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A new species of *Ombrophytum* (Balanophoraceae), a genus not previously recorded for Colombia

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Abstract

A new species of Balanophoraceae, *Ombrophytum villamariensis* Guzmán-Guzmán, is described for Colombia, where the genus has not previously been recorded. At least the first part of the development of the inflorescence is underground. Inflorescences have simple lateral branches, bearing male flowers in the upper part of the inflorescence and female flowers in the lower part. The apical parts (peltas) of the inflorescence branches are morphologically different in the two areas. The first stages of the plants are ball-shaped, within which inflorescences are formed endogenously. When the latter finally emerge, they lift the ball's surface layer which usually splits, leaving an irregular volva at the base of the inflorescence.

Key words: Balanophoraceae, Caldas, Cordiaceae, Cordillera Central Andina, endogenous inflorescences, Lophophytoideae, parasitic plant, Oxycorynina

Introduction

During a recent field trip to Villamaría, Caldas, a remarkable parasitic plant was found and later identified as a species of the genus *Ombrophytum* Poeppig ex Endlicher (1836: 73) (Balanophoraceae). The inflorescence emerged from the forest floor, showing a whitish or cream-colored mass of branches on a central axis (Fig. 1A). Additional visits to the area have led to more details related to its morphology, floral visitors, and hosts.

Ombrophytum is a neotropical genus composed of five species, and is known from Brazil, Bolivia, Chile, Ecuador, French Guiana and Peru, and as well as a disjunct population in the Galapagos Islands (Hansen 1980, Delprete 2014, Cardoso 2014, Adsersen 1976), growing from 200 to 3,800 meters above sea level (Heide-Jørgensen 2008, Hansen 1980). The genus belongs to the subfamily Lophophytoideae Harms (1935: 311) which is characterized by flowers lacking paraphyses, branched inflorescences with mostly unisexual branches each terminated by an apical pelta, female flowers with two styles, anthers with conspicuous filaments, and a bract subtending each inflorescence (Hansen 1980).

Despite the abundance of this subfamily in some other countries of the Neotropics, collections in Colombian herbaria are very few and represent only *Lophophytum weddellii* Hooker f. (1856: 49) from two Santander localities made in 1856 and 1890 by W. Purdie and F. Sander *et al.*, respectively (Hansen 1980). Therefore, *Ombrophytum villamariensis*, is the first report of the subfamily in Colombia after 128 years.

The present article documents the new findings and describes the plant as a new species of *Ombrophytum*, a genus not previously known in Colombia, extending the distribution of the subfamily in the biogeographic region of the Colombian Andes.

Materials and methods

Field collections were carried out in the "Reserva Forestal Protectora Bosques CHEC" of the Central Hidroeléctrica de Caldas, located in the "Sector Gallinazo" of the municipality of Villamaría, Caldas. Three populations were located at 2400–2500 m, parasitizing two species of Cordiaceae, *Cordia killipiana* Miller (2012: 361) and *C. resinosa* Estrada (1995: 133–134). Identification of the hosts was carried out through the collections available in the FAUC herbarium,

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the virtual herbarium of the National University of Colombia (COL) and the Global Plant JSTOR database (https://plants.jstor.org).

Taxonomic Treatment

Ombrophytum villamariensis S. Guzmán-Guzmán, *sp. nov.*

Type: —COLOMBIA. Caldas: Villamaría, Vereda Gallinazo, Reserva Natural Bosques de la Chec, Sendero Cedral-Gallinazo, 5º01'08.1"N, 75º24'52.9", 2490 m, 25 June 2018, on *Cordia killipiana* and *C. resinosa*, *D. Pérez 001* (holotype: FAUC!; isotypes: COL!, K!).

Plants fleshy, cream to whitish, 10–20 cm high, consisting of a massive central axis with bullate surface cells, emerging from a tuberous or ball-shaped base attached to a host root, the short peduncle basally ensheathed by a volva that is brown outside and (when young) white inside, and is torn irregularly, bearing short warts 0.1–0.3 mm wide. Underground tubercles yellowish or white to brown, ellipsoid to globose, 6–9 cm, with warts 0.3–0.5 mm. Peduncle 30 × 10–120 mm, or absent, without foliar organs, glabrous**.** Fertile portion of inflorescence 100–120.5 mm long, the female portion being 1/3 to 1/4 of the total length, the remaining, upper portion being male. Each inflorescence branch initially subtended by an inconspicuous, fleshy, caducous bract. Bracts whitish, spatulate above, 4–5 (–7) × 0.4–0.6 mm, obtriangular with nail-like apex 0.6–1 mm wide and long, the filiform base 3–4 (–6) long, basal part 0.1–0.3 mm wide and apical part 0.4–0.6 mm wide. Male inflorescence branches 10 × 4.5 (–5) mm with ca. 20 flowers each, these attached in the furrows between bullate surface cells, each flower consisting of two stamens; perianth absent; pelta white, zygomorphic, panduriform of (4–) 7–10 × (–4) 6 mm; filaments 0.8–1.0 mm long, white, anthers oblong, basifixed, 1.5 (–2) × 1.0 mm, dehiscent with a longitudinal slit. Female branches 8–10 × 4–5 mm, as long as the male ones, peltas white to cream, more or less circular with lobed or slightly crenate margins, the shaft crowded with at least 80 cream-colored flowers consisting of a more or less spherical ovary 1.0–1.5 mm long bearing two white styles 0.3 mm long that protrude from a small terminal depression; perianth absent. Fruit a one-seeded, yellow to cream, 1.0–1.5 mm long, globose achene or drupelet.

Diagnosis: *Ombrophytum villamariensis* is similar to *O. microlepis* of low Amazonian areas of Peru and Brazil. However, differ in a much shorter peduncle (30 mm or absent vs 60 mm), longer male and female inflorescence branches (9–10 mm vs. 3–7 mm and 4–6 mm vs. 4 mm, respectively) and two entirely different types of peltas.

Etymology: The epithet refers to the municipality where the new species was discovered, a municipality that stands out for the beauty of its landscapes, its beauty immortalized in its hymn: "…De Colombia, Villa de las flores, y de Caldas bella rosa en botón…"

Phenology: The specimens were found blooming from June to October. A small population was found fruiting in July (Fig. 1D), along with bite marks from a possible disperser (discussed below).

Habitat and distribution: This species is found in Andean forests of the Central Cordillera of Colombia between 2400–2500 m, in the municipality of Villamaria, department of Caldas, Colombia. In addition to the two hosts mentioned above, other genera found at the site were *Brunellia* Ruiz & Pavón (1794: 71) (Brunelliaceae), *Chamaedorea* Willdenow (1806: 638) (Arecaceae), *Saurauia* Willdenow (1801: 407) (Actinidiaceae), *Oreopanax* Decaisne & Planchon (1854: 107) (Araliaceae), *Cyathea* Smith (1793: 416) (Cyatheaceae), *Juglans* Linnaeus (1753: 997) (Juglandaceae) and *Croton* Linnaeus (1753: 1004) (Euphorbiaceae).

Ecological interactions: Nothing is known, so far, about the pollination of this remarkable genus (Hansen 2015). It is therefore of great interest that, during the flowering period (June to October), beetles of the subtribe Oxycorynina Schoenherr (1840: 581) (Belidae) were observed on the inflorescences, entering the spaces between the branches of both sex of the inflorescence (Fig. 2C). It is known that species of this insect subtribe visit flowers of other Balanophoraceae as *Lophophytum*, *Ombrophytum* and *Helosis* Richard (1822: 430) (Marvaldi *et al.*, 2006, Ferrer *et al.*, 2011).

Additionally, it was interesting to find an inflorescence in which the peduncle had been partly eaten by an herbivore, probably a rodent (Fig. 2D). This confirms the prediction by Hansen (2015) that the high starch content in tissues of Balanophoraceae might attract herbivores. Pio Corrêa (1948) similarly reported that species of the genus *Dasyprocta* Illiger (1811: 93) (Rodentia: Dasyproctidae), consumed floral peduncles of *Helosis cayennensis* (Sw.) Sprengel (1826: 765). Interestingly, Mauseth *et al.* (1992) found that residents of Chiu Chiu (Atacama Desert, Chile) consider peduncles of the local species of *Ombrophytum subterraneum* (Aspl.) Bertel Hansen (1980: 62) a delicacy.

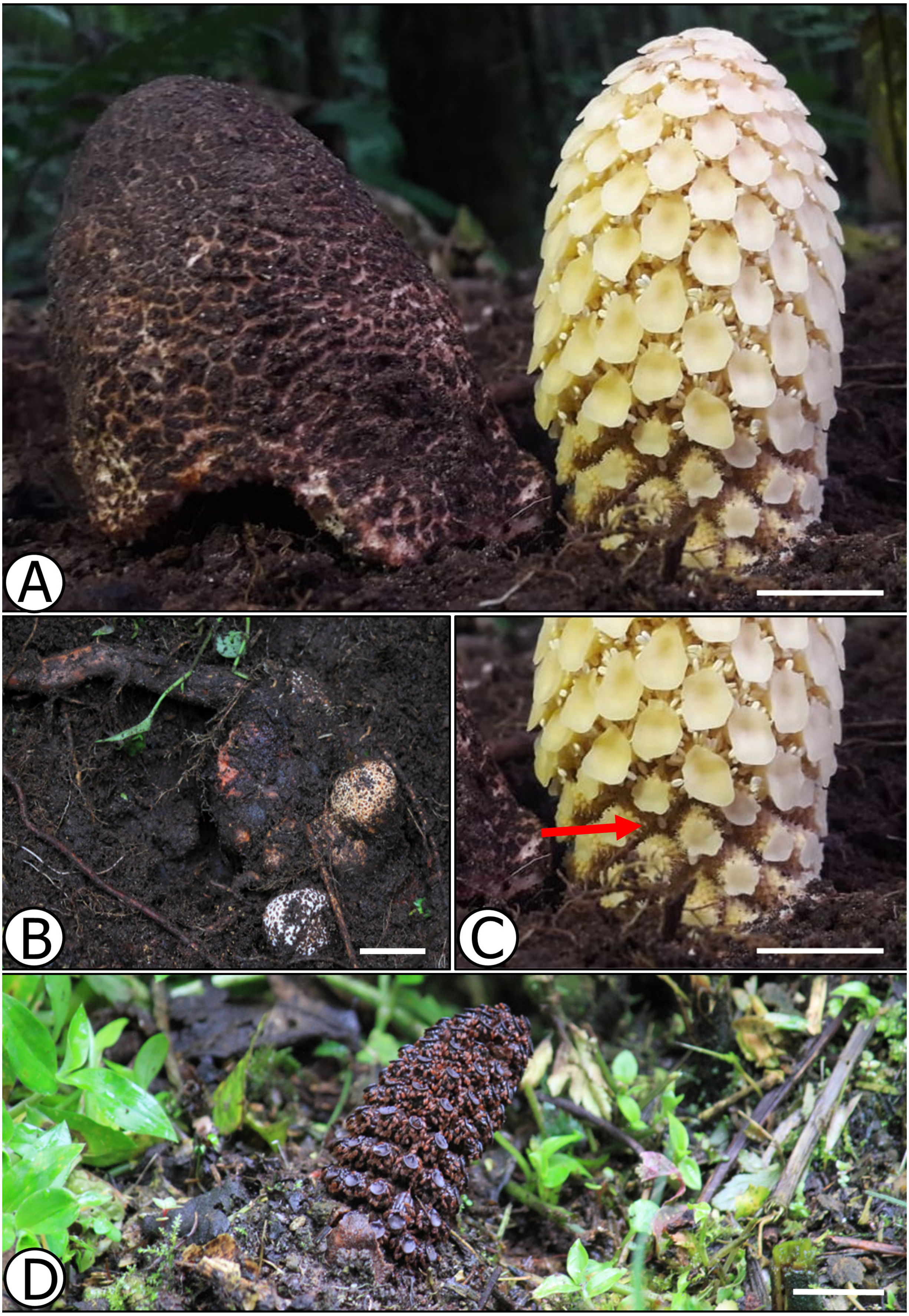

FIGURE 1. *Ombrophytum villamariensis* in situ. A. Inflorescence emerging from the ground; the calyptra is on the left. B. Mature tuber with two lateral tubers in development. C. Bract apex between female branches (red arrow). D. Old male inflorescences where the female part has remained underground. Scale bar: A, C, D = 20 mm; B = 4 mm. Photos by A. Montaña (A and C) & H. F. Arias (B and D).

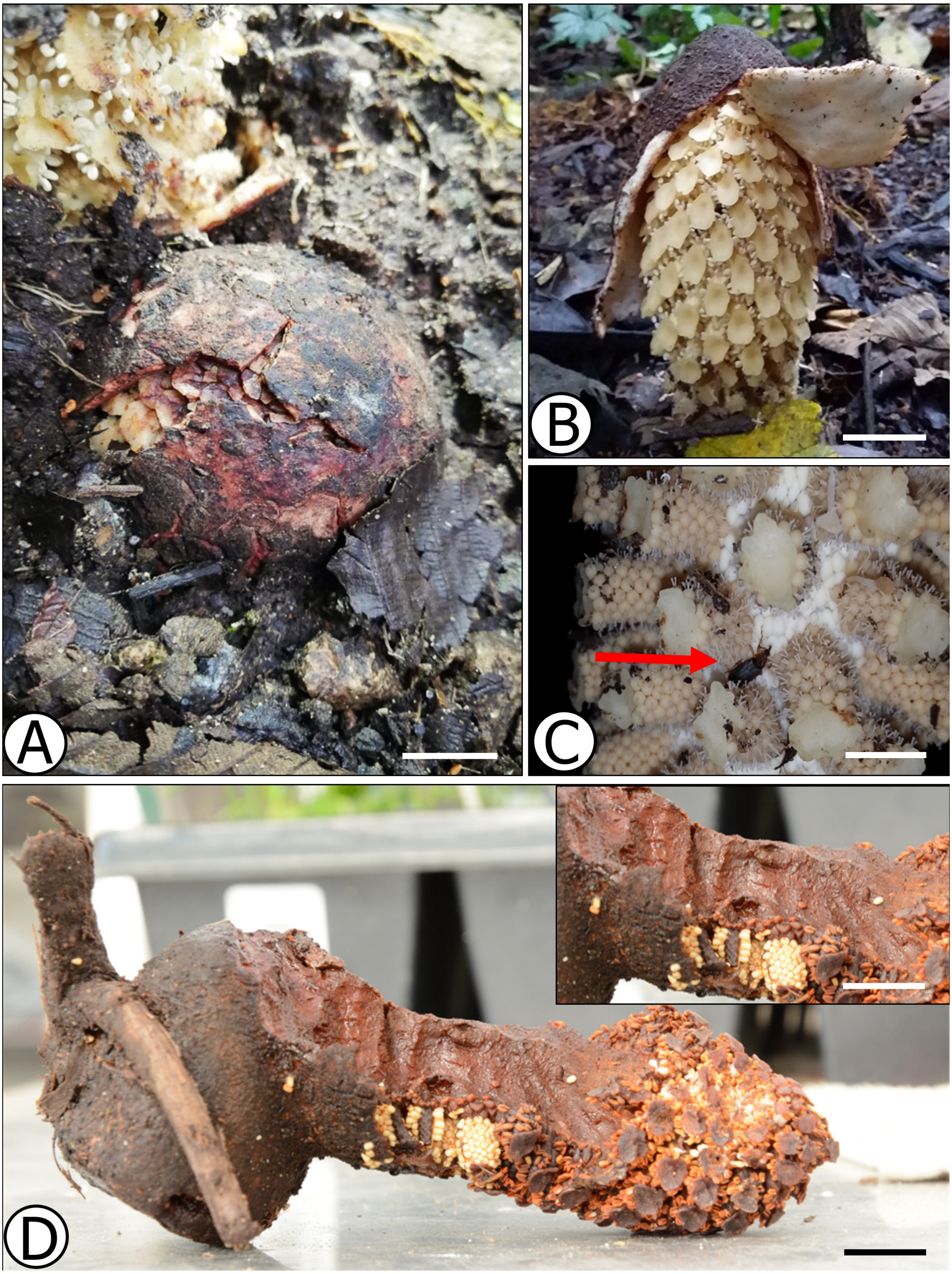

FIGURE 2. Types of rupture of the volva of *Ombrophytum villamariensis* and ecological interactions. A. Inflorescence emerging from the tubercle producing a trilobular volva. B. "Calyptra" with irregular ruptures partially covering the inflorescence. C. Beetle of the subtribe Oxycorynina observed between the female and male inflorescence branches (red arrow). D. Bite marks of possible rodent (see enlarged section); tuber and host roots to the left. Scale bar: A = 6 mm; B, D (and section) = 20mm; C = 4mm. Photos by A. Montaña (D) & J. C. Tovar (A, C and B).

Discussion

Ombrophytum villamariensis is similar to *O. microlepis* Hansen (1980: 60) of low Amazonian areas of Peru and Brazil (Hansen 1980), but exhibits some distinctive features. First of all, the new species is much more compact than *O. microlepis*, having a much shorter peduncle (see Hansen 1980, Figure 25). The most striking difference is that the new species bears two entirely different types of peltas at the tips of its inflorescence branches, zygomorphic ones with slightly folded margins in the narrow portion in the male, and radially symmetrical ones in the female branches. This sexual dimorphism in the inflorescence is believed to be unique to the genus. Additionally, male inflorescence branches are longer (9–10 mm vs. 3–7 mm) than female branches (4–6 mm vs. 4.0 mm). The inside of the volva of *O. microlepis* is violet, but that of *O. villamariensis* is white. Finally, as indicated already, *O. microlepis* is reported from the tropical rain forests of the Brazilian and Peruvian Amazonia at altitudes ranging from 100–300 m (Hansen 1980), while the new species is known from Andean forest of the Central Colombian Cordillera at altitudes of 2400–2500 m.

The bizarre physical nature and the partly subterranean early development of Balanophoraceae have hindered the collection of specimens and therefore little is known about the early development stages in the family (Fig. 1B). In *Ombrophytum*, in particular, nothing is known about its earliest stages. Therefore, the discovery and field study of *O. villamariensis* reported here have added significantly to the knowledge of this genus. This study has also revealed the challenges involved in the identification of such highly reduced parasites, e.g., herbarium specimens are very uncommon and of little assistance for identification. Another problems encountered in this study was the inconsistent used of the specialized terminology. In *Ombrophytum*, for example, inflorescences are characterized by lateral flower-bearing branches, each subtended by an inconspicuous bract (Fig. 1C). The tip of a branch is expanded into a distinctive pelta; the tip of a bract is also modified, and confusingly has also been referred to as a pelta (Hansen 1980, 2015). However, it is not peltate in form in the new species, being more nail-like.

The endogenous origin of the inflorescence allows questioning whether a true epidermis is present in the genus or, any other genera with endogenously generated inflorescences. In this sense, it may be relevant to mention that the stomata have not been observed in the family (Kuijt & Dong 1990). Interestingly, at least some other non-chlorophyllic plants with parts that apparently are endogenous seem to lack stomata too, e.g. *Neottia* Guettard (1754: 374) and *Monotropa* Linnaeus (1753: 387) (Evert 2006, p. 219).

The expansion of the inflorescence usually causes the surface of the emerging structure to split irregularly, producing the volva (Fig. 2A). In some cases, there is no splitting and a calyptra-like cap forms which eventually brakes off in a circumscissile fashion (Fig. 2B). Either developmental pathway documents the fact that the lobes of the volva (at least in *Ombrophytum*) are not foliar in nature. However, this conclusion should not be extended to other members of the family characterized by the presence of volvas.

In highly reduced parasitic plants it is tempting to suppose a high host specificity, but the (very scant) records do not bear this out for holoparasites (Kuijt 1969). In *Ombrophytum subterraneum* (Asplund) Hansen (1980: 62) lists 10 different hosts in 4-four families of Angiosperms, but provides "no material to support the idea that the Balanophoraceae are specific in their choice of host." Mauseth *et al.* (1992) based their study on plants parasitizing the native *Tessaria absinthioides* (Hokk. & Arn.) Candolle (1836: 457) (Asteraceae) as well as cultivated alfalfa *Medicago sativa* Linnaeus (1753: 778–779) (Fabaceae).

Finally, it should be noted that both Hansen (1980) and Mauseth *et al.* (1992) erred in using the name *O. subterraneum*. The protologue of that Bolivian species explicitly states that inflorescence branches are bisexual, a unique feature in the genus. It may thus be anticipated that *Ombrophytum villamariensis* may also parasitize woody plants in addition to the two hosts here reported. As stated above, the host species involved here are *Cordia killipiana* and *C. resinosa*, both endemics for Colombia. The former is reported for the Andean mountain ranges of the departments of Caldas, Cauca, and Meta at 2300–2500 m (Miller 2012), the latter for the Central and Western cordilleras between 1400 and 2800 m (Estrada 1995).

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References

Adsersen, H. (1976) *Ombrophytum peruvianum* (Balanophoraceae) found in the Galapagos Islands. *Botaniska Notiser* 129 (2): 113–117.

Asplund, E. (1928) Eine neue Balanophoreen-Gattung aus Bolivien. *Svensk Botanisk Tidskrift* 22: 261–277.

Cardoso, L.J. (2014) *Balanophoraceae no Brasil (Tesis de maestría).* Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Escola Nacional de Botânica Tropical, Rio de Janeiro, Brasil.

Delprete, P.G. (2014) *Ombrophytum guayanensis,* the first record of subfamily Lophophytoideae (Balanophoraceae) in the Guayana Shield. *Phytotaxa* 175 (5): 263–269.
https://doi.org/10.11646/phytotaxa.175.5.4

Estrada, J. (1995) *Flora de Colombia*. *Cordia*. Universidad Nacional de Colombia, Instituto de Ciencias Naturales, 176 pp.

Evert, R.F. (2006) *Esau's Plant Anatomy*. John Wiley & Sons, Hoboken, New Jersey.

Ferrer, M.S., Marvaldi, A.E. & Gonzalez, A.M. (2011) Biological notes on two species of *Oxycorynus* (Coleoptera: Belidae) associated with parasitic plants of the genus *Lophophytum* (Balanophoraceae), and new distribution records in Argentina. *Revista Sociedad Entomológica, Argentina* 70 (3–4): 351–355.

Hansen, B. (1980) *Balanophoraceae*. New York Botanical Garden, N.Y. *Flora Neotropica Monograph* 23: 1–80.

Hansen, B. (2015) *Balanophorales*. *In:* Kubitzki, K. (Ed.) *The families and genera of vascular plants.* Vol. 12. Springer, pp. 191–213.

Heide-Jørgensen, H.S. (2008) *Parasitic Flowering Plants.* Brill, Leiden.
https://doi.org/10.1163/ej.9789004167506.i-438

Illiger, C.D. (1811) *Prodromus systematis mammalium et avium additis terminis zoographicis uttriusque classis*. Salfeld, Berlin, 301 pp.
https://doi.org/10.5962/bhl.title.106965

Kuijt, J. & Dong, W.X. (1990) Surface features of the leaves of Balanophoraceae – a family without stomata? *Plant Systematics and Evolution* 170: 29–35.
https://doi.org/10.1007/BF00937847

Kuijt, Job (1969) *The biology of parasitic flowering plants*. University of California Press, Berkeley & Los Angeles.

Marvaldi, A.E., Oberprieler, R.G., Lyal, C.H.C., Bradbury, T. & Anderson, R.S. (2006) Phylogeny of the Oxycoryninae *sensu lato* (Coleoptera: Belidae) and evolution of host-plant associations. *Invertebrate Systematics* 20: 447–476.
https://doi.org/10.1071/IS05059

Mauseth, J.D., Hsiao, S.-C. & Montenegro, G. (1992) Vegetative body of the parasitic angiosperm *Ombrophytum subterraneum* (Balanophoraceae). *Bulletin of the Torrey Botanical Club* 119: 407–417.
https://doi.org/10.2307/2996729

Miller, J.S. (2012) New Boraginales from tropical America 7: A new species of *Cordia* from Bolivia and nomenclatural notes on neotropical Cordiaceae. *Brittonia* 64 (4): 359–362.
https://doi.org/10.1007/s12228-012-9243-3

Pio Corrêa, M. (1984) *Dicionário das Plantas Úteis do Brasil e das Exóticas Cultivadas*. Imprensa Nacional, Rio de Janeiro, vol. 2. 707 pp.

Schoenherr, C.J. (1840) *Genera et species curculionidum, cum synonymia hujus familiae. Species novae aut hactenus minus cognitae, descriptionibus a Dom. L. Gyllenhal, C. H. Boheman, O. J. Fahraeus et entomologis aliis, illustratae*. vol. 5. part. 2. Roret, Paris, pp. 465–970.