

monotonous sandstone ridges. The predominant soils are humic-carbonated soils on limestone, tropical brown soils on sandstone and ferritic soils on serpentine.

**b. Climate:** Seasonal with dry winter of 1–2 or 3–4 months duration. Annual precipitation 1000–1800 mm.

**c. Flora:** Two centres of flora development may be distinguished, both being rich in endemics. The first is the mogotes of Sierra de Nipe with about 15 endemic species, such as *Hemithrinax compacta* (Fig. 13), *Spathelia lobulata* (Fig. 6), *Plinia ramosissima*, *Calyptanthes paradoxa*, *Eugenia bayatensis*, *E. excisa*, *Hydrocotyle oligantha*, *Matelea bayatensis*, *Tabebuia picotensis*, *T. mogotensis*, *Gesneria lopezii*, and *Isidorea polyneura*. The other centre is the group of Monte Libano, Monte Verde and Monte Cristo which must have been the principal junction of migratory routes during the development of the Oriente flora. This area is still a rich meeting point of the limestone and serpentine floras, as well as of the semi-desert xerotherm elements. On the soils derived from serpentine the range of many species of Nipe and Cristal overlaps the distribution of Moa elements. Moreover, only at this point reach certain serpentinophilous species (*Pinus cubensis*, *Agave shaferi*) the limestone zone. Also, some coastal species were able to spread up to 6–700 m on the southern slopes where the xerotherm elements and the montane rainforest species meet. The three mountains possess 40 endemics altogether, some of them exhibiting vicariance (e.g., *Siphocampylus*, *Gesneria*). Examples of characteristic plant species are *Hernandia cubensis*, *Auerodendron glaucescens*, *Salacia wrightii*, *Begonia libanensis*, *Scolosanthus granulatus*, *Spermacoce exasperata*, *Verbesina wrightii*, 3 *Dorstenia*, 6 *Pleurothallis*, 2 *Calyptanthes* and 2 *Ossaea* species.

**d. Vegetation:** Karstic woods in the mogotes, seasonal evergreen forests in the valleys as well as in the sandstone areas. Arid scrubs on limestone slopes and pinewoods on serpentine which may occasionally extend to the limestones. Rainforest patches may occur in some places in the deep valleys and montane rainforest fragments are found at higher altitudes.

### Sector C.2.: Sierra Maestra (*Maestricum*) (Fig. 43)

The 250 km long and 15–20 km wide Sierra Maestra is almost 750 m higher than the ancient Sagua-Baracoa massif from which its flora originated. As a result of this altitude difference and of the presence of rocks more effectively enforcing the moist climate (limestone, sandstone, granite, grano-diorite and diorite), a wide montane rainforest and cloud forest belt developed, in which the ancient Sagua-Baracoa flora enriched in Jamaican and Hispaniolan elements, may have become a new evolutionary centre. This spontaneously formed secondary centre is characterized by two endemic genus (*Solonia* and *Cubacroton*) and 155 endemic species, for example, *Cneorum trimerum* (ancient relict!), *Pinus maestrensis*, *Laplacea urbani*, *Cleyera ekmani*, *Persea anomala*, *Pithecellobium maestrense*, *Platygyne dentata* (Fig. 14), *Pera microcarpa*, *Sapium maestrense*, *Cubacroton maestrensis*, *Maytenus saxicola*, *Clidemia pterosepala*, *Karwinskia bicolor*, *Cinnamodendron cubense*, *Talauma orbiculata*, *T. truncata*, *Scolosanthus maestrensis*, *Cordia longipedunculata*, *Solanum maestrense*, *Tabebuia oligolepis*, *T. hypoleuca*, *Justicia maestrensis*, *Peratanthe cubensis*, *Schradera cubensis*, 9 *Eugenia* 6 *Miconia*, 6 *Ossaea*, 5 *Gesneria*, 5 *Eupatorium* and 6 *Rondeletia* species. The boundary of this sector runs at 300–400 m on the slopes in the south, and at the margin of the Cauto basin in the north.

### District C.2.1.: The Western and Central Maestra (*Turquinense*)

**a. Geography:** This area extends from Pilón to the Santiago valley and includes two higher mountainous groups (Turquino and La Bayamesa), in between whose highest points are over 1500 m. These mountains comprise, deeply inclined sharp ridges and conical formations so

that the superficial drainage ratio is high (35–50 l/sec · km<sup>2</sup>) and the erosion is intensive. Tropical brown soils occur at medium elevation, up to 600 m and then yellowish-red montane soils are found up to 1300 m. Next, up to 1750 m, yellowish-brown montane soils become predominant, these are replaced by brown montane soils on the peaks. The northern slopes are covered by yellow montane soils over 1300 m.

**b. Climate:** Seasonal with dry winter. 3–4 dry months at the foothills, 1–2 dry months up to 800 m. Further up there is a moist montane rainforest climate which is replaced by a humid, high-altitude temperate rainforest climate at 1700 m. The annual precipitation ranges from 800 to 3000 mm.

**c. Flora:** Besides the characteristic endemics listed in section C.2., there are numerous regional endemic species of mossy forests in this district. For example, *Myrsine microphylla*, *Nectandra reticularis*, *Eupatorium paucibracteatum*, *E. praestans*, *Henriettea ekmanii*, *Hedyosmum cubense*, *Ossaea turquinensis*, *Rondeletia naguensis*, *Myrica cacuminis*, *Rubus turquinensis*, *Symplocos leonis*, *Sapium erythrococcum*, *Eugenia maestrensis*, and *E. laeteviridis*, etc. In addition, local endemics have been found in several mountain groups and valleys: Nagua has 4 endemics Pico Caracas is famous by the remarkable paleoendemism *Cneorum trimerum* and the *Podocarpus* woods; *Citharexylum ternatum*, *Tabebuia elongata*, *Eugenia naguana* and *Polygala rhynchosperma*, Rio Guamá, Hacienda Sevilla, Nima-nima, El Cuero, Rio Yara, Yao arriba, Pico Joaquin, and Loma Regino possess one-two endemics each, whereas in Pico Bayamesa 4 local endemics occur (e.g., *Vernonia maestralis*, *Purdiaea maestrensis*, *Lepanthes acunae* and *Psychotria ekmanii*). The most prominent evolutionary centre is the Turquino group having approximately 25 local endemics (e.g., *Coccothrinax acunana* — Fig. 46, *Agave pendentata*, *Satureja bucheri*, *Juniperus saxicola*, *Miconia turquinensis*, *Ilex turquinensis*, *I. nunezii*, *Lobelia cacuminis*, *Chaptalia turquinensis*, *Mitracarpus acunae*, *Lepanthes ekmanii*, *L. turquinoensis* and *L. pergracilis*, etc.).

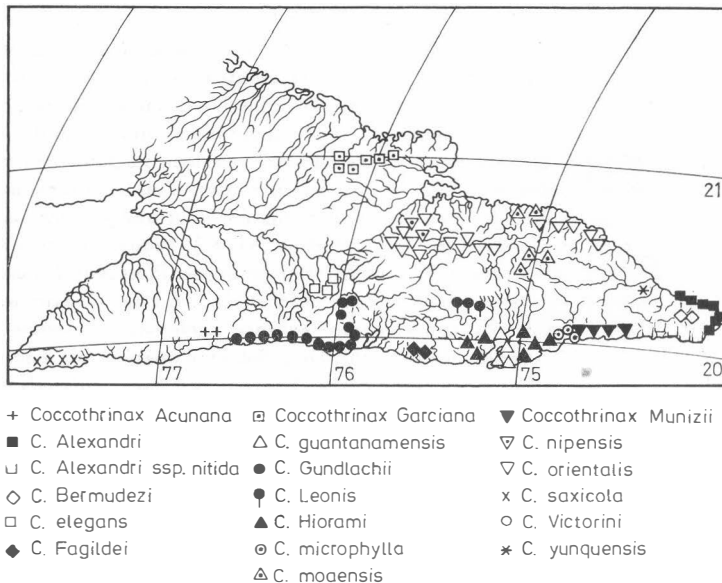


Fig. 46. Geographical distribution of the East-Cuban taxa of the genus *Coccothrinax* (after BORHIDI 1973, modified)

**d. Vegetation:** Arid evergreen shrubwoods on the southern slopes up to 300 m, semi-deciduous forests (Yayales p.p.) between 300–500 m, seasonal rainforests (Yayales p. maj. p.) between 500–800 m, moist montane rainforests (fangales) between 800–1600 m and mossy forests (monte fresco) between 1600–1900 m. Over 1900 m high altitude moist shrublands predominate. On the northern slopes the seasonal rainforest zone begins as low as 150–200 m. This is replaced by montane rainforests at 800–1000 m. At the boundary of these two rainforest types a 100–200 m wide belt of “extrazonal” pinewood stands (*Pinus maestrensis*) are found on sandstone which may extend even up to 1800 m on the northern slopes of Turquino. At 1500 m begins the mossy forest zone.

#### District C.2.2.: The eastern Sierra Maestra (Piedraense)

**a. Geography:** This area includes Gran Piedra, a limestone range covered by granodiorite. Its highest point is 1219 m. North of it are found the limestone mountains of Sierra de Santa Maria Loreto. All mountains are deeply inclined, large bluffs occur in the north. Tropical brown soils predominate up to 800 m. Further up yellowish-red montane soils are found.

**b. Climate:** Similar to that of the preceding district.

**c. Flora:** As few as two local endemics (*Callicarpa floccosa* and *Rondeletia intermedia*) have been known. Here is the only population of *Pinus cubensis* in the Sierra Maestra, which is supposed to be a hybridogenous one between *P. cubensis* and *P. maestrensis*.

**d. Vegetation:** Similar zonation as in the preceding floristic district. The only difference is that the pine forest stands enclosed by the seasonal evergreen forest and montane rainforests are composed of *Pinus maestrensis* (or rather *P. cubensis* × *P. maestrensis*).

#### District C.2.3.: The mogotes of Baire, (northern Sierra Maestra) (Tablaense)

**a. Geography:** These karsts are found within the Charco Redondo—Los Monos—Matias—Los Negros quadrangle. Conical hills of 400–600 m height with perpendicular rocky walls. Rendzina soils predominate, whereas in the valleys humic-carbonated soils occur.

**b. Climate:** Seasonal with dry winter of 3–4 months duration. Annual precipitation between 1200–1600 mm.

**c. Flora:** The flora of this area had been unexplored for a long time. Due to geographic isolation, the flora is very rich. A remote relationship to the mogotes of Nipe is indicated by the presence of the endemic genus *Synapsis* and of *Siphocampylus undulatus*, *Clerodendron denticulatum* and *Byttneria microphylla*. Also, there is a connection with the flora of arid limestone terraces in the Cabo Cruz area (*Catalpa brevipes*). More than ten local endemics are found here, e.g., *Coccothrinax elegans* (Fig. 46), *Neobraccia susannina* (Fig. 9), *Malpighia acunana*, *Rhytidophyllum mogoticola*, *Tabebuia candicans* and *Pilea uninervis*.

**d. Vegetation:** Semi-deciduous forests with *Coccothrinax* palms, cacti and agaves predominating in the mogotes. Seasonal evergreen forests occur in the valleys.

#### Sector C.3.: The southern and northeastern coasts of Oriente (Santiagicum) (Fig. 43)

This sector includes the most extensive and most extremely arid zone of Cuba: the area extending from Cabo Cruz over Maisi to Navas in the shade of the Sierra Maestra and the southern Baracoa Mountains which are mainly responsible for the dry climate. This region is continued as a narrow strip along the northern coast to Navas. The Sierra Canasta, the Guantanamo Basin, the southern slopes of Sierra Maestra up to about 200 m, and the terraces of

southern Baracoa up to 300–400 m are also included. In the Monte Libano group some coastal elements managed to reach 700 m altitude. This area is an old coastal land with an eventful geological past. During millions of years sections of this land rose and sunk, became separated and joined again in different points of time, resulting in several evolutionary centres of the flora. Therefore, the common species of this sector are mostly widely distributed xerophilous species, such as *Dendrocereus nudiflorus*, *Lemaireocereus hystrix*, *Cordia taylori*, *Pseudocarpidium avicennioides*, *Croton rosmarinoides*, *C. myricifolius* and *C. littoralis*. There are two monospecific endemic genera: *Cubacroton* and *Caribaea*, and about 110 endemic species, most of them being confined to a given locality or a floristic district. The number of endemics found throughout the sector is relatively small (e.g., *Guettarda cueroensis*, *G. coxiana*, *Galactia cuneata*, *Consolia macracantha*, *Myrtus oonophylla*, *Cordia leucosebestena*, *C. leptoclada*, *C. brittonii*, *Lantana parvifolia*, *Callicarpa grisebachii*, *C. bucheri*, *Pseudocarpidium multidentis*, *Spirotecoma spiralis*, *Eupatorium helianthemoides*, *Vernonia complicata*, *Gochnatia calcicola*, *Bonania elliptica*, *Croton micradenus*, *C. munizii*, etc.). The vicarious *Melocactus* species and *Coccothrinax* palms (Figs 45–46) are also typical.

### District C.3.1.: The coast and terraced land between Belic and Pilón (Pilonense)

**a. Geography:** The Pliocene limestone cliffs, sometimes reaching 50 m height, the western end of Sierra Maestra having several terraced levels, and the plain at Pilón Bay with sedimentary origin from the Quaternary are included. Limestone rendzina and humic-carbonated soils predominate in the first two. The plain is covered by tropical alluvial soils.

**b. Climate:** Seasonal bixeric with two dry seasons of 7–8 or 5–6 months duration. Annual precipitation is 700–1200 mm. At higher altitudes 3–4 dry months, all in the winter, and 1000–1400 mm annual precipitation.

**c. Flora:** Fairly isolated from that of the other districts in the sector. It is characterized by the low number of regional endemics and by many local endemic species with several centres of flora development. For example, Media Luna (*Coccothrinax victorini* — Fig. 46), Niquero (*Copernicia humicola* — Fig. 42, *Cassia niqueroensis*, *Chamaesyce niqueroana*), Cabo Cruz (*Cordia corallicola*, *C. dumosa*, *Eugenia peninsularis*, *E. aceitillo*, *Amyris polymorpha*, *Croton corallicola*, *Rondeletia peninsularis*, *Coccothrinax saxicola* — Fig. 46 and *Portulaca tuberculata*) and Pilón (*Chaptalia comptonioides*, *Justicia agria*, *Belairia parvifolia*, *Pilea cowellii*, *P. carnososa*, *Begonia cowelli*, *Leptocereus sylvestris*). There is certain relationship to the flora of the mogotes of Baire as shown by the occurrence of *Catalpa brevipes*.

**d. Vegetation:** Arid evergreen shrublands in the coastal zone, dry evergreen forests in the lower terraces, and semi-deciduous forests higher up. The original vegetation of the plain was a tropical humid woodland.

### District C.3.2.: The coastal area between Marea del Portillo and Nima-nima (Uveroense)

**a. Geography:** Narrow and mostly rocky coasts at the western wing of Sierra Maestra. Gravelly and sandy beaches at the estuaries, and the lower parts of slopes exposed to the south. Rendzina and humic-carbonated soils are usual, whereas tropical brown soils occur in the valleys.

**b. Climate:** Evenly warm bixeric climate with two dry seasons of a total of 5–6 months duration. Annual rainfall 800–1200 mm.

**c. Flora:** Very little studied. Probably several evolutionary centres could be detected here. *Rhytidophyllum minus* is an endemic in common with the preceding district, and some local endemic species, e.g. *Tabebuia acunana*, *Rondeletia sevillensis*, *Erigeron taylori*, *Pilea*

*sevillensis*, *Melocactus nagyii* (Fig. 45) characterize the area. There is also an endemic palm, common with the Sierra Maestra, is *Coccothrinax gundlachii* (Fig. 46).

**d. Vegetation:** Microphyllous evergreen shrublands, dry evergreen forests with deciduous elements, and locally, mangroves in the estuaries and the gravelly coastal depressions.

### District C.3.3.: Coastal belt and terraces between Santiago de Cuba–Guantánamo–Maisi and Baracoa (Guantanamense)

**a. Geography:** High cliffs and low limestone terraces with small inlets and coastal plains. Rendzina and cinnamon-coloured humic carbonate soils predominate. Also the plain in the Guantánamo Basin covered partly by brown humic carbonated soils. The district includes the southern coasts at the foot of the Gran Piedra range, the Guantanamo Basin with Sierra de Canasta, the coasts and terraces from Guantánamo to Maisi up to an elevation of 400 m, and the northern Baracoa shores between Maisi and Navas.

**b. Climate:** Evenly warm seasonal bixeric climate with two dry seasons (5–8 dry months) and annual precipitation totalling 600–1100 mm. Also, semi-desert climate with 9–10 dry months and 300–600 mm annual rainfall develops in the rain shadow of the Sierra de Puriales and Sierra de Imias, south and east of Guantánamo ranging eastward to Jauco. Between Maisi and Baracoa seasonal climate with short summer dry period is characteristic.

**c. Flora:** Very rich and diverse xerothermophilous flora, with several small areas characterized by local endemics. A single monospecific endemic genus is *Caribaea* (Yctaginaceae), a particular littoral cushion plant with very restricted area. A great number of regional endemic species occur also, as *Coccothrinax alexandri* s. l. *C. hiorami*, *C. munizii* (Fig. 46), *Rhytidophyllum acunae*, *Melocactus acunai* (Fig. 45), *Caesalpinia pinnata*, *Passiflora santiagana*, *Castela victorini*, *Consolia macracantha*, *Rondeletia apiculata*, *Tabebuia libanensis*, *Reynosia mucronata* ssp. *azulensis* (Fig. 16), *Maytenus buxifolia* ssp. *cochlearifolia* (Fig. 15). The area abounds in very important local evolutionary centres with 80 endemic taxa altogether. Local endemic species are at Santiago de Cuba: *Rondeletia norlindii*, *Acacia cowellii*, *Caesalpinia subglauca*, *Eugenia amblyophylla*, *E. itephylla*, *Lasiocroton gracilis* and *Tephrosia clementis*; at Aguadores: *Nashia armata*, *Rochefortia oblongata*, at Siboney: *Neobraccia martiana* (Fig. 9) and *Barleriola saturejoides* ssp. *hirsuta* (Fig. 47); at Daiquiri: *Cassia scleroxyla*, *Chamaesyce microclada* and *Coccothrinax fagildei* (Fig. 46); at Baconao: *Justicia maestrensis*, *Jacquinia verticillaris* and *Machaonia urbaniana* (Fig. 37) occur. Fifteen local endemics live around Guantánamo,

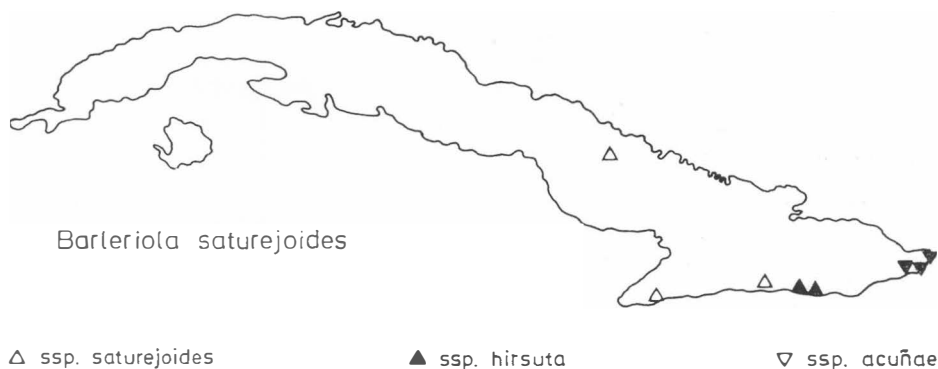


Fig. 47. Geographical distribution of *Barleriola saturejoides* (Acanthaceae) (after BORHIDI 1973)

e.g. *Coccothrinax guantanamensis* (Fig. 46), *Andrachne brittonii*, *Croton excisus*, *Colubrina obtusata*, *Opuntia militaris*, *Melocactus evae* (Fig. 45), *Myrtus nummularioides* and *Geophila multiflora*. Between Guantánamo and Macambo *Agave albescens*, *Casearia comocladifolia*, *Thouinia leonis*, *Stigmaphyllon coccolobaefolium*, *Coccothrinax microphylla* (Fig. 46), *Scolosanthus strictus* occur; at Macambo *Caribaea littoralis*, *Drymaria glandulosa* and *Apassalus parvulus* are local endemics, whereas between Cajobabo and Jauco *Pheidonocorpa cubensis*, *Gyminda orbicularis*, *Isidorea rheedioides*, *Tabebuia jaucoensis*, *Micromeria suborbicularis*, *Barleriola saturejoides* ssp. *acunae* (Fig. 47), *Scolosanthus hirsutus* are found. Additional 15–20 endemics are known from the Maisi plain and the surrounding terraces, for example, *Isidorea leonis*, *Pseudocarpidium shaferi*, *Cnidocolus matosii*, *Acacia seifriziana*, *Tabebuia leonis*, *Duranta arida*, *Harpalyce maisiana*, *Galactia maisiana*, *Jacquinia maisiana*, *Scolosanthus hispidus* and *S. nannophyllus*. On the young serpentine outcrops around the lagune of the Jójó valley some local neoendemics live as *Rondeletia ingrata* and *Melocactus acunai* ssp. *lagunaënsis* (Fig. 45).

The role of xerotherm elements that are also found in Hispaniola is increased (e.g. *Coccothrinax fragrans*, *Pithecellobium oppositifolium*, *Bellonia spinosa*, *Jacquinia berterii*, *Caesalpinia glandulosa*, *Exostema spinosum*, etc.). Floristic relations with Hispaniola is especially manifested at the easternmost part of the southeast coast of Oriente around Maisi, where some common species of Cuba and Hispaniola with very restricted areas occur, as *Omphalea commutata*, *Petitia urbanii*, *Victorinia regina*, etc. (Fig. 21).

**d. Vegetation:** Microphyllous evergreen and deciduous shrubwoods and shrublands. Open shrublands with cacti in the understory and semi-desert scrubs with columnar cacti occur in many areas. Eastward of Guantánamo the dominant vegetation type is the semi-desert scrub with tree-shaped and columnar cacti. On the terraces arid evergreen shrubwoods, open scrubs with agaves, dwarf and tall thin palms predominate. In the flat valleys of rivers secondary savannas composed of short grasses, with *Sabal parviflora* palms are found.

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