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CHAPTER 24

FOOD CONSUMPTION IN THREE FOREST POPULATIONS OF THE SOUTHERN COASTAL AREA OF CAMEROON: YASSA – MVAE – BAKOLA

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INTRODUCTION

The equatorial forest tends to be perceived as an environment hostile to human inhabitants (Barrau, 1986). Nevertheless, archaeological sites in Central Africa, and particularly Sangoan and Lumpembian artefacts which reveal exploitation of the forests' plant and animal resources, are evidence of an ancient human presence in the forest. In southern Cameroon, in Obobogo in the suburbs of Yaoundé, a "late stone age" site, underlying a neolithic level, has been dated as 6000 years BP (Maret, 1985). The various Pygmy and Pygmoid groups scattered from Cameroon to Burundi are the oldest inhabitants of the forest (see Bahuchet, 1993, this volume). Several Bantu groups settled in the forest in more recent times and have had to adapt their activities to the forest environment. From a biological perspective, the forest inhabitants have to satisfy their quantitative and qualitative food requirements from their environment. Each group has developed specific strategies and makes particular choices among the food resources available, according to its culture and history. The nutritional requirements of these populations vary in different seasons and the food resources available also show seasonal variation and may not be adequate to cover nutritional needs in certain groups at particular times of the year.

Accordingly, from 1983 to 1986, the Campo district was chosen for a study of human adaptability to tropical environments such as dense forest (and semi-arid mountains and the Sahelian plains in other regions of Cameroon). The aim of these studies was to compare the differences between three

populations with different origins, living in the same ecosystem and having chosen contrasting production strategies. Within this international and multidisciplinary project, studies have incorporated nutritional and metabolic aspects (food consumption, seasonal variation in diet and energy expenditure, nutritional status), health aspects (clinical and serological data), ethnographic issues (ethnobiology, cultural preferences and perceptions of nutritional value) and ecological considerations (land use, influence on lifestyle).

This contribution concerns the food consumption studies carried out in 1984-85 among the three populations described below within the project "Food Anthropology of Cameroonian Populations". Other contributions in this volume deal with energy expenditure (Pasquet and Koppert, 1993), biomedical surveys (Froment *et al.*, 1993), and socio-cultural aspects (Garine, 1993) of these populations.

POPULATIONS AND THEIR ECOLOGICAL SETTING

The Campo district lies in the south-west of Cameroon, on the Atlantic coast and the border of Equatorial Guinea (2°30' N, 10°E) and includes a rain forest game reserve (Figure 24.1). The climate is "four-seasons equatorial" with a clearly defined major dry season and high rainfall (on average 2500 mm and 145 rainy days a year between 1976 and 1988). The mean monthly temperature is 25.6°C (maximum 28.9°C; minimum 22.3°C)

Three populations (and also a few Mabea families linguistically related to the Ngoumba) live in this area in identical climatic and phytogeographic conditions:

(1) the coastal Yassa, principally a fishing population;

(2) the Mvae, agriculturalists and hunters, one group of whom have left the interior and settled near the coast (we thus distinguish coastal and forest Mvae);

(3) the Bakola Pygmies, traditionally hunter-gatherers, scattered throughout the forest. The Bakola (Loung, 1987) nowadays practise rudimentary agriculture, but they also exchange game with neighbouring agriculturalist villagers for staple foods and manufactured goods.

The Yassa, the Mvae and the Bakola are three Bantu speaking populations. The language of the Yassa is classified A 30 by Guthrie (1967-1970), in the Bubi-Benga group, whereas the Mvae belong to the Beti-Fang linguistic group (A 70). The Bakola are classified A 80 by Guthrie in the Maka-Njem group which includes the Ngumba with whom the Bakola migrated towards the West by the second half of the 19th century. The Yassa live in Cameroon and in Equatorial Guinea. In Cameroon their number is estimated at 800. In the Campo district, the Mvae are estimated to number around 2000 but show no clearcut separation from other Beti-Fang groups, and the Bakola

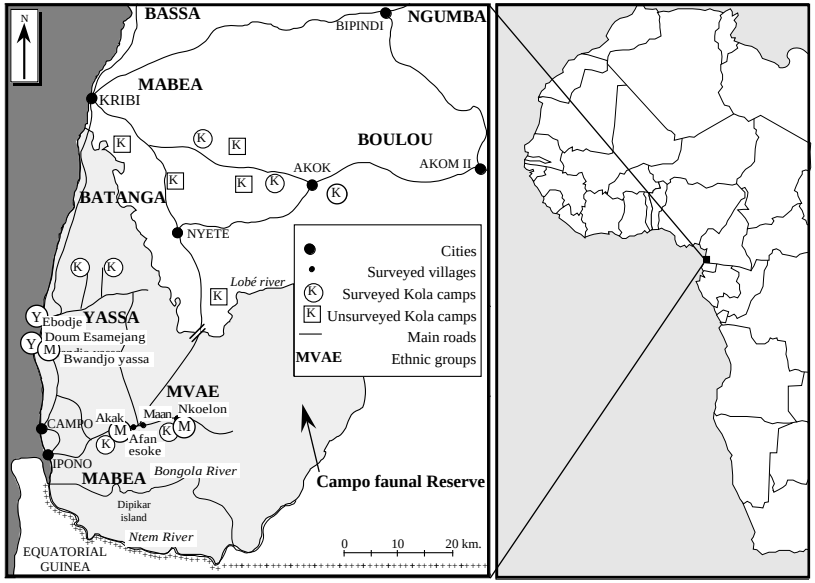

Figure 24.1 The study area in southern Cameroon, showing the location of the surveyed villages (Y: Yassa; M: Mvae), the Kola Pygmy camps (K) and the Campo faunal Reserve (stippled)

less than 400 (estimated total population of the Campo district in 1990: 4300). The human population density is low, in the order of 1.3 people km^{-2}. Most of the population is settled in villages along the two main roads running respectively North-South along the coast and East-West along the Bongola river.

The household is the basic socio-economic unit in all three communities and is expected to be self-sufficient in terms of food energy and material needs. In each household most adults of both sexes are engaged in similar subsistence activities – agriculture and sea fishing among the Yassa, agriculture and hunting (mainly trapping) among the Mvae, hunting, gathering and rudimentary agriculture based on cassava for the Bakola.

METHODOLOGY

A food consumption study was carried out among 40 Yassa and 40 Mvae families (15 in a coastal village near the Yassa and 25 in four villages in the forest), and 33 Bakola families in eight camps. As for most studies conducted in the tropics, the standard weighing technique has been chosen (Koppert and Hladik,1990). Details of the samples are given in Table 24.1.

Table 24.1 Samples and characteristics of the food consumption survey

Ethnic group	Food production	Number of households	Number of survey days	Number of subjects	Number of preparations	Number of dishes
Yassa	Fishing and agriculture	40	691	339	2823	23376
Mvae	Hunting and agriculture	40	877	432	4102	35832
Bakola	Foraging and rudimentary agriculture	33	379	238	2015	10884
TOTAL		113	1947	1009	8940	70092

A random sample of households was drawn from the larger Yassa villages and the coastal Mvae village; all other villages and camps were surveyed as a whole. One local assistant was assigned to each of the households. Household size varied from 5 to 20 people. Each family was surveyed during three periods of seven days in each of three seasons: minor dry season (July-August), major rainy season (November-December), minor rainy season (March-April), which is also the planting season (Figure 24.2).

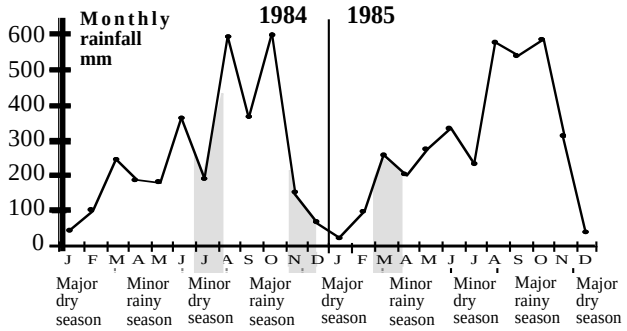

Figure 24.2 The three periods of food survey (stippled) and the monthly rainfall in 1984 and 1985

As no clear picture of seasonal differences in food consumption emerged in this study, we consider mainly the annual average consumption. Ingredients used for food preparation as well as the prepared food and its distribution within the family were weighed in the compound. Leftovers, and received and donated foods, were taken into account. Taking snacks between meals was estimated by questioning people, but it is the main source of error because not everything could always be traced.

Table 24.2 Dish sharing coefficients as estimated after ten iterations and comparison with coefficients derived from FAO recommended calorie intakes (category 7 is taken as the standard)

Category	Age group	Yassa	Mvae	Kola	FAO %	FAO kcal
Children						
1	1-3	39%	47%	36%	45%	1350
2	4-6	42%	53%	42%	60%	1800
3	7-9	59%	65%	62%	73%	2190
Boys						
4	10-12	66%	73%	43%	87%	2610
5	13-15	83%	63%	52%	96%	2880
6	16-19	79%	86%	60%	102%	3060
Men						
7	20-39	100%	100%	100%	100%	3000
8	40-49	112%	134%	99%	95%	2850
9	50+	115%	111%	98%	86%	2580
Girls						
10	10-12	63%	59%	49%	78%	2340
11	13-15	68%	79%	39%	83%	2490
12	6-19	76%	95%	79%	77%	2310
Women						
13	20-39	88%	94%	89%	73%	2190
14	40-49	84%	106%	100%	69%	2070
15	50+	80%	115%	91%	63%	1890

The energy and nutrient composition of the diet was calculated using local and international food composition tables. Individual consumption estimates, calculated using an iterative method we developed (see below), are given for 15 age and gender categories (regrouped into five large groups; Table 24.2) and as "*per capita*" consumption (average consumption of the entire population, children and adults included). Consumption data are usually given as *per capita* consumption in the literature (e.g. Perissé, 1966), but are not very informative since they are dependent on the demographic structure of the populations, their workload and their body weights.

Most prepared dishes are eaten by groups of consumers (Garine, 1990; Koppert, 1991). Usually, adult men eat alone or together with other men, women with other women and small children, most children with others of their age group, but sometimes the whole family shares one common dish. In order to estimate individual intakes, we developed a method based on the theory of Cresta (1970) on intra-family food distribution.

The energy content of all the dishes weighed for each population (Yassa 23 376; Mvae 35 832; Bakola 10 884) was calculated and used to estimate sharing among the fifteen categories shown in Table 24.2. These categories were defined according to recommended dietary allowances (FAO/OMS, 1974).

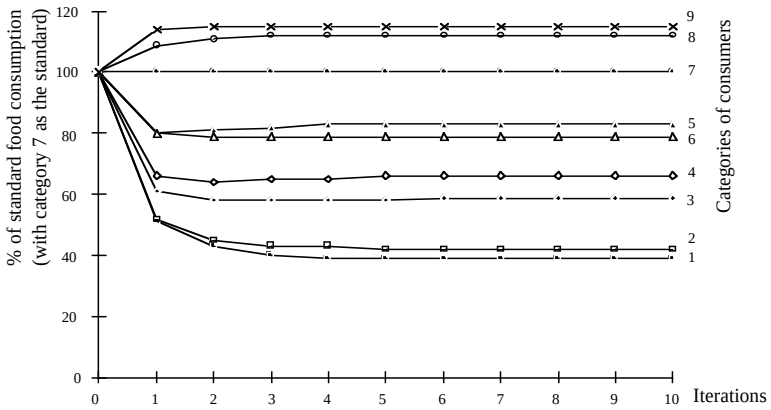

Figure 24.3 Example of results obtained during successive estimates of food distribution coefficients in ten iterations, for the first nine categories of sex and age in the Yassa sample

The method of calculation is an iterative process. The initial assumption is that each common dish is divided equally among its consumers, independent of their sex and age. The results of the first calculation show important differences in the quantity eaten by the different sex and age categories (expressed as a percentage of the food intake of category 7 “men aged 20-39”, taken as the standard). These differences are due to unequal distribution of the common dishes (obviously, a group of three men will receive a bigger dish than a group of three children).

The second iteration is based on the results of this first calculation, using the percentage of the standard consumption for each category (obtained during the first step) to make a new estimate. Only when consumption groups are composed of consumers of different categories does the iterative process influence the calculation of the sharing of their common dishes. The new percentages calculated are used for the third iteration, etc...

As shown in Figure 24.3, before ten iterations (six iterations for Yassa) of this process have been carried out, a plateau is reached, which is considered to be the distribution coefficient for each group as compared to the standard.

The successive iterations measure both what the women distributing food in the common dishes gave out, according to their idea of what the different categories should and can eat, and what these categories actually eat (dishes may have leftovers; consumers may ask for a second helping...)

Final coefficients for the three populations and coefficients calculated from daily recommendations formulated by FAO/OMS (1974) are compared in Table 24.2. Clearly, in all populations, the children's share of any dish is much less than would be appropriate according to FAO standards, while adult men and women have more than would be expected.

FOOD CONSUMPTION AND FOOD SHARING

The main ingredients of the diet of all populations are cassava (*Manihot esculenta*) as a staple, and fish and meat (game) for the accompanying dishes.

As can been seen from Figure 24.4 (right), animal food means fish for the coastal populations and game with some freshwater fish in the forest. The total amount of fish and meat eaten varies between 187 g for the coastal Mvae and 238 g for the Bakola pygmies, with 223 g for the Yassa and 226 g for the forest Mvae. Animal food consumption is not only high but also very regular: during the study period the Yassa prepared animal food on 89% of days, the coastal Mvae 70%, the forest Mvae and Bakola slightly less on respectively 64 and 69% of days.

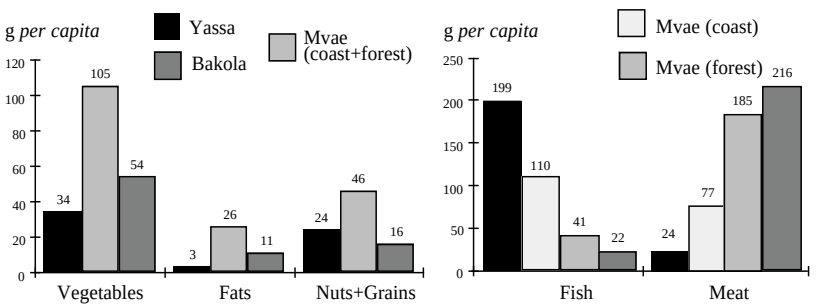

Figure 24.4 Consumption (in g *per capita*) of vegetable foods (left) and fish and meat (right) among the Yassa, Mvae and Bakola

Figure 24.4 (left) also shows that green vegetables are only consumed in significant quantities by the Mvae (total 105 g *per capita*, the most important being cassava leaves, about 50 g). For the Yassa, who only consume 34 g daily, the most important vegetable is a spice: red pepper, *Capsicum* spp. (6 g). Among the fatty foodstuffs the washed pericarp of the oil-palm fruit (*Elaeis guineensis*) is by far the most commonly used. It is added to vegetable dishes and those that contain (mainly smoked) fish and meat. Ingested nuts and grains are peanuts (*Arachis hypogea*) and cucumber seeds (*Cucumeropsis mannii*) for the Mvae and small quantities of cucumber seeds only for the other populations. Their consumption is low, however, and largely seasonal (July-August).

Cassava is used in many different forms. The “bâton de manioc” (cassava stick: soaked and ground cassava, wrapped in leaves and steamed) is the most important form in all three groups. Beside this, the Yassa and the

Bakola are characterized by their use of cassava flour, the Mvae and again the Bakola by steamed sweet cassava. Other staples are yam (*Dioscorea* spp.), macabo (*Xanthosoma sagittifolium*), plantain (*Musa paradisiaca*), breadfruit (*Artocarpus altilis*) and green sweet bananas (*Musa sapientum*), but these contribute only about 10 to 15% of the total staple diet.

Sharing within the family: food consumption of sex and age categories

For some types of foods, we have calculated the distribution by weight among the family members according to sex and age groups (Table 24.3). Interpretation of the results will be made easier if we compare these data with those on energy consumption. For example, Yassa children eat 109 g of fish and meat for 1255 kcal of daily intake, while adult men eat 295 g of animal food for 2731 kcal. The children thus receive 87 g per 1000 kcal and the men 108 g. We can then express the relative consumption of the children as 87/108 (that is 80%) of what would be expected if all foods were equally shared. The results of this method are presented in Figure 24.5 and show that the share of meat and fish given to children and women is less than expected, while their share of roots and tubers is relatively high.

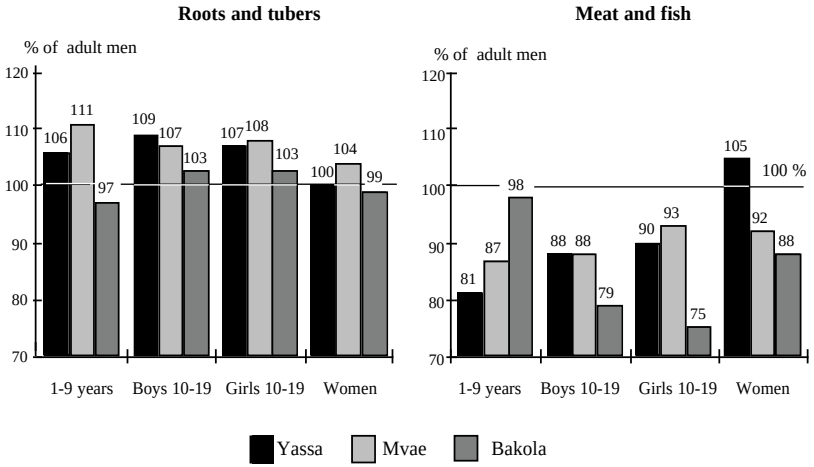

Figure 24.5 Relative consumption of roots and tubers (left) and meat and fish (right) in the diet of different sex and age categories (as a percentage of that of adult men), among the Yassa, Mvae and Bakola

Table 24.3 Consumption (in g day^{-1}) by the Yassa, Mvae and Bakola according to sex and age categories (average of all periods, mean ± standard error of mean)

	n=	Cereals	Starchy foods	Fatty foods	Vegetables and fruits	Meat	Fish	Meat +fish
1-9 years								
Yassa	111	18 ± 02	494 ± 14	14 ± 01	20 ± 03	7 ± 01	102 ± 04	109 ± 04
Mvae	111	31 ± 03	422 ± 15	34 ± 02	61 ± 04	78 ± 06	38 ± 03	116 ± 05
Bakola	47	11 ± 02	387 ± 18	9 ± 01	31 ± 05	112 ± 12	11 ± 02	124 ± 11
Boys 10-19 years								
Yassa	39	16 ± 04	752 ± 29	26 ± 04	39 ± 07	10 ± 03	168 ± 11	178 ± 11
Mvae	42	52 ± 10	531 ± 21	45 ± 04	95 ± 11	97 ± 10	57 ± 05	155 ± 09
Bakola	23	14 ± 03	544 ± 49	18 ± 05	37 ± 07	119 ± 21	12 ± 03	131 ± 20
Girls 10-19 years								
Yassa	38	15 ± 03	688 ± 30	25 ± 04	38 ± 12	16 ± 07	154 ± 08	170 ± 09
Mvae	57	37 ± 06	581 ± 27	54 ± 05	87 ± 08	129 ± 11	43 ± 08	172 ± 12
Bakola	18	6 ± 04	563 ± 50	20 ± 05	46 ± 11	114 ± 23	16 ± 03	130 ± 22
Men 20 years and more								
Yassa	62	17 ± 04	1012 ± 26	36 ± 03	37 ± 03	30 ± 05	265 ± 11	295 ± 11
Mvae	96	46 ± 05	774 ± 21	96 ± 08	121 ± 08	196 ± 11	75 ± 07	271 ± 11
Bakola	72	19 ± 04	965 ± 41	36 ± 04	60 ± 07	285 ± 24	21 ± 04	306 ± 24
Women 20 years and more								
Yassa	89	20 ± 03	808 ± 18	30 ± 02	39 ± 03	28 ± 05	218 ± 09	246 ± 08
Mvae	126	40 ± 04	691 ± 21	91 ± 07	125 ± 07	133 ± 08	83 ± 06	216 ± 07
Bakola	79	18 ± 03	856 ± 32	31 ± 03	71 ± 07	220 ± 17	20 ± 03	241 ± 17
Total population								
Yassa	339	18 ± 01	723 ± 14	25 ± 01	32 ± 02	18 ± 02	176 ± 05	194 ± 05
Mvae	432	40 ± 02	611 ± 11	68 ± 03	100 ± 03	129 ± 05	62 ± 03	191 ± 05
Bakola	239	16 ± 02	744 ± 23	26 ± 02	54 ± 04	201 ± 11	18 ± 02	218 ± 11

Energy and nutrients

The average energy consumption is about 1800-1900 kcal *per capita*: 1890 kcal for the Yassa, 1840 kcal for the Mvae and 1820 kcal for the Bakola. The protein content of this diet is 50-60 g *per capita*: 51 g for the Yassa, 57 g for the Mvae and 56 g for the Bakola. These proteins are essentially of animal origin. Table 24.4 gives the energy, protein, lipid and carbohydrate consumption of children, adolescents, adult men and women.

For children under 10, a percentage of the total energy needs is given. For all other groups, a percentage of only the Basal Metabolic Rate is given to which actual energy expenditure in activities would have to be added for a true comparison (FAO/WHO/UNU, 1985; James and Schofield, 1990)

The inequality in the kinds of foods allocated to different age and sex categories in the households has, of course, an impact on the nutritional

Table 24.4 Energy (kcal) and nutrient consumption (g) according to sex and age groups (mean ± SEM)

	n=	% of needs[a]	kcal	Protein	Fat	Carbohydrates
1-9 years						
Yassa	111	92 ± 03	1255 ± 030	33.3 ± 1.1	13.6 ± 0.6	247 ± 06
Mvae	111	86 ± 03	1204 ± 032	40.5 ± 1.7	24.9 ± 1.3	206 ± 06
Bakola	47	85 ± 04	967 ± 040	30.5 ± 2.3	10.2 ± 1.0	186 ± 08
Boys 10-19 years						
Yassa	39	142 ± 06	1869 ± 060	49.7 ± 2.3	20.9 ± 1.6	366 ± 12
Mvae	42	120 ± 05	1569 ± 070	51.6 ± 3.2	33.3 ± 2.7	267 ± 10
Bakola	23	101 ± 07	1281 ± 097	34.3 ± 4.2	12.8 ± 1.7	255 ± 20
Girls 10-19 years						
Yassa	38	140 ± 04	1739 ± 048	49.7 ± 2.9	19.9 ± 1.7	337 ± 11
Mvae	57	131 ± 05	1665 ± 067	58.0 ± 3.5	35.0 ± 2.3	282 ± 11
Bakola	18	117 ± 10	1335 ± 118	36.7 ± 5.1	14.0 ± 2.5	264 ± 21
Men 20 years and more						
Yassa	62	179 ± 05	2731 ± 070	84.4 ± 2.8	32.2 ± 1.9	499 ± 12
Mvae	96	158 ± 04	2446 ± 066	88.4 ± 3.2	58.5 ± 3.1	388 ± 09
Bakola	72	168 ± 07	2351 ± 094	76.4 ± 4.6	27.8 ± 1.9	442 ± 19
Women 20 years and more						
Yassa	89	172 ± 03	2171 ± 042	70.2 ± 2.1	27.4 ± 1.3	398 ± 08
Mvae	126	167 ± 04	2112 ± 044	76.4 ± 2.4	52.2 ± 2.3	338 ± 07
Bakola	79	180 ± 07	2106 ± 079	64.2 ± 3.9	24.4 ± 1.8	402 ± 15
Total population						
Yassa	339		1891 ± 036	56.1 ± 1.4	22.2 ± 0.7	356 ± 06
Mvae	432		1839 ± 033	64.9 ± 1.5	42.4 ± 1.3	301 ± 05
Bakola	239		1816 ± 054	56.2 ± 2.4	20.7 ± 1.0	347 ± 10

[a] Percentage of global recommendations for children 1-9 years; percentage of the basal metabolic rate for all other categories

value of the diet. Figure 24.6 describes the protein "density" (g per 1000 kcal) of the diet according to population and sex-age category. This figure clearly shows the meagre portion of the higher quality foodstuffs allotted to the Yassa children and most young adolescents in all three populations.

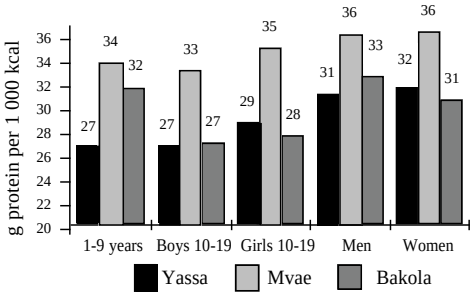

Figure 24.6 Protein "density" of the diet according to sex and age categories among the Yassa, Mvae and Bakola

Seasonal variation in the diet

Seasonal variation is small (Table 24.5) as compared, for example to the variation observed in the Sahelian part of Cameroon (Garine and Koppert, 1988). The Bakola show a significant decrease in calorie intake towards the end of the main rainy season. For Yassa, as well as Mvae, this is a period of relative abundance of fish and meat, with an almost stable calorie intake.

Table 24.5 Seasonal variation of the energy (kcal *per capita*) and protein content (g *per capita*) of the diet of the Yassa, Mvae and Bakola

	Yassa			Mvae			Bakola		
	n=	kcal	Protein	n=	kcal	Protein	n=	kcal	Protein
Jul.-Aug.	215	1911 ± 51	185 ± 7	415	1821 ± 39	180 ± 7	160	1911 ± 69	231 ± 18
Nov.-Dec.	222	1892 ± 47	211 ± 8	271	1864 ± 45	210 ± 8	131	1690 ± 66	207 ± 11
Mar.-Apr.	217	1868 ± 48	183 ± 8	295	1804 ± 40	178 ± 6	107	1953 ± 86	236 ± 15
		NS	*		NS	**		*	NS

** significant difference ($p<0.01$); * ($p<00.5$); NS = no significant seasonal difference (ANOVA)

A well balanced diet?

In all populations, the staple food is the main source of energy, fish and meat the main source of proteins. One does observe, however, that the Mvae, with their higher consumption of vegetables and fat-rich foods have a more balanced diet than the Yassa and Bakola (Figure 24.7).

Diets based on roots and tubers, especially cassava, are known to be very low in proteins and other nutrients. This paucity is corrected here by an important intake of animal proteins from fish and meat (game): they account for 88% of the protein intake of the Yassa, 70% for the Mvae and 78% for the Bakola. Cassava equally lacks other macro- and micro-nutrients which have to be provided by other foodstuffs.

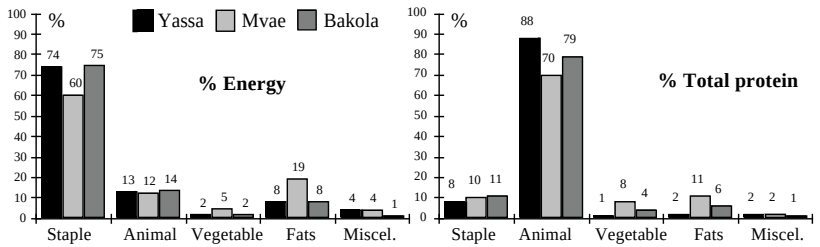

Figure 24.7 Contribution of food categories to energy content (left) and protein content (right) of diet

Wild, cultivated, and imported food

Food can also be categorized by how it is obtained: (1) foraging; (2) importing, (3) local production and (4) fishing and hunting (Figure 24.8).

The three populations are still mainly self-sufficient in food: over 80% of their food energy is provided by local production, 3 to 5% is imported from outside the area and 12 to 15% comes from fishing and hunting (see also Garine, 1993, this volume).

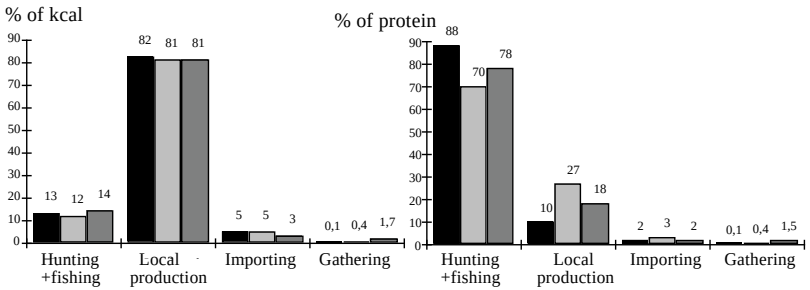

Figure 24.8 Contribution to the energy (left) and protein (right) content of the diet of the Yassa, Mvae and Bakola, according to food acquisition method

Hunting and fishing are of utmost importance for the protein content of the diet. In contrast, the part contributed by foraging for non-animal food is very small, even for the Bakola Pygmies (Plate 24.1).

Non-meat forest resources are mushrooms (about 5 g for the Yassa and the Mvae, 3 g for the Bakola), some wild yams (less than 1% of the staple for the Bakola) and some nuts and grains (*Irvingia gabonensis*, *Panda oleosa* and *Poga oleosa*, the latter two only for the Bakola). No gathered leaves or vegetables are regularly used. Seasonal variations are large here: wild mango (*Irvingia gabonensis*) kernels are present in 3–5% of the relishes in July-August, but absent the remainder of the year.

Some of the reasons for this under-exploitation of the forest are related to the time budget of women. Much time is already spent every day in the fields and in the kitchen (see Pasquet and Koppert, 1993, this volume), and if they are to have a major impact on the diet, wild foodstuffs have to be gathered very regularly, if not daily. For this to be possible, these foods have to be present in large quantities in specific areas, conveniently located not too far from the village or the camp. Mvae men and Bakola hunters do use more wild foods while on hunting trips, where they move around a great deal in the forest and so visit many potentially good sites for wild food.

Plate 24.1 Kola Pygmies in a temporary camp, during the food survey carried on by a local assistant (photo by E. Dounias, August 1984)

The small quantities used make these resources more like spices added to the relish than important foods used for their nutritional value. Gathered foods are slightly more important as sources of proteins than energy.

The discrepancy between what is known to be edible wild plant food and what is actually used argues for a recent change of the diet towards the security and ease of cultivated products and away from the uncertainty and difficulties involved in obtaining forest products.

COMPARISON OF THE DIET WITH OTHER POPULATIONS

Comparison of the diets of these populations with those of other populations from Cameroon and elsewhere in Africa (in terms of energy, total protein and animal protein) come from data provided by Périssé (1966) and Pondi *et al.* (1990). The average consumption figures for data from each country were calculated. In comparison with these figures, Yassa, Mvae and Bakola have an average energy intake, but a high total protein intake, only surpassed by rural populations from Côte d'Ivoire and Gabon. Compared to

Table 24. 6 Comparison of energy and protein quality in the diet of the Yassa, Mvae and Bakola with other African forest populations (sources: Périssé, 1966; Pondi *et al*.,1990)

	kcal *per capita*	Total protein (g)	Protein (g per 1 000 kcal)	Percentage of animal protein
Present study:				
Yassa	1891	51	27	88
Mvae	1839	57	31	70
Bakola	1816	56	31	78
Other Cameroonian populations:				
Douala	1719	55	32	57
Evodoula	1634	40	25	27
Batouri	1611	31	19	32
Other African populations:				
Central African Republic	2224	42	19	38
Côte d'Ivoire	2165	55	34	25
Congo	2043	46	22	43
Togo	2031	41	20	20
Gabon	1989	69	35	59
Uganda	1826	39	22	9
Nigeria	1785	46	26	4

other Cameroonian populations studied in the 1950s, such as Evodoula and Batouri, their energy and protein consumption is much greater (Table 24.6)

The comparison of protein "density" (g per 1000 kcal) and the proportion of animal protein in the diet shows that the latter is exceptionally high among the surveyed Cameroonian populations.

CONCLUSIONS

The diet of the three Cameroonian coastal and forest populations is close to recommendations (FAO/WHO/UNU, 1985) and characterized by a very high intake of animal food. Seasonal variations in total energy intake are significant only for the Bakola at the end of the main rainy season (about 250 kcal less *per capita* than during the other periods).

Intra-family distribution of food is not equal: men tend to have relatively larger shares of animal food and smaller shares of staple food. The reverse is true for children, women and adolescents, who particularly need high quality food to sustain growth, pregnancy and lactation.

The diet is based on cassava and fish or meat, with vegetable foods lacking, especially among the Yassa. The three populations currently have a reasonably energy-rich diet of high protein quality but future development of the region may influence its quality. The future of the fishing activities of

the Yassa seems more certain than that of the hunting activities of the Mvae and Bakola. Timber exploitation, population growth and export of game can easily and rapidly diminish densities of game populations in this forest, although it is legally a game reserve.

Effective preservation of the forest as the habitat of game as essential food for the Mvae and the Bakola is important in order to prevent them being left with a diet that would only contain about 10 to 20 g of protein. No food of plant origin in the present diet can replace game as a source of protein. The very low levels of consumption of plant resources from the fields and the forest are responsable for this. It is important that these populations should develop the use of a wider range of available forest resources and cultivated foodstuffs. Increasing the availability of fresh or smoked sea-fish throughout the region is recommended as another way of coping with uncertainty in future food supply.

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