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NATURAL DIET OF CHIMPANZEES (*PAN TROGLODYTES SCHWEINFURTHII*): Long-term Record from the Mahale Mountains, Tanzania

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ABSTRACT All the plant and animal foods recorded to be eaten by wild chimpanzees of Kasoje in the Mahale Mountains, Tanzania between 1965 and 1981 are listed up together with some additional miscellaneous foods. As for the plant foods, the chimpanzees have been confirmed to utilize 328 food items from 198 species (including 8 food items from 6 cultigen species). They also consume 12 species of mammals, 5 species of birds or their eggs (including one domestic species), and more than 15 genera of insects (including at least 25 species). Since drastic inter-annual changes in food composition in the diet of wild chimpanzees exist, only such data collected on the basis of a long-term perspective can reveal their diversified food repertoire.

INTRODUCTION

Feeding habits of wild chimpanzees have received much attention from anthropologists, because they are likely to shed light on the proto-hominid diet (Itani, 1966; Itani & Suzuki, 1967; Suzuki, 1969; Tanner & Zihlman, 1976; Isaac, 1978; Zihlman, 1978; Peters & O'Brien, 1981). This paper lists up all the plant and animal foods observed to be eaten by chimpanzees of Kasoje in the Mahale Mountains, Tanzania and aims to provide archaeologists and paleontologists with fresh field data which would be useful in reconstructing the diet of early hominid as well as to present basic data on the feeding ecology of the chimpanzee.

METHOD

The data on which this paper is based were obtained from multiple field studies conducted by the authors (1965–1981). Although the study covers four unit-groups (B, K, M, & L) of chimpanzees living in the study area, almost all data come from the study of two habituated unit-groups (K & M including roughly 110 chimpanzees in total), and mostly from a single unit-group (K) which has been studied most intensively. Only the species that have been identified scientifically are included in the list. The leaves of the plants which were eaten only as "wadge" are excluded, though they were included in the earlier paper (Nishida, 1974). There are still other unidentified edible fruits, the seeds of which have been found in the chimpanzees' feces. Therefore, this list is not yet comprehensive. However, it is quite likely that all the important food items have already been collected. Only long-term study can reveal the diversified food repertoire of wild chimpanzees: for example, it is only recent years (1975 and 1977 respectively) that *Toddalia* and *Mimusops* fruits were known to be eaten much by chimpanzees. Food composition changes from year to year, and some food almost neglected in one year might be harvested in great amounts in another year.

When available, the maximal length of feeding bout and the number of bouts in which the bout-lengths were measured are reported here, so that readers may have a general idea as to

the degree of importance of the specific food item in the total food repertoire. Such data were taken from only recent field studies (Nishida; Oct. 1973–Jan. 1974, May 1975–May 1976, July-Sept. 1977, July–Dec. 1979, Aug.–Dec. 1981: Uehara; Oct. 1973–Mar. 1974, Dec. 1976–Nov. 1978). Some plant foods lack the bout-length data, mainly because the employment of the focal animal sampling method was biased to the season, August-December. Therefore, the number of bouts is not always comparable with each other in terms of the food availability, since the food item available in August-December period has been more often sampled than in any other period of the year.

Botanical Latin names: All Latin and author names in this paper are used in accordance with the rules explained in an earlier listing (Nishida & Uehara eds., 1981: 112–113). In addition, only the name shown by botanists to fertile samples is preferentially chosen in this listing in case that different names have been given to a single species. However, there are several cases in which two names are simply listed. This is either because fertile samples of the same species have been identified as two different species or because fertile specimens of the species have not been collected yet. The only exception to the rules above is *Salacia* sp. (Celastraceae) whose fertile samples have been given three trivial names on different occasions. Only generic and specific names are mentioned here.

Plant parts eaten by chimpanzees: Plant parts eaten are divided into the following categories. LS: leaves, buds, and/or young shoot (or stem). Bl: blossom. F: fruits, including pods and grass seeds. Se: seed. Applied only when seeds extracted from fruits are selectively eaten with other parts rejected. B: bark or cambium. W: wood. Applied to live or dry dead wood and only when it is chewed. Sp: sap. Any licked substance including liquid from live or dead trunk or branch of tree. P: pith. Applied only when live inner unlignified tissue extracted from shoot or stem is selectively consumed with leaves ignored. R: resin. Applied to solid or soft semisolid substance secreted from live trunk or branch of tree and only when it is chewed.

Only particular portions of the nine categories are harvested by the chimpanzees in some cases (e.g., pith of petiole etc.). These are described in the section of 'Notes on Techniques for Feeding on Plant Foods'.

Life form: The life form of the plant is divided into five categories. T: tree. S: shrub. H: herb. L: liana, or other climber. P: parasite.

Habitat: Habitat of the food plants is divided into three categories. F: any type of forests including moist, evergreen or semi-deciduous gallery forest and dryer types of semi-deciduous forest occurring on the ridge of a hill. S: any type of openland vegetation including *Acacia* savanna, *Brachystegia* woodland and a variety of mixed woodland types except "L" that follows. L: lakeside sand beach and open riverside vegetation including aquatic plants. F–S indicates that the species, though extending over the openland to a certain degree, distributes mainly in the forest, while S–F indicates that the species distributes more abundantly in the openland than in the forest.

PLANT FOODS

The plant species consumed by the chimpanzees are listed in Table 1.

NOTES ON TECHNIQUES FOR FEEDING ON PLANT FOODS

Leaves: Chimpanzees hold the leafy branch with one hand and strip tiny leaves off with the mouth in a stroke of head movement, or pull them through with fingers and put them into the mouth. They may pick off a large leaf or leaves with one hand, putting them into the mouth.

Table 1. List of plant foods. This table lists (1) botanical name, followed in this order by (2) life form, (3) habitat, (4) part eaten, (5) food season, (6) maximal length of feeding bout in min, and (7) number (N) of bouts in which the bout-lengths were recorded. The order of families follows that of J. Hutchinson (1926 and 1934) *Families of Flowering Plants* first edition). Symbols: *; food items recorded only once, ‡; cultigens, [B] [M] [L]; recorded only in chimpanzees of B (M, or L) group. All other foods were recorded at least once in K-group chimpanzees.

PTERIDOPHYTA						
Dennstaedtiaceae						
Pteridium aquilinum (L.) Kuhn	H	S	LS:	Jan, Mar, Jul–Aug, Oct, Dec	2	N = 18
			P:	May, Aug	4	N = 1
ANGIOSPERMAE: DICOTYLEDONS						
Annonaceae						
Annona senegalensis Pers.	T	S	F:	Oct–Feb	2	N = 1
			LS:	Oct–Mar	1	N = 2
			Bk:	Jan, Sept		
Artabotrys monteiroae Oliv.	L	F	F:	Jul	1	N = 1
Uvaria angolensis Oliv.	L	F	F:	Feb–May	38	N = 22
			LS:	Nov–Apr	1	N = 3
Hernandiaceae						
Illigera pentaphylla Welw.	L	F	*LS:	Nov	5	N = 1
Myristicaceae						
Pycnanthus angolensis (Welw.) Warb.	T	F	*Bl:	Mar		
			F:	Jun–Feb	37	N = 221
			LS:	Oct, Dec	12	N = 3
			Bk:	Nov –Dec, Mar, Jun	3	N = 2
			W:	Mar–Apr, Jun, Aug–Sept, Nov–Dec	34	N = 20
Ranunculaceae						
Clematopsis scabiosifolia (DC.) Hutch.	H	S	*F:	Jul		
Menispermaceae						
Dioscoreophyllum volkensii Engl.	L	F	LS:	Feb, Sept	1	N = 1
Stephania abyssinica (Dillon & A. Rich.) Walp.	L	S	*LS:	Nov	2	N = 1
Tinospora caffra (Miers) Troupin	L	F	LS:	Nov–Aug	28	N = 115
			P:	Mar		
Rafflesiaceae						
Pilostyles aethiopica Welw.	P	S	F:	Jul	26	N = 1
Piperaceae						
Piper umbellatum L.	H	F	F:	Jun–Jul		
			P:	Jan, May	13	N = 1
Flacourtiaceae						
Flacourtia indica (Burm. f.) Merrill	S	S	F:	Jan–Mar, Jun–Jul	2	N = 3
Passifloraceae						
Adenia rumicifolia Engl. & Harms	L	F	*Bl:	Apr	1	N = 1
			LS:	Nov–Mar, Aug	1	N = 1
Cucurbitaceae						
Coccinia barteri (Hook. f.) Keay or *C. adoensis* (A. Rich.) Cogn.	L	F	LS:	Jul		
Mukia maderaspatana (L.) R. J. Roem.	L	S	LS:	Jan, May	1	N = 2
Dipterocarpaceae						
Monotes elegans Gilg	T	S	*Bl:	Jan	1	N = 1
			*R:	Aug		
Myrtaceae						
Syzygium guineense (Willd.) DC. [L]	T	F	F:	Oct		
Combretaceae						
Combretum molle G. Don	T	S	LS:	Oct–Feb	1	N = 2
			R:	Sept		
Guttiferae						
Garcinia huillensis Oliv.	T	S–F	F:	Jul–Jan	71	N = 289

			Sp:	Dec	11	N = 5
Harungana madagascariensis Poir.	T	S–F	F:	Apr–Sept	64	N = 44
Tiliaceae						
Grewia mollis Juss.	T	S	F:	Mar–Jun	13	N = 7
Grewia platyclada K. Schum.	S–L	F	Bl:	Mar		
			F:	Mar–Sept	1	N = 2
			LS:	Apr, Jul	8	N = 1
Sterculiaceae						
Dombeya rotundifolia (Hochst.) Planch.	T	S	Bl:	Aug	7	N = 1
			LS:	Nov–Dec		
Pterygota macrocarpa K. Schum.	T	F	*LS:	Sept		
Sterculia quinqueloba (Garcke) K. Schum.	T	S	Bl:	Aug	33	N = 4
			F:	Aug–Nov		
			LS:	Jul–Oct	11	N = 1
			Bk:	Mar		
Sterculia tragacantha Lindl.	T	S	Bl:	Jul–Aug	49	N = 3
			F:	Mar–Aug	34	N = 23
			LS:	All year	62	N = 152
			Bk:	Jan, Mar		
Malvaceae						
Azanza garckeana (F. Hoffm.) Exell & Hillcoat	T	S	Bl:	Jan–Mar	8	N = 4
			F:	Mar–Nov	51	N = 35
Hibiscus aponeurus Sprague & Hutch.	S	S	LS:	Feb–Apr		
Hibiscus cannabinus L.	S	F	LS:	Jul	1	N = 1
Hibiscus nyikensis S rague	S	S	LS:	Jan, Mar–Jun	1	N = 3
Hibiscus rostellatus Guill. & Perr.	S	L	LS:	May–Jul		
Hibiscus surattensis L.	S	F	LS:	Feb, Sept	1	N = 1
Hibiscus sp.	S	F	LS:	Jul–Aug		
Euphorbiaceae						
Acalypha chirindica S. Moore	S	S	LS:	Jan, Mar	2	N = 1
Acalypha ornata A. Rich.	S	F	LS:	Oct–Feb	2	N = 1
Antidesma membranaceum Muell. Arg.	T	S	F:	Feb–Jun	66	N = 46
Bridelia atroviridis Muell. Arg.	T	S	F:	Jun–Jul		
Croton sylvaticus Hochst. ex Krause	T	F	F:	Apr		
			LS:	Apr, Aug, Nov		
Margaritaria discoidea (Baill.) Webster	T	S	F:	Jan–Apr		
			LS:	Dec–Jan		
Ricinodendron heudelotii (Baill.) Pierre ex Pax [B]	T	S	Bl:	Nov		
			LS:	Oct		
Uapaca kirkiana Muell. Arg.	T	S	F:	Aug–Nov	20	N = 3
Uapaca nitida Muell. Arg.	T	S	Bl:	Mar		
			F:	Apr, Aug–Nov	36	N = 10
Uapaca sansibarica Pax	T	S	F:	Aug–Oct	1	N = 2
Rosaceae						
Parinari curatellifolia Benth.	T	S	F:	Mar–May, Jul–Aug	9	N = 1
			LS:	Oct–Mar		
			*Bk:	Dec		
			Sp:	Dec	7	N = 9
Rubus pinnatus Willd.	S	F	F:	Jun–Jul		
Caesalpiniaceae						
Afzelia africana Pers.	T	S	*Se:	Mar		
Bauhinia petersiana Bolle	T	S	Bl:	Jan, Apr		
			Se:	Apr, Jul		
			LS:	Oct–Apr, Aug		
Brachystegia bussei Harms	T	S	*F:	Jun	6	N = 1
			Se:	Jun–Sept	76	N = 13
			LS:	Oct–Jan, Jun		
			Bk:	Nov–May	63	N = 36
			R:	Jul–Aug, Dec	2	N = 3

			Sp:	Feb	14	N = 3
Brachystegia spiciformis Benth.	T	S	Se:	Feb, Jul–Aug, Dec	1	N = 1
Julbernardia seretti (De Wild.) Troupin	T	F	Se:	Nov		
			LS:	Dec–Jan		
Piliostigma thonningii (Schumach.) Milne-Redh.	T	S	Se:	Apr, Jul–Sept	29	N = 7
Mimosaceae						
Acacia hockii De Wild.	S–T	S	Se:	Aug–Sept	60	N = 2
Acacia sieberiana DC.	T	S	Se:	Jul–Sept	25	N = 7
Albizia glaberrima (Schum. & Thonn.) Benth.	T	F	LS:	Dec–Feb	1	N = 1
			*Bk:	Jun	2	N = 1
			R:	Nov–Dec	5	N = 2
Parkia filicoidea Oliv.	T	F	*Bl:	Oct	5	N = 1
			Se:	Sept–Dec	32	N = 51
Papilionaceae						
Baphia capparidifolia Bak.	L	F	Bl:	Jul–Dec	38	N = 51
			*F:	Nov	3	N = 1
			LS:	All year	100	N = 252
♯ *Cajanus cajan* (L.) Millsp.	S	—	Se:	Mar		
Crotalaria sp.	S	F–S	LS:	Feb, Apr–Jun	1	N = 1
Crotalaria sp.	S	S–F	LS:	Feb–Apr	8	N = 1
Dalbergia boehmii Taub.	T	S	Bl:	Aug		
Dalbergia malangensis E. P. Sousa	L	F	LS:	Jun–Jul, Dec	29	N = 2
Erythrina abyssinica DC.	T	S	Bl:	Aug–Oct	36	N = 41
			F:	Sept–Oct	10	N = 6
			LS:	Sept–Apr	18	N = 29
			*Bk:	Jul		
Glycine wightii (Wight & Arn.) Verdc.	L	S	Bl:	Apr–May	23	N = 19
			*F:	Jul	1	N = 1
			LS:	Dec–Jul	26	N = 155
Indigofera podocarpa Bak. f. & Martin	S	S	Bl:	Mar–Apr		
			*LS:	Apr		
Mucuna gigantea (Willd.) DC.	L	F–S	LS:	Jan	1	N = 1
Neorautanenia mitis (A. Rich.) Verdc.	L	S	F:	Jan. Mar	1	N = 2
Pseudarthria hookeri Wight & Arn.	S	L	LS:	Jan		
Psophocarpus scandens (Endl.) Verdc.	L	S–L	LS:	Jan, Jul, Sept	1	N = 1
Pterocarpus tinctorius Welw.	T	S	Bl:	Feb–Apr	69	N = 31
			F:	Apr–Jun	50	N = 6
			Se:	Jun–Sept	35	N = 20
			LS:	All year	87	N = 546
Rhynchosia sp.	L	F–S	*LS:	Feb		
Rhynchosia sp. or *Vigna* sp.	L	S–F	LS:	Nov–Jan, Mar		
Sesbania sesban (L.) Merrill	T	L	Bk:	Dec–Jan, Mar–Apr, Jul–Sept	19	N = 19
			W:	Jan, Sept	3	N = 1
			Sp:	Mar	19	N = 5
Vigna ambacensis Bak.	L	S	Bl:	Jun–Jul		
			Se:	Jun–Jul		
			LS:	Mar, Jun–Jul		
Ulmaceae						
Celtis africana Burm. f.	T	F	LS:	Jan	1	N = 2
Trema orientalis (L.) Blume	T	S–F	LS:	Nov–Dec		
Moraceae						
Chlorophora excelsa (Welw.) Benth. & Hook. f.	T	F	Bl:	Aug	42	N = 4
			LS:	Aug	27	N = 3
Ficus capensis Thunb.	T	F	F:	All year	70	N = 283
			LS:	Feb–Mar, Oct		
			W:	Aug–Sept	16	N = 3
Ficus congensis Engl.	T	F	F:	Mar–Apr, Jul, Oct–Nov	29	N = 11

			LS:	Apr–May, Sept, Nov–Dec	10	N = 5
Ficus cyathistipula Warb. = *F. kirkii* Hutch.	T	F	F:	Mar	61	N = 20
Ficus exasperata Vahl	T	F	F:	Jul–Feb	53	N = 78
			LS:	All year	66	N = 99
Ficus glumosa Del.		T S	F:	Feb		
Ficus ingens (Miq.) Miq.		T F	F:	Sept	32	N = 5
			LS:	Dec		
Ficus sonderi Miq.	T	S	F:	Jul–Aug, Oct	43	N = 9
Ficus thonningii Blume	T	L	F:	Apr, Jul–Sept	32	N = 15
Ficus urceolaris Welw. ex Hiern	S	F	F:	All year	17	N = 78
			LS:	All year	36	N = 310
Ficus vallis-choudae Del.	T	F	F:	All year	61	N = 118
			LS:	Feb–Jun, Aug, Oct, Dec	10	N = 3
			W:	Feb, Apr	3	N = 1
Ficus sp.	T	S–F	F:	Jul, Sept	15	N = 6
			LS:	Dec–Jan, Jul	1	N = 1
Ficus sp.	T	F	F:	Aug, Oct	19	N = 4
Myrianthus holstii Engl.	T	F	F:	Sept–Nov	34	N = 16
			LS:	Dec–Sept	6	N = 5
			P:	Apr–May, Dec	13	N = 1
			*Bk:	Jan		
Celastraceae						
Salacia sp.	L	F	F:	Oct		
			*LS:	Jan	1	N = 1
Olacaceae						
Ximenia americana L.	S–T	S	F:	Oct–Nov	1	N = 1
Rhamnaceae						
Ziziphus mucronata Willd.	T	S	F:	Jul–Aug	56	N = 15
Vitaceae						
Ampelocissus africana (Lour.) Merr.	L	S	*F:	Apr		
Ampelocissus cavicaulis (Bak.) Planch.	L	F	F:	Feb–May	9	N = 2
			LS:	Dec–Feb		
			P:	Jan–Feb, Aug–Oct	4	N = 6
Cissus oliveri (Engl.) Gilg	L	S–L	*LS:	Jan		
			W:	Dec		
Cissus ?petiolata Hook. f.	L	S	F:	Apr	1	N = 3
			P:	Sept	2	N = 2
Cissus rubiginosa (Welw. ex Bak.) Planch	L	S	F:	Feb–Apr	1	N = 1
Cyphostemma sp. [B]	H	S	F:	Nov		
			P:	Nov		
Leea guineensis G. Don	S	F	F:	Jun–Sept		
			LS:	Jan, May	1	N = 1
			P:	May–Jun		
Rhoicissus sp.	L	F	LS:	Jul	6	N = 1
			P:	Jul		
Rutaceae						
♯ *Citrus limon* (L.) Burm. f.	T	—	F:	Sept–Nov	(McGrew, pers. comm.)	
Teclea nobilis Del. [B]	T	F	F:			
Toddalia asiatica (L.) Lam.	L	F	F:	May–Oct		
Burseraceae						
Canarium schweinfurthii Engl.	T	F	*F:	Dec		
Meliaceae						
Trichilia prieuriana A. Juss.	T	F	LS:	Mar-Jul	53	N = 49
Sapindaceae						
Allophylus congolanus Gilg	S–T	F–S	LS:	Feb–Mar	8	N = 1
Deinbollia fulvo-tomentella Bak. f.	S–T	F	F:	Jan	1	N = 2
Haplocoelum foliolosum (Hiern) Bullock	T	S	LS:			
Lecaniodiscus fraxinifolius Bak.	T	F–S	F:	Nov–Dec		
Paullinia pinnata L.	L	F–S	F:	Sept–Oct		

			LS:	Jun–Aug		
Zanha golungensis Hiern	T	F	F:	Nov	34	N = 8
			LS:	Sept		
Anacardiaceae						
Lannea schimperi (A. Rich.) Engl.	T	S	F:	Sept–Nov	28	N = 11
			LS:	Oct–Jan	1	N = 1
			R:	Mar [M] (Hiraiwa, pers. comm.)		
Pseudospondias microcarpa (A. Rich.) Engl.	T	F	F:	Jun–Nov	84	N = 194
			LS:	Nov–Apr, Aug		
			*Bk:	Apr		
♯ *Mangifera indica* L.	T	—	F:	Oct	(Takasaki, in press)	
Ebenaceae						
Diospyros kirkii Hiern [B]	T	S	F:	Jul		
Sapotaceae						
Afrosersalisia cerasifera (Welw.) Aubrev.	T	F	F:	Feb–Jul		
Bequaertiodendron magalismontanum (Sond.) Hiene & J. H. Hemsl.	T	F	F:	Nov		
Mimusops penduliflora Engl.	T	F	F:	Jun–Jul	26	N = 19
Loganiaceae						
Anthocleista schweinfurthii Gilg	T	F	F:	Nov		
Strychnos innocua Del.	T	S	F:	Mar–Apr, Sept–Dec	19	N = 14
			LS:	Jan		
Oleaceae						
Jasminum sp.	S–L	?	LS:	Nov–Dec ?		
Apocynaceae						
Ancylobothrys amoena Hua	L	F	F:	Jan	7	N = 5
Diplorhynchus condylocarpon (Muell. Arg.) Pichon	T	S	Bl:	Oct–Nov	2	N = 1
			Se:	Jan–Sept	124	N = 180
			LS:	Sept–Feb	2	N = 2
			*P:	May	1	N = 1
Landolphia owariensis P. Beauv.	L	F	F:	Sept–Mar	27	N = 68
			LS:	Nov–Jan, Jun	8	N = 2
			*Sp:	Apr	4	N = 1
			P:	Feb–Dec	21	N = 56
Oncinotis inandensis Wood. & Evan	L	F	F:	Oct–Dec		
Saba florida (Benth.) Bullock	L	F	F:	Jul–Mar	46	N = 350
			Se:	Jan (coprophagy)	10	N = 1
			LS:	Dec–Jan, May–Jun, Aug, Oct	8	N = 3
			P:	Feb–Aug, Oct	19	N = 23
Tabernaemontana holstii K. Schum.	T	F	F:	Jul, Sept	16	N = 1
			*LS:	Dec	1	N = 1
Voacanga lutescens Stapf	T	F	F:	May–Oct	15	N = 11
Asclepiadaceae						
Ceropegia sp. or *Cynanchum* sp.	L	F–S	Bl:	Dec–Jan	4	N = 2
			F:	Jun, Sept	6	N = 3
			LS:	Sept–Jul	10	N = 79
Ceropegia sp.	L	F	LS:	Dec–Jan	9	N = 6
Dregea schimperi (Decne.) Bullock	L	S	*LS:	Nov	2	N = 1
Riocreuxia profusa N. E. Br.	L	F	LS:	Dec–Jan, Jul		
Rubiaceae						
Canthium crassum Hiern	T	S	F:	Jun–Sept	17	N = 52
Canthium venosum (Oliv.) Hiern	L	S	F:	Aug–Apr	32	N = 6
			LS:	Jan–Feb	1	N = 1
Canthium rubrocostatum Robyns or *C. vulgare* (K. Schum.) Bullock	T	S–F	F:	Apr–Aug	49	N = 42
Chassalia cristata (Hiern) Bremek	L	F	F:	Nov	(Hiraiwa, pers. comm.)	
			LS:	Jun–Jul		
Mussaenda arcuata Lam. ex Poir.	S–L–T	F–S	F:	Oct		

			LS:	Mar–Apr, Jul	5	N = 4
			P:	Mar		
Pavetta sp.	T	F	F:	Jun–Jul, Oct		
Psychotria peduncularis (Salisb.) Steyerm.	S	F	F:	Mar–Jul	23	N = 23
Rothmania manganjae (Hiern) Keay	T	F	LS:	Jan, Mar		
Rytigynia sp.	S	F	*F:	Jan		
			LS:	Jan		
Compositae						
Aspilia mossambicensis (Oliv.) Wild	H	S	LS:	All year	10	N = 14
Bidens grantii (Oliv.) Scherff.	H	L	Bl:	May	4	N = 2
			LS:	Jan, May		
Crassocephalum bojeri (DC.) Robyns or *Gynura scandens* O. Hoffm.	L	L	LS:	Jan–May		
Crassocephalum crepidioides (Benth.) S. Moore	H	S	*Bl:	Mar	1	N = 1
			*LS:	Mar	1	N = 1
Crassocephalum vitellinum (Benth.) S. Moore	H	F–S	*LS:	Feb		
Sonchus schweinfurthii Oliv. & Hiern	H	S–F	LS:	Jan–Feb		
Vernonia amygdalina Del.	T	S	LS:	Nov–Apr, Jul–Sept	1	N = 1
			P:	Nov–May, Aug–Sept	9	N = 18
			Bk:	Jul–Aug	2	N = 2
Vernonia subuligera O. Hoffm .	T	S	Bl:	Jul–Aug		
			P:	Jan, Mar, Oct	10	N = 3
Boraginaceae						
Cordia africana Lam.	T	F	F:	Jun–Sept	9	N = 4
Cordia millenii Bak.	T	F	Bl:	Sept	42	N = 8
			F:	Feb–Aug, Oct–Dec	41	N = 48
			LS:	Apr, Oct, Dec		
			P:	Apr		
			R:	Feb–Apr [M] (Hiraiwa, pers. comm.)		
Convolvulaceae						
Hewittia sublobata (L. f.) O. Ktze.	L	L–S	LS:	Jan–Feb, Jun–Jul, Sept	3	N = 5
Ipomoea cairica (L.) Sweet	L	L–S	LS:	Jan, Apr–May, Jul–Sept	10	N = 5
Ipomoea muricata (L.) Jacq.	L	F	LS:	Jun		
Ipomoea ochracea (Lindl.) G. Don	L	F	LS:	Jun		
Ipomoea rubens Choisy	L	F	LS:	Jan, Aug, Nov	30	N = 9
Ipomoea sp.	L	S	Bl:	Jun	4	N = 2
			F:	Jun	4	N = 2
			LS:	Jan, Apr–Jun	4	N = 4
Lepistemon owariense (Beauv.) Hall. f.	L	F–S	*LS:	Feb		
Merremia pterygocaulos (Steud. ex Choisy) Hall. f.	L	S	*LS:	Jun		
Bignoniaceae						
Markhamia hildebrandti (Bak.) Sprague	T	F	LS:	Nov-Feb, Aug		
			*Bk:	Dec		
Spathodea nilotica Seem.	T	F	*Se:	Aug		
Stereospermum kunthianum Cham.	T	S	LS:	Jan, Nov		
			*Sp:	Jul		
Acanthaceae						
Asystasia gangetica (L.) T. Anders.	H	S–L	*Bl:	Apr	1	N = 1
			LS:	Jan–Apr, Aug, Nov	8	N = 4
Blepharis buchneri Lindau	H	L–S	LS:	Dec–Jul	44	N = 53
			P:	Jan		
Dyschoriste trichocalyx (Oliv.) Lindau	T	F	LS:	Aug–Dec		
Thunbergia alata Boj. ex Sims	L	S–F	LS:	Jan–May	3	N = 8
Whitfieldia sp. [B]	L	F	*LS:	Oct		
Verbenaceae						
Clerodendrum schweinfurthii Guerke	S–L	F	*Bl (galled flower):	Apr	1	N = 1
			LS:	Aug–Nov		
Lippia plicata Baker	H–S	S	*LS:	Mar	1	N = 1

Premna sp.	T	S	LS:	Mar–Apr	1	N = 1
Vitex doniana Sweet	T	S	F:	Jun		
ANGIOSPERMAE: MONOCOTYLEDONS						
Musaceae						
Ensete edule (Gmel) Horan	H	F	P:	Oct		
♯ *Musa* sp.	H	—	F:	All year		
			LS:	Mar, Aug, Sept	5	N = 3
			P:	All year	11	N = 36
Zingiberaceae						
Aframomum alboviolaceum (Ridley) K. Schum.	H	S	P:	Sept–Jun	47	N = 105
Aframomum mala (K. Schum.) K. Schum.	H	F	F:	All year	1	N = 1
			P:	All year	21	N = 83
Aframomum sp.	H	S	F:	Mar–Aug		
			P:		2	N = 10
Costus after Ker–Gawl	H	F	F:	Jul [B]		
			P:	Feb–Dec	9	N = 20
Renealmia engleri K. Schum.	H	F	P:	Mar–Aug		
Marantaceae						
Marantochloa leucantha (K. Schum.) Milne-Redh.	H	F	*F:	Jul		
			P:	Jun–Dec	22	N = 22
Smilacaceae						
Smilax kraussiana Meisn.	L	F–S	LS:	Sept–May	10	N = 42
Araceae						
Culcasia scandens P. Beauv.	L	F	*LS:	May		
Dioscoreaceae						
Dioscorea odoratissima Pax	L	S–F	F:	Mar–Apr	55	N = 27
			LS:	Mar	23	N = 8
Dioscorea schimperana Kunth	L	S	F:	Mar–Apr	10	N = 11
			LS:	Oct–Mar	2	N = 7
			P:	Oct	2	N = 3
Agavaceae						
Dracaena reflexa Lam.	T	F	LS:	Jan, Jul		
			*Bk:	Jan		
Taccaceae						
Tacca leontopetaloides (L.) O. Ktze.	H	S	F:	Mar		
Cyperaceae						
Cyperus papyrus L.	H	L	P:	Mar	1	N = 1
Cyperus sp. [M]	H	L	P:			
Gramineae						
Brachiaria brizantha (A. Rich.) Stapf	H	S	F:	Apr	3	N = 4
Hyparrhenia variabilis	H	S	*P:	Jan		
Olyra latifolia L.	H	F	F:	Apr–May, Jul–Aug	4	N = 1
			P:	May, Oct		
Oxytenanthera abyssinica (A. Rich.) Munro [B]	H	S	P:	Oct–Nov		
Panicum maximum Jacq.	H	S	F:	Apr–May, Aug		
Pennisetum purpureum Schum·ch	H	S–L	P:	All year	28	N = 119
Phragmites mauritianus Kunth	H	L	P:	Jul–Mar, May	56	N = 20
♯ *Saccharum officinarum* L.	H	—	P:	All year		
Vossia cuspidata (Roxb.) Griff.	H	L	P:	All year	31	N = 95
♯ *Zea mays* L.	H	—	P:	Dec–Feb	2	N = 1

N. B.: The following four species (life form and parts eaten in parentheses) have been recorded only by the Tanzanian assistants as additional food p'ants of the chimpanzee. They are, as a temporary measure, not included in the further analysis in the section of 'Diversity of Plant Foods'.

Annonaceae:	?*Uvaria* sp.	(?L; F)
Papilionaceae:	*Sphenostylis stenocarpa* (A. Rich.) Harms	(L; Bl, F, LS)
Loganiaceae:	*Strychnos cocculoides* Bak.	(T; Bl, F)
Gramineae:	♯ *Sorghum bicolor* (L.) Moench	(H; P)

Sometimes, they make a pile of leaves in a hand and then put them altogether into the mouth. On other occasions, they make a pile of leaves in the mouth and then chew all of them together. Young leaves or buds are preferred and are frequently consumed along with the shoot or stem to which they are attached. Leaves are eaten mostly in the tree; however, they often obtain leaves of particular species on the ground (small trees of *Pterocarpus tinctorius* and *Sterculia tragacantha*, shrubs of *Ficus urceolaris*, etc.). Leaf-blades of some plants are mostly ignored with only the petiole (or the pith of the petiole) consumed: Such plants are *Cordia millenii*, *Ficus congensis, Ipomoea rubens* and *Myrianthus holstii*.

Blossoms: Blossoms are usually eaten in similar ways as the leaves. For some species (e.g., *Erythrina abyssinica, Sterculia tragacantha*, etc.), chimpanzees break off and hold the flowering branch with one hand and put each blossom into the mouth. Favorite flowers such as *E. abyssinica* are also occasionally recovered from the ground, when conspecifics in the tree let them fall.

Fruits and seeds: Fruits and seeds are mainly taken in the tree. Particularly, the seeds of *Parkia fillicoidea* are available usually 20 m or higher above the ground. However, chimpanzees prefer to obtain fallen fruits, rather than intact ones, of some species on the ground; these are mostly dry types of fruits with stickly pulp available in the dry season (e.g., fruits of *Canthium crassum*, *Parinari curatellifolia*, *Uapaca kirkiana*, seeds of *Piliostigma thonningii*, etc.). To humans, only fallen, ripe fruits of the former three species seem tannin-free and edible. On the other hand, fallen dry seeds of *Brachystegia bussei* are usually neglected.

Very many species of fruits which are usually harvested in the tree are also recovered on the ground. When chimpanzees in large numbers climb a huge fruiting tree (e.g., *Pseudospondias microcarpa*), some adults (especially older ones) remain on the ground, picking up and feeding from the fruit-laden branches which are inadvertently discarded by conspecifics climbing on the tree. More commonly, when chimpanzees revisit the same fruiting tree after a few days of the former exploitation, they eagerly search for and pick up the fallen fruits, occasionally under the fallen leaves and even from the surface water, which have become ripe on the ground.

A few species of intact fruits are regularly harvested on the ground from short trees or shrubs (*Ficus urceolaris, Psychotria peduncularis*, etc.). The feeding method on fruits of particular genera are recognized to change seasonally: Chimpanzees usually feed on seeds, pulp and fruit-skin from immature fruits, and only seeds from mature fruits of *Pterocarpus tinctorius*, *Sterculia tragacantha*, *S. quinqueloba*, etc. Hard-shelled fruits of Apocynaceae (e.g., *Saba florida*) or Loganiaceae (e.g., *Strychnos innocua*) are bit open with incisors.

Pith: Herbs of Gramineae and Zingiberaceae are eaten quite regularly throughout the year. Usually pith of lower parts of immature grass and mature zinger stems is eaten, but occasionally pith of the upper part of mature grass (e.g., *Pennisetum purpureum*) is eaten. Pith of a woody vine species (*Landolphia owariensis*) is particularly common diet in the chimpanzees of Mahale. Green-yellow inner pith of 1 mm in diameter is quite skillfully extracted with teeth and fingers and consumed. In one species, only the pith of branch is eaten (*Cordia millenii*).

Bamboo shoots of Gramineae (*Phragmites, Olyra*, and *Oxytenanthera*) are rarely eaten.

Bark: Although outer and inner bark of some species (e.g., *Pycnanthus angolensis, Sesbania sesban, Vernonia amygdalina*, etc.) is consumed, chimpanzees feed only upon inner bark or cambium of particular plant species (*Brachystegia bussei, S. tragacantha, S. quinqueloba*, etc.), usually in the later part of the rainy season, when fruits are usually less available than in any other part of a year (Nishida, 1976). Cambium of *B. bussei* was especially important at least for one week in March 1976, and quite lengthy feeding bouts were recorded.

Wood: Though rarely, chimpanzees earnestly feed on (sometimes, lick on) live or dry wood of particular trees such as *Ficus capensis, Pycnanthus angolensis*, etc. Some of the dry trees are

regularly visited by chimpanzees, and huge "caves" are thus formed. Since a chimpanzee creeps into the "cave" with the head first, only its buttocks are seen at the outside of the trunk of the tree when feeding on the wood.

Resin: Resin is available only in small quantities. Usually a chimpanzee stands bipedally on the ground and picks off a small piece of resin from *B. bussei, Combretum molle* or *Monotes elegans* trees. Only twice, more than three chimpanzees were observed to feed on resin simultaneously, which occurred high up in a giant tree (*Albizia glaberrima*).

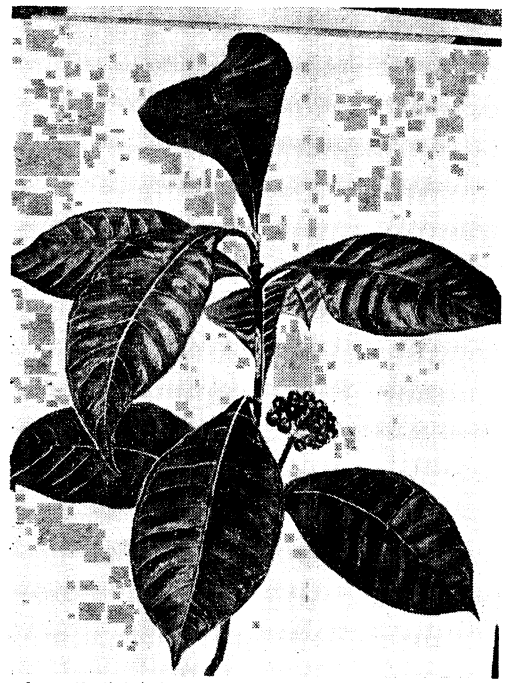

Fig. 1. *Psychotria peduncularis* (Salisb.) Steyerm., Rubiaceae (Drawing by M. Uehara).

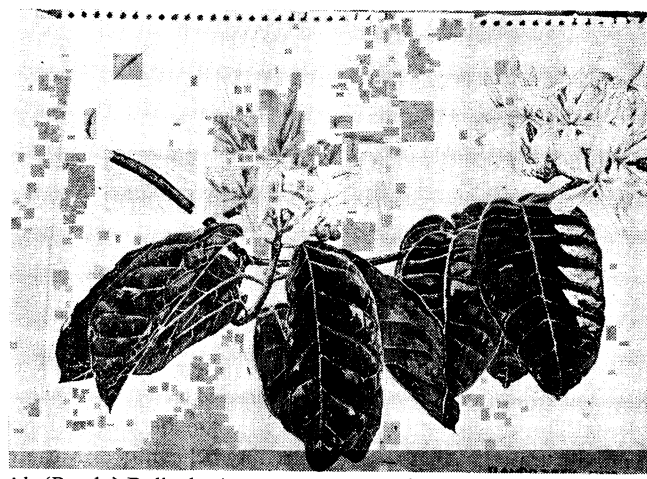

Fig. 2. *Saba florida* (Benth.) Bullock, Apocynaceae (Drawing by M. Uehara).

Fig. 3. *Vernonia amygdalina* Del., Compositae (Drawing by M. Uehara).

Fig. 4. A juvenile male feeding on figs of *Ficus exasperata* Vahl (Moraceae).

Root: Though not identified botanically, a few species of woody roots which emerge on the ground are cut off with incisors and chewed. No root-digging behavior has been observed.

Several plants are illustrated in Figs. 1–3, and feeding behaviors on various parts of plants are illustrated in photos (Figs. 4–9).

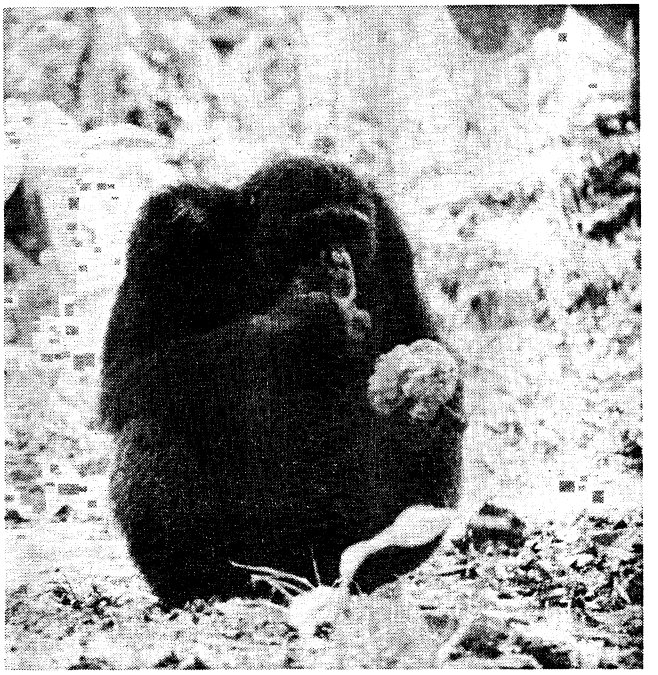

Fig. 5. A past-prime male feeding on a fruit of *Myrianthus holstii* Engl. (Moraceae).

Fig. 6. An adolescent female feeding on the resin from *Albizia glaberrima* (Schum. & Thonn.) Benth. (Mimosaceae).

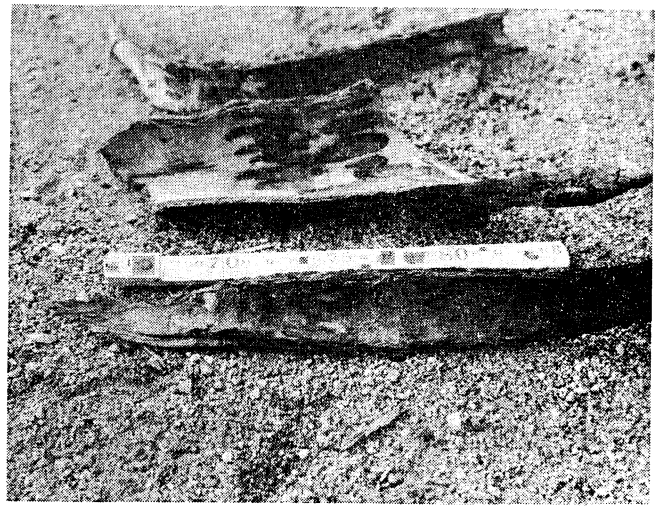

Fig. 7. Tooth-marked inner bark of *Brachystegia bussei* Harms (Caesalpiniaceae).

Fig. 8. An adolescent male feeding on the pith of *Pennisetum purpureum* Schumach. (Gramineae).

Fig. 9. An old male feeding on dry dead wood of *Pycnanthus angolensis* (Welw.) Warb. (Myristicaceae).

DIVERSITY OF PLANT FOODS

The 328 recorded plant foods (including eight foods from cultigens) are from 198 species (including six species of cultigens) of plants. As only K-group chimpanzees are concerned, they consume 315 food items (or 307 excluding food items from cultigens) from 190 plant species (or 184 excluding cultigens) (Table 2). This result contrasts with 184 plant foods from 141 plant species reported for Gombe chimpanzees (Wrangham, 1975), the only other data available from a similarly long-term study. This difference may probably be caused by richer flora and more time spent in collecting food data at Mahale.

However, 46 (14.0%) of 328 food items were recorded only once throughout the study period. Moreover, over 40 items were recorded on less than 10 times. Wrangham (1975) stated that 27 (17%) of the163 confirmed records were seen eaten only once. Probably, individuals were experimenting by eating items not previously used as foods, as Wrangham (1975) suggested. Long-term fecal analysis (Nishida et al., unpublished data) has elucidated drastic inter-annual changes in food composition and relative importance of specific plant food item in the diet of wild chimpanzees. Probably, some food items important in the diet in one year may be unimportant in another, even when it is available. Kortlandt and van Zon (1969) stated that before large-scale persecution by man started no less than about one half of the geographical range of the chimpanzee consisted of savannas, open woodlands and dry forests, and the other half of rain forests. Wrangham (1975) states that the ability to use such a large range of food items is important in permitting adaptation to a wide geographical range. The discrepancy in the number of food items between Gombe and Mahale might prove the ability of chimpanzees to exploit and incorporate new food items into their diet from the environment that they might newly colonize. Plant food repertoire of chimpanzees in other parts of Africa are given by Nissen (1931), Azuma & Toyoshima (1962), Reynolds & Reynolds (1965), Izawa & Itani (1966), de Bournonville (1967), Suzuki (1969) and Hladik (1973).

The 192 wild species are composed of one parasite (0.5%), 29 herbs (15.1%), 18 shrubs (9.4%), 83 trees (43.2%), 52 lianas (27.1%), 1 herb-shrub (0.5%), 3 shrub-lianas (1.6%), 4 shrub-trees (2.1%), and one shrub-liana-tree (0.5%); or they consist of 80 forest species (41.7%), 73 openland species (38.0%), 10 lakeshore species (5.2%), 11 forest-openland spe-

Table 2. Number of food types classified by parts eaten.

Part Eaten	Total No. of Species	No. of Food Types Recorded Only Once	Cultigens	Food Types Recorded Only in B-group	Food Types Recorded Only in L-group	Food Types Recorded Only in M-group	Natural Food Types Recorded in K-group*	Natural Food Types Regularly Eaten in K-group*
LS	117	16**	1	2	0	0	114	99
F	100	8	3	4	1	0	92	84
Bl	29	7	0	1	0	0	28	21
P	36	3***	3	2	0	1	30	28
Bk	14	7	0	0	0	0	14	7
Se	15	2	1	0	0	0	14	12
W	5	0	0	0	0	0	5	5
Sp	6	2	0	0	0	0	6	4
R	6	1	0	0	0	2	4	3
Total	328	46	8	9	1	3	307	263

*excluding cultigens
**including one recorded only in B-group
***including one recorded only in M-group

Table 3. List of animal foods. Number of direct observational episodes of vertebrate predation (capture, carcass transport, and consumption) from the onset of the field study in this area (October 1965) to May 1982 is given below for each vertebrate species. On the other hand, data of the maximum length of the feeding bout in min are given for entomophagy.

Vertebrates: Stages eaten are described last. ♯ indicates domestic species.		
Class Mammalia		
Primates		
Galago crassicaudatus crassicaudatus	N = 1	Adult
Colobus badius tephrosceles	N = 10	Juveniles
Cercopithecus ascanius schmidti	N = 6	Juveniles
C. aethiops centralis	N = 3	Juveniles
Pan troglodytes schweinfurthii	N = 3	Infants
Rodentia		
Cricetomys eminii	N = 1	Juvenile
squirrel	N = 1	Adult
Artiodactyla		
Cephalophus monticola	N = 20	Juveniles, Adults
Tragelaphus scriptus	N = 13	Juveniles
Potamochoerus porcus	N = 7	Infants, Juveniles
Hyracoidea		
Heterohyrax brucei	N = 2	
Unidentified	N = 3	
Class Aves		
Francolinus squamatus	N = 2	Young birds
Guttera eduardi	N = 1	Egg
Melanopteryx nigerrimus	N = 3	Fledgelings, Eggs
Centropus superciliosus	N = 1	Adult
♯ *Gallus gallus*	N = 11	Chickens

cies (5.7%), 10 openland-forest species (5.2%), 4 openland-lakeshore species (2.1%), 3 lakeshore-openland species (1.6%), and one species of unconfirmed habitat.

ANIMAL FOODS

Animal diet of wild chimpanzees consists of vertebrates and insects. Since the list of animal foods eaten by the chimpanzees of the Mahale Mountains and their feeding techniques have already been reported elsewhere (vertebrates—Nishida et al., 1979; Nishida, 1981; Kawanaka 1981, 1982; Hasegawa et al., in press; Norikoshi, 1982, in press; Takahata et al., in prep.; insects—Nishida, 1973; Nishida & Uehara, 1980; Uehara, 1982; Nishida & Hiraiwa, 1982), this paper reviews these studies, supplemented by a few unpublished data (Table 3).

Only evidence by direct observation is listed in Table 3. Comments on indirect evidence such as fecal remains will be given in "Notes on Vertebrate Prey".

NOTES ON VERTEBRATE PREY

Among vertebrates, chimpanzees select only mammals and birds as their prey. They have never been seen to feed on reptiles, amphibians or fishes. Prey species consist mainly of primates and artiodactyles. Preying upon animals of the other orders is quite uncommon. This trend is similar throughout Africa (Goodall, 1963; Teleki, 1973, 1981; Suzuki, 1971; McGrew et al., 1979; Kawabe, 1966; Wrangham, 1975).

Among potential prey, blue monkeys (*Cercopithecus mitis*), yellow baboons (*Papio cynocephalus cynocephalus*), warthogs (*Phacochoerus aethiopicus*) and klipspringers (*Oreotragus oreotragus*) have not been observed to be preyed upon by the chimpanzees of Mahale. This

Table 3 (continued). Insects: Description of insect foods consists of (1) scientific name of the prey species, followed in this order by (2) stages or parts eaten, (3) recorded maximal length of feeding bout in min., (4) number of feeding bouts in which bout-lengths were recorded, and (5) feeding season (mentioned only for fr quently observed prey).

Hymenoptera				
Crematogaster spp. (at least 5 species)	Eggs, Larvae, Pupae Workers, Reproductives	43	N = 300	All year
Camponotus vividus	Soldiers, Workers			
C. maculatus	Soldiers, Workers	136	N = 191	All year
C. brutus	Soldiers, Workers			
C. sg. Myromotrema	Soldiers, Workers			
Oecophylla longinoda	Soldiers, Workers	19	N = 22	All year
Tetramorium aculeatum	Workers			All year
Monamorium afrum	Eggs, Pupae, Larvae, Workers			
Apis mellifera	Honey, Workers (incidentally eaten)	1	N = 1	
Trigona spp. (at least 3 species)	Honey, Larvae	5	N = 3	
Xylocopa sp.	Honey, Larvae	13	N = 4	
Blastophaga spp.	Imagines			All year
Isoptera				
Pseudacanthotermes spiniger	Soldiers	47	N = 12	Oct–Nov
	Workers	2	N = 1	
	Reproductives	21	N = 49	Mar–May
P. militaris	Soldiers, Workers	2	N = 2	
Macrotermes subhyalinus [B]	Soldiers			Oct–Feb
Hemiptera				
Phytolima lata (in galled leaves of *Chlorophola excelsa*)	Larvae	153	N = 27	Aug–Sept
Coleoptera				
Cerambycidae (unidentified)	Larvae, Imagines	2	N = 1	
Orthoptera				
Acridoidea (unidentified)	Imagines	1	N = 1	
Lepidoptera				
moth (unidentified)	Larvae, Imagines	1	N = 1	

may be directly related with their availability. All of these species are either of low population density (*C. mitis*), or having very limited habitat overlap with the chimpanzees (*Oreotragus*), or both (yellow baboons and warthogs). Warthogs have only recently penetrated into the study area from outside, and the chimpanzees were observed to attempt to capture a warthog juvenile for the first time in 1981.

Chimpanzees do prey upon squirrels. Previous reports (Nishida et al., 1979; Kawanaka, 1982) designated the prey squirrel as *Protoxerus stangeri*. However, we have found that there coexist two different species of larger squirrels quite similar in size, form, color and habitat in our study area: *P. stangeri* and *Heliosciurus rufobrachium*. Probably, chimpanzees may eat both of them. However, we cannot specify which species chimpanzees actually preyed upon in previous observations.

Chimpanzees have been observed to attempt to capture a chequered elephant shrew (*Rhynchocyon cirnei*) twice (Kawanaka, 1982; Nishida, unpublished). Therefore, it is plausible that they occasionally prey upon them. A lump of mongoose fur was once detected in the feces of a chimpanzee and reported as *Ichneumia albicauda* (Nishida, et al., 1979). However, it has proved now that there are at least 3 species of mongoose in the study area (*Bdeogale crassicauda, Mungos mungo, I. albicauda*). Therefore, we cannot give specific name to the prey mongoose.

Chimpanzees of Mahale occasionally scavenge upon carcasses of bushbucks and blue duikers (Hasegawa et al., in press).

Mammal genera reported to be eaten at other areas of Africa, but not at Mahale include *Papio, Perodicticus* and *Manis* (McGrew, in press; Sugiyama, 1981). *Perodicticus* is unavailable at Mahale.

Chimpanzees prey upon eggs, fledgelings or chickens of birds. They have been observed to kill and eat an adult bird only once. That was an injured white-browed coucal (*Centropus superciliosus*) (R. Nyundo, pers. comm.). It is likely that chimpanzees usually do not prey upon healthy mature birds.

An adult male was once observed to try to take eggs or fledgelings from the nest of a crowned hawk eagle (*Stephanoaetus coronatus*) in the tree, but gave up his attempt, being discouraged by the parent's attack (Takahata et al., in prep.).

Chimpanzees of Mahale only recently began to eat chickens of domestic fowls. Some chimpanzees of M-group and K-group began to prey upon chickens at our camps or workers' camps (R. Nyundo, J. Katensi, & M. Hiraiwa, pers. comm.; Norikoshi, in press). Although chickens were available at Myako Camp all year round for more than two years from early 1976 to November 1978, chimpanzees of K-group preyed upon them only in a restricted period (July–August) when they also preyed upon the chicks of francolins in the natural habitat. Therefore, francolin feeding probably triggered the new habit of feeding on the chickens of domestic fowls. However, it is likely that this habit has not yet been popular to all individuals of two unit-groups. Wrangham (1975) listed 6 bird species as prey to the chimpanzees of Gombe; none of them have been recorded to be eaten at Mahale. (However, out of the 6 species in Wrangham's listing 5 were recorded only once). At least 3 of the 6 species are present at Mahale.

NOTES ON INSECT PREY

Most of insects preyed upon by chimpanzees belong to the taxa, Hymenoptera, Isoptera and Hemiptera. Feeding method was described in detail in Nishida (1973), Uehara (1982), and Nishida & Hiraiwa (1982) (See Fig. 10).

The following genera were reported to be eaten also in other parts of Africa. *Crematogaster*: Kahuzi, Zaire (A. Goodall, 1979), Gombe (Wrangham, 1975). *Camponotus*: Kasakati Basin (Suzuki, 1966), Mt. Assirik, Senegal (McGrew, in press). *Oecophylla*: Kasakati Basin (Suzuki, 1966), Gombe (Goodall, 1968). *Trigona*: Kasakati Basin (Izawa & Itani, 1966). *Blastophaga*: Gombe (Wrangham, 1975). *Macrotermes*: Gombe (Goodall, 1968), Rio Muni (Sabater Pi, 1974), Mt. Assirik (McGrew, in press), Bossou, Guinea (Sugiyama, 1981), Gabon (McGrew & Rogers, in press), Kasakati (Suzuki, 1966). *Pseudacanthotermes*: Gombe (Goodall, 1968). *Apis*: Gombe (Goodall, 1968), Mt. Assirik (McGrew, in press), Kahuzi (A. Goodall, 1979). *Phytolima*: Gombe (Wrangham, 1975).

There is yet no record of feeding upon *Tetramorium*, *Monamorium* and *Xylocopa* in other parts of Africa. *Dorylus* is eaten at Gombe and Mt. Assirik, while chimpanzees of Mahale neglect it. *Paracopium* (Hemiptera) was reported only from Gombe (Wrangham, 1975).

MINERAL AND MISCELLANEOUS FOODS

Mineral and miscellaneous foods are listed in Table 4. Chimpanzees feed or lick on inorganic matters such as rocks, sandy soil of a stream bed, and termite mud, and drink water (Fig. 11). They lick or feed on the rocks at the shore of Lake Tanganyika (Nishida, 1980),

Fig. 10. An adult male feeding on *Crematogaster* ants from *Vossia cuspidata* (Roxb.) Griff. (Gramineae).

Table 4. Mineral and miscellaneous foods. The maximal bout-length and number of bouts in which the bout-lengths were measured are given below for termite mud and rock feeding.

Termite mud	Max. = 8 min	N = 61
Rock	Max. = 71 min	N = 60

Fig. 11. An adult male drinking water from a stream.

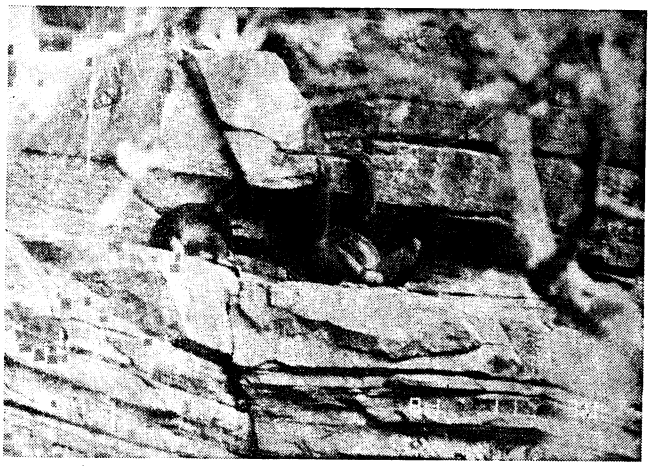

Fig. 12. An adult male (right) and an adolescent female licking the rock on the huge precipitous cliff.

or on the banks of rivers. A huge precipitous rock cliff was once visited and repeatedly licked by several chimpanzees of M-group (Fig. 12). Termite mud is eaten quite regularly all year round, though the bout-length seldom exceeds half a minute.

Chimpanzees ingest their own, or other conspecific's somatic secretions (snivel, semen, vaginal secretions, etc.) and blood. Wrangham (1975) lists up such miscellaneous items from his observation at Gombe. Bodily hair may be occasionally swallowed incidentally when grooming, since it is sometimes detected in their feces. Coprophagy is seldom observed.

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