A New Species of *Commelina* (Commelinaceae) from Tanzania

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ABSTRACT. *Commelina polhillii* Faden & Alford, a new annual species of *Commelina* with buff-orange flowers, is described from Tanzania. It differs from the similar *C. subulata* primarily in seed morphology. However, staminode shape, the presence of basal lobes on the medial anther connective, and differences in spathe pubescence also serve to varying extent to distinguish the two taxa. Leaf anatomy reveals one major difference but primarily helps to unite the two species with a group of approximately seven other species. A preliminary chromosome count, $2n$ = ca. 30, is recorded.

Key words: *Commelina*, Commelinaceae, Tanzania.

Herbarium studies at the Royal Botanic Gardens, Kew, over the past several years by the senior author have confirmed the richness of the flora of Tropical East Africa (Kenya, Uganda, and Tanzania) in species of Commelinaceae (Faden, 1994). He has described a number of new species (Faden, 1984, 1991, 1994) and recognized other undescribed species. Fieldwork in Tanzania in 1996 afforded the senior author the opportunity to collect some of the unnamed species. The availability of living material, grown from field-collected seeds, and a summer internship by the junior author have enabled the completion of the study of one of these new species.

Commelina polhillii Faden & Alford, sp. nov. TYPE: Tanzania. Iringa District: 9 km SW of Iringa along the Mbeya Road, 7°49′23″S, 35°38′37″E, murram pit in drying sand among grass, locally common, 10 June 1996, *R. B. Faden, S. M. Phillips, A. M. Muasya & E. Macha 96/94* (holotype, US3342557; isotypes, K, NHT). Figures 1, 2.

Herbae annuae ad 7–20(45) cm longas; folia lamina lineari ad lineari-lanceolatam, conduplicata, 1.0–8.4 (–11.4) × 0.3–0.7 cm; spathae pedunculo 0.6–5.0 mm longo, solitariae, 3.9–11.0(–16.5) mm longae, 2.6–6.0 mm altae, paginis glabris, marginibus ciliatis; cincinnus superior vestigialis vel nullus, cincinnus inferior 3–4 flores efferens; flores armeniaci, 7–10 mm lati; capsulae 2.5–4.0 × 1.5–2.7 mm, triloculares, trivalves, loculo dorsali dehiscenti, monospermo, loculis ventralibus 2-spermis; semina 0.85–1.4 mm diametro cum fovea rotunda profunda dorsali, testa brunnea farinosa. Differt a *C. subulata* seminibus.

Annual with erect or ascending to decumbent shoots 7–20(45) cm long, sometimes rooting at the lower nodes; roots thin, fibrous; stems slightly flattened on one side, often maroon or with maroon stripes, especially on older parts or near the nodes; internodes to 10 cm long, glabrous except for a line of pubescence continuous with that of the distal sheath. Leaves with sheaths 3–7 mm long, usually split to the base, sometimes purple-veined, with a line of hairs along the split edge, otherwise glabrous, lamina sessile, conduplicate, often falcate, linear to linear-lanceolate, 1.0–8.4(–11.4) × 0.3–0.7 cm, apex acuminate, margins often ciliate toward the lamina base, rarely ciliate distally, scabrous apically, surfaces glabrous, midrib moderately prominent on abaxial surface. Spathes solitary; peduncles 0.6–5.0 mm long, with a line of pubescence; spathes slightly to not at all falcate, 3.9–11.0(–16.5) mm long, 2.6–6.0 mm high, apex acute to acuminate, base cordate to deeply cordate or occasionally truncate to hastate, margins free, ciliate, with hairs decreasing in length toward the spathe apex, surfaces entirely glabrous, green (rarely the veins faintly purple), somewhat paler basally; upper cincinnus absent or vestigial, lower cincinnus 3- or 4-flowered, its peduncle 2.5–3 mm long. Flowers mostly perfect, occasionally staminate, 7–10 mm wide; pedicels 1.4–3.9 mm long; sepals 3, translucent, tinged pink apically, upper sepal cup-shaped, ovate, 1.4–1.9 × 1.1–1.5 mm, paired sepals basally fused for about one-half to two-thirds

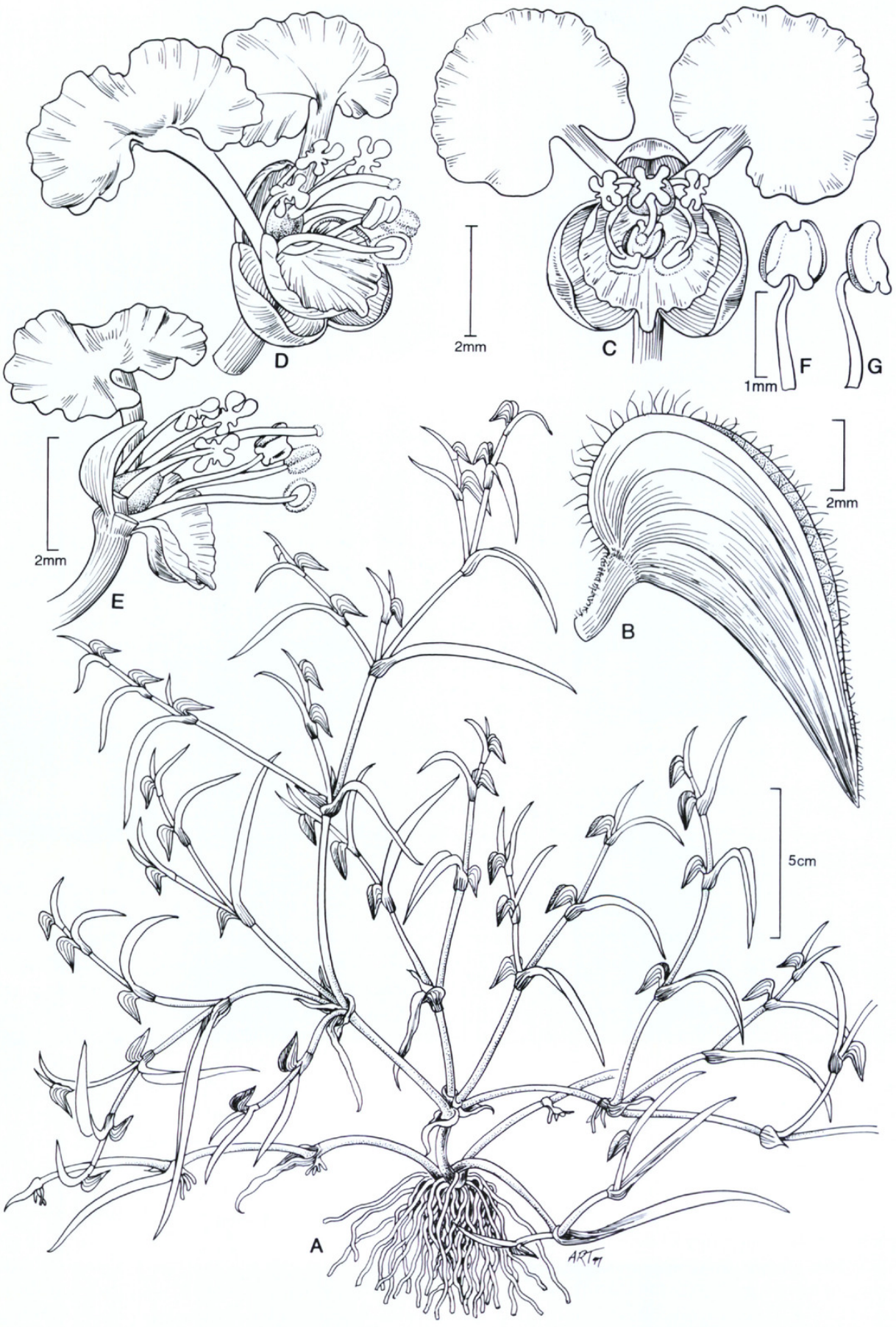

Figure 1. *Commelina polhillii* Faden & Alford. —A. Habit. —B. Spathe. —C. Bisexual flower, front view. —D. Bisexual flower, with petals reflexed, front/side view. —E. Bisexual flower, with front lateral petal and lateral sepal removed, side view. —F. Medial stamen, top view. —G. Medial stamen, side view. All from *Faden, Phillips, Muasya & Macha 96/94B* (ex cultivation Smithsonian Institution).

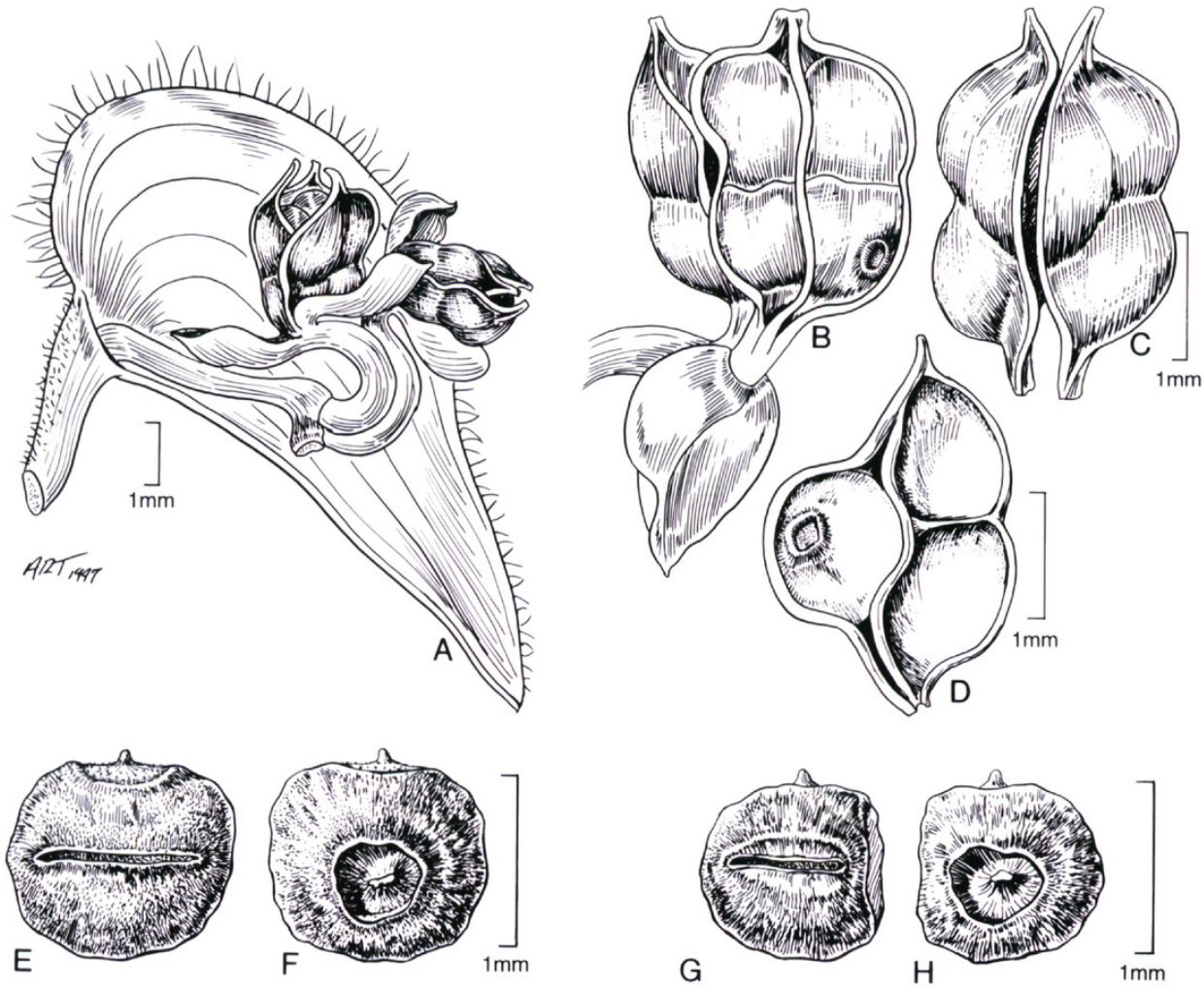

Figure 2. *Commelina polhillii*.—A. Spathe, with two mature, dehiscing fruits, front half of spathe removed. —B. Dehiscing capsule, lateral view. —C. Dehiscing capsule, dorsal view, showing middorsal dehiscence. —D. Dorsilateral capsule valve, internal view. —E. Dorsal locule seed, ventral view. —F. Dorsal locule seed, dorsal view. —G. Ventral locule seed, ventral view. —H. Ventral locule seed, dorsal view. All from *Faden, Phillips, Muasya & Macha 96/94B* (ex cultivation Smithsonian Institution).

of their length, each sepal broadly elliptic, 1.4–2.1 × 1.5–2.2 mm; paired petals 3.5–4.8 × 2.5–4 mm, buff-orange (168D in *R.H.S. Colour Chart* (1995)), limb reniform and often reflexed, 2.5–3.3 × 2.5–4 mm, claw 1.2–2.0 mm long, concolorous with the limb, lower petal concolorous, transversely elliptic, 1.3–2.1 × 2.0–2.8 mm, with an apical tooth; staminodes 3, equal, filaments directed toward the front of the flower, 1.3–2.2 mm long, reddish, antherodes yellow, 6-lobed with minute pollen sacs, generally as wide as long, ca. 0.8 mm square; lateral stamens with filaments parallel or slightly divergent, 1.6–3.2 mm long, light pink, anthers ovate, 0.6–0.7 × 0.4–0.7 mm, sutures dark, pollen orange; medial stamen with filament 1.8–2.3 mm long, light pink, anther saddle-shaped, 0.8 × 0.8–1.0 mm, yellow, connective with two prominent, sterile basal lobes, pollen orange; ovary ovoid, 0.7–1.0 × 0.4–0.7 mm, light green, style 2.5–3.2 mm long, light pink becoming translucent apically, stigma capitate. Capsules trilocular, trivalved, 2.5–4.0 × 1.5–2.7 mm, apiculate; dorsal locule dehiscent, 1-seeded; ventral locules each 2-seeded. Seeds circular to slightly elliptic in outline, slightly dorsiventrally compressed, 0.85–1.4 mm diam., with a large, deep, central dorsal pit 0.3–0.65 mm diam. (the pit with a conical projection arising from its base but not emergent), testa dark brown, lightly covered throughout, including within the pit, by white farinose granules, sometimes also sparsely warty; embryotega concolorous with the testa, not very distinct, hilum shorter than the seed, linear, straight or curved, slightly raised.

Habitat. Woodland, murram ["a hard lateritic material associated with soils with impeded drainage in Africa and locally used as road metal," *Oxford English Dictionary*] pits, edge of cultivation, shallow soil on ironstone outcrop, sandy soil; ca. 1050–1500 m.

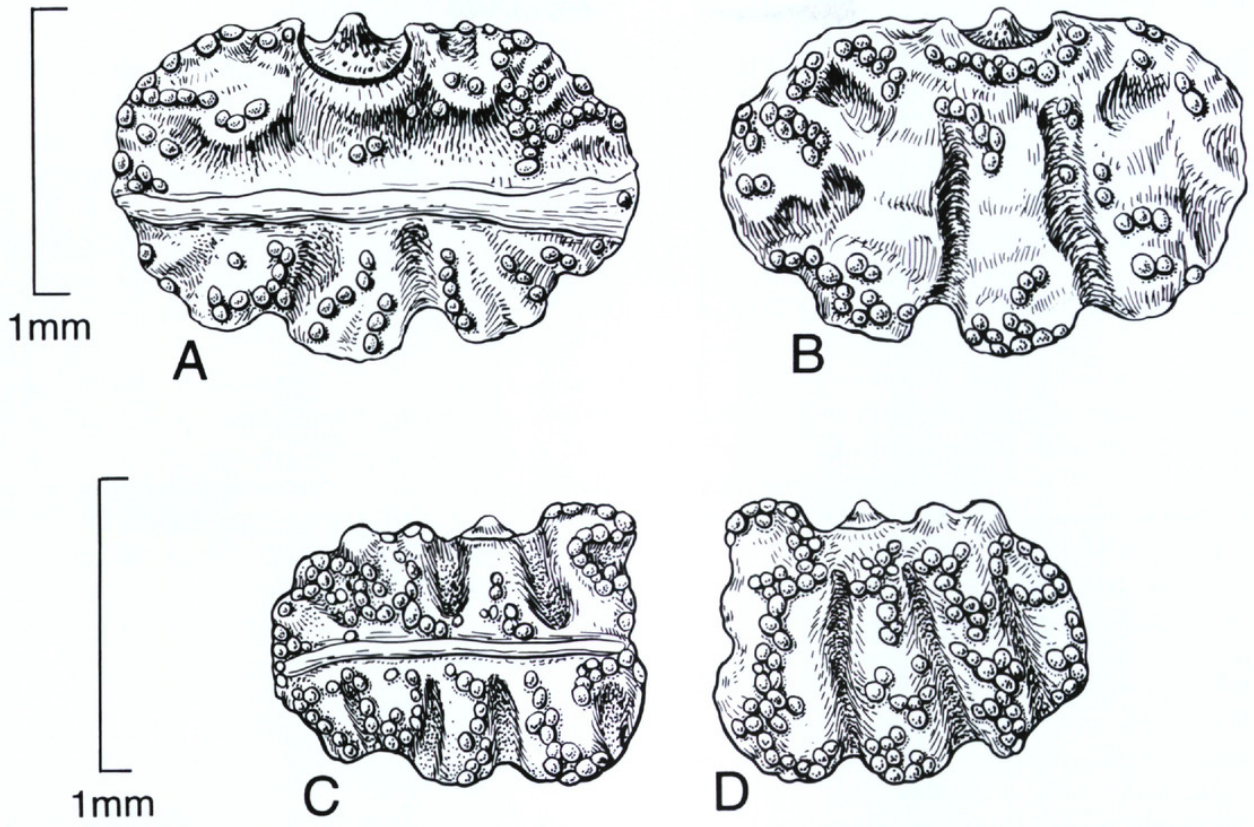

Figure 3. *Commelina subulata* Roth. —A. Dorsal locule seed, ventral view. —B. Dorsal locule seed, dorsal view. —C. Ventral locule seed, ventral view. —D. Ventral locule seed, dorsal view. All from *Faden, Phillips, Muasya & Macha 96/216* (from Tanzania).

Chromosome number. $2n$ = ca. 30.

Distribution. Known only from the Iringa and Mpanda Districts (flora districts T4, 7 of *Flora of Tropical East Africa* (Polhill, 1988)), Tanzania.

Commelina polhillii is morphologically very similar to the sympatric *C. subulata* Roth. (Both species were collected at the type locality of *C. polhillii*.) The seeds serve as the primary differentiating feature. The seeds of *C. polhillii* are round to slightly elliptic in outline (nearly isodiametric), with a single, central, round, deep dorsal pit, while those of *C. subulata* are elliptic (length/width ratio usually ca. 2:1) with 3–4 deep furrows separated by warty ridges radiately arranged on the dorsal surface (Figs. 2, 3).

The unusual seeds of *Polhill & Paulo 1375* were initially spotted by J. P. M. Brenan, who separated this specimen as a distinct species related to *C. purpurea* Rendle in the Kew herbarium. Our study has confirmed the importance of this seed type, has revealed additional collections with the same seeds, and has shown that the new species is more closely similar to the annual *C. subulata* than to the perennial *C. purpurea*, which is much larger in all of its parts.

The difficulty in finding additional characters to separate *C. polhillii* from *C. subulata* stems from the latter species' extremely wide distribution (throughout tropical Africa; also in Yemen and India) and associated great variability in spathe size, pubescence, and markings. The seeds, however, seem to be much less variable than the spathes. *Commelina subulata* has not been fully studied. In particular, the flowers are inadequately known, especially from forms with larger spathes.

Several characters in *C. subulata* are quite variable. The antherodes (staminode anthers) range from rectangular to U-shaped to broadly cruciform, whereas in *C. polhillii* they are squarely cruciform (Fig. 1C–E). The spathes of *C. subulata* are variable in size and can be completely glabrous, have glabrous surfaces and ciliate margins, or have the surfaces sparsely to densely pilose. The spathes can be entirely green or have prominently maroon veins.

In *C. polhillii* the spathes are typically small (≤ 11 mm long), with glabrous surfaces and ciliate margins. Usually the veins are completely green, but rarely they are faintly purple. Thus the spathes of *C. polhillii* are identical to a subset of specimens of *C. subulata*. Additional collections of *C. polhillii* might demonstrate a greater variability in spathe characters. However, based on our current knowledge, only 2 of the 13 collections of *C. subulata*

from Tanzania in the United States National Herbarium (US) fall within the range of spathe characters of *C. polhillii*.

The medial anther in *C. subulata* is also variable. In the liquid-preserved material that has been examined at K and US, in small-spathed plants (spathes ≤ 10 mm long), e.g., *Gillett 13558* (K spirit #2219), the medial stamen lacks sterile basal lobes. In the single large-spathed collection examined, *Bullock s.n.* (K spirit #4568), prominent sterile basal lobes were present on the medial anther. In *C. polhillii* the medial anther has distinct sterile basal lobes. It is uncertain whether this character is sufficiently constant to always separate *C. polhillii* flowers from those of similar-sized *C. subulata* plants.

Leaf anatomy lends some taxonomic help. *Commelina polhillii* has several rows of adaxial papillae near the margin and does not have extensive cellular differentiation below the vascular bundles on the abaxial surface. *Commelina subulata* lacks the rows of papillae and has very prominent, elongate (rectangular) cells under the vascular bundles on the abaxial surface. However, the small number of samples and even smaller number of populations represented make these data preliminary at best.

In cultivation it was observed that 25% of all flowers of *C. polhillii* were functionally male, with a reduced gynoecium. However, the cultivated plants were quite old when this observation was made, so this may be an artifact. In a pollinator exclusion experiment, 9 out of 10 bagged, bisexual flowers set fruit.

A preliminary chromosome count of $2n = 30$ was obtained for *C. polhillii*, using the method of Faden and Suda (1980). Two intact root tip cells of one plant yielded exact counts of $2n = 30$, but the two living plants became senescent and no further counts could be obtained.

Commelina polhillii and *C. subulata* belong to an unnamed, almost entirely African species group that is characterized by spathes with free margins, buff-orange flowers, the lower petal large and usually concolorous with the paired petals, and apiculate, trilocular, usually trivalved and five-seeded capsules. The species in this group, which is centered in Tropical East Africa, are mostly annuals of seasonally wet habitats. The recognized species, in addition to the above two, are *C. purpurea*, *C. lugardii* Bullock, *C. reptans* Brenan, *C. nyasensis* C. B. Clarke, *C. merkeri* K. Schumann, *C. trilobosperma* K. Schumann, and *C. arenicola* Faden, the last species, an endemic of Somalia, being the only species in the group to occur at low elevations and to have a bilocular capsule with an indehiscent dorsal locule.

Leaf morphology and anatomy have proven to be at least as distinctive of this species group as the reproductive characters listed above. The leaves are always linear to linear-lanceolate, with a symmetric base and conduplicate vernation (as opposed to supervolute or involute vernation, which are typical of other *Commelina* species). The transverse section of the lamina, as studied in *C. polhillii*, *C. subulata*, *C. lugardii*, *C. reptans*, *C. nyasensis*, and *C. merkeri*, shows two unique features for the genus: a continuous, one- to several-layered adaxial hypodermis and both adaxial and abaxial palisade layers. Some variation occurs between species, but not enough populations have been investigated to know whether the differences are diagnostic.

This species is named for Roger M. Polhill, whose collections of liquid-preserved flowers of East African Commelinaceae have greatly facilitated the study of this family.

Paratypes. TANZANIA. **Iringa:** Ruaha National Park, Magangwe Ranger Post, 1330 m, *Terminalia mollis-T. sericea-Combretum grandifolium-C. zeyheri-Dalbergiella nyassae-Julbernardia globiflora* woodland, 8 Mar. 1972, *Bjørnstad AB 1431A* (mixed collection with *Bjørnstad 1431B*: *C.? saxosa* De Wild.) (K); 9 km SW of Iringa along the Mbeya Road, E side of road, 7°49′23″S, 35°38′37″E, murram pit in drying sand among grass, 10 June 1996, cult. Smithsonian Institution, pressed 15 July 1997, *Faden, Phillips, Muasya & Macha 96/94A* (DAR, K, US); same locality and cultivation, pressed 29 July 1997, *Faden, Phillips, Muasya & Macha 96/94B* (EA, MO, US); Kalenga, 15 km SW of Iringa, 1435 m, wet sandy soil with some clay admixed, edge of cultivation, 7 Feb. 1962, *Polhill & Paulo 1375* (K); Ruaha National Park, Magangwe, *Brachystegia* woodland, 18 May 1968, *Renvoize 2241* (K). **Mpanda:** 10 km on Mpanda–Inyanga road, 6°22′S, 31°09′E, 1050 m, ironstone outcrop with shallow soil and *Brachystegia* woodland, 15 May 1997, *Bidgood, Sitoni, Vollesen & Whitehead 3972* (K, US).

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Literature Cited

Faden, R. B. 1984. New taxa of *Aneilema* R. Br. (Commelinaceae) from southern and tropical East Africa. Bothalia. 15: 89–100.

———. 1991. The morphology and taxonomy of *Aneilema* R. Brown (Commelinaceae). Smithsonian Contr. Bot. 76: 1–166.

———. 1994. New species of *Commelina* (Commelinaceae) from the Flora of Tropical East Africa. Novon 4: 224–235.

——— & Y. Suda. 1980. Cytotaxonomy of Commelinaceae: Chromosome numbers of some African and Asiatic species. J. Linn. Soc., Bot. 81: 301–325.

Polhill, D. 1988. Flora of Tropical East Africa. Index of Collecting Localities. Royal Botanic Gardens, Kew.

R.H.S. Colour Chart. 1995. Royal Horticultural Society, London.