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Floristic and Physiognomic Characterization of *Casino Campestre* City Park in Camagüey, Cuba

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ABSTRACT

A floristic and physiognomic characterization was made to the flora and vegetation of *Casino Campestre*, the most important city park in Camagüey, Cuba. The presence of 198 species from 170 genera and 72 families was reported to live in the park. Most species are exotic trees, which also grow along with some native and endemic elements. Their social, cultural, and environmental significance was assessed.

KEY WORDS:/ City park, exotic species, endemic species, environmental education, extracurricular education.

INTRODUCCION

The city of Camagüey is the third most populated urban area in Cuba (National Office of Statistics and Information, 2015). It was founded in 1514 near the north coast; and later it was moved to the current site, between the Tinima and Hatibonico rivers, in 1528. The first name given to the city was *Villa de Santa Maria del Puerto del Principe*; later, it was named *Puerto Principe*. The current name (Camagüey) was given to the city after the Spanish domination, in 1898. This is the capital city of the province under the same name, located in the mid-eastern region of the main island of Cuba, covering 83.40 km^2 (Primelles (2010), with a population of 304 738 inhabitants (National Office of Statistics and Information, 2015)

The urban layout of Camagüey is well preserved and unique. The streets are windy, with abundant alleys and irregular blocks. There are many squares and piazzas associated to important catholic churches. The architectonic typology of homes is characterized by extended use of clay bricks, floor and roof tiles, and *tinajones* (large earthenware jars to collect rain water), besides eaves, aerial pilasters and windows with turned wood banisters, holding dust covers and brackets (Gómez, 2016). Accordingly, in 2008, the historic center of the city was declared World Heritage (UNESCO, 2008).

One of the best attractions of the city is *Casino Campestre*, an urban park linked to the local

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history, which is very near the city center. Its extension, high functionality, exuberant vegetation, and abundance of monuments, has become notorious outside the capital, Havana.

This area deserves further studies of history, architecture, culture, environment, etc. The aims of this paper were to provide broader knowledge of the role the park plays in the functionality of the city, and study the key role that plants have in shaping land ecosystems. It is also important to characterize its flora and vegetation, and to assess their significance in the urban ecological layout and the social and cultural life of Camagüey.

MATERIALS AND METHODS

Information collected from different documentary sources was integrated to characterize the location: satellite images (Google Earth <http://www.google.com/intl/es/earth/>), maps (geomorphological, geological, edaphic, climatic, hydrological, biogeographic, and landscape), made by Mendieta (2005) and Primelles (2010), and the data provided by previous authors (Aróstegui, 2008; Luna, 2002; Perpiñá, 1889; and Torres Lasqueti, 1888). All the data were complemented with the criteria given by local experts in natural and social sciences. The techniques used included modeling, comparison, and spatial multi criterion analysis. The map was designed with MapInfo, version 12.02.

The criteria of Gómez (2016) were taken into account for description of the urban settlement. A survey of the number of benches, monuments, and other buildings in the area, including nearby public facilities, was completed by corroboration of facts. The inventory of flora was made by *de visu* identification of all the plants observed. Others which could not be identified at first were photographed and herborized for further detailed analysis.

For sample identification, first, a probable identity was established according to Tropicos database (<http://www.tropicos.org/>), Acevedo & Strong (2012), and Greuter & Rankin (2016). Later, they were compared to other specimens in the herbarium of the Ignacio Agramonte Loynaz University of Camagüey (HIPC), with on-line images, and the utilization of analytical keys and existing descriptors in the literature.

Taxonomic arrangement was made according to Judd *et al.* (2016) for higher ranking taxons, and Greuter & Rankin (2016) for spermatophyte families. The data corresponding to the original region of the species, and the particularities of their presence in Cuba were taken from Acevedo & Strong (2012) and Greuter & Rankin (2016). Assessment of their utilization was performed according to Roig (1963, 1974) and Acuña (1970). The invading potential and threat of extinction was determined according to Oviedo & González (2015), and González, Palmarola, González, Bécquer, Testé & Barrios (2016), respectively.

Characterization of the original vegetation was based on the references of Capote and Berazaín (1984), and the most preserved plant formations in nearby locations, with similar soil, climate, and environmental conditions. The existing plant coverage was described from biological types and from the species that predominate with a particular physiognomy.

RESULTS AND DISCUSSION

The floristic-physiognomic characterization of the area demands previous determinations about its geographic location, along with a short geological, geomorphological, edaphic, and climatic

characterization. Likewise, it requires an approximate description of the original vegetation and the history of human activities that led to the creation of the park and later development.

The center of the park is on coordinates 21º 22' 34" N and 77º 54' 42" W, on the banks of Juan del Toro River, an affluent of the nearby Hatibonico River. The park rests on a granodioritic-type geological complex that derives into a denudative-accumulative plain (Primelles, 2010).

The local weather is mid humid due to the highly predominant relative humidity, and the existence of a rainy season from May to October, followed by a dry season between November and April, which produce 1 200-1 400 mm of annual rainfall, combined. The mean temperatures vary between 22.6 ºC in Jan-Feb, and 27.6 ºC in Jul-Aug. The predominant winds come from the northeast and east, sometimes from the southeast (Primelles, 2010). These conditions are expected to vary in the short and mid-term due to climate change. In Cuba, the climate trend moves toward elevated air temperatures and reduced day-time temperature ranges, with increasingly frequent long and severe droughts in the summer, as well as higher rainfall totals associated to precipitation events in winter (Planos, Rivero, and Guevara, 2013).

The original soils are basically brown-red fersialitic (Mendieta, 2005) which have been benefited by the deposition of allochtonous sediments brought by Juan del Toro and Hatibonico rivers. However, the soil is mixed with various substrates (construction materials) carried away from different facilities, soil for the playground, organic matter added with new trees or mixed with the layers of transplanted grass.

Most probably, before the XVI Century, this location was covered with the type of forest that Capote and Berazaín (1984) classified as mesophylous semideciduous (deciduous trees 40-65% proportion, with relatively large leaves, 13-26 cm long), whose top arboreal strata reached 15-20 m high, though there were surely 25 m or higher trees (palm trees, particularly). Species like *Andira inermis*, *Bursera simaruba*, *Cedrela odorata*, *Ceiba pentandra*, *Cordia collococca*, *Oxandra lanceolata*, *Roystonea regia*, and *Zanthoxylum elephantiasis* must have been represented. The vegetation on the banks of Juan Toro River must have acquired the typical gallery forest shape from the most heliophyllic species of the surrounding vegetation, like Callophyllum *antillanum*, *C. rivulare*, *Lonchocarpus dominguensis*, *Roystonea regia*, and *Tabebuia angustata*.

Still in the XVIII Century, the lands east of the Hatibonico River were outside the then Villa de Santa María del Puerto del Príncipe. The fertility of the soils contributed to the emergence of farms, and pottery shops, two common practices of the settlement. The erection of the so called Puente de la Caridad, first made of wood in 1729, then of stone in 1773 (Torres Lasqueti, 1888; Luna, 2002; and Barreto, 2016), facilitated access to the location, which would later become the Caridad Quarter, settled next to Casino Campestre Park.

By 1850, various cattle and crop fairs and exhibitions were held under the name of Feria de la Caridad (Caridad Fair). Those, along with various social and cultural events, marked its beginning as a public space. In 1860, the City Hall purchased the land, and began to build several facilities needed to exhibit goods, including lawn, promenades, and horse tracks. The name given to the whole area was Casino Campestre.

The boom of Casino Campestre was halted at the beginning of the War of 100 Years, in 1868, which forced the authorities to use the land to foster agriculture to feed the population again. Later on, this area hosted the Spanish troops that fought in the war.

After the third war of independence (war of 1895), different organizations tried to use the location to build sports and recreational facilities, but he municipal authorities ratified their right of ownership over the land, thus strengthening its public usefulness and the condition of urban park. In 1902, it was the venue of the celebrations of the Republican Era, for which several areas were paved.

In 1916, the authorities tried to change the name of Casino Campestre for Gonzalo de Quesada y Arostegui, in honor of that outstanding patriot who collaborated with José Martí, the Apostle of Cuban Independence. However, this proposal was not backed by the population, who preferred to use the original name already rooted in the collective memory. The first images of that place are still preserved (Fig. 1).

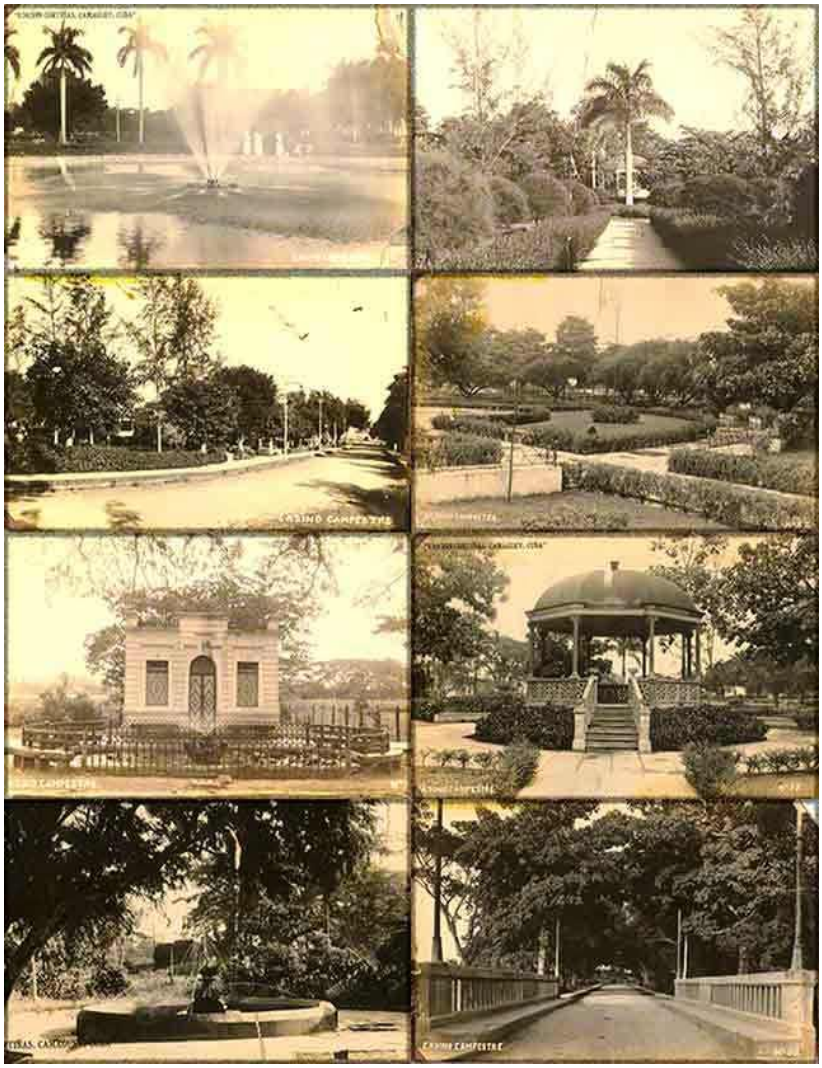

Fig. 1. Images of Casino Campestre during the first decades of the Twentieth Century.

Today, the park extends over nine hectares (González, 2012). It has boundaries with Carretera Central, 26 de Julio Ave., Juan del Toro River, and Cornelio Porro and Javier de la Vega Streets (Fig. 2).

Within the perimeter of the park, there are a small zoo, a fresh-water fish aquarium, a playground, and several eateries. The park includes seven allegorical monuments of outstanding local personalities and remarkable events that took place along history. Various plaques in memory of figures like Jorge Ramón Cuevas, or significant dates can be seen across the park. A pavilion and a man-made cave are also added to the display of various other buildings and structures that increase the heritage values of the park. The park is fit with a number of city light poles and garbage containers, 100 benches (most of them with a particular design that includes bronze carvings and the acronym of the park) (Fig. 3).

Fig. 2. Location and distribution of Casino Campestre. (A) Orthophoto (Google Earth <http://www.

Fig. 3. Relevant architectonic elements of the park. (A) Pavilion. (B) Model of the current structures. (C) Monument to Salvador Cisneros Betancourt (1828-1914), Santa Lucía Marquee, president of the Republic on Arms twice, etc. (D) Monument in honor of the Literacy Campaign of 1961 (hive-like shelter for pigeons that reproduces the shape of lanterns used by the young teachers to light their classrooms). (E) Monolith of peace. Photos: Isidro E. Méndez Santos

Relevant facilities adjacent Casino Campestre that complement the significance of the park. Plaza de la Revolución "Mayor General Ignacio Agramonte", Provincial Assembly of the People's Power, "Candido González" baseball stadium, "Rafael Fortún Chacón" Sports Palace, "Patricio Lumumba" Sports Center, "Casino Campestre" Recreational and Cultural Center, "Álvaro Morell Álvarez" High School, "Iván Hidalgo Funes" Auditorium.

Although urbanization, development of green areas, and location of monuments was more intense in the first half of the Twentieth Century, it continues to the day. The growth of the city has left Casino Campestre in the center of the urban perimeter, very near the historic center of the city declared World Heritage by UNESCO. Hence, the main ways of communication of the city converge in this area and many of the most important urban events are held in the surroundings.

Regardless of the facilities mentioned previously, the main attraction of the park is its natural conditions, especially its flora and vegetation. Below are data that support the above, in relation to taxonomy, phytogeography, usefulness, preservation, and behavior of the park species in other ecosystems of Cuba, which are associated to the physiognomy of plant formation.

This study confirmed the existence of 198 species from 170 genera, and 72 families of Embryophytes (Fig. 4). Appendix 1 shows a complete relationship of all these systems, which include taxons introduced by man (67%) and others that grow spontaneously (33%)

Fig. 4. Some plant species of the park. (A) Palm trees. On a second plane: *Acrocomia crispa* (with epiphytes of *Tillandsia recurvata* growing on the trunk); to the bottom and smaller: *Latania loddigesii*. (B) *Tillandsia balbisiana* growing on branches of *Samanea saman.* (C) *Couroupita guianensis*. (D) *Ceiba pentandra*. Photos: Isidro E. Méndez Santos

A high percentage of these elements (96%) belongs to angiosperms or flower plants, whereas a much lower percentage (4%) is made of three taxons of gymnosperms, two of pteridophytes, and one of moss. The families with the highest representation are Poaceae (19 genera and 21 species), Arecaceae (15 genera and 18 species), Asteraceae (9 genera and 9 species), and Euphorbiaceae (7 genera and 9 species). Genera *Ficus*, with 5 species and *Cordia*, with 4, are the most widely represented.

Many of the species are exotic (57%), though none of them was introduced in the country with the purpose of enriching this collection; on the contrary, all of them are widely cultivated in other parts and have incorporated to the wild flora. Of them, 36% is from Asia, Australia, and the Pacific; 26% is native to the Americas; 12% comes from Africa; and 10% is widely spread in the world. Approximately a third of these species are still cultivated in Cuba, but the rest has naturalized. Most of these plants (76%) act like invading or potentially invading species of natural ecosystems, including 17 taxons that are part of the 100 most harmful species affecting the Cuban archipelago, 11 out of which generate high concerns.

Eighty-four indigenous species are also represented, six of which are endemic to Cuba. Some of them (46%) are endangered species: 33 with Minor Risk (MR), one preliminarily considered Threatened (T), one vulnerable (V), and another in Critical Danger (CR).

Ethnobotanically, 87% of these species has some kind of usefulness, namely, ornamental (49%), honey producing (32%) for nectar (22%) or pollen (11%) to hives (8 have the two attributes), medicinal (26%), forest (24%), animal food (10%), human food (7%), fiber (2%), or utilization in rituals and folk ceremonies (1%).

Arboreal taxons predominate (45%), then grass (36%), shrubs (10%), lianas (6%), and epiphytes (3%). The first two groups share most elements whose presence in the park responds to an intentional selection, and are under control through agro-technical and gardening labors, regardless of the natural regeneration of many of them.

The tree stratum of the park varies between 10 and 20 (25) m, with species like *Ceiba pentandra*, *Enterolobium cyclocarpum, Khaya senegalensis*, *Roystonea regia*, *Samanea saman, Spathodea campanulata, Sterculia apetala, Tamarindus indica* and *Taliparitі elatum*. The dosel is not fully closed, though, and shrub species are being fostered in many sunny spots, with species like *Acalypha wilkesiana*, *Codiaeum variegatum, Galphimia gracilis*, *Plumbago scandens*, and grass, specially cespitose graminaceae.

The lawn deserves particular analysis. Out of 55 species of lawn, only two (*Bouteloua dimorpha and Paspalum notatum)* seemed to have been originally planted in the place. The current grass species have spread in the park following their own natural ways of dispersion. In the latter, the possibility of previous existence from ancient times, before the park, cannot be disregarded. The rest is made of a mix of sinatropic elements (ruderal, segetal) that grow spontaneously, which remain at the desired height in perfect aesthetic combination with the whole set, thanks to systematic trimming.

Casino Campestre does not preserve any remains of its native vegetation. All the native plant formations were destroyed and replaced for new vegetation, which was fostered and controlled by man. Species that exist in the park today and probably were before the Nineteenth Century (*Cedrela odorata*, *Ceiba pentandra, Cordia collococca*, *Callophyllum antillanum*, and others),

were later introduced in the park. Hence, this agro-forest population meets the needs of the social mission of the urban park, especially in relation to extensive shaded spaces suitable for resting, recreation, and spiritual relaxation. The park arboretum stands out due to the integration of its floristic and physiognomic values.

Landscaping practices have articulated agro-technical and gardening labors (especially trimming and removal of detached or dry branches). Therefore, on the horizontal plane, from every angle, most monuments can be seen, along with trails, the lawn, and the trunks of large trees, many of which exhibit prominent buttresses. Looking up, no obstacles block the visitors´view of the highest foliage, birds, and other animals that live in the park. The weather conditions, and the sun or the moon (depending on the time) can also be observed from below (Fig. 5).

The floristic and physiognomic composition of the plant coverage described above

Fig. 5. View of vegetation in Casino Campestre, from different angles. Photos: Isidro E. Méndez Santos

has not been stable throughout history in Casino Campestre. On the contrary, they have been subject to variations caused by different agents, including damage caused by hurricanes, floods, architectonic remodeling, and the availability of resources at times; the effects of the ongoing climate change should be added.

Just like for other parks in similar cities, the green layer of Casino Campestre has become a significant part of the environmental functioning of Camagüey, by hosting a varied wildlife that includes animals in captivity as well as others that have proliferated in the area spontaneously. The former are confined to the zoo, with more than 1 000 individuals from 104 species.

The wild animals are very diverse. Preliminary studies conducted by the authors of this article have corroborated the existence of 85 species and 34 subspecies, corresponding to phyla Mollusca, Annelida, Artrhopoda, and Chordata. The most commonly represented groups are insects (lepidoptera), particularly daylight butterflies (Rhopalocera). Most of these animals are adapted to living with humans and they show up around the city. Such is the case of some mollusks (*Zachrysia auricoma*), daylight butterflies (*Anartia jatrophae guantanamo, Heliconius charithonia ramsdeni*), chilopoda (*Scolopendra alternans*), amphibians (*Eleutherodactylus planirostris*), reptiles (*Anolis allisoni*), and birds (*Chlorostilbon ricordii*). However, others, like bird *Melanerpes superciliaris*, whose habitat is in the forests, traditionally, have found shelter in the park and migrated to the city forced by the advance of deforestation (Fig. 6).

Fig. 6. Some animal species found in the park. (A) *Scolopendra alternans*. (B) *Heliconius charithonia ramsdeni.* (C) *Zachrysia auricoma*. (D) *Anolis allisoni*. (E) *Melanerpes superciliaris.* (F) *Chlorostilbon ricordii.* Photos: A, B, C and D, Isidro E. Méndez Santos; E and F, Leonardo Mejías Proenza.

The function described in the previous paragraph has gained more importance as agriculture, city development, construction materials processing, and the exploitation of other raw materials, have gradually altered the environmental patterns by growing in the suburban surroundings.

The park contributes to the purification of the air that the local population inhales, which benefits the urban sections south of the park. It also contributes to the removal of CO_2 from the air, somehow due to its limited dimensions, though it is relatively invaluable within the urban scenario. In this site, the genetic resources of nationally important forest species are safeguarded (Hechavarría & Manzanares, 2016).

The most relevant environmental significance of Casino Campestre, however, is given by the direct benefits the social life of the city receives from the park. One of them is in relation to the potential of the park to conduct classwork through formal and non-formal ways of different grades without having to move long distances. The schools of the city have access to an ideal camp to teach students about representative species of taxonomic groups included in the curricula, especially the species of the Angiosperm family, with varied growth habits, usefulness, and links to the local culture. Some of them have become notorious due to their limited distribution, like *Hebestigma* (Fabaceae), monotypical and endemic to Cuba, or *Coccothrinax macroglossa* palm trees, only found in the mid-eastern part of Cuba (Camagüey, Tunas, and Holguin), and *Acrocomia crispa*, which grows from Pinar del Rio to Holguin provinces.

The relevance of other species lies in that they confront serious risk of extinction, such as *Juniperus barbadensis* (Cupressaceae), classified as in critical danger (CR). Another reason is their invading behavior, such as *Dichrostachys cinerea* (Mimosacee), which has occupied more than 3 800 000 ha nationwide, and the park staff has been unable to prevent it from spontaneous growth. Many educational activities can also be encouraged in the presence of trees that have acquired celebrity, like the *Ceiba pentandra* (Bombacaceae) specimen, allegorical to the foundation of the Republic, which was planted on May 20, 1902.

Casino Campestre is also a suitable scenario to assess gardening critically, especially to appreciate good related practices. Likewise, animal-plant interaction and the network of links created between the environment and society can be studied further.

Plant coverage, easy access, and land extension, among other aspects described, create favorable conditions for the park to become the venue of some of the most important cultural and recreational activities held in the city, such as the Book Fair and the Children's Carnaval. This is also the most commonly used place for family recreation, their private contact with nature within the city. Many city residents visit the park to take photos during their most significant anniversaries, as well as tourists, to complete the evidence of their stay in Camagüey. It also has a space for syncretic cults of Afro Cuban religions, corroborated by the many offerings usually placed under the foliage of *Ceiba pentandra*, a tree with a special meaning in the context of the complex processes of transculturization that have nurtured the Cuban culture (Fig. 7). In short, Casino Campestre has played a critical role in the spirituality of Camagüeyans and, therefore, it works as an element of great relevance in the processes that generate its identity.

Fig. 7. Offerings related to Afro Cuban religious rituals, placed by the trunks of *Ceiba pentandra* in Casino Campestre. Photos: Isidro E. Méndez Santos

CONCLUSIONS

The selection of species incorporated in Casino Campestre and the physiognomic configuration of the plant coverage, does not seem to have followed any initial planning. Even the arboretum is far from a taxonomic, phytogeographic, or ethnobotanical perspective; rather, it responds to landscaping criteria. The different stages of the park have been influenced by objective and subjective factors, including the predominant opinions of government authorities, park administrations, and the workers.

Nevertheless, the park has meant much more than a center for leisure and recreation of the population. The flora and fauna of the park have mingled with the costumes, living patterns, beliefs, and artistic expressions, which have been passed on from generation to generation.

Moreover, this symbiosis has provided an opportunity to enrich the biological diversity of the city, manage its ecosystem services, and improve health and wellbeing of humans, significantly. These two are more relevant in the current and perspective context of mitigation and adaptation to climate change.

RECOMMENDATIONS

Because of the environmental and heritage significance of Casino Campestre for the city of Camagüey, the park should receive special attention in the context of public policies and urban planning; hence, a master plan for preservation and development, in which the physiognomic and

floristic criteria play a corresponding role, according to the importance of plants in the ecosystems.

The features of climate change identified for Cuba should be taken into account either to select species or plan the potential physiognomy of vegetation and social use that will be given to the facility.

More relevance should be given to the park as a camp to carry out different kinds of educational activities due to the relevance of the park in the people's spirituality, and therefore, be an example in the recovery of the urban surrounding, and assume advanced ideals of sustainability.

Accordingly, new species related to the local and national history and culture should be introduced; for instance, the national flower of Cuba (*Hedychium coronarium*), which is absent.

Native and endemic species in danger of extinction, particularly those poorly spread in the province, should be prioritized. That way, the inhabitants of the city and visitors, not only can show their feelings of identity to floristic elements of their city within the national and international contexts, but also find the strength to encourage their feeling of responsibility to preservation.

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