

A synopsis of the genus *Cynoglossum* L. (Boraginaceae) in Madagascar and the Comoro Islands

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ABSTRACT

The species of *Cynoglossum* L. known from Madagascar and the Comoro Islands are revised and six species are recognized from the region. *Cynoglossum lanceolatum* is a widespread species that is common throughout Madagascar and also Africa and Asia; *C. cernuum* occurs in Madagascar and the Mascarene Islands, but the other four species are endemic to Madagascar, three of which (*C. birkinshawii*, *C. lowryanum*, and *C. tsaratananense*) are described as new. Of the six species of *Cynoglossum* known from Madagascar and the Comoro Islands, four face significant threat of extinction and three are critically endangered.

RÉSUMÉ

Synopsis du genre Cynoglossum L. (Boraginaceae) à Madagascar et aux Comores.

Les espèces de *Cynoglossum* L. connues de Madagascar et des Comores sont révisées, six espèces sont reconnues de la région. *Cynoglossum lanceolatum* est une espèce largement répandue qui est commune dans tout Madagascar ainsi qu'en Afrique et en Asie ; *C. cernuum* se trouve à Madagascar et aux Mascareignes, les quatre autres espèces sont endémiques de Madagascar, trois d'entre elles (*C. birkinshawii*, *C. lowryanum* et *C. tsaratananense*) sont nouvellement décrites. Sur les six espèces de *Cynoglossum* connues de Madagascar et des Comores, quatre sont significativement menacées d'extinction et trois sont en danger critique.

MOTS CLÉS

Boraginaceae,
Cynoglossum,
Madagascar,
Comores,
conservation,
nouvelles espèces.

INTRODUCTION

The flora of Madagascar remained very poorly known prior to 1900 with only a limited number of collections available that provided an uneven

picture of plant diversity. The situation has changed as hundreds of thousands of herbarium specimens were collected during the 20th century and, in association with this massive inventory effort, the *Flore de Madagascar et des Comores*

project (Muséum national d'Histoire naturelle, Paris) began to publish fascicle family treatments. Boraginaceae are among the families that have never been published for the Flora, and the Malagasy members of the family were poorly treated in most encyclopedic works of the 1800s (e.g., CANDOLLE 1845) because of the paucity of collections available at that time. The woody Boraginaceae were not included in the completed parts of ENGLER's *Pflanzenreich*, whereas the herbaceous members of the family were covered in two parts (BRAND 1921, 1931). However, the number of collections available to BRAND was inadequate to understand species-level diversity of *Cynoglossum* L. within Madagascar. Recent efforts to review the family and prepare a treatment for the *Flore de Madagascar et des Comores* have resulted in revisions for the Malagasy species of *Cordia* (MILLER 2001a), *Ehretia* (MILLER 2002), *Heliotropium* (MILLER 2003a), *Hilsenbergia* (MILLER 2003b), and *Tournefortia* (MILLER 2001b); this article surveys the diversity of *Cynoglossum* L., the last genus with native species in Madagascar.

Cynoglossum comprises about 55 species that occur throughout temperate regions and upland parts of the tropics. No modern revision of the genus has been published since the last comprehensive review of BRAND (1921). Since that time, most taxonomic work on *Cynoglossum* has been published in various floras (e.g., MARTINS 1990; NOWICKE & MILLER 1991; VERDCOURT 1991). Recent review of the collections of *Cynoglossum* at the Muséum national d'Histoire naturelle in Paris, the Natural History Museum in London,

the Royal Botanic Gardens, Kew, the Missouri Botanical Garden, and the two main herbaria in Madagascar (TAN and TEF) revealed that six species occur in Madagascar, three of which are described here as new.

GEOGRAPHY AND CONSERVATION

Six species of *Cynoglossum* are recognized in Madagascar, four of which are narrowly distributed endemics. *Cynoglossum lanceolatum* Forssk., one of the two non-endemic taxa, is a widespread species that grows in disturbed habitats and ranges throughout many parts of Africa and Asia as well as Madagascar. It is not clear, however, whether this species is native or introduced. *Cynoglossum cernuum* Baker is known from upland areas in Madagascar but also occurs on the Mascarene Islands. The other four species of *Cynoglossum* are all endemic to Madagascar, and all of them are very narrowly distributed. Each of the four endemic species has been recorded from at least one of Madagascar's protected areas, but none are known from more than a small number of collections, and they all appear to be in danger of extinction.

The locality data for specimens of species of *Cynoglossum* from Madagascar and the Comoro Islands have been analyzed for a provisional assessment of their risk of extinction following IUCN Red List Categories and Criteria (IUCN 2001). The data used for the analysis and the resulting conclusions are summarized in Table 1; more detailed information is provided following the discussion under each species.

TABLE 1. — Collection and conservation information for the species of *Cynoglossum* in Madagascar. Extent of Occurrence in km² and Area of Occupancy in 10 km² grid cells occupied. Conservation status follows IUCN 2001.

Species	Number of collections	Two most recent collections	Extent of Occurrence	Area of Occurrence	IUCN Red List category
<i>C. birkinshawii</i>	3	2001; 1964	200	2	EN
<i>C. cernuum</i>	21	1959; 1956	32373	19	DD
<i>C. lanceolatum</i>	110	1994; 1994	421545	61	LC
<i>C. lowryanum</i>	1	1911	100	1	CR
<i>C. monoplebium</i>	16	1975; 1975	10603	10	VU
<i>C. tsaratananense</i>	1	1929	100	1	CR

CYNOGLOSSUM L.

Sp. Pl.: 134 (1753).

TYPE. — *Cynoglossum officinale* L.

Perennial, or less frequently annual or biennial herbs from a thickened rootstock, usually branched, pubescent or rarely glabrous. Leaves alternate, simple, entire, the basal leaves on distinct petioles, the cauline leaves often sessile. Inflorescences racemes or panicles, the branches

scorpioid, usually ebracteate. Flowers bisexual, actinomorphic, usually pedicellate; sepals 5, distinct nearly to the base, often accrescent in fruit; corolla blue, purple, or rarely white, salverform to campanulate, 5-lobed, with 5 faucal appendages; stamens 5, the anthers on short filaments or nearly sessile, oblong to ellipsoid; ovary 4-lobed, the style gynobasic, the stigma 1, capitate. Fruits of 4 spreading nutlets, attached apically to the gynobase, the scar restricted to the apical half of the ventral surface, the dorsal surface usually with short glochidiate spines.

Key to the Malagasy species of *Cynoglossum*

1. Nutlets glabrous on the dorsal surface or glochidiate on a marginal wing and/or with a median line or scattered glochidia 2
- 1'. Nutlets more or less evenly glochidiate on the dorsal surface 5
2. Fruits less than 6 mm in diam.; nutlets less than 3 mm broad 3
- 2'. Fruits *c.* 10 mm in diam.; nutlets *c.* 5 mm broad 4
3. Basal leaves obtuse to rounded at the base and then abruptly decurrent along the petiole for 5-10 mm; leaf margin minutely erose to undulate with magnification 4. *C. lowryanum*
- 3'. Basal leaves attenuate at the base; leaf margin entire 2. *C. cernuum*
4. Basal leaf blades narrowly elliptic to lanceolate, 11-17(-20) cm long, apex acute to slightly acuminate; petioles 10-20 cm long 6. *C. tsaratananense*
- 4'. Basal leaf blades oblanceolate, 2.5-5.5 cm long, apex obtuse to rounded; petioles 1.5-3.5 cm long 1. *C. birkinshawii*
5. Leaf margin unevenly serrate or minutely erose 6
- 5'. Leaf margin more or less entire 3. *C. lanceolatum*
6. Lower leaves clustered in a basal rosette, the base obtuse to rounded and then abruptly decurrent along the petiole for 5-10 mm; leaf margin minutely erose to undulate with magnification 4. *C. lowryanum*
- 6'. Lower leaves not clustered in a rosette, the base clasping; leaf margin unevenly serrate, sometimes minutely so 5. *C. monophlebium*

1. *Cynoglossum birkinshawii* J.S.Mill., sp. nov.

Haec species inter congeneros madagascarienses quoad nucas dorsaliter glabras 4-5 mm latas atque fructum in diam. 7-10 mm ad Cynoglossum tsaratananense maxime accedit, sed ab eo foliorum basalium laminis oblanceolatis 2.5-5.5 cm longis apice obtusis rotundatisve atque petiolis 1.5-3.5 cm longis distinguitur.

TYPUS. — *Birkinshaw* 915, Madagascar, Prov. Antsiranana, Tsaratanana Massif, Mahatsabory Mica, 12 km N of Mangindrano, around dried-up lake and adjacent mid-elevation humid evergreen forest, 2050 m, 14°09'09"S, 48°57'21"E, fl., 15 Oct. 2001 (holo-, MO!, iso-, TAN).

Perennial herb, from a woody taproot 3-5 mm in diam.; stems erect, 12-30 cm tall, with scattered, thin, appressed to erect hairs; basal leaves 5-10, clustered in a loose rosette, blades oblanceolate, 2.5-5.5 cm long, 0.6-1.4 cm wide, the apex obtuse to rounded, the base attenuate, the margin entire, the adaxial surface with scattered appressed hairs, the abaxial surface with short, appressed hairs or nearly glabrous, but evenly strigose on the midrib; venation brochidodromous, the midrib impressed on the adaxial surface; secondary and tertiary veins visible on the abaxial surface; petioles 1.5-3.5 cm long, canaliculate on the adaxial surface, glabrous or with

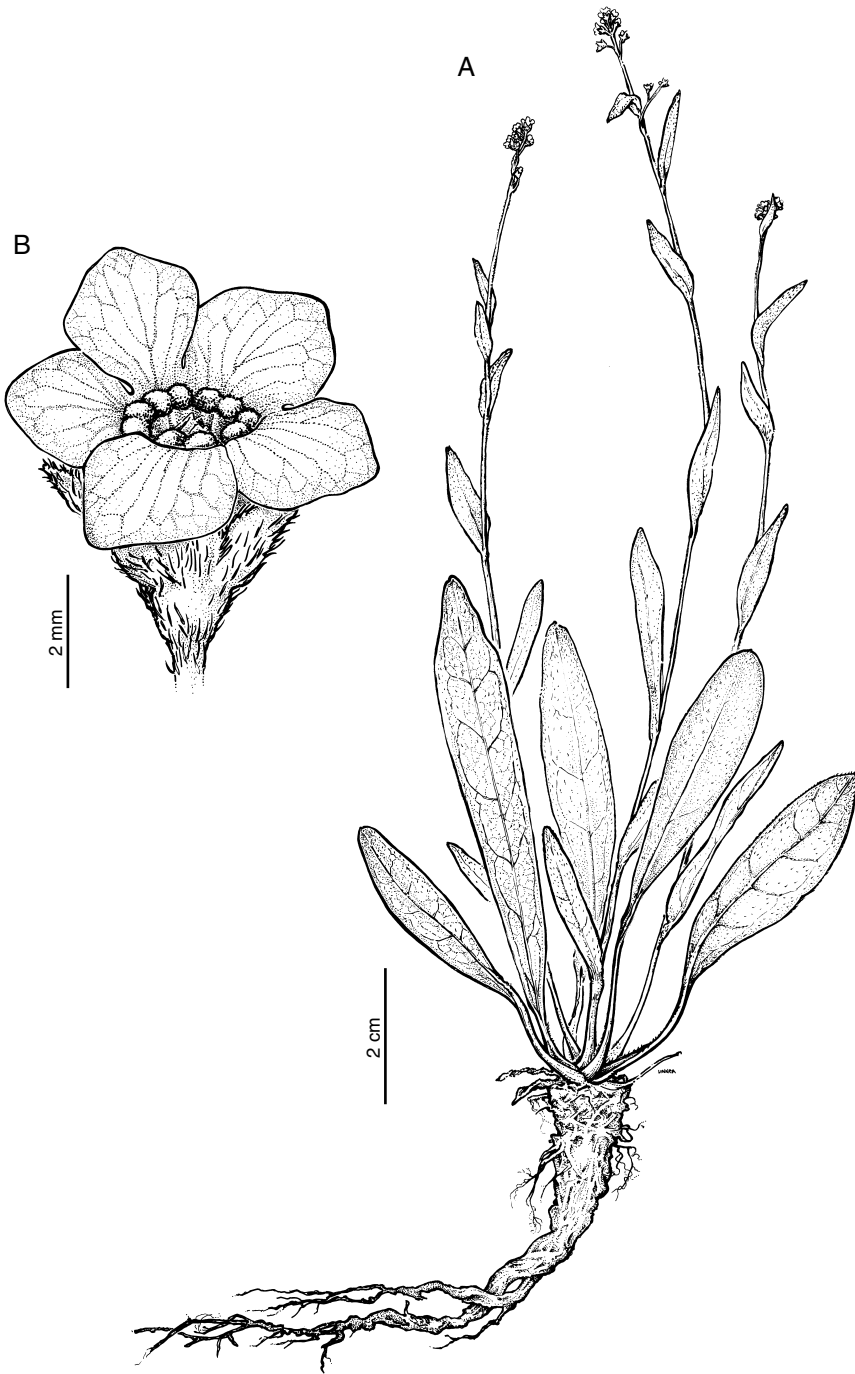


FIG. 1. — *Cynoglossum birkinshawii* J.S.Mill.: A, flowering plant; B, flower. Birkinshaw 915 (MO).

scattered hairs; cauline leaves alternate, sessile, blades lanceolate, 1.5-4 cm long, 0.5-0.8 cm wide, the apex acute or obtuse, the base obtuse to clasping, the margin entire.

Inflorescences terminal, the stems unbranched or branched one time; flowers bisexual, on pedicels 2-6 mm long; sepals ovate, 2-2.5 mm long, 1-1.3 mm wide, acute to obtuse at the apex, sparsely to moderately strigillose; corolla blue, campanulate, the tube 2-2.5 mm long, with 5 saccate granular faucal appendages, the lobes widely depressed ovate, 1.5-2 mm long; anthers borne just beneath the faucal appendages, *c.* 1 mm long, sessile or nearly so; ovary less than 1 mm tall, the style *c.* 1 mm long, the stigma capitate.

Fruits 7-10 mm broad; nutlets ovoid, 4-5 mm broad, margin with a spiny to nearly entire wing, the dorsal surface glabrous. — Fig. 1.

Cynoglossum birkinshawii is a very distinctive species known from only three collections, all from the southern and western slopes of the Tsaratanana massif. It is quite distinctive among the Malagasy species in having very large nutlets (*c.* 5 mm broad), which lack glochidia on the surface and have the spines on the marginal wing that lack barbs at the apex. The nutlets of *C. birkinshawii* are very similar to those of *C. tsaratananense*, which occurs in the same area, although the two species differ significantly in leaf morphology and size. *Cynoglossum birkinshawii* is also a much more diminutive plant, with an unbranched or once-branched inflorescence and quite small leaves. Although these are the only two Malagasy species with completely glabrous nutlets, there are great differences in vegetative morphology between them. *Cynoglossum birkinshawii* occurs 550-900 m below *C. tsaratananense*, yet appears very consistent in its diminutive habit of growth and much smaller leaves, which strongly supports their recognition as distinct species. However, both are known from few collections and further investigation in the field will be necessary to understand their relationships.

This species is named in honor of Christopher BIRKINSHAW, my friend and research colleague who has collected extensively in Madagascar and

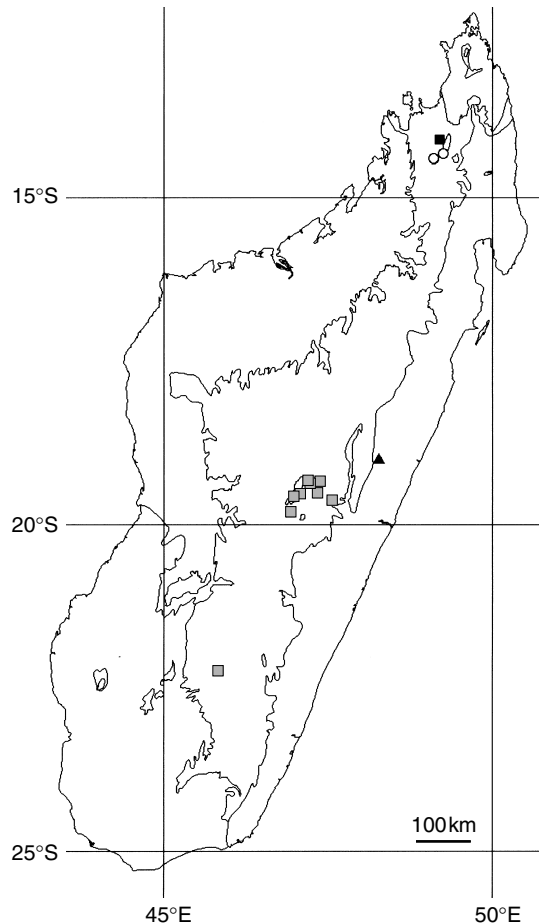


FIG. 2. — Distributions of the endemic species of *Cynoglossum* mapped on the bioclimatic zones of Madagascar (after CORNET 1974; see SCHATZ 2000): *C. birkinshawii* J.S.Mill. (○), *C. lowryanum* J.S.Mill. (▲), *C. monophlebium* Baker (□), *C. tsaratananense* J.S.Mill. (■).

contributed so much to the development of many young Malagasy botanists.

DISTRIBUTION. — *Cynoglossum birkinshawii* is known only from the Tsaratanana massif (Fig. 2) where it grows on the margins of ephemeral lakes from 1700-2050 m in elevation.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Endangered (EN B1ab(i-iv) + 2ab(i-iv)). *Cynoglossum birkinshawii* is known from only two populations within the Réserve Naturelle de Tsaratanana.

PARATYPES. — MADAGASCAR: *Humbert 18676*, Prov. Antsiranana, bassin supérieur du Sambirano, forêt ombrophile sur sol siliceux, lac n° 1, bords vaseux de petits lacs en forêts vierges vers les sources du Sambirano, 1700 m, 14°14'S, 48°48'E, fl., fr., Nov.-Dec. 1937 (K!, MO!, P!); *Service Forestier: SF 21083*, Prov. Antsiranana, Massif de Tsaratanana, Ampanopia, 14°08'S, 48°52'W, fl., fr., 5 Dec. 1964 (P!).

2. *Cynoglossum cernuum* Baker

J. Linn. Soc. Bot. 20: 211 (1884). — Type: *Baron 2033*, Madagascar, central Madagascar, fl., fr., s. date (holo-, K!; iso-, P!).

Cynoglossum discolor Baker, J. Linn. Soc. Bot. 20: 212 (1884). — Type: *Baron 1898*, Madagascar, central Madagascar, fl., immature fr., Oct. 1882 (holo-, K!; iso-, P!).

Perennial herb, forming a rosette, from a woody taproot 3-6(-15) mm in diam.; stems erect, with sparse, fine, appressed hairs or glabrous. Basal leaves with blades linear or less commonly narrowly elliptic, 1.5-15.0 cm long, 2-5(-17) mm wide, the apex acute, the base attenuate, the margin usually entire, rarely unevenly serrate, the adaxial surface evenly strigose, the hairs fine, the abaxial surface unevenly strigose, more densely so towards the margin, the midrib impressed on the adaxial surface; petioles on the basal leaves 2-5.2 cm long, glabrous or nearly so; cauline leaves sessile; blades lanceolate to oblanceolate to linear, 1.5-5.0 cm long, 2-12 mm wide, the apex acute to acuminate, the base attenuate.

Inflorescences terminal, the stems usually branched multiple times into multi-flowered cymes; the flowers bisexual, borne on slender pedicels 1-1.5 mm long; sepals ovate, 1.5-1.7 mm long, 0.5-0.8 mm wide, acute at the apex, evenly strigillose or with only a few scattered appressed hairs; corolla blue, campanulate, the tube *c.* 2 mm long, with raised, papillate faucal appendages, the lobes widely depressed ovate, *c.* 3 mm long, 2 mm wide; anthers borne just beneath the faucal appendages, *c.* 1 mm long, the filaments *c.* 1 mm long, glabrous; ovary less than 2 mm tall, the style 1.0-1.5 mm long, the stigma capitate.

Fruits 3-6(-8) mm broad; nutlets depressed ovoid, 1.5-2 mm broad, the margin with a wing crested with glochidiate spines, the dorsal surface more or less glabrous or with a few scattered glochidia or a sparse median row of glochidia.

The type of *Cynoglossum discolor* (*Baron 1898*) is incomplete material and difficult to assign with complete certainty. The leaves and general appearance of the plant are suggestive of *C. cernuum* and the few very immature nutlets on the holotype at K suggest that when mature they will lack glochidiate spines on the dorsal surface.

DISTRIBUTION. — *Cynoglossum cernuum* is known from upland regions in central and southern Madagascar (Fig. 4) where it occurs from 1500-2200 m in elevation. It is also known from the Mascarenes.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Data Deficient (DD). Although *Cynoglossum cernuum* has a wide distribution within Madagascar, it has not been collected for nearly 50 years, and efforts to locate historical populations will therefore be necessary to document its present conservation status.

MATERIAL EXAMINED. — MADAGASCAR: *Baron 1828*, Central Madagascar, fl., fr., Oct. 1882 (BM!, K!); *Camponon s.n.*, s. loc., fl., fr., s. date (P!); *Decary s.n.*, Prov. Antananarivo, Tsimbazaza, 18°55'S, 47°32'E, fl., fr., 16 Jan. 1917 (MO!, P!); *Decary 2012*, Prov. Mahajanga, Ankaizina, 14°30'S, 48°55'E, fl., fr., 20 Apr. 1923 (P!); *Decary 17544*, Prov. Fianarantsoa, forêt au S d'Ambositra, 20°32'S, 47°15'E, fl., fr., 8 Feb. 1942 (MO!, P!); *Guillaumet 3752*, Prov. Fianarantsoa, Rive du Riembovy, Andohariana, Andringitra, 2000-2100 m, 21°10'S, 46°54'E, fl., fr., s. date (P!, TAN); *Hildebrandt 3644*, Prov. Antananarivo, Andrangoloaka, 19°02'S, 47°55'E, fl., Nov. 1880 (BM!, G, K!, P!); *Humbert 3671*, Prov. Fianarantsoa, Massif de l'Andringitra (Iratsy), vallées de la Riambava et de l'Antsifotra et montagnes environnantes, 2000 m, 22°14'S, 46°56'E, fl., 27 Nov.-8 Dec. 1924 (MO!, P!); *Peltier & Peltier 1586*, Prov. Antananarivo, Talata-Volonondry, bords de ruisseau, 18°45'S, 47°41'E, fl., fr., 11 Dec. 1959 (MO!, P!, TAN); *Perrier de la Bâthie 9072*, Prov. Antananarivo, Manankazo, 1500 m, 18°09'S, 47°14'E, fl., fr., Jul. 1915 (P!); *Perrier de la Bâthie 13352*, Prov. Antananarivo, flanc est du Tsiafajavona, Ankaratra, 1700-2200 m, 19°21'S, 47°15'E, fl., fr., Dec. 1920

(MO!, P!); *Perrier de la Bâthie 13725*, Prov. Fianarantsoa, Massif d'Andringitra, 2200 m, 22°14'S, 46°56'E, fl., fr., Apr. 1921 (MO!, P!); *Perrier de la Bâthie 14397*, Prov. Fianarantsoa, Massif d'Andringitra, 2000 m, 22°14'S, 46°56'E, fl., fr., Feb. 1922 (MO!, P!); *Perrier de la Bâthie 14489*, Prov. Fianarantsoa, Massif d'Andringitra, 2200 m, 22°14'S, 46°56'E, fl., fr., Feb. 1922 (MO!, P!); *Perrier de la Bâthie 15107*, Prov. Antananarivo, Marangaka, 1200 m, 14°21'S, 48°41'E, fl., fr., Sep. 1922 (MO!, P!); *Réserves Naturelles: RN 3537*, Prov. Fianarantsoa, Andringitra, RN 5, 22°14'S, 46°56'E, fl., 16 Dec. 1951 (MO!, P!, TAN); *Réserves Naturelles: RN 4820*, Prov. Fianarantsoa, Andringitra, RN 5, 22°14'S, 46°56'E, fl., 19 Dec. 1952 (MO!, P!, TAN); *Réserves Naturelles: RN 4822*, Prov. Fianarantsoa, Andringitra, RN 5, 22°14'S, 46°56'E, fl., fr., 19 Dec. 1952 (P!, TAN); *Réserves Naturelles: RN 8494*, Prov. Fianarantsoa, Andringitra, RN 5, 22°14'S, 46°56'E, fl., 28 Oct. 1956 (P!, TAN); *Service Forestier: SF 693 R 174*, Prov. Fianarantsoa, Andringitra, RN 5, 22°14'S, 46°56'E, fl., 11 Dec. 1954 (P!); *Waterlot 587*, Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., Oct. 1922 (P!).

3. *Cynoglossum lanceolatum* Forssk.

Fl. Aegypt.-Arab. 41 (1775). — Type: *Forskål s.n.*, Yemen, Hadie (holo-, C).

Annual or biennial herb, the taproot 1-8 mm in diam.; stems erect, to *c.* 1 m tall, with sparse to moderate, appressed to spreading pubescence. Basal leaves in an evident rosette or smaller plants apparently immediately erect and lacking a basal rosette; basal leaf blades elliptic, 3.5-10(-18) cm long, 1.5-5.5 cm wide, the apex acute, the base cuneate, the margin entire, the adaxial surface strigillose to strigose, the abaxial surface sparsely to densely strigillose, more prominently so on the midrib, the venation brochidodromous, the midrib impressed on the adaxial surface, the tertiary venation mostly obscure; petioles 7-30 (-70) mm long, stiff pubescent; cauline leaf blades elliptic to lanceolate or oblanceolate, 1.5-9.5 cm long, 0.3-3.5 cm wide, the apex acute or less commonly obtuse, the base cuneate, the margin entire, indument and venation similar to the basal leaves, sessile or on petioles to 4 cm long, sparsely to moderately stiff pubescent.

Inflorescences terminal, once to several times dichotomously branched cymes, the branches

strigillose; flowers on pedicels 1-7 mm long, bisexual; sepals narrowly ovate, 1.2-1.6 mm long, 0.4-0.7 mm wide, the apex acute to obtuse, strigillose; corolla blue, campanulate, the tube *c.* 1 mm long, with 5 saccate, granular faucal appendages, the lobes widely ovate, *c.* 1 mm long, 1 mm wide; anthers borne just beneath the faucal appendages, *c.* 0.5 mm long, sessile or nearly so; ovary less than 1 mm tall, style *c.* 0.5 mm long, stigma capitate.

Fruits 4.5-5.5 mm broad; nutlets ovoid, 2-3 mm broad, margin with a prominent, raised glochidiate wing, the dorsal surface evenly glochidiate.

Cynoglossum lanceolatum is extremely variable. The plants range in size from 20 cm tall with stems arising from sparse basal rosettes that appear to have flowered in their first year, to more robust biennials more than 1 m tall, with more or less every imaginable intermediate represented among the available specimens. Despite this vegetative variability, all the specimens assigned to *C. lanceolatum* have nutlets that are consistently evenly glochidiate, range in size from 1.5-3.0 mm, and have a small to prominent raised marginal crest.

DISTRIBUTION. — *Cynoglossum lanceolatum* is a wide-ranging species that is common throughout parts of Africa and Asia. In Madagascar, *C. lanceolatum* is widespread and sometimes locally abundant in disturbed, open habitats, primarily in upland areas (Fig. 4), where it occurs from (400-)800-1800 m in elevation. Three populations have been recorded from along the east coast (although their label data are questionable and it is not clear whether the species really occurs in these areas).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Least Concern (LC). *Cynoglossum lanceolatum* is a widespread species in many warm parts of the Old World, and is weedy and common in many parts of Madagascar, where it seems to persist well in disturbed habitats.

MATERIAL EXAMINED. — MADAGASCAR: *Académie Malgache s.n.*, Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., fr., Sep. 1905 (P!); *Alleizette s.n.*,

- Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., fr., Nov. 1901 (P!); *Alleizette s.n.*, Prov. Antananarivo, environs de Manjakandriana, 18°56'S, 47°49'E, fl., fr., Sep. 1905 (P!); *Baron 64*, s. loc., fl., fr., s. date (P!); *Baron 774*, Central Madagascar, fl., fr., s. date (K!, P!); *Baron 1756*, Central Madagascar, fl., Oct. 1882 (K!); *Baron 2057*, Central Madagascar, fl., Oct. 1882 (K!); *Baron 3555*, s. loc., fl., s. date (P!); *Baron 3588*, Central Madagascar, fl., fr., s. date (K!, P!); *Baron 3655*, Central Madagascar, fl., fr., s. date (BM!, K!); *Baron 3747*, Central Madagascar, fl., fr., s. date (K!, P!); *Baron 5088*, NW Madagascar, fl., fr., s. date (K!); *Baron 6343*, s. loc., fl., fr., s. date (K!); *Baron 6694*, s. loc., fl., fr., s. date (K!, P!); *Baron 7034*, s. loc., fl., fr., s. date (K!); *Benoist 59*, Prov. Antananarivo, Tsimbazaza, 18°55'S, 47°32'E, fl., fr., 7 Aug. 1950 (P!, TAN); *Benoist 1489*, Prov. Toamasina, Périnet, 18°56'S, 48°26'E, fl., 9 Nov. 1951 (P!, TAN); *Birkinshaw & Rabenantoandro 1204*, Prov. Mahajanga, Ambanintelo, 4 km NE of Mangindrano, disturbed forest adjacent to stream, 1200 m, 14°13'31"S, 48°57'43"E, fl., fr., 18 Feb. 2003 (MO!, P, TAN); *Birkinshaw et al. 1302*, Prov. Mahajanga, Tsaratanana Massif, limit of forest, 6 km N of Mangindrano, mid-elevation evergreen humid forest, 1477 m, 14°12'11"S, 48°57'12"E, fl., fr., 25 Feb. 2003 (MO!, P, TAN); *Boissieu s.n.*, s. loc., fl., fr., s. date (P!); *Campeyron s.n.*, s. loc., fl., fr., s. date (P!); *Catat 73*, Prov. Antananarivo, environs de Tananarive, 18°55'S, 47°32'E, fl., fr., 13 Apr. 1889 (P!); *Catat 81*, Prov. Antananarivo, environs de Tananarive, 18°55'S, 47°32'E, fl., Apr. 1889 (P!); *Catat 372*, Andraraty, fl., fr., s. date (P!); *Catat 1207*, Prov. Fianarantsoa, Mananjary, 21°14'S, 48°21'E, fl., fr., 12 May 1889 (P!); *Chapelier s.n.*, s. loc., fl., fr., s. date (P!); *Cowan s.n.*, fl., fr., 1880 (BM!, P!); *Croat 28554*, Prov. Antananarivo, along route #2 to Tamatave from Tananarive between Ahimangakely and Carion, in valley of Ampasimbe River, 800 m, 18°55'S, 47°43'E, fl., fr., 16 Jan. 1975 (MO!); *Croat 28630*, Prov. Antananarivo, Tananarive, Parc Tsimbazaza, 1200 m, 18°55'S, 47°31'E, fr., 17 Jan. 1975 (MO!); *Croat 30283*, Prov. Fianarantsoa, on and around inselbergs near PK 475 W of Ambalavao, 950-1050 m, 21°50'S, 46°56'E, fl., fr., 1 Feb. 1975 (MO!); *Decary s.n.*, Ambatobevoandaza, fl., fr., 7 Jan. 1917 (P!); *Decary s.n.*, Ambohimananbola, fl., fr., 22 Feb. 1917 (P!); *Decary 1941*, Prov. Mahajanga, Ankaizana, 1700 m, 14°30'S, 48°55'E, fl., fr., 19 Apr. 1923 (P!); *Decary 1799*, Prov. Mahajanga, Ankaizana, 1200 m, 14°30'S, 48°55'E, fl., fr., 12 Apr. 1923 (P!); *Decary 5350*, Prov. Fianarantsoa, base est du pic d'Ivohibe, 800 m, 22°32'S, 46°59'E, fl., fr., 19 Sep. 1926 (MO!, P!); *Decary 6928*, Prov. Toamasina, S de Moramanga, 18°57'S, 48°14'E, fl., fr., 8 Feb. 1930 (MO!, P!); *Decary 7149*, Prov. Toamasina, S de Moramanga, 18°57'S, 48°14'E, fl., 17 Feb. 1930 (MO!, P!); *Decary 14268*, Prov. Fianarantsoa, vallée du Sakaleona, 20°35'S, 48°05'E, fl., fr., 13 June 1939 (MO!, P!); *Decary 17125*, Prov. Antananarivo, Tampoketsa d'Ankozobe, 18°01'S, 47°09'E, fl., fr., 2 Jan. 1942 (MO!, P!); *Decary 17414*, Prov. Fianarantsoa, Ambatofinandrahana, bois de Tapia, 20°33'S, 46°48'E, fl., 3 Feb. 1942 (MO!, P!); *Decary 17776*, Prov. Toamasina, Sandrangato au S de Moramanga, 19°07'S, 48°15'E, fl., fr., 7 Mar. 1962 (MO!, P!); *Decary 17927*, Prov. Toamasina, environs de Moramanga, 18°57'S, 48°14'E, fl., fr., 7 Jul. 1942 (P!); *Decary 18333*, Prov. Toamasina, S de Moramanga, 18°57'S, 48°14'E, fl., fr., 3 Sep. 1942 (P!); *Dequaire 27901*, s. loc., fl., fr., s. date (P!); *Dorr 2872*, Prov. Antananarivo, Parc de Tsimbazaza, 1300 m, 18°55'S, 47°31'E, fl., fr., 7 Mar. 1984 (K!, MO!, P!); *Dorr & Barnett 3167*, Prov. Antananarivo, Parc de Tsimbazaza, 1300 m, 18°55'S, 47°31'E, fl., 22 Oct. 1984 (K!, MO!, P!); *Du Petit-Thouars s.n.*, s. loc., fl., fr., s. date (P!); *Forsyth Major 28*, Ivohimanitra, fl., fr., Nov. 1894 (BM!, G, K!); *Forsyth Major 350*, Prov. Fianarantsoa, Ambohimitombo forest, 1350-1440 m, 20°43'S, 47°26'E, fl., fr., 27 Nov. 1894 (K!); *Forsyth Major 596*, Prov. Fianarantsoa, Ambohimitombo forest, 1350-1440 m, 20°43'S, 47°26'E, fl., fr., 27 Nov. 1894 (K!); *Hildebrandt 3644a*, Prov. Antananarivo, Andrangoloaka, 19°02'S, 47°55'E, fl., fr., Nov. 1880 (BM!, K!, P!); *Hildebrandt 3645*, Prov. Antananarivo, Andrangoloaka, 19°02'S, 47°55'E, fl., Nov. 1880 (BM!, G, K!, P!); *Hilsenberg & Bojer s.n.*, Prov. Antananarivo, prope Tananarive, fl., fr., s. date (BM!); *Hodgkin & Stanfield s.n.*, Central Plateau, fl., fr., s. date (K!); *Homolle 1275*, s. loc., fl., s. date (P!); *Humbert 6510*, Prov. Toliara, haute vallée du Mandrare, 600-900 m, 24°40'S, 46°05'E, fl., fr., 8-15 Nov. 1928 (MO!, P!); *Humbert 6674 bis*, Prov. Toliara, haute vallée du Mandrare, 900 m, 24°40'S, 46°05'E, fl., fr., 8-15 Nov. 1928 (P!); *Humbert 12023*, Prov. Toliara, massif du Kalambatritra, Mont Beanjavidy, 1500-1600 m, 23°22'S, 46°20'E, fl., fr., Nov. 1933 (MO!, P!); *Humbert 13248*, Prov. Toliara, vallée de la Manambolo, rive droite, bassin du Mandrare, aux environs d'Isomono, confluent de la Sakamalio, Mont Morahariva, 1000-1400 m, 24°32'S, 46°38'E, fl., fr., Dec. 1933 (MO!, P!); *Humbert 17631*, Prov. Toamasina, massif de l'Andrangovalu au SE du Lac Alaotra, Réserve Naturelle Zahamena, 1000 m, 17°40'S, 48°45'E, fl., fr., Oct. 1937 (MO!, P!); *Humbert 18674*, Prov. Anstiranana, bassin supérieur du Sambirano, bords vaseux de petits lacs, 1700 m, 13°55'S, 48°38'E, fl., fr., Nov.-Dec. 1937 (MO!, P!); *Humbert 19762*, Prov. Toliara, forêt d'Analavelona, bassin du Fiherenana, forêt trophile sur basalte, 1000-1200 m, 22°38'S, 44°12'E, fl., fr., 15-19 Dec. 1946 (MO!, P!); *Humbert 20875*, Prov. Antananarivo, Mont Angavokely près Carion, Imerina, savoka sur argiles latérites et granite 1200-1400 m, 18°55'S, 47°44'E, fl., fr., 27 Apr. 1947 (MO!, P!); *Humbert 24464*, Prov. Anstiranana, massif de l'Anjanaharibe, pentes et sommet nord, à l'Ouest d'Andapa, haute Andramonta, bassin de la Lokoho, 500-700 m, 14°43'S, 49°28'E, fl., fr., 10 Dec. 1950-

- 3 Jan. 1951 (P!); *Humbert 24951*, Prov. Antsiranana, montagnes au nord de Mangihdrano, haute Maevarano, jusqu'aux sommets d'Ambohimirahavavy, partage des eaux Mahavavy-Androranga, 1800 m, 13°46'S, 48°05'E, fl., fr., 19 Jan.-12 Feb. 1951 (MO!, P!); *Humbert 25089*, Prov. Antsiranana, montagnes au N de Mangindrano, haute Maevarano, jusqu'aux sommets d'Ambohimirahavavy, partage des eaux Mahavavy-Androranga, 1800 m, 13°46'S, 48°05'E, fl., fr., 19 Jan.-12 Feb. 1951 (MO!, P!); *Humbert 28463*, Prov. Fianarantsoa, Station Forestière Andrambovato à l'Est de Fianarantsoa, 800-1000 m, 21°31'S, 47°25'E, fl., fr., 24-25 Jan. 1955 (P!); *Humboldt 606*, s. loc., fl., s. date (K!, MO!, P!); *Leandri 777*, Prov. Mahajanga, Tsingy de Bemaraha, 18°41'S, 44°45'E, fl., fr., 31 Jan. 1933 (P!); *Leandri 823*, Prov. Mahajanga, Tsingy de Bemaraha, 18°41'S, 44°45'E, fl., fr., Feb.-Apr. 1933 (P!); *Leandri 2537*, Prov. Antananarivo, Station Forestière Angavokely, 1700-1800 m, 18°55'S, 47°46'E, fl., fr., 14 Jan. 1960 (P!); *Leandri 2809*, Prov. Mahajanga, forêt à feuilles caduques sur calcaires de l'Antsingy, vers Bevert, E d'Antsalova, 400-600 m, 18°35'S, 44°47'E, fl., fr., 29 Jan. 1960 (P!); *Leandri 3101*, Prov. Antananarivo, environs d'Andramasina, 30 km SSE de Tananarive, 1400-1500 m, 19°12'S, 47°36'E, fl., fr., Feb.-Mar. 1960 (MO!, P!); *Leeuwenberg, Andrianantoanina & Rapanarivo 14311*, Prov. Antsiranana, Montagne d'Ambre, near Station des Roussettes, 1000 m, 12°31'S, 49°10'E, fl., fr., 23 Jan. 1994 (K!, MO!, P!, TAN!); *Le Myre de Vilers s.n.*, s. loc., fl., fr., 1887 (P!); *Miller 3633*, Prov. Antsiranana, forest reserve at Montagne d'Ambre, 1050 m, 12°32'S, 49°10'E, fl., fr., 21 Oct. 1988 (K!, MO!, P!); *Miller 3756*, Prov. Toamasina, along the road between Moramanga and Tamatave, 4 km S of the turnoff to Andasibe, cloud forest on ridges 1 km S of the road, 1000 m, 18°58'S, 48°25'E, fl., fr., 19 Dec. 1988 (K!, MO!, P!); *Miller & Miller 3810*, Prov. Antananarivo, Parc Tsimbazaza, 1200 m, 18°55'S, 47°31'E, fl., fr., 26 Jan. 1989 (MO!, P!, TAN!); *Peltier & Peltier 1075*, Prov. Toamasina, Lac Alaotra, vallée de la Menaloha, 17°42'S, 48°28'E, fl., fr., 11 Sep. 1959 (P!); *Peltier & Peltier 1742*, Prov. Antananarivo, Station Forestière Angavokely, 18°55'S, 47°46'E, fl., fr., 14 Jan. 1960 (P!); *Peltier & Peltier 1917*, Prov. Antananarivo, Station Forestière Nanokely, 19°36'S, 47°03'E, fl., fr., 26 Feb. 1960 (MO!, P!); *Perrier de la Bâthie 1493*, Prov. Fianarantsoa, Mandrano, 21°09'S, 47°04'E, fl., fr., Nov. 1902 (P!); *Perrier de la Bâthie 9083*, Prov. Antsiranana, Montagne d'Ambre, 12°37'S, 49°10'E, fl., fr., Sep. 1909 (P!); *Perrier de la Bâthie 9085*, Prov. Fianarantsoa, Ranohira, 600 m, 22°33'S, 45°25'E, fl., fr., Jul. 1910 (P!); *Perrier de la Bâthie 9086*, Prov. Toamasina, forêt d'Andasibe, 1400 m, 18°56'S, 48°25'E, fl., Nov. 1911 (P!); *Perrier de la Bâthie 9088*, Bassin du Matilana, fl., fr., Oct. 1911 (P!); *Perrier de la Bâthie 14404*, Prov. Fianarantsoa, Massif d'Andringitra, 1800 m, 22°14'S, 46°56'E, fl., fr., 28 Oct. 1922 (MO!, P!); *Perrier de la Bâthie 18314*, Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., Oct. 1922 (MO!, P!); *Perrier de la Bâthie 18333*, Prov. Antananarivo, Ambatolaona, 18°56'S, 47°54'E, fl., fr., Dec. 1927 (MO!, P!); *Pervillé 698*, Prov. Antsiranana, Île Nossi Be, 13°18'S, 48°16'E, fl., fr., 19 Mar. 1841 (P!); *Prudhomme 61*, Prov. Antananarivo, Tananarive et les environs, 18°55'S, 47°32'E, fl., fr., 4 Apr. 1897 (P!); *Rakotovao, Razafindrabe, Zjhra & Hutcheon 135*, Prov. Fianarantsoa, Ivohibe, Ambarongy, Réserve Naturelle Intégrale d'Andringitra, près du campement n° 1, au N de la fleuve d'Iatara, 720 m, 22°13'20"S, 47°01'29"E, fl., fr., 12 Oct. 1994 (P!); *Réserve Naturelles: RN 1574*, Prov. Toamasina, Réserve Naturelle Zahamena, Nonokambo, 17°45'S, 48°45'E, fl., fr., 11 Nov. 1948 (P!); *Réserve Naturelles: RN 8493*, Prov. Fianarantsoa, Réserve Naturelle d'Andringitra, 22°14'S, 46°56'E, fl., fr., 28 Oct. 1956 (P!, TAN!); *Réserve Naturelles: RN 8496*, Prov. Fianarantsoa, Réserve Naturelle d'Andringitra, 22°14'S, 46°56'E, fl., fr., 28 Oct. 1922 (P!); *Réserve Naturelles: RN 11290*, Prov. Toamasina, Réserve Naturelle Zahamena, 17°39'S, 48°50'E, fl., fr., 16 Jul. 1960 (P!); *Rotereau s.n.*, Prov. Toamasina, Analakely, 17°41'S, 49°31'E, fl., fr., 1906 (P!); *Scott-Elliott 2071*, Prov. Fianarantsoa, open grassy country, Fianarantsoa, fl., fr., s. date (K!); *Service Forestier: SF 687-R-174 (Rakotovao)*, Prov. Fianarantsoa, Antanifotsy, 22°06'S, 46°54'E, fl., fr., 6 Dec. (P!); *Seyrig 492*, Prov. Toliara, Ampandrandava, 1000-1200 m, dans les endroits détruits de la forêt de Belambo, 24°05'S, 45°42'E, fl., fr., Jan. 1943 (P!); *Viguier & Humbert 453*, Prov. Toamasina, Andovoranto, dist. d'Anivorano, terrains vagues à Brickaville, 18°50'S, 49°04'E, fl., fr., 3 Oct. 1912 (MO!, P!); *Viguier & Humbert 966*, Prov. Toamasina, Andovoranto, dist. Moramanga, forêt d'Analama-zoatra, près du col d'Amboasary, 950 m, 18°56'S, 48°26'E, fl., fr., 23 Oct. 1912 (MO!, P!); *Viguier & Humbert 1367*, Prov. Antananarivo, Vakinankaratra, dist. de Betafo, près du sommet du pic de Vohimalaza, 1650 m, 19°51'S, 46°51'E, fl., fr., 18 Nov. 1912 (P!); *Viguier & Humbert 1783bis*, Prov. Antananarivo, dist. d'Ambatolampy, 19°23'S, 47°25'E, fl., fr., 1912 (P!); *Waterlot s.n.*, Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., fr., May 1915 (P!); *Waterlot s.n.*, Prov. Antananarivo, Tananarive, 18°55'S, 47°32'E, fl., fr., Jan. 1916 (P!).
- COMORES: *Benson 257*, Anjouan, M'Remani, 800 m, fl., fr., 10 Oct. 1958 (BM!); *Boivin s.n.*, Grande Comore, fl., fr., s. date (P!); *Boivin 3231*, Mayotte, 12°45'S, 45°07'E, fl., fr., s. date (P!); *D'Arcy 17570*, Anjouan, top of ridge N of saddle between Koki and Chandra, NE part of island, fl., 10 Aug. 1987 (MO!); *Floret 943*, Grande Comore, centre Sud à bords du village de Kourani, 800 m, 11°48'S, 43°12'E, fl., fr., 1975 (P!); *Humboldt 97*, Comoro Islands, fl., fr., s. date (BM!, K!, MO!); *Humboldt 1197*, Comoro Islands, fl., fr., s. date (P!); *Meller s.n.*, Johanna Island, fl., fr., Apr. 1861 (K!).

4. *Cynoglossum lowryanum* J.S. Mill., sp. nov.

Haec species inter congeneros madagascarienses quoad nucas dorsaliter plusminusve uniformiter glochidiatas atque folia margine non integra ad Cynoglossum monophlebium maxime accedit, sed ab eo foliis inferioribus in rosulam basalem dispositis e basi obtusa rotundatave secus petiolum per 5-10 mm abrupte decurrentibus margine minute erosis undulatisve distinguitur.

TYPUS. — Perrier de la Bâthie 2206, Madagascar, Prov. Toamasina, bassin du l'Onive-Mangoro, Forêt d'Andasibe, 1400 m, 18°56'S, 48°25'E, fl., fr., Nov. 1911 (holo-, P!).

Annual? herb with a slightly woody taproot 3-4 mm in diam.; stems erect, 50-80 cm tall, nearly glabrous with only a few scattered, thin hairs. Basal leaves in a loose rosette; blades ovate, 2.5-3.5 cm long, 1.8-2.2 cm wide, the apex acuminate, the base obtuse to rounded and then abruptly decurrent along the petiole for 5-10 mm, the margin nearly entire, minutely erose to undulate with magnification, the adaxial surface strigose, the abaxial surface sparsely strigose, the venation brochidodromous, the midrib impressed on both surfaces, the tertiary venation obscure; petioles 2.5-4 cm long, sparsely pubescent; the lower cauline leaves on petioles to 2 cm long, the upper sessile; blades ovate to elliptic, 2-5 cm long, 0.9-2.6 cm wide, the apex acute to acuminate, the base obtuse to acute and abruptly and evidently decurrent along the petiole (if present), the margin minutely erose, the indument and venation similar to those of the basal leaves.

Inflorescences terminal, sparsely-branched cymes with evenly-spaced flowers, the branches strigose; flowers bisexual, borne on pedicels 3-10(-22) mm long; sepals 2-2.5 mm long, 1-1.2 mm wide, the apex acute, strigillose; corolla blue, campanulate, the tube *c.* 1.5 mm long, with 5 saccate, slightly granular faucal appendages, the lobes widely ovate, *c.* 1.5 mm long, 1.5 mm wide; anthers borne just beneath the faucal appendages, *c.* 0.8 mm long, sessile or nearly so; ovary less than 1 mm tall, style *c.* 1 mm long, stigma capitate.

Fruits *c.* 5 mm broad; nutlets ovoid, *c.* 2.5 mm broad, margin with a raised glochidiate wing, the dorsal surface with glochidia in a median line and

a few scattered glochidia between the median line and margin. — Fig. 3.

Cynoglossum lowryanum is puzzling in that it occurs near Andasibe, a relatively well-collected locality, but has only been collected once, nearly a hundred years ago. Yet it is a very distinctive species in its growth habit, the shape and margin of its leaves, and in having nutlets with glochidia concentrated along the marginal ridges. Although PERRIER DE LA BÂTHIE described this plant as annual on the label of the type, it appears to have a substantially thickened root.

The species is named in honor of my friend and fellow botanist, Porter P. LOWRY II, who has contributed greatly to our understanding of the botany of Madagascar and has provided much encouragement for those working on the flora of Madagascar.

DISTRIBUTION. — *Cynoglossum lowryanum* is known only from the type collection from Andasibe (Fig. 4) made at 1400 m in elevation.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Critically Endangered (CR B1ab(i-iv) + 2ab(i-iv)). *Cynoglossum lowryanum* has not been collected since 1911 and it is questionable whether this species still survives.

5. *Cynoglossum monophlebium* Baker

J. Linn. Soc. Bot. 20: 211 (1884). — Type: *Baron 1871*, Madagascar, Central Madagascar, fl., fr., Oct. 1882 (lecto-, K!; iso-, P!).

Perennial herb, lacking an evident rosette, from a woody taproot (apparently sometimes flowering in the first year and lacking the taproot at that stage); stems erect, with a few scattered siliceous hairs or glabrous. Leaves alternate, those at the base larger, but otherwise not morphologically different from the cauline leaves; blades oblanceolate to linear, 2.5-5(-7.5) cm long, 2.5-10(-15) mm wide, the apex obtuse to rounded, the base clasping, the margin unevenly serrate, sometimes minutely so, or undulate, the adaxial surface moderately to sparsely strigillose, sometimes unevenly so, the hairs thin, the abaxial surface sparsely to moderately strigose, more densely so

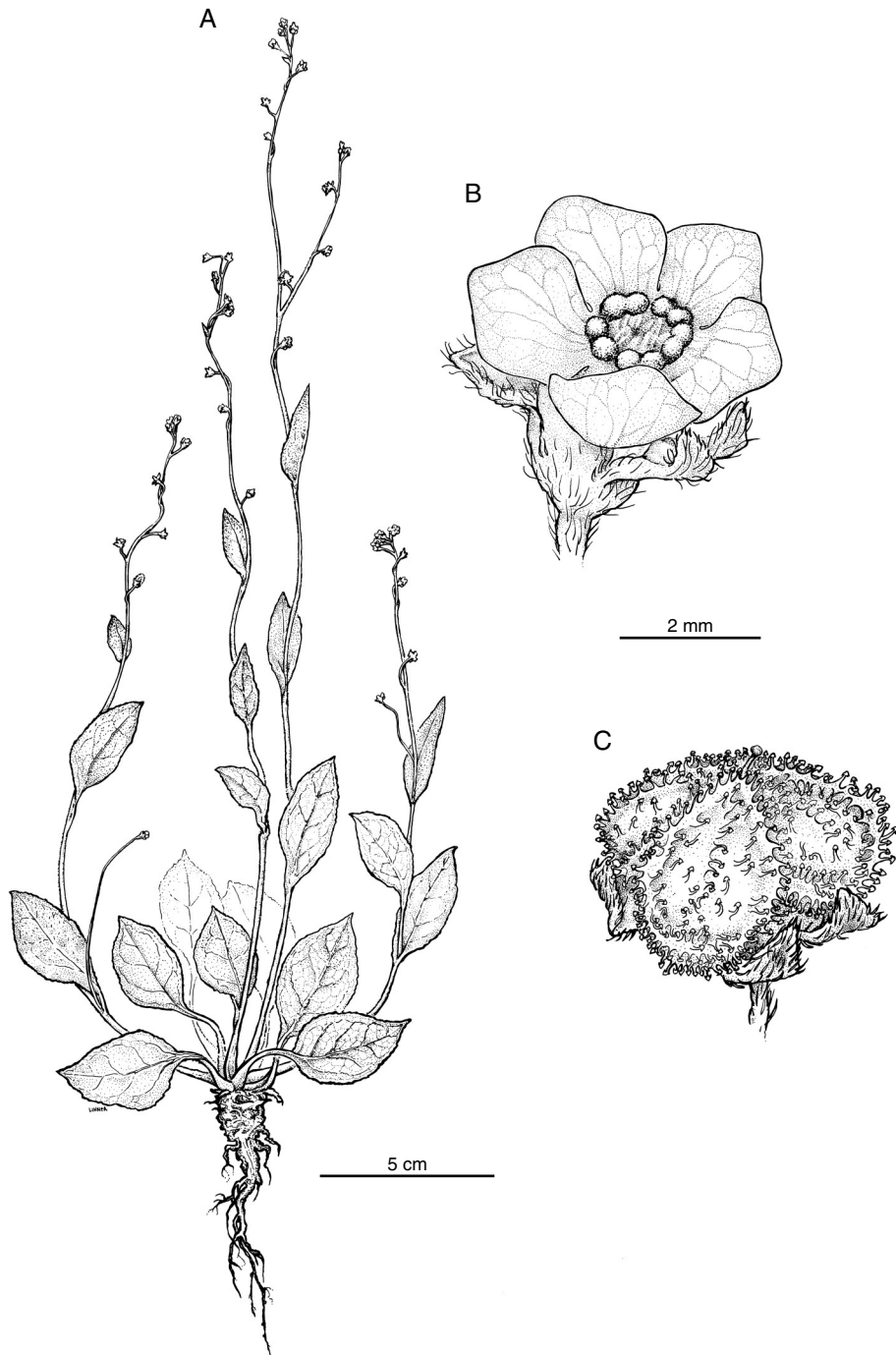


FIG. 3. — *Cynoglossum lowryanum* J.S.Mill.: A, flowering plant; B, flower; C, nutlets. Perrier de la Bâthie 2206 (P).

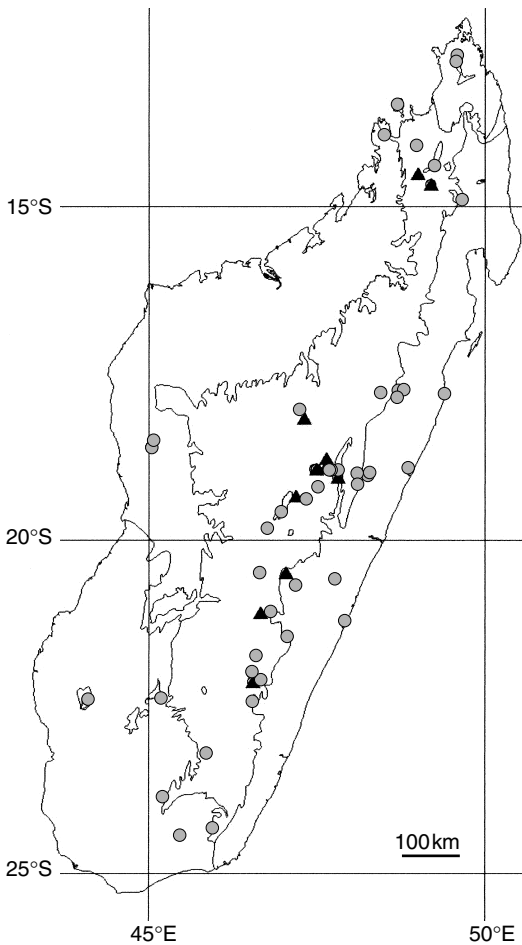


FIG. 4. — Distributions of the non-endemic species of *Cynoglossum* mapped on the bioclimatic zones of Madagascar (after CORNET 1974; see SCHATZ 2000): *C. cernuum* Baker (▲), *C. lanceolatum* Forssk. (●).

on the midrib, the hairs thicker than those on the adaxial surface; midrib impressed on the adaxial surface, the secondary venation obscure.

Inflorescences terminal, the stems usually branched multiple times into multi-flowered cymes; flowers bisexual, borne on slender pedicels 0.5–4 mm long; sepals ovate, 1.3–1.5 mm long, 0.5–0.6 mm wide, acute at the apex, evenly strigillose; corolla blue, campanulate, the tube *c.* 1.3 mm long, with small papillate, saccate faecal appendages, the lobes ovate to widely ovate, 1.5 mm long, 1.5–2 mm wide; anthers borne just

beneath the faecal appendages, 0.5 mm long, nearly sessile; ovary *c.* 0.3 mm tall, style 0.3–0.5 mm long, the stigma capitate.

Fruits 3–4 mm broad; nutlets ovoid, 1.5–2 mm broad, the margin with a glochidiate wing, the dorsal surface evenly glochidiate.

This is a very distinctive species, in its perennial, non-rosette growth habit, nearly glabrous stems, distinctive leaves with odd, uneven serration, very small flowers, and uniformly glochidiate fruits.

DISTRIBUTION. — *Cynoglossum monophlebium* is restricted to south-central Madagascar (Fig. 4), where it occurs on the massif at Ankaratra and also near Ihosy, from 1400–2300 m in elevation.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU B1ab(i-iv)). *Cynoglossum monophlebium* has a restricted distribution within central Madagascar but appears not to be uncommon where it does occur.

MATERIAL EXAMINED. — MADAGASCAR: *Baron 360*, Central Madagascar, fl., s. date (K!); *Baron 2009*, Central Madagascar, fl., fr. (fasciated abnormal growth), Oct. 1882 (K!, P!); *Baron 3307*, Central Madagascar, fl., fr., s. date (K!, P!); *Bosser 8712*, Prov. Antananarivo, Nanokely, Ankaratra, 19°33'S, 47°09'E, fl., Nov. 1955 (MO!, P!, TAN); *Bosser 8816*, Prov. Antananarivo, Ambohimandroso, près d'Ambatolampy, cultures et jachères sur alluvions récentes de l'Onive, 1500 m, 19°32'S, 47°26'E, fl., fr., Dec. 1955 (P!, TAN); *Croat 29069*, Prov. Antananarivo, massif l'Ankaratra, station forestière Manjakatampo, near Sommet Nosiarivo, 1950 m, 19°20'S, 47°15'E, fl., fr., 22 Jan. 1975 (MO!, P!); *Croat 29089*, Prov. Antananarivo, vicinity of station forestière Antsampanrano, 1750 m, 19°36'S, 47°03'E, fl., fr., 23 Jan. 1975 (MO!, P!); *Decary 15053*, Prov. Fianarantsoa, Ihosy, 22°24'S, 46°08'E, fl., 9 Oct. 1939 (MO!, P!); *Jacquemin H243J*, Prov. Antananarivo, sur rocher en trachyte de l'Ambohimirandana, station forestière de l'Ankaratra, 19°20'S, 47°27'E, fl., 27 Feb. 1966 (P!); *Le Myre de Vilers s.n.*, s. loc., fl., s. date (P!); *Peltier & Peltier 1835*, Prov. Antananarivo, Manjakatampo, Sommet Anosiarivo, 19°22'S, 47°18'E, fl., 3 Feb. 1960 (P!); *Perrier de la Bâthie 9089*, Prov. Antananarivo, alluvions de l'Onive à Tsinjoarivo, 1400 m, 19°38'S, 47°42'E, fl., fr., Sep. 1911 (P!); *Perrier de la Bâthie 18312*, Prov. Antananarivo, Antsirabe, 19°51'S, 47°02'E, fl., Oct. 1927 (P!); *Schlieben 8150*, Prov. Antananarivo, Antsirabe, 1500 m, 19°51'S, 47°02'E, fl., 13 Dec. 1959 (BM!, K!); *Viguier & Humbert 1708*, Prov.

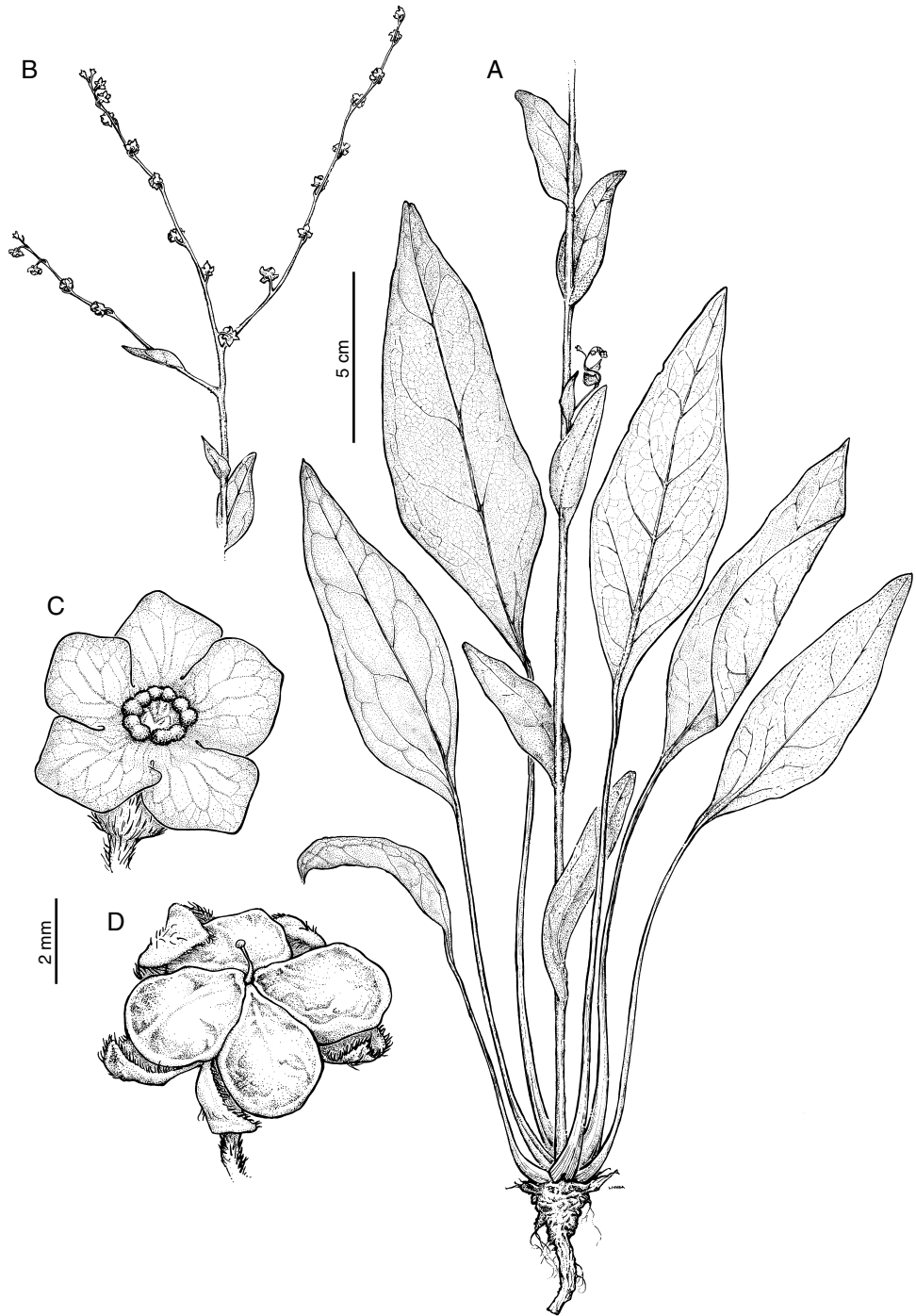


FIG. 5. — *Cynoglossum tsaratananense* J.S.Mill.: **A**, flowering plant; **B**, upper portion of inflorescence; **C**, flower; **D**, nutlets. Perrier de la Bâthie 16465 (MO).

Antananarivo, flanc W de l'Ankaratra, entre Ambatofotsy et le Tsiarafajavona, 2000-2300 m, 19°21'S, 47°15'E, fl., 27 Nov. 1912 (P!).

6. *Cynoglossum tsaratananense* J.S. Mill., sp. nov.

Haec species inter congeneros madagascarienses quoad nuculas dorsaliter glabras 4-5 mm latas atque fructum in diam. 7-10 mm ad Cynoglossum birkinshawii maxime accedit, sed ab eo foliorum basaliium laminis anguste ellipticis usque lanceolatis 11-17(-20) cm longis apice acutis usque leviter acuminatis atque petiolis 10-20 cm longis distinguitur.

TYPUS. — *Perrier de la Bâthie 16465*, Madagascar, Prov. Antsiranana, massif de Tsaratanana, près des eaux, 2600 m, 13°57'S, 48°52'E, fl., fr., Apr. 1929 (holo-, P!; iso-, MO!, P!).

Perennial herb from a woody taproot 3-5 mm in diam.; stems erect to 55 cm, with scattered, thin, appressed to erect hairs; basal leaves clustered in a loose rosette of 5-10, blades narrowly elliptic to lanceolate, 11-17(-20) cm long, 2.5-5.5 cm wide, the apex acute to slightly acuminate, the base cuneate to attenuate, the margin entire, the adaxial surface with scattered appressed hairs, the abaxial surface with short, appressed hairs or nearly glabrous, but evenly strigose on the midrib; venation brochidodromous, the midrib impressed on the adaxial surface; secondary and tertiary veins visible on the abaxial surface; petioles 10-20 cm long, canaliculate on the adaxial surface, glabrous or with scattered hairs; cauline leaves alternate, sessile, blades lanceolate to ovate, 3.5-8 cm long, 1-2.5 cm wide, the apex acute to obtuse, the base obtuse to clasping, the margin entire.

Inflorescences terminal, the stems usually branched multiple times into multi-flowered cymes; flowers bisexual, borne on pedicels 2-6 mm long; sepals ovate, 2-2.5 mm long, 1-1.3 mm wide, acute to obtuse at the apex, sparsely to moderately strigillose; corolla blue, campanulate, the tube 2-2.5 mm long, with 5 saccate granular faucal appendages, the lobes widely depressed ovate, 1.5-2 mm long; anthers borne just beneath the faucal appen-

dages, *c.* 1 mm long, sessile or nearly so; ovary less than 1 mm tall, style *c.* 1 mm long, stigma capitate.

Fruits 7-10 mm broad; nutlets ovoid, 4-5 mm broad, margin with an entire wing, the dorsal surface glabrous, glochidia completely absent. — Fig. 5.

DISTRIBUTION. — *Cynoglossum tsaratananense* is known only from the type collection made at 2600 m on Tsaratanana in north-central Madagascar (Fig. 4).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Critically Endangered (CR B1ab(i-iv) + 2ab(i-iv)). *Cynoglossum tsaratananense* has been collected only once, and not since 1929, and it is questionable whether this species still survives, although its single known locality is within a protected area.

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