THE DIET OF MACACA SYLVANUS IN DIFFERENT HABITAT TYPES IN ALGERIA : I. THE DIET IN A DECIDUOUS OAK FOREST

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In Algeria as in Morocco, the Barbary macaque lives in various habitats ranging from evergreen or deciduous forest, to scrubland and rocky summits (Fa et al., 1984).

Various authors who have studied this monkey in Morocco recognized its remarkable adaptive capacities (Deag, 1974; Taub, 1977; Drucker, 1984; Mehlman, 1984). However, the studies of Fa (1982) and Fa et al. (1984) showed that the population densities are very variable depending on different environments.

In Algeria, a comparative study of the demography of three troops living in three types of environments shows, in addition to variations in density, differences in the size and composition of social units, their stability as well as birth and survival rates of infants (Ménard et al., 1985). Schematically, evergreen cedar-oak forests appear to be the most suitable habitat for the species; in deciduous oak forests, the density is lower and the survival rate of infants is lower; while on rocky summits, even the survival of the species seems precarious.

The nature and extent of the vegetation cover and the food resources available in the various environments seem to be the primary factors likely to account for these demographic differences. In parallel with a study of the vegetation, we therefore undertook a comparative analysis of the modalities of resource use by the three groups mentioned above in order to highlight their degree of trophic dependence on the specific characteristics of each environment, and to show how these characteristics are likely to have an impact on population dynamics.

In this first article, we will present the results concerning the group living in a deciduous oak forest, by analyzing the seasonal variations in the diet of the different age classes, during the annual cycle and by emphasizing the relative contribution of the different levels of vegetation to the feeding of the group.

The results concerning the groups living in evergreen forest and on rocky summits will be the subject of a second article. Then the differences highlighted in the modalities of use of resources by the three groups will be analyzed in relation to food availability in the three habitats considered. It will then be possible to look for the existence of critical factors that could account for the demographic differences.

MATERIAL AND METHODS

STUDY SUBJECT

The size of the observed group varied from 33 individuals in February 1983 to 38 in September 1984; its composition changed from 8 adult males (> 5 years), 6 adult females (> 4 years), 4 sub-adults (3 to 4 or 5 years) and 15 young (0 to 3 years), to 10 adult males and 10 adult females, 7 sub-adults and 11 young (see details in Ménard et al., 1985). During the three months of field preparation and preliminary observations, the animals became habituated to the observer and the approach distance changed from 50-100 m to 5-10 m: these excellent observation conditions suggest that there is little bias in our data collection, depending on the type of food or the environment concerned.

STUDY SITE AND CLIMATE

The group lives in the Akfadou forest massif (4° 33' E., 36° 43' N.), in Great Kabylie. Its annual home range, with an area of approximately 3 km², is composed, at the tree layer level, of 52% *Quercus faginea* high forest, 41% *Q. afares* high forest, 2% cork oak forest and 5% coppice. The shrub layer is dominated by *Cytisus triflorus*, distributed fairly evenly. The herbaceous layer is diverse and heterogeneous, with variable dominance. This area is located between 800 and 1,300 m above sea level, on either side of a ridge line oriented N. -W. -S.-E. marked by a firebreak trench.

The climate is characterized by an average minimum temperature of +9° and an average maximum temperature of +21°. The coldest month is January with a temperature of +1.5°, and the warmest month is July with a maximum temperature of +33.7°.

The average annual precipitation is 1,010 mm. In 1983, autumn rains began in November and were followed by two months of snow in February and March, with a maximum in February: then came spring rains until May. Overall, the summer of 1984 was cooler and wetter than in 1983 with precipitation beginning as early as August.

DURATION OF STUDY

The study period extended from February 1983 to October 1984, with a total of 14 months of quantified observations, beginning in April 1983 and including the months of April and May twice.

METHODS OF OBSERVATION

The group was observed from sunrise to sunset, for 5 to 6 days per month (or 40 to 77 hours each month, depending on the length of the day).

Every quarter of an hour, an "instantaneous and scan sampling" observation type, or "scan" (Altman, 1974) was carried out on five animals, noting: the individual, its vertical situation, its activity, the object of its activity (another animal or food, etc.). At the next "scan", five other animals were taken into account, so as to observe all the individuals in the group during the day, and to maintain independence of the data between the "scans". Within a "scan",

only the animals taking food were retained for this quantitative analysis of the diet; this behavior was defined as follows: an animal takes food and puts it in its mouth.

Between each "scan", a five-minute "focus" type observation was carried out on the same animal, emphasizing the nature of the foods consumed and the consumption methods. These observations allow occasional foods to be taken into account; they are not included in the quantitative analysis of the diets.

The types of food identified were seeds, leaves, flowers, fruits, flower stems, underground reserves (bulbs, roots, basal swellings of grasses), fungi, lichens, animal prey and water.

DATA ANALYSES

Four age and sex classes were retained: juveniles from 0.5 to 3 years, sub-adults from 3-4 years, adult females, adult and sub-adult males over 4 years (grouped in the text under the term "adult male"). Infants from 0 to 6 months, unweaned, were not taken into account.

The quantitative composition of the diet, calculated from the scan-type observations, is expressed as a percentage of the feeding time spent eating a given food. Of the 3,494 observations of macaques feeding, only 3,309 of individuals whose age and sex were known were used in the following analysis.

For each individual category, the annual composition of the diet was calculated by averaging, for each food, the monthly percentages of consumption in order to take into account sampling variations from one month to the next. For the months of April and May, the values used represent the averages for the two years 1983 and 1984.

For the entire group, the diet (r) was calculated according to the formula:

$$r\,Ni = [r\,NI + r\,N2 + r\,N3 + r\,N4]/[NI + N2 + N3 + N4]$$

where Ni corresponds to the average composition of the group, NI to the number of males, N2 to the number of females, N3 to the number of sub-adults and N4 to the number of juveniles (Gautier-Hion, 1980).

To highlight the differences in diet and use of vegetation layer between consumers, we established a 49 X 4 contingency table, where C (i, j) is the frequency at which "food-height-month" i enters the diet of consumer j. This table was processed by correspondence analysis (Benzecri, 1973). Nine types of food are distinguished and two levels of food intake; the level from 0 to 1 m corresponds to all samples taken from the ground, whether they are foods from the herbaceous or shrubby layer. Above one meter, all foods come from the tree.

For clarity of results, months with the closest similarities in diet were grouped into periods according to an ascending classification of the data (Benzecri, 1973). The new variables thus constituted: "food-height-period" were carried over as additional variables; they correspond to the center of gravity of the variables "food-height-month".

A diet diversity index was calculated using Simpson's formula (Levins, 1968): $D = (\sum p^2_i)^{-1}$ where p is the frequency of the different species consumed during month i. D can vary

from 1 to N: 1 when only one species is present in the diet; N when the N species are of equal importance.

The overlap of the diets of the different consumer classes was calculated, for each season, according to the formula $R = P_{ij} * P_{IK/} P_{ij}^2 * P_{IK}^2$ where P_{ii} and P_{ik} represent the proportions of species consumed by consumer classes j and k, in season i (Pianka, 1973). R is between 0 and 1.

RESULTS

ANNUAL COMPOSITION OF THE DIET AND RELATIVE IMPORTANCE OF THE VEGETATION LAYER USED

Annually, the group spent 89% of its feeding time on plants and 10.5% on animal prey. In deciduous oak forests, the Barbary Macaque can be considered a granivorous-folivorous species (nearly 60% of the diet). It should also be noted that lichen consumption was remarkably important, while fruits contributed relatively little to the diet (Table I).

TABLE I. *Average annual composition of the diet, in percentages*.

Classes	Whole group	Adult males	Adult females	Subadults	Juveniles
Age		> 4 years	> 4 years	3-4 years	0.5-3 years
Seeds	32.2	29.9	28.4	34.1	36.5
Leaves	27.3	33.7	32.7	32.7	15.2
Lichens	14.2	7.7	10.4	10.6	23.3
Roots	6.9	8.8	9.4	3.0	2.6
Mushrooms	4.1	4.4	3.1	3.6	4.6
Flowers	3.4	5.1	4.2	2.5	1.4
Fruits	0.8	1.9	0.6	< 0.05	0.5
Flower stems	0.1	< 0.05	0.6	< 0.05	< 0.05
Animal preys	10.5	7.9	9.7	11.7	14.0
Water	0.2	0.3	0.2	< 0.05	< 0.05
Undetermined	0.3	0.2	0.7	1.8	2.0
Number of observations	3309	1130	862	443	874

The diet of adult males and females differs little. On the other hand, we notice a gradual change in the relative importance of certain foods according to age.

— Juvenile macaques consume three times more lichens, more seeds and twice as much animal prey as adults.

— Adults are distinguished by greater folivory and a tendency to seek more underground reserves.

— Sub-adults occupy an intermediate position between these two extremes, for all foods concerned.

Overall, the group feeds on the ground in more than 55% of feeding observations and in trees in 44%. The 1 to 5 m layer is very little used (Table II). It is noted that arboreality, well developed in juvenile individuals during feeding (nearly 70% of the time), decreases with age. In adults, 70% of food is collected from the ground, while sub-adults collect about half of their food on the ground.

TABLE II. *Relative use of vegetation layers, in percentages*.

Classes Age	Whole group	Adult males > 4 years	Adult females > 4 years	Subadults 3-4 years	Juveniles 0.5-3 years
5 – 20 m	38.1	25.3	26.4	41.4	58.6
1 – 5 m	6.2	4.6	4.8	5.4	9.5
0 – 1 m	55.7	70.1	68.8	53.2	31.9
Number of observations	3309	1130	862	443	874

VARIATIONS IN DIET AND USE OF VEGETATION LAYERS DURING THE YEAR

The variations in the average composition of the group's diet are marked and delimit different periods, characterized by the significant intake of one or two types of food.

The months of April-May (1983-1984) are remarkable for the great amount of animal prey in the diet. Seeds dominate the diet in October-November 1983 and July, August and September 1984. Leaves and lichens seem to be the staple food in June 1983 and January to March 1984 (Figure 1 A).

Flower consumption is only significant in April, while mushrooms are actively sought after from the first rains in November. Finally, the foraging for underground reserves is particularly marked in July.

We can thus schematically delimit three periods in the annual change of the diet of this group:

— a mainly carnivorous period: the prey ingested are almost entirely phytophagous caterpillars;

— a granivorous period dominated by the consumption of acorns;

— a "folivorous" period characterized mainly by the consumption of cocksfoot leaves (Dactylis glomerata) and lichens.

Figure 1. — Monthly variations in diet composition and vertical layer use (%)

The relative importance of arboreality and terrestriality is adjusted to the consumption rates of these various types of food (Figure 1 B). Thus, the highest rate of arboreality (nearly 80% in October 1983 and August 1984) corresponds to the highest consumption of acorns, while maximum terrestriality is observed correlatively to the consumption of grass leaves. Finally, the ingestion of caterpillars Is associated with a temporary increase in arboreality (65% in April 1983 and 1984) which decreases rapidly (23 and 24% in May 1983 and 1984) when the caterpillars, close to pupation, migrate to the ground where they are consumed.

CHARACTERISTICS OF THE DIET OF CLASSES OF INDIVIDUALS ACCORDING TO THE TIME OF YEAR

The main characteristics likely to differentiate age and sex classes according to the types of food they consume and the sampling layer were investigated though interactions between these three factors by correspondence analysis. Three periods of the annual cycle were considered, on the basis of an ascending hierarchical classification (Figure 2): period 1, April and May; period 2, July to November; period 3, December to March and June.

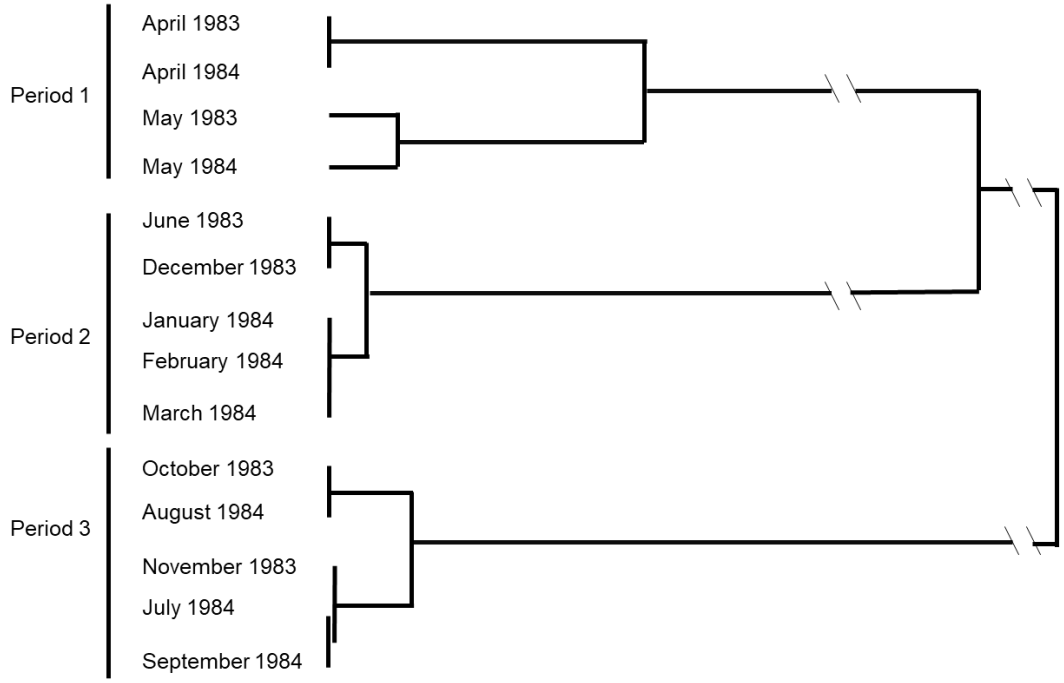

Figure 2. — Grouping months into periods based on diet similarities

The factorial plan (1-2) of the analysis accounts for 92% of the total inertia. On axis 1 (75% of the inertia), the main dispersion factors are lichens in period 3, animal prey in period 1, consumed either in trees (bottom of figure 3) or on the ground (top of the figure). Along this same axis, adult males, characterized by feeding on the ground are, whatever the period considered, opposed to juvenile animals, characterized by feeding in trees. Thus, in period 1, the diet of juveniles is mainly dominated by caterpillars collected in trees, while adult males eat mainly caterpillars and flowers on the ground. In periods 2 and 3, juvenile macaques mainly consume acorns taken from trees and lichens collected on trunks, while adults feed on the ground on leaves and seeds of herbaceous plants, fallen acorns, roots and fungi. We notice little difference between adult males and females; as for the subadults, they are little differentiated by this analysis, which confirms their intermediate position between juveniles and adults, all year round, both for the type of food and for the layer of feeding.

Axis 2 accounts for only 17% of the total inertia and does not provide any additional information. Overall, it is noted that the differences in arboreality between age classes is associated with a more or less diversified diet in terms of food types, with the tree layer appearing to provide a less diversified diet.

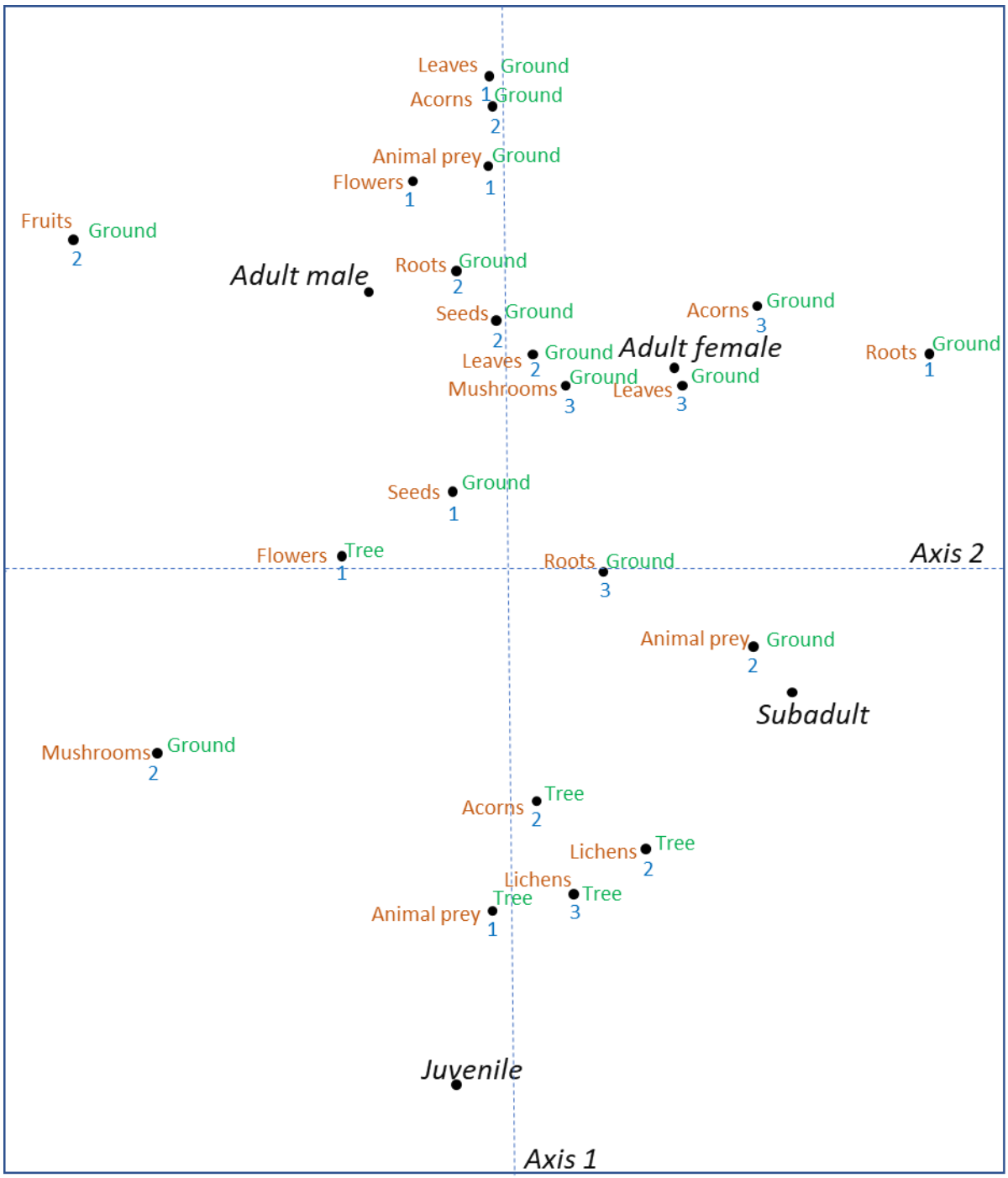

Figure 3. Interaction between diet composition (in orange), vertical use (in green) of the environment (in trees; from the ground) according to age and sex classes during different periods of the year (1, 2 and 3, in blue)

COMPOSITION AND SPECIFIC DIVERSITY OF THE DIET

Seventy-three plant species belonging to 26 families, three species of lichens, various fungi and 6 categories of animal prey enter into the annual diet of the group. However, four plant species (*Dactylis glomerata*, *Quercus faginea*, *Q. afares*, *Cytisus triflorus*), three lichens and one animal species (Geometrida sp. caterpillars) provide 74% of the food intake (Table III).

Each month, monkeys feed on 8 to 27 different species, but one or two species most often form the staple diet (51.1 to 93.2% of the monthly diet). These include:

— in April, Geometridae caterpillars and flowers of *Cytisus triflorus* (respectively 55 and 36% in 1983; 61 and 28% in 1984);

— in May 1983, Carex seeds (29%) and caterpillars (27%), and in May 1984 caterpillars (83.5%);

— in June 1983 leaves of *Calycotome spinosa* (37%) and three species of lichens (17%);

— in October and November 1983, acorns of *Q. faginea* (84 and 66%);

— in December 1983, leaves of *D. glomerata* (39%) and mushrooms (24%);

— from January to March 1984, leaves of *D. glomerata* (35 and 40%) and lichens (33 to 43%);

— in July 1984, acorns of *Q. afares* (31%) and swellings at the base of stems of *D. glomerata* (20%);

— from August to September 1984, acorns of *Q. afares* (79 and 35%) with, in September, a contribution of *Asphodelus acaulis* seeds (25%).

Each of the other species consumed accounts for less than 10% of the monthly diet and the consumption of some of them was observed only once. Finally, some species are present in the diet almost all year round, such as *C. triflorus* (leaves and flowers: 12 months), *D. glomerata* leaves or swellings of the stem, 12 months, *A. acaulis* (leaves, flower stalks or seeds: 10 months), the three species of lichens, collected mainly on *Q. afares* (10 months), *Ornithogallum ombellatum* (bulbs and leaves: 8 months), *Q. afares* and *Q. faginea* (leaves or flowers: 8 months). The observations from February and March 1983, insufficient for quantitative analysis, are presented only from a qualitative point of view.

Given the small number of quantitatively important species in the diet, both annual and monthly diversity indices are low (respectively 9.75; D varying from 0 to 85; and 1.4 to 5.95, D varying from 0 to 8 and from 0 to 27, depending on the month (Table III).

This index, calculated for the year and the three periods mentioned above, as well as for the three age groups, shows that (Table IV):

— overall, the diet of juveniles is less varied than that of adults and sub-adults, as would be expected from the almost exclusive use of the tree layer by these animals;

— the diversity of the diet of sub-adults is intermediate between those of the other two age classes, except in period 3;

TABLE III. *Composition (%) and specific diversity of the diet*.

The nomenclature adopted for plant species is that of Quézel and Santa (1961). "Ɛ" indicates occasional consumption of a food (< 0.05%), according to our scan samplings (scans) and our focal animal samplings.

			Mean annual	Mean monthly															
				1983									1984						
	Species	**Food items**		**F**	**M**	**A**	**M**	**J**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**A**	**S**
Tree layer	*Quercus faginea*	leaves	0.1	Ɛ	Ɛ	0.3								1.5					
		flowers	0.5			7									5.8				
		acorns	13.8						84.1	65.7	16					Ɛ		Ɛ	
	Quercus afares	flowers	Ɛ												0.2				
		acorns	12.1														31.1	79.2	35.2
	Quercus suber	acorns	0.3							1									2.6
	Lichens		14.2	Ɛ	Ɛ			16.9	Ɛ		14.2	43.1	42.2	32.6	0.2		8.8	1.6	9.8
	Ramalina farinacea subfarinacea																		
	Ramalina fraxinea																		
	Physia peptalea																		
Shrub layer	*Crataegus laciniata*	leaves	0.2											1.9				Ɛ	
	Rosa canina	fruits	Ɛ															Ɛ	
	Rubus ulmifolius and	leaves	0.1			Ɛ								0.6	Ɛ	0.4		0.7	
	Rubus incanescens	fruits	0.8																
	Cytisus troflorus	leaves	5			0.5	16.4	11.1	2.2	0.7	1.9	3	10.2	9		5.7	5.1	1.3	3.5
		shrub sucker	Ɛ	Ɛ								0.4							
		flowers	2.7			36.2	0.3								27.7	0.4			
	Calycotome spinosa	leaves	3.4					37.2			1.3		1.1	Ɛ	0.4			Ɛ	1.1
		flowers	0.2				4												
Herbaceous layer	*Osmunda regalis*	fern fronds	Ɛ			Ɛ									0.6				
	grass sp.	leaves	0.9	Ɛ		0.4	5.7	6.2	0.7										
		seeds	0.8					7											2.2

		Mean annual	Mean monthly															
			1983								1984							
Species	**Food items**		**F**	**M**	**A**	**M**	**J**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**A**	**S**
Phleum nodosum ssp. pratense	roots	ε														ε		
Ampelodesma mauritanicum	flower stems	0.1					1.5								ε			
Dactylis glomerata	leaves	13.7							12.2	38.9	39.7	35	36.5	1.1	0.7			0.8
	roots	2.7														20	2.4	10
	seeds	ε													0.4			
Poa bulbosa	roots	0.5															0.9	4.7
Poa annua	leaves	ε															ε	
Briza maxima	seeds	0.1					1.1								1.1			
Festuca ovina	leaves	ε	ε										0.4				ε	
grass sp. 1	leaves	ε																
grass sp. 2	leaves	ε			ε	ε											ε	
grass sp. 3	leaves	ε		ε														
grass sp. 4	leaves	0.1							ε			0.8		ε				
Carex sp.	seeds	1.2				28.7	1.1											
	roots	ε																ε
Arisarum vulgare	roots	ε														ε		
Luzula forsteri	roots	ε														ε		
Asphodelus microcarpus	leaves	1.2		ε	ε	1.9	4			1.2	2.3	0.8	5	0.6	0.7			
	seeds	3.5														7.9	8.6	25.1
	flower stems	ε											0.1					
Scilla hispanica	leaves	ε	ε										ε		0.4			
	roots	0.1	ε		0.3							1		ε	ε			
Ornithogalum ombellatum	leaves + roots	1.4				1.2					3.1	3.2	4.5	0.6	1.2	3.8	0.2	ε
Romulea sp.	leaves + roots	0.1	ε									1.3	ε					
Cerastium glomeratum	leaves + flowers	0.1			ε	1.9								0.2	1			
Moerhingia trinervia	leaves + flowers	0.1				ε					0.2	ε	0.8	0.4	0.7			
Silene italica ssp. mellifera	seeds	ε					ε									ε		
Ranunculus sp.	leaves	ε		ε	ε						ε	0.1	0.4		ε			
Ranunculus muricatus	roots	ε															ε	
Ranunculus paludosus	roots	0.1				1.2	ε									ε	0.2	
Ranunculus spicatus rupestris	leaves	ε											ε					
Fumaria agraria	leaves	ε										ε						

		Mean annual	Mean monthly															
			1983								1984							
Species	Food items		F	M	A	M	J	O	N	D	J	F	M	A	M	J	A	S
Alliaria officinalis	roots	ε														0.4		
Cotyledon umbilicus veneris	leaves	0.1									ε	0.6	0.4					
Saxifraga globulifera	leaves	ε											0.4					
Geum urbanum	roots	ε														0.4		
Geum sylvaticum	roots	ε														ε		
Lotus sp.	leaves	ε																0.5
Geranium atlanticum	leaves	ε		ε	ε													
Geranium robertianum	leaves	ε											ε	ε				
Eryngium campestre	roots	ε															ε	
Sanicula europaea	roots	ε															0.2	
Thapsia villosa	leaves	ε										ε	ε					
	flower stems	ε				ε												
Elaeoselinum asclepium meoides	leaves	ε									ε		ε	ε				
Ferula communis	leaves	0.1								0.6								
Myosotis collina	leaves	ε											ε					
Mentha pulegium	leaves	ε															ε	ε
Scutellaria columnea	seeds	0.3														3.6		
Lamium bifidum	leaves	0.1	ε		ε						ε	ε	0.4		0.4			
Lamium amplexicaule	leaves + flowers	0.1									0.4		0.4	ε				
Veronica anagallis aquatica	leaves	0.1															0.7	
Linaria reflexa	leaves + flowers	ε										ε	ε					
Galium aparine	leaves	0.3	ε		ε	0.9					ε	0.3		ε	2.7			
Galium tunetanum	leaves	ε											0.1					
Galium sp.	leaves	ε													ε	ε		
Fedia cornucopiae	flowers	ε													ε			
Spercularia falcata	leaves	0.1				1.9												
Bellis sylvestris rotundifolia	leaves	ε							ε									
	flower stems	ε		ε	ε						ε		ε	ε				ε
Pulicaria odora	flower stems	ε													0.7			
Chrysantemum fontanesii	leaves	ε										ε						
Centaurea seridis	roots	ε														ε		
Hyoseris radiata	leaves	ε										0.4						

			Mean annual	Mean monthly															
				1983									1984						
	Species	**Food items**		**F**	**M**	**A**	**M**	**J**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**A**	**S**
	Leontodon tuberosus	leaves	ε						ε										
	Undetermined herbaceous species 1	leaves	ε	ε															
	Undetermined herbaceous species 2	leaves	ε						ε										
	Undetermined herbaceous species 3	leaves	ε							0.7									
	Undetermined herbaceous species 4	leaves	ε											ε					
	Undetermined herbaceous species 5	roots	ε															ε	
	Undetermined herbaceous species 6	leaves	ε											ε					
	Undetermined plants	roots	2				1.1	7.7						0.4			8.9	3.2	2.9
		leaves	1.5						1.6	4.2		6.7	1.4	3	0.7		0.4	0.4	
		unidentified part	0.4	ε					2.3		0.3	0.4	0.7	0.8					
	Mushrooms																		
	Boletus sp.		0.5					6.2											
	bracket fungus on stump		ε									ε	ε						
	other mushrooms		3.6				7.8			14.1	23.7						0.8		
Animal prey																			
	Caterpillars		9.5			55.3	27								61.4	83.5			
	Grasshopers		1						9.1	1.4	1.3						ε	ε	
	Oak galls (2 species)		0.1												0.1				0.8
	Ant brood		ε															ε	
	Spiders		ε															ε	
Water			0.2								0.6	0.9	0.4	0.8			ε	ε	ε
Undetermined			ε														0.4		ε
Number of species eaten			85			14	15	12	8	8	9	14	20	27	22	17	16	24	16
Specific dversity index			11.08			2.29	5.16	5.03	1.4	2.12	3.93	2.87	3.21	3.97	2.2	1.43	5.95	1.58	4.73
Number of observations			3309			336	106	63	130	121	161	222	262	263	474	278	247	411	235

TABLE IV. *Diversity index of diets of different age classes.*

D may vary depending on the different age classes (Adults, Subadults, Juveniles), from 0 to 45, 26 or 25 for the year; from 0 to 23, 10 or 9 in period 1; from 0 to 20, 13 or 16 in period 2; from 0 to 27, 16 or 15 in period 3.

Classes	Adults	Subadults	Juveniles
Annual	10.03	9.59	7.02
Period 1	3.31	2.07	1.60
Period 2	6.09	4.26	3.72
Period 3	5.16	5.74	3.04

The overlap indices show that the diets of adults and subadults are the most similar; finally, the diet of the different age classes is the most similar from July to November (period 2). The lowest overlap is observed between adults and juveniles, whatever the season, while the diet of subadults is sometimes closer to that of juveniles (periods 2 and 3), sometimes to that of adults (period 1) (Table V). There does not seem to be any correlation between the specific diversity of diets and their degree of overlap.

The second part of this work will deal with the diets of the Barbary Macaque in cedar forests and on rocky summits. The use of food resources by the three groups studied will then be compared and discussed.

TABLE V. *Dietary overlap index between different age groups*.

Classes	Adults-Subadults	Subadults-Juveniles	Adults-Juveniles
Annual	096	0.88	0.79
Period 1	0.87	0.99	0.81
Period 2	0.96	0.98	0.94
Period 3	0.97	0.76	0.72

SUMMARY

The composition of the diet of a troop of Barbary macaques was studied in Algeria, from February 1983 to October 1984, in a deciduous oak forest (*Quercus faginea* and *Q. afares).*

Eighty nine percent of the feeding time was devoted annually to feeding on plant material. The troop observed had a basically granivorous and folivorous diet (60%), lichens and animal prey contributing to 14 and 10.5 percent of the diet respectively.

Great seasonal variations were observed: Barbary macaques were mainly carnivorous in spring, feeding on Geometrid moth caterpillars teeming on oak trees leaves; in summer and autumn they essentially ate acorns, before turning to leaves of *Dactylis glomerata* and lichens in winter time.

Differences in the diet of the three age classes were apparent throughout the year. Juveniles (0.5-3-year-old) ate three times as many lichens and twice as many animal prey the

adults. Adults (> 4-year-old) were more folivorous, while the diet of subadults stood in-between.

Seventy-three plant species, three kinds of lichens, some mushrooms and six kinds of prey were identified in the macaques' diet. However, 74% of the food items were contributed by four plant species only (*Dactylis glomerata, Quercus faginea, Q. afared* and *Cytisus triflorus),* three lichens and the caterpillars. Furthermore, 2 species out of the 8 to 27 consumed each month contributed to more than half of the monthly diet.

A little more than fifty percent of the major food items (acorns, lichens and caterpillars) came from the arboreal layer of the oak forest, 12.4% from the shrub layer, and 37.1% from the grass layer. Therefore, half of the food items of this "terrestrial" monkey was dependent upon the presence of trees. Similarly, 44% of the time spent feeding took place in trees. The variations of the relative levels of arboreality and terrestriality were well adjusted to the relative rates of consumption of different food types. However, significant differences did exist between age classes, since juveniles spent twice as much time feeding in trees than adults. The adult macaques fed preferably on fallen acorns and on caterpillars moving down to the forest floor to pupate, whereas the juveniles gathered both acorns and caterpillars higher up in trees.

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