

Patrón Panbiogeográfico de la Provincia Choco
Panbiogeographic Pattern of the Choco Province

LEIDY VIVIANA ROMERO ALARCON

UNIVERSIDAD INDUSTRIAL DE SANTANDER
FACULTAD DE CIENCIAS
ESCUELA DE BIOLOGÍA
BUCARAMANGA

2016

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LEIDY VIVIANA ROMERO ALARCON

Trabajo de Grado para optar por título de Bióloga

Director

DANIEL R. MIRANDA ESQUIVEL

Dr. en Ciencias Naturales

UNIVERSIDAD INDUSTRIAL DE SANTANDER

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*"Y el niño abrió los ojos y lo primero que vio fue el
pulmon azul cobalto del pecho del pájaro tente"*

Zoro: J.A. Niño, 1972

*A ti madre por dar todo tu ser y a ti padre por desper-
tar mi gusto por conocer, leer y aprender.*

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RESUMEN

TÍTULO: PATRÓN PANBIOGEOGRÁFICO DE LA PRIVINCIA CHOCÓ*

AUTOR: ROMERO ALARCON LEIDY VIVIANA**

PALABRAS CLAVES: Áreas de Endemismo, Trazos Generalizados, Patrón Biogeográfico, Chocó Biogeográfico.

DESCRIPCIÓN

El Chocó Biogeográfico ha sido considerado como el andén Pacífico desde Costa Rica a Ecuador, incluyendo los valles interandinos del Bloque Norte de los Andes. Para evaluar los patrones biogeográficos para la región biogeográfica del Chocó, usamos la información disponible en la infraestructura Global de Información de Biodiversidad (GBIF). Nosotros usamos dos aproximaciones, áreas de endemismo siguiendo el criterio de optimalidad implementado en el algoritmo de NDM/VNDM y la aproximación de distancia geométrica implementada en el programa MatTracks para trazos generalizados. El conjunto de datos fue analizado usando diferentes tamaños de cuadrícula (0.5, 0.75, 1.0, 1.25) y clases taxonómicas (Amphibia, Mammalia, Reptilia, Aves, Liliopsida, Magnoliopsida). Nosotros comparamos los patrones encontrados entre las diferentes particiones y contra las definiciones previas. Nosotros identificamos seis patrones generales que fueron congruentes para todas las particiones y para ambos métodos. Sin embargo ninguno de los patrones generales encontrados fue congruente en su totalidad con las áreas previamente propuestas por otros autores como Chocó Biogeográfico. Nuestras áreas son congruentes con algunos distritos como el de Alto Atrato-San Juan de Hernández-Camacho et al. (1992). Nuestros resultados mostraron que no es posible considerar el Chocó como una única área continua. Esto implica el cambio en los esquemas biogeográficos empleados en campos del conocimiento como Biogeografía, Ecología y Biología de la Conservación.

* Trabajo de grado

** Facultad de Ciencias, Escuela de Biología, Director: Daniel R. Miranda Esquivel, Dr. en Ciencias.

ABSTRACT

TITLE: PANBIOGEOGRAPHIC PATTERNS OF THE CHOCO PROVINCE*

AUTHOR: ROMERO ALARCON LEIDY VIVIANA**

KEY WORDS: Areas of Endemism, Generalized Tracks, Panbiogeographic Pattern, Biogeographic Choco.

DESCRIPCIÓN

To Evaluate the biogeographic patterns for the biogeographic Choco region, using the available information in the Global Biodiversity Information Facility (GBIF). The western coastal strip that runs from Costa Rica to Ecuador, including the Interandean valleys of the Block North of the Andes. We used two approaches, area of endemism and Generalized Tracks. We performed the analyses using the optimality criterion implemented in the NDM/VNDM algorithm for areas of endemism and the geometric approach implemented in the MartiTracks algorithm for generalized tracks. The data set was analyzed at different grid sizes (0.5° , 0.75° , 1.0° and 1.25°) and taxonomic levels. We compared the patterns among and between partitions and against previous definitions. We identified five general patterns that were congruent for all partitions and were recovered for both methods. However the five areas did not correspond to the total extension of the areas previously defined as Choco. Our areas only shared with other definitions some regions, previously defined as districts or provinces. Our results showed that is not possible to consider the Choco as a single continuous area as previously stated. Therefore, we encourage a change in the scheme employed in terms of biogeography, ecology and conservation biology.

* Bachelor Thesis

** Facultad de Ciencias, Escuela de Biología, Director: Daniel R. Miranda Esquivel, Dr. en Ciencias.

Framework of the internship

The developing of this internship is framed on the project: ‘Biogeographic history of North of Andes Block and its neighboring areas’ and developed by the Systematics and Biogeography Laboratory at the Universidad Industrial de Santander.

I have performed the analysis for the Biogeographic Choco region, this project had the following objectives:

- Establish whether the biogeographic Choco is a one or various areas of endemism, given the biogeographic patterns described for its biota.
- Determine the relations between the Choco province and others historic units from Central and South America.
- Describe the distributional and diversification pattern of the chocoan biota.

Chapter 1

Accomplished Competences Report

1.1 Introduction

The biogeographic Choco is a concept that has been used in different fields from conservation, ecology, geology, biogeography to environmental niche modeling, among others. In general, the researchers have used the term to refer to the North-western pacific slope of south America and the Southern part of Central America.

Independent of the research field, the limits of this area depend on the authors who define it. Thus, we can find approaches such as definitions that include the area from San Blas-Panama to Tumbes-Peru with the West Cordillera as the eastern limit (*sensu*: Abell et al., 2008; BirdLife International, 2012), or an area from San blas-Panama to the Oro province-Ecuador including the Magdalena valley as the eastern limit (*sensu*: Hernández-Camacho et al., 1992; Udvardy, 1975) or an area from Carmen del Baudo-Colombia to the Esmeraldas province-Ecuador (*sensu*: Cabrera & Willink, 1973; Chapman, 1918; Dinerstein et al., 1995; Haffer, 1967; Morrone, 1999, 2001, 2002, 2006, 2014; Muller, 1973; Myers et al., 2000; Noguera-Urbano & Escalante, 2014; Savage, 1966; von Humboldt, 1824).

Most of these approaches have been the product of personal perspectives about the distributional patterns of particular taxa, but not the product of a specific criterion to define the area.

Morrone (1999, 2001, 2002, 2006, 2014) evaluated the Choco under the panbiogeography criterion, using tracks (Croizat, 1958) and Parsimony Analysis of endemicy (PAE) (Morrone, 1994; Rosen, 1988), and proposed the Choco province as the area from San Blas province-Panama to the pacific coast of Ecuador and Colombia. Only some individual tracks, for example *Aristolochia trianae* and

Androdon aequatorialis were feasible to recover the area as was described by Morrone (1999, 2001). However, other authors using the congruence of the historical pattern of *Piper* (Quijano-Abril et al., 2006) or the optimality criterion (Bolivar-Leguizamón, 2009) for a large set of taxa and they did not recover this area as a biogeographic unit.

Given these discrepancies, it is important to identify which are the limits of the area, using a reproducible analysis based on a quantitative analysis as the optimality criterion or the generalized tracks analysis.

1.2 General Objectives

- Define the area or areas of endemism of the Choco province.
- Evaluate the historical distributional pattern of the biota of the Choco province.

1.3 Competences

The relative value (RV) corresponds to the perceptual contribution of each competence.

1.3.1 Information gathering

Collect distributional data for different taxonomic groups from the most important electronic biodiversity databases.

Method

Collect distributional data from the most important electronic biodiversity databases (VertNET (Constable et al., 2010), The Global Biodiversity information Facility (Telenius, 2011)), and nacional scientific collections (SIB Colombia, Universidad Nacional de Colombia, Universidad De Antioquia, Universidad Tecnologica del Choco, Universidad Industrial de Santander, Universidad del Valle del Cauca), all occurrences reported for the classes: Amphibia, Reptilia, Mammalia, Aves, Magnoliopsida, Liliopsida.

Evaluation (RV: 5%)

Provide a database for all occurrences for each taxon, following the Darwin Core Standard (Wieczorek et al., 2012).

Accomplished: 100%

I provided a database for the seven taxa in Darwin Core format (Wieczorek et al., 2012). However, the electronic databases above mentioned and the national collections are participant nodes of GBIF (Telenius, 2011). Therefore, to avoid redundant information, I used only data from GBIF (Telenius, 2011) to develop this project.

1.3.2 Data cleaning

Make an adequate cleaning of the distributional data.

Method

Identify the most common errors in geographical data and filter the data using computational tools.

Evaluation (RV: 10%)

Provide a demo instruction manual to teach how to clean geographical data.

Provide the computational code (Scripts) to clean data. This code has to be in R language programming.

Provide a database with refined coordinates, following the Darwin Core Standard (Wieczorek et al., 2012).

Accomplished: 100%

I wrote a package in R language (R Core Team, 2013), that uses functions to detect and correct the most common errors in geographical data. This package (geocleaMT) is also a protocol to clean data, this can be used following the pipelines proposed or each function can be performed independently (R-Alarcon & Miranda-Esquivel, Submitted). I used this cleaned database to developed all the analyses.

1.3.3 Analysis of Generalized Tracks and Areas of Endemism

Manipulate computational tools appropriately to perform an optimality analysis of areas of endemism and evaluate distributional patterns.

Method

Use and understand the eNDeMism/Visual of eNDeMism (NDM/VNDM) algorithms (Szumik et al., 2002; Szumik & Goloboff, 2004) to make an optimality analysis, and the MartiTracks algorithm (Echeverría-Londoño & Miranda-Esquivel, 2011) to obtain generalized tracks.

Evaluation (RV: 20%)

Provide the scripts to make both analysis, areas of endemism and generalized tracks.

Provide the analysis results in 'eNDeMism' (.ndm) format and 'xydata' (.xyd) one for areas of endemism and Shapefile (.shp) format to generalized tracks.

Accomplished: 100%

For the areas of endemism analysis, I compiled the NDM program (Szumik et al., 2002; Szumik & Goloboff, 2004) on Linux (Ubuntu 14.04) and build a script in Bash programming language that can automate the processes for each grid size (0.5 - 1.25 each 2.5 decimal degrees) for each taxonomic group.

I did the same exercise for the generalized tracks using the Martitracks algorithm (Echeverría-Londoño & Miranda-Esquivel, 2011).

1.3.4 Visualization of Results

Use computational tools to build maps using vector layers in shapeFile (.shp) format.

Method

Make maps using programs as Quantum-Gis (QGIS Development Team, 2009), Diva-Gis (Hijmans et al., 2005) or R packages as maptools (Bivand & Lewin-Koh, 2015) and sp (Pebesma et al., 2015).

Evaluation (RV: 5%)

Provide all maps for the areas of endemism and the generalized tracks in shapefile format.

Accomplished: 100%

I made two functions to convert between formats, the first converts the VNDM output file in Global Mapper format (ASCII) to the shapeFile format. The second one converts the VNDM output file in Diva-Gis format to the shapeFile format.

I built the appropriate polygons to represent the final areas of endemism, and the areas that represent the different definitions of the Biogeographic Choco. I converted the generalized tracks from KML format to the shapeFile format. I built a script in R language (R Core Team, 2013) to automate the construction of maps for the more than 10.000 unique areas obtained in the analyses.

1.3.5 Analysis of Results

Understand the concepts of area of endemism, individual tracks, generalized tracks and nodes.

Give an adequate interpretation for each pattern found.

Evaluation (RV: 20%)

Build the discussion based on the comparison between areas of endemism and generalized tracks, searching the general pattern to raise hypotheses about biogeographic units.

Accomplished: 100%

I built a new definition for the Choco area. This is the first hypothesis for this area was built using a numerical method, different taxonomic groups and approx. 100.000 occurrences and 5.000 species.

1.3.6 Scientific Report Writting

Write a Scientific Report.

Method

Write a internship report like a scientific article.

Evaluation (RV:40%)

Provide a report following the editorial rules of a scientific journal.

Accomplished: 100%

I provided two complete scientific papers, the manual and the worked example for the package. The first paper presented is *geocleaMT*: A new package to cleaning geographical data, submitted to the journal ‘Ecography’, and the second one presents the biogeographic pattern of the Choco region, tht it will be submitted to the Journal of Biogeography.

1.4 Expected Results

1.4.1 Objective

Describe the panbiogeographic pattern or patterns of the Biogeographic Choco region.

Accomplishment: I wrote two scientific articles, one describing the different patterns on Choco and other developing a R package to clean geographical data. These results can be see in this document Chapters 2, 3, 4, 5.

1.4.2 Divulgation

Divulgation in national or international scientific events.

Accomplishment: As soon as the preliminary results was obtained, these were presented in three different international events in the follow order:

- **Preliminar Areas of endemism:**

Title: ‘¿Es Chocó un área Biogeográfica?: Una visión desde áreas de endemismo bajo el criterio de óptimabilidad’.

Event: ‘The third Meeting of the Network for Neotropical Biogeography’. Universidad de los Andes. Bogotá - Colombia. (Fig. 1)

- **Preliminar Generalized Tracks:**

Title: ‘Hipótesis Primaria de Homología del Chocó Biogeográfico: Una aproximación desde Anfibios’.

Event: ‘X Congreso Latinoamericano de Herpetología. In : IV Congreso Colombiano de Zoología’ . Cartagena - Colombia. (Fig. 2)

Award: The first prize to the best work mode video-presentation. (Fig. 3)

- **A new R Package:**

Title: ‘*geoCAMT*: Cleanig geographical data using multiplex approaches, a tools of sistematic cleaning’.

Event: ‘The fourth Meeting of the Network for Neotropical Biogeography’. Smithsonian Institute. Panama City - Panama. (Fig. 4)

1.4.3 Publishing

Submitting the conclusion to a national or international journal type A, following the ‘Departamento Administrativo de Ciencias, Tecnología e innovación- Colciencias’.

Accomplishment: The result have been submitted or will be submitted to different journals.

- Chapter 2:

Title: *geocleaMT*: An R package for cleaning/testing geographical data from electronic biodatabases

State: It will be submitted

Journal: Ecography

- Chapter 3:

Title: What is the Biogeography Choco ?

State: It will be submitted

Journal: Journal of Biogeography

Chapter 2

geocleaMT: An R package for cleaning/testing geographical data from electronic biodatabases

2.1 Introduction

The advances in electronic communications have enabled the effective and efficient exchange of information on large scales. This is the case of electronic databases of biodiversity, where different initiatives are the primary information source for most of the research at a regional/global level (Hampton et al., 2013; Soberón & Peterson, 2015; Uhen et al., 2013). For example, ones the best known are the NIH genetic sequence database (GenBank) (Benson et al., 1999; Bilofsky & Christian, 1988) and the Global Biodiversity Information (GBIF) (Telenius, 2011) (See: Table 1).

Nowadays, GBIF represents one of the biggest online sources to compile and facilitate Primary Biodiversity Records (PBR) (Beck et al., 2012; Jetz et al., 2012; Robertson et al., 2014), which are frequently used on different fields as ecology, historical biogeography, species distribution modeling, environmental planning, bio-regionalization, and selection of conservation reserves. Although GBIF does not exhibit the exponential growth (Costello et al., 2013) as others huge databases, it should be considered as ‘big data’ because of its volume, velocity, value and structure. However, the volume feature is which leads to a lower capacity of management, control, manipulation and analysis in such databases (Cai &

Zhu, 2015), increasing the need for developing new tools to systematize and facilitate the access to the information of databases (Antonelli et al., 2014; Chapman, 2005; Costello & Vanden-Berghe, 2006). On the other hand, another important feature is the ‘value’, inversely proportional to the volume, this represents the error because the greater the density of data, the lower the quality of them (Cai & Zhu, 2015; HoHowe et al., 2008; Nasser & Tariq, 2015). Some errors which generate such low quality, are difficult or even impossible to remove (i.e the human error). Thus, the error is an inevitable variable in any discipline in science (Gelfand & Tsang, 2015), and the large biodatabases are no exception. The mistakes on distributional data are well known in the literature (Antonelli et al., 2014; Chapman, 2005; Soberón & Peterson, 2009) and we could rank them as follows:

1. The taxonomic error has two possible causes: poor identification of a specimen by the researcher or the lack of taxonomic update of the biodatabase, although this process is unwieldy when speaking of millions of records.
2. Georeferencing error of the specimen’s location, with some subtypes:
 - (a) Some records resented just a reference point as a descriptor of locality/country/town, because few previous records used a Global Position System (GPS) tool. Although occurrences with no geocode are not a mistake, these occurrences ungeoreferenced are part of the noise that may have a database.
 - (b) Geocode is present, but the coordinate could be at the sea in the case of terrestrial specimens or viceversa for marine specimens.
 - (c) Error(s) in sign of the coordinate (i.e. a locality south of Equator would mistakenly be assigned to the north of Ecuador).
 - (d) Allocation of 0.0 values out of ignorance in latitude, longitude, or both; or because the field on the database was left empty and was replaced by 0.0, even when the name of the locality is known.

There is also another potential source of error due to the redundancy that could lead to mis-interpretations of the data, if we consider the number of occurrences in a given locality. For example, when two institutions worked cooperatively in the same investigation or place, and specimens of the same species are loaded independently, or the case of an institution that load a record twice. These could lead to duplicated points.

Given that these errors are a continuous problem to big biodata compilers such as GBIF, efforts are often focused on creating filters to detect problems in their own systems. Mechanisms to counteract these problems are the creation of policies and rules for sharing information (Canhos et al., 2015; Otegui et al., 2013). Independent institutions have implemented different algorithms as ANUCLIM (Houlder et al., 2000), Diva-GIS (Hijmans et al., 2001), BioGeomancer (Guralnick et al., 2006), speciesLink (CRIA, 2005), ModestR (García-Rosello et al., 2013) and Data Refinement Workflow (DRW) (Mathew et al., 2014), to detect and correct such mistakes and avoid bias in subsequent analysis. However, some of these algorithms could be slow, difficult to manage or perform only some tasks, and some have problems processing thousands of records simultaneously.

Nevertheless, the inherent noise found in databases and the criticisms made by its widespread use, specifically on GBIF (Beck et al., 2013, 2014; Pelayo-Villamil et al., 2014; Yang et al., 2013; Yesson et al., 2007), does not stop their use. By 2012, the number of publications that used data compiled by GBIF as the main source of information was of 250 (GBIF, 2012), which incremented to 350 in 2014 (GBIF, 2015), and continues to increase to date.

Nonetheless, very few of those empirical papers described the method implemented for downloading data and the protocols used in the analysis. So a good practice should be to describe the cleaning protocols, as well as appending supplementary data to guarantee the reproducibility of the analysis (Costello et al., 2013; Hampton et al., 2013).

Finally, the data is neither good nor bad, and the quality depends on the purpose of its use (Cai & Zhu, 2015; Chapman, 2005). Therefore, the quality and viability of the data in a analysis of biodiversity depends on the detection of the noise and the cleaning done (Otegui et al., 2013; Yesson et al., 2007). This process is expensive in terms of time and energy, spending up to 80% of the total time of the research, and leading to additional human error (Antonelli et al., 2014; Chapman, 2005; Pelayo-Villamil et al., 2012). Then, if the automation of those processes is achieved, data exploration could be wider and wiser, and the use of human time would be more efficient. This time should be spent in analysis and not on repetitive tasks that could easily be made by a computer.

Here, we present a new cleaning/testing protocol for distributional data and an automated tool to provide the necessary data mining process before any diversity analysis. The protocol takes into account the most common mistakes found in distributional records and attempts to minimize its possibility, increasing users' confidence in their data.

2.2 *geocleaMT*: describing the R package

geocleaMT is an open package (GPL-2 license) written in the programming language R (Ihaka & Gentleman, 1996), a flexible and suitable programming language which has been integrated as part of the box in informatics of biodiversity analysis, and add in similar fields as bioinformatics and phylogenetics (Paradis, 2010).

Although, the functions could be used in the suggested pipelines (Fig. 5), each function is suited to perform a specific task or a set of them, given the package a high level of customizability. The comparison between *geocleaMT* and other tools can be see in Table 2.

In general the analysis begins with a list of species, with or without their distribution. In the first case the distribution could be downloaded from GBIF using the function '*gbifDownSp*'. If the distribution is obtained from other suppliers, the format should follow the headers proposed on the Darwin Core Standard (Wieczorek et al., 2012).

All functions on both pipelines use a basic table with at least three columns (species / decimalLatitude / decimalLongitude) as input, and save the same format after a specific task is performed. This scheme allows the user to handle the dataset in a standard way as a data frame object (data.frame class (Chambers, 1992)), to communicate easily with other packages. Additionally, all functions return a descriptive report about the process made, that can be also saved as a data frame object.

When the PBR for each species are in memory as a data frame object, the functions from *geocleaMT* may be used to perform processes as:

1. Separate occurrences with and without geocode.
2. Delete points with latitude and longitude assigned as 0.0 (assuming this is a mistake, and not a real record).
3. Delete duplicated records.
4. Check decimal degree coordinates format.
5. Verify that coordinates are into the range for latitude (-90°,90°) and longitude (-180°,180°).
6. Separate points on land and at sea.
7. Delete points / species outside a given distribution. Using this function, it is possible to delete widespread species or delete distributional outliers.

8. Eliminate specific records.
9. Separate species with a minimum number of occurrences, and calculate for each species some general descriptors (mean propinquity (Rapoport, 1975), extreme distances, etc.).

Additionally, there are functions for processes as assign altitude to a coordinate from the database included in the package or from the Google Maps Elevation API (developers.google.com/maps/documentation/elevation), and given a country name, assign its centroid, ISO 3166 alpha-2 or alpha-3 code (ISO, 2015) or vice-versa.

Our package can work using R version 3.2.1 or higher on all three major operating system: Linux (tested on Ubuntu v14.04 and 15.10), Mac Os X (v 10.9 or superior) or Windows (8.0/8.1).

The package depends on the R libraries: `rgbif` (Chamberlain et al., 2015a), `RJSONIO` (Temple Lang, 2015), `RCurl` (Temple Lang & the CRAN team, 2015), `maptools` (Bivand & Lewin-Koh, 2015), `plyr` (Wickham, 2015), `vegan` (Oksanen et al., 2015), and `modeest` (Poncet, 2015) for its operation.

geocleaMT depends heavily on the available memory in the computer. For a standard 8GB RAM, a dataset of one hundred thousand records can be handled easily using the `'readDbR'` function. Larger datasets could be manipulated with the `'readDbBash'` function, that allows huge datasets (1×10^7). `'readDbBash'` can only be used on Linux or Mac OS because this function depends on the Unix system program `'cut'` from the command language interpreter Bash (Chet, 1994) (this is not the function `'cut'` in R). In Windows OS the user could use it, if a Bash emulator is installed.

These processes were tested without any problem, using a dataset of about 10 millions occurrences, and an Intel Core i7, 3.33 GHz / 16 GB of RAM computer, running Ubuntu 14.04/15.10.

All information about issues, installation and bug reports can be accessed from the GitHub platform (github.com/alarconvv/geocleaMT) or ***geocleaMT*** Google group (groups.google.com/forum/\#!forum/geocleamt). Additionally, a complete example describing the options could be found in github platform or along with the package. To download the latest build of the package, in your R session, you must have installed devtools and use these command lines:

```
library("devtools")
```

```
install_github("alarconvv/geocleaMT", dependencies=TRUE)
```

2.3 Following the protocol

To test the protocol we proposed as our main objective to obtain the distributions of mammalian species restricted to the biogeographic Choco (*sensu*: Hernández-Camacho et al., 1992) to perform a further biogeographic analysis.

Using records from GBIF only, we faced two challenges, select species restricted to a specific area and elevation, and clean all occurrences for each species. To fulfill these two tasks, we designed two pipelines.

2.3.1 Species selection: Pipeline 1

Given a reference polygon which represented the biogeographic Choco (*sensu*: Hernández-Camacho et al., 1992) (Supplementary material Appendix 1: Fig. 1), we downloaded all occurrences for mammalian species registered in GBIF for this area. We obtained a table in Darwin Core format (Wieczorek et al., 2012), with records from 620 species assigned to 239 genera and 64 families (Supplementary material Appendix 2: Table 1). We read this table using *'readDbBash'* function because it outperforms the *'readDbR'* function in reading time (approx. four times faster).

Our own elevation database for part of the North-Andes Block (Bowin, 1976; Freymuller et al., 1993; Pennington, 1981) was read using the command *'data(elevations)'* (Supplementary material Appendix 1: Fig. 1). This database has a precision of 0.1 decimal degrees and consists of a table with three columns (decimalLatitude / decimalLongitude / elevation) loaded as a data.frame object. We used it in the *'assignElevation'* function to assign the altitude to each geographical coordinate.

To obtain species distributed only in the lowlands (0-1000 m.a.s.l.) we used the *'cutRange'* function (Fig. 5B), and to eliminate invasive species reported by the Invasive Species Specialist Group (ISSG) (Lowe et al., 2000) and the Island Biodiversity and Invasive Species (IBIS) (Kells & Worswick, 1997) we used the *'invasiveSp'* function (Fig. 5C).

As a result of these processes, we obtained a list of 543 mammalian species non invasive that are distributed on the biogeographic Choco, from 0 to 1000 m.a.s.l., excluding invasive species.

2.3.2 Download and Clean the Data: Pipeline 2

Using the list of species obtained above (543 species), we downloaded the complete distribution for each species from GBIF using the *'gbifDownSp'* function. *'gbifDownSp'* is limited to the process done

for `'occ_search'` function from `rgbif` package to download occurrences. However, our function saves these occurrences in such a way that they might be used by *geocleaMT* and can follow the workflow that we propose in this paper.

We used the `'readAndWrite'` function into each function of the workflow to save a file for each species (in RDS format by default to optimize disk space, but the user can choose text format). This function can be used as a separate process to read or write the results of any function in *geocleaMT* (i.e. to change between formats). This is the easiest way to delete or include a given species in the pipeline, as the user needs only to delete/include a file from the folder designed to read species information. We downloaded 1195435 occurrences of the 543 species of the initial list. Species included in 215 genera assigned to 57 families (Fig. 5D).

We separated records with and without georeferenced occurrences and only 23.87% of the cases had an assigned geocode (Fig. 5E; Fig. 6A). For the geocoded occurrences, we checked the coordinates format using the `'checkCoord'` function and none were corrected or deleted.

Continental species can have occurrences at the sea and this mistake can be present for many reasons, like a change in the sign of a coordinate. To resolve this, we used the `'pointsAtSea'` function which allows to separate occurrences on the land from the coordinates at sea. In this step we kept 14.80% of occurrences and the same species of the initial list (Fig. 5F; Fig. 6A).

At this level we had corrected the most common errors, but some problems, like widespread species or separating African species out with mistaken occurrences in South America (or vice-versa), still remained and had not been resolved yet.

The `'spOutPoly'` function could apply a series of rules that allow us to detect and/or delete widespread species and mis-allocated geocodes. This function requires a spatial polygon of the `SpatialPolygon-DataFrame` class or a polygon in Shapefile format that can be read by the `'readShapePoly'` function from the `maptools` package (Bivand & Lewin-Koh, 2015). This spatial polygon is an area where the species should have their restricted distribution.

There are two important parameters (`max.perc.out` and `max.occ.out`) in the `'spOutPoly'` function. The first parameter is the maximum percentage of records that a species could have outside of the reference area, while the second one is the absolute maximum number of occurrences that the species could have outside of this area. Given these parameters, some conditions are applied to categorize each species as narrowly or widely spread (Table 3).

These categories are assigned given three descriptors (Table 2). The descriptors depend on how the

range of distribution of the species is, in respect to a reference area. In the case of the second descriptor, three conditions could be applied to categorized species. Each condition is similar to the other conditions, only are different whether we delete or not occurrences or species.

For example, given the reference polygon (i.e. the biogeographic Choco) the first descriptor (A) (Table 2) is fulfilled when a species does not have occurrences outside of the reference polygon and the action to execute is to maintain the species and continue the process. However if the species have records in and outside of the reference area, the second descriptor (B) is fulfilled and the conditions 1 and 2 will be applied (Table 2).

Each condition is divided into two decisions that depend on deleting (B1T/B2T) or not (B1F/B2F) the occurrences outside the reference polygon.

If we have a species with 50 occurrences and 2 of them are outside the reference polygon, and we use the values $\text{max.perc.out} = 5$ and $\text{max.occ.out} = 3$, the species will be assigned to the first condition (B1) because 2 occurrences out is less than 5% of 50 ones and less than 3, the maximum absolute number of occurrences outside. If we select the condition called 'B1T' these 2 records are deleted, while if we use the 'B1F' condition the occurrences are not deleted.

But, if we have a species with 10 occurrences and 2 of them are outside the reference polygon, given that it has so few occurrences and the 2 occurrences outside represents 20% of total, it will be assigned to the second condition (B2). It will be eliminated if we use the command 'B2T' or not if we use 'B2F'. In these two conditions (B1, B2) species are not eliminated, only occurrences are deleted, the species will continue the process on the pipeline.

On the other hand, if we keep the same values for the parameters ($\text{max.perc.out} = 5, \text{max.occ.out} = 3$), and there is a species with 30 records but 20 of them are outside, this species is assigned to the third condition (B3). Because more than 5% of total occurrences were outside the reference area (max.perc.out) and this 5% represented more than 3 occurrences (max.occ.out), the action will be to remove the species from the process because it is a widely distributed species or, for example, it is an African species with some mistaken points in South America. Finally, when the species does not have points on the reference polygon it is assigned to third descriptor (C) (Table 2), and therefore deleted from the process.

We performed this filter with the most restrictive approach to get those species distributed only on the American continent. To this analysis the maximum percentage of records outside of the area could not be larger than 10% ($\text{max.perc.out} = 10$), but this 10% can not represent 3 or fewer occurrences outside

the area ($\text{max.occ.out} = 3$). We used the ‘B1T’ and B2T’ conditions and kept 9.51% of occurrences, 93% of species on America from the initial download (Fig. 5G; Fig. 6B).

Then, we used a relaxed approach to obtain the species with **most** of their distributions on the biogeographic Choco (Fig. 5H; Fig. 6B) using a 50% value to the maximum percentage of records outside ($\text{max.perc.out} = 50$) and 10 to maximum number of records outside ($\text{max.occ.out} = 10$) and we applied the ‘B1T’ and ‘B2F’ conditions. We kept 0.29% of the occurrences and 29.47% of species, this meant that 152 species recorded in GBIF are restricted in most of their distribution on the biogeographic Choco, but their complete and real distributions are restricted to Meso-America and South America (Fig. 5I; Fig. 6B).

The great change in species percentage (from 93% to 29.47%) could be considered an abrupt fallen, but this phenomenon occurs because the area of reference is small; however, these species are the most informative for any biogeographic analysis on the biogeographic Choco.

Given that we used the relaxed ‘B2F’ condition and some points are outside of the polygon, still we could have some mis-allocated points. Therefore, we used the ‘*delPointOrSp*’ function to explore areas that should not have occurrences, for example the species *Artibeus lituratus* with neotropical distribution still kept a mistaken occurrence in Alaska or *Saguinus oedipus* has part of its distribution, occurrences on Santa Barbara and San Francisco, California, United States.

This process is semi-automatic because ‘*delPointOrSp*’ search for anomalous occurrences (Fig. 6C) and asks the user whether delete the occurrence or delete the species from analysis, or keep the species and its distribution. Very few species or occurrences were eliminated in this process, however it served to refine the distribution of species (Fig. 5I; Fig. 6C).

Finally, the ‘*usefulSp*’ function separates species with a minimal number of occurrences. In this case, we consider a useful species with more than 3 occurrences, because it is the minimal number of points to make a polygon. We got as the final result 142 species with 3402 occurrences, only 0.28% of initial data that was downloaded using the *gbifDownSp* (Fig. 5J; Fig. 6D). These species are individual files that we joined using the ‘*stackSp*’ function. This dataset is ready to be used in any biogeographic analysis.

We also calculated the mean propinquity for the general distribution of Mammalia and by species using the ‘*meanPropinquity*’ function. This is a good parameter to evaluate the distribution of the occurrences. For Mammalia in general the distribution has a mean propinquity of 0.1469 degrees, a median propinquity of 0.0489 degrees and a standard deviation of 0.4536 degrees; indicating that the

points are not separated from each other or there are not extreme points that might be an evident mistake, such as we expected given the size of the area used (Fig. 5K; Fig. 6D).

We obtain a output file in plain format like the initial file downloaded from GBIF, this file have the species with distribution restricted to the biogeographic Choco or with most of their distribution on this area, the final occurrences will be the most informative and with the least possible noise.

Chapter 3

What is the Biogeographic Choco?

3.1 Introduction

3.1.1 The Biogeographic Choco

When we talk about the biogeographic Choco, we think on the land bridge between the northwestern of South America and the southwestern of Central America. A neotropical area that has been cataloged as a "hotspot" for being one of the richest places on the world (Myers et al., 2000). But this richness can be better understood when we analyze its geological history and its involvement on the most important biotic event on the American continent, 'The Great American Biotic Interchange or GABI' (Leigh et al., 2014; Marshall et al., 1979; Simpson, 1950; Woodburne, 2010).

Generally, the Choco has been considered as the western coastal strip that runs from the southern of Central America to Ecuador. This area has been considered as an independent biogeographic area for its apparent isolation, however, it is where the biota from Central America, South America and some Andean elements have converged during a lot of time (Gentry, 1989; Haffer, 1967; Hernández-Camacho et al., 1992; Leigh et al., 2014).

There has been different definitions for Choco, such early as von Humboldt (1824) who considered it as a biogeographic area, until the most recent work by Noguera-Urbano & Escalante (2014) who considered it as a transition area; passing for a plethora of definitions (Chapman, 1918; Savage, 1966; Haffer, 1967; Cabrera & Willink, 1973; Muller, 1973; Udvardy, 1975; Cracraft, 1985; Dinerstein et al., 1995; Morrone, 1999; Myers et al., 2000; Morrone, 2001; Abell et al., 2008; BirdLife International, 2012; Morrone, 2014).

Most of the definitions have been based on analysis of distributional pattern for a specific taxonomic group, as Aves (Cracraft, 1985, 1988; Haffer, 1967). By contrast, using several groups to perform the analysis to define historic units has been less used, although this practice is the best way to conduct such analyses (Parenti & Ebach, 2009). Two taxonomic groups can be affected simultaneously for the same historic, climatic and/or ecological factor(s) and the influence of them can be reflected on the distribution of the species, showing a pattern/congruent distribution on a particular area (Planick, 1991; Rosen, 1988; Szumik et al., 2002).

3.1.2 Methods to find the biogeographic patterns

There are two basic concepts to describe the biogeographic patterns, the first one is generalized tracks as the superposition of two or more congruent individual tracks (the minimal spanning tree of occurrences of the species distribution) (Croizat, 1958) and the second one is areas of endemism, a geographic polygon of the distributional congruence of two or more species (Linder, 2001; Planick, 1991).

Various methods have been developed to search these biogeographic units, from simple methods as manual generalized tracks by overlapping of individual tracks (Croizat, 1958), to numerical methods implemented in software as track compatibility (Craw, 1988), Trazos 2004 (Rojas-Parra, 2007), Parsimony Analysis of Endemism (PAE-PCE) (Morrone, 1994; Rosen, 1988), Martitracks (Echeverría-Londoño & Miranda-Esquivel, 2011) among others (see: Fernández-Badillo et al. (2014)).

In order to define areas of endemism there are numerical methods as Nested Clade Area Analysis (NAEA) (Deo & DeSalle, 2006), Cladistic Analysis of Distributions and Endemism (CADE) (Porzecanski & Cracraft, 2005), Parsimony Analysis of Endemism (PAE) (Morrone, 1994; Rosen, 1988), Network Analysis Method (NAM) (Dos Santos et al., 2008), eNDeMism (NDM) (Szumik et al., 2002) / Visual of eNDeMism (VNDM) (Szumik & Goloboff, 2004) and Kernel Interpolation (Oliveira et al., 2015).

Despite of the methods to obtain areas of endemism, there are few analyses that evaluate the Choco as an area of endemism. The first studies identified biogeographic areas into the neotropical area or/and in South America using the manual overlapping of species distribution (Cabrera & Willink, 1973; Chapman, 1918; Cracraft, 1985; Haffer, 1967; Savage, 1966), while most of the numerical analyses have been made using PAE or NDM/VNDM for areas of endemism, and PAE for generalized tracks (do Prado et al., 2014; Echeverry & Morrone, 2013; Ferretti et al., 2014; Sandoval & Barquez, 2013).

Besides, few of these studies have used more than 500 species and/or more than 1000 records (Aagesen et al., 2009; Aagesen & Szumik, 2013; Noguera-Urbano & Escalante, 2014) and only two of them have used higher taxonomic levels as classes (Szumik et al., 2012; Szumik & Goloboff, 2015).

Taking advantage of the high level of information available on biodiversity databases, we evaluated the biogeographic patterns for the Biogeographic Choco region, using the available information at the Global Biodiversity Information Facility (GBIF) (Telenius, 2011) for this area. We also compared the congruence of this analysis with previous definitions (Abell et al., 2008; Hernández-Camacho et al., 1992; Morrone, 2014).

3.2 Methods

3.2.1 Study area

We grouped all definitions for the Biogeographic Choco given the similarity between the limits that each author has established. We obtained three groups that differ in the North and South limits but have in common the highlands of the Andes as the East limit, the Ocean Pacific as the West one and 1000 m.a.s.l. as the altitudinal one (Fig. 7). We described these groups as:

The first (Fig. 7A) is a area from the Darien Mountains on the Colombia-Panama border, to Esmeraldas province in the southern of Ecuador, and possibly until the Manabi province (*sensu*: Cabrera & Willink, 1973; Chapman, 1918; Cracraft, 1985; Dinerstein et al., 1995; Morrone, 1999, 2001, 2014; Muller, 1973; Myers et al., 2000; Noguera-Urbano & Escalante, 2014; Savage, 1966).

The second one (Fig. 7B) is an area that covers from northern from the Darien Mountains on the Colombia-Panama border, to Oro province in Ecuador, including the Inter-Andean valleys and some extensions of biotic elements until the Pacific Coast in Costa Rica. (*sensu*: Hernández-Camacho et al., 1992; Udvardy, 1975) .

The last one (Fig. 7C) is from San Blas in Panama mountains to Tumbes in Peru passing for the Pacific slope (*sensu*: Abell et al., 2008; BirdLife International, 2012).

Thus, we have considered the Biogeographic Choco as the set of three areas previously described (Fig 1d: hypothetical area). We evaluated and compared the patterns found against this hypothetical area and against each ones of the three groups of areas.

3.2.2 Data

We downloaded from GBIF (Telenius, 2011), all the available occurrences for each species with at least one record to the Choco (Fig. 7D). If a species was on Choco but it was on Amazonian too, the complete distribution to this species was downloaded and was not cut off.

geocleaMT protocol (R-Alarcon & Miranda-Esquivel, Submitted) requires some parameters to perform the processes of cleaning. For that, we defined a widespread species as a species whose distribution has less than 10% ($\text{max.per.out}= 10$) from the total occurrences outside of the American continent and this 10% is not more than 3 occurrences ($\text{max.occ.out}= 3$). If the 10% is less than 3 occurrences, these records will be deleted from the distribution of the species ($\text{B1}=\text{B2}=\text{TRUE}$). To get the species restricted to the reference polygon (Fig. 7D), we used the parameters $\text{max.per.out}= 50$, $\text{max.occ.out}= 10$, without deleting the points outside the reference polygon (Fig 1d) ($\text{B1}=\text{B2}=\text{FALSE}$). We kept only species with at least 3 occurrences.

We sampled species of the taxonomic classes that were well represented in GBIF (Telenius, 2011; GBIF, 2015), Mammalia, Reptilia, Aves, Amphibia, Magnoliopsida, and Liliopsida.

We made nine partitions: six partitions were the taxonomic classes, one was the set of animals (Mammalia + Reptilia + Aves + amphibia), it was assigned as the ‘Zoo’ partition, another was the set of plants (Magnoliopsida + Liliopsida), it was named the ‘Phyta’ partition. The last partition was the set of the whole taxonomic classes, that was called ‘TE’ by Total Evidence. The taxonomic update was made following the Catalogue of life (Roskov et al., 2015) using the R package Taxize (Chamberlain et al., 2015b).

3.2.3 Areas of endemism

We used the optimality criterion for areas of endemism, implemented in the software program NDM (Szumik et al., 2002) and the results were visualized using the software program VNDM (Szumik & Goloboff, 2004).

As the number and composition of species for each area is sensitive to changes of the grid size (Aagesen et al., 2009; do Prado et al., 2014; Szumik et al., 2012), we followed the suggestions presented by (Aagesen et al., 2009; Szumik et al., 2012), and performed the analysis with four grid sizes that reflect the mean propinquity of the data, its standard deviation, and the size of the study area.

The highest mean propinquity was 0.492° (Mammalia partition) and the standard deviation was 0.22° , therefore our first value for grid size was $0.5^\circ \times 0.5^\circ$ and the second is $0.75^\circ \times 0.75^\circ$ (mean $\approx 0.5^\circ +$

sd $\approx 0.25^\circ$).

The third and fourth values corresponded to the size of the study area at the widest part of the Pacific strip excluding the western mountain range ($1.0^\circ \times 1.0^\circ$) and including one ($1.25^\circ \times 1.25^\circ$). We performed the analysis for each partition and each grid size.

We used an heuristic search, keeping the same origin point ($46^\circ, -120^\circ$), swapping one cell at a time, saving sets within 0.99 of the current score, set with a score above 4.00 and 2 or more endemic species. Some parameters were dependent on the partition. For the classes partitions, we saved areas with a score greater than 4.00, for the 'Zoo' and 'Phyta' ones it was greater than 8.00, and for 'TE' was greater than 16.00. We used 40 %, 60% and 80% as the comparison percentage between areas respectively. The minimum score for a species to be considered as endemic was 0.4 for each partition.

We used 20 replicates to perform the search and '9999' as the random seed to guarantee the reproducibility of the analysis.

As a similarity metric to compare two analyses, we calculated the number of shared cells scaled by the total number of unique cells for each partition. We used this metric to compare between the partitions for each size.

Finally, we kept areas/patterns that appear at least in six of the nine partitions and were not sensitive to changes on the grid size. The areas that could not fulfill the conditions were considered as computational artifacts (Aagesen et al., 2009).

3.2.4 Generalized tracks

We analyzed the similarity of the distribution using individual and generalized tracks (Croizat, 1958). We used the geometrical approach implemented in the Martitracks program (Echeverría-Londoño & Miranda-Esquivel, 2011) with parameters as $cv = 0.25$, $lmax = 0.25$, $lmin = 0.5$, $maxline = 0.75$ y $ci = 0.8$. We employed the "juan1" parameter as the strategy to search, it allows obtain the raw similarity between individual tracks following the approach implemented by Morrone (1994) to get generalized tracks.

Given that the endemism area analysis and track analysis are based on the same concept (García-Marorejo et al., 2008), for the similarity value we used the same value of congruence value used in the NDM analysis (80%) for the 'TE' partition.

3.3 Results and Discussion

We recovered 3935 species and 421125 occurrences, approximately 50 % of species and 21 % of occurrences from the initial data, downloaded from GBIF (Telenius, 2011). Notwithstanding the low amount of data recovered from the biodatabase after the process of cleaning data, our final data was successful to build the regional patterns of the Choco (Table 4).

We analyzed 7619 unique areas of endemism for the total of partitions and the grid sizes. The lowest number of unique area of endemism were obtained with $0.5^\circ \times 0.5^\circ$ (677), it was about of 9% from total areas. Around of 25 % were obtained with the $1.25^\circ \times 1.25^\circ$ size (1902), which was the highest amount of areas found (Supplementary material Appendix 2: Table 2).

We found the same behavior for grid sizes and the class partitions, where the number of unique areas was proportional to the number of endemic species by partition ($R^2:0.999$) and by grid size ($R^2:0.989$). This happens because more initial species involve produce more possible combinations, add if the grid size increase too, it could take more area and more species could be included as endemic ones (Aagesen et al., 2009; do Prado et al., 2014; Szumik et al., 2012).

In the other hand, the Mammalia partition was the unique one that did not show any pattern, following on Reptilia that only presented ten areas of endemism. This was different from Noguera-Urbano & Escalante (2014) who used the Mammalia class to define areas of endemism on the Neotropical area, finding some patterns in the Magdalena valley, Panama and Ecuador. However they had a sample equidistant and uniform different from us (Table 4). Although with the mammalian species we did not recover congruent patterns, somemammalian species were part of the patterns obtained by the ‘Zoo’ and ‘TE’ partitions.

In general, the analysis was not sensitive to changes on grid size and/or the values of the parameter used to each partition (See: Methods section). The levels of similarity for the patterns recovered were between 10% and 100%, being more similar among large partitions than among small ones versus large ones. For example ‘TE’ *versus* Magnoliopsida or ‘Phyta’ *versus* Reptilia (Supplementary material Appendix 2: Table 3). However, there were patterns that were consistent for most partitions, agreeing with the results of Szumik et al. (2012) and Navarro et al. (2009), where different taxonomic classes could present similar patterns, independently whether have been affected by historic or ecologic factors. Thus, five general patterns were found (Fig. 8A-F) and were congruent between both methods used. We named them as: Costa Rica-Panama (Fig. 8A: CP), Panama-Magdalena (Fig. 8B: PM), Panama-Choco (Fig. 8C: PC), North of the Central and Western Cordilleras-Interandean Valleys (Fig. 8D:

CI), High Atrato-San Juan-Baudo-West Cordillera (Fig. 8E: AW) and West of Ecuador (Fig.8F: WE). Each area was supported by more than two species following the area of endemism concept proposed by Planick (1991), even the area that with less number of specie with restricted distribution to it was North of the Central and Western Cordilleras-Interandean Valleys with 55 species restricted to it (Supplementary material Appendix 2: Table 4).

For areas of endemism, the endemism index (EI) varied between 6.00 and 140.00, being WE, PC and CP the areas with the highest index values (40.00-60.00, 50.00-70.00 and 90.00-140.00 respectively), and AW with the lowest reported (6.000- 20.000). It was similar to Aguado-Bautista & Escalante (2015), where most EI were related to the number of species or the density of occurrences and not to the size of the area(Supplementary material Appendix 1: Fig. 2).

For tracks analysis, we found 31 generalized tracks. We grouped them into eight sets of which five corresponded with areas of endemism. The overlapping of each pattern/set showed transition areas where by a expansion processes. Two biotas of different biogeographic units are convergent(Morrone, 1994; Noguera-Urbano & Escalante, 2014)

We recognized two transitions, the first one was congruent with the Sinu-San Jorge and Nechi districts proposed by Hernández-Camacho et al. (1992). They took about a mix between the biota of Magdalena valley, Cauca valley, Choco and Panama. Possibly, the geographic features of this zone provided different environments, where during a long time the species were moved between depressions of the cordillera (Gentry, 1989; Haffer, 1967; Musilivá et al., 2015).

The second one is on Panama, it have been recognized as three different areas by Morrone (2014): South of Guatuso-Talamanca province, South of Puntarenas-Chiriqui province and North of Choco-Darien province. Although, this area will be the best model for a transition zone because it has been a important center of interchange of biota for more than 15 Ma (Bacon et al., 2015; Marshall et al., 1979; Montes et al., 2012; Leigh et al., 2014; Woodburne, 2010).

Other patterns were shared in low proportion between both methods (Fig. 8G), it was the case for two patterns/sets found with tracks. One defined the Central Cordillera with some extensions to the Interandean valleys and was found twice with areas of endemism (Magnoliopsida/0.5°, Aves/0.75°). The second one were tracks from Tumbes-Peru passing on Huancabamba depression to western flank of Andes, it was found one time with areas of endemism (Magnoliopsida/0.75°).

In the same way, the zone between Buenaventura-Colombia and Esmeraldas-Ecuador was not recognized in tracks analysis but appeared twice with areas of endemism (Phyta/0.75° and Magnoliopsida/0.75°).

Although this area had not equivalent in our analysis of generalized tracks, this was equivalent to one of the generalized tracks found for the genus *Piper* in the proposed regionalization by Quijano-Abril et al. (2006), it was defined as the track of connection of Andes North and Neotropical area.

Although, the last sets of tracks were not congruent with areas of endemism, we named them because these could be reflecting two events of dispersion, a historic pattern that runs over the Central Cordillera of the Block North of Andes (Benham et al., 2014; Bonaccorso & Guayasamin, 2013) and another one where the Humcabamba depression could be a connection between both flanks of the Central Andes from Peru (Musilivá et al., 2015).

Finally, Our patterns did not correspond to the total extension of neither areas previously defined as Choco (Fig. 7), including the patterns non-shared between methods. These areas only shared with other definitions some regions of its total length, being the most similar the districts defined by Hernández-Camacho et al. (1992), the provinces by Morrone (1994) and the areas of endemism by Noguera-Urbano & Escalante (2014) and by (Quijano-Abril et al., 2006)(Table 5).

Given that the definition for the Biogeographic Choco had been framed on the Pacific slope, only two patterns were on this area. The High Atrato-San Juan-Baudo-West Cordillera and connection of Andes North and Neotropical area could be the areas that take part of the Biogeographic Choco. This statement is supported by Hernández-Camacho et al. (1992), who considered that between the Carmen del Darien and the Esmeraldas Province, could be established two areas whose separation are defined by the delta of the San Juan river. Possibly the explanation is given by the geological formation of both terrains. as the delta of San Juan river to the North corresponds to the Panama-Choco arc, which is formed and strikes with the American South plate between the late Oligocene and the late Miocene (Montes et al., 2012). Furthermore, toward the South of the delta of San Juan river, this one corresponds to the JuanTumaco basin and its adjacent arches, which were formed between the late Cretaceous and the late Miocene (Suarez-Rodriguez, 2007).

Although, during the Pleistocene the Pacific slope had been a continuous corridor from Panama to Ecuador Haffer (1967), our areas could be reflected the style and differential settings of the geological formation for both sectors (See: Suarez-Rodriguez, 2007).

3.4 Conclusions

The andean orogenesis has been considered as the vicariant event that has structured the distribution patterns in the Block North of Andes, however our patterns show there are regions on the Andes where

the different biotas have been converged. Possibly, it is due to the northern part of the Central and West Cordillera having low altitudes and great amount of depressions that may have had continuous forests that could function as corridors of dispersion.

If we refer to the Pacific slope as the Biogeografic Choco, then it could be two historic units that are separated by the delta of San Juan river, and not a unique area as had been defined so far. The remaining areas that were found in this research are independient biogeographic units that do not correspond in its total extention with neither regionalization. This suggest that it is important for future works to rethink the neotropical regionalization using different taxonomic groups and employing the numerical methods.

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FIGURE. 1. Certificate of attendance to ‘The third Meeting of the Network for Neotropical Biogeography’, 2014.

Figure 1



**Third Meeting of the
Network for Neotropical Biogeography**
Universidad de los Andes, Bogotá, Colombia
January 7–10, 2014

Certificate of attendance

This is to certify that

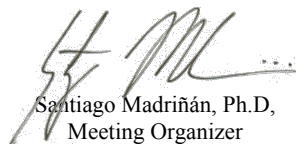
Leidy Viviana Romero Alarcón

presented a poster entitled

¿Es Chocó un área Biogeográfica?: Una visión desde áreas de endemismo bajo el criterio de óptimabilidad.

coauthored by

Daniel R. Miranda-Esquivel



Santiago Madriñán, Ph.D,
Meeting Organizer

FIGURE. 2. Certificate of attendance to 'X Congreso Latinoamericano de Herpetología', 2014.

Figure 2



X Congreso Latinoamericano de Herpetología

Certifica que el trabajo titulado

HIPÓTESIS PRIMARIA DE HOMOLOGÍA DEL CHOCÓ BIOGEOGRÁFICO: UNA APROXIMACIÓN DESDE ANFIBIOS.

Por

Romero Alarcon, Leidy Viviana - Universidad Industrial de Santander - alarconvv@gmail.com
Miranda Ezquivel, Daniel Rafael - Universidad Industrial de Santander - dmiranda@uis.edu.co*

fue presentado en

H3 - Simposio Latinoamericano de Sistemática y Biogeografía de Anfibios y Reptiles

Evento realizado en la ciudad de Cartagena D.T, Colombia del 1 al 5 de diciembre de 2014
www.aczcolombia.org - info@aczcolombia.org



La biodiversidad sensible, un patrimonio natural irremplazable.

FIGURE. 3. Award for the best video-presentation presented at ‘X Congreso Latinoamericano de Herpetología In: IV Congreso Colombiano de Zoología’, 2014.

Figure 3



**PREMIO A MEJOR VIDEO-PRESENTACIÓN
PRIMER PUESTO**

Otorgado a:

Leidy Viviana Romero Alarcón, y Daniel Rafael Miranda Esquivel

**HIPÓTESIS PRIMARIA DE HOMOLOGÍA DEL CHOCÓ
BIOGEOGRÁFICO: UNA APROXIMACIÓN DESDE ANFIBIOS.**

Entregado en la Ciudad de Cartagena, el día 5 de Diciembre de 2014


JOSE VICENTE RODRIGUEZ M.
Presidente Asociación Colombiana de Zoología




GUSTAVO KATTAN KATTAN
Vicepresidente Asociación Colombiana de Zoología

FIGURE. 4. Certificate of attendance to ‘The fourth Meeting of the Network for Neotropical Biogeography’, 2015.

Figure 4



Smithsonian Tropical Research Institute
Instituto Smithsonian de Investigaciones Tropicales

Panamá, Octubre 23 de 2015

A QUIEN PUEDA INTERESAR

El comité organizador de la **4^{ta} Reunión de la Red de Biogeografía Neotropical (NNB4**, por sus siglas en inglés), certifica la participación de Leidy Viviana Romero Alarcon, como expositora del poster titulado “GeoCAMT: CLeaning geOgraphical dAta using MulTIple approaches, Una herramienta de limpieza sistematizada” autores Leidy Viviana Romero Alarcon y Daniel Rafael Miranda-Esquivel. La reunión se llevó a cabo del 14 al 17 de Enero de 2015 y fue organizada por el Instituto Smithsonian de Investigaciones Tropicales, Ciudad de Panamá, Panamá.

Si necesitan más información al respecto, no duden en comunicarse conmigo.

Cordialmente,

Carlos Jaramillo
Staff Scientist
jaramilloc@si.edu
ph 507 2128089
fax 507 2128154

SMITHSONIAN INSTITUTION
Apartado 2072
Balboa Ancón, República de Panamá
OR
Unit 0948
APO AA 34002-0948
507. 212.8000 Telephone
507. 212-8148 Fax

FIGURE 5. **Protocol proposed to clean geographical data.** Green dashed line: input/output files, light grey line: Pathway of process described as Pipeline 1, dark grey line: Pathway of process described as Pipeline 2. A-C: Percentage of data kept through the Pipeline 1 process, D-J: Percentage of data kept through the Pipeline 2 process, K: Density plot of distances among occurrences for Mammals in general with some descriptors as mean propinquity, median and mode.

Figure 5

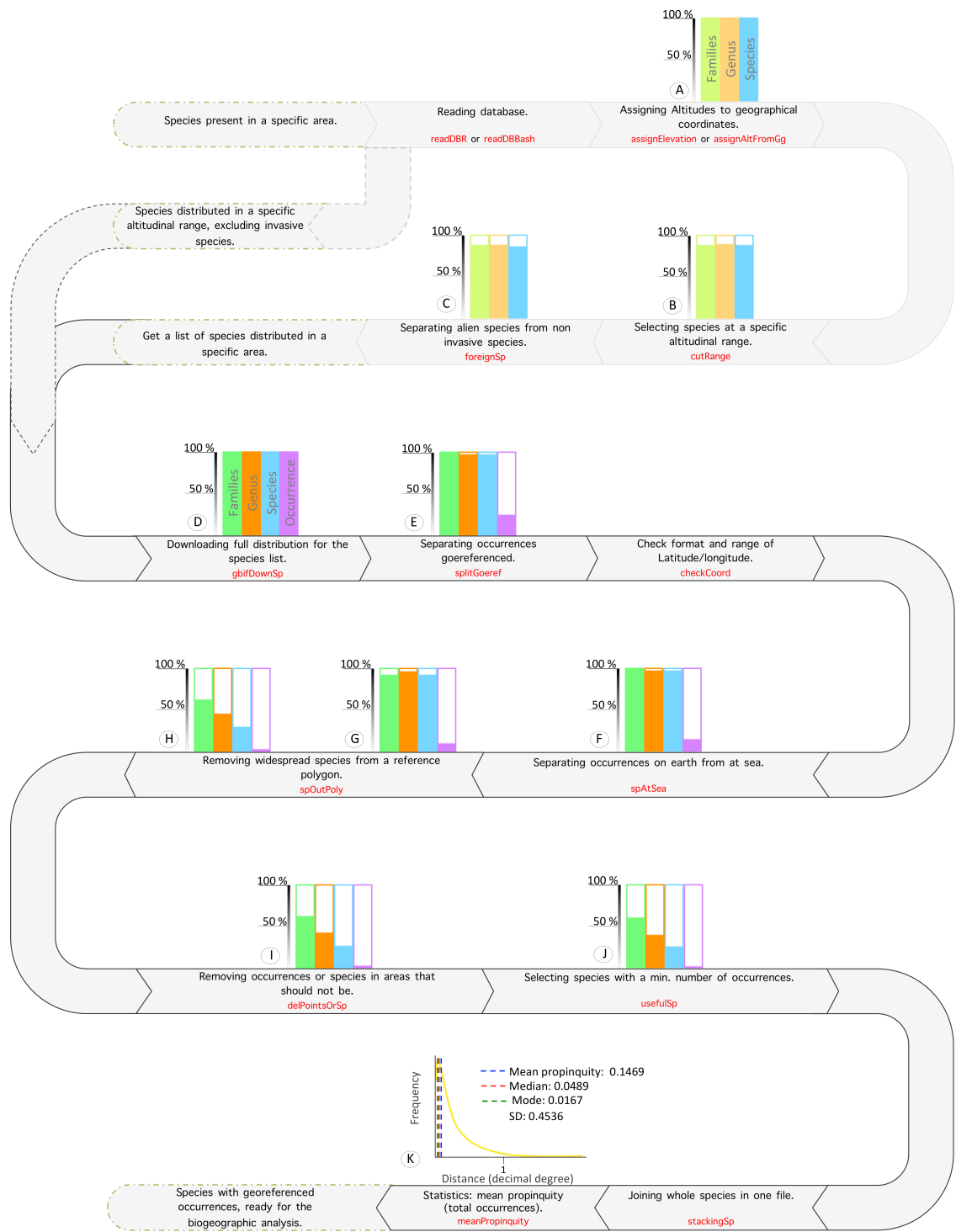


FIGURE. 6. Map of data through the pipelines for data analyses. Red: occurrences deleted, Black: occurrences maintained in each step on Pipelines. A: Total occurrences reported from GBIF for mammalian species distributed on the biogeographic Choco, black: records on earth, red: records at sea. B: Total occurrences for mammalian species with American distribution, black: occurrences of species with Chocoan distribution, red: occurrences of species widespread on the American continent. C: Distribution reported as native to Chocoan species, black: occurrences of species in their possible 'native' distribution, red: occurrences do not correspond the possible 'native' distribution of their species. D: Final occurrences after all filters, black: distribution of final species, ready for a biogeographic analysis, red: species do not have the minimal number of occurrences to continue the process.

Figure 6A

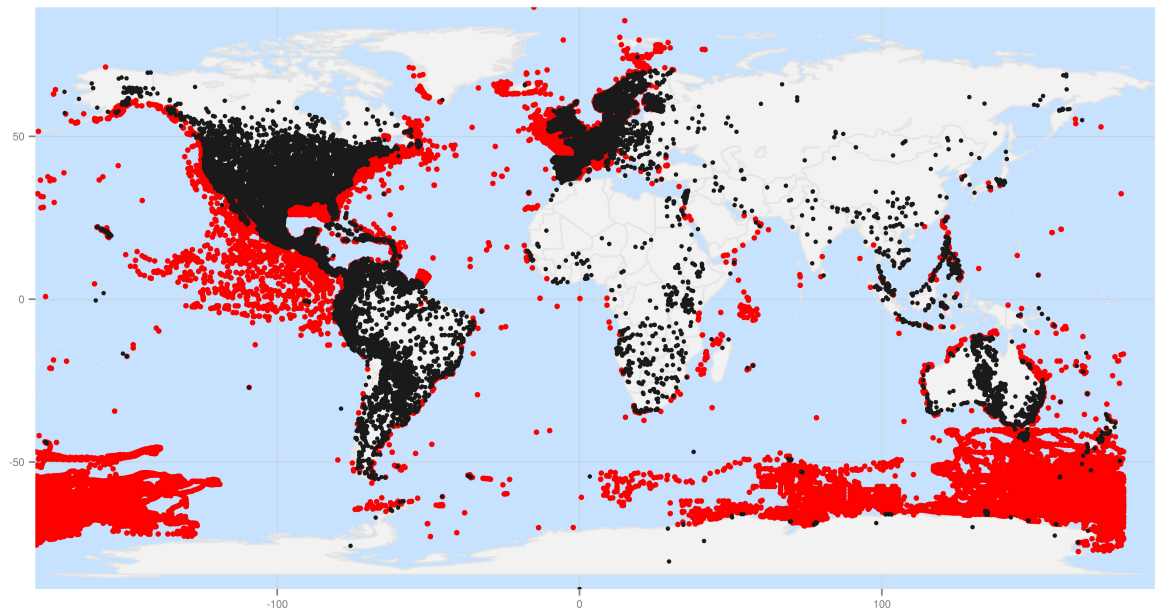


Figure 6B

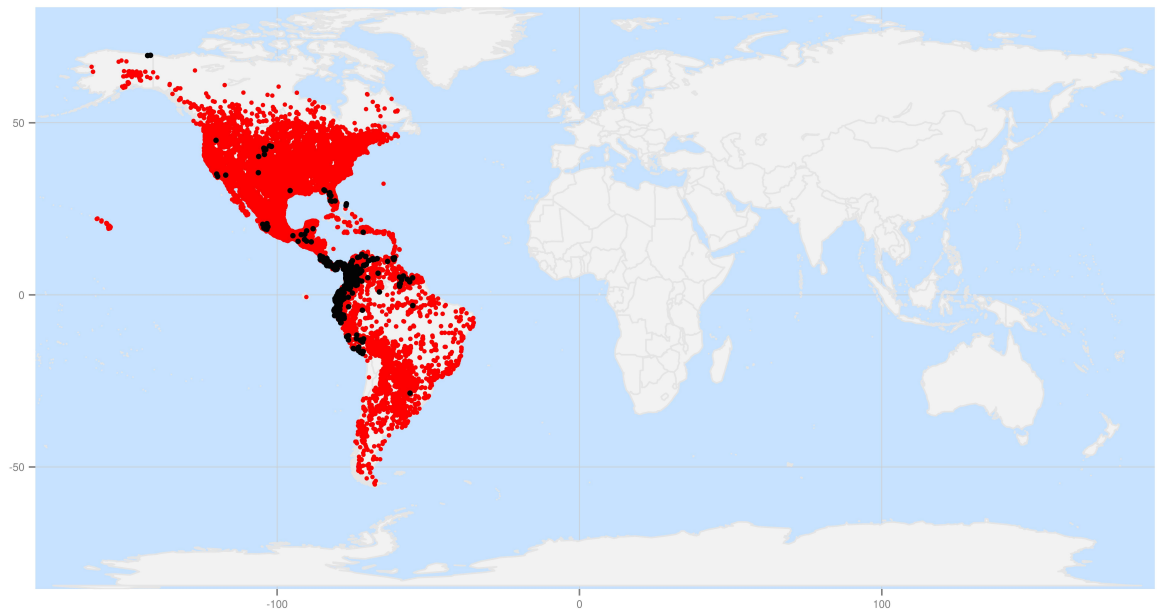


Figure 6C

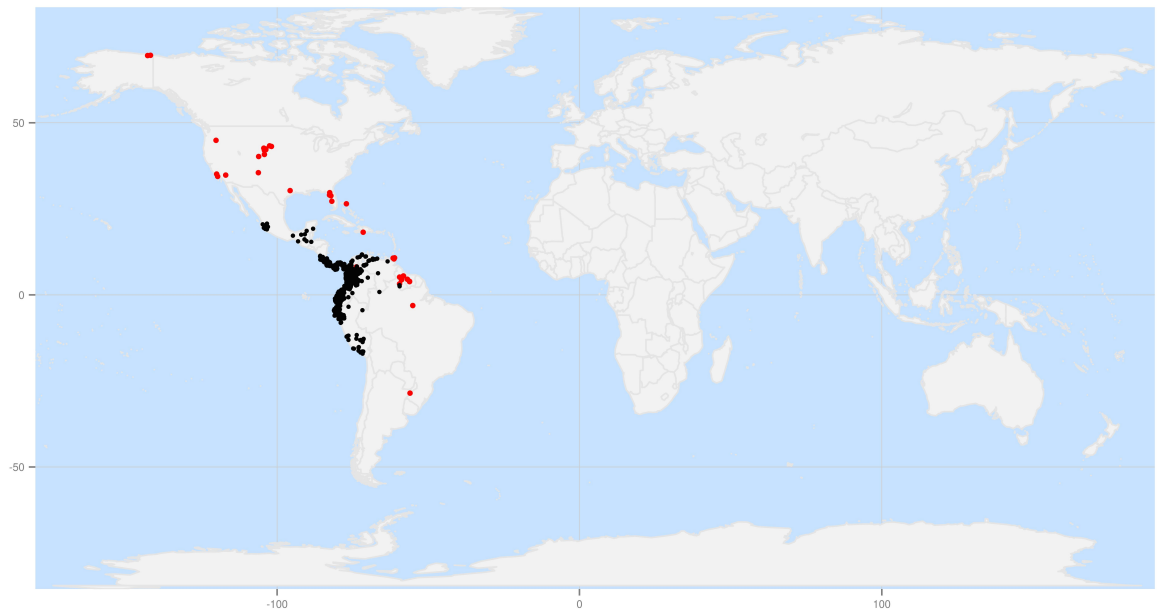


Figure 6D



FIGURE 7. Representations for the Biogeographic Choco. A: Biogeographic Choco *sensu*:(Hernández-Camacho et al., 1992; Udvardy, 1975). B: Biogeographic Choco *sensu*: Cabrera & Willink (1973); Chapman (1918); Cracraft (1985); Dinerstein et al. (1995); Morrone (1999, 2001, 2014); Muller (1973); Myers et al. (2000); Noguera-Urbano & Escalante (2014); Savage (1966). C: Biogeographic Choco *sensu*: Abell et al. (2008); BirdLife International (2012). D: Set of definition for Biogeographic Choco. They were considered as our hypothetical areas.

Figure 7A

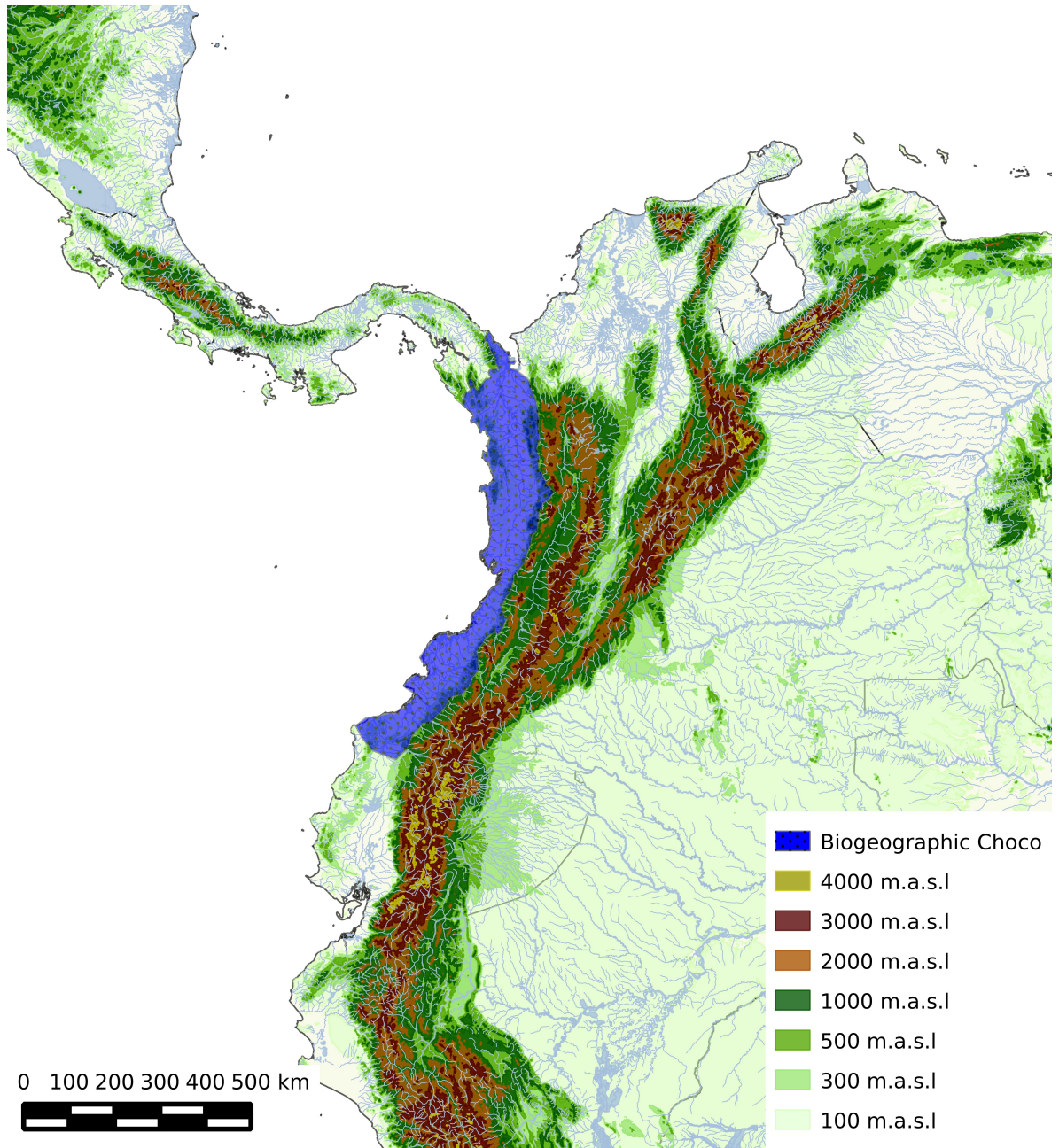


Figure 7B

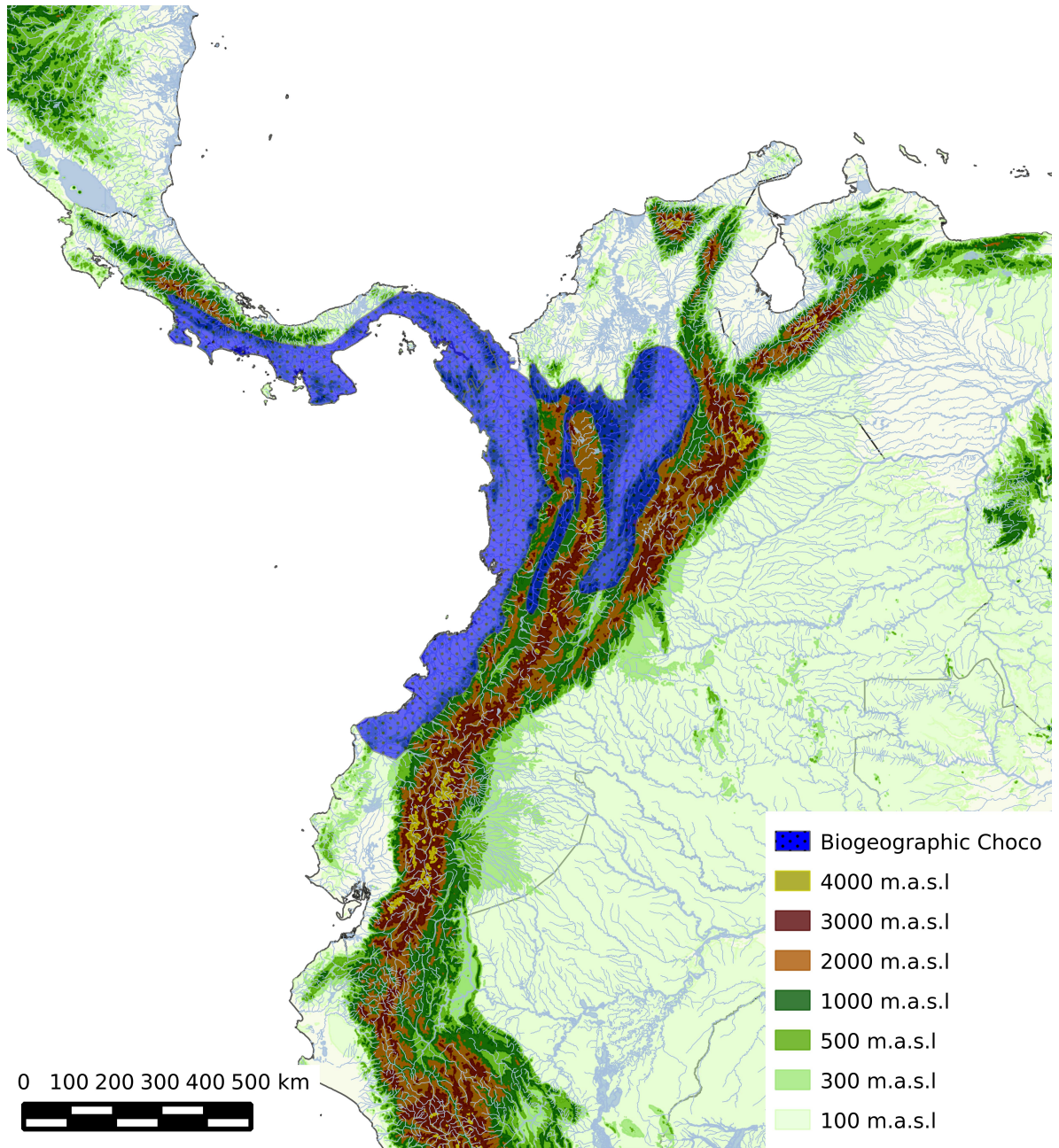


Figure 7C

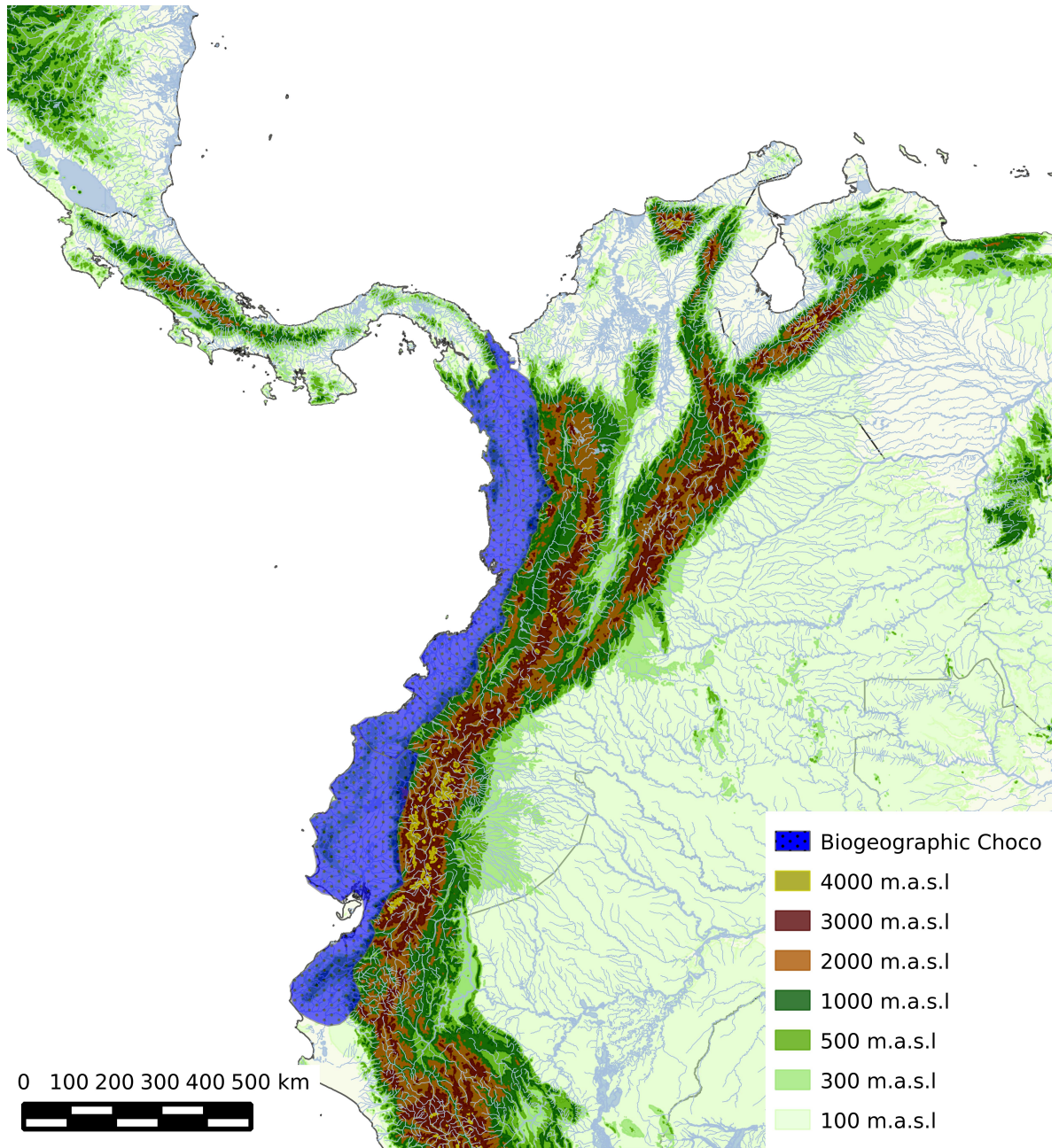


Figure 7D

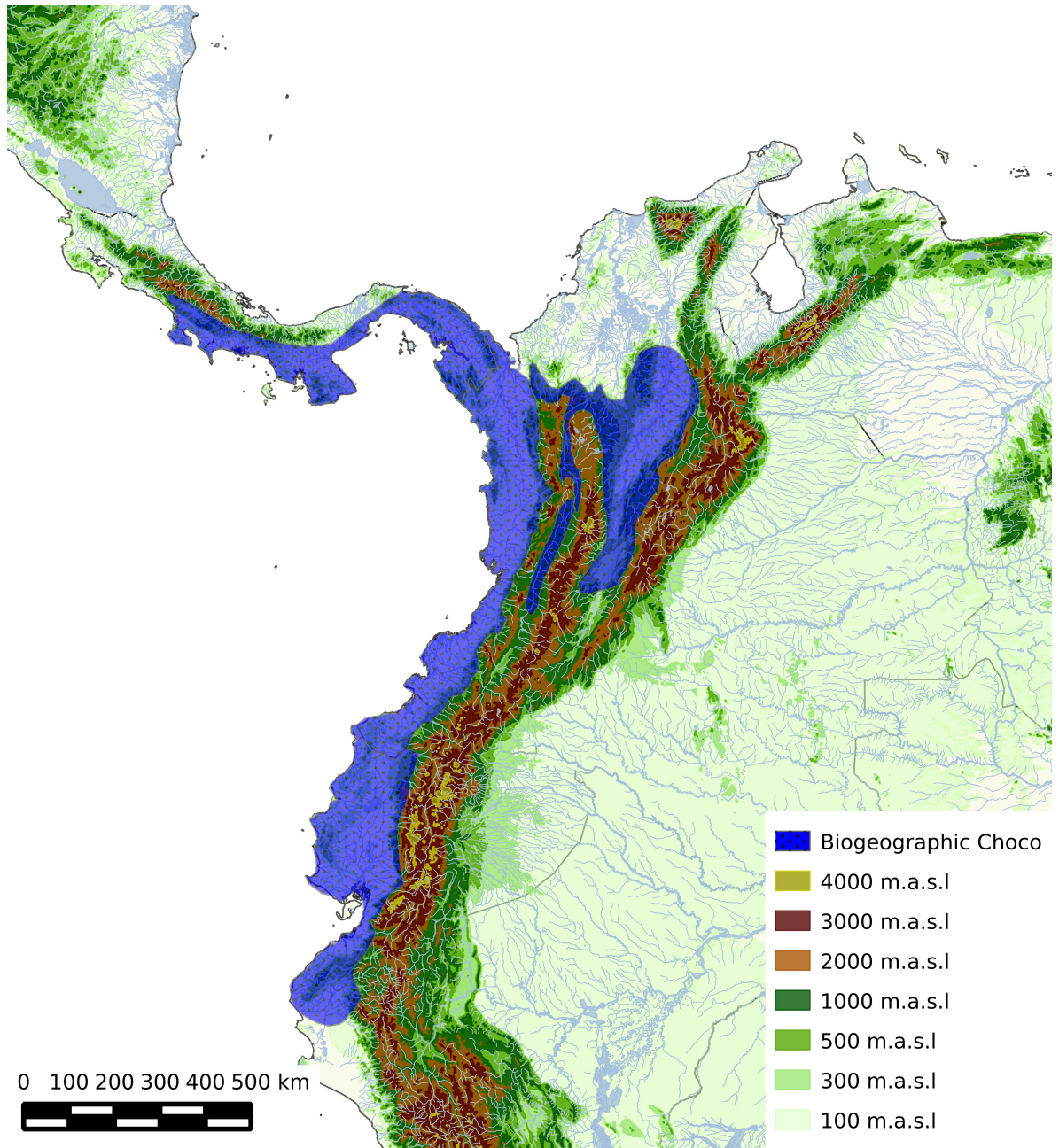


FIGURE. 8. **Panbiogeographic pattern of the Choco province.** A-F: General pattern for the species from the classes Mammalia, Reptilia, Amphibia, Aves, Magnoliophyta and Liliopsida. G: Patterns that were not congruent between areas of endemism and tracks. Orange area recovered by Analysis of endemism from NDM/VNDM, tracks in orange and cyan recovered by Martitracks. A: Costa Rica-Panama (CP), B: Panama-Magdalena (PM), C: Panama-Choco (PC), D: North of the Central and Western Cordilleras-Interandean Valleys (CI), E: West of Ecuador (WE), F: High Atrato-San Juan-Baudo-West Cordillera (AW).

Figure 8A

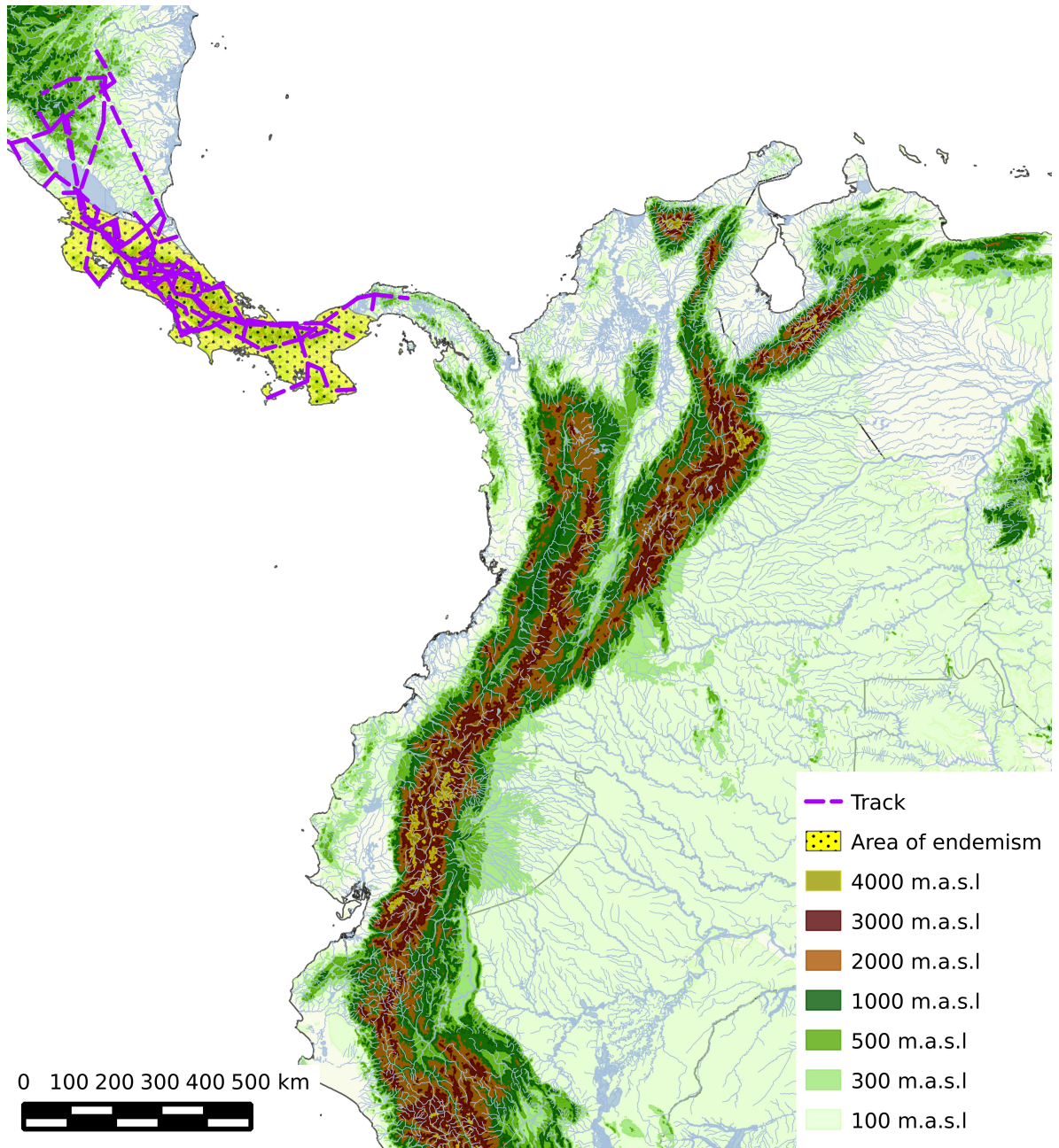


Figure 8B

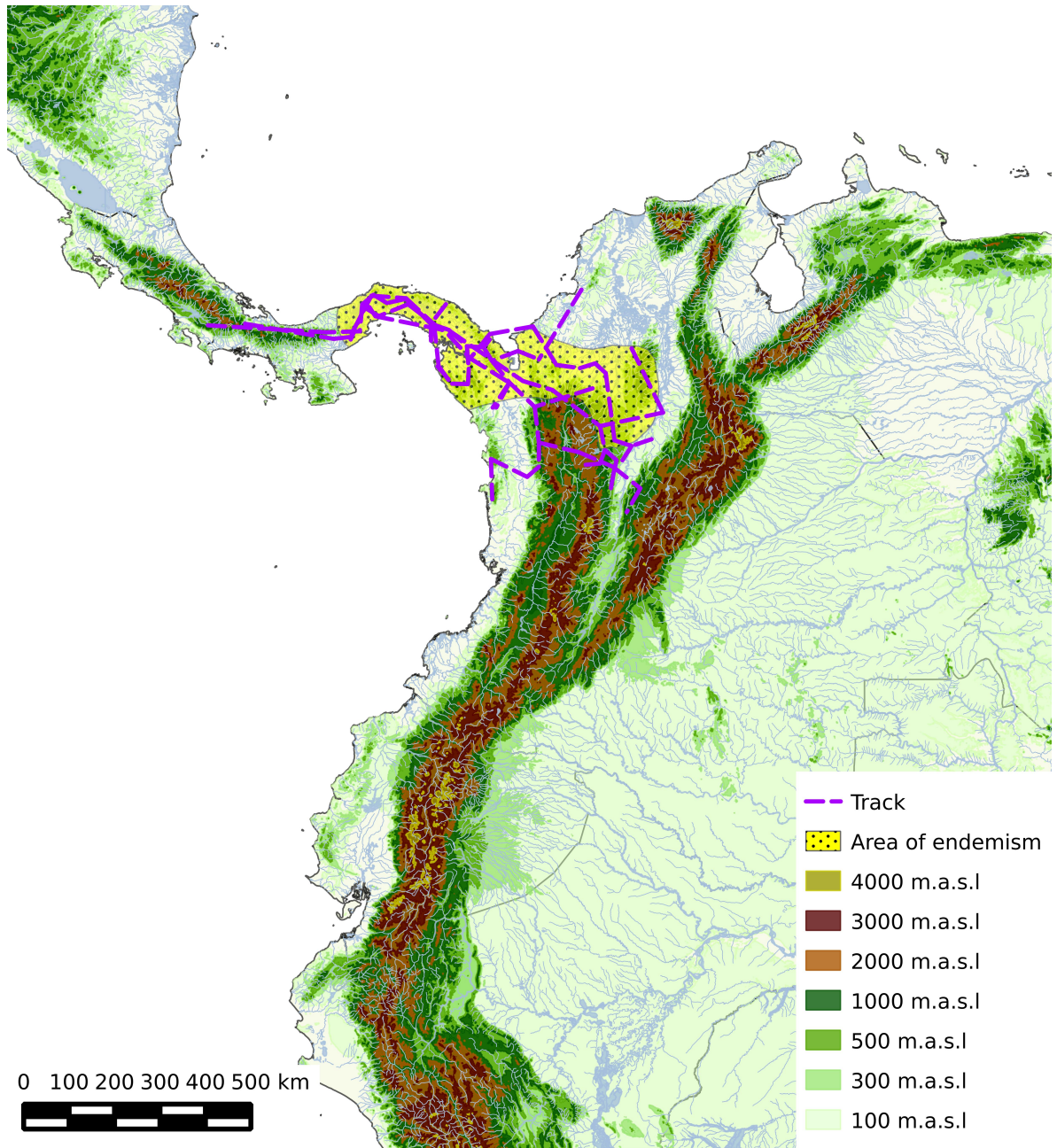


Figure 8C



Figure 8D

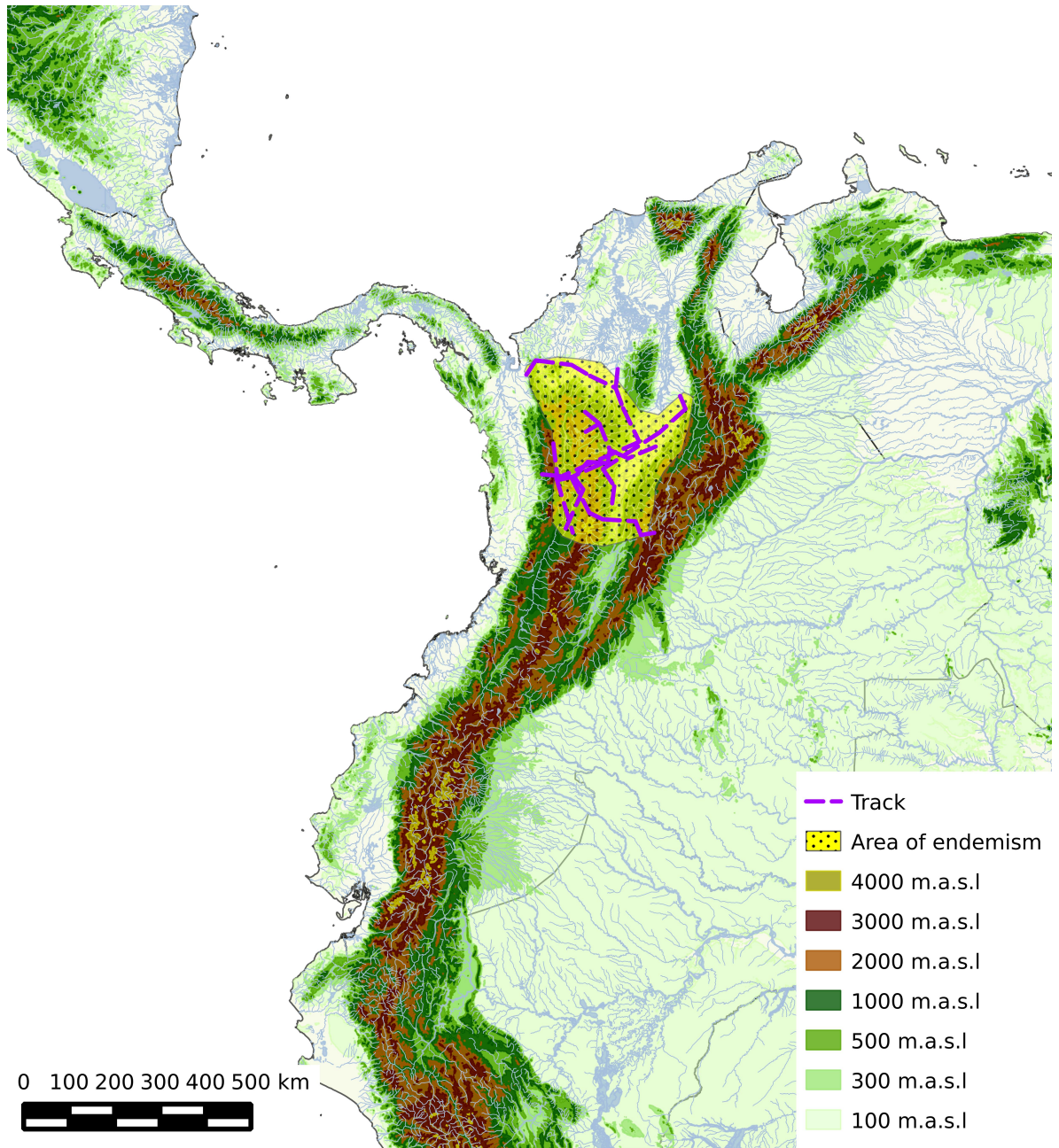


Figure 8E

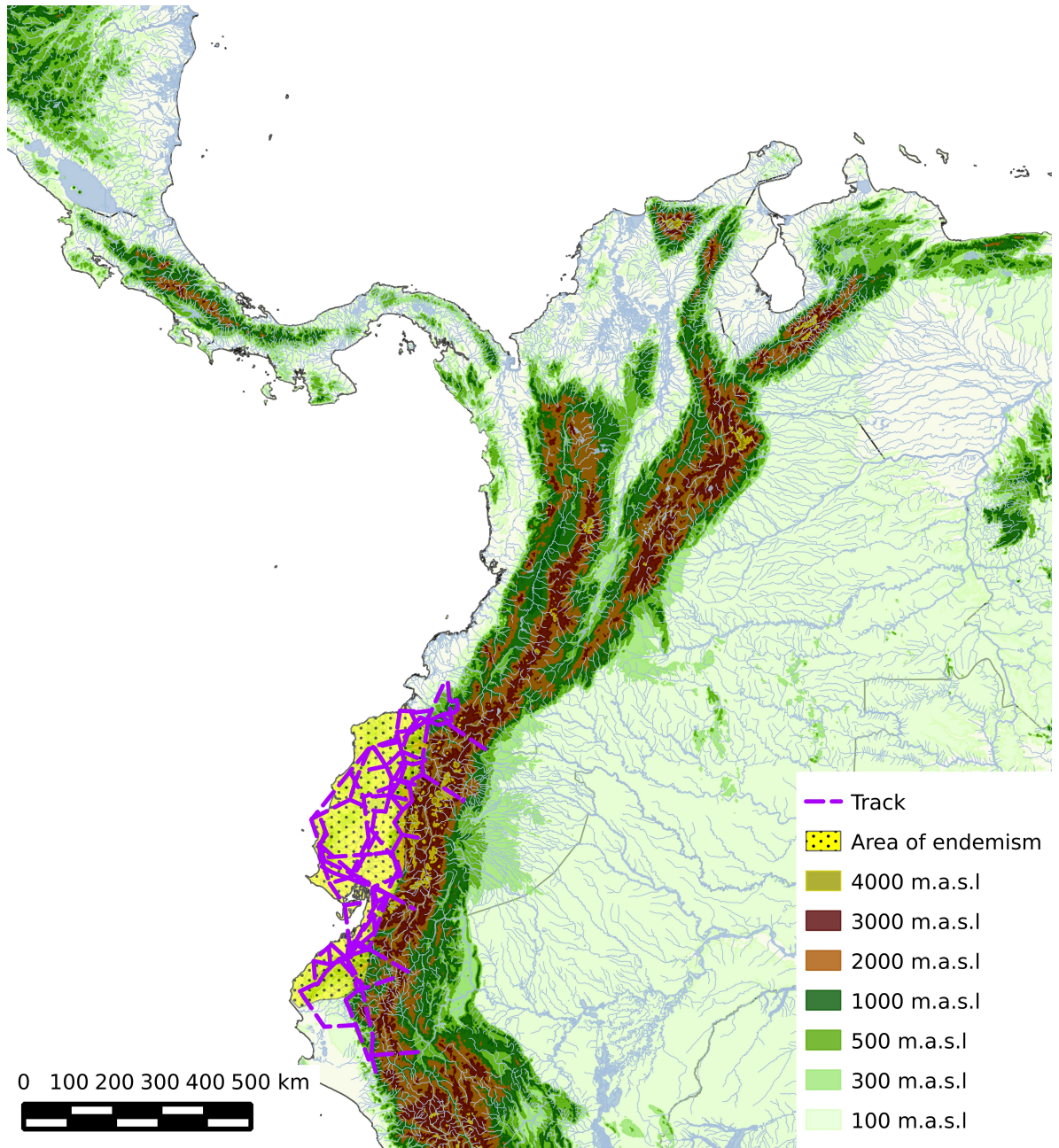


Figure 8F

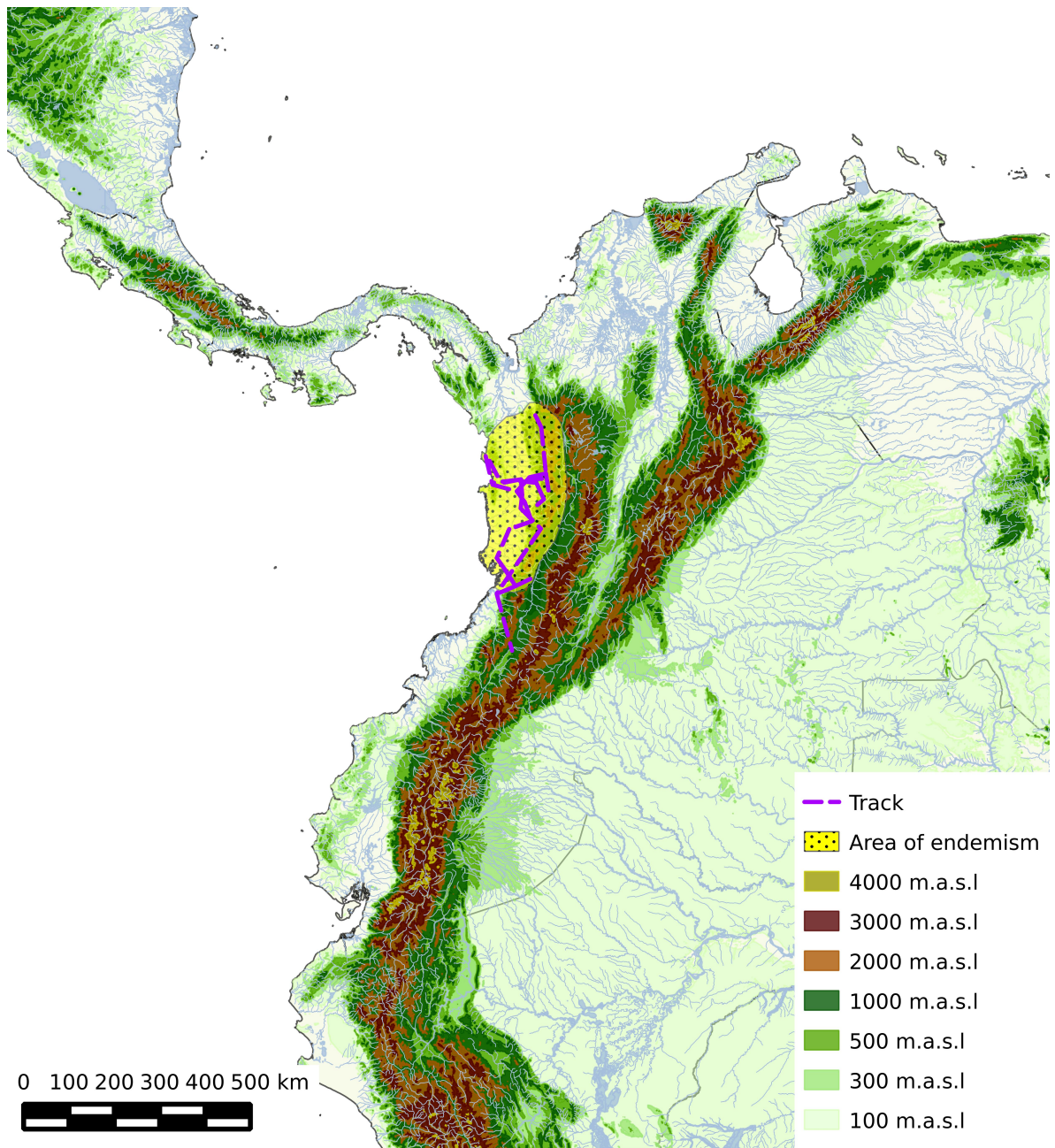


Figure 8G

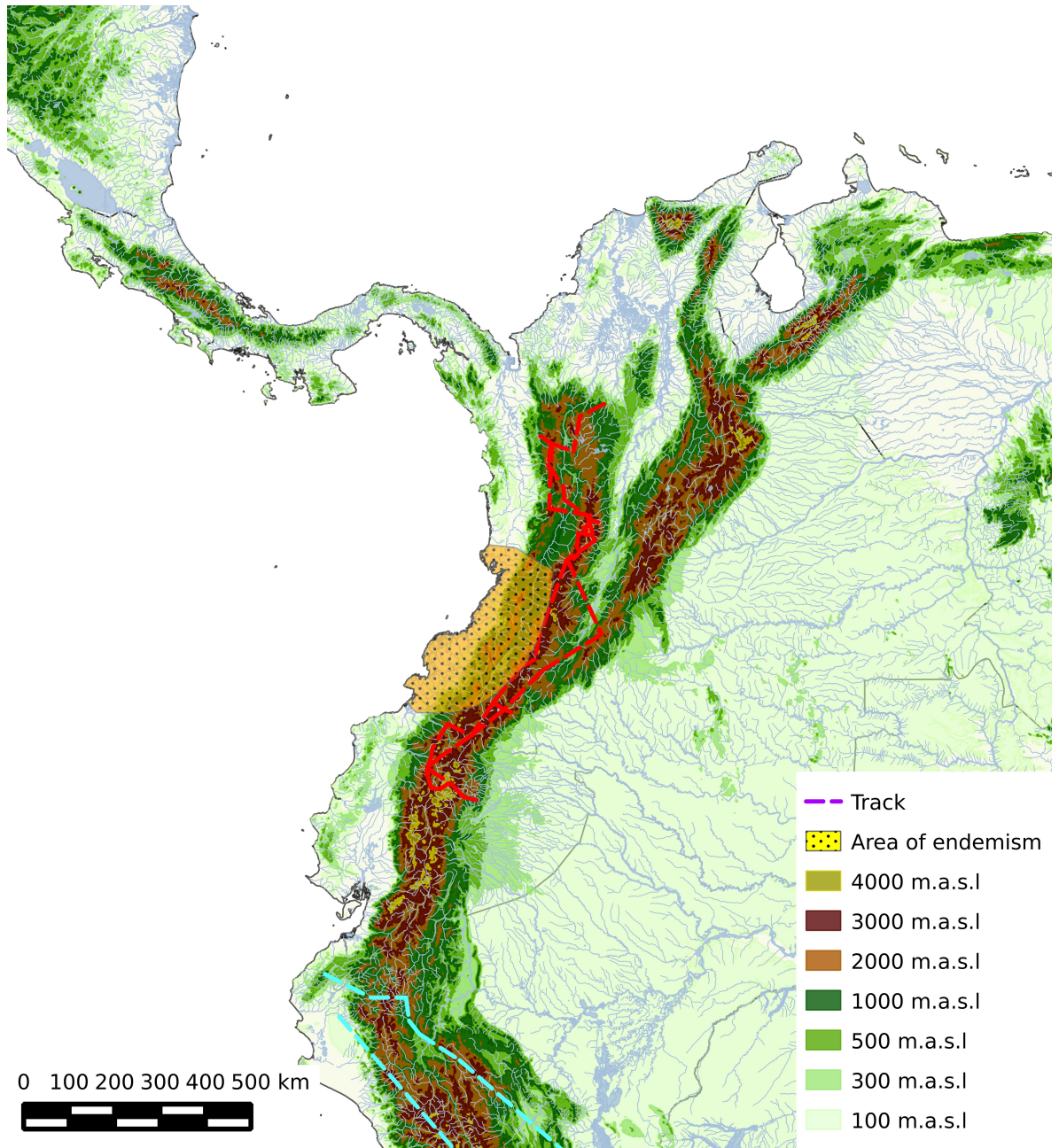


TABLE 1. **Initiatives to compile public data of biodiversity.**

Table 1

Biodatabase	Acronym	Available at	Cite
The NIH genetic sequence database	GenBank	www.ncbi.nlm.nih.gov/genbank	(Benson et al., 1999; Bilofsky & Christian, 1988).
Data Publisher for Earth & Environmental Science	PANGAEA	www.pangaea.de	(Diepenbroek et al., 2002)
VertNet Project	VertNet	www.vertnet.org	(Constable et al., 2010)
Morphobank:Biological Imaging	Morphobank	www.morphobank.net	(Prieto-Marquez et al., 2007)
Homology Of Phenotypes Over The Web	MorphoBank	www.morphobank.org	(O'Leary & Kaufman, 2011)
Ocean Biogeographic Information System	OBIS	www.obis.org	(Grassle et al., 2000)
Paleobiology Database	PaleoBioDB	www.paleobiodb.org	(Uhen, 2014)
PALEOMAP Project	PALEOMAP	www.scotese.com	(Scotese & Golonka, 2001)
Miocene Mammal Mapping Project	MIOMAP	www.ucmp.berkeley.edu/miomap	(Carrasco et al., 2007)
Island Biodiversity and Invasive Species	IBIS	http://ibis.fos.auckland.ac.nz/	(Kells & Worswick, 1997)
Global Invasive Species Database	ISSG	www.issg.org	(Lowe et al., 2000)
Digital Repository Dryad	Dryad or DRIADE	www.datadryad.org	(Dube et al., 2008)
Global Biodiversity Information	GBIF	www.gbif.org	(Telemius, 2011)
Integrated Digitized Biocollections	iDigBio	www.idigbio.org	(ADBC, 2015)

TABLE 2. **Comparison of geocleaMT against the packages most used to perform cleaning distributional data.** The signal "x" correspond to proceses that the package can do. the signal "-" correspond to processes that the packages can not do or were not specified in the its presentation.

Table 2

Functions/Package	GeocleaMT	speciesgeocodeR	Biogeo	rgbif	SpeciesLINK	ModestR	openrefine
Handling more than 10 million occurrences	x	-	-	-	-	-	-
Assigning elevations from a personal database	x	-	x	x	-	-	-
Assigning elevations from Google Elevation API	x	-	-	x	-	-	x
Separate species altitudinal range	x	-	-	-	-	-	-
Separate invasive species	x	-	-	-	-	-	-
Download species from GBIF	x	-	x	x	-	x	-
Separate occurrences with geocode	x	-	x	x	x	x	x
Review of decimal degree format	x	-	x	x	-	x	x
Delete duplicate points	x	-	x	x	-	x	x
Delete Latitude and Longitude assigned as 0.0	x	-	x	x	-	x	x
Separate reference land / sea	x	-	x	-	-	x	-
Separate widely distributed species given a polygon reference	x	-	-	-	-	-	-
Separating species with a minimum number of occurrences	x	x	x	-	-	-	x
Remove species and / or specific occurrences	x	-	-	x	x	-	x
Calculate the mean propinquity for the set of data and/or each species	x	-	-	-	-	-	-
Assigning geocode to ISO-3 alpha Code and vice versa	x	x	-	-	-	-	-
Assigning geocode to ISO-2 alpha Code and vice versa	x	-	-	-	-	-	-
Assigning the country name to coordinate	x	-	x	-	-	-	-
Handling the code	x	x	x	x	-	x	-
Free code	x	x	x	x	x	x	x
Cleaning Protocol	x	-	-	-	-	-	-
Following the Darwin Core format	x	x	-	x	-	-	-
Using as script on a server/cluster	x	x	-	x	-	x	-

TABLE 3. **Conditions to assign the descriptor to a species in the process performed using the ‘sp.outside.poly’ function.** x: records of a species, q(x): percentage of records outside, p: argument in the max.perc.out parameter, r(x): number of occurrences outside the polygon, z: argument in the max.occ.out parameter, d: delete.point parameter, T: logical TRUE, F = logical FALSE, s(x): percentage of records within the polygon.

Table 3

Des.	Condit.	Conditional	Category	Action
A	-	$\{x \mid q(x) = \emptyset\}$	Species with restricted distribution to the polygon	Keeping species.
B	1T	$\{x \mid q(x) < p \bigwedge d = T\}$	Species with restricted distribution to polygon with some points outside.	Keeping species and delete points outside the polygon.
B	1F	$\{x \mid q(x) < p \bigwedge d = F\}$	Species with restricted distribution to polygon with some points outside.	Keeping species and do not delete points outside the polygon.
B	2T	$\{x \mid q(x) > p \bigwedge r(x) < z \bigwedge d = T\}$	Species with restricted distribution to polygon, with few records and some points outside the polygon.	Keeping species and delete points outside the polygon.
B	2F	$\{x \mid q(x) > p \bigwedge r(x) < z \bigwedge d = F\}$	Species with restricted distribution to polygon, with few records and some points outside the polygon.	Keeping species and do not delete points outside the polygon.
B	3	$\{x \mid q(x) > p \bigwedge r(x) > z\}$	Species distribution outside the polygon or widely distributed.	Remove the species from process and save as a species outside the polygon.
C	-	$\{x \mid s(x) = \emptyset\}$	Species distribution outside the polygon.	Remove the species from process and save as a species outside the polygon.

TABLE 4. Occurrences, species, genus and families for each partitions used to perform the areas of endemism and generalized tracks analysis.

Table 4

Partitions	Families	Genus	Species	Occurences
Mammalia	29	76	128	4610
Reptilia	21	81	227	6741
Amphibia	17	59	316	11446
Aves	42	309	606	72259
Liliopsida	25	304	2211	71187
Magnoliopsida	162	978	6061	254882
Zoo	109	525	1277	95056
Phyta	187	1282	8272	326069
Total evidence	296	1807	9549	421125

TABLE 5. **Table 5. Congruence between the patterns found and the area as previously described by different authors.** This comparison is partial because our areas were not compatible in length with other authors.

Table 5

Area	Correspondency with others authors
Costa Rica-Panama (CP)	Chiriquí subcentre(Muller, 1973), Puntarenas-Chiriquí province(Morrone, 2014), Western Panamanian Isthmus province (Morrone, 2001) north-eastern Panama Darien and western Costa Rica (Quijano-Abril et al., 2006), Costa Rican Seasonal Moist Forests ecoregion (Dinerstein et al., 1995), Talamanca province (Savage, 1966)
Panama-Magdalena (PM)	Magdalena province (Morrone, 2014), Magdalena sector (Hernández-Camacho et al., 1992), Magdalena/Urabá Moist Forests ecoregion (Dinerstein et al., 1995), Chiriquí-Darién Highlands area (Porzecanski & Cracraft, 2005), Nechí refuge (Haffer, 1967), Sinú-San Jorge district (Hernández-Camacho et al., 1992)
Panama-Choco (PC)	Choco province (Morrone, 2014), Chiriquí-Darién Highlands area (Porzecanski & Cracraft, 2005), El Limón-Pierre, Baudó, Río Sucio and Murri districts (Hernández-Camacho et al., 1992), north-western Colombia- Cauca province (Quijano-Abril et al., 2006)
North of the Central and Western Cordilleras-Interandean Valleys (CI)	Magdalena province (Morrone, 2014), Magdalena sector (Hernández-Camacho et al., 1992), Magdalena/Urabá Moist Forests ecoregion (Dinerstein et al., 1995),Nechí refuge (Haffer, 1967), Sinú-San Jorge district (Hernández-Camacho et al., 1992), Magdalena province (Noguera-Urbano & Escalante, 2014)
High Atrato-San Juan-Baudo-West Cordillera (AW)	Choco refuge (Haffer, 1967), Alto Atrato-Sanjuan District (Hernández-Camacho et al., 1992), Choco province (Morrone, 2014)
West of Ecuador (WE)	North-western of Ecudaor (Quijano-Abril et al., 2006),Western Ecuador province (Morrone, 1999, 2014)

Supplementary Material

APPENDIX 1

FIGURE. 1. **Referenced area to get the initial data from GBIF, and to perform the process of cleaning.** Polygon: the (*sensu*: Hernández-Camacho et al., 1992), red: Area with approx 29.000 coordinates with elevation data, compiled in the database ‘Altitudes’, resolution: 0.1 decimal degrees.

Figure 1

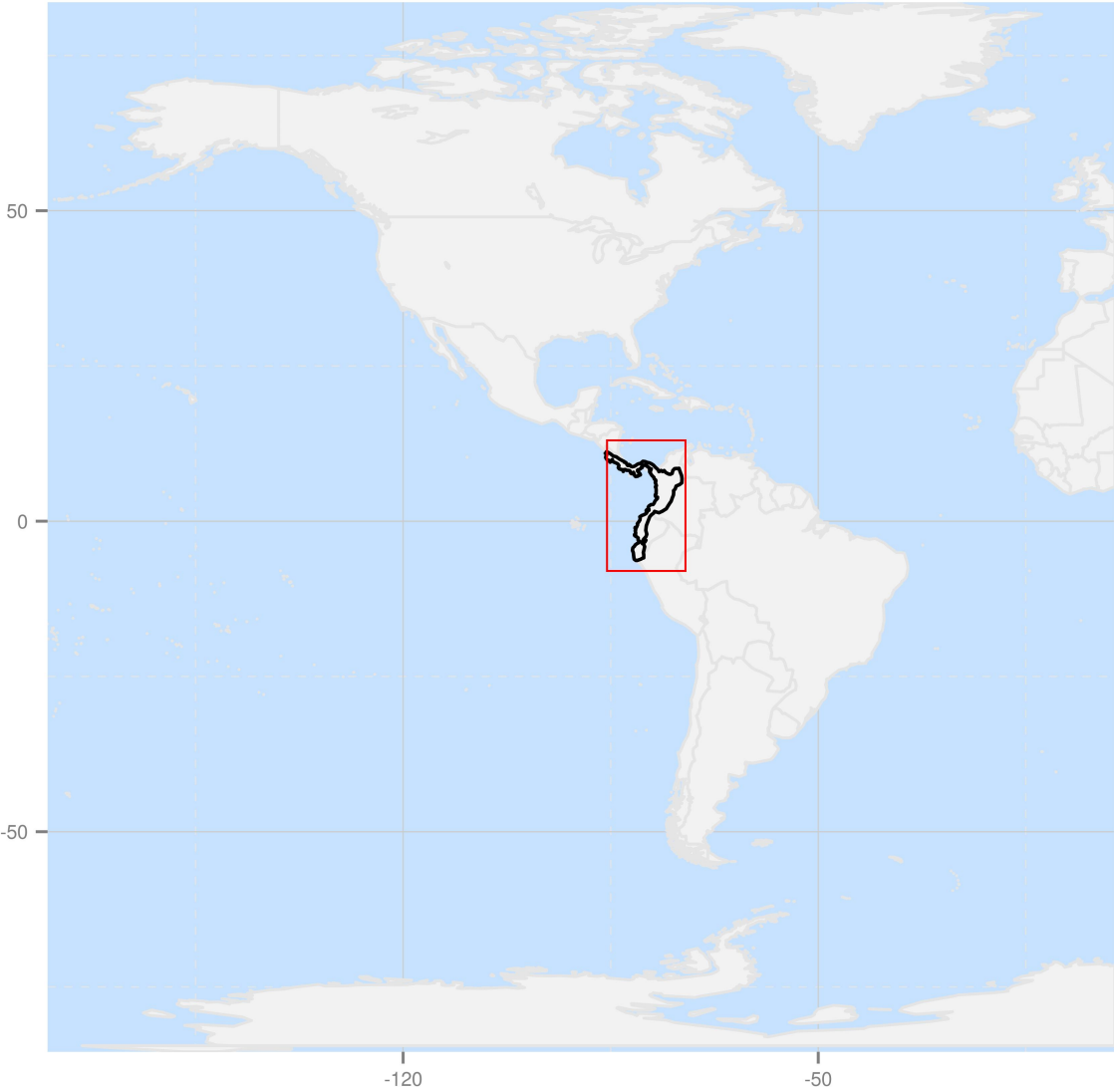
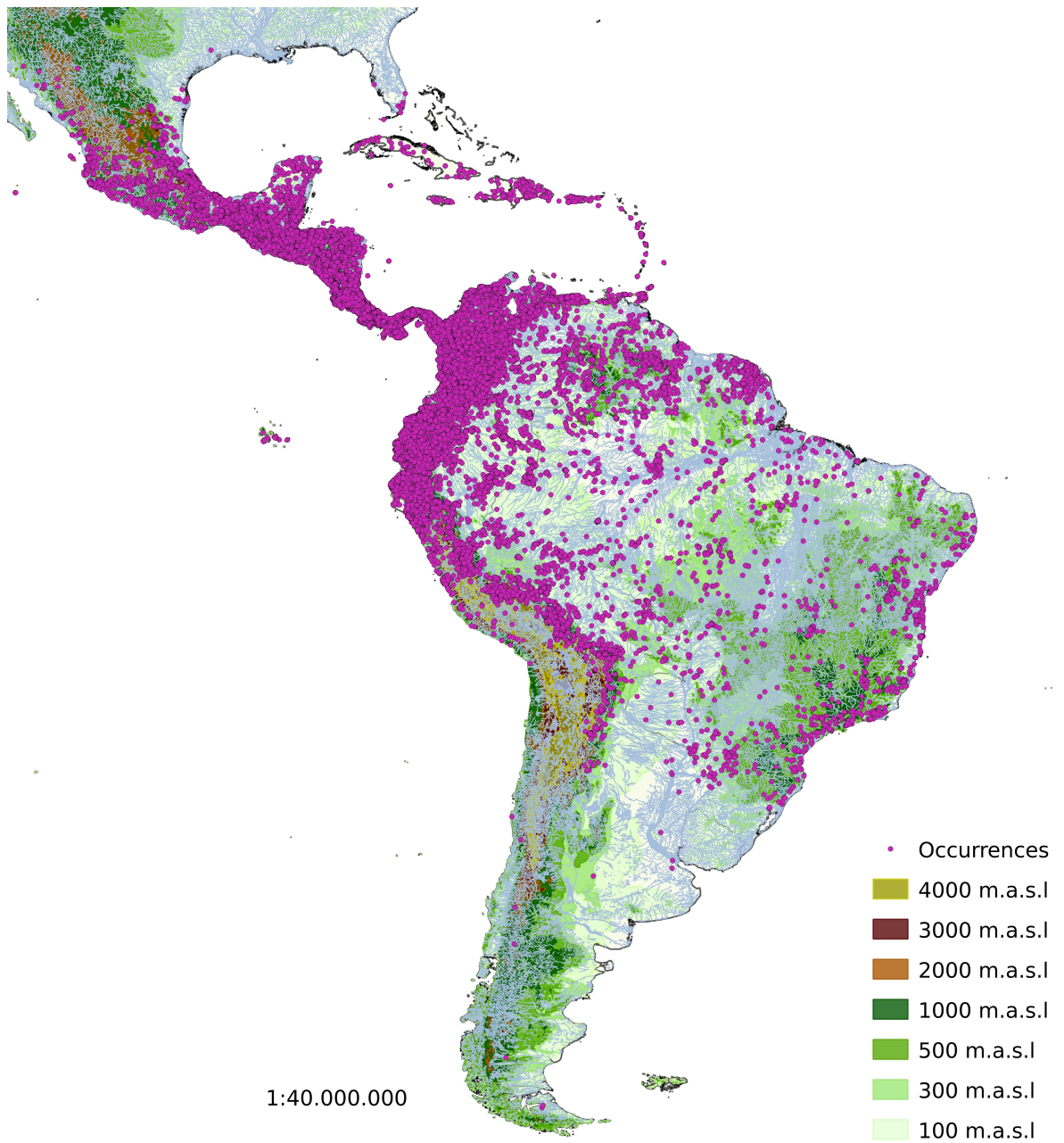


FIGURE. 2. Total occurrences used to perform the analysis of areas of endemism and generalized tracks.

Figure 2



APPENDIX 2

TABLE 1. Data in absolute values and percentage for each step on the pipelines plotted in figure 1, main text.

Table 1

Checkpoint	Families	%	Genera	%	Species	%	Occurrences	%
A	64	100	239	100	620	100	-	-
B	57	89	216	90.38	551	88.87	-	-
C	57	89	215	89.96	543	87.58	-	-
D	57	100	215	100	543	100	1195435	100
E	57	100	212	90.60	536	98.71	283580	23.87
F	57	100	212	98.60	535	98.53	176944	14.80
G	54	94.74	203	94.42	505	93	113687	9.51
H	36	63.16	97	45.12	160	29.47	3477	0.29
I	36	63.16	94	43.72	152	27.99	3417	0.29
J	35	61.40	88	40.93	142	26.15	3402	0.28

TABLE 2. **Unique Areas of endemism for each partition and grid size.**

Table 2

Partitions	$0.5^\circ \times 0.5^\circ$	$0.75^\circ \times 0.75^\circ$	$1.0^\circ \times 1.0^\circ$	$1.25^\circ \times 1.25^\circ$	Total
Reptilia	6	11	8	19	44
Amphibia	14	24	36	32	106
Aves	19	34	59	77	189
Liliopsida	252	282	269	360	1163
Magnoliopsida	679	900	1061	1295	3935
Zoo	14	38	69	67	188
Phyta	279	318	399	469	1465
Total evidence	121	111	127	164	523
Total	1384	1720	2030	2485	7619

TABLE 3. **Similarity between the cell shared for the $0.75^\circ \times 0.75^\circ$ grid for each partition.s**

The tendency for the grid sizes of 0.5° , 1.0° , and 1.25° was the same that present for $0.75^\circ \times 0.75^\circ$.

Table 3

Partitions	Reptilia	Amphibia	Aves	Lillopsida	Magnoliopsida	Zoo	Phyta	Total Evi- dence
Reptilia	1	0.737	0.947	1	1	0.947	1	1
Amphibia	0.37	1	0.8	0.975	1	0.825	0.975	0.95
Aves	0.217	0.389	1	0.669	0.892	0.867	0.855	0.627
Lillopsida	0.192	0.394	0.586	1	0.99	0.626	0.939	0.758
Magnoliopsida	0.122	0.256	0.474	0.628	1	0.442	0.833	0.5
Zoo	0.31	0.423	0.923	0.795	0.885	1	0.859	0.718
Phyta	0.145	0.298	0.542	0.71	0.992	0.511	1	0.6
Total Evi- dence	0.244	0.487	0.667	0.962	1	0.718	1	1

TABLE 4. **Given the GBIF data, we present a list of species that was considered for the Areas of endemism and generalized tracks analysis as species with distribution restricted to each area.**

AREA	Area of Endemism	Generalized Tracks
Costa Rica-Panama (CP)	<i>Acalypha radinostachya</i>	<i>Craugastor stejnerianus</i>
Costa Rica-Panama (CP)	<i>Acanthidops bairdi</i>	<i>Craugastor persimilis</i>
Costa Rica-Panama (CP)	<i>Acrorchis roseola</i>	<i>Bolitoglossa colonnea</i>
Costa Rica-Panama (CP)	<i>Aechmea pittieri</i>	<i>Atelopus chiriquiensis</i>
Costa Rica-Panama (CP)	<i>Agalychnis annae</i>	<i>Arremon crassirostris</i>
Costa Rica-Panama (CP)	<i>Agave wercklei</i>	<i>Chamaepetes unicolor</i>
Costa Rica-Panama (CP)	<i>Aiouea costaricensis</i>	<i>Lampornis calolaemus</i>
Costa Rica-Panama (CP)	<i>Alfaroa guanacastensis</i>	<i>Acrorchis roseola</i>
Costa Rica-Panama (CP)	<i>Alibertia utleyorum</i>	<i>Anthurium amnicola</i>
Costa Rica-Panama (CP)	<i>Allomarkgrafia brenesiana</i>	<i>Anthurium cucullispathum</i>
Costa Rica-Panama (CP)	<i>Amalophyllon laceratum</i>	<i>Anthurium tutense</i>
Costa Rica-Panama (CP)	<i>Amazilia decora</i>	<i>Bomarea caudatisepala</i>
Costa Rica-Panama (CP)	<i>Ampelocissus javalensis</i>	<i>Brassia endresii</i>
Costa Rica-Panama (CP)	<i>Amphitecna gentryi</i>	<i>Calathea plicata</i>
Costa Rica-Panama (CP)	<i>Amyris magnifolia</i>	<i>Calyptrogyna deneversii</i>
Costa Rica-Panama (CP)	<i>Anolis aliae</i>	<i>Calyptrogyna kunorum</i>
Costa Rica-Panama (CP)	<i>Anolis aquaticus</i>	<i>Chamaedorea anemophila</i>
Costa Rica-Panama (CP)	<i>Anolis intermedius</i>	<i>Chorigyne pterophylla</i>
Costa Rica-Panama (CP)	<i>Anolis pachypus</i>	<i>Dichaea sarapiquensis</i>
Costa Rica-Panama (CP)	<i>Anolis polylepis</i>	<i>Dicranopygium tatica</i>
Costa Rica-Panama (CP)	<i>Anolis woodi</i>	<i>Dioscorea natalia</i>
Costa Rica-Panama (CP)	<i>Anthurium alatipedunculatum</i>	<i>Elleanthus glaucophyllus</i>
Costa Rica-Panama (CP)	<i>Anthurium amnicola</i>	<i>Epidendrum lankesteri</i>
Costa Rica-Panama (CP)	<i>Anthurium angustispadix</i>	<i>Epidendrum vulgoamparoanum</i>
Costa Rica-Panama (CP)	<i>Anthurium brenesii</i>	<i>Guzmania scandens</i>
Costa Rica-Panama (CP)	<i>Anthurium caloveboranum</i>	<i>Heliconia thomasiana</i>
Costa Rica-Panama (CP)	<i>Anthurium carnosum</i>	<i>Microchilus whitefoordiae</i>
Costa Rica-Panama (CP)	<i>Anthurium chiriquense</i>	<i>Philodendron crassispathum</i>
Costa Rica-Panama (CP)	<i>Anthurium clavatum</i>	<i>Philodendron dolichophyllum</i>
Costa Rica-Panama (CP)	<i>Anthurium cotobrusii</i>	<i>Platythelys alajuelae</i>
Costa Rica-Panama (CP)	<i>Anthurium eximium</i>	<i>Pleurothallis beyrodtiana</i>
Costa Rica-Panama (CP)	<i>Anthurium fusiforme</i>	<i>Plowmanianthus panamensis</i>
Costa Rica-Panama (CP)	<i>Anthurium globosum</i>	<i>Renealmia helenae</i>
Costa Rica-Panama (CP)	<i>Anthurium longistipitatum</i>	<i>Scaphyglottis clavata</i>
Costa Rica-Panama (CP)	<i>Anthurium nervalum</i>	<i>Sphaeradenia magniglobula</i>
Costa Rica-Panama (CP)	<i>Anthurium prolatum</i>	<i>Syngonium rayi</i>
Costa Rica-Panama (CP)	<i>Anthurium pseudospectabile</i>	<i>Vriesea leucophylla</i>
Costa Rica-Panama (CP)	<i>Anthurium schottianum</i>	<i>Vriesea tonduziana</i>
Costa Rica-Panama (CP)	<i>Anthurium seibertii</i>	<i>Warczewiczella lipscombiae</i>
Costa Rica-Panama (CP)	<i>Anthurium spectabile</i>	<i>Xanthosoma dealbatum</i>
Costa Rica-Panama (CP)	<i>Anthurium sytsmae</i>	<i>Arachnothryx povedae</i>
Costa Rica-Panama (CP)	<i>Anthurium tutense</i>	<i>Ardisia dwyeri</i>
Costa Rica-Panama (CP)	<i>Anthurium utleyorum</i>	<i>Begonia buseyi</i>
Costa Rica-Panama (CP)	<i>Anthurium validifolium</i>	<i>Blakea brenesii</i>
Costa Rica-Panama (CP)	<i>Anthurium watermaliense</i>	<i>Blakea brunnea</i>
Costa Rica-Panama (CP)	<i>Antrostomus saturatus</i>	<i>Blakea gregii</i>

Costa Rica-Panama (CP)	<i>Arachnothryx brenesii</i>	<i>Cavendishia stenophylla</i>
Costa Rica-Panama (CP)	<i>Arachnothryx calycosa</i>	<i>Chrysophyllum hirsutum</i>
Costa Rica-Panama (CP)	<i>Arachnothryx chaconii</i>	<i>Clidemia coloradensis</i>
Costa Rica-Panama (CP)	<i>Arachnothryx monteверdensis</i>	<i>Coccoloba darienensis</i>
Costa Rica-Panama (CP)	<i>Arachnothryx povedae</i>	<i>Coccoloba lasseri</i>
Costa Rica-Panama (CP)	<i>Arachnothryx tayloriae</i>	<i>Columnea allenii</i>
Costa Rica-Panama (CP)	<i>Arachnothryx torresii</i>	<i>Columnea hirsutissima</i>
Costa Rica-Panama (CP)	<i>Archibaccharis panamensis</i>	<i>Crematosperma westrae</i>
Costa Rica-Panama (CP)	<i>Arcytophyllum lavarum</i>	<i>Croton jimenezii</i>
Costa Rica-Panama (CP)	<i>Ardisia blepharodes</i>	<i>Dicella aciculifera</i>
Costa Rica-Panama (CP)	<i>Ardisia capitellata</i>	<i>Erythrochiton gymnanthus</i>
Costa Rica-Panama (CP)	<i>Ardisia cartagoana</i>	<i>Eschweilera neei</i>
Costa Rica-Panama (CP)	<i>Ardisia copeyana</i>	<i>Eugenia hammelii</i>
Costa Rica-Panama (CP)	<i>Ardisia costaricensis</i>	<i>Faramea scalaris</i>
Costa Rica-Panama (CP)	<i>Ardisia crassipedicellata</i>	<i>Fleischmannia sideritides</i>
Costa Rica-Panama (CP)	<i>Ardisia dunlapiana</i>	<i>Gonzalagunia brenesii</i>
Costa Rica-Panama (CP)	<i>Ardisia furfuracea</i>	<i>Guarea constricta</i>
Costa Rica-Panama (CP)	<i>Ardisia furfuracella</i>	<i>Guatteria chiriquiensis</i>
Costa Rica-Panama (CP)	<i>Ardisia glomerata</i>	<i>Guatteria lucens</i>
Costa Rica-Panama (CP)	<i>Ardisia hagenii</i>	<i>Guatteria pudica</i>
Costa Rica-Panama (CP)	<i>Ardisia liesneri</i>	<i>Gustavia brachycarpa</i>
Costa Rica-Panama (CP)	<i>Ardisia nervosissima</i>	<i>Hamelia sanguinea</i>
Costa Rica-Panama (CP)	<i>Ardisia pleurobotrya</i>	<i>Hansteinia stricta</i>
Costa Rica-Panama (CP)	<i>Ardisia subsessilifolia</i>	<i>Hoffmannia leucocarpa</i>
Costa Rica-Panama (CP)	<i>Ardisia tilaranensis</i>	<i>Ilex carpintera</i>
Costa Rica-Panama (CP)	<i>Arremon costaricensis</i>	<i>Inga mortoniana</i>
Costa Rica-Panama (CP)	<i>Arremon crassirostris</i>	<i>Licania stevensii</i>
Costa Rica-Panama (CP)	<i>Arthrotylidium merostachyoides</i>	<i>Licaria pergamentacea</i>
Costa Rica-Panama (CP)	<i>Aspidogyne utriculata</i>	<i>Lisianthus peduncularis</i>
Costa Rica-Panama (CP)	<i>Atelopus senex</i>	<i>Matelea costaricensis</i>
Costa Rica-Panama (CP)	<i>Atropoides picadoi</i>	<i>Mikania castroi</i>
Costa Rica-Panama (CP)	<i>Axonopus volcanicus</i>	<i>Monnina sylvicola</i>
Costa Rica-Panama (CP)	<i>Ayenia mastatalensis</i>	<i>Mortoniodendron moralesii</i>
Costa Rica-Panama (CP)	<i>Bactris herrerana</i>	<i>Nectandra longipetiolata</i>
Costa Rica-Panama (CP)	<i>Bactris longiseta</i>	<i>Ocotea darcy</i>
Costa Rica-Panama (CP)	<i>Bartlettina maxonii</i>	<i>Ocotea jefensis</i>
Costa Rica-Panama (CP)	<i>Begonia carletonii</i>	<i>Ocotea quadriporata</i>
Costa Rica-Panama (CP)	<i>Begonia cooperi</i>	<i>Pera aperta</i>
Costa Rica-Panama (CP)	<i>Begonia croatii</i>	<i>Picramnia gracilis</i>
Costa Rica-Panama (CP)	<i>Begonia lignescens</i>	<i>Piper betleoides</i>
Costa Rica-Panama (CP)	<i>Begonia quaternata</i>	<i>Piper jacquemontianum</i>
Costa Rica-Panama (CP)	<i>Begonia seemanniana</i>	<i>Piper villiramulum</i>
Costa Rica-Panama (CP)	<i>Begonia vestita</i>	<i>Platymiscium pleiostachyum</i>
Costa Rica-Panama (CP)	<i>Beilschmiedia immersinervis</i>	<i>Pleodendron costaricense</i>
Costa Rica-Panama (CP)	<i>Beilschmiedia pendula</i>	<i>Pouteria exfoliata</i>
Costa Rica-Panama (CP)	<i>Berberis nigricans</i>	<i>Pouteria filiformis</i>
Costa Rica-Panama (CP)	<i>Besleria barbensis</i>	<i>Prosopanche costaricensis</i>
Costa Rica-Panama (CP)	<i>Besleria macropoda</i>	<i>Psychotria orosioides</i>

Costa Rica-Panama (CP)	<i>Besleria obliqua</i>	<i>Ruellia praeclara</i>
Costa Rica-Panama (CP)	<i>Besleria princeps</i>	<i>Schefflera panamensis</i>
Costa Rica-Panama (CP)	<i>Bidens boquetiensis</i>	<i>Schizocalyx veraguensis</i>
Costa Rica-Panama (CP)	<i>Biophytum falcifolium</i>	<i>Sclerolobium costaricense</i>
Costa Rica-Panama (CP)	<i>Blakea brenesii</i>	<i>Serjania pluvialiflorens</i>
Costa Rica-Panama (CP)	<i>Blakea brunnea</i>	<i>Sorocea pubivena</i>
Costa Rica-Panama (CP)	<i>Blakea cordata</i>	<i>Symphysia jefensis</i>
Costa Rica-Panama (CP)	<i>Blakea costaricensis</i>	<i>Trichilia pallida</i>
Costa Rica-Panama (CP)	<i>Blakea dimorphophylla</i>	<i>Unonopsis bullata</i>
Costa Rica-Panama (CP)	<i>Blakea fragrantissima</i>	<i>Verbesina fuscasiccans</i>
Costa Rica-Panama (CP)	<i>Blakea gregii</i>	<i>Weberocereus imitans</i>
Costa Rica-Panama (CP)	<i>Blakea hammelii</i>	<i>Hylocereus costaricensis</i>
Costa Rica-Panama (CP)	<i>Blakea intricata</i>	<i>Jaltomata darcyana</i>
Costa Rica-Panama (CP)	<i>Blakea lentii</i>	<i>Peniocereus hirschtianus</i>
Costa Rica-Panama (CP)	<i>Blakea storkii</i>	<i>Phoradendron burgeri</i>
Costa Rica-Panama (CP)	<i>Blakea suaveolens</i>	<i>Bactris dianeura</i>
Costa Rica-Panama (CP)	<i>Bolitoglossa alvaradoi</i>	<i>Beloglottis hameri</i>
Costa Rica-Panama (CP)	<i>Bolitoglossa pesrubra</i>	<i>Asplundia multistaminata</i>
Costa Rica-Panama (CP)	<i>Bolitoglossa robusta</i>	<i>Camaridium ramonense</i>
Costa Rica-Panama (CP)	<i>Bolitoglossa subpalmata</i>	<i>Vriesea apiculata</i>
Costa Rica-Panama (CP)	<i>Bomarea bracteolata</i>	<i>Anthurium clidemioides</i>
Costa Rica-Panama (CP)	<i>Bomarea caudatisepala</i>	<i>Craugastor andi</i>
Costa Rica-Panama (CP)	<i>Bomarea chiriquina</i>	<i>Craugastor melanostictus</i>
Costa Rica-Panama (CP)	<i>Bomarea costaricensis</i>	<i>Diasporus hylaeiformis</i>
Costa Rica-Panama (CP)	<i>Bomarea suberecta</i>	<i>Duellmanohyla rufioculis</i>
Costa Rica-Panama (CP)	<i>Bothriechis lateralis</i>	<i>Geophis zeledoni</i>
Costa Rica-Panama (CP)	<i>Brassia gireoudiana</i>	<i>Anthurium austin-smithii</i>
Costa Rica-Panama (CP)	<i>Brunellia costaricensis</i>	<i>Anthurium bradeanum</i>
Costa Rica-Panama (CP)	<i>Buchenavia costaricensis</i>	<i>Anthurium brenesii</i>
Costa Rica-Panama (CP)	<i>Buddleja filibracteolata</i>	<i>Anthurium protensum</i>
Costa Rica-Panama (CP)	<i>Bunchosia grayumii</i>	<i>Astrocaryum alatum</i>
Costa Rica-Panama (CP)	<i>Bunchosia odorata</i>	<i>Bactris polystachya</i>
Costa Rica-Panama (CP)	<i>Bunchosia ternata</i>	<i>Brachionidium folsomii</i>
Costa Rica-Panama (CP)	<i>Bunchosia ursana</i>	<i>Coccineorchis standleyi</i>
Costa Rica-Panama (CP)	<i>Bunchosia veluticarpa</i>	<i>Epidendrum lancilabium</i>
Costa Rica-Panama (CP)	<i>Burmeistera glauca</i>	<i>Pleurothallis bothros</i>
Costa Rica-Panama (CP)	<i>Burmeistera toroensis</i>	<i>Scaphyglottis limonensis</i>
Costa Rica-Panama (CP)	<i>Bursera howellii</i>	<i>Clethra pyrogena</i>
Costa Rica-Panama (CP)	<i>Bursera standleyana</i>	<i>Columnea ornata</i>
Costa Rica-Panama (CP)	<i>Byrsonima herrerae</i>	<i>Eugenia tilarana</i>
Costa Rica-Panama (CP)	<i>Calathea brenesii</i>	<i>Hoffmannia asclepiadea</i>
Costa Rica-Panama (CP)	<i>Calathea cuneata</i>	<i>Justicia densibracteata</i>
Costa Rica-Panama (CP)	<i>Calathea hylaeanthoides</i>	<i>Phyllanthus valerioi</i>
Costa Rica-Panama (CP)	<i>Calathea incompta</i>	<i>Syngonium mauroanum</i>
Costa Rica-Panama (CP)	<i>Calathea longiflora</i>	<i>Aristolochia panamensis</i>
Costa Rica-Panama (CP)	<i>Calathea retroflexa</i>	<i>Anthurium bradeanum</i>
Costa Rica-Panama (CP)	<i>Calathea robiniae</i>	<i>Anthurium brenesii</i>
Costa Rica-Panama (CP)	<i>Calathea trichoneura</i>	<i>Anthurium protensum</i>

Costa Rica-Panama (CP)	<i>Callianthe brenesii</i>	<i>Astrocaryum alatum</i>
Costa Rica-Panama (CP)	<i>Calliphlox bryantae</i>	<i>Bactris polystachya</i>
Costa Rica-Panama (CP)	<i>Calyptranthes monteverdensis</i>	<i>Brachionidium folsomii</i>
Costa Rica-Panama (CP)	<i>Calyptranthes pittieri</i>	<i>Coccineorchis standleyi</i>
Costa Rica-Panama (CP)	<i>Calyptrogynne condensata</i>	<i>Epidendrum lancilabium</i>
Costa Rica-Panama (CP)	<i>Calyptrogynne osensis</i>	<i>Pleurothallis bothros</i>
Costa Rica-Panama (CP)	<i>Calyptrogynne panamensis</i>	<i>Scaphyglottis limonensis</i>
Costa Rica-Panama (CP)	<i>Calyptrogynne trichostachys</i>	<i>Clethra pyrogena</i>
Costa Rica-Panama (CP)	<i>Camaridium allenii</i>	<i>Columnea ornata</i>
Costa Rica-Panama (CP)	<i>Camaridium amabile</i>	<i>Eugenia tilarana</i>
Costa Rica-Panama (CP)	<i>Camaridium anceps</i>	<i>Hoffmannia asclepiadea</i>
Costa Rica-Panama (CP)	<i>Camaridium aurantiacum</i>	<i>Justicia densibracteata</i>
Costa Rica-Panama (CP)	<i>Camaridium ctenostachys</i>	<i>Phyllanthus valerioi</i>
Costa Rica-Panama (CP)	<i>Camaridium dendrobioides</i>	
Costa Rica-Panama (CP)	<i>Camaridium falcatum</i>	
Costa Rica-Panama (CP)	<i>Camaridium gomezianum</i>	
Costa Rica-Panama (CP)	<i>Camaridium haberi</i>	
Costa Rica-Panama (CP)	<i>Camaridium horichii</i>	
Costa Rica-Panama (CP)	<i>Camaridium imbricatum</i>	
Costa Rica-Panama (CP)	<i>Camaridium inauditum</i>	
Costa Rica-Panama (CP)	<i>Camaridium latifolium</i>	
Costa Rica-Panama (CP)	<i>Camaridium nutantiflorum</i>	
Costa Rica-Panama (CP)	<i>Camaridium parvilabium</i>	
Costa Rica-Panama (CP)	<i>Camaridium pygmaeum</i>	
Costa Rica-Panama (CP)	<i>Camaridium ramonense</i>	
Costa Rica-Panama (CP)	<i>Camaridium scalariforme</i>	
Costa Rica-Panama (CP)	<i>Camaridium suaveolens</i>	
Costa Rica-Panama (CP)	<i>Camaridium valerioi</i>	
Costa Rica-Panama (CP)	<i>Cantorchilus semibadiis</i>	
Costa Rica-Panama (CP)	<i>Castilleja irasuensis</i>	
Costa Rica-Panama (CP)	<i>Castilleja quirosii</i>	
Costa Rica-Panama (CP)	<i>Catharus gracilirostris</i>	
Costa Rica-Panama (CP)	<i>Cattleya dowiana</i>	
Costa Rica-Panama (CP)	<i>Cavendishia calycina</i>	
Costa Rica-Panama (CP)	<i>Cavendishia capitata</i>	
Costa Rica-Panama (CP)	<i>Cavendishia chiriquiensis</i>	
Costa Rica-Panama (CP)	<i>Cavendishia confertiflora</i>	
Costa Rica-Panama (CP)	<i>Cavendishia copeensis</i>	
Costa Rica-Panama (CP)	<i>Cavendishia fortunensis</i>	
Costa Rica-Panama (CP)	<i>Cavendishia linearifolia</i>	
Costa Rica-Panama (CP)	<i>Cavendishia megabracteata</i>	
Costa Rica-Panama (CP)	<i>Cavendishia melastomoides</i>	
Costa Rica-Panama (CP)	<i>Cavendishia quercina</i>	
Costa Rica-Panama (CP)	<i>Cavendishia santafeensis</i>	
Costa Rica-Panama (CP)	<i>Cavendishia stenophylla</i>	
Costa Rica-Panama (CP)	<i>Cavendishia talamancensis</i>	
Costa Rica-Panama (CP)	<i>Celestus hylaius</i>	
Costa Rica-Panama (CP)	<i>Centropogon costaricae</i>	

Costa Rica-Panama (CP)	<i>Centropogon floricomus</i>	
Costa Rica-Panama (CP)	<i>Centropogon gutierrezii</i>	
Costa Rica-Panama (CP)	<i>Centropogon luteynii</i>	
Costa Rica-Panama (CP)	<i>Centropogon palmanus</i>	
Costa Rica-Panama (CP)	<i>Centropogon smithii</i>	
Costa Rica-Panama (CP)	<i>Centropogon talamancensis</i>	
Costa Rica-Panama (CP)	<i>Cephaelis dimorphandrioides</i>	
Costa Rica-Panama (CP)	<i>Cestrum donnell-smithii</i>	
Costa Rica-Panama (CP)	<i>Cestrum johnniegentrianum</i>	
Costa Rica-Panama (CP)	<i>Cestrum poasanum</i>	
Costa Rica-Panama (CP)	<i>Cestrum racemosum</i>	
Costa Rica-Panama (CP)	<i>Chaetolepis cufodontisii</i>	
Costa Rica-Panama (CP)	<i>Chaetura fumosa</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea brachyclada</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea crucensis</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea hodellii</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea palmeriana</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea robertii</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea rossteniorum</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea scheryi</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea stenocarpa</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea undulatifolia</i>	
Costa Rica-Panama (CP)	<i>Chamaedorea zamorae</i>	
Costa Rica-Panama (CP)	<i>Chamaepetes unicolor</i>	
Costa Rica-Panama (CP)	<i>Chamaeranthemum durandii</i>	
Costa Rica-Panama (CP)	<i>Chamaeranthemum tonduzii</i>	
Costa Rica-Panama (CP)	<i>Chimarrhis latifolia</i>	
Costa Rica-Panama (CP)	<i>Chlorophonia callophrys</i>	
Costa Rica-Panama (CP)	<i>Chlorospatha hammeliana</i>	
Costa Rica-Panama (CP)	<i>Chlorospingus pileatus</i>	
Costa Rica-Panama (CP)	<i>Chomelia venulosa</i>	
Costa Rica-Panama (CP)	<i>Chorigyne pterophylla</i>	
Costa Rica-Panama (CP)	<i>Chrysochlamys allenii</i>	
Costa Rica-Panama (CP)	<i>Chrysochlamys angustifolia</i>	
Costa Rica-Panama (CP)	<i>Chrysochlamys grandifolia</i>	
Costa Rica-Panama (CP)	<i>Chrysochlamys psychotriifolia</i>	
Costa Rica-Panama (CP)	<i>Chrysochlamys skutchii</i>	
Costa Rica-Panama (CP)	<i>Chusquea amistadensis</i>	
Costa Rica-Panama (CP)	<i>Chusquea pohlii</i>	
Costa Rica-Panama (CP)	<i>Chusquea scabra</i>	
Costa Rica-Panama (CP)	<i>Cinnamomum brenesii</i>	
Costa Rica-Panama (CP)	<i>Cissus osaensis</i>	
Costa Rica-Panama (CP)	<i>Citharexylum macradenium</i>	
Costa Rica-Panama (CP)	<i>Clethra consimilis</i>	
Costa Rica-Panama (CP)	<i>Clethra pyrogena</i>	
Costa Rica-Panama (CP)	<i>Clibadium sessile</i>	
Costa Rica-Panama (CP)	<i>Clidemia coloradensis</i>	
Costa Rica-Panama (CP)	<i>Clidemia folsomii</i>	

Costa Rica-Panama (CP)	<i>Clidemia fraterna</i>	
Costa Rica-Panama (CP)	<i>Clidemia globuliflora</i>	
Costa Rica-Panama (CP)	<i>Clidemia mortoniana</i>	
Costa Rica-Panama (CP)	<i>Clidemia rodriguezii</i>	
Costa Rica-Panama (CP)	<i>Clidemia subpeltata</i>	
Costa Rica-Panama (CP)	<i>Clidemia tenebrosa</i>	
Costa Rica-Panama (CP)	<i>Cobaea gracilis</i>	
Costa Rica-Panama (CP)	<i>Coccoloba ascendens</i>	
Costa Rica-Panama (CP)	<i>Coccoloba liportizii</i>	
Costa Rica-Panama (CP)	<i>Coccoloba porphyrostachys</i>	
Costa Rica-Panama (CP)	<i>Cochleanthes aromatica</i>	
Costa Rica-Panama (CP)	<i>Cojoba costaricensis</i>	
Costa Rica-Panama (CP)	<i>Columnea allenii</i>	
Costa Rica-Panama (CP)	<i>Columnea aurantia</i>	
Costa Rica-Panama (CP)	<i>Columnea flaccida</i>	
Costa Rica-Panama (CP)	<i>Columnea lepidocaula</i>	
Costa Rica-Panama (CP)	<i>Columnea microphylla</i>	
Costa Rica-Panama (CP)	<i>Columnea ornata</i>	
Costa Rica-Panama (CP)	<i>Columnea oxyphylla</i>	
Costa Rica-Panama (CP)	<i>Columnea praetexta</i>	
Costa Rica-Panama (CP)	<i>Columnea querceti</i>	
Costa Rica-Panama (CP)	<i>Columnea raymondii</i>	
Costa Rica-Panama (CP)	<i>Columnea rubra</i>	
Costa Rica-Panama (CP)	<i>Columnea segregata</i>	
Costa Rica-Panama (CP)	<i>Columnea serrata</i>	
Costa Rica-Panama (CP)	<i>Columnea tenuis</i>	
Costa Rica-Panama (CP)	<i>Combretum graciliflorum</i>	
Costa Rica-Panama (CP)	<i>Connarus vulcanicus</i>	
Costa Rica-Panama (CP)	<i>Conostegia bigibbosa</i>	
Costa Rica-Panama (CP)	<i>Conostegia macrantha</i>	
Costa Rica-Panama (CP)	<i>Conostegia muriculata</i>	
Costa Rica-Panama (CP)	<i>Conostegia rhodopetala</i>	
Costa Rica-Panama (CP)	<i>Contopus lugubris</i>	
Costa Rica-Panama (CP)	<i>Contopus ochraceus</i>	
Costa Rica-Panama (CP)	<i>Cordia liesneri</i>	
Costa Rica-Panama (CP)	<i>Cosmibuena valerii</i>	
Costa Rica-Panama (CP)	<i>Costus barbatus</i>	
Costa Rica-Panama (CP)	<i>Costus montanus</i>	
Costa Rica-Panama (CP)	<i>Costus nitidus</i>	
Costa Rica-Panama (CP)	<i>Costus ricus</i>	
Costa Rica-Panama (CP)	<i>Costus stenophyllus</i>	
Costa Rica-Panama (CP)	<i>Costus wilsonii</i>	
Costa Rica-Panama (CP)	<i>Cotinga ridgwayi</i>	
Costa Rica-Panama (CP)	<i>Coussapoa macerrima</i>	
Costa Rica-Panama (CP)	<i>Craugastor andi</i>	
Costa Rica-Panama (CP)	<i>Craugastor angelicus</i>	
Costa Rica-Panama (CP)	<i>Craugastor escoces</i>	
Costa Rica-Panama (CP)	<i>Craugastor melanostictus</i>	

Costa Rica-Panama (CP)	<i>Craugastor persimilis</i>	
Costa Rica-Panama (CP)	<i>Craugastor podiciferus</i>	
Costa Rica-Panama (CP)	<i>Craugastor punctariolus</i>	
Costa Rica-Panama (CP)	<i>Craugastor stejnegerianus</i>	
Costa Rica-Panama (CP)	<i>Craugastor underwoodi</i>	
Costa Rica-Panama (CP)	<i>Creмосperma maculatum</i>	
Costa Rica-Panama (CP)	<i>Crisantophis nevermanni</i>	
Costa Rica-Panama (CP)	<i>Critonia laurifolia</i>	
Costa Rica-Panama (CP)	<i>Crossoglossa blephariglottis</i>	
Costa Rica-Panama (CP)	<i>Crossopetalum enervium</i>	
Costa Rica-Panama (CP)	<i>Crossopetalum gomezii</i>	
Costa Rica-Panama (CP)	<i>Croton jimenezii</i>	
Costa Rica-Panama (CP)	<i>Croton megistocarpus</i>	
Costa Rica-Panama (CP)	<i>Croton tenuicaudatus</i>	
Costa Rica-Panama (CP)	<i>Cryosophila grayumii</i>	
Costa Rica-Panama (CP)	<i>Cryosophila guagara</i>	
Costa Rica-Panama (CP)	<i>Cryptocentrum calcaratum</i>	
Costa Rica-Panama (CP)	<i>Cryptocentrum gracillimum</i>	
Costa Rica-Panama (CP)	<i>Cupania largifolia</i>	
Costa Rica-Panama (CP)	<i>Cyanolyca argentigula</i>	
Costa Rica-Panama (CP)	<i>Cymbopetalum rugulosum</i>	
Costa Rica-Panama (CP)	<i>Cyrtchiloides panduriformis</i>	
Costa Rica-Panama (CP)	<i>Daiotyla albicans</i>	
Costa Rica-Panama (CP)	<i>Dalbergia tilarana</i>	
Costa Rica-Panama (CP)	<i>Dalechampia arenalensis</i>	
Costa Rica-Panama (CP)	<i>Dalechampia osana</i>	
Costa Rica-Panama (CP)	<i>Daphnopsis costaricensis</i>	
Costa Rica-Panama (CP)	<i>Daphnopsis hammelii</i>	
Costa Rica-Panama (CP)	<i>Decachaeta thieleana</i>	
Costa Rica-Panama (CP)	<i>Deherainia matudae</i>	
Costa Rica-Panama (CP)	<i>Dendropanax latilobus</i>	
Costa Rica-Panama (CP)	<i>Dendropanax praestans</i>	
Costa Rica-Panama (CP)	<i>Dendropanax ravenii</i>	
Costa Rica-Panama (CP)	<i>Deprea sylvarum</i>	
Costa Rica-Panama (CP)	<i>Dermophis parviceps</i>	
Costa Rica-Panama (CP)	<i>Desfontainia splendens</i>	
Costa Rica-Panama (CP)	<i>Desmoncus stans</i>	
Costa Rica-Panama (CP)	<i>Desmopsis heteropetala</i>	
Costa Rica-Panama (CP)	<i>Desmopsis oerstedii</i>	
Costa Rica-Panama (CP)	<i>Desmopsis verrucipes</i>	
Costa Rica-Panama (CP)	<i>Diasporus hylaeiformis</i>	
Costa Rica-Panama (CP)	<i>Dicella aciculifera</i>	
Costa Rica-Panama (CP)	<i>Dichaea costaricensis</i>	
Costa Rica-Panama (CP)	<i>Dichaea cryptarrhena</i>	
Costa Rica-Panama (CP)	<i>Dichaea eligulata</i>	
Costa Rica-Panama (CP)	<i>Dichaea obovatipetala</i>	
Costa Rica-Panama (CP)	<i>Dichaea poicillantha</i>	
Costa Rica-Panama (CP)	<i>Dichaea sarapiquinsis</i>	

Costa Rica-Panama (CP)	<i>Dichapetalum costaricense</i>	
Costa Rica-Panama (CP)	<i>Dichapetalum hammelii</i>	
Costa Rica-Panama (CP)	<i>Dichapetalum reliquum</i>	
Costa Rica-Panama (CP)	<i>Dicliptera pallida</i>	
Costa Rica-Panama (CP)	<i>Dicliptera skutchii</i>	
Costa Rica-Panama (CP)	<i>Dicranopygium tatica</i>	
Costa Rica-Panama (CP)	<i>Didonica pendula</i>	
Costa Rica-Panama (CP)	<i>Dieffenbachia aurantiaca</i>	
Costa Rica-Panama (CP)	<i>Dieffenbachia burgeri</i>	
Costa Rica-Panama (CP)	<i>Dieffenbachia fortunensis</i>	
Costa Rica-Panama (CP)	<i>Dieffenbachia horichii</i>	
Costa Rica-Panama (CP)	<i>Diglossa plumbea</i>	
Costa Rica-Panama (CP)	<i>Dioscorea laevis</i>	
Costa Rica-Panama (CP)	<i>Dioscorea natalia</i>	
Costa Rica-Panama (CP)	<i>Diospyros hartmanniana</i>	
Costa Rica-Panama (CP)	<i>Diospyros panamense</i>	
Costa Rica-Panama (CP)	<i>Diplostegium costaricense</i>	
Costa Rica-Panama (CP)	<i>Disterigma trimerum</i>	
Costa Rica-Panama (CP)	<i>Dracontium pittieri</i>	
Costa Rica-Panama (CP)	<i>Drymonia parviflora</i>	
Costa Rica-Panama (CP)	<i>Duellmanohyla rufiocularis</i>	
Costa Rica-Panama (CP)	<i>Duellmanohyla uranochroa</i>	
Costa Rica-Panama (CP)	<i>Duroia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Echinosepala pan</i>	
Costa Rica-Panama (CP)	<i>Echinosepala sempergemmata</i>	
Costa Rica-Panama (CP)	<i>Elaeagia glossostipula</i>	
Costa Rica-Panama (CP)	<i>Elleanthus jimenezii</i>	
Costa Rica-Panama (CP)	<i>Elleanthus wercklei</i>	
Costa Rica-Panama (CP)	<i>Elvira chionura</i>	
Costa Rica-Panama (CP)	<i>Empidonax atriceps</i>	
Costa Rica-Panama (CP)	<i>Epidendrum anastasioi</i>	
Costa Rica-Panama (CP)	<i>Epidendrum anoglossum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum belloi</i>	
Costa Rica-Panama (CP)	<i>Epidendrum bisulcatum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum caluerorum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum confertum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum endresii</i>	
Costa Rica-Panama (CP)	<i>Epidendrum goniorhachis</i>	
Costa Rica-Panama (CP)	<i>Epidendrum haberi</i>	
Costa Rica-Panama (CP)	<i>Epidendrum horichii</i>	
Costa Rica-Panama (CP)	<i>Epidendrum infundibulum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum intermixtum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum lancilabium</i>	
Costa Rica-Panama (CP)	<i>Epidendrum lankesteri</i>	
Costa Rica-Panama (CP)	<i>Epidendrum longibracteatum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum mirabile</i>	
Costa Rica-Panama (CP)	<i>Epidendrum muscicola</i>	
Costa Rica-Panama (CP)	<i>Epidendrum odontochilum</i>	

Costa Rica-Panama (CP)	<i>Epidendrum paranthicum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum pentadactylum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum phyllocharis</i>	
Costa Rica-Panama (CP)	<i>Epidendrum piliferum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum pinniferum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum platystigma</i>	
Costa Rica-Panama (CP)	<i>Epidendrum pleurothalloides</i>	
Costa Rica-Panama (CP)	<i>Epidendrum powellii</i>	
Costa Rica-Panama (CP)	<i>Epidendrum pseudoschumannianum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum pumilum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum ramonianum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum stolidium</i>	
Costa Rica-Panama (CP)	<i>Epidendrum storkii</i>	
Costa Rica-Panama (CP)	<i>Epidendrum summerhayesii</i>	
Costa Rica-Panama (CP)	<i>Epidendrum tetraceros</i>	
Costa Rica-Panama (CP)	<i>Epidendrum vicentinum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum volutum</i>	
Costa Rica-Panama (CP)	<i>Epidendrum vulgoamparoanum</i>	
Costa Rica-Panama (CP)	<i>Epiphyllum cartagense</i>	
Costa Rica-Panama (CP)	<i>Eriocaulon panamense</i>	
Costa Rica-Panama (CP)	<i>Erythrochiton gymnanthus</i>	
Costa Rica-Panama (CP)	<i>Escallonia myrtilloides</i>	
Costa Rica-Panama (CP)	<i>Eschweilera biflora</i>	
Costa Rica-Panama (CP)	<i>Eugenia basilaris</i>	
Costa Rica-Panama (CP)	<i>Eugenia belloi</i>	
Costa Rica-Panama (CP)	<i>Eugenia cararensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia cartagensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia cerrocacaoensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia chavarriae</i>	
Costa Rica-Panama (CP)	<i>Eugenia earthiana</i>	
Costa Rica-Panama (CP)	<i>Eugenia gomezii</i>	
Costa Rica-Panama (CP)	<i>Eugenia grayumii</i>	
Costa Rica-Panama (CP)	<i>Eugenia haberi</i>	
Costa Rica-Panama (CP)	<i>Eugenia herrerae</i>	
Costa Rica-Panama (CP)	<i>Eugenia lithosperma</i>	
Costa Rica-Panama (CP)	<i>Eugenia monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia paloverdensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia riosae</i>	
Costa Rica-Panama (CP)	<i>Eugenia sarapiquensis</i>	
Costa Rica-Panama (CP)	<i>Eugenia selvana</i>	
Costa Rica-Panama (CP)	<i>Eugenia teresae</i>	
Costa Rica-Panama (CP)	<i>Eugenia tilarana</i>	
Costa Rica-Panama (CP)	<i>Eugenia truncata</i>	
Costa Rica-Panama (CP)	<i>Eugenia zuchowskiae</i>	
Costa Rica-Panama (CP)	<i>Eupherusa nigriventris</i>	
Costa Rica-Panama (CP)	<i>Euphonia imitans</i>	
Costa Rica-Panama (CP)	<i>Euphorbia hoffmanniana</i>	
Costa Rica-Panama (CP)	<i>Faramea scalaris</i>	

Costa Rica-Panama (CP)	<i>Ficus rensoniana</i>	
Costa Rica-Panama (CP)	<i>Ficus romeroi</i>	
Costa Rica-Panama (CP)	<i>Firmiana pallens</i>	
Costa Rica-Panama (CP)	<i>Fleischmannia hymenophylla</i>	
Costa Rica-Panama (CP)	<i>Fleischmannia sideritides</i>	
Costa Rica-Panama (CP)	<i>Fuchsia jimenezii</i>	
Costa Rica-Panama (CP)	<i>Gasteranthus imbricans</i>	
Costa Rica-Panama (CP)	<i>Gasteranthus osaensis</i>	
Costa Rica-Panama (CP)	<i>Gaultheria chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Geonoma hugonis</i>	
Costa Rica-Panama (CP)	<i>Geonoma monospatha</i>	
Costa Rica-Panama (CP)	<i>Geonoma mooreana</i>	
Costa Rica-Panama (CP)	<i>Geophis ruthveni</i>	
Costa Rica-Panama (CP)	<i>Geophis zeledoni</i>	
Costa Rica-Panama (CP)	<i>Geotrygon chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Geranium costaricense</i>	
Costa Rica-Panama (CP)	<i>Gloeospermum pauciflorum</i>	
Costa Rica-Panama (CP)	<i>Gongora armeniaca</i>	
Costa Rica-Panama (CP)	<i>Gongora horichiana</i>	
Costa Rica-Panama (CP)	<i>Gonocalyx almedae</i>	
Costa Rica-Panama (CP)	<i>Gonocalyx pterocarpus</i>	
Costa Rica-Panama (CP)	<i>Gonolobus chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Gonolobus fuscoviolaceus</i>	
Costa Rica-Panama (CP)	<i>Gonolobus variabilis</i>	
Costa Rica-Panama (CP)	<i>Gonzalagunia brenesii</i>	
Costa Rica-Panama (CP)	<i>Gonzalagunia kallunkii</i>	
Costa Rica-Panama (CP)	<i>Gonzalagunia osaensis</i>	
Costa Rica-Panama (CP)	<i>Gonzalagunia stenostachya</i>	
Costa Rica-Panama (CP)	<i>Greigia sylvicola</i>	
Costa Rica-Panama (CP)	<i>Guarea adenophylla</i>	
Costa Rica-Panama (CP)	<i>Guarea arcuata</i>	
Costa Rica-Panama (CP)	<i>Guarea constricta</i>	
Costa Rica-Panama (CP)	<i>Guarea macrocalyx</i>	
Costa Rica-Panama (CP)	<i>Guarea montana</i>	
Costa Rica-Panama (CP)	<i>Guarea zarceroensis</i>	
Costa Rica-Panama (CP)	<i>Guatteria chiriquiensis</i>	
Costa Rica-Panama (CP)	<i>Guatteria costaricensis</i>	
Costa Rica-Panama (CP)	<i>Guatteria pudica</i>	
Costa Rica-Panama (CP)	<i>Guatteria slateri</i>	
Costa Rica-Panama (CP)	<i>Guatteria talamancana</i>	
Costa Rica-Panama (CP)	<i>Guatteria zamorae</i>	
Costa Rica-Panama (CP)	<i>Guettarda brenesii</i>	
Costa Rica-Panama (CP)	<i>Gunnera talamancana</i>	
Costa Rica-Panama (CP)	<i>Gustavia brachycarpa</i>	
Costa Rica-Panama (CP)	<i>Guzmania blassii</i>	
Costa Rica-Panama (CP)	<i>Guzmania herrerae</i>	
Costa Rica-Panama (CP)	<i>Habenaria aviculoides</i>	
Costa Rica-Panama (CP)	<i>Habenaria costaricensis</i>	

Costa Rica-Panama (CP)	<i>Habenaria lankesteri</i>	
Costa Rica-Panama (CP)	<i>Habenaria mediocris</i>	
Costa Rica-Panama (CP)	<i>Halenia euryphylla</i>	
Costa Rica-Panama (CP)	<i>Halenia rhyacophila</i>	
Costa Rica-Panama (CP)	<i>Handroanthus ochraceus</i>	
Costa Rica-Panama (CP)	<i>Hansteinia stricta</i>	
Costa Rica-Panama (CP)	<i>Hauya lucida</i>	
Costa Rica-Panama (CP)	<i>Hebeclinium hygrohylaemum</i>	
Costa Rica-Panama (CP)	<i>Hedyosmum burgerianum</i>	
Costa Rica-Panama (CP)	<i>Hedyosmum correanum</i>	
Costa Rica-Panama (CP)	<i>Hedyosmum costaricense</i>	
Costa Rica-Panama (CP)	<i>Heliconia barryana</i>	
Costa Rica-Panama (CP)	<i>Heliconia clinophila</i>	
Costa Rica-Panama (CP)	<i>Heliconia cucullata</i>	
Costa Rica-Panama (CP)	<i>Heliconia danielsiana</i>	
Costa Rica-Panama (CP)	<i>Heliconia faunorum</i>	
Costa Rica-Panama (CP)	<i>Heliconia gracilis</i>	
Costa Rica-Panama (CP)	<i>Heliconia ignescens</i>	
Costa Rica-Panama (CP)	<i>Heliconia lankesteri</i>	
Costa Rica-Panama (CP)	<i>Heliconia lophocarpa</i>	
Costa Rica-Panama (CP)	<i>Heliconia monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Heliconia nubigena</i>	
Costa Rica-Panama (CP)	<i>Heliconia nutans</i>	
Costa Rica-Panama (CP)	<i>Heliconia stilesii</i>	
Costa Rica-Panama (CP)	<i>Heliconia talamancana</i>	
Costa Rica-Panama (CP)	<i>Heliconia wilsonii</i>	
Costa Rica-Panama (CP)	<i>Herpetacanthus stenophyllus</i>	
Costa Rica-Panama (CP)	<i>Heteropterys minutiflora</i>	
Costa Rica-Panama (CP)	<i>Hibiscus cocleanus</i>	
Costa Rica-Panama (CP)	<i>Hillia allenii</i>	
Costa Rica-Panama (CP)	<i>Hillia longifilamentosa</i>	
Costa Rica-Panama (CP)	<i>Hiraea haberi</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia amplexifolia</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia arborescens</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia areolata</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia asclepiadea</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia dwyeri</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia fortunensis</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia inamoena</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia leucocarpa</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia pustulata</i>	
Costa Rica-Panama (CP)	<i>Hoffmannia valerii</i>	
Costa Rica-Panama (CP)	<i>Huberodendron allenii</i>	
Costa Rica-Panama (CP)	<i>Hyalinobatrachium talamancae</i>	
Costa Rica-Panama (CP)	<i>Hylocereus calcaratus</i>	
Costa Rica-Panama (CP)	<i>Hylomantis lemur</i>	
Costa Rica-Panama (CP)	<i>Hymenandra pittieri</i>	
Costa Rica-Panama (CP)	<i>Hymenandra sordida</i>	

Costa Rica-Panama (CP)	<i>Hymenandra squamata</i>	
Costa Rica-Panama (CP)	<i>Hypericum irazuense</i>	
Costa Rica-Panama (CP)	<i>Ilex carpintera</i>	
Costa Rica-Panama (CP)	<i>Ilex hemiepiphytica</i>	
Costa Rica-Panama (CP)	<i>Ilex stellata</i>	
Costa Rica-Panama (CP)	<i>Incilius melanochlorus</i>	
Costa Rica-Panama (CP)	<i>Inga bracteifera</i>	
Costa Rica-Panama (CP)	<i>Inga golfodulcensis</i>	
Costa Rica-Panama (CP)	<i>Inga herrerae</i>	
Costa Rica-Panama (CP)	<i>Inga litoralis</i>	
Costa Rica-Panama (CP)	<i>Inga longispica</i>	
Costa Rica-Panama (CP)	<i>Inga skutchii</i>	
Costa Rica-Panama (CP)	<i>Ipomoea chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Isthmohyla angustilineata</i>	
Costa Rica-Panama (CP)	<i>Isthmohyla lancasteri</i>	
Costa Rica-Panama (CP)	<i>Isthmohyla pseudopuma</i>	
Costa Rica-Panama (CP)	<i>Isthmohyla rivularis</i>	
Costa Rica-Panama (CP)	<i>Isthmohyla tica</i>	
Costa Rica-Panama (CP)	<i>Jacquiella aporophylla</i>	
Costa Rica-Panama (CP)	<i>Jacquiella standleyi</i>	
Costa Rica-Panama (CP)	<i>Jaltomata darciana</i>	
Costa Rica-Panama (CP)	<i>Jessee cooperi</i>	
Costa Rica-Panama (CP)	<i>Justicia allenii</i>	
Costa Rica-Panama (CP)	<i>Justicia arborescens</i>	
Costa Rica-Panama (CP)	<i>Justicia aurantiimutata</i>	
Costa Rica-Panama (CP)	<i>Justicia brenesii</i>	
Costa Rica-Panama (CP)	<i>Justicia costaricana</i>	
Costa Rica-Panama (CP)	<i>Justicia deaurata</i>	
Costa Rica-Panama (CP)	<i>Justicia fortunensis</i>	
Costa Rica-Panama (CP)	<i>Justicia peninsularis</i>	
Costa Rica-Panama (CP)	<i>Justicia pittieri</i>	
Costa Rica-Panama (CP)	<i>Justicia sarapiquensis</i>	
Costa Rica-Panama (CP)	<i>Justicia skutchii</i>	
Costa Rica-Panama (CP)	<i>Justicia tonduzii</i>	
Costa Rica-Panama (CP)	<i>Justicia valerii</i>	
Costa Rica-Panama (CP)	<i>Klarobelia stipitata</i>	
Costa Rica-Panama (CP)	<i>Koanophyllon hylonoma</i>	
Costa Rica-Panama (CP)	<i>Koanophyllon hylonomum</i>	
Costa Rica-Panama (CP)	<i>Koanophyllon panamensis</i>	
Costa Rica-Panama (CP)	<i>Kohleria allenii</i>	
Costa Rica-Panama (CP)	<i>Krugiodendron ferreum</i>	
Costa Rica-Panama (CP)	<i>Lachemilla venusta</i>	
Costa Rica-Panama (CP)	<i>Lacmellea zamorae</i>	
Costa Rica-Panama (CP)	<i>Ladenbergia brenesii</i>	
Costa Rica-Panama (CP)	<i>Lampornis castaneiventris</i>	
Costa Rica-Panama (CP)	<i>Lampornis hemileucus</i>	
Costa Rica-Panama (CP)	<i>Lepanthes acoridilabia</i>	
Costa Rica-Panama (CP)	<i>Lepanthes candida</i>	

Costa Rica-Panama (CP)	<i>Lepanthes chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Lepanthes ciliisepala</i>	
Costa Rica-Panama (CP)	<i>Lepanthes elata</i>	
Costa Rica-Panama (CP)	<i>Lepanthes horichii</i>	
Costa Rica-Panama (CP)	<i>Lepanthes horrida</i>	
Costa Rica-Panama (CP)	<i>Lepanthes inornata</i>	
Costa Rica-Panama (CP)	<i>Lepanthes jimenezii</i>	
Costa Rica-Panama (CP)	<i>Lepanthes subdimidiata</i>	
Costa Rica-Panama (CP)	<i>Lepanthes tipulifera</i>	
Costa Rica-Panama (CP)	<i>Lepidophyma reticulatum</i>	
Costa Rica-Panama (CP)	<i>Licania costaricensis</i>	
Costa Rica-Panama (CP)	<i>Licania kallunkii</i>	
Costa Rica-Panama (CP)	<i>Licania operculipetala</i>	
Costa Rica-Panama (CP)	<i>Licania riverae</i>	
Costa Rica-Panama (CP)	<i>Licaria brenesii</i>	
Costa Rica-Panama (CP)	<i>Licaria leonis</i>	
Costa Rica-Panama (CP)	<i>Licaria pergamentacea</i>	
Costa Rica-Panama (CP)	<i>Lippia cardiostegia</i>	
Costa Rica-Panama (CP)	<i>Lippia macrophylla</i>	
Costa Rica-Panama (CP)	<i>Lippia umbellata</i>	
Costa Rica-Panama (CP)	<i>Lisianthus peduncularis</i>	
Costa Rica-Panama (CP)	<i>Lithobates taylori</i>	
Costa Rica-Panama (CP)	<i>Lithobates vibicarius</i>	
Costa Rica-Panama (CP)	<i>Lockhartia dipleura</i>	
Costa Rica-Panama (CP)	<i>Lonchocarpus calcaratus</i>	
Costa Rica-Panama (CP)	<i>Lonchocarpus costaricensis</i>	
Costa Rica-Panama (CP)	<i>Lonchocarpus haberi</i>	
Costa Rica-Panama (CP)	<i>Lonchocarpus montevidis</i>	
Costa Rica-Panama (CP)	<i>Lophanthera hammelii</i>	
Costa Rica-Panama (CP)	<i>Lophornis adorabilis</i>	
Costa Rica-Panama (CP)	<i>Lycaste brevispatha</i>	
Costa Rica-Panama (CP)	<i>Lycaste leucantha</i>	
Costa Rica-Panama (CP)	<i>Lycianthes furcatistellata</i>	
Costa Rica-Panama (CP)	<i>Lycianthes grandifrons</i>	
Costa Rica-Panama (CP)	<i>Lycianthes hawkesiana</i>	
Costa Rica-Panama (CP)	<i>Lycianthes howardiana</i>	
Costa Rica-Panama (CP)	<i>Lycianthes luteynii</i>	
Costa Rica-Panama (CP)	<i>Lycianthes storkii</i>	
Costa Rica-Panama (CP)	<i>Lycoseris grandis</i>	
Costa Rica-Panama (CP)	<i>Macleania rupestris</i>	
Costa Rica-Panama (CP)	<i>Macrocarpaea subcaudata</i>	
Costa Rica-Panama (CP)	<i>Macrocarpaea valerii</i>	
Costa Rica-Panama (CP)	<i>Macroclinium generalense</i>	
Costa Rica-Panama (CP)	<i>Malaxis simillima</i>	
Costa Rica-Panama (CP)	<i>Malaxis woodsonii</i>	
Costa Rica-Panama (CP)	<i>Manettia longicalycina</i>	
Costa Rica-Panama (CP)	<i>Margarornis rubiginosus</i>	
Costa Rica-Panama (CP)	<i>Marlierea mesoamericana</i>	

Costa Rica-Panama (CP)	<i>Masdevallia attenuata</i>	
Costa Rica-Panama (CP)	<i>Masdevallia calura</i>	
Costa Rica-Panama (CP)	<i>Masdevallia cupularis</i>	
Costa Rica-Panama (CP)	<i>Masdevallia tonduzii</i>	
Costa Rica-Panama (CP)	<i>Matayba ingifolia</i>	
Costa Rica-Panama (CP)	<i>Matelea corrugata</i>	
Costa Rica-Panama (CP)	<i>Matelea costaricensis</i>	
Costa Rica-Panama (CP)	<i>Matelea haberi</i>	
Costa Rica-Panama (CP)	<i>Matelea tinctoria</i>	
Costa Rica-Panama (CP)	<i>Matisia tinamastiana</i>	
Costa Rica-Panama (CP)	<i>Mauria heterophylla</i>	
Costa Rica-Panama (CP)	<i>Maxillaria longiloba</i>	
Costa Rica-Panama (CP)	<i>Maxillariella appendiculoides</i>	
Costa Rica-Panama (CP)	<i>Maxillariella costaricensis</i>	
Costa Rica-Panama (CP)	<i>Maxillariella linearifolia</i>	
Costa Rica-Panama (CP)	<i>Maytenus recondita</i>	
Costa Rica-Panama (CP)	<i>Maytenus woodsonii</i>	
Costa Rica-Panama (CP)	<i>Melanerpes chrysauchen</i>	
Costa Rica-Panama (CP)	<i>Meliosma chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Meliosma clandestina</i>	
Costa Rica-Panama (CP)	<i>Meliosma depressiva</i>	
Costa Rica-Panama (CP)	<i>Meliosma grandiflora</i>	
Costa Rica-Panama (CP)	<i>Meliosma subcordata</i>	
Costa Rica-Panama (CP)	<i>Meliosma vernicosa</i>	
Costa Rica-Panama (CP)	<i>Mendoncia costaricana</i>	
Costa Rica-Panama (CP)	<i>Meriania grandiflora</i>	
Costa Rica-Panama (CP)	<i>Meriania odorata</i>	
Costa Rica-Panama (CP)	<i>Meriania panamensis</i>	
Costa Rica-Panama (CP)	<i>Mesaspis monticola</i>	
Costa Rica-Panama (CP)	<i>Metastelma liesnerianum</i>	
Costa Rica-Panama (CP)	<i>Miconia aguilarii</i>	
Costa Rica-Panama (CP)	<i>Miconia amplinodis</i>	
Costa Rica-Panama (CP)	<i>Miconia biolleyana</i>	
Costa Rica-Panama (CP)	<i>Miconia biperulifera</i>	
Costa Rica-Panama (CP)	<i>Miconia chiriquiensis</i>	
Costa Rica-Panama (CP)	<i>Miconia commutata</i>	
Costa Rica-Panama (CP)	<i>Miconia concinna</i>	
Costa Rica-Panama (CP)	<i>Miconia cremadena</i>	
Costa Rica-Panama (CP)	<i>Miconia dissita</i>	
Costa Rica-Panama (CP)	<i>Miconia dissitiflora</i>	
Costa Rica-Panama (CP)	<i>Miconia friedmaniorum</i>	
Costa Rica-Panama (CP)	<i>Miconia grandidentata</i>	
Costa Rica-Panama (CP)	<i>Miconia incurva</i>	
Costa Rica-Panama (CP)	<i>Miconia iteophylla</i>	
Costa Rica-Panama (CP)	<i>Miconia melanotricha</i>	
Costa Rica-Panama (CP)	<i>Miconia osaensis</i>	
Costa Rica-Panama (CP)	<i>Miconia pittieri</i>	
Costa Rica-Panama (CP)	<i>Miconia schnellii</i>	

Costa Rica-Panama (CP)	<i>Microchilus calophyllus</i>	
Costa Rica-Panama (CP)	<i>Microchilus epiphyticus</i>	
Costa Rica-Panama (CP)	<i>Microchilus maasii</i>	
Costa Rica-Panama (CP)	<i>Microchilus whitefoordiae</i>	
Costa Rica-Panama (CP)	<i>Mikania castroi</i>	
Costa Rica-Panama (CP)	<i>Mikania riparia</i>	
Costa Rica-Panama (CP)	<i>Mimosa guanacastensis</i>	
Costa Rica-Panama (CP)	<i>Monnina costaricensis</i>	
Costa Rica-Panama (CP)	<i>Monnina crepinii</i>	
Costa Rica-Panama (CP)	<i>Monnina deppei</i>	
Costa Rica-Panama (CP)	<i>Monnina pittieri</i>	
Costa Rica-Panama (CP)	<i>Monnina saprogena</i>	
Costa Rica-Panama (CP)	<i>Monnina sylvatica</i>	
Costa Rica-Panama (CP)	<i>Monnina sylvicola</i>	
Costa Rica-Panama (CP)	<i>Monnina xalapensis</i>	
Costa Rica-Panama (CP)	<i>Monochaetum compactum</i>	
Costa Rica-Panama (CP)	<i>Monochaetum cordatum</i>	
Costa Rica-Panama (CP)	<i>Monochaetum exaltatum</i>	
Costa Rica-Panama (CP)	<i>Monochaetum neglectum</i>	
Costa Rica-Panama (CP)	<i>Monochaetum trichophyllum</i>	
Costa Rica-Panama (CP)	<i>Monochaetum vulcanicum</i>	
Costa Rica-Panama (CP)	<i>Monolena grandiloba</i>	
Costa Rica-Panama (CP)	<i>Monolena panamensis</i>	
Costa Rica-Panama (CP)	<i>Monolena trichopoda</i>	
Costa Rica-Panama (CP)	<i>Monopyle panamensis</i>	
Costa Rica-Panama (CP)	<i>Monstera buseyi</i>	
Costa Rica-Panama (CP)	<i>Monstera lentii</i>	
Costa Rica-Panama (CP)	<i>Monstera luteynii</i>	
Costa Rica-Panama (CP)	<i>Monstera membranacea</i>	
Costa Rica-Panama (CP)	<i>Monstera molinae</i>	
Costa Rica-Panama (CP)	<i>Morella phanerodonta</i>	
Costa Rica-Panama (CP)	<i>Mormodes colossus</i>	
Costa Rica-Panama (CP)	<i>Mortoniodendron apetalum</i>	
Costa Rica-Panama (CP)	<i>Mortoniodendron cauliflorum</i>	
Costa Rica-Panama (CP)	<i>Mortoniodendron longipedunculatum</i>	
Costa Rica-Panama (CP)	<i>Mortoniodendron moralesii</i>	
Costa Rica-Panama (CP)	<i>Mosannonna costaricensis</i>	
Costa Rica-Panama (CP)	<i>Mouriri osaensis</i>	
Costa Rica-Panama (CP)	<i>Moussonia strigosa</i>	
Costa Rica-Panama (CP)	<i>Munnozia wilburii</i>	
Costa Rica-Panama (CP)	<i>Myadestes melanops</i>	
Costa Rica-Panama (CP)	<i>Myioborus torquatus</i>	
Costa Rica-Panama (CP)	<i>Myiodynastes hemichrysus</i>	
Costa Rica-Panama (CP)	<i>Myrcianthes storkii</i>	
Costa Rica-Panama (CP)	<i>Myrrhidendron chirripoense</i>	
Costa Rica-Panama (CP)	<i>Myrrhidendron maxonii</i>	
Costa Rica-Panama (CP)	<i>Nasa speciosa</i>	
Costa Rica-Panama (CP)	<i>Nautilocalyx biserrulatus</i>	

Costa Rica-Panama (CP)	<i>Nectandra cufodontisii</i>	
Costa Rica-Panama (CP)	<i>Nectandra ramonensis</i>	
Costa Rica-Panama (CP)	<i>Nectandra smithii</i>	
Costa Rica-Panama (CP)	<i>Neea psychotrioides</i>	
Costa Rica-Panama (CP)	<i>Neomirandea arthodes</i>	
Costa Rica-Panama (CP)	<i>Neomirandea arthrodes</i>	
Costa Rica-Panama (CP)	<i>Neomirandea carnosa</i>	
Costa Rica-Panama (CP)	<i>Neomirandea folsomiana</i>	
Costa Rica-Panama (CP)	<i>Neriacanthus grandiflorus</i>	
Costa Rica-Panama (CP)	<i>Ninia psephota</i>	
Costa Rica-Panama (CP)	<i>Notopleura maxonii</i>	
Costa Rica-Panama (CP)	<i>Notopleura nepokroeffiae</i>	
Costa Rica-Panama (CP)	<i>Nyssa talamancana</i>	
Costa Rica-Panama (CP)	<i>Ocotea brenesii</i>	
Costa Rica-Panama (CP)	<i>Ocotea darcyi</i>	
Costa Rica-Panama (CP)	<i>Ocotea gordonii</i>	
Costa Rica-Panama (CP)	<i>Ocotea haberi</i>	
Costa Rica-Panama (CP)	<i>Ocotea holdridgeiana</i>	
Costa Rica-Panama (CP)	<i>Ocotea mollicella</i>	
Costa Rica-Panama (CP)	<i>Ocotea monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Ocotea multiflora</i>	
Costa Rica-Panama (CP)	<i>Ocotea rivularis</i>	
Costa Rica-Panama (CP)	<i>Ocotea rufescens</i>	
Costa Rica-Panama (CP)	<i>Ocotea valerioides</i>	
Costa Rica-Panama (CP)	<i>Ocotea veraguensis</i>	
Costa Rica-Panama (CP)	<i>Odontophorus leucolaemus</i>	
Costa Rica-Panama (CP)	<i>Oedipina alfaroi</i>	
Costa Rica-Panama (CP)	<i>Oedipina gracilis</i>	
Costa Rica-Panama (CP)	<i>Oedipina poelzi</i>	
Costa Rica-Panama (CP)	<i>Oedipina pseudouniformis</i>	
Costa Rica-Panama (CP)	<i>Oedipina uniformis</i>	
Costa Rica-Panama (CP)	<i>Oncidium allenii</i>	
Costa Rica-Panama (CP)	<i>Oncidium brownii</i>	
Costa Rica-Panama (CP)	<i>Oncidium bryolophotum</i>	
Costa Rica-Panama (CP)	<i>Oncidium cariniferum</i>	
Costa Rica-Panama (CP)	<i>Oncidium luteum</i>	
Costa Rica-Panama (CP)	<i>Oncidium macrobulbon</i>	
Costa Rica-Panama (CP)	<i>Oncidium stenobulbon</i>	
Costa Rica-Panama (CP)	<i>Oreomunnea pterocarpa</i>	
Costa Rica-Panama (CP)	<i>Oreopanax compactus</i>	
Costa Rica-Panama (CP)	<i>Oreopanax costaricensis</i>	
Costa Rica-Panama (CP)	<i>Oreopanax donnell-smithii</i>	
Costa Rica-Panama (CP)	<i>Oreopanax oerstedianus</i>	
Costa Rica-Panama (CP)	<i>Oreopanax striatus</i>	
Costa Rica-Panama (CP)	<i>Oreopanax superoerstedianus</i>	
Costa Rica-Panama (CP)	<i>Oreothlypis gutturalis</i>	
Costa Rica-Panama (CP)	<i>Ornithocephalus cochleariformis</i>	
Costa Rica-Panama (CP)	<i>Orthaea panamensis</i>	

Costa Rica-Panama (CP)	<i>Orthosia glaberrima</i>	
Costa Rica-Panama (CP)	<i>Ouratea osaensis</i>	
Costa Rica-Panama (CP)	<i>Ouratea rinconensis</i>	
Costa Rica-Panama (CP)	<i>Ouratea stenobasis</i>	
Costa Rica-Panama (CP)	<i>Paepalanthus costaricensis</i>	
Costa Rica-Panama (CP)	<i>Palicourea alajuelensis</i>	
Costa Rica-Panama (CP)	<i>Palicourea beachiana</i>	
Costa Rica-Panama (CP)	<i>Palicourea bella</i>	
Costa Rica-Panama (CP)	<i>Palicourea bellula</i>	
Costa Rica-Panama (CP)	<i>Palicourea chiriquina</i>	
Costa Rica-Panama (CP)	<i>Palicourea grandifruca</i>	
Costa Rica-Panama (CP)	<i>Palicourea hammelii</i>	
Costa Rica-Panama (CP)	<i>Palicourea lancifera</i>	
Costa Rica-Panama (CP)	<i>Palicourea macrocalyx</i>	
Costa Rica-Panama (CP)	<i>Palicourea montivaga</i>	
Costa Rica-Panama (CP)	<i>Palicourea pauciflora</i>	
Costa Rica-Panama (CP)	<i>Palicourea psychotrioides</i>	
Costa Rica-Panama (CP)	<i>Palicourea roseofaucis</i>	
Costa Rica-Panama (CP)	<i>Palicourea salicifolia</i>	
Costa Rica-Panama (CP)	<i>Palicourea tilaranensis</i>	
Costa Rica-Panama (CP)	<i>Palicourea vestita</i>	
Costa Rica-Panama (CP)	<i>Panamanthus panamensis</i>	
Costa Rica-Panama (CP)	<i>Panopsis acostana</i>	
Costa Rica-Panama (CP)	<i>Panopsis suaveolens</i>	
Costa Rica-Panama (CP)	<i>Panterpe insignis</i>	
Costa Rica-Panama (CP)	<i>Paradrymonia alata</i>	
Costa Rica-Panama (CP)	<i>Paradrymonia longipetiolata</i>	
Costa Rica-Panama (CP)	<i>Paradrymonia lurida</i>	
Costa Rica-Panama (CP)	<i>Paradrymonia macrophylla</i>	
Costa Rica-Panama (CP)	<i>Paramachaerium gruberi</i>	
Costa Rica-Panama (CP)	<i>Parathesis acostensis</i>	
Costa Rica-Panama (CP)	<i>Parathesis cartagoana</i>	
Costa Rica-Panama (CP)	<i>Parathesis crassiramea</i>	
Costa Rica-Panama (CP)	<i>Parathesis glendae</i>	
Costa Rica-Panama (CP)	<i>Parathesis longipedicellata</i>	
Costa Rica-Panama (CP)	<i>Parathesis macrantha</i>	
Costa Rica-Panama (CP)	<i>Parathesis seibertii</i>	
Costa Rica-Panama (CP)	<i>Parmentiera valerii</i>	
Costa Rica-Panama (CP)	<i>Passiflora boenderi</i>	
Costa Rica-Panama (CP)	<i>Passiflora brevifila</i>	
Costa Rica-Panama (CP)	<i>Passiflora nubicola</i>	
Costa Rica-Panama (CP)	<i>Passiflora veraguasensis</i>	
Costa Rica-Panama (CP)	<i>Paullinia brenesii</i>	
Costa Rica-Panama (CP)	<i>Paullinia fourneri</i>	
Costa Rica-Panama (CP)	<i>Paullinia talamancensis</i>	
Costa Rica-Panama (CP)	<i>Peltaea riedelii</i>	
Costa Rica-Panama (CP)	<i>Pennisetum tempisqueense</i>	
Costa Rica-Panama (CP)	<i>Pentacalia candelaria</i>	

Costa Rica-Panama (CP)	<i>Pentacalia firmipes</i>	
Costa Rica-Panama (CP)	<i>Pentacalia phanerandra</i>	
Costa Rica-Panama (CP)	<i>Pentacalia streptothamna</i>	
Costa Rica-Panama (CP)	<i>Pentagonia donnell-smithii</i>	
Costa Rica-Panama (CP)	<i>Pentagonia nuciformis</i>	
Costa Rica-Panama (CP)	<i>Peperomia alata</i>	
Costa Rica-Panama (CP)	<i>Peperomia donnell-smithii</i>	
Costa Rica-Panama (CP)	<i>Peperomia hammelii</i>	
Costa Rica-Panama (CP)	<i>Peperomia pittieri</i>	
Costa Rica-Panama (CP)	<i>Peperomia saintpauliella</i>	
Costa Rica-Panama (CP)	<i>Peperomia tenelliformis</i>	
Costa Rica-Panama (CP)	<i>Peperomia tonduzii</i>	
Costa Rica-Panama (CP)	<i>Peperomia ursina</i>	
Costa Rica-Panama (CP)	<i>Pera oppositifolia</i>	
Costa Rica-Panama (CP)	<i>Pereilema crinitum</i>	
Costa Rica-Panama (CP)	<i>Persea brenesii</i>	
Costa Rica-Panama (CP)	<i>Persea laevifolia</i>	
Costa Rica-Panama (CP)	<i>Persea obtusifolia</i>	
Costa Rica-Panama (CP)	<i>Persea veraguasensis</i>	
Costa Rica-Panama (CP)	<i>Phainoptila melanoxantha</i>	
Costa Rica-Panama (CP)	<i>Pheucticus tibialis</i>	
Costa Rica-Panama (CP)	<i>Philodendron alticola</i>	
Costa Rica-Panama (CP)	<i>Philodendron antonioanum</i>	
Costa Rica-Panama (CP)	<i>Philodendron copense</i>	
Costa Rica-Panama (CP)	<i>Philodendron crassispalum</i>	
Costa Rica-Panama (CP)	<i>Philodendron fortunense</i>	
Costa Rica-Panama (CP)	<i>Philodendron grayumii</i>	
Costa Rica-Panama (CP)	<i>Philodendron microstictum</i>	
Costa Rica-Panama (CP)	<i>Philodendron thalassicum</i>	
Costa Rica-Panama (CP)	<i>Philodendron zhuanum</i>	
Costa Rica-Panama (CP)	<i>Phoradendron dwyeri</i>	
Costa Rica-Panama (CP)	<i>Phoradendron haberi</i>	
Costa Rica-Panama (CP)	<i>Phyllanthus valerii</i>	
Costa Rica-Panama (CP)	<i>Phyllanthus valerioi</i>	
Costa Rica-Panama (CP)	<i>Phyllonoma tenuidens</i>	
Costa Rica-Panama (CP)	<i>Picramnia antidesma</i>	
Costa Rica-Panama (CP)	<i>Picramnia teapensis</i>	
Costa Rica-Panama (CP)	<i>Pilea corona</i>	
Costa Rica-Panama (CP)	<i>Pilea gomeziana</i>	
Costa Rica-Panama (CP)	<i>Pilea herrerae</i>	
Costa Rica-Panama (CP)	<i>Pilea pallida</i>	
Costa Rica-Panama (CP)	<i>Pilea puruiensis</i>	
Costa Rica-Panama (CP)	<i>Pilea tilarana</i>	
Costa Rica-Panama (CP)	<i>Pilea tripartita</i>	
Costa Rica-Panama (CP)	<i>Pilocosta campanensis</i>	
Costa Rica-Panama (CP)	<i>Pinochia monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Piper amalago</i>	
Costa Rica-Panama (CP)	<i>Piper arboreum</i>	

Costa Rica-Panama (CP)	<i>Piper artanthopse</i>	
Costa Rica-Panama (CP)	<i>Piper augustum</i>	
Costa Rica-Panama (CP)	<i>Piper austini</i>	
Costa Rica-Panama (CP)	<i>Piper betleooides</i>	
Costa Rica-Panama (CP)	<i>Piper boquetense</i>	
Costa Rica-Panama (CP)	<i>Piper calcariforme</i>	
Costa Rica-Panama (CP)	<i>Piper clavuliger</i>	
Costa Rica-Panama (CP)	<i>Piper coilostachyum</i>	
Costa Rica-Panama (CP)	<i>Piper curvipilum</i>	
Costa Rica-Panama (CP)	<i>Piper davidsonii</i>	
Costa Rica-Panama (CP)	<i>Piper dilatatum</i>	
Costa Rica-Panama (CP)	<i>Piper dotanum</i>	
Costa Rica-Panama (CP)	<i>Piper erubescentspicum</i>	
Costa Rica-Panama (CP)	<i>Piper fimbriulatum</i>	
Costa Rica-Panama (CP)	<i>Piper fortunaense</i>	
Costa Rica-Panama (CP)	<i>Piper hispidum</i>	
Costa Rica-Panama (CP)	<i>Piper imperiale</i>	
Costa Rica-Panama (CP)	<i>Piper longepetiolatum</i>	
Costa Rica-Panama (CP)	<i>Piper minute-scabiosum</i>	
Costa Rica-Panama (CP)	<i>Piper pavasense</i>	
Costa Rica-Panama (CP)	<i>Piper phytolaccifolium</i>	
Costa Rica-Panama (CP)	<i>Piper poasanum</i>	
Costa Rica-Panama (CP)	<i>Piper pseudolindenii</i>	
Costa Rica-Panama (CP)	<i>Piper retalhuleuense</i>	
Costa Rica-Panama (CP)	<i>Piper sagittifolium</i>	
Costa Rica-Panama (CP)	<i>Piper sancti-felicis</i>	
Costa Rica-Panama (CP)	<i>Piper sanctum</i>	
Costa Rica-Panama (CP)	<i>Piper terrabanum</i>	
Costa Rica-Panama (CP)	<i>Piper tonduzii</i>	
Costa Rica-Panama (CP)	<i>Piper triquetrofructum</i>	
Costa Rica-Panama (CP)	<i>Piper tuisanum</i>	
Costa Rica-Panama (CP)	<i>Piper umbricola</i>	
Costa Rica-Panama (CP)	<i>Piper villiramulum</i>	
Costa Rica-Panama (CP)	<i>Piper virgultorum</i>	
Costa Rica-Panama (CP)	<i>Piper wagneri</i>	
Costa Rica-Panama (CP)	<i>Piper zhorquinense</i>	
Costa Rica-Panama (CP)	<i>Pisonia silvatica</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia calcicola</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia chiriquensis</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia funkiae</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia membranifolia</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia quesnelioides</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia rundelliana</i>	
Costa Rica-Panama (CP)	<i>Pitcairnia valerii</i>	
Costa Rica-Panama (CP)	<i>Platymiscium curuense</i>	
Costa Rica-Panama (CP)	<i>Platystele microtatantha</i>	
Costa Rica-Panama (CP)	<i>Platythelys alajuelae</i>	
Costa Rica-Panama (CP)	<i>Plelostachya leiostachya</i>	

Costa Rica-Panama (CP)	<i>Pleodendron costaricense</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis bitumida</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis bothros</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis compressa</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis crescentilabia</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis dentipetala</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis eumecocaulon</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis montezumae</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis peculiaris</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis scaphipetala</i>	
Costa Rica-Panama (CP)	<i>Pleurothallis tonduzii</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium golfodulcense</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium guindonii</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium hexaglandulosum</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium immersum</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium oblongum</i>	
Costa Rica-Panama (CP)	<i>Pleurothyrium palmanum</i>	
Costa Rica-Panama (CP)	<i>Plinia guanacastensis</i>	
Costa Rica-Panama (CP)	<i>Plinia moralesii</i>	
Costa Rica-Panama (CP)	<i>Plinia salticola</i>	
Costa Rica-Panama (CP)	<i>Plowmanianthus dressleri</i>	
Costa Rica-Panama (CP)	<i>Podandrogynne formosa</i>	
Costa Rica-Panama (CP)	<i>Polygala panamensis</i>	
Costa Rica-Panama (CP)	<i>Pombalia hespericliva</i>	
Costa Rica-Panama (CP)	<i>Potamites apodemus</i>	
Costa Rica-Panama (CP)	<i>Pouteria exfoliata</i>	
Costa Rica-Panama (CP)	<i>Pouteria triplarifolia</i>	
Costa Rica-Panama (CP)	<i>Prestonia longifolia</i>	
Costa Rica-Panama (CP)	<i>Prestonia riverae</i>	
Costa Rica-Panama (CP)	<i>Pristimantis altae</i>	
Costa Rica-Panama (CP)	<i>Prosopanche costaricensis</i>	
Costa Rica-Panama (CP)	<i>Prosthechea campylostalix</i>	
Costa Rica-Panama (CP)	<i>Prosthechea prismatocarpa</i>	
Costa Rica-Panama (CP)	<i>Prosthechea racemifera</i>	
Costa Rica-Panama (CP)	<i>Protium pecuniosum</i>	
Costa Rica-Panama (CP)	<i>Prunus fortunensis</i>	
Costa Rica-Panama (CP)	<i>Psammisia williamsii</i>	
Costa Rica-Panama (CP)	<i>Pseudolachnostoma cynanchiflorum</i>	
Costa Rica-Panama (CP)	<i>Pseudolmedia glabrata</i>	
Costa Rica-Panama (CP)	<i>Pseudorhizalis himantoclada</i>	
Costa Rica-Panama (CP)	<i>Psittacanthus costaricensis</i>	
Costa Rica-Panama (CP)	<i>Psittacanthus scheryi</i>	
Costa Rica-Panama (CP)	<i>Psychotria alfaroana</i>	
Costa Rica-Panama (CP)	<i>Psychotria aurantibractea</i>	
Costa Rica-Panama (CP)	<i>Psychotria bakeri</i>	
Costa Rica-Panama (CP)	<i>Psychotria boquetensis</i>	
Costa Rica-Panama (CP)	<i>Psychotria chiriquiensis</i>	
Costa Rica-Panama (CP)	<i>Psychotria dichroa</i>	

Costa Rica-Panama (CP)	<i>Psychotria insueta</i>	
Costa Rica-Panama (CP)	<i>Psychotria jimenezii</i>	
Costa Rica-Panama (CP)	<i>Psychotria monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Psychotria nebulosa</i>	
Costa Rica-Panama (CP)	<i>Psychotria orosioides</i>	
Costa Rica-Panama (CP)	<i>Psychotria sixaolensis</i>	
Costa Rica-Panama (CP)	<i>Psychotria tapantiensis</i>	
Costa Rica-Panama (CP)	<i>Psychotria turrubarensis</i>	
Costa Rica-Panama (CP)	<i>Pteroglossus frantzii</i>	
Costa Rica-Panama (CP)	<i>Ptychoglossus plicatus</i>	
Costa Rica-Panama (CP)	<i>Ptychohyla legleri</i>	
Costa Rica-Panama (CP)	<i>Pyrrhura hoffmanni</i>	
Costa Rica-Panama (CP)	<i>Quararibea costaricensis</i>	
Costa Rica-Panama (CP)	<i>Quararibea gomeziana</i>	
Costa Rica-Panama (CP)	<i>Quararibea pendula</i>	
Costa Rica-Panama (CP)	<i>Quercus gulielmi-treleasei</i>	
Costa Rica-Panama (CP)	<i>Ramphocelus costaricensis</i>	
Costa Rica-Panama (CP)	<i>Randia calycosa</i>	
Costa Rica-Panama (CP)	<i>Randia pittieri</i>	
Costa Rica-Panama (CP)	<i>Razisea citrina</i>	
Costa Rica-Panama (CP)	<i>Renealmia chiriquina</i>	
Costa Rica-Panama (CP)	<i>Renealmia scaposa</i>	
Costa Rica-Panama (CP)	<i>Rhadinaea calligaster</i>	
Costa Rica-Panama (CP)	<i>Rhynchosia quercetorum</i>	
Costa Rica-Panama (CP)	<i>Rhynchospora torresiana</i>	
Costa Rica-Panama (CP)	<i>Romanschulzia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Rossioglossum oerstedii</i>	
Costa Rica-Panama (CP)	<i>Rourea latifoliolata</i>	
Costa Rica-Panama (CP)	<i>Rudgea amplexicaulis</i>	
Costa Rica-Panama (CP)	<i>Rudgea raveniana</i>	
Costa Rica-Panama (CP)	<i>Ruellia golfodulcensis</i>	
Costa Rica-Panama (CP)	<i>Ruellia palustris</i>	
Costa Rica-Panama (CP)	<i>Rufodorsia congestiflora</i>	
Costa Rica-Panama (CP)	<i>Ruprechtia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Rustia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Ruyschia valerii</i>	
Costa Rica-Panama (CP)	<i>Sapium allenii</i>	
Costa Rica-Panama (CP)	<i>Saurauia pittieri</i>	
Costa Rica-Panama (CP)	<i>Saurauia seibertii</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis acostaei</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis atwoodii</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis clavata</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis densa</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis jimenezii</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis mesocopis</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis pachybulbon</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis pulchella</i>	
Costa Rica-Panama (CP)	<i>Scaphyglottis sigmoidea</i>	

Costa Rica-Panama (CP)	<i>Scaphyglottis spathulata</i>	
Costa Rica-Panama (CP)	<i>Schefflera brenesii</i>	
Costa Rica-Panama (CP)	<i>Schefflera cicatricata</i>	
Costa Rica-Panama (CP)	<i>Schefflera pubens</i>	
Costa Rica-Panama (CP)	<i>Schefflera rodriguesiana</i>	
Costa Rica-Panama (CP)	<i>Schizocalyx veraguensis</i>	
Costa Rica-Panama (CP)	<i>Schradera costaricensis</i>	
Costa Rica-Panama (CP)	<i>Schradera obtusifolia</i>	
Costa Rica-Panama (CP)	<i>Schwartzia brenesii</i>	
Costa Rica-Panama (CP)	<i>Schwartzia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Scutellaria glabra</i>	
Costa Rica-Panama (CP)	<i>Scutellaria isocheila</i>	
Costa Rica-Panama (CP)	<i>Scutellaria lactea</i>	
Costa Rica-Panama (CP)	<i>Scutellaria maxonii</i>	
Costa Rica-Panama (CP)	<i>Scytalopus argentifrons</i>	
Costa Rica-Panama (CP)	<i>Sechium venosum</i>	
Costa Rica-Panama (CP)	<i>Securidaca micheliana</i>	
Costa Rica-Panama (CP)	<i>Selasphorus ardens</i>	
Costa Rica-Panama (CP)	<i>Selasphorus scintilla</i>	
Costa Rica-Panama (CP)	<i>Semnornis frantzii</i>	
Costa Rica-Panama (CP)	<i>Senecio brenesii</i>	
Costa Rica-Panama (CP)	<i>Senecio multivenius</i>	
Costa Rica-Panama (CP)	<i>Senna williamsii</i>	
Costa Rica-Panama (CP)	<i>Serjania valerii</i>	
Costa Rica-Panama (CP)	<i>Simsia santarosensis</i>	
Costa Rica-Panama (CP)	<i>Sloanea geniculata</i>	
Costa Rica-Panama (CP)	<i>Sloanea guapilensis</i>	
Costa Rica-Panama (CP)	<i>Sloanea laevigata</i>	
Costa Rica-Panama (CP)	<i>Sobralia allenii</i>	
Costa Rica-Panama (CP)	<i>Sobralia kerryae</i>	
Costa Rica-Panama (CP)	<i>Sobralia labiata</i>	
Costa Rica-Panama (CP)	<i>Sobralia nutans</i>	
Costa Rica-Panama (CP)	<i>Sobralia quinata</i>	
Costa Rica-Panama (CP)	<i>Solanum longiconicum</i>	
Costa Rica-Panama (CP)	<i>Solanum pluviale</i>	
Costa Rica-Panama (CP)	<i>Solanum ramonense</i>	
Costa Rica-Panama (CP)	<i>Solanum roblense</i>	
Costa Rica-Panama (CP)	<i>Solanum storkii</i>	
Costa Rica-Panama (CP)	<i>Solanum truncatum</i>	
Costa Rica-Panama (CP)	<i>Solenocentrum costaricense</i>	
Costa Rica-Panama (CP)	<i>Solenophora calycosa</i>	
Costa Rica-Panama (CP)	<i>Sorocea pubivena</i>	
Costa Rica-Panama (CP)	<i>Spathacanthus hoffmannii</i>	
Costa Rica-Panama (CP)	<i>Spathiphyllum atrovirens</i>	
Costa Rica-Panama (CP)	<i>Spathiphyllum montanum</i>	
Costa Rica-Panama (CP)	<i>Specklinia barbae</i>	
Costa Rica-Panama (CP)	<i>Specklinia condylata</i>	
Costa Rica-Panama (CP)	<i>Sphaeradenia chiriquensis</i>	

Costa Rica-Panama (CP)	<i>Sphaeradenia magniglobula</i>	
Costa Rica-Panama (CP)	<i>Sphaeradenia occidentalis</i>	
Costa Rica-Panama (CP)	<i>Sphaerodactylus graptolaemus</i>	
Costa Rica-Panama (CP)	<i>Sphyrospermum linearifolium</i>	
Costa Rica-Panama (CP)	<i>Stanhopea warszewicziana</i>	
Costa Rica-Panama (CP)	<i>Stelis alta</i>	
Costa Rica-Panama (CP)	<i>Stelis carpintera</i>	
Costa Rica-Panama (CP)	<i>Stelis conochila</i>	
Costa Rica-Panama (CP)	<i>Stelis cooperi</i>	
Costa Rica-Panama (CP)	<i>Stelis janetiae</i>	
Costa Rica-Panama (CP)	<i>Stelis pilosa</i>	
Costa Rica-Panama (CP)	<i>Stelis skutchii</i>	
Costa Rica-Panama (CP)	<i>Stelis thecoglossa</i>	
Costa Rica-Panama (CP)	<i>Stelis thymochila</i>	
Costa Rica-Panama (CP)	<i>Stelis triangulabia</i>	
Costa Rica-Panama (CP)	<i>Stenocereus aragonii</i>	
Costa Rica-Panama (CP)	<i>Stenospermation majus</i>	
Costa Rica-Panama (CP)	<i>Stenostephanus reflexiflorus</i>	
Costa Rica-Panama (CP)	<i>Stenostephanus sessilifolius</i>	
Costa Rica-Panama (CP)	<i>Stenotyla picta</i>	
Costa Rica-Panama (CP)	<i>Stigmaphyllon tonduzii</i>	
Costa Rica-Panama (CP)	<i>Streblacanthus monospermus</i>	
Costa Rica-Panama (CP)	<i>Stromanthe guapilesensis</i>	
Costa Rica-Panama (CP)	<i>Stromanthe palustris</i>	
Costa Rica-Panama (CP)	<i>Struthanthus acostensis</i>	
Costa Rica-Panama (CP)	<i>Symphysia costaricensis</i>	
Costa Rica-Panama (CP)	<i>Symphysia floccosa</i>	
Costa Rica-Panama (CP)	<i>Symphysia orosiensis</i>	
Costa Rica-Panama (CP)	<i>Symphysia ovata</i>	
Costa Rica-Panama (CP)	<i>Symplocos limoncillo</i>	
Costa Rica-Panama (CP)	<i>Symplocos naniflora</i>	
Costa Rica-Panama (CP)	<i>Syngonium laterinervium</i>	
Costa Rica-Panama (CP)	<i>Systemoglossum costaricense</i>	
Costa Rica-Panama (CP)	<i>Tabernaemontana simulans</i>	
Costa Rica-Panama (CP)	<i>Talamancalia boquetensis</i>	
Costa Rica-Panama (CP)	<i>Tangara dowii</i>	
Costa Rica-Panama (CP)	<i>Tarenaya costaricensis</i>	
Costa Rica-Panama (CP)	<i>Telipogon storkii</i>	
Costa Rica-Panama (CP)	<i>Ternstroemia multiovulata</i>	
Costa Rica-Panama (CP)	<i>Tetrapteryx monteverdensis</i>	
Costa Rica-Panama (CP)	<i>Tetrorchidium costaricense</i>	
Costa Rica-Panama (CP)	<i>Thalictrum lankesteri</i>	
Costa Rica-Panama (CP)	<i>Thalictrum panamense</i>	
Costa Rica-Panama (CP)	<i>Themistoclesia horquetensis</i>	
Costa Rica-Panama (CP)	<i>Themistoclesia smithiana</i>	
Costa Rica-Panama (CP)	<i>Thyorchilus browni</i>	
Costa Rica-Panama (CP)	<i>Tibouchina inopinata</i>	
Costa Rica-Panama (CP)	<i>Tillandsia abdita</i>	

Costa Rica-Panama (CP)	<i>Tillandsia insignis</i>	
Costa Rica-Panama (CP)	<i>Touit costaricensis</i>	
Costa Rica-Panama (CP)	<i>Tournefortia isabellina</i>	
Costa Rica-Panama (CP)	<i>Tournefortia longispica</i>	
Costa Rica-Panama (CP)	<i>Tournefortia ramonensis</i>	
Costa Rica-Panama (CP)	<i>Tournefortia subspicata</i>	
Costa Rica-Panama (CP)	<i>Tradescantia grantii</i>	
Costa Rica-Panama (CP)	<i>Tradescantia petricola</i>	
Costa Rica-Panama (CP)	<i>Trichilia pallida</i>	
Costa Rica-Panama (CP)	<i>Trichocentrum caloceras</i>	
Costa Rica-Panama (CP)	<i>Trichopilia suavis</i>	
Costa Rica-Panama (CP)	<i>Trichopilia turialvae</i>	
Costa Rica-Panama (CP)	<i>Trichosalpinx rotundata</i>	
Costa Rica-Panama (CP)	<i>Trimetopon pliolepis</i>	
Costa Rica-Panama (CP)	<i>Trimetopon slevini</i>	
Costa Rica-Panama (CP)	<i>Triphora ravenii</i>	
Costa Rica-Panama (CP)	<i>Triumfetta arborescens</i>	
Costa Rica-Panama (CP)	<i>Trogon aurantiiventris</i>	
Costa Rica-Panama (CP)	<i>Trogon bairdii</i>	
Costa Rica-Panama (CP)	<i>Trogon clathratus</i>	
Costa Rica-Panama (CP)	<i>Tynanthus macranthus</i>	
Costa Rica-Panama (CP)	<i>Unonopsis osae</i>	
Costa Rica-Panama (CP)	<i>Unonopsis penduliflora</i>	
Costa Rica-Panama (CP)	<i>Vaccinium furfuraceum</i>	
Costa Rica-Panama (CP)	<i>Vachellia allenii</i>	
Costa Rica-Panama (CP)	<i>Valeriana clematitis</i>	
Costa Rica-Panama (CP)	<i>Verbesina baruensis</i>	
Costa Rica-Panama (CP)	<i>Verbesina ricacosta</i>	
Costa Rica-Panama (CP)	<i>Viguiera strigosa</i>	
Costa Rica-Panama (CP)	<i>Viguiera sylvatica</i>	
Costa Rica-Panama (CP)	<i>Vriesea apiculata</i>	
Costa Rica-Panama (CP)	<i>Vriesea camptoclada</i>	
Costa Rica-Panama (CP)	<i>Vriesea dodsonii</i>	
Costa Rica-Panama (CP)	<i>Vriesea graminifolia</i>	
Costa Rica-Panama (CP)	<i>Vriesea kathyae</i>	
Costa Rica-Panama (CP)	<i>Vriesea leucophylla</i>	
Costa Rica-Panama (CP)	<i>Vriesea marnier-lapostollei</i>	
Costa Rica-Panama (CP)	<i>Vriesea panamaensis</i>	
Costa Rica-Panama (CP)	<i>Vriesea patzeltii</i>	
Costa Rica-Panama (CP)	<i>Vriesea pittieri</i>	
Costa Rica-Panama (CP)	<i>Vriesea tonduziana</i>	
Costa Rica-Panama (CP)	<i>Weberocereus bradei</i>	
Costa Rica-Panama (CP)	<i>Weberocereus imitans</i>	
Costa Rica-Panama (CP)	<i>Weinmannia pinnata</i>	
Costa Rica-Panama (CP)	<i>Weinmannia wercklei</i>	
Costa Rica-Panama (CP)	<i>Wercklea insignis</i>	
Costa Rica-Panama (CP)	<i>Witheringia maculata</i>	
Costa Rica-Panama (CP)	<i>Witheringia mortonii</i>	

Costa Rica-Panama (CP)	<i>Xanthosoma dealbatum</i>	
Costa Rica-Panama (CP)	<i>Xylosma hispidula</i>	
Costa Rica-Panama (CP)	<i>Zanthoxylum melanostictum</i>	
Costa Rica-Panama (CP)	<i>Zapoteca costaricensis</i>	
Costa Rica-Panama (CP)	<i>Zapoteca mollis</i>	
Costa Rica-Panama (CP)	<i>Zeledonia coronata</i>	
Costa Rica-Panama (CP)	<i>Zinowiewia integerrima</i>	
Panama-Magdalena (PM)	<i>Adenocalymma arthropetiolatum</i>	<i>Anthurium redolens</i>
Panama-Magdalena (PM)	<i>Aiouea vexatrix</i>	<i>Columnnea perpulchra</i>
Panama-Magdalena (PM)	<i>Amphidasya panamensis</i>	<i>Annona hayesii</i>
Panama-Magdalena (PM)	<i>Anthurium cartiense</i>	<i>Centrolobium yavizanum</i>
Panama-Magdalena (PM)	<i>Anthurium cinereopetiolatum</i>	<i>Abuta racemosa</i>
Panama-Magdalena (PM)	<i>Anthurium gentryi</i>	<i>Aphelandra hartwegiana</i>
Panama-Magdalena (PM)	<i>Anthurium kamemotoanum</i>	<i>Anthurium pendens</i>
Panama-Magdalena (PM)	<i>Anthurium pirrense</i>	<i>Anthurium cinereopetiolatum</i>
Panama-Magdalena (PM)	<i>Anthurium platyrhizum</i>	<i>Anthurium curvispadix</i>
Panama-Magdalena (PM)	<i>Aphelandra darienensis</i>	<i>Callisia ciliata</i>
Panama-Magdalena (PM)	<i>Aphelandra laxa</i>	<i>Cischweinfia pusilla</i>
Panama-Magdalena (PM)	<i>Arachnothryx dwyeri</i>	<i>Desmoncus myriacanthos</i>
Panama-Magdalena (PM)	<i>Arachnothryx secunda</i>	<i>Dieffenbachia isthmia</i>
Panama-Magdalena (PM)	<i>Ardisia bartletii</i>	<i>Heliconia xanthovillosa</i>
Panama-Magdalena (PM)	<i>Ardisia darienensis</i>	<i>Microchilus panamanicus</i>
Panama-Magdalena (PM)	<i>Ardisia dwyeri</i>	<i>Palmorchis trinotata</i>
Panama-Magdalena (PM)	<i>Ardisia nervosissima</i>	<i>Amphidasya longicalycina</i>
Panama-Magdalena (PM)	<i>Ardisia tysonii</i>	<i>Ardisia bartletii</i>
Panama-Magdalena (PM)	<i>Ardisia unguiensis</i>	<i>Cavendishia darienensis</i>
Panama-Magdalena (PM)	<i>Attalea iguadummat</i>	<i>Clidemia tenebrosa</i>
Panama-Magdalena (PM)	<i>Bactris charnleyae</i>	<i>Faramea areolata</i>
Panama-Magdalena (PM)	<i>Begonia buseyi</i>	
Panama-Magdalena (PM)	<i>Biophytum mucronatum</i>	
Panama-Magdalena (PM)	<i>Blakea pluvialis</i>	
Panama-Magdalena (PM)	<i>Brownea excelsa</i>	
Panama-Magdalena (PM)	<i>Bunchosia brevisurcularis</i>	
Panama-Magdalena (PM)	<i>Burmeistera pirrensis</i>	
Panama-Magdalena (PM)	<i>Byrsonima dressleri</i>	
Panama-Magdalena (PM)	<i>Calderonella sylvatica</i>	
Panama-Magdalena (PM)	<i>Callisia ciliata</i>	
Panama-Magdalena (PM)	<i>Calyptanthes longicalyprata</i>	
Panama-Magdalena (PM)	<i>Calyptrogyne anomala</i>	
Panama-Magdalena (PM)	<i>Calyptrogyne deneversii</i>	
Panama-Magdalena (PM)	<i>Calyptrogyne kunorum</i>	
Panama-Magdalena (PM)	<i>Camaridium fragrans</i>	
Panama-Magdalena (PM)	<i>Cavendishia revoluta</i>	
Panama-Magdalena (PM)	<i>Chamaedorea serpens</i>	
Panama-Magdalena (PM)	<i>Chamaedorea subjectifolia</i>	
Panama-Magdalena (PM)	<i>Clidemia oblonga</i>	
Panama-Magdalena (PM)	<i>Clusia cupulata</i>	

Panama-Magdalena (PM)	<i>Coccoloba darienensis</i>	
Panama-Magdalena (PM)	<i>Coccoloba manzinellensis</i>	
Panama-Magdalena (PM)	<i>Codonanthe luteola</i>	
Panama-Magdalena (PM)	<i>Columnea mira</i>	
Panama-Magdalena (PM)	<i>Columnea silvarum</i>	
Panama-Magdalena (PM)	<i>Connarus turczaninowii</i>	
Panama-Magdalena (PM)	<i>Costus vinosus</i>	
Panama-Magdalena (PM)	<i>Couepia scottmorii</i>	
Panama-Magdalena (PM)	<i>Coussarea brevipedunculata</i>	
Panama-Magdalena (PM)	<i>Crematosperma westrae</i>	
Panama-Magdalena (PM)	<i>Crossopetalum parviflorum</i>	
Panama-Magdalena (PM)	<i>Daphnopsis correae</i>	
Panama-Magdalena (PM)	<i>Dresslerella pertusa</i>	
Panama-Magdalena (PM)	<i>Duguetia tuberculata</i>	
Panama-Magdalena (PM)	<i>Elaphandra bicornis</i>	
Panama-Magdalena (PM)	<i>Faramea areolata</i>	
Panama-Magdalena (PM)	<i>Faramea correae</i>	
Panama-Magdalena (PM)	<i>Faramea liesneri</i>	
Panama-Magdalena (PM)	<i>Faramea papillata</i>	
Panama-Magdalena (PM)	<i>Gloeospermum pauciflorum</i>	
Panama-Magdalena (PM)	<i>Gloeospermum portobelense</i>	
Panama-Magdalena (PM)	<i>Gustavia fosteri</i>	
Panama-Magdalena (PM)	<i>Guzmania butcheri</i>	
Panama-Magdalena (PM)	<i>Heliconia lutea</i>	
Panama-Magdalena (PM)	<i>Heliconia maculata</i>	
Panama-Magdalena (PM)	<i>Hoffmannia gentryi</i>	
Panama-Magdalena (PM)	<i>Inga urceolata</i>	
Panama-Magdalena (PM)	<i>Isertia scorpioides</i>	
Panama-Magdalena (PM)	<i>Ixora knappiae</i>	
Panama-Magdalena (PM)	<i>Justicia readii</i>	
Panama-Magdalena (PM)	<i>Ladenbergia dwyeri</i>	
Panama-Magdalena (PM)	<i>Laetia micrantha</i>	
Panama-Magdalena (PM)	<i>Licania fasciculata</i>	
Panama-Magdalena (PM)	<i>Licania morii</i>	
Panama-Magdalena (PM)	<i>Lisianthus habuensis</i>	
Panama-Magdalena (PM)	<i>Lycianthes tysoniana</i>	
Panama-Magdalena (PM)	<i>Mabea jefensis</i>	
Panama-Magdalena (PM)	<i>Manettia arboricola</i>	
Panama-Magdalena (PM)	<i>Maripa lewisii</i>	
Panama-Magdalena (PM)	<i>Marsdenia crassipes</i>	
Panama-Magdalena (PM)	<i>Matisia jefensis</i>	
Panama-Magdalena (PM)	<i>Maxillaria darienensis</i>	
Panama-Magdalena (PM)	<i>Miconia centrosperma</i>	
Panama-Magdalena (PM)	<i>Miconia rufostellulata</i>	
Panama-Magdalena (PM)	<i>Miconia santaritensis</i>	
Panama-Magdalena (PM)	<i>Monolena dressleri</i>	
Panama-Magdalena (PM)	<i>Monopyle grandiflora</i>	
Panama-Magdalena (PM)	<i>Monopyle panamensis</i>	

Panama-Magdalena (PM)	<i>Mosannonna maculata</i>	
Panama-Magdalena (PM)	<i>Myrcia fusca</i>	
Panama-Magdalena (PM)	<i>Myrcia zetekiana</i>	
Panama-Magdalena (PM)	<i>Neea darienensis</i>	
Panama-Magdalena (PM)	<i>Notopleura perparva</i>	
Panama-Magdalena (PM)	<i>Notopleura sanblasensis</i>	
Panama-Magdalena (PM)	<i>Ocotea arcuata</i>	
Panama-Magdalena (PM)	<i>Ocotea jefensis</i>	
Panama-Magdalena (PM)	<i>Odontonema microphyllus</i>	
Panama-Magdalena (PM)	<i>Olyra holtumiana</i>	
Panama-Magdalena (PM)	<i>Oncidium allenii</i>	
Panama-Magdalena (PM)	<i>Ouratea knappiae</i>	
Panama-Magdalena (PM)	<i>Ouratea sulcatinervia</i>	
Panama-Magdalena (PM)	<i>Palicourea tubuliflora</i>	
Panama-Magdalena (PM)	<i>Pariana strigosa</i>	
Panama-Magdalena (PM)	<i>Passiflora malletii</i>	
Panama-Magdalena (PM)	<i>Passiflora sandrae</i>	
Panama-Magdalena (PM)	<i>Paullinia correae</i>	
Panama-Magdalena (PM)	<i>Paullinia kallunkii</i>	
Panama-Magdalena (PM)	<i>Paullinia panamensis</i>	
Panama-Magdalena (PM)	<i>Paullinia sternii</i>	
Panama-Magdalena (PM)	<i>Pera aperta</i>	
Panama-Magdalena (PM)	<i>Philodendron clewellii</i>	
Panama-Magdalena (PM)	<i>Philodendron croatii</i>	
Panama-Magdalena (PM)	<i>Philodendron immixtum</i>	
Panama-Magdalena (PM)	<i>Philodendron lazorii</i>	
Panama-Magdalena (PM)	<i>Philodendron morii</i>	
Panama-Magdalena (PM)	<i>Philodendron pirense</i>	
Panama-Magdalena (PM)	<i>Phragmotheca rubriflora</i>	
Panama-Magdalena (PM)	<i>Phyllanthus gentryi</i>	
Panama-Magdalena (PM)	<i>Picramnia gracilis</i>	
Panama-Magdalena (PM)	<i>Pilea forgetii</i>	
Panama-Magdalena (PM)	<i>Pilocosta campanensis</i>	
Panama-Magdalena (PM)	<i>Piper campanum</i>	
Panama-Magdalena (PM)	<i>Piper pseudogaragaranum</i>	
Panama-Magdalena (PM)	<i>Piper sperdinum</i>	
Panama-Magdalena (PM)	<i>Piper viridicaule</i>	
Panama-Magdalena (PM)	<i>Plinia darienensis</i>	
Panama-Magdalena (PM)	<i>Plinia salamancana</i>	
Panama-Magdalena (PM)	<i>Plowmanianthus panamensis</i>	
Panama-Magdalena (PM)	<i>Polygala jefensis</i>	
Panama-Magdalena (PM)	<i>Preslianthus panamensis</i>	
Panama-Magdalena (PM)	<i>Prestonia lenticellata</i>	
Panama-Magdalena (PM)	<i>Pristimera dariense</i>	
Panama-Magdalena (PM)	<i>Psittacanthus pusillus</i>	
Panama-Magdalena (PM)	<i>Psychotria olgae</i>	
Panama-Magdalena (PM)	<i>Psychotria sanblasensis</i>	
Panama-Magdalena (PM)	<i>Quadrella mirifica</i>	

Panama-Magdalena (PM)	<i>Qualea cymulosa</i>	
Panama-Magdalena (PM)	<i>Quararibea santaritensis</i>	
Panama-Magdalena (PM)	<i>Rondeletia panamensis</i>	
Panama-Magdalena (PM)	<i>Roupala percoriacea</i>	
Panama-Magdalena (PM)	<i>Rudgea isthmensis</i>	
Panama-Magdalena (PM)	<i>Rustia dressleri</i>	
Panama-Magdalena (PM)	<i>Sanblasia dressleri</i>	
Panama-Magdalena (PM)	<i>Schefflera jefensis</i>	
Panama-Magdalena (PM)	<i>Schefflera panamensis</i>	
Panama-Magdalena (PM)	<i>Sciadotenia nitida</i>	
Panama-Magdalena (PM)	<i>Scutellaria oblongifolia</i>	
Panama-Magdalena (PM)	<i>Serjania membranacea</i>	
Panama-Magdalena (PM)	<i>Solanum fosbergianum</i>	
Panama-Magdalena (PM)	<i>Sphaeradenia virella</i>	
Panama-Magdalena (PM)	<i>Stigmaphyllon panamense</i>	
Panama-Magdalena (PM)	<i>Tetrapterys hirsutula</i>	
Panama-Magdalena (PM)	<i>Vitex masoniana</i>	
Panama-Magdalena (PM)	<i>Warczewiczella lipscombiae</i>	
Panama-Choco (PC)	<i>Abuta dwyerana</i>	<i>Chamaedorea matae</i>
Panama-Choco (PC)	<i>Acianthera butcheri</i>	<i>Monstera membranacea</i>
Panama-Choco (PC)	<i>Acianthera ellipsophylla</i>	<i>Oncidium stenobulbon</i>
Panama-Choco (PC)	<i>Aechmea strobilina</i>	<i>Combretum graciliflorum</i>
Panama-Choco (PC)	<i>Ageratum oerstedii</i>	<i>Anthurium pirrense</i>
Panama-Choco (PC)	<i>Ageratum riparium</i>	<i>Brassia allenii</i>
Panama-Choco (PC)	<i>Allomarkgrafia campanulata</i>	<i>Heliconia colgantea</i>
Panama-Choco (PC)	<i>Amaioua pedicellata</i>	<i>Philodendron annulatum</i>
Panama-Choco (PC)	<i>Anaxagorea panamensis</i>	<i>Bactris glandulosa</i>
Panama-Choco (PC)	<i>Anthopteropsis insignis</i>	<i>Costus stenophyllus</i>
Panama-Choco (PC)	<i>Anthurium alticola</i>	<i>Gonzalagunia osaensis</i>
Panama-Choco (PC)	<i>Anthurium cerrocampanense</i>	<i>Paramachaerium gruberi</i>
Panama-Choco (PC)	<i>Anthurium concolor</i>	<i>Aphelandra panamensis</i>
Panama-Choco (PC)	<i>Anthurium crassiradix</i>	
Panama-Choco (PC)	<i>Anthurium curvilaminum</i>	
Panama-Choco (PC)	<i>Anthurium curvispadix</i>	
Panama-Choco (PC)	<i>Anthurium hornitense</i>	
Panama-Choco (PC)	<i>Anthurium jefense</i>	
Panama-Choco (PC)	<i>Anthurium lentii</i>	
Panama-Choco (PC)	<i>Anthurium luteynii</i>	
Panama-Choco (PC)	<i>Anthurium madisonianum</i>	
Panama-Choco (PC)	<i>Anthurium melastomatis</i>	
Panama-Choco (PC)	<i>Anthurium pageanum</i>	
Panama-Choco (PC)	<i>Anthurium pendens</i>	
Panama-Choco (PC)	<i>Anthurium purpureospathum</i>	
Panama-Choco (PC)	<i>Anthurium redolens</i>	
Panama-Choco (PC)	<i>Anthurium roseospadix</i>	
Panama-Choco (PC)	<i>Anthurium rotundatum</i>	
Panama-Choco (PC)	<i>Anthurium wedelianum</i>	

Panama-Choco (PC)	<i>Aphelandra panamensis</i>	
Panama-Choco (PC)	<i>Aphelandra tonduzii</i>	
Panama-Choco (PC)	<i>Arberella lancifolia</i>	
Panama-Choco (PC)	<i>Ardisia megistophylla</i>	
Panama-Choco (PC)	<i>Ardisia ursina</i>	
Panama-Choco (PC)	<i>Aristolochia panamensis</i>	
Panama-Choco (PC)	<i>Aristolochia tonduzii</i>	
Panama-Choco (PC)	<i>Asplundia brunneistigma</i>	
Panama-Choco (PC)	<i>Atelopus chiriquiensis</i>	
Panama-Choco (PC)	<i>Bactris panamensis</i>	
Panama-Choco (PC)	<i>Begonia garagarana</i>	
Panama-Choco (PC)	<i>Begonia tonduzii</i>	
Panama-Choco (PC)	<i>Benzingia reichenbachiana</i>	
Panama-Choco (PC)	<i>Blakea crassifolia</i>	
Panama-Choco (PC)	<i>Blakea foliacea</i>	
Panama-Choco (PC)	<i>Blakea hexandra</i>	
Panama-Choco (PC)	<i>Blakea tetramera</i>	
Panama-Choco (PC)	<i>Blakea wilburiana</i>	
Panama-Choco (PC)	<i>Brassia allenii</i>	
Panama-Choco (PC)	<i>Brunellia standleyana</i>	
Panama-Choco (PC)	<i>Burmeistera morii</i>	
Panama-Choco (PC)	<i>Calathea caesariata</i>	
Panama-Choco (PC)	<i>Calathea donnell-smithii</i>	
Panama-Choco (PC)	<i>Calyptanthes tumidonodia</i>	
Panama-Choco (PC)	<i>Calyptrogyne costatifrons</i>	
Panama-Choco (PC)	<i>Camaridium longicolumna</i>	
Panama-Choco (PC)	<i>Camaridium obscurum</i>	
Panama-Choco (PC)	<i>Caryocar costaricense</i>	
Panama-Choco (PC)	<i>Casearia atlantica</i>	
Panama-Choco (PC)	<i>Cavendishia allenii</i>	
Panama-Choco (PC)	<i>Cavendishia fusiformis</i>	
Panama-Choco (PC)	<i>Cayaponia bidentata</i>	
Panama-Choco (PC)	<i>Chamaedorea amabilis</i>	
Panama-Choco (PC)	<i>Chamaedorea anemophila</i>	
Panama-Choco (PC)	<i>Chamaedorea correae</i>	
Panama-Choco (PC)	<i>Chamaedorea matae</i>	
Panama-Choco (PC)	<i>Chichicaste grandis</i>	
Panama-Choco (PC)	<i>Chorigyne cylindrica</i>	
Panama-Choco (PC)	<i>Chrysochlamys membrillensis</i>	
Panama-Choco (PC)	<i>Chrysochlamys myrcioides</i>	
Panama-Choco (PC)	<i>Chrysochlamys tenuis</i>	
Panama-Choco (PC)	<i>Cischweinfia pusilla</i>	
Panama-Choco (PC)	<i>Clavija pubens</i>	
Panama-Choco (PC)	<i>Clibadium anceps</i>	
Panama-Choco (PC)	<i>Clibadium glomeratum</i>	
Panama-Choco (PC)	<i>Clidemia collina</i>	
Panama-Choco (PC)	<i>Clidemia lanuginosa</i>	
Panama-Choco (PC)	<i>Clidemia taurina</i>	

Panama-Choco (PC)	<i>Clidemia trichosantha</i>	
Panama-Choco (PC)	<i>Clusia coclensis</i>	
Panama-Choco (PC)	<i>Clusia liesneri</i>	
Panama-Choco (PC)	<i>Clusia osseocarpa</i>	
Panama-Choco (PC)	<i>Coccoloba lasseri</i>	
Panama-Choco (PC)	<i>Coeliopsis hyacinthosma</i>	
Panama-Choco (PC)	<i>Columnea billbergiana</i>	
Panama-Choco (PC)	<i>Columnea crassa</i>	
Panama-Choco (PC)	<i>Columnea cruenta</i>	
Panama-Choco (PC)	<i>Columnea hirsutissima</i>	
Panama-Choco (PC)	<i>Columnea maculata</i>	
Panama-Choco (PC)	<i>Columnea perpulchra</i>	
Panama-Choco (PC)	<i>Columnea polyantha</i>	
Panama-Choco (PC)	<i>Columnea pulchra</i>	
Panama-Choco (PC)	<i>Columnea zebrina</i>	
Panama-Choco (PC)	<i>Copaífera panamensis</i>	
Panama-Choco (PC)	<i>Cordia correae</i>	
Panama-Choco (PC)	<i>Couratari scottmorii</i>	
Panama-Choco (PC)	<i>Crematosperma panamense</i>	
Panama-Choco (PC)	<i>Cryptochloa dressleri</i>	
Panama-Choco (PC)	<i>Cupania rufescens</i>	
Panama-Choco (PC)	<i>Cycnoches warszewiczii</i>	
Panama-Choco (PC)	<i>Daphnopsis folsomii</i>	
Panama-Choco (PC)	<i>Daphnopsis morii</i>	
Panama-Choco (PC)	<i>Dendropanax punctatus</i>	
Panama-Choco (PC)	<i>Dendropanax sessiliflorus</i>	
Panama-Choco (PC)	<i>Dendrophthora panamensis</i>	
Panama-Choco (PC)	<i>Desmodium saccatum</i>	
Panama-Choco (PC)	<i>Desmoncus myriacanthos</i>	
Panama-Choco (PC)	<i>Dichaea ciliolata</i>	
Panama-Choco (PC)	<i>Dichaea elliptica</i>	
Panama-Choco (PC)	<i>Dichaea violacea</i>	
Panama-Choco (PC)	<i>Dichapetalum gentryi</i>	
Panama-Choco (PC)	<i>Dicliptera iopus</i>	
Panama-Choco (PC)	<i>Dicliptera trifurca</i>	
Panama-Choco (PC)	<i>Dicranopygium testaceum</i>	
Panama-Choco (PC)	<i>Dieffenbachia crebripistillata</i>	
Panama-Choco (PC)	<i>Dieffenbachia davidsei</i>	
Panama-Choco (PC)	<i>Dieffenbachia galdamesiae</i>	
Panama-Choco (PC)	<i>Dieffenbachia isthmia</i>	
Panama-Choco (PC)	<i>Dieffenbachia panamensis</i>	
Panama-Choco (PC)	<i>Diospyros panamensis</i>	
Panama-Choco (PC)	<i>Dorstenia panamensis</i>	
Panama-Choco (PC)	<i>Dresslerothamnus angustiradiatus</i>	
Panama-Choco (PC)	<i>Drymonia aciculata</i>	
Panama-Choco (PC)	<i>Duranta costaricensis</i>	
Panama-Choco (PC)	<i>Elephantopus dilatatus</i>	
Panama-Choco (PC)	<i>Epidendrum antonense</i>	

Panama-Choco (PC)	<i>Epidendrum jefeallenii</i>	
Panama-Choco (PC)	<i>Epidendrum lockhartioides</i>	
Panama-Choco (PC)	<i>Epidendrum panamense</i>	
Panama-Choco (PC)	<i>Epidryos allenii</i>	
Panama-Choco (PC)	<i>Erythroxyllum brennae</i>	
Panama-Choco (PC)	<i>Eschweilera jacquelyniae</i>	
Panama-Choco (PC)	<i>Eucharis bouchei</i>	
Panama-Choco (PC)	<i>Eugenia darcyi</i>	
Panama-Choco (PC)	<i>Fleischmannia sideritidis</i>	
Panama-Choco (PC)	<i>Forsteronia chiriquensis</i>	
Panama-Choco (PC)	<i>Gasteranthus acropodus</i>	
Panama-Choco (PC)	<i>Geonoma epetiolata</i>	
Panama-Choco (PC)	<i>Gibsoniothamnus allenii</i>	
Panama-Choco (PC)	<i>Gibsoniothamnus epiphyticus</i>	
Panama-Choco (PC)	<i>Gibsoniothamnus grandiflorus</i>	
Panama-Choco (PC)	<i>Gibsoniothamnus latidentatus</i>	
Panama-Choco (PC)	<i>Gibsoniothamnus mirificus</i>	
Panama-Choco (PC)	<i>Gloeospermum blakeanum</i>	
Panama-Choco (PC)	<i>Gonolobus lewisii</i>	
Panama-Choco (PC)	<i>Guatteria allenii</i>	
Panama-Choco (PC)	<i>Guatteria rotundata</i>	
Panama-Choco (PC)	<i>Guatteria sessilicarpa</i>	
Panama-Choco (PC)	<i>Guzmania circinnata</i>	
Panama-Choco (PC)	<i>Guzmania filiorum</i>	
Panama-Choco (PC)	<i>Guzmania polycephala</i>	
Panama-Choco (PC)	<i>Hamelia sanguinea</i>	
Panama-Choco (PC)	<i>Hampea micrantha</i>	
Panama-Choco (PC)	<i>Hebeclinium costaricense</i>	
Panama-Choco (PC)	<i>Heliconia colgantea</i>	
Panama-Choco (PC)	<i>Heliconia magnifica</i>	
Panama-Choco (PC)	<i>Heliconia thomasiana</i>	
Panama-Choco (PC)	<i>Hoffmannia vesiculifera</i>	
Panama-Choco (PC)	<i>Homalomena wallisii</i>	
Panama-Choco (PC)	<i>Huntleya lucida</i>	
Panama-Choco (PC)	<i>Hymenandra crosbyi</i>	
Panama-Choco (PC)	<i>Inga bella</i>	
Panama-Choco (PC)	<i>Inga jimenezii</i>	
Panama-Choco (PC)	<i>Ischnosiphon helenae</i>	
Panama-Choco (PC)	<i>Juanulloa wardiana</i>	
Panama-Choco (PC)	<i>Justicia bitarkarae</i>	
Panama-Choco (PC)	<i>Justicia ephemera</i>	
Panama-Choco (PC)	<i>Justicia graciliflora</i>	
Panama-Choco (PC)	<i>Justicia isthmensis</i>	
Panama-Choco (PC)	<i>Justicia urophylla</i>	
Panama-Choco (PC)	<i>Koanophyllon wetmorei</i>	
Panama-Choco (PC)	<i>Laelia lueddemani</i>	
Panama-Choco (PC)	<i>Lisianthus jefensis</i>	
Panama-Choco (PC)	<i>Lisianthus weaveri</i>	

Panama-Choco (PC)	<i>Lycianthes beckneriana</i>	
Panama-Choco (PC)	<i>Macleania epiphytica</i>	
Panama-Choco (PC)	<i>Macoubea mesoamericana</i>	
Panama-Choco (PC)	<i>Macroclinium junctum</i>	
Panama-Choco (PC)	<i>Macroclinium lineare</i>	
Panama-Choco (PC)	<i>Macrolobium dressleri</i>	
Panama-Choco (PC)	<i>Mapania cuatrecasasii</i>	
Panama-Choco (PC)	<i>Marcgravia panamensis</i>	
Panama-Choco (PC)	<i>Masdevallia livingstoneana</i>	
Panama-Choco (PC)	<i>Maxillaria acostae</i>	
Panama-Choco (PC)	<i>Maxillaria arachnitiflora</i>	
Panama-Choco (PC)	<i>Merinthopodium neuranthum</i>	
Panama-Choco (PC)	<i>Miconia colliculosa</i>	
Panama-Choco (PC)	<i>Microchilus panamanicus</i>	
Panama-Choco (PC)	<i>Mouriri panamensis</i>	
Panama-Choco (PC)	<i>Myrcia fosteri</i>	
Panama-Choco (PC)	<i>Nautilocalyx dressleri</i>	
Panama-Choco (PC)	<i>Nautilocalyx speciosus</i>	
Panama-Choco (PC)	<i>Neomirandea allenii</i>	
Panama-Choco (PC)	<i>Notopleura angustissima</i>	
Panama-Choco (PC)	<i>Notopleura panamensis</i>	
Panama-Choco (PC)	<i>Notopleura parvifolia</i>	
Panama-Choco (PC)	<i>Notopleura penduliflora</i>	
Panama-Choco (PC)	<i>Notylia pittieri</i>	
Panama-Choco (PC)	<i>Ocotea pullifolia</i>	
Panama-Choco (PC)	<i>Oncidium isthmi</i>	
Panama-Choco (PC)	<i>Ornithidium repens</i>	
Panama-Choco (PC)	<i>Ouratea jefensis</i>	
Panama-Choco (PC)	<i>Ouratea tristis</i>	
Panama-Choco (PC)	<i>Pachira sessilis</i>	
Panama-Choco (PC)	<i>Palicourea pendula</i>	
Panama-Choco (PC)	<i>Palmorchis nitida</i>	
Panama-Choco (PC)	<i>Palmorchis powellii</i>	
Panama-Choco (PC)	<i>Palmorchis trinotata</i>	
Panama-Choco (PC)	<i>Paradymonia hirta</i>	
Panama-Choco (PC)	<i>Parathesis amplifolia</i>	
Panama-Choco (PC)	<i>Passiflora eueidipabulum</i>	
Panama-Choco (PC)	<i>Paullinia dodgei</i>	
Panama-Choco (PC)	<i>Paullinia eliasii</i>	
Panama-Choco (PC)	<i>Pavonia castaneifolia</i>	
Panama-Choco (PC)	<i>Pentagonia gymnopoda</i>	
Panama-Choco (PC)	<i>Pentagonia hirsuta</i>	
Panama-Choco (PC)	<i>Peperomia ciliolibractea</i>	
Panama-Choco (PC)	<i>Peperomia cordulatiformis</i>	
Panama-Choco (PC)	<i>Peperomia elata</i>	
Panama-Choco (PC)	<i>Peperomia insueta</i>	
Panama-Choco (PC)	<i>Persea albiramea</i>	
Panama-Choco (PC)	<i>Philodendron annulatum</i>	

Panama-Choco (PC)	<i>Philodendron dolichophyllum</i>	
Panama-Choco (PC)	<i>Philodendron edenudatum</i>	
Panama-Choco (PC)	<i>Philodendron knappiae</i>	
Panama-Choco (PC)	<i>Philodendron llanense</i>	
Panama-Choco (PC)	<i>Pholidostachys kalbreyeri</i>	
Panama-Choco (PC)	<i>Pilea centradenoides</i>	
Panama-Choco (PC)	<i>Pilea digitata</i>	
Panama-Choco (PC)	<i>Pilea magnicarpa</i>	
Panama-Choco (PC)	<i>Piper amphioxys</i>	
Panama-Choco (PC)	<i>Piper arthantopse</i>	
Panama-Choco (PC)	<i>Piper biseriatum</i>	
Panama-Choco (PC)	<i>Piper canaliculum</i>	
Panama-Choco (PC)	<i>Piper cordulatum</i>	
Panama-Choco (PC)	<i>Piper curtispicum</i>	
Panama-Choco (PC)	<i>Piper deductum</i>	
Panama-Choco (PC)	<i>Piper lucigaudens</i>	
Panama-Choco (PC)	<i>Piper magnantherum</i>	
Panama-Choco (PC)	<i>Piper premnospicum</i>	
Panama-Choco (PC)	<i>Piper pubistipulum</i>	
Panama-Choco (PC)	<i>Piper thomasii</i>	
Panama-Choco (PC)	<i>Pleurothallis phyllocardia</i>	
Panama-Choco (PC)	<i>Pleurothallis volcanica</i>	
Panama-Choco (PC)	<i>Plinia coclensis</i>	
Panama-Choco (PC)	<i>Plinia panamensis</i>	
Panama-Choco (PC)	<i>Polygala wurdackiana</i>	
Panama-Choco (PC)	<i>Pouteria chiricana</i>	
Panama-Choco (PC)	<i>Prestoea pubens</i>	
Panama-Choco (PC)	<i>Prestonia seemannii</i>	
Panama-Choco (PC)	<i>Prosthechea ionocentra</i>	
Panama-Choco (PC)	<i>Prosthechea sima</i>	
Panama-Choco (PC)	<i>Protium confusum</i>	
Panama-Choco (PC)	<i>Protium sessiliflorum</i>	
Panama-Choco (PC)	<i>Psammisia panamensis</i>	
Panama-Choco (PC)	<i>Psychotria acicularis</i>	
Panama-Choco (PC)	<i>Psychotria cascajalensis</i>	
Panama-Choco (PC)	<i>Psychotria croatii</i>	
Panama-Choco (PC)	<i>Psychotria croceovenosa</i>	
Panama-Choco (PC)	<i>Psychotria jefensis</i>	
Panama-Choco (PC)	<i>Psychotria mortoniana</i>	
Panama-Choco (PC)	<i>Psychotria paradichroa</i>	
Panama-Choco (PC)	<i>Quadrella antonensis</i>	
Panama-Choco (PC)	<i>Renealmia helenae</i>	
Panama-Choco (PC)	<i>Renealmia pirrensis</i>	
Panama-Choco (PC)	<i>Rinorea crenata</i>	
Panama-Choco (PC)	<i>Ruellia anthracina</i>	
Panama-Choco (PC)	<i>Ruellia panamensis</i>	
Panama-Choco (PC)	<i>Ruellia pittieri</i>	
Panama-Choco (PC)	<i>Ruellia praeclara</i>	

Panama-Choco (PC)	<i>Rufodorsia intermedia</i>	
Panama-Choco (PC)	<i>Sarcopera sessiliflora</i>	
Panama-Choco (PC)	<i>Scaphyglottis chlorantha</i>	
Panama-Choco (PC)	<i>Scaphyglottis coriacea</i>	
Panama-Choco (PC)	<i>Scaphyglottis laevilabium</i>	
Panama-Choco (PC)	<i>Scaphyglottis panamensis</i>	
Panama-Choco (PC)	<i>Scaphyglottis robusta</i>	
Panama-Choco (PC)	<i>Schultesianthus crosbianus</i>	
Panama-Choco (PC)	<i>Scutellaria tenuipetiolata</i>	
Panama-Choco (PC)	<i>Sebastiania panamensis</i>	
Panama-Choco (PC)	<i>Serjania pyramidata</i>	
Panama-Choco (PC)	<i>Silverstoneia flotator</i>	
Panama-Choco (PC)	<i>Solanum incomptum</i>	
Panama-Choco (PC)	<i>Sorocea ruminata</i>	
Panama-Choco (PC)	<i>Sphaeradenia alba</i>	
Panama-Choco (PC)	<i>Sphaeradenia alleniana</i>	
Panama-Choco (PC)	<i>Sphaeradenia woodsonii</i>	
Panama-Choco (PC)	<i>Stanhopea pulla</i>	
Panama-Choco (PC)	<i>Stelis atrorubens</i>	
Panama-Choco (PC)	<i>Stigmaphyllon hypargyrium</i>	
Panama-Choco (PC)	<i>Symphysia jefensis</i>	
Panama-Choco (PC)	<i>Syngonium mauroanum</i>	
Panama-Choco (PC)	<i>Syngonium wendlandii</i>	
Panama-Choco (PC)	<i>Systeloglossum panamense</i>	
Panama-Choco (PC)	<i>Tachigali versicolor</i>	
Panama-Choco (PC)	<i>Themistoclesia pentandra</i>	
Panama-Choco (PC)	<i>Thismia luetzelburgii</i>	
Panama-Choco (PC)	<i>Tibouchina wurdackii</i>	
Panama-Choco (PC)	<i>Tournefortia multiflora</i>	
Panama-Choco (PC)	<i>Trichocentrum capistratum</i>	
Panama-Choco (PC)	<i>Trichopilia maculata</i>	
Panama-Choco (PC)	<i>Tynanthus croatianus</i>	
Panama-Choco (PC)	<i>Unonopsis bullata</i>	
Panama-Choco (PC)	<i>Unonopsis panamensis</i>	
Panama-Choco (PC)	<i>Unonopsis theobromifolia</i>	
Panama-Choco (PC)	<i>Verbesina fuscasciccans</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Adelobotrys antioquiensis</i>	<i>Pristimantis zophus</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Aiphanes parvifolia</i>	<i>Grallaria rufocinerea</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Anthurium antioquiense</i>	<i>Andira chigorodensis</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Anthurium chrysolithos</i>	<i>Annona spraguei</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Aphelandra haughtii</i>	<i>Dendropsophus bogerti</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Aphelandra lasiophylla</i>	<i>Hyloxalus ramosi</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Ayenia saligna</i>	<i>Ranitomeya opisthomelas</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Blakea stephanochaeta</i>	<i>Brownea santanderensis</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Brachycylix vageleri</i>	<i>Cochranella punctulata</i>

North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Brownea santanderensis</i>	<i>Cochranella susatamai</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Calliandra antioquiae</i>	<i>Epicrionops parkeri</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Calliandra medellinensis</i>	<i>Heliconia laxa</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Caraipa colombiana</i>	<i>Heliconia rigida</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Caryodaphnopsis cogolloi</i>	<i>Casimirella crispula</i>
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Casimirella crispula</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Cayaponia ovata</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Chamaedorea ricardoii</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Clidemia anoriensis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Cochranella punctulata</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Cochranella susatamai</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Compsoeura anoriensis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Conceveiba santanderensis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Coussarea antioquiiana</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Crematosperma magdalenae</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Duguetia colombiana</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Epicrionops parkeri</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Gasteranthus anomalus</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Gurania bignoniacea</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Heliconia antioquiensis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Hyloxalus ramosi</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Ladenbergia magdalenae</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Mendoncia mirabilis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Meriania albertiae</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Meriania hoyosii</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Nymphargus rosada</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Palicourea denslowiae</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Parvicaecilia nicefori</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Passiflora parritae</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Piper obrutum</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Piper protracticuspidatum</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pitcairnia fluvialis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pourouma lawrancei</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pristimantis viejas</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pseudoxandra sclerocarpa</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Psychotria ovatistipula</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pterandra colombiana</i>	

North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Pteropepon oleiferum</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Rheobates pseudopalmaris</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Rinorea ulmifolia</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Romeroa verticillata</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Simira hirsuta</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Tococa racemifera</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Trichilia oligofoliolata</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Vantanea magdalenensis</i>	
North of the Central and Western Cordilleras-Interandean Valleys (CI)	<i>Zapoteca microcephala</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Aechmea germinyana</i>	<i>Pristimantis sanguineus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium albertiae</i>	<i>Phylllobates bicolor</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium barbaocoense</i>	<i>Hypsiboas rubracylus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium calimense</i>	<i>Engystomops coloradorum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium chocoense</i>	<i>Epipedobates espinosai</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium cogolloanum</i>	<i>Hypsiboas picturatus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium coleorrhiza</i>	<i>Ranitomeya fulgurita</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium cordobense</i>	<i>Anisognathus notabilis</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium hodgei</i>	<i>Bangsia edwardsi</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium isidroense</i>	<i>Pittasoma rufopileatum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium joaquinense</i>	<i>Anthurium albertiae</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium malagaense</i>	<i>Anthurium cordobense</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium morae</i>	<i>Anthurium debilis</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium oxyanthum</i>	<i>Aechmea germinyana</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium perviride</i>	<i>Hyalinobatrachium aureoguttatum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium prominerve</i>	<i>Caecilia abitaguae</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium riparium</i>	<i>Hyloxalus awa</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium splendidum</i>	<i>Pristimantis chalceus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Anthurium variilobum</i>	<i>Pristimantis eremitus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Aphelandra garciae</i>	<i>Pristimantis floridus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ardisia brevis</i>	<i>Pristimantis pyrrhomerus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ardisia cabrerai</i>	<i>Rhaebo hypomelas</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Begonia kalbreyeri</i>	<i>Agelaiocercus coelestis</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Blakea clavata</i>	<i>Capito quinticolor</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Blakea cuprina</i>	<i>Chrysothlypis salmomi</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Calathea colombiana</i>	<i>Anthurium calimense</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Clibadium cordatum</i>	<i>Anthurium coleorrhiza</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Columnnea cuspidata</i>	<i>Anthurium filiforme</i>

High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Cremosperma ignotum</i>	<i>Anthurium isidroense</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Disterigma parallelinerve</i>	<i>Anthurium lautum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Dracula spectrum</i>	<i>Anthurium oxyanthum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Eschweilera integricalyx</i>	<i>Anthurium panduraeforme</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Faramea monsalveae</i>	<i>Anthurium riparium</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ficus pertusa</i>	<i>Anthurium rubrivellus</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Geonoma divisa</i>	<i>Calathea colombiana</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Guatteria collina</i>	<i>Anthurium cogolloanum</i>
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Heliconia atratensis</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Heliconia mucilagina</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Heliconia terciopela</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Homalomena moffleriana</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Hypsiboas rubracylus</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ilex flosparva</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Justicia leptochlamys</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Licania espiniae</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Licania gentryi</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Magnolia lenticellata</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Magnolia urraoensis</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Matisia bullata</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Matisia racemifera</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Matisia spathacea</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Matisia valdes-bermejoi</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Mauritiella macroclada</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Monolena cordifolia</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Monolena pilosiuscula</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Monotagma haughtii</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Mouriri pachyphylla</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ouratea chochoensis</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Paradrymonia sericea</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron baudoense</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron chrysocarpum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron dryanderiae</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron longipes</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron monsalveae</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron ninoanum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron rhodospathiphyllum</i>	

High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron tricostratum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Philodendron venulosum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Phoradendron triflorum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Piper amoenum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Piper catripense</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Piper contraverrugosa</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Piper griseolimbum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Pitcairnia arida</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Pristimantis sanguineus</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Protium nervosum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Psammisia orthoneura</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Pseuderanthemum chilianthium</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Pseudoxandra vallicola</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Ranitomeya fulgurita</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Renealmia vallensis</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Roucheria monsalvaeae</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Satyria latifolia</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Scaphyglottis gentryi</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Schefflera calypticuspida</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Schefflera lilacina</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Schefflera yurumanguinis</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Solanum unifoliatum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Sphaeradenia pallida</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Stenospermation velutinum</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Symphonia globulifera</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Thibaudia archeri</i>	
High Atrato-SanJuan-Baudo-West Cordillera (AW)	<i>Zanthoxylum gentryi</i>	
West of Ecuador (WE)	<i>Acanthosyris glabrata</i>	<i>Aechmea pyramidalis</i>
West of Ecuador (WE)	<i>Aechmea pyramidalis</i>	<i>Pachyramphus spodiurus</i>
West of Ecuador (WE)	<i>Aeschynomene pluriarticulata</i>	<i>Aechmea aciculosa</i>
West of Ecuador (WE)	<i>Aiphanes eggersii</i>	<i>Myiothlypis fraseri</i>
West of Ecuador (WE)	<i>Amalophyllon clarkii</i>	<i>Thamnophilus bernardi</i>
West of Ecuador (WE)	<i>Amaranthus squamulatus</i>	<i>Turdus reevei</i>
West of Ecuador (WE)	<i>Annona deceptrix</i>	<i>Attila torridus</i>
West of Ecuador (WE)	<i>Anthurium acutissimum</i>	<i>Brotogeris pyrrhoptera</i>
West of Ecuador (WE)	<i>Anthurium iltisii</i>	<i>Trogon mesurus</i>
West of Ecuador (WE)	<i>Anthurium samamaense</i>	<i>Armatocereus cartwrightianus</i>
West of Ecuador (WE)	<i>Anthurium sparreorum</i>	<i>Synallaxis stictothorax</i>
West of Ecuador (WE)	<i>Anthurium subcoeruleum</i>	<i>Leptotila ochraceiventris</i>

West of Ecuador (WE)	<i>Aspidosperma rigidum</i>	<i>Icterus graceannae</i>
West of Ecuador (WE)	<i>Asplundia quinindensis</i>	<i>Grallaria watkinsi</i>
West of Ecuador (WE)	<i>Bauhinia haughtii</i>	<i>Cyanocorax mystacalis</i>
West of Ecuador (WE)	<i>Begonia harlingii</i>	<i>Arremon abeillei</i>
West of Ecuador (WE)	<i>Bolitoglossa chica</i>	<i>Aratinga erythrogenys</i>
West of Ecuador (WE)	<i>Brownea angustiflora</i>	<i>Crypturellus transfasciatus</i>
West of Ecuador (WE)	<i>Brownea disepala</i>	<i>Lathrotriccus griseipectus</i>
West of Ecuador (WE)	<i>Byttneria parviflora</i>	<i>Melanopareia elegans</i>
West of Ecuador (WE)	<i>Campylocentrum ecuadorensis</i>	<i>Myrmia micrura</i>
West of Ecuador (WE)	<i>Catasetum macroglossum</i>	<i>Cienfuegosia hitchcockii</i>
West of Ecuador (WE)	<i>Clavija pungens</i>	<i>Anthurium marginellum</i>
West of Ecuador (WE)	<i>Cordia macrantha</i>	<i>Pristimantis subsigillatus</i>
West of Ecuador (WE)	<i>Costus geothysus</i>	<i>Pristimantis ornatissimus</i>
West of Ecuador (WE)	<i>Croizatia cimallonia</i>	<i>Pristimantis thymalopsoides</i>
West of Ecuador (WE)	<i>Cycnoches lehmannii</i>	<i>Rhaebo caeruleostictus</i>
West of Ecuador (WE)	<i>Cynophalla sclerophylla</i>	<i>Scinax quinquifasciatus</i>
West of Ecuador (WE)	<i>Dichaea angustisegmenta</i>	<i>Campephilus gayaquilensis</i>
West of Ecuador (WE)	<i>Dimerandra rimbachii</i>	<i>Columbina buckleyi</i>
West of Ecuador (WE)	<i>Drymonia rhodoloma</i>	<i>Furnarius cinnamomeus</i>
West of Ecuador (WE)	<i>Engystomops coloradorum</i>	<i>Hylocryptus erythrocephalus</i>
West of Ecuador (WE)	<i>Epidendrum echinatum</i>	<i>Leucopternis occidentalis</i>
West of Ecuador (WE)	<i>Erythrochiton giganteus</i>	<i>Myiarchus phaeocephalus</i>
West of Ecuador (WE)	<i>Eucharis astrophiala</i>	<i>Myiopagis subplacens</i>
West of Ecuador (WE)	<i>Eugenia castaneiflora</i>	<i>Picumnus sclateri</i>
West of Ecuador (WE)	<i>Gasteranthus perennis</i>	<i>Pteroglossus erythropygius</i>
West of Ecuador (WE)	<i>Geonoma linearis</i>	<i>Rhodospingus cruentus</i>
West of Ecuador (WE)	<i>Geonoma tenuissima</i>	<i>Spinus siemiradzki</i>
West of Ecuador (WE)	<i>Gonzalagunia dodsonii</i>	<i>Synallaxis tithys</i>
West of Ecuador (WE)	<i>Gurania pedata</i>	<i>Turdus maculirostris</i>
West of Ecuador (WE)	<i>Gustavia serrata</i>	<i>Tyrannus niveigularis</i>
West of Ecuador (WE)	<i>Hibiscus escobariae</i>	<i>Veniliornis callonotus</i>
West of Ecuador (WE)	<i>Hylocryptus erythrocephalus</i>	<i>Aiphanes eggersii</i>
West of Ecuador (WE)	<i>Inga alatocarpa</i>	<i>Aiphanes grandis</i>
West of Ecuador (WE)	<i>Inga carinata</i>	<i>Anthurium acutissimum</i>
West of Ecuador (WE)	<i>Inga manabiensis</i>	<i>Anthurium balslevii</i>
West of Ecuador (WE)	<i>Justicia ianthina</i>	<i>Anthurium barclayanum</i>
West of Ecuador (WE)	<i>Leucopternis occidentalis</i>	<i>Anthurium chimborazense</i>
West of Ecuador (WE)	<i>Mandevilla sagittarii</i>	<i>Anthurium citrifolium</i>
West of Ecuador (WE)	<i>Matisia giacomettoi</i>	<i>Anthurium iltisii</i>
West of Ecuador (WE)	<i>Matisia palenquiana</i>	<i>Anthurium napaeum</i>
West of Ecuador (WE)	<i>Miconia guayaquilensis</i>	<i>Dimerandra rimbachii</i>
West of Ecuador (WE)	<i>Mikania tafallana</i>	<i>Elleanthus isochiloides</i>
West of Ecuador (WE)	<i>Mormolyca richii</i>	<i>Maxillariella pardalina</i>
West of Ecuador (WE)	<i>Muehlenbeckia tamnifolia</i>	<i>Amalophyllon clarkii</i>
West of Ecuador (WE)	<i>Notylia rimbachii</i>	<i>Amphilophium ecuadorensis</i>
West of Ecuador (WE)	<i>Odontocarya perforata</i>	<i>Cobaea flava</i>
West of Ecuador (WE)	<i>Oxalis glauca</i>	<i>Columnea schimpffii</i>
West of Ecuador (WE)	<i>Pectis arida</i>	<i>Anolis princeps</i>

West of Ecuador (WE)	<i>Peperomia cacaophila</i>	<i>Anolis lynchi</i>
West of Ecuador (WE)	<i>Pharus ecuadoricus</i>	<i>Leptodactylus peritoaktites</i>
West of Ecuador (WE)	<i>Philodendron balaoanum</i>	<i>Epipedobates machalilla</i>
West of Ecuador (WE)	<i>Picramnia latifolia</i>	<i>Epicrionops lativittatus</i>
West of Ecuador (WE)	<i>Piper entradense</i>	<i>Bolitoglossa chica</i>
West of Ecuador (WE)	<i>Pitcairnia daiseyana</i>	<i>Barycholos pulcher</i>
West of Ecuador (WE)	<i>Pitcairnia unilateralis</i>	<i>Atelopus coynei</i>
West of Ecuador (WE)	<i>Pleurothyrium giganteum</i>	<i>Atelopus mindoensis</i>
West of Ecuador (WE)	<i>Pristimantis luteolateralis</i>	<i>Epipedobates boulengeri</i>
West of Ecuador (WE)	<i>Pristimantis muricatus</i>	<i>Gastrotheca dendronastes</i>
West of Ecuador (WE)	<i>Pristimantis parvillus</i>	<i>Hyloxalus abditaurentius</i>
West of Ecuador (WE)	<i>Pristimantis tenebrionis</i>	<i>Hyloxalus lehmanni</i>
West of Ecuador (WE)	<i>Pristimantis thymalopsoides</i>	<i>Hyloxalus toachi</i>
West of Ecuador (WE)	<i>Prockia pentamera</i>	<i>Nymphargus griffithsi</i>
West of Ecuador (WE)	<i>Rinorea deflexa</i>	<i>Nymphargus rosada</i>
West of Ecuador (WE)	<i>Schizoptera peduncularis</i>	<i>Parvicaecilia nicefori</i>
West of Ecuador (WE)	<i>Siparuna palenquensis</i>	<i>Pristimantis calcarulatus</i>
West of Ecuador (WE)	<i>Solanum manabiense</i>	<i>Pristimantis caprifer</i>
West of Ecuador (WE)	<i>Sphyrnospermum haughtii</i>	<i>Pristimantis crenunguis</i>
West of Ecuador (WE)	<i>Stanhopea annulata</i>	<i>Pristimantis crucifer</i>
West of Ecuador (WE)	<i>Tetrorchidium hirsutum</i>	<i>Pristimantis illotus</i>
West of Ecuador (WE)	<i>Verbesina minuticeps</i>	<i>Pristimantis luteolateralis</i>
West of Ecuador (WE)	<i>Virola aequatorialis</i>	<i>Pristimantis molybrignus</i>
West of Ecuador (WE)	<i>Vitex gigantea</i>	<i>Pristimantis muricatus</i>
West of Ecuador (WE)		<i>Pristimantis orpacobates</i>
West of Ecuador (WE)		<i>Pristimantis parvillus</i>
West of Ecuador (WE)		<i>Pristimantis pteridophilus</i>
West of Ecuador (WE)		<i>Pristimantis quinquagesimus</i>
West of Ecuador (WE)		<i>Pristimantis tenebrionis</i>
West of Ecuador (WE)		<i>Pristimantis viejas</i>
West of Ecuador (WE)		<i>Rheobates pseudopalermatus</i>
West of Ecuador (WE)		<i>Strabomantis cerastes</i>
West of Ecuador (WE)		<i>Strabomantis necerus</i>
West of Ecuador (WE)		<i>Strabomantis zygodactylus</i>
West of Ecuador (WE)		<i>Anolis gemmosus</i>
West of Ecuador (WE)		<i>Atractus paucidens</i>
West of Ecuador (WE)		<i>Lepidoblepharis buchwaldi</i>
West of Ecuador (WE)		<i>Lepidoblepharis grandis</i>
West of Ecuador (WE)		<i>Amazilia rosenbergi</i>
West of Ecuador (WE)		<i>Bangsia rothschildi</i>
West of Ecuador (WE)		<i>Boissonneaua jardini</i>
West of Ecuador (WE)		<i>Calliphlox mitchellii</i>
West of Ecuador (WE)		<i>Chlorochrysa phoenicotis</i>
West of Ecuador (WE)		<i>Chlorospingus flavovirens</i>
West of Ecuador (WE)		<i>Chlorospingus semifuscus</i>
West of Ecuador (WE)		<i>Chlorostilbon melanorhynchus</i>
West of Ecuador (WE)		<i>Chlorothraupis stolzmanni</i>
West of Ecuador (WE)		<i>Coeligena wilsoni</i>

West of Ecuador (WE)		<i>Cyanolyca pulchra</i>
West of Ecuador (WE)		<i>Diglossa indigotica</i>
West of Ecuador (WE)		<i>Geotrygon purpurata</i>
West of Ecuador (WE)		<i>Grallaria flavotincta</i>
West of Ecuador (WE)		<i>Heliodoxa imperatrix</i>
West of Ecuador (WE)		<i>Machaeropterus deliciosus</i>
West of Ecuador (WE)		<i>Margarornis stellatus</i>
West of Ecuador (WE)		<i>Megascops colombianus</i>
West of Ecuador (WE)		<i>Micrastur plumbeus</i>
West of Ecuador (WE)		<i>Neomorphus radiolosus</i>
West of Ecuador (WE)		<i>Nyctiphrynus rosenbergi</i>
West of Ecuador (WE)		<i>Oreothraupis arremonops</i>
West of Ecuador (WE)		<i>Pipreola jucunda</i>
West of Ecuador (WE)		<i>Rhynchocyclus pacificus</i>
West of Ecuador (WE)		<i>Saltator atripennis</i>
West of Ecuador (WE)		<i>Scytalopus vicinior</i>
West of Ecuador (WE)		<i>Semnormis ramphastinus</i>
West of Ecuador (WE)		<i>Tangara rufigula</i>
West of Ecuador (WE)		<i>Aiphanes chiribogensis</i>
West of Ecuador (WE)		<i>Aiphanes parvifolia</i>
West of Ecuador (WE)		<i>Anthurium alatum</i>
West of Ecuador (WE)		<i>Anthurium alluriquinense</i>
West of Ecuador (WE)		<i>Anthurium andinum</i>
West of Ecuador (WE)		<i>Anthurium antioquiense</i>
West of Ecuador (WE)		<i>Anthurium barbacoasense</i>
West of Ecuador (WE)		<i>Anthurium buccayanum</i>
West of Ecuador (WE)		<i>Anthurium caucavallense</i>
West of Ecuador (WE)		<i>Anthurium caulorrhizum</i>
West of Ecuador (WE)		<i>Anthurium chochoense</i>
West of Ecuador (WE)		<i>Anthurium chrysolithos</i>
West of Ecuador (WE)		<i>Anthurium daguense</i>
West of Ecuador (WE)		<i>Anthurium dolichophyllum</i>
West of Ecuador (WE)		<i>Anthurium dolichostachyum</i>
West of Ecuador (WE)		<i>Anthurium draconopterum</i>
West of Ecuador (WE)		<i>Anthurium esmeraldense</i>
West of Ecuador (WE)		<i>Anthurium fragrans</i>
West of Ecuador (WE)		<i>Anthurium furcatum</i>
West of Ecuador (WE)		<i>Anthurium giraldoi</i>
West of Ecuador (WE)		<i>Anthurium hebetatilaminum</i>
West of Ecuador (WE)		<i>Anthurium hinoideum</i>
West of Ecuador (WE)		<i>Anthurium hodgei</i>
West of Ecuador (WE)		<i>Anthurium jaramilloi</i>
West of Ecuador (WE)		<i>Anthurium jimeneae</i>
West of Ecuador (WE)		<i>Anthurium lacinosum</i>
West of Ecuador (WE)		<i>Anthurium maculosum</i>
West of Ecuador (WE)		<i>Anthurium magnifolium</i>
West of Ecuador (WE)		<i>Anthurium malagaense</i>
West of Ecuador (WE)		<i>Anthurium margaricarpum</i>

West of Ecuador (WE)		<i>Anthurium marmoratum</i>
West of Ecuador (WE)		<i>Anthurium membranaceum</i>
West of Ecuador (WE)		<i>Anthurium morae</i>
West of Ecuador (WE)		<i>Anthurium nemorale</i>
West of Ecuador (WE)		<i>Anthurium obscurinervium</i>
West of Ecuador (WE)		<i>Anthurium ochreatum</i>
West of Ecuador (WE)		<i>Anthurium oreophilum</i>
West of Ecuador (WE)		<i>Anthurium palenquense</i>
West of Ecuador (WE)		<i>Anthurium pedunculare</i>
West of Ecuador (WE)		<i>Anthurium perviride</i>
West of Ecuador (WE)		<i>Anthurium praealtum</i>
West of Ecuador (WE)		<i>Anthurium promininerve</i>
West of Ecuador (WE)		<i>Anthurium rimbachii</i>
West of Ecuador (WE)		<i>Anthurium rivulare</i>
West of Ecuador (WE)		<i>Anthurium rodrigueziae</i>
West of Ecuador (WE)		<i>Anthurium saccardoi</i>
West of Ecuador (WE)		<i>Anthurium samamaense</i>
West of Ecuador (WE)		<i>Anthurium sodiroanum</i>
West of Ecuador (WE)		<i>Anthurium soejartoi</i>
West of Ecuador (WE)		<i>Anthurium sparreorum</i>
West of Ecuador (WE)		<i>Anthurium splendidum</i>
West of Ecuador (WE)		<i>Anthurium subcarinatum</i>
West of Ecuador (WE)		<i>Anthurium subcoerulescens</i>
West of Ecuador (WE)		<i>Anthurium tenuifolium</i>
West of Ecuador (WE)		<i>Anthurium variilobum</i>
West of Ecuador (WE)		<i>Anthurium wattii</i>
West of Ecuador (WE)		<i>Anthurium werffii</i>
West of Ecuador (WE)		<i>Aspasia psittacina</i>
West of Ecuador (WE)		<i>Asplundia cayapensis</i>
West of Ecuador (WE)		<i>Asplundia fagerlindii</i>
West of Ecuador (WE)		<i>Asplundia quinindensis</i>
West of Ecuador (WE)		<i>Attalea cuatrecasana</i>
West of Ecuador (WE)		<i>Bisboeckelera vinacea</i>
West of Ecuador (WE)		<i>Bomarea diffracta</i>
West of Ecuador (WE)		<i>Calathea multicingta</i>
West of Ecuador (WE)		<i>Calathea roseobracteata</i>
West of Ecuador (WE)		<i>Calathea selbyana</i>
West of Ecuador (WE)		<i>Calathea timothei</i>
West of Ecuador (WE)		<i>Calyptogyne baudensis</i>
West of Ecuador (WE)		<i>Campylocentrum ecuadoreense</i>
West of Ecuador (WE)		<i>Catasetum macroglossum</i>
West of Ecuador (WE)		<i>Cattleya maxima</i>
West of Ecuador (WE)		<i>Chamaedorea ricardoii</i>
West of Ecuador (WE)		<i>Chlorospatha atropurpurea</i>
West of Ecuador (WE)		<i>Chlorospatha dodsonii</i>
West of Ecuador (WE)		<i>Chusquea maclurei</i>
West of Ecuador (WE)		<i>Costus geothyrsus</i>
West of Ecuador (WE)		<i>Cycnoches lehmannii</i>

West of Ecuador (WE)		<i>Cyrtochiloides riopalenequeana</i>
West of Ecuador (WE)		<i>Dianthoveus cremnophilus</i>
West of Ecuador (WE)		<i>Dichaea angustisegmenta</i>
West of Ecuador (WE)		<i>Dichaea richii</i>
West of Ecuador (WE)		<i>Dicranopygium trianae</i>
West of Ecuador (WE)		<i>Dracontium croatii</i>
West of Ecuador (WE)		<i>Dracula spectrum</i>
West of Ecuador (WE)		<i>Elleanthus aristatus</i>
West of Ecuador (WE)		<i>Epidendrum borchsenii</i>
West of Ecuador (WE)		<i>Epidendrum cornanthera</i>
West of Ecuador (WE)		<i>Epidendrum echinatum</i>
West of Ecuador (WE)		<i>Epidendrum littorale</i>
West of Ecuador (WE)		<i>Epidendrum macrophorum</i>
West of Ecuador (WE)		<i>Epidendrum williamsii</i>
West of Ecuador (WE)		<i>Epidryos micrantherus</i>
West of Ecuador (WE)		<i>Eucharis astrophiala</i>
West of Ecuador (WE)		<i>Eucrosia aurantiaca</i>
West of Ecuador (WE)		<i>Eucrosia dodsonii</i>
West of Ecuador (WE)		<i>Eucrosia stricklandii</i>
West of Ecuador (WE)		<i>Geonoma chlamydotachys</i>
West of Ecuador (WE)		<i>Geonoma divisa</i>
West of Ecuador (WE)		<i>Geonoma irena</i>
West of Ecuador (WE)		<i>Geonoma linearis</i>
West of Ecuador (WE)		<i>Geonoma tenuissima</i>
West of Ecuador (WE)		<i>Guzmania albescens</i>
West of Ecuador (WE)		<i>Guzmania alborosea</i>
West of Ecuador (WE)		<i>Guzmania bracteosa</i>
West of Ecuador (WE)		<i>Guzmania conglomerata</i>
West of Ecuador (WE)		<i>Guzmania fosteriana</i>
West of Ecuador (WE)		<i>Guzmania fuquae</i>
West of Ecuador (WE)		<i>Guzmania harlingii</i>
West of Ecuador (WE)		<i>Guzmania hitchcockiana</i>
West of Ecuador (WE)		<i>Guzmania jaramilloi</i>
West of Ecuador (WE)		<i>Guzmania longipetala</i>
West of Ecuador (WE)		<i>Guzmania regalis</i>
West of Ecuador (WE)		<i>Guzmania remyi</i>
West of Ecuador (WE)		<i>Guzmania teuscheri</i>
West of Ecuador (WE)		<i>Guzmania wittmackii</i>
West of Ecuador (WE)		<i>Guzmania xanthobracteata</i>
West of Ecuador (WE)		<i>Heliconia antioquiensis</i>
West of Ecuador (WE)		<i>Heliconia atratensis</i>
West of Ecuador (WE)		<i>Heliconia fragilis</i>
West of Ecuador (WE)		<i>Heliconia gaiboriana</i>
West of Ecuador (WE)		<i>Heliconia harlingii</i>
West of Ecuador (WE)		<i>Heliconia mucilagina</i>
West of Ecuador (WE)		<i>Heliconia terciopela</i>