# Name of the xerophytic communities of the Ciénaga de La Palmita, Zulia state, Venezuela

## Denominación de las comunidades xerófilas de la Ciénaga de La Palmita, estado Zulia, Venezuela

## Denominação das comunidades xéricas da Ciénaga de La Palmita, estado Zulia, Venezuela

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## Abstract

The designation of deciduous thorny xerophytic shrublands is proposed for the plant communities xerophytic of the Ciénaga de La Palmita, Zulia state, Venezuela. The research was carried out in two areas: the southern sector of the xerophytic forest and the xerophytic enclave of the isleta El Hicacal of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros.Tours, field explorations and collection of botanical samples were carried out (september 2019-february 2020) during the dry and rainy periods, and emphasis was placed on floristics, life habits and average height of individuals. The predominant biotype was the arboreal one and presented an average height of 6.5 and 7.9 m (low height) for each area respectively, thus designating the term shrublands. The xerophytic and thorny traits were present in the families with the highest number of species (Cactaceae, Euphorbiaceae, Fabaceae and Poaceae), highlighting leafless species, with aquiferous parenchyma, photosynthetic stem, thick leaf cuticles, compound leaves, thorns, spines and underground organs, giving them the qualifiers xerophilous and thorny. The term deciduous resulted from the high variety of deciduous species compared to the reports made for other communities in arid and semiarid areas of the country. The denomination of deciduous thorny xerophytic shrublands constitutes a new denomination for the studied area, appropriate to be included in the Planning and Use Regulation Plan (PORU) of said biotic space and provides precise guidance on the administration and management of the natural plant resources of this Area Under Special Administration Regime (ABRAE).

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## Resumen

Se propone la denominación de arbustales xerófilos espinosos deciduos para las comunidades xerófilas de la Ciénaga de La Palmita, estado Zulia, Venezuela. La investigación se desarrolló en dos zonas: el sector sur del bosque xerófilo y el enclave xerófito de la isleta El Hicacal de la Reserva de Fauna Silvestre Ciénaga de La Palmita e Isla de Pájaros. Se realizaron recorridos, exploraciones de campo y recolecta de muestras botánicas (septiembre 2019-febrero 2020) en los periodos seco y lluvioso, y se enfatizó en la florística, hábitos de vida y altura media de los individuos. El biotipo predominante fue el arbóreo y presentó una altura media de 6,5 y 7,9 m (porte bajo) para cada zona respectivamente, designándose así el término arbustales. Los rasgos de xerofitismo y de espinas se presentaron en las familias con mayor número de especies (Cactaceae, Euphorbiaceae, Fabaceae y Poaceae), destacando especies áfilas, con parénquima acuífero, tallo fotosintético, cutículas foliares gruesas, hojas compuestas, aguijones, espinas y órganos subterráneos, adjudicándoles los calificativos xerófilo y espinoso. El vocablo deciduo resultó de la alta variedad de especies caducifolias en comparación con los reportes realizados para otras comunidades de zonas áridas y semiáridas del país. La denominación de arbustales xerófilos espinosos deciduos, constituye una denominación nueva para la zona estudiada, apropiada para ser incluida en el Plan de Ordenamiento y Reglamento de Uso (PORU) de dicho espacio biótico y brinda orientación precisa sobre la administración y el manejo de los recursos naturales vegetales de esta Área Bajo Régimen de Administración Especial (ABRAE).

**Palabras clave**: área bajo régimen de administración especial, bosque muy seco tropical, formaciones xerófilas, reserva de fauna silvestre, zonas áridas y semiáridas.

## Resumo

O nome de arbustos xéricos decíduos espinhosos é proposto para as comunidades xéricas de Ciénaga de La Palmita, estado de Zulia, Venezuela. A pesquisa foi realizada em duas áreas: o setor sul da floresta xérica e o enclave xerófito do ilhéu El Hicacal da Reserva Natural Ciénaga de La Palmita e Isla de Pájaros. Foram realizados passeios, explorações de campo e coleta de amostras botânicas (setembro de 2019 a fevereiro de 2020) nos períodos seco e chuvoso, com ênfase na florística, hábitos de vida e altura média dos indivíduos. O biótipo predominante foi arbóreo e apresentava altura média de 6,5 e 7,9 m (baixo crescimento) para cada zona respectivamente, designando assim o termo arbustos. Os traços xerofíticos e espinhosos estiveram presentes nas famílias com maior número de espécies (Cactaceae, Euphorbiaceae, Fabaceae e Poaceae), destacando-se espécies de bordas pontiagudas, com parênquima aquoso, caule fotossintético, cutículas foliares grossas, folhas compostas, ferrões, espinhos e órgãos subterrâneos, dando-lhes os nomes de xerófilos e espinhosos. A palavra caducifólia resultou da grande variedade de espécies caducifólias em comparação com relatos feitos para outras comunidades em áreas áridas e semiáridas do país. A denominação de arbustos xerófilos caducifólios espinhosos constitui uma nova denominação para a área estudada, adequada para ser incluída no Plano de Ordenamento e Regulamento de Uso (PORU) do referido espaço biótico e fornece orientações precisas sobre a administração e manejo dos recursos vegetais naturais do mesmo. esta Área em Regime de Administração Especial (ABRAE).

**Palavras-chave:** áreas sob regime de administração especial, floresta tropical muito seca, comunidades xéricas, reserva de vida silvestre, zonas áridas e semiáridas.

## Introduction

The vegetation found in each geographic area or zone responds to the climatic, soil, chemical, physical, physiographic, altitude, gradient conditions and factors, among other parameters, which precisely influence and determine its presence in that environment or ecosystem. Likewise, the plant communities also correspond to the attributes and traits of the predominant biotype or growth habit, which provides arguments and support for the identification of such communities.

The arid zones of Venezuela are located in four geographic regions, namely: along the Venezuelan coast from La Guajira to the Gulf of Cariaco, in the Barquisimeto plateau, in the arid mesas of the Andes and in the Caribbean islands of the country. This is about 4,200,000 ha distributed in 11 governmental entities, of which 75 % of its surface corresponds to the states of Falcón, Lara and Zulia (Alvarado *et al*., 2015).

In addition, the arid zones of the Venezuelan territory are exposed to an incidence almost perpendicular to solar radiation, high temperatures and water deficit, coupled with a great geographical variety and a wide range of ecological niches (FAO and MINEC, 2023). All these factors make these ecosystems one of the most unfavorable for the development of plant communities in the country; however, they have a varied floristic richness and are highly threatened (Ewel and Madriz, 1968; Llamozas *et al*., 2003; Hokche *et al*., 2008; Rodríguez *et al*., 2010; Huérfano *et al*., 2020).

In the arid and semi-arid areas of Venezuela, xerophytic vegetation predominates and the plant communities have received various names such as: xerophytic forests and xerophytic savannas, Zulia state (González, 1980; Zambrano, 1994), xerophytic scrublands, Falcón state (Silva and Espinoza, 1995), thorny shrublands, in different states of the Venezuelan territory (Huber and Oliveira-Miranda, 2010), thorny semiarid ecosystems, Lara state (Alvarado *et al*., 2015), xerophytic enclave, Mérida state (Aranguren *et al*., 2015), coastal thorny scrublands, Vargas state (currently La Guaira) (Ponce-Calderón *et al*., 2016), premontane thorny woodland and lower montane thorny steppe, Mérida state (La Marca and Contreras, 2019), xerophytic shrublands, Sucre state and Federal Dependency La Tortuga Island (Bello and Barrios, 2019; Véliz *et al*., 2021), plant communities of very dry tropical forest, Zulia state (Rivera *et al*., 2022), tropical thorny scrublands, Zulia state (FAO and MINEC, 2023) among others.

Each of these different nomenclatures obey diverse scientific-technical arguments and reasons, and derived in part from the space-time context of the community. The names also respond to the characteristics of each of these biotic spaces, and it is also important to make them known to the scientific community in order to have a precise and as concrete identification as possible of the plant community considered.

Despite the above argument, the term thorny shrublands has been given to these plant communities in arid and semi-arid areas of the country, according to the representation of the plant formations of Venezuela prepared by Huber and Oliveira-Miranda (2010). However, the need to have a classification, cataloging and typification of such communities on a smaller scale, taking into account the various

climatic, physiographic and spatial conditions of each particular region or locality of the national territory, is highlighted.

The Ciénaga de La Palmita is a heterogeneous biotic space located on the eastern coast of the Strait of Lake Maracaibo, Zulia state, Venezuela. It covers an area of 2,525.85 ha and was declared an Area Under Special Administration Regime (Área Bajo Régimen de Administración Especial; ABRAE) under the designation of Wildlife Fauna Reservoir (Reserva de Fauna Silvestre; RFS) on March 9, 2000. The objective of this decree was to conserve the habitat of numerous species of birds, species of hunting interest and in danger of extinction (Gaceta Oficial de la República Bolivariana de Venezuela, 2000).

However, the Ciénaga de La Palmita is currently exposed to stress agents and anthropogenic disturbances that significantly threaten the plant communities that comprise it (Vera, 2022); despite being legally protected and safeguarded by the Venezuelan state (Gaceta Oficial de la República Bolivariana de Venezuela, 2000).

In this ABRAE there is vegetation adapted to the semi-arid conditions of the area, known in a very general way as a xerophytic forest of 1,352.5 ha, which has not been characterized nor is there knowledge about the technical-scientific nomenclature referring to its identification. Only some names have been indicated to designate such plant communities based on the calculations of the Normalized Difference Vegetation Index (NDVI) and the landscape units determined by Vera *et al*. (2020a). However, the precise designation of an appropriate name for the xerophytic plant communities under study has not yet been presented.

The objective of this research was to propose the name of the xerophytic plant communities of the Ciénaga de La Palmita, Zulia state, Venezuela.

## Materials and methods

The research was carried out in a first area located in the southern sector of the xerophytic forest of the ciénega (10° 35’ 46.0’’ N and 71° 30’ 09.0’’ W) made up of xerophytic plant communities intervened according to Vera et al. (2020a) (figure 1) while the second study area corresponded to a small xerophytic enclave (cacti-thorny forests and deciduous plant communities) of approximately 26 ha called El Hicacal islet (10º 36’ 53’’ N and 71º 29’ 42’’ W) (Vera *et al*., 2019) (figure 2).

**Figure 1. Deciduous xerophytic thorny shrublands in the southern sector of the xerophytic forest of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros.**

**Figure 2. Deciduous xerophytic thorny shrublands in the xerophytic enclave of the El Hicacal islet of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros.**

Both areas belong to the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros, Eastern Coast of the Strait of Lake Maracaibo, Zulia State, Venezuela; they are subject to semiarid conditions of very dry tropical forest according to Ewel and Madriz (1968), and they correspond to thorny shrublands according to the classification of plant communities in Venezuela by Huber and Oliveira-Miranda (2010). The average temperature of the study areas ranges between 27.8 and 28.3º C and precipitation from 400 to 500 mm with a bimodal rainfall pattern (Vera *et al*., 2010).

Field surveys and explorations were carried out from September 2019 to February 2020, covering the rainy and dry periods, and information was gathered on floristics, life habits, and average height of the species.

For the naming of plant communities, nomenclatural aspects related to the dominant life habit (biotype), plant xerophytic traits, leaf or stem structures (with thorns or prickles) and leaf renewal, i.e. deciduous species, were taken into consideration.

The taxonomic determination was made directly in the field, by consulting specialists such as Ángel Villarreal from the Universidad Nacional Experimental Rafael María Baralt (UNERMB) and Darisol Pacheco from the Universidad del Zulia (LUZ) and through comparison with material from the Omar Zambrano HERZU herbarium of the Faculty of Agronomy of the Universidad del Zulia; while for the designation of epithets the botanical nomenclature of the World Flora Online Plant List was used.

## Results and discussion

### Shrub character

The tree was the dominant life habit in the studied plant communities, with 45 % for the southern sector of the xerophytic forest, while herbs accounted for 31 %, shrubs 17 %, epiphytes 2.8 %, hemiparasites 2.8 % and sufrútices 1.4 %.

In relation to the communities of the xerophytic enclave of the El Hicacal islet, the tree biotype was 43.21 %, herbs occupied 31 %, shrubs 16.04 %, hemiparasites 3.7 %, sufrútices 2.46 %, epiphytes

1.23 %, stipes 1.23 % and climbers 1.23 %. All this showed that the tree biological type stood out in the plant architecture and the physical-spatial conformation of such community's plant.

The trees that identify the investigated plant communities had average heights of 6.5 m for the southern sector of the xerophytic forest and 7.9 m for the xerophytic enclave of the El Hicacal islet (Figures 1 and 2). These altimetric values gave them the character of low-growing trees or shrubs, which led to the use of the term shrublands.

The findings reported for the xerophytic communities of this wildlife fauna reservoir under study coincided with those described by Bello (2020), who designated the plant communities semiarid on the northern slope of the Araya Peninsula, Sucre state, Venezuela, as xerophytic shrublands. This last author based himself on the nomenclature proposed by Huber and Oliveira-Miranda (2010) and adjusted it to his work.

Furthermore, the definition of xerophytic shrublands indicated by Bello (2020) fully coincided with that referred to for the wildlife fauna reservoir investigated. This author stated that they are communities plant mainly made up of an upper tree-shrub stratum formed by woody species that do not exceed 6 m in height, with a sparse or semi-sparse canopy, because most of the species are aphyllous or have compound leaves, with very small leaflets and generally deciduous (legumes and cacti).

This particularity, in the structuring of vegetation, has also been reported as a generality for other dry forests from Venezuela, where it constitutes an important component in the characterization of their physiognomy (Silva and Espinoza, 1995; Alvarado *et al*., 2015; Aranguren *et al*., 2015; Ponce-Calderón *et al*., 2016; Jiménez *et al*., 2017; Bello and Barrios, 2019; La Marca and Contreras, 2019; Véliz *et al*., 2021; Rivera *et al*., 2022).

There is no doubt that the low height of the woody tree component, dominant in the xerophytic communities of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros, is due to the effect that, as a general rule, the limiting climatic-environmental factors (high solar radiation, high temperatures, low rainfall, high evapotranspiration demand, water deficit and generally oligotrophic soils) cause, such as a decrease in the metabolic performance of the growth and development of the plant species of such communities in arid and semi-arid zones of the country.

In addition, disturbances such as logging for timber, the use of space for population settlements (housing), for the creation of roads (routes for the transit of people) and routes for practicing BMX, for the development of agricultural practices (crops) and the implementation of livestock activities (cattle and goat grazing) present in the wildlife fauna reservoir investigated (Vera *et al*., 2019; Vera *et al*., 2021), have also obstructed the development of the successional process of such plant communities, causing them to currently be in the intermediate seral stage; therefore, they have not yet reached their mature climax stage in which the tree component becomes the dominant plant life form, reaching the highest values of height, growth, development and size.

In addition to the above, Bello *et al*. (2020a) have stated that the floristic and physiognomic aspects of the xerophytic shrublands of three geological outcrops at the western end of the Araya Peninsula, Venezuela, are conditioned by the edaphoclimatic adversities and anthropogenic disturbances to which they have been subjected; which has resulted in these plant communities being designated as xerophytic shrublands.

Therefore, the synergy between these two major factors could be considered as the cause responsible for the existence of these plant communities classified as shrublands.

**Xerophytic and thorny traits**

Other aspects considered in the nomenclature that defined the communities under study were plant xerophytism and the thorny trait of the representative floristic species.

In this sense, four families were found that together grouped the largest number of species inventoried for the plant communities under study. Of these, the Fabaceae family had 9 spp. for the communities of the southern area of the xerophytic forest of the swamp and 14 spp. for the xerophytic enclave of El Hicacal islet; while the Poaceae taxon grouped 9 spp. and 8 spp. for the same areas indicated respectively.

The rest of the Cactaceae and Euphorbiaceae families presented the same number of species for both areas under study, 7 spp. and 5 spp. respectively.

These four families grouped various species with xerophytic characteristics (adaptations to drought conditions) and some of them also showed the thorny trait through the presence of thorns and prickles as anatomical elements of armed plants (thorny). Both aspects, xerophytic and thorny, are indicators that identify the index or main taxa of the plant communities of arid and semiarid areas of the country.

In addition to the above, the designation of xerophytic savanna as a type of vegetation in the Venezuelan Guajira, Zulia state, reported by Zambrano (1994), stands out. The denomination of this name was made to an area of approximately 17,000 flat hectares, which constitute an edaphic association whose substrates are fine-clay textured soils.

These substrate conditions originated a vegetal cover where the herbaceous element predominates with the dominant species *Phyla nodiflora* L. Greene, associated with *Paspalum vaginatum* Sw. and with scattered shrub elements of the genera *Opuntia*, *Cereus* and *Prosopis*. It is also noteworthy that this xerophytic savannah is located between xerophytic thorny shrublands or tropical thorn bushes and halophilous and psammophilous coastal grasslands, which are different in structure, physiognomy and edaphological conditions (Zambrano, 1994).

Similarly, Alvarado *et al*. (2015) described the existence of xerophytic thorn forests (espinares) for the semi-arid vegetation in the surroundings of San Francisco, Lara state, made up of mostly armed plants, that is, with reduced, compound leaves such as *Parkinsonia praecox* (Ruiz & Pav.) Hawkins (syn. *Cercidium praecox*), *Mimosa arenosa* (Willd.) Poir. and *Neltuma juliflora* (Sw.) Raf. (syn. *Prosopis juliflora*) and columnar cacti of tree trunk, highlighting *Stenocereus griseus* (Haw.) Buxb. and *Cereus repandus* (L.) Mill. (syn. *Subpilocereus repandus*) and others with flattened stems such as *Opuntia caracasana* Salm-Dyck and *Cylindropuntia caribaea* (Britton & Rose) F.M. Knuth (syn. *Opuntia caribaea*) for the San Francisco station and the Santa Rosa sector, Torres municipality, Lara state, Venezuela.

In the present wildlife fauna reservoir work under investigation, species with a marked xerophytic attitude were found, that is, those with xeromorphic characteristics or morpho-anatomical features adapted to drought conditions, such as aphyllous species with leaves transformed into spines, reserve parenchyma (aquifer) and photosynthetic stem, such as the Cactaceae *Acanthocereus tetragonus* (L.) Hummelinck, *O. caracassana*, *S. griseu*s and *C. repandus*, among others.

Mesophyllous leaves, thick leaf cuticles, compound leaves segmented into pinnae or pinnules, thorns and spines on stems and branches (armed plants) were also recorded, such as the Fabaceae species *P. praecox*, *Chloroleucon mangense* (Jacq.) Britton & Rose, *Piptadenia retusa* (Jacq.) P.G. Ribeiro, Seigler & Ebinger (syn. *Piptadenia flava*), *Pithecellobium dulce* (Roxb.) Benth., *N. juliflora* and *Vachellia macracantha* (Humb. & Bonpl. ex Willd.) Seigler & Ebinger.

In addition, traits such as spines and/or mesophyllous leaves stood out in the Euphorbiaceae *Cnidoscolus urens* (L.) Arthur, *Jatropha gossypiifolia* L. and *Croton conduplicatus* Kunth while among the herbaceous taxa with xerophytism the Poaceae *Aristida* sp., *Axonopus* sp., *Cenchrus pilosus* Kunth, *Dactyloctenium aegyptium* (L.) Willd. and *Melinis repens* (Willd.) Zizka, which are adapted to oligotrophic soils (poor in nutrients), with underground organs (bulb stems and roots) resistant to drought, which accumulate reserve substances to produce new aerial biomass when the substrate is hydrated and water is incorporated into its tissues with the beginning of the rainy season.

The Fabaceae, Euphorbiaceae, Cactaceae and Poaceae families group species with xerophytic and thorny traits similar to those mentioned for the taxa in this research, and these have been reported for plant communities in arid and semiarid areas of Venezuela such as thorn forests in Lara (Alvarado *et al*., 2015), the xerophytic enclave in Mérida (Aranguren *et al*., 2015), coastal thorny scrublands in Vargas (currently La Guaira) (Ponce-Calderón *et al*., 2016), xerophytic shrublands, scrublands and xerophytic thorn forests in Sucre (Bello *et al*., 2014; Bello *et al*., 2016; Jiménez *et al*., 2017; Bello, 2018; Bello *et al*., 2020b), relicts of communities xerophytes and plant communities of very dry tropical forests in Zulia (Vera *et al*., 2020b; Rivera *et al*., 2022; Sánchez-Urdaneta *et al*., 2022).

All these adaptations and traits (anatomical, ecological, structural, physical, physiological and morphological) adopted by plant species that possess both their xeric character (plants adapted to dry environments) and their predominant trait of armed species (thorns and spines), have served as valuable and successful tools in their transition through evolutionary history. Therefore, the designation of these plant communities of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros as thorny xerophytic communities is very important and valid.

**Deciduous attribute**

The plant communities of the wildlife fauna reservoir under study, in addition to being made up of species with xerophytic and thorny traits, also presented plants with deciduous attributes, since they experienced loss of foliage during the drought period from December 2019 to February 2020. In these plant communities, a total of 20 deciduous species (7 shrubs and 13 trees) were inventoried: *Astronium graveolens* Jacq., *Bursera simaruba* (L.) Sarg., *Bursera tomentosa* (Jacq.) Triana & Planch., *C. conduplicatus*, *C. mangense*, *C. urens*, *Cochlospermum vitifolium* (Willd.) Spreng., *Gyrocarpus americanus* Jacq., *Handroanthus billbergii* (Bureau & K. Schum.) S.O.Grose., *J. gossypiifolia*, *Leuenbergeria guamacho* (F.A.C.Weber) Lodé (syn. *Pereskia guamacho*), *Malpighia glabra* L., *Manihot carthaginensis* (Jacq.) Müll.Arg., *P. dulce*, *P. retusa*, *Phyllostylon rhamnoides* (J. Poiss.) Taub., *Pseudobombax septenatum* (Jacq.) Dugand, *Randia obcordata* S.Watson (syn. *Randia gaumeri*), *Ruprechtia ramiflora* (Jacq.) C.A.Mey. and *Senegalia tamarindifolia* (L.) Britton & Rose.

This number of deciduous species was relatively higher than those recorded for other xerophytic communities in the Venezuelan geography, highlighting the xerophytic shrubland of Laguna de Caparú in the middle valley of the Chama River in San Juan de Lagunillas, Mérida state (Soriano *et al*., 1991) in which 4 deciduous species were inventoried: *Cordia curassavica* (Jacq.) Roem. & Schult., *C. conduplicatus*, *J. gossypiifolia* and *L. guamacho*.

Likewise, in the xerophytic shrubland of the town of Punta de Araya, in the northwestern of the Araya peninsula, Cruz Salmerón Acosta Municipality, Sucre state, the 7 deciduous species were reported: *Bursera karsteniana* Engl., *C. conduplicatus*, *C. urens*, *Heliotropium verdcourtii* Craven (syn. *Bourreria cumanensis*), *J. gossypiifolia*, *P. praecox* and *Pithecellobium unguis-cati* (L.) Benth. (Velásquez *et al*., 2012). Also five deciduous species *Mimosa arenosa* var. *leiocarpa* (DC.) Barneby, *Malpighia emarginata* DC., *H. verdcourtii*, *Plectrocarpa arborea* (Jacq.) Christenh. & Byng (syn. *Bulnesia arborea*) and *P. praecox* were reported in the xerophytic thorn forest of San Francisco, Torres Municipality, Lara State (Alvarado *et al*., 2015).

In another study, conducted by Bello *et al*. (2016), the 13 deciduous taxa *B. karsteniana*, *C. urens*, *H. verdcourtii*, *Handroanthus serratifolius* (Vahl) S.O.Grose (syn. *Tabebuia serratifolia*), *J. gossypiifolia*, *M. glabra*, *L. guamacho*, *P. praecox*, *P. retusa*, *P. unguis-cati*, *S. tamarindifolia*, *Senna atomaria* (L.) H.S. Irwin & Barneby and *Trema micranthum* (L.) Blume (syn. *Cordia alba*) were registered in the xerophytic shrubs around the lagoon complex Bocaripo-Chacopata in the Araya Peninsula, Sucre state.

It is important to highlight that the greater number of deciduous species found in the xerophytic communities of Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros, compared to other regions of Venezuela mentioned above, provides support for considering the inclusion of the deciduous attribute in the denomination of the studied plant communities.

## Conclusions

The designation of deciduous thorny xerophytic shrublands to the xerophytic communities of the Wildlife Fauna Reservoir Ciénaga de La Palmita and Isla de Pájaros constitutes a new designation for the vegetation of the studied area; it also provides information and knowledge important and valuable scientific for the formulation of the Management Plan and Regulation of Use (PORU) of said biotic space and also allows for more precise guidance on the administration, management, decision-making and handling of the natural plant resources available in this ABRAE.

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