

Flora of Nepal

नेपालका वनस्पति

Parnassiaceae

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Genera in this account

Parnassia (p.2)

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Appendices

1: Illustration plates

2: Format, abbreviations and categories used in Flora of Nepal

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Royal
Botanic Garden
Edinburgh



Parnassiaceae

Bhaskar Adhikari & Shinobu Akiyama

Perennial herbs, glabrous. Flowering stems erect, solitary to several. Radical leaves one to many, petiolate, palmate-veined. Cauline leaf solitary, sessile or semi-amplexicaul, usually with a few brown hairs at the base, palmate-veined. Flowers solitary, terminal, actinomorphic, bisexual. Hypanthium campanulate, free or adnate to lower half of ovary. Sepals 5. Petals 5, white or green, margin entire, erose or fimbriate. Stamens 5, opposite to sepals, equal or unequal. Staminoes 5, opposite to petals, discoid or divided into lobes or finger-like segments, apical glands distinct or not. Ovary semi-inferior or superior, 1-locular. Ovules many, placentation parietal. Style short with 3 or 4 lobes. Fruit 3 or 4-valved capsule.

Worldwide one genus and about 70 species in temperate regions of the N hemisphere, especially E Asia. Seven species in Nepal.

1. *Parnassia* L., Sp. Pl. 1: 273 (1753).

Description as for Parnassiaceae.

Key to Species

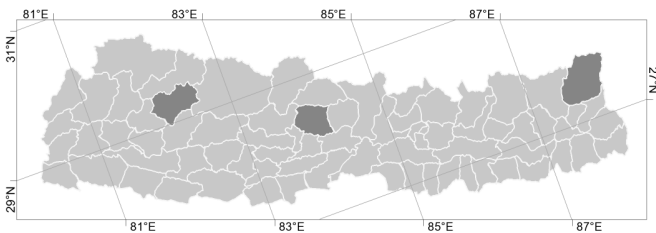
- 1a Flowers green. Staminoes entire, discoid.....1 *P. tenella*
- b Flowers white. Staminoes divided into 3–6 lobes or segments2
- 2a Apex of staminoes divided into 5–6 linear segments.....2 *P. wightiana*
- b Apex of staminoes divided into 3 lobes or segments.....3
- 3a Stems 15–45 cm tall. Petals 10–15 × 5–10 mm 3 *P. nubicola*
- b Stems 2–13 cm tall. Petals 3–10 × 1.5–4 mm4
- 4a Petals up to 1.5× longer than sepals. Cauline leaf usually near the flower or in upper half of stem 4 *P. kumaonica*
- b Petals at least 2× longer than sepals. Cauline leaf usually in the middle of lower half of stem5
- 5a Petal margin distinctly fimbriate5 *P. chinensis*
- b Petal margin entire or erose6
- 6a Radical leaves usually cordate at base6 *P. pusilla*
- b Radical leaves cuneate to rounded at base7 *P. trinervis*

1. *Parnassia tenella* Hook.f. & Thomson, J. Proc. Linn. Soc., Bot. 2: 80 (1857).

Flowering stems usually solitary, rarely 2, 6–15 cm. Radical leaves 1 or 2, petioles 4–9 cm. Leaves reniform, 1–2 × 1.5–2.5 cm, base deeply cordate, apex obtuse or rounded, margin entire. Cauline leaf near middle or in upper half of stem, cordate, 0.5–1.0 × 0.5–1 cm, base cordate, apex obtuse or rounded, margin entire. Flowers green, 0.5–1 cm across. Hypanthium 1–2 mm. Sepals ovate to oblong-ovate, 2–3 × 1–2 mm, base rarely with a few brown hairs, apex acute or obtuse, margin entire. Petals broadly obovate, 3–5 × 3–4 mm, base cuneate or narrowed into a claw, apex obtuse, margin entire. Filaments usually equal, 3–4 mm; anthers ca. 1 mm. Staminoes 2–3 mm, discoid ca. 1 mm in diameter, glands absent. Ovary superior or slightly inferior, 2–3 mm. Style ca. 0.5 mm, stigma 3 or 4-lobed.

Fig. 1l-n

Distribution: Nepal, E Himalaya, Tibetan Plateau and E Asia.



Altitudinal range: 3000–3500 m.

Ecology: Alpine meadows.

Flowering: August–September. **Fruiting:** September–October.

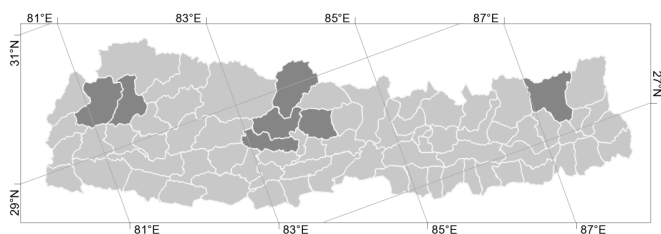
2. *Parnassia wightiana* Wall. ex Wight & Arn., Prodr. Fl. Ind. Orient. 1: 35 (1834).

Parnassia ornata Wall. ex Arn.; *P. ornata* Wall. nom. nud.; *P. wightiana* Wall. nom. nud.

Flowering stems 1–2, 12–30 cm. Radical leaves many, petioles 5–20 cm. Leaves usually cordate, rarely ovate, 1.5–4 × 1–4 cm, base cuneate, cordate or truncate, apex acute or obtuse, margin entire. Cauline leaf near middle or in lower half of stem, ovate or cordate, 1.5–3 × 1–3.5 cm, base semi-amplexicaul, apex acute or obtuse, margin entire. Flowers white, 1.5–3 cm across. Hypanthium ca. 2 mm. Sepals oblong-ovate, 5–10 × 3–5 mm, base usually with a few brown hairs, apex bluntly pointed, margin entire. Petals obovate, 10–15 × 3–8 mm, base abruptly narrowed into a claw, apex obtuse, margin entire or undulate above, densely fimbriate in lower half. Filaments sometimes unequal, 3–7 mm; anthers 2–2.5 mm. Staminodes 4–6 mm, segments 5 or 6 finger-like, 2–2.5 mm, glands distinct. Ovary semi-inferior, 5–5.5 mm. Style indistinct or ca. 1 mm, stigma 3-lobed.

Fig. 1r-t

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau, Assam-Burma, E Asia and SE Asia.



Altitudinal range: 2200–3500 m.

Ecology: Moist places.

Flowering: July–September. **Fruiting:** August–November.

3. *Parnassia nubicola* Wall. ex Royle, Ill. Bot. Himal. Mts. [7]: 227, pl. 50 fig. 3 (1835).

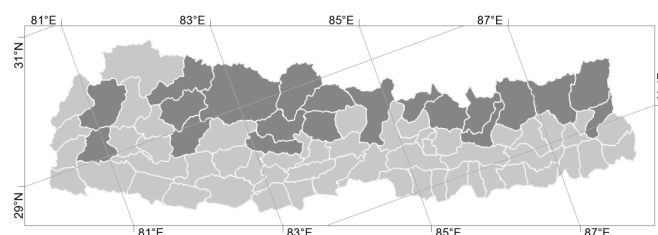
Parnassia nubicola Wall. nom. nud.

निरबिशी Nirbishi (Nepali).

Flowering stems 1–3, 15–45 cm. Radical leaves many, petioles 3–10 cm. Leaves ovate or narrowly ovate to elliptic, 2–8 × 1.5–3 cm, base cuneate to truncate or attenuate to petiole, rarely cordate, apex acute, rarely obtuse, margin entire. Cauline leaf near middle or in lower half of stem, ovate to elliptic, 1.5–5 × 1–2.5 cm, base semi-amplexicaul, apex acute or obtuse, margin entire. Flowers white, 1–3 cm across. Hypanthium 2.5–4 mm. Sepals ovate to oblong-ovate, 5–10 × 3–5 mm, base usually with a few brown hairs, apex bluntly pointed, margin entire. Petals obovate, 10–15 × 5–10 mm, base cuneate or narrowed into a claw, apex obtuse or retuse, margin entire or minutely fimbriate in lower half. Filaments usually unequal, 1.5–6 mm; anthers 1.5–3 mm. Staminodes 4–6 mm, segments 3, 1–1.5 mm, glands usually distinct. Ovary semi-inferior, 5–8 mm. Style ca. 2 mm, stigma 3-lobed.

Fig. 1f-h

Distribution: Nepal, W Himalaya, E Himalaya, Tibetan Plateau, E Asia and SW Asia.



Altitudinal range: 2100–4600 m.

Ecology: Moist, open grasslands.

Flowering: July–September. **Fruiting:** August–December.

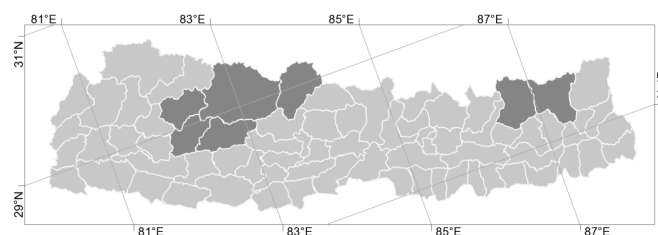
Juice of the roots is applied to wounds.

4. *Parnassia kumaonica* Nekr., Bull. Soc. Bot. France 74: 646 (1927).

Flowering stems 1–6, 2–6 cm. Radical leaves 1–6, petioles 1–3 cm. Leaves cordate to ovate, 4–10 × 3–8 mm, base cordate or truncate, apex obtuse, rarely acute, margin entire. Cauline leaf usually near flower or in the upper half of stem, cordate to ovate, 3–10 × 2–8 mm, base semi-amplexicaul, apex acute or obtuse, margin entire. Flowers white, 0.5–1 cm across. Hypanthium 1.5–2 mm. Sepals ovate to oblong-ovate, 3–6 × 2–4 mm, base rarely with a few brown hairs, apex obtuse, margin entire. Petals obovate, 3–8 × 2–4 mm, base cuneate, apex obtuse or retuse, margin entire, undulate or rarely minutely fimbriate at lower half. Filaments usually unequal, 1.5–5 mm; anthers 1–1.5 mm. Staminodes 2.5–3.5 mm, 3-lobed, lobes ca. 0.5 mm, glands absent or indistinct. Ovary semi-inferior, 4–5 mm. Style 0.5–1.5 mm, stigma 3-lobed.

Fig. 1c-e

Distribution: Nepal and W Himalaya.



Altitudinal range: 3500–4700 m.

Ecology: Open, moist places and on mossy rocks.

Flowering: June–September. **Fruiting:** August–October.

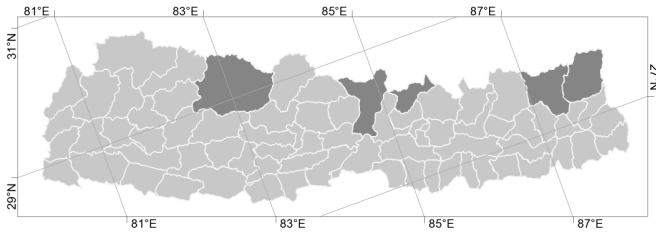
5. *Parnassia chinensis* Franch., Bull. Soc. Bot. France 44: 252 (1897).

Flowering stem one to many, 2.5–7 cm. Radical leaves 1 to many, petioles 1–4 cm. Leaves broadly ovate to cordate, 3–10

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× 2–10 mm, base usually cordate, rarely truncate, apex obtuse, margin entire. Cauline leaf near middle or in lower half of stem, rarely in upper half, ovate to cordate, 3–7 × 2–6 mm, base semi-amplexicaul, apex obtuse, margin entire. Flowers white, 0.5–1 cm across. Hypanthium 2–3 mm. Sepals ovate to oblong-ovate, 2.5–5 × 1.5–4 mm, base rarely with brown hairs, apex obtuse, margin entire. Petals obovate to narrowly obovate, 5–10 × 2–3.5 mm, base cuneate or sometimes narrowed into a claw, usually with few hairs at base, apex obtuse, margin fimbriate except at apex and base. Filaments 1.5–7 mm, sometimes unequal; anthers 3–4 mm. Staminodes 2–3 mm, 3-lobed, lobes 0.5–0.7 mm, glands absent or indistinct. Ovary semi-inferior, 3–4 mm. Style 0.5–2 mm, stigma 3-lobed.

Distribution: Nepal, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.

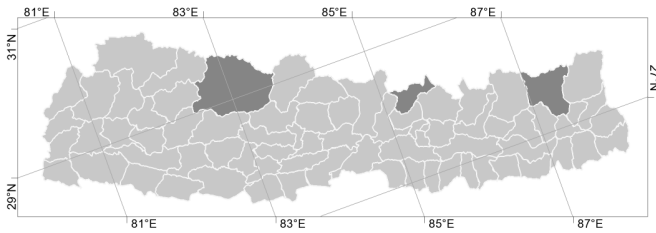


- 1a Margin of petals densely fimbriate except at base and apex, usually with a few hairs at base var. **chinensis**
- b Margin of petals slightly fimbriate except at apex and base, base without hairs..... var. **ganeshii**

Parnassia chinensis Franch. var. **chinensis**

Margin of petals densely fimbriate except at base and apex, usually with a few hairs at base.
Fig. 1a-b

Distribution: Nepal, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 3300–4600 m.

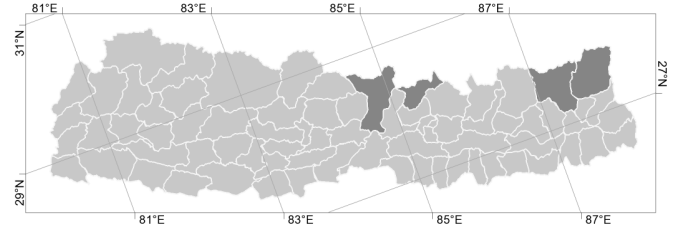
Ecology: Moist and rocky places.

Flowering: July–August. **Fruiting:** August–September.

Parnassia chinensis var. **ganeshii** S.Akiyama & H.Ohba, Bull. Natl. Sci. Mus., Tokyo, B. 27(4): 129 (2001).

Margin of petals slightly fimbriate except at apex and base, base without hairs.

Distribution: Endemic to Nepal.



Altitudinal range: 3900–5200 m.

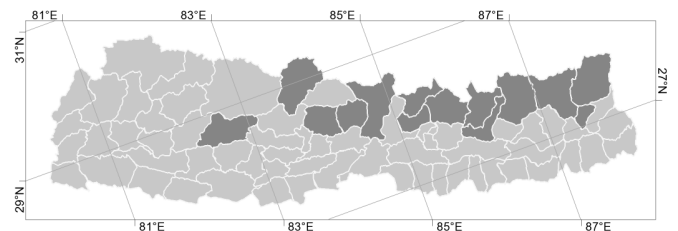
Ecology: Alpine meadows.

Flowering: July–August. **Fruiting:** August–September.

6. *Parnassia pusilla* Wall. ex Arn., Companion Bot. Mag. 2: 315 (1837).
Parnassia affinis Hook.f. & Thomson; *P. pusilla* Wall. nom. nud.

Flowering stem usually solitary, 2–10 cm. Radical leaves many, petioles 1–3 cm. Leaves usually cordate, rarely ovate, 3–10 × 2–8 mm, base usually cordate, rarely truncate, apex acute or obtuse, margin entire. Cauline leaf near middle or in lower half of stem, rarely in upper half, cordate or ovate, 3–8 × 1–7 mm, base semi-amplexicaul, apex acute or obtuse, margin entire. Flowers white, 5–8 mm across. Hypanthium ca. 2 mm. Sepals ovate to oblong-ovate, 2–4 × 1.5–3 mm, base rarely with brown hairs, apex acute, margin entire. Petals obovate or narrowly obovate, 4–8 × 1.5–3.5 mm, base cuneate sometimes narrowed into a claw, apex obtuse or retuse, margin entire or slightly erose. Filaments sometimes unequal, 1.5–4 mm; anthers 0.5–1 mm. Staminodes 2–2.5 mm, 3-lobed, lobes 0.5–1 mm, glands absent or indistinct. Ovary semi-inferior, 1.5–3 mm. Style 0.5–0.7 mm, stigma 3-lobed.
Fig. 1i-k

Distribution: Nepal, W Himalaya, E Himalaya and Tibetan Plateau.



Altitudinal range: 2200–4400 m.

Ecology: Moist places.

Flowering: July–September. **Fruiting:** August–November.

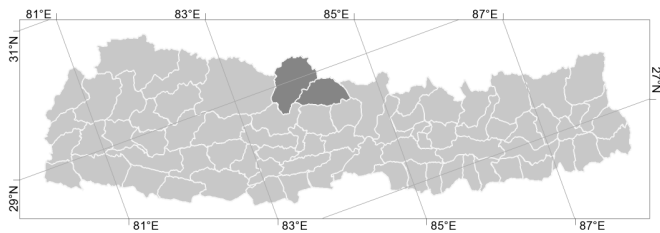
Clarke misapplied the names *Parnassia mysorensis* Heyne (Fl.

Brit. Ind. 2: 402. 1878) and *P. ovata* Ledeb. (Fl. Brit. Ind. 2: 403. 1878) to this species.

7. *Parnassia trinervis* Drude, Linnaea 39: 322 (1875).

Flowering stem usually 1–3, rarely more, 2.5–13 cm. Radical leaves 3–9 (to many), petioles (0.5–)1–1.5(–3) cm. Leaves ovate to narrowly ovate, 0.5–1.5 × 0.3–1 cm, base rounded to cuneate, apex acute, margin entire. Cauline leaf usually in lower half of stem, sometimes in the middle, ovate to ovate-lanceolate, 0.5–1 × 0.5–0.8 cm, base semi-amplexicaul, apex acute or obtuse, margin entire. Flowers white, ca. 1 cm across. Hypanthium ca. 2 mm. Sepals oblong-ovate, 2.5–4.5 × 1.5–3 mm, base rarely with brown hairs, apex rounded to obtuse, margin entire. Petals obovate or narrowly obovate, 6.5–10 × 2–4 mm, base gradually narrowed, apex obtuse or rounded, margin entire or sometimes slightly erose. Filaments usually equal, 3–5 mm; anthers 0.5–1 mm. Staminodes 2–2.5 mm, 3-lobed, lobes ca. 0.5 mm, glands absent or indistinct. Ovary semi-inferior, ca. 2 mm. Style ca. 0.5 mm, stigma 3-lobed. Fig. 1o-q

Distribution: Nepal, Tibetan Plateau, Assam-Burma and E Asia.



Altitudinal range: 3500–4900 m.

Ecology: Open, moist places.

Flowering: July–August. **Fruiting:** August–September.

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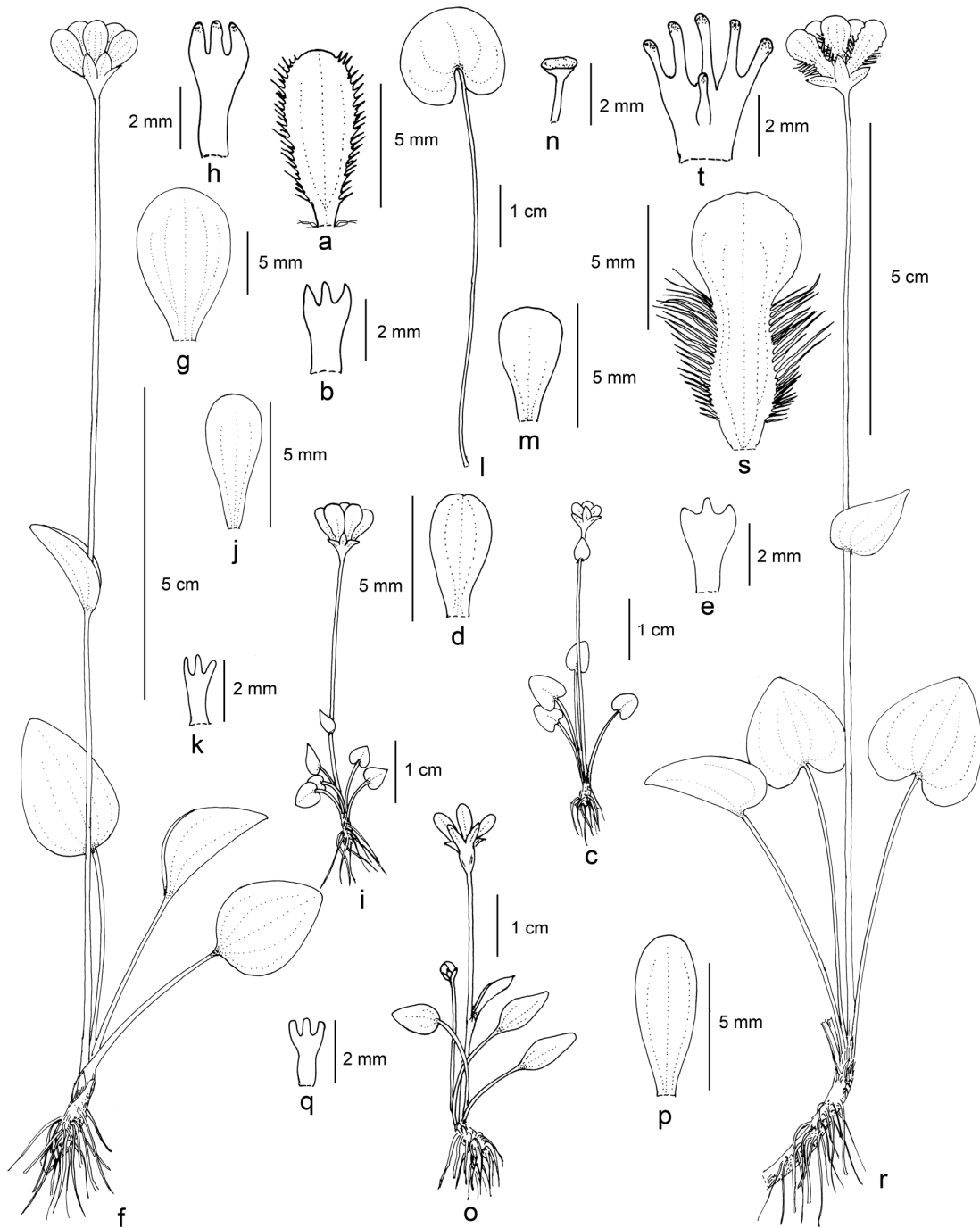


Fig. 1.
 PARNASSIACEAE. **Parnassia chinensis** var. **chinensis**: a, petal; b, staminode. **Parnassia kumaonica**: c, flowering plant; d, petal; e, staminode. **Parnassia nubicola**: f, flowering plant; g, petal; h, staminode. **Parnassia pusilla**: i, flowering plant; j, petal; k, staminode. **Parnassia tenella**: l, leaf; m, petal; n, staminode. **Parnassia trinervis**: o, flowering plant; p, petal; q, staminode. **Parnassia wightiana**: r, flowering plant; s, petal; t, staminode.

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Fig. 1

Bhaskar Adhikari

How to use this pdf web edition

This Web-edition pdf document forms part of a set of Flora accounts for families and genera that have been finalized, including those in volumes yet to be printed. These pdf documents are made accessible via the *Flora of Nepal* website (www.floraofnepal.org) and will be periodically updated in numbered versions, permanently available and citable.

Flora of Nepal takes an innovative approach to Flora writing, with an underlying data base system managing the *Flora of Nepal Knowledge Base* from which the printed volumes and the 'online Flora' (www.floraofnepal.org) are generated. The Internet-accessible dataset augments the printed Flora by presenting all herbarium specimen data, detailed taxonomic information (such as full nomenclatural references and typification), distribution maps with point occurrences and images used when preparing the Flora. Much of this information is accumulated as a normal part of taxonomic working practices when undertaking a floristic revision, but it is usually lost to a wider audience as it is rarely included in the traditional printed Flora.

Flora of Nepal includes all native and fully naturalized vascular plants recorded within the political borders of Nepal, including brief references to agricultural and horticultural plants as appropriate. For pragmatic reasons the arrangement of families in the printed *Flora of Nepal* follows a modified Englerian sequence, closely following that of the *Flora of China* and, to a lesser extent, the *Flora of Bhutan*.^{1,2} In recent years the world view on the arrangement of families has radically changed following overwhelming phylogenetic evidence. The emergent family-level classification, now in its third iteration as APG III, is reasonably stable and widely accepted.³ It has not been possible to alter the family sequence in *Flora of Nepal* printed volumes midway through the project, but as the data are stored separately in a database, the families can be reorganized electronically at a later date to reflect alternative classifications. Circumscription of families and genera, however, generally does follow a contemporary understanding of their relationships, except where group experts advise otherwise. Genera and species are treated in taxonomic order, or if there is disagreement then morphologically similar species are usually grouped together or occasionally listed alphabetically. Intraspecific taxa are always presented in alphabetical order. Intermediate ranks, such as subfamily, tribe, subgenus, section and series, are only used when they are useful in the treatment of large families or genera.

Information on nomenclature and classification is given for all accepted scientific names and synonyms pertaining to Nepal and nearby regions. Emphasis is given to those names listed in the primary checklists for Nepal: *Enumeration of the Flowering Plants of Nepal*,⁴ *Annotated Checklist of the Flowering Plants of Nepal*,⁵ and *Flowering Plants of Nepal (Phanerogams)*.⁶ At the generic level, synonyms widely used in the Asian literature are included. Full bibliographic citation with authorship is given for all accepted names and their basionyms at the rank of genus and below. As far as possible, the bibliographic citations of all accepted names and their basionyms have been verified with the original literature. The basionym precedes all other synonyms, which are listed alphabetically. Misapplied names (misidentifications encountered in the literature) are not included in synonymy, but are discussed in the supporting information at the end of a taxon. Authors of plant names follow the standard forms given in *Authors of Plant Names* and its continuously updated online supplement (www.ipni.org).⁷ Bibliographic references are given using the standard abbreviations in BPH-2 for serial publications (journals and periodicals) and in TL-2 (and its supplements) for books.^{8,9} In some cases books were published in several fascicles on different dates, sometimes over different years, but not indicated as such in the printed work. Date of publication is critical for establishing nomenclatural priority, and so it is important to be precise when citing names published in such works. The fascicle composition and publication dates of these often complex cases are clearly explained in TL-2, but the standard abbreviation does not differentiate between them. In these instances the TL-2 abbreviation has been amended with brackets to clearly indicate which fascicle is being referred to, for example Wallich, N., Pl. As. Rar. 2[8]. 1831. Books and periodicals not included in these two standard references have been abbreviated according to the recommendation in Appendix A of BPH-2.

Where a taxon has a widely recognized local name this is given in Devanagari script, followed by its transliteration into the Latin alphabet and the language of the vernacular name in parentheses '()'. One local name is given in the printed *Flora*, whereas multiple alternative vernacular names in different languages may be included in the *Flora of Nepal Knowledge Base* and made available online. Separate indexes to vernacular names in Devanagari, their Latin transliterations and scientific names are included at the end of each volume.

Descriptions are given for all taxa (family, genus, species, infraspecies and occasionally intermediate ranks) and wherever possible are based on primary observations and measurements made on specimens from Nepal. If no such material was available to authors, descriptions are taken from specimens from adjacent countries or secondary sources, and annotated as such. Most descriptions are about 150 words long, but exceptionally they are shorter or longer depending on the complexity of the taxon being described. For species with more than one infraspecific taxon, a full description is given for the species and short diagnoses for the lower taxa. Descriptions aim to be consistent and parallel between taxa of the same rank within a higher taxon. Authors were asked to standardize descriptive terms using the definitions given in *Plant Identification Terminology*.¹⁰ If a single measurement is given it refers to length, and if width is also given it is in the format length x width. Ranges are separated by an en-dash (–) and discontinuous states by the word 'or'. Exceptional measurements are given in parentheses '()'. Taxon statistics and short statements on worldwide distribution are provided for families and genera, with summary statistics of lower taxa represented in Nepal.

Identification keys are dichotomous and presented in a bracketed format, with all elements strictly parallel between the two leads of each couplet. Keys are artificial and not intended to reflect any taxonomic classification. There is usually a single key to genera within a family, combining flowering, fruiting and vegetative characters, but where this is unwieldy separate keys are given for flowering and fruiting material (e.g. *Cruciferae*, *Rosaceae*). Keys are also given for species within a genus and taxa within a species. Figures are provided to aid identification by illustrating the diagnostic characters of each family and genus, and for large genera variation in major morphological features is represented.

The geographic distribution within Nepal is indicated for each species and infraspecific taxon at the political district level by a shaded distribution map. The distribution maps are evidence-based, produced from the *Flora of Nepal Knowledge Base* using locality information taken from authenticated herbarium specimens and records of plants *in situ* made by credible observers. Ideally all specimens identified by authors should be geo-referenced and databased when they are preparing *Flora of Nepal* accounts, but where this is not possible a minimum of one specimen per district is required. Sometimes the distribution of a species is greater than the sum of the distribution maps of its infraspecific taxa. This is a result of some herbarium specimens only being identifiable to species level. Occasionally species are known only from poorly localised collections, especially those from the early 19th century. For example, Wallich often only gave 'Nepalia' as the locality for many of his 1820–1821 collections. These specimens are most likely to have come from the Kathmandu Valley, known as the 'Nepal Valley' or just 'Nepal' at that time, but they might also have been collected during his inward and outward journeys from India via Hetauda, or by pilgrims going north to 'Gossainthan' (Gossainkund). It is therefore impossible to be sure of the correct district and in such cases this is noted in the supporting information and the map omitted. The *Flora of Nepal* website gives access to the underlying distribution and specimen information through an interactive dot map plotting all geo-referenced occurrence records and a listing of all material recorded.

Distribution for species and infraspecific taxa occurring outside Nepal is indicated by a list of geographical regions, with the resolution becoming coarser with increasing distance from Nepal. In order to utilise information contained within other published Floras these areas are defined according to political borders, with countries or provinces grouped to form regions that have some underlying biogeographic basis. For example, although the Tibetan Plateau extends into parts of Sichuan and Yunnan, we limit it to Xizang and Qinghai. *Flora of Nepal* takes no stance on any politically disputed border areas and is following the current

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international mapping convention of using the 'lines of control' to delineate its regions. The names used for the regions are intended to be descriptive and non-political. The regions are:

<i>W Himalaya</i>	India (Jammu & Kashmir, Himachal Pradesh, Uttarakhand), northern Pakistan (Khyber Pakhtunkhwa, previously known as North West Frontier Province).
<i>E Himalaya</i>	Sikkim, Darjeeling, Bhutan, NE India (Arunachal Pradesh).
<i>Tibetan Plateau</i>	China (Xizang, Qinghai).
<i>Assam-Burma</i>	Assam, Nagaland, Manipur, Myanmar.
<i>S Asia</i>	Eastern Pakistan (Punjab, Sind, Islamabad), Peninsular India, Sri Lanka, Bangladesh, Maldives.
<i>E Asia</i>	China (excluding Xizang, Xinjiang, Qinghai), Korea, Japan, Taiwan.
<i>SE Asia</i>	Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea.
<i>N Asia</i>	China (Xinjiang), Russia, Mongolia.
<i>C Asia</i>	Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan.
<i>SW Asia</i>	Afghanistan, western Pakistan (Baluchistan, Federally Administered Tribal Areas), Iran, Middle East, Arabian Peninsula, Turkey, Azerbaijan, Armenia, Georgia.
<i>Asia</i>	collective term for all above areas of Asia.
<i>Europe</i>	includes Ukraine, Belarus, Baltic republics.
<i>Africa</i>	includes Madagascar.
<i>N America</i>	includes C America south to Panama.
<i>S America</i>	south of Panama.
<i>Australasia</i>	Australia, New Zealand, Pacific Islands.
<i>Cosmopolitan</i>	collective term for a generally worldwide distribution.

Altitudes (elevation above sea level) are based on herbarium specimen data or records from credible observers. They are given to the nearest 100 m rounded up or down, with exceptional altitudes given in parentheses '()'. Likewise, flowering and fruiting times are based on specimens collected from Nepal, or on material from adjacent regions if these data are lacking and a note is provided to explain this. The short statement on the ecological preference of each species and infraspecific taxon is mostly taken from herbarium specimen data. Currently these often lack detail, a reflection of the shortcomings of poor-quality data recorded by the past collectors of herbarium material, but these will improve with more field studies.

Supplementary information is given at the end of a taxon account discussing taxonomic issues, highlighting spot characters useful for identification, noting similar species that could cause confusion, and detailing the misapplication of names. Summary information is provided for ethnobotanical and other uses, but this is not intended to be exhaustive and is derived from secondary sources, such as *Plants and People of Nepal* and *A Compendium of Medicinal Plants of Nepal*.^{11, 12}

Abbreviations

Standard abbreviations for the International System of Units (SI) are used for measurements. Herbaria are cited using the standard abbreviation in *Index Herbariorum*.¹³ Other abbreviations used in the text include:

C	central.
ca.	<i>circa</i> – about, approximately.
comb. nov.	<i>combinatio nova</i> – new combination of name and epithet.
dbh	diameter at breast height – measured on tree trunks at 1.3 m above the ground.
E	east, eastern.
et al.	<i>et alia</i> – and others.
fig.	figure.
N	north, northern.

nom. cons.	<i>nomen conservandum</i> – name officially conserved in ICBN. ¹⁴
nom. illegit.	<i>nomen illegitimum</i> – illegitimate name, according to ICBN. ¹⁴
nom. inval.	<i>nomen invalidum</i> – invalid name, according to ICBN. ¹⁴
nom. nud.	<i>nomen nudum</i> – name lacking a description, or reference to an effectively published description, and so invalid according to ICBN. ¹⁴
nom. rej.	<i>nomen rejiciendum</i> – name officially rejected in ICBN. ¹⁴
nom. superfl.	<i>nomen superfluum</i> – name superfluous when published, and so illegitimate according to ICBN. ¹⁴
pl.	plate.
q.v.	<i>quod vide</i> – which see.
S	south, southern.
s.l.	<i>sensu lato</i> – for a taxon treated in a broad sense.
s.s.	<i>sensu stricto</i> – for a taxon treated in a narrow sense.
sect.	section.
subfam.	subfamily.
subgen.	subgenus.
subsp.	subspecies.
subvar.	subvariety.
syn.	synonym
var.	variety.
W	west, western.
>	greater than
<	less than

References

- 1 Wu, Z.Y., Raven, P.H. & Hong, D.Y. (1994–ongoing). *Flora of China*, Science Press (Beijing) & Missouri Botanical Garden Press, St Louis [available online at flora.huh.harvard.edu/china].
- 2 Grierson, A.J.C., Long, D.G. & Noltie, H.J. (1983–2002). *Flora of Bhutan*, Royal Botanic Garden Edinburgh, Edinburgh.
- 3 Angiosperm Phylogeny Group III (2009). 'An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants': APG III. *Bot. J. Linn. Soc.* 161: 105–21.
- 4 Hara, H., Stearn, W.T., Williams, W.T. & Chater, A.O. (1978, 1979, 1982). *An Enumeration of the Flowering Plants of Nepal*, 3 volumes, Trustees of the British Museum (Natural History), London.
- 5 Press, R., Shrestha, K.K. & Sutton, D.A. (2000). *Annotated Checklist of Flowering Plants of Nepal*, Natural History Museum: London & Tribhuvan University, Kathmandu [updated version available online at efloras.org].
- 6 Singh, A.P., Bista, M.S., Adhikari, M.K. & Rajbhandari, K.R. (2001). *Flowering Plants of Nepal (Phanerogams)*, HM Government of Nepal, Ministry of Forests, Department of Medicinal Plants, Kathmandu.
- 7 Brummit, R.K. & Powell, C.E. (1992). *Authors of Plant Names*, Royal Botanic Gardens, Kew, London [available online with revisions at www.ipni.org].
- 8 Bridson, G.D.R. & Smith, E.R. (1991). *Botanico-Periodicum-Huntianum*, ed. 2, Hunt Institute for Botanical Documentation, Pittsburgh.
- 9 Stafleu, F.A., Cowan, R.S. & Mennega, E. (1973–1988). *Taxonomic Literature*, ed. 2 (TL-2), Bonn, Scheltma & Holkema, Utrecht/Antwerpen; dr. W. Junk b.v., The Hague/Boston [available online at tl2.idcpublishers.info].
- 10 Harris, J.G. & Harris, M.W. (2001). *Plant Identification Terminology*, ed. 2, Spring Lake Publishing, Utah.
- 11 Manandhar, N.P. (2002). *Plants and People of Nepal*, Timber Press, Oregon.
- 12 Baral, S.R. & Kurmi, P.P. (2006). *A Compendium of Medicinal Plants in Nepal*, Mass Printing Press, Kathmandu.
- 13 Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (eds) (1990). *Index Herbariorum. Part 1: The Herbaria of the World*. ed. 8. New York Botanic Garden: New York. [available online with revisions at sweetgum.nybg.org/ih].
- 14 McNeill, J., Barrie, F.R., Burdet, H.M., Demoulin, V., Hawksworth, D.L., Marhold, K., Nicolson, D.H., Prado, J., Silva, P.C., Skog, J.E., Wiersema, J.H. & Turland, N.J. (eds) (2006). *International Code of Botanical Nomenclature (Vienna Code)*, Regnum Vegetabile 146. Gantner, Ruggell.