

NOTES RELATING TO THE FLORA OF BHUTAN: IX *Corydalis* (Fumariaceae)

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ABSTRACT. The following new taxa, combinations and synonymy in the genus *Corydalis* from the E Himalaya and adjacent regions are proposed: *C. gerdae* Fedde var. *physodes* Long, var. nov. from Bhutan; *C. cashmeriana* Royle subsp. *brevicornu* (Prain) Long, stat. nov., of which *C. jigmei* Fischer & Kaul becomes a synonym; *C. ecristata* (Prain) Long, comb. et stat. nov.; *C. ecristata* var. *longicalcarata* Long var. nov. from Nepal, Tibet, Sikkim and Bhutan; *C. dorjii* Long, sp. nov. from Bhutan, Tibet and Manipur; *C. laelia* Prain subsp. *bhutanica* Long, subsp. nov. from Bhutan; *C. delicatula* Long, sp. nov. from Bhutan; *C. iochanensis* Léveillé is reported from Bhutan, Tibet, Yunnan and Szechwan; *C. bowes-lyonii* Long, sp. nov. from Bhutan, Tibet and Yunnan; *C. drepanantha* Long, sp. nov. from Bhutan and Arunachal Pradesh; *C. prainiana* Kanodia & Mukerjee is shown to be superfluous name for *C. casimiriana* Duthie & Prain; *C. changuensis* Long, sp. nov. from Sikkim; *C. cavei* Long, sp. nov. from Nepal and Sikkim, and *C. calliantha* Long, sp. nov. from Bhutan.

INTRODUCTION

The genus *Corydalis* is an extremely large one in the Sino-Himalayan region and much in need of comprehensive revision. The Himalayan species are comparatively well-known compared to the Chinese ones, as outlined by Stearn (in Ludlow & Stearn, 1975) who provided a historical outline of past studies in the area. Included in that paper were fifteen new taxa described by Ludlow, mostly from collections of Ludlow, Sherriff and their co-collectors from Bhutan and Tibet, of Polunin, Stainton, Sykes and Williams from Nepal, and of Kingdon Ward from Assam. Unfortunately Ludlow did not undertake a complete revision of the Himalayan taxa but left manuscript notes concerning several possible new taxa on specimens in the BM.

Prior to Ludlow's work, the most important work on the genus in India was the revision by Prain (1896) in which many new taxa were described. Since Prain's time, many additional collections of *Corydalis* have been made in Bhutan and Sikkim, for example by Cave, Cooper and Gould, most of which were not critically studied by Ludlow. Revision of the genus for the *Flora of Bhutan* has necessitated study of these collections from which several new taxa and nomenclatural problems requiring treatment have come to light, and are formally dealt with here. The taxa are set out following the *Flora of Bhutan*, with the blue/purple-flowered species first, the yellow-flowered second. The geographical districts given with the localities also follow the *Flora of Bhutan* (Grierson & Long, 1983).

***Corydalis gerdae* Fedde var. *physodes* Long, var. nov.**

Varietati typicae similis sed in omnibus partibus majoribus, pedicellis 2.5–3.5 cm longis, bracteis profunde dissectis, floribus valde inflatis, petalo superiore 24–25 × 7–8 mm, calvari latissimo 4.5–5.5 × 4.0–4.5 mm incluso differt.

BHUTAN. [Ha district], Kang La to Ha, 2740–4570 m, vii 1938, Gould 1106 (holo. E, iso. K).

This new variety, as yet known only from a single locality in W Bhutan, differs from the typical var. *gerdae* in its larger size throughout, longer pedicels 2.5–3.5 cm, more deeply incised bracts, larger, more strongly inflated flowers with upper petal 24–25 × 7–8 mm, including very broad spur 4.5–5.5 × 4.0–4.5 mm; in var. *gerdae* the pedicels are 1.0–1.5 cm, upper petal 16–19(–22) × 4–5 mm, including spur 3.5–6.0 × 2.5–3.5 mm.

***Corydalis cashmeriana* Royle and allied taxa**

Corydalis cashmeriana was first described by Royle (1833–40) based on a collection made by him in Kashmir, NW Himalaya. Hooker & Thomson later (1855) included under that name plants from Kashmir to as far east as Sikkim. Prain (1896) realized that more than one taxon was involved and divided the species into three varieties, var. *typica* (correctly var. *cashmeriana*) from Kashmir to W Nepal, and two new E Himalayan varieties, var. *brevicornu* Prain and var. *ecristata* Prain. Concerning var. *ecristata* he commented 'It is not improbable that this last very distinct variety may prove to be a species apart.'

Since Prain's time no revision of this group has been undertaken, although Fischer & Kaul (1940) described a new species, *C. jigmei*, from the Chumbi Valley, which falls within Hooker's broad concept of *C. cashmeriana*. Much more material, particularly from Nepal, Sikkim and Bhutan is now available to reassess this difficult group.

Rather than three taxa, as outlined by Prain, four taxa can now be recognized, as delimited below; these are best grouped into two species, *C. cashmeriana* Royle with a western subspecies *cashmeriana* and an eastern subspecies *brevicornu* (Prain) Long, and *C. ecristata* (Prain) Long, comprising two varieties both restricted to the E Himalaya, var. *ecristata* and var. *longicalcarata* Long. The differences between the four taxa are summarized in Table 1, and their distribution plotted in Fig. 2.

***Corydalis cashmeriana* Royle, Illust. Bot. Himal. 69 (1833). subsp. *cashmeriana* (Fig. 1).**

This is the only representative of the complex found in NW Himalaya; it is apparently common in Kashmir, Himachal Pradesh and W Nepal, and is the plant cultivated in British gardens as *C. cashmeriana* (Sealy 1968). The most important differences with allied taxa (Table 1) are the broadly crested outer petals, rhombic lower lip and relatively long spur. Royle's type specimen of *C. cashmeriana* in LIVU (Fig. 1) is a mixture of a species with ternatisect leaves (lower plant) and one with pinnatisect leaves (upper two plants) of which the latter clearly accords with his description. The top left-hand specimen has been selected as lectotype.

The following specimens are representative of subsp. *cashmeriana*: NW INDIA, KASHMIR. without locality, Royle s.n. (lectotype LIVU top left-hand specimen, see Fig. 1); Sach Pass, Kishtawar, 3650 m, vi 1848, Thomson s.n. (K); Sanch Pass, Chenab Valley, 3650 m, vi 1879, Ellis 287 (K); Zanskar, below Kukli Pass, 3650 m, vi 1879, Watt 3199 (E); above Kainmul, Liddar Valley, 3650 m, vii 1893, Duthie 13114 (BM, E); Sibundi, Sach Pass, vii 1927, Stewart 2526 (K); Mantar Nullah, Bringhi Valley, 3050 m, v 1939, Ludlow 47 (BM); Zaiwan, Sind Valley, 3350–3650 m, vi 1940, Ludlow & Sherriff 7653 (BM); Rajparyan Sanctuary, 3800 m, viii

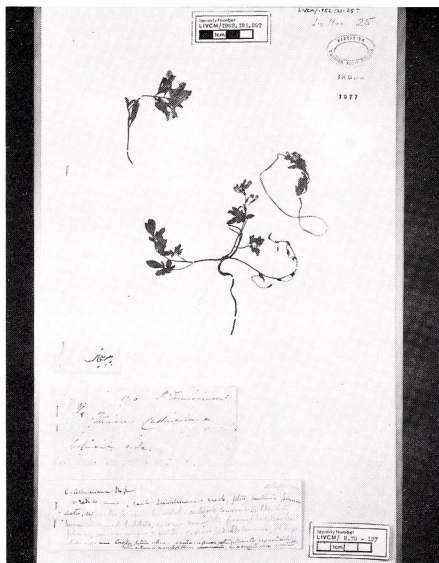


FIG. 1. *Corydalis cashmeriana* Royle (LIVU). Lectotype: upper left-hand plant.

1943, Ludlow & Sherriff 9318 (BM); Kolhoi Glacier, Lidder Valley E of Srinagar, 3960 m, vi 1976, Maxwell 16 (E).

NE INDIA, HIMACHAL PRADESH. Manali, Lahul, 3650 m, v 1941, Bor 12624 (E, K); Puidh, Simla, 3050 m, vi 1882 Collett s.n. (K); Kulu, 3650 m, vi 1888, Drummond 8349 (BM, K); Chandrakani, Kulu, 3350 m, vii 1916, Cooper 5084 (E); Parbatti Valley, Kulu, 3350 m, vi 1934, Parkinson 4079 (E);

NW INDIA, UTTAR PRADESH. Madkari Pass, Kumaon, 3050 m, Strachey & Winterbottom 2 (BM, K); Bishtola, N. Garhwal, 3800 m vi 1959, Rau 10224 (E); Kuari, Bhyundar Valley, 3650 m, J.M.L. 54 (K).

TABLE 1

	<i>C. cashmeriana</i> subsp. <i>cashmeriana</i>	<i>C. cashmeriana</i> subsp. <i>brevicornu</i>	<i>C. ecristata</i> var. <i>ecristata</i>	<i>C. ecristata</i> var. <i>longicalcarata</i>
Umbels	4-7-flowered	4-6-flowered	2-4-flowered	2-4-flowered
Upper petal length	15-20 mm	11-14 mm	13-18 mm	18-22 mm
Spur length	7-10 mm	4-7 mm	6-10 mm	11-16 mm
Tip of spur	almost straight	weakly deflexed	deflexed	strongly deflexed
Crest on upper petal	broadly crested	narrowly crested	not or very narrowly crested	not or very narrowly crested
Shape of limb of lower lip	rhombic, acute, longer than broad, with rounded lateral lobes	rhombic, acute, longer than broad, with rounded lateral lobes	suborbicular, broader than long, not or weakly lobed	suborbicular, broader than long, not or weakly lobed
Breadth of lower lip	5-7 mm	4-6 mm	6-11 mm	7-10 mm
Exsertion of lower lip	2-3 mm beyond upper petal	1-3 mm beyond upper petal	4-6 mm beyond upper petal	5-8 mm beyond upper petal

W NEPAL. Mahrigaon, 4260 m, vii 1952, *Polunin, Sykes & Williams* 266 (BM, E); Kala Kanda, Pulanto Dara, 3350 m, iv 1952, *Polunin et al.* 870 (BM, E, K); Jangla Bhanjyang, 4570 m, vii 1952, *Polunin et al.* 2353 (BM, K); between Padmara and Bumsa, 3505 m, v 1952, *Polunin et al.* 4069 (BM, E); Thakurji Lekh, S of Jumla, 3800 m, vii 1952, *Polunin et al.* 4717 (BM, K); Okhaldungagaon, 3505 m, v 1954, *Stainton, Sykes & Williams* 355 (BM, E); Taglung, S of Tukucha, 4420 m, vii 1954, *Stainton et al.* 1823 (BM); S of Gurjakhani, 3650 m, vi 1954, *Stainton et al.* 3073 (BM, E, K); Dogardi Khola, 3800 m, vi 1954, *Stainton et al.* 3223 (BM); Ramkot, 3500 m, v 1973, *Dobremez* 2198 (BM).

C NEPAL. Kangsiru, 4570 m, vii 1950, *Lowndes* 1156 (BM); Bambrong, Lamjung Himal, 3960 m, vii 1954, *Stainton, Sykes & Williams* 6081 (BM, E).

***Corydalis cashmeriana* Royle subsp. *brevicornu* (Prain) Long. stat. nov.**

Basionym: *C. cashmeriana* Royle var. *brevicornu* Prain in J. Asiatic Soc. Bengal 65:22 (1896).

Syn.: *C. jigmei* Fischer & Kaul in Kew Bull. 1940:266 (1940).

In its typical form, subsp. *brevicornu* is distinct morphologically and isolated geographically from subsp. *cashmeriana*, being restricted to N Sikkim, Chumbi and Bhutan. It differs from the latter in its usually smaller flowers with a shorter spur and in the outer petals bearing only a narrow crest. One collection of subsp. *cashmeriana* from W Nepal (*Polunin et al.* 2353) is somewhat intermediate in that its flowers have a short spur but the outer petals are broadly crested.

In the description of *C. jigmei*, Fischer & Kaul (1940) compared it to a Chinese species, *C. hsiaowutaishanensis* T. P. Wang but from the description of the latter the two are not closely related, as Wang's species bears

several much less finely-dissected leaves restricted to the lower part of the stem, and simple bracts, whereas *C. cashmeriana* and its allies, (including *C. jigmei*) have the leaves finely dissected and mostly radical, with a single leaf near the apex of the stem, and have deeply pinnatisect bracts.

Ludlow (in Ludlow & Stearn, 1975), in describing the new species *C. oxalidifolia* Ludlow from Bhutan, indicated *C. jigmei* as its closest relative. However the two are not particularly closely related as *C. oxalidifolia* lacks cauline leaves, has simply ternate radical leaves, more congested umbels not exerted beyond the bracts, smaller flowers with the upper petal only 8–10 mm including a very short spur 3–5 mm, and has a narrow boat-shaped lip not flattened as in *C. cashmeriana* and its allies.

C. jigmei fits well within the range of *C. cashmeriana* subsp. *brevicornu* and must be regarded as a synonym. The following specimens of subsp. *brevicornu* have been examined.

SIKKIM. without locality, 3960–4260 m, *Hooker* s.n. (E); Chaerlung, 4880 m, ix 1912, *Rohmoo* 397 (E), 399 (E); between Donkia La and Samdong, 4570–5490 m, vii 1933, *Wager* 304 (K); Lhonak, 4880–5800 m, 1936, *Chapman* 71 (K).

TIBET, CHUMBI. Do-lep [Jelap], vii 1882, *King's collector* s.n. (isosyntype BM); Panka-la above Chumbi, vii 1878, *Dunghoo* s.n. (isosyntype K); Phari to Tremo La, 4570 m, vi 1939, *Gould* 2160 (**holotype** of *C. jigmei*, K).

TIBET?. Chogha, Karma Valley, 4420 m, vi 1922, *Everest Expedition* 22 (K).

BHUTAN. Phajudin, Timpu [Pajoding, Thimphu district], 3960 m, viii 1914, *Cooper* 3229 (E); Tremo La to Kang La [Thimphu district] 4570–4880 m, vii 1938, *Gould* 1091 (K); Pangotang, Tsampa [Upper Bumthang Chu district], 4420 m, vii 1949, *Ludlow, Sherriff & Hicks* 19341 (BM).

Corydalis ecristata* (Prain) Long, *comb et stat. nov.

Basionym: *Corydalis cashmeriana* Royle var. *ecristata* Prain in J. Asiatic Soc. Bengal 65:22 (1896).

var. *ecristata*

Corydalis ecristata, although overlapping in range (Fig. 2) with *C. cashmeriana* subsp. *brevicornu*, is normally quite distinct and as suggested by Prain can be regarded as a good species (Table 1). In most specimens the outer petals are totally without a crest, and the lower lip is long-exserted, broad and rounded, whereas in *C. cashmeriana* the outer petals are distinctly crested, and the lower lip rhombic-acute, relatively narrow and only shortly exerted beyond the upper lip. *C. ecristata* can be subdivided into two sympatric varieties, distinguished primarily by the length of spur (Table 1).

A few specimens are intermediate in some respects with *C. cashmeriana* subsp. *brevicornu* and it is possible that hybridisation is involved, for example *Ludlow et al.* 21354 is typical of *C. ecristata* var. *ecristata* except that it has the lower lip rather pointed as in *C. cashmeriana*. Var. *ecristata* is the commoner, ranging from E Nepal, W Sikkim and Chumbi to E Bhutan, whilst var. *longicalcarata* is more local in E Nepal, E Sikkim, Chumbi and W Bhutan. The following specimens of var. *ecristata* have been studied:

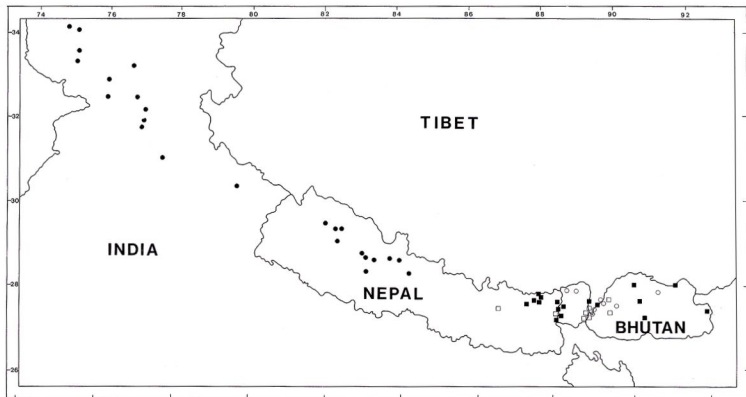


FIG. 2. Himalayan distribution of *Corydalis cashmeriana* Royle subsp. *cashmeriana* (●), and subsp. *brevicornu* (Prain) Long (○); *C. ecristata* (Prain) Long var. *ecristata* (■) and var. *longicalcarata* Long (□).

NEPAL. S of Topke Gola, 4260 m, vii 1956, *Stainton* 883 (E); Lumba-sumba Himal, 4420 m, vii 1971, *Beer* 8321 (BM, K); Iswa Khola, 4260 m, viii 1971, *Beer* 10008 (BM, K); Barun Khola, 4260 m, vii 1971, *Beer* 9550 (BM); NW of Topke Gola, 3960–4260 m, vii 1971, *Smith* 13 (BM); Rate Pohare, 4260 m, vii 1971, *Shrestha & Joshi* 333 (BM); Yalung, 3960 m, ix 1978, *Binns et al.* 169 (E).

SIKKIM: Ney-go-la near Jongri, vii 1887, *King's Collector* s.n. (isosynotype K); Jongri 3960 m, vii 1896, *Pantling's Collector* s.n. (K); Kangpupchuthang, 4880 m, ix 1911, *Ribu & Rohmoo* 5216 (K); Pheonp, 4110 m, 1913, *Ribu & Rohmoo* 6376 (E); Chowbanjan, 3350 m, 1913, *Ribu & Rohmoo* 6367 (E); Yampung, 4260 m, viii 1913, *Rohmoo* 873 (E); Gocha La, 5190 m, ix 1983, *Macpherson* 103 (E).

TIBET, CHUMBI. above Gantsa, 3650 m, viii 1936, *Chapman* 264 (K); Yatung to Lachung La, 3650 m, vi 1939, *Gould* 2043 (K).

BHUTAN. [Punakha district], Dungshinggang, 4570 m, vi 1937, *Ludlow & Sherriff* 3284 (BM); [Tongsa district], Rinchen Chu, 4260 m, vii 1937, *Ludlow & Sherriff* 3360 (BM); [Sakden district], Orka La, 3960 m, vii 1934, *Ludlow & Sherriff* 644 (BM); [Upper Pho Chu district], Chesha La, 4260 m, vi 1949, *Ludlow, Sherriff & Hicks* 16638 (BM, E, K); [Upper Kuru Chu district], Narim Thang, 4260 m, vii 1949, *Ludlow et al.* 21354 (BM, E).

***Corydalis ecristata* (Prain) Long var. *longicalcarata* Long, var. nov.**

A var. *ecristata* floribus majoribus, petalo superiore 18–22 mm longo, calcarī gracili 11–16 mm ad apicem valde deflexo, limbo petali inferioris ultra labio superiore 5–8 mm exserto differt.

NEPAL. Inukhu Khola N of Cherem, 4570 m, vi 1964, *McCosh* 283 (BM, E); Kangrang La, 4110 m, vi 1969, *Williams* 770 (BM).

SIKKIM. above Changu, 3800 m, vi 1913, *Cooper* 21 (E); S of Kapup, 3650 m, vii 1913, *Cooper* 169 (E); Sheraothang, 3650 m, vii 1913, *Cooper* 308 (E); Gnathong, vi 1919, *Cave* s.n. (E); Changu, 3840 m, vi 1943, *Lowndes* 738 (E); Jelep La, 3960 m, v 1921, *Everest Expedition* 28 (K).

TIBET, CHUMBI. Yatung, 3200 m, vi 1939, *Gould* 2070 (K).

BHUTAN. [Ha district], Chelai La, 3810 m, vi 1933, *Ludlow & Sherriff* 131 (E); [Thimphu district], above Barshong, 3960 m, v 1949, *Ludlow, Sherriff & Hicks* 16350 (*holo.* E; iso. BM, K).

***Corydalis dorjii* Long, sp. nov. (Fig. 3A).**

Syn.: *C. triternata?* sensu Prain in J. Asiatic Soc. Bengal, 64(2):25 (1896), non Franchet.

C. pseudoclematis Fedde similis sed radicibus tubera fusiformia 1.5–2 cm longa ferentibus, racemis 2–4-floris 2–4 cm longis, pedicellis 1.5–3 mm longis, sepalis minutis c.0.08 mm longis, subintegris, petalis subcaeruleis vel violaceis eis exterioribus ad apicem cristam humilem 3–3.5 mm longam instructis, eo superiore 25–28 mm longo, calcarī gracili deflexo 16–18 mm longo incluso, glande nectarifera 7–8 mm, calcarī minus quam dimidio brevior distincta.

Slender erect herb; stems 30–50 cm, arising from a cluster of spindle-shaped tuberous roots 1.5–2 cm, stem with 1–3 short axillary branches. Basal leaves 2–3, sometimes absent or early-withering, triternate, broadly

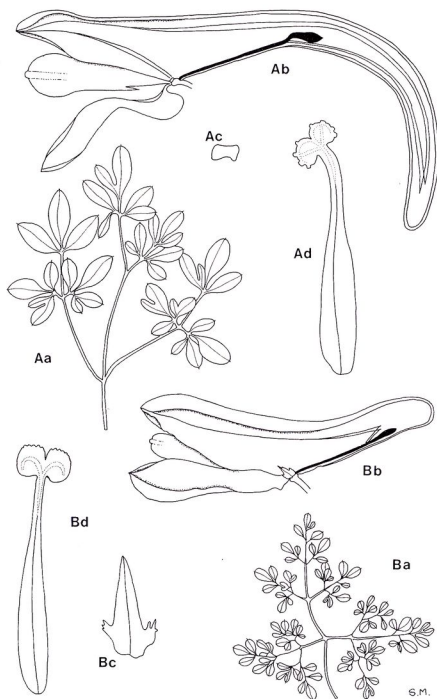


FIG. 3. A, *Corydalis dorjii* Long, Bhutan, Ludlow *et al.* 20599; B, *Corydalis delicatula* Long, Bhutan, Ludlow *et al.* 20624; a, leaf lamina; b, flower; c, sepal; d, gynoecium. Scale: Aa, Ba $\times \frac{1}{3}$, Ab, Bb $\times 5.5$, Bc, Ad, Bd $\times 10$, Ac $\times 20$.

triangular in outline, 7–11 cm long and broad, ultimate segments elliptic-ovate, 1.2–2.2 × 0.5–1.3 cm, obtuse, base attenuate, margin entire, glabrous, whitish beneath; petioles of basal leaves 10–14 cm, primary petiolules 2.5–4.5 cm, secondary petiolules 0.5–2 cm. Stem leaves 2–3, alternate, distant, similar to basal leaves but on shorter petioles 2–6 cm. Flowers 2–4 in short terminal racemes 2–4 cm on slender peduncle 3–20 cm. Bracts elliptic, 3–6 × 1–3 mm, acute, entire. Pedicels short, 1.5–3.0 mm. Sepals minute, rim-like, c. 0.08 mm long, subentire. Petals pale blue, lilac or pale mauve, outer pair with a short low crest in apical 3–3.5 mm; upper petal 25–28 mm including slender, deflexed spur 16–18 mm; lower lip equalling upper, boat-shaped, gibbous near insertion with pedicel. Nectariferous gland 7–8 mm, less than half length of spur. Capsules (immature) narrowly compressed-ellipsoid, c. 15 × 3 mm, becoming torulose.

BHUTAN. [Upper Kuru Chu district], Dunkhar, Kuru Chu valley, 27°50'N 91°07'E, 1980 m, v 1949, *Ludlow, Sherriff & Hicks* 18833 (BM); [Upper Kulong Chu district], Lao, Trashig Yangsi Chu, 27°52'N 91°28'E, 2440 m, 'Flower pale mauve. Growing in moist situation in dense mixed forest', v 1949, *Ludlow, Sherriff & Hicks* 20599 (holo. BM).

SE TIBET. Kongbo, between Nyuksang and Senge Dzong (Tsangpo Gorge), 29°46'N 95°00'E, 2560 m, iv 1947, *Ludlow, Sherriff & Elliot* 13571 (BM, E).

INDIA. MANIPUR. Ching Sow, 2560 m, iv 1882, *Watt* 6537 (E, K).

Corydalis dorjii is a distinctive new species first collected as sterile specimens in Manipur by George Watt in 1882. Prain (1896) tentatively placed this material close to *C. triternata* Franchet from W China, and commented 'This plant, very distinct from any other Indian species, may possibly prove to be the same as M Franchet's *C. triternata* of which it closely imitates the foliage.' *C. triternata*, however, from the description, differs in its smaller, yellow flowers with the spur ascending, and with the outer petals broadly crested.

The two Bhutan collections of *C. dorjii* were studied by Ludlow who compared them with *C. triternata* and also with another species from W China, *C. pseudoclematis* Fedde. In his annotations he remarked 'These forest plants from E Bhutan are equivalent to Watt 6537 from Chingsow, Manipur.... Watt's specimen, and the above gatherings from Bhutan, possibly represent an undescribed species.... The Bhutan and Manipur plants are also close to, if not identical with, *C. pseudoclematis* Fedde. Fedde gives no flower colour for his *C. pseudoclematis*, but Harry Smith says of his No. 10204 (which Fedde says is *C. pseudoclematis*) that the flower colour is "flavo-brunnei". Unfortunately neither Franchet nor Fedde give any description of the root systems of their respective plants. The fascicle of root tubers in L, S & H 18833 and 20599 should be noted.'

Although *C. pseudoclematis* is probably the closest relative of *C. dorjii*, it differs in a number of important respects summarised in Table 2. *C. triternata* is a poorly known plant; *Kingdon Ward* 3264 (E) from Laktang, may be identical with it. *C. pseudoclematis* appears to be more widespread in W China; its diagnostic characters listed in Table 2 are taken partly from Fedde's description and illustration, and partly from the following

TABLE 2

	<i>C. dorjii</i>	<i>C. pseudoclematis</i>
Roots	with spindle-shaped tubers 1.5–2 cm	long, fibrous, without tubers
Racemes	2–4 cm, 2–4-flowered	3–8 cm, 8–14-flowered
Pedicels	1.5–3 mm	3–7 mm
Sepals	minute, rim-like, subentire, c. 0.08 mm long	small, ovate, dentate, c. 0.5 mm
Flower colour	pale blue, violet or mauve	yellow
Upper petal length	25–28 mm	22–25 mm
Upper petal crest	with low crest in apical 3–3.5 mm	not crested
Upper petal spur	16–18 mm, deflexed	15–17 mm, \pm straight
Nectariferous gland	7–8 mm (less than $\frac{1}{2}$ length of spur)	c. 12 mm (c. $\frac{2}{3}$ of spur)

W Chinese specimens in E: Fang 877, Forrest 7796 and 29512, Kingdon Ward 4542, and Yu 16164 and 16215.

In the Indian region, the closest ally of *C. dorjii* is *C. leptocarpa* Hook. f. & Thomson, widespread in central and E Nepal, Sikkim, Bhutan, Assam and N Burma. The latter differs in its smaller size, fibrous roots, smaller, biternate leaves with crenately lobed segments, obovate bracts 6–10 mm, the lower ones toothed, outer petals more conspicuously crested, upper petal longer, 26–30 mm including a broader spur 13–15 mm long.

Like *C. leptocarpa*, *C. dorjii* is one of the few Himalayan *Corydalis* species restricted to moist broad-leaved forest habitats at lower altitudes; most other species occur above the tree-line or in the montane Conifer/Rhododendron forest zones. Ludlow & Sherriff described the habitat as 'dense mixed forest', but from the altitudinal range (1980–2560 m) it is likely that they grew in Cool broad-leaved forest (Grierson & Long, 1983). *C. leptocarpa*, on the other hand is found in Bhutan at even lower altitudes (1000–2500 m) in both Warm and Cool broad-leaved forests.

The species is named in recognition of the support and assistance given by the Director of Forests in Bhutan, Dasho C. Dorji, for the Flora of Bhutan project and associated collecting trips to Bhutan.

***Corydalis laelia* Prain subsp. *bhutanica* Long, subsp. nov.**

A varietate typica foliis grosse divisis, segmentis ultimis oblanceolato-ellipticis 3–5 mm latis, obtusis vel minute mucronatis, calcaris petali superioris 2.5–3.5 mm lato differt.

BHUTAN. [Punakha district], SW of Wangdu Phodrang, 2740 m, 'Wet site in mixed forest. 18" high. Bright yellow flowers, black lip.'. v 1971, *Bowes Lyon* 6050 (holo. BM); [Tongsa district], Chendebi near Trongsa, 3350 m, vii 1933, *Ludlow & Sherriff* 231 (BM).

Corydalis laelia is an E Himalayan endemic confined to Sikkim, Chumbi and W Bhutan. Its closest relative is *C. yunnanensis* Franchet from W China and NE Burma. The above collections from Bhutan are interesting in that they provide a link between the two species, having foliage almost indistinguishable from that of *C. yunnanensis*, but have the larger, more broadly-crested flowers of *C. laelia*.

***Corydalis delicatula* Long, sp. nov. (Fig. 3B).**

Species *C. pseudoclematis* Fedde similis sed foliis triternatisectis subtiliter dissectis, segmentis minoribus obovatis 3–10 × 2–7 mm, floribus 4–8 in racemis minoribus, petalo superiore 13–14 mm distincte cristato, calcaris leniter sursum curvato 7.0–7.5 mm longo incluso differt.

Slender, erect, little-branched herb; stems 26–45 cm, arising from a dense cluster of slender fasciculate fibrous roots. Basal leaves 1–3, triternatisect, broadly ovate-triangular in outline, 4–11 × 6–10 cm, finely dissected into delicate obovate segments 3–10 × 2–7 mm, these sometimes united at base, obtuse or truncate and minutely mucronate, pale beneath; petioles of basal leaves 3–14 cm; primary petiolules 2.5–4.5 cm, secondary petiolules 0.5–1.7 cm. Stem leaves 1–3, similar to basal leaves but on shorter petioles 2–4 cm. Flowers 4–8 in short terminal racemes 2.5–4.5 cm, on peduncle 4.6–6.0 cm. Lowermost bract 1–2 cm, leaf-like, upper bracts oblanceolate 2–5 mm, acute, entire or denticulate. Pedicels 2.5–5.0 mm. Sepals ovate, minute, 0.8 mm, laciniate. Petals yellow, upper 13–14 mm, including weakly upwardly curved spur 7.0–7.5 mm, sometimes slightly deflexed at apex, upper petal distinctly crested; lower lip equalling upper, boat-shaped, narrowly crested, with small gibbous swelling near insertion with pedicel. Nectariferous gland conspicuous, 4.8–6.0 mm, over $\frac{3}{4}$ length of spur. Capsules (immature) oblanceolate, c. 11 × 3 mm, weakly torulose.

BHUTAN. [Punakha district], Tang Chu, Ritang, 27°28'N 89°54'E, 3200 m, vi 1937, *Ludlow & Sherriff* 3199 (BM), [Punakha district] Pele La, W side, 3050 m, vi 1969, *Bowes Lyon* 15024 (BM); [Mongar district] Donga La, W side, 27°34'N 91°19'E, 2740 m, iv 1949, *Ludlow, Sherriff & Hicks* 20516 (BM); [Upper Kulong Chu district] Lao, Trashi Yangsi Chu, 27°52'N 91°28'E, 2740 m, 'Flowers yellow. Growing in moist situations in *Rhodo.* & *Tsuga* & *Abies* forest', 11 v 1949, *Ludlow, Sherriff & Hicks* 20624 (holo. BM, iso. E).

Although endemic to Bhutan, *C. delicatula* clearly belongs to a group of species centred in W China, characterized by their yellow flowers and delicate ternatisect leaves, including *C. davidii* Franchet, *C. pseudoclematis* Fedde, *C. triternata* Franchet and *C. yunnanensis* Franchet. The Himalayan species *C. leptocarpa* Hook. f. & Thomson and *C. dorjii* Long are also related but have blue or purple flowers. Of the above yellow-flowered species, *C. pseudoclematis* is probably closest as it shares a similar fibrous root system, has leaves dissected into obovate segments and has strongly dimorphic bracts with the lowest one large and leaf-like, the others small and undivided. The two differ, however, in foliage and flowers: in *C. pseudoclematis* the leaves are biternatisect, with larger segments 10–17.5 × 5–10 mm, the racemes 8–12-flowered, upper petal uncrested, larger, c. 2.5 cm; in *C. delicatula* the leaves are triternatisect with

segments 3–10 × 2–7 mm, the racemes 4–8-flowered and upper petal 13–14 mm, distinctly crested.

C. triternata Franchet is a more robust plant with coarser, ovate leaf segments and longer upper petal and spur. *C. yunnanensis* Franchet is likewise a larger plant with leaves divided into elliptic or linear, acute segments, branched many-flowered racemes with bigger flowers. *C. davidii* Franchet (the name tentatively applied to the Bhutan plants by Ludlow) differs in its larger, biternatisect leaves with acute segments, bracts all uniform, undivided and flowers over 2 cm long.

This group of *Corydalis* predominantly favours damp, shady forest habitats; *C. delicatula* appears to frequent moist Hemlock and Fir/Rhododendron forests, at altitudes between 2740 and 3200 m.

***Corydalis iochanensis* Lévillé, Cat. Pl. Yunnan 202 (1916).**

This species has been reported previously only from the type locality in Yunnan, where it was collected in 1912 by E. E. Maire. Lévillé's description is very brief and misleading as he described the capsule as 'brevés' due to the fact that some of the fruits on Maire's specimen are galled and subglobose (the specimen also bears mature ungalled linear-ellipsoid capsules). Fedde (1924) studied the type specimen and published a detailed description, but did not cite any further collections.

Recent study of *Corydalis* material from Bhutan revealed what was thought to be an undescribed species, but comparison with *C. iochanensis* shows that it must be referred to that species. The following description applies to the Bhutan plants:

Slender, erect or decumbent annual herb, with numerous slender fasciculate roots; stems 15–30 cm, branching only at base. Radical leaves few or numerous, broadly ovate or suborbicular in outline, 3.0–4.5 × 2–5 cm, on slender petioles 5–15 cm, deeply biternatisect, lateral petiolules 2–5 mm, terminal petiolule 7–12 mm; ultimate segments narrowly obovate or oblanceolate, 1.5–5.0 mm broad, obtuse or mucronate. Cauline leaves 2–4 similar to radical leaves but on shorter petioles 1.5–5.0 cm. Flowers in compact few- to many-flowered racemes 2–3 cm long. Lower bracts 6–12 mm, deeply divided into 3–7 linear, acute teeth, usually exceeding pedicels; upper bracts linear, entire. Pedicels slender, 4–7 mm. Sepals triangular, 1.2–2.0 mm, laciniate. Petals pale yellow, outer pair not crested; upper petal 13–15 mm including strongly deflexed spur 4.5–6.5 mm; lower lip equalling upper, boat-shaped, acute, distinctly gibbous near insertion. Nectariferous gland 2.0–3.1 mm. Capsule ellipsoid, 13–15 × 3.0–4.5 mm, seeds 9–15 in 2 rows, smooth, black, glossy.

BHUTAN. [Thimphu district] Pemithanka, 27°26'N 89°32'E, 2500 m, v 1938, Gould 149 (K); [Thimphu district], Dotena Chu, 27°35'N 89°35'E, 3050 m, v 1949, Ludlow, Sherriff & Hicks 16376 (BM, E); [Tongsa district], Phobsikha, 27°17'N 90°24'E, 3050 m, v 1937, Ludlow & Sherriff 3108 (BM); [Bumthang district], Takhung, Bumthang Tang, 27°36'N 90°50'E, 3200 m, v 1949, Ludlow, Sherriff & Hicks 18914 (BM, E); [Bumthang district], Kyikyí La, N side, 27°33'N 90°41'E, 3200 m, vi 1969, Bowes Lyon 15077 (BM); Bumthang district, W side of Ura La, 27°27'N 90°51'E, 3500 m, vi 1979, Grierson & Long 1865 (E, K, TI, THIMPHU).

SE TIBET. Trimo, Nyam Jang Chu, 27°55'N 91°54'E, 3500 m, v 1947, *Ludlow, Sherriff & Elliot* 12519 (BM, E).

W CHINA, YUNNAN. descent to the Yangtze from the eastern boundary of the Lichiang Valley, 27°16'N, 2740–3050 m, vi 1913, *Forrest* 10094 (E); Bord des Torrents du Io-Chan, 3300 m, vii 1912, *Maire* s.n. (**holo.** E).

W CHINA, SZECHWAN. Kangtin-hsien (Tatsienlu), 2740–2890 m, ix 1928, *Fang* 3557 (E).

The illustration provided by Fedde (1924) shows the outer petals as broadly crested, but this is not the case in any of the specimens examined: in these the outer petals bear only a thickened keel which could be interpreted as a very low crest.

***Corydalis bowes-lyonii* Long, sp. nov. (Fig. 4C).**

Species *C. crispae* Prain (*C. stracheyioides* Fedde) similis sed planta robustior, caulibus 45–90 cm altis, foliis majoribus 7–12 × 8–12 cm segmentis ultimis 3–5 mm latis, racemis multifloris 4–8 cm longis, floribus majoribus, petala superiore (1.1–)1.4–1.6 cm longo calcar 2–3 mm lato incluso insignis.

Robust herb, stems 45–90 cm, arising from a stout woody rhizome. Basal leaves absent or not persisting; lower stem leaves broadly ovate-triangular 7–12 × 8–12 cm, ternate, terminal leaflet often much longer than laterals (and leaf appearing somewhat pinnate); leaflets deeply pinnatisect, ultimate segments obovate, 3–5 mm broad, obtuse, minutely mucronate, base attenuate, pale beneath; petioles of lower leaves 4–14 cm; primary petioles 0.5–3 cm, those of lateral leaflets shorter. Upper stem leaves smaller, shortly petioled or sessile. Racemes terminal, 4–8 cm, many-flowered. Lower bracts 1–1.7 cm, deeply pinnatisect, becoming shorter upwards. Flowers secund, yellow. Outer petals with broad rounded crenulate crest 1–2 mm tall, upper petal (1.1–)1.4–1.6 cm, including upwardly curved spur (5–)7–9 mm; lower lip equalling upper. Nectariferous gland (3–)4.5–5.5 mm, c. $\frac{3}{4}$ length of petal spur. Mature capsules unknown. BHUTAN. [Thimphu district], Thimphu, W side, c. 27°29'N 89°38'E, 4140 m, 'Among rank herbage in grazing ground. Flowers yellow, 18" high', 18 ix 1967, *Bowes Lyon* 5120 (**holo.** BM); [Upper Mangde Chu district] Ju La, Mangde Chu, 27°47'N 90°35'E, 4110 m, vii 1949, *Ludlow, Sherriff & Hicks* 16907 (BM); [Upper Bumthang Chu district], Champa, Bumthang, 27°49'N 90°43'E, 3800 m, ix 1914, *Cooper* 2183 (E). TIBET. Reting, 60 miles N of Lhasa, 30°22'N 91°28'E, 4110 m, vii 1944, *Ludlow & Sherriff* 11037 (BM, E).

W CHINA, YUNNAN. E slopes of Likiang Snow Range, Yangtze watershed, 3350 m, 1923–24, *Rock* 9871 (E).

The similarity of the above Bhutan and Tibet collections to *C. crispae* Prain, and the fact that *C. stracheyioides* Fedde is a synonym of *C. crispae*, were noted by Ludlow in herbarium annotations at BM and E. *C. bowes-lyonii* differs from *C. crispae* in its much more robust, erect habit, larger, more coarsely subdivided leaves, larger and more deeply pinnatisect bracts and usually bigger flowers with a broader spur. *C. crispae* is a diffuse, much-branched herb 15–25 cm tall, with leaves 1.5–3 cm long, racemes 2–5 cm, upper petal 10–12 mm with narrow spur 1.5–2 mm broad.

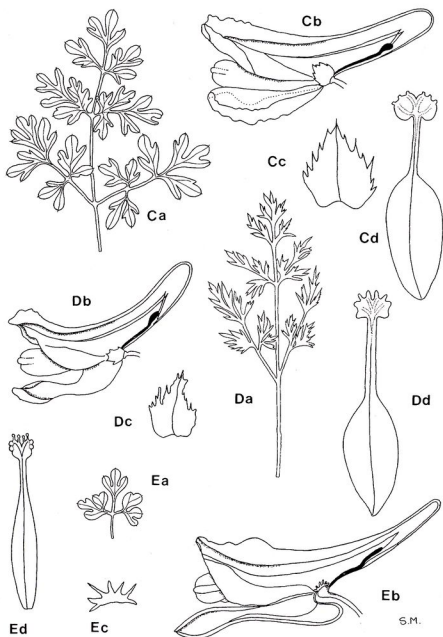


FIG. 4. C, *Corydalis bowes-lyonii* Long, Bhutan, Bowes Lyon 5120; D, *Corydalis drepanantha* Long, Arunchal Pradesh, Ludlow & Sherriff 1272; E, *Corydalis changuensis* Long, Sikkim, Cooper 845; a, leaf lamina; b, flower; c, sepal; d, gynoeceium. Scale: Ca $\times \frac{2}{3}$; Da, Ea $\times 1$; Cb, Db, Eb $\times 5$; Ed $\times 7$; Cd, Dd $\times 9$; Cc, Dc $\times 10.5$; Ec $\times 30$.

In stature *C. bowes-lyonii* is more akin to *C. laelia* Prain, *C. yunnanensis* Franchet and *C. chaerophylla* DC. The first two of these differ in their fibrous root systems whilst *C. chaerophylla* differs in its larger size, more finely dissected leaves with acute segments, simple bracts, and flowers with a very low crest and long slender spur.

The specimen from W China (Rock 9871) differs from the other collections in its shorter petal spur and may represent a different subspecies. *C. bowes-lyonii* shows an unusual distribution pattern (N Bhutan, Tibet and W China). Its habitat appears to be in damp meadows and marshes above the tree line, and in swampy *Rhododendron* scrub, at between 3150 and 4140 m altitude. It is named in honour of S. Bowes Lyon, in appreciation of his valuable herbarium collections (BM) made in Bhutan in 1966, 1967, 1969 and 1971.

***Corydalis drepanantha* Long, sp. nov. (Fig. 4D).**

Species *C. crispae* Prain (*C. stracheyioidi* Fedde) similis sed herba erectior, foliis aequis triternatisectis majoribus 3.5–5 × 4.0–5.5 cm, segmentis ultimis lineari-oblongatis acutis 0.5–1.5 mm latis, racemis 6–12-floris, bracteis quam pedicellis longioribus, petalis exterioribus cristis latis ultra labiis procurrentibus, glande nectarifera calcari circa dimidio longiore distinguenda.

Erect perennial herb, stems 12–29 cm, branched in lower part, borne on slender rootstock. Lower stem leaves broadly ovate, triternatisect, 3.5–5.0 × 4.0–5.5 cm, secondary leaf divisions ovate, ternately dissected into linear-oblongate teeth or segments 0.5–1.5 mm broad, acute; petioles 5–9 cm; primary petiolules 0.7–2.4 cm. Upper stem leaves smaller, shortly petioled. Flowers 6–12 in terminal racemes 3.5–5 cm on peduncles 4–9 cm. Lower bracts leaf-like 1.1–2.1 cm, upper bracts linear, 4–6 mm, longer than pedicels. Pedicels 3–10 mm. Flowers yellow, secund. Sepals broadly ovate, 0.5 mm, dentate. Outer petals broadly crested, with apex of crest irregularly dentate and projecting forwards beyond lips; upper petal 10–13 mm, including slender, upwardly curved spur 6–9 × 1–1.5 mm; lower lip boat-shaped, equalling upper, not gibbous near insertion. Nectariferous gland 3.2–4.0 mm, c. $\frac{1}{2}$ length of spur. Capsules obovate-elliptic, 9 × 3 mm, obtuse.

INDIA, ARUNACHAL PRADESH. between Pangchen and Le, Nyam Jang Chu, c. 27°45'N 91°49'E, 2285 m, 'Golden yellow. On damp grassy banks in forest glades', 4 iv 1936, Ludlow & Sherriff 1272 (holo. BM).

BHUTAN. [Tashigang district], Dengchung, Khoma Chu, 27°44'N 91°14'E, 2130 m, iv 1949, Ludlow, Sherriff & Hicks 18765 (BM).

Corydalis drepanantha, so-called on account of its sickle-shaped flowers, is at present known from two localities in E Bhutan and neighbouring Arunachal Pradesh. In its ternately dissected leaves and yellow flowers with a slender, upwardly-curved spur it is allied to a number of other Himalayan species, *C. delicatula* Long, *C. crispa* Prain, *C. bowes-lyonii* Long, *C. casimiri* Duthie & Prain, *C. longipes* DC. and *C. changuensis* Long, and in its distinctive forwardly-projecting crest on the outer petals it is similar to *C. laelia* Prain. Both *C. laelia* and *C. delicatula* differ in their densely fasciculate fibrous roots (*C. drepanantha* bears a simple rhizome), *C. crispa* and *C. bowes-lyonii* differ in their unequally ternate

leaves with obovate, obtuse segments, and petals without forwardly-projecting crests; *C. casimiriana* and its close relatives *C. longipes* and *C. changuensis* differ in their slender wiry habit, much smaller leaves with obovate segments, and in their outer petals, bearing a narrower crest not projecting forwards.

Like *C. delicatula*, *C. drepanantha* is a woodland plant, found in forests at between 2130 and 2285 m, presumably moist, cool, broad-leaved forests, whereas the other allied taxa are alpine plants from above the tree-line.

Corydalis casimiriana Duthie & Prain in J. Asiatic Soc. Bengal, 65(2):27 (1897).

Syn.: *C. prainiana* Kanodia & Mukerjee, Rec. Bot. Survey India 20(2):32 (1974) *nom. superfl.*

Kanodia & Mukerjee (l.c.) proposed the name *Corydalis prainiana* to replace *C. casimiriana* Duthie & Prain, presumably on the grounds that they considered the latter epithet to be an orthographic variant of *C. cashmeriana* Royle, and therefore an illegitimate homonym. However, the two are quite unrelated species and the names are unlikely to be a source of confusion, and have quite different derivations: *C. cashmeriana* derives from the state of Kashmir whilst *C. casimiriana* commemorates the botanist Casimir de Candolle.

Corydalis changuensis Long, *sp. nov.* (Fig. 4E).

Species *C. casimirianae* Duthie & Prain et *C. longipiti* DC. similis sed floribus majoribus, petalo superiore 13–15 mm longo, calcaris longiore et latiore 7.7–10.0 × 2.0–3.4 mm leniter sursum curvato, crista dorsali paene ad apicem calcaris decurrenti, labio inferiore calcaris brevi et lato 1.2–1.4 mm longo prope insertionem pedicelli instructo, glande nectarifera longiora 4.8–5.7 mm longitudine $\frac{1}{2}$ – $\frac{2}{3}$ calcaris aequanti distincta.

Diffuse much-branched perennial herb with thin woody rootstock, stems 12–30 cm. Leaves numerous, mostly cauline, broadly ovate in outline, 1.4–2.5 × 1.7–3.1 cm, deeply and equally biternatisect, on slender petioles 3–9 cm; leaflets subequal, ovate, cuneate at base, lateral leaflets on short petiolules 3–5 mm, terminal on longer petiolule 4–11 mm; leaflets deeply ternately dissected into obovate, obtuse segments 3–7 × 2–5 mm. Racemes lax, 3–6-flowered, 1.5–3 cm. Lower bracts 3–5 mm, often deeply 3-fid into linear segments, upper bracts smaller, lanceolate, entire. Pedicels 3–8 mm, longer than bracts. Sepals reduced to a minute dentate rim. Petals yellow, tipped black, upper 13–15 mm including tapering, weakly upwardly-curved spur 7.7–10.0 × 2.0–3.4 mm; limb apiculate with broad dorsal crest decurrent almost to tip of spur; lower petal equalling upper, near insertion with pedicel bearing short, obtuse spur 1.2–1.4 mm long and broad, limb crested. Nectariferous gland long, 4.8–5.7 mm, $\frac{1}{2}$ – $\frac{2}{3}$ length of upper petal spur. Capsules (immature), ellipsoid, 6–7 mm.

SIKKIM. Changu, 3960 m, 'Delicate habit, straggling over moist stretches. Yellow and black', ix 1913, *Cooper* 845 (*holo.* E, iso. BM); above Changu, 3960 m, ix 1913, *Cooper* 854 (E); Changu, 3650 m, ix 1916, *Cave* s.n. (E).

Corydalis changuensis is a very local new species known only from the Changu district of SE Sikkim, close to the border with Tibet. It is most

TABLE 3

	<i>C. casimiriana</i>	<i>C. longipes</i>	<i>C. changuensis</i>
Upper bracts	entire	deeply toothed	entire
Upper petal length	10-12 mm	9-11 mm	13-15 mm
Spur: length	5.5-7.0 mm	6.3-8.3 mm	7.7-10.0 mm
width at base	0.8-1.7 mm	1.0-2.0 mm	2.0-3.4 mm
(excluding crest)			
curvature	strongly upwardly curved	moderately to strongly upwardly curved	weakly upwardly curved
Decurrence of crest on upper petal	crest narrow, not decurrent on spur	crest broad, decurrent on spur	crest broad, decurrent on spur
Base of lower petal	not gibbous or spurred	gibbous near base	with short broad spur 1.2-1.4 mm long
Nectariferous gland	2.0-3.0 mm ($\frac{3}{4}$ -length of spur)	0.7-1.4 mm ($\frac{1}{6}$ - $\frac{1}{8}$ length of spur)	4.8-5.7 mm ($\frac{1}{2}$ -length of spur)
Capsule shape and length	linear, 6-10 mm	obovoid, 4-6 mm	(immature) ellipsoid, 6-7 mm

closely allied to two other Himalayan species, *C. casimiriana* Duthie & Prain and *C. longipes* DC. both of which occur in Sikkim and Bhutan; all three share a slender, diffuse growth form, small biternatisect leaves and delicate yellow flowers with the upper petal spur curving upwards. Their differences are listed in Table 3. The most striking feature of *C. changuensis*, unique amongst Indo-Himalayan species, is that in addition to the upper petal bearing a long spur, the base of the lower petal is also spurred. In several other Himalayan species, e.g. *C. longipes* DC., *C. dorjii* Long and *C. iochanensis* Lévêillé, the lower petal is somewhat gibbous near the insertion with the pedicel but is never truly spurred.

***Corydalis cavei* Long, sp. nov. (Fig. 5F).**

Species *C. casimirianae* Duthie & Prain similis sed racemis 4-7 cm longis 8-16-floris, sepalis majoribus suborbicularibus 1.8-2 mm longis, petalis exterioribus laticristatis, eo superiore 13.5-15.0 mm longo, calcar lato 7.0-8.5 \times 2.5-3 mm incluso, glande nectarifera 4-6 mm longo longitudine $\frac{1}{2}$ - $\frac{2}{3}$ calcaris aequanti distincta.

Slender decumbent perennial herb with slender rhizome. Stems 18-30 cm, branched. Leaves mostly cauline, broadly ovate, 2-3 \times 1.5-2 cm, equally biternatisect with ultimate segments obovate 1.5-3 mm broad, obtuse or truncate, minutely mucronate; petioles of lower leaves 5-9 cm, of upper leaves 1-1.5 cm; primary petiolules 6-13 mm. Racemes 4-7 cm, 8-16-flowered. Bracts 3-6 mm, lower ones pinnatisect in upper half, upper bracts becoming linear, entire, acute. Pedicels 4-11 mm, exceeding bracts. Sepals suborbicular 1.8-2.0 mm diameter, dentate. Petals yellow, outer pair broadly crested, upper 13.5-15.0 mm including broad weakly upwardly curved spur 7.0-8.5 \times 2.5-3.0 mm. Lower outer petal equalling upper, without swelling or spur near insertion with pedicel. Nectariferous gland 4-6 mm, $\frac{1}{2}$ - $\frac{2}{3}$ length of spur. Capsules unknown.

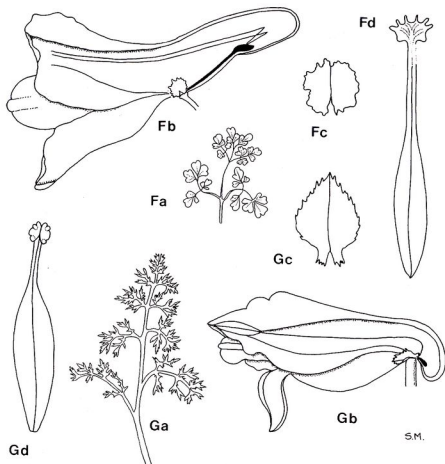


FIG. 5. F, *Corydalis cavei* Long, Sikkim, Cave s.n.; G, *Corydalis calliantha* Long, Bhutan, Cooper 1975. a, leaf lamina; b, flower; c, sepal; d, gynoeceium. Scale: Fa, Ga $\times 1$; Gb $\times 4$; Fb, Gd $\times 5$; Fc, Gc $\times 7$; Fd $\times 8$.

E NEPAL. Phaploo [27°30'N 86°35'E], 2440–2740 m, 1930, Dhwoj 93 (E).
 SIKKIM. Phallut [27°12'N 88°01'E], 3350 m, 1 ix 1919, Cave s.n. (holo. E).

C. cavei, at present known only from two localities in E Nepal and Sikkim, is almost indistinguishable in habit and foliage from *C. casimiriensis* Duthie & Prain, *C. longipes* DC. and *C. changuensis*. However the inflorescence and flowers of *C. cavei* are very strikingly different from those of its allies. *C. cavei* has longer racemes with more numerous flowers, which are larger, have a more inflated spur, the outer petals are more broadly crested and the lower lip bears no trace of a swelling or spur near its insertion with the pedicel. The species is named after G. H. Cave who first collected the plant in Sikkim. Further collections are desirable to gain information on the fruit and ecology.

***Corydalis calliantha* Long, sp. nov. (Fig. 5G).**

Species *C. meifoliae* Wallich var. *sikkimensis* similis sed caulibus gracilibus et brevioribus, foliis minoribus 4-7 × 1.5-3.5 cm, segmentibus ultimis 1.3-2.2 × 0.5-0.8 mm, floribus 4-9 in racemis brevibus subumbellatis condensatis, pedicellis 12-25 mm longis, floribus majoribus, sepalis ovatis 3-4 × 2-3 mm acutis dentatis, petalo superiore 16-20 mm calcari lato deflexo 3-5 mm longo incluso distinguenda.

Suberect or decumbent perennial herb with slender woody rhizome 3-5 mm broad, bearing 2-6 stems amongst a cluster of persistent petiole bases. Stems 7-16 cm, branched. Radical leaves few, not persistent except for petiole bases. Lower cauline leaves subopposite, ovate-oblong, 4-7 × 1.5-3.5 cm, deeply tripinnatisect; petioles 2-9 cm; primary petioliules 3-9 mm; ultimate segments linear-elliptic, 1.3-2.2 × 0.5-0.8 mm, acute. Upper cauline leaves alternate, smaller, shortly petioled. Racemes terminal, condensed, subumbellate, 4-9-flowered. Lower bracts large, 11-17 × 6-12 mm, deeply pinnatisect or bipinnatisect in upper half, base oblong, segments linear, acute, often toothed or lobed; upper bracts smaller, less divided. Pedicels 12-25 mm, slightly exceeding bracts. Flowers suberect, yellow or golden-yellow. Sepals broadly ovate, c. 3-4 × 2-3 mm, acute, dentate. Upper petal inflated, 16-20 mm long including short, broad, deflexed spur 3-5 × 3.5-4.5 mm; limb acute, broadly crested, crest narrowly decurrent along spur. Lower petal 14-17 mm, narrowly crested, lip deflexed. Nectariferous gland short, c. 1 mm. Capsules unknown.

BHUTAN. [Thimphu district] Parshong [Barshong, 27°42'N 89°33'E], 3960 m, vii 1914, *Cooper* 1975 (BM, E); [Punakha district], Tang Chu, Ritang, 27°34'N 90°10'E, 4570 m, vii 1937, *Ludlow & Sherriff* 3365 (BM); [Panukha district], Maru [27°35'N 90°16'E], 3808 m, vi 1969, *Bowes Lyon* 15045 (BM); [Tonga district], Thita Tso (Rinchen Chu), 27°38'N 90°18'E, 'Perianth bright golden yellow. Leaves dull glaucous green. Growing on almost bare cliff faces', 12 vii 1937, *Ludlow & Sherriff* 3425 (holo. BM, iso. E); [Upper Mo Chu district] Lingshi to Yale La, [27°55'N 89°27'E], 4570 m, vii 1938, *Gould* 1149 (K); [Upper Mangde Chu district], Namda La, Mangde Chu, 27°51'N 90°34'E, 4730 m, x 1949, *Ludlow, Sherriff & Hicks* 19809 (BM).

C. calliantha is a distinctive new species endemic to Bhutan. Its closest relatives appear to be *C. meifolia* Wall. var. *sikkimensis* Prain, *C. aurantiaca* Ludlow and *C. gerdae* Fedde. The last of these is easily recognized on account of its purple flowers. Some of the above collections of *C. calliantha* were annotated '*Corydalis meifolia* var.?' by Ludlow, but from the latter species it differs in its smaller leaves 4-7 × 1.5-3.5 cm, shorter ultimate segments 1.3-2.2 × 0.5-0.8 mm, fewer (4-9) flowers in short, subumbellate racemes, larger, ovate sepals 3-4 × 2-3 mm, larger flowers with upper petal 16-20 mm and stouter spur 3-5 × 3.5-4.5 mm. In *C. meifolia* var. *sikkimensis* the lower leaves are 5-10 × 2.5-4 cm, with linear ultimate segments 2.5-4.7 × 0.7-1.1 mm, flowers numerous in dense racemes, sepals oblong, 2-3 × 1-1.5 mm and upper petal 13-14 mm with spur 2-2.5 mm long and broad.

C. aurantiaca Ludlow is similar to *C. calliantha* in habit but differs in its smaller size, smaller leaves with obovate or oblanceolate segments,

rounded sepals often broader than long and longer, more slender flowers with upper petal 20–22 mm and narrower spur.

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