

# PLANT COLLECTING IN SOUTH-EASTERN TIBET

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## PART I

IN 1938 I was invited by my friends, FRANK LUDLOW and GEORGE SHERRIFF, to accompany them to S.E. Tibet, and it has been suggested that my field observations, especially on *Meconopsis*, might be of some interest to horticulturists. It may not be out of place to mention that the magnificent collections made by LUDLOW and SHERRIFF on their many expeditions are preserved in the British Museum (Natural History) where they may be consulted on application to the Keeper of Botany. The specimens are fully documented with descriptions of the plants and particulars of the natural habitat. All plants which have been introduced to gardens by LUDLOW and SHERRIFF are represented. Horticulturists may, therefore, appreciate access to these details as an aid to cultivation.

The expedition of 1938 was one of a series, planned by LUDLOW and SHERRIFF, to carry biological investigation from the western frontier of Bhutan to the gorge of the Tsangpo. In 1936 my companions had travelled through the Tibetan districts of Chayul, Charme and Tsari and had paid hurried visits into the Tsangpo Valley: in 1938 the eastward exploration was continued through the provinces of Takpo and Kongbo and along the main Himalaya to the neighbourhood of Namcha Barwa. This noble mountain (25,445 feet) and the more massive but less impressive Gyala Peri (23,460 feet) form the portals of the gorge which the mighty Tsangpo cuts through the Himalaya, falling 6,000 feet in 150 miles, to emerge as the Dihang from the foothills of Assam. From the Lo La, the most easterly pass reached in 1936, to Namcha Barwa the main range gradually converges to the Tsangpo over a distance of some ninety miles and on this stretch it was proposed to concentrate our main collecting effort.

The Himalaya is a formidable barrier to the moisture-laden clouds of the S.W. monsoon and comparatively little rain penetrates beyond the main range. North of Sikkim and Bhutan the change from a wet to a dry zone is very abrupt; within three or four miles one passes from lush vegetation to the aridity of the Tibetan plateau. A heavier monsoon assails the eastern end of the Himalaya which is traversed by several low passes and where the average height of the range is less than further west. In this region, too, terrific gorges breach the main range where rivers from Tibet have pierced their way through. Here, then, the range is not such an effective barrier to rain and the monsoon clouds penetrate the gorges and sweep over the lower mountains, so that the northern slopes, receiving an annual and prolonged drenching, support an extremely rich flora with a high representation of plants of garden merit.

In order to reach our collecting area we decided to cross the plateau by the Lhasa road from Sikkim (Fig. 58) to the point where it crosses

the Tsangpo and then to follow the river down. The route to Gyantse has been fully described by many travellers and there is a good account of the country from Gyantse to Tsela Dzong in KINGDON-WARD'S *The Riddle of the Tsangpo Gorges* which also deals charmingly with the vegetation of much of the area which we visited.

By splitting into parties we were able to visit over a dozen passes at the height of the flowering season, few of them shown on existing maps and only one (Doshong La) previously explored. When the parties reunited it was obvious that some interesting comparisons could be made. It was found that many passes, in the alpine zone particularly, held distinctive plants, and this was very marked in the genus *Primula*. For instance, the alpine slopes of the Lusha La were ablaze with the rich purple flowers of *P. calliantha*, while on the Tamnyen La, barely five miles away, there was no sign of this species which was only previously known from far-off Yunnan. An even more striking contrast was afforded by the Doshong La and the Pero La. On the Doshong La, so vividly described in KINGDON-WARD'S writings, huge drifts of *P. falcifolia*, *P. chionota* and *P. Valentiniana* (See *Quart. Bull. Alp. Gard. Soc.* vii, 228 (1939)) covered the moorland, but these species were all absent from the Pero La barely three miles away. Climatic and edaphic conditions on the passes seemed to be identical and it is not easy to interpret such erratic local occurrences of plants, which were by no means confined to *Primula*.

The phyto-geography of the area which we explored is intensely interesting and our collections should help in its further elucidation. It is axiomatic that mountain ranges such as the Himalaya have acted as highways for the dispersal of plants, and where we were it was possible to recognize floral elements, some of which clearly had migrated from the west and some from the east. Several species of British plants flourished in company with some characteristic of Szechuan and Yunnan which here, apparently, reach the westerly limit of their range.

I left Gangtok in Sikkim for the Chumbi Valley in early April 1938 and for the first few days delighted in the profuse vernal flora of the southern Himalayan slopes. Above the subtropical zone, the scarlet trusses of *Rhododendron arboreum*, mingling with the white chalices of *Magnolia Campbellii* in the canopy of the forest, made an unforgettable picture. This was only one of many thrills which enriched my introduction to the Himalayan flora. Many plants which I had previously known only from dried museum specimens were revealed in their true beauty.

On the second day's march (April 9), I saw the first Himalayan Poppy. I had left the track to examine fine clumps of *Primula gracilipes* and *P. Listeri*, whose rich magenta flowers carpeted the peaty loam on a shady bank amongst dwarf *Rhododendrons*, when I noticed amongst the adjoining scrub the expanding leaves of a species of *Meconopsis*. The withered remnants of fruiting inflorescences with narrow tattered capsules, which had survived the rigours of winter, proclaimed the plant to be *M. villosa*. The tight tufted rosette was

much enhanced in appearance by the dense covering of golden brown bristles. This species deserves to be more widely grown and, judging from the natural habitat, should be specially at home amongst dwarf *Rhododendrons* and other small shrubs.

On the following day (April 10) I left Changu bungalow to cross the Tibetan frontier at the Nathu La. It had snowed overnight and the small *Rhododendrons* peeping through the snow blanket looked very forlorn with drooping leaves. At about 12,000 feet, in open spaces on the hillside, where scraggy specimens of *Abies Webbiana* were dotted about, I saw the tall fruiting inflorescence of a Poppy protruding from the snow. By scraping away the snow near to the dead specimens, the handsome winter rosettes of *Meconopsis paniculata* were revealed. These plants must endure great extremes of temperature and possibly take some years to reach maturity.

Once one is across the Nathu La into the Chumbi Valley, the luxuriant Himalayan vegetation is soon left behind though there is much to interest the botanist and horticulturist in the river-valleys and even on the plateau of Tibet. I had to traverse the plateau and travel far down the Tsangpo Valley before I saw further species of *Meconopsis*. It was an eventful day—May 16. I was on the last lap of my solitary journey to meet LUDLOW and SHERRIFF at Molo and my route, deviating from the Tsangpo, led up to the Palang Chu to the Lang La. On the higher grazing grounds, copiously mulched with yak droppings, enormous clumps of *Primula Roylei* (see *Quart. Bull. Alp. Gard. Soc.* viii, 112 (1940)) were growing to perfection. It is a pity that this fine plant will not accommodate itself to conditions in our garden. The alpine grassland, between 14,000 and 15,000 feet was gay with the bright blue flowers of a charming little annual *Gentian*, mixed with the deep indigo-purple flowers of *Gueldenstaedtia himalaica*. I had sent the transport ahead so that I could wander on the slopes collecting. Some distance from the top of the valley the track suddenly turned east and made a bee-line up steep slopes to the crest of the mountains. I caught up with the transport about 1,000 feet below the Lang La, which is almost 16,000 feet in height. For some time I had been ploughing waist-deep through drifts of snow and I was not surprised to find some of the mules floundering and making unavailing efforts to scale the steep snow-slopes. Other animals were standing motionless with their heads and backs barely showing above the snow, but after five hours spent in beating out a track, the unwilling beasts were hauled, pushed and whipped to the summit. Over the pass there was practically no snow and the beautiful valley of the Ne Chu lay below us. On its southern (north-facing) flanks it supports immense Fir forests. Shortly after leaving the pass I was delighted to see two species of *Meconopsis*. Scattered on the lichen-covered scree-slopes were fruiting specimens of the racemose form of *M. horridula* which is not an inviting plant to collect on account of its formidable armature of pungent spines. Rosettes of young plants showed the leaves occasionally stained purple at the base of the spines, a form which was once designated *M. rudis*. In some burnt *Rhododendron*

scrub there was considerable abundance of *M. simplicifolia*, the dense tufted rosettes of which, beset with golden-brown hairs, were throwing up flowering stems, but the flowers were not yet expanded and inside the buds the crinkled petals were a rich maroon colour.

LUDLOW and SHERRIFF had been six weeks ahead of me, as I was unable to leave this country in time to start with them, and they planned to explore the rich but inhospitable district of Packakshiri, south of the main range, before our meeting at Molo. "Round about the middle of May at Molo" was as good a guess as any for our assignation and this was the arrangement proposed by SHERRIFF in February over the telephone from Calcutta. My friends reached Molo at 2 P.M. on May 17 and, much to their astonishment, I walked into camp at 2.30! Our punctuality was indeed exemplary.

We remained a few days in Molo, repacking our stores and preparing for the more intensive collecting which lay ahead. It was decided that LUDLOW and I should proceed down the Lilung Chu to the Tsangpo and follow the river as far as Lusha before tackling the main range. Our eastern limit was to be Namcha Barwa, while SHERRIFF was to work eastwards from Molo to link up with us.

Below Molo the steep slopes of the Lilung Chu were beautifully wooded, Spruce (*Picea likiangensis*) and Larch (*Larix Griffithiana*) being the dominant species in the upper part of the valley.

A pleasant reminder of home was afforded by the colonies of our native Moschatel (*Adoxa Moschatellina*), on mossy banks in the shade of shrubs, bearing a profusion of tiny green globular flower heads. *Podophyllum emodi* grew in some abundance in rich damp humus on the forest floor. Some days previously I had seen it in the open in splendid flower along irrigation channels in the Tsangpo Valley and the young deflexed crimped leaves, blotched with chestnut-brown, provided a perfect foil for the flushed pink petals surrounding the cluster of golden-yellow anthers. In the Lilung Chu the foliage had fully expanded and the plants were passing into fruit.

Amongst rocks by the river occasional plants of *Rhododendron telmateium* were in full flower. This species, which was first found in Yunnan, is not uncommon on the hillsides and lower parts of the side valleys along the Tsangpo. It forms bushes up to five feet in height and has attractive rich magenta flowers.

We camped in a clearing encircled with magnificent specimens of Spruce, which I judged to be at least 150 feet high, with a few flowering trees of *Malus baccata* lending colour to the undergrowth. On the next day's march we passed through much evergreen Oak (*Quercus semecarpifolia*) and a forest of almost pure *Pinus tabuliformis* to the dry valley of the Tsangpo. The white flowers of *Clematis montana* var. *grandiflora* smothered some of the shrubs growing in clearings of the Pine forest. The turf gleamed with the brilliant blue-violet flowers of *Iris decora* with yellow crests on the falls, although an occasional albino was seen. A conspicuous and rather showy plant of these clearings was *Piptanthus napaulensis*. Here, too, was a species of *Berberis* which has recently been described as *B. kashemirica*. The latter has a

six feet in height with lax racemes of up to twenty-five greenish-yellow flowers and attractive reddish-brown twigs.

The track down the south bank of the Tsangpo led through several villages, and it was noticeable that irrigation-channels, a feature of the upper Tsangpo Valley, were no longer required to aid cultivation. Trees reached almost to the bank of the river, and the valleys, running south into the mountains, were thickly forested. At places the track meandered through sand-dunes colonized with a profusion of *Sophora Moorcroftiana*, which was often adorned with the fleshy yellow flowers of *Clematis orientalis* (Fig. 54). Growing prostrate on the sand, the attractive *Oxytropis sericopetala* caught the eye with its deep purple flowers and silvery tomentose leaves while on the hill slopes *Rhododendron triflorum* and fine specimens of *R. vellereum* were in full flower. Several species of considerable horticultural value were noted in this part of the Tsangpo Valley. *Paeonia lutea* formed a thicket on a dry gravelly river terrace and its long, spindly, usually unbranched stems up to eight feet in height, bore a few leaves, towards the top and above carried up to four golden-yellow flowers which, with the sun shining through the translucent silky petals, were brilliant. Another noteworthy plant was *Elaeagnus umbellata*, which formed a handsome spiny shrub, up to six feet high, glistening with silvery scales. It was in splendid flower (strongly fragrant) in May and we saw it again later with its reddish fruits. On fixed dunes near the river were bushes of *Spiraea arcuata*, up to seven feet in height, with long arching branches smothered with sprays of white flowers. A lovely Tamarisk, *Myricaria Wardii*, grew in a dry gravelly stream bed: a shrub of ten feet with elegant fine-leaved branches, the pink flowers were borne on slender catkin-like inflorescences.

We reached the small settlement of Tse on May 30 and halted for four days as we had to pay our respects to the *dzongpon* and ensure his agreement to our plans. Immediately above our camp was a narrow, steep-sided, richly-wooded glen which, somewhat unexpectedly, provided a wealth of fine plants. Many similar valleys open into the Tsangpo from the south and their exploration would undoubtedly yield much of interest. No track led up to the Tse stream and we had to scramble along the rock-choked bed to reach the heights. Not far from camp, in a small grassy clearing at 10,500 feet, very damp and clearly liable to frequent flooding, *Meconopsis betonicifolia* grew in huge clumps in company with *Primula bellidifolia*. The plants were about four feet tall and the sky-blue flowers (four inches in diameter) with the central boss of orange anthers looked more attractive than any I had seen grown at home. Much higher up, at 12,000 feet, I collected the small rosettes of a *Meconopsis* belonging to the *Primulinae* on a mossy clearing in the *Rhododendron* forest and this species was later found in flower in other localities. These were the only Poppies seen, but their comparative absence was amply offset by the abundance of other treasures. The exquisite beauty of one in particular baffles description. I shall never forget my amazement on seeing *Paraquilegia tibeticoides* for the first time, and indeed for sheer delicacy, poise and

refinement this plant must be supreme. I was stunned by its perfection, as it hung in aged tufts from dry overhanging rocks, the glaucous leaves a beautiful foil to the tremulous pale lilac flowers (Fig. 55). Close by, in similar situations between 11,000 and 12,000 feet, grew another beautiful plant—*Primula Baileyana*. The flowers of this Primrose vary from violet to dark violet-purple and the whole plant is powdered with a fine white farina. Many other plants of distinction inhabited this valley but I must leave them unnoticed as I have much to record from other localities.

We left Tse on June 5, reaching Lusha in two marches, where we camped beside the Lusha Chu amongst masses of sweet-scented *Primula alpicola*, very variable in colour here but mostly the var. *violacea*. *Iris Clarkei* was abundant along the stream side. This handsome species, with white-blotched dark-lustrous-purple falls, mottled in the throat, is a common species in the Tsangpo Valley.

We started from Lusha to climb the Lusha La on June 7. A feature of the valley, as of those of the Tamnyen and Doshong, which we visited later, was the gentle gradient until we had almost reached the main range, when the ascent became abrupt and steep. The rough track, only occasionally used by the Lobas from south of the Himalaya on their bartering journeys to the Tsangpo villages, crossed the river a short distance from Lusha. Forging the river was easy enough on the upward journey but on our return the waters, much swollen by the monsoon, were negotiated only with considerable difficulty and our laden porters crossed with linked arms. We passed through the usual evergreen Oak and Pine forest into mixed Spruce, Larch, Poplar and Birch. There was little of interest in the forest except a Lily ally, *Streptopus simplex*, growing on shady banks in deep moss and it reminded me of a miniature *Nomocharis* with its pendant flowers beneath the leaves. The petals were white or flushed pink and copiously mottled with reddish-purple and some live plants were dug up later and sent home by air but did not survive the journey. Occasionally we crossed extensive grassy flats and bogland which afforded lush grazing for yaks. To these high *drogpas* the Tibetans drive their animals for the summer months, a custom reminiscent of the former seasonal habit in the Highlands of Scotland when families moved with their cattle to the shielings in the mountains.

On our second day's march the path rose steeply and entered the *Abies* forest but at times it ran beside the turbulent river. Small islands and exposed gravel beds were covered with thickets of a fine Tamarisk, *Myricaria davurica*. The bushes were up to six feet high with slender branches bearing small closely packed glaucous leaves and clusters of rich magenta flower spikes. We collected seed of this desirable shrub later in the year. Occasionally the valley broadened into meadows in which many fine plants were gathered. One of these flats was white with an Edelweiss (*Leontopodium himalayanicum*). We camped at about 12,000 feet on the upper fringe of the forest. That day (June 8) the monsoon, heralded by sharp thunderstorms, broke in earnest over the main range and eight hectic but glorious

days were spent exploring this floral paradise in a perpetual fury of rain. The same conditions greeted us in the other Himalayan valleys. It was not easy to cope with the flow of specimens as every day brought a fresh harvest of plants, though we were a trifle early for the higher alpinists. On the slopes of the Lusha Chu, just above camp, I saw *Meconopsis simplicifolia* in magnificent flower. It was scattered amongst bushes of *Berberis macrosepala* and Willows, where, as it did not venture into the open, it was apparently protected from the grazing yaks. The petals varied from sky-blue to deep-blue and the plants were beautifully bespangled with rain drops. On the higher slopes I found *Meconopsis spectosa*. It was growing at 13,000 feet in crevices of dryish rocks with a southern exposure. The delicate silky petals were sky-blue but the plant was not common here though we found it in some abundance on the Sang La a fortnight later.

One of the glories of this pass was *Primula calliantha*, which has been described and figured in the *Quarterly Bulletin of the Alpine Garden Society* (Vol. VII, 238 (1939)). It might be of interest to mention other *Primulas* collected on this pass: *P. concholoba*, with dark purple flowers, grew amongst shady rocks in *Rhododendron* thickets; *P. rhodochroa*, a charming dwarf farinose species, with pink to cherry-red flowers, brightened damp mossy rocks; *P. Jonardunii* (*tom. cit.*, 237), another farinose mat-forming species with rose-crimson flowers, graced rock-crevices and ledges; *P. chamaethauma* (*tom. cit.*, 231) was abundant on wet avalanche-slopes and open moorland, with a profusion of blue-violet flowers each with a dull orange eye; *P. sikkimensis* var. *pudibunda*, with creamy-white flowers, favoured the soggy avalanche-slopes; *P. vernicosa* (*tom. cit.*, 232), with white or blue-violet flowers, appeared precociously beside the melting snow; *P. Genestieriana*, a beautiful dwarf with violet-purple flowers, colonized sodden snow-fed gravelly soil; *P. minor*, with deep-magenta flowers, grew on gritty soil at the margin of loose screes; *P. glabra*, with pink or purplish flowers, grew on wet grassy flushes; *P. Dickieana* was abundant in the damp meadows, with flowers varying in colour from white through magenta to violet-purple.

The valley was very rich in *Rhododendron* and some idea of the variety may be gained from the following list: *R. anthopogon*, *R. dignabile*, *R. fragariflorum*, *R. Forrestii*, *R. paludosum*, *R. pumilum*, *R. riparium*, *R. tsariense*, *R. Wardii*.

The plants mentioned above make a sufficiently imposing list for such a small area, but do not by any means exhaust the riches of the Lusha La. It is impossible to deal here with all the noteworthy species inhabiting the pass, but one or two others deserve notice in view of their potential horticultural merit. Gravel banks and avalanche slopes supported dense clumps of *Diplarche multiflora* which, in habit, strongly resemble our native *Phyllodoce caerulea*. Tight globose heads of pink flowers terminate the vertical shoots and this miniature Ericaceous shrub would certainly appeal strongly to those interested in heaths. In its distribution, *Diplarche multiflora* extends from Sikkim

to Yunnan and it would be surprising if attempts had not been made to introduce the species. We returned to the Lusha La in late September and obtained abundance of seed of *Diplarche* but have no record of successful cultivation. Hugging the rocks were low bushes of the rare British species *Cotoneaster integerrima* with the prostrate branches studded with deep red-petalled flowers. *C. microphylla* was also seen in flower.

Two kinds of Cassiope—*C. selaginoides* var. *nana* and *C. Wardii*—grow here and there in profusion and were flowering at their zenith at the time of our visit. Their beautiful, pure-white, campanulate flowers stood out conspicuously in the alpine pastures and on many rock shelves. *C. selaginoides* var. *nana* formed compact carpets in open spaces amongst Rhododendrons and extended into the moorland, where it favoured seams and soil-pockets in moss-covered rocks. *C. Wardii* was a most striking species, forming large colonies on exposed, loose gravel banks and rock-strewn slopes at an altitude around 12,500 feet. It forms an attractive miniature shrub about a foot in height, closely branched and fastigiate, the tightly ranked leaves adorned with long white silky hairs. These Cassiopes, could they be induced to thrive in our gardens as they do in the wild, would gain immense popularity. These remarks apply equally to *Diapensia himalaica*, which surely combines the attributes of an ideal alpine. It forms dense mats of miniature evergreen foliage in the alpine grassland but is equally at home spreading over rock-shelves. The tight cushions are studded with comparatively large flowers of a rich rose-pink. In September, when we returned to collect seeds, *Gentiana Elwesii* and *G. sino-ornata* were flowering beautifully and *G. Sherriffii* was passing into fruit.

This bare catalogue gives a woefully incomplete picture of the gorgeous alpine flora of the beautiful Lusha Chu Valley, and I confess my inability to convey an adequate appreciation of its treasures.

On our return we rested for a couple of days to complete the drying of our collections and enjoy a respite from the ceaseless rain assailing the high tops. Our next objective was the unexplored valley of the Tamnyen Chu, and in one march from Lusha we reached the small hamlet of Tamnyen on June 18. A week was spent in the Tamnyen Chu and an ascent made to the Tamnyen La. Many interesting additions were made to our collections but, somewhat surprisingly, no *Meconopsis* were seen, although conditions appeared ideal for their occurrence.

One plant of special interest, and forging another link between the floras of western China and the Himalaya, was *Vaccinium modestum*, a species previously known only from western Yunnan, where it was discovered by KINGDON-WARD on the Doker La. This engaging dwarf shrub, its leaf-bearing branches never reaching more than six inches above the mossy beds in which a network of stems ramifies, formed carpets on mossy banks and in plashy *Sphagnum* bogs. The greenish flowers, often flushed with pink or red, were solitary and borne on slender pedicels about an inch long. Two large reddish



bracteoles almost concealed the flower and persisted until the fruit was mature. In September, when we returned for seed, the plants were even more attractive with the foliage splashed with ruddy autumn tints and with the large glaucous-black globular berries, half an inch in diameter, borne like miniature grapes on rigid stalks.

This valley was perhaps not quite so rich in species as that of the Lusha Chu, yet it supported a luxuriant flora and we collected many fine plants which were new to us. Once again we were subject to continual rain and decided, as our next venture, to cross the Tsangpo to the drier ranges behind the persistent monsoon-screen whence KINGDON-WARD had reported rich populations of *Meconopsis*.

We crossed the Tsangpo by ferrying in two 40-foot dugouts lashed together with bamboo thongs. These were propelled by two large oars with enormous blades, the oarsmen starting each stroke in a standing position and completing it seated. The effort of a few strokes carried the unwieldy craft into the powerful current and it was then allowed to drift rapidly downstream to be guided to the other bank about a mile below our starting point. We walked a few miles down river, crossing an immense sandhill, and made our camp at Sang on an alluvial flat. The Sang La lies at the head of a valley leading to the Rong Chu above Tumbatse. This was the area from which KINGDON-WARD made the bulk of his collections during his expedition of 1924-1925 and he has vividly described the vegetation in his *The Riddle of the Tsangpo Gorges*. His explorations, however, did not include the Sang La and we were on that account rather optimistic about our prospects. Our expectations were not misplaced, as results far exceeded our high hopes. The time, though wet and boisterous, spent on this pass and neighbouring hills was full of excitement as the area was prolific in species of *Meconopsis* and I had splendid opportunities for testing in the field conclusions (reached with some hesitancy) based on study of herbarium specimens and cultivated plants. Altogether six different Poppies were seen in this district.

A short distance from Sang we climbed a rough track through dry evergreen Oak and entered mixed forest. It was rather surprising to find a species of *Primula* flourishing on the sun-baked banks but *P. Jaffreyana* is happiest in such exposed situations. Later in the season we saw abundance of the species, in similar places, in its winter resting state when the rosette leaves were shrivelled and dry, powdering to the touch and the roots were wrinkled and contracted and merely served for anchorage. In the centre was a tiny hard bud with no external appearance of life whatever, but removal of the tight bud scales, however, revealed the minute green germ from which the next year's plant would develop. A number of these desiccated plants were pulled up and brought home, surviving about two months' journey, and produced beautiful flowering specimens in the following year.

*Rhododendron telmateium* was flowering in the lowest forest and we passed a magnificent clump of *Notholirion hyacinthinum* just coming into flower, the perianth segments lilac-purple with a darker greenish

tinge at the base and whitish towards the apex with a green blotch at the tip.

To reach the alpine zone we climbed steeply through mixed *Abies* and *Rhododendron* forest, collecting and photographing many interesting plants on the way. Among the most striking species of *Primula* were *P. Cawdoriana*, in magnificent flower on grassy banks or bare black soil, the pendant violet-purple corolla lightly sprinkled with farina, *P. Baileyana* and a superb form of *P. sinopurpurea* with deep violet-purple flowers.

As we emerged from the forest our hearts gave a leap at the prospect before us; the rolling moorland was a billowy sea of dwarf *Rhododendrons* and other shrubs. Spires of yellow Poppy flowers pierced this matting and all about were colonies of the sky-blue *Meconopsis simplicifolia* (Fig. 56). Our admiration of the scene was unbounded and we pitched our tents on a broad exposed ridge in the midst of this glorious alpine garden about 200 feet below the Sang La. We were quite oblivious to the sharp sleet showers as we traversed the hill-slopes, eagerly cramming the choice plants into our presses and vascula. Failing light brought our labours on this memorable day (June 28) to a close and as we turned for camp in the gathering dusk we had superb views away to the south beyond the Tsangpo of the mighty snow-range, muffled in an ever-changing cloud mantle.

No locality, except the neighbouring Nyima La, excelled or indeed approached the Sang La for variety and profusion of *Meconopsis*. The most conspicuous plant on the moorland was *M. integrifolia*, whose fountain of yellow flowers rose elegantly through the carpet of *Rhododendron laudandum* and *Potentilla fruticosa* var. *grandiflora* (Fig. 59). At this elevation, about 13,000 feet, the plants were up to four feet in height and very homogeneous in character. All had prominent, slender, cylindrical styles and the ovaries were densely covered with golden-brown adpressed hairs. *Meconopsis simplicifolia* grew in association but was not so prominent, as its flowers barely showed above the hummocky *Rhododendrons*. Colonies of the species grew in small clearings (Fig. 62). But the most exciting plant was one bearing pure-white to pale-yellow flowers which occurred sporadically in association with *M. integrifolia* and *M. simplicifolia*. At a glance this was recognized as KINGDON-WARD'S Ivory Poppy, which was discovered in 1942 on the nearby Temo La (Fig. 60). In my *Account of the Genus Meconopsis* I tentatively assigned this plant to  $\times$  *M. Harleyana*, but little did I imagine then that I would have the opportunity of confirming my opinion in the field. The hybrid, in habit and flower colour, was easily picked out and we counted about twenty individuals in the area where the parents overlapped. The Ivory Poppy was not found isolated from both parents. In the majority of the specimens the flowers were borne on basal scapes and the leaves were usually notched, characters which have been derived from *M. simplicifolia*. The flowers were up to five inches in diameter and in texture, shape and colour showed the influence of *M. integrifolia*, though occasionally the petals had a faint flush of mauve from

*M. simplicifolia*. In its ovary characters, the plant was intermediate between the parents. The capsules of  $\times$  *M. Harleyana*, in contrast to the turgid state of those of the parents, were narrow and spindly and when opened they showed rows of abortive ovules. All the plants examined were monocarpic and by September had completely withered with the gaping capsules containing powdery undeveloped seed.

In sheltered pockets of black soil in the block boulder scree at 15,500 feet another form of *M. integrifolia* was found. This plant was barely two feet in height, with up to twelve narrow petals, and with the style so contracted that it was concealed by the dark brown hairs of the ovary. Such states have been treated as species by some authors but study of some hundreds of herbarium and cultivated specimens and examination in the field show that the forms of this very polymorphic species merge and do not justify taxonomic separation.

The other species seen on the Sang La were *M. horridula*—the racemose form just coming into flower on the scree slopes: *M. impedita* on earthy banks under *Rhododendron* and bearing intensely violet-purple satiny flowers on spiny basal scapes, and *M. speciosa* (Fig. 61). I remember hearing the late GEORGE FORREST extolling the virtues of *M. speciosa* and he was full of regret that the species had never become established in gardens from his expeditions. Having seen the plant in its native habitat—in boulder scree or in crevices of dry rocks with a southern exposure—I can well understand FORREST'S sentiments. The flowers are usually of a beautiful silky azure-blue, though I saw some plants with rich maroon petals. We collected a quantity of seed of these forms, but apparently no success has attended our attempted introduction.

Remarks on other Sang La plants must be restricted to bare mention of a few other species. *Cassiope pectinata* and *C. fastigiata* grew together amongst dwarf *Rhododendrons* and the intense blue flowers of *Gentiana tubiflora* var. *namlaensis* and *G. phyllocalyx* made brilliant splashes of colour. A very attractive dwarf *Polygonum*, with a dense spike of pink flowers, grew in turf and on loose earthy screes and *Cremanthodium Thomsonii* and *C. plantagineum* were prominent. A few early yellow flowers had appeared on *Cyananthus spathulifolius*.

On July 1 we struck camp, crossed the Sang La, and descended into the lush Rong Chu Valley. Fine specimens of *Meconopsis integrifolia* (Fig. 66), with flowers six inches across, grew in the moorland but also at much lower altitudes in the *Rhododendron* forest. *M. simplicifolia* also occurred in some abundance on the north side of the pass and the Ivory Poppy was also seen. A rough and, at places, overgrown track brought us to the waters of the Rong Chu which we followed to Tumbatse through rich meadows gay with masses of fragrant *Primula alpicola* var. *luna*, *Aster tibeticus* and *Iris Clarkei*.

We spent two days at Tumbatse but the weather was so deplorable that we were forced to change our plans and our collecting was confined to the low ground where the plants were chiefly of botanical interest. To add variety to our diet we bought a small yak for about ten shillings and our efficient cook served us with grilled steaks, followed by tarts

made from wild gooseberries and smothered with full cream and sugar.

It was now time to return to our main collecting ground on the Himalaya and our route to the Tsangpo Valley led over the Nyima La, which KINGDON-WARD explored in 1924 and of which he gives a glowing account in his *The Riddle of the Tsangpo Gorges*. As we approached the summit of the pass a thunderstorm broke and torrential rain and hail drenched us for nearly an hour. Through the rain screen we could see the snow-capped main range in sunshine. It was from the Nyima La that KINGDON-WARD first reported the Ivory Poppy—"very rare--so rare that we counted only six plants of it, though these were widely scattered." The year of our visit was more favourable—we saw some dozens of  $\times$  *Meconopsis Harleyana* plants on both sides of the pass wherever the two parents co-mingled. *M. horridula*, *M. speciosa* and *M. impedita* were also in perfect flower.

We reached Timpa on the north bank of the Tsangpo on July 5 and that evening we enjoyed superb views of the Himalaya. A temporary break in the monsoon had dispelled the clouds from the main peaks and the magnificent cone of Namcha Barwa, with its sierra-like northern spur falling away to the Tsangpo Gorge, was an unforgettable sight. We lingered over our evening meal in the open, enthralled by the changing colour effects on the snow as the setting sun crept up the flanks of the mountain. Later, the peak was bathed in soft moonlight and remained clearly etched against the starry heavens when we retired reluctantly to rest.

We ferried across the river next day and camped at Pe, where the stream from the Doshong La joins the Tsangpo. The extraordinary richness of the Doshong La was first revealed by KINGDON-WARD, and we assumed that the neighbouring Pero La, a little to the east, would hold similar floral wealth. The track over the Pero La into Pemako had fallen into disuse and the path through the forest was almost completely obscured in the undergrowth and jumble of fallen trees. Above the forest we had to traverse a disordered mass of huge, slippery, moss-grown boulders colonized by *Rhododendron*, *Berberis*, *Salix* and *Lonicera* species, before reaching the marshy basin at the head of the valley where we pitched our tents in an oozy bog. As I was scanning the slopes above camp with binoculars I picked out a black bear which was apparently amusing itself by knocking down the tall stems of *Rheum nobile* with its forepaws.

On the way up the valley there were few indications of unusual profusion or variety in the vegetation. I collected *Primula szechuanica*, *Berberis Taylorii*, *Rhododendron lepidotum*, and the graceful but evil-smelling *Codonopsis mollis* with slaty-blue tubular flowers with a darker network of veins.

The alpine slopes around us looked most promising and we felt certain that they would yield plenty of interest; but we were to be disappointed and our results did not bear out our optimism. Possibly we were too early for this particular valley, though we judged the season should have been at its height. A great deal of snow remained in

the gullies and a biting wind with stinging rain swept down from the pass. We climbed up a steep snow-slope to reach the Pero La to find it choked with snow. A huge cornice overhung on the north side and we climbed up the ridge above the pass to get a glimpse to the south of the main range. Below was a seething cauldron of mist, swirling round the great cliffs, which were weathered at places into ghostly pinnacles. A penetrating wind drove us back to the lee side and we skirted the rocks and scree slopes round the head of the valley. Prostrate plants of the minute shrublet *Diplarche pauciflora* pushed their pink flower-heads through the moss covering of rocks. We descended to a small tarn in the *Rhododendron* moorland, in which *R. campylogyuum* with port-wine coloured flowers was a striking constituent and round the margin a species of *Pleurogyne* and *Gentiana cerastiiformis* were flowering beautifully. The most notable plants collected on the Pero La were *Primula Baileyana*, *P. Cawdoriana*, *P. rhodochroa* var. *meiotera*, *P. tenella* (see *Quart. Bull. Alp. Gard. Soc.* viii, 117 (1940) ), *P. dryadifolia*, *Gentiana cerastiiformis*, *G. Sherriffii*, *G. tubiflora*, var. *namlaensis* and *Meconopsis speciosa* with rich maroon petals.

Ordinarily this would have been quite a respectable haul, but our experience on other passes and the super-abundance described by KINGDON-WARD from the Doshong La had pitched our hopes somewhat higher. A day was spent exploring the ridge separating the Pero La from the Doshong La but again the results were disappointing. Far below us lay the Doshong La, which looked a greener valley than that of the Pero La. We were to visit the Doshong La within the next few days and it far outstripped the Pero La in wealth of vegetation.

We descended to Pe on July 12 and next day made camp on the Doshong La on the upper fringe of the *Abies* zone. It is needless for me to attempt to describe the amazing richness of this pass when KINGDON-WARD has given such a brilliant account of it in his *The Riddle of the Tsangpo Gorges*.

As if to compensate for the surfeit of other beautiful plants, *Meconopsis* was only represented by the most inconspicuous member of the genus, *M. lyrata*. The plant has a short radish-like tap root and the weak flowering stem reaches six inches in height though usually it does not exceed four; the small pendulous flowers have four pale watery-blue petals. It was growing on the banks of a stream under *Rhododendrons* and also on open slopes in shade of ferns. Seeds were collected in September but if plants were raised it is hardly likely that they would arouse much enthusiasm.

Memories of home were awakened by the sight of a quaking peat bog blanketed with our native Buckbean (*Menyanthes trifoliata*) in perfect flower. The racemes of rose-flushed, white, fringed flowers were quite in harmony with the aristocratic floral setting and we could not help feeling that the beauty of the Buckbean might be more appreciated by gardeners if it could be obtained only in Tibet.

Our stay on the Doshong La was for five days but the weather was cruel and it rained or snowed or there was dense mist all the time.

The sustained excitement of plant hunting in such a prolific area made us almost unmindful of the uncomfortable weather conditions and it was only the difficulty of preserving our collections which drove us down to the Tsangpo. We had, however, quartered the area pretty thoroughly and descended for some distance into Pemako on the other side of the pass.

On July 20 we set out for Gyala at the head of the Tsangpo Gorge as LUDLOW was particularly keen to investigate the avifauna where the Indian Himalaya terminates and to see whether birds from the south had ascended through the gorge. The area was very interesting botanically but there was little to excite the envy of horticulturists.

At Pe the Tsangpo pursues an unruffled course with no hint of the astounding transformation which occurs within a few miles, where the valley suddenly contracts and the river is forced into a series of rapids. The roar of the convulsed water is deafening, waves shoot up where submerged rocks impede the flow, and huge logs are tossed about as if they were matchsticks.

On the way to Gyala we camped in a delightful meadow at Tripe (pronounced *tree-pay*!) at the foot of a beautifully wooded glen dominated by the icebound peak of Namcha Barwa (Fig. 53). While we were here we had splendid views of the summit-cone and the approach to the mountain was so inviting that we decided to push up the valley and establish a camp near the snows. This was a thrilling and very profitable expedition. We climbed steeply through Bamboo, evergreen Oak and Juniper into the *Picea* and *Abies* zone, and then emerging from the forest we were confronted with the full grandeur of Namcha Barwa. Countless frozen cascades seamed the face of the mountain and there was a continuous tinkle as ice particles sprayed down from the topmost rocks. Two large crevassed and gravel-strewn glaciers, one from the base of the main peak and the other from a lateral valley, merged below the spot where we camped. The dirty tongue of ice thrust down the forest-clad valley towards the Tsangpo between large lateral moraines. This glacier terminates barely a mile from the Tsangpo and on its surface, some distance above the snout, it supports a thin Conifer forest. The small emergent stream was glassy green.

The icy, north-facing cliffs of Namcha Barwa looked entirely barren and it did not seem possible for plants to become established on its inhospitable rocks or gain a foothold on its huge scree chutes. What a contrast was afforded by the south-facing slopes, which teemed with glorious alpinists and where the rocks were draped with choice plants!

In a short distance we collected nine species of *Primula*, including a new member of the genus. At 11,500 feet, amongst shady rocks in the forest, we found *P. Maximowiczii*, one of the least attractive species with maroon corolla tube and plum-purple reflexed lobes. On slopes facing south in the *Rhododendron* thicket and on rock ledges there was abundance of *P. Cawdoriana*, though it had mostly finished flowering and some plants had already set seed. Magnificent specimens of

*P. Littledalei* (see *Quart. Bull. Alp. Gard. Soc.*, VII, 239 (1939)), which it seemed sacrilege to disturb, grew tucked away in crevices under overhanging rocks which shielded the copiously-white farinose plants from direct rainfall. The corolla-lobes were of a deep purple-magenta with a dingy yellow eye. In more exposed situations on the grassy alps and rock ledges *P. Baileyana*, *P. bellidifolia*, *P. gemmifera* and *P. Aliceae* grew luxuriantly. *P. gemmifera* is a very desirable plant, about four inches high with an umbel of deep magenta flowers shading to white towards the centre and with an orange eye. *P. Aliceae*, a new species of the *Souliei* section, was an arresting sight on the grassy rock ledges where it grew amongst bushes of the yellow-flowered *Rhododendron elaeagnoides*. The slender scape bears up to six flowers, which are pale lavender to deep violet-blue with a white farinose eye. Seed was collected in October and the species flowered in this country in 1940 but it has been so intractable that it now seems to have been lost. *P. Walshii* colonized steep earthy scree slopes but it had passed flowering. In similar screes *P. rhodochroa* still showed sufficient flowers to indicate how fine it must have been in its prime. This member of the *Minutissimae* is surely one of the most charming dwarf alpinists. It is scarcely an inch in height, forms small tufts with leaves, pedicels and calyx powdered with yellow farina, while the flowers range from pink to cherry-red and are almost half an inch in diameter.

Other attractive plants inhabited the alpine zone. *Codonopsis mollis* with its dainty, light slaty-blue pendulous flowers with dark veining was ideally placed on the high rock shelves while the intense blue flowers of *Cyananthus lobatus* were very conspicuous on steep grassy slopes. The yellow flowers of *C. spathulifolius* were just beginning to appear. On the screes, an Edelweiss (*Leontopodium Jacotianum* var. *caespitosum*) grew in loose spreading cushions: the uppermost leaves subtending the cluster of capitals were attractively tinged with purple. *Gentiana nubigena* was also in flower, with its deep-blue trumpets mottled with dark purple-blue within. Several species of *Sedum* and *Saxifraga* also adorned the rock faces. It was pleasing to find the extremely rare British species *Saxifraga cernua* growing here in quantity—so luxuriant and floriferous that it was difficult to recognize as the weakly plant which leads a precarious existence on Ben Lawers, where its survival depends on the production of small bulbils which normally replace the flowers. Large colonies of *Cassiope Wardii* were conspicuous amongst rocks and seed was collected. It would be interesting to know whether plants were raised of this beautiful species. Dotted about on the steep loose screes was the dainty *Cremanthodium palmatum* subsp. *rhodocephalum* with crimson pedicels and ray florets of the palest pink. Seed of this sub-species was collected later in the year and it may survive in cultivation.

(To be concluded)

PLANT COLLECTING  
IN SOUTH-EASTERN TIBET

By George Taylor, D.Sc.

PART II

1200  
R.H.S.  
May, 19  
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WE had arranged to meet SHERRIFF on July 31 and four marches along the Tsangpo brought us to our rendezvous at Tse where our companion arrived shortly after we had pitched our tents. Six busy days were spent here, reading and disposing of our mail, developing films, comparing notes on our collections and looking them over preparatory to packing for the homeward journey. It was an exciting business opening our bundles and outbidding each other on the merits of our respective finds. We were pleasantly satisfied with our haul and had collected a wealth of material of botanical and horticultural interest. About 3,000 gatherings had been preserved and of most there was sufficient to allow generous distribution of duplicates. By way of celebration, and as a break from our scientific duties, SHERRIFF and I took a hand in the kitchen. We claimed the offal of a freshly killed sheep and, with the addition of suitable ingredients, concocted a most excellent haggis. The "chieftain o' the puddin' race" was served with all the honours (except bagpipes) and grudgingly voted a success by our epicurean Sassenach.

The peak of the flowering season was now over. Mulberries, Peaches and Walnuts were ripening and the grain-crops were being pulled or cut by golf-like swipes with a sickle attached to the end of a stick. Women were already flailing the grain to the accompaniment of monotonous chanting. In about a month to six weeks, we thought, it would be time to revisit our earlier collecting grounds to gather the seeds of marked plants. It was decided that, in the interval, LUDLOW would travel to the high plateau region on the Kham border while SHERRIFF and I explored the side valleys of the Nyang Chu, one of the largest tributaries of the Tsangpo.

On August 7, we crossed to the north side of the Tsangpo in coracles and camped below Tsela Dzong on the west bank of the Nyang Chu, shortly above its delta-like confluence with the Tsangpo. Tsela Dzong is an important administrative centre and two days were spent exchanging courtesy visits with local notables. We moved off on August 10 and parted with LUDLOW at Puchu whence our route deviated from the main valley and led to the rolling plateau in the neighbourhood of the Mira La.

A short distance from the Nyang Chu we entered thin forest but there was little of interest in the lower parts. As we ascended the rough stony path through the *Abies* and *Picea*, interesting plants began to appear. In a clearing amongst shrubs there was a fine group of *Nethelion hyacinthinum*, the plants up to four and a half feet high and bearing up to thirty rose-pink flowers. Grassy banks in the forest were covered at places with *Cyananthus lobatus* in beautiful flower. *Calliopsis mollis* was in plenty, perched on high narrow cliff ledges,



its lovely soft mauve-purple tubular flowers seemed as if suspended in space. On damp rocks in the *Picea* forest we found a very attractive small, yellow-flowered species of *Meconopsis* which clearly was one of the *Primulinae*, having the radish-like rootstock which betokens difficulty in culture. The flowers (up to nine in number) were borne singly on basal or agglutinated scapes up to six inches in height and were up to an inch and a half in diameter while the pale, lemon-yellow petals were usually four but varied up to seven. At first sight the plant recalled the white-flowered *M. argemonantha* which I then knew only from habitat photographs and herbarium specimens, although the yellow petals suggested the possibility of identity with *M. Florindae*, which KINGDON-WARD had discovered on the Tra La some distance to the east. A few weeks later, on the Bimba La, I collected *M. argemonantha* in fruit and the resemblance to the Mira La plant was so striking that there could be no doubt of their very close relationship. The *Primulinae* comprise an assemblage of somewhat ill-defined species in which it is difficult to find stable criteria for separation and as more material becomes available some readjustment in the classification of series may be necessary. From examination of the herbarium material I find it impossible, apart from the difference in petal colour, to distinguish the small Mira La yellow-flowered Poppy from *M. argemonantha* and I have therefore decided to recognize it as a new variety of that species. *M. argemonantha* var. *lutea* \* (Figs. 57 [April] and 75) is represented in our 1938 collection by six gatherings as follows: valley above Tse, leaf-rosettes only, 12,000 feet, June 1938, LUDLOW, SHERRIFF and TAYLOR 4589; same locality, August 1938, L., S. & T. 4589a; Tum la, Nayu, 12,500 feet, July 1938, L., S. & T. 5790; Go Nyi Re, Paka Phu Chu, 14,000 feet, July 1938, L., S. & T. 5898; Mira La, Nyang Chu, 12,500 feet, August 1938, L., S. & T. 4589b; same locality, 14,000-15,000 feet, August 1938, L., S. & T. 6064. From *M. Florindae*, which has a leafy flowering stem, the new variety is distinguished by having the flowers borne on bristly basal scapes though these may sometimes be agglutinated. In *M. Florindae* the whole plant is glabrous or almost so, whereas in *M. argemonantha* var. *lutea*, though the leaves may sometimes be almost glabrous, the scape and ovary are more or less densely bristly. The capsule is usually quite densely covered with spreading or reflexed bristles.

Above the forest the late alpenes were in profusion and we decided to camp at about 13,000 feet on a grazing flat by the stream. Close to the tents grew a magnificent thistle, *Cirsium eriophoroides* subsp. *bolocephalum*, about three feet high and forming massive colonies (Fig. 85). Its developing capitula were exceedingly beautiful with the spiny bracts protruding through a dense, snow-white, cobwebby felt, and the emergence of the reddish-purple florets beyond the ornamental involucre making a most striking effect. Surely no thistle

\* *Meconopsis argemonantha* var. *lutea* G. Tayl., var. nov. a typo (var *genuina* G. Tayl.) petalis citreis distincta. Typus F. Ludlow, G. Sherriff and G. Taylor 5790 in Herb. Mus. Brit., ad Tum La, Nayu in Tibet austro-orientali anno 1938 lectus.

more handsome. Seed was taken but there has been no report of germination.

Most of the *Primula* species were past flowering but we collected a respectable number of specimens including the following: *P. bellidifolia*, *P. Baileyana*, *P. Littledalei* (Fig. 77), *P. sinoplantaginea*, *P. advena*, *P. crispata*, *P. amabilis* and *P. Youngeriana*. The last was a new species growing in dry moss under huge boulders in company with *P. Littledalei* and is a lovely plant with the under-surface of the flaccid leaves, like the scape, bracts and calyx-lobes, white-farinose. The corolla is usually deep blue-violet with a large white eye.

On the Mira La we added to the tally of *Meconopsis*. In June 1936, SHERRIFF discovered *M. horridula* var. *lutea* in very small quantity at 16,000 feet on the Shagam La in Tsari, about eighty miles to the south. Judge of our delight when we found abundance of the plant between 15,000 and 16,000 feet in block boulder scree on a very steep grassy hillside (Fig. 64 April). The specimens were up to three and a half feet in height with pale yellow-sulphur petals and were growing in association with the short-styled form of *M. integrifolia* which was in immature fruit and commonly had but one flower. Not far away, amongst dwarf Rhododendrons, was *M. simplicifolia* but we did not detect any  $\times$  *M. Harleyana*. On grassy cliff ledges a few blue-violet flowers lingered on *M. impedita*.

The turfey hill-slopes were bright with hosts of Gentians which seemed to vie with each other in their lavish display. The variety of species on the Mira La was astonishing. Here, plants which were hailed with delight when introduced from S.W. China grew with those usually associated with the eastern Himalaya. In no other area visited was this mingling of the eastern and western floras so forcibly illustrated, but it was not, of course, confined to the Gentians. Blue was the predominant colour amongst the autumn-flowering alpiners and the most vivid splashes of colour were provided by species of *Gentiana*. Several members of this lovely but critical genus await further study before being identified, but it may be of some interest to mention those from the Mira La which have been named so far. At 12,500 feet, on a damp grassy flat near the stream, *G. sikkimensis* spread over mossy hummocks. The corolla-tube was green and mottled with greenish-blue on the outside towards the top: the segments were slaty-blue with intervening white plicae. Close at hand, amongst *Salix* on a steep bank and on the open hillside, was *G. Przewalskii*. The corolla-tube and lobes were white and speckled with greenish-blue or flushed with blue-purple on the outside; the lobes were evenly spotted with greenish-blue on the inside and the plicae were white. In some plants the inflorescences were congested and only a few inches in height, but usually they were more open and up to a foot. *G. cypripediflora* with bright blue flowers formed rosettes on open meadows from 13,500 to 15,000 feet. A splendid form of *G. trichotoma*, over a foot high in places, grew amongst dwarf Rhododendrons and on open damp grassy meadows. Its corolla-tube and segments were blue with a tinge of green and the plicae were mauve. *G. tsarongensis* (Fig. 79), a

neat and attractive little plant with miniature leaves along short prostrate branches, was growing on open grassy hill slopes. The corolla-tube is short, concealed by the green calyx, but the flowers expand as beautiful blue-violet stars. On the higher hillsides from 14,500 to 16,000 feet, in damp hollows amongst boulders, were mats of *G. Sherriffii*. (Fig. 83). The cobalt-blue flowers, for all the world like bubbles, are sessile and so restricted at the top that the mouth of the corolla is closed by the small white-margined lobes which conceal the white plicae. Even in full sunshine the flowers did not appear to open to any extent. *G. ornata* var. *dichroa* occurred very sparingly on the grassy slopes. Dense tufts of *G. infelix* grew in mossy situations and in damp grassy meadows. This is a small prostrate, tufted plant with slaty-blue lobes at the apex of the blue-veined white tube. One of the neatest and attractive Gentians in this valley was *G. filistyla*. From the miniature rosettes arise dark-blue trumpets an inch and a half in height and about half an inch in diameter. Another charming member of the *Gentiana-ceae* in the Mira La was *Lomatogonium oreocharis*, three to four inches in height, with blue-violet darkly-veined petals forming shallow cup-shaped flowers about an inch across. Sheets of this plant gave a gay touch to the steep rocky hillsides.

Rivalling the Gentians in their display were several species of *Cyananthus*. *C. incanus* formed tufts on grassy banks at 10,500 feet with each shoot bearing erect violet-blue flowers. Perhaps the most showy was *C. lobatus* which grew in profusion on open banks about 13,000 feet. This plant is familiar enough in cultivation but the effect of acres of turf stained with its deep blue-violet flowers could not easily be reproduced in gardens here. On the open hill slopes between 14,000 and 15,000 feet two species grew together. One, *C. spathulifolius*, had pale yellow flowers with the tube purple-veined. In the other, *C. macrocalyx*, the corolla-tube was greenish-white in the lower half, dark-purple above, and the lobes blue-violet. Close at hand, on a grassy meadow, we collected another campanulid of great charm and attractiveness, *Codonopsis nervosa*, whose the bell-shaped flowers, whitish-mauve with copious anastomosing blue-purple veins, nodded gracefully on slender stalks.

Some of the most beautiful high alpiners, whose charm could scarcely fail to captivate the most fastidious gardener, belong to the Sino-Himalayan genus *Cremanthodium*. It is a great misfortune that they have so far proved intractable in cultivation. We had admired the occasional plants which we had seen previously, but on the Mira La they revealed their true glory. At 16,000 feet the loose granitic scree sparkled with myriads of the yellow heads of *C. humile*. It is a perfect little gem whose inch-wide heads forsake the usual nodding habit and become sub-erect. The flower-stems (one to four inches high) spring from a neat basal rosette of small leaves which are most attractively white-tomentose on the under-surface. Brown shaggy hairs clothe the stem and on the involucre and bracts form a soft woolly felt. Another plant of distinction, forming large colonies on open earthy screes, was *C. palmatum* subsp. *rhodocephalum* (Fig. 78), which appears to

greatest concentration in Yunnan, whence it was described  
by FORREST'S collections. The dull crimson flower-scape emerges  
from a cluster of shallowly notched kidney-shaped leaves and bears a  
single drooping capitulum with broad showy ligules which are delicately  
suffused with pink. When fully developed the ray florets tend to lose  
the pink flush and become almost white. In 1936 my friends collected  
this species in Tsari and noted this variability in colour. From fruits  
which they gathered, plants were raised at Edinburgh which had white  
ligulate florets. On this account they were regarded as belonging to  
a new species and described under the name *C. Sherriffii* but the type-  
specimen is indistinguishable from that of *C. rhodocephalum* and the  
slight colour aberration is of no diagnostic value. We had previously  
collected the plant above Tripe, where it grew scattered sparsely on  
steep loose scree slopes, but on the Mira La it occurred in great pro-  
fusion. A very elegant form of the yellow *C. plantagineum* adorned  
the open grassy hillsides between 14,500 and 15,000 feet. Up to  
fifteen inches in height, it had pendant heads with ligulate florets about  
an inch and a half long capped with the steel-grey woolly involucre.

Of the remaining alpiners, *Saxifraga Diapensia*, a member of the  
*Hirculoideae*, deserves special mention. This plant, its dense tufts  
aglow with butter-yellow flowers, brightened many damp mossy  
pockets in the boulder scree at 16,000 feet. The petals are speckled  
with orange and the scape and margins of the sepals are embellished  
with purple-tipped glands. Unfortunately we were unable to return  
later for seeds of this lovely species.

We crossed the watershed on August 16 and descended into a  
tributary valley of the Nyang Chu which we reached at Chomo on the  
following day. On the rapid descent we collected some splendid  
Saxifrages, *Primula capitata*, *P. szechuanica*, *P. latisecta* and abundance  
of *Notholirion hyacinthinum*.

We rested a day at Chomo to deal with our collections and took the  
opportunity of visiting the local paper factory. We had seen a good  
deal of the tough Tibetan paper in use and indeed our passports were  
written in a beautiful hand on its rough surface. It was not possible  
to recognise the *Daphne* from which the paper was prepared. The  
bales of bark strips were said to come from the north but we could get  
no detailed description of the plant which must occur in some quantity  
to provide a continual supply of raw materials as the plants from which  
the bark is stripped have little chance of survival. The process of  
paper-making in the Tibetan fashion was as follows. A group of  
women pounded the *Daphne* strips with wooden mallets on smooth  
boulders and then scraped the soft tissue from the inner side of the  
lacerated bark into basins. After being boiled in water, the mash was  
poured into the same type of long cylindrical churn as is used in  
making the renowned Tibetan tea. By the piston-like action of a  
dolly, the *Daphne* was pulped to a fine suspension. Meanwhile wooden  
frames with fine stretched muslin had been placed in a shallow trough,  
about ten feet long and three feet wide, which was fed by a trickle of  
water led from a near-by stream. The fluid was then drawn from the

churn in wooden ladles and poured as evenly and thinly as possible over the submerged muslin and smoothed out by hand. The frames were then raised gently from the water and placed in the sun to dry. In a day or two sheets of paper could be peeled from the frames.

We crossed the Nyang Chu on August 19 and marched up the eastern bank to Kyabden where we made camp. On the way we collected many interesting aquatic plants but none of any horticultural consequence. By an unkind stroke of fate, our stay at Kyabden was prolonged and our immediate plans entirely upset. For two or three days I had been much below par and had struggled along hoping that my griping pains would cease, but at Kyabden I was completely prostrated. I was unable to leave camp for a fortnight and it was galling to hold up the work of the expedition, but my companions would not agree to go on and allow me to catch up with them. SHERRIFF sent off runners to LUDLOW, then on the borders of Pome, and he returned post haste. There was no doubt about their alarm. My symptoms did not fit any of the ailments in our *vade mecum* and the nearest approach to a diagnosis was appendicitis. When the medicines dispensed stimulated too much in one direction, the process was reversed by pills of a different colour. At any rate the ministrations of my thoughtful and attentive friends certainly put me on my feet again. Their exertions to provide an adequate and agreeable diet—at one period three *Tibetan* chickens a day—were most praiseworthy. The table at my bedside was kept gay with seasonal flowers of which *Gentiana Waltonii* was probably the most spectacular, its magnificent sprays remaining fresh for many days in a glass of water. It was a great relief to be away from Kyabden and to be able to forage for plants once more.

We did short marches to the Tsangpo Valley and, after a halt at Dzeng, we were ready to cope with the seed harvest. On dry gravel terraces old-established plants of *Gentiana Waltonii* carried a profusion of blossom. The corolla-tube was pale purplish to chocolate outside, streaked with purple within. The plicae were bright pale-blue and the segments dark-blue outside, bright-blue within. It is a lovely plant when growing to perfection and should become a favourite in home gardens.

*Codonopsis vinciflora* (Fig. 81) festooned shrubs and small herbs and its lovely violet-blue flowers gave a glorious display. This species, with *C. convolvulacea*, is somewhat isolated from the other members of the genus. It is a true twiner with deeply lobed rotate corolla and the flowers are not pendulous and lack the putrid scent of its relatives. The perennating organ is a small tuber buried deep in the poor sunbaked stony soil, often in the midst of *Berberis* and Rose thickets. Digging the tubers in such situations was not a congenial job, but as many survived and have become established in some gardens the efforts were amply rewarded.

SHERRIFF set off to his early collecting grounds on September 16, while LUDLOW and I drifted down the Tsangpo in *kowas* to Lusha, which we made our base for a week of hurried expeditions to the passes visited in June and July to collect the autumn flowers and seeds of those plants which we had marked as desirable for cultivation at home.

ed collecting can be an exasperating business and, in spite of careful planning, often ends in disappointment. Many plants, conspicuous enough during their flowering season, are not easily recognisable in fruit when the character of the surrounding vegetation has completely changed and the markers have become obscured. The plants may have failed to produce seed or it may still be immature; or it may have been shed, or devoured by grubs (*Meconopsis* seemed very prone to such attacks), or the plants may be deep in snow. Obstacles to travel are common. Fallen trees, landslides and broken bridges over unfordable rivers are all possible legacies from the monsoon, and we had experience of each. So when the gardener feels dissatisfied with a meagre portion of seed let him give a thought to the difficulties and hazards attending its collection. Occasionally, with species notoriously difficult to raise from seed, it may be desirable to lift live plants; but the trouble of transport, the worry of keeping them alive during a plateau crossing and through the steamy tropical valleys before reaching India, combined with the expense of sending them home by air, confines this treatment to exceptionally interesting species. Plants dealt with in this way included several species of petiolarid and nivalid *Primulas*, *Diapensia* species, *Berneuxia thibetica*, *Diplarche multiflora*, *Streptopus simplex* and a species of *Cypripedium*. Some of these survived the journey but most did not respond to the care and attention lavished on them at Edinburgh and have, I believe, now died.

The weather on the passes was just as detestable as that which we experienced earlier in the year but, nevertheless, we reaped a rich harvest of seeds and garnered several plants not seen on our previous visits. Time was now pressing and we had to prepare for our long journey back to India. We left Lusha on September 23 and, following the Tsangpo, reached Lilung on October 1. The destruction of a bridge over the Lilung Chu, half-way to Molo, where we had deposited our winter clothing and some of our collections, necessitated a wide detour to reach Kyimdong Dzong. We sent our dependable head servant with a party of porters to collect our baggage at Molo. On their return we lost no time in leaving Kyimdong Dzong and on October 12 we travelled up a dry narrow valley through scrub of *Cotoneaster*, *Spiraea*, *Caragana*, *Artemisia*, *Leptodermis*, *Rhamnus*, *Buddleja*, *Ceratostigma* and *Euonymus* and camped at Sumbatse on a pleasant green plain by the river. Next day we climbed steadily through terraced fields to the open uplands where the glory of the autumn colours left us entranced. Two kinds of *Berberis*—*B. Jaeschkeana* var. *bimbilaica* and, very appropriately, *B. Ludlowii*—varied through all shades of bronze-red to flaming scarlet. Blending beautifully were clumps of a Rose with yellow-bronze foliage. It was not a niggardly display; for miles the south-facing slopes were ablaze with brilliant colour.

Next day we crossed the Bimbi La and so left the Tsangpo drainage system. Near the summit we collected *Primula Caveana* on dry rock ledges, *P. dryadifolia*, *Gentiana Przewalskii* in dampish places on slaty scree, *G. sino-ornata* with its white variety, *G. tubiflora*, *G. Wardii*,

*Lomatogonium oreocharis*, *Swertia multicaulis*, and the prostrate *Diplarche pauciflora* on mossy scree. The slopes below the pass were brilliantly coloured by *Berberis Jaeschkeana* var. *bimbilaica* and *B. Ludlowii*. On the grassy hillsides, some way down, there was abundance of *Cyananthus Sherriffii* in fruit but with next year's hairy shoots peering through broad investing scale leaves, *Cassiope fastigiata*, and *Primula glabra*. Mossy banks under *Rhododendrons* were covered with *P. Whitei* (See *Quart. Bull. Alp. Gard. Soc.* viii, III (1940) ) mixed with *C. selaginoides*. On mossy scree slopes we collected fruiting material and seeds of *Diapensia Wardii* and *Diplarche pauciflora* but no report has been received of germination.

We camped in a narrow defile where the huge crags and scree slopes on either hand were garnished with choice plants. At this season, of course, few flowers were to be seen, yet there was abundant evidence of the floral wealth. In 1936 LUDLOW and SHERRIFF had thoroughly botanized the Bimbi La and, under their guidance, I was directed to several of the more interesting plants. I was specially pleased to see two *Meconopsis* new to me in their natural surroundings—*M. argemonantha* var. *genuina* and *M. bella*. Both were fruiting on grassy ledges of the crags. For many years *M. argemonantha*, described from two detached flowers and two leaves, remained a species of uncertain affinity until KINGDON-WARD in 1935 and SHERRIFF in 1936 rediscovered the species in Tsari and from their material it was possible to assign the plant to the *Primulinae*.

At Podzo Sumdo, where *Meconopsis paniculata* grew in profusion amongst *Rhododendron cinnabarinum* and *R. lepidotum*, we turned up the great Tsari Valley. We had entered the holy district of Tsari where the few inhabitants depend on the generosity of passing pilgrims for their subsistence. No cultivation is allowed and no animals may be killed. The valley must be one of the most lovely in Tibet and strongly reminded me of some parts of the upper Dee valley. Both sides were densely wooded and the district was obviously in the wet zone. LUDLOW has described Tsari as a paradise of flowers and the results of the 1936 expedition certainly confirm this view. Even now, in mid-October, there was plenty to interest the botanist. Gentians were most conspicuous and the meadows were adorned by thousands of their showy flowers. *Gentiana epiporphyra*, *G. Veitchiorum* (Fig. 82) and *G. sino-ornata* were the commonest species in the open, but *G. sikkimensis* and *G. gilvostrata* made brave splashes of colour under *Rhododendrons*. We had an exquisite camp site at Chickchar on a broad meadow which, in season, must have been a wonderful sight with hordes of *Primulas*. Above to the south, towered the majestic peak of Takpa Shiri with hanging glaciers scoring its upper flanks. Wisps of cloud trailed across its face and the scene was one of superb grandeur (Fig. 72).

On October 16, a cold wet day, we continued our march up the Tsari Chu to Chosam with no very appreciable ascent. Around Chosam we collected *Berberis tsarica*, a shrub of three feet with blood-red leaves, and the tantalisingly lovely *Gentiana rhodandra*. This annual

Gentian, at most two inches high, bedecked dry turfy banks with its myriads of flowers. The corolla-lobes and plicae were of the purest sky-blue and opened flat out to display the cinnamon anthers.

Near the head of the Tsari Chu we turned sharply to the south to cross the Cha La. A short distance below the summit, on a wet flush at about 16,000 feet, we gathered *Gentiana amplirater*, a plant strongly resembling *G. depressa*, which seems likely to become established in this country. On the loose screes of the pass we found *G. amoena* forma *pallida*. It is not only the pale colour which distinguishes this plant from typical *G. amoena* and a summation of the differences suggests that some amendment to the status of *G. amoena* forma *pallida* may be required. From our observations, which are confirmed by the field notes of other collectors, the two plants show a strong ecological divergence. *G. amoena* forma *pallida* is confined to the loose dry screes of the plateau. Its dry membranous, almost papery, corolla-tube, shorter than in typical *G. amoena*, is inflated at the base and contracted towards the top. On the outside the corolla-tube is irregularly streaked with reddish-purple. The segments are slaty-blue with a white median line and the plicae are white, broadly deltoid and commonly entire. Typical *G. amoena*, on the other hand, is a plant of the main range and is found in damp situations, usually on the southern face. The brownish-purple corolla tube is more or less straight throughout its length. The segments are evenly blue-violet, while the intervening plicae are pale blue and usually deeply notched or at least fimbriate at the apex. It should be observed, however, that MARQUAND (in *Journ. Linn. Soc. Bot.* xlviii, 204 (1929)) states that the pale form (which he based on a KINGDON-WARD specimen collected on slaty screes on the plateau at Atsa) was collected with the type by the 1921 Mount Everest Expedition.

Other plants noted on the steep scree slopes of the pass were *Delphinium Bcesianum* with deep blue-violet flowers, *Meconopsis horridula* and *Phlomis rotata*. The vegetation of the Cha La was typical of the Tibetan plateau and the stony hillsides were rather bare. In the neighbourhood we saw several herds of burrhel and a few gazelle, another indication of plateau conditions.

On the south side of the pass wide screes flanked the valley leading to the Char Chu and the landscape was rather drab and dreary. Leaving the alpine plateau we entered the transitional zone indicated by such plants as *Thermopsis barbata*, *Primula Jaffreyana*, *Gentiana Waltonii*, *Incarvillea lutea*, *Dracocephalum Hemsleyanum*, *Stellera Chamaejasme* and *Picea likiangensis*. On October 18 we reached the important monastic centre of Sanga Chöling. The flat ground by the river was occupied by a large monastery and immediately above another magnificent *gonpa* straddled a steep narrow ridge. Viewed from the slopes above the south bank of the Char Chu, the prospect of the white-washed and painted buildings of Sanga Chöling was very impressive. We camped on a pleasantly wooded lawn within the lower monastery and rested for some days in preparation for the rapid marches to follow if I was to reach India in time to take my passage home.



We followed the dry Char Chu Valley to Charme (where *Paeonia lutea* was fruiting on dry gravel-terraces) and there turned abruptly to the west to ascend to the Le La. A species of *Cotoneaster* dominated the south-facing slopes in the lower part of the valley and further up we passed into mixed scrub. On the other (north-facing) side of the valley, there was abundance of Juniper which gave way, as we ascended, to dense mixed forest of *Abies*, *Larix* and *Picea*. *Gentiana Waltonii* was abundant with *Primula Jaffreyana* (Fig. 76) on the dry slopes.

To the south above the forest, we gazed longingly at the snow-covered nick in the mountains—the Drichung La—the only known locality for *Meconopsis Sherriffii*, and debated whether we should add yet another species to our bag. The temptation to see such a rare plant, though past flowering, was too much for us and specimens were collected from the black, peaty, moss-covered soil-pockets in the boulder scree at 17,000 feet. It is well nigh impossible to reproduce such high altitude conditions in this country with the snow-shroud which covers the plants for weeks on end. Possibly this fine species still lingers in a few gardens, but it is hardly likely to become generally established. The coloured plate (Fig. 65 April), from a photograph by SHERRIFF, shows the plant on the Drichung La.

In a small gorge below the Le La, on grassy rock-ledges and banks usually in the shade of overhanging cliffs, *Meconopsis bella* was collected in fruit. At 17,000 feet, on loose, dusty, slaty scree, *Gentiana amoena* forma *pallida* and *G. amplicrater* were flowering and the watery-blue papery flowers of *Delphinium viscosum* rustled in the wind. We dropped down to the valley of the Loro Chu and arrived at Chayul Dzong on October 24. This march was a tragic one for LUDLOW. A mule carrying two boxes with clutches of precious eggs collided with an awkward tree at the side of the narrow track. The girth straps snapped under the strain and the boxes went careering down the steep hillside. Helplessly we watched them bouncing over the rocks until they came to rest. In these few minutes, weeks of patient work had been written off and only fragments of shells remained of the unique collection so much desired by the British Museum. This incident recalls a similar one, fortunately with a happier sequel, which occurred as we were crossing the Lilung Chu by a narrow swaying bridge. One of the mules carrying two boxes full of plant specimens knocked against one of the wooden stanchions. The carrier thongs broke and the boxes fell. As if by a miracle they trembled on either side of the bridge and came to rest overhanging the swirling waters of the river. A mere fraction of an inch had saved them from being swept away to the Tsangpo. The mule, meanwhile, pursued its placid, unburdened course while LUDLOW and I endured palpitations.

The Loro Chu drained a very dry valley with enormous gravel terraces from which a fierce wind whipped up quantities of stinging grit to add pungency to our journey. The river was quite a diminutive stream for such a broad valley. *Primula tibetica* was still in flower on damp flats by the river but the dominant plant there was *Iris lactea*—mostly in mature fruit but showing a few out-of-season flowers with

pale-blue standards and greenish-yellow falls copiously pencilled with violet-blue. On the gravel beds were old trees of *Hippophae rhamnoides*. Bushes of a new *Berberis* species (*B. xanthoplaea*) were in flower on the dry terraces in company with *Ceratostigma Griffithii*.

In four marches, in bitterly cold weather, we reached the Nyala La and hurried down to camp at Tre. We arrived with our eyes and mouths iced up and with icicles hanging from our noses. On the pass at 17,000 feet we saw kyang (*Equus hemionus*, a species of wild ass), gazelle, *Ovis ammon* (giant wild sheep) and burrhel. The late October days on the plateau were exhilarating. The sun shone from a cloudless sky and only the penetrating wind caused much discomfort. Once the sun was set the evenings were crisp with hard frost. Meals had to be eaten speedily if the fat was not to congeal in the dish. At night our breath froze as hoar frost on our blankets and water in a glass at one's bedside quickly turned to ice. The Gentians seemed to enjoy the cold! In the early morning they sparkled with ice crystals but later opened their flowers to the sun as it climbed in the heavens.

We reached the Pö La on October 30 and from the edge of the plateau we looked into the densely wooded valley of the Nyam Jang Chu. The contrast was astonishing and in a few miles we passed into an entirely different biotype. Without regret we left the roof of the world and plunged down the sheltered slopes of the Nyam Jang Chu. On the west side of the Pö La, *Meconopsis bella* and *Primula hyacinthina* were in fruit and here, too, we collected typical *Gentiana amoena* (on grassy rocks and damp mossy banks by the stream) with corolla-tube brownish-purple on the outside and spotted with blue-purple within. The corolla-lobes were blue-violet and the plicae very pale blue. At about 12,500 feet, in *Berberis* and *Salix* thickets, *Meconopsis grandis* and *M. simplicifolia* grew together. Both were fruiting but *M. grandis* was showing the offsets for the next year while the plants of *M. simplicifolia* were withered and dead.

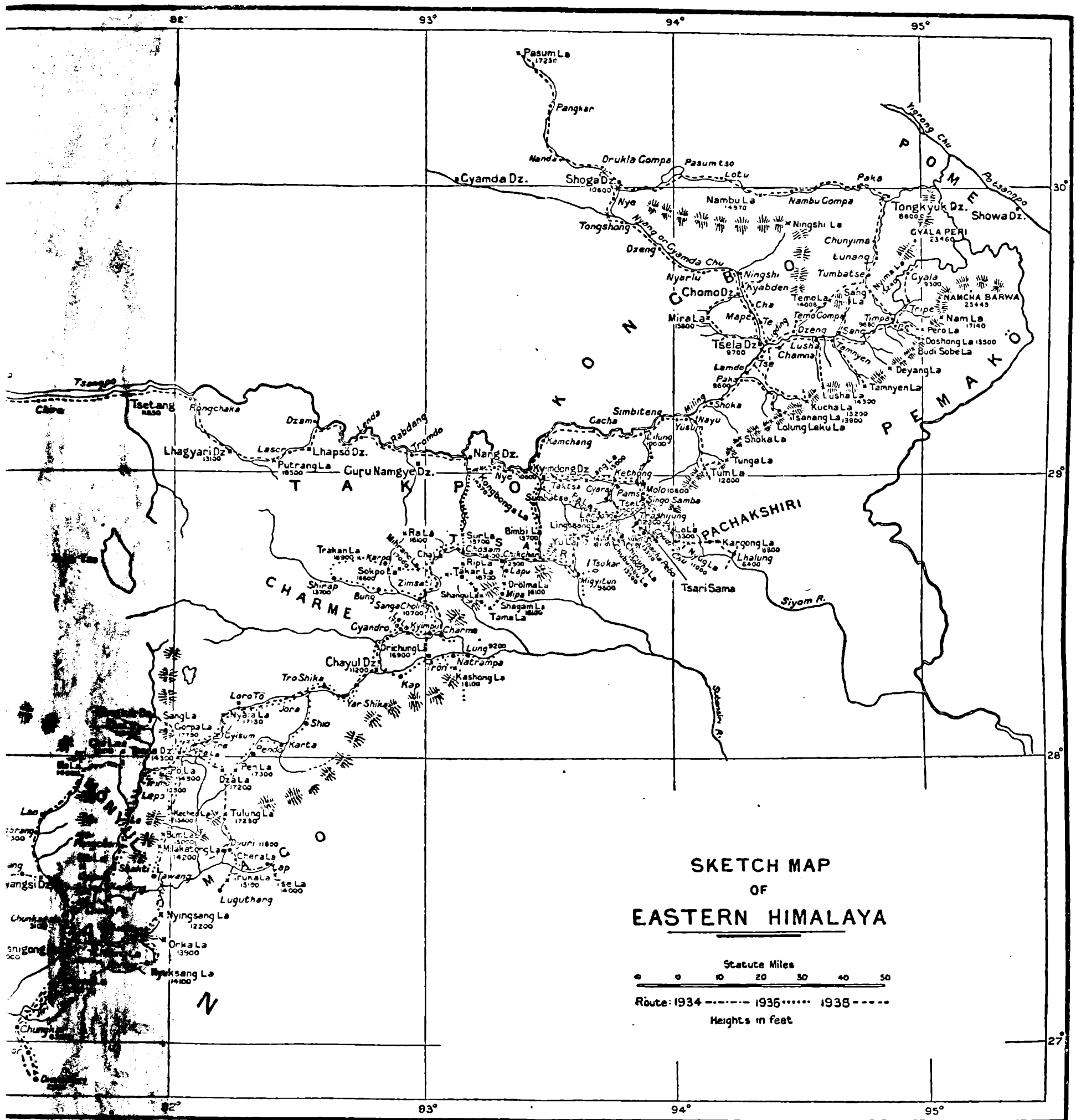
Around Trimo, where we camped at 9,800 feet, we revelled in the rich vegetation after weeks of travel on the inhospitable plateau. *Pinus Wallichiana*, *Tsuga dumosa*, and *Larix Griffithiana* were the dominant trees, but there was a wealth of interesting shrubs including *Rhododendron Wallichii* and species of *Berberis*, *Buxus*, *Cotoneaster*, *Sorbus*, *Ilex*, *Hedera*, *Buddleja*, *Enkianthus*, *Vaccinium*, *Colquhounia*, *Daphne*, *Elaeagnus*, *Litsea* and *Juniperus*. *Gentiana speciosa* with pale washy-blue flowers scrambled over *Vaccinium* bushes.

Below Trimo the valley descends rapidly and the vegetation becomes subtropical. The Nyam Jang Chu drains the Mönnyul district of Tibet and flows through East Bhutan as the Manaas River to the plains of India. In spite of the late season and rapid marches we had full presses each day until we reached railhead at Diwangiri on November 14. Thus ended a memorable and highly interesting journey.

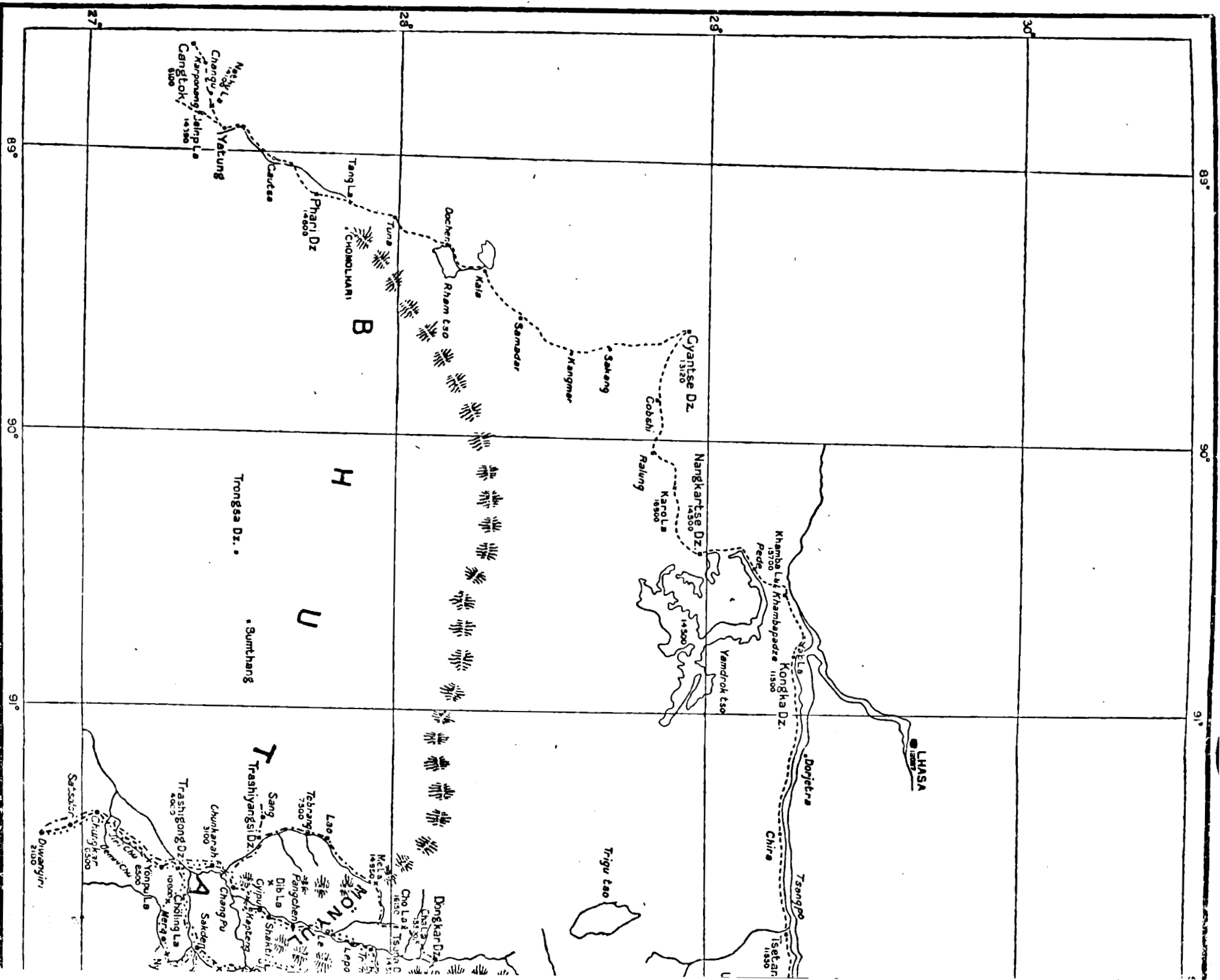
When I reflect on our months of travel, the overwhelming numbers of beautiful plants seen, the sustained excitement of plant-hunting from day to day, the thrills in ascending to unexplored passes, the wonderful prospects of mountain and valley, I am only too conscious

that my sketchy account is sadly deficient. Many good plants found during the expedition have not been mentioned (a large number await identification) but it is hoped that all will be enumerated eventually. Those of sufficient interest to horticulturists, and of which photographs are available, may be subjects of later published notes.

It is impossible for me to express adequately my deep gratitude to my friends LUDLOW and SHERRIFF for ~~much~~ personal kindness and for their unsparing efforts to ensure the comfort and success of the expedition. Access to Tibet is notoriously difficult and travel in the country is not for the neophyte without knowledge of its language and strange customs. With the unrivalled experience of my companions these difficulties vanished and I was left entirely free to devote my time to collecting. I am also under very great obligation to my colleague, Dr. J. RAMSBOTTOM, Keeper of Botany at the British Museum, for his kind encouragement and keen interest: on his recommendation the Trustees of the British Museum allowed me to join the expedition.



EASTERN TIBET OF LUDLOW, SHERRIFF AND TAYLOR IN 1934, 1936 AND 1938 (Opposite p. 176)



THE PLANT COLLECTING JOURNEYS IN SOUTH-EASTERN TIBET OF LU