Phytotaxa 175 (5): 263–269
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.175.5.4

Ombrophytum guayanensis, the first record of subfamily Lophophytoideae (Balanophoraceae) in the Guayana Shield

PIERO G. DELPRETE[1]*
[1]*Herbier de Guyane, Institut de Recherche pour le Développement (IRD), UMR AMAP, Boite Postale 165, 97323 Cayenne Cedex, French Guiana, France.*
E-mail: piero.delprete@ird.fr
**Author for correspondence*

Abstract

The family Balanophoraceae continues to be poorly known and rarely collected, mostly due to its partially or completely subterranean habit and its general aspect resembling a fungus. A recent collection from French Guiana was identified as a species of *Ombrophytum* unknown to science (*O. guayanensis*), which is here described and illustrated. This species also represents the first record of the subfamily Lophophytoideae for the Guayana Shield.

Key Words: French Guiana, critically endangered species, taxonomy

Introduction

The Balanophoraceae is a pantropical family of holoparasitic plants, partially or entirely subterranean, with extremely reduced morphological features. For example, the family lacks a fully developed ovary and a complete placenta, the ovules are rather rudimentary (Fagerlind 1938, 1945a, 1945b, 1945c, Eichler 1867, 1869), and apparently it lacks stomata (Kuijt & Dong 1990). All these features remain to be studied in detail in order to understand the little-known physiology and reproduction biology of these plants. The family continues to be poorly collected, mostly due to his general aspect resembling a fungus (and not of a flowering plant), and because of its irregular emergence. Ongoing studies in neotropical Balanophoraceae has lead to the recent description of two new species, i.e., *Lophophytum rizzoi* Delprete (2004: 292) and *Langsdorffia heterosepala* Cardoso, Alves & Braga (2011: 424). In addition, a recent collection from French Guiana has called my attention, mostly because the morphological features of the specimens do not match any of the known Neotropical species of this family.

In the Neotropics the family Balanophoraceae is currently represented by seven genera and 17 species (18 with the new species described below). Hansen (1980), divided the family into three subfamilies, which he distinguished using the following characters: 1) Balanophoroideae, with one style per flower, wax in tubers and elsewhere, and flowers not imbedded in filiform hairs; 2) Scybalioideae, with two styles per flower, starch in tubers and elsewhere, flowers embedded in a layer of filiform hairs, and anthers merged into a usually tri-merous synandrum; 3) Lophophytoideae, with two styles per flower, starch in tubers and elsewhere, flowers not embedded in hairs, on elongated branches subtended by early deciduous peltate bracts. As no molecular phylogenies focused on this family have been produced to date, the subfamilial classification proposed by Hansen (1980) remains the most recent reference for the systematics of this group.

After detailed study, it became clear that the recently collected specimens that called my attention belong to subfamily Lophophytoideae, as circumscribed by Hansen, because the flowers are not imbedded in hairs, female flowers have two styles, and both female and male flowers are on conspicuous branches terminating with enlarged peltate bracts and the inflorescence branches are intermixed among bracts. In the Lophophytoideae, Hansen (1980, 1993) included the genera *Lophophytum* Schott & Endlicher (1832: 1), *Lathrophytum* Eichler (1868: 550) and *Ombrophytum* Poeppig ex Endlicher (1836: 73). On the other hand, until now, *Helosis cayennensis* (Swartz 1788: 12) Sprengel (1826: 765) and *Langsdorffia hypogea* Martius (1818: 179) are the only two species of Balanophoraceae reported to occur in

Accepted by Maarten Christenhusz: 2 Aug. 2014; published: 15 Aug. 2014

the Guayana Shield (Hansen 1993, Hansen & Miller 2007); therefore, no account of the subfamily Lophophytoideae has been recorded from this region.

A further analysis of the specimens showed that this species belongs to the genus *Ombrophytum*, because the inflorescence branches are regularly intermixed among bracts, and the apical part of both male and female branches is peltately enlarged (Hansen 1980: 23). A comparison with the known species of *Ombrophytum* shows that it is a species new to science, which is thus described and illustrated below.

Material and Methods

This study is based on digital images and examinations of specimens preserved in 60% ethanol, collected at Cacao Mountain, Upper Camopi River, French Guiana (France), as well as field observations, provided by the collector. Herbarium specimens were deposited at the CAY, K, NY and US herbaria. A few specimens preserved in 60% ethanol are also deposited at CAY, to facilitate the study of vegetative and reproductive parts of this species. Pickled specimens were examined using a dissecting microscope. Conservation status is assessed applying the 2001 IUCN Red list Categories and Criteria version 3.1.

Description

Ombrophytum guayanensis* Delprete, *sp. nov. (Figs. 1 and 2).

Type:—FRENCH GUIANA. Commune de Camopi, Upper Camopi River, Cacao Mountain, in undercanopy of forest 15–20 m tall, on lateritic soil, 02°21'18"N, 53°12'44"W, 200 m, 13 July 2012, *G. leotard 1000* (holotype CAY!, isotypes K!, NY!, US!; material preserved in alcohol at CAY).

Description and measurements made from specimens preserved in 60% ethanol and digital images. Total length of the plant 16−21 cm (including the tuber). Tuber subterranean, irregularly depressed-ellipsoid, 5−7 cm wide. Volva coriaceous, shape unknown (only the basal portion observed in an old individual), breaking off irregularly. Inflorescence bisexual, 13−16 cm long; lower sterile part short-cylindrical, 1−1.5 cm long, 2−2.5 cm in diam.; intermediate female part faintly ellipsoid, 6−9 cm long, 5−7 cm in diam. (including inflorescence branches); upper male part conical, 5−6 cm long, 3.5−4.5 cm in diam. at base (including inflorescence branches); surface of inflorescence axis among male branches conspicuously mammillate (somewhat ruminate in cross section), yellow when fresh. Bracts angular-clavate, vinaceous when fresh, regularly intermixed and emerging above male and female inflorescence branches, when these are not completely expanded (before anthesis); falling off before anthesis, leaving circular scars among inflorescence branches. Bracts intermixed among female branches 6−8 mm long (when female branches are 4−5 mm long); basal stalk truncate-obconical, 4−5(−6)-angular, 4.5−5 mm long, 1.3−1.5 mm wide at base and 2−2.5 mm wide just below the head; head irregularly hemi-ellipsoid to shallowly conical (without central protrusion), 3.5−4 mm wide, 2.5−3 mm thick. Bracts intermixed among male branches 6−8 mm long (when male branches are 3.5−4 mm long); basal stalk truncate-obconical, 4−5(−6)-angular, 3.5−4 mm long, 1.5−1.8 mm wide at base and 2.5−3.5 mm wide just below the head; head mammiform, 4.5−6 mm wide, 2.5−4 mm thick, the central protrusion with a tiny depression in the center. Female branches white to cream-white when fresh, 6.5−8 mm long during anthesis (9−12 mm long at fruiting stage), with 60−90 flowers densely arranged on the narrow, terete central branch; apical part peltately enlarged; pelta 7−8.5 mm in diam. during anthesis (9−12 mm in diam. during fruiting stage), irregularly crenate-dentate, fleshy when fresh. Female flowers without perianth; ovary obconical- to parallelepipedal-prismatic (due to mutual pressure), 1.8−2.2 mm long, 1.2−1.4 mm wide at truncate top; styles 2, appearing from a shallow pit at the truncate apical part of the ovary, 0.6−0.7 mm long, stigma capitellate, 0.2 mm in diam. at tip (microscopically mammillate). Male branches white to cream-white when fresh, 3.5−4 mm long when young (with anthers not fully developed, and when female branches are in anthesis), 5−6 mm long during anthesis (withering at fruiting stage), with 10−12 decussately arranged flowers, inserted on the terete central branch; apical part peltately enlarged; pelta 3.5−4 mm in diam. during anthesis, irregularly crenate-dentate, fleshy when fresh. Male flowers with 2 stamens; filaments 0.1−0.2 mm long, anthers basifixed, ellipsoid, 1.5−1.6 × 1−1.1 mm, thecae equal in length. Fruit 1-seeded, parallelepipedal-prismatic (due to mutual pressure), 2.4−2.7 mm long, 1.2−1.5 mm wide at truncate top.

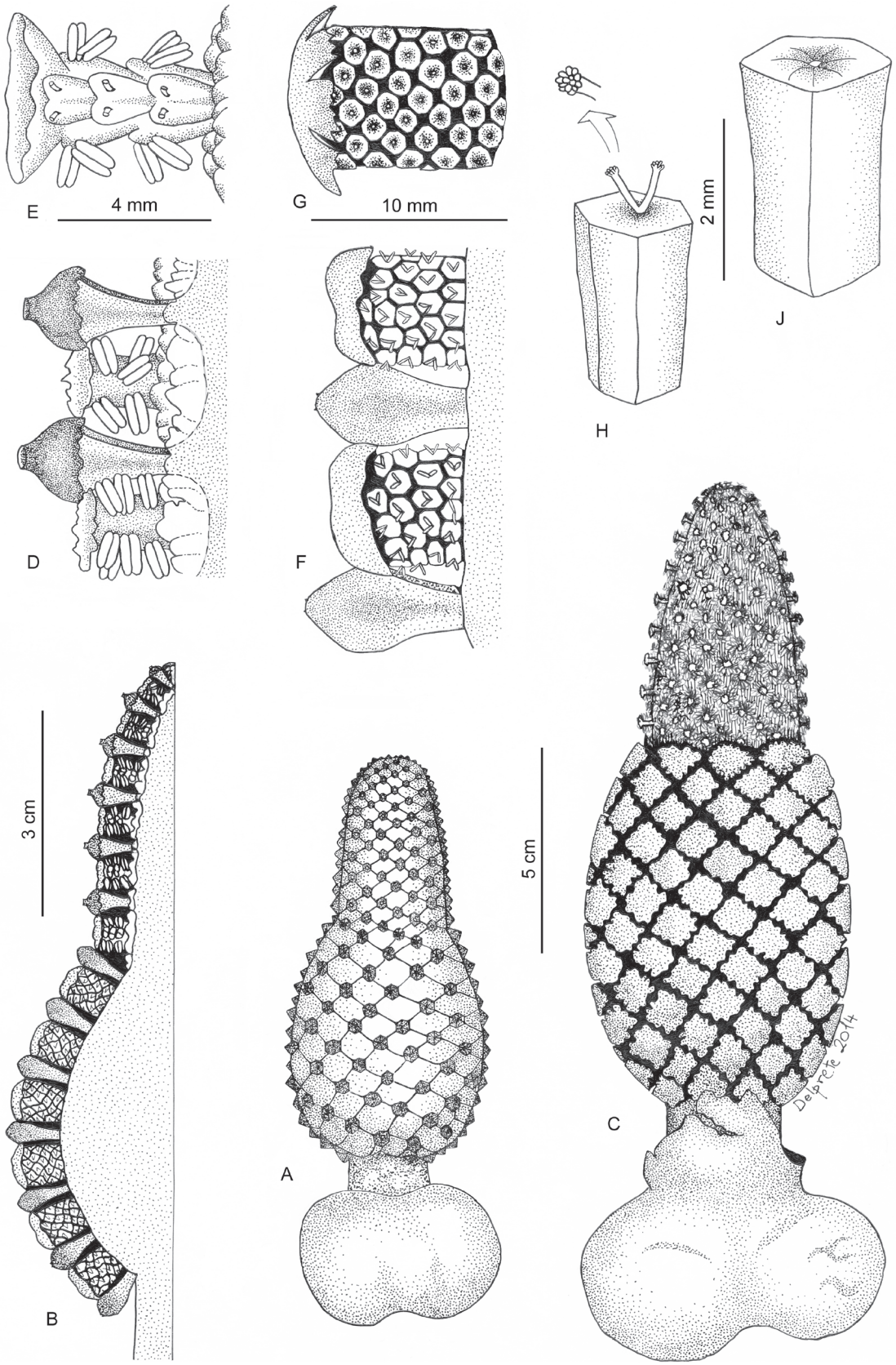

FIGURE 1. *Ombrophytum guayanensis*. **A,** habit of a young individual, with stalk and basal tuber; **B,** longitudinal section of the young individual, showing the basal stalk, the intermediate female part with female branches intermixed among bracts, and the upper male part with male branches intermixed among bracts; **C,** individual in advanced stage, with female branches with mature fruits (not visible, present below the pelta); **D,** portion of the male part of the young individual, with two bracts and two immature male branches; **E,** male branches in anthesis, with dehisced anthers; **F,** portion of the female part of the young individual, with two bracts and two female branches in anthesis (stigmas receptive); **G,** Female branch with mature fruits; **H,** female flower in anthesis, with detail of the receptive stigma; **J,** mature fruit. (D−E at same scale, F−G drawn at same scale, H−J drawn at same scale). Drawn by P.G. Delprete from type specimens preserved in alcohol.

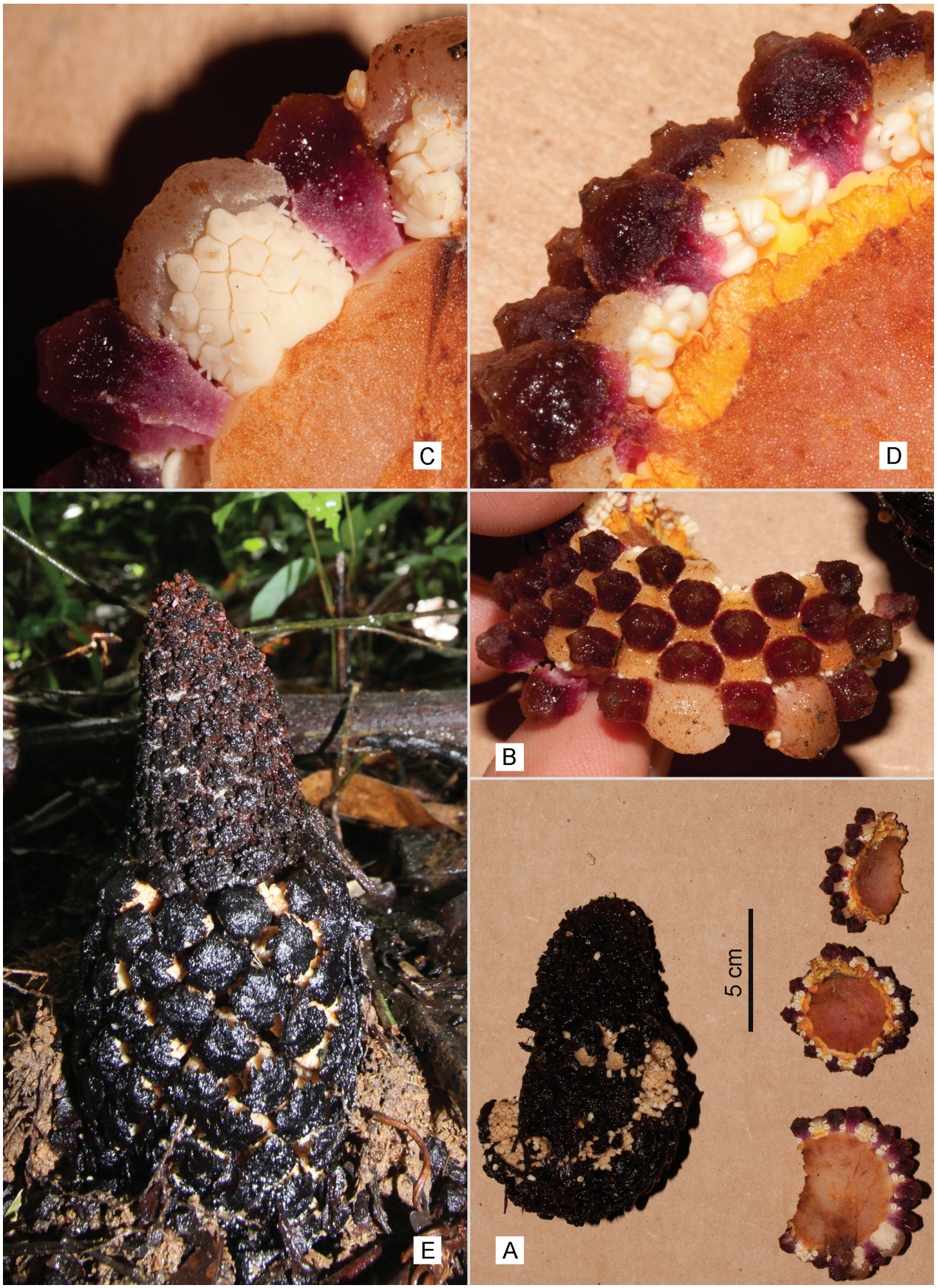

FIGURE 2. *Ombrophytum guayanensis*. **A,** habit of a young individual, with cross sections of female and male portions; **B,** Side view of a cross section of a male portion, with two female branches at base (see too bigger pelta al base); **C,** detail of the cross section of the female portion of the young individual, with female flowers in anthesis; **D,** detail of the cross section of the male portion of the young individual, with undevelopped male branches and very young anthers; **E,** individual in advanced stage, with female branches with mature fruits (present below the pelta). Photos by G. Leotard.

Etymology:—The specific epithet refers to the Guyana Shield, because this the first species of this genus found in this region.

Distribution, Habitat and Ecology:—The only material known of this species is from a locality near Cacao Mountain, not far from the source of the Camopi River, French Guiana, growing in the undercanopy of a forest 15−20 m tall, on lateritic soil, at the base of an inselberg. The specimens were collected from a population of about 15 individuals in an area of about 3−4 m². Most of the individuals were at the end of fructification, some of them already in advanced stage of decomposition, and only one young individual at the blooming stage. The plants were originally discovered by L. Proux and V. Pelletier on 8 July 2012, and were preserved in alcohol by G. Leotard on 13 July 2012.

Phenology:—Individuals in flowering and fruiting stage were collected from the same population, in July 2012. As for blooming strategy, it was observed that the female flowers bloom before the male flowers of the same individual (protogynous). In the young individual studied, the female flowers were in anthesis, with receptive stigmas, while the male flowers were with the anthers still closed. In the older individuals, instead, while the male branches were with opened anthers and releasing pollen, the female branches were already bearing mature fruits, with the styles fallen off.

Suggested conservation status:—This species is known only from a single population of about 15 individuals in an area of about 3−4 m². As explained above, members of the Balanophoraceae are rarely collected; therefore, it is difficult to establish their true geographic distribution. However, taking into consideration the small population observed (Criterion B2) and the small area of occupancy (Criterion D), this species should be treated as "Critically Endangered" (CR) following IUCN criteria (IUCN 2001).

Taxonomic relationships:—The classical reference for identification of Neotropical Balanophoraceae is the monograph published by Hansen (1980). According to this treatment, *Ombrophytum guayanensis* is unique in the genus because of the shape of the bracts that are regularly intermixed among the male and female branches, and by the subsessile anthers (filaments 0.1−0.2 mm long).

As in all other species of the genus, the inflorescence bracts of *Ombrophytum guayanensis* are difficult to observe because they are readily caducous, as they fall off just after anthesis (leaving a circular scar among inflorescence branches; i.e., they are absent at fruiting stage); therefore, they are present only in young individuals. Only one young individual of this species was available, and it was possible to observe that in both male and female portions of the inflorescence, the bracts are angular-clavate, while in all other species of the genus they are peltate. In *O. guayanensis*, the bracts have a 4−5(−6)-angular, tronco-obconical basal stalk, and a fleshy, expanded head; additionally, their shape varies depending on their position in the male or female portion of the inflorescence. The bracts intermixed among female branches are 6−8 mm long (when female branches are 4−5 mm long), with a basal stock 4.5−5 mm long, 1.3−1.5 mm wide at base and 2−2.5 mm wide just below the head, with and fleshy, irregularly hemi-ellipsoid to shallowly obconical head, 3.5−4 mm wide and 2.5–3 mm thick (Figs. 1B, 1F−G, 2C); meanwhile, the bracts intermixed among male branches are 6−8 mm long (when male branches are 3.5−4 mm long), with a basal stock 3.5−4 mm long, 1.5−1.8 mm wide at base and 2.5−3.5 mm wide just below the head, and a fleshy, irregularly mammiform head, 4.5−6 mm wide and 2.5−4 mm thick, with a central protrusion (Figs. 1B, 1D−E, 2B, 2D).

According to the species descriptions available in Hansen's (1980) monograph, *Ombrophytum guayanensis* is most similar to *O. violaceum* Hansen (1980: 58), as they both have monoecious inflorescences up to 16 cm long, and male flowers decussately arranged on male branches; the previous differing from the latter principally by the angular-clavate bracts (vs. peltate in all other species of the genus), male inflorescence branches with 10−12 flowers (vs. 4−8 flowers per branch in *O. violaceum*), anthers 1.5−1.6 mm long (vs. 1−1.25 mm long), female inflorescence branches 6.5−8 mm long (vs. 4−6 mm long), ovary and fruit 2−2.5 mm long (vs. 1.2−1.5 mm long), and styles 0.6−0.7 mm long (vs. 0.5 mm long). A comparison of the main morphological differences of the five species of *Ombrophytum*, and their geographic distribution, is available in Table 1.

TABLE 1. Table comparing morphological features and geographic distribution of the species of *Ombrophytum* (from Hansen 1980, and Delprete, this publication).

Characters	*O. violaceum*	*O. microlepis*	*O. guayanensis*	*O. peruvianum*	*O. subterraneum*
Inflorescence length	up to 16 cm	up to 20 cm	13−16 cm	up to 35 cm	(10−)15(−26) cm
Inflorescence sexuality	Monoecious	Monoecious	Monoecious	Monoecious	Monoecious or female
Bracts intermixed or subtending inflorescence branches	Peltate	Peltate	Angular-clavate	Peltate	Peltate
Male branch length (during anthesis)	1.5−4 mm	3−7 mm	5−6 mm	5−10 mm	3−8 mm
Number and position of flowers on male branch	4−8, decussate	up to 20, alternate	10−12, decussate	10−50, alternate	ca. 50, alternate
Filament length	0.25−0.5 mm	1−1.2 mm	0.1−0.2 mm	1 mm	0.6−2 mm
Anther length	1−1.25 mm	1.2 mm	1.5−1.6 mm	2 mm	1.4−2.3 mm
Female branch length (during anthesis)	4−6 mm	4 mm	6.5−8 mm	8−20 mm	(3−)11(−22) mm
Number of flowers on each female branch	many (exact number unknown)	50−80	60−90	40−100	ca. 100
Ovary length	1.2−1.5 mm	1 mm	1.8−2.2 mm	1.5 mm	1−2 mm
Styles length	0.5 mm	0.5 mm	0.6−0.7 mm	unknown	0.5−0.75 mm
Geographic distribution	Ecuador, Peru, Brazil (Amazonas)	Peru, Brazil (Acre)	French Guiana	Ecuador, Peru, Brazil (Acre)	Andes of Bolivia and Argentina

Acknowledgments

I thank Guillaume Leotard, for providing specimens preserved in alcohol, photographs and field observations. I also wish to express my gratitude to the anonymous reviewer for the careful review and the insightful comments that much improved the manuscript.

References

Cardoso, L.J.T., Alves, R.J.V. & Braga, J.M.A. (2011) A new species and a key for *Langsdorffia* (Balanophoraceae). *Systematic Botany* 36: 424−427. http://dx.doi.org/10.1600/036364411x569606

Delprete, P.G. (2004) A new species of *Lophophytum* and the first report of *Lathrophytum* (Balanophoraceae) from the state of Goiás, Central Brazil. *Kew Bulletin* 59: 291−295. http://dx.doi.org/10.2307/4115863

Eichler, A.G. (1867) *Sur la structure de la fleur femelle de quelques Balanophorées.* Actes du Congrès International de Botanique, Paris. Pp. 137−155, tabs. 1−2.

Eichler, A.G. (1869) Balanophoreae. *In:* Martius, C.F.P., Eichler, A.G. & Urban, I. (Eds.) *Flora Brasiliensis* volume 4, part 2. Fleischer, München, pp. 1−74, tabs. 1−16.

Fagerlind, F. (1938) Bau und entwicklung der floralen organe von *Helosis cayennensis*. *Svensk Botanisk Tidskrift* 32: 139−159.

Fagerlind, F. (1945a) Bildung und entwicklung des embryosacks bei sexuellen und agamo spermischen *Balanophora*-arten. *Svensk Botanisk Tidskrift* 39: 65−82.

Fagerlind, F. (1945b) Blüte und blütenstand der gattung *Balanophora*. *Botaniska Notiser* 1945: 330−350.

Fagerlind, F. (1945c) Bau der floralen organe bei der gattung *Langsdorffia*. *Svensk Botanisk Tidskrift* 39: 197−210.

Hansen, B. (1980) *Balanophoraceae. Flora Neotropica Monographs*, Volume 23. The New York Botanical Garden, Bronx, 80 pp.

Hansen, B. (1993) 107. Balanophoraceae. *In:* Görts-van Rijn, A.R.A. (Ed.), *Flora of the Guianas, Ser. A, Phanerogams*, Volume 14, Koeltz Scientific Books, Koenigstein, pp. 40−43.

Hansen, B. & Miller, J.S. (2007) Balanophoraceae. *In:* Funk, V., Hollowell, T., Berry, P., Kelloff, C. & Alexander, S.N. (Eds.) Checklist of the plants of the Guiana Shield (Venezuela: Amazonas, Bolivar, Delta Amacuro; Guyana, Surinam, French Guiana). *Contributions from the United States National Herbarium* 55: 212− 213.

IUCN (2001) *IUCN Red List Categories: Version 3.1*. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, U.K., ii + 30 pp.

Kuijt, J. & Dong, W.X. (1990) Surface features of the leaves of Balanophoraceae - A family without stomata? *Plant Systematics and Evolution* 170: 29−35.

Martius, C.F.P. (1818) Über eine neue Brasilianische Pflanzengattung. *Journal von Brasilien oder vermischte aus Brasilien, auf wissenschaftlichen Reisen Gesammelt* 2: 178−191, tab. 5.

Sprengel, K. (1826) *Helosis. Caroli Linnaei Systema Vegetabilium*, 16th Edition, Volume 3, Göttingen, pp. 765.

Swartz, O. (1788) *Cynomorium*. *Nova Genera et Species Plantarum*, Stockholm, Uppsala, Åbo, pp. 12.