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The dry forest vegetation communities of little Tobago Island, West Indies: floristic affinities

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Abstract: The floristic affinities of the dry forest of Little Tobago, a continental island off northern South America, were assessed**.** Surveys found a total of 103 native species in the vegetation community of Little Tobago Island. Floristic affinities were strongest with northern South American countries but were also heavily influenced by Antillean elements indicating that Little Tobago lay in a transition zone between continental South American dry forests and Antillean dry forests. Poor protection of dry forests in the areas with which Little Tobago has the highest floristic affinities make the island important for conservation purposes.

Resumen: Se evaluaron las afinidades florísticas del bosque seco de Little Tobago, una isla continental cerca de la costa norte de Sudamérica. Durante la prospección se encontraron en total 103 especies nativas en la comunidad vegetal de la isla. Las afinidades florísticas fueron más fuertes con los países del norte de Sudamérica, pero también estuvieron fuertemente influenciadas por elementos antillanos, indicando que Little Tobago está en una zona de transición entre los bosques secos continentales de Sudamérica y los bosques secos antillanos. La pobre protección de los bosques secos en las áreas de bosque seco con las que Little Tobago tiene las afinidades más altas hacen que esta isla tenga importancia para fines de conservación.

Resumo: As afinidades florísticas da floresta seca da Pequena Tobago, uma ilha continental a norte da América do Sul foram avaliadas. Os inventários encontraram um total de103 espécies vegetais nativas na comunidade florística da ilha de Pequeno Tobago. As afinidades florísticas eram as mais fortes com os países do norte da América do Sul mas encontravam-se também fortemente influenciadas pelos elementos das Antilhas indicando que a Pequeno Tobago se situa na transição entre as florestas secas do continente Sul Americano e as das Antilhas. Um protecção pobre das florestas secas com as quais a Pequeno Tobago tem as mais elevadas afinidades florísticas tornam a ilha importante para os objectivos da preservação.

Key words: Biogeography, conservation status, dry forest biome, floristic affinities, Lesser Antilles, neotropics, Tobago, Trinidad, Venezuela.

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Introduction

The vegetation communities of tropical dry forests have been recognized as comprising some of the most endangered ecosystems in the tropics (Hoekstra *et al.* 2005). These ecosystems are preferentially settled and developed as they are easier to clear and maintain and they are in close proximity to desirable resources such as fisheries, grazing pasture, beaches, coastal scenery and arable agricultural land (Beard 1949; Boodram 2001; Dinerstein *et al.* 1995; Janzen 1986; Maass 1995; Murphy & Lugo 1995; Pennington *et al.* 2000; Sánchez-Azofeifa *et al.* 2005). A neotropical dry forest is found on Little Tobago Island, a secure protected area off the coast of Tobago W.I. (Fig. 1). Little Tobago Island is gazetted as wildlife sanctuary with only low impact uses such as day tours to see the abundant bird life on the island. There is no permanent human presence on the island and no agriculture save a small (<10 m^2) block of fruit trees on the island. It is an important tourism revenue earner so is unlikely to suffer clearing and development in the future. This paper aims to assess the floristic affinities of the Little Tobago dry forests to further the understanding of the origin of the flora of Trinidad and Tobago and to understand its importance in regional conservation of tropical dry forests.

Physiognomically, dry forests are variable across their range in the neotropics (Gentry 1995). On the South American continent and in Central America they are similar structurally to moist forests, while Antillean dry forests are characterized by a much higher stem density in the lower and medium DBH size classes and a lower occurrence of lianas (Gentry 1995; Murphy & Lugo 1986). Neotropical dry forests are distinct in their low numbers of epiphytes, high numbers of herbs and shrubs and high numbers of small vines (as distinct from woody lianas), a characteristic that appears similar in all dry forests (Gentry 1995).

Floristically, the neotropical dry forest tree flora at the family level tend to be dominated by Leguminosae, Bignoniaceae and Capparidaceae in northern South America and by Myrtaceae and Flacourtiaceae in Antillean dry forests (Gentry 1995). Other important neotropical dry forest tree families include Rubiaceae, Sapindaceae and Euphorbiaceae (Gentry 1995). When non-tree flora are included, Leguminosae is joined by Euphorbiaceae and Poaceace as the most important continental dry forest families, while Euphorbiaceae, Myrtaceae and Rubiaceae are the most important families in the Antillean dry forests by numbers of species (Gentry 1995). At the genus level the tree flora of dry forests tend to be dominated by *Tabebuia*, *Cordia*, *Casearia*, *Bauhinia*, *Trichilia*, *Erythroxylum*, *Randia*, *Hippocratea*, *Serjania*, *Croton* and *Zanthoxylum* (Gentry 1995). Main differences in tree genera between the Antillean and Continental South American dry forests appear to be the

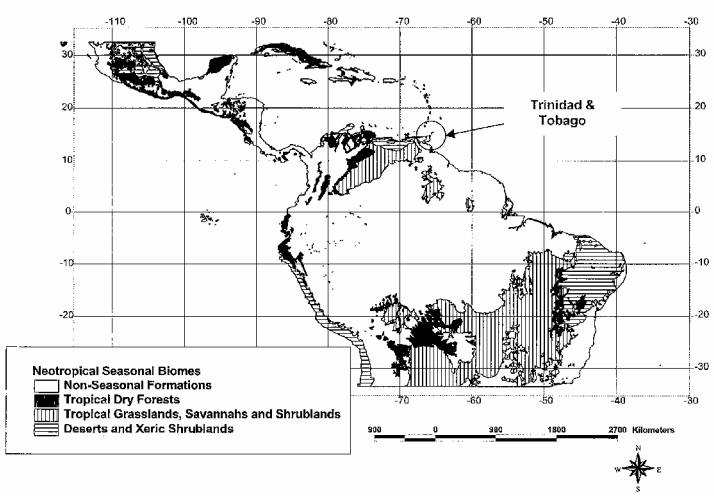


Fig. 1. Tropical seasonal biomes after Olsen *et al.* (2001) ecoregion classification. Tropical Grasslands, Savannahs and Shrublands and Deserts and Xeric Shrublands are included because in some cases they include elements of Tropical Dry Forests.

overrepresentation of *Coccoloba*, *Eugenia*, *Erythroxylum*, *Drypetes* and *Casearia* in the Antilles and the overrepresentation of *Capparis*, *Acacia* and *Arrabidaea* in the northern South American (mainly Venezuelan) dry forests (Gentry 1995).

Beard (1944a, 1944b,1955) used the ecosystem on Little Tobago Island to typify the climax of his Deciduous Seasonal Forest, the dry forest type he described for Trinidad and Tobago, northern South America and the Lesser Antilles. The vegetation of Little Tobago Island was first described by Beard (1944b) as climax Deciduous Seasonal Forest (taken here to be dry forest) of the *Bursera-Lonchocarpus* associaton (*Coccothrinax* faciation).

The affinities of the flora of Little Tobago Island have not been dealt with directly. Beard (1944b) states the flora of the "mainland" of Tobago "is entirely continental in its affinities" and "corresponds in a close degree with that of Trinidad". He also states the floristic groups of Trinidad and Tobago correspond up to a point beyond which those of Tobago have a "curiously Antillean stamp". It becomes apparent that he regards the close affinity of Tobago to Trinidad (and by extension to northern South America) to be best developed in the moist Montane and Lower Montane rainforest and least developed in the drier Seasonal Deciduous Forest. Beard (1944b) states the seasonally deciduous *Bursera-Lonchocarpus* Association that he describes for Little Tobago is found commonly throughout the Lesser Antilles and also in Trinidad. Beard (1944a) also places his Seasonal Deciduous Association in the adjacent areas of Venezuela although it is clear that the ecosystems are grouped together on the basis of the physiognomy of the vegetation not the floristic characters. Beard (1944b) does not analyze the floristic affinities of Tobago with the Lesser Antilles or the South American Continent in a quantitative sense and he bases his conclusions principally on the tree flora.

The specific objectives of this study were to systematically survey the vascular plant flora of Little Tobago Island to generate a comprehensive list and to quantify the affinities of the flora at the levels of family, genus and species to better understand the relative contributions of the Amazonian and Caribbean Floristic regions to the Little Tobago flora. In addition the structure and physiognomy of the Little Tobago vegetation communities will be compared to those reported for dry forests in the Antilles and South America. On the basis of these results, the origins of the Little Tobago Island flora will be discussed.

Site description

Little Tobago Island (11°18'N 60°30'W) is 2.4 km off the northeast coast of Tobago opposite the town of Speyside (Fig. 2). It is approximately 100 ha in area, generally consisting of steep slopes rising to 137 m above sea level. There are no streams or watercourses and only one spring that is dry for several months of the year (Dinsmore 1969; Niddrie 1980). Little Tobago has a seasonal tropical climate with a temperature range from 21°C to 30°C and an average annual rainfall of

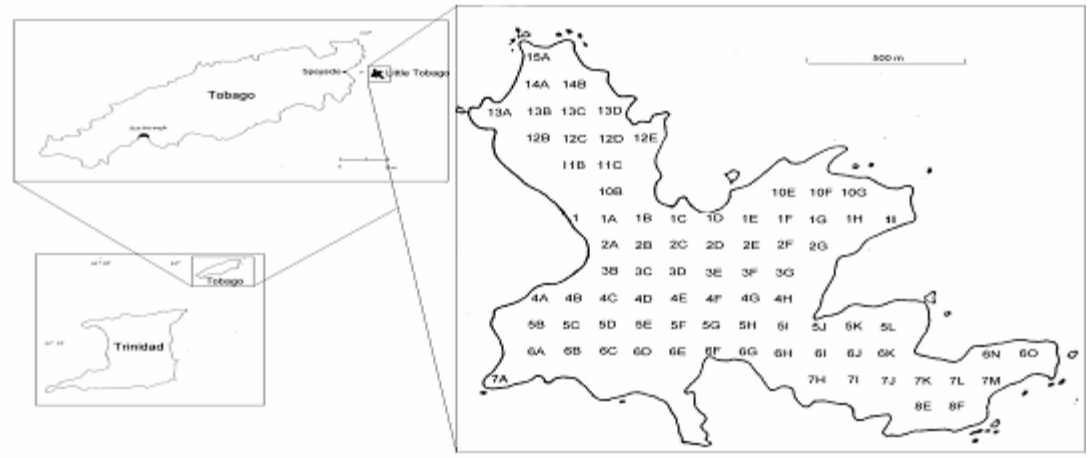


Fig. 2. Location of Little Tobago Island and sample sites.

1520 mm with a dry season from January to June (Bertrand *et al*. 1991). Tobago and Little Tobago formed in the Mesozoic as a fragment of an accreted oceanic arc system (Snoke *et al*. 2001). The rocks of Little Tobago consist entirely of pyroclastic tuff breccias and agglomerate volcanics of the Merchiston formation (Maxwell 1948). The soils are shallow sandy to gravelly clay loams of medium fertility (Boodram 2001).

Beard (1944b) noted the trees *Coccothrinax barbadensis* (Arecaceae), *Bursera simaruba* (Bursuraceae), *Lonchocarpus domingensis* (Leguminosae), *Diospyros inconstans* (Ebenaceae), *Pithcellobium ungis-cati* (Leguminosae) and *Eugenia ligustrina* and other Myrtaceae as abundant on Little Tobago Island. He also noted the under-story was dominated by *Anthurium hookeri* (Araceae). Dinsmore (1972) noted deciduous forest on parts of the island that were protected from the wind. Apart from descriptions of the vegetation by Beard (1944a) and Dinsmore (1972) the only other vegetation work previous to this study was sporadic plant collections by various individuals that were recorded from specimens deposited in the National Herbarium of Trinidad and Tobago (TRIN).

The island's vegetation has been affected by two major disturbances since European colonization. The first was clearing of parts of the island for sea-island cotton (*Gossypium barbadense*) cultivation in the 18th century and abandonment in the early 20th century (Beard 1944b). Beard (1944b) considered the vegetation to have fully recovered from this disturbance as it was not possible to tell which parts of the island had been cultivated and which had not. The second disturbance was caused by the passage of Hurricane Flora in 1963 (Dinsmore 1967). Dinsmore (1970) records that the parts of the island damaged by the hurricane were characterized by few tall trees and ground flora dominated by shrubs such as *Aphelandra pulcherrima* (Acanthacaeae) and saplings of rapidly growing tree species such as *Cordia collococca* (Boraginaceae).

Methodology

The vascular flora of Little Tobago Island was sampled at 82 sites arranged on a 100 m x 100 m grid across the island (Fig. 2). The data were gathered from April to June 1997 with follow up visits to all sites in November 1997 and May 1998 to record seasonal changes in the vegetation communities. Tree data were collected using point-centred-quarter methods (Brower *et al*. 1990) at four randomly selected points along a 20 m transect at each site. Thus the species identities of a total of 16 trees were recorded at each site. Ground flora data were recorded from a 2 m x 2 m quadrat at each site. Species presence/absence and percent cover were estimated from 100 points arranged systematically in the quadrat. Epiphytes were surveyed and recorded on the four closest trees in four quadrants around the centre point of each site. Species encountered external to the sample grid were opportunistically collected and recorded. Species were sorted into morpho-types in the field and a representative sample was collected and taken to the National Herbarium of Trinidad and Tobago (TRIN) for identification. Species names follow those used in the National Herbarium of Trinidad & Tobago (TRIN). Apart from the species identified in this survey, 15 species recorded as having been collected from Little Tobago Island in the accession books for the collections at TRIN were noted. Of these two were subsequently encountered on the island outside of the survey area and added to the species list generated from the primary survey. The remaining 13 species (Table 1) were generally small weedy species and may still be extant on the island despite not being picked up in the comprehensive survey. They were not included on the species list for distribution analysis as their current status on Little Tobago could not be ascertained.

To quantify the structure of the vegetation community on Little Tobago, the average number of plants $\geq$10cm DBH per site were calculated to compare with the figures quoted in Gentry (1995) for continental and Antillean dry forests. The percentage of species in different lifeform groups was calculated following the groups used by Gentry (1995).

In order to study the floristic affinities, the families, genera and species found on Little Tobago were classified according to their type of distribution. Widespread taxa were classified as either cosmopolitan, pan-tropical or neotropical following the definitions for these distribution types as found in Good (1974). The taxa that were distributed within but not extending throughout

the neotropics were scored as occurring in one or more of the following regions:

1. Antillean (including the Greater and Lesser Antilles)
   a. Lesser Antillean
   b. Greater Antillean
2. South American
   a. Northern South American (Colombia, Venezuela and the Guianas) (NSA)
   b. Western South American (Ecuador and Peru)(WSA)
   c. Central South American (Brazil) (CSA)
3. Central American

The occurrence of a species in a particular region was ascertained using the Flora of the Lesser Antilles (Howard 1974-1989); Flora of the Venezuelan Guyana (Berry *et al.* 1995); Flora Neotropica (Luteyn & Gradstein 1967); Flora of the Guianas (Jansen-Jacobs *et al.* 1983); Flora of Trinidad and Tobago (Williams & Cheesman 1928); Flowering Plants of Jamaica (Adams 1972); Checklist of the Plants of the Guianas (Boggan *et al.* 1997); Descriptive Flora of Puerto Rico (Liogier 1985-1997); Common Trees of Puerto Rico and the Virgin Islands (Little & Wadsworth 1964; Little *et al.* 1974); and the Plant Book (Mabberley 1981). Distributions were recorded in a species by region matrix as being present or absent within a region (Appendix 1).

The numbers of the species found on Little Tobago that occurred in each region was counted and expressed as a percentage.

Table 1. Species recorded in National Herbarium (TRIN) Accession books (and verified in the collection), but not found during this study either in the survey or observed outside sample sites. Species names, family names and authorities according to TRIN.

Family	Species
Apocynaceae	*Mandevilla subsagittata* (R.B.P.) Woods.
Asclepiadaceae	*Gonolobus denticulatus* (M.Vahl)
Asteraceae	*Bidens cynapiifolia* H.B.K.
Asteraceae	*Emilia sonchifolia* (L.) DC. ex Wight
Cyperaceae	*Cyperus confertus* Sw.
Cyperaceae	*Cyperus thysiflorus* Jungh.
Malvaceae	*Gossypium barbadense* L.
Marantaceae	*Maranta gibba* Sm.
Nyctaginaceae	*Boerhavia diffusa* L.
Passifloraceae	*Passiflora foetida* L.
Poaceae	*Dactyloctenium aegyptium* Willd.
Portulacaceae	*Talinum paniculatum* (Jacq.) Gaertn
Pteridiaceae	*Adiantum terminatum* Kunze ex Miq.
Rubiaceae	*Psychotria microdon* (DC.) Urban
Verbenaceae	*Priva lappulacea* L.

Results

A total of 112 species were found on Little Tobago Island in this survey; of these, 101 species are native belonging to 95 genera and 62 families. Non-native species were excluded from the analysis. All species found on Little Tobago are also found in Trinidad or Tobago.

The density of stems > 2.5 cm DBH could not be calculated from this data set as only trees > 5 cm DBH were measured. However, the density of stems > 10 cm DBH was extrapolated to be 134 in 0.1 ha. An analysis of the lifeform distribution of the vegetation showed herbs formed the largest portion of the vegetation community followed by trees with climbers contributing a very small

Table 2. Largest families on Little Tobago Island by number of species.

Family	# of Species
Poaceae	6
Leguminosae	6
Caesalpiniaceae	1
Fabaceae	4
Mimosaceae	1
Myrtaceae	5
Asteraceae	3
Boraginaceae	3
Cactaceae	3
Passifloraceae	3
Rubiaceae	3
Solanaceae	3
Acanthaceae	2
Amaranthaceae	2
Araceae	2
Arecaceae	2
Erythroxylaceae	2
Flacourtiaceae	2
Malvaceae	2
Menispermaceae	2
Moraceae	2
Nyctaginaceae	2
Piperaceae	2
Polygonaceae	2

portion of species (Fig. 3).

Of the 62 native plant families recorded, 20 (32%) are cosmopolitan in distribution, 35 (57%) are pan-tropical and 7 (11%) are neotropical (Appendix 2). The most specious families on Little Tobago Island were Poaceae, Leguminosae and Myrtaceae (Table 2).

Of the 95 native genera recorded, 6 (6%) are cosmopolitan in distribution, 35 (37%) are pan-tropical, 33 (35%) are neotropical, and 21 (22%) have varying distributions within the neotropics and were subsequently further analysed. All of the 21 genera are also found in Meso-America. Twenty of the 21 genera (95%) are found in South America although two genera, *Coccothrinax* and *Bourreria*, were only found in coastal Venezuela and Columbia. Three of the 21 genera (*Isiea*, *Calliandra* and *Caularthron*) are found in South America but not in the Antilles. Seven of the 21 genera are common in the Antilles with one of these genera not found in South America (*Pimenta*). Three of the 21 genera like *Coccothrinax* and *Bourreria* mentioned above are Caribbean basin genera restricted to coastal northern South America.

From the analysis of the distributions of the 96 native species (five species were identified to genus only and are excluded from the analysis), two species (2%) are pan-tropical and 22 (23%) are found throughout the neotropics (Appendix 1). The 72 remaining species have varying distributions within the neotropics. To the south of Little Tobago, 70 species (73% of the 96 species analysed) are found in northern South America (Columbia, Venezuela and the Guianas), with 11 species (11%) restricted to this region (Table 3). Seventeen species (18%) had a wider range in South America and are found in Central South America (Brazil) and Western South America (Ecuador or Peru). To the north, 51 of the Little Tobago species (54%) are found on the Lesser Antillean islands and 39 species (41%) have a wider distribution and are also found in the Greater Antilles. Only three species (3%) are restricted to the Antilles and also occur on Little Tobago (Table 3).

Twenty six species showed a concentration in the Antilles (Table 4) and 22 species showed a marked South American distribution with their distributions predominantly centered in South America (Table 4).

Table 3. Species with restricted distributions found on Little Tobago Island.

Family	Species
Species restricted to NSA*	
Acanthaceae	*Aphelandra pulcherrima*
Cactaceae	*Pilosocereus lanuginosus*
Erythroxylaceae	*Erythroxylum cumanense*
Menispermaceae	*Odontocarya tamoides*
Mimosaceae	*Enterolobium cyclocarpum*
Nyctaginaceae	*Pisonia pacurero*
Passifloraceae	*Passiflora cyanea*
Piperaceae	*Piper guayranum*
Sapindaceae	*Melicoccus bijugatus*
Smilacaceae	*Smilax cumanensis*
Solanaceae	*Cestrum alternifolium* var. *pendulinum*
Species restricted to the Greater and Lesser Antilles	
Cactaceae	*Melocactus broadwayi*
Celastraceae	*Maytenus tetragonus*
Myrtaceae	*Eugenia dussii*

* NSA = Columbia Venezuela, the Guianas and Trinidad & Tobago.

Discussion

The data collected enabled us to analyze the affinities of Little Tobago Island with data reported for other dry forests in the region. Structurally, the Little Tobago site has a number of > 10 cm DBH stems per 0.1 ha more reminiscent of Antillean sites than continental dry forest sites (Gentry 1995). The high number of stems may be a result of past disturbance by hurricanes, a common impact on Lesser Antillean dry forests also experienced by Little Tobago in 1963. The life form spectrum of Little Tobago reflects the compositions found in other dry forests by Gentry (1995). Herbs, shrubs and treelets dominate but epiphytes are represented by a much lower proportion of species than in other areas (Fig. 3).

The Family composition of the Little Tobago flora is dominated by Poacece, Leguminosae and Myrtaceae. Gentry (1995) found a similar dominance of grasses and legumes in continental dry forests but found Myrtaceae to be more characteristic of Antillean dry forests where it is dominant. The prevalence of Myrtaceae on Little Tobago Island along with Leguminosae and Poaceae indicates the transitional nature of the site between continental and Antillean type dry

forests. Most families and genera are cosmopolitan in their affinities as is also the case for Kaituer Falls on the Guianan Shield (Kelloff & Funk 2004). The large number of cosmopolitan genera can also be partly due to coastal locality of the site allowing for a relatively high percentage of widely dispersed littoral species.

Species affinities show the strong affinity of Little Tobago Island to both the NSA and Antillean regions. However, the stronger ties appear to be with the NSA region as shown by the percentage of Little Tobago species in common with the different regions (71% in common with NSA compared to 52% in common with the Antilles), and the number of Little Tobago species restricted to different regions (11% restricted to NSA compared to 3% restricted to the Antilles).

The affinities found in this study are in line with the hypothesis of Pennington *et al*. (2000) who suggest a far more extensive distribution of dry forests in the quaternary reaching a maximum around 18,000 to 12,000 years before present during the last glacial and coinciding with the contraction of moist forests. They postulate dry forests occurred in a continuous arc around the Amazon basin and north into Central America and the Caribbean. This continuous body of dry forest has since been fragmented by a return to warmer, wetter conditions and a replacement of dry forest with moist forest in many areas, and rise in sea

Table 4. Centres of distribution of different species found on Little Tobago. ANT = Antillean (Greater and Lesser) Distribution. NSA = northern South American distribution (Columbia, Venezuela, the Guianas and Trinidad & Tobago (unless otherwise stated).

Species with an Antillean centre of distribution		Species with a South American centre of distribution	
In at least one ANT *country but no* NSA *countries (excl T&T)*		*In at least one* NSA *country but in no* ANT *countries*	
Annonaceae	*Annona reticulata*	Acanthaceae	*Aphelandra pulcherrima*
Annonaceae	*Annona muricata*	Anacardiaceae	*Spondias mombin*
Cactaceae	*Melocactus broadwayi*	Araceae	*Anthurium jenmanii*
Celastraceae	*Maytenus tetragonus*	Araceae	*Philodendron acutatum*
Myrtaceae	*Eugenia dussii*	Asteraceae	*Vernonia scorpioides*
Poaceae	*Panicum maximum*	Cactaceae	*Hylocereus lemairei*
Sapotaceae	*Chrysophyllum cainito*	Cactaceae	*Pilosocereus lanuginosus*
		Clusiaceae	*Clusia palmicida*
In at least one ANT *country and no more than two* NSA *countries*		Convolvulaceae	*Iseia luxurians*
		Erythroxylaceae	*Erythroxylum cumanense*
Arecaceae	*Coccothrinax barbadensis*	Marantaceae	*Maranta gibba*
Arecaceae	*Roystonea oleracea*	Menispermaceae	*Odontocarya tamoides*
Boraginaceae	*Bourreria succulenta*	Mimosaceae	*Enterolobium cyclocarpum*
Erythroxylaceae	*Erythroxylum havanense*	Nyctaginaceae	*Pisonia pacurero*
Mimosaceae	*Pithecellobium unguis-cati*	Orchidaceae	*Caularthron bicornutum*
Myrtaceae	*Pimenta racemosa*	Passifloraceae	*Passiflora cyanea*
Ochnaceae	*Ouratea guildingii*	Piperaceae	*Piper guayranum*
Oleaceae	*Chionanthus compacta*	Piperaceae	*Piper tuberculatum*
Oxalidaceae	*Oxalis frutescens*	Sapindaceae	*Melicoccus bijugatus*
Poaceae	*Oplismenus hirtellus*	Smilacaceae	*Smilax cumanensis*
Polygonaceae	*Coccoloba venosa*	Solanaceae	*Cestrum alternifolium* var. *pendulinum*
Rubiaceae	*Erithalis fruticosa*	Solanaceae	*Solanum adhaerens*
Rubiaceae	*Randia aculeata*		
Simaroubaceae	*Picramnia pentandra*		
Solanaceae	*Cestrum alternifolium*		
Solanaceae	*Solanum hirtum*		
Theophrastaceae	*Jacquinia armillaris*		
Verbenaceae	*Citharexylum spinosum*		
Viscaceae	*Phoradendron trinervium*		

level flooding dry forests on exposed continental shelves (Penington *et al*. 2000). It is probable that during the last ice age the dry forests of Little Tobago were the north-western most extension of a large continental dry forest. Tobago has been above water since the Middle Pliocene (3 million years before present) (Rohr 1990) at which time it formed part of the Orinoco Delta and was attached to mainland South America. It is likely the Main Ridge of Tobago, the Northern Range of Trinidad and the Costa Cordillera of the Paria Peninsula of Venezuela formed low ranges of mountains supporting moist forest in a plain of mixed swamp forest, edaphic savannah, riparian forest and dry forest which included Little Tobago (Van der Hammen 1974). Grenada and may be more of the Leeward Islands were also connected to the mainland of South America as indicated by the stronger South American character of the biota in the southern islands of the Lesser Antillean chain and the presence of non-volant taxa such as capybara and sloths in the fossil record on Grenada (Beard 1949; MacPhee *et al*. 2000). It is unlikely this land link would have been through Tobago, however. Sea level rises from 12,000 years before present and advance of moist forest have isolated the dry forests of Tobago and Little Tobago from mainland South American dry forests (Van der Hammen 1974). The strong Antillean element in Little Tobago's flora probably colonized during the last glacial period as well when the sea levels were lower and dispersal between islands was possible. The northern parts of the continental dry forests (including the proto-Little Tobago hills, Main Ridge Tobago, Northern Range and the Costa Cordillera) were likely to have been most influenced by the Antillean invasion (Howard 1974).

In the conservation context of dry forests in the eastern Caribbean and northern South America (Oatham & Boodram in prep.), there appear to be no protected areas for dry forests in

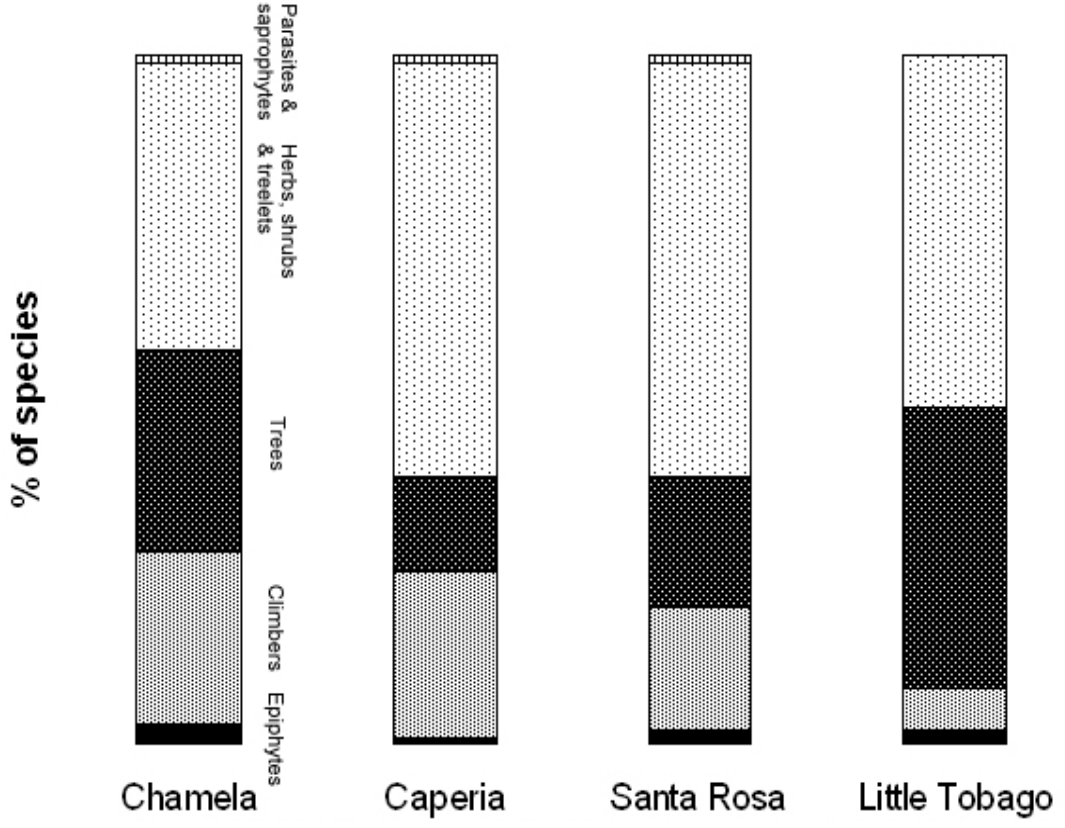


Fig. 3. Percentage of species in different life forms. Data for Chamela(mexico),Caperia(Ecuador) and Santa Rosa (Costa Rica) dry forests included for comparison from Gentry (1995). Format modified from Gentry(1995).

the Lesser Antilles whose countries have tended to focus conservation efforts on the interior montane forests. Little Tobago Island is an important protected area for the Dry Forest of northern South America and the Lesser Antilles. Little Tobago is a Dry Forest that is well protected, it lacks the animal diversity of mainland sites but has significant plant diversity. The plant assemblage is distinctly NSA-Caribbean basin. Little Tobago is also an important breeding ground for many bird species. The island is a good source of propagules for restoration of dry forests in Tobago and for correctly formulating the composition of plantings for dry forest restoration in N. South America and the southern Lesser Antilles.

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Appendix 2. Family and genus list and geographical distribution scores of the plant families and genera recorded for Little Tobago Island.

Family	Genus	NSA	CSA	WSA	MAM	LA	GA	USA	Neo Trop	Pan-T	Cosmop
Acanthaceae		0	0	0	0	0	0	0	0	1	0
	Aphelandra	0	0	0	0	0	0	0	1	0	0
	Blechum	0	0	0	0	0	0	0	1	0	0
Agavaceae		0	0	0	1	0	0	1	1	0	0
	Agave	0	0	0	0	0	0	0	1	0	0
Amaranthaceae		0	0	0	0	0	0	0	0	0	1
	Alternanthera	0	0	0	0	0	0	0	1	1	0
	Blutaparon	1	1	1	1	1	0	1	0	0	0
Anacardiaceae		0	0	0	0	0	0	0	0	1	0
	Mangifera	0	0	0	0	0	0	0	0	i	0
	Spondias	0	0	0	0	0	0	0	1	0	0
Annonaceae		0	0	0	0	0	0	0	0	1	0
	Annona	0	0	0	0	0	0	0	1	0	0
Araceae		0	0	0	0	0	0	0	0	0	1
	Anthurium	0	0	0	0	0	0	0	1	0	0
	Philodendron	0	0	0	0	0	0	0	1	0	0
Arecaceae		0	0	0	0	0	0	0	0	1	0
	Coccothrinax	1	0	0	1	1	1	0	0	0	0
	Cocos	0	0	0	0	0	0	0	0	i	0
	Roystonea	1	0	0	1	1	1	0	0	0	0
Asteraceae		0	0	0	0	0	0	0	0	0	1
	Synedrella	0	0	0	0	0	0	0	1	0	0
	Tilesia	1	1	1	1	1	1	0	0	0	0
	Vernonia	0	0	0	0	0	0	0	0	1	0
Aizoaceae		0	0	0	0	0	0	0	0	1	0
	Trianthema	0	0	0	0	0	0	0	0	1	0
Boraginaceae		0	0	0	0	0	0	0	0	0	1
	Bourreria	1	0	0	1	1	1	0	0	0	0
	Cordia	0	0	0	0	0	0	0	0	1	0
Bromeliaceae		0	0	0	0	0	0	0	1	0	0
	Tillandsia	0	0	0	0	0	0	0	1	0	0
Burseraceae		0	0	0	0	0	0	0	0	1	0
	Bursera	1	1	1	1	1	1	1	0	0	0
Cactaceae		0	0	0	0	0	0	0	1	0	0
	Hylocereus	1	0	1	1	1	1	0	0	0	0
	Melocactus	1	0	1	1	1	1	0	0	0	0
	Pilosocereus	1	1	1	1	1	1	1	0	0	0
Caesalpiniaceae		0	0	0	0	0	0	0	0	1	0
	Senna	0	0	0	0	0	0	0	0	1	0
Capparaceae		0	0	0	0	0	0	0	0	1	0
	Capparis	0	0	0	0	0	0	0	0	1	0
Caricaceae		0	0	0	0	0	0	0	1	0	0
	Carica	0	0	0	0	0	0	0	1	0	0
Cecropiaceae		0	0	0	0	0	0	0	0	1	0
	Cecropia	1	1	1	1	1	1	0	0	0	0

Continued…

Appendix 2. Continued.

Family	Genus	NSA	CSA	WSA	MAM	LA	GA	USA	Neo Trop	Pan-T	Cosmop
Celastraceae		0	0	0	0	0	0	0	0	1	0
	Maytenus	0	0	0	0	0	0	0	0	1	0
Clusiaceae		0	0	0	0	0	0	0	0	1	0
	Clusia	0	0	0	0	0	0	0	1	0	0
Commelinaceae		0	0	0	0	0	0	0	0	1	1
	Commelina	0	0	0	0	0	0	0	0	1	1
Convolvulaceae		0	0	0	0	0	0	0	0	1	0
	Ipomea	0	0	0	0	0	0	0	0	1	0
	Iseia	1	1	1	1	0	0	0	0	0	0
Cucurbitaceae		0	0	0	0	0	0	0	0	1	0
	Psiguria	1	1	1	1	1	1	0	0	0	0
Cyperaceae		0	0	0	0	0	0	0	0	0	1
	Cyperus	0	0	0	0	0	0	0	0	1	0
Ebenaceae		0	0	0	0	0	0	0	0	1	0
	Diospyros	0	0	0	0	0	0	0	0	1	0
Erythroxylaceae		0	0	0	0	0	0	0	0	1	0
	Erythroxylum	0	0	0	0	0	0	0	0	1	0
Euphorbiaceae		0	0	0	0	0	0	0	0	1	0
	Codiaeum	0	0	0	0	0	0	0	i	0	0
	Tragia	0	0	0	0	0	0	0	0	1	0
Fabaceae		0	0	0	0	0	0	0	0	0	1
	Abrus	0	0	0	0	0	0	0	i	1	0
	Andira	1	1	1	1	1	1	0	0	0	0
	Desmodium	0	0	0	0	0	0	0	0	1	0
	Piscidia	0	0	0	0	0	0	0	1	0	0
	Rhynchosia	0	0	0	0	0	0	0	0	1	0
Flacourtiaceae		0	0	0	0	0	0	0	0	1	0
	Casearia	0	0	0	0	0	0	0	0	1	0
	Prockia	0	0	0	0	0	0	0	1	0	0
Heliconiaceae		0	0	0	0	0	0	0	1	0	0
	Heliconia	0	0	0	0	0	0	0	1	0	0
Malpighiaceae		0	0	0	0	0	0	0	0	1	0
	Malpighia	1	0	1	1	1	1	0	0	0	0
Malvaceae		0	0	0	0	0	0	0	0	1	0
	Gossypium	0	0	0	0	0	0	0	1	0	0
	Hibiscus	0	0	0	0	0	0	0	1	0	0
	Malvastrum	0	0	0	0	0	0	0	0	1	0
Marantaceae		0	0	0	0	0	0	0	1	0	0
	Maranta	1	1	1	1	1	1	0	0	0	0
Melastomataceae		0	0	0	0	0	0	0	0	1	0
	Miconia	0	0	0	0	0	0	0	1	0	0
Menispermaceae		0	0	0	0	0	0	0	0	1	0
	Cissampelos	0	0	0	0	0	0	0	0	1	0
	Odontocarya	0	0	0	0	0	0	0	1	0	0
Mimosaceae		0	0	0	0	0	0	0	0	1	0
	Calliandra	1	1	1	1	0	0	1	0	0	0
	Enterolobium	1	1	1	1	1	1	0	0	0	0
	Pithecellobium	0	0	0	0	0	0	0	0	0	0

Continued…

Appendix 2. Continued.

Family	Genus	NSA	CSA	WSA	MAM	LA	GA	USA	Neo Trop	Pan-T	Cosmop
Moraceae		0	0	0	0	0	0	0	0	1	0
	Ficus	0	0	0	0	0	0	0	0	1	0
	Maclura	0	0	0	0	0	0	0	0	1	0
Musaceae		0	0	0	0	0	0	0	0	i	0
	Musa	0	0	0	0	0	0	0	0	i	0
Myrtaceae		0	0	0	0	0	0	0	0	1	0
	Eugenia	0	0	0	0	0	0	0	0	1	0
	Myrcia	0	0	0	0	0	0	0	1	0	0
	Pimenta	0	0	0	1	1	1	0	0	0	0
	Psidium	1	1	1	1	1	1	0	0	0	0
	Syzygium	0	0	0	0	0	0	0	i	0	0
Nyctaginaceae		0	0	0	0	0	0	0	0	1	0
	Pisonia	1	1	1	1	1	1	0	0	0	0
Ochnaceae		0	0	0	0	0	0	0	0	1	0
	Ouratea	0	0	0	0	0	0	0	1	0	0
Oleaceae		0	0	0	0	0	0	0	0	0	1
	Chionanthus	0	0	0	0	0	0	0	0	1	0
Orchidaceae		0	0	0	0	0	0	0	0	0	1
	Caularthron	1	1	1	1	0	0	0	0	0	0
Oxalidaceae		0	0	0	0	0	0	0	0	0	1
	Oxalis	0	0	0	0	0	0	0	0	0	1
Passifloraceae		0	0	0	0	0	0	0	0	1	0
	Passiflora	0	0	0	0	0	0	0	1	0	0
Phytolaccaceae		0	0	0	1	0	0	1	0	1	0
	Rivina	1	1	1	1	1	1	1	0	0	0
Piperaceae		0	0	0	0	0	0	0	0	1	0
	Piper	0	0	0	0	0	0	0	0	1	0
Plumbaginaceae		0	0	0	0	0	0	0	0	0	1
	Plumbago	0	0	0	0	0	0	0	0	1	0
Poaceae		0	0	0	0	0	0	0	0	0	1
	Bambusa	0	0	0	0	0	0	0	i	0	0
	Cynodon	0	0	0	0	0	0	0	0	0	1
	Lasiacis	0	0	0	0	0	0	0	1	0	0
	Olyra	0	0	0	0	0	0	0	1	0	0
	Oplismenus	0	0	0	0	0	0	0	0	1	0
	Panicum	0	0	0	0	0	0	0	0	0	1
	Paspalum	0	0	0	0	0	0	0	0	1	0
	Pharus	0	0	0	0	0	0	0	1	0	0
	Urochloa	0	0	0	0	0	0	0	1	0	0
Polygalaceae		0	0	0	0	0	0	0	0	0	1
	Securidaca	0	0	0	0	0	0	0	0	1	0
Polygonaceae		0	0	0	0	0	0	0	0	0	1
	Coccoloba	0	0	0	0	0	0	0	1	0	0
Pteridiaceae		0	0	0	0	0	0	0	0	0	1
	Adiantum	0	0	0	0	0	0	0	0	1	0
Rubiaceae		0	0	0	0	0	0	0	0	0	1
	Erithalis	0	0	0	0	0	0	0	1	0	0
	Randia	0	0	0	0	0	0	0	0	1	0

Continued…

Appendix 2. Continued.

Family	Genus	NSA	CSA	WSA	MAM	LA	GA	USA	Neo Trop	Pan-T	Cosmop
	Spermacoce	0	0	0	0	0	0	0	0	0	1
Sapindaceae		0	0	0	0	0	0	0	0	1	0
	Melicoccus	0	0	0	0	0	0	0	1	0	0
Sapotaceae		0	0	0	0	0	0	0	0	1	0
	Chrysophyllum	0	0	0	0	0	0	0	0	1	0
	Manilkara	0	0	0	0	0	0	0	0	1	0
Simaroubaceae		0	0	0	0	0	0	0	0	1	0
	Picramnia	0	0	0	0	0	0	0	1	0	0
Smilacaceae		0	0	0	0	0	0	0	0	0	1
	Smilax	0	0	0	0	0	0	0	0	1	0
Solanaceae		0	0	0	0	0	0	0	0	0	1
	Cestrum	0	0	0	0	0	0	0	1	0	0
	Solanum	0	0	0	0	0	0	0	0	0	1
Theophrastaceae		0	0	0	0	0	0	0	1	0	0
	Jacquinia	0	0	0	0	0	0	0	1	0	0
Tiliaceae		0	0	0	0	0	0	0	0	1	0
	Triumfetta	0	0	0	0	0	0	0	0	1	0
Verbenaceae		0	0	0	0	0	0	0	0	1	0
	Citharexylum	0	0	0	0	0	0	0	1	0	0
Viscaceae		0	0	0	0	0	0	0	0	0	1
	Phoradendron	0	0	0	0	0	0	1	1	0	0
Vitaceae		0	0	0	0	0	0	0	0	1	0
	Cissus	0	0	0	0	0	0	0	0	1	0
Vittariaceae		0	0	0	0	0	0	0	0	0	1
	Vittaria	0	0	0	0	0	0	0	0	1	0

NSA= Northern South America; CSA= Central South America; WSA= Western South America; MAM= Meso-America; LA= Lesser Antilles; GA= Greater Antilles; USA= United States of America; NeoTrop= Neotropical; Pan-T= Pan-Tropical; Cosmop= Cosmopolitan. Families and genera marked with an i in any of the regions were introduced by humans to that region