PHYTOSOCIOLOGICAL CLASSIFICATION OF FOREST VEGETATION IN VENEZUELAN LLANOS

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Abstract. The forest vegetation of Venezuelan Llanos (Anzoátegui, Barinas, Guárico, Monagas, Portuguesa, and Táchira states) was characterized using 68 units (plots) between 500 m^2 and 1000 m^2. All individuals with a diameter at breast height (DBH) ≥ 10 cm were measured, and the basal area (m^2), relative abundance (%), relative dominance (%), and a reduced importance value index (IVI) were calculated. The Sigmatist school guidelines were used to classify the forests, using the floristic composition data. The forests were grouped in the *Guazumo ulmifoliae-Spondiadetea mombinis* class (65,000 m^2, 630 species, and a richness index of 0.97 × 10^{-2} sp/m^2). This class has two orders: the *Cupanio americanae-Protietalia heptaphylli* order (38,000 m^2, 510 species, and a richness index of 1.3 × 10^{-2} sp/m^2), which is mixed with palm communities (*Protio heptaphylli-Attaleion* alliance) and the forests of the alliance *Xylopio aromaticae-Protion heptaphylli*, has three associations; and the *Cupanio americanae-Tabebuietalia roseae* order, which harbors the *Ceibo pentandrae-Trichilion martianae* alliance with three associations. In the latter order, a total of 9554 individuals were counted (average 245) with a density index of 25.1 × 10^{-2} individuals per square meter. The vegetation of both the Venezuelan Llanos and the Colombian Llanos contain *Attalea butyracea* palm communities. Another interesting affinity is found with the Colombian Caribbean vegetation: both regions share the *Spondias mombin* and *Attalea butyracea* community at the class level, and *Protium heptaphyllum*, *Anacardium excelsum*, and *Pterocarpus acapulcensis* at the alliance level. The dominance shown by *Guazuma ulmifolia* and *Cupania americana* in the vegetation units in the Venezuelan Llanos is a very important floristic characteristic observed between the two Llanos regions of Colombia and Venezuela. This floristic-ecological convergence between the two regions may be related to the lower levels of precipitation in many places in the Venezuelan Llanos. This phytosociological study allowed for the characterization of one class, two orders, three alliances, and ten associations. These results highlight the importance of this methodology to define and classify the vegetation of northeastern South America.

Keywords: Tropical forests, phytosociology, floristic composition, structural aspects, Llanos, Venezuela

Resumen. La vegetación boscosa de los Llanos de Venezuela (estados Anzoátegui, Barinas, Guárico, Monagas, Portuguesa y Táchira) es caracterizada utilizando la información de 68 levantamientos (parcelas) entre 500 m^2 y 1000 m^2. Se midieron todos los individuos con un diámetro a la altura del pecho (DAP) ≥ 10 cm, y se calculó el área basal (m^2), abundancia relativa (%), dominancia relativa (%). Con estos valores se estimó el índice de valor de importancia "reducido" (IVI). Para 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 *Guazumo ulmifoliae-Spondiadetea mombinis* (65,000 m^2, con 630 especies y un índice de riqueza de 0.97 × 10^{-2} sp./m^2). Esta clase posee dos órdenes: *Cupanio americanae-Protietalia heptaphylli* (38.000 m^2, 510 especies un índice de riqueza de 1.3 × 10^{-2} sp./m^2), el cual incluye las comunidades mixtas de palmas (*Protio heptaphylli-Attaleion* alliance) y los bosques de la alianza *Xylopio aromaticae-Protion heptaphylli*, la cual posee tres asociaciones. El otro orden: *Cupanio americanae-Tabebuietalia roseae* incluye la alianza *Ceibo pentandrae-Trichilion martianae,* la cual posee tres asociaciones. En este orden, 9554 individuos fueron censados (una media de 245) con un índice de densidad de 25.1 × 10^{-2} de individuos por m^2. La vegetación boscosa de los Llanos de Venezuela comparte con los Llanos de Colombia las comunidades de la palma *Attalea butyracea*. Se encontraron dos interesantes afinidades con la región del caribe colombiano, a nivel de clase con las comunidades de *Spondias mombin* y *Attalea butyracea*, y a nivel de alianza, las comunidades de *Protium heptaphyllum*, *Anacardium excelsum* y *Pterocarpus acapulcensis*. Los valores de dominancia de *Guazuma ulmifolia* y *Cupania americana* esrepresentan importantes rasgos florísticos observados en los Llanos de Colombia y Venezuela. Esta convergencia ecológica/florística entre ambas regiones quizás está relacionada a los bajos valores de precipitación de varios sectores de los Llanos venezolanos. El presente estudio fitosociológico permitió caracterizar una clase, dos órdenes, tres alianzas, y diez asociaciones. Estos resultados demuestran la importancia de esta metodología para clasificar la vegetación del noreste de Sudamérica.

Palabras clave: Bosques tropicales, fitosociología, composición florística, estructura, Llanos, Venezuela.

The Orinoco plains or "Llanos del Orinoco" have an area of ca. 532,000 km^2 (Fig. 1), of which 254,000 km^2 correspond to Colombia and 278,000 km^2 to Venezuela (Aymard, 2017). Due to its species richness and numerous types of vegetation, this region is considered one of the most diverse biogeographic areas in the Neotropics (Huber et al., 2006; Duno de Stefano et al., 2007; Rangel-Ch. and Minorta-C., 2014; Rangel-Ch., 2015; Rangel-Ch. et al., 2022). This large sector comprises an almost uninterrupted region of plains that gradually descends from the base of the Andes (250–500 m) in a west-east direction, ending on the left bank and in the deltaic plain of the Orinoco River (Schargel, 2007).

Previous studies of the flora and vegetation of Llanos in Venezuela were by P. Löefling (1754–1756), A. von Humboldt and A. Bonpland (1800), A. Codazzi (1840), and K. Karsten between 1846–1847 (Aymard and González, 2014). At the beginning of the 19th century, A. von Humboldt and A. Bonpland (Humboldt, 1818–1819) traveled through

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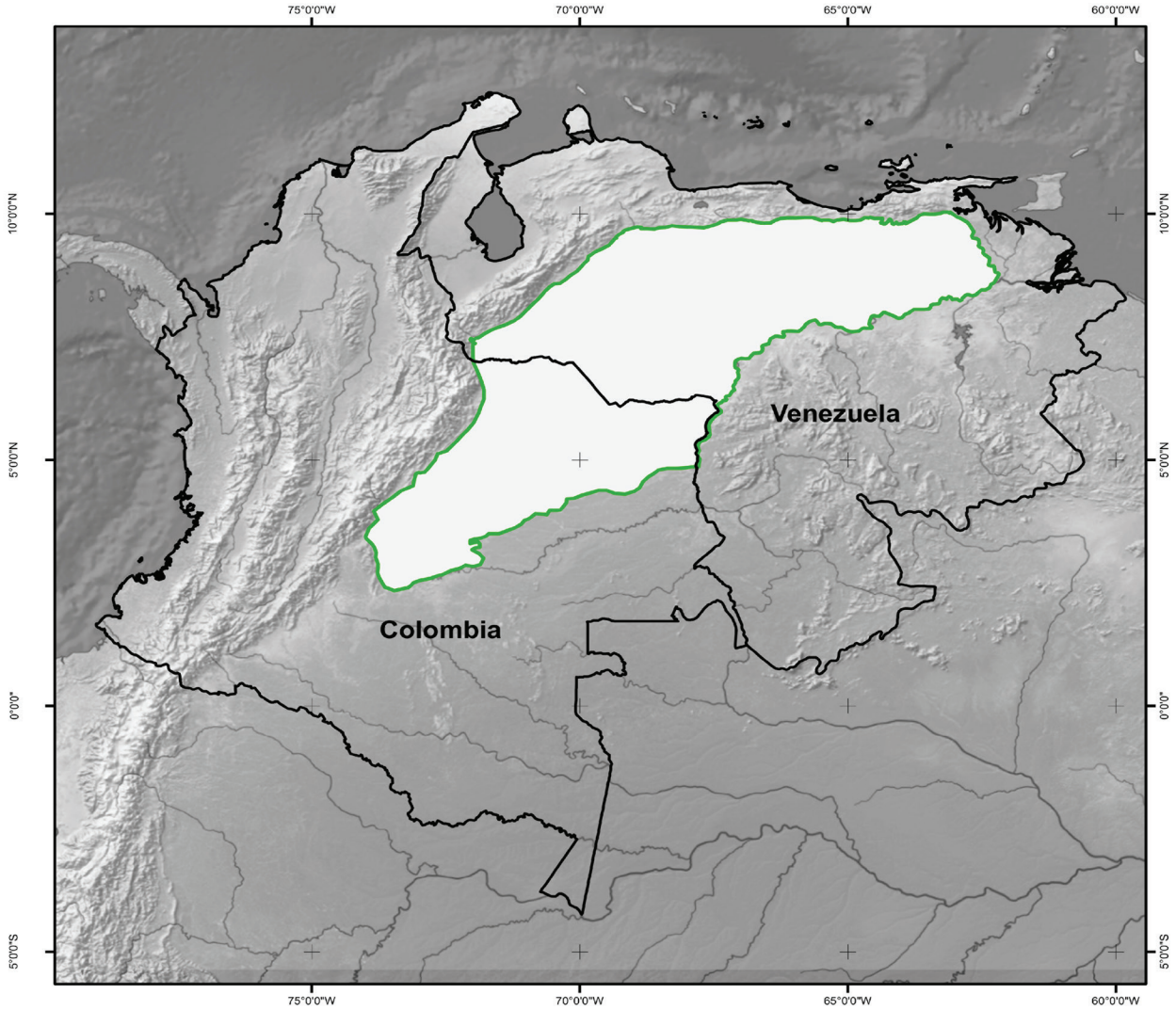

FIGURE 1. Geographic area (within green lines) of Colombian and Venezuelan Llanos (from Aymard, 2017).

the central Llanos of Venezuela and continued up the Orinoco river, making numerous botanical collections in the mouths of the rivers Apure, Arauca, and Meta, and in the Atures (today in Venezuela) and Maypures (today in Colombia) regions (Sandwith, 1925). These naturalists made the first geographical and botanical descriptions of the wide interior savannas and forests of Venezuela, called "Llanos" (Humboldt, 1818–1819). Based on geological processes that differentiated soils and vegetation, A. Jahn applied the terms "Llanos Occidentales" and "Llanos Orientales" to separate these two regions (Jahn, 1921). H. Pittier developed the first map of the vegetation of Venezuela (Pittier 1920, 1937) based on structural characteristics and floristic composition. Other early studies in this region were made by Veillon et al. (1949), Beard (1955), Tamayo (1958, 1972a, b), Hueck (1960), Aristeguieta (1968), Finol (1976), and Veillon (1976). More recently, the Llanos vegetation has been studied by González (1985, 1987), Montes et al. (1987, 2013), Cuello et al. (1989), Arends et al. (1993), Vareschi (1992), and Hernández and Guevara (1994). For a detailed historical review see Aymard and González (2007) and Aymard (2017). In their vegetation map of Venezuela, Huber and Alarcón (1988) mentioned gallery forests, palm communities, deciduous, semi-deciduous, and evergreen forests in this bioregion. Additional contributions documenting the vegetation types of the Llanos of Colombia and Venezuela can be found in Galán de Mera et al. (2006), Fernández (2007), Rojas and Aymard (2010), Aymard (2011, 2015), Rangel-Ch. and Minorta-C. (2014), Cárdenas-L. et al. (2016), Madriñan et al. (2017), and Rangel- Ch. (2024). This last set of contributions represent the current state of knowledge of the floras and types of vegetation of the Colombian and Venezuelan Llanos, and the ecological importance of the Orinoquía bioregion through its floristic richness and the descriptions of its numerous plant communities.

The Venezuelan Llanos are limited to the north by the Coastal Cordillera mountain system (of Upper Tertiary origin), to the south-southwest by the ancient (Precambrian) and massive mountain system of the Guayana Shield and the Colombian Llanos, to the west by the Andean Cordillera of mid-Tertiary age, and to the east by the alluvial Quaternary deposits located in the muddy plains of the Guarapiche and San Juan rivers and the Orinoco river delta (Schargel, 2007, 2015).The southwestern limit of the Venezuelan Llanos extends from the Arauca and Meta rivers toward the Vichada and Guaviare river basins, a region known as the Colombian Eastern Plains (Blydenstein, 1967) or the Colombian Orinoquia (van der Hammen and Rangel, 1997). The Llanos extend along a larger, southwest-northeast-oriented geosyncline occurring between the base of the Guayana Shield and the Coastal Cordillera (Schargel, 2007). As a result of the orogenic processes caused by the Andean uplift, an enormous depression was formed and originally flooded by marine waters. This depression has filled up since the Upper Tertiary and during the Quaternary with sediments that currently dominate the superficial geology of the region (Huber et al. 2006; Zinck, 2015). Moreover, during the mid- and late-Tertiary periods, the Llanos depression was subject to differential tectonic processes (Huber et al., 2006). Its central and eastern sectors have suffered from a moderate uplift causing subsequent pronounced erosion in the area, whereas in the western sector, subsidence prevailed, which was then followed by intense sediment accumulation (Schargel, 2007, 2015; Zinck, 2015). According to Schargel (2007, 2015), the core Venezuela Llanos region includes four principal geomorphological landscapes. The alluvial plains ("planicies aluviales"), which are plains with low slopes (usually < 1%) produced mainly by overflow of the rivers with consequent periodic accumulation of sediment. They are most evident in the west and the extreme northeast Llanos. The aeolian plains ("planicies eólicas") are plains covered by sand and silt, which were deposited by wind during the Pleistocene. In the Llanos, aeolian plains with stabilized Pleistocenic dunes more than 10 m high are distinguished from completely flat aeolian plains covered by silt strata. These plains extend principally from the south-central Llanos to the lower Arauca-Cinaruco basins in the western Llanos. The high plains or plateaus ("altiplanicies") are plains formed by flat or slightly undulated extensions where the rivers are flowing in valleys or fluvial incisions more than 10 m deep (in some cases >150 m deep). They consist of flat mesas elevated by tectonic movements and are most frequent and visible in the eastern Llanos. The hills and denuded surfaces ("colinas y superficies de denudación"), where erosion has dismantled a high plain, hills less than 300 m high remain, including low "Mesa" remnants and colluvial glacis. This landscape can be seen mainly in the central Llanos.

In this study, new data from the Venezuelan Llanos are presented to establish the structural and compositional characteristics of these forests. We established 68 forest plots distributed across the Venezuelan Llanos region and studied local tree abundance, dominance, and frequency to perform a hierarchical forest classification. This forest vegetation characterization follows the combined approaches of the European Sigmatist School (Braun-Blanquet, 1979) and the Anglo-Saxon forest schools method based on structural parameters (Curtis and McIntosh, 1950; Curtis and Cottam, 1962).

Study Area

The Venezuelan Llanos, a well-defined bioregion in northern South America, occupy an area of approximately 278,000 km^2 lying between 7° and 10° N (Huber et al. 2006; Aymard, 2017). These wide lowland plains consist mainly of Quaternary alluvial sediments covered by a mosaic of savannas, gallery forests, and dry to semideciduous forests. The climate is markedly macrothermic (>24 C) and tropophilous, with a strong alternation between one rainy and one dry season, and with an average rainfall between 800 and 2200 mm/year, and average annual temperatures between 25 and 35 C (Huber et al. 2006). Therefore, the core Llanos region of Venezuela and adjacent Colombia is subject to a strongly seasonal climate, with a single dry season extending between November and April–May and a single rainy season between April–May and October (Huber et al., 2006). The rainless period of the year is locally called "verano" (summer). During April and May, the sky becomes cloudy due to the activation of the intertropical convergence zone (ITCZ), which annually operates north and south of the equator zone (Richards et al., 2015). This climatic phenomenon loads humidity and generates large local precipitation until August and September (Andressen, 2003). ITS is generated by the trade winds, which circulate freely through the Caribbean Sea and enter the Llanos bioregion. The trade winds also increase their drying power due to the low pressures that originate in the Llanos (Andressen, 2003; Ranseyer and Miller, 2021). Torrential rains begin in April (more than 80% of the annual rainfall falls during the 5–6 months of the rainy season), and extensive flooding occurs in the lower-lying parts of the Llanos, such as Apure and southern Guárico states (Huber et al., 2006). The altitude ranges between 0 to 450 m in the Andean foothills (Schargel, 2007).

Materials and Methods

The localities that were visited are found in the forest vegetation of the Venezuelan Llanos, mainly in gallery forests, palm communities, and deciduous, semi-deciduous, and evergreen forests. The study area is represented by 68 plots that were established in Anzoátegui, Barinas, Guárico, Monagas, Portuguesa, and Táchira states (Table 1). In these localities, the forest vegetation was characterized using sample plots with areas between 500 m^2 and 1000 m^2. The ecological parameters that were estimated in the field were height (m), number of individuals, and diameter at breast height (DBH) ≥ 10 cm. With these measurements, basal area, relative density, and importance value index

(IVI) were calculated (Curtis and McIntosh, 1950; Curtis and Cottam, 1962). The botanical samples were processed and determined in the Herbario Universitario (PORT) at UNELLEZ-Guanare, Programa de Ciencias del Agro y el Mar, Portuguesa state, Venezuela. The species names and nomenclatural validity were revised and updated by consulting 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). The vegetation characterization follows the combined approaches of the European Sigmatist School (Braun-Blanquet, 1979) and the Anglo-Saxon forest schools method based on dominance and other structural 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 (a two-way divisive technique: plots, species with indicator species) with the PC-ORD version 6 program (McCune and Mefford, 2011). This classification was used to prepare floristic composition tables, that were used to assemble the vegetation into classes, orders, alliances, and associations. 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). These tables were processed to obtain a classification of communities or associations defined in their floristic composition and contrasted with field observations. The fidelity score was estimated according to the Szafer and Pawlowski scale (1934; in Braun-Blanquet, 1979).

Results

The Syntaxonomical units

The present phytosociological study assembles vegetation into one class, two orders, three alliances, ten associations, and two well-defined forests. The syntaxonomic units are described below. These results represent an innovative proposal to classify the Venezuelan Llanos forest vegetation.

Class *Guazumo ulmifoliae-Spondiadetea mombinis* *class nov*., in this contribution. (Tables 2, 3).

Typus: *Cupanio americanae-Protietalia heptaphylli*

Physiognomy-floristic composition: This new class grouped the "guaduales" (vegetation dominated by *Guadua* spp., Poaceae) mixed with palm communities and forests.

The characteristic-dominant species (40) include *Spondias mombin*, *Guazuma ulmifolia*, *Cecropia peltata*, *Leptobalanus apetalus*, *Sapium glandulosum*, *Cochlospermum vitifolium*, *Tapirira guianensis*, *Astronium graveolens*, *Zanthoxylum caribaeum*, *Apeiba tibourbou*, *Sorocea sprucei*, *Schnella* (*Bauhinia*) *guianensis*, *Platymiscium pinnatum*, and *Annona purpurea*. There are 26 other species in this class. The species with the highest value in the importance value index (IVI) are *Luehea candida*, *Guettarda divaricata*, *Bactris major*, *Inga ingoides*, *Inga interrupta*, *Annona jahnii*, *Guarea guidonia*, *Machaerium robinifolium*, *Enterolobium cyclocarpum*, *Vismia cayenensis*, *Casearia silvestris*, *Ceiba pentandra*, *Cordia toqueve*, and *Tabebuia rosea*.

Distribution: This forest vegetation is established in Barinas, Portuguesa, Táchira, Anzoátegui y Monagas states, at altitudes of 20–322 m.

There are three surveys that present very high values in species, individual number, and basal area, which showed different trends compared with the remaining surveys. These surveys are: plot-52, Barinas state, Pedro Morales (130 species, 986 individuals and 16.8 m^2 of basal area); plot-32, Barinas state, Las Colinas (105 species, 697 individuals and 17.71 m^2 of basal area); and plot-14, Barinas state, El Trueno, with 82 species, 932 individuals and 21.75 m^2 of basal area. All three of these survey areas are humid forests located on the Andean foothills (Rojas and Aymard, 2010).

In 66 surveys, the total number of species was 630, average 30 and variation per survey between 12 and 75 and the total number of individuals was 13,469. For the remaining 63 surveys, the number of individuals fluctuates between 35 and 614 with an average of 172 individuals. The species with the highest number of individuals are *Guazuma ulmifolia*, *Cecropia peltata*, *Spondias mombin*, *Leptobalanus (Licania) apetalus*, and *Sapium glandulosum*. Total basal area is 323.6 m^2 in 66 surveys. For the remaining 63 surveys, the basal area was 267.37 m2 with variation between 0.79 and 16.99 m2 and average of 4.24 m^2. The species with the largest basal area are *Spondias mombin*, *Guazuma ulmifolia*, *Cecropia peltata*, and *Leptobalanus apetalus*. The species with the highest IVI values are *Spondias mombin*, *Guazuma ulmifolia*, *Cecropia peltata*, *Leptobalanus apetalus*, and *Sapium glandulosum*.

Order *Cupanio americanae-Protietalia heptaphylli* *ord. nov*., in this contribution. (Table 2).

Typus: *Xylopio aromaticae-Protion heptaphylli*

Physiognomy-floristic composition: palm communities, mixed palm, guaduales, and forests

The characteristic-dominant species in this order are *Protium heptaphyllum*, *P. tenuifolium*, *P. stevensonii*, *Ceiba pentandra*, *Guarea guidonia*, *Cupania americana*, *Ardisia foetida*, *Didymopanax morototoni*, *Clitoria dendrina*, *Allophyllus racemosus*, *Cordia alliodora*, *Vitex compressa*, *Ocotea puberula*, and *Casearia sylvestris*.

The diagnostic species (order differentials) are *Annona montana*, *Aspidosperma cuspa*, *Bauhinia pauletia*, *Bertiera guianensis*, *Casearia aculeata*, *Cecropia peltata*, *Coccoloba caracasana*, *Cordia sericicalyx*, *Couroupita guianensis*, *Euterpe precatoria*, and nine other species (see Table 2).

Information on floristic composition and structure of the *Cupanio americanae-Protietalia heptaphylli* order, such as species, number of individuals, basal area, and IVI values, is found in Table 3.

Alliance *Protio heptaphylli-Attaleion butyraceae* *all. nov*., in this contribution. Table 2.

Typus: *Attaleo butyraceae-Rudgeetum crassilobae*

Floristic composition: Among the characteristic-dominant species (23) are *Attalea butyracea*, *Guatteria pilosula*, *Protium heptaphyllum*, *Pradosia caracasana*, *Hirtella triandra*, *Citharexylum venezuelense*, *Anacardium excelsum*, *Vitex orinocensis*, *Guadua angustifolia*, *Rudgea crassiloba*, *Guarea guidonia*, *Spondias mombin*, *Xylopia aromatica*, *Platypodium elegans*, *Pochota fendleri*, *Ocotea bofo*, *Zanthoxylum rhoifolium*, and *Tanaecium tetragonolobum*. Other dominant species included in this alliance are *Ficus insipida*, *Rudgea crassiloba*, *Xylopia aromatica*, *Astronium graveolens*, *Cecropia peltate*, and *Erythrina fusca*.

Physiognomy: The alliance is dominated by palm communities and mixed forests. It is very rare to find an upper tree stratum; only *Hirtella trianda* was mesaured with individuals 30 m high. In the lower tree layer, *Guarea guidonia*, *Guateria pilosula*, *Tapirira guianensis*, and *Zanthoxylum caribaeum* are very common, and in the sub-arboreal layer *Attalea butyracea*, *Citharexylum venezuelense*, *Guarea guidonia*, *Protium heptaphyllum*, and *Protium tenuifolium* are very common. In the shrub layer, the dominant species are *Miconia magdalenae*, *Calathea lutea*, and young individuals of *Protium heptaphyllum*, *Brosimum alicastum*, *Notopleura macrophylla*, and *Spondias mombin*.

Distribution: This alliance is found in Barinas, Portuguesa, Táchira, Anzóategui, and Monagas states between 20–322 m (Table 1).

Information on floristic composition and structure of this alliance, such as species, number of individuals, basal area, and IVI values, is found in Table 4.

Association *Attaleo butyraceae-Guaduetum angustifoliae* *ass. nov*., in this contribution. (Table 2).

Typus: Aymard 52-2012

Floristic composition: Among the characteristic-dominant species (32) are *Cecropia peltata*, *Guadua angustifolia*, *Spondias mombin*, *Brosimum alicastrum*, *Aiphanes horrida*, *Astronium graveolens*, *Cupania americana*, *Protium heptaphyllum*, *P. crenatum*, *P. tenuifolium*, *Guarea guidonia*, *Attalea butyracea*, *Ficus insipida*, *Guatteria pillosula*, *Terminalia amazonia*, *Bixa urucurana*, *Notopleura macrophylla*, *Anacardium excelsum*, *Acalypha diversifolia*, and *Pleurothyrium trianae*.

The differential diagnostic species are *Machaerium humboldtianum*, *Stylogyne micrantha*, *Triplaris americana*, and *Parinari pachyphylla*.

Physiognomy: The vegetation in this association is compound by mixed palm and bambu commutinies ("guadual-palmar"); *Hirtella trianda* (30 m high) and *Notopleura macrophylla* were found in the upper tree layer. The lower tree stratum is dominated by *Guadua angustifolia* accompanied by *Luehea seemanii*, *Cochlospermum vitifolium*, *Ficus insipida*, *Terminalia amazonia*, *Cecropia peltata*, *Protium tenuifolium*, *Anacardium excelsum*, *Chrysophyllum argenteum*, *Zanthoxylum caribaeum*, and *Guarea guidonia*. The sub-arboreal stratum is dominated by *Guadua angustifolia*, *Attalea butyracea*, *Cupania americana*, *Acalypha diversifolia*, *Aiphanes horrida*, *Erythrina fusca*, *Guarea guidonia*, *Inga edulis*, *Vitex orinocensis*, and 15 other species distributed in the three surveys (Plots 14, 52 and 32). In the shrub layer, there are shoots of *Brosimum alicastum, Hura crepitans, Dendropanax arboreus, Spondias mombin, Notopleura macrophylla, Pleurothyrium triana, Ardisia foetida*, and *Guadua angustifolia*.

The climbing (vines, lianas) taxa that reach the upper strata of the forest are represented by several species of *Fridericia*.

Distribution: Localities are in El Trueno, Pedro Morales, and Las Colinas, Barinas state (Rojas and Aymard, 2010).

Information on floristic composition and structure of this association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Association *Attaleo butyraceae-Rudgeetum crassilobae* *ass. nov*., in this contribution. Table 2.

Typus: Aymard 60-2012

Floristic composition: Among the characteristic-dominant species (26) are *Protium heptaphyllum, P. tenuifolium, Attalea butyracea, Rudgea crassiloba, Guarea guidonia, Xylopia aromatica, Myrcia splendens, Deguelia* (*Lonchocarpus*) *picta, Guatteria pilosula, Didymopanax morototoni, Oenocarpus mapora, Pochota fendleri, Astronium graveolens, Hymenaea courbaril, Spondias mombin*, and *Pradosia caracasana*. The diagnostic species in this association are *Warszewiczia coccinea, Inga sapindoides,* and *Bunchosia argentea*.

Physiognomy: The vegetation of this association is composed of mixed palm communities and forest, where the upper tree stratum is not differentiated. *Hymenaea courbaril* (25 m high) is the tallest species in this layer. In the sub-arboreal layer, the dominant species are *Rudgea crassiloba, Triplaris caracasana, Myrcia splendens, Protium heptaphyllum, P. stevensonii, Ocotea puberula, Miconia magdalenae*, and *Swartzia pittieri*. The lower stratum is dominated by *Miconia magdalenae, Rudgea crassiloba, Triplaris caracasana, Protium heptaphyllum, Myrcia splendens,* and *Genipa americana*. In some surveys (i.e., plot-60), a marked dominance of *Calathea lutea* and *Bactris major* was observed. In survey plot-40, the understory is dominated by juvenile individuals of *Oenocarpus mapora*. The climbing species (vines, lianas) that reach the upper strata of the forest are *Davilla nitida, Fridericia platyphylla,* and *Xylophragma seemannianum*.

Distribution: The vegetation of this association is found in Morador 1, Morador 4, Tucupido, and Morador 2 surveys located in Portuguesa state, and Navay and Culebra 1 surveys in Táchira state (Table 1).

Information on richness and structure of this association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Undefined alliance

Association *Protio heptaphylli-Euterpetum precatoriae* *ass. nov*., in this contribution. Appendix II.

Typus: Aymard 33-2012

Floristic composition: Among the characteristic-dominant species (18) are *Cupania americana, Spondias mombin, Euterpe precatoria, Tapirira guianensis, Sapium glandulosum, Inga ingoides, Jacaranda obtusifolia,* and

Protium heptaphyllum. Other species in this association are *Attalea maripa, Macrolobium acaciifolium, Alchornea glandulosa, Maquira coriacea, Abarema jupumba,* and *Guarea guidonia*. The diagnostic species of the association are *Conceveibum cordatum* and *Tanaecium tetragonolobum*.

Physiognomy: The vegetation is composed of mixed palm communities. The dominant species of the lower arboreal and small tree strata are *Maquira coriacea, Euterpe precatoria, Inga ingoides, Protium heptaphyllum, Macrolobium acaciifolium, Abarema jupumba, Jacaranda obtusifolia, Lonchocarpus hedyosmus, Leptobalanus apetalus, Cordia collococca,* and *Attalea maripa*. The understory layer is dominated by *Virola elongata, Calathea lutea,* and *Ischnosiphon arouma*.

Distribution: This association is found in Río Guanipa, Los Pozos de Guanipa, Oeste de La Hormiga, and Las Coloradas, Monagas state, and Navay and Urimán 2, Táchira state (Table 1).

Data on richness and structure of this association, such as species, number of individuals, basal area, and IVI values, are found in Appendix I.

Alliance *Xylopio aromaticae-Protion heptaphylli* *all. nov*., in this contribution. Table 5.

Typus: *Vochysio lehmanni-Protietum heptaphylli*

Floristic composition: Among the characteristic-dominant species (23) are *Cecropia peltata, Xylopia aromatica, Spondias mombin, Astronium graveolens, Cupania americana, Protium heptaphyllum, P. stevensonii, Croton fragrans, Annona purpurea,* and *Cassia moschata*. Other dominant species are *Anacardium excelsum, Leptobalanus apetalus, Vochysia lehmannii, Virola elongata, Hura crepitans, Allophyllus racemosus,* and *Uniostium velutinifolium*. The diagnostic-differential species are *Inga vera, Genipa americana, Petrea pubescens, Swartzia pittieri,* and *Chrysophyllum argenteum*.

Physiognomy: The vegetation of this alliance includes forests, which in some cases have a discontinuous upper tree layer represented by *Anacardium excelsum, Cassia grandis, Petrea pubescens, Astronium graveolens, Xylopia aromatica, Protium heptaphyllum,* and *Hura crepitans*. *Guazuma ulmifolia, Mauritia flexuosa*, and *Pradosia caracasana* are found in the lower tree layer. The shrub layer is dominated by *Ardisia foetida, Croton fragrans, Guarea guidonia, Leptobalanus apetalus,* and *Protium heptaphyllum*. Other species with local importance are *Calathea lutea, Montrichardia arborescens, Piper tuberculatum,* and *Stylogyne micrantha*.

Distribution: The vegetation of this alliance was found in La Productora, Bumbi Pastoreña 1, 2, 3; Smurfit, Ospino, La Cabaña 1 and 3; Los Alacranes 1, 2, 3, Saltanejas 1, 2, 3, El Tesoro 1, Tacamajaca 1, 2, and 3, Portuguesa state. Other localities are Cerro Negro, Boca del Cogollal, El Rincón, Río Yabo, Paso Marcano, Río Orocual, and Puente Amarillo, Monagas state (Table 1).

Information on richness and structure of this alliance, such as species, number of individuals, basal area, and IVI values, is found in Table 4.

Association *Ingo verae-Anacardietum excelsi* *ass. nov*., in this contribution. Table 5.

Typus: Aymard 9-2012

Floristic composition: Among the characteristic-dominant species (28) are *Cecropia peltata, Inga vera, Leptobalanus apetalus, Anacardium excelsum, Guazuma ulmifolia, Cupania americana, Ardisia foetida, Neea ovalifolia, Ormosia macrocalyx, Acalypha diversifolia, Pradosia caracasana, Guarea guidonia, Protium tenuifolium, Melicoccus bijugatus*, and *Parinari campestris*. The differential species are *Rudgea trujilloi, Coursetia ferruginea*, and *Apuleia leiocarpa*.

Physiognomy: The upper tree layer in plot-26 is dominated by emergent individuals of *Anacardium excelsum* (40 m), *Ormosia macrocalyx* (35 m), and *Cassia grandis* (30 m). Usually, *A. excelsum* has a higher basal area and IVI values, because it is one of the largest trees in the Venezuelan Llanos (Aymard et al., 2011; Lugo et al., 2020). In general, the lower tree layer is dominated by *A. excelsum, Melicoccus bijugatus, Hirtella triandra, Aspidosperma cuspa, Vitex compressa, Protium heptaphyllum,* and *Zanthoxylum caribaeum*. The sub-arboreal stratum is composed of *Protium heptaphyllum, Hirtella triandra, Inga vera, Vitex compressa, Pseudalbizzia niopoides, Pouteria glomerata, Cupania american, Guapira ferruginea*, and 19 other species measured in the nine surveys that are included in this association. The lower layer is composed of *Melicoccus bijugatus, Calathea lutea, Ardisia foetida, Piper tuberculatum, Guapira ferruginea, Stylogyne micrantha, Leptobalanus apetalus, Ormosia macrocalyx*, and 15 other species.

The climbing species (vines, lianas) that reach the upper strata of the forest are *Mascagnia ovatifolia, Friredicia florida, Fridericia dichotoma, Davilla nitida, Xylophragma seemannianum*, and *Carolus sinemariensis*.

Distribution: The *Ingo verae-Anacardietum excelsi* association is found in La Productora, Bumbi, Pastoreña 1 and 2, Smurfit, Ospino, La Cabaña 1 and 3, and Los Alacranes 3 localities, Portuguesa state.

Information on richness and structure of the *Ingo verae-Anacardietum excelsi* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Association *Vochysio lehmanni-Protietum heptaphylli* *ass. nov*., in this contribution. Table 5.

Typus: Aymard 54-2012

Floristic composition: Among the characteristic-dominant species (30) are *Cecropia peltata, Spondias mombin, Vochysia lehmannii, Astronium graveolens, Cupania americana, Mabea occidentalis, Protium heptaphyllum, Ardisia foetida, Protium tenuifolium, Protium stevensonii, Cassia moschata, Uniostium velutinifolium*, and *Genipa americana*. The differential species are *Zanthoxylum rhoifolium, Miconia prasina, Amaioua glomerulata, Nectandra bartlettiana, Roupala montana, Myrciaria floribunda,* and *Pterocarpus acapulcensis*.

Physiognomy: This association has forest with an upper tree layer composed of *Astronium graveolens, Xylopia aromatica,* and *Protium heptaphyllum*. The lower arboreal layer is dominated by *Ocotea puberula, Cecropia peltata, Cordia sericicalyx, Protium heptaphyllum, Petrea pubescens, Cordia bicolor,* and *Vochysia lehmannii*. Common in the lower stratum are *Croton fragrans, Protium tenuifolium, Cupania americana, Nectandra bartlettiana, Allophyllus racemosus, Ocotea puberula, Xylopia aromatica, Zanthoxylum rhoifolium, Vochysia lehmannii, Guarea guidonia, Inga vera, Mabea occidentalis*, and 26 other species. The climbing species (vines, lianas) that reach the upper strata are *Fridericia mollissima, Fridericia oxycarpa, Davilla nítida, Friredicia florida, Xylophragma seemannianum,* and *Davilla kunthii*.

Distribution: The *Vochysio lehmanni-Protietum heptaphylli* association is found in Los Alacranes 1 and 2, Bumbi, Pastoreña 3, La Productora, Saltanejas 1, 2, and 3; Smurfit, Ospino, El Tesoro 1 and Tacamajaca 1, 2, and 3 localities, Portuguesa state.

Information on richness and structure of the *Vochysio lehmanni-Protietum heptaphylli* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Association *Eschweilero subglandulosae-Protietm heptaphylli* *ass. nov*., in this contribution, Table 5.

Typus: Aymard 51-2012

Floristic composition: Among the characteristic-dominant species (30) of this association are *Cecropia peltata, Tapirira guianensis, Eschweilera subglandulosa, Vismia cayennensis, Protium heptaphyllum, Guarea guidonia, Virola elongata, Mauritia flexuosa, Symphonia globulifera, Calophyllum brasiliense, Tabebuia insignis, Ceiba pentandra, Hura crepitans, Chrysobalanus icaco,* and *Xylopia aromatica*. The differentiating species include *Coccoloba latifolia* and *Maprounea guianensis*.

Physiognomy: In plot-20, *Hura crepitans* is an important species in the upper tree layer. In the lower tree layer, the dominant species are *Protium heptaphyllum, Tapirira guianensis, Mauritia flexuosa, Symphonia globulifera, Didymopanax morototoni, Virola elongata, Trichilia pallida, Zanthoxylum caribaeum, Eschweilera pedicellata, and E. subglandulosa*. The lower stratum is dominated by *Calophyllum brasiliense, Chrysobalanus icaco, Eschweilera subglandulosa, Protium heptaphyllum, Swartzia polyphylla, Monteverdia guyanensis, Virola elongata,* and 18 species placed in the four surveys present in this association.

Distribution: The *Eschweilero subglandulosae-Protietm heptaphylli* association is found in Cerro Negro, Boca del Cogollal, El Rincón, Río Yabo, Paso Marcano, Río Orocual, and sector Puente Amarillo, Anzoátegui state.

Information on richness and structure of the *Eschweilero subglandulosae-Protietm heptaphylli* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

***Cassia moschata* and *Chomelia spinosa* forest,** Appendix II.

Physiognomy: The *Cassia moschata* and *Chomelia spinosa* forest has a tree layer composed of *Spondias mombin, Cochlospermum vitifolium, Handroanthus chrysanthus, Cassia moschata,* and *Xylopia aromatica*. The lower stratum is dominated by *Cupania americana, Annona jahnii, Luehea candida, Chomelia spinosa,* and *Copaifera officinalis*. Also, armed (thorny) elements, such as *Leuenbergeria* (*Pereskia*) *guamacho*, *Randia aculeata,* and *Xylosma benthamii*, are common in this community.

The climbing species (vines, lianas) that reach the upper strata of this forest are *Fridericia mollissima, F. oxycarpa,* and *Xylophragma seemannianum*.

Floristic composition: The characteristic-dominant species are *Chomelia spinosa, Genipa americana, Cupania americana, Guettarda divaricata, Luehea candida,* and *Lonchocarpus macrocarpus*.

Distribution: The community is based on Gentry's survey (1980) in Guárico state, Calabozo, Llanos Biological Station, 110 m (Phillips and Miller, 2002).

Information on richness, floristic composition, and structure of the *Cassia moschata* and *Chomelia spinosa* forest, such as species, number of individuals, basal area, and IVI values, is found in Appendix II.

Order *Cupanio americanae-Tabebuietalia roseae* *ord. nov*., in this contribution. Table 6.

Typus: *Ceibo pentandrae-Trichilion martianae*

Physiognomy: The vegetation of the *Cupanio Americanae-Tabebuietalia roseae* order includes "guaduales" and forest communities.

Floristic composition: Among the characteristic-dominant species (25) are *Tabebuia rosea, Genipa americana, Cupania americana, Deguelia picta, Bursera simaruba, Coursetia ferruginea, Hymenaea courbaril, Guettarda divaricata, Luehea candida, Annona jahnii, Doliocarpus dentatus, Cordia toqueve, Agonandra brasiliensis,* and *Margaritaria nobilis*.

The diagnostic species (differential) are *Aralia excelsa, Clitoria arborecescens, Enterolobium cyclocarpum, Machaerium biovolatum, Ormosia macrocalyx, Stylogyne micrantha,* and *Triplaris caracasana*.

Information on richness, floristic composition, and structure of the *Cupanio Americanae-Tabebuietalia roseae* order, such as species, number of individuals, basal area, and IVI values, is found in Table 3.

Alliance *Ceibo pentandrae-Trichilion martianae* *all. nov*., in this contribution. Table 6.

Typus: *Ingo interruptae-Pterocarpetum acapulcensis*

Floristic composition: Among the characteristic-dominant species (22) are *Ceiba pentandra, Trichilia martiana, Sterculia apetala, Guazuma ulmifolia, Spondias mombin, Deguelia picta, Casearia guianensis, Erythrina fusca, Sapium glandulosum, Tabebuia rosea, Hura crepitans, Coccoloba latifolia, Pterocarpus acapulcensis, Pithecellobium lanceolatum, Cochlospermum vitifolium, Allophylus racemosus,* and *Guadua angustifolia*.

Physiognomy: The vegetation of this alliance includes "guaduales" and forest communities. The vegetation

has a well-defined upper tree layer, where *Erythrina fusca, Anacardium excelsum, Pterocarpus acapulcensis, Doliocarpus dentatus,* and *Pachira aquatica* are dominant. The lower arboreal stratum is dominated by *Erythrina fusca, Tabebuia rosea, Guazuma ulmifolia, Spondias mombin, Inga ingoides, Sterculia apetala,* and *Euterpe oleracea*. *Seguieria macrophylla, Guadua angustifolia, Casearia guianensis,* and *Trichilia martiana* are present in the lower stratum.

The woody climbers (vines) that reach the upper strata are *Fridericia mollissima, F. platyphylla*, and *F. pubescens*.

Distribution: The vegetation of the *Ceibo pentandrae-Trichilion martianae* alliance is found in Río Amana (sector Caño Amarillo), NE of Sta. Barbará de Maturín, Río Guarapiche, Los bajos del Furrial and Carmen del Guarapiche, Los Colorados, San José de Buja, El Rabanal, localities, Monagas state, as well as in Montelar, La Productora, Papelón 1, Portuguesa state, Chaparito 2, Los Cocos, Chaparrito 1, and Caño San Rafael, Barinas state.

Information on richness, floristic composition, and structure of the *Ceibo pentandrae-Trichilion martianae* alliance, such as species, number of individuals, basal area, and IVI values, is found in Table 4.

Association *Huro crepitantis-Guaduetum angustifoliae* *ass. nov*., in this contribution. Table 6.

Typus: Aymard 38-2012

Floristic composition: Among the characteristic-dominant species (24) are *Ceiba pentandra, Trichilia martiana, Guadua angustifolia, Sterculia apetala, Tanaecium tetragonolobum, Tabebuia rosea, Guazuma ulmifolia, Pterocarpus acapulcensis, Casearia guianensis, Samanea saman, Spondias mombin, Coccoloba latifolia, Cecropia peltata, Sapium glandulosum,* and *Hura crepitans*. The diagnostic species are *Roystonea oleracea, Desmoncus orthacanthos, Faramea occidentalis, Strychnos mattogrossensis,* and *S. panamensis*.

Physiognomy: The vegetation of this association is composed of guadales, with forests that harbor an upper tree layer (>25 m) with *Erythrina fusca, Anacardium excelsum,* and *Pterocarpus acapulcensis*. In the lower tree layer, the dominant species are *Erythrina fusca, Tabebuia rosea, Guazuma ulmifolia, Mauritia flexuosa, Spondias mombin, Inga ingoides, Hura crepitans, Sterculia apetala,* and *Ruprechtia cruegeri*. *Coccoloba latifolia, Seguieria macrophylla, Guadua angustifolia, Casearia guianensis,* and *Tanaecium tetragonolobum* are dominant in the sub-arboreal stratum.

The climbing species (vines, lianas) that reach the upper strata are *Fridericia pubescens, Fridericia platyphylla,* and *Davilla kunthii*.

Distribution: The vegetation of this association is found in Río Amana, NE of Sta. Bárbara de Maturín, Río Guarapiche, and bajos del Furrial, Monagas state, as well as in Montelar and La Productora localities, Portuguesa state.

Information on richness, floristic composition, and structure of the *Huro crepitantis-Guaduetum angustifoliae* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Association *Ingo interruptae-Pterocarpetum acapulcensis* *ass. nov*., in this contribution. Table 6.

Typus: Aymard 28-2012

Floristic composition: Among the characteristic-dominant species (25) are *Guazuma ulmifolia, Cochlospermum vitifolium, Inga interrupta, Spondias mombin, Pterocarpus acapulcensis, Coccoloba caracasana, Ruprechtia ramiflora, Pithecellobium lanceolatum, Sapium glandulosum, Bravaisia integerrima, Ceiba pentandra,* and *Deguelia picta*.

The diagnostic species are *Pseudalbizzia niopoides, Cordia tetrandra, Samanea saman, Tetracera volubilis, Casearia completa, Pisonia aculeata,* and *Libidibia punctata*.

Physiognomy: This forest has a well-defined upper tree layer (> 25 m) with *Hymenaea courbaril, Pterocarpus acapulcensis,* and *Spondias mombim* as dominant species. In the lower tree layer, *Ceiba pentandra, Cecropia peltata, Bravaisia integerrima, Cochlospermum vitifolium, Guazuma ulmifolia, Pithecellobium lanceolatum,* and *Astronium graveolens* were observed. In the lower stratum, *Pterocarpus acapulcensis, Clitoria dendrina, Lonchocarpus velutinus, Sapium glandulosum, and Machaerium robiniifolium* were dominant species.

The climbing species (vines, lianas) that reach the upper strata of the forest are *Fridericia dichotoma, F. mollissima, F. platyphylla,* and *F. pubescens*.

Distribution: The vegetation of the *Ingo interruptae-Pterocarpetum acapulcensis* association is found in La Productora and Papelón 1–2, Portuguesa state, as well as in the Chaparito 1–2, Los Cocos, and Caño San Rafael localities, Barinas state, and in Carmen del Guarapiche, Monagas state.

Information on richness, floristic composition, and structure of the *Ingo interruptae-Pterocarpetum acapulcensis* association, such as species, number of individuals, basal area, and IVI values, is found in I.

Association *Spondiado mombinis-Trichilietum pallidae* *ass. nov*., in this contribution. Table 6.

Typus: Aymard 22-2012

Floristic composition: Among the characteristic-dominant species (20) are *Guazuma ulmifolia, Spondias mombin, Sapium glandulosum, Cupania americana, Genipa americana, Hymenaea courbaril, Trichilia martiana, Trichilia pallida, Neea spruceana, Attalea maripa, Coccoloba latifolia, Vismia cayennensis, Couroupita guianensis,* and *Cordia collococca*.

The diagnostic species are *Pachira aquatica, Eugenia cribrata, Casearia sylvestris* var. *sylvestris,* and *Protium laxiflorum*.

Physiognomy: This forest has an open upper tree layer (>25 m) with *Pachira aquatica* (Plot 8). The lower tree layer is dominated by *Tapirira guianensis, Cochlospermum orinocense, Attalea maripa, Euterpe oleracea, Cupania americana, Spondias mombin,* and *Jacaranda obtusifolia*.. The lower stratum is composed of *Tapirira guianensis, Attalea maripa, Brownea coccinea, Cupania americana, Coccoloba latifolia, Trichilia pallida,* and *Casearia aculeata*.

The most common climbing species (vines, lianas) that reaches the upper strata of the forest is *Davilla kunthii*.

Distribution: The vegetation of this association is found in Los Colorados, río Amana, San José de Buja and Rabanal, Monagas state.

Information on richness, floristic composition, and structure of the *Spondiado mombinis-Trichilietum pallidae* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Undefined alliance

***Anacardium excelsum* and *Guazuma ulmifolia* forest community.** Table 7.

Floristic composition and physiognomy: This forest has an upper stratum dominated by *Guazuma ulmifolia, Cecropia peltata*, *Coccoloba caracasana, Anacardium excelsum, Inga vera, Bactris major, Guadua* sp., and *Annona purpurea*. The lower tree layer is dominated by *Guadua* sp., *Guazuma ulmifolia, Anacardium excelsum,* and *Annona purpurea*.

The most common climbing species (vines, lianas) that reaches the upper strata of the forest is *Xylophragma seemannianum*.

Distribution: The vegetation of this forest community is found in Smurfit, Ospino, and La Cabaña 2 localities, Portuguesa state.

Information on richness, floristic composition, and structure of the *Anacardium excelsum* and *Guazuma ulmifolia* forest community, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

***Connarus araucanus* and *Eugenia punicifolia* forest** Table 7.

Floristic composition: Among the dominant species (20) are *Deguelia picta, Coursetia ferruginea, Hymenaea courbaril, Guettarda divaricata, Cordia alliodora, Connarus araucanus, Eugenia punicifolia, Lonchocarpus violaceus, Senegalia polyphylla, Casearia ulmifolia, Machaerium myrianthum, Cupania latifolia, Strychnos fendleri,* and *Uniostium velutinifolium*.

Physiognomy: This forest has a lower tree layer dominated by *Cordia alliodora, Lonchocarpus violaceus, Senegalia polyphylla,* and *Uniostium velutinifolium*. The lower stratum is dominated by *Eugenia punicifolia, Connarus araucanus, Guettarda divaricata, Eugenia cribata,* and *Uniostium velutinifolium*.

The most common climbing species (vines, lianas) that reach the upper strata of the forest are *Fridericia mollissima* and *Strychnos fendleri*.

Distribution: The vegetation of this forest is found in río Amana locality, Monagas state, and Cerro Negro, Anzoátegui state.

Information on richness, floristic composition, and structure of the *Connarus araucanus* and *Eugenia punicifolia* forest, such as species, number of individuals, basal area, and IVI values, is found in Appendix I.

Association *Homalolepidis cedrontis-Guareetum guidoniae* *ass. nov*., in this contribution. Table 7.

Typus: Aymard 48-2012

Floristic composition: Among the characteristic-dominant species (15) are *Sapium glandulosum, Tabebuia rosea, Homalolepis* (*Simaba*) *cedron, Guarea guidonia, Ficus máxima, Protium heptaphyllum, Didymopanax morototoni, Vismia guianensis, Zygia latifolia, Tapirira guianensis, Spondias mombin,* and *Ocotea leptobotra*.

Physiognomy: This forest has a lower tree layer dominated by *Tapirira guianensis, Zygia latifolia, Guarea guidonia, Protium heptaphyllum, Xylopia aromatica, Ocotea aurantiodora, Homalolepis cedron, Croton megalodendron, Annona fendleri,* and *Duguetia lucida*.

Distribution: The vegetation of this association is found in Navay, Urimán 1, Culebra 2, Los Monos 1 and El Tesoro 2, Táchira state.

Information on richness, floristic composition, and structure of the *Homalolepidis cedrontis-Guareetum guidoniae* association, such as species, number of individuals, basal area, and IVI values, is found in Appendix 1.

Discussion

This phytosociological arrangement grouped vegetation into one class, two orders, five alliances, 10 associations, and two forest communities. This classification allowed the definition of the *Guazumo ulmifoliae-Spondiadetea mombinis* class with two orders: the *Cupanio americanae-Protietalia heptaphylli* order, in which the mixed palm groves dominated by *Attalea butyracea* and the forests dominated by *Protium heptaphyllum* meet; and the *Cupanio americanae-Tabebuietalia roseae* order, that harbors the forests dominated by *Trichillia* spp., *Pterocarpus acalpucensis*, *Connarus araucanus,* and *Guarea guidonia*, among other species. The syntaxonomic units described here represent the first modern proposal to classify the forest vegetation in the Venezuelan Llanos. The analysis technique used showed the floristic differences between the groups. In general, these forests have between three and four well-defined strata, with an average canopy height of 25 m, with emergent individuals to 40 m.

The species and individuals (by species) values of each syntaxonomic unit are shown in Table 8.

In the *Guazumo ulmifoliae-Spondiadetea mombinis,* 630 species were found in 65,000 m^2 (6.5 ha), with an average of 30 species/plot in the 66 surveys carried out. The richness index (species per square meter) is 0.97 $x10^{-2}$. In total, 13,469 individuals were found (average 188) and the density index was 20.7 $x10^{-2}$ individuals per m^2. In the order *Cupanio americanae-Protietalia heptaphylli* in 38,000 m^2 (3.8 ha), 510 species were found with an average of 38 species/plot. The richness index is 1.3 $x10^{-2}$ species per m^2. In total 9554 individuals were found (average 245) and density index 25.1 $x10^{-2}$ individuals per m^2.

At the alliance level, the highest values were found in the *Protio heptaphylli-Attaleion butyraceae,* with 295 species, a richness index of 4 $x10^{-2}$ and 3470 individuals with a density index of 43 $x10^{-2}$ in eight surveys covering 8000 m^2.

In the other order *Cupanio americanae-Tabebuietalia roseae* in 27000 m^2 (2.7 ha) 278 species were found with an average of 22 species/survey and density index

14.5 $x10^{-2}$ individuals per m^2. In the *Ceibo pentandrae-Trichilion martianae* alliance 236 species were found and a richness index of 1 $x10^{-2}$. It total, 3078 individuals (average 154) were measured, with a density index 16 $x10^{-2}$ individuals per m^2/survey.

At the association level, the highest number of species (215) was found in *Attaleo butyraceae-Guaduetum angustifoliae* in an area of 3,000 m^2, the richness index (sp./m^2) is 7 x10-2. The lowest values in number of species were found in the communities of *Anacardium excelsum*, *Guazuma ulmifoliae* (26), *Connarus araucanus*, and *Eugenia punicifolia* (47). Regarding the number of individuals, the highest value (3045) was found in the association *Vochysio lehmanni-Protietum heptaphylli* and the lowest (212) in *Homalolepidis cedrontis-Guareetum guidoniae*.

The lowest values of species number were found in the *Anacardium excelsum* and *Guazuma ulmifolia* (26) and the *Connarus araucanus* and *Eugenia punicifolia* (47) forest communities. The highest individual value (3045) was found in the *Vochysio lehmanni-Protietum heptaphylli* association, and the lowest (212) in the *Homalolepidis cedrontis-Guareetum guidoniae* association.

The information from A. Gentry's field plots using 0.10 ha (1000 m^2 ; each consisting of ten 2 m × 50 m subplots/subtransects) is based on the worldwide woody plant abundance records in 197 localities (Gentry, 1995; Phillips and Miller, 2002). In dry forests, Gentry found between 50 and 70 species (60 average, I.R. = 6×10^{-2} species per square meter). He pointed out that the richest dry forests in Latin America are located in Los Colorados, Colombia (121 species), Coloso, Colombia (113 species), and in Chamela, Mexico (103). The highest richness value in this work was 106 species (0.1 ha) in the "palm-guadual" community in the *Attaleo butyraceae-Guaduetum angustifoliae* association. Gentry's forest transect data have been frequently used to assess global patterns of plant diversity and plant species compositional changes along environmental and geographical gradients. However, Gentry's data were collected along narrow transects, and, therefore, the dependence among sampled individuals due to spatial aggregation is generally weak (Chao et al., 2023). The same authors also pointed out that coverage-based standardization analysis reveals latitudinal beta diversity patterns/trends not only for richness-based, but also for abundance-sensitive beta diversity. Additionally, Fajardo et al. (2005) mentioned between 110–170 species for Venezuelan dry forests in an area of 10 hectares.

This syntaxonomic scheme of the Venezuelan Llanos is compared with other regions, such as the Caribbean and the Colombian Llanos, resulting in interesting floristic convergence between these regions. A notable feature is the dominance of *Cupania americana* in the Venezuelan Llanos. In the Orinoquia of Colombia, the latter species is a companion taxon in the *Protio tenuifoli-Himatanthion articulati* alliance and of the *Jacarando copaiae-Luehetea seemani* class (Rangel-Ch. et al., 2022). In the Venezuelan Llanos, *Guazuma ulmifolia* is a very important taxon at a higher level (class), a condition that does not occur in the vegetation of the eastern "Llanos" of Colombia. The Llanos of Colombia and Venezuela share vegetation associations, such as the palm communities with *Attalea butyracea,* the forests with *Spondias mombin and Protium heptaphyllum*, and the forests of *Connarus araucanus* and *Guadua angustifolia*.

Like many biomes in Latin America, the Orinoco Llanos have been subjected (especially since the last century) to excessive exploitation of their natural resources based on the expansion of the agricultural frontier, logging, and the extraction of hydrocarbons (Pacheco-Angulo et al., 2011, 2017). The anthropogenic transformations have been manifested in changes in the species composition and structure of the forests. The changes may translate into a response of the vegetation that is associated with a higher level of dominance of a few widely distributed species. This floristic composition is associated with pioneer species in the processes of plant succession. The final objective is the restoration of the original conditions in the pattern of plant richness to continue offering the varied environmental services that vegetation provides. The conservation efforts carried out by governmental and non-governmental organizations can be improved with original scientific information such as that offered here. It is essential to implement management plans based on knowledge of the natural environment in such a way as to ensure the persistence of the biodiversity of the very important natural region.

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Table 1. Location of sampling sites (States and localities).

Plot Aymard 2012	Localities	Alt. (m)
State Anzoátegui, Cerro Negro		
6	Boca del Cogollal	80
7	Boca del Cogollal	80
13	El Rincón, Río Yabo	80
51	Paso Marcano, Río Yabo	80
Estado Barinas		
14	El Trueno	300
32	Las Colinas	300
37	Los Cocos, ca. 30 S de Guanare	300
52	Pedro Morales	300
12	Chaparito 2	87
11	Chaparrito 1, Caño San Rafael	123
State Monagas		
15	Bajo del Carmen del Guarapiche, SO de Jusepín	230
19	Caserío La Laguna, 15 km al Norte de Jusepín	230-241
4	Lower Río Amana	50
33	Oeste de la Hormiga, sector Las Coloradas	20
2	Río Amana (sector Caño Amarillo)	125
18	Río Amana, NE Sta. Bárbara de Maturín	90
1	Río Amana, 2 km S de Musipán	122
3	Río Amana, 5 km N de Morón	125
5	Río Amana, NE de Sta. Barbará de Maturín	150
17	Río Amana, sector Amana abajo	48
16	Río Guarapiche, sector bajos del Furrial, Norte del Furrial	110
56	San José de Buja, sector el Rabanal	20
23	Río Guanipa, sector Los Pozos de Guanipa	110
20	Río Orocual, sector Puente Amarillo, 15 km Norte de La Toscana	105-112
21	San José de Buja, sector El Rabanal	12
22	Sector Los Colorados, Oeste del Caserío La Hormiga	10-14
State Táchira, Navay		
46	Culebra 1	188
47	Culebra 2	188
42	El Tesoro 1	188
43	El Tesoro 2	188
48	Los Monos 1	188
44	Urimán 1	188
45	Urimán 2	188

Plot Aymard 2012	Localities	Alt. (m)
State Portuguesa		
10	Bumbi Pastoreña 3	200
24	La Cabaña 1	176
25	La Cabaña 2	184
26	La Cabaña 3	176
34	Los Alacranes 1	220
35	Los Alacranes 2	254
36	Los Alacranes 3	228
49	Papelón 1, ca. 25 SE de Guanare	180
50	Papelón- 2, ca. 25 SE de Guanare	180
53	Saltanejas 1	180
54	Saltanejas 2	180
55	Saltanejas 3	180
61	Smurfit, Ospino	176
62	Smurfit, Ospino	176
63	Smurfit, Ospino	200
64	Smurfit, Ospino	200
65	Smurfit, Ospino	200
67	Smurfit, Ospino	200
57	Tacamajaca 1	260
58	Tacamajaca 2	256
59	Tacamajaca 3	260
9	Bumbi Pastoreña 2	200
27	Finca La Productora, 20 km NE de Guanare	180
28	Finca La Productora, 20 km NE de Guanare	180
29	Finca La Productora, 20 km NE de Guanare	180
30	Finca La Productora, 20 km NE de Guanare	180
31	Finca La Productora, 20 km NE de Guanare	180
38	Finca Montelar, 50 km NE de Guanare	181
39	Morador 1	300
40	Morador 2	316
41	Morador 4	322
60	Tucupido dam	250
8	Bumbi Pastoreña 1	200
Estado Guárico, Calabozo		
Gentry, 1980	Llanos Biological station	110

TABLE 2. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class and Cupanio americanae-Protietalia heptaphylli* order.

PLOT AYMARD 2012	14	52	32	39	41	46	60	40
SURFACE PLOT. (M²):	1000							
ALTITUDE (M):	300	300	300	300	322	188	250	316
	Relative Density (%)							
Class *Guazumo ulmifoliae-Spondiadetea mombinis*								
Cecropia peltata	1,2	1,0	0,7			2,0	1,4	0,6
Spondias mombin	1,0	0,5	0,6			6,0	0,9	
Astronium graveolens		0,4	2,6	0,4			0,9	3,0
Fissicalyx fendleri	0,2	0,2	0,3				0,5	
Cochlospermum vitifolium	0,2		0,1		0,5			
Guazuma ulmifolia	0,1	0,2	0,7					
Sorocea sprucei		1,6	0,7				0,9	
Apeiba tibourbou	0,1		0,1					0,6
Tapirira guianensis		0,5	0,1				2,3	
Sapium glandulosum	0,3	0,1						0,6
Jacaranda obtusifolia	0,1	0,1	1,6					
Inga ingoides	0,9	0,1					0,9	
Annona montana	0,4	0,2	0,9					
Schnella guianensis		0,1	0,9					
Zanthoxylum caribaeum			1,4				2,8	
Platymiscium pinnatum			0,1					0,6
Leptobalanus apetalus	0,2		0,1					
Inga interrupta		0,1					1,4	
Hymenaea courbaril				1,3	0,5			
Luehea candida		0,3						1,2
Phyllanthus acuminatus	0,2							
Clitoria arborescens							0,5	
Cordia toqueve		0,1						
Order *Cupanio americanae-Protietalia heptaphylli*								
Didymopanax morototoni	0,2	0,6	1,1	3,0	1,5	12		0,6
Cupania americana	0,2	0,5	2,0	0,4	0,5	4		
Guarea guidonia	2,8	1,5	1,4		1,5	30	0,5	
Protium heptaphyllum				7,0	9,7	4	2,3	4,2
Protium tenuifolium		2,8	0,3		1,5		0,5	9,1
Ardisia foetida			4,3		1,0		0,9	0,6
Casearia sylvestris	0,5		0,1				0,5	
Allophylus racemosus				3,0			0,5	
Ocotea puberula				4,8	4,6			
Vitex compressa		0,2					1,9	
Protium stevensonii				2,2			0,5	
Agonandra brasiliensis					1,0		0,5	
Neea amplifolia			0,3					0,6
Oenocarpus mapora				0,4				22,4

TABLE 2 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class and Cupanio americanae-Protietalia heptaphylli* order.

PLOT AYMARD 2012	14	52	32	39	41	46	60	40
Cordia alliodora				3,9				
Ceiba pentandra		0,2						
Amphilophium paniculatum		0,5						
Cestrum latifolium		0,4						
Casearia aculeata		0,2						
Euterpe precatoria	0,9							
Ouratea castaneifolia							0,5	
Ouratea guildingii		0,1						
Piper arboreum								1,2
Piper marginatum	0,3							
Psychotria carthagenensis	0,1							
Sloanea sp.				1,3				
Miconia minutiflora					0,5			
Protio heptaphylli-Attaleion butyraceae								
Attalea butyracea	2,7	3,8	5,9	0,9	2,6	2	3,3	4,8
Guatteria pilosula	0,3	0,8	0,9	3,0	2		0,5	
Miconia magdalenae	0,4	0,1	0,4	4,3				7,9
Pradosia caracasana	0,1	0,1	0,3				2,8	
Hirtella triandra	0,7	0,1	0,4				2,3	
Clavija ornata	0,1	0,1	1,1				0,5	
Citharexylum venezuelense		0,3	0,7				1,9	0,6
Anacardium excelsum	0,1		0,9				0,9	
Bixa urucurana	1,5	5,7					0,9	
Vitex orinocensis		0,1	0,3		0,5			
Cyathea microdonta			0,1					3,6
Nectandra hihua		0,4						2,4
Platypodium elegans			0,3				0,5	
Serjania atrolineata		0,3					0,5	
Pochota fendleri			0,6				1,4	
Stylogyne longifolia		0,2					0,5	
Pombalia prunifolia		0,2					0,5	
Ficus maxima		0,1				2,0		
Myrtaceae		0,2					0,5	
Ocotea bofo			0,9				1,4	
Croton gossypiifolius	0,1						1,9	
Zanthoxylum rhoifolium		0,3			2,6			
Tanaecium tetragonolobum		0,2					0,9	
Attaleo butyraceae-Guaduetum angustifoliae								
Guadua angustifolia	52,7	41,1	9,3					
Brosimum alicastrum	2,4	0,3	1					
Paullinia cururu	1,3	1,1	0,1					
Fridericia sp.	0,7	1,1	2,2					

TABLE 2 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class and Cupanio americanae-Protietalia heptaphylli* order.

PLOT AYMARD 2012	14	52	32	39	41	46	60	40
Machaerium humboldtianum	0,5	0,2					0,9	
Stylogyne micrantha	0,9	0,2	1,4					
Aiphanes horrida	0,6	0,7	2,7					
Dendropanax arboreus	0,2	0,6	2,6					
Ficus insipida	0,2	0,4	0,7					
Protium crenatum	0,3	0,3	5,9					
Smilax purhampuy	0,2	1,1	0,6					
Triplaris americana	0,2	0,1	0,4					
Inga sp2	0,1	0,4	0,3					
Ocotea sp2	0,2	0,1						
Ocotea sp3	0,1	0,1						
Costus guanaiensis	0,1	0,7						
Parinari pachyphylla		2,9	0,1					
Herrania albiflora	1,9		1,7					
Myrcia sp.		0,3	6,2					
Inga sp.	1,2	1,2						
Mabea macrocalyx		1,5	1,0					
Adenocalymma sp.	0,3		0,1					
Myrcia splendens		0,5	0,9					
Myrcia sp2	0,3		0,1					
Nectandra sp.	0,5	0,3						
Notopleura macrophylla	2,8		2,7					
Erythrina fusca	1,0	0,5						
Gouania polygama	0,1		0,4					
Protium opacum subsp. *exaggeratum*		0,4	0,6					
Tabernaemontana grandiflora		0,3	0,7					
Luehea seemannii	0,2		1,4				2,3	
Siparuna guianensis	0,1		1					
Pleurothyrium trianae	2,6	1,5						1,2
Rudgea hostmanniana		0,1	1,7					
Cordia sp.		0,2	0,3					
Paullinia leiocarpa	0,3		0,3					
Talisia sp.		0,3	0,3					
Urera caracasana	1,0	0,4						
Roystonea oleracea		1	1,7					
Annona glabra	0,2	1						
Himatanthus articulatus		0,2	0,7					
Acalypha diversifolia	4,0	2,5	0,6					
Pouteria baehniana	0,1	0,1						
Attaleo butyraceae-Rudgeetum crassilobae								
Rudgea crassiloba			2,3	16,5	48,5		0,5	1,2
Xylopia aromatica		0,2		5,2	8,7			0,6

TABLE 2 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class and Cupanio americanae-Protietalia heptaphylli* order.

PLOT AYMARD 2012	14	52	32	39	41	46	60	40
Serjania adusta				2,2	4,1			2,4
Warszewiczia coccinea			0,4			2	1,9	
Inga sapindoides		0,1				2	0,5	
Myrcia splendens				9,1	2,6			
Bunchosia argentea					1		0,5	
Deguelia picta				0,9			2,8	
Petrea pubescens				0,4			0,5	
Rudgea trujilloi					0,5		0,5	
Triplaris caracasana				10,4			0,5	
Bactris major							4,2	5,5
Miconia prasina							0,5	3,6
Miconia serrulata			1,9		0,5			1,2
Cassia moschata				0,4				0,6
Genipa americana		0.2			0,5			11
Species number	82	130	105	36	26	21	75	31

Other species present:
Strychnos panamensis (14/0,11), (32/0,14), *Terminalia oblonga* (14/0,11), *Aegiphila elata* var. *macrophylla* (14/0,11), *Aristolochia odoratissima* (14/0,11), *Stigmaphyllon sinuatum* (14/0,11), *Celtis iguanaea* (14/0,21), *Dioscorea polygonoides* (14/0,21), Indeterminado (14/0,21), *Mucuna urens* (14/0,21), *Ocotea* sp5 (14/0,21), *Acalypha macrostachya* (14/0,32), *Ocotea* sp4 (14/0,32), *Matelea* sp. (14/0,43), *Salacia elliptica* (14/0,43), *Hura crepitans* (14/0,53), *Piper tenue* (14/0,53), *Inga subnuda* (14/0,64), *Ocotea* sp1 (14/1,39), *Ocotea* sp. 1 (52/0,1), (32/0,86), *Aralia excelsa* (52/0,1), *Jupunba trapezifolia* (52/0,1), *Ocotea leptobotra* (52/0,1), *Maclura tinctoria* (52/0,1), *Libidibia punctata* (52/0,1), *Connarus araucanus* (52/0,1), *Fridericia* sp.2 (52/0,1), Bignoniaceae sp.1 (52/0,1), Bignoniaceae sp.4 (52/0,1), *Dilodendron bipinnatum* (52/0,1), *Hieronyma alchorneoides* (52/0,1), *Monteverdia macrocarpa* (52/0,1), *Miconia ibaguensis* (52/0,1), *Ochroma pyramidale* (52/0,1), *Passiflora foetida* (52/0,1), *Paullinia pinnata* (52/0,1), *Senna macrophylla* (52/0,1), *Trigonia bracteata* (52/0,1), *Verbesina caracasana* (52/0,1), *Zanthoxylum setulosum* (52/0,1), *Chrysophyllum argenteum* (52/0,2), (32/0,43), *Amphilophium paniculatum* (52/0,2), *Carludovica palmata* (52/0,2), *Cestrum alternifolium* (52/0,2), *Machaerium kegelii* (52/0,2), *Matayba guianensis* (52/0,2), *Piper demeraranum* (52/0,2), *Terminalia amazonia* (52/0,3), *Annona exsucca* (52/0,3), *Mangifera indica* (52/0,3), *Protium mucronatum* (52/0,3), *Trichilia maynasiana* (52/0,41), *Inga punctata* (52/0,51), *Piper hispidum* (52/0,61), *Pterocarpus* sp. (32/0,14), (46/2), *Combretum fruticosum* (32/0,14), *Heisteria acuminata* (32/0,14), *Amaioua glomerulata* (32/0,14), *Lonchocarpus hedyosmus* (32/0,14), *Syagrus sancona* (32/0,14), *Aphelandra scabra* (32/0,14), *Guettarda tobagensis* (32/0,14), Indeterminado (32/0,14), *Machaerium arboreum* (32/0,14), *Phyllanthus* sp. (32/0,14), *Posoqueria latifolia* (32/0,14), *Piper tuberculatum* (32/0,29), *Rinorea pubiflora* (32/0,29), *Randia venezuelensis* (32/0,43), *Zanthoxylum syncarpum* (32/0,43), *Adelia ricinella* (32/1), *Casearia mollis* (32/1), *Lonchocarpus* sp. (32/1,15), *Annona mucosa* (39/0,43), *Albizia* aff. *barinensis* (39/0,43), *Macropsychanthus malacocarpus* (39/0,43), *Eugenia pseudopsidium* (39/0,43), *Vitex capitata* (39/0,87), *Jacaranda caucana* (39/0,87), *Acaciella angustissima* (39/0,87), *Fridericia platyphylla* (39/0,87), *Casearia arborea* (39/1,3), *Swartzia pittieri* (39/2,61), *Xylophragma seemannianum* (39/3,91), *Machaerium biovulatum* (41/0,51), *Davilla nitida* (41/1,02), *Machaerium inundatum* (41/1,53), *Homalolepis cedron* (46/2), *Tabebuia rosea* (46/2), *Trigynaea duckei* (46/2), *Socratea exorrhiza* (46/4), *Vismia guianensis* (46/4), *Cochlospermum orinocense* (46/6), *Handroanthus serratifolius* (46/6), *Pseudoalbizia niopoides* (60/0,47), *Pseudosamanea guachapele* (60/0,47), *Crateva tapia* (60/0,47), *Bromelia chrysantha* (60/0,47), *Centrolobium paraense* (60/0,47), *Coccoloba padiformis* (60/0,47), *Guadua latifolia* (60/0,47), *Ocotea leptobotra* (60/0,47), *Rinorea lindeniana* (60/0,47), *Simira lezamae* (60/0,47), *Solanum bicolor* (60/0,47), *Zanthoxylum culantrillo* (60/0,47), *Inga vera* (60/0,93), *Ormosia macrocalyx* (60/0,93), *Bursera simaruba* (60/0,93), *Trichanthera gigantea* (60/0,93), *Coccoloba ovata* (60/0,93), *Costus comosus* (60/0,93), *Strychnos schultesiana* (60/0,93), *Mouriri pseudogeminata* (60/1,4), *Pseudobombax septenatum* (60/1,87), *Croton fragrans* (60/1,87), *Euphorbia cotinifolia* (60/2,34), *Faramea occidentalis* (60/5,61), *Calathea lutea* (60/16,82), *Vochysia lehmannii* (40/0,61), *Lacistema aggregatum* (40/2,42), *Inga capitata* (40/1,21), *Erythroxylum macrophyllum* (52/0,1), (32/1), (39/3,91), *Myrcia* sp. (32/0,29), *Neea* sp. (32/0,29), *Acalypha villosa* (14/0,11), *Licania* sp. (14/0,11), *Miconia sp*1 (14/0,11), *Myrcia sp*1 (14/0,11), Fabaceae (52/0,1), *Inga nobilis* (52/0,1), *Maripa* sp. (52/0,1), *Ocotea sp*6 (52/0,1), *Turpinia* sp. (52/0,1), *Fridericia* sp.1 (52/0,2), *Piper aequale* (52/0,2), *Guatteria* sp. (52/0,3), *Inga edulis* (52/0,41), *Piper amalago* (52/0,41), *Herrania sp* (52/0,91), *Miconia trinervia* (32/0,14), *Andira inermis* (32/0,14), *Hippocratea* sp. (32/0,14), *Dioclea* sp. (32/0,14), *Inga* sp. 1 (32/0,14), *Myrcia* sp. (32/0,29), *Neea* sp. (32/0,29), *Ouratea* sp. (32/0,43), *Ocotea* sp. 2 (32/0,57), *Simira* sp. (32/0,72), *Piper* sp. (40/3,64), Lauraceae 1 (46/2), Lauraceae 2 (46/2), *Bactris* sp. (46/2), *Psidium* sp. (39/1,3), *Machaerium* sp. (32/0,14), Fabaceae 1 (39/0,43), *Pouteria* sp. 5 (52/0,1), *Pouteria* sp.1 (52/0,1), *Theobroma* sp. (52/0,1), *Pouteria* sp. (52/0,1), *Protium* sp4 (32/0,14), *Guapira* sp. (60/0,47).

TABLE 3. Importance Value Index (IVI) to *Guazumo ulmifoliae-Spondiadetea mombinis* class and *Cupanio americanae-Protietalia heptaphylli* and *Cupanio americanae-Tabebuietalia roseae* orders.

SPECIES	IND.	IND. %	FREC. ABS.	FREC. %	A.B.(CM²) ABS.	A.B. %	IVI ABS.	IVI %
Class *Guazumo ulmifoliae-Spondiadetea mombinis*								
Spondias mombin	157	9,14	31	9,31	158819,32	27,72	46,17	15,39
Guazuma ulmifolia	294	17,11	32	9,61	72392,17	12,63	39,36	13,12
Cecropia peltata	242	14,09	34	10,21	45477,89	7,94	32,23	10,74
Leptobalanus apetalus	126	7,33	8	2,4	57358,48	10,01	19,75	6,58
Sapium glandulosum	92	5,36	20	6,01	35959,78	6,28	17,64	5,88
Cochlospermum vitifolium	90	5,24	20	6,01	24455,12	4,27	15,51	5,17
Tapirira guianensis	89	5,18	15	4,5	26518,06	4,63	14,31	4,77
Astronium graveolens	57	3,32	17	5,11	26805,25	4,68	13,1	4,37
Zanthoxylum caribaeum	45	2,62	15	4,5	21786,9	3,8	10,93	3,64
Apeiba tibourbou	58	3,38	12	3,6	12870,84	2,25	9,23	3,08
Sorocea sprucei	57	3,32	13	3,9	6235,23	1,09	8,31	2,77
Schnella guianensis	51	2,97	15	4,5	4067,51	0,71	8,18	2,73
Platymiscium pinnatum	31	1,8	15	4,5	7442,99	1,3	7,61	2,54
Annona purpurea	51	2,97	7	2,1	12905,13	2,25	7,32	2,44
Subtotal	**1440**	**83,83**	**254**	**76,26**	**513094,67**	**89,56**	**249,65**	**83,22**
Other taxa: 26 species	278	16,18	79	23,72	59873,51	10,45	50,36	16,79
Subtotal: 40 species	**1718**	**100**	**333**	**100**	**572968,18**	**100**	**300**	**100**
Remaining taxa: 590 species	**11751**				**2663336,09**			
Total 630 species	**13469**	**NA**	**NA**	**NA**	**3236304,27**	**NA**	**NA**	**NA**
Order *Cupanio americanae-Protietalia heptaphylli*								
Protium heptaphyllum	624	24,55	23	8,42	55078,36	13,53	46,5	15,5
Ceiba pentandra	7	0,28	6	2,2	126418,33	31,05	33,52	11,17
Protium tenuifolium	375	14,75	15	5,49	29333,98	7,2	27,45	9,15
Protium stevensonii	368	14,48	9	3,3	30143,85	7,4	25,18	8,39
Guarea guidonia	177	6,96	19	6,96	36940,62	9,07	23	7,67
Cupania americana	139	5,47	26	9,52	15186,52	3,73	18,72	6,24
Ardisia foetida	185	7,28	20	7,33	9033,88	2,22	16,82	5,61
Didymopanax morototoni	60	2,36	19	6,96	25901,29	6,36	15,68	5,23
Clitoria dendrina	87	3,42	13	4,76	8245,81	2,03	10,21	3,4
Allophyllus racemosus	109	4,29	13	4,76	3602	0,88	9,93	3,31
Vitex compressa	28	1,1	10	3,66	10381,77	2,55	7,31	2,44
Cordia alliodora	33	1,3	7	2,56	13456,09	3,3	7,17	2,39
Ocotea puberula	55	2,16	8	2,93	4479,64	1,1	6,19	2,06
Casearia sylvestris	21	0,83	9	3,3	1866,38	0,46	4,58	1,53
Subtotal	2268	89,23	197	72,15	370068,52	90,88	252,26	84,09
Other taxa: 35 species	274	10,78	76	27,86	37087,46	9,11	47,73	15,91
Subtotal: 49 species	**2542**	**100**	**273**	**100**	**407155,96**	**100**	**300**	**100**
Remaining taxa: 461 species	**7012**				**1637052,91**			
Total: 510 species	**9554**	**NA**	**NA**	**NA**	**2044208,87**	**NA**	**NA**	**NA**
Order *Cupanio americanae-Tabebuietalia roseae*								
Tabebuia rosea	35	11,15	15	16,85	40757,78	46,88	74,88	24,96
Genipa americana	44	14,01	12	13,48	6417,91	7,38	34,88	11,63
Hymenaea courbaril	20	6,37	6	6,74	16403,52	18,87	31,98	10,66
Cupania americana	30	9,55	9	10,11	2212,01	2,54	22,21	7,4
Deguelia picta	38	12,1	2	2,25	2297,92	2,64	16,99	5,66
Bursera simaruba	23	7,32	2	2,25	4612,6	5,31	14,88	4,96
Coursetia ferruginea	24	7,64	2	2,25	568,32	0,65	10,54	3,51
Guettarda divaricata	10	3,18	5	5,62	327,99	0,38	9,18	3,06
Annona jahnii	15	4,78	3	3,37	644,32	0,74	8,89	2,96
Luehea candida	8	2,55	4	4,49	1263,68	1,45	8,5	2,83
Doliocarpus dentatus	4	1,27	2	2,25	2617,53	3,01	6,53	2,18
Cordia toqueve	8	2,55	2	2,25	1280,25	1,47	6,27	2,09
Agonandra brasiliensis	7	2,23	2	2,25	1353,09	1,56	6,03	2,01
Margaritaria nobilis	8	2,55	2	2,25	716,45	0,82	5,62	1,87
Subtotal	274	87,25	68	76,41	81473,37	93,7	257,38	85,78
Other taxa: 11 species	40	12,74	21	23,6	5459,19	6,27	42,61	14,19
Subtotal: 25 species	**314**	**100**	**89**	**100**	**86932,59**	**100**	**300**	**100**
Remaining taxa: 253 species	**3601**				**1105162,81**			
Total: 278 species	**3915**	**NA**	**NA**	**NA**	**1192095,4**	**NA**	**NA**	**NA**

TABLE 4. Importance Value Index (IVI) to P*rotio heptaphylli-Attaleion butyraceae, Xylopio aromaticae-Protion heptaphylli* and *Ceibo pentandrae-Trichilion martianae* alliances.

SPECIES	IND.	IND. %	FREC. ABS.	FREC. %	A.B.(CM²) ABS.	A.B. %	IVI ABS.	IVI %
alianza *Protio heptaphylli-Attaleion butyraceae*								
Guadua angustifolia	963	27,75	3	0,59	88788,92	11,18	39,53	13,18
Attalea butyracea	126	3,63	8	1,57	112866,53	14,22	19,42	6,47
Ficus insipida	11	0,32	3	0,59	74184,19	9,34	10,25	3,42
Rudgea crassiloba	152	4,38	5	0,98	13587,59	1,71	7,08	2,36
Guarea guidonia	70	2,02	6	1,18	21633,38	2,72	5,92	1,97
Spondias mombin	23	0,66	5	0,98	29509,59	3,72	5,36	1,79
Guatteria pillosula	29	0,84	6	1,18	19700,66	2,48	4,5	1,5
Didymopanax morototoni	33	0,95	7	1,38	15458,95	1,95	4,28	1,43
*Xylopia aromatic*a	32	0,92	4	0,79	16636,81	2,1	3,81	1,27
Anacardium excelsum	9	0,26	3	0,59	21636,62	2,73	3,58	1,19
Bixa urucurana	72	2,07	3	0,59	6799,16	0,86	3,52	1,17
Astronium graveolens	30	0,86	5	0,98	12453,8	1,57	3,42	1,14
Terminalia amazonia	3	0,09	1	0,2	23170,03	2,92	3,2	1,07
Cecropia peltata	31	0,89	6	1,18	8020,7	1,01	3,08	1,03
Erythrina fusca	14	0,4	2	0,39	17931,57	2,26	3,06	1,02
Protium heptaphyllum	49	1,41	5	0,98	5191,16	0,65	3,05	1,02
Subtotal	**1647**	**47,45**	**72**	**14,15**	**487569,66**	**61,42**	**123,06**	**41,03**
Other taxa: 278 species	1823	52,54	436	85,82	306394,33	38,58	176,95	58,99
Total	**3470**	**100**	**508**	**100**	**793963,99**	**100**	**300**	**100**
alianza *Xylopio aromaticae-Protion heptaphylli*								
Protium heptaphyllum	575	9,86	18	2,02	49887,2	4,45	16,33	5,44
Anacardium excelsum	37	0,63	9	1,01	138447,51	12,35	13,99	4,66
Ceiba pentandra	4	0,07	4	0,45	121417,05	10,83	11,34	3,78
Protium stevensonii	362	6,21	7	0,78	29945,48	2,67	9,66	3,22
Protium tenuifolium	326	5,59	10	1,12	26064,13	2,32	9,04	3,01
Leptobalanus apetalus	123	2,11	6	0,67	56723,3	5,06	7,84	2,61
Cecropia peltata	156	2,67	17	1,91	21558,18	1,92	6,5	2,17
Vochysia lehmannii	129	2,21	9	1,01	33077,35	2,95	6,17	2,06
Virola elongata	138	2,37	3	0,34	33015,81	2,94	5,65	1,88
Cupania americana	111	1,9	19	2,13	10458,02	0,93	4,97	1,66
*Annona purpure*a	64	1,1	9	1,01	31442,39	2,8	4,91	1,64
Cassia moschata	26	0,45	11	1,23	35189,6	3,14	4,82	1,61
Ardisia foetida	150	2,57	16	1,79	4991,75	0,45	4,81	1,6
Xylopia aromatica	75	1,29	13	1,46	22207,72	1,98	4,72	1,57
Croton fragrans	217	3,72	5	0,56	3941,25	0,35	4,63	1,54
Guarea guidonia	98	1,68	12	1,35	11897,26	1,06	4,09	1,36
Clitoria dendrina	87	1,49	13	1,46	8245,81	0,74	3,68	1,23
Uniostium velutinifolium	25	0,43	8	0,9	23945,81	2,14	3,46	1,15
Hura crepitans	5	0,09	2	0,22	33788,72	3,01	3,32	1,11
Allophyllus racemosus	101	1,73	11	1,23	3386,52	0,3	3,27	1,09
Subtotal	**2809**	**48,17**	**202**	**22,65**	**699630,84**	**62,39**	**133,2**	**44,4**
Other taxa: 305 species	3023	51,83	690	77,35	421796,57	37,61	166,8	55,6
Total	**5832**	**100**	**892**	**100**	**1121427,41**	**100**	**300**	**100**
alianza *Ceibo pentandrae-Trichilion martianae*								
Spondias mombin	114	3,7	17	2,67	114749,3	11,52	17,9	5,97
Guazuma ulmifolia	220	7,15	19	2,99	54475,5	5,47	15,61	5,2
Hura crepitans	31	1,01	7	1,1	81297,36	8,16	10,27	3,42
Coccoloba latifolia	169	5,49	9	1,42	16962,85	1,7	8,61	2,87
Pterocarpus acapulcensis	80	2,6	7	1,1	46889,83	4,71	8,41	2,8
Erythrina fusca	23	0,75	7	1,1	52095,98	5,23	7,08	2,36
Pithecellobium lanceolatum	83	2,7	5	0,79	33560,02	3,37	6,85	2,28
Sapium glandulosum	74	2,4	9	1,42	27311,19	2,74	6,56	2,19
Casearia guianensis	119	3,87	7	1,1	11951,01	1,2	6,17	2,06
Ruprechtia cruegeri	20	0,65	1	0,16	53211,23	5,34	6,15	2,05
Tabebuia rosea	29	0,94	10	1,57	35231,57	3,54	6,05	2,02
Ceiba pentandra	20	0,65	14	2,2	27344,69	2,75	5,6	1,87
Cochlospermum vitifolium	60	1,95	9	1,42	11722,17	1,18	4,54	1,51
Allophylus racemosus	102	3,31	4	0,63	3436,45	0,35	4,29	1,43
Guadua angustifolia	78	2,53	6	0,94	7842,49	0,79	4,27	1,42
Cecropia peltata	46	1,49	7	1,1	14559,53	1,46	4,06	1,35
Subtotal	**1268**	**41,2**	**138**	**21,7**	**592641,15**	**59,52**	**122,41**	**40,8**
Other taxa: 219 species	1810	58,8	498	78,3	403130,98	40,48	177,59	59,2
Total	**3078**	**100**	**636**	**100**	**995772,13**	**100**	**300**	**100**

TABLE 5. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
PLOTS AREA (M^2):	1000																										
ALTITUDE (M):		200	200	176	200	228	200	176		220	254	200		180	200	180	188	260	200	256	260	180	176			105-112	
	Relative Density (%)																										
Class *Guazumo ulmifoliae-Spondiadetea mombinis*																											
Cecropia peltata	0,9		0,2	1		1,1	0,5	17	1,2	8,3	18		3,2	0,5			1,4	0,8		1,0				0,7	8,5		1,3
Schnella guianensis	1,3		0,1						0,6	0,7	1,5	9,2			0,6									0,3		4,4	
Zanthoxylum caribaeum		1,7			1,8	0,4			1,7	0,7			0,9	0,9									0,6			4,4	
Spondias mombin						0,4			2,3	1,4	0,5	0,4	1,1			0,8											
Astronium graveolens						0,4			0,6			0,8		0,9		0,8		0,4					2,9				
Cochlospermum vitifolium		0,6							2,3		1,5	0,4	2,5					0,4			1,3						
Guazuma ulmifolia			0,1	5,9		0,4		1,3					0,2										7,5				
Platymiscium pinnatum	1,3	0,6		1,5					1,2				0,5										2,9				
Sorocea sprucei				0,5			0,5		3,5			1,5	0,7										2,9				
Leptobalanus apetalus	0,9		89				25		4,6									1,9		0,5							
Guettarda divaricata				2,4	4,3				0,6	0,7			2,8										1,7				
Apeiba tibourbou	0,9				1,2			2,9	2,9				1,4														
Tapirira guianensis	0,4																							9,0	1,3		5,2
Sapium glandulosum								0,4					0,2				1,4							0,7			
Inga interrupta		0,9	1,7								0,7			0,5													
Jacaranda obtusifolia							3,2								0,6												
Hymenaea courbaril										0,7			0,2						0,6								
Luehea candida		0,4													2,3		4,8										
Annona jahnii									0,6				1,8										1,2				
Fridericia platyphylla	1,3								0,6				0,7														
Phyllanthus acuminatus						1,1		0,4																			
Machaerium robiniifolium		1,7				2,2																					
Acrocomia aculeata													0,2														
Fridericia mollissima									1,2													1					
Clitoria arborescens	0,9																										
Cordia toqueve														2,3													
Enterolobium cyclocarpum						0,4							0,2														
Vismia cayennensis																									0,6		1,6

TABLE 5 CONT. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
Order *Cupanio americanae - Protietalia heptaphylli*																											
Cupania americana	0,4	2,8	1,1		6,7	0,4	0,5	2,5	0,6	4,8	0,5	5,7	1,8	11		8		0,4		2,6	1,6	2,7				1,1	
Protium heptaphyllum	3,8	5,5						0,8	3,5			20	1,4	13	1,2	14		11	4,6	12	25	35		20	15	6,7	29
Ardisia foetida	14	23	0,1	0,5	1,2	0,4	13	2,1	4			1,5	4,1		1,2	1,6				0,5	0,9			1,4			
Guarea guidonia		0,6		16	0,6	0,4		0,8		1,4	2		5	1,9			27								0,3		2,6
Didymopanax morototoni	0,4									0,7	1	0,8				0,8	2,7	0,4			0,3	0,3		2,8			2
Protium tenuifolium	0,4	13			1,8				0,6	5,5	7,3				82	9,6				45		11					
Allophylus racemosus	1,7	1,1			4,3	11		1,3	2,3	2,1			8,9	1,9		1,6										2,2	
Clitoria dendrina		3,3			6,7	2,9		0,4	2,9		2	3,1	4,6	4,6		7,2		0,4			0,3	1					
Casearia sylvestris	0,9				3,7				0,6		0,5	1,1										0,3					
Ocotea puberula										4,8	7,8	0,4			5,3			0,4		0,5							
Vitex compressa	2,6	1,7				1,1	1,6		0,6			0,4	0,9			0,8											
Protium stevensonii							1,1		1,2				5,3					52	53		34					3,3	
Agonandra brasiliensis	0,9	0,6							1,2			0,4	0,2											1,7			
Cordia alliodora					3	0,7			1,7				2,8					0,4									
Ceiba pentandra		0,6		0,5					0,6																	1,1	
Doliocarpus dentatus	0,4							2,1					1,8							2	6,3						
Neea amplifolia	2,6												1,6														
Amphilophium paniculatum						1,1						1,1															
Cestrum latifolium										1,4				1,4													
Casearia aculeata				2																						10	
Euterpe precatoria																	2,7										
*Aspidosperma cusp*a	2,6								0,6																		
Handroanthus chrysanthus									0,6				0,7														
Ouratea castaneifolia													0,2														
Ouratea guildingii														0,5													
Piper marginatum									1,2																		
Pouteria glomerata		7,2				2,2																					
Psychotria carthagenensis									0,6																		
Sloanea sp.														0,5												1,1	
Fridericia oxycarpa		6,6									2																
Bauhinia pauletia									3,5		0,5																
Bertiera guianensis																						0,7					
Bignonia corymbosa								1,3				0,4															

TABLE 5 CONT. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
Cordia sericicalyx										1,4				0,9													
Dolichandra unguis-cati				0,5		0,4																					
Miconia minutiflora												0,8															
Coccoloba caracasana				2				0,8															5,2				
Samanea saman				1,5																							
Couroupita guianensis				0,5					0,6																		
Sapindus saponaria	0,4			0,5																							
Alliance *Xylopio aromaticae-Protion heptaphylli*																											
Inga vera	3	2,2	4,5	0,5	1,2	2,9	3,2	0,8	0,6	1,4	1,5	1,5		0,9													
Xylopia aromatica		0,6			10						4,4	2,3	1,1			1,6		1,2	2,3	1,5	5,7	1,7		0,3	0,6		1,3
Genipa americana			0,1	1,5	2,4	0,4			4,6	0,7	0,5		6			0,8			0,6	0,5			0,6				0,3
Cassia moschata	0,4				0,6			0,4	0,6			1,1	1,4	0,5		4				1	0,9	0,7					
Petrea pubescens	0,9	1,1			0,6	1,8	0,5		2,9			1,1	0,9		0,6	5,6											
Davilla nitida		1,1			2,4	0,7	0,5					7,7						3,5	2,3	1	2,8	0,7					
Annona purpurea		2,2		5,4		1,5	2,1	3,4		1,4			3,9	3,7		4,8											
Uniostium velutinifolium	0,9						0,5	0,4	0,6			0,8	3	0,9								1					
Swartzia pittieri					0,6	3,6				1,4		1,5			0,6			0,8									
Xylophragma seemannianum					0,6			0,4		2,8				6,5		9,6							16				
Chrysophyllum argenteum	1,7	1,1			18										1,8				0,6			0,3					
Croton fragrans						28		3,8	0,6	46	31																
Bactris major				6,3		0,4		17		2,1		2,7															
Parinari campestris		2,8		3,4	0,6																0,6						3
Pradosia caracasana	1,7								4,0				0,7													3,3	
Vitex capitata		0,6														0,8											0,7
Bursera simaruba	1,7								0,6																	1,1	
Terminalia oblonga		0,6							1,2													0,3					
Deguelia picta									0,6				2,3										2,9				
Fridericia florida							10								2,9				6,3								
Myrcia splendens															0,6				6,9		6,6						
Machaerium biovulatum	1,3								1,7				0,2														
Cochlospermum orinocense																	6,8								0,3		
Association *Ingo verae-Anacardietum excelsi*																											

TABLE 5 CONT. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
Anacardium excelsum	5,1	1,1	0,1	1	4,3	1,5	1,6	0,4	2,9																		
Neea ovalifolia		2,8		3,4	1,2	1,1	3,7	2,1			1,5																
Rudgea trujilloi	1,3	1,1			3,7				0,6			1,1	3,9														
Acalypha diversifolia				2,9		0,4		32	0,6			0,4															
Coursetia ferruginea	0,4	0,6						0,4	0,6																		
Apuleia leiocarpa		0,6			1,2	0,4				0,7																	
Ormosia macrocalyx	0,4			7,8			1,1		1,2																		
Brosimum alicastrum	0,9	1,7				2,5																				1,1	
Piper tuberculatum			0,3			2,9		0,4	0,6																		
Guapira ferruginea			0,6				2,6								0,6												
Combretum fruticosum			0,2	1		20																					
Melicoccus bijugatus	14			4,4					0,6																		
Vitex orinocensis			2,1	0,5																			0,6				
Cedrela odorata						0,4			1,7					0,5													
Sterculia apetala							0,5	1,3															0,6				
Triplaris caracasana								0,4	2,3																		
Parinari pachyphylla	1,7						6,3								0,6		2,7										
Aralia excelsa		2,2			2,4																						
Pseudobombax septenatum	0,4								1,7																		
Warszewiczia coccinea	5,1								1,2																		
Hippocratea volubilis			0,7				8,5											0,4									
Mascagnia ovatifolia				4,4			3,2																				
Paullinia densiflora			0,4				2,1																				
Vochysio lehmanni-Protietum heptaphylli																											
Vochysia lehmannii					1,8						2,4	20	0,7	15		0,8		7,8		0,5	3,8						
Zanthoxylum rhoifolium											3,4			2,3		0,8		0,8				0,3					
Miconia prasina												5		1,4			6,8	3,1		0,5	4,1						
Amaioua glomerulata															0,6			6,2	2,9	0,5	0,9					1,1	3,3
Nectandra bartlettiana				1,5	0,6					4,8	6,3	0,8						0,4			0,3						
Roupala montana		0,6			0,6													0,8		0,5	0,3	1,4					
Jacaranda caucana				7,8	0,6				2,3							1,6					0,3	0,7					
Mabea occidentalis												3,1		6		4				11		5,1					
Myrciaria floribunda		2,8																0,4	12	0,5	0,3						
Cordia bicolor											1					0,8				0,5		0,7					

TABLE 5 CONT. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
Miconia serrulata																		0,8		1							
Serjania adusta														3,7								1					
Pterocarpus acapulcensis	0,4	0,6									0,5		2,3			0,8							6,4				
Fridericia florida																2,4				6,1		3,7					
Myrcia paivae					1,8													2,3		11							
Ocotea fendleri														0,9		2,4						8,8					
Cassia grandis				0,5						0,7	0,5																
Erythroxylum macrophyllum																	0,4			0,3							
Securidaca coriacea												0,4		0,5													
Swietenia macrophylla				1,5								0,4															
Aegiphila integrifolia													1,1								0,3						
Erythroxylum orinocense					1,8								0,5								0,3						
Eugenia sp.														1,4		1,6											
Gouania lupuloides																			0,6		0,9						
Mabea montana																		2,7			0,3						
Miconia multispicata											2	0,4															
Myrcia guianensis																2,4						20					
Eschweilero subglandulosae-Protietm heptaphylli																											
Eschweilera subglandulosa																								0,3	3,2	1,1	2
Aparisthmium cordatum																	2,7							1,7	1,3		
Virola elongata																								3,5	36		4,3
Coccoloba latifolia																								0,7	3,5		0,3
Mauritia flexuosa																								2,8		3,3	0,3
Calophyllum brasiliense																								2,4	0,6		3,3
Chrysobalanus icaco																								5,9	2,2		1,6
Inga sp.																								2,4	0,3	1,1	
Symphonia globulifera																								6,2	4,1		0,7
Tabebuia insignis																								12	8,2		3
Maprounea guianensis	0,4																							1	0,9		1
Lacistema aggregatum																									0,6		0,3
Pouteria sp.																										1,1	
Sloanea																									0,3		0,7
Attalea maripa																										2,2	

TABLE 5 CONT. Floristic composition of alliance *Xylopio aromaticae-Protion heptaphylli*.

PLOT NUMBER. AYMARD 2012	31	9	64	26	8	36	67	24	30	34	35	10	29	53	65	54	42	57	63	58	59	55	62	7	13	20	51
Euterpe oleracea																								1	0,6		
Swartzia polyphylla																								2,4	0,9		
Andira surinamensis																									0,9		0,3
Doliocarpus brevipedicellatus																							0,7			1,3	
Guapira cuspidata																								0,3	0,3		
Guatteria inundata																								1	1,3		
Hirtella racemosa																									1,3		2,3
Ilex jenmanii																								1,7	5,4		
Inga heterophylla																								0,7			1
Macrolobium acaciifolium																											0,3
Maquira coriacea																									0,6		
Montrichardia arborescens																								9,7			1,3
Trichilia pallida																										11	
Desmoncus orthacanthos																								0,3			
Himatanthus articulatus																										1,1	1,3
Species number	58	38	21	36	36	38	31	31	69	27	25	38	55	37	15	34	17	27	15	22	26	26	28	39	29	26	43

Other species present:

Myrcia sp. (31/2,55), *Siparuna guianensis* (31/0,43), *Heliconia bihai* (31/1,28), *Banara guianensis* (31/0,43), *Fridericia dichotoma* (31/0,43), *Curatella americana* (31/0,43), *Aralia excelsa* (31/0,43), *Aristolochia maxima* (31/0,85), *Hirtella triandra* (31/2,98), *Smilax oblongata* (31/0,85), *Hura crepitans* (31/1,28), (20/2,22), *Annona mucosa* (9/0,55), (55/0,34), *Leptobalanus octandrus* (63/5,75), *Conceveiba guianensis* (7/0,35), *Heisteria acuminata* (51/0,33), *Protium paniculatum* (51/0,33), *Rinorea melanodonta* (31/0,85), *Strychnos panamensis* (31/0,43), *Homalolepis cedron* (42/1,35), *Vismia macrophylla* (42/4,05), *Carolus sinemariensis* (26/1,95), *Croton gossypiifolius* (8/0,61), *Morisonia frondosa* (64/0,02), *Ruprechtia ramiflora* (64/0,05), *Eugenia galalonensis* (64/0,07), *Stylogyne micrantha* (64/0,38), *Alchornea glandulosa* (42/9,46), *Socratea exorrhiza* (42/20,27), *Jupunba trapezifolia* (42/4,05), *Casearia arborea* (42/4,05), *Monteverdia guyanensis* (7/2,42), *Gmelina arborea* (34/2,76), *Clusia* sp. (7/0,35), *Guarea* sp. (7/0,35), *Coccoloba* sp. (64/0,02), *Paullinia cururu* (26/7,32), Bignoniaceae (29/0,23), *Clavija ornata* (8/0,61), *Senna viciifolia* (8/1,83), *Vigna luteola* (8/4,27), Fabaceae 2 (53/0,46), *Ficus citrifolia* (67/0,53), *Ocotea bofo* (67/0,53), *Indeterminado* (9/1,66), *Acacia* sp. (51/0,33), *Mabea trianae* (63/1,15), *Eugenia punicifolia* (55/0,34), *Guatteria inundata* (7/0,35), *Casearia corymbosa* (59/1,27), (62/1,73), *Brownea coccinea* (20/24,44), *Banisteriopsis muricata* (36/0,36), *Guatteria pilosula* (31/0,43), (10/0,38), *Tabebuia ochracea* (36/0,36), (62/2,31), *Zanthoxylum fagara* (67/1,06), (62/0,58), *Tetracera costata* subsp. *costata* (51/1,64), *Strychnos mattogrossensis* (63/0,57), *Rudgea crassiloba* (30/1,73), (29/0,23), *Machaerium humboldtianum* (30/1,73), *Senegalia polyphylla* (34/0,69), (54/0,8), *Bignonia aequinoctialis* (24/1,26), (62/0,58), *Rosenbergiodendron formosum* (36/1,09), *Doliocarpus dentatus* (13/0,32), *Henriettea multiflora* (13/0,32), *Handroanthus ochraceus* (54/0,8), *Trichanthera gigantea* (67/1,06), *Lonchocarpus punctatus* (62/3,47), *Casearia completa* (62/0,58), *Machaerium myrianthum* (62/1,16), *Tanaecium pyramidatum* (62/1,16), *Erythrina poeppigiana* (30/0,58), *Acalypha macrostachya* (30/0,58), *Chomelia venezuelensis* (29/0,46), *Tournefortia bicolor* (67/1,06), *Tabernaemontana cymosa* (67/1,06), *Citharexylum venezuelense* (67/1,59), *Casearia mariquitensis* (67/1,59), *Deguelia utilis* (29/1,15), *Anacardium occidentale* (7/0,35), *Rudgea hostmanniana* (20/2,22), *Connarus lambertii* (51/0,98), *Lycoseris triplinervia* (24/0,84), *Casearia guianensis* (36/2,91), *Ipomoea corymbosa* (26/0,49), *Trichilia martiana* (30/0,58), *Guadua paniculata* (30/0,58), *Guapira pubescens* (26/1,46), *Clitoria glaberrima* (30/0,58), *Dianthera secunda* (30/0,58), *Platypodium elegans* (30/1,16), *Zanthoxylum schreberi* (29/8,49), *Heliconia marginata* (30/1,73), *Senna robiniifolia* (30/1,73), *Fridericia dichotoma* (30/2,31), *Cordia collococca* (62/2,31), *Eugenia cribrata* (62/3,47), *Copaifera officinalis* (51/0,66), *Eugenia coffeifolia* (35/0,38), *Vismia baccifera* (35/0,38), *Casearia hirsuta* (29/0,23), *Miconia sericea* (30/0,58), *Piptocoma acuminata* (29/0,46), *Guadua angustifolia* (29/0,69), *Tetracera volubilis* (29/0,69), *Mansoa verrucifera* (24/0,42), *Davilla kunthii* (29/1,15), *Cordia tetrandra* (29/1,61), *Bauhinia aculeata* (30/1,16), *Muellera fendleri* (62/0,58), *Eumachia microdon* (62/0,58), *Pachira quinata* (62/1,16), *Alibertia edulis* (51/3,28), *Cupania latifolia* (51/0,98), *Coutarea hexandra* (53/0,46), *Serjania atrolineata* (53/0,93), *Tetrapterys crispa* (53/0,93), *Prionostemma aspera* (53/1,85), *Bonamia trichantha* (53/3,7), *Annona mucosa* (53/4,63), *Pinzona coriacea* (65/0,59), *Pouteria stipitata* (54/0,8), *Eugenia monticola* (54/0,8), *Homalium racemosum* (54/0,8), *Terminalia amazonia* (42/1,35), *Balizia pedicellaris* (51/0,66), *Eschweilera pedicellata* (51/2,3), *Ilex guianensis* (51/0,33), *Ormosia coccinea* (51/7,87), *Parinari excelsa* (51/2,3), *Cissus alata* (57/0,39), *Duguetia* sp. (7/0,35), *Duroia eriopila* (7/0,35), *Pera glabrata* (51/2,3), *Licania hypoleuca* (20/1,11), *Delonix regia* (64/0,38), *Bixa urucurana* (26/0,49), *Ficus maxima* (42/1,35), *Pseudoalbizia niopoides* (31/1,7), *Calathea lutea* (31/2,13), *Tovomita* sp. (7/0,69), *Hiraea reclinata* (20/2,22), *Swartzia pinnata* (20/5,56), *Guadua* sp. (62/28,9), Myrtaceae (7/0,35), *Annona glabra* (35/1,15).

TABLE 6. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class* and *Cupanio americanae-Tabebuietalia roseae* order.

PLOTS AYMARD 2012	2	5	18	16	38	27	1	4	28	12	15	37	11	49	50	22	17	56	19	21
PLOTS AREA (M^2):	1000						500	1000												
ALTITUDE (M):	125	150	90	110	181		122	50		87			123			10-14	48	20	235	16
	Relative Density (%)																			
Class *Guazumo ulmifoliae-Spondiadetea mombinis*																				
Guazuma ulmifolia	10	4,1	4,2	1	2,2	19	23	3,2	1,5	7,2	7,3	31	4,3	25	65	1,1	3,2	3,2		3,5
Spondias mombin	22	9,8	10		0,9	0,7	11	1,1	5,5	4,8	3,1		3,5		3,6	3,2	1,1	0,8	1	0,9
Sapium glandulosum						6,6			4,7	2,8		16	1,9	3,8				0,8	1	0,9
Cochlospermum vitifolium					1,7	1			3,6	9,6		1,7	1,2	1,9	1,8				1	
Cecropia peltata					7,3	3,1			2,3	0,4						1,1		1,6		1,8
Annona purpurea					1,7	3,8			2	2,8		3,4		3,8						
Platymiscium pinnatum						1,4		3,2	0,3					1,9			1,1		1	
Tapirira guianensis	2	0,8	0,8					1,1								4,3	1,1			
Sorocea sprucei					2,2	2,4			0,2				0,4							
Astronium graveolens					0,9	0,3			0,2				3,5							
Bactris major				0,6						2,8				1,9						
Cordia alliodora					3,4				4,4	0,4										
Casearia sylvestris					0,9							1,7								
Schnella guianensis						0,7													1	
Apeiba tibourbou					3,4				3,6	0,4										
Zanthoxylum caribaeum					0,4				0,3	1,6										
Jacaranda obtusifolia					1,3											3,2				
Order *Cupanio americanae-Tabebuietalia roseae*																				
Cupania americana					1,7	1		1,1	0,8							3,2	1,1	4,8		5,3
Tabebuia rosea	14	0,8	0,8	21			2,9	1,1		0,8	3,1		0,8			1,1				
Vitex compressa									0,3											
Doliocarpus dentatus						1			0,2											
Genipa americana			0,8		0,9					0,4				1,9			1,1		1	1,8
Guettarda divaricata					0,4	0,3				0,4			1,2							
Hymenaea courbaril					0,4				0,5									1,6	1	1,8
Annona jahnii						2,4				0,4			2,7							
Luehea candida													0,4						2,9	

TABLE 6 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class* and *Cupanio americanae-Tabebuietalia roseae* order.

PLOTS AYMARD 2012	2	5	18	16	38	27	1	4	28	12	15	37	11	49	50	22	17	56	19	21
Warszewiczia coccinea						0,3			0,3											
Fridericia mollissima									1											
Clitoria arborescens					0,4									1,9						
Cordia toqueve								4,3									4,3			
Enterolobium cyclocarpum						0,3				0,4										
Machaerium biovulatum					0,4				0,2											
Stylogyne micrantha					0,4								0,4							
Bursera simaruba					0,4				3,6											
Coursetia ferruginea																			5,7	
Paullinia cururu						1,7				1,2										
Triplaris caracasana						1,7				0,8										
Ormosia macrocalyx					0,4															
Aralia excelsa									0,2										1	
Alliance *Ceibo pentandrae-Trichilion martianae*																				
Ceiba pentandra	2	1,6	1,7	3,7	0,4	0,3	2,9	1,1	0,8	0,4	0,5		0,4		1,8		1,1			
Trichilia martiana	2	3,3	3,4		2,6			4,3	0,2		0,5		0,4			2,2		2,4	1	2,6
Sterculia apetala		1,6	1,7		0,4	0,3		1,1	0,3	0,4							1,1			
Tanaecium tetragonolobum	4	3,3	3,4		3,4			2,1			3,1			3,8		1,1	2,1	2,4	1	1,8
Deguelia picta					0,9	2,1			0,8	0,4			10	3,8	1,8					
Casearia guianensis		8,1	7,6		0,4			6,4									6,4	38		34
Erythrina fusca	8	0,8	0,8				2,9			2,4			3,5					0,8		
Coccoloba caracasana				2,4	0,9	1,7			0,2	0,4		3,4	9,3		5,5					
Coccoloba latifolia	4	17,1	18				11	31			19						31	10		11
Cordia collococca	2				1,3			5,3		0,4	14	3,4					6,4			
Machaerium humboldtianum				0,2	0,9						0,5	3,4	0,8						1	
Bixa urucurana		0,8	0,8					8,5								1,1	8,5			
Fridericia sp.	2		0,8				2,9			3,2	1		0,4							
Genipa americana		0,8				1		3,2	4,2									1,6		
Casearia aculeata	2						5,7	4,3									5,3	3,2	3,8	3,5
Lonchocarpus hedyosmus					3,4					2,4				1,9			7,4	0,8		0,9
Deguelia utilis					0,9	1,4			0,7	12									29	
Ruprechtia ramiflora		0,8	0,8							1,2			8,1	3,8	3,6					

TABLE 6 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class* and *Cupanio americanae-Tabebuietalia roseae* order.

PLOTS AYMARD 2012	2	5	18	16	38	27	1	4	28	12	15	37	11	49	50	22	17	56	19	21
Lonchocarpus violaceus								4,3												
Senegalia polyphylla					7,3				2,9	0,8					1,8					
Couroupita guianensis	2							1,1		0,4							1,1			
Sapindus saponaria	2			0,2														0,8		0,9
Eugenia punicifolia								2,1									3,2			
Urera baccifera					2,2			1,1									1,1			
Guadua paniculata								1,1			0,5						1,1			
Casearia corymbosa					0,4							12								
Piptadenia robusta					6							1,7							8,6	
Maclura tinctoria					0,4	2,1						1,7	0,8							
Guarea guidonia	2					1												0,8		0,9
Andira inermis					0,9														7,6	
Bignoniaceae						0,3										2,2				
Brownea coccinea				0,9												3,2				
Chomelia venezuelensis						2,1				2										
Coccoloba portuguesana					0,9							1,7								
Securidaca scandens				0,1															1	
Serjania mexicana							2,9			0,4										
Huro crepitantis-Guaduetum angustifoliae																				
Guadua angustifolia	2	23	21		1,7	5,2	14													
Hura crepitans	2	4,1	4,2	1,1	6,9		2,9				0,5									
Roystonea oleracea	2	0,8	0,8	4																
Desmoncus orthacanthos		2,4	2,5	0,1																
Faramea occidentalis		1,6	1,7			0,3														
Fridericia pubescens					2,2	1,7			0,2											
Strychnos panamensis	2	2,4					2,9	2,1									2,1			
Strychnos mattogrossensis					0,4	1,7														
Entada polystachya		0,8	0,8																	
Homalium guianense		1,6	0,8																	
Mimosa schomburgkii		0,8	0,8																	
Strychnos davidsei			2,5				2,9													
Inga ingoides	2	6,5	5,9	0,1												1,1				

TABLE 6 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class* and *Cupanio americanae-Tabebuietalia roseae* order.

PLOTS AYMARD 2012	2	5	18	16	38	27	1	4	28	12	15	37	11	49	50	22	17	56	19	21
Leptobalanus apetalus		0,8	0,8																	
Annona montana		0,8	0,8				2,9													
Fridericia platyphylla					0,9	0,7			2,9											
Allophylus racemosus				0,2	4,7	4,2			13											
Margaritaria nobilis				0,4		0,3														
Ingo interruptae-Pterocarpetum acapulcensis																				
Inga interrupta						4,2			0,7	0,8			5,8	1,9	3,6					
Pterocarpus acapulcensis					1,3	5,2			7,3	1,6			3,5	5,8	1,8					
Pseudoalbizia niopoides					2,2				0,8	0,4	0,5	1,7		1,9						
Pithecellobium lanceolatum				12						0,4	29	1,7	2,3							
Cordia tetrandra						0,7			1,5	2,8			1,6							
Crateva tapia											2,6	1,7	0,4							
Samanea saman					0,4	1				0,4			0,4	1,9						
Tetracera volubilis		0,8	0,8							0,4		3,4	2,3							
Casearia completa										0,8			2,7	17	7,3					
Pisonia aculeata					0,4	1,4			0,2	0,4			2,3							
Libidibia punctata													0,8	1,9	1,8					
Bravaisia integerrima										16	13									
Copernicia tectorum													3,1	1,9						
Malvaviscus arboreus												3,4		1,9						
Trichilia trifolia										1,2			2,7							
Sarcomphalus saeri													2,3	1,9						
Fissicalyx fendleri				0,4						0,4	0,5									
Machaerium robiniifolium									4,6	0,4			3,5							
Acrocomia aculeata										0,4		1,7								
Neea amplifolia									0,3			1,7		1,9						
Myrcia sp.									0,2				1,6							
Spondiado mombinis-Trichilietum pallidae																				
Trichilia pallida																1,1	4,3	0,8	1,9	0,9

TABLE 6 CONT. Floristic composition of *Guazumo ulmifoliae-Spondiadetea mombinis class* and *Cupanio americanae-Tabebuietalia roseae* order.

PLOTS AYMARD 2012	2	5	18	16	38	27	1	4	28	12	15	37	11	49	50	22	17	56	19	21
Pachira aquatica																1,1		2,4		2,6
Neea spruceana								3,2			0,5						3,2	1,6	1	1,8
Eugenia cribrata																		4		4,4
Davilla kunthii						1												0,8		0,9
Casearia sylvestris																			2,9	0,9
Cordia panamensis																		0,8		0,9
Virola surinamensis							2,9									2,2				
Zanthoxylum fagara																			1	
Swartzia pinnata																		0,8		0,9
Protium laxiflorum																		1,6		1,8
Psidium acutangulum																		3,2		1,8
Phyllanthus acuminatus																		0,8		0,9
Vismia cayennensis																		7,1		7,9
Didymopanax morototoni																		0,8		0,9
Species number	22	27	28	22	61	46	16	25	54	58	21	21	46	24	12	31	24	30	36	30

Other species present:

Seguieria macrophylla (2/4), *Mauritia flexuosa* (2/6), *Hamelia patens* (27/0,35), *Adelia ricinella* (27/2,08), *Maclura* sp. (5/0,11), *Ficus* sp. (5/0,7), *Ruprechtia cruegeri* (5/50,99), *Heliconia bihai* (4/3,19), *Randia armata* (38/0,43), *Paullinia leiocarpa* (38/0,43), Fabaceae (38/0,43), *Hippocratea* sp. (38/0,43), *Indeterminado* (38/0,43), Rubiaceae (38/0,43), *Trichilia* sp. (38/0,43), *Clerodendrum* sp. (38/3,88), *Prionostemma aspera* (12/1,2), *Casearia ulmifolia* (27/4,84), *Leptobalanus apetalus* (1/5,71), *Trema micrantha* (28/0,16), *Cedrela odorata* (28/0,33), *Cassia moschata* (28/0,49), *Platypodium elegans* (28/0,49), *Banara guianensis* (28/0,49), *Anacardium excelsum* (38/1,72), *Melicoccus bijugatus* (38/2,16), *Pradosia caracasana* (28/0,98), *Cornutia pyramidata* (28/1,14), *Lecythis minor* (38/2,16), *Handroanthus billbergii* (19/1,9), *Acacia* sp. (11/0,39), *Lonchocarpus velutinus* (28/4,72), *Clitoria dendrina* (28/6,19), *Ficus maxima* (12/0,4), *Cassia grandis* (12/0,4), *Syagrus sancona* (12/0,4), *Rudgea* sp. (11/0,39), *Cissus erosa* (12/0,4), *Cupania scrobiculata* (12/0,4), *Funastrum clausum* (12/0,4), *Lecythis ollaria* (12/0,4), *Ruprechtia apurensis* (12/0,4), *Piper tuberculatum* (12/0,8), *Lonchocarpus* (*Derris*) sp. (11/0,39), *Strychnos fendleri* (19/4,76), *Ayenia catalpifolia* (15/0,52), *Coccoloba ovata* (37/1,72), *Terminalia guyanensis* (37/1,72), *Senegalia polyphylla* (11/0,39), *Attalea maripa* (22/34,41), *Machaerium* sp. (11/0,39), *Securidaca divaricata* (11/0,39), *Aspidosperma cuspa* (11/0,78), *Muellera fendleri* (11/1,16), *Phyllanthus elsiae* (11/2,71), *Fridericia dichotoma* (11/3,1), *Trichilia trifolia* (49/1,92), *Morisonia odoratissmia* (49/3,85), *Conceveibum cordatum* (22/1,08), *Connarus lambertii* (19/0,95), *Bauhinia aculeata* (27/3,46), (28/0,33), *Zanthoxylum schreberi* (28/1,95), *Uniostium velutinifolium* (28/2,61), *Erythroxylum orinocense* (28/0,49), *Brosimum alicastrum* (5/0,06), (12/0,4), *Vitex orinocensis* var. *multiflora* (27/1,04), *Pseudosamanea guachapele* (11/0,78), *Cochlospermum orinocense* (22/6,45), *Pseudosamanea guachapele* (12/1,2), *Coccoloba portuguesana* (12/2,39), *Maprounea guianensis* (15/0,52), *Tanaecium tetragonolobum* (5/0,11), *Agonandra brasiliensis* (38/0,43), *Handroanthus chrysanthus* (28/2,77), *Alibertia edulis* (15/0,52), *Machaerium inundatum* (22/1,08), *Astrocaryum aculeatum* (22/1,08), *Manilkara bidentata* (22/1,08), *Xylopia discreta* (22/1,08), *Chrysophyllum* (22/1,08), *Protium* (22/1,08), *Ischnosiphon arouma* (22/2,15), *Pouteria* sp. (22/3,23), *Calathea lutea* (22/4,3), *Cordia* sp. (22/4,3), *Euterpe oleracea* (22/4,3), *Heliconia caribaea* (17/2,13), *Bromelia pinguin* (56/0,79), *Trichilia pallida* (56/0,79), *Parinari campestris* (22/1,08), *Mabea occidentalis* (19/0,95), *Guapira pubescens* (19/0,95), *Calliandra laxa* (19/0,95), *Dalbergia frutescens* (19/0,95), *Erythroxylum gracilipes* (19/0,95), *Melicoccus oliviformis* (19/0,95), *Randia* sp. (19/0,95), *Alseis labatioides* (19/1,9), *Copaifera officinalis* (19/2,86), *Bunchosia mollis* (19/2,86), Myrtaceae (19/2,86), *Bromelia* sp. (21/0,88), *Erythrina fusca* (21/0,88).

TABLE 7. Floristic composition of *Anacardium excelsum* and *Guazuma ulmifoliae*, *Connarus araucanus* and *Eugenia punicifolia* forests and the *Homalolepidis cedrontis-Guareetum guidoniae* association.

PLOT AYMARD 2012	61	25	3	6	44	47	48	43
SURFACE PLOT. (M²):	1000		500	1000				
ALTITUDE (M):	176	184	125		188	188	188	188
	Relative Density (%)							
Class *Guazumo ulmifoliae-Spondiadetea mombinis*								
Guazuma ulmifolia	11	23			2,1			
Spondias mombin								3,6
Sapium glandulosum		1,9					1,8	5,4
Cochlospermum vitifolium			1,5					
Cecropia peltata	1	3,8				7,7		
Annona purpurea		25						
Platymiscium pinnatum		1,9						
Tapirira guianensis					38			
Astronium graveolens	0,5							
Bactris major		13						
Cordia alliodora			4,4					
Casearia sylvestris			2,9					
Schnella guianensis		1,9					1,8	
Apeiba tibourbou		3,8						
Zanthoxylum caribaeum			1,5					
Order *Cupanio americanae-Tabebuietum roseae*								
Cupania americana			1,5					
Tabebuia rosea			2,9		2,1	1,9	1,8	1,8
Guettarda divaricata			5,9					
Hymenaea courbaril				3,5				
Luehea candida		3,8						3,6
Warszewiczia coccinea								1,8
Fridericia mollissima				0,6				
Coursetia ferruginea				5,8				
Deguelia picta	5,7			8,7				
Agonandra brasiliensis		1,9		1,9				
Margaritaria nobilis				1,9				3,6
Undifines alliance								
Anacardium excelsum and Guazuma ulmifolia forest								
Coccoloba caracasana	2,1	3,8						
Anacardium excelsum		7,5						
Inga vera		1,9						
Neea ovalifolia		1,9						

TABLE 7 CONT. Floristic composition of *Anacardium excelsum* and *Guazuma ulmifoliae, Connarus araucanus* and *Eugenia punicifolia* forests and the *Homalolepidis cedrontis-Guareetum guidoniae* association.

PLOT AYMARD 2012	61	25	3	6	44	47	48	43
Connarus araucanus* and *Eugenia punicifolia forest								
Connarus araucanus			8,8	3,5				
Eugenia punicifolia			21	0,6				
Tabernaemontana cymosa			5,9					
Homalolepidis cedrontis-Guareetum guidoniae								
Homalolepis cedron					6,4	5,8	3,5	3,6
Guarea guidonia						48	25	18
Ficus maxima					2,1	1,9		1,8
Protium heptaphyllum					2,1	3,8	3,5	
Casearia arborea					4,3		3,5	
Didymopanax morototoni						1,9	3,5	3,6
Vismia guianensis					2,1			1,8
Zygia latifolia					11			11
Lauraceae						3,8		1,8
Species number	13	16	19	30	14	13	17	23

Other species present:
Pterocarpus acapulcensis (61/0,52), *Genipa americana* (61/0,52), *Senegalia polyphylla* (61/0,52), *Combretum fruticosum* (61/0,52), *Pseudosamanea guachapele* (61/1,03), *Coccoloba* sp. (61/1,03), *Xylophragma seemannianum* (61/9,28), *Guadua* sp. (61/66,49), *Acalypha diversifolia* (25/1,89), *Sterculia apetala* (25/3,77), *Casearia guianensis* (3/1,47), *Cassia moschata* (3/1,47), *Gouania polygama* (3/1,47), *Guapira* sp. (3/1,47), *Mabea piriri* (3/2,94), *Deguelia utilis* (3/4,41), *Machaerium myrianthum* (3/4,41), *Tanaecium tetragonolobum* (3/7,35), *Lonchocarpus violaceus* (3/19,12), *Randia armata* (6/0,32), *Erythroxylum gracilipes* (6/0,32), *Hirtella paniculata* (6/0,32), *Myrcia* sp. (6/0,32), *Copaifera officinalis* (6/0,65), *Cordia bicolor* (6/0,65), *Handroanthus ochraceus* (6/0,65), *Bredemeyera floribunda* (6/0,65), *Bourreria exsucca* (6/0,97), *Ouratea grosourdyi* (6/0,97), *Bunchosia mollis* (6/1,29), *Zanthoxylum martinicense* (6/1,29), *Casearia sylvestris* (6/1,61), *Pouteria stipitata* (6/1,61), *Connarus lambertii* (6/1,94), *Vitex capitata* (6/2,26), (48/1,75), *Uniostium velutinifolium* (6/3,55), *Senegalia polyphylla* (6/4,84), *Casearia ulmifolia* (6/4,84), *Cupania latifolia* (6/8,39), *Eugenia cribrata* (6/9,35), *Strychnos fendleri* (6/26,45), *Rudgea crassiloba* (44/2,13), Lauraceae 1 (44/4,26), Lauraceae 2 (44/4,26), *Himatanthus articulatus* (44/8,51), *Ocotea glomerata* (44/10,64), *Vismia macrophylla* (47/1,92), *Trigynaea duckei* (47/1,92), *Alchornea discolor* (47/1,92), *Pterocarpus* sp. (47/7,69), *Croton megalodendron* (47/11,54), *Zanthoxylum rhoifolium* (48/1,75), *Albizia* sp. (48/1,75), *Talisia macrophylla* (48/1,75), *Ocotea leptobotra* (48/3,51), *Duguetia lucida* (48/7,02), *Ocotea aurantiodora* (48/8,77), *Annona fendleri* (48/12,28), *Xylopia aromatica* (48/17,54), *Parinari pachyphylla* (43/1,79), *Pouteria caimito* (43/1,79), *Gustavia macarenensis* (43/1,79), *Euterpe precatoria* (43/1,79), *Conceveibum cordatum* (43/3,57), *Socratea exorrhiza* (43/3,57), *Lonchocarpus* sp. (43/3,57), *Miconia prasina* (43/7,14), *Dichapetalum* sp. (43/7,14), *Virola sebifera* (43/7,14).

TABLE 8. Pattern of richness and density of Venezuelan Llanos vegetation units described.

			Species				Individuals			
UNITS	**NUMBER. PLOT.**	**SURFACE (M^2)**	**AVERAGE SP.**	**VARIATION NO. SPP.**	**TOTAL SPP.**	**I. RICH. $x10^{-2}$ ($SPPXM^2$)**	**AVERAGE. IND.**	**VARIATIN NO. IND.**	**NUMBER IND.**	**I. DEN. $x10^{-2}$ ($INDXM^2$)**
Attaleo butyraceae-Guaduetum angustifoliae	3	3000	106	82-131	215	7	872	697-986	2615	87
Attaleo butyraceae-Rudgeetum crassilobae	5	5000	38	21-75	135	3	171	50-230	855	17
All. *Protio heptaphylli-Attaleion butyraceae*	8	8000	63	21-131	295	4	434	50-986	3470	43
Ingo verae-Anacardietum excelsi	9	9000	37	22-58	176	2	199	128-275	1787	20
Vochysio lehmanni-Protietum heptaphylli	14	14000	28	15-55	176	1	218	74-436	3045	22
Eschweilero subglandulosae-Protietm heptaphylli	4	4000	34	26-43	88	2	250	90-316	1000	25
All. *Xylopio aromaticae-Protion heptaphylli*	27	27000	33	15-69	322	1	216	74-436	5832	22
Protio heptaphylli-Euterpetum precatoriae	3	3000	21	14-30	57	1,9	84	69-95	252	8,4
Order *Cupanio americanae-Protietalia heptaphylli*	38	38000	38	14-131	510	1,3	245	50-986	9554	25,1
Huro crepitantis-Guaduetum angustifoliae	8	7500	31	16-61	108	1	133	35-289	1066	14
Ingo interruptae-Pterocarpetum acapulcensis	7	7000	34	12-59	129	2	211	52-614	1480	21
Spondiado mombinis-Trichilietum pallidae	5	5000	30	24-36	93	2	106	93-126	532	11
All. *Ceibo pentandrae-Trichilion martianae*	20	19500	32	12-61	236	1	154	35-614	3078	16
Com. de Anacardium excelsum and Guazuma ulmifoliae	2	2000	14	13 y 16	26	1,3	123	53 y 194	247	12,4
Com. de Connarus araucanus and Eugenia punicifolia	2	1500	24	19 y 30	47	3,1	189	68 y 310	378	25,2
Homalolepidis cedrontis-Guareetum guidoniae	4	4000	17	13 y 23	48	1,2	53	47 y 57	212	5,3
Order *Cupanio americanae-Tabebuietalia roseae*	28	27000	22	12-61	278	1,03	130	35-614	3915	14,5
Class. *Guazumo ulmifoliae-Spondiadetea mombinis*	66	65000	30	12-131	630	0,97	188	35-986	13469	20,7

APPENDIX I

Importance Value Index (IVI) by species.

SPECIES	IND.	IND. %	FREC. ABS.	FREC. %	A.B.(CM²) ABS.	A.B. %	IVI ABS.	IVI %
Association *Attaleo butyraceae-Guaduetum angustifoliae*								
Guadua angustifolia	963	36,83	3	0,94	88788,92	15,78	53,55	17,85
Attalea butyracea	103	3,94	3	0,94	88991,84	15,82	20,7	6,9
Ficus insipida	11	0,42	3	0,94	74184,19	13,19	14,55	4,85
Spondias mombin	18	0,69	3	0,94	21431,44	3,81	5,44	1,81
Guatteria hirsuta	17	0,65	3	0,94	19051,87	3,39	4,98	1,66
Guarea guidonia	51	1,95	3	0,94	10061,97	1,79	4,68	1,56
Terminalia amazonia	3	0,11	1	0,31	23170,03	4,12	4,55	1,52
Bixa urucurana	70	2,68	2	0,63	6769,36	1,2	4,51	1,5
Erythrina fusca	14	0,54	2	0,63	17931,57	3,19	4,35	1,45
Notopleura macrophylla	45	1,72	2	0,63	9599,22	1,71	4,05	1,35
Protium crenatum	47	1,8	3	0,94	6007,08	1,07	3,81	1,27
Anacardium excelsum	7	0,27	2	0,63	16373,19	2,91	3,81	1,27
Acalypha diversifolia	66	2,52	3	0,94	1122,66	0,2	3,66	1,22
Pleurothyrium trianae	39	1,49	2	0,63	8451,11	1,5	3,62	1,21
Brosimum alicastrum	32	1,22	3	0,94	7723,1	1,37	3,54	1,18
Cecropia peltata	26	0,99	3	0,94	7398,88	1,32	3,25	1,08
Aiphanes horrida	32	1,22	3	0,94	5961,2	1,06	3,22	1,07
Subtotal	**1544**	**59,04**	**44**	**13,79**	**413017,65**	**73,41**	**146,25**	**48,75**
Other taxa: 197 especies	1071	40,96	275	86,21	149563,16	26,59	153,75	51,25
Total	**2615**	**100**	**319**	**100**	**562580,81**	**100**	**300**	**100**
Association *Attaleo butyraceae-Rudgeetum crassilobae*								
Rudgea crassiloba	136	15,91	4	2,12	12972,17	5,61	23,63	7,88
Attalea butyracea	23	2,69	5	2,65	23874,69	10,32	15,65	5,22
Xylopia aromatica	30	3,51	3	1,59	16604,61	7,18	12,27	4,09
Protium heptaphyllum	49	5,73	5	2,65	5191,16	2,24	10,62	3,54
Deguelia picta	8	0,94	2	1,06	18493,92	7,99	9,99	3,33
Guarea guidonia	19	2,22	3	1,59	11571,41	5	8,81	2,94
Didymopanax morototoni	17	1,99	4	2,12	9376,7	4,05	8,16	2,72
Oenocarpus mapora	38	4,44	2	1,06	2112,33	0,91	6,42	2,14
Pochota fendleri	3	0,35	1	0,53	11949,62	5,16	6,04	2,01
Astronium graveolens	8	0,94	3	1,59	7953,15	3,44	5,96	1,99
Hymenaea courbaril	4	0,47	2	1,06	8714,63	3,77	5,29	1,76
Spondias mombin	5	0,58	2	1,06	8078,15	3,49	5,13	1,71
Pradosia caracasana	6	0,7	1	0,53	8611,84	3,72	4,95	1,65
Zanthoxylum caribaeum	6	0,7	1	0,53	7834,51	3,39	4,62	1,54
Myrcia splendens	26	3,04	2	1,06	770,09	0,33	4,43	1,48
Protium tenuifolium	19	2,22	3	1,59	1062,44	0,46	4,27	1,42
Subtotal	**397**	**46,43**	**43**	**22,79**	**155171,42**	**67,06**	**136,24**	**45,42**
Other taxa: 118 especies	458	53,57	146	77,21	76211,76	32,94	163,76	54,58
Total	**855**	**100**	**189**	**100**	**231383,18**	**100**	**300**	**100**
Association *Protio heptaphylli-Euterpetum precatoriae*								
Attalea maripa	24	9,52	1	1,56	17208,13	13,36	24,44	8,15
Macrolobium acaciifolium	11	4,37	1	1,56	21127,75	16,4	22,33	7,44
Alchornea glandulosa	10	3,97	1	1,56	14728,06	11,43	16,96	5,65
Maquira coriacea	27	10,71	1	1,56	5534,89	4,3	16,57	5,52
Abarema jupumba	14	5,56	1	1,56	11528,72	8,95	16,07	5,36
Leptobalanus apetalus	7	2,78	1	1,56	8668,86	6,73	11,07	3,69
Jacaranda obtusifolia	12	4,76	2	3,13	2311,24	1,79	9,68	3,23
Inga ingoides	12	4,76	2	3,13	2300,19	1,79	9,67	3,22
Guarea guidonia	9	3,57	1	1,56	3409,98	2,65	7,78	2,59
Euterpe precatoria	8	3,17	2	3,13	1809,72	1,4	7,7	2,57
Vismia macrophylla	6	2,38	1	1,56	2970,95	2,31	6,25	2,08
Protium heptaphyllum	3	1,19	3	4,69	207,24	0,16	6,04	2,01
Ceiba pentandra	1	0,4	1	1,56	4899,19	3,8	5,76	1,92
Lonchocarpus hedyosmus	8	3,17	1	1,56	1206,81	0,94	5,67	1,89
Sapium glandulosum	3	1,19	1	1,56	3723,6	2,89	5,64	1,88
Subtotal	**155**	**61,5**	**20**	**31,24**	**101635,33**	**78,9**	**171,63**	**57,2**
Other taxa: 42 especies	97	38,48	44	68,75	27182,14	21,1	128,35	42,78
Total	**252**	**100**	**64**	**100**	**128817,47**	**100**	**300**	**100**

Appendix I cont.

Importance Value Index (IVI) by species.

Species	Ind.	Ind. %	Frec. Abs.	Frec. %	A.B.(cm²) Abs.	A.B. %	IVI Abs.	IVI %
Association *Ingo verae-Anacardietum excelsi*								
Anacardium excelsum	37	2,07	9	2,49	138447,51	32,55	37,11	12,37
Leptobalanus apetalus	117	6,55	4	1,1	56562,93	13,3	20,95	6,98
Ardisia foetida	116	6,49	9	2,49	4379,1	1,03	10,01	3,34
Annona purpurea	31	1,73	5	1,38	24509,07	5,76	8,88	2,96
Cecropia peltata	54	3,02	7	1,93	6579,98	1,55	6,5	2,17
Croton fragrans	88	4,92	3	0,83	1306,74	0,31	6,06	2,02
Acalypha diversifolia	84	4,7	4	1,1	1044,8	0,25	6,05	2,02
Ormosia macrocalyx	21	1,18	4	1,1	15883,73	3,73	6,01	2
Inga vera	37	2,07	9	2,49	4242,98	1	5,55	1,85
Neea ovalifolia	29	1,62	6	1,66	8083,11	1,9	5,18	1,73
Allophyllus racemosus	51	2,85	6	1,66	1331,63	0,31	4,82	1,61
Cupania americana	27	1,51	8	2,21	4055,1	0,95	4,67	1,56
Melicoccus bijugatus	44	2,46	3	0,83	4396,55	1,03	4,32	1,44
Combretum fruticosum	57	3,19	3	0,83	870,77	0,2	4,22	1,41
Pradosia caracasana	11	0,62	2	0,55	12316,61	2,9	4,06	1,35
Bactris major	54	3,02	3	0,83	795,32	0,19	4,04	1,35
Vitex compressa	16	0,9	5	1,38	7373,2	1,73	4,01	1,34
Subtotal	**874**	**48,91**	**90**	**24,86**	**292179,16**	**68,69**	**142,46**	**47,49**
Other taxa: 159 especies	913	51,09	272	75,14	133167,09	31,31	157,54	52,51
Total	**1787**	**100**	**362**	**100**	**425346,25**	**100**	**300**	**100**
Association *Vochysio lehmanni-Protietum heptaphylli*								
Protium stevensonii	355	11,66	4	1,02	29517,22	7,55	20,22	6,74
Protium heptaphyllum	348	11,43	10	2,54	21107,42	5,4	19,37	6,46
Protium tenuifolium	297	9,75	6	1,53	22277,02	5,7	16,98	5,66
Vochysia lehmannii	126	4,14	8	2,04	31464,88	8,05	14,22	4,74
Cassia moschata	22	0,72	7	1,78	31189,01	7,98	10,48	3,49
Xylopia aromatica	50	1,64	8	2,04	16852,45	4,31	7,99	2,66
Cecropia peltata	69	2,27	7	1,78	13580,15	3,47	7,52	2,51
Cupania americana	83	2,73	10	2,54	6383,29	1,63	6,9	2,3
Uniostium velutinifolium	20	0,66	4	1,02	19880,44	5,08	6,76	2,25
Guarea guidonia	52	1,71	5	1,27	10445,61	2,67	5,65	1,88
Mabea occidentalis	62	2,04	5	1,27	8350,69	2,14	5,44	1,81
Croton fragrans	129	4,24	2	0,51	2634,52	0,67	5,42	1,81
Clitoria dendrina	56	1,84	8	2,04	4496,55	1,15	5,02	1,67
Didymopanax morototoni	11	0,36	8	2,04	7716,85	1,97	4,37	1,46
Genipa americana	32	1,05	7	1,78	5527,2	1,41	4,25	1,42
Subtotal	**1712**	**56,22**	**99**	**25,19**	**231423,3**	**59,18**	**140,6**	**46,87**
Other taxa: 160 especies	1333	43,78	294	74,81	159609,12	40,82	159,4	53,13
Total	**3045**	**100**	**393**	**100**	**391032,43**	**100**	**300**	**100**
Association *Eschweilero subglandulosae-Protietum heptaphylli*								
Ceiba pentandra	1	0,1	1	0,73	119398,5	39,14	39,97	13,32
Protium heptaphyllum	200	20	4	2,92	25890,96	8,49	31,41	10,47
Virola elongata	138	13,8	3	2,19	33015,81	10,82	26,81	8,94
Tabebuia insignis	69	6,9	3	2,19	7666,34	2,51	11,6	3,87
Tapirira guianensis	46	4,6	3	2,19	7578,78	2,48	9,27	3,09
Hura crepitans	2	0,2	1	0,73	24570,5	8,05	8,98	2,99
Mauritia flexuosa	12	1,2	3	2,19	10283,19	3,37	6,76	2,25
Symphonia globulifera	33	3,3	3	2,19	2685,34	0,88	6,37	2,12
Eschweilera subglandulosa	18	1,8	4	2,92	4663,21	1,53	6,25	2,08
Cecropia peltata	33	3,3	3	2,19	1398,05	0,46	5,95	1,98
Calophyllum brasiliense	19	1,9	3	2,19	5509,45	1,81	5,9	1,97
Chrysobalanus icaco	29	2,9	3	2,19	1814,01	0,59	5,68	1,89
Brownea coccinea	22	2,2	1	0,73	6865,51	2,25	5,18	1,73
Montrichardia arborescens	32	3,2	2	1,46	494,19	0,16	4,82	1,61
Ormosia coccinea	24	2,4	1	0,73	2959,62	0,97	4,1	1,37
Subtotal	**678**	**67,8**	**38**	**27,74**	**254793,47**	**83,53**	**179,06**	**59,69**
Other taxa: 73 especies	322	32,2	99	72,26	50255,26	16,47	120,94	40,31
Total	**1000**	**100**	**137**	**100**	**305048,73**	**100**	**300**	**100**

APPENDIX I CONT.

Importance Value Index (IVI) by species.

SPECIES	IND.	IND. %	FREC. ABS.	FREC. %	A.B.(CM²) ABS.	A.B. %	IVI ABS.	IVI %
Association *Huro crepitantis-Guaduetum angustifoliae*								
Hura crepitans	30	2,81	6	2,43	80151,27	14,54	19,79	6,6
Spondias mombin	44	4,13	7	2,83	63132,1	11,46	18,42	6,14
Guazuma ulmifolia	89	8,35	8	3,24	26504,92	4,81	16,4	5,47
Ruprechtia cruegeri	20	1,88	1	0,4	53211,23	9,66	11,94	3,98
Coccoloba latifolia	78	7,32	5	2,02	11092,33	2,01	11,35	3,78
Guadua angustifolia	78	7,32	6	2,43	7842,49	1,42	11,17	3,72
Tabebuia rosea	18	1,69	6	2,43	29731,71	5,39	9,51	3,17
Erythrina fusca	7	0,66	4	1,62	31539,52	5,72	8	2,67
Ceiba pentandra	10	0,94	8	3,24	19357,44	3,51	7,69	2,56
Pterocarpus acapulcensis	18	1,69	2	0,81	20696,91	3,76	6,25	2,08
Casearia guianensis	26	2,44	4	1,62	6588,34	1,2	5,25	1,75
Samanea saman	4	0,38	2	0,81	22050,04	4	5,19	1,73
Cecropia peltata	26	2,44	2	0,81	8356,69	1,52	4,77	1,59
Inga ingoides	17	1,59	4	1,62	8471,81	1,54	4,75	1,58
Pithecellobium lanceolatum	20	1,88	1	0,4	12647,52	2,29	4,58	1,53
Trichilia martiana	19	1,78	5	2,02	3098,47	0,56	4,37	1,46
Subtotal	**504**	**47,3**	**71**	**28,73**	**404472,79**	**73,39**	**149,43**	**49,81**
Other taxa: 109 especies	562	52,72	176	71,24	146633,3	26,6	150,58	50,19
Total	**1066**	**100**	**247**	**100**	**551106,105**	**100**	**300**	**100**
Association *Ingo interruptae-Pterocarpetum acapulcensis*								
Guazuma ulmifolia	119	8,04	7	2,94	25065,48	7,68	18,67	6,22
Spondias mombin	63	4,26	5	2,1	37907,84	11,62	17,98	5,99
Pterocarpus acapulcensis	62	4,19	5	2,1	26192,92	8,03	14,32	4,77
Pithecellobium lanceolatum	63	4,26	4	1,68	20912,5	6,41	12,35	4,12
Sapium glandulosum	52	3,51	5	2,1	15032,42	4,61	10,22	3,41
Cochlospermum vitifolium	52	3,51	6	2,52	9645,66	2,96	8,99	3
Bravaisia integerrima	64	4,32	2	0,84	11531,32	3,53	8,7	2,9
Erythrina fusca	15	1,01	2	0,84	19984,18	6,13	7,98	2,66
Ruprechtia ramiflora	28	1,89	4	1,68	11738,9	3,6	7,17	2,39
Allophylus racemosus	78	5,27	1	0,42	2255,87	0,69	6,38	2,13
Inga interrupta	24	1,62	5	2,1	6028,39	1,85	5,57	1,86
Deguelia picta	35	2,36	5	2,1	2805,26	0,86	5,33	1,78
Ceiba pentandra	9	0,61	5	2,1	7414,69	2,27	4,98	1,66
Coccoloba caracasana	31	2,09	5	2,1	2010,96	0,62	4,81	1,6
Uniostium velutinifolium	16	1,08	1	0,42	9502,86	2,91	4,41	1,47
Machaerium robiinifolium	38	2,57	3	1,26	1851,73	0,57	4,4	1,47
Subtotal	**749**	**50,59**	**65**	**27,3**	**209880,98**	**64,34**	**142,26**	**47,43**
Other taxa: 115 especies	731	49,39	173	72,69	116346,88	35,67	157,74	52,57
Total	**1480**	**100**	**238**	**100**	**326227,84**	**100**	**300**	**100**
Association *Spondiado mombinis-Trichilietum pallidae*								
Attalea maripa	32	6,02	1	0,66	21809,69	18,41	25,09	8,36
Casearia guianensis	93	17,48	3	1,99	5362,67	4,53	24	8
Spondias mombin	7	1,32	5	3,31	13709,37	11,58	16,2	5,4
Coccoloba latifolia	55	10,34	3	1,99	4461,86	3,77	16,09	5,36
Deguelia utilis	30	5,64	1	0,66	3633,84	3,07	9,37	3,12
Guazuma ulmifolia	12	2,26	4	2,65	2905,11	2,45	7,36	2,45
Neea spruceana	8	1,5	4	2,65	3259,99	2,75	6,91	2,3
Vismia cayennensis	18	3,38	2	1,32	2461,4	2,08	6,79	2,26
Casearia aculeata	17	3,2	4	2,65	875,34	0,74	6,58	2,19
Cupania americana	16	3,01	4	2,65	1037,93	0,88	6,53	2,18
Tanaecium tetragonolobum	9	1,69	5	3,31	1624,77	1,37	6,37	2,12
Hymenaea courbaril	5	0,94	3	1,99	3370,63	2,85	5,77	1,92
Trichilia pallida	9	1,69	5	3,31	620,76	0,52	5,53	1,84
Lonchocarpus hedyosmus	9	1,69	3	1,99	2072,19	1,75	5,43	1,81
Copaifera officinalis	3	0,56	1	0,66	4718,14	3,98	5,21	1,74
Couroupita guianensis	1	0,19	1	0,66	4417,86	3,73	4,58	1,53
Trichilia martiana	9	1,69	4	2,65	234,09	0,2	4,54	1,51
Genipa americana	6	1,13	4	2,65	790,01	0,67	4,44	1,48
Cordia collococca	6	1,13	1	0,66	3078,28	2,6	4,39	1,46
Subtotal	**345**	**64,85**	**58**	**38,41**	**80443,93**	**67,92**	**171,18**	**57,06**
Other taxa: 73 especies	187	35,15	93	61,59	37994,26	32,08	128,82	42,94
Total	**532**	**100**	**151**	**100**	**118438,19**	**100**	**300**	**100**

APPENDIX I CONT.

Importance Value Index (IVI) by species.

SPECIES	IND.	IND. %	FREC. ABS.	FREC. %	A.B.(CM²) ABS.	A.B. %	IVI ABS.	IVI %
***Anacardium excelsum and Guazuma ulmifolia* forest community**								
Guadua sp.	129	52,23	1	3,45	3098,4	6,03	61,7	20,57
Anacardium excelsum	4	1,62	1	3,45	28138,33	54,73	59,8	19,93
Guazuma ulmifolia	33	13,36	2	6,9	7700,12	14,98	35,23	11,74
Annona purpurea	13	5,26	1	3,45	5137,49	9,99	18,7	6,23
Astronium graveolens	1	0,4	1	3,45	3245,57	6,31	10,17	3,39
Coccoloba caracasana	6	2,43	2	6,9	244,72	0,48	9,8	3,27
Cecropia peltata	4	1,62	2	6,9	406,15	0,79	9,31	3,1
Deguelia picta	11	4,45	1	3,45	403,69	0,79	8,69	2,9
Bactris major	7	2,83	1	3,45	87,31	0,17	6,45	2,15
Subtotal	**208**	**84,2**	**12**	**41,4**	**48461,78**	**94,27**	**219,85**	**73,28**
Other taxa: 16 especies	39	15,8	17	58,6	2953,43	5,73	80,15	26,72
Total	**247**	**100**	**29**	**100**	**51415,21**	**100**	**300**	**100**
***Connarus araucanus and Eugenia punicifolia* forest community**								
Strychnos fendleri	82	21,69	1	2,04	2614,27	6,18	29,92	9,97
Hymenaea courbaril	11	2,91	1	2,04	5888,36	13,93	18,88	6,29
Senegalia polyphylla	15	3,97	1	2,04	4071,4	9,63	15,64	5,21
Copaifera officinalis	2	0,53	1	2,04	5080,43	12,02	14,59	4,86
Deguelia picta	27	7,14	1	2,04	1894,24	4,48	13,66	4,55
Uniostium velutinifolium	11	2,91	1	2,04	3138,92	7,42	12,38	4,13
Cupania latifolia	26	6,88	1	2,04	967,39	2,29	11,21	3,74
Vitex capitata	7	1,85	1	2,04	2980,44	7,05	10,94	3,65
Eugenia cribata	29	7,67	1	2,04	431,15	1,02	10,73	3,58
Eugenia punicifolia	16	4,23	2	4,08	726,91	1,72	10,03	3,34
Connarus araucanus	17	4,5	2	4,08	582,03	1,38	9,96	3,32
Lonchocarpus violaceus	13	3,44	1	2,04	1545,67	3,66	9,14	3,05
Coursetia ferruginea	18	4,76	1	2,04	442,14	1,05	7,85	2,62
Casearia ulmifolia	15	3,97	1	2,04	681,69	1,61	7,62	2,54
Tabebuia rosea	2	0,53	1	2,04	1986,21	4,7	7,27	2,42
Subtotal	**291**	**76,98**	**17**	**34,68**	**33031,25**	**78,14**	**189,82**	**63,27**
Other taxa: 32 especies	87	23,01	32	65,3	9248,7	21,88	110,19	36,74
Total	**378**	**100**	**49**	**100**	**42279,97**	**100**	**300**	**100**
Association *Homalolepidis cedrontis-Guareetum guidoniae*								
Guarea guidonia	49	23,11	3	4,48	20531,64	20,01	47,6	15,87
Tapirira guianensis	18	8,49	1	1,49	7916,52	7,71	17,7	5,9
Homalolepis cedron	10	4,72	4	5,97	4754,6	4,63	15,32	5,11
Ficus maxima	3	1,42	3	4,48	8504,76	8,29	14,18	4,73
Zygia latifolia	11	5,19	2	2,99	3338,16	3,25	11,43	3,81
Tabebuia rosea	4	1,89	4	5,97	3539,99	3,45	11,31	3,77
Xylopia aromatica	10	4,72	1	1,49	3895,46	3,8	10,01	3,34
Virola sebifera	4	1,89	1	1,49	6315,72	6,15	9,53	3,18
Didymopanax morototoni	5	2,36	3	4,48	1986,14	1,94	8,77	2,92
Spondias mombin	2	0,94	1	1,49	5863,04	5,71	8,15	2,72
Protium heptaphyllum	5	2,36	3	4,48	1296,62	1,26	8,1	2,7
Sapium glandulosum	4	1,89	2	2,99	1892,15	1,84	6,72	2,24
Annona fendleri	7	3,3	1	1,49	1284,39	1,25	6,05	2,02
Pterocarpus acapulcensis	4	1,89	1	1,49	2661,06	2,59	5,97	1,99
Ocotea aurantiodora	5	2,36	1	1,49	1905,48	1,86	5,71	1,9
Subtotal	**141**	**66,53**	**31**	**46,27**	**75685,73**	**73,74**	**186,55**	**62,2**
Other taxa: 32 especies	71	33,47	36	53,73	26942,36	26,26	113,45	37,8
Total	**212**	**100**	**67**	**100**	**102628,09**	**100**	**300**	**100**

APPENDIX II

Floristic composition of *Protio heptaphylli-Euterpetum precatoriae* association **(A)** and *Cassia moschata* and *Chomelia spinosa* forest **(B)**

A. *Protio heptaphylli-Euterpetum precatoriae* association

PLOT AYMARD 2012	23	33	45
SURFACE PLOT (M²):	1000	1000	1000
ALTITUDE (M):	110	20	188
	Relative density (%)		
Class *Guazumo ulmifoliae-Spondiadetea mombinis* and Order *Cupanio americanae -Protietalia heptaphylli*			
Cupania americana		3,4	
Guarea guidonia			13
Spondias mombin		3,4	
Tapirira guianensis		4,5	
Sapium glandulosum			4,3
Tabebuia rosea		1,1	
Annona montana	1,1		
Ceiba pentandra	1,1		
Guazuma ulmifolia		1,1	
Cecropia peltata		1,1	
Didymopanax morototoni			1,4
Cordia alliodora			1,4
Alliance undefined			
Protio heptaphylli-Euterpetum precatoriae			
Protium heptaphyllum	1,1	1,1	1,4
Euterpe precatoria		4,5	5,8
Conceveibum cordatum		1,1	1,4
Inga ingoides	11,6	1,1	
Jacaranda obtusifolia	9,5	3,4	
Tanaecium tetragonolobum	2,1	3,4	
Species number	20	30	14

Other species present:
Maquira coriacea (23/28,42), *Macrolobium acaciifolium* (23/11,58), *Lonchocarpus hedyosmus* (23/8,42), *Leptobalanus apetalus* (23/7,37), *Cordia collococca* (23/3,16), *Ormosia paraensis* (23/2,11), *Stryphnodendron guianense* (23/2,11), *Stylogyne micrantha* (23/1,05), *Coccoloba latifolia* (23/1,05), *Desmoncus orthacanthos* (23/1,05), *Seguieria macrophylla* (23/1,05), *Dalbergia monetaria* (23/1,05), *Cochlospermum orinocense* (33/6,82), *Cordia panamensis* (33/4,55), *Astrocaryum aculeatum* (33/3,41), *Brownea coccinea* (33/3,41), *Virola surinamensis* (33/2,27), *Ischnosiphon arouma* (33/2,27), *Trichilia martiana* (33/1,14), *Parinari campestris* (33/1,14), *Machaerium inundatum* (33/1,14), *Manilkara bidentata* (33/1,14), *Jupunba trapezifolia* (45/20,29), *Alchornea glandulosa* (45/14,49), *Oenocarpus bataua* (45/11,59), *Vismia macrophylla* (45/8,7), *Miconia trinervia* (45/7,25), *Hernandia guianensis* (45/4,35), *Fridericia* sp. (23/1,05), *Pouteria* sp. (33/3,41), *Ficus maxima* (45/4,35), *Chrysophyllum* (33/1,14), *Bixa urucurana* (33/2,27), *Virola elongata* (23/4,21), *Attalea maripa* (33/27,27), *Trichilia pallida* (33/2,27), *Calathea lutea* (33/4,55), *Xylopia discreta* (33/1,14), *Pachira aquatica* (33/1,14).

APPENDIX II CONT.

B. *Cassia moschata* and *Chomelia spinosa* forest

PLOT	Gentry, 1980
SURFACE OF PLOT. (M^2):	1000
ALTITUDE (M).	110
	Relative density (%)
Class *Guazumo ulmifoliae-Spondiadetea mombinis*	
Spondias mombin	2,7
Cochlospermum vitifolium	5,3
Guazuma ulmifolia	1,3
Guettarda divaricata	6,7
Jacaranda obtusifolia	1,3
Luehea candida	4,0
Annona jahnii	6,7
Fridericia mollissima	2,7
Order *Cupanio americanae-Protietalia heptaphylli*	
Cupania americana	1,3
Allophylus racemosus	5,3
Casearia sylvestris	2,7
Handroanthus chrysanthus	1,3
Ouratea guildingii	1,3
Fridericia oxycarpa	4,0
Alliance *Xylopio aromaticae-Protion heptaphylli*	
Xylopia aromatica	1,3
Genipa americana	1,3
Cassia moschata	6,7
Xylophragma seemannianum	1,3
Cassia moschata -Chomelia spinosa forest	
Chomelia spinosa	6,7
Lonchocarpus macrocarpus	4
Pleonotoma clematis	4
Byrsonima crassifolia	2,7
Copaifera officinalis	2,7
Eugenia biflora	2,7
Erythroxylum orinocense	2,7
Bowdichia virgilioides	1,3
Casearia decandra	1,3
Connarus araucanus	1,3
Godmania aesculifolia	1,3
Guapira pacurero	1,3
Leuenbergeria (Pereskia) guamacho	1,3
Passiflora serrulata	1,3
Pterocarpus rohrii	1,3
Randia aculeata	1,3
Securidaca diversifolia	1,3
Senegalia polyphylla	1,3
Vochysia venezuelana	1,3
Xylosma benthamii	1,3
Species number	38