



EDITORIAL

Dynamics of the Vegetation and Natural selection of the Small fauna: case of the small Mammals of the national park of Banco in Côte d'Ivoire

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ABSTRACT

This work established the relations between the dynamics of the vegetation and the presence or the absence of the small mammals within a natural forest. It was carried out in the national park of Banco, natural forest located at the south of Côte d'Ivoire. The main aim was to identify certain small mammals like indicators of the dynamics of the vegetation. The characterization of the vegetation was based on floristic inventories inspired of the itinerant method and that of Grixel. The small mammals were inventoried on the basis of standardized method of measurement and follow-up of the diversity of the mammals and the instructions of the US company of mammalogists. The results showed that the captured animals are species of Hybomys, Praomys, Malacomys and Mastomys. In this group, Hybomys, Praomys and Malacomys are characteristic of the wet forest medium. Praomys and Malacomys are characteristic of the vegetation with closed canopy, stable and homogeneous middle. They account for 51% of the captures. Hybomys (44, 19% of the captures) meet in disturbed middle and sometimes rich in pionniers (Palisota hirsuta, Chromolaena odorata). Mastomys (4,6% of the captures), are characteristic of the degraded middle.

Key words: dynamic, Banco park, vegetation, characterization, animals

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INTRODUCTION

The interdependence fauna-flora within nature was put in obviousness by many work. Gautier-hion *et al.*, [1] highlighted the co-adaptation between the temporal methods of the fructification of the arborescent species and those of the fruit consumption by the animals in wet tropical forest. The works of Kouamé *et al.*, [2] showed that by supporting the germination of certain species, the elephants play an important ecological part in forest regeneration. Westman *et al.*, [3] have also insist on the significant contribution of the elephants to the increase in diversity of the plants and by rebound of the herbivorous mammals. In addition, Tchataat *et al.* [4] showed that the tropical forests play a key role in the regulation of the greenhouse effect, climatic great balances and constitute the largest tank of biodiversity of planet. However, these forests which contain more half of total specific diversity are the object of increasing anthropic pressures leading to their fragmentation with the destruction of the habitats and the impoverishment of fauna; what has ecological and economic consequences priceless [5]. Nowadays, face to the marked degradation of the forest formations in the world and particularly in Ivory Coast, research is mainly directed towards durable and integrated management these ecosystems. Also, an effective management of these natural formations is it based on their strict protection; which protection must be firstly directed towards the identification of the factors and/or indicators of degradation which in the future will make it possible to intervene in an objective and effective. The town of Abidjan is a great urban area which shelters the largest industrial societies. This city is constantly exposed to the pollution caused by waste of the factories and the large industrial firms. Moreover, the fast urbanization accentuates the

pollution risks. Face these risks, the Banco forest, located in full heart of this urban area plays a part paramount in the purification of the atmosphere via the sequestration of carbon. The safeguarding of this rich heritage implies a continuous follow-up and sometimes an adapted installation. For this purpose, the research of the elements of evaluation of possible degradations in order to put forward corrective measures proves to be necessary. In such a context, identification of criteria of evaluation implying the small mammals as indicators of the dynamics of the vegetation proves to be a tool which the structures of research and the sciences engaged in forest research want to have.

The present study was carried out in order to establish the relation between the organic-éco-climatic characteristics of the natural formations and the presence or the absence of small mammals within these known formations. It established moreover, of the comparisons of the flora and the vegetation of the mediums attended by these small mammals and that of the not attended mediums; this in order to highlight the dynamics of the flora of their habitat. In the future, the results of this work will make it possible to better use these small mammals like indicators of the dynamics of the forest ecosystems.

MATERIALS AND METHODS

Among the national parks, of Côte d'Ivoire, that of the Banco forest (3474 ha) constitutes a priceless floristic sample of wet dense forest in the middle of the vast urban area of the economic capital. This natural heritage extends between 5°21' and 5°25' from Northern latitude and between 4°01' and 4°05' from western longitude.

It is surrounded by the communes of Yopougon to South-west, Attécoubé in the South, Adjamé in the east and Abobo in the North-East (Fig. 1). This park is under the influence of a climate of the subequatorial type at four seasons with a pluviometry annual average of 1700 mm and an annual average temperature of 26 °C, with an amplitude of 3°C [6]. The great rain season extends from May to July. The small rain season extends from September to November. The great dry season, from December to March, is marked more and more by the effects of the harmattan whereas the small dry season is centered over August. The natural formation of the park of Banco is the wet dense forest with *Turraeanthus africanus* (Meliaceae) and *Heisteria parvifolia* (Ochnaceae). The species met are inter alia: *Petersianthus macropcarpus* (Lecythidaceae), *Piptadeniastrum africanum* (Mimosaceae), *Parinari excelsa* (Crhysobalanaceae), *Berlinia confusa* (Caesalpiniaceae), ... The herbaceous recrus resulting from windfallen woods and the secondary formations colonize the pioneers more and more. It is thus not rare to meet heliophilous ligneous family such as: *Musanga cecropioides* (Moranthaceae), *Albizia* sp. (Mimosaceae), *Dieresis orientalis* (Ulmaceae), *Cleistopholis patens* (Rutaceae), *Sterculia tragacantha* (Sterculiaceae). There exists in addition, with the accesses of the waterway natural a marshy forest and a forest gallery with open canopy dominated by some large trees such: *Alstonia boonei* (Euphorbiaceae), *Uapaca* sp (Euphorbiaceae), *Hallea ledermanii* (Rubiaceae), *Parkia bicolor* (Mimosaceae), *Pycnanthus angolensis* (Myristicaceae). The average layer is shrubby, lianescent and more closed sometimes much than the forest on firm ground. The frequent species are *Xylopia* sp., *Raffia hookeri*, *Laccosperma secundiflorum*, etc Of the anthropized formations made up by old forest plantations, a arboretum, old cacao-plantations under forest and of the bamboos of China (*Bambusa* sp.) are also present.

It is in this park that floristic inventories were carried out on lines in the purpose to characterize the wealth and the diversity of the flora. The vegetation of each sampled site was described. The description consisted in appreciating the opening of the canopy, the structure of the vegetation, the presence of plants exogenic, heliophilous, with particular status, endemic, etc the itinerant inventory by the enumeration of the species on layouts and the method of the grixels [7], which consists in describing the vegetation (enumeration and classification of the species) on surfaces of approximately 20 m of dimensioned, according to the four cardinal points, with a precise spacing (fig. 2) is that which was used. The positions of the sampled sites were located using a GPS (Garmin map 60 CSx). The tailboards (fig. 3) carried out covered more than 50% of the surface of the park. The inventories were carried out for all the periods of the year (at every season). They are on the whole 25 tailboards of 500 m each one including 8 under closed canopy, 8 under half-open canopy and 9 under open canopy which were inventoried. The techniques of inventory of the small fauna are those of the standardized methods of measurement and follow-up of the diversity of the mammals [8] and the instructions of the US company of mammalogists [9]. Thus, to capture the small mammals, 30 traps of the type Sherman and 21 traps of the Longworth type were used for each tailboard. The installation of the traps and the data-gathering were carried out according to a quite precise chronogram. Thus at the 1st day, of the crammed traps of mesocarp of seed of the palm tree with oil (*Elaeis guineensis*) and of dry fish were posed on each line of 500 m at various stations separated by 10 m. The 2nd and the 3rd day were devoted to the control of the traps, the floristic inventories and the description of the vegetation of the sites of trapping. The 4th day was reserved to the last control and the collecting of the traps. The traps and the stations were temporarily marked with

ribbons colored to facilitate their location. All the lines of trapping were controlled each morning between 7:00 and 10:00 and the captured animals were identified then slackened. 25 lines of 500 m length were traced in this park of approximately 3000 ha.

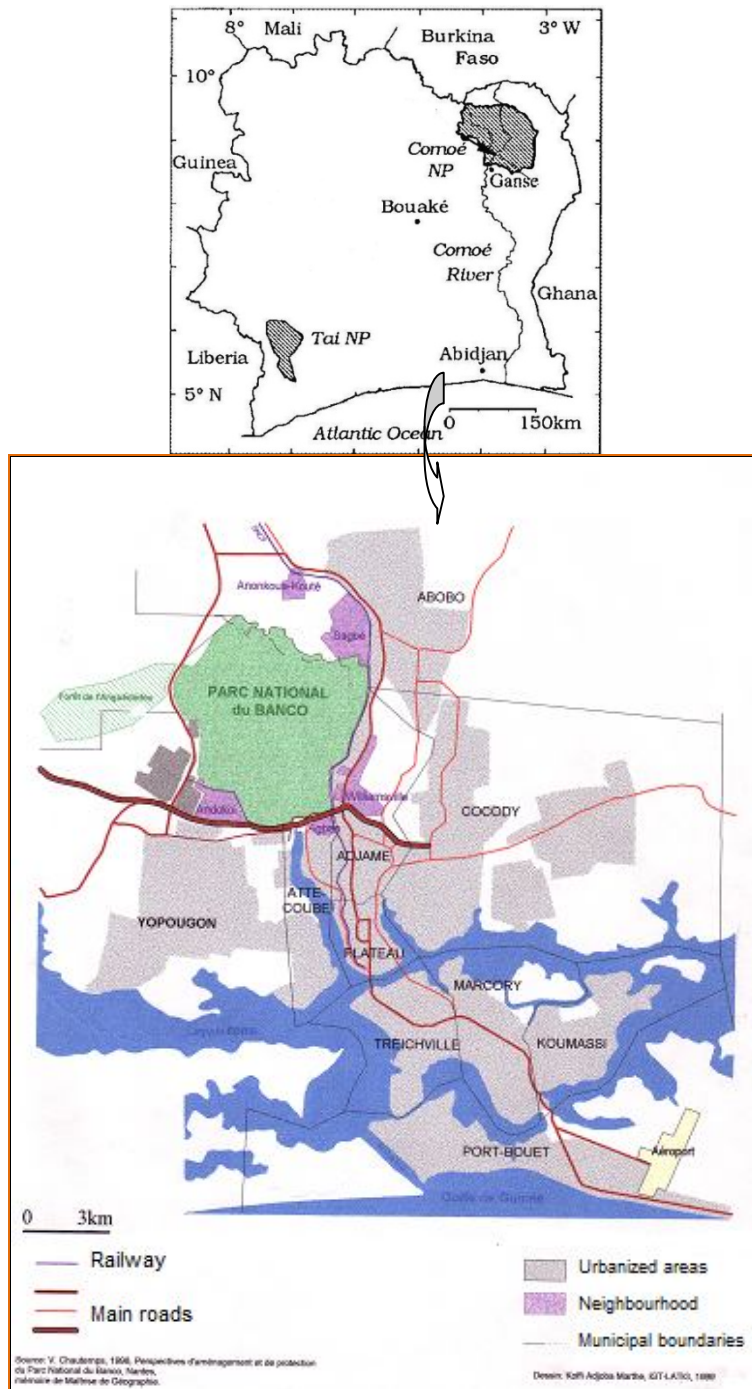
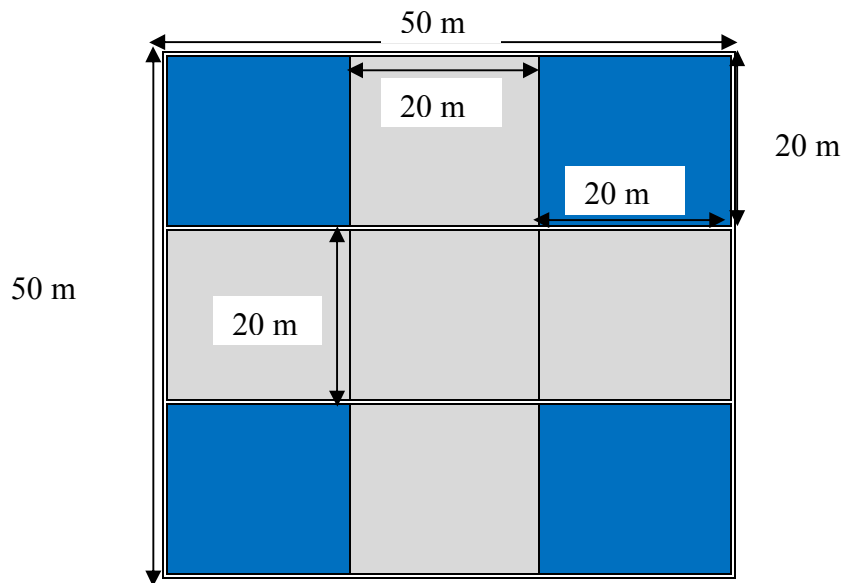


Fig. 1. Location map of Banco national Park

II- flora Analyzes

Several indices make it possible to express the diversity of a flora. The index of Shannon-weaver [10] which we chose for the processing the data of this study is one of very used. It is expressed according to the following formula: $H = - \sum P_i (\log p_i)$, with $p_i = Fr/N$ (N is the full number of plant species or animal inventoried); $Fr = Fa/i$ (i am the full number of statement and F is the number of vegetable or animal appearance of a species during the inventory). The Equitability is expressed starting from the index of Shannon. It is expressed as follows: $E = H/\log (N)$. The distribution of the species was given starting from

the index of Shannon. In addition, the floristic Homogeneity of the mediums was evaluated starting from the Equitability.



Parcel of floristic inventories

Fig. 2: Configuration of the parcels of floristic inventories

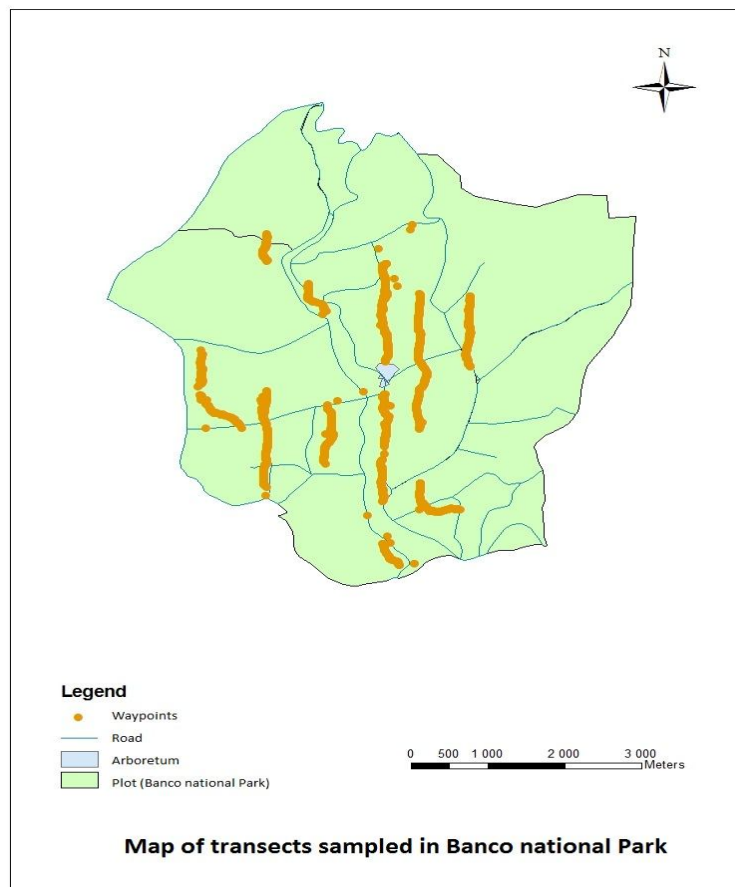


Fig. 3 Transects sampled

RESULTS**Wealth and diversity of the flora**

The floristic inventories carried out in the closed canopies show that the flora of this zone is rich of approximately, 286 species. The value of the floristic index of diversity of Shannon is about: $H = 5.41$. The equitability of the flora has a value estimated at: $E = 0.66$. In addition, 18 species with particular status (tableau1) were inventoried within the vegetations with closed canopy.

Table I: List of the plant species with particular status inventoried in the zone with closed canopy

N°	Species	Family	Status
1	<i>Anopyxis klaineana</i>	Rhizophoraceae	Vulnerable (UICN, 2009)
2	<i>Antrocaryon micraster</i>	Anacardiaceae	Vulnerable (UICN, 2009)
3	<i>Cordia platythyrsa</i>	Boraginaceae	Vulnerable (UICN, 2009)
4	<i>Didelotia idea</i>	Caesalpinaceae	risk (UICN, 2009)
5	<i>Entandrophragma angolense</i>	Meliaceae	Vulnerable (UICN, 2009)
6	<i>Entandrophragma candollei</i>	Meliaceae	Vulnerable (UICN, 2009)
7	<i>Entandrophragma cylindricum</i>	Meliaceae	Vulnérable (UICN, 2009)
8	<i>Entandrophragma utile</i>	Meliaceae	Vulnerable (UICN, 2009)
9	<i>Eribroma oblonga</i>	Sterculiaceae	Vulnerable (UICN, 2009)
10	<i>Gilbertiodendron splendidum</i>	Caesalpinaceae	Vulnerable (UICN, 2009)
11	<i>Guarea cedrata</i>	Meliaceae	Vulnerable (UICN, 2009)
12	<i>Guibourtia ehie</i>	Caesalpinaceae	Vulnerable (UICN, 2009)
13	<i>Gymnostemon zaizou</i>	Simaroubaceae	Vulnerable (UICN, 2009)
14	<i>Khaya grandifoliola</i>	Meliaceae	Vulnerable (UICN, 2009)
15	<i>Lophira alata</i>	Ochnaceae	Vulnérable (UICN, 2009)
16	<i>Microdesmis keayana</i>	Pandaceae	Vulnerable (UICN, 2009)
17	<i>Milicia excelsa</i>	Moraceae	Vulnerable (UICN, 2009)
18	<i>Nesogordonia papaverifera</i>	Sterculiaceae	Vulnerable (UICN, 2009)

The flora of half-open spaces is rich approximately 286 species. These spaces in full regeneration are quite as rich as those of the closed canopy. The indices of diversity and equitability obtained in these mediums are: $H = 4.46$ and $E = 0.55$. Eleven (11) species with particular status were inventoried in the flora with half-open canopy (table 2).

Table II: list of the plant species with particular status of the half-open zone

N°	Species	Family	Status
1	<i>Azelia Africana</i>	Caesalpinaceae	Vulnerable (UICN, 2009)
2	<i>Entandrophragma angolense</i>	Meliaceae	Vulnerable (UICN, 2009)
3	<i>Garcinia afzelii</i>	Guttiferae	Vulnerable (UICN, 2009)
4	<i>Guarea cedrata</i>	Meliaceae	Vulnerable (UICN, 2009)
5	<i>Guibourtia ehie</i>	Caesalpinaceae	Vulnerable (UICN, 2009)
6	<i>Hallea ledermannii</i>	Rubiaceae	Vulnerable (UICN, 2009)
7	<i>Irvingia gabonensis</i>	Inrviaceae	risk (UICN, 2009)
8	<i>Khaya grandifoliola</i>	Meliaceae	Vulnerable (UICN, 2009)
9	<i>Milicia excels</i>	Moraceae	Vulnerable (UICN, 2009)
10	<i>Nesogordonia papaverifera</i>	Sterculiaceae	Vulnerable (UICN, 2009)
11	<i>Placodiscus pseudostipularis</i>	Mimosaceae	in danger (UICN, 2009)

The floristic data collected in the open canopy show a rich flora of approximately 124 species. In this medium, the floristic index of diversity is fairly high ($H = 4.7$). On the other hand, the index of equitability is raised ($E = 0.67$). The number of the species with particular status inventoried in this flora is about 6 (table 3).

Table III: List of the plant species with particular status inventoried in the zone with open canopy

N°	Species	Family	Status
1	<i>Anopyxis klaineana</i>	Rhizophoraceae	Vulnerable (UICN, 2009)
2	<i>Cassia aubrevillei</i>	Caesalpinaceae	Vulnerable (UICN, 2009)
3	<i>Milicia excels</i>	Moraceae	Vulnerable (UICN, 2009)
4	<i>Nesogordonia papaverifera</i>	Sterculiaceae	Vulnerable (UICN, 2009)
5	<i>Placodiscus pseudostipularis</i>	Sapindaceae	In danger (UICN, 2009)
6	<i>Rhodognaphalon brevicusp</i>	Bombacaceae	Vulnerable (UICN, 2009)

Wealth and diversity of fauna

The cumulated manpower of species captured on the tailboards sampled is increasing. This number believes independently amongst sampled tailboards. The captured individuals were left again by species (Table 4). With the analysis, on a total of 43 captured individuals, 19 are of *Hybomys* (fig. 4), 14 are of *Praomys* (fig. 5), 8 are of *Malacomys* (fig. 6) and 2 are of *Mastomys* (fig. 7). The tailboards 15 and 25 (L15, L25) have the greatest specific wealths, with 8 individuals captured, on the tailboard 15 and 8 individuals out of Tailboard 25. The indices of diversity of Shannon (table 5) show that those of the tailboards: L15, L25 and L19 are higher with, of the values of about 0.746; 0.682 and 0.409. In the same way the

tailboards L15, L25 and L19 have densities high of species captured with respective values of about 8.4 and 9 different species.



Fig. 4: *Praomys rostratus*



Fig. 5: *Hybomys trivirgatus*



Fig. 6: *Malacomys edwardsi*



Fig. 7: *Mastomys erythroleucus*

Table IV: Distribution of the animals inventoried by species

N° Ligne	Inventoried species				Total (N)
	<i>Hybomys trivirgatus</i>	<i>Praomys rostratus</i>	<i>Malacomys edwardsi</i>	<i>Mastomys erythroleucus</i>	
L1	0	1	0	0	1
L2	0	0	2	0	2
L3	0	0	0	0	0
L4	0	0	0	0	0
L5	0	4	0	0	5
L6	0	0	1	0	1
L7	1	0	0	0	2
L8	0	0	0	0	1
L9	0	0	0	0	0
L10	1	0	1	0	2
L11	0	0	0	0	0
L12	0	1	0	0	1
L13	0	0	0	0	0
L14	0	0	0	0	0
L15	4	1	2	1	8
L16	3	0	0	0	3

L17	1	0	0	0	1
L18	1	0	0	0	1
L19	1	1	0	1	3
L20	1	2	0	0	3
L21	0	0	0	0	0
L22	1	1	0	0	2
L23	0	0	0	0	0
L24	0	1	1	0	2
L25	5	2	1	0	8
Total (N)	19	14	8	2	43
Relative abundance	44,19	32,56	18,6	4,6	100

Table V: Specific wealth, density and Index of diversity of the inventoried tailboards

	Species number (n)	Density (ni/tailboard)	Diversity (H)	Pielou P
L1	2	2	0,205	0,076
L2	1	2	0,170	0,063
L3	0	0	0	0
L4	0	0	0	0
L5	2	5	0,371	0,138
L6	2	2	0,102	0,038
L7	2	2	0,205	0,076
L8	1	1	0,102	0,038
L9	1	1	0,102	0,038
L10	2	2	0,205	0,076
L11	1	1	0,102	0,038
L12	1	1	0,102	0,038
L13	2	3	0,272	0,101
L14	0	0	0	0
L15	5	8	0,746	0,276
L16	1	3	0,224	0,083
L17	1	1	0,102	0,038
L18	1	1	0,102	0,038
L19	4	4	0,409	0,152
L20	2	3	0,272	0,101
L21	0	0	0	0
L22	3	3	0,307	0,114
L23	0	0	0	0
L24	2	2	0,205	0,076
L25	4	8	0,682	0,253

The number of animals inventoried within each population is also higher on each one of these tailboards. These numbers are fairly estimated at 9, 4 and 8. These tailboards are quite as rich as diversified with, of the values of about 5, 4, 4. The tailboard 22 is fairly diversified ($H = 0.307$). The densities of the species

captured on the tailboards 13, 20 and 22 are high, with respective values of about 3. The tailboard 22 is fairly (3) rich in cash. The other tailboards have indices of diversity < 0.3 , densities < 3 and specific wealths relatively weak, < 3 . The Indices of Pielou of the Tailboards: L15, L19, and L25 are raised and are respectively about 0.276; 0.152 and 0.253. The Weakest (0) are those of the tailboards: L3, L4, L14, L21 and L23. The other tailboards have the mean indices.

Typology of the vegetable formations and distribution of the species of small mammals

The inventoried species were left again compared to various environmental factors (table 6).

Table VI. Distribution of the species of small mammals by factors

Nature of the vegetable formation	Hybomys	Praomys	Malacomys	
F	9	6	2	0
S	9	8	5	1
O	1	0	0	1

Close (f), half-close (s) open (o)

With the analysis, the *Hybomys* (9) were mainly inventoried in the closed canopies consisted the arborescent woody species of the layer superior (S3) such as *Tuaeranthus africanus*, *Heisteria parvifolia*, *Entandrophragma* sp., *Piptadeniastrum africanum*,...; the species of the average layer (S2) such as: *Olex gambecola*, *Cola heterophylla*, *Beilschmiedia manii*; the lianescentes such as: *Heremopatha macrocarpa*, *Lacosperma secundiflorum*, sp, *Landolphia heudelotii*.... and of the species of under wood (S1) such as: *Palisota hirsuta*, *Geophylla obvalata*, *Thaumatococcus daniellii* (fig. 8), etc and in the half-open mediums comprising the floristic species of the higher layer disseminated, such as: *Piptadeniastrum africanum*, *Entandrophragma* sp. and *Crysophyllum* sp., an average layer (S2) more provided floristic in cash, with let us tax such as: *Cola heterophylla*, *Palisota hirsuta*, *Musanga cecropioides*; spontaneous species of the low layer such as *Chromolaena odorata*, *Geophylla obvallata*, *Thaumatococcus daniellii*, *Streptogina crinita*, *Oplismenus* sp. (Fig. 9) Only 1 species of *Hybomys* was inventoried in the open mediums comprising of many shrubby and herbaceous species (fig. 10 and 11). *Praomys* were also mainly inventoried in the half-open and closed formations. Indeed, of the 14 inventoried individuals 8 were found in the half-open formations (SO) and 6 in the formations with closed canopy. No individual of this species was found in the formations completely open. In the same way, *Malacomys* are mainly represented in the vegetable formations with half-open canopy (5) and those with closed canopy (2). In addition no individual of this species was inventoried in the mediums completely open. On the other hand, the *Mastomys* inventoried were found in the open mediums (1) and the half-open mediums (1).

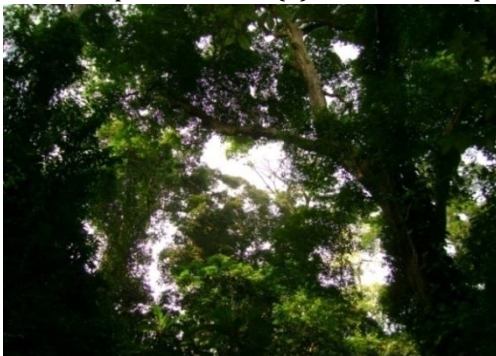


Fig. 8: Vegetation with closed canopy



Fig. 9: Vegetation with half-closed canopy



Fig. 10: open canopy (Herbaceous and shrubby)



Fig. 11: open canopy (Herbaceous)

DISCUSSION

Diversity of the flora and fauna

The high values of the index of diversity in the vegetations with closed canopy show that the various activities undertaken in this zone were certainly of the sources of ecological disturbances, but those can be regarded as minor disturbances on the diversity of the flora. The indices of diversity ($H = 4.46$) and of homogeneity ($E = 0.55$) obtained in the half-open mediums show that these mediums are diversified than those of the zones with closed canopy. The Equitability high under the vegetations with open canopy shows that this medium although it is less rich rest all the same homogeneous and stable of the point of the floristic view.

Evolution of the typology of the vegetation and distribution of the small mammals

The three types of vegetations in which the small mammals were inventoried constitute selection criteria of these animals. However, of these three mediums, those with closed canopy and those with completely open canopy gives more clear-cut information about three ecotypes of small mammals. Indeed, the open semi mediums are the places where are brewed all the inventoried species. This medium can thus be qualified of transitory and/or temporal habitat for the species of the *Hybomys* which have as a medium of the canopy closed but anthropized and/or disturbed predilection, *Praomys* and *Malacomys* which attend the wet forests with closed canopy, and for the *Mastomys* which have as a medium of predilection, the completely open canopies. The vegetable formations with closed canopy comprising of the species of the K group [11], or of standard dense forest with *Heisteria parvifolia* and *Tuaerranthus africanus* [12], [13], more homogeneous and more stable from the floristic and ecological point of view are those which shelter *Praomys* and *Malacomys*. On the other hand, the mediums open to low level of moisture which are the resultants of windfallen wood and natural windbreaks made up by spontaneous species and of grew again forest (mainly of herbaceous) are those which live *Mastomys*. The low number of *Mastomys* inventoried is related to the fact that the park highly protected is not subjected to the aggressions of anthropic origins. The rare open places are those which recorded natural windfallen woods or windbreaks. On the other hand, only the *Hybomys* inventoried in the open medium is an accidental case. The *Praomys* and the *Malacomys* were inventoried only in the mediums with closed and half-open canopy. It is the proof that these two species attend only these two types of mediums where they lived. But if the populations of *Praomys* inventoried in these two mediums let predict that this species is fond of only the mediums with closed canopy, the inventoried populations of *Malacomys* give more moderate information about their habitat. Indeed, their number inventoried in each one of these two mediums shows that this species with for predilection, the mediums half-open or in full reconstitution. These types of formations are those which were described by Alexandre [14] in wet dense forest and Kouassi *et al.* [15] in semi-deciduous forest of Côte d'Ivoire.

Wealth and specific diversity of the inventoried tailboards

Of all the inventoried lines, the L15 tailboards, L19 and L25 are riched and are diversified in cash small mammals. This diversity is related to the characteristics of the vegetable formations which sheltered these tailboards. Indeed, the lines which comprise the vegetations with open closed and semi canopy are those which had the greatest floristic wealths. The completely open vegetable formations are attended by these species. In addition, the *Hybomys*, the *Praomys* and the *Malacomys*, species characteristic of the closed canopies are those which were mainly captured at the places with closed canopy. The tailboards L5 and L22 which are fairly diversified shelters of vegetations with half-open canopy on a long distance (approximately 350 m) and small portions of vegetable formations with half-open canopy (approximately 150 m). The tailboards, L3, L4, L14, L21, L23 comprise a small extent of vegetations with closed canopy and most of vegetation with half-open and opened canopy. These places are thus not attended by these small mammals. But also this quasi-absence of small mammals in these places can be dependent of the presence of certain predatory which have as a predilection of these open canopies. The other tailboards L2, L6, L7, L8, L9, L10, L11, L12, L13, L15, L16, L17, L18, L19, L20, L22 are slightly diversified because of their vegetations mainly with half-open canopy. However, if the vegetations with canopy closed and homogeneous are the places of predilections for the *Hybomys*, the *Praomys* and the *Malacomys* because these places offer secure habitats to them and provided them food necessary for their survival. The *Mastomys* prefer the open canopies of the anthropized zones. Their low number inventoried on the tailboards is related to the rarefaction of the canopy open in this space highly protected. The nature of the foods and the climate (rainy day or not) can also influence the number and the varieties of populations, and the multitude of the small mammals on the lines of trapping. Indeed, the rain can push these mammals to seek convenient refuges among which can be arranged the burrows, dead woods, buttresses of the arborescent species and ultimately certain traps with their carried. In spite of these probable assumptions, the *Hybomys*, the *Praomys* and the *Malacomys* can beings considered as indicators of closed canopies and thus of homogeneous vegetations on the floristic view. The *Matomys* inventoried exclusively

in the open canopies are characteristic of these types of mediums. But among the three species characteristic of the vegetations with closed canopies, Hybomys are those of which ecology related to the canopy is closed.

CONCLUSION

At the end of the experiment 43 small mammals were captured. These specimens set out again in 4 groups of species: Hybomys, Praomys, Malacomys, and Mastomys. On a population comprising 43 inventoried individuals, 41 is of Hybomys, Praomys and Malacomys. These three species were inventoried in wet mediums of forests. In this group, Praomys and Malacomys (17 species), are characteristic of the forest mediums preserved well at closed canopy. Hybomys (19 species), were met in wet mediums of forests anthropized and sometimes in grown again of secondary formations. The sites of captures comprised dead trees of the secondary thickets rich in *Palisota hirsuta* and lianescentes. The Mastomys (2) were captured in mediums degraded with open and poor canopy floristic in cash.

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