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# Contribution to the knowledge of the edaphoxerophilous communities of the Samana Peninsula (Dominican Republic)

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**Abstract**
The Samana Peninsula belongs to the biogeographical North Sector of the Caribbean-Atlantic Subprovince (Hispaniola Province, Caribbean-Mesoamerican Region). In the past the Peninsula was separated from the rest of Hispaniola but today it is joined by a small strip of land made up of Quaternary sediments in the Gran Estero. Rainfall records are as high as 2,339 mm. The Io value is 7.3 (i.e., humid ombrotype) and Ti/Tic values are 741/675. These conditions give rise to an infratropical thermotype. The Samana Peninsula forms a geomorphological unit dominated by karstic materials, limestones, schists and marls. Despite the heavy rainfall rates, the presence of escarpments (farallones) gives rise to an edaphoxerophilous community. Species such as *Pilosocereus polygonus, Zamia debilis, Agave antillarum, Eugenia samanensis, Bursera simaruba, Capparis fexuosa, Ficus velutina, Opuntia dellinii, Comocladia dodonaea, Stigmaphyllum emarginatum* are not infrequent in this plant community. This edaphoxerophilous community is rich in endemic species and is dominated by *Coccotrinax gracilis, Agave antillarum, Leptocereus weingartianus* and, to a lesser extent, by *Eugenia samanensis*. The presence in the peninsula of 134 endemic species justifies considering this a biogeographical territory (A4) within the North Sector (Cano *et al*., 2010).

Key words: association, edaphoxerophilous, flore, vegetation.

## Introduction

The Samana Peninsula forms a geomorphological unit with a maximum altitude of 605 m in the area known as La Meseta. There is a predominance of karstic materials, limestones, schists and marbles. The emergence of this area as an island, separated from Hispaniola, dates back to the Cretaceous period, in the Mesozoic Era and the area continued to be an island until fairly recently. Despite the high rainfall rates, the presence of escarpments (farallones) has given rise to an edaphoxerophilous community. The Samana territory with an area of 768 km$^2$ belongs to the Dominican Republic and is included in the Samanense territory (A4) of the biogeographical North Sector within the Caribbean-Atlantic Subprovince (Hispaniola province, Caribbean-Mesoamerican Region (Fig. 1). The peninsula was separated from the rest of Hispaniola, but nowadays a narrow strip of land made up of Quaternary materials deposited over the last 500 years in the Gran Estero joins the two territories. In Nagua the annual average temperature is 25 °C, the rainy season lasts for 8 months and consequently the rainfall records are high (2,183 mm). There is not much natural vegetation cover as a result of human pressure, particularly where there are coconut and coffee plantations. The inland areas are the best preserved, as are the wetlands and rocky sites (farallones). Due to the subhumid-humid ombrotype, the dominant vegetation is made up of pluvial evergreen forest and the manaclar or community of *Prestoea acuminata* (Willd.) H. E. Moore = *Prestoea montana* (grah.) Nichol in the sites with higher rainfall rates. In the lowland territories of El Limón, Gran Estero, La Majagua, i.e., in fresh-water logged sites, there is a forest of *Perocarpus officinalis* Jacq., *Roystonea hispaniolana* L. H. Bailey. In Cano *et al*. (2009), we have described this forest as *Roystoneo hispaniolanae-Pterocarpetum officinalis* Cano, Veloz, Cano-Ortiz & Esteban 2009 and have included it in the alliance *Marcgravio rubrae-Pterocarpion officinalis* Cano, Veloz, Cano-Ortiz & Esteban 2009.

## Materials and Methods

With the help of previous botanical studies on North America (Rivas-Martínez, 2004, 2005), (Rivas-Martínez *et al*., 1999), our own field research data, as published in Cano *et al*. (2009), Cano *et al*. (2010) and Cano *et al*. (2011), and recent studies, in this paper we provide an interpretation of the edaphoxeric communities growing on karstic rocky sites in the Samana Peninsula. For that purpose we not only studied the

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bioclimatology of the territory and some other nearby areas, but also carried out phytosociological relevés of the communities involved. In order to distinguish these rocky habitats from others found in the Caribbean-East territory (A7) (Cano & Veloz, 2012), we converted the phytosociological indexes to the equivalent values of Van der Maarel and performed a cluster analysis and a PCA. For an accurate estimation of the conservation status, we analysed the total number of species and also the native, introduced and endemic species. For our floristic study we followed Liogier (2000) and Liogier (1996-2000).

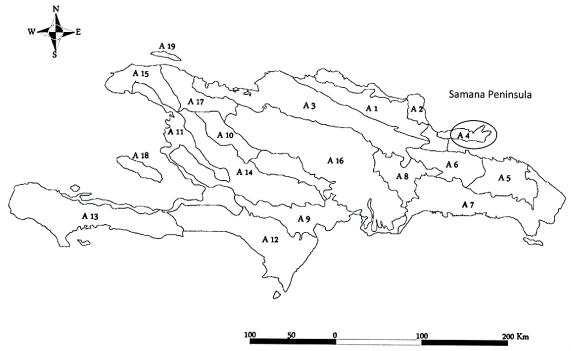



Fig. 1 - Biogeographical territories of Hispaniola. A1.- Cordillera Septentrional. A2.- Coastal-Atlantic Unit. A3.- Cibao Valley. A4.- Samanense. A5.- Eastern. A6.- Haitiense. A7.- Caribbean-East. A 8.- Yamasense. A9.- Azua-Sán Juan-Lago Herniquillo. 10.- Central Plain (Haití). A11.- Port-au-Prince-Ariobonite-Gonaivës. A12- Bahoruco-La Selle. A13- Hottense. A14.- Neiba-Matheux. A15.- North-west Haiti. A16.- Centre-East. A17.- Centre-West (Massif du Nord). A18.- Gonave Island. A19 Tortuga Island.

## Results and discussion

### *Biogeographical and bioclimatic study*

The presence in the peninsula of 134 endemic species is sufficient reason to propose that Area A4 should be promoted to the rank of a biogeographical territory within the North Sector. Area A4 (Samana Peninsula) can be distinguished from nearby areas, such as A2, A3, A5 and A6, by the presence of its own endemic species and habitats. Pearson's r value recorded in Cano *et al*. (2010) ranges from 0.71 to 0.99.

The bioclimatic analysis of Hispaniola, as published in Cano *et al*. (2012) and Cano *et al*. (2010), reveals an annual average temperature T = 25 °C, with maximum and minimum temperatures of, respectively, Tm = 29.7 °C and 6.4 °C in Y. Nuevo at an altitude of 2,300 m. The macrobioclimates of Hispaniola are tropical pluviseasonal, pluvial and xeric, ombrotypes range from upper semiarid to hyperhumid and the thermotype, from infratropical to supratropical. However, in the Samana Peninsula we only find a tropical pluvial bioclimate with rainfall rates ranging from 2,000 to 2,400, and subhumid and humid ombrotypes. The hyperhumid ombrotype can also be found, though only occasionally, in the gullies facing the Atlantic.

The application of the bioclimatic indexes (Rivas-Martínez & Loidi, 1999) to the records of the weather station of Samaná and other nearby stations (Tab. 1) produced a maximum Io value of 7.1 (humid ombrotype), a It/Itc value of 741/675 (infratropical thermotype) and a minimum Io value of 4.8 (lower subhumid) in H Mayor. Meanwhile, the thermotype is infratropical in all cases (Fig. 2 and 3).

BIOCLIMATIC INDEX AND DIAGNOSIS

| | | |
|---|---|---|
| Thermicity index | *(It)* | 750 |
| Compensated thermicity index | *(Itc)* | 751 |
| Simple continentality index | *(Ic)* | 3.8 |
| Diurnality index | *(Id)* | 0.0 |
| Annual ombrothermic index | *(Io)* | 7.36 |
| Bimonthly dry ombrothermic index | *(Iod2)* | 4.21 |
| Threemonthly dry ombrothermic index | *(Iod3)* | 4.44 |
| Fourmonthly dry ombrothermic index | *(Iod4)* | 4.92 |
| Annual ombro-evaporation index | *(Ioe)* | 1.47 |
| Annual aridity index | *(Iar)* | 0.7 |
| Annual positive temperature | *(Tp)* | 3176 |
| Annual negative temperature | *(Tn)* | 0 |
| Dry station temperature | *(Td)* | 759 |
| Positive precipitation | *(Pp)* | 2339 |

| N° of | P>4T | P:2T-4T | PT-2T | P<T | T<0° |
|---|---|---|---|---|---|
| Months | 12 | 0 | 0 | 0 | 0 |

Continentality-Latitudinal Belt: Extremely Hyperoceanic - Eutropical
Bioclimate.....: TROPICAL PLUVIAL
Bioclimatic belt...: UPPER INFRATROPICAL LOW HUMID

Fig. 2 - Bioclimatic indexes of the weather station of Samaná.

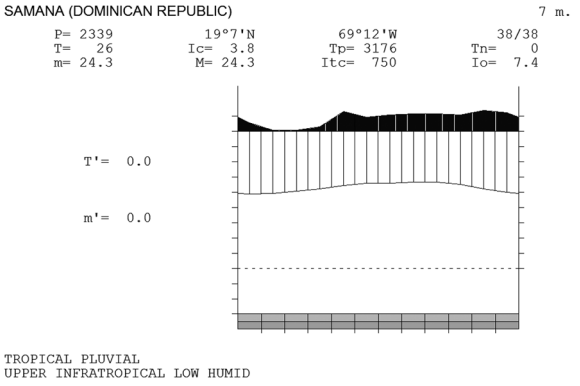



Fig. 3 - Bioclimatic charts of the weather station of Samaná (38 years).

### *Floristic study*

The floristic study of the Samana Peninsula provided by Salazar *et al*. (1997) is extremely valuable for an accurate estimation of the conservation status of these areas. Of a total number of 1,252 species belonging to 680 genera and 142 families, 217 (17.33%) are introduced, 844 (67.41%) are native and 134 (10.70%) are endemic. Of these latter, 20 species are exclusive to either Samaná or Los Haitises, and 7 of them are exclusive to the Samana Peninsula: *Annona haitiensis* subsp. *apendiculata* R.E. Fries; *Eugenia samanen-*

Tab. 1 - Bioclimatic indexes of the weather stations in the study area and nearby areas.

| Site | WS No. | Al. m. | Tm | Tmi | T | Tp | P | ETP | Ioe | Ic | Io | Ombrotype | Ref. Io value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D. Miguel | 102 | 45 | 27.4 | 22.4 | 24.8 | 2976 | 1365 | 1525 | 0.89 | 5.0 | 4.5 | Lower subhumid | 3.6-4.8 |
| H Mayor | 255 | 102 | 28.3 | 24.5 | 26.7 | 3204 | 1548 | 1458 | 1.06 | 3.8 | 4.8 | Lower subhumid | 3.6-4.8 |
| Samaná | 256 | 7 | 28.1 | 24.3 | 26.5 | 3180 | 2339 | 1209 | 1.93 | 3.8 | 7.3 | Lower humid | 7.0-10.5 |
| Miches | 291 | 3 | 27.0 | 24.8 | 25.9 | 3108 | 1983 | 1327 | 1.49 | 2.2 | 6.3 | Upper subhumid | 4.8-7.0 |
| Cevicos | 309 | 90 | 27.5 | 23.4 | 25.7 | 3084 | 2041 | 1223 | 1.66 | 4.1 | 6.6 | Upper subhumid | 4.8-7.0 |
| Cabrera | 338 | 14 | 26.6 | 24.8 | 25.8 | 3096 | 2141 | 1264 | 1.69 | 1.8 | 6.9 | Upper subhumid | 4.8-7.0 |
| Victoria | 346 | 12 | 27.9 | 25.0 | 26.7 | 3204 | 1806 | 1355 | 1.33 | 2.9 | 5.6 | Upper subhumid | 4.8-7.0 |
| Bayaguaana | 353 | 76 | 28.8 | 26.0 | 27.7 | 3324 | 1738 | 1416 | 1.22 | 2.8 | 5.2 | Upper subhumid | 4.8-7.0 |
| V. Riva | 358 | 17 | 27.7 | 24.2 | 26.2 | 3144 | 2202 | 1229 | 1.79 | 3.5 | 7.0 | Upper subhumid | 4.8.7.0 |
| M.Plata | 365 | 56 | 27.1 | 23.3 | 25.5 | 3060 | 1860 | 1276 | 1.45 | 3.8 | 6.0 | Upper subhumid | 4.8-7.0 |
| Nagua | 387 | 3 | 26.7 | 24.7 | 25.5 | 3060 | 2183 | 1236 | 1.76 | 2.0 | 7.1 | Lower humid | 7.0-10.5 |
| Tavera | 402 | 300 | 25.7 | 22.0 | 24.0 | 2880 | 1210 | 1588 | 0.76 | 3.7 | 4.2 | Lower subhumid | 3.6-4.8 |

*sis* Alain (*Myrtaceae*); *Rajania marginata* R. Kunth (*Phytolaccaceae*); *Solanum dendroicum* Schultz & Ekm. (*Solanaceae*); *Pilea samanensis* Urb. (*Urticaceae*). Both *Annona haitiensis* subsp. *apendiculata* and *Eugenia samanensis* are considered as critically endangered by Peguero & Veloz (1997). According to Mejía (2006), the Samana Peninsula is home to 134 of all the endemic species present in the Península and 6.53% of the 2,050 endemic plants growing on the island of Hispaniola.

As regards the dominant biotypes, 38% of these plants are tree species, 31% shrubs, 19% climbers and 7% of them epiphytes. A total of 584 species belong to 16 families (Fig. 4) and the remaining 668 belong to 126 families. Of the 142 families involved, the 134 endemic species belong to one of the following 51 families: *Agavaceae* (1 species). *Anacardiaceae* (2). *Annonaceae* (2). *Apocynaceae* (3). *Araceae* (1). *Arecaceae* (5). *Aristolochiaceae* (2). *Asclepiadaceae* (1). *Asteraceae* (10). *Begoniaceae* (2). *Bignoniaceae* (6). *Boraginaceae* (2). *Bromeliaceae* (2). *Cactaceae* (2). *Canellaceae* (1). *Capparaceae* (1). *Celastraceae* (1). *Clusiaceae* (3). *Convolvulaceae* (2). *Cucurbitaceae* (1). *Ebenaceae* (1). *Erythrosylaceae* (1). *Euphorbiaceae* (3). *Fabaceae* (4). *Flacourtiaceae* (1). *Gesneriaceae* (1). *Goetzeaceae* (1). *Icacinaceae* (1). *Loranthaceae* (2). *Malpighiaceae* (5). *Malvaceae* (1). *Margcgraviaceae* (1). *Melastomataceae* (3). *Mimosaceae* (3). *Myrtaceae* (6). *Nyctaginaceae* (1). *Orchidaceae* (5). *Phytolaccaceae* (2). *Piperaceae* (2). *Polygonaceae* (6). *Rhizophoraceae* (1). *Rubiaceae* (11). *Rutaceae* (2). *Sabiaceae* (1). *Sapindaceae* (2). *Sapotaceae* (2). *Solanaceae* (6). *Theophrastaceae* (3). *Urticaceae* (4). *Verbenaceae* (1). *Vitaceae* (1).

***Vegetation study***

The high rainfall records of the Samana Peninsula has given rise to broad-leaved evergreen vegetation. When the conservation status is good, this is a subhumid-humid, fog forest rich in lianas and with a high cover rate. Unfortunately, most of these forests are seriously altered due to human pressure. Despite the high rainfall rates, when the vegetation occurs on fractured, calcareous rocky sites, the loss of water gives rise to edaphoxerophilous communities.

This plant community frequently exhibits the following species: *Pilosocereus polygonus, Zamia debilis, Agave antillarum, Eugenia samanensis, Bursera simaruba, Capparis fexuosa, Ficus velutina, Opuntia dellinii, Comocladia dodonaea, Stigmaphyllum emarginatum*. This edaphoxerophilous community is rich in endemic taxa and is dominated by *Coccotrinax gracilis, Agave antillarum, Leptocereus weingartianus, Bursera simaruba* and, to a lesser extent, by *Eugenia samanensis*. Therefore, we propose a new association of endemic character for the Samanense territory: *Coccotrino gracili-Burseretum simarubae ass*. nova *hoc loco* (Tab. 2 inv. 1-4 typus inv. 4).

Our cluster analysis and PCA (Fig. 5, 6) separate relevés 13, 14, 15 and 18 from the first 12 relevés belonging to the dry forest of the Caribbean-East territory, which we have included in the associations *Chrysophyllo oliviformi-Sideroxyletum salicifolii* Cano & Veloz 2012; *Zamio debilis-Metopietum toxiferi* Cano & Veloz 2912.

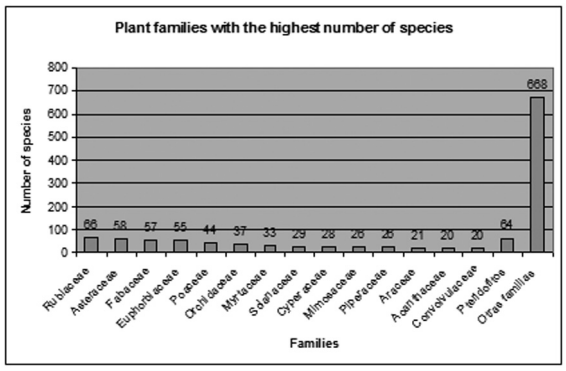



Fig. 4 - Plant families with the highest number of species.

Tab. 2 - Association *Coccotrino gracili-Burseretum simarubae* ass. nova.

| No. of order | 1 | 2 | 3 | 4 | | | |
|---|---|---|---|---|---|---|---|
| No. of cluster | 15 | 16 | 17 | 18 | | | |
| Area in $m^2$ | 500 | 500 | 500 | 500 | | | |
| Altitude in m. | 31 | 18 | 40 | 25 | | | |
| Cover rate % | 45 | 70 | 60 | 50 | Biotype | Status | Family |
| Average height of vegetation in m | 5 | 5 | 5 | 4.5 | | | |
| Characteristics of ass. and upper units | | | | | | | |
| Bursera simaruba (L.) Sarg. | 3 | 3 | 4 | 3 | A | N | Burseraceae |
| Coccotrinax gracilis Burret | 3 | 3 | 3 | 3 | Es | E | Arecaceae |
| Agave antillarum Descourt. | 1 | 1 | 3 | 1 | Sar | E | Agavaceae |
| Ipomoea viridiflora Urb. | 1 | 1 | 1 | 1 | T | E | Convolvulaceae |
| Leptocereus weingartianus (Hartn.) Britt. & Rose | 1 | 1 | 1 | 1 | Sar | E | Cactaceae |
| Comocladia dodonaea (L.) Urb. | 2 | 2 | 2 | 2 | Ar | N | Anacardiaceae |
| Capparis flexuosa (L.) L. | 1 | 1 | 1 | 1 | Ar | N | Capparaceae |
| Pilosocereus polygonus (Lam.) B. & R. | 2 | 1 | 2 | 1 | Sar | N | Cactaceae |
| Opuntia dillenii (Ker-Gawl) Haw | | + | + | 1 | Sar | N | Cactaceae |
| Plumeria obtusa L. | + | 3 | + | 2 | Ar | N | Apocynaceae |
| Zamia debilis L | 1 | 2 | 2 | 1 | Es | N | Zamiaceae |
| Serjania polyphylla (L.) Radlk. | | 1 | 2 | | T | N | Sapindaceae |
| Sideroxylon foetidissimum Jacq. | | + | + | | A | N | Sapotaceae |
| Stigmaphyllon emarginatum (Cav.) Adr. | + | | | + | T | N | Malpoghiaceae |
| Thouinia trifoliata | + | + | | | Ar | N | Sapindaceae |
| Ceiba pentandra (L.) Gaert. | | + | 1 | | A | N | Bombacaceae |
| Cissus verticillata (L.) Nichols & Jarvis | + | | + | + | T | N | Vitaceae |
| Clusia rosea Jacq. | | 1 | | | A | N | Clusiaceae |
| Eugenia maleolens Pers. | | 3 | 2 | 1 | Ar | N | Myrtaceae |
| Eugenia samanensis Alain | | | + | + | A | E | Myrtaceae |
| Ficus velutina H. & B. Ex Willd. | + | 1 | 2 | | A | N | Moraceae |
| Guaiacum officinale L. | | | + | | A | N | Zygophyllaceae |
| Hippocratea volubilis L. | | + | | | T | N | Hippocrateaceae |
| Trema micrantha (L.) Blume | + | | | | A | N | Ulmaceae |
| Trichilia hirta L. | + | | 1 | | A | N | Meliaceae |
| Trichilia pallida Sw. | | | + | | A | N | Meliaceae |
| Trichostigma octandrum (L.) H. Walt. | 2 | | 1 | | T | N | Phytolacaceae |
| Annona haitiensis subp. apendiculata R. E. Fries | | | | + | Ar | E | Annonaceae |
| Vanilla claviculata (W.W.R.) Sw. | | | + | | T | N | Orchidaceae |
| Coccoloba uvifera (L.) L. | | | | + | A | N | Polygonaceae |
| Companion species | | | | | | | |
| Abrus precatorius L. | | | + | | T | N | Leguminosae |
| Adelia ricinella L. | + | + | | | Ar | N | Euphorbiaceae |
| Brougtonia domingensis (Lindl.) Rolf. | | + | | 1 | Ep | N | Orchidaceae |
| Corchorus hirsutus L. | | 1 | | | Ar | N | Tiliaceae |
| Croton linearis Jacq. | | | | + | Ar | N | Euphorbiaceae |
| Oeceoclades maculata (Lindl.) Lindl. | | | + | | H | Na | Orchidaceae |
| Oplonia spinosa (Jacq.) Raf. | | | + | | Ar | N | Acanthaceae |
| Tillandsia recurvata (L.) L. | + | | | | H | N | Bromeliaceae |
| Urera baccifera (L) Gaudich. Ex Wedd | + | | | | Ar | N | Urticaceae |

Fig. 5 - Cluster of the edaphoxerophilous communities of the Samanense and Caribbean-East biogeographical territories.

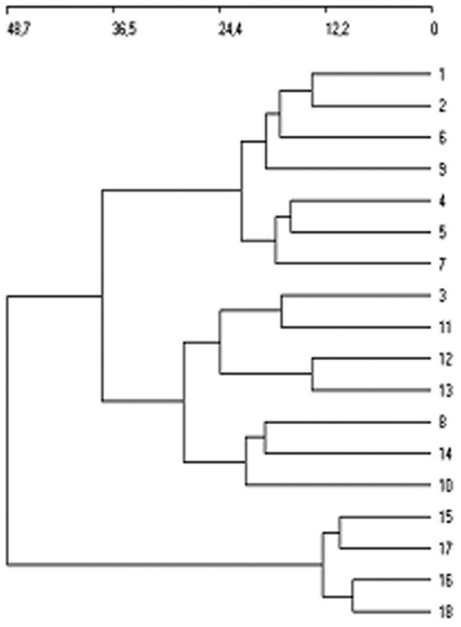
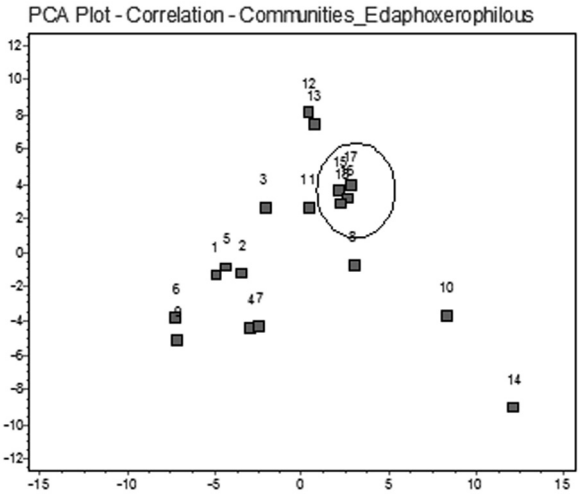
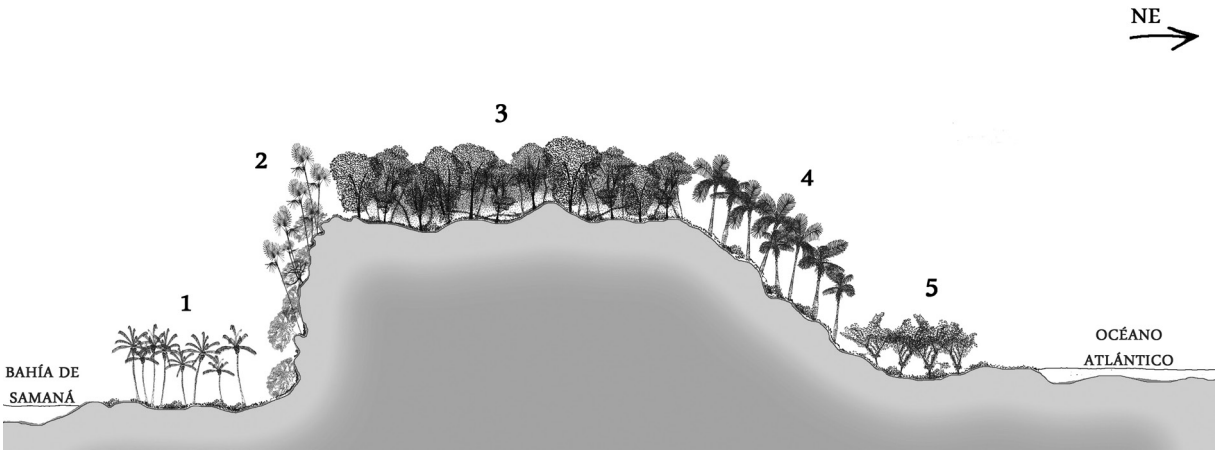



Fig. 6 - PCA of the edaphoxerophilous communities of the Samanense and Caribbean-East biogeographical territories.



The presence of endemic species such as *Coccotrinax gracilis, Agave antillarum, Ipomoea viridiflora, Leptocereus weingartianus* in the calcareous rocky sites or farallones and the occurrence of the species *Eugenia samanensis* and *Annona haitiensis* subsp. *apendiculata*, endemic to the Samana Peninsula, both critically endangered as a result of human pressure and the high rate of introduced species, is sufficient reason for us to propose the preservation of this endemic habitat under the description of *Coccotrino gracili-Burseretum simarubae* (Fig. 7).

Fig. 7 - Profile of the vegetation of the Samana Peninsula. 1. Coconut cultivation; 3. Broadleaf forest; 2. Community of *Coccotrinax gracilis* and *Bursera simaruba* As. *Coccotrino gracili-Burseretum simarubae*; 4. Cloud forest of *Prestoea montana*; 5. Forest of *Pterocarpus officinalis* As. *Roystoneo hispaniolanae-Pterocarpetum officinalis*.




**Syntaxonomical scheme**

COCCOTRINACETHO-PLUMERIETEA Knapp (1942) Borhidi 1991
*EUGENIO-METOPIETALIA TOXIFERI* Knapp (1942) Borhidi 1991
**Eugenio-Capparidion** Borhidi in Borhidi *et al*. 1959
*Chrysophyllo oliviformi-Sideroxyletum salicifolii* Cano & Velóz 2012
*Zamio debilis-Metopietum toxiferi* Cano & Velóz 2012
*Coccotrino gracili-Burseretum simarubae* ass. nova *hoc loco*

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**References**

Cano E., Veloz A., Cano-Ortiz A. & Esteban Ruiz J.F., 2009. Analysis of the *Pterocarpus officinalis* forests in the Gran Estero (Dominican Republic). Acta Botanica Gallica 134(2): 339-35.

Cano E., Veloz A. & Cano-Ortiz A., 2010. Contribution to the biogeography of Hispaniola (Dominican Republic. Haiti). Acta Botanica Gallica 135(2): 381-398.

Cano E., Veloz A. & Cano-Ortiz A., 2011. Phytosociological study of the *Pinus occidentalis* forests in the Dominican Republic. Plant Biosystems 145(2): 286-297.

Cano E. & Veloz A., 2012. Contribution to the knowledge of the plant communities of the Caribbean-Cibensean Sector in the Dominican Republic. Acta Botanica Gallica 159(2): 201-2010.

Cano E., Cano-Ortiz A., Del Río González S., Alatorre Cobos J. & Veloz A, 2012. Bioclimatic map of the Dominican Republic. Plant Sociology 49(1): 81-90.

Liogier A.H., 199-2000. La Flora de la Española. I-IX. Jardín Botánico Nacional Dr. Rafael Ma. Moscoso. Santo Domingo.

Liogier A.H., 2000. Diccionario Botánico de nombres vulgares de la Española. Jardín Botánico Nacional Dr. Rafael Ma. Moscoso. Santo Domingo 398 pp.

Mejia M., 2006. Flora de la Española: conocimiento actual y estado de conservación. Actas IX Congreso Latinoamericano de Botánica p. 11-12.

Peguero B. & Veloz A., 1997. Algunas plantas amenazadas de la Península de Samaná. 1er Simposium internacional sobre Extinción. Santo Domingo. República Dominicana 19 pp.

Rivas-Martínez S., 2004. Sinopsis biogeográfica. bio-

climática y vegetacional de América del Norte. Fitosociologia 41: 19-52.
Rivas-Martínez S., 2005. Notions on dynamic-catenal phytosociology as a basis of landscape science. Plant Biosystems 139(2): 135-144.
Rivas-Martínez S. & Loidi J., 1999. Bioclimatology of the Iberian Peninsula. Itinera Geobotanica 13:41-47.
Rivas-Martínez S. Sánchez Mata D. & Costa M., 1999. North American boreal and western temperate forest vegetation. Syntaxonomical synopsis of the potential natural plant communities of North America. II. Itinera Geobotanica 12: 5-326.
Salazar J., Peguero B. & Veloz A., 1997. Flora de la Península de Samaná. República Dominicana. Moscossoa 9:133-188.

**Appendix: Localities of relevès**

Tab. 2: 1, 3-4 km from Cabo de Samaná (19Q281195/+1+9311); +, The area surrounding Cabo de Samaná (19Q28++54/+1+994); 1, Cabo de Samaná (19Q28+411/+11195); 2, Los Cacaos (Samaná) (19Q28+518/+1118).