

Bushmeat in Nigeria as a Natural Resource with Environmental Implications*

by

G.H.G. MARTIN, Ph.D.(C.N.A.A.), Dip. Cons.(U.C. London)

Department of Biological Sciences, University of Benin, P.M.B. 1154, Benin City, Nigeria; currently Lecturer, Department of Zoology, Kenyatta University College, P.O. Box 43844, Nairobi, Kenya.

INTRODUCTION

Malnutrition is a world-wide problem especially in the Third World, where the production of animal protein has long been insufficient to meet demands (FAO, 1970). This is true in Nigeria, where food consumption widely falls below levels that are generally acceptable in both quality and quantity (Olayide *et al.*, 1972). Recognition of this fact was one major reason that led the Nigerian Government to instigate the current programme, Operation Feed the Nation (OFN), which is aimed at increasing domestic food-production.

It has frequently been suggested that one way to alleviate the general protein shortage in the African continent would be the greater use of wildlife as a human food-resource (Talbot *et al.*, 1962, 1965; Mossman, 1963; Bigalke, 1964; Dasmann, 1964, 1965; Talbot, 1964; Skinner, 1967, 1973; Crawford, 1968, 1974; Asibey, 1969a, 1969b, 1974a, 1974c; Pollock, 1969; Deane & Feeley, 1971; Johnstone, 1971; Retief, 1971; Hartog & Vos, 1973; Topps, 1975).

Most of the work in this field has been carried out in East and South Africa, where a number of workers have examined various species of wild animals in relation to their meat characteristics (including Zyl, 1962; Ledger, 1963a; Talbot, 1963; Ledger & Smith, 1964; Ledger *et al.*, 1967; Chevallier, 1970, 1972).

The present study concentrates on the utilization of wild animals as a food resource in Nigeria together with some related economic values of wildlife, as these aspects have a direct application and relevance to current needs of many Third World countries.

West Africa has not the variety or number of large game animals that are found in East and Southern Africa. Nevertheless, wildlife is an important source of protein in many areas of West Africa, and a number of reports have been published urging closer examination of the potential of the wild animals of the area as a human food-source and for other economic uses (Cremoux, 1963; Petrides, 1965; Asibey, 1969a, 1969b, 1974a; Curry-Lindahl, 1969a, 1969b; Ajayi, 1971; St John, 1971; Child & Henshaw, 1972; Charter, 1973).

In West Africa, Ajayi (1975a, 1975b, 1976) in Nigeria, and Asibey (1969a, 1974a, 1974b, 1976) in Ghana, have been the principal workers in the field of developing the practical aspects of utilizing wildlife as a source of pro-

tein. Although it was known that wildlife formed an important source of protein in Nigeria (Nigerian Federal Office of Statistics, 1967; Charter, 1973), the only known survey of the market structure for this type of meat was the one carried out by Olawoye & Ajayi (1975) in Ibadan City.

In Nigeria, meat from wild animals is commonly known as 'bushmeat', and this term is employed for such meat throughout the present paper. The main objective of the study was to provide a more up-to-date general picture of the consumer section of the bushmeat market, particularly in Southern Nigeria, than was currently available. A second major objective was to investigate the economic and nutritional value of this renewable resource. The study was aimed at providing the information necessary for the design and justification of the next stage in a research programme investigating the domestication of species of wild animals that were found to be widely acceptable as human food, and studying wild populations with a view to game-cropping. The role of bushmeat in the economy of the country also has very wide environmental implications.

Three lines of research were pursued:

1. A survey of bushmeat sold by the roadside;
2. A survey of meat prices in local markets; and
3. A questionnaire survey of bushmeat consumption by the general public.

METHODS

1. Roadside Survey

At least once in each month, a survey was made of the bushmeat observed as being for sale along the 190 km length of the main Auchin-Benin-Sapele road in Bendel State, Nigeria (Fig. 1), from November 1976 to the end of October 1977. This road was selected as it runs roughly North-South through both derived guinea savanna in the north and rain-forest in the south. Roads that were surveyed less frequently were the Benin-Asaba road and the Irrua-Illushi road (Fig. 1). Other roads were surveyed occasionally. The species and number of bushmeat animals displayed for sale were noted, and a record of the prices and weights of the various species were made wherever possible. After October 1977, regular surveys were discontinued but records continued to be kept during normal travel around Bendel State.

2. Survey of Meat Prices in Local Markets

Two sources of information were used in this study: firstly, interviewers engaged in the questionnaire survey were instructed to record the price per kilogram of different kinds of meat found in the local markets. Secondly, consumer guides in local papers were consulted. An

* We regret the delays in publication of this paper, due to various factors including chronic difficulties of communication, but are assured by a distinguished West African referee that conditions have not changed enough in the last few years to invalidate what he further reassures us is a valuable contribution. - Ed.

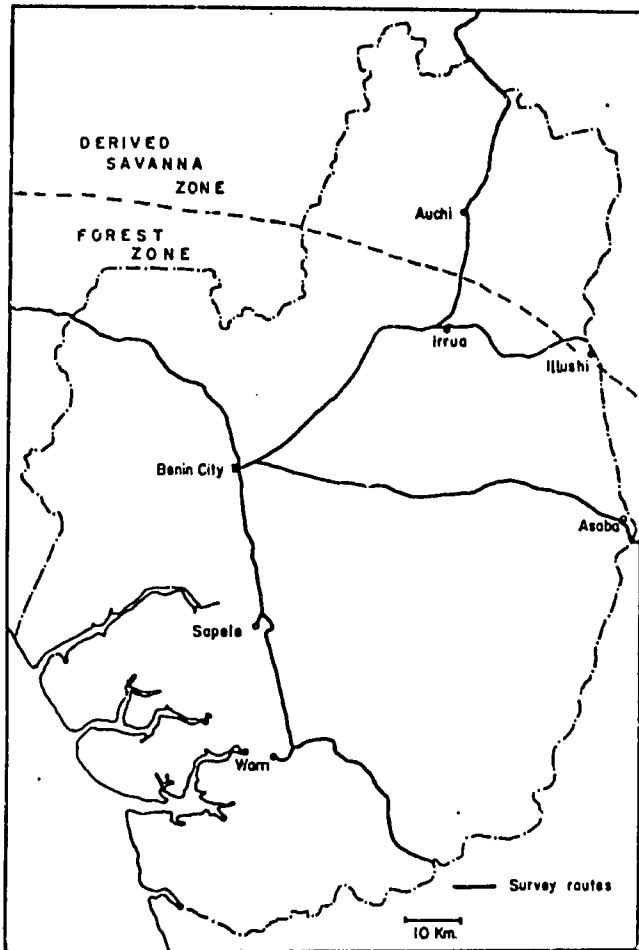


Fig. 1 Sketch-map of Bendel State, Nigeria, showing principal roadside survey routes.

approximation of meat prices was made from comparisons of these two sources.

3. Questionnaire Survey

The study area:—The area covered in the survey was virtually the whole of Southern Nigeria and parts of Plateau and Bauchi States. However, due to limitations of finance and transport facilities, the majority of the interviews were conducted in and around the following population centres: Lagos, Ibadan, Benin, Agbor, Sapele, Warri, Port Harcourt, Owerri, Jos, and Bauchi (Fig. 2).

Problems affecting survey design:—A survey should provide the information necessary to give an accurate idea of the survey subject, in this instance the bushmeat market. From the data collected, it was hoped that reliable assessment could be made of the size and value of the bushmeat market—including preferences, prejudices, and requirements, of consumers. Information would be desirable on a host of other factors—such as income group, ethnic group, religion and the geographical location, of market participants, as all these can affect market conditions.

The survey involved the use of questionnaires, the simplicity of which had to be maintained both for the benefit of the interviewees (who had very limited ex-

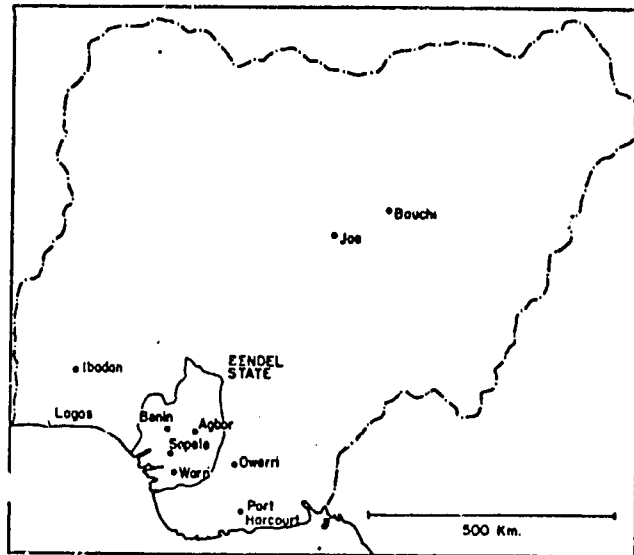


Fig. 2. Sketch-map of Nigeria showing position of Bendel State and population centres in and around which interviews were conducted.

perience of survey methods) and for members of the public. Further, interviewees were often poorly educated and so were understandably suspicious of answering questions. Other problems included ethnic barriers and communications in an area where up to 400 languages have been estimated as being spoken (Bangbose, 1971). The *lingua franca* of Southern Nigeria is pidgin English, which does not allow for much subtlety of expression; this can lead to misinterpretation of a question and/or answer. Long questionnaires could lead to boredom with answering questions, resulting in the forms being left incomplete. The considerations outlined above meant that questionnaires had to be kept fairly short and simple.

Stratification of the survey:—In order to get an unbiased picture, a survey should be designed to ensure that the sample of the population interviewed is representative of the whole population. This is extremely difficult even when socio-economic statistics are available for consultation during the designing of a questionnaire survey. In Nigeria, where such statistics are incomplete, it is even more difficult. The necessity of keeping the survey questionnaires fairly simple for the reasons outlined previously, imposed an additional limitation on the complexity of the questionnaire.

An attempt was nevertheless made to reduce any sampling bias of the consumer section of the market by limited stratification of the survey. The criteria used were: firstly, location of interview, i.e. whether the questionnaire was presented in an urban or rural area; and, secondly, the income group of the interviewee. These two criteria were selected because it was obvious that they would have great influence on the availability of bushmeat for purchase and an individual's ability to buy. Data relating to the first criterion showed that about 70% of the population of Nigeria live in rural situations and 30% in urban areas.

As far as the information on the second criterion was concerned, statistics relating to the proportion of the

TABLE I. The Proportion of the Population in Various Income Groups.

Annual Income (Naira*)	% of population in income group		
	Rural	Urban	Combined
Less than 500	18	7	25
500-1,000	27	11	38
1,000-2,000	21	9	30
2,000-4,000	2	2	4
Over 4,000	1.5	1.5	3

*Naira = ₦ = approximately US\$ 1.5 or £ 0.8 in 1977.

population in various income groups was not readily available. However, Professor J. Sada of the University of Benin kindly supplied some results from his own socio-economic researches on urban populations. Using these data as a basis, the percentage of the population in the various income-groups shown in Table I was derived. It should be emphasized that these figures are essentially 'guesstimates' based on the limited data available, and for which the Author takes responsibility.

Interviewers were instructed to present the questionnaire forms to the general public in rural and urban areas in the proportions according to the income groups shown in Table I. There are of course other important factors, such as cultural and ethnic background and religious beliefs, that would affect market conditions; but to have incorporated these into the survey design would have increased the complexity of the stratification immensely—almost certainly to the extent of causing confusion to interviewers and interviewees alike. Therefore, questions on these factors were not included in the questionnaire.

Interviewers:—The questionnaire forms were presented by undergraduates of the University of Benin who were doing major courses in biological subjects. Interviewers were carefully briefed on the survey aims and methods, and especially on the purpose of the different questions. In addition, interviewers were issued with instruction sheets. After briefing, they were sent into Benin for a practice period before going to their assigned areas.

The questionnaire:—Interviewers were asked to note the date and location of the interview, and the sex of the interviewee; wherever possible they were required to record the profession, annual income, and place of origin, of the person who was being interviewed. Interviewees were then asked the following questions:

1. Do you eat bushmeat?
2. What species do you eat most regularly?
3. What other species have you eaten?
4. What species are not eaten?
5. How often do you eat bushmeat?
6. Approximately how much do you spend on bushmeat in a week?
7. Can you get as much bushmeat as you want?
8. Indicate the order of preference for the following meats: a) chicken, b) snails*, c) beef, d) your preferred bushmeat animal, e) goat, f) mutton, g) pork.

*Snails were placed in a separate category from bushmeat animals as some people did not think of snails as bushmeat.

9. Would you eat bushmeat if the animal were domesticated?
10. If you would not eat domesticated bushmeat animals, say why not.
11. If you would eat domesticated bushmeat animals, what species would you prefer?
12. Why do you not eat bushmeat? (If the answer to Question 1 is NO), or that particular species? (see Question 4).
 - a) Because it is regarded as taboo or jujju by your people?
 - b) because of diseases or parasites it may carry?
 - c) because of personal dislike?
 - d) other reasons?
13. What is the average price you pay for a) Grasscutter, b) small antelope?

RESULTS

Roadside Survey

The survey showed that the Grasscutter (*Thryonomys swinderianus*), small antelope species (mainly *Cephalophus* spp.), and Brush-tailed Porcupine (*Atherurus africanus*), were the wild animals most commonly sold as bushmeat in Bendel State (Table II). The numbers of the

TABLE II. Animals Recorded for Sale by the Roadside.

Species	Number	% of total
Small antelopes (mainly <i>Cephalophus</i> spp.)	236	25.8
Grasscutter (<i>Thryonomys swinderianus</i>)	186	20.4
Brush-tailed Porcupine (<i>Atherurus africanus</i>)	174	19.0
Giant Rat (<i>Cricetomys gambianus</i>)	74	8.1
Monkeys (mainly <i>Cercocebus torquatus</i> and <i>Cercopithecus mona</i>)	72	7.9
Viverrids (mainly <i>Viverra civetta</i> and <i>Nandinia binotata</i>)	36	3.8
Bushbuck (<i>Tragelaphus scriptus</i>)	30	3.3
Bush-pig (<i>Potamochoerus poreus</i>)	28	3.1
Bushdog (<i>Dendrohyrax arboreus</i>)	28	3.1
Pangolin (<i>Manis</i> spp.)	16	1.8
Potto (<i>Perodicticus potto</i>)	10	1.1
Flying squirrels (<i>Anomalurops</i> spp.)	8	0.9
Birds	2	0.4
Snakes	6	0.6
Tortoises and 'Turtles'	2	0.4
	<u>914</u>	<u>100</u>

Giant African Snail (*Archachatina marginata*) were not counted, but their sale was widespread in Bendel State, where they were commonest in the forested areas of the south.

The results of the meat price survey (Tables IIIa & b) indicate that, apart from frozen fish in local markets, most types of meat sold for about two naira a kilogram in 1976-77. Chickens sold alive in local markets sometimes compared unfavourably in price with some coldstore packs of dressed birds at ₦ 17.50 for 10 kg.

TABLE IIIa. Meat Prices in Nigerian Markets* (November 1976-October 1977).†

Meat	Approximate price (Naira**) per kg
Chicken, local, alive	2.00
Chicken, dressed, coldstore (in 10 kg packs)	2.00
Chicken, dressed, supermarket	3.50
Beef, local	2.00
Beef, local, supermarket	3.50
Beef, imported steak, supermarket	7.00
Goat, local	2.50
Pork, local	2.00
Pork, local, supermarket	4.00
Mutton, local	2.00
Mutton, imported, supermarket	4.00
Fish, iced	0.75
Fish, local, fresh	4.00

* Unless otherwise stated, prices are based on meat purchased in traditional markets.

† In response to our request for updating Dr Martin replied (in *lit.* 7, September 1982), 'from sources I have kept in touch with since leaving Nigeria [in mid-1979?] the bushmeat situation does not appear to have changed significantly' although some increases are indicated below.—Ed.

** Naira = ca US\$ 1.5 = ca £ 0.8 in 1977.

TABLE IIIb. Prices of Some Bushmeat Species based on Animals Obtained from Roadside Sellers (November 1976-December 1977).†

Species	Approximate price (Naira**) per kg
Grasscutter (dressed carcass)	5.00
Brush-tailed Porcupine (dressed carcass)	5.50
Duiker, Maxwell's (dressed carcass)	4.25
Bush-pig (fresh-butchered portion)	5.00
Bushbuck (fresh-butchered portion)	2.00
Snails (including shell)	1.40

** Naira ₦ = ca US\$ 1.5 = ca £ 0.80 in 1977.

However, they were still cheaper than most chickens sold in modern supermarkets. Perhaps the most noticeable feature was the high cost of bushmeat (based on a butchered carcass); only the best cuts of imported steak were more expensive.

Questionnaire survey:—Some 5,100 questionnaires were collected, many of which were incomplete but still provided useful information. Not all interviewers kept to the criteria recommended but, overall, stratification was quite close to that planned (Table IV).

The frequency of bushmeat eating was very similar in income groups above 500 a year; people with the lowest incomes tended to eat bushmeat less regularly than those in higher-income groups. In the percentage of interviewees who never ate bushmeat, there was a downward trend from the lowest-income group to the highest (Fig. 3 upper). Some 95% of those interviewed ate bushmeat; however, those in rural areas ate bushmeat more regularly than those in urban areas (Fig. 3 lower).

TABLE IV. Stratification of Questionnaire Survey, Objectives, and Achievements (%)

	Locations	Objective	Achieved
	Rural	70	65.9
	Urban	30	34.1
	Income Group*		
Rural	< 500	18	17.8
	500-1000	27	25.1
	1000-2000	21	18.8
	2000-4000	2	2.7
	> 4000	1.5	1.5
Urban	< 500	7	6.4
	500-1000	11	12.2
	1000-2000	9	11.6
	2000-4000	2	2.8
	> 4000	1.5	1.1
Combined	< 500	25	24.2
	500-1000	38	37.5
	1000-2000	30	30.4
	2000-4000	4	5.5
	> 4000	3	2.6

* Naira per annum.

The average amount of money spent per month on bushmeat showed a distinct trend, with those in high-income groups spending much more on it than those in the lower-income groups (Fig. 4 upper). Some 20% more was spent on bushmeat by people in urban areas as compared with those in the countryside (₦ 10.49 as compared with ₦ 8.75). A combined average for the amount spent per month on bushmeat was ₦ 9.31 (Fig. 4 lower). Some 60% of the bushmeat-eating members of the public interviewed, stated that they were unable to get enough bushmeat.

The results in Table V reveal that the Grasscutter (*Thryonomys swinderianus*) was the species eaten most regularly, followed by the small antelopes. Over a dozen other wild animals, ranging from Elephant (*Loxodonta africana*) to monitor lizard (*Varanus* sp.) made up the 'other species' category (questionnaire item 3, see above). The average cost per animal of these two most regularly eaten bushmeat items was ₦ 11.42 for a Grasscutter and ₦ 17.37 for a small antelope.

The average order of preference for each type of meat was calculated from the data. These values formed four natural preference-groups. Chicken was the meat greatly preferred to all others, with bushmeat sharing the second position with goat. Beef and snails formed the third group, while pork and mutton were the least popular meats.

A high proportion (85% of those interviewed) expressed a willingness to eat domesticated bushmeat ani-

TABLE V. Species Eaten Most Regularly (% of total recorded, the figures in brackets indicating the numbers involved).

Grasscutter	Small antelopes	Other species
39 (597)	25 (377)	36 (588)

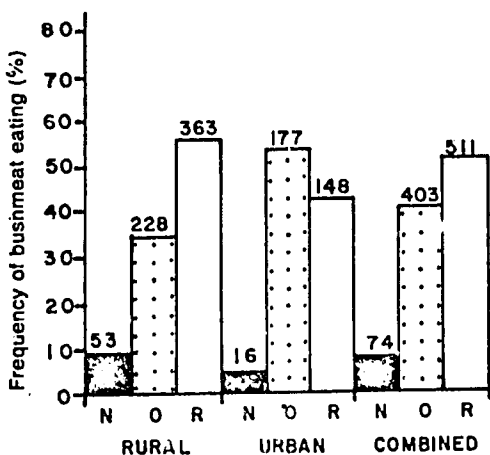
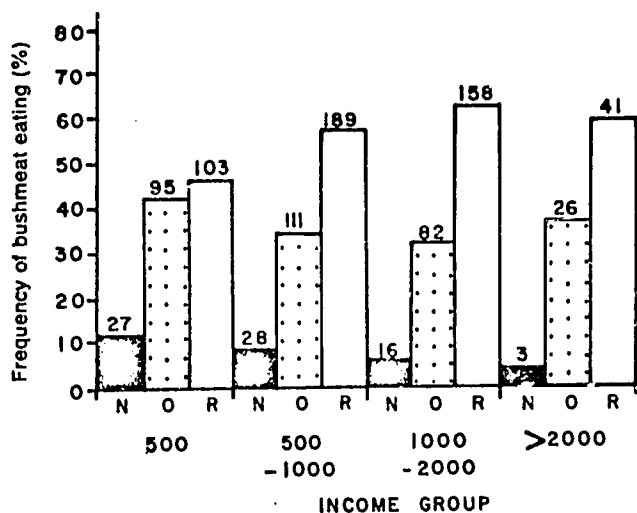


Fig. 3 (upper). Frequency of bushmeat eating according to income.

Fig. 3 (lower). Frequency of bushmeat eating according to location of interview. (N = never, O = often, R = regularly; figures above columns = numbers in samples.)

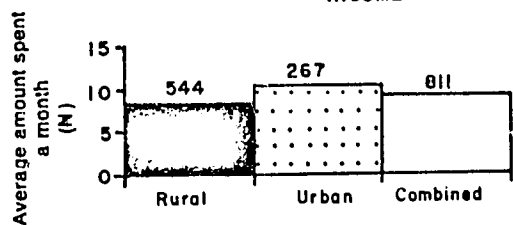
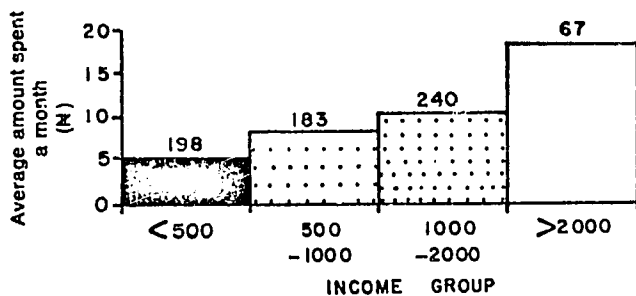


Fig. 4 (upper). Amount spent a month on bushmeat according to income.

Fig. 4 (lower). Amount spent a month on bushmeat according to location of interview. N.B. Figures above columns are the numbers in the samples.

TABLE VI. Species Preferred for Domestication (% of total recorded, the figures in brackets indicating the numbers involved).

Grasscutter	Small antelopes	Other species
42 (562)	28 (371)	30 (400)

mals. The species most widely preferred for domestication were the Grasscutter and the small antelopes (Table VI).

DISCUSSION

With any survey there remains the question of reliability of data. This is particularly true in the survey of the general public in Nigeria, where there were several areas of uncertainty. Some, such as inexperienced interviewers and a suspicious and often poorly-educated subject population, have already been mentioned. A further problem is the social courtesy that requires an agreeable answer to be made to a question. However, in the course of their briefing, interviewers were made aware of the inaccuracies to which this would lead, and the importance of not asking leading questions was emphasized.

Cross-checks within the study provided evidence suggesting a reasonable reliability of results. The results of the roadside survey (Table II) supported the data in the public questionnaire on species eaten most regularly (Table V), confirming that Grasscutter and small antelopes were the two most favoured types of bushmeat. However, the roadside survey indicated that the Brush-tailed Porcupine (*Atherurus africanus*) was almost as common a bushmeat animal as the Grasscutter in Bendel State (Table II). The prices paid for whole animals, calculated from questionnaire returns, were similar to those found during the roadside survey. Furthermore, results from other workers in West Africa are in general agreement with those from this study, as will be seen from the discussion that follows.

The survey sample was small and it would be unwise to place too much reliance on the precise values of the figures quoted. Nevertheless the major trends and general orders of magnitude involved seem clear, and it is believed that the results of the survey are generally reliable. The percentages recorded in the roadside survey are likely to be biased against the more popular types of bushmeat. For example, because the Grasscutter (*Thryonomys swinderianus*) is a favourite bushmeat species it is likely to be sold very quickly, whereas a less popular animal such as monkey, which is taboo in some areas or disliked by some people for its resemblance to a human being, will probably be left hanging up for a longer period of time and is therefore more likely to be recorded.

The prices per kilogram quoted for the bushmeat species listed in Table IIIb are likely to be lower than the prices for dressed animals sold by a local seller, as they are based on carcasses dressed by the Author when no charge was made for the preparation. The Author followed the method of carcass preparation described by Ledger (1963b).

The prices quoted in Table IIIb were averages for the period October 1976 up to and including October 1977,

5

whereas by March 1979 there had been increases in the price of bushmeat generally by about 25%, and in the case of the Grasscutter (*Thryonomys swinderianus*) by up to 75%. In the same period other meat prices in Nigeria increased by about 20% to 25%, so it appears that bushmeat is increasing in price faster than other meats; a similar observation was made by Asibey (1976).

In a small-scale survey of the bushmeat market in Ibadan quoted by Olowoye & Ajayi (1975), 25% of respondents spent between 10 and 50 Naira per month on bushmeat; bearing in mind inflation, the average figure of 10.49 per month in urban areas seems not unlikely. The fact that a person from an urban area spends 20% more than his rural counterpart (Fig. 4 lower) is not surprising considering factors such as transport costs, availability, and the often higher income of a city dweller.

The percentage of regular bushmeat eaters was high in all income groups, ranging from 46% to 62% of total meat consumption (cf. Fig. 3 upper). However, there was a general upward trend in the relationship between amount spent on bushmeat and income group (Fig. 4 upper). A possible explanation is that people in lower income groups were purchasing smaller quantities but with similar frequencies to those with higher incomes. More people in rural areas eat bushmeat regularly than in urban areas (Fig. 3 lower). This probably reflects the fact that, as rural areas are the source of bushmeat, it is more readily available in them.

Other studies on bushmeat in West Africa support the results from the present survey indicating that the Grasscutter (*Thryonomys swinderianus*) is probably the most popular animal, and although bushmeat is one of the most expensive forms of protein, it is in heavy demand (St John, 1971; Asibey, 1974a, 1974c, 1976; Olowoye & Ajayi, 1975). The situation in Liberia appears to be a little different; there 'meat from domesticated animals is more expensive than bushmeat' (Jeffrey, 1977).

The high preference for chicken revealed by this study, contrasted with the apparent unpopularity of this meat reported by Jollans (1959) in Ghana*. He stated that this might be attributable to its high price. In Nigeria, most chickens are bought alive in the markets and although there is an increasing amount of chicken production (Olayide *et al.*, 1972), the price of live chickens compares unfavourably with that of most other local meats when once they have been dressed. Nevertheless its premier preference position suggests that most people have eaten chicken and enjoyed it and will buy it regardless of price.

The low preference position of pork and mutton probably reflects the fact that in general, pigs and sheep are relatively uncommon in Nigeria. Also a sizeable proportion of the population of Nigeria is Moslem and adheres to the Islamic prohibition of eating pork.

* A specialist referee from Ghana comments 'Jollans worked in Kumasi, Ashanti... I have never known nor heard of chicken being unpopular [there]. It has always been highly respectable to eat chicken and very highly favoured among Ashantis. The same goes for sheep...'—Ed.

Public reaction to the possibility of eating domesticated bushmeat animals indicated that 85% of those interviewed would eat domesticated wild animals. Ajayi & Olowoye (1974) and Ajayi (1975b) have investigated the social acceptance of the Giant Rat (*Cricetomys gambianus*), one of the bushmeat species of Southern Nigeria, and found that over 70% of respondents would eat it if it were domesticated. This, together with the observations of the present study, suggest that there would be little market resistance to meat from 'new' types of domesticated animal.

The animal most strongly preferred for domestication was, not surprisingly, the Grasscutter (*Thryonomys swinderianus*), as indicated in Table VI. Attempts are being made to domesticate this animal in Ghana, and have met with some success (Asibey, 1974b, 1976). Ajayi & Tewe (1980) have recently recorded some success in maintaining this animal in captivity. They also report that in Bacita, in the savanna zone, people have reared Grasscutter for domestic consumption.

In Table VII are presented a series of estimates of the Nigerian national value of the bushmeat trade in the late 1970s. They represent a synthesis of data from a variety of sources, including the surveys under discussion. The estimates range between ₦ 150,000,000 and ₦ 3,600,000,000, but the true value probably lies somewhere near the middle between these two, though whatever this value may be, it is clear that the market is immense.

The sale of bushmeat by small-scale farmers to augment their incomes may play a significant role in rural economies in Nigeria in the manner indicated for Ghana by Asibey (1977), who was also concerned with the expected effects of land-use patterns on bushmeat supplies more widely in Africa.

The case for seriously examining the possibility of domesticating selected wild animals, and of studying wildlife populations with a view to controlled game-cropping, is therefore strong. Game-cropping in Nigeria is at present virtually uncontrolled outside of the game reserves, and this fact, coupled with ever-increasing habitat destruction, is a major reason for the rapidly diminishing populations of Nigeria's remaining animal wildlife. Any system of controlled cropping would have to be accompanied by enforceable legislation aimed at ensuring adequate and realistic conservation measures, including stricter controls on habitat destruction and hunting than are operative at present. It would be desirable but unrealistic to suspend hunting in Nigeria until more is known than at present about the strength of the different wildlife populations.

CONSERVATION CONSIDERATIONS

The designation of areas of the remaining forest and bush outside the various parks and reserves, as conservation zones where properly controlled cropping of animals could take place, would be a useful protective measure. But shortage of financial and other resources make this something of a pipe-dream.

One of the principal objectives of this study was to demonstrate the value of wildlife protein in terms of its

TABLE VII. Estimates of the Nigerian Value of the Bushmeat Market in the late 1970s.†

1. Assumptions: a) Amount spent a year on bushmeat by an average member of the Nigerian labour force, approximated to: ₦ 10 × 12 = ₦ 120 per year.
 b) A representative sample of the labour force was surveyed in the present study.
 c) The labour force of Nigeria was about 30,000,000 (projection of Second National Development Plan).

Annual value of the bushmeat market = ₦ 120 × 30,000,000
 = ₦ 3,600,000,000

- 2(i). Assumptions: a) The amount of bushmeat eaten, *per caput*, of 2.647 kg per year in 1968–69, has remained unchanged. This figure was agreed upon by the Study Group on Food Crops of the National Agricultural Development Committee (Olayide *et al.*, 1972).
 b) The population in Nigeria had not changed since the 1973 estimate of 71,300,000 (Mott & Fapohunda, 1975).**
 c) The price per kilogram of bushmeat was about ₦ 4.00 (according to the present study).

Annual value of the bushmeat market
 = ₦ 4.00 × 2.647 × 71,300,000
 = ₦ 754,924,400

- 2(ii). Assumptions: a) Annual amount of bushmeat eaten *per caput* was 4.416 kg per year (1975 projection, Olayide *et al.*, 1972).
 b) and c) as in 2(i) above.**

Annual value of the bushmeat market
 = ₦ 4.00 × 4.416 × 71,300,000
 = ₦ 1,259,443,200

3. The estimated value of the bushmeat trade in Nigeria in the mid-1960s was £ 10,200,000 in Southern Nigeria (Charter, 1973), a conservative estimate of this amount in present-day terms being ₦ 150,000,000–200,000,000.

† See footnote on page 125, left-hand column.— Ed.

** Quite recently we have been informed that the total human population of Nigeria probably now exceeds 100 millions.— Ed.

nutritional and monetary values. These aspects were emphasized as they represent facets of the value of this natural resource that are both obvious and have an important application. However, there are other advantages attached to the wise utilization of meat from wild animals that are worth mentioning.

Conservation areas used for game-cropping and, at least initially, as sources of species for domestication, would have benefits beyond that of food production. The areas could assume a multipurpose role, so as to include economically valuable features such as wildlife viewing and providing a source of materials for local craft industries utilizing hides and bones from animals. Both of these suggestions have attractive possibilities for the stimulation of an inflow of foreign exchange through tourists. Nor should the importance of wild plants for food

and drugs be forgotten in setting aside and maintaining areas for their survival in the natural state.

Large-scale conservation areas would have a major, if less obviously beneficial, effect. The importance of the role of natural vegetation, especially forests, in stabilizing and ameliorating climate, is being increasingly recognized, and a policy of tree-planting is being pursued in many countries—including Nigeria, where desertification is increasing. Thus a policy of careful utilization of bushmeat as a natural resource could have long-term environmental and economic benefits.

ACKNOWLEDGEMENTS

I would like to thank Professor J. C. Ene, of the Department of Biological Sciences, University of Benin, for all his help and advice, and to express the hope that this work will continue actively with his encouragement. Finally the students who acted as interviewers deserve special thanks for all their hard work.

SUMMARY

The value of protein from wild animals ('bushmeat') in Nigeria was examined, especially with respect to the consumer market. Surveys were made of roadside sales, meat prices in markets, and bushmeat consumption by the general public. The results showed that, in the 1970s, over 50% of the population ate bushmeat regularly, and that bushmeat was popular with all income-groups. The results have wide environmental implications.

The case is made for investigating in more detail than hitherto the potential for domestication and game-cropping. In addition to economic advantages resulting from careful management of animal wildlife as a renewable resource, there appear to be others—including major environmental ones through the maintenance of large-scale reserves.

REFERENCES

- AJAYI, S.S. (1971). Wildlife as a source of protein in Nigeria: some priorities for development. *Nigerian Field*, 36(3), pp. 115–27.
 AJAYI, S.S. (1975a). *Domestication of the African Giant Rat (Cricetomys gambianus, Waterhouse)*. Publ. Dept for Res. Management, University of Ibadan, Ibadan, Nigeria: vi + 44 pp., illustr.
 AJAYI, S.S. (1975b). Observations on the biology, domestication, and reproductive performance, of the African Giant Rat (*Cricetomys gambianus, Waterhouse*) in Nigeria. *Mammalia*, 39(3), pp. 343–64.
 AJAYI, S.S. (1976). *An Approach to the Domestication of African Rodents*. F.A.O. Working Party on Wildlife Management and National Parks, 5th session 1976. FAO, Rome, Italy: 8 pp. (mimeogr.).
 AJAYI, S.S. & OLAWOYE, O.O. (1974). Some indications of the social acceptance of the African Giant Rat (*Cricetomys gambianus*). *Nig. J. For.*, 4(1), pp. 36–41.
 AJAYI, S.S. & TEWE, O.O. (1980). Food preference and carcass composition of the Grasscutter (*Thryonomys swinderianus*) in captivity. *Afr. J. Ecol.*, 18, pp. 133–40.
 ASIBEY, E.O.A., (1969a). *Grasscutter (Thryonomys swinderianus) as a Source of Bushmeat in Ghana*. Department of Game & Wildlife, Accra, Ghana: 44 pp. (mimeogr.).
 ASIBEY, E.O.A. (1969b). *Wild Animals and Ghana's Economy*. Department of Game and Wildlife, Accra, Ghana: 38 pp. (mimeogr.).

- ASIBEY, E.O.A. (1974a). The Grasscutter (*Thryonomys swinderianus* Tem.) in Ghana. *Symp. Zool. Soc. Lond.*, **34**, pp. 161-70.
- ASIBEY, E.O.A. (1974b). Reproduction in the Grasscutter (*Thryonomys swinderianus* Tem.) in Ghana. *Symp. Zool. Soc. Lond.*, **34**, pp. 251-63.
- ASIBEY, E.O.A. (1974c). Wildlife as a source of protein south of the Sahara. *Biological Conservation*, **6**(1), pp. 32-9.
- ASIBEY, E.O.A. (1976). *The Grasscutter (Thryonomys swinderianus Tem.) in the Diet of West Africans*. Department of Game and Wildlife, Accra, Ghana: 13 pp. (mimeogr.).
- ASIBEY, E.O.A. (1977). Expected effects of land-use patterns on future supplies of bushmeat in Africa south of the Sahara. *Environmental Conservation*, **4**(1), pp. 43-9.
- BAMGHOSE, A. (1971). The English Language in Nigeria. P. 36 in *The English Language in West Africa* (Ed. John Spencer). Longmans, London, England, UK: 190 pp., illustr.
- BIGALKE, R.C. (1964). Can Africa produce new domestic animals? *New Scientist*, **374**, pp. 141-6.
- CHARTER, J.F. (1973). *The Economic Value of Wildlife in Nigeria*. (Paper presented at 1st Annual Conf. For. Assoc. Nigeria.) Research paper (Forest series) No. 19, Federal Department of Forest Research, Ibadan, Nigeria: 11 pp. (mimeogr.).
- CHEVALLERIE, M. VON LA (1970). Meat production from wild ungulates. *Proc. S. Afr. Soc. Anim. Prod.*, **9**, pp. 73-88.
- CHEVALLERIE, M. VON LA (1972). Meat quality in seven wild ungulate species. *S. Afr. J. Anim. Sci.*, **2**, pp. 101-2.
- CHILD, G.S. & HENSHAW, J. (1972). The development of wildlife in Nigeria. *Nig. J. For.*, **1**, pp. 69-71.
- CRAWFORD, M.A. (1968). Possible use of wild animals as future sources of food in Africa. *Brit. Vet. Rec.*, **82**, pp. 305-15.
- CRAWFORD, M.A. (1974). The case for new domestic animals. *Oryx*, **12**, pp. 35-6.
- CREMOUX, P. (1963). The importance of game meat consumption in the diet of sedentary and nomadic peoples of the Senegal River Valley. Pp. 127-9 in *Conservation of Nature and Natural Resources in Modern African States* (Ed. G. G. Watterson). IUCN Publ. New Series No. 1, Morges, Switzerland: 367 pp., illustr.
- CURRY-LINDAHL, K. (1969a). Report to the Government of Ghana on conservation, management, and utilization, of wildlife resources. *IUCN New Series, Supplementary Paper No. 18*, Morges, Switzerland. 28 pp.
- CURRY-LINDAHL, K. (1969b). Report to the Government of Liberia on conservation, management, and utilization, of wildlife resources. *IUCN New Series, Supplementary Paper No. 24*, Morges, Switzerland: 31 pp.
- DASMANN, R.F. (1964). *African Game Ranching*. Pergamon Press, Oxford, England, UK: ix + 75 pp., illustr.
- DASMANN, R.F. (1965). Biomass, yield, and economic value of wild and domestic ungulates. *Int. Congr. Game Biol.*, **6**, pp. 227-35.
- DEANE, N.N. & FREELY, J.M. (1971). The development of a South African game ranch. *IUCN Publ. No. 24*, pp. 82-7.
- FAO (1970). *Report of the 2nd World Food Congress*. F.A.O., Rome, Italy. [Not available for checking.]
- HARTOG, A.P. DEN & VOS, A. DE (1973). The use of rodents as food in Tropical Africa. *F.A.O. Nutr. Newsl.*, **11**, pp. 1-14.
- JEFFREY, S. (1977). New Liberia uses wildlife. *Oryx*, **14**, pp. 168-73.
- JOHNSTONE, P.A. (1971). Wildlife husbandry on a Rhodesian game-ranch. *IUCN Publ. No. 24.*, pp. 888-92.
- JOLLANS, J.L. (1959). Meat preferences of people in the central region of Ghana. *J. W. Afr. Sci. Assoc.*, **5**, pp. 64-78.
- LEDGER, H.P. (1963a). A note on the body composition of wild and domesticated ruminants. *Bull. Epiz. Dis. Afr.*, **11**, pp. 163-5.
- LEDGER, H.P. (1963b). Animal husbandry research and wildlife in East Africa. *J. E. Afr. Wildl.*, **1**, pp. 18-29.
- LEDGER, H.P. & SMITH, N.S. (1964). The carcass and body composition of the Uganda Kob. *J. Wildl. Mgmt*, **28**(4), pp. 827-9.
- LEDGER, H.P., SACTIS, R. & SMITH, N.S. (1967). Wildlife and food production with special reference to the semi-arid areas of the tropics and sub-tropics. *World Rev. Ani. Prod.*, **3**, pp. 13-37.
- MOSSMAN, A.S. (1963). Wildlife ranching in Southern Rhodesia. Pp. 147-9 in *Conservation of Nature and Natural Resources in Modern African States* (Ed. G.G. Watterson). IUCN Publ. New Series No. 1, Morges, Switzerland: 367 pp., illustr.
- MOTT, F.L. & FAPOHUNDA, O.J. (1975). *The Population of Nigeria*. Human Resources Research Unit, Monograph No. 3, University of Lagos, Lagos, Nigeria: 100 pp.
- NIGERIAN FEDERAL OFFICE OF STATISTICS (1967). *Rural Economic Survey of Nigeria 1965-1966, Rural Consumption Enquiry: Food Items*. Federal Office of Statistics, Lagos, Nigeria [not available for checking].
- OLAWOYE, O.O. & AJAYI, S.S. (1975). *Highlights of the Problem of Bushmeat Production and Marketing in Nigeria*. Wildl. Bull. Nigeria, No. 3, Fed. Department of Forestry, Ibadan, Nigeria: 15 pp.
- OLAYIDE, S.O., OLATUNBOSON, D., IDUSOGIE, E.O. & ABIAGOM, J.D. (1972). *A Quantitative Analysis of Food Requirements, Supplies, and Demands, in Nigeria, 1968-1985*. (Federal Department of Agriculture, Lagos, Nigeria.) Ibadan University Press, Ibadan, Nigeria: 113 pp.
- PETRIDES, G.A. (1965). *Advisory Report on Wildlife and National Parks in Nigeria*. (Special Publ. No. 19, American Committee for International Wildlife Protection.) Bronx, New York, NY, USA: [not available for checking].
- POLLOCK, N.C. (1969). Some observations on game ranching in Southern Africa. *Biological Conservation*, **2**(1), pp. 18-23.
- RETIEF, G.P. (1971). The potential of game domestication in Africa, with special reference to Botswana. *J. South Afr. Med. Assoc.*, **42**(2), pp. 119-27.
- ST JOHN, A.C. (1971). Wildlife as a source of protein in Ghana. *F.A.O. Nutr. Africa*, **9**, pp. 7-11.
- SKINNER, J.D. (1967). An appraisal of the Eland as a farm animal in Africa. *Anim. Breeding Abs.*, **35**(2), pp. 177-87.
- SKINNER, J.D. (1973). An appraisal of the status of certain antelopes for game ranching in South Africa. *Z. Tier. Z. Züchtungsbiol.*, **90**(3), pp. 263-77.
- TALBOT, L.M. (1963). Comparison of the efficiency of wild animals and domesticated livestock in utilization of East African rangelands. *IUCN Publ. New Series No. 1.*, pp. 329-35.
- TALBOT, L.M. (1964). Wild animals as a source of food. *Proc. 6th Int. Congr. Nutr. (Edinburgh), 1963*, pp. 243-51.
- TALBOT, L.M., LEDGER, H.P. & PAYNE, W.J.A. (1962). The possibility of using wild animals for animal production in the semi-arid tropics of East Africa. *8th Int. Congr. Anim. Prod. (Hamburg) 1961*, **3**(Final report), pp. 205-10.
- TALBOT, L.M., PAYNE, W.J.A., LEDGER, H.P., VERDCOURT, L.D. & PAYNE, M. (1965). The meat production potential of wild animals in Africa, a review of biological knowledge. *Comm. Agric. Bureaux Technical Communication No. 16*, 42 pp.
- TOPPS, J.N. (1975). Behavioural and physiological adaptation of wild animals and their potential for meat production. *Proc. Nutr. Soc.*, **31**(1), pp. 85-93.
- ZYL, S.H.M. VAN (1962). The meat production of Southern African game animals, I: The Eland. *Fauna und Flora (Pretoria)*, **13**, pp. 35-40.