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Assessment of the Distribution of Seed Plants Endemic to the Lesser Antilles in Terms of Habitat, Elevation, and Conservation Status

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Abstract - The Lesser Antilles is part of the Caribbean biodiversity hotspot and a priority for conservation of its flora is its endemic taxa. Using data from herbarium specimen labels, we recently carried out a preliminary conservation assessment of the 263 seed plant taxa unique to these islands, reporting that 70% of them are potentially threatened. In an effort to make conservation recommendations for the threatened species, we have further analyzed the specimen data for patterns in their distribution. We found that just over ⅓ of the region's endemics are restricted to a single island, and the majority of these are only found at a single location, whereas the others are found at multiple sites on each island. Diversity of regional endemics appears to be associated with larger islands, and while there appears to be a loose correlation between areas of high diversity of regional endemics and local endemism, there are a number of isolated centers of local endemism scattered across the island chain that may be of particular conservation concern. We also detected a relationship between diversity and elevation, with a peak in the number of endemic species occurred at mid-elevations (400–800 m). This correlation translates to a relationship between endemism and habitat type, with elevated numbers of endemics found in rainforest and elfin woodland, both communities that typically occur at mid- to high elevations, respectively. The highest proportion of threatened taxa is found in restricted and fragmented communities (elfin woodland, summit-herb vegetation, river bank, and moist forest) and the lowest proportion is found in the largest, most contiguous community (rainforest). Focused conservation action should occur in these important areas where plant endemism is locally high and habitat types are restricted and fragmented.

Introduction

Despite the recognition of the Caribbean as a global biodiversity hot spot (Mittermeier et al. 2004, Myers et al. 2000) there is limited information available on the conservation status of Caribbean plants (Maunder et al. 2011). An on-line, up-to-date, searchable database of the seed plants of the West Indies (Acevedo-Rodríguez and Strong 2017) is a strong contribution to Target 1 of the Global Strategy for Plant Conservation (GSPC), which calls for "an online flora of all known plants", and we have begun to make progress in the Caribbean on GSPC Target 2, which calls for "an assessment of the conservation status of all known plant species, as far as

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possible, to guide conservation action" (Convention on Biological Diversity 2010). An important part of targeted conservation is understanding the characteristics and distributions of the plants and biological communities at risk, as emphasized in GSPC Target 5, "At least 75 percent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants." Target 5 has 2 components: identifying the areas important for plant diversity and ensuring effective protection of at least 75% of these areas.

Herbarium specimens are records of plant distribution in time and space, the more recent of which usually provide more information than the older, historic ones. Researchers are finding new uses for herbarium collections far beyond those for which they were originally intended, including conservation assessment and identifying areas important for the protection and preservation of different species (Nualart et al. 2017). Data from herbarium specimens have already contributed to preliminary global conservation assessments of the flora of Puerto Rico and the Virgin Islands (Miller et al. 2012, 2013) and, more recently, of the endemic seed plants of the Lesser Antilles (Carrington et al. 2017), both based on IUCN Red List Categories and Criteria (IUCN 2001). In the latter study, the focus was on Lesser Antillean endemic taxa (Acevedo-Rodríguez and Strong 2017) because these species are found nowhere else and so are prioritized when embarking on conservation work. This preliminary assessment of the 263 seed plant taxa endemic to the Lesser Antilles revealed some 70% of taxa were at risk (Carrington et al. 2017). In the present study, we carried out further analyses on the 263 seed plant taxa endemic to the Lesser Antilles (Appendix 1). Using the elevations and habitats recorded on specimen labels, we determined how threatened and non-threatened endemics are distributed ecologically and spatially, and generated maps of endemic-species richness and local endemism to identify areas and habitats that may be of conservation concern.

Methods

We prepared a list of 263 seed plants (248 species, 6 subspecies and 9 varieties in 73 families) endemic to the Lesser Antilles (as defined by Acevedo-Rodríguez and Strong [2008]: Anguilla, Antigua, Barbados, Barbuda, Dominica, Grenada, the Grenadines, Guadeloupe, Martinique, Montserrat, Nevis, Saba, St Barthélemy, St. Eustatius, St. Kitts, St. Lucia, St. Maarten/St. Martin, and St. Vincent) using the Flora of the West Indies database (Acevedo-Rodríguez and Strong 2017). We noted pertinent data (collector, specimen number, collection date, island, locality, habitat, elevation) from 6193 specimen labels of these taxa from 11 herbaria with important Lesser Antilles plant collections (see Carrington et al. 2017). We used the descriptions of habitat on the herbarium sheet labels to categorize specimens to 1 of 20 habitat types—open habitat, cultivated area, roadside, beach vegetation, coastal vegetation, mangrove, swamp, pond, river bank, grassland, scrub, thicket, forest (type unspecified), dry forest, moist forest, rainforest, forest border, elfin woodland, summit-herb vegetation, and fumarole. This classification system comprises simple land-use categories and vegetation types derived from Beard's (1949) system, which is widely recognized in the Caribbean. These categories were broad

enough yet sufficiently clear-cut to be applied unequivocally to the habitat descriptions found on the specimens. We assigned each taxon to a habitat type based on the predominant habitat recorded on the specimen labels for that taxon. The one exception was when the generic term "forest" was the most common for a taxon, in which case we assigned the specimen to the type of forest that was next most-frequently recorded for that taxon. If a label did not include habitat information, we did not attempt to use our knowledge of localities to assign a specific habitat to the specimen.

We determined mean elevation for each taxon using the elevations that were written on the specimen labels (56% of all specimens had elevation data). For specimens where the label described an elevation range, we based our calculation for that specimen on the median elevation. We also determined mean elevation for each taxon based on GPS elevation values calculated at 3 arc seconds using the Shuttle Radar Topography Mission (SRTM-1) digital elevation model (http://srtm.csi.cgiar.org/) for each georeferenced specimen. We did not calculate elevation values for specimens with vague locality information.

We employed the results of a preliminary conservation assessment using the IUCN Red List Categories and Criteria (IUCN 2001) to rate taxa as threatened (critically endangered [CR], endangered [EN], or vulnerable [VU]), not threatened (near threatened [NT] or least concern [LC]), or data deficient (DD), as previously detailed (Carrington et al. 2017).

We were working only with species already identified as endemic to the island group as a whole ("regionally endemic"); thus, we refer to patterns of range restriction within these species as "local endemism". We carried out analyses of richness and local endemism on all endemic taxa, except 5 species with vague or no locality information (*Calyptranthes boldinghii* Urb., *Croton martinicenis* Urb., *Cuphea crudyana* Koehne, *Metastelma martinicense* Schltr., and *Ocotea l'herminieri* Mez). We georeferenced specimens as previously described (Carrington et al. 2017) and removed centroided data. We converted coordinates from WGS84 to UTM20 to minimize projection distortion. We aggregated records to 5-km edge grid-cells using Biodiverse v1.99_007 (Laffan et al. 2010) and calculated measures for corrected weighted endemism (CWE) and species richness. We used CWE to identify areas with a high representation of narrow-range taxa, and to pinpoint areas of high priority for conservation. We weighted species in a grid cell by the proportion of their ranges that the cell represented; the narrower the range, the higher the weight assigned to that species. We summed the weight and divided by the number of species in that cell to correct for richness and inflation of values due to many relatively wide-ranging species (Crisp et al. 2001, Laffan and Crisp 2003). We replicated these analyses for all regionally endemic species, threatened regional endemics only, and non-threatened regional endemics only.

Results

The geographical ranges of the 263 Lesser Antillean endemics vary considerably but with a noticeable inverse relationship between the number of species and

the number of islands on which they are found; 96 taxa are known only from 1 island and 1 taxon occurs on 16 islands (Fig. 1). Single-island endemics constitute the largest category (37%) of the Lesser Antillean endemics, with slightly more than half of these (56%) known from only 1 location. Location is defined as a "distinct area in which a single threatening event can rapidly affect all individuals of the taxon" (IUCN 2001:13), which in the Lessser Antilles context we relate to volcanic activity with locations at least 10 km apart (Carrington et al. 2017). As the range of an endemic taxon extends, the organism is more and more likely to occur at multiple locations per island. Once a range of 8 islands is reached, no species is restricted to a single location per island.

Patterns of species richness were almost identical whether considering all regional endemics or just threatened and non-threatened subsets; thus, we present only results for all taxa here (Fig. 2a). Greater endemic-species richness tends to be found on larger islands, and in those areas with greater topographic relief, a trend that is illustrated in the contrast between higher diversity in the mountainous western Basse-Terre portion of Guadeloupe compared to the eastern Grand-Terre area, and the elevated regions of northern Martinique when compared to the south.

Patterns of local endemism are less clear, and while there appears to be a loose correlation between areas of high diversity and local endemism, there are a number of smaller centers of local endemism scattered across the island chain (Fig. 2b–d). Areas of particular note include the Anguilla/St. Martin/St. Barts cluster, Antigua and Barbuda, Barbados, eastern Guadeloupe, and St. Eustatius, the latter being particularly high in locally endemic threatened taxa. The island of St. Vincent also has relatively high local endemism of threatened species compared to non-

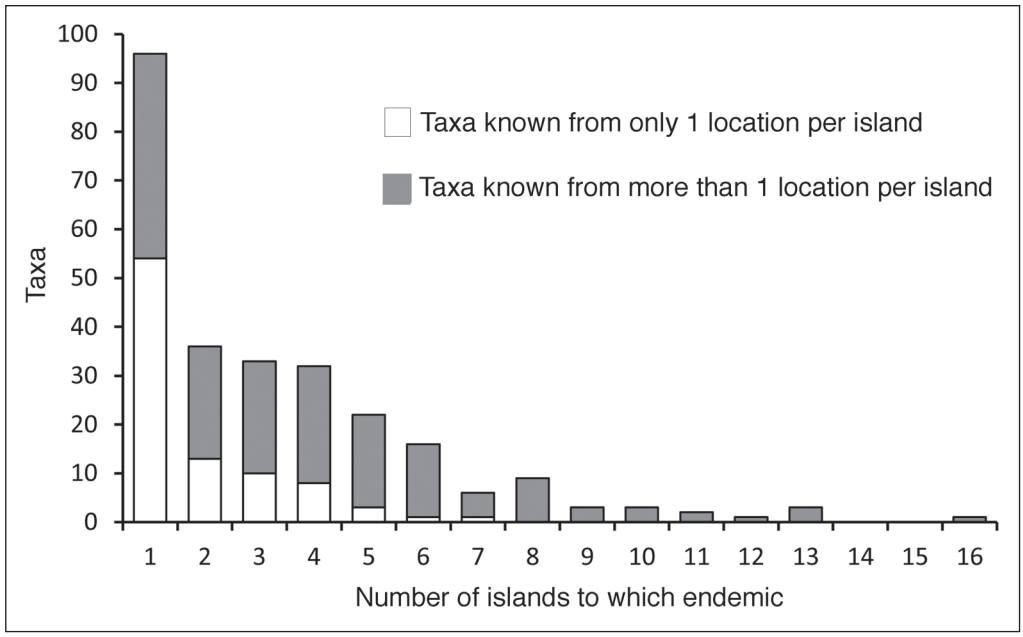

Figure 1. Range distribution of the 263 Lesser Antillean endemic seed plants across the archipelago.

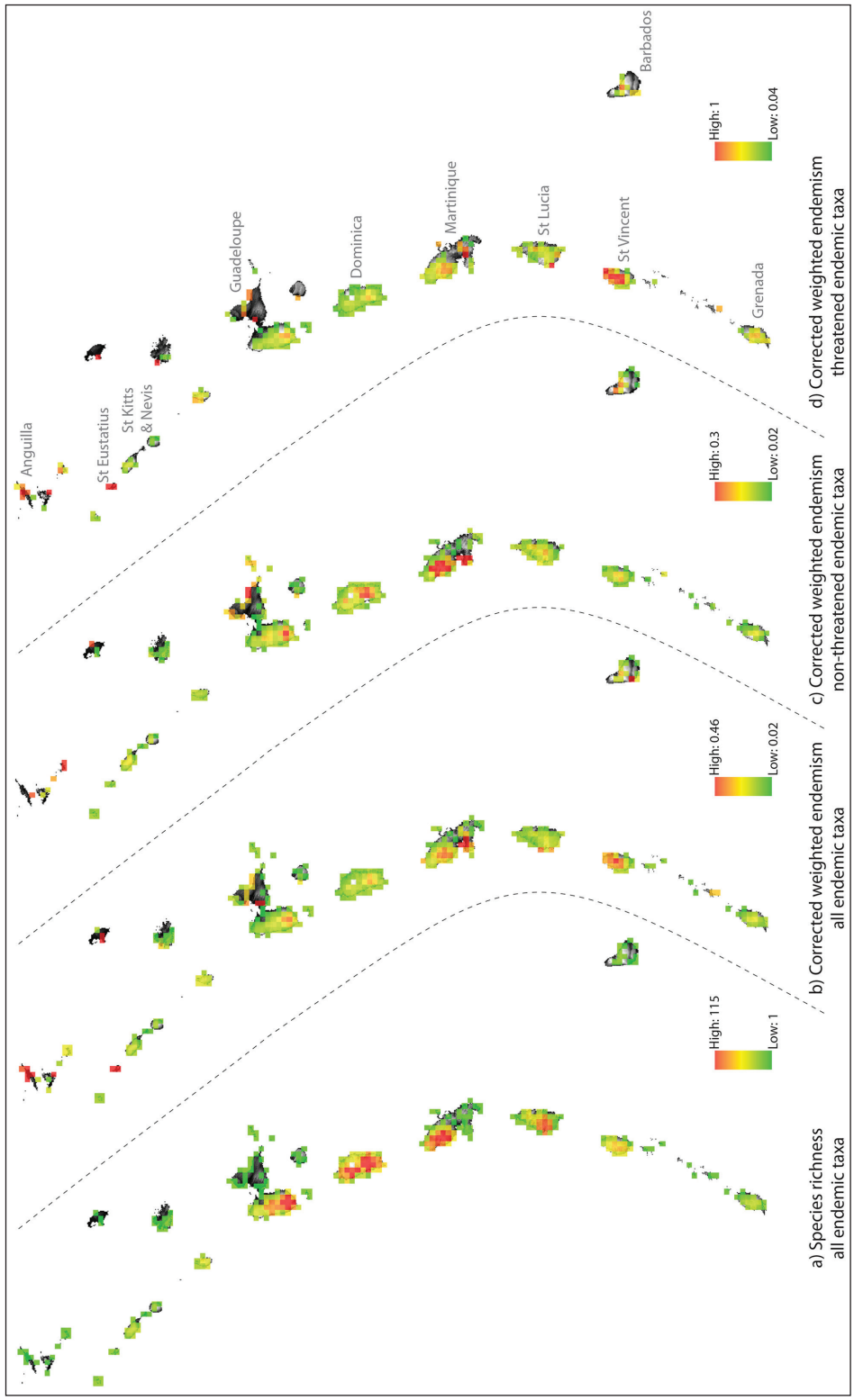

Figure 2. Endemism across the Lesser Antilles. (a) Species richness calculated for all endemic taxa, (b) corrected weighted endemism (CWE) calculated for all endemic taxa, (c) for non-threatened endemic species only, and (d) for threatened endemic species only.

threatened taxa, while Martinique and Dominica have lower local endemism of threatened species compared to non-threatened.

At a finer scale, most of the regional endemics are recorded as occurring at 400–800 m in elevation, with the most taxa at 400–600 m (Fig. 3A). We obtained

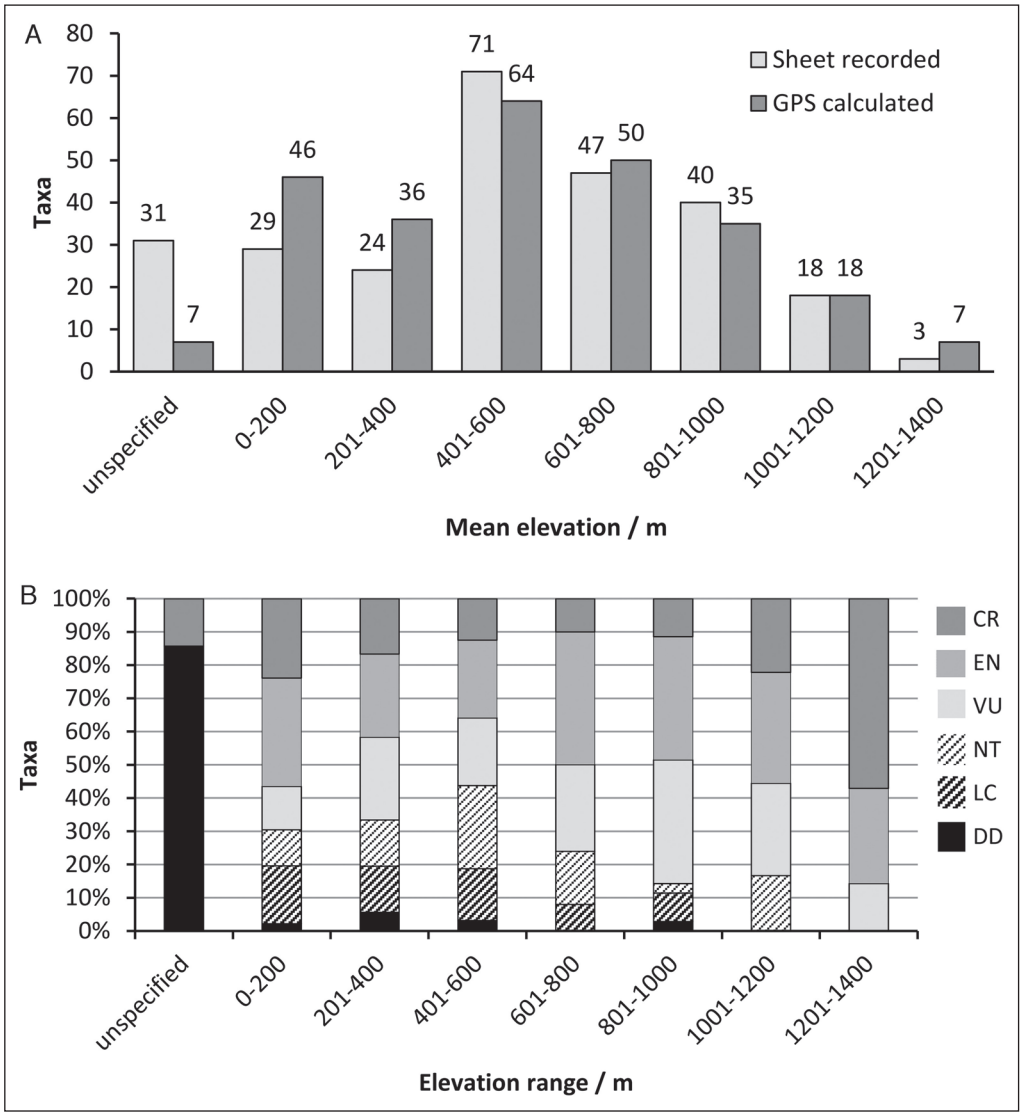

Figure 3. (A) Distribution of Lesser Antillean endemic seed plant taxa according to the mean elevation recorded on herbarium sheets (light grey bars) and mean elevation as calculated using the GPS Shuttle Radar Topography Mission (SRTM-1) digital elevation model (dark grey bars). The category "unspecified" comprises taxa where no elevation was recorded or where elevation was not calculable. (B) Percentage of threatened (CR = critically endangered, EN = endangered, VU = vulnerable), not threatened (NT = near threatened, LC = least concern), and data deficient (DD) Lesser Antillean endemic seed plant taxa at various elevation ranges based on GPS-calculated mean elevation. The category "unspecified" comprises taxa where no elevation was recorded or where elevation was not calculable.

the same result whether we used the plant collector's recorded elevation or the GPS-calculated elevation. These mid-elevations equate with rainforest, the climax vegetation of the volcanic islands, which typifies the Lesser Antilles (Beard 1949). Above this peak-elevation range, the number of endemic taxa recorded declines with increasing altitude to only 7 of these taxa at the highest elevation—*Epidendrum discoidale* Lindl., *Juncus guadeloupensis* Buchenau & Urb., *Miconia mornicola* A.C. Nicolson, *Myrsine rolletii* R.A. Howard, *Peperomia truncigaudens* C. DC., *Verbesina guadelopensis* Urb., and *Verbesina howardiana* J.Olsen. No elevation was recorded for 31 (12%) regionally endemic taxa and elevation could not be calculated for 7 (3%) regionally endemic taxa, most of which were last collected over a century ago, and all of which are represented by 1 or few specimens. The GPS-calculations shifted a quarter of the sheet-recorded taxa either up (8%) or down (19%) 1 elevation class, with the largest shift of taxa number to 0–200 m in elevation.

In all of the elevation ranges, the proportion of threatened (critically endangered [CR], endangered [EN], or vulnerable [VU]) taxa was 56% or greater and increased to 83% or more of taxa at elevations exceeding 800 m (Fig. 3B). At all elevations, the EN category represents the largest proportion of threatened taxa, except at the highest elevation where the CR category represents the largest proportion of threatened taxa. Most taxa represented by older collections where no elevation is recorded have not been re-collected for some time, are from few locations, and are poorly known, which is consistent with the DD or CR ratings of the majority of these taxa.

Based on the most common habitat recorded for each of the 263 Lesser Antillean endemics, taxa are distributed across 14 typical habitat types plus 1 category for taxa where no habitat was reported (Fig. 4). About 73% of the taxa are found mainly in forested areas; rainforest (35%) and elfin woodland (20%) are listed as the habitats with which they were most often associated. The habitat of 29 (11%) taxa was described by the general term "forest" without specifying a forest type, and it is highly likely that some of these may in fact be from rainforest or elfin woodland. Some of the river bank taxa (~4%) may also occur alongside rivers that flow through forested areas. Despite the preponderance of the endemic taxa in montane habitats, 21 (8%) are found in coastal vegetation and 12 (~5%) in dry forest (Fig. 4).

Using the preliminary conservation assessments determined for the Lesser Antillean endemics (Carrington et al. 2017), we examined the proportion of threatened, not threatened, and DD taxa in the 10 main (≥ 5 taxa) habitat categories. Most of the taxa where no habitat is reported had a DD or CR rating (Fig. 5), as was also the case for those where no elevation was recorded (Fig. 3b). Although the roadside habitat comprises few taxa, all members of this group are threatened (Fig. 5). The habitats with the next highest proportion of threatened taxa (80–90%) were river bank, moist forest, elfin woodland, and summit-herb vegetation (the non-woody sub-climax of elfin woodland). In comparison, rainforest has the lowest proportion of threatened taxa (53%), and dry forest has the second lowest (58%). Although the largest number of taxa are found in the rainforest community (49 threatened

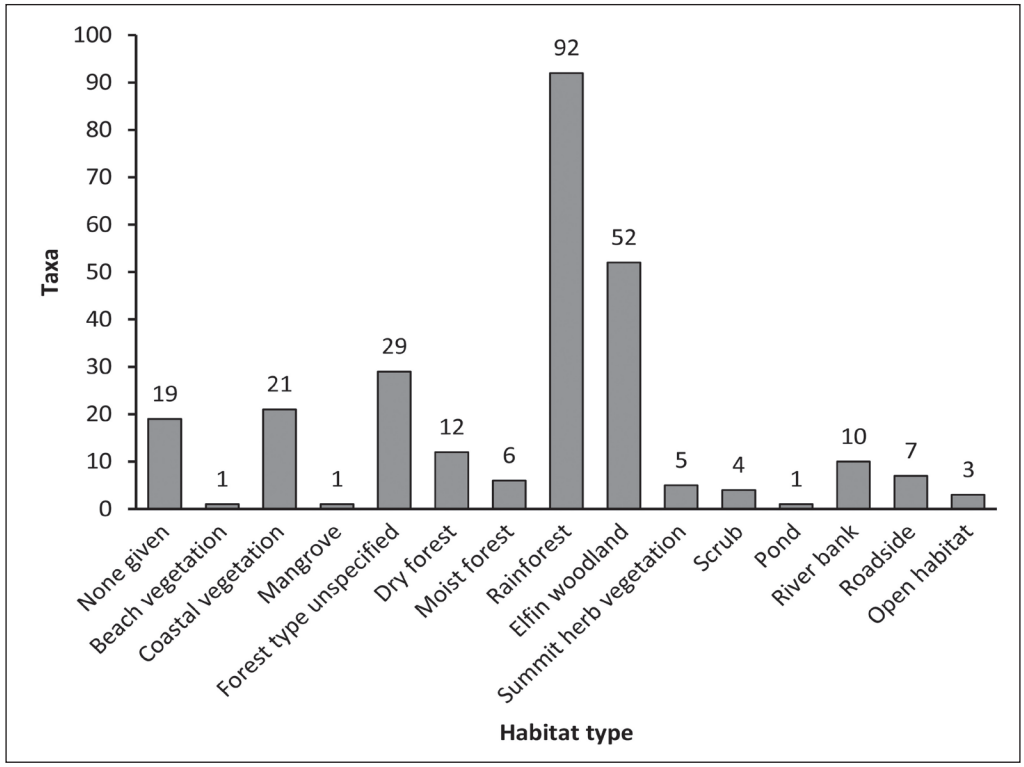

Figure 4. Distribution of Lesser Antillean endemic seed plant taxa across a variety of habitat types. For each taxon, the predominant habitat recorded on the herbarium sheets was assigned. The category "None given" corresponds to taxa where no habitat was recorded.

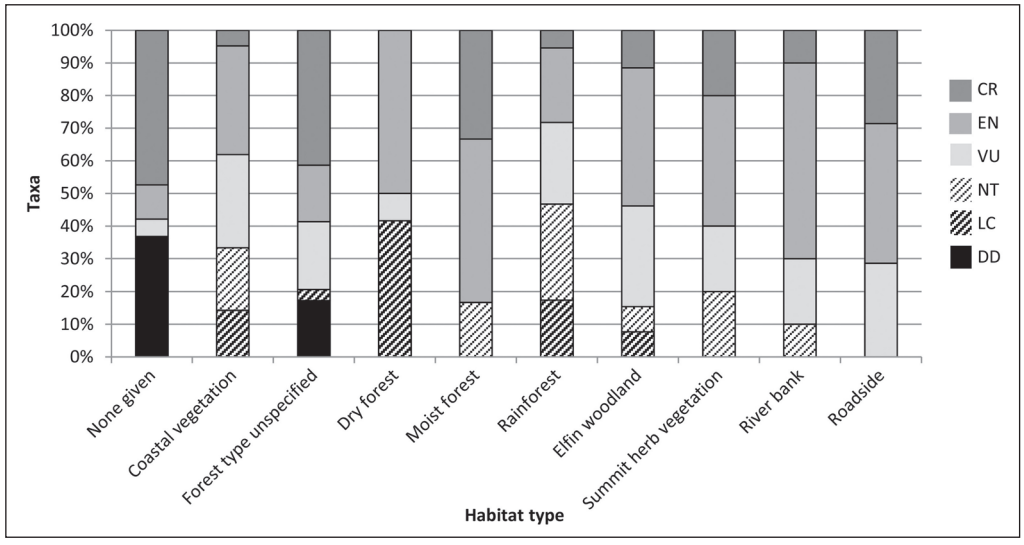

Figure 5. Percentage of Lesser Antillean endemic seed plant taxa deemed threatened (CR = critically endangered, EN = endangered, VU = vulnerable), not threatened (NT = near threatened, LC = least concern), and data deficient (DD) across major habitat-types. The category "None given" comprises taxa where no habitat was recorded.

endemic taxa), the number is just slightly higher than the 44 threatened taxa found in elfin woodland. We assigned each taxon exclusively to 1 typical habitat; with a total of 184 Lesser Antillean endemics rated as threatened using Red List criteria (Carrington et al. 2017), about 51% of the threatened taxa are found in these 2 forest types.

Discussion

Using the current list of 263 Lesser Antillean endemic seed plants, we found that most endemics are restricted to 1 (37%), 2 (14%), or 3 (13%) islands (Fig. 1), with the minority (25%) spread over 5 or more islands, a pattern similar to that reported by Acevedo-Rodríguez and Strong (2008) for what was then 306 Lesser Antillean endemic seed plant taxa. This trend is supported by the spatial analyses where areas of high local-endemism are relatively restricted and scattered (Fig. 2b–d). These analyses also show that while diversity is greater on larger islands like Dominica, Guadeloupe, Martinique, and St. Lucia (Fig. 2a), areas of higher local endemism are also found on a number of smaller islands like Anguilla, Barbuda, St Eustatius, and St Martin, which have otherwise low species diversity (Fig. 2b). The restricted range of these endemics makes them vulnerable to habitat loss from natural and human activities, especially when 56% of the single-island endemics are in turn known from only 1 location (Fig. 1).

In an ecological context, it is well documented that species richness in the tropics increases with elevation, reaches a maximum value, then declines with increasing altitude (Lieberman et al. 1996). Similarly, for the Lesser Antillean endemics, we found low numbers at lower elevations, a maximum at mid-elevations (400–600 m), and fewer endemics with increasing altitude (Fig. 3A). This pattern was also observed for endemics on other island systems such as the Canary Islands (Bacaro et al. 2015) and Hispaniola (Cano-Ortiz et al. 2016). The highest proportion of threatened Lesser Antillean endemics was found at elevations greater than 800 m, which equates with the uppermost regions of these mountainous islands. These high mountain peaks constitute a rather restricted area with a very limited variety of habitats, which puts such plants at severe risk of stochastic events and habitat loss through climate change (Foden and Young 2016) and may explain the high levels of threatened endemics in these summit regions.

We recognized 19 vegetation categories based on the habitat descriptions collected from herbarium labels. These are broadly based on simple land-use categories and the system of classification of vegetation types devised for the Lesser Antilles by Beard (1949), which is still widely employed because of its ease of use. There are other more recent Caribbean vegetation classification systems such as the one presented in Areces-Mallea et al. (1999), but due to their complexity, they are not appropriate for the simple habitat descriptions typically found on herbarium specimen labels. By using the most commonly encountered habitat description on the specimen labels to identify the vegetation category to which each endemic taxon belongs, we have ignored the amplitude of some taxa and their capacity to occur in more than 1 vegetation type. We feel that our methodology was appropriate, despite

the fact that 40% of the taxa with habitat data were reported from 1 habitat only, while 60% were recorded from more than 1 habitat. We take this stance because even when there was more than 1 habitat recorded for a taxon, there was invariably 1 predominant habitat. For conservation purposes, it is critical that the main habitat be recognized for each taxon so that communities containing the highest proportion of threatened endemics are identified.

That the highest number of endemic taxa occur in rainforest and the second highest in elfin woodland (Fig. 4) is consistent with a peak and subsequent decline in endemic species as elevation increases above 400 m (Figs. 3A, 4). Lesser Antillean rainforest is typically found at ~400–800 m elevation, whereas elfin woodland occurs above this altitude (Beard 1949). For the few mountainous islands where up-to-date vegetation maps are available, rainforest, including its degraded forms, is also the most extensive, least-fragmented natural vegetation type (Graveson 2009, Helmer et al. 2008, Parc national de la Guadeloupe 2016), allowing it to support not only the largest number of endemics but also the smallest proportion of threatened taxa (Fig. 5). By contrast, elfin woodland has a considerably greater ratio of threatened to non-threatened species, similar to other smaller and community types that are more fragmented, such as roadsides, river banks, and summit herb vegetation. Occurrence of plants endemic to coastal vegetation is between these extremes and may reflect an interplay between a historically widespread and contiguous habitat, and growing pressures from development and the increasing threat of climate-change–induced sea-level rise. The Caribbean is a tourism-dependent region, and tourism's impact on coastal areas can be seen in the increase in the amount of developed land (including golf courses) on 4 Lesser Antillean islands of between 86% and 2314% in the period 1945–2000 (Helmer et al. 2008).

In this study, we have identified patterns of endemism in the flora of the Lesser Antilles and singled out important plant areas and habitats that are of high conservation priority. We have also shown that herbarium specimens can provide data that can objectively indicate the plant community and elevation range in which plant species are found; these data can in turn be used for conservation management. Our study relies solely on information provided on the specimen labels and so we have avoided the temptation to use fully documented specimens to provide missing habitat-data for specimens of the same taxon collected at the equivalent locality because many localities support a range of habitats. It should be noted that, while 45% of the specimens used in this study had no record of habitat/vegetation type and 44% of the specimens bore no indication of the elevation at which the plant was collected, 76% of the specimens did provide information on 1 or both of these fields. We consider ours to be a very sizeable sample from which to deduce the habitat and elevation range of taxa and consider it preferable to traditional reliance on perceptions based on field experience. Aside from historical pre-1900 specimens, which usually lacked habitat and elevation data and were a small portion (12%) of the database, specimens that included either vegetation type or elevation tended to be scattered throughout the collecting history of each taxon and so provided a representative sample.

Handheld GPS devices are widely accessible; thus, going forward, all herbarium specimens should include elevation. We emphasize that accuracy of these measurements requires quality instruments and proper use. There is also a clear need for botanists to take the time to record the vegetation type in which a plant is collected and follow a regionally recognized vegetation-classification scheme if these records are to be useful for conservation assessments and species management.

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Appendix 1. The 263 seed plant taxa identified as endemic to the Lesser Antilles (Carrington et al. 2017) with the number of islands from which each has been recorded.

Family	Scientific name	# of islands
Acanthaceae	*Justicia androsaemifolia* Sieb. ex Nees.	4
Apocynaceae	*Gonolobus absalonensis* Krings	1
	Gonolobus aloiensis Krings & Axelrod	1
	Gonolobus dussii Krings	2
	Gonolobus iyanolensis Krings	1
	Gonolobus martinicensis Decne.	1
	Gonolobus waitukubuliensis Krings	1
	Gonolobus youroumaynensis Krings	1
	Marsdenia dussii Schltr.	1
	Marsdenia macroglossa Schltr.	3
	Metastelma barbadense Schltr.	2
	Metastelma martinicense Schltr.	1
Aquifoliaceae	*Ilex macfadyenii* ssp. *ovata* (Griseb.) Nicolson	5
Araceae	*Philodendron dussii* Engl.	1
Araliaceae	*Oreopanax dussii* Krug & Urb. ex Duss	3
	Oreopanax ramosissimus A. C. Sm.	1
	Schefflera attenuata (Sw.) Frodin	8
	Schefflera urbaniana (Marchal) Frodin	1
Arecaceae	*Aiphanes minima* (Gaertn.) Burret	7
	Geonoma pinnatifrons ssp. *martinicensis* (Martius) Henderson	5
	Geonoma undata ssp. *dussiana* (Becc.) Henderson	3
	Syagrus amara (Jacq.) Mart.	4
Asparagaceae	*Agave caribaeicola* Trel.	4
	Agave karatto Mill.	13
Asteraceae	*Chromolaena dussii* (Urb.) R.M. King & H. Rob.	3
	Chromolaena impetiolaris (Griseb.) Nicolson	1
	Chromolaena integrifolia (Bertero ex Spreng.) R.M. King & H. Rob.	9
	Chromolaena macrantha (Sw.) R.M. King & H. Rob.	4
	Chromolaena macrodon (DC.) Nicolson	2
	Chromolaena ossaeana (DC.) R.M. King & H. Rob.	1
	Chromolaena trigonocarpa (Griseb.) R.M. King & H. Rob.	6
	Critonia macropoda DC.	3
	Dendrophorbium lucidum (DC.) C. Jeffrey	3
	Erigeron polycladus Urb.	2
	Lepidaploa pallescens (Gleason) H. Rob.	1
	Mikania latifolia Sm.	8
	Mikania ovalis Griseb.	3
	Pectis ericifolia D.J. Keil	1
	Verbesina guadeloupensis Urb.	1
	Verbesina howardiana J. Olsen	1
	Verbesina leprosa Klatt	1
Begoniaceae	*Begonia obliqua* L.	6

Family	Scientific name	# of islands
	Begonia pensilis L.B. Sm. & Wassh.	1
	Begonia retusa O.E. Schulz	5
Bignoniaceae	*Tabebuia pallida* (Lindl.) Miers	21
Boraginaceae	*Tournefortia caribaea* Griseb.	6
	Varronia martinicensis Jacq.	5
	Varronia nesophila (I.M. Johnston) Borhidi	12
Bromeliaceae	*Aechmea flemingii* H.E. Luther	1
	Aechmea reclinata Sastre & Brithmer	1
	Aechmea serrata (L.) Mez	1
	Aechmea smithiorum Mez var. *longistipitata* E. Gross	1
	Aechmea smithiorum Mez var. *smithiorum*	7
	Glomeropitcairnia penduliflora (Griseb.) Mez	4
	Guzmania dussii Mez	3
	Pitcairnia bifrons (Lindl.) Read	4
	Pitcairnia micotrinensis Read	1
	Pitcairnia spicata (Lam.) Mez	1
	Pitcairnia sulphurea Andrews	1
	Vriesea antillana L.B. Sm. & Pittendr.	6
	Vriesea guadelupensis (Baker) Mez	4
Brunelliaceae	*Brunellia comocladifolia* Humb.& Bonpl. ssp. *guadalupensis* Cuatrecasas	1
Burseraceae	*Protium attenuatum* (Rose) Urb.	4
Buxaceae	*Buxus subcolumnaris* Müll. Arg.	1
Calophyllaceae	*Marila racemosa* Sw.	
Campanulaceae	*Centropogon berteroanus* (Spreng.) DC.	3
	Lobelia brigittalis E.H.L. Krause	1
	Lobelia cirsiifolia Lam.	8
	Lobelia conglobata Lam.	1
	Lobelia digitalifolia (Griseb.) Urb.	3
	Lobelia kraussii Graham	1
	Lobelia persicifolia Lam.	1
	Lobelia santa-luciae Rendle	1
	Lobelia stricta Sw.	6
Celastraceae	*Maytenus grenadensis* Urb.	1
Chrysobalinaceae	*Chrysobalanus cuspidatus* Griseb. ex Duss	5
	Hirtella pendula Sol. ex Lam.	2
	Licania ternatensis Hook.f. ex Duss	6
Clusiaceae	*Chrysochlamys caribaea* Urb.	2
	Clusia major L.	13
	Clusia mangle Rich. ex Planch. & Triana	3
	Clusia plukenetii Urb.	3
	Tovomita plumieri Griseb.	3
Connaraceae	*Connarus grandifolius* Planch.	5
Convolvulaceae	*Ipomoea sphenophylla* Urb.	1
	Ipomoea walpersiana Duchass.	1
	Operculina leptoptera Urb.	1

Family	Scientific name	# of islands
Cupressaceae	*Juniperus barbadensis* L. var. *barbadensis*	1
Cyclanthaceae	*Asplundia dussii* Harl.	2
	Asplundia insignis (Duchass. ex Griseb.) Harl.	8
Cyperaceae	*Rhynchospora tenuis* Link. var. *brevinux* Kük.	5
Dichapetalaceae	*Tapura latifolia* Benth.	4
Dioscoreaceae	*Dioscorea duchassaingii* R. Kunth	2
Elaeocarpaceae	*Sloanea dentata* L.	6
	Sloanea dussii Urb.	2
	Sloanea truncata Urb.	8
Ericaceae	*Gonocalyx smilacifolius* (Griseb.) A.C. Smith	2
Euphorbiaceae	*Acalypha elizabethae* R.A. Howard	1
	Acalypha vincentina Urb.	1
	Bernardia laurentii R.A. Howard	1
	Croton martinicensis Urb.	1
	Euphorbia balbisii Boiss.	6
	Euphorbia dussii Krug & Urb. ex Duss	2
	Euphorbia multinodis Urb.	1
	Sebastiania hexaptera Urb.	3
Fabaceae	*Chamaecrista obcordata* (Sw. ex Wikst.) Britton	5
	Erythrina corallodendron L. var. *bicolor* Krukoff	10
	Galactia albiflora Urb.	1
	Galactia longiflora Arn.	8
	Galactia nummularia Urb.	1
	Galactia rubra (Jacq.) Urb.	9
	Inga dominicensis Benth.	1
	Inga martinicensis C. Presl	1
	Inga sastreana Acev.-Rodr., S. Carrington & T.D. Penn.	1
	Poitea carinalis (Griseb.) Lavin	1
	Swartzia caribaea Griseb.	3
Gentianaceae	*Symbolanthus frigidus* (Sw.)Struwe & K. Gould	3
Gesneriaceae	*Besleria elongata* Urb.	1
	Besleria filipes Urb.	3
	Besleria lanceolata Urb.	3
	Besleria petiolaris (Griseb.) Urb.	1
	Crantzia cristata (L.) Scop. ex Fritsch	8
	Gesneria ventricosa Sw. subsp. *cymosa* (Urb.) L.E. Skog	1
	Rhytidophyllum caribaeum Urb.	1
Juncaceae	*Juncus guadeloupensis* Buchenau & Urb.	2
Lamiaceae	*Salvia lamiifolia* Jacq.	2
Lauraceae	*Aniba ramageana* Mez	3
	Cinnamomum falcatum (Mez) R.A. Howard	2
	Licaria sericea (Griseb.) Kosterm.	3
	Ocotea alpina R.A. Howard	4
	Ocotea dominicana (Meisn.) R.A. Howard	4
	Ocotea dussii Mez	1
		# of

Family	Scientific name	islands
	Ocotea imrayana Mez	4
	Ocotea jacquinii (Meisn.) Mez	4
	Ocotea l'herminieri Mez	1
	Ocotea martinicensis Mez	5
Linderniaceae	*Lindernia brucei* R.A. Howard	1
Loraceae	*Psittacanthus americanus* (L.) Martius	4
Lythraceae	*Cuphea crudyana* Koehne	1
Magnoliaceae	*Magnolia dodecapetala* (Lam.) Govaerts	5
Malpighiaceae	*Byrsonima trinitensis* A. Juss.	7
	Heteropterys platyptera DC.	5
	Malpighia martinicensis Jacq.	7
Malvaceae	*Sterculia caribaea* R. Br.	6
	Wercklea tulipiflora (Hook.) Fryx.	3
Maranthaceae	*Calathea martinicensis* Urb.	1
Marcgraviaceae	*Marcgravia lineolata* Krug & Urb.	4
	Marcgravia umbellata L.	9
Melastomataceae	*Charianthus alpinus* (Sw.) R.A. Howard	4
	Charianthus corymbosus (Rich.) Cogn.	4
	Charianthus dominicensis Pennys & Judd	1
	Charianthus grenadensis Pennys & Judd	1
	Charianthus nodosus (Desr.) Triana	1
	Charianthus purpureus D. Don	5
	Clidemia guadalupensis Griseb.	4
	Clidemia vincentina Urb.	1
	Henriettea lateriflora (Vahl) R.A. Howard & E A. Kellogg	5
	Henriettea triflora (Vahl) Alain	3
	Miconia andersonii Fawc. & Rendle	2
	Miconia cornifolia (Desr.) Naudin	9
	Miconia ernstii Wurdack	1
	Miconia furfuracea (Vahl) Griseb.	5
	Miconia globuliflora (Rich.) Cogn. var. *dominicae* R.A. Howard & E.A.Kellogg	4
	Miconia globuliflora (Rich.) Cogn. var. *vulcanica* (Naudin) R.A.Howard & E.A.Kellogg	1
	Miconia luciana Gleason	1
	Miconia martinicensis Cogn.	1
	Miconia mornicola A.C. Nicolson	1
	Miconia secunda R.A. Howard & E.A. Kellogg	1
	Miconia trichotoma (Desr.) DC.	5
	Tetrazygia discolor (L.) DC.	11
	Tibouchina chamaecistus (Naud.) Cogn.	3
	Tibouchina chironioides (Griseb.) Cogn.	1
	Tibouchina cistoides (Griseb.) Cogn.	1
	Tibouchina ornata (Sw.) Baill.	7
Meliaceae	*Guarea macrophylla* Vahl subsp. *macrophylla*	9
Menispermaceae	*Odontocarya smithiorum* Diels	2
		# of

Family	Scientific name	# of islands
Myrtaceae	*Calyptranthes boldinghii* Urb.	1
	Calyptranthes elegans Krug & Urb.	3
	Eugenia chrysobalanoides DC.	3
	Eugenia duchassaingiana O. Berg.	3
	Eugenia greggii (Sw.) Poir.	4
	Eugenia gryposperma Krug & Urb.	1
	Eugenia hodgei McVaugh	3
	Eugenia trinitatis DC.	3
	Myrcia antillana McVaugh	4
	Myrcia ramageana Krug & Urb.	3
Nyctaginaceae	*Pisonia suborbiculata* Hemsl. ex Duss.	2
Oleaceae	*Chionanthus dussii* (Krug & Urb.) Stearn	2
Orchidaceae	*Elleanthus dussii* Cogn.	4
	Epidendrum discoidale Lindl.	1
	Epidendrum grand-ansense Nir	1
	Epidendrum montserratense Nir	1
	Epidendrum pallidiflorum Hook.	6
	Epidendrum patens Sw.	7
	Lepanthes aurea Urb.	2
	Lepanthes dussii Urb.	2
	Maxillaria guadalupensis Cogn.	1
	Octomeria ffrenchiana P. Feldmann & N. Barré	1
	Pleurothallis mazei Urb.	2
	Pleurothallis sieberi Luer	4
	Ponthieva petiolata Lindl.	8
	Pseudocentrum guadalupense Cogn.	1
	Psychilis correllii Sauleda	4
	Stelis dussii Cogn.	1
	Stelis scabrida Lindl.	6
	Tolumnia urophylla (Lodd. ex Lindl.) Braem	13
Passifloraceae	*Passiflora andersonii* DC.	6
	Passiflora rotundifolia L.	6
	Passiflora stenosepala Killip	3
Pentaphylacaceae	*Freziera cordata* Tul.	2
	Freziera undulata (Sw.) Willd.	10
	Ternstroemia elliptica Sw.	7
Phyllanthaceae	*Amanoa caribaea* Krug & Urb.	2
	Phyllanthus anderssonii Muell. Arg.	1
	Phyllanthus megapodus G.L. Webster	2
	Phyllanthus ovatus Poir.	1
Piperaceae	*Manekia incurva* (Sieber ex Schult.) T. Arias, Callejas, & Bornst.	3
	Peperomia hirtella Miq.	5
	Peperomia smithiana C. DC.	2
	Peperomia truncigaudens C. DC.	1
	Peperomia vincentiana Miq.	2
	Piper dussii C. DC.	11

Family	Scientific name	islands
Poaceace	*Arthrostylidium obtusatum* Pilger	1
Polygonaceae	*Coccoloba boxii* Sandw.	2
Primulaceae	*Cybianthus dussii* (Mez) Agostini	1
	Cybianthus parasiticus (Sw.) Pipoly	5
	Myrsine rolletii R.A. Howard	2
	Stylogyne canaliculata (Lodd.) Mez	5
Putranjivaceae	*Drypetes dussii* Krug & Urb.	1
	Drypetes serrata (Maycock) Krug & Urb. var. *serrata*	5
Rosaceae	*Rubus ferrugineus* Wikstr.	2
Rubiaceae	*Exostema sanctae-luciae* (Kentish) Britten	5
	Hoffmannia tubiflora Griseb.	4
	Manettia dominicensis Wernham	4
	Psychotria pleeana Urb.	2
	Psychotria urbaniana Steyerm.	6
	Rondeletia americana L.	2
	Rondeletia anguillensis R. Howard & E. Kellog	1
	Rondeletia buxifolia Vahl	1
	Rondeletia martinicensis Krug & Urb.	1
	Rondeletia parviflora Poir.	6
	Rudgea citrifolia (Sw.) K. Schum.	5
	Rudgea vincentina Urb.	1
	Spermacoce berteroana R.A. Howard	5
	Spermacoce dussii (Standl.) R.A. Howard	1
Sabiaceae	*Meliosma pardonii* Krug & Urb.	1
Salicaceae	*Xylosma martinicensis* (Krug. & Urb.) Urb.	2
Salicaceae	*Xylosma serrata* (Sw.) Krug. & Urb.	1
Santalaceae	*Dendrophthora macrostachya* (Jacq.) Eichler	2
Sapotaceae	*Pouteria pallida* (C.F. Gaertn.) Baehni	4
	Pouteria semecarpifolia (Pierre ex Duss) Pierre	6
Siparunaceae	*Siparuna glabrescens* (C. Presl) A. DC.	4
Solanaceae	*Solanum urens* Dunal	1
Symplocaceae	*Symplocos guadeloupensis* Krug & Urb.	3
	Symplocos urbaniana Brand	1
Thymeleaceae	*Daphnopsis macrocarpa* Nevling	1
Urticaceae	*Gyrotaenia crassifolia* (Wedd.) Urb.	2
	Pilea caribaea Urb.	4
	Pilea forsythiana Wedd. var. *forsythiana*	4
Verbenaceae	*Duranta stenostachya* Tod.	4
	Lantana hodgei Sanders	2
Zingiberaceae	*Renealmia pyramidalis* (Lam.) Maas	5