

NOTES ON THE DISTRIBUTION AND ECOLOGY OF THE HIGHER PRIMATES OF RIO MUNI, WEST AFRICA

JORGE SABATER PÍ

and

CLYDE JONES

*Delta Regional Primate Research Center of Tulane University
Covington, Louisiana 70433*

ABSTRACT

Data taken from preliminary observations of distribution and ecology are presented and summarized for twelve species of primates from Rio Muni, West Africa. Three basic patterns of ecologic distribution are apparent. Nine taxa of primates occur mainly in dense and defective forests, two species occur primarily in regions of hygrophilic and litoral vegetation, and one species occurs typically in plantation areas. The most widely distributed species are those that occur in many rather than few plant communities. The influence of man has resulted in a reduced range for nine species of primates and an increased range for one species. Two species seemingly are unaffected.

INTRODUCTION

Little information has been published on the ecology and distribution of primates in Rio Muni, a part of the Equatorial Region of Spain (Spanish Guinea). Information on gorillas in Rio Muni has been contributed by Sabater Pí and Lassaletta (1958) and Sabater Pí (1960, 1964, 1966a, 1966b). Basilio (1962), while presenting general information on some vertebrates of Spanish Guinea, mentioned the ecology and distribution of primates. Information on primates in areas adjacent to Rio Muni in West Africa has been presented by Malbrant and MacLachy (1949).

The purpose of this report is to furnish information on the geographic and ecologic distributions of the higher primates (Anthropoidea) of Rio Muni and to discuss briefly some of the factors that influence these distributions.

METHODS AND MATERIALS

Procedures.—Reconnaissance of Rio Muni and the compilation of data for this report were accomplished mostly during 50 days in July and August, 1966; we spent 35 days, 221.5 hrs., observing and studying primates. It must be noted, however, that Sabater Pí has been publishing results of observations of gorillas since 1958 (Sabater Pí and Lassaletta, 1958).

Information on centers of abundance of primates was obtained from natives and then field expeditions were made into the areas that were selected. All major sections of the country have been visited. Distributions of gorillas and chimpanzees were determined by sightings and by locating recent beds, droppings, and feeding areas. General ecologic conditions of the localities and vicinity where primates were seen and identified by us were noted.

No attempts have been made to review thoroughly the literature or to summarize completely data from specimens in museums. Some specimens have been examined in order to corroborate identifications.

Description of the area.—The Spanish province of Rio Muni is a region of approximately 26,000 km² located in West Africa between 1° and 2° 30' N lat and 9° 30' and 11° 30' E long. From the coast, the elevation rises to 1,200 m at the highest peak, Mt. Mira. Much of the interior plains of the area has an elevation of 500 to 600 m. Three major river systems provide drainage and influence the biota of this geographic region, the Rio Campo and the Rio

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Mbia in the north, the system of the Rio Benito in the central section, and the estuaries and tributaries of the Rio Muni in the south.

The climate is characterized throughout the year by rather uniform temperature and humidity, but variable rainfall. The mean annual temperature is 24.8° C, with a recorded maximum of 33.2° C in April and a recorded minimum of 15.5° C in August. Temperatures in the interior high plains average 2 to 3° C lower than temperatures in the lowland regions. The mean annual relative humidity is 90.3% with a minimum of 88.0% recorded in August and February. Typically, cloud cover is present at night over much of the area. Over the lowland areas, clouds are relatively high, but over the higher inland regions, clouds prevail as ground fog about 80% of the time. The cloud cover usually disperses about 10:00 AM. Because of these differences in cloud cover, relative humidity and rainfall are greater in the highland areas than in lowland sections of the country. Rainfall varies from a recorded high of 492.3 mm in October to a recorded low of 1 mm in July. The mean annual rainfall varies from 2,250 mm to 2,500 mm. Most precipitation occurs from September to December and the least rain falls during June to September. These climatic data were taken mostly from records of the airport observatory in Bata, but are complete for only one entire year (1962) and merely indicate general climatic conditions of the area.

The soils, typical of many tropical regions, are laterites formed by the decomposition of granite and gneiss. These soils are slightly acidic and the pH of surface water is 5.5 to 6.0. The plains and old playas near the present coast are deposits of sand and sandstone.

Approximately 200,000 humans live in Rio Muni, a density of about 7.5 inhabitants/km². The distribution and the influence of the human inhabitants upon the distribution and ecology of other primates are discussed later in this report.

The vegetation of Rio Muni was categorized generally as dense forest by Clark (1965). Sabater Pi (1964) recognized that three major types of vegetation were important with regard to the distribution of gorillas. Because of the complexity of the vegetation and because of the influence of

human cultures on the natural vegetation and on the primates in the area studied, further descriptions and discussions of vegetation are warranted.

In the following descriptions of vegetation and characterizations of ecologic communities, some names of plants were taken from the publications by Emilio Guinea (1946) and Saint Aubin (1963). In addition, some plants from Rio Muni were identified by various persons at the Museum National d'Histoire Naturelle de Paris, the Koninklijk Museum Voor Midden-Afrika, Tervuren, Belgium, the Royal Botanical Gardens, Kew, England, and the New York Botanical Garden, New York. Personnel of the Forest Service of Rio Muni also aided in the identifications of plants.

In accordance with the varied topography of the study area, the distributional limits of the many types of vegetation are irregular and interdigitating, resulting in many complex ecotones. In addition, the composition of a given vegetation varies from one locality to the next. Herein, we attempt only to describe and characterize the types of vegetation that seem important with regard to the distribution of primates in Rio Muni. Four types of vegetation are distributed over large areas and four other types are relatively limited in distribution (Fig. 1).

Dense forests.—These primary forests represent the most stable and mature forests within the study area. For discussions and some dates of early disturbances of some forested regions of West Africa, see Clark and Fagan (1965). Dense forests occupy about 20% of Rio Muni, and are typically found in the interior high plains, but occur in some lowland and coastal parts of the country. These forests are characterized by a rather uneven canopy, nearly completely closed, and 50 to 60 m high. In some areas it is possible to distinguish three strata. Low-growing vegetation is rather sparse. Light and visibility at ground level are generally poor. Some plants typical of this type of forest include *Terminalia altissima*, *T. superba*, *Erythroleum ivorensis*, *Baillonella toxisperma*, *Copaifera tessmanni*, *Lophira alata*, *Desbordesia glaucescens*, *Entandio-
phragma cylindricum*, *Piptadeniastrum africanus*, *Anthrocaryon klaineanus*, and *Uapaca* sp.

Defective forests.—These forests occur in approximately 20% of the study area ad-

Hygrophilic forest.—This formation often adjoins the defective forest and these communities are frequently inundated by water. They are found in three to six percent of Rio Muni. They are confined to inland swamp areas as well as river margins, and are frequently affected by changing water levels due to runoff, or in coastal areas, due to tides. This forest type exhibits a low, dense, almost closed canopy 10 to 12 m high. There is no low ground vegetation between the clumps of large plants. Visibility is poor. Plants typical of the inland swamps include *Raphia vinifera*, *R. hookeri*, *Sclerosperma manni*, *Myrtagine ciliata*, *Oxytenanthera abyssinica*, and *Cyrtosperma senegalense*. Stands of *Pandanus* sp., *Raphia vinifera*, *R. hookeri*, and *Sclerosperma manni* are common along river margins not affected greatly by tides. In the areas that are influenced by tides, dense growths of *Rhizophora mangle* and *Laguncularia* sp. occur.

Littoral screen.—This type of vegetation is represented in a rather narrow, but distinct, band bordering the coast and near the mouths of river systems. Most obvious plants include *Phoenix reclinata*, *Cocos nucifera*, *Canavalia ensiformis*, *Urena lobata*, *Pennisetum purpureum*, and *Terminalia cattapa*.

Domed peaks.—These geologic formations are restricted to some of the steep, high hills of the southeastern portion of the study area and generally support two obvious zones of vegetation. Thickets of *Triumfetta cordifolia*, *Euphorbia camerunensis*, and *Strophantus* sp., as well as herbaceous forms such as *Virecta* sp., *Habenaria* sp., and *Orquideas* sp. are present. In some cases, there are exposures of almost barren granitic materials.

Meadows.—These communities are located near the coast and are confined to disjunct regions of sand, which is remnant of Quaternary playas. The low-growing vegetation, usually one meter and less in height, includes numerous representatives of the families Gramineae, Cyperaceae, and Compositae.

ANNOTATED LIST OF SPECIES

Excluding man, the higher primates of Rio Muni include representatives of 2 families, 3 subfamilies, 7 genera, and 12 species representing 13 races. In the following ac-

counts, species are listed according to the order following by Simpson (1945).

Cerocebus albigena albigena (Gray).—This species was found only in limited areas of dense forests and in some marginal formations that have well developed tall vegetation. This form appeared to be confined mostly to several disjunct regions (Fig. 2), but was often associated with *Cercopithecus cephus*, *C. nictitans*, and *C. mona*.

Cerocebus galeritus agilis (Milne Edwards).—The only known example of this species from Rio Muni, an adult female, was trapped in a local marsh area that supports a stand of *Pandanus* (Fig. 2).

Cerocebus torquatus torquatus (Kerr).—This species especially occurred in lowlands adjacent to the confluences of the major river systems and the sea, but also occurred in limited areas in the interior. It also was found in some areas of littoral vegetation near the coast (Fig. 2).

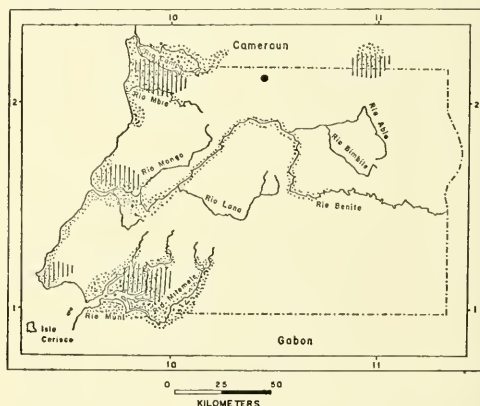


Figure 2. Map showing the general distribution of *Cerocebus torquatus* (stippled areas) and *C. albigena* (lined areas) in Rio Muni. The dot represents the locality for *C. galeritus*.

Papio sphinx (Linnaeus).—This animal seemed common, especially in regenerating forests, but may be locally abundant in nearly all parts of Rio Muni, except in areas of extensive cultivation near some of the larger villages. This form has been seen in fairly open areas on some of the domed peaks and in the meadows. For a depiction of distribution of this species, see Fig. 3.

Cercopithecus cephus cephus (Linnaeus).—This form was found in dense, defective, and agrological forests in most parts of Rio Muni (Fig. 4). It occurred in areas with

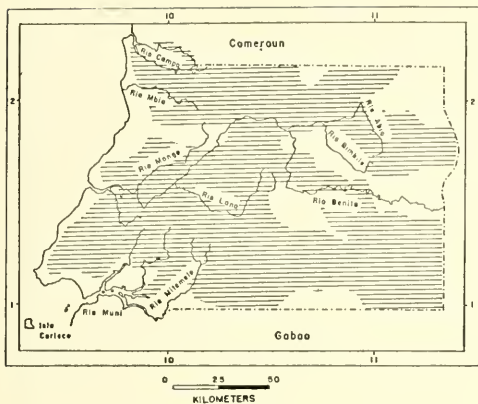


Figure 3. Map showing the general distribution of *Papio sphinx* (lined areas) in Rio Muni.

C. nictitans, but *C. cephus*, was more abundant and was seen more often in margins of plantations near pueblos than *C. nictitans*. In some areas, *C. cephus* occurred with *C. neglectus* and sometimes with *Colobus*.

Cercopithecus mona Schreber.—This form occurred in dense, defective, and agrological

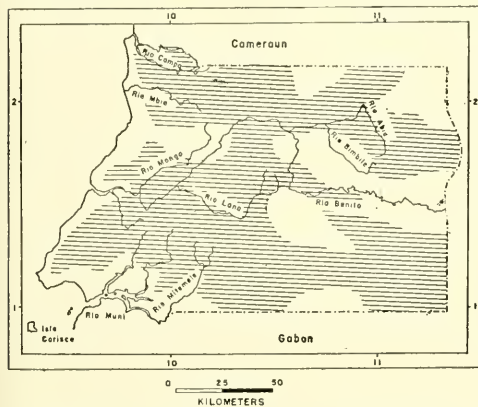


Figure 4. Map showing the general distribution of *Cercopithecus cephus* and *C. nictitans* (lined areas) in Rio Muni. For more discussions of the distributions of these species, see comments in the text.

forests in the study area (Fig. 5). This species is under study by Pierre Dandelot of the Museum National d'Histoire Naturelle de Paris, who currently recognizes two subspecies on the basis of morphological features. *Cercopithecus mona grayi* Fraser was frequently associated with *Colobus*, *Cercopithecus nictitans*, *C. cephus*, *C. neglectus*, and occasionally with *Miopithecus talapoin*; *C.*

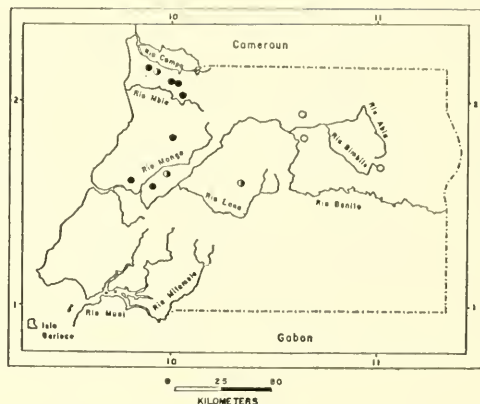


Figure 5. Map showing the distribution of *Cercopithecus mona* in Rio Muni. Open circles represent localities for *C. m. grayi*, dots represent localities for *C. m. nigripes*. Half-closed circles represent localities where intermediate forms were taken, but these forms are referred to *C. m. nigripes* on the basis of distribution. All specimens were collected by Sabater Pi and are deposited in the Museum National d'Histoire Naturelle de Paris and information was furnished by Pierre Dandelot.

mona nigripes du Chaillu was often found along with *C. nictitans*, *C. cephus*, *C. neglectus*, *C. albigena*, and in some regions, with *Miopithecus talapoin*.

Cercopithecus neglectus Schlegel.—The typical habitat for this species was the dense vegetation adjacent to rivers. It also occurred in some limited areas in the interior, as well as in some parts along the coast. It was more common in lowland coastal regions than in the interior. In some communities, this species exists with *C. nictitans*, *C. cephus*, and *C. mona*. Distribution of this form is shown in Fig. 6.

Cercopithecus nictitans nictitans (Linnaeus).—In general, this species was found in dense, defective, and agrological forests throughout most of the area studied (Fig. 4). It was absent from well developed plantations. These animals were seen often with or near groups of *C. cephus*, but *C. nictitans* was seemingly more shy than the former species. In addition, *C. nictitans* occurred occasionally with *C. mona* and *Colobus*.

Miopithecus talapoin talapoin (Schreber). This was an abundant species in agrological forests and plantations near the habitations of humans. It also occurred in marginal vegetation along rivers and was the only

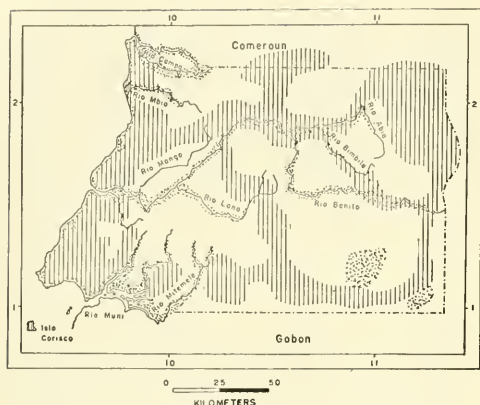


Figure 6. Map depicting the general distribution of *Cercopithecus neglectus* (stippled areas) and *Miopithecus talapoin* (lined areas) in Rio Muni.

form present on the island of Corisco (Fig. 6). In some limited areas, it occurred occasionally with *Cercopithecus nictitans*, *C. cephus*, and *C. mona*.

Colobus satanas anthracinus Leconte.—Animals of this species occurred mostly in rather restricted areas of high, dense forests, usually away from human habitation. It has been seen with *Cercopithecus nictitans*, *C. cephus*, and *C. mona*. The geographic distribution of this form (Fig. 7) is discussed later in this report.

Pan troglodytes (Linnaeus).—This species was present in extensive areas of dense forests, in defective forests, and in agrological forests near plantations. Evidence of its feeding activities was frequently seen in small agricultural areas, especially in plantations near agrological or dense forests. *Pan*

occupies an area slightly larger than the area inhabited by *Gorilla*, and the former probably is more abundant than the latter (Fig. 8).

Gorilla gorilla gorilla (Savage and Wyman).—This primate typically occurs in the thick vegetation of the dense forests, defective forests, and agrological forests, but also frequently enters plantation areas for food. In addition, this animal has occasionally been seen in open areas of the domed peaks. Sabater Pi (1964) estimated that a population of approximately 5,000 animals was dispersed in four major local populations with a maximum density of about 1.3 ani-

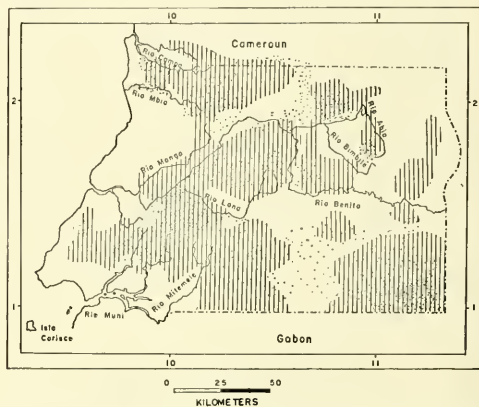


Figure 8. Map showing the general distribution of *Pan troglodytes* (lined areas) and *Gorilla gorilla* (stippled areas) in Rio Muni.

mals/km² in the southeast portion of the area. For additional discussions of various aspects of the ecology of gorillas in Rio Muni, see Sabater Pi and Lassaletta (1958) and Sabater Pi (1960, 1964, 1966a, 1966b). The distribution of this species depicted in Figure 8 is a modification of the map of Sabater Pi (1964). Recent changes in the distribution of gorillas are due to activities of man in expanding areas of agriculture and lumbering in parts of Rio Muni.

DISCUSSION

In the preceding accounts of the higher primates of Rio Muni, the conspicuous absence of *Papio leucocephalus* (F. Cuvier) warrants brief explanation. This animal was recorded from Rio Muni by Basilio (1962), but we have been unable to satisfactorily corroborate its presence in Rio Muni. In the field and especially in the native villages, we have observed many ex-

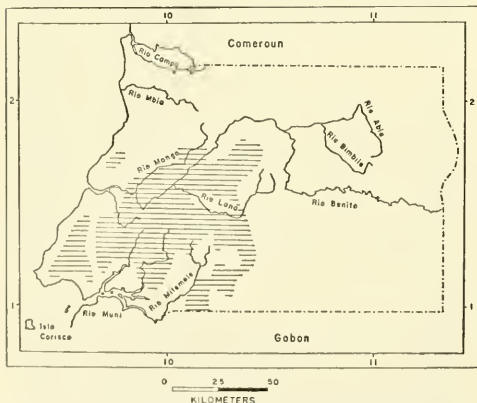


Figure 7. Map showing the distribution of *Colobus* (lined areas) in Rio Muni.

amples of *P. sphinx* of several age classes, but we have seen no *P. leucocephalus*. In addition, the records of the Centro de Ikunde of the Barcelona Zoo show that 205 *P. sphinx* have been handled in the past several years, but not a single *P. leucocephalus* was recorded. Milbrant and Maclatchy (1949) state that the drill coexists in similar habitats with the mandrill in most of French Equatorial Africa, but the distribution of the drill is irregular in some parts of the range.

The ecologic distributions of the species of primates listed in this report are summarized in Table I. Nine forms (*Cercocebus albigena*, *Papio*, *Cercopithecus cephus*, *C. mona grayi*, *C. m. nigripes*, *C. nictitans*, *Colobus*, *Pan*, and *Gorilla*) occur mainly in dense and defective forests. Of these nine forms, all except *Cercocebus albigena* and *Colobus* inhabit agrological forests and three (*Papio*, *Pan*, and *Gorilla*) occur rather frequently in some plantation areas. In addition, *Papio* occurs very occasionally in some of the meadows, and *Papio* and *Gorilla* have been observed in the open areas of some of the domed peaks. Two species (*Cercocebus torquatus* and *Cercopithecus neglectus*) typically occur in dense vegetation near rivers. On infrequent occasions, these species may be found in vegetation of the littoral plain, and also occur rarely in forests near rivers, but usually within about 2 km of the water. *Miopithecus talapoin* typically lives in agrological forests and plan-

tations, but is found commonly in riverside vegetation as well. For one species (*Cercocebus galeritus*), ecologic data are insufficient.

Of the 12 species of higher primates in Rio Muni, two (*Cercocebus albigena* and *Colobus*) exhibit a narrow range of ecologic tolerance and occur in only two major types of vegetation. *Papio sphinx*, in contrast, has a rather broad ecologic range and occurs in six zones of vegetation. In general, those forms with narrow ecologic ranges (*Cercocebus albigena*, *C. torquatus*, *Cercopithecus neglectus*, and *Colobus*) are distributed in small geographic areas, but the species with broad ecologic ranges (*Papio*, *Pan*, and *Gorilla*) have extended geographic distributions.

For some groups of primates that coexist in areas of similar habitat, limited data with regard to vertical stratification are available (Fig. 9). A few general statements on ecologic relationships may be drawn from these data. The level of the upper stratum (Fig. 9), occupied mainly by *Cercopithecus* and *Colobus*, reflects the habits of these species and the height of the vegetation. This stratum also supports populations of the white crested hornbill (*Tropicranus albocristatus*). This form is frequently seen in the presence of primates and the ecologic relationships between these forms were mentioned by Chapin (1932) and Malbrant and Maclatchy (1949). The lower stratum is frequented by *Papio* and *Gorilla*. *Pan* was observed in this

TABLE I

The ecologic distributions of the higher primates of Rio Muni arranged with respect to the major types of vegetation. Because of inadequate data, *Cercocebus galeritus* is not included.

	Dense forests	Defective forests	Agrological forests	Plantations	Hygrophilic forests	Domed hills	Littoral screen	Meadows
<i>Colobus satanas</i>	X	X						
<i>Cercocebus albigena</i>	X	X						
<i>Cercopithecus mona grayi</i>	X	X	X					
<i>Cercopithecus mona nigripes</i>	X	X	X					
<i>Cercopithecus nictitans</i>	X	X	X					
<i>Cercopithecus cephus</i>	X	X	X					
<i>Pan troglodytes</i>	X	X	X	X				
<i>Gorilla gorilla</i>	X	X	X	X		X		
<i>Papio sphinx</i>	X	X	X	X		X		X
<i>Miopithecus talapoin</i>			X	X				
<i>Cercopithecus neglectus</i>					X		X	
<i>Cercocebus torquatus</i>					X		X	

stratum nearly as frequently as in the upper levels.

Distributions of primates in Rio Muni are correlated with the presence of and interaction with man.

Species that occur on the ground or below 15 m, the height of the upper limit of the placement of traps by the natives, are captured frequently and utilized mostly for food. The total impact of human pressures upon the various species of primates of the lower strata is not known fully at this time. An example of the influence of man's activities on a primate is illustrated by the distribution of *Colobus*, an inhabitant of ecologic strata not frequented by man (Fig. 9).

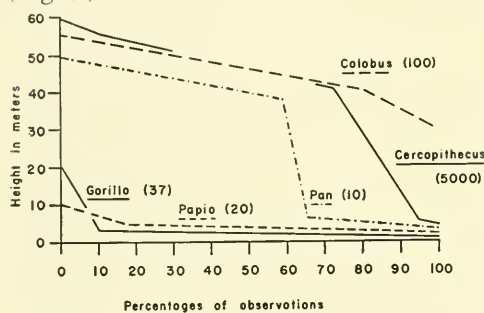


Figure 9. Vertical stratification of several groups of primates in Rio Muni. The number of observations is given in parentheses by the name of each animal; the numbers given for *Colobus* and *Cercopithecus* are approximate. The line under the name of each species identifies the graph line for that species.

This species, which is highly territorial, and is localized in small areas probably occupied all of Rio Muni a century ago but now is restricted to an area of less than 1/3 of the original habitat. In earlier years, the pelts were highly prized, but now *Colobus* is killed mostly for food.

The effects of the molestation of vegetation by man also are very important factors that influence the distributions of most of the primates of the study area. Disturbances of vegetation by man have been occurring in various degrees for some time. There is ample evidence that cultivation by Neolithic cultures, dating to ± 450 A.D. in Fernando Po (Clark and Fagan, 1965), had a sizeable role in the destruction of natural vegetation in some areas and influenced the distribution of certain species of plants.

Current disturbances of vegetation in Rio Muni are considerable. Due to the traditional system of progressive clearing of forests for purposes of agriculture and an ever-increasing demand for food materials, the areas of distribution of plantation and agrological forests are being expanded in geometric fashion. For example, on the basis of data gathered from interviews with inhabitants and from personal examinations of cleared and regenerating forest areas near the pueblo of Ayaminken, we estimate that approximately 50 km² of forest has been cut in the past 50 years (the approximate age of the pueblo). The population of Ayaminken includes 150 persons, but 25 years ago only 50 inhabitants were present. Because of severe degeneration of soils after a few years of human disturbance, many areas exploited previously and located typically adjacent to pueblos support only grasses, a habitat that is unsuitable for non-human primates.

The distributions of only two species (*Cercocebus torquatus* and *Cercopithecus neglectus*) of primates in Rio Muni possibly are not influenced greatly by current activities of man. These species occur in areas that are relatively impenetrable to man, including inundated riverside regions and inland swamps that are characterized by the presence of perennial mud, tangles of *Rhizophora*, and stands of *Pandanus*.

Only one species, *Miopithecus talapoin*, is common in the much disturbed sections of agrologic forests and plantations near the presence of man. This reduction of species in exploited areas is exemplified vividly in the extensive agricultural area of the northeast section of Rio Muni where only *Miopithecus talapoin* and man are found.

SUMMARY AND CONCLUSIONS

Preliminary determinations of ecologic and geographic distributions of some of the primates that occur in Rio Muni were made by conducting general surveys of the major types of vegetation in all sections of the country and by noting, whenever possible, the presence of representative plants in each major community.

Three basic patterns of ecologic distribution are obvious. Nine taxa of primates occur mainly in dense and defective forests; seven of them also occur in agrologic forests, but only three are found in agricultural

regions. Two species of primates occur principally in regions of hygrophilic vegetation, but do occur occasionally in vegetation of the litoral screen. One primate occurs typically in plantation areas, in agrologic forests, and in hygrophilic forests. Species that inhabit a greater range of plant communities are distributed more widely than those species that occur in a few communities.

The data indicate that as a result of the influences of man, the ranges of nine species of primates are reduced, the distributions of two forms seemingly are not greatly affected, and one species has an increased range of distribution.

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