

The endemic flora of Podocarpus National Park

La flora endemica del Parque Nacional Podocarpus

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Resumen

El Parque Nacional Podocarpus (PNP), posee 211 especies endémicas para el Ecuador. El presente diagnóstico reconoce 99 especies endémicas exclusivas, en 29 familias y 57 géneros, de los cuales 23 tipos existen en herbarios del Ecuador. Algunas taxones tienen su centro de diversidad en el PNP (*Brachyotum*, *Centropogon* y *Lysipomia*). El mayor endemismo, se ubican principalmente sobre los 2800 m s.n.m., hacia la parte occidental (El paso Loja-Zamora, Cajanuma, Cerro Toledo y el cruce Yangana a Valladolid). Existen 32 especies en peligro de extinción, según los criterios de UICN. Este análisis permitirá formular estrategias de conservación y manejo de esta flora endémica.

Palabras clave: endemismo, diagnóstico, manejo, Podocarpus

Abstract

211 endemic plant species registered for Ecuador occur Podocarpus National Park (PNP). This study recognizes 99 species restricted to Podocarpus Park, belonging to 29 families and 57 genera. Only 23 type specimens are deposited in Ecuadorian herbaria. Some taxa have their maximum diversity in this area (*Brachyotum*, *Centropogon*, and *Lysipomia*). Areas with high endemism are generally found above 2800 m, (El paso Loja-Zamora, Cajanuma, Cerro Toledo and the crossing Yangana to Valladolid). There are 32 endangered species in the PNP, following the IUCN criteria standards. This analysis will allow to establish future strategies for conservation and management of these plants.

Key words: endemism, diagnosis, management, Podocarpus

Introduction

The knowledge of endemic plants is extremely important, because it points out habitats and rare ecosystems. The complex Andean biogeography however makes the identification of endemic species and research on their distribution and their populations very difficult, especially in the Southern part. Where the floristic features are different (Jørgensen y Ulloa 1996), with a restricted endemism, probably "neoendemism", Gentry (1982) mentions species that are limited to small areas, or depend on antropic disturbances. The Red book of endemic plants of Ecuador (Valencia et al. 2000), shows the actual status of endemics in the country, and points out problems like that in continental Ecuador three species have not been recorded during the last 50 years, considering them as "extinct".

The Podocarpus National Park (PNP), one of the most diverse areas in Ecuador, with the highest number of endemics, has several problems like mining, fire, colonization. For this reason it is important to start with specific works to ensure his conservation.

Methodology

The analysis of endemic plants of Podocarpus National Park (PNP) was carried out by revision of specific literature, particularly: the *Red book of endemic plants of Ecuador* (Valencia et al. 2000), the *Catalogue of the Vascular Plants of Ecuador* (Jørgensen y León-Yáñez 1999), some volumes of *Flora of Ecuador* (Harling y Andersson 1986–2001), the *Catalogue of Vasculares plants of Peru* (Bracko y Zaruchi 1993) and the *Botanical studies at southern Ecuador* (Espinosa [1948] 1997). The species were checked to analyze if their endemism is regional, national or international. A database of endemic plants of PNP was obtained from Renato Valencia (QCA), separating the species exclusive to Podocarpus National Park, and reconfirm their status.

At the Herbario Reinaldo Espinosa (LOJA) the number of type species was identified. All the type specimens were photocopied, as a reference for LOJA herbaria. The local distribution was analyzed. Following the criteria of IUCN (2000), and the previous diagnosis of the red book, the highly threatened species were identified, and suggestions for management elaborated.

Results

The Podocarpus National Park, has 99 exclusives endemic species, belonging to 29 families and 57 genera (Appendix 1). Only the species occurring at Loja and Zamora-Chinchiipe with records in the park were considered. The overall species number could change because an additional 183 endemic species are reported in neighbouring localities of the Podocarpus park, but are without records inside.

From the 99 endemic species, 23 are represented with type collections in Ecuador, however the highest number of types specimens are concentrated in international herbaria with approximately 217 specimens. From these 12 species have not any specimen in Ecuadorian herbaria (Appendix 1). This is a serious problem for ecuadorian taxonomists, trying to identify samples collected from these species.

The determination of the most important families by species and genera number helps to identify some taxa with their speciation center in this zone such as: *Brachyotum*, *Centropogon* y *Lysipomia*, furthermore some families well represented in each zone as: Campanulaceae, Melastomataceae y Orchidaceae (Tablas 1 y 2).

Table 1 shows 29 families, with the Orchidaceae as the most representative one with 19 species, followed by Campanulaceae with 14 species, Melastomataceae with 13, Rubiaceae with six, Bromeliaceae and Ericaceae with five species each and finally Poaceae with four species. From the others three families occur with three species, five families with two species and 14 families are represent by only one specie.

Table 1. Families, genera and species recorded for the Podocarpus National Park.
Tabla 1. Familias, géneros y especies registrados en el Parque Nacional Podocarpus

Family	Genera	Species	Family	Genera	Species
Orchidaceae	11	19	Amaryllidaceae	1	1
Bromeliaceae	4	5	Arecaceae	1	1
Ericaceae	4	5	Brassicaceae	1	1
Campanulaceae	3	14	Buddlejaceae	1	1
Melastomataceae	3	13	Celastraceae	1	1
Rubiaceae	3	6	Chloranthaceae	1	1
Poaceae	2	4	Cunoniaceae	1	1
Asclepiadaceae	2	3	Dennstaedtiaceae	1	1
Gentianaceae	2	3	Lamiaceae	1	1
Asteraceae	2	2	Loranthaceae	1	1
Dryopteridaceae	2	2	Passifloraceae	1	1
Solanaceae	2	2	Piperaceae	1	1
Onagraceae	1	3	Symplocaceae	1	1
Lycopodiaceae	1	2	Thymelaeaceae	1	1
Scrophulariaceae	1	2			

Table 2. Genera with the highest number of endemic species to the Podocarpus National Park.
Tabla 2. Géneros con alto número de especies endémicas en el Parque Nacional Podocarpus

Genera	Species	Genera	Species
<i>Lysipomia</i>	7	<i>Neurolepis</i>	3
<i>Centropogon</i>	6	<i>Ceratostema</i>	2
<i>Brachyotum</i>	5	<i>Cynanchum</i>	2
<i>Meriania</i>	4	<i>Gentianella</i>	2
<i>Miconia</i>	4	<i>Huperzia</i>	2
<i>Palicourea</i>	4	<i>Pleurothallis</i>	2
<i>Cyrtochilum</i>	3	<i>Trichosalpinx</i>	2
<i>Fuchsia</i>	3	<i>Vriesea</i>	2
<i>Lepanthes</i>	3	<i>Calceolaria</i>	2
<i>Masdevallia</i>	3		

Table 2 shows the most diverse genera as: *Lysipomia* (7 spp.), *Centropogon* (6 spp.), *Brachyotum* (5 spp.) and *Meriania*, *Miconia* and *Palicourea* (4 spp.). Five genera are represented by three species, eight by two, and the last 38 are represented by only one species.

The distribution of the 99 exclusive species, clearly shows the areas of high endemism, located above 2800 m. at the occidental part, with species clusters in: El paso Loja–Zamora, Cajanuma, Cerro Toledo and crossing Yangana–Valladolid and their buffer zones.

Threatened state of endemic plants

According to IUCN (2000) criteria, the state of 66 species is vulnerable (VU), while 32 are endangered (EN) and for only one species no data (DD) exist.

The 32 endangered species (EN) should be considered as priorities due to their threatened state, see (Appendix 1).

Conclusions

Podocarpus National Park has higher endemic records than any other protected area in Ecuador. It is important to note that there has been extensive field work at the occidental side of the park for about fifteen years, therefore the number of records for other areas probably will rise, when the botanical studies concentrate at oriental part, which covers 75% of the total area.

It is important to consider the floristic elements without records in any ecuadorian herbaria, like: *Cyrtochilum gyriferum*, *Cyrtochilum loxense*, *Dendrophorbium gesnerifolium* (EN), , *Deprea ecuatoriana*, *Ditassa anderssonii*, *Elaphoglossum pala*, *Lepanthes eruca*, *Markea fosbergii* (EN), *Masdevallia hystrix*, *Pamianthe parviflora*, *Pachyphyllum dalstroemii*, *Trichosalpinx lamellata*. It is extremely necessary to give technical support to botanical and ecological studies.

Another group which needs studies and management are the genera with the highest numbers of endemic species, as: *Brachyotum*, *Centropogon*, *Cyrtochilum*, *Fuchsia*, *Lepanthes*, *Lysipomia*, *Masdevallia*, *Meriania*, *Miconia*, *Neurolepis*. Providing management *ex-situ*, is especially crucial for 32 species considered endangered (EN) and one without data (DD).

The geographic distribution of endemic plants shows some cluster centers. This early result is probably based on the extensive fieldwork done and the accessibility of the respective areas. It is important to carry out expeditions to different places in the park, to obtain a better knowledge of plant distribution and new records.

With these criteria we hope to contribute to the rescue of the threatened flora, and start facilitate the management and complementary works related to environmental education. The *ex-situ* management in the botanical garden will improve the knowledge and behaviour of species and provide a germoplasm bank and a possibility for citizens education.

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. Endemic species recorded at the Podocarpus National Park.
 pecies endémicas registradas en el Parque Nacional Podocarpus

SPECIES	COLLECTIONS IN ECUADORIAN HERBARIA	THREATENED CRITERIA (IUCN 2000)
LIDACEAE	None	Vulnerable
AE	<i>Panicum parviflorum</i> Meerow	Threatened
DACEAE	<i>Aphanes verrucosa</i> Borchs. y Balslev	Vulnerable
DACEAE	<i>Cynanchum elleanum</i> Morillo	Vulnerable
DACEAE	<i>Cynanchum hirtellii</i> Morillo	Vulnerable
AE	<i>Ditassa anderssonii</i> Morillo	Threatened
AE	<i>Dendrophorbium gesnerifolium</i> (Cuatrec.) B. Nord	Vulnerable
AE	<i>Pentacalia millei</i> (Greenm.) Cuatrec.	Threatened
AE	<i>Mezobromelia fulgens</i> L.B. Sm.	Vulnerable
AE	<i>Papa obconica</i> L.B. Sm.	Threatened
AE	<i>Tillandsia nervisepala</i> (Gilmartin) L.B. Sm.	Vulnerable
AE	<i>Vriesea appendiculata</i> (L.B. Sm.) L.B. Sm.	Threatened
AE	<i>Vriesea lutheri</i> Manzanares y W. Till	Vulnerable
CEAE	<i>Cardamine lojanensis</i> Al-Shehbaz	Vulnerable
AE	<i>Eudaleja lojensis</i> Norman	Vulnerable
LACEAE	<i>Centropogon comosus</i> Gleason	Threatened
LACEAE	<i>Centropogon erythraeus</i> Drake	Threatened
LACEAE	<i>Centropogon hartwegii</i> (Benth.) Benth. y Hook. f. Ex B. D. Jacks.	Threatened
LACEAE	<i>Centropogon heterophyllus</i> E. Wimm.	Threatened
LACEAE	<i>Centropogon steyermarkii</i> Jeppesen	Threatened
LACEAE	<i>Centropogon zamorensis</i> Jeppesen	Threatened
LACEAE	<i>Lobelia collina</i> Kunth	Threatened
LACEAE	<i>Lysipomia aretioides</i> Kunth	Threatened
LACEAE	<i>Lysipomia bilineata</i> McVaugh	Threatened
LACEAE	<i>Lysipomia caespitosa</i> T.J. Ayers	Vulnerable

LACEAE	<i>Lysipomia crassomarginata</i> (E. Wimm.) Jeppesen	QCA (1), LOJA (1)	Threatened
LACEAE	<i>Lysipomia cylindrocarpa</i> T.J. Ayers	LOJA (6)	Threatened
LACEAE	<i>Lysipomia leucina</i> E. Wimm.	QCA (1), QCNE (1), LOJA (2)	Threatened
LACEAE	<i>Lysipomia lekmanni</i> Hieron. Ex Zahlbr.	QCA (2), QCNE (1)	Threatened
ACEAE	<i>Zinowiewia madsonii</i> C. Ulloa y P. Jørg	LOJA (9), QCA (6), QCNE (9)	Vulnerable
THACEAE	<i>Hedyosmum purpurascens</i> Tordzia	QCA (8+T), QCNE (4+T), LOJA (7)	Vulnerable
AE	<i>Weinmannia loxensis</i> Harling	QCNE (11+T), LOJA (1)	Vulnerable
RIDACEAE	<i>Diplazium navarretei</i> Stolze	QCA (1)	Vulnerable
RIDACEAE	<i>Elaphoglossum pala André ex H. Christ.</i>	None	No data
EDTACEAE	<i>Dennstaedtia macrosora</i> H. Navarrete y B. Øllg	QCA (2+T), LOJA (1)	Vulnerable
ECACEAE	<i>Bejaria subvessilis</i> Benth.	QCNE (3), LOJA (2)	Vulnerable
E	<i>Ceratostema lanceolatum</i> Benth.	QCA (2), QCNE (4), LOJA (9)	Vulnerable
E	<i>Ceratostema oellgaardii</i> Luteyn	QCA (1), QCNE (2), LOJA (2)	Vulnerable
E	<i>Oreanthus hypogaeus</i> (A.C. Sm.) Luteyn	QCA (5), QCNE (2), LOJA (2)	Vulnerable
E	<i>Triplaris joergensenii</i> A.C. Sm.	QCA (10), QCNE (5), LOJA (3)	Threatened
ACEAE	<i>Gentianella fastigiat</i> Fabris	QCA (1), LOJA (1)	Vulnerable
ACEAE	<i>Gentianella oellgaardii</i> J.S. Pringle	QCA (3), QCNE (2)	Vulnerable
ACEAE	<i>Macrocaraea harlingii</i> J.S. Pringle	QCA (1+T), LOJA (3)	Vulnerable
AE	<i>Lepechinia musica</i> (Benth.) Epling	QCNE (3), LOJA (4)	Vulnerable
ACEAE	<i>Struthanthus lojiae</i> Kuji	QCA (4)	Threatened
LACEAE	<i>Hyperzia espinosana</i> B. Øllg	QCA (1), QCNE (1), LOJA (3)	Vulnerable
LACEAE	<i>Hyperzia loxensis</i> B. Øllg.	QCA (2+T), QCNE (3), LOJA (4)	Threatened
MATACEAE	<i>Brachyotum benthamicarum</i> Triana	QCA (3), QCNE (4), LOJA (3)	Vulnerable
MATACEAE	<i>Brachyotum incrassatum</i> E. Cotton	QCA (3), QCNE (1)	Vulnerable
MATACEAE	<i>Brachyotum johannes-julii</i> E. Cotton	QCA (5), QCNE (2)	Vulnerable
MATACEAE	<i>Brachyotum rotundifolium</i> Cogn.	QCA (6), QCNE (1)	Threatened
MATACEAE	<i>Brachyotum russatum</i> E. Cotton	LOJA (1), QCA (1)	Vulnerable
MATACEAE	<i>Meriania almedae</i> Wurdack	QCA (2), QCNE (1)	Vulnerable
MATACEAE	<i>Meriania furvianthera</i> Wurdack	QCA (10), QCNE (8), LOJA (1)	Vulnerable
MATACEAE	<i>Meriania loxensis</i> Gleason	QCA (2), QCNE (4)	Threatened
MATACEAE	<i>Meriania maguirei</i> Wurdack	QCA (5), QCNE (2), LOJA (2)	Threatened

MAT ACE AE	<i>Miconia dissimulans</i> Wurdack	QCNE (1), LOJA (2)	Vulnerable
MAT ACE AE	<i>Miconia dodsonii</i> Wurdack	QCA (2), QCNE (1), LOJA (6)	Threatened
MAT ACE AE	<i>Miconia namandensis</i> Wurdack	QCA (1), QCNE (1), LOJA (12)	Vulnerable
MAT ACE AE	<i>Miconia oellgaardii</i> E. Cotton	LOJA (T?), QCA (1)	Vulnerable
EAE	<i>Flacisia schaffneri</i> André	LOJA (1), QCA (15)	Threatened
EAE	<i>Flacisia steyermarkii</i> P.E. Berry	QCA (5)	Vulnerable
EAE	<i>Flacisia summa</i> P.E. Berry	QCA (3+T)	Vulnerable
EAE	<i>Brachionidium hirtzii</i> Luer	QCA (3), QCNE (2+T), LOJA (3)	Vulnerable
EAE	<i>Cyrtocidium alborosum</i> (Dalström) Dalström	QCNE (1)	Vulnerable
EAE	<i>Cyrtocidium gyriferum</i> (Rchb. f.) Kraenzl.	None	Vulnerable
EAE	<i>Cyrtocidium loxense</i> (Lindl.) Kraenzl.	None	Vulnerable
EAE	<i>Lepanthes eruca</i> Luer y Hirtz	None	Vulnerable
EAE	<i>Lepanthes ravaea</i> Luer	QCNE (1)	Vulnerable
EAE	<i>Lepanthes otara</i> Luer	None	Vulnerable
EAE	<i>Masdevallia figuerocae</i> Luer	QCA (1), QCNE (1)	Vulnerable
EAE	<i>Masdevallia hystrix</i> Luer y Hirtz	None	Vulnerable
EAE	<i>Masdevallia picta</i> Luer	QCA (3), QCNE (1)	Vulnerable
EAE	<i>Myoxanthus eumeces</i> (Luer) Luer	QCNE (1)	Vulnerable
EAE	<i>Pachyphyllum dalstroemii</i> Dodson	None	Vulnerable
EAE	<i>Pleurothallis repterophylla</i> Luer	None	Vulnerable
EAE	<i>Pleurothallis porfillae</i> Luer	None	Vulnerable
EAE	<i>Prescotia lojana</i> Dodson	QCA (1)	Vulnerable
EAE	<i>Stellitrium fymerei</i> Dodson	LOJA (1), QCNE (1)	Vulnerable
EAE	<i>Telipogon dodsonii</i> Braas	QCA (1)	Vulnerable
EAE	<i>Trichosalpinx lamellata</i> Luer	None	Vulnerable
EAE	<i>Trichosalpinx lexicularis</i> (Luer) Luer	QCA (2), QCNE (2)	Vulnerable
RACEAE	<i>Passiflora loxensis</i> Killip y Cuatrec.	QCA (2), QCNE (3), LOJA (5+T)	Threatened
EAE	<i>Peperomia persulcata</i> Yundk.	LOJA (5)	Vulnerable
	<i>Chusquea loxensis</i> L.G. Clark	QCA (4+T), LOJA (8)	Vulnerable
	<i>Neurolepis asymmetrica</i> L.G. Clark	QCA (6+T), QCNE (7+T), LOJA (7)	Vulnerable
	<i>Neurolepis elata</i> (Kunth) Pilg.	QCA (8), QCNE (8), LOJA (15)	Threatened

	<i>Neurolepis laegardii</i> L.G. Clark	QCA (10+T), QCNE (6), LOJA (19)	Vulnerable
E	<i>Cinchona mutisi</i> Lamb.	QCA (2), QCNE (2), LOJA (24)	Threatened
E	<i>Jussiaea aequatoria</i> Steyerl.	QCA (1), LOJA (3)	Threatened
E	<i>Palicourea azurea</i> C.M.Taylor	LOJA (1)	Vulnerable
E	<i>Palicourea calycina</i> Benth.	QCNE (2), LOJA (8)	Vulnerable
E	<i>Palicourea canariensis</i> C.M.Taylor	LOJA (1)	Vulnerable
E	<i>Palicourea jaramilloi</i> C.M.Taylor	LOJA (T +2), QCNE (2+T)	Vulnerable
-ARIACEAE	<i>Catceolaria semiconnata</i> Pennell	LOJA (2), QCA (7), QCNE (1)	Threatened
-ARIACEAE	<i>Catceolaria stricta</i> Kunth	LOJA (3), QCA (3)	Vulnerable
EAE	<i>Deprea ecuatoriana</i> Hunz. y Barboza	None	Vulnerable
EAE	<i>Markea foerbergii</i> Hunz.	None	Threatened
ACEAE	<i>Synlocos fuscata</i> B. Stahl	QCNE (8), LOJA (14)	Vulnerable
URIDACEAE	<i>Thelyptis eustyphrix</i> A.R. Sm.	LOJA (1)	Vulnerable

