FOREST DIVERSITY OF THE CUMARIBO REGION (VICHADA DEPARTMENT) IN THE TRANSITION ZONE BETWEEN THE AMAZONIA AND THE ORINOQUIA OF COLOMBIA

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Abstract. Forest vegetation (flooded, semi-flooded, and non-flooded or "terra firme") of the Cumaribo region was characterized using data from 29 plots. This sector is located in municipality at the Vichada department, and in adjacent areas of the Guainía and Guaviare departments, Colombia. In 1000 m² plots, all individuals with a diameter (DAP) > 10 cm were measured, the basal area (m²), relative abundance (%), and relative dominance (%) were calculated. The latter values helped to estimate the "reduced" importance value index (IVI).The Sigmatist school guidelines were used to classify the forests. According to floristic composition, patterns of structure, and spatial distribution of the species, forests were grouped in class *Brosimo lactescentis-Eschweileretea subglandulosae* with an estimated basal area of 165.7 m² in 10,579 individuals belonging to 685 species. In Mabeo nitidae-Mespilodaphnetalia cymbari forests (14 plots, 14000 m² of sampled area), the basal area value of 101.9 m² was estimated at 4770 individuals in 348 species, and the *Duguetio quitarensis-Amphirrhocion longifoliae* alliance covered 55.94 m² at 1901 individuals of 192 species. The association *Vitici compressae-Attaleetum butyraceae* presented the highest value of dominance index (basal area/sampling area) with 1.2%. In the alliance *Virolo surinamensis-Mespilodaphnion cymbari,* the basal area was 21.9 m² with 1461 individuals in 138 species. The association *Aspidospermo desmanthi-Mespilodaphnetum cymbari* presented a basal area of 24.4 m² with 1408 individuals and 211 species. In *Phenakospermo guyannenses-Minquartietalia guianensis* forests (13 plots, 13000 m²) basal area was 63.8 m² in 5809 individuals and 486 species. These values were provided by the alliance *Attaleo maripoae-Iryantherion laevis* with its five associations, where the palm association *Attaleo maripae-Euterpetum precatoriae* showed the highest richness value index with 6.3%. The *Micropholio venulosae-Eschweileretum bracteosae* forests presented the highest density index with a 0.6 number of individuals/sampling area. The present study grouped forest vegetation into one class, two orders, 2 alliances, and 10 associations. These results represent the first proposal of a phytosociological classification of the forests located in the transition region of the Orinoquia and the Colombian Amazon.

Keywords: Tropical forests, phytosociology, floristic composition, structural aspects, Orinoquia-Amazonia.

Resumen. Se utilizó la información de 29 levantamientos (parcelas) para caracterizar los bosques (inundables, semi-inundables y no inundables o de "tierra firme") en la región de Cumaribo, departamento del Vichada, y en localidades adyacentes de los departamentos del Guainía y Guaviare, Colombia. En parcelas de 1.000 m² se midieron todos los individuos con un diámetro a la altura del pecho (DAP) > 10 cm, y se calculó el área basal (m²), abundancia relativa (%), dominancia relativa (%), con estos valores se estimo el indice de valor de importancia "reducido" (IVI). En la clasificación de la vegetación, se siguieron los lineamientos de la escuela sigmatista. De acuerdo con la composición florística, los bosques se agruparon en la clase *Brosimo lactescentis-Eschweileretea subglandulosae*, con un área basal estimada de 165,7 m², en 10.579 individuos pertenecientes a 685 especies y en el orden *Mabeo nitidae-Mespilodaphnetalia cymbari* (14 parcelas, 14000 m² de superficie muestreada) con un área basal de 101,9 m² en 4.770 individuos en 348 especies. En la clasificación fitosociológica, figura la alianza *Dugetio quitarensis-Amphirrhocion longifoliae* con 55,94 m², 1901 individuos en 192 especies, con varios tipos de bosques y el palmar mixto *Vitici compressae-Attaleetum butyraceae*, el cual tuvo el valor mayor de índice de dominancia (área basal/área de muestreo, 1.2%). En la alianza *Virolo surinamensis-Mespilodaphnion cymbari,* el área basal es de 21,9 m² para 1461 individuos en 138 especies. En los bosques de la asociación *Aspidospermo desmanthii-Mespilodaphnetum cymbari* se encontró un área basal de 24,4 m² de 1408 individuos y 211 especies. En los bosques del orden *Phenakospermo guyannenses- Minquartetlia guianenesis* (13 parcelas, 13000 m² de superficie muestreada), el área basal fue de 63,8 m² en 5809 individuos y 486 especies. Estos valores los aportó la alianza *Attaleo maripae-Iryantherion laevis* con sus cinco asociaciones, de las cuales el palmar de *Attaleo maripae-Euterpetum precatoriae* mostró el mayor valor de índice de riqueza (6.3%). Los bosques de *Micropholio venulosae-Eschweileretum bracteosae* presentaron el mayor valor del índice de densidad (número de individuos/área de muestreo, 0.6%). En el presente estudio, la vegetación se agrupó en una clase, dos órdenes, 2 alianzas y 10 asociaciones, resultados que representan la primera propuesta de clasificación fitosociológica de la vegetación boscosa en la región de transición entre la Orinoquia y la Amazonia de Colombia.

Palabras clave: Bosques tropicales, fitosociología, composición florística, aspectos de la estructura, Orinoquía-Amazonia.

The Orinoco region of Colombia is divided into four physiographic units, accordingly to their physical and biotic components and named as foothills or "piedemonte", alluvial plain, highplains, and Macarena Mountain range (FAO, 1965; Goosen, 1971; Rangel-Ch. et al., 1995, Rangel and Minorta, 2014). This region is also known as the Colombian Eastern Plains or the Colombian Orinoquia (van der Hammen and Rangel, 1997; Rangel-Ch., 2014). The southwestern boundary

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of the Colombian plains that contacts the northwestern Amazon region is defined by a wide mosaic of forests, shrublands and grasslands commonly grouped under the term "savannah" in the basins of the Vichada, Matavén, and Guaviare rivers as well their main tributary, the Inírida River (Aymard et al., 2021). This transition region, between the Colombian Orinoquia and the northwestern macrothermal humid forests of the Colombian Amazon basin is determined by different physiographic, climatic, and edaphological variables (Jaramillo and Rangel, 2014).

In this area, the climatic/edaphological frontier is determined in great measure by the influence of the northeast and southeast trade winds, and the soils derived from the residual parent materials of the Guiana Shield and the alluvial plains respectively (Cortés-Lombana, 1981). The northeast trade winds are characterized by their thermal inversion, entering the Venezuelan coast in a north-south direction towards the plains through the Unare river basin. These winds circulate freely, accelerating during the strongest part of the dry season (which increases their drying power) due to low pressures originating in the plains (Andressen, 2003). Both variables determine the vegetation response to water availability and soil types. Such is the case of the dry savannas of the Vichada plains in Colombia and the lower stature forests, mixed with hawthorns and "cardonales" from the central and eastern plains in Venezuela llanos. These communities are characterized by the presence of numerous deciduous species of Capparaceae, Euphorbiaceae, Fabaceae, and Zygophyllaceae families (Aymard et al., 2021). However, south of the Guaviare, Guainía and Inírida basins, towards the equatorial zone (2°N, 2°S), there is a sector of warming and humid air melting from the north and south latitudes of the equator.

This region is strongly influenced by a low-pressure center known as the intertropical front or the intertropical convergence zone (ITCZ; Richards et al., 2015). Here, annual rainfall increases towards the northwest part of the Amazon basin, due to the north and south trade winds that merge from both latitudes from May to September. The movement of the Intertropical Convergence Zone (ITCZ) rain belt produces seasonal drought and increased rainfall variability along the southern and eastern Amazon rim (Garreaud et al., 2009). Therefore, increasing rainfall in equatorial countries represents an atmospheric phenomenon that largely allows the permanence of equatorial rainforests.

The Amazon basin harbors a noteworthy variation in floristic composition and forest structure, even at local and regional scales and environmental gradients (Prance, 2001; Valencia et al., 2005; Stropp et al., 2009). According to numerous studies, such variation and geographic gradients are substantially correlated with geomorphology, soils, geology, drainage, water types, and climate (Pitman et al., 2008; Aymard et al., 2009; Schargel and Marvez, 2009; Quesada et al., 2011, 2012; Wittmann et al., 2017; Figueiredo et al., 2017; Toumisto et al., 2019; Hofhansl et al., 2020; Ríos-Villamizar et al., 2020; Lehtonen et al., 2021).

The classification of vegetation in the basin have been proposed according to geological units and geomorphology, based on climate conditions such as precipitation amounts (Hilker et al., 2014) and average temperature values, and the flow regime that periodically waterlogged habitats associated with rivers and their influence on the land (Carvajal et al., 1979; Prance 1979; Luize et al., 2018). A study aimed to regionalize the Amazon tree flora identified 13 subregions inside the basin through the 5081 indicator taxa (Silva-Souza and Souza, 2020).

Recently, Oliveira-Filho et al. (2021), using data for virtually all known tree species in the Amazon (8,224) distributed across 1.584 sites, applied ordination analyses and multiple regressions to test the floristic differentiation among Amazonian vegetation types. They found that the traditional classification of Amazonian vegetation (i.g., Caatinga Amazonica, Igapó, Terra Firme, Várzea) are consistent with quantitative patterns of tree species composition.

However, most studies on ecology and distribution of the Amazon flora still lack several physiognomy aspects (i.e., high or low forests) and drained substrate conditions (flooded forests, terrace forests, terra firme forests). These exercises *hardly* lead to a comprehensive understanding of the relationships between vegetation and abiotic components (Duivenvoorden and Lips, 1993). The regional forest matrix was assumed as uniform with few variations in their floristic patterns. Nevertheless, the vegetation ecological classifications or ordinations based on species and their expressions of dominance and abundance were rarely used to detect changes in floristic composition. Towards the end of last century, classifications based on floristic composition with a hierarchical approach appeared, like Urrego's (1992, 1997) on the phytosociology of palm groves and mixed floodplain forests in the middle basin of the Caquetá River and Duivenvoorden and Lips's (1993), based on dominance. Cantillo and Rangel (2011) also presented the phytosociological characterization of the Amazon trapezium (Leticia) forests. Duque et al. (2003), Rudas and Prieto (2005), and Cárdenas and Giraldo (1997) partially referred to aspects of forest dominance and variability without considering the hierarchical phytosociological classification.

This contributions show new results on forest diversity (floristic composition and aspects of structure-architecture) in a geographical transition zone in the east of Colombia as a case study. These results promote a methodological approach that highlights the characteristics of the regional plant richness (flora and vegetation) and constitute an adequate tool for management and conservation plans of very high expression of biological richness.

Study Area

The study area is placed in the alluvial plain inside the great high plains in the Orinoquia bioregion, in localities very close to the northern limits of the Amazon region, over Tertiary alluvial plains, at a 100–200 m altitude. According to data recorded during the rainfall seasons, the climatic regime corresponds to super-humid. Rainfall amounts range

from 1564 to 3100 mm/year. The rainfall distribution is unimodal-bi-seasonal, with rainfall predominating between April–May and September–October, a period in which more than 80.5% of the annual precipitation originates. The humidity gradient goes from humid sites (to the south) with higher precipitation amounts, reaches the highest values in the middle band (4°29'N, 4°57'N), and decreases towards the north, reaching the lowest values in the band in between (5°40'N, 6°10'N). The monthly averages (multi-year) of mean, minimum, and maximum temperature are 26.6°C, 22.5°C, and 30.7°C, respectively. Climate types according to Thornthwaite range from B4RA' very humid to B2RA' moderately humid, with very little or no water deficiency (Minorta-Cely and Rangel-Ch., 2014).

The predominant soil orders are Inceptisols, Oxisols and Entisols, Ultisols and Spodosols. The most frequently found groups are Fluventic Dystrudepts (Inceptisol), Typic acrudox (Oxisol), Typic Kandiudults (Ultisol), and Typic Quartzipsamments (Entisol). The pH values fluctuate between 3.9 (extremely acidic) and 6 (medium acidic). The contents of calcium, magnesium, and potassium, as well as those of total bases, are low. Organic carbon values (%) are predominantly low (<1.2 %, 47 %), but high (>2.3 %) and medium (1.2–2.3 %) values are well represented in Typic Quartzipsamments (Entisol), Fluvaquentic Humaquepts (Inceptisol), and Typic Kandiudults (Ultisol) soils. Phosphorus contents are very low. Aluminum contents and saturation are high. In some places, nitrogen has high values (>0.20 %), though low values predominate (Rangel et al., 2019).

This sector of the Guaviare River alluvial plain has different dissection degrees, where forest vegetation prevails over scrublands and pastures. Areas of permanent and semi-permanent swamps are also frequent (Minorta-Cely et al., 2020b). The landscape of the study area has slopes between 3° and 8° and is dominated by terraces of various dissection degrees of fluvial-lacustrine origin, overflow plains, and areas of poor drainage, on which there are large swamp areas distributed in parallel to the interfluves that drain the Guaviare and Inirida rivers (Minorta-Cely et al., 2020b). Along the banks and recent alluvium (river valleys), soils vary from moderately to well-drained with moderately coarse to fine textures, and large contribution of sands and clays. Large extensions of forest formations and mixed palm communities are distributed along the great alluvial plain of the Guaviare River and its tributaries. Also, wider belts of scrub and semi-permanent swamps are found between the peneplains and the river alluvial plains. These communities connect with the riparian forests through the meanders along the banks of the large riverbeds ("madreviejas") during the rainy season. There are also some dense "terra firme" forests located at the base of the lower hills ("lomeríos") surrounding the higher terraces (Minorta-Cely et al., 2020b; Aymard et al., 2021).

Methodology

The study area is represented by 29 localities, placed in the middle and lower basin of the Guaviare river, southeast of San José del Guaviare, on the transition between the eastern plains and the Amazon plains of Colombia (Fig. 1, Table 1). Table 1 presents information on the geographic location of the 1000 m^2 (100 × 10 m) vegetation surveys (plots, *relevés*). These were established in areas (flooded, semi-flooded, and non-flooded) in the Guainía, Guaviare, and Vichada departments, respectively. The individuals' census (direct count) and the cover and abundance or density estimation were carried out stratum by stratum according to Rangel and Lozano (1986). The cover was estimated by the projection of the individual canopy on the ground (initial calculation in m^2), then transformed into % (Cleef et al., 1984). The number of individuals with a diameter at chest height, DBH > 10 cm per stratum is a real figure over the inventoried area. Botanical samples were processed and determined in the Colombian National Herbarium (COL), where the *exsiccatae* were deposited under the numbering of Vladimir Minorta-Cely et al. The basic catalog of flora from the study area was published in Minorta-Cely et al. (2020a). The species names and nomenclatural validity were revised and updated by consulting the website Tropicos (http://legacy.tropicos.org/Home.aspx) and the International Plant Names Index (https://www.ipni.org/). The syntaxonomy names follow the International Code of Phytosociological Nomenclature rules (Izco and Del Arco, 2003; Theurillat et al., 2021). Characterization of the vegetation follows Avella-M. and Rangel-Ch. (2012), Rangel-Ch. (2012), and Rangel-Ch. and Minorta-Cely (2014). These authors combined classification approaches from the European Sigmatist School (Braun-Blanquet, 1979), and the Anglo-Saxon forest schools method based on dominance and other structure parameters (Curtis and McIntosh, 1950; Curtis and Cottam, 1962). Based on floristic composition information, vegetation hierarchical classification was carried out by using the TWINSPAN algorithm (the two-way divisive technique: plots, species with indicator species) with the PC-ORD version 6 program (McCune and Mefford, 2011). This previous classification detected the tendency to assemble the vegetation into classes, orders, alliances, and associations as well. These preliminary tables were manually processed to obtain a classification of communities or associations defined in their floristic composition and contrasted with field observations. The coverage value (%) was used as a variable, although a species can be represented by individuals in different strata, in the final table, it only appears on one occasion with the highest value that it reached in any defined strata. Characterization of aspects of the vegetation structure (according to the height of individuals) and the types of habit or growth forms (tree, sapling, shrub, herb, liana, and liana creeper) follow the recommendations of Rangel-Ch. and Lozano (1986). Each unit was described according to its floristic composition, focusing on species with the highest values in cover, and structural variables such as frequency, basal area, and the number of individuals (Avella and Rangel-Ch., 2012).

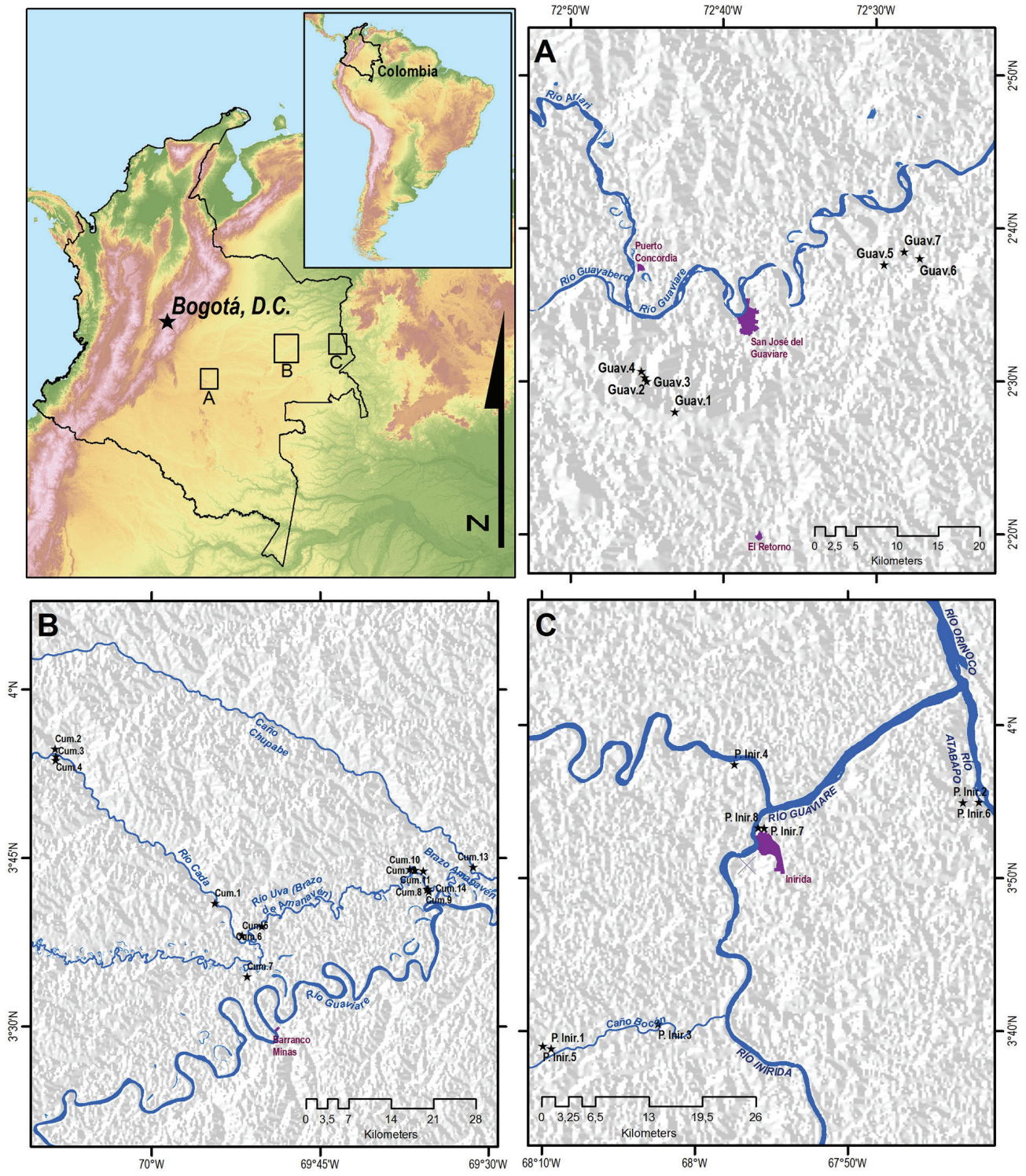

Figure 1. Map of the transition region of the Orinoquia and the Colombian Amazon. The localities are the plots contained in Table 1.

Table 1. Location of sampling plots (1,000 m^2).

Plot Number	Habitat	Dpto.	Mpio.	Place	Latitud	Longitud	Altitud (m)
Cum.1	Semi-flooded area	Vichada	Cumaribo	Caño Cada, El Pesebre	-69,90611	3,68269	288
Cum.10	Flooded area	Vichada	Cumaribo	Río Uva	-69,60933	3,73194	133
Cum.11	Flooded area	Vichada	Cumaribo	Río Uva, Laguna Negra	-69,61658	3,73286	99
Cum.12	"Terra firme"	Vichada	Cumaribo	Río Uva, Finca Minesitas	-69,59683	3,73039	115
Cum.13	Flooded area	Vichada	Cumaribo	Caño Chupave, Sector Sardinas	-69,52306	3,73631	115
Cum.14	Semi-flooded área	Vichada	Cumaribo	Caño Minitas	-69,58869	3,70021	137
Cum.2	"Terra firme"	Vichada	Cumaribo	Caño Pelusa	-70,14322	3,91164	148
Cum.3	"Terra firme"	Vichada	Cumaribo	Caño Cada	-70,14306	3,89461	175
Cum.4	Área de rebalse	Vichada	Cumaribo	Caño Pelusa	-70,14222	3,90021	149
Cum.5	Semi-flooded área	Vichada	Cumaribo	Caño Cada	-69,86567	3,63433	135
Cum.6	Flooded area	Vichada	Cumaribo	Río Uva	-69,83636	3,64844	113
Cum.7	Flooded area	Vichada	Cumaribo	Río Uva	-69,85844	3,57364	124
Cum.8	Semi-flooded area	Vichada	Cumaribo	Caño Minesitos	-69,58961	3,70367	143
Cum.9	Flooded area	Vichada	Cumaribo	Río Uva	-69,59128	3,70292	116
Guav.1	"Terra firme"	Guaviare	San José del Guaviare	La Pizarra (Nueva Tolima)	-72,71929	2,46668	200
Guav.2	"Terra firme"	Guaviare	San José del Guaviare	Vereda El Retiro, La Lindosa	-72,75217	2,50383	249
Guav.3	"Terra firme"	Guaviare	San José del Guaviare	Vereda El Retiro, La Lindosa	-72,75001	2,50002	249
Guav.4	"Terra firme"	Guaviare	San José del Guaviare	Vereda El Retiro, La Lindosa	-72,75575	2,51064	249
Guav.5	"Terra firme	Guaviare	San José del Guaviare	Resguardo La Fuga	-72,49125	2,62714	100
Guav.6	Flooded areas with mixted waters	Guaviare	San José del Guaviare	Resguardo La Fuga	-72,45237	2,63380	207
Guav.7	Flooded areas with mixted waters	Guaviare	San José del Guaviare	Resguardo La Fuga	-72,46944	2,64108	207
P. Inír.1	Flooded areas with black waters	Guainía	Puerto Inírida	Comunidad Yuri	-68,15646	3,64737	117
P. Inír.2	Flooded area	Guainía	Puerto Inírida	Comunidad Caño Raya	-67,69034	3,91596	114
P. Inír.3	Flooded area	Guainía	Puerto Inírida	Comunidad Santa Rosa	-68,03998	3,67401	109
P. Inír.4	Flooded área	Guainía	Puerto Inírida	Laguna Macasabe (río Guaviare)	-67,95666	3,95727	87
P. Inír.5	Semi-flooded área	Guainía	Puerto Inírida	Comunidad Yuri	-68,16545	3,64984	103
P. Inír.6	"Terra firme"	Guainía	Puerto Inírida	Comunidad Caño Raya	-67,70777	3,91561	108
P. Inír.7	"Terra firme"	Guainía	Puerto Inírida	Comunidad Paujil	-67,92423	3,88755	109
P. Inír.8	"Terra firme"	Guainía	Puerto Inírida	Comunidad Paujil	-67,93053	3,88819	121

Results

Syntaxonomical units

The present phytosociological study assembles vegetation into one class, two orders, two alliances, and ten associations (Fig. 2). These syntaxonomic units are described below. Results represent the first proposal to classify the forest vegetation in the transition region of the Orinoquia and the Colombian Amazon.

***Brosimo lactescentis-Eschweileretea subglandulosae*,** *class nov.* in this contribution (Table 2)
Typus: *Mabeo nitidae-Mespilodaphnetalia cymbari*, *ord. nov.*

Floristic composition: Characteristic-dominant species: *Eschweilera subglandulosa* (this record represents the first collection of this taxon to Colombia flora), *Brosimum lactescens*, *Matayba elegans*, *Amphirrhox longifolia*, *Euterpe precatoria*, *Protium llanorum*, *Brosimum guianense*, *Virola sebifera*, *Hydrochorea corymbosa*, *Tovomita spruceana*, *Abuta grandifolia*, *Swartzia leptopetala*, *Gustavia augusta*, *Moquilea subarachnophylla*, *Attalea butyracea*, *Sorocea muriculata*, *Zygia inaequalis*, *Licania mollis*, *Stylogyne longifolia,* and *Adenocalymma cladotrichum*.

Physiognomy-structure: mixed forests and palm communities in flooded and semi-flooded areas, exceptionally in non-flooded areas. Individuals with an average height of 22 m and several individuals emerging up to 30 m. Upper tree stratum is dominated by *Eschweilera subglandulosa*, *Euterpe precatoria,* and *Mespilodaphne cymbarum* with a DBH average of 45 cm. These taxa concentrated the maximum value of basal area (86 m^2). Small tree stratum was dominated by *Amphirrhox longifolia*, *Aparisthmium cordatum*, *Attalea maripa*, *Phenakospermum guyannense*, *Brownea coccinea,* and *Sorocea muriculata*. This group has the largest number of individuals (4208).

Order: ***Mabeo nitidae-Mespilodaphnetalia cymbari***, *ord. nov.* in this contribution (Table 2)
Typus: ***Duguetio quitarensis-Amphirrhocion longifoliae***, *all. nov.* in this contribution.

Floristic composition: Characteristic-dominant species: *Mespilodaphne cymbarum*, *Mabea nitida*, *Brownea coccinea*, *Pouteria cuspidata, P. gomphiifolia, Pseudolmedia laevigata*, *Hirtella paniculata*, *Cynometra marginata*, *Garcinia madruno*, *Myrcia ruiziana, M. splendens*, *Calophyllum brasiliense*, *Faramea torquata*, *Palicourea justiciifolia*, *Eschweilera decolorans*, *E. parvifolia*, *Adenocalymma impressum*, *Mouriri guianensis*, *Ceiba pentandra*, *Quiina rhytidopus*, *Salacia* aff. *S. macrantha*, *Virola pavonis, V. schultesii*, *Simarouba amara*, *Socratea exorrhiza*, *Annona ambotay*, *Doliocarpus dentatus*, *Nectandra cuspidata*, *Swartzia leptopetala,* and *Xylopia discreta*.

Physiognomy-structure: forests in semi-flooded to flooded areas, with individuals of an average height of 22 m and emerging trees of 30 m. Upper tree stratum dominated by *Mespilodaphne cymbarum*, *Euterpe precatoria*, *Eschweilera subglandulosa,* and *Socratea*

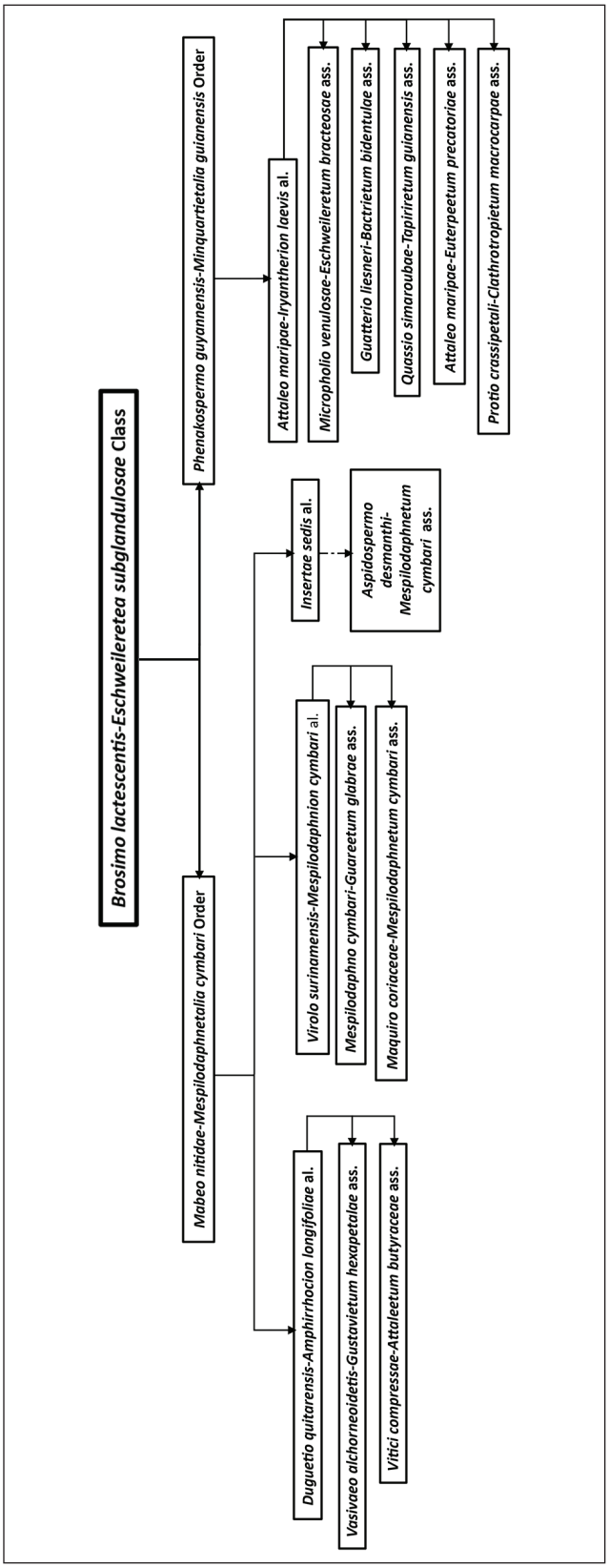

Figure 2. Syntaxonomic assembly of the *Brosimo lactescentis-Eschweileretea subglandulosae* class.

TABLE 2. Floristic composition of forests of the class *Brosimo lactescentis-Eschweileretea subglandulosae*.

PLOTS	Cum .8	Cum .9	Cum. 11	Cum. 10	Cum. 14	Cum .4	Guav .4	Cum. 13	Cum .6
	Relative coverage values (%)								
***Brosimo lactescentis-Eschweileretea subglandulosae* class**									
Eschweilera subglandulosa	9	1	.	2	4	70	.	.	45
Brosimum lactescens	4	.	18	30	.	17	.	.	.
Amphirrhox longifolia	33	70	2	2	8				
Matayba elegans	2	.	1	2	.	.	1	1	.
Euterpe precatoria	16	13	.	.	51	3	.	.	.
Hydrochorea corymbosa	.	.	4	6	5	.	.	5	.
Tovomita spruceana	1	.	.	.	.	2	.	.	2
Sorocea muriculata	1	4	.	.	.	.	.	.	15
Zygia inaequalis	.	.	6	6	1	.	.	.	.
Brosimum guianense	2	1	.	.	.	.	.	.	.
Protium llanorum	.	1	.	.	.	.	1	.	.
Virola sebifera	.	.	.	.	.	2	1	.	.
Gustavia augusta	.	1	.	2	.	.	.	.	.
Stylogyne longifolia	.	.	12	2	.	.	.	.	.
Licania mollis	.							6	4
***Mabeo nitidae-Mespilodaphnetalia cymbari* ord.**									
Mabea nitida	.	.	9	5	.	.	.	14	.
Mespilodaphne cymbarum	.	.	6	15	.	8	.	10	14
Brownea coccinea	16	11	.	.	.	.	.	.	28
Byrsonima japurensis	.	.	7	1	.	.	.	1	.
Symmeria paniculata	1	.	9	1	.	.	.	.	.
Pouteria gomphiifolia	.	.	4	26	.	2	.	.	.
Pseudolmedia laevigata	1	1	1	2	.	.	1	14	.
Curarea aff. *C. toxicofera*	1	1	1	3	1	1	.	.	.
Hirtella paniculata	1	1	1	.	.	1	.	.	1
Pouteria cuspidata	.	.	2	2	.	8	3	8	3
Garcinia madruno	.	.	1	9	.	.	.	1	.
Myrcia splendens	1	.	3	2	.	11	1	6	.
Calophyllum brasiliense	.	.	.	.	23	.	.	.	3
Faramea torquata	.	.	2	1	.	3	.	2	3
Duroia micrantha	.	.	4	.	.	.	.	1	.
Palicourea justiciifolia	.	.	2	2	.	1	.	1	.
Eschweilera decolorans	.	.	2	.	.	1	.	.	.
Eschweilera parvifolia	.	.	.	.	5	.	.	81	.
Mouriri guianensis	.	.	1	.	.	.	.	1	.
Ceiba pentandra	24	.	.	.	.	.	.	.	9
Quiina rhytidopus	.	.	.	1	.	.	.	1	.
Salacia aff. *S. macrantha*	.	.	1	.	.	.	.	1	.
Virola schultesii	.	.	.	.	3	.	.	3	.
Ischnosiphon arouma	.	.	1	.	.	.	3	.	.
Strychnos bredemeyeri	.	.	1	.	.	.	.	1	.
Simarouba amara	2	.	.	.	.	.	1	.	.
Socratea exorrhiza	.	.	.	.	8	.	2	.	.
Virola pavonis	.	.	1	.	.	.	.	7	.
Annona ambotay	.	.	1	.	.	.	1	.	.
Doliocarpus dentatus	.	.	.	1	.	.	1	.	.
Nectandra cuspidata	.	1	.	.	.	1	.	.	.
Simira rubescens	1	.	.	.	.	1	.	.	.
***Duguetio quitarensis-Amphirrhocion longifoliae* all.**									
Duguetia quitarensis	2	4	28	16	1	.	.	.	.
Apeiba glabra	11	3	2	3	.	.	.	.	.
Tapura acreana	1	.	5	1	9	.	.	.	6
Tapura guianensis	5	2	4	1	.	.	.	.	.
Garcinia macrophylla	.	1	5	2	.	.	.	.	.
Mouriri pauciflora	.	1	1	1	.	.	.	3	.
Campsiandra angustifolia	.	4	4	35	.	.	.	.	.
Adenocalymma impressum	1	1	2	.	.	.	.	1	.
Cynometra marginata	.	6	3	.	4	.	.	.	.
Ditaxis polygama	1	.	.	2	.	.	.	.	.
Ficus albert-smithii	26	.	.	9	.	.	.	.	.
Lecythis sp.	.	2	.	.	13	.	.	.	.
Eugenia florida	.	7	.	1	.	8	.	.	.
Cynometra bauhiniifolia	.	1	.	1	.	.	.	.	.
Machaerium floribundum	.	2	.	1	.	.	.	.	.
Campsiandra nutans	2	.	.	.	6	.	.	.	.

TABLE 2 CONT. Floristic composition of forests of the class *Brosimo lactescentis-Eschweileretea subglandulosae*.

PLOTS	Cum .8	Cum .9	Cum. 11	Cum. 10	Cum. 14	Cum .4	Guav .4	Cum. 13	Cum .6
	Relative coverage values (%)								
***Duguetio quitarensis-Amphirrhocion longifoliae* all.**									
Chomelia tenuiflora	.	1	1	.	.	.	.	.	.
Vismia macrophylla	1	.	1	.	.	.	.	.	.
Virola calophylla	6	.	.	.	1	.	.	.	.
Minquartia guianensis	.	3	1	.	.	.	.	.	.
Abuta grandifolia	1	1	.	.	.	.	.	.	.
***Vitici compressae-Attaleetum butyraceae* ass.**									
Vitex compressa	3	39	.	.	.	.	.	.	.
Attalea butyracea	59	65	.	.	2	.	.	.	.
Mabea trianae	4	4	.	.	.	.	.	.	.
Piparea dentata	1	1	1	.	.	.	.	.	.
Macrolobium angustifolium	1	1	.	.	.	.	.	.	.
Lindackeria paludosa	1	1	.	.	.	.	1	.	.
Xylopia sericea	1	2	.	.	.	.	1	.	.
Clathrotropis brachypetala	6	1	.	.	.	.	.	.	3
Machaerium biovulatum	1	1	.	.	.	.	.	1	.
Cordia panamensis	1	2	.	.	.	.	.	.	.
Seguieria aculeata	1	1	.	.	.	.	.	.	.
Doliocarpus major	1	3	.	.	.	.	.	.	.
Hieronyma alchorneoides	5	3	.	.	.	.	.	.	.
Euterpe oleracea	1	5	.	.	.	17	.	.	.
Ocotea leptobotra	1	1	.	.	.	.	.	.	.
Protium unifoliolatum	1	10	.	.	.	.	.	.	.
Rinorea falcata	9	2	.	.	.	.	.	.	.
Swartzia myrtifolia	1	1	.	.	.	.	.	.	.
***Vasivaeo alchorneoidis-Gustavietum hexapetalae* ass.**									
Vasivaea alchorneoides	.	.	8	6	6	.	.	.	1
Gustavia hexapetala	.	.	15	7	14	.	.	1	.
Tabernaemontana macrocalyx	.	.	1	6	.	.	.	1	.
Alibertia bertierifolia	.	.	1	8	.	.	.	.	.
Cecropia peltata	.	.	1	1	.	.	.	.	.
Pterocarpus dubius	.	.	9	1	.	.	.	.	.
Ficus americana subsp. guianensis	.	.	1	1	.	.	.	.	.
Guatteria inundata	.	.	16	9	.	.	.	.	.
Leptolobium nitens	.	.	5	1	.	.	.	.	.
Pouteria glomerata	.	.	2	2	.	.	.	.	.
Pouteria multiflora	.	.	3	3	.	.	.	.	.
Ruprechtia tenuiflora	.	.	1	3	.	.	.	.	.
Salacia elíptica	.	.	1	3	.	.	.	.	.
Styrax guyanensis	.	.	2	1	.	.	.	.	.
Croton cuneatus	.	.	8	1	.	.	.	.	.
Macrolobium acaciifolium	.	.	4	7	.	.	.	.	.
Salacia insignis	.	.	38	1	.	.	.	.	.
Strychnos mitscherlichii	.	.	1	3	.	.	.	.	.
***Aspidospermo desmanthii-Mespilodaphnetum cymbari* ass.**									
Aspidosperma desmanthum	.	.	.	.	.	5	3	.	3
Macrosamanea consanguinea	.	.	.	.	.	1	.	1	1
Caraipa densifolia	.	.	.	.	.	1	.	.	1
Oenocarpus minor	.	.	.	.	.	1	1	.	.
Protium llanorum	.	.	.	.	.	4	.	1	.
Combretum laxum	.	.	1	.	.	.	1	1	.
Discocarpus gentryi	.	.	.	.	.	3	.	.	1
Piparea multiflora	.	.	.	.	.	2	2	.	3
Tachigali plúmbea	.	.	.	.	.	1	.	5	.
Zygia latifolia	.	.	.	.	.	8	.	.	11
Pseudolmedia laevis	.	.	.	.	.	.	1	1	.
Lacmellea foxii	.					1	1		
Endlicheria levelii	.	.	.	.	.	3	1	.	.
Phenakospermum guyannense	.	.	.	.	.	2	19	.	.
Aspidosperma excelsum	.	.	.	.	.	.	3	4	.
Aniba panurensis	.	.	.	.	.	1	1	.	.
Myrcia ruiziana				1					20
Swartzia leptopetala	.	.	6	.	.	.	.	10	3
Xylopia discreta	.	1	.	.	.	.	.	.	29
Attalea maripa							5		1
Miconia splendens							3	2	3

TABLE 2 CONT. Floristic composition of forests of the class *Brosimo lactescentis-Eschweileretea subglandulosae*.

Other species:

Swartzia sp. (Cum.6: 1). Piparea multiflora (Guav.4: 1). Oenocarpus bacaba (Guav.4: 1) Didymopanax morototoni (Guav.4: 2) Aparisthmium cordatum (Guav.4: 1) Brosimum utile (Guav.4: 1) Clusia grandiflora (Guav.4: 4) Licania mollis (Cum.13: 3) Piper arboreum (Guav.4: 2) Aniba cylindriflora (Guav.4: 2) Protium laxiflorum (Guav.4: 4) Sloanea eichleri (Guav.4: 2) Stachyarrena penduliflora (Cum.13: 2) Alchornea discolor (Cum.11: 1) Astrocaryum gynacanthum (Guav.4: 5) Bactris maraja (Cum.8: 1) Bathysa bracteosa (Guav.4: 5) Cordia ucayaliensis (Guav.4: 6) Couma macrocarpa (Guav.4: 1) Dichapetalum spruceanum (Guav.4: 1) Enterolobium schomburgkii (Guav.4: 1) Euterpe oleracea (Cum.4: 13) Geonoma deversa (Guav.4: 2) Goupia glabra (Guav.4: 2) Guatteria punctata (Guav.4: 4) Hieronyma oblonga (Guav.4: 5) Inga alba (Guav.4: 8) Inga thibaudiana (Guav.4: 1) Jacaranda copaia (Cum.4: 1) Moquilea subarachnophylla (Guav.4: 1) Maprounea guianensis (Guav.4: 1) Maquira calophylla (Cum.14: 13) Miconia elata (Guav.4: 1) Micropholis venulosa (Cum.10: 2) Mouriri myrtilloides (Cum.8: 1) Olyra latifolia (Guav.4: 1) Sacoglottis guianensis (Guav.4: 3) Sagotia racemosa (Cum.6: 1)Siparuna guianensis (Guav.4: 1) Sloanea aff. tuerckheimii (Cum.13: 1) Syagrus orinocensis (Guav.4: 11) Tabernaemontana undulata (Guav.4: 1) Tapura amazonica (Cum.8: 1) Miconia tococoronata (Cum.13: 1) Miconia tococa (Cum.4: 4) Vitex triflora (Guav.4: 1) Clathrotropis macrocarpa (Cum.6: 1)Dormilón VMC 3254 (Cum.6: 7)Trattinnickia aspera (Guav.4: 3) Erythroxylum divaricatum (Cum.6: 1)Maquira coriacea (Cum.11: 1) Alchornea triplinervia (Guav.4: 4) Adenocalymma cladotrichum (Guav.4: 1) Protium crassipetalum (Guav.4: 1) Myrcia sp. (Guav.4: 1) Inga sp. (Guav.4: 1) Pouteria sp. (Guav.4: 2) Zygia cataractae (Cum.10: 1) Oenocarpus bataua (Guav.4: 4) Swartzia leptopetala (Cum.11: 1) Ocotea sp. (Guav.4: 1) Tapirira guianensis (Guav.4: 13) Astrocaryum chambira (Guav.4: 2) Iryanthera laevis (Guav.4: 1) Bactris simplicifrons (Cum.4: 2) Hevea benthamiana (Cum.6: 6) Perebea mollis (Guav.4: 1) Pourouma tomentosa (Cum.4: 2) Mouriri nigra (Cum.4: 1) Rinorea pubiflora (Cum.6: 7) Alchorneopsis floribunda (Guav.4: 5) Annona duckei (Guav.4: 2) Batocarpus orinocensis (Guav.4: 2) Bellucia grossularioides (Guav.4: 4) Bizcocho VMC 3273 (Cum.6: 1) Byrsonima crispa (Guav.4: 1) Couepia paraensis (Cum.13: 1) Crepidospermum sp. nov. (Cum.9: 1) Dalbergia inundata (Cum.13: 1) Diospyros guianensis (Cum.13: 1) Ficus guianensis (Guav.4: 1) Ficus sp.1 (Cum.8: 2) Forsteronia gracilis (Guav.4: 2) Genipa americana (Cum.14: 4) Humiria balsamifera (Guav.4: 1) Inga cf. pilosula (Cum.4: 1) Inga marginata (Cum.13: 1) Iryanthera ulei (Guav.4: 2) Lacmellea foxii (Guav.4: 1) Casearia suaveolens (Cum.11: 1) Malouetia naias (Cum.11: 1) Miconia poeppigii (Guav.4: 2) Ocotea oblonga (Guav.4: 3) Ormosia grandiflora (Guav.4: 1) Orthomene schomburgkii (Cum.9: 1) Ouratea ferruginea (Cum.11: 1) Panopsis rubescens (Cum.13: 2) Parinari rodolphii (Guav.4: 1) Passiflora guazumifolia (Cum.10: 1) Paypayrola grandiflora (Cum.9: 1) Pleonotoma jasminifolia (Cum.11: 1) Potalia resinifera (Cum.4: 1) Pouteria elegans (Cum.13: 2) Pouteria sp.3 (Cum.13: 1) Protium guianense (Guav.4: 1) Protium heptaphyllum (Guav.4: 1) Pseudoxandra lucida (Cum.4: 1) Psychotria sp. (Cum.13: 1) Pterocarpus sp. (Cum.6: 2)Tetracera costata (Cum.8: 1) Tetracera willdenowiana (Cum.14: 1) Toulicia pulvinata (Cum.9: 4) Uncaria guianensis (Cum.8: 1)Virola carinata (Cum.4: 8) Zanthoxylum compactum (Cum.11: 1) Adenocalymma flaviflorum (Cum.10: 1) Apuleia leiocarpa (Cum.11: 1) Bauhinia longicuspis (Cum.10: 1) Schnella glabra (Cum.8: 1) Bejuco indet. VMC 3693 - B (Cum.9: 1) Bignoniaceae sp. VMC 3656 (Cum.8: 1) Bignoniaceae sp. VMC 4127 (Cum.13: 1) Byttneria aff. coriacea (Cum.10: 1) Myrcia (Calyptranthes) sp.1 (Cum.8: 1) Casearia aff. leandra (Cum.8: 1) Cathedra sp. (Cum.10: 1) Chomelia aff. polyantha (Cum.10: 4) Chrysophyllum argenteum (Cum.8: 2) Citharexylum aff. spinosum (Cum.8: 1) Clusia rosea (Cum.13: 1) Crudia glaberrima (Cum.8: 1) Cupania macrostylis (Cum.8: 1) Cyclanthus bipartitus (Guav.4: 1) Cymbosema roseum (Cum.10: 1) Cynometra spruceana (Cum.13: 13) Deguelia densiflora (Cum.9: 1) Deguelia amazonica (Guav.4: 2) Desmoncus polyacanthos (Cum.4: 1) Diclidanthera bolivarensis (Cum.10: 1) Dipteryx odorata (Cum.13: 1) Discocarpus gentryi (Cum.13: 8) Doliocarpus gentryi (Cum.8: 1) Dulacia macrophylla (Cum.13: 1) Erythroxylum mucronatum (Guav.4: 1) Eschweilera coriacea (Guav.4: 2) Eschweilera sp.4 (Cum.10: 1) Eugenia aff. anastomosans (Cum.6: 1) Eugenia sp. VMC 3360 (Cum.4: 3) Fabaceae sp.1 (Cum.14: 10) Ficus insipida (Cum.10: 6) Ficus trigona (Cum.9: 1) Guadua sp. VMC 3773 (Cum.10: 1) Heisteria sp. 1 (Cum.10: 2) Heliconia hirsuta (Cum.11: 1) Higuerilla (Cum.6: 4) Hirtella brachystachya (Cum.8: 1) Homalium sp. (Cum.11: 1) Hypolytrum longifolium (Cum.4: 1) Indet. (Guav.4: 2) Indet. Sp. VMC 3665 (Cum.8: 2) Indet. Sp. VMC 4100 (Cum.13: 4) Myrcia ruiziana (Cum.6: 11)Inga cf. cylindrica (Cum.8: 7) Inga cf. edulis (Cum.9: 4) Inga stenoptera (Cum.9: 1) Lacmellea sp. (Cum.4: 1) Leopoldinia pulchra (Cum.13: 60) Leretia cordata (Cum.8: 1) Licania steyermarkii (Guav.4: 1) Luhea cymulosa (Cum.10: 6) Lundia densiflora (Cum.4: 1) Macairea lasiophylla (Guav.4: 1) Macrolobium bifolium (Cum.13: 1) Malouetia duckei (Cum.13: 1) Malouetia pubescens (Cum.11: 6) Maquira guianensis (Cum.10: 1) Mobteverdia (Maytenus) sp. VMC 3872 (Cum.11: 1) Adenocalymma sp. VMC 3663 (Cum.8: 1) Miconia tomentosa (Guav.4: 1) Micropholis egensis (Cum.11: 2) Monotagma sp. VMC 3345 (Cum.4: 1) Myrcia sp. 1 (Cum.4: 4) Myrcia sp. VMC 3647 (Cum.8: 1) Myrcia sp. VMC 3794 (Cum.10: 1) Myrcia sp. VMC 3798 (Cum.10: 1) Myrcia sp. VMC 3802 (Cum.10: 1) Myrcia sp. VMC 3870 (Cum.11: 2) Myrcia sp. VMC 3877 (Cum.11: 1) Myrcia sp. VMC 3878-A (Cum.11: 1) Myrcia sp. VMC 4109 (Cum.13: 1) Myrcianthes sp. VMC 3782 (Cum.10: 1) Myrtaceae sp. VMC 3373 (Cum.4: 2) Myrtaceae sp. VMC 4094 (Cum.13: 1) Myrtaceae sp. VMC 4098 (Cum.13: 3) Myrtaceae sp. VMC 4110 (Cum.13: 1) Myrtaceae sp. VMC 4114 (Cum.13: 1) Myrtaceae sp. VMC 4116 (Cum.13: 1) Myrtaceae sp. VMC 4121 (Cum.13: 1) Norantea guianensis (Guav.4: 1) Ocotea javitensis (Guav.4: 1) Ocotea leptobotra (Cum.13: 1) Ocotea puberula (Cum.11: 1) Passiflora costata VMC 3847 (Cum.13: 1) Passiflora franciscoi VMC 3847 (Cum.11: 1) Pera arborea (Guav.4: 1) Perebea sp. (Guav.4: 1) Piranhea trifoliata (Cum.10: 4) Myrcia argentigemma (Cum.11: 5) Plinia sp. VMC 3896 (Cum.11: 2) Plinia sp.1 VMC 4083 (Cum.13: 1) Plinia sp.2 VMC 4119 (Cum.13: 1) Pouteria aff. gomphiifolia (Cum.4: 1) Pouteria sp.2 (Cum.10: 12) Pouteria surumuensis (Cum.10: 1) Psidium sp. VMC 3807 (Cum.10: 1) Psychotria remota (Cum.11: 1) Quiina longifolia (Cum.11: 1) Raputia sp. (Guav.4: 1) Richeria grandis (Cum.6: 1) Rinorea lindeniana (Cum.6: 2) Rodriguezia lanceolata (Cum.4: 1) Salicaceae sp. (Cum.11: 1) Sarcaulus brasiliensis (Guav.4: 1) Securidaca pendula (Cum.13: 1) Senna reticulata (Cum.10: 1) Theobroma cacao (Cum.6: 15) Trichillia quadrijuga (Cum.10: 3) Triplaris weigeltiana (Cum.9: 1) Vismia cayennensis (Guav.4: 1) Vitex klugii (Cum.14: 5) Xylopia emarginata (Cum.13: 1) Xylopia sericophylla (Cum.4: 4) Zygia coccinea (Cum.13: 9).

exorrhiza has a DBH average of 48 cm. This stratum concentrates the maximum value of basal area (59 m^2) and was composed of *Chomelia* aff. *C. polyantha*, *Cynometra spruceana*, *Duguetia quitarensis, Gustavia hexapetala*, *Myrcia splendens,* and *Rinorea falcata*. This stratum harbors the higher species number of individuals (2202). In the vegetation of the *Duguetio quitarensis-Amphirrhocion longifoliae* alliance, the 31 species characteristic of the order represent 54.4% of the reduced IVI, with a predominance of *Mespilodaphne cymbarum* and *Mabea nitida* (Table 3).

Duguetio quitarensis-Amphirrhocion longifoliae, *all. nov.* in this contribution (Table 2)
Typus: *Vitici compressae-Attaleetum butyraceae*, *ass. nov.*

Floristic composition: Characteristic-dominant species: *Duguetia quitarensis*, *Apeiba glabra*, *Tapura acreana*, *T. guianensis*, *Garcinia macrophylla*, *Mouriri pauciflora*, *Campsiandra angustifolia*, *C. nutans, Ditaxis polygama*, *Ficus albert-smithii*, *Eugenia florida*, *Cynometra bauhiniifolia*, *Machaerium floribundum*, *Chomelia tenuiflora*, *Vismia calophylla,* and *V. macrophylla*.

Physiognomy-structure: forests with an average height of 23 m and some individuals emerging up to 31 m. Upper tree stratum dominated by *Apeiba glabra*, *Euterpe precatoria,* and *Hydrochorea corymbosa*, with a DBH average of 50 cm, and high-value basal area (37 m^2). Smaller tree stratum dominated by *Guatteria inundata*, *Pouteria glomerata*, *Strychnos mitscherlichii, Stylogyne longifolia*, *Salacia insignis,* and *Duguetia quitarensis* with 1014 individuals. The 17 characteristic species represent 23% of the total value of the reduced IVI, especially due to the high amount of individuals of *Duguetia quitarensis, Campsiandra angustifolia,* and *Ficus albert-smithii* (Table 3).

Vitici compressae-Attaleetum butyraceae *ass. nov.*, in this contribution (Table 2)
Typus: Cum.9

Floristic composition: Characteristic-dominant species: *Vitex compressa*, *Mabea trianae*, *Piparea dentata*, *Attalea butyracea*, *Macrolobium angustifolium*, *Lindackeria paludosa*, *Xylopia sericea*, *Clathrotropis brachypetala*, *Machaerium biovulatum*, *Cordia panamensis*, *Seguieria aculeata*, *Doliocarpus major*, *Hieronyma alchorneoides*, *Euterpe oleracea*, *Ocotea leptobotra*, *Protium unifoliolatum*, *Rinorea falcata,* and *Swartzia myrtifolia*.

Physiognomy-structure: forests with an average height of 18 m, some individuals emerging to 29 m. Upper arboreal dominated by *Vitex compressa*, *Attalea butyracea,* and *Toulicia pulvinata* with a DBH average of 60 cm (11.7 m^2). Small tree stratum dominated by *Amphirrhox longifolia*, *Brownea coccinea*, *Rinorea falcata, Matayba elegans*, *Euterpe precatoria,* and *Lindackeria paludosa*. The main 17 species concentrate 46% of total reduced IVI, especially by *Vitex compressa* and *Rinorea falcata* (Table 3).

Vasivaeo alchorneoidis-Gustavietum hexapetalae *ass. nov.*, in this contribution (Table 2)
Typus: Cum.11

Floristic composition: Characteristic-dominant species: *Vasivaea alchorneoides* (this record represents the first collection of this taxon to Colombia flora), *Gustavia hexapetala*, *Tabernaemontana macrocalyx*, *Alibertia bertierifolia*, *Cecropia peltata*, *Pterocarpus dubius*, *Ficus americana* subsp. *guianensis*, *Guatteria inundata*, *Leptolobium nitens*, *Pouteria glomerata*, *P. multiflora*, *Ruprechtia tenuiflora*, *Salacia eliptica*, *Styrax guyanensis*, *Croton cuneatus*, *Macrolobium acaciifolium*, *Salacia insignis,* and *Strychnos mitscherlichii*.

Physiognomy: forests with an average height of 23 m and some emerging to 32 m. Upper tree stratum dominated by *Socratea exorrhiza, Euterpe precatoria* and *Brosimum lactescens* with a DBH average of 47 cm and maximum value of basal area at 25.4 m^2. Small tree stratum dominated by *Chomelia aff. C. polyantha, Combretum laxum, Vasivaea alchorneoides, Virola calophylla, Stylogyne longifolia,* and *Pouteria glomerata*. This group harbors the largest number of individuals (517). The 18 characteristic species concentrate ca. 49.6% of the total value of the IVI, especially by *Alibertia bertierifolia* and *Gustavia hexapetala*.

Alliance not defined
Aspidospermo desmanthi-Mespilodaphnetum cymbari, *ass. nov.* in this contribution (Table 2)
Typus: Cum.4

Floristic composition: Characteristic-dominant species: *Aspidosperma desmanthum*, *A. excelsum*, *Macrosamanea consanguinea*, *Caraipa densifolia*, *Oenocarpus minor*, *Protium llanorum*, *Combretum laxum*, *Discocarpus gentryi*, *Piparea multiflora*, *Tachigali plumbea*, *Zygia latifolia*, *Pseudolmedia laevis*, *Lacmellea foxii*, *Endlicheria levelii*, *Phenakospermum guyannense*, *Licania mollis,* and *Aniba panurensis*.

Physiognomy-structure: forests with an average height of 20 m and emerging individuals with 28 m tall. Upper tree stratum dominated by *Eschweilera subglandulosa*, *Mespilodaphne cymbarum,* and *Xylopia sericophylla*.The DBH average is 46 cm, with a higher value of basal area (9.7 m^2). Small tree stratum with the largest number of individuals (715) dominated by *Attalea maripa*, *Euterpe oleracea*, *Brosimum lactescens*, *Brownea coccinea,* and *Cynometra spruceana*. The 17 characteristic species concentrate 9.37% of the total value of the IVI (Table 3), mainly by the input of *Aspidosperma desmanthum* and *Phenakospermum guyannense*.

Virolo surinamensis-Mespilodaphnion cymbari, *all. nov.* in this contribution (Table 5)
Typus: *Mespilodaphno cymbari-Guareetum glabrae* (in this contribution)

Floristic composition: Characteristic-dominant species: *Virola surinamensis*, *Zygia cataractae*, *Pouteria gomphiifolia*, *Casearia zizyphoides*, *Maquira coriacea*, *Salacia amplifolia*, *Myrcia splendens*, *Inga ingoides*, *Malouetia virescens*, *Nectandra membranacea*, *Eschweilera subglandulosa*, *Euterpe precatoria*, *Tacarcuna amanoifolia,* and *Trichilia quadrijuga*.

Physiognomy-structure: forests with a height average of 21 m, and some emerging up to 28 m. Upper tree stratum

TABLE 3. Aspects of the alliance's vegetation structure *Duguetio quitarensis-Amphirrhocion longifoliae* (order *Mabeo nitidae-Mespilodaphnetalia cymbari*).

SINTAXONOMIC UNIT	SPECIES	BASAL AREA (M^2) -%	ABUNDANCE - U	IVI RED.
***Mabeo nitidae-Mespilodaphnetalia cymbari* ord.**	*Mespilodaphne cymbarum*	9.21 (9.01)	18 (0.38)	9.38
	Mabea nitida	1.23 (1,2)	80 (1.68)	2.88
	Brownea coccinea	0.92 (0.9)	97 (2.03)	2.93
	Pseudolmedia laevigata	0.11 (0.11)	63 (1.32)	1.43
	Eschweilera parvifolia	1.38 (1.35)	80 (1.68)	3.03
	Ceiba pentandra	3.03 (2.96)	2 (0.04)	3
	Sum with 31 other characteristic species	**23.66 (29.4)**	**828 (25)**	**54.4**
	Other species	**56.68 (70.5)**	**2481 (75)**	**145.5**
	All species	**80.38 (100)**	**3309 (100)**	**200**
***Duguetio quitarensis-Amphirrhocion longifoliae* all.**	*Duguetia quitarensis*	0.44 (0.8)	90 (4.7)	5.5
	Apeiba glabra	0.52 (0.9)	4 (0.2)	1.1
	Tapura acreana	0.53 (0.9)	6 (0.3)	1.3
	Tapura guianensis	0.39 (0.7)	12 (0.6)	1.3
	Campsiandra angustifolia	1.77 (3.2)	22 (1.2)	4.3
	Ficus albert-smithii	2.02 (3.6)	2 (0.1)	3.7
	Sum with 11 other characteristic species	**7.14 (12.8)**	**187 (9.8)**	**22.6**
	Other 175 species	**48.8 (87.2)**	**1714 (90.2)**	**177.4**
	Total 192	**55,94 (100)**	**1901 (100)**	**200**
***Vitici compressae-Attaleetum butyraceae* ass.**	*Vitex compressa*	5.49 (23.8)	9 (1.1)	24.8
	Mabea trianae	0.09 (0.4)	15 (1.8)	2.2
	Machaerium biovulatum	0.06 (0.3)	11 (1.3)	1.6
	Hieronyma alchorneoides	0.33 (1.4)	13 (1.6)	3
	Protium unifoliolatum	0.19 (0.8)	14 (1.7)	2.5
	Rinorea falcata	0.18 (0.8)	29 (3.5)	4.3
	Sum with 11 other characteristic species	**6.84 (29.6)**	**138 (16,7)**	**46.3**
	Other 74 species	**16.29 (70.4)**	**687 (83,3)**	**153.7**
	Total 91	**23.13 (100)**	**825 (100)**	**200**
***Vasivaeo alchorneoidis-Gustavietum hexapetalae* ass.**	*Vasivaea alchorneoides*	0.24 (0.72)	32 (2.97)	3.69
	Gustavia hexapetala	0.5 (1.53)	39 (3.62)	5.15
	Alibertia bertierifolia	0.14 (0.42)	76 (7.06)	7.48
	Pouteria multiflora	0.73 (2.22)	4 (0.37)	2.59
	Salacia eliptica	0.04 (0.13)	27 (2.51)	2.64
	Sum with 11 other characteristic species	**5.54 (16.88)**	**351 (32.62)**	**49.5**
	Other 119 especies	**27.27 (83.12)**	**725 (67.38)**	**150.5**
	Total 137	**32.81 (100)**	**1076 (100)**	**200**
***Aspidospermo desmanthii-Mespilodaphnetum cymbari* ass.**	*Aspidosperma desmanthum*	0.66 (2.7)	12 (0.85)	3.55
	Tachigali plumbea	0.23 (0.96)	3 (0.21)	1.17
	Zygia latifolia	0.37 (1.52)	12 (0.85)	2.37
	Phenakospermum guyannense	0.22 (0.89)	46 (3.27)	4.16
	Licania mollis	0.12 (0.51)	13 (0.92)	1.43
	Aspidosperma excelsum	0.35 (.42)	7 (0.5)	1.91
	Sum with 11 other characteristic species	**2.34 (9.56)**	**138 (9.8)**	**19.37**
	Other 194 especies	**22.1 (90.44)**	**1270 (90.2)**	**180.63**
	Total 211	**24.44 (100)**	**1408 (100)**	**200**

TABLE 4. Aspects of the alliance's vegetation structure *Virolo surinamensis-Mespilodaphnion cymbari* (*Mabeo nitidae-Mespilodaphnetalia cymbari* ord.).

	SPECIES	BASAL AREA (M^2) -%	ABUNDANCE - U	IVI RED.
Mabeo nitidae-Mespilodaphnetalia cymbari ord.	*Mespilodaphne cymbarum*	3.86 (17.6)	7 (0.5)	18.1
	Matayba elegans	0.23 (1.1)	16 (1.1)	2.1
	Amphirrhox longifolia	0.03 (0.1)	10 (0.7)	0.8
	Brosimum lactescens	0.47 (2.2)	17 (1.2)	3.3
	Eschweilera subglandulosa	1.3 (6)	31 (2.1)	8.1
	Euterpe precatoria	0.56 (2.6)	9 (0.6)	3.2
	Sum with other 11 species	**8.16 (37.3)**	**271 (18.5)**	**55.9**
	Other 121 species	**13.73 (62.7)**	**1190 (81.5)**	**144.1**
	Total 138	**21.9 (100)**	**1461 (100)**	**200**
Virolo surinamensis-Mespilodaphnion cymbari all.	*Mespilodaphne cymbarum*	3.9 (17.6)	7 (0.5)	18.1
	Psychotria sp.	0.1 (0.2)	172 (11.8)	12.0
	Salacia amplifolia	0.5 (2.4)	127 (8.7)	11.1
	Eschweilera subglandulosa	1.5 (7)	32 (2.2)	9.2
	Maquira coriacea	1.8 (8.2)	9 (0.6)	8.8
	Virola surinamensis	0.9 (4)	40 (2.7)	6.8
	Sum with other 5 species	**11.8 (53.8)**	**588 (40.2)**	**94**
	Other 127 species	**10.1 (46.2)**	**873 (59.8)**	**106**
	Total 138	**21.9 (100)**	**1461 (100)**	**200**
Mespilodaphno cymbari-Guareetum glabrae ass.	*Psychotria* sp.	0.1 (0.9)	172 (28)	28.9
	Mespilodaphne cymbarum	1.6 (26.3)	2 (0.3)	26.6
	Pouteria reticulata	0.9 (14.8)	3 (0.5)	15.3
	Eschweilera subglandulosa	0.6 (9.6)	5 (0.8)	10.4
	Virola surinamensis	0.3 (4.3)	32 (5.2)	9.5
	Guarea glabra	0.2 (2.8)	37 (6)	8.8
	Sum with other 9 species	**5.4 (90.6)**	**476 (77.5)**	**168.1**
	Other 36 species	**0.6 (9.4)**	**138 (22.5)**	**31.9**
	Total 51	**5.9 (100)**	**614 (100)**	**200**
Maquiro coriaceae-Mespilodaphnetum cymbari ass.	*Mespilodaphne cymbarum*	2.3 (14.4)	5 (0.6)	15
	Maquira coriacea	1.8 (11.2)	9 (1.1)	12.3
	Eschweilera subglandulosa	1 (6.1)	27 (3.2)	9.3
	Mabea nitida	0.5 (3.4)	37 (4.4)	7.8
	Salacia amplifolia	0.5 (3.1)	67 (7.9)	11
	Sum with other 10 species	**10.9 (68.8)**	**477 (56.4)**	**125.1**
	Other 94 species	**5 (31.4)**	**406 (47.9)**	**79.3**
	Total 109	**15.9 (100)**	**847 (100)**	**200**

dominated by *Mespilodaphne cymbarum* and *Virola surinamensis*, has a DBH average of 47 cm, and a maximum value of the basal area of 12 m^2. The shrub and small tree stratum have the largest number of individuals (734), which was dominated by *Faramea torquata*, *Mabea nitida*, *Myrcia splendens*, *Miconia tococoronata,* and *Astrocaryum jauari*. The eleven characteristic-dominant species concentrate 94% of the total IVI, especially contributed by *Mespilodaphne cymbarum*, *Salacia amplifolia,* and *Eschweilera subglandulosa* (Table 4).

Mespilodaphno cymbari-Guareetum glabrae, *ass. nov.* in this contribution (Table 5)
Typus: P. Inír3.

Floristic composition: Characteristic-dominant species: *Guarea glabra, Astrocaryum jauari, Mouriri myrtilloides, Machaerium quinatum, Eschweilera subglandulosa, Matayba elegans, Virola surinamensis, Mespilodaphne cymbarum,* and *Zygia cataractae*.

Physiognomy-structure: forests with an average height of 16 m and emerging individuals up 31 m. Upper

TABLE 5. Floristic composition of *Mabeo nitidae-Mespilodaphnetalia cymbari* ord.

PLOTS	P.Inír.2	P.Inír.3	Guav.6	Guav.7	Cum.7
	Valores de cobertura relativa %				
***Brosimo lactescentis-Eschweileretea subglandulosae* class**					
Matayba elegans	10	14	10	.	.
Amphirrhox longifolia	1	5	1	.	.
Brosimum lactescens	.	.	19	14	1
Eschweilera subglandulosa	22	19	4	.	37
Euterpe precatoria	.	.	1	.	24
Swartzia leptopetala	2	1	5	3	.
Gustavia augusta	.	16	.	.	2
Hydrochorea corymbosa	.	1	9	1	.
Stylogyne longifolia	.	4	.	.	.
Brosimum guianense	.	.	2	.	.
Adenocalymma cladotrichum	.	.	10	.	.
Zygia inaequalis	.	2	2	.	.
***Mabeo nitidae-Mespilodaphnetalia cymbari* ord.**					
Mabea nitida	11	7	9	56	.
Byrsonima japurensis	.	.	9	1	.
Symmeria paniculata	.	.	1	9	.
Myrcia splendens	.	.	17	16	.
***Virolo surinamensis-Mespilodaphnion cymbari* all.**					
Virola surinamensis	17	34	15	34	.
Mespilodaphne cymbarum	11	38	5	33	21
Zygia cataractae	4	4	18	27	.
Malouetia virescens	8	3	1	1	.
Pouteria gomphiifolia	18	1	1	.	.
Casearia zizyphoides	9	1	1	.	.
Salacia amplifolia	2	.	13	13	.
Inga ingoides	.	2	.	1	33
Coccoloba sp.	.	1	2	.	.
Miconia tococoronata	.	1	.	3	.
Nectandra membranacea	.	1	2	10	.
Tabernaemontana siphilitica	.	1	1	.	.
Guatteria sp.	1	.	.	3	.
Cathedra acuminata	.	1	1	.	.
***Mespilodaphno cymbari-Guareetum glabrae* ass.**					
Psychotria sp.	10	26	.	.	.
Guarea glabra	38	36	.	.	.
Mouriri myrtilloides	8	1	.	.	.
Myrcia sp.	33	13	.	.	.
Astrocaryum jauari	4	13	.	.	.
Machaerium quinatum	38	3	.	.	.
Tovomita spruceana	1	2	.	.	.
Quiina florida	1	1	.	.	.
***Maquiro coriaceae-Mespilodaphnetum cymbari* ass.**					
Maquira coriacea	.	.	35	7	1
Stylogyne turbacensis	.	.	1	7	1
Trichilia quadrijuga	.	.	1	3	5
Strychnos bredemeyeri	.	.	1	6	.
Croton cuneatus	.	.	2	1	.
Eugenia florida	.	.	1	2	.
Mouriri acutiflora	.	.	5	4	.
Combretum laurifolium	.	.	1	4	.
Dalbergia foliosa	.	.	1	2	.
Dulacia candida	.	.	1	1	.
Eschweilera parviflora	.	.	1	5	.
Heisteria acuminata	.	.	1	7	.
Posoqueria panamensis	.	.	3	2	.
Tacarcuna amanoifolia	.	.	4	1	.
Guapira pacurero	.	.	3	.	.
Attalea maripa					37

TABLE 5 CONT. Floristic composition of *Mabeo nitidae-Mespilodaphnetalia cymbari* ord.

Other species:
Duguetia sp. (Guav.6: 1) Adenocalymma cladotrichum (Guav.6: 1) Erythroxylum divaricatum (Guav.7: 2) Heterostemon mimosoides (P.Inír.3: 5) Ormosia sp. (P.Inír.2: 1) Calophyllum brasiliense (Guav.6: 2) Macrolobium acaciifolium (Guav.6: 3) Micropholis venulosa (Guav.7: 1) Tapura amazonica (Guav.6: 2) Micropholis sp. (P.Inír.3: 0,08) Astrocaryum chambira (Cum.7: 0,16) Ocotea sp. (P.Inír.3: 0,12) Dormilón VMC 3254 (Cum.7: 2) Duguetia cauliflora (Cum.7: 8) Cecropia sciadophylla (Cum.7: 4) Bactris simplicifrons (Cum.7: 14) Bocageopsis multiflora (Cum.7: 2) Hevea benthamiana (Cum.7: 6) Ocotea sp.1 (Cum.7: 0,08) Osteophloeum platyspermum (Cum.7: 1) Aspidosperma desmanthum (Cum.7: 0,48) Hymenolobium petraeum (Cum.7: 1) Salacia impressifolia (Cum.7: 1) Brownea coccinea (Cum.7: 10) Licania mollis (Cum.7: 3) Garcinia madruno (Guav.6: 1) Alchornea fluviatilis (P.Inír.3: 2) Faramea sessilifolia (P.Inír.2: 3) Hirtella racemosa (Guav.6: 0,034) Ouratea castaneifolia (Guav.7: 0,05) Rinorea flavescens (Guav.6: 3) Securidaca sp. (Guav.7: 1) Duroia micrantha (P.Inír.3: 1) Cynometra bauhiniifolia (Guav.7: 2) Xylopia discreta (Cum.7: 4) Strychnos mitscherlichii (Cum.7: 0,12) Faramea torquata (P.Inír.3: 8) Dalbergia inundata (P.Inír.3: 0,36) Ficus sp.1 (Cum.7: 0,48) Casearia suaveolens (Guav.7: 0,24) Malouetia naias (Guav.7: 0,1) Panopsis rubescens (Guav.6: 1) Passiflora guazumifolia (Guav.7: 1) Toulicia pulvinata (Guav.6: 2) Uncaria guianensis (Guav.6: 3) Zanthoxylum compactum (Cum.7: 1) Amanoa guianensis (Guav.7: 2) Casearia zizyphoides (Guav.6: 0,102) Chomelia sp. (Guav.6: 2) Clusia amazonica (Guav.7: 0,24) Combretum frangulifolium (Guav.6: 0,34) Couepia guianensis (P.Inír.2: 0,48) Discocarpus spruceanus (Guav.6: 7) Dracontium asperum (Cum.7: 0,01) Eugenia biflora (Guav.6: 1) Faramea occidentalis (Guav.6: 0,204) Guadua sp. (P.Inír.3: 10) Gustavia sp. (Guav.6: 1) Heisteria duckei (P.Inír.3: 0,32) Henriettea succosa (Guav.7: 0,25) Henriettea sp. (Guav.6: 0,14) Homalium guianense (P.Inír.3: 0,12) Inga ingoides (Cum.7: 19) Leptobalanus apetalus (Guav.6: 0,17) Deguelia densiflora (Guav.6: 1) Lonchocarpus sp. (Guav.6: 2) Maprounea amazonica (P.Inír.3: 0,16) Melastomataceae sp. VMC 3468 (Cum.7: 0,15) Moluetia sp. (P.Inír.3: 8) Montrichardia arborescens (P.Inír.3: 0,48) Panopsis sp. (Guav.6: 0,255) Pouteria reticulata (Guav.6: 3) Pterocarpus amazonum (Guav.6: 6) Quiina macrophylla (Guav.6: 1) Randia armata (Guav.6: 0,07) Randia sp. (P.Inír.2: 0,4) Rosenbergiodendron formosum (Guav.6: 0,42) Simira rubescens (Guav.7: 0,1) Solanaceae sp. VMC 3467 (Cum.7: 1) Stachyarrhena spicata (Guav.7: 1) Tovomita longifolia (P.Inír.3: 0,36) Trichilia sp. (Cum.7: 3) Vatairea guianensis (P.Inír.3: 15) Vatairea sp. (P.Inír.2: 18).

tree stratum dominated by *Mespilodaphne cymbarum*, *Machaerium quinata*, *Pouteria reticulata,* and *Eschweilera subglandulosa*. DBH average of 42 cm and the highest value of basal area (3.9 m^2). Small tree stratum harbors 143 individuals with species of *Guarea glabra*, *Virola surinamensis*, *Astrocaryum jauari, Faramea sessilifolia*, *Inga ingoides,* and *Mabea nitida*. The fifteen characteristic-dominant species concentrate 168% of the total reduced IVI, contributed especially by *Mespilodaphne cymbarum*, *Pouteria reticulata,* and *Eschweilera subglandulosa* (Table 4).

Maquiro coriaceae-Mespilodaphnetum cymbari, *ass. nov.* in this contribution (Table 5)
Typus: Guav.7

Floristic composition: Characteristic-dominant species: *Eschweilera subglandulosa, Maquira coriacea, Trichilia quadrijuga, Mabea nitida, Stylogyne turbacensis, Matayba elegans, Virola surinamensis, Brosimum lactescens, Swartzia leptopetala, Mespilodaphne cymbarum* and *Zygia cataractae*.

Physiognomy-structure: forests with an average height of 17 m and emerging individuals up 27 m. Upper tree stratum with a DBH average of 51 cm, that concentrates the maximum value of the basal area of 8m^2 dominated by *Mespilodaphne cymbarum*, *Maquira coriacea,* and *Eschweilera subglandulosa*. Small tree stratum with 330 individuals, dominated by *Attalea maripa*, *Trichilia quadrijuga*, *Zygia cataractae, Eschweilera subglandulosa*, *Brownea coccinea,* and *Inga ingoides*. The fifteen characteristic-dominant species concentrate 125% of the total reduced IVI, especially contributed by *Mespilodaphne cymbarum*, *Maquira coriacea,* and *Eschweilera subglandulosa* (Table 4).

Phenakospermo guyannensis-Minquartietalia guianensis, *ord. nov.* in this contribution (Table 6)
Typus: *Attaleo maripae-Iryantherion laevis*, *all. nov.*

Floristic composition: Characteristic-dominant species: *Minquartia guianensis, Phenakospermum guyannense, Piparea multiflora, Oenocarpus bacaba, Brosimum utile, Trichilia elegans, Brosimum rubescens, Stachyarrena penduliflora, Guapira sipapoana, Virola sebifera, Annona ambotay,* and *Ficus guianensis*.

Physiognomy-structure: forests located in semi-flooded areas, with an average height of 17 m and emerging individuals up 28 m. Upper arboreal stratum with DBH average of 41 cm and the maximum value of the basal area of 23 m^2. The dominating species were *Eschweilera subglandulosa*, *Brosimum guianense*, *Oenocarpus bacaba*, *Matayba elegans*, and *Minquartia guianensis*. The shrub and small stratum had 2,300 individuals, with *Amphirrhox longifolia*, *Bactris bidentula*, *Bocageopsis multiflora*, *Perebea mollis*, and *Sorocea muriculata*. The six characteristic species concentrate 16.4% of the total value of the IVI, contributed especially by *Phenakospermum guyannense*, *Oenocarpus bacaba,* and *Minquartia guianensis* (Table 7).

Attaleo maripae-Iryantherion laevis, *all. nov.* in this contribution (Table 6)
Typus: *Guatterio liesneri-Bactrietum bidentulae*, *ass. nov.*

Floristic composition: Característic-dominant species: *Iryanthera laevis*, *Attalea maripa*, *Duguetia cauliflora*, *Iriartella setigera*, *Ocotea aurantiodora*, *Virola elongata*, *Astrocaryum chambira*, *Aniba panurensis*, *Inga marginata*, *Myrcia splendens*, *Erisma uncinatum*, *Clathrotropis macrocarpa*, *Pseudolmedia laevis*, *Endlicheria levelii*, *Oenocarpus bataua*, *Bactris simplicifrons*, *Bocageopsis multiflora*, *Perebea mollis*, *Theobroma subincanum*,

TABLE 6. Floristic composition of *Phenakospermo guyannenses-Minquartietalia guianensis* order and subordinates and units.

PLOTS	P.Inír.1	P.Inír.6	Cum.3	Cum.2	Cum.1	Guav.3	Guav.1	Guav.2	Cum.5	Guav.5	P.Inír.7	P.Inír.8	Cum.12
	Relative cover values %												
Species *Brosimo lactescentis-Eschweileretea subglandulosae* class													
Escheweilera subglandulosa	.	.	11	6	1	.	.	.	43	.	.	.	19
Protium llanorum	.	72	.	6	3	3	.	.	.	.	17	6	1
Matayba elegans	1	3	.	.	.	.	.	.	.	1	16	1	.
Brosimum guianense	20	.	.	.	.	1	.	1	.	1	1	.	.
Moquilea subarachnophylla	.	.	.	.	.	2	2	.	.	.	.	.	.
Amphirrhox longifolia	60	.	22	1	.	.	.	.	.	.	.	.	16
Trichilia elegans	.	1	.	.	.	.	.	1	.	.	13	4	.
Abuta grandifolia	.	2	.	.	.	3	.	3	1	.	.	.	.
Brosimum utile	2	5	.	.	.	1	1	1	.	.	.	1	.
Brosimum lactescens	1	.	.	.	.	.	.	.	.	1	.	.	1
Swartzia leptopetala	9	.	.	.	1	.	.	.	.	.	.	30	.
Guapira sipapoana	.	.	.	.	.	.	4	.	.	.	1	.	.
***Phenakospermo guyannenses-Minquartietalia guianensi* ord.**													
Minquartia guianensis	8	4	.	2	.	2	4	8	.	.	.	.	.
Phenakospermum guyannense	.	.	20	20	41	43	5	1	2	34	.	1	6
Piparea multiflora	.	1	3	.	.	1	1	1	.	.	1	.	.
Virola sebifera	.	1	5	6	.	1	.	.	.	6	.	3	.
Oenocarpus bacaba	.	16	2	.	83	.	1	.	.	.	3	.	.
Brosimum rubescens		5										1	
Annona ambotay	.	5	.	.	.	.	.	.	.	1	2	.	1
***Attaleo maripae-Iryentherion laevis* all.**													
Iryanthera laevis	.	3	18	15	18	.	4	.	3	1	23	2	3
Attalea maripa	.	.	.	20	.	21	1	20	20	21	.	.	3
Duguetia cauliflora	1	.	.	.	2	.	.	.	2	.	1	5	4
Iriartella setigera	.	4	1	2	6	.	.	.	.	.	10	1	.
Ocotea aurantiodora	1	4	.	.	.	1	.	1	.	2	.	4	.
Virola elongata	.	.	.	.	.	1	.	.	.	1	3	2	1
Astrocaryum chambira	.	.	8	.	3	2	2	1	.	.	.	.	.
Aniba panurensis	.	.	.	3	1	2	.	3	.	1	.	.	.
Didymopanax morototoni	.	.	.	.	.	5	4	2	.	1	.	.	1
Mouriri nigra	.	2	1	.	.	.	.	.	1	.	1	.	1
Cecropia sciadophylla	.	.	6	20	2	.	.	.	.	7	.	.	2
Inga marginata	1	1	.	.	.	.	.	.	.	.	2	3	1
Cordia nodosa	.	1	.	.	.	.	.	1	.	1	1	.	1
Myrcia splendens	20	1	.	.	.	8	.	1	.	.	.	.	.
Erisma uncinatum	.	6	.	.	.	.	.	.	19	.	5	.	1
Ischnosiphon arouma	.	.	.	1	1	1	.	.	.	.	.	.	16
Aparisthmium cordatum	.	.	51	2	.	.	3	.	9	.	.	.	.
Pseudolmedia laevis	.	.	.	.	.	1	1	.	.	24	.	.	3
Endlicheria levelii	.	.	.	.	1	.	1	1	.	1	.	.	.
Oenocarpus bataua	.	6	.	.	.	.	.	.	.	4	2	29	.
Bactris simplicifrons	1	.	.	.	.	.	.	.	2	.	1	.	2
Bocageopsis multiflora	.	1	.	1	3	.	.	.	.	.	.	.	1
Perebea mollis	.	.	2	8	.	.	.	.	.	.	.	1	4
Theobroma subincanum	.	.	.	1	3	.	.	.	1	.	.	.	2
Dendropanax arboreus							7			1			
Conceveiba guianensis	.	1	.	.	.	.	.	.	3	.	.	3	.
Inga heterophylla	.	3	.	.	.	.	.	.	.	.	.	2	1
Trattinnickia aspera	.	.	.	.	.	9	.	7	.	1	.	.	.
Cochlospermum orinocense	.	.	.	.	.	1	.	3	.	4	.	.	.
Inga brachyrhachis	.	.	.	.	.	2	.	2	.	1	.	.	.
Protium sagotianum	.	.	.	.	.	.	.	.	.	9	.	.	5
Hymenaea oblongifolia	.	.	.	.	.	.	.	.	.	2	.	.	5
Matisia ochrocalyx	.	.	1	.	.	.	.	.	.	1	.	.	1
Siparuna guianensis						1				1			
Petrea volubilis	.	.	.	.	.	.	.	.	.	2	.	.	1
Bactris maraja	.	.	.	.	.	.	.	.	.	1	.	.	1
Hieronyma oblonga	.	.	.	.	.	.	.	.	.	6	.	.	1
Protium amazonicum	.	1	.	.	.	.	.	.	.	1	.	.	1
Socratea exorrhiza	.	.	.	.	.	1	.	.	.	1	.	.	3
Pourouma minor	.	.	.	1	.	.	.	.	.	11	.	.	14
Ocotea aurantiodora						1							1
Virola calophylla	.	.	.	2	.	.	.	.	34	.	.	.	10
Jacaranda copaia	.	.	.	.	.	.	.	.	.	2	.	.	9
***Micropholio venulosae-Eschweileretum bracteosa* ass.**													
Eschweilera bracteosa	79	8	.	3	.	.	.	.	.	.	.	.	.
Micropholis venulosa	8	7	.	.	.	.	.	.	.	.	1	2	.
Faramea capillipes	2	5	.	.	.	.	.	.	.	.	5	.	1
Ouratea sp.	1	1	.	.	.	.	.	.	.	.	1	.	.
Doliocarpus dentatus	2	2	.	.	.	.	.	.	.	.	.	.	.
Stachyarrena penduliflora	1	1	.	.	.	.	.	.	.	.	.	.	.
Pouteria ucuqui	.	9	.	.	.	2	.	.	.	.	7	.	.

TABLE 6 CONT. Floristic composition of *Phenakospermo guyannenses-Minquartietalia guianensis* order and subordinates and units.

PLOTS	P.Inír.1	P.Inír.6	Cum.3	Cum.2	Cum.1	Guav.3	Guav.1	Guav.2	Cum.5	Guav.5	P.Inír.7	P.Inír.8	Cum.12
	Relative cover values %												
***Micropholio venulosae-Eschweileretum bracteosa* ass.**													
Bactris hirta	.	1	.	.	.	.	.	.	.	.	1	.	.
Terminalia macrophylla	.	3	.	.	.	.	.	.	.	.	1	.	.
***Guatterio liesneri-Bactrietum bidentulae* ass.**													
Bactris bidentula	.	.	6	46	45	.	.	.	.	.	.	.	.
Guatteria liesneri	.	.	1	8	30	.	.	.	.	.	.	.	.
Leptabalanus longistylus	.	.	8	11	5	.	.	.	.	.	.	.	.
Pourouma tomentosa	.	.	1	16	13	.	.	.	.	.	.	.	.
Miconia dispar	.	.	6	11	1	.	.	.	1	.	.	.	.
Hevea benthamiana	.	.	12	17	.	.	.	.	15	.	.	.	.
Vochysia aff. V. tetraphylla	.	.	5	6	.	.	.	.	.	.	.	.	.
Simira rubescens	.	.	1	3	.	.	.	.	.	.	.	.	.
Euterpe oleracea	.	.	1	22	.	.	.	.	.	.	.	.	.
Rinorea pubiflora	.	.	4	9	.	.	.	.	37	.	.	.	.
Virola pavonis	.	.	1	11	.	.	.	.	1	.	.	.	.
Nectandra cuspidata	.	.	3	.	5	.	.	.	.	.	.	.	.
Alchornea triplinervia	.	.	.	5	7	3	.	.	.	.	.	.	.
Osteophloeum platyspermum	.	.	.	4	2	.	.	.	.	.	.	.	.
Chamaedorea pinnatifrons	.	.	.	1	1	.	.	.	.	.	.	.	.
Dacryodes granatensis	.	.	2	6	.	.	.	.	.	.	.	.	8
Qualea paraensis	.	.	.	34	4	.	.	.	.	.	.	.	.
Attalea butyracea	.	.	.	14	61	.	.	.	.	.	.	.	.
***Quassio simaroubae-Tapiriretum guianensis* ass.**													
Tapirira guianensis	2	.	.	.	.	9	6	22	.	.	.	1	.
Simarouba amara	.	.	.	.	.	10	22	1	.	.	.	.	.
Hymenopus latifolius	.	.	.	.	.	1	1	28	.	.	.	.	.
Protium laxiflorum	.	.	.	.	.	5	8	10	.	.	.	.	.
Clusia grandiflora	.	.	.	.	.	4	6	8	.	.	.	.	1
Sloanea eichleri	.	.	.	.	.	3	1	5	.	.	.	.	.
Aniba cylindriflora	.	.	.	.	.	1	4	1	.	.	.	.	.
Piper arboretum	.	.	.	.	.	1	1	1	.	2	.	.	.
Ficus guianensis	.	.	.	.	.	1	.	6	.	.	.	.	.
Guarea cristata	.	.	.	.	.	1	.	1	.	.	.	.	.
Miconia tococoidea	.	.	.	.	.	.	1	1	.	.	.	.	.
Maprounea guianensis	.	.	.	.	.	.	3	9	.	.	.	.	.
Duroia fusifera	.	.	.	.	.	1	3	.	.	.	.	.	.
Miconia minutiflora	.	.	.	.	.	.	2	.	.	.	.	1	.
Miconia tococa	.	.	.	.	.	.	1	.	.	.	.	1	.
Myrcia fallax	.	.	.	.	.	1	.	5	.	.	.	.	.
Adenocalymma cladotrichum	.	.	.	.	.	3	.	1	.	.	.	.	.
Bathysa bracteosa	.	.	.	.	.	8	.	6	.	.	.	.	.
Cordia ucayaliensis	.	.	.	.	.	3	.	1	.	.	.	.	.
Couma macrocarpa	.	.	.	.	.	8	.	27	.	.	.	.	.
Enterolobium schomburgkii	.	.	.	.	.	8	.	7	.	.	.	.	.
Inga alba	.	.	.	.	.	3	.	28	1	.	.	.	.
Sacoglottis guianensis	.	.	.	.	.	1	.	2	.	.	.	.	.
Syagrus orinocensis	.	.	.	.	.	13	.	61	.	.	.	.	.
***Attaleo maripae-Euterpetum precatoriae* ass.**													
Trattinnickia lawrancei	.	.	.	.	.	.	.	.	2	4	.	.	4
Euterpe precatoria	17	.	.	.	.	.	.	.	64	8	.	.	1
Clarisia racemosa	.	.	.	.	.	.	.	.	1	1	.	.	1
Sorocea muriculata	.	.	.	.	.	.	.	.	36	.	.	.	1
Cedrelinga cateniformis	.	.	.	.	.	.	.	.	2	.	.	.	1
Cupania scrobiculata	.	.	.	.	.	.	.	.	5	.	.	.	1
Pachira paraensis	.	.	.	.	.	.	.	.	1	.	.	.	1
Licania mollis	.	.	.	.	.	.	.	.	1	.	.	.	1
Inga heterophylla	.	.	.	.	.	.	.	.	2	.	.	.	2
Ocotea aurantiodora	.	.	.	.	.	1	.	.	2	.	.	.	3
Protium aracouchini						1				41			
***Protio crassipetali-Clathrotropietum macrocarpae* ass.**													
Clathrotropis macrocarpa	.	.	.	.	1	.	.	.	.	.	25	30	15
Dacryodes chimantensis	.	5	.	.	.	.	.	.	.	.	6	1	3
Protium crassipetalum	.	.	.	.	.	.	.	.	.	.	3	5	8
Trymatococcus amazonicus	.	2	.	.	.	.	.	.	.	.	.	3	1
Pouteria ucuqui											3	4	
Sandwithia sp.											21	23	
Macrolobium limbatum											1	2	
Anaxagorea rufa											8	21	
Aspidosperma sp.											1	11	
Caraipa sp.											2	1	

TABLE 7. Aspects of the alliance's vegetation structure *Attaleo maripae-Iryantherion laevis* (*Phenakospermo guyannenses-Minquartietalia guianensis* ord.).

SINTAXONOMIC UNITS	SPECIE	BASAL AREA (m^2) -%	ABUNDANCE - U	IVI RED.
***Brosimo lactescentis-Eschweileretea subglandulosae* class**	*Eschweilera subglandulosa*	5 (8.5)	74 (1.4)	10
	Protium llanorum	0.6 (1)	121 (2.4)	3.4
	Amphirrhox longifolia	0.8 (1.4)	285 (5.6)	6.9
	Euterpe precatoria	0.7 (1.2)	80 (1.6)	2.8
	Trichilia elegans	0.1 (0.2)	50 (1)	1.1
	Sum with other 8 characteristic species	**7.8 (13.3)**	**692 (13.5)**	**26.7**
	Other 473 species	**54 (86.7)**	**4439 (86.5)**	**173.3**
	Total 486	**61.8 (100)**	**5131 (100)**	**200**
Phenakospermo guyannenses-Minquartietalia guianensis ord.	*Minquartia guianensis*	0.8 (1.4)	9 (0.2)	1.5
	Phenakospermum guyannense	2.8 (4.8)	257 (5)	9.8
	Virola sebifera	0.2 (0.4)	44 (0.9)	1.3
	Oenocarpus bacaba	0.9 (1.5)	96 (1.9)	3.4
	Sum with 2 other characteristic species	**4.7 (8.1)**	**426 (7.3)**	**16.4**
	Other 480 species	**57.1 (91.9)**	**5383 (92.7)**	**183.6**
	Total 486	**61.8 (100)**	**5809 (100)**	**200**
Attaleo maripae-Iryantherion laevis all.	*Iryanthera laevis*	0.9 (1.5)	80 (1.6)	3.1
	Attalea maripa	2.6 (4.4)	92 (1.8)	6.2
	Iriartella setigera	0.2 (0.3)	63 (1.2)	1.6
	Cecropia sciadophylla	1.4 (2.4)	21 (0.4)	2.8
	Erisma uncinatum	1.9 (3.2)	12 (0.2)	3.4
	Clathrotropis macrocarpa	0.6 (0.9)	60 (1.2)	2.1
	Sum with 24 other characteristic species	**11.21 (19.2)**	**1027 (18)**	**39.2**
	Other 453 species	**50.6 (80.8)**	**4782 (82)**	**160.8**
	Total 486	**61.8 (100)**	**5809 (100)**	**200**
Micropholio venulosae-Eschweileretum bracteosae ass.	*Micropholis venulosa*	0.07 (1.6)	4 (0.4)	2
	Faramea capillipes	0.04 (1)	28 (2.5)	3.5
	Pouteria ucuqui	0.1 (3.5)	25 (2.3)	5.8
	Bactris hirta	0.02 (0.5)	7 (0.6)	1.1
	Sum with 6 other characteristic species	**0.3 (7.7)**	**86 (7.8)**	**15.5**
	Other 87 species	**3.8 (92.3)**	**1016 (92.2)**	**184.5**
	Total 97	**4.09 (100)**	**1102 (100)**	**200**

Dacryodes chimantensis, *Conceveiba guianensis*, *Protium crassipetalum*, *Inga heterophylla*, *Trymatococcus amazonicus*, *Trattinnickia aspera*, *Cochlospermum orinocense,* and *Inga brachyrhachis*.

Physiognomy-structure: mixed palm communities with an upper tree stratum dominated by *Eschweilera subglandulosa*, *Oenocarpus bacaba,* and *Qualea paraensis*, with the highest basal area value (28 m^2). Lower arboreal stratum is dominated by *Euterpe precatoria*, *Iryanthera laevis*, *Protium llanorum,* and *Attalea maripa*, and small trees of *Anaxagorea rufa*, *Aparisthmium cordatum*, *Bactris bidentula*, *Clathrotropis macrocarpa*, *Iryanthera paraensis,* and *Phenakospermum guyannense*. Shrub and small tree stratum dominated by *Amphirrhox longifolia*, *Bactris bidentula,* and *Sorocea muriculata*. This stratum concentrates the largest number of individuals (2,300). The thirty characteristic species concentrate 39.2% of the total value of the reduced IVI, with a dominance of *Iryanthera laevis*, *Attalea maripa,* and *Iriartella setigera* (Table 7).

Micropholio venulosae-Eschweileretum bracteosae, *ass. nov*. in this publication (Table 6)
Typus: P. Inír.6

Floristic Composition: Characteristic-dominant species:

TABLE 7 CONT. Aspects of the alliance's vegetation structure *Attaleo maripae-Iryantherion laevis* (*Phenakospermo guyannenses-Minquartietalia guianensis* ord.).

SINTAXONOMIC UNITS	SPECIE	BASAL AREA (M^2) -%	ABUNDANCE - U	IVI RED.
Guatterio liesneri-Bactrietum bidentulae ass.	*Bactris bidentula*	0.3 (1.2)	169 (13.5)	14.7
	Guatteria liesneri	0.4 (1.9)	35 (2.8)	4.7
	Pourouma tomentosa	0.8 (3.8)	19 (1.5)	5.3
	Vochysia aff. V. tetraphylla	0.7 (3.1)	19 (1.5)	4.6
	Qualea paraensis	2.4 (11.5)	7 (0.6)	12.1
	Attalea butyracea	1.1 (5.4)	68 (5.4)	10.8
	Sum with 12 other characteristic species	**7.8 (37.3)**	**516 (41.3)**	**78.6**
	Other 78 species	**13.1 (62.7)**	**732 (58.7)**	**121.4**
	Total 96	**20.9 (100)**	**1248 (100)**	**200**
Simaroubo amarae-Tapiriretum guianensis ass.	*Tapirira guianensis*	0.4 (3.8)	20 (2)	5.8
	Simarouba amara	0.5 (4.4)	6 (0.6)	5
	Hymenopus latifolius	0.4 (3.7)	7 (0.7)	4.4
	Protium laxiflorum	0.2 (1.6)	27 (2.7)	4.3
	Bathysa bracteosa	01 (08)	39 (3.9)	4.8
	Couma macrocarpa	0.4 (3.5)	2 (0.2)	3.7
	Syagrus orinocensis	0.4 (3.6)	51 (5.2)	8.7
	Sum with other 17 caratheristics species	**3.2 (30.2)**	**272 (27.5)**	**57.6**
	Other 97 species	**7.4 (69.8)**	**718 (72.5)**	**142.4**
	Total 121	**10.6 (100)**	**990 (100)**	**200**
Attaleo maripae-Euterpetum precatoriae ass.	*Eschweilera subglandulosa*	2.6 (21.3)	21 (2.4)	23.7
	Erisma uncinatum	1.9 (15.5)	6 (0.7)	16.2
	Attalea maripa	1.2 (9.7)	42 (4.8)	14,6
	Euterpe precatoria	0.6 (5.5)	66 (7.66)	13.2
	Sorocea muriculata	0,3 (2.1)	86 (10)	12
	Phenakospermum guyannense	0.6 (5.1)	54 (6.2)	11.3
	Sum with other 9 caratheristics species	**9.6 (80.2)**	**452 (52.3)**	**132.5**
	Other 110 species	**2.4 (19.8)**	**412 (47.7)**	**67.5**
	Total 125	**12 (100)**	**864 (100)**	**200**
Protio crassipetali-Clathrotropietum macrocarpae ass.	*Eschweilera subglandulosa*	1.7 (12)	15 (0.9)	12.9
	Clathrotropis macrocarpa	0.5 (3.8)	57 (3.6)	7.4
	Compsoneura sprucei	1.4 (9.7)	29 (1.8)	11.5
	Protium crassipetalum	0.2 (1.7)	37 (2.3)	4
	Pouteria ucuqui	0.5 (3.5)	28 (1.7)	5.2
	Phenakospermum guyannense	1.2 (8.3)	23 (1.4)	9.7
	Sum with other 9 caratheristics species	**9.04 (63.6)**	**614 (38.3)**	**101.9**
	Other 163 species	**5.2 (36.4)**	**991 (61.7)**	**98.1**
	Total 178	**14.2 (100)**	**1605 (100)**	**200**

Micropholis venulosa, *Faramea capillipes*, *Ouratea sp*., *Eschweilera bracteosa*, *Doliocarpus dentatus*, *Brosimum utile*, *Stachyarrena penduliflora*, *Pouteria ucuqui*, *Bactris hirta,* and *Terminalia macrophylla*.

Physiognomy-structure: forests with an average height of 17 m and several emerging individuals reaching 25 m. The high arboreal stratum is dominated by *Brosimum guianense*, *Aspidosperma excelsum,* and *Pouteria ucuqui*, with DBH average of 31 cm.

Lower arboreal stratum dominated by *Clathrotropis macrocarpa*, *Micropholis venulosa*, *Oenocarpus bacaba,* and *Schnella guianensis*. The highest value of basal area (2 m^2) is concentrated by *Amphirrhox longifolia*, *Anaxagorea rufa*, *Bactris simplicifrons*, *Eschweilera bracteosa,* and *Faramea capilipes* with 723 individuals. The ten characteristic species concentrate 15.5% of the total value of the IVI, especially contributed by *Micropholis venulosa*, *Faramea capillipes,* and *Pouteria ucuqui* (Table 7).

Guatterio liesneri-Bactrietum bidentulae*, ass. nov*. in this publication (**Table 6**)
Typus: Cum.2

Floristic Composition: Characteristic-dominant species: *Bactris bidentula*, *Guatteria liesneri*, *Leptabalanus longistylus*, *Pourouma tomentosa*, *Miconia dispar*, *Hevea benthamiana*, *Dacryodes granatensis*, *Vochysia* aff. *V. tetraphylla*, *Euterpe oleracea*, *Rinorea pubiflora*, *Virola pavonis*, *Miconia splendens*, *Nectandra cuspidata*, *Alchornea triplinervia*, *Osteophloeum platyspermum*, *Chamaedorea pinnatifrons*, *Qualea paraensis,* and *Attalea butyracea*.

Physiognomy-structure: forests with an average height of 15 m and some emerging up to 32 m. Upper arboreal stratum dominated by *Oenocarpus bacaba*, *Qualea paraensis,* and *Guatteria liesneri* with DBH average of 42 cm and the highest value of the basal area of 12 m^2. Lower arboreal stratum with 602 individuals, with *Bactris bidentula*, *Attalea butyracea*, *Astrocaryum chambira, Guatteria liesneri*, *Iryanthera laevis,* and *Sagotia racemose* as dominating species. The 18 characteristic species concentrate 78.6% of the total reduced IVI, with the dominance of *Bactris bidentula, Qualea paraensis,* and *Attalea butyracea* (Table 7).

Quassio simaroubae-Tapiriretum guianensis, *ass. nov*. in this publication (Table 6)
Typus: Guav.2

Floristic Composition: Characteristic-dominant species: *Tapirira guianensis*, *Simarouba amara*, *Hymenopus latifolius*, *Protium laxiflorum*, *Clusia grandiflora*, *Sloanea eichleri*, *Aniba cylindriflora*, *Guarea cristata*, *Miconia tococoidea, Maprounea guianensis*, *Myrcia fallax*, *Adenocalymma cladotrichum*, *Bathysa bracteosa*, *Cordia ucayaliensis*, *Couma macrocarpa*, *Enterolobium schomburgkii*, *Inga alba*, *Sacoglottis guianensis,* and *Syagrus orinocensis*.

Physiognomy-structure: forests with an average height of 17 m and some emerging trees up 25 m. Upper arboreal stratum dominated by *Couma macrocarpa*, *Enterolobium schomburgkii,* and *Hymenopus latifolius* with DBH average of 40 cm. In the medium stratum, *Attalea maripa*, *Tapirira guianensis*, *Protium laxiflorum,* and *Clusia grandiflora* concentrate a basal area maximum value of 5.5 m^2. Small tree stratum had 424 individuals, and was dominated by *Syagrus orinocensis*, *Astrocaryum gynacanthum*, *A. chambira, Phenakospermum guyannense*, *Bathysa bracteosa,* and *Simarouba amara*. The 24 characteristic species concentrate 57.6% of the total reduced IVI, with dominance of *Tapirira guianensis, Simarouba amara,* and *Syagrus orinocensis* (Table 7).

Attaleo maripae-Euterpetum precatoriae*, ass. nov*. in this publication (Table 6)
Typus: Cum5.

Floristic Composition: Characteristic dominant species: *Trattinnickia lawrancei*, *Clarisia racemosa*, *Virola calophylla*, *Sorocea muriculata*, *Cedrelinga cateniformis*, *Cupania scrobiculata*, *Inga heterophylla*, *Pachira paraensis*, *Licania mollis*, *Ocotea aurantiodora*, *Pourouma minor,* and *Protium aracouchini*.

Physiognomy-structure: forests with an average height of 15 m and some emerging up to 30 m. Upper arboreal dominated by *Eschweilera subglandulosa*, *Erisma uncinatum* and *Protium crassipetalum*, with DBH average of 44 cm and a basal area maximum value of 12 m^2. Shrub stratum had 825 individuals and was dominated by *Amphirrhox longifolia*, *Bactris acanthocarpa*, *Compsoneura sprucei*, *Geonoma interrupta,* and *Ischnosiphon arouma*. The 15 characteristic species concentrate 57.6% of the total reduced IVI with dominance of *Eschweilera subglandulosa, Erisma uncinatum, and Attalea maripa* (Table 7).

Protio crassipetali-Clathrotropietum macrocarpae, *ass. nov*. in this publication (Table 6)
Typus: Cum12

Floristic Composition: Characteristic dominant species: *Clathrotropis macrocarpa, Protium crassipetalum, Trymatococcus amazonicus, Iryanthera laevis, Attalea maripa, Duguetia cauliflora,* and *Protium llanorum*.

Physiognomy-structure: Forests with an average height of 16 m and some emerging up to 30 m. Upper arboreal stratum dominated by *Clathrotopis macrocarpa, Eschweilera subglandulosa*, *Pouteria ucuqui*, and *Aspidosperma excelsum*, with DBH average of 41 cm and basal area maximum value of 6.6 m^2. Small tree stratum had 654 individuals and was dominated by *Clathrotropis macrocarpa*, *Oxandra euneura*, *Protium crassipetalum, Anaxagorea rufa*, *Compsoneura sprucei*, and *Phenakospermum guyannense*.

Syntaxonomy and diversity

Table 8 shows the information on the number of species, basal area, and the number of individuals in each defined association. Parameters varied as follows:

Richness

The number of species ranged from 51 in the forests of *Mespilodaphno cymbari-Guareetum glabrae* to 211 in the forests of *Aspidospermo desmanthi-Mespilodaphnetum cymbari*. When related to the sampling area, the highest richness index value (6.3) was observed in the palm community of *Attaleo maripae-Euterpetum precatoriae*.

Basal area

Values ranged from 32.81 m^2 in the forests of *Vasivaeo alchorneoidis-Gustavietum hexapetalae* to 4.09 m^2 in the forests of *Micropholio venulosae-Eschweileretum bracteosae*. When related to the sampling area, the highest value was found in the mixed palm community of *Vitici compressae-Attaleetum butyraceae* with 1.2%.

Abundance

The number of individuals with a DBH > 10 cm fluctuated between 614 in the forests of *Mespilodaphno cymbari-Guareetum glabrae* and 1605 in the forests of *Protio crassipetali-Clathrotropietum macrocarpae*. When related to the sampling area, the highest value of the density index (0.6%) was present in the forests of *Micropholio venulosae-Eschweileretum bracteosae*.

Table 8. Species number, basal area, individual's number, and indexes among the associations.

Order	Alliance	Associations	Sampling area	Total species	Richness I, % (#spp/area x 10^{-2})	Basal area (m^2)	Dominance I, % (basal area/sampling areao)	Abundance	Density I. % (Individulas number/sampling area)
***Mabeo nitidae-Mespilodaphnetalia cymbari* 14000 m2**	*Duguetio quitarensis-Amphirrhocion longifoliae* 5000 m2	*Vitici compressae-Attaleetum butyraceae*	2000	**91**	**4.6**	**23.13**	**1.2**	**825**	0.4
		Vasivaeo alchorneoidis-Gustavietum hexapetalae	3000	**137**	**4.6**	**32.81**	**1.1**	**1076**	0.4
		Aspidospermo desmanthii-Mespilodaphnetum cymbari	4000	**211**	**5.3**	**24.44**	**0.6**	**1408**	0.4
	Virolo surinamensis-Mespilodaphnion cymbari 5000 m2	*Mespilodaphno cymbari-Guareetum glabrae*	2000	**51**	**2.6**	**5.9**	**0.3**	**614**	0.3
		Maquiro coriaceae-Mespilodaphnetum cymbari	3000	**109**	**3.6**	**15.9**	**0.5**	**847**	0.3
Phenakosperm o guyannenses-Minquartietalia guianensis 13000 m2	*Attaleo maripae-Iryantherion laevis* 13000 m2	*Micropholio venulosae-Eschweileretum bracteosae*	2000	**97**	**4.9**	**4.09**	**0.2**	**1102**	0.6
		Guatterio liesneri-Bactrietum bidentulae	3000	**96**	**3.2**	**20.9**	**0.7**	**1248**	0.4
		Quassio simaroubae-Tapiriretum guianensis	3000	**121**	**4**	**10.6**	**0.4**	**990**	0.3
		Attaleo maripae-Euterpetum precatoriae	2000	**125**	**6.3**	**12**	**0.6**	**864**	0.4
		Protio crassipetali-Clathrotropietum macrocarpae	3000	**178**	**5.9**	**14.2**	**0.5**	**1605**	0.5

Discussion

The final phytosociological arrangement grouped vegetation into one class, two orders, two alliances, and 10 associations (Fig. 1). The syntaxonomic units described here represent the first proposal to classify the forest vegetation in the transition region of the Orinoquia and the Colombian Amazon. The analysis technique used showed strongly floristic differences between the groups. Structurally, it was observed that these forest communities can be differentiated by topography. A clear example is the *Attaleo maripae-Euterpetum precatoriae* alliance, a palm community only found on poorly drained soils in the alteration plains.

These forests have at least four well-defined strata, with an average canopy height of 25 m. The 20 characteristic-

dominant species account for 20% of the total basal area, with an upper tree stratum (individuals > 25 m in height) accounting for more than 50% of the parameter. The upper strata grouped 60% of the total individuals, characteristics that are associated with individuals of large size and coverage in the different vegetation types.

In 29000 m², which covered the 29 inventory plots of forests of the *Brosimo latescentis-Eschweileretea subglandulosae* class, there are 9901 individuals and 165.7 m² of basal area (Table 9). In the forests of the order *Mabeo nitidae-Mespilodaphnetalia cymbari* (14 plots, 14,000 m² of sampled area), the highest basal area value (102.2 m²) was found in 4770 individuals of 348 species. In this order, the alliance *Duguetio quitarensis-Amphirrhocion longifoliae* contributed with 55.94 m² of 1901 individuals of 192 species. The mixed palm communities of the association *Vitici compressae-Attaleetum butyraceae* presented the highest value of dominance index (basal area/sampling area) with a 1.2%. In the alliance *Virolo surinamensis-Mespilodaphnion cymbari*, the basal area was 21.9 m² of 1461 individuals and 138 species. The association *Aspidospermo desmanthi-Mespilodaphnetum cymbari* presented a basal area of 24.4 m² of 1408 individuals and 211 species.

In the forests of the order *Phenakospermo guyannenses-Minquartetlia guianenesis* (13 plots, 13,000 m² of sampled area), 63.8 m² of the basal area was found in 5809 individuals of 486 species. In this order, the *Aspidospermo desmanthi-Mespilodaphnetum cymbari* alliance contributed with its five associations, of which the *Attaleo maripae-Euterpetum precatoriae* palm communities showed the highest richness index value (6.3%). The *Micropholio venulosae-Eschweileretum bracteosae* forests presented the highest density index value (number of individuals/sampling area, 0.6%).

Table 9. DBH, basal area and abundance to class level and the vegetation orders.

	Stratum	DBH Average (cm)	Basal area (m²)	Abundance
Brosimo lactescentis-Eschweileretea subglandulosae class	Small trees	7	27.3	4488
	Inferior stratum	18	45.8	1380
	Upper stratum	45	87.9	379
	Shrubs	3	4.7	4332
	Total		165.7	10579
Mabeo nitidae-Mespilodaphnetalia cymbari ord.	Small trees	8	13	2202
	Inferior stratum	20	28	698
	Upper stratum	49	59	213
	Shrubs	3	1.9	1657
	Total		101.9	4770
Phenakospermo guyannenses-Minquartietalia guianensis ord.	Small trees	7	14.3	2286
	Inferior stratum	16	17.8	682
	Upper stratum	41	28.9	166
	Shrubs	3	2.8	2675
	Total		63.8	5809

Synecology and Some Phytogeographic Relationships

There are important floristic relationships between the transition forests of the Colombian Amazon and Orinoquia with other phytogeographic regions of the Neotropics. Rangel-Ch. (2020) synthesized the ecological features of the different types of vegetation of the Colombian Amazon and highlighted as characteristic species of the floodplain the following taxa: *Mauritia flexuosa*, *Maquira coriacea*, *Virola flexuosa*, *Inga punctata*, *Micropholis guyanensis*, *Hymatanthus bracteata*, *Escheweilera coriacea*, *E. juruensis*, *Clathrotropis macrocarpa*, *Pseudolmedia laevis*, *Oenocarpus bataua*, *Pouteria guianensis,* and *Iryanthera ulei*. In terra firme forests, this author mentioned *Brosimum lactescens*, *Minquartia guianensis*, *Attalea maripa,* and *Iryanthera laevis* as characteristic species.

The vegetation characterized in Cumaribo and the surrounding localities shows floristic relationships and several aspects of structure that clearly associate it with the vegetation of the Amazon region of Colombia. Similarities were also detected in the floristic patterns and aspects of structure with those of other neighboring countries and with the natural regions of Colombia.

In Venezuela, the vegetation of the study area resembles the complex of the alluvial plains of the middle Orinoco and its transition with the regions of the Guayana and the Amazon. The Cumaribo region has relationships with the vegetation in the Caño Carinagua basin, Amazonas state (Venezuela) through the dominance of the palms genera *Attalea*, *Oenocarpus,* and *Euterpe*. On the alluvial plains, forests dominated by *Phenakospermum guayanense*, *Erisma uncinatum,* and *Eschweilera subglandulosa* are established (Aymard *et al*., 2009). Gama et al. (2005) reported in the state of Pará (Brazil) the importance-dominance of *Tapirira guianensis*, *Inga alba*, *Hevea brasiliensis*, *Guarea kunthiana*, *Micropholis venulosa*, *Clarisia racemosa*, *Enterolobium schomburgkii*, *Goupia glabra*, *Dipteryx odorata*, *Protium altsonii*, *Trattinnickia rhoifolia*, *Inga heterophylla*, *Casearia discolor*, *Pterocarpus officinalis*, *Brosimum guianensis*, *Didymopanax morototoni*, *Socratea exorrhiza,* and several species of the genera *Protium*, *Eschweilera,* and *Licania* (*s.l.*). In Peru, Laurance et al. (1998; 2004) mentioned the importance of *Protium* (*Crepidospermum*) *goudotianum*, *P. sagotianum,* and *Ocotea aurantiodora* in the Amazonian forest. In the forests of La Macarena mountain range, Stevenson et al. (2004) and Stevenson and Rodríguez (2008) mentioned *Protium* (*Crepidospermum*) *goudotianum*, *P. rhoifolium*, *P. sagotianum,* and *Socratea exorrhiza* among the species with high values of dominance. In a forest located south of the Guaviare River, several taxa were found that share with the study area such as *Cecropia sciadophylla*, *Pourouma minor*, *Oenocarpus bataua*, *Pseudolmedia laevis*, *P. laevigata,* and *Brosimum lactescens*. This region also has larger palms communities dominated by *Oenocarpus bataua* and *Iryanthera laevis* (Minorta-Cely et al., 2020). Forests dominated by *Mabea trianae* are characteristic of the alluvial plains of the department of Arauca, including mixed palm associations dominated by *Attalea maripa* and *Phenakospermum guyannense*, and forests of *Aniba panurensis* and *Eschweilera subglandulosa* (Minorta-Cely et al., 2020). The two species are also dominant in the forests of Vichada, Guaviare, and Guainía.

Regarding other vegetation types characterized in similar environments in the Amazonian region of Colombia, several dominant species in the Orinoco-Amazon transition zone have been mentioned as characteristic-dominant by Van Andel (1992), Urrego (1997), Duivenvoorden and Lips (1993), Cárdenas and Giraldo-Cañas (1997), Rudas and Prieto (2005), and Cantillo and Rangel (2011). These species mentioned in these works highlight *Minquartia guianensis*, a species that dominates the vegetation in the middle part of the Caquetá River. Forests dominated by *Iryanthera laevis* are established in the floodplain of Amazonian rivers. In the mainland vegetation of the Amacayacu National Natural Park, the dominant species are *Clathrotropis macrocarpa*, *Phenakospermum guyannense*, *Eschweilera coriacea,* and *Pseudolmedia laevigata*. *Euterpe precatoria* is dominant in the mixed palm communities with *Didymocistus chrysadenius* in the floodplain of the Caquetá River. The latter also dominated in the *Mauritia flexuosa* palm communities that are established in dissected areas in the Amacayacu National Natural Park. *Eschweilera subglandulosa* dominates in the forests that are established in colluvial and lower hills in localities of the National Natural Park Amacayacu, Tarapacá, accompanied by *Clathrotropis macrocarpa* (Rudas and Prieto, 2005).

Pseudolmedia laevigata dominates in forests of the alluvial plain in transition to the terraces of the Apaporis River and in the terra firme forests of the Amacayacu National Natural Park (Rudas and Prieto, 2005). *Minquartia guianensis* is dominant in the forests established in the channel complex of the Caquetá River; *Qualea pulcherrima*, *Iryanthera ulei* and *Pouteria torta* also appear as associate species. In the well-drained terraces of the middle part of the Caquetá River, *Clathrotropis macrocarpa* is dominant in the mixed palm communities with *Chamaedorea pinnatifrons*.

According to Carvajal et al. (1979), *Clathrotropis macrocarpa* typifies the forests that extend widely in the Amazon region in Caquetá and Putumayo. It is also dominant in terra firme forests on well-drained sites along the middle Caquetá River basin (Duivenvoorden and Lips, 1993). *Oenocarpus bataua* is dominant in the mixed palm groves of the alluvial plain in transition with the terraces of the Caquetá River (IGAC, 1993). In general, it is a dominant species of the vegetation of the low terraces of the Amazonian rivers. It has also been mentioned as dominant in the forests with palm communities in the middle terraces in the foothills of the La Macarena mountain range.

Among the most striking similarities for the Colombian Caribbean region is the presence of palm communities dominated by *Attalea butyracea*, a taxon that dominates areas with good water content in the soil, around the marshes of the Cesar department. The species also characterizes the remnants of palm communities in the mountain foothills towards the Magdalena River valley and in the Orinoco region. *Chamaedorea pinnatifrons* is the characteristic palm of the understory and lower strata in the different vegetation types established along the altitudinal gradient of the Perijá mountain range (Rangel-Ch., 2012).

Tapirira guianensis is the dominant species of the *Cratevo tapiae-Astronietea graveolentis* class, which encompasses all the vegetation of flooded sites, good water saturation in soils around the Caribbean marshes, especially in the Córdoba and Sucre departments (Rangel-Ch. et al., 2010). *Matayba elegans* is a dominant species of the forests around the marshes of the Córdoba department, which is associated with *Pseudolmedia laevigata*, *Brosimum guianensis,* and *Piparea multiflora* (Rangel-Ch. *et al*., 2010).

Brosimum utile characterizes the forests of the humid zone in the south of the Córdoba department (Rangel-Ch, 2012). It is the dominant species in the forests of the foothills of the western slopes of the Cordillera Occidental and in the vegetation of very humid and pluvial sites within the Colombian Pacific depression (Rangel-Ch., 2004). Finally, *Machaerium biovulatum* typifies large formation of forests with *Eugenia procera* that are established in the tropical dry

forest at the foothills of the Sierra Nevada de Santa Marta, the Besotes sanctuary, and the foothills of the Tayrona Park (Berdugo and Rangel-Ch., 2015).

Separation in terms of floristic composition and structure at the level of forest types in the present phytosociological classification confirms the existence of a high diversity o Beta diversity among habitats. A clear separation was detected in terra firme forests (i.e., *Protio crassipetali-Clathrotropietum macrocarpae* association) and those forests with drainage problems (i.e., *Mabeo nitidae-Mespilodaphnetalia cymbari* order).

Transition forests of the Colombian Orinoquia and Amazon are composed of a wide mosaic of forest vegetation. This shows that the concept of forest types is used to describe and understand the extensive variation in floristic composition and its environmental determinants. However, changes are sometimes gradual and without obvious boundaries; therefore, vegetation types defined are no more than sections of a continuous gradient. In the present study, several forest types were recognized based on the dominant species in a definite number of established plots. The segregation of the different types of forests is a relevant result that indicates the convenience of not extrapolating floristic characterizations since the plots are clearly associated with the habitat's ecological conditions. Due to this peculiarity, one future tasks is to continue studying through phytosociological analysis if the variations in floristic composition and environment are gradual to demonstrate the usefulness of classifying forest communities using the Sigmatist school.

Another key point to consider in vegetation studies is the accurate identification and documentation of all plants studied through collections of botanical specimens, rigorous herbarium work, and the specialists' consultations (see acknowledgments).

As in all regions of the Amazon and Orinoco basins, pressure to exploit the study region is growing every day. In many cases, these projects do not take into consideration scientific information indispensable for the elaboration of the different use management, and conservation plans for these valuable ecosystems. It is obvious that these ecosystems must be exploited in some way. The rational way to do it should be to use them in such a way that they can renew and reproduce themselves. At present, not enough scientific knowledge has been generated to form the basis for this type of development, due to the size of the territory, and the enormous quantity and variability of soil, water, flora, fauna, and ecosystem resources that the region harbors.

Finally, all forests studied are located on very poor soils that are susceptible to rapid degradation if intensively used, considering the rainfall magnitude in the area. Here lies the importance of conserving the superficial horizon, since it is the source that continuously supplies nutrients to the natural vegetation. A poor nutrient bank determines a very restricted natural fertility of the soils, which, combined with the topographic characteristics (slope), climate, and drainage, severely limits their use. To date, shifting agriculture has allowed long periods of recovery for the forest. However, if this activity increases, this could destroy in the short term not only the forests but also the soils that sustain them.

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