

SYSTEMATIC STUDIES ON FAMILY COMMELINACEAE OF SIKKIM

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ABSTRACT

The present paper deals with the detailed taxonomic treatment of the family Commelinaceae comprising of 8 genera and 25 species in Sikkim. A key to the genera and species based on the morphological characters is also given for easy identification. *Streptolirion volubile* subsp. *khasianum* (C.B.Clarke) D.Y. Hong is reported for the first time from Sikkim.

Keywords : Biogeography, Commelinaceae, Morphology, Systematics, Sikkim.

INTRODUCTION

The family Commelinaceae commonly known as the Spiderwort family consists of 40 genera and 600 species (Mabberley 2008). The members of the family are mainly distributed in the tropical, subtropical and subtemperate regions of Northern hemisphere. Several species of *Commelina*, *Tradescantia*, *Zebrina* are cultivated due their ornamental value or as in house plants.

The family was studied by several taxonomists like Bruckner (1930), Hutchinson (1934,1973), Woodson (1942), and Pichon (1946). Bruckner and Pichon segregated the genera on the basis of perianth structure. Woodson and Hutchinson segregated the genera according to the type of inflorescence. The Indian members of the family were studied by Hassk. (1870); Panigrahi (1975); Santapau (1955); Rao (1964, 1966, 1971). Kammathy & Rao (1962,1965) and Rao & al. (1968) studied the cytology of the members of the family. The chromosome pattern and evolutionary trends were studied by Rao & al. (1972).

The state of Sikkim is situated in the eastern Himalaya between 27°5'– 28°9'N lat. and 87° to 89° E long. The state has a total geographic area of 7096 sq. km. and elevation ranges from 250m to 8598m. Its unique geographic position, varied range of altitude and topography with high annual precipitation has made this state one of the richest botanical areas of the country. The state is endowed with 42.8 % of the area under forest and c.4500 species of flowering plants, i.e. 26% of Indian flora (Dash & Singh 2002).

In Sikkim, the family Commelinaceae is represented by 8 genera, 25 species and 2 subspecies. No systematic study of the family Commelinaceae of Sikkim is available. Hooker (1892), Mitra (1952), Hara & al. (1982) and Noltie (1994) provided only a sketchy references of the species occurring in the state. In the present paper, key to genera and species is given to facilitate their identification. All the genera are arranged alphabetically. Within the genera the species are also arranged alphabetically. Description of all genera is given. For each species detailed citations, description, phenology, field note and specimens examined are provided.

MORPHOLOGY

Morphology plays an important role for segregating the genera and particularly the species of Commelinaceae of Sikkim. Description of the morphological characters is based on the field observations and on herbarium specimens housed in Sikkim (BSHC).

Habit

All the members of Commelinaceae found in Sikkim are invariably herbs or undershrubs, except *Streptolirion* which is having a climbing habit. The stem is variable from decumbent to ascending and scandent. In *Commelina*, the stem is often swollen at nodes and develop conspicuous adventitious roots. Stems are variously pubescent, ciliate or glabrous.

Leaves

Generally the leaves are alternate, entire and simple. Two types of leaves are found, basal and upper (cauline). Basal leaves are found in *Commelina*, *Cyanotis*, *Murdannia* and *Streptolirion*. The shape and size of the leaves are variable from linear-lanceolate to elliptic to oblanceolate. In *Streptolirion*, the leaves are ovate-cordate while in *Amischotolype* they are elliptic.

Inflorescence

Inflorescence is fundamentally of two types, cymose (determinate) or racemose (indeterminate). Both the types are present in same genus also. Flowers are mostly pedicellate and subtended by a spathe like bract. Inflorescence is of thyrsiform racemes in *Streptolirion*, *Commelina*, *Floscopa* and *Rhopalephora*, while it is of terminal globose heads in *Amischotolype*. In *Cyanotis* it may be unbranched helicoid cymes. In *Murdannia* and *Polia* it is branched or unbranched subumbellate one flowered thyrsoid panicles.

The flower bearing stem is not sharply distinguished from the vegetative shoot except in *Polia* and *Streptolirion*. In both the genera, the inflorescence is thyrsiform, in which flowers are deflexed after anthesis. Spathes may be conduplicate or funnel shaped in *Commelina* or sickle shaped in *Cyanotis*. Leafy spathes are found in *Floscopa* and *Polia* while in *Rhopalephora* the spathes are funnel shaped with oblique free ends.

Flowers

Both unisexual and bisexual flowers are found in family Commelinaceae. In *Streptolirion* and *Commelina*, the flowers are bisexual and when unisexual then only with male flowers. The flowers are trimerous, but in *Murdannia* and *Cyanotis* they are either modified by suppression or fusion of parts. Flowers are hypogynous. Flowers are occasionally cleistogamous in *Commelina*. The flowers are diplochlamydeous and the number of tepals are 2-3. The reduction in perianth number may be due to fusion, which is very rarely found in some members of *Commelina*. Stamens in the family Commelinaceae are in two whorls. Reduction of any number may be in either of whorls. However, the outer whorl fluctuates considerably. The total number of stamens ranges from 3-6, even in the single genus. The filament length is variable. Ovary is superior, 2-3 celled with one locule indehiscent.

Fruits

Fruits are loculicidal capsule with 2-3 locules. Seeds are prismatic, dorsiventrally compressed and bearing a circular boss. All the members having a median boss except *Streptolirion*, where the position is apical.

BIOGEOGRAPHY

There are no species found endemic to the state. Out of 25 species, 13 (52%) species show distribution in almost all regions of the country with an eastern range up to Vietnam and western range up to Pakistan. Only 3 species viz. *Amischotolype hookeri*, *Streptolirion volubile* and *Polia hassakarlii* are restricted in distribution in eastern himalaya and NE region of the country. *Polia subumbellata* shows a disjunct distribution in the eastern Himalaya, NE India and Western ghats, while *Rhopalephora scaberimma* is distributed in eastern Himalaya, NE India, peninsular India and south of eastern ghats of India. Almost all species are showing their distribution common to both eastern and western himalayas. Twenty three species are found in NE India while as many as 16 species show their distribution in peninsular India. Members of the family Commelinaceae show a wide range of distribution in Sikkim. The species are restricted in between tropical to subtropical regions of the state. *Commelina* and *Cyanotis* are the only two genera which show a distribution in the temperate regions of the state.

Species found in Sikkim show a wide range of distribution in other parts of the world. About 84% of species which are found in Sikkim are common to China except four species, viz., *Amischotolype glabrata*, *Commelina coroliniana*, *Commelina sikkimensis* and *Cyanotis fasciculata*; 40% of species shows their range up to Pakistan (Table – I).

Table I : Distribution pattern of the family Commelinaceae of Sikkim in other parts.

Name of the Species	W. Himalaya (Himachl, J&K)	E. Himalaya (Nepal, Bhutan)	NE India	Peninsular India	W. Ghats/ W. India	North India (Rajasthan, UP, Delhi)	Central India (M.P., Chattisgarh)	East India (W.B., Orissa)	Pakistan	China	Eastern Limit
<i>Amischotolype hookeri</i>	x	√	√	x	x	x	x	x	x	x	Vietnam
<i>Amischotolype mollissima</i>	x	√	√	√	x	x	x	x	x	x	Bhutan
<i>Commelina benghalensis</i>	√	√	√	√	√	√	√	√	√	√	China
<i>Commelina diffusa</i>	x	√	√	√	√	x	√	√	x	x	China
<i>Commelina coroliniana</i>	√	√	√	√	√	√	√	√	√	√	Vietnam
<i>Commelina maculata</i>	√	√	√	√	√	√	√	√	√	x	China
<i>Commelina paludosa</i>	x	√	√	x	x	x	√	x	x	x	China
<i>Commelina sikkimensis</i>	x	√	√	x	x	x	x	x	x	x	Bhutan
<i>Commelina suffruticosa</i>	x	√	√	x	√	x	√	√	x	x	China
<i>Cyanotis arachnoidea</i>	x	√	x	√	x	x	√	x	x	x	Vietnam
<i>Cyanotis axillaris</i>	√	√	√	√	√	√	√	√	√	x	Vietnam
<i>Cyanotis cristata</i>	x	√	√	√	√	√	√	√	√	x	Vietnam
<i>Cyanotis fasciculata</i>	√	√	√	x	x	x	√	√	x	x	Bhutan
<i>Cyanotis vaga</i>	x	√	x	x	x	x	x	√	x	x	Bhutan
<i>Floscopa scandens</i>	x	√	√	√	√	√	x	√	√	√	Vietnam
<i>Murdannia divergens</i>	x	x	√	√	x	x	x	√	x	√	China
<i>Murdannia edulis</i>	√	√	√	√	√	√	√	√	√	√	Malaysia
<i>Murdannia japonica</i>	√	√	√	√	√	√	√	√	√	√	China
<i>Murdannia nudiflora</i>	√	√	√	√	√	√	√	√	√	√	China
<i>Murdannia spirata</i>	√	√	√	√	√	√	√	√	√	√	China
<i>Murdannia vaginata</i>	√	√	√	√	√	√	√	√	x	√	Vietnam
<i>Pollia hasskarlii</i>	x	√	√	x	x	x	x	x	x	√	China
<i>Pollia subumbellata</i>	x	√	√	x	√	x	x	x	x	√	China
<i>Rhopalephora scaberrima</i>	x	√	√	√	x	x	x	x	x	√	China
<i>Streptolirion volubile</i>											
subsp. <i>volubile</i>	x	√	√	x	x	x	x	x	x	√	Japan
subsp. <i>hasianum</i>	x	√	√	x	x	x	x	x	x	√	China

√ : Occur in the region; x does not occur in the region.

ECONOMIC IMPORTANCE

Species of Commelinaceae are used for fodder and vegetables in the traditional pattern among rural as well as urban populations. *Commelina benghalensis* is used as laxative, emollient and demulcent. Leaves of *Floscopa scandens* are used as fodder, in bone fractures, while the root of the same plant is used as febrifuge against chronic cough and cold. Leaves of *Murdannia nudiflora* used as pot herbs and as a poulticing agent against boils, itches and burns. Roots of *Cyanotis arachnoidea* are reported to be used for stimulating blood circulation and as a muscle relaxant.

SYSTEMATIC TREATMENT

COMMELINACEAE

Annual or perennial herbs, sometimes tuberous; stems erect or decumbent, rooting at nodes, usually with a line of hairs. Leaves alternate, distichous, lanceolate, ensiform, narrowed to petiole like leaf-base, sheaths prominent, open or closed, margins hairy. Inflorescence terminal or axillary cymose, sometimes solitary flower, supported by a membranous spathe. Flowers bisexual, hypogynous, trimerous, sepals 3, persistent; petals 3, ephemeral, 2 similar, broadly ovate, one smaller or absent, lanceolate, stamens in two whorls of 3 each, one of the whorls sometimes sterile or bearing staminodes, filaments glabrous or hairy, ovary 2-3-locular, placentation axile; styles filiform. Fruits a loculicidal capsule. 2 – 3 loculed; one locule sometimes indehiscent. Seeds usually prismatic, dorsiventrally compressed, bearing a circular boss.

c. 40 genera and 600 species distributed from tropical to subtemperate regions (Mabberley 2008); 14 genera and 84 species in India (Karthik. & al. 1989); 8 genera, 25 species and 2 subspecies in Sikkim.

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| 1a. Climbing herbs; inflorescences cincinnus covered by a involucre bract | 8. <i>Streptolirion</i> |
| 1b. Prostrate or erect herbs; inflorescences simple or helicoid cymes | 2 |
| 2a. Inflorescence penetrating leaf sheath, capitate; fertile stamens 6 | 1. <i>Amischotolype</i> |
| 2b. Inflorescence not as above, fertile stamens 6 or less | 3 |
| 3a. Fruits indehiscent, baccate, bluish; petals usually white | 6. <i>Polia</i> |
| 3b. Fruits dehiscent, capsular, brown or blackish; petals blue | 4 |
| 4a. Filaments with glandular hooked hairs; upper petals clawed, bluish | 7. <i>Rhopalephora</i> |
| 4b. Filaments glabrous; upper petals simple | 5 |
| 5a. Inflorescence in racemes, terminal, many flowered, capsules 2-valved | 4. <i>Floscopa</i> |
| 5b. Inflorescence in cymes, lateral, few flowered, capsules 3-valved | 6 |
| 6a. Stamens 6, all perfect; petals connate below | 3. <i>Cyanotis</i> |
| 6b. Stamens 3-6, staminodes 3, bright coloured, petals free | 7 |
| 7a. Involucre bracts spathe-like; staminodes 4-lobed, fimbriate, butterfly like | 2. <i>Commelina</i> |
| 7b. Involucre bract spreading; staminodes 3-lobed, sagittate | 5. <i>Murdannia</i> |

1. AMISCHOTOLYPE HASSK.

Erect herbs; stems rooting at lower nodes; rhizomes long. Leaves elliptic; sheath tubular, persistent. Inflorescences capitate or globose fascicled cymes, always subtended by a membranous bract. Sepals 3, subequal, free; petals 3, subequal; stamens 6, all perfect, filaments beaded; anthers ovoid, ovary 3 celled, each bearing 1 or 2 superimposed ovules. Seeds with long linear hilum, rugose, covered by a red aril.

c. 15 species distributed in Old world, Europe (Mabberley 2008); 3 species in India (Karthik. & al. 1989); 2 species in Sikkim.

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|---|-----------------------|
| 1a. Capsule oblong, hairy all over, larger than sepals | 1. <i>A. hookeri</i> |
| 1b. Capsules globose, densely long hairy near apex, shorter than sepals | 2. <i>A. glabrata</i> |

***Amischotolype hookeri* (Hassk.) H. Hara, Fl. E. Himal. 399. 1966; Karthik. & al., Fl. India. Enum. Monocot. 23.1989; Noltie, Fl. Bhutan 3(1): 223. 1994. *Forrestia hookeri* Hassk. in Flora 47:629.1864; Hook. f., Fl. Brit. India 6: 384. 1892.**

Herbs; stems ascending, Leaves elliptic-oblong, 14-25 x 5-8 cm, caudate-acuminate at apex, cuneate at base, margin minutely ciliate, densely appressed yellowish hairy beneath, glabrous above; leaf sheath overlapping, widely cylindrical, densely brownish hairy. Inflorescence in cymose heads, shortly peduncled, up to 10-flowered. Flowers white; sepals oblong, 4-7 x 2-5 mm, keeled, glabrous; petals oblong, equaling to or slightly longer than sepal; stamens 6, all fertile, filaments c. 8 mm long, bearded with jointed hairs; anthers 2 mm long; ovary trigonous. Capsules oblong-lanceolate or narrowly ellipsoid, much exceeding the persistent sepal, 10-12 x 5-7 mm, acute at apex, sparsely brown hairy, 3 locular, 2 locules with 2 seeds and one locule with 1 seed. Seeds rugose.

Flowering & Fruiting : May – October.



Fig. 1. A. *Commelina benghalensis*. B. *Commelina paludosa*. C. *Commelina sikkimensis*. D. *Commelina coroliniana*. E. *Commelina diffusa*. F. *Commelina maculata*.

Field notes: Scattered on moist areas, broad leaved forests, 120-1200 m.

Specimens examined: Sikkim, Hooker s.n. (CAL).

Amischotolype mollissima (Blume) Hassk. in Flora 46: 392.1863; Karthik. & al., Fl. India. Enum. Monocot. 23.1989. *Campellia mollissima* Blume, Enum. Pl. Jav. 1: 7. 1827. *Amischotolype glabrata* (Hassk.)Hassk. in Flora 46: 392. 1863; Noltie, Fl. Bhutan 3(1): 224. 1994. *Forrestia glabrata* (Hassk.)Hassk. in Flora 47: 630. 1864; Hook. f., Fl. Brit. India 6: 384. 1892.

Herbs perennial, stems erect, c. 1 m high, creeping and rooting below. Leaves elliptic, 8-27 x 3.5-8 cm, caudate-acuminate at apex, entire, base narrowed to a petiole, glabrous, ciliate towards base, petioles densely hairy with golden or whitish hairs; sheath 2-3.5 cm long, ciliate at mouth. Inflorescence in axillary dense umbels, 1-10-flowered. Flowers white, subtended by a lanceolate membranous white sessile bracteole; sepals oblong, 1-5 mm, glabrous, densely hairy towards apex and margin; petals sub-equal, stamens 6, all perfect, filaments beaded; anthers ovoid, ovary 3-celled. Fruits equaling or smaller than sepals, trigonous, 3-valved, mucronate with persistent style, densely hairy towards the apex turns red at maturity. Seeds 2 in each cells, seeds oblong, rugose.

Flowering & Fruiting : June – October.

Field notes: Common on marshy grounds, 500 – 1500 m.

Specimens examined: Bijan Bari, N.R. Mandal 11729 (BSHC), Namnasa, N.R. Mandal 11231(BSHC).

2. COMMELINA L.

Herbs, stem creeping and ascending. Leaves lanceolate or oblong-elliptic, with a loose sheath. Inflorescence few flowered cymes, enclosed in a conduplicate or funnel shaped spathe, upper cymes deciduous or continue only with male flowers, inner cymes with bisexual flowers, pedicels sharply recurved and thickened in fruit. Sepals 3, membranous, outer one free, two inner sepals often connate below; petals 3, longer than sepals, two clawed and one lanceolate; stamens 3 perfect; anthers oblong, two lateral anthers similar, medial anther larger, imperfect stamens 2-3; antheroids small, fimbriate; ovary 2-3-celled. Capsules 3-celled, two cell loculicidal and third cell indehiscent. Seeds ellipsoid, smooth or rugose.

c. 170 species distributed in tropical and warmer regions (Mabberley 2008); 24 species in India (Karthik.& al. 1989); 7 species in Sikkim.

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|---|---------------------------|
| 1a. Leaves elliptic-ovate, underground cleistogamous flower are present | 1. <i>C. benghalensis</i> |
| 1b. Leaves lanceolate; underground cleistogamous flowers never present | 2 |
| 2a. Capsules 3-celled; seeds one per locule; spathe connate along the margin, funnel shaped | 3 |
| 2b. Capsules 2-3-celled, anterior locules of capsules 2-seeded, posterior locule one seeded, spathe open along the margin, conduplicate | 4 |
| 3a. Plant robust; leaves 13 cm long or more; leaf sheath mouth densely brown-hirsute | 5. <i>C. paludosa</i> |
| 3b. Flaccid herbs; leaves less than 7 cm long, leaf sheath mouth glabrous or sparsely ciliate | 4. <i>C. maculata</i> |
| 4a. Capsules 2-locular, involucre bract cordate | 7. <i>C. suffruticosa</i> |
| 4b. Capsules 3-locular, involucre bract rounded | 5 |
| 5a. Seeds smooth, without surface reticulation | 2. <i>C. coroliniana</i> |
| 5b. Seeds rugose, with surface reticulation | 6 |
| 6a. Leaves and spathe finely acuminate, seed reticulation deeply grooved | 6. <i>C. sikkimensis</i> |
| 6b. Leaves and spathe acute, seed reticulation without groove | 3. <i>C. diffusa</i> |
1. **Commelina benghalensis** L., Sp. Pl. 41. 1753; Hook. f., Fl. Brit. India 6: 370. 1892; H. Hara, Fl. E. Himal. 399. 1966; Karthik. & al., Fl. India. Enum. Monocot. 24.1989; Noltie, Fl. Bhutan 3(1): 238. 1994.

Herbs perennial; stems 15-80 cm long, rooting at nodes. Leaves ovate or elliptic-ovate, 2-9 x 0.7-3.5 cm, rounded or obtuse at apex, entire, margin densely ciliate, base rounded, contracted to a short petiole, pubescent with whitish hairs; leaf sheath funnel shaped, 0.5-1.5 cm long, pubescent or villous, mouth ciliate with jointed hairs. Spathe 1-3, c. 1 x 1 cm, terminal, funnel shaped, densely villous, margin fused. Cymes 2, one

with 2-3 flowers and other with single flower, exerted shortly. Outer single flower male, occasionally bisexual. Flowers blue; petals 3, 2-clawed, oblong-ovate, c. 4 x 5 mm, one lanceolate, c. 4 x 1.5 mm; stamens 3, perfect; filaments unequal, c. 6 mm long; median anther longer than lateral anthers; ovary c. 2 x 1 mm, styles c. 6 mm long, coiled at apex. Capsules oblong, 3-celled, anterior cells with 2 seeds, dehiscent, posterior cell with 1 seeded, indehiscent. Seeds rugose, paired seeds truncate at common end, brown, boss c. 1 mm long.

Flowering & Fruiting : July – October.

Field notes: Scattered on moist places, 300 – 1800 m.

Specimens examined: Namak, *N.R.Mandal* 10146 (BSHC); Machung, *N. R. Mandal & P. Singh* 13471(BSHC); Gangtok, *N. R. Mandal* 7277 (BSHC); Rangpo, *N. R. Mandal* 11902(BSHC).

2. ***Commelina coroliniana*** Walter, Fl. Carol. 68.1788. *Commelina hasskalii* C. B. Clarke, Commelyn. Cyrt. and Bengal. 13, t. 5:1874. 1892; in Hook. f., Fl. Brit. India 6: 370. 1892; H. Hara, Fl. E. Himal. 400. 1966; Karthik. & al., Fl. India. Enum. Monocot. 25.1989

Herbs, annual; stems trailing, grooved, glabrous, much branched from the base. Leaves narrowly lanceolate, upper leaves larger, lower leaves smaller, 3-6 x 0.7-1.5 cm, rounded at base, entire, subacute at apex, granulose on upper surface, glabrous on lower surface; leaf sheath 1-1.5 cm long, glabrous, brown, mouth and margin ciliate. Inflorescence cincinnus, usually 2, upper 2-4 flowered, lower 1-3 flowered. Flowers blue; involucre bract conduplicate, c. 2.5 cm long, ovate-lanceolate, cordate at base, acute at apex; sepals ovate-lanceolate; petals obovate, clawed. Capsules ellipsoid-oblong shortly beaked, 3-celled. Seeds 2 in larger cells and 1 with a undeveloped seeds brown-black, acute on one end, truncate on other end, smooth; hilum linear, c. 4 x 1 mm.

Flowering & Fruiting : August – December.

Field notes: Common on marshy places, 800 – 1500 m.

Specimens examined: East: Sichey basty Gangtok, *N.R. Mandal*, 13741 (BSHC).

3. ***Commelina diffusa*** Burm. f., Fl. Indica. 18. 1768; R.S. Rao in Notes Roy. Bot. Gard. Edinburgh 25: 179. 1964; H. Hara Fl. E. Himal. 400. 1966; Karthik. & al., Fl. India. Enum. Monocot. 23.1989; Noltie, Fl. Bhutan 3(1): 237. 1994. *Commelina nudiflora sensu* Hook. f., Fl. Brit. India 6: 369. 1892; *non* L. 1753.

Herbs, annual, stems trailing, glabrous. Leaves lanceolate, 3-7 x 1-1.5 cm, acuminate at apex, entire, base rounded, glabrous; leaf sheath membranous, c. 1-3 cm long, whitish, hispid, mouth ciliate, red spotted. Spathe c. 2 cm long, conduplicate, acuminate, glabrous, base slightly cordate. Inflorescence in paired cymes; peduncles c. 1.5 cm long, outer with exerted peduncle and male flowers, inner 2-3 bisexual flowers. Sepals lanceolate, 4-5 mm; petals clawed, orbicular; perfect stamens 3, filaments c. 5 mm long; ovary trigonous. Capsules 3-celled, 3-seeded. Seeds rugose; hilum linear, blackish, marked with surface reticulation.

Flowering & Fruiting : April – September.

Field notes: Common on shady moist and stream sides, rice fields, 300-1800m.

Specimens examined: Simbar-Namchi *N.R. Mandal* 14741, 14703(BSHC); Tendong R.F., *A.K. Verma* 6763 (BSHC); Melli, *B.K. Shukla* 18790 (BSHC); Tareng to Dead Khola, *N.R. Mandal* 1359, 11342 (BSHC).

4. ***Commelina maculata*** Edgew. in Trans. Linn. Soc. London 20: 89. 1846; Karthik. & al., Fl. India. Enum. Monocot. 25.1989. *p.p.* ; Noltie, Fl. Bhutan 3(1): 235. 1994. *Commelina obliqua* Buch.-Ham. ex D.Don var. *viscida* (C. B. Clarke) R.S.Rao & Kammathy in Bull. Bot. Surv. India 3: 168.1962 (1961).

Herbs, perennial, stems creeping, branched, 10-40 cm long, minutely hairy, usually with a line of reflexed hairs. Leaves lanceolate, 2.5-7 x 1-2.5 cm, acuminate at apex, entire, rounded or oblique at base, upper surface pubescent; leaf sheaths conical, 0.8-1.5 cm, brown hairy, mouth with jointed brownish cilia. Spathe 1-2, c. 1 x 1 cm, funnel shaped, glabrous or very minutely hairy towards the acute apex. Flowers pale blue, 4 in a spathe, pedicels c. 4 mm long; sepals 3, oblong, 4 x 3 mm; petals 3, anterior petals clawed, c. 6 x 7 mm,

lanceolate, posterior petals smaller; stamens 4, perfect; anthers 8-10 mm long, brightly yellow, filaments coiled, 6-8 mm long, antheroids 2, globose; style recurved at top, c. 7-8 mm long. Capsules 2-4 x 2-4 mm, 3-locular, 1-seeded in each locule. Seeds elliptic, sparsely papillose.

Flowering & Fruiting : June – October.

Field notes: Common in marshy fields; agricultural fields and open areas; 500 – 3000 m.

Specimens examined: Gangtok, *N.R. Mandal* 13740, 9919 (BSHC); Yumthang to Lachung, *N.R. Mandal* 10113, 10115 (BSHC); Chungthang, *N.R. Mandal* 10074 (BSHC); Bay, *N.R. Mandal* 10584, 11090 (BSHC).

5. ***Commelina paludosa*** Blume, Enum. Pl. Java. 1: 2. 1827; R. S. Rao in Notes Roy. Bot. Gard. Edinburgh 25: 181. 1964; H. Hara, Fl. E. Himal. 400. 1966; Noltie, Fl. Bhutan 3(1): 235. 1994. *Commelina obliqua* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 45. 1825; *non* Vahl, 1806; Hook. f., Fl. Brit. India 6: 372. 1892.

Herbs, perennial, stems robust, erect, 50-150 cm long, glabrous, much branched. Leaves lanceolate, 7-22 x 2-5.6 cm, acuminate or caudate-acuminate at apex, entire, base cuneate, glandular above, glabrous and glandular beneath; leaf sheaths tubular, 1.5-3 cm long, pubescent along the margin, mouth densely ciliate with brown cilia. Spathe terminal, subsessile or minutely stalked; funnel shaped. Cymes single, 4-7 flowered, occasionally exserted from spathe. Sepals oblong-ovate, 5-4 mm long; petals 3, unequal, 2 oblong-elliptic, c. 8 x 9 mm, one lanceolate 7 x 2 mm; stamens 6, perfect 3; staminodes 3, filaments 6 mm long, anthers bright yellow, ellipsoid, antheroids 1.5 mm, filaments coiled, 9-10 mm long; ovary trigonous, c. 0.7 x 0.5 mm long, style recurved at apex, 7-9 mm long. Capsules oblong, truncate at base, 3-valved, one seed in each locule. Seeds dark brown, c. 4 x 2 mm, minutely glandular, boss 0.5 – 1 mm across.

Flowering & Fruiting : June – October.

Field notes: Common on moist and grassy slopes, stream sides; 200 – 1850 m.

Specimens examined: Gangtok, *N.R. Mandal*, 13724, 7281 (BSHC); *S.S. Dash* 24035 (BSHC); Lingya, *B. Mitra* 6881 (BSHC); Mangan, *N.R. Mandal* 11847 (BSHC); Namchi, *R.C. Srivastava* 10976 (BSHC); Kewsing, *N.R. Mandal* 13730 (BSHC).

6. ***Commelina sikkimensis*** C.B. Clarke, Commel. & Cyrt. Bengal. t. 6: 1874 & in A. DC. & C. DC. Monogr. Phan. 3: 147. 1881; Hook. f., Fl. Brit. India 6: 367. 1892; Karthik. & al., Fl. India. Enum. Monocot. 25. 1989. Noltie, Fl. Bhutan. 3(1): 236. 1994.

Herbs, annual; stems trailing, ascending, 50-180 cm high, glabrous or minutely pubescent. Leaves lanceolate or ovate-lanceolate, 3-9 x 0.7-2.5 cm, sessile, rounded at base, entire, acuminate at apex, peberulous on upper surface, glabrous on lower surface; leaf sheath 2-3 cm long, mouth long ciliate, red spotted throughout. Inflorescence in short cymes, usually 2, outer exserted from spathe, with 2-4 male flowers, inner enclosed, with bisexual flowers; spathe ovate-lanceolate, 3.5-4 cm long, acuminate. Sepals ovate-lanceolate, 5 x 2 mm; petals blue, 3, anterior 2 clawed, c. 3 x 4.5 mm orbicular, posterior petal smaller, lanceolate; perfect stamens 3, median longer than lateral; anther c. 1.2-2 mm long; antheroids curved; filaments c. 1 mm; ovary ellipsoid-trigonous, 4 x 1.5 mm; styles filiform, 6-8 mm. Capsules oblong-ellipsoid, two locules dehiscent with 2 seeds each, one locule indehiscent, 1 seeded; seeds rugose, with deeply pitted reticulation, boss c. 1 mm across.

Flowering & Fruiting : August – November.

Field notes: Common on marshy, open and streamside, 750-2300m.

Specimens examined: Machung gumba, *N.R. Mandal* & *P. Singh* 13407 (BSHC), Sichey-Gangtok, *N. R. Mandal* & *S.K. Rai* 9934 (BSHC); Namak to Dikchu, *N.R. Mandal*, 11288 (BSHC); Lingu, Pentong, *N.R. Mandal* 11128 (BSHC); Dentam, *P. Singh* 16370 (BSHC); Samsar, *N.R. Mandal* 14706 (BSHC).

7. ***Commelina suffruticosa*** Blume, Catalogus 35. 1823; Hook. f., Fl. Brit. India 6: 374. 1892; Karthik. & al., Fl. India. Enum. Monocot. 26. 1989; Noltie, Fl. Bhutan 3(1): 236. 1994.

Herbs; stems 10-40 cm long, terete, much branched at nodes, nodes swollen. Leaves lanceolate, 4-12 x 1.5-2.5 cm, acuminate at apex, entire, base cuneate or rounded, occasionally oblique, pubescent on both sides, more along the veins; sheaths tubular, scabrid, mouth ciliate with black jointed hairs. Inflorescence in terminal single cymes, 7-8-flowered; spathe funnel shaped, covered by two opposite leaves, acute, densely hairy. Flowers white or pale blue; anterior petals 2, clawed, c. 3 x 2 mm, posterior petals lanceolate, c. 2 x 1 mm; perfect stamens 3; filaments c. 6 mm long; anthers subequal; ovary trigonous; styles c. 3 mm long, recurved at apex. Capsules oblong, compressed, 4-6 x 6-8 mm, 2-locular, 1-seeded each; seeds minutely papillate, 4 x 3 mm, boss 1 mm across.

Flowering & Fruiting : June- December.

Field notes:: Scattered in moist and shady localities, 300 – 1850 m.

Specimens examined: Pentong, N.R. Mandal 11086 (BSHC); Chungthang, N.R. Mandal 10046 (BSHC); Gangtok, N.R. Mandal 13724 (BSHC).

3. CYANOTIS D. DON (nom. cons.)

Herbs, perennial or annual; stems prostrate or decumbent, pubescent along the lateral line, otherwise glabrous. Inflorescence in terminal helicoid cymes, subtended by spathe like involucral bract; bracts falcate, imbricating. Sepals subequal, free or connate below; petals united into a tube below, lobes free in upper portion; stamens 6, all perfect; filaments with beaded hairs; anthers oblong; ovary 3-locular, each with 2 axile ovules; styles filiform, often with beaded hairs. Capsules 3-valved, loculicidal. Seeds superposed, cuboid or conical, rugose, boss apical.

c. 50 species distributed in Old World tropics (Mabberley 2008); 16 species in India (Karthik. & al. 1989); 5 species in Sikkim.

- | | |
|---|--------------------------|
| 1a. Flowers all in axils of leaf- sheath | 2. <i>C. axillaris</i> |
| 1b. Flowers are in conspicuous terminal cymes | 2 |
| 2a. Leaves oblong- lanceolate, margins densely ciliate | 3. <i>C. cristata</i> |
| 2b. Leaves linear-lanceolate or linear-oblong, leaf margin glabrous | 3 |
| 3a. Bracts hairy or glabrous, if hairy silky arachnoid hairs absent | 5. <i>C. vaga</i> |
| 3b. Bracts hairy with silky arachnoid hairs | 4 |
| 4a. Flacid herbs, roots bulbous, seeds conspicuously pitted | 4. <i>C. fasciculata</i> |
| 4b. Robust herbs, roots tuberous, seeds obscurely pitted. | 1. <i>C. arachnoidea</i> |

1. Cyanotis arachnoidea C. B. Clarke, in A. DC. & C. DC., Monogr. Phan 3: 250.1881; Hook. f., Fl. Brit. India 6: 386. 1892; Karthik. & al., Fl. India. Enum. Monocot. 25.1989.

Herbs, perennial; stems decumbent, glabrous, 15 – 70 cm long, rooting at nodes; roots fibrous. Leaves linear – oblong or lanceolate, ensiform, 1-6 x 0.5-1.5 cm, acuminate at apex, attenuate at base to a leaf sheath, minutely silky pubescent (arachnoid) beneath; leaf sheath c. 1 cm long. Flowers in axillary or terminal cymes, usually subtended by a leafy spathe; bracteoles lanceolate, minutely pubescent; sepals linear-lanceolate, c. 4 x 1 mm, ciliate at margin; petals oblong, c. 3 x 1.5 mm; stamens 6, filaments blue arachnoid; ovary 3-celled; style bearded and thickened below. Capsules oblong. Seeds elongate, obscurely pitted.

Flowering & Fruiting : July –October.

Field notes: Common through out the shady and moist slopes and waste lands, 500 – 2700 m.

Specimens examined: Gyathang to Dikchu, N. R. Mandal, 10428 (BSHC); Linju to Pentong, N.R. Mandal 1119 (BSHC).

2. Cyanotis axillaris (L.) D.Don ex Sweet, Hort. Brit.430.1826; Hook. f., Fl. Brit. India 6: 388. 1892; Karthik. & al., Fl. India. Enum. Monocot. 23.1989. Noltie, Fl. Bhutan 3(1): 222. 1994. *Commelina axillaris* L., Sp. Pl. 1: 42. 1753. *Tonningia axillaris* (L.) Kuntze, Revis.Gen. Pl. 2: 721. 1891; Karthik. & al., Fl. India. Enum. Monocot. 23.1989. *Amischophacelus axillaris* (L.) R.S. Rao & Kammathy in J. Linn. Soc. Bot. 59. 305. 1966.

Herbs, annual; stem creeping, glabrous, with spreading branches, ascending part 10-35 cm high. Leaves all cauline, linear-lanceolate, 4-8.5 x 0.2-0.9 cm, acute or acuminate at apex, base narrowed to a small petiole, glabrous, leaf sheath concealing the flowers, glabrous, margin of the sheath usually with long white hairs. Flowers blue, 3-6 in short axillary clusters of inflated leaf sheath; calyx split up to half, sepals 3, c. 7 x 1.5 mm, linear-lanceolate, enlarged in fruit; corolla slender, petals ovate, c. 1 cm long; stamens 6, filaments bluish, covered with jointed hairs, inserted at base; anthers yellow, oblong; styles filiform, glabrous. Capsules oblong, glabrous, acute, apiculate. Seeds oblong or subcylindrical, c. 2 x 1 mm, coarsely pitted, shining.

Flowering & Fruiting : May – September.

Field notes: Scattered in marshes, humid sandy places, 300-900m

Specimens examined: Along Teesta river bed, Rangpo, S.S.Dash 19523 (BSHC).

3. *Cyanotis cristata* (L.) D. Don, Prodr. Fl. Nepal 46. 1825; Hook.f., Fl. Brit. India 6: 385. 1892; H. Hara, Fl. E. Himal. 400. 1966; Karthik. & al., Fl. India. Enum. Monocot. 26.1989; Noltie, Fl. Bhutan 3(1): 222. 1994. *Commelina cristata* L., Sp. Pl. 1: 42. 1753.

Herbs, perennial; roots fibrous; stems erect or procumbent, inconspicuously grooved. Leaves ovate-oblong or oblong-lanceolate, 3-6 x 1-1.5 cm, acute or rounded at base, acute at apex, margin densely ciliate, glabrous on upper surface, lower surface sparsely hairy with spreading hairs. Inflorescence of elongated cincinnus, solitary; peduncles recurved and exserted from a spatheous bract, margin densely pubescent, bracteoles overlapped, glabrous, sickle shaped. Flowers pink or pale blue; sepals linear-oblong or lanceolate, acute at apex, hairy at apex, keeled; petals oblong, blue; stamens 6, filaments with beaded hairs; styles thickened at apex. Capsules oblong, whitish pubescent at apex. Seeds pitted, boss apically present, truncate on common end, slightly ribbed.

Flowering & Fruiting : May – September.

Field notes: Common on rocky places and damp mossy ground, 200 – 2000 m.

Specimens examined: Tareng to Dead Khola, N.R. Mandal 11378 (BSHC); Dikchu, N.R. Mandal, 10407 (BSHC); Dikchu, R.C. Srivastava 12173 (BSHC); Machung Gumpa, N. R. Mandal & P. Singh 13414 (BSHC).

4. *Cyanotis fasciculata* (B. Heyne ex Roth) Schult. & Schult. in J.J. Roemer & J.A. Schultes, Syst. Veg. 7: 1152. 1830; Hook.f., Fl. Brit. India 6: 387. 1892; Karthik. & al., Fl. India. Enum. Monocot. 26.1989; Noltie, Fl. Bhutan 3(1): 221. 1994. *Tadescantia fasciculata* B. Heyne ex Roth, Nov. Pl. Sp. 189.1821.

Herbs, perennial; stems decumbent, grooved, often rooting at nodes; roots fibrous. Leaves linear-lanceolate, 1-4 x 0.3-0.5 cm, acute at apex, base attenuate, silky arachnoid beneath; leaf sheath up to 1 cm long, membranous on dry. Inflorescence in cincinnus, axillary or terminal, subtended by a leafy involucre bract; bracteoles sickle shaped, densely silky arachnoid pubescent, 1-1.5 x 0.5-0.7 mm. Sepals oblong, 3-4.5 x 1-1.5 mm; stamens 6; anthers emarginated; filaments slightly exserted. Capsules oblong, whitish pubescent near apex. Seeds conical, boss rounded towards one end, obscurely pitted and rugose.

Flowering & Fruiting : July – October.

Field notes: Common on dry fields, waste lands 500 – 2500 m

Specimens examined: Namak to Dikchu, N.R. Mandal 11271 (BSHC); Bichu to Chungthang, N.R. Mandal 10068 (BSHC).

5. *Cyanotis vaga* (Lour.) Schult. & Schult. in J.J. Roemer & J.A. Schultes, Syst. Veg. 7: 1153. 1830; H. Hara, E. Himal. 400. 1966; Karthik. & al., Fl. India. Enum. Monocot. 27.1989; Noltie, Fl. Bhutan 3(1): 220. 1994. *Tradescantia vaga* Lour. Fl. Cochinch. 1: 193. 1790. *Cyanotis barbata* D. Don, Prodr. Fl. Nepal 46. 1825; Hook.f., Fl. Brit. India 6: 385. 1892.

Herbs, perennial 40-70 cm high; stems decumbent, rooting at nodes; roots bulbiferous. Leaves linear lanceolate, 1.5-9 x 0.3-0.7cm, tapering gradually from base to apex, base terminates to a leaf sheath, entire, glabrous or very minutely pubescent on both sides; leaf sheath 0.5 – 1.5 cm, sparsely hairy, mouth of the

sheath densely whitish ciliate. Inflorescence in scorpioid cymes, axillary or terminal, subtended by a leaf-like spathe, bracteoles overlapped, sickle shaped, acuminate at apex, margins white hairy. Sepals fused at base, oblanceolate, acute, 4-5 x 1-1.5 mm, white hairy near apex and margin; corolla blue, tubular on lower side; lobes oblong or obovate, 6-8 mm across; stamens 6, filaments exserted from corolla, beaded with white hairs, anthers oblong, emarginate, yellow; ovary truncate at apex, hairy, styles exserted, beaded towards apex, c. 7 mm long. Capsules trilobed, truncate, hairy towards apex. Seeds 2 in each locule, rugose, truncate at both ends.

Flowering & Fruiting : July to November.

Field notes: Common on rocks, open fields and sloppy areas, 500 – 2800 m.

Specimens examined: Gangtok, *N.R. Mandal* 7279 (BSHC); Dikchu, *N.R. Mandal* 10428 (BSHC); Orkhey to Hilley, *P. Singh* 13963 (BSHC); Kabi, *N.R. Mandal*, 13082 (BSHC); Lachen *S.S. Dash* 19492 (BSHC).

4. FLOSCOPA LOUR.

Herbs perennial; stems densely hairy on young parts. Leaves lanceolate, sheaths tubular, with a wide open mouth, mouths ciliate. Inflorescence in terminal branched thysiform racemes; branches densely hairy. Flowers minute, bracteate, pedicels hairy; sepals oblong, free; petals obovate, free; stamens 5 + 1, 2 outer stamens straight, 3 inner stamens shorter, anthers deflexed, filaments glabrous, ovary 2-celled. Capsules 2-valved, loculicidal, and shining. Seeds oblong, with radiating grooves from the central boss.

c. 20 species distributed in tropical and warmer regions (Mabberley 2008); 1 species in India including Sikkim. (Karthik. & al. 1989).

1. *Floscopa scandens* Lour., Fl. Cochinch. 1: 193. 1790; Hook. f., Fl. Brit. India 6: 390. 1892; H. Hara, Fl. E. Himal. 401. 1966; Karthik. & al., Fl. India. Enum. Monocot. 25.1989; Noltie, Fl. Bhutan 3(1): 225. 1994.

Herbs perennial; stems c. 50 cm high, erect or decumbent, creeping below, terete, sparsely hairy. Leaves lanceolate or elliptic, 3-9 x 1-2.5 cm, acuminate at apex, entire at margin, base cuneate, glabrous, occasionally pubescent above; leaf sheath 1.5-3 cm long, densely ciliate at mouth, mouth wide open. Inflorescence in terminal, thyrsoid branched panicles, peduncles 2-10 cm long; bracts leafy. Flowers pink-violet, minute, pedicels 2-5 mm long, densely hairy; sepals 3, oblong or oblanceolate, 3.5 x 1.5 mm, acute at apex, truncate at apex, persistent, free, densely hairy outside; petals obovate-lanceolate, 3, free; perfect stamens 5; filaments glabrous, connate below; anthers orbicular, deflexed; ovary 2 locular, styles 2-6 mm. Capsules 2 valved, crustaceous, loculicidal, oblong. Seeds ellipsoid, margin undulate, 2 x 1 mm, glabrous, grooved with radiating from a central boss.

Flowering & Fruiting : August – March.

Field notes: Common on wet grounds, 300 – 1500 m.

Specimens examined: Gangtok, *P.K. Hajra* 682 (BSHC), Teesta river bed near Bardang *S. S. Dash* 20931 (BSHC); Mangal *B. Krishna* 3215 (BSHC); Dikchu, *D.C.S. Raju & R. C. Srivastava* 12154 (BSHC).

5. MURDANNIA ROYLE (nom. cons.)

Herbs, annual or perennial; roots often fusiform, stems prostrate or decumbent. Leaves linear or lanceolate, occasionally basal rosette present. Inflorescence in terminal and axillary cymes, often in paniculate cymes; peduncles leafy or leafless; bracteoles caducous or persistent. Sepals and petals free and similar; stamens 6, outer 3-4 sterile, inner 2-3 fertile; filaments hairy, occasionally glabrous, anthers oblong. Ovary 3-locular, ovules 1-4. Capsules 3-locular. Seeds 1-4 in each locule, variously rugose, hilum linear, boss lateral to dorsal.

c. 50 species distributed in the tropical and warmer regions (Mabberley 2008); 24 species in India (Karthik. & al. 1989); 6 species in Sikkim.

- 1a. Stem leafless, roots thickened, flowers appear before or with young leaves 2. *M. edulis*
- 1b. Stem leafy; roots not thickened; flowers appears when stem is leafy 2
- 2a. Inflorescences of one flowered cymes, capsules one seeded 6. *M. vaginata*
- 2b. Inflorescences many flowered cymes, capsules more than one seed 3
- 3a. Leaves linear or linear-lanceolate, capsules 2-seeded in each locule 4. *M. nudiflora*
- 3b. Leaves oblong or ovate; seeds more than 3 in each locule 4
- 4a. Plants with horizontal rhizomes; leaves ovate-lanceolate; seeds 4 in each locule. 5. *M. spirata*
- 4b. Plants without horizontal rhizomes, leaves elliptic; seeds numerous in each locule 5
- 5a. Leaves with clasping base, seed boss symmetrically placed. 3. *M. japonica*
- 5b. Leaves without clasping base, seed boss asymmetrically placed. 1. *M. divergens*

1. *Murdannia divergens* (C.B.Clarke) G. Bruckn. in H.G.A. Engler Nat. Pflanzenfam. ed. 2, 15a. 173. 1930; Karthik. & al., Fl. India. Enum. Monocot. 28.1989; Noltie, Fl. Bhutan 3(1): 228. 1994. *Aneilema herbaceum* (Roxb.) Wall. ex C.B.Clarke var. *divergens* C.B. Clarke in J. Linn. Soc., Bot. 11: 448. 1870. *Aneilema divergens* (C.B. Clarke) C.B.Clarke, Commelyn. & Cyrt. Bengal. 28. 1874; Hook. f., Fl. Brit. India 6: 376. 1892.

Herbs, annual or perennial; roots tuberous; stems up to 35 cm long, erect. Leaves sessile, linear-lanceolate, 9-15 x 1-1.5 cm, acute at apex, base rounded, minutely red spotted above; leaf sheaths 1-2 cm long, whitish ciliate at margin and mouth. Inflorescence in terminal panicles, 3-8 cm long; bracts ovate, persistent; bracteoles c. 5 x 2.5 mm, clasping, membranous. Flowers pinkish; sepals linear-oblong, c. 2 x 1 mm, glabrous; petals obovate, c. 8-10 x 5-7 mm, stamens 3 perfect, unilateral, filaments 3-4 mm long, bearded with purplish hairs; anthers lobes oblong, c. 1 x 0.5 mm; styles 2-4 mm long, straight. Capsules ellipsoid, acute at both ends, 3-locular, styles persistent in fruit. Seeds 3 in each locule, yellowish, c. 1 x 0.5 mm, boss asymmetrically placed.

Flowering & Fruiting : June-September.

Field notes: Common among open bushes, hilly moist slopes, 1000 – 2000 m.

Specimens examined: Dikchu, N.R. Mandal 9950 (BSHC).

2. *Murdannia edulis* (Stokes) Faden in Taxon 29: 77.1980; Karthik. & al., Fl. India. Enum. Monocot. 28.1989. *Commelina edulis* Stokes, Bot. Mat. Med. 1:184.1812. *Aneilema scapiflorum* (Roxb.) Kostel., Allg-Med. Pharm. Fl. 1: 127. 1831; Hook.f., Fl. Brit. India 6: 637. 1892. *Commelina scapiflora* Roxb., Fl. Ind.(eds. Carey & Wall.)1: 178. 1820.

Annual herbs; roots fibrous; stems 10-25 cm high. Leaves all in basal rosette, absent during flowering period, radical leaves linear lanceolate, 10-15 x 1-1.5 cm, acuminate at apex, base rounded, minutely red-spotted on above; leaf-sheaths long whitish ciliate at margin and mouth. Inflorescence in terminal leaf less scapes; bracts large sheathing base, upper bracts amplexicaule. Flowers blue-mauve; sepals linear-ovate; petals obovate or suborbicular, 9-10 x 5-6.5 mm; perfect stamens 3; filaments beaded, staminodes 3, antheroids yellow; styles filiform. Capsules oblong-ellipsoid, mucronate at apex, 3-valved. Seeds 4 in each locule, boss asymmetrically placed.

Flowering & Fruiting : May – August.

Field notes: Scattered on grassy slopes. 600-1800m.

Specimens examined: Sikkim G. King s.n.[Acc.No. 487888 (CAL)].

3. *Murdannia japonica* (Thunb.) Faden in Taxon 26: 142. 1977; Karthik. & al., Fl. India. Enum. Monocot. 28.1989; Noltie, Fl. Bhutan 3(1): 226. 1994. *Commelina japonica* Thunb. in Trans. Linn. Soc. London 2: 332. 1794. *Aneilema lineolatum* Kunth, Enum. Pl. 4: 69. 1843; Hook. f., Fl. Brit. India 6: 376. 1892.

Herbs, perennial; roots fibrous; stem stout, c. 1m long, deeply grooved, glabrous, arising from basal rosettes. Leaves lanceolate or oblong, 8-16 x 2-3.5 cm, base clasped to the stem, entire, acuminate at apex, glabrous; leaf sheath open, 1-3cm long, pubescent along the margin. Inflorescence in axillary and terminal thyriform panicles, branches spreading, glabrous; bracts tubular. Flowers blue, pedicels c. 1cm long; sepal oblong lanceolate; 4-5 x 2.5-3mm, membranous; petals obovate, 4 x 2 mm, equalling to sepal; perfect stamens 4, filaments 2-4 mm long, white beaded; anthers ellipsoid, 1 x 1 mm; antheroids yellow, c. 0.7 x 0.8 mm, reflexed; ovary trigonous, styles persistent. Capsules ellipsoid-trigonous, mucronate at apex, loculicidal. Seeds 4 in small, papillose.

Flowering & Fruiting : June – September.

Field notes: Scattered in the wet and moist places, 1200-2000m.

Specimens examined: Rongli Khola, DCS Raju 4051 (BSHC).

4. **Murdannia nudiflora** (L.) Brenan in Kew Bull. 7: 189. 1952; Hara, Fl. E. Himal. 401. 1966; Noltie, Fl. Bhutan 3(1): 229. 1994. *Commelina nudiflora* L., Sp. Pl. 1:41. 1753. *Aneilema nudiflorum* R.Br., Prodr. 271.1810; Hook.f., Fl. Brit. India 6: 378. 1892.

Herbs, annual; stems profusely branched near apex, decumbent, rooting at nodes, glabrous. Leaves linear or linear-lanceolate, sessile, 2-7 x 0.5-1 cm acute at apex, entire, base rounded or truncate, glabrous; leaf sheath c. 1 cm long, whitish ciliate at mouth and margin. Inflorescence in terminal or leaf-opposed paniculate cymes or capitate, 4-10-flowered; peduncles 3-7cm long, leafy or prominently marked with fallen bracteole scars. Flowers bluish or pink; sepals oblong-lanceolate, hooded, 3-5 x 1-2 mm glabrous; petals 3-4 x 1-2.5 mm; perfect stamens 2; filaments 2-3 mm long hairy with whitish hairs; staminodes bright yellow; styles c. 2 mm long. Capsules oblong, mucronate, 3-locular, each locule with 2 seeds. Seeds broadly oblong, rugose and pitted, truncate at common wall, acute on other wall, boss rounded.

Flowering & Fruiting : July – September.

Field notes: Common on shady and moist ground, 300 – 2700 m.

Specimens examined: Rongpo, S.S. Dash 20927 (BSHC); Gangtok, DCS Raju 1308 (BSHC); Lachen, N.R. Mandal 11073 (BSHC); Dentam, P. Singh 16394 (BSHC).

5. **Murdannia spirata** (L.) G. Bruckn. in H.G.A. Engler, Nat. Pflanzenfam. ed. 2, 15a: 173. 1930; H. Hara, Fl. E. Himal. 402. 1966; Karthik. & al., Fl. India. Enum. Monocot. 30.1989; Noltie, Fl. Bhutan 3(1): 229. 1994. *Commelina spirata* L., Mant. Pl. 2: 176. 1771. *Aneilema spiratum* (L.) Sweet, Hort. Suburb. Land. 12.1808; Hook. f., Fl. Brit. India 6: 377. 1892.

Diffuse herbs; stems ascending or procumbent, pubescent along a line, much branched at base. Leaves oblong, 1.5-3.5 x 0.7-1.2 cm, acute at apex, base obtuse, rounded or cordate, upper leaves amplexicaule, entire, glabrous on both surfaces, upper surface minutely papillose, leaf sheath 0.5-1cm long, pubescent along margin and mouth. Inflorescence in terminal, branched paniculate cymes, 4-6- flowered, bracteoles cupular, persistent. Flowers violet; sepals brownish, ovate-lanceolate, 2-3 mm long; petals obovate, c. 4 x 3.5 mm; stamens 3; filaments c. 2mm long, glabrous or beaded. Capsules oblong, acutely trigonous, mucronate or shortly beaked at apex. Seeds 4, in a single row in each locule, cuboid, smooth, minutely papillose.

Flowering & Fruiting : July-September.

Field notes: Common in river banks, rice fields and moist areas.

Specimens examined: Burtuk, S.K. Rai 16084 (BSHC); Pentong to Sakyong, N.R. Mandal 11067 (BSHC); Bay to Tendong, N.R. Mandal 10591 (BSHC).

6. **Murdannia vaginata** (L.) G. Bruckn. in H.G.A. Engler Nat. Pflanzenfam. ed. 2, 15a: 173. 1930; Karthik. & al., Fl. India. Enum. Monocot. 30.1989. *Commelina vaginata* L., Mant. Pl. 2: 177. 1771. *Aneilema vaginatum* (L.) Wall., Num. List 5212.1831; Hook. f., Fl. Brit. India 6: 381. 1892.



Fig. 2. A. *Pollia submubellata*. B. *Amischotolype hookeri*. C. *Amischotolype glabrata*. D. *Streptolirion volubile*. E. *Floscopa scandens*.

Herbs, perennial; roots fibrous; stem decumbent, 10-50 cm long, rooting at lower nodes. Leaves linear or linear lanceolate, 5-10 x 0.7-1 cm, acuminate at apex, glabrous; leaf sheath open. Inflorescence in 1-3 flowered fascicled cymes. Flowers purple, shortly pedicellate, pedicels jointed in the middle; sepals linear-oblong, blue, ovate or oblong; stamens 2, staminodes 4. Capsules 3-locular, 1 seed in each locule.

Flowering & Fruiting : July – October.

Field notes: Common in wet grounds, Gangtok, 515 – 1800 m.

Specimens examined: Sichey-Gangtok, N.R. Mandal 11138 (BSHC).

6. POLLIA THUNB.

Herbs, perennial; rhizomes horizontal, stem ascending. Leaves lanceolate or elliptic-lanceolate. Inflorescence in terminal panicle cymes. Sepals 3, free; petals 3, free, obovate, persistent. Stamens 6 or 3, all equal; filaments glabrous. Ovary 3-celled, each cell with 2 rows of ovules. Fruits globose or ovoid, indehiscent. Seeds vertically compressed, hilum punctate, boss centrally placed.

c. 17 species distributed in the old World tropics (Mabberley 2008); 5 species in India Karthik. & al. 1989; 2 species in Sikkim.

- | | |
|---|---------------------------|
| 1a. Stamens all fertile; inflorescence with peduncles, sepals pubescent on outer side | 1. <i>P. hassakarlii</i> |
| 1b. Stamens 6, 3 fertile, 3 sterile; inflorescence without peduncle; sepals glabrous outside. | 2. <i>P. subumbellata</i> |

1. Pollia hasskari R. S. Rao in Notes, Roy. Bot. Gard. Edinburgh 25: 188. 1964; Karthik. & al., Fl. India. Enum. Monocot. 30.1989; Noltie, Fl. Bhutan 3(1): 232. 1994. *Pollia aclisia* Hassk. Commelin. Ind. 55.1870, non Hassk.1852; Hook. f, Fl. Brit. India 6: 367. 1892.

Perennial herbs; stems 50-90 cm high, terete. Leaves coriaceous, lanceolate or oblanceolate, 11-32 x 3-6 cm, finely acuminate at apex, entire at margin, attenuate at base and gradually narrowed to a broad petiole, glabrous on both sides; leaf sheaths 3-5 cm long; persistent in older parts. Inflorescence pyramidal, peduncles stout, 4-9 cm long, subtended by a small leaf like bract. Flowers white; pedicels c. 5 mm long, pedicels and peduncles densely clothed with hooked hairs. sepals 3, concave, orbicular, 4-5 mm across, hairy on outside, membranous; petals 3; ovary globose, 1-2 mm long, glabrous; styles 3mm long. Fruits subglobose capsules, c. 6 mm across blue-black, shining. Seeds brown, 5-8 in each locule, flattened and angled.

Flowering & Fruiting : June – September

Field notes: Rarely found in moist and shaded places, between 500-1800 m.

Specimens examined: Dikchu-Abdora, N.R. Mandal 11230 (BSHC); Lingdhen, B. Mitra 6891 (BSHC).

2. Pollia subumbellata C.B. Clarke in J. Linn.Soc., Bot. 11: 451. 1870; Hook. f., Fl. Brit. India 6: 368. 1892; Karthik. & al., Fl. India. Enum. Monocot. 30.1989; Noltie, Fl. Bhutan 3(1): 233. 1994.

Perennial herbs; stems 20-40 cm high, ascending, rooting at nodes. Leaves elliptic, lanceolate, 6-13 x 2-4 cm, caudate-acuminate at apex, entire at margin, narrowed at base, scaberulous on both surfaces; petioles c. 2cm long; sheathing at base, sheaths 2-3 cm long, minutely pubescent. Inflorescence in sessile, subumbellate panicles, branches deflexed. Flowers white; pedicels 3 mm long, bracts small, subulate, persistent, amplexicaule at base; sepals 3, elliptic-ovate, c. 5 x 3 mm, glabrous; petals 3; stamens 6, 3 fertile and 3 sterile; ovary globose, glabrous. Fruits subglobose. Seeds trapezoids; dorsally much flattened.

Flowering & Fruiting : July – October.

Field notes: Commonly found in moist areas, 300 – 1800m.

Specimens examined: Dikchu Bazar, N.R. Mandal 11706 (BSHC); Dikchu dam site, N.R. Mandal 11758 (BSHC).

7. RHOPALEPHORA HASSK.

Erect herbs. Leaves lanceolate, acuminate, narrowed at base, densely hispid on margin. Inflorescence in branched panicles; bracts funnel shaped, acuminate, persistent. Petals free, stamens 2-3 perfect, filaments glabrous. Capsules globose hairy, sepals reflexed in fruit. Seeds 1 per locule.

3-4 species distributed in Madagascar and India to Vietnam (Mabberley 2008); 1 species in India including Sikkim (Karthik. & al. 1989).

1. *Rhopalephora scaberrima* (Blume) Fader in *Phytologia* 37:480.1977; Karthik. & al., *Fl. India Enum. Monocot.* 31.1989. *Commelina scaberrima* Blume, *Enum. Pl. Jav.* 1: 4. 1827. *Dictyospermum scaberrimum* (Blume) C.V.Mortan ex Panigrahi in *Phytologia* 29: 338. 1975 (1974). *Aneilema scaberrimum* (Blume) Kunth, *Enum. Pl.* 4: 69. 1843; Hook.f., *Fl. Brit. India* 6: 382. 1892; H. Hara in *Fl. E. Himal.* 399. 1966.

Herbs, perennial; stems erect, c. 1m tall. Leaves 3-12 x 2-3.5 cm, lanceolate, acuminate at apex entire, margin ciliate, narrowly attenuate at base to a short petiole, sparsely pubescent above, more along margin; petioles c. 2cm long; leaf sheath 2-3.5 cm, hairy, mouth long ciliate. Inflorescences in terminal, thyrisiform branched cymes, peduncles hairy, deflexed in older. Flowers bluish or purple; pedicels 1-2cm long, glabrous, bracts funnel shaped with oblique mouth; sepals 3, ovate, c. 3 x 1 mm, glabrous, margin scaberulous; petals 3, c. 5 x 2 mm; stamens 6, outer stamens 3, perfect; filaments c. 4mm long, anther lobes yellow; antheroids bright yellow; ovary globose, single, c. 4 mm. Capsules oblong, densely hooked hairy. Seeds 1 per locule, oblong-ellipsoid, boss asymmetrically placed, coarsely rugose.

Flowering & Fruiting : August – October.

Field notes: Common throughout the marshy places. 700-1950m.

Specimens examined: Sichey, *B. Krishna* 1698 (BSHC); Deorali, *N.R. Mandal* 13724 (BSHC); Dikchu, *N.R. Mandal* 9963, 9964 (BSHC); Bijan Bari, *N.R. Mandal* 11719 (BSHC); Namchi, *R.C.Srivastava* 11497 (BSHC).

8. STREPTOLIRION EDGEW.

Twining herbs; stem grooved. Leaves ovate-cordate, caudate-acuminate at apex, margin densely ciliate, deeply cordate at base. Inflorescence in axillary or terminal racemes. Flowers usually bisexual, when unisexual then only male; sepals ovate-oblong, petals linear, free; stamens 6; anthers yellow; filaments beaded with jointed hairs, hairs yellow; ovary trigonous. Capsules 3-valved, beaked.

1 species distributed in E. Himalaya to Korea and SE Asia (Mabberley 2008).

1. *Streptolirion volubile* Edgew. In *Proc. Linn. Soc., London* 1: 245. 1845. Hook. f., *Fl. Brit. India* 6: 389. 1892; H. Hara, *Fl. E. Himal.* 402. 1966; Karthik. & al., *Fl. India Enum. Monocot.* 31.1989; Noltie, *Fl. Bhutan* 3(1): 218. 1994.

1a. Stems and leaves glabrous.

8.1 subsp. *volubile*

1b. Stem and leaves densely pubescent with brown hairs.

8.2. subsp. *khaisanum*

8.1. subsp. *volubile*

Twining herbs; stems deeply grooved. Leaves ovate-cordate or cordate-orbicular, upper leaves 6-9.5 x 4.5-7 cm, lower leaves 10-13 x 8.5-11 cm, long acuminate at apex, densely ciliate at margin, base deeply cordate, upper surface glabrous, reticulate venation prominent on beneath; petioles 3-10 cm long; sheaths short, 0.5-1 cm long, glabrous, mouth ciliate, oblique. Inflorescence borne at each node, in thyriform panicles; peduncles 4-15 cm long, subtended by a leafy bract. Flowers bisexual or unisexual, when unisexual only with male flowers, white; sepals 3, free, ovate-oblong, c. 3 x 1.5 cm; petals 3, linear-lanceolate, free, c. 4 x

0.7 mm, stamens 6, filaments 0.7-1 mm long, beaded with jointed hairs; anthers dumb-bell shaped; filaments connate below; ovary 3-locular, gradually tapers to a style, style c. 0.5 mm long. Capsules oblong-trigonal, beaded, loculicidal.

Flowering & Fruiting : July – October.

Field notes: Scattered in moist areas, 1000-3000 m.

Specimens examined: Rabongla, A.K. Verma 6532 (BSHC); Gangtok, P.K. Hajra 559 (BSHC); Rate-Chu, D.G. Long & al., 17767 (BSHC).

- 8.2. subsp. **khastianum** (C.B. Clarke) D. Y. Hong, in Acta Phytotax. Sin. 12:463.1974. Karthik. & al., Fl. India. Enum. Monocot. 31.1989. *Streptolirion volubile* var. *khastianum* C.B. Clarke in A. DC & C. DC. Monogr. Phan. 3: 261. 1881.

Flowering & Fruiting : July – September.

Field notes: Rarely found in the tropical and subtropical broad leaved forests. 900 – 1800 m.

Specimens examined: Damthang, R. Gopalan 97609 (BSHC).

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सिक्किम के कोमेलिनेसी कुल पर व्यवस्थित अध्ययन

एस.एस. दास

सार संक्षेप

सिक्किम में कोमेलिनेसी कुल में शामिल 8 वंश और 25 प्रजातियों के विस्तृत वर्गीकरण के साथ मौजूद पेपर संबंधित हैं। वर्ण के आधार पर वंश और प्रजातियों के लिए एक कुंजी भी आसान पहचान के लिए दी गई है। वर्तमान पेपर में *स्ट्रेप्लोरियम* *वोल्चूबल* सबस्पी. *खासियनम* (सी.बी. क्लार्क) डी वाई हांग की सिक्किम से पहली बार सूचना दी है।