

Additions to the liverwort and hornwort flora of São Tomé and Príncipe

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Abstract: 18 species of liverworts and hornworts are reported as new for the country of São Tomé and Príncipe, Gulf of Guinea, West Africa. An additional 8 species are reported as new for one of the islands of the country. Of this total, 13 species are new for Príncipe and 16 species new for São Tomé. The liverwort and hornwort flora for the country is now reported to have 147 species.

Resumo: 18 espécies de hepáticas e antóceros foram reportadas como novas para o país de São Tomé e de Príncipe, golfo da Guiné, África ocidental. 8 espécies adicionais foram reportadas como novas somente para uma das ilhas do país. Deste total, 13 espécies são novas para Príncipe e 16 para São Tomé. A flora de hepática e antóceros do país possui atualmente 147 espécies.

Keywords: biodiversity, bryophytes, distribution, Gulf of Guinea, inventory, tropical forests.

Introduction

The Democratic Republic of São Tomé and Príncipe is the second smallest country in Africa. It lies in the eastern Gulf of Guinea, from the equator northward to 1°40'N and about 280 km off the African mainland. Of the two islands comprising the country, São Tomé is much the larger at 836 km², and Príncipe the smaller at 128 km².

Both islands are of volcanic origin, and Príncipe, the older of the two is estimated to be 31 my old with São Tomé considerably younger at only 13 my old (Burke 2001). Besides the size differences between these two islands, elevation relief is also an important factor to explain bryophyte distributions. Pico de São Tomé at 2024 m, is the tallest mountain in the country and creates a rain shadow effect on the northern end of the island. The Pico de Príncipe at 836 m forms the highest point on Príncipe. Although lower slopes of both islands have been impacted by either coffee or cocoa plantations, and much earlier by sugar cane, much of the rugged interior still has intact tropical forests, which are maintained by the ample precipitation. Much of the highest elevations are occupied by cloud forest habitats, draped in bryophyte cover. A good overview of the flora and vegetation is

presented in Exell (1944), and a list of 37 bryophytes is presented in Appendix 1 of that work.

The San Francisco-based California Academy of Sciences (CAS) has conducted four multi-disciplinary research expeditions to São Tomé and Príncipe from 2001–2010. During the third expedition in 2009 the focus was on vascular plant inventory, although a few bryophytes were also collected by Rebecca Wenk, a member of the vascular plant collecting team. The fourth expedition took place during February–March 2010. The main botanical focus of this expedition was the acquisition of bryophyte specimens and a continuation of the vascular plant inventory, especially for ferns. During the month-long expedition in 2010, only one week was available for collecting activities on Príncipe. One of the factors making field work in this country more difficult is the limited number of roads and trails into the mountainous interior of both islands. Many areas are best accessed by boat, but then extended cross-country hiking is required to get up into higher reaches of the river basins. Future CAS expeditions are planned to address some of these collecting difficulties. Nonetheless, the limited 2010 expedition yielded many taxa new for the country or reported for the first time on one of the islands. In total, 682

bryophyte collections were made during this expedition. Of these, 245 numbered collections were hepatics. Only a few hornwort collections were obtained. We report the following findings based on these limited numbers of available collections.

The hepatics and hornworts reported in the literature from São Tomé and Príncipe are consolidated in Wigginton (2009), and the mosses in O'Shea (2006). During the compilation of this manuscript an updated catalogue of the bryophytes of São Tomé and Príncipe was published (Sérgio & Garcia 2011). A few additions have been published by Pócs (2011a, 2011b). For the other islands of the Gulf of Guinea, Bioko and Annobón, there is a bryophyte checklist (Heras & Infante 1996) and a few more recent publications which contain new records (Heras & Infante 2001, Infante et al. 1997, Müller 1996, 2006, Müller & Pócs 2007).

Annotated list of new records for São Tomé or Príncipe

Species marked with an asterisk (*) are new for the whole country of São Tomé and Príncipe; species without asterisk are new for São Tomé or Príncipe, but already known from the country. The liverwort and hornwort catalogue hitherto included 129 species from São Tomé and Príncipe (Sérgio & Garcia 2011). In this paper we report 16 species new for São Tomé and 13 species new for Príncipe. Voucher specimens are conserved in the herbarium of the California Academy of Sciences (CAS), with duplicates in the herbaria of the Eszterházy College of Eger (EGR) and the University of Dresden (DR). A synoptic set of the entire collection will reside at Jardim Botânico de Bom Sucesso (STPH). Collections numbers (e.g., "34241") not attributed to a collector refer to collections made by the third author, and these were determined by T. Pócs (Frullaniaceae, Lejeuneaceae, Lepidoziaceae, Porellaceae) or by F. Müller (Aneuraceae, Anthocerotaceae, Geocalycaceae, Marchantiaceae, Pallaviciniaceae, Plagiochilaceae, Radulaceae, Ricciaceae).

* *Acrolejeunea emergens* (Mitt.) Steph.
São Tomé, 34241. On buttress of *Ceiba* in sun.
Widespread in the drier habitats of tropical America and Africa.

* *Bazzania nitida* (F. Weber) Grolle
São Tomé, 34552. On hardwood trunk in filtered light.
Widespread in the mountainous areas of tropical Africa, more common in East than in West Africa, where it was previously known only from Bioko and Cameroon.

Cololejeunea obliqua (Nees & Mont.) Schiffn.
Príncipe, 34666. On fern leaves in filtered light.
A pantropical rainforest species.

* *Drepanolejeunea capulata* (Taylor) Steph.
São Tomé, 34325. On leaves of small shrubs in filtered light.
A rare West African endemic previously known only from Bioko and Nigeria.

* *Fossombronina* spec.
Príncipe, 34730. On vertical soil and rock wall in filtered light.
The material is only in sterile condition and therefore determination to species level is not possible. The genus has not been previously reported from São Tomé and Príncipe.

* *Frullania apiculata* (Reinw., Blume & Nees) Nees
São Tomé, 34558, 34767. On fallen hardwood branches.
Palaeotropical forest species widespread in tropical Africa, Indomalesia and Oceania.

Frullania spongiosa Steph.
Príncipe, 34687, 34750. On hardwood trunk in sun to filtered light.
Scattered all over sub-Saharan Africa in more open habitats.

* *Lejeunea anisophylla* Mont.
São Tomé, 34322A, 34368. Appressed to smooth surface of hardwood trunk and buttress in filtered light.
Príncipe, 34635A, 34701A, 34749. Base of hardwood trunks in filtered light.
A widespread Palaeotropical species formerly mistakenly known under the name of *Lejeunea caespitosa* (see Pócs 2010).

* *Lejeunea* cf. *obtusata* Gottsche
São Tomé, 34449. On coconut palm trunk in sun.
A more East African species known from West Africa from Sierra Leone and from Ghana, new to the Gulf of Guinea Islands.
The examined material represents a very scanty specimen. Therefore we are not absolutely sure in its identity.

* *Lejeunea papilionacea* Steph.
São Tomé, 34322. Appressed to smooth surface of hardwood trunk in filtered light.
A relatively rare lowland tropical African species. In West Africa known from Guinea, Rio Muni, Sierra Leone, Ghana and Cameroon.

* *Lejeunea phyllobola* Nees & Mont.
Príncipe, 34674. Volcanic rock wall in filtered light.
African records were formerly recorded under the names *Rectolejeunea arnellii* E.W. Jones or *Lejeunea*

brittoniae (A.Evans) Grolle, both of which were made synonyms of *Lejeunea phyllobola* Nees & Mont. (Reiner-Drehwald 2000). Previously known in West Africa only from Sierra Leone. More widespread in East Africa and in tropical America.

Lejeunea tabularis (Spreng.) Gottsche, Lindenb. & Nees

São Tomé, 34217, 34316, 34322B, 34487. On hardwood trunk and volcanic boulder in filtered light. Widespread all over tropical and southern Africa.

* *Lejeunea tuberculosa* Steph.

Príncipe, 34690. Volcanic rock wall in filtered light. A Palaeotropical species widespread both in tropical Africa and Asia.

Lepidozia succida Mitt.

Príncipe, Wenk 758, Wenk 761, Wenk 770, 34562, 34565, 34566, 34577, 34579, 34598, 34604, 34642, 34643, 34691, 34722, 34740. On volcanic clayey soil, volcanic boulders with soil, palm trunks, and exposed fern roots with soil in filtered light.

Widespread from West to Central Africa and also occurs in Comoros and Madagascar.

* *Lopholejeunea nigricans* (Lindenb.) Schifff.

São Tomé, 34204. Soil and litter over volcanic rock in filtered light.

Príncipe, 34638, 34669, 34702, 34711, 34743. On volcanic boulders, and exposed hardwood roots along river (seasonally inundated) in filtered light.

Widespread pantropical species.

* *Lopholejeunea subfusca* (Nees) Schifff.

Príncipe, 34571. Palm trunk in sun to filtered light.

Widespread pantropical species.

Plagiochila moenkemeyeri Steph.

Príncipe, 34710. On lianas along river in filtered light. Widely distributed in West Africa including the Gulf of Guinea Islands, but hitherto unknown from Príncipe.

Plagiochila pectinata Willd. ex Lindenb.

Príncipe, 34597. Hardwood trunk in filtered light. An Afro-montane species, previously known from São Tomé, but hitherto unknown from Príncipe.

* *Plagiochila pinniflora* Steph.

São Tomé, 34757. Fallen hardwood branch in filtered light.

A predominantly West African species. Hitherto known only from the African mainland, it can here be reported as new to the Gulf of Guinea Islands. The nearest records are from Cameroon, Gabon, and Rio Muni.

* *Porella abyssinica* Trevis. var. *hoehnelii* (Steph.) Pócs

São Tomé, 34226. On a built volcanic retaining rock wall in filtered light.

An Afro-montane species hitherto known only from East and Central Africa, new to West Africa.

* *Radula ankefinensis* Gottsche ex Steph.

Príncipe, 34618. Volcanic boulders in filtered light.

An Afro-montane species, in West Africa hitherto known only from Cameroon and Bioko.

Radula fulvifolia (Hook.f. & Taylor) Gottsche, Lindenb. & Nees

São Tomé, 34203. Litter and soil over volcanic rock in filtered light.

Widespread in tropical Africa, already known from Príncipe, but hitherto not reported for São Tomé.

Riccardia limbata (Steph.) E.W.Jones

Príncipe, 34730. On vertical rock and soil wall in filtered light.

Frequent in tropical Africa, reported previously from São Tomé, but hitherto unknown from Príncipe.

* *Riccardia longispica* (Steph.) Pearson

São Tomé, 34151, wall of volcanic boulders in full shade; Pócs 00144/H, Pócs 00147/D, Pócs 00148/C, on irrigated rock and on cliff.

Scattered through tropical Africa, in West Africa known from Bioko, Cameroon, and Rio Muni. New for the country of São Tomé and Príncipe.

* *Symphyogyna podophylla* (Thunb.) Mont. & Nees

São Tomé, 34534. Wall of volcanic rock outcrop in filtered light to partial shade.

A montane species, in West Africa hitherto known from higher elevations in Bioko and Cameroon. New for the country of São Tomé and Príncipe.

* *Taxilejeunea conformis* (Mont. & Nees) Steph.

São Tomé, 34131, 34140, 34150, 34179, 34344, 34350, 34483. Moist volcanic rock with soil, tree fern trunk, fallen hardwood trunk, and twigs of hardwood shrubs in filtered light to full shade.

A widespread Afro-montane species.

* *Telaranea coactilis* (Spruce) J.J.Engel & G.L.S.Merr.

São Tomé, 34533. Volcanic rock wall in filtered light to partial shade; mixed among other liverworts.

A species widespread in tropical Africa, which was distinguished by Engel and Smith Merrill (2004) from *Telaranea diacantha* (former *Arachniopsis diacantha* (Mont.) M.Howe) and considered by them a species restricted to tropical America. However, according to recent investigations (Pócs, unpublished data) both species occur in tropical Africa.

Discussion

The results of this expedition indicate that with further field work and exploration, additional bryophyte species are very likely to be found. In our view, more systematic field inventory sampling in Príncipe and at the higher altitudes of São Tomé would be a profitable enterprise and further define the distribution of Gulf of Guinea bryophytes.

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