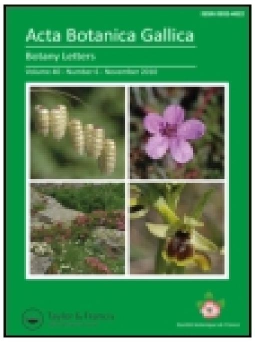

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Contribution to the biogeography of the Hispaniola (Dominican Republic, Haiti)

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Abstract.- .- This paper, which deals with the geological history of Hispaniola in the general framework of Central America and particularly the Caribbean Sea, aims at revealing the influence of it on other areas. The paper studies the distribution of 675 species of Melastomataceae family, a family which has been used to establish the biogeographical ranges of Superprovince and biogeographical Province. The research also carried out a floristic and distributional study of 1.582 endemic species on Hispaniola. Nineteen working areas were defined and plant samples were taken in most of them following the Central European phytosociological method. With these datas, we plotted a map with the biogeographical Subprovinces and another one with the Sectors. The Superprovinces of Western Antilles, Central-Eastern Antilles have been established. This latter includes the Provinces of Eastern Antilles and Hispaniola. We propose a comprehensive biogeographical typology of the island. Due to its high endemicity and the great diversity of its habitats is moved to a upper range called biogeographical Province encompassing two Subprovinces: Central (one Sector) and Caribbean-Atlantic (Bahoruco-Hottense, Neiba-Metheux-Noroeste, Azua - San Juan - Hoya Henriquillo - Puerto Príncipe - Artiobonite - Gonaives, Caribbean-Cibense and North).

Key words : Caribbean - biogeography - flora - vegetation.

Résumé.- Nous analysons ici l'histoire géologique de La Hispaniola, pour étudier l'influence de l'Amérique centrale et surtout de la Caraïbe par la distribution de 675 espèces de Melastomataceae, afin d'établir les rangs biogéographiques de sous-region, superprovince, province et sous-province. L'étude floristique et de la distribution de 1.582 plantes endémiques de La Hispaniola révèle finalement deux grandes régions. Nous avons fait l'inventaire de la végétation dans ces deux régions, en suivant la méthode phytosociologique européenne ; on en déduit deux sous-provinces. La haute endémicité et la grande diversité d'habitats justifient le rang de province, en distinguant deux sous-provincias : la Centrale (un seul secteur), la Caribéo-atlantique (avec les secteurs Bahoruco-Hottense, Neiba-Metheux-Nord-Ouest, Azua - Sán Juán - Lac Henriquillo - Port Prince - Artiobonite - Gonaives, Caribéo-Cibense et Nord);

Mots clés : Caraïbe - biogéographie - flore - végétation.

I. INTRODUCTION

Our botanical study is biogeographical in character since, despite the numerous botanical-floristic investigations carried out by researchers such as Urban, Ekman, Cicero, Donald Dungan, Marcano Fondeur, Jürgen Hoppe, Liogier, Zanoni, Hager, May, Borhidi, Megia, Jiménez, R. García, A. Veloz, etc., there are few from a phytogeographical point of view and those in the field of the science of vegetation are rare. In addition, the most recent studies are floristic and physiognomical, but not phytosociological (Zanoni *et al.*,1990; Höner & Jimenez, 1994; Guerrero *et al.*, 1997; May, 1997, 2000, 2001; Mejía & Jiménez, 1998; Rivas-Martínez *et al.*, 1999; Rivas-Martínez, 2004; May & Peguero, 2000; Slocum *et al.*, 2000; Mejía *et al.*, 2000; García *et al.*, 2002; Velóz & Peguero, 2002; García & Clase, 2002; Peguero & Salazar, 2002; Cano *et al.*, 2009a, b).

The geological history of the island of Hispaniola, the great altitudinal variations and a wide range of substrates have produced 2.050 endemic species distributed in a wide variety of exclusive habitats which must be duly described for their preservation. For this reason, we begin our study with a biogeographical description of the Hispaniola.

In the general description of the floristic regions of the world provided by Takhtajan (1986) and in the description provided by Rivas-Martínez *et al.* (1999) for North America and Central America, Hispaniola is considered as a Sector included in the Neotropical-Austroamerican Kingdom, Caribbean-Mesoamerican Region, Antillean Province. The studies carried out by Borhidi (1991) on Cuba, those by Samek (1988) and Trejo-Torres & Ackerman (2001) – in which the differences between the Greater Antilles (Cuba, Hispaniola, Jamaica and Puerto Rico) and the Lesser Antilles are clearly stated on the fundamental grounds of the high biodiversity and distribution of species belonging to the Orchidaceae family –, the local studies available on the Hispaniola (Mejía *et al.*, 2000; May, 2000) and our own, recent field research have led us to establish a biogeographical typology based on the biogeographical elemental unit or tesela. A tesela is defined as an area of variable surface, either continuous or not, but with homogeneous geomorphological and ecological features which give rise only to one single type of potential vegetation. The biogeographical typology presents different ranks. The District is defined as a territory which has had a traditional use and presents some edaphic and climatic factors allowing the occurrence of its own species and associations, which are absent in neighbouring districts. The Sector is a wide geographical area which exhibits not only exclusive species and associations, but also a peculiar altitudinal zonation of vegetation, with its own vegetation series and permanent communities. The Province is a wide territory with an original endemic flora, with geoseries and macroseries and a peculiar zonation of vegetation. However, the Region is a vast territory with endemic flora and original vegetation, bioclimatic belts and macrobioclimates or its own bioclimates. Finally, the Kingdom, the largest biogeographical rank, comprises Regions sharing similar history, flora, vegetation and climate.

All these considerations have led us to carry out floristic and phytosociological samples, which, together with other previous studies, have produced our proposed biogeographical typology for the island.

II. MATERIAL AND METHODS

A. Study area

The paper deals with the Island of Hispaniola (Dominican Republic, Haiti), which belongs to the Greater Antilles, a section of the Antillean Arc, and has an area of

76.484 km^2. The island is the second largest in the area, only after the island of Cuba, which has an area of 110.861 km^2. The Greater Antilles comprise the islands of Cuba, Hispaniola, Jamaica and Puerto Rico, located approximately in the centre of the archipelago. Meanwhile, the Bahamas are a scattered group of islands in the Atlantic Ocean on a southeast-northwest axis, comprising islands such as the Grand Bahama, Andros, Mayaguana, Great Inagua and Turks and Caicos. The Arc of the Lesser Antilles, which comprises the Virgin Islands, St Kitts Nevis, Antigua and Barbuda, Dominica, St Lucia, St Vincent and The Grenadines, Barbados, Grenada, Trinidad and Tobago, is located to the southeast of Puerto Rico.

Although there are no exhaustive geological studies on Hispaniola (Liogier, 2000), subscribes to Weyl's hypothesis, according to which there were three convergent tectonic movements. The first one originated in Yucatán (Mexico) and gave rise to the Cuban orographical area. The second tectonic movement, originating in Honduras and Belize, crossed the Cayman Islands and gave rise to the Sierra Maestra in Cuba. The effects of this second tectonic movement converged with the effects of the first one to produce the St Nicolas Peninsula in Haiti and the Cordillera Central in the Dominican Republic, a range which extends towards the southeast to terminate in Puerto Rico. The third tectonic movement originated in Honduras and Nicaragua, crossed Jamaica, the Southern Peninsula of Haiti (the massifs de la Hotte and de la Selle) and the Sierra de Bahoruco, which belongs to Haiti and to the Dominican Republic. These large islands, Cuba, Hispaniola, Jamaica and Puerto Rico, form the Greater Antilles, a homogeneous group of islands which, through a series of geological vicissitudes, underwent changes such as sinkings, elevations, etc., as a result of the movements of the Caribbean tectonic plate.

Recently Mollat *et al*. (2004) carried out a more detailed analysis of the geological structure of the Dominican Republic. These authors place the Island of Hispaniola on the northern rim of the Caribbean plate, which is separated from the North American plate by a transform fault, and they maintain that the insular arc rocks of Hispaniola, with its vertebral, axial ranges, were formed during the Cretaceous period. The erosion silted the valleys between the ranges and during the Tertiary and Quaternary sea sediments deposited along the coasts gave rise to territories such as Hoya Henriquillo, the Bahoruco-Neiba platform, Samaná, Cibao Valley, Llanura del Este and the young Cordillera Septentrional.

The island is not very old. The ranges of Hispaniola were formed mostly during the Cretaceous period, 130 million years ago, and during the Oligocene-Miocene periods of the Tertiary Era, 50 million years ago. The different mountain massifs formed during the Alpine orogeny are connected by Quaternary deposits. The oldest territories have acid substrates and give rise to a very specialised flora in comparison with the younger calcareous zones, such as those with coral substrates, a fact which reveals that a large portion of Hispaniola was below sea level in the Quaternary period.

The orographical system formed in this way comprises several massifs. The most important of these is the Cordillera Central, which extends into the Massif du Nord (Haiti). This huge massif originated in the Cretaceous Period. Siliceous, igneous or volcanic materials tend to be dominant in this massif, and volcanic or metamorphic rocks and calcareous islands are relatively frequent in the Massif du Nord. The Cordillera Central presents the highest peaks not only in the Island of Hispaniola, but also in the whole of the Antilles. These peaks are Pico Duarte (3,175 m), La Polona (3.087 m), La Rusilla (3.038 m) and Pico del Yaque (2.761 m).

The Cordillera Oriental, located in the northeast of the Dominican Republic, also originated during the Cretaceous Period, but it has no peaks over 800 m.

The Cordillera Septentrional, however, is younger and located in the north of the island, on a northwest-southeast axis. It extends from Montecristi to Gran Estero, near Nagua, all of it belonging to the Dominican Republic. This range originated during the Oligocene-Miocene periods of the Tertiary Era and presents abundant sedimentary rocks. The highest peak of the range is Pico Diego de Ocampo, with 1.229 m.

Apart from the three cordilleras already mentioned, Hispaniola also has some other ranges of some importance. The Dominican Republic has, for example, Samaná, Yamasá, Neiba, Bahoruco and Martín García. The Sierra de Neiba continues in Haiti with the Chaine des Matheaux, a karstic range which extends under the sea to Central America. To the south this Sierra was formerly linked to Sierra Martín García, but some later tectonic movements split the complex. Bahoruco, a limestone mountain system which extends into Haiti with the Massif du Selle, Tiburón and Massif de la Hotte (A.R.N., 2004), is as old as the Cordillera Central. Of no lesser importance are the karstic systems of Haitises, Promontorio de Cabrera (Cordillera Septentrional), Promontorio de Barahona (Bahoruco) and Samana Peninsula. Like the Cordillera Oriental, this latter originated in the Cretaceous Period and presents complex geological materials: schists, calcoschists, micaceous schists and marbles (Salazar *et al*., 1997).

Vast plains of Quaternary origin link the large cordilleras and sierras. These areas correspond to the Cibao Valley, to the north (which connects the Cordillera Central with the Cordillera Septentrional), and Valle de San Juan (which extends into Haiti with the Central Plain). All these territories are located between the Cordillera Central, Sierra Neiba and Chaine des Matheaux. Hoya de Enriquillo, between Neiba and Bahoruco, also extends into Haiti via Puerto Principe and Artiobonite to Gonaivë. Finally, at the foot of the Cordillera Oriental the vast eastern coastal plain extends to the Caribbean Sea.

Our sectorization of Hispaniola is based on previous studies made by Liogier (2000), Mollat *et al*. (2004) and the geomorphological studies of A.R.N. (2004). Three hundred vegetation samples in different areas of the island and numerous floristic studies enabled us to establish the corresponding biogeographical areas. For this purpose we carried out a study of endemic taxa, not only at the level of the whole island, but also locally, and this revealed the floristic differences of the territory. Once we had defined the sampling unit, which ranged from 500 to 2.000 m^2, according to the vegetation (herbaceous, scrub or forest taxa), the study determined the number of endemic species per sampling unit. Both Jaccard's and Pearson's numerical analyses were applied to check the correctness of the sectorization proposed as far as the floristic differences and the vegetation are concerned. We also carried out a bioclimatic, territorial study. For this purpose we used meteorological stations whose data were complete. The bioclimatic indexes according to Rivas-Martínez (1996) and Rivas-Martínez *et al*. (1999) were also calculated. In order to establish the biogeographical areas we used edaphological, bioclimatic, floristic, botanical and historical criteria. The floristic analysis used 1.582 endemic species recorded in the bibliography and in our own samples. For this purpose we have taken the endemic taxa occurring in different areas, areas which coincide mostly with geomorphological zones (Fig. 1):

A1 - Cordillera Septentrional (40). A2 - Coastal-Atlantic Unit (64). A3 - Cibao Valley-Montecristi-Extensión into Haiti (136). A4 - Samana Peninsula (130). A5 - Cordillera Oriental (8). A6 - Los Haitises (50). A7 - Coastal-Eastern Plain (136). A8 - Sierra de Yamasa and Prieta (7). A9 - Azua-Lago Henriquillo-S.M.García-Valle de San Juán (85). A10 - Central Plain (Haiti) (9). A11 - Puerto Principe-Ariobonite-Gran Caimite.-Gonaivë (70). A12 - Bahoruco-Procurrente de Barahona and Massif de la Selle (715). A13 - Massif de La Hotte and Tiburón (173). A14 - Massif de Matheux and Montañas

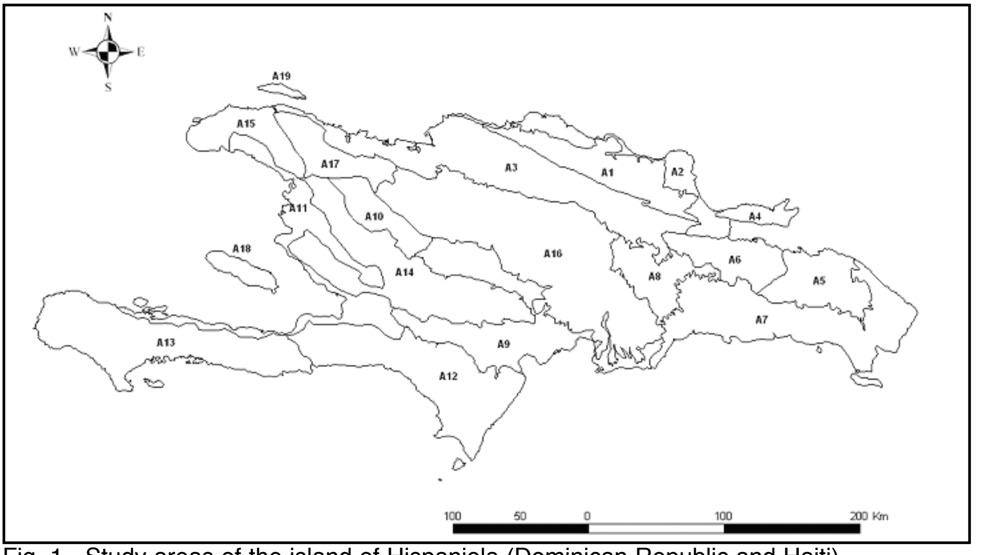

Fig. 1.- Study areas of the island of Hispaniola (Dominican Republic and Haiti).
Fig. 1.- Zones d'étude de La Hispaniola (République dominicaine et Haïti).

Negras (27). A15 - Northwest Haiti (60). A16 - Cordillera Central Oriental (451). A17 - Cordillera Central Occidental Massif du Nord) (639). A18 - Ile de la Gonave (21). A19 - Ile de la Tortue (15). We have followed Liogier (1996, 2000), Martín & Cremers (2007) for the authorship of the taxa.

To find the impact of Central America and the north of South America on the island we have studied the distribution of 675 species of the Melastomataceae family in 16 sites: 1 - Mexico. 2 - Brazil. 3 - Venezuela. 4 - Bolivia. 5 - Guyana. 6 - French Guyana. 7 - Peru. 8 - Cuba. 9 - Jamaica. 10 - Colombia. 11 - Panama. 12 - Guatemala. 13 - Ecuador. 14 - Puerto Rico. 15 - Lesser Antilles. 16 - Hispaniola (Cano *et al*., 2009a).

To find the distance both between the 16 areas according to the occurrence/absence of species by means of the Jaccard index and between the 19 areas defined in the Island of Hispaniola, a numerical analysis was carried out.

III. RESULTS AND DISCUSSION

A. Bioclimatology

The location of the Island of Hispaniola between the parallels 17º and 19º north has given the island a tropical climate only altered by the Atlantic trade winds and the topography of the island. Generally speaking, the climate is very similar to that of the other Greater Antilles. The annual average temperature is 25 ºC, with little variation during night or day and few seasonal fluctuations. The hottest month is August and the coldest is January. The annual rainfall distribution clearly reveals two wet seasons, from April to June and from September to November. Meanwhile, the dry season extends from December to March. The rainfall distribution reflects the direction of the trade winds and the orientation of the mountain ranges. As happens in all the Greater Antilles, in Hispaniola the highest rainfall rates are recorded in the north due to the influence of the Atlantic Ocean, while the driest regions are located in the south, along the Caribbean coast. These latter regions are rain shadow areas because of the situation of the Cordillera Central. This fact explains the cases of Tamayo and Dauverge, with I_o = 1.4, or A. Sisal, with I_o = 1.1 (semiarid ombrotype). Montecristi represents an exceptional case. Despite being exposed to the influence of the Atlantic, it is an extremely dry site because of its location in a rain shadow area induced by the nearby Cordillera Septentrional. This explains its I_o = 2,1 (dry ombrotype)

The altitude gives rise to a temperature and rainfall gradient which becomes subtropical and temperate over 1.200-1.500 m. For this reason, temperatures of 0 ºC can be recorded in inner valleys over 1.800 m during the winter months. Hurricanes and storms dramatically change the climate from June to November, especially in the south. These hurricanes originate in the tropics close to the equator and are carried to the Caribbean Sea by the south equatorial current.

Rainfall rates in Hispaniola range from 400 mm to 3.000 mm (these latter records in very restricted sites). The highest rainfall rates correspond to the eastern end of the Cordillera Septentrional and the Haitises, with records of 2.000-3.000 mm. Loma Quita Espuela has the highest rainfall rate of all. In the Samana Peninsula the rainfall rates range from 2.000 to 2.400 mm and the highest rainfall rate in the Cordillera Central is recorded in Monseñor Nouel Province, with values ranging from 2.000-3.000 mm. Nevertheless, most of the island shows rainfall records ranging from 1.000 to 2.000 mm. The lowest values are recorded in Pedernales, Parque Nacional Jaragua and Cabo Rojo (with 400-800 mm), Azua, Lago Henriquillo (with 600-800 mm) and along the Montecristi-Santiago axis (with 600-800 mm). Consequently, the most xeric zones in absolute terms belong to a tropical, dry bioclimate (Rivas-Martínez *et al*., 1999). The macrobioclimate is Tropical Caribbean-Mesoamerican Pluviseasonal, Tropical Caribbean-Mesoamerican Pluvial and Tropical Caribbean-Mesoamerican Xeric, while the thermotype ranges from infratropical to supratropical, and the ombrotype between semiarid and hyperhumid (Cano *et al*., 2009b).

B. Analysis and origin of the flora

The flora of Hispaniola has 5.600 Phanerogam species (Liogier, 2000), of which 1.800 (32%) are endemic. These data have been recently updated by Mejía (2006), who increased the number of species to 6.000, 2.050 of which are endemic taxa. The floristic analysis reveals a great variety of influences. Since a large number of species on Hispaniola derived, by means of migratory routes, from the floras of tropical South America and Central America, it is not surprising that the affinities with the floras of those areas are the most significant, as the high frequency on the island of species and genera from these regions reveals.

The Antilles finally separated from Central America at the end of the Tertiary, in the Pliocene epoch, 13 million years ago. The South American species managed to migrate to the Caribbean islands via a series of land bridges. There is little doubt about the presence of these bridges, since it is unlikely that genera and species could cross the Caribbean Sea which is hundreds of kilometres wide. The Lesser Antilles, which connect Venezuela with Puerto Rico, were one of the main land bridges. Since the current Mona Channel, which separates Puerto Rico from the Island of Hispaniola, did not exist, the migration of Venezuelan species and other species from the Lesser Antilles and Puerto Rico could take place. This is the case of Gaussia attenuata (Mejía *et al*., 1998). Since the Gaussia genus reached Mexico, Cuba and Belize, we can consider it as a Caribbean genus. By contrast, *Coccotrinax barbadensis* must be considered a taxon peculiar to the Lesser Antilles, only reaching the east of Hispaniola. Consequently, besides the migratory route through the Lesser Antilles, there was a second migratory route, the Mexican route through the Yucatán Peninsula, which connected with Cuba and Haiti via what are nowadays the Cayman Islands. This bridge enabled the arrival of species from Central America. A third migratory route came from North America, although there does not seem to have been any land bridge. In this case the species must have been brought by birds which crossed the Gulf of Mexico coming from North America to spend the winter in the Antilles. Since this last route was weaker than the others, the impact of the flora from North America on the island has been less. However, a fourth migratory route from the north had considerable impact. This fourth route came via the Bahamas and its decisive impact on the flora of Hispaniola explains the small distance between Cuba and Hispaniola as far as the Jaccard index is concerned (Cano *et al*., 2009a).

The evolution of the Antillean endemic taxa, with species occurring on 1, 2, 3 or more islands reflects the insular nature of the Antilles. These Antillean species took refuge on the emerged areas of the archipelago, Cuba and the Hispaniola, at a time when the other Antilles remained under the sea. From then on these two large islands played the role of secondary centres of dispersion for the Caribbean Sea. This fact explains why Jamaica, which remained separated from the Greater Antilles for a longer time, has a somewhat different flora from that of Cuba, Hispaniola and Puerto Rico. The analysis of the four migratory routes and other dispersion mechanisms, such as wind (cyclones), birds, sea currents and man, enables us to understand the occurrence of species on Hispaniola, Puerto Rico and the Lesser Antilles. They come from the northern regions of South America via the southern migratory route. Likewise, the occurrence of a group of species in Cuba, the Bahamas and Florida must be ascribed to the migratory route from North America and Yucatán (Cano *et al*., 2009).

C. Biogeographical analysis

The geological origin of the island, its bioclimatic profile, with thermotypes ranging from infratropical to supratropical, the ombrotypes, which vary from semiarid to hyperhumid, the origin of the flora as a result of migratory routes, and the isolation undergone by the different ranges and mountains have produced a large number of endemic species and habitats. The island has 1.284 genera, 31 of them endemic on the island: *Zombia, Leptogonum, Arcoa, Neobuchia, Fuertesia, Sarcopilea, Salcedoa, Eupatorina, Vegaea, Coeloneurum, Theophrasta, Haitia, Stevensia, Samuelssonia, Hottea, Anacaona* among others. Some endemic genera are monotypical and only in restricted areas, such as *Vegaea pungens, Zephyranthes ciceroana, Gautheria domingensis, Magnolia domingensis, Omphalea ekmanii, Gonocalyx tetrapterus, Pinguicula casabitoana, Salcedoa mirabaliarum, Fuertesia domingensis, Pereskia quisqueyana, Melicoccus jimenezii, Salvia montecristina, Acacia cucuyo, Goetzea ekmanii, Reinhardtia paiewonskiana, Pseudophoenix ekmanii, Eugenia chacueyana, Pimenta haitiensis, Caesalpinia barahonensis, Eugenia samanensis, Cojota bahorucensis*.

According to Liogier (1996-2000), the total number of species is 5.800. This number was later increased by Mejía (2006) to 6.000 vascular species distributed in 1.284 genera, with an estimation of 2.050 endemic species. For biogeographical characterization purposes our study comprises 1.582 endemic species distributed in 19 areas (A1, ..., A19). These taxa, together with the occurrence of peculiar vegetation catenae, have led us to ascribe the rank of biogeographical Province both to the island of Hispaniola and to

Jamaica, and to break the former down into two Subprovinces: Central Subprovince and Caribbean-Atlantic Subprovince. These subprovinces are clearly delimited one from the other by the differences in their geological, bioclimatic, floristic and vegetational origin. The Province of Hispaniola is characterized, among others, by the endemic genera *Hottea* and *Tortuella* and the following endemic species: *Alchemilla domingensis, Allophyllus crassinervis, Alsophila urbanii, Anthirea oligantha, Coccoloba fuertesii, Dendropemom constantiae, Eurystyles alticola, Marcgravia rubra, Psidium gracilipes, Psychotria azuensis, Terminalia intermedia, Matelea pauciflora, Mecranium amygdalinum, Exostema elegans, Galactia filiformis* var. *filiformis, Galactia schomburgkii, Ipomoea luteoviridis, Jacaranda poitaei, Meliosma abbreviata, Ocotea oligoneura, Peperomia montium, Pilea betulifolia, P. franquevilleana, P. constanzanum, P. cuspidatum, Rondeletia royenifolia, Salvia calaminthifolia, Xylosma lineolatum, Sapium buchii, Tetranthus littoralis, Macroptilium ekmanianum, Stevensia buxifolia, Begonia plumieri, B. repens, B. rotundifolia, Allophyllus rigidus, Diodia scandens, Clerodendron spinosum, Duranta arida subsp domingensis, Vernonia buxifolia.* And the following Melastomataceae endemic plants too: *Calycogonium apleurum, C. brevifolium, C. hispidulum, C. domatiatum, C. ekmanii, C. impressum, C. lomense, C. maculatum, C. ramosissimum, C. reticulatum, C. tetragonolobum, C. torbecianum, C. turbinatum; Clidemia picnantha, Cl. rubripila, Cl. tetraptera, Cl. vegaënsis; Conostegia affinis, C. furfuracea, C. lomensis; Graffenrieda barahonensis; Henriettea barkeri, H. ciliata, H. hotteana, H. megaloclada, H. reflexa; Leandra alloeotricha, L. humilis, L. hybophylla, L. inaequidens, L. limoides, L. marigotiana, L. polychaeta; Mecranium acuminatum, M. alpestre, M. amygdalinum, M. birimosum, M. crassinerve, M. haitiense, M. microdictyum, M. multiflorum, M ovatum, M. plicatum, M. puberulum, M. revolutum, M. septentrionale, M. tricostatum; Meriania brevipedunculata, M. ekmanii, M. involucrata, M. parvifolia, M. squamulosa; Miconia zanonii, M. abegii, M. adenocalyx, M. alainii, M. albiviridis, M. apiculata, M. barkeri, M. basilensis, M. campanensis, M. coniophora, M. desportesii, M. dielsiana, M. domingensis, M. favosa, M. ferruginea, M. fuertesii, M. howardiana, M. hypioides, M. jimenezii, M. krugii, M. lanceolata, M. leptantha, M. luteola, M. macayana, M. mansfeldiana, M. monciona, M. multiglandulosa, M. nematophora, M. niedenzuana, M. ossaeifolia, M. rigidissima, M. samanensis, M. santanana, M. selleana, M. septentrionalis, M. sphagnicola, M. stenobotrys, M. subcompressa, M. tetrazygioides, M. viscidula, M. xenotricha; Mouriri crassisepala, M. gonavensis, M. helleri var samanensis, M. lancifolia; Ossaea rubrinervis; Sagraea abbottii, S. barahonensis, S. cinerea, S. curvipila, S. ellipsoidea, S. fuertesii, S. gracilis, S. lanceifolia, S. oligantha, S. polychaete, S. pusilliflora, S. setulosa, S. woodsii; Tetrazygia cordata, T. longicollis, T. tuerckheimii, T. urbaniana.*

All these species are widely distributed on the island. The presence of a high number of endemic species widely distributed on the island leads the application of Pearson's index (Table I) to reveal a low correspondence between the areas A12 and A16 (r = 1,25), as a result of their different geological and floristic character, and between A16 and A13 (r = 1,17) and between A12 and A13 (r = 1,23). In the last case, the low correspondence between both areas is due to the difference observed in the number of endemic taxa. Although both areas have calcareous substrates, A13 has undergone greater human intervention. Figure 2 shows that A16 and A17 are very different one fron the other. This is not surprising, since the Massif du Nord (A17) is an extension of the Cordillera Central (A16). However, the frequent occurrence of calcareous islets in A17 and the enormous human impact explain the large differences between these two areas while A17 shows a greater similarity to A15 (northwest of Haiti).

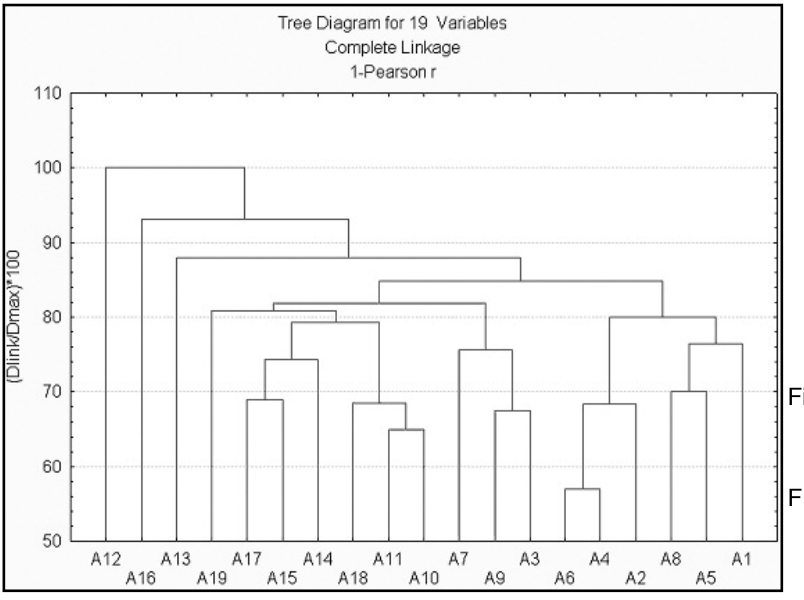

Fig. 2.- Tree diagram for 19 variables 1-Pearson *r*.
Fig. 2.- Arbre hiérarchique des 19 variables.

Table I.- Values obtained in Pearson's analysis.
Tableau I.- Valeurs de l'analyse de Pearson.

	Pearson *r*																		
Variable	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19
A1	0.00	0.99	0.95	0.93	0.96	1.00	1.03	0.95	0.99	0.96	1.02	1.13	1.06	0.99	1.01	1.05	1.03	0.95	0.97
A2	0.99	0.00	1.03	0.73	0.97	0.86	0.97	0.91	1.02	1.02	1.04	1.09	1.07	1.03	1.02	1.05	1.04	1.02	0.99
A3	0.95	1.03	0.00	0.99	1.02	1.04	0.95	0.97	0.85	0.97	0.96	1.09	1.04	0.96	0.98	1.09	0.95	1.00	1.02
A4	0.93	0.73	0.99	0.00	0.81	0.71	0.93	0.98	0.98	1.02	1.06	1.17	1.10	1.04	1.04	1.05	1.06	1.03	1.00
A5	0.96	0.97	1.02	0.81	0.00	0.91	1.02	0.88	0.98	1.01	1.02	1.03	1.03	1.01	1.02	0.93	1.02	1.01	1.01
A6	1.00	0.86	1.04	0.71	0.91	0.00	1.04	0.95	1.01	0.96	1.02	1.11	1.05	1.02	1.04	1.07	1.02	1.02	1.02
A7	1.03	0.97	0.95	0.93	1.02	1.04	0.00	1.01	0.92	0.97	1.01	1.03	1.06	1.00	1.03	1.12	1.01	1.02	1.02
A8	0.95	0.91	0.97	0.98	0.88	0.95	1.01	0.00	1.02	1.01	1.01	1.04	1.02	1.01	1.01	1.00	1.01	1.01	1.01
A9	0.99	1.02	0.85	0.98	0.98	1.01	0.92	1.02	0.00	0.91	0.97	1.00	1.08	0.99	1.02	1.09	1.02	1.00	0.99
A10	0.96	1.02	0.97	1.02	1.01	0.96	0.97	1.01	0.91	0.00	0.81	1.05	0.97	0.95	0.84	1.01	0.93	0.86	1.01
A11	1.02	1.04	0.96	1.06	1.02	1.02	1.01	1.01	0.97	0.81	0.00	1.11	0.92	0.92	0.89	1.09	0.97	0.83	0.99
A12	1.13	1.09	1.09	1.17	1.03	1.11	1.03	1.04	1.00	1.05	1.11	0.00	1.23	1.05	1.14	1.25	1.16	1.09	1.09
A13	1.06	1.07	1.04	1.10	1.03	1.05	1.96	1.02	1.08	0.97	0.92	1.23	0.00	1.02	1.04	1.17	1.01	1.02	1.03
A14	0.99	1.03	0.96	1.04	1.01	1.02	1.00	1.01	0.99	0.95	0.92	1.05	1.02	0.00	0.93	1.04	0.91	0.97	1.01
A15	1.01	1.02	0.98	1.04	1.02	1.04	1.03	1.01	1.02	0.84	0.89	1.14	1.04	0.93	0.00	1.07	0.86	0.94	0.89
A16	1.05	1.05	1.09	1.05	0.93	1.07	1.12	1.00	1.09	1.01	1.09	1.25	1.17	1.04	1.07	0.00	1.04	1.04	1.06
A17	1.03	1.04	0.95	1.06	1.02	1.02	1.01	1.01	1.02	0.93	0.97	1.16	1.01	0.91	0.86	1.04	0.00	0.99	0.99
A18	0.95	1.02	1.00	1.03	1.01	1.02	1.02	1.01	1.00	0.86	0.83	1.09	1.02	0.97	0.94	1.04	0.99	0.00	1.01
A19	0.97	0.99	1.02	1.00	1.01	1.02	1.02	1.01	0.99	1.01	0.99	1.09	1.03	1.01	0.89	1.06	0.99	1.01	0.00

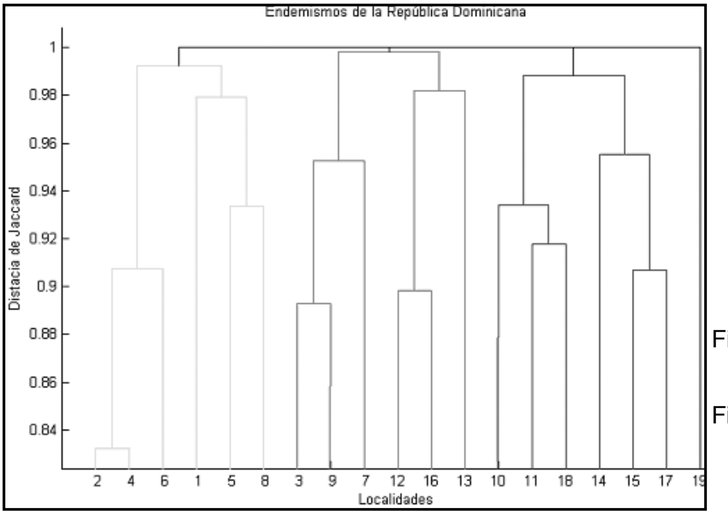

Fig. 3.- Endemic species of the Hispaniola (Jaccard's distance).
Fig. 3.- Espèces endémiques de la Hispaniola (distance de Jaccard).

Jaccard's analysis of distances (Fig. 3) also reveals a distance of 0.9 for the areas A12 and A16, which means only 10% of coincidences and 90% of differences. The result is much the same for A16 and A17 too: the analysis confirms that A17 has a greater similarity to A15. Jaccard analysis and Pearson analysis tend to be coincidental as far as areas A12 and A13 are concerned. We include area A8, which corresponds to Sierra de Yamasá, in the Caribbean-Cibense Sector 2.4, although the statistical analysis reveals a greater distance between A8 and A3 or A7, and a shorter distance with areas of the North Sector 2.5. This is caused by the presence of serpentines, which induce some xericity in the territory and, consequently, thorny xerophytic vegetation, more closely related to the vegetation occurring in areas A3 and A7.

1.- Central Subprovince (A16), Central Sector

The area comprises the Cordillera Central (Dominican Republic, Haiti), of Cretaceous origin. This range of mountains has the highest altitudes of all the Caribbean area, with Pico Duarte, 3.175 m altitude. Materials are siliceous, gabbro, diorite, granite, quartz, volcanic metamorphed rocks and metamorphic rocks. The thermotype ranges from infratropical, which penetrates into the ravines facing the Caribbean Sea, and supratropical. The ombrotype varies from dry to hyperhumid, with a tropical pluvial macrobioclimate, and tropical pluviseasonal on the peaks, and locally, tropical xeric at the foot of the mountains. All this has produced a particular endemic flora with 451 taxa and different vegetation units and frequent tropical evergreen broad-leaved forests. There are remnants of *Sloanea ilicifolia*, a species which occurs in areas between 650 and 1.500 m altitude with rainfall of 2.000 mm and is associated to *Clusia rosea* and *Dendropanax arboreus*. In the shady ravines, forests of *Sloanea* meet with those of *Prestoea montana*, a species which tends to occur with *Cestrum inclusum, Psychotria domingensis, Blechnum occidentale, B. tuerckheimii, Cyathea furfuracea, Dendropanax arboreus, Alchornea latifolia, Coccoloba wrightii*.

The broad-leaved cloudy forest of *Magnolia pallescens* occurs in areas with heavier rainfalls as a result of the influence of the trade winds. This forest, found at medium altitudes of 900 to 2.100 m, is not only characterized by *M. pallescens*, but also by *Torralbasia* *cuneifolia, Didymopanax tremulus, Persea oblongifolia, Cyrilla racemiflora, Ditta maestracensis, Polygala fuertesii, Rondeletia ochracea, Cyathea furfuracea, Myrcia splendens, Arthrostylidium multispicatum*, etc. However, as the altitude increases to 1.600 to 2.200 m, the forest incorporates species such as the wind tree *Didymopanax tremulus* and *Podocarpus aristulatus, Weinmannia pinnata, Brunellia comocladifolia, Rondeletia ochracea, Hyeronima montana, Cyathea furfuracea*.

At higher altitudes over 2.000 m, that is, in the supratropical belt above the trade winds, where winter temperatures can descend to 0 ºC, there is a forest of *Pinus occidentalis*, characterized by *Ilex tuerckheimii, Garrya fadyenii, Myrica picardae, Miconia selleana, Tetrazygia urbaniana, Rubus eggersii, Dendropemon pycnophyllus, Lyonia heptamera*. A community of *Danthonia domingensis* hard gramineae can also be found in the clearings of the pine forest.

As endemic taxa of this Sector mention should be made of *Daphnopsis hispaniolica, Gesneria decapleura, Lyonia rubiginosa* var. *costata, L. truncatula* var. *montecristina, Miconia fuertesii, M. nematophora, M. stenobotrys, Mora ekmanii, Peperomia dondenensis, Pilea formonensis, Sagrada oligantha, Salvia brachyphylla, Zanthoxylum atratum*.

2. Caribbean-Atlantic Subprovince

The Subprovince covers a vast area of calcareous ranges: Matheux, Negras, La Selle, La Hotte, Central Plain, Northwest, Massif du Nord, Artiobonite and Port-au-Prince of Haiti, and also the islands of Grande Cayemite, Gonave, Tortugas and, in the Dominican Republic, the ranges of Bahoruco, Neiba, Martín García, Oriental, Yamasa, Prieta, Samaná, Septentrional and all the coastal plains of coralline origin and sedimentary valleys formed during the Tertiary and Quaternary. The subprovince comprises areas A1 to A19, with the exception of area A16. The highest altitudes are in the Cordillera Septentrional, with the peak of Diego de Ocampo (1.229 m), and Sierra de Bahoruco (2.367 m). There are two large valleys, Cibao and San Juan, which connects with Hoya de Enriquillo, the Eastern-Coastal Plain. This very complex territory tends to be dominated by calcareous rocks and recently originated coralline limestones, materials deposited during the Quaternary, and even gypsum outcrops in the area of Lago Enriquillo and serpentines in Yamasá, Prieta, Dabajón, Puerto Plata and Gaspar Hernández. In the recently formed plains the infratropical thermotype and semiarid-dry ombrotype tend to be dominant, with a subhumid-humid and even hyperhumid ombrotype in the rest of the territory. While the thermotropical and mesotropical belts are well represented in the whole biogeographical unit, the supratropical belt occurs only in Bahoruco, Matheaux, Neiba and Massif du Nord. The origin and the connection during the Quaternary of these mountains of Alpine orogeny and the above mentioned factors are responsible for the great richness of endemic taxa and plant communities (Table II). As a result, we propose several biogeographical sectors for this subprovince: 2.1 - Bahoruco - Hottense (A12, A13), 2.2 - Neiba-Matheux-Northwest (A14, A15, A17 and A19), 2.3 - Azua - San Juan - Hoya Enriquillo-Puerto Principe-Artiobonite-Gonaivës (A9, A10, A11 and A18), 2.4 - Caribbean-Cibense (A3, A7 and A8), 2.5 - North (A1, A2, A4, A5 and A6). The Subprovince is characterized, among others, by the following endemic taxa: *Clerodendrum spinosum, Coccothrinax boschiana, Eupatorium sinuatum* var. *viscigerum, Agave antillarum, Annona dumetorum, Aristolochia ehrenbergiana, Chamaesyce adenoptera* subsp. *pergamera, Cissus oblongo-lanceolata, Coccoloba buchii, Cordia fitchii, Cubanola domingensis, Eupatorium sinuatum, Gochnatia microcephala* var. *buchii, Ipomoea furcyensis, Leptocereus weingartianus, Mosiera urbaniana, Myrcia abbottiana, Neea collina,*

Table II.- General characters of the sectors of the Hispaniola Province.
Tableau II.- Caractères généraux des secteurs de la province d'Hispaniola.

Subprovinces and sectors	Geology	Thermotype	Ombrotype	Plant communities
Central Subprovince				
Cordillera Central Sector	Substrates siliceous, granites, diorites, quartz, volcanic rocks, metamorphic rocks	Infratropical-Supratropical	Dry-Hyperhumid	* Broad-leaved forest dominated by *Alchornea latifolia, Brunellia comocladifolia, Myrsine coriacea*, *Styrax ochraceus, Meliosma impressa*, *Ditta maestrensis, Cestrum coelophlebium, Polygala fuertesii, Rondeletia ochracea, Myrcia splendens* * Cloudy forest (Manaclar) dominated by *Prestoea montana, Cyathea furfuracea, C. arborea, Magnolia domingensis, M. pallescens, Ocotea foeniculacea, Cestrum inclusum, C. milciomejiae, Arthrostylidium multispicatum, Myrcia splendens, Picramia dyctioneura* * Cloudy forest of *Didymopanax tremulus, Magnolia domingensis* * Forest of *Pinus occidentalis, Ilex turckheimii, I. fuertesiana, Rubus eggersii, Myrica picardae, Garrya fadyenii, Dendropemon pycnophyllus, Lyonia urbaniana* * Grasslands of *Danthonia domingensis, Hypericum constanzae, Carex polystachya*
Caribbean-Atlantic Subprovince				
Bahoruco-Hottense Sector	Limestones, coral limestones, sedimentary Miocene materials	Infratropical-Supratropical	Semiarid-Humid	* Cloudy broad-leaved forest: *Magnolia hamorii, Didymopanax tremulus, Lasianthus bahorucanas*, *Mikania venosa, Arthrostylidium sarmentosum, Columnea domingensis, Mecranium ovatum, Vriesea tuercheimii* * Ombrophilous forest: *Prestoea montana, Lasianthus bahorucanus, Psychotria domingensis, Hyeronima domingensis, Didymopanax tremulus, Vriesea tuercheimii* * Pine forest of *Pinus occidentalis, Coccothrinax scoparia, Agave intermixta, Narvalina domingensis* * Dry forest: *Pilosocereus polygonus, Lemairocereus hystrix, Lantana exarata, Cylindropuntia caribaea, Consolea moniliformis, Galactia dictyophylla, Coccoloba incrassata, Caesalpinia domingensis, Acacia skleroxyla, Serjania sinuata, Coeloneurum ferrugineum, Lonchocarpus pycnophyllum, Eugenia pomifera, Bonanza domingensis, Melocactus pedernalensis, Agave antillarum, Harrisia nashii, Cameraria linearifolia, Malpighia micropetala...* * Swamp vegetation: mangrove swamps of *Rhizophora mangle, Laguncularia racemosa, Avicennia germinans* which in drier areas

				becomes a community of *Conocarpus erectus*. The mangrove swamp areas alternate with communities of *Salicornia bigelobii, Batis maritima, Sesuvium portulacastrum*
Neiba-Metheux-Northwest Sector	Calcareous substrates	Infratropical-Supratropical	Dry-Humid	* Semideciduous forest: *Swietenia mahagonii* * Broad-leaved forest: *Podocarpus aristulatus, Didymopanax tremulus, Ocotea wrightii, O. cicatricosa, Persea krugii* * Cloudy forest: *Prestoea montana, Ocotea leucoxylon, Psychotria guadalupensis, Cyathea fulgens* * Pine forest of *Pinus occidentalis*
Azua- San Juan-Hoya Herniquillo-Port-au-Prince-Artiobonite-Gonaives Sector	Quaternary materials, basic, limestones, marls, alluvial materials .	Infratropical-Thermotropical	Semiarid-Dry-(Subhumid)	* Dry forest: *Pilosocereus polygonus, Lemairocereus hystrix, Agave antillarum, Mimosa diplotricha, Bryas buxifolia, Neoabbottia paniculata, Thouinia domingensis, Solanum microphyllum, Coccothrinax spissa, Acacia skleroxyla, Scolosanthus triacanthus, Consolea moniliformis, Melocactus lemairei, Cylindropuntia caribaea* * Hemicryptophytic communities of *Leptochloopsis virgata* * Broad-leaved forest of S. Martín García
Caribbean-Cibense Sector	Coral drilled limestones, alluvial materials, Miocene conglomerates, marls	Infratropical-Thermotropical	Semiarid-Subhumid	* Semideciduous forest: *Swietenia mahagonii, Metopium toxiferum*, *Krugiodendron ferreum, Coccoloba diversifolia, Guaiacum sanctus*, *Thouinia trifoliata, Zamia debilis*, *Coccothrinax barbadensis, Exostema caribaeum, Sideroxylon salicifolium, Chrysophyllum oliviforme, Aristolochia bilobata* * Dry forest of edaphic character: *Sideroxylon foetidissimum* and *Pereskia quisqueyana, Pilosocereus polygonus, Leptocereus weingartianus, Bursera simaruba, Clusia rosea, Sideroxylon salicifolium, Celtis trinervia, Bucida buceras, Cissus oblongo-lanceolata, Ficus citrifolia, Coccoloba diversifolia, Guaiacum sanctus, Acacia skleroxyla, Melicoccus jimenezii, Pithecellobium unguis-cati, Chrysophyllum oliviforme, Krugiodendron ferreum, Guapira fragans, Capparis cynophallophora* * Dry forest of edaphic character on serpentines: *Calliandra haematomma* and *Phyllanthus nummularioides, Caliptrogenia biflora, Eugenia crenulata, E. dictyoneura, Coccothrinax argentea, Leptogonum buchii, Coccoloba nodosa, C. jimenezii, Croton impressus, Vides heptafila, Ternstroemia peduncularis, Garcinia glaucescens, Scolosanthus densiflorus, Rondeletia berterii, Oplonia spinosa, Pictetia spinifolia, Zamia debilis* * Hemicryptophytic communities of *Leptochloopsis virgata*

North Sector	Limestones, Quaternary sedimentary materials, swamps.	Infratropical-Mesotropical	Subhumid-Hyperhumid	* Semideciduous forest: *Swietenia mahagonii, Coccoloba diversifolia, Alchornea latifolia*, *Zanthoxylum martinicense, Ocotea leucoxylon, Comocladia angustifolia, Securidaca virgata, Calophyllum calaba, Chrysophyllum argenteum, C. oliviforme, Guarea guidonia, Didymopanax morotononi* * Broad-leaved forest: in areas less cloudy than the ombrophilous forest and, consequently, at a lower altitude, there are broad-leaved pluvial forests of *Mora abbottii, Ocotea leucoxylon, Cyrilla racemiflora, Marcgravia rectiflora* * Ombrophilous forest: *Prestoea montana, Cyathea arborea, Smilax havanensis, Arthrostylidium sarmentosum, Cyrilla racemiflora, Casearia arborea, Ocotea leucoxylon, O. floribumda, Didymopanax tremulus* * Secondary small forests in regeneration: *Guazuma tomentosa, Ocotea coriacea, Chrysophyllum oliviforme, Zantoxylum martinicense, Cecropia schreberiana, Roystonea hispaniolana*. The occurrence of *Swieteania mahagonii* and *Coccoloba diversifolia* together with the species in regeneration leads us to think that the potential vegetation is a mahogany forest * Wet forests in ravines: *Roystonea hispaniolana, Bucida buceras, Calophyllum calaba, Inga vera, I. fagifolia, Lonchocarpus domingensis, Guazuma tomentosa* * Forest vegetation on hills: *Guarea guidonia, Cecropia screberiana, Clusia rosea, Bombacopsis emarginata, Calophyllum calaba, Drypetes alba, D. lateriflora* * Dry forest on serpentines: *Zombia antillanum* and *Sideroxylon cubecens*, with frequent occurrences of *Leptogonum buchii, Ouratea ilicifolia, Croton sidaefolius, C. linearis, Eugenia foetida, E. crenulata, E. odorata, Jacquinia umbellata, Coccoloba jimenezii, Randia aculeata, Garcinia barqueriana, Maytenus buxifolia, Caliptrogenia biflora, Vitex heptafila, Metopium toxiferum, Leptochloopsis virgata, Cordia lima, Tabebuia polyantha, Calliandra haematomma, Diospyros caribaea, Chrysophyllum oliviforme, Coeloneurum ferrugineum, Bromelia pinguis, Byrsonima spicata, Poitea galegoides, Coccoloba pubescens* * Vegetation of swampy areas: mangrove swamps of *Rhizophora mangle, Laguncularia racemosa, Avicemia germinans* * Vegetation of swampy areas of fresh water: *Pterocarpus officinalis, Thespesia populnea, Annona glabra, Typha domingensis*

	* Dry (edaphoxerophilous) forest: *Pilosocereus polygonus, Zamia debilis, Agave antillarum, Eugenia samanensis, E. foetida, Bursera simaruba, Capparis flexuosa, Ficus velutina, Opuntia dilenii, Comocladia dodonaea, Stigmaphyllum emarginatum, Croton linearis* * Semideciduous forest: *Swietenia mahagoni, Coccoloba diversifolia, Metopium toxiferum,Clusia rosea, Citharexylum fruticosum, Erithalis fruticosa, Plumeria obtusa, Krugiodendron ferreum* * Broad-leaved cloudy forest: *Didymopanax morototoni, Inga fagifolia, Turpinia occidentales, Cyathea arborea, Guarea guidonea, Prestoea montana, Securidaca virgata, Bactris plumeriana* * Ombrophilous forest: in the case of Haitises, where the rainfall rates exceed 2,000 mm, there is valley vegetation where *Dendropanax arboreus, Guarea guidonea, Sloanea berteriana, Prestoea montana, Turpìnia occidentales, Cordia sulfata, Ormosia krugii* are dominant.

Pavonia coccinea, Pilosocereus polygonus, Psychilis rubeniana, Tolumnia guianensis, Zombia antillarum. Endemic species for the sectors:

2.1 - Bahoruco - Hottense (A12, A13): *Begonia exilis, Bunchosia ekmanii, Mecranium plicatum, Oxalis scoparia, Pictetia lectocardia, Pictetia luisiana, Piper atropremnon, Piper perpallidum, Poitaea plumieri, Rondeletia carnea, Rondeletia pitreana, Satureja ekmaniana, Satureja schusteri, Senecio kuekenthalii, Thouinidium pinnatum, Wallenia aquifolia, Wallenia ekmanii, Wallenia formonensis, Zanthoxylum tetraphyllum*.

2.2 - Neiba-Matheux-Northwest (A14, A15, A17 and A19): *Guettarda oxyphylla, Mimosa extranea, Thouinidium pinnatum*.

2.3 -Azua - San Juan - Hoya Enriquillo - Puerto Principe - Artiobonite - Gonaivës (A9, A10, A11 and A18): *Bumelia picardae, Catesbaea microcarpa, Guettarda polytheca, G. saxicola*, *G. tenuiramis, Hyperbaena lindmanii, Kallstroemia incana, Malpighia aquifolia, M. setosa, Peperomia truncatula, Phenax pauciflorus, Plumeria paulinae, Psychotria buchii, Rubus haitiensis, Thouinia milleri, Thouinidium pinnatum*.

2.4 - Caribbean-Cibense (A3, A7 and A8): *Agave antillarum, Guapira brevipetiolata, Hippomane spinosa, Ipomoea desrousseauxii, Randia parvifolia, Thouinidium pinnatum, Zombia antillarum.*

2.5 - North (A1, A2, A4, A5 and A6): *Acrocomia quisqueyana, Amyris metopioides, Anemia abbottii, Annona haitiensis* var. *appendiculata, Bactris plumeriana, Begonia brachypoda* var. *pilosula, Calycogonium hispidulum, Calyptranthes garciae, Cassipourea obtusa, Cinnamodendron ekmanii, Cissus oblongo-lanceolata, Clerodendrum spinosum, Clusia abbottii, C. picardae, Coccoloba samanensis, Coccothrinax argentea, Comocladia cuneata, Daphnopsis ekamanii, Eugenia samamensis, Eupatorium obtusissimum, Gesneria viridiflora* subsp. *quisqueyana, Guapira reticulata, Guettarda abbottii, Isidorea pedicellaris, I. veris, Jacaranda abbottii, J. poitaei, Jacquinia eggersii, Leptogomum molle, Miconia samanensis, Mikania venosa, Mimosa domingensis, Mouriri helliri* var.

samanensis, Myrcia abbottiana, Philodendron consanguineum, Pilea samanensis, Pimenta terebentina, Piper laeteviridis, Plumeria magna, P. tuberculata, Poitaea galegoides, Pouteria domingensis subsp. *cuprea, Pouteria sessiliflora, Psidium acranthum, Psychilis olivacea, Rhodopis planisiliqua, Rondeletia berteroana, Roystonea hispaniolana, Sabal domingensis, Senecio samanensis, Solanum dendroicum, S. fugax, Spirotecoma rubriflora, Stevensia acueleolata, S. samanensis, Stigmaphyllon angulosum, Tabebuia berteroi, T. maxonii, T. paniculata, T. zanonii, Tetrazygia cordata, Theophrasta americana, Th. jussieui, Thouinia tomentosa, Vitex intregrifolia, Xylosma coriaceum*.

IV. CONCLUSION: PROPOSAL OF BIOGEOGRAPHICAL TYPOLOGY

As a result of the studies carried out in Hispaniola, the island, previously considered a biogeographical Sector (Rivas-Martinez *et al*., 1999) and included in the Antillean Province, is now ascribed the rank of biogeographical Province. Consequently, we promote to the rank of Superprovince the Province previously mentioned, which we name Central-Eastern Antilles, and which includes the islands of Jamaica and Hispaniola, which, together with a group de small nearby islands, Beata, Saona, Gonave and Tortuga, form the Hispaniola Province. Meanwhile, we include in the Eastern Antilles Province Puerto Rico and the string of scattered islands which belong to the Lesser Antilles. For the Hispaniola Province in particular we define six biogeographical sectors (Fig. 4).

- Caribbean-Mesoamerican region
  - Western Antilles Superprovince
    - Cuba Province
    - Florida Province
  - Central-Eastern Antilles Superprovince
    - Eastern Antilles Province
      - 1.- Puerto Rico Sector
      - 2.- Lesser Antilles Sector
    - Hispaniola Province
      - 1.- Central Subprovince
        - 1.1.- Central Sector
      - 2.- Caribbean-Atlantic Subprovince
        - 2.1.- Bahoruco-Hottense Sector
        - 2.2.- Neiba-Matheux-Northwest Sector
        - 2.3.- Azua- San Juan-.Hoya Enriquillo-Port-au-Prince-Artiobonite-Gonaivës Sector
        - 2.4.- Caribbean-Cibense Sector
        - 2.5.-North

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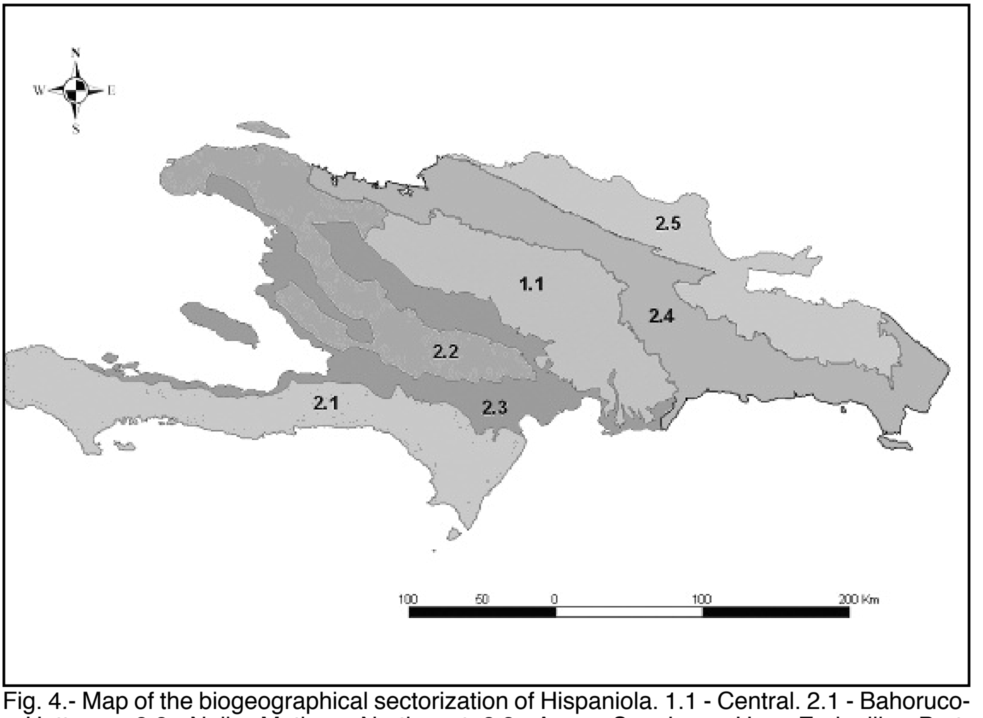

Fig. 4.- Map of the biogeographical sectorization of Hispaniola. 1.1 - Central. 2.1 - Bahoruco-Hottense, 2.2 - Neiba-Matheux-Northwest, 2.3 - Azua - San Juan - Hoya Enriquillo - Port-au-Prince - Artiobonite - Gonaivës, 2.4 - Caribbean-Cibense, 2.5- North.
Fig. 4.- Carte des secteurs biogéographiques d'Hispaniola.

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