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A preliminary evaluation of the current conservation status of Cuban endemic true ferns

Abstract

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A preliminary evaluation of the conservation status of 54 Cuban endemic species of *Polypodiopsida* is presented; 14 are Critically Endangered (CR), 12 Endangered (EN), 9 Vulnerable (VU), 3 Near Threatened (NT) and 16 are Least Concerned (LC). The most common threat is the loss or degradation of the habitat because of agriculture, mining, deforestation and infrastructure development. Distribution and habitat are depicted.

Key words: Cuba, *Pteridophyta*, *Polypodiopsida*, biodiversity conservation, Red List.

Introduction

An important step towards the conservation of our natural resources is to expand the knowledge of the endemic species of our flora. The knowledge of the ferns (and allied plants) in the Cuban flora is particularly deficient. Information on taxonomy and systematics of the Cuban pteridophytes was very scarce and dispersed before 1970, and even today only for three families of ferns a modern taxonomic treatment is available: the filmy ferns, *Hymenophyllaceae* (Sánchez 2000), the spleenworts, *Aspleniaceae* (Sánchez & Regalado 2003) and the tree ferns, *Cyatheaceae* (Caluff & Shelton 2003). The families *Osmundaceae*, *Schizaeaceae* and *Gleicheniaceae* were treated not long ago by Duek (1976).

The aim of this work is to provide an updated list of the endemic Cuban ferns, with a brief characterization of distribution and habitat for each species, as well as and a preliminary assessment of their risk of extinction. The attention of the Action Plan of Conservationist Strategy of the Cuban pteridologists and the people working on plant conservation in Cuba in general is focused on these plants, mainly the threatened species, because of their high level of endemism. The information about distribution, basic habitat requirements and the updated assessment of the conservation status of Cuban endemic ferns presented here are a modest contribution to the life histories of these interesting plants.

The evaluation of the risk for the threatened species follows the IUCN Red List categories and criteria (IUCN 2001). The main criteria to identify the categories are (1) the geographic range in the form of either B1, the extent of occurrence, or B2, the area of occupancy, or both, and (2) the population size as number of mature individuals (D1) or presence of populations with a very restricted area of occupancy (<20 km²) or number of locations (<5) (D2).

Some of the included taxa have been evaluated before and their threat category is established in the CAMP Workshops (Peña & al. 1998, Lazcano & al. 2001), mostly the filmy ferns and tree ferns. In a review of threatened Cuban ferns and allied plants (Sánchez & Caluff 1997), 17 species were studied but following the IUCN criteria of 1986 (Davis & al. 1986).

Distribution data were obtained by reviewing the main Cuban herbaria, in the Institute of Ecology and Systematics (HAC), the National Botanical Garden "Prof. Dr. Johannes Bisse" (HAJB) and the section of pteridophytes of the Eastern Center of Ecosystems and Biodiversity of Santiago de Cuba (BSC). The acronyms used correspond to the Index Herbariorum (Holmgren & al. 1990, Holmgren & Holmgren 2001: 605). Ecological notes and evaluations of the approximate numbers of individuals are the result of more than 25 years of field observations made during expeditions throughout all of Cuba, including the main mountain ranges and several other special ecotopes where these plants are found. The classification of Cuban vegetation of Capote & Berazaín (1984) is used, following the English translation in Capote & al. (1989).

The use of quantitative and qualitative criteria was essential, in terms of distribution and number of individuals in the populations. Knowledge of the life histories of the taxa is also very important, but was not directly taken into account to define the threat categories. However, it was extremely useful to formulate estimates, inferences and projections of the conservationist objectives for each endangered taxon.

The life history of the species is related to the habitat requirements. Many ferns have a very peculiar and distinctive autecology. When the quality of the habitat is altered, the life cycle of these plants is affected, in particular the gametophyte generation, the most vulnerable.

Of particular concern for many Cuban endemic ferns is the low number of individuals in the available populations or subpopulations. In the field it is common to observe in a locality only one or a few (<10) individuals of a rare, endemic taxon. During further investigation of the same area, even when covering several kilometers, it has usually been impossible to detect other individuals of this species. This situation is particularly worrying because a sufficient number of mature individuals is basic for the survival success of the species. It is difficult to apply the defined criteria of area of occupancy and size of population consequently in view of extreme fluctuations and reductions.

The endemic Cuban true ferns are grouped according to the IUCN threat categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), and Least Concern (LC). Notes about their distribution, with the main locations by province, comments on their ecology and data of last record for CR, EN and VU species are provided.

Critically Endangered (CR) species – Fig. 1

1. *Anemia pumilio* Mickel

Distribution and habitat: NE Cuba: Holguín: La Melba, Sierra of Moa. – Terrestrial in montane or submontane rain forest (purple ferritic soils, laterites), in filtered or full sunlight, 400-500 m.

Criteria: B1b(i,ii,iii) c(i,ii,iii) +2b(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by wood extraction, deforestation, mining.

Last record: Cuba, Holguín, Moa, km 26 of road to La Melba, banks of stream near Aserrío Viejo, 2.4.1990, Sánchez & al. 69034 (HAJB).

2. *Hymenophyllum turquinense* C. Sánchez

Distribution and habitat: SE Cuba: Granma: La Bayamesa Peak, Sierra Maestra. Santiago de Cuba: Turquino Peak, Sierra Maestra. – Epiphytic and lithophytic in cloud forest, in shade or filtered sunlight, 1700-1900 m.

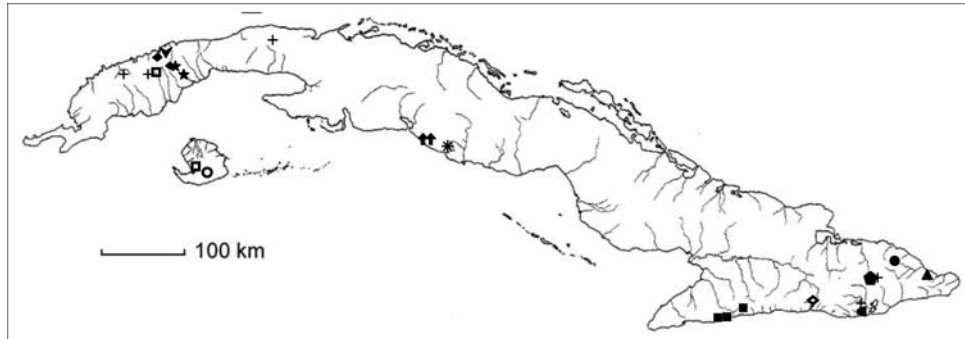


Fig. 1. Distribution of Critically Endangered (CR) Cuban endemic species of true ferns. ● *Anemia pumilio*, ■ *Hymenophyllum turquinense*, ▲ *Trichomanes caluffii*, ★ ×*Cyathidaria acunae*, ◆ *Adiantopsis asplenioides*, ◀ *Notholaena cubensis*, ↑ *Ctenitis santae-clarae*, ● *Ctenitis velata*, ○ *Thelypteris acunae*, □ *Atalopteris aspidioides*, + *Ctenitis melanochlamys*, ▼ *Polystichum wrightii*, ★ *Polystichum rhizophyllum* var. *cubense*, ◇ *Polystichum deminuens*.

Criteria: B1b(i,ii,iii) c(i,ii,iii) +2b(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by deforestation and infrastructure development (tourism/recreation).

Last record: Cuba, Santiago de Cuba, Guamá, from camp site, Aguada de Joaquín, passing by Mecías waterfall to pines on N slope of Turquino, 5 km from camp, 1000-1200 m, 22.2.1998, *Sánchez & al.* 75891 (HAJB).

3. *Trichomanes caluffii* C. Sánchez

Distribution and habitat: NE Cuba: Guantánamo: Frío river, Quibiján, Baracoa. – Epiphyte on palm stems, in submontane rain forest, in shade, 50-200 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by wood extraction (selective or small-scale subsistence logging).

Last record: Cuba, Guantánamo, Baracoa, Quibiján, Frío river, 200 m, 31.3.1988, *Caluff* 2606 (HAJB, holotype).

4. ×*Cyathidaria acunae* Caluff & Shelton

Distribution and habitat: W Cuba: Pinar del Río: El Rangel, Mundito Ranch, Taco-Taco river, Sierra of Rosario. – In gallery forest, in filtered sunlight, 350-500 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by agriculture and wood extraction.

Last record: Cuba, Pinar del Río, Sierra de los Órganos, El Rangel, banks of Taco-Taco river, 29.10.1998, *Caluff & Shelton* 4463 A-B (BSC).

5. *Adiantopsis asplenioides* Maxon

Distribution and habitat: W Cuba: Pinar del Río: El Rangel, Sierra del Rosario, Sierra de los Órganos, Cajálbana. – Terrestrial or lithophytic in “mogote” complex and xeromorphic thorny thicket (“cuabal” on serpentinite), on cliffs and rocks, in filtered or full sunlight, a xerophytic fern.

Criteria: B1b(i,ii,iii,iv) c(i,ii,iii,iv) +2b(i,ii,iii,iv) c(i,ii,iii,iv).

Threats: Habitat loss/degradation by agriculture (crops, and small farm holdings), fires and deforestation.

Last record: Cuba, Pinar del Río, Rangel, Zambumbia hill, serpentinite soils, 1.1957, *Bro. Alain* 6108 (HAC); Pinar del Río, Cajálbana, in the 1990s (Urquiola, pers. comm. 2005).

6. *Notholaena cubensis* Maxon

Distribution and habitat: SE Cuba: Guantánamo: Los Monitongos, Caimanera. – Terrestrial or lithophytic in coastal and subcoastal xeromorphic thicket, on calcareous rocks, in full sunlight, a xerophytic fern sometimes growing intermixed with *Melocactus* sp.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by natural disasters (flooding, hurricanes) or human action.

Last record: E Cuba, Los Monitongos, far away from Baconao lagoon, 100 m, in rocky crevices, intermixed with *Melocactus* sp., very dry place, 18.5.1989, *Curbelo 2785* (BSC).

7. *Thelypteris acunae* C. Sánchez & Zavaró

Distribution and habitat: SW Cuba: Isla de la Juventud: Cayo Piedras. – Terrestrial in gallery forests or secondary vegetation, in filtered sunlight, 0-50 m.

Criteria: B1b(i,ii,iii) c(i,ii,iii) +2b(ii,iii) c(ii,iii); D1.

Threats: Habitat loss/degradation by natural disasters (flooding, hurricanes), deforestation and agriculture.

Last record: Cuba, Isla de la Juventud, Cayo Piedras, near coast guard post, 15 m, gallery forest, 15.3.1990, *Sánchez 68651* (HAJB, holotype).

8. *Atalopteris aspidioides* (Griseb.) Maxon & C. Chr.

Distribution and habitat: W Cuba: Pinar del Río: San Diego de los Baños. – Terrestrial, pine forest.

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv) +2ab(ii,iii,iv) c(ii,iii,iv); C2a(i); D1.

Threats: Habitat loss/degradation by agriculture, deforestation, infrastructure development and human disturbance.

Last record: Cuba, Pinar del Río, pine forests of San Diego de Los Baños, 28.8.1915, *Hno. León 5079* (HAC).

9. *Ctenitis melanochlamys* (Fée) Ching

Distribution and habitat: W Cuba: Pinar del Río: Viñales; Sierra of Güira. La Habana: Jaruco hills. – E Cuba: Guantánamo: La Prenda, Monteverde. – Terrestrial or lithophytic in “mogotes” complex, on calcareous rocks and crevices with abundant semi-decayed humus in shade or filtered sunlight, 300-600 m.

Criteria: B2b(ii,iii,iv,v) c(ii,iii,iv,v); C2a(i); D1.

Threats: Habitat loss/degradation by agriculture, wood extraction (selective logging or clear cutting) and natural disasters (flooding or hurricanes).

Last record: Cuba, Pinar del Río, Sierra of Güira, N slope, 13.12.2003, *Regalado & al. 42334* (HAC).

10. *Ctenitis santae-clarae* (C. Chr.) Ching

Distribution and habitat: Central Cuba: Cienfuegos: Buenos Aires, San Blas. Villa Clara: Sierra of Siguanea. – Terrestrial in “mogotes” complex, in calcareous humid cliffs and rocks, in filtered sunlight, 400-800 m.

Criteria: B1b(i,ii,iii,iv) c(i,ii,iii,iv) +2b(ii,iii,iv) c(ii,iii,iv); C2a(i); D1.

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding or hurricanes).

Last record: Cuba, Santa Clara [now Cienfuegos province], Trinidad Mts, Buenos Aires, 900 m, 17.3.1929, *Jack 7108* (HAC).

11. *Ctenitis velata* (Mett.) R. M. Tryon & A. F. Tryon

Distribution and habitat: E Cuba: Guantánamo: Mt Líbano, Guaso plain. – Terrestrial or lithophytic in “mogotes” complex, on calcareous humid cliffs or rocks, in filtered sunlight or shade, 500-600 m.

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv) +2ab(ii,iii,iv) c(ii,iii,iv); C2a(i); D1.

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding or hurricanes).

Last record: Cuba, Oriente, Líbano mountain, Termópilas caves, c. 600 m, shaded talus slopes of limestone cliffs, 27.-28.4.1907, *Maxon 4238* (HAJB).

12. *Polystichum deminuens* Maxon

Distribution and habitat: E Cuba: Santiago de Cuba: Josephina. – Habitat unknown.

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv) +2ab(ii,iii,iv) c(ii,iii,iv); D1.

Threats: Habitat loss/degradation by agriculture and deforestation.

Last collection: Cuba, in Cuba orientali, prope Josephina, in summo monte, 4.11.1859, *Wright 1057* (YU, holotype).

13. *Polystichum wrightii* (Baker) C. Chr.

Distribution and habitat: W Cuba: Pinar del Río: Pan de Guajaibón, Sierra of Rosario. – Terrestrial or lithophytic in degraded evergreen forest, on calcareous humid cliffs and rocks, in filtered sunlight, 600-700 m.

Criteria: B1ab(i,ii,iii) c(ii,iii).

Threats: Habitat loss/degradation by wood extraction or natural disasters (flooding or hurricanes).

Last record: Cuba, Pinar del Río, Bahía Honda, Pan de Guajaibón, near top of N slope, 680-700 m, 30.3.2004, *Béccquer 81698* (HAJB).

14. *Polystichum rhizophyllum* var. *cubense* Mickel

Distribution and habitat: Central Cuba: Sancti Spiritus: Topes de Collantes, Trinidad Mts. – Terrestrial in secondary vegetation (rural garden), in filtered sunlight, alt. 550-650 m.

Criteria: B1b(i,ii,iii,iv) c(i,ii,iii,iv) +2b(ii,iii,iv) c(ii,iii,iv).

Threats: Habitat loss/degradation by human disturbance.

Last record: Escambray, Topes de Collantes, Mi Retiro “mogote”, El Mirador hill and around Department of Agriculture station, 16.4.1997, *Sánchez & Cuesta 74298* (HAJB).

Endangered (EN) species

1. *Anemia alternifolia* Mickel – Fig. 2

Distribution and habitat: W Cuba: Pinar del Río: Rancho San Vicente, Sierra of Órganos. Matanzas: Santo Tomás, Zapata swamps. – Terrestrial or lithophytic in swamp forest, on calcareous, humid rocks or soils, in filtered sunlight, 50-300 m.

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv) +2ab(i,ii,iii,iv) c(i,ii,iii,iv).

Threats: Habitat loss/degradation by wood extraction, human disturbance (recreation/tourism) or natural disasters (flooding or hurricanes).

Last record: Cuba, Zapata swamps, fernery along Santo Tomás, 25.3.1984, *Oviedo 30525* (HAC).

2. *Anemia obovata* Maxon – Fig. 2

Distribution and habitat: W Cuba: Pinar del Río: Mogote River, Sumidero; Caracoles, Mantua; Picadura Valley. – Terrestrial or lithophytic in “mogotes” complex, or gallery forest, on calcareous humid rock or soil, in filtered sunlight, 200-300 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii).

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding or hurricanes).

Last record: Cuba, Pinar del Río, Mantua, river banks near Caracoles, 50 m, 22.10.1983, *Álvarez & al. 51212* (HAJB).

3. *Anemia voerkeliana* Duek – Fig. 2

Distribution and habitat: NE Cuba: Holguín: Cayo Rey, Sierra of Nipe; Cristal Peak, Sierra Cristal; El Toldo Peak; Cayo Guam; Yamanigüey; Jaguaní river (between Nuevo Mundo and La Melba), Moa. Guantánamo: Palenque, Cayo Fortuna. – Terrestrial or lithophytic in submontane rain forest (purple ferritic soils, laterites), in filtered sunlight, 400-500 m.

Criteria: B1b(i,ii,iii) c(i,ii,iii) +2b(i,ii,iii,iv) c(i,ii,iii).

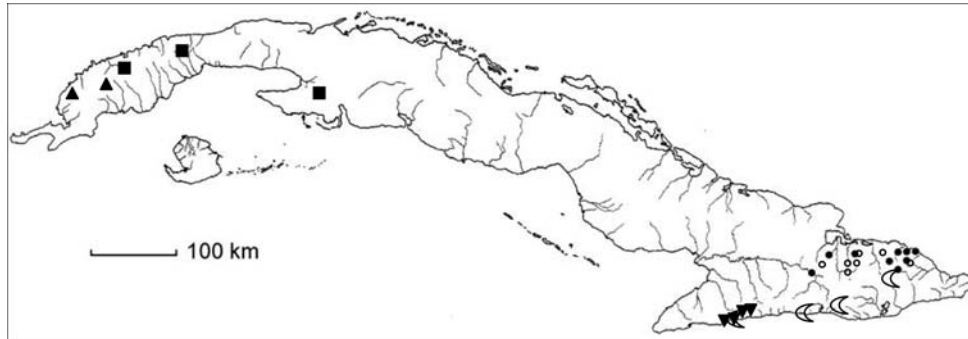


Fig. 2. Distribution of Endangered (EN) Cuban endemic species of true ferns. ● *Anemia voerkeliana*, ■ *Anemia alternifolia*, ▲ *Anemia obovata*, ▼ *Sticherus leonis*, ⊕ *Polystichum viviparum*, ○ *Thelypteris shaferi*.

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding or hurricanes).

Last record: Cuba, Holguín, Moa, National Park “Alejandro de Humboldt”, El Toldo plain, 1-3.2.2001, *Sánchez & al.* 78759 (HAJB).

4. *Sticherus leonis* (Maxon) Nakai – Fig. 2

Distribution and habitat: E Cuba: Santiago de Cuba: Turquino Peak region, Sierra Maestra. Granma: Palma Mocha Peak; La Bayamesa Peak region; Loma del Guardia, Sierra Maestra. – Terrestrial in montane rain forest, in shade or filtered sunlight, frequently near watercourse banks, 200-900 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii).

Threats: Habitat loss/degradation by agriculture, deforestation and intrinsic factors (hybridization). Last record: Cuba, Granma, Buey Arriba, Sierra Maestra, El Guardia hill on slope to Turquino Peak, 8.1988, *Zavaro & al.* 68625 (HAJB).

5. *Alsophila* × *fagildei* Caluff & Shelton – Fig. 3

Distribution and habitat: NE Cuba: Holguín: Headwaters of Toa River, Cupeyal del Norte, Sierra of Moa; Sierra Cristal. Guantánamo: Viento Frío, Quibiján, Sierra of Purial. – Terrestrial in montane or submontane rain forest (purple ferritic soils, laterites), in filtered sunlight, 300-700 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by wood extraction (small-scale subsistence and selective logging), and intrinsic factors (hybridization).

Last record: Cuba, Guantánamo [error on label, actually Holguín province], Cupeyal del Norte, headwaters of Toa river, 500 m, 27.8.1986, *Caluff & Fagilde* 2092 (HAJB).

6. *Alsophila* × *medinae* Caluff & Shelton – Fig. 3

Distribution and habitat: Central Cuba: Cienfuegos: El Palomar. Sancti Spiritus: Cudina, Topes de Collantes. – Terrestrial in montane rain forest, in filtered or full sunlight, 600-900 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

Threats: Habitat loss/degradation by wood extraction (small scale subsistence) and intrinsic factors (hybridization).

Last record: Cuba, Trinidad Mts, Topes de Collantes, Cudina, Jesús Delgado stream, 500-600 m, 25.4.1985, *Caluff* 1282 (A-B) (HAJB, isotype).

7. *Alsophila* × *boytelii* Caluff & Shelton – Fig. 3

Distribution and habitat: SE Cuba: Santiago de Cuba: Gran Piedra; San Juan hill, Sierra of Cobre. – Terrestrial in tropical montane rain forest, in filtered sunlight, 700-1000 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D1.

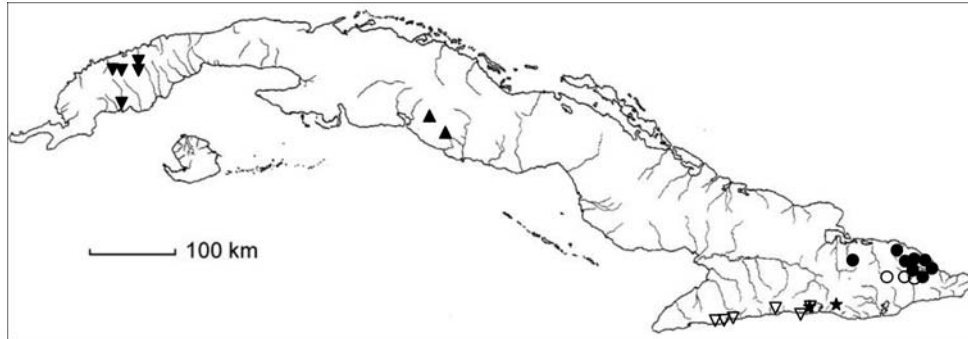


Fig. 3. Distribution of Endangered (EN) Cuban endemic species of true ferns. ● *Trichomanes bissei*, ▲ *Alsophila* × *medinae*, ▼ *Adiantopsis rupicola*, ★ *Alsophila* × *boytelii*, ○ *Alsophila* × *fagildei*, ▽ *Polystichum ilicifolium*.

Threats: Habitat loss/degradation by wood extraction (small scale subsistence), deforestation and intrinsic factors (hybridization).

Last record: Cuba, Santiago de Cuba, Gran Piedra, La Siberia, 900 m, 19.10.1984, *Caluff* (HAJB).

8. *Adiantopsis rupicola* Maxon – Fig. 3

Distribution and habitat: W Cuba: Pinar del Río: Pico Chico; Sierra of Güira; Sierra of Galera; Sierra Ancón; El Guamá; San Vicente Baths; from Buena Ventura to San Juan de Guacamaya. – Terrestrial or lithophytic in “mogotes” complex, on calcareous humid rocks and cliffs; in shade or filtered sunlight, 200-400 m.

Criteria: B1b(i,ii) c(iii) +2b(iii) c(iii).

Threats: Habitat loss/degradation by natural disasters (flooding or hurricanes) and deforestation.

Last record: Cuba, Pinar del Río, La Palma, Pico Chico, 13.11.2002, *Regalado & al.* 42332 (HAC).

9. *Thelypteris shaferi* (Maxon & C. Chr.) Duek – Fig. 2

Distribution and habitat: E Cuba: Santiago de Cuba: Cristal stream, Sierra Cristal, Mayarí Arriba, Levisa. Holguín: Guayabo River, Sierra of Nipe; Mensura hill, Sierra of Nipe; between La China and La Zanja; Toldo plain, Sierra of Moa; La Breña, Moa; La Veguita, banks of Limones river, Moa; Cupeyal del Norte. – Terrestrial in montane and submontane rain forests (purple ferritic soils, laterites), pine forest, gallery forest, 500-700 m.

Criteria: B1b(i,ii) c(iii).

Threats: Habitat loss/degradation by wood extraction and mining.

Last record: Cuba, Santiago de Cuba [error on label, actually Holguín], Sierra Cristal, ravines between La China and La Zanja, 750-600 m, 23.3.2001, *Caluff & Shelton* 4695 (BSC).

10. *Polystichum ilicifolium* Fée – Fig. 3

Distribution and habitat: SE Cuba: Santiago de Cuba: La Plata River; Turquino region; Magdalena River; Pinar de la Cana; El Gato hill, Sierra of Cobre. – Terrestrial or lithophytic in montane rain forest, near streams, in filtered or full sunlight, 50-1750 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii); D1.

Last record: Cuba, Santiago de Cuba, Guamá, La Plata river, 26.5.1988, *Álvarez & al.* 65263 (HAJB).

11. *Polystichum viviparum* Fée – Fig. 2

Distribution and habitat: E Cuba: Santiago de Cuba: El Gato hill, Sierra of Cobre, Gran Piedra. Guantánamo: Perla Cliffs, Guaso plain. – Terrestrial or lithophytic in “mogotes” complex and montane rain forest, in filtered sunlight or shade, 800-1000 m.

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv) +2ab(ii,iii,iv) c(ii,iii,iv).

Threats: Habitat loss/degradation by agriculture, wood extraction and deforestation.

Last record: Cuba, Santiago de Cuba, North Isabelica reserve, Gran Piedra, path and river of Cuban Academy of Sciences Reserve (protected area), 1100 m, 23.4.2004, *Sánchez & al.* 82157 (HAJB).

Note: *Polystichum heterolepis* Fée, reported by Mickel (1997) as a Cuban endemic species, is considered here as synonym of *Polystichum viviparum*.

12. *Trichomanes bissei* C. Sánchez – Fig. 3

Distribution and habitat: NE Cuba: Holguín: road from Los Lirios to Pancho's Road, Poal river, Moa; La Melba; Limones river, Moa; La Breña, Moa; Sierra Cristal. Guantánamo: Mina Iberia, Baracoa; Taco Bay, Baracoa; Tabajó, Baracoa; Sierra Azul, Baracoa. – Terrestrial in montane and submontane rain forest (purple ferritic soils, laterites), alt. 100-600 m.

Criteria: B1b(i,ii,iii,iv) c(i,ii,iii,iv) +2b(i,ii,iii,iv) c(i,ii,iii,iv).

Threats: Habitat loss/degradation by wood extraction and mining.

Last record: Cuba, Holguín, Moa, National Park “Alejandro de Humboldt”, Mina Iberia plain, tributary of Macaguanigua river, up waters (2 km), 20.1.2002, *Sánchez & al.* 79262 (HAJB).

Vulnerable (VU) species

1. *Cyathea strigillosa* (Maxon) Domin – Fig. 5

Distribution and habitat: E Cuba: Granma: El Guardia hill, Bartolomé Masó. Santiago de Cuba: Nima-Nima; Gran Piedra. Holguín: Sierra of Moa. Guantánamo: Monteverde; Sierra of Imías. – Terrestrial in montane rain forest and cloud forest, in full sunlight, 900-1900 m

Criteria: B1ab(i,ii,iii,iv) c(i,ii,iii,iv); D2.

Threats: Habitat loss/degradation by wood extraction, mining and agriculture.

Last collection: Cuba, Granma, B. Masó, El Cojo camp, NE slope, El Guardia hill, upper ravine, 800-1000 m, rain forest, 21.2.1998, *Sánchez & al.* 75830 (HAJB).

2. *Cyathea xcalolepis* (Hook.) Domin – Fig. 4

Distribution and habitat: E Cuba: Granma: Pino del Agua; La Bayamesa. Santiago de Cuba: Gran Piedra; El Gato hill, Sierra of Cobre. Holguín: Sierra of Moa. Guantánamo: Jojo River, Sierra of Imías; Monteverde. – Terrestrial in montane rain forest, in filtered or full sunlight, 900-1300 m.

Criteria: B1ab(i,iii) c(i,iii); D2.

Threats: Habitat, loss/degradation by wood extraction, and agriculture.

Last record: Cuba, Granma, Guisa, Sierra Maestra, La Bayamesa, ravine near 9 (The Nine) camp, 19.4.2004, *Sánchez & al.* 82138 (HAJB).

3. *Notholaena ekmani* Maxon – Fig. 5

Distribution and habitat: W Cuba: Pinar del Río: Loma Pelada, Cajálbana. – E Cuba: Holguín: Galano hill, Sierra of Nipe. – Terrestrial or lithophytic in xeromorphic, thorny or subthorny thicket (“cuabal” and “charrascal” on serpentinite), on humid rocks and cliffs, in filtered or full sunlight, 400-500 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D2.

Threats: Habitat loss/degradation by natural disasters (flooding and hurricanes), fires and deforestation.

Last record: Cuba, Holguín, Galano hill, 100 m, 12.1974, *Catasús* (HAC).

4. *Lindsaea cubensis* Underw. & Maxon – Fig. 5

Distribution and habitat: W Cuba: Isla de la Juventud: San Pedro; San Francisco de Las Piedras; Santa Bárbara. Pinar del Río: Viñales; Camarones, Mantua; Fuego stream, San Diego de Los Baños; Cayo Ratonés. – Terrestrial in gallery forest, pine forest, stream banks and slate soil with abundant silica, humid cliffs, in shade, 10-300 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D2.

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding or hurricanes).

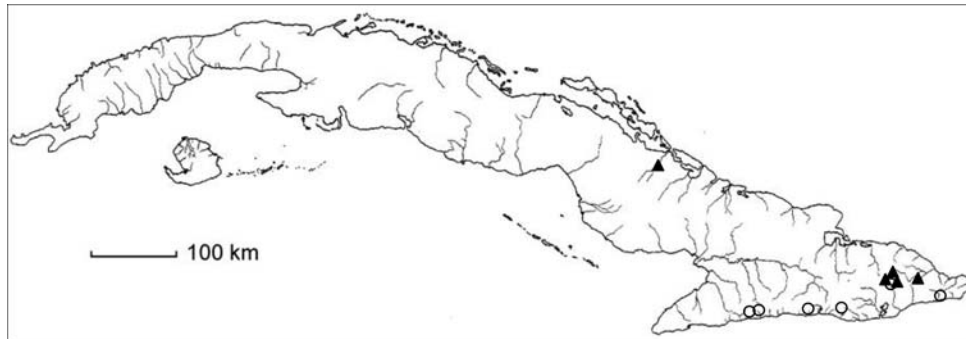


Fig. 4. Distribution of Vulnerable (VU) Cuban endemic species of true ferns. ▲ *Asplenium mortonii*, ○ *Cyathea x calolepis*.

Last record: Cuba, Pinar del Río, Mantua, Camarones, gully of Calentura stream, 100 m, 18.5.1984, Álvarez & al. 54633 (HAJB).

5. *Thelypteris dissimulans* (C. Chr.) C. F. Reed – Fig. 5

Distribution and habitat: Central Cuba: Sancti Spíritus: Cantú hills, Banao; Sierra of Gavilanes. – E Cuba: Guantánamo: Las Ninfas; Yunque of Baracoa. – Terrestrial or lithophytic in “mogotes” complex or gallery forest, on calcareous humid rocks and cliffs, in shade or filtered sunlight, 200-500 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii) +2ab(i,ii,iii) c(i,ii,iii); D2.

Threats: Habitat loss/degradation by agriculture, wood extraction and natural disasters (flooding, hurricanes).

Last record: Cuba, Guantánamo, National Park “Alejandro de Humboldt”, Baracoa, Yunque of Baracoa, slope and peak, 22.1.2002, Sánchez. & al. 79397 (HAJB).

6. *Asplenium mortonii* Duek – Fig. 4

Distribution and habitat: Central Cuba: Camagüey: Hoyo de Bonet, Sierra of Cubitas. – E Cuba: Guantánamo: La Prenda; La Perla; Monteverde; Mt Rus; La Municipión, Viento Frío. – Terrestrial or lithophytic in “mogotes” complex, on calcareous humid moss covered rocks and cliffs, in filtered sunlight, 80-400 m.

Criteria: B1ab(i,ii,iii) c(ii, iii); D2.

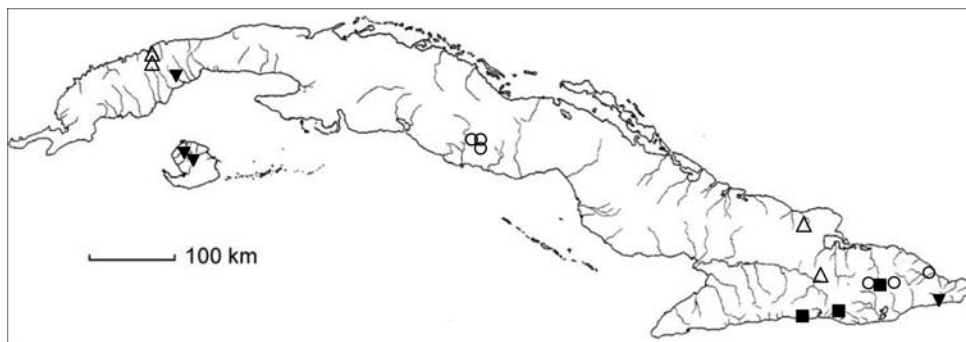


Fig. 5. Distribution of Vulnerable (VU) Cuban endemic species of true ferns. ■ *Cyathea strigillosa*, ▼ *Lindsaea cubensis*, ○ *Thelypteris dissimulans*, △ *Notholaena ekmani*.

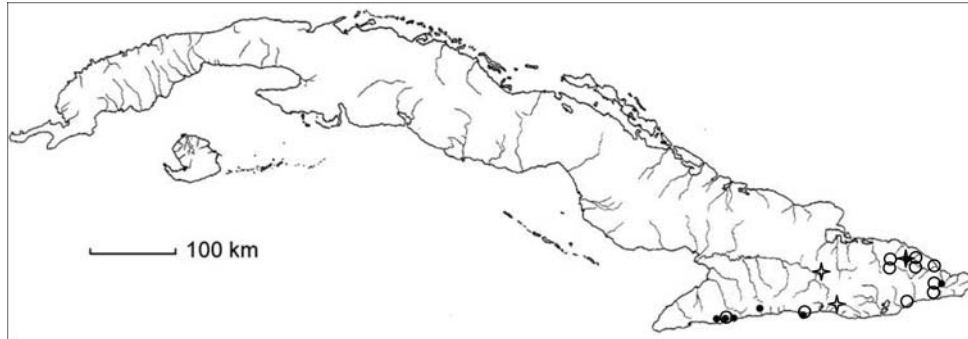


Fig. 6. Distribution of Vulnerable (VU) Cuban endemic species of true ferns. ● *Stigmatopteris hemiptera*, ○ *Lomariopsis wrightii*, ★ *Terpsichore flexuosa*.

Threats: Habitat loss/degradation by wood extraction and natural disasters (flooding, hurricanes).
Last record: Cuba, Camagüey, Minas, Hoyo de Bonet, 20.8.1996, *Regalado 72578* (HAJB).

7. *Stigmatopteris hemiptera* (Maxon) C. Chr. – Fig. 6

Distribution and habitat: E Cuba: Granma: Mont Pié ranch; Yara river. Santiago de Cuba: El Gato hill, Sierra of Cobre; Region of Turquino Peak. Guantánamo: Viento Frío, Sierra of Purial. – Terrestrial in montane rain forest, near streams, in filtered or full sunlight, alt. 150-1700 m.

Criteria: B1ab(i,ii,iii) c(i,ii,iii).

Threats: Habitat loss/degradation by agriculture and wood extraction.

Last record: Cuba, Granma, Guisa, Punta de Lanza, along road to Los Lirios, left side rain forest, 1 km from base of Punta de Lanza, 1300 m, 30.1.2003, *Sánchez & Morejón 80490* (HAJB).

8. *Lomariopsis wrightii* D. C. Eaton – Fig. 6

Distribution and habitat: E Cuba: Santiago de Cuba: El Gato hill, Sierra of Cobre; Cuba Peak, Turquino region. Holguín: Sierra Cristal; headwaters of Toa river; Los Lirios, Sierra of Moa; Jaguaní and Palmares river. Guantánamo: Sierra of Frijol; Piedra La Vela; La Prenda; Mina Iberia, Baracoa; Baitiquirí; Yunque of Baracoa. – Terrestrial or hemiepiphytic in montane and submontane rain forest, in shaded or filtered sunlight, 150-1200 m.

Criteria: B1ab(i,ii,iii) c(ii,iii).

Threats: Habitat loss/degradation by agriculture and wood extraction.

Last record: Cuba, Holguín, Moa, Los Lirios, tributary of Los Lirios river (tributary of Jaguaní river), 30.7.2001, *Morejón 79011* (HAJB).

9. *Terpsichore flexuosa* (Maxon) A. R. Sm. – Fig. 6

Distribution and habitat: E Cuba: Santiago de Cuba: El Gato hill, Sierra of Cobre. – Epiphytic or lithophytic in montane and submontane rain forests, on mossy cliffs, and trunks, in shade, 150-1200 m.

Criteria: B1b(i,iii) c(i,iii); D2.

Threats: Habitat loss/degradation by agriculture and deforestation by wood extraction.

Last record: Guantánamo, Moa, La Melba, La Aurora stream, 1 km to Jaguaní River, 150-250 m, epiphyte at 2 m above soil level, gallery forest, 14.2.2004, *Caluff 4829* (BSC).

Near threatened (NT) species

1. *Adiantum sericeum* D. C. Eaton

Distribution and habitat: Central Cuba: Cienfuegos: Carlota Mine, San Juan. Sancti Spíritus: Hoyo del Naranjal. – E Cuba: Granma: Boca de Toro, mouth of Ojo del Toro river, Pilón. Santiago de Cuba: Sardinero, Justicí Reserve; San Juan river; Aguadores; Santiago de Cuba fort; Mt Picote;

central Miranda; Florida Blanca. – Terrestrial or lithophytic in “mogotes” complex, gallery forest and coastal and sub-coastal xeromorphic thicket, on calcareous dry rock crevices and cliffs, in filtered sunlight; 0-300 m.

2. *Thelypteris oviedoae* C. Sánchez & Zavaro

Distribution and habitat: W Cuba: Pinar del Río: El Salón hill, El Rangel, Las Terrazas, Sierra of Rosario; Cuzco River, Sierra of Rosario. La Habana: Escaleras de Jaruco. – Central Cuba: Cienfuegos: San Blas, Sierra of San Juan; Mandulo; N slope of San Juan Peak. Sancti Spíritus, old road between La Sabina and Jarico; Caja de Agua ravine, mountains of Sancti Spiritus; surroundings of Hoyo del Naranjal, banks of Higuanojo river. – Terrestrial in evergreen forest, gallery forest and secondary vegetation, on calcareous and rocky soils, along the border of the forest, road banks, open places, in filtered or full sunlight, 100-500 m.

3. *Elaphoglossum palmeri* Underw. & Maxon

Distribution and habitat: W Cuba: Pinar del Río: Cayo Ratones; Sabanalamar; Guane; Pan de Guajaibón, Sierra of Rosario. – Central Cuba: Cienfuegos: San Juan Peak. NE Cuba: Holguín: Cayo Mambí, Sierra of Nipe. Guantánamo: La Gurbia; Sierra of Purial; Sierra of Imías; Mina Iberia. – Epiphytic and lithophytic in tropical moist montane rain forest, evergreen forest and gallery forest, on mossy trunks and rocks, in shade, 0-1200 m.

Least Concern (LC) species

1. *Anemia coriacea* Griseb.

Distribution and habitat: W Cuba: Pinar del Río: Cajálbana. La Habana: San Adrián, Cuabal del Espinal, Canasí; Piedra Sola, Canasí. – E Cuba: Holguín: Cayo Guam, river valley, Moa; stream of “Aserrío”, Moa; Pinalito; Vaca beach, Moa; Jaragua stream, Moa; Los Lirios; Potosí Mine; km 10 from Moa to La Melba; La Veguita; Cayo Chiquito, Moa; Miraflores hills, Cananovas; Sabana river, Yaguaneque, Cananovas; Cromita river, Punta Gorda, Sierra of Nipe; Galano hill, Sierra of Nipe. Guantánamo: Báez river, near Los Naranjos camp; Sierra Azul, Baracoa; La Cuaba quarry, Baracoa; Taco Bay; La Mina river; Amores Mine; Nibujón; Alto de Cotilla; Vega de La Palma; La Tinta; La Cuchilla; Palmarito de Yamagua. – Terrestrial or lithophytic in montane rain forests, xeromorphic thorny and sub-thorny ticket (“cuabal” or “charrascal” on serpentinite), pine forest, in filtered or full sunlight, 0-1250 m.

2. *Anemia cuneata* Kunze

Distribution and habitat: W Cuba: Pinar del Río: Soroa, Candelaria; Santo Domingo river, Santa Cruz. La Habana: N of Galindo hills. – Central Cuba: Villa Clara: Jibacoa dam. Cienfuegos: San Blas, Sierra of San Juan; Arroyo Navarro, Carlota Mine, Cumanayagua, Sierra of San Juan. Sancti Spíritus: Banao hills, Potrerillo Peak, Trinidad Mts; Palma stream SE of Sancti Spíritus; Los Manantiales. – E Cuba: Granma: Karst of Baire; Pinalito. Holguín: Jaragua River, Moa; Mayarí, Sierra of Nipe; Sierra of Moa. Guantánamo: Bayate. – Terrestrial or lithophytic in gallery forests, frequently associated with stream banks, on calcareous, humid rocks and cliffs, in filtered or full sunlight, 150-600 m.

3. *Anemia nipeensis* Benedict

Distribution and habitat: E Cuba: Santiago de Cuba: El Gallego hill; La Estrella hill. Holguín: headwaters of Cristal stream, Sierra Cristal; Miguel river, Mayarí, Sierra Cristal; la Cueva quarry; N of Zanja; Levisa river, Cristal Peak, Sierra Cristal; SW of El Culebro, upward slope of Cuncuní, Sierra Cristal; Rosa Castillo between Quemado and Cabonico, Mayarí; Majayara Arriba; Lengua de Pajaro, Mayarí; La Mensura hill, Sierra of Nipe; La Bandera hill; Medio Woodfred river, Sierra of Nipe; Piedra Gorda to Woodfred, Sierra of Nipe. – Terrestrial or lithophytic in montane rain forest (purple ferritic soils, laterites), gallery forests, xeromorphic sub-thorny ticket (“charrascal” on serpentinite), pine forest, in filtered or full sunlight, 500-800 m.

4. *Lygodium cubense* Kunth

Distribution and habitat: W Cuba: Pinar del Río: Santa Cruz de los Pinos; Galalón pine forest; in Sierra of Rosario, Soroa; El Retiro; Rangel, Herradura, Mundito Ranch, Cayajabos, Candelaria; Pan de Guajaibón; San Diego de los Baños; Las Yeguas; Farallón de Rodríguez near Seboruco; San Julián. La Habana: La Pita; San Miguel de Casandra; source of Guanabo river; La Trampa; Campo Florido. Isla de la Juventud: Santa Bárbara; San Francisco de Piedras; La Cañada. – Central Cuba: Villa Clara: Agabama Dam. Sancti Spíritus: El Arriero, Cabaiguán. – E Cuba: Santiago de Cuba: El Gato hill, Sierra of Cobre; road to La Magdalena; Gran Piedra. Holguín: Lengua de Pájaro, Mayarí. Guantánamo: Bayate; La Farola, Baracoa. – Terrestrial or climbing, in montane rain forest, evergreen forest, semideciduous forest and secondary vegetation, road banks, in dry and open places, in filtered or full sunlight, 200-600 m.

5. *Alsophila balanocarpa* (D. C. Eaton) D. S. Conant

Distribution and habitat: Central Cuba: Cienfuegos: Buenos Aires; hills S of San Juan Peak; San Juan Peak. Sancti Spíritus: Topes de Collantes. Granma: in Sierra Maestra mountains, Barrio Nuevo; zone 120; La Bayamesa peak; Punta de Lanza; La Jeringa hill, Aguada de Joaquín; tributary of Palma Mocha river. Santiago de Cuba: La Alcarraza; Turquino region; El Gato hill, Sierra of Cobre; Cruce de Lima; Gran Piedra. – Terrestrial in montane rain forests and cloud forests, in shade, 600-1500 m.

6. *Alsophila minor* (D. C. Eaton) R. M. Tryon

Distribution and habitat: E Cuba: Santiago de Cuba: headwaters of Levisa river, El Halcón, Sierra Cristal; El Gallego hill, Sierra Cristal. Holguín: Cayo Mambí, Sierra of Nipe; SW of Culebro, upward slope to El Mono hill, N slope of Sierra Cristal; La Melba, Moa; Arroyo Limones, Moa; Arroyo Bueno, La Melba, Moa; Toldo plain; Los Lirios to mouth of Jaguaní. Guantánamo: Cayo Fortuna; Silla de Baracoa hill; El Imbano (Limbano), Cuchillas de Baracoa; Arroyón, Cuchillas de Baracoa; Duaba river, E slope, Cuchillas de Baracoa; Palenque Bernardo, Sierra of Frijol; Tres Piedras, Sierra of Imías; headwaters of Jojo River, Sierra of Imías; La Yamagua, Sierra of Imías; Alto de Clavellinas, Sierra of Imías. – Terrestrial in montane rain forest (purple ferritic soils, laterites), in shade or filtered sunlight, 100-900 m.

7. *Alsophila cubensis* (Underw. ex Maxon) Caluff & Shelton

Distribution and habitat: W Cuba: Pinar del Río: Rangel; Sierra of Brujo, Sierra of Rosario. – Central Cuba: Cienfuegos: Buenos Aires, Sierra of San Juan. Sancti Spíritus: Topes de Collantes; El Naranjal, Banao hills. – E Cuba: Granma: La Bayamesa region. Santiago de Cuba: Turquino Peak region; El Gato hill, Sierra of Cobre, Florida Blanca. Guantánamo: La Prenda; La Perla; Taco Bay, Baracoa. – Terrestrial in montane rain forest, pine forest and gallery forests, in shade, filtered or full sunlight, 100-900 m.

8. *Odontosoria wrightiana* Maxon

Distribution and habitat: W Cuba: Pinar del Río: Taco-Taco; Las Terrazas; Pelada de Cayajabos hills; Cananovas hills; Cayo Ratones; Sierra of Güira; hill of Cabras; Cortina ranch; Las Yeguas; San Diego de los Baños; San Juan and Martínez; Herradura; Galalón; Cajálbana; Guane; Viñales; Moncada ranch; Valle of Picadura. Isla de la Juventud: Los Indios; Nueva Gerona; Sierra La Cañada; Las Delicias; Santa Bárbara; Cunagua. – Central Cuba: Sancti Spíritus: El Tibisial; Banao; Topes de Collantes. Santiago de Cuba: Aura Cave, Turquino region; between Alcarraza and Punta de Lanza; La Francia hill. – Terrestrial, forming thickets, in “mogotes” complex, pine forest, montane rain forest and xeromorphic thorny thicket (“cuabal” on serpentinite), in road banks, on calcareous or ultramafic humid soils and cliffs, in open places, in full sunlight, 0-700 m.

9. *Adiantum melanoleucum* var. *cubense* Bonap.

Distribution and habitat: W Cuba: Pinar del Río: Soroa, Sierra of Rosario. NE Cuba: Holguín: El Peñón and La Tabla; Jucaral river; area of the Pinalito and Mola. Guantánamo: Abra del Yumurí; Baracoa; Las Ninfas; Jauco river; Mt Rus; between Tinta and Jauco; San Antonio del Sur; Maestra

hill, near Yamagua, Sierra of Imías; Tres Piedras, Sierra of Imías; Maisí plain. – Terrestrial in “mogotes” complex, gallery forest and coastal shrub and sub-coastal xeromorphic thicket, on calcareous dry rocks, crevices and cliffs, in filtered sunlight, 0-300 m.

10. *Thelypteris crypta* (Underw. & Maxon) C. F. Reed

Distribution and habitat: E Cuba: Santiago de Cuba: El Gallego hill, Sierra Cristal; rainforests between El Halcón and Batista, Sierra Cristal; S slope of Sierra Cristal. Holguín: El Mono hill; Palenque in region of Brazo Grande; La Breña, Moa; Aserrío Arroyo Blanco, Moa; Revuelta de los Chinos, Sierra of Moa; road to aserrío of mine, La Melba, Moa; road from Lirios to Poal river; Mangüeyes, Cupeyal del Norte; Cayo Guam, Moa; Sierra Cristal. Guantánamo: Taco Bay; Mina Iberia, Baracoa; Los Lechugos, Sierra of Imías; Majagua Hueca hill, Sierra of Imías; Mirador hill; La Mina river, 4 km from Dos Bocas. – Terrestrial and lithophytic in montane rain forests (purple ferritic soils, laterites), gallery forest, usually associated with streams banks, on ultramafic humid rocks and cliffs, often under overhangs, in hollows, cracks and crevices; 0-900 m.

11. *Thelypteris lonchodes* (D. C. Eaton) Ching

Distribution and habitat: E Cuba: Santiago de Cuba: Cristal stream, Sierra Cristal; El Gallego hill, Sierra Cristal. Holguín: Sierra of Nipe; road between La Zanja and the crossroads of Batista and El Oro, Sierra Cristal; coffee plantations 4 km SW of El Culebro, region of Brazo Grande, Sierra Cristal; SW of El Culebro, in the rise to El Mono hill, Sierra Cristal; SW of El Culebro, stream running down the slope to Cuncuní hill, Sierra Cristal; km 8-10 of road from Moa to La Melba; Revuelta de los Chinos, Sierra of Moa; La Breña, Moa; La Melba, near “Aserrío”; Cayo Guam, Moa; Sierra of Maquey, Cuchillas de Toa; Cromita River, Punta Gorda. Guantánamo: Puriales de Caujerí, Sierra of Purial, near Arroyón; W slope of Majagua Hueca hill, Sierra of Imías; Palmarito of Yamagua Sierra of Imías; El Yunque, Baracoa; Loma del Mirador, Baracoa; Arroyo Blanco, on road to Vega de la Palma; Vega de la Palma, surroundings of Duaba river, Baracoa; Dos Bocas, Baracoa; El Imbano (Limbano), Baracoa; Cayo Fortuna, Yateras; Mina Iberia, Baracoa. – Terrestrial in montane rain forests (purple ferritic soils, laterites), forming dense clusters in the understory, in shade or filtered sunlight, 0-900 m.

12. *Thelypteris wrightii* (D. C. Eaton) C. F. Reed

Distribution and habitat: NE Cuba: Holguín: Grande river, N of La Zanja, Mayarí, Sierra Cristal; El Culebro, Sierra Cristal; km 10 on road from Moa to La Melba; La Melba, Moa; La Breña, Moa; El Peñón and La Tabla, Moa; Sierra of Moa; Maguey Sierra, Cuchillas de Toa. Guantánamo: Tres Piedras, Sierra of Imías; Quibiján, Baracoa; surroundings of Duaba river, near Vega La Palma, Baracoa; banks of Arroyo Blanco near Vega La Palma, Baracoa; rain forests at head of Naranjo river; Las Pulgas, Baracoa, Sierra of Purial; Puriales de Caujerí, near Arroyón, Sierra of Purial; plain of La Faldiguera, Baracoa; Palmarito, Yateras; Yamagua, main hill, Sierra of Imías; Tres Piedras hill; Sierra of Imías; Las Clavellinas hill, Sierra of Imías. – Terrestrial in montane or submontane rain forests (purple ferritic soils, laterites), forming dense clusters in the understory, in shade, 0-900 m.

13. *Polystichum machaerophyllum* Sloss.

Distribution and habitat: E Cuba: Holguín: Cayo Rey, Sierra of Nipe; Guayabo River, Sierra of Nipe; Lengua de Pájaro; Miguel River, Sierra Cristal; la Zanja, Sierra Cristal; Manzano river, Sierra Cristal; Levisa river, Sierra Cristal; La Melba, Moa; Cayo Guam, Moa; Toldo plain, Moa; Peña Prieta, Moa; la Veguita, Moa; Pinalito and Mola, Moa; Cupeyal del Norte. Guantánamo: Puntón del Cuero, Imías; Mt California, Sabanilla. – Terrestrial or lithophytic in montane or submontane rain forests (purple ferritic soils, laterites), gallery forest, near streams, in shade or filtered sunlight, 400-600 m.

14. *Olfersia alata* C. Sánchez & Caluff

Distribution and habitat: E Cuba: Santiago de Cuba: S slope of Cristal Peak. Holguín: Cayo Mambí, Sierra Cristal; upper part of Levisa river, Sierra Cristal; Palenque, Brazo Grande, N slope of Sierra

Cristal; SW of Culebro, N slope of Sierra Cristal; Río Grande N of La Zanja, Sierra Cristal; km 10 in road from Moa to La Melba; Pinalito and Mola, Cupeyal del Norte. Guantánamo: Vega de la Palma, surroundings of Duaba River; Palenque Bernardo, Sierra of Frijol; hills W of Duaba River, Baracoa; La Perla; Monteverde, La Sabana; Yunque of Baracoa, summit; Quibiján, Baracoa; Yamagua, Maestra hill; Palmarito de Yamagua, Sierra of Imías; Alto de Clavellinas, Sierra of Imías; Los Guineos, Baracoa; sources of Naranjo river; Puriales de Caujerí, near Arroyón, Sierra of Purial; Vega de Taco Bay, Baracoa. – Terrestrial or rarely hemiepiphytic, in montane or submontane rain forests (purple ferritic soils, laterites), gallery forest, forming dense clusters in the understory, on humus accumulations, in shade or filtered sunlight, 0-900 m.

15. *Cochlidium repandum* L. E. Bishop

Distribution and habitat: NE Cuba: Holguín: Alto de La Melba, Moa; Jaragua river; Merceditas Mine, Moa; Cayo Guam, Moa; Toldo plain, El Toldo Peak; Dos Comadres; Moa airport; Mt La Breña, Moa; streams of “Aserrío”, La Melba, Moa; La Mensura hill, Mayarí; Delta Mine, Moa; La Veguita, Sierra of Moa; Limones River, Moa. Guantánamo: high plateau of Mina Iberia; Arroyo Blanco, Baracoa; Tabajó, Baracoa; Sierra Azul, Quibiján, Baracoa; Yunque of Baracoa; Sabanilla, vía Azul; Majagua Hueca hill, Sierra of Imías; Duaba river, Baracoa; Vega de la Palma, Duaba river; Maraví river, Baracoa. – Epiphyte or lithophytic near the ground, in montane or submontane rain forests (purple ferritic soils, laterites), on mossy trunks, logs and rocks, in shade, 0-1200 m.

16. *Elaphoglossum wrightii* (Mett.) T. Moore

Distribution and habitat: E Cuba: Santiago de Cuba: S slope of Sierra Cristal; between El Halcón and Batista, Sierra Cristal. Holguín: SW of El Culebro, upward slope to Cielo Peak, N slope of Sierra Cristal; SW of El Culebro, upward slope to El Mono hill, N slope of Sierra Cristal; Palenque, Cayo Mambí, Sierra Cristal; km 10 on road from Moa to La Melba, Moa; La Melba, near “Aserrío”, Moa; Revuelta de los Chinos, Sierra of Moa; Mt La Breña, Moa; N slope of Sierra of Moa; source of Toa river, Cupeyal del Norte. Guantánamo: Palenque Bernardo, Sierra of Frijol; Aserrío Nuevo Mundo, W slope of Mina Iberia; Yunque of Baracoa; S Yunque of Baracoa; Vega de la Palma, surroundings of Duaba river; N slope of Tres Piedras hill, Sierra of Imías; Los Lechugos, NW of Alto de Yamagua; Palmarito de Yamagua, Sierra of Imías; W slope of Majagua Hueca hill, Sierra of Imías. – Epiphytic or lithophytic in montane or submontane rain forests (purple ferritic soils, laterites), in shade or filtered sunlight, 0-900 m.

Final considerations

Of the 54 endemic taxa considered, more than 60 % are in the most alarming threat categories, Critically Endangered (CR, 14); Endangered (EN, 12) and Vulnerable (VU, 9). Loss or degradation of habitat because of agriculture, mining, deforestation, wood extraction, infrastructure development (tourism/recreation), fires and meteorological events (storms/flooding, hurricanes), is the threat that affects most the endemic fern populations in Cuba. Four species have not been observed or collected for several years and their survival in nature in the national territory is unconfirmed (with the year of last record in brackets): *Polystichum deminuens* (1859); *Ctenitis velata* (1907); *Atalopteris aspidioides* (1915) and *Ctenitis santae-clarae* (1929).

Setting up an integrated strategy, emphasizing on the “in situ” conservation, to preserve the quality of the natural habitats, is the most feasible approach to maintain and protect this group of ferns. It is suggested to the authorities who decide on environmental strategies of the country, to include these plants in the environmental educational plans being developed in towns near their natural habitats, some of which are part of the National System of Protected Areas following the classification in CENAP (2002).

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References

- Caluff, M. G. & Shelton, G. 2003: *Cyatheaceae*. – Pp. 1-63 in: Greuter, W. (ed.), Flora de la República de Cuba **8**. – Königstein.
- Capote, R. P. & Berazaín, R. 1984: Clasificación de las formaciones vegetales de Cuba. — Rev. Jard. Bot. Nac. **5**: 27-75.
- , — & Leiva, A. T. 1989: Regional reports V. Caribbean. Cuba. – Pp. 317-335 in: Campbell, D. G. & Hammon, H. D. (ed.), Floristic inventory of tropical countries: the status of plant systematics, collections and vegetation, plus recommendations for the future. – New York.
- Centro Nacional de Áreas Protegidas (CENAP) 2002: Listado de áreas protegidas, actuales y propuestas, que conforman el SNAP. – Pp. 216-222 in: Sistema nacional de áreas protegidas. Cuba. Plan 2003-2008. – Sevilla.
- Davis, S. D., Droop, S. J. M., Gregerson, P., Henson, L., Leon, C. J., Villa-lobos, J. L., Synge, H. & Zantovska, J. 1986: Plants in danger: what do we know? – Pp. 1-461 in: IUCN. International Union for Conservation of Nature and Natural Resources. – Gland.
- Duek, J. J. 1976: Contribution of the Flora of Cuba: *Osmundaceae*, *Schizaeaceae* and *Gleicheniaceae* (Pteridophyta). – Feddes Repert. **87**: 325-360.
- Holmgren, P. & Holmgren, N. H. 2001: Additions to Index Herbariorum (Herbaria) ed. 8. – Taxon **50**: 605.
- , — & Barnett, L. C. (ed.) 1990: Index Herbariorum I. The herbaria of the world, ed. 8. – Regnum Veg. **120**.
- IUCN 2001: IUCN Red List categories and criteria: version 3.1. – Gland & Cambridge.
- Lazcano Lara, J. C., Peña García, E., del Risco González, L., Leiva Sánchez, A. T., Alpízar Muñoz, S. & Matamoros, Y. (ed.) 2001: Memorias del Segundo Taller para la Conservación, Análisis y Manejo planificado de Plantas Silvestres Cubanas, CAMP II. 12-14 marzo IUCN/SSC. – Apple Valley, MN.
- Mickel, J. M. 1997: A review of the West Indian species of *Polystichum*. – Pp: 119-143 in: Johns, R. J. (ed.), Holttum memorial volume. – Kew.
- Peña García, E., López García, P. I., Lazcano Lara, J., Leiva Sánchez, A. T. & Seal, U. S. (ed.) 1998: Memorias del primer taller para la conservación, análisis y manejo planificado de plantas silvestres Cubanas, CAMP I. 13-15 abril IUCN/SSC. – Apple Valley, MN.
- Sánchez, C. 2000: *Hymenophyllaceae*. – Pp. 1-96 in: Greuter, W. (ed.), Flora de la República de Cuba **4**. – Königstein.
- & Caluff, M. G. 1997: The threatened ferns and allied plants from Cuba. – Pp: 203-215 in: Johns, R. J. (ed.), Holttum memorial volume. – Kew.
- & Regalado, L. 2003: *Aspleniaceae*. – Pp. 1-65 in: Greuter, W. (ed.), Flora de la República de Central Cuba **8**. – Königstein.

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