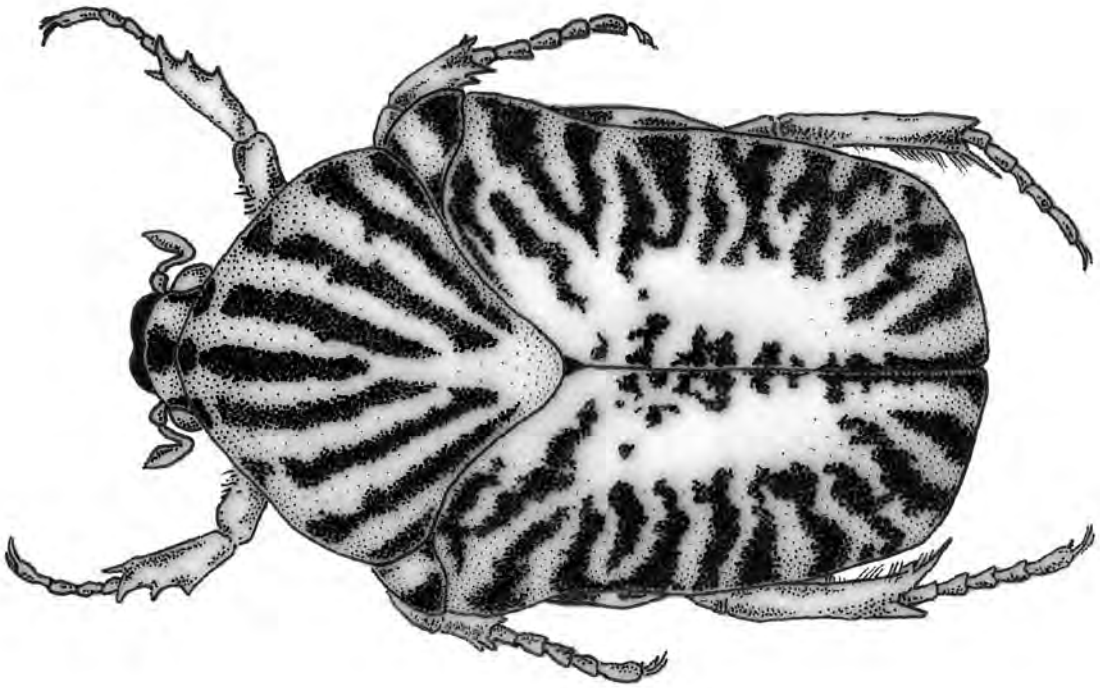
BIOTA COLOMBIANA

ISSN 0124-5376

Volumen 8 - Número 1, junio de 2007



INSTITUTO HUMBOLDT COLOMBIA

UNIVERSIDAD NACIONAL DE COLOMBIA
Instituto de Ciencias Naturales

invemar

Biota Colombiana publica listados taxonómicos de las especies (o géneros, en casos excepcionales), que conformen algún grupo de organismos presente en el territorio marino o continental de Colombia. Dichos listados pueden ser de cobertura neotropical (siempre y cuando el grupo en mención se registre para Colombia), nacional, regional (estos últimos al nivel de regiones o unidades biogeográficas, paisajes marinos y/o departamentos).

Los artículos en ***Biota Colombiana*** constan de una introducción (donde usualmente se presenta un panorama general del grupo y su estado actual de conocimiento), el listado taxonómico (en formato de tabla para facilitar su consulta), un anexo con los sinónimos de los taxa, y referencias citadas. En los listados, cada registro consta del nombre científico completo del taxón, generalidades sobre su distribución, un *voucher* o testigo de colección, y una referencia bibliográfica como soporte adicional.

Biota Colombiana incluye, además, las secciones de Notas y Comentarios, Reseñas, y Novedades Bibliográficas, donde se pueden hacer actualizaciones o comentarios sobre artículos ya publicados, o bien se puede divulgar información de interés general como la aparición de catálogos o monografías que incluyan algún grupo taxonómico presente en Colombia.

Biota Colombiana *publishes taxonomic lists of species (or genera in exceptional cases) that are found in the continental and marine territories of Colombia. These checklists can have coverage at the neotropical (only if the group is found in Colombia), national, regional (biogeographic units, natural marine landscapes, and/or departments of Colombia) levels.*

Articles published in **Biota Colombiana** *include an introduction (which generally presents an overview of the group and our current understanding), taxonomic checklists (presented as a table for easier use), an annex with synonyms for the taxa, and references cited. The checklist includes the complete scientific name for each taxon, general information about its distribution, reference to a voucher in a collection and a bibliographic reference as additional support.*

Biota Colombiana *also includes the sections of Notes and Comments, Reviews, and Bibliographic News, designed for additional information on already published articles, or information on the publication of catalogues or monographs that include some taxa found in Colombia.*

Biota Colombiana aparece registrada en Redalyc, Latindex, BIOSIS: Zoological Record, Ulrich's y EBSCO.

Biota Colombiana *is indexed in Redalyc, Latindex, BIOSIS: Zoological Record, Ulrich's and EBSCO.*

Biota Colombiana es una publicación semestral. Para mayor información contéctenos / Biota Colombiana *is published two times a year. For further information please contact us.*

http://www.humboldt.org.co/biota
biotacol@humboldt.org.co

Impreso por Ediprint E.U.
Quien sólo actúa como impresor.

Impreso en Colombia / *Printed in Colombia*

Revista *Biota Colombiana*
Instituto Alexander von Humboldt
Teléfono / *Phone* (+57-1) 3202767
Diagonal 27 # 15 – 09
Bogotá, Colombia

Biota Colombiana 8 (1) 1 - 45, 2007

Diversity of Colombian Passifloraceae: biogeography and an updated list for conservation

John Ocampo Pérez[1], Geo Coppens d'Eeckenbrugge[2], María Restrepo[1], Andy Jarvis[1,3], Mike Salazar[1], and Creuci Caetano[1,4].

1 Bioversity International (formerly IPGRI), Regional Office for the Americas, A.A. 6713, Cali, Colombia. E-mail: *ocampo.john@gmail.com*
2 CIRAD/FLHOR, UPR 'Gestion des ressources génétiques et dynamiques sociales', Campus CNRS/Cefe, 1919 route de Mende, 34 293 Montpellier, France.
3 International Center for Tropical Agriculture (CIAT), A.A. 6713, Cali, Colombia.
4 Universidad Nacional de Colombia Sede Palmira. Facultad de Ciencias Agropecuarias. Kra. 32 Chapinero, vía Candelaria. Palmira, Valle del Cauca, Colombia.

Abstract

The list of Colombian Passifloraceae was revised, using 3.930 records from literature, herbaria, and field observations. It includes 167 species, 165 of them native, which is equivalent to 27% of the family. Our list includes more details on species distribution and presents 26 species new to Colombia. *Passiflora* is the most important genus, with 162 species, whose center of diversity is in the Ecuadorian and Colombian Andes. Inside Colombia, the highest diversity is concentrated in the Andean region, which houses 81% of the species, particularly in the departments of Antioquia, Valle del Cauca, Cundinamarca, Quindío, Risaralda, and Caldas. The highest number of species is found at between 1000 and 2000 m above sea level and the most common thrive in disturbed habitats, such as roadsides, cultivated plots, and secondary forests. Most of the 58 endemic species are found at between 1500 to 2500 m and belong mainly to subgenera *Tacsonia* and *Decaloba*. Forty-two species produce an edible fruit, and nine are commercially cultivated. Among the species reported, 70% are threatened to some degree and three are considered extinct. Colombia may still house many unknown species in poorly explored departments, but more information about *Passiflora* diversity and distribution is needed to develop its economic potential. The conservation of this threatened species along with its habitat is essential and urgent. Because of the species' multiple ecological interactions with many organisms, both aspects can be combined using Passifloraceae as an indicator of biodiversity in the Andean region.

Keywords: biogeography, biodiversity, Colombia, Neotropics, Passifloraceae, passionflower, threatened species

Resumen

La lista de Passifloraceae colombianas fue revisada, usando 3.930 datos provenientes de la literatura, herbarios, y observaciones de campo. Incluye 167 especies, de las cuales 165 son nativas, representado el 27% de la familia. Nuestra lista trae más detalles de la distribución de las especies y presenta 26 especies nuevas para Colombia. Passiflora es el género más importante, con 162 especies. En comparación con otras regiones, los Andes de Colombia y del Ecuador constituyen su centro de la diversidad. Dentro de Colombia, la mayor diversidad se concentra en la región andina con 81% de las especies, particularmente en los bosques de las cuencas hidrográficas entre 1000 y 2000 m, en los departamentos de Antioquia, Valle del Cauca, Cundinamarca, Quindío, Risaralda, y Caldas. Las especies comunes crecen generalmente en habitats disturbados, como bordes de caminos y de cultivos, y bosques secundarios. La mayoría de las especies endémicas (58) son encontradas entre los 1500 y 2500 m, y pertenecen principalmente a los subgéneros Tacsonia y Decaloba. Veinte y dos especies producen un fruto comestible, y nueve se cultivan comercialmente. Entre las especies reportadas, 70% presentan algún grado de amenaza y tres se consideran extintas. Colombia puede ser el escenario de muchas especies desconocidas en departamentos poco explorados. Un mejor conocimiento de la diversidad del género Passiflora *y de su distribución es necesario para desarrollar su potencial económico. Es una tarea urgente la conservación de esta riqueza amenazada y de su habitat. Proponemos combinar ambos aspectos, utilizando las Passifloraceae como indicador de la biodiversidad en la región andina, lo cual parece justificado por sus múltiples interacciones ecológicas con otros organismos.*

Palabras claves*: *biogeografía, biodiversidad, Colombia, Neotrópico, Passifloraceae, flor de la pasión, especies amenazadas

Introduction

The Passifloraceae consist of 18 genera and approximately 630 species, distributed throughout the tropics from the coastal zones up to 3800 m above sea level in the Andean paramos (Holm-Nielsen *et al*. 1988). In America, the family is represented by four genera (*Ancistrothyrsus*, *Dilkea*, *Mitostemma* and *Passiflora*), of which *Passiflora,* with about 530 species distributed mainly in the New World, is numerically and economically the most important genus of the family (Ulmer & MacDougal 2004). Only 22 species of the subgenus *Decaloba* (syn. *Plectostemma sensu* Killip) are distributed in the Old World, in the tropical and sub-tropical regions of Southeast Asia and Austral Pacific. Passionflowers are generally perennial lianas or herbaceous vines with tendrils, although some are trees, shrubs, or even annuals. Their wide morphological variation appears to result from the diversity of their habitats as well as their coevolutionary relationships with many organisms, including protective ants (Apple & Feener 2001), herbivores (particularly *Heliconius* spp. butterflies; Gilbert 1982), pollinators, and the plant communities providing them physical support and access to sunlight. Pollination is mainly carried out by insects and birds; several species are bat-pollinated (Endress 1994; Büchert & Mogens 2001), and a few species exhibit elements of the carnivory syndrome (Radhamani *et al*. 1995). Many species are cultivated for their edible fruit, as ornamentals, or for their medicinal properties (Ulmer & MacDougal 2004; Coppens d'Eeckenbrugge 2003; Martin & Nakasone 1970; Dharwan *et al*. 2004). *P. edulis* Sims (maracuja) is by far the best known and economically important species of the family.

When Spanish missionaries arrived in South America in the 16th century, they felt that passionflowers were a good omen for their mission. In their unique morphology, they saw the elements of the Passion of Jesus Christ and a sign that the New World would successfully be converted to Christianity (Killip 1938; Uribe 1955a). This religious symbolism gave the plant its common name of *Flos Passionis*, or "Passion Flower". The Latin translation by Pluckenet (1696) was accepted for the genus *Passiflora* created by Linnaeus in 1753, who described 24 species in his *Species Plantarum*, a number increased to 35 by Lamarck (1789). The first extensive monograph of the family was published by Cavanilles in 1780, with 43 species treated. They were followed by authors like Jussieu (1805), De Candolle's (1828), Roemer (1846), Masters (1872), Triana & Planchon (1873) and Harms (1925), who described about 250 species divided into 21 sections (Killip 1938). In his 1938 monograph, *The American Species of Passifloraceae*, Killip made the most extensive description of the New World species, classifying 355 species into 17 genera and 22 subgenera, based on floral morphology. In Colombia, the priest Uribe (1954, 1955a, 1955b, 1957, 1958, 1972) described several new species, and Escobar (1986, 1987, 1988a, 1988b, 1989, 1990, 1990 inedited, 1994) revised the subgenera *Distephana*, *Manicata* (syn. *Granadillastrum*), *Rathea* and *Tacsonia*, including *Tacsoniopsis* in the latter, and described one additional subgenus, *Porphyropathanthus*. She passed away in 1993, leaving an inedited document on her revision of subgenus *Astrophea*. MacDougal revised subgenus *Plectostemma* in 1994, restoring its ancient name *Decaloba*. In the last decade, MacDougal and Feuillet have published many papers including the description of about 15 new species, mainly of the subgenera *Decaloba* and *Astrophea* (MacDougal 1992, 1994, 2006; Feuillet 2002, 2004). Recently, Feuillet & MacDougal (2003) proposed a new infrageneric classification in *Passiflora*. According to this proposal, only based on morphological characters, four subgenera would be recognized: *Astrophea* and *Deidamioides*, from South and Central America; *Decaloba*, from America, Southeast Asia and Australia; and *Passiflora*, exclusively from America (Ulmer & MacDougal 2004). Additionally, they proposed to downgrade the genus *Tetrastylis* as a section of the subgenus *Deidamioides*. Recent molecular analyses (Muschner *et al*. 2003; Yockteng & Nadot 2004; Hansen *et al*. 2006) partly support the reduction in the number of subgenera, with the existence of at least three major groups, corresponding globally to subgenera *Decaloba*, *Passiflora* and *Astrophea* of the new proposal. On the other hand, molecular data from the different studies are not always consistent on the relative placement of these groups, and their results are less clear at lower levels, with inconsistent grouping of particular species and poor correspondence with some well established morphological divisions. In addition, the monophyly of *Passiflora* has not been established, and the study of Muschner et al. (2003) even raises some doubts about it. Clearly, more studies, involving more numerous species samples, are needed before re-evaluating such a complex and fast evolving group as is that of the *Passiflora*.

Colombia is the second most biodiverse country in the world (MacNeely *et al*. 1990). The country is divided into five main biogeographic regions: Amazon, Andes, Caribbean, Orinoco, and Pacific. The Andean region presents a highly varied topography (1000-5400 m) with three main mountain ranges. Thus, the Eastern, Central and Western Cordilleras separate two large inter-Andean valleys from the Pacific Coast to the West and the Orinoquean'Llanos' to the East. The uplift of the Andes created new habitats and increased local isolation, favoring high speciation rates in many taxa. In *Passiflora*, a particularly striking example is given by subgenus *Tacsonia*, whose beautiful and large-flowered species are strictly adapted to high altitudes in cloud

forests (2000-3800 m), and pollination by the sword-billed hummingbird *Ensifera ensifera* Lesson, which shows the same distribution (Büchert & Mogens 2001). As a result of this variety of habitats, Colombian flora includes one of the world's most diverse groups of vascular plants, with 51.220 documented species (May 1992; UNEP-WCMC 2004). However, Colombia has undergone recent transformation of large parts of its natural ecosystems, in particular in the Andean region. Seventy percent of the Andes, an area vital to the conservation of Colombia's water supply, has been deforested as a result of both agricultural colonization and human migration (World Press Review 1993). Destruction of natural habitats has drastically affected many species distributions, often reducing their historical ranges to a set of small, fragmented populations (Brooks *et al*. 2002). It has been predicted that such habitat alteration will lead to a substantial risk of extinction in the near future.

Passifloraceae are of great interest within this context of rapid erosion of biodiversity, and not only for their fast radiation and spectacular variation in morphology and reproductive biology. Indeed, as stated above, this family is exemplative from the standpoint of coevolution in many respects, such as their particular relationship with specialized herbivores, ants and other nectar feeding insects; most importantly, they are parasites of structure, as they depend on many very different species for support, from low shrubs in disturbed habitats to high trees in primary forests. They are mainly perennials, but their life cycle is much shorter than that of their supports. They are sensitive to long-term changes in the ecosystem (dependence on trees) as well as short-to medium-term changes (by their other adaptive traits). Thus, they should constitute an excellent indicator group for the monitoring of biodiversity in Colombia. In addition, Colombia presents a long tradition of diversity in fruit production and consumption, and it is the country with the highest number of marketed passion fruit species, so the study of *Passiflora* diversity must also be thought of in terms of conservation of genetic resources of important or promising fruit crops.

The last inventory by Hernández & Bernal (2000) recorded 141 Passifloraceae species distributed in all the biogeographic regions. Forty-eight of them, mainly housed in the Andean region, are endemic to Colombia. This inventory was based on the study of specimens from five herbaria (COL, HUA, JAUM, MEDEL and MO), and the citations made in publications compiled by several authors that have worked on the family.

Several recent collaborative projects have been focused on Passifloraceae. The Interamerican Development Bank (BID) has supported a regional project, coordinated by Bioversity International (formerly IPGRI) in 1994-1997. Colciencias funded, in 1999-2001, the national project "Conservación y utilización de los recursos genéticos de pasifloras", developed by French and Colombian scientists at the Bioversity Americas office. In 2004, the same group developed a study of diversity of the *Passifloraceae* and *Caricaceae* in the Colombian coffee growing area. All these projects have generated a considerable amount of information on morphology, cytology, palynology, molecular diversity, and biogeography of *Passiflora*, providing most of the material for the present inventory and allowing us to supplement and update the list of Hernández & Bernal (2000) with new information, such as species new to science or to the country and elements of ethnobotanical information. In addition, the use of a Geographic Information System (GIS) allowed us to re-assess the conservation status of Colombian Passifloraceae species.

Materials and methods

Study Area

Colombia is situated in the north of South America, between 12° 26' 46" N and 4° 13' 30" S, and between 66° 50' 54" W and 79° 02' 33" W, covering an area of 1,141,748 km^2, with an altitudinal range from sea level up to 5775 m (http://www.igac.gov.co). The main administrative division defines 32 departments, and geographers recognize five biogeographic regions (Hernández *et al*. 1991).

Herbarium and Literature Data

The data set consists of information gathered from specimen labels from 18 Colombian herbaria (AFP, CAUP, CDMB, CHOCO, COL, COAH, CUVC, FAUC, FMB, HUA, HUQ, JAUM, MEDEL, PSO, SURCO, TOLI, VALLE, UIS), and five herbaria in other countries (K, MA, MO, NY, P). These collections were gathered between 1750 and 2006. Most specimens were verified or identified, using the keys and descriptions of Killip (1938), Holm-Nielsen *et al*. (1988), Escobar (1988a, 1994), MacDougal (1994) and Tillet (2003). A synonymy list, based on the general list of Feuillet & MacDougal (2003), is given in Appendix 1. When possible, voucher label information was used to assign geographic coordinates to specimens, using gazetteers and topographic maps of Colombia (scale 1:50,000 and 1:250,000). The database was supplemented with materials mentioned in species descriptions, essentially those of Killip (1938, 1960), Uribe (1955a), and Escobar (1988a,b, 1989, 1990, 1990 inedited, 1994). Collection records with obviously inaccurate or doubtful data were excluded from the analysis. Coordinates were further checked by plotting all species on a dot map, using the DIVA-GIS 5.2 software (Hijmans *et al*. 2001). Finally, we followed the infrageneric classification by Killip (1938) with the amendments of Escobar (1988, 1989) and MacDougal (1994).

Expeditions and Samples Collected

The dot map of all geo-referenced specimens was used to plan germplasm collecting trips. The prioritization of explored areas followed three criteria: permission to access (unfortunately not obtained for protected areas), richness of species and collection gaps. The collecting trips were carried out during 2003-2006, covering 555 localities in 17 departments, between 0 and 4200 m of altitude. The explorations were concentrated in the Andean region, in watersheds, wild forest areas, cultivated fields and road edges. Data were recorded for each collected specimen, including locality names, elevation, geographic coordinates using a hand-held GPS device, status (wild, cultivated or introduced), and ethnobotanical information (if any). These passport data were recorded and tabulated. Finally, the Geographic Information System software DIVA-GIS 5.2 was used to generate a dot map of the distribution of accessions collected / observed during the expedition.

Threat Status of Passifloraceae

The distribution area of each native species was characterized by the maximum distance (MaxD) and the circular area (CA_{50}), following the method of Hijmans *et al*. (2001). This methodology has been applied in a number of studies to provide quantitative assessment of the distribution area required by the Red List criteria, for example by Maxted et al. (2005). MaxD is the largest distance between any pair of observations of one species. CA_{50} is the total surface within a 50-km radius around all the observations for a same species. These methods were supplemented with historical records of each taxon and subjected to the Red List criteria of the World Conservation Union (IUCN 2003, 2004), involving complex combinations of quantitative observations concerning the size and structure of the population, the range and fragmentation of its distribution (extent of occurrence and area of occupancy), as well as the intensity of their past or foreseeable variation. Along these lines, we considered that CA_{50} under 20.000 km^2, MaxD under 100 km and number of observations under six, as well as the absence of records younger than 100 years, are critical.

Results

Data collecting

A total of 3330 herbaria and 45 literature data, concerning 120 species, were gathered and georeferenced when coordinates were not directly available. The highest number of species and specimens were found in the Colombian herbaria COL and HUA, with 1056 and 976 records respectively. During the collecting trips, most specimens were observed in forest fragments, gallery forest and forest and road edges, mainly in the watersheds of the coffee growing zone, between 1000 and 2000 m. In all sites visited during the expeditions, 87 Passifloraceae species were recorded, of which five individuals could not be identified. The dot map in Figure 1 shows the spatial distribution of our final dataset of 3930 records per herbarium (3330), literature (45) and field collections (555) of Passifloraceae in the different biogeographic regions.

Distribution of Species Richness

The number of observations and species richness was highest on the Andean slopes with 123 species, followed by the Amazonian region with 45 species (Box 1). The Orinoquean region was the poorest, with only 18 species. The Andean and Caribbean regions share the highest number of species (27). By contrast, the Pacific and Caribbean regions only present four species in common. Figure 2 gives a synthetic image of the similarities in species occurrence among regions, confirming a relative similarity between the Amazonian and Orinoquean, as well as between the Andean and Caribbean regions. The Pacific Coast Passifloraceae appears relatively divergent. The Andean region, as well as the departments of Antioquia, Valle del Cauca, Cundinamarca and Santander displayed the highest richness of specimens and species (Box 2). Considering their area, Quindío, Risaralda and Caldas are even more diverse. The department of San Andrés and Providencia (Caribbean islands) are only represented by *P. biflora* Lam. and *P. pallida* L.

Box 1 Distribution of Passifloraceae by biogeographic region. The diagonal gives their contribution in species number (bold) and contribution to the country's total. The other cells give the number and proportion of shared species for each pair of regions.

Biogeographic region	amz	and	car	**ori**	**pac**
Amazonian	45 (28%)	21 (14%)	9 (12%)	**15 (31%)**	**15 (23%)**
Andean		123 (76%)	27 (20%)	**7 (5%)**	**14 (10%)**
Caribbean			38 (23%)	**9 (19%)**	**4 (6%)**
Orinoquian				**19 (12%)**	**9 (14%)**
Pacific					**36 (22%)**

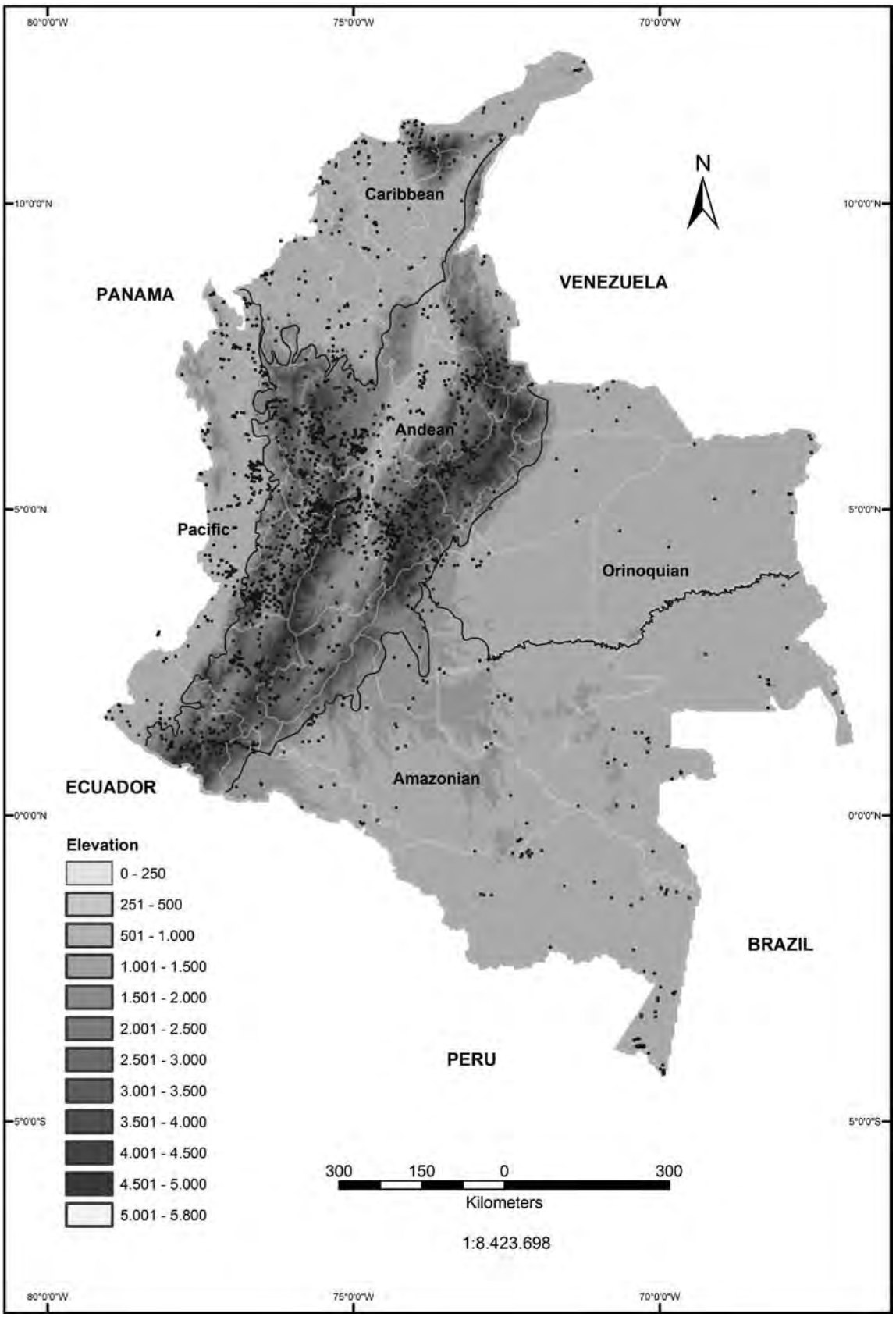


Figure 1. Map of distribution of Passifloraceae specimens for 3,930 collections on five biogeographic regions in Colombia. Points on the maps represent sites of collection.

Box 2 Number of observations and species of Passifloraceae in the 32 Colombian departments.

Department	Abbreviation	Biogeographic region	Observation number	Species number
Amazonas	ama	amz	87	19
Antioquia	ant	and car pac	784	70
Arauca	ara	and ori	10	6
Atlántico	at	car	18	7
Bolívar	bl	and car	33	17
Boyacá	by	and ori	145	36
Caldas	cl	and	245	36
Caquetá	cq	amz and	47	18
Casanare	cs	and ori	4	4
Cauca	cau	amz and pac	161	42
Cesar	ce	and car	13	10
Chocó	cho	and pac	211	40
Córdoba	cor	and car	33	9
Cundinamarca	cun	and ori	419	53
Guainía	gn	amz	16	10
Guaviare	gv	amz	27	14
Huila	hu	and	62	22
La Guajira	lg	and car	21	12
Magdalena	ma	car	71	31
Meta	met	amz and ori	85	24
Nariño	na	and pac	170	44
Norte de Santander	ns	and	79	36
Putumayo	pu	amz and	56	26
Quindío	qu	and	150	38
Risaralda	ri	and pac	68	24
San Andrés y Providencia	sp	car	4	2
Santander	snt	and	203	48
Sucre	suc	car	6	3
Tolima	to	and	213	44
Valle del Cauca	vc	and pac	420	56
Vaupés	va	amz	35	20
Vichada	vch	ori	16	9

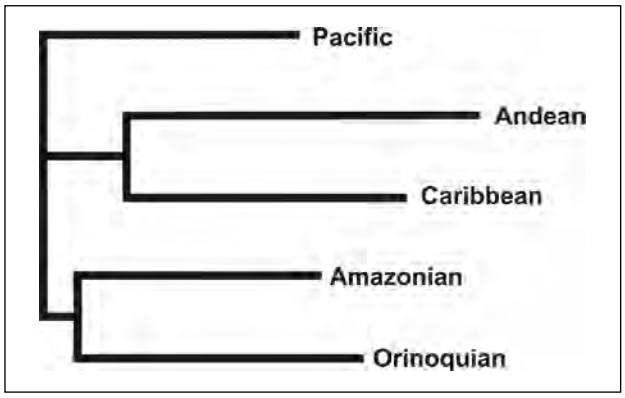


Figure 2. Diagram comparing the similarity in contribution of Passifloraceae species to the floras of the Colombian biogeographic regions (Jaccard distance).

New Passifloraceae Checklist for Colombia

Box 3 gives the number of species for each genus and subgenus present in Colombia in relation with the number of species present in the Neotropics. The updated inventory of the Colombian species (Box 4) includes a total of 167 Passifloraceae species, representing three genera, *Ancistrothyrsus*, *Dilkea* and *Passiflora*. This is equivalent to 27% of all Passifloraceae. The genus *Passiflora* is by far the most important with 162 species, representing 11 of Killip's subgenera, and all the four subgenera defined in the classification proposed by Feuillet and MacDougal (2003). The most abundant species were *P. vitifolia* Kunth (359 specimens) and *P. mixta* L. (162 specimens), while 67 species (23%) were represented by a single specimen.

In the expeditions, we found some species that had not been collected in the last decades, such as *P. erytrophylla* Mast., *P. guazumaefolia* Juss., and the semi-arborescent *P. mariquitensis* Mutis *ex* Uribe. The latter was described in 1783 by José Celestino Mutis during the Botanical Expedition of the "Nuevo Reino de Granada" in Mariquita (Tolima). It was considered extinct by Uribe (1955a) and a synonym of *P. pittieri* Mast. by Escobar (1990 inedited). However, we could verify that *P. mariquitensis* still exists, as three specimens that we have collected in a forest with high distribution near Mariquita corresponded closely to the type specimen, while they appeared morphologically distinct from *P. pittieri* specimens from Costa Rica, Panama, and northwestern Colombia in several traits (e.g. nectar shape, peduncle length, nerve shape). Similarly, after comparing the collected materials with the type specimens, we maintained other species that had been considered synonyms by Hernández & Bernal (2000), such as *P. mollis* Kunth H.B.K. (vs. *P. cuspidifolia* Harms), and *P. hahnii* (Fourn) Mast. (vs. *P. guatemalensis* S. Watson). Our list includes 26 species new to Colombia, from those recognized by Killip (1960), Feuillet & MacDougal (2003) and Ulmer & McDougal (2004) and three inedited from Escobar (1990) and Hernández (2003): *Ancistrothyrsus antioquiensis* L.K Escobar (ined.), *P. alata* Curtis, *P. andina* Killip, *P. bucaramangensis* Killip, *P. candollei* Tr. & Planch., *P. chocoensis* Gerlach & Ulmer, *P. cincinnata* Mast., *P. hahnii*, *P. hirtiflora* Jørgensen & Holm-Nielsen, *P. killipiana* Cuatrecasas, *P. lyra* Planch. & Linden & *ex* Killip, *P. megacoriacea* Porter-Utley (ined.), *P. mollis*, *P. monadelpha* Jørgensen & Holm-Nielsen, *P. munchiquensis* Hernández (ined.), *P. occidentalis* Hernández (ined.), *P. pallida* L. (clearly separated from *P. suberosa* by Porter-Utley, 2003), *P. pillosissima* Killip, *P. popenovii* Killip, *P. sodiroi* Harms, *P. tuberosa* Jacq., *P. rigidifolia* Killip, *P. tricuspis* Mast., *P. truxillensis* Planch. & Lind. *P. caerulea* L., recently introduced from Brazil and Argentina and cultivated as an ornamental, was not included in the counts of each department. *P. alata* was not counted for Quindío and Valle del Cauca either, as the material under cultivation was also introduced from Brazil. *P. micrantha* Killip was not included because Hernández (2003) considered it a synonym of *P. erythrophylla*. Nine more species occur close to the Colombian international border (less than 100km), and possibly exist also in the country, although they have not been included in this inventory. Another important result is the presence of the genera *Ancistrothyrsus* and *Dilkea* in the Andean and Pacific regions, the former following the mention of *A. antioquiensis* by Escobar (1990 ined.), who, unfortunately, passed away before publishing her monograph on arborescent Passifloraceae.

Several botanical forms and varieties are mentioned for *P. edulis* Sims, *P. cumbalensis* (Karst.) Harms, *P. foetida* L, *P. ligularis* Juss., *P. longipes* Juss., *P. rugosa* (Mast.) and *P. tripartita* (Juss.) Poir. A total of 42 species with edible fruit are reported. Nine of them are sold on the international, national and/or local markets, *P. edulis* f. *flavicarpa* Degener and *P. edulis* f. *edulis* (introduced), *P. ligularis*, *P. tripartita* var. *mollissima*, *P. tarminiana* Coppens & Barney, *P. quadrangularis* L., *P. maliformis* L., *P. popenovii* Killip, *P. nitida* Kunth, and *P. alata* Curtis. Other species, such as *P. antioquiensis* H. Karst., *P. cumbalensis*, *P. laurifolia* L., *P. nitida* Kunth, *P. palenquensis* Holm-Niels. & Lawesson *P. tiliifolia* L., and *P. pinnatistipula* Cav. are cultivated in home gardens. Some commonly cultivated species seem to depend on human activity for their propagation, which suggests an advanced stage of domestication and/or an incomplete acclimatisation following an ancient introduction. Thus, *P. edulis* f. *flavicarpa*, *P. ligularis*, *P. quadrangularis* L., *P. popenovii*, *P. tripartita* var. *mollissima*, and *P. tarminiana*, are exceptionally found as feral plants. The latter has pullulated as an invasive plant in Hawaii and New Zealand. Another particular

case is *P. edulis* f. *edulis*, introduced from southern South America, which has naturalized at intermediate to high altitudes, where it is not uncommon in the wild.

The vernacular names are very diverse for each species. In the Amazonian region, we noted several indigenous names for the species *P. foetida* var. *gossypiifolia* Desv. (Iñana-leeg, Murulale), *P. holtii* Killip (Guachique), *P. nitida* (Burucuña, Gemarundare, Tuchica, Jino-Gojé), *P. serratodigitata* L. (Cipo-Cipo), *P. vitifolia* (Maloca de Fisi). In the Cauca and Nariño departments (south of the Andean region) *P. fimbriatistipula* Harms and *P. ligularis* are named Pachuaca and Awapit in the indigenous languages.

Among the species collected in our expeditions, we found several species growing very commonly in disturbed habitats like the road edges, secondary forest margins, and especially riverbanks between 1000 and 2000 m: *P. adenopoda* Moc, & Sessé *ex* DC., *P. alnifolia* Kunth, *P. coriaceae* Juss., *P. capsularis* L., *P. rubra* L, and *P. suberosa* L. The latter two are considered weeds in the coffee plantations. At higher altitudes (above 2500 m), *P. mixta* is also very common in disturbed habitats.

Box 3 Number of Passifloraceae species in Colombia and the Neotropics.

Genus	Subgenus	Colombia	Neotropics
Ancystrothyrsus		2	3
Dilkea		3	5
Mitostemma		0	3
Passiflora	*Astrophea*	22	57
	Decaloba	52	190
	Dysosmia	2	20
	Distephana	6	15
	Manicata	1	5
	Passiflora	38	156
	Porphyropathanthus	1	1
	Psilanthus	3	4
	Rathea	2	3
	Tacsonia	30	55
	Tryphostemmatoides	4	7
All Passifloraceae		**167**	**533**

Endemism

Among the 165 native species, 58 (36%) are endemic to the country. The largest concentration of these occurs in the Andean region, principally in the Cordillera Central, in the departments of Antioquia and Tolima. The elevation belt between 1500 and 2500 m presents the highest richness of endemic and rare species (≤ 5 observations). Only eight of these were represented with only one specimen (e.g. *P. cremastantha* Harms), while *P. bogotensis* Benth and *P. antioquiensis* were the most common endemic species, with 23 recorded specimens each. The proportion of endemic species varied considerably among taxonomic groups, especially among the subgenera of *Passiflora* (Box 4). Thus, *Tacsonia* (21), *Decaloba* (14), *Passiflora* (9) and *Astrophea* (7) present the highest number of endemic species. Subgenus *Tacsonia* displays the highest richness of endemic species in the Cordillera Central with eight species, mainly of the Colombian section characterized by a very long peduncle (*P. flexipes* Triana & Planch., *P. linearistipula* L.K. Escobar,

P. quindiensis Killip and *P. tenerifensis* L.K. Escobar). Twenty-one species (37%) are restricted to very small areas of one department. These are located mainly in the departments of Antioquia (7), Tolima (4), Santander (3), Cauca (2), while only one such narrow endemic species is found for the departments of Bolivar, Boyacá, Chocó, Caldas, Cauca, and Magdalena.

Threatened Species

The distribution parameters of the 165 Colombian Passifloraceae native species are given in Appendix 2, and Figure 3 shows their repartition according to their threat status under the criteria of the IUCN (2003, 2004). Seventy-one percent of them are under some degree of threat, 10% being critically endangered (**CR**), 6.1% vulnerable (**VU**) or endangered (**EN**). Four of the 16 critically endangered species are endemic. All three extinct species (**EX**) belong to the Andean subgenus *Tacsonia*. Unfortunately, the only two species of genus *Ancistrothyrsus* are included in the category CR. Only 16% of the species were placed in the two categories **LC** and **NT**, 'least concern' and 'near threatened'. The species *P. alata*, *P. megacoriacea* Porter-Utley and *P. rigidifolia* Killip are placed in the **DD** category because of deficient data. The 29.3% classified in 'least concern', belong mostly to subgenera *Decaloba* and *Passiflora* with 18 and 14 species, respectively.

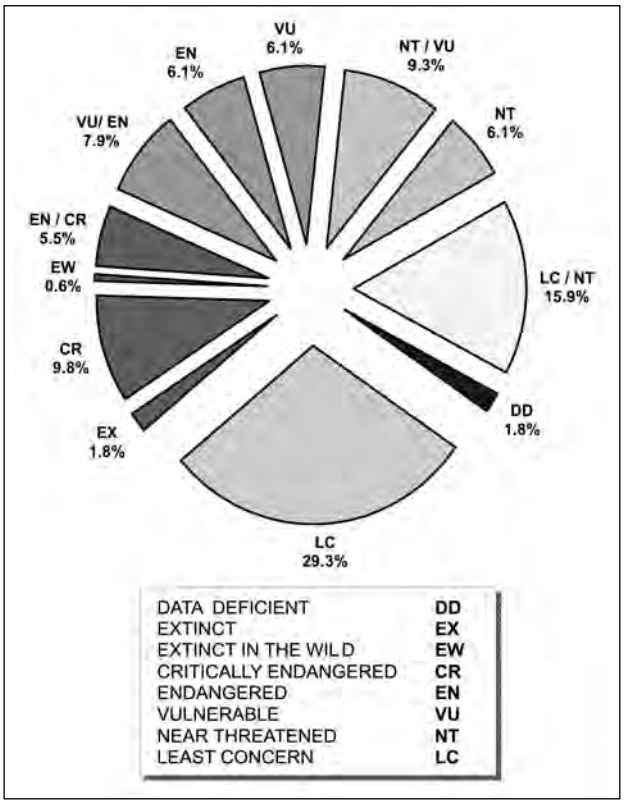


Figure 3. Percentual number of the threat status of 165 Passifloraceae native species under the IUCN criteria.

Box 4 List of 167 Passifloraceae species of Colombia. Fifty-eight endemic species are marked by an asterisk (*); twenty-six species new to Colombia by the abbreviation 'nr'; nine species probably present in the country are indicated between square brackets. New records, for a given biogeographic region, department (abbreviated as in Tables 1 and 2) or elevation-range are indicated by bold letters. Abbreviations in bold letters in the 'Notes' column correspond to the plant habits: shrub (Ab), tree (Ar), and climber (Tr). V.N and I.N. indicate vernacular and indigenous names, respectively.

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Genus *Ancistrothyrsus* Harms, 1931							
Ancistrothyrsus antioquiensis L.K Escobar (ined), 1988 * nr	and	ant	90-800	Escobar & Roldán 8819 (HUA) - Type	F.J Roldán (*pers. com.*), Escobar (1990 inedited)	CR	Tr
[*Ancistrothyrsus hirtellus* A.H. Gentry, 1992]	amz		150-350	Gentry & Stein 47114 (MO) - Isotype	Gentry 1992		Tr Reported in the Ecuadorian, Peruvian and Venezuelan Amazon.
Ancistrothyrsus tessmannii Harms, 1931	amz	ama pu	50-400	Vester & Matapi 639 (COAH)	Holm-Nielsen *et al.* 1988	CR	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Genus *Dilkea* Mast., 1871							
Dilkea johannesii Barb. Rodr., 1885	amz	va	100-500	Soejarto 2461 (HUA)	Killip 1938	CR	Tr
Dilkea parviflora Killip, 1938	amz	ama cq va	100-500	Gentry 64981 (MO)	Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Canilla de Tente, Tripa de Tente (ama). Edible fruit
Dilkea retusa Mast., 1871	amz and pac	ama ant cho cq gv met pu snt va vc	100-500	López *et al*. 5947 (COAH)	Killip 1938; Uribe 1955b; Holm-Nielsen 1974; Holm-Nielsen *et al*.1988	LC	Tr
Genus *Passiflora* L., 1753							
Subgenus *Astrophea* (DC.) Masters, 1871							
Section *Astrophea*							
Passiflora callistema L.K. Escobar, 1994 *	car	bl	100	E. Forero 487 (COL) - Type	Escobar 1990 Inéd., 1994	CR	Tr Known only from the type.
Section *Botryastrophea*							
Passiflora holtii Killip, 1938	amz	ama cq gn va	150-500	Jaramillo 7890 (COL)	Killip 1938; Escobar 1990 Inéd., 1994	LC/NT	Tr I.N: Guachique, Bejuco (ama). Edible fruit
Passiflora pyrrhantha Harms, 1926	amz	va	400-1000	Shultes & Cabrera 12693 (COL)	Killip 1938; Holm-Nielsen *et al*.1988; Escobar 1990 Inéd., 1994	EN/CR	Tr
Passiflora securiclata Mast., 1893	amz ori	ara by gv va vch	150-500	Betancourt *et al*. 9753 (COAH)	Killip 1960; Escobar 1990 Inéd., 1994	LC	Tr
Passiflora spicata Mast., 1872	amz	gv	150-500	Cuatrecasas 7397 (COL)	Killip 1938; Holm-Nielsen *et al*. 1988; Escobar 1990 Inéd, 1994	VU	Tr
Passiflora spinosa (Poepp. & Endl.) Mast., 1871	amz and ori car	ama ant by cq cor cun gn met pu snt va vch	150-500	Zarucchi 4279 (COL)	Killip 1938; Holm-Nielsen 1974; Holm-Nielsen *et al*.1988; Escobar 1990 Inéd., 1994	VU	Tr V.N.: Cocorella (bl), Bejuco campano (snt)

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Section *Dolichostemma*							
Passiflora citrifolia (Juss.) Mast., 1871	amz	va vch	85-500	Barbosa & Zurucchi 2989 (COAH)	Killip 1838; Escobar 1990 Inéd.	LC	Tr
Passiflora haughtii Killip, 1938 *	and	snt	100-700	Haught 1635 (COL)	Killip 1938; Escobar 1990 Inéd., 1994	CR	Ab
Passiflora mariquitensis Mutis *ex* Uribe, 1954 *	and	to	420-700	Ocampo *et al.* 55 (TOLI)	Killip 1938; Escobar 1990 Inéd., 1994	CR	Ab Formerly considered extinct.
Passiflora mutisii Killip, 1938 *	and	to	600	Mutis 2279 (MA) - Type	Killip 1938; Escobar 1990 Inéd., 1994	EX	Tr
Passiflora pittieri Mast., 1897	pac	ant cho	50-1000	Gentry & Aguirre 15318 (COL)	Killip 1938; Escobar 1990 Inéd., 1994; Gentry 1976	VU	Ab
Section *Euastrophea*							
Passiflora arborea Spreng., 1826	and car	ant bl by cau cl cun hu ma na qu ri to vc	1000-2300	Humboldt & Bonpland 5864 (P) - Type	Killip 1938; Pérez 1956; Holm-Nielsen *et al.* 1988; Escobar 1990 Inéd.	NT	Ar V.N: Cherimoyo (vc), Granadillo arboreo (cun). Edible fruit
Passiflora lindeniana Planch. *ex* Triana & Planch., 1873	and	cun ns snt	1000-2700	Linden 1409 (P) - Type	Escobar 1994	NT	Ab
Passiflora emarginata Humb. & Bonpl., 1813 *	and pac	cau cl cho na vc	1500-2000	Humboldt & Bonpland (P) - Type	Killip 1938; Escobar 1990 Inéd., 1994	LC	Ar Edible fruit
Passiflora engleriana Harms, 1894 *	and	ant	1500-2500	Escobar 8853 (COL)	Killip 1938; Escobar 1990 Inéd., 1994	VU/EN	Ar
Passiflora macrophylla Spruce *ex* Mast., 1883	amz and pac	ant cau cho pu na	60-1800	Alcázar & Salgado 1203 (CAUP)	Killip 1938; Holm-Nielsen *et al.* 1988; Escobar 1990 Inéd., 1994	LC	Ab V.N: Acaba familia (cho)
Passiflora putumayensis Killip, 1938	and	pu	1350-2500	Mora-0. 3438 (PSO)	Killip 1938; Escobar 1990 Inéd., 1994	EN/CR	Ab
Passiflora sphaerocarpa Triana & Planch., 1873 *	and	ant ce cun na ns qu ri snt to vc	400-1700	Schlim 285 (P) - Type	Killip 1938; Uribe 1972; Escobar 1990 Inéd., 1994	LC/NT	Ar V.N: Gulupo de Arbol (cun), Capafraile (to). Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora tica Gomez-Laur. & L.D. Gómez, 1981	pac	ant cho	450-1500	Escobar 2192 (HUA)	Escobar 1990 Inéd., 1994	LC/NT	Ar
Section *Pseudoastrophea*							
[*Passiflora costata* Mast., 1872]	amz		50-350	Spruce 1670 (K) - Type	Killip 1938; Escobar 1990 Inéd., 1994		Tr Reported in the Amazon of Peru, Brazil, Guianas, and Venezuela) (confluence of the rivers Rio Negro and Casiquiare).
Passiflora grandis Killip, 1938 *	and	ns snt	1000-2000	Schlim 585 (K)	Escobar 1990 Inéd., 1994	EN/CR	Ar
[*Passiflora ovata* Martin *ex* DC., 1828]	ori		0-150	Colector n.v.	Killip 1938; Escobar 1990 Inéd., 1994		Tr Reported in the Amazon of Venezuela.
Passiflora phaeocaula Killip, 1927	amz ori	gn va vch	150-1100	Madriñan 893 (MO,GH)	Killip 1938; Holm-Nielsen 1974; Escobar 1990 Inéd., 1994	LC/NT	Tr Ab
Passiflora skiantha Huber, 1960	amz	gv	150-500	Cuatrecasas 7366 (COL)	Killip 1938; Escobar 1990 Inéd.	NT/VU	Tr
[*Passiflora tessmannii* Harms, 1926]	amz		50-500	Tessmann 4385 (N) - Type	Killip 1938; Escobar 1990 Inéd., 1994		Tr Reported in the northern Amazon of Peru.
Passiflora venosa Rusby	and pac	cho	50-450	Juncosa s.n. (JAUM) n.v.	Killip 1938; Escobar 1990 Inéd.	VU/EN	Tr
Subgenus *Decaloba* (DC.) Rchb., 1828							
Section *Cieca*							
Passiflora apoda Harms, 1929	and	ant cau cl qu na ri to vc	1900-3260	Hazen 9688 (MO) - Isotype	Killip 1938; Hernández 2003	LC/NT	Tr
Passiflora coriacea Juss., 1805	and car pac	ant by cau cl cho cun hu ma ns qu ri snt to vc	250-1500	Uribe 2565 (COL)	Croat 1978; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Ala de Murcielago
Passiflora holosericea L., 1753	car	at bl ce	0-1400	Cuadros-H 1882 (COL)	Killip 1938	LC/NT	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora megacoriacea Porter-Utley, 2003 nr	car	bl	100-200	Killip & Smith 14415 (US)	Porter-Utley 2003	DD	Tr
Passiflora pallida L., 1753 nr	car	at bl ma sp	0-200	Dugand & Jaramillo 2844 (COL)	Porter-Utley 2003	LC	Tr Appel Monkey (sp)
Passiflora sodiroi Harms, 1922 nr	and	cau	1850-2150	Escobar *et al.* 4368 (PSO)	Holm-Nielsen *et al.* 1988	EN/CR	Tr
Passiflora suberosa L., 1753	and car	ant cau cl cun gv na ns qu snt suc to vc	200-2200	Cuatrecasas 15930 (VALLE)	Holm-Nielsen *et al.* 1988	LC	Tr V.N.: Curubita de Monte (ant)
Section *Decaloba*							
Series *Auriculatae*							
Passiflora auriculata Kunth, 1817	amz and car ori pac	ama ant bl by cau cl cho cor cq cun gn gv met na ns pu qu snt to va vc vch	0-1500	Killip & Cuatrecasas 58988 (VALLE)	Holm-Nielsen 1974; Holm-Nielsen *et al.* 1988	LC	Tr V.N: Rejito (cun)
Series *Sexflorae*							
Passiflora sexflora Juss., 1805	and	ant hu qu to vc	1700-2300	Zurucchi *et al.* 5813 (CHOCO)	Holm-Nielsen *et al.* 1988	NT/VU	Tr V.N.: Corvejo (na)
Series *Luteae*							
Passiflora filipes Benth., 1843	and	qu ri vc	950-1250	Silverstone 7205 (CUCV)	Holm-Nielsen *et al.* 1988	VU	Tr
Series *Miserae*							
Passiflora misera Kunth, 1817	and car ori pac	ant at ara bl by cau cl cho cor cun cs lg ma met vc ns	0-1050	E. Forero 9936 (COL)	Killip 1938	LC	Tr
Passiflora tricuspis Mast., 1872 nr	and	met	1220-2000	Estrada *et al.* 146 (MA)	Killip 1938	CR	Tr
[*Passifora trifasciata* Lemaire, 1868]	amz	ama pu	130-1100	Brandbyge *et al.*33556 (AAU)	Killip 1938; Nielsen *et al.* 1988		Tr Reported in the Amazon of Ecuador, Brazil and Peru. Ornamental (qu)
Series *Punctatae*							
Passiflora alnifolia Kunth, 1817	and car	ant by cau cl cun ma na pu qu ri snt to vc	1400-2500	Hno. Daniel 2803 (MEDEL)	Holm-Nielsen *et al.* 1988	LC	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora andreana Mast., 1883	and	ant cau cun ma na qu ri	1500-3150	Garcia-B.12949 (COL)	Holm-Nielsen *et al*. 1988	CR	Tr
Passiflora azeroana L. Uribe, 1955 *	and	by cun hu snt	2500-3000	Lozano 3718 (COL)	Uribe 1957	NT/VU	Tr
Passiflora biflora Lam., 1789	and car	ant at bl ce cl cho cun hu ma met na ns ri sp snt to vc	0-1500	Garcia-B. 11720 (COL)	Killip1938; Holm-Nielsen 1974; Croat 1978	LC	Tr V.N.: Peyen Papaya (sp), Desjarretadera (cun)
Passiflora bogotensis Benth., 1845 *	and car	by cun hu lg ma ns snt vc	2000-3700	Garcia-B. 15291 (COL)	Killip 1938; Holm-Nielsen 1974	LC	Tr V.N.: Curubo macho (cun)
Passiflora bucaramangensis Killip, 1930 * nr	and	snt	1500-2600	Killip & Smith 16787 (MO) - Isotype	Killip 1930, 1938	EN	Tr
Passiflora candollei Tr. & Planch., 1873 nr	amz	ama	100	Rudas *et al*. 2180 (COL)	Killip 1938	NT	Tr
Passiflora chelidonea Mast., 1979	and car pac	ant ara cau cho na ns pu ri snt vc	900-3000	Cuatrecasas 12526 (COL)	Holm-Nielsen *et al*. 1988	LC	Tr
Passiflora cuneata Willd., 1809	and car	ant by cho cun ma met ns snt vc	900-3000	Uribe 5973 (COL)	Killip 1938; Hno. Daniel 1968; Holm-Nielsen 1974	LC	Tr V.N.: Granadillita de Monte (ant)
Passiflora cuspidifolia Harms, 1893	and	by cun snt	2000-3200	Prieto 302 (UIS)	Holm-Nielsen *et al*. 1988	LC	Tr
Passiflora dawei Killip, 1930 *	and	cun snt	900-1600	Idrobo 2037 (COL)	Killip 1930, 1938; Hernández 2003	VU/EN	Tr
Passiflora erytrophylla Mast., 1872 *	and	by cun	1600-2790	Ocampo *et al*. 54 (HUA)	Killip 1938; Uribe 1955a; Hernández 2003	EN	Tr Not collected since 1938.
Passiflora lyra Planch. & Lind. *ex* Killip, 1846 nr	and	ant	400-840	MacDougal 4161 (HUA)	Killip 1938	NT/VU	Tr
Passiflora magdalenae Triana & Planch., 1873 *	and	cl cun to	200-1200	Uribe 2568 (COL)	Killip 1938; Pérez 1956	NT/VU	Tr V.N.: Granadillo del Magdalena.
Passiflora micropetala Mast., 1872	amz and	ama ant by cho cq met pu vc	0-710	Perez-A.669 (COL)	Holm-Nielsen *et al*. 1988	LC	Tr
Passiflora mollis HBK., 1817 * nr	and	ant cl cho qu lg snt to vc	1400-2500	Humboldt & Bonpland (P) - Type	Killip 1938; Hno. Daniel 1968	LC/NT	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora monadelpha Jørgensen & Holm-Nielsen, 1987 nr	and	to vc	2800-3310	Escobar 4859 (HUA)	Holm-Nielsen *et al.* 1988; Hernández 2003	VU/EN	Tr
Passiflora munchiquensis Hernández (ined), 2003 * nr	and	cau vc	1900-3200	Vargas 3909 (HUA)	Hernández 2003; A.Hernández (*pers. com.*).	NT/VU	Tr
Passiflora occidentalis Hernández (ined), 2003 * nr	and pac	cau cho na pu vc	50-1200	Killip 39025 (COL)	Hernández 2003; A.Hernández (*pers. com*).	LC/NT	Tr
Passiflora panamensis Killip, 1922	pac car	ant bl cho cor	0-500	Zarucchi *et al.* 5107 (CHOCO)	Killip 1938	NT	Tr V.N.: Gulupa (ant)
Passiflora pilosissima Killip, 1931 * nr	and	ant vc	1500-2100	Lehmann 7630 (US)	Killip 1938	CR	Tr
Passiflora popayanensis Killip, 1930 *	and	cau	2400-2900	Lozano 6472 (COL)	Killip 1938	VU/EN	Tr
Passiflora punctata L., 1753	and pac	cau cun na vc	20-1750	Romero-C. 3150 (COL)	Croat 1978; Holm-Nielsen *et al.* 1988	LC/NT	Tr
[*Passiflora sandrae* J. MacDougal, 2006]	pac	cho	800-1100	Garwood 1178 (MO) - Type	MacDougal 2006		Tr Collected in the border of Panama and Colombia (cho)
Passiflora tribolophylla Harms, 1922 *	pac	ant cau cho	50-1820	Lehmann 5420 (foto, COL)	Killip 1938; Hno. Daniel 1968	LC/NT	Tr
Passiflora tuberosa Jacq., 1804 nr	and	vc	1200	Cuatrecasas 15930 (VALLE)	Killip 1938	EN	Tr
Passiflora ursina Killip & Cuatrec., 1960	and	ant na vc	2100-3100	Roldán 2345 (HUA)	Killip 1960; Holm-Nielsen *et al.* 1988; Hernández 2003	VU/EN	Tr
Passiflora vespertilio L., 1753	amz and ori	ama met na	150-500	Plowman 2425 (COL)	Holm-Nielsen *et al.* 1988	LC/NT	Tr
Section *Hahniopathanthus*							
Passiflora guatemalensis S. Watson, 1887	and car	ant cl lg ma qu ri to vc	0-1580	Uribe 2532 (COL)	Killip 1938; Ulmer & MacDougal 2004	LC	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora hahnii (Fourn.) Mast., 1872 nr	and car	ant cl lg ma to vc	100-1250	Killip & Hazen 8670 (Y)	Uribe 1955b; Holm-Nielsen 1974; Ulmer & MacDougal 2004	CR	Tr V.N.: Granadilla Abroquelada (ant)
Section *Pseudodysosmia*							
Passiflora adenopoda Moc. & Sessé *ex* DC., 1828	and car	ant by cl cun cau ma qu ri to vc	100-2100	Cuatrecasas 15703 (VALLE)	Holm-Nielsen *et al*. 1988; MacDougal 1994	LC	Tr V.N: Pegajosa (qu), Granadilla Culebra (vc), Gulupo (cun). Edible fruit
Passiflora lobata (Killip) Hutch. *ex* J.M. MacDougal,1986	pac	ant cho	0-1200	Gentry 23791 (COL)	MacDougal 1994; Ulmer & MacDougal 2004	NT	Tr
Passiflora morifolia Mast., 1872	and	na	500-1000	Karsten s.n. (W) n.v.	Killip 1938; MacDougal 1994.	EN	Tr
Section *Pseudogranadilla*							
Passiflora bicornis Mill., 1768	car	ant at bl lg ma	0-500	Saravia 3643 (COL)	Killip1938; Holm-Nielsen 1974	LC	Tr V.N.: Cachito de Venado (bl), Cinco Llagas (at)
Passiflora hirtiflora Jørgensen & Holm-Nielsen, 1987 nr	and	ns	2650	Escobar 3152 (HUA)	Hernández 2003	CR	Tr
Passiflora kalbreyeri Mast., 1883 *	and car	ce ns snt	1100-3100	Killip 20284 (COL)	Killip 1938	LC/NT	Tr
Passiflora menispermacea Triana & Planch., 1873 *	and	to	1400-3000	Cuatrecasas 9247 (MA)	Killip 1938	LC	Tr
Section *Xerogona*							
Passiflora capsularis L., 1753	and car pac	ant cl cun cho hu lg ma na ns qu snt to vc	100-2000	Uribe 2566 (COL)	Killip 1938; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988	LC	Tr
Passiflora costaricensis Killip, 1922	pac	cho	20-1500	Croat 42591 (HUA)	Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988	NT	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora escobariana J.M. MacDougal, 1992	and	ant	1090-1100	MacDougal 3823 (HUA) - Isotype	MacDougal 1992; Ulmer & MacDougal 2004	VU	Tr
Passiflora rubra L., 1753	and car	ant cl cau cun hu lg pu na pu qu ri to vc	500-2000	Garcia-B. 17279 (COL)	Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Chulupa de Monte (cl)
Subgenus *Dysosmia* (DC.) Killip, 1938							
Passiflora foetida var. *eliasii* Killip, 1938	car	at bl ma	0-500	Penell 12029 (N)	Kiliip 1938	VU	Tr V.N.: Flor de la Pasión, Pasionaria (at)
Passiflora foetida var. *gossypiifolia* (Desv.) Mast. 1872	amz and car ori pac	ama ant ara at bl by cau ce cor cq cs cun cho gn gv hu lg ma met na ns qu snt suc to va vc	0-1500	Schultes 22576 (COL)	Killip 1938; Martin & Nakasone 1970; Romero-C. 1991; Ulmer & MacDougal 2004; Ulmer & Ulmer, 2005	LC	Tr V.N.: Granadilla (cho), Flor de la Pasión (at), Gulupo (cun), Bejuco Canastilla (met), Chulupa de Loma (ant hu), Cinco Llagas (cor). I.N.: Iñana-leeg murulale (ama). Edible fruit
Passiflora foetida var. *hispida* (DC.) Killip *ex* Gleason, 1931	and car	ant bl cun ns to	0-1500	Killip & Smith 21000 (N)	Killip 1938; Ulmer & Ulmer, 2005	LC	Tr V.N: flor de la pasión (ma), gulupo (cun)
Passiflora foetida var. *isthmina* Killip, 1938	and pac	na snt vc	0-1200	Killip 5289 (N)	Killip 1938	VU	Tr V.N.: Flor de la Pasión (vc)
Passiflora foetida var. *moritziana* (Planch.) Killip *ex* Pull, 1937	car	ma	0-500	Killip & Smith 21088 (N)	Killip 1938	VU	Tr V.N.: Flor de la Pasión (ma)
Passiflora foetida var. *sanctae-martae* Killip, 1938 * nr	car	ma	0-500	Smith 1532 (P)	Kiliip 1938	EN	Tr Flor de la Pasión (ma)
Passiflora vestita Killip, 1938	amz	pu	0-500	Betancourt 5164 (MO) n.v.	Killip 1938; Holm-Nielsen *et al*. 1988	VU/EN	Tr
***Distephana* (Juss.) Killip, 1938**							
Passiflora coccinea Aubl., 1775	amz ori	ama cs gn gv met na va vch	150-1500	Davidse 5321 (COL)	Escobar 1988a	LC	Tr V.N.: Lluvia Padie, Granadillo de Conga (ama), Granadilla colorada (cs). Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora involucrata (Mast) A.H. Gentry, 1981	amz	ama cq va	150-350	Schultes 6923 (COL)	Escobar 1988a	LC	Tr
Passiflora glandulosa Cav., 1790	amz	va	150-500	Romero-C. 3668 (AAU) n.v.	Killip 1938; Holm-Nielsen 1974	EN	Tr
Passiflora quadriglandulosa Rodschied, 1796	amz	ama gu	150-500	Lozano 604 (COL)	Escobar 1988a; Holm-Nielsen *et al*. 1988	LC/NT	Tr
Passiflora variolata Poepp. & Endl., 1838	amz	ama cq va	150-500	Zarucchi 2197 (COL)	Escobar 1988a	LC/NT	Tr V.N.: Granadilla, Oncilla, Parcha de Culebra de Agua (ama)
Passiflora vitifolia Kunth, 1817	amz and car ori pac	ama ant bl by cau ce cl cho cor cq cun lg gv ma met na pu ri snt to va vc vch	0-1800	Cuatrecasas 15740 (VALLE)	Killip 1938; Romero C. 1956, 1991; Martin & Nakasone 1970; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Chulupo (cq), Granadilla de Monte (cho), Granadillo (met cq), Gulupa (to). I.N.: Maloca de Fisi (ama). Edible fruit
Subgenus *Manicata* (Harms) Escobar, 1988 (Syn. *Granadillastrum*)							
Passiflora manicata (Juss.) Pers., 1807	and	by cau cl cun na ns qu snt to vc	1400-2700	Richter s.n. (COL)	Jussieu 1805; Holm-Nielsen 1974; Escobar 1988a	LC	Tr V.N.: Tacso (na), Curubo de Monte (qu ns).
***Passiflora* (Medik.) Mast., 1871 (Syn. *Granadilla*)**							
Series *Digitatae*							
Passiflora serratodigitata L., 1753	amz and pac	ama cho ns ant	0-1000	Renteria 3542 (COL)	Killip 1938; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988; Romero-C. 1991	LC	Tr V.N.: Cocorilla (cho). Granadilla, Naracujinha (ama). N.I.: Cipo-Cipo Naracujinha (ama).
Series *Laurifoliae*							
Passiflora ambigua Hemsl. *ex* Hook., 1902	amz and ori pac	ant by cl cho cun hu ma met pu snt vc	0-2000	Fuchs 21744 (COL)	Holm-Nielsen *et al*. 1988	LC	Tr Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora gleasonii Killip, 1924	ori	gn	150-500	Madriñán 1014 (COL)	Killip 1938	EN	Tr
Passiflora guazumaefolia Juss., 1805	and car	ce cor bl ma snt	0-500	Uribe 2405 (COL)	Killip 1938; Coppens 2003	LC/NT	Tr V.N: La Parcha (ce), Cocorilla (ma). Edible fruit
Passiflora killipiana Cuatrecasas, 1960 nr	amz	cq	250-500	Schultes 5875 (US)	Killip 1960	CR	Tr
Passiflora laurifolia L., 1753	and amz pac	ama cho cq gv hu met snt va	0-1700	Zarucchi 1824 (COL)	Killip 1938	LC	Tr Edible fruit
Passiflora nitida Kunth, 1817	amz and car ori pac	ama ant cho cq cun cs gn gv ma met na pu va vc	0-1940	Triana 2931 (P)	Killip 1938; Romero-C. 1956, 1991; Holm-Nielsen 1974; García-B. 1975; Croat 1978	LC	Tr V.N.: Granadilla (cho met), Granadilla Babosa (na). N.I.: Burucuña, Gemarundare, Tuchica, Jino-Gojé (va). Edible fruit
[*Passiflora phellos* C. Feuillet, 2004]	amz		90-150	Wurdack & Addeley 43479 (NY) - Holotype	Feuillet 2004		Tr Reported in the Amazon of Brazil, Peru and Venezuela
Passiflora popenovii Killip, 1922 nr	and	cau na vc	1200-2050	Escobar & Escobar 1017 (HUA)	Killip 1938; Holm-Nielsen *et al*. 1988; Romero-C. 1991; Ulmer & MacDougal 2004	EW	Tr V.N: Granadilla de Quijos (na), granadilla caucana, curubejo (cau). Cultivated. Edible fruit
Passiflora riparia Mart. e*x* Mast., 1872	amz	cq pu va	300-400	Smith 3157 (US)	Killip 1960	LC/NT	Tr Edible fruit
Passiflora tolimana Harms, 1894 *	and	ant to vc	820-2000	Echeverry 3627 (TOLI)	Killip 1938	NT/VU	Tr Edible fruit
Series *Incarnatae*							
Passiflora cincinnata Mast., 1868 nr	and	ns	1200	Killip & Smith 20879 (Y)	Killip 1938	CR	Tr Ornamental (qu). Edible fruit
Passiflora edulis f. *edulis* Sims, 1818	amz and pac	ant cl cau cho cun gv met na qu ri snt to vch vc	1100-2750	Idrobo 1637 (COL)	Holm-Nielsen *et al*. 1988; Vanderplank 2000; Ulmer & MacDougal 2004	NE	Tr Introduced from Brazil in the 1950s. V.N: Curuba Redonda (ant cl ri qu), Gulupa (cun). Cultivated or feral. Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora edulis f. *flavicarpa* Degener, 1932 nr	amz and car ori pac	ant ara bl ce cl cho cun gn hu met pu qu snt ri to vc	0-1800	Silvestone 14399 (CUVC)	Killip 1938; Ulmer & MacDougal 2004	NE	Tr Introduced from Brazil in the 50s. V.N.: Maracuyá. Cultivated. Edible fruit
Series *Kermesinae*							
Passiflora lehmanni Mast., 1885 *	amz and	ant cau cl cun hu pu qu ri snt vc	1000-2000	Uribe 2588 (COL)	Killip 1938; Holm-Nielsen 1974	LC	Tr
Passiflora smithii Killip, 1930	and car	cun ma qu snt to vc	500-2000	Killip & Smithii 15015 (MO) - Holotype	Killip 1938; Holm-Nielsen 1974	LC	Tr V.N.: Curuba Silvestre (to).
Passiflora trisulca Mast., 1887 *	and	ant cl vc	1300-1800	Marulanda 91 (HUA)	Killip 1938; Hno. Daniel 1968	NT	Tr
Series *Lobatae*							
Passiflora caerulea L., 1753 nr	and	cl cun qu	1000-2700	Ocampo 83 (VALLE)	Deginani 2001		Tr Introduced from Argentina. Ornamental. Edible fruit
Passiflora gritensis H. Karst., 1859	and	by ns	2450-2500	Cuatrecasas 1808 (COL)	Killip 1938	LC/NT	Tr
[*Passiflora montana* Holm-Nielsen & Lawesson, 1987]	and		2600	Holm-Nielsen *et al.* 6200 (AAU)	Holm-Nielsen *et al.* 1988		Tr Collected on the border of Ecuador and Colombia (na)
Passiflora picturata Ker, 1822 nr	ori	met	450	Uribe 1334 (US)	Killip 1938, 1960	DD	Tr
Passiflora pennellii Killip, 1924 *	and	ant cun	1200-1600	Uribe 4827 (COL)	Killip 1938	NT/VU	Tr
Passiflora resticulata Mast. & André, 1884	amz and pac	cau gv na vc	0-2000	Marulanda & Márquez 1665 (HUA)	Killip 1938; Holm-Nielsen 1974;Holm-Nielsen *et al.* 1988	NT/VU	Tr
Passiflora semiciliosa Planch & Linden, 1873 *	and car	ma ns	1850-3000	Garcia-B. 20749 (COL)	Killip 1938	VU	Tr V.N.: Gulupa, Palcha (ns)
Passiflora subpeltata Ortega, 1798	amz and car ori	ant bl cau ce cor cq cs cun ma suc to vc	0-2400	Ramírez *et al.* 11507 (CAUP)	Killip 1938; Holm-Nielsen 1974	LC	Tr V.N.: Cocorilla (bl)

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Series *Quadrangulares*							
Passiflora alata Curtis, 1788 nr	amz	ama	200	Ocampo 82 (VALLE)	Killip 1938; Ulmer & MacDougal 2004	DD	Tr Introduced (qu vc) from Brazil in the 90s. V.N.: Maracúa. Cutivated. Edible fruit
Passiflora quadrangularis L.,1759	amz and car ori pac	ama ant bl cau cl cho cq cun gn hu ma met na ns qu va ri snt to vc	0-1500	Gentry 15371 (COL)	Killip 1938; Romero-C. 1956, 1991; Holm-Nielsen1974; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Badea (ant cl hu cun met qu ri), corvejo (snt), Granadillo Grande (cau), curuba (vc), Motorro (gn). Cultivated. Edible fruit
Series *Menispermifoliae*							
Passiflora chocoensis G. Gerlach & T. Ulmer, 2000 * nr	pac	cho	0-100	Gerlach 434917 (COL) - Holotype	Gerlach & Ulmer, 2000; Ulmer & MacDougal 2004	CR	Tr
Passiflora menispermifolia Kunth, 1817	amz car and pac	ant bl by cho cor cq cun met na ns snt to vc	0-2140	Cuatrecasas 15541 (VALLE)	Croat 1978; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Chulupe (cq)
Series *Simplicifoliae*							
Passiflora danielii Killip, 1960 *	and	ant	1300-2600	Hno. Daniel 1536 (MEDEL) - Isotype	Killip 1960; Hno. Daniel 1968	VU/EN	Tr
Passiflora longipes Juss., 1805 *	and	cun by qu snt to	2500-3500	Sanchez 17 (COL)	Killip 1938	NT	Tr
Passiflora longipes var. *oxyphylla* L. Uribe, 1977 *	and	by ns snt	2000-2600	Cadena 83 (UIS)	Uribe 1977	NT	Tr
Passiflora oerstedii Mast., 1872	and ori pac	ant cau cho cun cau met na qu ri vc	0-2000	Romero-C. 6141 (COL)	Killip 1938; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988	LC	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Series *Tiliaefoliae*							
Passiflora ligularis f. *lobata* (Mast.) Killip, 1938 nr	and	ant	1800-2000	Archer 1498 (COL)	Killip 1938	NT	Tr V.N: Granadilla. Cultivated. Edible fruit
Passiflora ligularis Juss., 1805	and	ant cl cun cau by cho hu met na ns pu qu ri snt to vc	1550-2500	Dombey 739 (P) - Type	Killip 1938; Romero-C. 1956, 1991; Holm-Nielsen *et al*. 1988	LC	Tr V.N: Granadilla; Granadilla Pipo (na). N.I.: Awapit (na). Cultivated. Edible fruit
Passiflora magnifica L.K. Escobar, 1990 *	and	ant	1250-1750	Callejas 6586 (HUA) n.v.	Escobar 1990; Ulmer & MacDougal 2004	VU	Tr Edible fruit
Passiflora maliformis L., 1753	and car pac	ant by cl cau cun cho hu ma na qu snt to vc	0-2200	Humboldt & Bonpland 1804 (P) - Type	Killip 1938; Romero-C, 1956, 1991; Holm-Nielsen, 1974; García-B. 1975; Holm-Nielsen *et al*. 1988	LC	Tr V.N: Gulupa, Granadilla de Piedra, o de Hueso (cu, na vc), Gurapa (snt), Chulupa (hu). Cultivated. Edible fruit
Passiflora multiformis Jacq., 1809	and car	lg ma ns	0-1300	Romero-C. 8992 (COL)	Killip 1938	NT/VU	Tr V.N: Palchita (ns). Edible fruit
Passiflora palenquensis Holm-Niels. & Lawesson, 1987	pac	ant cau cho na vc	0-1200	Espina & Garcia 1951 (COL)	Holm-Nielsen & Lawesson 1987; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Granadilla (cho), "Camelo" (vc). Cultivated. Edible fruit
Passiflora platyloba Killip, 1922	pac	cho	0-1050	Gentry & Juncosa 40946 (COL)	Gentry 1976	NT/VU	Tr Edible fruit
Passiflora seemannii Griseb., 1858	amz and pac ori	ant by cho cun gn gv met ns snt va vc vch	0-1300	MacDougal 4144 (HUA)	Croat 1978	LC	Tr V.N.: Palcha, Chulupa (met), Granadilla Montañera (cun). Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora serrulata Jacq., 1767	car	at ma lg	0-500	Bunch 601 (FMB)	Killip 1938; Coppens 2003	NT/VU	Tr V.N.: Guayabita Cimarrona (ma). Edible fruit
Passiflora tiliifolia L., 1753	and pac	ant cau cho cl na qu vc to	1100-2500	González 1411 (CAUP)	Killip 1938; Holm-Nielsen 1974; Holm-Nielsen *et al*.1988; Coppens 2003	LC/NT	Tr V.N.: Granadilla, Machimbi (Colombia). Cultivada. Fruto comestible.
Subgenus *Porphyropathanthus* L.K Escobar, 1989							
Passiflora sierrae L.K. Escobar, 1989 *	car	ma	3000-3700	Cuatrecasas 24375 (COL)	Escobar 1989	EN/CR	Tr
Subgenus *Psilanthus* (DC.) Killip, 1938							
Passiflora bicuspidata (H. Karst.) Mast., 1872 *	and	by cun ns snt	2500-3500	Rojas 138 (CDMB)	Uribe 1972; Killip 1978	VU	Tr
Passiflora hyacinthiflora Planch. & Linden, 1873 *	and	by ma ns	2900-3300	Garcia-B. 20700 (COL)	Killip 1938	LC/NT	Tr
Passiflora trinervia (Juss.) Poir., 1811 *	and	cl qu to vc	2500-3700	Cuatrecasas 20241 (VALLE)	Jussieu 1805; Killip 1938	VU	Tr
Subgenus *Rathea* (Karst.) Killip, 1938							
Passiflora andina Killip, 1938 nr	and	na	2800	Karsten (V)	Killip 1938; Holm-Nielsen *et al*.1988	CR	Tr
Passiflora colombiana L.K. Escobar, 1986 *	and	na pu	3000-3600	Mora 6175 (PSO) - Paratype	Escobar 1986, 1988	CR	Tr
Subgenus *Tacsonia* (Juss.) Tr. & Planch, 1873							
Section *Bracteogama*							
Passiflora cumbalensis var. *caucana* L.K. Escobar, 1987 *	and	cau	2300-2800	Tryon 6001 (COL)	Escobar 1987, 1988b	LC	Tr V.N.: Curuba de Monte. Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora cumbalensis var. *cumbalensis* (H. Karst.) Harms,1894	and	na pu	3000-3800	Fernandez 5834 (COL)	Romero-C. 1956; Holm-Nielsen 1974; Escobar 1987, 1988; Holm-Nielsen *et al*. 1988	LC/NT	Tr V.N.: Curuba Roja, Tauso (na). Edible fruit
Passiflora cumbalensis var. *goudotiana* (Triana & Planch.) L.K. Escobar, 1987	and car	ant by cl cq cun hu ma na pu qu ri snt to vc	1800-3300	Uribe 2593 (COL)	Escobar 1987, 1988; Holm-Nielsen *et al*. 1988	LC	Tr V.N.: Curuba bogotana (cun), Curubo mucura, curuba rosada, Tausa (na). Cultivated. Edible fruit
[*Passiflora sanctae-barbarae* Holm-Nielsen & Jørgensen, 1987]	and		2200-2700	Harling & Andersson 12445 (AAU) - Isotype	Holm-Nielsen *et al*. 1988		Tr Reported in the northern Andes of Ecuador
Passiflora tripartita var. *azuayensis* Holm-Nielsen & Jørgensen, 1988 nr	and car	ant by cun ma ns	2000-2610	Escobar 19999 (HUA)	Holm-Nielsen *et al*. 1988	LC/NT	Tr V.N.: Curuba. Edible fruit (by cun)
Passiflora tripartita var. *mollissima* Holm-Nielsen & Jørgensen, 1988	and car	ant by cau cl cun ma na ns pu snt vc	2200-3500	Romero-C 8007 (PSO)	Holm-Nielsen *et al*. 1988; Romero-C. 1991; Ulmer & MacDougal 2004	LC	Tr V.N.: Curuba de Castilla (ant by cu cl); Tauxso (na). Cultivated. Edible fruit
Passiflora tarminiana Coppens & Barney, 2001	and	ant by cau cl cun hu na qu snt to vc	2000-2900	Coppens 72 (COL) - Type	Coppens *et al*. 2001; Campos 2001	LC	Tr V.N.: Curuba India. Cultivated. Edible fruit.
Section *Colombiana*							
Series *Colombianae*							
Passiflora adulterina L.f., 1781 *	and	by cun snt to	2600-3600	Barclay 4517 (COL)	Escobar 1988a	NT	Tr
Passiflora crispolanata L.Uribe, 1954 *	and	by cun	2500-3500	Uribe 6773 (COL)	Uribe 1954; Escobar 1988a	NT	Tr V.N.: Curuba Paramera (cun)
Passiflora cuatrecasasii Killip, 1960 *	and	by cun met snt	2200-3500	Cuatrecasas 9479 (foto, MEDEL)	Killip 1960; Escobar 1988a	VU	Tr

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora formosa T. Ulmer, 1999 *	and	by	3000-3100	Uribe 5945 (COL)	Ulmer 1999	EN	Tr
Passiflora lanata (Juss.) Poir., 1811 *	and	cun by snt to	2200-3500	Uribe 2587 (COL)	Jussieu 1805; Holm-Nielsen 1974; Escobar 1988a	NT/VU	Tr V.N.: Granadilla (cun)
Passiflora pamplonensis Planch.& Linden *ex* Triana & Planch., 1873 *	and	snt	2000-3000	Funck & Schlim 1385 (foto, VALLE)	Escobar 1988a	EN/CR	Tr Curubita de Piñuela (snt)
Passiflora rigidifolia Killip, 1960 * nr	and	ant	3750	Burke 185 (K) - Type	Killip 1960	DD	Tr Known only from the type.
Passiflora rugosa var. *rugosa* (Mast.) Triana & Planch., 1873	and	cun met ns	3000-3500	Peñuela 008 (COL)	Escobar 1988a	LC/NT	Tr
Passiflora rugosa var. *venezolana* L.K. Escobar, 1986	and	ns snt	2500-3500	Garcia-B. 20001 (COL)	Escobar 1988a	LC/NT	Tr
Passiflora trianae Killip, 1938 *	and	ns snt	3000-3500	Escobar 569 (COL)	Escobar 1988a	VU/EN	Tr
Passiflora truxillensis Planch. & Linden, 1873 nr	and	ns	1800-3000	V. Barney & G. Coppens (foto), *pers. com*.	Escobar 1988a; Ulmer & Ulmer 2005	EN	Tr
Series *Leptomischae*							
Passiflora antioquiensis H. Karst., 1859 *	and	ant cau cl cun hu pu qu ri to vc	1800-2700	Escobar 2133 (HUA)	Hno. Daniel 1968; Uribe 1972; Garcia-B. 1975; Escobar 1988a	LC/NT	Tr V.N.: Granadilla (vc), Curuba Antioqueña (ant). Wild or cultivated in home gardens. Edible fruit
Passiflora cremastantha Harms, 1922 *	and	cau	2000-2500	Lehmann 5421 (F) - Type	Escobar 1988a	EX	Tr Known only from the type.
Passiflora flexipes Triana & Planch., 1873 *	and	cl qu ri	2500-3380	Vargas 626 (FAUC)	Escobar 1988a	NT/VU	Tr V.N.: Curuba de Monte (cl qu ri). Edible fruit
Passiflora leptomischa Harms, 1922 *	and	ant cau qu vc	2000-2800	Escobar *et al*. 4421 (PSO)	Escobar 1988a	LC/NT	Tr Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora tenerifensis L.K. Escobar, 1988 *	and	vc	2800-3100	Escobar 4853 (COL)	Escobar 1988a, 1989b; Campos 2001	EN/CR	Tr V.N.: Curuba de Monte (vc). Edible fruit
Series *Quindiensae*							
Passiflora linearistipula L.K. Escobar, 1988 *	and	cl	2650-3170	Ocampo *et al*. 56 (HUA)	Escobar 1988a	EN/CR	Tr Not collected since 1984.
Passiflora quindiensis Killip, 1938 *	and	to	2900-3100	Uribe 3320 (COL)	Escobar 1988; Campos 2001	VU/EN	Tr
Section *Fimbriatistipula*							
Passiflora fimbriatistipula Harms, 1894 *	and	cau hu	2130-3240	Fernandez *et al*. 30182 (AFP)	Escobar 1988a	NT/VU	Tr I.N.: Pachuaca (cau)
Passiflora uribei L.K. Escobar, 1988 *	and	na pu	2500-2700	Escobar *et al*. 2896 (HUA)	Uribe 1958; Escobar 1988a	EN	Tr
Section *Parritana*							
Passiflora jardinensis L.K. Escobar, 1988 *	and	ant	2750-3000	Zarucchi 6963 (COL)	Escobar 1988b	VU/EN	Tr
Passiflora parritae (Mast.) L.H. Bailey, 1916 *	and	cl qu ri to	2500-3020	Sánchez 15 (FAUC)	Escobar 1988a	VU/EN	Tr Curuba de Monte (to). Edible fruit
Section *Poggendorffia*							
Passiflora pinnatistipula Cav., 1799	and	ant by cun na ns	2000-3600	Uribe 6643 (COL)	Escobar 1988b; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988; Campos 2001	LC/NT	Tr V.N.: Curuba Redonda, Gulupa (cun) Cultivated. Edible fruit
Passiflora x *rosea* (H. Karst.) Killip, 1938	and	by cun	2500-3500	Uribe 3941 (COL)	Escobar 1988a	VU	Tr Natural hybrid of *P. pinnatistipula* x *P. tripartita* var. *mollissima*. Edible fruit (when fertile)
Section *Tacsonia*							
Passiflora mixta L. f., 1781	and	ant cl by cau cun na ns qu ri snt to vc	1700-3700	Humboldt & Bonpland (P) - Type	Escobar 1988a; Holm-Nielsen 1974; Holm-Nielsen *et al*. 1988; García-B. 1975	LC	Tr V.N.: Curuba de Monte (vc), Curubo de Páramo (cun), Palchuaca (cau), Curubito de Indio (cl). Edible fruit

Taxon	Biogeographic Region	Geopolitical Distribution	Elevation	Collection for Reference	Bibliographic Reference	IUCN Category	Notes
Passiflora schlimiana Triana & Planch., 1873 *	car	ce lg ma	2400-3220	Romero-C. 7407 (COL)	Holm-Nielsen 1974; Escobar 1988a; Romero-C. 1991; Coppens 2003	VU/EN	Tr V.N.: Curuba. Edible fruit
Section *Tacsoniopsis*							
Passiflora bracteosa Planch. & Linden, 1873	and	ns snt	2200-3000	Garcia-B. 20745 (COL)	Escobar 1988a	EN	Tr V.N.: Palchoaca (ns, snt)
Passiflora purdiei Killip, 1938 *	and	cun ma		Purdie s.n. (K) n.v.	Escobar 1988a	EX	Tr Known only from the type.
Subgenus *Tryphostemmatoides* (Harms) Killip), 1938							
Passiflora tryphostemmatoides Harms, 1894	and	ant cau hu qu ri vc	1000-2700	Lehmann 5662 (K) - Isotype	Killip 1938; Holm-Nielsen *et al.* 1988	NT	Tr
Passiflora gracillima Killip, 1924	and	ant cau cl hu na qu to	2000-3150	Penell 9393 (MO) - Isotype	Killip 1924, 1938	LC	Tr V.N.
Passiflora arbelaezii L. Uribe, 1957	and pac	ant cau cho cun na vc	0-2300	Roldán 1162 (COL)	Uribe 1957	LC/NT	Tr V.N.: Golondrina (cho)
Passiflora pacifica L.K. Escobar, 1988 *	pac	cho na vc	0-1800	Escobar 2143 (HUA)	Escobar 1988b	LC/NT	Tr

Discussion

Colombia has been subject of many studies focused on inventories of plant species groups (Gentry 1993; Silverstone-Sopkin & Ramos 1995; Galeano *et al.* 1998; Rangel 1995, 2002). Passifloraceae have been inventoried in taxonomical works by Escobar (1998a, 1989, 1990 inedited) and Hernández & Bernal (2000). Compared to the latter, we have added new information on geographical distribution of each taxon and extended the list to a total of 167 Passifloraceae species, from three genera and the five biogeographic regions, with reports of 26 species new to Colombia.

For obvious reasons, the quality of botanical inventories depends on the quality of taxonomical work in this complex family. While the definition of genera and subgenera should not significantly affect studies of the distribution of its diversity across the Colombian territory, such work may be affected to some extent by poor definitions below the subgenus level. Indeed, several morphological groups include species that are very similar, and regularly reported as very difficult to distinguish from each other. In several cases, experts may have underestimated intraspecific variation in widely distributed species, or even intra-individual variation, splitting well-known species in several new species only distinguished by a few quantitative or color traits. Among the difficult groups, let us mention particularly subgenus *Astrophea*, whose species tend to be less well differentiated, at least in sterile specimens, by the position and number of the nectar glands, having only two at the junction of the lamina and petiole, while they may show impressive intraspecific variation in pubescence and intra-individual variation in leaf size and shape according to light exposure and whole tree development (heteroblasty). Also in the subgenus *Decaloba* there are several morphological groups that demand great experience and care in their identification, even for the most common species such as *P. capsularis* and *P. rubra*, which can be found in the same habitats. In the most difficult cases, several species have even changed status several times. For instance, Killip

merged *P. bauhinifolia* Kunth. with *P. andreana* Mast. in 1938, and restored it as a distinct species in 1960, while Holm-Nielsen *et al*. (1988) merged *P. bauhinifolia* with another close relative, *P. alnifolia*, a position we have adopted here. A couple of other species, such as *P. mollis* and *P. cuspidifolia* or *P. hahnii* and *P. guatemalensis,* may also show very little morphological difference, but differ in their altitudinal distribution, which confirms they are different. Many new species of subgenus *Distephana* are also questionable, as one of its two most common species, *P. coccinea* Aubl., distributed in most of the Amazon, has been split in several species on the basis of bract size, number of nectar glands, and small variation in numbers and respective colors of the corona series. Concerning Colombia, Vanderplank (2006) underlined that the description of *P. coccinea* by Escobar (1988) matches perfectly that of *P. miniata* Vanderplank, so he considered the latter a Colombian species. However, we have not adhered to this opinion for several reasons: Vanderplank described it on material grown in glasshouse and his report does not refer to the examination of Colombian materials. The type and level of the differentiation described between the various new species and *P. coccinea* is at most of the same order as morphological variation in other common widespread species (e.g. *P. vitifolia*, *P. foetida*, *P. suberosa*, *P. alnifolia*, *P. capsularis*, *P. mixta*, *P. cumbalensis*, *P. maliformis*, or *P. emarginata*). He reported a high level of sexual compatibility with the other common *Distephana* species, *P. vitifolia*, which raises the expectation of sexual compatibility with the even closer "true" *P. coccinea*. Thus we have stuck to the treatment of *P. coccinea* by Escobar (1988), whose quantitative description is more precise than the original by Aublet (1775), but not fundamentally different. Within subgenus *Passiflora*, *P. maliformis*, *P. serrulata* and *P. multiformis* constitute other cases of possible overclassification, as they are mostly differentiated by the degree of lobation of their leaves, a trait that is quite variable in many other species, including other *Tiliifoliae*, such as *P. ligularis* (Killip 1938; *pers. obs*.). A wider problematic group is the series *Laurifoliae*, with ten species in Colombia, always difficult to identify from incomplete specimens. Although they probably constitute a very young group and they exhibit a high number of common traits, species of subgenus *Tacsonia* are relatively easy to differentiate. Particularly interesting are the endemics of Colombian section, from the center of the cordilleras, often characterized by a very long peduncle and linear-lanceolate stipules, and from the northeast and up to the Venezuelan Andes. Several authors have reported easy interspecific hybridization in subgenus *Tacsonia*, involving cultivated, as well as wild materials (Escobar 1985). This phenomenon, by producing spontaneous off-types, may have led to some overclassification in this subgenus. Indeed, of the 30 species reported here for Colombia, five are known only from the type material (*P. cremastantha* Harms, *P. formosa* Ulmer, *P. pamplonensis* Planch.& Linden *ex* Triana & Planch., *P. purdiei* Killip, *P. rigidifolia* Killip) are known only from the type material. Whether this is due to high endemism, ancient extinction, or off-types resulting from hybridization cannot be ascertained, unless a second specimen is recorded, as we did for *P. linearistipula*. It is important to note that *P. formosa* was described as a new species from the same specimen considered an off-type of *P. lanata* (Juss.) by Escobar (1988). Overclassification may be suspected even in better known species, as *P. parritae* (Mast.) Bailey, and *P. jardinensis* L.K. Escobar. Indeed, in populations of the former, we have observed sufficient morphological variation to include the few known specimens of the latter species, which might simply represent a small isolated population. On the other hand, most endemics of subgenus *Tacsonia* were found in difficult to access highlands, and more species can be described from relatively poorly explored areas such as the South of Tolima, Santander and Norte de Santander departments.

Our list ranks Colombia as the country with the highest richness of Passifloraceae, followed by Brazil with 127 species. Figure 4 allows comparisons for species richness and relative diversity of passion flowers in the Neotropics, showing the strong influence of latitude (typical of a tropical distribution) and topography on *Passiflora* diversity**.** Colombian species richness and diversity is more than twice that of Peru and Venezuela, two countries of similar surface and latitude. Given its much smaller area, Ecuador also presents an impressive diversity. Thus, the northern Andes of Colombia and Ecuador clearly constitute the center of diversity for the genus *Passiflora*. This is probably due to the greater availability of habitats, especially at high elevations, in these two countries. The presence of three Andean cordilleras in Colombia very probably played a significant role. Indeed, radiation has been very active in the northern Andes, with particular contribution of recent and fast evolving groups, such as subgenera *Rathea* and *Tacsonia*, accounting for more than 41 highland species in Colombia and Ecuador. Among them, 21 (14%) species are endemic to Colombia. Colombian highlands are also rich in representatives of subgenus *Decaloba*.

According to Escobar (1988a), 40% of the New World Passifloraceae are found in the Andes. In Colombia, habitats between 1000 and 3000 m account for only 27% of the land area, yet 81% of the species of Passifloraceae grow there. With 123 species, the Andean region concen-

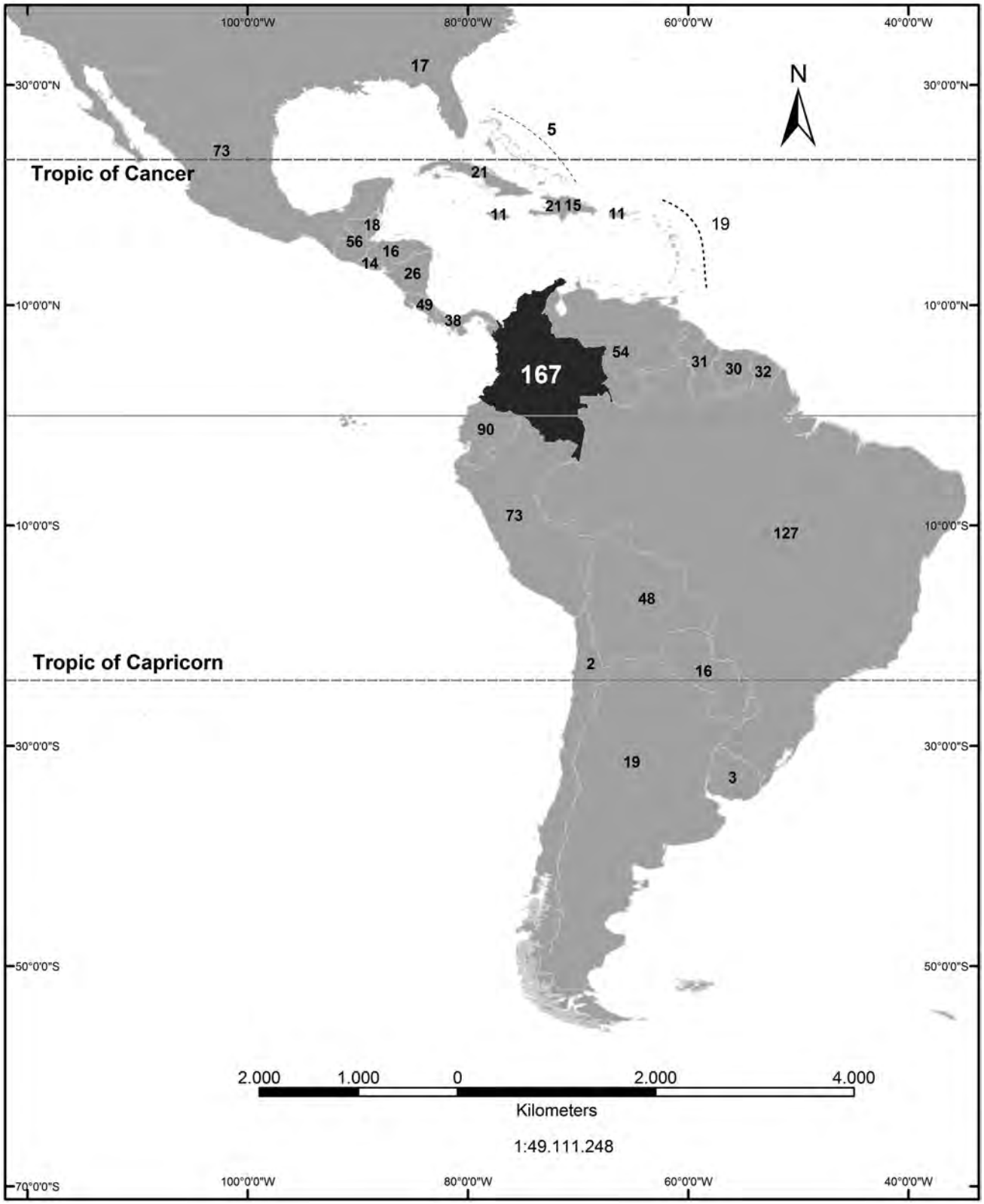


Figure 4. Distribution of species richness of Passifloraceae in American countries, according to information gathered from Killip (1938, 1960), Escobar (1988, 1989, 1990 inedited, 1994), Holm-Nielsen *et al*. (1988), Jørgensen & León (1999), MacDougal (1994), Vanderplank (2000), Deginiani (2001), Tillet (2003), Ulmer & MacDougal (2004), records of the herbaria cited in this study and many journal articles related with the description of new species present in the America.

trates the highest richness, mainly between 1000 and 2000 m. The Caribbean region shares the highest proportion of species (27) with the Andean region (Box 1). This is mostly due to the presence of the Sierra Nevada de Santa Marta mountain range in northern Colombia, with a steep gradient of elevation from the Caribbean Sea to 5775m summits. The increase of species richness and endemism with the elevation is generally interpreted as a result of the increasing isolation and decreasing habitat surface in high mountain regions, leading to small, fragmented populations which are prone to speciation (Simpson 1975; Jørgensen *et al*. 1995).

Another contribution to the particular species richness in Colombia and Ecuador is that of the Pacific Coast region, which continues down from the similar highly diverse ecosystems of Central America (Chocó-Darién/Western Ecuador hotspot of Myers *et al*. 2000). In strong contrast with the conditions prevailing in the westerns Andes and the Peruvian coast that are arid or semi-arid, or the drier and more contrasted climate of Venezuela, this area receives one of the highest precipitation rates in the world. The composition of the Passifloraceae species of this region appears both diverse and well-differentiated when compared to that of the other biogeographic regions (Figure 2). This is not surprising, considering that the Choco region is recognized as one of the most diverse biotas in the world, with nearly 40% endemism (Gentry 1986).

Until recently, the genera *Dilkea* and *Ancistrothyrsus* were only known as originating from the Amazon basin; however, Escobar's description of *A. antioquiensis* (1990 ined.) in the Andes and the observation of *Dilkea retusa* in the Andes and Pacific regions extend their distribution to other important biota.

The distribution of Passifloraceae has been drastically affected by deforestation, principally in the Andean region. Its historical range corresponds to a region with a long history of livestock and agriculture that now supports extensive coffee, sugar cane, rice, banana, and potato plantations. According to our field observations, very common species, such as *P. adenopoda*, *P. alnifolia*, *P. capsularis*, *P. coriaceae*, *P. rubra*, *P. suberosa*, and *P. mixta*, are mostly species that thrive in secondary forests or disturbed old-growth forests. Human disturbances may even have contributed to the extention of their distribution, as reported with other plants (Svenning 1998).

According to Myers *et al*. (2000) and Robbirt *et al*. (2006), rarity and endemism represent two factors of particular significance in the consideration of the risk of decline and extinction. In this context, most Colombian Passifloraceae (70.6%) are under some degree of threat according to IUCN criteria. Only 29.4% (48 species) fall in the 'least concern' category (**LC**), which clearly illustrates the alarming situation for the family (Figure 3). Our results are consistent with a first Red List of Colombian Plants published by the von Humboldt Institute (Calderón 2005), based on the 141 species listed by Hernández & Bernal (2000), with similar percentages for each category. However, this list only includes *P. colombiana* L.K Escobar under the category of critically endangered species (**CR**), while ours places 16 species in this category. A second list, recently published by Hernández & García (2006), includes two different species, *P. cremastantha* and *P. pamplonensis*, in this category. Despite several attempts by Escobar and ourselves, the former species, collected before 1922, is only known from the type specimen. Escobar (1988) was followed in considering its probable extinction. Moreover, the list of Hernández & García (2006) gives much lower numbers for the other threat categories, placing as few as 25 species in the threat categories (including two species in the NT category) and 119 species in the Least Concern one. These numbers are far from likely for a group which (i) exhibits its highest diversity in the highly disturbed central coffee growing zone and (ii) includes 58 endemics. The general discrepancy is probably due the fact that our extensive inventory and direct field observations allowed us to take into account both the number of records and existing populations, as well as the date of the last record for each species, evidencing their dramatic reduction over the recent period.

Exploration for Passifloraceae was not possible in the protected areas of Colombia that are of essential importance for the conservation of the country's biodiversity, as the Colombian Ministry of the Environment (MMA) denied us permission to access. Another limiting factor of research for conservation purposes is the armed conflict prevailing in many parts of the country (Martin & Szuter 1999; Dévalos 2001).

Forests in the northern Andes are currently one of the major conservation priorities on a global scale due to their fragility, biological richness, high rates of endemism and multiple anthropogenic threats (Olson & Dinerstein 1998). As Passifloraceae display very high species richness, endemism and risk of extinction in this area; and given their multiple ecological interactions with many organisms, as well as their economic potential, this family should constitute both an important conservation target, as well as a good indicator of the success of the efforts made.

Conclusions

With 167 reported species, Colombia is the country with the highest Passifloraceae richness. This richness is concentrated in the Andean region, particularly in the departments of Antioquia, Valle del Cauca and Cundinamarca. Comparing data with other countries confirms that the northern Andes of Colombia and Ecuador constitute the center of diversity for the most important genus, *Passiflora*. The limited number of explorations in parts of the Andes, the Amazonian and the Orinoquean regions raises expectations that Colombia may harbor many, as yet, unknown species. Future studies should encompass new regions, including protected areas and areas of conflict. Indeed, more information about the species' diversity and its distribution is urgently required for the *in situ* conservation of, both, species and habitat. Both aspects may even be combined if the genus *Passiflora* can be used as an indicator of biodiversity in the Andean region, as was the objective of a project in the coffee growing area. Another important aspect is its direct valorization as a germplasm resource for crop diversification programs, implying the need for a better understanding of its morphological and genetic diversity.

Acknowledgements

The authors wish to thank the herbaria that provided specimens or collection data, particularly Francisco J. Roldán (HUA) and Alexandra Hernández (COL), as well as Colciencias, the Colombian Ministry of the Environment (MMA) and the Research Center of the Colombian Coffee Grower Federation (Cenicafé) for funding the collection missions. The first author gratefully acknowledges financial support from the Gines-Mera Fellowship Foundation (CIAT-CBN). We are indebted also to José O. Velasquez (Casa Mutis, Mariquita), Hernando Criollo (U.Nariño), Mauricio Villegas (Cenicafé), Vicky Barney (Bioversity International), Alvinxon Castro (U.Chocó), Robinson Galindo (PNN Catatumbo), Carolina Alcazar (Proselva) and Gustavo Morales (J.B. José Celestino Mutis) for assistance in obtaining plant data for this study. We are extremely grateful to Colombian farmers contacted in the fieldwork for their continuous help and availability in localizing a great part of the observed plant material.

Literature cited

Apple J., D. Feener. (2001). Ant visitation of extrafloral nectaries of *Passiflora*: the effects of nectary attributes and ant behavior on patterns in facultative ant-plant mutualisms. *Oecologia* 127(3): 409-416.

Aublet F. (1775). *Histoire des plantes de la Guiane française*. *Paris : P.F. Didot,* 2: 828-324.

Brooks T. M., R.A. Mittermier., C.G. Mittermier., G.A.B. da Fonseca., A.B. Rylands., W.R. Konstant., P. Flick., J. Pilgrim., S. Oldfield., G. Magin., C. Hilton-Tyalor. (2002). Habitat loss and extinction in hotspot of biodiversity. *Conservation Biology* 16: 909-923.

Büchert A., J. Mogens. (2001). The fragility of extreme specialization: *Passiflora mixta* and its pollinating hummingbird *Ensifera ensifera*. *Journal of Tropical Ecology* 17: 323-329.

Cavanilles A.J. (1790). Monadelphia classis dissertation decen. Diss. 10: Decemia dissertatio botânica de Passiflora. Typographia regia, Madrid: 439-463.

Calderón E. (2005). Familia Passifloraceae. Programa de biología de la conservación, proyecto flora amenazada. Instituto Alexander von Humboldt. http://www.humboldt.org/ListasRojas/PASSIFLORACAE. Cited 3 abril de 2005.

Campos T. (2001). La Curuba: Su cultivo. Bogotá, Colombia, IICA. 30pp.

Coppens d'Eeckenbrugge G., V. Barney, P.M. Jørgensen, J.M. MacDougal. (2001). *Passiflora tarminiana*, a new cultivated species of *Passiflora* subgenus *Tacsonia* (*Passifloraceae*). *Novon* 11: 8-15.

Coppens d'Eeckenbrugge G. (2003). Promesas de las pasifloras. Memorias del X Seminario Nacional y IV Internacional sobre Especies Promisorias, Medellín Octubre 29-31 de 2003. CD.

Croat T. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford. 943pp.

De Candolle A.P. (1828). Mémoires de la Société de Physique et d'Histoire Naturelle de Geneve 1 : 434-436.

Deginani N.B. (2001). Las especies argentinas del género *Passiflora* (Passifloraceae). *Darwiniana* 39: 43-129.

Dévalos L.M. (2001). The San Lucas mountain range in Colombia: how much conservation is owed to

the violence?. *Biodiversity and Conservation* 10: 69-78.

Dharwan K., S. Dharwan, A. Sharma. (2004). *Passiflora*: a review update. *Journal Ethno-Pharmacology* 94: 1-23.

Endress P.K. (1994). Diversity and evolutionary biology of tropical flowers. Cambridge, England: Cambridge University Press.

Escobar L.K. (1985). Biología reproductive de *Passiflora manicata* e hibridación con la curuba *Passiflora mollissima* (H.B.K.) Bailey. *Actualidades Biológicas*. 14 (54): 111-121.

Escobar L.K. (1986). New species and varieties of *Passiflora* (*Passifloraceae*) from the Andes of South America. *Systematic Botany* 11(1): 88-97.

Escobar L.K. (1987). A taxonomic revision of the varieties of *Passiflora cumbalensis* (*Passifloraceae*). *Systematic Botany* 12 (2): 238-250.

Escobar L.K. (1988a). *Passifloraceae*. Flora de Colombia 10. Instituto de Ciencias Naturales, Universidad Nacional de Colombia, 138pp.

Escobar L.K. (1988b). Novedades en *Passiflora* (Passifloraceae) de Colombia *Mutisia* 71:1-8.

Escobar L.K. (1989). A new subgenus and five new species in *Passiflora* (*Passifloraceae*) from South America. *Annals of the Missouri Botanical Garden* 76: 877-885.

Escobar L.K. (1990). Two new species of *Passiflora* (*Passifloraceae*) from northern South America. *Phytologia* 69 (5): 364-365.

Escobar L.K. (1990, inédito). Una revisión taxonómica de *Passiflora* subg. *Astrophea* (*Passifloraceae*). 289 pp.

Escobar L.K. (1994). Two new species and a key to *Passiflora* subg. *Astrophea*. *Systematic Botany* 19 (2): 203-210.

Feuillet C. (2004). *Passiflora phellos*, a new species in subgenus *Passiflora* (*Passifloraceae*). *Novon* 14: 285-287.

Feuillet C., J.M. MacDougal. (2002). Checklist of recognized species names of passion flowers. *Passiflora* 12 (2) : 41-43.

Feuillet C., J.M. MacDougal. (2003). A new infrageneric classification of *Passiflora* L. (Passifloraceae). *Passiflora* 13 (2): 34-38.

Galeano G., S. Suarez., H. Balslev. (1998). Vascular plant species count in a wet forest in the Chocó area on the Pacific coast of Colombia. *Biodiversity and Conservation* 7: 1563-1572.

García-Barriga H. (1975). Flora medicinal de Colombia. Tomo II, Instituto de Ciencias Naturales, Universidad Nacional – Bogotá, D.E. Colombia. 253-264.

Gelach G., T. Ulmer. (2000). Una nueva especie de *Passiflora*, subgénero *Passiflora* (Passifloraceae) del oeste de Colombia. *Caldasia* 22 (2): 231-235.

Gentry A.H. (1976). Additional Panamanian *Passifloraceae*. *Annals of the Missouri Botanical Garden* 63: 341-345.

Gentry A.H. (1986). Species richness and floristic composition of Choco´ Region plant communities. *Caldasia* 15: 71–75.

Gentry A.H. (1992). New species of woody plants from Amazonian Peru. *Novon* 2(4): 333-338.

Gentry A.H. (1993). "Riqueza de especies y composición florística." In: P. LEYVA (Ed.). *Colombia Pacífico*, Vol. 1. Fondo Protección del Medio Ambiente José Celestino Mutis, Publicaciones Financiera Eléctrica Nacional (FEN), Bogotá.

Gilbert L.E. (1982). The evolution of a butterfly and a vine, *Heliconious* butterflies. *Scientific American* 247: 110-121.

Hansen A.K., G. Lawrence., B.B. Simpson., S.R. Downie., R. Stephen., A.C. Cervi., R. K. Jansen. (2006). Phylogenetic relationships and chromosome number evolution in *Passiflora*. *Systematic Botany* 31(1): 138-150.

Harms, H. (1925). Passifloraceae. In: Engler A, ed. *Die Natürlichen Pflanzenfamilien*. Leipzig: Wilhelm Engelmann. 470-507.

Hernández J., A. Hurtado, R. Ortiz, T. Walschburger. (1991). Unidades Biogeográficas de Colombia En: Hernández J., R. Ortiz, T. Walshburger, A. Hurtado (Eds.) Estado de la Biodiversidad en Colombia Informe Final Santafé de Bogotá, Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología "Francisco José de Caldas" - Conciencias.

Hernández A. (2003). Revisión taxonómica de *Passiflora*, subgénero *Decaloba* (*Passifloraceae*) en Colombia. Tesis, Facultad de Ciencias, Departamento de Biología, Universidad Nacional de Colombia sede Bogotá. 138pp.

Hernández A., R. Bernal. (2000). Lista de especies de

Passifloraceae de Colombia. *Biota Colombiana* 1(3): 320-335.

Hernández A., N. García (2006). Las pasifloras (familia Passifloraceae). En: Libro rojo de plantas de Colombia. Las bromelias, las labiadas y las pasifloras. Garcia N., and Galeano G. (eds.). Volumen 3: 553-663.

Hijmans R.J., M. Schreuder, M. De la Cruz, E. Rojas. (2001). Computer tools for spatial analysis of plant genetic resources data: DIVA-GIS. *Plant Genetic Resources Newsletter* 27: 15-19.

Hno. Daniel (J. González Patiño) (1968). Curiosidades de una flor y de una familia botánica (La Flor de la Pasión). Boletín del Instituto de la Salle, Bogotá. 208: 261-270.

Holm-Nielsen L.B. (1974). Notes on central Andean Passifloraceae. *Botaniska Notiser* 127:338-351.

Holm-Nielsen L.B., P. M. Jørgensen., J.E. Lawesson. (1988). *Passifloraceae*. In: Harling & L. Andersson (eds.), Flora del Ecuador 31: 124pp.

IUCN (2003). Guidelines for application of IUCN Red List criteria at regional levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN (2004). Guidelines for using the IUCN Red List categories and criteria. Standards and petitions subcommittee of the IUCN SSC Red List programme committee. IUCN, Gland, Switzerland and Cambridge, U.K.

Jørgensen P.M., J.E. Lawesson., L.B. Holm-Nielsen. (1984). A guide to collecting passion flowers. *Annals of the Missouri Botanical Garden* 71(4): 1172-1174.

Jørgensen P.M., C. Ulloa., J.E. Madsen., R. Valencia. (1995). A floristic analysis of the high Andes of Ecuador. Churchill, S. P., H. Balslev, E. Forero & J. L. Luteyn (eds.). *Biodiversity and Conservation of Neotropical Montane Forests*, Proceedings of the Neotropical Montane Forest Biodiversity and Conservation Symposium, The New York Botanical Garden, Bronx, NY: 221-237.

Jørgensen P.M., S. León-Yánez. (1999). Catalogue of the vascular plants of Ecuador. Monograph Systematic Botanic. *Missouri Botanical Garden* 75: i–viii, 1–1182.

Jussieu A.L. de. (1805). Second Mémoire sur la famille des Passiflorées, et particulièrement sur quelques espèces nouvelles du genre *Tacsonia*. Annales du Muséum d'Histoire Naturelle 6: 388- 396.

Killip E.P., W.F. Meggers, D.F. Hewett. (1924). New species of *Passiflora* from Tropical America. *Journal of the Washington Academy of Sciences* 14 (5): 108-112.

Killip E.P. (1930). Ten new species of *Passiflora*, mainly from Colombia and Peru. *Journal of the Washington Academy of Sciences* 20 (15): 374-381.

Killip E.P. (1938). The American Species of *Passifloraceae* Field Museum of Natural History Publication, Botanical Series 19 (1, 2): 1-613.

Killip, E.P. (1960). Supplemental notes to the American species of *Passiflora* with descriptions of new species. Contributions from the U.S. National Herbarium 35: 2 (Tomo I).

Lemarck J.B. Monenet de. (1789). Encyclopédie Méthodique, Botanique 3(1). Paris: Panckoucke.

Linneaus C. (1753). *Species Plantarum*. Vol. 2. Stockholm: L. Salvius.

MacDougal J.M. (1992). New species of *Passiflora* subg. *Plectostemma* (*Passifloaceae*). *Novon* 2(4): 358-367.

MacDougal J.M. (1994). Revision of *Passiflora* section *Decaloba*, *Pseudodysosmia* (*Passifloraceae*). *Systematic Botany Monographs* 14: 146pp.

MacDougal J.M. (2006). *Passiflora sandrae* (Passifloraceae), a new species from Panama. *Novon* 16: 85-88.

MacNeely J.A., K.R. Miller., N.A. Reid., R.A. Mittemer., T.B. Wainer. (1990). Conserving the world's biological diversity World Conservation Union, World Resources Institute, World Wildlife Fund – U.S. World Bank, Washigton, D.C.

Martin F.W., H.Y. Nakasone. (1970). The edible species of *Passiflora*. *Economic Botany* 24 (3): 333-343.

Martin P.S., C.R. Szuter. (1999). War zones and game sinks in Lewis and Clark's West. *Conservation Biology* 13: 36-45.

Master M.T. (1872). Passifloraceae. In *Flora Brasiliensis* 13 (1). Ed. K. Mrtius and A. Eichler. 529-628.

May R.M. (1992). "How many species inhabit the Earth?" *Scientific American* 267(4): 18-24.

Maxted N., Mabuza-Dlamini P., Moss H., Padulosi S.,

Jarvis A., Guarino L., (2004) African Vigna : An Ecogeographic Study, IPGRI, Rome, Italy.

Muschner V.C., A.P. Lorenz., A.C. Cervi., S.L. Boniato., T.T. Souza-Chies., F.M. Salzano., L.B. Freitas. (2003). A first molecular phylogenetic analysis of *Passiflora* (*Passifloraceae*). *American Journal of Botany* 90 (8): 1229-1238.

Myers J.E. (2000). The biodiversity challenge: Expanded hot spots analysis. *The Environmentalist* 10: 243-256.

Olson D.M. E. Dinerstein. (1998). "The Global 200: A representation approach to conserving the earth's most biologically valuable ecoregions." *Conservation Biology* 12: 502–515.

Pérez E. (1956). Plantas útiles de Colombia. Tercera redacción muy corregida y aumentada, con XLV laminas en negro, otras en color y 752 figuras en el texto. Librería Colombiana – Camacho Roldán (Cia, Ltda.) – Bogotá. 611- 614.

Plukenet, L. (1696). Almagestum botanicum sive Phytographiæ Pluckenetianae onomasticon methodo syntheticâ digestum, exhibens stirpium exoticarum, rariorum, novarumque nomina, quæ descriptionis locum supplere possunt. Selbstverlag, London.

Porter-Utley K.E. (2003). Revision of Passiflora subgenus *Decaloba* Supersection *Cieca* (Passifloraceae). Thesis Ph.D. Florida of University. 444p.

Radhamani T.R., L. Sudarshana., R. Krishnan. (1995). Defence and carnivory: dual roles of bracts in *Passiflora foetida* L. *Journal of Biosciences* 20: 657-664.

Rangel J.O. (1995). La diversidad florística en el espacio andino de Colombia. En S.P. Churchill *et al.*, eds. Churchill, S. P., H. Balslev, E. Forero & J. L. Luteyn (eds.). 1995. *Biodiversity and Conservation of Neotropical Montane Forests*, Proceedings of the Neotropical Montane Forest Biodiversity and Conservation Symposium, The New York Botanical Garden, Bronx, NY: 187-205.

Rangel J.O. (2002). El estado actual del conocimiento de la flora de Colombia. Pág. 570 en: Rangel J.O., J. Aguirre-C & M.G. Andrade-C. (eds), Libro de resúmenes octavo congreso latinoamericano y segundo Colombiano de botánica Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá.

Robbirt K.M., D.L. Roberts., J.A. Hawkins. (2006). Comparing IUCN and probabilistic assessments of threat: do IUCN red list criteria conflate rarity and threat?. *Biodiversity and Conservation* 15: 1903-1912.

Roemer, M.J. (1846). *Familiarum naturalium regni vegetabilis synopses monographicae*. Landes-Industrie-Comptoir, Weimar.

Romero-C.R. (1956). Plantas de valor comercial del género *Passiflora*: Granadilla, curuba, badea, y otras. *Agricultura Tropical* 12 (6): 403-407.

Romero-C.R. (1991). Frutas silvestres de Colombia. Segunda edición actualizada, Volumen con 207 ilustraciones. Instituto Colombiano de Cultura Hispánica. 423-429 p.

Segura S., G. Coppens d'Eeckenbrugge., L. López., M. Grum., L. Guarino. (2003). Mapping the potential distribution of five species of *Passiflora* in Andean countries. *Genetic Resources and Crop Evolution* 50: 555-566.

Silverstone-Sopkin P.A., J.E. Ramos-Pérez. (1995). Floristic exploration and phytogeography of the cerro del Torrá, Chocó, Colombia. Biodiversity of Conservation of Neotropical Montane Forests: 169-86. I*n* Biodiversity and Conservation of Neotropical Montane Forests, Proceedings of a Symposium, New York Botanical Garden, 21-26 June 1993 (S.P. Churchill, H. Balslev, E. Forero and J.L. Luteyn, eds.). New York Botanical Garden, New York.

Simpson B. (1975). Pleistocene changes in the flora of high tropical Andes. *Paleobiology* 1:273-294.

Svenning J.C. (1998). The effect of land-use on the local distribution of palm species in an Andean rain forest fragment in northwestern Ecuador. *Biodiversity and Conservation* **7**: 1529–1537.

Tillet S. (2003). Passifloraceae. In: *Flora of the Venezuelan Guayana* Volume 7: *Myrtaceae-Plumbaginaceae* by Julian A. Steyermark, Paul E. Berry, Kay Yatskievych, and Bruce K. Holtz (eds.): 625-667.

Triana, M., J.E. Planchon. (1873). *Passifloraeae*. *Annales des Sciences Naturelles* 17: 121-186.

Ulmer T. (1999). *Passiflora formosa* sp. nov., a hitherto misunderstood taxon in *Passiflora* subgenus *Tacsonia* (Passifloraceae) from Colombia. *Edinburgh Journal of Botany* 56 (2): 195-198.

Ulmer T., J.M. MacDougal (2004). *Passiflora*: Passionflowers of the world. Timber Press, Inc. 430pp.

UNEP-WCMC. (2004). World Conservation Monitoring Centre of the United Nations Environment

Programme. Species Data (unpublished, September 2004). Web site at: http://www.unep-wcmc.org. Cambridge, England: UNEP-WCMC.

Uribe L. (1954). Dos nuevas *Passifloraceae* colombianas. *Mutisia* 21: 1-5.

Uribe L. (1955a). Pasifloráceas y Begoniáceas de la Real Expedición Botánica del Nuevo Reino de Granada. Ediciones Cultura Hispánica. Madrid 26:1-98.

Uribe L. (1955b). Sertula Florae Colombiana 2. *Caldasia* 7(32):159-165.

Uribe L. (1957). Una nueva e interesante *Passiflora* de Colombia. *Caldasia* 7(35):335-338.

Uribe L. (1958). Sertula Florae Colombiae 4. *Caldasia* 8 (37):127-130.

Uribe L. (1972). Catalogo ilustrado de las plantas de Cundinamarca: *Passifloraceae*, *Begoniaceae*, *Melastomataceae*. Instituto de Ciencias Naturales, Facultad de Ciencias, Universidad Nacional. (5): 11-41.

Uribe L. (1977). Sertula Florae Colombiae 14. *Caldasia* 12 (56): 13-18.

Vanderplank J. (2000). Passion Flowers. 3nd ed. The MIT Press. Cambridge, Massachusetts. 224 pp.

Vanderplank J. (2006). *Passiflora miniata*: Passifloraceae. *Curtis's Botanical Magazine 23* (3): 223-230.

World Press Review. (1993). Colombia's vanishing forests, World Press Review, June 1993, Vol. 40 (6): 43pp.

Yockteng R., S. Nadot. (2004). Phylogenetic relationships among *Passiflora* species based on the glutamine synthetase nuclear gene expressed in chloroplast (ncpGS). *Molecular Phylogenetics and Evolution* 31: 379-396.

Appendix 1. Synonymy = valid name

Cieca auriculata M. Roemer, 1846 = *Passiflora auriculata* Kunth, 1817

Cieca coriacea (Juss) M. Roemer, 1846 = *Pasiflora coriacea* Juss., 1805

Cieca discolor M. Roemer, 1846 = *Passiflora misera* Kunth., 1817

Cieca pallida (L.) M. Roemer, 1846 = *Passiflora pallida* L., 1753

Decaloba alnifolia M. Roemer, 1846 = *Pasiflora alnifolia* Kunth, 1817

Decaloba biflora (Lam.) M. Roemer., 1846 = *Pasiflora biflora* Lam., 1789

Decaloba bogotensis (Benth.) M. Roemer, 1846 = *Passiflora bogotensis* Benth., 1845

Decaloba cuneata M. Roemer., 1846 = *Passiflora cuneata* Willd., 1809

Decaloba filipes M. Roemer, 1846 = *Pasiflora filipes* Benth, 1843

Decaloba holosericea M. Roemer, 1846 = *Passiflora holosericea* L., 1753

Decaloba jacquini M. Roemer, 1846 = *Passiflora pulchella* Kunth, 1817

Dilkea johannesii var. *parvifolia* Hoehne, 1915 = *Dilkea johannesii* Barb.Rodr., 1885

Dilkea acuminata Mast., 1871 = *Dilkea retusa* Mast., 1871

Dilkea magnifica Steyerm., 1968 = *Dilkea retusa* Mast., 1871

Dilkea wallisii Mast., 1872 = *Dilkea retusa* Mast., 1871

Disemma hahnii E. Fourn., 1869 = *Passiflora hahnii* Mast., 1872

Disemma hahnii Fourn., 1869 = *Passiflora hahnii* (Fourn.) Mast., 1872

Distephana cuneata M. Roemer, 1846 = *Passiflora bicuspidata* (H.Karst.) Mast., 1872

Distephana spinosa (Poeep. & Endl.) M. Roemer, 1835 = *Passiflora spinosa* (Poepp. & Ende.) Mast., 1871

Granadilla rubra Moench, 1802 = *Passiflora rubra* L., 1753

Grandilla vespertilio Moench, 1802 = *Passiflora vespertilio* L., 1753

Passiflora erubescens Triana & Planch., 1873 = *Passiflora erytrophylla* Mast., 1872

Passiflora velata Mast., 1872 = *Passiflora serrulata* Jacq., 1767

Passiflora williamsii Killip, 1922 = *Passiflora platyloba* var. *williamsii* (Killip) A.H. Gentry, 1976

Passiflora adenophylla Mast., 1872 = *Passiflora subpeltata* Ortega, 1798

Passiflora alba Link & Otto, 1798 = *Passiflora subpeltata* Ortega, 1798

Passiflora albicans L. Uribe, 1958 = *Passiflora uribei* L. K. Escobar, 1988

Passiflora angustifolia Swartz, 1788 = *Passiflora suberosa* L., 1753

Passiflora appendiculata G.F.W. Mey., 1818 = *Pasiflora auriculata* Kunth, 1817

Passiflora bauhinifolia Kunth, 1817 = *Passiflora alnifolia* Kunth, 1817

Passiflora bifurca Mast., 1873 = *Passiflora cuneata* Willd., 1809

Passiflora bilobata Vell., 1827 = *Passiflora rubra* L., 1735

Passiflora boyacana Killip, 1960 = *Passiflora crispolanata* L. Uribe, 1954

Passiflora capsularis var. *geminifolia* DC., 1828 = *Passiflora sexflora* Juss., 1805

Passiflora caucaense Holm-Niels., 1974 = *Passiflora emarginata* Humb. & Bonpl., 1813

Passiflora chilensis Miers, 1826 = *Passiflora pinnatistipula* Cav., 1799

Passiflora cisnana Harms, 1894 = *Passiflora rubra* L., 1753

Passiflora corumbaensis Barb., 1898 = *Passiflora cincinnata* Mast., 1868

Passiflora cualiflora Harms, 1906 = *Passiflora citrifolia* (Juss.) Mast., 1871

Passiflora difformis Kunth, 1817 = *Passiflora coriaceae* Juss., 1805

Passiflora digitata L., 1763 = *Passiflora serratodigitata* L., 1753

Passiflora elegans Triana & Planch., 1873 = *Passiflora quindiensis* Killip, 1938

Passiflora emiliae Sacco, 1966 = *Passiflora ambigua* Hemsl. *ex* Hook., 1902

Passiflora eminula Mast., 1883 = *Passiflora costata* Mast., 1872

Passiflora eriocaula Harms, 1922 = *Passiflora rugosa* (Mast.) Triana & Planch.var. *rugosa,*1873

Passiflora erosa Rusby, 1907 = *Passiflora morifolia* Mast., 1872

Passiflora erosa Rusby, 1906 = *Passiflora morifolia* Mast., 1872

Passiflora fulgens Wallis *ex* Morren, 1866 = *Passiflora coccinea* Aubl., 1775

Passiflora gigantifolia Harms, 1894 = *Passiflora macrophylla* Spruce *ex* Mast., 1883

Passiflora glauca Humb. & Bonpl., 1813 = *Passiflora arborea* Spreng., 1826

Passiflora goudotiana Triana & Planch., 1873 = *Passiflora cumbalensis* (H. Karst.) Harms var. *goudotiana* (Triana & Planch.) L. K. Escobar, 1987

Passiflora heydei Killip, 1922 = *Passiflora morifolia* Mast., 1872

Passiflora hydrophila Barb Rodr., 1891 = *Passiflora costata* Mast., 1872

Passiflora incana Seemann *ex* Mast., 1883 = *Passiflora seemanni* Griseb., 1858

Passiflora inundata Ducke, 1925 = *Passiflora costata* Mast., 1872

Passiflora laticualis Killip, 1924 = *Passiflora misera* Kunth., 1817

Passiflora longipes var. *retusa* Triana & Planch., 1873 = *Passiflora longipes* Juss., 1805

Passiflora lorifera Mast. & André, 1883 = *Passiflora macrophylla* Spruce *ex* Mast., 1883

Passiflora lunata J.E. Smith., 1790 = *Passiflora biflora* Lam., 1879

Passiflora macrocaropa Mast., 1869 = *Passiflora quadrangularis* l., 1759

Passiflora micrantha Killip, 1938 = *Passiflora erythrophylla* Mast., 1872

Passiflora miraflorensis Killip, 1924 = *Passiflora sexflora* Juss., 1805

Passiflora mollis var. *integrifolia* Planch. *ex* Mast., 1872 = *Passiflora cuspidifolia* Harms, 1893

Passiflora nympheoides Karst., 1859 = *Passiflora nitida* Kunth, 1817

Passiflora oblongifolia Pulle, 1906 = *Passiflora laurifolia* L., 1753

Passiflora ocanensis Planch. & Linden, 1873 = *Passiflora lindeniana* Planch. *ex* Triana & Planch., 1873

Passiflora ornata Kunth, 1817 = *Passiflora maliformis* L., 1753

Passiflora pala Planch. & Linden, 1873 = *Passiflora bogotensis* Benth., 1845

Passiflora paraguayensis Chad., 1899 = *Passiflora capsularis* L., 1753

Passiflora pennipes Sm., 1819 = *Passiflora pinnatistipula* Cav., 1799

Passiflora praeacuta Mast., 1887 = *Passiflora oerstedii* Mast., 1872

Passiflora pubera Planch. & Linden, 1873 = *Passiflora sphaerocarpa* Triana & Planch., 1873

Passiflora pulchella Kunth,1817 = *Passiflora bicornis* Mill., 1768

Passiflora quadriglandulosa var. *involucrata* (Mast.) Killip, 1938 = *Passiflora involucrata* (Mast.) A.H. Gentry, 1981

Passiflora reticulata Sauv., 1873 = *Passiflora holosericea* L.,1753

Passiflora salmonea Harms, 1894 = *Passiflora parritae* (Mast.) Bailey, 1916

Passiflora sanguinea J.E. Smithi, 1819 = *Passiflora vitifolia* Kunth, 1817

Passiflora schultzei Harms, 1929 = *Passiflora arborea* Spreng., 1826

Passiflora spherocarpa var. *pilosula* Mast., 1883 = *Passiflora pubera* Planch. & Linden, 1873

Passiflora stipulata Aubl., 1858 = *Passiflora subpeltata* Ortega, 1798

Passiflora suberosa var. *pallida* (L.) Mast. = *Passiflora pallida* L., 1753

Passiflora tomentosa Lam. var. *mollissima* Triana & Planch., 1873 = *Passiflora mollissima* (Kunth) L.H. Bailey, 1916

Passiflora trisecta Planch. & Linden *ex* Triana & Planch., 1873 = *Passiflora trianae* Killip, 1938

Passiflora Van-Volxemii Triana & Planch., 1893 = *Passiflora antioquienesis* Karst., 1859

Passiflora var. *cuellensis* Goudot *ex* Triana & Planch., 1873 = *Passiflora menispermifolia* Kunth, 1817

Passiflora vesicaria L., 1753 = *Passiflora foetida* L., 1753

Passiflora vitifolia var. *involucrata* Mast., 1872 = *Passiflora involucrata* (Mast.) A.H. Gentry, 1981

Passiflora weberiana André, 1885 = *Passiflora morifolia* Mast., 1872

Passiiflora acerifolia Schlecht. & Cham., 1830 = *Passiflora adenopoda* Moc. & Sessé *ex* DC., 1828

Rathea floribunda Karst., 1859 = *Passiflora andina* Killip, 1938

Tacsonia adulterina Juss., 1805 = *Passiflora adulterina* L. f., 1781

Tacsonia bicuspidata H. Karst., 1859 = *Passiflora bicuspidata* (H. Karst.) Mast., 1872

Tacsonia cumbalensis H. Karst., 1859 = *Passiflora cumbalensis* var. *cumbalensis* (H. Karst.) Harms, 1894

Tacsonia cuneata Benth, 1845 = *Passiflora bicuspidata* (H. Karst.) Mast.,1872

Tacsonia flexipes (Triana & Planch) Mast., 1883 = *Passiflora flexipes* Triana & Planch., 1873

Tacsonia glandulosa Juss., 1805 = *Passiflora glandulosa* Cav.,1790

Tacsonia infundibularis Mast., 1883 = *Passiflora bracteosa* Planch. & Linden, 1873

Tacsonia lanata Juss., 1811= *Passiflora lanata* (Juss.) Poir., 1811

Tacsonia mixta (L.f.) Juss., 1805 = *Passiflora mixta* L.f., 1781

Tacsonia mollissima Kunth var. *glabrescens* Mast.,1872 = *Passiflora mollissima* (Kunth) L.H. Bailey, 1916

Tacsonia mollissima Kunth, 1817 = *Passiflora mollissima* (Kunth) L.H. Bailey, 1916

Tacsonia parritae Mast., 1882 = *Passiflora parritae* (Mast.) L.H. Bailey, 1916

Tacsonia pinnatistipula var. *pennipes* (Sm.) DC., 1828 = *Passiflora pinnatistipula* Cav., 1799

Tacsonia pinnatistipula (Cav.) Juss., 1805 = *Passiflora pinnatistipula* Cav.,1799

Tacsonia quadriglandulosa (Rodschied) DC., 1828 = *Passiflora quadriglandulosa* Rodschied, 1796

Tacsonia rosea (H. Karst.) Sodiro, 1903 = *Passiflora* x *rosea (*H. Karst.) Killip, 1938

Tacsonia rugosa Mast., 1872 = *Passiflora rugosa* (Mast.) Triana & Planch, 1873 var. *rugosa*

Tacsonia spinescens Klotsch in Schomb., 1848 = *Passiflora securiclata* Mast., 1893

Tacsonia spinosa Poepp. & Endl., 1835 = *Passiflora spinosa* (Poepp. & Ende.) Mast., 1871

Tacsonia trinervia Juss., 1805 = *Passiflora trinervia* (Juss.) Poir., 1811

Tetrastylis lobata Killip, 1926 = *Passiflora lobata* (Killip) Hutch. *ex* J.M. MacDougal, 1986

Appendix 2. Total number of Passifloraceae present in Colombia.

Number of observations, Maximum distance (MaxD) and Circular area (CA) for each species. Endemic species are highlighted by an asterisk (*). RC: species rare for Colombia; Roc: species rare in other countries; Rne: rare narrow endemic, Ne: narrow endemic; Re: rare endemic; Ce: common endemic.

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Ancistrothyrsus antioquiensis L.K. Escobar (ined.)*	2	41	11,762	RC	Rne (Antioquia)
Ancistrothyrsus tessmannii Harms	1	0	7,814	RC / Roc	
Dilkea johannesii Barb. Rodr.	1	0	7,814	RC / Roc	
Dilkea parviflora Killip	22	1,185	40,688		
Dilkea retusa Mast.	5	952	106,159	RC	
Passiflora adenopoda Moc. & Sessé *ex* DC.	51	383	82,65		
Passiflora adulterina L.f. *	43	234	39,072		Ce
Passiflora alnifolia Kunth	121	1,244	170,761		
Passiflora alata Curtis	1	0	7,814	RC	
Passiflora ambigua Hemsl. *ex* Hook.	48	929	137,261		
Passiflora andina Killip	1	0	7,814	RC /Roc	Colombia and Ecuador
Passiflora andreana Mast.	3	45	12,214	RC	
Passiflora antioquiensis H. Karst. *	55	667	99,064		Ce
Passiflora apoda Harms	43	678	83,615		
Passiflora arbelaezii L. Uribe	48	746	113,491		
Passiflora arborea Spreng.	67	1,204	144,115		
Passiflora auriculata Kunth	128	1,635	334,952		
Passiflora azeroana L. Uribe *	10	574	34,734		Ce
Passiflora bicornis Mill., 1768	11	675	52,098		
Passiflora bicuspidata (H. Karst.) Mast. *	16	438	61,674		Ce
Passiflora biflora Lam.	40	1,326	122,047		
Passiflora bogotensis Benth. *	56	1,057	89,25		Ce
Passiflora bracteosa Planch. & Linden	7	122	23,18	RC /Roc	Colombia and Venezuela

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora bucaramangensis Killip *	8	70	15,032	RC	Ne (Santander)
Passiflora callistema L.K. Escobar *	1	0	7,814	RC	Rne (Bolivar)
Passiflora candollei Tr. & Planch.	4	854	26,294	RC	
Passiflora capsularis L.	64	1,437	159,962		
Passiflora chelidonea Mast.	18	1,024	94,209		
Passiflora chocoensis G. Gerlach & T. Ulmer *	1	0	7,814	RC	Rne (Choco)
Passiflora cincinnata Mast.	1	0	7,814	RC	
Passiflora citrifolia (Juss.) Mast.	3	68	14,049	RC	
Passiflora coccinea Aubl.	21	1,285	107,128		
Passiflora colombiana L.K. Escobar *	2	42	11,91	RC	Rne
Passiflora coriacea Juss.	59	741	136,372		
Passiflora costaricensis Killip	1	0	7,814	RC	
Passiflora cremastantha Harms *	1	0	7,814	RC	Rne (Cauca)
Passiflora crispolanata L.Uribe *	11	246	29,72		Ce
Passiflora cuatrecasasii Killip *	9	181	21,312		Ne
Passiflora cumbalensis (Karst.) Harms	156	1,196	199,941		
Passiflora cuneata Willd.	9	877	50,607		
Passiflora cuspidifolia Harms, 1893	33	812	86,64		
Passiflora danielii Killip *	5	180	20,59	RC	Rne (Antioquia)
Passiflora dawei Killip *	4	208	23,702	RC	Rne
Passiflora emarginata Humb. & Bonpl.*	46	654	78,393		Ce
Passiflora engleriana Harms *	2	110	8,902	RC	Rne (Antioquia)
Passiflora erytrophylla Mast. *	6	225	27,643		Ne
Passiflora escobariana J.M. MacDougal	2	3	8,136	RC	
Passiflora filipes Benth.	3	48	13,227	RC / Roc	México to Ecuador
Passiflora fimbriatistipula Harms *	18	198	33,664		Ne
Passiflora flexipes Triana & Planch. *	24	322	36,121		Ce

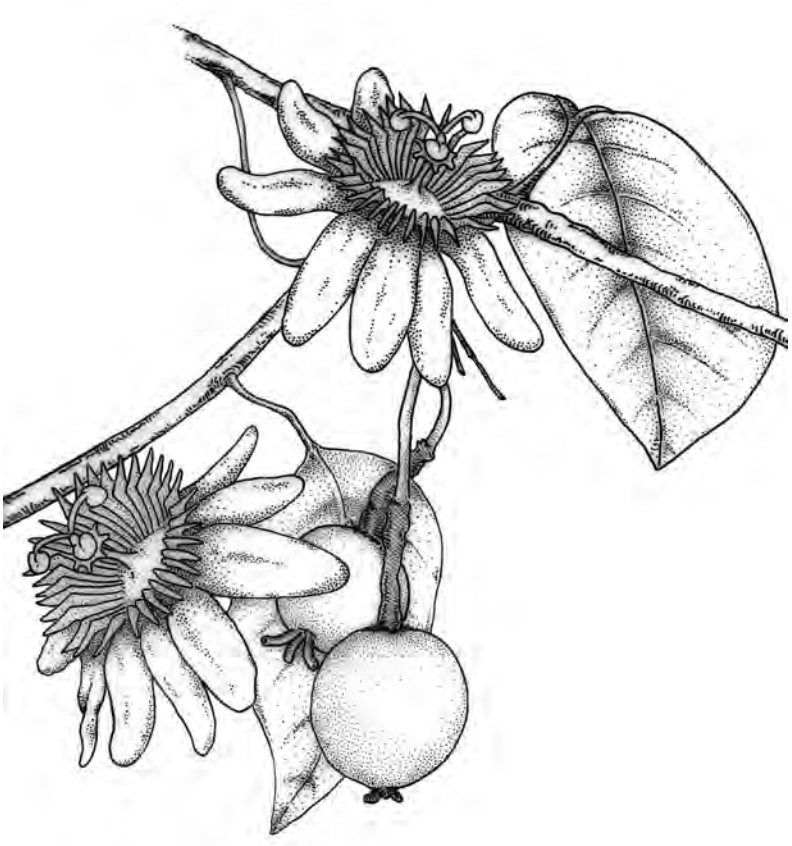
Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora foetida L.	143	1,83	420,44		
Passiflora formosa T. Ulmer *	1	0	7,814	RC	Rne (Boyacá)
Passiflora glandulosa Cav.	1	0	7,814	RC	
Passiflora gleasonii Killip	2	3	8,075	RC	
Passiflora gracillima Killip	29	684	74,546		
Passiflora grandis Killip *	2	14	9,161	RC	Rne
Passiflora gritensis H. Karst.	8	346	26,115		
Passiflora guatemalensis S. Watson	11	971	59,505		
Passiflora guazumaefolia Juss.	8	349	41,192		
Passiflora hahnii (Fourn.) Mast.	1	0	7,814	RC	
Passiflora haughtii Killip *	1	0	7,814	RC	Rne (Santander)
Passiflora hirtiflora Jorgensen & Holm-Nielsen	1	0	7,814	RC	
Passiflora holosericea L.	7	238	25,632		
Passiflora holtii Killip	1	0	7,814	RC / Roc	
Passiflora hyacinthiflora Planch. & Linden *	3	305	17,746	RC	Re
Passiflora involucrata (Mast) A.H. Gentry	8	1,197	48,827		
Passiflora jardinensis L.K. Escobar *	8	35	11,335	RC	Ne (Antioquia)
Passiflora kalbreyeri Mast. *	19	426	41,237		Ce
Passiflora killipiana Cuatrecasas	1	0	7,814	RC / Roc	Colombia to Peru
Passiflora lanata (Juss.) Poir. *	32	284	45,476		Ce
Passiflora laurifolia L.	11	1,35	84,672		
Passiflora lehmanni Mast. *	17	805	91,156		Ce
Passiflora leptomischa Harms *	21	449	46,331		Ce
Passiflora ligularis Juss.	101	914	170,123		
Passiflora lindeniana Planch. *ex* Triana & Planch.	2	395	15,628	RC / Roc	Colombia and Venezuela
Passiflora linearistipula L.K. Escobar *	4	8	8,695	RC	Rne (Caldas)

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora lobata (Killip) Hutch. *ex* J.M. MacDougal	3	194	23,115	RC	
Passiflora longipes Juss. *	21	334	45,557		Ce
Passiflora lyra Planch. & Lind. *ex* Killip	4	69	14,716	RC / Roc	
Passiflora macrophylla Spruce *ex* Mast.	20	716	90,432		
Passiflora magdalenae Triana & Planch. *	21	129	31,127		Ne
Passiflora magnifica L.K. Escobar*	6	33	12,215	RC	Ne (Antioquia)
Passiflora maliformis L.	122	1,208	212,27		
Passiflora manicata (Juss.) Pers.	62	889	114,036		
Passiflora mariquitensis Mutis *ex* Uribe *	3	10	8,436	RC	Rne (Tolima)
Passiflora megacoriacea Porter-Utley (ined.)	1	0	7,814	RC	
Passiflora menispermacea Triana & Planch. *	2	18	9,61	RC	Rne (Tolima)
Passiflora menispermifolia Kunth	43	1,41	167,659		
Passiflora micropetala Mast.	11	1,318	68,015		
Passiflora misera Kunth	54	1,148	145,398		
Passiflora mixta L. f.	162	966	191,787		
Passiflora mollis Kunth	17	554	208,941		
Passiflora monadelpha Jorgensen & Holm-Nielsen	7	67	33,665	RC / Roc	Colombia and Ecuador
Passiflora morifolia Mast.	1	0	7,814	RC	
Passiflora multiformis Jacq.	4	147	17,652	RC	
Passiflora munchiquensis Hernandez (ined.)*	4	200	22,441	RC	Rne
Passiflora mutisii Killip *	1	0	7,814	RC	Rne (Tolima)
Passiflora nitida Kunth	72	1,452	279,511		
Passiflora occidentalis Hernandez (ined.)*	10	474	42,35		Ce
Passiflora oerstedii Mast.	41	728	148,975		
Passiflora pacifica L.K. Escobar *	9	510	39,585		Ce
Passiflora palenquensis Holm-Niels. & Lawesson	20	1,181	100,769		
Passiflora pamplonensis Planch.& Linden *ex* Tr. & Planch. *	1	0	7,814	RC	Rne (N. de Santander)

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora pallida L.	6	898	50,078		
Passiflora panamensis Killip	15	295	41,614		
Passiflora parritae (Mast.) L.H. Bailey *	14	100	20,357	RC	Ne
Passiflora pennellii Killip *	6	313	24,413		Ce
Passiflora phaeocaula Killip	5	498	28,305	RC / Roc	
Passiflora picturata Ker	1	0	7,814	RC	
Passiflora pilosissima Killip *	2	270	15,628		Re
Passiflora pinnatistipula Cav.	21	750	57,114		
Passiflora pittieri Mast.	1	0	12,661	RC	
Passiflora platyloba Killip	4	201	16,471	RC	
Passiflora popayanensis Killip *	6	64	15,078	RC	Ne (Cauca)
Passiflora popenovii Killip	17	636	31,075		
Passiflora punctata L.	8	592	40,022		
Passiflora purdiei Killip *	1	0	7,814	RC	Rne
Passiflora putumayensis Killip	1	0	7,814	RC / Roc	
Passiflora pyrrhantha Harms	1	0	7,814	RC / Roc	
Passiflora quadrangularis L.	112	1,676	314,317		
Passiflora quadriglandulosa Rodschied	4	414	21,256	RC	
Passiflora quindiensis Killip *	8	225	24,711		Ne (Tolima)
Passiflora resticulata Mast. & André	4	414	18,938		
Passiflora rigidifolia Killip *	1	0	7,814	RC	Rne (Antioquia)
Passiflora riparia Mart. *ex* Mast.	3	716	23,442	RC	
Passiflora rubra L.	90	1,351	117,934		
Passiflora rugosa (Mast.) Triana & Planch	12	421	35,549		
Passiflora schlimiana Triana & Planch. *	7	181	27,852	Roc	Ne
Passiflora securiclata Mast.	4	849	30,708	RC / Roc	Colombia and Venezuela
Passiflora seemannii Griseb.	40	1,341	129,777		

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora semiciliosa Planch & Linden *	4	578	26,175	RC	Re
Passiflora serratodigitata L.	18	1,566	67,105		
Passiflora serrulata Jacq.	10	331	29,354		
Passiflora sexflora Juss.	14	353	43,143		
Passiflora sierrae L.K. Escobar *	2	46	12,194	RC	Rne (Magdalena)
Passiflora skiantha Huber	1	0	7,814	RC / Roc	Colombia and Peru
Passiflora smithii Killip	28	827	72,555		
Passiflora sodiroi Harms	1	0	7,814	RC / Roc	Colombia and Ecuador
Passiflora sphaerocarpa Triana & Planch. *	35	878	96,244		Ce
Passiflora spicata Mast.	1	0	7,814	RC / Roc	Colombia and Brazil
Passiflora spinosa (Poepp. & Endl.) Mast.	20	1,521	118,197		
Passiflora suberosa L.	66	1,497	158,86		
Passiflora subpeltata Ortega	35	1,344	89,527		
Passiflora tarminiana Coppens & Barney	28	832	103,373		
Passiflora tenerifensis L.K. Escobar *	4	71	15,195	RC	Rne (Valle del Cauca)
Passiflora tica Gómez-Laur. & L.D. Gómez	5	319	23,119	RC	
Passiflora tiliifolia L.	48	1,01	97,205		
Passiflora tolimana Harms *	12	426	33,711		Ce
Passiflora trianae Killip *	2	39	11,594	RC	Rne
Passiflora tribolophylla Harms *	1	0	7,814	RC	Rne
Passiflora tricuspis Mast.	1	0	7,814	RC	
Passiflora trinervia (Juss.) Poir.*	27	220	36,932		Ne
Passiflora tripartita (Juss.) Poir.	56	1,21	145,398		
Passiflora trisulca Mast. *	8	441	25,258		Ce
Passiflora truxillensis Planch. & Linden *ex* Triana & Planch.	1	0	15,628	RC / Roc	Colombia and Venezuela
Passiflora tryphostemmatoides Harms	25	557	77,831		
Passiflora tuberosa Jacq.	1	0	7,814	RC	

Species	Nb. observ.	MaxD (km)	CA (km2)	Rare species	Endemics and distribution
Passiflora uribei L.K. Escobar *	3	54	12,96	RC	Rne
Passiflora ursina Killip & Cuatrec.	2	7	8,503	RC / Roc	Colombia and Ecuador
Passiflora variolata Poepp. & Endl.	6	412	27,059		
Passiflora venosa Rusby	1	0	7,814	RC / Roc	
Passiflora vespertilio L.	3	292	20,887	RC	
Passiflora vestita Killip	1	0	7,814	RC / Roc	Colombia and Ecuador
Passiflora vitifolia Kunth	359	1,729	456,229		
Passiflora x *rosea* (H. Karst.) Killip	7	161	20,988		



P. emarginata

Recibido: 18/01/2007
Aceptado: 13/03/2007

Biota Colombiana 8 (1) 47 - 51, 2007

Pseudoescorpiones de Colombia (Arachnida: Pseudoscorpiones): lista actualizada de especies

Alejandra Ceballos[1] y Eduardo Florez D.[2]

1 Cátedra de Diversidad Animal I, Facultad de Ciencias Exactas Físicas y Naturales, Córdoba, Argentina. *cebalel@com.uncor.edu*
2 Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota, *aeflorezd@unal.edu.co*

Palabras clave: Pseudoescorpiones, arácnidos, lista de especies, Colombia

Introducción

Los pseudoescorpiones son arácnidos terrestres cuyos fósiles más antiguos se remontan al Devónico, su morfología y adaptaciones al medio no han sufrido grandes cambios en el transcurso de los diferentes períodos geológicos (Judson, 1998 y 2000). Habitan mayormente en los trópicos y subtrópicos del mundo, llegando hasta zonas cercanas a los polos (Weygoldt, 1969) e incluso pueden encontrarse en zonas desérticas con altas temperaturas (Judson, 1994). Son organismos de hábitos depredadores y se los suele hallar agrupados o en forma aislada, bajo la corteza de troncos, ramas, hojarasca, bajo piedras, sobre musgo, en suelo, nidos de aves y madrigueras de mamíferos, etc. Dado su pequeño tamaño (entre 1 y 10 mm) y sus hábitos crípticos, no son observados con facilidad; su cuerpo y coloración están adaptados a sus microhábitats, siendo deprimido dorsoventralmente con coloraciones castaño amarillento, rojizo y hasta negros. Presentan sexos separados, la transferencia espermática es indirecta mediante espermatóforos, son ovovivíparos y presentan tres estadíos postembrionarios antes de llegar a adultos (Weygolgt, 1969).

El orden Pseudoscorpiones en la actualidad se agrupa en 25 familias (Harvey, 2002; Judson, 2005), que contienen 437 géneros y 3336 especies (Harvey, com pers). La pseudoescorpiofauna mundial ha sido sintetizada en el "Catalogue of the Pseudoscorpionida" Harvey (1991); la clasificación de este orden fue objeto de una profunda revisión, proponiendo Harvey (1992), un nuevo ordenamiento basado en un análisis cladístico de las relaciones filogenéticas dentro del mismo. Shultz (1990) y Wheeler & Hayashi (1998) han concluído, en base a estudios cladísticos que tanto los pseudoscorpiones como los solífugos, conforman un clado, basándose en sinapomorfías de sus extremidades y piezas bucales. En cambio, Alberti & Peretti (2002) no los consideran grupos hermanos después de recientes estudios de la ultraestructura del sistema genital masculino y del esperma.

El conocimiento del grupo dista aún bastante de alcanzar a cubrir la fauna de las diferentes regiones del mundo, siendo éste escaso y fragmentario para el territorio de América del Sur, requiriéndose de un urgente esfuerzo de revisión taxonómica (Mahnert & Adis, 2002). Según Mahnert (1994), quién ha realizado numerosos aportes sobre esta fauna en Sudamérica, las colecciones existentes en diversas Instituciones de la región contienen en general nuevos taxa.

La fauna de pseudoescorpiones de Colombia ha sido pobremente estudiada, y las especies registradas para el país corresponden a descripciones efectuadas por autores foráneos, la mayoría de las cuales fueron realizadas hace más de un siglo, conteniendo muchas de ellas imprecisiones en la citación de localidades. Florez & Sánchez (1995) efectuaron un listado preliminar basado en registros de la literatura, consignando nueve especies distribuidas en nueve géneros y seis familias.

En la actual contribución se presenta un listado de las especies registradas a la fecha, consignando las distribuciones geográficas disponibles. Como resultado de ello se obtuvieron 23 especies de pseudoescorpiones, pertenecientes a 18 géneros y seis familias.

Sin embargo, se debe considerar que esta cifra se encuentra subvalorada en relación con el número de especies que deben existir en los bosques colombianos, si se tiene en

cuenta los altos valores de diversidad biótica existentes en Colombia; esto se percibe, a partir del material indeterminado que reposa en las colecciones zoológicas colombianas.

Las particularidades anteriormente anotadas demandan entonces de urgentes esfuerzos encaminados al estudio de la diversidad de este particular grupo de artrópodos en Colombia.

Pseudoscorpions (Arachnida: Pseudoscorpiones) from Colombia: checklist of species

Alejandra Ceballos and Eduardo Florez D.

Keywords: *Pseudoscorpions, arachnids, list of species, Colombia*

Introduction

Pseudoscorpions are terrestrial arachnids whose oldest fossil records date back to the Devonian period. Their morphology and adaptation to the environment has not altered significantly since then (Judson, l998, 2000). They are primarily distributed in the tropical and subtropical areas of the world, but they can also be found near the poles (Weygoldt, l969), and in desert areas with very high temperatures (Judson, l994). They are predators, and can usually be found grouped together or isolated under tree bark, branches, litter, under stones, on moss, in soil, in the nests of birds and mammals, etc. Due to their small size (between l and 10mm) and their cryptic habits it is not easy to observe them; their bodies and colorations are adapted to their microhabitats: They are depressed dorsiventrally with yellowish brown, reddish, and even black colorations. They have separated sexes, showing indirect spermatic transference; they are ovoviviparous and present three postembryonic stages before adulthood (Weygoldt, l969).

The Pseudoscorpions order is currently grouped into 25 families (Harvey, 2002; Judson, 2005)), which contain 437 genera and 3336 species (Harvey, pers. comm.). The world pseudoscorpion fauna has been synthesized in the "Pseudoscorpionida Catalogue" Harvey (l99l), and the classification of this order was subject to thorough revision. Harvey (1992) proposed a new arrangement based on a cladistic analysis of phylogenetics relationships inside itself. Shultz (l990) and Wheeler & Hayashi (1998), concluded according to Cladistic studies that pseudoscorpions as well as solifugids form a clado based on synapomorphies of their appendages and oral plates. After studying the species' sperm ultrastructure and masculine genital system, Alberti & Peretti (2002) now consider them sister groups.

Information about this group is still fragmented and scarce for the South American territory, and, therefore, not enough to cover fauna in different regions of the world; thus a revisional taxonomy study is urgently needed (Manhert & Adis, 2002). According to Mahnert (1994), who has made several contrubutions to the available records of this fauna in South America, current collections in institutions in this region contain new taxa.

The Pseudoscorpion fauna has not been widely studied in Colombia and the known species in the country were recorded by foreign authors over a century ago, although they were not recorded fully or precisely in as far as the names of the areas in which they were found. Florez & Sànchez (1995) published a preliminary list based on literature records, establishing nine species distributed in nine genera and six families.

The present contribution shows an updated list of registered species listing available geographical distributions. As a result, 23 pseudoscorpions species belonging to l8 genera and six families were recorded.

Nevertheless, the number of records is unsatisfactory considering the number of species housed in the Colombian forests and taking into account Colombian biodiversity. The above reasons undoubtedly illustrate the urgent need for the study of this particular group of arthropods in Colombia.

Listado taxonómico / *Taxonomic list*

Acrónimos / *Acronyms*:
BMNH: Natural History Museum of London, England
CAS: California Academy of Sciences, San Francisco, U.S.A., incorporating the J.C. Chamberlin collection
FSCA: Florida State Collection of Arthropods, Gainesville, U.S.A.
NCIVA: Instituto Vallecaucano de Investigaciones Científicas, Cali, Colombia.
NHMW: Naturhistorisches Museum, Wien, Austria.
ZMB: Zoologisches Museum aus Berlin, Germany.

Taxon / *Taxon*	**Región / *Region***	**Departamentos / *Departments***	**Distribución / *Distribution***	**Referencias / *References***	**Colección de referencia / *Collection of reference***	**Observaciones / *Observations***
Atemnidae						
Paratemnoides minor (Balzan, 1892)			ar, br, co, ec, gu, me, pn, pe, vn	Harvey, 1991		
Paratemnoides sp.	and	vc	co		INCIVA	Det: V. Mahnert
Chernetidae						
Cordylochernes scorpioides (Linnaeus, 1758)	and	cau	Neotropical	Harvey, 1991,		
Dasychernes inquilinus Chamberlin, 1929	car	mag	co	Harvey, 1991 Muchmore, 1993	JCC	
Gomphochernes communis (Balzan, 1888)			ar, br, co, rep dom, ec, me, pr, pe, isla san vicent, trinidad, ur, vn	Harvey, 1991		
Incachernes brevipilosus (Ellingsen, 1910)	central		co	Harvey, 1991	ZMB	
Lustrochernes argentinus (Thorell, 1877)	pac	vc	ar, br, co, ec, pr, pe, vn	Harvey, 1991,	ICN-UN	
Parachernes (*Parachernes*) *albomaculatus* (Balzan, 1899)			br, co, vn	Harvey, 1991, Aguiar and Bührnheim, 1998 a y b		
Parachernes (*Parachernes*) *crassimanus* (Balzan, 1887)			ar, br, co, ec, pr, pe, vn	Harvey, 1991		
Parachernes (*Parachernes*) *pallidus* Beier, 1959	and	cun	co	Harvey, 1991	CAS NHMW	
Parazaona ellingsenii (With, 1908)	and	cun	co	Harvey, 1991, Muchmore, 1993	BMNH	
Pseudopilanus sp.	and	vc	co		INCIVA	Det: V. Mahnert

Taxon / *Taxon*	Región / *Region*	Departamentos / *Departments*	Distribución / *Distribution*	Referencias / *References*	Colección de referencia / *Collection of reference*	Observaciones / *Observations*
Garypidae						
Garypus viridans Banks, 1909	car	ma	co	Harvey, 1991, Muchmore 1991		
Olpiidae						
Amblyolpium ortonedae (Ellingsen, 1902)			br, co, ec	Harvey, 1991		
Apolpium cordimanum (Balzan, 1892)			co, ve	Harvey, 1991		
Apolpium vastum Beier, 1959			co	Harvey, 1991,	CAS NHMW	
Pachyolpium granulatum Beier, 1954			co, pe, ve	Harvey, 1991	NHMW	
Syarinidae						
Ideobisium peckorum Muchmore, 1982	ama	amz	br, co	Harvey, 1991, Mahnert & Adis, 2002	FSCA	
Ideoblothrus colombiae Muchmore, 1982	car (iv)	ma	co	Harvey, 1991	FSCA	
Ideoblothrus kochalkai Muchmore, 1982	car (iv)	ma	co	Harvey, 1991	FSCA	
Withiidae						
Parawithius nobilis (With, 1908)	and		co	Muchmore, 1993, Harvey, 2004	CAS BMNH	
Victorwithius venezuelanus (Beier, 1932 b)			ar, br, co, ec, vn	Harvey, 1991, Harvey, 2004	CAS NHMW BMNH	
Cystowithius colombicus Harvey, 2004	and		co	Harvey, 2004	NHMW	

Agradecimientos / *Acknowledgments*

Al Dr. Mark S. Harvey, Department of Terrestrial Invertebrates, Western Australian Museum, por su valioso aporte respecto a número actual de especies y datos sobre las colecciones**,** como así también los enriquecedores comentarios de los revisores de este trabajo

Thanks to Dr. Mark S. Harvey, Department of Terrestrial Invertebrates, Western Australian Museum, for his valuable help regarding the actual species number and collections information, as well as the comments from the reviewers.

Literatura citada / *Literature cited*

Aguiar, N.O. & P.F. Bührnheim 1998a. Phoretic pseudoscorpions associated with flying insects in Brazilian Amazônia. *J. Arachnology* 26:452-459.

Aguiar, N.O. & P.F. Bührnheim 1998b. Pseudoscorpions (Arachnida) of the Ilha de Maracá. Pp. 381-389, *In* Maracá. The biodiversity and environment of an Amazonian rainforest. (W. Milliken & J.A. Ratter eds). John Wiley and Sons, Chichester, etc.

Alberti, G & A.V. Peretti. 2002. Fine structure of male genital system and sperm in Solifugae does not support a sister-group relationship with pseudoscorpiones (Arachnida). *J. Arachnol.,* 30: 268-276.

Florez, D.E. & H. Sanchez. 1995. La diversidad de los arácnidos en Colombia. In: O. Rangel Ed. Colombia Diversidad Biotica I. Universidad Nacional de Colombia, Inderena. Pp:327-372.

Harvey, M. S. 1991. Catalogue of the Pseudoscorpionida. Manchester University Press, Manchester. 726 pp.

Harvey, M. S. 1992. The phylogeny and classification of the Pseudoscorpionida (Chelicerata: Arachnida). *Invertebr. Taxon*. 6: 1373-435

Harvey, M. 2002. The neglected cousins: What do we know about the smaller arachnid orders?. *J. Arachnology* 30: 357-372

Harvey, M. S. 2004. Remarks on the new world pseudoscorpion genera *Parawithius* and *Victorwithius*, with a new genus bearing a remarkable sternal modification (Pseudoscorpiones, Withiidae). *J. Arachnol*. 32: 436–456

Judson, M. L. I. 1994. Les Pseudoscorpions. *Pénélope*, nº 12: pp. 6-37

Judson, M. L.I. 1998. A sternophorid pseudoscorpion (Chelonethi) in Dominican Amber, with remarks on the family. *J. Arachnol*., 26: 419-428

Judson, M. L.I. 2000. *Electrobisium acutum* Cockerell, a cheiridiid pseudoscorpion from Burmese amber, with remarks on the validity of the Cheiridioidea (Arachnida, Chelonethi). *Bull. Nat. Hist. Mus. Geol. Series* 56 (1): 79-83

Judson, M.L.I. 2005. Baltic amber fossil of *Garypinus electri* Beier provides first evidence of phoresy in the pseudoscorpion family Garypinidae (Arachnida: Chelonethi). Pp. 127-131, *In* European Arachnology 2003 (Proceedings of the 21st European Colloquium of Arachnology, St.-Petersburg, 4-9 August 2003. (D.V. Logunov & D. Penney eds).

Mahnert, V. 1994. New chernetid pseudoscorpions (Pseudoscorpionida: Chernetidae) from Venezuela and Brazil, with remarks on the genus Ancalochernes Beier. *Revue Suisse de Zoologie* 101**:** 829-838.

Mahnert, V & Adis, J. 2002. Pseudoscorpiones. In: Amazonian Arachnida and Myriapoda. Ed Adis, J. Sofía – Moscow: Pensoft Publisher, pp. 367-380.

Muchmore, W.B. 1991. Redescription of *Garypus viridans* (Pseudoscorpionida, Garypidae). *Caribbean Journal of Science* 27: 203-204.

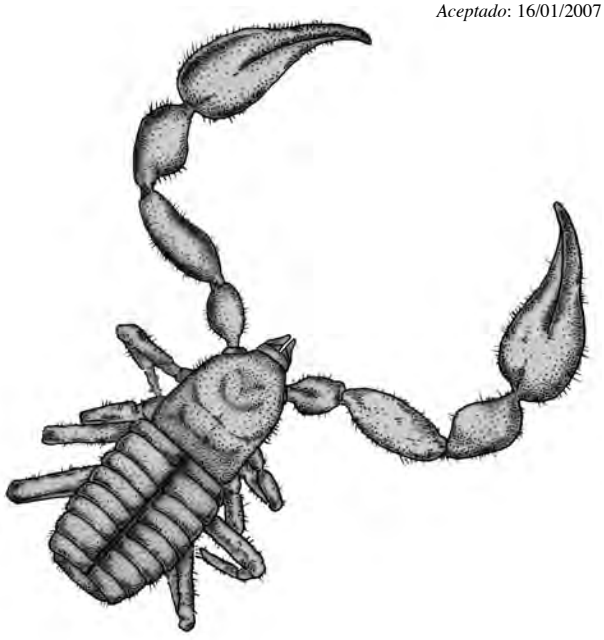
Muchmore, W..B. 1993. Annotated list and bibliography of Pseudoscorpionida reported from the Caribbean region. I. Trinidad, Venezuela, and Colombia, and including Aruba, Bonaire and Curacao. *Tropical Zoology*, Special issue, 1:83-104.

Shultz, J. W. 1990. Evolutionary morphology and phylogeny of Arachnida. *Cladistics* 6: 1-38

Weygoldt, P. 1969. The Biology of Pseudoscorpions. Harvard University Press: Cambridge, Massachusetts. 145 pp

Wheeler, W. C & Hayashi, C. Y. 1998. The phylogeny of the extant chelicerate orders. *Cladistics* 14: 173-192.

Recibido: 22/08/2006
Aceptado: 16/01/2007



Lustrochernes argentinus

Biota Colombiana 8 (1) 53 - 68, 2007

Especies de vida libre de la subclase Copepoda (Arthropoda, Crustacea) en aguas continentales de Colombia

Santiago Gaviria[1] y Nelson Aranguren[2]

1 Department of Limnology and Hydrobotany, University of Vienna, Austria. (Dirección para correspondencia: Technisches Büro für Biologie, Fred-Raymondgasse 19/2/4, A-1220 Vienna, Austria). *santiago.gaviria@gmx.at*
2 Unidad de Ecología en Sistemas Acuáticos (UDESA), Escuela de Biología, Universidad Pedagógica y Tecnológica de Colombia, Tunja, Boyacá, Colombia. *narangur@tunja.uptc.edu.co*

Palabras Clave: Copepoda, zooplancton, meiobentos, distribución geográfica, Colombia.

Introducción

Los copépodos pertenecen a un grupo relativamente pequeño de artrópodos acuáticos con 11,500 especies (Humes 1994) y se considera que son los metazoos más abundantes del planeta (Boxshall & Halsey 2004). El grupo está más diversificado en el mar y el número de especies parásitas marinas es cerca de una tercera parte de aquellas de vida libre. En aguas continentales se conocen cerca de 2500 especies.

Los copépodos habitan en lagos, estanques, embalses, charcos, ríos, aguas subterráneas y se les encuentra también en fitotelmatas y en ambientes semiterrestres como musgos y suelos húmedos forestales (Reid 1986). Su tamaño en aguas continentales varía entre 0,3 y 5 mm, siendo la mayoría de especies cercanas a 1 mm (Dussart & Defaye 2001).

Sistemática

En aguas continentales el grupo está representado por 4 órdenes: Calanoida, Cyclopoida, Harpacticoida y Gelyelloida. El último orden creado recientemente, tiene pocos (2) representantes y únicamente en el Paleártico occidental, en medio subterráneo. En Colombia se conocen actualmente 69 especies y subespecies de Copepoda (14 Calanoida, 41 Cyclopoida y 14 Harpacticoida).

Para la elaboración del inventario se revisaron críticamente los registros de Copepoda en territorio Colombiano incluidos en los siguientes estudios: Taxonomía (Thiébaud 1912, Chappuis 1956, Kiefer 1956, Noodt 1972, Reid 1985, 1987, 1988, Petkovski 1986a, 1986b, 1988, Gaviria 1988, 1989, 1993a, 1994, Cicchino *et al*. 1989, 2001, Reid *et al*. 1990, Monroy *et al*. 2004), faunistica (Pearse 1915, Löffler 1972, 1981), ecología del zooplancton en lagos andinos (Andrade *et al*. 1991, Aranguren & Andrade 2003, Gaviria 1993b, Ramirez & Diaz 1997, Buitrago 1998, Jaramillo 2002, Jaramillo & Gaviria 2003, Gallo-Sánchez *et al*. 2004), en una ciénaga (Aranguren 1998) y en embalses (Camargo 1994, Herrera-Martinez & Guillot 1999, Estrada Posada 1999, 2006). Registros individuales de especies fueron hechos por Sturm (1978) en un estudio de ecología del páramo, Suárez *et al*. (1984) en un estudio biomédico y Roldán (1992) en un texto de limnología neotropical. Se incluyeron además colectas recientes y observaciones personales de los autores.

La taxonomía del presente artículo está basada en Boxshall & Halsey (2004) y en las listas mundiales de Dussart & Defaye (2002) para Calanoida, Dussart & Defaye (1985) para Cyclopoida y Dussart & Defaye (1990) para Harpacticoida. Las familias y géneros de Copepoda pueden identificarse con la clave de Dussart & Defaye (1995, 2001), las especies de Centropagidae con la clave de Bayly (1992), gran parte de aquellas de Cyclopoida con la de Reid (1985) y parte de las de Harpacticoida con la de Lang (1948). Para el género *Mesocyclops* se puede usar la clave de Hołyńska *et al*. (2003), para *Thermocyclops* la de Mirabdullayev *et al*. (2003), para *Paracyclops* la de Karaytug (1999) y para *Neocyclops* la de Petkovski (1986a).

Las especies de Diaptomidae *Notodiaptomus dilatatus, N. echinatus* (sinónimo *N. kieferi*), *N. henseni* citadas por Dussart (1984) y *Rhacodiaptomus ringueleti* (Cicchino & Dussart 1991) recolectadas en el Río Atabapo, fueron reportadas como parte de la fauna de Venezuela; sin embar-

go, ellas pertenecen también a la fauna de Colombia, ya que el río es parte de la frontera entre ambos paises. Otras hembras de la familia Diaptomidae recolectadas en el mismo río fueron asignadas por Dussart (*op.cit.*) a *Rhacodiaptomus calatus coalescens* y otros ejemplares machos a *Notodiaptomus coniferoides;* posteriormente se demostró que ambos pertenecen realmente a *Notodiaptomus simillimus* (Cicchino *et al*. 2001).

Los ejemplares asignados a *Mesocyclops brasilianus* Kiefer, 1933 por Kiefer (1956), Reid (1988), Gaviria (1994), Aranguren (1998, 2003) y Hołyńska *et al*. (2003) pertenecen a *Mesocyclops venezolanus* Dussart, 1987, como fué confirmado recientemente en material reestudiado de la Ciénaga de Guarinocito por los autores y de Tumaco (Hołyńska, Varsovia, com. pers.). *M. venezolanus* es la especie más común del género que habita aguas cálidas de los valles interandinos y de las llanuras del Caribe, *M. brasilianus* parece no estar presente en Colombia.

La especie *Notodiaptomus coniferoides* constituye un nuevo registro de calanoideos para Colombia, tres de las especies de *Microcyclops* (*M. anceps anceps*, *M. ceibaensis* y *M. finitimus*), además de *Mesocyclops venezolanus*, *Acanthocyclops vernalis* y *Thermocyclops tenuis* son nuevos reportes de ciclopoideos. Entre los harpacticoides, dos especies de *Elaphoidella* (*E. bidens* y *E. grandidieri*) y una de *Attheyella (A. freyi*) representan también nuevos registros.

Distribución

Entre los calanoideos, la familia Centropagidae en Colombia está restringida a lagos de altura en la Cordillera de Los Andes mientras que los Diaptomidae en general, habitan lagos y ríos en altitudes medias hasta zonas bajas, con excepción de *Colombodiaptomus* (distribución altoandina) y *Prionodiaptomus* (distribuido desde el altiplano Cundinoboyacense hasta zonas bajas) (Gaviria 1994). La especie de la familia Acartiidae conocida en Colombia está restringida a aguas salobres (Pearse 1915). La familia Pseudodiaptomidae, aun no reportada en el pais, debe tener representantes en zonas estuarinas Colombianas de acuerdo a la distribución geográfica de las especies indicada por Walter (1989).

Entre los ciclopoideos, los géneros *Apocyclops* y *Neocyclops* son eurihalinos y de distribución mundial (Dussart & Defaye 1985). Con excepción de *Hesperocyclops* y *Neutrocyclops*, los géneros restringidos a aguas dulces en Colombia son también cosmopolitas. *Metacyclops*, *Mesocyclops* y *Microcyclops* están bien diversificados como en otros paises tropicales (Dussart 1984, Hołyńska *et al* 2003). Se anotan casos de especies cosmopolitas (e.g. *Macrocyclops albidus albidus*, *Ectocyclops phaleratus*), pantropicales (e.g. *Ectocyclops rubescens*, *Mesocyclops aspericornis*), americanas (e.g. *Thermocyclops tenuis*), restringidas a parte del neotrópico (e.g. *Microcyclops anceps anceps*) o a Suramérica (e.g. *Metacyclops tredecimus*), y algunos casos de elementos endémicos (e.g. *Metacyclops leptopus totensis*, *Tropocyclops prasinus altoandinus*).

Entre los harpacticoides, hay unas pocas especies cosmopolitas (*Elaphoidella bidens*, *Epactophanes richardi* y *Phyllognathopus viguieri*), una pantropical (*Elaphoidella grandidieri*), algunos elementos de distribución subantártica - tropical/montana (e.g. *Attheyella* subgénero *Chappuisiella*) y un alto porcentaje de especies aparentemente endémicas (3 especies del género *Parastenocaris*, 3 de *Elaphoidella* y una subespecie de *Nitokra lacustris*). Sin embargo, esto puede ser debido a la falta de estudios taxonómicos y faunísticos en regiones diferentes de la localidad típica.

Con el presente inventario el número de taxones aumenta de 56 (Gaviria 1994) a 69, debido principalmente a la exploración faunística de nuevos territorios (e.g. noroccidente de Colombia) y de nuevos biotopos (e.g. macrófitas en ciénagas del Magdalena). Las areas geográficas más conocidas en cuanto a la fauna copepodológica son la Cordillera Oriental y Central (Antioquia), y parte de la llanura del Caribe. En los valles interandinos y la costa del Pacífico los estudios han sido escasos y puntuales. De los 32 departamentos de Colombia, en 11 de ellos no existen registros de Copepoda.

A nivel neotropical, Brasil presenta el mayor número de especies (196) (Reid 1998, Rocha & Botelho 1998, Santos-Silva 1998). La diversidad en Colombia (69 taxones) es algo menor a la de México (78) (Suárez *et al*. 2000) y mayor a la de Venezuela (66) (Dussart 1984) y a la de Cuba (56) (Collado *et al*. 1984).

Se recomienda hacer prospección en los páramos (Cordillera Central y sur de los Andes), en la Sierra Nevada de Santa Marta y en la Serranía del Catatumbo, en los Llanos, la Amazonía, y los valles del Río San Jorge y del bajo Magdalena. Los biotopos que deben investigarse son el bentos lacustre y fluvial, el intersticial y las aguas subterraneas, las charcas y los ambientes semiterrestres. Con ello es de esperar que la diversidad de copépodos en Colombia aumente en por lo menos un 25 %.

Free-living species of the Copepoda (Arthropoda, Crustacea) subclass of the Colombian continental waters

Santiago Gaviria and Nelson Aranguren

Key words: *Copepoda, zooplankton, meiobenthos, geographical distribution, Colombia.*

Introduction

Copepods are a relatively small group of aquatic arthropods which include more than 11.500 species (Humes 1994) and are considered the most abundant metazoans on Earth (Boxshall & Halsey 2004). The group is more diversified in the sea, and the number of parasitic species found there makes up approximately one third of the total marine species. About 2500 species live in continental waters.

Copepods can be found in lakes, reservoirs, ponds, pools, rivers and groundwaters, as well as living in phytotelmata and semiterrestrial environments such as mosses and humid forest soils (Reid 1986). Although most are 1mm long, their body size can vary from 0.3mm to 5mm. (Dussart & Defaye 1995, 2001).

Systematics

Four orders of free-living copepods are present in continental waters: Calanoida, Cyclopoida, Harpacticoida and Gelyelloida. The latter was created recently and has only few (2) representatives in groundwaters of the western Palearctic Region. The number of copepod taxa known in Colombia today is 69 (14 calanoids, 41 cyclopoids and 14 harpacticoids).

The present list was compiled based on a critical review of the records taken on Colombian territory within the following investigations: Taxonomy (Thiébaud 1912, Chappuis 1956, Kiefer 1956, Noodt 1972, Reid 1985, 1987, 1988, Petkovski 1986a, 1986b, 1988, Gaviria 1988, 1989, 1993a, 1994, Cicchino et al. *1989, 2001, Reid* et al. *1990, Monroy* et al. *2004); faunistic (Pearse 1915, Löffler 1972, 1981); zooplancton ecology in Andean lakes (Andrade* et al. *1991, Aranguren & Andrade 2003, Gaviria 1993b, Ramirez & Diaz 1997, Buitrago 1998, Jaramillo 2002, Jaramillo & Gaviria 2003, Gallo-Sánchez* et al. *2004); swamps (Aranguren 1998) and reservoirs (Camargo 1994, Herrera-Martinez & Guillot 1999, Estrada Posada 1999, 2006). Individual species were recorded by Sturm (1978) in a study of Paramo ecology, by Suárez* et al. *(1984) in a biomedical study and by Roldán (1992) in his book on neotropical limnology. Recent collections and personal observations carried out by the authors were included as well.*

The diaptomid calanoids Notodiaptomus dilatatus, N. echinatus *(syn.* N. kieferi), N. henseni *cited by Dussart (1984) and* Rhacodiaptomus ringueleti *(Cicchino & Dussart 1991) from the Atabapo River were reported as part of Venezuelan fauna, but they also belong to Colombian fauna as the river constitutes the border between the two countries in the state of Guainia. Dussart (op.cit.) also found, in the same river, females which he assigned to* Rhacodiaptomus calatus coalescens *and males which he assigned to* Notodiaptomus coniferoides, *but they actually belong to* Notodiaptomus simillimus *(Cicchino* et al. *2001).*

Kiefer (1956), Gaviria (1994), Aranguren (1998, 2003) and Hołyńska et al. *(2003) reported* Mesocyclops brasilianus *Kiefer, 1933 in Colombia, but actually these reports seem to correspond to* Mesocyclops venezolanus *Dussart, 1987, as it was recently demonstrated with restudied material from Ciénaga de Guarinocito (pers. obs. of both authors) and Tumaco (Hołyńska, Warsaw, pers. com.).* M. venezolanus *was found to be the most widespread species of the genus in warm water lakes and rivers of the Andean valleys and the Caribbean plains. It seems that* M. brasilianus *is not present in Colombia.*

The calanoid copepod Notodiaptomus coniferoides *constitute a new record for Colombia, while three species of* Microcyclops (M. anceps anceps, M. ceibaensis *and* M. finitimus), Mesocyclops venezolanus, Acanthocyclops vernalis *and* Thermocyclops tenuis *are new records of cyclopoids. Among the harpacticoid copepods, two species of the genus* Elaphoidella (E. bidens *and* E. grandidieri) *and one of the genus* Attheyella (A. freyi) *are also new for the country.*

Distribution

Within calanoid copepods, the Centropagidae family is restricted to high Andean lakes and ponds, while members of the Diaptomidae family are mainly found in lakes and rivers from medium altitudes down to the lowlands, except Colombodiaptomus *(high Andean distribution) and* Prionodiaptomus *(distributed from the altiplano of Cundinamarca and Boyacá down to the lowlands) (Gaviria 1994). The Arcrtiidae family with one known species in Colombia is restricted to brackish waters, while the Pseudodiaptomidae family, which is not yet known in the country, should have representative species in Colombian estuaries as shown by Walter (1989).*

Among cyclopoid copepods, the genera Apocyclops *and* Neocyclops *are euryhaline and can be found worldwide. With exception of* Hesperocyclops *and* Neutrocyclops, *freshwater-only genera present in Colombia also exist worldwide. The genera* Metacyclops, Microcyclops *and* Mesocyclops *are well diversified, and occur in other tropical countries (Dussart 1984, Hołyńska* et al *2003). Moreover, there are species with cosmopolitan (e.g.* Macrocyclops albidus albidus, Ectocyclops phaleratus*), pantropical (*Ectocyclops rubescens, Mesocyclops aspericornis and Thermocyclops decipiens*) or American (e.g.* Thermocyclops tenuis*) distribution, some species are restricted to part of the Neotropical Region (e.g.* Microcyclops anceps anceps*) or to South America (e.g.* Metacyclops tredecimus*), and some are endemic (e.g.* Metacyclops leptopus totensis, Tropocyclops prasinus altoandinus*).*

*Few of the harpacticoid copepods are cosmopolitan (*Elaphoidella bidens, Epactophanes richardi and Phyllognathopus viguieri), or pantropical (Elaphoidella gradidieri*), some elements have a subantarctic - tropical/mountain distribution (e.g.* Attheyella *subgenus* Chappuisiella*), and an apparently high number of species are endemic (3 species of the genus* Parastenocaris*, 3 of* Elaphoidella *and 1 subspecies of* Nitokra lacustris*). However, some cases of apparent endemism could be explained by too few faunistic and taxonomical studies and by the fact that the species has been found only once at the typical locality.*

Taxonomy follows Boxshall & Halsey (2004) and the world lists of Dussart & Defaye (2002) for Calanoida, Dussart & Defaye (1985) for Cyclopoida and Dussart & Defaye (1990) for Harpacticoida. Families and genera of the subclass Copepoda can be identified using the Dussart & Defaye key (1995 and 2001), species of Centropagidae with that of Bayly (1992), most of the species of Cyclopoida with the Reid key (1985) and part of the species of Harpacticoida with that of Lang (1948). For the determination of the species of the genus Mesocyclops *the Hołyńska* et al. *(2003) key can be used, for those of* Thermocyclops *that of Mirabdullayev* et al. *2003,* Paracyclops *with Karaytug (1999) and* Neocyclops *with Petkovski (1986a).*

With the present list, the total number of taxa increased from 56 (Gaviria 1994) to 69, mainly based on fauna surveys of new territories (e.g. northwestern Colombia) and new biotopes (e.g. swamp-dwelling macrophytes). The most widely studied regions are the western and central mountain ranges, and part of the Caribbean plains. Studies in the Andean valleys are scarse and limited to small areas. No records of copepods exist in 11 of the 32 Colombian states.

In the Neotropical Region, Brazil has the highest number of species (196) (Reid 1998, Rocha & Botelho 1998, Santos-Silva 1998). Diversity of copepods in Colombia (69 taxa) is slightly lower than in Mexico (78) (Suárez et al. *2000) and higher than in Venezuela (66) (Dussart 1984) and Cuba (56) (Collado* et al. *1984).*

Faunistic surveys in the Paramo areas (central mountain range and the southern Andes), in the Sierra Nevada de Santa Marta and the Serrania del Catatumbo, the Llanos, the Amazon Region and in the river valleys of San Jorge and lower Magdalena are recommended. Biotopes such as lacustrian and river benthos, interstitial and subterranean waters, puddles and semi-terrestrial environments should be included in future investigations, so that the number of copepod species should increase by at least 25 %.

Cuadro 1. Sinopsis taxonómica de familias, géneros y subgéneros de los copépodos continentales de vida libre presentes en Colombia y con representación en el Neotrópico. Las cifras indican el número de especies, aquellas entre paréntesis, el número de subespecies por género o subgénero. Las cifras en negrilla indican el número total de especies y subespecies para cada orden.

Box 1*: Taxonomic synopsis of the families, genera and subgenera of the free-living continental copepods present in Colombia and with representation in the Neotropical Region. Numbers indicate number of species and subspecies (in brackets) for each genus or subgenus. Numbers in bold indicate total number of species and subspecies for each order.*

Taxón / *Taxon*	**Neotrópico / *Neotropics***	**Colombia / *Colombia***
Orden Calanoida Sars, 1903		**14**
Familia Acartiidae Sars, 1900		
Acartia Dana, 1846		
Acanthacartia Steuer, 1915	3	1
Familia Centropagidae Giesbrecht, 1893		
Boeckella Guerne & Richard, 1889	20	2
Familia Diaptomidae Baird, 1850		
Arctodiaptomus Kiefer, 1932		
Arctodiaptomus Kiefer, 1932	1	1
Colombodiaptomus Gaviria, 1989	1	1 (2)
Notodiaptomus Kiefer, 1936	28	6
Prionodiaptomus Light, 1939	2	1
Rhacodiaptomus Kiefer, 1936	7	1
Orden Cyclopoida Burmeister, 1835		**41**
Familia Cyclopidae Sars, 1913		
Subfamilia Cyclopinae Kiefer, 1927		
Acanthocyclops Kiefer, 1927	4	1
Apocyclops Lindberg, 1942	5	2
Diacyclops Kiefer, 1927	3	2
Hesperocyclops Herbst, 1984	2	1
Mesocyclops Sars, 1914	16	5
Metacyclops Kiefer, 1927	14 (16)	4 (5)
Microcyclops Claus, 1893	10 (13)	5

Taxón / *Taxon*	**Neotrópico / *Neotropics***	**Colombia / *Colombia***
Neutrocyclops Kiefer, 1936	1	1
Thermocyclops Kiefer, 1937	5	2
Subfamilia Eucyclopinae Kiefer, 1927		
Ectocyclops Brady, 1904	6	2
Eucyclops Claus, 1893	19 (21)	7
Macrocyclops Claus, 1893	3 (5)	1 (2)
Paracyclops Claus, 1893	8	3
Tropocyclops Kiefer, 1927	5 (12)	1 (2)
Subfamilia Halicyclopinae Kiefer, 1927		
Neocyclops Gurney, 1927		
Protoneocyclops Petkovski, 1986	1	1
Orden Harpacticoida Sars, 1903		**14**
Familia Ameiridae Monard, 1927		
Nitokra Boeck, 1865	4 (5)	1
Familia Canthocamptidae Sars, 1906		
Attheyella Brady, 1880		
Chappuisiella Chappuis, 1936	16 (17)	2
Delachauxiella Brehm, 1926	17	1
Elaphoidella Chappuis, 1929	30 (31)	5
Epactophanes Mrázek, 1893	1	1
Familia Parastenocarididae Chappuis, 1933		
Parastenocaris Kessler, 1913 [1]	46 (47)	3
Familia Phyllognathopodidae Gurney, 1932		
Phyllognathopus Mrazek, 1893	2	1

Listado Taxonómico / *Taxonomic List*

Listado taxonómico de las especies válidas de Copepoda de vida libre de las aguas continentales de Colombia. Para cada especie se incluye distribución mundial, distribución en Colombia por departamentos, rango altitudinal, habitat conocido en Colombia y las colecciones de museo y referencias bibliográficas que respaldan la información copilada. Se excluyeron referencias de colecciones privadas.

El significado de numerales y abreviaturas se indica a continuación:

Distribución mundial: Las cifras en corchetes indican [1] cosmopolita, [2] cosmopolita fuera de América del Sur, [3] pantropical, [4] holártico, [5] Canadá, [6] Suráfrica, [7] India, [8] Islas Kerguelen y [9] Bermuda.

Habitat: Se indican por medio de abreviaturas: asu - aguas subterráneas, ben - bentónico, ch - charca, cie - ciénaga, cue - cueva, emb - embalse, est - estanque, este - estero, fue - fuente, int - intersticial, lag - lago, lit - litoral, mad - madrevieja, pan - pantano, pel - pelágico, pt - planta de tratamiento, río - río, sal - aguas salobres, semiter - semiterrestre y ta - tanque.

Acrónimos: NHMW - Naturhistorisches Museum Wien, Viena (Austria); MNHN - Muséum National d' Histoire Naturelle, Paris (Francia); IZT-UCV - Instituto de Zoología Tropical, Universidad Central de Venezuela, Caracas (Venezuela); SMNK - Staatliches Museum für Naturkunde, Karlsruhe (Alemania); USNM -United States National Museum, Smithsonian Institution, Washington, D.C. (E.U.A.); ICN-MHN - Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional, Bogotá (Colombia).

Referencia Bibliográfica: obs. pers. - observación personal, DB – Deo Baribwegure, NA - Nelson Aranguren, SG - Santiago Gaviria..

Taxonomic list of the valid species of free-living copepods in Colombian continental waters. For each species world distribution, national distribution in each state, altitudinal range, known habitat in Colombia, depositary collection and /or bibliographic reference (s) that support the compiled information are included. Private collections are not included.

Numbers and acronyms mean:

World distribution: Numbers in brackets mean [1] cosmopolitan, [2] cosmopolitan outside South America, [3] pantropical, [4] holarctic, [5] Canada, [6] South Africa, [7] India, [8] Kerguelen Islands and [9] Bermuda.

Habitat: Habitat types are indicated using abbreviations: asu - groundwater, ben - benthic, ch - pond, cie - "ciénaga" (lowland floodplain lake), cue - cave, emb - water reservoir, est - man-made pond, este - "estero" (typical meadow in the east plains "Llanos"), fue - spring, int - interstitial, lag - lake, lit - littoral, mad - "madrevieja" (backwater lake), pan - swamp, pel - pelagic, pt - water treatment plant, río – river, sal - brackish water, semiter - semiterrestric and ta - watertank.

Acronyms: NHMW - Naturhistorisches Museum Wien, Viena (Austria); MNHN - Muséum National d' Histoire Naturelle, Paris (Francia); IZT-UCV - Instituto de Zoología Tropical, Universidad Central de Venezuela, Caracas (Venezuela); SMNK - Staatliches Museum für Naturkunde, Karlsruhe (Germany);USNM - United States National Museum, Smithsonian Institution, Washington, D.C. (E.U.A.); ICN-MHN - Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional, Bogotá (Colombia).

Bibliographic reference: obs. pers. - personal observation, DB - Deo Baribwegure, NA - Nelson Aranguren, SG - Santiago Gaviria.

Taxon / *Taxon*	Distribución Mundial / *World Distribution*	Distribución en Colombia / *Distribution in Colombia*	Altitud (msnm) / *Altitude (masl)*	Habitat / *Habitat*	Colección de Referencia / *Reference Collection*	Referencia Bibliográfica / *Bibliographic Reference*
Orden Calanoida						
Familia Acartiidae						
Acartia (Acanthacartia) tonsa Dana, 1849	[1]	ma	0	cie sal		Pearse 1915
Familia Centropagidae						
Boeckella gracilis Daday, 1902	ar bol ch co ec pe	cun by met na	3000 - 3800	cha lag pel	NHMW	Gaviria 1989
Boeckella occidentalis Marsh, 1906	co bol ch ec pe	cun met ri	3300 - 4100	cha lag pel	NHMW	Gaviria 1989
Familia Diaptomidae						
*Arctodiaptomus dorsalis (*Marsh, 1907)	am co cr cu eu gu me ni pn vn [5]	ant cau cho	0 - 2100	cie cha emb pel		Buitrago 1998
Colombodiaptomus brandorffi Gaviria, 1989	co	cun by	2900 - 3700	cha emb lag pel	NHMW	Gaviria 1989
Colombodiaptomus brandorffi pilosus Gaviria, 1989	co	cun	3680 - 3730	cha	NHMW	Gaviria 1989
Notodiaptomus coniferoides (Wright, 1927)	ar bol br co	ma to	0 - 200	cie mad pel		obs. pers. SG, NA
Notodiaptomus dilatatus Dussart, 1984	br co vn	gn	300	rio	MNHN	Dussart, 1984
Notodiaptomus echinatus (Lowndes, 1934)	ar br co gf pr vn	gn	300	lag pel rio	MNHN	Dussart & Defaye 2002
Notodiaptomus henseni (Dahl, 1894)	br co gf vn	gn vch	300	lag pel rio	MNHN	Dussart 1984, Cicchino *et al*. 1989
Notodiaptomus maracaibensis Kiefer, 1956	co vn	at ce cho cor ma	0 - 200	cie pel	SMNK	Kiefer, 1956
Notodiaptomus simillimus Cicchino, Santos Silva & Robertson, 2001	co vn	gn met	300	rio	IZT-UCV	Cicchino *et al*. 1941, obs. pers. SG, como *N. coniferoides* Dussart 1984
Prionodiaptomus colombiensis Thiébaud, 1912	br co es eu gu ho me ni pe pn vz	at by ma cun	0 - 2600	lag pan pel	NHMW	Gaviria 1989
Rhacodiaptomus ringueleti Cicchino & Dussart, 1991	co vn	gn	300	cha rio		Cicchino & Dussart 1991

Taxon / *Taxon*	Distribución Mundial / *World Distribution*	Distribución en Colombia / *Distribution in Colombia*	Altitud (msnm) / *Altitude (masl)*	Habitat / *Habitat*	Colección de Referencia / *Reference Collection*	Referencia Bibliográfica / *Bibliographic Reference*
Orden Cyclopoida						
Familia Cyclopidae						
Subfamilia Cyclopinae						
Acanthocyclops vernalis (Fisher, 1853)	[1]	cun	2700	rio		obs. pers. SG
Apocyclops distans Kiefer, 1956	an co vn	sp	0	cue sal		Petkovski 1988
Apocylops panamensis Marsh, 1913	am co eu ho me pn	cho sp	0	cue sal	USNM	Reid 1988, Petkovski 1988
Diacyclops bernardi (Petkovski, 1986a)	co eu me	sp	0	cue sal	USNM	Petkovski 1986a, 1988, Reid 1993
Diacyclops hispidus Reid, 1988	co	cho	0	cha sal	USNM	Reid 1988
Hesperocyclops pescei Petkovski, 1988	an? co	snt	1500	cue		Petkovski 1988
Mesocyclops aspericornis (Daday, 1906)	[3]	ant cun sp	0 - 1200	est fue tan	USNM	Reid 1987, Suarez *et al.*1984, Petkovski 1986b
Mesocyclops longisetus (Thiébaud, 1912)	am an ar bo br ch co eu vn [5] [8]	ama ant cor cun ma	100 - 2600	cha est lag lit pel rio		Gaviria 1988, obs. pers. NA
Mesocyclops meridianus (Kiefer, 1926)	an ar bo co ec pr vn ur	cun gn	100 - 1500	est rio	MHNH	Dussart 1984 obs. pers. NA
Mesocyclops reidae Petkovski, 1986a	an? co eu ho me	sp	0	fue		Petkovski 1986b
Mesocyclops venezolanus Dussart, 1987	co ho vn [5]	ama ant cl cho cor ma na	0 - 1200	cie est	USNM	Como *M. brasilianus* en Reid 1988, Gaviria 1994 y Aranguren 1998; obs. pers. SG
Metacyclops laticornis (Lowndes, 1934)	ar co pr	cun	2600	est pan	NHMW	Gaviria 1994
Metacyclops leptopus leptopus (Kiefer, 1927)	co bo pe	ma cun	2700 - 3500	lag pel		Löffler 1972, Gaviria 1988
Matacyclops leptopus totensis Reid, Molina Arévalo & Fukushima, 1990	co	cun by	3000 - 3700	cha lag pel	USNM	Reid *et al.* 1990 Aranguren & Andrade 2003

Taxon / *Taxon*	Distribución Mundial / *World Distribution*	Distribución en Colombia / *Distribution in Colombia*	Altitud (msnm) / *Altitude (masl)*	Habitat / *Habitat*	Colección de Referencia / *Reference Collection*	Referencia Bibliográfica / *Bibliographic Reference*
Metacyclops mendocinus (Wierzejski, 1892)	ar bo br ch co bo ec gf pr ur	ant cun snt sp	0 - 2600	asu emb lag est lit pel pt		Thiébaud 1912, Petkovski 1988
Metacyclops tredecimus (Lowndes, 1934)	ar br co pr vn	me	300	este		Gaviria 1994
Microcyclops alius (Kiefer, 1935)	bo ch co ec ni ur	cun na	0 - 2600	cha lag	USNM	Reid 1988, obs. pers. NA
Microcyclops anceps anceps (Richard, 1897)	ar br ch co gf me pe pn pr vn ur	ant cor cun ma	0 - 1500	cha est lag lit		obs. pers. SG, NA
Microcyclops ceibaensis (Marsh, 1919)	co cu ho	cor	100	cie lit		obs. pers. SG
Microcyclops finitimus Dussart, 1984	co gf vn	cor ma	100	cha cie lit		obs. pers. SG
Microcyclops dubitabilis Kiefer, 1934	am cr co vn	ant at cor cun ma	0 - 2600	cha est lag lit pan		obs. pers. SG, NA
Neutrocyclops brevifurca (Lowndes, 1934)	an co br vn	at ma	0 - 100	lag lit pan	SMNK	Kiefer 1956, obs. pers. SG
Thermocyclops decipiens (Kiefer, 1929)	[3]	ama ant at cl cun hu na to	0 - 2000	cha emb est lag ma pel pan	SMNK	Kiefer 1956, Aranguren 1988
Thermocyclops tenuis (Marsh, 1910)	am ar br co cr cu es eu me pn pr vn ur	ce ma	100	cie pel		obs.pers. DB, SG
Subfamilia Eucyclopinae						
Ectocyclops rubescens Brady, 1904	[3]	at na	0-100	ben cha lag	SMNK, USNM	Kiefer 1956, Reid 1988
Ectocyclops phaleratus (Koch, 1838)	[1]	cun na	0 - 2600	ben cha lag pan	USNM	Thiébaud 1912, Reid 1988
Eucyclops bondi (Kiefer, 1934)	am an co cr eu	na	0	no reportado	USNM	Reid 1988
Eucyclops cf. *alticola* Kiefer, 1957	bo co	snt	1500	cue		Petkovski 1988
Eucyclops delachauxi (Kiefer, 1925)	bo co pe	cun met	2600 - 3800	cha ben est lit lag		Gaviria 1994
Eucyclops demacedoi Lindberg, 1957	co pe	cun	3625	cha		Gaviria 1994
Eucyclops pseudoensifer Dussart, 1984	co vn	cun	3650	cha		Gaviria 1994

Taxon / *Taxon*	**Distribución Mundial / *World Distribution***	**Distribución en Colombia / *Distribution in Colombia***	**Altitud (msnm) / *Altitude (masl)***	**Habitat / *Habitat***	**Colección de Referencia / *Reference Collection***	**Referencia Bibliográfica / *Bibliographic Reference***
Eucyclops serrulatus serrulatus (Fisher, 1851)	[1]	ant by cun	500 - 4000	cha ben emb est lit lag tan	USNM	Reid 1987 Gaviria 1988, Thiébaud 1912
Eucyclops speratus (Lilljeborg, 1901)	co cu [4][6][7]	cun	1600 - 2600	ben est lag pan		Gaviria 1994, obs.pers. NA
Macrocyclops albidus albidus (Jurine, 1820)	[1]	ant at by cun met	0 - 4100	cha ben est lag lit pan		Gaviria 1988 Thiébaud 1912
Macrocyclops albidus principalis Herbst, 1962	co br vn	snt	1500	cue		Petkovski 1988
Paracyclops andinus Kiefer, 1957	pe co	vc	0	tan	USNM	Reid 1987
Paracyclops chiltoni (Thompson, 1882)	[1]	cun	1600 - 2700	ben est lag rio		Gaviria 1988
Paracyclops novenarius Reid, 1987	co	vc	0	tan	USNM	Reid 1987
Tropocyclops prasinus altoandinus Gaviria, 1994	co	ant cun met	2000 - 3775	ben lag emb lit	ICN-MHN	Gaviria 1994, Aranguren & Andrade 2003 como *T. prasinus prasinus*
Tropocyclops prasinus prasinus (Fischer, 1860)	br co [2]	ant at cun na	0 - 2600	ben est lag lit	USNM	Reid 1988, NA obs. pers.
Subfamilia Halicyclopinae						
Neocyclops (Protoneocyclops) stocki Pesce, 1985	co [9]	sp	0	cue sal		Petkovski 1986a
Orden Harpacticoida						
Familia Ameiridae						
Nitokra lacustris colombianus Reid, 1988	co	cho	0	no reportado	USNM	Reid 1988
Familia Canthocamptidae						
Attheyella (Chappuisiella) fuhrmanni (Thiébaud, 1912)	ar br gu cr co ur vn	ant at cun	0 - 2600	ben est lag pan		Thiébaud 1912, Chappuis 1956
Attheyella (Chappuisiella) pichilafquensis Löffler, 1961	ch co ec	cun	3400	ben lag	NHMW	Gaviria 1993a
Attheyella (Delachauxiella) freyi Löffler, 1963	co ec	cau	3500	ben ch	MNHN	obs. pers. SG

Taxon / *Taxon*	Distribución Mundial / *World Distribution*	Distribución en Colombia / *Distribution in Colombia*	Altitud (msnm) / *Altitude (masl)*	Habitat / *Habitat*	Colección de Referencia / *Reference Collection*	Referencia Bibliográfica / *Bibliographic Reference*
Elaphoidella bidens (Sars, 1904)	[1]	ant	1000	ben lag	NHMW	obs.pers. SG
Elaphoidella colombiana Gaviria, 1993	co	cun	3750	ben lag	ICN-MHN, NHMW	Gaviria 1993a
Elaphoidella grandidieri (Guerne & Richard, 1893)	an br co cu [3]	ant	1000-1600	ben est	MNHN	obs.pers. SG
Elaphoidella radkei Reid, 1987	co	vc	0	no reportado	USNM	Reid 1987
Elaphoidella suarezi Reid, 1987	co	vc	0	no reportado	USNM	Reid 1987
Epactophanes richardi Mrázek, 1893	[1]	cun	3000	semiter		Sturm 1978
Familia Parastenocarididae [1]						
Parastenocaris columbiensis Noodt, 1972	co	met	300	int-rio		Noodt 1972
Parastenocaris kubitzkii Noodt, 1972	co	met	300	int-rio		Noodt 1972
Parastenocaris roettgeri Noodt, 1972	co	met	300	int-rio		Noodt 1972
Familia Phyllognathopodidae						
*Phyllognathopus viguieri (*Maupas, 1892)	[1]	met	300	int-rio		Noodt 1972

1 *Parastenocaris bidens* Noodt, 1955, *P. hexacantha* Kiefer, 1936, *P. staheli* Menzel, 1916 y *P. surinamensis* Menzel, 1921 reportados erróneamente por Löffler (1981) para Colombia no están presentes en el país.

1 Records of Parastenocaris bidens *Noodt, 1955,* P. hexacantha *Kiefer, 1936,* P. staheli *Menzel, 1916 and* P. surinamensis *Menzel, 1921 done by Löffler (1981) are erroneous and not present in Colombia.*

Agradecimientos / *Acknowledgments*

Agradecemos a Deo Baribwegure, University of Ghent, Bélgica, por suministro de datos no publicados, a J.J. Ramirez, J. Palacios, L.M. Vazquez y L.S. Velasquez de la Universidad de Antioquia, Medellín, a J.P. Alvarez, G. Gómez y M. Laython de la Universidad Nacional de Colombia (UNAC), Bogotá, a Z. Marin de la UNAC, Leticia, por el suministro de muestras y a Janet W. Reid, Martinsville, Virginia, USA, por la revisión de una primera versión inglesa del manuscrito. Algunos de los datos de Antioquia, Chocó y Córdoba se obtuvieron del estudio de muestras colectadas por L.M. Vazquez, L.J. Gallo y S. Gaviria durante el desarrollo del proyecto CODI- IN 379 CE, Universidad de Antioquia "Biodiversidad de Cladóceros y Copépodos de Antioquia y regiones vecinas". Parte de este trabajo fué presentado en el taller "Dioversidad de Copépodos en el Neotrópico: Conocimiento actual y pautas para futuras investigaciones" realizado en San Sebastian, SP, Brasil, en 1999, organizado por Carlos Eduardo F. da Rocha.

We are grateful to Deo Baribwegure, University of Ghent (Belgium) for allowing us to use their unpublished records. Thanks go to J. J. Ramirez, J. Palacios, L. M. Vazquez and L. S. Velasquez, all from Universidad de Antioquia, Medellín, J.P. Alvarez, G. Gómez and M. Laython, Universidad Nacional de Colombia (UNAC), Bogotá, Z. Marin, (UNAC), Leticia, for providing samples and to Janet W. Reid, Martinsville, Virginia, for suggestions to improve a first English version of the manuscript. Some of the records from Antioquia, Chocó and Córdoba were obtained from samples collected by L. M.

Vasquez, L.J. Gallo and S. Gaviria during the development of the CODI – Project IN 379 CE, Universidad de Antioquia "Biodiversity of Cladocerans and Copepods of Antioquia and Neighbouring Regions". Part of the present article was presented at the "Copepod Diversity in Neotropics: Present Knowledge and New Directions for Research" workshop held at San Sebastian, SP, Brazil, in 1999, organized by Carlos Eduardo F. da Rocha.

Literatura citada / *Literature Cited*

Para referencias de autores taxonómicos (Cuadro 1, Lista Taxonómica y Anexo) no incluidos en el presente artículo, ver Dussart & Defaye (1985, 1990, 1995, 2002), Dussart (1984, 1987), Gaviria (1989) y Reid (1985).

For references to taxonomic authors (Box 1, Taxonomic List and Appendix) not included in this article, see Dussart & Defaye (1985, 1990, 1995, 2002), Dussart (1984, 1987), Gaviria (1989) and Reid (1985).

Andrade, C., N. Aranguren, G. Cárdenas, H. Florido, W. López, G. Oquendo, P. Patiño, G. Rueda (1991) Estudio limnológico de tres lagunas del Páramo de Chisacá. Tesis Pregrado,Universidad Pedagógica Nacional, Bogotá, 115 pp.

Aranguren, N. (1998) Estudio de los copépodos planctónicos (Crustacea) de la Ciénaga de Guarinosito, Magdalena Medio, Tesis de maestría, Universidad de Los Andes, Bogotá, 61pp.

Aranguren, N. & C. Andrade (2003) Estructura de la comunidad zooplanctónica (Copépodos y Cladóceros) en tres lagunas Colombianas de alta montaña *Ciencia en Desarrollo* (*Revista de la Facultad de Ciencias, Universidad Pedagógica y Tecnológica de Colombia, Tunja*)1(1):70-83

Bayly, I. A. E. (1992) The non-marine Centropagidae (Copepoda: Calanoida) of the World, H.J. Dumont (coord.ed.) *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* 2, SPB Academic Publishing bv, The Hague, 30 pp.

Boxshall, G.A., S.H. Halsey (2004) An Introduction to Copepod Diversity vol. 1, pp.1-421, vol. 2, pp. 423-966, The Ray Society, London.

Buitrago, L.F. (1998) Dinámica poblacional de *Arctodiaptomus dorsalis* en un ecosistema tropical raso Laguna Parque Norte, Medellín, Colombia. Tesis de maestría, Universidad del Cauca, Popayán.

Camargo, L. F. (1994) Estudio cualitativo y semicuantitativo del zooplancton superficial en el Embalse El Guájaro (Atlántico), Colombia) *Trianea* (*Acta Científica y Tecnológica, INDERENA*) 5: 235-253

Chappuis, P. A. (1956) Freilebende Ruderfusskrebse (Crustacea, Copepoda), II. Harpacticoida En F. Gessner, F. ,V. Vareschi (eds.) *Ergebnisse der Deutschen Limnologischen Venezuela-Expedition 1952*, 1:269-276

Cicchino, G., B.H. Dussart. 1991. Una nueva especie del género *Rhacodiaptomus* (Crustacea Copepoda) de Venezuela *Acta Biológica Venezolana* 13 (1-2):105-108

Cicchino, G., E.N. Santos Silva, B. Robertson (2001) A new species of *Notodiaptomus* Kiefer, 1936 (Copepoda, Diaptomidae) from the Amazon and Orinoco River Basins *Hydrobiologia* 453/454:539-548

Cicchino, G., E. Zoppi de Roa, E. Montiel (1989) *Notodiaptomus henseni* Dahl (Crustacea - Copepoda): un problema de sinonimia en el zooplancton de Venezuela *Acta Biológica Venezolana* 12: 98-105

Collado, C., C.H. Fernando, D. Sephton (1984) The freshwater zooplankton of Central America and the Caribbean *Hydrobiologia* 113:105-119

Dussart, B.H. (1984) Some Crustacea Copepoda from Venezuela *Hydrobiologia* 113:25-67

Dussart, B.H. (1987) Sur quelques *Mesocyclops* (Crustacea, Copepoda) d´Amérique du Sud *Amazoniana* 10:149-161

Dussart, B.H., D. Defaye. (1985) Répertoire Mondial des Crustacés Cyclopoides, Editions du Centre National de la Recherche Scientifique, Paris, 236 pp.

Dussart, B.H., D. Defaye (1990) Répertoire Mondial des Crustacés Copépodes des Eaux Intérieures, III. Harpacticoïdes *Crustaceana*, Supplement 16:1-383

Dussart, B.H., D. Defaye (1995) Introduction to the Copepoda, H.J. Dumont (coord.ed) *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* 16, Backhuys Publishers Bv, Leiden, 277pp.

Dussart, B.H., D. Defaye (2001) Introduction to the Copepoda, 2nd edition, H.J. Dumont (coord.ed) *Guides*

to the Identification of the Microinvertebrates of the Continental Waters of the World 7, SPB Academic Publishing bv, The Hague, 344pp.

Dussart, B.H., D. Defaye. (2002) World Directory of Crustacea Copepoda. I. Calaniformes, Backhuys Publishers Bv, Leiden, 276 pp.

Estrada Posada, A. L. (1999) Variação espacial e temporal da comunidade zooplanctônica do Reservatório "La Fé", Antioquia, Colombia, Dissertação Mestre em Ciências, Universidade de São Paulo, São Paulo, 78 pp.

Estrada Posada, A. L. (2006) Variación de la estructura y la distribución del zooplancton en función de los gradientes longitudinales en el embalse Río Grande II, Antioquia, Colombia, Tesis doctoral, Universidad de Antioquia, Medellín, 83 pp.

Gallo-Sanchez, L.J., S. Gaviria-Melo, J.J. Ramirez-Restrepo (2004) Dinámica de la comunidad zooplanctónica (excepto Protozoa) en la Laguna del parque Norte, Medellín (Antioquia, Colombia) *Actualidades Biológicas* 26 (81):231-241

Gaviria, S. 1988. Calanoida und Cyclopoida (Crustacea, Copepoda) der Cordillera Oriental der kolumbianischen Anden, mit besonderer Berücksichtigung ihrer Taxonomie, Ökologie und geographischen Verbreitung, Dissertationsarbeit, Universität Wien, Formal- und Naturwissenschaftliche Fakultät, Viena, 221 pp.

Gaviria, S. (1989) The calanoid fauna (Crustacea, Copepoda) of the Cordillera Oriental of the Colombian Andes *Hydrobiologia* 178:113-134

Gaviria, S. (1993a). Zwei Canthocamptidae (Copepoda, Harpacticoida) aus kolumbianischen Andengewässern *Annalen der Naturhistorisches Museum Wien* 94/95, B:361-375

Gaviria, S. (1993b) Crustacean plankton of a high altitude tropical lake: Laguna de Chingaza, Colombia *Verhandlungen des Internationalen Vereins für Theoretische und Angewandte Limnologie* 25:906-911

Gaviria, S. (1994) Los copépodos (Arthropoda, Crustacea) de vida libre de las aguas continentales de Colombia *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 19(73):361-385

Herrera-Martinez, Y., G. Guillot (1999) Composición taxonómica del zooplancton del Embalse de Betania, Departamento del Huila, Colombia *Acta Biológica Colombiana* 4 (1):5-19

Holyńska, M., J.W. Reid, H. Ueda (2003) Genus *Mesocyclops* Sars, 1914 pp 12-213 En H. Ueda & J.W. Reid (eds.) Copepoda: Cyclopoida, Genera *Mesocyclops* and *Thermocyclops,* H.J.F. Dumont (coord. ed.) *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* 20, Backhuys Publishers, Leiden.

Humes, A.G. (1994) How many copepods? *Hydrobiologia* 292/293:1-7

Jaramillo, J.C. (2002) Caracterización fisicoquímica y estructura de la comunidad zooplanctónica de un pequeño cuerpo de agua tropical de alta montaña: Lago Santander, Rionegro, Antioquia, Tesis de maestría, Universidad de Antioquia, 45 pp.

Jaramillo, J.C., S. Gaviria (2003) Caracterización física, química y estructura de la comunidad zooplanctónica de un pequeño lago tropical, Lago Santander (Rionegro, Antioquia) *Caldasia* 25 (2):355-380

Karaytug, S. (1999) Copepoda: Cyclopoida. Genera *Paracyclops*, *Ochridacyclops* and Key to the Eucyclopinae, *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* 14, H.J.F. Dumont (coord. ed.), Backhuys Publishers, Leiden, 214 pp.

Kiefer, F. (1933) Süßwassercopepoden aus Brasilien *Zoologischer Anzeiger 105*:38-43

Kiefer, F. (1956) Freilebende Ruderfusskrebse (Crustacea, Copepoda). Calanoida und Cyclopoida En F.Gessner, V. Vareschi (eds.) *Ergebnisse der Deutschen Limnologischen Venezuela-Expedition* 1952, 1: 233-268

Lang, K. (1948) Monographie der Harpacticiden. Lund, 2 vol., 1682 pp.

Löffler, H. (1972) Contribution to the limnology of high mountain lakes in Central America Internationale *Revue der gesamten Hydrobiologie* 57:397-408

Löffler, H. (1981) Copepoda pp. 14-19 En Hurlbert, S.H., G. Rodriguez, N. D. dos Santos (eds.) *Aquatic Biota of Tropical South America,* Part I. Arthropoda. San Diego State University Press, San Diego

Mirabdullayev, I., J.W. Reid, H. Ueda (2003) Genus *Thermocyclops* Kiefer, 1927 pp. 214-302 En H. Ueda, J.W. Reid (eds.) Copepoda: Cyclopoida. Genera *Mesocyclops* and *Thermocyclops,* H.J.F. Dumont (coord. ed.) *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* 20, Backhuys Publishers, Leiden.

Monroy J.D., N.J. Aranguren, S.Gaviria (2004) Los crustaceos planctónicos del Lago de Tota *Ciencia en Desarrollo* 1 (2):64-81

Noodt, W. (1972) Drei neue *Parastenocaris* aus Kolumbien (Crustacea, Copepoda) 1. Mitteilung über kolumbianische Grundwasser-Crustaceen *Studies on Neotropical Fauna and Environment* 7:101-112

Pearse, A.S. (1915) An account of the Crustacea collected by the Walker Expedition to Santa Marta, Colombia *Proccedings of the U.S. National Musem* 49:531-556

Petkovski, T.K. (1986a) Zur Taxonomie des Genus *Neocyclops* Gurney 1927 (Crustacea, Copepoda, Cyclopoida) *Acta Musei Macedonici Scientiarum Naturalium* 18 (2/148):27-46

Petkovski, T.K. (1986b) Zur Taxonomie des Genus *Mesocyclops* G.O. Sars 1914 (Crustacea, Copepoda, Cyclopoida) in der Neotropis *Acta Musei Macedonici Scientiarum Naturalium* 18 (2/149):47-79

Petkovski, T.K. (1988) Zur Cyclopidenfauna Kolumbiens (Crustacea, Copepoda) *Acta Musei Macedonici Scientiarum* Natalium 19(2/155):39-64

Ramirez, J.J., A. Diaz. (1997) Fluctuación estacional del zooplancton en laguna Parque Norte, Medellín, Colombia *Revista de Biologia Tropical* 44 (3)/45(1):549-563

Reid, J.W. (1985) Chave de identificação e lista de referências bibliográficas para as espécies continentais sulamericanas de vida livre da ordem Cyclopoida (Crustacea, Copepoda) *Boletim de Zoologia, Universidade de São Paulo* 9:17-143

Reid, J.W. (1986) Some usually overlooked cryptic copepod habitats *Styllogeus* 58: 494-598

Reid, J.W. (1987) Some cyclopoid and harpacticoid copepods from Colombia, including descriptions of three new species *Proccedings of the Biological Society of Washington* 100:262-271.

Reid, J.W. (1988) Cyclopoid and harpacticoid copepods (Crustacea) from Mexico, Guatemala and Colombia *Transactions of the American Microscopical Society* 107:190-202

Reid, J.W. (1993) New records and redescriptions of American species of *Mesocyclops* and *Diacyclops bernardi (*Petkovski, 1986) (Copepoda: Cyclopoida) *Bijdragen tot de Dierkunde* 63:173-191

Reid, J.W. (1998) Maxillopoda-Copepoda, Harpacticoida pp 74-127 En Young, P.S. (ed.) Catalogue of Crustacea of Brasil, Museo Nacional, Universidad Federal do Rio de Janeiro, III Serie, Serie Livros 6

Reid, J.W., J.A. Molina, M.M. Fukushima (1990) *Metacyclops leptopus totaensis*, new species from Lago de Tota, Colombia *Proccedings of the Biological Society of Washington* 103:674-680

Rocha, C.E.F. da, M.J.C. Botelho (1998) Maxillopoda-Copepoda, Cyclopoida pp 129-166 En Young, P.S. (ed.) Catalogue of Crustacea of Brasil, Museo Nacional, Universidad Federal do Rio de Janeiro, III Serie, Serie Livros 6

Roldán, G. (1992) Fundamentos de Limnología Tropical. Editorial Universidad de Antioquia, Medellín, 529 pp.

Santos-Silva, E.N. (1998) Maxillopoda-Copepoda, Freshwater Calanoida pp 201-220 En Young, P.S. (ed.) Catalogue of Crustacea of Brasil, Museo Nacional, Universidad Federal do Rio de Janeiro, III Serie, Serie Livros 6

Sturm, H. (1978) Zur Ökologie der andinen Páramoregion *Biogeographica* 14:1-115

Suárez, M. F., D. Ayala, M.J. Nelson, J.W. Reid (1984) Hallazgo de *Mesocyclops aspericornis* (Daday) (Copepoda: Cyclopidae) depredador de larvas de *Aedes aegypti* en Anapoima-Colombia *Biomédica* 4:74-76

Suárez-Morales, E., J.W. Reid, R. Gasca (2000) Copepoda pp 171-190 En Llorente Bousquets J.E., E. González Soriano, N. Papavero (eds.) *Biodiversidad , Taxonomía y* B*iogeografía de Artrópodos de México: Hacia una Síntesis de su Conocimiento* 2, D.R. Universidad Nacional Autónoma de México, México D.F.

Thiébaud, M. (1912) Copépodes de Colombie et des Cordillères de Mendoza En O. Fuhrmann, E. Mayor (eds.) Voyage d'Exploration Scientifique en Colombie *Mémoires de la Societé Neuchâteloise de Sciences Naturelles* 5:160-175

Walter, T.C. (1989) Review of the new world species of *Pseudodiaptomus* (Copepoda: Calanoida) with a key to the species *Bulletin of Marine Sciences* 45 (3):590-628

Anexo / *Appendix*

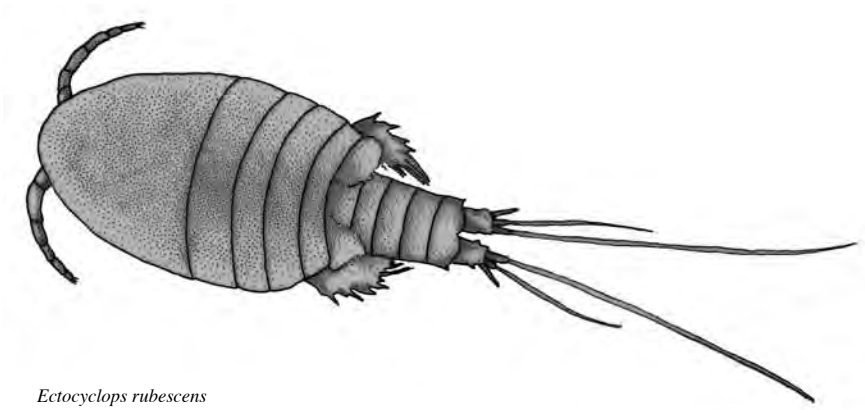
Listado de sinonimias que todavía aparecen en literatura reciente / Synonymies list of names that still appear on recent references

***Attheyella (Chappuisiella) fuhrmani* (Thiébaud, 1912)**
Attheyella (Chappuisiella) derelicta (Brian, 1927)

***Notodiaptomus echinatus* (Lowndes, 1934)**
Notodiaptomus kieferi Brandorff, 1973

***Notodiaptomus henseni* (Dahl, 1894)**
Notodiaptomus venezolanus Kiefer, 1956
Notodiaptomus venezolanus deeveyorum Bowman, 1973
Notodiaptomus deeveyorum Dussart, 1984

***Paracyclops andinus* Kiefer, 1957**
non *Paracyclops fimbriatus andinus* Lindberg, 1957 (syn. *Paracyclops hardingi* Karaytug & Boxshall, 1998)



Ectocyclops rubescens

Recibido: 13/06/2006
Aceptado: 12/02/2007

Biota Colombiana 8 (1) 69 - 76, 2007

Lista de especies de los escarabajos fruteros (Melolonthidae: Cetoniinae) de Colombia

Miguel Andrés Suárez-G.[1] y Germán Amat-García [2]

1 Biólogo, Universidad Nacional de Colombia *mastermigue@gmail.com*
2 Grupo Insectos de Colombia. Profesor Asociado, Instituto de Ciencias Naturales, Universidad Nacional de Colombia *gdamatg@unal.edu.co*

Palabras Clave: Coleoptera, Melolonthidae, Cetoniinae, Colombia

Introducción

Los escarabajos frugívoros son coleópteros pertenecientes a la superfamilia Scarabaeoidea; están incluidos en la subfamilia Cetoniinae, que agrupa aproximadamente 3100 especies; la mayor parte de ellas localizadas en las áreas tropicales y subtropicales del mundo (Krikken, 1984). Aunque la región afrotropical presenta la mayor riqueza en términos genéricos y el más alto porcentaje de endemismo (con 230 géneros, de los cuales el 94% de ellos son endémicos), la región neotropical presenta una situación similar, es decir, 44 géneros endémicos (89% de todas las especies del grupo) pertenecientes a las tribus Cetoniini, Goliathini, Gymnetiini y Cremastocheilini. En América existen alrededor de 250 especies distribuidas en 41 géneros Solís (2004); para Colombia se han registrado 24 especies distribuidas en 14 géneros y tres tribus. Restrepo *et al*. (2003). Pardo-Locarno y Orozco (2002) estimaron la riqueza del país en 40 especies.

Los adultos de Cetoniinae se caracterizan por ser de forma ovalada-alargada, compactos, frecuentemente robustos y generalmente aplanados dorso-ventralmente. El dimorfismo sexual puede ser desde imperceptible hasta muy acentuado; en caso de presentarse, se evidencia en el desarrollo de troncos cefálicos y torácicos con forma, número y longitud variables (Morón & Deloya, 1997). También existen diferencias notables en el grosor, la longitud y el armamento de la patas anteriores de los machos, como en la coloración y la textura de la superficie dorsal (Morón, 1982).

Las características anteriores se presentan en la mayoría de las especies de cetoninos, sin embargo las especies suramericanas de la subfamilia presentan una combinación de las siguientes características:

• Articulación de las antenas observables dorsalmente debido a la existencia de una escotadura anteocular.

• Élitros con una escotadura lateral amplia que les permite un vuelo de alta velocidad y una mayor capacidad de maniobra, a diferencia de otros escarabajos que deben abrir mas los élitros y mantenerlos de esta manera para poder volar.

• Coloración del cuerpo variable desde simple, opaca y de un solo color a compleja con varios colores en ocasiones metálicos y con diferentes patrones de manchas y puntuaciones.

Los adultos de los Cetoninos también se caracterizan por sus particulares hábitos alimenticios debido a que tienen sus piezas bucales adaptadas para la ingestión de alimentos blandos, líquidos o semilíquidos, lo cual les permite alimentarse de flores y de frutos dulces.

Algunas especies de Cetoniinae tienen importancia agrícola pues han sido descritas en repetidas ocasiones como visitantes frecuentes de flores de ornato, pastos, frutos de cáscara suave, (uva *Vitis vinifera* L., guayaba *Psidium guajava* L., durazno *Prunus persica* (L.) Batsch. y otros).

Morón, 1982; Gallego & Vélez,1989; Posada,1989. En Colombia, los adultos de *Gymnetis pantherina* son comunes alimentándose de flores del rosal *Rosa* sp., de frutos del aguacate *Persea gratissima*, de frutos del maíz *Zea mays*, del mango *Mangifera indica* y de banano

Musa paradisiaca y de mandarina *Citrus reticulata* . Es muy probable que, algunas especies conocidas en el país, alcancen el estatus de plagas de bajo impacto. Futuras investigaciones establecerán las condiciones bajo las cuales actúan los cetoninos como plagas.

Las características particulares tanto de los adultos como de las larvas, han llevado a algunos autores a considerarlos como un grupo independiente dentro de la familia Scarabaeidae. Varios autores latinoamericanos siguen la propuesta de Endrodi, (1966), quién considera a los Cetoninos, como una subfamilia dentro de la familia Melolonthidae. La revisión supragenérica de Krikken, (1984), eleva este grupo a un nivel de familia Cetoniidae, incluyendo en ella a las subfamilias Cetoniinae, Trichinae y Valginae las cuales conforman grupo monofilético relacionado con los Rutelinae-Dynastinae (Morón & Deloya, 1997) Esta propuesta es seguida por la escuela americana, sin embargo aún no existe un consenso entre los especialistas latinos y americanos. En el presente trabajo se adopta la propuesta latinoamericana.

Los estudios de cetoninos de Colombia se conocieron desde el siglo pasado con una revisión de la tribu Gymnetiini (Schurhöff,1937), quien registró algunas especies colombianas e incluyó una clave para el reconocimiento de las especies. Pardo-Locarno, & Orozco realizaron una sinopsis de la subfamilia y Restrepo, *et al*.(2003) listaron las especies presentes en el país con importante información sobre su distribución. Orozco & Pardo-Locarno (2004) realizaron la descripción de los estados inmaduros de tres especies de cetoninos presentes en Colombia. Amat-García & Trujillo (2004) realizaron un inventario de los Scarabaeoidea del Chocó, en el cual incluyeron 4 especies de Cetoniinae con información de su distribución geográfica. Finalmente, Neita, *et al*. (2006) establecieron 4 nuevos registros para Colombia en la selva baja del bosque pluvial tropical del Chocó-Biogeográfico.

De la literatura conocida se concluye que se requieren mas estudios relacionados con el conocimiento de las especies neotropicales y por ende, especialistas que emprendan nuevas investigaciones a cerca del grupo.

List of fruit beetle species (Melolonthidae: Cetoniinae) of Colombia

Miguel Andrés Suárez-G. and Germán Amat-García

Key words: *Coleoptera, Melolonthidae, Cetoniinae, Colombia*

Introduction

The fruit beetle belongs to the Scarabaeoidea superfamily, and is included in the Cetoniinae subfamily. The group includes approximately, 3100 species most of them inhabiting tropical and subtropical areas of the world (Krikken, 1984). Although the Afrotropical region displays the highest richness in terms of genera and the highest percentage of endemism (of 230 genera, 94% are endemic), the Neotropical region is similar in that it houses 44 endemic genera (89% of all the species of the group) pertaining to the Cetoniini, Goliathini, Gymnetiini and Cremastocheilini tribes.

In America there are around 250 species distributed in 41 genera (2004); for Colombia, 24 species distributed in 14 genera and three tribes have been registered. Restrepo et al. *Pardo-Locarno y Orozco (2002) estimate that there are 40 species in the country.*

Cetoniinae adults are characterized by a compact oval-extended form; they are frequently robust and generally have a flat back-ventral. The sexual dimorphism can range from being barely visible to very accentuated; in the latter case, it has developed cephalic and thoracic trunks with variable form, number and length. In addition, there are remarkable differences in the thickness, length and armament of the anterior legs of the males, as well as the coloration and the texture of the dorsal surface (Morón, 1982).

The previous characteristics are present in most of the species of Cetoniinae; however, the South American species of the subfamily display a combination of the following characteristics:

- *Joint of the antennas is visible from above due to an emargination before the eye.*
- *Elytra with a wide lateral emargination that allows for a high speed flight and a better ability to maneuver*

than other beetles that need to open the elytra wider and maintain this in order to be able to fly.

• The coloration of the body varies from simple, opaque and with only one color to complex with several colors, sometimes shiny with different patterns of spots and punctures.

Adult Cetoniinae are also characterized by their particular nutritional habits as their buccal aparatus are adapted for the ingestion of soft, liquid or semifluid food, which allows them to feed on flowers and sweet fruits.

Some species of Cetoniinae are of agricultural importance because they have been reported as frequent visitors to decorative flowers, grass, and fruits with soft rinds, (grape Vitis vinifera *L., guayaba* Psidium guajava *L, peach tree* Prunus persica *(L.) Batsch. and others) Morón, 1982 ; Gallego & Vélez,1989; Posada, 1989. In Colombia,* Gymnetis pantherina *adults frequently feed* Rosa sp. *flowers, on avocado fruits* - Persea gratissima*, on fruits of the corn variety* - Zea mays*, on Mangos* - Mangifera indica*, bananas* - Musa paradisiacal*, and Tangerines* - Citrus reticulata. *It is very probable that some species, known in the country, cause low impact plagues. Future investigations will establish the conditions under which the Cetoniinae can be plagues.*

The particular characteristics of both adults and larvae, have led some authors to consider them an independent group within the Scarabaeidae family. Several Latin American authors follow the proposal of Endrodi, (1966), who considers the Cetoniinae a subfamily within the Melolonthidae family. The suprageneric revision of Krikken, (1984), elevates this group to the level of the Cetoniidae family, including the subfamilies Cetoniinae, Trichinae and Valginae who make up a monophyletic group related to the Rutelinae-Dynastinae (Morón & Deloya, 1997). Although this proposal is followed by the American school, there is not yet a consensus between the Latin American and American specialists. In this work the Latin American proposal is adopted.

The studies regarding Colombian Cetoniinae were known from the last century with a revision of the Gymnetiini tribe. Schurhöff, (1937), recorded some Colombian species and included a key for the recognition of the species. Pardo-Locarno, & Orozco made a synopsis of the subfamily and Restrepo, et al.*(2003) listed the present species in the country with important information on their distribution. Orozco & Pardo-Locarno (2004) described the immature states of three Cetoniinae species in Colombia. Amat-García & Trujillo (2004) put together an inventory of the Scarabaeoidea of the Chocó region, in which they included 4 species of Cetoniinae with information regarding their geographic distribution. Finally, Neita,* et al. *(2006) established 4 new records for Colombia in the low tropical pluvial forest of the Chocó-Biogeographic region.*

One can conclude from the existing literature that more information related to this Neotropical species is required, and consequently more specialists to undertake new investigations about the group.

Listado Taxonómico / *Taxonomic List*

Se presenta el listado de las especies de escarabajos fruteros conocidos para Colombia, con su respectiva distribución geográfica y altitudinal, por primera vez se dan registros de localidad para varias especies. El material revisado de esta familia se encuentra depositado en 10 de las principales colecciones entomológicas del pais.

The listing of the species of the fruit beetles known for Colombia appears, with respective geographic and altitudinal distribution, records of the locality for several species appear for the first time. The reviewed material of this family is deposited in 10 of the main entomological collections of the country.

Abreviaturas / *Abbreviations*

(ICN-MHN) Instituto de Ciencias Naturales, Museo de Historia Natural, Sección de Entomología, Universidad Nacional de Colombia Sede Bogotá; (UNAB) Museo Entomológico de Agronomía Universidad Nacional de Colombia Sede Bogotá; (GAG) Colección Germán Amat García, Bogotá; (IAVH) Colección de Insectos, Instituto Alexander von Humboldt, Villa de Leyva; (UNIV), Colección entomológica de la Universidad del Valle, Cali, (CIAT) Centro de Investigación de Agricultura Tropical, Palmira; (CEUA) Colección Entomológica, Universidad de Antioquia; (MEPB) Museo Entomológico, Insectario Piedras Blancas, Piedras Blancas; (MEFLG) Museo Entomológico Francisco Luís Gallego, Universidad Nacional Sede Medellín, Medellín; (CIB) Centro de Investigación en Biodiversidad, Medellín.

Taxón / *Taxon*	**Distribución en Colombia / *Distribution in Colombia***	**Rango Altitud (msnm) / *Altitude (masl)***	**Colección de referencia / *Collection of reference***
Cremastocheilini			
Cyclydius elongatus (Olivier, 1789)	ama met pu	100-850	IAvH-E ICN CO
Cetoniini			
Euphoria lurida	ant ce	10-	MEFLG
Euphoria precaria Janson, 1881	ant by cun vc	2200	IAvH-E MEFLG UNAB
Euphoriopsis hera Burmeister,1842	ant by cho cun ns	43-2040	ICN CO UNAB MEFLG
Gymnetini			
Allorhina carmelita (Burmeister, 1842)	met	350	IAvH-E
Amithao decemguttatum (Waterhouse, 1876)	ant cho vc	30-2000	CIB ICN CO MUSENUV MEFLG UNAB
Amithao niveosparsus (Moser, 1913)	cho cun	40	ICN CO UNAB
Argyripa lansbergei (Salle, 1857)	snt	2000	ICN CO
Cotinis barthelemyi (Burmeister, 1842)	at cl ma	60 - 480	ICN CO UNAB
Cotinis columbica (Gory & Percheron, 1833)	cau cun hu lg met to	290 - 2600	CEUA ICN CO MEFLG MUSENUV UNAB
Cotinis lebasi (Gory & Percheron, 1833)	ant by cau cl ce cho cun ma snt to	0- 1850	CEUA CIB IAvH-E ICN CO UNAB MEFLG MEPB MUSENUV UNAB
Desicasta reichei (Thomson, 1860)	ant snt to vc	320-1300	UNAB MEFLG
Guatemalica hueti (Chevrolat, 1870)	cho	90	ICN CO UNAB
Gymnetis coturnix (Burmeister, 1842)	ama ant by cq cho cun gv ma qu snt	120-2010	ICN CO UNAB CEUA IAvH-E MEFLG
Gymnetis holosericea (Voet, 1779)	ant cho hu ma qu snt to vc	40-1500	CEUA IAvH-E ICN CO MEFLG MUSENUV UNAB

Taxón / *Taxon*	**Distribución en Colombia / *Distribution in Colombia***	**Rango Altitud (msnm) / *Altitude (masl)***	**Colección de referencia / *Collection of reference***
Gymnetis pantherina (Blanchard, 1843)	ant by cl cs cau cho cun gv hu ma met ns qu ri snt vc	43-2600	CEUA CIAT CIB IAvH-E ICN CO MEPB MEFLG MUSENUV UNAB
Gymnetis pardalis (Gory & Percheron, 1833)	ant met	522	ICN CO UNAB CEUA MUSENUV CIB
Gymnetis stellata (Latreille, 1833)	ant bl cho cun ma met ri snt suc to vc	20-1200	ICN CO CEUA UNAB MEFLG MUSENUV UNAB
Gymnetis vandepolli (Bates, 1887)	cho va	43	UNAB MEFLG
Gymnetis wollastoni (Schaum, 1848)	cho	43	UNAB
Hoplopyga liturata (Olivier, 1789)	ant by cl cs cau cor cun cho gv met ns qu cnt suc vc	10-2600	CEUA CIB ICN CO IAvH-E UNAB MEFLG MUSENUV UNAB
Hoplopyga ocellata (Gory & Percheron, 1833)	cho vc	43-575	ICN CO UNAB
Howdenipa gloriosa (Ratcliffe, 1978)	cs vc	1000	ICN CO
Marmarina maculosa (Olivier, 1789)	ant cho cun ma ns vc	40-2560	CIAT CIB UNAB MEFLG

Agradecimientos/ *Acknowledgments*

Los autores agradecemos al Instituto de Ciencias Naturales de la Universidad Nacional de Colombia por su colaboración en la logística del estudio. A Brett Rattcliffe del la Universidad de Nebraska, a Henry Howden del Museo Natural Canadiense y a John Cesar Neita, estudiante de posgrado de la Universidad Nacional por la determinación taxonómica de ejemplares; A Fernando Fernández, Eduardo Amat, Diego Campos y Héctor Gasca por su colaboración con comentarios al trabajo. A Marta Wolf de la Universidad de Antioquia y Nancy Carrejo de la Universidad del Valle, por su colaboración en el acceso al material de esta colecciones. Por último a Clara Gómez, Miguel Angel Suárez, en la financiación y parte logística y a Clara Lucia Suárez y Natalia Torres, por su valiosa colaboración en diversos aspectos del trabajo.

The authors would like to thank the Instituto de Ciencias Naturales de la Universidad Nacional de Colombia for its collaboration in the logistics of the study; Brett Rattcliffe of the University of Nebraska, Henry Howden of the Canadian Natural Museum and John Cesar Neita, for the taxonomic determination. We would also like to thank Fernando Fernandez, Eduardo Amát, Diego Campos and Héctor Gasca for their valuable comment on the project; Marta Wolf of the Universidad de Antioquia and Nancy Carrejo of Universidad del Valle for their assistance in the access to the material of these collections. Finally to Clara Gómez, Miguel Angel Suárez, in the funding and in the logistic part and to Clara Suárez and Natalia Torres for their valuable collaboration in various aspects of the work.

Literatura Citada / *Literature Cited*

Amat G. Trujillo D (2004) Escarabajos(Coleoptera: Scarabaeoidea) en el Choco biogeográfico pp. 745-754. *En*: Rangel O. (Editor). "Colombia Diversidad Biotica IV". Universidad Nacional de Colombia-Conservación internacional de Colombia.

Arnaud, P (1988) Les espèces du genre *Argyripa* (Cetoniinae) *Bulletin Sciences* 57. pp 4 p 1 col.

Bacchus, M. E (1974) A catalogue of the type-specimens of the Cetoniinae described by G.J. Arrow *Bull. B. M .N .H* ., 31(2) pp 25-44.

Boos, J, B. Ratcliffe (1985) A new species of *Inca clathrata* (Olivier) from Trinidad, West Indies and range extensions for *Inca clathrata sommeri* Westwood (Coleoptera: Scarabaeidae: Trichiinae) *The Coleopterist Bulletin* 39(4): 381-389.

Blackwelder, R.E (1944) Checklist of coleopterus insects of Mexico, Central America, the west Indies and South America, 2 *Bulletin of the United States National Museum*, 185, 197-265.

Burmeister, H. C. C (1842) Handbuch der Entomologie (Coleoptera Lamellicornia Melitophila) Berlín 826 pp.

Chevrolat, L. A. A (1870) Description de six coléoptères exotiques éclos a Paris *Annales de la Soc. Entom. de Belgique* 14:5-8.

Delgado-Castillo, L, M. A. Morón (1991) A new genus and species of Trichiini from México (Coleoptera: Melolonthidae) *Pan-pacific Entomologist* 67 (3) 181-188.

Delgado, L. Pérez, A. Blackaller J (2000) Claves para determinar taxones genéricos y supragenéricos de Scarabaeoidea Latreille, 1802 (Coleoptera) de México *Folia entomológica Mexicana* 110: 33-87.

Deloya, C (1995) A new species of *Cotinis* (Cotinis) Burmeister from Mexico (Coleoptera: Melolonthidae, Cetoniinae) *The Coleopterist Bulletin* 49(2) pp 149-152.

Flint, O (2000) A new species of *Leptonema* of the occidentale grup (Trichoptera:Hydropsychidae) from *Madagascar Entomological News* 111(3):177-180.

Goodrich, M. A. (1965) A redescription and revision of the genus *Balsameda* Thomson (Coleoptera: Scarabaeidae) *Canadian Entomologist l* 97 (3) pp 298-302.

Goodrich, M. A (1966) A revision of the genus *Cotinis* (Coleoptera: Scarabaeidae) *Annals of the Entomological Society of America* Vol. 59, No. 3, 550-568.

Gory, H. L. y Percheron, A. R (1833) Monographie des cétoines et genres voisins, formant, dans les familles naturelles de Latreille, la division des scarabées mélitophiles París 410pp.

Hardy, A. R. (1987) Clarification of a name in Gymnetini (Coleoptera: Scarabaeidae) *The Coleopterist Bulletin* 41 (2) pp 154-155.

Hardy, A. R (1988) Studies in the *Euphoriina* of the Americas (Coleoptera: Scarabaeidae) I: Introduction and generic concepts *The Coleopterist Bulletin* 42(1), 1-9.

Hardy, A (1975) New world Gymnetini: An attemp at clarification (Coleoptera: Scarabaeidae) *The Coleopterist Bulletin* 29(3) 205-208.

Hedstrom, I (1984) Prepona butterflies (Nymphalidae) and Hoplopyga beetles (Scarabaeoidea) on the same food source during the Neotropical dry season –a case of commensalism? *Revista de Biología Tropical*, 32 (2): 313-316.

Howden, H. F (1968) A review of the Trichiinae of North and Central America (Coleoptera: Scarabaeidae). *Memoirs of the Entomological Society of Canada* No 54 77 pp.

Howden, H. F (1971) Key To The New Word Cremastocheiline, with notes and description of a new genus (Coleoptera: Scarabaeidae) *Proceedings of the Entomological Society of Washington* Vol 73, No 2: 224-230

Janson, O. E (1875) Descriptions of three new species of American Cetoniidae *Cistula Entomológica* 1:373-376.

Janson, O. E (1880) Description of new American Cetoniidae *Cistula Entomológica* 2. 575-80.

Krikken, J (1984) A new Key to the suprageneric taxa in the beetle family Cetoniidae, with annotated lists of the known genera En *Zoologische Verhandelingen* No. 210 1-75.

Latreille, P. A (1802) The Beetles of the United States 395-431.

Latreille, P. A (1833) Insectes de L'Amérique Equinoxiale, recueillis pendant le voyage de MM. de Humboldt et Bonpland Observations de zoologie et d'anatomie comparée 2:1-64.

Martinez, A (1949) Notas coleopterologicas II. *Anales de la Sociedad Científica Argentina* 147: 13-15

Martinez, A (1992) Una nueva especie de *Genuchinus* Westwood (Coleoptera: Melolonthidae: Cetoniinae) *Folia Entomologica Mexicana* 85: 39-45.

Micheli, J (1976) Gymnetis chalcipes undata (Oliv.) in Puerto Rico (Coleoptera: Scarabaeidae) *The Coleopterists Bulletin* 30(4) Pag 330.

Micó, E., W. E. Hall, and B. C. Ratcliffe (2001) Descriptions of the larvae of *Hoplopyga singularis* (Gory and Percheron) and *Hologymnetis cinerea* (Gory and Percheron) with a revised key to the larvae of New World Gymnetini (Coleoptera: Scarabaeidae: Cetoniinae) *The Coleopterists Bulletin* 55(2): 205-217.

Morón, M. A, B. C. Ratcliffe (1984) Description of the larva and pupa of *Argyripa lansbergei* (Sallé) with new distributional records for the genus and a key to the new world Gymnetini larvae (Coleoptera: Scarabaeidae: Cetoniinae) *Proceedings of the Entomological Society of Washington* 86: 760-768.

Morón, M.A., Deloya C (1988) Fauna de Coleopteros Melolonthidae Scarabaeidae y Trogidae de la región de Chamela, Jalisco Mexico *Folia Entomologica Mexicana* No.77: 313-378.

Morón. M (1994) La Diversidad Genética de los Coleopteros Melolonthidae en Mexico *Acta Zoológica Mexicana* 61: 7-19

Morón. M (1995) Fenologia y hábitos de los Cetoniinae (Coleoptera: Melolonthidae) en la region de Xalapa-Coatepec, Veracruz, Mexico G. it. Entomol. 7: 317-332

Morón, M, B. Ratcliffe, C. Deloya (1997) Atlas de los escarabajos de Mexico. I. Familia Melolonthidae. Sociedad Mexicana de Entomología.

Morón M "Escarabajos 200 millones de años de evolución" pp. 119-145 Instituto de Ecología A.C. –Sociedad Entomológica Aragonesa.

Neervoort Van De Poll, H. tour New Cetoniidae From Central –And South-America Notes From The Leyden Museum Vol. VIII 231-237.

Neita J, Orozco. J, B. Ratcliffe Escarabajos (Scarabaeidae: Pleurosticti) de la selva baja del bosque pluvial tropical, Chocó, Colombia *Acta Zoologica Mexicana* 22 (1) 2006.

Orozco, J. y Pardo-Locarno, L (2004) Description of the immature stages of three species of American Cetoniinae (Coleoptera: Scarabaeidae: Cetoniinae) *Zootaxa* 769; 1-14.

Ratcliffe, B. (1976) Notes on the biology of *Euphoriaspis hirtipes* (Horn) and description of the larvae and pupa (Coleoptera: Scarabaeidae) *The Coleopterist Bulletin* 30: 217-225.

Ractliffe, B. C. (1978) A review of the genus *Argyripa* (Coleoptera: Scarabaeidae). *Systematic Entomology* 3: 371-378.

Ratcliffe, B. C, A. C. Deloya (1992) The biogeography and phylogeny of *Hologymnetis* (Coleoptera: Scarabaeidae: Cetoniinae) with a revision of the genus *The Coleopterists Bulletin* 46:161-202.

Ratcliffe, B. C, E. Micó (2001) A review of the Neotropical genus *Neocorvicoana*. Ratcliffe and Micó, new genus (Coleoptera: Scarabaeidae: Cetoniinae: Gymnetini) *The Coleopterists Bulletin*, 55(3):279-296.

Ratcliffe, B. (2002) A check list of the Scarabaeoidea (Coleoptera) of Panama. *Zootaxa* 32 pp 1-48.

Restrepo et al. (2003) Catálogo de Coleoptera Melolonthidae (Scarabaeidae Pleurosticti de Colombia) *Folia Entomológica Mexicana* 42(2): 239-263.

Ritsema, C. C (1885) Four new species of exotic Coleoptera *Notes from the Leyden Museum* 7:39-46.

Schaum, H. R (1847) Two decades of new Cetoniidae *Transactions of the Entomological Society of London*. 5:64-76.

Schurhoff, P. N (1937) Beitrage zur kenntnis der Cetoniden (Col.) VIII Revison der gattung *Gymnetis* MacLeay *Deutsche Entomologische Zeitschrift* 1937:565-580

Simon, U. Zotz, G (2002) Cetoniinae the developing in a living stalk of Bromeliaceae (Coleoptera: Scarabaeidae: Cetoniinae: Gymnetina) *The Coleopterist Bulletin* 56(4):533-539.

Solís A. (2004) Escarabajos fruteros de Costa Rica. INBio. Costa Rica.

Vaz-De-Mello, F., J. N. C. Louzada, J. H. Schoereder (1998) New data and comments on Scarabaeidae (Coleoptera: Scarabaeidae) associated with Attini

(Hymenoptera: Formicidae) *The Coleopterists Bulletin*, 52(3): 209-216.

Velez R (1989) Catalogo del Museo de Entomología "Francisco Luis Gallego" Universidad Nacional de Colombia sede Medellín 46-55

Waterhouse, C. O. (1876) Descriptions of two new species of Cetoniidae. *Ann. Mag. Nat. Hist., Ser* 4. 18:422-423.

Recibido: 24/11/2006
Aceptado: 19/02/2007

Gymnetis stellata

Biota Colombiana 8 (1) 77 - 86, 2007

Escarabajos coprófagos (Coleoptera: Scarabaeidae) de la provincia de la Sierra Nevada de Santa Marta

Jorge Ari Noriega A.[1], Cesil Solis [2], Federico Escobar S.[3], Emilio Realpe R.[1].

1 Laboratorio de Zoología y Ecología Acuática, Universidad de los Andes, Bogota – Colombia. *jnorieg@hotmail.com*.
2 Departamento de Investigación Fundación Hidrobiológica George Dahl, Barranquilla-Colombia.
3 Departamento de Ecología y Comportamiento Animal, Instituto de Ecología, A.C., Apartado Postal 63, 91000 Xalapa, Veracruz - México.

Palabras clave: Escarabajos coprófagos, Scarabaeidae, Provincia Sierra Nevada de Santa Marta, Lista de especies, Colombia.

Introducción

Los bosques montanos de los Andes, son los mayores centros de endemismo y diversidad del mundo (WWF 1986; Rangel 1995), a pesar de no exceder el 0.2% del planeta (Carrizosa 1990). Esta diversidad se atribuye al rápido surgimiento de las cordilleras, generando una heterogeneidad de hábitats, que facilitaron la llegada y coexistencia de nuevas especies (Ortiz Von Halle 1991). A pesar de su importancia, los bosques montanos se encuentran entre los menos conocidos y más amenazados, debido a la presión antrópica (Andrade 1992; Cavelier & Etter 1995).

La Provincia de la Sierra Nevada de Santa Marta (SNS Marta, Figura 1), es uno de estos casos, en donde se desconoce su diversidad y su destrucción es acelerada (Rangel & Garzón 1995), sin que exista la implementación de medidas para su preservación (Fundación Pro-Sierra 1991). Hernández *et al*. (1992) la postula como un refugio del pleistoceno, presentando selvas húmedas, bosques secos, sabanas, bosques de matorral subxerofíticos, bosques de niebla y páramo. Comprende cinco diferentes distritos: Guachaca, Aracataca, Caracolicito, Marocaso y Chundúa; con elementos derivados de tierras bajas y procesos de especiación en zonas altas, con aportes provenientes de la Serranía del Perijá y Mérida (Hernández *et al*. 1992).

Uno de los grupos menos conocidos dentro de estos ambientes son los insectos, aunque representan el componente más diverso (Wilson 1987; Kremen *et al*. 1993; Jaffe 1993; Kellert 1993), su conocimiento y conservación ha sido un subproducto de investigaciones sobre plantas y vertebrados (Janzen 1987; Hafernik 1992; Kim 1993).

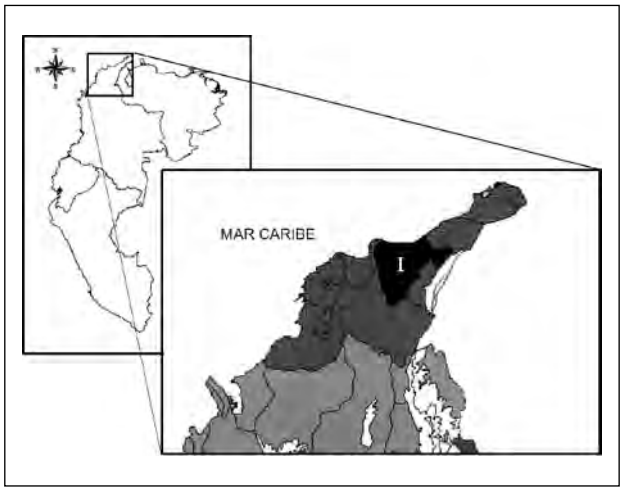


Figura 1. Mapa de la ubicación en Colombia de la Provincia de la SNS Marta (Zona I), según Hernández *et al*. (1992).

Figure 1. *Map showing the location of the SNS Marta region (Zone 1) within Colombia, after Hernandez* et al. *(1992).*

Dentro de los insectos, cabe destacar aquellos que presentan una asociación con determinados componentes del hábitat, por lo que su presencia es utilizada como indicador del estado de conservación (Kremen 1992; Amat 1993; Pearson 1994). A este grupo de insectos se les conoce como bioindicadores, y su uso ha aumentado en las últimas décadas (Brown 1991; Kremen 1994; Fagua *et*

al. 1999). Uno de estos grupos es el gremio de los insectos coprófagos, especialmente los escarabajos de la familia Scarabaeidae, quienes al utilizar el excremento de los mamíferos pueden ser utilizados como indicadores del estado de conservación de ciertas zonas (Halffter & Favila 1993).

El conocimiento de los escarabajos estercoleros en el país ha aumentando en las ultimas dos décadas, a raíz de trabajos de índole local, regional y nacional (Medina & Kattan 1996; Amat *et al*. 1997; Escobar 1997; Amezquita *et al*. 1999; Castellaños *et al*. 1999; Escobar 2000a, 2000b; Escobar & Chacon de Ulloa 2000; Vitolo 2000; Medina & Lopera 2001; Medina *et al*. 2002; Noriega 2002a, 2002b; Escobar 2003; Pulido *et al*. 2003; Escobar 2004; Noriega 2004; Garcia & Pardo 2004; Vitolo 2004; Escobar *et al*. 2005). Existen hasta la actualidad un total de 285 especies, contenidas en 39 géneros, descritas para Colombia (Medina *et al*. 2001; Noriega 2002a; Vaz de Mello 2003).

A pesar de ello existen zonas que se desconocen por completo o que han sido muy poco estudiadas como la Provincia de la SNS Marta. Hasta el compendio de estudios realizado por Escobar (2000a) solo existían registradas cuatro especies: *Ontherus sanctaemartae*, *O. lichyi*, *Scybalocanthon darlingtoni* y *Sulcophanaeus steinheili*. El siguiente trabajo se constituye en un importante aporte al conocimiento de los escarabajos coprófagos de Colombia (Tabla 1) y especialmente al vació que se tenía para esta región (Figura 2).

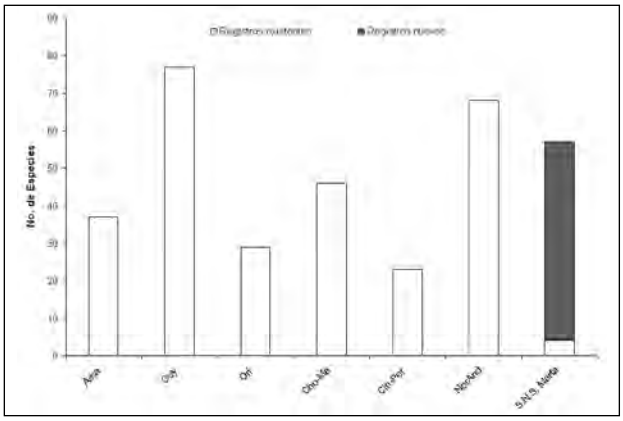


Figura 2. Número de especies observadas en cada una de las provincias biogeográficas de Colombia, según los registros existentes (Escobar 2000a) y los nuevos registros para la Provincia de la SNS Marta aportados en este trabajo. Ama: Amazonia, Guy: Guyana, Ori: Orinoquía, Cho-Ma: Choco – Magdalena, Cin-Per: Cinturón Pericaribeño, NorAnd: NorAndina, S.N.S. Marta: Sierra Nevada de Santa Marta.

Figure 2*. Number of species observed in each of the biogeographic zones in Colombia, according to existing records (Escobar 2000a) and the new samples provided for the region of SNS Marta by this work. Ama: Amazonia, Guy: Guyana, Ori: Orinoquia, Cho-Ma: Choco – Magdalena, Cin-Per: Peri-Caribbean belt, NorAnd: Northern Andes, S.N.S. Marta: Sierra Nevada de Santa Marta.*

Dung beetles (Coleoptera: Scarabaeidae) from Sierra Nevada of Santa Marta region

Jorge Ari Noriega A., Cesil Solis , Federico Escobar S., Emilio Realpe R.

Keywords*:* *Dung beetles, Scarabaeidae, Sierra Nevada of Santa Marta Region, species list, Colombia.*

Introduction

Andean montane forests are the greatest centers of endemism and biodiversity in the world (WWF 1986; Rangel 1995), despite occupying only 0.2% of the planet (Carrizosa 1990). This diversity is attributed to the rapid upsurge of the mountain range, which resulted in heterogeneous habitats that facilitated both the arrival and coexistence of new species (Ortiz Von Halle 1991). Despite their importance, these montane forests are among the least known and most threatened by anthropogenic pressure (Andrade 1992; Cavelier & Etter 1995).

The region of the Sierra Nevada of Santa Marta (SNS Marta, Figure 1) is an example of an area whose poorly understood biodiversity is being rapidly destroyed (Rangel & Garzón 1995), without any measures being taken for its preservation (Fundación Pro-Sierra 1991). Hernández et al. *(1992) postulates the zone as a Pleistocene refuge, with rainforests, dry forests, savannas, sub-xerophytic shrubs, cloud forest, and paramo. Made up of five different districts, Guachaca, Aracataca, Caracolicito, Marocaso, and Chundúa, the region has elements derived from the lowlands and speciation in high lands with contributions coming from the mountainous regions of Perijá and Mérida (Hernández* et al. *1992).*

Insects are the most diverse component of the environments discussed above, yet they remain one of the least apprehended (Wilson 1987; Kremen et al. *1993; Jaffe*

1993; Kellert 1993). Knowledge about insects and their conservation has been only a sub-product of research on plants and vertebrates (Janzen 1987; Hafernik 1992; Kim 1993).

It is worth noting that the presence of those insects that are associated with particular habitat characteristics are used as an indicator of the state of conservation (Kremen 1992; Amat 1993; Pearson 1994). These insects are known as bioindicators and their use has increased in the last few decades (Brown 1991; Kremen 1994; Fagua et al. *1998). One such group of bioindicators is the guild of coprophagic insects, particularly beetles belonging to the Scarabaeidae family, which, given their consumption of mammal excrement, can be used as indicators of the state of conservation in certain areas (Halffter & Favila 1993).*

Knowledge of dung beetles in Colombia has increased in the last twenty years, due to local, regional and national efforts (Medina & Kattan 1996; Amat et al. *1997; Escobar 1997; Amezquita* et al. *1999; Castellaños* et al. *1999; Escobar 2000a, 2000b; Escobar & Chacon de Ulloa 2000; Vitolo 2000; Medina & Lopera 2001; Medina* et al. *2002; Noriega 2002a, 2002b; Escobar 2003; Pulido* et al. *2003; Escobar 2004; Noriega 2004; Garcia & Pardo 2004; Vitolo 2004; Escobar* et al. *2005). In Colombia 285 species exists, in 39 genus (Medina* et al. *2001; Noriega 2002a; Vaz de Mello 2003).*

Despite this, there are zones, including the region of SNS Marta, where they are not very extensively studied or even completely unknown. The summary of studies carried out by Escobar (2000a) only finds four species: Ontherus sanctaemartae, O. lichy, Scybalocanthon darlingtoni, *and* Sulcophanaeus steinheili. *The following work, then, is an important contribution to the understanding of the coprophagic beetles of Colombia (Box 1) and especially to filling the large information gaps in the study of beetles in SNS Marta (Figure 2).*

Tabla 1. Listado comparativo de los géneros descritos para el Neotrópico, Colombia y para la Provincia de la SNS Marta presentes en este trabajo. En la última columna se muestra el porcentaje de lo encontrado en la Provincia de la SNS, con respecto a lo descrito para Colombia.

Box 1. *Comparative listing of the genera described for the Neotropics, Colombia and of those presented in this work for the SNS Marta region. The last column shows the number of genera found in the SNS Marta region as a percentage of all the genera described for Colombia.*

Tribu - *Género* / *Tribe - Genus*	**No. de especies / *Species number***			**(%)**
	Región Neotropical / *Neotropical Region*	**Colombia / *Colombia***	**Provincia SNS Marta / *SNS Marta region***	
Ateuchini				
Canthidium	139	27	6	22,2
Dichotomius	161	36	1	2,8
Ontherus	59	18	3	16,7
Scatimus	12	3	1	33,3
Uroxys	55	15	4	26,7
Canthonini				
Canthon	174	36	10	27,8
Deltochilum	81	21	3	14,3
Malagoniella	9	1	1	100
Scybalocanthon	16	7	2	28,6

Tribu - *Género* / *Tribe - Genus*	No. de especies / *Species number*			(%)
	Región Neotropical / *Neotropical Region*	Colombia / *Colombia*	Provincia SNS Marta / *SNS Marta region*	
Eurysternini				
Eurysternus	36	12	5	41,7
Onthophagini				
Digitonthophagus	1	1	1	100
Onthophagus	99	31	11	35,5
Phanaeini				
Coprophanaeus	28	9	3	33,3
Diabroctis	3	2	1	50
Oxysternon	15	7	2	28,6
Phanaeus	48	8	2	25
Sulcophanaeus	14	7	1	14,3
Total:	**950**	**241 (285)**	**57**	23,7

Listado Taxonómico / *Taxonomic List*

A continuación se presenta el listado de las especies de escarabajos coprófagos que se registran en la Provincia de la SNS Marta – Colombia. Este listado es el compendio tanto de registros bibliográficos, como de información recopilada en museos y colecciones, así como también de información obtenida en muestreos realizados por los autores en diferentes localidades, enmarcados en trabajos de grado e inventarios faunísticos locales. Algunos géneros como *Canthidium*, *Onthophagus* y *Uroxys* carecen de revisión taxonómica, así como algunas especies colectadas, las cuales han sido remitidas a especialistas para su identificación, por todo lo anterior es posible que en un futuro este listado pueda incrementar su número y especificidad.

The following is a listing of the species of coprophagic beetles that have been recorded in the SNS Marta region, Colombia. This listing summarizes literature reviews, information complied in museums and collections, data from student theses and local fauna inventories, and information gathered through sampling done by the authors at different locations. Some genera, such as Canthidium, Onthophagus *and* Uroxys*, and species collected are currently under taxonomic revision, therefore, the samples collected of the species in question have been submitted to specialists for identification making it possible for this list to be increased both in number and specificity, in the future.*

Las siglas utilizadas en la segunda columna corresponden a: Sb: Sabana, BS-S: Bosque Seco Secundario, SBH-P: Selva Basal Húmeda Primaria, SBH-S: Selva Basal Húmeda Secundaria, SPM-S: Selva de Pie de Monte Secundaria, SSA-S: Selva SubAndina Secundaria, SA-S: Selva Andina Secundaria, según Etter (1993). La cuarta columna corresponde a las siguientes instituciones: **CJAN**, Colección de Referencia, Jorge Ari Noriega, Bogota; **CUA**, Colección de Insectos, Universidad del Atlántico, Barranquilla; **MPUJ**, Museo de Historia Natural, Lorenzo Uribe S.J., Pontificia Universidad Javeriana, Bogota. **NR**: Nuevo Registro.

The acronyms used in the second column correspond to the following: Sb: Savanna, BS-S: Secondary Dry Forest, SBH-P: Primary Lowland Rainforest, SBH-S: Secondary Lowland Rainforest, SPM-S: Secondary Sub-Montane Forest, SSA-S: Sub-Andean Secondary Forest, SA-S: Andean Secondary Forest, after Etter (1993). Acronyms in the fourth column correspond to the following institutions: ***CJAN****: Reference Collection, Jorge Ari Noriega, Bogotá;* ***CUA****: Insect Collection, University of the Atlantic, Baranquilla;* ***MPUJ****: Museum of Natural History, Lorenzo Uribe S.J., Pontificia Javeriana University, Bogotá.* ***NR****: New Record.*

Taxon / ***Taxon***	**Hábitat /** ***Habitat***	**Altitud /** ***Elevation*** **(msnm)**	**Colección Referencia /** ***Collection for Reference***	**Referencia Bibliográfica /** ***Bibliographic Reference***
Tribu Ateuchini				
Canthidium aurifex Bates, 1887	BS-S	0-500	CJAN MPUJ	NR
Canthidium centrale Boucomont, 1928	SBH-S, SPM-S, SSA-S	0-1800	CJAN MPUJ	NR
Canthidium cf. *euchalceum* Balthasar, 1939	SBH-S, SPM-S	100-700	CJAN CUA	Noriega 2001
Canthidium haroldi Preudhomme, 1886	BS-S	100-500	CJAN	NR
Canthidium macroculare Howden & Gill, 1987	SBH-S, SPM-S	100-900	CJAN	Noriega 2001
Canthidium cf. *steinheili* Harold, 1880	SBH-S, SPM-S	100-700	CJAN	NR
Dichotomius cf. *belus* (Harold, 1880)	SBH-S	100-300	CJAN	Noriega 2001
Ontherus brevipennis Harold, 1867	SBH-P	0-500	CJAN	Genier 1996
Ontherus lichyi Martínez, 1947	SPM-S	800-950	CJAN	Genier 1996
Ontherus sanctaemartae Genier, 1996	SPM-S, SSA-S, SA-S	700-2500	CJAN CUA	Genier 1996
Scatimus ovatus Harold, 1862	SBH-P	500-700	CJAN CUA	Genier & Kohlmann 2003
Uroxys cf. *bidentis* Howden & Young, 1981	SBH-S	100-500	CJAN	NR
Uroxys macrocularis Howden & Young, 1981	SSA-S	1600-1700	CJAN	Noriega 2001
Uroxys micros Bates, 1887	SBH-S, SPM-S, SSA-S	100-2100	CJAN	Noriega 2001
Uroxys nebulinus Howden & Gill, 1987	SPM-S, SSA-S	1200-2000	CJAN	Noriega 2001
Tribu Canthonini				
Canthon acutus Harold, 1868	SBH-S	0-300	CJAN CUA	NR
Canthon cf. *aequinoctialis* Harold, 1868	SBH-P	0-100	CUA	NR
Canthon cyanellus Harold, 1863	SBH-S	0-300	CJAN CUA	NR

Taxon / *Taxon*	**Hábitat / *Habitat***	**Altitud / *Elevation* (msnm)**	**Colección Referencia / *Collection for Reference***	**Referencia Bibliográfica / *Bibliographic Reference***
Canthon cf. *juvencus* Harold, 1868	SBH-S	0-500	CJAN MPUJ	Pereira & Martínez 1956
Canthon lituratus (Germar, 1824)	SBH-S	0-500	CJAN CUA	NR
Canthon cf. *luteicollis* (Erichson, 1847)	SBH-P	0-100	CUA	NR
Canthon mutabilis Lucas, 1857	SBH-S	0-300	CJAN CUA	NR
Canthon s. septemmaculatus (Latreille, 1811)	SBH-S	0-300	CJAN CUA	NR
Canthon subhyalinus Harold, 1867	SBH-S, SPM-S, SSA-S	300-1900	CJAN MPUJ	Noriega 2001
Canthon variabilis (Martínez, 1948)	BS-S	400-500	CJAN	Noriega 2001
Deltochilum gibbosum cf. *panamense* Howden, 1966	SBH-S, SPM-S	0-900	CJAN CUA	Medina *et al.* 2001
Deltochilum laevigatum Balthasar, 1939	SSA-S	1200-1700	CJAN MPUJ	Noriega 2001
Deltochilum orbignyi Blanchard, 1843	SBH-S	0-400	CJAN CUA	Noriega 2001
Malagoniella astyanax columbica (Harold, 1867)	BS-S	0-400	CJAN CUA	NR
Scybalocanthon darlingtoni Paulian, 1939	SSA-S	1600-1700	CJAN	Pereira & Martínez 1956
Scybalocanthon sexpilotus (Guerin, 1855)	BS-S	0-100	CJAN	Vulcano & Pereira 1967
Tribu Eurysternini				
Eurysternus caribaeus (Herbst, 1789)	SBH-S, SPM-S, SSA-S	0-1300	CJAN CUA	Medina *et al.* 2001
Eurysternus impresicollis Castelnau, 1840	SBH-P	0-100	CJAN CUA	NR
Eurysternus marmoreus Castelnau, 1840	SSA-S, SA-S	1200-2600	CJAN MPUJ	Noriega 2001
Eurysternus mexicanus Harold, 1869	BS-S, SPM-S	100-1100	CJAN MPUJ	Noriega 2001
Eurysternus plebejus Harold, 1880	SBH-S, SPM-S, SSA-S	100-1300	CJAN MPUJ	Medina *et al.* 2001
Tribu Onthophagini				
Digitonthophagus gazella (Fabricius, 1787)	Sb	0-100	CJAN MPUJ	Noriega *et al.* 2006
Onthophagus acuminatus Harold, 1880	SBH-S, SPM-S	0-900	CJAN	Noriega 2001
Onthophagus cf. *buculus* Mannerheim, 1829	SBH-S, SPM-S	0-900	CJAN	Noriega 2001
Onthophagus cf. *clypeatus* Blanchard, 1843	SBH-S, SPM-S, SSA-S	400-1700	CJAN	Noriega 2001

Taxon / *Taxon*	**Hábitat / *Habitat***	**Altitud / *Elevation* (msnm)**	**Colección Referencia / *Collection for Reference***	**Referencia Bibliográfica / *Bibliographic Reference***
Onthophagus haematopus Harold, 1875	BS-S	0-500	CJAN	Noriega 2001
Onthophagus cf. *hirculus* Mannerheim, 1829	BS-S	0-500	CJAN	Noriega 2001
Onthophagus landolti Harold, 1880	SBH-S	0-200	CJAN CUA	NR
Onthophagus lebasi Boucomont, 1932	SBH-S	0-500	CJAN	Noriega 2001
Onthophagus marginicollis Harold, 1880	SBH-S	0-300	CJAN CUA	NR
Onthophagus nyctopus Bates, 1887	BS-S	400-500	CJAN	Noriega 2001
Onthophagus praecellens Bates, 1887	BS-S	0-100	CJAN	Medina *et al*. 2001
Onthophagus sharpi Harold, 1875	SPM-S, SSA-S	900-1100	CJAN	Medina *et al*. 2001
Tribu Phanaeini				
Coprophanaeus jasius (Oliver, 1789)	SBH-S	0-500	CJAN MPUJ	Pardo 1997
Coprophanaeus telamon corythus (Harold, 1863)	SBH-P	0-500	CJAN	NR
Coprophanaeus cf. *edmondsi* Arnaud, 1997	BS-S	0-100	CJAN	NR
Diabroctis cadmus (Harold, 1868)	Sb	0-100	CJAN CUA	Medina *et al*. 2001
Oxysternon conspicillatum (Weber, 1801)	SPM-S, SSA-S	900-1400	CJAN MPUJ	Vitolo 2004
Oxysternon silenus Laporte, 1840	SBH-P	0-200	CJAN MPUJ	Escobar 2000a
Phanaeus hermes Harold, 1868	SBH-S	0-500	CJAN CUA	Edmonds 1994
Phanaeus prasinus Harold, 1868	SBH-S, SPM-S	400-900	CJAN MPUJ	Medina *et al*. 2001
Sulcophanaeus steinheili (Harold, 1875)	Sb	100-200	CJAN	Pardo 1997

Agradecimientos / *Acknowledgments*

Al laboratorio de Zoología y Ecología Acuática de la Universidad de Los Andes, por permitir el desarrollo del trabajo en sus instalaciones. A las autoridades oficiales del Parque Nacional Natural SNS Marta y Tayrona, especialmente a Carlos Sáenz. A David Edmonds, Luis Eugenio Rivera, Mario Zunino, Alejandro Lopera y muy especialmente a Fernando Vaz de Mello por su ayuda en la identificación y confirmación del material. A los asistentes de campo Alfredo Navas, Alejandro Hoyos, Adriana Sánchez, Jair García y Santiago Bustamante. A Mariana Samper y Gustavo Bravo por su colaboración en el proceso de trabajo en laboratorio. A Luis Alberto Acosta, Ingrid Quintero, Fernando Vaz de Mello y Amalia Díaz por los valiosos comentarios al manuscrito. A Bert Kohlmann por la información suministrada. A Juan Cristóbal Calle, por la elaboración del dibujo (*S. darlingtoni*) que acompaña este documento

We would like to thank the laboratory of Zoology and Aquatic Ecology at the University of Los Andes, for providing the space to carry out our work. Our thanks also go to the wardens in the Sierra Nevada de Santa Marta and Tayrona National Parks, in particular Carlos Sáenz. We thank David Edmonds, Luis Eugenio Rivera, Mario Zunino, Alejandro Lopera, and, especially, Fernando Vaz de Mello for their help in the identification and confirmation of our material. Appreciation goes to our field assistants, Alfredo Navas, Alejandro Hoyos, Adriana Sanchez, Jair Garcia and Santiago Bustamante; Mariana Samper and Gustavo Bravo for their help with the laboratory work; Luis Alberto Acosta, Ingrid Quintero, Fernando Vaz de Mello and Amalia Diaz for their valuable comments on the manuscript, and Bert Kohlmann for the supplied information. Finally we would like to thank Juan Cristóbal Calle, for creating the illustration (*S. darlingtoni*) *that accompanies this document.*

Literatura Citada / *Cited Literature*

Amat G. (1993) Los insectos como modelos biológicos en estudios de Biodiversidad y Conservación *Entomólogo* 75:4-5.

Amat G., A.T. Lopera, S. Amezquita (1997) Patrones de distribución de escarabajos coprófagos en relicto del bosque altoandino Cordillera Oriental de Colombia *Caldasia* 19(1-2):191-204.

Amézquita S.J., A. Forsyth, A. Lopera, A. Camacho (1999) Comparación de la composición y riqueza de especies de escarabajos coprófagos (Coleoptera: Scarabaeidae) en remanentes de bosque de la Orinoquía Colombiana *Acta Zoológica Mexicana* (n.s.) 76:113-126.

Andrade M.G. (1992) Biodiversidad y Conservación. p.23-44. En: Andrade, G., J. Ruiz, R. Gómez (eds.) *Biodiversidad, Conservación y Uso de Recursos Naturales: Colombia en el contexto Internacional*.

Brown K.S. Jr. (1991) Conservation of neotropical environments: insects as indicators. p.449-504. In: Collins, N & J. Thomas (eds.) *Conservation of insects and their environments*. Academic Press London.

Carrizosa U.J. (1990) La selva Andina p.151-184. En: J. Carrizosa, J. Hernández (eds.) *Selva y futuro* El Sello Bogotá.

Castellanos M.C., F. Escobar, P.R. Stevenson (1999) Dung beetles (Scarabaeidae: Scarabaeinae) attracted to woolly monkey (*Lagothrix lagothricha* Humboldt) dung at Tinigua National Park, Colombia *The Coleopterists Bulletin* 53(2):155-159.

Cavelier J., A. Etter (1995) Deforestation of montane forests in Colombia as a result of illegal plantations of opium 541-550 pp. En: S.P. Churchill *et al*. (eds). *Biodiversity and conservation of neotropical montane forests* Proceedings Nueva York, The New York Botanical Garden.

Edmonds W.D. (1994) Revision of *Phanaeus* Macleay, a New World Genus of Scarabaeinae Dung Beetles (Coleoptera: Scarabaeidae, Scarabaeinae) *Contributions in Science Natural History Museum of Los Angeles Country* 443:1-105 pp.

Escobar F. (1997) Estudio de la comunidad de coleópteros coprófagos (Scarabaeidae) en un remanente de bosque seco al norte del Tolima Colombia *Caldasia* 19(3):419-430.

Escobar F. (2000a) Diversidad y distribución de los escarabajos del estiércol (Coleoptera: Scarabaeidae: Scarabaeinae) de Colombia. p.197–210. En: F. Martín - Piera. J. J. Morrone, A. Melic (eds.). *Hacia un proyecto CYTED para el inventario y estimación de la Diversidad Entomológica en Ibero América: PrIBES 2000*. Monografías Tercer Milenio Vol. 1. Sociedad Entomológica Aragonesa Programa Iberoamericano de Ciencia y Tecnología para el desarrollo Instituto Humboldt.

Escobar F. (2000b). Diversidad de coleópteros coprófagos (Scarabaeidae: Scarabaeinae) en un mosaico de hábitats en la Reserva Natural Nukak, Guaviare, Colombia *Acta Zoológica Mexicana* (n.s) 79:103-121.

Escobar F. (2003) Feeding habits and distributional records of 11 species of Neotropical Scarabaeinae (Coleoptera: Scarabaeidae) *The Coleopterist Bulletin* 57(2):131-132.

Escobar F. (2004) Diversity and composition of dung beetle (Scarabaeidae) assemblages in a heterogeneous Andean landscape *Tropical Zoology* 17:123-136.

Escobar F., J.M. Lobo, G. Halffter (2005) Altitudinal variation of dung beetle (Scarabaeidae: Scarabaeinae) assemblages in the Colombian Andes *Global Ecology and Biogeography* 14:327-337.

Escobar F., P. Chacon de Ulloa (2000) Distribución espacial

y temporal en un gradiente de sucesión de la fauna de coleópteros coprófagos (Scarabaeinae, Aphodiinae) en un bosque tropical montano, Nariño – Colombia *Revista Biología Tropical* 48(4):961-975.

Etter A. (1993) Diversidad Ecosistémica en Colombia Hoy. En: *Nuestra Diversidad Biológica*, CEREC (Ed.), pp. 47-66. Fund. A. Angel-Escobar, Bogotá.

Fagua G., A.R. Amarillo, M.G. Andrade (1999) Mariposas (Lepidoptera) como Bioindicadores del grado de Intervención en la cuenca del Río Pato (Caquetá). p.285-315. En: Amat G., G. Andrade, F. Fernández (eds.) *Insectos de Colombia* Vol. II Academia Colombiana de Ciencias Exactas Bogotá.

Fundación Pro-Sierra Nevada de Santa Marta (1991) *Historia y Geografía, Sierra Nevada de Santa Marta* Fondo Editorial Pro-Sierra Nevada de Santa Marta Bogota 47 pp.

García J.C., L.C. Pardo (2004) Escarabajos Scarabaeinae saprófagos (Coleoptera: Scarabaeidae) en un bosque muy húmedo o premontano de los andes occidentales colombianos *Ecología Aplicada* 3(1,2): 59-63.

Genier F. (1996) A revision of the neotropical genus *Ontherus* Erichson (Coleoptera: Scarabaeidae, Scarabaeinae) *Memoirs of The Entomological Society of Canada* 170:1-168.

Genier F., B. Kohlmann (2003) Revision of the Neotropical dung beetle genera *Scatimus* Erichson and *Scatrichus* gen. nov. (Coleoptera: Scarabaeidae, Scarabaeinae) *Fabreries* 28(2): 57-111.

Hafernik J.E. (1992) Threats to Invertebrate Biodiversity: Implications for conservation Strategies p.172-195. In: Fiedler P.L., S. K. Jain (eds.) *Conservation Biology: The theory and practice of nature conservation, preservation and management* Chapman and Hall New York.

Halffter G., M.E. Favila (1993) The Scarabaeidae (Insecta: Coleoptera) an animal group for analysing, inventoryng and monitoring biodiversity in tropical rainforest and modified landscapes *Biology International* 27:1-21.

Hernández J., A. Hurtado, R. Ortiz, T. Walschburger (1992) Unidades biogeográficas de Colombia pp. 105-151. En: G. Halffter (ed.) *La Diversidad Biológica de Iberoamerica* Acta Zoológica Mexicana, Volumen especial.

Jaffe K. (1993) *El Mundo de las Hormigas* Universidad Simón Bolívar Equinoccio Venezuela 183 pp.

Janzen D.H. (1987) Insect Diversity of a Costa Rican Dry Forest: Why Keep it, and How? *Biological Journal of the Linnean Society* 30:343-356.

Kellert S. (1993) Values and Perception of Invertebrates *Conservation Biology* 7(4):845-855.

Kim K.C. (1993) Biodiversity, Conservation and Inventory: Why Insects Matter *Biodiversity and conservation* 2:191-214.

Kremen C. (1992) Assessing the indicator properties of species assemblages for natural areas monitoring *Ecological Applications* 2(2):203-217.

Kremen C. (1994) Biological inventory using target taxa: a case study of the butterflies of Madagascar *Ecological Applications* 4(3):407-422.

Kremen C., R.K. Collwell, T.L. Erwin, D.D. Murphy, R.F. Noss, M.A. Sanjayan (1993) Terrestrial Arthropod Assemblages: Their Use in Conservation Planning *Conservation Biology* 7(4):796-808.

Medina C.A., A. Lopera (2001) Clave ilustrada para la identificación de géneros de escarabajos coprófagos (Coleoptera: Scarabaeinae) de Colombia *Caldasia* 22(2):299-315.

Medina C.A., A.T. Lopera, A. Vitolo, B. Gill (2001) Escarabajos coprófagos (Coleoptera: Scarabaeidae: Scarabaeinae) de Colombia *Biota Colombiana* 2(2):131-144.

Medina C.A., G. H. Kattan (1996) Diversidad de coleópteros coprófagos (Scarabaeidae) de la reserva forestal de Escalerete *Cespedesia* 21(68):89-102.

Medina C.A., F. Escobar, G. Kattan (2002) Diversity, habitat use of dung beetles in a restored Andean landscapes *Biotropica* 34(1):181-187.

Noriega J.A. (2001) Estudio de la actividad diaria de colonización del recurso alimenticio, en una comunidad de escarabajos coprófagos (Coleoptera: Scarabaeidae), a lo largo de un gradiente altitudinal en la Sierra Nevada de Santa Marta. Tesis de Grado Universidad de Los Andes Bogotá 110 pp.

Noriega J.A. (2002a) First report of the presence of the genus *Digitonthophagus* (Coleoptera: Scarabaeidae) in Colombia *Caldasia* 24(1):213-215.

Noriega J.A. (2002b) Aportes a la biología del escarabajo suramericano *Sulcophanaeus leander* (Coleoptera: Scarabaeidae) *Acta Zoológica Mexicana* (n.s.) 87:67-82.

Noriega J.A. (2004) Preliminary checklist of the scarab community (Coleoptera: Scarabaeidae) at CIEM, Tinigua National Park, Meta-Colombia *Field Studies of Fauna and Flora La Macarena Colombia* 14:37-44.

Noriega J.A., C. Solis, I. Quintero, L.G. Pérez, H.G. Garcia, D.A. Ospino (2006) Registro continental de *Digitonthophagus gazella* (Coleoptera: Scarabaeidae) en Colombia *Caldasia* 28(2):379-381.

Ortiz Von Halle B. (1991) La Fauna de los Bosques Montanos En: Uribe H. (ed.) *Bosques de Niebla de Colombia* Banco de Occidente Cali.

Pardo L. (1997) Notas sobre los escarabajos Phanaeine (Col: Scarabaeidae) de Colombia con énfasis en la cuenca Calima-Bajo San Juan, Valle, Choco. Memorias XXIV Congreso Socolen, Pereira 132-141 pp.

Pearson D. (1994) Selection indicator taxa for the cuantitative assessment of biodiversity *Philosophical Transactions of the Royal Society of London* 345(1311):75-79.

Pereira F.S., A. Martínez (1956) Os géneros de Canthonini americanos (Col. Scarabaeidae) *Revista Brasiliense Entomologia* 6:91-192.

Pulido L.A., R.A. Riveros, F. Gast, P. von Hildebrand (2003) Escarabajos coprófagos (Coleoptera: Scarabaeidae: Scarabaeinae) del Parque Nacional Natural "Serrania de Chiribiquete", Caqueta, Colombia (Parte I) p. 51-58. *En*: G. Onore, P. Reyes-Castillo, M. Zunino (eds.) *Escarabaeidos de Latinoamérica: Estado de su conocimiento* Monografías Tercer Milenio, vol 3, SEA, Zaragoza.

Rangel J.O. (1995) La diversidad florística en el espacio andino de Colombia p. 187-205. En: S.P. Churchill *et al*. (eds). *Biodiversity and conservation of neotropical montane forests* Proceedings Nueva York, The New York Botanical Garden.

Rangel J.O., A. Garzón (1995) Sierra Nevada de Santa Marta-Colombia. p.155-170. En: J.O. Rangel (ed.) *Colombia Diversidad Biotica* I. Instituto de Ciencias Naturales, Bogota – Colombia.

Vaz de Mello F. (2003) Species formerly in the genera *Trichillum* Harold, 1868 and *Pedaridium* Harold, 1868 (Coleoptera: Scarabaeidae). Dissertação de Mestrado Universidade Federal de Lavras, Minas Gerais, Brasil.

Vitolo A. (2000) Clave para la identificación de los géneros y especies Phanaeinas (Coleoptera: Scarabaeidae: Coprinae: Phanaeini) de Colombia *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 24(93):591-603.

Vitolo A. (2004) Escarabajos estercoleros de la tribu Phanaeini de Colombia (Coleoptera: Scarabaeoidea: Scarabaeidae) p.277-318. En: F. Fernández, M.G. Andrade, G.D. Amat (eds.) *Insectos de Colombia* Vol. 3 Facultad de Ciencias Universidad Nacional de Colombia Bogota.

Vulcano M.A., F.S. Pereira (1967) Sinópse dos Passalidae e Scarabaeidae *s. str.* da região amazônica (Insecta, Coleoptera) *Atas do Simposio sôbre a Biota Amazônica* Vol 5 (Zoologia) 533-603.

Wilson E.O. (1987) The Little Things than Run the World (the importance and conservation of invertebrates) *Conservation Biology* 1(4):344-346.

WWF (1986) Programa de los Andes Tropicales. Protegiendo un Gran Centro Mundial de Diversidad Biológica L.F. Potees (ed.) 32 pp.

Scybalocanthon darlingtoni (Paulian, 1939)

Recibido: 9/02/2006
Aceptado: 18/08/2006

Biota Colombiana 8 (1) 87 - 98, 2007

Plantas leñosas del bosque seco tropical de la isla de Providencia, Colombia, Caribe sur occidental

Jorge Ruiz[1] y María Claudia Fandiño Orozco[2]

1 Profesor Asociado, Programa de Estudios de Postgrado en Geografía, Convenio Universidad Pedagógica y Tecnológica de Colombia (UPTC) – Instituto Geográfico Agustín Codazzi (IGAC). Investigador Asociado Instituto Alexander von Humboldt. *jruiz@tunja.uptc.edu.co*

2 Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. *mcfandino@humboldt.org.co*

Palabras clave: Bosque seco tropical, Providencia, Colombia, Caribe Sur-Occidental, plantas leñosas

Introducción

A pesar de la diversidad de zonas de vida en el Caribe, más de la mitad de la vegetación se encuentra en la zona de bosque seco (Murphy y Lugo, 1996). Sin embargo, el conocimiento actual sobre las dimensiones humanas y biofísicas de los cambios en el bosque seco tropical y sus efectos acumulativos esta en las etapas iniciales del descubrimiento académico (Mooney *et al*., 1996; Sánchez-Azofeifa *et al*., 2005). En efecto, es insuficiente lo que se conoce del bosque seco colombiano y existen pocos remanentes de este ecosistema (Instituto Alexander von Humboldt, 1998, Mendoza 1999). Adicionalmente, este ecosistema se encuentra muy pobremente representado en el portafolio de áreas protegidas colombianas.

Durante los últimas décadas, las islas de Providencia y Santa Catalina han experimentado un sistemático abandono de sus tierras dedicadas a la agricultura y la ganadería, dando paso a un proceso de forestación y brindando una rara oportunidad para el estudio de la sucesión del bosque seco tropical (Ruiz *et al*. 2005a). Las islas se encuentran localizadas en el caribe sur occidental (13° 21' norte 81° 21' oeste), cubriendo un área de 22.2 km^{2}. Están situadas a 230 kilómetros al este de Nicaragua. Su ubicación geográfica, lejos de la plataforma continental colombiana, hace que se encuentren allí plantas no presentes en Colombia continental (Márquez 1996, Lowy, 2000). Alwyn H. Gentry visitó a Providencia en 1993, y en el prólogo de González y colaboradores (1995) anota que los bosques son muy ricos en especies y se encuentran en buen estado, valiendo la pena su conservación. Según los datos climatológicos de la estación del IDEAM en el aeropuerto El Embrujo de Providencia, la isla presenta un período seco entre enero a mayo y en particular de enero a abril, cuando llueve menos de 100 mm al mes. La precipitación en Providencia entre el año 1973 y el año 2006 promedió 1,681 mm $año^{-1}$, ocurriendo un 90% de esta entre junio y diciembre, mientras que la temperatura media anual fue de 27.5°C y los vientos predominantes son provenientes del nordeste. Pareciera que la temperatura se ha incrementado ya que desde 1977 no se registra temperatura por debajo de 27°C, al mismo tiempo, la precipitación parece haber aumentado ya que desde 1998 no se registra por debajo de 1,500 mm.

Muchos autores han clasificado el bosque de las islas como transicional entre húmedo y seco (Instituto Geográfico Agustín Codazzi, 1962; Espinal, 1963; Márquez, 1987, 1996; Márquez *et al*.1992; Borrero *et al*. 1994, Lowy 2000); a pesar de no existir en la literatura una definición de dicho tipo de bosque transicional. Otros autores lo han clasificado como bosque seco (Espinal y Montenegro 1977, Ruiz, 2002, Ruiz *et al*. 2005a,b; Morales 2005), o con enclaves de bosque seco, (Etter 1993, 1998). Es importante subrayar que definiciones de bosque seco tropical hay muchas (Mendoza 1999). La definición más sencilla es aquella que se refiere a bosques ubicados en la región tropical que se ven afectados por varios meses de sequía, incluso con meses de sequía absoluta (Mooney *et al*., 1996). Con base en los registros de plantas leñosas aquí reportados, los valores de abundancia relativa encontrados por Ruiz (2002), así como las características climatológicas, consideramos el bosque de estas islas como correspondiente a bosque seco tropical (BsT). *Sensu* Murphy y Lugo (1986), este bosque debe considerarse seco: esto es, una razón de temperatura por

100 a precipitación mayor que uno. En el caso de las islas de Providencia y Santa Catalina esto es:

27.5 (100) / 1681 = 1.64

Igualmente, el bosque de Providencia y Santa Catalina cumple con la definición del Instituto Alexander von Humboldt (1998) de bosque seco tropical: esto es un bosque con una elevación igual o menor a mil metros, temperatura entre 17° y 35° C, precipitación entre 700 y 2000 mm y la presencia de uno o dos períodos marcados de sequía al año. A su vez, la vegetación se caracteriza por una cobertura boscosa continua y por la pérdida total o parcial del follaje durante las épocas secas cada año.

Woody plants of the dry tropical forest of Old Providence, south west Caribbean, Colombia

Jorge Ruiz and María Claudia Fandiño Orozco

Key words: *Dry tropical forest, Old Providence, Colombia, woody plants, southwest Caribbean.*

Introduction

In spite of the diversity of life-zones in the Caribbean, over half of the vegetation is found in the dry tropical forest area (Murphy and Lugo, 1996). Nonetheless, current knowledge of the human and biophysical dimensions of changes in dry topical forests as well as the cumulative effects of these changes are, as yet, in the initial phases of academic discovery (Mooney et al.*, 1996; Sanchez—Azofeifa* et al.*, 2005). Indeed, little is known about this ecosystem and few remnants exist (Instituto Alexander von Humboldt, 1998; Mendoza, 1999). Furthermore, this type of ecosystem is poorly represented in the portfolio of Colombia's protected areas.*

During the last few decades, land dedicated to agriculture and ranching on the islands of Old Providence and Santa Catalina have been systematically abandoned giving way to forest regrowth and, hence, to a rare opportunity for the study of dry tropical forests (Ruiz et al. *2005a).*

The islands are located in the southwest Caribbean (13° 21' north 81° 21' West), 230 km East of Nicaragua, and they cover an area of 22.2 km^2. Their geographic location, far from the Colombian mainland, means that the islands house a number of plants which cannot be found on the Colombian continental platform (Marquez, 1996; Lowy, 2000). Alwyn H. Gentry visited the islands in 1993 and in the prologue by Gonzalez et al. *(1995) describes them as being very rich and in good condition, and thus, a valuable conservation site. According to IDEAM`s meteorological station at the airport, the islands have a dry period between January and May, and particularly between January to April, when it rains less than 100 mm per month. Precipitation for Old Providence between 1973 and 2006 averaged 1681mm year^{-1}, 90% of it occurs between July and December, and annual mean temperature was 27.5°C, with winds from the northeast. It appears that the temperature has been rising since 1977 as it has not fallen below 27°C, at the same time since 1998 precipitation appears to be increasing since it has not been registered below 1500mm. Several authors have classified the forests of Old Providence as transitional between moist and dry (Instituto Geográfico Agustín Codazzi, 1962; Espinal, 1963; Márquez, 1987, 1996; Márquez* et al. *1992; Borrero* et al. *1994, Lowy 2000). Yet, there is no definition in the literature for this transitional ecosystem. Other authors have classified it as dry tropical forest (Ruiz* et al. *2005 a, b; Morales, 2005; Ruiz, 2002; Espinal and Montenegro 1977), or with enclaves of dry tropical forest (Etter 1993, 1998). It is important to underline that there are several definitions of what a dry tropical forest is (Mendoza 1999). The simplest definition refers to forests located in the tropical region that are affected by several months of draught, including moths with absolute draught (Mooney* et al.*, 1996). Based on the woody species reported here, the relative importance values reported by Ruiz (2002) as well as the climatological characteristics, we consider the forest of Old Providence, dry tropical.* Sensu *Murphy and Lugo (1986), this forest should be considered dry tropical, indicated by a ratio of temperature, times 100, to precipitation greater than one. In the case of Old Providence this should* be:

27.5 (100) / 1681 = 1.64

Similarly, the forests of Old Providence meet the definition given by the Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (1998) of dry tropical forest: that is, a forest under 1000 m of elevation, with a mean temperature between 17° and 35° C, precipitation between 700 and 2000 mm year^{-1} and the presence of one or two dry periods per year. In turn, the vegetation is characterized by a continuous canopy cover and the total or partial loss of leaves during the dry months.

Materiales y Métodos / *Materials and methods*

Desde la perspectiva de la ecología del paisaje, es decir teniendo en cuenta la totalidad del archipiélago, que comprende las islas de Providencia y Santa Catalina, y utilizando una cronosecuencia > 56 años con replicas en seis grupos de edad, establecimos 59 cuadrantes de 2 x 50 m (0.01 ha) en el bosque, mediante un muestreo aleatorio estratificado simple. Las clases etarias o los estratos, fueron determinadas mediante un sistema de información geográfica (SIG), utilizando fotografías aéreas pancromáticas ortorectificadas tomadas entre 1944 y 1996 e imágenes de satélite Landsat 7 ETM+ de los años 1999 y 2000. Mayor detalle de los materiales y métodos se pueden obtener de Ruiz y colaboradores (2005a y 2005b). Se navegó a los cuadrantes seleccionados utilizando un receptor del sistema global de posicionamiento o GPS. Se censaron y midieron los árboles y arbustos >2.5 cm de Diámetro a la Altura del Pecho (DAP), siguiendo el protocolo de Gentry (1982) excepto que se excluyeron las lianas por la dificultad de los nativos en identificar estos individuos (Gentry, 1982); los manglares no fueron incluidos en el muestreo por considerarse otro ecosistema.

La diferencia fundamental con el listado de Lowy (2000), así como con el de González *et al*. (1995), radica en que nosotros reportamos únicamente especies "silvestres" encontradas mediante un muestreo aleatorio estratificado en el bosque seco tropical de estas islas, excluyendo lianas y el ecosistema manglar. Nuestra aproximación no busca reportar el mayor número de especies posibles, tan solo aquellas que se encontraron en los transectos muestreados; mientras que Lowy (2000) como González y colaboradores (1995) buscan reportar toda la flora vascular terrestre presente en el archipiélago de San Andrés, Providencia y Santa Catalina, incluidas especies ornamentales y cultivadas, sin seguir protocolo alguno de muestreo. Esto no quiere decir que un método sea mejor que el otro. Si bien el listado de Lowy (2000) y de González *et al*. (1995) es la forma más expedita de tener el listado más completo de la flora y es una herramienta fundamental para otros estudios, adolece de las falencias intrínsecas al muestreo no aleatorio y no permite el cálculo de curvas de riqueza total de especies *vs*. esfuerzo muestral o la estimación no paramétrica de la riqueza total de especies.

Un total de 2030 individuos fueron medidos en diámetro, altura y su nombre común anotado, según un experimentado raizal. Una especie no pudo ser identificada. Se recolectaron especimenes para aquellas especies que no se tenía absoluta certeza de su identidad. Los 32 ejemplares colectados se encuentran depositados en el herbario del Instituto Alexander von Humboldt (FSB) en Villa de Leyva, Boyacá. La identificación de especimenes fue adelantada por R. Bernal, J. L. Fernández, E. Linares y J. C. Murillo y del Herbario Nacional Colombiano (COL), P. E. Berry de la Universidad de Wisconsin (WIS, Madison, Wisconsin, EUA), R. Liesner, J. L. Matt, J. S. Miller, J. Pruski y C. M. Taylor del Missouri Botanical Garden (MO, Saint Louis, Missouri, EUA) y finalmente F. R. Barrie del Field Museum (F, Chicago, Illinois, EUA).

From a landscape perspective considering the entire archipelago, and using a chronosequence >56 yr., with replicates in six age groups, we established 59 quadrants of 2 x 50m (0.01ha) in the forest, through stratified random sampling. Age classes, the strata, were established through a geographic information system (GIS) based on orthorectified panchromatic aerial photos acquired between 1944 and 1996 and three Landsat 7 ETM+ satellite images acquired between 1999 and 2000. Greater detail on the materials and methods are available at Ruiz and colleagues (2005 a, b). The selected quadrants were reached using a global positioning system (GPS) receiver. Following the protocol by Gentry (1982), 2030 live trees greater than one inch Diameter at Breast Height (DBH), except for lianas which could not be easily identified by the local woodsmen, were measured for DBH and height and identified with a common name. Fieldwork took place in July-August, 2001 and mangrove forests were not considered as they represent a different type of ecosystem.

The fundamental difference with Lowy's (2000), as well as Gonzalez et al. *(1995) lists is that we only report species found in the wild through stratified random sampling excluding lianas and the mangrove ecosystem. Our approach does not intend to report the greatest number possible of woody species, but only those found in the sampled plots, while Lowy's (2000) and Gonzalez* et al. *(1995) aim to report all the vascular flora, including ornamental and cultivated plants found on San Andres, Old Providence and Santa Catalina, not following a sampling protocol. This does not mean that our method is better than the other. While the approach by Lowy and Gonzalez* et al. *(1995) is the most expedite way of having a more complete inventory of the flora and is a fundamental tool for other studies, it has intrinsic flaws associated with non random*

sampling and does not allow for the construction of species richness vs. sampling effort nor the non parametric estimation of total species richness.

A total of 2030 individuals were measured in diameter and height and recorded with their local common name. One species could not be identified. Where identity was uncertain specimens were collected. The 32 collected samples are kept at FSB the herbarium of Instituto de Investigación de Recursos Biológicos Alexander von Humboldt in Villa de Leyva, Boyacá, Colombia. Specimen identification was performed by R. Bernal, J. L. Fernàndez, E. Linares and J. C. Murillo of the Colombian National Herbarium (COL), P. E. Berry of the University of Wisconsin, WI, USA; R. Liesner, J. L. Matt, J. S. Miller, J. Prusky and C. M. Taylor of the Missouri Botanical Garden (MO) and F. R. Barrie of the Field Museum at Chicago, IL, USA.

Resultados / *Results*

Se registraron 35 familias, 58 géneros y 70 especies de plantas leñosas, excluidas lianas, del bosque seco tropical de estas islas colombianas (ver tabla 1 y listado taxonómico).

Respecto a la lista publicada en esta revista por Lowy (2000) de plantas vasculares para San Andrés y Providencia, adicionamos 13 nuevos reportes, presentamos el primer reporte de la familia Ebenaceae para Providencia y tres nuevos reportes de Eugenia (Myrtaceae).

Si bien la flora del archipiélago es un subconjunto de la flora antillana y mesoamericana, concluimos con la flora aquí consignada, mayor afinidad florística por la primera, en armonía con lo aseverado por Gentry en el prólogo de González *et al*. (1995), a pesar de que se haya traducido erróneamente del inglés. Igualmente, Morales (2005), en su estudio localizado exclusivamente de la zona del Peak, en la parte elevada de la isla, encuentra también mayor afinidad con las Antillas, opuesto a lo afirmado por Márquez *et al*. (1994). Una plausible explicación de mayor afinidad florística con el Caribe puede ser el hecho de la dirección de los vientos, provenientes en su mayor parte del nordeste. No obstante, Márquez *et al*. (1994) aseguran mayor afinidad biogeográfica en las partes altas con América Central y en las partes bajas con las Antillas; adicionalmente, Lowy (2000), incluyendo la flora de San Andrés, encuentra mayor afinidad con Centroamérica.

Tanto Olivier (1978) como Parsons (1956) reportan la existencia de caoba (*Swentia mahogany*). Dicha especie no fue reportada por nosotros ni por Diaz y Lowy (1992) y tampoco existen reportes de esta especie por Collet (1837) o Kupperman (1992). Así, consideramos dudoso que esta especie haya existido en Providencia. Algunas especies que se encontraron silvestremente como el aguacate o la guanábana son normalmente consideradas como cultivadas. No obstante, es necesario tener en cuenta que muestreamos predios abandonados que en algún momento pudieron tener estas especies cultivadas y es un hecho que en la actualidad no hay cultivadores viviendo permanentemente en las partes más altas de la isla como lo hicieron en el pasado.

La especie dominante en la isla en términos del Índice de Importancia Relativa (RIV) fue el "cock spur" o *Acacia collinsii* Saff. (Ruiz 2002). Cuando la isla fue poblada permanentemente por vez primera en 1630 (Kupperman 1992), no hay indicios de esta especie pues es simbiótica con la hormiga negra *Pseudomyrmex ferruginea*, la cual es ponzoñosa. Un hecho así no hubiera pasado sin registrar en las rutinarias comunicaciones de Providencia a Inglaterra (Kupperman, comunicación personal). En una detallada historia del naufragio de Edward Seaward en 1733 (Porter, 1878), tampoco se hace mención a la hormiga aunque si a la Acacia de cachos. Por vez primera se encuentra mención a la hormiga en la literatura por Collett (1837). Lo anterior sugiere que esta hormiga fue probablemente introducida de América Central después de 1734 y antes de 1837.

36 families, 58 genera and 70 species of woody flora excluding climbing trees of the dry tropical forest were recorded (see Box 1 and taxonomic list).

With respect to Lowy's (2000) list, we have 13 new reports, including the first report of Ebenaceae and three new reports of Eugenia (Myrtaceae). While the flora of the archipelago is a subset of the Antillean and Mesoamerican flora, we conclude, based on the flora of this report, greater floristical affinity with the former, in harmony with Gentry`s claim in Gonzalez et al. *(1995) prologue, in spite of being erroneously translated from English. Similarly, Morales (2005), in her study exclusively of the Peak zone, in the upper part of the island, also found greater affinity with the Antilles, opposing the claim by Marquez and colleagues (1994). A plausible explanation for the greater affinity with the Caribbean can be due to wind direction, which is mainly from a northeast direction. However, Marquez* et al. *(1994) claim greater biogeographical affinity at higher elevations with Central America and at the lower parts with the Caribbean. In addition, Lowy (2000), including the flora in San Andres, finds that there is greater affinity with Central America.*

*Both Olivier (1978) and Parsons (1956) report the existence of mahogany (*Swentia mahogany*). Considering that this species was reported neither by us, or by Diaz and Lowy (1992), or Lowy (2000), or González* et al. *(1995),*

or even by Collet (1837) or Kupperman (1992), we assume it unlikely that it ever existed on Old Providence. Some of the species found in the wild, like avocado or soursop are normally considered cultivated. However, considering that we sampled abandoned properties, it is possible that they were cultivated at some point in the past. It is a fact that farmers no longer live permanently at higher elevations like they did long ago.

*The dominant species on the island in terms of the Relative Importance Index (RIV) is cock spur (*Acacia collinsii*) (Ruiz 2002). When the island was first settled in 1630 (Kupperman, 1992), there is no evidence of this species that lives symbiotically with cock spur. In fact, there is no report of the ant in any of the routine reports between Old Providence and England (Kupperman, personal communication); however, a detailed account of Edward Seaward shipwreck in 1733, there is mention of the cock spur, but not the ant (Porter 1971). The ant was first documented by Collett (1837), which suggests that it was probably introduced from Central America sometime after 1734 and before 1837.*

Tabla 1. Número de especies leñosas por familia y de nuevos reportes por familia encontrados en Providencia en 59 cuadrantes de 0.01 ha.

Box 1. *Number of woody species and new records found in Old Providence (59 plots of 0.01 ha.) for every family.*

Familia / *Family*	**Número de especies / *Species Number***	**Nuevos reportes / *New records***
Anacardiaceae	4	
Annonaceae	1	
Arecaceae	3	
Asteraceae	1	
Bignoniaceae	1	
Bombacaceae	1	
Boraginaceae	2	
Burseraceae	1	
Cactaceae	2	
Caesalpiniaceae	2	
Capparidaceae	2	
Cecropiaceae	1	
Combretaceae	1	
Ebenaceae	1	1
Euphorbiaceae	4	2
Flacourtiaceae	4	
Lauraceae	1	
Malpighiaceae	1	
Malvaceae	1	

Familia / *Family*	**Número de especies / *Species number***	**Nuevos reportes / *New records***
Melastomataceae	2	1
Meliaceae	4	2
Mimosaceae	3	
Moraceae	3	
Myricaceae	1	1
Myrtaceae	5	3
Nyctaginaceae	2	2
Ochnaceae	1	
Papilionaceae	1	
Polygonaceae	1	1
Rubiaceae	4	
Rutaceae	1	
Sapindaceae	2	
Sapotaceae	2	
Simaroubaceae	1	
Verbenaceae	2	
Total	70	13

Listado Taxonómico / *Taxonomic list*

Especies leñosas con DAP >2.5 cm encontradas en 59 cuadrantes de 0.01 ha, Providencia y Santa Catalina, Colombia. BsT= Bosque seco tropical BhT= Bosque húmedo tropical. La altitud hace referencia exclusivamente a donde se encontraron en Providencia y Santa Catalina. * = nuevos reportes para las islas. Casi la totalidad de las especies siguen la nomenclatura de la base de datos de flora vascular W^3 Tropicos del Missouri Botanical Garden (2006). En observaciones se especifica la persona que realizó identificación del espécimen recolectado, si es introducida y el herbario donde se encuentra el ejemplar colectado.

Woody species DBH >2.5cm found in 59 plots of 0.01ha, in Old Providence and Santa Catalina, Colombia.
*DtF= Dry tropical forest, HtF= Humid tropical forest. Elevation refers exclusively to where the species were found in Old Providence and Santa Catalina. * = new reports for the island. Almost all of the species follow the nomenclature of vascular flora by W^3 Tropics of the Missouri Botanical Garden (2006).*
The observation mentions the individuals that identified the collected species, whether the species is introduced, and the herbarium where a specimen is kept.

Taxón / *Taxon*	**Ecosistema / Hábitat *Ecosystem / Habitat***	**Rango altitudinal (m) / *Altitudinal range (m)***	**Referencias / *References***	**Observaciones / *Observations***
ANACARDIACEAE				
Mangifera indica L.	BsT, BhT	0-350	Ruiz (2002)	Introducida y naturalizada
Metopium brownei (Jacq.) Urb.	BsT	100-350	Ruiz (2002)	
Spondias mombin L.	BsT, BhT	0-350	Ruiz (2002)	
Spondias purpurea L.	BsT, BhT	< 100	Ruiz (2002)	E. Linares. FSB
ANNONACACEAE				
Annona muricata L.	BhT	100-350	Ruiz (2002)	
ARECACEAE				
Acoelorraphe wrightii (Griseb. & H. Wendl.) H. Wendl. ex Becc.	BsT, BhT	0-350	Ruiz (2002)	
Coccothrinax jamaicensis Read	BhT	0-350	Ruiz *et al*. (2005a)	R. Bernal, FSB
Cocos nucifera L.	BhT	0-350	Ruiz (2002)	Introducida y naturalizada
ASTERACEAE				
Verbesina turbacensis Kunth	BhT	< 100	Ruiz *et al*. (2005a)	J. Pruski, FSB *
BIGNONIACEAE				
Crescentia cujete L.	BsT	100-350	Ruiz (2002)	
BOMBACACEAE				
Ceiba pentandra (L.) Gaertn.	BsT, BhT	0-350	Ruiz (2002)	
BORAGINACEAE				
Cordia sebestena L.	BsT	< 100	Ruiz (2002)	
Cordia collococca L.	BsT	< 100	Ruiz (2002)	J. L. Matt. FSB
BURSERACEAE				
Bursera simaruba (L.) Sarg.	BsT	0-350	Ruiz (2002)	
CACTACEAE				
Acanthocereus pentagonus (L.) Britton & Rose	BsT	< 100	Ruiz (2002)	
Opuntia wentiana Britton & Rose	BsT	< 100	Ruiz (2002)	FSB

Taxón / *Taxon*	**Ecosistema / Hábitat *Ecosystem / Habitat***	**Rango altitudinal (m) / *Altitudinal range (m)***	**Referencias / *References***	**Observaciones / *Observations***
CAESALPINIACEAE				
Cassia grandis L. f.	BsT	< 100	Ruiz (2002)	
Tamarindus indica L.	BsT	< 100	Ruiz (2002)	
CAPPARIDACEAE				
Capparis odoratissima Jacq.	BsT	< 100	Ruiz (2002)	
Capparis frondosa Jacq.	BsT	0-350	Ruiz (2002)	
CECROPIACEAE				
Cecropia peltata L.	BhT	0-350	Ruiz (2002)	
COMBRETACEAE				
Terminalia catappa L.	BhT	< 100	Ruiz (2002)	
EBENACEAE				
Diospyros tetrasperma Sw.	BsT	< 100	Ruiz *et al*. (2005a)	R. Liesner. FSB *
EUPHORBIACEAE				
Adelia triloba (Müll. Arg.) Hemsl.	BhT	0-350	Ruiz *et al*. (2005a)	R. Liesner. FSB *
Croton glabellus L.	BsT	100-350	Ruiz (2002)	
Croton aff. *morifolius* Kunth	BsT	0-350	Ruiz *et al*. (2005a)	P. E. Berry FSB *
Euphorbia cotinifolia L.	BhT	0-350	Ruiz (2002)	
FLACOURTIACEAE				
Casearia aculeata Jacq.	BsT	0-350	Ruiz (2002)	R. Liesner. FSB
Casearia commersioniana Cambess.	BsT	0-350	Ruiz (2002)	R. Liesner. FSB
Xylosma sp.	BsT	< 100	Ruiz *et al*. (2005a)	R. Liesner. FSB
Zuelania guidonia (Sw.) Britton & Millsp.	BsT	100-350	Ruiz (2002)	R. Liesner. FSB
LAURACEAE				
Persea americana Mill.	BhT	0-350	Ruiz (2002)	
MALPIGHIACEAE				
Byrsonima crassifolia (L.) Kunth	BsT	0-350	Ruiz (2002)	

Taxón / *Taxon*	**Ecosistema / Hábitat *Ecosystem / Habitat***	**Rango altitudinal (m) / *Altitudinal range (m)***	**Referencias / *References***	**Observaciones / *Observations***
MALVACEAE				
Hibiscus tiliaceus L.	BhT	< 100	Ruiz (2002)	Introducida
MELASTOMATACEAE				
Miconia argentea (Sw.) DC.	BsT	< 100	Ruiz *et al*. (2005a)	R. LIesner. FSB *
Mouriri myrtilloides (Sw.) Poir.	BsT, BhT	0-350	Ruiz (2002)	R. Liesner. FSB
MELIACEAE				
Cedrela odorata L.	BsT, BhT	< 100	Ruiz (2002)	
Trichilia sp.	BsT	< 100	Ruiz (2002)	R. Liesner. FSB*
Trichilia hirta L.	BsT	0-350	Ruiz (2002)	FSB
Trichilia martiana C. DC.	BsT, BhT	100-350	Ruiz (2002)	FSB
MIMOSACEAE				
Acacia collinsii Saff.	BsT	0-350	Ruiz (2002)	
Leucaena leucocephala (Lam.) De Wit	BsT	< 100	Ruiz (2002)	
Pithecellobium lanceolatum Benth.	BsT	0-350	Ruiz (2002)	
MORACEAE				
Chlorophora tinctoria (L.) Gaudich. ex Benth.	BhT	< 100	Ruiz (2002)	
Ficus trigonata L.	BsT	< 100	Ruiz (2002)	
MYRICACEAE				
Morella cerifera (L.) Small	BsT, BhT	100-350	Ruiz (2002)	R. Liesner FSB*
MYRTACEAE				
Eugenia sp.		0-350	Ruiz (2002)	F. R. Barrie. FSB *
Eugenia acapulensis Steud.	BhT	100-350	Ruiz (2002)	F. R. Barrie. FSB
Eugenia venezuelensis O. Berg	BhT	100-350	Ruiz *et al*. (2005a)	F. R. Barrie. FSB *, COL
Eugenia galalonensis (Griseb.) Drug & Urb.		0-350	Ruiz *et al*. (2005 a)	F. R. Barrie FSB *
Myrcianthes fragrans (Sw.) McVaugh	BsT	0-350	Ruiz *et al*. (2005a)	F. R. Barrie. FSB *

Taxón / *Taxon*	**Ecosistema / Hábitat *Ecosystem / Habitat***	**Rango altitudinal (m) / *Altitudinal range (m)***	**Referencias / *References***	**Observaciones / *Observations***
NYCTAGINACEAE				
Bougainvillea aff *glabra* Choisy	BsT	< 100	Ruiz *et al*. (2005a)	J. L. Fernández. FSB *
Neea psychotrioides Donn. Sm.	BsT, BhT	100-350	Ruiz *et al*. (2005a)	R. Liesner. FSB *
OCHNACEAE				
Ouratea nitida (Sw.) Engl.	BsT	100-350	Ruiz (2002)	R. Liesner. FSB
PAPILIONACEAE				
Gliricidia sepium (Jacq.) Kunth ex Walp.	BsT	0-350	Ruiz (2002)	
POLYGONACEAE				
Coccoloba sp.		0-350	Ruiz (2002)	E. Linares. FSB*
RUBIACEAE				
Faramea occidentalis (L.) A. Rich.	BhT	100-350	Ruiz (2002)	C. M. Taylor. FSB
Guettarda elliptica Sw.	BsT	< 100	Ruiz (2002)	C. M. Taylor. FSB
Randia aculeata L.	BsT	< 100	Ruiz (2002)	
Randia armata (Sw.) DC.	BsT	0-350	Ruiz et al. (2005a)	FSB
RUTACEAE				
Zanthoxylum martinicense (Lam.) DC.	BhT, BsT	100-350	Ruiz (2002)	
SAPINDACEAE				
Matayba oppositifolia (A. Rich.) Britton	BsT	100-350	Ruiz (2002)	R. Liesner. IAVH
Melicoccus bijugatus Jacq.	BsT, BhT	< 100	Ruiz (2002)	
SAPOTACEAE				
Chrysophyllum cainito L.	BhT	100-350	Ruiz (2002)	E. Linares. IAVH
Manilkara zapota (L.) P. Royen	BsT, BhT	0-350	Ruiz (2002)	
SIMAROUBACEAE				
Simarouba amara Aubl.	BhT	0-350	Ruiz (2002)	
VERBENACEAE				
Lantana camara L.	BsT	100-350	Ruiz (2002)	
Vitex cymosa Bertero ex Spreng.	BhT	0-350	Ruiz (2002)	Introducida

Agradecimientos / *Acknowledgments*

Este estudio fue posible gracias al permiso de investigación según las resoluciones 006 del 2002 y 598 del 2006 de CORALINA, que ampararon la recolecta de especimenes, y en la jurisdicción del Parque Nacional Natural Old Providence & McBean Lagoon, al permiso de investigación 229-00 de la Unidad Administrativa Especial del Sistema de Parques Naturales Nacionales – UAESPNN, que adicionalmente brindó generosamente apoyo logístico. Se recibió apoyo financiero del Department of Natural Resources Management así como de la Research Foundation de la University of Connecticut, Storrs, CT, EUA. Agradecemos la identificación de especies por nombre vernáculo adelantada por el difunto Sr. Asmond Duffis; estamos agradecidos a la familia Talero y a Juan Manuel Orozco por su hospitalidad. Finalmente, reconocemos los comentarios y correcciones aportadas por dos evaluadores anónimos.

Financial support was received from the Department of Natural Resources Management as well as the Research Foundation of the University of Connecticut, Storrs, CT, USA. This study was possible thanks to the research permit 006, 2002 for the jurisdiction of CORALINA, as well as the research permit 229-00 for the jurisdiction of Old Providene & McBean Lagoon National Park, who kindly provided logistical support. We thank the late Asmond Duffis for sharing his knowledge of woody plants with us. We are grateful to the Talero family and Juan Manuel Orozco for their hospitality. Finally, we acknowledge the comments and corrections of two anonymous reviewers.

Literatura Citada / *Literatura cited*

Borrero, J. M., González L., R. Contreras (1994) *Estrategia de conservación y sostenibilidad en las islas de San Andrés, Providencia y Santa Catalina*. Cali: FIPMA, 257 pp.

Collett, C. F. (1837) On the Island of Providencia. *Journal of the Royal Geographical Society of London* 7:203-210.

Diaz, J., P. Lowy (1992) *Flora vascular terrestre del archipiélago de San Andrés y Providencia*. Tesis de grado para optar el título de biólogo. Departamento de Biología. Universidad Nacional de Colombia.

Espinal, L. S. y E. Montenegro (1977) *Zonas de vida o formaciones vegetales de Colombia : memoria explicativa sobre el mapa ecológico*. Bogota: Instituto Geográfico Agustín Codazzi, 237pp.

Espinal, L. S. (1963) *Formaciones vegetales de Colombia*. Bogota: Instituto Geográfico Agustín Codazzi.

Etter, A. (1993) *Diversidad ecosistémica en Colombia hoy*. Bogotá: CEREC/Fundación Alejandro Ángel Escobar, 296 pp.

Etter, A. (1998) *Mapa general de los ecosistemas de Colombia*. Villa de Leyva: Instituto Alexander von Humboldt.

Gentry, A. H. (1982). Patterns of Neotropical plant species diversity. Evolutionary Biology 15:1-84.

González, F., J. Díaz, P. Lowy (1995) *Flora ilustrada de San Andrés y Providencia*. Convenio SENA-Universidad Nacional de Colombia, Bogotá, 280pp.

Instituto Geográfico Agustín Codazzi (1962) *Mapa ecológico de Colombia*. Bogotá: Instituto Geográfico Agustín Codazzi.

Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. (1998). Bosque seco tropical. En: Chávez M. y N. Arango (Editores) Tomo 1 pp 56-71. *Informe nacional sobre el estado de la biodiversidad en Colombia*. Bogotá: Ministerio del Medio Ambiente/United Nations.

Kupperman, K. (1992) *Providence Island: the other Puritan colony, 1630-1641***.** Cambridge, Inglaterra: Cambridge University Press, 394 pp.

Lowy, P. D. (2000) Flora vascular terrestre del archipiélago de San Andrés y Providencia. *Biota Colombiana* 1:109-124.

Márquez, G. (1987) *Las islas de Providencia y Santa Catalina Ecología Regional*. Bogota: Universidad Nacional de Colombia.

Márquez, G., C. Martínez, M. E. Pérez, J. Ramírez, L. Vollmer, A. Posada, A. Rodríguez. (1992). *Archipiélago de San Andres y Providencia. Perspectivas y acciones posibles*. Bogota: OEA/COLCIENCIAS/IDEA

Márquez, G. E., M. E. Pérez, C. Toro. 1994. A guide to the environment of Old Providence and Santa Catalina. OEA/COLCIENCIAS/IDEA, Bogotá, D. C. 42 pp.

Márquez, G. (1996) *Ecosistemas estratégicos y otros estudios de ecología ambiental*. Bogotá: Fondo FEN

Mendoza, C. H. (1999) Estructura y riqueza florística del bosque seco tropical en la región Caribe y el valle del río Magdalena, Colombia. *Caldasia* 21: 70-94.

Mooney, H. A., S. H. Bullock, E. Medina. (1996). Introducción. Pp 1-6. En: Bullock, S. H., H. A. Mooney, E. Medina (Eds.) Seasonally dry tropical forests. Cambridge, Inglaterra: Cambridge University Press.

Missouri Botanical Garden (2006) http://mobot.mobot.org/cgi-bin/search_vast

Murphy, P. G., A. E. Lugo. (1986). Ecology of tropical dry forest. *Annual Review of Ecology and Systematics* 17:67-86.

Murphy, P. G., A. E. Lugo (1996). Dry forests of Central America and the Caribbean. Pp 9-34. En: Bullock, S. H., H. A. Mooney, E. Medina (Eds.) Seasonally dry tropical forests. Cambridge, Inglaterra: Cambridge University Press.

Morales, A. (2005) Estudio de la flora del bosque seco caribeño de la isla de Providencia (Colombia) en el área del Peak y análisis de su afinidad geográfica. Tesis de pregrado para optar el título de Ecólogo. Bogotá, D. C.: Pontificia Universidad Javeriana, Facultad de Estudios Ambientales y Rurales, Departamento de Ecología, 130 pp.

Olivier S. R. (1978) *Estudio general de la situación actual del medio ambiente en la Isla de Providencia y posibilidades de su desarrollo integrado teniendo en cuanta la tradición del pueblo isleño, la riqueza de la tierra y el mar*. Bogotá: Departamento Nacional de Planeación.

Parsons, J. J. (1956). San Andres and Providencia, English speaking islands in the Western Caribbean. *University of California Publications in Geography* 12:1-84.

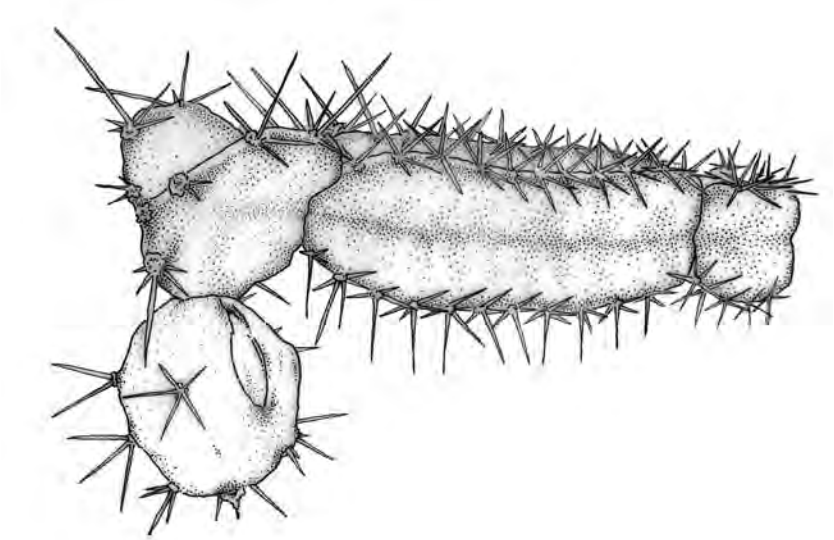
Porter J. (1878) Sir Edward Seaward's narrative of his shipwreck, and discovery of certain islands in the Caribbean sea; with a detail of many extraordinary and highly interesting events in his life, from the year 1733 to 1749. William P. Nimmo, London. 634pp.

Ruiz, J. (2002). Secondary succession of dry tropical forests through a 1944-2000 chronosequence in Providencia Island, Colombia. Tesis de grado para optar el título de Ph. D. en Recursos Naturales. Storrs, CT, EUA: University of Connecticut, College of Agriculture and Natural Resources, Department of Natural Resources Management & Engineering, 172 pp.

Ruiz, J., Fandiño, M. C., Chazdon, R. L. (2005a) Vegetation structure, composition, and species richness across a 56-year chronosequence of dry tropical forest on Providencia Island, Colombia. *Biotrópica* 37:520-530.

Ruiz, J., Fandiño, M. C., Meyer, T. H., Ortega. I. M., (2005b) Cambio de la cobertura boscosa en Providencia. Revista de Investigación, Universidad de La Salle 5:141-152.

Sánchez-Azofeifa, G. A., M. Quesada, J. P. Rodríguez, J. M., Nassar, K. E., Stoner, A., Castillo, T., Garvin, E., Zent, J. C. Calvo-Alvarado, M. E. R., Kalacska, J. A., Gamon, P., Cuevas-Reyes P. (2005). Research priorities for Neotropical dry forests. Biotropica 37:477-485.



Acanthocereus pentagonus

Recibido: 27/01/2006
Aceptado: 28/03/2007

Guía para autores

(ver también: http://www.humboldt.org.co/biota)

Preparación del manuscrito

Los autores que deseen hacer sus contribuciones a *Biota Colombiana* pueden someter sus documentos a través de correo electrónico, o enviando por correo una copia magnética del manuscrito. Para la elaboración de los textos del manuscrito se puede usar un procesador de palabra cualquiera (preferiblemente Word); los listados (a manera de tabla) deben ser elaborados en una hoja de cálculo (preferiblemente Excel). Para someter un manuscrito es necesario anexar una carta de intención en la que se indique claramente:

1. Nombre(s) completo(s) del(os) autor(es), y direcciones para envío de correspondencia (es indispensable suministrar una dirección de correo electrónico para comunicación directa)
2. Titulo completo del Manuscrito
3. Nombres, tamaños y tipos de archivos suministrados
4. Lista de mínimo 2 o 3 revisores[1] que puedan evaluar el manuscrito, con sus respectivas direcciones.

Estructura de los listados:

Biota Colombiana es una publicación bilingüe, con sus contenidos en español e inglés. Los autores deben presentar sus manuscritos en los dos idiomas según sea el caso. *Biota Colombiana* está organizada en seis secciones: 1) Listados taxonómicos; 2) Análisis cladísticos; 3) Estudios biogeográficos; 4) Claves de identificación; 5) Noticias y comentarios de colecciones e instituciones y 6) Reseñas y Novedades bibliográficas. (Para mayores detalles por favor visitar la página web *http://www.humboldt.org.co/biota*).

Evaluación del manuscrito

Los manuscritos sometidos serán revisados por pares científicos calificados cuya respuesta final de evaluación puede ser: a) Aceptado (en cuyo caso se asume que no existe ningún cambio, omisión u adición al artículo, y que se recomienda su publicación en la forma actualmente presentada); b) Aceptación Condicional (se acepta y recomienda el artículo para su publicación solo sí se realizan los cambios indicados por el evaluador); y c) Rechazo (en el cual el evaluador considera que los contenidos y/o forma de presentación del artículo no se ajustan al esquema de publicación de *Biota Colombiana*).

LISTA DE INSTRUCCIONES

- Para la presentación del manuscrito configure las páginas de los textos en tamaño carta, márgenes de 2,5cm en todos los lados, doble espacio y alineación hacia la izquierda (incluyendo título y bibliografía).
- Las tablas donde se presentan los listados taxonómicos, no necesitan de una configuración de página específica. Simplemente se requiere que todas las columnas estén dentro de una misma página (no se aceptan columnas en páginas separadas). Evite el uso de bordes de cualquier tipo en la edición de las tablas.
- ?En la construcción de las tablas use encabezados para las columnas UNICAMENTE en la primera hoja. Continúe siempre las tablas en hojas nuevas con registros nuevos; NUNCA corte la información de un registro para continuarlo en una nueva página.
- Las figuras deben estar a una resolución de 300 dpi y en formato .jpg, .eps ó .tiff
- Utilice como fuente Times New Roman o Arial, tamaño 12, en todos los textos. Para tablas cambie el tamaño de la fuente a 10. Géneros y especies en itálica. Evite el uso de negritas o subrayados;.
- -Todas las páginas de texto (a excepción de la primera correspondiente al título), deben numerarse en la parte inferior - derecha de la hoja.
- Cada referencia de la bibliografía debe estar citada en el texto, y viceversa. Para citar un autor use: Gómez (1995) o (Gómez 1995); para dos autores: Otero & Blum (1970) o (Otero & Blum 1970); para más de dos autores: Silva *et al*. (1998) o (Silva *et al*. 1998). Para citar varias referencias al final de una frase ordénelas cronológicamente, de la más antigua a la más reciente, y luego ordénelas alfabéticamente: (Otero & Blum 1970; Gómez 1995; MacArthur 1995; Silva *et al*. 1998); utilice este mismo esquema para citar varias veces un mismo autor: Santos (1995, 1997), o (Santos 1995, 1997), o en medio de varias citas: (Otero & Blum 1970; Santos 1995, 1997; Silva *et al*. 1998).
- En la literatura citada escriba las referencias completas, de acuerdo con el siguiente patrón:
  - **Revistas:** Agosti D., C. R. F. Brandao, S. Diniz. (1999). The New World species of the subfamily Leptanilloidinae (Hymenoptera: Formicidae). *Systematic Entomology* 24:14-20
  - **Libros:**Watkins W. F. Jr. (1976). The identification and distribution of New World Army Ants. Waco, Texas, 102pp.
  - **Capítulos**:Fernández F., E. E. Palacio, W. P. MacKay (1996). Introducción al estudio de las hormigas (Hymenoptera: Formicidae) de Colombia pp.349-412 En: G. D. Amat, G. Andrade, F. Fernández (eds.) Insectos de Colombia, Estudios Escogidos Academia Colombiana de Ciencias Exactas, Físicas y Naturales & Centro Editorial Javeriano, Bogotá D.C.
- Utilice puntos seguidos para separar autores de año, año de título, etc. En caso de varios autores sepárelos por medio de comas; no utilice &, y, o and para referirse al último autor. Los volúmenes, números y páginas deben presentarse de manera continua, sin espacios entre sí. Para el caso de artículos de revistas, escriba el nombre completo de la revista, no use abreviaturas. No use sangrías ni subrayados en la presentación de la bibliografía.
- Para referirse a números dentro del texto, escriba en palabras únicamente los números del uno al diez (p.e., cinco especies) a menos que esté combinado con otros números o se trate de medidas (p.e., 3 géneros y 7 especies; 8 km2). Emplee comas para separar miles (a excepción de 1000), y comas para decimales. Para porcentajes utilice el símbolo % seguido del valor, sin espacios.
- Dentro del texto puede referirse a comunicaciones y/o observaciones personales, de la siguiente forma: E. Palacio (com. pers.); (E. Palacio, com. pers.); C. Sarmiento (obs. pers.); (C. Sarmiento, obs. pers.).
- Para la elaboración de listados neotropicales o nacionales, utilice las abreviaturas suministradas al final del presente documento, o consulte un número de la revista. Utilice ambos tipos de subdivisiones en columnas separadas (geopolítica y biogeográfica). Cuando utilice varias abreviaturas para un mismo registro, ordénelas alfabéticamente y sepárelas entre sí por espacios, NO USE COMAS (por ejemplo: am cq gn vu).
- Si para la columna de Distribución en listados nacionales utiliza un referente biogeográfico distinto a región, debe suministrar de forma separada una clave de las abreviaturas empleadas. Si el esquema biogeográfico utilizado por usted ya ha sido presentado en artículos de números anteriores de la revista, se recomienda usar la misma clave de abreviaturas allí expuesta.
- Cualquier duda o inquietud consúltela inmediatamente al editor en jefe de Biota Colombiana.
- No se olvide de leer la presente guía en su totalidad antes de someter un manuscrito para evaluación. Cualquier duda o inquietud consúltela inmediatamente al editor en jefe de *Biota Colombiana*.

[1] Tanto el Editor en Jefe como los miembros del comité editorial se reservan el derecho de seleccionar los revisores para cada manuscrito; igualmente, los editores podrán buscar revisores anónimos distintos a los sugeridos inicialmente por el(los) autor(es).

Guidelines for authors

(see also: http://www.humboldt.org.co/biota)

Manuscript Preparation

Authors interested in contributing to *Biota Colombiana* may submit manuscripts by email, or by sending their file on a diskette by regular mail. Any word-processing program may be used for text (Word is recommended). We prefer for taxonomic lists and any other type of table to be sent in spread format (Excel is recommended). Lists for taxonomic groups inferior to genera, such as subgenera or species groups, will not be accepted.
Submitted manuscripts must be accompanied by a cover letter which clearly indicates:

1. *Full names, mailing addresses and e-mail addresses of all authors. (Please note that email addresses are essential).*
2. *The complete title of the article.*
3. *Names, sizes, and types of files submitted.*
4. *A list of the names and addresses of at least three (3) reviewers[1] who are qualified to evaluate the manuscript.*

Lists Structure

Biota Colombiana *is a completely bilingual publication, with all contents in both Spanish and English. Authors may present manuscripts in either language, or in both.* Biota Colombiana *is divided into six sections: 1) Taxonomic lists; 2) Cladistic analyses; 3) Biogeographic studies; 4) Identification keys 5) News and comments from Institutions 6) Reviews and bibliographic novelties. (For further information, see* http://www.humboldt.org.co/biota*).*

Evaluation

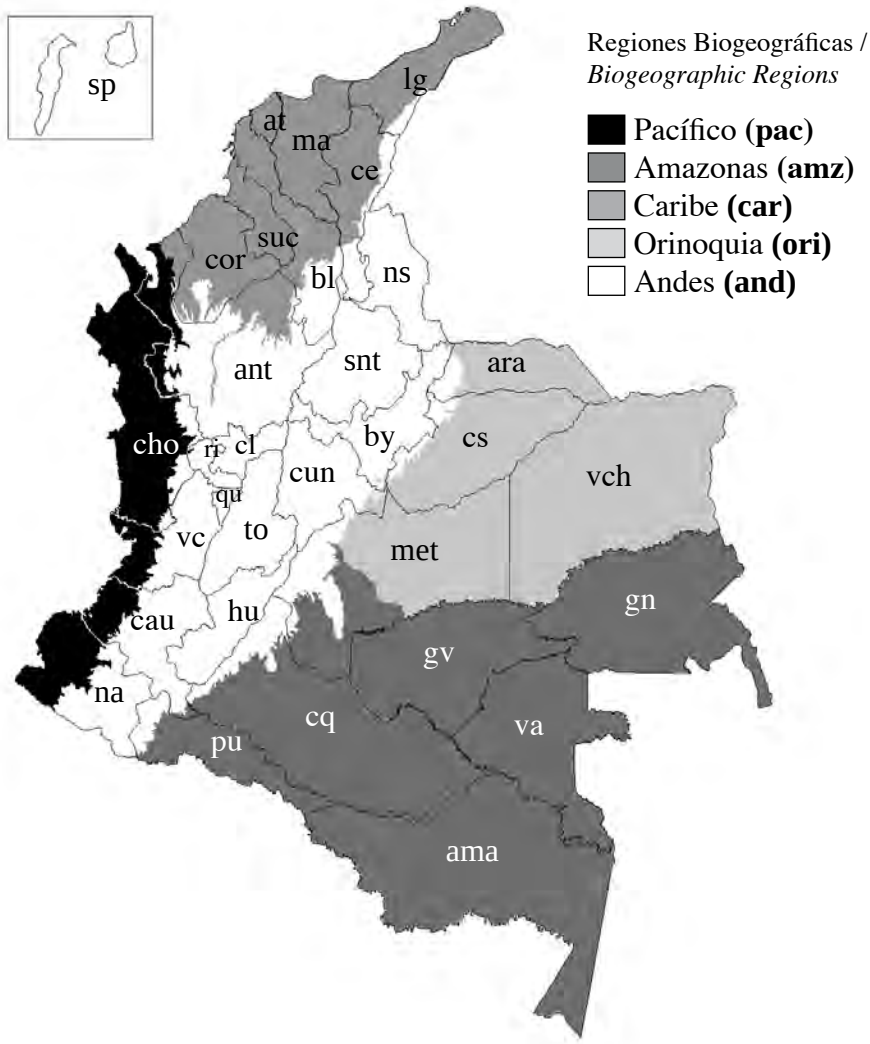
The evaluation could result in any of the following: a) Accepted *(In this case we assume that no change, omission or addition to the article is required and it will be published as presented.); b)* Conditional acceptance *(The article is accepted and recommended to be published but it needs to be corrected as indicated by the evaluator); and c)* Rejected *(in this case the evaluator considers that the article presentation, contents and/or form are not compatible with the usual publication scheme of* Biota Colombiana*).*

INSTRUCTIONS

- *The manuscript should be configured for letter size paper, with 2.5cm margins on all side. It should be single-spaced and left-aligned (including title and bibliography).*
- *The tables in which the lists are presented do not require any specific page configuration. All the columns must fit across a single page (columns on separate pages are not acceptable). Avoid the use of borders of any type in editing the tables.*
- *In setting up the tables, use column headings ONLY for the first page. Always start additional pages with a new record; NEVER cut the information of one record so that it continues on a subsequent page.*
- *Figures must be sent at 300 dpi and in .jpeg, .eps or .tiff format.*
- *Use Times New Roman or Arial font, size 12, for all texts. Use size 10 text in tables. Avoid the use of* ***bold*** *or* underlining *(italics are recommended where considered necessary for emphasis or clarity).*
- *All pages of the text (with the exception of the title page) should be numbered. Page numbers should be located in the lower right corner of the page.*
- *Each reference in the bibliography should be cited in the text, and vice versa. Only cite published material or that which is in press. To cite a single author use the format: Gómez (1995) or (Gómez 1995); to cite two authors: Otero & Blum (1970) or (Otero & Blum 1970); for more than two authors: Silva et al. (1998) or (Silva et al. 1998). To cite various references at the end of a sentence, order them chronologically, from oldest to most recent, and then alphabetically: (Otero & Blum 1970; Gómez 1995; MacArthur 1995; Silva et al. 1998). Use the same format for citing the same author more than once: Santos (1995, 1997), or (Santos 1995, 1997), or among several citations: (Otero & Blum 1970; Santos 1995, 1997; Silva et al. 1998).*
- *In the bibliography, write the complete reference, according to the following pattern:*
  - ***Journals:*** *Agosti D., C. R. F. Brandao, S. Diniz 1999 The New World species of the subfamily Leptanilloidinae (Hymenoptera: Formicidae) Systematic Entomology 24:14-20*
  - ***Books:*** *Watkins W. F. Jr. 1976 The identification and distribution of New World Army Ants Waco, Texas, 102pp.*
  - ***Chapters****: Fernández F., E. E. Palacio, W. P. MacKay 1996 Introducción al estudio de las hormigas (Hymenoptera: Formicidae) de Colombia pp.349-412 In: G. D. Amat, G. Andrade, F. Fernández (eds.) Insectos de Colombia, Estudios Escogidos Academia Colombiana de Ciencias Exactas, Físicas y Naturales & Centro Editorial Javeriano, Bogotá D.C.*
- *Use periods to separate author from year, year from title, etc. In the case of several authors, separate them by commas; do not use &, y, or and before the last author. The volume, issue, and page numbers should be presented in continuous format, without spacing. Check all citations for names, accent marks, and spelling. In the case of journal articles, write the full name of the journal, without abbreviations. Do not use hanging indents or underlining in the bibliography.*
- *To refer to numbers within the text, write only the numbers from one to ten in words (e.g., five species), unless combining with other numbers or measures (e.g., 3 genera and 7 species; 8 km²). Use commas to separate thousands (with the exception of 1000), and commas for decimal points. For percentages, use the symbol % followed by the value, without spaces.*
- *Within the text, refer to personal communication or observations in the following way: E. Palacio (pers. comm.); (E. Palacio, pers. comm.); C. Sarmiento (pers. obs.); (C. Sarmiento, pers. obs.).*
- *In Neotropical or national lists, use the standardized abbreviations at the end of this issue. If possible, use different columns for geopolitical and biogeographical subdivisions. When using several abbreviations for the same record, order them alphabetically and separate them by spaces. DO NOT USE COMMAS (e.g., am cq gn vu).*
- *If, in the Distribution column of national lists, you use a different biogeographical referent from 'region'; you must provide an alternative abbreviations key. If the biogeographical system you use has been published previously in earlier issues of the journal, it is recommended that you use the same key for the abbreviations.*
- *Read the complete guidelines before submitting a manuscript for evaluation. If you have any questions, do not hesitate to consult the editor of* Biota Colombiana.

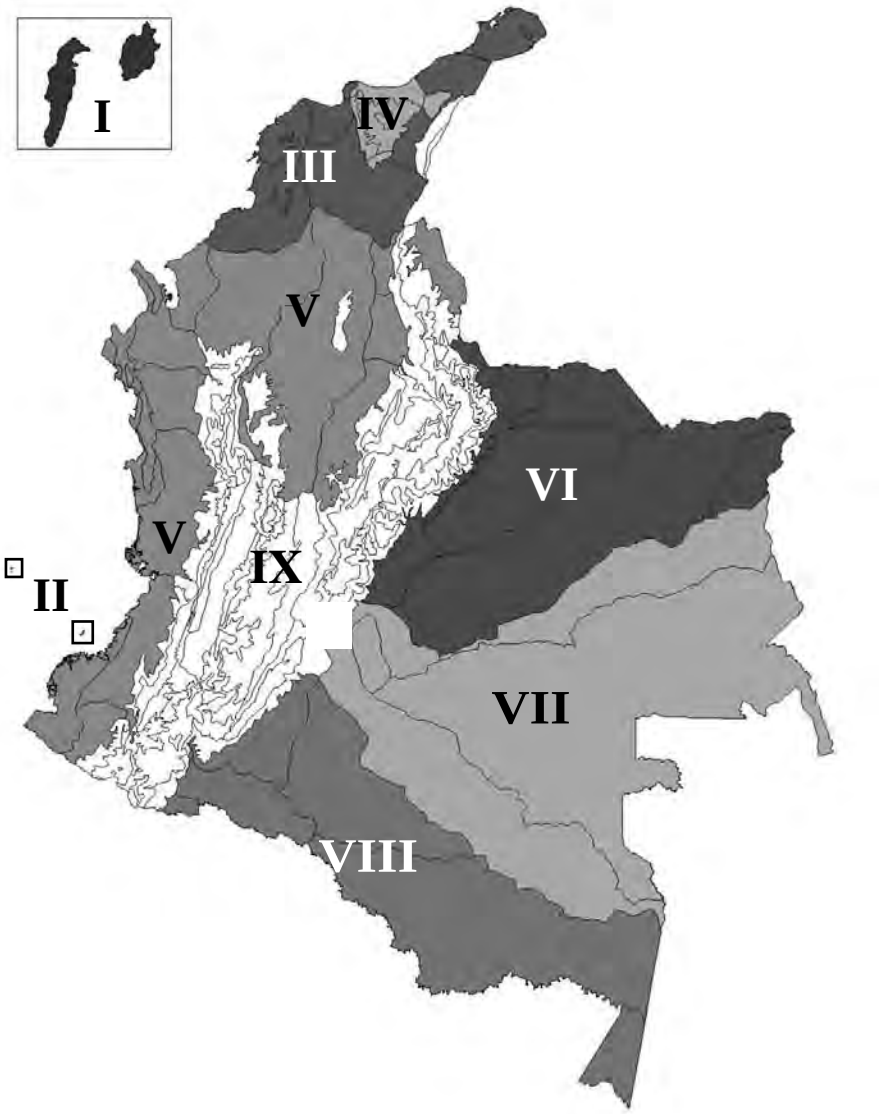
[1] *The editor and members of the editorial committee reserve the right to select the reviewers for each manuscript and to choose anonymous reviewers different from those initially suggested by the author(s).*

Departamentos y Regiones Biogeográficas Continentales de Colombia
Geopolitical Distribution and Continental Biogeographic Regions of Colombia



Departamentos / *Departments*			
Amazonas	ama	**Huila**	hu
Antioquia	ant	**La Guajira**	lg
Arauca	ara	**Magdalena**	ma
Atlántico	at	**Meta**	met
Bolívar	bl	**Nariño**	na
Boyacá	by	**Norte de Santander**	ns
Cauca	cau	**Putumayo**	pu
Cesar	ce	**Quindío**	qu
Caldas	cl	**Risaralda**	ri
Córdoba	cor	**Santander**	snt
Caquetá	cq	**San Andrés y Providencia**	sp
Casanare	cs	**Sucre**	suc
Cundinamarca	cun	**Tolima**	to
Chocó	cho	**Vaupés**	va
Guainía	gn	**Valle del Cauca**	vc
Guaviare	gv	**Vichada**	vch

Unidades Biogeográficas de Colombia / *Biogeographic units of Colombia*

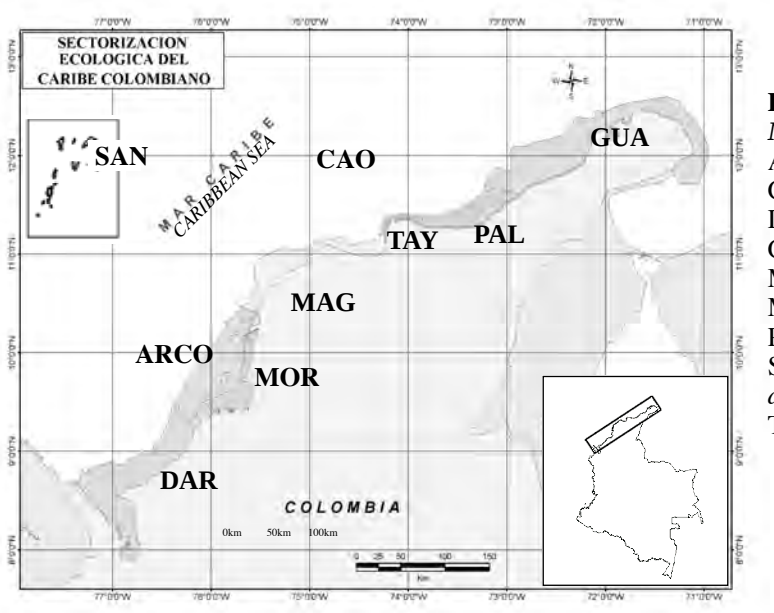


Unidades Biogeográficas / *Biogeographic Units*

Territorios Insulares Oceánicos Caribeños / *Caribbean Oceanic Insular Territories*	**I**
Territorios Insulares Oceánicos del Pacífico / *Pacific Oceanic Insular Territories*	**II**
Cinturón Arido Pericaribeño / *Arid Peri-Caribbean Belt*	**III**
Macizo de la Sierra Nevada de Santa Marta / *Massif of the Sierra Nevada de Santa Marta*	**IV**
Provincia del Chocó-Magdalena / *Choco-Magdalena Province*	**V**
Provincia de la Orinoquia / *Orinoquia Province*	**VI**
Provincia de la Guyana / *Guyana Province*	**VII**
Provincia de la Amazonia / *Amazonian Province*	**VIII**
Provincia Norandina / *North-Andean Province*	**IX**

Tomado de: Hernández J., A. Hurtado, R. Ortiz, T. Walschburger 1991 Unidades Biogeográficas de Colombia En: Hernández J., R. Ortiz, T. Walshburger, A. Hurtado (Eds.) Estado de la Biodiversidad en Colombia Informe Final Santafé de Bogotá, Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología "Francisco José de Caldas" – Colciencias

Paisaje Natural Marino del Atlántico y Pacífico / *Natural Marine Landscape of the Atlantic and Pacific*

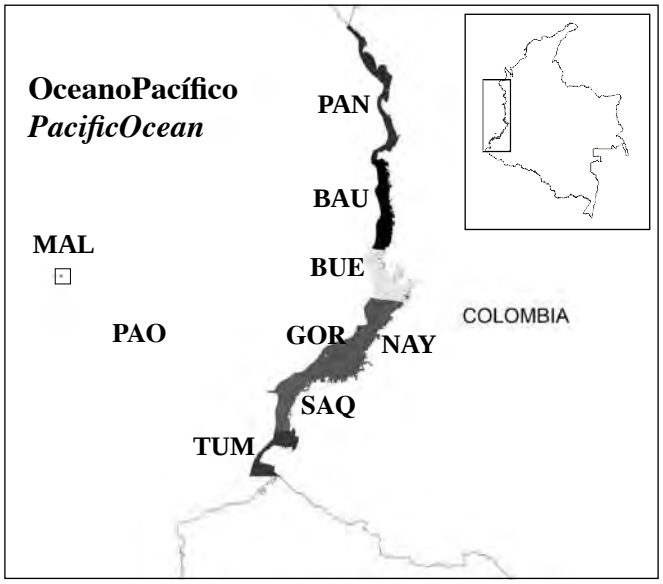


Paisaje Natural Marino - Atlántico
Natural Marine Landscape - Atlantic

Archipiélagos Coralinos / *Reef Archipielago*	ARCO
Caribe Oceánico / *Oceanic Carib*	CAO
Darién / *Darién*	DAR
Guajira / *Guajira*	GUA
Magdalena / *Magdalena*	MAG
Morrosquillo / *Morrosquillo*	MOR
Palomino / *Palomino*	PAL
San Andrés y Providencia / *San Andres and Providencia*	SAN
Tayrona / *Tayrona*	TAY

Paisaje Natural Marino - Pacífico
Natural Marine Landscape - Pacific

Baudó / *Baudo*	BAU
Buenaventura / *Buenaventura*	BUE
Gorgona / *Gorgona*	GOR
Malpelo / *Malpelo*	MAL
Naya / *Naya*	NAY
Pacífico Norte / *North Pacific*	PAN
Pacífico Oceánico / *Oceanic Pacific*	PAO
Sanquianga / *Sanquianga*	SAQ
Tumaco / *Tumaco*	TUM



Tomado de: INVEMAR (2000) Instituto de Investigaciones Marinas y Costeras "José Benito Vives de Andréis. Programa Nacional de Investigación en Biodiversidad Marina y Costera PNIBM. Editado por Juan Manuel Díaz Merlano y Diana Isabel Gómez López. Santa Marta: INVEMAR, FONADE, MMA. 83 p.

Abreviaturas de Países / *Countries Abbreviations*

Países / *Countries*

Antillas Mayores / *Greater Antilles*	**am**	Guyana Francesa / *French Guiana*	**gf**
Antillas Menores / *Lesser Antillas*	**an**	Guyana / *Guyana*	**gi**
Argentina / *Argentina*	**ar**	Guatemala / *Guatemala*	**gu**
Bahamas / *Bahamas*	**bh**	Honduras / *Honduras*	**ho**
Belice / *Belize*	**be**	Jamaica / *Jamaica*	**ja**
Bolivia / *Bolivia*	**bo**	México / *Mexico*	**me**
Brasil / *Brazil*	**br**	Nicaragua / *Nicaragua*	**ni**
Colombia / *Colombia*	**co**	Perú / *Peru*	**pe**
Costa Rica / *Costa Rica*	**cr**	Panamá / *Panama*	**pn**
Cuba / *Cuba*	**cu**	Paraguay / *Paraguay*	**pr**
Chile / *Chile*	**ch**	Surinam / *Suriname*	**su**
Ecuador / *Ecuador*	**ec**	Trinidad y Tobago / *Trinidad and Tobago*	**tt**
El Salvador / *El Salvador*	**es**	Uruguay / *Uruguay*	**ur**
Estados Unidos / *United States*	**eu**	Venezuela / *Venezuela*	**vn**

Biota Colombiana Vol. 8 (1), 2007

Una publicación del / *A publication of*: Instituto Alexander von Humboldt

En asocio con / *In collaboration with:*
Instituto de Ciencias Naturales de la Universidad Nacional de Colombia
Instituto de Investigaciones Marinas y Costeras - Invemar
Missouri Botanical Garden

ESTUDIOS BIOGEOGRÁFICOS / *BIOGEOGRAPHIC STUDIES*

LISTADOS TAXONÓMICOS / *TAXONOMIC LISTS*

Listados Nacionales / *National Lists*

Listados Regionales / *Regional Lists*

9 770124 537003 01>