

New records of plants for San Andres and Old Providence islands (International Biosphere Reserve *Seaflower*), Caribbean Colombia

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ABSTRACT: Fifty seven new records of vascular plants are reported for the Archipelago of San Andres and Old Providence, part of the International Biosphere Reserve *Seaflower*. Of these, about 81% have been introduced for agriculture or ornamental purpose. With these introductions, we report ten new families and 30 new genera for the Archipelago. The possible impacts of some of these introductions are discussed.

INTRODUCTION

The archipelago of San Andres, Old Providence and Sainte Cataline islands is located about 200 km off the coast of Nicaragua and due to its vicinity with the Central American continental platform, the vascular flora has a higher affinity with the flora of Central America and Northern South America, compared to the Antillean flora (Lowy 2000).

The island vegetation is classified as transitional, with elements of both dry forest and wet tropical forest (González *et al.* 1995; Lowy 2000). Due to the high population density, the natural vegetation on San Andres Island has been completely transformed, while on Old Providence Island the original vegetation is still present on the top of the hill (the Peak, Marquez *et al.* 2006).

The flora of the Archipelago has not been extensively studied. Díaz and Lowy (1992) reported 374 species of vascular plants (366 angiosperms and 7 pteridophytes). Later, Lowy (2000) updated all the botanical information available for the islands, including reports (e.g. Barriga 1969; González *et al.* 1995) and herbarium specimens, registering a total of 409 species of vascular plants, 77% of which were considered native, and the other 23% introduced.

More recently, Tobar and Gavio (2011) reported the presence of the invasive *Pteridium caudatum* on Old Providence Island.

Introduced plants are an important component of the actual flora of most countries (Chacón and Saborío 2006), and may cause extensive damage (Mack and Lonsdale 2000). Particularly, introduced species are the most important threat for native species in oceanic islands (Chacón and Saborío 2006).

To contribute to the knowledge of the vascular flora of the International Biosphere Reserve, we carried out an inventory of species not previously reported for the islands. All species have been introduced for agricultural or ornamental purposes. The possible impact of some of these species is discussed.

MATERIALS AND METHODS

Study area

The Archipelago of San Andres, Old Providence and Sainte Cataline is located in the southwestern Caribbean, in the intertropical region, with a marine area of more than 250,000 km² of oceanic waters and only 70 km² of terrestrial landmass (Márquez 2006). The islands lie in the transition zone between tropical dry and the tropical wet climate. The influence of trade winds mitigates the dry and warm climate. The annual mean temperature is 27.4°C, with maximum values between 29 and 30°C (May to June) and minimum between 25.5 and 26.0°C (December to February). The annual mean precipitation is 1797.8 mm, unevenly distributed in a dry season (January to April), with stronger winds, and a wet season (October to December) when 80% of the annual rain falls. During the period from May to July the rains are moderate in intensity (IDEAM 1995).

The islands are volcanic in origin with the subsidence of the volcanic base of San Andres Island, and its simultaneous cover with calcareous deposits, biogenic in origin, during the Tertiary and Quaternary, gave rise to the present island (Gonzalez *et al.* 1995), while Old Providence Island maintained its volcanic nature.

The flora was collected at different sites on the two main islands (Figures 1 and 2).

Sampling method

To complete the inventory of the flora of the archipelago, we collected both in anthropogenic and natural areas (Tables 1-2). Species were taxonomically identified using taxonomic literature and personal knowledge. The samples were mounted and deposited in the herbarium of the Universidad Nacional de Colombia sede Caribe, with a duplicate sent to the National Herbarium (COL).

RESULTS AND DISCUSSION

We found fifty-seven new records for the archipelago, distributed in thirty families and forty-seven genera. Of

these, ten families and thirty genera are reported for the first time from the islands (Table 3). All species encountered have a wide tropical and subtropical distribution, and have been introduced for ornamental and agricultural purposes. While 81% of the species listed herein are still confined to greenhouses, backyards and gardens, the other 19% of the new records are naturalised and often escaped into the surrounding areas.

With this study, the percentage of introduced plant species in the International Biosphere Reserve increases to 30%, from the 23% reported by Lowy (2000). The

majority of the taxa newly reported have ornamental use (Table 2). Of these, *X. sagittifolium*, *C. maxina*, *M. x paradisiaca*, *C. lanatus*, *A. macrorrhizos*, *C. melo*, *T. divaricata*, *C.warscewiczii*, *P. ebenea* and *S. podophyllum* have been observed in wild settings on the islands.

Among the species reported, two may become a possible nuisance, due to its invasive behaviour reported in other regions. *S. podophyllum* (Abrecht et al. 2003) is a species which is difficult to eradicate and tends to expand rapidly at the expense of other species because it has an epiphytical growth form that may suffocate native species. *S. podophyllum* has been observed in several parts of San Andres Island, in the wild, completely covering other plants.

Casuarina equisetifolia is an invasive tree native to South-east Asia, Australia and southern Pacific islands to Tahiti and Samoa. Its non-native range now extends to North and Central America, much of the Caribbean as well as islands in the northern Pacific and Indian Oceans. It is thought to be one of the most common tree species on beaches in the tropics (Wheeler et al. 2011). If *Casuarina* expands, it may alter the habitat of infested areas, inhibiting native plants with rapid growth, dense coverage, and thick litter accumulation (Hammerton, 2001). *Casuarina* is thought to promote beach erosion (Austin 1978; Deaton 1994; Hammerton 2001), reduce populations of small mammals (Mazzotti et al. 1981), and interfere with the nesting of

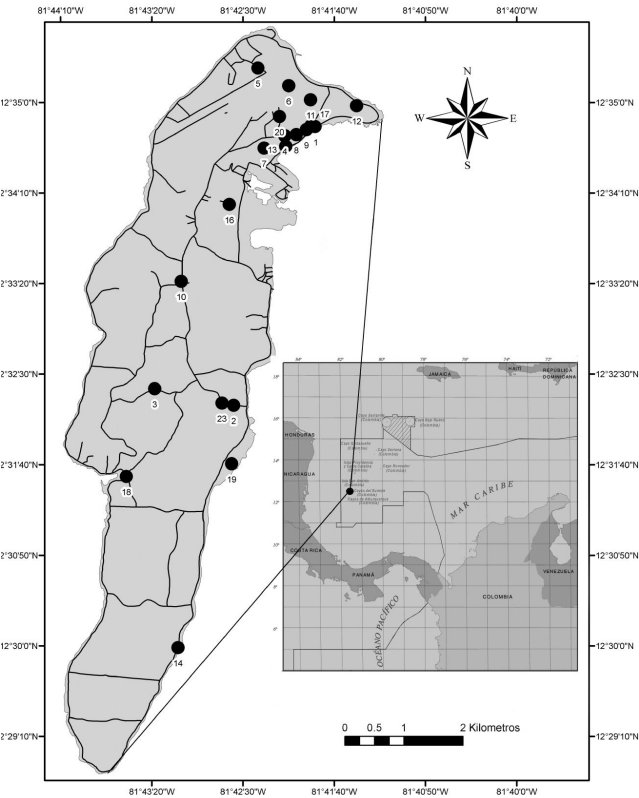


FIGURE 1. Map of San Andres Island with sample sites.

TABLE 1. Sampling sites on San Andres Island.

Number	Name and Abbreviation
1	Police Station (PNS)
2	San Luis, Harmony Hill (SHH)
3	Duppy Gully (DG)
4	School Cajasai (CS)
5	Sarie Bay (SB)
6	Airport surroundings (ARP)
7	School Sagrada familia (CSF)
8	Avenida 20 de Julio (A20J)
9	Parque Simón Bolívar (PSB)
10	La Loma diagonal San Francisco Church (LLR)
11	Center (CEN)
12	New Point Mall (CNP)
13	Los Almendros (BLA)
14	Elsy Bar (SEB)
15	Simpson Well (BSW)
16	Vietnam (BVC)
17	School Modelo Adventista (CMA)
18	Vía San Luis in front of basketball stadium (VSL)
19	Juan XXIII (J23)
23	Botanical Garden (JBU)

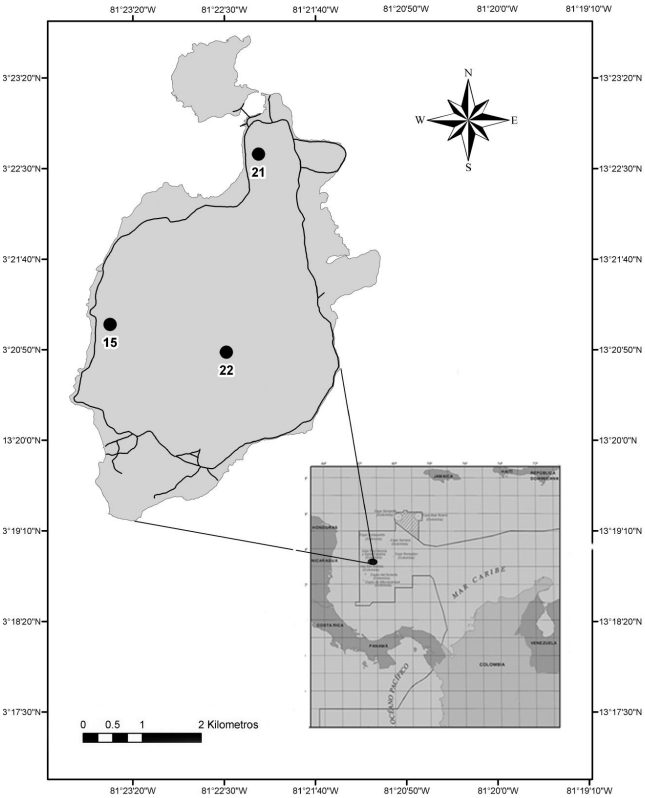


FIGURE 2. Map of Old Providence Island with sample sites.

TABLE 2. Sampling sites on Old Providence Island.

Number	Name and Abbreviation
15	Agua Dulce (ADP)
21	Surroundings of the catholic church María Inmaculada (IMI)
22	The peak (PEP)

endangered sea turtles (Schmid *et al.* 2008). Planted along beaches and near homes for protection against wind, the trees are among the first to fall during high winds because of their great height and shallow roots (Schmid *et al.* 2008; Wheeler *et al.* 2011). Its wood is susceptible to termites, and if planted close to traditional wooden houses may accelerate their deterioration.

The species *Allamanda blanchetii*, *Aglaonema commutatum* and *Cnidioscolus chayamansa* are toxic if consumed, while *Allamanda blanchetii* produces a latex which may irritate the skin upon contact.

As for the highly invasive and cancirogenic fern *Pteridium caudatum*, reported recently for Old Providence (Tobar and Gavio 2011), all the species registered here have been voluntarily introduced by the inhabitants of the islands. It is necessary to improve environmental education in the islands and explain the potential risks of introduced species to the population, to avoid negative impacts on the native flora of the archipelago. Small islands are more susceptible to invasive species, and particular care should be taken to reduce the introduction of exotic species and mitigate their impact once established.

TABLE 3. Species list of new botanical records in San Andres and Old Providence islands. New families are marked with **, new genera with *.

SPECIES	ORIGIN AND DISTRIBUTION	COMMON NAME	COLLECTION SITE	VOUCHER NUMBER	NOTES
ACANTHACEAE					
<i>Pseuderanthemum carruthersii</i> var. <i>reticulatum</i> (Seem.) Guillaumin.	Thought to be originally from Polynesia or Melanesia. Cultivated in tropical America	golden Pseuderanthemum, El dorado, golden net-bush	VSL, LLR, BSB, CEN, BOO	ATV195	Ornamental
AGAVACEAE					
<i>Agave angustifolia</i> var. <i>marginata</i> Hort. ex Gentry.	Native of the tropical regions of Costa Rica and Mexico. Found in North and Central America and in India	agave, agave caribe	VSL, SHH	ATV407	Ornamental, food
**AMARYLLADACEAE					
* <i>Crinum bulbispermum</i> (Burm. f.) Milne-Redh. and Schweick.	Native from tropical West Africa, distributed in Central America and the Caribbean	lirio	BSB	ATV402	Ornamental
AMARANTHACEAE					
* <i>Celosia argentea</i> var. <i>argentea</i>	Native from Asia, found in the tropical regions of the Americas	plumón, pluma, plumero rosa	VSL, LLR	ATV412	Ornamental
<i>Celosia argentea</i> var. <i>cristata</i> (L.) Kuntze.	Found in tropical regions. Cultivated in Central America.	cresta de gallo	VSL, CNP	ATV406	Ornamental
<i>Gomphrena globosa</i> L.	Native from India, it is found in anthropogenic areas, in temperate and tropical regions of the world.	Inmortales, botón lila	JBU, CNP, A20J	ATV405	Ornamental and medicinal
ANNONACEAE					
<i>Anona cherimola</i> Mill.	Possibly native of Ecuador. Cultivated in Central and South America	Chirimoya	IMI, LLR	ATV146	Edible
APOCYNACEAE					
<i>Allamanda blanchetii</i> A. DC.	Native of Brazil, cultivated along in other parts of tropical America	trompeta morada, allamanda violácea	VSL, LLR, BSB, BLA	ATV423	Ornamental. Produces a irritant latex
<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roemer and J.A. Schultes.	Native of South East Asia. Cultivated in tropical and subtropical regions	Jazmín crepé, Flor del Molinete, Jazmín de la India	VSL, BSB, LLR, BOO	ATV420	Ornamental. Poisonous
ARACEAE					
* <i>Aglaonema commutatum</i> Schott.	Native of Southeast Asia. Now a pantropical distribution	Aglaonema, cafeto ornamental	USL, JBU	ATV230; ATV439	Ornamental, toxic
* <i>Alocasia plumbea</i> Van Houtte.	Native of Southeast Asia. Tropical distribution	Pato morado	JBU, A20J, BLA, J23, VSL, BSB	ATV73; ATV434	Ornamental
<i>Alocasia cucullata</i> (Lour.) G. Don.	Possibly native of China. Commonly found in Caribbean, Central and South America and Pacific Islands	Colombus	CEN	ATV411	Ornamental
<i>Alocasia sinuata</i> N.E Br.	Native of the Philippines. Tropical distributed	Alocasia	BSB, BOO, LLR, JBU	ATV63; ATV441	Ornamental
<i>Alocasia macrorrhizos</i> (L.) G. Don.	Native of Southeast Asia. Tropical distribution	Oreja de elefante, taro gigante, ñame de canarias	JBU, LLR, BSB, MDG, VSL, A20J, BSW	ATV172; ATV431	Ornamental
* <i>Caladium bicolor</i> Vent.	Native of Asia. Distributed in Central and South America	Caladio, corazón de Jesús, paleta del pintor	BSB, VSL	ATV70; ATV421	Ornamental
* <i>Philodendron</i> "Autumn"	Neotropical distribution.	Corazón	ARP, BOO	Photographic record	Ornamental Hybrid
<i>Philodendron bipinnatifidum</i> Schott ex Endl.	Native of tropical South America	Filodendro paraguay, guarani, ímbe, Güembé	BOO, JBU	ATV61; ATV440	Ornamental edible fruit
<i>Syngonium podophyllum</i> Schott, Bot. Zeitung.	Native of tropical America	Singonio, pata de ganso, esmeralda	VSL, JBU, BSB	ATV228; ATV427	Invasive behavior

TABLE 3. CONTINUED.

SPECIES	ORIGIN AND DISTRIBUTION	COMMON NAME	COLLECTION SITE	VOUCHER NUMBER	NOTES
* <i>Xanthosoma sagittifolium</i> (L.) Schott.	Native of South America, and Antilles.	Mafafa	MDG, LLR, VSL	ATV173	Food
**ARAUCARIACEAE					
* <i>Araucaria heterophylla</i> (Salisb.) Franco.	Native of Australia, cultivated in South America	Araucaria	BSB, JBU, LLR	ATV74; ATV433	Ornamental
ARECACEAE					
* <i>Caryota mitis</i> Lour.	Native of Southeast Asia. Distributed in Central America	Palma de Cola de pescado, palma mariposa	ARP, JBU, LLR	ATV212	Ornamental
BROMELIACEAE					
* <i>Ananas comosus</i> (L.) Merr.	Native of Amazonia, cultivated in tropical America	Piña, ananas, piña tropical	JBU, LLR	ATV415	Only in culture. Edible fruits and medicinal use
CANNACEAE					
<i>Canna warscewiczii</i> A.Dietr.	Native of South America, cultivated in the tropics	Achira, Achira roja	ADP, MDG	ATV120; ATV442	Ornamental
**CASUARINACEAE					
* <i>Casuarina equisetifolia</i> L.	Native of Australia, cultivated in the tropics, especially in coastal areas.	Casuarina, Árbol del maderero, Pino australiano, pino de mar.	VSL	Photographic record.	Ornamental, used for wood and invasive
COMMELINACEAE					
* <i>Tradescantia pallida</i> (Rose.) D.R. Hunt.	Native of Mexico, Distributed in Central and South America, and in Africa (Gabon).	Reina purpura, purpurina	JBU, A20J, BSB, VSL	ATV209; ATV424	Ornamental
<i>Tradescantia spathacea</i> Sw.	Native of America	Buquecito	PSB, A20J, VSL, LLR	ATV425	Ornamental, medicinal use and toxic
**CUPRESSACEAE					
* <i>Platycladus orientalis</i> (L.) Franco.	Native of Central Asia.	Árbol de la vida, Pino libro	BSB, JBU	ATV72; ATV432	Ornamental, medicinal and wood use
CUCURBITACEAE					
* <i>Citrillus lanatus</i> (Thunb.) Matsum. and Nakai.	Native of South Africa. Cultivated worldwide.	Sandia, Patilla, watermelon	LLR, VSL, COV	ATV 409	Food
* <i>Cucurbita maxima</i> Duchesne.	Native of South Africa. Cultivated worldwide.	Auyama, Pumpkin, Sapayo	ADP, LLR, VSL	ATV80	Food
* <i>Cucumis melo</i> L.	Native of Paleotropics, cultivated worldwide	Melón		ATV413	Food, used as diuretic
**CYCADACEAE					
* <i>Cycas revoluta</i> Thunb.	Native of Japan. Introduced in Central America	Cica, palma fúnebre, Sago palm	JBU, LLR, BSB, BLA	ATV183/182	Ornamental Toxic
EUPHORBIACEAE					
<i>Acalypha hispida</i> Burm. f.	Probably native of Indonesia. Cultivated in the tropics	Cola de gato, Gusano rojo, cola de zorro	EPN, LLR	ATV177; ATV 410	Ornamental
<i>Acalypha amentacea</i> subsp. <i>willkesiana</i> (Müll.Arg.) Fosberg.	Probably native of Oceanía. Cultivated in the tropics.	Bronce	A20J, VSL, LLR	ATV418	Ornamental
<i>Codiaeum variegatum</i> (L.) Blume.	Native of India. Cultivated worldwide.	Hoja de la Independencia, Acuarela, croto, crotón	VSL, BSB, LLR, VSL	Photographic record.	Ornamental
* <i>Cnidoscolus chayamansa</i> McVaugh.	Native of America.	Árbol espinaca, Chaya	VSL, LLR, BOO	ATV417	Ornamental and edible, toxic if consumed raw
<i>Euphorbia aphylla</i> Brouss. ex Willd.	Endemic of the Canary islands.	Árbol desnudo, Tolda, Árbol palito	JBU, VSL, LLR, BSB	ATV208; ATV426	Ornamental
<i>Euphorbia milii</i> var. <i>splendens</i> (Bojer ex Hook.) Ursch and Leandri.	Native of Madagascar. Pantropical distribution	Corona de cristo, corona de espinas, espinas de cristo	LLR, VSL, JBU	ATV438	Ornamental latex used to cure wounds
<i>Jatropha podagrica</i> Hook.	Native of Central America. Pantropical distribution.	Árbol botella, Yunco, Corales	JBU, BVC	ATV430	Ornamental
**HELICONIACEAE					
* <i>Heliconia episcopalis</i> Vell.	Native of Neotropics	Platanillo, Lanza, Platanillo	JBU, LLR	ATV90	Ornamental

TABLE 3. CONTINUED.

SPECIES	ORIGIN AND DISTRIBUTION	COMMON NAME	COLLECTION SITE	VOUCHER NUMBER	NOTES
<i>Heliconia psittacorum</i> x <i>spathocircinata</i> "Golden Torch"	Native of Guyana. Tropical distribution	Platanillo amarillo	JBU, LLR	ATV 222 ATV428 ATV435	Ornamental hybrid
<i>Heliconia wagneriana</i> Petersen.	Native of Neotropics	Heliconia, platanillo	JBU	ATV443	Ornamental and medicinal
LILIACEAE					
* <i>Cordyline terminalis</i> (L.) Kunth.	Native of Southeast Asia. Pantropical distribution	Cordiline, palmita roja	JBU, SEB, VSL	ATV429	Ornamental
MUSACEAE					
<i>Musa x paradisiaca</i> L.	Native of Asia. Cultivated in tropics regions	Banano, Banana, platano, guineo plantain.	VSL, BOO, LLR, COV, ADP	ATV437	Food and medicinal
MALVACEAE					
<i>Hibiscus rosa-sinensis</i> L. var. <i>kermessinus</i>	Origin unknown. Pantropical distribution	Hibiscus	VSL, JBU, BSB, CEN	ATV403	Ornamental
MYRTACEAE					
<i>Eugenia uniflora</i> L.	Native of South America, it is cultivated and/or naturalised in large parts of the Old World tropics and subtropics but is not native.	pitanga	BSB	ATV422	Food and ornamental.
PLUMBAGINACEAE					
<i>Plumbago auriculata</i> Lam.	Native of South Africa. Cultivated in the Americas	Plumbago, Jazmín azul, Azulina, Jazmín celeste, Cape leadwort	JBU, VSL, LLR	ATV175	Ornamental
POACEAE					
* <i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl.	Native of India and Native of Indonesia. Now pantropical distribution	Bambú, Bambú amarillo, Guadua pintada	CSF, CMA, MDG	ATV125	Ornamental, artesanal, wood
PTERIDACEAE					
* <i>Pityrogramma ebenea</i> (L.) Proctor.	Distributed in the Caribbean, Central and South America	Helecho tatuaje	MDG	ATV105	Ornamental
**ROSACEAE					
* <i>Rosa chinensis</i> Jacq.	Native of China Worldwide distribution	Rosa, rose	ADP, BSB, BLA, LLR	ATV118	Ornamental and medicinal
** RUSCACEAE					
* <i>Dracaena marginata</i> Lam.	Native of Madagascar.	Punta de lanza, lanza roja	JBU, LLR, VSL	ATV226	Ornamental
* <i>Sansevieria trifasciata</i> Hort. ex Prain Laurentii.	Native of tropical Africa Tropical distribution	Lengua de tigre, Rabo de tigre, espada de San Jorge	BOO, BSB, BLA, CEN	ATV436	Ornamental
SOLANACEAE					
* <i>Capsicum chinense</i> Jacq.	Native of the Neotropics, cultivated in the whole continent	Ají, Chile	MDG, CEN, VSL	ATV108	Food, medicinal and ritual use
* <i>Lycopersicon esculentum</i> Mill.	Native of the Neotropics, cultivated worldwide	Tomate, gold-apple	VSL, LLR, COV	Photographic record	Food, medicinal
**STRELITZIACEAE					
* <i>Ravenala madagascariensis</i> Sonn.	Native of Madagascar. Tropical distribution, found in greenhouses in temperate climates	Palma del viajero, palma abanico, árbol del viajero	JBU, VSL	Photographic record	Ornamental
**ZINGIBERACEAE					
* <i>Costus barbatus</i> Suess.	Native of tropical America	Spiral ginger	CCS, BLA, ADP	ATV57; ATV 416	Ornamental
* <i>Alpinia purpurata</i> (Vieill.) K. Schum.	Native of New Guinea. Tropical distribution	Yinyer, Ginger	CCS, ADP	ATV58; ATV408	Ornamental
* <i>Alpinia zerumbet</i> (Pers.) B.L. Burt and R.M. Sm.	Native of Asia, distributed in Central and South America	Shellflower, shell-ginger	SHH, LLR	ATV401	Ornamental

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