

A taxonomic treatment of *Drypetes calvescens* and a new endangered species from the western Congolian swamp forest, *D. palustris* sp. nov. (Putranjivaceae)

Alejandro QUINTANAR^{1*}, Patricia BARBERÁ² & David J. HARRIS³

¹Herbarium MA, Unidad de Herbarios, Real Jardín Botánico, CSIC, 28014 Madrid, Spain

²Africa and Madagascar Department, Missouri Botanical Garden, 4344 Shaw Blvd., St. Louis, Missouri 63110, USA

³Royal Botanic Garden of Edinburgh, Inverleith Row, Edinburgh EH3 5LR, United Kingdom

*Correspondence: quintanar@rjb.csic.es

¹<https://orcid.org/0000-0001-7618-3112>, ²<https://orcid.org/0000-0002-4110-8419>

³<https://orcid.org/0000-0002-6801-2484>

Abstract. We publish in this article a new species of tree of *Drypetes* (Putranjivaceae) from the Democratic Republic of the Congo and Republic of the Congo, *D. palustris*, which occurs in the Western Congolian Swamp Forests ecoregion. It is known from eight gatherings and we compare it with the species with the most similar morphology, *D. calvescens*, of which we have studied 51 gatherings collected in Central Africa. A taxonomic treatment of both species, including their detailed descriptions, typification of their names, a comparative table summarizing their main morphological differences, an illustration and information about their habitat and distribution are provided. A provisional IUCN Red List assessment shows that *D. palustris* is Endangered and *D. calvescens* is of Least Concern.

Keywords. Central Africa, conservation status, endangered species, new species, taxonomy, swamp forests.

Resumen. En este artículo publicamos una nueva especie arbórea de *Drypetes* (Putranjivaceae) de la República del Congo y la República Democrática del Congo, *D. palustris*, que se da en la región ecológica denominada Bosques pantanosos congoleños occidentales. Se conoce gracias a ocho recolecciones y la comparamos con la especie de morfología más parecida, *D. calvescens*, de la que hemos estudiado 51 recolecciones hechas en África central. Presentamos un tratamiento taxonómico de ambas especies que incluye la descripción detallada de su morfología, la tipificación de sus nombres, una tabla comparativa que resume sus principales diferencias morfológicas y una ilustración, así como información acerca de su hábitat y distribución. La evaluación provisional realizada para la Lista Roja de la UICN revela que *D. palustris* se encuentra En peligro y *D. calvescens* es de Preocupación menor.

Palabras clave. África central, bosques pantanosos, especie en peligro, especie nueva, estado de conservación, taxonomía.

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Title in Spanish: Tratamiento taxonómico de *Drypetes calvescens* y una nueva especie en peligro de extinción del bosque pantanoso congoleño occidental, *D. palustris* sp. nov. (Putranjivaceae).

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INTRODUCTION

The genus *Drypetes* Vahl (Putranjivaceae Endl., Malpighiales Juss. ex Bercht. & J.Presl) comprises more than 200 species (Govaerts & al. 2000; Radcliffe-Smith 2001) of trees and shrubs, found in forests and savannas throughout the tropics. During the last two years, four new species of this genus have been published for Africa, increasing the number of species that occur in this continent and Madagascar to 77 (Radcliffe-Smith 2001; Cheek & al. 2021; Quintanar & al. 2020, 2021a, 2021b), including those previously considered as belonging to *Sibangea* Oliv. Species of *Drypetes* typically have simple, petiolate leaves with a slightly (oblique) to markedly asymmetric base. They are mostly dioecious with solitary or clustered flowers, arranged in leaf or leafless axils along the branchlets or on slightly raised woody cushions on older branches or the main trunk. Their flowers are apetalous and bear a nectariferous disk that, in the male (staminate) flowers, is surrounded or penetrated by the stamens, whereas in the female (pistillate) flowers the disk appears typically to encircle the ovary base. Flowers, especially on the older branches and the main trunk, are subtended by an often very dense and compact array of minute bracts which comprises both the new ones sprouted during the year and the adjoining remnants of those of previous years, more or less degraded due to the passage of time. The stigmas, subsessile or on short styles, are frequently flattened, fleshy and resistant enough to persist on the somewhat fleshy, drupaceous fruit. The biochemistry of *Drypetes* species has proven to be of interest, and during the last decades has been the subject of many studies (e.g., Johnson & al. 2009; Grace & al. 2016; Zhang & al. 2016).

Drypetes calvescens Pax & K.Hoffm. is a poorly known species of tree that occurs in rainforests over 400 m a.s.l. throughout a very wide area in Central Africa, in Gabon, Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of the Congo and Uganda. It was classified in *D.* sect. *Stenogynium* (Müll.Arg.) Pax & K.Hoffm. by Pax & Hoffmann (1922), presumably due to having small deciduous stipules, short stamens encircling the disk, 2-celled ovaries, and gracile styles with dilated, entire or bifid, apex. During the study of the herbarium material of *D. calvescens*, we found several specimens in the herbarium BR that were collected by C.M. Evrard (1926–2009) from the flooded forests of Mongala (north-western D.R. Congo) in 1955 during his studies of the vegetation of the Congo Basin (Bamps & Bouharmont 2010) and whose morphology differed. These were Evrard 1608 and 1609. The preliminary designation “*Drypetes evrardii*” was handwritten by J. Léonard on the herbarium labels, suggesting that he recognized that these specimens represented a new species that he wanted to name after their collector, Evrard. Furthermore, in another handwrit-

ten note preserved with the specimens, the morphology of *D. palustris* sp. nov. was compared to that of *D. calvescens* without concluding if these two taxa should be classified as the same species or if they really constituted two similar species. However, both these specimens and Léonard’s designation seem to have been neglected perhaps because the specimens shared most of the characters described in the protologue of *D. calvescens* (Pax & Hoffmann 1922), which was based only on flowering specimens. Both species represent trees with glabrescent young branchlets, leaves of similar sizes and oblique bases, very small male flowers with four or five stamens, and ovaries usually with two bifid stigmas on two styles that are united just at the base or a little bit further along their lengths. Very little in the protologue of *D. calvescens* could have served to differentiate this species from “*Drypetes evrardii*”, perhaps just the leaf base, unambiguously described as acute, the obscurely denticulate margin, and the glabrous inner surface of the sepals.

Fruiting material of *D. calvescens* does not appear to have become available until the 1960s, additionally showing that the fruits are smaller and quite different from those of “*Drypetes evrardii*”. These specimens collected by Evrard, together with others collected more recently, clearly represent a new species in *Drypetes*, different from *D. calvescens*, that we have chosen to name *D. palustris* D.J.Harris, Barberá & Quintanar, sp. nov. since we have not detected any dissemination of its previous designation and we prefer a name which reflects the important habitat in which it occurs. *Drypetes palustris* sp. nov. are trees to ca. 15 m high that occur in periodically flooded, riparian forests in the western part of the Congo River Basin, an area that straddles two different countries, the Republic of the Congo and the Democratic Republic of the Congo, at 270–410 m elevation. The geographical area and the type of habitat correspond to the Western Congolian Swamp Forests ecoregion (according with the World Wide Fund for Nature, cf. <https://www.worldwildlife.org/ecoregions/at0129>), one of the largest and best conserved areas of tropical swamp forests in the world, as well as a region that is still very poorly known as shown by the recent description of Dargie & al. (2017), who present the swamps of the Cuvette Centrale depression in the central Congo Basin as the most extensive peatland complex in the tropics.

This new study has deepened our knowledge of *Drypetes calvescens*, coupled with the study of some new specimens and the verification of many collections whose identity remained doubtful, most of them vegetative. In March 2021 an IUCN Red List Assessment of *D. calvescens* was published (Barberá & al. 2021), as ‘Least Concern’. Additional information and new specimens have become available since this assessment was presented and we have been able to confirm its presence in the Republic

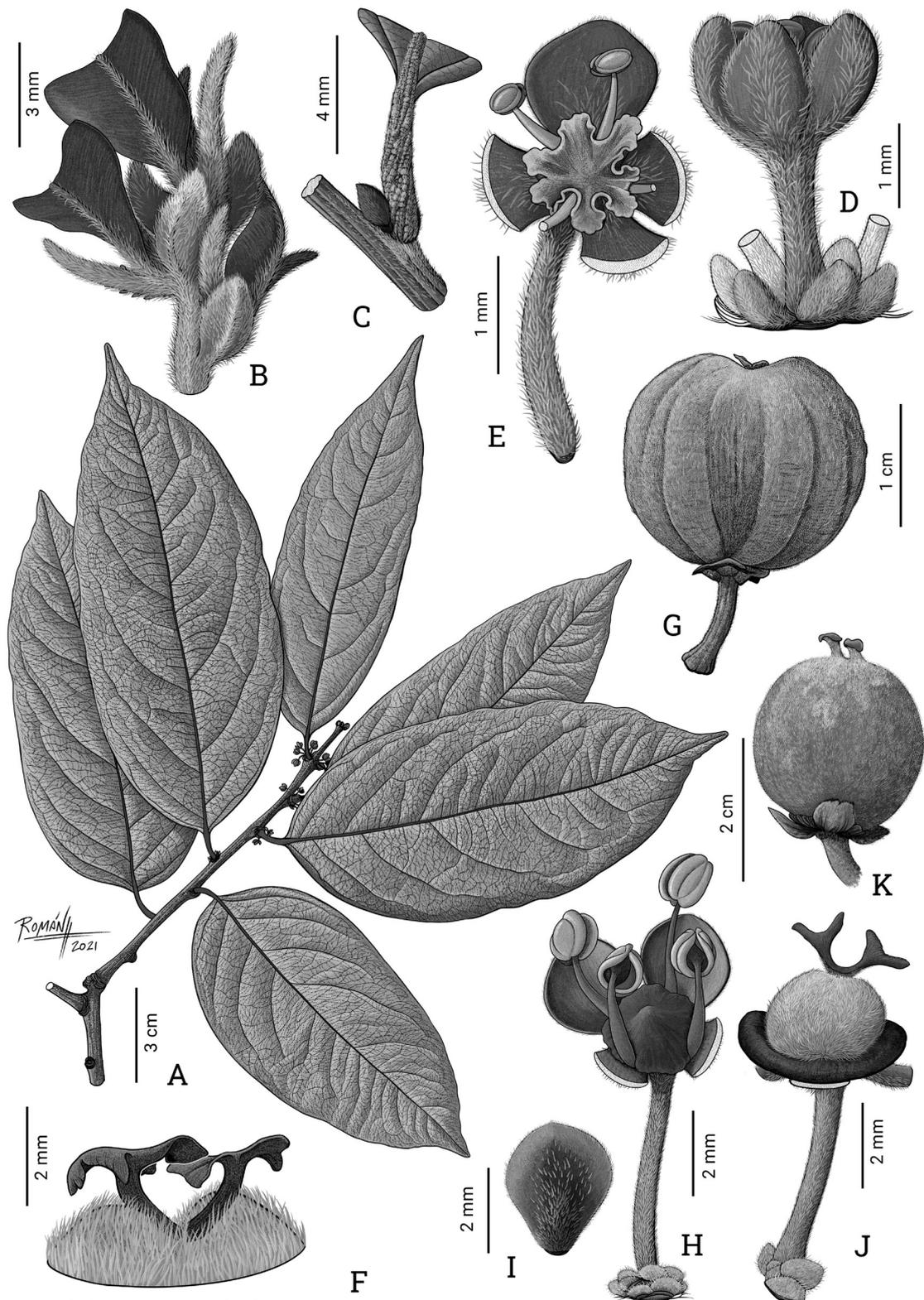


Fig. 1. *Drypetes palustris* D.J.Harris, Barberá & Quintanar, sp. nov.: **a**, branchlet, leaves, and male inflorescences; **b**, twig showing scales and stipules; **c**, petiole and axillary bud; **d**, male flower just before anthesis; **e**, male flower open, showing the disk; **f**, apex of a mature ovary, showing styles and stigmas; **g**, fruit. *D. calvescens* Pax & K.Hoffm.: **h**, male flower, showing the disk; **i**, male sepal, abaxial view; **j**, female flower without sepals, showing the disk; **k**, fruit [a, b, c, e, P. Sita 1903 (P04707765, isotype); c, g, J. Lejoly 96/123 (BRLU 0024560); f, P. Sita 2818 (P04707762); h, i, G.W.J. Mildbraed 4923 (HBG-516347); j, G.W.J. Mildbraed 4993 (HBG-516348); k, R. Pierlot 2347 (BR0000015785589)]. Illustration by Román García Mora.

of the Congo and Uganda (from the latter country it was already accounted for by Radcliffe-Smith 1978, 1987). In the case of Gabon, the presence of *D. calvescens* is based on vegetative specimens and represents an addition to the treatment of the species of *Drypetes* that we recently presented for publication in the series *Flore du Gabon* (Harris & al. 2021). In addition, we describe *D. palustris* sp. nov. and compare its morphology with that of *D. calvescens* as it is currently circumscribed, as well as designating a lectotype from among the syntypes cited in its protologue. We also provide a diagnosis for the new species, a table in which we summarize the main characters that distinguish it from *D. calvescens*, a plate to illustrate their characters, a distribution map, and information on the distribution, habitat, phenology, typification and etymology of the scientific name, conservation status, and a list of all the studied material of each species.

MATERIAL AND METHODS

The descriptions presented here, as well as all information on the habitat and distribution, is based on the study of eight gatherings of *Drypetes palustris* sp. nov. and 51 of *D. calvescens* (see the list of associated specimens in the taxonomic treatment of each species) from the following herbaria: BM, BR, BRLU, HBG, K, MO, P, POZG, PR, US and WAG (Thiers, continuously updated), all collected in Central Africa. Measurements were carried out using a Mitutoyo CD-15CD digital caliper and a manual scale with a precision of 0.1 mm to record quantitative morphological characters and prepare the descriptions of the species, as well as for comparative purposes. The descriptive terminology follows that used in Stearn (1973) and Harris & Harris (1994), as well as that of Pole (1991) for leaf venation. We have compiled the main diagnostic characters to distinguish *D. palustris* sp. nov. from *D. calvescens* in Table 1, which supplements the information offered in the last section, Taxonomic notes. Abbreviations: fl., flowering specimens; fr., fruiting specimens; veg., vegetative specimens. We also present a drawing of *D. palustris* sp. nov. that illustrates its habit and morphology for comparative purposes, in which we have also included details of the flowers of *D. calvescens*, illustrated here for the first time.

The information compiled on the habitat of each species, as well as on their phenology and chorology, was obtained from collection labels. Geographical coordinates were used to build a distribution map for *Drypetes palustris* sp. nov. and *D. calvescens* with ArcView GIS v. 3.2 for Windows (ESRI 2020). The coordinates that were not indicated on collection labels were determined a posteriori and are presented between square brackets. A preliminary risk of extinction assessment using the IUCN Red List categories and criteria (IUCN 2019) is provided for *D. palustris* sp. nov., and an updated assessment for *D. calvescens*

is given to supplement that of Barberá & al. (2021) using the new data and information obtained while conducting the present study. The geographical parameters of Area of Occupancy (AOO) and Extend of Occurrence (EOO), estimated using a 2×2 km grid, were calculated using GeoCAT (2020).

RESULTS AND DISCUSSION

Taxonomic treatment

Drypetes palustris D.J.Harris, Barberá & Quintanar, **sp. nov.** Type: Republic of the Congo, Brazzaville, Île M'Bamou, forêt de Kitengené, [4°12'S 15°25'E], 3 Nov 1967, male fl., P. Sita 1903 (holotype: BR0000016004719!; isotypes: BR0000016004726!, P04707765!). Fig. 1 a–g.

Diagnosis.—Haec species a *Drypete calvescente* Pax & K.Hoffm. foliis firme coriaceis margine subintegro secus longitudinem pro parte maxima leviter sed conspicue recurvato, basi acuta vel obtusa, nervis lateralibus principalibus ad marginem obscure anastomosantibus, petiolo vetere pubescente, squamis gemmarum stipulisque multo majoribus, stipulis anguste ovatis, inflorescentiis masculinis in axillas foliiferas positis, sepalis adaxialiter pubescentibus jam in alabastro majoribus, disco concavo ad marginem valde plicato, flore feminino solitario atque fructu majore ad apicem depresso longistrorsum costato costis principalibus secundariisque quattuor differt.

Tree ca. 15 m; trunk to 20(–35) cm in diameter, young branchlets subterete, angled, slightly sulcate, moderately and shortly pubescent, trichomes to 0.2 mm; terminal buds scaly, scales 1.8–2.6 \times 0.9–1.3 mm, ovate-triangular, shortly and densely pubescent outside, scantily so inside, trichomes 0.1–0.4 mm. Leaves alternate; stipules 3.5–3.8 \times 0.8–1 mm, very narrowly ovate, densely and shortly pubescent outside, much more scarcely inside, trichomes to 0.3 mm, caducous, very soon falling; petiole (6–)6.8–10(–11.5) mm long, (1.1–)1.3–1.8(–2.3) mm in diameter, transversely and longitudinally wrinkled, densely and shortly pubescent, persistently, trichomes to 0.2 mm; blade (7.3–)9.7–17.7(–21) \times (3.5–)4.2–8.5(–10.7), narrowly to widely ovate or elliptic, firmly coriaceous, base slightly obtuse or acute at base, oblique, sometimes near symmetric, both sides of the leaf blade meeting the petiole at the same height, rarely separately by up to 0.2 mm, subentire, margin slightly recurved along most of its length, acuminate, often shortly, apex 5–17 mm, abaxial surface among veins glabrescent, trichomes 0.1–0.3, few, scattered; midrib longitudinally wrinkled, quite depressed above, prominent beneath, glabrous, first order lateral veins 5–8 pairs, irregularly spaced, hardly or slightly depressed above, raised beneath, ascending, obscurely diminishing and anastomosing near the margin, oriented at (37–)42–51(–59)° to the

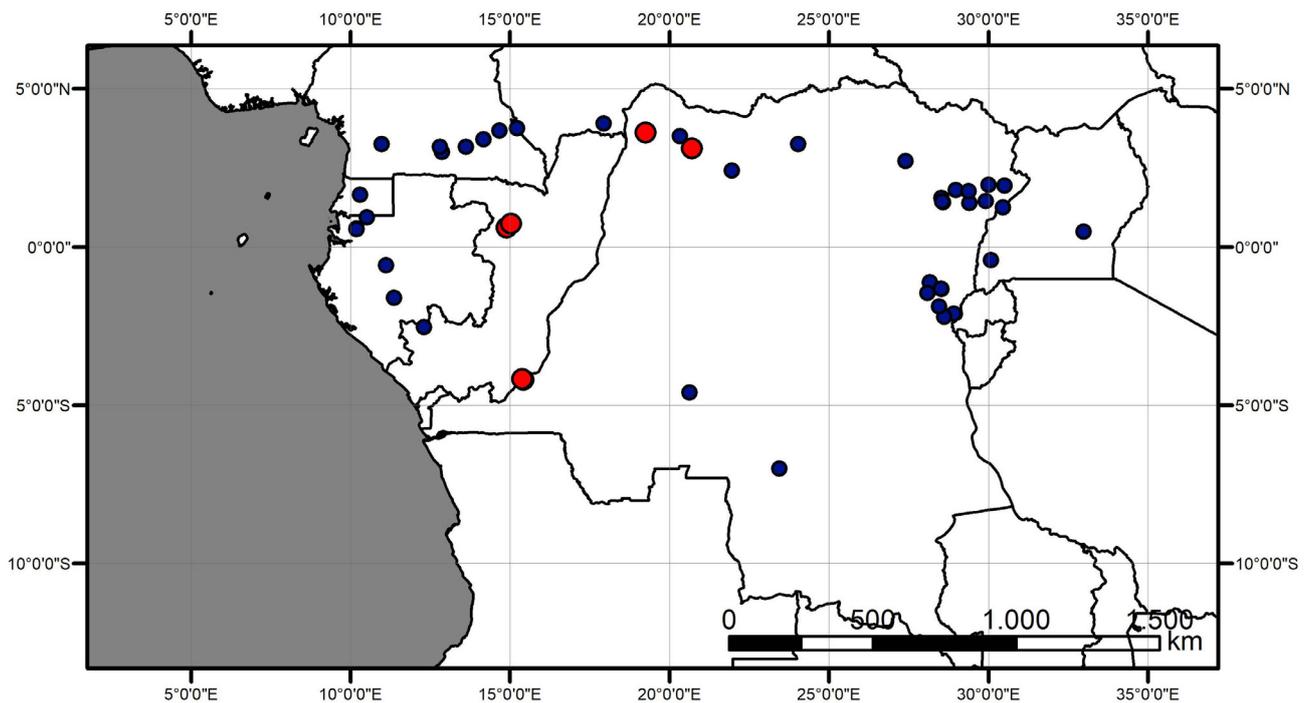


Fig. 2. Distribution map of *Drypetes palustris* D.J.Harris, Barberá & Quintanar, sp. nov. (red circles) and *D. calvescens* Pax & K.Hoffm. (blue circles).

midrib, glabrous, second order venation raised above and beneath. Male inflorescences borne in leaf axils, clusters of 5–10 flowers; bracts 1.1–1.7 × 1.1–2.1 mm, widely ovate, minutely pubescent outside, glabrous inside, trichomes to 0.1 mm. Male flowers greenish white, pedicellate; pedicel 2.1–2.4 mm long, 0.4–0.6 mm in diameter, slender, shortly pubescent, trichomes to 0.2 mm; sepals 4, 2–3.1 × 1.1–2.4 mm, narrowly elliptic to widely obovate, obtuse, cucullate, imbricate, densely and shortly pubescent outside, trichomes to 0.2 mm, shortly pubescent inside, especially near the base, trichomes 0.2–0.3 mm, shortly ciliate at margin, cilia 0.2–0.3 mm, barely distinguishable from the rest of the indumentum of the sepal abaxial face; stamens 4(–5) in a single whorl, surrounding the disk and only slightly enveloped by its marginal lobes, filaments ca. 1 mm, anthers ca. 0.8 mm long, 0.7 mm in diameter, widely ellipsoid, subbasifixed to dorsifixed, introrse, glabrous; disk 0.8–0.9 mm high, 1.4–1.6 mm in diameter, concave, cupular, thin, smooth, margin plicate and even constricted by the filaments, glabrous; pistillode absent. Female inflorescences borne in leaf and leafless axils, comprising a solitary flower; bracts 1.5–1.7 × 1.8–2.1 mm, widely ovate, minutely pubescent outside, glabrous inside, trichomes to 0.1 mm. Female flowers pedicellate, observed only well after anthesis with a noticeably thickened ovary and no sepals; pedicel 4.1–6.7 mm long, 1–1.3 mm in diameter, more or less slender, shortly pubescent, trichomes to 0.2 mm; disk 0.7–0.9 mm high, 5.1–6.2 mm in diameter, flat, fleshy, gla-

brous, often reflexed at margin; styles 2, 1.5–1.8 mm, free, adnate only at their base; stigmas 2, bifid, each arm 0.5–0.7 mm long, stigmatic surface 3–3.9 mm wide; ovary 3.9–4.8 mm long, 5.3–6 mm in diameter, widely elliptic-obovate, apically depressed, 2-celled, densely and shortly pubescent, trichomes 0.3–0.5 mm. Fruits 12–16.5 mm long, 12.5–17 mm in diameter, widely ellipsoid-obovoid, apically depressed, longitudinally ribbed with four main and four secondary much less marked ribs, 2-celled, 1–2-seeded, shortly pubescent, trichomes 0.2–0.3 mm, sepals deciduous, style and stigmas subpersistent, seeds 8.1–8.4 × 7–7.3 mm; subsessile to pedicellate, fruiting pedicel 2.3–2.9(–6.7) mm long, (1–)1.2–1.4 mm in diameter, minutely to shortly pubescent, trichomes 0.1–0.2 mm.

Distribution, habitat and phenology.—Central Africa: Democratic Republic of the Congo (Mongala and Sud-Ubangi) and Republic of the Congo (Brazzaville and Cuvette-Ouest) (Fig. 2, red circles). Swampy, periodically flooded, fluvial forests; 270–410 m elevation. Flowering specimens have been collected in November, and fruiting specimens in December and January.

Etymology.—The specific epithet is the nominative feminine singular of the Latin adjective *paluster*, which refers to the swampy nature of the forests that these plants inhabit.

Provisional IUCN red list assessment.—The extent of occurrence (EOO) of *Drypetes palustris* is estimated as 223,214 km² (far exceeding the upper threshold for Vulner-

able status under subcriterion B1 of the IUCN Red List), whereas its area of occupancy (AOO) is estimated to be 24 km² (which falls within the limits for Endangered status under subcriterion B2). The species is known from eight collections, made in swampy and periodically flooded forests of the western Congo basin, between 1955 and 1996. These eight collections represent six occurrences, and four subpopulations. In the Republic of the Congo, two occurrences are situated in a protected area (Odzala National Park), while the other two are located in the Mbamu Island forest and are threatened by small-scale agriculture. In the Democratic Republic of the Congo, the two occurrences are threatened by shifting agriculture and timber harvesting. As a consequence, these six occurrences represent four locations (cf. IUCN 2019) with regard to the most serious plausible threat (i.e., small-scale agriculture). Therefore, we infer a current and future continuous decline in the extent and quality of its habitat, and in the number of mature individuals. *Drypetes palustris* is thus provisionally assessed as Endangered, EN B2ab(iii, v).

Additional studied material.—DEMOCRATIC REPUBLIC OF THE CONGO. **Mongala:** Popolo, Forêt de la Mongala, [3°7'N 20°42'E], 10 Aug. 1955, fr., C. Evrard 1609 (BR0000015788214). **Sud-Ubangi.** Bombura, forêt de la Lua-Vindu, [3°37'N 19°15'E], 5 May 1955, immat. fr., C. Evrard 895 (BR0000015788184); same locality as preceding, 26 Jul. 1955, immat. fr., C. Evrard 1444 (BR0000015788191). REPUBLIC OF THE CONGO. **Brazzaville:** P. Sita 1903 (see above); Île M'Bamou, région de Talangaï, 600 m environ en amont de Talangaï, [4°10'S 15°23'E], 16 Nov. 1968, female fl., immat. fr., P. Sita 2818 (BR0000015778178, BR0000015778185, P04707760, P04707761, P04707762, WAG.1564766 image). **Cuvette-Ouest:** Parc National d'Odzala, Rivière Mambili, entre Moba et la confluence Lékoli-Mambili, 0°44'N 15° 2'E, 21 Jan. 1996, fr., J. Lejoly 96/123 (BRLU 0024560); Alima-Likouala, région de M'Bomo, réserve de chasse d'Odzala (M'Boko), [0°37'N 14°54'E], 15 Dec. 1970, fr., P. Sita 2989 (P04707766).

Drypetes calvescens Pax & K.Hoffm., *Das Pflanzenreich* 147, 15 (Heft 81): 276 (1922). Type: Democratic Republic of the Congo, Ituri, NO-Kongo, Ituri [Beni-Irumu], [1°27'N 29°55'S], 1910–1911, male fl., G.W.J. Mildbraed 2922 (lectotype, here designated: HBG-516345!). Fig. 1 h–k.

Tree to 15 m; trunk to 32 cm in diameter, sometimes sinuous, young branchlets subterete, angled, slightly sulcate, glabrescent, trichomes 0.1–0.2(–0.4) mm; terminal buds scaly, scales 1.1–1.2 × 0.5–0.7 mm, ovate, densely and shortly pubescent outside, glabrous inside, trichomes 0.1–0.2(–0.5) mm. Leaves alternate, deep green above, much paler beneath; stipules 0.9–2.1 × 0.3–1.1 mm, ovate-triangular, tough, shortly pubescent outside, glabrous inside, trichomes 0.1–0.3 mm, caducous, very soon

falling; petiole (3–)4.6–5.9(–8) mm long, (0.8–)1.1–1.5(–2) mm in diameter, longitudinally and slightly wrinkled, glabrescent, trichomes to 0.1(–0.3) mm; blade (8.7–)10.4–13.2(–17) × (2.6–)3.1–4.5(–5.1), narrowly elliptic to elliptic or slightly oblanceolate, subcoriaceous, acute at base, oblique, both sides of the leaf blade meeting the petiole at the same height, subentire to shallowly crenulate mostly along the distal half, crenulae to 0.6 mm, flat, acuminate to lengthy acuminate, apex (7–)9.4–12(–17) mm, abaxial surface among veins glabrescent, trichomes 0.1–0.2 mm, few, scattered; midrib longitudinally very slightly wrinkled, slightly depressed above, prominent beneath, glabrescent, first order lateral veins 6–7 pairs, quite regularly spaced, hardly depressed above, slightly prominent beneath, ascending, obscurely diminishing but often noticeably curved and anastomosing well within the margin, oriented at (50–)62–69(–78)° to the midrib, glabrescent, second order venation slightly raised above and beneath, often hardly above. Male inflorescences borne in leaf or leafless axils, along the branches, clusters of ca. 10 flowers; bracts 0.6–0.8 × 0.6–1.1 mm, widely ovate, minutely pubescent outside, glabrous inside, trichomes to 0.1 mm. Male flowers whitish or greenish white, pedicellate; pedicel (2.2–)2.8–3.8(–4.8) mm long, 0.2–0.5 mm in diameter, slender, minutely pubescent, trichomes to 0.1 mm; sepals 4, (1.2–)1.7–1.9(–2) × 1.3–2 mm, narrowly oblanceolate to widely ovate or obovate, obtuse, cucullate, imbricate, minutely pubescent outside, trichomes to 0.1 mm, glabrous inside, minutely ciliate at margin, cilia to 0.1 mm; stamens 4(–5) in a single whorl, surrounding the disk and only slightly enveloped by its marginal lobes, filaments 1.6–2.3 mm, anthers 0.6–0.7 mm long, 0.3–0.8 mm in diameter, obovoid to widely ellipsoid, dorsifixed, introrse, glabrous; disk 0.3–0.4 mm high, 1.4–2 mm in diameter, convex, dome-shaped, fleshy, slightly rugose, margin slightly lobed, dark-colored after drying, with a central prominence to 0.2(–0.3) mm high, glabrous; pistillode absent. Female inflorescences mostly borne in leafless axils, clusters of 1–3(–4) flowers; bracts 0.4–0.5 × 0.7–0.9 mm, widely ovate, minutely pubescent outside, glabrous inside, trichomes to 0.1 mm. Female flowers whitish, pedicellate; pedicel (3.3–)5–6(–6.4) mm long, 0.2–0.5(–0.7) mm in diameter, slender, minutely pubescent, trichomes to 0.1 mm; sepals 4, (1.7–)2.2–2.5(–3.3) × (1.4–)1.6–2.7(–3.1) mm, narrowly elliptic to widely ovate, obtuse, cucullate, imbricate, shortly pubescent outside, trichomes to 0.2 mm, glabrous inside, shortly ciliate at margin, cilia 0.1–0.2 mm; disk 0.3–0.5(–0.9) mm high, 2.6–3.7 mm in diameter, flat to cupulate, margin often raised upwards, fleshy, glabrous; style 1, (0.1–)0.2–0.5(–0.8) mm, adnate or 2-branched, basally united to 0.1–0.8 mm; stigmas 2, bifid, sometimes roughly reniform or obdeltoid, each free arm (0.4–)1–2.1(–2.4) mm long, stigmatic surface (0.4–)0.6–1.7(–1.9) mm wide; ovary 2–3 mm long, 1.1–2.7 mm in diameter, glo-

bose, 2-celled, densely and shortly pubescent, trichomes 0.2–0.4 mm. Fruits 10.5–12 mm long, 9.1–12.5 mm in diameter, widely ellipsoid, unribbed, brownish when ripe, 2-celled, 2-seeded, glabrescent, trichomes 0.2–0.9 mm, sepals subpersistent, style and stigmas subpersistent, seeds $7.8\text{--}8.6 \times 5.5\text{--}6$ mm; subsessile to pedicellate, fruiting pedicel 2.2–5.1 mm long, 1.4–1.7 mm in diameter, shortly pubescent, trichomes 0.2–0.4 mm.

Distribution, habitat and phenology.—Central Africa: Cameroon (East and South), Central African Republic (Lobaye), Democratic Republic of the Congo (Bas-Uele, Haut-Uele, Ituri, Kasai, Lomami, Mongala, North Kivu and South-Kivu), Equatorial Guinea (Centro Sur), Gabon (Estuaire, Ngounié and Woleu-Ntem), Republic of the Congo (Niari) and Uganda (Central Region and Western Region) (Fig. 2, blue circles). Rain forests, primary and secondary, gallery forests; 450–1900 m elevation. Flowering specimens have been collected from February to November, and fruiting specimens from January to June.

Typification.—We choose as lectotype of *Drypetes calvescens* the sheet HBG-516345 of the gathering Mildbraed 2922, since we consider it to be the most suitable specimen located among the original material cited in the protologue, v.gr.: “Westafrikanische Waldprovinz: Südkameruner Waldgebiet, Molundu, Posten Plehn, Urwald (Mildbraed n. 4923!, 4993!), Lomie (Mildbraed n. 5032!); Ebolowa-Jaunde, südl. des Njong, Amugebane-Nkolemajang (Mildbraed n. 7672!). Iturigebiet, Beni-Irumu (Mildbraed n. 2784!, 2922!)” (Pax & Hoffmann 1922). We excluded Mildbraed 7672 from our list of potential lectotypes of *D. calvescens*, since it includes specimens with male buds of *D. gabonensis* Pierre ex Hutch. (K000406365, BR0000015785268), other species of this genus that also occurs in Central Africa.

Etymology.—Pax & Hoffmann (1922) did not expressly explain their reason for choosing this epithet, the nominative feminine singular of the Latin adjective *calvescens*, which means becoming bald. It presumably alludes to the glabrescence of the young branchlets and leaves, as indicated in the protologue.

Amended IUCN Red List assessment.—The extent of occurrence (EOO) of *Drypetes calvescens* is estimated as 1,922,043 km² (far exceeding the upper threshold for Vulnerable status under subcriterion B1 of the IUCN Red List), whereas its area of occupancy (AOO) is estimated to be 164 km² (which falls within the limits for Endangered status under subcriterion B2). The species is known from 51 collections, made in terra firme and gallery forests, between 1908 and 2013. These 51 collections represent 41 occurrences and 17–20 subpopulations. One occurrence is located within the Monte Alén National Park (one location) in Equatorial Guinea, two in the Dja Biosphere Re-

serve (one location) in Cameroon, six within Okapi Wildlife Reserve and one in Virunga National Park in Democratic Republic of the Congo (two locations), and two in Uganda, one within Mabira Forest Reserve and one within Queen Elizabeth National Park (two locations). The occurrences in Cameroon outside a protected area represent five locations, two of them within two different forest concessions (two locations), threatened by logging. Four of the five occurrences in Gabon are located within forest concessions (five locations), as well as the occurrence in Boukoko in Central African Republic (one location), all being threatened by logging. The occurrences in the Democratic Republic of the Congo situated outside protected areas are threatened by shifting agriculture and timber harvesting, representing 14 locations, and one occurrence in Mongala is located within a logging concession, being threatened by logging (one location). The occurrence in the Republic of the Congo is threatened by wood harvesting (one location). As a consequence, those 41 occurrences represent 33 locations (cf. IUCN 2019) with regard to the most serious plausible threat (logging), far exceeding the upper threshold for Vulnerable status under criterion B. Moreover, the distribution area of *D. calvescens* is not severely fragmented and thus does not meet the threshold of any threatened categories under criterion B. None of the occurrences of the species are expected to disappear in the near future despite the threats of shifting agriculture, wood harvesting, or logging, and so no reduction in population size is anticipated that would qualify the species as Threatened under criterion A. *Drypetes calvescens* is therefore assessed as Least Concern (LC).

Studied Material.—CAMEROON. **East:** Concession d’Alpicam, Mindourou 2, 3°41’N 14°40’E, 20 May 2013, veg., IRD plot 670 (V. Droissart, L. Moses & V. Deblauwe) (BRLU); Lomie, [3°10’N 13°37’E], G.W.J. Mildbraed 5032 (B†?); Réserve de Biosphère du Dja, vers 1175 m sur la piste reliant la station de Bouamir et l’inselberg de Mbasakok, 3°10’N 12°48’E, 19 May 2001, veg., B. Senterre 1318 & S. Kouob (BRLU 0015702); Réserve de faune du Dja, Djolimpoum, 3°0’N 12°52’E, 14 Apr. 1995, B. Sonké 1478 (female fl.) (BR0000015783509, BRLU, YA n.v.); Südkameruner Waldgebiet, Bezirk Molundu [Moloundou], alte französische Grence zwischen, [3°45’N 15°13’E], 1911, male fl., G.W.J. Mildbraed 4923 (HBG-516346, HBG-516347, PR 824405); Südkameruner Waldgebiet, Bezirk Molundu, Unbewohnter Urwald zwischen Jukaduma (Posten Plehn) & Assobam, [3°24’N 14°10’E], 20 Apr. 1911, female fl., G.W.J. Mildbraed 4993 (HBG-516348). **South:** Ebolowa-Jaunde [südl. Des Njong, Amugebane-Nkolemajang], [3°15’N 10°59’E], Jan. 1914, male fl., G.W.J. Mildbraed 7672 (BR0000015785268, BR0000006576394 (BR-S.P. 657 639), K000406365 image). CENTRAL AFRICAN REPUBLIC. **Lobaye:** Boukoko, [3°54’N 17°56’E], 15 Mar. 1948, female fl., C. Tisserant 771 (BM, BR0000015777720,

K, P04651741, P04651742, P04651743); Boukoko, [3°54'N 17°56'E], 15 Jun. 1951, male fl., C. Tisserant 2138 (BM, BR0000015777850, G n.v., P04706875, P04706876, P04706877), 14 Mar. 1949, C. Tisserant 1405 (male fl.) (BM, BR0000015777829, P04651724, P04651725), 4 Mar. 1948, C. Tisserant 741 (male fl.) (BM, BR0000015777713, K, P04651762, P04651763). DEMOCRATIC REPUBLIC OF THE CONGO. **Bas-Uele:** Bambesa, Kpoyo, [3°15'N 24°2' E], 22 Mar. 1940, veg., J.M. Vrydagh 248 (BR0000015785541). **Haut-Uele:** Neisu, [2°43'N 27°24'E], Feb. 1939, male fl., G. Gilbert [DiFOR, Division Forestière 2072] (BR0000015785374, MO 2252371, WAG.1337295 image). **Ituri:** G.W.J. Mildbraed 2922 (see above); Djiapanda, [1°23'N 29°24'E], Apr. 1921, male fl., J. Claessens 429 (BR0000015785336, BR0000015785343, P04707077 image); Djombi-Djugu, [1°56'N 30°30'E], 24 Jun. 1959, female fl., A. Devillé 494 (BR0000015785558, WAG.1337290 image); Ituri Kgewas, Wand La Kulu, [1°46'N 29°23'E], 27 Apr. 1931, male fl., J. Brands 518bis (BR0000015785114); Ituri, env. Nduye, Mt. Tatotudu, au-dessus de la plantation Biasa, [1°48'N 28°59'E], 13 Apr. 1976, veg., S. Lisowski 42465 (BR0000015785022, POZG 2-4/2014); Kambia Mbote (Penghe-Irumu), (...) près village, [1°27'N 29°55'E], 1 Mar. 1914, male fl., J. Bequaert 2676 (BR0000015785282, BR0000015785299); NO-Kongo, Ituri [Beni-Irumu], [1°27'N 29°55'E], without date, G.W.J. Mildbraed 2784 (B+?); Ituri, Mongbwalu, north of Msisi village, 1°58'N 30°0'E, 24 Jan. 2011, veg., W.R.Q. Luke, F. Bujo & B. Bytebier 3280 (BR0000015785329, EA n.v., EPU n.v.); Ituri Forest, Afarama, 1°26'N 28°33'E, 9 Apr. 2000, male fl., A. Masanga 15 (WAG.1337291 image, WAG.1337292 image); Tesse (...) aux bords de la Semliki, [1°15'N 30°27'E], 21 Mar. 1914, male fl., J. Bequaert 3112 (BR0000015785305, BR0000015785312); Ward te La Kulu, Struikgewas, [1°46'N 29°23'E], 27 Apr. 1931, male fl., J. van den Brande 518 (BR0000015785503, BR0000015785510), 13 Apr. 1931, male fl., J. van den Brande 535 (BR0000015785527, BR0000015785534); Zone de Mambasa (Ituri Forest), 1°25'N 28°35'E, 5 Apr. 1991, male fl., T.B. Hart 1113 (BR0000014955198, MO 4301339); Zone de Mambasa (Ituri Forest), Afarama, au bord de la rivière Ecloro, 1°33'N 28°32'E, 12 Mar. 1995, male fl., I.B. Liengola 77 (WAG.1337293 image). **Kasai:** Bokwendelo, rivière Gobo, [4°36'S 20°38'E], 7 Mar. 1955, male fl., C. Evrard 423 (BR0000015785350). **Lomami:** Mwene Ditu, [7°0'S 23°27'E], 5 Nov. 1957, male fl., L. Liben 3954 (BR0000015785275, WAG.1337289 image). **Mongala:** Yambata, [2°25'N 21°57'E], Mar. 1914, male fl., S. de Giorgi 1763 (BR0000015784667). **Nord Ubangi:** Bosambala, rivière Godolu, [3°30'N 20°20'E], 12 Apr. 1955, male fl., C. Evrard 673 (BR0000015785367). **North Kivu:** Ishunga-Kakeyi, km 120 route Sake-Walikale, Territoire de Walikale, 1°20'S 28°32'E, 11 Jun. 1958, veg., R. Pierlot 2294 (BR0000015785480, WAG.1337287 im-

age); Kampala, territoire Walikale, km. 215 route Kavumu-Walikale, 1°27'S 28°5'E, 20 Aug. 1955, male fl., R. Pierlot 948 (BR0000015785428); Kembe, Territoire de Walikale, km 153 route Sake-Walikale, 1°7'S 28°10'E, 10 Jun. 1958, veg., R. Pierlot 2274 (BR0000015785435); Kitshanga Terr. Walikale, [1°19'S 28°31'E], 7 Feb. 1959, fr., A. Léonard 2835 (BR0000015785398, WAG.1337285 image, WAG.1337286 image); Kitshanga Terr. Walikale, [1°19'S 28°31'E], 8 Jan. 1959, fr., A. Léonard 2426 (BR0000015785381, WAG.1337309 image, WAG.1337284 image). **South Kivu:** Forêt de la Tshinganda, km 42 route Kavumu-Walikale, 2°12'S 28°37'E, 2 Jun. 1958, fr., R. Pierlot 2347 (BR0000015785589, WAG.1337288 image); Shabunda, territoire Kalehe, km 80 route Kavumu-Walikale, [2°6'S 28°55'E], 20 Aug. 1955, male fl., R. Pierlot 754 (BR0000015785411); Kalehe, vers le km 110 route Kavumu-Walikale, Irangi, réserve Irsac, [1°53'S 28°27'E], 17 Sep. 1957, male fl., G. Troupin 4387 (BR0000015785497, MO 2220779, WAG.1337294 image). **Unknown locality:** 4 Apr. 1955, veg., R. Boutique 300 (BR0000015784650); without date, veg., R. Pierlot 58T285 (BR0000015785466, BR0000015785473); without date, veg., R. Pierlot 58T119 (BR0000015785442, BR0000015785459). EQUATORIAL GUINEA. **Centro Sur:** transecto en el Monte Alén, 1°39'N 10°18'E, 19 Apr. 2001, female fl., fr., D. Ngomo 909 (BRLU). GABON. **Estuaire:** Monts de Cristal, montagnes de Mvé Lakéné, 0°35'N 10°11'E, 1 Jan. 2007, veg., MBG transect 628 (M. Leal, D. Nguema, E. Mounoumoulossi & P. Bissiemou) (BRLU); Monts de Cristal, montagnes de Mvé Lakéné, 0°34'N 10°11'E, 1 Jan. 2007, veg., MBG transect 637 (M. Leal, D. Nguema, E. Mounoumoulossi & P. Bissiemou) (BRLU, MO n.v.). **Ngounié:** Collines de Mboumi, ouest du Parc National de la Lopé, 0°35'S 11°7'E, Jan. 2007, veg., MBG transect 1550bis (M. Leal, D. Nguema, E. Mounoumoulossi & P. Bissiemou) (BRLU [mixed collection], MO n.v.); Entre Kembélé et Pounga, 1°36'S 11°22'E, 26 Feb. 2009, veg., G. Dauby 399, T. Stévant, D. Nguema, E. Mounoumoulossi, P. Bissiemou & P. Bissien-guou (BRLU, WAG n.v.). **Woleu-Ntem:** Inselberg Milobo, 0°56'N 10°31'E, 20 Oct. 2001, male fl., L. Ngok Banak 214, C.M. Wilks, A. Mougazi & A.J. Mabicka (BRLU, LBV n.v., WAG n.v.). REPUBLIC OF THE CONGO. **Niari:** Chantier à 4 km de Moukoudi, sur la route de Mougala, [2°32'S 12°18'E], 27 Oct. 1975, P. Sita 3940 (male fl.) (BR0000015778246, P04707759). UGANDA. **Central Region:** [Buganda, Mengo Distr.], Forest (Mabira), Mulange, [0°29'N 32°59'E], Oct. 1922, male fl., R.A. Dümmer 5575 (K, US 1349886). **Western Region:** Kalinzu Forest, [0°25'S 30°5'E], May 1938, veg., W.J. Eggeling 3628 (K n.v., BR0000015784612).

Taxonomic notes

Drypetes palustris is, like *D. calvescens*, a medium-sized tree with simple, alternate and often subentire

leaves. The leaf margin of *D. palustris* is slightly but distinctly recurved along most of the blade, while that of *D. calvescens* is flat and may also be crenulate or serrulate along the distal part. The base of the leaf and its texture also have diagnostic value: *D. palustris* has firmly coriaceous leaves with acute or obtuse bases, whereas *D. calvescens* has subcoriaceous leaves with an acute base. The petiole of both species appears to be longitudinally wrinkled when dried and is shortly pubescent, but that of *D. palustris* is usually longer ((6–)6.8–10(–11.5) vs. (3–)4.6–5.9(–8) mm, see Table 1) and has persistent indument. The petiole of *D. calvescens* is glabrescent, so that the petiole of the mature leaves hardly bears any trichomes. Leaf venation also exhibits some differences: the first order lateral veins of *D. palustris* are irregularly spaced and anastomose near the leaf margin, whereas those of *D. calvescens*, often more noticeably marked on the adaxial leaf surface, are regularly spaced and anastomose well within the margin, forming different angles to the midrib, smaller in *D. palustris* ((37–)42–51(–59) vs. (50–)62–69(–78)° in *D. calvescens*). In addition, second order venation is conspicuously raised in the adaxial and abaxial surfaces of the leaf blade of both species, but in *D. calvescens* is less raised, often hardly on the adaxial surface. Differences in the vegetative parts of both species can also be seen in the bud scales and the stipules, both much larger in *D. palustris* (1.8–2.6 × 0.9–1.3 and 3.5–3.8 × 0.8–1 mm, respectively) than in *D. calvescens* (1.1–1.2 × 0.5–0.7 and 0.9–2.1 × 0.3–1.1 mm, respectively), whose stipules are almost triangular, while in *D. palustris* they are narrowly ovate.

The male individuals of both species have axillary inflorescences, in *Drypetes palustris* they appear in leaf axils, whereas in *D. calvescens* they also occur in leafless axils. The only male flowers of the new species available to us were young and about to open, a circumstance that must be taken into account when using the characters in our descriptions, mostly regarding the length of the pedicel and the filament. The pedicel is shorter in *D. palustris* (2.1–2.4 vs. (2.2–)2.8–3.8(–4.8) mm) and the filament longer in *D. calvescens* (1.6–2.3 vs. ca. 1 mm), from which we have been able to describe male flowers in full anthesis. The dimensions of the sepals of *D. palustris* are larger than those of *D. calvescens* (2–3.1 × 1.1–2.4 vs. (1.2–)1.7–1.9(–2) × 1.3–2 mm) despite corresponding to immature flowers, and this character therefore appears to be of more diagnostic value. Furthermore, the adaxial surface of the sepals is shortly pubescent in *D. palustris*, while it is glabrous in *D. calvescens*. The floral disk also differs considerably between the two: in *D. palustris* it is concave, cupular, thin, and its margin is plicate and even slightly constricted by the filaments; in *D. calvescens*, on the other hand, it is convex, thick, and its margin is only slightly lobed. The disk of *D. calvescens* has also a no-

ticeable central prominence and a dark color after drying, features that are missing in *D. palustris*.

We have not seen any female material of *Drypetes palustris* collected at anthesis. However, we have had at our disposal a few specimens with very immature fruits (and our description of characters such as the diameter of the disk must therefore be taken with caution), whose sepals, styles and stigmas have fallen off. The female flowers of *D. palustris* are solitary, while those of *D. calvescens* are borne in small groups of up to three. The bracts of the female inflorescence are larger in *D. palustris* (1.5–1.7 × 1.8–2.1 vs. 0.4–0.5 × 0.7–0.9 mm), especially those closest to the pedicel. Both species have two basally adnate styles, although those of *D. palustris* are practically free and adnate just at their base, whereas in *D. calvescens* they can be adnate along some distance from their base (0.1–0.8 mm) and even appear completely united to form a single structure. The stigmas are bifid in both taxa, although those of *D. calvescens* sometimes may be considerably reduced and obscurely reniform or obdeltoid. The female disk of *D. palustris* is much wider than that of *D. calvescens* (5.1–6.2 vs. 2.6–3.7 mm) and somewhat reflexed, while that of the latter species often has a margin that is raised upwards. Finally, the fruits of *D. palustris* are slightly bigger than those of *D. calvescens* (12–16.5 × 12.5–17 vs. 10.5–12 × 9.1–12.5 mm), widely ellipsoid-obovoid, apically depressed and longitudinally ribbed with four main and four secondary much less marked ribs; conversely, the fruits of *D. calvescens* are widely ellipsoid, unribbed, and at maturity they preserve the sepals and the remnants of the styles and stigmas.

Among the various factors that make it difficult to identify species of *Drypetes*, we have previously mentioned the fact that most of them have inconspicuous flowers and fruits (Quintanar & al. 2021a). Furthermore, the high proportion of specimens lacking flowers or fruits means that identifications often rely on the diagnostic value of vegetative characters, which in a genus like *Drypetes*, which includes several groups of morphologically similar species, is often complicated, even for expert taxonomists. We think that this is well illustrated by the taxonomic treatment of both *D. palustris* and *D. calvescens*, which clearly shows the need for providing descriptions of species that are as detailed and complete as possible, especially in large geographical areas such as Africa, where species delimitation and recognition remain a significant challenge today. In addition to the proper description of both sexual and vegetative organs of the species of *Drypetes*, it is particularly important to identify and describe informative and potentially diagnostic vegetative characters such as the scales on the terminal buds and the stipules, structures that are absent in much of the available material. The publication of this new species is consistent with our recent prediction

Table 1. Summary of the main diagnostic characters to distinguish *Drypetes palustris* D.J.Harris, Barberá & Quintanar, sp. nov. from *D. calvescens* Pax & K.Hoffm.

Character	<i>D. palustris</i> sp. nov.	<i>D. calvescens</i>
Vegetative characters		
Terminal bud scales, dimensions (mm)	1.8–2.6 × 0.9–1.3	1.1–1.2 × 0.5–0.7
Stipules, dimensions (mm)	3.5–3.8 × 0.8–1	0.9–2.1 × 0.3–1.1
Stipules, shape	very narrowly ovate	ovate-triangular
Leaf base, angle	slightly obtuse, sometimes acute	acute
Leaf margin	subentire, slightly recurved along most of its length	subentire to crenulate or serrulate mostly along the distal half, flat
Leaf texture	firmly coriaceous	subcoriaceous
First order lateral veins	irregularly spaced, obscurely diminishing and anastomosing near the margin	regularly spaced, obscurely diminishing but often anastomosing well within the margin
Angle between midrib and first order lateral veins	(37–)42–51(–59)°	(50–)62–69(–78)°
Second order venation	raised above and beneath	slightly raised above and beneath, above often hardly
Petiole, length (mm)	(6–)6.8–10(–11.5)	(3–)4.6–5.9(–8)
Petiole, indumentum persistence	persistent	glabrescent
Males, reproductive characters		
Inflorescences, disposition	in leaf axils	in leaf and leafless axils
Pedicele, length (mm)	2.1–2.4	(2.2–)2.8–3.8(–4.8)
Sepals, dimensions (mm)	2–3.1 × 1.1–2.4	(1.2–)1.7–1.9(–2) × 1.3–2
Sepals, indumentum of inner surface	shortly pubescent	glabrous
Staminal filament, length (mm)	ca. 1	1.6–2.3
Disk	concave, cupular, thin, margin plicate	convex, thick, rugose, margin slightly lobed, with a central prominence
Females, reproductive characters		
Female flowers per inflorescence	1	1–3
Bracts, dimensions (mm)	1.5–1.7 × 1.8–2.1	0.4–0.5 × 0.7–0.9
Stigmatic surface, dimensions (mm)	0.5–0.7 × 3–3.9	(0.4–)1–2.1(–2.4) × (0.4–)0.6–1.7(–1.9)
Styles	adnate just at the bases	adnate for a variable length
Disk, diameter (mm)	5.1–6.2	2.6–3.7
Disk, margin	reflexed	often raised upwards
Fruit, length (mm)	12–16.5	10.5–12
Fruit, body surface	widely ellipsoid-obovoid, apically depressed, longitudinally ribbed with four main and four secondary ribs	widely ellipsoid, unribbed

that the number of described African species of *Drypetes* will increase considerably over the next few years (Quintanar & al. 2020). We are currently working on an updated infrageneric classification of *Drypetes* and the typification of its sections, a task requiring a phylogenetic study with the aid of molecular markers. Until we complete these studies, we have decided to refrain from assigning *D. palustris* to a section and to retain *D. calvescens* in the section where it has traditionally been placed, *D. sect. Stenogynium*. For now, we hope that this taxonomic work will be useful to recognize these still poorly known tree species from Central Africa and

to inform the scientific community of how much we know about them in order to promote future studies on their biology and to facilitate their conservation.

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