ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Translated from the original in spanish

Characterization of the pine forest on quartz sands of the Ecological Reserve "Los Pretiles", Pinar del Río, Cuba

Caracterización del bosque de pinos sobre arenas cuarcíticas de la Reserva Ecológica «Los Pretiles», Pinar del Río, Cuba

Alisberkys De la Caridad Gallardo Cruz[1]

Zenia Acosta Ramos[1]

Jardín Botánico de Pinar del Río. Centro de Investigaciones y Servicios Ambientales. Pinar del Río, Cuba. E-mail: zeniaacosta2012@gmail.com

Received: May 4th, 2018.
Approved: January 11th, 2019.

ABSTRACT

In Pinar del Rio, «Los Pretiles» is an area that is included within the ecosystems that demand a rapid conservation action. There is a strong degradation of the pine groves, as well as the disappearance of many typical species of these ecosystems. This fact becomes more important when we consider that this area is considered of great scientific-conservationist interest, given the high endemism of its flora and physiognomic features that characterize the vegetation. This paper shows the floristic characterization of the natural pine groves communities of *Pinus tropicalis* present in the Ecological Reserve «Los Pretiles», Mantua municipality, Pinar del Río. This area presents a great floristic diversity represented by 274 species, of these 97 are endemic to Cuba. In the same way, threatened species were also listed, with a total of 39 threatened species for 14.2 %, with 27 of these endemic species (84.4 %). The chorological study for Cuba shows that the greatest floristic relationships are manifested significantly in a high number of widely distributed species in the national territory. In the case of corology outside Cuba, the existing relationship with the Neotropics is remarkable, which is explained by the migrations of the ancestors of the flora of the Antilles during the Middle Eocene, through marine promontories of the Caribbean Sea. The analysis of the biological spectrum of the pine forest vegetation showed the existence of species of scarce biomass, accusing the extreme conditions of the substratum of the place, which do not allow the development of species of greater biomass, which explains the scarce representation of phanerophytes. The floristic characterization of this plant formation within the area constitutes a step towards the reworking of the management measures with a view to the reconstruction of the natural landscape

Keywords: pine groves; physiognomy; floristic and ecology.

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

RESUMEN

En Pinar del Río, «Los Pretiles» es un área que se incluye dentro de los ecosistemas que demandan una rápida acción de conservación. Existe una fuerte degradación de los pinares, así como la desaparición de muchas especies típicas de estos ecosistemas. Este hecho se hace más importante cuando tenemos en cuenta que esta área es considerada de gran interés científico-conservacionista, dado el alto endemismo de su flora y rasgos fisionómicos que caracteriza la vegetación. En este trabajo, se muestra la caracterización florística de las comunidades de pinares naturales de *Pinus tropicalis* presentes en la Reserva Ecológica «Los Pretiles», municipio Mantua, Pinar del Río. Esta área presenta una gran diversidad florística representada por 274 especies; de estas 97 son endémicas cubanas. De la misma manera, se listaron las especies amenazadas, con un total de 39 especies amenazadas para un 14,2 %, con 27 de estas endémicas (84,4 %). El estudio corológico para Cuba muestra que las mayores relaciones florísticas se manifiestan significativamente en un elevado número de especies de amplia distribución en el territorio nacional. En el caso de la corología fuera de Cuba, es notable la relación existente con el Neotrópico, lo cual se explica por las migraciones de los ancestros de la flora de Las Antillas durante el Eoceno medio, a través de promontorios marinos del mar Caribe. El análisis del espectro biológico de la vegetación del pinar mostró la existencia de especies de escasa biomasa, acusando a las condiciones extremas del sustrato del lugar, que no permiten el desarrollo de especies de mayor biomasa, lo que explica la escasa representación de fanerófitas. La caracterización florística de esta formación vegetal dentro del área constituye un paso hacia la reelaboración de las medidas de manejo con vista a la reconstrucción del paisaje natural.

Palabras clave: pinares; fisionómica; florística y ecológica

INTRODUCTION

The situation of the vegetation in the white sands of Pinar del Río, according to Urquiola, (1987) is really critical; he reports that the fundamental cause of the high extinction registered in the typical species of this district is mainly due to its high vulnerability, which is manifested because the narrow ecology of the species does not allow it to react satisfactorily to the ecological impacts, nor to take advantage in the competition with other species of greater adaptive possibilities. This phenomenon is accentuated if we add the impact of anthropogenic origin in a community as fragile as this one, where there is also a high level of endemism.

Within the district of Arenas Blancas, the area of "Los Pretiles" includes ecosystems that demand rapid conservation action. There is a strong degradation of the pine forests, as well as the disappearance of many species typical of these ecosystems.

This fact becomes even more important when we consider that this area is considered of great scientific conservation interest, given the high

endemism of its flora and physiognomic features that characterize the vegetation. In this sense, anthropic action has had a negative influence on the degree of deterioration of the natural pine forests of Pinus tropicalis in "Los Pretiles" Urquiola Ecological Reserve and others, (1999a). This study aims to characterize the flora of this plant formation in order to support adequate management of the area.

MATERIALS AND METHODS

Research area

The pine forest of sector 1 "Los Pretiles", whose coordinates are N22°25'47.8", W084°18'32.5", has an extension of 93 ha, it limits to the SW with a swamp area that is part of the mangrove associated with the "Camarones" River, to the SE with a swamp vegetation with mangrove, to the NE with another swamp area associated with the Marín River and to the NW with the sea. The southwestern plain of Pinar del Río, floristically speaking, includes the phytogeographic district known as "Sabana de Arena Blanca" according to Samek (1973) or the "Sabaloense" district according to Borhidi (1991). The study area, Los Pretiles Ecological Reserve, is located in this district.

Study of Flora

It was done based on the data of the species registered for the area and updated by Urquiola and others. (1999b). It was complemented with the species listed in the Ecological Reserve's management plan, in addition to four explorations of the area in the period from 2014-2017. To characterize the species not registered in the management plan or those that are doubtful, the work Spermatophytes of Cuba was used. Greuter and Rankin, (2017).

Chorological spectrum

A chorological study was carried out, using Borhidi's geoelements (1991), both for the distribution inside and outside Cuba, where only one type or geoelement was assigned in each case. In this way, a chorological spectrum was prepared for the analysis of endemism in Cuba and outside of Cuba.

Endemism

This was done by calculating the percentages of endemism, taking into account the following ranges: local or district endemics (X), endemics exclusive to Pinar del Río province (PR), endemics of Western Cuba (OC), endemics of Western and Central Cuba (OC-CC), species split between Western and Eastern Cuba (OC-OC) and Pancuban endemics (P).

Endangered flora

The threatened species were listed; for this purpose, the categories and criteria of threat published in the Red List of Cuban Flora by González-Torres (2016) were considered (See Table 1).

Vegetation study

Physiognomic study

The physiognomic study of the vegetation took into account the criteria of Borhidi and Herrera, (1977) and Capote and Berazaín, (1984). The structure of the vegetation was described by pointing out the representative species for each of the strata: arboreal, shrub and herbaceous, as well as lianas and epiphytes. The terms closed and open

applied here refer respectively to whether or not the canopies come into contact in each of the strata.

Morphological characteristics

All the species listed for the pine forest were determined by the biological type of Raunkiaer sensu Ellenberg and Mueller-Dombois, (1967), as well as the size of the leaves according to Raunkiaer, in the year 1934, modified by Borhidi, (1977); the texture of the leaves was made according to Berazaín (1979). All this information is recorded in Table 1.

Wealth and abundance indices

To calculate the biodiversity indices of Shanon Weaver and Simpson, Margalef, R. (1998), five plots were drawn, taking into account the minimum area criterion. This area was adequate to 16 m2 for each plot. In each of the plots, all the species in each stratum were listed and counted. Subsequently the above-mentioned biodiversity indices were calculated with the help of the EcoSim Professional software published by Entsminger in 2014.

RESULTS AND DISCUSSION

Floristic composition

274 species were listed, which are distributed in 68 families, of which 63 spermatophytes, four pteridophyte families and one bryophyte, grouped into 155 genera, of which 149 spermatophytes, five pteridophyte genera and one bryophyte (see Table 1).

The families with the largest number of species in Cuba are the best represented in this area; they are *Poaceae* with 62 species, *Cyperaceae* with 29, *Fabaceae* with 16, *Rubiaceae* with 12, *Asteraceae* with 10, *Orchidaceae* with 9, *Xyridacea* with 7 and *Melastomataceae* with 6. They also have two of the three genera of insectivorous plants reported for Cuba: *Pinguicula* and *Utricularia.* Other families present all their species reported in this area: *Pinaceae* and *Asclepiadaceae.*

One family, represented by only one species in Cuba, is located in the area: *Cistaceae* with *Lechea cubensis,* exclusive to this biotope, which grows only in these quartzite sandy soils.

Of the total number of species reported, there are 156 present in the Alturas de Pizarras del Norte, in Mantua Urquiola and others, (1999b), which represents 55.8 % of common species between both districts, evidencing the role played by the Alturas de Pizarras del Norte as a paleo-center; therefore, the origin of more than half of the flora of the white sands of "Los Pretiles" is the neighboring district. Of the 103 endemic to this area, 52 are common with the Alturas de Pizarras del Norte (50.5 %), which reinforces the point of view.

There are a total of 97 endemic species in the area, which represents 35.4 % of endemism. In addition, there are two monotypic genera endemic to Cuba, whose species are *Lachnorrhiza piloselloides* and *Nodocarpea radicans.*

Ferns, mosses, lichens and fungi are not well represented in this area, due to the soil conditions and humidity of the area.

Chorological spectrum and floristic relationships

In the analysis of the chorological spectrum in Cuba, it was obtained as a result that from the pineal plant formation, the high number of Pancuban species is significant (125 species, 45 %). This behavior must find its explanation in the existence of similar plant formations in other regions of the country, such as the forests of *Pinus* sp. div. Following, the relationship with the region of Pinar del Río-Isla de la Juventud with 44 species (16 %) is presented. This affinity is due to the recent separation in the Holocene between both territories.

Following this, the geoelement *Occideto Cubanicum*, with 35 species (13 %) and *Occidento Cubanicum-Centro Cubanicum* with 29 species (10,5 %). This trend should be explained by the geographical proximity of both territories, as well as the existence of common soil conditions with certain areas of Central Cuba, where there are sandy deposits, although they are currently highly degraded. In the case of *Occidento Cubanicum*, the existing relationship is evident, not only because of its proximity, but also because of the union during the last glaciation with the Isle of Youth. Following are very low values given for the *Occidento Cubanicum-Oriento Cubanicum,* represented by three species, which represents 1 % (See Table 1).

Regarding the district endemics present in the area, a total of 15 are registered, for a 14.6%; these three species are considered local endemics, representing 3% of the total endemics in the pine forest. This figure is explained by the edaphic characteristics, given by the sandy condition, seasonality, acidity, deficit of nutrients and organic matter, as well as the low capacity of cationic exchange; all this determines the existence of a highly specialized flora to the very unfavorable physical and chemical conditions in the substrate. On the other hand, it must be taken into account what Samek (1973) and Borhidi (1991) have proposed, regarding the possible conservative character of the endemism of the white sands. That is, the possible development of numerous endemics in the Alturas de Pizarras del Norte, because these species took refuge in white sand biotopes where they were able to adapt and evolve practically without competition. Despite this, many species, especially those adapted to humid places, must have originated in the white sands themselves.

In terms of the distribution outside Cuba (see table 1), the greatest floristic relationships are established with the Neotropics, with 42 species, for 15.3 %. Next, there are the Macroantillana with 24 species, for 9 %; the Antillana, with 23 species that represent 8.3 %; the United States with 17 species (6 %); Norcaribe with 18 (6.5 %); the Pantropical are 13 species (4.7 %) and the Florida-Antilles-Bahamas with 11 species for 4 % respectively; finally, there are other geographical zones whose values are below those mentioned above.

Endemism

From the 274 species reported for the area, 97 are endemic (see Table 1), which represents 35.4% of the total flora reported for the pine forest. These are distributed as follows: local endemics 3 (3 %), district 12 (12 %), Pinar del Río 12 (12 %), Pinar del Río-Isla de la Juventud 35 (34 %), *Occidento-Cubanicum* 13 (12 %), *Occidento-Cubanicum-Centro-*

Cubanicum 11 (11 %), *Oriento-Cubanicum-Occidento-Cubanicum* with 1 (1 %) and *Pancubanas* 16 (15,0 %). The representative families of the Cuban endemics present in the area are *Poaceae, Asteraceae, Euphorbiaceae, Rubiaceae* and *Eriocaulaceae*.

From the 97 endemic species reported for the area, 33 are present in the locality, Pinar del Río and Pinar del Río-Isla de la Juventud, according to Borhidi's categories, in research carried out in 1996, which represents 34%. As explained before, there is a common geological past between the white sand territories of Pinar del Río and Isla de la Juventud, as well as very similar soil conditions regarding sandy condition, seasonality, acidity, poor nutrients and organic matter and cation exchange capacity, among other characteristics, which determines the strong affinity from the floristic and phytogenic point of view. On the other hand, the endemism of the pine forest is significant, with three local endemic species, which can be explained by the extreme characteristics of the substrate mentioned above, as well as the endemics that emerged in the Northern Shale Heights and took refuge in the young biotope of the white sands, as explained by Samek, (1973) and Urquiola, (1999b).

Endangered flora

From the species referred to for the pine forest, 39 are in different categories of threat, which represents 14 %. It should be noted that 29 of these species (74 %) are endemic (See Table 1).

Regarding the spectrum of the species of the vegetation of the pine forest according to the habit, this formation is currently formed by a forest with widely separated canopy trees (open), of 6-10 m, although there are some specimens that reach 15 m in height. The arboreal stratum is represented by the families *Anacardiaceae, Annonaceae, Calophylla, Cyrillaceae,Fabaceae*, *Myrtaceae, Pinaceae* and *Arecaceae,* being its species: *Anacardium occidentale, Xylopia aromatica, Calophyllum pinetorum, Cyrilla microareolata, Brya ebenus, Eugenia maleolens, Pinus caribaea*, *Pinus tropicalis* and *Coccothrinax miraguama.*

The bush stratum is composed of a greater number of species (31), the most represented genera are Byrsonima (three species), Ouratea (two species), Hipericum (two species), Crossopetalum (two species) and Lyonia (two species). The species corresponding to these genera are: *Byrsonima crassifolia, Byrsonima pinetorum, Byrsonima wrightiana, Ouratea elliptica* and *Ouratea ilicifolia, Hypericum styphelioide, Hypericum nitidum, Crossopetalum aquifolium, Crossopetalum rhacoma*, *Lyonia ekmanii* and *Lyonia lucida*. Other genera in this stratum have only one representative species: *Acoelorraphe wrightii, Baccharis halimifolia, Tabebuia lepidophylla, Kalmia ericoides, Jatropha angustifolia, Malpighia horrida, Chaetolepis cubensis, Henriettea patrisiana, Pachyanthus wrightii, Tetrazygia impressa, Morella cerifera, Eugenia punicifolia, Psidium salutare, Chrysobalanus icaco, Callicarpa americana, Pavonia intermixta, Peltaea speciosa* and *Stachytarpheta angustifolia.*

The herbaceous stratum presents the greatest floristic richness (216 species), with the presence of species typical of pine forests on white sands; in this case we can mention the following species: *Eleocharis knutei, Schizachyriumn parvifolium, Xyris mantuesis* and *Waltheria arenicola.*

Biological types

Referring to the biological type and the morphological characteristics of size and texture of the leaves of each one of the species present in the pine forest, the biological spectrum of the vegetation of the pine forest (See table 1) shows that, out of 274 species present in the place, 93 species are hemicryptophytes (34 %), 67 are camephites (24 %), 30 are therophytes (11 %) and the nanophanerophytes are 27 (9.8 %). The remaining biological types are represented below 10 %. The predominance of species with low biomass is remarkable, showing the extreme conditions of the substrate referred to above. As is known, the climate is suitable for the development of forest formations; however, it is the substrate that does not allow the development of species with higher biomass, which explains the low representation of phanerophytes, which is the biological type ecologically adapted to the most appropriate living conditions for plant life.

Size and textures of leaves

Regarding the leaf size spectrum for the pine tree species, there is an evident predominance of microphilic leaves, present in 100 species, for 36.4 %. Following this, nanophiles appear in 69 species, for 25 %; then leptophiles in 57 species, for 20.8 % and notophiles in 31 species, for 11 %. As can be seen, there is a predominance of leaves with a tendency to reduce, i.e. from notophiles to leptophytes, over mesophiles, macrophiles and megaphiles. This is an indicator of the evident adaptation of these plants to the xerophitism imposed by the substrate, as well as to the action of the south wind, the proximity to the sea and the high temperatures existing in these formations that are mostly open.

The result obtained for the texture of the leaves shows that, out of a total of 274 species, there is a predominance of carthaceous leaves (184 species for 67 %), membranoids (53 species for 19 %), sclerophytes (17 species), for 6 %) and coriaceae (15 species, for 5 %) The behaviour of this indicator shows synergy with those analysed above, highlighting the xerophytic character of the vegetation due to the scarcity of leaves with membranoid texture.

Table 1. - General characteristics of the natural pine forest "Los Pretiles"

FAMILIA	ESPECIE	COR.CUBA	COR.EXT	CAT.AME	HÁBITO	TIPO BIO	TAM.HOJA	TEX.HOJA
Acanthaceae	*Blechum brownei Juss.*	P	PT		Hierba	H	Mic	Car
Acanthaceae	*Stenandrium droseroides Nees.*	P	A-B		Arbusto	Ch	Mic	Car
Agavaceae	*Furcraea hexapetala (Jacq.) Urb.*	P	MA		Hierba	Ch	Meg	Car
Amaranthaceae	*Froelichia interrupta (L.) Moq.*	PR	NT		Hierba	Ch	Not	Cor
Amaranthaceae	*Gonphrena dispersa Standl.*	P	NC		Hierba	Ch	Mic	Car
Amaryllidaceae	*Crinum oliganthum Urb.*	OC	NoTien		Hierba	G	Mic	Men
Anacardiaceae	*Anacardium occidentale L.*	P	NT		Árbol	Mc-McP	Mac	Car
Commelinaceae	*Commelina erecta L.*	P	NT		Hierba	Ch	Mic	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Annonaceae	*Xylopia aromatica (Lam.) Mart.*	OC-CC	SA-C		Árbol	Mc-McP	Mes	Men
Antirrhinaceae	*Angelonia pilosela J. Kickx f.*	OC	MA		Hierba	Ch	Nan	Car
Antirrhinaceae	*Cheilophyllum microphyllum Pennell*	PR	NoTien	CR	Hierba	Th	Lep	Afila
Antirrhinaceae	*Cheilophyllum radicans (Griseb.) Pennell*	P	NoTien		Hierba	Ch	Lep	Cor
Apocynaceae	*Angadenia berterii (A. DC.) Miers*	P	A-B		Hierba	LH	Mic	Car
Apocynaceae	*Echites umbellata Jacq.*	P	NT		Liana	LP	Not	Car
Apocynaceae	*Mesechites rosea (A. DC.) Miers*	P	NoTien		Liana	LH	Mic	Car
Apocynaceae	*Metastelma linearifolium A. Rich.*	OC	NoTien		Hierba	LH	Lep	Car
Arecaceae	*Acoelorraphe wrightii (Griseb. et Wendl.) Wendl. ex Becc.*	P	NC		Arbusto	McP	Meg	Men
Arecaceae	*Coccothrinax miraguama (HBK.) Leon*	PR	NoTien		Árbol	MsP	Meg	Car
Asteraceae	*Baccharis halimifolia L.*	OC-CC	NoTien		Arbusto	McP	Mic	Car
Asteraceae	*Elephantopus arenarius Britt. et Wils.*	OC	NoTien	DD	Hierba	Ch	Not	Car
Asteraceae	*Elephantopus pratensis Wr.*	PR-IJ	NoTien		Hierba	Ch	Not	Car
Asteraceae	*Erigeron bellidiastroides Griseb.*	PR-IJ	NoTien	EN	Hierba	Th-H	Mic	Car
Asteraceae	*Lachnorhiza micrantha (Borhidi) Borhidi*	OC	NoTien	DD	Arbusto	H	Not	Car
Asteraceae	*Neja marginata (Griseb.) G. L. Nesom*	OC	NoTien	CR	Hierba	Ch	Lep	Car
Asteraceae	*Pectis juniperina Rydb.*	PR	NoTien	CR	Hierba	Ch	Lep	Car
Asteraceae	*Sachsia polycephala Griseb.*	P	MA		Hierba	Ch	Not	Car
Asteraceae	*Tetraperone bellioides (Griseb.) Urb.*	PR	NoTien	CR	Hierba	Ch	Mic	Men
Asteraceae	*Wedelia rugosa Greenm.*	P	NoTien		Hierba	Ch	Mes	Car
Bignoniaceae	*Tabebuia lepidophylla (A. Rich.) Greenm.*	PR-IJ	NoTien		Arbusto	McP	Not	Car
Blechnaceae	*Blechnum serrulatum Rich.*	NoCono	NoCono		Hierba	Th	Not	Car
Boraginaceae	*Euploca humifusa (Kunth) Diane & Hilger*	P	MA		Hierba	Ch	Lep	Car
Bromeliaceae	*Burmannia capitata (J. F. Gmel.) Mart.*	OC-CC	NT		Hierba	Th	Lep	Car
Bromeliaceae	*Burmannia flava Mart.*	PR	SC		Hierba	Th	Lep	Car
Bromeliaceae	*Tillandsia balbisiana Schult. f.*	P	NT		Epífita	Epífita	Nan	Men
Bromeliaceae	*Tillandsia bulbosa Hook.*	P	NT		Epífita	Epífita	Nan	Car
Bromeliaceae	*Tillandsia flexuosa Sw.*	P	PT		Epífita	Epífita	Not	Car
Byttneriaceae	*Melochia savannarum Britton*	PR-IJ	NoTien		Hierba	NP	Nan	Car
Byttneriaceae	*Melochia spicata (L.) Fryxell*	P	NT		Hierba	Ch	Mic	Car
Byttneriaceae	*Waltheria arenicola A. Rodr.*	OC-CC	NoTien		Hierba	Ch	Mic	Car
Cactaceae	*Opuntia stricta (Haw.) Haw.*	P	NC		Hierba	NP	Afila	Car
Calophyllaceae	*Calophyllum antillanum Britton*	PR-IJ	NoTien		Árbol	MgP	Not	Car
Celastraceae	*Crossopetalum aquifolium (Griseb.) A. S. Hitchc.*	P	A-B		Arbusto	NP	Mic	Esc
Celastraceae	*Crossopetalum rhacoma Crantz*	P	PC		Arbusto	NP	Mic	Men
Chrysobalanaceae	*Chrysobalanus icaco L.*	P	SC		Arbusto	McP	Not	Men

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Cistaceae	*Lechea cubensis Leggett*	PR	NoTien	EN	Hierba	Ch	Lep	Car
Cleomaceae	*Cleome guianensis Aubl.*	PR	A	CR	Hierba	Th	Lep	Men
Convolvulaceae	*Evolvulus grisebachii Peter*	PR-IJ	EU		Hierba	Ch	Lep	Car
Convolvulaceae	*Ipomoea alterniflora Griseb.*	OC-OC	NoTien		Liana	LH	Mes	Men
Convolvulaceae	*Ipomoea asarifolia (Desr.) Roem. & Schult.*	P	PT		Liana	LH	Mic	Men
Convolvulaceae	*Ipomoea microdactyla Griseb.*	P	FAB		Liana	LH	Mic	Cor
Cyperaceae	*Cyperus floridanus Britt.*	OC-OC	NC		Árbol	H	Mic	Car
Cyperaceae	*Cyperus filiformis Sw.*	P	A		Hierba	H	Nan	Car
Cyperaceae	*Eleocharis knutei Pavón et Zavaro*	PR	NT	CR	Hierba	H	Mic	Car
Cyperaceae	*Fimbristylis ferruginea (L.) Vahl*	P	PT		Hierba	H	Lep	Car
Cyperaceae	*Rhynchospora brittonii Gale*	OC	NoTien		Hierba	NP	Mic	Men
Cyperaceae	*Rhynchospora colorata (L.) H. Pfeiff.*	P	NC		Hierba	H	Mic	Car
Cyperaceae	*Rhynchospora corniculata (Lam.) A. Gray*	PR	EU		Hierba	H	Nan	Men
Cyperaceae	*Rhynchospora divergens Chapm. ex M. A. Curtis*	PR	EU		Hierba	H	Mic	Car
Cyperaceae	*Rhynchospora fascicularis (Michx.) Vahl*	OC	PT		Hierba	H	Mic	Cor
Cyperaceae	*Rhynchospora filifolia A. Gray*	OC-CC	EU		Hierba	H	Mic	Men
Cyperaceae	*Rhynchospora globosa (Kunth) Roem. & Schult.*	OC-CC	NT		Hierba	H	Not	Men
Cyperaceae	*Rhynchospora globularis (Chapm.) Small*	P	FAB		Hierba	NP	Mic	Esc
Cyperaceae	*Rhynchospora hirsuta (Vahl) Vahl*	OC	NT		Hierba	H	Mic	Car
Cyperaceae	*Rhynchospora holoschoenoides (Rich.) Herter*	P	PT		Hierba	NP	Mic	Car
Cyperaceae	*Rhynchospora leptorhyncha C. Wright*	OC	NoTien		Hierba	H	Mic	Men
Cyperaceae	*Rhynchospora nervosa (Vahl) Boeckeler*	OC-OC	A		Hierba	H	Mic	Esc
Cyperaceae	*Rhynchospora rariflora (Michx.) Elliott*	OC	FAB		Hierba	H	Mic	Esc
Cyperaceae	*Rhynchospora recognita (Gale) Kral*	OC	NC		Hierba	NP	Mic	Car
Cyperaceae	*Rhynchospora seslerioides Griseb.*	OC	NoTien		Hierba	H	Mic	Car
Cyperaceae	*Rhynchospora subsetigera H. Pfeiff.*	P	NoTien		Hierba	H	Mic	Car
Cyperaceae	*Rhynchospora tenuifolia Griseb.*	OC	MA		Hierba	H	Nan	Car
Cyperaceae	*Rhynchospora wrightiana Boeckeler*	PR	EU		Hierba	H	Mic	Car
Cyperaceae	*Scleria brittonii Core*	PR	EU		Hierba	G	Mic	Esc
Cyperaceae	*Scleria interrupta Rich*	OC	NT		Hierba	Th	Mic	Car
Cyperaceae	*Scleria interrupta Rich.*	PR	MA		Hierba	Th	Mic	Car
Cyperaceae	*Scleria mucronata Poir.*	P	A		Hierba	H	Mic	Car
Cyperaceae	*Scleria muehlenbergii Steud.*	P	NT		Hierba	H	Nan	Car
Cyperaceae	*Scleria pauciflora Muhl. ex Willd.*	OC	EU		Hierba	G	Nan	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Cyperaceae	*Scleria testacea Nees ex Kunth*	P	NT		Hierba	H	Mic	Car
Cyrillaceae	*Cyrilla microareolata Berazaín subsp. microareolata*	OC-OC	PC		Hierba	Mc-McP	Not	Esc
Dennstaedtiaceae	*Pteridium caudatum (L.) Maxon*	P	NoConc		Hierba	H	Mac	Car
Dicranaceae	*Campylopus delicatulus R. S. Williams*	PR-IJ	Amer		Hierba	Ch	Lep	Car
Dicranaceae	*Octoblepharum albidum J. Helwig*	P	C		Hierba	Epífita	Lep	Esc
Dilleniaceae	*Curatella americana L.*	P	NT		Arbusto	Mc-McP	Mac	Car
Ericaceae	*Kalmia ericoides C. Wright ex Griseb.*	PR	NoTien	CR	Arbusto	NP	Lep	Car
Ericaceae	*Lyonia ekmanii Urb.*	PR	NoTien	CR	Arbusto	McP	Mic	Car
Ericaceae	*Lyonia lucida (Lam.) K. Koch*	P-IJ	EU		Arbusto	McP	Mic	Car
Eriocaulaceae	*Paepalanthus alsinoides C. Wright subsp. alsinoides*	PR-IJ	NoTien	CR	Hierba	H	Nan	Car
Eriocaulaceae	*Paepalanthus lamarckii Kunth*	PR	NoTien	EN	Hierba	H	Cam	Car
Eriocaulaceae	*Paepalanthus retusus C. Wright*	PR	NoTien	CR	Hierba	H	Nan	Car
Eriocaulaceae	*Syngonanthus androsaceus (Griseb.) Ruhland*	PR-IJ	NoTien		Hierba	H	Lep	Car
Eriocaulaceae	*Syngonanthus lagopodioides (Griseb.) Ruhland*	PR-IJ	NoTien		Hierba	H	Lep	Cor
Euphorbiaceae	*Chamaesyce camagueyensis Millsp.*	PR-IJ	NoTien		Hierba	Ch	Lep	Car
Euphorbiaceae	*Croton cerinus Müll. Arg.*	PR-IJ	NoTien		Hierba	Ch	Not	Men
Euphorbiaceae	*Croton craspedotrichus Griseb.*	PR-IJ	NoTien		Hierba	Ch	Mic	Esc
Euphorbiaceae	*Jatropha angustifolia Griseb.*	PR	NoTien	VU	Arbusto	McP	Mic	Men
Euphorbiaceae	*Microstachys corniculata (Vahl) Griseb.*	P	SA-C		Hierba	Th	Mic	Car
Fabaceae	*Aeschynomene tenuis Griseb.*	OC-CC	NoTien		Hierba	Ch	Lep	Men
Fabaceae	*Aeschynomene viscidula Michx.*	P	NT		Hierba	Ch	Lep	Men
Fabaceae	*Brya ebenus (L.) DC.*	P	MA		Árbol	McP	Lep	Car
Fabaceae	*Centrosema virginianum (L.) Benth.*	P	NT		Liana	LH	Mic	Cor
Fabaceae	*Chamaecrista diphylla (L.) Greene*	P	A		Hierba	Ch	Nan	Car
Fabaceae	*Chamaecrista kunthiana (Schltdl. & Cham.) H. S. Irwin & Barneby*	OC	A		Hierba	Ch	Lep	Car
Fabaceae	*Chamaecrista pilosa (L.) Greene*	OC	A		Hierba	Ch	Nan	Car
Fabaceae	*Chamaecrista pygmaea (DC.) Britton*	PR-IJ	NoTien		Hierba	Ch	Lep	Car
Fabaceae	*Crotalaria maypurensis Kunth*	OC	NC		Hierba	Th	Mic	Esc
Fabaceae	*Crotalaria pumila Ortega*	P	NT		Hierba	Th	Nan	Men
Fabaceae	*Eriosema crinitum (Kunth) G. Don*	P	A		Hierba	Ch	Mic	Car
Fabaceae	*Galactia combsii Urb.*	OC-CC	NoTien		Liana	LH	Mic	Car
Fabaceae	*Galactia savannarum Britton*	P	NoTien		Liana	LH	Nan	Car
Fabaceae	*Herpyza grandiflora (Griseb.) C. Wright*	PR-IJ	NoTien		Liana	LH	Nan	Car
Fabaceae	*Indigofera miniata Ortega*	OC	NC		Hierba	Ch	Lep	Men
Fabaceae	*Zornia reticulata Sm.*	P	PT	CR	Hierba	Ch	Mic	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Gentianaceae	*Schultesia guianensis (Aubl.) Malme*	P	NT		Hierba	Th	Lep	Car
Gleicheniaceae	*Dicranopteris flexuosa (Schrad.) Underw.*	P	NoCono		Hierba	Th-H	Not	Car.
Haemodoraceae	*Lachnanthes caroliniana (Lam.) Dandy*	PR	EU	EN	Hierba	G	Not	Car
Haemodoraceae	*Xiphidium xanthorrhizon C. Wright ex Griseb.*	OC	NoTien	VU	Hierba	G	Not	Car
Hypericaceae	*Hypericum nitidum subsp. exile (W. P. Adams) N. Robson*	PR	NC		Arbusto	NP	Nan	Car
Hypericaceae	*Hypericum styphelioides subsp. moaense Lippold*	P	NoTien		Arbusto	NP	Lep	Car
Hypoxidaceae	*Curculigo scorzonerifolia (Lam.) Baker*	P	A		Hierba	G	Mic	Car
Hypoxidaceae	*Hypoxis decumbens L.*	OC-CC	FAB		Hierba	G	Nan	Car
Juncaceae	*Juncus marginatus Rostk.*	P	NC		Hierba	H	Mic	Car
Juncaceae	*Juncus repens Michx.*	P	FAB		Hierba	H	Nan	Car
Lamiaceae	*Cyanocephalus pedalipes (Griseb.) Harley & J.*	PR-IJ	NoTien	EN	Hierba	Ch	Mic	Men
Lamiaceae	*Hyptis eriocauloides A. Rich.*	OC-CC	NoTien		Hierba	Ch	Lep	Car
Lamiaceae	*Hyptis minutifolia Griseb.*	P	NoTien		Hierba	Ch	Lep	Car
Lauraceae	*Cassytha filiformis L.*	P	C		Liana	LH	Afila	Car
Lentibulariacea	*Pinguicula albida C. Wright ex Griseb.*	PR	NoTien	CR	Hierba	Th	Not	Car
Lentibulariacea	*Pinguicula filifolia C. Wright ex Griseb. subsp. filifolia*	PR-IJ	NoTien	CR	Hierba	Th	Nan	Car
Lentibulariacea	*Utricularia fimbriata Kunth*	OC-CC	NT	A	Hierba	Th	Lep	Car
Loganiaceae	*Spigelia sphagnicola C. Wright*	PR-IJ	NoTien		Hierba	Ch	Nan	Car
Lycopodiaceae	*Lycopodiella cernua (L.)*	P	NoCono		Hierba	NP	Lep	Car
Lygodiaceae	*Lygodium cubense Kunth*	P	NoCono		Liana	LP	Not	Car
Lygodiaceae	*Lygodium venustum Sw.*	P	NoCono		Liana	LP	Mic	Car
Lythraceae	*Cuphea melanium (L.) R. Br. ex Steud.*	P	MA		Hierba	Ch	Lep	Esc
Lythraceae	*Cuphea micrantha Kunth*	OC	PC		Hierba	Ch	Lep	Car
Lythraceae	*Cuphea pseudosilene Griseb.*	OC	NoTien		Hierba	Ch	Lep	Car
Malpighiaceae	*Byrsonima crassifolia (L.) Kunth*	P	A		Arbusto	McP	Mac	Men
Malpighiaceae	*Byrsonima pinetorum C. Wright ex Griseb.*	PR	NoTien		Arbusto	NP	Mic	Men
Malpighiaceae	*Byrsonima wrightiana Nied.*	PR-IJ	NoTien		Arbusto	NP	Not	Men
Malpighiaceae	*Malpighia horrida Small*	P	A		Arbusto	NP	Nan	Car
Malvaceae	*Hibiscus costatus A. Rich.*	OC-CC	A		Arbusto	NP	Mes	Car
Malvaceae	*Pavonia intermixta A. Rich.*	PR-IJ	NoTien		Arbusto	NP	Mic	Car
Malvaceae	*Peltaea speciosa (Kunth) Standl.*	PR	A		Arbusto	NP	Not	Men
Malvaceae	*Sida brittonii León*	PR	NoTien		Hierba	Ch	Nan	Nan
Malvaceae	*Sida linifolia Cav.*	OC-CC	SA-C		Hierba	Ch	Mic	Car
Melastomataceae	*Acisanthera erecta J. St. Hil.*	P	NT		Hierba	Ch	Lep	Esc
Melastomataceae	*Acisanthera limnobios (DC.) Triana*	OC-CC	A		Hierba	Ch	Lep	Men
Melastomataceae	*Henriettea patrisiana DC.*	PR-IJ	NoTien		Arbusto	McP	Mes	Car
Melastomataceae	*Miconia impressa (Urb.) Judd & al.*	PR	NoTien	A	Arbusto	McP	Not	Men

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Melastomataceae	*Pachyanthus wrightii Griseb.*	PR-IJ	NoTien	CR	Arbusto	NP	Not	Car
Melastomataceae	*Tibouchina cubensis (A. Rich.) M. Gómez*	PR-IJ	NoTien		Hierba	NP	Mic	Men
Molluginaceae	*Mollugo brevipes Urb.*	PR	NoTien	VU	Hierba	Ch	Lep	Car
Molluginaceae	*Mollugo nudicaulis Lam.*	P	NT		Hierba	Ch	Lep	Car
Molluginaceae	*Mollugo verticillata L.*	PR	PT		Hierba	Ch	Lep	Men
Myricaceae	*Morella cerifera (L.) Small*	P	A		Arbusto	McP	Mic	Esc
Myrtaceae	*Eugenia monticola (Sw.) DC.*	P	NC		Árbol	McP	Nan	Men
Myrtaceae	*Psidium salutare (Kunth) O. Berg*	PR-IJ	A		Arbusto	NP	Mic	Car
Nephrolepidaceae	*Nephrolepis biserrata (Sw.) Schott*	P	NoCono		Hierba	H	Not	Men
Nephrolepidaceae	*Nephrolepis exaltata (L.) Schott*	P	NoCono		Hierba	H	Not	Men
Ochnaceae	*Ouratea agrophylla (Tiegh.) Urb.*	P	MA		Arbusto	NP	Mes	Car
Ochnaceae	*Ouratea elliptica (A. Rich.) M. Gómez*	PR-IJ	NoTien		Arbusto	NP	Not	Car
Ochnaceae	*Sauvagesia erecta subsp. brownei (Planch.)*	P	MA		Hierba	Ch	Lep	Car
Orchidaceae	*Encyclia phoenicea (Lindl.) Neumann*	P	NoTien		Epífita	Epífita	Not	Car
Orchidaceae	*Habenaria bicornis Lindl.*	P	NoTien		Hierba	Th	Mic	Cor
Orchidaceae	*Habenaria brittoniae Ames*	OC-CC	NoTien		Hierba	Th	Nan	Car
Orchidaceae	*Habenaria eustachya Rchb. f.*	P	FAB		Hierba	Th	Mic	Car
Orchidaceae	*Habenaria floribunda Lindl.*	P	NC		Hierba	Th	Mic	Men
Orchidaceae	*Habenaria quinqueseta (Michx.) Sw.*	OC-CC	NC		Hierba	Th	Mic	Car
Orchidaceae	*Habenaria repens Nutt.*	P	NT		Hierba	Th	Nan	Men
Orchidaceae	*Platanthera replicata (A. Rich.) Ackerman*	OC-CC	NoTien		Hierba	Th	Mic	Men
Orchidaceae	*Tetramicra tenera (A. Rich.) Rolfe*	P	NoTien		Hierba	H	Mic	Car
Orobanchaceae	*Agalinis albida Britton & Pennell*	OC-CC	MA		Hierba	Th	Lep	Esc
Orobanchaceae	*Anisantherina hispidula (Mart.) Pennell*	P	A		Hierba	Th	Nan	Car
Orobanchaceae	*Buchnera longifolia Kunth*	P	NT		Hierba	Ch	Nan	Car
Oxalidaceae	*Oxalis pinetorum (Small) Urb.*	PR-IJ	NoTien		Hierba	Ch	Nan	Car
Phyllanthaceae	*Phyllanthus echinospermus C. Wright*	PR	NoTien	EN	Hierba	Th	Lep	Men
Phyllanthaceae	*Phyllanthus heliotropus C. Wright ex Griseb.*	PR-IJ	NoTien		Hierba	Ch	Lep	Men
Phyllanthaceae	*Phyllanthus junceus Müll. Arg.*	PR-IJ	NoTien	A	Hierba	Ch	Lep	Car
Pinaceae	*Pinus caribaea Morelet*	PR-IJ	NoTien		Árbol	MgP	Mic	Men
Pinaceae	*Pinus tropicalis Morelet*	PR-IJ	NoTien		Árbol	MsP	Mic	Cor
Poaceae	*Schizachyrium gracile (Spreng.) Nash*	P	FAB		Hierba	H	Nan	Car
Poaceae	*Achlaena piptostachya Griseb*	P	MA		Hierba	H	Mic	Men
Poaceae	*Andropogon bicornis L.*	P	SA-A		Hierba	H	Nan	Car
Poaceae	*Andropogon fastigiatus Sw.*	OC	PT		Hierba	H	Mic	Car
Poaceae	*Andropogon glomeratus (Walter) Britton & al. subsp. glomeratus*	OC-CC	NoTien		Hierba	H	Nan	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Poaceae	*Andropogon lateralis Nees*	PR	SA-C		Hierba	H	Nan	Car
Poaceae	*Andropogon leucostachyus Kunth*	P	SA-A		Liana	H	Nan	Car
Poaceae	*Andropogon macrothrix Trin.*	PR-IJ			Hierba	H	Nan	Car
Poaceae	*Anthaenantia lanata (Kunth) Benth.*	P	NoTien		Hierba	H	Mic	Car
Poaceae	*Aristida fragilis Hitchc. & Ekman*	PR	NoTien	CR	Hierba	H	Lep	Car
Poaceae	*Aristida neglecta subsp. breviglumis Catasús*	P	MA		Hierba	H	Lep	Car
Poaceae	*Aristida refracta Griseb.*	P	MA		Hierba	H	Lep	Car
Poaceae	*Aristida spiciformis Elliott subsp. spiciformis*	PR	EU		Hierba	H	Nan	Car
Poaceae	*Aristida spiciformis subsp. antillarum (Catasús) Catasús*	OC	NoTien		Hierba	H	Nan	Car
Poaceae	*Aristida vilfifolia Henrard*	P	A-B		Hierba	H	Nan	Car
Poaceae	*Cenchrus distichophyllus Griseb.*	PR	NoTien	CR	Hierba	H	Nan	Men
Poaceae	*Chloris arenaria Hitchc.*	P	NoTien	EN	Hierba	Th-H	Nan	Car
Poaceae	*Chloris ekmanii Hitchc.*	P	MA		Hierba	Th-H	Nan	Car
Poaceae	*Chrysopogon pauciflorus (Chapm.) Benth. ex Vasey*	P	EU		Hierba	Th	Lep	Men
Poaceae	*Coleataenia petersonii (Hitchc. & Ekman) Soreng*	OC-CC	NoTien		Hierba	H	Nan	Cor
Poaceae	*Coleataenia tenera (Trin.) Soreng*	P	EU		Hierba	H	Mic	Men
Poaceae	*Dichanthelium aciculare (Poir.) Gould & C. A. Clark*	P	NC		Hierba	H	Nan	Car
Poaceae	*Dichanthelium acuminatum (Sw.) Gould & C. A. Clark*	P	MA		Hierba	H	Not	Car
Poaceae	*Dichanthelium dichotomum (L.) Gould*	P	NC		Hierba	H	Mic	Car
Poaceae	*Dichanthelium lancearium (Trin.) Greuter & R. Rankin*	P	NC		Hierba	H	Mic	Car
Poaceae	*Dichanthelium sphaerocarpum (Elliott) Gould*	P	EU		Hierba	H	Mic	Car
Poaceae	*Dichanthelium strigosum (Elliott) Freckmann*	P	FAB		Hierba	H	Mic	Car
Poaceae	*Dichanthium annulatum (Forssk.) Stapf*	OC	PT		Hierba	H	Nan	Car
Poaceae	*Digitaria ekmanii Hitchc.*	OC-CC	NoTien		Hierba	H	Mic	Esc
Poaceae	*Digitaria serotina (Walter) Michx.*	OC	EU		Hierba	Th-H	Nan	Car
Poaceae	*Eragrostis cubensis Hitchc. & Ekman*	P	MA		Hierba	Th-H	Nan	Car
Poaceae	*Eragrostis elliottii S. Watson*	P	FAB		Epífita	H	Nan	Nan
Poaceae	*Leptochloa virgata (L.) P. Beauv.*	P	NT		Hierba	NP	Nan	Cor
Poaceae	*Mesosetum loliiforme (Steud.) Chase ex Hitchc.*	P	SA-A		Hierba	H	Mic	Cor
Poaceae	*Mesosetum wrightii Hitchc.*	P	NoTien		Hierba	H	Mic	Cor
Poaceae	*Mnesithea impressa (Griseb.) de Koning & Sosef*	P	NoTien		Hierba	H	Lep	Car
Poaceae	*Mnesithea tuberculosa (Nash) de Koning & Sosef*	PR	EU		Hierba	NP	Nan	Car
Poaceae	*Muhlenbergia capillaris (Lam.) Trin.*	P	NC		Hierba	Th-H	Mic	Men
Poaceae	*Panicum cayennense Lam.*	OC	SA-A		Hierba	H	Mic	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Poaceae	*Panicum parvifolium Lam.*	OC	SA-A		Hierba	H	Mic	Car
Poaceae	*Paspalum alterniflorum A. Rich.*	P	MA		Hierba	H	Mic	Car
Poaceae	*Paspalum distichum L.*	P	NT		Hierba	H	Nan	Car
Poaceae	*Dichanthelium strigosum (Elliott) Freckmann*	P	FAB		Hierba	H	Mic	Car
Poaceae	*Dichanthium annulatum (Forssk.) Stapf*	OC	PT		Hierba	H	Nan	Car
Poaceae	*Paspalum distortum Chase*	P	MA		Hierba	H	Mic	Car
Poaceae	*Paspalum filiforme Sw.*	P	MA		Hierba	H	Nan	Car
Poaceae	*Paspalum lineare Trin.*	OC-OR	PC		Hierba	H	Mic	Car
Poaceae	*Paspalum nanum C. Wright ex Griseb.*	OC	NoTien		Hierba	H	Lep	Car
Poaceae	*Paspalum plicatulum Michx.*	P	NT		Hierba	H	Mic	Car
Poaceae	*Paspalum pulchellum Kunth*	P	NT		Hierba	H	Nan	Car
Poaceae	*Paspalum rottboellioides C. Wright*	PR-IJ	NoTien		Hierba	H	Nan	Car
Poaceae	*Paspalum setaceum Michx.*	P	MA		Hierba	H	Nan	Car
Poaceae	*Reynaudia filiformis (Schult.) Kunth*	P	MA		Hierba	H	Mic	Men
Poaceae	*Rhytachne rottboellioides Ham.*	P	SA-C		Hierba	H	Mic	Car
Poaceae	*Saugetia fasciculata Hitchc. & Chase*	P	MA	EN	Hierba	NP	Mic	Car
Poaceae	*Schizachyrium brevifolium (Sw.) Nees ex Buse*	P	PT		Hierba	H	Nan	Car
Poaceae	*Schizachyrium cubense (Hack.) Nash*	PR-IJ	NoTien		Hierba	H	Nan	Car
Poaceae	*Schizachyrium parvifolium (Hitchc.) Borhidi & Catasús*	PR	NoTien		Hierba	H	Nan	Car
Poaceae	*Schizachyrium sanguineum (Retz.) Alston*	P	PT		Hierba	H	Nan	Car
Poaceae	*Schizachyrium tenerum Nees*	OC-CC	NT		Hierba	H	Nan	Car
Poaceae	*Paspalum distortum Chase*	P	MA		Hierba	H	Mic	Car
Poaceae	*Paspalum filiforme Sw.*	P	MA		Hierba	H	Nan	Car
Poaceae	*Paspalum lineare Trin.*	OC-OR	PC		Hierba	H	Mic	Car
Poaceae	*Paspalum nanum C. Wright ex Griseb.*	OC	NoTien		Hierba	H	Lep	Car
Poaceae	*Paspalum plicatulum Michx.*	P	NT		Hierba	H	Mic	Car
Poaceae	*Paspalum pulchellum Kunth*	P	NT		Hierba	H	Nan	Car
Poaceae	*Paspalum rottboellioides C. Wright*	PR-IJ	NoTien		Hierba	H	Nan	Car
Poaceae	*Paspalum setaceum Michx.*	P	MA		Hierba	H	Nan	Car
Poaceae	*Reynaudia filiformis (Schult.) Kunth*	P	MA		Hierba	H	Mic	Men
Poaceae	*Rhytachne rottboellioides Ham.*	P	SA-C		Hierba	H	Mic	Car
Poaceae	*Saugetia fasciculata Hitchc. & Chase*	P	MA	EN	Hierba	NP	Mic	Car
Poaceae	*Schizachyrium brevifolium (Sw.) Nees ex Buse*	P	PT		Hierba	H	Nan	Car
Poaceae	*Schizachyrium cubense (Hack.) Nash*	PR-IJ	NoTien		Hierba	H	Nan	Car
Poaceae	*Schizachyrium parvifolium (Hitchc.) Borhidi & Catasús*	PR	NoTien		Hierba	H	Nan	Car
Poaceae	*Schizachyrium sanguineum (Retz.) Alston*	P	PT		Hierba	H	Nan	Car

ISSN: 2310–3469 RNPS: 2347
Revista Cubana de Ciencias Forestales. 2019; January-April 7(1): 125-144

Poaceae	*Schizachyrium tenerum Nees*	OC-CC	NT		Hierba	H	Nan	Car
Poaceae	*Sporobolus cubensis Hitchc.*	PR	NT		Hierba	H	Nan	Men
Poaceae	*Sporobolus purpurascens (Sw.) Ham.*	PR-IJ	NT		Hierba	H	Mic	Car
Poaceae	*Steinchisma exiguiflorum (Griseb.) W. V. Br.*	P	MA		Hierba	H	Nan	Car
Poaceae	*Trachypogon macroglossus Trin.*	PR-IJ	NoTien		Hierba	H	Mic	Car
Polygalaceae	*Polygala glochidiata Kunth*	PR-IJ	NT		Hierba	Ch	Lep	Cor
Polygalaceae	*Polygala leptocaulis Torrey & A. Gray*	OC-CC	NT		Hierba	Th	Lep	Car
Polygalaceae	*Polygala squamifolia C. Wright ex Griseb.*	PR-IJ	NoTien		Hierba	Ch	Lep	Car
Portulacaceae	*Portulaca pilosa L.*	P	NT		Hierba	Ch	Lep	Car
Rubiaceae	*Coccocypselum hirsutum Bartl. ex DC.*	PR-IJ	NT		Hierba	Ch	Not	Car
Rubiaceae	*Hexasepalum teres (Walter) J. H. Kirkbr.& Delprete*	P	NT		Hierba	Ch	Nan	Car
Rubiaceae	*Mitracarpus glabrescens (Griseb.) Urb.*	OC	NoTien		Hierba	Ch	Mic	Esc
Rubiaceae	*Mitracarpus laeteviridis C. Wright*	PR	NoTien		Hierba	Ch	Nan	Car
Rubiaceae	*Mitracarpus sagranus DC.*	P	NT		Hierba	Th	Mic	Car
Rubiaceae	*Mitracarpus scaberulus Urb.*	PR	NoTien	A	Hierba	Ch	Nan	Men
Rubiaceae	*Nodocarpaea radicans (Griseb.) A. Gray*	PR	NoTien	CR	Hierba	Ch	Not	Men
Rubiaceae	*Oldenlandia uniflora L.*	OC	FAB		Hierba	Th	Lep	Car
Rubiaceae	*Richardia brasiliensis Gomes*	P	NT		Hierba	Ch	Nan	Car
Rubiaceae	*Richardia muricata (Griseb.) B. L. Rob. subsp. muricata*	OC-CC	NoTien		Hierba	Ch	Nan	Esc
Rubiaceae	*Spermacoce strumpfioides (Griseb.) C. Wright*	PR-IJ	NoTien		Hierba	Ch	Lep	Car
Rubiaceae	*Spermacoce verticillata L.*	P	NoTien		Hierba	Ch	Lep	Cor
Solanaceae	*Schwenckia americana L.*	P	NT		Hierba	Ch	Nan	Car
Tetrachondraceae	*Polypremum procumbens L.*	OC	PC		Hierba	Ch	Lep	Car
Turneraceae	*Piriqueta cistoides (L.) Griseb. subsp. cistoides*	P	NT		Hierba	Th	Nan	Men
Turneraceae	*Piriqueta viscosa Griseb. subsp. viscosa*	P	A		Hierba	Ch	Mic	Afila
Turneraceae	*Turnera pumilea L.*	P	A		Hierba	Th	Mic	Car
Verbenaceae	*Callicarpa americana L.*	PR-IJ	NC		Arbusto	McP	Mes	Esc
Verbenaceae	*Stachytarpheta angustifolia (Mill.) Vahl*	P	NT		Arbusto	NP	Mic	Car
Xyridaceae	*Xyris ambigua Beyr. ex Kunth*	OC	EU	EN	Hierba	H	Not	Car
Xyridaceae	*Xyris bicarinata Griseb.*	PR-IJ	NoTien	CR	Hierba	H	Mic	Men
Xyridaceae	*Xyris brevifolia Michx.*	PR-IJ	EU		Hierba	H	Nan	Men
Xyridaceae	*Xyris caroliniana Walter*	P	PT	CR	Hierba	G	Mic	Men
Xyridaceae	*Xyris elliottii Chapm.*	OC	FAB	EN	Hierba	H	Mic	Cor
Xyridaceae	*Xyris mantuensis Urquiola & Kral*	PR	NoTien	CR	Hierba	H	Mic	Men
Xyridaceae	*Xyris navicularis var. Abbreviata Malme*	OC-CC	NT	EN	Hierba	H	Mic	Car
Zamiaceae	*Zamia pygmaea Sims*	P	NoTien	EN	Hierba	G	Mic	Car

Legend:
Cor. Cuba (chorology in Cuba), where PR (Endemic exclusively to Pinar del Río province), PR-IJ (Disjunctive species between Pinar Río and Isle of Youth), OC (Occidento-Cubanicum, western Cuba), OC-CC (Occidento-Cubanicum-Centro-Cubanicum), OC-OR (Occidento-Cubanicum-Orientocum), P (Pancubanas), NoCono (Not known). Cor. Ext (Chorology outside Cuba), where PT(Pantropical), A-B (Antilles-Bahamas), MA (Macroantillas), NC (Norcaribe), SA-C (South America-Cuba), EU (Florida-south-eastern United States), FAB (Florida-Antilles-Bahamas), NT (Neotropical), SC (North of South America), A (Antilles), Amer (Americans), C (Cosmopolitans), PC (Pan Caribbean), SA-A (South America-Antilles), NoTien (No chorology outside Cuba, they are Cuban endemics), NoCono (Not known). Ca. Ame (Category of threat), where: A (Threatened), CR (Critically Endangered), EN (Endangered), VU (Vulnerable). Tip. Bio (Biological Type), where: H (Hememicryptophytes), Ch (Camephites), G (Geophytes), Mc-McP (Micro-Mesophanerophytes), LH (Micro-Mesophanerophytes), LP (Woody Lianas), McP (Micro-Phanerophytes), MsP (Mesophanerophytes), Th-H (Hemiterophytes), Th (Therophytes), MgP (Mega-Phanerophytes), NP (Nano-Phanerophytes).
Ta. Leaf (Size of the leaf), where: Mic (Microphilic), Nan (Nanophilic), Mes (Mesophilic), Not (Notophilic), Lep (Leptophilic), Mac (Macrophilic), Meg (Megaphilic).
Tea. Leaf (Texture of the leaves), where: Car (Carthaceae), Cor (Coriaceae), Men (Membranoceae), Esc (Sclerophylls).

Biodiversity indices

The calculated average Shannon-Weaver index was 1.7912, while the average Simpson index was 0.5210. These values take on absolute meaning when we refer to their extreme values; otherwise, their interpretation is relative to the comparison with indices calculated elsewhere. For example, table 2 shows the indices for the natural pine forest of "Los Pretiles".

Table 2. - Shannon-Weaver and Simpson biodiversity indices for the "Los Petriles" pine forest

Índice	Pinar "Los Pretiles"
Shanon-Weaver	1,7912
Simpson	0,5210

As it can be seen, both the Shannon-Weaver and Simpson indexes are high in the natural pine forest "Los Pretiles", evidencing that there is a high species richness and abundance in this plant formation. The high biodiversity is due precisely to the conservation character of the endemism in the white sands. That is to say, many endemic species of Alturas de Pizarras del Norte took refuge in white sand biotopes, where they were able to adapt and evolve practically without competitors. In addition to this fact, speciation developed in the area, manifested in the origin of new species for this area, especially those adapted to humid places. The greater abundance is explained by the extreme soil conditions of the area. The plants adapted to these conditions of the substrate present scarce biomass, which makes them small and can manifest themselves with a greater number of individuals. This fact should result in "Los Pretiles" having more abundance than biodiversity in its flora.

There is a great floristic diversity of 274 species and a high endemism in the flora that characterizes the area, where the predominance of species of scarce biomass is notable, accentuating the extreme conditions of the substrate.

The analysis of the chorology in Cuba shows that the greatest floristic relationships are significantly manifested in the high number of species with a wide distribution in the national territory. Regarding the size of the leaves, there is a predominance of leaves with a tendency to reduce; that is, from notophiles to leptophytes, over mesophiles, macrophiles and megaphiles, while carthaceous and coriaceous leaves predominate.

BIBLIOGRAPHICAL REFERENCES

BERAZAÍN, R., 1979. *Fitogeografía*. La Habana, Cuba: Universidad de la Habana.

BORHIDI, A., 1991. *Phytogeography and Vegetation Ecology of Cuba* [en línea]. S.l.: Akadémiai Kiadó. ISBN 978-963-05-5295-0. Disponible en: https://books.google.com.cu/books/about/Phytogeography_and_Vegetation_Ecology_of.html?id=8IolAQAAMAAJ&redir_esc=y.

BORHIDI, A. y HERRERA PEREZA, R.A., 1977. «Génesis, características, y clasificación de los ecosistemas de sabana de Cuba». *Ciencias Biológicas* [en línea], vol. 1, pp. 115-130. [Consulta: 21 noviembre 2018]. Disponible en: http://repositorio.geotech.cu/jspui/handle/1234/1111.

CAPOTE, R.P. y BERAZAÍN, R., 1984. «Clasificación de las formaciones vegetales de Cuba». *Revista del Jardín Botánico Nacional* [en línea], vol. 5, no. 2, pp. 27-75. [Consulta: 31 octubre 2018]. ISSN 0253-5696. Disponible en: https://www.jstor.org/stable/42596743.

ELLENBERG, H., 1967. *A Key to Raunkiaer Plant Life Forms with Revised Subdivisions* [en línea]. S.l.: s.n. Disponible en: https://books.google.com.cu/books/about/A_Key_to_Raunkiaer_Plant_Life_Forms_with.html?id=aiwDnQEACAAJ&redir_esc=y.

GONZÁLEZ TORRES, L.R., PALMAROLA, A., GONZÁLEZ OLIVA, L. y BÉCQUER, E.R., 2016. «Lista roja de la flora de Cuba». *Bissea*, vol. 10, no. (número especial 1), pp. 1-352.

GREUTER, W. y RANKIN, R., 2016. *Espermatofitos de Cuba. Listado Preliminar. Parte II*. La Habana, Cuba: Botanischer Garten & Botanisches Museum Berlin-Dahlem Jardín Botánico Nacional, Universidad de La Habana.

MARGALEF, R., 1998. *Ecología* [en línea]. 8. S.l.: Ediciones Omega. ISBN 978-84-282-0405-7. Disponible en: http://www.ediciones-omega.es/ecologia/47-ecologia-978-84-282-0405-7.html.

OXFORD AT THE CLARENDON PRESS, 1934. *The Life Forms Of Plants And Statistical Plant Geography* [en línea]. India: Digital Library of India Item 2015.271790. [Consulta: 21 noviembre 2018]. Disponible en: http://archive.org/details/in.ernet.dli.2015.271790.

SAMEK, V., 1973. Repositorio Digital de Informacion: «Regiones fitogeográficas de Cuba». *Acad. Cienc. de Cuba. Serie Forestal* [en línea], vol. 15, no. 1-63.

[Consulta: 21 noviembre 2018]. Disponible en: http://webcache.googleusercontent.com/search?q=cache:ogLuFo7RfwwJ:repositorio.geotech.cu/jspui/handle/1234/1453+&cd=1&hl=es&ct=clnk&gl=cu&client=firefox-b.

URQUIOLA, A.J., 1987. *La vegetación de las Arenas Blancas de Pinar del Río. Propuesta de áreas protegidas*. Tesis de doctorado. La Habana, Cuba: Universidad de la Habana.

URQUIOLA, A.J., URQUIOLA, A. y NOVO, R., 1999a. Levantamiento de la Flora de la Provincia de Pinar del Río. Aproximación a sus 14 municipios. Proyecto Territorial, Programa de Medio Ambiente y Desarrollo Sostenible. 1999. S.l.: CITMA.

URQUIOLA, A.J., URQUIOLA, A. y NOVO, R., 1999b. Levantamiento de la Flora de la Provincia de Pinar del Río. Aproximación a sus 14 municipios. Proyecto Territorial, Programa de Medio Ambiente y Desarrollo Sostenible. 1999. S.l.: CITMA.