EDINBURGH JOURNAL OF BOTANY 64 (2): 253–268 (2007) 

doi:10.1017/S0960428607000935

# A REVISION OF *GENTIANELLA*, *COMASTOMA* AND *GENTIANOPSIS* (*GENTIANACEAE*) IN NEPAL

E. AITKEN

The genus *Gentianella* in Nepal is revised and five species are recognized: *G. angustiflora* Harry Sm., *G. azurea* (Bunge) Holub, *G. glanduligera* Airy Shaw, *G. lowndesii* Harry Sm. and *G. moorcroftiana* (Wall. ex G.Don) Airy Shaw. *Gentianella maddenii* (C.B.Clarke) Airy Shaw, usually treated as a distinct species, is placed in synonymy of *G. moorcroftiana*. The genus *Comastoma* in Nepal is revised, four species are recognized and one new combination is made: *C. falcatum* (Turcz. ex Kar. & Kir.) Toyok., *C. pedunculatum* (D.Don) Holub, *C. stellariifolium* (Franch.) Holub and *C. urnigerum* (E.Aitken & D.G.Long) E.Aitken *comb. nov*. The genus *Gentianopsis* in Nepal is revised and three species are recognized: *G. contorta* (Royle) Ma, *G. paludosa* (Hook.) Ma and *G. vvedenskyi* (Grossh.) Pissjauk.

*Keywords.* *Comastoma*, *Gentianella*, *Gentianopsis*, Nepal, taxonomy.

## INTRODUCTION

In the revision of *Gentianaceae* for the *Flora of Bhutan* Vol. 2 Part 2 (Aitken, 1999), the genus *Gentianella* was treated in the broad sense, to include *Comastoma*, *Aloitis*, *Aliopsis* and *Gentianopsis*, as it seemed an appropriate arrangement for such a localized study and also followed the herbarium arrangement at E, K and BM (see Aitken & Long, 1994). This led to occasional problems as to which generic names were appropriate in studies covering wider geographical areas as there is no generally accepted worldwide treatment of generic limits. Von Hagen & Kadereit (2001) have found good molecular evidence to separate *Comastoma* from *Gentianella* s.str. However, their findings also indicate that the relationships between *Gentianella* s.str., *Comastoma*, *Gentianopsis*, *Lomatogonium* and *Swertia* p.p. are very complex and further sampling is required to obtain more clearly defined groupings.

The *Checklist of the Flowering Plants of Nepal* (Press *et al.*, 2000) and the *Flora of China* (Ho & Pringle, 1995) have treated *Comastoma* and *Gentianopsis* as separate genera from *Gentianella*, and the same treatment is followed here. This also makes it necessary to transfer *Gentianella urnigera* to the genus *Comastoma*, making it *Comastoma urnigerum* (E.Aitken & D.G.Long) E.Aitken.

*Notes.* Geographical distributions are cited in accordance with the forthcoming *Flora of Nepal*: e.g. **W** corresponds to Mid Western and Far Western Development

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK. E-mail: e.aitken@rbge.ac.uk

Regions, **C** to Central and Western Development Regions and **E** to Eastern Development Region.

All specimens have been seen unless otherwise indicated.

*Key to the genera*

1a. Corolla with fringe of thick, white, non-vascularized fimbriae in throat _____ **2. Comastoma**

1b. Corolla without fringe of fimbriae in throat _____ 2

2a. Calyx tubular, 4-angled, lobes in unequal pairs; intracalycular membrane present _____ **3. Gentianopsis**

2b. Calyx divided almost to base, lobes sometimes unequal but not in pairs; intracalycular membrane absent _____ **1. Gentianella**

## 1. GENTIANELLA Moench, Meth. Pl. 482 (1794)

Annual, biennial or perennial herbs. Leaves opposite. Flowers 4- or 5-merous, terminal, solitary or in cymes. Calyx divided almost to base, without intracalycular membrane. Corolla tubular, subcampanulate or funnel-shaped, without appendages or plicae. Nectaries 8 or 10 at base of corolla tube, double the number of corolla lobes. Stamens attached at middle or base of corolla tube. Ovary sessile or with distinct stipe. Stigmas 2, prominent, sessile or subsessile. Capsules 2-valved. Seeds smooth to warty.

About 125 species: N and S temperate zones worldwide; five species in Nepal. – Type species: *Gentianella tetranda* Moench, based on *Gentiana campestris* L. = *Gentianella campestris* (L.) Börner.

*Key to species of* Gentianella

1a. Flowers tubular, in elongated, narrow cymes; calyx usually less than half corolla length _____ **1. G. angustiflora**

1b. Flowers funnel-shaped, hypocrateriform or subcampanulate; calyx more than half corolla length _____ 2

2a. Flowers hypocrateriform or subcampanulate; calyx with distinct blackish margin; ovary sessile _____ **2. G. azurea**

2b. Flowers funnel-shaped; calyx without blackish margin; ovary not sessile ___ 3

3a. Lower leaves elliptic; flowers angled; corolla lobes very short, about ¼ length of tube _____ **4. G. lowndesii**

3b. Lower leaves lanceolate or linear; flowers not angled; corolla lobes more than ¼ length of tube _____ 4

4a. Leaves linear, 5–10 × 1–2 mm; calyx tube 1–2 mm; corolla 9–12 mm long __ **3. G. glanduligera**

4b. Leaves linear to lanceolate, 6–20(–30) × 1–4 mm; calyx tube usually more than 2 mm; corolla (9–)11–27 mm long **5. G. moorcroftiana**

**1. Gentianella angustiflora** Harry Sm., [ex Nilsson in Grana Palyn. 7: 106 (1967), nom. nud.] J. Jap. Bot. 56: 275 (1981). – Type: C Nepal: Manang district, Sabze Khola, 13,000 ft, 5 ix 1950, *D.G. Lowndes* 1490 (holo BM). **Fig. 1.**

Annual to 25 cm tall. *Stems* erect or slightly decumbent, often reddish, angular or ridged, scabrous. *Basal leaves* withered at flowering time; stem leaves sometimes reddish, lanceolate to elliptic, 4–12 × 1–3 mm, acute. *Inflorescence* of elongated, narrow cymes. *Pedicel* 3–12 mm. *Flowers* 4- or 5-merous, often angled up to 90° on pedicel. *Calyx* scabrous, green or reddish; tube c.1 mm; lobes unequal, lanceolate, 2–4 × 0.5–1 mm, slightly spreading, acute, sometimes narrowed at base. *Corolla* dark blue or purple, narrowly tubular; tube 4–8 mm; lobes oblong or ovate, 2–3 × 0.5–2 mm, subacute or rounded. *Filaments* 1–1.5 mm; anthers yellow, ellipsoid,

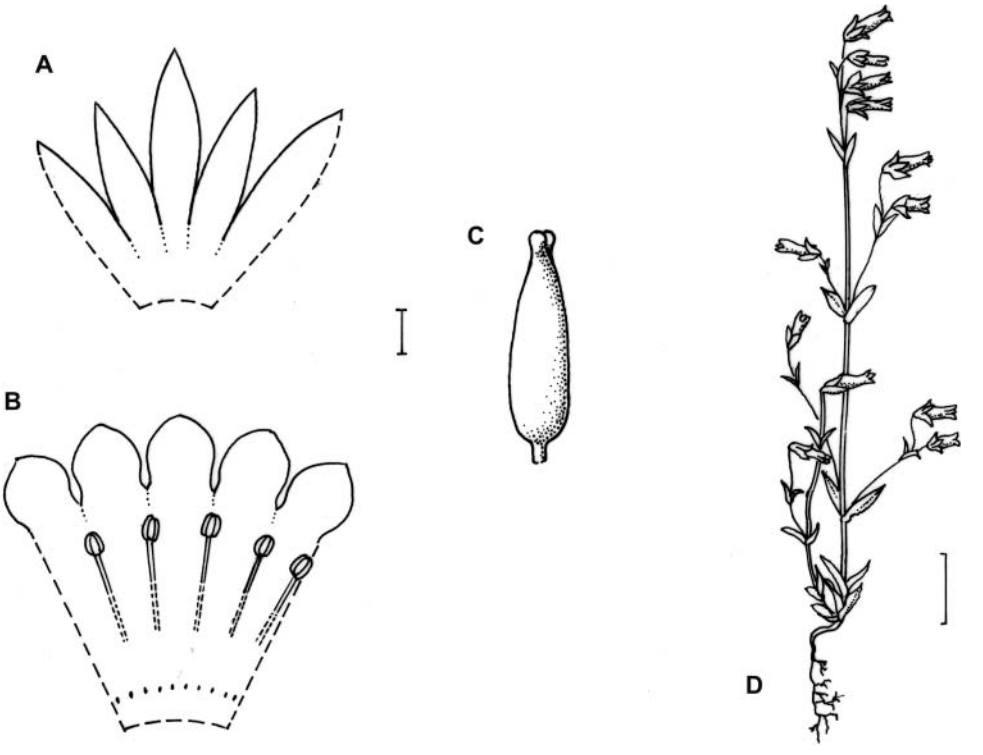


FIG. 1. *Gentianella angustiflora* Harry Sm. A, calyx; B, corolla; C, ovary; D, habit. A, B & C based on *Polunin, Sykes & Williams* 5365; D based on *Stainton, Sykes & Williams* 5310. Scale bars: 1 mm (A–C), 1 cm (D).

c.0.5 mm. *Ovary* sessile, narrowly ellipsoid, 3–7 × 1–2 mm. *Style* indistinct; stigma lobes suborbicular. *Capsule* 6–11 × 1–2 mm, protruding slightly from corolla. *Seeds* smooth.

*Distribution.* W, C and E Nepal [W Himalaya (Kashmir); Tibetan Plateau (China: Xizang)].

*Ecology.* Open grass slopes or in sand among rocks on river bed; 1220–4570 m. Flowering and fruiting August–September.

*Specimens examined.* **W:** Dolpa district, 4 miles west of Tingkyu, c.4200 m, 5 xiii 1973, *Grey-Wilson & Phillips* 509 (K); Lulo Khola, 15,000 ft, 19 ix 1952, *Polunin, Sykes & Williams* 3516 (BM, E); Jangla Banyang, 3800 m, 18 viii 1973, *Einarsson, Skärby & Wetterhall* 3568 (BM). Mugu district, Khaptang, Mugu Khola, 15,000 ft, 21 viii 1952, *Stainton, Sykes & Williams* 5363 (BM, E). Rukum district, East of Chalike Pahar, 4000 ft, 21 ix 1954, *Stainton, Sykes & Williams* 4523 (BM, E). **C:** Mustang district, Bhena, 28°59′N, 83°48′E, 3780 m, 26 viii 2001, *G. & S. Miehe* 01-072-24 (E); Pass between Narsing and Yak Khola, 28°54′N, 83°58′E, 4770 m, 8 viii 2001, *G. & S. Miehe* 01-017-22 (E); Sandah, north of Tukucha, 13,500 ft, 18 viii 1954, *Stainton, Sykes & Williams* 7310 (BM, E). Manang district, north aspect of Annapurna, 3900 m, 28 ix 2004, *Chaudhary, Bhatta & Subedi* 490 (TUCH, photocopy at E). **E:** Sankhuwasabha district, Nehe Kharka, S side of Barun Khola, 3730 m, 30 ix 1991, *EMAK* 430 (E).

*Note.* Garg (1987) made this a synonym of *G. azurea* (Bunge) Holub. Although the flowers of *G. azurea* are also angled on the pedicels it has several distinct differences, described below.

**2. Gentianella azurea** (Bunge) Holub, Folia Geobot. Phytotax. 2: 116 (1967). – *Gentiana azurea* Bunge, Nouv. Mém. Soc. Nat. Mosc. 7: 230, t.10, fig.3 (1829). – *Aloitis azurea* (Bunge) Omer, Fl. Pakistan 197: 109 (1995). – Type: Russia, Siberia, Baikal, 1821, *Bunge* s.n. (holo LE, digital image; iso G-DC, microfiche).

Annual to 7 cm tall. *Stems* ascending, branched diffusely from base and above, ridged, scabrous. *Basal leaves* often withered at flowering time; stem leaves ovate to lanceolate, 3–7 × 2–3 mm, acute, sometimes with blackish margin. *Inflorescence* of loose, few-flowered cymes. *Pedicel* 10–40 mm. *Flowers* 5-merous. *Calyx* tube 1–2 mm; lobes elliptic to lanceolate, 3–4 mm, with distinct blackish margin. *Corolla* deep blue, subcampanulate or hypocrateriform; tube 4–5 mm; lobes ovate, 3–4 × 1–2 mm, acute. *Filaments* 2–3 mm; anthers blue, c.1 mm. *Ovary* sessile, narrowly ellipsoid, 6–7 × 1 mm. *Style* indistinct; stigma lobes suborbicular. *Capsule* not seen.

*Distribution.* W Nepal [Tibetan Plateau (Qinghai, Xinjiang, Xizang); E Himalaya (Bhutan); W Himalaya (Pakistan); E Asia (China: Gansu, NW Sichuan, NW Yunnan); C and N Asia (Kazakhstan, Kyrgyzstan, Mongolia, Siberia)]. Not previously recorded from Nepal.

*Ecology.* Open hillsides; c.5000 m. Flowering August.

*Specimens examined.* **W:** Dolpa district, West side of Khung Khola, c.5000 m, 19 xiii 1973, *Grey-Wilson & Phillips* 678 (2 sheets, K).

*Note. Gentiana marginata* Turcz. ex Bess. has been included as a synonym of *G. azurea* by various authors but no type specimen is available to allow the validity of this to be assessed.

**3. Gentianella glanduligera** Airy Shaw in Hooker's Icon. Pl. 35: t.3431 (1943). – *Gentianella maddenii* var. *glanduligera* (Airy Shaw) S.Agrawal, Indian Forester 109: 576 (1983). – Type: Cult. ex Nepal. Grown in Mr. C. T. Musgrave's garden at Hascombe, near Godalming, Surrey from seeds sent by Mr. Hay, Oct. 1939 "Seed no. 69" (holo K).

Ascending or erect annual to 11 cm tall. *Stems* branched from base and above, purplish red. *Leaves* green above, often slightly purplish beneath, linear, 5–10 × 1–2 mm, acute, bases shortly connate and minutely scaberulous-papillose. *Inflorescence* of loose cymes. *Pedicel* 5–20 mm. *Flowers* 5-merous. *Calyx* tube 1–2 mm, purplish; lobes green within, purple outside, linear to subspathulate, 4–7 × 1–2 mm, acute, slightly fleshy, minutely papillose, apex spreading. *Corolla* funnel-shaped; tube green at base, 5–7 mm, whitish inside; lobes purple to greenish blue outside, bright purplish blue inside, oblong, 4–5 × 1–2.5 mm, obtuse or subacute, contorted in bud. *Filaments* 5–6 mm; anthers deep purple, 0.5 mm. *Ovary* narrowly ellipsoid or oblong, 5–7.5 × 1–2 mm; stipe 0.5–0.75 mm. *Style* indistinct or c.1 mm. *Stigma* ligulate, bluish, 1.5 mm, densely papillose, shortly decurrent on ovary, recurved. *Capsule* not seen.

*Distribution.* C Nepal [W Himalaya (India: Kumaon?)].

*Ecology.* Open grassy hillsides; 2800–4575 m. Flowering September–October.

*Specimens examined.* **C:** Manang district, Khangsar, 15,000 ft, 9 xi 1950, *D.G. Lowndes* 1503 (BM); Marsyandi valley: on alluvions above Chame, 2800 m, 24 ix 1969, *T. Wraber* 386 (BM). Mustang district, E of Thorong-La, 14,200 ft, 9 xi 1977, *G. Miehe* 642 (BM); Chalungpa, above Jelua Forest, 28°53′N, 83°44′E, 4350 m, 6 ix 2001, *G. & S. Miehe* 01-111-07a (E); Chalungpa, above Jelua Forest, 28°53′N, 83°44′E, 4350 m, 6 ix 2001, *G. & S. Miehe* 01-111-06 (E).

*Note.* As *Gentianella glanduligera* was originally described from cultivated material, there seems to have been some doubt regarding its status as a species. Airy Shaw (1943) recognized a close relationship with *Gentianella maddenii.* Agrawal (1983) considered it to be a cultivated form of *G. maddenii* and reduced it to *Gentianella maddenii* var. *glanduligera* (Airy Shaw) S.Agrawal. She based this on one specimen, *T.A. Rao* 4589 (BSD) from Kumaon, the identity of which has not been verified here. Depauperate forms of *Gentianella maddenii* or *G. moorcroftiana* differ from *G. glanduligera* in having proportionally much larger, elongated flowers in relation to the plant size.

**4. Gentianella lowndesii** Harry Sm., J. Jap. Bot. 56: 276 (1981). – Type: C Nepal: Manang district, Bimtakothi, *D.G. Lowndes* 1541 (holo BM).

Erect biennial to 20 cm tall. *Stems* simple or with few branches, sometimes reddish. *Leaves* lanceolate, 3–20 × 1–4 mm, acute, sometimes dark reddish purple; upper stem leaves often whorled and larger than lower leaves. *Inflorescence* one-flowered or of loose, few-flowered cymes. *Pedicel* 6–40 mm. *Flowers* 5-merous, angled on pedicel up to 90° when mature. *Calyx* tube 3–5 mm; lobes lanceolate to spathulate, slightly unequal, 4–10 × 1–3 mm, acute, narrowing at base. *Corolla* funnel-shaped, purplish blue, red-violet or lilac, sometimes with darker stripes; tube (8–)10–18 mm; lobes oblong or ovate, 2–4 × 2–4 mm, rounded or obtuse. *Filaments* (4–)8–10 mm; anthers 1–1.5 mm. *Ovary* cylindrical, (5–)9–10 × (1–)2–3 mm; stipe (2–)3–4 mm. *Style* absent. *Stigmas* flattened, c.1 mm, recurved. *Capsule* not seen.

*Distribution.* Endemic to W and C Nepal.

*Ecology.* Glacial moraine, rock ledges or silt; 3800–4570 m. Flowering August–September.

*Specimens examined.* **W:** Dolpa district, Lulo Khola, 15,000 ft, 18 ix 1952, *Polunin, Sykes & Williams* 3479 (BM, E); Rohagaon, Suli Gad, 11,000 ft, 14 ix 1952, *Polunin, Sykes & Williams* 3382 (mixed sheet with *G. moorcroftiana*) (BM). Jumla district, Munigaon, 3800 m, 27 viii 1973, *Einarsson, Skärby & Wetterhall* 3725 (BM). **C:** Manang district, Bimtakothi, 13,500 ft, 27 viii 1950, *Lowndes* 1470 (BM).

**5. Gentianella moorcroftiana** (Wall. ex G.Don) Airy Shaw in Hooker's Icon. Pl. 35: sub t.3431 (1943). – *Gentiana moorcroftiana* Wall. [Cat.154, n.4390 (1831), nom. nud.] ex G.Don, Gen. Syst. 4: 182 (1838). – *Aloitis moorcroftiana* (Wall. ex G.Don) Omer, Qaiser & Ali, Pakistan J. Bot. 20: 57 (1988). – Type: From Srinuggar to Luddak, *Moorcroft* in *Wallich* 4390 (lecto K-W, first step designation by Omer in Fl. Pakistan 197: 115 (1995), second step, central plant of 5 on sheet, designated here; iso BM, E, K n.v., K-W, digital image).

*Gentiana moorcroftiana* var. *maddenii* C.B.Clarke in Hook.f., Fl. Brit. Ind. 4: 108 (1883). – *Gentianella maddenii* (C.B.Clarke) Airy Shaw in Hooker's Icon. Pl. 35: sub t.3431 (1943). – *Aloitis maddenii* (C.B.Clarke) Omer, Qaiser & Ali, Pakistan J. Bot. 20: 155 (1988). – Type: India: Kumaon, Pinsara Pass, 3270 m, x 1875, *Davidson* s.n. (lecto K, designated here; iso DD n.v.).

Erect annual or biennial to 22 cm tall. Stems, leaves and calyx glabrous or sometimes reddish and finely glandular-papillose. *Stems* single or diffusely branched from base or above. *Lower leaves* withered at flowering time; stem leaves linear to lanceolate, 6–20(–30) × 1–4 mm, acute. *Inflorescence* of many-flowered cymes. *Pedicel* (2–)5–20(–30) mm. *Flowers* 5-merous. *Calyx* tube 2–5 mm; lobes unequal, linear to lanceolate, (2–)4–20 × 0.5–2 mm, acute or rounded, sometimes reflexed at apex or narrowed at base. *Corolla* mauve, blue or pink, often white within; funnel-shaped or

tubular, tube 6–15 mm, lobes oblong to obovoid, (3–)5–12 × 2–5 mm, rounded or acute. *Filaments* 2–6 mm; anthers 1–1.5 mm. *Ovary* narrowly ellipsoid, 8–15 × 1–3 mm; stipe 1–3 mm. *Style* c.1 mm. *Stigma* c.1 mm. *Capsule* not seen.

*Distribution.* W and C Nepal [Tibetan Plateau (Xizang); W Himalaya (Pakistan, India, Kashmir); SW Asia (Afghanistan)].

*Ecology.* Open grass slopes or scree; 2890–5180 m. Flowering August–October.

*Specimens examined.* **W:** Bajhang district, 4 miles NE of Saipal, 17,000 ft, 26 viii 1954, *J.E.M. Arnold* 269 (BM). Dolpa district, Rohagaon, Suli Gad, 11,000 ft, 14 ix 1952, *Polunin, Sykes & Williams* 3382 (mixed sheet with *G. lowndesii*) (BM); Rohagaon, Suli Gad, 11,500 ft, 14 ix 1952, *Polunin, Sykes & Williams* 3393 (BM, E); North-east of Tarap, c.4500 m, 27 viii 1973, *Grey-Wilson & Phillips* 750 (K). Jumla district, Munigaon, SE of Jumla, 9500 ft, 28 ix 1952, *Polunin, Sykes & Williams* 5445 (BM, E); Between Padmara and Jumla, 10,500 ft, 6 x 1952, *Polunin, Sykes & Williams* 5508 (BM, E); Chakura Lekh, 14,000 ft, 29 ix 1952, *Polunin, Sykes & Williams* 5691 (BM). Rukum district, East of Chalike Pahar, 14,000 ft, 23 ix 1954, *Stainton, Sykes & Williams* 4566 (BM, E). **C:** Mustang district, Muktinath, 13,500 ft, 1 x 1954, *Stainton, Sykes & Williams* 8056 (BM); Muktinath, 13,000 ft, 1 x 1954, *Stainton, Sykes & Williams* 8133 (BM, E); Larjung, south of Tukucha, Kali Gandaki valley, 9500 ft, 16 x 1954, *Stainton, Sykes & Williams* 8172 (BM, E); Tukucha, Kali Gandaki valley, 10,000 ft, 15 x 1954, *Stainton, Sykes & Williams* 8155 (BM, E); Chalungpa, above Jelua Forest, 28°53′N, 83°44′E, 4350 m, 6 ix 2001, *G. & S. Miehe* 01-111-07 (E). **District uncertain:** Near Saure Khola, 14,500 ft, 3 x 1954, *Stainton, Sykes & Williams* 4679 (BM, E).

*Notes.* The above synonymy is in accordance with Ho & Pringle (1995). This is an extremely variable species which may occur in very large or dwarf forms which intergrade. Specimens with narrower leaves and more tubular corollas have been treated separately by Clarke (1883) as *Gentiana moorcroftiana* var. *maddenii* and by Airy Shaw (1943) as *Gentianella maddenii*.

### 2. COMASTOMA (Wettst.) Toyok., Bot. Mag. (Tokyo) 74: 198 (1961)

Annual or perennial herbs. Basal leaves in rosette, stem leaves opposite. Flowers 4- or 5-merous, solitary on long pedicels or in loose cymes. Calyx divided almost to base, without intracalycular membrane. Corolla tubular, funnel-shaped or urn-shaped; throat fringed with thick, non-vascularized, white fimbriae; plicae absent. Nectaries at base of corolla tube 8 or 10, double the number of corolla lobes. Stamens attached at middle or towards base of corolla tube; filaments white. Ovary sessile. Stigma sessile. Capsule 2-valved. Seeds smooth.

15 species: North America, Asia, Europe; four species in Nepal. – Type species: *Comastoma tenellum* (Rottb.) Toyok.

*Key to species of* Comastoma

1a. Stem leaves spathulate or obovate with broad petiole; corolla urn-shaped ___ **4. C. urnigerum**

1b. Stem leaves ovate, elliptic or lanceolate, sessile; corolla cylindrical or tubular _____ 2

2a. Stems weak, straggling; stem leaves ovate, up to 3 mm long **3. C. stellariifolium**
2b. Stems ascending; stem leaves, if present, elliptic or lanceolate, usually more than 3 mm long _____ 3

3a. Calyx slightly saccate at base, apex of lobes recurved, acuminate **1. C. falcatum**
3b. Calyx not saccate at base, lobes erect or spreading, acute **2. C. pedunculatum**

**1. Comastoma falcatum** (Turcz. ex Kar. & Kir.) Toyok., Bot. Mag. (Tokyo) 74: 198 (1961). – *Gentiana falcata* Turcz. ex Kar. & Kir., Bull. Soc. Nat. Mosc. 15: 404 (1842). – *Gentiana tenella* Turcz. ex Kar. & Kir. var. *falcata* C.B.Clarke in Hook.f., Fl. Brit. Ind. 4: 110 (1885). – *Gentianella falcata* (Turcz. ex Kar. & Kir.) Harry Sm. in Nilsson, Grana Palyn. 7: 144 (1967). – Type: Baikal, in humidis alpis Nuchusaban, 1834, *Turczaninow* (lecto LE, designated here, digital image). **Fig. 2.**

Ascending annual to 20 cm tall. *Stems* branching from base. *Leaves* elliptic, usually clustered at base, stem leaves few, 7–20 × 2–5 mm, acute. *Inflorescence*

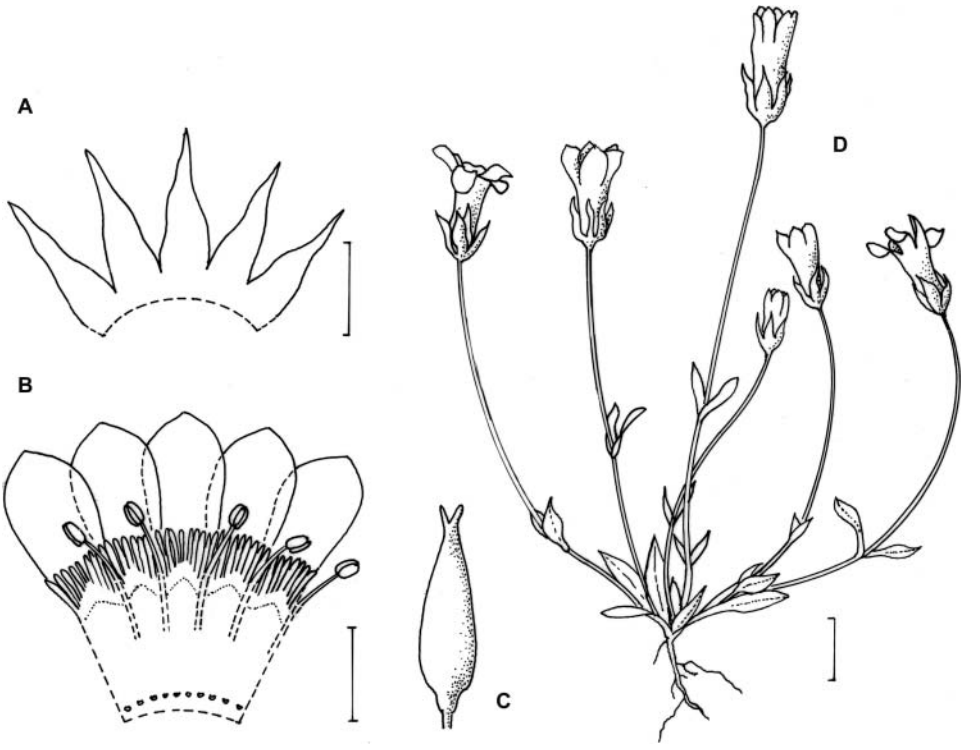


FIG. 2. *Comastoma falcatum* (Turcz. ex Kar. & Kir.) Toyok. A, calyx; B, corolla; C, ovary; D, habit. Based on *Stainton, Sykes & Williams* 7258. Scale bars: 5 mm (A–C), 1 cm (D).

one-flowered. *Pedicel* (10–)20–120 mm. *Flowers* 5-merous. *Calyx* tube 1–2 mm, slightly saccate at base; lobes unequal, lanceolate, 4–9 × 1–3 mm, apex acuminate, often recurved. *Corolla* tubular, blue-violet or dark blue; tube 5–10 mm; lobes oblong, 4–8 × 2–4 mm, spreading, obtuse or acute. *Filaments* 3–5 mm; anthers 1–1.5 mm, yellow. *Ovary* narrowly ellipsoid, 8–10 × 1–3 mm. *Capsule* not seen.

*Distribution.* W, C and E Nepal [Tibetan Plateau (Qinghai, Xinjiang, Xizang); W Himalaya (Pakistan, India, Kashmir); E Asia (China: Gansu, Hebei, Nei Mongol, Shanxi, NW Sichuan); N and C Asia (Mongolia, Siberia, Kyrgyzstan, Tajikistan)].

*Ecology.* Among stones near streams or on grassy slopes; 4000–5300 m. Flowering July–August.

*Specimens examined.* **W:** Dolpa district, Langla Pass between Shimen, Langla and Mur (Mosoc), c.300 m, 6 viii 1973, *Grey-Wilson & Phillips* 547 (K). **C:** Baglung district, Above Dogadi Khola, 15,000 ft, 12 viii 1954, *Stainton, Sykes & Williams* 3830 (BM, E). Mustang district, Namdo, north of Mustang, 17,000 ft, 10 viii 1954, *Stainton, Sykes & Williams* 2355 (BM); Namdo, north of Mustang, 16,000 ft, 9 viii 1954, *Stainton, Sykes & Williams* 2324 (BM); Samargaon, north of Tukucha, 15,000 ft, 16 viii 1954, *Stainton, Sykes & Williams* 7258 (BM, E); Jengla, west of Namdo, 5300 m, 25 viii 1973, *Grey-Wilson & Phillips* 710 (BM, K); Cha Lungpa, near Sangda-La, 17,200 ft, *G. Miehe* 137 (BM); Cha Lungpa, 17,200 ft, 14 viii 1977, *G. Miehe* 472a (BM); Dhaulagiri hidden valley, between Dhampus Pass and French Pass, 5055m, 5 ix–15 x 1980, *E. Wald (American Women's Climbing Expedition)* 10 (BM). **E:** Solu Khumbu district, Pheriche, Khumbu, 14,000 ft, 29 viii 1970, *Horsfall* 34a (BM).

**2. Comastoma pedunculatum** (D.Don) Holub, Folia Geobot. Phytotax. 3: 218 (1968). – *Eurythalia pedunculata* D.Don, London Edinburgh Philos. Mag. & J. Sci. 8: 76 (1836). – *Gentiana pedunculata* (D.Don) Royle ex G.Don, Gen. Syst. 4: 182 (1838). – *Gentianella pedunculata* (D.Don) Harry Sm. in Nilsson, Grana Palyn. 7: 144 (1967). – Type: Cachemere & Kunour, *Royle* 113/12 (lectotype LIV, digital image, plant on far left of sheet designated here). See note below.

*Gentiana tenella* auct. non Rottb.: C.B.Clarke in Fl. Brit. Ind. 4: 109 (1883).

Nepali name: '*Sermaguru*'.

Annual to 22 cm tall. *Stems* erect or ascending, branching from base and above. *Leaves* often all basal; one or two pairs on stems; elliptic to lanceolate, (3–)4–20 × (1–)2–10 mm, apex rounded or acute. *Inflorescence* one-flowered or of very loose, few-flowered cymes. *Pedicel* (10–)15–120 mm. *Flowers* 5-merous. *Calyx* tube 1–2 mm; lobes slightly unequal, (1–)2–5(–8) × 1–3 mm, lanceolate or ovate, acute. *Corolla* bright blue, pale blue, yellow or white; tube cylindrical, often narrow, (4–)8–10 mm; lobes oblong or ovate, (3–)4–6(–10) × 2–3(–4) mm, rounded. *Filaments* 2–3 mm; anthers c.1 mm. *Ovary* cylindrical or narrowly ovoid, 4–8 × 1–2 mm. *Capsule* cylindrical, 10–14 × 3–5 mm. (Ho & Pringle (1995) stated that the capsule protrudes from the corolla but this does not seem to be the case with the material from Nepal.)

*Distribution.* W, C and E Nepal [Tibetan Plateau (Qinghai, Xizang); W Himalaya (Pakistan, India, Kashmir); E Himalaya (Bhutan, Sikkim); E Asia (China: Gansu, W Sichuan, NW Yunnan)].

*Ecology.* Open grassy alpine slopes or damp stony ground by rivers; 3050–5100 m. Flowering August–October.

*Specimens examined.* **W:** Dolpa district, Rohagaon, Suli Gad, 10,000 ft, 14 ix 1952, *Polunin, Sykes & Williams* 3380 (BM, E, K); Rohagaon, Suli Gad, 11,500 ft, 14 ix 1952, *Polunin, Sykes & Williams* 3396 (BM, E); North-east of Tiling, c.5100 m, 12 viii 1973, *Grey-Wilson & Phillips* 595 (K). Humla district, Saipal, 15,000 ft, 18 viii 1954, *J.E.M. Arnold* 4 (BM). Jumla district, Chakure Lekh, 14,000 ft, 30 ix 1952, *Polunin, Sykes & Williams* 5481 (BM). Mugu district, Tarkia, Mugu Khola, 13,000 ft, 21 viii 1952, *Polunin, Sykes & Williams* 5356 (BM, E). **C:** Baglung district, Above Dogadi Khola, 13,500 ft, 1 ix 1954, *Stainton, Sykes & Williams* 4659 (BM). Manang district, Bimtakothi, 13,500 ft, 27 viii 1950, *D.G. Lowndes* 1471 (BM); Khangsar, 15,000 ft, 9 ix 1950, *D.G. Lowndes* 1503a (BM, E). Mustang district, Cha Lungpa, 17,200 ft, 14 viii 1977, *G. Miehe* 472Ab (BM); Cha Lungpa, 17,200 ft, 14 viii 1977, *G. Miehe* 472Bb (BM) [2 separate sheets]; Tukucha, Kali Gandaki Valley, 12,500 ft, 11 ix 1954, *Stainton, Sykes & Williams* 7766c (BM); Tukucha, Kali Gandaki Valley, 12,000 ft, 9 ix 1954, *Stainton, Sykes & Williams* 7740 (BM); Tukucha, Kali Gandaki Valley, 12,500 ft, 12 ix 1954, *Stainton, Sykes & Williams* 7785 (BM, E); Kimaling, north of Mustang, 14,000 ft, 11 viii 1954, *Stainton, Sykes & Williams* 2379 (BM). Rasuwa district, Langtang village area, 11,500 ft, 1 viii 1949, *Polunin* 1544 (BM, E); Changbu, above Khangyin, 3800 m, 21 ix 1966, *D.H. Nicolson* 2585 (BM); Langtang Valley, 13,000 ft, 17 ix 1965, *J.B. Shrestha & P.R. Shakya* 3886 (BM). **E:** Sankhuwasabha district, Khumbakarna Himal, Makalu, Upper Barun Valley, 4900 m, 15 ix 1972, *T. Wraber* 185 (BM); Khumbakarna Himal, Makalu, Upper Barun Valley, 5050 m, 19 ix 1972, *T. Wraber* 221 (BM); Solu Khumbu, Nangma (Naogma), north of village, W side of Lobuche Khola, 27°54′54″N, 86°48′53″E, *DNEP3*, *BX187* (E); Solu Khumbu district, Khumbu, Mt. Everest Base Camp, 16,500 ft, 7 ix 1969, *Stainton* 6588 (BM); Chule, 27°57′37″N, 86°36′22″E, *DNEP3*, *AY104* (E). Tapeljung district, Ghunsa, Pung Pema, 5100 m, 9 x 1985, *Curzon* 217 (K); Kambachen to Lhonak, 4300 m, 10 ix 1989, *KEKE* 538b (E, K). **District uncertain:** Dumbudada, 14,600 ft, 5 ix 1932, *K.N. Sharma* E480 (BM, E).

*Notes.* The type specimen at LIV was annotated as type material and cited by Omer (1992) but not lectotypified. The evidence for this specimen being original material is circumstantial but probably justified. Although the specimen has not been annotated by David Don, he refers to a Royle collection. Royle himself annotated the specimen as *Gentiana pedunculata* and the coincidence of the name and the mention of Royle in the protologue would suggest that this is indeed original material.

Clarke (1883) placed *Gentiana pedunculata* (D.Don) G.Don in synonymy under his description of *G. tenella*. He noted that 'alpine examples half the size of the fully developed plant are frequent'.

**3. Comastoma stellariifolium** (Franch.) Holub, Folia Geobot. Phytotax. 3: 217 (1968). – *Gentiana stellariifolia* Franch. in Forbes & Hemsl., J. Linn. Soc. Bot. 26: 135 (1890). – *Gentianella stellariifolia* (Franch.) Harry Sm. in Nilsson, Grana

Palyn. 7: 145 (1967). – Type: China: Yunnan, Lopinshan at Langkong, 3200 m, *Delavay* (holo K).

*Gentiana tenella* Rottb. var. *sikkimensis* C.B.Clarke in Hook.f., Fl. Brit. Ind. 4: 110 (1885). – *Gentianella tenella* (Rottb.) Borner var. *sikkimensis* (C.B.Clarke) S.Agrawal, Indian Gentianaceae, A Checklist 22 (1988). – Type: Sikkim, iii 1877, *Elwes* s.n. (lecto K, designated here).

Annual to 10 cm tall. *Stems* weak, ascending or straggling. *Basal leaves* forming rosettes or loose mats, often absent on flowering specimens, lanceolate, 10–15 × 1–2 mm, acute; stem leaves in widely spaced pairs, ovate, 2–3 × 1–2 mm, acute. *Inflorescence* one-flowered. *Pedicel* 5–40 mm. *Flowers* 5-merous. *Calyx* tube 0.5 mm; lobes unequal, lanceolate to elliptic, 3–5 × 1–2 mm, acute. *Corolla* dark or pale blue; tube 3–6 mm; lobes oblong to ovate, 3–7 × 1.5–3 mm, obtuse, spreading. *Filaments* 1–1.5 mm; anthers c.0.5 mm. *Ovary* ellipsoid, 4–7 × 1–2 mm. *Capsule* not exserted from corolla; stipe c.1 mm.

*Distribution.* E Nepal [E Himalaya (Bhutan, Sikkim); E Asia (China, NW Yunnan); Assam – Burma (Burma)].

*Ecology.* Open, sunny, grassy banks; 3530–4300 m. Flowering August–September.

*Specimens examined.* **E:** Sankhuwasabha district, Arun Valley, Barun Khola, NW of Num, 13,500 ft, 18 ix 1956, *Stainton* 1677 (BM); Near Kauma, S of Shipton La, 3530 m, 26 ix 1991, *EMAK* 283 (E); Sankhuwasabha district, Shipton La, 4030 m, 27 ix 1991, *EMAK* 341 (E). **District uncertain:** Tulo Thorme, 4300 m, 23 viii 1972, *J.F. Dobremez* 1694 (BM).

**4. Comastoma urnigerum** (E.Aitken & D.G.Long) E.Aitken, **comb. nov.** – *Gentianella urnigera* E.Aitken & D.G.Long, Edinburgh J. Bot. 53: 82 (1996). – Type: E Nepal: Sankhuwasahba district, S side of Lower Barun Glacier, opposite Mera, 4420 m, 3 x 1991, *EMAK* 503 (holo E).

Annual to 5 cm tall. *Stems* decumbent, diffusely branched from base. *Leaves* spathulate or obovate, 4–10 × 2–4 mm, rounded. *Inflorescence* one-flowered. *Pedicel* 3–20 mm. *Flowers* 4- or 5-merous. *Calyx* tube 0.5–2 mm; lobes unequal, ovate or lanceolate, 3–5 × 1–3 mm, rounded or acute. *Corolla* slaty blue or deep blue-violet; tube 3–6 mm; lobes oblong or ovate, 2–4 × 1.5–2 mm, rounded or subacute. *Filaments* 1–2 mm; anthers 0.5–1 mm. *Ovary* ovoid, 3–3.5 × 1–2 mm. *Capsule* ellipsoid, 5–6 × 2–2.5 mm.

*Distribution.* E Nepal [E Himalaya (Bhutan, Sikkim); SW China?].

*Ecology.* Grassy, alpine slopes or stony ground; 4270–4720 m. Flowering and fruiting August–October.

*Specimens examined.* **E:** Sankhuwasabha district, S side of Lower Barun glacier, opposite Mera, 4420 m, 3 x 1991, *EMAK* 500 (E).

*Doubtful species*

Ohba & Ikeda (2000) mentioned the following unidentified species of *Comastoma*.

*Comastoma* sp. 1: Seto Pokhari – Chhomalang Base Camp, 4500 m (*TI* 9592268), 4605 m (*TI* 956297), 4700 m (*TI* 9584197, 952301); Tangna – Samakang Kharka, 3800 m (*TI* 9580385).

*Comastoma* sp. 2: Khare – Tangna, 4560 m (*TI* 19584212); around Dudh Kund, 4500 m (*TI* 9588235, 9592447), 4610 m (*TI* 9584254), 4670 m (*TI* 9715229); around Tangna, 4550 m (*TI* 9729246); Tangna – Samakang Kharka, 4090 m (*TI* 95966419).

This material has not been seen as it is possibly part of a large collection being worked on in Tokyo, but from the description, *Comastoma* sp. 1 could possibly be *C. pedunculatum* (Royle ex D.Don) Holub. The description of *Comastoma* sp. 2 is inadequate for identification as no habit, shape or measurements are given. It seems to be unusual in having very short hairs on the upper surface of the leaves. None of the species of *Comastoma* possess this character and therefore it may belong to another genus.

### 3. GENTIANOPSIS Ma, Acta Phytotax. Sin. 1(1): 7 (1951)

Annual, biennial or perennial, erect herbs. Leaves opposite. Flowers 4-merous, solitary or in loose cymes. Calyx tubular-campanulate, winged or keeled, with triangular, discontinuous intracalycular membrane; 2 outer lobes narrower than, and basally overlapping, the 2 inner lobes. Corolla tubular-campanulate to funnel-shaped; margins of lobes entire, toothed or fringed; plicae absent. Nectaries 4, at base of corolla tube. Stamens attached at middle or base of corolla tube. Ovary with distinct stipe, style small or absent, stigmas 2, enlarged. Capsules 2-valved, seeds angular, papillose.

24 species: North America, Asia, Europe; three species in Nepal. – Type species: *Gentianopsis barbata* (Froel.) Ma.

*Key to species of* Gentianopsis

1a. Pedicels 5–30 mm; corolla lobes lacking fringed margins at base **1. G. contorta**
1b. Pedicels 25–200 mm; corolla lobes with fringed margins at base _____ 2

2a. Stem leaves elliptic to lanceolate, 6–15 mm broad _____ **2. G. paludosa**
2b. Stem leaves linear, 1–3 mm broad _____ **3. G. vvedenskyi**

**1. Gentianopsis contorta** (Royle) Ma, Acta Phytotax. Sin. 1: 14 (1951). – *Gentiana contorta* Royle, Ill. Bot. Himal. 278, t.68, fig.3 (1835). – *Gentianella contorta*

(Royle) Harry Sm. in Hand.-Mazz., Symb. Sin. 7: 979 (1936). – Type: Illustration of *Gentiana contorta* Royle, Ill. Bot. Himal. 278, t.68, fig.3 (1835) (lecto designated here). Note: Royle states that his specimens from ''Mussooree, near Captain Debude's house and the Abbey-hill'', from which the drawing was prepared, could not be found. – Epitype: Mussoorie, Lower Park Rd., 6500 ft, x 1915, *A. Anderson* (epitype E, designated here).

Erect biennial to 32 cm. *Stems* simple or branching. *Lower leaves* often withered at flowering; stem leaves elliptic to lanceolate, 15–35 × 3–9 mm, acute or rounded. *Inflorescence* of loose cymes. *Pedicel* 5–30 mm. *Calyx* tube 10–17 mm; lobes ovate to lanceolate, 5–8 × 3–5 mm, acuminate. *Corolla* creamy white; tube 15–18 mm; lobes tightly contorted in bud, pale blue, oblong, 7–8 × 2–3 mm, apex rounded, margins not fringed. *Filaments* c.10 mm; anthers 0.5 mm. *Ovary* narrowly ellipsoid, 9–10 × 3–6 mm; stipe 5–8 mm. *Capsule* not seen.

*Distribution.* W and C Nepal [Tibetan Plateau (Qinghai, Xizang); W Himalaya (Pakistan, India); E Himalaya (Bhutan); E Asia (China: Guizhou, Liaoning, Sichuan, Yunnan, Japan)].

*Ecology.* Dry slopes in coniferous forest; 3000–3100 m. Flowering September–October.

*Specimens examined.* **W:** Dolpa district, between Rohagaon and Lulo Khola, Suli Gad, 10,000 ft, 15 ix 1952, *Polunin, Sykes & Williams* 3401 (BM, E). **C:** Manang district, Marsyandi Valley, towards Pisang, 3100 m, 24 ix 1969, *T. Wraber* 394 (BM).

**2. Gentianopsis paludosa** (Hook.) Ma, Acta Phytotax. Sin. 1(1): 11 (1951). – *Gentiana detonsa* Rottb. var. *paludosa* Hook., Hooker's Icon. Pl. 9: t.857 (1852). – *Gentianella paludosa* (Hook.) Harry Sm. in Hand.-Mazz., Symb. Sin. 7: 980 (1936). – Type: Tibet, marshes at Kisung, *Captain Munro* 2852 (holo K n.v.). See note below. **Fig. 3**.

*Gentiana detonsa* Rottb. var. *stracheyi* C.B.Clarke in Hook.f., Fl. Brit. Ind. 4: 118 (1883). – *Gentianella stracheyi* (C.B.Clarke) Harry Sm. in Hand.-Mazz., Symb. Sin. 7: 980 in obs. (1936). – *Gentiana stracheyi* (C.B.Clarke) Kitam., Fl. Pl. W. Pakistan 117 (1964). – Type: Locality unknown, ''*Gentiana* sp. no. 8'', 26 ix 1848, *T. Thomson* (lecto K, designated here).

Erect biennial to 55 cm. *Stems* simple or little-branched, sometimes tinged purple. *Basal rosette* usually withered at flowering; stem leaves elliptic or lanceolate, 25–45 × 6–15 mm, rounded or acute. *Inflorescence* one-flowered or of few-flowered cymes. *Pedicel* 50–200 mm. *Calyx* tube 13–18 mm; lobes ovate or lanceolate, 6–12 × 2–7 mm, acute or acuminate. *Corolla* deep blue, purplish or white, sometimes with thin blue or white stripes; tube 25–40 mm; lobes oblong or spathulate, 8–20 × 5–10 mm, margins fringed at base. *Filaments* 5–15 mm; anthers 1.5–2 mm. *Ovary* oblong or narrowly ellipsoid, 20–25 × 2–3 mm; stipe 5–15 mm. *Capsule* 25–35 × 5 mm.

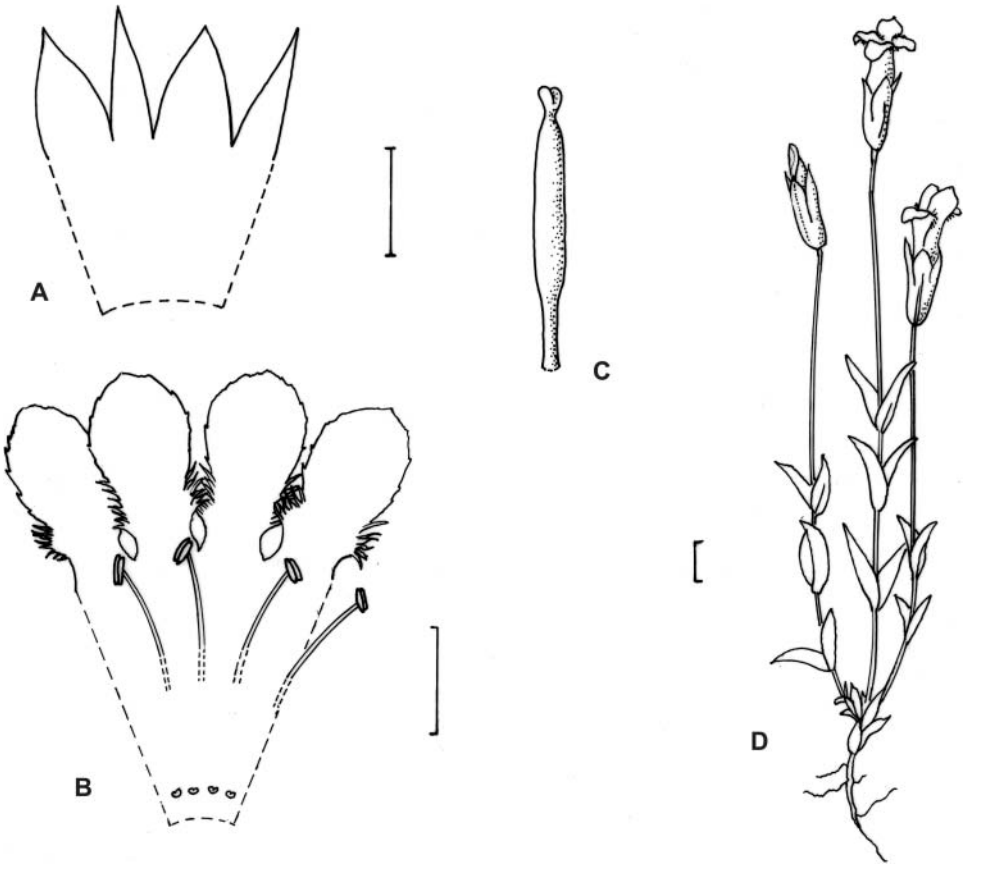


FIG. 3. *Gentianopsis paludosa* (Hook.) Ma. A, calyx; B, corolla; C, ovary; D, habit. Based on *SHBEN* 9470355. Scale bars: 1 cm.

*Distribution.* W, C and E Nepal [Tibetan Plateau (Qinghai, Xizang); W Himalaya (Pakistan, India); E Himalaya (Bhutan, Sikkim); E Asia (N, NE and SW China)].

*Ecology.* Dry stony soil, grassy hillsides or by streams; 3420–4880 m. Flowering and fruiting July–September.

*Specimens examined.* **W:** Dolpa district, Basia Banyang [Bhanjyang], 4700 m, 6 viii 1973, *S. Einarsson, L. Skärby & B. Wetterhall* 2812 (BM); Jarap Khola, 13,000 ft, 17 vii 1966, *T.B. Shrestha* 5413 (BM); Dolpa, Tarap, 29°2′N, 83°12′E, 13,500 ft, 17 vii 1966, *Stainton* 5548 (BM, E); Barbung Khola, E of Chankkha, c.4500 m, 31 vii 1973, *Grey-Wilson & Phillips* 461 (K); 3 miles north of Shimen, c.4300 m, 6 viii 1973, *Grey-Wilson & Phillips* 533 (BM, K). Humla district, Saipal, 15,000 ft, 19 viii 1954, *J.E.M. Arnold* 70 (BM). Jumla district, Bhurchula Lekhm near Jumla, 12,000 ft, 15 vii 1952, *Polunin, Sykes & Wlliams* 4702 (BM). Jumla district?, Maharigaon, 14,000 ft, 22 vii 1953, *Polunin, Sykes & Williams* 283 (BM). **C:** Gorkha district, Thanmanang Kharka, 3700 m, 7 viii 1994, *(Suzuki et al.) SHBEN* 9485337 (E); Sama Gompa, 3420 m, 8 viii 1994, *SHBEN* 9470355 (E); Sama Gompa, 3410 m, 8 viii 1994, *SHBEN* 9485353 (E); Gorkha district, 3420 m, 8 viii 1994, *SHBEN* 9470355 (2 sheets E).

Manang district, Marsyandi Khola, near Annapurna II base camp, 12,600 ft, 17 ix 1977, *G. Miehe* 697 (BM); Sabze Khola, 12,000 ft, 20 vii 1970, *D.G. Lowndes* 1214 (BM); Marsyandi, 11,500 ft, 13 vii 1950, *D.G. Lowndes* 1185 (BM, E); Marsyandi, 12,500 ft, 30 vii 1950, *D.G. Lowndes* 1301 (E); Khangsar, 16,000 ft, 27 vii 1950, *D.G. Lowndes* 1259 (BM, E); Khangsar, Marsyandi, 12,200 ft, 21 vii 1983, *R.J.D. McBeath* 1451 (E); Khangsar, Marsyandi, 12,200 ft, 21 vii 1983, *R.J.D. McBeath* 1452 (E). Mugu district, Khaptang, Mugu Khola, 15,000 ft, 21 viii 1952, *Polunin, Sykes & Williams* 5362 (BM, E). Mustang district, 13,000 ft, 4 viii 1954, *Stainton, Sykes & Williams* 2171 (BM, E); Tanglung, south of Tukucha, Kali Gandaki Valley, 12,500 ft, 15 vii 1954, *Stainton, Sykes & Williams* 1785 (BM); Kimaling, north of Mustang, 14,000 ft, 22 viii 1954, *Stainton, Sykes & Williams* 2365 (BM, E); Tukucha, Kali Gandaki Valley, 12,500 ft, 11 ix 1954, *Stainton, Sykes & Williams* 7757 (BM, E); Muktinath, 15,000 ft, 15 vii 1931, *K.N. Sharma* E22 (BM); Damodar Kund, north of Muktinath, 14,000 ft, 30 vii 1954, *Stainton, Sykes & Williams* 2103 (BM, E); Pura, Muktinath, 12,000 ft, 27 vii 1954, *Stainton, Sykes & Williams* 2022 (BM); above Muktinath, 3920 m, 20 viii 1994, *SHBEN* 9470514 (E); Maharang, south of Mustang, 14,000 ft, 13 viii 1954, *Stainton, Sykes & Williams* 7204 (BM, E); Marpa, c.4000 m, 7 ix 1973, *Grey-Wilson & Phillips* 804 (K). Rasuwa district, Brangechen Kharka, 12,500 ft, viii 1949, *Polunin* 1723 (BM); Dagpache, 15,000 ft, 13 viii 1949, *Polunin* 1752 (BM). **E:** Taplejung district, Tamur Valley,Yangma Khola, NE of Walungchang Gola, 13,000 ft, 23 vii 1956, *Stainton* 1085 (BM, E). Sankhuwasabha district, Mahagung Kola, 6 miles east of Tingkyu, c.4800 m, 3 viii 1973, *Grey-Wilson & Phillips* 484 (BM, K).

*Note.* Omer (1995: 197) lectotypified the name with the illustration of *Gentiana detonsa* var. *paludosa* in Hooker's Icon. Pl. 9: t.857 (1852) as no specimens of *Munro* 2852 can be found at K.

**3. Gentianopsis vvedenskyi** (Grossh.) Pissjauk., Fl. Tadzhiksoi S.S.R. 7: 292 (1984). – *Gentiana vvedenskyi* Grossh. in Shishkin & Bobrov, Fl. URSS 18: 751 (1952). – *Gentianella vvedenskyi* (Grossh.) Harry Sm. in Hara et al., Enum. Fl. Pl. Nepal 3: 94 (1982). – Type: Pamir, Langarsu, in humidis, 17 viii 1857, *S. Korshinsky* (holo LE, digital image).

*Gentiana stricta* Klotzsch, Bot. Ergebn. Reise Waldemar 90 (1862), non Willd. ex Schultes (1820). – Type: *Hoffmeister* (B, probably destroyed). Illustration of *G. stricta* Klotzsch, Bot. Ergebn. Reise Waldemar 90, t.69 (1862) (lecto, designated here). – Epitype: Henus, Ladak, Kashmir, 11,000 ft, 6 viii 1931, *W. Koelz* 2457 (epitype E, designated here).

Annual or biennial to 45 cm tall. *Stems* erect, simple or branched. *Basal leaves* rosulate, spathulate to lanceolate, 15–40 × 3–6 mm, usually withered at flowering; stem leaves linear, 6–40 × 1–3 mm, acute, margins revolute. *Pedicel* 2.5–20 cm. *Inflorescence* one-flowered or of loose cymes. *Calyx* tube 7–9 mm; lobes lanceolate, 5–12 × 2–3 mm, acuminate, with dark prominent mid-vein. *Corolla* blue; tube 21–28 mm; lobes oblong, 5–9 × 2–4 mm, obtuse or rounded, margins fringed at base. *Filaments* 5–7 mm; anthers oblong, 1–2 mm. *Ovary* narrowly ellipsoid to cylindrical, c.15 × 3 mm; stipe c.4 mm. *Capsule* 20–30 × 3 mm, not protruding from corolla.

*Distribution.* C Nepal [Tibetan Plateau (Xizang); W Himalaya (Pakistan, India); N Asia (Mongolia); C and SW Asia].

*Ecology*. Open alpine pastures, beside streams; 4150–5000 m. Flowering and fruiting July–September.

*Specimens examined.* **W:** Dolpa district, West side of Khung Khola, c.5000 m, 19 viii 1973, *Grey-Wilson & Phillips* 679 (K). **C:** Mustang district, 14,000 ft, 12 viii 1954, *Stainton, Sykes & Williams* 2386 (BM); Damodar Kund, north of Muktinath, 14,000 ft, 30 vii 1954, *Stainton, Sykes & Williams* 2103A (BM); Chalungpa, 13,600 ft, 29 viii 1977, *G. Miehe* 554 (BM); Chalungpa, above Jelua Forest, 28°53′N, 83°44′E, 4350 m, 6 ix 2001, *G. & S. Miehe* 01-111-04 (E); Thulun Khola, Karak, 29°10′N, 83°56′E, 4080 m, 22 viii 2001, *G. & S. Miehe* 01-060-06 (E); Upper Yakchhu Khola, 28°54′N, 83°55′E, 4500 m, 7 viii 2001, *G. & S. Miehe* 01-020-07 (E).

## Acknowledgements

I wish to thank Dr Bernard von Hagen (MJG) for help in defining generic relationships; the Directors of the Herbaria at K and BM for the loan of specimens; Dr Nicholas Hind and Dr Timothy Harris (K-W), Dr John Edmondson (LIV) and Professor Leonid Averyanov (LE) for digital images of type specimens; and Louise Olley for the illustrations.

## References

AGRAWAL, S. (1983). A note on *Gentianella glanduligera* Airy Shaw (Gentianaceae). *Indian Forester* 109: 576–577.

AIRY SHAW, H. K. (1943). *Hooker's Icon. Pl.* 35: sub t.3431.

AITKEN, E. (1999). Gentianaceae. In: GRIERSON, A. J. C. & LONG, D. G. (eds) *Flora of Bhutan* 2(2): 602–656.

AITKEN, E. & LONG, D. G. (1994). Notes relating to the Flora of Bhutan: XXVII. *Gentianella griersonii*, a new species from Bhutan. *Edinburgh J. Bot.* 51(2): 165–167.

CLARKE, C. B. (1883). Gentianaceae. In: HOOKER, J. D. (ed.) *Flora of British India* 4: 93–132.

GARG, S. (1987). *Gentianaceae of North West Himalayas (A Revision)*. International Bioscience Monograph 17. New Delhi: Today and Tomorrow's Printers and Publishers.

VON HAGEN, K. B. & KADEREIT, J. W. (2001). The phylogeny of *Gentianella* (Gentianaceae) and its colonization of the southern hemisphere as revealed by nuclear and chloroplast DNA sequence variation. *Organisms Diversity & Evolution* 1: 61–79.

HO, T. N. & PRINGLE, J. S. (1995). Gentianaceae. In: WU, Z. Y. & RAVEN, P. H. (eds) *Flora of China* 16. Beijing & St Louis: Science Press & Missouri Botanical Garden.

OHBA, H. & IKEDA, H. (2000). The Flora of Hinku and Hunku Valleys. *Nature and Culture* No. 6: 1–272. The University Museum, University of Tokyo.

OMER, S. (1992). Notes on the genus *Comastoma* Toyok. (Gentianaceae) from Pakistan and Kashmir. *Candollea* 47: 539–553.

OMER, S. (1995). *Gentianaceae*. In: ALI, S. I. & QAISER, M. (eds) *Flora of Pakistan* 197. Karachi, Pakistan: Department of Botany, University of Karachi.

PRESS, J. R., SHRESTHA, K. K. & SUTTON, D. A. (2000). *Annotated Checklist of the Flowering Plants of Nepal*. London: The Natural History Museum.

*Received 22 February 2007; accepted for publication 27 April 2007*