

New plant records for Bonaire and the Dutch Caribbean islands

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ABSTRACT.—Although the flora of Bonaire has been well studied three previously undocumented species have been found for Bonaire. Two of these three species are fern species and are new for the six islands of the Dutch Caribbean. The third species (*Capparis linearis*) occurs also on Curaçao and Aruba and is also a rare species on those islands. Data on the distribution of twelve rare species (eleven are previously unreported rare species for the Washington-Slagbaai National Park (WSNP) are also presented. A number of publications indicate the deleterious effects of introduced goats, donkeys and pigs on the vegetation and flora of islands. These animals are also found in the WSNP. The lack of saplings and the (very) small numbers of seedlings of only a few rare tree species found in the present study are ascribed to the deleterious effects of goats, donkeys and pigs.

KEYWORDS.—Bonaire, deleterious effects, Dutch Caribbean, flora, introduced animals, new additions, rare plant species

Although the flora of the Dutch Leeward island of Bonaire has been relatively well studied (de Freitas and Rojer 2000; de Freitas et al. 2005) data on the distribution of rare species on the island remains scant. Such data is nevertheless critical in the determination of conservation priorities for nature management (Debrot and de Freitas 1991). To improve our knowledge about the distribution of rare plant species in the Washington-Slagbaai National Park (WSNP) on Bonaire, a number of the higher hills in this park were visited between September 2007 and March 2008. Preliminary surveys conducted by Lo Fo Wong and de Jongh (1994) showed that the higher hills and gullies in the WSNP were the key areas harboring rare plant species.

In the present study the following hills in the WSNP were visited: Juwa (September 20, 2007; March 4 and 6, 2008), Brandaris (October 24 and 26, 2007), Seru Yuwana, Seru Largu and Matadó di Pasku, (March 3 and 5, 2008), Hobao (March 4, 2008), Lasana (March 5, 2008), and Seru di Roi Hoba (March 6, 2008). Besides documenting previously unreported rare species for the park, this resulted in three new plant species records for Bonaire. Two of these are also new for the Netherlands Antilles and Aruba (Rojer 1997 a,b,c).

1. *ADIANTUM CAPILLUS-VENERIS* L.
(FERN; FAMILY: *PTERIDACEAE*)

Three specimens were found on the ground under a low rock ledge in an area of approximately 1 m² on the eastern slope of the Hobao. Identification was based on photographs and confirmed by Dr. Alan R. Smith (Herbarium of the University of California at Berkeley, USA). It has been reported as cosmopolitan in tropical, sub-tropical and warm-temperate regions (Proctor 1977; Proctor 1989). In the Caribbean it occurs in Dominica, St. Lucia, St. Vincent and Barbados and is considered rare, except for Barbados (Proctor 1977). Its characteristic habitat is moist limestone or other non-acidic ledges, shaded cliffs and old masonry walls at low to middle elevations (Proctor 1989).

2. *THELYPTERIS* (STEIROPTERIS) *DENTATA*
(FORSSKÅL) E.P.ST. JOHN
(FERN; FAMILY: *THELYPTERIDACEAE*)

One specimen was found on a rock ledge on the northern slope of the Matadó di Pasku. Identification was based on photographs and confirmed by Julián Mostacero Giannangeli (Herbario Nacional de Venezuela). *T. dentata* is found in the Lesser Antilles,

Trinidad, Tobago, Colombia, Venezuela, Surinam and Guyana (Proctor 1977). In the Lesser Antilles it is found in Guadeloupe, Marie Galante, Dominica, Martinique, St. Lucia, St. Vincent, Grenada and Barbados. It is possible an invasive species (Proctor 1977). It occurs on wet rocky banks at chiefly middle elevations. The species has not been documented before in the Dutch Caribbean islands (Stoffers 1962; Arnoldo 1964; van Proosdij 2001).

3. *CAPPARIS LINEARIS* JACQ.
(TREE; FAMILY: CAPPARACEAE)

Two specimens were found on a rock ledge on the eastern side of the Brandaris. Identification was based on photographs.

C. linearis is a small tree species that has a restricted distribution on both Curaçao and Aruba (de Freitas 1996; Stoffers 1982). It further occurs in Margarita and northern South America (Stoffers 1982).

Because of the rarity of the two fern species and the fact that the two specimens of *C. linearis* were hanging from a cliff no herbarium specimens were made of these three species. Photographs of these species have been added to the biodiversity database of the Dutch Caribbean islands.

Table 1 shows the 12 new rare species that can be added to the list of rare plant species known for the WSNP (Lo Fo Wong and de Jongh 1994; de Freitas 2008) and adds data on the distribution of *Myrcia curassavica* (Amshoff) Stoffers that was first

TABLE 1. Twelve new rare plant species for the WSNP and new distribution data of *Myrcia curassavica* in the WSNP.

Species	No. of specimens	Location (mostly hills)
<i>Brassavola nodosa</i> (L.) Lindl.	five occurrences of 50-100 specimens two occurrences of 50-100 specimens one occurrence of 20 specimens	Hobao Matadó di Pasku Lasana
<i>Capparis tenuisiliqua</i> Jacq. ¹	one specimen	a gully in the lowest part eastern slope Juwa
<i>Cheilanthes microphylla</i> (Sw.) Sw.	one occurrence of an undetermined number of specimens	Matadó di Pasku
<i>Clusia rosea</i> Jacq.	one specimen	eastern slope of Matadó di Pasku (in a <i>Bursera tomentosa</i> tree)
<i>Croton niveus</i> Jacq. <i>Eugenia procera</i> (Sw.) Poir.	two specimens eight specimens one specimen eight specimens	Juwa Brandaris Juwa Matadó di Pasku
<i>Jacquinia armillaris</i> (Loefl.) Mez	one specimen	higher part of eastern slope of Matadó di Pasku
<i>Lygodium venustum</i> Sw.	one specimen	Hobao
<i>Maytenus versluysii</i> Boldingh ²	seven specimens two specimens three specimens eleven specimens	Matadó di Pasku Brandaris Hobao Matadó di Pasku
<i>Myrcia curassavica</i> ²	four specimens three specimens	Brandaris Matadó di Pasku
<i>Nephrolepis biserrata</i> (Sw.) Schott	one occurrence of an undetermined number of specimens two occurrences of an undetermined number of specimens four occurrences of an undetermined number of specimens	Brandaris Hobao Matadó di Pasku
<i>Schoepfia schreberi</i> J.F. Gmel.	one specimen three specimens	Juwa Matadó di Pasku

¹Thought to be extinct on Bonaire (van Proosdij 2001).

²Endemic to Bonaire and Curaçao (Stoffers 1981; van Proosdij 2001).

reported for Bonaire in 1998 (de Freitas and Rojer 2000). These species are also rare for Bonaire with the exception of *J. armillaris* (Stoffers 1981; Lo Fo Wong and de Jongh 1994; de Freitas 1996; Debrot 1997; Debrot et al. 1998; van Proosdij 2001; de Freitas et al. 2005).

No saplings were found for any of the following tree species considered rare for the WSNP: *C. linearis*, *C. tenuisiliqua*, *Celtis iguanaea* (Jacq.) Sarg., *C. rosea*, *Crateva tapia* L., *C. niveus*, *E. procera*, *Geoffroea spinosa* Jacq., *J. armillaris*, *Maytenus tetragona* Griseb., *M. versluysii*, *M. curassavica*, *Psidium sartorianum* (O. Berg.) Nied., *S. schreberi*, and *Spondias mombin* L.

Seedlings of all the above-mentioned rare tree species were either absent or occurred in very low numbers; the latter was the case for *E. procera* (Brandaris, Juwa, Matadó di Pasku), *M. tetragona* (Brandaris, Juwa), *M. curassavica* (Brandaris, Juwa, Matadó di Pasku), *P. sartorianum* (Brandaris) and *S. schreberi* (Matadó di Pasku). The paucity of seedlings and saplings are the consequence of the presence of the introduced goats, pigs and donkeys in the WSNP. In Curaçao the abovementioned and also other rare species have ample seedlings and saplings due to stringent control of goats in the Christoffelpark (fencing out and shooting). However in the WSNP Bonaire, this is not the case. For instance, in a total of 90 3 × 3 m sample plots that were surveyed between September 2007 and March 2008 for the establishment of exclosures and non-treatment sites (de Freitas 2008) 97% had two or more goat dung pellets in it. An average of 50 goat dung pellets was found in these plots. In an island-wide vegetation study for Bonaire 52% of the plots contained goat dung (and 36% donkey excrement; de Freitas et al. 2005). Goats, pigs and donkeys impact the natural vegetation (of islands) in a deleterious way (Bratton 1975; Hamman 1979; National Park Service 1979; Singer et al. 1982; Noy-Meir 1990; Debrot and de Freitas 1993; Ickes 2001; Campbell and Donlan 2005; de Freitas et al. 2005) and these results emphasize that their removal and eradication should be a management priority for the WSNP and other protected areas of Bonaire.

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