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Coccothrinax jimenezii – A Critically Endangered Palm from Hispaniola

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Coccothrinax jimenezii **M.M. Mejía & R.G. García (Fig. 1) is assigned the IUCN's Critically Endangered conservation category. Extensive field work performed in 2015 confirmed the existence of a population of 43 individuals, mostly juvenile, in Haiti (previously reported in 1995). These field studies also corroborated that the species (18 individuals, mostly adults) is restricted to only a single site in the Dominican Republic. None of the trees was in reproductive stage during our visits. Two major conservation challenges include: (1) a current trend for water levels to increase in the hypersaline Lago Enriquillo and (2) harvest of palm leaves for making brooms in Haiti. Recommendations are made to collect seed for ex situ conservation and future species reintroductions in its original habitat.**

1. Individuals of *Coccothrinax jimenezii* growing in a cluster on the fringing fossil coral reef near the shoreline of Lago Enriquillo, Dominican Republic.

Palms represent one of the most important elements of the Caribbean Island landscapes. They are also characteristic species of several of the vegetation types of the region. In addition, there are major concerns regarding palm conservation in these islands (Henderson et al. 1990; Zona et al. 2007; Roncal et al. 2008).

Coccothrinax (ca. 50 species) (Arecaceae) is restricted to the Caribbean Basin [Mexico, Belize, South Florida, Paria Peninsula (Venezuela), Trinidad, Tobago, Margarita Island, the Bahama Archipelago, the Greater Antilles, and the Lesser Antilles] (Dransfield et al. 2008). Most species of *Coccothrinax* are island endemics confined to the Caribbean Island Biodiversity Hotspot. Ten of these insular species occur in Hispaniola, with six of them endemic to the island (Mejía & García 2013); the remaining four are shared with other Caribbean islands. *Coccothrinax* is regarded as taxonomically difficult, in need of taxonomically reviewed, to establish clear species boundaries (Dransfield et al. 2008).

The latest described species within this genus, *Coccothrinax jimenezii*, was discovered and described by taxonomists from the National Botanic Garden of the Dominican Republic (NBGDR) (Mejía & García 2013, Fig. 1). The specific epithet honors Francisco Jiménez Rodríguez, Head of the Botany Department of the NBGDR. In this paper we focus on the distribution range and conservation issues of *C. jimenezii* as a distinct species without discussing potential taxonomic relationships with other taxa of the genus. However, in the original description, Mejía and García (2013) suggested morphological similarities with the Hispaniolan endemic *C. gracilis*.

The original publication described a slender palm that can reach up to 5 m in height, with stem diameter of 4–6 cm (Fig. 2). It has leaf sheaths, 11–13 cm in length, that are smooth on the base and edges, made of two layers of flexible fine fibers and with no spines (Fig. 3). Petioles are (20–)33–34(–42) cm in length, and total leaf length is 51–77 cm. The hastula is 6–10 mm long, 11–13 mm wide, rigid, slightly acuminate to truncate in shape (Fig. 4), hardly noticeable on the leaf underside (Fig. 5). The leaf lamina is covered on both sides by a white-silver indumentum (more noticeable in young

2 The crown of the slender palm *Coccothrinax jimenezii*, at the Lago Enriquillo site, Dominican Republic.

leaves), and comprises 21–28 segments, 24–33 cm in length, 1–2 cm in width. Segments are bifid at the apex. The inflorescences (Fig. 6) are (20–)25–30 cm long, recurved, with 3 or 4 partial inflorescences and each one of them with (4–)10–17(–19) secondary branches, 10–15 cm long, and 13–16 rachillae, 3–6 cm long. Flowers have 4 or 5 stamens; filaments are 1–1.5 mm; anthers are 2 mm long, with two thecae; and the ovary is 1 mm long. Fruits are globose, 4.5–5.5 mm x 5.3–6.3 mm, which are slightly depressed from the apex to the base, verrucose (finely bumpy) in texture, green-yellowish in color turning whitish when fully mature. It has ruminate seeds with 5 or 6 lobes, rounded or slightly flattened, and dark brown in color.

The original description of *Coccothrinax jimenezii* was based on material from the Dominican Republic (type locality) and Haiti (Fig. 7); however, Mejía and García (2013) indicated that the only known record from Haiti came from a single herbarium collection made by T. Zanoni, M. Mejía and R. García in 1985 (specimen 82525, JBSD). With the support of the Mohamed Bin Zayed Species Conservation Fund, we (BP, AX, WC, BJ) undertook plant exploration expeditions in Haiti in January 2015 (Fig. 2) and in the Dominican Republic (BP, FJ) in March–April 2015 to confirm if this threatened palm still existed in Haiti and to examine the known distribution of the species in the Dominican Republic. Demographic inventories were conducted to determine the number of seedlings, juveniles and adult individuals. DNA samples for conservation genetic studies were collected from all the individuals of the two populations (Fig. 8). Preliminary molecular data indicated that at least seven microsatellite (SSRs) loci can be used to address population and conservation genetics issues from this species. In addition, during our field work we recorded data pertinent to conservation threats. The project also had an outreach component with printed material (one poster and one postcard) produced to be distributed to conservation shareholders.

Distribution, ecology, and conservation concerns

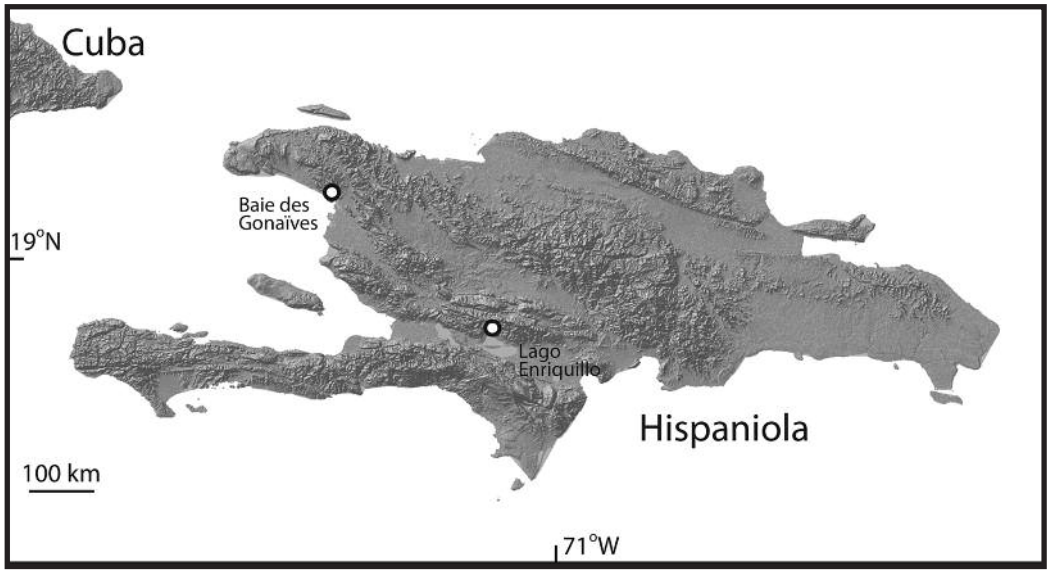
Dominican Republic. The only population of *Coccothrinax jimenezii* from Dominican

3 Fibers of the sheats of *Coccothrinax jimenezii*, at theLago Enriquillo site, Dominican Republic.

4 (top). Petiole base and hastula (leaf upperside) of *Coccothrinax jimenezii*, at the Lago Enriquillo site, Dominican Republic. 5 (bottom). Petiole base and hastula (leaf underside) of *Coccothrinax jimenezii*, at the Lago Enriquillo site, Dominican Republic.

Republic occurs in Provincia Independencia, near the shoreline of Lago Enriquillo (Fig. 3), a hypersaline lake located 45 m below sea level at approximately 9 km from the border with Haiti. This is the largest lake in the Caribbean Islands, and it has three islands. These islands and the coastal areas form a national park known as Parque Nacional Lago Enriquillo e Isla Cabritos. Therefore, this population of *C. jimenezii* is officially conserved inside a protected area. Within the park, we found a total of 16 adults and two juveniles. In

6 Inflorescences and upper stem part of *Coccothrinax jimenezii*, at the Lago Enriquillo site, Dominican Republic.



7. Location of the two known populations of the Hispaniolan endemic *Coccothrinax jimenezii* in the Dominican Republic and Haiti.

addition, we recorded one dead plant. None of the adult individuals were in reproductive stage. All plants were growing in a cluster and were relatively close to one another (total distribution area ca. 400 m^2), except one adult individual that was located at approximately 1.5 km from this core population.

Lago Enriquillo is located along a valley that separates two distinct geological units of Hispaniola that represent two ancient paleo-islands that collided in the Middle Miocene (ca. 16 MYA) (Graham 2003). The environmental history of this valley has been influenced by sea-level changes linked to global climatic change. During interglacial periods it was below sea level (Mann et al. 1984). The exposed geology of Lago Enriquillo provides additional evidence for past marine environments, as outcrops of an extensive fossil coral reef fringe many sections of this lake (Reuter et al. 2013). *Coccothrinax jimenezii* grows on one of these fossil coral reef outcrops. The vegetation type can be defined as a Lowland Drought-Deciduous Shrubland with elements from the Mixed Evergreen-Deciduous Thorn Woodland, following the vegetation classification of Areces-Mallea et al. (1999). The most common plants growing in the area where this palm occurs are: *Plumeria subsessilis* (Apocynaceae), *Tabebuia microphylla* (Bignoniaceae), *Guaiacum officinale* (Zygophyllaceae), *G. sanctum*, *Isidorea leonardii* (Rubiaceae), *Cameraria linearifolia* (Apocynaceae), *Echites umbellatus* (Apocynaceae), *Acacia scleroxyla* (Fabaceae), *Turnera diffusa* (Passifloraceae), *Calliandra haematomma* (Fabaceae), *Melocactus lemairei* (Cactaceae), *Guapira brevipetiolata* (Nyctaginaceae), *Ziziphus rignoni* (Rhamnaceae) and *Croton poitaei* (Euphorbiaceae) (Mejía & García 2013).

In the last ten years Lago Enriquillo has experienced an unexpected rise in water level. This has resulted in flooding that has had negative effects in farmland and roads (Romero Luna 2011). It is unclear what environmental variables are behind the water dynamics of this lake, although Romero Luna (2011) suggested that atypical rain fluctuations could account for changes in the lake water levels. Because the only known Dominican Republic site of *C. jimenezii* is located near the shore of this lake, we believe that changes in the hydrology represent a potential threat for the conservation of this species. Because of this major conservation concern and the fact that the population of Lago Enriquillo has fewer individuals than that of Haiti (see below), we recommend collecting seeds for *ex situ* conservation and a future reintroduction program as a main management priority for the national park authorities. It is worth mentioning that during our field trips we did not notice any use of this palm by the people who reside in this area.

Haiti. The only site of *Coccothrinax jimenezii* in Haiti is in the vicinity of the city of Gonaïves, Département de l'Artibonite, growing on limestone substrate; however, this substrate

8. Pierre Angelo Joseph collecting leaf samples of *Coccothrinax jimenezii* for DNA studies, at the Gonaïves site, Haiti.

did not seem to be associated with a fossil coral reef. The site is located approximately 250 m from the coastline of the Baie des Gonaïves (Fig. 3). This locality has 43 individuals, 42 of them formed a cluster that covered ca. 10,000 m^2. One isolated individual was found at approximately 1 km from this cluster. The vegetation type can be defined as a Lowland Drought-Deciduous Shrubland with strong marine littoral influence. Common plants found in this area include: *Prosopis juliflora* (Fabaceae), *Parkinsonia praecox* (Fabaceae), *Consolea moniliformis* (Cactaceae), *Pilosocereus polygonus* (Cactaceae), *Tabebuia* sp., *Agave antillarum* (Asparagaceae), *Stylosanthes hamate* (Fabaceae), *Convolvulus nodiflorus* (Convolvulaceae), *Jacquemontia havanensis* (Convolvulaceae), *Stigmaphyllon emarginatum* (Malpighiaceae), *Echites umbellatus* (Apocynaceae), *Mesechites repens* (Apocynaceae), *Melocactus lemairei* (Cactaceae), *Tournefortia stenophylla* (Boraginaceae), *Cissus trifoliata* (Vitaceae), *Melochia tomentosa* (Malvaceae), *Tridax procumbens* (Asteraceae), *Capparis flexuosa* (Capparaceae), *Turnera diffusa*, *Mammillaria* sp. (Cactaceae), *Plumeria subsessilis* and *Picrodendron baccatum* (Picrodendraceae). Despite this population having more individuals than the one in the Dominican Republic, none of the plants was more than two meters tall. Most individuals were below 1.0 m in height, and they were identified as juveniles. We did not find any seedlings, and none of the plants had fruits or flowers. We also noticed that the leaves of this species seem to be heavily harvested (Fig. 9) to make brooms, an ethnobotanical practice that we believe has detrimental consequences for the plants and might explain why all of the individuals were so short and without mature leaves. Indeed, we located only one isolated individual that was not harvested and still had a full crown of leaves.

Conservation assessment

Assessment for the conservation status of the target species was achieved using the red listing categories and criteria established by the IUCN (2014a). The IUCN (2014b) data base of threatened species does not include this species. In addition, Mejía and García (2013) did not provide an IUCN-based conservation assessment for this species because information for this species in Haiti was lacking. Based on

our field studies the species should receive the Critically Endangered (CR) conservation status (criteria B2C2i). The species has this status because it meets the following two criteria: [1] an Area of Occupancy below 10 km^2 (criteria B2) and [2] fewer than 250 mature individuals, an observed continuing decline and fewer than 50 mature individuals in each population (criteria C2i).

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