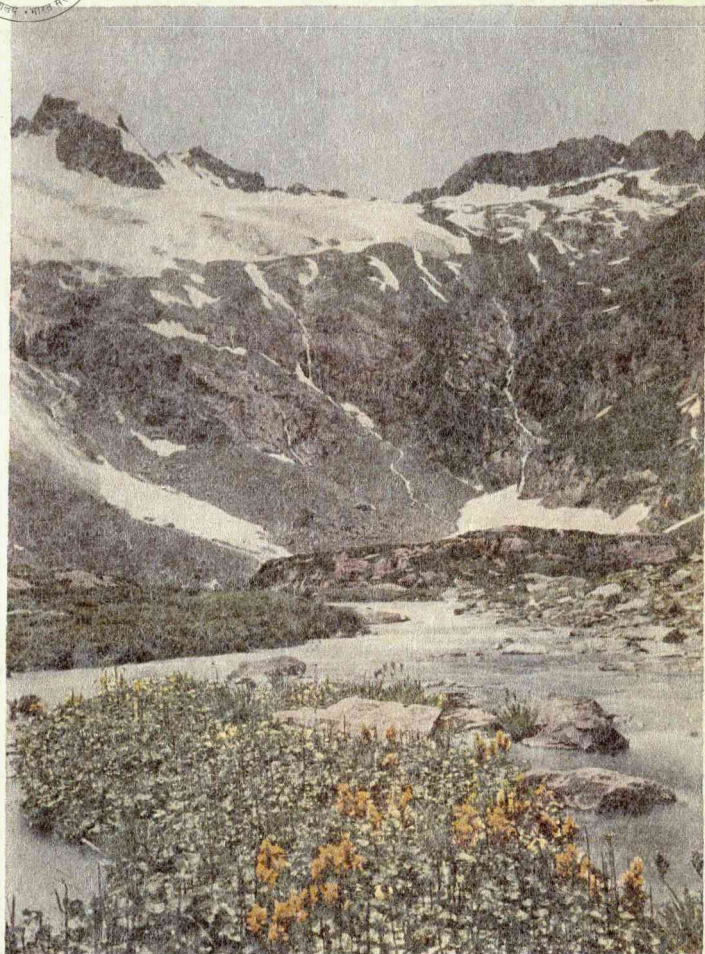




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WILD FLOWERS
OF KASHMIR



CREMANTHODIUM DECAISNEI, *Clarke*, AND CORYDALIS
THYRSIFLORA, *Prain*, IN THE BED OF A GLACIAL STREAM,
NEAR SONASAR, AT 13,000', IN THE LIDDAR VALLEY.



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WILD FLOWERS OF KASHMIR

(SERIES III)

BY

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CONSERVATOR OF FORESTS

WITH DESCRIPTIONS AND
COLOURED ILLUSTRATIONS OF FIFTY SPECIES
REPRODUCED FROM
DIRECT COLOUR PHOTOGRAPHS

LONDON :
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1930





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PREFACE.

THE contents of this volume have been arranged on the same lines as in the two previous volumes, with the addition of a note in the Introduction on the pronunciation of the scientific names, which has been abstracted from Nicholson's Dictionary of Gardening. It is hoped that this addition will be found useful. Another slight alteration has been made by using the term Family instead of Natural Order. This has been done as the term order is now often used for a group of Families. The Family name *Papilionaceæ* has also been used instead of the Order name *Leguminosæ*, the latter consisting of the three Families (i) *Papilionaceæ*, (ii) *Cæsalpinneaceæ* and (iii) *Mimosaceæ*.

For the specimens of *Pleurogyne spathulata*, *Corydalis Falconeri*, *Thermopsis barbata* and *Gentiana cachemirica*, the author is indebted to the Rev. Canon Stokoe, Colonel Houston, Captain L. Goadby and Miss G. Ward, respectively.

The author also acknowledges with sincere gratitude the very kind assistance given to him by Messrs. S. T. Dunn and C. E. C. Fischer, of the Kew Herbarium, in the identification of some of the plants and for other useful information.

Srinagar,

1st February, 1929.



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INTRODUCTION.

PRONUNCIATION OF THE SCIENTIFIC NAMES.

In the descriptions of the plants in this volume, against the heading "Name," the scientific names have been divided into syllables, and their pronunciation is explained as follows :

1. The sign ' marks the syllable to be accentuated. It does not in any way affect the quantity of the syllable, which may be long or short : *e.g.*, Mor-ī'-na ; Thal-īc'-trum.

2. All the vowels to be sounded long are marked (-). The vowels left unmarked or marked (˘) are all to be sounded short.

This arrangement is in accordance with the following rules :

- (i) When a vowel terminates any syllable, except the last, it is to be sounded long (-).
- (ii) When a consonant terminates any syllable, the preceding vowel is to be sounded short (˘).
- (iii) At the end of a word, a, is almost always short ; e, is generally long ; i, is almost always long.

Exceptions to the above have been marked long (-), or short (˘).



3. The following rules apply to the pronunciation of the scientific names derived from Latin or Greek :

(i) The vowels are to be sounded as in the following examples :

| | | | | | |
|--------------|----------|---------|-----------|--------|----------|
| <i>Short</i> | ă | ĕ | ĭ | ŏ | ŭ |
| | ăpart | slĕnder | thĭn | rŏtten | powerfŭl |
| <i>Long</i> | ā | ē | ī | ō | ū |
| | psālmist | vēined | machīnist | vōter | rŭler |

(ii) *y*, is sounded as *i* ; *e.g.*, *ÿ* as *ĭ* ; *ȳ* as *ī*.

(iii) Diphthongs are always long :

æ, *œ*, *ei* are sounded nearly as *ai* in *pain*.

au, is sounded as *ou* in *house*.

(iv) Consonants : *g*, is always hard as in *good*.

c, is sounded as in *muscular*.

Ch, „ „ *Christian*.

4. The above rules do not apply to names which, although derived from Latin or Greek, are used as English names. For instance, although *An-em-ō'-nē* is the correct pronunciation of the scientific name, the same word when used as an English name is pronounced *An-em'-ō-nē*.

5. Names derived otherwise than from Latin or Greek are pronounced as they would be pronounced in the language from which they are derived, except the suffix which follows the Latin pronunciation.



EXPLANATION OF THE BOTANICAL TERMS USED.

Achene, a small, dry, one-seeded fruit.

Acuminate, when the apex of a leaf is narrowed to a long point.

Acute, when the apex of a leaf is sharp-pointed, forming a narrow angle.

Adnate, when dissimilar parts are united.

Alternate, when the leaves are arranged singly at the nodes, and not in pairs or whorls of several leaves at the same node.

Amplexicaul, when the base of a sessile leaf clasps the stem.

Annual, lasting for only one year.

Apiculate, with a short point on the top of the leaf.

Ascending, when the stem grows obliquely upwards.

Auricle, a small appendage resembling the lobe of an ear.

Awn, a long bristle.

Axillary, when growing from the axil of a leaf, *i.e.*, in the angle between the base of a leaf and the stem.

Bi-fid, when a leaf is cut into two segments, the cut not extending much beyond the middle.

Bract, a small leaf-like or scale-like organ immediately beneath a flower or cluster of flowers, or on the peduncle or pedicel.

Bracteole, a small secondary bract.

Campanulate, bell-shaped.

Capitate, with a rounded head.



Capsule, a dry fruit, which splits open whilst on the plant to set the seeds free, and formed of several united carpels.

Cauline, inserted on the stem.

Ciliate, when the margin of a leaf is fringed with hairs.

Clawed, when the lower part of a petal is narrowed to a stalk.

Compound, when a leaf is divided to the petiole or midrib into several distinct leaflets.

Connate, when the bases are united.

Cordate, when the base of a leaf is produced downwards into two rounded lobes, *e.g.*, heart-shaped.

Corymb, an inflorescence in which the pedicels start from different points, the lower ones being longer than the upper ones, so that all the flowers are brought more or less to the same level.

Crenate, with blunt, rounded teeth.

Cuneate, wedge-shaped.

Cuspidate, terminating in a long point, which is broad at the base and tapering upwards, as in a spear-head.

Cyme, an inflorescence in which the main axis and lateral axes are each terminated by a flower, and the flowering proceeds outwards and downwards.

Decomound, when a leaf is several times compound.

Decumbent, trailing on the ground with the end ascending.

Di-adelphous, when the stamens are united into two bundles.

Diœcious, when male and female flowers are on different plants.



Disk (1) a protuberance from the receptacle between the calyx and carpels, or (2) the central portion of a flower head as distinguished from the border or ray.

Divaricate, separating widely apart.

Ebracteate, without bracts.

Emarginate, when the apex of a leaf has a decided terminal notch.

Ensiform, sword-like.

Entire, when the margin of a leaf is not cut in any way.

Falcate, sickle-shaped.

Falls, the name often used for the outer segments (corresponding to sepals) of the perianth in the flowers of the Iris.

Fimbriate, with a fringe of hairs.

Follicle, a fruit formed from a single carpel, which, when ripe, splits down one side only.

Gibbous, a swelling on one side.

Glabrescent, almost glabrous.

Glabrous, smooth, without any hairs.

Glandular hairy, when the hairs have a swelling at the tip from which some oily or sticky substance exudes.

Glochidia, barbed bristles.

Hastate, like a spear-head.

Hermaphrodite, when a flower possesses both stamens and pistil.

Hoary, with a whitish or greyish appearance.

Imbricate, when close together and overlapping.

Involucre, the collective name for the bracts, when they are whorled below a flower-head, umbel, or other cluster of flowers.



Lanceolate, when a leaf is about three times or more as long as broad, broadest below the middle, and the apex tapering to a point, *e.g.*, lance-head.

Ligule, the extended strap-like part of the corolla of the ray flowers in some species of the Compositæ Family.

Limb, the upper part of a petal when it is narrowed below into a stalk, or the upper expanded part of a gamopetalous corolla, when the lower portion is narrowed to a tube.

Linear, when a leaf is long and narrow, being more or less of equal width throughout its length.

Lobulate, with small lobes.

Monadelphous, when the stamens are all united into one bundle.

Mucronate, when the apex of a leaf abruptly terminates in a short, sharp point.

Nectary, a part of the flower which secretes sweet honey juices.

Nodes, the points on a stem at which the leaves are attached.

Ob-lanceolate, when a leaf is about three times or more as long as broad, broadest above the middle, and tapering downwards to a point, *e.g.*, the reverse of lanceolate.

Ob-ovate, the reverse of ovate, *i.e.*, the broad end at the top and the narrowed end at the base.

Obtuse, when the apex of a leaf is blunt, rounded or wide-angled.

Opposite, when two leaves grow from the same node on opposite sides of the stem.

Orbicular, circular in outline.



Ovate, when a leaf is scarcely twice as long as broad, and broader below the middle, *e.g.*, egg-shaped.

Panicle, when the rachis divides into branches which bear more than one flower.

Pappus, the name of a calyx consisting of hairs in the Compositæ Family.

Partite, divided almost to the base.

Pedicel, the stalk of a single flower, when the peduncle bears several flowers.

Peduncle, the stalk of a flower, or cluster of flowers.

Perianth, the collective name for both the sepals and petals. The term is usually used when there is little distinction between the sepals and petals.

Persistent, when any part of the flower does not fall early, but remains until the fruit is matured.

Petaloid, when the sepals are coloured and have the appearance of petals.

Pinnate, when the leaflets of a compound leaf are arranged on each side of the rachis like the branches of a feather.

Plumose, like a feather.

Polygamous, when the flowers are both hermaphrodite and unisexual.

Procumbent, when a stem lies for the greater part of its length on the ground.

Prostrate, when a stem lies flat on the ground.

Pubescent, hairy, with rather short, soft, straight hairs.

Raceme, when the flowers are borne on pedicels along an undivided rachis.



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Rachis, the prolongation of the petiole or peduncle on which the leaflets or flowers are inserted.

Radical, when the leaves grow directly from the rootstock.

Receptacle, the top of the peduncle inside the calyx on which the parts of the flower are inserted.

Reflexed, bent abruptly backwards, or downwards.

Reniform, kidney-shaped.

Rhizome, a thick, prostrate, or underground, and usually branching rootstock, producing roots on the lower surface and leaves and stems from the upper surface.

Rootstock, that part of the plant which forms the junction between the root and stem, or root and leaves in the case of leaves growing direct from the rootstock. It may be either erect above ground, or prostrate, growing horizontally above or below ground, producing buds on the upper surface from which stems or leaves develop, and roots on the lower surface.

Rosulate, when the leaves are radical and arranged in whorls forming a rosette close on the ground.

Rotate, when the limb of the corolla is flat, with a very short tube, resembling a wheel.

Saccate, swollen, forming a pouch or little bag.

Saggitate, when the base of a leaf is produced downwards, into two pointed lobes, like an arrow head.

Salver-shaped, similar to rotate, but with a long corolla-tube.

Scabrid, when the surface of a leaf is rough to the touch.

Scape, the name for a leafless flower stalk growing direct from the rootstock.



Scarious, when the texture of a leaf is thin and dry, as opposed to green and succulent.

Serrate, with sharp teeth, like the teeth of a saw.

Sessile, without a stalk, or petiole.

Setaceous, bristle-like.

Sheath, the expanded base of a petiole.

Simple, when a leaf is undivided into separate leaflets, *i.e.*, the opposite to compound.

Sinuuous, with a wavy margin.

Sinus, the space between the lobes of a leaf.

Spathe, a large, sheath-like bract enclosing a cluster of flowers.

Spathulate, when a leaf is broad and rounded at the apex and gradually narrowed downwards, like a spatula.

Standard, the large, posterior petal in a pea-like flower of the Papilionaceæ Family. The segments of the perianth corresponding to petals in the Iris are also often termed the standards.

Stellate, star-like.

Stipules, small scale-like or leaf-like organs at the base of a leaf.

Stipels, small secondary stipules, at the base of the pinnæ or leaflets in a compound leaf.

Striate, marked with thin lines or minute furrows.

Subulate, when shaped like a shoe-maker's awl.

Sub-sessile, almost sessile.

Superior, when the ovary is free from the calyx, with the petals and stamens inserted below the ovary.

Tendrill, a slender prolongation of the rachis, often serving as a holdfast for climbing.



Terete, round in section.

Ternate, when a compound leaf is divided into three leaflets springing from the same point.

Tomentose, densely covered with short, soft, matted hairs.

Tuberous, swollen into a rounded form.

Turbinate, with the shape of a top, or inverted cone.

Umbel, an inflorescence, in which the pedicels radiate from the top of a peduncle, and are all of about the same length.

Ventricose, swollen on one side.

Whorl, when several leaves are arranged in a circle around the stem.

CLASSIFICATION.

The following key shows how the Families represented in this volume are classified into classes, sub-classes and series.

Class I. **Dicotyledons**. Plants with the parts of the flower in fours or fives or multiples of these ; leaves with the veins branching in a network manner : two cotyledons (rudimentary leaves) to the embryo in the seed.

Sub-class I. **Polypetalæ**. Petals not united.

Series (i). **Thalamifloræ**. Parts of the flower inserted on the receptacle. Petals and stamens inserted below the ovary : ovary free from the calyx.

| | | |
|----------|---|--------------------|
| Families | { | 1. Ranunculaceæ. |
| | | 2. Fumariaceæ. |
| | | 3. Cruciferæ. |
| | | 4. Caryophyllaceæ. |



Series (ii). **Discifloræ**. The receptacle usually expanded into a disc between the petals and ovary.

Family ... 5. Rutaceæ.

Series (iii). **Calycifloræ**. Parts of the flower (petals and stamens) inserted on the calyx, the stamens being inserted above the base of the ovary.

| | | |
|----------|---|------------------|
| Families | { | 6. Papilionaceæ. |
| | | 7. Rosaceæ. |
| | | 8. Saxifragaceæ. |
| | | 9. Crassulaceæ. |

Sub-class II. **Gamopetalæ**. Petals united.

Series (i). With the ovary inferior.

| | | |
|----------|---|-------------------|
| Families | { | 10. Dipsaceæ. |
| | | 11. Compositæ. |
| | | 12. Campanulaceæ. |

Series (ii). With the ovary superior.

| | | |
|----------|---|----------------------|
| Families | { | 13. Gentianaceæ. |
| | | 14. Boraginaceæ. |
| | | 15. Scrophulariaceæ. |
| | | 16. Selaginaceæ. |

Class II. **Monocotyledons**. Plants with the parts of the flower in threes or multiples of three ; veins of the leaves parallel : one cotyledon to the embryo in the seed.

Sub-class. **Petaloidæ**. The perianth with at least one whorl like petals.

Series (i). With the ovary inferior.

Family ... 17. Iridaceæ.

Series (ii). With the ovary superior.



ANEMONE VITIFOLIA, *Ham.* (Pl. I.)

Vine-leaved Anemone.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. An-em-ō'-nē, from the Greek "*anemos*," the wind, probably referring to the early flowering of some species in March, the month when winds are prevalent; vi-tif-ol'-i-a, from the Latin "*vītis*," a vine, and "*folium*," a leaf. The English name is pronounced An-em'-ō-nē.

Description. A robust perennial with large radical leaves, and numerous large white flowers borne on a tall branching scape.

Rootstock, stout, woody.

Flowering stem or scape, 1-3' in height, stout, erect, branched.

Leaves, all radical, 4-12" diam., long-petioled, orbicular-cordate, 5-lobed, glabrous above and tomentose beneath, the main lobes often with smaller lobes, and sharply toothed.

Flowers, white, 1½-2" diam., numerous, on long peduncles borne on a stout, branching scape, forming a compound cyme. **Involucral bracts** petioled, similar to the radical leaves but smaller and less lobed.

Sepals, 5-8, petaloid, white, silky outside.

Petals, 0.

Stamens, many.

Carpels, many, free, each with a single ovule.

Fruit, a globose head of free achenes, which, when ripe, are embedded in dense, white wool.

Distinguishing characters. The tall, branching scape, with numerous large flowers, the large 5-lobed radical leaves,



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ANEMONE VITIFOLIA—*continued*.

the ripe achenes embedded in white wool, and the late flowering season make it easily distinguished from other species. In general habit it closely resembles *A. japonica* which is much cultivated in gardens, but this latter species has 3-foliolate leaves.

Flowering Season. August to October.

Locality. At temperate elevations of about 5–7,000', usually growing on open, grassy slopes, *e.g.*, Ferozepore Nala, below Gulmarg.

Distribution. Throughout the Temperate Himalaya, from Kashmir to the inner ranges of Sikkim.



ANEMONE VITIFOLIA, *Ham.*



THALICTRUM PAUCIFLORUM, *Royl*



THALICTRUM PAUCIFLORUM, *Royle*

Few-flowered Meadow-rue. (Pl. II.)

Family. *Ranunculaceae*. The Buttercup Family.

Name. Thal-ic'-trum, from the Greek "*thallo*," to flourish ; pau-cif-lō'-rum, from the Latin "*paucus*," few, and "*flōs*," a flower, referring to the comparatively few flowers at the ends of the branches.

Description. A graceful, erect, wiry perennial, with much divided leaves and small flowers from which the slender stamens hang down in bunches like little tassels, which shake with the slightest breath of wind.

Stem, erect, wiry, glabrous, branched, 1-2' in height.

Leaves, sub-sessile, 2-ternate, 1-2" in length and more or less uniform in size all up the stem. **Leaflets,** small, petioled, ob-ovate-cuneate or orbicular, usually 3-lobed and the lobes with 2 or 3 rounded teeth.

Flowers, $\frac{1}{4}$ " diam., rusty-red, brown or purplish, in panicles with 1 or few flowers at the ends of long, wiry branches.

Sepals, reddish-purple, ovate, acute, 3-nerved.

Petals, 0.

Stamens, many, pendulous ; the filaments reddish-purple, very slender, much longer than the sepals ; the anthers rusty-red, shortly pointed.

Carpels, usually 5, free, shortly stalked ; the stigma sessile, rusty-red, ovate-triangular.

Fruit, a cluster of 3-5 free achenes ; the achenes compressed, ob-ovate or elliptic, shortly stalked, 3-nerved on each side.

Distinguishing characters. The short sub-sessile leaves, which are more or less uniform in size all up the stem, is a distinctive character.



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THALICTRUM PAUCIFLORUM—*continued.*

Flowering Season. August.

Locality. At elevations of about 10-11,000', e.g., Killenmarg, Tosh Maidan.

Distribution. From Kashmir to Kumaon.



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THALICTRUM MINUS, *Linn.*
VAR. MAJUS, *Hook.f. & T.* (Pl. III.)

Greater Meadow-rue.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Thal-ic'-trum, from the Greek "*thallo*," to flourish; min'-us is the Latin word for less, and mā'-jus, for elder or greater.

Description. A tall, robust perennial, with large leaves much divided into small leaflets, and long, terminal panicles of small, greenish-yellow flowers.

Stem, erect, 3-8' in height, stout, hollow, branching, striate, glabrous.

Leaves, decomponently pinnate, the lower ones often 1' or more in length and of the same width across the lowermost pair of pinnæ; a few of the lower leaves shortly petioled, the others sub-sessile, with the lowermost pair of pinnæ arising from the top of a broad sheath; the lower pinnæ usually with a pair of short, thick stipels at the base; petioles, sheathing and auricled. **Leaflets**, $\frac{1}{2}$ -1 $\frac{1}{4}$ " in length, petioled, oblong or ob-ovate or orbicular, 3-lobed, the lobes 1-3 toothed, the teeth mostly acute, but some also obtuse; the under surface with or without glands; the upper surface glabrous.

Flowers, greenish-yellow, $\frac{1}{4}$ " diam., in long, branching panicles.

Sepals, $\frac{1}{8}$ " in length, petaloid, greenish-yellow, oblong or elliptic, obtuse, 3-nerved.

Petals, 0.

Stamens, numerous, sub-erect or pendulous: anthers linear, short-pointed, yellow turning brown.

Carpels, several, free; the stigma sub-sessile, ovate-triangular.

**THALICTRUM MINUS**—*continued*.

Fruit, a cluster of 5-8 free sessile achenes ; the achenes not compressed, elliptic or oblong, with many prominent ribs, terminated by a short, straight or curved beak : seed linear-oblong, narrowed at one end.

Distinguishing characters. The tall stem, large leaves which are mostly sub-sessile, large leaflets with acute teeth, stipellæ usually present, stigma sub-sessile, achenes not compressed, distinguish it from other species.

Flowering Season. Latter half of June, July. Fruits ripen about the end of August.

Locality. At elevations of 7-9,000', *e.g.*, Pahlgam.

Distribution. Temperate Himalaya, West Thibet, N. Asia, Abyssinia, S. Africa, Europe, including Great Britain.



THALICTRUM MINUS, *Linn.*, var. MAJUS, *Hook.f. & T.*

**AQUILEGIA JUCUNDA**, *Fisch. & Mey.*

Solitary-flowered Columbine.

(Pl. IV.)

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Aq-uil-ē'-gī-a, from the Latin "*aquila*," an eagle, referring to the spurs of the flowers which are supposed to resemble the claws of the eagle; jū-cun'-da is the Latin word for pleasant. The English name is from the Latin "*columba*," a dove, referring to the resemblance of the inverted flower to a nest of doves.

Description. A beautiful Alpine perennial with much-divided leaves, and a short stem bearing a solitary terminal dark purple flower with spurred petals.

Stem, erect, simple, 4-8" in height.

Leaves, radical leaves, few, long-petioled, 2-ternate; the leaflets sub-sessile, deeply incised into broad, blunt teeth. **Cauline leaves**, 1 or 2, similar to the radical leaves, but smaller or sometimes nil.

Flowers, $1\frac{1}{2}$ -2 $\frac{1}{2}$ " diam., dark purple, drooping; only one solitary terminal flower.

Sepals, 5, petaloid, very dark purple, spreading, broadly ovate to sub-orbicular.

Petals, 5, erect, funnel-shaped, produced into a spur at the base, the spurs much incurved.

Stamens, many, the inner ones reduced to scales.

Carpels, 5 or more, free.

Fruit, a cluster of 5 follicles.

Distinguishing characters. The short, simple stem, bearing a solitary terminal dark purple flower, with broad, rounded sepals, and much-incurved spurs distinguishes it from *A. vulgaris* (Linn.).

Flowering Season. July, August.



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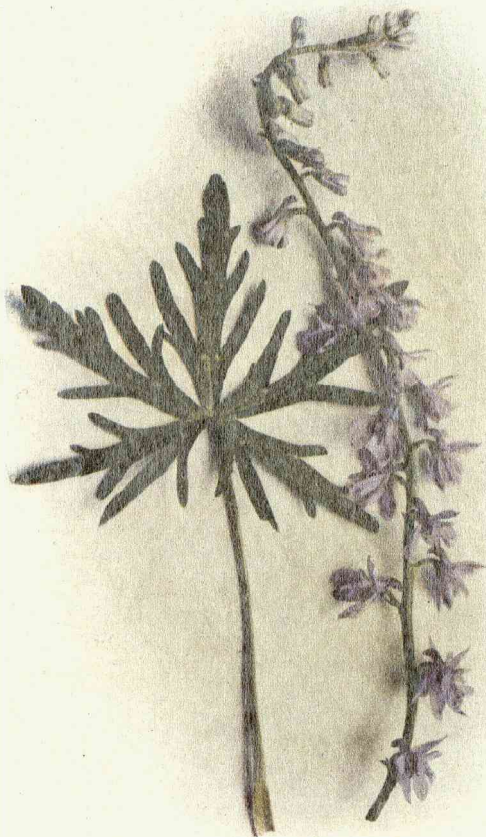
AQUILEGIA JUCUNDA—*continued*.

Locality. At elevations of 10–13,000' ; *e.g.*, Zoipal, Apharwat, Astan Marg.

Distribution. Kashmir.



AQUILEGIA JUCUNDA, *Fisch. & Mey.*



DELPHINIUM UNCINATUM, *Hook. f. & T.*



DELPHINIUM UNCINATUM,

Hook. f. & T. (Pl. v.)

Hook-spurred Larkspur.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Del-phī'-nī-um, from the Greek "*delphis*," a dolphin, referring to the shape of the flowers ; un-cī-nā'-ta is from the Latin "*uncus*," a hook, referring to the hooked spur of the flowers.

Description. A tall, robust perennial, with long-petioled, deeply-cut leaves, and a long, terminal raceme of purple flowers, with short, hooked spurs.

Rootstock, stout, woody.

Stem, erect, 1-2½' in height, stout, simple or sparingly branched, glabrous or glandular-hairy on the upper part.

Leaves, alternate, long-petioled, 2-6" diam., orbicular, 5-partite, the segments broad with deep incisions, or narrow and incised into linear lobes ; the topmost leaf usually incised into 3 or 5 linear lobes : glabrous or sparsely pubescent.

Flowers, rather less than 1" diam., usually pale red-purple, in a many flowered glandular-hairy terminal raceme up to 1' in length : the pedicles curved, glandular-hairy, about ¼" in length.

Sepals, 5, petaloid, purple, spreading, ½" in length, oblong or ovate, obtuse, hairy outside ; the spur shorter than the sepals, about ¼", cylindrical with the tip bent at right angles and a swelling at the bend, glandular-hairy.

Petals, 4, small, the same colour as the sepals but slightly paler ; the 2 anterior ones erect, clawed, the limb cleft into 2 linear lobes, covered with long hairs ; the 2 dorsal petals erect, glabrous, 2-fid, spurred.

**DELPHINIUM UNCINATUM**—*continued*.

Stamens, many.

Carpels, several, free ; the ovaries slightly hairy.

Fruit, a cluster of 3 follicles.

Distinguishing characters. The short, cylindrical, hooked spur shorter than the sepals, distinguishes it from other species.

Flowering Season. April, May.

Locality. At low elevations of 2–7,000' ; *e.g.*, Dulai on the Jhelum Valley Road.

Distribution. Sub-Tropical and Temperate Himalaya, Murree, and also the Salt Range in the Punjab.



DELPHINIUM INCANUM, Royle (Pl. VI.)

Hoary Larkspur.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Del-phī'-nī-um, from the Greek "*delphīs*," a dolphin, referring to the shape of the flowers ; in-cā'-num is from the Latin "*incānus*," grey or hoary, referring to the greyish or hoary character of the stem.

Description. A tall, erect perennial, with deeply-cut leaves and racemes of intense blue or dull purple spurred flowers.

Stem, erect, $1\frac{1}{2}$ –3' in height, hoary, with dense, short, greyish pubescence.

Leaves, mostly sub-sessile, a few of the lower ones shortly petioled, reniform or orbicular-cordate in outline, 3–5 lobed more or less to the base, the lobes sub-pinnately cut into linear segments, glabrescent on the upper surface, pubescent on the lower surface.

Flowers, intense blue, or dull purple, $1\frac{1}{4}$ " in length by about the same diam., in long, terminal, dense-flowered racemes. **Pedicels** about $\frac{1}{2}$ " in length. **Bracts**, the lower ones longer than the pedicels, linear or 3-lobed, the upper ones shorter than the pedicels. **Bracteoles**, usually 2 small linear bracteoles on the lower pedicels.

Sepals, 5, petaloid, blue or dull purple, with a thickened green spot on the under surface towards the tip, spreading, orbicular or oblong, obtuse, unequal ; the dorsal sepal spurred, the spur subulate, straight or curved, equal to or longer than the sepals.

Petals, 4, erect, small, purple, the 2 posterior ones stiff and rigid with 2-fid white tips and long, slender, cylindrical spurs, extending into the spur of the dorsal sepal ; the 2 anterior ones clawed, with an oblong 2-fid limb bearing a few long, white hairs on the upper surface.

**DELPHINIUM INCANUM**—*continued*.

Stamens, many.

Carpels, several, free.

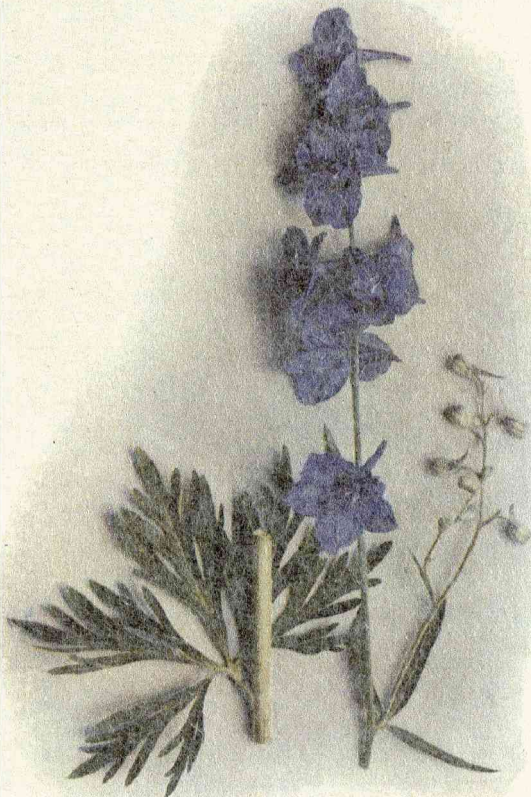
Fruit, a cluster of 3 free follicles, which are slightly pubescent.

Distinguishing characters. The hoary stem, leaves mostly sub-sessile and divided into linear segments, flowers intense blue or dull purple, sepals spreading, and the spur slender, subulate or cylindrical, not hooked at the tip, distinguishes it from other species.

Flowering Season. August.

Locality. At elevations of 6–8,000' ; *e.g.*, Tangmarg, Pahlgam.

Distribution. Temperate Himalaya, from Kashmir to the Sutlej River.



DELPHINIUM INCANUM; *Royle*



DELPHINIUM DENUDATUM, Wall.

Denuded Larkspur. Vern.: *Nirbisi*. (Pl. VII.)

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Del-phī'-nī-um, from the Greek "*delphīs*," a dolphin, referring to the shape of the flowers ; dē-nū-dā'-tum is from the Latin "*dēnūdo*," to lay bare, referring to the naked stems which are more or less without hairs.

Description. A tall, erect perennial, with orbicular-cordate leaves divided into narrow lobes, and long, terminal racemes of pale blue spurred flowers.

Stem, erect, 2-3' in height, simple or sparingly branched, glabrous or slightly downy above.

Leaves. **Radical leaves,** few, long-petioled, orbicular 2-6" diam., 5-9 lobed more or less to the base, the lobes narrow, cuneate-ovate, sub-pinnately incised into linear segments. **Cauline leaves,** few, the lower ones long-petioled, similar to the radical leaves but smaller, glabrous.

Flowers, pale blue, about 1-1½" in length by about the same diam., few, distant, forming long, lax, terminal racemes. **Pedicels,** ¾-1" in length, usually with 2 small bracteoles. **Bracts,** narrow, linear, entire.

Sepals, 5, petaloid, pale blue, with a yellowish central portion on the lower surface, spreading, elliptic or oblong, obtuse, unequal ; the dorsal sepal spurred, the spur slender, subulate, straight or curved, equal to or longer than the sepals.

Petals, 4, erect, small, blue, the 2 posterior ones stiff and rigid, with 2-fid tips, and long, slender, cylindrical spurs, extending into the spur of the dorsal sepal ; the 2 anterior ones clawed, with an oblong, deeply 2-fid limb, bearing long, white hairs on both surfaces.

**DELPHINIUM DENUDATUM—continued.**

Stamens, many.

Carpels, several, free.

Fruit, a cluster of 3 free follicles, which before ripening are glandular pubescent.

Distinguishing characters. The glabrous stem, cauline leaves few, long-petioled, and divided into linear segments, flowers pale blue, sepals spreading, and the spur slender, subulate or cylindrical, not hooked at the tip, distinguishes it from other species.

Flowering Season. May, June.

Locality. At elevations of 5–8,000', usually on open, dry ground ; *e.g.*, Eishmakam, Pahlgam, Dachigam.

Distribution. From Kashmir to Kumaon.



DELPHINIUM DENUDATUM, Wall.



ACONITUM LAEVE, Royle (Pl. VIII.)

Himalayan Spurred Monkshood. Vern.: *Bika*.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Ac-on-ī'-tum, from Acone, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance ; lae'-vē is the Latin word for wrongly or awkwardly, referring to the peculiar spur-like protuberance on the dorsal sepal. In Hooker's *Flora of British India*, the plant is described under *Aconitum Lycopodium* (Linn.).

Description. A tall, robust perennial, with large, simple, lobed leaves, and long racemes of white, pale yellow or dull purple flowers, which have a long, blunt, spur-like protuberance on the back of the uppermost sepal.

Rootstock, stout, without tubers.

Stem, erect, stout, much branched, 3-6' in height, glabrous or pubescent, often glandular-pubescent on the upper portion.

Leaves, 6-12" diam., orbicular-cordate, deeply 5-9 lobed, sharply and coarsely toothed, the lower ones long-petioled, the upper ones sub-sessile.

Flowers, white, pale yellow or dull red-purple, or variegated white and purple, about 1" in length from tip of lower sepals to tip of the dorsal spur, in long, branching racemes. **Pedicels** about 1" in length, glandular hairy, with or without bracteoles. **Bracts,** linear or lanceolate, entire.

Sepals, 5, petaloid, the upper or dorsal one (termed the helmet) helmet-shaped, with a short beak, forming a hood over the other sepals, and with a long upcurved, spur-like, dorsal protuberance, which is

ACONITUM LAEVE—*continued*.

blunt and swollen at the tip ; the 2 lower or anterior ones elliptic, obtuse ; the 2 lateral ones orbicular, with a short, broad claw.

Petals, 2 to 5, very small ; the 2 upper ones reduced to nectaries, with honey secretions, and consisting of a long, slender claw, with a small, hooded and spurred limb enclosed in the dorsal protuberance of the helmet ; the lower ones linear-lanceolate, entire, about $\frac{1}{5}$ " in length or often absent.



Petal
or Nectary.

Stamens, many.

Carpels, several, free.

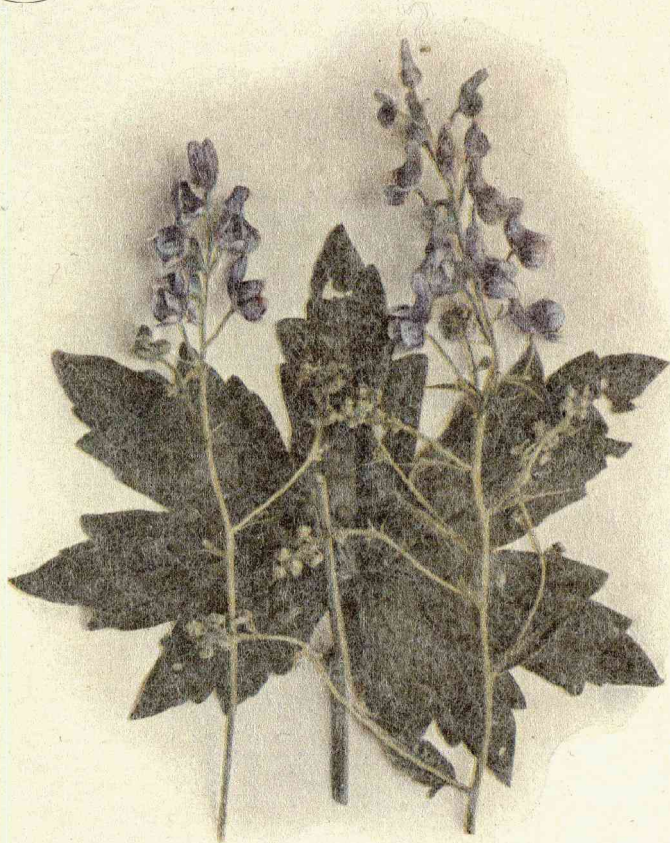
Fruit, a cluster of 3 free follicles.

Distinguishing characters. The spur-like protuberance on the back of the helmet distinguishes it easily from other species.

Flowering Season. July, August.

Locality. At elevations of 7–11,000', usually in woods ; e.g., Gulmarg, Tannin, Pahlgam, Kamri.

Distribution. From Kashmir to Kumaon.



ACONITUM LAEVE, *Royle*



ACONITUM MOSCHATUM, *Staf*



ACONITUM MOSCHATUM, Stapf (Pl. IX.)

Musk Monkshood.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Ac-on-ī'-tum, from Acone, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance; mos-chā'-tum is from the Greek "*moskos*," musk. The English name refers to the shape of the flowers, in which the upper sepal forms a cowl or hood over the others. The plant is not described in Hooker's *Flora of British India*.

Description. A densely tufted Alpine perennial, with many long-petioled radical leaves, and several stems bearing terminal racemes of variegated green and dark brown flowers, with the uppermost sepal forming a hood over the other ones.

Rootstock, stout, woody, without tubers, densely clothed with the remains of previous years' leaf-stalks.

Stems, several, 1-2' in height, erect, simple, with few hairs.

Leaves. **Radical leaves,** many, long-petioled, orbicular-cordate or reniform, 2-3" diam., glabrous or slightly pubescent, 5-7 lobed to near the middle, the lobes broad, shortly incised into broad, rounded apiculate teeth; the petioles stout, 3-6", with a broad sheath at the base.

Cauline leaves, few, 2 or 3, the lower ones long-petioled, similar to the radical leaves but smaller.

Flowers, variegated green and dark brown, about $\frac{3}{4}$ " in length, in a terminal lax raceme. **Pedicels,** $\frac{1}{4}$ - $\frac{1}{2}$ ", stout, erect, glandular-hairy, with 2 bracteoles. **Bracts,** the lowermost leaf-like, lobed and toothed, the upper ones oblong-elliptic, 3-nerved, glandular-hairy, saccate at the base.

ACONITUM MOSCHATUM—*continued*.

Sepals, 5, petaloid, variegated, with the lower part yellowish-green and the marginal portion brown to almost black, glandular-hairy on the outside; the upper sepal (helmet) $\frac{1}{2}$ – $\frac{3}{4}$ " in length by $\frac{1}{4}$ " in depth, the tip rounded without a beak; the 2 lateral ones obliquely ob-ovate, the 2 lower ones ob-ovate with rounded tips.

Petals, 2, small, reduced to nectaries enclosed in the helmet and consisting of a slender claw, with a small extinguisher-shaped, green and brownish limb, with the lower margin turned upwards in front, forming a small lip.



Petal
or Nectary.

Stamens, many, the anthers black.

Carpels, several, free, densely hairy.

Fruit, a cluster of 1–5 follicles (usually 3), about $\frac{3}{4}$ " in length, often glandular-hairy.

Distinguishing characters. Easily recognised by its tufted character, orbicular leaves, incised to near the middle with broad, rounded teeth, and its variegated greenish and brown-black flowers.

Flowering Season. July, August.

Locality. At elevations of 11–13,000'; e.g., Zojpal, Shisha Nag.

Distribution. Not recorded from outside of Kashmir.

ACONITUM CHASMANTHUM, Stapf

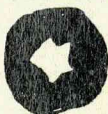
Deadly Monkshood, Mohri. (Pl. x.)

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Ac-on-i'-tum, from Acone, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance; chas-man'-thum is from "*chasma*," a chasm, and "*anthemum*," a flower. The English name for plants of this genus is Monkshood, referring to the shape of the flowers, in which the upper sepal forms a cowl or hood over the other sepals. The plant is described in Hooker's *Flora of British India* under *Aconitum Napellus* (Linn.).

Description. A poisonous, tuberous herb, with round leaves, which are cut up into linear segments, and a terminal, long raceme of pale or dark blue flowers, in which the upper sepal forms a hood over the other sepals.

Rootstock, 2 small tubers, about $1\frac{1}{2}$ –2" in length; a fresh tuber cut transversely is white inside with a pale brownish, continuous, sinuous ring (the cambium) about half-way towards the centre, but the portion outside the cambium very rapidly changes to a brown colour, the inside portion remaining white.



Stem, $1\frac{1}{2}$ –4' in height, erect, stout, simple below, but usually with a few or many short, erect, raceme-bearing branches just below the main terminal raceme; glabrous or hairy.

Leaves, numerous, often densely crowded, the lowermost ones long-petioled, but most of them short-petioled, or sub-sessile on the upper part of the stem; the blade orbicular or reniform in outline, 2–4" diam., palmately lobed more or less to the base, the lobes sub-pinnately dissected into linear segments, glabrous or sparsely hairy.

Flowers, numerous, in a long, dense, terminal raceme up to 1' or more in length, with usually several shorter, erect branches or axillary racemes from near its base; the flowers about 1" in length, from pale blue, often variegated with white, to dark blue; pedicels erect, glabrous or pubescent on the upper part; bracteoles small, linear.

ACONITUM CHASMANTHUM—*continued.*

Sepals, 5, petaloid, blue, the upper one helmet-shaped, about $\frac{3}{4}$ " in length, glabrous or hairy; the two lateral ones sub-orbicular; the two lower ones elliptic or oblong, much smaller than the lateral ones.

Petals, 2, small, reduced to nectaries, enclosed in the helmet, and consisting of a slender claw and a small hood-like limb; the limb in the form of a white membranous inverted sac, open below with the front margin prolonged and turned upwards forming a 2-lobed lip, and the honey-gland at the top; the claw deeply channelled and terminating in a small hood inside the membranous sac, which checks access to the honey-gland up the channel of the claw.



Stamens, numerous, the filaments glabrous or hairy on the upper part, and winged below, the anthers brownish-black with white pollen.

Carpels, usually 5, free, glabrous or slightly hairy, or densely hairy with long hairs.

Fruit, a cluster of 5 free, glabrous or hairy follicles.

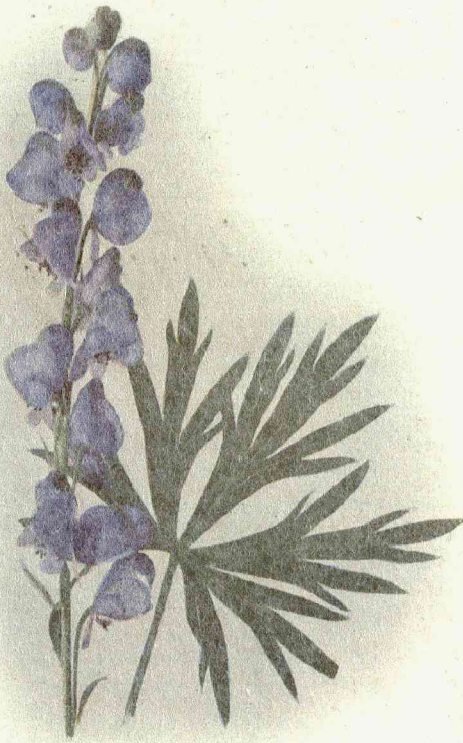
Distinguishing characters. The tall, densely-leafy stems, leaves mostly short-petioled and deeply dissected into linear segments, long dense-flowered racemes, blue flowers, continuous cambium, and the portion of the tuber outside the cambium changing to a brown colour, distinguishes it from other species.

Flowering Season. End of July, August.

Locality. At elevations of 7–12,000'; e.g., Ferozepore Nala, near Gulmarg, Gosai, Badwan.

Distribution. Chitral, Hazara.

Uses. The tubers contain a very poisonous alkaloid, "indaconitine," which is a valuable drug for medicinal purposes. They are said to yield 4.25 to 4.5 per cent. of total alkaloid, whereas the tubers of the European species, *A. Napellus* (Linn), yield only $\frac{1}{2}$ per cent. of the alkaloid "aconitine." Both alkaloids have more or less the same medicinal properties.



ACONITUM CHASMANTHUM, *Stapf*

ACONITUM VIOLACEUM, Jacq.

Jacquemont's Monkshood.

(Pl. XI.)

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Ac-on-i'-tum, from Acone, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance. In Hooker's *Flora of British India*, the plant is included under *A. Napellus* (Linn).

Description. An Alpine tuberous herb, with round leaves much divided into linear segments, and a terminal, short raceme of blue flowers, in which the uppermost sepal forms a hood over the other sepals.

Rootstock. 2 small tubers, about $\frac{3}{4}$ –1 $\frac{1}{4}$ " in length; a fresh tuber cut transversely is white inside with a pale yellowish, continuous, sinuous ring (the cambium) near the centre, and remains white.



Stem. 4–12" in height, erect, slender or stout, simple or branched from the base upwards, glabrous or hairy.

Leaves. few, all with long petioles, except one or two at the top of the stem, which have short petioles or are sub-sessile; the blade orbicular-cordate or reniform in outline, 1–3" diam., palmately lobed to the base; the lobes much dissected into linear segments; the lobes and segments often much overlapping with the tips of the segments curved upwards; glabrous or sparsely hairy.

Flowers. few, in a short, terminal, close raceme of about 4–10 flowers, with or without axillary racemes bearing one or two flowers; the flowers $\frac{3}{4}$ –1" in length, dark blue, or paler blue, often variegated with white, or sometimes almost white; pedicels erect, densely hairy on the upper part; bracteoles small, linear.

ACONITUM VIOLACEUM—continued.

Sepals, 5, petaloid, blue, more or less pubescent, the upper one helmet-shaped, $\frac{3}{4}$ " in length; the two lateral ones sub-orbicular to sub-quadrate; the two lower ones oblong, obtuse, smaller than the lateral ones.

Petals, 2, small, reduced to nectaries enclosed in the helmet, and consisting of a slender claw and a small hood-like limb; the claw curved at the top, so that the upper part is horizontal; the limb in the form of a white or purple membranous sac extending some distance along the claw, open at the lower end, and with the front margin prolonged and turned upwards forming



an entire or shortly toothed lip; the honey gland forms a black or dark-green shining knob at the top of the membranous sac; the claw terminates in a small hood inside the membranous sac.

Stamens, numerous; the filaments hairy with long yellowish hairs on the upper part, and winged below; anthers brownish-black with white pollen.

Carpels, usually 5, free, densely hairy with long yellowish hairs.

Fruit, a cluster of 5 free, hairy follicles.

Distinguishing characters. The short stem; few, long-petioled leaves, much divided into linear segments, short few-flowered close racemes, flowers blue, lip of the limb of the petals entire or shortly toothed, continuous cambium, and the fresh tuber not changing to a brown colour when cut, distinguishes it from other species. *A. violaceum*, var. *robustum* (Stapf.) is a larger plant, 1-2' in height, with more scattered and often more numerous leaves, and longer racemes, often many flowered.

Flowering Season. August, September.

Locality. At elevations of 11-13,000'; e.g., Apharwat, Shisha Nag, Astan Marg.

Distribution. From Gilgit to Kumaon.



ACONITUM VIOLACEUM, Jacq.

ACONITUM HETEROPHYLLUM, Wall.

Various-leaved Monkshood. (Pl. XII.)
Vern. name : *Atis, Patis*.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. *Ac-on-i'-tum*, from *Acone*, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance; *het-er-oph-yl'-lum* is from the Greek "*heteros*," different, and "*phýllon*," a leaf.

Description. A tall, robust, tuberous herb, with simple, toothed leaves and variegated green and brownish-purple flowers in long racemes, the upper sepal of the flowers forming a hood over the other sepals.

Rootstock, 2 small tubers, about $1-1\frac{1}{2}$ " in length ; a fresh tuber cut transversely is white inside with about 5 yellowish spots (the cambium strands) arranged in a circle ; the cut surface usually remains white or sometimes changes to a pale reddish-brown colour except just around the cambium strands.



Stem, 1-4' in height, erect, stout, simple below, sparingly branched or not above, glabrous or pubescent on the upper part.

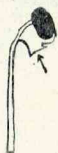
Leaves, a few of the lowermost petioled, the others all sub-sessile to sessile, amplexicaul ; the blade ovate-cordate or some of the lower ones orbicular-cordate, 2-4" in length, coarsely toothed, sometimes more or less lobed, acute or obtuse, sparsely pubescent.

Flowers, green, variegated with reddish-brown or brownish-purple, or dull greenish-blue with darker purple veins, $1-1\frac{1}{4}$ " in length, in elongate lax racemes ; pedicels $\frac{1}{2}-2$ " in length, spreading or sometimes sub-erect ; bracteoles very variable in different localities, either (i) very small, linear, low down on the pedicels or (ii) small, ovate, often with short petioles, or (iii) very large, ovate or orbicular, concave, entire, $\frac{1}{2}$ " diam., erect, close under the sepals enclosing the lower part of the flower or the lower half of the follicles in fruit.

ACONITUM HETEROPHYLLUM—*continued*.

Sepals, 5, petaloid; the upper one helmet-shaped, the two lateral ones sub-rhomboidal, with the lower front margin much extended and often produced in a curly point, margins sinuate; the two lower ones elliptic, much smaller than the lateral ones.

Petals, 2, small, reduced to nectaries enclosed in the helmet, and consisting of a long, slender claw and a small hood-like limb; the top of the limb is black or green and shining (the honey-gland) with a white membranous sac below it, which has two canal-like entrances side by side to the honey-gland from the front, with very short lips above them.



Stamens, numerous, the filaments slightly hairy above and winged below, anthers yellow.

Carpels, 5, free, pubescent with short hairs.

Fruit, a cluster of 5 free, hairy follicles which are broad at the top with the inner side rounded and the style on the outer side.

Distinguishing characters. Stem 1-4', rarely branched at the base; leaves numerous, mostly ovate-cordate, sessile, amplexicaul; flowers not bright blue, usually numerous; bracteoles usually entire or slightly toothed; lateral sepals with the front and lower margins produced downwards more or less to a point; carpels with short hairs; limb of nectary broad and rounded at the top; tubers white inside, with the cambium consisting of isolated strands.

Hybrid forms often with bright blue flowers and characters intermediate between this species and *A. kashmiricum*, *Stapf* (inedit.) occur abundantly on Killenmarg.

Flowering Season. August, September.

Locality. At elevations of 7-11,000'; e.g., Gulmarg, Killenmarg, Badwan, Burzil, Gosai.

Distribution. From Kashmir to Kumaon.

Uses. The tubers are non-poisonous, but they contain an alkaloid, "*atisine*," and an extract prepared from them is much used for medicinal purposes, chiefly as a febrifuge and tonic.



ACONITUM HETEROPHYLLUM, Wall.



CSL

ACONITUM KASHMIRICUM,

Stapf (inedit). (Pl. XIII.)

Kashmir Monkshood. Vern.: *Pevak*.

Family. *Ranunculaceæ*. The Buttercup Family.

Name. Ac-on-i'-tum, from Acone, a harbour of Heraclea, in Bithynia, in the neighbourhood of which certain species of *Aconitum* were found in abundance. This plant is not separately described in Hooker's *Flora of British India*, but what appear to be hybrid forms of it (*A. cordatum*, *Royle*) have been included under *A. heterophyllum*, *Wall*.

Description. An erect, tuberous herb, with orbicular-cordate and ovate-cordate leaves, and intense bright blue flowers in racemes, the upper sepal of the flowers forming a hood over the other sepals.

Rootstock, 2 small tubers about $\frac{3}{4}$ –1" in length; a fresh tuber cut transversely is white inside with 4 isolated pale yellow spots (cambium strands) arranged in a circle about half-way towards the centre; the cut surface remains white, but the cambium strands



become dark brown.

Stem, 4–12" in height, erect, slender, simple or often branched at the base, and sparingly branched above; glabrous or pubescent on the upper part.

Leaves, few, glabrous, all long-petioled except one or two on the upper part of the stem, which are sub-sessile; the blade orbicular-cordate or ovate-cordate, $\frac{1}{2}$ –1 $\frac{1}{2}$ " diam., incised into broad lobes with about 3–5 apiculate teeth. In small plants the leaves are sometimes all orbicular-cordate, incised to $\frac{1}{2}$ – $\frac{3}{4}$ the way down (sometimes deeper) into broadly cuneate toothed lobes.

Flowers, intense blue, $\frac{3}{4}$ –1" in length, solitary, or two together at the top of the stem on long peduncles of more or less equal length, or in racemes of a few distant flowers;

ACONITUM KASHMIRICUM—continued.

pedicels erect, pubescent, $\frac{1}{2}$ –2" in length ; bracteoles usually 2, broadly ovate, deeply incised and toothed, often with short petioles, usually inserted low down on the pedicels.

Sepals, 5, petaloid, blue, the upper one helmet-shaped, with a small crest near the tip ; the two lateral ones sub-rhomboidal to sub-orbicular ; the two lower ones elliptic, much smaller than the lateral ones.

Petals, 2, small, reduced to nectaries enclosed in the helmet, and consisting of a slender, curved, channelled claw with a small limb ; the limb in the form of a more or less oval black or green shining knob (the honey-gland) with a narrow white membranous sac extending in front of it, the top of the limb narrowed to a point ; the



entrance to the honey-gland is at the bottom with a small lip above it.

Stamens, numerous, the filaments hairy on the upper part and winged below, the anthers black with white pollen.

Carpels, usually 5, free, densely pubescent with yellowish hairs.

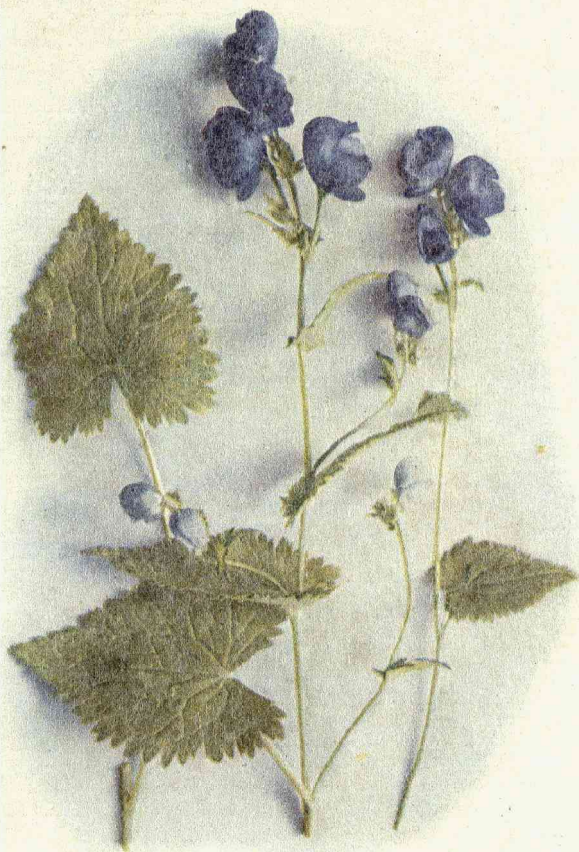
Fruit, a cluster of 5 free, erect, hairy follicles.

Distinguishing characters. Stem 4–12", often branched at the base ; leaves few, long-petioled, orbicular-cordate to ovate-cordate, incised and toothed ; flowers few, bright blue ; bracteoles deeply incised and toothed ; lateral sepals sub-orbicular ; carpels with long, yellowish hairs ; limb of nectary narrowed to a point at the top ; tubers white inside, the cambium consisting of isolated strands. Hybrid forms with characters intermediate between this species and *A. heterophyllum* (Wall.) occur abundantly on Killenmarg.

Flowering Season. August, September.

Locality. At elevations of 10–12,000' ; e.g., Killenmarg.

Distribution. Not recorded from outside of Kashmir.



ACONITUM KASHMIRICUM, *Stapf (inedit.)*,

**CORYDALIS FALCONERI**, *Hook. f. & T.*

Falconer's Corydalis.

(Pl. XIV.)

Family. *Fumariaceæ*. The Fumitory Family.

Name. Cor-yd'-al-is, from the Greek "*korudalos*," a lark, referring to a supposed resemblance of the spur of the flowers with the spur of the lark. The specific name, *Fal-con-er'-i*, was given in honour of the celebrated botanist, Falconer.

Description. An Alpine perennial, with two opposite, pinnate leaves on the stem, and a terminal raceme of yellow, spurred flowers.

Rootstock, stout, crowned with old leaf-sheaths.

Stem, 6-15" in height, erect, unbranched, usually several from the same rootstock.

Leaves. **Radical leaves,** few, long-petioled, 1-2 pinnate, with one or two pairs of pinnae; the leaflets 3-partite, the segments linear or linear-oblong, entire or lobed. **Cauline leaves,** 2, opposite, near the middle of the stem, sessile or shortly petioled, similar to the radical leaves but smaller.

Flowers, $\frac{3}{4}$ " in length, bright yellow, with greenish tips, in a terminal raceme, 1-2" in length, becoming elongated in fruit. **Bracts,** linear-lanceolate or ovate-lanceolate, acute or acuminate, longer than the pedicels, usually entire.

Sepals, 2, minute, caducous.

Petals, 4, equal in length to the slightly curved, obtuse spur; the upper and lower ones prominently winged.

Stamens, 6, in 2 bundles, the upper bundle with a basal spur extending into the spur of the upper petal.

Fruit, an oblong capsule, about $\frac{1}{2}$ " in length.



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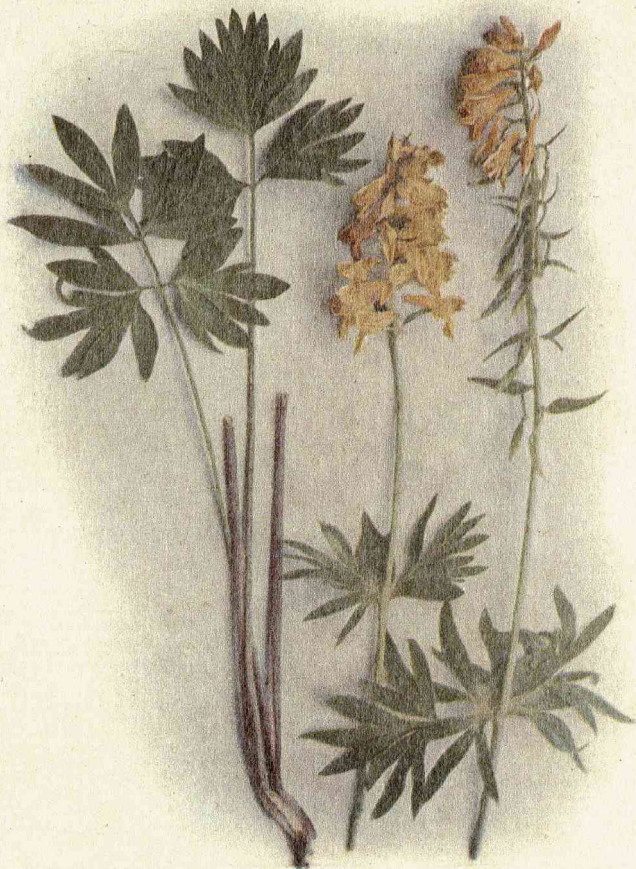
CORYDALIS FALCONERI—*continued*.

Distinguishing characters. The simple stem, yellow flowers, spur equal to the petals, and the two opposite leaves near the centre of the stem, distinguish it from other species.

Flowering Season. July, August.

Locality. At elevations of 11-13,000'; *e.g.*, Astan Marg, Tulian (above Pahlgam), Apharwat.

Distribution. Western Thibet.



CORYDALIS FALCONERI, *Hook. f. & T.*



CORYDALIS RAMOSA, Wall.

(Pl. xv.)

Family. *Fumariaceæ*. The Fumitory Family.

Name. Cor-yd'-al-is, from the Greek "*korudalos*," a lark, referring to the spurs of the flowers which are supposed to resemble the spurs of the lark; *rā-mō'-sa* is the Latin word for branching.

Description. A tall, slender, much-branching perennial, with leaves much divided into small leaflets, and many racemes of yellow, spurred flowers.

Rootstock, not crowned with old leaf-sheaths.

Stem, 1-3', erect or decumbent, weak, hollow, much branched, terete or obscurely angled, but not winged.

Leaves. **Radical leaves,** few, early withering. **Cauline leaves,** alternate, long-petioled, ternately-decompound; the lateral pinnae usually opposite, the lowest pair of pinnae much longer than those above, giving the leaf a triangular shape in outline; the terminal pinna longer than the lateral pinnae. **Leaflets,** deeply cut into narrow elliptic or ob-ovate segments. **Petiole,** channelled and long-sheathing at the base.

Flowers, bright yellow with greenish tips, $\frac{5}{8}$ " in length, in dense flowered racemes 2-6" in length, becoming longer in fruit. **Bracts,** the lower ones leaf-like, broadly-ovate, 3-lobed, the lobes cut into linear segments, the upper ones elliptic, acute, entire, longer than the pedicels.

Sepals, 0.

Petals, 4, the upper one spurred, acute, with a lacerate or sub-entire dorsal wing; the lower one gibbous at the base, with a lacerate or sub-entire wing beneath; the spur equal in length to the upper petal, broad, conical, obtuse, straight or curved.

**CORYDALIS RAMOSA**—*continued*.

Stamens, in 2 bundles, the upper one with a spur extending into the spur of the upper petal.

Fruit, an ob-ovate-oblong capsule, about $\frac{1}{2}$ " in length ; seeds black, smooth, shining, 2-seriate.

Distinguishing characters. Not tufted ; rootstock not crowned with old leaf-sheaths ; radical leaves 0 or inconspicuous ; cauline leaves ternately-decompound, triangular in outline ; stem conspicuously leafy, much branched, with many racemes ; flowers yellow, less than $\frac{3}{4}$ " in length ; spur equal to the petals, distinguish it from other species except the following :—

C. cornuta, *Royle* Segments of the leaves broad, sub-orbicular ; wing on the dorsal petal entire ; flowers purple-tipped ; spur narrow, cylindrical ; seeds punctate, matt ; capsule ob-ovate-oblong.

C. Stewartii, *Fedde* Stem winged ; segments of leaves broad, sub-orbicular ; dorsal petal not winged ; spur very narrow, cylindrical ; flowers very small, $\frac{1}{2}$ " or less in length ; capsule linear.

C. longipes, *DC.* Flowers pale yellow with conspicuously purple tips and very broad across the back ; dorsal petal not winged ; racemes lax with 3 to 9 flowers on very long terminal and axillary peduncles ; capsule oblong.

C. Casimiriana, *Duthie and Prain* Capsule linear, seeds 1-seriate, upper bracts sub-entire, lower outer petal not saccate.

Flowering Season. Latter half of July, August.

Locality. At elevations of 7–10,000' ; abundant at Pahlgam.

Distribution. Kashmir to Sikkim.



CORYDALIS RAMOSA, Wall.



CORYDALIS CLARKEI, *Prain* (Pl. XVI.)

Clarke's Corydalis.

Family. *Fumariaceæ*. The Fumitory Family.

Name. Cor-yd'-al-is, from the Greek "*korudalos*," a lark, referring to the spurs of the flowers which are supposed to resemble the spurs of the lark. Clār'k'-ě-ī, in honour of the celebrated botanist, C. B. Clarke.

Description. A small, tufted Alpine perennial, with long-petioled radical leaves almost as long as the stems, and terminal racemes of yellow short-spurred flowers.

Rootstock, stout, crowned with old leaf-sheaths.

Stems, several, tufted, stout, erect or ascending, 6-10" in height, striate, leafy, usually simple.

Leaves. Radical leaves, long-petioled almost as long as the stems, simply pinnate with sessile incised leaflets, or 2-pinnatisect with shortly-petioled incised leaflets; the segments elliptic, acute or obtuse. **Cauline leaves,** simply pinnate, the leaflets incised into elliptic segments.

Flowers, bright yellow, $\frac{3}{4}$ - $\frac{7}{8}$ " in length, in terminal racemes of 3-4" in length. **Bracts** ovate to elliptic, all entire, or sometimes a few of the lowermost ones incised into 2-4 lobes.

Sepals, 2, minute, caducous.

Petals, 4, the upper one with a broad, dorsal wing; the spur $\frac{1}{4}$ " in length, shorter than the petals, broad, obtuse, straight or curved; the lower petal equal in length to the upper petal, prominently saccate, with a broad wing beneath.

Stamens, in 2 bundles, the upper one with a spur extending into the spur of the dorsal petal; the filaments broad and much inflated.

Fruit, an oblong-ob-ovate capsule.

**CORYDALIS CLARKEI**—*continued*.

Distinguishing characters. The tufted radical leaves almost as long as the stems, yellow flowers with spur shorter than the upper petal and large, entire, broad bracts, distinguish it from other species.

Flowering Season. August.

Locality. At elevations of 11–13,000'; *e.g.*, Liddar Valley, on hills above Zojpal, Burzil-la.

Distribution. Western Thibet, Kunawar in the Punjab.



CORYDALIS CLARKEI, *Prain*

DRABA ALPINA, Linn. (Pl. xvii.)

Alpine Whitlow-grass.

Family. *Cruciferae*. The Cabbage Family.

Name. Drā'-ba, from the Greek "*drābe*," acrid, referring to the taste of the leaves of some species; al-pī'-na is the Latin word meaning Alpine.

Description. A small, densely tufted, Alpine perennial, with rosulate leaves, stellate hairs and clusters of small yellow flowers at the top of leafless scapes.

Stems, densely tufted, 1-3" in height (sometimes up to 6" or more).

Leaves, densely rosulate, oblong-spathulate or lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ " in length (or sometimes up to 1"), covered with mixed simple and stellate hairs, or glabrous with ciliate margins.

Flowers, yellow, $\frac{1}{8}$ - $\frac{1}{4}$ " in length, shortly pedicelled, in a terminal sub-capitate cluster of 1-10 flowers on leafless (or sometimes 1-leaved) scapes.

Sepals, 4, oblong, obtuse, glabrous or with few long hairs.

Petals, 4, sub-erect, ob-ovate, emarginate, shortly clawed, about $1\frac{1}{2}$ times as long as the sepals.

Stamens, 6.

Fruit, a small, elliptic, glabrous, straight pod, $\frac{1}{8}$ - $\frac{1}{4}$ " in length.

Distinguishing characters. The densely tufted stems, yellow flowers, oblong-spathulate leaves without a stout midrib beneath, and straight pods, distinguish it from other species. *D. glacialis* (Adams.), which it closely resembles, has linear leaves with a stout midrib beneath, and twisted pods.

Flowering Season. July, August.

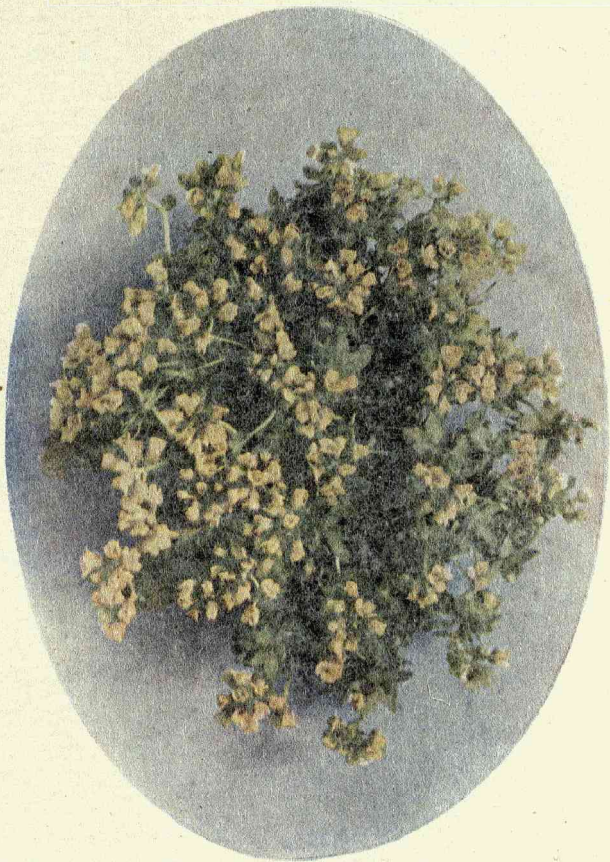


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DRABA ALPINA—*continued*.

Locality. At elevations of 12-14,000' ; *e.g.*, Apharwat, Sonasar, Panjitarni.

Distribution. Kashmir to Sikkim, West Thibet, North Europe, Rocky Mountains and Arctic Regions.



DRABA ALPINA, *Linn.*



ERYSIMUM ODORATUM, *Hook. f. & T.*

Large-flowered Erysimum. (Pl. XVIII.)

Family. *Cruciferae*. The Cabbage Family.

Name. Er-ys'-im-um, from the Greek "*eruo*," to draw up or blister; od-ō-rā'-ta is from the Latin "*odōrātus*," sweet-smelling. The English name for the species occurring in Great Britain is Treacle Mustard.

Description. An erect perennial, with simple, alternate leaves, forked hairs lying close on the stem and leaves, and orange or yellow flowers in terminal racemes.

Stem. usually solitary, simple or much branched all up the stem, 6" to 3' in height, slender or stout, erect, angular, striate, green or sometimes hoary, slightly scaberulous, densely covered with minute, appressed, 2-forked hairs.

Leaves, alternate, sessile, linear-lanceolate or narrowly elliptic, 1-3" in length, usually acute, sinuate-toothed, with few distant, short, sharp teeth, midrib prominent below, green or sometimes hoary, slightly scaberulous, densely covered with minute, appressed, 2-forked hairs, with a few 3-forked ones intermixed.

Flowers, orange or yellow, $\frac{1}{2}$ - $\frac{3}{4}$ " diam. (usually $\frac{5}{8}$ "), in terminal, close flowered racemes, which become much elongated in fruit. **Pedicels,** stout, shorter than the sepals, about $\frac{1}{4}$ ".

Sepals, 4, glabrous, rather shorter than the claws of the petals, erect, saccate at the base, margins incurved; tips scarious, obtuse; dorsally keeled; the 2 lateral ones narrower, more incurved at the base, and with a small, compressed, pouch-like protuberance on the back of the tip.

**ERYSIMUM ODORATUM**—*continued*.

Petals, 4, clawed ; the claw slender, $\frac{3}{8}$ " ; the limb spreading, ob-ovate oblong, with prominent veins on the under surface.

Stamens, 6 ; the filaments of the 2 shorter, outer ones terete, of the 4 longer, inner ones flattened ; anthers linear, divaricate at the base.

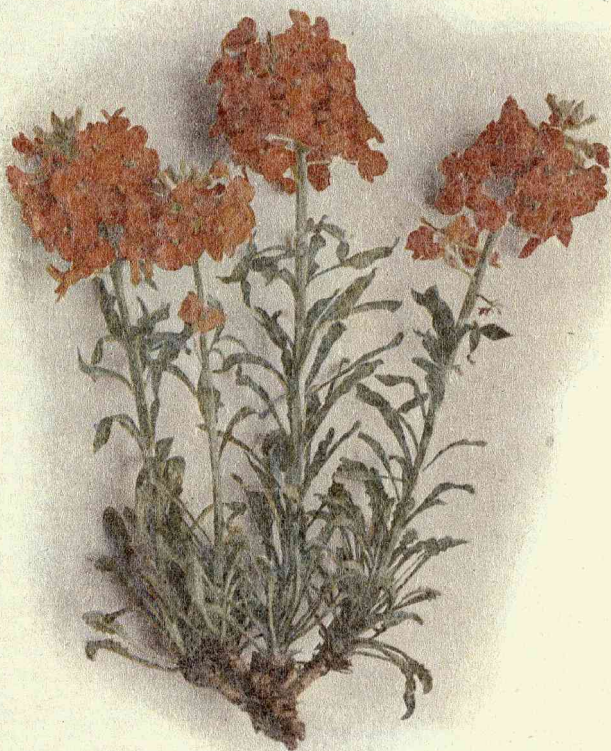
Fruit, a narrow, linear, 4-angled pod, $1-2\frac{1}{2}$ " in length, scaberulous, horizontal or ascending (some often erect).

Distinguishing characters. The flowers $\frac{1}{2}-\frac{3}{4}$ " diam., stem and leaves with mostly 2-forked hairs ; leaves sessile, usually acute ; pods pedicelled, scaberulous, horizontal to ascending (or some erect), distinguish it from other species. *E. altaicum* (Hook. f. & T.), to which it is closely allied, has smaller flowers $\frac{1}{3}-\frac{1}{2}$ " diam., hoary and more scabrid stem and leaves, covered with mostly 3-forked hairs, the leaves usually obtuse, the lower ones often petioled, and more erect pods. It does not appear to have any definite characters distinguishing it from *E. Melicentae* (Dunn).

Flowering Season. June to August.

Locality. At elevations of 7-12,000' ; *e.g.*, common in the Liddar Valley, Banihal, Burzil, Kamri.

Distribution. Kashmir and West Thibet.



ERYSIMUM ODORATUM, *Hook. f. & T.*

**DIANTHUS JACQUEMONTII**, *Edgew.*

Jacquemont's Pink.

(Pl. XIX.)

Family. *Caryophyllaceæ*. The Pink Family.

Name. Dī-anth'-us, from the Greek "*dios*," divine and "*anthos*," a flower, referring to the beauty and fragrance of some species of which the carnation is an example. Jac-quem-on'-tī-i, in honour of the traveller and naturalist, Jacquemont.

Description. A small, tufted perennial, with slender stems, opposite narrow leaves, and solitary white flowers of about 1" diam. at the ends of the branches.

Stems, numerous, laxly tufted from a much-branching, woody rootstock; slender, erect, simple or branched, 4-12" in length.

Leaves, linear, 1-1½" in length, in few, distant, opposite pairs, sessile and connate at the base, glabrous, not channelled, margins very finely serrulate.

Flowers, white, about 1" diam., solitary and terminal at the ends of the stem and branches. **Bracts**, 4 (or sometimes 6), in opposite, imbricate pairs, connate at the base, tightly enclosing the base of the calyx; broad and cuspidate, or with a linear, leaf-like tip of variable length.

Calyx, tubular, narrow, cylindrical, 1" in length, with 5 lanceolate or ovate, acute, stiff teeth about one-fourth the length of the tube; the tube closely striated, with 7-9 ribs to each tooth.

Petals, 5, clawed; the claw slender, exceeding the calyx; the limb spreading, broadly ob-ovate, with fine, irregular teeth on the upper margin (not fimbriate), glabrous.

Stamens, 10, with the anthers exserted.

Ovary, linear, 1-celled, shortly stalked; styles 2, long and slender, often far protruding.

DIANTHUS JACQUEMONTII—*continued*.

Fruit, a linear capsule.

Distinguishing characters. Stems 4–10", simple or branched (not dichotomously); leaves $1\frac{1}{2}$ " or less in length; flowers solitary and terminal; calyx 1" or less in length; surface of the petals smooth, and their margins entire or toothed (not fimbriate) distinguishes it from other species except the following :—

D. anatolicus, *Boiss.* Stems numerous in close tufts, simple or branched; leaves $\frac{1}{2}$ –1"; flowers $\frac{1}{2}$ " diam., white or pink; bracts 6 (or 4–8), very broad, cuspidate (sometimes with a long, leaf-like point); calyx-teeth acute; petals with the margin crenate-toothed.

D. cachemiricus, *Edgew.* Stems several in close tufts, usually simple; leaves 1– $1\frac{1}{2}$ ", channelled; flowers 1– $1\frac{1}{2}$ " diam., rose-pink; bracts 4, lanceolate with a long, leaf-like point; calyx-teeth ovate-lanceolate, acute or acuminate, with scarious margins and usually scarious at the tips; petals entire or shortly toothed.

D. Falconeri, *Edgew.* Stems several, woody below, 1–2', dichotomously branched; leaves $1\frac{1}{2}$ –6", channelled; flowers about 1" diam., pink; bracts 4 (or 6), broad-ovate with a long cusp; calyx $1\frac{1}{2}$ –2", teeth lanceolate, acute, stiff; petals finely toothed.

Flowering Season. June, July, August.

Locality. At elevations of 5–7,000', on dry, open ground; *e.g.*, Pahlgam, Tangmarg, Gandarbal, Srinagar.

Distribution. Kashmir.



DIANTHUS JACQUEMONTII, *Edgew.*



ARENARIA FOLIOSA, Royle (Pl. xx.)

Leafy Sandwort.

Family. *Caryophyllaceæ*. The Pink Family.

Name. Ar-ē-nā'-rī-a, from the Latin "*arēna*," sand, referring to the fact that most species grow in light sandy soil; fol-ī-ō'-sa is from the Latin "*folium*," a leaf.

Description. A small, rock perennial, forming dense tufts, with fine linear leaves, and rather large white flowers.

Stems, numerous, densely tufted, erect, rigid, much branching from the base, glabrous, 2-6" in height.

Leaves, opposite, narrow, linear, acute, $\frac{1}{3}$ - $\frac{3}{8}$ " in length, 1-3-nerved, dense at the base of the stems, more distant above, glabrous.

Flowers, white, $\frac{1}{2}$ " diam., in long-peduncled, sub-umbellate cymes. **Bracteoles**, short, ovate, acute.

Pedicels, slender, equal to or longer than the sepals.

Sepals, 5, ovate-lanceolate, acuminate, 3-nerved, much shorter than the petals.

Petals, 5, entire, about $\frac{1}{3}$ " in length, broadly ob-ovate, rounded at the tip.

Stamens, 10.

Styles, 3.

Fruit, a small, ovoid, 3-valved capsule.

Distinguishing characters. The short, densely tufted stems, narrow, linear leaves, and 3-valved capsules, distinguish it from other species, except *A. kashmirica*.

A. kashmirica, *Edgew.* Glandular - pubescent throughout, stems loosely tufted, weak, ascending, bracteoles ovate-subulate, strongly nerved, pedicels often shorter than the sepals.



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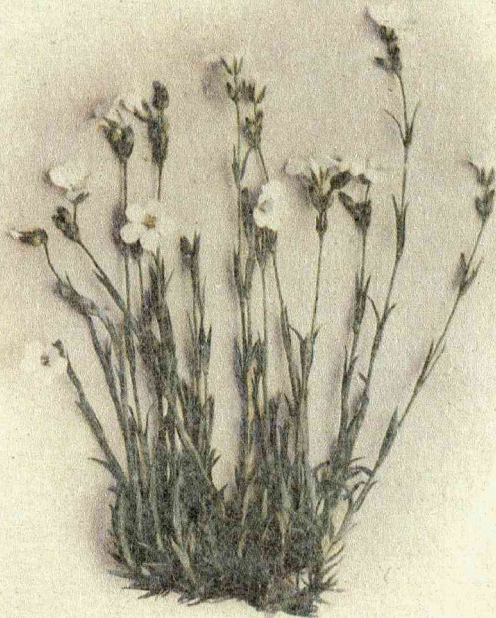
ARENARIA FOLIOSA—*continued*.

A. foliosa, Royle Glabrous, stems densely tufted, erect, rigid, bracteoles short, ovate, pedicels equalling or exceeding the sepals.

Flowering Season. July, August.

Locality. At elevations of 10-13,000', growing on rocks ; *e.g.*, Tannin, Liddarwat, Shisha Nag.

Distribution. Kashmir to Garhwal.



ARENARIA FOLIOSA, Royle

**PEGANUM HARMALA, Linn. (Pl. XXI.)**

Harmal.

Family. *Rutaceae*. The Orange Family.**Name.** Pē'-gan-um, the old Greek name used by Theophrastus for the Rue; har'-mal-ā is from the Arabic name for the plant.**Description.** A much-branched perennial, growing in the form of a small bush 1-2' in height, with the leaves deeply cut into narrow lobes, and flowers of a pale greenish-yellow colour.**Stem,** much branched, forming a small bush 1-2' in height.**Leaves,** alternate, 2-3" in length, pinnatifidly cut to the midrib into a few long, narrow, spreading lobes.**Flowers,** $\frac{1}{2}$ - $\frac{3}{4}$ " in diam., white, diffused with greenish-yellow; solitary in the axils of the branches, leaf-opposed, sessile or pedicelled.**Calyx,** 4-5 lobed, the lobes very narrow, acute, longer than the petals, persistent.**Petals,** 4-5, elliptic-oblong, obtuse.**Stamens,** 12-15, inserted at the base of the disk.**Ovary,** globose, deeply 2-3 lobed; the styles basal, twisted, 2-3 keeled above.**Fruit,** a globose capsule, about $\frac{1}{3}$ " diam.**Distinguishing characters.** No other species. Easily recognised by its bush-like form, narrowly lobed leaves and greenish-white solitary flowers.**Flowering Season.** June, July (Srinagar), April, May (on the Plains).

**PEGANUM HARMALA**—*continued.*

Locality. From the Plains to 5,500', in dry, hot, exposed situations; *e.g.*, Srinagar, the Karewahs near Pampore.

Distribution. N.W. India, Sindh, the Punjab Plains to Delhi and Agra, the Western Deccan; Soongaria, Arabia, N. Africa, and Westward to Hungary and Spain.

Uses. A valuable medicinal plant, containing the alkaloid "*harmaline*," which is said to possess properties similar to those of quinine. The roots, leaves and seeds are used for medicinal purposes.



PEGANUM HARMALA, *Linn.*



THERMOPSIS BARBATA, Royle (Pl. XXII.)

Bearded Thermopsis.

Family. *Papilionaceæ*. The Pea Family.

Name. Ther-mop'-sis, from the Greek "*thermos*," a lupine and "*opsis*," resemblance; bar-bā'-ta is from the Latin "*barbātus*," bearded, referring to the long hairs on most parts of the plant.

Description. A robust, shaggy perennial, with whorls of short, simple leaves which are united below, forming a short collar-like sheath around the stem, and large, very dark red-purple (almost black) pea-like flowers.

Rootstock, stout, woody.

Stems, usually several from the rootstock, erect, branched, stout, 6-12" in height, densely clothed with long hairs.

Leaves, in the form of whorls of 3-7 simple leaflets, connate at the base, forming a short, collar-like sheath around the stem, but each whorl is regarded as a digitate, sessile leaf, with the leaflets and stipules all similar and connate at the base; the leaflets $\frac{1}{2}$ -1" in length, lanceolate or elliptic, entire, acute or obtuse, densely covered with long hairs.

Flowers, very dark (almost black) red-purple, 1-1 $\frac{1}{4}$ " in length, in short, terminal, interrupted, bracteate racemes of about 5-12 flowers. The flowers opposite or in whorls of 3, subtended by a whorl of bracts similar to the leaves.

Calyx, campanulate, densely hairy, 5-lobed, the lobes ovate-lanceolate, about as long as the tube, the 2 upper ones shorter than the others.

Petals, 5, glabrous, clawed; the standard orbicular, emarginate, channelled $\frac{3}{4}$ -1" diam.; the wings slightly shorter than the keel; the keel petals united along the middle portion.

**THERMOPSIS BARBATA**—*continued*.

Stamens, 10, quite free, inserted on the calyx-tube.

Ovary, silky hairy, shortly stalked, with a long, slender style.

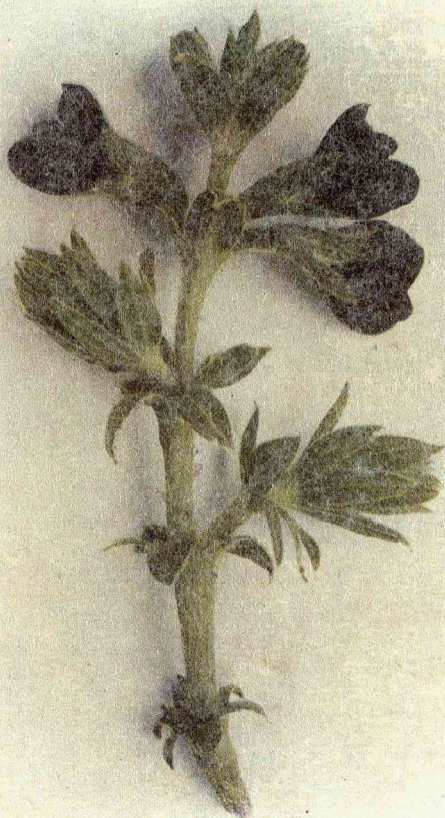
Fruit, a short stalked pod, 1-2" in length by $\frac{1}{2}$ - $\frac{3}{4}$ " broad, containing 1-6 seeds.

Distinguishing characters. No other species. Easily recognised by its free stamens, whorled, connate leaflets and large, dark red-purple or almost black flowers.

Flowering Season. Latter part of May, June.

Locality. At elevations of 8-11,000' ; *e.g.*, Bannihal Pass.

Distribution. From Kashmir to Sikkim.



THERMOPSIS BARBATA, *Royle*

**OXYTROPIS CACHEMIRICA, Camb.**

Kashmir Oxytropis.

(Pl. XXIII.)

Family. *Papilionaceæ*. The Pea Family.

Name. Ox-*yt'*-rop-is, from the Greek "*oxys*," sharp and "*tropis*," a keel, referring to the sharp-pointed keel of the flower ; cache-mir'-i-ca, from Kashmir, the locality where the plant is found.

Description. A prostrate, spreading perennial, with densely white, silky, pinnate leaves, and purple flowers in short, dense racemes.

Rootstock, woody, branching, forming spreading, loose tufts.

Stem, the main stems prostrate, elongate, branching, producing short, ascending branches 1-3" in length, pubescent with mixed white and black hairs.

Leaves, few, rather crowded, pinnate, petioled, 1-2½" in length including the petiole. **Leaflets,** crowded, 13-25, oblong-lanceolate, ¼-½" in length, obtuse or acute, densely covered with long, white, silky hairs on both surfaces.

Stipules, ovate-lanceolate, connate at the base, ¾" in length.

Flowers, bright purple, about ½" or rather more in length, with very short pedicels, in short, dense racemes, on long peduncles ; the peduncles 1½-3" in length, densely hairy with black hairs and scattered longer white ones.

Bracts, linear-lanceolate, plumose, ¼" in length.

Calyx, ¾" in length, densely hairy, with mixed black and white hairs, 5-toothed ; the teeth linear, plumose, as long as or longer than the tube.

Petals, 5, clawed ; the standard sub-orbicular, reflexed, with a broad claw ; the wings slightly shorter than the standard, ob-ovate, with a long, slender claw ;

**OXYTROPIS CACHEMIRICA—continued.**

the keel shorter than the wings, the limb ob-ovate, obtuse, with a long, vertical prolongation from the top (cuspidate), the claws broad.

Stamens, diadelphous or monadelphous.

Ovary, linear, silky.

Fruit, a small, inflated, sessile, round-oblong pod.

Distinguishing characters. The leaflets 13–25, densely covered with long, white, silky hairs, the calyx-teeth as long as or longer than the tube, the bracts linear-lanceolate, plumose, $\frac{1}{4}$ ", distinguish it from other species. The cuspidate keel distinguishes the genus *Oxytropis* from the genus *Astragalus*.

Flowering Season. July, August.

Locality. At elevations of 11-13,000', on open, dry slopes; e.g., Zoipal in the Liddar Valley.

Distribution. West Thibet, Central Siberia.



OXYTROPIS CACHEMIRICA, *Camb.*

LATHYRUS ALTAICUS, *Led.* (Pl. XXIV.)

Altaian Pea.

Family. *Papilionaceæ*. The Pea Family.

Name. Lath'-yr-us, from the Greek "*lathuros*," the old Greek name for the Pea, used by Theophrastus ; al-tā'-ic-us refers to the Altai Mountains, a locality where the plant grows.

Description. A slender perennial, with pinnate leaves terminating in a tendril, and short racemes of red-purple or variegated white and purple flowers in short racemes on long peduncles.

Stem, 6-12", slender, sub-erect, angled.

Leaves, 2-3", petioled, pinnate and terminating in a long slender, simple or branched tendril. **Leaflets,** 4-8, oblong or ovate-lanceolate, obtuse, apiculate, $\frac{3}{4}$ -1 $\frac{1}{4}$ " in length. **Stipules,** $\frac{1}{2}$ - $\frac{3}{4}$ " in length, lanceolate, with a fine point, slightly toothed below.

Flowers, red-purple or variegated white and purple, about $\frac{5}{8}$ " in length, shortly pedicelled, in short, lax racemes of 3-6 flowers, on long, erect axillary peduncles of 2-4" in length.

Calyx, $\frac{3}{8}$ " in length, 5-toothed, the teeth unequal, the lower ones linear, about as long as the tube, the upper ones shorter, triangular.

Petals, 5, clawed ; the standard orbicular, emarginate, $\frac{1}{2}$ " diam., almost twice the length of the calyx, the limb spreading at right angles to the broad claw ; the wings shorter than the standard, with a slender claw ; the keel much shorter than the wings.

Stamens, diadelphous, mouth of staminal tube not oblique.

**LATHYRUS ALTAICUS**—*continued*.

Style, flattened and bearded on the inner side.

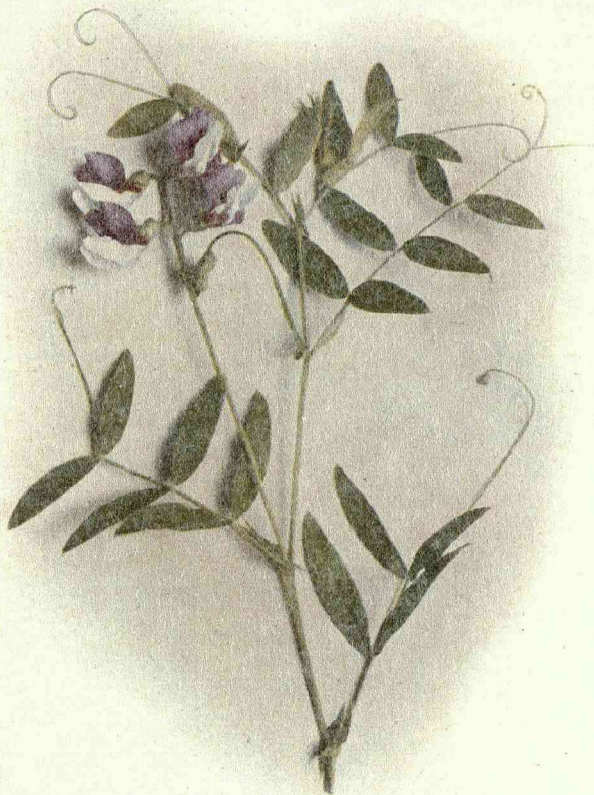
Fruit, a pod.

Distinguishing characters. The leaves with 4-8 leaflets terminating in a tendril, and the flowers red-purple or variegated white and purple in lax racemes of 3-6 flowers, on long peduncles, distinguish it from other species.

Flowering Season. June, July.

Locality. At elevations of 10-12,000' ; *e.g.*, Liddarwat, Kolohoi, Kamri.

Distribution. Western Himalaya, Siberia.



LATHYRUS ALTAICUS, *Led.*



LATHYRUS LUTEUS, *Baker* (Pl. xxv.)

Yellow Pea.

Family. *Papilionaceæ*. The Pea Family.

Name. Lath'-yr-us, from the Greek "*lathuros*," the old Greek name used by Theophrastus for the Pea; lū'-tē-um is the Latin word for yellow.

Description. A tall, slender perennial, with pinnate leaves terminating in a short bristle, and long-peduncled racemes of yellow or bright rose-pink flowers, which usually change to an orange colour before withering.

Stem, erect, slender, 2-3', branching.

Leaves, 3-5", petioled, pinnate, terminating in a short bristle. **Leaflets,** 6-10, oblong or elliptic, acute or obtuse, $1\frac{1}{2}$ -3" in length. **Stipules,** large, leafy, green, ovate, acute, auricled at the base.

Flowers, 1" in length, cream or yellow at low elevations, bright rose-pink at high elevations; usually changing to orange before withering; in long-peduncled, axillary racemes of about 6-12 flowers, with pedicels of about $\frac{1}{8}$ - $\frac{1}{4}$ ".

Calyx, about $\frac{1}{2}$ ", 5-toothed; the lower teeth lanceolate, the upper ones triangular; the mouth of the calyx-tube oblique.

Petals, 5, clawed; the standard orbicular; the limb turned back at right angles to the claw; the keel shorter than the wings.

Stamens, diadelphous.

Fruit, a linear, beaked pod, 2-3" in length.

Distinguishing characters. The leaves with 6-10 leaflets, with the rachis terminating in a short bristle, and the flowers in long-peduncled racemes of 6-12 flowers, distinguish it from other species.

**LATHYRUS LUTEUS**—*continued*.

Flowering Season. June, July.

Locality. The yellow-flowered variety occurs usually at low elevations below about 9,000', and the rose-pink flowered variety at higher elevations extending to about 12,000'; *e.g.*, Gulmarg (yellow variety); Astan Marg, Kolohoi, Zojpal (rose-pink variety).

Distribution. Kashmir to Kumaon; Europe, Altai, Soongaria.



LATHYRUS LUTEUS, *Baker*



POTENTILLA ERIOCARPA, Wall.



POTENTILLA ERIOCARPA, Wall.

Hairy-fruited Potentilla. (Pl. XXVI.)

Family. *Rosaceæ*. The Rose Family.

Name. Pot-en-til'-la, from the Latin "*potens*," powerful, potent, referring to the medicinal properties said to be possessed by some species; er'-i-oc-ar'-pa is from the Greek "*erion*," wool, referring to the long hairs on the receptacle and achenes.

Description. A tufted, Alpine rock perennial, with stout perennial stems bearing at their tips tufts of long-petioled, 3-foliolate leaves and annual stems with 1-4 yellow flowers of 1-1 $\frac{1}{4}$ " diameter.

Rootstock, stout, woody.

Stems, several from the rootstock, perennial, stout, much branched, decumbent or ascending, up to 12" in length, densely covered with dry brown, imbricate, stipular sheaths of the previous years' leaves, and bearing at their tips tufts of leaves and annual flowering stems; the annual flowering stems sub-erect, slender, 4-10" in length, glabrous or with silky hairs.

Leaves, long-petioled, 3-foliolate, in tufts at the tips of the perennial stems, with the sheathing, stipular bases of the petioles closely imbricate; the leaflets, $\frac{1}{2}$ -1 $\frac{1}{2}$ " in length, cuneate or ob-ovate cuneate, the lower half entire or with a few denticulations, and the upper half with few large serrations, glabrous with ciliate margins; the central leaflet shortly petioled and longer than the lateral, sessile ones; the petioles 1-2 $\frac{1}{2}$ " in length, with a sheathing, stipular base. Leaves on the flowering stems 1-3, petioled with adnate stipules, the lowermost often simple, the others 3-foliolate.

Flowers, 1-1 $\frac{1}{4}$ " in diam., bright yellow, solitary, terminal and axillary on long peduncles, usually about 1-4 flowers on each stem.

**POTENTILLA ERIOCARPA**—*continued*.

Sepals, 5, ovate, acute, shorter than the petals glabrous, with ciliate margins.

Bracteoles, 5, about the same length as the sepals but much narrower, acute.

Petals, 5, orbicular, entire or slightly emarginate.

Stamens, numerous (or more than 10).

Carpels, many, free, with slender styles.

Fruit, of many free, minute achenes, with long hairs, and concealed by the long hairs of the receptacle.

Distinguishing characters. The perennial stems covered with the old stipular sheaths, numerous stamens, 3-foliolate leaves and hairy achenes concealed by the long hairs of the receptacle, distinguish it from other species.

Flowering Season. July, August.

Locality. At elevations of 12–14,000', growing on rock precipices; *e.g.*, Sonasar in the Liddar Valley.

Distribution. From Kashmir to Sikkim.



SAXIFRAGA DIVERSIFOLIA, Wall.

Various-leaved Saxifrage. (Pl. XXVII.)

Family. *Saxifragaceæ*. The Saxifrage Family.

Name. Sax-if'-rag-a, from the Latin "*saxum*," a stone, and "*frango*," to break, referring to the characteristic of some species of growing on rocks and splitting them by the penetration of their stout rootstock into the rock crevices; dī-ver-sif-ol'-ī-a is from the Latin "*diversus*," different, and "*folium*," a leaf.

Description. A small, slender, Sub-Alpine or Alpine perennial, with simple leaves and corymbs of golden yellow flowers.

Stem, erect, 6-18" in height, leafy, glandular-hairy above.

Leaves. Radical leaves, long-petioled, entire, elliptic and narrowed below into the petiole, or ovate, subcordate. **Cauline leaves,** alternate, $\frac{1}{2}$ -2" in length, lower ones petioled, upper ones sessile, ovate or oblong, often cordate, amplexicaul, entire, obtuse.

Flowers, $\frac{1}{2}$ - $\frac{3}{4}$ " diam., golden yellow on long peduncles, in terminal corymbs.

Sepals, almost free, 5, ovate-oblong, glandular-hairy, reflexed in fruit.

Petals, 5, ob-ovate-orbicular or oblong, entire, about twice the length of the sepals, often with darker yellow or reddish spots.

Stamens, 10.

Carpels, 2, united below, with the upper portions free and narrowed into the styles.

Fruit, an ovoid or oblong, 2-lobed capsule.

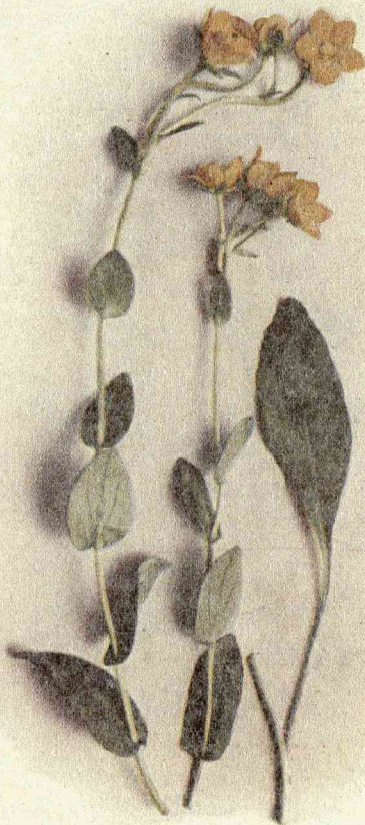
**SAXIFRAGA DIVERSIFOLIA**—*continued*.

Distinguishing characters. The long-peduncled, golden-yellow flowers in corymbs, cauline leaves distant and often cordate, amplexicaul, petals rounded and imbricate, distinguish it from other species.

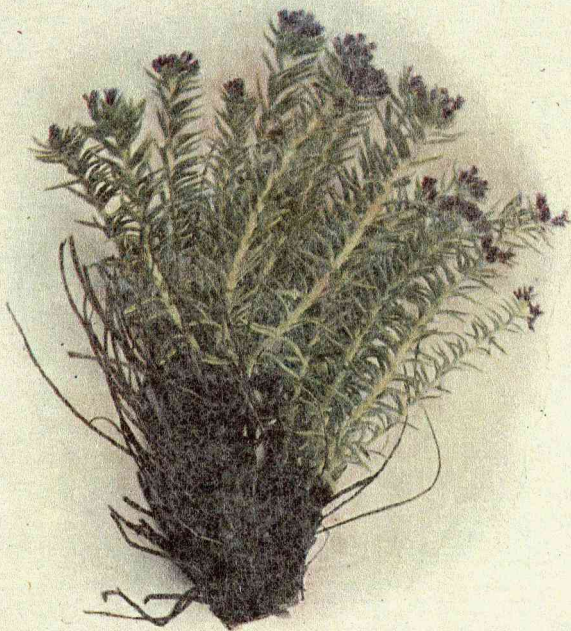
Flowering Season. August, September.

Locality. At elevations of 10–13,000', in damp, rocky situations, often in the beds of streams ; *e.g.*, Apharwat, Zojpal, Burzil.

Distribution. From Kashmir to Bhotan.



SAXIFRAGA DIVERSIFOLIA, Wall.



SEDUM QUADRIFIDUM, *Pall.*



SEDUM QUADRIFIDUM, *Pall.* (Pl. XXVIII.)

Four-cleft Stonecrop.

Family. *Crassulaceæ*. The Stonecrop Family.

Name. Sed'-um, from the Latin "*sedere*," to sit, referring to the leaves of some species being arranged in a rosette close to the ground; quad-rif'-id-um refers to the parts of the flower being usually in fours.

Description. An Alpine perennial rock-plant, with short, densely-tufted stems, bearing small, linear, succulent leaves, and dense clusters of small dark red or variegated green and red flowers.

Rootstock, stout, woody, with sub-erect, short, stout branches crowned with scales, from the axils of which arise the annual stems, and densely bristly with the long, dry, brown or almost black persistent remains of previous years' shoots.

Stems, erect, $1\frac{1}{2}$ –5" in height, in clusters at the tips of the short, perennial branches of the rootstock, forming dense tufts.

Leaves, dense, $\frac{1}{4}$ – $\frac{3}{8}$ " in length, sessile, linear or lanceolate, or sub-terete, succulent, entire, acute or obtuse, glabrous.

Flowers, polygamous and diœcious (*i.e.*, hermaphrodite flowers and female flowers on different plants), $\frac{1}{2}$ – $\frac{1}{4}$ " diam., dark red (often all parts of the flowers) or variegated greenish-yellow and red, in terminal sub-umbellate or corymbose cymes of usually about 1–5 flowers (but sometimes up to 12).

Sepals, 4 (or 5), narrow, oblong-lanceolate, obtuse.

Petals, 4 (or 5), spreading, elliptic, obtuse, ribbed outside, about twice the length of the sepals. In the female flowers the sepals and petals are usually smaller and linear, the petals slightly exceeding the sepals.

**SEDUM QUADRIFIDUM**—*continued*.

Stamens, 8 (or 10).

Hypogynous scales, 4 (or 5), quadrate with emarginate tips.

Carpels, 4 (or 5), almost free, narrowed above into the short, stout styles.

Fruit, of 4 (or 5) follicles with recurved styles.

Distinguishing characters. The woody rootstock, with long, stiff bristles at the base of the annual shoots, leaves less than $\frac{1}{2}$ ", and the dark red or variegated green and red flowers distinguish it from other species.

Flowering Season. July, August.

Locality. At elevations of 11–13,000', growing on rocks and also on hillsides; *e.g.*, Apharwat, Zojpal, Gosai, Kamri.

Distribution. From Kashmir to Kumaon; Sikkim, Arctic Russia, Siberia.

**SEDUM JAESCHKEI**, *Kurz* (Pl. XXIX.)

Jaeschke's Stonecrop.

Family. *Crassulaceae*. The Stonecrop Family.

Name. *Sed'-um*, from the Latin "*sedere*," to sit, referring to the character of the leaves in some species being arranged in rosettes close to the ground. The specific name *Jaesch'-kē-ī* was given in honour of the Rev. Jaeschke, a missionary in Lahoul.

Description. A dwarf Alpine rock-plant, about 2" in height, with small, thick, succulent leaves, and golden-yellow flowers.

Stem, simple, erect, bearing a single terminal flower, or branched with few or many erect, candelabra-like branches, each bearing a terminal flower, 1-2½" in height.

Leaves, alternate, sessile, thick and succulent, spathulate-oblong, obtuse, mucronate, entire, distant on the lower part of the stems and becoming more crowded and imbricate on the upper part; the lower ones about ⅓" and the upper ones ¼" in length; the rosulate leaves ⅓-¼" in length in sub-globose rosettes of about ¼-½" diam.

Flowers, golden yellow, ⅓-½" diam., solitary and terminal at the ends of the branches.

Sepals, 5, free almost to the base, similar to the leaves; persistent, erect and becoming slightly longer than the leaves in fruit.

Petals, 5, spathulate, obtuse, about 1½ times as long as the sepals, persistent in fruit, the upper third spreading, recurved, margins slightly lacerate, scarcely clawed.

Stamens, 10, about half the length of the petals.

Carpels, 5, free, with short styles.

**SEDUM JAESCHKEI**—*continued*.

Hypogynous scales, 5 (or 4), yellow, succulent, quadrate, very small, longer than broad.

Fruit, of 5 narrow, oblong, erect follicles of about $\frac{1}{4}$ " in length.

Distinguishing characters. The short stems and golden-yellow flowers distinguishes it from other species.

Flowering Season. July to middle of August.

Locality. At elevations of 11–13,000', usually on damp rocks ; *e.g.*, Zojpal, Apharwat, Gosai.

Distribution. Kashmir to Lahoul.



SEDUM JAESCHKEI, *Kurz*



SEDUM CRASSIPES, Hook. f. & T.

Thick-stemmed Stonecrop. (Pl. xxx.)

Family. *Crassulaceæ*. The Stonecrop Family.

Name. Sed'-um, from the Latin "*sedere*," to sit, referring to the rosulate leaves close to the ground in some species; cras'-sip-ēs is from the Latin "*crassus*," thick, and "*pes*," a foot, referring to the thick, succulent, erect branches of the rootstock, from the tips of which the annual stems arise. In Hooker's *Flora of British India*, the plant is included under *S. asiaticum*, DC.

Description. A stout, perennial, Alpine rock-plant, with a thick, branching rootstock, bearing tufts of annual stems at the tips of the branches of the rootstock and terminal dense clusters of greenish-yellow flowers.

Rootstock, stout, woody below, with sub-erect, short, succulent branches crowned with scales, from the axils of which the annual stems arise.

Stems, erect, 4-12", stout, glabrous, in tufts of many stems from the tips of the branches of the rootstock.

Leaves, dense on all sides of the stem, $\frac{1}{2}$ -1 $\frac{1}{4}$ " in length, sessile, linear, acute, glabrous, with few remote teeth (or some entire).

Flowers, hermaphrodite, pale greenish-yellow, or almost colourless, or sometimes tinged with red, up to $\frac{1}{2}$ " diam. and about $\frac{1}{4}$ " or rather more in length, in dense, terminal, sub-umbellate cymes of few or many flowers.

Sepals, 5 (or 4), linear or lanceolate.

Petals, 5 (or 4), sub-erect or spreading, $\frac{1}{4}$ " or rather more in length, elliptic to almost linear or lanceolate-spathulate, about twice the length of the sepals.

**SEDUM CRASSIPES—continued.**

Stamens, 10, as long as the petals.

Hypogynous scales, small, quadrate, yellow.

Carpels, 5 (or 4), more or less free.

Fruit, of 5 (or 4) follicles, with straight or slightly curved styles.

Distinguishing characters. The stout, woody root-stock, without long bristles, sessile, linear, toothed leaves, dense cymes, almost colourless petals of $\frac{1}{4}$ " length, distinguish it from other species. It is closely allied to *S. asiaticum*, DC., which has quite entire leaves.

Flowering Season. July, August.

Locality. At elevations of 10–13,000'; e.g., Zojpal, Apharwat.

Distribution. Kashmir to Sikkim.



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CORRIGENDA.

Series I, page 63 and plate xxxi.

The name *PRIMULA STUARTII*, *Wall.*, should be corrected to read *PRIMULA MOORCROFTIANA*, *Wall.*

Series II, Frontispiece, page 71 and plate xxxvi.

The plant named *PRIMULA NIVALIS*, *Pall.*, var. *MACROPHYLLA*, *Pax.*, is now known as *PRIMULA MACROPHYLLA*, *D. Don.*

Both of the above plants are included as varieties under *P. Stuartii*, *Wall.*, in Hooker's "Flora of British India"; but this latter plant is now regarded as a distinct species, with yellow flowers, and it does not appear to occur in Kashmir.



SEDUM CRASSIPES, *Hook. f. & T.*



DIPSACUS INERMIS, Wall. (Pl. xxxi.)

Smooth-headed Teasel. Vern. *Uppalhak*.

Family. *Dipsacaceæ*. The Teasel Family.

Name. Dip'-sā-cus, from the Greek "*dipsao*," I thirst, referring to the cup-like depression formed by the united bases of the opposite leaves in some species in which water collects; in-er'-mis is the Latin word for unarmed, some species having the heads of flowers armed with long prickles. The English name is from the Dutch "*teesen*," to pick or pull about, the prickly fruit-heads of the common Teasel being used for raising the nap on cloth.

Description. A tall, robust perennial, with opposite leaves and globose heads of cream-white flowers, on very long peduncles.

Stem, erect, stout, 4-8', branched, more or less rough, with short scattered prickles.

Leaves, opposite, pinnatifid, with few distant lobes, the terminal one much the largest; some of the upper leaves sometimes without lobes; coarsely toothed, long pointed, 3-12" in length, the petioles dilated and united at the base

Flowers, cream-white or yellowish, in globose, long-peduncled, terminal heads of about 1" diam. **Involucre**, of about 6-8 spreading, linear or ovate green bracts.

Receptacle, covered with broad scales, which are abruptly narrowed into long fringed bristles, which protrude beyond the buds, but not beyond the open flowers. **Involucel**, 8-ribbed, closely adnate to the ovary, with 4 minute teeth.

Calyx, cup-shaped, 4-angled, 4-lobed, extending above the involucel.



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DIPSACUS INERMIS—*continued.*

Corolla, funnel-shaped, with an unequally 4-lobed limb.

Stamens, 4, the anthers protruding from the corolla.

Fruit, a head of achenes; the achenes 8-ribbed, adnate to the involucre and crowned with the calyx limb.

Distinguishing characters. No other species.

Flowering Season. July, August.

Locality. At elevations of 7-10,000'; e.g., Pahlgam, Gulmarg.

Distribution. From Kashmir to Bhotan.



DIPSACUS INERMIS, Wall.



DORONICUM ROYLEI, DC. (Pl. XXXII.)

Royle's Leopard's-bane.

Family. *Compositæ*. The Composite Family.

Name. Dō-rō-nī'-cum, from "*doroniji*," the Arabic name; Roy'-lē-ī, in honour of the celebrated botanist.

Description. A tall, robust perennial, with broad, rounded leaves, and lemon-yellow heads of flowers.

Stem, 2-4', erect, stout, hollow, very succulent, corymbosely branched above, ribbed, the upper portion densely glandular-hairy.

Leaves. Radical leaves, long-petioled, broadly ovate or orbicular, rounded or cordate at the base, 3-8" in length, glabrous or with a few hairs on veins beneath, the veins terminating in small blunt points on the margin of the leaves, the intermediate portions of the margin glandular-ciliate; the petiole stout, 4-6", deeply grooved.

Cauline leaves, alternate, ovate to orbicular, sinuate toothed and glandular-ciliate, abruptly pointed at the tip; the lower ones with narrowly winged petioles, the intermediate ones with the blade abruptly constricted into a broad winged petiole, auricled and stem-clasping; the uppermost leaves sessile, amplexicaul.

Flowers, in radiate heads of 1-1½" diam., on long, slender, glandular-hairy peduncles; lemon yellow in colour. **Involucral bracts,** ½", herbaceous, in 2 series, linear-lanceolate, acuminate, glandular-hairy. **Receptacle,** naked, elevated, conical. **Flowers of the ray** (outer ones), yellow, with linear, 3-toothed ligules of about ½" in length, and reddish pappus. **Flowers of the disk,** yellow, tubular, 5-toothed, without pappus.

Fruit, a head of deeply grooved, glabrous achenes.



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DORONICUM ROYLEI—continued.

Distinguishing characters. The corymbosely branched stem and auricled, amplexicaul, cauline leaves, distinguish it from other species.

Flowering Season. July.

Locality. At elevations of 7–10,000', usually in damp, shady woods ; *e.g.*, Gulmarg, Pahlgam, Tannin.

Distribution. From Kashmir to Garhwal.



DORONICUM ROYLEI, DC.

**SENECIO ARNICOIDES, Wall.****VAR. FRIGIDA. (Pl. XXXIII.)**

Nodding Senecio.

Family. *Compositæ*. The Composite Family.

Name. Sen-ec'-i-ō, from the Latin "*senex*," an old man, referring to the white, hair-like pappus on the fruits of many species; ar-nic-ō-i'-dēs refers to a resemblance of the plant to *Arnica montana* (Linn.), a European species known as Mountain Tobacco; "*frī-gid-a*" is the Latin word for cold, and also means far-fetched or without point.

Description. A small, stout perennial, with large, broad, elliptic or oblong, uncut leaves, and a solitary, large terminal nodding yellow head of flowers, of about $2\frac{1}{2}$ " in diameter.

Root, of thick, tuberous fibres.

Rootstock, stout, crowned with a dense mass of fine brown fibres.

Stem, erect, stout, simple, 6-10" in height, the upper portion densely covered with long, black, curly hairs.

Leaves. **Radical leaves,** 3-6" in length, by $\frac{1}{2}$ -1 $\frac{1}{2}$ " broad, elliptic, obtuse, glabrous, margins with short, erect, distant, blunt, glandular-teeth, midrib very prominent beneath; sessile or base narrowed into a stout, winged petiole. **Cauline leaves,** ovate or oblong, 2-4" in length, obtuse, sessile, narrowed at the base and stem-clasping, glabrous, short distant teeth, parallel veins; the uppermost leaf linear, entire, about 1" in length.

Flowers, yellow, in a terminal, solitary, nodding, radiate head of about $2\frac{1}{2}$ " diam. **Involucral bracts,** 12-14, 1-seriate, ovate-lanceolate, $\frac{3}{4}$ " in length, densely covered

**SENECIO ARNICOIDES**—*continued*.

with long, black, curly hairs, the lower half of the bracts united, the upper halves free, with acute tips. **Flowers of the ray**, about 15, 1-seriate, yellow in colour; ligules about 1" in length by $\frac{1}{4}$ ", with 3 short teeth. **Pappus-hairs**, few, white. **Flowers of the disk**, brown, tubular, $\frac{3}{8}$ " in length, 5-toothed. **Pappus**, scanty.

Fruit, a head of achenes, with scanty pappus.

Distinguishing characters. The broad, elliptic, unlobed leaves, and large solitary, terminal, nodding head, distinguish it from other species. It may readily be distinguished from *Cremanthodium*, which also has a large nodding head, by the leaves, which are reniform in the latter species. It closely resembles *Werneria Ellisii* (Hook. f.), but in this latter plant the head is erect and the involucre bracts connate to above the middle.

Flowering Season. August, September.

Locality. At elevations of 12-14,000'; e.g., Liddar Valley.

Distribution. Kashmir to Garhwal.



SENECIO ARNICOIDES, *Wall.*, var. FRIGIDA.

SENECIO LIGULARIA, *Hook. f.* (Pl. XXXIV.)

Giant Senecio.

Family. *Compositæ*. The Composite Family.

Name. Sen-ec'-i-ō, from the Latin "*senex*," an old man, referring to the white hair-like pappus on the fruits of many species; Lig-ul-ā'-rī-a is the old name of a genus which has been amalgamated with Senecio.

Description. A tall, robust perennial, with very large rounded leaves, and stout stems bearing a terminal raceme of yellow heads of flowers.

Stem, 3-5' in height, simple, erect, stout, glabrous or cottony above.

Leaves, usually reniform, but sometimes cordate-saggitate or sub-triangular, obtuse or acute, coarsely toothed, glabrous; the lower ones up to 1' in diam., with stout petioles up to 1' in length, without wings; the upper ones smaller, with broadly winged, sheathing petioles.

Flowers, all yellow, in radiate heads. **Heads,** in a simple, terminal more or less one-sided raceme, the heads $\frac{3}{4}$ " in length and $1\frac{1}{2}$ -2" diam. across the ligules. **Pedicels,** stout, $\frac{1}{2}$ -1 $\frac{1}{2}$ " in length, erect or curved. **Involucral bracts,** about 8-10, in one series, oblong, acute, free to the base; alternate ones with broad, membranous margins, overlapped by the narrower, intermediate ones. **Ligules,** few, about 7-8, ob-lanceolate, 3-toothed, about $\frac{3}{4}$ " in length. **Disk-flowers,** tubular, with a 5-lobed, campanulate limb, the tube equal in length to the limb. **Pappus,** reddish, $\frac{1}{2}$ - $\frac{1}{4}$ " in length.

Fruit, a head of achenes about $\frac{1}{3}$ " in length.

Distinguishing characters. The large, rounded, long-petioled leaves, and long-liguled heads, in a simple raceme, distinguish it from other species except *S. Jacquemontianus* (*Benth.*), which it closely resembles in general appearance.

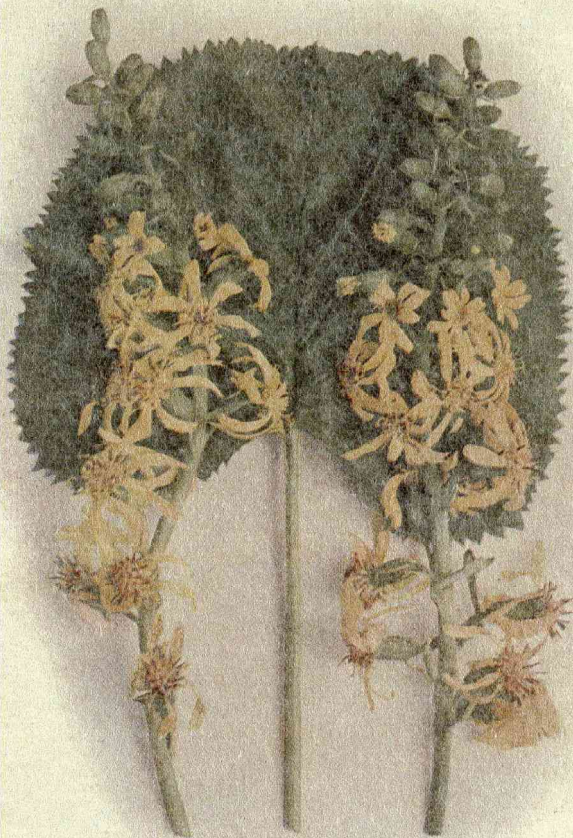
**SENECIO LIGULARIA**—*continued*.

S. Jacquemontianus, Benth. Leaves usually ovate-cordate, petiole of lower leaves winged, raceme not secund, involucral bracts sub-connnate at the base, ligules 12–15, tube of disk-flowers shorter than limb ; pappus $\frac{1}{16}$ " in length, shorter than the achenes and united at the base (coroniform).

Flowering Season. July, August.

Locality. At elevations of 8–10,000' ; *e.g.*, Pahlgam.

Distribution. From Kashmir to Sikkim ; Siberia, Dahuria, Japan.



SENECIO LIGULARIA, Hook. f.



CODONOPSIS ROTUNDIFOLIA, Benth.

Round-leaved Codonopsis. (Pl. xxxv.)

Family. *Campanulaceæ*. The Bell-flower Family.

Name. Cō-dō-nop'-sis, from the Greek "*kodon*," a bell, and "*opsis*," resemblance, referring to the bell-shaped flowers; rot-un-dif-ol'-ī-a is from the Latin "*rotundus*," round and "*folium*," a leaf.

Description. A rambling climber, with twining stems, simple, rounded leaves, and rather large variegated green and purple bell-shaped flowers.

Stem, slender, twining, branching, with scattered, long hairs, growing to about 6' in height.

Leaves, alternate or sub-opposite, petioled, $1-2\frac{1}{2}$ " in length, ovate or orbicular-ovate, rounded at the base, obtuse, with broad, rounded teeth; petioles $\frac{1}{2}-\frac{3}{4}$ ".

Flowers, $\frac{3}{4}-1\frac{1}{4}$ " in length by the same in diameter, campanulate, green or purplish outside and greenish-yellow mottled with red-purple on the inside, solitary on long axillary and terminal peduncles; the peduncles 2-3" and often leaf-opposed.

Calyx, superior, with 5 long, leaf-like, spreading lobes; the lobes $\frac{3}{4}$ ", oblong-elliptic, obtuse, or sub-acute.

Corolla, widely campanulate, rounded at the base, 5-lobed; the lobes $\frac{1}{4}-\frac{3}{8}$ ", broadly ovate, obtuse, recurved.

Stamens, 5, free, inserted on the margin of a disk.

Ovary, with the lower half inferior, turbinate, and the upper half superior, conical; style cylindric; stigma of 3 large ovate lobes.

Fruit, a hemispheric capsule, $\frac{1}{2}-\frac{3}{4}$ " in diam., with a conical beak.



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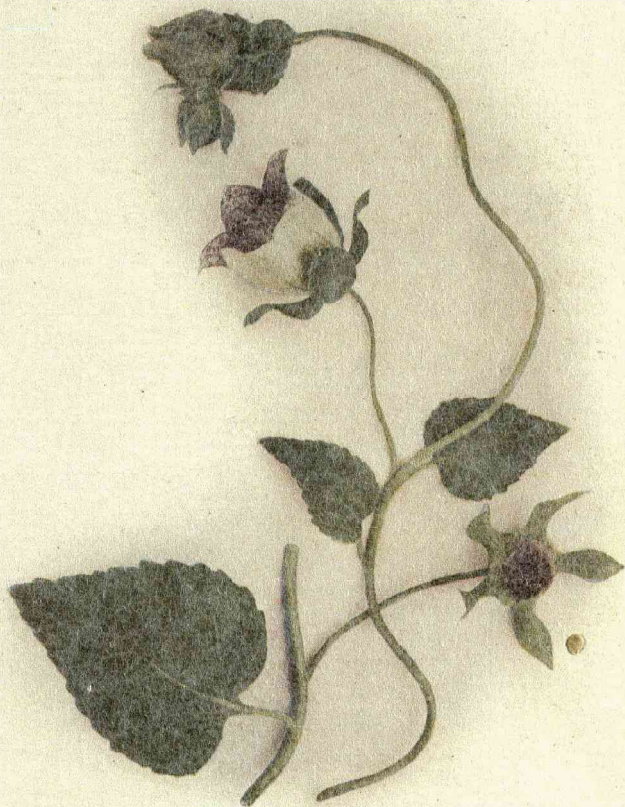
CODONOPSIS ROTUNDIFOLIA—*continued*.

Distinguishing characters. The twining stem easily distinguishes it from *C. ovata* (*Benth.*), the only other Kashmir species.

Flowering Season. Latter half of July, August.

Locality. At elevations of 7–10,000' ; *e.g.*, Gulmarg, Pahlgam, Sonamarg.

Distribution. From Kashmir to Kumaon.



CODONOPSIS ROTUNDIFOLIA, Benth.



CAMPANULA ARISTATA, Wall.

Bearded Campanula. (Pl. XXXVI.)

Family. *Campanulaceae*. The Bell-flower Family.

Name. Cam-pā'-nul-a, from the Latin "*campānula*," a little bell, referring to the shape of the flowers ; ar-is-tā'-ta is from the Latin "*arista*," the awn or beard of an ear of corn, referring to the awn-like lobes of the calyx.

Description. A slender, small, graceful, Alpine herb, with a simple stem, and a solitary, terminal, small, dark blue, bell-shaped flower.

Stem, erect, very slender, simple, 8-24" in height, glabrous.

Leaves. Radical leaves, elliptic, long-petioled, sub-entire, glabrous. **Cauline leaves,** linear, about $1\frac{1}{2}$ " in length.

Flowers, dark blue, about $\frac{1}{3}$ " diam., solitary, terminal.

Calyx, turbinate, with the tube adnate to the ovary, the limb with 5 fine, linear, awn-like teeth, about $\frac{1}{3}$ " in length and as long as the corolla.

Corolla, $\frac{1}{3}$ " in length, ob-conic to a narrowed base, and 5-lobed to about half-way down.

Stamens, 5, free.

Ovary, inferior, 3-celled.

Fruit, a narrow capsule about $\frac{3}{4}$ " in length.

Distinguishing characters. The small, dark blue, solitary, terminal flowers, with long, awn-like, calyx teeth, distinguishes it from other species.

Flowering Season. July, August.



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CAMPANULA ARISTATA—*continued*.

Locality. At elevations of 11–13,000' ; *e.g.*, Apharwat, Zojpal, Shisha Nag.

Distribution. From Kashmir to Sikkim.



CAMPANULA ARISTATA, Wall.



GENTIANA ARGENTEA, Royle (Pl. XXXVII.)

Silver-leaved Gentian.

Family. *Gentianaceæ*. The Gentian Family.

Name. Gen-tī-ā'-na, the name used by Dioscorides in honour of Gentius, a king of Illyria, who is supposed to have been the first to discover the medicinal value of certain species; ar-gen'-tē-a is from the Latin "*argentum*," silver.

Description. A small, tufted annual, with small, simple, silvery-shining leaves, and clusters of blue or blue and white flowers.

Stems, 1-4", erect, corymbosely branched above, usually several from the base forming tufts.

Leaves. Radical leaves, sessile, more or less rosulate, about $\frac{1}{2}$ " in length, ovate or lanceolate, mucronate.

Cauline leaves, opposite, sessile, ovate, elliptic or lanceolate, falcate, glabrous, $\frac{1}{4}$ - $\frac{1}{2}$ " in length; silvery-shining, dense on the upper part of the stem.

Flowers, blue or variegated blue and white, $\frac{3}{8}$ " in length by $\frac{1}{2}$ " diam., sessile or shortly pedicelled, crowded in dense, leafy, terminal clusters.

Calyx, 5-lobed, the lobes lanceolate, acute.

Corolla, campanulate, with 5 spreading lobes and smaller folds between the lobes; the folds entire or toothed; no fimbriæ at the mouth of the corolla-tube.

Stamens, 5, inserted on the corolla-tube.

Ovary, superior, 1-celled.

Fruit, a small, ob-ovoid capsule, $\frac{1}{3}$ " in length.

Distinguishing characters. The corolla less than 1" in length, 5-lobed, with folds between the lobes, no fimbriæ, and short stems with small, silvery, falcate leaves, distinguishes it from other species. It appears to be indistinguishable from *G. decemfida* (Ham.).



CSL

GENTIANA ARGENTEA—*continued.*

Flowering Season. March, April, May.

Locality. At elevations of 5–8,000', on open, sunny banks.

Distribution. From Kashmir to Nepal, Afghanistan.



GENTIANA ARGENTEA, *Royle*



GENTIANA VENUSTA, Wall. (Pl. XXXVIII.)

Charming Gentian.

Family. *Gentianaceæ*. The Gentian Family.

Name. Gen-tī-ā'-na, from *Gentius*, a king of Illyria, who is supposed to have discovered the medicinal value of certain species of *Gentiana*; ven-us'-ta is from the Latin "*venustus*," charming or beautiful.

Description. A dwarf Alpine plant, with leafy stems and rather long, tubular flowers of a blue or greenish-blue colour.

Rootstock, short or elongate, slender, creeping and rooting.

Stems, erect, $\frac{1}{2}$ – $1\frac{1}{2}$ ", simple, leafy, solitary or several from the rootstock.

Leaves, elliptic or ob-ovate, obtuse, entire, glabrous, $\frac{1}{4}$ – $\frac{1}{2}$ " in length; the lowermost often sub-orbicular with a short, broad petiole.

Flowers, $1-1\frac{1}{2}$ " in length, blue or greenish-blue, the lower portion usually much paler or almost white; 1–4 flowers, sub-sessile in the axils of the uppermost leaves, forming a cluster at the top of the short, leafy stems.

Calyx, $\frac{1}{2}$ " in length, with 5 linear-oblong, obtuse or acute lobes equal to or less than the tube, with a wide sinus between the lobes.

Corolla, $1-1\frac{1}{2}$ " in length, tubular, with 5 short, erect lobes, narrowed below and becoming spindle-shaped when the mouth is closed; very small folds between the lobes; no fimbriæ at the mouth of the corolla-tube.

Stamens, 5.

Ovary, spindle-shaped on a long stalk, 1-celled; style short and stout; stigma of 2 spreading, oblong, recurved lobes.

**GENTIANA VENUSTA**—*continued*.

Fruit, a narrow, ellipsoid capsule, $\frac{1}{2}$ – $\frac{3}{4}$ " in length, with a stalk of about $\frac{1}{2}$ ", acute above, splitting to the base when ripe.

Distinguishing characters. Flowers 1" or more in length, 5-lobed, with small folds between the lobes, no fimbriæ, short stems of less than 2", leaves $\frac{1}{2}$ " or less, flowers in a cluster and the stalk of the capsule $\frac{1}{2}$ ", distinguish it from other species. It is closely allied to *G. tubiflora* (Wall.), but in this latter species the stalks of the capsule are 1–1 $\frac{3}{4}$ " in length.

Flowering Season. August, September.

Locality. At elevations of 11–14,000' ; e.g., Apharwat, hills above Zojpal in the Liddar Valley.

Distribution. From Kashmir to Kumaon.



GENTIANA VENUSTA, Wall.



GENTIANA CACHEMIRICA, Dcne.

Rock Gentian.

(Pl. XXXIX.)

Family. *Gentianaceæ*. The Gentian Family.

Name. Gen-tī-ā'-na, from Gentius, a king of Illyria, who is supposed to have discovered the medicinal value of certain species of Gentiana.

Description. A beautiful perennial Alpine rock-plant, with tufted, drooping stems, and large, bright blue flowers.

Stems, tufted, drooping, simple, 2-6" in length, with vertical rows of small, red glands.

Leaves. Radical leaves, about 1" in length, spatulate or ob-ovate-oblong, with a broad petiole. **Cauline leaves,** opposite, crowded, elliptic or oblong, abruptly narrowed into a short, broad petiole, obtuse, apiculate, $\frac{1}{4}$ - $\frac{2}{3}$ " in length, glabrous, midrib prominent, margins minutely serrate ; the bases of the petioles connate into a short tube.

Flowers, bright blue, $1\frac{1}{4}$ - $1\frac{1}{2}$ " in length by $1\frac{1}{4}$ " across the expanded lobes, 1-3 flowers, sessile, terminal and axillary.

Calyx, tubular, 5-lobed ; the lobes $\frac{1}{4}$ - $\frac{1}{2}$ " in length, with ovate or elliptic, leaf-like, acute or obtuse tips, unequal, with a wide sinus between the lobes ; tube $\frac{1}{2}$ " in length, angled, with 5 prominent ribs extending from the tips of the lobes to the base of the tube, striated with vertical rows of small, red glands ; the tube sometimes split on one side.

Corolla, trumpet - shaped, $1\frac{1}{4}$ - $1\frac{1}{2}$ " in length, 5-lobed, with folds between the lobes, but without fimbriae at the mouth ; the lobes about $\frac{1}{2}$ " in length, broadly ovate or elliptic, acute, spreading, with recurved tips ; the folds with several unequal teeth ;

**GENTIANA CACHEMIRICA**—*continued*.

the tube about 1" in length, the inner surface white with blue striations, the outer surface white below, and with vertical bands of purple above.

Stamens, 5, inserted on the corolla-tube.

Ovary, cylindrical, with a short, straight style.

Fruit, a small, narrow capsule.

Distinguishing characters. Flowers 1" or more in length, 5-lobed, with folds between the lobes, no fimbriæ, tufted, drooping stems, leaves less than 1" in length, flowers 1-3, corolla-lobes $\frac{1}{2}$ ", spreading, with recurved tips, distinguish it from other species.

Flowering Season. August, September.

Locality. At elevations of 10-13,000', growing on rock cliffs ; *e.g.*, near Tulian above Pahlgam.

Distribution. Kashmir.



GENTIANA CACHEMIRICA, *Dcne.*

SWERTIA THOMSONI, *Clarke* (Pl. XL.)

Thomson's Swertia.

Family. *Gentianaceae*. The Gentian Family.

Name. Swert'-i-a, given in honour of Emanuel Swert, a Dutch botanist of the 17th Century ; Thom'-son-i, in honour of the botanist, Thomson.

Description. A robust perennial, with dense tufts of radical leaves, and flowering stems bearing narrow panicles of flowers of about 1" diameter.

Rootstock, stout, woody.

Stems, many from the rootstock, erect, solid, 1-2' in height.

Leaves. **Radical leaves,** in dense tufts, long-petioled, simple, entire, elliptic or oblong, acute or acuminate, up to 1' in length, including the petiole, 3-nerved beneath (or with 2 additional feint nerves near the margins).

Cauline leaves, the lower ones long-petioled, similar to the radical leaves, the petioles connate at the base, forming a short tube ; the upper ones sessile, not connate, or sometimes slightly connate, oblong, acute or acuminate, broad and rounded at the base, prominently 3-nerved beneath.

Flowers, about 1" diam., the outside almost black-purple or metallic blue-green, with a narrow, white margin or greenish-yellow diffused more or less with blue-green, the upper surface pale greenish-yellow with greenish veins (by transmitted light the flowers appear a delicate pale blue) ; the flowers in cymes, on long, erect, axillary and terminal peduncles, forming a long, narrow panicle ; the peduncles erect, stout, 1-2½" in length, bearing 1-5 flowers ; the pedicels ½-¾", erect, with the upper part curved so that the flowers are drooping. Bracteoles in pairs at the base of the pedicels, ovate, acuminate, ½-¾" in length, with a prominent midrib.

SWERTIA THOMSONI—*continued*.

Sepals, 5, ovate or lanceolate, acute or acuminate, $\frac{1}{4}$ – $\frac{3}{8}$ " in length, green or purple.

Corolla, rotate, 5-lobed almost to the base; the lobes oblong or elliptic, obtuse, $\frac{1}{3}$ – $\frac{1}{2}$ " in length by $\frac{1}{5}$ " in width, with 2 glands near the base of each lobe; the glands free from one another or sub-confluent, about $\frac{1}{10}$ " in length, more or less semi-circular or oval, greenish-yellow, surface more or less flat with lower margin slightly turned upwards, naked or with few fimbriæ on lower margin.

Stamens, 5, the filaments rather short, linear, broad; often greenish-blue; at the base of the filaments one or two small, white scales with fimbriæ.

Ovary, ovoid, style short, stigma of 2 short, oblong plates.

Fruit, a small capsule about $\frac{1}{4}$ – $\frac{1}{3}$ " in length.

Distinguishing characters. The cauline leaves only slightly connate at the base (or not connate), prominently 3-nerved, peduncles 1–5 fld.; corolla-lobes oblong, obtuse, $\frac{1}{3}$ – $\frac{1}{2}$ " in length: glands naked or with few fimbriæ on lower edge, and fimbriæ at the base of the stamens, distinguish it from other species.

Flowering Season. From the middle of August, September.

Locality. At elevations of 8–12,000'; e.g., Zojpal in the Liddar Valley, Badwan, Gosai.

Distribution. Kashmir.



SWERTIA THOMSONI, *Clarke*



PLEUROGYNE SPATHULATA, *A. Kerner*

Large Himalayan Pleurogyne. (Pl. XLI.)

Family. *Gentianaceæ*. The Gentian Family.

Name. Pleur-og'-yn-ē, from the Greek "*pleuron*," a side, and "*gynē*," a female, referring to the stigma; spath-ul-ā'-tum is from the Latin "*spātha*," a spatula, referring to the shape of the leaves.

Description. A robust, Sub-Alpine annual, with sessile, radical leaves, and leafy stems crowded with bluish-purple, star-like flowers of about $1\frac{1}{2}$ " diameter.

Rootstock, slender.

Stem, solitary, simple or branched, erect, 4-12" in height, fairly stout, more or less angular and narrowly winged, the branches erect.

Leaves. Radical leaves, few, sub-sessile, linear-spathulate or linear-oblong, obtuse, 1-3" in length.

Cauline leaves, $\frac{3}{4}$ -1 $\frac{1}{2}$ " in length by $\frac{1}{8}$ - $\frac{1}{4}$ " wide, linear-lanceolate or linear-oblong, acute or obtuse, sessile with margins meeting at the base, but not connate, midrib prominent.

Flowers, 1-1 $\frac{1}{2}$ " diam., pale bluish-purple, with blue-green veins on the outside; solitary in the axils of the leaves, and terminal, on stout, erect peduncles of $\frac{1}{4}$ -1 $\frac{1}{2}$ " in length; the flowers often densely crowded.

Sepals, 5, linear-lanceolate, acute, about $\frac{1}{2}$ " in length.

Corolla, sub-rotate, 5-lobed almost to the base; the lobes elliptic or ovate, acute or obtuse, spreading, with 2 separate, conspicuous scales close to the base of each lobe, the scales tubular, about $\frac{1}{8}$ " in length, with their upper margins fimbriate, with long, stout fimbriae; the corolla-tube very short.



PLEUROGYNE SPATHULATA—continued.

CSL

Stamens, 5, the filaments somewhat flattened, the anthers blue before ripening, basifixed, versatile, hastate at the base, reflexed to an inverted position.

Ovary, greenish-blue, shortly stalked, linear-oblong, with a sessile, entire, obtuse stigma, forming a short, blunt tip to the ovary.

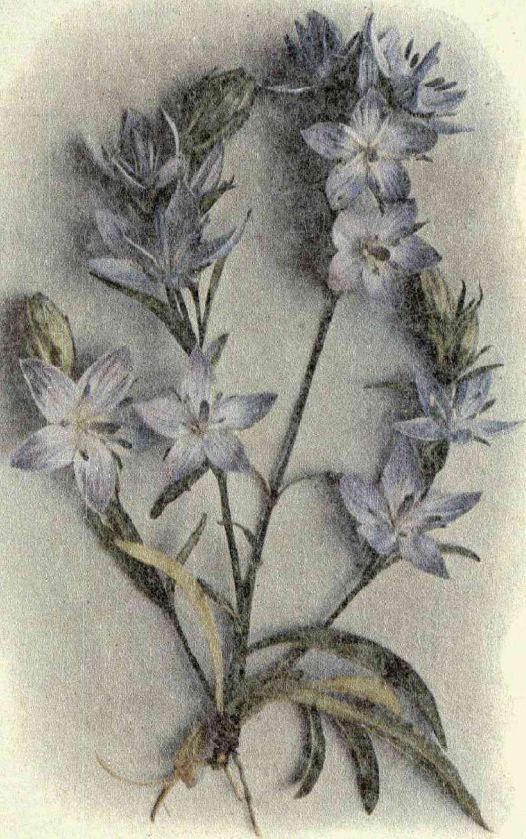
Fruit, a narrowly, oblong capsule about $\frac{3}{4}$ " in length.

Distinguishing characters. The rather long, narrow leaves and large flowers, which are often densely crowded, distinguishes it from other species. *P. carinthiaca* (Griseb.) is a very slender plant with smaller, broader leaves, few and much smaller flowers, on long, slender peduncles.

Flowering Season. September, October.

Locality. At elevations of 9–11,000'; e.g., Banihal, Killenmarg.

Distribution. Kashmir to Lahoul.



PLEUROGYNE SPATHULATA, *A. Kerner*



CYNOGLOSSUM GLOCHIDIATUM,

Wall. (Pl. XLII.)

Common Himalayan Hounds-tongue.

Family. *Boraginaceæ*. The Borage Family.

Name. Cyn-og-lōs'-sum, from the Greek "cyon," a dog, referring to the rough character of the leaves of some species. The two species, *C. Wallichii* (G. Don) and *C. denticulatum* (A. DC.) are now both included under the above name.

Description. An erect, branching herb, with small, dark blue flowers like the Forget-me-not, in long, branching racemes.

Stem, solitary or several, erect, branching, 1-2½' in height, covered with long, white hairs.

Leaves. Radical leaves, none at the flowering time.

Cauline leaves, ovate-lanceolate to oblong-lanceolate, obtuse or acute, hairy on both surfaces, with long hairs with bulbous bases, margins ciliate or denticulate, the lower ones narrowed at the base and sometimes prolonged into a petiole; 1-5" in length by ½-1" in width.

Flowers, dark blue, $\frac{1}{8}$ - $\frac{1}{3}$ " diam., very shortly pedicelled, in terminal, forked racemes, which are tightly coiled inwards in bud.

Calyx, 5-lobed almost to the base, the lobes ovate to oblong, obtuse, densely hairy, green or often black-purple, especially in bud; about $\frac{1}{2}$ " in length, becoming elongated to $\frac{1}{3}$ " or more in fruit.

Corolla, rotate, with a very short tube, 5-lobed, with 5 erect scales at the mouth of the corolla-tube; the scales almost square and larger than the anthers.

Stamens, 5, the filaments included inside the corolla-tube, with anthers below the scales.



CYNOGLOSSUM GLOCHIDIATUM—continued.

Ovary, 4-lobed, the style less than $\frac{1}{8}$ " in length and arising from between the lobes.

Fruit, of 4 small nutlets attached to a carpophore, forming a much-depressed pyramid; the apices of the nutlets little produced above their point of attachment, their bases rounded and much produced downwards; the margins armed with stout, barbed bristles (glochidia) with connate bases forming a distinct rim and the faces with scattered glochidia.

Distinguishing characters. The flowers $\frac{1}{8}$ " or less in diam., style less than $\frac{1}{8}$ " and nutlets attached by their tips to the style, only separating when ripe, distinguishes it from other species, except the following :—

C. zeylanicum, *Thumb.* (= *C. furcatum*, *Wall.*, in Hooker's *Flora of British India*). Nutlets without a distinct rim around their faces; scales almost square, smaller than the anthers.

C. lanceolatum, *Forsk.* (includes *C. micranthum*, *Desf.*). Nutlets without a distinct rim around their faces; scales much broader than long; flowers pale blue or white, very small, less than $\frac{1}{8}$ " diam.

Flowering Season. July to October.

Locality. At elevations of 5–10,000'; e.g., Pahlgam, Gulmarg.

Distribution. From Kashmir to Sikkim.



CYNOGLOSSUM GLOCHIDIATUM, Wall.



CYNOGLOSSUM MICROGLOCHIN,

Benth. (Pl. XLIII.)

Tall Himalayan Hound's-tongue.

Family. *Boraginaceæ*. The Borage Family.

Name. Cyn-og-lōs'-sum, from the Greek "cyon," a dog, and "glossa," a tongue, referring to the shape and rough surface of the leaves of some species; mic-rō'-glōchin, from the Greek "mikros," small and "glōchis, a point, referring to the barbed bristles (glochidia) on the fruits.

Description. A tall, robust perennial, with long-petioled, radical and lower stem leaves, and long, branching racemes of dark blue or dull purple flowers of about $\frac{1}{2}$ " diameter.

Rootstock, stout, woody.

Stem, solitary or several, erect, stout, much branched, 2-5' in height. In fruit the branches stand out at right angles to the stem, with the fruits all turned to one side, facing downwards.

Leaves. **Radical leaves,** long-petioled, ovate to oblong, acute or obtuse, rounded or narrowed at the base; the blade 4-6" by 2-3", hairy on both surfaces; the petiole about as long as the blade, deeply channelled; foliaceous shoots (without a flowering stem) produce leaves with a blade up to 10" by 6", and a petiole as long as the blade.

Cauline leaves, distant, the lower ones long-petioled, ovate or ovate-oblong, obtuse, 3-5" by $1\frac{1}{2}$ -3", with petioles up to 4" in length; the upper ones smaller, narrower, acute or acuminate, sub-sessile; the upper surface rough, with long hairs from bulbous bases; veins prominent.

Flowers, dark blue or dull purple, about $\frac{1}{3}$ - $\frac{1}{2}$ " diam., in long, branching racemes; the pedicels short in flower, becoming elongated to $\frac{1}{4}$ " in fruit.

**CYNOGLOSSUM MICROGLOCHIN**—continued.

Calyx, 5-lobed almost to the base, about $\frac{1}{8}$ " in length ; the lobes elliptic, obtuse, densely hairy, often black-purple outside, the margins densely ciliate with white hairs; the lobes becoming somewhat longer in fruit.

Corolla, rotate, the limb 5-lobed almost to the tube ; the tube about $\frac{1}{8}$ " in length, shorter than the calyx ; 5 erect scales at the mouth.

Stamens, 5, the filaments very short, flattened, with a broad base, inserted close to the mouth of the corolla-tube and extending like little brackets almost at right angles to the tube, with the dorsifixed anthers in a vertical position partly above the mouth of the corolla-tube, but completely below the scales.

Ovary, 4-lobed, the style $\frac{1}{8}$ ", becoming elongated to $\frac{1}{4}$ " in fruit.

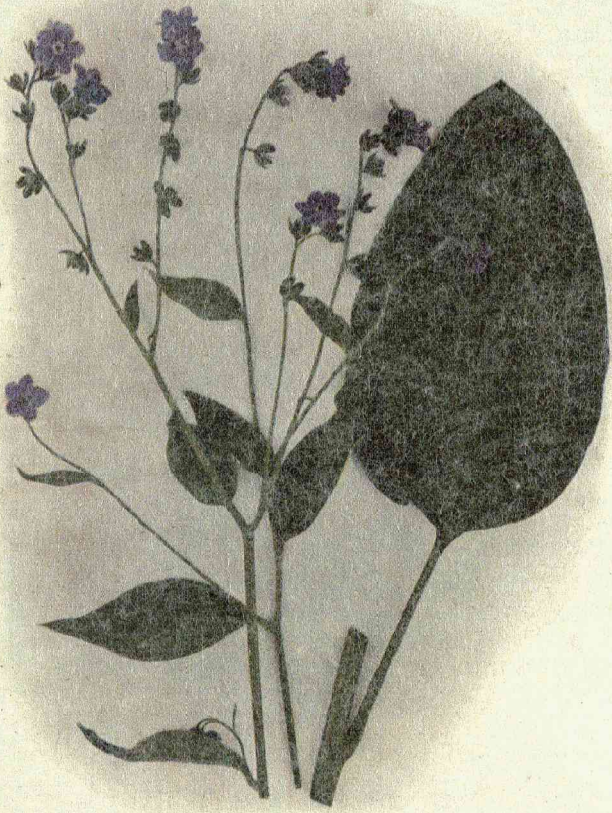
Fruit, of 4 nutlets, attached to a conical carpophore, forming a depressed pyramid; the nutlets ovate, $\frac{1}{8}$ " in length, the margins turned upwards and bearing stout glochidia (hooked bristles) ; the faces of the nutlets without or with a few glochidia, the apex of the nutlets attached to the style, and separating from it only at maturity.

Distinguishing characters. The tall stem, long-petioled lower cauline leaves, flowers $\frac{1}{3}$ - $\frac{1}{2}$ " diam., styles $\frac{1}{4}$ " in fruit, distinguish it from other species, except *C. nervosum* (Benth.), which may be distinguished by the tips of the nutlets being free from the style before maturity and the flowers often larger in diameter.

Flowering Season. July, August.

Locality. At elevations of 7-10,000', usually in shady, moist situations ; e.g., Pahlgam, Gulmarg, Sonamarg.

Distribution. From Kashmir to Kumaon.



CYNOGLOSSUM MICROGLOCHIN, *Benth.*

**LINDELOFIA LONGIFLORA, Baillon**

Long-flowered Lindelofia. (Pl. XLIV.)

Family. *Boraginaceæ*. The Borage Family.**Name.** Lin-del-of'-i-a, in honour of Friedrich von Lindelof, a patron of Botany; long-if-lō'-ra is from the Latin "*longus*," long, and "*flōs*," a flower, referring to the long corolla-tube. The plant is described in Hooker's *Flora of British India* under *Lindelofia spectabilis* (Lehm.)**Description.** A robust, tufted perennial, with long-petioled, narrow, radical leaves, and terminal, branching racemes of blue or purple flowers of $\frac{1}{2}$ - $\frac{3}{4}$ " diameter.**Rootstock,** stout, woody.**Stems,** tufted, 1-2' in height, erect, simple or sparingly branched near the top, densely hairy.**Leaves.** **Radical leaves,** petioled, the blade 2-6" by $\frac{1}{8}$ -1", narrow elliptic, gradually narrowed below to the petiole, acute or obtuse, densely hairy with longish, stiff hairs from bulbous bases, nerves prominent on the lower surface. **Cauline leaves,** numerous, often crowded; the lowermost shortly petioled, the others sessile, oblong or ovate to linear-lanceolate, rounded at the base or subcordate amplexicaul, 1-3" by $\frac{1}{2}$ - $\frac{3}{4}$ ", obtuse or acute.**Flowers,** $\frac{1}{2}$ - $\frac{3}{4}$ " diam., intense dark blue, or paler blue or purple, in branching racemes; pedicels $\frac{1}{8}$ - $\frac{1}{4}$ ".**Calyx,** lobed almost to the base; the lobes elliptic or oblong, obtuse, densely hairy, margins with a white fringe of hairs; $\frac{1}{4}$ " in length, becoming elongated to $\frac{1}{4}$ " or rather more in fruit.**Corolla,** sub-salver-shaped; the limb 5-lobed almost to the mouth of the tube; the lobes rounded, spreading; the tube cylindrical, very variable in length, from 1-3 times the length of the calyx, with 5 erect, prominent trapeziform scales at the mouth.**Stamens,** 5, erect, inserted on the mouth of the corolla-tube at the same level as, and alternate with, the scales; the filaments equal to or rather shorter than the scales, curved at the tip with the dorsifixed anthers in a vertical position either below the scales or with about half their length protruding above the scales.

**LINDELOFIA LONGIFLORA**—continued.

Ovary, 4-lobed, style long, arising from between the lobes.

Fruit, of 4 nutlets attached to a conical carpophore, forming a depressed pyramid; the apices of the nutlets little produced beyond the point of attachment; their bases rounded and produced downwards; the nutlets with stout, hooked bristles (glochidia) on their margins, a few or none on their faces and none on their sides; style $\frac{1}{4}$ – $\frac{1}{2}$ " in length, varying with the length of the corolla-tube.

Distinguishing characters. The plant is very variable with regard to the shape of the cauline leaves and length of the corolla-tube, and in Hooker's *Flora of British India*, the two following varieties are mentioned :—

***L. longiflora*, Baill., var. *Levingii*.** Leaves elliptic and ovate, acute; calyx-lobes $\frac{1}{4}$ – $\frac{1}{3}$ ", ovate; corolla-tube $\frac{3}{4}$ " by $\frac{1}{4}$ "; corolla-lobes orbicular, $\frac{1}{3}$ " diam., style $\frac{3}{4}$ ".

***L. longiflora*, Baill., var. *Falconeri*.** Leaves linear-lanceolate; calyx-lobes $\frac{1}{5}$ ", narrowly oblong; corolla-tube $\frac{1}{2}$ – $\frac{3}{4}$ ".

There is one other distinct species, namely, *L. angustifolia* (Brand), described in Hooker's *Flora of British India* under *L. Benthami* (Hook. f.), which may be distinguished as follows :—

***L. angustifolia*, Brand.** Stem and leaves hoary with appressed hairs, or almost silvery; cauline leaves few, distant; flowers usually sky-blue; limb of corolla cup-shaped with sub-erect lobes, the lobes extending about half-way down the limb; scales sub-triangular, i.e., narrowed from the base upwards to an obtuse tip; nutlets densely glochidiate on their sides below the face margins.

The erect stamens with the filaments protruding above the mouth of the corolla-tube distinguishes *Lindelofia* from the genus *Cynoglossum*.

Flowering Season. July, August.

Locality. At elevations of 8–12,000'; e.g., Gulmarg, Zojpal, Liddarwat.

Distribution. From Kashmir to Garhwal.



LINDELOFIA LONGIFLORA, *Baillon*



LAPPULA UNCINIATA, Fischer (Pl. XLV.)

Barbed-fruited Lappula.

Family. *Boraginaceæ*. The Borage Family.

Name. Lap'-pul-a, from the Latin "*lappa*," a bur referring to the little bur-like nutlets; un-cī-nī-ā'-ta is from the Latin "*uncinātus*," a hook, referring to the hooked bristles on the nutlets. The plant is described in Hooker's *Flora of British India* under *Paracaryum glochidiatum* (Benth.).

Description. A tall, robust, branching perennial, with racemes of pale blue flowers of about $\frac{1}{2}$ " diameter.

Stem, solitary or several from a stout rootstock, erect, 2-4' in height, branched, hairy.

Leaves. **Radical leaves**, long-petioled, ovate-cordate, 2-3 $\frac{1}{2}$ " by 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ ", acute or acuminate, sparsely hairy on both surfaces; petioles up to 6" or more in length. **Cauline leaves**, the lower ones long-petioled, cordate, becoming shorter petioled, narrower, less cordate, longer pointed, higher up the stem; the upper ones sub-sessile and rounded at the base; texture, thin or membranous, veins very prominent on lower surface.

Flowers, pale blue with a yellow eye, $\frac{3}{8}$ - $\frac{3}{4}$ " diam., in terminal, often branching racemes; the pedicels $\frac{1}{8}$ - $\frac{1}{4}$ " in flower, becoming elongated and reflexed in fruit to $\frac{1}{2}$ ".

• **Calyx**, very small, about $\frac{1}{10}$ ", exceeding the corolla-tube, 5-lobed almost to the base, the lobes elliptic, spreading, obtuse, densely hairy.

Corolla, rotate, 5-lobed; the lobes extending almost to the mouth of the tube, orbicular-oblong, with 5 erect, yellow scales at the mouth of the tube; the corolla-tube very short, about $\frac{1}{20}$ ".

Stamens, 5, included below the scales.

**LAPPULA UNCINIATA**—*continued*.

Ovary, 4-lobed, the style minute, $\frac{1}{10}$ " or less, inserted between the lobes, shorter than the calyx-lobes.

Fruit, of 4 nutlets, attached to a conical carpophore for the greater part of their length, forming an erect pyramid; the apices and bases little produced beyond the attached portion; margins of nutlets with long, hooked glochidia $\frac{1}{8}$ " or more in length and connate at the base, forming a broad margin; the faces of the nutlets tuberculate, but without glochidia.

Distinguishing characters. The tall, branching stem, cordate leaves, pale blue flowers about $\frac{1}{2}$ " diam., and nutlets with smooth faces and very long glochidia on the margins distinguish it from other species.

Flowering Season. July, August.

Locality. At elevations of 7–11,000', usually in damp, shady localities; e.g., Pahlgam, Gulmarg, Liddarwat, Kamri.

Distribution. From Kashmir to Sikkim.



LAPPULA UNCINIATA, *Fischer*



MERTENSIA MOLTKIOIDES, *Clarke*

Large Himalayan Mertensia. (Pl. XLVI.)

Family. *Boraginaceæ*. The Borage Family.

Name. Mer-ten'-sī-a, in honour of Prof. F. C. Mertens, a German botanist; molt-kī'-ō-i'-dēs means that the plant has a resemblance to plants of the genus Moltkia.

Description. A small, creeping perennial, with oblong leaves and bright blue or purple flowers, in racemes.

Rootstock, stout, with elongate, rooting branches, often forming extensive patches of plants.

Stems, erect, 6-9" in height, simple, hairy.

Leaves. Radical leaves, petioled, oblong or elliptic, acute or obtuse, rounded or narrowed at the base, the blade 1-3" by $\frac{1}{2}$ -1 $\frac{1}{2}$ ", the petiole 1-3" in length. **Cauline leaves,** similar to the radical leaves but smaller and often spatulate; the lower ones petioled; the upper ones subsessile or sessile; hairy, with erect or spreading hairs.

Flowers, bright intense blue or purple, $\frac{1}{3}$ - $\frac{1}{2}$ " or rather more in diam., in a terminal raceme, which becomes much elongated in fruit; pedicels $\frac{1}{8}$ - $\frac{1}{4}$ ".

Calyx, narrow, 5-lobed almost to the base, the lobes erect, linear, hairy.

Corolla, more or less salver-shaped; the limb 5-lobed almost to the mouth of the tube; the lobes rounded at the top, spreading out almost flat or curved upwards, forming a shallow cup; the tube $\frac{1}{3}$ - $\frac{1}{2}$ " in length exceeding, to more than twice the length of, the calyx, with 5 very small but distinct scales at the mouth.

Stamens, 5, the filaments very short, inserted just below the mouth of the corolla-tube, with the anthers below the scales or partly protruding above them.

**MERTENSIA MOLTKIOIDES**—continued.

Ovary, 4-lobed, style about $\frac{1}{8}$ – $\frac{1}{2}$ ".

Fruit, of 4 erect, smooth, ovoid-oblong nutlets of about $\frac{1}{8}$ " in length.

Distinguishing characters. The rather large elliptic or oblong radical leaves up to 4" in length, hairs erect or spreading (*i.e.*, not adpressed), corolla with a spreading limb, and corolla-tube much exceeding the calyx, distinguish it from other species. It is very closely allied to *M. elongata* (Benth.), but this latter species has adpressed hairs and the corolla-tube only slightly exceeds the calyx. It is doubtful whether these characters are sufficiently constant for the separation of the two species, as intermediate forms appear to occur. *M. echioides* (Benth.) is quite a distinctive species and may be distinguished by the following characters :—

M. echioides, Benth. Tufted ; stems 6–15" ; radical leaves long-petioled, narrow elliptic ; corolla sub-campanulate, with erect lobes extending about one-third of the way down, and uniformly narrowed from the top to the base, about $\frac{1}{2}$ " in length by $\frac{1}{3}$ " diam. across the top of the lobes ; scales small, yellow, about half-way down the corolla, and consisting of pits on the outside which project, forming protuberances on the inner surface ; anthers partly protruding above the scales.

Flowering Season. May, June.

Locality. At elevations of 7–10,000', usually growing on shady, damp rock surfaces where rich leaf-mould has accumulated ; *e.g.*, Palhgam, Liddarwat.

Distribution. Kashmir.



MERTENSIA MOLTKII, Clarke



PEDICULARIS BICORNUTA, *Klotzsch*

Two-horned Lousewort. (Pl. XLVII.)

Family. Scrophulariaceæ. The Figwort Family.

Name. Ped-i-cul-ā'-ris, from the Latin "*pediculus*," a louse, referring to the erroneous supposition that the infection of sheep with lice was due to plants of this genus; bic-or-nū'-ta is from the Latin "*bi*," two, and "*cornu*," a horn, referring to the upper lip of the flower.

Description. A handsome, robust perennial, with a dense, terminal raceme of bright yellow, 2-lipped flowers.

Rootstock, stout.

Stem, erect, simple, stout, 6-24" in height; small, stemless plants with the raceme arising direct from the rootstock also occur.

Leaves, alternate, petioled, linear or linear-oblong, pinnatifid; the lobes crenate or lobulate.

Flowers, bright yellow, 1-1½" in length, in a dense, terminal raceme of 3-8" in length; pedicels short or absent. Bracts crenate and usually shorter than the calyx.

Calyx, ½-¾" in length, 5-lobed, the lobes crested.

Corolla, yellow, 2-lipped; the upper lip annular, with a double twist at the base, and produced into a slender bi-fid tail; the lower lip 1-1½" broad, sub-orbicular; the corolla-tube up to twice the length of the calyx.

Stamens, 4, two longer than the other two.

Ovary, superior, style slender.

Fruit, a capsule, 1-1½" in length, oblong-lanceolate, long-pointed.

**PEDICULARIS BICORNUTA**—*continued*.

Distinguishing characters. The alternate leaves, and yellow flowers with the upper lip with a double twist at the base and produced into two slender tails, distinguishes it from other species.

Flowering Season. July, August.

Locality. At elevations of 9–13,000' ; *e.g.*, Killenmarg, Sonamarg, Zojpal.

Distribution. From Kashmir to Simla ; Afghanistan, Yarkand, Kashgar.



PEDICULARIS BICORNUTA, *Klotzsch*



LAGOTIS GLAUCA, Gaertn.
VAR. CASHMIREANA. (Pl. XLVIII.)

Kashmir Hare's Ear.

Family. *Selaginaceæ*. The Hare's Ear Family.

Name. Lag-ō'-tis, from the Greek "*lagos*," a hare, and "*otis*," an ear, referring to a supposed resemblance of the bi-fid calyx in some species to the ears of the hare; "*glau'-ca*" is the Latin word indicating bluish-grey.

Description. A small Alpine perennial, with a terminal spike of small, very dark blue flowers.

Rootstock, stout.

Stem, stout, erect, 2-6" in height.

Leaves. **Radical leaves,** petioled, elliptic or oblong, obtuse, narrowed at the base, 2-3", crenate: the petioles stout. **Cauline leaves,** few, alternate, $\frac{1}{2}$ -1 $\frac{1}{2}$ " in length, obtuse, crenate or entire.

Flowers, very small, dark blue, in a dense, terminal spike of 1-2" in length.

Bracts, shorter than the flowers, ovate, toothed.

Calyx, spathe-like.

Corolla, much longer than the calyx; the limb 2-lipped, the lower lip 2 or 3 cleft; the corolla-tube slender, curved.

Stamens, 2, inserted on the throat of the corolla; the filaments adnate to the margins of the corolla, the anthers reniform.

Ovary, superior, 2-celled; the style exserted from the corolla, jointed below.

Fruit, a small, 2-celled drupe, with 1 or 2 seeds.



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LAGOTIS GLAUCA—*continued.*

Distinguishing characters. The spathe-like calyx distinguishes it from other species.

Flowering Season. June, July.

Locality. At elevations of 10-12,000' ; *e.g.*, Killenmarg, Astanmarg, Zoipal.

Distribution. From Kashmir to Chamba.



LAGOTIS GLAUCA, Gaertn., var. CASHMIREANA

**IRIS SPURIA**, *Linn.* **VAR. NOTHA**, *Baker*

Spurious Iris.

(Pl. XLIX.)

Family. *Iridaceæ*. The Iris Family.

Name. I'-ris, the Greek name for the rainbow, referring to the beautiful and varied colours of the flowers; spur'-i-a is the Latin word for spurious; not'ha is from the Latin "*nothus*," meaning spurious.

Description. A perennial with densely tufted, long, sword-like, flat leaves, and tall stems bearing large lilac-purple flowers.

Rootstock, a stout, branching and creeping rhizome.

Stems, several, erect, stout, 2-4' in height, over-topping the leaves.

Leaves, 1-3' in length by $\frac{1}{2}$ -1 $\frac{1}{4}$ " in width, ensiform (sword-like), striate.

Flowers, 3-4" diam., blue-purple or lilac-purple, in 1-3 heads; but usually there are 4 flowers, of which 2 are together at the top of the stem, and the other 2 are at different points lower down, forming a raceme; the **pedicels** 1-3", stout, erect, so that the lateral flowers are close against the main stem, shorter than the spathe; **spathes** green, herbaceous, with scarious tips, erect, about 3-5" in length.

• **Perianth-tube**, short, funnel-shaped, $\frac{3}{8}$ - $\frac{1}{2}$ " in length, 6-ribbed.

Sepals (or Falls) 3, petaloid, clawed, 2 $\frac{1}{2}$ -3" in length; the limb lilac-purple with darker purple veins, orbicular-oblong, 1 $\frac{1}{4}$ " in length by 1-1 $\frac{1}{4}$ " in width, reflexed; the claw pale, with lilac veins and a bright yellow, shallow keel, narrowly elliptic, $\frac{1}{2}$ " broad, equal to or somewhat longer than the limb, a narrow channelled constriction between the limb and claw.

**IRIS SPURIA**—*continued*.

Petals (or Standards) 3, darker lilac-purple and rather shorter than the sepals, erect, ob-lanceolate, $2\frac{1}{2}$ " in length by 1" broad.

Stamens, 3, the filaments $\frac{1}{2}$ " in length, flattened, the anthers 1" in length, with orange-yellow pollen.

Ovary, narrowed above, 6-ribbed; the style-arms 3, petaloid, about $1\frac{1}{4}$ " in length, with reflexed, triangular crests of $\frac{3}{8}$ " in length.

Fruit, a 6-ribbed, beaked capsule of 1-2" in length.

Distinguishing characters. The sepals without a beard or crest, distinct perianth-tube, lilac-purple flowers and 6-ribbed capsule, distinguish it from other species.

Flowering Season. Latter part of May, June.

Locality. At 5-6,000'; e.g., Bij-behara.

Distribution. Kashmir.



IRIS SPURIA, Linn., var. NOTHA, Baker

IRIS HOOKERIANA, *Foster* (Pl. L.)

Hooker's Iris.

Family. *Iridaceæ*. The Iris Family.

Name. I'-ris, the Greek name for the rainbow, referring to the beautiful and varied colours of the flowers ; Hook-er-i-ā'-na, in honour of the celebrated botanist, Hooker.

Description. A perennial with densely tufted, flat, sword-like leaves, and short, stout stems, bearing one or two large, variegated purple flowers.

Rootstock, a stout, branching and creeping rhizome.

Flowering stems, several, 3-6" in height, stout.

Leaves. **Radical leaves,** in fan-like clusters of 5 or 6, sheathing, linear, leaves forming dense, spreading tufts ; the longer ones about 6-10" in length by $\frac{1}{4}$ - $\frac{1}{3}$ " broad at flowering time, but becoming longer after the flowering season is over. **Cauline leaves,** 3 or 4, of about 1-4" by $\frac{1}{4}$ ".

Flowers, $1\frac{1}{2}$ -2" diam., purple, in one head of 2 flowers at the top of the stem. **Spathes,** 3, green, herbaceous, 2-3" in length, lanceolate, ventricose. **Pedicels,** $\frac{1}{2}$ ", becoming elongated to about 1" in fruit.

Perianth-tube, $\frac{1}{2}$ - $\frac{3}{4}$ " in length.

Sepals (or Falls), 3, clawed, about $1\frac{3}{4}$ " in length ; the limb pale or dark red-purple or blue-purple, variegated with paler or darker blotches, but sometimes not variegated, broadly ob-ovate-oblong, about 1" by $\frac{5}{8}$ ", reflexed ; the claw about $\frac{3}{4}$ " by $\frac{1}{4}$ ", the central portion thickened, green on the outside, and bearded on the upper surface, with curly, white hairs, with thickened, orange-yellow tips.

Petals (or Standards), 3, erect, clawed, shorter and smaller than the sepals ; the limb 1" by $\frac{1}{2}$ ", ob-ovate-

**IRIS HOOKERIANA**—*continued*.

oblong, more or less the same colour as the sepals, but not variegated with blotches, tip emarginate; the claw shorter than the limb, white with purple veins and blotches, channelled.

Stamens, 3, the filaments flattened, $\frac{1}{2}$ " in length; the anthers linear, about $\frac{3}{8}$ " in length, divaricate at the base.

Ovary, inferior, narrowed at both ends, $\frac{1}{2}$ – $\frac{3}{4}$ " in length. **Style-arms**, 3, petaloid, purple, about $\frac{3}{4}$ " in length by $\frac{1}{4}$ " broad, with a 2-lobed crest of about $\frac{1}{4}$ ", the lobes triangular with serrulate margins.

Fruit, a beaked capsule, about $1\frac{1}{2}$ –2" in length, on a pedicel of about 1".

Distinguishing characters. The short stems and bearded sepals distinguish it from other Kashmir species, with the exception of *Iris kumaonensis* (Wall.), from which it may be distinguished as follows :

***Iris kumaonensis*, Wall.** Stem usually undeveloped, under 1", and only rarely 2–3" in length; perianth-tube 2–3"; capsule small, $\frac{3}{4}$ –1" in length.

***Iris Hookeriana*, Foster.** Stem about 5"; perianth-tube under 1"; capsule about $1\frac{1}{2}$ –2" in length.

Flowering Season. June, July.

Locality. At elevations of 10–12,000', on open, sunny, dry hill sides, often covering large areas; e.g., Liddarwat, Zoipal.

Distribution. Kashmir to Lahoul.

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IRIS HOOKERIANA, *Foster*



CALENDAR SHOWING THE MONTH OF
FLOWERING OF THE SPECIES
ILLUSTRATED.

MARCH.

Gentiana argentea, Royle

APRIL.

Delphinium uncinatum, Hook.
f. & T.

Peganum Harmala, Linn.

MAY.

Delphinium denudatum, Wall.

Iris spuria, Linn, var. *Notha*,
Baker

Mertensia moltkioides, Clarke

Thermopsis barbata, Royle

JUNE.

Dianthus Jacquemontii, Edgew.

Erysimum odoratum, Hook. f. & T.

Iris Hookeriana, Foster

Lagotis glauca, Gaertn., var.
cashmireana.

Lathyrus altaicus, Led.

„ *luteus*, Baker

Lindelofia longiflora, Baill.

Thalictrum minus, Linn, var.
majus.

JULY.

Aconitum laeve, Royle

„ *moschatum*, Stapf

„ *chasmanthum*, Stapf

Aquilegia jucunda, Fisch. & Mey.

Arenaria foliosa, Royle

Campanula aristata, Wall.

Codonopsis rotundifolia, Benth.

Corydalis Falconeri, Hook. f. & T.

„ *ramosa*, Wall.

Cynoglossum glochidiatum, Wall.

„ *microglochin*, Benth.

Dipsacus inermis, Wall.

Doronicum Roylei, DC.

Draba alpina, Linn.

Lappula unciniata, Fischer

Oxytropis cachemirica, Camb.

Pedicularis bicornuta, Klotzsch

Potentilla eriocarpa, Wall.

Sedum quadrifidum, Pall.

„ *Jaeschkei*, Kurz

„ *crassipes*, Hook. f. & T.

Senecio ligularia, Hook. f.

AUGUST.

Aconitum violaceum, Jacq.

„ *heterophyllum*, Wall.

„ *kashmiricum*, Stapf
(inedit.)

Anemone vitifolia, Ham.

Corydalis Clarkei, Prain

Delphinium incanum, Royle

Gentiana venusta, Wall.

„ *cachemirica*, Dcne.

Saxifraga diversifolia, Wall.

Senecio arnicoides, Wall., var.
frigida.

Swertia Thomsoni, Clarke

Thalictrum pauciflorum, Royle

SEPTEMBER.

Pleurogyne spathulata, A. Kerner



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LIST OF MEDICINAL PLANTS, CLIMBERS AND ROCK PLANTS ILLUSTRATED.

MEDICINAL.

Aconitum chasmanthum, *Stapf*
 „ *heterophyllum*, *Wall.*
Peganum Harmala, *Linn.*

CLIMBER.

Codonopsis rotundifolia, *Benth.*

ROCK PLANTS.

Arenaria foliosa, *Royle*
Gentiana cachemirica, *Dcne.*
Potentilla eriocarpa, *Wall.*
Sedum quadrifidum, *Pall.*
 „ *Jaeschkei*, *Kurz*
 „ *crassipes*, *Hook. f. & T.*

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