Preliminary Results on Determination of Foods Eaten By Some East African Wild Ungulates

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Knowledge of the feeding habits of wild animals is central to effective wildlife management and to many phases of ecological research in wild lands. Very few data are available on this subject in East Africa. One of the aims of the present ecological study has been to obtain food preference data from several species of plainsland herbivores. Most of the data have not yet been processed, but preliminary results from five of the most common herbivores are presented below.

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Methods

Observation:

Initially, an attempt was made to determine the foods eaten by observation alone. Animals of various species were observed with ten powered binoculars from as close a range as possible to determine which plants or grasses were being eaten, and the individual plants were then identified. Usually, in the case of animals eating bushes, trees, or isolated herbs or grass plants, the observational method was quite satisfactory. However, with animals feeding on grasses or herbs in grassland, the observational method proved of very limited value. Throughout much of the study area, six or more species of grass may occur within a square foot, and several species may be found growing in the same clump. Under these conditions even if one were to stand beside the animal, it would be difficult to identify which individual plants were being eaten. This problem is magnified when the observation must be carried out from the distances involved with most wild animals. Examination of stomach contents of grass eating animals collected immediately after their feeding was observed in the above manner has shown the observational method to be more often wrong than right.

Examination of plants to identify those which have been fed upon also proved of limited value. Where domestic livestock plus from six to over twenty wild herbivores feed on an area, it is most difficult to tell what animal has eaten which plant.

A further limitation to the observational method in this work is that even when identification of the plant foods is possible, one can only get a qualitative idea of the plants eaten. Except in the general terms of time spent actually eating each food species, no quantitative picture can be given from observation alone of the food species preferences and relative amounts of each ingested.

Faecal analysis:

Some successful work has been done identifying the foods eaten by an animal through analysis of the faeces. Successful application of this method requires determining the microscopic and macroscopic identification characteristics of the various food plants, and a knowledge of the relative digestability of the species involved. Favorite succulent grasses making up the bulk of the diet may be so completely digested that their identification in faeces is most difficult, while an occasional coarse plant of a species rarely taken may be passed through the digestive tract in readily identifiable form. Thus simple analysis of the faeces involved might give an erronious picture of the food preferences, and only with a considerable background research could analysis yeild an accurate quantitative picture of the food habits.

Ruminal or Oesophogeal Fistulas:

Fistulas have been used with outstanding success to determine food preferences and characteristics from domestic animals, and to a limited extent with tame deer in the United States. They allow an investigator to collect a sample of the food after it has been eaten, but before it has been subjected to rumination and/or digestion. The effective use of a fistula requires a tame animal whose feeding preferences have not been altered by the taming. No such animals of the species involved have been available to us. Consequently, this method, while probably being the most accurate and satisfactory means of determining food preferences of an herbivore, has not been possible in this study.

Stomach samples:

The method adopted as standard for the present study has been to examine the stomach contents of freshly collected animals. A grap sample is taken at random through the contents. This sample is spread out, and the recently ingested food (items eaten usually within the last hour or two) separated out. These are then separated by species, and the percent composition of the identified species and unidentified herbaceous

and grass material in this sample is estimated carefully. A sample is then preserved in formalin or spirits for future quantitative and qualitative detail analysis.

The sample thus obtained is a sample not of the entire rumen contents, but of what has been eaten within the past hour or two. Since the animals are collected at all times of day, from dawn to dusk, when sufficient specimens have been collected the result is a valid sample of the species' feeding habits from roughly two hours before sun-up to dusk. Night collecting could provide a 24 hour sample if the species' habits warranted it.

In addition, the total stomach contents is spread out and the total percentages of grass to other types of food estimated, along with the percent of green to dry matter. These in each case have closely approximated or duplicated the sample results.

A further species check is obtained from food in the mouth of animals killed instantly with a neck vertebrae shot, and from animals immobilized with Flaxedil or succinylcholine chloride. When animals are immobilized with these two drugs, the jaw and muscles controlling swallowing are the first to be paralysed, so food remains in the mouth when the animal is immobilized, and subsequently the food in the mouth can be easily removed.

To date, in the course of the present study, 248 animals representing individuals of 15 species have been examined. In most cases the examinations have included stomach contents, and samples have been preserved for future analysis. The preliminary data below represents field analysis from individuals of the five commonest species in the study area, and only those individuals have been included which have been examined -- qualitatively and quantitatively -- in the standardized method described above.

Results

A summary of the preliminary results is presented in Tables I - V. Nomenclature for animals follows Swynnerton and Hayman (1950) and that for plants Bogdan (1958).

The foods eaten have been first divided into two classes: grasses and other material (herbs, shrubs, trees and seeds). Within each catagory the genera and, if possible, the species is determined. With grass species, the food is further subdivided into leaves, stems, dry material, seed heads, runners and roots.

The percentage figures are based on careful, cross-checked estimates and counts. All percentages are rounded off to the nearest percent, and any figure below 1% is noted as a "trace."

Column II in Section III gives the relative amount of each food item expressed as a percentage of the total sample contents of all stomachs; it gives the relative amounts of each food item expressed as an average percent of an average stomach, based on the stomach contents samples. Columns III through VII give the portion of the individual plants eaten, each portion being expressed as a percent of the total for that individual plant. For example, in Table I, Hyparrhenia lintonii represents only a trace item in the total sample stomach contents. Of that trace, 50 % is green leaves and 50 % green stalks.

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Table I

Animal species: White-bearded Wildebeest (Gorgon taurinus)

Number of stomachs: 60 (males, females, and young)

Location: Kenya, Narok District; Loita Plains and Mara region: 44
Kenya, Kajiado District; Athi Plains and Rift Valley: 4
Tanganyika, Serengeti Plains south of park boundary: 10

Date of collection: September, 1959 - December, 1960

1. Class of Foods:

Grass: 98 % (80 % identified, 20 % unidentified)

Other: 2 % (trace of Sida schimperi, Justicia sp., seeds, the rest unidentified)

2. Total Dry Material:

% of stomachs contained	% dry material
72.4	0 - 10
8.6	11 - 33
10.3	34 - 67
8.6	68 - 100

3. Food Analysis:

I Item	II % in total sample stomach contents	III Portion of plant eaten: green leaves	IV green stalks	V dry	VI % within species seed head	VII runners roots
Grass:						
Themeda triandra	26	78	14	6	2	-
Pennisetum mezianum	19	52	33	15	2	-
Cynodon dactylon	12	63	28	7	-	2
Aristida spp.	5	64	26	5	-	5
Bothriochloa insculpta	4	74	26	-	-	-
Eragrostis spp.	3	65	26	9	-	-
Microchloa kunthii	3	62	24	-	14	-
Digitaria spp.	3	90	10	-	-	-
Sporobolis spp.	3	63	21	16	-	-
Chloris sp.	trace	75	25	-	-	-
Hyparrhonia sp.	trace	75	25	-	-	-
Panicum sp.	trace	67	33	-	-	-
Hyparrhonia lintonii	trace	50	50	-	-	-
Grass - unidentified	20					
Other:						
Herbs - unidentified	2	100	-	-	-	-
Seeds - unidentified	trace	-	-	-	100	-
Sida schimperi	trace	100	-	-	-	-
Justicia sp.	trace	100	-	-	-	-

Remarks: There was no significant difference between stomach contents of the wildebeest from the three locations. Calves contained some grass in the rumen from the age of about ten days. There does not appear to be any significant difference between grasses eaten by the young and those eaten by adults. Milk was found in the abomasum in some young animals up to the age of 16 months, although most are completely weaned by 12 months.

Table II

Animal Species: Thomson's Gazelle (*Gazella thomsonii*)

Number of Stomachs: 10 (males, females, and young)

Location: Kenya, Narok District; Loita Plains and Mara region - 7

Tanganyika, Serengeti Plains south of park boundary - 3

Date of Collection: February 1960 - December 1960

1. Class of Foods:

Grass: 80 % (82 % identified, 18 % unidentified)

Other: 20 % (69 % identified, 31 % unidentified)

2. Total Dry Material:

% of stomachs	contained	% dry material
50		0 - 10
50		11 - 67

3. Food Analysis:

I Item	II % in total sample stomach contents	III Portion of plant eaten: green leaves	IV green stalks	V dry	VI % within species seed head	VII runners root
Grass:						
Cynodon dactylon	21	57	43	-	-	-
Pennisetum mezianum	15	80	20	-	-	-
Panicum sp.	12	50	50	-	-	-
Digitaria spp.	7	40	60	-	-	-
Eragrostis spp.	7	40	60	-	-	-
Thomoda triandra	3	100	-	-	-	-
Unidentified	15					
Other:						
Sida schimperi	5	100	-	-	-	-
Solanum sp.	4	70	-	-	30	-
Justicia sp.	2	100	-	-	-	-
Leguminous seeds	2	-	-	-	100	-
Courbonia sp.	1	70	-	-	30	-
Unidentified	6					

Table III

Animal Species: Grant's Gazelle (Gazella granti)

Number of Stomachs: 10 (males, females, and young)

Location: Tanganyika, Serengeti Plains south of park boundary - 8
Kenya, Narok District, Mara region - 2

Date of Collection: February, 1960 - December 1960

1. Class of Foods:

Grass: 40 % (84 % identified, 16 % unidentified)

Other: 60 % (67 % identified, 33 % unidentified)

2. Total Dry Material:

% of stomachs contained	% dry material
30	0 - 33
40	34 - 67
30	68 - 100

3. Food Analysis:

I Item	II % in total sample stomach contents	III Portion of plant eaten: green leaves	IV green stalks	V dry	VI % within species seed heads	VII runners roots
Grass:						
Harpachne schimperi	10	67	33	-	-	-
Cynodon dactylon	9	80	20	-	-	-
Hyparrhenia lintonii	9	80	20	-	-	-
Microchloa kunthii	6	50	30	-	20	-
Thomeda triandra	trace	80	20	-	-	-
Unidentified	6	5	70	25	-	-
Other:						
Indigofera sp.	11	60	40	-	-	-
Sida schimperi	11	90	10	-	-	-
Solanum sp.	6	80	-	-	20	-
Legume seeds, pods	4	-	-	-	100	-
Aster sp.	4	60	40	-	-	-
Balanites aegyptica	2	100	-	-	-	-
Unidentified	22					

Remarks: Of the animals considered in this paper the Grant's gazelle has the highest percent consumption of items other than grass. In spite of the availability of other food species, the principal species of grass and other foods chosen by the Grant's gazelle are those which invade or become dominant in overgrazed, abused, grasslands in the study area (Heady, 1959; Talbot, 1960). With the exception of Cynodon dactylon, this animal's food preferences are complementary to those of domestic livestock and the other wild animals studied.

Table IV

Animal Species: Impala (Aepyceros melampus)

Number of Stomachs: 7 (male, female, and young)

Location: Kenya, Narok District, Mara region - 6
Kenya, Kajiado District, Rift Valley - 1

Date of Collection: January, 1960 - December, 1960

1. Class of Foods:
   Grass: 56 % (74 % identified, 26 % unidentified)
   Other: 44 % (67 % identified, 33 % unidentified)

2. Total Dry Material:

% of stomachs	contained	% dry material
100		0 - 33

3. Food Analysis:

I Item	II % in total sample stomach contents	III Portion of plant eaten: green leaves	IV green stalks	V dry	VI % within species seed heads	VII runners roots
Grass:						
Themeda triandra	11	67	33	-	-	-
Pennisetum mezianum	10	31	31	38	-	-
Panicum maximum	10	77	23	-	-	-
Chloris gayana	7	56	44	-	-	-
Cynodon dactylon	4	83	-	17	-	-
Unidentified	15					
Other:						
Solanum sp.	15	60	-	-	40	-
Legume seeds, pods	15	-	-	-	100	-
Eucleo schimperi	4	100	-	-	-	-
Unidentified	15	100	-	-	-	-

Table V

Animal Species: Topi (*Damaliscus korrigum*)

Number of Stomachs: 5 (male and female)

Location: Kenya, Narok District; Mara region

Date of Collection: July, 1960 - December, 1960

1. Class of Foods:

Grass: 97 % (65 % identified, 35 % unidentified)

Other: 3 % (all an unidentified species of Cyperaceae)

2. Total Dry Material: % of stomachs contained % dry material

100 67 - 100

3. Food Analaysis:

I Item	II % in total sample stomach contents	III Portion of plant eaten: Green leaves	IV Green stalks	V dry	VI % within species Seed heads	VII Runners roots
Grass:						
Cynodon dactylon	14	21	5	74	-	-
Aristida spp.	13	18	41	41	-	-
Pennisetum mezianum	9	trace	17	83	-	-
Themeda triandra	8	55	-	45	-	-
Harpachne schimperi	8	27	27	46	-	-
Eragrostis sp.	7	-	33	67	-	-
Bothriochloa insculpta	4	20	-	80	-	-
Unidentified	34					
Other:						
Cyperaceae (Carex?)	3	100	-	-	-	-

Remarks:

Green material of all species taken was present at the sites where each of the animals involved was collected, and the stomach contents of wildebeest collected at the same time on the same location contained about 100 % green material. Therefore the preponderence of dry material in the topi stomachs reflects choice rather than necessity.