

# THE FLORA OF THE DEOSAI PLAINS

By Dr. R. R. Stewart

The Deosai Plains are located on the north slope of the main Himalayan Range. They were formerly a part of the old State of Kashmir but they are now controlled by Pakistan. Astor District of the Gilgit Agency lies to the west ; the Gilgit Agency and Baltistan lie to the north and the Dras District of Kashmir is towards the east. The whole area except a small corner toward Dras and Kargil is treeless and uninhabited. The region lies between 76 and 77' east longitude and it is crossed by the 35th parallel. The area is roughly 2,500 sq. miles in area and as almost all of it is above 13,000' in altitude, the flora is alpine and much like a bit of arctic tundra.

The plains are surrounded on all sides by a rim of high mountains and the passes by which one enters are from 13,500 to 16,500' in altitude so that visitors are never likely to be numerous. Lying so far back in the mountains the streams which drain the area have not yet cut deep gorges. The slope of all the upper valleys is gentle and in many places there are swamps with a black peaty soil which provide breeding places for myriads of mosquitoes which make a journey in the region a torment during the summer as is the case in many places in the Arctic. Until late in the summer a visitor needs gloves and a face net.

There are a number of small lakes at the heads of valleys and it is probable, from the evidence of old moraines, that the whole area was under ice during the Pleistocene. This would suggest that the present flora is recent and has migrated into this region since the last Ice Age. Snow lies all summer in sheltered places and there are still some small glaciers in the mountains. Few would ever have crossed these barren plains but for the fact that they furnished a summer short cut for travellers going from the Kashmir and the Kishenganga Valley to Skardu or for persons from Astor and Gilgit desiring to go to Dras or Ladakh.

We saw little animal life except for the mosquitoes and the marmots. Bears are reported. There is a small species of fish often called snow trout with very oily flesh which is abundant and which can sometimes be caught in blankets or thrown out of the water by hand if a shoal of fish can be frightened into shallow water. Travellers must take fuel as well as food with them. We were fortunate in being able to buy a goat from the only shepherds we saw on the Bara (Large) Deosai. There is so little grazing by goats or wild animals that the vegetation is largely in a natural condition unlike most Himalayan valleys which are overgrazed and where the natural climax cannot develop.

There are two main routes across the Deosai from the Upper Kishenganga Valley. The first starts at Minimarg (9,300') and ascends the Burzil Pass (13,900') as far as the rest house at Burzil Chowki (11,740'). [Burzil, by the way, means white birch.] Leaving the pony track which goes to Gurikot, Astor and Gilgit the path goes roughly northeast until it enters the Little Deosai by the Mir Parzil Pass (12,800') and then goes north toward Skardu after crossing the Sarsangar Pass (14,200'). We intended to leave the plains by the Burji La, (15,900') but although it was late in July 1940 the pass was still closed by snow and we had to go about a day's march further east and descend to the Indus at Skardu by the Satpura La which is not quite so high.

The second main route is at right angles to this and does not touch it at any point though it also begins at Minimarg. It ascends the Kishenganga to a little above the beautiful meadow at Domel, where two streams meet, and then turns east toward the Kashmir-Ladakh Road. The path ascends the Nagai Nullah to the Deosai Pass. On both routes tents must be taken as there is no shelter by the way. The first halt is at Domel. The second is in a thicket of dwarf willows below a large moraine at the bottom of the steep descent from the pass. The third camping place is above Gulteri on the Shingo River where there are some willow trees. The fourth day brings the road down to a few stone huts, some scanty cultivation and a few abandoned fields on benches above the river. By this time the plains have ended as the river has cut a gorge for itself which is difficult to descend. The road then leaves the Shigar and goes right, ascending to the Marpo La (15,600') and descending to Dras (9000'). Dras is a stage on the main Kashmir-Ladakh road.

In the list which follows I have included the plants found on both of my journeys across the Deosai and those which have been listed by other travellers in the area. Most of the plants mentioned grow above 12,000' but for completeness sake I have noted those found at Burzil Chowki and above, those in the Gulteri area, plants of the Upper Satpura Nullah toward Skardu and those on the Dras side of the Marpo La down to about 12,000'. Almost all of the region is above the tree line. There are birches and *Pyrus lanata* at Burzil Chowki and there are small birches on the ascent to the Marpo La from Gulteri. There are willow trees by the river in Gulteri and prostrate junipers in the Upper Satpura Nullah. Near the road on the Deosai the dwarf junipers mentioned by early travellers seem to have been exterminated for fuel.

No one seems to have been on the plains long enough to have gathered meteorological data. The first European to cross seems to have been Vigne in 1835. He states that the plains are only free of snow for about two and a half months, from the middle of July to the first of October. No attempt is made to cross in the winter but he states that it is possible to cross on hard snow from the middle of April to the middle of June. It is then an impassable lake for about a month. The winter snow is said to be five or six yards deep.

As a result of these severe conditions and the short growing period most species are in bloom at the same time. In the last week in July we found *Anemone pulsatilla* and *Caltha palustris* in fruit along with dwarf willows. Most species were in flower but there was an *Artemisia* and a *Tanacetum* which was still in bud. It was evident that plant collecting is only worth while in July and August. Early September would be a good time to collect seeds.

In the valley bottoms the soil may be completely covered by plants but there is much bare soil on the slopes. Many plants in addition to the grasses and sedges grow in tufts. A small *Thesium* seems to be the only parasite. Annuals are not very common. Dwarf perennials are abundant. Species of *Draba*, *Potentilla*, *Saxifraga* and *Androsace* form cushions on the high ridges and passes. Few plants are more than knee high and most leaves are small. To me the most interesting plants are those which are specialized for life in the gravel slides near the upper limit of plant growth. They are able to send up underground shoots or suckers to the surface when covered by sliding sand and gravel.

They have a remarkable root system to keep them well anchored. Examples are *Corydalis crassifolia*, *Nepeta longibracteata*, *Lagotis globosa*, *Saussurea gnaphaloides*, *Soroseris deasyi*, *Arabis tibetica*, *Oxytropis cachemirica* and *Lychnis apetala*.

There is here very little in common with the desert flora a few miles to the north in the valley of the Indus and its tributaries. There are, however, numbers of Central Asian plants like *Aconitum rotundifolium*, *Biebersteinia odora*, *Geranium collinum*, *Potentilla salessoviana*, and *Anemone pulsatilla*. Most of the species are Himalayan and are found at similar altitudes in Kashmir and many of them are found on the Karakorum as well. Many of the Linnaean species are widespread in the northern hemisphere. Examples are *Polygonum islandica*, *P. viviparum*, *Oxyria digyna*; *Hippuris vulgaris*, *Thymus serpyllum* and *Cystopteris fragilis*.

There are few if any endemic species. Fedde described two new species of *Corydalis* from Meebold's collections made on the Burji La in 1905, *Corydalis onobrychis* and *C. onobrychoides*. Toppin found the second of these species in Chitral. There are only a few lichens and mosses. *Carex*, *Kobresia*, *Juncus* and grasses are well represented and *Salix* sp. are common along streams. Because of the altitude there are not many water plants. Xerophytic species of *Polygonum* and *Sempervivum* grow on dry, gravelly hill sides. *Carex obscuripes* is the commonest sedge in marshes and *Alopecurus aequalis* is the only aquatic grass though others grow in damp soil.

The first to collect plants on the Deosai was G. T. Vigne (12) who crossed in 1835, but he was not a trained botanist, and by the time his specimens reached Royle for identification they were practically worthless. Hugh Falconer joined Vigne in Skardu in 1837 and he made excellent collections in Dras and Baltistan but no record of his discoveries has ever been published in systematic form although Hooker and others have made use of his collections.

Richard Strafchev (10), J. E. Winterbottom and Thomas Thomson (11) collected widely in the Western Himalayas from 1847 to 1849 in connection with the Tibetan Boundary Survey and there are specimens at Kew collected "in Deotsu," the old name of this region both by Winterbottom and by Thomson.

In 1876 C. B. Clarke, on his journey to the Karakorum Mts. crossed the Deosai from north to south, entering by the Burji ("Barji" La) and descending to the Kishenganga Valley (Neelam) by the Burzil Pass. Some of his collections are cited in the Flora of British India.

In 1892 J. F. Duthie (4) of the Indian Botanical Survey skirted the northern edge of the Deosai while travelling from Dras to Skardu and then went on into Astor by the Alampi La. He visited Kashmir again in 1893, travelling to the south of the Deosai, ascending the Burzil Pass and visiting the Sherzan Lake at the edge of the plains.

Alfred Meebold (7) crossed the Deosai in 1905 by the route followed by Clarke in 1876. In the account of his trip he remarked that he did not find much of interest. This may have been because he crossed late in the season.

Filippo De Filippi (3) of the Abruzzi Expedition to the Karakorum Mts. in 1909 published a list of 39 species he found on the Deosai.

Walter Koelz, collecting for the Bureau of Plant Industry of the U. S. Dept. of Agriculture crossed the Deosai from south to north in 1936. When I arrived in America on furlough in 1941 most of his specimens were still unnamed and I was glad to be able to study them along with my own from Kashmir.

My two trips to the Deosai were in 1940 and 1946. On both trips I was assisted by my wife, Isabelle Darrow Stewart. In 1946, my colleague, Prof. Eugene Nasir accompanied us. In 1955 Dr. Grady Webster, then of Harvard University and Prof. Nasir ascended the Satpura La from Skardu, crossed the northwestern side of the Deosai to Chillam on the Burzil branch of the Astor River and returned by the same route except that they descended by the Burji La on their way back to Skardu.

The following families are represented by more than 10 species each and 47 families of Angiosperms are listed.

<i>Compositae</i>	71	<i>Ranunculaceae</i>	30	<i>Polygonaceae</i>	21
<i>Gramineae</i>	50	<i>Caryophyllaceae</i>	25	<i>Leguminosae</i>	20
<i>Cruciferae</i>	37	<i>Labiatae</i>	25	<i>Caprifoliaceae</i>	16
<i>Scrophulariaceae</i>	34	<i>Cyperaceae</i>	24	<i>Gentianaceae</i>	14
<i>Rosaceae</i>	32	<i>Umbelliferae</i>	24	<i>Saxifragaceae</i>	14
				<i>Boraginaceae</i>	12

The following genera have five or more species.

<i>Aconitum</i>	6	<i>Saxifraga</i>	9	<i>Pedicularis</i>	13
<i>Ranunculus</i>	7	<i>Sedum</i>	7	<i>Veronica</i>	7
<i>Aconitum</i>	5	<i>Epilobium</i>	7	<i>Nepeta</i>	13
<i>Corydalis</i>	9	<i>Pleurospermum</i>	5	<i>Polygonum</i>	15
<i>Draba</i>	10	<i>Lonicera</i>	10	<i>Salix</i>	7
<i>Lychnis</i>	5	<i>Artemisia</i>	6	<i>Juncus</i>	6
<i>Stellaria</i>	6	<i>Erigeron</i>	8	<i>Carex</i>	16
<i>Astragalus</i>	10	<i>Saussurea</i>	10	<i>Kobresia</i>	7
<i>Potentilla</i>	19	<i>Androsace</i>	8	<i>Festuca</i>	5
		<i>Primula</i>	7	<i>Poa</i>	6
		<i>Gentiana</i>	8		

*Saussurea* is the only genus which might be unfamiliar to a British botanist. *Leguminosae* which are so important on the plains are poorly represented except for two genera. *Orchis latifolia* is the only orchid and there are only 92 monocotyledons while there are 467 dicotyledons in this list. There are ten ferns and five gymnosperms.

### Acknowledgments

I am indebted to Dr. N. L. Bor of Kew for checking the names of many of the grasses, to the late Dr. F. W. Pennell of the Philadelphia Academy of Sciences for naming most of the *Scrophulariaceae*; Dr. S. I. Ali of Karachi University has checked many of the legumes, Dr. S.M.H. Jafri of Khairpur Mirs, the crucifers, Prof. Nasir of Gordon College has seen the umbles and the *Caryophyllaceae* and has been consulted many times in the Herbarium. Dr. George W. Cummins of Purdue University named the rusts; Drs. Babcock and Stebbins of the University of California named *Crepis* and *Sorooseris* and

Dr. Grady Webster looked up a number of difficult species while working at Harvard. Dr. I. M. Johnston of the Arnold Arboretum has from time to time named borages and my Primulas have been checked at Edinburgh. As there is no important Herbarium in Pakistan it is still necessary to send critical species abroad for identification.

I feel sure that this list is not complete for I have found a good many things at similar altitudes about Nanga Parbat, in the Gilgit Agency, in Dras, Baltistan, Tilel and the Kamri Pass which may occur in the Deosai area. Unfortunately no catalogue of the plants of any of these areas has been published, except the list published in German by Dr. C. Troll of the German Nanga Parbat Expedition. Troll is an ecologist and it is unfortunate that his book is not available in this country. I have manuscript lists of the plants of these areas and following my retirement in 1960 hope to find time to publish them.

## RANUNCULACEAE

### *A nemoney*

- |     |   |                      |
|-----|---|----------------------|
| I   | Achenes with long feathery styles   | <i>A. pulsatilla</i> |
| II  | Achenes with short styles embedded in dense wool, flos. 1-2"  | <i>A. rupicola</i>   |
| III | Achenes tipped with a short style, not embedded in wool, oblong, cylindrical or slightly compressed   | <i>A. obtusiloba</i> |
| IV  | Achenes with a short style, much compressed, almost winged.   |                      |
|     | (A) Flos. in simple umbels (sometimes compound) plants densely silky, leaves 5—7 lobed, scapes erect ; leaves 2-4" in diam., long petioled  | <i>A. polyanthes</i> |
|     | (B) Flos. in umbels or cymes ; glabrate, 2-4' tall, leaves deeply 5 lobed, achenes obovate oblong with a hooked beak, Leaves large, 3-10" in diam., cymes twice or thrice divided | <i>A. tetrsepala</i> |
- (1) *Anemone pulsatilla* L, (*A. albana* Stev., *A. wallichiana* Royle), 10-15000'. Common and one of the first plants to flower. Deosai Plains, Satpura La, Marpo La, Nanga Parbat etc.
- (2) *A. rupicola* Camb. var. *glabriuscula* H. & T. Satpura Nullah.
- (3) ditto var. *sericea* H. & T. Marpo La. Both forms are in found stony places on high passes and ridges, 12-15,000'.
- (4) *A. obtusiloba* D. Don, 7-15,000'. Burzil Pass, common and very variable. The flos. are often pure white and mixed with these are flowers which are white within and blue purple without. At high levels they may be golden.
- (5) *A. polyanthes* D. Don, 10-12,000'. Burzil Pass, Minimarg, Nanga Parbat (Troll).
- (6) *A. tetrsepala* Royle, 8-11,000'. Marpo La, Burzil Chowki. The tallest species ; flos. pure white, perianth parts 4 or 5.

## Thalictrum

(7) *Thalictrum alpinum* L. var. *stipitatum* Yabe, 10-17,000' in damp soil. Deosai, Burzil, Kamri etc. Dwarf and common in swampy places at high altitudes.

(8) *T. foetidum* L. (Under *T. minus* in F. B. I.), 10-12,000'. Minimarg. Shingo Vy., Deosai Camp to Gulteri. Much larger; easily recognized by its evil smell and by the numerous glandular points like tiny prickles on the lower surfaces of the leaves.

(9) *T. minus* L. var. *majus* H. & T. Near Burzil Chowki, cir 11,000'. Dras, Minimarg. The leaves are larger, the leaflets 1" long acutely 3 lobed.

## Ranunculus

I Water plants, flos. white, leaves submerged and much divided *R. trichophyllus*  
II Perennial, flos. yellow, achenes not tubercled or muricate, beaks short.

(A) Radical leaves undivided, stem leaves may be 3-7 toothed or lobed

*R. pulchellus*

(B) Leaves lobed or much divided; achenes turgid not margined.

(1) Plants dwarf

(a) Petals little longer than sepals, branches often decumbent, roots fleshy

*R. munroanus.*

(b) Erect, one flowered, sepals and upper part of stems shaggy; stems 1-3" tall, glabrous below

*R. nivalis*

(2) Plants up to 18" tall, stems many, many flowered except in alpine forms, achenes inflated in an oblong or globose head.

*R. hirtellus.*

(3) Leaves deeply divided; achenes flattened with an intramarginal rib.

*R. laetus.*

10. *Ranunculus trichophyllus* Chaix. (Under *R. aquatilis* in F. B. I.). Plains to 13,000'. Deosai, Shingo Vy., Dras. Grows in pools or in slowly moving water.

11. *R. pulchellus* C. A. M. 10-18,000', growing in swampy soil. Deosai, Marpo La.

12. *R. munroanus* J. R. Drum., (Under *R. hyperboreus* in F. B. I.) 10-14,000', growing in damp rock crevices and under sheltering rocks in shallow soil. Kamri; Deosai (Clarke).

13. *R. nivalis* L. Deosai (De Filippi).

14. *R. hirtellus* Royle, 7-16,000'. Very common and variable, Kamri, Burzil, Thalle La etc.

15. *R. laetus* Wall. 3-12,000', common, the largest species in this area. Burzil Chowki.

16. *R. indet.* Near the top of the Marpo La in bare gravel at 15,000' I found a handsome, glaucous, large flowered species which I could not identify. Possibly Central Asian.

### **Adonis**

17. *Adonis chrysocyathus* H. & T. 10-14,000' ; a handsome large flowered species growing in large tufts on alpine meadows as it is left by grazing animals as are most species of the buttercup family. Deosai.

### **Caltha**

18. *Caltha palustris* L. var. *alba* (Jacq.) H. & T. The White Marsh Marigold is everywhere in alpine water courses from 8-13,000'. It flowers very early. Deosai, Burzil and Marpo Passes.

### **Trollius**

19. *rollius acaulis* Lindl. Like *Adonis* this is common on meadows from 10-13,000' ; not in large tufts ; 3-6" tall when the flowers start but 12" or more in fruit. Burzil, Kamri.

### **Paraquilegia**

20. *Paraquilegia anemonoides* (Willd.) Ulbr. (Under *Isopyrum grandiflorum* in F. B. I.) A delightful tufted cliff plant, 11-15,000' with Anemone like flos., which are lilac outside and white within.

### **Aquilegia**

21. *Aquilegia fragrans* Bth. (Under *A. vulgaris* in F. B. I.) A handsome, large flowered, sweet scented Columbine growing on most alpine meadows and among junipers from 10-14,000'. Kamri, Burzil, Deosai.

22. *A. jucunda* F. & M. 12-14,000'. A smaller, dark blue purple form, almost black in the centre is to be expected as it grows near by on the Kamri Pass at 13,000'.

### **Delphinium**

23. *Delphinium cashmirianum* Royle, 11-16,000' ; Satpura Nullah, Deosai ; Shingo Vy., usually strigose or softly hairy and 12-18" tall, follicles 3-7, downy.

24. *D. brunonianum* Royle, 11-16,000', common on glacial moraines and near streams, with large blue purple flos and glandular stems, leaves and carpels. The leaves have a varnished appearance. The whole plant smells musky. Chopra says that the juice of the leaves is good for ticks.

### **Aconitum**

I Flos. bluish purple and white ; helmet tall, projecting upwards like a spur ; basal leaves large 6-10" in diam.

*A. leave.*

- II Flos. greenish blue with purple veins, stem leaves entire, amplexicaul ; basal leaves 2-4", 5 lobed *A. heterophyllum*
- III Flos. white ; leaves palmatipartite, segments many, leaf outline round. *A. rotundifolium*
- IV Flos. bright or dull blue, leaves much divided, palmatipartite
- (1) Stems leaves many *A. chasmanthum*
- (2) Stem leaves few *A. violaceum.*

25. *Aconitum laeve* Royle, (Under *A. lycocotum* in F. B. I.), 7-12,000', usually in forest shade. This is the largest of our species and it is often mistaken for a larkspur. In Gulmarg there is a white form. Kamri, Burzil, Minimarg.

26. *A. heterophyllum* Wall. *Atis.* Kamri, Burzil, Minimarg, Deosai, 8-13,000' Tubers much valued as a febrifuge and tonic.

27. *A. rotundifolium* K. & K. 12-15,000', Common on the Deosai, Thalle La.

28. *A. chasmanthum* Stapf., (Under *A. napellus* in F. B. I. as is the next). *Mitha telia* is very poisonous. It grows on alpine meadows or among shrubs, 8-12,000'. Deosai and Kamri Passes.

29. *A. violaceum* Jacq. There are two forms of this, one tall with stems hollow at the base, var. *robustum*, and a smaller, slender stemmed plant with leaves chiefly basal. The flos. in this species seem to be a brighter blue. Deosai, Burzil, Chillam ; leaves more divided and tubers differ from those in the last. Common in swamps and borders of streams.

### Actaea

30. *Actaea spicata* L. The Baneberry is a forest species at lower levels. The flos. are white and small in racemes 1-3" long. The only member of the family with the fruit a berry, which is elliptic or subglobose. 7-12,000'. Minimarg, Kamri, Burzil.

## BERBERIDACEAE

### Berberis

31. *Berberis orthobotrys* Bienert. Burzil Pass, Skardu, Gulteri, Sumbal. Berries and stems red.

32. *B. petiolaris* Wall. ex G. Don. A large species with flos. in a raceme and with leaves which are large and often obovate. Burzil Chowki.

### Podophyllum

33. *Podophyllum hexandrum* Royle (*P. emodi* auctt.). This medicinal plant is found on the Kamri Pass and at the Burzil Chowki. It bears a single terminal red or orange berry.



## PAPAVERACEAE

### Papaver

34. *Papaver nudicaule* L. The Iceland Poppy with pretty yellow or orange flos; grows in wet soil and shallow watercourses up to 15,000'.

## FUMARIACEAE

### Corydalis

35. *Corydalis clarkei* Prain. A rather coarse species which is not rare on high ridges and passes. Burzil, Marpo La, Mir Panzil Pass. The broad bracts are undivided.

36. *C. crassifolia* Royle, (*Cysticorydalis crassifolia* (Royle) Fedde. The thick, brittle, fleshy glaucous leaves are edible and can be used as greens. A plant of gravel slides at high altitudes. Burzil Pass.

37. *C. crithmifolia* Royle var. *munroi* Fedde. The bracts in the inflorescence are long, narrow and undivided. Deosai, Burzil.

38. *C. govaniana* Wall. The tallest species which often grows protected by juniper. There are many old leaf bases and the bracts are large and pinnatisect.

39. *C. moorcroftiana* Wall. Burji La, 15,000'; Mir Panzil Pass. A species near *C. clarkei* but the entire bracts are more linear, the leaves more divided and the spurs less saccate.

40. *C. onobrychis* Fedde. Burji La, Yusi Mar and Satpura La on cliffs.

41. *C. onobrychoides* Fedde. Fedde discovered this among Meebold's specimens of the last species.

42. *C. tibetica* H. & T. Burji La (Meebold), Burzil Pass (Coventry). A small, delicate species with finely divided leaves.

43. *C. thysiflora* Prain (*C. gortshakovii* of Fl. Brit. Ind.) This is recognized by the fact that the inflorescence is paniced, not racemose and the plants grow at the edges of water courses.

*C. elegans* Wall. is reported by Falconer but as this species is said to be *C. clarkei* Prain "in part" it is probably a duplication.

## CRUCIFERAE

### *Christolea*, (*Ermannia*; *Cheiranthus* in part).

44. *Christolea himalayensis* (Camb.) Jafri, (*Cheiranthus himalayensis* Camb.). A plant which grows in mineral soil on mt. tops and high passes, 15-17,000'; Marpo La, 15,500'; Satpura La. The pods are covered with white hairs.

## Roripa (Under Nasturtium in F.B.I.)

45. *Roripa islandica* (Oed.) Borbas. (*Nasturtium palustre* DC.). A plant of damp soil with small yellow flos ; siliculas short and round in cross section. Deosai. 4-12,000'.

## Barbarea

46. *Barbarea intermedia* Boreau. Another yellow flowered plant growing in damp places from 6-17,000'. Upper leaves pinnate.

47. *B. vulgaris* R. Br. Rather coarser than the last and usually at lower altitudes, 8-12,000 Dras, Burzil Chowki ; Kamri, Deosai.

## Arabis

48. *Arabis scaposa* O.E.S.; about 8" tall, leaves basal, 1.5-2" long ; pods 1.2" long. Kamri Pass, Ladakh, Lahul.

49. *A. tenuirostris* O.E.S. 7,500-12,000'; flos. rather small ; fruits long slender with a long slender beak.

50. *A. tibetica* H. & T. Common at high levels and able to grow in gravel slides ; flos. white and large for the genus, much branched from the base ; pods about 2" long, falcate ; 9-16,000'. Large flowered specimens of this approach *A. quinqueloba* O. E. Shulz from the Kamri Pass. The flos. are said to be larger than in *A. tibetica* with the pinnatifid leaves having two lobes on each side. This may not be distinct. Kamri, Burji, Marpo La, Dras, Deosai etc.

## Braya

51. *Braya oxycarpa* H. & T. (*Pycnophilthus uniflora* O.E.S.). A dwarf alpine perennial, 10-17,000', Marpo La (Duthie). The rootstock is stout, fleshy, covered with bleached petioles ; leaves fleshy, linear spatulate, 1" long, entire ; scapes 1-4", flos. white or purple, one to several.

## Draba

I Plants annual, flos. yellow, stems erect, 3-20 cm. tall

*D. stenocarpa*

II Plants perennial

A Leucodraba. Flos. white

(1) Plants slender, basal leaves minute, 3-10, rarely 15mm, stem leaves small (0-3)

(a) Last years basal leaves not persistent, stems hirsute ; basal leaves hairy and ciliate

*D. altaica*

(b) Last years basal leaves persistent, very white hoary

*D. winterbottomi*

(2) Plants medium size, leaves 1-2cm. long, cauline leaves often many.

- (a) Fruits elliptic lanceolate, much twisted, shorter and broader than in the next, stems sparsely leafy *D. lasiophylla*
- (b) Fruit oblong or linear with soft stellate hairs
- (c) Stems with 4-12 leaves, rarely branched, leaves usually toothed, pods longer than their pedicels *D. lanceolata*
- (d) Stems with 1-2 leaves ; pods 7-18mm. *D. tibetica*

## B Chrysodraba

- (1) Leaves not rough, leaves not hoary tomentose
  - (a) Fruits compressed ; fruiting raceme lax, leaves rigid, ciliate, with a stout midrib beneath *D. setosa*
  - (b) Fruits inflated ; fruits round at base ; leaves green below
    - (c) Leaves soft ; 6-12 seeded ; pods acute *D. oreades*
    - (d) Leaves minute, 3-4 mm. long, rigid ; pods acute *D. cachemirica*
- (2) Leaves somewhat rough and often white tomentose ; pods inflated ; pods with 8-14 seeds *D. olgae*

52. *D. stenocarpa* H. & T. 10-16,500' ; Astor, Satpura Nullah.

53. *D. altaica* (C. A. M.) Bunge, 12-17,000' ; Lal Pir (Koelz).

54. *D. winterbottomi* (H. & T.) Pohle, 14-18,000'. Burji and Satpura Passes. Hoary, white tomentose.

55. *D. lasiophylla* Royle, 14-18,000'. Burji La, (Clarke).

56. *D. lanceolata* Royle, 11-15,000'. Burzil Pass ; Satpura Nullah, Deosai, Kamri.

57. *D. tibetica* H. & T. var. *duthiei* O.E.S. Karpuchu Vy. 43-4600m.

58. *D. setosa* Royle 13-16,500' ; Deosai, Burzil Pass ; Dras.

59. *D. oreades* Schrenk, (Under *D. alpina* in F.B.I.) Kamri Pass ; Thalle La, Burzil.

60. *D. cachemirica* Gand. (Under *D. glacialis* in F. B. I.) Common, 13-16,000' Marpo La ; Deosai, Burji, Satpura.

61. *D. olgae* Regel & Schm. (?) Satpura Pass, 15-16,000'.

## Aphragmus

62. *Aphragmus oxycarpus* (H. & T.) Jafri (*A. stewartii* (Dunn) O.E.S.). A dwarf *Draba* like plant near the snow line, Deosai, Burzil, Satpura and Burji Passes. Flos. white

### **Lignariella**

63. *Lignariella obscura* (Dunn) Jafri, (*Aphragmus* in O.E.S. ; *Draba obscura* Dunn.) Burzil Pass. Near the last species.

### **Arabidopsis**

64. *Arabidopsis mollissima* (C.A.M.) O.E.S. Common on high meadows with pink-purple flos.

65. *A. mollissima* var. *thomsonii* (Hk.f.) O.E.S. Duthie in Shingo Vy. Cited by O.E.S.

66. *A. thaliana* (L.) Heynh. A small erect annual with a basal rosette and white flos. Burzil Pass, Satpura La.

### **Descurainea.**

67. *Descurainea sophia* (L.) Webb. (*Sisymbrium sophia* L.). An annual weed with tiny yellow flos. and leaves divided into filiform lobes. Gulteri.

### **Sisymbrium.**

68. *Sisymbrium brassiciforme* C.A.M. Shingo Vy. Flos. yellow and long slender pods.

### **Eutrema**

69. *Eutrema septigerum* Bunge, Burzil Pass, 4,000m. (Duthie) Cited by O.E.S. ; Thalle La.

### **Erysimum**

70. *Erysimum hieraciifolium* L. Marpo La, 11,000'. Flos. orange, fruits narrower than in the next species.

71. *E. melicentae* Dunn. This Wallflower has larger orange coloured flos.

72. *E. pachycarpum* (H. & T.) ssp. *cachemicum* (O.E.S.) Jafri. Burzil Chowki. Stems simple, leaves entire, petiolate, fruit 3-5 cm. x 2.5 mm.

### **Capsella.**

73. *Capsella bursa pastoris* L. Shepherd's Purse was found at Gulteri.

### **Thlaspi.**

74. *Thlaspi cochleariforme* DC. (*T. alpestre* Hk. f. non L.) Burzil Pass.

75. *T. cochlearioides* H. & T. Deosai, Burzil Pass, Marpo La. At higher altitudes than the last and with numerous small branches from a common base ; not so tall.

76. *T. arvense* L. An annual weed with much larger fruits. Gulteri.

## Megacarpaea

77. *Megacarpaea polyandra* Bth. Above Burzil Chowki, Minimarg. The largest of the family with fruits larger than in *Thlaspi arvense*. Stamens numerous, not 6 as in the rest of the family. The plants are used as greens and stored for winter use.

78. *M. bifida* Bth. "Deotsu" (Falconer). I did not find this species. Was it the last ?

## Chorispora

79. *Chorispora elegans* Camb. (including *C. sabulosa* Camb.). A pretty alpine with flowers white to lavender is common near melting snow and shallow running water. The beaded pods are distinctive.

80. *C. macropoda* Trautv. A similar species with leaves entire or nearly so. I wonder whether or not these specimens should be considered to be worth more than varietal rank. Top of Marpo La. This seems to be the same as *C. elegans* Camb. var. *stenophylla* O.E.S.

81. *C. sibirica* DC. An annual with yellow flowers with beaded pods bearing a sharp beak. Burzil Pass at 12,000'.

## VIOLACEAE

### Viola

82. *Viola biflora* L. The yellow violet grows on the Burzil, Burji and Marpo Passes.

83. *V. kunawarensis* Royle is a dwarf, alpine, white flowered species with lilac veins. Leaves up to .75" long, wedge shaped at base and oblong or ovate in shape. Satpura La.

84. *V. rupestris* F. W. Schum. is another high alpine meadow species with larger flowers and heart shaped leaves. Burji and Satpura Passes ; Deosai .

85. *V. sylvatica* Fries, marpo La, 11-12,000'; Burzil Pass.

## CARYOPHYLLACEAE

### Arenaria

86. *Arenaria griffithii* Boiss. A dwarf alpine with a woody root and numerous linear leaves with sharp points up to 1" long. Flos. white. Marpo La.

87. *A. neelgerrensis* W. & A. A prostrate species very much like the next but the leaves are a little shorter and rounded at the tip, not acute. Burzil and Deosai Passes up to 13,000'.

88. *A. serpyllifolia* L. Another small weedy plant with a remarkable range from the plains to the alpine zone. Burzil Chowki.

### **Minuartia** (Under **Arenaria** in the F. B. I.)

89. *Minuartia biflora* (L) Sch. & Th. (*Arenaria biflora* L.) A dwarf alpine growing in mats with the flowering stems up to 2" tall and linear leaves. Burzil Pass and the Deosai. 12-16,000'.

90. *M. lineata* (C.A.M.) Born. (Including *Arenaria foliosa* Royle and *A. Kashmirica* Edgew.) This is a taller plant, slender, erect, growing in mats in rock crevices from 8-15,000'. The glabrous form grows on the Satpura and the glandular form in the Upper Shingo Valley.

### **Cerastium.**

91. *Cerastium cerastioides* (L.) Britt., (*C. trigynum* Vill.), with pretty flowers is very common on alpine meadows, 12-16,000'.

92. *C. pusillum* Ser. vel aff., a smaller species grows on the little Deosai.

### **Dianthus.**

93. *Dianthus anatolicus* Boiss. Deosai-Chillam, 11,000' (Nasir); Shingo Vy, Marpo La, Minimarg etc. The flowers are small, pink or white and the petals are crenate toothed, not fimbriate.

94. *D. falconeri* Edgew. is reported in the F.B.I. from Astor and 'Deotsu.' I have not found it on the Deosai and suspect that it came from lower altitudes. According to Coventry the flowers are pink and the plants 1-2' tall instead of from 16-10" in the last species.

### **Leprodiclis**

95. *Leprodiclis holosteoides* (C.A.M.) Fenzl. (*Arenaria* in F.B.I.). This is a much branched, weak stemmed, weedy herb with white flowers which is found frequently in grain fields. Shingo Valley, Tilel.

### **Lychnis.**

I Seeds compressed or angled, winged; wing thick and inflated; stems scape like 1-(2-3) flowered.

(A) Plants glandular pubescent, flos. nodding.

(1) Carpophore 0 or very short

*L. apetala*

(2) ,, 1/6 to 1/4th length of the capsule

*L. nigrescens*

(B) Plants minutely pubescent, more slender, heads 1-3

*L. himalayensis*

II Seeds turgid, reniform, wingless.

(A) Stems short, single flowered, rarely 2

*L. macrorhiza*

(B) Stems elongate, flos. in cymes

*L. cachemiriana*

96. *Lychnis apetala* L. (*Melandrium apetalum* (L.) Fenzl. Common 12-17,000' Deosai, Marpo La.

97. *L. nigrescens* Edgew. (*Melandrium nigrescens* (Royle) Walp). I have specimens which seem to be this from the Burzil. Usually there is only one flower which is larger and more inflated with broad purple brown nerves ; stems more leafy.

98. *L. himalayensis* Edgew. (*Mel. apetalum* L. var. *himalayense* Rohrb.). Taller, more slender and without the glands of the last two species. Marpo La, Satpura, Deosai etc.

99. *L. macrohiza* Royle. Burzil Pass, and Duthie has one from the Lamchen Nala above Dras, 11-12,000'. Usually 12-16,000'.

100. *L. cachemeriana* Royle. Below Chillam Pass, Burzil Chowki, Minimarg, Kamri. The carpophore is broad and densely wooly and the claw of the petals are also wooly. It is usually found below 10,000'.

### Sagina

101. *Sagina saginoides* (L) Dalle Torre,, (*S. procumbens* F.B.I.). Dwarf and much branched up to 6" tall ; usually much less. Flos. green very small, often found in wet soil or the edges of streams. 6-14,000'. Chillam.

### Silene.

Calyx inflated ; 10-20 nerved ; reticulate veined, glabrous *S. venosa*  
Calyx not inflated at the base.

Flos. 1 (2-3) terminal or subterminal ; calyx 1-1.25" long *S. moorcroftiana*

Flos. in short racemes ; calyx .33-.5" long *S. tenuis*

102. *Silene venosa* (Gilib.) Aschers., (*S. cucubalus* Wib., *S. inflata* Smith). Shingo Vy., 12,000'.

103. *S. moorcroftiana* Wall. Common, 8-16,000' ; flos. greenish white ; Burzil Pass, Deosai, above Gulteri etc.

104. *S. tenuis* Willd. Common, 8-13,500' ; flos. greenish brown ; Burzil, Kamri, Deosai.

### Stellaria.

I Subscandent, tall, 2-4' ; leaf edges crisped, leaves large *S. monosperma*

II Flaccid, laxly caespitose herbs, glabrous or nearly so

A Petals equalling sepals or larger

(a) Leaves often ciliate towards the base ; flos. .33" ; plants 3-10" tall ; *S. graminea*

(b) Leaves glabrous ; capsules as long as sepals ; flos. .5-.75" ; 1-2' tall *S. glauca*

B Petals minute or absent

- (1) Stamens 10 ; plants 6-18" tall ; flos. .25" ; leaves ovate or oblong. *S. uliginosa*
- (2) Stamens 5 ; plants 6" tall ; flos. 1/6" ; leaves linear or elliptic oblong. An alpine *S. subumbellata*

III Dwarf, tufted, alpine ; leaves shining ; petals minute or none *S. decumbens*

105. *Stellaria monosperma* Ham. (*S. crispata* Wall.). Usually found in forest from 6-11,000', Burzil Chowki.

106. *S. graminea* L. Burji La. (Clarke 29,872) ; Burzil Pass.

107. *S. glauca* With. Burji La ; (Clarke 29,928). I find it hard in practice to separate these two plants. One or both are common on and about the Deosai.

108. *S. uliginosa* L. Not rare in damp shady places from 9-11,000'. Minimarg, Burzil Chowki.

109. *S. subumbellata* Edgew. This dwarf plant is not rare on high passes and near glaciers. The flos. are terminal and the pedicels soon become deflexed after flowering ; in moss ; by streams and between and under rocks. Kamri, Burzil, Burji La etc.

110. *S. decumbens* Edgew. To be expected as it is common from 11-15,000' in the Kashmir Mts. Burji La ?

### TAMARICACEAE

#### Myricaria.

Flos. white ; leaves usually .5 to .8" long *M. elegans*

Flos. pink ; leaves up to .25" in length

(1) Flowering racemes lateral as well as terminal *M. dahurica*

(2) Flowering racemes terminal *M. bracteata*

111. *Myricaria elegans* Royle, Shingo River below Gulteri at perhaps 10,000' ; Satpura Nullah. *M. bracteata* grows in the Satpura Nullah but does not reach the Deosai. *M. dahurica* grows in the Tilel Vy.

### GERANIACEAE

#### Biebersteinia.

112. *Biebersteinia odora* Steph. (*B. emodi* J. & S.). A dwarf, tufted, glandular, yellow flowered plant found in rocky places at high altitudes. Satpura La, 15,000'.

#### Geranium.

Outline of leaves rounded not angular ; 5-7 lobed, usually less than 12" tall

*G. collinum*



Outline of leaves more angular, usually taller

- (1) Flos. nearly 2" across ; leaves pentagonal in outline *G. grandiflorum*  
(2) Flos. 1.5 to 2" across ; leaves 7-9 partite *G. pratense*

113. *Geranium collinum* M. Bieb. Common in the inner Himalayas ; Burji and Satpura Passes. 12-15,000'. The glandular form is called var. *glandulosum* Ledeb.

114. *G. grandiflorum* Edgew. Kamri, Burzil and Mir Panzil Passes. Alpine meadows.

115. *G. pratense* L. Common from 7-14,000' usually 2' or more tall.

## BALSAMINACEAE

### *Impatiens.*

116. *Impatiens thomsoni* HK. f. Burzil Chowki, Chillam, Kamri Pass. Rose coloured, the spur and lip spotted with brown or yellow. 10-13,000'. Alpine meadows.

## RHAMNACEAE

### *Rhamnus.*

117. *Rhamnus prostrata* Jacq. ex Parker. A dwarf, intricately branched shrub. Deosai Pass and Marpa La. A plant of rocky ground, spinous. 9-14,000'.

## LEGUMINOSAE

### *Astragalus.*

- I Flos. in dense mostly stalked rounded heads ; flos. mostly lilac or purple.
- (A) Leaflets 13-15 ; stems up to 2' tall, calyx with black hairs ; teeth as long as tube *A. melanostachys*
- (B) Leaflets 15-17 ; stems up to 6" tall ; calyx with appressed, mixed white and black hairs ; teeth setaceous twice as long as the tube *A. oxyodon*
- (C) Leaflets 19-25
- (1) Stems zigzag, ascending, cir 6" tall, flos. .75" long *A. tibetanus.*
- (2) Stems weak, prostrate, up to 24" long ; flos. up to .5" long *A. himalayanus*
- II Flos. in long racemes ; stipules large, flos. yellow, leaflets 9-15 *A. frigidus*
- Flos. in long racemes ; stipules small, flos. yellow tinged with lilac.
- (1) Leaflets 17-19 ; pods 1" long clothed with spreading black hairs *A. maxwellii*
- (2) Leaflets 21-25 ; pods  $\frac{1}{2}$  to 5/8" long, glabrous *A. longicaulis*

- III Flos in close heads, yellow, stemless or short stemmed low shrubs
- (1) Stems distinct ; leaflets 17-25 *A. candolleanus*
- (2) Stemless
- (a) Leaf rachises not indurated ; leaflets 31-41 ; persistently hairy on both sides *A. rhizanthus*
- (b) Leaf rachises indurated ; leaflets 31-51 ; spreading hairs few on young leaves *A. webbianus*
118. *Astragalus melanostachys* Bth. Deosai in river bed.
119. *A. oxyodon* Baker, Burzil Pass, rare.
120. *A. tibetanus* Bth. Satpura Lake ; Dras. 9-14,000" (Baker).
121. *A. himalayanus* Klotzsch, common on alpine meadows and passes up to 13,000'.
122. *A. frigidus* (L.) A. Gray, Upper Satpura Nullah.
123. *A. maxwellii* (Royle) ex Bth. (*A. ciliolatus* Bth ex Baker) Minimarg, Kamri Pass. Deosai Pass, 11-13000'
124. *A. longicaulis* Baker, Burzil Pass, Kamri Pass, Deosai.
125. *A. candolleanus* Wall. ex Bth. Common 8-13,000'.
126. *A. rhizanthus* Royle. Common, 9-16,000' ; Deosai Pass, Shingo Vy. Marpo La.
127. *A. webbianus* Grah. Mir Panzil Pass, 12-16,000'.

#### Cicer.

128. *Cicer soongaricum* Steph. On dry mineral soil ; Burzil Pass, Marpo La, Shingo Vy.

#### Medicago

129. *Medicago falcata* L. Yellow Lucerne ; Gulteri on Shingo Vy. cir 10,000'.

#### Hedysarum.

130. *Hedysarum cachemirianum* Bth. Burzil Chowki and above, Deosai, Kamri, 10-13,000' Flos. red ; pods distinctly jointed.

#### Oxytropis.

- I Pods oblong cylindrical or linear oblong ; flos. purple
- (A) Flos. in permanently dense heads, most ripe pods deflexed *O. lapponica*
- (B) Heads finally sub lax ; pods ascending *O. mollis*

II Pods inflated when ripe, not much longer than broad

- (A) Stemless, leaflets 13-21, densely matted with white silky hairs,  
3-4" tall *O. tatarica*
- (B) Stems short, leaflets 13-21, clothed with white, loose silky  
hairs, 4-6" tall *O. cachemirica*

131. *Oxytropis lapponica* (Wall). Gaud. Common in the alpine zone, 9-17,000'.

132. *O. mollis* Royle (including *O. thomsoni* Bth.). Common on the Burzil and other passes. Ali who has recently studied this group has joined *O. thomsoni* with this species because of intermediates. *O. thomsoni* has larger, longer leaves and the leaflets are often more numerous ; up to 51.

133. *O. tatarica* Jacq. Grows in pure granite dust on the top of the Marpo La. Drier places on the Deosai.

134. *O. cachemirica* Camb. (*O. proboscidea* Bunge). Common on the Deosai.

### **Trifolium.**

135. *Trifolium pratense* L. The red flowered clover grows near Burzil Chowki and at Chillam.

136. *T. repens* L. The white clover is more common, Chillam, Shingo Vy., Burzil Pass.

### **Vicia**

137. *Vicia mollis* Bth. Reported from the Burzil but I do not think that I have found it above Minimarg, cir 9,500'. It is suberect, not climbing ; fresh flos. white with blue purple veins.

### **ROSACEAE**

#### **Alchemilla**

138. *Alchemilla ypsilotoma* Rothm. (*A. vulgaris* F.B.I.). Easily recognized by its orbicular, cordate, 7-9 lobed leaves and small yellow-green flos. without any petals. A plant of alpine meadows, Deosai and Burzil.

#### **Cotoneaster.**

139. *Cotoneaster humilis* Dunn. Mir Panzil Pass, Satpura Nullah, Deosai. This may well be a dwarf form of *C. integerrima* Medik.

#### **Fragaria.**

140. *Fragaria vesca* L. sens. lat. Burzil Pass, 11,000'.

## Geum.

141. *Geum elatum* Wall. Alpine meadow on the Deosai.

## Sibbaldia.

142. *Sibbaldia cuneata* Kze. (*Potentilla sibbaldi* F. B. I.). Common 7-15,000'. Bases woody ; flos. in branched cymes ; petals 5 ; stamens 5-10.

143. *Sibbaldia tetrandra* Bunge, (*Potentilla tetrandra* F. B. I.). Burji La, Satpura La. A plant of the highest passes, 14-18,000' ; "forming dense moss like patches" (Hook. f.) Flos. sessile or subsessile, small, petals 4, achenes 4, stamens 4.

## Potentilla.

Section I Receptacle with erect stiff hairs concealing the achenes. In counting the leaflets in this genus basal leaves should be used, not those near the inflorescence.

### (A) Leave pinnate

(1) Dwarf shrubs of high altitudes. Flos. yellow.

(a) Depressed, very dwarf ; leaflets 1/8-1/4", flos. sessile ;  
.3-.5" across *P. fruticosa* var.  
*pumila*

(b) A tufted alpine shrub up to 6" tall, branches obscured  
by the remains of the stipules ; leaflets 5-7, larger,  
Flos. .6" across ; peduncles exceeding the leaves ;  
flos. solitary *P. biflora*

(2) Shrubs 1-3' tall, flos. white, numerous, 1" across. *P. salessoviana*

(B) Leaves digitately 3 foliolate, stems 1-6" ; flos. solitary *P. ambigua*

Section II *Potentilla* proper. Achenes not concealed.

### (A) Root perennial

(1) Leaves interruptedly pinnate, branches prostrate. *P. anserina*

(2) Leaves not interruptedly pinnate

(a) Pinnae white below

(c) Pinnae glabrous above, without silky hairs, 3-5  
foliolate *P. multifida*

(d) Pinnae with white silky hairs on both sides, 5-11  
leaflets *P. sericea*

(e) Leaflets usually 5 (9-11), hairs long and spread-  
ing ; achenes on an elevated receptacle, minute-  
ly wrinkled. *P. leschenaultiana*

(b) Pinnae not white below

- (f) Leaflets 5-7, hirsute ; flos. corymbose, achenes on an elevated receptacle *P. fragarioides*
- (g) Leaflets 5-15 ; the lower 2-3 fid or partite *P. bifurca*
- (3) Leaves digitately 5 foliolate
- (a) Hoary with appressed white tomentum ; achenes on a villous hairy receptacle *P. argentea*
- (b) Not as above ; stems erect, plants weedy looking
- (h) Plants covered with stipitate glands *P. desertorum*
- (i) Plants similar but pubescent, not glandular ; somewhat smaller *P. arnavatensis*
- (4) Leaves digitately 3 foliolate
- (a) Leaflets narrowly linear-cuneate, truncate and trifid at the tip ; pedicels filiform, decurved, a cliff plant *P. curviseta*
- (b) not as above
- (j) Dwarf, covered with appressed white hairs *P. nivea*
- (k) Larger, leaflets white silky on both sides *P. leucochroa*
- (l) Leaflets grey on both surfaces *P. ?*
- (m) Leaflets more or less pubescent, not white or grey.
- (n) Style conical from a swollen base *P. monanthes*
- (o) Style clavellate from a narrow base *P. gelida*

144. *Potentilla fruticosa* L. var. *pumila* Hk. f. Stems many, slender but woody, Burji and Satpura passes. This seems to be what Wendelbo calls *P. dryadanthoides* Juz.

145. *P. biflora* Willd. (*P. inglisii* Royle.). A size larger than the last. I have a note that I saw this on the Satpura Pass at about 14,000'. It grows also on the Thalle La in Baltistan, not far away. It also grows in mats at high altitudes 14-15,000'.

146. *P. salessoviana* Steph. (*Comarum* auctt.). This handsome, white flowered shrub is usually found growing gregariously in stony stream beds. Satpura Nullah, 9-11,000'.

147. *P. ambigua* Camb. 7-14,000'; to be expected.

148. *P. anserina* L. (*P. pseudanserina* Bert.) A prostrate plant often creeping in damp soil. Satpura Lake cir 10,000'.

149. *P. multifida* L. Common on the Deosai at the edge of swamps. These specimens all seem to be var. *angustifolia* Lehm. 9-13,000'.

150. *P. sericea* L. Burji La, Satpura La. Variable, to 16,000'.

151. *P. leschenaultiana* Ser. Blatter unites with *P. fragarioides* L. Yusi Mar. 13,000'.

152. *P. fragarioides* L. Deosai ; Chillam, Das Kirim-Sardar-Kothi in dry soil. Usually found in the temperate zone from 4-9,000'.

153. *P. bifurca* L. Very variable in size. Chillam, Shingo Vy. Marpo La in dry gravely soil, 12,000'.

154. *P. argentea* L. Kamri Pass. May turn up on the Burzil.

155. *P. desertorum* Bunge, a weedy plant on sterile soil, pubescence glandular.

156. *P. arnavatensis* Wolf., much like the last but with a different pubescence.

157. *P. curviseta* Hk. f. Marpo La, 13,000'; Kamri. Bases woody, grows on cliffs.

158. *P. nivea* L. Burji La, Satpura La. 15-16,000'. Some would refer this to *P. saundersiana*.

159. *P. leucochroa* Lindl. Burzil Pass. 10-15,000'. This has been considered to be a variety of *P. argyrophylla* Wall., a taller, larger species with leaflets white below. Flos. usually single.

160. *P. ?* There are specimens from the Deosai which I do not have a name for. The flos. are yellow and smaller than in *P. leucochroa*; the plants are larger and the ashy coloured pubescence is different. The heads are aggregated; Plants 12-16" tall.

161. *P. monanthes* is sometimes hard to distinguish from the next species but it is usually more glandular and weedy looking. The carpels are distinctive. To be expected.

162. *P. gelida* C.A.M. Common on passes and high meadows 13-17,000'.

### **Pyrus.**

163. *Pyrus lanata* D. Don, Burzil Chowki, a tree with leaves snowy white below.

164. *P. thianshanica* Rupr. Leaflets 13-19, acuminate, glabrous or nearly so; Dras, Shingo Vy., 11,000'; Satpura Nullah, Thalle La.

### **Rosa**

165. *Rosa macrophylla* Lindl. Burzil Chowki. A smaller form with larger pink flos. is found up to 12,000' protected by juniper. Can this be Lindley's var. minor? Marpo La etc.

### **Rubus.**

166. *Rubus irritans* Focke with leaflets 3, white below, stems bristly and glandular is found at Chillam: the Satpura Nullah to 11,500' and the Burzil, 10,000'.

167. *R. saxatilis* L. A trailing, herbaceous species with a few large red sour drupelets grows at Chillam, above Minimarg, Deosai, Burzil, Dras.

### **Spiraea**

168. *Spiraea affinis* Parker. Grows on the Burzil Pass (Duthie). 8-13,000'.

169. *S. lycioides* Parker, Satpura La, Tilel, Gudhai-Chillam.

## SAXIFRAGACEAE.

### Parnassia.

170. *Parnassia affinis* H. & T. (*P. ovata* F.B.I.). Burzil and Kamri Passes in damp soil. 8-15,000'.

### Ribes.

Calyx limb, short, spreading

- (a) Sticky glandular, lobes of the leaves obtuse *R. orientale*  
(b) Nearly glabrous, lobes of the leaves acute *R. glaciale*

Calyx limb campanulate or tubular

- (a) Leaves with yellow glands beneath *R. nigrum*  
(b) Leaves without yellow glands *R. rubrum*

171. *Ribes orientale* Desf. Common in dry places 7-11,000'. Satpura Nullah etc.

172. *R. glaciale* L. Kamri Pass and Thalle La at 12,000'. Often found in the dwarf juniper zone. To be expected.

173. *R. rubrum* L. var. Satpura Nullah, 14,000'; Thalle La. Juniper zone.

174. *R. nigrum* L. 7-12,000'. Berries edible; Chillam, Satpura La, Marpo La.

### Saxifraga.

I. Rootstock stout ; leaves large with a large sheath at the base of the petiole *S. stracheyi*

II Not as above

(1) Flos. white ;

- (A) A dwarf tufted alpine, tips of leaves often 3 toothed *S. androsacea*  
(B) ditto leaves up to .25" long, dense, a perforated whitened pit at the apex of the upper leaves *S. imbricata*  
(C) Plants erect, 6-8" tall, basal leaves kidney shaped, 5-7 lobed, flos. 1-10 *S. sibirica*

(2) Flos. yellow

- (A) Plants with numerous thread like runners *S. flagellaris*  
(B) Not as above.  
(1) A dwarf alpine forming prostrate mats, leaves orbicular or elliptic up to .25" long, flos. solitary, subsessile *S. jacquemontiana*  
(2) Plants erect  
(a) Plants up to 16" tall, flos. corymbose ; leaves broadly elliptic, narrowed below *S. moorcroftiana*  
(b) Plants up to 12" tall, flos. 1-3 ; peduncles red brown villous *S. hirculus*

175. *Saxifraga stracheyi* H. & T. Common ; gregarious in rocky places, 8-14,000'; Burzil Pass top, Deosai. At Yusi Mar and elsewhere on the Deosai there is a form with narrower leaves. Under *Bergenia* in many authors.

176. *S. androsacea* L. To be expected as it is found both on the Kamri Pass and the Thalle La, 13-16,000'. Not in Hooker.

177. *S. sibirica* L. This white flowered saxifrage is very common in wet soil on alpine meadows and passes, 10-14,000'. A related species which is a size larger is found on the Kamri. It is *S. asarifolia* Sternb., 10-13,000'.

178. *S. flagellaris* Willd. ssp. *euflagellaris* Engl. & Irm. In this form the runners are glabrous and more slender. Burzil, Kamri, Deosai etc. 11-17,000'.

179. *S. flagellaris* ssp. *mucronulata* Engl. & Irm. In this the runners tend to be thicker and glandular and the leaf margins more ciliate. Common in same regions.

180. *S. jacquemontiana* Dcne. A plant of mt. tops and passes, 13-18,000'; Burzil, Burji and Marpo Passes.

181. *S. moorcroftiana* Wall. Common in damp places, 9-15,000', Chillam, Kamri, Sherzan Lake, 14,500' (Duthie).

182. *S. hirculus* L. var. *alpina* Engl. Burji La, 15,000', Satpura Nullah etc.. in swampy places. In this variety there is a single head instead of several, leaves narrowly elliptic.

183. *S. imbricata* Royle which is usually found from 12-17,000' in rocky places, forming carpets, has been found above Dras and is to be expected.

## CRASSULACEAE

### Sedum.

I Flos. yellow

(A) Plants annual, flos. solitary

*S. oreades*

(B) Plants perennial, rootstocks thick, woody

(1) Outer layer of bark thin and pale ; leaves narrowly elliptic.

*S. crassipes*

(2) Outer layer of bark dark, leaves broadly elliptic to ovate

*S. roseum*

II Flos. rosy pink-red.

(1) Leaves obovate or orbicular, a rock plant

*S. ewersii*

(2) Leaves subterete cir .25" long, approximate, an alpine

*S. quadrifidum*

184. *Sedum oreades* (Dcne.) Hamet, (*S. jaeschkei* Kurz). Up to 5" tall, usually on damp rocks 11-13,000'. Deosai.

185. *S. crassipes* H. & T. Common, 11-16,000'; rootstocks as thick as a finger ; leaves up to 1.5", linear, remotely dentate. Burzil, Deosai etc.



186. *S. roseum* (L.) Scop. Annual branches leafy arising from the axils of scales at the top of the rootstock, flos. dioecious or polygamous, stems up to 15" tall, cymes densely congested. 12-17,000' Burzil, Deosai. The roots are supposed to smell like roses.

187. *S. roseum* var. *heterodontum* Fedtschk. Leaves ovate incise dentate from a broad or cordate auriculate base prominently white margined. Satpura La.

188. *S. ewersii* Ledeb. Very common in rock crevices 8-17,000'; leaves thick and variable in size. Burzil, Kamri, Deosai etc.

189. *S. quadrifidum* Pall. Stems short, 2-5" tall, numerous from a thick root with old leaf bases, leaves subterete up to .25" long; usually growing in gravel. 11-18,000'. Burzil Kamri etc. Flos red.

190. *S. quadrifidum* var. *fastigiatum* (H. & T.) Frod. Resembles the last but with longer stems, larger flowers and fruit. Satpura Nullah, 14,000'.

### **Sempervivum.**

191. *Sempervivum acuminatum* Dcne. 4-8" tall. Annual stems arise from a rosette of thick, fleshy leaves 1-2.5" long, flos. in lax cymes, rose-purple with veins darker. 9-15,000'. A plant growing in dry mineral soil; Burzil, Kamri, Deosai. Hamet reduces to Sedum.

### **CALLITRICHACEAE. (Under HALORAGAEA (in F.B.I.))**

#### **Callitriche.**

192. *Callitriche verna* L. A slender water plant with small oblong spatulate leaves growing in swampy pools.

### **HIPPURIDACEAE.**

#### **Hippuris.**

193. *Hippuris vulgaris* L. An erect, horse tail like plant with whorls of narrow leaves growing gregariously in shallow water. Deosai Plains.

### **ONAGRACEAE.**

#### **Epilobium.**

Note. I find *Epilobium* very difficult except for the first two species which are found commonly throughout the Northern Hemisphere. There are more species than are described in the F. B. I. and Haussknecht's Monograph is out of date, hard to use and unobtainable in this country. Some of the following identifications are provisional and I have a number of specimens which I do not know what to do with.

## Section I **Chamaenerium.**

- I. Flos. irregular ; stamens deflexed on one side, young styles bent to one side.
- (A) Stems 2-4' tall, leaves up to 6 by .75", acute ; flos. rose purple in spikes. *E. angustifolium*
- (B) Stems cir 1' tall, leaves up to 3 by .75", usually obtuse, flos. similar ; Plants of stony stream beds. *E. latifolium*
- II Flos. regular, stamens erect

## Section II

194. *Epilobium angustifolium* L. Deosai 13,000'.
195. *E. latifolium* L. Common near water at high altitudes Deosai, Burzil etc.
196. *Epilobium amplexens* Bth. This or a related species is common on the Burzil at Rama and on high meadows and passes in Kashmir. The stem bases are scaly, the upper stem leaves are broadly amplexicaul ; teeth faint. The flowers are large, terminal and the fruits are erect.
197. *E. cylindricum* Don or possibly *E. tibetanum* Haussk. is a much larger species with pale pink, almost white flowers ; leaves about four times as long as broad and tapering both ways ; the lower with petioles. A plant of wet places with many stems. Kamri, Burzil Chowki etc. Common.
198. *E. davuricum* Fisch. vel aff. A small, erect plant, very slender, 6-16" tall ; apparently annual. Flos. usually one or two, terminal or axillary, pedicels slender and often more than an inch long ; leaves narrowly elliptic, erect or nearly so. Satpura Lake, as Kirim to Sardar Kothi ?
199. *E. sp.* near *lividum* Haussk. Flos. pink, in masses in wet places. Related to *E. cylindricum*. Shingo Vy.; Marpo La.

## UMBELLIFERAE

### **Anthriscus.**

200. *Anthriscus nemerosa* Spreng. Usually 7-11,000'. South slopes of Burzil and Mir Panzil Passes, cir 12,000'. Usually the dark coloured fruits are prominently hispid but specimens from the Kamri Pass and in Poonch are glabrous and have been described as var. *glabriusculus* Nasir.

### **Archangelica.**

201. *Archangelica officinalis* Hoffm. var. *himalaica* Clarke. The largest member of the family, stems hollow, growing in stream beds or where springs overflow. Deosai near Yusi Mar cir 13,000'.

### Bupleurum.

- I Flos. yellow, upper leaves cordate amplexicaul, carpels 5 winged *B. thomsoni*  
II Flos. and fruit black purple. *B. longicaule*  
III Stems numerous, usually procumbent, bracts 3-4, linear lanceolate leaves linear. *B. gracillimum*

202. *Bupleurum thomsoni* Clarke, Deosai, Burji La, Satpura La etc. Common on alpine meadows.

203. *B. longicaule* Wall. var. *himalensis* (Kl.) Clarke. Burzil, Kamri and Satpura Passes ; 9-14,000'.

204. *B. gracillimum* Kl. (under *B. falcatum* in F. B. I.). Satpura Nullah, 14,000'.

### Carum.

205. *Carum carui* L. Wild Caroway. Shingo Valley in damp soil, 9-12,000'.

### Chaerophyllum.

206. *Chaerophyllum villosum* Wall. 5-12,000'. Burzil Pass, Deosai. Stem bases hispid with retrorse hairs. Bears are said to be fond of the carrot like roots.

207. *C. reflexum* Lindl. Burzil Chowki, 11,000'.

### Heracleum.

I Lower leaves twice pinnate ; fruits up to  $\frac{1}{4}$  by  $\frac{1}{6}$ " ; plants 12-20" *H. thomsoni*

II Lower leaves much larger, pinnate or pinnatifid ; fruits .5 to cir .33" ; plants 2-6' tall *H. candicans*

208. *Heracleum thomsoni* var. *glabrior* Clarke. Satpura Pass Dras, Minimarg. A desert plant usually found from 11-15,000'.

209. *H. candicans* Wall. 6-14,000'. Often found in the junipur zone. Burzil, Deosai.

### Pleurospermum.

I Leaves once pinnate ; bracteoles usually overtopping umbel *P. candollei*

II Leaves 1-2 pinnate

(A) Plants large 2-4' tall, bracteoles 6-10, lanceolate *P. stylosum*

(B) Plants small, up to 12" tall, bracteoles 5-8, oblong *P. lindleyanum*

III Leaves 2-3 pinnate, 8-20" tall, bracteoles 6-10, narrowly lanceolate *P. hookeri*

IV Leaves 4 pinnate, 6-15" tall, bracteoles 5-8, elliptic *P. densiflorum*

210. *Pleurospermum candollei* Bth. A handsome, hollowstemmed plant with a characteristic scent and white bracts is found on almost every high pass and ridge from 11-14,000', Kamri and probably on the Burzil.

211. *P. stylosum* Clarke, a tall handsome plant with white margined bracts. Burzil Chowki, Dras. Usually 8-11,000', in rocky places.

212. *P. lindleyanum* (KL.) Diels, (*P. stellatum* var. *lindleyana* Clarke.) Usually 13-16,000'. Mir Panzil Pass.

213. *P. hookeri* Clarke var. *thomsoni* Clarke. Satpura Pass, 13,000'; Deosai Rootstock and main peduncle thick, heads dense. Clayx teeth ovate.

214. *P. densiflorum* (Lindl.) Bth. Kamri and Burzil Passes. Leaves finely divided; leaflets with ultimate segments very narrowly lanceolate or linear. Usually 11-14,000'.

### Selinum.

I Lacks old shredded leaf bases ; lateral ridges of fruit papery not corky *S. papyraceum*

II Old shredded leaf bases present.  
(A) Bracteoles 1-2 pinnate, leaves twice pinnate *S. vaginatum*  
(B) Bracteoles often lobed, rarely pinnate ; leaves 4 times pinnate *S. tenuifolium*

215. *Selinum papyraceum* Clarke. Usually 8-12,000'; Burzil Chowki ; Satpura Pass.

216. *S. vaginatum* Clarke, Burzil Pass.

217. *S. tenuifolium* var. *elata* Clarke. Kamri and Burzil Passes to about 11,000'. It seems to me that this 'variety' is distinct from *S. tenuifolium* proper.

### Trachydium.

218. *Trachydium roylei* Lindl. Stem 0-2", branches prostrate, umbel solitary, sessile, with some of its rays again umbelled ; ridges of fruit inflated, spongy, finally tubercled. A plant of high ridges and meadows 11-15,000'. Burzil Pass, Marpo La, Deosai

### Vicatia.

219. *Vicatia conifolia* Dc. Common from 6-12,000', usually in shady woods ; flos. maroon or greenish white. Burzil, Deosai, Kamri.

220. *V. wolffiana* (Wolff & Fedde) Norman, (*Pimpinella saxifraga* L. var. *dissectifolia* Clarke). Usually 13-14,000' in damp soil ; Yusi Mar on the Deosai, Satpura Nullah.

### Aegopodium.

221. *Aegopodium alpestre* Ledeb., (*Pimpinella kashmirica* Dunn.). Rather common in shady woods from 7-10,000'. Kamri Pass ; Burzil Chowki cir 11,000'.

## Prangos.

222. *Prangos pabularia* Lindl. Common on dry hillsides with Artemisias, 6-11000' Kamri, Burzil, Marpo La.

## Cortia.

223. *Cortia depressa* (Don.) Norman. 11-16,000', Marpo La. Stemless to 8" Bracteoles compound pinnate, umbel rays unequal; sometimes 8-12" long.

## CAPRIFOLIACAE.

### Lonicera.

- I Bractlets wholly connate into a glabrous cupula tightly enclosing two free ovaries and growing with them into a large blue fruit cir. .5" long. flos. whitish *L. coerulea*
- II Not as above
- A. Bracts broad, bracteoles 0 or minute
- (1) Bracts boat shaped *L. vaccinioides*
- (2) Bracts flat
- (a) Twigs wiry, plants glabrous except leaf margins *L. semenovii*
- (b) Twigs stouter, plant more or less hispid all over *L. asperifolia*
- B. Bracts linear or narrow oblong, bracteoles may be connate or prominent.
- (1) Corolla regular or nearly so
- (a) Rigid small shrubs; leaves up to .5", fruit blue black *L. obovata*
- (b) Erect shrubs, leaves larger, flowers purple *L. purpurascens*
- (2) Corolla two lipped
- (a) Small shrubs, 3' tall or less
- (c) Leaves subsessile, .5-.75" long, oblong or obovate *L. microphylla*
- (d) Leaves 2.5 by .5-1", narrowed at both ends, irregularly sinuate or sub-lobate *L. heterophylla*
- (b) Large shrubs
- (e) Peduncle .5-1" long, ovaries free *L. orientalis*
- (f) Peduncle 1-2" long, ovaries free *L. webbiana*

224. *Lonicera coerulea* L. var. *altaica* Sweet. Ascent Deosai Pass, Shingo Vy.

225. *L. vaccinioides* Rehder. Banks of alpine streams, Burzil and Mir Panzil Passes. Near *L. hispida* Pall. but the leaves and flos. are smaller. The leaves and calyx are usually hispid only on the margins.

226. *L. semenovii* Regel, (*L. glauca* Hk. f.). The smallest of the genus, glabrous except the leaf margins, found among rocks at high altitudes; sometimes by alpine lakes; Burji La, Satpura La. Usually 12-16,000'.

227. *L. asperifolia* H. & T. Deosai Pass, Upper Satpura Valley. Stems and leaves are prickly. Usually 9-13,000'.

228. *L. obovata* Royle Common from 8-12,000'. Burzil Pass (Clarke).

229. *L. purpurascens* Walp. Usually 8-13,000'. Burzil Chowki in birch.

230. *L. microphylla* Willd. A small shrub of the dry inner zone, usually 11-14,000'. Satpura La ; Thalle La.

231. *L. heterophylla* Dcne. Burji La (Clarke) ; Satpura La to 14,500', Thalle La.

232. *L. orientalis* Lamk. var. *govaniiana* Rehder. Usually 7-12,000'. Shingo Vy. near Gulteri.

233. *L. webbiana* Wall. (*L. alpigena* F.B.I.). Usually 4-12,000'. Burzil Chowki, Shingo Valley.

### Viburnum.

234. *Viburnum cotinifolium* D. Don. Burzil Chowki. Usually 4-11,000'.

## RUBIACEAE.

### Galium.

- I. Fruit without hooked hairs, plants erect ; flos. yellow *G. verum*
- II Fruits with hooked hairs
- (A) Leaves 3 nerved from the base ; plants erect, corolla white *G. boreale*
- (B) Leaves penninerved, or nerves obsolete.
- (1) Perennial, plants erect or decumbent ; 6-8 leaves in a whorl, nearly glabrous. *G. asperuloides*
- (2) Annual, stems weak, decumbent or climbing.
- (a) Scabrid with reflexed hairs or prickles, leaves 6-8 in a whorl ; peduncles axillary and terminal ; peduncles 3 flowered *G. aparine*
- (b) Stems smooth, very slender, leaves 4-6 in a whorl ; flowers usually single, not in threes *G. pauciflorum*

235. *Galium verum* L. Usually 5-10,000'. Deosai, Kamri and Burzil Passes.

236. *G. boreale* L. Deosai, Kamri and Burzil Passes.

237. *G. asperuloides* Edgew. (*G. triflorum* F.B.I.). Usually 6-10,000' in forest shade. Kamri and Burzil Passes.

238. *G. aparine* L. A weed which is common from the plains to 12,000'. Burzil Chowki.

239. *G. pauciflorum* Bunge. This seems to be a small edition of the last which is usually found from 12-14,000'. Burzil and Kamri Passes. Dras.

## VALERIANACEAE.

### Valeriana.

- I Fruit hairy ; flos. pink ; rootstock woody ; 6-9" tall *V. elegans*
- II Fruit glabrous
- (A) Radical leaves ovate, entire, obtuse cauline pinnatifid, lateral lobes few, narrow, the terminal obtuse ; 8-16" tall *V. dioica*
- (B) Radical leaves, petioled, orbicular, or elliptic obtuse, cauline sessile, ovate ; stems up to 10", succulent, often pubescent *V. pyrolaefolia*
- (C) All leaves pinnate, segments narrow, entire or toothed *V. officinalis* ?

240. *Valeriana elegans* Clarke. Satpura Lake, Skardu, 9-10,000', Dras.

241. *V. dioica* Clarke in F. B. I. According to Wendelbo the Himalayan specimens differ from the Linnaean species. Flos. pink ; common in marshy ground, 11-14,000'. Satpura La ; Kamri Pass.

242. *V. pyrolaefolia* Dcne. 9-14,000'. Closely related to *V. jatamansi* Jones (*V. wallichii* DC.) but almost always at higher altitudes. Burzil Chowki, Minimarg, Kamri.

203. *V. officinalis* Clarke. The common Himalayan form does not seem to be true *officinalis*. It is common in rock crevices or in shallow pockets of soil on big boulders above 9,000'. The stems are slender but they take a long time to dry in the press. Should it be called *V. dubia* Bunge ? Minimarg, Deosai Pass.

Note. *V. hardwickii* Wall, a taller, erect species with pinnate leaves bearing 1-5 lanceolate acute pinnules is often found among juniper and as it grows on the Kamri may be expected on the Burzil as well. 4-12,000'.

## DIPSACEAE.

### Dipsacus.

244. *Dipsacus strictus* D. Don. Kamri, Burzil, Minimarg up to cir 12,000'. This form may merely be the alpine form of *D. inermis* Wall. At higher altitudes the leaves are undivided and there may only be a single head. It is like so many other plants often protected by dwarf juniper.

### Morina.

245. *Morina coulteriana* Royle. A plant of open hillsides, 9-13,000' ; flos. yellow. Deosai.

246. *M. longifolia* Royle. Usually 9-14,000'. Flos. reddish pink ; often protected by junipers. Burzil Pass.

### Scabiosa.

247. *Scabiosa speciosa* Royle. Usually 7-11,000'. Burzil Chowki, Marpo La, 13,000'. The handsome flos. are mauve in colour.

## COMPOSITAE.

### Solidago.

248. *Solidago virgaurea* L. Goldenrod is common from 5-12,000'. Kamri, Burzil, Marpo La, Deosai, Satpura Nullah at 14,000'.

### Aster.

I Involucral bracts herbaceous ; heads large, solitary, orange.

(A) Flower heads, blue, cir 3.5" across, disk flos. yellow; stems very leafy *A. falconeri*

(B) Flower heads smaller, cir 2" across, leaves largely basal ; cauline only 1-2, half amplexicaul. Plants cir 2"—8" tall. *A. flaccidus*

II Involucral bracts dry or scarious ; stems 2-3' tall ; flos. much smaller, lavender, up to 2.3" across, stems branched *A. altaicus*

249. *Aster falconeri* Hutch. A handsome plant found on alpine meadows ; usually 9-12,000' Burzil, Kamri, Deosai.

250. *A. flaccidus* Bunge, (*A. heterochaeta* Bth.) Very common on the Deosai Plains and ascending to 15,500' on the passes. Ligules 50-60.

251. *A. altaicus* Willd. Usually 9-13,000'. A plant which is common in the inner drier regions in dry soil. Burzil Pass.

### Brachyactis.

252. *Brachyactis robusta* Bth. Stout, erect, weedy, heads about .5" in diam. 4-14,000'. Deosai, Burzil and Satpura Nullahs.

253. *B. umbrosa* Bth. Small, slender, up to 8" tall, branched from the base, heads smaller and more numerous cir. 1/3" in diam. Marpo La, 12,000' ; Satpura Nullah.



### Erigeron.

254. *Erigeron andryaloides* Bth. Common 9-18,000', densely softly tomentose or wooly, white or ash coloured; bases stout, woody, heads 2/3" across pappus; white then reddish. Marpo La, Deosai Plains, Burji La.

255. *E. ellissii* Hk. f. A plant from the *E. alpinus* complex. The upper stem leaves are broad based and stem clasping. Heads cir 2/3", ligules white. Burzil Pass, 12,000'.

256. *E. multiradiatus* Bth. Heads 2-3" across, the largest flowered in the area. Leaves all cauline; involucre broad and villous. Burzil Pass and Deosai.

257. *E. multicaulis* Wall. (under *alpinus* in F.B.I.). Heads cir 2/3" in diam. The Himalayan forms related to this have never been worked out satisfactorily. Burzil Pass, Gulteri.

258. *E. pulchellum* (Willd.) DC. A rare pink flowered species was found on the Marpo La.

259. *E. uniflorus* L. (*E. patentisquama* J. F. Jeffrey). Common on the edges of swamps; heads single cir. .5" across, white; plants densely pale hairy all over; pappus whitish. Kamri top; Deosai; Burzil 10-14,000'.

### Leontopodium.

260. *Leontopodium alpinum* Cass. sens. lat. Various forms of this composite species are found from 7-18,000'. A very large branched form is found at Minimarg, Kamri, Burzil, Deosai etc. The commonest Himalayan form is *L. leontopodium* (DC.) Hand. Maz.

### Anaphalis.

261. *Anaphalis nubigena* DC. is the form from 12-16,000'. The heads are large and usually 1 (3). Kamri and Burzil 13-14,000'.

262. *A. cuneifolia* Hk. f. is the common form from 8-12,000' and Airy Shaw is probably right in considering them to be a single species. In this form the plants are taller, the leaves larger and the heads are more numerous but smaller. Burzil etc.

263. *A. virgata* Thoms. is a slender erect wooly herb with a branching panicle with many heads which are sweet scented and are often pinkish in colour. It grows in dry places and is usually found from 8-13,000'. Burzil Pass.

### Gnaphalium.

264. *Gnaphalium stewartii* Clarke is the smallest of the genus and is found on high alpine pastures. The plants are cottony and only 2-4" tall. The small heads grow on a dense terminal raceme. Top of Burzil, 14,000'.

## Inula.

265. *Inula royleana* DC. a plant with large yellow heads cir. 4" across with long rays ; Kamri and Burzil Passes. 7-cir. 12,000'; often protected by juniper.

## Achillea.

266. *Achillea millefolium* L. Usually yarrow is found from 6-12,000'. The scent and the finely divided leaves are characteristic. Kamri, Burzil, Deosai.

## Waldheimia (Allardia).

267. *Waldheimia tridactylites* K. & K., (*Allardia glabra* Dcne.). A creeping perennial of the higher alpine zone with pretty pink, daisy like flowers which later develop a copious brown pappus. Common 14-16,000' Burzil, Burji, Kamri, Marpo La.

268. *W. tomentosa* (Dcne.) Regel, (*A. tomentosa* Dcne.). Heads up to about 2" across clothed with soft white wool, 4-8" tall, leaves 1-2 pinnatifid. Flos. pink. On gravel slide at the top of the Marpo La at 15,500'. Usually 13-16,000'.

## Chrysanthemum.

269. *Chrysanthemum pyrethroides* (K. & K.) Fedtsch. (*C. richteria* Bth. Clarke). Dras, Marpo La, Nanga Parbat.

270. *C. griffithii* Clarke (*C. stoliczkai* Clarke). Burji La.

## Tanacetum.

271. *Tanacetum falconeri* Hk. f. Stems 1-2', robust grey tomentose or hoary, radical leaves 2-4"; 2 pinnatisect, segments linear narrow acute. Burzil, Deosai ?

272. *T. longifolium* Wall. Easily recognized by the foliage as the basal leaves are from 6-18" long with very narrow segments. Common on alpine meadows, 10-13,500', Burzil, Kamri, Deosai.

273. *T. tomentosum* DC. (*T. senecionis* Gay). Much smaller but with more stems from the base ; 4-10" high, radical leaves only 1-3" long. Burji La, Satpura La, Deosai, Marpa La,. Usually 11-14,000'.

## Artemisia.

I An annual, erect or with prostrate branches ; heads small 1/10-1/8" in spiked clusters *A. stricta*

II Perennials

(A) Outer flos. female ; disk flos. bisexual but sterile, receptacle naked, leaves sessile, linear cuneate, variously cut at the tip, heads up to 1/8" *A. japonica*

(B) All flos. bisexual and fertile, receptacle naked, an undershrub *A. maritima*.

(C) Ray flos. female, disk flos. bisexual ; all fertile, receptacle naked

(1) Perennials with small heads usually in spreading paniced spikes or racemes.

(a) Rootstock creeping *A. roxburghiana*

(b) Rootstocks not creeping, shrubby below ; heads 15-20 flowered, in nodding, subsecund, distant heads in slenderpaniced racemes *A. sacrorum*

(2) Perennials with rather large heads, tomentum hoary and white, plants strongly scented, tall, erect, receptacle obscurely pubescent, heads 1/6" in diam. *A. persica*

274. *Artemisia stricta* Edgew. Marpo La, Dras.

275. *A. japonica* Thunb. var. *parviflora* (Roxb.) Pamp., (*A. parviflora* Roxb.) Burzil Pass, 12-13,000'. Satpura Nullah, 10,000'.

276. *A. maritima* L. including *A. brevifolia* Wall. This is the species which supplies the worm medicine, *santonin*. Deosai Plains, Shingo Vy., Satpura Nullah. Usually found on dry slopes 8-14,000'.

277. *A. roxburghiana* Besser. Burzil Chowki. Usually 5-10,000'.

278. *A. sacrorum* Ledeb. Often in large clumps. Satpura Nullah, 13-14,000'.

279. *A. persica* Boiss. Near Gulteri, Shingo Vy., Dras. Usually 9-14,000'.

### **Cremanthodium.**

280. *Cremanthodium decaisnei* Clarke. A common handsome yellow flowered plant with leaves which are chiefly radical, reniform and with crenate margins. The single heads are borne on stout peduncles. They are nodding and up to 2.5" in diam. The plants are always found in wet places such as stream border or islands in streams, from 11-14,000'. Kamri, Burzil, Satpura Nullah, Deosai.

### **Doronicum.**

281. *Doronicum falconeri* Clarke Hk. f. A stout erect herb about 18" tall with one or two glandular, villous heads 2-3" in diam. with numerous ligules. Flos. yellow. The achenes of the ray have no pappus while those of the disk have a short pappus. Satpura Nullah, 13-14,000'. Thalle La.

### **Senecio.**

282. *Senecio chrysanthemoides* DC. sens. lat. Very variable and the commonest of the Senecios in the mts. It is left alone by grazing animals and seems to flourish where animals have lain. It is very common from 8-13,000' in forest openings and on alpine meadows. At higher altitudes the plants become smaller and the leaves narrower and less lobed.

283. *S. tibeticus* H. & T. with leaves narrow and almost entire and large flowers is common on the Deosai and the high passes. There seem to be intermediates between this and the last.

284. *S. jacquemontianus* Bth. belongs to the *Ligularia* section. It is gregarious on many alpine meadows with huge basal leaves, ovate cordate or subhastate in outline. The stems are up to 5' tall and the heads up to 2" across. 8-12,500'.

285. *S. arnicoides* Wall. var. *frigida* Hk. f. Some refer this to the genus *Cremanthodium*. There is a single nodding head, the leaves are chiefly radical and the leaves are coriaceous. It grows on the Deosai and the Satpura Pass, 14-15,500'.

### Carduus.

286. *Carduus nutans* L. Spring on the Little Deosai cir. 12,000'. This is a pink flowered thistle with winged, prickly stems.

### Cousinia

287. *Cousinia thomsoni* Clarke. A very xerophytic thistle like plant with an erect stem arising from a rosette of spiny leaves. Stems cobwebby, heads purple, up to 2" across; involucre bracts up to 1.5" ending in a stiff spine. Usually 10-14,000'. Shingo Vy. near Gulteri.

### Saussurea.

- (A) A dwarf alpine with flower heads crowded on the flat, hollow, dilated top of the stem. *S. gnaphaloides*
- (B) Not as above
- I Stemless; heads solitary, rarely 2 or 3 *S. atkinsoni*
- II Stems simple leafy, flower heads numerous enclosed in inflated, membranous upper leaves *S. schultzii*
- III Stems simple; heads usually solitary; leaves basal and cauline, plants usually small up to cir. 18".
- (1) Leaves pinnatifid, heads solitary
- (a) Leaves runcinate pinnatifid, stem bases with withered petioles, leaves nearly glabrous above, white below; pappus .5" long *S. taraxifolia*
- (b) Leaves irregularly sinuate pinnatifid or toothed, cottony above and more so below, stems stout; corolla .25" long, pappus more than .5" long *S. falconeri*
- (2) Leaves entire or nearly so, stems stout and thickened under the head; head large much like the last species. Pappus .33" long, pale brown *S. roylei*
- IV Stem simple, erect, all leaves cauline, flos. small in dense corymbs or clusters, stems winged from decurrent petioles; 1-3' tall *S. candolleana*

- V Stems tall, 3' or more, pappus white,  
 (1) Heads 1-1.5" ; leaves variable, oblong to lyrate  
 pinnatifid, pale pink, achenes 5 angled *S. candicans*  
 (2) Heads .5-.66" ; leaves variable, tip teeth apiculate,  
 achenes narrow 4 angled *S. albescens*
- VI Stems tall, pappus brown, leaves quite entire,  
 scaberulous, half amplexicaul ; heads .5-.66" *S. jacea*
- VII Stems tall, basal leaves very large ; outer pappus bristles  
 feathery ; pappus hairs .66" brown. *S. lappa*

288. *Saussurea gnaphaloides* (Royle) Ostenf., (*S. sorocephala* Hk. f.). A plant of screes and gravel slides at high levels. Burji La, 16,000' ; Satpura La, 15,500'.

289. *S. atkinsoni* Clarke is an interesting prostrate gregarious species with the pretty purple flos. in the centre of a prominent rosette of leaves. Deosai, Burzil Pass. Usually 10-13,000'.

290. *S. schultzii* Hk. f. Another interesting high level form with the flos. hidden by the head of bracts. Satpura La, 15,000' ; Lal Pir (Koelz).

291. *S. taraxifolia* Wall. Deosai ; Lal Pir (Koelz) ; Marpo La ? Usually 12-15,000'.

292. *S. falconeri* Hk. f. I find it difficult to separate this from the next species which is supposed to have less divided leaves. Burji La.

293. *S. roylei* Clarke. Common on passes to 14,000'.

294. *S. candolleana* Wall. A plant of lower levels ; often in forest shade. Burzil and Kamri Passes ; Deosai ; often protected by juniper.

295. *S. albescens* Hk. f. Usually from 6-10,000' ; Kamri and Burzil Passes on dry hillsides.

296. *S. jacea* Clarke is a xerophytic species and the leaves have a varnished appearance. Dras ; Lower Satpura Nullah.

297. *S. lappa* Clarke. Burzil Chowki. This species has been pretty well exterminated by collectors collecting 'kuth' for export to China. Since that trade has been cut off the plant may recover. It is found in forest at lower levels and among juniper toward its upper limit of 12,000'.

### Jurinea.

298. *Jurinea ceratocarpa* Bth. var. *depressa* Clarke, Marpo La, 13,500' on rocks. The achenes are peculiar. They are 4-5 angled, the thickened angles ending in erect spines.

299. *J. macrocephala* Bth. *Dhup* is gregarious on high meadows and passes from 11-14,000'. It is stemless and there is a very large rosette of lobed leaves. Very common on the Deosai Pass, Marpo La, Deosai etc.

### Soroseris.

300. *Soroseris deasyi* (S. Moore) Stebbins, *Crepis glomerata* Dcne.) A remarkable plant found on gravel slides. The heads are numerous and densely crowded, sessile or shortly peduncled on the dilated, hollow, top of a simple villous club shaped stem, 1-6" tall. Juice milky. Usually above 13,000'. Burzil Pass, Burji La, Marpo La top, Mir Panzil Pass.

### Picris.

301. *Picris hieracioides* L. Up to 12,500' from 6,000'. It is a coarse, weedy erect herb with yellow, ligulate flos. The stems bear prickly hairs. Burzil Pass ; Marpo La.

### Koelipinia.

302. *Koelipinia linearis* Pall. Flos. yellow and achenes like birds' claws has been found up to 14,000' but in this area I have only found it on the Thalle La, the lower Satpura Nullah and at Dras. To be expected.

### Crepis.

303. *Crepis glauca* Nutt, (*C. flexuosa* Clarke). A peculiar, glabrous, glaucous, much branched herb up to 12" tall, plants often as broad as they are tall. Heads .33-.5" across. Sometimes found at high altitudes. Thalle La, Lower Satpura Nullah. A plant of hot dry sandy places.

304. *C. multicaulis* Ledeb. ssp. *congesta* Regel (*C. stoliczkai* Clarke). Leaves all radical, flowering stems up to 12" tall. Usually 12,000' or above and often in bare soil. Burji La, Thalle La, Marpo La, Burzil etc.

305. *C. sancta* (L.) Babcock ssp. *bifida* (Vis.) Thell.) (*Pterotheca falconeri* Hk. f.) Another annual with a tuft of basal leaves and an erect flower bearing stem up to 18" tall. Very common by roadsides and in waste places from about 3-10,000'. It is found on the Marpo La to 12,000', Burzil to 10,000', Deosai Pass etc.

306. *C. kashmirica* Babcock, (*C. blattarioides* Vill.) Kamri 13,000'. Heads 1" in diam ; very long dark hairs on involucre and upper stem.

### Hieracium.

307. *Hieracium crocatum* Fries. Deosai. Stems strict, 1-2' tall, stem leaves linear oblong or lanceolate, bases rounded, truncate or cordate. Usually only 6-8,000'.

308. *H. echioides* Waldst. and Kit. Burzil Pass near Sirdar Kothi. Stems and leaves covered with rust covered hairs.

309. *H. robustum* Fries var. *kaschmirensis* Zahn. Deosai, 13,000'; cauline leaves narrow at base.

310. *H. virosum* Pall. Shingo Vy. 11,000'; glabrous or nearly so; leaves oblong ovate, cordate, margins ciliate and beneath;

311. *Taraxacum officinale* Wigg sens lat. Throughout the area to 16,000' and very variable but no one has worked out all the Himalayan forms.

### Lactuca.

- I. Tall leafy herbs, roots tuberous or spindle shaped ; flos. blue purple.
- (A) Stems leafy, leaves not hastate *L. decipiens*
- (B) Stems leafy, lower leaves long petioled hastate cordate to deltoid *L. rapunculoides*
- II Plants stemless or up to 12" tall, base tuberous, flos. purple *L. lessertiana*
312. *Lactuca decipiens* Clarke. Usually 8-10,000'. Marpo La, Minimarg, Kamri.
313. *L. rapunculoides* Clarke. Burzil and Mir Panzil Passes cir 12,000'.
314. *L. lessertiana* (Wall) Clarke. Very common at high altitudes. Marpo La, 15,000'; Burzil Pass, 14,000', Deosai etc. Most alpine and wooliest of these species.

### Tragopogon.

315. *Tragopogon pratense* L. Marpo La, 12,000', Dras, Minimarg.

### Scorzonera.

316. *Scorzonera virgata* DC. (*S. divaricata* Turcz.) Xerophytic ; a plant of gravelly slopes with grass like leaves. Kamri, Burzil, Satpura Passes and on the Deosai. Duthie reported *S. purpurea* L. from the Burzil at 10,500' but I have never found it and wonder whether he did not have the present species. The yellow ligules sometimes change color.

### CAMPANULACEAE.

317. *Campanula aristata* Wall. Burzil Pass. Deosai etc or alpine meadows, sometimes protected by juniper. The tap root is thickened and the radical leaves are long petioled and elliptic. Flos. solitary and deep blue. 11-16,000'.

318. *C. cashmiriana* Royle, Marpo La, possibly at 11,000'. Stems rigid, brittle hoary and often zigzag. Leaves hoary. Plants often grow in rock crevices.

319. *C. latifolia* L. Burzil Chowki cir 11,000'. The largest of the genus often up to 6' tall, corolla 1.25 by 1".

### Codonopsis.

320. *Codonopsis clematidea* (Schrenk) Clarke. Deosai and Marpo La. This species is joined to *C. ovata* in the F.B.I. It is a more widespread species extending to Turkestan. The calyx lobes are glabrous unless at the margin and are not revolute.

321. *C. ovata* Bth. Like the last this beautiful, sky blue, bell shaped flower has a very characteristic unpleasant odour. It is erect or ascending while the last tends to be prostrate or straggling . Burzil Mir Panzil Pass. 9-14,000'.

## PLUMBAGINACEAE.

### Acantholimon.

322. *Acantholimon lycopodioides* Boiss. 9-14,000'. Gulteri, Satpura Nullah, Marpo La etc. A spiny xerophytic cushion plant on dry slopes.

### Statice.

323. *Statice macrorhabdos* Boiss. Another interesting xerophytic plant found in the Upper Satpura Nullah with a basal rosette of tough , broad tipped leaves 2 by 2 by 1.5-2". and a tall scape of pink ? flos.

## ERICACEAE

### Cassiope.

324. *Cassiope fastigiata* (Wall.) D. Don, Burzil Pass (Koelz). A peculiar under shrub up to 12" tall with tiny drooping bell shaped white flos. and stems covered with minute overlapping leaves ; growing on cliffs. 10-14,000'.

### Pyrola.

325. *Pyrola rotundifolia* L. Burzil Pass, 11,000' (Koelz). To be expected between 9-12,000'. It is sometimes protected by juniper. Usually rare, but on the Kamri Pass both this species and *P. secunda* L. are fairly common. *P. secunda* also grows above Mini-marg toward Domel at about 10,000'.

### Rhododendron.

326. *Rhododendron hypenanthum* Balf. (*R. anthopogon* D. Don) Burzil Pass, Satpura Nullah, 14,000'; Deosai Pass, Marpo La etc. Gregarious above the birch zone. Flos. cream colour fading to pale yellow. 11-16,000'.

327. *R. lepidotum* Wall. 8-15,000'. with magenta purple flos. grows at Burzil Chowki.

## PRIMULACEAE.

### Androsace.

I Scapes numerous. Leaves all radical ; no stolons

(A) Leaves long petioled, rounded cordate, lobulate and crenate *A. rotundifolia*

(B) Leaves lanceolate elliptic or spathulate, densely rosulate

(1) Glabrous, apparently annual, scapes several, flos.  
small white

*A. septentrionalis*



- (2) Glandular pubescent, perennia!, leaves cartilaginous  
 spathulate cuspidate, ciliolate *A. aizoon*
- II Scapes solitary, flos. umbelled except in some forms of villosa  
 (A) Leaves minute, cartilaginous, glabrous except for the ciliate  
 margins  
 (1) Stolons stout 1-1.5" long, leaves .25-.33" long, scapes  
 1-3" *A. sempervivoides*  
 (2) Stolons 0 or obscure; leaves minute, densely im-  
 bricate, up to  $\frac{1}{8}$ " ; scapes up to 1" *A. mucronifolia*  
 (B) Leaves villous or silky  
 (1) Densely villous all over; flos. white or rose *A. villosa*  
 (2) Not densely villous all over. flos. white *A. chamaejasme*
- III Scapes solitary 1 flowered; leaves in close set balls the size of  
 a pea, plants in patches with stolons 2-6" long *A. muscoidea*

328. *Androsace rotundifolia* Hard. var. *thomsoni* Watt. 'Barji' La 11,000' (Clarke).  
 This variety is found in dry soil; is glandular and the lobes of the leaves are acutely  
 toothed.

329. *A. septentrionalis* L. Common on the Deosai 12-14,000'.

330. *A. aizoon* Duby, 7-12,000'. Tilel Vy., Lower Kamri, Minimarg. A rock  
 plant.

331. *A. sempervivoides* Jacq. 10-14,000'. Tilel and Burzil (Blatter). Rose pink  
 with a darker eye.

332. *A. mucronifolia* Watt., (*A. microphylla* Hk. f.). Very common forming mats  
 at high altitudes with pretty pink or reddish pink flos. Burzil top, Deosai, Burji La.  
 11-14,000'.

333. *A. villosa* L. Satpura La, Thalle La; white with a yellowish or orange eye  
 forming mats on gravelly soil, 12-17,000'.

334. *A. chamaejasme* Host. Reported from the 'Burji La' and Karakorum by Clarke.

335. *A. muscoidea* Duby. Plants from the Burji La and Satpura La at cir 15,500'  
 seem to match var. *longiscapa* (Kn.) Hand. Maz. There is some confusion about the last  
 three dwarf species. Handel-Mazetti says that *A. villosa* form *A. breviscapa* is the real  
*A. muscoidea* of Duby. More study and collecting is desirable.

### Primula.

- I Scape normally much longer than the leaves. Flos very numer-  
 ous in dense heads, purple; bracts small short, usually hidden by  
 the flos., bases not gibbous or produced *P. denticulata*
- II Scape normally much longer than the leaves; flos. umbelled, pink  
 or purple; bracts forming a 1 seriate involucre, gibbous or pro-  
 duced downwards at the base. ...

(A) Flos purple ; leaves elliptic ovate or ovate oblong, sharply toothed *P. elliptica*

(B) Flos. rosy ; leaves dense sessile obovate oblong or spatulate ; capsules globose *P. rosea*

III Scape longer than the leaves ; flos. many, umbelled or in superposed whorls ; bases of bracts not gibbous.

(A) Flos. a handsome creamy white *P. duthieana*

(B) Flos. deep purple.

(1) Leaves white or yellow mealy beneath at least along the edges. Calyx lobes linear oblong and round at the tip. *P. macrophylla*

(2) Leaves usually without meal below, 2-4" long and narrower ; scapes shorter and fewer flowered ; calyx lobes narrow acuminate *P. moorcroftiana*

IV Minute species without a scape, creeping ; leaves up to .25" lobed one third of the way down, margins recurved *P. reptans*

336. *Primula denticulata* Sm. Deosai ; Kamri to cir 13,000'. An early species flowering as the snow melts.

337. *P. elliptica* Royle, 8-14,000'. Burzil Pass ; Lal Pir (Koelz). Flos. violet purple with orange yellow centre.

338. *P. rosea* Royle. Abundant as snow melts in damp soil as where springs over flow. 9-13,000'. Kamri, Burzil, Deosai.

339. *P. duthieana* Balf. & W. W. Smith. Burzil Pass in shallow water of glacial stream. Except for the colour resembles *P. macrophylla*. 13-14,000'.

340. *P. macrophylla* Don, (*P. nivalis* var. in Pax, under *P. stuartii* in F. B. I.). A handsome plant at the edges of shallow glacial streams. The highest plant found on the American Expedition to K2. Usually 12-14,000'. Burzil.

341. *P. moorcroftiana* Wall. (Under *P. stuartii* in F. B. I. ; *P. meeboldii* Pax). According to Coventry the flos. are a dark bluish purple with a white eye. The centres of *P. macrophylla* are usually dark. Kamri, Deosai.

342. *P. reptans* Hook. f. 'Burji' La (Clarke) ; Lal Pir (Koelz). 13-14,500'.

#### **Cortusa.**

343. *Cortusa matthioli* L. Flos. pink purple ; leaves long petioled, rounded cordate 7-9 lobed ; scape slender with an umbel of 6-10 flos. Usually in shade of forest or of junipers. Usually 9-13,000'. Kamri Pass.

## GENTIANACEAE.

### Gentiana.

- (A) Corolla not longer than 1" ; no folds between the lobes, capsule included in calyx tube.
- I Corolla not fimbriate in throat
- (1) Corolla blue, capsule 2/3" long, lanceolate *G. moorcroftiana*
- (2) ,, yellowish, bluish or pink, capsule .25", oblong *G. aurea*
- II Corolla fimbriate in the throat
- (1) Corolla pink purple , capsule 1/3" long ; stalk 1/12" *G. borealis*
- (2) ,, violet, capsule 2/3" long, no stalk *G. pulmonaria*
- (B) Corolla not longer than .5" long
- I Dwarf in wet places, ripe capsules much elongated *G. leucomelaena*
- II Larger ; plants of grassy hillsides *G. marginata*
- (C) Rootstock stout; basal leaves many, flowering stems up to 10" long *G. thianshanica*
- (D) Erect, slender, branched herbs ; flos. cir 2" long, parts in 4s *G. serrata*

344. *Gentiana moorcroftiana* Wall. 8-12,000'. Shingo Vy., 10-11,000' ; Deosai. Corollas about 1" long ; plants often found in grass near water courses.

345. *G. aurea* L. Gulteri to Sumbal, Shingo Vy. 10-11,000'. Flos. umbellate, yellowish.

346. *G. borealis* Bunge, resembles the last but throats fimbriate ; flos. less aggregated, larger, seems to be annual ; 4-5 lobed, plants erect. Burji La (Clarke).

347. *G. pulmonaria* Turcz. (*G. tenella* of F.B.I.).

348. *G. leucomelaena* Max. (*G. prostrata* Haenke ?). Satpura Lake, Thalle La. Wet soil.

349. *G. marginata* Griseb. (*G. carinata* Griseb. var. *intermedia* Clarke). Very acute straight leaves and no fimbriae. Burji La, top of Satpura La. A similar plant but with fimbriae ; *G. coronata* Royle grows on the Kamri and may be expected on the Burzil.

350. *G. thianshanica* Rupr. (*G. decumbens* of F.B.I.). Common ; Burzil 10-13,000' ; Deosai, Shingo Vy., Thalle etc.

351. *G. serrata* Gunner var. *stracheyi* Clarke. The four angles of the calyx are winged. Burzil, Kamri, Deosai, Shingo Vy. 10-13,000'.

### Jaeschkea.

352. *Jaeschkea gentianoides* Kurz. Common 9-12,000'. Burzil, Mir Panzil and Marpo La. Resembles the gentians but the stamens are attached in the notches of the corollas which are tubular.

## Pleurogyne.

353. *Pleurogyne carinthiaca* Griseb. (*Lomatogonium carinthiaca* (Wulf.) Reichneb.). In this genus the corolla is rotate not tubular and the stamens are attached at the base. Common by water courses and in damp soil from 10-14,000'; Burzil Pass, Deosai.

## Swertia.

- I Flos. blue purple ; few, usually only 2-5 ; 6-12" tall *S. coerulea*  
II Not as above ; flos. white, lurid grey or bluish green ; taller.  
(A) Two fimbriate glands on each corolla lobe  
(1) Seeds not winged ; flos. lurid grey or nearly white, blue  
grey veins *S. petiolata*  
(2) Seeds winged ; flos. lurid grey *S. perfoliata*  
(B) Glands not fimbriate *S. thomsoni*

354. *Swertia coerulea* (Royle) ; *Pleurogyne spathulata* Clarke non Kern. ; *Lomatogonium coeruleum* (Royle) H. Smith. Looks like a large *Pleurogyne*. Flos. blue like a gentian. Deosai, Marpo La, Burzil. 9-13,000'.

355. *S. petiolata* Royle. A plant of alpine meadows, 10-15,000' Burzil Pass ; Deosai ; Burji La.

356. *S. perfoliata* Royle ex G. Don. Common in damp meadows and on the banks of streams. Burzil Pass. 9-12,000'.

357. *S. thomsoni* Clarke. In this species which also favours damp soil the flos. are somewhat smaller than they are in other three and the glands are not fringed as they are in the last two. The outside of the petals is bluish green. Kamri, Burzil, Deosai, 8-13,000'.

## POLEMONIACEAE.

### Polemonium.

358. *Polemonium coeruleum* L. A handsome perennial herb up to 4' tall with a terminal corymb of many handsome blue flowers about 1" in diam. Leaves pinnate. 7-12,000'. Deosai, Burzil Chowki, Kamri very common.

## BORAGINACEAE.

### Arnebia.

359. *Arnebia euchroma* (Royle) I. M. Johnston, (*Macrotomia perennis* Boiss.). Satura Nullah, Deosai Pass, 12,000'. Xerophytic, up to 20" tall, roughly hairy, radical leaves long ; 5 by .33" from a thick root which contains a purplish dye which stains the blotting paper and later the mounting paper in the herbarium.

### Cynoglossum.

360. *Cynoglossum glochidiatum* Don var. *alpina* Brand. (*C. wallichii* G. Don, *C. denticulatum* A. DC. Very common 5-11,000'; Burzil Chowki.

### Eritrichium.

- I Glochidia on the margin of the nutlets confluent at their bases ;  
rootstock woody, stems 2-6", numerous decumbent, villous *E. rupestre*
- II Nutlets conic-obovoid, margin strong fringed with divided hairs,  
stems 3-7", solitary or few, erect, softly villous *E. nanum*

361. *Eritrichium rupestre* Bunge var. *spathulatum* Brand., (*E. spathulatum* Clarke) 'Salpur Mullah', cited by Brand (Duthie's collection) was probably Satpur Nullah.

362. *Eritrichium nanum* Schrad. var. *villosum* Brand. ; (*E. villosum* (Ledeb.) Bunge ; *E. basifixum* Clarke). Usually 13-15,000'. Deosai, Kamri top, Burzil Pass (Duthie).

### Lappula.

363. *Lappula barbata* (M. Bieb.) Gurke ; 8,500-13,500'; Satpura Vy., Gulteri, Shingo Vy.

### Lindelofia.

364. *Lindelofia longiflora* (Bth.) Baill. var. *falconeri* Clarke. Common on meadows 8-13,000'. Handsome dark bluish purple flos. Stems up to 2' tall, hairy, radical leaves long up to 18"; stems leaves broad based, often heart shaped at the base and stem clasping. Burzil and Mir Panzil Passes, Deosai.

### Adelocaryum.

365. *Adelocaryum anchusoides* Brand, *Lindelofia anchusoides* (Lindl.) Lehm. Flos. pink to purple ; a plant of dry soils, much like the last but usually taller and flos. with more pink 5-11,000'. Shingo Vy.

### Mertensia.

Corolla lobes erect ; tube  $1/5-1/4$ " long lobes  $1/6$ " *M. echioides*

,, ,, not erect ; corolla tube 4-7 times as long as the calyx *M. tibetica*

366. *Mertensia echioides* Bth. Common in rock pockets, Satpura Nullah, 14,000' Gulteri-Sumbal.

367. *M. tibetica* Clarke. Lal Pir, 13,500' (Koelz) ; Kamri Pass top. 12-16,000.

## Macrotomia.

368. *Macrotomia benthami* DC. *Gao zuban* is one of the most striking plants of the alpine meadows with tall, hairy, bracteate, spicate heads with flos. of several colours as they change with age. 10-13,000'. Deosai Pass common, Kamri, Burzil.

## Myosotis. Forget Me Not.

369. *Myosotis sylvatica* (Ehrh.) Hoffm. Very common and variable, 7-15,000'.

## Onosma.

370. *Onosma echiooides* L. A tall, bristly plant growing on dry slopes, 9-12,000' The flos. are creamy yellow. Chillam ; Marpo La, Deosai Pass.

## CUSCUTACEAE.

### Cuscuta.

371. *Cuscuta europaea* L. var. *indica* Engelm.; usually 8-13,000'; Gulteri-Sumbal. cir 11,000'; Das Kirim.

## SCROPHULARIACEAE.

### Euphrasia.

- I Bracts with lateral lobes rounded to barely acute ; leaves with rounded lobes,
- (A) Leaves longer than wide ; corolla violet with dark lines, stems usually less than 10cm. tall *E. paucifolia*
- (B) Leaves as wide as or wider than long, rotund ovate ; corolla white with dark violet lines, stems usually 10-15 cm. tall *E. platyphylla*
- II Bracts lateral lobes acuminate to attenuate
- (A) Much branched, bracts with 5-6 pairs of lobules *E. schlagintweitii*
- (B) Freely branching ; finely pubescent with recurved white hairs ; Corolla usually 8-10mm. long, white or lavender with yellow throat, bracts with 3-4 pairs of lobules *E. foliosa*
372. *Euphrasia paucifolia* Wettstein. Deosai, Burzil, Kamri.
373. *E. platyphylla* Pennell. Deosai, Burzil.
374. *E. schlagintweitii* Wettstein. Deosai Pass, 12-13,000'. Flos. white and yellow, veins violet.

375. *E. foliosa* Pennell. Minimarg to Burzil, Tilel Vy. "Among Himalayan Euphrasiae this species is remarkable for the large proportion of leaves retained at anthesis giving the plant an unusually foliose aspect." Pennell.

## Lagotis.

- I Leaves pinnatisect ; flos. in round bracteate heads, a plant of gravel slides *L. globosa*
- II Leaf blades oblong to ovate in outline
- (A) Corolla dark violet, leaf blades crenate *L. cashmeriana*
- (B) Corolla white, leaf blades irregularly dentate or denticulate *L. kunawurensis*
376. *Lagotis globosa* (Kurz) Hk. f. Rare and only at high altitudes on screes. Lal Pir "Very fragrant, lemon verbena fragrance" (Koelz) 15-16,000'.
377. *L. cashmeriana* (Royle) Rupr. (Under *L. glauca* in F.B.I.). Alpine meadows 11-15,000'. Near Gadsar, Tilel ; to be expected.
378. *L. kunawurensis* (Royle) Rupr. (Under *L. glauca* in F.B.I.) very common on the Deosai to 15,000' usually near water. Flos. scented. 12-15,000'.

## Pedicularis

- A Leaves opposite or whorled, inflorescence of fasciculate clusters
- B<sub>a</sub> Galea not or slightly beaked, beak not longer than wide ; leaves whorled. (In pycnantha the lower are opposite).
- C Lower lip of corolla as long as or longer than the ascending galea ; corolla purple, its tube strongly deflexed ; corolla 12-15 mm long *P. roylei*
- CC Lower lip of corolla shorter than the galea ; corolla tube only slightly deflexed from calyx.
- D Capsule 10-12 mm ; nearly all within calyx ; globose ovoid ; corolla yellow to purplish ; pinnae irregularly dentate and lobed *P. pycnantha*
- DD Capsule 15 mm. lance-attenuate, corolla 18-20 mm. long white or purple
- E Corolla white throughout or the galea purplish, beak truncate or rounded ; margin of calyx lobes recurved showing inner surface *P. albida*
- EE Corolla purple throughout, only the throat pale, its beak tapering to an acutish or narrowly rounded apex, margin of calyx dark green, erect *P. purpurea*
- BB Corolla prolonged into a slender beak
- C Beak straight or slightly decurved, corolla purple *P. brevifolia*
- CC Beak of galea strongly decurved or coiled
- D Corolla yellow ; leaves with 12-20 pairs of pinnae *P. tenuirostris*
- DD Corolla purple, bracts villose externally
- E Galea with basal portion about as long as corolla tube, then abruptly projecting with the tapering base about as

long as the incurved or slightly coiled beak ; corolla tube straight, widely ribbed; pinnae of leaf blades strongly dentate lobed

*P. pectinata*

EE Galea with basal widened portion about  $\frac{1}{2}$  as long as the corolla tube, thence abruptly decurved ; leaf blades ovate lanceolate to ovate ; stems taller.

F Inflorescence thick of 5-15 fascicles, usually villous hirsute ; beak of galea usually more than 10 mm. long, thicker than in the last, longer and often projecting as in an elephant trumpeting ; calyx 10-12 mm. long its tube inflated

*P. pyramidata*

FF Inflorescence slender of 10-20 fascicles, loosely villous to glabrous ; beakless than 10 mm long

*P. kashmiriana*

AA Leaves alternate ; inflorescence more continuous

• B Galea beakless, rounded at the apex, erect ; flos. yellow, tip dark

*P. oederi*

BB Galea beaked

C Flos. yellow, tip of beak split

*P. bicornuta*

CC Flos. pink , lavender or purple

D Flos. white in centre ; bright pink ; hood of galea twisted, much gland dotted; beak upcurved; exerted; tube of corolla 2-3 times the length of ovary; calyx lobes apparently less than five through fusion

*P. punctata*

DD Lower lip of corolla wider, 14-20 mm. wide ; its lobes eciliate hood of galea less gland dotted ; beak incurved with the tip against the lower lip or becoming sigmoid and outcurved; tube of corolla  $\frac{1}{2}$  to twice the length of the calyx ; calyx lobes 5, the posterior one entire , often smaller

*P. rhinanthoides*

379. *Pedicularis roylei* Maxim (*P. verticillata* Bth.). Plants small, 4-10" tall Burzil Pass by stream, 12,500'.

380. *P. pycnantha* Boiss. A plant of dry soil. Upper Satpura Nullah, Marpo La 8-11,000'.

381. *P. albida* Pennell. Very common on the Deosai Plains and especially about swamps to about 15,500'.

382. *P. purpurea* Pennell. Like the last species segregated from *C. cheilanthifolia* Schrenk. Chatpani Nullah, west of Dras (Duthie). 11-16,000'.

383. *P. brevifolia* Don.. Top of Burzil Pass, Satpura and Burji Passes. Usually 10-14,000'.

384. *P. tenuirostris* Bth. A tall yellow species growing amongst herbage. Burzil Chowki ; 11,000'. Minimarg, Kamri. Usually 7-12,000'.



385. *P. pectinata* Wall. Burji La ; Burzil, Shingo Vy. Variable, 7-15,000'.
386. *P. pyramidata* Royle, 9-16,000'. Common on alpine meadows. Burzil and Satpura Passes ; Gulteri.
387. *P. kashmiriana* Pennell var. *typica* (Under *P. pyramidata* in F.B.I.) Minimarg ; Sarsanjeri (Koelz).
388. *P. kashmiriana* var. *ornata* Pennell. Corolla larger, the beak of the galea stouter and the lower lip 15mm wide. Burji La to Burzil (Falconer) ; Deosai ; Gulteri, Shingo Vy. 9-13,000'.
389. *P. bicornuta* Klotzsch. A fine large handsome yellow species. Burzil Pass, Deosai, Kamri Pass etc.
390. *P. oederi* Vahl. (*P. versicolor* in F.B.I.). Deosai sparing to 15,000'.
391. *P. rhinanthoides* Schrenk. Common at high altitudes in wet soil. Burzil Pass, Burji La.; Marpo La.

### Picrorhiza.

392. *Picrorhiza kurrooa* Royle ; (*P. lindleyana* (Wall.) Wettst.). *Kaur* is an alpine to be expected in patches, 9-15,000'; rootstock thick ; leaves chiefly radical ; flower spikes 2-4" long ; stamens long exserted. Chillam (Zaman).

### Scrophularia.

- I Sepals acute to attenuate, not scarious margined ; corolla green ; leaf blades ovate to ovate lanceolate. *S. calycina*
- II Sepals rounded, scarious margined, much shorter than the capsule, corolla externally glabrous.
- (A) Corolla 5-7 mm long, purple brown, leaves ovate or oval in main outline ; dentate, dentate lobed or somewhat pinnatifid ; plants of dry hillsides *S. koelzii*
- (B) Corolla : upper lip deep madder purple of blackish, the rest white 6-9 mm long ; leaf blades pinnatisect to pinnatifid, the segments linear lanceolate to linear. Plants of alpine meadows often by stream margins. *S. decomposita*
393. *Scrophularia calycina* Bth. 9-12,000'. Burzil and Kamri Passes.
394. *S. koelzii* Pennell. Marpo La to Dras, 10-12,000'; Gulteri.
395. *S. decomposita* Royle var. *typica* Pennell (*S. lucida* in F.B.I.) Very common on alpine meadows. Burzil Pass, Marpo La, Deosai. 8-13,000'.

### Verbascum.

396. *Verbascum thapsus* L. Deosai. Plains to 12,000'.

## Leptorhabdos.

397. *Leptorhabdos parviflora* (Bth.) Bth. (*L. benthamiana* Walp.). Erect up to 6' tall, 5-11,000'; flos. small pink. Kamri and Burzil in sunny places.

## Veronica.

- I Perennials, only upper axils flower bearing ; inflorescence racemose
- A Capsule as long as or longer than wide ; stems erect, from the base or from near the base. Corolla uniformly coloured.
- (1) Leaf blades lanceolate to ovate, acute to acuminate, serrate, longer than wide ; one sepal very small or lacking petals 4 ; style as long as or longer than the capsule *V. lanosa*
- (2) Style less than 1/3 the length of the capsule which is hirsute and about as wide as long ; corolla .5 mm long, leaf blades oval, crenate to nearly entire ; flos. in heads *V. lasiocarpa*
- AA Capsules obviously wider than long, notched  $\frac{1}{4}$  their depth, corolla pale violet bluish with darker lines posteriorly ; leaf blades ovate oblong or oval, obscurely crenate ; petioled ; stems widely creeping *V. serpyllifolia*
- II Annuals ; most leaf axils flower bearing
- A Calyx lobes shorter than the capsule ; capsules glabrous, cells hemisphaeric, sinus very narrow and style quite hidden ; plants .2-10 cm. tall *V. perpusilla*
- AA Calyx lobes ovate, larger than the capsule, sinus between cells widely open, shortly pubescent ; style visible, .5mm long *V. biloba*
- III Water or marsh plants. Main stem never terminating in an inflorescence ; leaves opposite throughout ; flos. in axillary racemes.
- A Stems prostrate ; rooting at nodes ; plants glabrous *V. beccabunga*
- AA Stems erect, often tall, rachis pedicels, sepals and capsules glandular pubescent *V. secunda*
398. *Veronica lanosa* Royle, (*V. deltigera* Wall.). Erect with recemes of pretty dark blue flos. growing in rock crevices or gravelly places. Mir Panzil Pass, Marpo La ; Shingo Vy. Usually 8-12,000'.
399. *V. lasiocarpa* Pennell, (*V. capitata* Bth.). Common from 10-14,000' on passes and high alpine meadows. Burji La, Deosai, Lal Pir (Koelz) ; Burzil Pass.
400. *V. serpyllifolia* L. var. *humifusa* (Dickson) Vahl. Deosai, Burzil and Mir Panzil Passes. 7-13,000'.
401. *V. perpusilla* Boiss. Common on the Deosai, very small, only an inch or two in height.
402. *V. biloba* L. From 2-15,000'. Burzil Chowki, Deosai etc.

403. *V. beccabunga* L. Prostrate and rooting at nodes; Deosai in water courses and wet places. 7-12,000'.

404. *V. secunda* Pennell. Sometimes 2-3' tall; a plant of swampy places. 2,900-4,000m. Chillam.

Note. Keys in *scrophulariaceae* adapted from Pennell.

### **LABIATAE.**

#### **Calamintha.**

405. *Calamintha umbrosa* Bth. A very common plant, 4-12,000'. Burzil Pass.

#### **Dracocephalum.**

Calyx coriaceous, 2 lipped; upper lip of one very broad ovate entire acute tooth; stamens included

*D. nutans*

Clayx nearly equally 5 cleft; stamens exerted

*D. stamineum*

406. *Dracocephalum nutans* L. Common to 15,500' on the passes and high meadows from about 7,000'.

407. *D. stamineum* Kar. & Kir. "Burji" La. (Clarke) at 11,000'. Low, diffusely branched from the base; corolla small, dark blue.

#### **Elsholtzia.**

408. *Elsholtzia densa* Bth. Shingo Vy., field borders; Minimarg, Dras. Usually 9-11,000'.

#### **Mentha.**

409. *Mentha longifolia* (L.) Huds., (*M. sylvestris* L.). Common from 4-12,500' by water courses and where springs overflow. Variable. Marpo La.

#### **Origanum. Marjoram.**

410. *Origanum vulgare* L. Common from 7-14000,' but also found as low as 2,000.,

#### **Nepeta.**

I Leaves sessile or nearly so

(A) Stems wooly, white hoary or glandular hairy

(1) Stems glandular hairy, stout, whorls many, distant, mostly axillary

*N. glutinosa*

(2) Stems sometimes wooly; terminal spike usually entire, calyx teeth long awned; leaves linear, lanceolate acuminate but bases cordate

*N. connata*

(B) Stems glabrous or slightly or finely hairy

(1) Calyx 1/3" long, curved, nutlets linear

*N. kokanica*

- (2) Calyx  $\frac{1}{4}$ " long
- (a) Leaves linear, entire, rootstock tuberous ; may be as large as a walnut *N. linearis*
- (b) Not as above, leaves with teeth ; finely hairy
- (c) Spike of dense approximate superposed whorls with green elliptic bracts far exceeding the calyces *N. coerulascens*
- (d) Leaves broadly ovate or ovate cordate, obtuse, crenate ; .5-.75" long *N. eriostachya*
- (e) Leaves 2-4 by .33-.75" long ; rootstock long, woody *N. nervosa*
- II Leaves distinctly stalked
- (A) Floccose with white wool ; verticillasters in branched panicles *N. floccosa*
- (B) Not as above
- (1) Leaves 1-2" long ; tall, erect, tufted ; flos. in strict terminal spikes, shortly peduncled in lower axils ; blue *N. clarkei*
- (2) leaves less than 1" long
- (a) Dwarf, 3-6" tall, growing in gravel slides, bracts long silky ; heads subglobose, lower bracts fan shaped, pectinate *N. longibracteata*
- (b) Plants usually taller, stems weak, ascending, bracts elliptic mucronate ; leaves broadly ovate or ovate cordate, crenate, usually pale or white hoary below *N. discolor*
- (c) Stems numerous from the base, nearly naked, leaves orbicular cordate or reniform, deeply crenate ; flos. capitate *N. multicaulis*
411. *Nepeta glutinosa* Bth. Satpura and Burji Passes, north slope in dry places up to 13,000'. Flos. white or bluish.
412. *N. connata* Royle ; flos. large for the genus ; 8-14,000'. Deosai ; Burzil Pass.
413. *N. kokanica* Regel, (*N. supina* Stev.). A plant of high levels near water ; Marpo La, 15,000' ; Burji La, north slope.
414. *N. linearis* Royle, Burzil Pass, 11,000'.
415. *N. coerulascens* Max. (*N. thomsoni*) Bth.) Marpo La, 14-15,000'.
416. *N. eriostachya* Bth. At times the leaves are almost white below ; calyx .25" long, teeth slender plumosa ; bracts hairy, bright blue flos. Deosai.
417. *N. nervosa* Royle. Burzil Pass, 13,500' ; flos. purple.
418. *N. nervosa* var. *lutea* Hk. f. flos. yellow to cream. Satpura La. Burzil, Mir Panzil Passes.

419. *N. floccosa* Bth. Usually 7-11,000'. Satpura Nullah, 9,000'.
420. *N. clarkei* Hk. f. Usually 7,500-11,000'. Near streamlets. Burzil.
421. *N. longibracteata* Bth. Common in the scree near the tops of mts. 14-17,000'.
422. *N. discolor* Bth. Very common on the Deosai, Dras, Chillam. 10-15,000'.
423. *N. multicaulis* Mukerjea. Looks like *Dracocephalum stamineum* but can be distinguished through this lacking its long stamens. Deosai region (Nasir).

#### **Phlomis.**

424. *Phlomis bracteosa* Royle, common on meadows to 13,000'; Burzil, Deosai etc.

#### **Salvia.**

425. *Salvia hians* Royle. Usually 9-13,000' on meadows. Kamri, Burzil.

#### **Stachys.**

426. *Stachys alpina* L. Near *S. sericea* but with larger flos. Burzil Chowki.
427. *Stachys tibetica* Vatke. Spiny and xerophytic. Sometimes ascends to 14,000' Shingo Vy., Dras.

#### **Thymus.**

428. *Thymus serpyllum* L. Very common growing in mats and easily recognized by its scent. Flos. pink; 5-13,000'.

#### **Scutellaria.**

429. *Scutellaria prostrata* Jacq. Often in patches on dry soil with prostrate branches; flos. yellow tipped with violet. 9-12,000'. Kamri, Burzil, Minimarg.

### **PLANTAGINACEAE.**

#### **Plantago.**

430. *Plantago brachyphylla* Edgew. A small alpine edition of *P. major*. Deosai. 9-13,000'.
431. *P. major* L. Plains to cir. 12,000' in waste places. Shingo Vy.; Marpo La.

### **CHENOPODIACEAE.**

#### **Chenopodium.**

432. *Chenopodium album* L. Plants erect and leaves and stems usually somewhat mealy. Seeds smooth and keeled. Marpo La, Shingo Vy. Plains to 12,000'.

433. *C. glaucum* L. Singo Vy. Branches decumbent or prostrate, leaves small ; up to 1" long ; often sinuate lobed. 9-14,000'.

434. *C. hybridum* L. Leaves much larger than in the other species, up to 5" long ; broadly triangular ; erect. 1-3' tall. 5-12,000'. To be expected.

435. *C. virgatum* (L.) Amb., *C. blitum* Hk. f., *C. foliosum* (Moench). Aschers. The Strawberry Goosefoot is easily recognized by its red baccate fruits. This plant makes very good greens. Marpo La, Burzil Chowki. A nitrophile.

### **Eurotia.**

436. *Eurotia ceratoides* C.A.M. 8-14,000' in dry places. Skardu. To be expected in our area.

## **SANTALACEAE.**

### **Thesium.**

437. *Thesium himalense* Royle. Deosai Pass ; Satpura Nullah. A slender, green root parasite with small white flos.

## **POLYGONACEAE.**

### **Oxyria.**

438. *Oxyria digyna* Hill. Leaves cordate or reniform, erect, leaves chiefly radical. Common in wet places 10-14,000'. Common. Good for greens.

### **Polygonum.**

(A) Stipules minute, two partite

I A minute annual, flos. in terminal clusters. Stigmas subsessile ; nut subterete *P. standicum*

II Slender annuals ; flos. in terminal and axillary clusters ; styles minute, free ; seeds loose in the triquetrous nut.

(a) Quite glabrous ; 4-12" tall ; leaves  $1/6-1/4$ " long ; elliptic ovate, subsessile ; stamens 2-3 ; *P. delicatulum*

(b) Stems sparingly strigose ; leaves strigose below, leaves  $1/3-2/3$ " long ; petioled ; stamens 3-4 *P. filicaule*

B Stipules tubular elongate

I Leaves small ; stipules hyaline ; cleft or torn ; Flos. axillary ; styles minute free ; albumen horny.

(a) Rootstocks stout, woody

(1) Stems 2-6" long ; leaves  $1/3-1/2$ " long, petioled, elliptic, thick, nerveless ; perianth tube twice as long as the lobes *P. cognatum*

- (2) Stems very stout ; 1-4" long, leaves linear, margins recurved, mucro deciduous ; fruiting perianth shorter than the tube ; stipules in young plants concealing both leaves and stem *P. paronychioides*
- (b) Plants annual.
- (1) Stems grooved ; usually prostrate ; perianth obovoid cleft to near the base ; nut ovoid, obtusely trigonous, minutely rough striolate *P. aviculare*
- (2) Stems not grooved, leaf margins recurved ; leaves linear.
- (c) Perianth ovoid, tube much longer than the small rounded white or pink lobes, nut triquetrous, smooth shining *P. tubulosum*
- (d) Calyx lobes equal the tube *P. polycnemoides*
- II Flos. in spiciform racemes ; bracts hyaline, not tubular.
- (a) Stem solitary, simple erect ; flos. suberect pink or white ; the lower replaced by bulbils ; inflorescence slender *P. viviparum*
- (b) Rootstock stout, woody branched ; racemes dense, stout ; upper stem leaves amplexicaul ; flos. white, pink or rosy *P. amplexicaule*
- (c) Somewhat similar but stems cir. 1' tall instead of 2-3' in the last species ; more alpine, more tufted, leaves narrower, linear or elliptic lanceolate, chiefly basal and bases narrowed into the petiole, not broad based and heart shaped *P. affine*
- III Flos. capitate, bracts not tubular ; leaves broad ; a dwarf annual 2-4" tall ; leaves broadly ovate, obtuse, .5-.75" long with petioles as long as the blades ; upper part of petioles broadened *P. glaciale*
- IV Erect, shrubby below ; flos. in branched panicles ; bracts open or shortly tubular.
- (a) Leaves 3-5" long, bases acute ; flos. in much branched terminal panicles of creamy white flos. *P. alpinum*
- (b) Leaves 3-5" by 1.5-3" ; ovate or ovate cordate, obtuse or subobtusate ; panicles sessile ; flos. greenish *P. rumicifolium*

439. *Polygonum islandicum* (L) Hk. f. (*Koenigia islandica* L.) Deosai (Clarke) ; a plant of marshy places, 11-14,000'.

440. *P. delicatum* Meissn. Burzil Chowki. A tiny species of damp rocks ; 10-16,000'.

441. *P. filicaule* Wall. Burzil Pass, Marpo La 9-16,000'.

442. *P. cognatum* Meissn. Very common in dry places ; Burzil Pass, Shingo Vy. etc. 11-15,000'.

443. *P. Paronychicoides* C.A.M. Very common in the dry inner regions, 8-12,000'. According to J. F. Brenckle this is composite species and may be separated into.

444. *P. mucronatum* Royle ex Bab. with mucronate tips to the leaves and *P. pulvinatum* Kom without these tips. The form on the Burji La and the Marpo La seems to be the second of these.

445. *P. aviculare* L. A very common barnyard weed from 5-13,000'; said to be used for *sag* by the *gujars*; will grow near where animals lie at night.

446. *P. tubulosum* Boiss. 8-11,000' in mineral soil. Satpura Nullah (Nasir). Dras.

447. *P. polycnemoides* J. & S. Burzil Chowki. Resembles the last but this is more slender, flexuous and the stems are more leafless in appearance.

448. *P. viviparum* L. A plant growing in wet places at high levels, 10-14,000'; Deosai, Burzil, Kamri, Marpo La. etc. Flos. usually white.

449. *P. amplexicaule* Don. Very common from 7-12,000' Flos, red, pink or white. To be expected on the Burzil.

450. *P. affine* D. Don is the finest of the high level species. It is commonly gregarious on ridges from 10-14,000' with handsome spikes of rosy flos. Burzil, Deosai, Marpo La etc.

451. *P. glaciale* Hk. f. Burzil Chowki. Usually 9-12,000'.

452. *P. alpinum* All. Kamri, Burzil, Minimarg. Large and much branched and may be up to 6' tall. Usually 7-12,000'.

453. *P. rumicifolium* Royle. A weedy species which is common on meadows from 10-14,000' Kamri and Burzil Passes to their tops; Deosai, Marpo La etc.

454. *P. tortuosum* Don. Marpo La, Burzil, north slope to about 13,000', a plant of dry soil.

### Rheum.

- |    |  |                     |
|----|--|---------------------|
| I  | Stemless species; flowers paniced; panicles leafless | <i>R. tibeticum</i> |
| II | Stem branched and panicle leafy                      | <i>R. webbianum</i> |

455. *Rheum tibeticum* Maxim. Burji La (Clarke). Satpura La rhubarb seems to be similar. The thick petioles are good stewed when tender. 12-14,000'.

456. *R. webbianum* Royle. 8-15,000'; often protected by juniper and often gregarious on alpine hill sides. Burzil, Marpo La; Chillam.

### Rumex.

1. Flos. 2 sexual; styles terminal; inner sepals coriaceous; enlarged in fruit. Leaves not hastate.  
(A) Inner fruiting sepals quite entire *R. patientia*



(B) Inner fruiting sepals with much toothed wings, the wings ending in hooks *R. nepalensis*

II Flos. dioecious ; styles arising from the angles of the ovary ; panicle contracted, branches strict, erect. Leaves hastate *R. acetosa*

457. *Rumex patientia* L. var. *tibeticus* Rech. f. Midrib of calyx tubercled. Deosai.

458. *R. nepalensis* Spreng. Very common by roadsides and where animals have lain. The hooks on the ripe fruits catch in clothing. Used for greens. 4-12,000'. Grows on the Marpo la at 12,000'.

459. *R. acetosa* L. A plant of alpine meadows, common 9-12,000'. Kamri, Burzil, Deosai.

## EUPHORBIACEAE.

### Euphorbia.

I Perennial herb, capsules smooth ; stems 12" high ; capsules .33" long. *E. thomsoniana*

II Perennial herb, capsules warted ; stems 6-8" high *E. micractina*

460. *Euphorbia thomsoniana* Boiss. Burzil Chowki, Chillam Pass (Nasir) ; Shingo Vy. Common. Usually 10-12,000'.

461. *E. micractina* Boiss. Several slender annual stems from a thick woody root. Burzil and Mir Panzil Passes. 12-13,000'.

## CUPULIFERAE.

### Betula.

462. *Betula utilis* D. Don, 10-14,000'. The white birch is found at Burzil Chowki ; on the Marpo La etc. Usually the tree nearest the tree line except in the driest regions where it is replaced by juniper.

## SALICACEAE.

### Salix.

I Dwarf prostrate shrubs

A Rachis of catkins hairy ; leaves .5-1" by .3-.6" *S. flabellaris*

B Rachis of catkins glabrous ; Leaves .5-.8" by .2-.3" *S. lindleyana*

II Erect shrubs usually 3-6' tall.

A Capsules glabrous ; leaves 1-3 by .5-2" young stems reddish brown *S. himalensis*

B Capsules silvery pubescent ; leaves elliptic 1" long *S. myricaefolia*

III Large shrubs or small trees.

A Leaves 2-5 by .2-.7" linear lanceolate, silvery silky below *S. viminalis*

- B Leaves 1.5-3.5 by .6-1.2", glabrous and shining when mature *S. oxycarpa*  
 C Leaves broad for their length, ovate *S. pseudo-wallichiana*

463. *Salix flabellaris* Anders. Deosai, Burzil and Burji Passes. 10-15,000'

464. *S. lindleyana* Wall var. *latifolia* Parker. The smallest of the alpine willows ; Burzil and Satpura Passes. 10-14,000'.

465. *S. himalensis* Flod. (Under *S. hastata* in Parker). Common, Burzil, Deosai, Kamri, Marpo La etc. Gregarious 9-15,000'.

466. *S. myricaefolia* Anders. Gregarious in swamps, Chillam, Deosai ; Burzil 9-13,000'.

467. *S. viminalis* L. 8-11,000'. Above Minimarg ; Shingo Vy.

468. *S. oxycarpa* Anders. 9-11,000'. Shingo Vy. Small trees by river.

469. *S. pseudo-wallichiana* Goss. Shingo Vy. (Duthie). I have found this species at about 11,000' in the Naltar Vy., Gilgit but not near the Deosai.

## MONOCOTYLEDONAE ORCHIDACEAE.

### Orchis.

470. *Orchis latifolia* L. sens. lat. Burzil Pass and the Deosai. A plant of damp soil. 7-12,000'.

## IRIDACEAE.

### Iris.

471. *Iris hookeriana* Foster. Burzil (Duthie) ; Marpo La. Often gregarious on alpine meadows and spreading because it is not eaten by animals. 7-13,000'.

## LILIACEAE.

### Allium

Flos. pale yellow in sub-globose dense heads.

Leaves 2-3 stout about equalling the stout scape ; bulbs tufted ; sepals .5-.66". *A. semenovii*

Leaves 1-2, much shorter than the tall scape ; bulb 0 ; segments of perianth .25-.33" *A. fedschenkoanum*

Flos. red purple ; bulbs tufted ; leaves 4-5 ; 6-9 by 1/6 to 1/3" long *A. thomsoni*

472. *Allium semenovii* Regel, 8-14,000'. I have been calling the yellow onion growing on high alpine meadows and passes of the Deosai, Shingo Vy. ; Burzil etc. by this name but it may be next.

473. *A. fedschenkoanum* Regel. Burzil Pass, 12,000' (Clarke).

474. *A. thomsoni* Baker. Burzil, 12,000'; Gulteri, Minimarg; Kamri. 9-12,000'.

### Lloydia.

475. *Lloydia alpina* Salisb. (*L. serotina* Reichb.). Ordinarily a plant of rock crevices except at the highest levels where it may grow in gravel. 10-15,000'. Kamri, Burzil, Deosai, Thalle La.

### Fritillaria.

476. *Fritillaria roylei* Hk. f. Burzil Pass, Kamri, 8-12,000'. An interesting lily with drooping, bell shaped greenish flos. with dark spots on the perianth.

### Eremurus.

477. *Eremurus himalaicus* Baker, 7-12,000', gregarious often covering whole hill-sides with tall cream coloured spikes. Cut for greens when young. Dras, Minimarg, Kamri; Burzil Chowki. Conspicuous when in fruit as well as when in flower.

### Polygonatum.

Leaves in 2s or 3s, rarely solitary; 12-18" tall, nerves ciliolate beneath; perianth creamy yellow with tips green or lilac *P. geminiflorum*

Leaves usually whorled; 4-8 in a whorl, narrower; perianth greenish *P. verticillatum*

478. *Polygonatum geminiflorum* Dcne. 7-11,000'. Kamri, Burzil in birch zone.

479. *P. verticillatum* All. 6-11,000'. Gulteri, Shingo Vy.

## JUNCACEAE.

### Juncus.

- I. Plants annual; stems copiously branched, cymes scattered, flos. few *J. bufonius*
- II Heads globose or subglobose; leaves narrow channelled, terete or filiform, septae none or indistinct.
- (A) Cyme a solitary sessile head, leaves near the base of stem
- (a) Stems 2-6" tall; heads dark chestnut brown *J. thomsoni*
- (b) ditto; heads white *J. leucomelas*
- (B) Cymes solitary, one or more leaves above the middle; anthers linear exserted; cymes many flowered; flos. white *J. membranaceus*
- (C) Cymes compound; composed of 2 or more dark brown heads, each with 3-8 flos. *J. himalensis*

480. *Juncus bufonius* L. A plant of wet places ; plains to 13,000'. Marpo La.
481. *J. thomsoni* Buchen. Beside streams ; Deosai, 13,000'. Possibly a colour variation of the next.
482. *J. leucomelas* Royle. Burzil Pass. Usually 12-16,000'.
483. *J. membranaceus* Royle. Common, 6-13,000'. Deosai, Burzil etc.
484. *J. himalensis* Klotzsch. Common, 7-14,000'. Burzil Pass, Deosai, Burjila etc.

### Juncoides.

485. *Juncoides spicata* (L.) Kze, (*Luzula spicata* DC.). 12-16,000' on Deosai Passes.

## JUNCAGINACEAE (Under NAIADACEAE in F.B.I.)

### Triglochin.

486. *Triglochin palustre* L. Deosai, common in marshy ground.

## NAIADACEAE.

### Potamogeton.

487. *Potamogeton alpinus* Balb.? Gulteri-Sumbal in Shingo Vy.

## CYPERACEAE.

### Blysmus.

488. *Blysmus compressus* (L.) Link, (*Scirpus compressus* (L.) Pers.). *S. caricis* Retz. Common in swamps up to 15,000'. Burzil Chowki, Chota Deosai.

### Kobresia.

- I Stems less than 2" tall, in dense tufts ; spikes unisexual ; leaves setaceous, as long as stems, spikes 1/6 to 1/3" long *K. pygmaea*
- II Stems with 1 apparently simple linear or oblong spike.
- (A) Stems somewhat slender, leaves linear setaceous somewhat shorter than the peduncles which are up to 16" tall, spikes up to 1" by 1/4" *K. capillifolia*
- (B) Stems stout rigid. leaves broader, channelled.
- (a) Up to 10" tall ; bracteoles ovate, obtuse, shining ; leaves often overtop stem *K. nitens*
- (b) Up to 2' tall, leaves 1/3 to equalling the stems, bracteoles chaffy, not shining ; spikes oblong dense up to 1" by 1/3" *K. schoenoides*

- III One spike per stem, oblong or ovate, compound, subcampanulate, dense or interrupted at base ; leaves flat when dry ; spikes variable .6 to 2.5" long *K. royleana*
- IV Spikes loosely paniced, lowest bract long, leaflike *K. laxa*
- V Style 2 fid, long linear ; nut flat, stems ceaspitosa, 2-7" tall ; leaves many  $\frac{1}{2}$  stem length, flat .05-.1" wide, spikes  $\frac{2}{3}$  by .5" *K. macrantha*

489. *Kobresia pygmaea* Clarke, 12-15,000'. Burji La, south slope.

490. *K. capillifolia* Clarke, 10-13,000'. Common on alpine passes.

491. *K. nitens* Clarke, 12-15,000'. Common on high passes ; Kamri, Chota Deosai.

492. *K. schoenoides* Boeck. Should this be called *K. bamiroalaica* Ivanova ? Usually the largest and tallest of the genus in the Himalayas, 10-16,000' ; Burzil Pass ; Burji La, Chota Deosai.

493. *K. royleana* (Nees) Boeck., 10-16,000'. Satpura Nullah ; Marpo La.

494. *K. laxa* Boeck., 6,500-12,000' usually in damp soil. According to Ivanova this is too different to remain in *Kobresia* and he calls this plant *Schoenoxiphium laxum* (Nees) Ivanova. Gulteri to Sumbal, Shingo Vy.

495. *K. macrantha* Boeck vel aff. Marpo La, Burzil Pass.

This is a difficult genus and requires much more collecting and the determinations should be compared with the work of Ivanova who has done recent work on the group.

### Carex.

#### I Style 2 fid

- (A) Terminal spike fem. at base, male at top ; spikes short, ovoid or oblong *C. pseudofoetida*
- (B) Term. spike male at base ; fem. at top, spikes short, .25 to .5" long, greenish cylindric, approximate. Inflor. 2-5" long ; lowest branch setaceous 1" long ; utricle with 8-10 slender nerves on each face *C. curta*
- (C) Term. spike wholly male ; the others fem. or male at top solitary ; spikes 3-4 close together, cylindric, dense ; .5-.75" by .6-.25" fem. glumes chestnut purple ; plants stoloniferous *C. orbicularis*

#### II Style 3 fid

- (A) Stem with 1 spike, fem. at base
- (a) Spike .25-.5" long, utricles lanceolate acuminate, when ripe the deflexed seta protruded *C. michroglochis*
- (b) Spikes .25-.75", utricles long beaked, when ripe deflexed but seta included. Plant stouter *C. parva*

(B) Terminal spike male at base, fem. at top

- (a) Spikes 3-4 ; .33 by .25", short cylindric, approximate ; leaves much shorter than the stem, narrow ; .1" wide, weak ; glumes dense with a yellow keel *C. pseudobicolor*
- (b) Spikes 3-7 ; oblong or cylindric, .75" by .16" oblong or cylindric ; utricle oblong narrowed to each end, yellow, smooth ; leaves often overtopping stem, 1/6" wide. *C. obscura*
- (c) Spikes 3-6 ; large, approximate, cylindric, dense ; lowest peduncle nodding, .75-1" by .25-.33" wide ; glumes ovate acuminate, utricle inflated, yellow brown, smooth, beakless, leaves often as long as the stem, 1/8-1/6" broad, glumes uniformly black except margin *C. nigerrima*
- (d) Term. spike wholly male or fem. at top ; utricle broad, much compressed often of thin texture, margins acute and beak minute, nut stalked, very small, utricles concolorous with glumes, blackish red in type *C. nivalis*
- (e) Like the last but spikes cinnamon colour *C. luteo-brunnea*

(C) Terminal spike wholly male.

- (a) Utricle glabrous (or scabrous on margins) ; beak 0 or very short.
- (1) Spikes 3-6, approximate ; lowest peduncle rarely .25", glumes black red ; spikes .5 by .25".; leaves numerous, nearly as long as stem. 16" broad *C. melanantha*
- (2) Similar but more xerophytic, spikes larger and brighter ; terminal spike often pale, utricle larger, pale upwards ; pale yellow utricles alternate with dark chestnut glumes *C. moorcroftii*
- (3) Spikes 5-12, remote ; peduncle of lowest 3-6" ; stems up to 2' tall. ; fem. spikes often 1" long ; lowest peduncle may bear up to 3 spikes. ; utricle more or less red black *C. cruenta*
- (b) Utricle glabrous with a beak
- (1) Spikes 6-8, cylindric ; uppermost 3 usually male, utricle glabrous but fulvous hispid on angles ; leaves rarely 1/2 stem, 1/6-1/4" broad ; spikes chestnut purple ; lowest peduncle often 3-5" distant. *C. sempervirens*
- (2) Stems 2-3', robust ; leaves often 2/3 of stem, .25" broad, utricle ovoid or ellipsoid, much inflated, narrowed suddenly into short beak ; female glumes purple chestnut with narrow pale back *C. obscuripes*
- (c) Utricle hairy or minutely setulose
- (1) Leaves very narrow enrolled when dry ; utricle ellipsoid lanceolate, very long up to .33" *C. hirtella*

596. *Carex pseudofetida* Kuk. Gulteri, Shingo Vy., 11,000' det Nelves. Clarke 29,626 from the Burzil was identified as *C. curaica* Kunth, (*C. vulpinaris* Nees var. *angustifolia* Kuk. I do not know how these differ.
597. *C. curta* Good. (*C. canescens* in F.B.I.). Burzil Chowki ; Deosai, 13,000'.
598. *C. orbicularis* Boott, (*C. rigida* Good.). Burzil (Clarke), Deosai. Usually 10-13,000'.
599. *C. microglochin* Wahlenb. Like the next a dwarf, slender plant growing in wet places which is likely to be overlooked ; usually 11-15,000'. Deosai, Burji La.
500. *C. parva* Nees. Deosai (Winterbottom). 11-15,000'.
501. *C. pseudobicolor* Boeck. (*C. alpina* of F. B. I.). Common in the alpine zone from 8-15,000' Burzil.
502. *C. obscura* Nees. Usually 8-11,000'. To be expected.
503. *C. nigerrima* Nelves, (*C. atrata* in F. B. I.). Clarke 29,722 from the Burzil Pass is the type.
504. *C. nivalis* Boott. One of the finest of the Himalayan Carice with dark drooping heads, 11-17,000'. Common. Burzil, Deosai.
505. *C. luteobrunnea* (Kuk) Nelves, (*C. nivalis* var. *cinnamonea* Kunth). Like the last except for colour. Satpura La.
506. *C. melanantha* C.A.M. 11-16,000'. Deosai, Burzil top.
507. *C. moorcroftii* Falc. ex Boott. Sometimes considered to be a variety of the last ; 12-16,000'. Common in dry deserts of Ladakh. Chillam-Deosai.
508. *C. cruenta* Nees. Common, 8-15,000', Burzil Pass ; Dras.
509. *C. sempervirens* Vill. var. *tristis* Kuk. (*C. tristis* M. Bieb). 13-15,000' Burji La.
510. *C. obscuripes pamirica* Kuk. (*C. rostrata* in F.B.I. ?). Very large and common in swamps on the Deosai, 13-14,000'.
511. *C. hirtella* Drejer. 9-13,000'. Shingo Vy.

## GRAMINEAE

### *Anthosachne* (*Agropyron* in F.B.I.)

512. *Anthosachne jacquemontii* (Hk. f.) Nevski, (*Agropyron Jacquemontii* Hk. f.) Deosai (Clarke 29,827a) at 13,000'. Melderis refers this number to var. *setulosa*. Closely related to the next but small up to 12" tall, leaves filiform, silvery sheaths and slender awns.

### Agropyron.

513. *Agropyron longearistatum* (Boiss.) Boiss., (*Roegneria schugnanica* Nevski). One of the commonest high level grasses in the Western Himalaya. 9-18,000'. Burzil Pass. Deosai etc. Easily recognized by its long curving awns. Resembles and may cross with *Elymus nutans*.

514. *A. dentatum* Hk. f. is easily recognized by being awnless or nearly so. In this the spikelets are closely imbricating and glumes are 7-9 nerved while in the next the spikelets are rather distant and 3-5 awned. This is usually found from 9-12,000' Deosai Plains, Burji La.

515. *A. repens* (L.) Beauv. Burzil Pass, Mir Panzil Pass ; Satpura La.

### Agrostis.

516. *Agrostis canina* L. Burzil Pass, 12,000' ; usually 9-12,000', very common. The spikelets are awned and often reddish at high altitudes.

517. *A. nervosa* Nees ex Trin., (*A. pilosula* Trin.; *Calamagrostis pilosula* Hk. f.) Spikelets awned, panicle effuse, branches 6-10 cm. long, bare in lower half, spikelets greenish or greenish yellow. Deosai Pass.

### Alopecurus.

518. *Alopecurus aequalis* Sobol. Very common in shallow water on the Deosai.

519. *A. arundinaceus* Poir. Common ; usually 7,500'-13,000'. Marpo La, Deosai, Burzil. Near the next but less hairy, shorter awned, heads narrower, less fulvous.

520. *A. himalaicus* Hk. f. 10-14,500'. Top of Burzil Pass ; Marpo La etc.

### Briza Quaking Grass.

521. *Briza media* L. 8-13,000'. Chillam, Burzil and Deosai Passes.

### Bromus.

522. *Bromus inermis* Leyss. var. *confinis* Stapf. 9-13,000'. Burzil Chowki.

523. *B. oxyodon* Schrenk. An annual with long and curving awns. Usually 8,500-12,000'. Marpo La.

524. *B. tectorum* L. 7-12,000'. An annual weed of roadsides and fields. Satpura Nullah.

### Calamagrostis.

525. *Calamagrostis epigeios* (L.) Roth, 8-14,000'. Shingo and Burzil Vys. 10-11,000'. A large grass 2-4' tall much like the next but this has glume III dorsally



awned at the middle or below it while in the next species the awn is in the upper third or at the tip. Not very common.

526. *C. pseudophragmites* (Hall. f.) Koeler. (*C. littorea* DC.). Very large and very common, up to 5' tall. Very variable. A plant of dry soils up to 15,000'.

### **Colpodium, (Catabrosa in F.B.I.)**

527. *Colpodium himalaicum* (Hk. f.) Bor ; (*Catabrosa himalaica* Stapf), 13-16,500' A plant of marshy places, Burji La (Clarke) ; "Deotsu" (T. Thomson). Spikelets 1-2 ; .1 to .16" long, panicle erect, spiciform, dense flowered.

528. *C. nutans* Griseb. (*Catabrosa nutans* Stapf). 10-14,000' ; Kamri and Burzil Passes ; Deosai Plains. A fine grass suggesting *Poa alpina* with broad glumes, erose at the tip, variegated in colour ; spikelets 2-5 and .25 to .33" long.

### **Deschampsia.**

529. *Deschampsia caespitosa* (L.) Beauv., 10-17,000'. A pretty marsh grass with a larger panicle than the next, 4-8" long with white and silvery or purplish spikelets. Panicle often lax. Burzil, Minimarg, Dras.

530. *D. koelerioides* Regel, 10-16,000'. Common in damp soil ; inflorescence more compact. 1-1.5" long, brownish yellow. The colour is retained in the herbarium. Deosai, Marpo La, Burzil Pass etc.

### **Dactylis.**

531. *Dactylis glomerata* L. Common from 6-12,000' and often found on alpine meadows. Kamri Pass. In sun the inflorescence may be purplish.

### **Deyeuxia.**

532. *Deyeuxia arundinacea* (L.) Bor, 9-13,000', Deosai Pass ; Above Minimarg (Duthie). In this species the awn of glume III is basal or subbasal while in the next species it is inserted above the middle of the glume. A large grass up to 5'.

533. *D. scabrescens* Duthie, 11-14,000', Shingo Vy., Deosai Pass. Another large grass.

### **Duthiea.**

534. *Duthiea bromoides* Hack. 10-13,000'. A xerophytic perennial grass with many old leaf bases ; Bromus like with long awns. Marpo La.

### **Elymus.**

535. *Elymus nutans* Griseb. *Clinelymus nutans* (Griseb.) Nevski ; *E. sibiricus* of F.B.I. 9-15,000'. A genus like *Agropyron* but the spikelets are for the most part in pairs. This species suggests *Anthosachne longae aristata*.

Note.—*E. dahuricus* Turc. and *E. dasystachys* Trin. are also to be expected. Both are tall, xerophytic grasses, the first with slender and the second with stout strict spikes.

### **Eremopoa** (Under **Poa** in some authors.)

536. *Eremopoa persica* (Trin.) Roshev. A common high level annual grass, 8-15,000'; Deosai ; Burzil Chowki.

537. *E. soongarica* (Schrenk.) Roshev. Deosai Plains ; much like the last species but with fewer spikelets i.2. three or less flos. per spikelet. 7-14,000'.

### **Festuca.**

538. *Festuca altaica* Trin., Karpuchy Vy. near Dras (Duthie) ; Burji La ; Satpura Pass, 14,000'. This pretty grass with distant purple spikelets on filiform pedicels is usually found from 13-16,000'.

539. *F. kashmiriana* Stapf. 8-14,000'. Burji La. A species intermediate between the last and the next. The panicle is usually green, not as lax as in the last and not strict as in the next.

540. *F. ovina* L. (*F. valesiaca* of F.B.I.). 9-16,000'. Common on passes and high ridges, small, much tufted ; inflorescence narrow, erect, leaves involute, filiform. To be expected.

541. *F. rubra* L. var. *villosa* Mert. & Koch, 6-16,000'. Satpura Nullah, Marpo La.

542. *F. sibirica* Hack. (*Leucopoa sibirica* Griseb.), 13-15,000' ; Satpura Nullah above Skardu. Flos. dioecious, stem sheathed to the top, awnless or nearly so ; white and hyaline except along the green nerve.

### **Helictorichon** (Under **Avena** in F.B.I.)

543. *Helictotrichon pratense* (L.) Pilger, 9-14,000'. Common in the Deosai region ; heads tan coloured or golden brown (margin may be purplish). Marpo La, Satpura Nullah, Burzil Chowki ; Mir Panzil Pass etc.

### **Hierochloe.**

544. *Hierochloe laxa* R. Br., 10-15,000'. A fine golden coloured sweet scented grass. Burzil Pass.

### **Koeleria.**

545. *Koeleria gracilis* Pers. (*K. cristata* (L) Pers.) .5-12,000'. A good forage plant.

### **Melica.**

546. *Melica jacquemontii* Dcne. This poisonous grass differs from the next in having the sheaths of the leaves glabrous. Xerophytic ; Shingo Vy., 10-11,000'. (Duthie) ; Kamri.

547. *M. persica* Kunth, Sheaths pilose and the heads are usually dark red. Satpura Lake cir. 10,000'.

### Milium.

548. *Milium effusum* L. 6-10,000'. Minimarg ; Kamri Pass ; Burzil.

### Oryzopsis.

549. *Oryzopsis lateralis* Stapf. 5-15,000'. Marpo La ; Burzil Pass. The most spicate of our species.

### Phleum.

550. *Phleum alpinum* L. 10-16,000'; common. Deosai, Burzil etc.

### Poa.

551. *Poa alpina* L. 10-16,000'; very common Burzil Pass, Deosai etc. The leaves are chiefly basal and .16" broad ; the spikelets are broadly ovate, thin, broad ; usually parti coloured.

552. *P. annua* L. 6-12,000'; ligules long, keels of palea ciliate ; lower branches of the panicle at length spreading or deflexed.

553. *P. araratica* Traut. Marpo La. Bases of culms reddish ; spikelets narrow ; glumes acute. A high level xerophytic grass.

554. *P. pratensis* L. 5-15,000'. A common and valuable pasture grass with scaly rhizomes. Deosai Plains, Marpo La.

555. *P. stapfiana* Bor, (*P. tremula* F.B.I.). 8-15,000'. To be expected. Panicle up to 10" long, pyramidal ; very lax and flaccid ; lower branches often 6" long and capillary ; spikelets distant. Much like *P. pagophila* Bor (*P. flexuosa* of F.B.I.)

556. *P. supina* Schrad. (*P. annua* var. *supina*). Deosai.

### Stipa.

- |     |   |                      |
|-----|---|----------------------|
| I   | Awn 2.5-3" long ; plumose throughout its length | <i>S. orientalis</i> |
| II  | Awn plumose above the column only 6-9" long     | <i>S. himalaica</i>  |
| III | Awn glabrous throughout 6-8" long               | <i>S. capillata</i>  |

557. *Stipa capillata* L. Shingo Vy., 10-11,000'; very long curled awns.

558. *S. himalaica* Roshev. (*S. pennata* Hk. f.). Shingo Vy., 10-11,000'.

459. *S. orientalis* Trin. 8-15,000', in deserts. Satpura Nullah (Duthie).

### Trisetum.

560. *Trisetum aeneum* (Hk. f.) R.R.S. (*T. aureum* Nees), 8-14,000'. Spikes a golden colour. Deosai, Kamri.

561. *T. spicatum* (L.) Richt., 10-18,000'; common in the alpine zone, Burzil Pass.

## GYMNOSPERMAE.

### GNETALES.

#### **Ephedra.**

562. *Ephedra gerardiana* Wall. var. *saxatilis* Stapf. Usually 8-14,000'. Often only 2" tall at high levels as on the Burji, Satpura and Thalle Passes. Burzil Pass. Found at 19,000' on the Kyensa La in Ladakh. Deosai.

563. *E. intermedia* Schrenk & Meyer. Stems rougher and coarser; usually growing on rocks; with woody bases 1" thick and 3' tall; a desert plant at lower altitudes; usually 6-9,000'. Satpura Nullah, Thalle La.

### CONIFERAE.

#### **Juniperus.**

564. *Juniperus polycarpus* Koch, (*J. macropoda* Boiss., *J. semiglobosa* Regel) 6-15,000'. In many places the only tree in the dry Inner Himalaya and in Baluchistan. It may become 50' tall and have a girth of 30' at the base. North slope of Burzil Pass; Shingo Vy. etc.

565. *J. communis* L. var. *saxatilis* Pall. (*J. nana* Willd.). A very common, gregarious shrub usually growing in rocky places above the tree line, 9-14,000' and often providing shelter for many herbs. The leaves are needle like in threes up to .5" long. The stems are more or less procumbent and colonies of this plant may cover a great deal of ground.

566. *J. turkestanica* Kom. may be prostrate at high altitudes as on the north slope of the Satpura La at about 14,000' or it may be erect as on the Thalle La in Baltistan not far from Skardu. This species is close to *J. pseudosabina* F. & M. The foliage is often dimorphous with longer juvenile needles and most branches with small scale leaves. This differs from *J. pseudosabina* in having thicker small branches; cones more than twice as big and in the size and shape of the seed. The fruits are 10-15 mm long by 8-10mm wide. The seeds are up to 10 mm by .7 mm.

## PTERIDOPHYTA.

### POLYPODIACEAE.

#### **Cystopteris.**

567. *Cystopteris fragilis* (L.) Bernh. The only species noticed on the Deosai plains.

#### **Dryopteris.**

568. *Dryopteris brunoniana* (Wall.) O. Kze. Ascent of Mir Panzil Pass to Deosai. 12,000'.

### **Polystichum.**

569. *Polystichum thomsoni* (Hook). Bedd. Mir Panzil Pass.  
570. *P. lachenense* (Hk.) Bedd. Kamri Pass ; to be expected.

### **Asplenium.**

571. *Asplenium viride* L. Marpo La, a rock crevice plant.

### **Athyrium.**

572. *Athyrium filix foemina* (L.) Roth, Mir Panzil Pass.

### **Cryptogramma.**

573. *Cryptogramma brunoniana* Wall. ex Hk. & Grev ; Mir Panzil Pass, 13,000'.  
574. *C. stelleri* (Gmel.) Roth, Shingo Valley to the Marpo La.

### **EQUISETACEAE.**

575. *Equisetum* sp. I found an *Equisetum* at the Burzil Chowki. It was possibly *E. ramosissimum* Desf.

### **FUNGI.**

#### **UREDINALES.**

##### **Aecidium.**

576. *Aecidium ranunculacearum* DC. on *Ranunculus hirtellus* Royle, Deosai.

##### **Puccinia.**

577. *Puccinia acrophila* Peck on *Lagotis kunawarensis* (Royle) Rupr. Deosai.  
578. *P. leveillei* Mont. on *Geranium collinum* Steph. Satpura Nullah, 14,000'.  
579. *P. longerostris* Kom. on *Lonicera* 20310.  
580. *P. rubigovera* (DC.) Wint. on *Aquilegia* 19883.  
581. *P. ligustici* E. & C. on *Selinum papyraceum* Clarke 19881.

##### **Trachyspora.**

582. *Trachyspora alchemillae* (Pers.) Fuckel, on *Alchemilla ypsilotoma* Rothm. Deosai Plains.

## Uromyces.

583. *Uromyces lapponicus* Lagerh. on *Astragalus himalayanus* Kl. Burzil Pass.

## USTILAGINALES.

### Cintractia.

584. *Cintractia elynae* Sydow, on *Kobresia capillifolia* Clarke.

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## ADDENDA

### Dubiae.

- (1) *Oxytropis glabra* DC. (*O. diffusa* Ledeb.). Skardu, Astor Vy., Thalle La, to Deosai. Flos. pink purple, stems copiously branched, zigzag, caulescent, perennial; flos. in elongated racemes. Probably not found as high as the Deosai.
- (2) *Lathyrus humilis* Fisch ex DC. (*L. altaicus* Ledeb.). Kamri Pass, 10-12,000'; Minimarg toward Deosai Pass. Flos. early soon after the snow melts; reddish, plants erect, perennial, 6-12", often in forest.
- (3) *Lonicera hispida* Pall. ex R. & S. 9-13,000' (Parker). A plant of moist places such as banks of streams, easily recognized by the broad boat shaped bracts and orange red berries. Chillam, Kamri Pass.
- (4) *Ligusticum thomsoni* Clarke. Satpura La. Usually 7-12,000'. Old shreds at stem base; leaves once pinnate, largely basal.
- (5) *Peucedanum skardicum* Clarke 29,982 Burji La. This species is based on a top of a plant with very young fruit and may not be a good species.
- (6) *Erigeron bellidioides* (Don) Bth. Burzil Chowki, 10,500'; Domel above Minimarg. Next to *E. multicaulis* Wall. but with narrower leaves; flos. white to lavender.
- (7) *E. monticolus* DC. Burji La (Clarke); scapose from a woody root, heads usually single, stems and leaves greenish with a varnished appearance; involucre with glandular hairs.
- (8) *Crepis kashmirica* Babcock; (*C. blatterioides* Vill.) 11-13,000'; often in the upper border of birch forest; flos. 1" in diam., involucre and peduncles dark woolly. Kamri Pass.
- (9) *Launaea microcephala* Hk. f. Meebold, Skardu-Burji La. I have not seen this.
- (10) *Convolvulus tenellus* Stocks, "Burji La" (Winterbottom in 1847). I do not know this.
- (11) *Euphrasia jaeschkei* Wettst. Lateral lobes of bracts more or less attenuate, mid lobe acute, corolla large, 8-9 mm. long; leaf blades broadly ovate. Kamri.
- (12) *Veronica hirta* Pennell, usually 10-15,000'. Kamri Pass 13-14,000'. A plant of dry soil on high alpine meadows, all parts pubescent, flos. in axillary racemes capsules 6-7 mm. long, leaves up to 5 cm. long denticulate serrate.
- (13) *Dracocephalum heterophyllum* Bth. Deosai (De Filippi).