A new endemic species of Philippine *Hedyotis* L. (Rubiaceae) named after Pope Francis

Grecebio Jonathan D. Alejandro, Dr.rer.nat.
University of Santo Tomas, Graduate School

Hedyotis papafranciscoi, a new endemic species from Mt. Madja-as, Antique, Philippines, is here described and illustrated. The specific epithet was coined in honor of Pope Francis. This endangered species is vegetatively closely related to H. microphylla but differs in its strictly axillary, non-pedunculate, single-flowered inflorescences present in almost every leaf axil, and sessile flowers with purple calyx lobes.

Keywords: Antique, endangered, *Hedyotis*, Philippines

Introduction

Hedyotis L. is a species-rich genus in the tribe Spermacoceae of Rubiaceae (coffee family) consisting of ca. 500-600 species of herb to shrub or small tree (Wikström et al. 2013). For a long time, the genus has been the immediate generic affiliation for uncategorized tropical herbaceous species with multiovulate locules (Wikström et al. 2013). This makes the genus confusing with other Rubiaceae such as the Oldenlandia L. and their allies. In the recent phylogenetic analyses of Spermacoceae (Guo et al. 2013; Wikström et al. 2013), the genus was delimited as Hedyotis sensu stricto (s.str.) distributed in Sri Lanka, India, SE China, Indo-China, Malesia, Papuasia, and NW Pacific. Hedyotis is currently characterized by terminal or axillary inflorescences, 4-merous flowers; globose to ovoid or ellipsoid capsules, dehiscing septicidally, followed by a semi-loculicidal dehiscence; and minute, dorsiventrally compressed seeds, with prominent hilum (Jiang Wang 2008; Wikström et al. 2013).

Acknowledgement
The author thanks the UST–Research Center for the Natural and Applied Sciences (RCNAS) and the DOST–Philippine Council for Health, Research and Development (PCHRD) for the funding.

Molecular studies involving members of Spermacoceae (Kårehed et al. 2008; Groeninckx et al. 2009; Guo et al. 2013; Wikström et al. 2013) have included limited samples of Asian species. In fact, Guo et al. (2013) encourage a comprehensive taxonomic revision for an estimate of 150 Asian species of *Hedyotis-Oldenlandia* complex because of the species richness in the continent. In the Philippines, the available account of *Hedyotis* comprises 36 endemic species (Merrill 1923). However, this is more than 90 years old and needs to be updated because of the newly delimited *Hedyotis* s.str. During the ongoing process of constructing molecular phylogeny and taxonomic revision of Philippine *Hedyotis*, a divergent species of the genus was collected in Mt. Madja-as, Tibiao, Antique. A thorough evaluation based on morphology shows no match with any currently recognized Philippine *Hedyotis*. Further, molecular data from cpDNA (*rps*16 and *trn*H-*psb*A markers) and nrDNA (ITS region) (Alejandro et al. unpub.) support the placement of the species in the *Hedyotis* s.str. clade. Therefore, a new Philippine species of *Hedyotis* is here described and illustrated.

Materials and Method

This study was based on field observations and examinations of herbarium specimens from Mt. Madja-as, Antique. Herbarium specimens were submitted to the University of Santo Tomas Herbarium (USTH) for accession. The collected specimen was compared with the herbarium specimens available in herbaria of the New York Botanical Garden (NY), Royal Botanical Gardens Kew (K), British Museum of Natural History (BM), and Muséum National d'Histoire Naturelle (P).

Reproductive parts were preserved in 70% ethanol. Vegetative structures were measured using a vernier caliper (Disston), and reproductive parts were examined using the Olympus dissecting microscope. Measurements and colors were based on field notes and herbarium sheets. Conservation status was assessed applying the IUCN Red List Categories and Criteria version 3.1 (2011).

Taxonomic Treatment

***Hedyotis papafranciscoi* Alejandro,** sp. nov. (Figs. 1 and 2)

Type: PHILIPPINES. Luzon, Mt.Madja-as, Barangay Pitac, Tibiao, Antique, 11°21'N 122°05'E, 200 masl, 18 April 2014, *GJD Alejandro, DNT Armendares, AH Arriola, PS Bangcaya, MG Davadilla, IBB De Jesus &RKC Plan 14-641* (Holotype, USTH; Isotype, PNH).

Hedyotis papafranciscoi is almost vegetatively similar with *H. microphylla,* especially the size and shape of leaves and stipules. It differs obviously in its strictly axillary, non-pedunculate, single-flowered inflorescences present in almost every leaf axil, and sessile flowers with purple calyx lobes.

An erect shrub, 1−2 m tall; branches glabrous, woody, young green, mature brownish purple, and quadrangular. Leaves opposite, subcoriaceous to coriaceous; blades narrowly ovate to lanceolate, 1−1.5 x 0.3−0.5 cm, both upper and lower surfaces entirely glabrous, apex acute, base attenuate, margin entire, midrib prominent; lateral nerves 3−4 pairs, slightly obscure in both upper and lower surfaces; petiole 0.5-1 mm long, or subsessile, glabrous. Stipules broadly triangular at the base; the apex 3-partite, narrow, 1 x 1 mm, glabrous.

Inflorescences axillary, non-pedunculate, single-flowered, almost present in every leaf axil; bracts narrowly acute, 0.25−0.5 mm long, glabrous. Hypanthium 0.7 x 0.5 mm, obovoid. Flowers purely white, sessile. Calyx tube ovoid, 2 mm long; lobes constantly 4, 1−1.2 x 1 mm, purple, oblong ovate, apex acute, outside scabrid, inside glabrous. Corolla tube infundibular, 3.5−4.5 mm long, outside glabrous, inside pubescent, especially near the throat region and base of the lobes; lobes 4, reflexed, oblong ovate, 1.5−2 x 1.5 mm, apex attenuate, pubescent on both sides. Stamens 4; filaments glabrous, 4.5−5.5 mm long, epipetalous, attached at ¾ from base to top of tube length, exserted; anthers narrowly oblong, dorsifixed, 1 x 0.25 mm, exserted. Ovary 2-locular, puberulous, 0.8 mm long; style 1.5−2mm long, glabrous, inserted; stigma bilobed, 3-4mm long. Fruits and seeds not seen.

Distribution and Habitat: *Hedyotis papafranciscoi* is an endemic species, known only from the type locality, Mt. Madja-as, Barangay Pitac, Tibiao, Antique. This species grows in open places of secondary forest, at 200 to 300m asl.

Phenology: Flowering in April.

Conservation status: *Hedyotis papafranciscoi* is restricted to its type locality, having less than 15 mature individuals. The conservation status of *H. papafranciscoi* is assessed as a critically endangered species (CR D1) based on the IUCN Red List Categories and Criteria (2001). The conservation of this species is highly encouraged because of its small and restricted population.

Etymology: This species is dedicated to Pope Francis, the reigning pope (March 2013 to present) of the Catholic Church. Jorge Mario Bergoglio chose Francis as his papal name in honor of Saint Francis of Assisi. Francis is the first Jesuit pope.

Figure 1. Field photographs of *Hedyotis papafranciscoi*:

A. Habit
B. Inflorescences showing solitary flower
C. Close-up of flowers showing purple calyx lobes and exserted stamens.

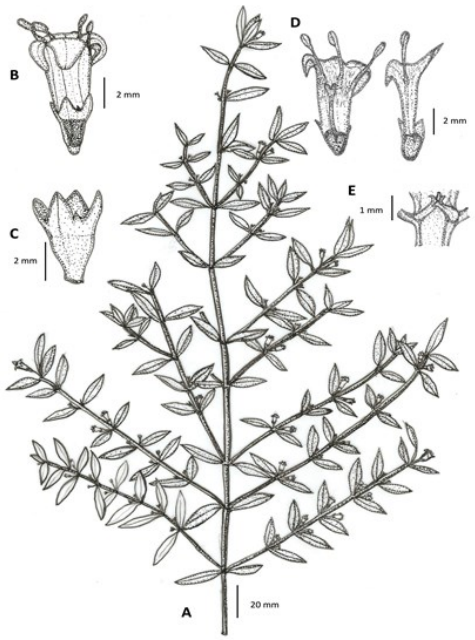

Figure 2. Botanical illustration of *Hedyotis papafranciscoi*.

A. Flowering branch showing inflorescences at leaf axils.
B. Flower showing exserted stamens.
C. Calyx. D. Opened flower in longitudinal section showing stamen and inserted pistil. E. Stipule. Drawn from the type specimen by P. Santor).

Notes: *Hedyotis papafranciscoi* shares many similar features with *H. microphylla,* especially with regard to leaf and stipule structures. *H. papafranciscoi* is distinguished from *H. microphylla* by having axillary and never terminal; non-pedunculate, single-flowered inflorescences, present in almost leaf axils; and sessile flowers with purple calyx lobes. In contrast, *H. microphylla* possesses axillary and terminal; 3-flowered cyme inflorescences, seating on peduncles 1-2 cm long; and pedicellate (up to 5 mm long) flowers.

The former is restricted to Antique (Visayas) while the latter was recorded in Benguet, Bontoc, and Ifugao (Luzon). Further, *H. microphylla* is only known from mountain rainforests ("mossy forest") of 2000-2300 m alt. (see Merrill′s protologue) and, thereby, differs much from the lowland forest habitat of *H. papafranciscoi*.

References

Groeninckx, I, Dessein, S, Ochoterena, H, Persson, C, Motley, TJ, Kårehed, J, Bremer, B, Huysmans, S & Smets, E, 2009, 'Phylogeny of the herbaceous tribe Spermacoceae (Rubiaceae) based on plastid DNA data', *Annals of the Missouri Botanical Garden*, vol. 96, no. 1, pp. 109–132.

Guo, X, Wang, R, Simmons, M, But, P & Yu, J, 2013, 'Phylogeny of the Asian *Hedyotis-Oldenlandia*complex (Spermacoceae, Rubiaceae): evidence for high levels of polyphyly and parallel evolution of diplophragmous capsules', *Molecular Phylogenetics and Evolution*, vol. 67, pp.110 -122.

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

Jiang Wang, R, 2008, 'Two New Species of *Hedyotis* (Rubiaceae: Hedyotideae) from Hainan, China', *Novon: A Journal for Botanical Nomenclature*, vol. 18, no. 2, pp. 264-268.

Kårehed, J, Groeninckx, I, Dessein, S, Motley, TJ & Bremer, B, 2008, 'The phylogenetic utility of chloroplast and nuclear DNA markers and the phylogeny of the Rubiaceae tribe Spermacoceae', *Molecular Phylogenetics and Evolution*, vol. 49, pp. 843 -866.

Merrill, E, 1923, *An enumeration of Philippine flowering plants*, Manila: Bureau of Printing, pp. 495-501.

Wilkström, N, Neupane, S, Kårehed, J, Motley, TJ & Bremer, B, 2013, 'Phylogeny of *Hedyotis* L. (Rubiaceae: Spermacoceae): Redefining a complex Asian-Pacific Assemblage', *Taxon*, vol. 62, pp. 357-374.

About the Author

Grecebio Jonathan D. Alejandro

<gdalejandro@mnl.ust.edu.ph> He is a Full Professor and currently Director of the Office for Graduate Research of the Graduate School of the University of Santo Tomas. He finished his M.Sc. in Biology at UST, Magna Cumlaude and doctoral degree (Dr.rer.nat.) in Plant Molecular Systematics and Evolution from the University of Bayreuth, Germany, Magna Cumlaude through the DAAD Fellowship. He was awarded the prestigious European fellowship, the Alexander von Humboldt (AvH) Postdoctoral Fellowship for two years. As a Humboltian, he was a visiting scientist in three Universities (Germany, France and Sweden). Dr. Alejandro is recognized for his pioneering research on Plant Molecular Phylogenetics in the Philippines and discovery of novel genera and several new endemic species in Rubiaceae. He established the Thomasian Angiosperm Phylogeny and Barcoding Group in the University of Santo Tomas and this has been awarded in a number of national and international conferences.