Botanical Tours in Bhutan

With Special Reference to the Occurrence of the Genus Primula.

BY

ROLAND EDGAR COOPER.

WITH PLATES CCXXXVII–CCXXXIX.

Introduction.

These notes are based on observations and plant specimens collected in Bhutan, and deal mainly with Primulas, of which genus a very representative range was found. Other genera have doubtless as extensive a range, and among the more interesting plants which were found was *Nomocharis nana* E. H. Wilson, also a still unnamed plant of Campanulaceae, unrepresented from any previous botanical collecting tour in India and having an affinity with the huge Lobelias of the mountains of Central Africa. A field photograph of several of these plants has been reproduced in The New Flora and Silva, Vol. i, part 4, fig. 73. The Rhododendrons collected in Bhutan are set out with Field Book Notes in The Rhododendron Society's Notes, Vol. iii, No. 4, 1928, amongst them being the unique *Rhododendron rhabdotum* Balf. f. et Cooper (in Notes, R.B.G., Edin. x, 1917, 141); a marvel with large red stripes down the four-inch white corolla.

These few instances, and there may be more when the collections are fully named, are sufficient to prove the contention of Sir Isaac Bayley Balfour that Bhutan is not only a rich field but also an interesting one, capable of providing links with the floras of Sikkim and Szechuan.

The travelling of the expedition was continuous, and it was unusual to spend two nights in the one place except at Pumthang, the Maharajah's Headquarters, and then, of course, it was politic to do so.

The Lepcha plant collectors were out searching the hillsides whenever the expedition halted, but even so the collections represent little more than an occasional mouthful snatched on the move—so to speak—and there are many areas which would prove very fruitful if really intensive botanising could be indulged in. Further opportunity has not been available, and these notes are written to give hints to any future traveller.

[Notes, R.B.G., Edin., No. LXXXVII, November 1933.]

I would give the majority of any credit for the harvest of these tours to my collectors—Lepchas from Sikkim, recruited in Darjeeling; the endeavours of one, who was by no means outstanding, resulted in the gem of all the new Primulas found being introduced to cultivation. Particulars of his exploit are to be found in Blackwood's Magazine for March 1929 as the "Story of a Flower." The "flower" was *Primula eburnea* Balf. f. et Cooper (syn. *P. Harroviana*). The dual description arose through my being on service with His Majesty's Forces and from the fact that it had not been possible to correlate in the Edinburgh herbarium the flowering and fruiting specimens of the same plant.

It should be remembered that the numbers recorded by no means indicate the sole occurrence of any one species. The more common were found in almost every section of the country traversed, and they were noted; but this paper considers only collected material.

For help with identification I am indebted to Professor Sir William Wright Smith, Regius Keeper of the Royal Botanic Garden.

For convenience of this survey Bhutan has been divided into three different areas: (1) The valley of Paro and Timpu, where the flora approximates that of Sikkim, being separated from it by the Chumbi valley (the western area); (2) the valleys of Punakha and Tongsa and Pumthang (the central area); and (3) the valleys of Kurmed and Kurted (the eastern area).

On the accompanying map these different areas are sub-divided into uplands, lower passes and southern groups of peaks, making altogether nine regions lettered A to I, by which the range of the species of Primula (as set out in the latest diagnosis of the genus, Smith and Forrest, R.H.S. Journal, Vol. liv, 1929) may be observed.

In the accompanying list of species Cooper's collecting numbers are given, together with the region of Bhutan in which they were found (map letter), as well as the section of Primulas to which they are considered to have the greatest affinity, while fuller details of each number are given in the extracts in numerical order from the Field Books.

The Country.

Bhutan is a country in the Himalayas bounded by Sikkim on its west flank, Tibet on the east and north, and Assam and Bengal on the south. It lies between 26° 40′ and 28° N. latitude and 89° 10′ and 91° 45′ E. longitude.

Part of the main Himalayan range, the Indo-Tibetan divide, forms the northern boundary of the country, and its big, snow-covered groups of peaks reach, at their highest points, elevations of 20–23,000 feet. From this main range a series of ridges run southwards, decreasing in elevation until they reach the plains of India; but where they cross the line of 27° 30′ N. lat. there is a noticeable tendency for many of

these ridges to throw up their crests in peaks varying from 14,000 feet to nearly 17,000 feet in altitude. Lateral spurs project with an easy slope into the valleys, but sometimes the slopes make an abrupt descent to the bottoms of the valleys from shoulders at elevations of 8–9,000 feet.

Plant Distribution.

The character of the vegetation is influenced by the strong, moisture-laden, monsoon winds from the south. The ramifying outer spurs have a heavy rainfall, and are densely clad by moist forest of tropical and sub-temperate genera. The central portions of the gorges and valleys have consequently a lesser rainfall and tend to bear a drier type of forest, represented by two species of Pinus, one at elevations below 6000 feet, and the other above that level. The shoulders of the spurs at 8–9,000 feet are often only sward-clad. The moisture-laden breezes of the upper layers of the atmosphere pass unscathed over the outer spurs, only to be arrested by the summits of the ridges in the interior, where in consequence they deposit their moisture, and a moist temperate flora develops. This is made up of moss-clad and lichen-draped Rhododendrons, Maples, Poplars and Birches.

Trees range up the slopes to an upper limit of approximately 13,000 feet, with a dense undergrowth of shrubs and bushes, but there are many open glades containing herbaceous plants only. Above 11,000 feet—the altitudinal limit of pines—Spruce and Juniper are found, mainly on moist and dry slopes respectively, and range to the limit of tree-growth.

Above tree-level where the slopes are moist they bear a rich moisture-loving flora of biennial and perennial dwarfish herbaceous plants. Those uplands, which are robbed of moisture by intervening peaks and ridges, are consequently drier and have a less profuse herbage, all forms showing adaptations to drought, and also response to the effects of high altitudes. These areas are free of snow only from April to September, and this short season, during which alone growth is possible, seems to generate a definite type of plant which produces flower spikes at the first awakening of growth, the leaves following immediately after. The climatic conditions of the drier upland valleys are coincident with those prevailing on the north side of the main chain (i.e. in Tibet), and plant forms range accordingly across the chain into that country.

References to Primulas Recorded in Bhutan.

The only previous botanical observations made on the Primulas of Bhutan are those by Turner in 1783; Wm. Griffith, F.L.S., in 1838; and Sir J. C. White, from 1905 to 1907. Turner on his Mission to Tibet passed through western Bhutan from Buxa Duars to Tassichudon

Djong and Paro, crossing the ridge to the west of Punakha. Of the flowers seen between Chukka and Chapcha (89° 40′ E. long., 27° 10′ N. lat.) he says: "I was much pleased with the recognition of many well-known English plants such as docks, nettles, *primroses* and dog-rose bushes which were now (26.5.1783) in full bloom." In the report of Mr. Robert Saunders, Surgeon with Turner's Embassy, there is no mention of Primulas.

Dr. Griffith was in the country from mid-January to mid-March 1838, and his "Journals" and "Itineraries" contain copious scientific notes and drawings of botanical and other subjects. A note on the Primulas recorded by Griffith will be found at the end of this paper.

At a later date Sir J. C. White of the Indian Political Service, on his expeditions in 1905–6–7, collected many plants.

Areas Visited.

The writer's expeditions in 1914 and 1915 were made solely for collecting botanical material, and in the two years a total number of 348 days were spent in the country. Many areas were visited that not only had had no European visitor before, but were places where the Bhutanese themselves scarcely ever went.

Ranging from west to east the following upland areas of Bhutan were visited: the region opposite Phari Djong in Tibet at 89° 15′ E. long.; the Phile La at 89° 30′ E. long.; and then Monlakachung at 90° 30′ E. long.; Narim Thang and the Gong La at 91° 15′: the furthest east point reached being at 91° 45′ E. long., north-east of Tashiyangsi.

The intervening valley ridges were all crossed and certain isolated peaks of southern Bhutan were also explored, viz. Taka, between Timpu and Angduphorang; Black Mountain, between Angduphorang and Tongsa; Thungsi La, between Pumthang and Kurmed; the Rudong La, between Pumthang and Kurted and the ridge in the south-east between Kurted and Kurmed.

Certain of my tours traversed the whole route taken by Griffith except a small section which, lying in the foothills of low elevation north of Dewangiri, could not be expected to contain any species of Primulas.

The 1914 Tour.

After a season's botanical collecting in Sikkim in 1913 permission was obtained to enter Bhutan in 1914 for the same work. The tour started in July and finished in November. The whole season's plans were upset by the discovery that since Bhutan had hitherto had none but official visitors the tour would have to be modified to arrange visits to all the Governors or Djongpens of the valleys which were to be crossed during the tour, as well as to call upon the Maharajah of Bhutan,

who lived away in one of the eastern valleys. Consequently full advantage was taken in the first valley traversed (that of the Rydak River or Wong Chu or Thimbu Chu, which runs due north of Buxa in Bengal) to botanise in all the high altitude areas in the central and upper reaches of the valley.

This was most fortunate, as there was not sufficient time to explore any other region after visiting the Maharajah, and the main seed harvest was thus obtained only from Thimbu.

The flowers were for the most part those of Sikkim, but *Cotoneaster Cooperi* Marquand (Hook. Icon. Pl. xxxii, t. 3146) was collected in the Thimbu valley, while the haul of forms of species of the Muscarioides section of Primula, including *P. Menziesiana* Balf. f. et W. W. Sm., was most gratifying.

The 1915 Tour.

The tour in Bhutan in 1915 commenced in April, too soon to obtain flowering specimens of Rhododendrons. The " inner line," the boundary of Indian Administration—to go beyond which requires special permission—was crossed at Buxa and the track northwards along the Rydak River was followed to Dorbjir Djong and thence westward to Paro.

The region of the snow peak Chumolhari (27° 50′ N. lat., 89° 20′ E. long.) was inspected and from there an attempt was made to visit the sources of the Mo Chu and Pho Chu to the east, but without success, as the floods from the newly melted snow had destroyed all the bridges.

Thereafter attention was concentrated on the high hills over 13,000 feet in elevation, along the north-east and eastern boundaries of the country and the peak clusters of the secondary ranges which rear their jagged heads among the welter of rolling hills composing the central and southern portion of Bhutan. Further landslips and floods along the Mo Chu valley in the autumn dispelled any idea of reaching the region of the source of this river, so after visiting the Taka La area (east of Chapcha in Timpu), the tour was perforce brought to a finish much earlier than was anticipated. The frontier was again reached in October 1915, but one collector in search of seed was cut off from the main party through the bridges of the Mo Chu being carried away by floods, and he did not arrive at Buxa until November.

Itinerary Notes.

The forest of the flat land about Buxa was remarkable in April for its beautiful scent from the many " Sal " (*Shorea robusta* Gaertn.) trees in flower.

After a short stay at Buxa, adjusting transport difficulties, the first march to Giagoh was made on the 18th April, 1915.

Along the valley of the Rydak River there were numerous grass fires and in consequence a thin blue haze filled the valley. There was little breeze for the first few marches, which were very hot. On mossy rocks above Chukka, at 6,700 feet, was found a small and local plant, later identified as *Primula filipes* Watt, the only representative of the Primula section, " Obconica," in these hills (No. 3808).

The slopes of the valley, particularly above Wanakka, one of the earlier Bhutanese villages encountered, looked very pretty with young fern fronds just uncurled, while dotted through the bracken were flowering heads of a blue Primula whose leaves had hardly developed. This was *P. erythrocarpa* Craib (No. 3811), a low elevation representative of the more temperate *P. denticulata* Sm. It was found in most of the drier valleys usually at about 6,000 feet elevation. The slopes that had been burnt over in the spring with the ground blackened by charred logs and bushes gave the country a very desolate aspect.

At Dorbjir, whence the route lay westwards to the valley of Paro, the Rydak River or Thimbu Chu is spanned by a bridge which was undergoing quinquennial repair, and only one shaky plank remained. The erection of a temporary bridge and more transport difficulties caused delay, so that Paro was not reached until 29th April.

The valley of the Par Chu is fairly open, with gradually sloping sides, the hills rising to 12-13,000 feet, and the river for the most part is mild in its passage. At this season the valley was gay with bushes of the four-petalled *Rosa sericea*, *Berberis* sp., *Elaeagnus* and *Coriaria*. Paro Djong stands upon a cliff which appears to be composed of a coarse-grained conglomerate, and in the hills to the east of it large outcrops of a greyish, white-streaked sandstone occur. The bed of the Par Chu near the Djong (Tibetan for Fort), the headquarters of the governor of the valley, has boulders of a peculiar, blackened appearance, which have been smoothed by water action.

The cultivated land and fields which surround Paro extend up the valley, about a day's march northwards, as far as Domjit Djong, a small fort which guarded the approach of the valley against one-time Tibetan invaders. Beyond Domjit the hills are forested with *Pinus excelsa* Wall., with an underscrub of *Quercus semecarpifolia* Sm. A little further north at 9,000 feet the forest becomes free of *Pinus* and the plants of the undergrowth develop into a dense forest of huge oaks, while large bushes of *Pieris* and *Rhododendron* cover the slopes to the 10,500-feet contour.

Under a large cliff, before a bend in the stream, there is a small settlement called Shingaraph, and from this place the road is very rough, winding among huge boulders scattered over the screes. The cliffs have a peculiar appearance caused by large white blotches of natural weathering, and the many rectangular crevices in the rock face are festooned by dwarf oaks and hanging Rhododendrons. The valley narrows to a gorge, which continues northwards with much

winding to an altitude of 12,000 feet, where it opens out to moorland slopes. These slopes extend to the Tremo La pass at 14,300 feet, and to the screes which skirt the peaks of the Chumolhari group of the main range. *Larix Griffithii* Hook. f. is profuse at 11,000 feet, mixed with *Juniper, Abies, Betula* and *Rhododendron* for a further few hundred feet.

Ghassa is on the Bhutan side of the Tremo La pass which leads to Phari Djong in Tibet, and about here, in mossy glades of Birch forest, were seen stretches of *Primula Whitei* W. W. Sm., a species which belongs to the Sonchifolia division of the Petiolares section. The moorland flora was just stirring in early May, after the recent melting of the snow, the earliest plants showing flower being *Primula tenuiloba* Pax and a species of *Gentiana*. At the pass a quantity of black balls resembling sheep's droppings proved to be unopened flower-buds of an *Oxygraphis*. Progress further north into Tibet itself was forbidden, so the adjacent glens were explored. Among the treasures found in this area were several plants of a small sessile, green-flowered, long-rooted herb growing under snow-bent *Betula* at 13,000 feet, a quantity of *Iris* sp. (perhaps *I. kumaonensis*) and *Primula orestora* Craib (No. 3837), a gay dwarf of the Denticulata section. The snow-clad slopes about Chumolhari itself looked magnificent, while the adjacent hills were covered every night with a light fall of snow which kept all the shrubs, such as *Berberis, Lonicera* and *Rosa*, dormant. This region having been searched, the expedition returned to Paro.

The country in the north-east of Bhutan being the main objective of the year's tour, a quick passage was made across country into the Thimbu valley and on to Chalimaphe—notable for its huge cypress—then to Punakha in the Mo Chu valley, Tongsa, and Biaka in Pumthang, the seat of the Maharajah of Bhutan.

The hills over 12,000 feet surrounding the Thimbu valley about Tashichhu Djong had many species of Primula in flower, including *P. sikkimensis, obliqua, reticulata, obtusifolia, Smithiana, pusilla* and *sapphirina* and, east of the Bela La, a splendid quantity of *P. Roylei* Balf. f. et W. W. Sm. (No. 3902) was found on mossy rocks under Rhododendron scrub.

The ridge separating the Thimbu and Punakha valleys was crossed by a pass called the Dokey La. It is one of several, but is the one generally used by travellers proceeding along the main (east and west) highway of Bhutan. In shady moist forest just below the pass, which is just over 10,000 feet in elevation, two Primulas were found. One, a form of *P. petiolaris—P. Boothii* (No. 3919)—was profuse to the east of the pass, growing on moist gravel; the other, *P. bracteosa* Craib (No. 3917), is a much more delicate species, with sweet-scented, white flowers set in small heads, and it was growing in shaded sandy soil under thin oak forest with some fine Senecios. *Bryocarpum himalaicum* Hook. f. et T. (No. 3916) was seen at 9,200 feet.

Punakha was reached on the 23rd May and the Punakha Djongpen,

or Governor, in consequence of the receipt of orders from the Maharajah, was willing to give every facility to tour. *Primula erythrocarpa* Craib was found here in moist red soil at 4,500 feet.

The source of the Pho Chu, which flows from the east to Punakha, was the object of a short tour. The track was said to be very poor (which meant we must travel with light loads) and lay past Neptaika by the stream side. Southerly jutting spurs from the flanking ridges cause the Pho Chu to pursue a tortuous course and on successive spurs differing types of vegetation are to be seen. The most southerly spurs are only sward-clad, the next up the valley northwards have *Pinus longifolia* forest, and the further series have a covering of scattered oaks with *Rhododendron argenteum* beneath them. Beyond Kawayna, the last piece of cultivation seen, a tributary flows from the west past an island and joins the Pho Chu. The valley of this tributary has dense moist forest, including plants of *Magnoliaceae*, *Tiliaceae*, *Apocynaceae*, *Meliaceae*, *Araliaceae*, *Duabanga* sp., *Albizzia* sp., and *Alnus* sp., with soft fleshy Urticaceous herbs, and spiny climbers, chiefly *Rutaceae*, *Combretaceae* and *Rubiaceae*.

Along the main valley a small undulating piece of land was seen to stretch like a raised beach for some miles, extending to the foot of steep cliffs. It was covered with *Pinus longifolia* Roxb. and oaks, with occasional *Rhododendron argenteum* Hook. f., Leguminous bushes, and bracken, giving the gentle undulations an indescribably picturesque appearance. The cliffs rise sheer from the river and necessitate either a stiff climb or a scramble in shallow waters along the foot of them. Screes emerge from breaks in the cliffs and form small spurs across the valley, which become lower and less extended as the valley gets narrower further north. The spur tops are used as grazing stations by herdsmen, and each had a small hut upon it, untenable for any of the party because of the voracious appetites of the innumerable fleas therein. The successive spur tops northwards, with their huts, are called Sichu, Lantanka, Purthanka, and the last—the smallest and lowest by the side of the stream itself—was chosen as a camping site. The cliffs, however, become more and more precipitous until any progress further up the valley required tools and equipment, which the expedition did not carry and could not obtain.

North of this place hazardous climbs were necessary, up almost perpendicular rock faces covered with wet, loose plant debris. Short stretches of forty feet or so in height were traversed by erect, notched poles, whose slippery steps gave a good hold for the bare feet of natives, but no hold to boots, and even when enlarged these steps were difficult. Other parts of the track lay along small ledges overhanging the stream, and made of a rough platform of branches, which proved rotten in the least suspected parts, and let the travellers through often up to the armpits.

But at last the track descended to the main stream at a place called

Dongaysam, beyond which the cliffs were absolutely impossible to scale. Some interesting Rhododendrons were seen in the scrub about here, including *Rhodo. rhabdotum* (Nos. 3935 and 3937), which the late Sir Isaac Bayley Balfour, when describing it originally, called a " wonder " —a large flowered plant with red stripes up the corolla, like an Ipomoea. Many huge specimens of *Cupressus funebris* Endl. (the weeping Cypress) occur on steep exposed slopes, and glimpses of extensive forests of this or an allied species had been seen through binoculars in the further reaches of the valley (beyond Dongaysam) which could not be approached. These forests are said to be at the sole disposal of the Maharajah of Bhutan and the timber used mostly in replacing the main beams of the Gompas or temples. The elevation of the river at Dongaysam is 5,800 feet, while the highest elevation reached was a little over 6,500 feet. The stream further north is said to run through a gorge where five crossings or fords have to be made before reaching the place where the valley again broadens. Here is a small settlement called Usana, whose villagers are said to be few and very poor and uncouth, ekeing out a miserable existence on cattle-raising and buckwheat (*Fagopyrum*) cultivation.

The stream at Dongaysam can be crossed in the cold weather (when the flow is lessened by the freezing of the snows) by bridges placed from boulder to boulder, but in the month of May, the time of the expedition's visit, these boulders were all under water. Since no progress could be made further north the party returned down the valley to Punakha.

Eight days were occupied in this fruitless quest to Dongaysam, and on 30th May the road to Gichha up the Mo Chu was taken with the object of getting into the higher hills to the north. The road was quite good as far as Kaucham, but the small stream beyond it had had its bridge destroyed by floods. As it was estimated that a month would pass before the road was good enough for traffic, the Gichha hills were abandoned.

The road was now taken eastward to the hills in the vicinity of Biaka Djong in the Pumthang valley. The journey to Biaka was made without any trouble and the Djong was reached on 12th June 1915. On the Yato La, a pass on the ridge between Tongsa and Biaka, *Primula bracteosa* Craib (No. 3981) was found with *Primula Smithiana* Craib in marshy spots at elevations of 10,000 feet. A Rhododendron, also found here, epiphytic on mossy trees at 9,000 feet and with small red flowers, has been named *Rhododendron Cooperi* Balf. f.

On reaching Biaka collectors were sent out about the district and a short rest was made, since various scratches, leech and *pipsee* fly bites (which had been obtained in the Pho Chu valley) had become rather badly septic and needed attention.

From Champa in the Pumthang Chu valley three other valleys were visited, one to the north-west called Tolegong, which leads on to

another running east, the third the main Pumthang Chu valley, which reaches to the Melakatchu pass. Flowering specimens of Primula were found in great quantity in the hills below the pass (see Nos. 3989 to 4081), but the pass itself was under snow.

The dividing ridge between Pumthang and Tongsa has a cluster of high peaks south of the Yato La, the two main ones being called the Tibdeh La and Peugey La. These reach 14,860 feet and 14,640 feet respectively, and a short tour was made round them.

The valleys of the Pumthang Chu and its tributaries, the Jaisah Chu to the west, and the Tang Chu to the east, are wide and open, but the dividing ranges at the junction of the streams, five miles south-east of Biaka Djong, break up into ramifying spurs such as can be seen at the junction of foothills with the plains of India.

The track descends into the Jaisah Chu valley and then runs by the stream, passing the remains of several large moraines at the junction of the Pumthang and Jaisah Chus. The track crosses a small tributary at 8,000 feet and rises to a cluster of houses called Kyertsa, a few hundred feet above the stream.

The valley of the Pumthang Chu, south of the junction of its two tributaries, narrows to a gorge with steep and irregular sides, between which the broken waters of the river fill a tortuous channel. As the valley trends southwards the Pines are replaced by *Corylus*, *Taxus*, *Abies*, *Quercus* and species of *Magnoliaceae*, with a fairly dense scrub. The soil is a heavy clay, and in this scrub was seen a twenty-feet shrubby Rhododendron in fruit, with leaves having a peculiar edge like that of a not very prickly holly. This was *Rhododendron Kendrickii* Nutt. (No. 4086), and it is apparently a very local plant, having been collected only once before and then by Wm. Griffith in 1838, on the very same ridge. The flowers are pinkish with red spots on the inside of the corolla.

The track turns from its southward trend and goes westwards up a deep, steep-sided valley, crosses a small saddle on the ridge, and proceeds along the valley of a stream called the Pologong Chu to its source on the west side of the ridge.

The ridge itself at 13,000 feet is composed of smooth-topped hills and meadows with shallow lakes at the foot of imposing crags, the broken ends of canted stratified rocks. The sward of these slopes above tree limit contained the representative species of the East Himalayan high altitude flora, the only remarkable plants being a pure white variety of *Primula sikkimensis* Hook., which has been called *P. Hopeana* Balf. f. et Cooper; and a hairy mound of twelve inches, which was at first taken for a *Saussurea*, but afterwards proved to be the most unique Campanulaceae (No. 4099) not yet named (mentioned on page 67).

In a little swamp surrounded by Rhododendron bushes there was a quantity of *Cochlearia scapiflora* Hook. f. et T., which is usually

considered to have pale lilac and white flowers, but these plants had flowers of a deep yellow.

About another swamp were two kinds of Primula, one a small, few-flowered variety of the yellow *P. sikkimensis* named *P. pudibunda* W. W. Sm. (No. 4107), the other an erect, perpendicular-fronted, open-flowered plant (No. 4108) similar to *P. involucrata* Wall., but the flowers were all heliotrope, rather like *P. yargongensis* Petitm. Some plants of *Primula glabra* Klatt (No. 4096) growing among the boulders on the fringe of Rhododendron scrub at 13,000 feet had a far greater number of flowers than is usually seen. In crevices of moist, protruding rocks at 14,000 feet a quantity of *Primula soldanelloides* Watt was found.

The slopes to the north side of the peaks sweep away gently to the Jaisah Chu and appear to have much less rain than the abrupt southern cliffs. Edelweiss was common and two showy species of *Saussurea* occurred locally on screes ; one a plant with several large heads covered with huge spines ; the other, a many-headed form of *Saussurea gossyphora*, standing 18 inches high.

The cliffs on both sides of the ridge are clothed from 13,000 feet to 10,000 feet in *Abies* forest with its attendant scrub, but at 10,000 feet this gives way to a fringe of *Larix* and *Picea*, and then lower down, where the general conditions seem drier, the slopes are dressed with *Pinus excelsa* forest, with bushes of *Rosaceae*, *Philadelphus*, *Berberis* and *Elaeagnus* in open spaces.

During this tour the Prime Minister of Bhutan—Raja Ugyen Dorzi (an old acquaintance I had met in Kalimpong some years before)—had arrived at Biaka, and was most kind in furthering arrangements for touring in that part of Bhutan which lies east of Biaka. This is a region seldom visited by the Maharajah, on account of the trying roads over the passes and the heat of the low dry valleys.

A tour in this eastern district was commenced on 22nd July. The valley of the Pumthang Chu was gay at this time with quantities of a blue Aster, a yellow single Chrysanthemum, and a red Sorrel, while on a gravel slope were seen some plants of that unique Composite, *Arctium Lappa* L. with leaves two feet in diameter. Here was *Primula capitata* Hook., with white meal below the leaves and old flower stalks still standing among the young plants which had not flowered. *Primula Smithiana* Craib (No. 4148) was seen in the soaking peaty soil of some of the less precipitous streamlet beds. *Phytolacca acinosa* Roxb. or "Poke berry" was found at the base of sandy walls on the north sides of houses, a favourite site for this plant when out of its normal situation of moist forest ; perhaps growing here from seeds of discarded fruits that had been used for dyeing.

The watershed of the Tang and Pumthang Chus is composed of red sandy soil and was bare, except for scattered *Pinus excelsa* and fields of buck-wheat, the latter being cultivated as high as at an elevation of 11,000 feet.

The Tang Chu valley is wide, with the stream meandering through it. The road lies in an easterly direction, crosses the stream at 8,500 feet to Champka, and goes thence up a spur behind that village to 11,000 feet and then runs level through *Abies* forest to the base of another small spur, at the summit of which is the Rudong La.

The hillside up to the lower level of *Abies* forest had an interesting and regular arrangement of plants.

Isolated groups of Pines were surrounded with regular bands of different plants—first a fringe of *Salix* and *Berberis*, outside which were bushes of *Piptanthus* and dwarf roses with herbaceous forms such as *Verbascum*, *Senecio* and *Aster* blending into the turf of the open grassy slopes.

Two Primulas were seen in a swamp at the beginning of the level road, one, in profusion among the peaty turf, had a rosette of stiff entirely glabrous leaves from which rose a slender flower stem. The flowers, few in number, radiated horizontally from the stem in a terminal cluster of usually three to five, and were unique in that, although white, each had a large, yellow, distinctly marked star, surrounding the constricted opening of the corolla-tube and spreading over two-thirds of the open petals. This was *P. aureostellata* Balf. f. et Cooper (No. 4173). Another had large heads of gorgeous golden yellow, scentless, bell-shaped flowers and was common on peat blocks in stream beds (No. 4168); perhaps only an outstanding colour form of the wide-ranging and variable *P. sikkimensis* Hook. Small quantities of *Primula Roylei* Balf. f. et W. W. Sm., *Bryocarpum himalaicum* Hook. f. et T., and species of *Salvia*, *Polygonum*, *Potentilla*, *Geranium*, *Pedicularis*, *Valerianella*, *Aster*, *Campanula*, *Senecio* and *Cnicus* occurred in open glades of the *Abies* forest up to the pass at 13,000 feet. The ridge is first crossed by a small pass called the Kempey La, from which there is a gentle slope down to a rugged outcrop of rock beds at 12,000 feet. The quaint but not particularly effective candelabra, *Primula prenantha* Balf. f. et W. W. Sm. (No. 4164), grew here in pure sand, with a six-inch stem rising from a rosette of very reticulately veined leaves, with two or three but often single whorls of small, golden-yellow flowers, with pronounced brown calyces and bracts. The track runs along this outcrop and in its tortuous descent passes through several narrow gaps in the broken tilted rock beds. Because the horns of cattle used to get jammed here the whole of the pass crossing the ridge is called Rudong La, referring to the catching of a yak's horns; but the name is no longer applicable as the road has been widened and the steeper parts are stepped so that the passage for laden animals is now easy.

The way down the cliff face is at first very abrupt and has little on it except scattered bushes, among which was seen a plant three feet high with axillary clusters of white, waxy, tubular flowers which has been named, in compliment to the writer, *Buddleia Cooperi* W. W. Sm. (No. 4154). The debris from the upper cliff has formed a steep scree-

like slope between 10–11,000 feet, which is at first only turf-covered but develops various types of forest reaching to the river below. On the turf slope at 10–11,000 feet there is a hut called Pimi, below which *Acer*, *Aralia* and *Rhododendron* make a dense scrub. Forms of *Sapindaceae*, *Saxifragaceae*, *Styracaceae*, *Magnoliaceae* prevail from 9–6,000 feet, where *Quercus* becomes common.

On a gentle lower slope at 5,500 feet a small settlement called Anjor was reached at 7 p.m., after a long day's journey from Biaka and after stumbling in the gloaming through irrigation canals and the bordering inundated rice-fields. A *Cupressus*, commented upon by Griffith, so long ago as 1838, for its huge dimensions, makes the village distinctive for many miles along the tributary of the Kuru Chu beside which it is situated. The stream is crossed by a low covered-in bridge and the road gradually ascends to 6,000 feet. The hillsides about Anjor are steep and clothed in dense forest, and the approach to the drier valley of the Kuru Chu is evidenced by the appearance of *Pinus longifolia* Roxb., which occurs up the sandy, red, bordering hills of the main valley regularly to 6,000 feet. Above this elevation the forest alters and contains quantities of oaks, on the branches of which bunches of a mistletoe (*Viscum* sp.) were seen. The main ridge bordering the Kuru Chu, which flows south from Tibet through a gap in the north in the main range of the Himalayas, has many spurs at this point. Between the spurs are large flat aprons of debris, weathered through the ages, until now they are sufficiently fertile to enable the inhabitants of many scattered villages to attain a fair degree of comfort.

It is interesting to see how the country east of the Yato La ridge alters in character in its eastward trend. From a series of fairly clearly determined south-trending ridges of rock beds, which are set at an angle of dip of almost 45° towards the south-east, there is a change to the fierce upstanding outcrop at the Rudong La, while in the Kuru Chu valley the beds seem to be inclined in the opposite direction. As a consequence of this obvious upheaval, beds of limestone occur on the surface in the Kuru district, and their presence doubtless helps to account for the different facies of the floras that have been noticed on the Yato La ridge and the country east of it.

Across the Kuru Chu is the Djong of Lhuntzi or Lingtsi, perched at an elevation of 5,200 feet on the nose of a spur which comes down from the eastern side of the Kuru Chu valley. From this eminence it overlooks the junction of the Kuru Chu and its tributary from the east, the Khomo Chu, which flows almost a thousand feet below. The western bank of the Kuru Chu is remarkable for a large strip of alluvial soil stretching from near Lingtsi southwards to the valley in which the village of Manjibi is situated. This flat ground was extensively cultivated and dotted with houses. On flat stretches by the stream many specimens of a plant resembling *Butea minor* Buch. were seen, but their habit distinguished them from that species.

Two roads go to Tibet from Lingtsi, one along the banks of the Kuru Chu, the other along the Khomo Chu. The latter crosses the main divide in the north via the Bod La pass, and since it promised an interesting field among snow peaks it was followed.

The Khomo Chu valley is steep-sided, and to get above the gorge one must go up the Lingtsi ridge via Pakhang and cross the Reb La at 10,000 feet to Sawang, where the inhabitants are notoriously shy.

Pinus sp., probably *P. excelsa* Wall., were seen on the spur tops, and *Alnus nepalensis* D. Don, *Juglans*, *Quercus*, *Meliaceae* and *Styracaceae* by the stream. *Abies* appear in quantity at 10,000 feet, and in blackish, muddy pools at the edge of glades, and also by the road, more plants of *Primula prenantha* Balf. f. et W. W. Sm. were found. Some of them had only one complete whorl of five flowers, with a solitary terminal flower or a reduced whorl of three terminating the inflorescence; but others were seen having three complete whorls of five flowers—of these seed was collected. The best specimens grew on sour, soaking turf, which environment was also greatly appreciated by a petiolarid Primula and plants of the allied *Bryocarpum himalaicum*.

Many locusts were seen on this march, settling on bushes of *Strobilanthes* and on the small clusters of *Larix* and *Salix* at 10–11,000 feet. The stream divides at Teja or Tosumani and the road follows the western branch. This stream is very steep, with a pretty series of cascades coming from the flat terraces which are surrounded by snow peaks.

Singhi Djong is a small temple at the foot of a cliff upon one of these terraces at an elevation of 12,000 feet.

These flat areas, which have several meandering streams through them, are very pebbly and fringed with Rhododendron scrub. A poor mat flora occupies their greater part, composed of *Pedicularis*, *Senecio*, minute *Umbelliferae*, with bushes of a species of *Tamarix* in stony, drier parts. On soaking peat occasional plants of *Pinguicula* were found in fruit on 3rd August 1915.

The largest of the flats—Narim Thang—occurs at 14,000 feet, surrounded by many glaciers. On it is a hut used by travellers as a shelter either before or after encountering the rigours of the crossing over the main divide into Tibet. The sweep of snowy cliffs and peaks that encircle Narim Thang has a welter of glacial debris at its feet. The tangle of moraines and screes shelters several tarns, and beside the edge of the largest—which is a bean-shaped loch fifty feet long at an elevation of over 15,000 feet—many interesting plant forms were found. These included many dwarf Primulas, one of which was *P. sapphirina* Hook. f. (No. 4265). This species is a perennial and produces yearly, small branches, the spaces between which are filled with the previous year's foliage. The cold and wet soaks and rots these old leaves and stems, but the fibres of the latter give support to the whole, while the new growths root below the crown into the peaty

mass and so perpetuate the plant. Every growing season, flowers, produced from each crown, cover the whole clump with hundreds of dainty bells that dance in the wind on their slender stalks. Other Primulas were *P. Stirtoniana* Watt (No. 4269), *P. strumosa* Balf. f. et Cooper (No. 4270), with yellow flowers, an interesting Nivalid, and *P. macrophylla* Don var. (No. 4273).

The track over the Kengla or Gong La pass at 16,290 feet into Tibet passes the western end of this loch. Cushion-form plants, typical of such stony exposures—such as species of *Cruciferae, Saxifraga,* small *Umbelliferae* and *Pedicularis*—were scattered about. The Primulas included *Primula oreina* Balf. f. et Cooper (No. 4247), a plant very like *Primula Jonarduni* W. W. Sm. and an interesting link with *P. congestifolia* G. Forrest of Yunnan.

The gem of the whole of the eastern Himalaya is *Primula eburnea* Balf. f. et Cooper (No. 4236). This plant is less than six inches across, but wonderfully showy with a rosette of leaves, glabrous above and white mealy beneath, while the flowers, white with reflexed corollas, are borne in a cluster on a slender six-inch scape. It was found growing in peaty soil among boulders by a stream.

West of Singhi some single-flowered specimens of the yellow starred *Primula aureostellata* Balf. f. et Cooper were found in young fruit.

On the return journey to Lingtsi some plants of *Primula mollis* Nutt. (No. 4227) were found at 7,000 feet below the Reb La, among the succulent undergrowth of an adjacent stream. A few fields were to be seen by the stream, but the main crop (buckwheat) grown by the people of Sawang was said to be cultivated on the higher spur tops.

Separated from the Kuru Chu by a ridge crossed by the Dongo La pass is the valley of the Dangma Chu. The track running at first along the side of the Kuru Chu, which is alternately smooth and extremely tumultuous, ascends a spur on which is situated the village of Unji. It was noticed that the spray from the tumultuous portions of the stream gave off a most peculiar smell, as of ozone, similar to the flats in the mouth of the Thames estuary. The Kuru Chu was in flood and in places the track was submerged waist-high in the waters. These were also rapidly undermining the fringe of vegetation, which included *Grewia, Magnolia, Albizzia, Quercus, Cinnamomum* and *Mallotus,* and tufts of lemon grass. Among the debris that was being carried down stream at some speed was a despairingly lowing cow that members of the party rescued just before it reached a series of cascades.

The Unji spur from the west of the divide is very bare, and at first steep, with huge, glacially rounded outcrops occurring along the hillside, but extensive stretches of fields occupied the flatter slopes at 6,000 feet.

At 6,350 feet specimens of Walnut, Cypress, Musa, Maize, Rice, Erythrina, Citrus and Beans were seen. By the principal house of Unji village, *Belamcanda chinensis* Leman (*B. punctata* Moench) occurred

on a small flat. Large quantities of this plant had been seen the previous year on the Punakha plain.

The forest at 7,000 feet is principally composed of oak, which gives way at 9–10,000 feet to moss-hung Rhododendron and lichen-clad *Betula*, with an occasional *Taxus* sp. at 8,000 feet.

The ridge, which has *Abies* forest in sheltered hollows and stretches of herbage and bushes on exposed situations, is crossed at 12,000 feet after a most fearsome climb up and along a rugged rock edge. *Primula xanthopa* Balf. f. et Cooper (No. 4393), the sole Himalayan representative of the Souliei section, was found on this pass—a lovely plant, growing under light, open, moist forest at 12,500 feet. The curled or waved petals of a pale lavender shade contrast with the primrose yellow eye, set to attraction amid its rosette of deeply fringed leaves on the deep green moss of the boulder upon which it was perched.

The Dongo La is really a series of nine ridges, the highest of which is 12,000 feet, and the intermediate and lower ones are often merely spurs.

Between these spurs are little flats, on one of which was found quantities of a Primula (No. 4397). Wm. Griffith also found this plant in this locality under his No. 582 (Icon. fl. Bootan t. 43=K.D. 3514), which Craib (Notes, R.B.G., Edin., vi (1917), 276) considers to be *Primula Boothii* Craib. It was remarkable for its dark green leaves and the peculiar fragrance of its fruit capsules. It was noticed that the plants with the richest green leaves were on mossy granitic blocks by the stream. This plant is apparently not common, as the native collector said that it, or a similar plant, had only been found before on one of our particularly hazardous crossings, in 1913, from Chakung to Toong in Sikkim.

The Primulaceae show great variation in East Bhutan, but the majority of plants are those common throughout the whole country, although some new and interesting forms were found in the vicinity of the Kengla and Narim Thang that did not occur elsewhere.

The track on the eastern slopes of the Dongo La descends abruptly through a glen, covered in *Abies* and *Picea*, to 10,000 feet, where the valley opens out and bamboos become common, but in the vicinity of Sana at 8,500 feet the open forest of *Pinus excelsa* with its attendant scrub covers the hills, which again, nearing Tashiyangsi, are dotted with oaks.

A heavy rainstorm, occurring on this march, demonstrated the worst features of travelling in bamboo forest, with its dripping and dropping leaves, slush among the tangled roots, slippery pieces of the stems on the road ; with leeches to add a diversion!

Tashiyangsi is a small Djong on a south-facing spur at 6,000 feet between the Dangma Chu and its western tributary the Dungrikand Chu.

The valley to the northwards winds considerably, and in August

snowy peaks were seen to the north and east. Two species of *Pinus*, *P. longifolia* Roxb. and *P. excelsa* Wall., occur on the hillsides about Tashiyangsi—*P. longifolia* growing on slopes below 6,000 feet and *P. excelsa* on slopes above that elevation. Each species keeps to its own zone quite definitely, and there is no mingling of the two as might quite reasonably be expected. One pine combining the characters of both species, found in limited quantity along the junction of the zones of the two species, was collected (No. 4458). It has a pyramidal form, being thickly clothed to the ground with sinuous, long-needled branches. Some specimens were seen near Tashiyangsi on a little flat by the stream, used as a burying-ground. The country about Tashiyangsi changes absolutely from the series of southerly trending ridges which spring from the main Himalayan chain. This is the type of country so far experienced in Bhutan, but here the chain becomes broken up, so that in place of one long main range there occur scattered groups of high peaks, in the country (Tibet) adjacent to the north-east and eastern frontiers, from which lateral spurs trend in a south-westerly direction. These spurs and the valleys between them compose the country of east Bhutan. The eastern side of the Tashiyangsi valley consists of a tangle of spurs, that cut off the region of Donkar lying to the north-east in Tibet. From this area come the waters of the Dozam or Dangma Chu, which flow into the main stream of the Tashiyangsi valley called the Tashiyangsi Chu, a few miles north of Tashiyangsi Djong ; south of the Djong the same stream is called the Kulong Chu.

The spur running almost parallel with the main stream terminates at Khamna. From the Tibetan province of Tawang on Bhutan's eastern frontier the Tawang River flows in a broad valley, which is bounded on its southern flank by another great ridge that swings in a south-westerly direction from Tawang to peter out in the foothills about Dewangiri. The waters of the Tawang Chu join the Kulong Chu by Khamna, and the combined streams for the rest of their course are called the Dangma Chu. The Dongo La ridge on the west of the main Dangma valley continues almost directly south to a point about twenty-four miles south-west of Tashigong, where spurs from it approach others from the Dewangiri ridge in the east and make a constriction in the valley, which continues as a gorge for some miles. Below this gorge the Dangma Chu receives the waters of the Kuru Chu and another fifteen miles or so further south the waters of the Pumthang Chu join it. This had already received the waters of the Tongsa Chu about ten miles above the junction. The combined streams now make a river of some considerable size, which emerges from the foothills into the Bengal plains thirty miles west of Dewangiri and is then called the Manas River.

The hills of the Kulong Chu valley from Tashiyangsi to Khamna are steep and clothed in dense forest as at Tashiyangsi, but at the

junction of the valleys of the Kulong and Tawang Chus there is extensive cultivation about Khamna, extending over mild slopes between the elevations of 3,000 and 6,000 feet.

About ten miles as the crow flies, south from Khamna, Tashigong Djong sits—at an elevation of 3,180 feet on the rocky top of a northern spurlet from the Dewangiri ridge between the Dangma and the Gamdi Chu, a tributary of the former—close to and overlooking the Dangma Chu. Peaks of the ridge south-east of Tashigong run up to 14–15,000 feet in altitude.

The steeper slopes at Tashigong and other sandy stretches are dotted with Pines. The hillsides of this and other small spurs compel the track to follow a devious course in and out of the valleys between them, and in doing this it passes many ruined and deserted villages before again reaching the main stream.

The general aridity of the bare red-soiled hillsides makes a strong contrast with the fringe of vegetation by the streams, where *Sterculia*, *Bauhinia*, *Melia*, *Albizzia*, *Sapindaceae*, *Holmskioldia*, *Croton*, *Kalanchoe*, *Selaginella*, *Woodfordia*, *Bassia*, *Zizyphus*, *Vitex*, *Bombax*, *Wrightia*, *Bischoffia* and *Quercus* were seen. Patches of *Cycas* and occasional *Agave* plants grew on dry places. The principal crops are Cotton, Rice and Potatoes, and a *Cajanus* sp. used as a catch crop for the lac insect. The main crop of stick lac is raised on trees of a species of *Zizyphus*, which are scattered in the forest at 4,000 feet. The soil is stirred about their roots and manure given to stimulate root activity, and as the trees are pollarded when the crop is reaped the resultant shoot growth is exuberant. These plants, with their blackened stems, pollarded heads, and young branches with vivid green foliage, are one of the most striking features of this arid valley. Small pieces of insect-infected *Cajanus* are placed among the shoots of the *Zizyphus* in September when the fresh annual growth is complete. The insect breeds rapidly and covers the shoots with its progeny which, piercing them, causes a gum to exude. In November the shoots are pruned off and the now solid incrustation of insects and stained gum is sold. The weight of lac balancing a Tibetan "tanka" fetches the price of one tanka, i.e. the Tibetan fourpenny-piece.

The Dangma Chu, a little north of Tashigong Djong, is spanned by a very fine, iron-link, chain, suspension bridge, and from this a steep ascent leads to the Djong at an elevation of 3,850 feet above sea level and 1,100 feet above the stream. The high ridge behind the Djong was visited, and on the Djong spur at 6,000 feet is a small bay of cultivation round about the residence of the wife of the Tashigong Djongpen, and higher up, at 10,000 feet, is a deserted building called Prawnzong Gompa. The spur was crossed by a track over the Prengla at 13,000 feet, which, owing to its treacherous nature, is seldom used.

The trip gave little beyond splendid views of snowy peaks which lay at the northern end of the Dangma and Kuru Chu valleys. The

herbaceous flora included two kinds of Primula, *P. Griffithii* Pax and *P. Boothii* Craib, *Cyananthus*, *Gentiana*, *Cremanthodium*, *Salvia*, *Morina*, *Potentilla*, *Saxifraga* and small *Umbelliferae*.

An endeavour was made to return to Pumthang by crossing the Dongo La and Rudong ridges which divide the waters of the Dangma from the Kuru Chu, and those of the Kuru Chu from the Pumthang Chu, visiting on the way the clusters of peaks in mid-Bhutan on those ridges. The Dangma Chu winds considerably in the stretch of gorge south of Tashigong, and the hills near its junction with the Kuru Chu are clothed in dense forest. Along the western bank of the Dangma Chu, below Tashigong, a track runs westwards, crossing the Gongtong Chu, the Rolong Chu and Helong Chu, which are small tributaries of the Dangma Chu flowing from the western ridge. The track then rises along the spur on the south side of the Helong Chu, and after a steep ascent of a few hundred feet from the stream a little open flat called Yeayung is reached at 3,000 feet. Here, to the south-east and south, a view of more open and much cultivated country is seen in the Dangma valley.

The various settlements are called Geyoomdjong, due south; Oojrung, south-west by south; and Chassleur in the south-west.

The hills about the Helong Chu are very bare, and at 6,000 feet the scattered Pines give way to occasional oaks, with bushes of *Artemisia*, *Elscholtzia*, *Pieris* and *Gaultheria*, *Astragalus*, and a very hairy, blue-flowered *Strobilanthes* on sandy slopes. Quantities of the strangling dodder (*Cuscuta*) were seen on the general herbage.

A large courtyard at 7,100 feet elevation, called Damoitsa, straddles the spur top a short distance from a second small south-trending ridge. The village fields lie in adjacent hollows.

Specimens of the peculiar pine of Tashiyangsi were again seen near Damoitsa and the forest on different exposures has either oaks or *Pinus excelsa* as the main feature.

The depression between the ridge and Damoitsa is a precipitous-sided ravine clothed in a heavy oak forest. The second ridge is crossed at 6,400 feet by a depression called the Bagha La, whence the track crosses the Bami Chu at 5,000 feet and runs down into the Sher Chu valley. The Sher Chu trends south-west to join the Kuru Chu at the end of a comparatively low spur. On this spur and on the west bank of the Sher Chu is the village of Gnatsa at an elevation of 5,700 feet. The cliff sides below that place are precipitous. The track crosses the spur by a pass (the Kole La) at an elevation of 7,700 feet to drop down another small glen in which are the stream and village of Mungur. The track continues past this village to reach the Kuru Chu at the bridge, where the main Dewangiri Pumthang road crosses the main stream.

The Sher Chu is first crossed at 3,300 feet, where the valley is a little wider. The moist gullies are clothed in dense forest containing species

of *Magnoliaceae*, *Guttiferae*, etc., with *Musa*, *Callicarpa*, Tree Ferns, *Peperomia*, *Alocasia* and *Leea* in the undergrowth.

Below Gnatsa the Sher Chu runs beneath precipitous cliffs of horizontally bedded rocks that are bare of any but the smallest and poorest plants. The hills bordering the Sher Chu near its junction with the Kuru Chu in the distant south are very steep, but flats of alluvium, north of the gorge, are composed of reddish, sandy soil, and support stretches of fine, open, clean-stemmed forest of *Pinus longifolia*, through which the wind soughs in warm, languorous gusts.

The road from Gnatsa, crossing the ridge, runs at first past some glens in which tree ferns are again prominent, then through open but shady forest in which a scrambling fern (*Gleichenia dichotoma* Willd.) is conspicuous, and then up a small incline to the Koley La pass at 7,700 feet.

West of the pass the woods are composed of Oaks, *Bucklandia* and several plants of the Pine seen at Tashiyangsi; at 6,000 feet *Pinus longifolia* Roxb., *Pyrus*, and occasional plants of *Agave* occur. On this march numerous chortens or shrines were seen, remarkable for the fact that they were built of a white marble that weathered very little. Here there were two kinds of rock, one thin bedded and greasy to touch, with a silvery-grey colour, the other a pink, hard, marble-like stone.

On a spur of open, thinly-wooded country below the Koley La and set back from the main Kuru Chu valley is the village of Mungur at 5,500 feet, and in the valley of the Mungur Chu several species of Leguminous trees are common although *Pinus longifolia* is the predominating plant on the slopes of the main valley.

Cliffs of a side valley in the Kuru Chu basin showed steep surfaces of bedded rocks dipping to the south-west with a strike north-west to south-east. The Kuru Chu is crossed by a bridge at 2,300 feet, and the main road travels north alongside the stream. Since the peaks on the Rudong La ridge were the objective the main road was not followed, but a track that goes in a westerly direction from the bridge and rises gradually to a steep, blunt spur which separates the valley of the Shonga Chu, coming from the north-west, from that of the Kuru Chu.

The Shonga Chu valley winds at first through several large beds of alluvium that in places are covered in pure forest of *Pinus longifolia*, and a little fringe by the stream contained isolated plants of *Eriodendron*, *Sterculia*, *Bassia*, *Callicarpa*, *Bignoniaceae*, and *Mangifera* overrun with spiny *Leguminosae* climbers and *Combretaceae*.

Approaching Shonga Djong, the hillsides become steep and clothed in moist forest, and the Shonga Chu is crossed by a bridge called the Gindie Sam.

Shonga Djong is at 3,200 feet on a spur projecting from the western flank of the large ridge that, in the north, is crossed by the Rudong La. The Djong has been abandoned for many years, and now only shows

the walls peeping above the vegetation which has arisen round them. The Djong itself is reached by a short side track from the main path which, on account of the steep cliffs, has had to be constructed on the further side of the stream. On dry exposed faces the hills have pines, oaks, cotton trees and grasses ; but in sheltered nooks is a dense undergrowth of many shade-loving, moist-forest species of *Geraniaceae*, *Scrophulariaceae*, *Gesneraceae*, *Begoniaceae*, *Acanthaceae*, *Urticaceae* and *Scitamineae* growing below *Magnoliaceae*, *Guttiferae*, *Ochnaceae*, *Leguminosae* and *Sapindaceae*.

The road runs up a steep hill face from a second bridge on the Shonga Chu to Saling, a small settlement on a steep hillside at 5,000 feet, near which place plants of *Engelhardtia*, *Schima*, *Quercus*, *Pyrus*, *Styracaceae*, *Rubiaceae* and *Melastomaceae* were seen.

Behind Saling at 8,600 feet, going in a north-westerly direction, the spur is crossed by a pass called the Lado La, covered with *Abies*, *Acer*, and *Rhododendron* scrub. A little below the pass in very bare and stony places large clumps of a *Rubus* sp. were found, which had solitary, axillary, large, red fruits, and entire, elliptic leaves, silvery below, six inches long by two inches broad.

From the Lado La the way keeps level and ultimately rejoins the Shonga Chu at 8,500 feet. The country at this point is very rugged and clothed in a dense forest of *Picea morinda* Link and *Abies Webbiana* Lindl., but gradually opens out, at an elevation of 9,500 feet to 10,500 feet, to herb-clad rolling uplands. Dwarf shrubby forms of *Ericaceae*, *Coniferae*, *Rosaceae*, etc. occur in the small hollows and depressions.

These uplands afford grazing for many herds of cattle, and there is a small settlement called Singong at 9,500 feet with a few fenced enclosures of buckwheat.

Two high peaks of 12,500 feet elevation crown the main ridge north of Singong, and the path runs between them over a pass called Onta La (the Thungsi La of the map) at 12,150 feet elevation. This is approached on both sides by a very gradual slope on which, among the herbage, were found *P. capitata* Hook. (Nos. 4731 and 4732), *P. Smithiana* Craib (No. 4744), *P. sikkimensis* Hook., *P. petiolaris* var., *P. obtusifolia* Royle.

Heavy mists swathed the western side, but glimpses were caught at times of open, shallow basins, bare of trees but gay with fields of buckwheat and herbs. This was the district of Ohra, where the track undulates over low spurs between the dips. By a stream in one of the dips a quantity of *Coriaria terminalis* Wall. (No. 4736) was found in fruit. This plant is a low shrub two feet high, flourishing in sandy dryish soil under light shade and preferably by a stream ; the fruits are not edible and stain the hands a vivid purple brown when crushed.

The north slope from Ohra to the Shatta La—the pass which crosses the ridge separating the waters of the Tang and Ohra Chus—is gradual and bare, not only of woody plants but also of herbs, since fields of

buckwheat extend to 11,000 feet. The pass is only 200 feet higher. North-west from this spur, and one day's march further on, Biaka Djong, whence the expedition had set out forty days before, can be seen.

The valley of the Pumthang Chu is composed of large successive stretches of alluvium set off by the clusters of houses on adjacent spurs, with the huge mass of the Djong looming in the west of the valley.

The descent to the Tang Chu is at first over rolling, bare uplands, and then sheer down to the stream at 8,350 feet, through thin forest, for the most part of *Pinus excelsa*. The change from moorland to gorge is most abrupt, the gentler slopes being arrested at least sixty feet above the stream by the steep cliffs of granite rock which form the gorge.

A stay of twelve days was made at Biaka while collectors were sent out to the Melakatchu, Tibdeh La and Rudong La for seed, and the collections made on the round tour were finished and packed; and on the 12th of September the party left Biaka for Tongsa. The main track from Tongsa to Angduphorang was left at Chenebje and a track southwards was followed towards the Black Mountain. This, at first, led through *Pinus excelsa* forest, and then through typical *Abies* forest, over very steep hillsides to a small pass at 11,550 feet elevation called Lamsi La.

Actual rock outcrops were not often seen, although near Chenebje some appeared to be of a calcareous nature, but west of the pass great heaps of granitic boulders constitute the ridge. The country slopes away southwards in a wide, open, wind-swept, curved valley dotted with settlements and bare of trees except occasional patches of *Pinus excelsa*, with the typical scrub of this forest by the streams.

This wild district is called Pobchaka and it extends south-west for several miles, and further north-west another stretch of wide open country descends from the main ridge and joins the Pobchaka district. The streams draining these two regions join to form the Kein Chu, a tributary of the Punakha Chu. The general elevation of the valley is about 9,000 feet.

The Lamsi La ridge has some high peaks east of Pobchaka, including Black Mountain, elevation 16,130 feet. These were visited via the small ridge bounding Pobchaka on the east, which was traversed to its junction with the main ridge and the latter was then followed to the peaks. The road was very hazardous and at times lay along the edge of the rock outcrops. On this ridge there was Juniper forest which had many splendid plants thirty feet high, but Rhododendrons were scarce. *Cyananthus lobatus* Wall. dotted the open sward with its azure flowers, and on the steeper slopes a *Swertia* and a *Senecio* were conspicuous.

A halt was made in a barren turf-clad recess at 13,000 feet just below the peaks. Rain fell, so that no distant observations could be

made, but mat willows, *Leontopodium*, *Senecio*, *Saussurea* and *Swertia* were common at 14,000 feet, the first preferring a white, easily disintegrated rock.

The track to the actual Black Mountain peak itself was most trying, scrambling over steep rock faces and then through *Abies* forest in hollows and culminating in a fearful climb up long screes of loose blocks. The actual summit of the highest peak at 16,130 feet has a shape like a house with a gable roof with projecting eaves, and is unscalable for the few hundred feet to the top. The rock is dark and fine grained.

Many interesting Primulas were found on moister portions of the scree, including *P. chasmophila* Balf. f. (No. 4822) and *P. adenantha* Balf. f. et Cooper (No. 4855).

The first snow of the season fell on the 19th September and lay unmelted in crevices, so that the summit face appeared to have a pattern in rough squares. Snow had, however, been seen some few days before on the north-east slopes of the Taka La south of Angduphorang. From the peak the track lay northwards along a spur which overlooks Angduphorang, from which many minor spurs run in a south-westerly direction.

The countryside was at first a series of open shallow valleys, but these successively and rapidly deepened, to become gorges clothed in heavy forest.

The valley adjoining Pobchaka was remarkable for a curious effect caused by the changing of the bed of the stream in the marshy valley. It had several times formed a fresh channel, leaving the others to be filled as best they could. The many channels were all serpentine and showed their age by the development of the varying shades of green of the vegetation filling them. The youngest and most recent were a light green and the older ones darker, approximating the russet green common to the general marsh.

The head of the valley directly south-east of the ridge opposite the Angduphorang spur is fairly open and extensive, with much cultivation and many settlements upon it about Codakka at 8,500 feet.

The main ridge is finally crossed at an elevation of 10,000 feet at a point from which a comprehensive view of the Mo Chu valley, up to the Gichcha snows, is obtainable. The descent is on the north face of the spur and the forest is at first of *Picea*, beneath which on stony patches a form of *Primula capitata* Hook. (No. 4832) was seen, which had no meal on the leaves and scented, deep blue flowers.

The moist forest rapidly gives way to a drier flora and the soil at 6,000 feet is of the red, sandy nature common to the lower hills, and is dotted with oaks. Glimpses of the reddish soil of the hills show through the rich green of the young shoots of lemon grass (*Andropogon*) which dot the lower, drier slopes, giving, at a distance, a beautiful effect of shot silk.

The Djongpen of Angduphorang had his usual equanimity much perturbed because a huge landslip on the Mo Chu, beneath Kaucham and above Rinchu, had dammed the waters of the Mo Chu for the previous four days and the rush of water consequent on the breaking of the dam was expected to carry all bridges before it. The Djong of Punakha had already been vacated and the contents of value removed to a small monastery high up on the west bank. At 3 o'clock in the early morning of the 23rd September the waters came racing past and carried the big cantilever bridge, connecting Angduphorang with the country in the west, away with a crash. Collectors were sent both north and south along the Mo Chu to see how much damage had been done to roads, and they reported that only a portion of the waters had been liberated, and with that little the road had been so destroyed that the proposed visit to the region of Gichcha had to be definitely abandoned.

From the camp above the now destroyed bridge the party moved across the Punakha-Timpu divide to Chalimarphey, and from that place a tour was made round the Taka La peaks on the southern end of the divide to Chapcha.

A village north of Chapcha and east of Paga, called Gingyeka, is situated under the shadow of the main ridge, and in this village at 9,400 feet plants of *Ceratostigma Griffithii* C. B. Clarke (No. 4874) were found growing on ruined walls of abandoned houses. In the bed of a stream below Gingyeka some plants were found of an upright *Caragana* (No. 4882), the pods of which were nearly all pierced by a small insect. At 10,000 feet two distinct types of *Quercus* composed a dense scrub three feet high on an otherwise bare mountain side ; one variety (No. 4881) was very prickly, the other (No. 4880) had no prickles. The foliage and young parts of both were covered in brown tomentum.

Cliffs on the ridges are bare and extremely rocky, but the top of the ridge is glaciated and turf-covered. The usual species of *Ranunculaceae*, *Rosaceae*, *Compositae*, *Swertia*, *Saussurea* and *Meconopsis horridula* were present.

Quantities of *Potentilla coriandrifolia* D. Don (No. 4886) and tufts of another *Caragana* (No. 4883) six feet high were common, and like the other plants of this genus the fruits were found to be nearly all infested with a borer insect.

Taka La is on the main ridge at an elevation of 13,300 feet, but two other ridges of lower elevation branch off from it to the east. The main peak was visited and found to overlook a long lake at 14,500 feet called Chagie Chau, where, near the northern edge, a small hut had been built upon a rock outcrop. The night was spent in the small hut and a very early ascent made to the top of the peak at 15,540 feet. The ascent in the dark and cold over frost-covered boulders and stiffened grass clumps was arduous, but the view from the actual summit well repaid the exertion. To the south-east could be seen Taka Djong and

the valley of the Mo Chu stretching to the plains, away to the far west was a group of peaks recognised as Everest, then along the horizon, trending eastwards, successive clusters of peaks, showing white in the early sun, were recognised to be Kinchenjunga, Chola and Chumolhari ; due north were the Gichcha snows, and the Malakatchu snows in the north-east. The furthest east cluster of peaks that lay in the north-east of Bhutan had one with a squared top looming above snow-clad uplands, and had been seen before from Tashigong ridge. The name of these could not be determined as they could not be found on any map.

The whole of Bhutan was spread out below and showed a succession of valleys trending southwards to the plains from the line of hills in the north that seemed to border the very edge of the world.

Mist rapidly descended on the hill-tops and filled the valleys and, as the view was lost, emphasised the low temperature of this region. We returned through the mist along a very rugged and rocky ledge to the spur north of Chapcha, crossed by the Zeam La. This spur was afforested with *Pinus excelsa* Wall. from 10,000 feet and many plants of *Scabiosa Hookeri* C. B. Clarke were found in the sandy soil at that elevation.

A request to the Paro Penlop for permission to visit the Tremo La as a last resort for seed, since the Gichcha field had been cut off, was regrettably refused, so a straight return was made to Buxa, which was reached on 10th October 1915.

Notes on Distribution of the Genus Primula.

The genus *Primula* is divided by Smith and Forrest (Notes R.B.G. Edin., No. lxxvi, March 1928) into thirty-two sections, twenty of which have members in India. Representatives of seventeen sections are now recorded from Bhutan, and in ten of them a total of twenty new species were originally described, but recent investigations and reconsideration have resulted in some of these being reduced to the rank of sub-species or synonyms. The sections used in this report are arranged in sequence, according to their relationship (vide R.H.S. Prim. Conf. Report, 1928), which will enable affinities between east Himalayan and Chinese plants to be readily traced.

It is known that the valleys among the spurs running east from Kinchenjunga are rich in Primula species and that the Chumbi valley east of Sikkim is deficient in the genus. It was interesting to see that the eastern slopes of the Chumolhari group had more of the better-known Sikkimese Primulas than the western slopes. The hills to the north-east of Punakha up the Pho Chu valley were not visited, but are said by the local herdsmen to provide inferior grazing. A similar distribution of Primula was observed in the Pumthang Chu valley on

the eastern side of the Kulu Kangri group of peaks at 90° 30′ E. and 28° N.

Where the hot and arid valley of the Lhobrak Chu breaks through the main Himalayan chain from Tibet, along the line of 91° E. long., mountainous clusters stand sentinel on both the western and eastern banks of the gap.

Among the valleys trending south and east from the last-mentioned group is one notable for the Djong or castle of Singhi in its upper reaches. This region proved rich not only in Primula but in new species of the genus, and can be contrasted with the western-facing dales of the upper reaches of the Tashiyangsi Chu, about twenty miles further east, which were much less prolific in all herbaceous forms, Primula included.

On the isolated peaks of the interior ridges, which were visited late in the season, autumnal remains of Primulas were found, and it was interesting to notice that these resembled forms found in the area of the adjacent main valley heads to the north-west of each peak rather than those to the immediate north. Some very low elevation records of the genus, all of *Primula erythrocarpa* Craib, viz. Nos. 3923 at 4,500 feet, 2367 and 2555 at 5,000 feet, and 3811 at 6,000 feet, were found in the vicinity of Punakha.

In addition to the above, reference may be made to *Primula Emiliae* Balf. f. M.S., a plant raised from seed sent home by me from Bhutan, and the following extract from a letter to Sir Frederick Moore, Glasnevin, Dublin, from Sir Isaac Bayley Balfour, dated 9th May 1920, gives this plant a certain value, although it is to be regretted that the original type specimen cannot be traced :—

"*Primula* sp. Bees, Bhutan. An interesting Cooper plant of the Denticulata group which has been christened *P. Emiliae* after Mrs. R. E. Cooper. In its flat top to the inflorescence it resembles *P. platycrana*, but has a thinner scape—more wiry, larger, differently coloured flowers, in a lax head. The name has not yet been published. I don't know if the plant is in wide cultivation yet from Cooper's seeds, but it is as you say a nice plant and worth growing. I am afraid, however, it will not be long before hybridisation will so mix up these Chinese Denticulata forms with one another and with the Himalayan ones that the pure article will be scarce. I hope therefore you will keep a stock of it."

Fortunately, under Sir F. Moore and Mr. J. W. Besant, a stock of this plant has been kept in cultivation at Dublin and living plants have been procured.

The species of the Denticulata group common in Bhutan is *Primula erythrocarpa* Craib, and it is possible this may be an equivalent, but comparison of both species is necessary before a final decision can be made.

The following phenomena have been personally noticed in the eastern Himalaya :—The similarity of the fruiting stages of *Primula Kingii* Watt from Sikkim with those of *Primula aureostellata* from eastern Bhutan nearly three hundred miles further east, coupled with their very diverse floral characteristics ; the occurrence of changing colour in plants or forms of *P. involucrata* Wall., which were ranging over an area, again hundreds of miles in extent, and which varied from the white of the typical plant to the purple of *P. yargongensis* Petitm., a Yunnan species ; the amazing capability for variation shown by members of the Petiolares section in their leaf shapes, ranging from triangular to spathulate ; flower stalk varying in length from twelve inches to a mere stump and in the fimbriation and colour of their petals.

Concerning the section Muscarioides, in the upper reaches of the Thimbu valley on the flanks of Chumolhari, three collectings of apparently similar plants were made in July 1914, under numbers 1601 at 13,000 feet, 1645 at 15,000 feet, and 1890 at 12,000 feet. These were named *P. adenantha* Balf. f. et Cooper, although No. 1645 was considered comparable to the Sikkim *P. bellidifolia* King. A plant collected under No. 1771 in the same region at the same time was named *P. atricapilla* Balf. f. et Cooper, while No. 1824, a similar plant, was collected in this valley two days later.

When the area was visited in October of the same year to gather seeds, Nos. 3470 and 3476 were put on fruiting specimens which were considered relative to Nos. 1771 and 1824. It was not considered advisable to repeat numbers which had been given to flowering specimens, as this might lead to confusion, and also, since the fruiting stage of these plants differed so much from the flowering stage in size of leaf and length of scape, it was difficult to correlate the two stages of the same plant.

From seed under No. 3470, plants were raised and flowered in the Royal Botanic Garden, Edinburgh, providing material from which *P. Menziesiana* Balf. f. et W. W. Sm. was described. Thus with No. 3470 may be grouped 3476, which was collected half a mile or so distant, and the Nos. 1771 and 1824 attached to plants already collected in the flowering stages.

In the same year, in a valley much further to the east, No. 2249, " very variable plant," was found " on sandy, gravelly banks." This was named *P. adenantha*, after being at first considered *P. bellidifolia*.

The next year, on isolated peaks south of the main chain, Nos. 4056 and 4855 were found, differing only very little from the types, i.e. those mentioned above. These were named 4056 *P. micropetala* Balf. f. et Cooper and 4855 *P. adenantha*.

On further examination of these plants it appears that they are forms of one species closely allied to *P. bellidifolia* King. The prior name of this group is *P. Menziesiana* Balf. f. et W. W. Sm., and so

the names *adenantha*, *atricapilla* and *micropetala* must be considered synonyms of it. Full correlation of collected material, with collector's notes and the local habitats, has not been possible until recently, and the range of forms as described indicates an interesting response to environment, which may offer clues to closer affinity between forms described as different species in the east Himalaya eastwards to western China.

Concerning the section Soldanelloides, the following numbers, collected in 1914 and 1915 from the eastern valleys of Bhutan, refer to plants with a relationship to each other similar to that described in the Menziesiana group of the Muscarioides section. In 1914, No. 2134 was found in grassy ledges of dry rocks and had blue flowers with no black colour on the top of the head of the inflorescence. It was named *P. umbratilis* Balf. f. et Cooper, and is the type specimen. The following year Nos. 3995 at 11,000 feet, 4011 at 12,000 feet, and 4042 at 15,000 feet were found flowering in June, the flowers of the last number varying from pale heliotrope to white in contrast with the deep blue flowers of the others. No. 3995 was at first thought to be a new species, but was ultimately named *P. umbratilis* Balf. f. et Cooper. No. 4042 was made the type number for *P. metria* Balf. f. et Cooper. On further inspection this plant has been considered to be identical with *P. umbratilis*, and the name *P. metria* is regarded as a synonym. No. 4011 has been also identified as *P. umbratilis*.

No. 4787 was only found in fruit in the eastern valleys, and from seeds of it plants were raised and flowered in Edinburgh, providing ample material for diagnosis and description of *P. umbratilis*.

On an isolated peak in Bhutan No. 4822 was found in fruit, and, from seed of this, plants were raised and flowered in the Royal Botanic Gardens of Glasnevin and Edinburgh, to be later figured and described in the Bot. Mag., 1919 (t. 8791), as *P. chasmophila* Balf. f. et Cooper. A note in this publication reads thus: "The nearest allies of *P. chasmophila* are the Chinese *P. spicata* Franch. and the Himalayan *P. Wattii* King." This plant happened to be the most westerly record of any of the Soldanelloides group in Bhutan, apart from *P. sapphirina* Hook. f., and it is interesting to notice the concentration in the eastern valleys of Bhutan of all the forms of Primula which have proved comparable to *P. umbratilis*.

The distribution of the two sections Muscarioides and Soldanelloides is thus shown from the Bhutan collections to be remarkable in that the former are only recorded from the western valleys, near Sikkim, while the latter are from the eastern valleys, which are separated from China by the Tsanpo gorges. This distribution also is coincident with the difference in rock formation and climate of these two areas.

In the paper given by Prof. I. B. Balfour to the Primula Conference,

recorded in the R.H.S. Journal, 1913, it is interesting to find that in certain allied species with similar coloured flowers (pertaining to yellow or red and purple) each colour form is apparently confined to definite and different localities.

Without going into details of geological formation, it is sufficient to record that in Bhutan acid and alkaline rocks appear in different sections of the country and may have an effect on the range, colour, and possibly on the evolution of the species of the genus under consideration.

In the light of new evidence from anatomical, cytological and nutritive researches now being conducted in the genus Primula, further consideration of the members of this genus may help to define their behaviour as influenced by hitherto little-suspected factors of environment. The elucidation of these and other problems must give to botanical and horticultural students a greater insight into the genus than is possible from exhaustive tabulation of differences among artistically chosen type specimens. This implies a greater sympathy with the living plants, which is the essential to successful cultivation.

Distribution of Primulas in Districts of Bhutan

COOPER'S NUMBERS LETTERED FOR THE MAP SECTIONS.

Species tabulated according to the Primula Conference Report, R.H.S. Journ., 1928.

Section Number, Section and Species.	A B C are of the Western Valleys.	D E F of the Central Valleys.	G H I of the Eastern Valleys.
1. CORTUSOIDES			
P. geraniifolia Hook. f.	2585 A	—	—
P. mollis Nutt. . .	3896 B	—	4227 G
5. OBCONICA			
P. filipes Watt . .	3808 C	—	—
11. AMETHYSTINA			
P. aureostellata Balf. f. et Cooper . . .	—	4173 E 4150 E 4761 E	4297 G
13. PETIOLARES			
Subsection Petiolaris - Sonchifolia			
Group Hookeri			
P. Hookeri Watt . .	3836 A	—	—
Group Sonchifolia			
P. Whitei W. W. Sm. .	2574 A	3994 D 3970 E 4132 E 4134 E 4213 E 4111 F 4140 F	4230 G
Group Scapigera			
P. Boothii Craib . .	3919 B 4885 C	4121 E 4129 E 4214 E 4082 F	4516 I
P. bracteosa Craib . .	3917 B	3981 E	4397 H
Subsection Roylei			
P. Roylei Balf. f. et W. W. Sm.	3902 B	4019 E 4133 E 4166 E	—
P. Dianae Balf. f. et Cooper.	—	4000 D	—
P. Griffithii Pax . .	3865 A 3894 B	4217 E	4512 I 4515 I
17. DRYADIFOLIA			
P. congestifolia G. Forrest	—	—	4247 G
P. oreina Balf. f. et Cooper	—	—	4973 G

Section Number, Section and Species.	A B C are of the Western Valleys.	D E F of the Central Valleys.	G H I of the Eastern Valleys.
18. MINUTISSIMAE			
P. Stirtoniana Watt	—	—	4269 G
P. tenuiloba (Hook. f.) Pax	3835 A	4038 D	—
P. Waddellii Balf. f. et W. W. Sm.	3452 A	4039 D	—
19. BELLA			
P. indobella Balf. f. et W. W. Sm.	1759 A	—	—
P. pusilla Wall.	2484 A 2743 B 3526 B	—	—
20. SOULIEI			
P. xanthopa Balf. f. et Cooper	—	—	4393 H 4977 H
21. FARINOSAE			
P. concinna Watt	4902 C	4057 D	—
P. glabra Klatt	1619 A 1854 A 3900 B	4096 F 4139 F	—
P. involucrata Wall.	1603 A 1831 A 1976 A 1977 A 3011 A 3013 A	4108 F 4779 E	4302 G
P. Walshii Craib	1658 A	—	—
22. DENTICULATA			
P. atrodentata W. W. Sm.	1643 A 3088 B	4008 D 4017 D 4048 D	4244 G —
P. orestora Craib et Cooper	3837 A	4048 D	—
P. erythrocarpa Craib	1384 C 1490 C 2555 B 2662 B 3350 B 3555 C 3811 C 3828 C 3923 B	3977 E 4087 F	—
P. platycrana Craib	2367 B	—	—
23. CAPITATAE			
P. capitata Hook.	1249 1321 4832 C	4112 F 4132 E 4148 E 4731 E, I 4732 E, I	4547 I
P. crispata Balf. f. et W. W. Sm.	3509 A	2018 E 2084 E 2101 D	4235 G

Section Number, Section and Species.	A B C are of the Western Valleys.	D E F of the Central Valleys.	G H I of the Eastern Valleys.
24. MUSCARIOIDES			
P. adenantha Balf. f. et Cooper	1601 A 1645 A 1890 A	2249 D 4855 F	—
P. atricapilla Balf. f. et Cooper	1771 A 1824 A	—	—
P. Menziesiana Balf. f. et W. W. Sm.	3470 A 3476 A	—	—
P. micropetala Balf. f. et Cooper	—	4056 D	—
25. SOLDANELLOIDEAE			
P. chasmophila Balf. f.	—	4822 F	—
P. umbratilis Balf. f. et Cooper	—	2134 D 3995 D 4011 D 4787 D	—
P. eburnea Balf. f. et Cooper *Plants raised from seed of* 4975 *were named P. Harroviana Balf. f. et Cooper*	—	—	4236 G 4975 G
P. sapphirina Hook. f.	1641 A 1666 A 2741 B	—	4265 G
P. soldanelloides Watt	—	4058 D	—
P. metria Balf. f. et Cooper	—	4042 D	—
27. OBTUSIFOLIA			
P. Caveana W. W. Sm.	—	4059 D 4788 D	—
P. obtusifolia Royle	3224 B	—	—
P. tenella King	1660 A	—	—
28. NIVALES			
P. elongata Watt	2488 A 2930 A 3901 B	3989 E 4013 D 4016 D 4068 F 4781 E	—
P. macrophylla Don var. macrocarpa Watt	1737 A 1860 A 1972 A	4031 D 4032 D 4783 D	4273 G
P. obliqua W. W. Sm.	2485 A 2739 B 2933 A 3520 B 3532 B	4027 D 4076 E 4100 F 4771 E	4392 H
P. strumosa Balf. f. et Cooper	—	—	4072 G 4270 G

Section Number, Section and Species.	A B C are of the Western Valleys.	D E F of the Central Valleys.	G H I of the Eastern Valleys.
29. SIKKIMENSIS			
P. chumbiensis W. W. Sm.	1832 A 1987 A	4018 D	—
P. reticulata Wall. . .	—	4784 D	—
P. sikkimensis Hook. .	1584 A 1788 A 3027 A	2175 D 2176 D 3993 D 4168 E 4762 E	—
P. pudibunda W. W. Sm. .	1838 A	4107 F 4780 E	—
P. Hopeana Balf. f. et Cooper	—	3999 D 4081 D 4785 D 4807 F (type)	—
30. CANDELABRA			
P. prenantha Balf. f. et W. W. Sm. . . .	—	4164 E	4330 G
P. Smithiana Craib . .	2917 B 2934 B 3097 B 3209 B 3878 C	2283 E 3983 E 3986 E	4744 E, I
The following numbers refer to unidentified material . .	1602 A 1629 A 1772 A 1778 A 1834 A 1858 A 3461 A 3475 A	2115 D 2179 D	—

NEW SPECIES OF PRIMULA FROM BHUTAN.

REFERENCES FOR DESCRIPTIONS.

Species.	Author.	Where published.	
adenantha	Balf. f. et Cooper	Notes R.B.G. Edin., Vol. xiii, p. 2	x
atricapilla	,, ,,	,, ,, ,, ,, ,, ,, 4	x
aureostellata	,, ,,	,, ,, ,, ,, ix, ,, 149	
bracteosa	Craib	,, ,, ,, ,, vi, ,, 250	
chasmophila	Balf. f. et Cooper	Bot. Mag. t. 8791 (1919)	†
Dianae	,, ,,	Notes R.B.G. Edin., Vol. ix, ,, 163	
eburnea	,, ,,	,, ,, ,, ,, ix, ,, 166	
erythrocarpa	Craib	,, ,, ,, ,, x, ,, 206	
Harroviana	Balf. f. et Cooper	Trans. Bot. Soc. Edin. ,, xxvii, ,, 233 pt. 3 (1918)	!
Hopeana	,, ,,	,, ,, ,, ,, ,, 236	
Menziesiana	Balf. f. et W. W. Sm.	Notes R.B.G. Edin., Vol. ix, ,, 182	
metria	Balf. f. et. Cooper	,, ,, ,, ,, xiii, ,, 13	†
micropetala	,, ,,	,, ,, ,, ,, xiii, ,, 14	x
oreina	,, ,,	,, ,, ,, ,, ix, ,, 189	o
orestora	Craib et Cooper	,, ,, ,, ,, x, ,, 207	
platycrana	Craib	,, ,, ,, ,, x, ,, 209	
strumosa	Balf. f. et Cooper	,, ,, ,, ,, ix, ,, 201	
umbratilis	,, ,,	,, ,, ,, ,, xiii, ,, 22	
xanthopa	,, ,,	,, ,, ,, ,, ix, ,, 204	

x = *Menziesiana* Balf. f. et W. W. Sm.
! = *eburnea* Balf. f. et Cooper
† = *umbratilis* Balf. f. et Cooper
o = *congestifolia* G. Forrest

Field Book Notes on Primulas.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
1249	Records lost				
1321	,,				
1384	erythrocarpa Craib	Chapcha	7,000′	7/7/14	Flrs. pink, solitary, in moist loam.
1490	,,	Chali-marphey	7,500′	11/7/14	Purplish blue flrs. on shady side of Berberis.
1584	sikkimensis Hook.	Lingshi Thimbu	13,000′	30/7/14	
1601	Menziesiana Balf. f. et W. W. Sm. (type of *adenantha* Balf. f. et Cooper)	,,	,,	20/7/14	Flrs. blue, white inside. Leaves with glistening hairs.
1602	tibetica ?	,,	,,	,,	Flrs. solitary on 2″ red stem ; calyx red and yellow ribbed ; corolla pink-purple with yellow, mealy centre. In marshy peat.
1603	involucrata Wall.	,,	,,	,,	White flrs. in swampy peat.
1619	glabra Klatt	,,	15,000′	21/7/14	In fruit in peaty turf.
1629	capitata ?	,,	,,	,,	Purple with yellow centre. 8″. Silver meal on spike only.
1641	sapphirina Hook. f.	,,	,,	,,	
1643	atrodentata W. W. Sm.	,,	,,	,,	
1645	Menziesiana Balf. f. et W. W. Sm. (*adenantha* Balf. f. et Cooper)	,,	,,	,,	Common, but difficult of access on rock ledges.
1658	Walshii Craib	,,	14,500′	,,	Pink. Minute. Solitary in turf.
1660	tenella King	,,	15,000′	,,	Purple, among rocks, leaf larger. Mealy all over plant.
1666	sapphirina Hook. f.	,,	,,	,,	Past flr. and in fruit.
1737	macrophylla Don v. macrocarpa Watt	Philey La	14,000′	23/7/14	In fruit. Yellow meal under leaf.
1759	pusilla Wall. and indobella Balf. f. et W. W. Sm. (mixed)	,,	15,000′	,,	Locally in sandy soil.
1771	Menziesiana Balf. f. et W. W. Sm. (Type of *atricapilla* Balf. f. et Cooper)	,,	14,000′ upwards	,,	Flrs. blue. Head black above, green below. No meal, but hairy.
1772	capitata ?	,,	14,000′ not above	,,	Tall, blue, yellow eye, leaf white, meal below.
1778	Roylei ?	,,	14,000′ to 15,000′	,,	In fruit on sandy loam.
1788	sikkimensis Hook.	Chebisa	13,000′	,,	Dwarf, medium and tall vars.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
1824	Menziesiana Balf. f. et W. W. Sm. (*atricapilla* Balf. f. et Cooper)	Shado	13,000′	25/7/14	
1831	involucrata Wall.	Yeley La	14,000′	,,	White, slender, in sodden sand.
1832	chumbiensis W. W. Sm.	,,	15,000′	,,	Distinct var. with red stems and mid-ribs. Not common.
1834		,,	,,	,,	Small, uncommon, flrs. purple-lilac. Yellow meal below leaf.
1838	pudibunda W. W. Sm.	,,	16,000′	,,	Almost sessile flrs.
1854	glabra Klatt	Thimbu Lake	15,000′	,,	Leaves larger. In coarse, peaty turf.
1858	Roylei ?	Yeley La	15,000′ to 17,000′	,,	Flrs. purple. In turf.
1860	macrophylla Don v. macrocarpa Watt	,,	,,	,,	Purple, showy. Yellow meal on infl. but not on leaves.
1890	Menziesiana Balf. f. et W. W. Sm. (*adenantha* Balf. f. et Cooper)	Barshong	12,000′	26/7/14	Like a reduced *P. Wattii*.
1972	macrophylla Don v. macrocarpa Watt	,,	13,000′	27/7/14	Large inflated calyx. A distinct type.
1976	involucrata Wall.	,,	12,500′	,,	Flrs. white. Tube dark green to purple. In marsh.
1977	,,	,,	,,	,,	ditto. Corolla tube light green to yellow.
1987	chumbiensis W. W. Sm.	,,	,,	,,	White, open flrs. Large leaves. On peat and gravel.
2018	crispata W. W. Sm.	Ridang Angduphorang	8,000′	8/9/14	Early flowering species under forest by track. Flowers blue.
2084	crispata Balf. f. et W. W. Sm.	Yato La Tongsa	10,000′	12/9/14	In moist loam and marshy stream edges.
2101	crispata Balf. f. et W. W. Sm.	Kopub Pumthang	10,500′	24/9/14	Blue flrs. dense head. Loam, edge of forest.
2115	cf. Smithiana	,,	11,000′	,,	Flrs. *orange*-yellow in whorls. Prefers running water edge. Occurs with *P. sikkimensis*.
2134	umbratilis Balf. f. et Cooper	Kopub Kurmathang	,,	,,	On grassy ledge of dry rock. Flrs. blue, but no black above. Like *P. Wattii*.
2175	sikkimensis Hook. (normal)	Lhabja	12,500′	22/9/14	Marshy loam. Mixed with 2176.
2176	sikkimensis Hook. (tiered)	,,	,,	,,	Tendency to form whorls. Five on one stalk.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
2179	sp.	Lhabja	12,500′	22/9/14	Under forest. In peat around boulders.
2249	Menziesiana Balf. f. et W. W. Sm. (*adenantha* Balf. f. et Cooper)	Biaka Pumthang	10,000′	27/9/14	Very variable. On sandy, gravelly banks.
2283	Smithiana Craib	Yato La	10,500′	3/10/14	Flrs. yellow, and in fruit. In soaking peat over gravel.
2367	platycrana Craib	Angdu-phorang	5,000′	11/10/14	On shady bank below pines. Habit of *P. capitata*. Colour of *P. malacoides*, pink-purple with yellow eye. Only a few plants found. Perhaps a malformed *P. capitata*.
2484	pusilla Wall.	Dotena	12,500′	30/7/14	Purple flrs. Hair in mouth. On mossy rocks.
2485	obliqua W. W. Sm.	,,	,,	,,	In fruit, in peat over clayey loam.
2488	aff. elongata	,,	,,	,,	? candelabrate sp. in fruit.
2555	erythrocarpa Craib	Punakha	5,000′	19/8/14	Solitary flower.
2574	cf. Whitei	Barshong	11,000′	30/7/14	In peaty soil under forest.
2585	geraniifolia Hook. f.	,,	12,000′	28/7/14	In fruit, on sandy edges of stream.
2662	erythrocarpa Craib	Dukey La Thimbu	9,000′	17/8/14	
2739	obliqua W. W. Sm.	Fujudin	13,000′	5/8/14	
2741	sapphirina Hook. f.	,,	,,	,,	
2743	pusilla Wall.	,,	,,	,,	
2917	Smithiana Craib	Thimbu	10,000′	6/8/14	Flrs. yellow. In peat swamp.
2930	elongata Watt	Dotena	12,000′	15/9/14	In leafy soil among boulders.
2933	obliqua W. W. Sm.	,,	13,000′	,,	,,
2934	Smithiana Craib	Fujudin	10,000′	12/9/14	Flrs. in whorls. At edge of running water.
3011	involucrata Wall.	Barshong	13,000′	28/9/14	Flrs. white. 10″ high. In moist gravel.
3013	,,	,,	12,500′	,,	Varying in corolla tube colour.
3027	sikkimensis Hook.	,,	13,000′	,,	Flrs. yellow. On meadow.
3088	atrodentata W. W. Sm.	Fujudin	10,000′	13/7/14	
3097	Smithiana Craib	,,	11,000′	,,	Flrs. yellow. At edge of water.
3209	Smithiana Craib	Dukey La	10,000′	17/8/14	
3224	obtusifolia ?	Fujudin	13,000′	5/8/14	Flrs. red-purple.
3350	erythrocarpa Craib	Thimbu	8,000′	8/8/14	
3452	Waddellii Balf. f. et W. W. Sm.	Yeley La	16,000′	21/10/14	Flrs. purple? Under snow. In peat and sand.
3461	sp.	,,	,,	,,	Flrs. purple? Under snow. Only capsules showing.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
3470	Menziesiana Balf. f. et W. W. Sm.	Philey La	15,000′	23/10/14	
3475	sp.	,,	14,000′	,,	Only capsules found.
3476	Menziesiana Balf. f. et W. W. Sm.	Chebisa	12,500′	,,	2″ high in peaty marsh.
3509	crispata Balf. f. et W. W. Sm.	Parshong	9,000′ to 10,000′	29/10/14	A half-headed capitate var.
3520	obliqua W. W. Sm.	Fujudin	13,000′	1/11/14	In swampy peat below Rhododendrons.
3526	pusilla Wall.	,,	,,	4/11/14	In peat over gravel.
3532	obliqua ?	,,	,,	,,	In fruit.
3555	erythrocarpa Craib	Simu Dj. Thimbu	7,500′	6/11/14	Habit of *P. capitata*. Colour of *P. malacoides*. Just commencing to flr. in November.
3808	filipes Watt	Chukka	6,700′	24/4/15	Flrs. pale helio. On mossy rocks.
3811	erythrocarpa Craib	Chukka (locus classicus)	6,000′	,,	Heliotrope-coloured flrs. among bracken.
3828	erythrocarpa Craib	Paro	6,700′	28/4/15	Small plants with blue flrs. in dry meadow, larger plants in moister spots.
3835	tenuiloba (Hook. f.) Pax	Tremo La Pass	14,000′	3/5/15	On peaty turf. Flrs. purple, small, sessile. Throat mauve.
3836	muscoides Hook. f.	,,	14,600′	,,	Pink flowers. White or yellow eye. Leaves coarsely hairy. In peat turf.
3837	orestora Craib et Cooper	Ghassa Paro	13,000′	,,	
3865	Griffithii Pax	,,	11,000′	5/5/15	In moss over rocks in moist *Betula* and *Rhod.* forest. Flrs. purple, yellow eye, whorled, leaves white-veined, winged.
3878	Smithiana Craib	Paro Dj.	8,000′	,,	Yellow flrs. In swamp with running water.
3894	Griffithii Pax	Dotena	10,000′	15/5/15	Flrs. splendid blue with yellow eye. Under shade of forest in dry soil.
3896	geraniifolia Hook. f.	,,	,,	,,	Magenta flrs. in sandy soil under *Abies* forest by rocks.
3900	glabra Klatt	Fujudin	13,000′	,,	Flrs. magenta, yellow eye. Plant small, in peaty meadow.
3901	elongata ?	Pumo La	,,	,,	Yellow, scented flrs. in marshy peat.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
3902	Roylei Balf. f. et W. W. Sm.	Fujudin	12,000′	15/5/15	On both sides of ridge, in peaty turf, but not at the crest. Splendid prune colour.
3917	bracteosa Craib	Dukey La Below but not on Pass	8,000′ to 9,000′	21/5/15	Flrs. not seen, umbelled on thin stem. In sandy soil. Under light shade.
3919	Boothii	,,	8,000′	,,	Much cut edge of leaf. Fruit below leaves on short stalks 1″ long. Growing in moss under light forest.
3923	erythrocarpa Craib	Punakha	4,500′	22/5/15	Flrs. pink heliotrope with yellow eye. Leaves glabrous.
3970	Whitei W. W. Sm.	Pililapsa La, or Piley La	10,500′	,,	Flrs. not seen. By side of running water under Rhodo. Scarce.
3977	erythrocarpa Craib	Jaisah Pumthang	9,000′ to 10,000′	10/6/15	Early. Flrs. purple. Flowers later in season in swamp. This on drier peat.
3981	bracteosa Craib	Yato La Tongsa	10,000′	,,	In moss on shady tree trunks, always in shade. In ripe fruit. Flrs. stalked 2-20 in a whorl.
3983	Smithiana Craib	Tongsa to Jaisah	9,000′ to 10,500′	,, ,,	Very pale form of what is usually a deep yellow. Growing in moist, sandy loam.
3986	Smithiana Craib	Pumthang	9,000′	14/6/15	Golden yellow, normal.
3989	elongata Watt	Biaka Pumthang	11,000′	15/6/15	Leaves glabrous above and below. Flrs. cream. *No* annulus. Growing in moss on stones and tree trunks under *Pyrus* sp.
3993	sikkimensis Hook.	Kopub towards Langla	,,	19/6/15	
3994	Whitei W. W. Sm.	,,	,,	,,	Succulent herb in moss over stones. In fruit only.
3995	umbratilis Balf. f. et Cooper	,,	,,	,,	Flrs. blue. Allied to *P. Wattii* ? Hairy stem.
3999	Hopeana Balf. f. et Cooper	Champa	12,000′	20/6/15	Flrs. white, bracts leafy, serrate. In open marshes and also under light forest.
4000	Dianae Balf. f. et Cooper	,,	,,	19/6/15	Flrs. purple. Commonest in dry spots, but also in moist and wet spots.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
4008	atrodentata W. W. Sm.	Champa	12,000′	19/6/15	In fruit, head mealy. Capitate type. Low elevation type is earlier flowering. See 4017, 4048.
4011	umbratilis Balf. f. et Cooper	Tolegong	,,	20/6/15	Flrs. blue. On moss-covered stones in forest.
4013	elongata Watt				
4016	aff. elongata	Pumthang Taasiegem	14,000′	,,	Flrs. yellow with open mouth. Slight annulus. Young leaves yellow, mealy; old glabrous. Calyx lobes and bracts linear and mealy.
4017	atrodentata W. W. Sm.	,,	,,	,,	Flrs. purple, white throat. Calyx teeth black, mealy, acute. Old leaves profuse.
4018	chumbiensis W. W. Sm.	,,	,,	,,	Leaves smaller. Flrs. pale yellow, mealy. In marshy places and also dry turf.
4019	Roylei Balf. f. et W. W. Sm.	,,	,,	,,	Flrs. purple, calyx teeth acute. No eye. In peaty meadow.
4027	obliqua W. W. Sm.	Dole La Champa	15,000′	21/6/15	On open hillside. Sheltering by boulders in sandy, peaty moist turf.
4031	macrophylla Don v. macrocarpa Watt	,,	,,	,,	Flrs. blue. Calyx lobes acute, leaf edge regular. By stream edge.
4032	,,	,,	,,	,,	Flrs. purple. Calyx lobes obtuse. Leaf edge serrate.
4038	tenuiloba (Hook. f.) Pax	,,	,,	,,	Very small flrs. intense blue, stalked. In mossy rock crevices and also in meadow.
4039	Waddellii Balf. f. et W. W. Sm.	,,	,,	,,	Flrs. purple. Stemless and glabrous. In different parts of valley bed.
4042	umbratilis Balf. f. et Cooper (type of *metria* Balf. f. et Cooper)	,,	,,	,,	Flrs. pale heliotrope to white. Bracts dark. Among stones and peat sand.
4048	orestora Craib et Cooper	,,	,,	,,	Flrs. blue, purple eye. Densely mealy. In peat turf.
4056	Menziesiana Balf. f. et W. W. Sm. (type of *micropetala* Balf. f. et Cooper)	Hoopkge La	,,	,,	Flrs. deep blue. Under shelter of rocks in dry peat.
4057	concinna Watt	,,	,,	,,	Small, gold-mealy below. Dry meadow.
4058	soldanelloides Watt	,,	,,	,,	On mossy stones.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
4059	Caveana W. W. Sm.	Hoopkge La	15,000′	21/6/15	Flrs. bluish purple with light eye. Stalked. 2, 3, 5 per stalk. Mealy-white leaves. Also with past fruit.
4068	elongata Watt	Damkora	13,000′	24/6/15	Among Rhods. Flrs. yellow. Golden eye. Leaves petiolate to apetiolate.
4072	strumosa Balf. f. et Cooper	Tchutan	14,000′	,,	Flrs. yellow. Corolla tube enlarged after leaving calyx. Inflor. mealy. Foliage glabrous.
4076	obliqua? (aff. elongata)	Kiki La Pumthang	11,000′	28/6/15	Flrs. yellow tending to 2 whorls. In moist spots below Rhododendrons.
4081	Hopeana Balf. f. et Cooper	S. of Biaka Chu	14,000′	1/7/15	Flrs. pure white. cf. *P. sikkimensis*.
4082	petiolaris ?	,,	10,000′ to 11,000′	,,	Under *Abies* forest in moist leaf mould. In fruit only.
4087	erythrocarpa ?	Kyertsa	9,000′	,,	Large leaves seem to develop after flowering. In past flower.
4096	glabra Klatt	Tibdey La	13,000′	2/7/15	Has a dense head of flrs. In peaty soil among micaceous stones.
4100	obliqua W. W. Sm.	,,	,,	,,	Extremely local among Rhod. bushes Flrs. pure white, eye open, yellow.
4107	pudibunda W. W. Sm.	Ridge S. of Biaka Pumthang	,,	3/7/15	In moist turf and swamp by stream. Flrs. pale yellow, hanging.
4108	involucrata Wall. (var.) growing with 4107	,,	,,	,,	Flrs. *purple*, few in head, open. Short bracts, spurred. Annulated corolla. Usually flrs. are white, but *all these are purple*. Profuse.
4111	Whitei W. W. Sm.	,,	12,500′	4/7/15	Leaves deeply serrate. Flr. head on stalk. Under *Abies* forest.
4112	capitata ?	,,	,,	,,	Flrs. blue, large, pendulous. Leaves mealy below. Under *Abies* forest.
4121	Boothii Craib	Pumthang	,,	14/7/15	Growing in moist spots under *Abies* and *Rhod.* forest. Leaves long, petioled, spathulate. Vars. 2 and 3.
4122	Whitei W. W. Sm.	,,	,,	,,	Var. with calyx teeth doubly serrate and frilled. Var. 2.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
4129	Boothii Craib	Yato La Ridge	12,000′	13/7/15	In moist sand at foot of boulders, fringing stream. Infl. apedunculate.
4132	capitata ?	,,	13,000′	,,	In fruit only. In peaty turf of alpine meadow. Leaves softly hairy on both sides. No meal.
4133	Roylei Balf. f. et W. W. Sm.	Peugey La Ridge	,,	,,	Flrs. rich blood-purple in peat turf.
4134	Whitei W. W. Sm.	Yato La Ridge	10,000′	14/7/15	Below Rhod. by stream in moist, sandy, leaf mould. Var. 2.
4139	glabra Klatt	Kyertsa	12,500′	16/7/15	Large leaf form. In fruit, below spruce forest.
4140	Whitei ?	Bumsa Chu Valley	10,500′	16/7/15	In fruit. On drier soil below *Abies* forest. Hastate var.
4148	capitata Hook.	Biaka	9,500′	22/7/15	Local. White meal below. On exposed sunny spur.
4150	aureostellata Balf. f. et Cooper	Rudong La	10,500′	23/7/15	Solitary clump in past flr., holly-leaf edged, spathulate leaves.
4164	prenantha Balf. f. et W. W. Sm.	,,	12,000′	,,	In pure sand. Stem of 6″, leaves rotund, oblong, serrate, glabrous above and below, very reticulate. Flrs. yellow-gold, small, 2 tiers. Bracts brownish, no meal, candelabrate, Scarce.
4166	Roylei Balf. f. et W. W. Sm.	Kempey La	12,500′	,,	Under spruce forest. In ripening fruit.
4168	sikkimensis Hook.	,,	11,500′	,,	*Fine gold* flowers. Prefers peat, nodules surrounded by water. In marsh.
4173	aureostellata Balf. f. et Cooper	,,	11,000′	,,	Passing out of flower. In marsh. Glabrous. Flrs. open, cream-white with yellow star in centre. Glistening hairs in corolla mouth.
4213	Whitei W. W. Sm.	Yato La	,,		
4214	Boothii Craib	,,	,,		
4217	Griffithii Pax	Bela La	,,		Herb in moss or under Rhod. scrub.
4227	mollis Nutt.	Sawang	7,000′	28/7/15	In moist undergrowth by stream.
4230	Whitei W. W. Sm.	Singhi Djong	11,000′	30/7/15	In clumps. In leafy soil under *Abies* forest.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
4235	crispata Balf. f. et W. W. Sm.	Singhi Djong	12,000′	30/7/15	Flrs. blue, yellow eye in dense head. Leaves entirely free from meal.
4236	eburnea Balf. f. et Cooper	Narim Thang	14,000′	31/7/15	Pure white flowers, reflexed corollas. On scree.
4244	atrodentata W. W. Sm.	,,	14,500′	,,	Flrs. pale heliotrope, white centre. No meal. Small. In soaking peat.
4247	congestifolia G. Forrest (type of *oreina* Balf. f. et Cooper)	,,	14,000′	,,	Flrs. purple, large and solitary, leaves small, mealy below. Remaining on long stem to a length of several inches. In moist scree.
4265	sapphirina Hook. f.	Kengla or Gong La	15,000′	1/8/15	Small, purple, yellow eye. On peaty meadow by lake.
4269	Stirtoniana Watt	,,	,,	,,	Tufted or solitary, on scree. Hairy. Blue-flowered.
4270	strumosa Balf. f. et Cooper	,,	,,	,,	Flrs. yellow with an orange annulus, strong-scented. In peaty meadow.
4273	macrophylla Don v. macrocarpa Watt	,,	,,	,,	Fine heliotrope. In swamp and debris of moraine. Leaf serrate-edged, gold-mealy below.
4297	aureostellata Balf. f. et Cooper	Singhi	14,000′	2/8/15	Herb in fruit on peat turf by stream. Glabrous, single-headed. Leaf edge prickly ?
4302	involucrata Wall.	,,	,,	,,	White flrs. Leaves small. In marsh.
4330	prenantha Balf. f. et W. W. Sm.	,,	10,000′ to 11,000′	3/8/15	Flrs. yellow. By stream edge and in black moist peaty soil. 3-tiered.
4392	obliqua W. W. Sm.	Dongo La	12,500′	10/8/15	Among Rhod. bushes. Flrs. said to be white. Leaf edge entire. Mealy below.
4393	xanthopa Balf. f. et Cooper	,,	,,	,,	On mossy stones. Flrs. purple with rolled lobes and yellow eye. Meal below the thin, deeply serrate leaves and on flrs.
4397	Boothii Craib	,,	12,000′	,,	Plant among Acanthaceous undershrubs in sandy peat soil. In fruit. With peculiar scent. Fine dark green.

No.	Species.	Locality.	Elevation.	Date of Collecting.	Field Book Notes.
4512	Griffithii Pax	Praunzong Gompa S.E. of Tashigong	11,000′	28/8/15	Richest colour of leaves on granitic blocks, covered with moss, by stream. Coarse calyces. *Leaves not hastate.*
4515	Griffithii Pax	Ridge E. of Tashigong	11,000′	21/8/15	In fruit under Rhod. In moist sand and moss. *Leaf hastate.*
4516	aff. Boothii	,,	,,	,,	Stalked, serrate leaves. Plant small. In gravel and moss below Rhododendrons.
4547	capitata Hook.	E. Tashigong Ridge	12,000′	23/8/15	Flowers deep blue, throat yellow. Inflor. white-mealy. Leaves glabrous. Under shelter of dwarf Rhododendron scrub.
4731	capitata Hook.	Ohra La south of Rudong La on same ridge	10,500′	29/8/15	In dry soil. Meal white, *only* on inflorescence.
4732	capitata Hook.	,,	,,	,,	White meal on *under* leaf.
4744	Smithiana Craib	,,	10,000′	30/8/15	In moist peaty soil.
4761	aureostellata Balf. f. et Cooper	Tang Chu Valley and Rudong La	11,000′	5/9/15	Flrs. white with a yellow star. In moist peat.
4762	sikkimensis Hook.	Rudong La	,,	,,	*Rich gold* flrs. In peaty turf below *Abies* forest. In fruit cf. No. 4168.
4771	aff. obliqua ?	Tibdey La	13,000′	1/9/15	In fruit.
4779	involucrata Wall.	,,	,,	,,	Small plant. Flrs. purple. In swampy turf. In fruit = 4108.
4780	pudibunda W. W. Sm.	,,	,,	,,	Flrs. yellow? In fruit. In wet turf.
4781	aff. elongata	,,	,,	,,	Among Rhododendrons. In fruit.
4783	macrophylla Don var. macrocarpa Watt	Champa	,,	,,	Among gravel and peat by stream. In fruit.
4784	reticulata Wall.	,,	,,	,,	Leafy bracts. Flrs. yellow. In marsh. In fruit.
4785	Hopeana Balf. f. et Cooper	,,	,,	–/9/15	Glabrous, stiff-leaved, prickly edged. In marsh. (Flrs. white.) In fruit.
4787*	umbratilis Balf. f. et Cooper	,,	,,	,,	Loose head of flrs. ranging from blue to white. In fruit.

* "Plants raised from seed of this collection afforded the material for the original description."—I. B. B.

No.	Species.	Locality.	Elevation.	Date of Collecting	Field Book Notes.
4788	Caveana W. W. Sm.	Champa	15,000′	10/8/15	Flrs. large, delicate heliotrope with yellow eye. Loose headed, 2-3 in head. Fruit.
4807	Hopeana Balf. f. et Cooper	Chenebje	13,500′	16/9/15	In fruit. Said to have white flrs. In peaty, sandy soil.
4822	umbratilis Balf. f. et Cooper (*chasmophila* Balf. f.)	Joedawnchi between peaks	16,000′	18/9/15	Flrs. blue in dry rock crevices. Unripe fruit.
4832	capitata Hook.	Codakka	9,000′	20/9/15	Scented. Meal-less.
4855	Menziesiana Balf. f. et W. W. Sm. (*adenantha* Balf. f. et Cooper)	Joedawnchi	16,000′	19/9/15	Among scree debris.
4885	Boothii Craib	Taka La	11,000′	30/9/15	Herb under Rhododendron scrub.
4902	aff. concinna	,,	14,000′	1/10/15	In moist peat soil by stream.
4973	congestifolia G. Forrest (*oreina* Balf. f. et Cooper)	Singhi	16,000′	–/9/15	Magenta flrs. Creeping among glacial debris=4247.
4975*	eburnea Balf. f. et Cooper	,,	,,	,,	Flrs. white in scree =4236.
4977	xanthopa Balf. f. et Cooper	Dong La East of Lingtsi	12,000′	,,	Purple. Wavy petal lobes. Under spruce =4393.

* Plants raised from this seed were described as *P. Harroviana* Balf. f. et Cooper, now a synonym.

Notes on Wm. Griffith's Primulas from Bhutan, 1838, with special reference to *Primula filipes*.

WM. GRIFFITH was the surgeon attached to " The Embassy to Bootan " under Major Pemberton in 1838, and his botanical and other notes are collected together in " Posthumous Papers " arranged by John M'Clelland, F.L.S., published by the Government of Bengal in 1847.

The Embassy set out from Gowhatti on 21st December 1837, passed Dewangiri, a village on the Himalayan foothills overlooking Bengal (long. 91° 30′ E., lat. 26° 53′ N.) and travelled almost due northwards *via* Benka (Tashigong) on the Dangma Chu to Tassyassee (Tashiyangtse Djong) (long. 91° 32′ E., lat. 27° 34′ N.). From here it turned westwards to visit in turn Lingtsi Djong or Lenglung on the Kuru Chu (long. 91° 12′ E., lat. 27° 40′ N.), Byagur (Biaka) and Tonsa (Tongsa), the headquarters of the Governors of the different valleys, and so arrived at Punakha, then the capital of the country (long. 89° 52′ E., lat. 27° 35′ N.). It returned to Bengal by proceeding westwards from Punakha into the Teemboo valley (i.e. the Rydak River), whence the route lay almost directly southwards along the line of 89° 37′ east longitude *via* Buxa in the foothills to Cooch Behar in Bengal. The expedition left Bhutan on 18th May 1838.

Griffith numbered each set of plants from his various expeditions in separate series from 1 onwards, but when his specimens were distributed from Kew the whole of his collections were renumbered in one series to avoid the confusion which would have arisen from Griffith's system; it is difficult, therefore, to correlate Griffith's and the Kew Distribution Numbers (K.D. No. . . .). All the Griffithian numbers and references quoted here are from his published Journal (J.) or Itinerary (I.). His first record of Primula is from Khegumpa, north of the ridge which forms the east bank of the Dangma Chu, 27° 2′ N. by 91° 28′ E., where Primula sp. No. 396 was found (J., 208). " Primulae sp. Icon It. Bootan 41.—Planta minima proveniens inter muscos in rivos clivorum, fol. depressa canescentia. Corolla carnea majuscula, lobis obcordatis, stigmate capitato subexserto, on bluff rocks to Khegumpa, alt. 6,500 ft." (I., 123).

The figure in Ic. Pl. Bootan Pl. 485 depicts what appears to be—if allowances are made for draughtsmanship—*P. filipes*, described and figured in more detail by Watt in Journ. Linn. Soc. xx (1882), 5 (Tab. IIIa), wherein he quotes " Bhutan on rocks near Chuka, alt. 6,500 ft., Griffith." This is a misquotation as Notulae iv, p. 299, gives " 1. Primulaceae sp. Pl. 485, fig. 1. Itinerary Notes, p. 123, No. 396. Hab. Tassyasen, Bootan, Feb. 11, 1838," so that Khegumpa (Kherigumpa) thus becomes the locality from which *Primula filipes* was first collected by Griffith.

This occurrence is an interesting link with the forms of *Primula obconica* from western China, with which the species *P. filipes* has affinity.

Griffith's party travelled north up the valley of a small tributary of the Kuru Chu called the Diri Chu, crossed the ridge separating it from the main stream by the Yanba La pass and proceeded to Benka (Tashigong) and Khumna. Thence, on 7th February, proceeded to Phoollong, the Phiollong of Primula sp. 555, of which is said : " *Primulae* sp.—Planta perpulchra pedalis vel bipedalis, foliis exterioribus patentibus humi adpressis interior, erectis pallido-viridibus teneris, scapo folia excedent apice farinaceo. Umbella globosa densiflora calycibus farinaceo-albis, tubo praesertim intus aurantiaceo, lamina lilacinea fauce aurantiaceo ; odor primulae vulgaris. In humidis turfosis versus Phiollong, alt. 6,000 ft." (J., 233). This seems to be a form of *P. denticulata* or *P. capitata*. The route wound round the Khumna Mountain which " was barren throughout," but above this place, however, forest trees appeared—" Quercus robur commenced at about 5,200 ft., but stunted "—" Here there was a high ridge to the right," and " at a village here " (Chalee, 5,200 ft.) about which *Cupressus pendula* and *Bambusa* are recorded, was found a " Primula of the Khasya hills " (J., 233). Watt in Prim. Conf. Rep. 1913, p. 213, speaking of Griffith's collecting of a candelabra species in Bhutan, possibly Griffith's " Primula of the Khasia hills," says : " The plant collected by Griffith in Bhutan I believe to be distinct and closer to *P. imperialis* than *P. prolifera*." See also Balf. f. et W. W. Sm. in Notes R.B.G. ix, under *P. khasiana* Balf. f. et W. W. Sm. and *P. prenantha* Balf. f. et W. W. Sm. One hundred feet higher, the Journal (p. 233) records " *Primula* in abundance."

" Coming on a well-wooded ravine close to Phoollong . . . found *Quercus* . . . *Viburnum* . . . *Alnus* as before . . . *Primula Simsii*. . . ." (J., p. 234.) This cannot be traced. *P. Simsii* Sweet is *P. villosa flore albo*, an auricula, and does not occur in the Himalayas.

Continuing along the valley of the Dangma Chu, Griffith reached Tassyassee (Tashiyangtse at 91° 30′ E. by 27° 34′ N.). (J., p. 238)—" opposite Tassyassee . . . a large wood. In the broken ground before reaching this, *Primula minor* in crevices of rocks . . . *P. minor*, which grows in shade on the Khasia hills, is found here in sunny wet places." This plant, the smaller of a pair, has not yet been traced. On the east bank of the upper reaches of the Kooloong River (Tashiyangtse Chu), which Griffith explored for about a mile (on 11/2/38, J., p. 240), " The greatest acquisitions were a beautiful pink farinaceous, ascapous *Primula* and a new genus of Hamamelideae." A full description of the first is given under " No. 582. In ripis umbrosis secus Koollung Tassyassy, *Primula* sp. Icon. fl. Bootan, t. 43 " (I., p. 135), and Craib considers it to be *P. Boothii* (Notes R.B.G. Edin. vi, 249, 1917).

The Embassy went from Tassyassee to Sanah in the west and across the Doonglaila Peak (or Pass) on the south-trending range which separates the waters of the Monass River and the Kuru Chu. *Primula Stuartii* is recorded from both sides of the ridge. It ranged from 6,800 ft. to 7,800 ft. under " woods of stunted oaks " (J., p. 241) " up to 7,400 ft." (J., p. 242) and at 8,300 ft. was " common on swards . . . . as before " (J., p. 245), all these sites being in the vicinity of Sanah on the east slope of the pass. Descending the west side of the pass on the way to Linge (Lenglen or Lingtsi Djong) at 10,000 ft., swards were passed abounding with (among other things) " *Primula* scapigera floribus in globum densum pedalis " (J., p. 246), and " at 9,500 ft. *Primula Stuartii* " again (J., p. 247). At 9,000 ft., however, *Primula pulcherrima* appeared. This plant called *P. Stuartii* is recorded under No. 716 " *Primula globifera*—Capitulis densis sphaericis. About Jaisa, on banks, alt. 9,000 ft. Descent from Dhonglaila 10,000 to 9,500 ft." (I., p. 148). This is a double record as Jaisa is a village a little distance further west, and Griffith, perhaps considering the question of transport, which for a large Embassy was possibly a difficult one, was content to note the occurrence of this plant, which occurred in such evident profusion. The plant called *P. Stuartii* by Griffith is probably *P. erythrocarpa* Craib, as this species or a small form of *P. denticulata* (see Cooper's Nos. 4731, 4732, for region and date) was more likely to have been in flower at the time of Griffith's tour (January to March) than any form of *P. nivalis* (with which *P. Stuartii* was confused for so long) which flowers much later in the year. In considering it to be this species it is interesting to read what Watt says of *P. erosa* (Prim. Conference Report, 1913, p. 206)—" It occurs at lower elevations usually than *P. denticulata*, and so far has been recorded as met with in Kumaon and Bhutan only at altitudes of from 4,500 to 9,000 feet."

For further light on the confusion that is likely to arise in a field where plants with capitate types of inflorescence are found in the same or adjacent areas see I. B. Balfour and W. W. Smith in Notes R.B.G. Edin. ix, p. 185, and further notes by Sir G. Watt when describing plants of the Denticulata Section in Primula Conference Report, 1913, p. 203.

From Lenglen (Lingtsi Djong), 91° 12′ E., 27° 40′ N., on the Kuru Chu, a river which flows south from Tibet through the main range in the north and here has an elevation of a mere 4,000 ft., Griffith crossed the Pumthang and Kuru Chu watershed by the Rodoola Pass (Rudong La) at 12,035 ft. on 26th February, finding *P. Stuartii* by Tumashoo " in its old situations between 6–7,000 ft." (J., p. 253).

Westwards from the Rudong La is the Biaka Valley of Pumthang, which Griffith calls " the prettiest valley we have yet seen " (J., p. 259). About Bhoomlungtung " the ridges are clothed with the columnar *Abies densa* " (J., p. 260). " The marshy spots abound with *Juncus effusus* and show also a *Primula* out of flower " (J., p. 261). Griffith

collected no specimen of *Primula* from this (to me) most interesting area, but the Primula seen may have been *P. Smithiana* Craib, which occurs in marshy spots, although there is a chance that it also might have been *Primula prenantha* Balf. f. et W. W. Sm., which was recorded for the first time in Bhutan in 1915 (Cooper, No. 4164) in swampy spots under *Abies* forest at this place.

The ridge between Byagur (Biaka) and Tonsa (Tongsa) was crossed by Griffith probably by the pass now known as the Yato La, passing Jaisa where he collected his No. 716, "*P. globifera* . . . on banks, alt. 9,000 ft." (I., p. 148). This is *P. capitata* Hook. (F.B.I., iii, 486, and cf. Cooper, No. 3977). "I noticed *P. globifera* . . . as we approached the base of the ridge or rather the spot at which the ascent commenced" (J., p. 265). "At 9,300 ft. *P. pulcherrima*" (probably a synonym for *P. denticulata* Sm., Prim. Conference Report, 1913, p. 133) "and *Primula Stuartii* at 8,900 ft." *Primula pulcherrima* becomes "very common at 8,500 ft. to the nullah at 8,200 feet" (J., pp. 266–267).

P. Stuartii was seen again about Tongsa at 7,500 ft. before Tasheeling (J., p. 271), and at Chindupjee "between the commencement of the ascent and the pagoda" (of Chindupjee, J., p. 273).

On the crossing of the ridge between Punakha and Tongsa by the Pililee La, *P. globifera* is recorded above Ridang at 10,000 ft. (J., p. 275), with *P. Stuartii* on elevations about 8,000 ft. (See Cooper's No. 2018.) On 27th March, "during first part of descent (from Rydang to the Gnee River and on to Santagoung between 8–6,000 ft.) noticed one or two straggling cedars and Taxus, *Primula Stuartii*, the woods were formed by *Quercus robur*. . . ." (J., p. 277). Nearing Wandipore (Angduphorang) the next stage from Santagoung, Griffith considers "the country naked; no forest. The hills for some extent . . . appeared from some cause very red. But little interesting vegetation occurred; noticed . . . *Primula Stuartii*" (J., p. 279), but this was probably found in moister forest behind a knoll near Santagoung (cf. *P. platycrana* Craib, Cooper's No. 2367). Griffith then goes from "Wandipore" to Punakha, nine miles north, the objective of the Mission at 89° 52′ E., 27° 35′ N., elevation 4,630 feet above the sea.

On the return journey to Bengal the Embassy continued west and arrived at Telagoung, a small village, elevation about 5,600 ft., in a ravine opening from the west bank of the main Punakha River or Mo Chu. About Punakha "the country remained barren, the ravines in favourable places being clothed with underwood" and later (higher) "with trees," *P. Stuartii* was found on the way at lower levels, "at 3,800 ft. to 4,000 ft." (J., p. 284). This was probably *Primula erythrocarpa* Craib (vide Cooper, Nos. 2555 and 3923), which Griffith consistently calls by the other name. "*Primula pulcherrima*, very common," was noted at 9,000 ft. on the next march up to the Dukey La, a pass over the ridge separating the waters of the Mo Chu from those of the

Thimbu Chu in the east. This is *P. bracteosa* Craib (Notes R.B.G. Edin. vi (1917), 250). He saw " at 9,700 ft. *Primula Stuartii* in flower lower down, but here quite past " on 10th May 1838 (J., p. 286).

The Dukey La reaches 10,000 ft. elevation and the road runs through a small side valley clothed in moist forest before emerging into the main (Teemboo or Thimbu) valley which is pine clad and dry. The village of Woollakkoo sits on the south-eastern shoulder of the junction of these two valleys at an elevation of 8–9,000 ft., and Griffith notes (J., p. 288)—" Euphorbia confined to the Woollakkoo side as also *Primula*, etc., etc." *P. erythrocarpa*, without doubt. The Embassy turned at this point and proceeded in an almost southerly direction to Buxa.

The Itinerary, p. 186, against No. 960, records a " *Primulae* sp.—scape exaltato, flores aurea, calyce purpuraceo. In paludibus. Versus Woolookka—inter 9 et 7,500 ft." This golden-flowered plant is interesting, perhaps an early record of a candelabra type like *P. Smithiana*, which is an early flowerer.

Two days later, rising from Woollakkoo to the spur north of Chapcha at 8,000 ft., Griffith noted that—" the trees were covered in grey lichens, and assumed the usual highly picturesque appearance ; noticed *Primula Stuartii* in flower " (J., p. 290), and on 14th May " ascended to the *Gylong* village (Monastery houses) above Chupcha. The village may be . . . 8,700 ft. above the sea. . . . I ascended . . . to within 1,000 ft. of snow . . . an elevation of 11,000 ft. is required, in open places, to secure the presence of snow " (J., p. 292). *P. Stuartii* was recorded at 9,000 and 9,500 ft. " At 9,800 ft. southern face of the ridge bare, northern thickety, consisting of Rhododendron, Salix, Berberis, etc. In wet, sheltered spots, Iris, Aconitum. . . . Below this a little, woods commence of Cerasus, Salix, Acer. . . . The woods are open, the open spaces occupied by the remains of last summer's vegetation . . . in the woods *Primula purpurea*, a lovely species . . . *P. Stuartii* throughout, very abundant. The plants most limited were Papaveracea (Meconopsis or Cathcartia ?) . . . *Saxif. reniformis*, *Primula purpurea*. . . . The most dispersed are . . . *Primula Stuartii* " (J., p. 293). *P. purpurea* is given in the Flora Brit. Ind. iii, 490, as a variety of *P. Stuartii*, a plant of the Nivales Section. The only Primula collected by Griffith on this march is described under No. 1059, and seems to resemble a newly awakened bud of a species of the Petiolares section. " No. 1059—*Primulae* sp.—Caule inferne valde crasso, buried in mould, subfarinosa, foliis planis serratis, scapo spithamaeo, paucifloro, floribus erectis. Calyce pedunc. caesio farinac. Corolla magna, Pulcherrima purpurea fauce lutescente. Cum praecentibus." (I., p. 194 ; the preceding number is No. 1058, a Saxifrage, creeping in shady spots above Chapcha at 9,500 ft.) If this be compared with more recent records from an adjacent area, viz. Cooper's Nos. 3919 and 4885, both species of the Petiolares section, it will appear that Griffith's

No. 1059 is *P. bracteosa* Craib. On the road between Chapcha and Chukka " we passed some beautiful places, indeed the march throughout was pretty " (J., p. 294), and in the nullah (or gorge) immediately south of Chapcha *Primula Stuartii* was seen at 6,500 ft. in elevation. This is *P. erythrocarpa* again (cf. Cooper's No. 1384 for site, and No. 3811 for the time of year) and " the remainder of the march consisted of winding round spurs at about an average elevation of 6,000 ft. . . . Alnus became common soon ; the Pines disappeared, Osmunda (No. 1108a) common, *Primula rotundifolia* " (J., p. 295). This plant from 6,000 ft. cannot possibly be the *Primula rotundifolia* Wall. whose home is in the temperate Himalaya, 11–13,000 ft.

The only record of a Primula from Chukka in Bhutan other than that just mentioned is made by G. Watt in Journ. Linn. Soc. xx (1882), 5, Tab. IIIa. Here Watt cites under *P. filipes*, " Griff. Itin. Notes, 123, No. 396 ; Notulae iv, 299, Ic. Pl. Asiat. t. 485, fig. 1. Bhutan on rocks near Chukka, alt. 6,500 ft., Griffith," but the Notulae referred to say " Itin. Notes, p. 123, No. 396, Hab. Tassyasen Bootan, Feb. 11th 1838," so that Watt made a mistake in his quotation.

It may be assumed that *P. rotundifolia* from Chukka is the same species as his Primula sp. No. 296 from Khegumpa, the type of Watt's *Primula filipes*. The correctness of this assumption is borne out by a subsequent collection made by myself in Bhutan 77 years later when I found *P. filipes* (Cooper, No. 3808) at Chukka in April 1915 (supra, p. 72). " *P. rotundifolia* " may have been intended by Griffith as a name for the new species or merely as a descriptive term.

The records of *Primula filipes* Watt are therefore at present :—

(1) *Primula sp.* Griff. Itinerary Notes, p. 123, No. 396, Khegumpa (27° 2′ N. by 91° 28′ E.) ; Notulae iv, 299. Hab. Tassyasen, Bootan, 11th February 1838. Ic. Pl. Asiat. t. 485, fig. 1. Watt in Journ. Linn. Soc. xx (1882), 5. Tab. IIIa.

(2) *Primula rotundifolia*—Griff. Journ. 1838 (1847), p. 295, nom. nud.

(3) *Primula filipes* Watt.—Cooper, Nos. 3808, Chukka, April 1915.

There is no further record of *Primula* in either the Bhutan Journal or Itinerary ; the road traversing sub-tropical vegetation to Buxa, which was reached at 7 p.m. on 17th March 1838.

EXPLANATION OF PLATES.

PLATE CCXXXVII.—Map of Bhutan.

PLATE CCXXXVIII.—Fig. 1. *Primula congestifolia* G. Forrest, syn. *P. oreina* Balf. f. et Cooper, No. 4247 (type of *P. oreina*); Fig. 2 *Primula Menziesiana* Balf. f. et W. W. Sm, syn. *P. micropetala* Balf. f. et Cooper, No. 4056 (type of *P. micropetala*); Fig. 3. *Primula umbratilis* Balf. f. et Cooper, No. 4041; Fig. 4. *Primula umbratilis* Balf. f. et Cooper, syn. *P. metria* Balf. f. et Cooper, No. 4042; Fig. 5. *Primula xanthopa* Balf. f. et Cooper, No. 4393 (type).

PLATE CCXXXIX.—Fig. 1. *Primula strumosa* Balf. f. et Cooper, No. 4072 (type); Fig. 2. *Primula bracteosa* Craib, No. 3981 (type) in *situ*; Fig. 3. *Primula erythrocarpa* Craib, No. 3811.

All photographs were taken of the plants "*in situ*" in Bhutan.

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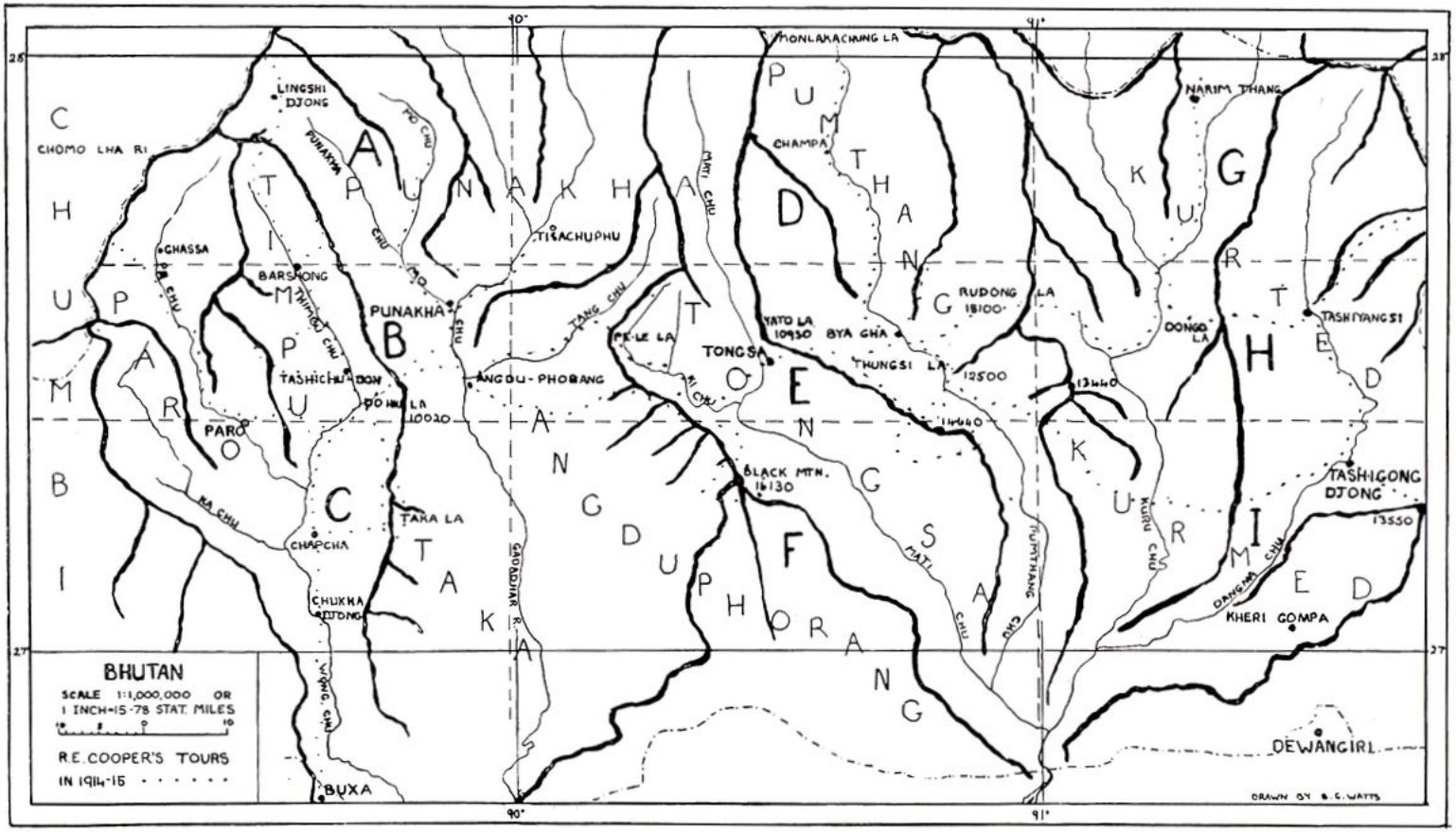

NOTES, R.B.G., EDIN.

PLATE CCXXXVII.

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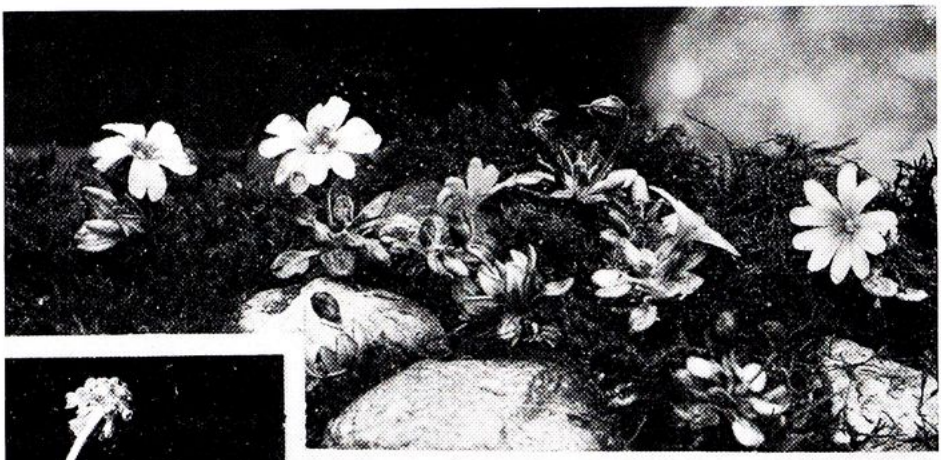

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