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Lobelia morogoroensis: another Tanzanian giant

E. KNOX* AND T. PÓCS**

Summary. A new species of giant *Lobelia* (*L. morogoroensis* Knox & Pócs) is described that grows at relatively low altitudes on cliffs and in dry semi-deciduous woodlands on mountains near Morogoro, Tanzania. The morphology and phenology reflect the plant's relatively xerophytic ecology.

The giant *Lobelia* species of eastern Africa generally occupy moist, open sites in mid- and high-altitude montane vegetation, sometimes becoming dominant (Thulin, 1984). The discovery of *L. morogoroensis* extends the known ecological range of the group to include steep, rocky sites in seasonally dry semi-deciduous forests and woodlands, 725–1400 m in altitude, and extending up to 2000 m along cliffs in the northern end of the Uluguru Mts., along the eastern side of the Nguru Mts., and on Mt. Nguru ya Ndege, Morogoro Region, Tanzania. A related species, *L. longisepala* Engler, grows at 800–1500 m, but reaches its lower altitudinal limit only in the extensions of submontane (intermediate) rainforests in the east-facing valleys of the Uluguru and other Eastern Arc mountains (Lovett, 1988). *L. longisepala* is a much smaller plant with limited wood production and no suckering from the base. It is commonly found along trails, on moist rocks, and in other gaps in the submontane rainforest. Despite the many differences associated with habit and habitat, the two species share a paniculate inflorescence, similar flower size, and shape of the ovary. *L. morogoroensis* is distinguished by the numerous differences in corolla shape, the shorter pedicel, the dehiscent capsule, and the oblong, dark brown seeds. This new species resembles *L. giberroa* Hemsley in vegetative gross anatomy (Figure 1) but differs in many morphological details. The stem is more robust and woody with a chambered pith (Figure 2). The lamina has a smooth, waxy cuticle on both surfaces and is held longitudinally folded at about 60 degrees, supported by a thick, fleshy midvein which is usually filled with spongy pith. Seven observations between 1987 and 1991 indicate that the inflorescence begins to emerge from the leaf rosette in January, that flowering normally begins in May and concludes in September, and that seed development and dispersal occurs from July to October, prior to commencement of the short rains. During production of the inflorescence (a large, lax panicle), the leaves and lower bracts senesce so that flowering proceeds atop a bare stem. Compared with other species of giant *Lobelia*, the rate of flower and fruit development is fast relative to the rate of inflorescence elongation; the flowers are therefore positioned at the tip of each

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raceme and the developmental stages are displayed within a relatively short distance along the axis.

The floral anatomy suggests affinity with members of series *Longisepalae* E. A. Bruce in subsection *Nicotianifoliae* Mabberley, section *Rhynchopetalum* (Fresen.)

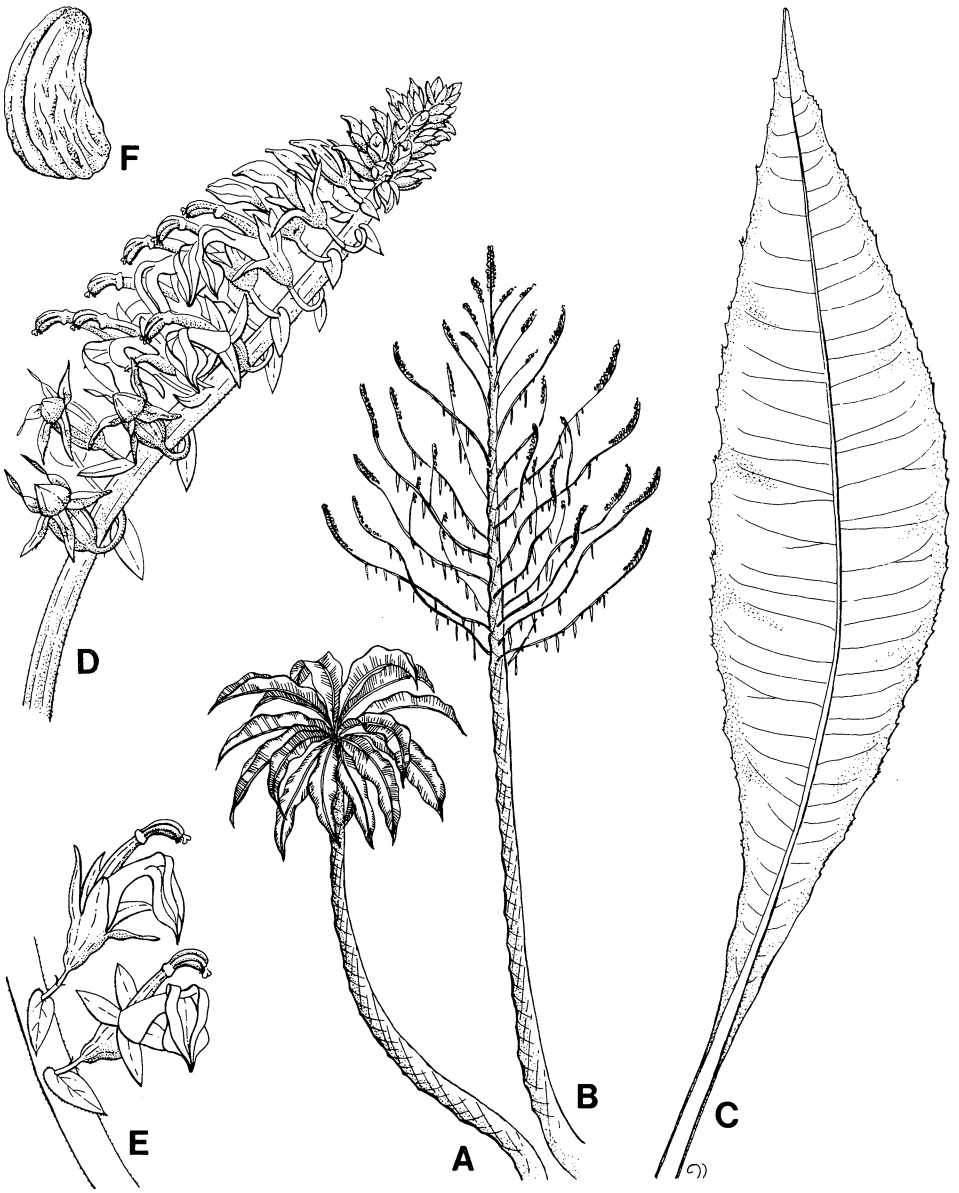

FIG. 1. *Lobelia morogoroensis*. **A** vegetative specimen; **B** mature inflorescence; **C** leaf; **D** tip of branch from developing inflorescence; **E** flowers; **F** seed. Drawn by Jilly Lovett.

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Benth. & Hook. f. as delimited by Mabberley (1974). This series contains species with branched inflorescences that are restricted to the old crystalline mountains of eastern Tanzania or, in one case (*L. stricklandiae* Gilliland), extend from central Tanzania south through Malawi, Zimbabwe and Mozambique to northeast Transvaal. According to Mabberley's treatment, the other species of giant *Lobelia* from eastern Africa are placed in series *Giberroae* E. A. Bruce of subsection *Nicotianifoliae* Mabberley (plants with hollow racemes growing in moderately drained, montane sites above 1500 m), in subsection *Rueppellianae* Mabberley (plants with hollow racemes growing in wet sites at mid and high altitudes plus *L. rhynchopetalum* Aschers from Ethiopia), and in subsection *Haynaldianae* E. Wimmer (one species, *L. petiolata* Hauman, from Zaire and Rwanda that grows as a small tree with numerous meristems and small horizontal panicles). *Lobelia morogoroensis* occupies an unusual position in that the floral anatomy suggests that it belongs in series *Longisepalae*, but the vegetative gross anatomy sufficiently resembles *L. giberroa* (series *Giberroae*) that several early collections of sterile specimens were classified as the latter species (e.g. *Pócs & Mwangabe* 6460/D [DSM, EA, SUA], *Mabberley* 653 [EA, K, CGE]).

Lobelia morogoroensis *Knox & Pócs* sp. nov. Haec species locos declives rupestres in sylvis tempestive siccis habitat. A *L. longisepala* Engler habitu rosulae giganteae et capsulis dehiscentibus, a *L. stricklandiae* Gilliland medulla locellata et 2 antheris infernis apicaliter barbatis, et *L. giberroa* Hemsley inflorescentia paniculata et floribus parvis differt. Typus: Tanzania, *Pócs & Knox* 88190/A (holotypus K; isotypi BP, MICH, SUA).

Plant up to 6 m tall in flower, erect or ascending, occasionally suckering from the base, but not otherwise branching vegetatively, with a paniculate inflorescence. Stem 6–13 cm thick at the base, terete, woody. Stem surface green, glabrous, developing with age a thin phelloderm enclosing the photosynthetic tissue. Pith 3·0–4·5 cm wide, a water-storing tissue when first produced,but becoming chambered with stiff, papery diaphragms at ca. 5 mm intervals in the stem, and solid and hollow in the basal and distal portions of the inflorescence, respectively. Terminal leaf rosette of 20–40 leaves, spirally arranged, deciduous, each leaving a conspicuous raised leaf scar with a corky abscission layer. Sap slightly yellowish and not as copious as in *L. giberroa*. Leaves of non-flowering plant subsessile, oblanceolate, 60–110 × 15–24 cm, acuminate at the apex, attenuate at the base, glabrous with a smooth waxy cuticle on both surfaces; margin finely serrate or doubly serrate; venation prominent beneath with a large, fleshy midvein, 12–19 mm thick at the base, filled almost completely with spongy pith; lateral veins 40–60 pairs, mostly straight and at 90 degrees to the midvein but often branched at or near it, becoming arcuate with a diminishing angle toward the apex.

Inflorescence a lax, pyramidal panicle, 2–2·5 m tall with 30–45 branches ranging from 140 cm long at the base to 17 cm long just below the terminal raceme; lower branches often with up to four secondary branches, 10–45 cm long; leafy bracts of diminishing size subtending successive branches and scattered along the basal portion of each branch but senescing prior to completion

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of flowering; distal clusters of long-pedicellate flowers crowding the upper side of weakly ascending racemes, the increasing weight giving long branches a characteristic S-shaped bend and the inflorescence a lax configuration; the floral bracts are also oriented to the upper side and are obscured by the flowers, the lowermost 22 × 7 mm and the uppermost 8 × 2 mm; pedicels, hypanthia, outer surface of calyx-lobes, subtending bracts, and distal portion of each branch all finely puberulous. Pedicels 8–10 mm long with two linear bracteoles, 1 mm long, subopposite, inserted just below the ovary when in bud but becoming centrally located as the pedicel elongates to 16–22 mm during fruit development. Hypanthium oblong, 6–8 mm long, 10-nerved. Calyx-lobes 8–10 × 3 mm, lanceolate, the unopened calyx thus fluted. Corolla 19–21 mm long, white, sometimes tinged with pink at base and tip; outside base sparsely papillose, elsewhere glabrous; split to the base on the back; two lateral petals linear, splitting to the middle, occasionally further; the three middle petals with sutures to the

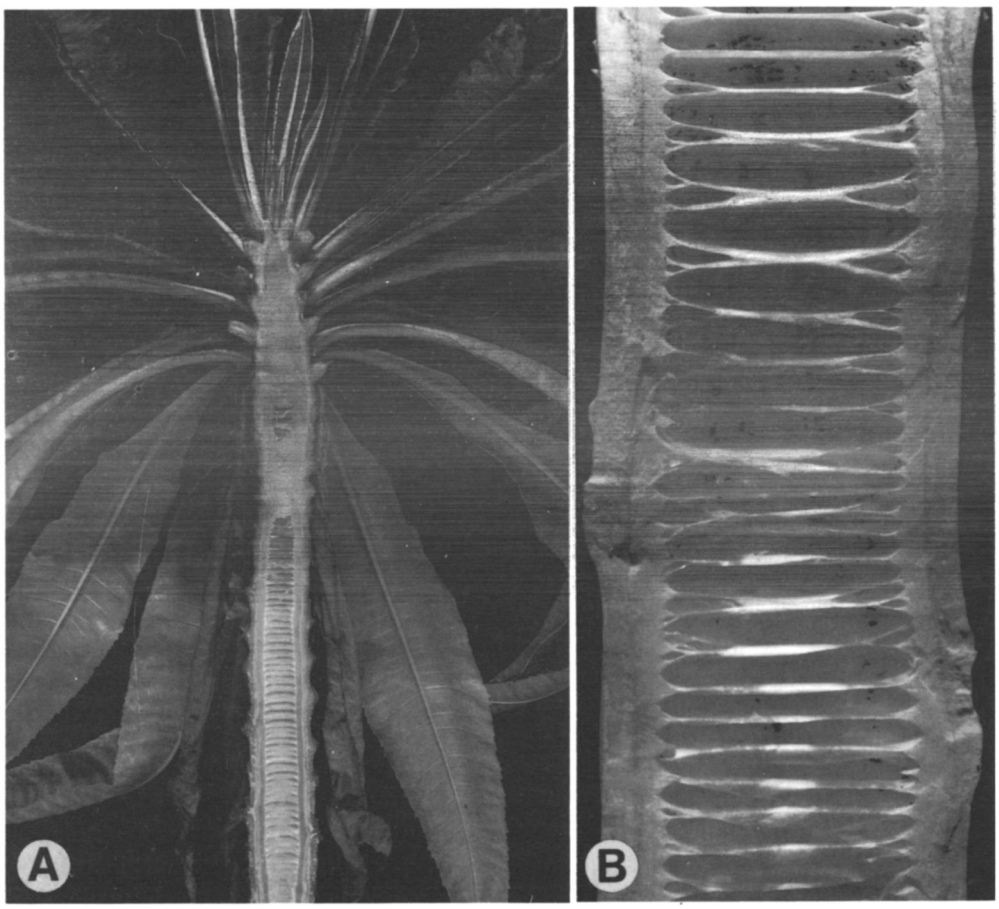

FIG. 2. Chambered pith of *Lobelia morogorensis*. **A** longitudinal section of a 28-month old greenhouse-grown specimen showing water-storing pith in the stem apex and the subsequent development of chambered pith below; **B** dried longitudinal section from a flowering specimen collected in the field (*Pócs & Knox*) 88189/A).

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middle but petals usually drying before splitting. Filaments connate except in the basal one-third, forming a firm tube; puberulent at base along veins and margins; free from corolla. Anther-tube 6–7 mm long, glabrous on the back, the two lower anthers barbate at apex, bristles 2 mm long. Ovary subinferior. Capsule erect, oblong, 14–18 mm long, 10-nerved, weakly puberulous with two distinct valves. Seeds oblong in outline, somewhat compressed, 0·8 mm long, finely striate, dark brown. Seedling with swollen, fleshy stem.

TANZANIA. Morogoro District, Uluguru Mts., north side above Bigwa Mission, 6°50′S, 37°43′E, 27 Sept. 1988, *Pócs & Knox* 88189/A (DSM, EA, MICH, UPS); 27 Sept. 1988, *Pócs & Knox* 88190/A (BP, K, MICH, SUA); Mt. Nguru ya Ndege, 6°42′S, 37°36′E, 22 Oct. 1988, *Knox & Pócs* 619 (DSM, MICH); Nguru Mts., east side above Turiani, 6°07′S, 37°33′E, 7 Feb. 1989, *Knox* 863 (DSM, MICH), 23 July 1990, *Knox* 1045 (DSM, MICH); Mt. Kanga, southeast side, 5°59′S, 37°43′E, 30 March 1989, *B. Pócs* 89112/A (MICH).

HABITAT. On steep, rocky sites in seasonally dry semi-deciduous forests and woodlands dominated by *Obetia radula, Erythrina abyssinica, Entada abyssinica, Ozoroa insignis* subsp. *reticulata* and *Cussonia arborea*.

The ecology of *L. morogoroensis* is unusual for this group of plants in that this species is able to tolerate seasonal drought. The largest individuals have been found growing along seepage channels, streams, or, as on Nguru ya Ndege, along the ecotone of a crescent-shaped ridge which supports mist-forest to the east (the direction of the rain-bearing winds) and seasonally dry forest to the west. It is tempting to suggest the necessity of a constant source of water for this species, but other large individuals have been found in surprisingly dry, rocky sites without such a source. This pattern of distribution may reflect the plants' inability to tolerate the annual fires that characterize the seasonally dry woodlands, rather than a physiological requirement for a constant water supply. It would be interesting to compare the ecophysiology of this species with that of *L. giberroa*. The reproductive phenology of the plant is also of interest. The senescence of leaves prior to flowering, along with the water storage capacity of the pith and the rapid fruit development, suggest that reproduction relies on stored water and that this generally determines reproductive output. 1988 was an unusual year in that there was occasional rain during late September and early October. The specimen of *L. morogoroensis* collected from Nguru ya Ndege seemed to reflect this unusual pattern of rainfall in that the inflorescence, which consisted almost entirely of mature capsules, had some branches that sported flowers either from resumption of growth at the apex, or the development of secondary branches.

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