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WESTERN LOWLAND GORILLAS FEEDING IN STREAMS AND ON SAVANNAS.

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This paper is about two aspects of feeding by gorillas which have not previously been reported. These concern the western lowland sub-species, of which so little is yet known, even though it forms over 99% of the world's population of gorillas. This neglect is perhaps due not only to the threatened status of mountain gorillas in East Africa, but also to the problems of limited visibility in a tropical forest habitat where the ground vegetation can be very dense.

The data were collected as part of the first long-term project in West Africa, which began in October 1983 in the Lope reserve in central Gabon. The study-area encompasses both forest and savanna (Figure 1), thus providing an unusual combination of habitats (as 85% of Gabon is forested), where unhabituated gorillas live in sympatry with chimpanzees. The data were obtained by analysing faeces, feeding trails, and, by direct observation.

Streams

A major part of the western gorilla's diet is formed by 2 families of large herbs: the Zingiberaceae or gingers, and the Marantaceae or arrowroot. I will focus on 3 species of semi-aquatic Marantaceae which are eaten by gorillas: *Marantochloa cordifolia*, *M. purpurea*, and *Halopegia azurea*. These are typically about 1m high and occur in dense monospecific stands in streams and marshes. Although we have not yet observed feeding on *Marantochloa*, we have seen gorillas in marshes and streams. Patches of flattened herbs, presumably to sit on, and split stems left floa-

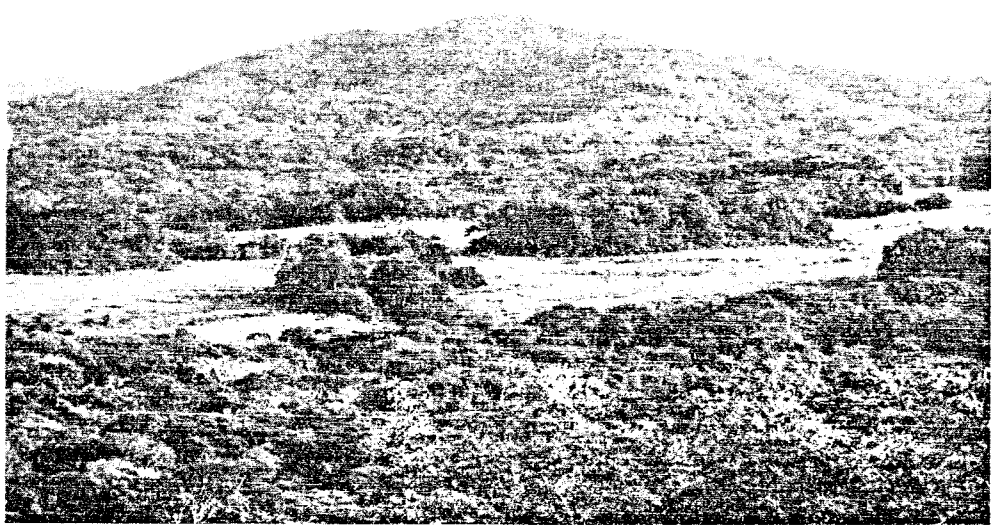

Fig. 1. The Lope study-area.

ting in the water indicate where gorillas have been feeding. They move down the middle of streams, in water about 30cm deep, uprooting plants from both banks. They eat a 10–15cm portion of the tender pink stem bases and discard the rest, although the young leaf bases of terrestrial Marantaceae are frequently eaten.

In one year, from May 1984 to April 1985, 64 occurrences of this behaviour were recorded, involving each of 7 gorilla groups known to us. One group visited 3 different streams during 1 day's foraging. The distance walked in streambeds is usually more than 50m, and up to 500m. *Marantochloa* distribution is dependant upon the presence of water, but only a limited number of sites are used by gorillas, as they show a tendency to re–use the same travel routes each time they pass through a particular area. For instance 22% (N=14) of our findings were in one particular stream. Often the apes took circuitous routes through marshes with a soft muddy substrate. Elephants, buffalo, and probably chevrotains, *Hyemoschus aquaticus*, and *sitatungas*, *Tragelaphus spekei*, also browse in the marshes. although these animals eat only the tops of the plants, not the bases.

It has been generally believed that wild gorillas avoid entering water at all times, and only cross streams when there is a natural bridge. But several published reports contradict this: In Equatorial Guinea, guides of the Fang tribe maintained that they had seen lowland gorillas "bathing" in forest streams many times (GROVES and SABATER PI, 1985); and there is a remarkable account from the Congo Basin of lowland gorillas which inhabit swamp forests, where the only solid substrate is formed by accumulated leaves and other vegetation (REGUSTERS, 1983). In East Africa, mountain gorillas of Kahuzi–Biega in Zaire visit *Cyperus* marshes to feed on the basal parts of this sedge, and have been observed wading through brooks 60cm deep (CASIMIR, 1975).

At Lopé gorillas regularly cross streams, as indicated by knuckle prints in the sandy banks. Juveniles have been seen crossing bipedally, while infants rode on their mother's backs. They do not always use available log bridges, or take the most direct route. We have even found day–nests on a half–submerged log surrounded by water.

In captivity the reaction of gorillas to water varies: Some have drowned but many thoroughly enjoy splashing in pools, fountains, and moats, as witnessed at several zoos (e.g., GOLDING, 1972; COUSINS, 1978).

We have no evidence that chimpanzees at Lopé enter water or that they feed on aquatic Marantaceae, but other species of *Marantochloa* appeared in food lists compiled for a Ugandan population of common chimpanzees (REYNOLDS and REYNOLDS, 1965) and for bonobos in Zaire (KANO, 1983). Bonobos eat various aquatic plants, including *Cyperus*, and there have been reports of chimpanzees entering water to feed (NISHIDA, 1980; SUSMAN et al.,1985).

There are several possible reasons why Lopé gorillas are willing to enter water to feed, when there is an apparently unlimited supply of terrestrial herbs (ROGERS and WILLIAMSON, in press). *Marantochloa* may be a source of (a) water; (b) additional bulk,or (c) rare nutrients. In Zaire, CASIMIR (1975) measured a high water content in *Cyperus* bases, and GOODALL (1974) found that they were of low nutritional value. As mountain gorillas consumed large amounts of *Cyperus* during the dry season, GOODALL thought it likely that they were eaten as a source of water. However, tropical forest is constantly humid and numerous streams pass through the Lopé study–area, so water is not limited. Also, given the association between *Marantochloa* and water, this would seem an unlikely explanation.

Marantochloa may simply provide an alternative source of fibre, in addition to other Marantaceae and *Aframomum*. The gorillas' consumption of herbaceous vegetation might increase when other food sources, such as fruit and new leaves are limited. However, a high incidence of

feeding on *Marantochloa* coincided with a period of maximum fruit availability. There is marked variation in the production of fruit, flowers, and new leaves between months, but the recorded incidences of foraging in streams were sporadic and there were no seasonal patterns.

An alternative way of investigating intake is to look at the fibre content of gorilla dung. Digested *Marantochloa* cannot be identified among the remains of other herbaceaous vegetation, and analysis of the overall abundance of fibre is only at a preliminary stage at present.

It is also possible that *Marantochloa* are a source of minerals. Studies of the North American moose, *Alces alces*, have shown that aquatic plants must be consumed to supply sodium requirements (BELOVSKY, 1978). The swamp plants eaten by guereza monkeys, *Colobus guezera*, are high in sodium and other minerals (OATES, 1978). We may find the same of *Marantochloa*, and we plan to perform phytochemical analyses in the near future. In addition, these succulent bases are, no doubt, more easily digested than other parts of the plants. It is possible that feeding on *Marantochloa* will be explained by a combination of these factors.

Savannas

The second aspect of gorilla behaviour I would like to describe is their use of the other extreme of their habitat, that is, the savanna. The savannas of Gabon are thought to be of human origin and are not used by large predators. The northern sector of the reserve is mostly savanna, crossed by a network of gallery forests, which grow up around water courses (Figure 2). Gorillas' visits to the galleries are highly seasonal. They are attracted by a kind of fruit which is rare in the main forest block and is a major source of food from October to January. It is produced by *Uapaca*

Fig. 2. Gallery forest and savanna, viewed from field–station.

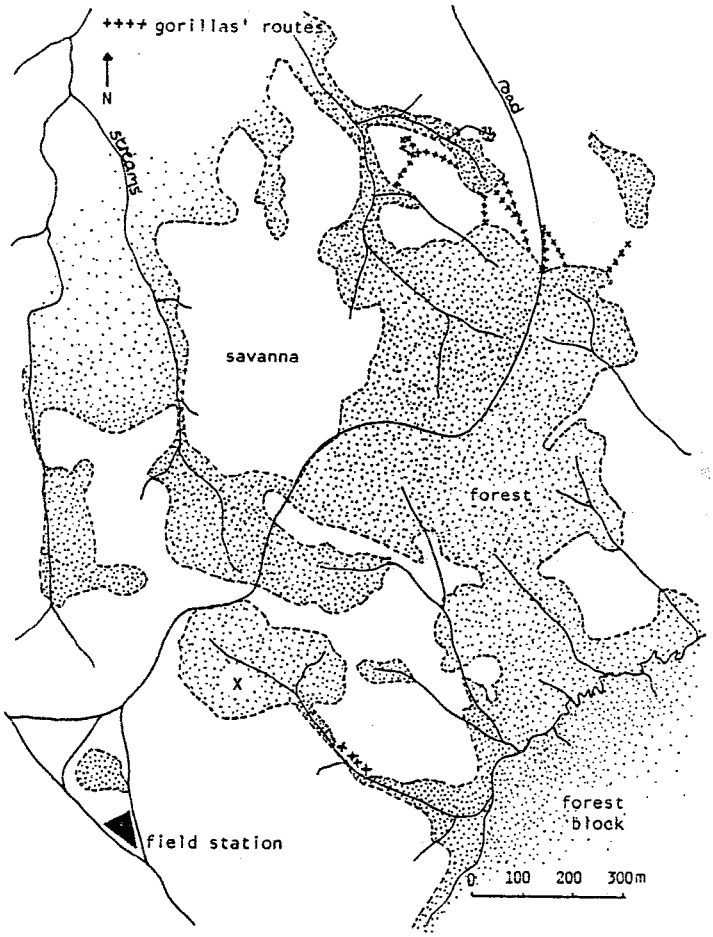

Fig. 3. Some of the routes used by gorillas when crossing savanna.

trees, which are associated with water. Gorillas were seen crossing savannas during the peak of the *Uapaca* season, when they were travelling to and from the galleries. Distances travelled in the open were between 50m and 250m. The apes always returned to the main forest block to build their night–nests. Figure 3 shows some of the routes they used, and an almost isolated gallery, X, which was visited by a solitary male during November 1984 and March 1985.

To the north of the study area, there is an isolated mango tree, *Mangifera indica*, beside a road. In April and May 1985 gorillas were seen feeding in this tree, over 1km from the forest block. Such excursions to food sources with limited temporal availability suggest that gorillas have an ability to form mental maps of their home ranges and to judge the timing of fruit production; they do not seem to utilize the galleries at other times of the year.

As for foraging on savannas, these grasslands offer little food, but in the transitional vegetation between forest and savanna are 2 shrubs, in particular: *Psidium* *sp.*, a wild guava, and *Antidesma vogelianum*. These produce small fruits during at least 6 months of the year and gorillas

Fig. 4. A gorilla's nest built from grasses on the savanna.

living close to the savanna borders regularly feed on them. We found 3 resting sites in the savannas, where areas up to 30m in diameter had been trampled. Day–nests were constructed from shrubs, ferns, and grasses (Figure 4). The gorillas were always cautious, and moved quickly into the forest once they became aware of our presence. However, they must have been relatively at ease when they built nests and rested in the open.

The use of savannas by the Lopé population may be unique, as access to savannas in Gabon is unusual. The gorillas' exploitation of food sources in both extremes of their habitat – the dense, wet, streams, and marshes, and the open, dry savannas –illustrates that the gorilla may be just as adaptable as it's close relative, the chimpanzee.

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