6 Monkeys in the Pirang forest

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6.1 Introduction

Results presented here have been obtained from diurnal and nocturnal observations during a stay in Senegambia, lasting from 17 October to 2 November 1986.

Some observations were made in small forest islands outside the Pirang forest, specially in the Abuko Reserve.

Although observations were made on a systematic basis, the relatively short period of observations precludes statistical significance. Certain results have been compared to data collected in the Taï National Park, Ivory Coast, where an 8 years study had been carried out by the Mammal Research Laboratory of ORSTOM as part of the UNESCO/MAB 1 Taï Project „The role of monkeys in the Yellow Fever cycle". Colobus badius badius, the red colobus of the Taï forest, has there been extensively studied (GALAT-LUONG, 1983) and has been found to have an ecological niche very similar to that of the Central African forms (CLUTTON-BROCK, 1972, 1973, 1974; MARSH, 1981a,b; NISHIDA, 1972; STRUHSAKER, 1975, 1978; STRUHSAKER and OATES, 1975). Therefore, this subspecies can be taken as a reference for this survey.

As the Red colobus (C. b. temmincki in Gambia) is the only one forest dwelling monkey living in the Pirang forest, many questions raise up concerning its adaptation to and survival in such a peculiar environment.

What is the population density the individuals live in? How do they adapt to such „insular" conditions ? How do they exploit the vegetation? What are their relations with the savanna dwelling species?

Results of the survey will first be presented and then discussed with reference to other studies in Senegal and Ivory Coast in order to answer two main questions:

– How can a large forest dwelling mammal adapt to a reduced wooded area?

– What are the conditions necessary for its survival?

Three species of monkeys have been identified: The Red colobus of West-Africa, Colobus badius temmincki, and two Guenons, the Green monkey, Cercopithecus aethiops and the Red monkey, Erythrocebus patas patas.

The Red colobus of West-Africa is a heavy monkey, reaching up to 10 kg of weight. It is a remarkable animal with its red-orange and silver-grey fur. Its shape (Fig. 1, 2, 3) shows its two essential adaptative features:

– a narrow chest and a voluminous belly which indicate, as in all colobines, the presence of a sacculate stomach and very long intestines necessary for the digestion of cellulose. This digestive process is long lasting and explains the long periods of rest, actually digesting phases, during which the Red colobus is sleeping stretched out on branches, arms and feet hanging down;

– very long front limbs with long hands and very long fingers but also the lack of thumbs which are signs of a pronounced arboreal life.

The leaps of this species are particularly spectacular and it is the only African monkey species known to make frequently use of brachiation, a mode of locomotion by which the animals hang and swing on their front extremities. The Red colobus is essentially a tree-born, folivorous monkey.

The Green monkey, also called Green vervet, is a small animal of grey-greenish fur colour, which is an efficient camouflage (Fig. 4). The absence of morphological adaptation indicates that its way of life is not very specialized.

GALAT (1983) has shown that this species has very likely been one of the most adaptative monkeys of Africa. The degree of arboreal life may vary from 25 to 75% according to its environment (GALAT, 1975). It is capable of extremely modifying its diet and up to 50% of animal food is possible (GALAT and GALAT-LUONG, 1976, 1977). Social organization and intergroup relationships are variable too, under the pressure of environmental factors, in an astonishing fashion, by forming groups comprising between 4 and up to 174 individuals (GALAT, 1983) and by exhibiting or not territorial behaviour (GALAT and GALAT-LUONG, 1978).

The Red monkey has several names, Patas monkey or Hussard monkey because of its red-brown and silver-grey fur (Fig. 5 and 6), but also Crying monkey because of the weeping sounds of its young. Built like a hound, this is a monkey with long and slender limbs. Its nearly straight handed posture on the ground shows the high degree of adaptation of this animal to running in open spaces, i.e., from southern savannas to Sahelian shrub lands.

The occasional presence of Guinea baboons, Papio papio, has been anticipated but none have been observed at Pirang. However, a young baboon has been spotted within a group of green monkeys in the Abuko Reserve, about 16 km from the Pirang forest. Baboons are almost absent in western Gambia, today. But they can still be observed upriver and inland.

6.3 Population structure

6.3.1 Colobus badius (The Red Colobus)

Three groups of Red colobus have been identified and counted. Group „M" comprises 18, group „R" 17 and group „D" at least 20 individuals, respectively, bringing the total of red monkeys in the Pirang forest to at least 55 animals. In each of the groups several adult males have been observed. The multi-male structure typical of this species occurs also in the Pirang population.

6.3.2 Cercopithecus aethiops (The Green Monkey)

This species is very difficult to be followed up and censused. Observations allow, however, to distinguish two groups, one, group „T", consists of 15 individuals while group „S" has at least 8 members. Whereas M. MÜHLENBERG (pers. comm.) has counted 30 individuals formed by groups „S" and „T" together when they met in a territorial conflict, implying that group „S" comprises about 15 individuals too. For group „T" the different members have been determined as follows: 1 adult male, 5

adult or subadult females, 1 juvenile male, 2 juvenile females, 1 juvenile of undetermined sex, and 5 young over 6 months old animals.

6.3.3 Erythrocebus patas (The Red Monkey)

A single group has visited the study area during the observation period. It consisted of 7 individuals: an adult male, 3 adult females, two juveniles and a young of over 6 months. According to H. ELLENBERG there had been a group of more than 20 individuals in May 1985 being present for two or three days, intermittently.

6.4 Home range and density

6.4.1 Colobus badius

A drawing showing the area occupied by each of the 3 groups has been overlaid in Fig. 7. A number of observations of this species has been made in the area where the canopy is not continuous, the majority of the observations, however, show that the groups stay predominantly within the most forested area. The preferred sleeping sites are also shown in the drawing. Because of the short observation period the home

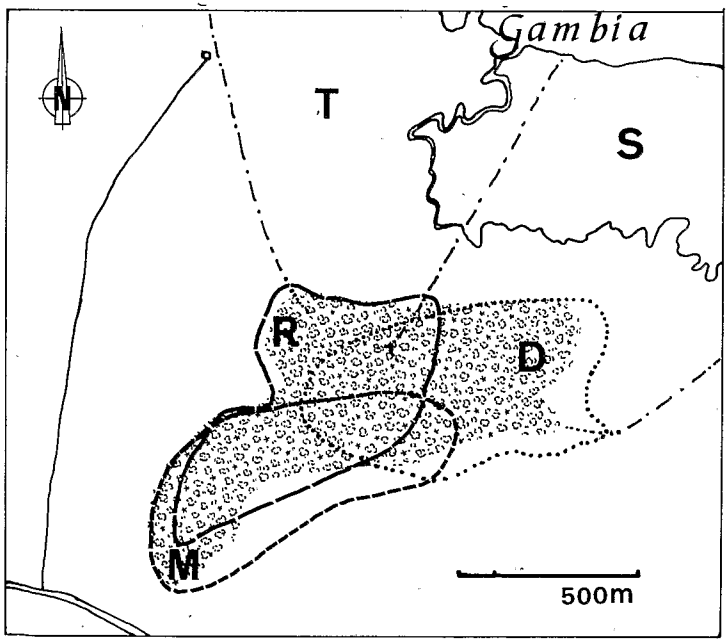

Fig. 7: Approximative limits of the monkeys' home ranges in the Pirang forest (October 1986). "M", "R" and "D": red Colobus group home ranges. "S" and "T": green monkey group supposed home ranges.

range limits established cannot be considered as final – an entire year of monitoring would be required before the total area of the home range could be determined. On the other hand it is possible to state that the population of 55 individuals uses the whole wooded area, hardly intruding into the mangrove belt (though H.ELLENBERG and E.DISTER, pers. comm., have seen a group of about 27 Red colobus monkeys feeding on young leaves and flowers in a tall Rhizophora racemosa belt 5 km east of Tendaba). The latter, however, is included in the zone occupied by the green monkeys. Excursions of colobus monkeys of 30 m to 50 m into open bush-land do occur. Over all, about 68 ha are utilized by the colobus monkeys, from which a density of 81 monkeys/km^2 can be derived.

6.4.2 Cercopithecus aethiops and Erythrocebus patas

Our investigations concentrated mostly on the Red colobus and no attempt has been made to monitor both species. The home range of the green monkeys probably covers 30 to 60 ha, depending on the depth to which the mangrove forest is actually being utilized.

The group of Patas monkeys has only crossed the study area. This occured at least two times in 8 days. We have not attempted to obtain further information on its home range. It is known (HALL, 1968) that these monkeys travel up to more than 10 km/day.

6.5 Arboreal Life

The structure of the Pirang forest is very heterogeneous and it is difficult to recognize the different functional strata as described by GALAT-LUONG (1983, fig. 6, p. 27) for the Taï forest of the Ivory Coast. Particularly the stratum of emergent trees, those which clearly top the canopy, is more difficult to detect. This is due to the fact that the Pirang forest comprises a mosaic of gaps, a typical feature of forest islands.

Nevertheless, we decided to use the term, „emergents" keeping in mind that certain observations concern monkeys located on isolated trees. Although the functions of the different strata can be found in the Pirang forest, tree heights are considerably lower and more variable from one forest island zone to the other. The height of big trees rarely exceeds 20 m in Pirang but reaches 45 m in the Taï forest.

This study was primarily directed at forest dwelling monkeys. Therefore, only Colobus badius has been the object of systematic investigations, i.e. by scanning visible animals every 1/4 hour. Estimates of the amounts of time spent in the different strata are based on 397 observations, 298 in Pirang, 99 in Abuko, of the location of colobus monkeys during the month of October 1986. The observations in the Abuko Reserve were made on two afternoons only and, therefore, do not reflect the activities of an entire day. They have been included in this study because of the better observation conditions in this Reserve, particularly on the ground. The results have been compiled in table I. Although in 80% of the observations the monkeys remained in the upper strata the occasions on the ground of 2,4% in Pirang and 15% in Abuko are an indication of the flexibility of this sub-species.

6.6 Territorial Behaviour

How do the members of one group react when another group, of the same or of a different species approaches?

According to GALAT and GALAT-LUONG (1976, 1978) the Green monkeys living in an environment such as the Pirang forest and the adjacent mangrove, should be territorial. The emission by adult Green monkey males of „loud calls" (GAUTIER 1975) with phono-responses is an indication in support of this hypothesis. With the Red colobus monkeys no territorial behaviour has been observed and, quite to the contrary, everything indicates that extensive home range overlap does occur. The possibilities of fusions-fissions of colobus groups as described by STARING (1981) must even be taken into account. The presence of 25 individuals in the zone of the groups „M" and „R" and the occasional absence of any colobus monkeys in the same zone are observations pointing into this direction.

6.7 Plurispecific associations

It is generally and implicitly recognized that the phenomenon of associations comprising several species of monkeys is a particular feature of forest dwelling species (GAUTIER and GAUTIER-HION 1979). Accordingly, in the Taï forest, groups of monkeys consisted of more than one species in 80% of all encounters (GALAT 1978, GALAT-LUONG and GALAT 1978). The same definitions and methods were used to measure the tendency towards association of species in the Pirang forest. Erythrocebus patas has only tentatively been included in this analysis because of insufficient data.

The results have been compiled in table II and show to what extend such associations are frequent events. In fact, in one third of all encounters of Red colobus monkeys they were associated with Green monkeys and inversely in 80% of encounters of Green monkeys in the forest, these were associated with Red colobus (Fig. 8 and 9). For the Patas monkeys this proportion is equal to 1 out of 2 encounters.

6.8 Discussion

6.8.1 The savanna dwelling species

The presence of Green monkeys and Patas and the absence of Baboons in this environment are the sole consequence of poaching pressure.

6.8.1.1 Size of groups

In a habitat of this type, groups of Green monkeys are generally rather small and the observed numbers are typical for this species even if somewhat low in this case. The figure of seven individuals for a Patas monkey group is within the standard range of the species too. – There have larger groups been present in May 1985...

6.8.1.2 Structure and social organization

Group „T" of the Green monkeys comprises only one adult male, untypical for this species, however, temporarily not uncommon for groups of reduced size. The share of males is very low: one adult male per 5 adult females, possibly the consequence of considerable emigration or of increased hunting pressure. Adult males are frequently shot because of their anti-predator behaviour (see GALAT and GALAT-LUONG, 1976). On the other hand the ratio of immature individuals is high: 1.5 immature animals per 1 adult. This figure is typical for guenons.

The Patas is the only one among the three species of the Pirang forest normally having an uni-male social organization, also called harem, because one male is accompagnied by several females and their young. The low proportion of males to females (here three adult females and only one male) is compensated by the existence of solitary males and bachelor parties (not observed in the Pirang forest).

6.8.1.3 Home range and density

Estimating the size of territories occupied by the Green monkeys of the Pirang forest means nothing but establishing the order of magnitude based on standards which we recognized for this species in a similar environment (GALAT and GALAT-LUONG, 1976). At Pirang it appears that the two groups are using partly the forest and the adjacent crop lands, and partly the mangrove (Fig. 10 and 11), probably just up to the river. The relatively low number of individuals within each group (hunting pressure) does not permit them to occupy larger territories. Very likely the minimum area should be around 60 ha, i.e., a density of around 25 monkeys/km^2. This is not very much lower than the value of 42 monkeys/km^2 established by GALAT and GALAT-LUONG (1976) in a mangrove forest of Sine-Saloum (Senegal), a population under considerable hunting pressure, too.

The situation is quite different for the Patas monkey. Naturally, a group of this species, capable of commuting over 10 km per day, cannot be confined to an area the size of the Pirang forest. Two excursions within 8 days indicate a peculiar strategy. The group must visit different sites where food is concentrated („supermarkets") and others again which are used as sleeping sites, possibly in a radius of about 10 km. The Pirang forest is only one such concentration site, which may be visited by other groups than the one observed, too.

These two frugivorous species contribute a great deal to plant seed dispersal, especially in the case of fruit-stones which are too large for small birds. Frequently guenons do not eat fruits on the spot, but use to fill their pouches and move some distance to eat on high and quiet places such as termitaries.

6.8.2 Colobus Badius

Of the three monkeys species observed in the Pirang forest the Red colobus deserves special attention. It is the only one to be in principle limited to dense forests. Indeed, Colobus badius temmincki appears to prove its outstanding adaptability which is not

observed in the other red colobus subspecies. This has already even been observed in a zone drier yet than the Pirang forest (Fig. 12). The northern-most population of Colobus badius temmincki lives in the forest of Fathalla, Senegal, (GATINOT, 1975 and pers. obs.) about 40 km from Pirang, a dry open forest (see AUBREVILLE, 1948). One group had also been observed on the southern bank of the Gambia river near the confluence of the Niokolo-Koba where the gallery forest did not consist of more than one row of trees (GALAT-LUONG, 1983). However, the Fathalla forest covers 7300 ha and the presence of a group of Red colobus in a gallery forest of the Gambia, even if narrow, does not imply that its members are isolated from the rest of the population.

Conditions of existence (or survival) for the 55 Red colobus of the Pirang forest are therefore quite special. Are there detectable ecological or behavioral adaptations of this population?

6.8.2.1 Size of groups

The three groups counted comprise 18, 17 and 20 members, respectively. Groups counted by GATINOT (1975) ranged from 9 to 62 members, the smaller group sizes (less than 23, n=8) were more frequent than the larger ones (over 33 individuals, n=5). STARIN describes a group of the typical size of 23 members. The size of groups in Pirang evidently corresponds perfectly to the norm of the species as established elsewhere.

6.8.2.2 Structure and sozial groups

The composition of the groups of Red colobus in the Pirang forest according to age classes and sex is no exception to the rule of the multimale structure of this species and no ecological pressure seems to have affected the social organization.

STARIN (1981) describes the mobility and flexibility („fusion-fission social organization") of the groups of the Abuko Reserve. At Pirang, one of the surveys (H. ELLENBERG, pers. com.) made in the zone of groups „M" and „R", yields a higher total (N= 25 individuals) than observed in any of the other groups. This could reflect the instantaneous fusion, probably linked to the presence of a group of Patas monkeys observed at this occasion. Such a fusion-fission strategy, which has never been observed in the Taï forest, would be the logical consequence of an adaptation to a limited habitat in the sense of resource sharing.

6.8.2.3 Home range and density

GATINOT (1975) estimated the home ranges of 7 groups in the Fathalla forest and found extreme values of 9 to 19, 7 ha per group. Three groups, then, could occupy a total area of between 27 ha and 60 ha. Our estimates for the groups in Pirang are within this range. For the total of these home ranges our density estimation is inferior to those established by GATINOT (1975) for the groups of the Fathalla forest: 81

individuals per km^2 against a range of 96 to 480/km^2. However, that author states that his values, particularly the maxima, are probably overestimated.

On the other hand, the density of Red colobus at Pirang appears to be higher than estimated by us for the Taï forest where we found 66 individuals per km^2 (GALAT and GALAT-LUONG, 1985). Hence, there is no indication that the density of Red colobus in Pirang would be beyond the carrying capacity of the environment.

6.8.2.4 Arboreal life

TABLE I

Utilization of the different strata by colobus monkeys in the Pirang and Abuko (Gambia, in percent of observations made) and Taï forest (Ivory Coast), in percent of time spent.

Country:	Gambia		Ivory Coast after Galat and Galat-Luong (1985)		
Species:	C. b. temmincki		C.b. badius	C. b. polykomos	C. verus
Site:	Abuko (1)	Pirang	Taï	Taï	Taï
Layer Emergents	(5.1)	27.2	41.6	32.9	15.2
E+C	(60.6)	79.5	91.7	84.7	74.9
Canopy	(55.5)	52.3	50.1	51.8	59.7
Understory	(24.2)	18.1	8.2	15.1	23.1
Ground	(15.2)	2.4	0.1	0.2	2.0
Number of Obersavations	(99)	298	1903	2242	397

(1): Observations in Abuko were made on only 2 afternoons and are not representative of the whole day. Data are here included because of better visibility conditions at ground level. For Pirang and Taï, data cover a daily period from 6.00 am to 7.00 pm.

Table I shows also the vegetation utilization profiles for each of the three different species of colobus monkeys of the Taï forest. The contrast to the Red colobus of the Taï is very marked: in Taï, Colobus badius badius lives essentially in the uppermost strata and only exceptionally moves about on the ground (less than one observation in 1000). In this respect the colobus of Pirang and Abuko have an extremely peculiar behaviour. Visits to the lower stratum, twice as many as in the Taï forest, gain in significance if one considers that in Pirang this stratum does not reach much higher than 4-5 m, whereas it ranges from 8 to 20 m in the Taï forest.

A comparison with the data of GATINOT (1975) from Fathalla is very informative: although a direct comparison is not possible because of methodological differences, it appears that at Fathalla the colobus monkeys continue to use essentially the upper quarter of the vegetation, i.e., with a mean tree height of 12 m, the author found the monkeys at an average height of 9.5 m.

Although the environments are different, the comparison of the utilization profiles of different strata by the colobus monkeys of the Taï forest (table I) shows that the utilization of the vegetation made by the Red colobus of Pirang is much more comparable to that of the Olive colobus (Colobus verus) than to his red homologue. In the Ivory Coast Colobus badius badius keeps strictly to dense high forest. The frequency distribution of the group totals of *Colobus badius* shows that the size of groups diminishes to below 20 individuals at the moment emergent trees are cut by logging companies (GALAT-LUONG, 1983). The species disappears when the forest cover disintegrates into small mosaic patches as a consequence of human intervention (GALAT, 1978). In the presence of the other two colobus species, *Colobus b. badius* has specialized in the exploitation of the upper strata and does not adapt to a degraded forest.

Table I shows, additionally, that of the three species of the Taï forest there is one, the Olive colobus, that shows utilization profiles very similar to the Red colobus of the Pirang forest. Exploitation of many different strata is definitely the best adaptation for securing survival in a degraded or a pioneer forest. GALAT-LUONG (1983) has shown at the Ivory Coast that not only the assumption of the Olive colobus being a rare animal was false but also that it is the colobus monkey which remains longest in degraded forests, i.e., secondary and pioneer forests and small forest islands.

Definitely, the descent to the ground is the most peculiar characteristic of the Red colobus at Pirang and Abuko. Although the same has been observed at Fathalla, it derives from the necessity of reaching isolated patches of forest where the canopy is broken. In contrast, in Pirang and Abuko the ground constitutes a stratum where all kinds of activities can be observed: not only displacements but also foraging, feeding, and all the social activities as playing youngsters, grooming and even mating (which occurs without the mating cries we observed with C.b. badius in the Taï forest). These activities take place without an increase of vigilance which usually occurs when the situation is assessed as being dangerous.

The only known other Red colobus species likely to come down to the ground in a significant proportion is Colobus pennanti oustaleti. GALAT-LUONG and GALAT (1979) observed this species in the Centrafrican Republic, splashing around in the M'baere river and feeding on aquatic plants.

6.8.2.5 Intergroup relationship

Strategies adapted by Green monkeys in Senegal in the case of unfavourable distribution of resources in space and time have been described by GALAT and GALAT-LUONG (1978). The utilization of scarce resources by several groups proceeds as follows:

– by temporal succession of the groups if available space does not permit the presence of more than one group at a time. This strategy leads to a considerable overlap of the home ranges of different groups and to complete absence of territorial behaviour. The tendency towards such a strategy has been found in the Taï forest with species using scanty and heterogeneous strata (GALAT and GALAT-LUONG, 1985b), particularly with the Red colobus. However, if the tropical rain forest is considered relatively homogeneous in comparison with Sahelian conditions this does not hold if one considers only a reduced area like the Pirang forest. Furthermore, it is no way homogeneous

with respect to certain strata, particularly for the stratum of emergent trees which is predominantly used by the Red colobus.

– by resource sharing, contrary to the conditions quoted above, if the site was sufficiently large. This sharing of resources leads – among others – to a fusion of groups for the time common use is made of the resources. Overlapping of the home ranges and the fusion-fission events of groups of Red colobus in Pirang and Abuko are an indication of their strategy of sharing restricted resources that are unevenly distributed in space and in time.

6.8.2.6 Plurispecific associations

TABLE II

Red colobus and Green monkey specific tendency to association in the Pirang forest.

Type of encounter: Species	plurispecific	monospecific	total	ta
Colobus badius	8	13	21	0.38
Cercopithecus Aethiops – Mangrove included	8	5	13	0.62
– Mangrove excluded	8	2	10	0.80

ta: specific tendency to association (method of GAUTIER and GAUTIER-HION, 1969).

It must be stressed that all observations in Pirang of the Red colobus monkeys on the ground, have been made when they had joined a group of Green monkeys. The latter are particularly adapted to the risks of open areas and have developed an effective protective system (setting-up of guards, specific warning calls, silent warning behaviour, GALAT and GALAT-LUONG, 1976).

Under the protection of this elaborated anti-predator system of Cercopithecus aethiops, Colobus badius temmincki has endeavoured to utilize an unfamiliar portion of the ecosystem to which the Red colobus monkeys are morphologically hardly adapted. In this way the Red colobus compensates his lack of adaptability to open spaces by trusting the „competence" of the Green monkey. This type of plurispecific association between forest and savanna dwelling species has never been described before. Besides obtaining protection from predators, the Red colobus profit from the Green monkey's knowledge of the seasonal availability of food and thus manage to widen their ecological niche on this level as well. This more intensive exploitation of strata has two implications:

– on the same area the available space/habitat is considerably larger;

– the ecological niche of the species widens to include a new environment for the groups living in forest islands, and, particularly, access to additional food resources, such as herbs, grasses and perhaps seeds, is gained.

6.9 Conclusion

6.9.1 Expansion of the ecological niche

Colobus badius badius, the species of the Taï forest in Ivory Coast, through its specialization on upper forest strata, occupies a particularly narrow ecological niche. This fits into the frame of a community of seven other monkeys among which the presence of two other colobus monkeys deserves mentioning: Colobus polykomos, the Western black and white colobus, and Colobus verus, the Olive colobus. It is interesting to note that the Taï forest is the only region of Africa where three colobus species live sympatrically. In the Centrafrican Republic, *C. pennanti oustaleti,* the local species of Red colobus, lives in community with six other monkey species, but only one other colobus, *C. guereza,* the Abyssinian black and white colobus.

In the Fathalla forest like in Pirang, no pressure whatsoever is exerted by other forest dwelling monkeys and the tendency to make more use of the other strata of the vegetation increases. But the Fathalla forest, with its 7300 ha, is large. This may explain, why at Pirang and Abuko, where the reduction of available resources is largest, at least temporally intermittently, due to the very small extent of the forest, the Red colobus exhibits the maximum of his capability of using new resources (Fig. 13 and 14).

6.9.2 Survival of the Red colobus in the Pirang forest

The answer to the question, whether a forest dwelling species can survive in a forest island as small as the Pirang forest, is affirmative.

Although certain parameters of its ecological niche seem to be hardly influenced by the particular environmental conditions, the presence of this species is only possible because this subspecies seems the most adaptable of the Red colobus monkeys.

Its survival depends primarily on the conservation of the forest environment and would evidently be favourably influenced by the possibility of genetic exchange with neighbouring populations by immigration/emigration via corridors to adjacent forest islands. The Red colobus of Fathalla have crossed a 2 km wide, open area to reach a sleeping place in two isolated trees in a field (GALAT and GALAT-LUONG, pers. obs.).

The survival of the Red colobus in Pirang depends also on the conservation of the other monkeys present, those who are not confined to the forest: mainly the association with the Green monkeys seems indispensable (see Fig. 8 and 9) for engaging in that great venture, the exploitation of a new environment.

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Figures

Fig. 1

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 8

Fig. 9

Fig. 10

Fig. 11

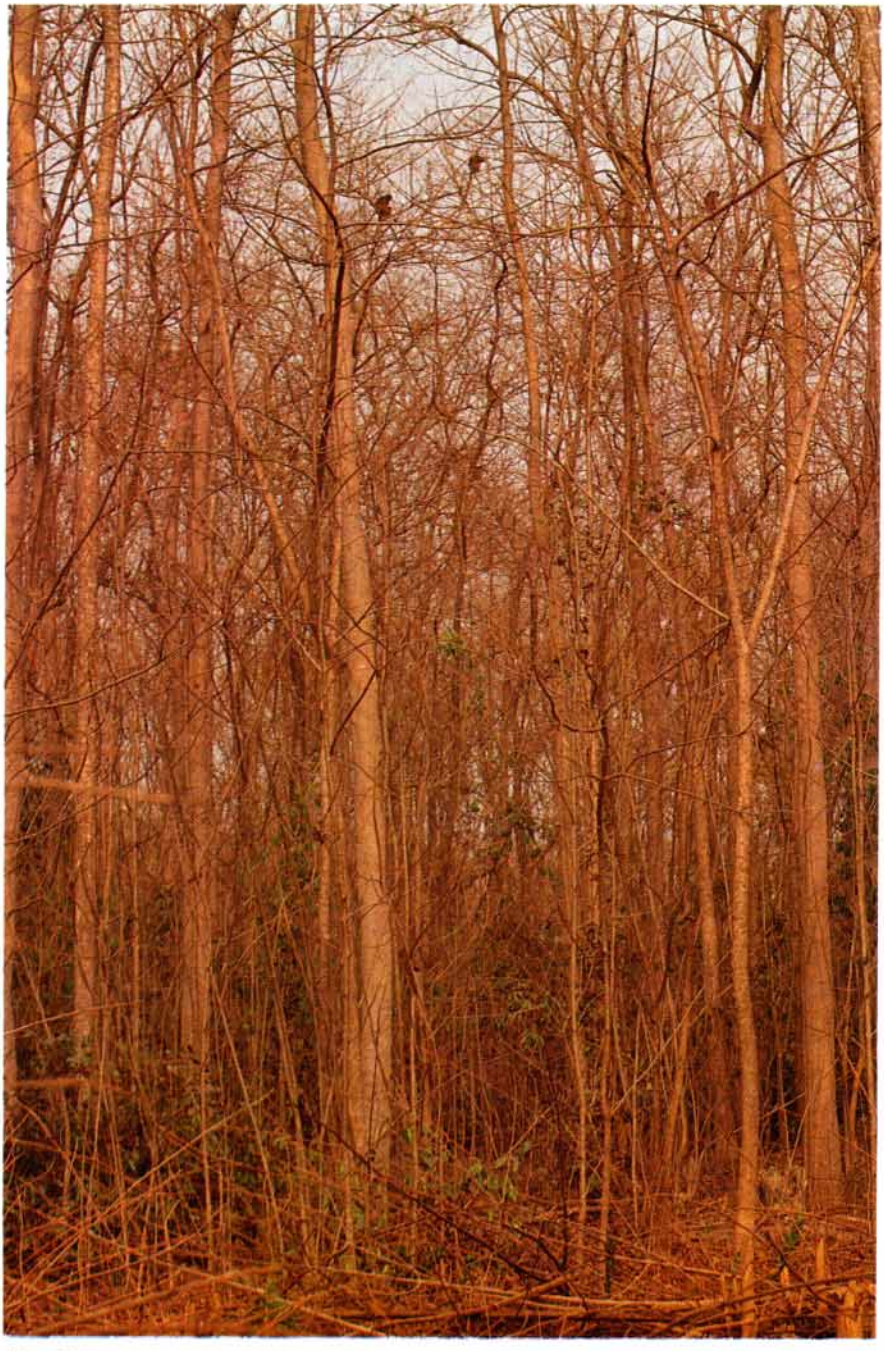

Fig. 12

SPECIES	PERCENTAGE OF PRESENCE IN EMERGENTS AND HIGH CANOPY
Colobus badius badius	91.7
Cercopithecus diana	89.7
Colobus polykomos	84.7
Colobus verus	74.9
Cercopithecus campbelli	68.3
Cercopithecus petaurista	63.2
Cercocebus otys	24.5

STRATUM	PERCENTAGE OF PRESENCE OF Colobus badius temmincki IN THE DIFFERENT STRATA
EMERGENTS AND CANOPY	79.5
LOWER STRATA	18.1
SOIL SURFACE	2.4

Fig. 14

PIRANG

Ecological Investigations In A Forest Island In The Gambia

by

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