1988).

Geology

The Riemland forms part of the Witwatersrand Basin and most of the geological formations in the area consist of sandstone or mudstone (Van Eeden 1972).

Land-use

The Riemland was named after the production of 'riempies' (thin leather strips) that took place on a large scale in the area in the early 1900s, as antelope, which were abundant in the area, were

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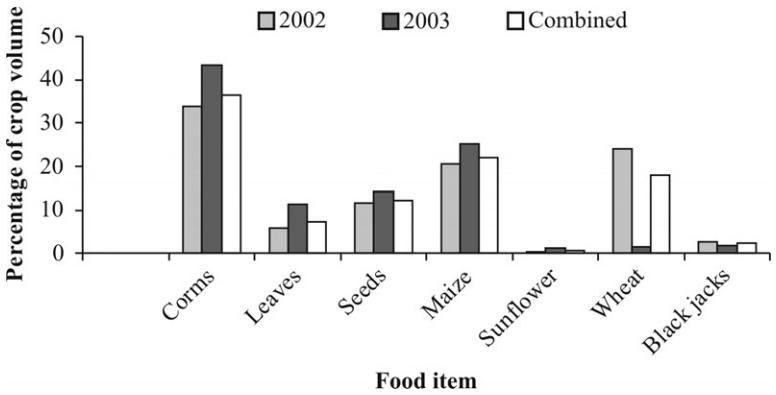

Fig. 1. Winter diet of helmeted guineafowl in the Riemland, South Africa, sampled during 2002–2003.

culled largely for the production of leather. In more recent times, the Riemland has been transformed to a farming area used mainly for agronomy and livestock. The study was conducted over an area totaling 17 840 ha. Natural grassland makes up 50% of the land and the remaining 50% is made up of annual croplands (15.5%), established pastures (23.5%) and fallow land (11%). Maize (7.5%), sunflower (8%) and wheat (5%) (a total of 20.5%) are the most common crops (percentages are given as part of the total area surveyed).

MATERIALS AND METHODS

Winter diet

During the hunting seasons (June to August) of 2002 and 2003, 798 (465 in 2002 and 333 in 2003) birds were collected and their crop contents analysed. The contents were separated into groups of items, e.g. worms, insects, bulbs/corms, maize, wheat, etc. The items in each group were counted and volumetric displacement (to the nearest mm^3) was measured by means of the water displacement method. Totals were calculated for natural foodstuffs (herbivorous feeding), agricultural foodstuffs (graminivorous feeding) and arthropods (insectivorous feeding). The time of day at which birds were shot were documented and this was used to establish a daily time series of their feeding.

Monthly variation in diet

From October 2002 to June 2003, 3–5 birds were collected monthly and the above procedure was repeated. Data for different months were compared to determine any seasonal change in food preferences.

RESULTS

Winter diet

A diet analysis showed that corms (*Cyperus* spp.) were the single most dominant food item in crops (36%) and the rest of the diet is made up largely of wheat and maize (Fig. 1). Large amounts of grass seeds, grass leaves, 'black jacks' (*Bidens pilosa*) and arthropods were found, but because of the small volume of these items, they are not represented clearly as a percentage of the total crop volume. In isolated instances sunflower seeds were found. The animal food consisted mainly of worms (71%) and beetles (17%). Specimens of snails, ants, spiders, hoppers, termites, millipedes, centipedes, flies and ticks were also found. There is a distinct difference in the wheat content of crops from 2002 and 2003. The decrease in wheat occurrence in the crop during 2003 is made up for in volume with a general increase in the occurrence of other foodstuffs.

The volume of the crop contents gradually increased from 6:00 to 14:00 daily, after which it decreased to about 60% of maximum and then stabilized (Fig. 2). Sudden decreases occurred just before 10:00 and just before 16:00. The largest increase in content took place between 10:00 and 13:00 daily.

Monthly variation in diet

Corms were an important part of the diet throughout the year, but were found to peak in October, November and January (Fig. 3). Maize was prevalent from March to August, and wheat featured highly in July and again in November. The presence of sunflower peaked in March. Arthropods were not present in the diet during the winter months, with a sudden increase in November and

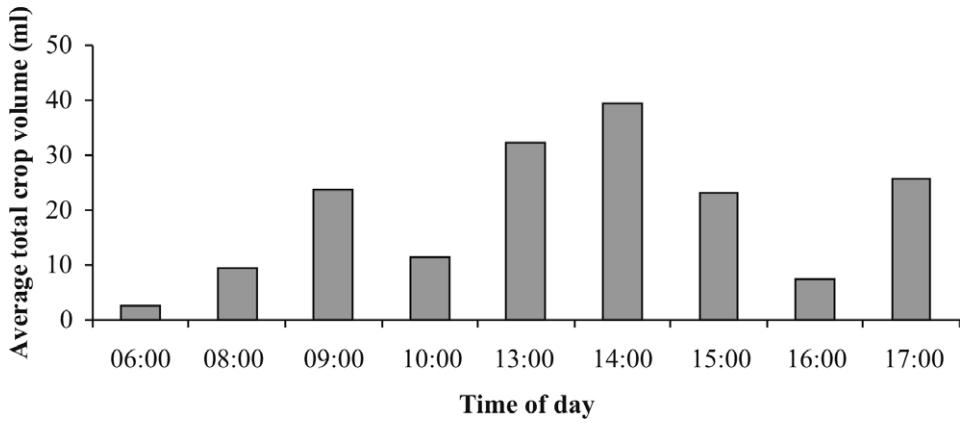

Fig. 2. Variation during the day in total crop volume of helmeted guineafowl sampled in the Riemland, South Africa, during 2002–2003.

a consistent presence during summer through to May.

DISCUSSION

Winter diet

The winter diet of helmeted guineafowl in the Riemland consisted mainly of corms of the genus *Cyperus,* wheat and maize. Grass seeds, grass leaves, black jacks and arthropods also occur in small amounts. This is in agreement with previous studies conducted in South Africa, which showed that during the winter the helmeted guineafowl feeds largely on the underground storage organs (corms) of a range of plants, the green leaves of some pasture plants and a small percentage of invertebrates (Mentis *et al.* 1975). Wheat was prevalent in the diet during 2002, but almost completely absent during 2003. Owing to a lack of rainfall late in 2002 and early in 2003, most of the farmers in the region decided against planting winter wheat.

Riemland farming consists of a combination of agronomy and livestock. Therefore, during a dry year, farmers would readily abandon the majority of cash crops and plant fodder for livestock or

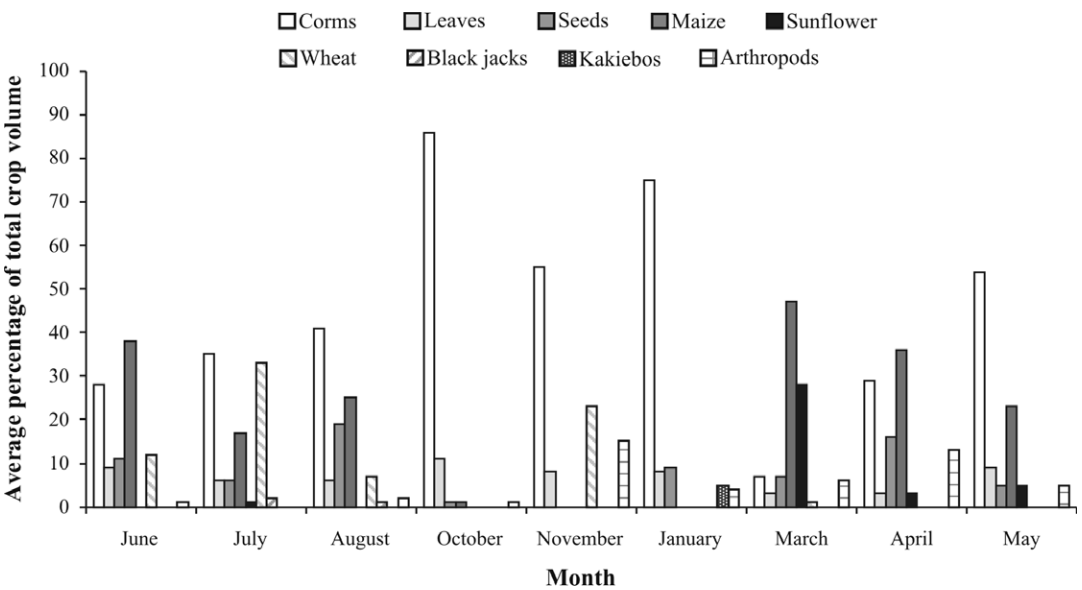

Fig. 3. Monthly variation in crop content of helmeted guineafowl sampled in the Riemland, South Africa, during 2002–2003.

leave the fields fallow. The lack of wheat in the diet can therefore be compensated for by an increase in the availability of weed seeds and insects. From Fig. 1, it is clear that this increase in availability of seeds and insects manifests in the diet of the helmeted guineafowl. This shows that, although there might be preferences, these birds are opportunistic feeders, especially during winter when food is scarce.

According to Grafton (1970), late winter is the most critical period of the year in terms of food availability. The availability of waste maize is essential for guineafowl during this period and this is probably the primary advantage that agricultural areas hold for guineafowl. When natural food is at its most limited, waste maize can serve as an additional source of food that would enhance winter survival.

The results show that corms ('uintjies') are the primary component of the winter diet of helmeted guineafowl in this area, making up 36% of the total volume of the crop contents that were analysed. *Cyperus* spp. are considered an undesirable herbaceous plant in agriculture. A total of 18 296 bulbs of corms belonging to this genus occurred in the 468 crops that were analysed, an average of 39 per bird.

A relatively high volume of maize also occurs in the crops. By the time the first birds were collected, the harvest had already been collected in the particular areas where the birds were shot. The maize in the crops could therefore not have been taken from maize plants, but is much more likely to be waste maize that was dropped on the ground during the harvest. Very low levels of sunflower and arthropods occur. Neither of these are common during the winter and therefore not available to guineafowl during this time of the year.

The largest amount of food is taken between 10:00 and 13:00 (perhaps because of the big time lapse without sampling between these hours). The second largest and probably more significant feeding peak was recorded between 8:00 and 9:00. The sudden decrease in volume for birds shot at 10:00 remains unexplained. It seems that more food was digested during this period than was eaten. This may also explain the gradual decrease that took place from 14:00 onwards. The sudden drop occurring at 16:00 can be disregarded because of the small sample size (12 birds) for this time. The crops main function as a storage organ is to supply food to the gastric apparatus as constantly as possible (Ziswiler & Farmer 1972).

Seasonal variation in diet

Arthropods are more prevalent during summer. Arthropods are a source of protein and the sudden increase in November indicates a need by the guineafowl to take protein before the breeding season. Because of very late commencement of rainfall, insects only became available late in 2002 (November) and, because of a very late onset of winter temperatures, were still available in small amounts during the beginning of winter (May 2003). This correlates with the amount of insects in the diet. This trend would suggest that insects are taken in small amounts when available as a protein source, with a very high prevalence just before the breeding season. The increase in gonad size and production of sperm that takes place before the breeding season requires high amounts of protein in the diet (Crowe 1978). Eggshells also consist mainly of protein and the formation of eggs would therefore also require high amounts of protein in the diet.

In South Africa, as in Zambia (Farkas 1965), most of the agricultural seeds taken are from waste crops after harvesting, and not readily from crop plants directly (Mentis 1972). Maize is clearly not taken during the planting season (October–December) (Fig. 3). This could be because maize is generally laid in pesticide before being planted and any guineafowl that do eat maize that are wasted by the mechanical planters, will be poisoned. Maize only started appearing in the crops in March. It is clear that planted maize seeds are therefore not scratched out by guineafowl, as has become a myth. When harvesting takes place (commencing in June), maize becomes prevalent in the diet. This would suggest that waste maize is gleaned from the ground as spillage from harvesters occurs. Allowing waste maize to remain on the fields may be a way to provide guineafowl with a ready food source and may prevent them from digging up germinating wheat.

From the monthly data (Fig. 3) it is evident, however, that guineafowl may pose a problem with regard to wheat farming. Wheat is prevalent in the diet during July (just after planting) and again in November (just after harvesting). Germinating wheat plants are, according to the crop data, utilized for food during the winter months.

No evidence was found of guineafowl posing any problem with regard to maize farming. On the contrary, large amounts of weeds and insects are taken, which should be an advantage to agriculture.

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