

THE
ACADEMY OF NATURAL SCIENCES
OF PHILADELPHIA

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MONOGRAPHS
Number 5

THE
SCROPHULARIACEAE
OF THE WESTERN HIMALAYAS

By

FRANCIS W. PENNELL

Curator of Botany, The Academy of Natural Sciences of Philadelphia

PHILADELPHIA

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The Scrophulariaceae of the western Himalayas
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THE SCROPHULARIACEAE OF THE
WESTERN HIMALAYAS

INTRODUCTION

This study of the Scrophulariaceae of the western Himalayas is based primarily upon the collections made over more than thirty years by Dr. Ralph R. Stewart, now President of Gordon College at Rawalpindi in north-western India. It was in 1911, as a young instructor there, that he commenced the gathering of specimens, and in 1912 that he made his first trip into Kashmir. Since then he has been repeatedly into the Himalayas, spending vacations in Kashmir and collecting in adjacent territory north to Baltistan and east to Ladakh; he has traversed the mountains of Lahul and Kulu, and also summered at Landour above Dehra Dun, much to the eastward.

I made Dr. Stewart's acquaintance in 1914 and 1915 when as a graduate student at the New York Botanical Garden he was studying his earliest collections toward his doctorate at Columbia University. Then, I asked that on his return to India he would pay particular attention to the Scrophulariaceae, a request that he has amply answered. By chance, my study of these special collections has been prosecuted at nine year intervals. It was after coming to the Academy of Natural Sciences of Philadelphia that I received his first large gatherings of this family, and in 1924 these were reviewed and a preliminary report sent him. I was delighted with the number of collections made for each species, and realized that such intensive collecting could yield real information toward deciding critical taxonomic problems. But there was so little Himalayan material in this country available for comparison, that I did not think of more than eventually preparing a simple account identifying Stewart's collections. My report to him suggested problems for further observation.

In 1933, while Dr. Stewart was home on sabbatical leave and with the assistance of many more specimens from him, I made a more serious effort to study his material. By this time I was also receiving Himalayan specimens gathered by Mr. Walter Koelz in the mountains of Ropshu, Zaskar, and Ladakh, districts just east of Kashmir proper.¹ The project now grew into a consideration of this family through the western Himalayas between the gorges of the Indus and the Sutlej rivers. But, when Dr. Stewart had to return to India, I had still before me the largest genus of all, *Pedicularis*, and with his departure my study again lapsed.

In 1942, with Dr. Stewart again in this country and with yet more specimens both from him and Mr. Koelz, I have at last carried this task

¹ Also there had become available for comparison the herbarium of the late Gustave Bonati, a French botanist who had published especially upon the Scrophulariaceae of southeastern Asia and who had collected material for a world revision of *Pedicularis*. These specimens, kindly loaned me by the University of California at Los Angeles through the interest of Dr. E. D. Merrill, contain much material from Sikkim. Duplicates from the Bonati series are enriching the Academy's herbarium.

to completion. But the project has been again enlarged. I realized keenly in 1933 that American herbaria lacked sufficient Himalayan collections to provide a satisfactory background for the identification of these recent collections or to give an adequate picture of the distribution of each species. On telling this to Dr. Stewart, he procured for me a large loan from the Dehra Dun Herbarium, at the Forest Research Institute at Dehra Dun, India. This mainly comprised specimens of *Scrophularia* and *Pedicularis*, and it has given invaluable help toward an understanding of those genera. The collectors from Dehra Dun, who seem to have been most active from about 1880 to 1910, being prevented by political restrictions from going eastward into Nepal or northward into Tibet, had gone westward even to the borders of Afghanistan, and had assembled the fullest collections known of the flora of the western Himalayas. So as to avail myself of this wealth of material, the limits of the present study have been extended to include all Scrophulariaceae from Chitral to Kumaun, from the eastern boundary of Afghanistan to the western boundary of Nepal. But it is only for *Scrophularia* and *Pedicularis* that these limits are really effective; for *Veronica*, *Euphrasia*, and other genera little has been seen from west of the Indus or east of the Sutlej.

There is logic in considering in a single study the flora of the western Himalayas, rather than that of the whole mighty chain. This western portion is more arid, and the mountains rise from a dry plain, whereas in its eastern portion all is moister, and much of the chain, indeed, receives the World's heaviest rainfall. Moreover, with the long stretch of Nepal forbidden territory, Sikkim, the next botanically well-known district eastward, is floristically in sharp contrast to Kumaun and Kashmir; its flora is more like that of Yunnan, though between these again there intervenes forbidden territory in Bhutan and the mountains to the east. The contrast between the floras of the western and eastern Himalayas is strongest at lower elevations, but we shall find that it holds even for alpine altitudes.

Dr. Stewart tells me that, although epiphytes extend west to Chamba, their abundant development reaches only to the Sutlej gorge, and we shall see that certain Scrophulariaceae of the eastern Himalayas will reach this latter district or extend slightly west of it. The actual line of demarcation is not precise, as edaphic factors make possible the local occurrence of moisture-loving species beyond their usual limits. But the Sutlej gorge in Bashahr seems to be the best theoretical divide between the eastern and western Himalayan floras. If this be so, the area of our study really comprises all the Scrophulariaceae of the true western Himalayas, and in addition an attenuated western extension of those of the eastern Himalayas.²

² Checking this opinion by *Pedicularis*, the one of the two adequately known genera of this study that is generally diffused over the Himalayas, we find 19 species belonging to the true western Himalayas, only one of which passes east of Bashahr to Kumaun;

The floristic picture of the western Himalayas shows an arid basal zone, that covers the plains and lower mountain-slopes; then a zone of xerophytic hardwood scrub; then a zone of mesophytic mixed coniferous and hardwood forest, its upper portion dominated by conifers; and, lastly, an alpine open zone. The picture is amply varied by local modifications, due to the rugged topography of deep gorges and snow-capped mountain-summits. The line between the Oriental (Tropical) and the Palaeartic (Temperate) Regions lies at about 1600 meters altitude, where one passes from the xerophytic scrub into the mesophytic forest. Of the floras of the different altitudinal zones and the climatic conditions that cause them, Dr. Stewart supplies the following generalized account:

“The plains of the Punjab and United Provinces are arid and barren except where there is irrigation and except for the summer monsoon period when they are covered with grass and sub-tropical ephemeral vegetation. The submontane floristic zone begins at 600 to 700 meters and extends to about 1600 meters. The lower foothills are largely covered with low thorny scrub with a good deal of bamboo on the eastern side of our area where the rainfall is heavier. On many ridges a hardy, fire-resistant pine, *Pinus longifolia*, begins at about 900 meters and extends up into the temperate or Himalayan zone. Many tropical groups of plants are represented in the scrub jungle. Some of the species range as far to the east as the Philippine Islands. There are acacias, wild olives, woody asclepiads, Apocynaceae, Euphorbiaceae, Tiliaceae, Flocourtiaceae, Rutaceae, figs, woody borages and the like which are almost entirely missing in the temperate region.

“The variations in the flora of the Himalayan slopes are largely due to the amount of the monsoon rainfall received. The farther one goes from the Bay of Bengal, the less the rainfall. The result is that the western end of the range has a very different flora from that in the central and eastern part of the range. Where the Ganges enters the plains, near Dehra Dun and Mussoorie the summer rainfall is about 80 inches. The trees are covered with ferns and flowering plants belonging to many groups and the flora is very rich in species. Farther west at Murree and Abbottabad, near where the Indus enters the plains, the rainfall is nearer 30 inches and as a result there are no epiphytes except a few mosses and lichens.

“The temperate zone begins at about 1600 meters in the west and a little higher in the eastern part of our area which is a little farther south and has a higher rainfall. Most of the Himalayan ‘Hill Stations’, the summer resorts of India, are in the lower temperate zone on the summits of

7 species of the eastern Himalayas that extend from Nepal westward to Kumaun and mostly to Bashahr; and 6 species that extend for considerable distances to either side of Bashahr, mostly eastward to at least Sikkim and westward to Chamba, Hazara, or Baltistan. In Nepal and Sikkim are many other eastern species of the genus.

the first important range and at about 2100 meters. The two most important trees of this zone are *Pinus longifolia* on the drier ridges and *Quercus incana*, an evergreen oak, which occupies the more favored situations. Broad-leaved temperate trees such as maples, elms, alders, willows, dogwoods, cherries, poplars, horse chestnut, and the like are found in ravines and on the damper northern exposures.

"The upper temperate zone is dominated by conifers, *Pinus excelsa*, *Abies pindrow*, *Picea smithiana*, and *Cedrus deodara* being the most important. Broad-leaved trees are common in deeper soils, near streams and in more sheltered places. The common shrubs belong to familiar genera such as *Lonicera*, *Berberis*, *Rubus*, *Syringa*, *Viburnum*, *Spiraea*, *Coton-easter*, and *Ribes*. There is usually a belt of *Betula utilis* at the limit of tree growth which may be as high as 4000 meters in the east.

"It is hard to say at what altitude the alpine zone begins as conditions vary tremendously. On northern slopes, in valleys once occupied by glaciers, or in gullies filled deep each winter by avalanche snow, the alpine flora may begin at 2700 meters while in other places alpine conditions may begin more than a thousand meters higher. Many shrubs are abundant and often gregarious in the lower alpine zone. Some of the more important of these are *Pyrus foliolosa*, *Rhododendron campanulatum*, and *R. anthopogon*, species of *Salix*, *Ribes*, *Lonicera*, *Berberis*, and *Juniperus*.

"The alpine meadows, the screes, ledges and moraines are covered with a multitude of grasses, sedges, and flowering plants right up to the snow line which is close to 4500 meters. This region is the home of many of our Scrophulariaceae, particularly of species of *Pedicularis*, *Veronica*, *Lagotis*, *Picrorhiza*, and *Euphrasia*.

"The main Himalayan Range stops the rain-laden clouds so that the Tibetan side is almost rainless. Desert conditions, aggravated by the great altitudes, permit but a scanty flora. Most of the plants are either found near melting snow, along the streams, or as weeds in the irrigated fields. Here the snow line is much higher, being about 5500 meters in many places. These conditions prevail in the four Tibetan provinces of Kashmir, i. e. Baltistan, Ladak, Zanskar, and Rupshu. Farther east similar conditions prevail in Lahul, Spiti, and Kunawar. Our collections are rich in specimens from the Tibetan type of climate."

The botanical exploration of the western Himalayas commenced early in the last century and presumably with a visit to Kumaun by Nathaniel Wallich, who was Superintendent of the Calcutta Botanical Garden. His records therefrom are included in his "Numerical List of the Dried Specimens of Plants in the East India Company's Museum, collected under the Superintendence of Dr. Wallich," a list of species with localities for them that appeared in parts from 1828 to 1832. Many of the new Scrophulariaceae

therein enumerated were validated by descriptions in George Bentham's "Scrophularineae Indicae" of 1835. A few Wallich had published himself in his beautifully illustrated "Plantae Asiaticae Rariores", issued from 1830 to 1832. His collections, mostly from northeastern India, were distributed from the Calcutta Garden, and a considerable series came to Lewis David von Schweinitz and so are now in the herbarium of this Academy.

Contemporary with Wallich was John Forbes Royle, who, as Superintendent of the Saharanpur Garden, was the first botanist resident in the territory of our study. Like Wallich he planned to publish many species, and a number of his Scrophulariaceae were likewise described by Bentham in his study of 1835. Royle traveled extensively through the western Himalayas, and is best known for his "Illustrations of the Botany and other Branches of the Natural History of the Himalayan Mountains and of the Flora of Cashmere", that was published in parts from 1833 to 1840. Royle's specimens, along with subsequent collections of the Saharanpur Garden, are now preserved in the Dehra Dun Herbarium. Unfortunately his mostly lack data, and are only recognizable by the handwriting.

Hugh Falconer, Royle's successor at Saharanpur, also traveled and collected extensively in the western Himalayas, and his specimens likewise survive at Dehra Dun. These bear data of locality and date; the latter pertain to the 1830s, but the former give places in an antiquated spelling, many of which can not be found on modern maps.

Next, William Griffith should be mentioned, because of the extent of his travels in India and Afghanistan, a record of which appears in his "Itinerary Notes", published at Calcutta in 1848. More particularly acquainted with the western Himalayas was Thomas Thomson, but unfortunately his specimens, studied in cooperation with Joseph D. Hooker, were combined with the latter's own from Sikkim under a common label headed: "Herb. Ind. Or. Hook. fil. & Thomson", and bear for locality merely the vague statement "Hab. Himal. Bor. Occ." To us to-day it seems amazing that Hooker, the greatest student of the flora of India, a man who had himself collected in the Himalayas, could have been content with such generalized geography.

Sir Joseph Hooker, to give him the title by which he was so long known as the distinguished Director of Kew Gardens, visited northeastern India from 1848 to 1850 and made vast collections in Sikkim, but he was never in the western Himalayas. After 1850, a main task, consuming the energies of many years, was the preparation of a comprehensive "Flora of British India." His account of the Scrophulariaceae, appearing in the fourth volume and issued in 1883 and 1884, is both the first and the last summary of this family that treats fully the species of the western Himalayas. As we shall repeatedly refer to it throughout this report, we need to know something of its standards. Even for its time the "Flora of British India"

was a conservative work. The younger Hooker was so impressed by the needless redescrptions of species by different authors that he was ever ready to interpret the presence of seeming intermediates as grounds for merging entities together.³ He applied this reasoning widely, and saw intergradations between plants of India and the Mediterranean Region, or of the Himalayas and central Europe, because of which he reduced many species proposed by his predecessors. But, just as in North America with the contemporary dicta of Asa Gray's "Synoptical Flora", later study, based upon fuller collections and considering a greater range of characters, is showing that Hooker's supposed species were often really groups of related species. It is natural that we must revise the opinions of sixty years ago.

Before passing beyond the time of Hooker's "Flora" we must note at least three scientific expeditions that visited the western Himalayas, each of which had made many collections and the first and second given careful descriptions of new Scrophulariaceae. From 1828 to 1832 Victor Jacquemont saw many parts of India, and in 1844 in the fourth volume of the "Voyage dans l'Inde", J. Cambessedes, with the help of Decaisne and apparently of Jacquemont himself, described many of the new species of plants found. In 1845 and 1846 Prince Waldemar of Prussia, with Dr. Werner Hoffmeister as surgeon and botanist, was in Bashahr (Kunauer) and Garhwal. The expedition resulted tragically in the death of Dr. Hoffmeister in a fray with the Sikhs. His notes about the specimens were lost, but they themselves were brought back to Germany and formed the basis of an admirably illustrated report on "Die Botanischen Ergebnisse der Reise" by Fr. Klotzsch and Aug. Garcke, in 1862. Lastly, from 1854 to 1858, the Schlagintweit brothers (Hermann, Adolphe, and Robert de Schlagintweit) with remarkable thoroughness traversed the western Himalayas, indicated the trails, made singularly beautiful paintings, and collected specimens of plants that have been widely distributed. Each of the large herbaria of the eastern United States possesses some, and usually different numbers.

The appearance of Hooker's "Flora" was the stimulus that made the later decades of the last century the great period of collecting throughout India. In the western Himalayas were a number of collectors, as is evident from the subjoined record kindly supplied by Dr. Stewart. The most important was J. F. Duthie, like Royle and Falconer a Superintendent of the Saharanpur Garden, who traveled much himself and sent his English and native collectors to remote parts of the mountains. G. A. Gammie seems to have been the ablest of the former, and Inayat and Harsukh of the latter. To Duthie came also such official collections as those made by

³ In one of his letters to Bentham (July 30, 1856) J. D. Hooker remarked "Many specimens always break down characters." Quoted in Leonard Huxley's "Life and Letters of Sir Joseph Dalton Hooker", vol. 1, p. 367.

S. A. Harriss and associates on the Chitral Relief Expedition. The vast collections assembled by Duthie were only in part named by him, and many have lain for years unstudied in the Dehra Dun Herbarium. Since his period of activity there has been little collecting until the recent work of Ralph R. Stewart and Walter Koelz.

Subsequent to the account of the Scrophulariaceae in Hooker's "Flora" of 1883-84 there is only one publication of moment for this family in the western Himalayas. In 1890 appeared "The Indian Species of *Pedicularis*", by Dr. David Prain, then Director of the Calcutta Botanical Garden, and later as Sir David Prain to become the Director of Kew Gardens in England. This sumptuously illustrated study, in the third volume of the Annals of the Calcutta Garden, gave a more progressive account of the species than Hooker had done six years earlier. But after half a century this study too needs revision, and we shall meet with problems in *Pedicularis* as well as in other genera.

In view of the amount of taxonomic progress in other parts of the World since 1890, it seems amazing that there has been a nearly complete silence as regards the Scrophulariaceae of the western Himalayas. With a corresponding cessation of collecting for some thirty years, I suppose that this family is not unique in such neglect. It is time for an awakening of interest in the flora of the Himalayas, and one hails the fullness of Dr. Stewart's recent gatherings as the beginning of a more critical and geographic appraisal of the species there.

Dr. Stewart has given in general outline a summary of his own collecting and of that of Mr. Koelz. These follow his list of collectors at the end of this introduction. He has also prepared for each a detailed enumeration of all collecting localities, and these are also appended. In the case of Stewart's own localities, the itinerary form makes his record especially useful since minute hamlets or scarcely inhabited places can be located as lying between places of more importance. Just as in my personal experience in the northern Andes, Himalayan practice seems to give a name to any spot however small. For the Himalayas the maps of "India and Adjacent Countries", published at Calcutta, have proved most helpful.

The study of Dr. Stewart's collections, gathered at these many places in and about Kashmir, has revealed and also solved problem after problem. Submerged species-entities have been restored, and both in Dr. Stewart's and Mr. Koelz' collections and among the specimens at Dehra Dun there have appeared various other species that must be described as new. Each of these proves to have its own definite range, each must be viewed as a geographic as well as taxonomic entity. In the following account there will appear as new, 9 species of *Scrophularia*, 1 of *Kickxia*, 1 of *Picrorhiza*, 9 of *Veronica*, 1 of *Odontites*, 13 of *Euphrasia*, and 12 (with 6 subspecies)

of *Pedicularis*, a total of 46 new species. Each of these is illustrated by a photograph, usually of the type specimen.

For this study I have not had the benefit of seeing the types of previously described species, since these are nearly all located in European herbaria; but there are a few isotypes in American herbaria, and they have been of assistance. Nor have I had field acquaintance with the species discussed, and, beyond what is given in Stewart's and Koelz' notes, there are details of flower-pattern and field-behaviour about which we need more knowledge. Nor have I seen the collections at Calcutta or in European herbaria, but no other herbarium can excel in representation for our territory that at Dehra Dun, nor in intensive covering of a definite area the series of specimens which Dr. Stewart has placed at my disposal.

In this report the specimens are cited under districts, and these follow a sequence from northwest to southeast along the chain of the Himalayas. Plant ranges in such territory are altitudinal, each species following the mountains in a narrow belt. Accordingly, it is thought that a single map showing these districts will be sufficient to portray with reasonable definiteness the range of each species. (For the making of this map I am indebted to the Academy's artist, Miss Helen E. Winchester, and for its lettering to my wife, Anne Walton Pennell.)

The accompanying map has been based on that of northwestern India in the Times Atlas (1922), and from it has been traced the contour of 2000 feet (609 meters) altitude. That is approximately the line of demarcation between the lowland plain of the Punjab and the highlands that rise to the north, northeast, and northwest of it. The districts indicated, however, differ considerably from those shown on the Times Atlas, and are those used on the much more accurate and detailed "Maps of India and Adjacent Countries", already mentioned.

For each collection is being stated the herbarium in which it may be consulted, these herbaria being denoted by the following letters:

ANSP—Academy of Natural Sciences of Philadelphia

(Calc—Calcutta Botanical Garden, Calcutta, India)

DD—Dehra Dun Herbarium, Forest Research Institute, Dehra Dun,
India

Gord—Gordon College, Rawalpindi, India

GH—Gray Herbarium of Harvard University, Cambridge, Mass.

(Isl—Islamia College, Peshawar, India)

(Mich—University of Michigan, Ann Arbor, Mich.)

NYBG—New York Botanical Garden, Bronx Park, New York City

UCLA—University of California, Los Angeles, Calif.

USNA—United States National Arboretum, U. S. Department of Agriculture, Washington, D. C.

USNH—United States National Herbarium, U. S. National Museum, Washington, D. C.

Herbaria enclosed by parentheses are ones from which only a very few specimens have been seen. Specimens cited in this report without accompanying letters are in the herbarium of the Academy of Natural Sciences.

My thanks are due to the curators of these herbaria for the loan of the valuable specimens in their charge.

Acknowledgment is here made to the American Philosophical Society for a grant-in-aid from the Johnson Fund, which has, in part, defrayed the cost of publishing this study.

RECORD OF COLLECTORS

This summary of those collectors whose specimens from the western Himalayas are cited in this report has been prepared jointly by Dr. Stewart and myself. He has supplied information as to years of life, career, and works published, and I the districts in the western Himalayas where they collected and the years of work there, so far as these can be gleaned from the labels with their specimens.

AITCHISON, DR. J. E. T., 1836-1898. Bengal Medical Service. Collected in India 1861-72 (on Salt Range near Rawalpindi, 1871), and in Afghanistan 1879-85 (in Kurram 1879-80, and along the Afghan-Indian border 1884-85). Author of "A Catalogue of the Plants of Punjab and Sindh", and "On the Flora of the Kuram Valley, &c., Afghanistan" in Journ. Linn. Soc. 18: 1-113; 19: 139-200, 1880-81. His collections are at Kew Gardens, England.

BAKSH, RAM. Collected for Drummond in Bashahr in 1884-85.

BIDDULPH, MAJOR J. Indian Army. Collected on Gilgit Expeditions in 1879 and 1881.

BRANDIS, SIR DIETRICH, 1824-1907. Indian Forest Service. Author of "Forest Flora of Northwestern and Central India", 1874, etc. Collected in 1864 in Bashahr, Chamba, Hazara, Ladakh, and Lahul; in 1881 in Kuna-war. Collections in Dehra Dun Herbarium.

CHAMPION, H. G. Indian Forest Service. Author of a "Check List of Kumaun Plants". Collected in 1924 in Almora; in 1930 in Dehra Dun.

CHAND, THAKUR RUP. Collected for Koelz in 1933 in Lahul.

CLARKE, C. B., 1832-1906. Was in India from 1865 to 1887, and cooperated with Hooker by preparing revisions of various orders for the "Flora of British India". Collected in 1874 in Chamba, and in 1879 in Baltistan. Collections at Kew Gardens, England.

COLLETT, GEN. SIR HENRY, 1836-1901. Author of "Flora Simlensis", 1902. Collected in 1893 in Peshawar; also collected in Kurram and near Simla.

DRUMMOND, J. R., 1851-1921. Indian Civil Service. Published a list of Punjab plants in *Journal of the Bombay Natural History Society*. Collected about Simla, and in 1884 presented his collections which are now in the Dehra Dun Herbarium.

DUTHIE, J. F., 1845-1922. Supt. Saharanpur Garden, 1873-1903. Author of the "Flora of the Upper Gangetic Plain and of the Adjacent Siwalik and Sub-Himalayan Tracts", 1903-1911, etc. Collected widely in the Northwest Himalaya, and with his Indian and British collectors gathered at least 25,000 numbers. Collected himself in 1877 in Dehra Dun and Tehri; in 1879 in Jaunsar; in 1881 and 1883 in Tehri; in 1884 and 1886 in Kumaun; in 1885 and 1886 in Garhwal; in 1888 in Hazara; in 1889 in Simla; in 1892 and 1893 in Kashmir, Baltistan, Astor, and Gilgit; in 1899 in Dehra Dun; and in 1900 in Kumaun. Collections are in Dehra Dun Herbarium.

FALCONER, HUGH, 1808-1865. Supt. Saharanpur Garden, 1832-1847. Wrote mainly palaeontological papers. Used native collectors extensively, and their specimens from the western Himalayas (as far within the mountains as Baltistan) and dated 1834, 1837, and 1838, are in the Dehra Dun Herbarium.

GAMBLE, J. S., 1847-1925. Indian Forest Service. Collected in 1878 at Simla; and in 1893 near Simla and in Tehri. Better known for his later work in southern India that resulted in his "Flora of Madras", 1915.

GAMMIE, G. A. Author of "A Botanical Tour in Chamba and Kangra" in 1896, issued in *Records of Botanical Survey of India* 1: 183-214, 1898. Collected in 1891 in Dehra Dun, Kashmir, and Purig; in 1893 in Kashmir; and in 1896 in Chamba and Kangra. Also collected much in the eastern Himalayas for the Calcutta Botanical Garden.

GATACRE, GEN. W. Collected in Chitral in 1895 on Chitral Relief Expedition. Specimens in Dehra Dun Herbarium.

GILES, DR. G. M. Indian Army. Collected on Gilgit Expedition of 1885. Specimens at Calcutta Botanical Garden.

GILL, H. A. C. Collected in 1933 in Spiti. Specimens in Dehra Dun Herbarium.

GILL, NORMAN, d. 1924. Collected in Kumaun. Specimens seen in Bonati Herbarium.

GOLLAN, W. Collected for Duthie in 1889 in Kashmir.

GORRIE, DR. R. M. Indian Forest Service. Collected in Bashahr.

GRIFFITH, WILLIAM, 1810-1845. Collected within northwestern India and Afghanistan, and his specimens at Kew Gardens studied by George Bentham. His "Posthumous Papers" issued at Calcutta, among which his "Itinerary Notes" (1848) give records locating his collections, while his

“ Journal of Travels in Assam, Burma, Bootan, Afghanistan and the Neighbouring Countries ” (1847) is of much interest.

GUPTA, B. L. Collected in 1927 in Dehra Dun.

HAMILTON, MAJOR H. Surgeon Lieutenant Colonel. Collected in 1896 in Chitral. Specimens in Dehra Dun Herbarium.

HARRISS, S. A. Surgeon Lieutenant on Chitral Relief Expedition of 1895. Collected in Chitral in 1895 and 1899. See Duthie’s “ The Botany of the Chitral Relief Expedition, 1895 ” in *Rec. Bot. Surv. India* 1: 139-181, 1898. Specimens in Dehra Dun Herbarium.

HARSUKH. One of Duthie’s Indian collectors. Collected in 1894 in Kurram; in 1895 in Waziristan; and in 1899 in Chamba.

HEYDE, REV. A. W. Collected in Pangi, Chamba, in 1874 and 1879. A few specimens seen in Dehra Dun Herbarium, but presumably the full series at the Calcutta Garden.

HUNTER-WESTON, A. G. Royal Engineers. Collected in 1890 in Bal-tistan.

INAYAT. Duthie’s main Indian collector. Collected in 1894, 1896, 1897, and 1899 in Kagan, Hazara; in 1897 and 1899 in Muzaffarabad; in 1898 in Kheri; in 1899 in Chamba; in 1900 in Almora, Naini Tal, and Kumaun; in 1901 in Kashmir, Astor, and Purig.

JAMESON, DR. WILLIAM, 1815-1882. Supt. Saharanpur Garden, 1842-1875. Collected in 1853 in Kangra, and specimens in Dehra Dun Herbarium. Other collections likely there, but recognizable only by handwriting.

KESHAVANAND. Indian Forest Service. Collected in 1897 in Tehri; and from 1906 to 1909 in Kashmir, especially in the Kishanganga Valley. Specimens in Dehra Dun Herbarium.

KOELZ, WALTER. Has collected widely since 1930 in the Punjab Hima-laya, Kashmir, Sind, Persia, and Afghanistan. In our territory collected in 1930 and 1931 for the Roerich Museum of New York (with Kulu as base); in 1933 for the University of Michigan; and from 1936 to 1940 for the United States Department of Agriculture. His many collecting stations are enumerated below.

LACE, J. H., 1857-1918. Indian Forest Service. Collected in 1890 and 1891 in Bashahr; and from 1895 to 1899 in Chamba. Published concerning plants of Burma and of Baluchistan.

NASIR, EUGENE. Of Gordon College, Rawalpindi. Collector in Attock and Kashmir.

NATH, MOHINDAR. Of Gordon College, Rawalpindi. Collected in Ti-rah, Peshawar, Rawalpindi, Kulu, Lahul, and the Simla Hills.

PARKINSON, C. E. For three years Forest Botanist at the Forest Research Institute at Dehra Dun. Collected in 1934 in Kulu; in 1935 in Kumaun; and in 1936 in Jaunsar.

PARMANAND, NEGI. Collected for Koelz in 1934 in Bashahr and in Garhwal.

QAZILBASH, NAWAZISH ALI. Islamia College, Peshawar. Recent collector in Peshawar; and also Kurram, Hazara, and Chitral.

RAIZADA, M. B. Forest Research Institute, Dehra Dun. Collected in 1930 in Hazara; in 1931 and 1936 in Jaunsar; and in 1933 in Agra. Many of his specimens from Dehra Dun are at the New York Botanical Garden.

ROYLE, JOHN FORBES, 1800-1858. Curator, Saharanpur Garden, 1823-1831. Author of "Botany of the Himalayas", 1834-38. Collected in 1831 in Kunawar ("Kunaor").

SCHLAGINTWEIT Brothers (HERMANN, 1826-1882; ADOLPHE, 1829-1857; and ROBERT, 1833-1885). Geographical explorers of the western Himalayas from 1854 to 1858. Published "Results of a Scientific Mission to India and High Asia", 1861-66. Collected plants extensively from Kashmir to Kumaun, and into western Tibet, these being distributed from Kew Gardens.

STEWART, JOHN LINDSAY, 1832?-1873. Conservator of Forests, Punjab. Author of "Punjab Plants" and "Notes of a Botanical Tour in Ladak or Western Tibet", both 1869. Collections from Chenie (Chini), Bashahr, in Brandis Herbarium at Dehra Dun; and specimens also at Kew and Edinburgh Botanical Gardens.

STEWART, RALPH R., Pres., Gordon College, Rawalpindi. Author of "The Flora of Ladak", 1916. Has collected extensively in Kashmir and adjacent territory from 1911 to date. Detailed itineraries of his routes follow below. (Unless otherwise stated, all records credited "Stewart" on our lists pertain to R. R. Stewart or to collections made jointly with his wife Isabelle Darrow Stewart.)

STRACHEY, SIR RICHARD, 1817-1908. With J. E. Winterbottom traveled in the Northwest Himalaya and adjacent Tibet, collecting in Punch, Kashmir, and Astor in 1847, and in Garhwal and Kumaun from 1840 to 1849. Specimens of the former series, distributed from the Calcutta Botanical Garden, have been seen in the Dehra Dun Herbarium; and of the latter series, presumably distributed from Kew Gardens, in the Gray Herbarium of Harvard University. Author of a "Catalogue of the Plants of Kumaon and of the Adjacent Portions of Garhwal and Tibet", that was originally prepared in 1852, but was only published with supplements by J. F. Duthie in 1906.

TANNER, COL. Collected in 1880 in Astor and Gilgit.

THOMSON, THOMAS, 1817-1878. Surgeon, Bengal Army. Author of "Western Himalayas and Tibet", 1852. Cooperated with Sir Joseph D.

Hooker on "Flora Indica", 1855. Collected widely in India, especially in the western Himalayas, as far as Nubra in western Tibet, but specimens distributed without records of locality. Specimens at Kew Gardens in England, with a partial duplicate set at the Gray Herbarium of Harvard University.

WATT, SIR GEORGE. Author of "Notes on the Vegetation &c. of Chumba State and British Lahoul", in the Journal of the Linnean Society, Botany, 18: 368-382, 1881, wherein is proposed *Pedicularis eximia* based on his own collections.

WILLIAMS, REV. J. Apparently a Church of England missionary. Collected in 1888 in Dera Ismail Khan. Specimens seen in Dehra Dun Herbarium.

WINTERBOTTOM, J. E. See STRACHEY, above.

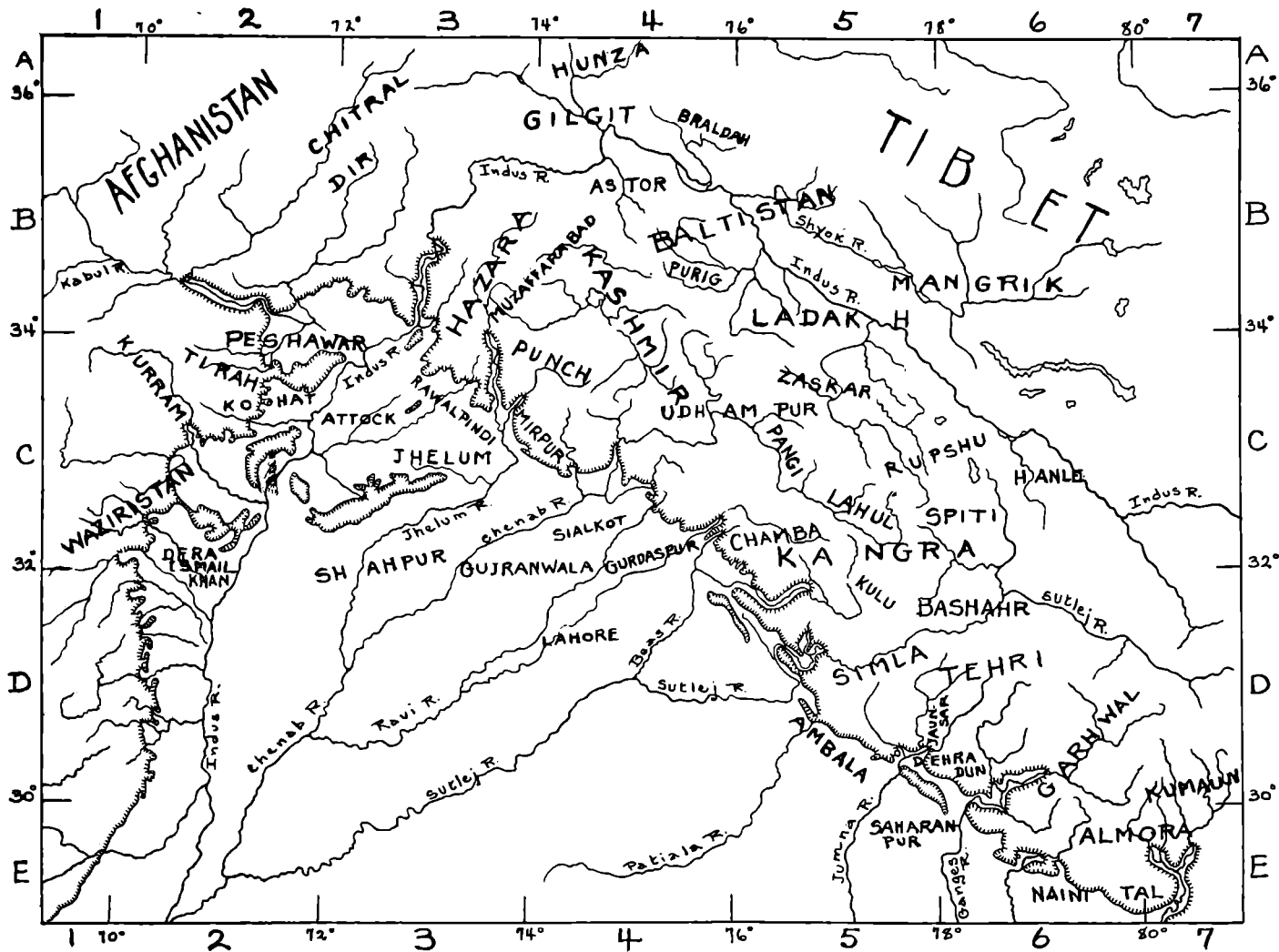
FIELD WORK AND COLLECTING LOCALITIES OF DR. R. R. STEWART AS OUTLINED BY HIMSELF

On behalf of the American United Presbyterian Mission I went to Gordon College, Rawalpindi, in 1911, and have collected extensively since that time in vacations. In 1912 and 1913 I collected in Kashmir, Ladak, Rupshu, Kulu and Lahul. In 1917 on a Cutting Fellowship from Columbia University I collected in the Punjab Plains, Dalhousie, Dharmsala, Chamba, Kishtwar, and Kashmir. In later years I took my family to Kashmir during the summer vacations, and instead of going on long trips, camped in one place for six weeks or so making short trips from camp. Several vacations were spent at Pahlgam, Sonamarg, Tragbal, and in the vicinity of Gulmarg. Many trips were made with students to the Murree Hills, Peshawar, and Hazara. Seven or eight summers were spent in Landour, Mussoorie, above Dehra Dun in the United Provinces.

After my children returned to America for college, longer trips were made in Kashmir. In 1939 the Kishanganga Valley and the Nanga Parbat region were visited, and in 1940 Baltistan and a part of Ladak. Altogether I have collected more than 21,000 numbers and built up a good working herbarium of north Indian plants at Gordon College. Duplicates of most of my collections are in the herbaria of the New York Botanical Garden and of Harvard University.

[On the following record, Dr. Stewart's collecting localities have been grouped by him according to routes of travel by trail. To his record I have prefixed the district names from the Indian official maps, and have transferred altitudes from feet to meters.—F. W. P.]

DEHRA DUN. Dehra Dun (670 m.); Rajpur (900 m.); Landour (1800-2100 m.); Mussoorie (2000 m.).



DISTRICTS OF THE WESTERN HIMALAYAS AND ADJACENT TERRITORY

(To which reference is made in the text)

- | | |
|--|--|
| 1.—Almora (E 6) | Kunawar (Kunaour, Kunawur), a former district nearly equivalent to the present Bashahr |
| 2.—Ambala (D 5) | 27.—Kurram (Kuram) (C 2) |
| 3.—Astor (B 4) | 28.—Ladakh (Ladak) (B 5) |
| 4.—Attock (C 3) | 29.—Lahore (D 4) |
| 5.—Baltistan (B 4) | 30.—Lahul (C 5) |
| 6.—Bashahr (Bushahr) (D 6) | 31.—Mangrik (B 6) |
| 7.—Braldah (B 4) | 32.—Mirpur (C 4) |
| 8.—Chamba (C 5) | 33.—Muzaffarabad (B 3) |
| 9.—Chitral (B 2) | 34.—Naini Tal (E 6) |
| 10.—Dehra Dun (D 6) | 35.—Pangi, north section of Chamba in Chenab Valley (C 5) |
| 11.—Dera Ismail Khan (D 2) | 36.—Peshawar (C 2) |
| 12.—Dir (B 2) | 37.—Punch (Poonch) (C 4) |
| 13.—Garhwal (British Garhwal) (D 6) | 38.—Purig, Dras Valley, formerly accounted in Baltistan but now in Ladakh (B 4) |
| 14.—Gilgit (B 4) | Rampur (just southwest of Naini Tal) |
| 15.—Gujranwala (C 3) | 39.—Rawalpindi (C 3) |
| 16.—Gurdaspur (C 4) | 40.—Rupshu (C 6) |
| 17.—Hanle (C 6) | 41.—Saharanpur (E 5) |
| 18.—Hazara (B 3) | 42.—Shahpur (C 3) |
| 19.—Hunza (A 4) | 43.—Sialkot (C 4) |
| 20.—Jaunsar, north extension of Dehra Dun (D 5) | 44.—Simla (Simla Hill States, excluding Bashahr) (D 5) |
| 21.—Jhelum (C 3) | 45.—Spiti |
| Kagan (valley of northern Hazara) | 46.—Tehri (Tehri-Garhwal, Tihri) (D 6) |
| 22.—Kangra (C 5) | 47.—Tirah (C 2) |
| 23.—Kashmir (districts of North and South, but not surrounding areas associated politically with it) (B 4) | 48.—Udhampur (C 4) |
| 24.—Kohat (C 2) | 49.—Waziristan (C 1) |
| 25.—Kulu (district of Kangra) (D 5) | 50.—Zaskar (Zanskar) (C 5) |
| 26.—Kumaun (Kamaon, Kumaon) (D 7) (once included most of Almora) | |

On this list the orthography of the Government of India Survey Maps has been adopted. However, some spellings are not yet standardized. The following are in general use, and seem to express better the pronunciation: Bushahr, Kumaon, Ladak, Poonch, and Zanskar. But, as Dr. Stewart also informs me, pronunciation itself is not uniform.

SIMLA. Simla (2100 m.).

CHAMBA. Dalhousie (1800-2100 m.).

KANGRA. Dharmsala (1800-2100 m.).

RAWALPINDI. Rawalpindi (520 m.); Murree (1800-2100 m.); Murree Hills (1800-2700 m.).

Route 1.—Up Jhelum River to Srinagar (Jhelum Valley Road).

Leaving Rawalpindi take road northeast to Jhelum River, thence north to Domel and east to Srinagar. MUZAFFARABAD: Kohala (600 m. alt.); Domel (670 m.), at mouth of Kishanganga R.; Garhi (850 m.); Chenari (1150 m.); Uri (1200 m.), whence Punch Road goes south over Aliabad Pass (2450 m.); Rampur (1370 m.). KASHMIR: Baramulla (1600 m.), entrance to Vale of Kashmir; Srinagar (1600 m.).

Route 2.—Northern slope of Pir Panjal Range (southeast of Baramulla and southwest of Srinagar, on Route 1).

KASHMIR: Dangarpur (2100 m.); Tangmarg (2200 m.); Gulmarg (2700 m.); Khillanmarg (3000 m.); Mt. Apharwat (4000 m.).

Route 3.—Plain northwest of Srinagar (Route 1).

KASHMIR: Srinagar; Dal Lake (1600 m.); Ganderbal (1600 m.), near mouth of Sind R.; Bandipura ("Bandipur"), on Wular Lake (1600 m.).

Route 4.—Srinagar (on Route 1) southeast to pass over Pir Panjal Range, thence south to Udhampur.

KASHMIR: Srinagar; up Jhelum R. to Islamabad (1600 m.); then Banihal Pass (2700 m.) into UDHAMPUR: Kad (1800-2100 m.); Udhampur (ca. 900 m.).

Route 5.—Liddar Valley, east of Srinagar.

KASHMIR: From Islamabad (on Route 4) north-northeast up Liddar River to Aish Magam ("Eishmakam") (1800 m.); Pahlgam (2200 m.), above which are alpine lakes of Sorus and Tulion; Arau ("Aru") (2450 m.), with one fork of river from southeast slope of Mt. Kolahoi; up western fork to the west of Mt. Kolahoi to Har Nag (ca. 3700 m.).

Route 6.—Headwaters of Liddar and Sind Rivers.

KASHMIR: From Pahlgam (on Route 5) north to Shish Nag (ca. 3700 m.); Panch (Panj) Tarni; Amarnath, on upper Sind R. (on Route 7).

Route 7.—Sind Valley, northeast of Srinagar.

KASHMIR: From Ganderbal (on Route 3) up Sind R. to Wayil (1650 m.); Kangan (ca. 1800 m.); Gund (2300 m.); Sonamarg (2800 m.); Baltal (2900 m.); Amarnath (on Route 6).

Route 8.—Dras Valley (Purig).

KASHMIR: From Baltal (on Route 7) northeastward over the Great Himalaya Range via the Zoji Pass (3700 m.) into LADAKH: to Mitsahoi

(3400 m.); Matayan (3050 m.); Dras (3000 m.); Kharbu (3000 m.); Chunagund (2900 m.).

Route 9.—Indus Valley in Baltistan.

LADAKH. Slightly east of Chunagund (on Route 8) leave Ladakh Road and take Baltistan Road northward down the Suru River to the Indus beyond Olthingthang ("Olding") (2700 m.); thence in BALTISTAN down Indus R. northwestward to Bagicha (2600 m.); Tolti (2500 m.); Parkutta (2500 m.); to Kiris (2400 m.); near mouth of Shyok R.; up Shyok north-eastward to Kuru (2500 m.); and Blaghar (2550 m.), opposite Doghani near mouth of Thalle; up Thalle northwestward to Khusomik ("Kasurmik") (3000 m.); thence westward over the Thalle La (4900 m.); to Shigar on lower Shigar R.; southwestward down Shigar R. to Skardu at its confluence with the Indus.

Route 10.—Kishanganga Valley.

MUZAFFARABAD. From Domel (on Route 1) northeastward up Kishanganga R. to Muzaffarabad (700 m.); Dhanni (750 m.); Battaki (900 m.); Tithwal ("Titwal") (1070 m.); Surkhala (1200 m.); Keran (1500 m.); Reshna (1700 m.); Shardi ("Sharda") (1800 m.); Kel ("Khel") (2000 m.). KASHMIR: Taobat ("Taubat") (2200 m.); Bagtor ("Bhagtour") (2250 m.); Kanzalwan ("Kunzalwan") (2400 m.); Badwan (2450 m.); Gurez ("Gurais") (2450 m.); Chorwan (2700 m.).

Route 11.—From Wular Lake north to the Kishanganga River.

KASHMIR: Bandipura (on Route 3); to Tragbal; Rajdhiangan Pass (3600 m.); Kanzalwan (on Route 10).

Route 12.—From the Kishanganga Valley via the Deosai Plains north-eastward to Skardu.

KASHMIR: From Chorwan (on Route 10); to Kamri; Minimarg (2750 m.); Burzil Chowki (3400 m.); Mir Panzil Pass (4300 m.), over the Great Himalaya Range. BALTISTAN: Deosai Plains (4000 m.); Burji La (4900 m.); Satpura La (4700 m.); Skardu (on Route 9), on Indus River.

Route 13.—Astor Excursion to Gurikot, east of Mt. Nanga Parbat.

KASHMIR: Kamri (on Route 12); north to Kamri Pass (4300 m.) over the Great Himalaya Range. ASTOR: Shankargarh (3200 m.); Rattu (2700 m.); Rupal Nullah (2400 m.); and Gurikot (2300 m.). Thence returning southeastward to Gudhoi ("Godai") (2600 m.); Chilam ("Chillam") (3000 m.); to Burzil Pass (4300 m.), over the Great Himalaya Range. KASHMIR: Burzil (on Route 12).

Route 14.—Sind to Kishanganga Valleys via Gangabal Lakes.

KASHMIR: Kangan (1800 m.) (on Route 7), on Sind River; up the Wangat stream to Nara Nag (2600 m.); Trunkal (3350 m.); Gangabal Lakes (3650 m.); Zojibal Pass (4100 m.); Mengandob (3350 m.); Gadsar (3350 m.); Masjid Gali (4100 m.); Kun Patthar (3000 m.); Lohan Gali (3300 m.); Waziri Thal (2700 m.), in Tilel Valley; Chorwan (on Route 10), on Kishanganga River.

INDEX TO COLLECTING LOCALITIES OF DR. R. R. STEWART

(Numbers refer to Itinerary Routes of preceding list.)

Aish Magam, 5	Har Nag, 5	Panch Tarni, 6
Aliabad Pass, 1	Indus R., 9, 12	Parkutta, 9
Amarnath, 6, 7	Islamabad, 4, 5	Rajdhiangan La, 11
Apharwat, 2	Jhelum R., 1, 4	Rajpur, Dehra Dun
Arau (Aru), 5	Kad, 4	Rampur, 1
Badwan, 10	Kamri, 12, 13	Rattu, 13
Bagicha, 9	Kangan, 7, 14	Rawalpindi
Bagtor, 10	Kanzalwan, 10, 11	Reshna, 10
Baltal, 7, 8	Kasurmik, 9	Rupal Nullah, 13
Bandipura (Bandipur), 3, 11	Kel (Khel), 10	Satpura La, 12
Banihal Pass, 4	Keran, 10	Shankargarh, 13
Baramulla, 1	Kharbu, 8	Shardi, 10
Battaki, 10	Khillanmarg, 2	Shigar, 9
Bhagtour, 10	Khusomik, 9	Shish Nag, 6
Blaghar, 9	Kiris, 9	Shyok R., 9
Burji La, 12	Kishanganga R., 10, 11, 12	Simla
Burzil, 12, 13	Kohala, 1	Sind R., 6, 7, 14
Chenari, 1	Kolahoi, 5	Skardu, 9, 12
Chilam, 13	Kun Patthar, 14	Sonamarg, 7
Chorwan, 10, 12, 14	Kunzalwan, 10, 11	Sorus Lake, 5
Chunagund, 8, 9	Kuru, 9	Srinagar, 1, 3, 4
Dal Lake, 3	Landour, Dehra Dun	Surkhala, 10
Dalhousie, Chamba	Liddar R., 5, 6	Suru R., 9
Dangarpur, 2	Lohan Gali, 14	Tangmarg, 2
Dehra Dun	Masjid Gali, 14	Taobat (Taubat), 10
Deosai, 12	Matayan, 8	Thalle, 9
Dhanni, 10	Mengandob, 14	Tilel, 14
Dharmasala, Kangra	Minimarg, 12	Tithwal (Titwal), 10
Domel, 1, 10	Mir Panzil La, 12	Tolti, 9
Dras, 8	Mitsaboi, 8	Tragbal, 11
Eishmakam, 5	Murrec, Rawalpindi	Trunkal, 14
Gadsar, 14	Mussoorie, Dehra Dun	Tulion, 5
Ganderbal, 3, 7	Muzaffarabad, 10	Udhampur, 4
Gangabal Lakes, 14	Nara Nag, 14	Uri, 1
Garhi, 1	Olthingthang (Olding), 9	Wangat, 14
Godai (Gudhoi), 13	Pahlgam, 5, 6	Wayil, 7
Gulmarg, 2		Waziri Thal, 14
Gund, 7		Wular Lake, 3, 11
Gurez (Gurais), 10		Zoji La, 8
Gurikot, 13		Zojibal La, 14

OUTLINE OF THE TRIPS OF WALTER KOELZ IN THE HIMALAYAS

(BY R. R. STEWART)

In 1930 Walter Koelz first collected in India under the auspices of the Roerich Museum. He began in June at Naggar, Kulú, in the Kangra District of the Punjab, crossed the Rotang La and spent most of July and early August in Lahul. He spent a few weeks in Chamba State to the west, and then collected in Rampur, Bashahr, Kulu, and Lahul.

In 1931 he went much farther afield. He collected a few specimens on the plains of the Punjab in February and early March, spending the next three months in the neighborhood of Kulu. In June he returned to Lahul and crossed the Baralacha Pass into Rupshu, a lofty plateau region in Kashmir, most of which is above 4500 meters. He visited Hanle and spent more than a month travelling in Ladak. In September he crossed the Kangi La into Zanskar, returning to Naggar in October.

In 1934 Mr. Koelz returned to India under the auspices of the University of Michigan, starting to collect again in Kangra in April. He collected again in Kulu, visiting the Parbati Valley and returned to Lahul in July, crossing the Great Range of the Himalayas by the Tsarichen La into Zanskar. He crossed into Purig and entered Ladak proper by the Namika La. He ascended the Indus to Hemis and turned east to Rupshu, arriving back in Lahul toward the end of August. He spent September in Spiti and October in Bashahr, returning to Kulu toward the middle of November.

In 1936 the United States Department of Agriculture sent Mr. Koelz to India for the fourth time. He began collecting in Kangra, visited Mandi and parts of Kulu and again entered Lahul. In early July he visited Chamba. Leaving Chamba he entered Kashmir by the motor road from Jammu beginning to collect on the Pir Panjal (Banihal) Pass. The rest of July was spent in the Vale of Kashmir. On July 30 he left Bandipur on the Wular Lake, crossed the Rajdhangan Pass and arrived at Gurez (Gurais) on the Kishanganga River on August 3. From Burzil he crossed the Deosai Plains and descended to Skardu in Baltistan. The next four or five weeks were spent in the highlands of Baltistan, especially in the Shyok watershed. In the autumn a few collections were again made in Kangra. Altogether Mr. Koelz and his native collectors gathered about 10,000 numbers in India.

SYSTEMATIC TREATMENT

KEY TO TRIBES

- A. Corolla with the upper lobes external, overlapping in the bud.
(ANTIRRHINOIDEAE)
- B. Capsule septicial or loculicidal by a simple slit, the septum breaking from the capsule-wall or rupturing; corolla not saccate or spurred anteriorly.
- C. Stigmas distinct, flattened (except in *Broomia*, *Scoparia*, and *Limosella*); seeds reticulate, wingless; capsule-walls membranous; inflorescence simply racemose, the bracts foliaceous or subulate, and the flowers axillary; filaments 4, didynamous, or 2; leaves opposite.....I. GRATIOLEAE
- CC. Stigmas wholly united, punctiform or capitate; seeds not reticulate, either smooth, tuberculate, ridged, or winged.
- D. Lobes of corolla all evident, the lips not inflated; filaments 4 or 5, the anther-cells contiguous.
- E. Leaves alternate; inflorescence racemose, the flowers single or fasciculate; filaments 5 or 4; corolla rotate, yellow or white.
II. VERBASCEAE
- EE. Leaves opposite; inflorescence compound, the flowers disposed in peduncled cymes; filaments 4; corolla zygomorphic, brown or greenish, the upper lobes horizontal, the lateral vertical, and the lowermost deflexed or recurved.....III. CHELONEAE
- DD. Lobes of the yellow corolla wholly merged in the rounded inflated lips; filaments 2, the anther-cells separated on arms of the connective.IV. CALCEOLARIEAE
- BB. Capsule transversely loculicidal, the septum and adjacent capsule-walls unruptured; corolla saccate or spurred anteriorly; leaves alternate.
V. ANTIRRHINEAE
- AA. Corolla with the lower lobes external, overlapping in the bud (excepting *Logotis*).
(RHINANTHOIDEAE)
- B. Upper lobes of corolla flattened or widely arched, often spreading; anthers all distinct.
- C. Capsule fleshy, red, lustrous, tardily dehiscent near apex septicially and slightly loculicidally; stigma and style scarcely evident; filaments fused with corolla entire length, the anthers sessile; leaf-blades sharply dimorphic, those of the main stems ovate, opposite, but of the shoots involute-acicular, crowded; outer layers of stem abscising.
VI. HEMIPHRAEGEAE
- CC. Capsule dry, dull, normally dehiscent; stigma capitate or punctiform; filaments distally free from corolla (except sometimes in *Logotis*); leaf-blades uniform, or gradually different from base to summit of plant; outer layers of stem not abscising.
- D. Anther-cells explanate, equal, parallel or divergent, confluent or (sometimes in *Veronica*) distinct; corolla violet-blue or white; capsule septicial or loculicidal; sepals distinct (except in *Logotis*); bracteoles none; leaves lanceolate to orbicular-ovate, opposite, alternate, or radical; plants not parasitic.VII. VERONICEAE
- DD. Anther-cells not explanate, distinct, parallel, equal or with one cell partially or wholly reduced; corolla yellow, purple, or (in *Buchnera* and sometimes in *Striga*) violet-blue or white; sepals united proximally; bracteoles a pair beneath calyx (but lacking in *Leptorhabdos*); leaves filiform-linear to lanceolate, opposite; plants usually root-parasites.....VIII. BUCHNEREAE
- B. Upper lobes of corolla narrowly arched, forming a definite saeta that encloses the anthers; anthers frequently cohering; stamens 4, didynamous; capsule loculicidal; probably mostly root-parasites.....IX. EUPHRASIEAE

Tribe I. *GRATIOLEAE*

Tribe mainly tropical, both of the Old and New Worlds.

KEY TO GENERA

- A. Anther-cells 2, distinct; plants caulescent, with racemose inflorescence, the flowers at least 5 mm. long.
- B. Cells of anther parallel; pedicels often bracteolate.
- C. Corolla rotate, white, densely pilose within on all sides, the lobes longer than the tube, the upper two petals united wholly into a single lobe; anthers and stigma far exerted from the corolla; capsule equally septi-
cidal and loculicidal.1. *Scoparia*
- CC. Corolla not rotate nor pilose on all sides, the lobes about equaling or shorter than the tube; anthers and stigma not exerted beyond the corolla.
- D. Anther-cells proximate; leaf-blades sessile, entire or nearly so, all opposite.
- E. Calyx bracteolate at base, the sepals unequal in width, distinct, longer than the ovoid capsule; stamens 4; corolla white or violet-tinged; capsule dehiscent both septi-
cidentally and loculicidally; leaf-blades ample throughout.
- F. Corolla campanulate; outer sepal ovate, smooth, only 2 to 3 times the width of the innermost; leaf-blades cuneate, rounded, 1-veined; plant repent, ascending at apex.
2. *Bramia*
- FF. Corolla narrow, zygomorphic; outer sepal rotund, truncate at base, reticulate-veined, more than 4 times the width of the innermost; leaf-blades linear-lanceolate, attenuate to an obtuse tip, pinnately veined; plant repent, ascending at apex.3. *Mella*
- EE. Calyx not bracteolate, the sepals all alike, united below, less than $\frac{1}{2}$ the length of the globose capsule; stamens 2; corolla violet, zygomorphic; capsule dehiscent loculicidally; only the lower leaf-blades large, those of the middle and upper part of the stem (bracts) small or even scale-like.4. *Dopatrium*
- DD. Anther-cells separated on short arms of the connective; calyx bracteolate at base, the bracteoles small; corolla narrow, zygomorphic; leaf-blades petioled to clasping, crenulate to bipinnatifid, opposite or whorled.
- E. Anthers all developed, polleniferous; sepals alike, united over $\frac{1}{2}$ length; capsule loculicidal; inflorescence racemose or slenderly spicate, the bracts often large and leaf-like.
- F. Corolla xanthic (yellow), strongly zygomorphic; capsule pubescent to hirsute; calyx hirsute, the lobes not or scarcely longer than the tube; leaves not glandular-punctate.5. *Lindenbergia*
- FF. Corolla cyanic (purplish or violet), less zygomorphic; capsule glabrous; calyx more finely pubescent or glabrate, the lobes longer than the tube; leaves and calyces glandular-punctate.6. *Limnophila*
- EE. Anthers unequally developed, one cell of longer (anterior) pair abortive; sepals unequal, the uppermost larger than the other four; capsule loculicidal and septi-
cidal.7. *Adenosma*
- BB. Cells of anther divergent; pedicels not bracteolate; corolla cyanic.
- C. Capsule dehiscent; corolla less than twice the length of the calyx; plants with well-developed stems.

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cidentally and loculicidally; leaf-blades ample throughout.
- F. Corolla campanulate; outer sepal ovate, smooth, only 2 to 3 times the width of the innermost; leaf-blades cuneate, rounded, 1-veined; plant repent, ascending at apex.2. *Bramia*
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- DD. Anther-cells separated on short arms of the connective; calyx bracteolate at base, the bracteoles small; corolla narrow, zygomorphic; leaf-blades petioled to clasping, crenulate to bipinnatifid, opposite or whorled.
- E. Anthers all developed, polleniferous; sepals alike, united over $\frac{1}{2}$ length; capsule loculicidal; inflorescence racemose or slenderly spicate, the bracts often large and leaf-like.
- F. Corolla xanthic (yellow), strongly zygomorphic; capsule pubescent to hirsute; calyx hirsute, the lobes not or scarcely longer than the tube; leaves not glandular-punctate.5. *Lindenbergia*
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cidal.7. *Adenosma*
- BB. Cells of anther divergent; pedicels not bracteolate; corolla cyanic.
- C. Capsule dehiscent; corolla less than twice the length of the calyx; plants with well-developed stems.

- D. Dehiscence of capsule septicial; anterior filaments seeming to arise from the distal part of the corolla, their proximal portions fused with the corolla-tube.
- E. Sepals distinct, or united $\frac{1}{2}$ length or less, spreading or ascending but not investing capsule; attached anterior filaments forming pubescent ridges; septum of capsule persistent. 8. *Lindernia*
- EE. Sepals united over $\frac{1}{2}$ length into a winged calyx-tube, the tips connivent above the closely invested capsule; attached anterior filaments not forming pubescent ridges; septum of capsule not persistent.9. *Torenia*
- DD. Dehiscence of capsule loculicidal; anterior filaments distinct from deep within corolla-tube.
- E. Sepals united over $\frac{2}{3}$ length, the campanulate calyx-tube usually enclosing the ovoid capsule; upper lip of corolla little shorter than lower, its free lobes rounded; bracts foliose. 10. *Mimulus*
- EE. Sepals united about $\frac{1}{2}$ length, the funnellform tube exposing the capsule which is as wide as long; upper lip of corolla much shorter than lower, its free lobes acute; bracts subulate. 11. *Mazus*
- CC. Capsule indehiscent, globose; corolla 20-25 mm. long, thrice the length of the calyx; plants with short stems, the flowers rising from the bases of the large leaves.12. *Lancea*
- AA. Anther-cells wholly confluent, opening as a single cell; low herbs, with minute flowers (less than 5 mm. long).
- B. Capsule 2-celled throughout; calyx 3-4 lobed, the hemispherical tube wholly enclosing the capsule; leaves opposite on the short stem; stolons none. 13. *Glossostigma*
- BB. Capsule distally 1-celled; calyx 5-lobed, the funnellform tube enclosing only the proximal $\frac{1}{2}$ of the capsule; plants acaulescent, with radical leaves and with stolons.14. *Limosella*

1. SCOPARIA Linnaeus

Scoparia L., Spec. Plant. 116, 1753; Gen. Plant. ed. V, 52, 1754. Genotype, *S. dulcis* L. Generic name from Latin word for broom, in allusion to its habit.

A genus of about 20 Neotropical species, of which the following is adventive to the Old World Tropics.

1. *Scoparia dulcis* L.

Scoparia dulcis L., l.c. "Habitat in Jamaica, Curassao." Apparently described from living material in the Clifford Garden in Holland. (See Monog. Acad. Nat. Sci. Phila. 1: 109, 1935.)

Corolla white. Flowering and fruiting through most of the year.

Waysides and waste places, 750 m. altitude, Dehra Dun to Rajpur, *Stewart* 11159. Probably much more common than this single collection would suggest. One of the commonest Tropical weeds.

2. BRAMIA Lamarck

Bramia Lam., Encyc. Meth., Bot. 1: 459, 1785. Genotype, *B. indica* Lam., the only original species. This was *Brami* of Rheede's Hortus Malabaricus (10: 27, tab. 14, 1690), the name being a native Indian one.

A genus, probably monotypic, occurring through the Tropics of both hemispheres, growing especially on and near sea-coasts.

1. *Bramia monnieri* (Linnaeus) Pennell

Lysimachia monnieri L., Cent. Plant. 2: 9, 1756. "Habitat in America meridionali. Hallman." D. Z. Hallman sent to Linnaeus specimens from Spain, so that it seems probable that the type of this was transmitted from some source in Spanish America. Although not so indicated, this was doubtless the basis of *Gratiola monnieri* L., Syst. Nat. ed. X, 851, Je. 1759, which became *G. monniera* L. in Amoen. Acad. 4: 306, Nov., 1759. The specific name has been generally used in this emended form, as in *Herpestis monniera* (L.) H.B.K., Nov. Gen. et Spec. 2: 366, 1818, the preferred name during the past century, and later in *Bramia monniera* (L.) Drake, Fl. Polyn. Franc. 142, 1892.

Bramia indica Lam., l.c. 459, 1785. "On trouve cette plante dans l'Inde &c au Malabar, dans des lieux humides; nous en avons recu des morceaux de M. Sonnerat, qui ne differe de celle de Rheede" The plants of both hemispheres have proved conspecific, the species being dispersed by ocean currents (cf. Guppy, Plants, Seeds, & Currents in W. Indies & Azores 477, 1917).

Bramia monnieri (L.) Pennell, in Proc. Acad. Nat. Sci. Phila. 75: 10, 1923.

Corolla white or violet-tinged. Flowering through most of year.

Moist soil, springy places, and along streams, below 700 meters altitude.

Peshawar: —, *Qazilbash* (Isl). Hazara: Makend, *Stewart* 9654. Rawalpindi: Rawalpindi, *Stewart* 13812 (ANSP, Gord, GH, NYBG). Shahpur: Ravi R., *Stewart* 1802. Garhwal: Boxar, *Inayat* 25967a (ANSP, UCLA). Kumaun: Berbatti, *N. Gill* 72 (ANSP, UCLA).

3. *MELLA* Vandelli

Mella Vandelli, Fl. Lusit. et Bras. 43, f. 23, 1788. Generic diagnosis only, based upon material from Brazil. As no species was cited, this name was not validly published according to the American Code, but it is to be counted so under the new International Rules of Nomenclature.

Caconapea Cham. in Linnaea 8: 28, 1833. Genotype, *C. gratioloides* Cham., of Brazil, the only original species.

Genus mainly Neotropical, but with a few species in the Old World Tropics. Differs from *Bacopa* Aubl. and *Herpestis* Gaertn. fl. in definitely bilabiate corollas, pinnately veined leaves, and erect habit.

1. *Mella hamiltoniana* (Bentham) comb. nov.

Herpestis hamiltoniana Benth. in Wall., Numer. List Spec. Ind. Mus. n. 3898, 1828, ined.; Scroph. Indicae 30, 1835. "Hab. ad Sukanaghur, *Hamilton* [in 1802-03]." Type not seen nor checked.

This differs from *Mella floribunda* (R. Br.) Pennell, a species of Malaya and northern Australia, in its flowers being sessile instead of pedicelled.

No specimens seen, but according to Hooker (Fl. Brit. India 4: 272, 1884) it occurs in the Punjab, ascending to 900 meters altitude. Through Tropical India.

4. *DOPATRIUM* Buchanan-Hamilton

Dopatrium Buch.-Ham., ex Benth., Scroph. Indicae 30, 1835. Genotype, *D. junceum* (Roxb.) Benth.

A genus of some 10 species in the Tropics of the Old World, Oriental and Ethiopian.

1. *Dopatrium junceum* (Roxburgh) Buchanan-Hamilton

Gratiola juncea Roxb., Pl. Coromand. 2: 16, t. 129, 1798. "Delights in a wet situation. Appears and flowers during the rains."

Dopatrium junceum (Roxb.) Benth., l.c. 31, 1835.

Although throughout the Indian peninsula, this aquatic has been seen in our territory only from the shores of Wular Lake, at 1500 to 1700 meters altitude, in Kashmir. Flowering in July.

Kashmir: Bandipur, *Stewart* 5026; Sopor, *Koelz* 9013.

5. LINDENBERGIA Lehmann

Lindenbergia Lehm., in Link & Otto, Sem. Hort. Hamburg, 1829. (Also see Linnaea 5: Litt.-Ber. 45, 1829.) Genotype, *L. urticaefolia* Lehm., of Nepal, the only original species. Genus named for J. B. G. Lindenberg, authority on European Hepaticae.

A genus of some 20 species, of tropical Asia and Africa. Ours all lowland, or on outer mountain ranges.

KEY TO SPECIES

- A. Corolla 30 mm. long, its lips not over $\frac{1}{2}$ length of tube, both spreading, upper like lower lobes rounded; calyx 8 mm. long, the lobes rounded; leaf-blades oval, attenuate, the larger 12-13 cm. long, 6 cm. wide.....1. *L. grandiflora*
- AA. Corolla 5-15 mm. long, its lower lip nearly as long as tube, its upper arched-projecting; calyx 3-6 mm. long, the lobes acute to obtuse or slightly rounded; leaf-blades elliptic or elliptic-ovate, acute to obtuse, the larger usually 2-5 cm. long, 1-2 cm. wide, occasionally much larger (presumably in wetter situations).
- B. Bracts smaller than main foliage-leaves, the inflorescence forming elongated interrupted spikes; corolla-lips scarcely spreading, the upper distally attenuate, its lobes free at apex and acute; calyx hirsute, the lobes acute; leaf-blades acute, sharply dentate.....2. *L. macrostachya*
- BB. Bracts identical with foliage-leaves, flowers developing in nearly all axils, the upper not aggregated into definite inflorescences; lower lip of corolla de-curved-spreading, the free lobes of both lips rounded; calyx loosely hirsute, the lobes acutish to obtuse-rounded; leaf-blades acutish to obtuse, with acute to crenately rounded dentations.....3. *L. ruderalis*

Possibly within our territory is also *Lindenbergia indica* (L.) Vatke (*Dodartia indica* L., 1753; *L. polyantha* Royle, 1835), which is attributed to the Punjab in Hooker's Flora (p. 262), and said to ascend the Himalayas to 1800 meters altitude. It differs from *L. macrostachya* by having smaller leaves, which are crenately dentate and at tip obtuse-rounded.

1. *Lindenbergia grandiflora* (Buchanan-Hamilton) Bentham

Stemodia grandiflora Buch. Ham. ex Don, Prod. Fl. Nepal. 89, 1825. "In Nepalia ad Narainhetty [prope Kathmandu], Hamilton [in 1802-03] . . ." Type not seen, but description distinctive.

Lindenbergia grandiflora (Buch. Ham.) Benth., Scroph. Indicae 22, 1835.

From Almora eastward to Burma.

Almora: Gangolikat, *Inayat* (DD). Kumaun: E. Kumaun, *Duthie*.

2. *Lindenbergia macrostachya* (Bentham) Bentham

Stemodia macrostachya Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3925, 1831, ined.; in Bot. Reg. 17: sub n. 1470, 1832. "Hab. in India Orientali in Martabania et Oude, *Wallich*"

Lindenbergia macrostachya (Benth.) Benth., Scroph. Indicae 22, 1835.

Corolla yellow. Flowering from early April to early May.

Waste places, on the plains and lower mountain valleys, up to 1800 meters altitude, from Hazara eastward to China and Siam.

Hazara: Abbottabad, *Stewart* 10779 (NYBG); Batrasi, *Stewart* 9629. Rawalpindi: Rawalpindi, *Stewart* 7028, 13829 (GH). Muzaffarabad: Barsala, *Stewart* 14786 (GH, NYBG); Domel-Garhi, *Stewart* 9604. Gurdaspur: Pathankot, *Stewart* 1725. Kangra: Bhadwar, *Koelz* 4304 (USNH); Dharmasala, *Stewart* 1851. Dehra Dun: Bhatta, *Stewart*.

3. *Lindenbergia ruderalis* (Retzius) Voigt

Stemodia ruderalis Retz., Observ. Bot. 5: 25, 1789. "In ruderalis Indiae Or. lectam misit *Cel. Konig*."

Stemodia muraria Roxb., ex Don, Prod. Fl. Nepal. 89, 1825. "In Nepalia, *Hamilton* [in 1802-03]."

Lindenbergia urticaefolia Lehm., in Link & Otto, Ind. Sem. Hort. Hamburg. 1829: 5, 1830. Original not seen, but presumably as in reprint in *Linnaea* 5, Litt. Ber.: 45, 1830. "Hab. in Nepalia." This makes no distinction between generic and specific characters, both elements being proposed as new to science.

Lindenbergia ruderalis (Retz.) Voigt, Hort. Suburb. Calcutta 501, 1845.

Flowers yellow, mostly opening from late July to early October.

Banks and walls, plains and lower mountain-valleys, up to 1400 meters altitude. Occurs from Afghanistan to China.

Chamba: on Dalhousie road (15th mile), *Stewart* 1163 (NYBG); between Kulel [Kalheli] and Musroond [Masrundi], *Gammie* 18496. Kangra: Bhadwar, *Koelz* 4415. Simla: Simla Hills, *Drummond* 585 (DD), 587 (DD), 599 (DD). Dehra Dun: Dehra Dun, *Gammie*; Jharipani, *Stewart* (GH); Landour, *Stewart* 16210 (NYBG); Rajpar to Mussoorie, *Stewart* 11176 (GH). Tehri: Deosari, *Stewart* 11365 (GH, USNH). Rampur: Nirith, *Koelz* 3234 (NYBG). Kumaun: Ganja, *N. Gill* 154; Lolha, *Drummond* 607 (DD); Pithoragarh, *Inayat* 24779 (DD).

6. LIMNOPHILA R. Brown

Ambulia Lam., Encyc. Meth., Bot. 1: 128, 1783. Genotype, *A. aromatica* Lam., of southern India, the only original species. Name, as explained by *Rheede*, Hort. Malab. 10: 11, 1690, is that used by the native Indians ("Ambuli Bramannes dicunt").

Limnophila R. Br., Prod. Fl. Nov. Holl. 442, 1810. Genotype, *L. gratioloides* R. Br., of northern Australia, the only original species. Name, of Greek etymology meaning "lake-loving" from the aquatic habitat, has been made a *nomen conservandum*.

A Palaeotropical genus of about 40 species, most developed in the Oriental Region.

KEY TO SPECIES

- A. Leaves ample (much longer than the internodes), all opposite, the petioles about $\frac{1}{2}$ the length of the oval pinnately veined blades; spikes head-like, usually shorter than the petioles. 1. *L. rugosa*
- AA. Leaves small (about equaling or shorter than the internodes), either whorled or, if opposite, clasping and with longitudinal veins; flowers more loosely disposed.
- B. Leaves all opposite, elliptic-oblong, crenulate; flowers nearly sessile; bracteoles linear-lanceolate, over $\frac{1}{2}$ the length of the lanceolate-attenuate sepals. 2. *L. connata*

BB. Leaves mostly whorled, submersed, pinnatifid, sometimes with uppermost opposite and bearing oblong-lanceolate, serrate, emersed blades; pedicels as long as or longer than the calyx; bracteoles linear-subulate, less than $\frac{1}{2}$ the length of the ovate-caudate sepals.....3. *L. indica*

1. *Limnophila rugosa* (Roth) Merrill

Herpestis rugosa Roth, Nov. Spec. 290, 1821. "In India orientali detexit *Benj. Heyne*."

Stemodia menthastrum Benth, in Wall., Numer. List Spec. Ind. Mus. n. 3927, 1830, ined.; in Bot. Reg. 17: sub tab. 1470, 1832. "*Ambulia menthastrum* Herb. Hamilt.—Hab. in India Orientali: in montibus Monghyr, *Hamilton*." This locality is in Bihar, eastern India.

Limnophila rugosa (Roth) Merr., Interpr. Rumph. Herb. Amboin. 466, 1917.

According to J. D. Hooker (Fl. Brit. India 4: 266, 1884) this occurs from Chamba eastward, doubtless wholly below 1500 meters altitude. An Oriental species, ranging from India to China and the Malay Archipelago.

Almora: below Almora, *Strachey & Winterbottom* 1 (GH).

2. *Limnophila connata* (Buchanan-Hamilton) comb. nov.

Cybbanthera connata Buch. Ham., Prod. Fl. Nepal. 87, 1825. "In Nepalia ad Naranhetty [prope Kathmandu], *Hamilton* [in 1802-03], *Wallich*." *Hamilton*'s specimen to be taken as type. Identified as the species now considered by *Bentham*, *Scroph. Indicae* 23, 1835, and the leaves stated to be cordate-amplexicaule, although the specimens now seen show them nearly or quite distinct and cordate-clasping.

Stemodia hypericifolia Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3934, 1829, ined.; in Bot. Reg. 17: sub tab. 1470, 1832. "Hab. in Napalia Indiae Orientalis, *Wallich*."

Limnophila hypericifolia (Benth.) Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 387, 1846.

A plant of wet places in mountainous India, below 1500 meters altitude; cited by *Hooker* from Kangra (*Edgeworth*) eastward.

Almora: below Almora, *Strachey & Winterbottom* (GH).

3. *Limnophila indica* (Linnaeus) Druce

Hottonia indica L., Syst. Nat. ed. X, 919, 1759. Distinguished from *H. palustris* L. by the single phrase "pedunculis axillaribus unifloris"; but identified by C. F. Gaertner (Fruct. et Semin. Plant. 3: 19, 1805) as his new genus and species, *Hydropityon*, which was by *Sprengel* (cur. L., Syst. Veg. 2: 802, 1825) accounted a synonym of *Limnophila gratiolooides* R. Br.

Limnophila gratiolooides R. Br., Prod. Fl. Nov. Holl. 442, 1810. Based wholly upon *Hottonia indica* L. Type of genus, *Limnophila*.

Ambulia indica (L.) W. F. Wight, in Contrib. U. S. Nat. Herb. 9: 181, 1905.

Limnophila indica (L.) Druce, in Rep. Bot. Exch. Club Brit. Isles 3: 420, 1914.

An aquatic plant, widespread over the Oriental Region. In our area below 1500 meters altitude.

Sialkot: Zafarwal, *Stewart* 645 (ANSP, Gord, GH, NYBG). Kangra: Keshapur, *Koelz* 1601 (ANSP, NYBG).

Related to *Limnophila indica* are *L. sessiliflora* Blume and *L. heterophylla* (Roxb.) Benth., both of which are said by J. D. Hooker (Fl. Brit. India 4: 270, 1884) to occur "throughout India", but which I have not seen from our territory. In both the pedicels are very short and the bracteoles over half the length of the sepals, though the leaves are whorled and pinnatifid.

7. **ADENOSMA** R. Brown

Adenosma R. Br., Prod. Fl. Nov. Holl. 442, 1810. Genotype, *A. coeruleum* R. Br., of northern Australia, the only original species. Name of Greek etymology, meaning "gland-smell", from the plant's odor.

Pterostigma Benth., Scroph. Indicae 20, 1835. Genotype, *P. grandiflorum* Benth. (= *Adenosma glutinosum* (L.) Druce), the first-named of four equally eligible species.

A genus of about 20 Oriental and Australasian species, ours the most northwestern.

1. **Adenosma capitatum** (Bentham) Hance

Stemodia capitata Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3926, 1830, ined., though with 10 citations of specimens of which the first suggested the name: "*Ambulia capitata* Hb. Hamilt. e Qualpira"; validated in Bot. Reg. 17: sub tab. 1470, Feb. 1, 1832. "Hab. in India Orientali: Napalia, Hindustania, Regno Birmanico, Ins. Penang, *Wallich* (v. s. comm. e Mus. Angl. Ind.)."

Erinus bilabiatum Roxb., Fl. Ind. 3: 92, Sept. 1832. "Reared in the Botanic Garden near Calcutta, from seeds received from the Moluccas.

Adenosma capitatum (Benth.) Hance, in Journ. Linn. Soc. 13: 114, 1873.

Adenosma bilabiatum (Roxb.) Merr., Enum. Philipp. Pl. 3: 434, 1923.

According to J. D. Hooker (Fl. Brit. Ind. 4: 264, 1884) this occurs from Kumaun eastward. Widespread through the Indo-Malayan Subregion from India to China and Malacca.

8. **LINDERNIA** Allioni

Lindernia All., in Misc. Taurin. 3: 178, tab. 5, 1766. Genotype, *L. pyxidaria* L. of Europe, the only original species. Genus named for F. B. von Lindern, who first described and illustrated this species.

Vandellia Browne, ex L., Mant. Plant. 1: 89, 1767. Genotype, *V. diffusa* L. of tropical America, the only original species. Genus named for Domingos Vandelli, a Portuguese botanist who sent Linnaeus specimens from Brazil.

Ilysanthes Raf., Ann. Nat. 13, 1820. Genotype, *I. riparia* Raf. of eastern North America, the only original species. Generic name, of Greek etymology, means "mud flower".

Bonnaya Link & Otto, Icon. Plant. Select. 25, tab. 11, 1820. Genotype, *B. brachiata* L. & O. of the Philippine Islands, the only original species. Genus named for the Marquis de Bonnay, a student of Algae.

A genus of 70 or more species, widely distributed over the Earth; most numerous in the warmer portions of the Old World, especially in the Oriental Region.

"By the union of the four-anthered *Lindernia* All. and *Vandellia* L. with the two-anthered *Ilysanthes* Raf. and *Bonnaya* Link & Otto is formed a large and clearly natural genus. It is characterized by the remarkably uniform corolla (with narrow posterior lip much shorter than the widely spreading anterior lip), by similar curiously recurving anterior filaments (the proximal portion of each projecting as if it were an appendage and the filament forked, although actually the process is formed by the sharp in-bending of the filament), and by similar septicidal dehiscence of the capsule (that nearly always leaves the entire septum persisting as a median plate)." ⁴

⁴ Monog. Acad. Nat. Sci. Phila. 1: 137, 1935.

KEY TO SPECIES

- A. Leaf-blades entire, semi-palmately veined, slightly clasping; capsule often tipped by the white callose style-base; sepals distinct or nearly so. (EULINDERNIA)
- B. Capsule ovoid, equaling the sepals and tipped by the white callose style-base; anterior filaments anther-bearing; leaves 3-5 veined.1. *L. pyxidaria*
- BB. Capsule cylindric-ellipsoid, longer than the sepals and slightly or not callose-tipped; anterior filaments sterile; plant lower and more diffuse, the larger leaves 3-veined.2. *L. parviflora*
- AA. Leaf-blades pinnately veined, usually more or less toothed, rounded or cuneate at base; capsule not callose-tipped.
- B. Sepals united about $\frac{1}{2}$ length, at least in anthesis, not exceeded by the capsule; anterior filaments anther-bearing; pedicels ascending; leaf-blades crenately serrate. (TORENOIDES)
- C. Calyx 3.5-4 mm. long, about equaling the widely ovoid capsule; leaf-blades ovate, 1-1.5 cm. long; angles of the stem, sides of petioles, and ridges of calyx ciliate with minute appressed hairs.3. *L. crustacea*
- CC. Calyx 8-9 mm. long, exceeding the narrowly ovoid capsule; leaf-blades oblong-lanceolate, 2-2.5 cm. long; calyx hirsute with spreading hairs, those of the petioles shorter, and the sharp angles of the stem glabrous.4. *L. hookeri*
- BB. Sepals mainly or wholly distinct, much exceeded by the capsule; pedicels divaricate. (VANDELLIA)
- C. Leaf-blades ovate to nearly orbicular, rounded or cordate at base; anterior filaments anther-bearing.
- D. Margin of leaves crenate; stems 2-6 dm. long, laxly spreading, glabrous.5. *L. cordifolia*
- DD. Margin of leaves serrate; stems 0.5 dm. tall, diffusely branched, finely pubescent on the angles.6. *L. nummularifolia*
- CC. Leaf-blades oblong to oblanceolate, cuneately narrowed at base; anterior filaments without anthers (except in *L. angustifolia*).
- D. Margin of leaves denticulate to dentate, the teeth appressed; corolla mostly 7-9 mm. long.
- E. Capsule narrowly cylindric, acuminate, widest about the middle; leaf-blades obscurely denticulate to essentially entire.
- F. Pedicels 15-25 mm. long, equaling or slightly exceeding the foliose bracts; anterior filaments anther-bearing; leaf-blades linear-oblong.7. *L. angustifolia*
- FF. Pedicels 5-12 mm. long, over twice the length of the setaceous bracts; anterior filaments without anthers; leaf-blades lanceolate-oblong.8. *L. verbaenaefolia*
- EE. Capsule linear-subulate, attenuate from below the middle; anterior filaments lacking anthers; leaf-blades oblanceolate, crenate-dentate.9. *L. anagallis*
- DD. Margin of leaves sharply and deeply serrate, the mucronate teeth spreading; corolla 5 mm. long; anterior filaments without anthers.10. *L. ciliata*

1. *Lindernia pyxidaria* Linnaeus

Lindernia pyxidaria L., Mant. Plant. 2: 252, 1771. "Habitat in Virginiae, Alsatae, Pedemontii paludibus spongiosis inundatis." Although mentioned first, the Virginia record is to be considered as supplemental since both the generic and specific names had been taken from the European component. The European plant is largely cleistogamous.

Gratiola integrifolia Roxb., Fl. Ind. 1: 138, 1820. "Native of Bengal, where it appears as a weed in gardens, during the rains."

Vandellia erecta Benth., Scroph. Indicae 36, 1835. "Hab. in Peninsula, Deyra Dhoon, Munghyr, Napalia, Sillet, Assufghur, Regno Birmannico, &c., Wallich, Royle, &c." Specific name, from *Tittmannia erecta* Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3947, 1829, ined., selects Wallich's specimen as type, though which this may be is not indicated.

While the last was described as chasmogamous and with 5-veined leaves, in contrast with the cleistogamy and 3-veined foliage habitual to the European plant, the material at hand fails to support such a characterization; I agree with J. D. Hooker (Fl. Brit. Ind. 4: 281, 1884), Wettstein (in Die Natürl. Pflanzenfam. IV, 3B: 80, 1895), and H. H. Haines (Bot. Bihar & Orissa 634, 1922) in considering the plants of Europe and India identical. Such wide distribution through tropical and temperate zones matches well that of the American *Lindernia dubia* (L.) Barnh. and *L. anagallidea* (Michx.) Penn. *L. dubia* is also extensively cleistogamous. Whether chasmogamy prevails in the warmer parts of the Old World and cleistogamy in the cooler, needs further investigation.

In our area seen only from rice fields and marshy lake-shores, at 1500 to 1700 meters altitude, in the Vale of Kashmir; although it was collected long ago by Dr. Royle near Dehra Dun.

Kashmir: Shalimar, Dal Lake, *Stewart* 3224; Sopor, *Koelz* 9012a; near Srinagar, *Gollan* 9093 (DD).

2. *Lindernia parviflora* (Roxburgh) Haines

Gratiola parviflora Roxb., Pl. Coromand. 3: 3, t. 203, 1819. "Native of low, moist places over India, where it appears and blossoms during rains." Described as with leaf-blades slightly serrate, but J. D. Hooker says "usually entire." All I have seen are so.

Ilysanthes parviflora (Roxb.) Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 419, 1846.
Lindernia parviflora (Roxb.) Haines, Bot. Bihar & Orissa 635, 1922.

Moist places, through much of lowland India; in the Himalayas up to 1800 meters altitude.

Gurdaspur: Pathankot, *Stewart* 1030 (ANSP, NYBG). Kangra: Keshapur, *Koelz* 1612 (NYBG); Kulu, *Koelz* 7502 (USNH).

3. *Lindernia crustacea* (Linnaeus) F. v. Mueller

Capraria crustacea L., Mant. Plant. 87, 1767. "Habitat in Amboina; China." Amboina plant described by Rumphius, Herb. Amboin. 5: 461, t. 170, f. 3, and verified by Dr. E. D. Merrill, Interp. Rumph. Herb. Amboin. 468, as the species now considered.

Vandellia crustacea (L.) Benth., Scroph. Indicae 35, 1835.

Lindernia crustacea (L.) F. v. Muell., Cens. Austral. Pl. 97, 1882.

Originally an Oriental species, but now widespread as a weed over the tropical parts of the Old and New World. In our area up to 1600 meters altitude.

Kangra: Baij Nath, *Nath*; Kangra, *Koelz* 10344. Dehra Dun: Dehra Dun, *Stewart* 11482, 14679 (GH, NYBG); to Deosari beyond Mussoorie, *Stewart* 11366.

4. *Lindernia hookeri* (Clarke) Wettstein

Vandellia hookeri Clarke, ex Hook., Fl. Brit. Ind. 4: 280, 1884. "Sikkim Terai, at Sili-goree, Clarke. Khasia Mts.; in cultivated fields at Pomrang, &c., J. D. H. & T. T. Pegu, Kurz. Behar; at Parasnath, Thomson, Clarke."

Lindernia hookeri (Clarke) Wettst. in Die Natürl. Pflanzenfam. IV 3b: 79, 1891.

This species of the moist eastern Himalayas and other mountains of eastern India is described as "softly hairy all over", whereas the plant from Kumaun, westward in the Himalayas, is much less hairy, the leaves being sparsely pubescent on the veins beneath and the stem essentially glabrous. In this it differs also from the eastern subspecies, *L. h. cochinchinensis* Bonati, which is described as with stems somewhat villose in the "sillons". So I propose it as a corresponding western subspecies.

Lindernia hookeri kumaunensis subsp. nov.

Plate 1, A.

Stem 4-5 cm. tall, sharply angled, glabrous or with a few short hairs. Leaves 2.5 cm. long, oblong-lanceolate, obtuse, crenately serrate, glabrous except for fine pubescence on veins beneath, cuneate to short hirsute petioles. Pedicels spreading, 5-10 mm. long, finely pubescent or usually glabrate. Calyx 8 mm. long, hispid with spreading hairs, the lance-attenuate sepals at first united about half length, but later separating irregularly to base. Capsule 4-5 mm. long.

Caulis glaber glabratusve; folia venis subtus pubescentia.

Type, at 900 to 1200 meters altitude, Kali Valley, Kumaun, collected in fruit September 23, 1884 by J. F. Duthie, no. 3239; in Dehra Dun Herbarium. Only collection seen.

5. *Lindernia cordifolia* (Colsmann) Merrill

Gratiola cordifolia Colsm., Prod. Desc. Grat. 15, 1793; reprinted in Archiv für Botanik 2: 244, 1799. "Habitat in graminosis humidiusculis Zeylon[a]e [a D. König detectal." Margin of leaf-blades described as "obsolete serrata."

Vandellia pedunculata Benth., Scroph. Indicae 37, 1835. "Hab. in Ceylona, Macrae, ad Sillet, Wallich."

Lindernia cordifolia (Colsm.) Merr., Enum. Philipp. Pl. 3: 437, 1923.

Widely distributed in tropical Asia and Malayan, Oriental and Australasian regions. In western Himalayas ascending to 1200 meters altitude.

Kangra: Baijnath, Koelz 4600 (USNH). Garhwal: Sitahani, Kotah Range, Inayat 25967. Almora: Almora, Strachey & Winterbottom 2.

6. *Lindernia nummularifolia* (Don) Wettstein

Vandellia nummularifolia D. Don, Prod. Fl. Nepal. 86, 1825. "Hab. in Nepalia, Wallich."

Vandellia sessiliflora Benth., Scroph. Indicae 37, 1835. "Hab. in Regno Birmannico ad Taong Dong montem, Wallich." This had earlier been named *Torenia sessiliflora* Benth., in Wall. Numer. List Spec. Ind. Mus. n. 3959, 1830, ined., bearing only the data: "Toong Dang Andr. 1826." Supposedly differing by subsessile flowers, but Haines states that on the same plant the pedicels vary from 0 to $\frac{1}{4}$ inch long.

Vandellia minima Royle, ex Benth., l.c. 37, 1835. "Hab. in Mussooree, Royle." Supposedly differing by sessile flowers, and from the last by more deeply cleft sepals, but later treated as identical by J. D. Hooker in 1834.

Lindernia nummularifolia (Don) Wettst., in Die Natürl. Pflanzenfam. IV, 3B: 79, 1891.

Banks and walls, widespread through lowland southeastern Asia, Oriental Region; ascending in our area to 1200 meters altitude.

Simla: Simla Hills, *Drummond* 584 (DD). Dehra Dun: Landour, *Stewart* 14226 (Gord, GH, NYBG), 16836 (NYBG); Mussoorie, *Stewart* 11266; above Rajpur, *Stewart* 11163.

7. *Lindernia angustifolia* (Bentham) Wettstein

Vandellia angustifolia Benth., *Scroph. Indicae* 37, 1835. "Hab. in Napalia, *Wallich*, ad Nathpur, *Hamilton* [in 1802-03]." This had been proposed in 1830 as the nomen nudum, *Tittmannia angustifolia* Benth. in *Wall.*, *Numer. List Spec. Ind. Mus.* n. 3951. Isotype, *Wallich* 3951, seen in *Herb. Academy of Natural Sciences of Philadelphia*.

Lindernia angustifolia (Benth.) Wettst., in *Die Natürl. Pflanzenfam.* IV: 3b: 79, 1891.

Probably widespread over southeastern Asia, Oriental Region; in our area seen only from fields at 1200 meters altitude in Dehra Dun.

Dehra Dun: Deosari beyond Mussoorie, *Stewart* 11363 (ANSP, NYBG).

8. *Lindernia verbenaefolia* (Colsmann) comb. nov.

Gratiola verbenaefolia Colsm., *Prod. Desc. Grat.* 8, 1793; reprinted in *Archiv für Botanik* 2:242, 1799. "Habitat in India orientali [a *D. König* detecta]." Descriptive of the species now considered, calling for a plant with lanceolate, very entire leaves, inflorescences ("pedunculus") 2-4 inches long (so definitely racemose), pedicels only 7-8 mm. long ("pedicelli semiunguiculares"), and bracts setaceous, short. All these qualifications are realized in the present plant.

In spite of the opinion of H. H. Haines (*Bot. Bihar & Orissa* 634, 1922) that this and *Lindernia angustifolia* are but forms of the same species, I think it more probable that they will prove distinct. Perhaps closer, as was thought by J. D. Hooker (*Fl. Brit. Ind.* 4: 285, 1884), is the relationship to the following species, agreement being especially in the minute bracts, but I think that they are separable by leaf- and capsule-form. The supposed difference in the development of the anterior pair of anthers needs checking by a much more ample series of specimens.

Widespread over southeastern Asia and western Malay Archipelago, Oriental Region; seen in our area only from Dehra Dun.

Dehra Dun: "Deyrah Doon", (DD).

9. *Lindernia anagallis* (Burmenn) Pennell

Ruellia anagallis Burm., *Fl. Ind.* 135, 1768. "Habitat in Java & Amboina." Based upon plants collected in Java by *Kleinhof* and in Amboina by *Rumphius*, the latter with accompanying illustration. Identified as the species now considered by *Merrill* in *Philipp. Journ. Sci.* 19: 381, 1921.

Lindernia anagallis (Burm.) Penn., in *Journ. Arnold Arbor.* 24: 252, 1943.

This is the plant that in *Hooker's Flora of British India* (4: 285, 1884) was called *Bonnaya veronicaefolia* and which has recently been known as *Lindernia antipoda* (L.) *Alston*. My identification of *Ruellia antipoda* L. as a different species from this to which *Dr. Merrill* has applied that name has been recently explained in the *Journal of the Arnold Arboretum*.

A common weed of southeastern Asia and the Malay Archipelago, Oriental Region. In the western Himalayas ascending to 1400 meters altitude.

Gurdaspur: Shalpur, near Pathankot, *Stewart* 1800. Chamba: Dharmasala, *Gammie* 18759. Kangra: Baijnath, *Koelz* 4576 (USNH). Kumaun: Bachawan, *N. Gill* 51.

10. *Lindernia ciliata* (Colsmann) Pennell

Gratiola ciliata Colsm., Prod. Descr. Grat. 14, 1793; reprinted in Archiv für Botanik 2: 243, 1799. "E Java. Königius non invenit." An excellent description of the species now considered.

Bonnaya brachiata Link & Otto, Icon. Plant. Select. 25, t. 11, 1820. "Habitat in Manila. E seminibus a Dno. Doctore de Chamisso circa urbem Manila in sabulosis collectis enata est." Illustration shows well the leaves of the species now considered.

Gratiola serrata Roxb., Fl. Ind. 1: 140, 1820. "Native of Bengal." Description clearly of the species now considered.

Lindernia ciliata (Colsm.) Penn., in Journ. Arnold Arbor. 24: 253, 1943.

A widespread species of southeastern Asia and the Malay Islands, Oriental Region. In the western Himalayas ascending to 1200 meters altitude.

Kangra: Baij Nath, *Nath* 457 (ANSP, Gord). Ambala: Chandgarh, *D[uthie]* 8361 (DD). Dehra Dun: Dehra Dun, *Stewart* 14681 (ANSP, GH, NYBG). Kumaun: Jeolikote, *N. Gill* 182.

9. **TORENIA** Linnaeus

Torenia L., Spec. Plant. 619, 1753; Gen. Plant. ed. V, 271, 1754. Genotype, *T. asiatica* L., the only original species. Genus named for Olof Toren, who had gathered this species in India.

A genus of about 30 species of the Old World Tropics, mostly Oriental.

1. *Torenia cordifolia* Roxburgh

Torenia cordifolia Roxb., Pl. Coromand. 2: 52, t. 161, 1798. "Native of the moist pasture lands about Samulcotah," southern India. No specimens seen from southern India, but presumably the descriptive matter in the key to this genus in J. S. Gamble's Flora of the Presidency of Madras 5: 955, 1923, is applicable to this species there, although possibly it has been somewhat modified to agree with the account in Hooker's Flora of British India 4: 276, 1884. The Himalayan plant has leaf-blades cuneate-truncate at base, lying within Gamble's phrase "cuneate or subcordate at base", but its calyx seems narrower than Gamble's phrase "broadly ovoid."

Corolla violet-blue, opening in August and September.

Moist places, India to China and Java; in our area eastward from Simla, at altitudes of 1200 to 1600 meters.

Simla: Simla Hills, *Drummond* 598 (DD), 610 (DD). Dehra Dun: Rajpur, *Stewart* 14553, 17048 (NYBG). Tehri: Deosari, *Stewart* 11305; Kolti, *Stewart* 15692.

10. **MIMULUS** Linnaeus

Mimulus L., Spec. Plant. 634, 1753; Gen. Plant. ed. V, 283, 1754. Genotype, *M. ringens* L. of eastern North America, the only original species.

A large genus of North and South America; one section also slightly represented in the Tropics of the Old World.

1. *Mimulus strictus* Bentham

Mimulus strictus Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3918, 1830, ined., "Ragmall 1820"; Scroph. Indicae 28, 1835. "Hab. in Rajemahl, Wallich, ad Kheeree Pass, Royle." Wallich's collection to be taken as type.

Although this was reduced to the synonymy of the Australian *Mimulus gracilis* R. Br. by Bentham himself in 1846 (in DC., Prod. Syst. Nat. Regn.

Veg. 10: 369), it seems distinct by possessing wider and longer leaves, longer calyces, and shorter pedicels, the Australian plant (as shown by a Queensland specimen in the Academy's herbarium and by the measurements in Ewart's Flora of Victoria, p. 1016, 1930) having linear-oblong to oblong leaves up to 3 cm. long, calyx only 5 mm. long, but pedicels 4-6 cm. long. The two seem to differ also in color, the corolla of *M. gracilis* being described by Ewart as "violet, purple or blue with yellowish protuberances", while that of the plant of India is stated by J. D. Hooker (Fl. Brit. India 4: 259) to be "white or pale blue" and by R. R. Stewart for his no. 17360 "almost white."

Widespread in tropical Asia and Africa, the Oriental and Ethiopian regions; in our territory along streams or in wet places on the plain and in lower mountain valleys up to 1500 meters altitude. Flowering from February to May.

Muzaffarabad: Bataki to Dhanni, in Kishanganga Valley, *Stewart* 17360. Rawalpindi: Rawalpindi, *Stewart* 13828 (ANSP, NYBG), 13864 (Gord), 16249 (GH). Punch: Mandi, *Stewart*. Gurdaspur: Domera, *Stewart* 1242; Pathankot, *Stewart* 1315, 1750 (Gord). Chamba: Chamba, *Stewart* 2299. Kangra: Baijnath, *Koelz* 4601 (USNH). Kumaun:, *Strachey & Winterbottom* (GH).

11. MAZUS Loureiro

Mazus Lour., Fl. Cochinch. 385, 1790. Genotype, *M. rugosus* Lour. of Indo-China, the only original species.

A genus of about 20 species, Oriental and Australasian.

KEY TO SPECIES

- A. Plants not stoloniferous; leaf-blades often acutely dentate.
 - B. Corolla 15-20 mm. long; main leaf-blades elliptic-oblong to ovate, acute, proximally rounded or subcordate to petioles; plants glabrate. 1. *M. dentatus*
 - BB. Corolla 7-9 mm. long; leaf-blades narrower, proximally tapering to the sessile or nearly sessile bases.
 - C. Pedicels and stem densely hirsutulous, the former shorter than the calyces; main leaf-blades oblanceolate to narrowly obovate, long-cuneate to the essentially sessile bases. 2. *M. delavayi*
 - CC. Pedicels and stem less densely hirsute, somewhat glandular, usually at least the lower pedicels as long as or longer than the calyces; leaf-blades oblanceolate, runcinate-lobed toward the attenuate bases.
 - 3. *M. goodenifolius*
- AA. Plants extensively stoloniferous; leaf-blades with rounded teeth or lobes; lower pedicels about as long as calyces; corolla 7-12 mm. long. 4. *M. surculosus*

1. *Mazus dentatus* Wallich

Mazus dentatus Wall., Numer. List Spec. Ind. Mus. n. 3914, 1830, ined. "Napalia 1821"; ex Benth., Scroph. Indicae 27, 1835. "Hab. in Napalia, Wallich."

In Hooker's Flora of British India (4: 260, 1884) this is extended west to Kumaun on the basis of a collection of *Strachey & Winterbottom*. It occurs eastward to Assam.

2. *Mazus delavayi* Bonati

Mazus delavayi Bonati, in Bull. Herb. Boiss. ser. II, 8: 530, 1908. "Habit. Yunnan, champs pres de Ta-pin-tze (*Delavay*) 1885 n° 1518 type herb. Mus. Paris." Topotype, *Delavay* 933, collected April 18, 1884, seen in Bonati Herbarium.

Mazus divaricatus Bonati, l.c. 534, 1908. "Habit. Sikkim (Anderson) 1862 n° 274 (Herb. Mus. Berlin)." Isotype, collected in Rungno Valley, May, 1862, seen in Bonati Herbarium. This was described as more diffuse and repent, and such plants occur in the western as in the eastern Himalayas. I agree with Dr. Stewart that they represent merely a more depressed and perhaps later stage of *M. delavayi*. The isotype is diffuse, but other specimens show the horizontal stems rooting at the nodes.

Corolla pale or white.

Rice fields, and along streams and ditches, lowland and lower valleys up to 2200 meters altitude.

Attock: Hasan Abdal, *Stewart* 13873. Hazara: Abbottabad, *Stewart* 13702 (ANSP, Gord, GH, NYBG); Dugabela, Shinkiyari, *Inayat* (DD); Malkandi, Kagan Valley, *Inayat* (DD). Rawalpindi: Murree Road (17th mile), *Stewart* 19401 (ANSP, Gord, NYBG, USNH); Rawalpindi, *Stewart* 13824 (NYBG). Muzaffarabad: Garhi to Uri, *Stewart* 14011 (GH, NYBG); Keran to Reshna, *Stewart* 17691 (ANSP, NYBG); Titwal, *Stewart* 17411 (Gord). Punch: Hagira, *Stewart* 12007a (NYBG, USNH); Mandi, *Stewart* 12016; Punch, *Stewart*. Kashmir: Ganderbal to Kangan, *Stewart* 6224; Khadmar, Baramula, *Keshavanand* 1170 (DD); Pahlgam, *Stewart* 9451a; Srinagar, *Gammie*; Tangmarg, *Stewart* (NYBG); Tragbal, *Stewart* 18457. Kangra: Bhadwar, *Koelz* 4254 (NYBG); Keshapur, *Koelz* 1646. Simla: Simla Hills, *Drummond* 611 (DD). Dehra Dun: Dehra Dun, *Duthie*; Mussoorie, *Stewart* 14208.

3. *Mazus goodenifolius* (Hornemann) Pennell

Gratiola goodenifolia Hornem., Enum. Pl. Hort. Hafn. 19, 1807. Original not seen, but diagnosis⁵ quoted in Willd., Enum. Pl. Hort. Berol. 654, 1809, where it is included as a synonym of *Hornemannia bicolor* Willd., there described from "India orientalis." I suspect from the alteration of Willdenow's primary diagnosis to "H. foliis obovatis basi integerrimis, calycibus patulibus pedunculisque glabris", that the latter was primarily based upon material of *Mazus japonicus*, since the omitted account of an incised-serrate narrow leaf-blade would denote the plant now considered, while the allusion to glabrous pedicels and calyces could only be to *M. japonicus*. In both the corolla would be bicolorous, the upper lip blue, the lower white.

Mazus goodenifolius (Hornem.) Penn., in Journ. Arnold Arbor. 24: 249, 1943.

Moist soil, plains, below 500 meters altitude. Widespread over lowland southeastern Asia, in the Oriental Region.

Lahore: Lahore, *Stewart* 834 (ANSP, Gord). Sialkot: Sialkot, *Stewart* 669. Gurdaspur: Chakki River, Jhandwal, *Stewart* 917 (ANSP, Gord, NYBG); Pathankot, *Stewart* 1042.

This is a tropical plant, whereas *Mazus japonicus* (Thunb.) Kuntze pertains to warm temperate floras.

4. *Mazus surculosus* Don

Mazus surculosus Don, Prod. Fl. Nepal. 87, 1825. "Habitat in Nepalia. *Wallich*." Description distinctive.

Mazus harmandi Bonati, in Bull. Herb. Boiss. II, 8: 533, 1908. "Habit. Himalaya occidentalis, Simla. (*Dr. Harmand*) Oct. 1888." "typ. Herb. Mus. Paris." Name applied to a more widely diffuse state, with more rounded leaf-blades, which Dr. Stewart believes to be of ecologic rather than taxonomic significance.

⁵ "Gratiola (goodenifolia) foliis obovato-lanceolatis inciso-serratis basi integerrimis, racemis terminalibus."

Sunny grassy places, at altitudes of 1500 to 2200 meters, from Udhampur eastward to Assam.

Udhampur: Jumu road to Batot Pass, *Stewart* 12536 (ANSP, NYBG). Chamba: Chuari & Chamba road, *Harsukh* (DD). Kangra: Dharmsala, *Stewart* 10304 (NYBG); Kasol, Parbati Valley, *Koelz* 4888 (USNH); Kulu, *Koelz* 32 (ANSP, NYBG), 4633 (USNH). Simla: Simla, *Drummond* 601 (DD); Simla Hills, *Drummond* 608 (DD). Dehra Dun: Landour, *Stewart* 10961 (ANSP, GH); Mussooree, *Royle*. Naini Tal: Bhimtal, *Inayat* (DD).

12. LANCEA Hooker & Thomson

Lancea Hook. f. & Thoms., in Journ. Bot. 9: 244, 1857. Genotype, *L. tibetica* Hook. f. & Thoms., the only original species. Genus named for "Mr. Lance, of the Bengal Service, to whom we are indebted for some interesting Tibetan and Kashmir plants, contributed through our friend, M. P. Edgeworth, Esq."

A Tibetan genus of a few species.

1. *Lancea tibetica* J. D. Hooker & T. Thomson

Lancea tibetica Hook. f. & Thoms., l.c. 244, t. 7, 1857. "In regione alpina et subalpina Tibetiae orientalis et occidentalis necnon Himalayae provinciae Sikkim; alt. 10-15,000 ped."

Usually with short rounded glabrous leaves, but these sometimes varying in form, size, and hairiness, an extreme combination being forma *pubescens* form. nov. to be characterized as follows: leaf-blades longer, 5-6 cm. long, and persistently pubescent on the upper surface (folia majora, 5-6 cm. longa, supra pubescentia). It may be typified by a collection in the Academy's herbarium made by the Schlagintweit brothers, on the right side of the Indus valley, between Leh and Kaltse, Ladakh, in flower July 12-14, 1856; and is represented in the Gray Herbarium by their number 909, from the left bank of the Indus near Leh, July 5-10, 1856. But Dr. R. R. Stewart's recent collections from Leh, made in July 1912 or 1913, contain both this form and specimens transitional to the usual glabrous shorter-leaved plant.

Flowers "deep rich purple, upper lip spotted paler" (note with *Koelz* 2319), opening in July and August.

Boggy places and shores of rivers and lakes, at altitudes of 3,300 to 4,400 meters, from Ladakh to Sikkim, or beyond. The following records are of supposedly typical plants, the leaves varying from sparsely hirsute above when young to wholly glabrous.

Baltistan: Kargong, *Koelz* 9837 (ANSP, USNA). Ladakh: Leh, *Stewart*; Shushal, *Koelz* 2443b (NYBG); Tsakzhun Tso, *Koelz* A114 (ANSP, NYBG); Tumti La to Kharbu Koma, *Schlagintweit*; upper Indus Valley, *Stewart* 155. Rupshu: Hanle, *Koelz* 2305a (GH, NYBG), 2319 (GH, NYBG, USNH).

13. GLOSSOSTIGMA Arnott

Peltimela Raf., Atlant. Journ. 199, 1833. Genotype, *P. cuneata* Raf., the only original species.

Glossostigma Arnott, ex Benth. in Compan. Bot. Mag. 2: 59, 1836. Genotype, *G. spatulatum* (Hook.) Arn., the only original species. Generic name, of Greek etymology, means "tongue-stigma." Curiously enough, this name for such a small genus of remarkably obscure plants, has been made a *nomen conservandum*. It should surely be stricken from the list.

About 3 species, in the Tropics of the Old World.

1. *Glossostigma spathulatum* (Hooker) Arnott

Microcarpaea spathulata Hook., ex Wight in Bot. Misc. 2: 101, suppl. tab. 4, 1831.
 "Found in wet soil, near tanks." From Negapatam in Madras, southern India.

Peltimela cuneata Raf., l.c. 199, 1833. "Habitat" Although brief and without statement of source of material, the description well characterizes this species.

Glossostigma spathulatum (Hook.) Arn., l.c. 59, 1836.

Wet soil, shores of ponds and rivers, tropical India; Oriental Region. In our area on the upper Gangetic plain.

Saharanpur: Saharanpur, (DD). Shahjahanpur: banks of Gumti near Sudalpur, *Duthie* 4252 (DD).

14. **LIMOSELLA** [Lindern] Linnaeus

Limosella L., Spec. Plant. 631, 1753; Gen. Plant. ed. V. 280, 1754. Genotype, *L. aquatica* L., the only original species. Generic name, of Latin etymology, alludes to the muddy habitat of this species.

A small, but nearly cosmopolitan, genus; species about 15.

1. *Limosella aquatica* Linnaeus

Limosella aquatica L., Spec. Plant. 631, 1753. "Habitat in Europae septentrionalis inundatis." Type seen in Linnean Herbarium at the Linnean Society in London, England. As Linnaeus first used this generic name in his *Flora Lapponica* of 1737, it seems evident that the type came from Lapland or northern Sweden.

Muddy shores of ponds and lakes, widespread over the North Temperate Zone, both Palaearctic and Nearctic. In the western Himalayas from Kashmir to Lahul, at altitudes of 2800 to 3500 meters.

Kashmir: Sonamarg, *Stewart* 9681 (ANSP, DD, Gord, GH, NYBG, USNH). Ladakh: Dras, *Stewart* 21180 (ANSP, NYBG); Marsho, *Koelz* 6375 (NYBG). Lahul: Sisu, *Koelz* 830. Spiti: Kanzam La, *Koelz* 6967 (NYBG). Zaskar: Shagam, *Koelz* 2978 (DD, NYBG, USNH).

Tribe II. **VERBASCEAE**

Tribe consisting mainly of the following genus.

15. **VERBASCUM** [Bauhin] Linnaeus

Verbascum L., Spec. Plant. 177, 1753; Gen. Plant. ed. V. 83, 1754. Genotype, *V. thapsus* L., of Europe; see Proc. Acad. Nat. Sci. Phila. 82: 14, 1930.

Celsia L., Spec. Plant. 621, 1753; Gen. Plant. ed. V. 272, 1754. Genotype, *C. orientalis* L., of Cappodocia and Armenia, the only original species. Generic name commemorates Olof Celsius, distinguished Swedish botanist, professor in the University of Uppsala and early patron of Linnaeus.

By Linnaeus these two genera were placed in different classes, *Verbascum* in Pentandria, with five stamens, and *Celsia* in Didynamia, with four stamens in two pairs. Also, although such characters were not mentioned in Linnaeus' *Genera Plantarum*, there would have seemed to be ample vegetative distinction between the relatively undivided leaves of the former and the bipinnatifid foliage of the latter. But Linnaeus concluded his account of *Celsia* with the comment that his adduced characters show how well it differs from *Verbascum*, an acknowledgment of the real relationship of the two.

After Linnaeus' time many species were added to both genera, until by 1846, when Bentham revised the Scrophulariaceae for DeCandolle's *Prodromus Systematis Naturalis Regni Vegetabilis* (10: 224-248), the two were placed next each other, with 92 species in *Verbascum* and 24 in *Celsia*. Only the number of stamens could be counted upon to distinguish them, while parallel species and sections were recognized in each genus. Most of the species now put in *Celsia* had relatively simple foliage that suggested in aspect Linnaeus' group of *Verbascum*; in fact one of his species, which further acquaintance had shown to have only four stamens, had been transferred to *Celsia*. In Bentham and Hooker's *Genera Plantarum* (2: 928-929) of 1873 the two genera were kept apart, but with the comment under *Celsia*: "Genus a *Verbascum* non differt nisi staminis quinti defectu, et a nonnullis cum eo jungitur."

It was in 1891 that Kuntze (*Revisio Generum Plantarum* 1: 468) definitely combined *Verbascum* and *Celsia*, making the necessary specific combinations under the former. He commented on the existence of *Verbascum celsioides* Bentham with either 4 or 5 stamens, on the close resemblance of *Celsia coromandeliana* Vahl to *Verbascum virgatum* With., and of *Verbascum arcturus* L. and its associates to *Celsia cretica* L.f., on the didynamy of the stamens apparent in much of *Verbascum* as well as in *Celsia*, and finally on Nees' evidence that the fifth posterior stamen is often sterile or incomplete in *Verbascum*.

In his recent studies of these genera, the most detailed ever made, Murbeck maintains the validity of these two genera, but his eventual treatment involves considerable shifting of species. First appeared his monograph of *Celsia* in *Acta Universitatis Lundensis* (22, n. 1: 1-237, tab. 1-16) in 1926. Later, in the same journal (29, n. 2: 1-630, tab. 1-31) in 1933, came his monograph of *Verbascum*. Comparing the keys to species in these papers one discovers that in both genera there is a primary division into *Aulacospermae* (with seeds longitudinally 6-9-sulcate and -costate), containing 1 species of *Verbascum* and 6 of *Celsia*; and *Bothrospermae* (with seeds transversely foveolate), containing 251 species of *Verbascum* and 68 of *Celsia*. The flowers are in fasciculate clusters in 199 species of *Verbascum*, and 1 of *Celsia*; while they are solitary to each axil in 53 species of *Verbascum*, and 73 of *Celsia*. The indumentum consists of branching hairs in most species of *Verbascum*, and in 9 species of *Celsia*; but of simple, often gland-tipped, hairs in the remaining species of *Verbascum* and in most species of *Celsia*. In the later monograph Murbeck transfers to *Verbascum* from *Celsia* a number of 4-stamened species clearly related to 5-stamened species of *Verbascum*, thus eliminating from *Celsia* all fasciculate-flowered species. He reaches the following contrast:

"*Verbascum*. Flores in bractearum axillis aut fasciculati aut solitarii. Stamina 5, raro (apud [9 species]) medianum in floribus nonnullis vel fere omnibus deficiens. Placentae sessiles, peltatae, plerumque in facie externa tantum ovuliferae. Capsula globosa vel oblonga vel breviter cylindrica.

"*Celsia*. Flores in bractearum axillis semper solitarii. Stamina 4; quintum medium interdum ut rudimentum obvium, raro in floribus nonnullis bene evolutum. Placentae sessiles, peltatae, in facie externa ovuliferae. Capsula globosa v. ovoidea, ad summum duplo longior quam latior."

In all this there is little convincing difference. Capsule distinctions, and especially placental ones, were introduced to distinguish both these genera from *Staurophragma* Fisch. & Mey., rather than to contrast *Verbascum* and *Celsia*. But there are definite trends between the latter, which might be summarized as follows: *Verbascum* has stamens usually five, flowers usually fasciculate, and hairs usually branching; and *Celsia* has stamens nearly always four, flowers always solitary to an axil, and hairs always simple. But surely such trends should not constitute genera.

Murbeck says that he can not see the necessity of combining *Verbascum* and *Celsia*, and that this is not practicable until one can see where the *Celsia* species will fit into an enlarged genus. From his presentation it is clear enough that *Verbascum* is a single coherent group, with an amazing preponderance of species in the Levant. *Celsia* falls into several groups taxonomically, and has a more diffuse type of distribution, even though no single species ranges as widely as do a few of the most aggressive *Verbascum*. Assuming, as has been so long done, that *Verbascum* is an ancient group, as shown by its retention of the fifth stamen, thus completing the symmetry of the pentamerous flower, one is at a loss to account for its localization as well as for the presence of some remarkably aggressive members. But, if, on the other hand, the view first proposed by Charles Robertson and developed in my Scrophulariaceae of Eastern Temperate North America⁶ be correct, that *Verbascum*, like *Capraria*, both now regular-flowered and pentamerous, has come from zygomorphic tetrandrous ancestry, I think that the situation becomes comprehensible and natural. The species hitherto included in *Celsia*, in their greater zygomorphy as well as in their simple hairs and solitary flowers, would be relatively primitive, and it is natural to find them divided into more pronounced subgroups and more widely dispersed geographically. But those with five stamens and more open corollas are in these points, as well as in their trend to branching hairs and to fasciculate disposition of the flowers, more modern, and form a group with close geographical coherence; this has developed into a great number of species, and in *Verbascum blattaria* and especially *V. thapsus* has developed remarkably adaptable and aggressive species.

⁶ Monog. Acad. Nat. Sci. Phila. 1: 34. 1935.

It seems to me that Kuntze's reasons for uniting *Verbascum* and *Celsia* into a single genus are most cogent, and that we need a phylogenetic rearrangement of the species of the enlarged genus *Verbascum*. Doubtless, the resurrection of the fifth stamen has occurred in more than one subgroup, and is of less significance taxonomically than other characters that should be stressed.

KEY TO SPECIES

- A. Stem, pedicels, calyces, capsules, and leaves with hairs simple or lacking; pedicels solitary, spreading, longer than the subglobose capsules; lower leaves lobed.
- B. Stamens usually 4, the filaments villose with yellowish hairs; corolla 10-15 mm. wide; leaves sharply dentate, the lower usually deeply lobed; pubescence fine, the hairs obscurely gland-tipped.1. *V. coromandelianum*
- BB. Stamens 5, the filaments villose with purple-violet hairs; corolla 25-30 mm. wide; leaves usually less sharply dentate, the lower less deeply lobed; pubescence sparser, the hairs with conspicuous glandular tips.2. *V. blattaria*
- AA. Stem, pedicels, calyces, capsules, and leaves with branched non-glandular hairs; pedicels fasciculate, more ascending, shorter than or equaling the ovoid capsules; stamens 5; lower leaves crenulate or denticulate.
- B. Cauline leaf-blades ovate or oval, usually darker green and less pubescent above, upper rounded-cordate at base, only the lower narrowed basally, none decurrent; inflorescence paniculately branched, interrupted, the flowers in fascicles of 2 to 5, the pedicels becoming 4-6 mm. long, about equaling the capsules3. *V. erianthum*
- BB. Cauline leaf-blades oblanceolate to ovate-oblong, permanently densely tomentose on both surfaces, all narrowed proximally and long-decurrent; inflorescence unbranched, very dense, the flowers few (usually maturing singly) to a fascicle, the pedicels very short, much shorter than the capsules.
4. *V. thapsus*

1. *Verbascum coromandelianum* (Vahl) Kuntze

Celsia coromandeliana Vahl, Symb. Bot. 3: 79, 1794. "Habitat in India orientali. König."

Verbascum celsioides Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 229, 1846. "In Indiae orientalis prov. Kunawur (*Edgeworth!*)" Described by Benthham as with stamens always five, but by J. D. Hooker, Fl. Brit. Ind. 4: 250, 1883, as with stamens four or five. I agree with Murbeck in accounting this a synonym of *Celsia coromandeliana*. In fact, Benthham's type material was culled from a collection of the latter.

Verbascum coromandelianum ("coromandelicum") (Vahl) Kuntze, Rev. Gen. Plant. 1: 468, 1891.

Widespread over lowland India, in the western Himalayas below 1000 meters altitude. Flowering from April to July.

Attock: Hasan Abdul, *Stewart* 7001. Rawalpindi: Rawalpindi, *Stewart* 13816 (Gord, NYBG); Saidpur R., *Stewart* 6253 (NYBG); Sohan R., *Stewart* 7026. Gurdaspur: Shahpur near Pathankot, *Stewart* 1798. Kumaun: *Strachey & Winterbottom* (GH).

2. *Verbascum blattaria* Linnaeus

Verbascum blattaria L., Spec. Plant. 178, 1753. "Habitat in Europae australioribus locis argillaceis."

A weed, now widely distributed over the Earth. As yet collected at only a single station in Kashmir, where doubtless naturalized.

Kashmir: Ganderbal ("Gunderbal"), *Gammie, Stewart* 7494.

3. *Verbascum erianthum* Bentham

Verbascum erianthum Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 235, 1846. “? in regno Cabulico (*Griffiths* [*Griffith*]! n. 630), in Armenia (*Aucher!*) (v. in herb. Hook. et DC.)” Boissier, in his Flora Orientalis 4: 320, 1879, informs us that Aucher's Armenian specimen is not the same as *Griffith* 630, which he credits definitely to the Cabul realm (Afghanistan); but as he says that it is very incomplete (“valde incompletum”), Aucher's plant may be ignored in typifying Bentham's species. This was evidently based upon *Griffith* 630, which is the species now considered.

In his Monograph of *Verbascum* (in Acta Univ. Lund. 29, nr. 2: 235, 1833) Murbeck counted this a synonym of *V. sinaiticum* Benth. (l. c. 236, 1846), but later he (l. c. 32, nr. 1: 35, 1836) revived it as var. *bactrianum* (Bunge) Murb., based on *V. bactrianum* Bunge, 1854. He then distinguished it from *V. sinaiticum* by its less dense indumentum, which is floccose on the upper part of the plant, by its more slender and ultimately glabrescent stem, and by its smaller calyx, corolla, and capsule. When these differences are emphasized by the remote ranges of the two as shown on Murbeck's map (l. c. 35, n. 1: 10, 1939), I think that we may well continue to treat them as distinct species. Accordingly I do so, restoring Bentham's appropriate name.

Dry rocky hills, 300 to 3000 meters altitude, Afghanistan to Kashmir. Flowering in May and June.

AFGHANISTAN. Chandan, *Koelz* 11760; Khash Dt., *Koelz* 12921; Kurram Valley, *Aitchison* 440; Nozi, *Koelz* 11984a; Puri Valley, *Eliz. Bacon* 80 (NYBG).

INDIA. Peshawar: Hayana, *Nawazich Ali* (Isl). Hazara: Batrasi Pass, *Stewart* 9627 (GH), 14123 (ANSP, Gord). Muzaffarabad: Domel, *Stewart* 12218 (USNH); Muzaffarabad, *Stewart* 17278 (ANSP, GH, NYBG). Gurdaspur: Gurdaspur, *Stewart* 1371.

4. *Verbascum thapsus* Linnaeus

Verbascum thapsus L., Spec. Plant. 177, 1753. “Habitat in Europae glareosis sterilibus.”

Fields and roadsides, widespread over the northern hemisphere as a weed, and common on the western Himalayas from 600 to 4000 meters altitude.

Dera Ismail Khan:, *Williams* 9220 (DD). Attock: Waw, *Stewart* 303 (NYBG). Kashmir: Sonamarg, *Stewart* 6378. Punch: Punch, *Schlagintweit* 12592 (GH). Udhampur: Kishtwar, *Schlagintweit* 2964 (GH). Chamba: Rakh, *Koelz* 8766 (ANSP, USNA). Zaskar: Char, *Koelz* 5711 (USNH); Mune, *Koelz* 1748 (NYBG). Lahul: Bhaga Valley, *Schlagintweit*; Jispa, *Koelz* 963 (NYBG); Kardang, *Chand* 400 (USNH); Kolung, *Koelz* 9923 (USNA), 10061 (USNA); Kyelang, *Koelz* 5149 (USNH), 8513 (USNA). Kangra: Bhadwar, *Koelz* 4270 (USNH); Negrota, *Koelz* 1746 (NYBG). Bashahr: Chhit Kul, *Parmanand* 148, 1095; Pangi, *Parmanand* 498 (USNA); Sungri, *Parmanand* 148 (USNA). Kumaun: Berbatti. *N. Gill* 106 (UCLA); Ralum, *Strachey & Winterbottom* 1 (GH). Naini Tal: Naini Tal, *Strachey & Winterbottom* 2 (GH).

Tribe III. CHELONEAE

A tribe comprising several large genera of the Palaearctic and Nearctic regions, only the following in our territory.

16. SCROPHULARIA [Bauhin] Linnaeus

Scrophularia L., Spec. Plant. 619, 1753; Gen. Plant. ed. V. 271, 1754. Genotype, *S. nodosa* L., of Europe; see Proc. Acad. Nat. Sci. Phila. 82: 21, 1930.

A genus of about 150 species, mainly Palaearctic, most numerous in the Mediterranean subregion from Spain to Persia; also Nearctic, and slightly entering the Neotropical and (as shown below) the Oriental Regions.

KEY TO SPECIES

- A. Sepals acute to attenuate, not scarious-margined; fertile filaments glabrous or nearly so; corolla green; leaf-blades ovate to ovate-lanceolate, dentate, not pinnatifid at base.
- B. Corolla externally glandular-pubescent; sterile filament subulate; fertile anthers all included; style 1-2 mm. long; sepals lance-attenuate, exceeding the corolla and mostly equaling the capsule; inflorescence a strict thyrus, the peduncles very short; petioles 0.5-2 cm. long, less than $\frac{1}{2}$ the length of the blades.1. *S. calycina*
- BB. Corolla externally glabrous; sterile filament distally dilated, triangular-obovate, green; fertile anthers slightly exerted from lower lip of corolla; style 3-4 mm. long, exerted; sepals oblong, acute to attenuate-tipped, much shorter than the corolla and capsule; inflorescence a panicle, the peduncles about 2 cm. long; petioles 2-4 cm. long, at least $\frac{1}{2}$ the length of the blades.
2. *S. edgeworthii*
- AA. Sepals rounded, scarious-margined, much shorter than the capsule; fertile filaments glandular-puberulent; corolla externally glabrous; inflorescence a thyrus or panicle.
- B. Veins of leaf-blade freely anastomosing, so venation finely reticulate; leaf-blades serrate to lobed; corolla green throughout or externally brown-tinged; stems solitary or few, 6-15 dm. tall or more; probably short-lived perennials, some annual.
- C. Fertile filaments longer than and conspicuously exerted from the corolla; style 4-8 mm. long; root perennial.
- D. Leaf-blades cordate at base, dentate but not lobed, glabrate; inflorescence relatively wide, about 10 cm. wide; sepals obtuse-rounded, slightly scarious-margined; corolla becoming 4-5 mm. long; style 6-9 mm. long; seeds 0.5-0.6 mm. long; stem nearly terete.
3. *S. himalayensis*
- DD. Leaf-blades truncate or truncately rounded at base, paler (especially beneath); inflorescence narrower; sepals circularly rounded; style 4-6 mm. long; stem 4-angled.
- E. Leaf-blades ovate, serrate, not or only slightly pinnate-lobed at base, pubescent; inflorescence a panicle 5-8 cm. wide; sepals with conspicuous scarious margins, that cover over $\frac{1}{2}$ the surface; corolla 2-3 mm. long.4. *S. polyantha*
- EE. Leaf-blades ovate-lanceolate, glabrate (except midrib beneath), coarsely dentate and proximally pinnately lobed; inflorescence a thyrus 3 cm. wide; sepals with narrower scarious margins covering less than $\frac{1}{2}$ the surface; corolla 4 mm. long.
5. *S. exserta*
- CC. Fertile filaments shorter than the corolla, included; style 2-3 mm. long; root apparently annual.
- D. Corolla 8-10 mm. long, green throughout; sterile filament less than $\frac{1}{2}$ the width of the base of the upper lip of the corolla; inflorescence divaricately diffuse, the pedicels 10-20 mm. long; leaf-blades crenately dentate, and stem sharply angled, both finely pubescent or puberulent.6. *S. obtusa*

- DD. Corolla 5-7 mm. long, greenish and somewhat tinged with brown; sterile filament at least $\frac{1}{2}$ the width of the base of the upper lip of the corolla; inflorescence less laxly spreading, the pedicels all ascending and usually shorter; leaf-blades crenately serrate, and stem usually slightly wing-angled, both glabrous.7. *S. robusta*
- BB. Veins of leaf-blade not or only slightly anastomosing; upper lip or half of corolla brown or purple-brown (paler in *S. petraea* and *S. scabiosaeifolia*); stems several or many, usually lower and more branching; root perennial, usually woody.
- C. Leaf-blades crenate, not lobed; sepals oblong-obovate, slightly scarious-margined; corolla 9-10 mm. long; sterile filament about as wide as the base of the upper lip of the corolla; stems 0.5-1 dm. tall.8. *S. petraea*
- CC. Leaf-blades dentate to pinnatifid, at least the lower blades proximally lobed; sepals circular, more strongly scarious-margined; corolla smaller; stems over 1 dm. tall.
- D. Sterile filament not or scarcely widening distally; corolla 3-5 mm. long, the lower lobes pale or white; leaf-blades dentate to dentate-lobed.
- E. Fertile filaments shorter than or equaling corolla; corolla 4-5 mm. long; sterile filament obtuse, linear or slightly clavate; inflorescence thyrsoid, the peduncles few- to 1-flowered; bases of stems (rhizomes) woody.
- F. Plant (excepting densely glandular inflorescence) cinereous-puberulent to -canescent, the hairs blunt and perhaps slightly gland-tipped; upper half of corolla, especially the posterior lobes, "maroon-madder"; growth broom-like.9. *S. dentata*
- FF. Plant (excepting sparsely glandular inflorescence) glabrous.
- G. Stems many, broom-like; leaves probably all cauline, the blades lanceolate, sessile; upper half of corolla pale brown or merely brownish-tinged.10. *S. scoparia*
- GG. Stems few or several, simple or branched; leaves at or near base of plant, the blades oblong or elliptic-oblong, cuneately narrowed to petioles, upper cauline leaves scarcely developed; upper half of corolla dark violet-purple.11. *S. nudata*
- EE. Fertile filaments conspicuously exserted; corolla 3 mm. long; sterile filament oblong, acutish; inflorescence wider, the peduncles usually about 5-flowered; leaf-blades oblong-lanceolate or narrowly elliptic, all petiolate; stem tall, and base (not seen) presumably not woody.12. *S. stewartii*
- DD. Sterile filament flabellate, much widened distally.
- E. Sterile filament narrower than the base of the upper lip of the corolla; upper lip of corolla pale to dark purple or violet-purple; scarious margin less than $\frac{1}{2}$ width of sepal; leaf-blades pale green, usually pinnately lobed at base.
- F. Plant glandular-pubescent or -puberulent throughout; inflorescence narrowly thyrsoid, the cymes 1-3-flowered.
- G. Sepals 1.5-2 mm. long, thick, narrowly margined; corolla 5 mm. long; sterile filament about $\frac{1}{2}$ the width of the base of the upper lip of the corolla; seeds 2 mm. long; leaves of middle portion of stem largest, dentate to dentate-lobed, cuneate to sessile or slightly petioled bases; stems woody below, the plant apparently lacking differentiated lower leaves.13. *S. suffruticosa*

- GG. Sepals 3.5-4 mm. long, relatively thin, with wide scarious margin; corolla 7 mm. long; sterile filament over $\frac{1}{2}$ the width of the base of the upper lip of the corolla; seeds probably smaller (not seen); leaves of basal portion of stem largest, more coarsely and irregularly dentate-lobed and proximally pinnatifid, more truncate to petioles; stems herbaceous from base, with well-differentiated lower leaves.
14. *S. stenothyrsa*
- FF. Plant glabrous below the inflorescence; inflorescence more open, a lax thyrsus or panicle, the cymes few- to several-flowered; seeds about 1 mm. long; lower leaves most ample, and stems herbaceous from base.
- G. Capsule 5-6 mm. long; corolla 5-7 mm. long; anthers included or the anterior slightly exerted; inflorescence narrow, the flowers all pedicelled and the lateral branches not elongated with moniliform disposition of flowers; pedicels with relatively large dark glands.15. *S. koelzii*
- GG. Capsule 3-4 mm. long; corolla 2-4 mm. long; anthers exerted; inflorescence wider and more diffuse, the cymes moniliform with the lateral flowers on very short pedicels.
- H. Corolla 3-4 mm. long, pale, the upper lip purplish; stems 3-8 dm. tall, leafy on the lower portions.16. *S. scabiosaeifolia*
- HH. Corolla 2-2.5 mm. long, brownish, the upper lip dark violet-purple; stems 2-4 dm. tall, leafy at base, or with smaller leaves elsewhere on lower portions of plant....17. *S. moniliformis*
- EE. Sterile filament as wide as the base of the upper lip of the corolla; upper lip of corolla dark violet-purple; scarious margin over $\frac{1}{2}$ width of sepal; leaf-blades coarsely or deeply lobed.
- F. Corolla 6-9 mm. long; sterile filament about as wide as the base of the upper lip of the corolla; capsule 5-6 mm. long; thyrsus narrow; leaf-blades ovate in general outline, coarsely toothed to pinnatifid, dark green; stems sharply 4-angled, relatively few and little branched.
18. *S. decomposita*
- FF. Corolla 3-5 mm. long; sterile filament about as wide as the expanded portion of the upper lip of the corolla; capsule smaller; panicle lax, the shortly pedicelled flowers moniliform on the extended cyme-branches; leaf-blades lanceolate in general outline, with a few relatively short and entire lobes light green; stems slightly ridge-angled (striate), many, much branched, broom-like...19. *S. striata*

1. *Scrophularia calycina* Bentham

Veronica? thyrsiflora Wall., Numer. List Spec. Ind. Mus. n. 6393. 1832, ined. "Himalaya kamounanensis R. B."

Scrophularia calycina Benth., Scroph. Indicae 18. 1835. "Hab. in Kamaon, Wallich, Kanaour, Royle." Type, collected by Wallich in 1812, seen in Herb. Kew Gardens.

Open waysides, borders of fields, and on alpine meadows, at altitudes of 2700 to 4000 meters, through the western Himalayas from Hazara to Kumaun. Flowering from early June to mid-August.

Hazara: Bagun, Kagan, *Inayat* (DD); Bala Bhurj, Kagan, *Inayat* (DD); Kuthyali, Kagan, *Inayat* 22054 (DD); Gali, Musalla, *Inayat*; Shefadyar, Relu, *Duthie* 24763; Shadal, Shinkiari, *Inayat* 20007 (DD). Kashmir: Gulmarg, *Stewart* 10482; Liddar Valley, *Duthie* 13158 (DD); Pahlgam, *Stewart* 5607, 5758, 7826 (NYBG); Sonamarg, *Stewart* 6370, 7290; Tragbol ("Tarakbal"), *Koelz* 9196. Chamba: Kukti Pass, *Koelz* 8618 (USNA); head of Sural Valley, *Harsukh* (DD). Lahul: Rotang Pass, *Brandis* 3154 (DD); Shipting Nullah, *Koelz* 935 (NYBG). Kangra: Dharmasala, *Stewart* 10316 (ANSP, GH); Kulu, *Koelz* 4655 (NYBG); Rotang La, *Koelz* 5053 (USNH). Bashahr: ———, *Parmanand* 1141 (ANSP, USNA, USNH). Simla: Mt. Halsa, *Drummond* 590 (DD). Tehri: Jumnotri, *Duthie* (DD). Garhwal: Bhowali, *Duthie* 4240 (DD); above Derali, *Duthie* 480 (DD); ridge above Shala, *Duthie* 160 (DD). Kumaun: Malaha Gadh, Darma, *Duthie* 5867 (DD); Palang Gadh, Byans, *Duthie* 5867 (DD); Pindari, *Strachey & Winterbottom* 6 (GH); Shafaudiyar, Ralam Valley, *Inayat* 24763 (DD).

2. *Scrophularia edgeworthii* Benth

Scrophularia edgeworthii Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 304, 1846. "In jugo Himalayano altit. 12000 ped. ad Musa Pani (*Edgeworth!*)."
Described as viscid-puberulent, and with leaf-blades coarsely doubly or incised-dentate, whereas the species now considered is essentially glabrous below the inflorescence and usually has leaf-blades less sharply dentate. Both these discrepancies are mentioned by J. D. Hooker in his Flora of British India (4: 255, 1883) where he associates with *Edgeworth's* plant from Garhwal one collected by *Strachey & Winterbottom* in Kumaun. He comments upon the nearly glabrous stem, while Benth's description of the leaf-dentation has been changed to "coarsely crenate-toothed." The plant that Hooker added is clearly the species now considered, of which Kumaun specimens form the majority of those cited below. Geographical considerations lead me to think Hooker correct in placing the two plants together. (Perhaps the supposed puberulence of *Edgeworth's* specimen was due to faulty preservation.)

As stated both by Benth and by Hooker this is nearly related to *Scrophularia elatior* Benth. of Nepal and Sikkim, but that has wider corollas from which the anthers and stigma are long-exserted, the style reaching 8-9 mm. long. The plant seemingly is taller, with more sharply angled stem and more attenuate leaf-blades.

Mountains, at altitudes of 2100 to 3400 meters, in the Himalayas of Almora and Kumaun. Flowering from late June to mid-August.

Almora: Tola, Gori R., *Champion* (DD). Kumaun: Ayar Pani, *Duthie* 3250 (DD); Gini, *Duthie* 3251 (DD); Munshiyari, *Inayat* 24762 (DD); Palong Gadh, Byans, *Duthie* 5868 (DD).

3. *Scrophularia himalayensis* Royle

Scrophularia himalayensis Royle, ex Benth., Scroph. Indicae 18, 1835. "Hab. in jugo Himalayano communis; *Royle*." Very likely gathered at Mussoorie or in its vicinity, where Dr. Royle collected.

Roadsides and waste places, at altitudes of 1500 to 4000 meters, through the western Himalayas from Chamba to Naini Tal. Flowering from early June to late August.

Chamba: Khajiar, *Koelz* 8862 (ANSP, USNA). Kangra: Kulu, *Koelz* 1486 (NYBG), 4796 (USNH); Mamkam, Parbatti Valley, *Koelz* 4818 (USNH); Pulga, P. V., *Nath* (ANSP, Gord). Simla section: Khanag, *Nath*; Konain, *Raizada* (DD); Simla Hills, *Drummond* 612 (DD). Dehra Dun: Landour, *Stewart* 11209 (GH), 14990 (ANSP, NYBG); Mussoorie, *Gammie* (DD). Tehri: Jangla, *Duthie* (DD); under Srikanta, *Duthie* 567 (DD); near Tehri. ——— (DD). Naini Tal: Naini Tal, *Strachey & Winterbottom* 4 (GH).

4. *Scrophularia polyantha* Royle

Scrophularia polyantha Royle, ex Benth., *Scroph. Indicae* 18, 1836. "Hab. in Mussooree, Royle."

Roadsides and waste places, at altitudes of 800 to 3000 meters, through the western Himalayas from Hazara to Tehri. Flowering from early June to early September.

Hazara: Changla Gali, *Stewart* 3947; Chuari & Chamba road,* *Harsukh* (DD); Ghora Dakka, *Inayat* 14665 (DD); Mastok, *Brandis* 1528 (DD); toward Panj Galli, Black Mt., *Duthie* 7556 (DD); Shinkiri, *Inayat* 20010 (DD); Bhonja Ka Kattha, Kagan, *Inayat* 20008 (DD); Nivu, Kagan, *Inayat*. Muzaffarabad: Domel, *Stewart* 10109 (ANSP, Gord). Kashmir: Badwan to Korakbal, *Stewart* 19248; Bandipur, *Koelz* 9057 (ANSP, GH, USNA, USNH); Chatru to Sinthan, *Stewart* 3066; Ganderbal, Sind Valley, *Duthie* 11437 (DD); Gurais, *Duthie* 14094 (DD); Kainmul, Liddar Valley, *Duthie* 13095 (DD); Kangan to Gund, *Stewart* 6236; Pahlgam, *Stewart* 5366, 5873; Rajaori, Tawi Valley, *Gammie* (DD); Shalimar Gardens, *Stewart* 3206 (ANSP, NYBG); Sonamarg, *Stewart* 6908, 9812 (GH, USNH); Srinagar, *Koelz* 8991 (NYBG, USNA), *Schlagintweit*; Tangmarg, *Stewart* 10544 (NYBG); Tragbal, *Stewart* 4757. Chamba: Alwas, *Stewart* 2475; Chamba, *Brandis* 4247 (DD); Dalhousie, *Stewart* 2150; Marrund to Kalel, *Stewart* 2310; Oli, upper Chenab valley, *Stewart* 3013 (Gord); Sao Valley, *Lace* 1706 (DD). Kangra,⁷ Baijnath, *Koelz* 4583 (USNH); Kulu, *Koelz* 4801 (USNH). Bashahr: Chhit Kul, *Parmanand* 1073. Simla: Koti, *Gamble* 24404 (DD); Simla, *Duthie* 7340 (DD). Dehra Dun: Konaain, Jaunsar, *Parkinson* 7135 (DD); Tons, *Duthie* (DD). Tehri: Dakara, *Gamble* 24404 (DD).

5. *Scrophularia exserta* sp. nov.

Plate 1, B.

Root perennial. Stem glabrous, slightly 4-angled, at least 6 dm. tall. Leaf-blades ovate-lanceolate in general outline, 3-4 cm. long, 1.5-2.5 cm. wide, above glabrate, beneath glaucous and pubescent on midrib, acute to acuminate, distally irregularly dentate, proximally with several pairs of lobes, the incisions cutting to midrib; petiole 1 cm. long, narrowly winged. Inflorescence probably about $\frac{1}{2}$ the height of the plant, of at least 8 pairs of opposite or scattered peduncles, each cyme of 3 to 5 flowers; finely glandular-pubescent throughout. Sepals 2 mm. long, nearly circular, green, with scarious erose margin 0.3 mm. wide. Corolla 4 mm. long, green (presumably purplish-tinged since called "pink" by collector), the posterior lobes projecting slightly beyond others. Sterile filament ovoid-truncate, as wide as long, about $\frac{1}{2}$ the width of the base of the upper lip of the corolla. Fertile filaments glandular-puberulent, about twice length of corolla. Style 6 mm. long. Capsule not seen.

Perennis; caulis glaber, altus; foliorum laminae ovato-lanceolatae dentatae proxime lobatae 3-4 cm. longae, petiolis 1 cm. longis; inflorescentia elongata, minute glanduloso-pubescentia; sepala 2 mm. longa, circularia, marginibus scariosis; corolla 4 mm. longa; staminodium ovoideo-truncatum; filamenta fertilia glanduloso-pubescentia; antheribus exsertis; stylus 6 mm. longus; capsula non visa.

Type, Lowarai Pass, Chitral, at 9000 feet (2700-2800 meters) altitude, collected in flower June 15, 1895, by S. A. Harriss, no. 16456; in Dehra Dun Herbarium.

* Although clearly marked "Hazara," this must rather have come from Chamba.

⁷ At Mamkam in the Parbati Valley, a place at which *Scrophularia himalayensis* was also collected, grows an apparent hybrid between that species and *S. polyantha*, having the wide leaf-blades and slightly scarious calyx of *himalayensis*, but the blades truncate at base and pubescent with the inflorescence narrow as in *polyantha*.

This, the only collection seen, was mistakenly identified as *Scrophularia himalayensis* Royle, and so reported on page 165 of J. F. Duthie's "The Botany of the Chitral Relief Expedition", in Records of the Botanical Survey of India, vol. 1, no. 9, 1898.

6. *Scrophularia obtusa* Edgeworth

Scrophularia obtusa Edgew., ex Hook. f., Fl. Brit. Ind. 4: 254, 1883. "Kumaon at Almora, alt. 6-6,500 ft., Edgeworth, &c."

Mountains, at altitudes of 700 to 2300 meters, in the Himalayas from Dehra Dun to Kumaun. Flowering from July to September.

Dehra Dun: Dhanaulti, *Royle* or *Jamison* (DD). Almora: Almora, ——— (DD); Binsar, *Inayat* 24766 (DD). Kumaun: Dhauli Valley, *Duthie* 5865 (DD); Hawulbagh, *Davidson Re* (DD); Kali Valley, *Duthie* 3249 (DD); Sarna Valley, *Duthie* 3251 (DD).

7. *Scrophularia robusta* sp. nov.

Plate 2, A.

Root annual, sending up a single glabrous narrowly winged stem, 8-15 dm. tall. Leaf-blades oblong-ovate, 7-10 cm. long, 3-4 cm. wide, crenately serrate, glabrous, slightly glaucous beneath (veins anastomosing), acute at apex, rounded at base to glabrous petioles 1-2 (-3) cm. long, the narrow wings of the petiole decurrent into the winged angles of the stem. Inflorescence less than $\frac{1}{2}$ the height of the plant, when fully developed of about 12 pairs of opposite, approximate, or (upper) scattered peduncles, each cyme of 7 to 13 flowers; rachis and peduncles mostly glabrous, but pedicels glandular-puberulent. Sepals 2 mm. long, circular, green, with white scarious entire margin 0.3 mm. wide. Corolla 4-7 mm. long, green, tinged ("washed") with madder or "rose-purple", but apparently the projecting posterior no darker than the anterior lobes, of which the mid-anterior is somewhat deflexed-spreading. Sterile filament flabellate, wider than long, $\frac{1}{2}$ to $\frac{3}{4}$ the width of the neck of the upper lip of the corolla. Fertile filaments glandular-puberulent, the anthers included within corolla. Style 2-3 mm. long. Capsule globose-ovoid, acuminate, 5 mm. long and wide. Seeds 0.7-0.8 mm. long, blackish, longitudinally ridged and with minute cross-lines.

Annual; caulis unicus glaber anguste alatus 8-15 dm. altus; foliorum laminae oblongo-ovatae crenato-serratae glabrae 7-10 cm. longae, petiolis 1-2 cm. longis; inflorescentia ampla; sepala 2 mm. longa, circularia, marginibus scariosis; corolla 4-7 mm. longa, purpurascens; staminodium flabellatum, latius quam longum; filamenta fertilia glanduloso-puberulentia, antheris inclusis; stylus 2-3 mm. longus; capsula 5 mm. longa; semina 0.7-0.8 mm. longa.

Type, along stream, Mak, Afghanistan, at 8500 feet (2600 meters) altitude, collected in fruit October 3, 1939, by Walter Koelz, no. 14075; in Herb. Academy of Natural Sciences of Philadelphia.

Along streams, at altitudes of 1300 to 2800 meters, in mountains from the Caucasus region of southern Russia to Chitral (northwesternmost India).

PERSIA. Khorasan: ———, *Aitchison* 685 (DD).

AFGHANISTAN. Hazratsaid, *Koelz* 12846; Mak, *Koelz* 14075; Paghman, *Koelz* 12152; Terak, *Koelz* 13891 (ANSP, NYBG).

INDIA. Chitral: Drosch, *Major Hamilton* 17901 (DD), *Harriss*; Mirga, *Harriss* 16457 (DD); Zachanah Pass, *Gatacre* 17364 (DD); Ziarat, *Harriss* 16460 (DD).

Scrophularia robusta resembles in its stoutness *S. aquatica* L. of Europe and northern Asia, although it is hardly so large as that species becomes. This, which seems to be actually its nearest relative, has a narrower and usually more elongated inflorescence and the leaf-blades normally cordate at base. In Boissier's *Flora Orientalis* (4: 399, 1879) our plant was identified as *S. alata* Gilib., but the original description of that in Gilibert's *Flora Lithuanica* (1: 127, 1781) described the root as very long and the petioles as very short and foliose; it seems to be matched by certain collections from Austria in the Academy's herbarium, that differ also in looser inflorescence (pedicels longer and more spreading), bracts usually longer, petioles shorter and more winged, and leaf-blades acuminate. I lack, however, sufficient material for comparison.

8. *Scrophularia petraea* Aitchison & Hemsley

Scrophularia petraea Aitch. & Hemsl., in Journ. Linn. Soc., Bot. 19: 180, 1882. "Hariab district [Afghanistan], amongst rock debris, at an altitude of from 11,000 to 14,000 feet [Aitchison 919 (1879)]." Isotypes seen in Dehra Dun Herbarium and in Gray Herbarium of Harvard University. The former supplies the locality "Sikaram" and the month August. Sikaram is a mountain on the border between the Jalalab and Hariob districts of Afghanistan and the Kurram District of India.

Rock debris, at altitudes of 3300 to 4300 meters, alpine zone of Mount Sikaram, Afghan-Indian border. Known from a single collection made on the Afghan side.

9. *Scrophularia dentata* Royle

Scrophularia dentata Royle, ex Benth., Scroph. Indicae 19, 1835. "Hab. in Kanaour, Royle." Description fits the species now considered, although the leaf-blades are usually narrower and more regularly dentate. The fertile filaments are not exerted beyond the posterior lip.

Root perennial, the woody bases of the old stems persisting. Stems many, in early anthesis 1-2 dm. tall, with rounded angles, sparsely glandular-puberulent. Leaf-blades 1.5-2 cm. long, 3-5 mm. wide, elliptic-lanceolate, puberulent, dentate, acute, gradually narrowed at base to a hardly defined petiole. Inflorescence narrow and densely flowered, slightly or somewhat glandular-puberulent, the peduncles hardly longer than the calyces. Sepals 1.5-2 mm. long, green with conspicuous white scarious entire border. Corolla 4-5 mm. long, reddish-brown ("maroon-madder"), brightest on the projecting posterior lobes, the anterior lobes pale, the mid-anterior deflexed. Filaments glandular-puberulent; the anthers slightly exerted from the lower lip of the corolla. Sterile filament clavate, purplish or dull. Style about 3 mm. long. Capsule 4 mm. long, globose-ovoid, with stiff beak 1 mm. long. Seeds not seen.

Alpine slopes, at altitudes of 4000 to 5000 meters, western Himalayas from Zaskar to Spiti. Flowering in July.

Zaskar: Bok, Pensi La, *Koelz* 5880 (USNH); Kargia, *Koelz* 5465 (USNH), 5466 (USNH). Lahul: Bara Lacha La, *Koelz* 5318 (USNH). Rupshu: Puga, *Koelz* 2154 (DD, NYBG, USNH). Spiti: Takenak to Giam, *Schlagintweit*.

10. *Scrophularia scoparia* sp. nov.

Plate 2, B.

Root perennial, woody. Stems many in a clump, glabrous, obtusely angled or nearly terete, somewhat glaucous, much branched, suffrutescent below, reaching 3 to 6 dm. tall. Leaves all cauline, alternate or scattered (some opposite or subopposite), glabrous and somewhat glaucous: blades narrowly lanceolate, acute or acutish, scarcely petioled, reaching 2 cm. long and slightly lobed; the upper smaller and narrower; the bracts subulate; the stems appearing mostly bare and broom-like. Inflorescence over $\frac{1}{2}$ the height of the plant, sparsely puberulent with sessile glands, the bracts and peduncles alternating or scattered, the lower peduncles sometimes 3-flowered, or all 1-flowered. Sepals 1.5-2 mm. long, circular, green, with white scarious entire margin 0.2-0.3 mm. wide. Corolla 5 mm. long, apparently light purplish brown externally, pale within, and with the anterior lobes yellowish white, the mid-lobe apparently little or not deflexed. Sterile filament clavate, pale. Fertile filaments glandular-puberulent, the anthers of the longer pair eventually somewhat exerted. Style 3-4 mm. long. Capsule globose-ovoid, mucronately tipped with the persistent style-base, not seen mature.

Perennis, scoparia; caules multi glabri obtuse angulati 3-6 dm. alti, saepissime nudi; foliorum laminae anguste lanceolatae parum lobatae glabrae 2 cm. longae subsessiles; inflorescentia thyrsoida; sepala 1.5-2 mm. longa, circularia, marginibus scariosis; corolla 5 mm. longa, purpurascens; staminodium clavatum; filamenta fertilia glanduloso-puberulenta, antheris filamentorum longiorum exertis; stylus 3-4 mm. longus; capsula matura non visa.

Type, dry slope, 2700-2800 meters altitude, Sirotai, Afghanistan, collected in flower June 17, 1937, by Walter Koelz, no. 11922; in Herb. Academy of Natural Sciences of Philadelphia.

Arid upland, at altitudes of 2600 to 3100 meters, northeastern Afghanistan and northwesternmost India, west of the Indus gorge. Flowering in June.

AFGHANISTAN. Sirotai, Koelz 11922 (ANSP, Gord, GH, NYBG); Zebak, Badakshan, Giles 175 (DD).

INDIA. Chitral: Chitral, Harris (DD).

This broom-like species resembles in aspect *Scrophularia striata* Boiss., but that differs in its dilated sterile filament, its smaller and darker corolla, its flowers lateral to the peduncles, and its angled stems. Also that species pertains to lower elevations.

I had hoped that this might be the mysterious *Scrophularia cabulica* Benth., also from northern and higher Afghanistan,⁸ described as like this in habit and with linear sterile filament, but the description of the leaves as obsoletely repand-dentate, the cymes as 5-7-flowered, and the flowers as sessile on the divaricate peduncles, seems to make such identification impossible. But I suspect that *S. cabulica* was based upon a mixture of this and *S. striata*, as is suggested by Bentham's contrast of the habit and flowers of his two specimens; if so, the name chosen might select as typical the

⁸ From Bamian, according to Boissier, Fl. Orient. 4: 420, 1879.

species now considered. However, as Bentham states that all the flowers he saw were imperfect, I think that the name may be safely dropped.

11. *Scrophularia nudata* spec. nov.

Plate 3, A.

Root and rhizome perennial, woody, relatively thick. Stems few or several in a clump, glabrous, obtusely angled, 3 to 7 dm. tall, simple or branched, sharply distinguished from woody rhizotomous base. Leaves in a basal rosette or a few somewhat higher-placed, glabrous; blades oblong or elliptic-oblong, rounded at apex, dentate or dentate-lobed with rounded teeth, sometimes pinnately lobed near base, 2-5 cm. long, 1-2 cm. wide, cuneately narrowed to petioles which may be as long; upper leaves (bracts) small or minute, the inflorescence appearing bare. Inflorescence over half the height of the plant, glabrate (sparsely puberulent with sessile glands), the peduncles opposite, subopposite, or mostly scattered, 1-5-flowered. Sepals 1.5-2 mm. long, circular, green, with white scarious nearly entire margin 0.1-0.2 mm. wide. Corolla 4-5 mm. long, posterior half dark, the slightly projecting posterior lobes dark violet-purple, anterior half pale, the mid-anterior lobe apparently not deflexed. Sterile filament linear-clavate. Fertile filaments glandular-puberulent, the anthers becoming slightly exserted. Style about 5 mm. long. Capsule 3-4 mm. long, globose-ovoid, caudately mucronate-tipped. Seeds 1 mm. long, flattened-cylindric, black, transversely pitted.

Perennis; caules pauci vel plures, obtuse angulati 3-7 dm. alti, saepissime nudi; folia radicalia et pauca caulina, glabra, laminis oblongis aut elliptico-oblongis, dentatis aut dentato-lobatis, petiolatis; inflorescentia thyrsoida; sepala 1.5-2 mm. longa, circularia, marginibus scariosis; corolla 4-5 mm. longa, latere posteriore atrovioleaceo, anteriore pallido; staminodium linear-clavatum; filamenta fertilia glanduloso-puberulentia, antheris paulum exsertis; stylus 5 mm. longus; capsula 3-4 mm. longa; semina 1 mm. longa.

Type, arid bare slopes, 2500-2800 meters altitude, Chunagand to Kharbu, Ladakh, collected in late flower and in fruit August 27, 1940, by R. R. Stewart, no. 21086; in Herb. Academy of Natural Sciences of Philadelphia.

Arid high slopes, at altitudes of 2400 to 2900 meters, upper Indus Valley behind the Himalayas, from Astor to Ladakh.

Astor: above Rattu, *Stewart* 18782. Baltistan: Indus Valley, to Parkutta from Kiris. *Stewart* 20888 (ANSP, Gord). Ladakh: Chunagand. *Stewart* 21060 (ANSP, NYBG); C. to Kharbu, *Stewart* 21086; Kargil, *Koelz* 6114 (NYBG), 6134 (USNH).

12. *Scrophularia stewartii* spec. nov.

Plate 3, B.

Root perennial. Stems few to a clump or solitary, glabrous, obtusely angled or nearly terete, branched, herbaceous throughout, tall and lax. Leaves glabrous: blades oblong-lanceolate or narrowly elliptic, obtuse or mucronulate, the lower reaching 7-11 cm. long, irregularly dentate or slightly dentate-lobed, slightly runcinate at base; on petioles 2.5-4 cm. long; the upper smaller throughout. Inflorescence lax, less than half the height of the plant, obscurely glandular-puberulent when young, the minute triangular-subulate bracts and peduncles opposite, the upper subopposite or scattered, peduncles about 5-flowered, flowers all distinctly pedicelled. Sepals 1.5 mm. long, circular, green, with white scarious nearly entire margin 0.1-

0.2 mm. wide. Corolla 2-2.5 mm. long, posteriorly madder-brown ("crimson", according to collector), the two upper lobes projecting and most colored, anteriorly paler, the lobes white or nearly so, the mid-anterior slightly spreading. Sterile filament oblong-acutish, green, minute. Fertile filaments glandular-puberulent, the anthers all conspicuously exerted. Style 3 mm. long. Capsule globose-ovoid, about 3 mm. long, thin-walled.

Perennis; caules pauci vel solitarii, obtuse angulati, alti; foliorum laminae oblongo-lanceolatae aut anguste ellipticae, glabrae, dentatae aut paulum dentato-lobatae, inferioribus 7-11 cm. longis, petiolis 2.5-4 cm. longis; inflorescentia laxa; sepala 1.5 mm. longa, circularia, marginibus anguste scariosis; corolla 2-2.5 mm. longa, latere posteriore purpureo-brunneo, lobis anterioribus albidis; staminodium oblongo-acutiusculum minutum; filamenta fertilia glanduloso-puberulentia, antheris exsertis; stylus 3 mm. longus; capsula ca. 3 mm. longa, parietibus tenuibus.

Type, clay bank, Phullaren, Jhelum District, Punjab, collected in flower April 1934, by R. R. Stewart, no. 13784; in Herb. Academy of Natural Sciences of Philadelphia.

Clayey soil, at altitudes of 400 to 900 meters, low ranges of the Jhelum River valley, below the Himalayas, northwestern India, from Shahpur to Jhelum. Flowering in April.

Shahpur: Karaha (Mt. Saherar), *Drummond* 14632. Jhelum: Phullaren, *Stewart* 13784 (ANSP, NYBG); Salt Range, *Aitchison* 19 (DD); Mt. Tilla, *Stewart* 721.

13. *Scrophularia suffruticosa* spec. nov.

Plate 4, B.

Root perennial, woody. Stems many in a clump, woody below, most of length herbaceous, slightly angled or nearly terete, finely glandular-pubescent or -puberulent, much branched, 3-4.5 dm. tall, purplish below. Leaves finely glandular-pubescent or -puberulent, opposite or subopposite: blades oblong-elliptic in general outline, obtuse, dentate-lobed, largest 2.5-3 cm. long, 12-15 mm. wide, proximally cuneately narrowed to sessile or nearly sessile bases. Inflorescence usually less than half the height of the plant, glandular-pubescent, the bracts and pedicels opposite or the upper scattered, bracts acute, shorter than the several- to usually one-flowered peduncles. Sepals 1.5-2 mm. long, circular, green or brownish green and finely glandular-pubescent, somewhat indurated, with white scarious nearly entire margin about 0.2 mm. wide. Corolla⁹ 5 mm. long, the posterior lobes slightly the longest, and the mid-anterior probably not deflexed. Sterile filament greenish, flattened-circular, hardly $\frac{1}{3}$ the width of the neck of the upper corolla-lip. Fertile filaments glandular-puberulent, the anthers included or eventually those of the longer pair slightly exerted. Style 3-4 mm. long. Capsule 5 mm. long, globose-ovoid, acuminate. Seeds 2 mm. long, blackish, roughened by a reticulate-impressed pattern, about half as wide as long.

Perennis; caules multi, basi lignosi, fere teretes, 3-4.5 dm. alti; folia oblongo-elliptica dentato-lobata, glanduloso-pubescentia puberulentiaive, fere sessilia, maximis 2.5-3 cm. longis; inflorescentia fere thyrsoida; sepala 1.5-2 mm. longa, circularia, marginibus anguste scariosis; corolla 5 mm.

⁹ Blackened in poorly dried specimen that alone shows flowers.

longa; staminodium circulare; filamenta fertilia glanduloso-puberulentia, antheris inclusis vel paulum exsertis; stylus 2 mm. longus; capsula 5 mm. longa; semina 2 mm. longa.

Type, Mangla, Bashahr, collected in flower and fruit September 24, 1934, by Negi Parmanand, no. 1241; in Herb. Academy of Natural Sciences of Philadelphia.

Presumably in arid situations, in the Himalaya Mountains from Spiti to Bashahr. Only collections seen were gathered in September, when the plant was almost wholly past blossom.

Spiti: Kibor¹⁰, *Koelz* (USNH), 7127 (USNH), 7131 (USNH). Bashahr: Mangla, *Parmanand* 1241 (ANSP, Gord, GH, NYBG).

14. *Scrophularia stenothyrsa* spec. nov.

Plate 4, A.

Root perennial. Stems probably few to a clump, finely glandular-pubescent or glandless below, sharply 4-angled, simple or somewhat branched, 4-8 dm. tall. Leaves finely glandular-pubescent: blades ovate or lance-ovate, acute, the lower reaching 5-10 cm. long, irregularly dentate or dentate-lobed, proximally pinnately parted to base, on petioles 1.5-6 cm. long; the upper simpler and shorter-petioled. Inflorescence a narrow thyrus, about $\frac{2}{3}$ the height of the plant, glandular-pubescent throughout, the bracts and bractlets lanceolate-attenuate, the former about equaling the peduncles; these short, 3-7 mm. long, ascending, 1-3-flowered, some pedicels as long. Sepals 3.5-4 mm. long, circular, green, with white scarious nearly entire margin 0.7-1 mm. wide. Corolla 7 mm. long, posteriorly brown, the two upper lobes longer than wide, strongly projecting and dark brown, anteriorly pale and the anterior lobes much wider than long, mid-anterior deflexed-spreading. Sterile filament yellowish green, flabellate, over half the width of the neck of the posterior lip of the corolla. Fertile filaments glandular-puberulent, the anthers included or barely exserted. Style 4 mm. long. Capsule 6-7 mm. long, globose-ovoid, acuminate. Seeds not seen.

Perennis; caulis argute quadrangulatus, 4-8 dm. altus; foliorum laminae ovatae aut lanceolato-ovatae, dentatae aut dentato-lobatae, glanduloso-pubescentes, inferioribus 5-10 cm. longis, petiolis 1.5-6 cm. longis; inflorescentia thyrsoidea; sepala 3.5-4 mm. longa, circularia, marginibus late scariosis; corolla 7 mm. longa, latere posteriore atro, anteriore pallido; staminodium flabellatum; filamenta fertilia glanduloso-puberulentia, antheris inclusis vel fere exsertis; stylus 4 mm. longus; capsula 6-7 mm. longa; semina non visa.

Type, at 3000 to 3100 meters altitude, Aina Mela, Kurram Valley, Afghanistan, collected in flower July 8, 1894, by Harsukh; no. 15421 in Dehra Dun Herbarium.

Upper Kurram Valley, northeastern Afghanistan, at about 3000 meters altitude. Presumably also in adjacent India.

AFGHANISTAN. Aina Mela, *Harsukh* 15421 (ANSP, DD); Alez (Ali) Khel, *Aitchison* 461 (DD, GH).

¹⁰ Also there are two more specimens from this locality, spelled "Kyiber", by an unnamed collector, number "57" and "58" (ANSP, USNA).

15. *Scrophularia koelzii* new species

Plate 5, A.

Root perennial, woody, from its crown sending up a cluster of slender glabrous obscurely angled stems, 4-10 dm. tall. Leaves glabrous: blades ovate or oval in main outline, slightly glaucous beneath, the largest 2-9 cm. long, 1.5-4 cm. wide, dentate, dentate-lobed, or somewhat pinnatifid, acute to rounded at apex, basally narrowed to slender glabrous petioles 1-3 cm. long. Inflorescence less than half the height of the plant, of 4 to 8 pairs of opposite, approximate, or usually scattered peduncles, each cyme of 1 to 6 flowers; rachis, peduncles, and pedicels puberulent with relatively large dark glands. Sepals 1.5-2 mm. long, with white scarious entire margin 0.3-0.5 mm. wide. Corolla 5-7 mm. long, the posterior lobes projecting, purple-brown, as may be also the posterior half of the corolla-tube; anterior lobes pale or greenish yellow, the mid-anterior lobe somewhat recurved. Sterile filament flabellate, about half the width of the base of the posterior lip of the corolla. Fertile filaments glandular-puberulent, the anthers included or slightly exerted. Style 2-4 mm. long. Capsule 5-6 mm. long, shortly or moderately beaked. Seeds 1.2 mm. long, transversely pitted.

Perennis; caules plures glabri obscure quadrangulares, 4-10 dm. alti; foliorum laminae ovatae ovaliaeve, dentatae vel dentato-lobatae vel paulum pinnatifidae, inferioribus 2-9 cm. longis, petiolis 1-3 cm. longis; inflorescentia paniculata; sepalia 1.5-2 mm. longa, circularia, marginibus late scariosis; corolla 5-7 mm. longa, latere posteriore atro, anteriore pallido; staminodium flabellatum; filamenta fertilia glanduloso-puberulentia, antheris inclusis vel paulum exsertis; stylus 2-4 mm. longus; capsula 5-6 mm. longa; semina 1.2 mm. longa.

Type, dry hillside, altitude 3350 meters, near Kukti Pass, Lahul, collected in flower and fruit August 26, 1930, by Walter Koelz, no. 1229; in Herb. Academy of Natural Sciences of Philadelphia.

Bare exposed banks, at altitudes of 2600 to 5100 meters, through the western Himalayas from eastern Afghanistan to Bashahr. Flowering from July to September.

Dera Ismail Khan: Pirgal, *Williams* 7884 (DD); Tariak, near Tank, *Williams* (DD). Chitral: Janba tai, *Harriss* 16462 (DD). Hazara: Kuthizali, ——— 22058b (DD); Silan, Kagan, *Inayat* (DD). Muzaffarabad: Matayan, *Stewart* 7431. Kashmir: Banihol Pass, *Stewart* 10600 (GH), 12177; Pahlgam, *Stewart* 5386, 8030 (ANSP, USNH), 9265 (Gord, NYBG). Astor: Astor Valley (Shunkergadh, Kamrinula), *Inayat* 25730a. Udhampur: Junga, Chenab, *Brandis* 3152 (DD). Baltistan: Chatpani Nullah, *Duthie* 13844 (DD); Lachit, Saltaro Valley, *Hunter-Weston* 10255¹¹ (DD); Marpu Nullah, *Duthie* (DD); Satpura Nullah, above Skardu, *Stewart* 20300 (ANSP, GH, NYBG, USNH); Thalle La, *Stewart* 20654 (ANSP, Gord, GH, NYBG, USNH). Purig: Dras, *Duthie* 11765 (DD); Dras-Pan Pass, *Stewart* 9996 (ANSP, NYBG, USNH); Tangola,

¹¹ This is the type collection of *Scrophularia variegata* f. *himalayensis* Gand., in Bull. Soc. Bot. France 46: 420. 1899. "Baltistan, alt. 9000 ped. . . . (Duthie, no 10255)." It was collected May 28, 1890 at Lachit, Saltaro Valley, and Duthie has written on the sheet "Coll. A. G. Hunter-Weston, R.E." I can only key this to *S. koelzii*, but it differs by more elongate and pinnatifid leaves restricted to the base of the stem, and long peduncles that give an unusually lax inflorescence. This correlation may denote a separate species, but all other collections from Baltistan seem normal enough *S. koelzii*. The stature of the plant makes me wonder if there may have been some confusing of data, as it is surprisingly large and lax for a district so far within the Himalayas.

Koelz 6087 (USNH). Chamba: Hodan Valley, *Harsukh* (DD); Kilar, Pangi, *Stewart* 2747; Kulail Forest, *Harsukh* (DD). Ladakh: Chortren Chen, *Koelz* 2669d (ANSP, NYBG); Gilgit Road, Deosai Plain (Kharbu to Dras), *Stewart* 21136 (ANSP, Gord); Tog, *Koelz* 2637 (NYBG). Zaskar: Abring, *Koelz* 2972a (NYBG); Mune, *Koelz* 5738 (USNH), 5740 (NYBG). Lahul: Kolung, *Koelz* 10066 (ANSP, NYBG, USNA); Kye-lang, *Koelz* 474 (NYBG); via Kukti Pass, *Koelz* 1229 (ANSP, NYBG); Sisu, *Koelz* 5094 (USNH), 8364 (ANSP, NYBG, USNA, USNH); Tsembak, *Chand* 153 (USNH), *Parmanand*. Spiti: Rangrik (Ki), *Koelz* 7150 (USNH). Bashahr: Mangla ("Hangla"). *Parmanand* 595 (ANSP, GH, NYBG); Tidong Nala, *Gorrie* 49227 (DD).¹²

In Hooker's *Flora of British India* (4: 256, 1883) this was identified as *Scrophularia variegata* Bieb., but the original description of Bieberstein's plant of the Caucasus (Besch. Casp. 177, App. n. 48, not seen, but quoted in *Flora Taurico-Caucasica* 2: 78, 1808) called for a plant woody at base, with bipinnatifid pubescent leaves, and pedicels hirsute with glochidiate hairs—evidently a different species from this of the Himalayas. It appears to be represented in the Academy's herbarium by a specimen marked in Schweinitz' hand "Caucas Ledeb *Scrophularia variegata*."

16. *Scrophularia scabiosaefolia* Bentham

Scrophularia scabiosaefolia Benth., in DC., *Prod. Regn. Nat. Veg. Syst.* 10: 311, 1846. "In regno Cabulico (*Griffiths!* [*Griffith*] n. 614, 622) (v. in herb. Hook.)" Description evidently composite, presumably of *S. stenothyrsa* and the species now considered. That would supply the alternative character of glandular ancescence, but the account of the slender peduncles that are bifid and usually 5-7-flowered applies best to the glabrous-stemmed species now considered. Bentham described the flowers as pedicelled, whereas the lateral ones are usually very shortly so, but the pedicels are often evident, as in Inayat's collection from the Sind Valley cited below, a plant with pinnatifid leaf-blades and long lax panicles. Hooker, who may be presumed to have studied primarily Bentham's specimens, speaks of the ample cymes, with the "flowers very small often spicate," features especially descriptive of our plant. Accordingly, I restrict the name to what I judge was the element preferred by Hooker, to a plant with small capsules and flowers, lax inflorescences, glaucescent leaf-blades that are dentate to pinnatisect, the blade and segments with teeth from rounded to acute or acuminate.

Root perennial, woody. Stems several, slender, sharply quadrangular, glabrous, branched, 3-6 dm. tall. Leaves glabrous: blades lanceolate to elliptic in main outline, slightly glaucous beneath, the largest 3-5 cm. long, 1-2 cm. wide, dentate to pinnatifid, acute to acutish at apex, at base rounded or narrowed to slender glabrous petioles 0.5-3 cm. long. Inflorescence usually less than half the height of the plant, of 4 to 6 pairs of opposite or usually scattered peduncles, each cyme of 2 to 4 flowers; rachis, peduncles, and pedicels more or less glandular-puberulent. Sepals 1.5-2 mm. long, green, with white scarious entire margin 0.3 mm. wide. Corolla 3-4 mm. long, the upper lobes slightly longest, projecting, pink, the 3 lower lobes cream-colored, recurved. Sterile filament greenish yellow, flabellate, about $\frac{2}{3}$ width of base of upper lip of corolla. Style 3 mm. long. Capsule 3-4 mm. long, shortly beaked. Seeds 0.8-1 mm. long, dark brown or blackish, transversely pitted.

Banks and rocky places, at altitudes of 1200 to 3600 meters, through the western Himalayas from eastern Afghanistan to Lahul. Flowering from early May to mid-August.

¹² Perhaps *Gorrie* 49227 is not this species, as the leaf-blade seems too deeply cut, and the inflorescence has too fine glands, but the sterile filament is that of *S. koelzii*.

AFGHANISTAN. Lorinj, *Koelz* 13656 (ANSP, USNA).

INDIA. Chitral: Bundai, *Harriss* 16453 (DD); Jambatai, *Harriss* 16452 (DD), 16454 (DD); Mirga, *Harriss* 14355 (DD); Ziarat, *Harriss* 16461 (DD). Hazara: Dogah, Saran Valley, *Inayat* (DD); Mansera to Abbottabad, *Stewart* 3781; -Kagan: Kamalban, *Inayat* (ANSP, DD); Kawai, *Inayat* 22057 (DD); Malkandi, *Inayat* 20011 (DD), 20014 (ANSP, DD), 22056 (DD). Muzaffarabad: Bataki to Dhanni, *Stewart* 17347 (ANSP, Gord, GH); Dhanni to Titwal, *Stewart* 17382 (ANSP, Gord, GH, NYBG, USNH); near Garhi, *Stewart* 8582a (NYBG); Titwal, Kishanganga Valley, *Stewart* 17459 (ANSP, NYBG); Uri, *Stewart* 12010 (ANSP, GH, NYBG), 14017 (ANSP, GH). Kashmir: Bandipur: *Koelz* 9093 (NYBG, USNA); Baramulla, *Stewart* 6097, 6098; Ganganguir, Sind Valley, *Inayat* 25730b (DD); Gulmarg, *Stewart* 10482a (ANSP, NYBG); Kangan to Gund (near Sonamarg), *Stewart* 6235; Pahlgam, *Stewart* 8030. Gilgit: Niltar Valley, north of Gilgit, *Duthie* 12347 (DD). Astor: Rattu, *Inayat* 25730 (DD), *Stewart* 18782 (ANSP, GH). Baltistan: Skagarthang Valley, *Duthie* 12124 (DD). Ladakh: Chatpani Nullah, west of Dras, *Duthie* 13812 (DD). Lahul: Sisu, *Koelz* 815.

17. *Scrophularia moniliformis* spec. nov.

Plate 5, B.

Root perennial. Stems several, branched below, rather sharply quadrangular, glabrous (but glandular-punctate), 2-4 dm. tall. Leaves glabrous, glaucous, the lower forming a rosette, the blades 2 cm. long, 1.2 cm. wide, rhombic-oval, obtuse, doubly dentate with a few rounded teeth, cuneately narrowed to petioles about as long as the blades; cauline leaves much smaller, narrower, with few obtuse lobes or teeth, all the leaves near the base of the stem. Inflorescence over $\frac{3}{4}$ the height of the plant, of 6 to 9 pairs of widely spreading peduncles (these all scattered), each cyme of 6 to 12 short-pedicelled flowers, which are all or nearly all along one cyme-arm; rhachis (toward apex), peduncles, and pedicels sparsely glandular-puberulent or glabrate. Calyx-lobes 1.5 mm. long, circular, green, with somewhat erose white scarious margin 0.2 mm. wide. Corolla 2-2.5 mm. long, brownish, the posterior lobes projecting, dark violet-purple, somewhat exceeding the anterior lobes. Sterile filament yellowish, flabellate, about half width of base of posterior lip of corolla. Fertile filaments glandular-puberulent, the anthers exerted, purple-brown. Style 2 mm. long. Capsule 1.5-2 mm. long, depressed-globose, mucronate. Seeds 0.8-1 mm. long, black, transversely pitted (somewhat irregularly angulate).

Perennis; caules plurimi glabri quadrangulares, 2-4 dm. alti; folia rosulata vel cauli inferiora, laminis ovalibus duplicato-dentatis infimis 2 cm. longis, petiolis 2 cm. longis; inflorescentia paniculata ramis florum moniliformibus; sepala 1.5 mm. longa, circularia, marginibus scariosis; corolla 2-2.5 mm. longa, brunnea, lobis posterioribus atroviolaceis; staminodium flabellatum; filamenta fertilia glanduloso-puberulentia, antheris exertis; stylus 2 mm. longus; capsula 1.5-2 mm. longa; semina 1 mm. longa.

Type, Kacha Garhi, near Peshawar, northwestern India, collected in flower May 25, 1928, by N. A. Qazilbash; in Herb. Academy of Natural Sciences of Philadelphia.

Gravelly soil, stream-beds, at altitudes of 300 meters, in Peshawar. Flowering in April and May.

Peshawar: Kacha Garhi, Peshawar (Islamia College), *Nath* 15834 (NYBG), *Qazilbash* (ANSP), *Stewart* 10176 (ANSP, DD, Gord, GH, NYBG, USNH).

18. *Scrophularia decomposita* Royle

In Hooker's Flora of British India (4: 254, 256, 1883) the plants that I am now associating under this specific name were sundered and placed under *Scrophularia scopoli* Hoppe and *S. lucida* L. From both of these the plants of the western Himalayas seem amply distinct; but, though at sight they appear yet more distinct from each other, there seems to be considerable intergradation where they are in geographical contact. Both have the same floral and fruiting characters, so that only leaf-cutting distinguishes the two subspecies. Apparent intergrades are marked by asterisks on the lists under each.

KEY TO SUBSPECIES

- A. Leaf-blades coarsely toothed or somewhat cleft into relatively wide (lanceolate) lobes. 18b. *S. d. latifolia*
 AA. Leaf-blades pinnatisect to pinnatifid, the segments linear-lanceolate to linear. 18a. *S. d. typica*

18a. *Scrophularia decomposita typica*

Scrophularia decomposita Royle, ex. Benth., Scroph. Indicae 18, 1835. "Hab. in Kanour, Royle." Type seen in Herb. Kew Gardens; isotype in Dehra Dun Herbarium.

*Scrophularia griffithii*¹³ Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 312, 1846. "In regno Cabulico (*Griffith*, n. 616) (v. in herb. Hooker.)" I fail to discern any actual contrast between Bentham's description of this and the preceding, as they occur on opposite pages of the Prodromus.

Varies greatly in degree of leaf-cutting, the coarsest states passing to subsp. *latifolia*, the finest (toward the eastern part of the range) being delicately much-divided.

Upper lip deep madder-purple or blackish, the corolla elsewhere yellow-green. Flowering from May to September.

Forming clumps in open valleys, usually in alpine meadows, at altitudes of 2000 to 4000 meters, through the western Himalayas from Afghanistan to Kumaun.

Waziristan: Shekai, *Harsukh* 15646 (DD). Hazara (Kagan Valley): Rewri Manur, *Inayat* 20006 (DD); *Saifar Maluk, *Inayat* 20018a (DD). Kashmir: Baltal, *Stewart* (ANSP, NYBG); Banihal Pass, *Stewart* 10720 (NYBG), 12200 (USNH); Burzil, *Duthie* 13970 (DD), 14034 (DD), *Koelz* 9443; Gulmarg, *Duthie* 13048 (DD), *Stewart* 10335 (NYBG), 15514 (ANSP, Gord, NYBG), 10654a (GH); Har Nag, Mt. Kolahoi, *Stewart* 9372 (ANSP, Gord); above Kainmul, Liddar Valley, *Duthie* 13149 (DD); Kajinag Range, *Duthie* 11051 (DD); Kamri Valley, *Duthie* (DD); Killanmarg, *Stewart* 8761 (ANSP, GH, USNH); Kolahoi Valley, *Duthie* 13502; Pahlgam, *Stewart* 5386, 5921, 8016 (Gord), 8432 (NYBG); Pir Panjal, *Strachey & Winterbottom* 115 (DD); Rajdhiangan Pass, *Stewart* 19515; Sinthan Pass, *Stewart* 6449; Sonamarg, *Stewart* 6321, 9708 (GH); Zogi La, *Gammie* (ANSP, DD). Gilgit: Kule Pam, *Giles* 176 (DD). Astor: Kalapani, Kamrinala, *Inayat* 25730c (DD). Baltistan: near Skardu (Escardoo), *Falconer's* collectors (DD); Thalle La, *Stewart* 20654a (ANSP, NYBG). Purig: Chatpani Nullah, west of Dras, *Duthie* 14174 (DD). Chamba: Alwas, *Stewart* 2429; Brahmour, *Koelz* 10141 (NYBG, USNA); Satrundi, *Lace* 1612 (DD); Sural Valley, *Harsukh* (DD). Kangra: above Dharmsala, *Stewart* 10317 (ANSP, Gord, GH); Rotang Pass, *Nath* (NYBG).

¹³ Bentham erroneously thought that the collector's name was "Griffiths", and so misspelled the name both in the reference to him and in the specific designation.

Zaskar: Pensi La, *Koelz* 5871 (USNH). Kulu: Tosnal, above Shari Jani Thach, *Parkinson* 4033 (DD). Bashahr: Pieri Pass, *Parmanand* 532 (ANSP, GH). Tehri: near Jamara camping ground in Damdar Valley, *Duthie* 235 (DD). Kumaun: "Kulti Yanati Valley", Byans, *Duthie* 5866 (DD); Milam¹⁴, Gori Valley, *Inayat* 24765 (DD); Par Chu, Gori Valley, *Inayat* 24761 (DD); Ralam Valley, *Inayat* 24764 (DD).

In his *Flora of British India* (4: 256, 1883) J. D. Hooker identified both *Scrophularia decomposita* and *S. griffithii* with *S. lucida* L. of southern Europe and southwestern Asia. As there considered, that species included several other entities, the plant of southern France (as illustrated by Coste in *Flore de France* 3: 4, 1906) having a sterile filament less than half the width of the base of the upper lip of the corolla, whereas that of Anatolia (as shown by *Bornmuller* 596 and 597, in the Academy's herbarium) has the sterile filament nearly as wide as the expanded portion of the upper corolla-lip. Both have more finely cut leaf-blades, that are usually more bipinnatifid. Whichever is real *S. lucida*, our Himalayan plant seems clearly different from it, or from any other specimens seen from west of Afghanistan.

18b. *Scrophularia decomposita latifolia* (Bentham) comb. nov.

Scrophularia griffithii latifolia Benth., in DC., *Prod. Syst. Nat. Regn. Veg.* 10: 312, 1846.

Cum priore [in regno Cabulico] *Griffith*¹⁵! n. 619 specim. fructiferum in herb. Hooker)." Distinguished from the species, which I identify above as subsp. *typica*, by the phrase: "foliis majoribus minus incisus," a clear characterization of the subspecies now considered.

Forming clumps of only a few stems (or even solitary), in forest, at altitudes of 2000 to 3400 meters, in the western Himalayas from Afghanistan to Kashmir. Flowering from May to August. (Specimens marked by asterisks intermediate with ssp. *typica*.)

AFGHANISTAN. Kurram Valley: Aina Mela, *Harsukh* 14719 (DD); in the Kuram and Hariab districts, *Aitchison* 77 (DD).

INDIA. Waziristan: Pirghal, *Harsukh* 15619 (DD). Astor: *Shunkergadh, Kamrinala, *Inayat* 25730a (DD). Hazara: Changla Gali, *Stewart* 10214 (ANSP, Gord, NYBG), 13900 (GH); Deoli, *Inayat* (ANSP, DD); Thandiani, Abbottabad Dist., *Inayat* 20009 (DD). Hazara (Kagan): Besri, *Inayat* 20017 (DD); Bhurj, *Inayat* 22055 (DD); Chapran, *Inayat* (DD); Jebri Manur, *Inayat* 20015 (DD); *Kunna Danna, *Inayat* 22058 (DD); Kuthyali, *Inayat* 22058 (DD); Makra, *Inayat* 22058 (ANSP, DD); Shinu Ka Katha, *Inayat* (DD); *Silan, *Inayat* (DD). Rawalpindi: Darya Gali, west of Murree, *Inayat* 14603 (DD); Gharial, Murree Hills, *Stewart* 3806, 7612 (ANSP, NYBG); Jhicca Gali, Murree Hills, *Stewart* 12359 (GH); Murree, *Stewart* 9625 (ANSP, Gord, NYBG), 15357 (ANSP, Gord, GH), 15888 (NYBG, USNH). Muzaffarabad: Kel, *Stewart* 17836; Musa, *Inayat* 14603 (DD); Thora, *Inayat* 22053 (DD). Punch: *Baramgala, *Strachey & Winterbottom* 82 (DD); Mandi, *Stewart* 12009 (ANSP, NYBG). Kashmir: *Chorwan, *Stewart* 19234 (ANSP, Gord); Gulmarg, **Duthie* 13041 (DD), *Stewart* 14755 (ANSP, NYBG); *Gurais, *Duthie* (DD); Pahlgam, *Stewart* 8016; Tangmarg, *Stewart* 10654 (ANSP, Gord).

J. D. Hooker in the *Flora of British India* (4: 254, 1883) identified this as *Scrophularia scopolii* Hoppe, a name dating from Bentham's description in DeCandolle's *Prodromus* (10: 308, 1846). It is certainly not the plant of eastern Europe and Asia Minor there described, as that was more pubes-

¹⁴ Finest leaf-cutting observed.

¹⁵ "Griffiths", error for Griffith.

cent, with leaf-blades crenately dentate and somewhat cordate at base, and, as shown by specimens in the Academy's herbarium, with sterile filament expanded $\frac{1}{2}$ to $\frac{2}{3}$ the width of the base of the upper lip of the corolla. Apparently also the upper lip, while dark, is much lighter than in *S. decomposita* and the present plant. In the latter the stem and foliage is glabrate or the stem somewhat glandular-puberulent above, the sepals have conspicuously wide scarious margins (0.5-1 mm. wide), the upper lip is dark purple-violet (almost blackish at times), and the sterile filament is about as wide as the base of the upper lip of the corolla.

Bentham placed *Scrophularia scopolii* among the species with leaf-blades showing a closed reticulation. *S. decomposita latifolia* shows gradations in its loss, while *S. d. typica* lacks it altogether.

19. *Scrophularia striata* Boissier

Scrophularia striata Boiss., Fl. Orient. 4: 413, 1879. "Hab. in montibus prope Jezd Persiae orientalis ad pagum Dehballo (*Buhse* 1339!)" Three other collections cited, and from the four the type must be selected. If the first is chosen, a topotype, *Bornmüller* 4997, is in Herb. Academy of Natural Sciences of Philadelphia.

Upper lip blackish crimson, corolla elsewhere pale, lower lobes white. Flowering from March to early June.

Forming very large clumps, stream-beds and rocky slopes, at altitudes below 1200 meters, in northwestern India. Ranging from the plateau of eastern Persia and Baluchistan to Rawalpindi, India.

PERSIA. Yesd: Yesd, *J. Bornmüller* 4997.

BALUCHISTAN. Fort Sandeman, ——— 20610 (DD); Kawas Tangi, *A. V. Monro* (DD); Mina Bazaar, ——— 18952 (DD).

AFGHANISTAN. Kurram Valley: from Badishkhel to Shalizan, *Aitchison* 264 (DD, GH).

INDIA. Waziristan: Torkhan, ——— 18953 (DD); ———, *Harsukh* 15724 (ANSP, DD). Kurram: Jiran, *Harsukh* 15420 (ANSP, DD); Parachinar, *Harsukh* 14673 (ANSP, DD); Shalizan, *Harsukh* 14794 (DD). Tirah: Khyber Pass, *Nath* 15451 (ANSP, NYBG). Peshawar: Peshawar, *Collett* (DD). Samana Range, N.W. Frontier, *Capt. Hare* (DD). Attock: Hasan Abdal, *Stewart* 7006, 7758 (ANSP, GH, NYBG), 9558 (Gord), 10136 (NYBG, USNH); Jhalar, *Nasir* 16309 (GH, NYBG); Chhoi, Kalachita Hills, *R. N. Parker* 3379 (GH). Hazara: Abbottabad, *Stewart* 14642 (ANSP, Gord, GH, NYBG); Havelian, *Stewart* 10780 (NYBG); Kaie, Kagan Valley, *Inayat* 20895 (DD). Rawalpindi ("Rawul Pindee"): Murree Hills, *Stewart* 7682 (Gord); Rawalpindi, *Aitchison* 489 (DD); Dharmyal, near R., *Nath* (NYBG); Morga, near R., *Stewart* 16626 (NYBG).

Tribe IV. CALCEOLARIEAE

Tribe mainly consisting of the following Neotropical genus.

17. CALCEOLARIA (Feuillee) Linnaeus

Calceolaria L., in Vetensk. Acad. Handl. 31: 288, 1770. Genotype, *C. integrifolia* L. of Chile, the one of the two original species that had been described in 1714 by Feuillee who first proposed the generic name.

A genus of some 500 species, all Neotropical.

1. *Calceolaria chelidonioides* Humboldt, Bonpland, & Kunth.

Calceolaria chelidonioides H. B. K., Nov. Gen. et Spec. 2: 378, 1818. "Crescit in radicibus montis Javirac prope Quito [Humboldt & Bonpland in 1802]." Isotype seen at Museum d'Histoire Naturelle at Paris, France.

Moist soil, naturalized from tropical America. Seen only from crevices of walls at Landour, Dehra Dun, at 2100 meters altitude, where gathered by Miss Cleland; in Herb. Gordon College 12540 and Acad. Nat. Sci. Phila.

Tribe V. *ANTIRRHINEAE*

Tribe mainly Palaearctic, slightly entering the Oriental Region as will be seen below.

KEY TO GENERA

- A. Capsule symmetrical, globose or cylindrical, finely pubescent or glabrous, the cells equal, opening nearly or quite their entire width; corolla yellow; plants not glandular.
- B. Seeds angled or flattened-winged; capsule dehiscent by irregular distal ruptures; corolla large, the spur (15-20 mm. long) as long as the remainder of the corolla; flowers nearly spicate; leaf-blades lance-ovate, sessile; plants erect, glabrous.18. *Linaria*
- BB. Seeds reticulate-alveolate or spinulose; capsule irregularly rupturing or over most of side, or the side abscissing as a plate; corolla small, the spur 2-5 mm. long, mostly shorter than corolla (4-7 mm. long); flowers on slender pedicels; leaf-blades ovate, rounded or hastate near base, petioled; plants twining, glabrous to villose.19. *Kickxia*
- AA. Capsule asymmetrical, the base of the slightly larger anterior cell wholly in front of the pedicel, both cells pubescent especially distally and both dehiscent by narrow distal openings; corolla cyanic; plants glandular-pubescent (at least in the inflorescence), erect.
- B. Corolla merely saccate at base, its orifice closed by the conspicuous palate; capsule woody, hairy, decurved at apex, the anterior cell opening by two definite pores, the posterior by a single pore; seeds cyathiform; pedicels short.20. *Antirrhinum*
- BB. Corolla spurred at base, the orifice open by the arching of the posterior lip above the palate; capsule membranous, finely pubescent, straight throughout, each cell opening by a single terminal pore; seeds with thin parallel wing-like ridges; pedicels 10-15 mm. long.21. *Chaenorhinum*

18. *LINARIA* [Bauhin] Miller

Linaria Mill., Gard. Dict., ed. IV. 1754. Genotype, *Antirrhinum linaria* L. of Europe.

A genus of about 100 species, mostly Palaearctic, a few Nearctic.

1. *Linaria dalmatica* (Linnaeus) Miller

Antirrhinum dalmaticum L., Spec. Plant. 616, 1753. "Habitat in Creta."

Occasional as an escape from gardens. Seen only from Kashmir, at altitudes of 2000 to 2500 meters.

Kashmir: Gulmarg, Stewart 10527a; Srinagar, Miss Pinfold.

19. **KICKXIA** Dumortier

Kickxia Dumort., Fl. Belg. 35, 1827. Genotype, *Antirrhinum elatine* L., of Europe, the more historic of the 2 original species. It was the type of the old genus, *Elatine* [Bauhin] J. Hill.

A genus of some 30 species, through the Mediterranean Subregion from Spain and northwestern Africa eastward, ultimately to western India.

KEY TO SPECIES

- A. Seeds less than 0.5 mm. long, spinulose; capsule irregularly rupturing distally, or eventually over most of side; most of corolla light yellow, the spur shorter than the remainder of corolla; sepals lanceolate, proximally scarious, distally subulate; leaf-blades hastate or acutely lobed at base, on petioles at least $\frac{1}{2}$ the length of the blades.
- B. Whole plant, including the external surface of the corolla, glabrous; corolla yellow throughout, 6 mm. long, the spur strongly curved forward; pedicels frequently much longer than the length of the sepals and capsule.
1. *K. ramosissima*
- BB. Whole plant, including the externally pubescent surface of the corolla, hairy, mostly hirsute; corolla 7 mm. long, with upper lip purplish and palate purple-spotted, the spur deflexed, straight or only slightly curved forward; pedicels usually about the length of the sepals and capsule, occasionally longer.
2. *K. incana*
- AA. Seeds 1 mm. long, reticulate-alveolate; capsule dehiscing by the abscission as a plate of most of the external wall of each cell; corolla a deeper yellow, with tips of lower lip "deep crimson" or "purple", the spur curving forward and about as long as the remainder of the corolla; sepals ovate-lanceolate; leaf-blades rounded or bluntly hastate-lobed at base, on petioles less than $\frac{1}{2}$ the length of the blades; plants villose. 3. *K. subsessilis*

1. ***Kickxia ramosissima*** (Wallich) Janchen

Linaria ramosissima Wall., Plant. Asiat. Rar. 2: 43, t. 153, 1831. "Habitat in ruderatis et petrosis Hindustaniae et Burnae ; prope Mirzapur ad ripam Ganges, 1820;" Description and illustration clearly of the species now considered.

Kickxia ramosissima (Wall.) Janchen, in Oesterr. Bot. Zeitschr. 82: 152, 1933.

Rocky places, at altitudes up to 1600 meters, plains and lower mountains, eastern Afghanistan to Almora. Flowering in March and April, with lingering blossom through the summer.

Waziristan: Kohat to Kalabagh, *Schlagintweit*; Shakai, *Duthie* 15692. Tirah: Khyber Pass, *Nath* 15432 (ANSP, NYBG). Attock: Attock, *Stewart* 13639 (ANSP, NYBG, USNH); Hasan Abdal, ———; Jhalar, *Stewart* (NYBG). Hazara: Abbottabad, *Stewart* 14643 (ANSP, GH, NYBG); Baghnotar, *Stewart* 9132a (ANSP, NYBG); Balakot, Kagan Valley, *Inayat* 19978 (DD); Shinkiyari, *Inayat* (DD). Jhelum: Mt. Tilla, *Stewart* 715. Rawalpindi: Dhamyal, *Nath* 17268a (USNH); Kahuta, *Nath* 19352a; Phullaren, *Stewart* 13784a (GH); Riwat, *Nath* 17276a; Saidpur, *Stewart* 6993, 13754 (Gord, GH, NYBG); Topi Park, Rawalpindi, *Stewart* 7107. Muzaffarabad: Domel, *Stewart* 5155; Muzaffarabad, *Stewart* 17312 (ANSP, Gord, GH, NYBG, USNH). Udhampur: Ramban, Jumu Road, *Stewart* 10726. Chamba: Kalel-Tissa, *Stewart* 2354. Almora: Almora, *Strachey & Winterbottom* 1 (GH).

2. ***Kickxia incana*** (Wallich) comb. nov.

Linaria incana Wall., Plant. Asiat. Rar. 2: 43, 1831. "Habitat in campis ruderatisque convallis Nepaliae." Description, by mention of leaf-blades twice longer than the petioles, calyx-lobes lanceolate and membranaceous-margined, palate of corolla purple-spotted and spur only half length of corolla, and capsule dehiscing from the vertex to the middle, denotes the species now considered, rather than the next to which J. D. Hooker in the Flora of British India (4: 252, 1883) applied the name.

Linaria cabulica Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 270, 1846. "In regno Cabulico (*Griffith*¹⁶) (v. in herb. Hook.)" A possible isotype, *Herb. Griffith* 3859 from Afghanistan, seen in Gray Herbarium of Harvard University, agrees wholly with Bentham's description, the pedicels (9-13 mm. long) being longer than the upper or most of the bracts. Stewart 715a has pedicels as long or longer, but the bracts are relatively larger. Usually in the species now considered the pedicels are much shorter, about equaling or little exceeding the length of the sepals or capsules.

Rocky places, at altitudes up to 1200 meters, plains and lower mountains, eastern Afghanistan to Nepal. Flowering from March to May, and also in the winter.

Attock: Hasan Abdal, *Stewart* 9538 (ANSP, Gord, NYBG, USNH), 13885 (Gord). Hazara: Abbottabad, *Stewart* 13673a; Baghnotar, *Stewart* 9132 (ANSP, USNH); Bala-kot, Kagan Valley, *Inayat* 22042 (DD). Jhelum: Mogli, *Stewart* 715a. Rawalpindi: Rawalpindi, *Stewart* 9507 (Gord, GH), 13853; Saidpur, *Stewart* 7608 (NYBG), 16254 (ANSP, GH, NYBG), 16565a (NYBG). Muzaffarabad: Domel, *Stewart* 5155a. Simla: Simla Hills, *Drummond* 620 (DD), *Strachey & Winterbottom* 2 (GH).

3. *Kickxia subsessilis* spec. nov.

Plate 6, A.

Root perennial. Plant villose throughout with white hairs. Stems much branched, prostrate, diffusely spreading to 3-6 dm. long. Leaf-blades oval to ovate, acute to broadly rounded, slightly dentate to hastate-lobed at and above base, or at times entire, 1-2.2 cm. long and nearly as wide, proximally truncately rounded to petioles less than 3 mm. long, these often hardly evident; nearly all leaves actually bracts, as stems are floriferous nearly throughout. Pedicels 8-18 mm. long, usually equaling or longer than the bracts, and divaricately spreading in direction usually opposite to bracts, upcurved at apex.¹⁷ Sepals ovate-lanceolate, attenuate, 3-4 mm. long, green throughout or obscurely scarious toward base. Corolla 4-5 mm. long, dark yellow, tip (of lower lip) deep crimson; corolla externally pubescent, internally hirsute-pubescent over the base of the lower lip; spur filiform, attenuate, deflexed, straight or nearly so, about as long as the remainder of the corolla. Filaments and anthers ciliate. Capsule 3 mm. long, depressed-globose, dehiscent by the abscission as a plate of most of the external cell-wall, from vertex $\frac{3}{4}$ or more toward base. Seeds 1 mm. long, ovoid, brown, irregularly reticulate-alveolate.

Radix perennis; planta villosa, diffusa; laminae foliorum (bractearum) ovaes ovatae, saepissime rotundatae, paulum hastatae integrae, petiolis brevissimis; pedicelli 8-18 mm. longi; sepala 3-4 mm. longa, ovato-lanceolata, attenuata, non vel obscure scariosa; corolla 4-5 mm. longa, fulva, apicibus purpuratis, calcar filiforme deflexo saepissime recto longiore; capsula 3 mm. longa, lateribus calyptris operculiformibus dehiscentibus; semina 1 mm. longa, ovoidea, reticulato-alveolata.

Type, loamy field, at an altitude of 1600 meters, Baramulla, Jhelum Valley, Kashmir, collected in flower July 1934, by R. R. Stewart, no. 14053; in Herb. Academy of Natural Sciences of Philadelphia.

¹⁶ "Griffiths" in original.

¹⁷ I take it that the leaves on the diffuse stems grow upward toward the light, and that the flowers are therefore placed beneath them toward the ground.

Fields in alluvial mountain valleys, at altitudes of 300 to 1700 meters, in the western Himalayas from eastern Afghanistan to Kashmir. Flowering in May and July, and probably through much more of the year.

Dera Ismail Khan: Tank, *Williams* 4185. Peshawar: Peshawar, *Qazibash*. Kashmir: Baramulla, *Stewart* 5048, 6107; Nasim Bagh, *Stewart* 3255; Srinagar, *Gammie*, *Stewart* 18060 (NYBG).

This is the species with which J. D. Hooker mistakenly identified *Linaria incana* Wall. Though he gave a new description in the Flora of British India (4: 252, 1883), it was largely inapplicable to the plant now considered, since in part it was based upon Wallich's description and only in part upon actual specimens.

20. ANTIRRHINUM [Bauhin] Linnaeus

Antirrhinum L., Spec. Plant. 612, 1753; Gen. Plant. ed. V. 268, 1754. Genotype, *A. majus* L., of Europe; see Proc. Acad. Nat. Sci. Phila. 82: 20, 1930.

A genus of about 30 species, most numerous in the Mediterranean Subregion of the Palaearctic Region; also in western North America (Nearctic); the following adventive to northern India.

1. *Antirrhinum orontium* Linnaeus

Antirrhinum orontium L., Spec. Plant. 617, 1753. "Habitat in Europae agris & arvis."

A weed-like annual, with small purple corollas, naturalized from Europe, occasional in northwestern India at altitudes up to 1100 meters. Flowering from February to May.

Attock: Jhalar, *Nasir* (*Stewart* 14745a) (NYBG). Rawalpindi: Margalla Pass, *Stewart* 10133. Muzaffarabad: Domel-Garhi Habebullah, *Stewart* 9667 (Gord). Gujranwala: Gujranwala, *Stewart* 12538 (GH). Gurdaspur: Pathankot, *Stewart* 1044. Kangra: Bhadwar, *Koelz* 4299 (USNH). Saharanpur: Saharanpur, *Duthie*.

21. CHAENORRHINUM (Chavannes) Lange

Chaenorhinum Lange, ex Willk. & Lange, Prod. Fl. Hisp. 2: 577, 1870. Based on *Linaria* sect. *Chaenorhinum* Chav., Monographie des Antirrhinees 92, 1833. Among several species common to both authors and equally eligible, I endorse Britton's selection of *Antirrhinum minus* L. as genotype, this being the most wide-ranging and familiar in Europe. Generic name, of Greek etymology, means "gaping snout", in allusion to the corolla-throat standing open.

A genus of about 20 species, through the Mediterranean Subregion of the Palaearctic Region from Spain and Morocco to northwestern India.

1. *Chaenorhinum johnstonii* (Stapf) comb. nov.

Linaria johnstonii Stapf, in Kew Bull. Misc. Inform. 75, 1906. Specimens cited from Baluchistan, Afghanistan, and India. None was designated as type, but the specific name selects the following: "Afghanistan Kyber Pass, *H. H. Johnston*, 157." Description distinctive of the species now considered, while the only specimen from India originally cited was one of Aitchison's from "Rawal Pindi."

Corolla violet-blue. Flowering in March and April.

Occasional in fields, loess, at altitudes below 520 meters, eastern Afghanistan and northwestern India.

Attock: Jhalar, *Nasir* (*Stewart* 14664a). Rawalpindi: Saidpur, *Stewart* 16566a (NYBG); Sohan R., *Stewart* 7097.

Tribe VI. *HEMIPHHRAGMEAE*

Now proposed as a tribe to include the following anomalous genus. We need fuller knowledge of its floral characters. Perhaps it does not even pertain to this family.

22. *HEMIPHHRAGMA* Wallich

Hemiphragma Wall., in Trans. Linn. Soc. London 13: 611, 1822. Genotype, *H. heterophyllum* Wall., the only original species.

A monotypic genus of the mountains of southeastern Asia.

In the report of the Nancy (1886) meeting of the Association Francaise pour l'Avancement des Sciences (15, pt. III: 498-503, 1887) Paul Maury shows that in this genus the wall between the two cells of the ovary is incomplete.

1. *Hemiphragma heterophyllum* Wallich

Hemiphragma heterophyllum Wall., l.c. 612, 1822. "In montibus Nepaliae saxatilis." Presumable isotype, labeled "3895 Wall. Cat." and from Nepal, seen in Gray Herbarium of Harvard University.

Through the eastern Himalayas and in the mountains of Yunnan. Recorded in Hooker's Flora of British India (4: 289, 1884) as occurring from Garhwal to Bhotan, at altitudes of 6000 to 12000 feet (1800-3700 meters). Probably Royle's collection from "Himalayas" in the Academy's herbarium, and Thomson's from "Himal. Bor. Occ." in the Gray Herbarium, came from our territory.

In the article above mentioned, Paul Maury, under the caption "Sur le Mode de Vegetation de l'*Hemiphragma heterophyllum* Wall.," considers the dimorphism of the leaves, showing that the large ample ones are those of the hot wet period and reach a climax in September, while the small subulate leaves are those of the cool dry season and persist over winter until the following May.

Tribe VII. *VERONICEAE*

A large Palearctic and Nearctic tribe, but present in other regions excepting only the Ethiopian.

KEY TO GENERA

- A. Leaves mostly radical and petioled, the scape-like stems sometimes with small alternate sessile leaves below the racemose or spicate inflorescence; anther-cells divergent or divaricate, obviously confluent; plants rhizomatose.
 - B. Stamens 4, the anthers exerted at least beyond the lower corolla-lobes; capsule turgid, acuminate, dehiscent both septicidally and loculicidally; seed-coat bladderly-inflated, lustrous, minutely reticulate; upper corolla-lobes apparently overlapping; rhizomes woody, spreading, subaerial....23. *Picrorhiza*
 - BB. Stamens 2 (the postero-lateral pair), the anthers included; capsule flattened; seed-coat firm, not reticulate nor lustrous; rhizomes short, not woody.
 - C. Cells of capsule containing many seeds, these wholly free; antero-lateral lobes of corolla overlapping in the bud; sepals distinct, green; flowers secundly racemose, the pedicels developed.....24. *Wulfenia*

- CC. Cells of capsule containing each a single seed, to which capsule-wall coheres so that the cell drops away entire (or by abortion only a single cell and seed); upper lobes of corolla overlapping in the bud; sepals joined, tending to be hyaline-chartaceous; flowers densely spicate, the pedicels not developed.....25. *Lagotis*
- AA. Leaves opposite or alternate, the stems well-developed and leafy throughout; stamens 2 (the postero-lateral pair), the anther-cells parallel or slightly divergent, distinct or nearly so; antero-lateral lobes of corolla overlapping in the bud; scarcely rhizomatous perennials to ephemeral annuals.....26. *Veronica*

23. PICRORHIZA Royle

Picrorhiza Royle, ex Benth., Scroph. Indicae 47, 1835. Genotype, *P. kurrooa* Royle, the only original species.

An alpine genus of southeastern Asia, hitherto considered monotypic.

1. *Picrorhiza kurrooa* Royle

Veronica lindleyana Wall., Numer. List Spec. Ind. Mus. n. 404, 1829, ined., with citation of two localities that were repeated by Bentham. On this was based *Picrorhiza lindleyana* Wettst., in Natürl. Pflanzenfam. IV, 3b: 84, 1891, likewise not validated.

*Picrorhiza kurrooa*¹⁸ Royle, ex Benth., Scroph. Indicae 47, 1835. "Hab. in Gossain Than et Kamaon, Wallich, ad Kidarkonta, Royle." The name was taken from Royle with reference to his then unpublished Illustr. Bot. Himal. t. 71. This shows well the plant now considered, and Royle's text (page 291, published in 1836) alludes to his having obtained it at Shalma, and that "the genus is named for the bitter root used in native medicine." Taking Royle's plant cited by Bentham as type, this came from "Kidarkonta"; Mount Kedar Kanta (mentioned on page 22 of Royle's text) is a Himalayan peak, east of the Sutlej gorge on the border between Garhwal and the Simla Hill States.

Usually with filaments 4 to 5 times the length of the corolla and with leaves from 3 to 9 cm. long; occasional smaller plants, with filaments from 1½ to 3 times the length of the corolla and leaves from 1 to 3 cm. long, are taken to be immature, as is suggested by their occurrence within the known range of the species. Such collections are marked by asterisk on the following list.

The normal state may be described as follows:

Rhizome stout, 5-8 mm. in diameter, 3-10 cm. long (or perhaps longer). Leaves 4-10 cm. long, distally 1-3.5 cm. wide, elliptic to oblanceolate, acute or acutish, sharply serrate, proximally narrowed to a semi-petiolar base or to a petiole that may be nearly as long as the leaf-blade, blades slightly paler beneath, slightly pubescent on both surfaces or glabrate, blackening in drying. Scape-like peduncles in anthesis 5-10 cm., in fruit 7-10 cm. tall, brown-pubescent, especially distally, with 1 to 4 bract-like leaves below the inflorescence. Raceme in anthesis 3-4 cm. long, in fruit 6-12 cm. long, the rachis and pedicels brown-pubescent. Bracts 8-9 mm. long, oblong-lanceolate, obtuse or obtusish, ciliate and somewhat brownish-pubescent. Pedicels becoming 1.5-3 mm. long. Sepals in anthesis 6-9 mm. long, in fruit 9-11 mm. long, lanceolate, acute, ciliate, and somewhat pilose. Corolla violet, nearly regular (but the lobes united slightly farther posteriorly), 4-5 mm. long, lobes about equaling or slightly longer than the tube, ovate or ovate-

¹⁸Specific name emended from "kurroa", as given by Bentham, to agree with Royle's original spelling, Bentham's form being likely an error in copying.

lanceolate, acuminate or somewhat attenuate, conspicuously ciliate and pilose within (corolla externally nearly glabrous), the two posterior lobes slightly smaller, united $\frac{1}{2}$ to $\frac{3}{4}$ length. Filaments scarcely didynamous, glabrous, 15-17 mm. long. Anther-cells 0.5-0.6 mm. long, as long as or longer than wide, obliquely divaricate. Capsule 9-10 mm. long, ovoid-attenuate, deeply sulcate, brown or black, dehiscent distally septically, and somewhat also loculicidally. Seeds 1.5 mm. wide, turgid, the reticulations of the testa faint, brown, alveolations slightly glistening.

Alpine meadows, often gregarious, at altitudes of 3000 to 4300 meters, through the western Himalayas from Kashmir to Kumaun. Flowering from late June to mid-August.

Kashmir: Burzil Pass, *Stewart* 18856, 19084 (NYBG), 19224; Kamri Pass (Nain-gund), *Inayat* 25732; Mir Panzil Pass, Deosai Road, *Stewart* 19945a; Nafran, *Stewart* 12537; Pahlgam, *Stewart* 5839, 7823 (NYBG), 9278 (NYBG); Sonamarg, *Stewart* 6417, 6597 $\frac{1}{2}$; Tragbal, *Stewart* 4618; Zojibal Pass, *Stewart* 18234 (ANSP, NYBG). Chamba: *Kukti Pass, *Koelz* 8600. Lahul: Dilburig, Chenab Valley, *Koelz* 9917; Kyelang, *Koelz* 538 (NYBG). Kangra (Kulu): *Chandrokani, *Koelz* 61 (ANSP, NYBG); Sumdo, *Koelz* 5011 (USNH). Bashahr: Chhit Kul, *Parmanand* 1032 (ANSP, GH); *Hangla Pass, *Parmanand* 688 (ANSP, NYBG); Pieri Pass, Kinnawar, *Parmanand* 521. Kumaun: Madhari Pass, *Strachey & Winterbottom* 1 (GH); Milam, *Schlagintweit* 9647 (GH).

In Hooker's Flora of British India (4: 290, 1884) *Picrorhiza kurroa* Benth. is stated to occur in the "Alpine Himalaya; from Kashmir to Sikkim, alt. 9-15,000 ft., common." Hooker considered its flowers to be dimorphic (a condition otherwise unknown in the Scrophulariaceae), and described them as follows: "Corolla of the long stamened form short, membranous, subequally 5-cleft to the middle; lobes ovate, acuminate, ciliate; of the shorter stamened, corolla-tube curved, broad; limb 2-lipped, upper lip longer, subgaleate emarginate, lower of 3 shorter ovate acute lobes, the middle one smallest." As all the collections seen from the western Himalayas agree in having the corolla of the long-stamened form, being *P. kurroa* as now limited, while those from the eastern Himalayas and Yunnan agree in having the corolla of the shorter-stamened form, it is evident that Hooker's distinctions are really racial, and characterize two species, one of the dry western, the other of the moist eastern, Himalayas. Although beyond the geographical area of this study, it seems desirable to consider the latter, too.

So remarkable are the distinctions between these two species, that it becomes necessary to place them in two distinct sections, each at present limited by the characters of its single component species. If further kinds are discovered, it may well be that details of size and pubescence, or of the shape of the bracts, will have to be modified, but those of corolla-form and capsule-dehiscence should hold true. These distinctions are as follows:

KEY TO SECTIONS

- A. Corolla longer than the sepals, its lobes very unequal (in form suggesting *Scrophularia*, with wholly united posterior lobes that project horizontally over stamens, much shorter and vertically placed antero-lateral lobes, and mid-anterior lobe that is shortest of all), not long-ciliate, and slightly glandular-puberulent within anteriorly; corolla externally glandular-puberulent; posterior filaments glabrous, anterior glandular-puberulent; capsule 12 mm. long, laterally deeply sulcate, its primary dehiscence loculicidal; seeds 2 mm. long; bracts ovate. (*SCROPHULARIODES*) 1. *P. scrophulariaeflora*
- AA. Corolla shorter than the sepals, its lobes nearly equal in length, strongly ciliate, the posterior lobes free and pilose within, the corolla externally nearly or quite glabrous; filaments all glabrous, elongating so that the anthers are long-exserted from the corolla; capsule 6 mm. long, laterally slightly sulcate, its primary dehiscence septical; seeds 1 mm. long; bracts elliptic or lanceolate. (*EUPICORRHIZA*) 2. *P. kurrooa*

Picrorhiza scrophulariaeflora sp. nov.

Plate 6, B.

Rhizome becoming stout, 3-8 mm. in diameter, at least 6-8 cm. long. Leaves becoming 5-7 cm. long, distally 1.5-2 cm. wide, spatulate or oblanceolate, rounded, serrate to sharply dentate, proximally cuneately narrowed to a semi-petiole base, glabrescent or glabrate, blades nearly concolorous, in age whitened-glaucous, blackening in drying. Scape-like peduncles in anthesis 2-3 cm. long, in fruit 6-9 cm. long, brown-pubescent (especially distally), without bract-like leaves below the inflorescence. Racemes in anthesis about 2 cm. long, the rachis and pedicels brown-pubescent. Bracts 5-6 mm. long, ovate, acuminate to a blunt tip, finely ciliate and slightly pubescent. Pedicels becoming 2-3 mm. long. Sepals in anthesis 5 mm., in fruit 10 mm. long, oblanceolate, acute, short-ciliate and slightly pilose. Corolla very irregular (like *Scrophularia* in form), 9-10 mm. long; the tube 3 mm. long; the two posterior lobes much the longest, wholly united to a truncate apex, each lobe slightly erose medianly, projecting as an upper lip (4 mm. long) horizontally over the anthers and stigma; the antero-lateral lobes in a vertical plane, free from posterior lobes about 1 mm., but from the mid-anterior lobe 3 mm., distally erose-truncate and longest toward anterior margin, about 2 mm. wide; the mid-anterior lobe 3 mm. long, lanceolate, less than 1 mm. wide, horizontally placed, apparently somewhat incurved; corolla externally glandular-puberulent, only slightly glandular-puberulent as a sparse ciliation of the anterior lobes and within the throat anteriorly. Filaments equal (so anthers at same level), 5 mm. long (the free portion of the posterior shorter because attached farther to corolla); posterior pair glabrous; anterior pair more slender and curved, glandular-puberulent. Anther-cells about 1 mm. long, oval, slightly divaricate. Capsule 10 mm. long, ovoid, obtuse, sulcate especially distally, black, strongly glaucous, dehiscing loculicidally, and later the carpels separate distally. Seeds 2 mm. wide, somewhat flattened, the reticulations of the testa nearly black, alveolations very glistening.

Rhizoma robustum; folia 5-7 mm. longa, spatulata oblanceolatae, rotundata, serrata, cuneata, glabrata, nigrescentia; pedunculi fructiferi 6-9 cm. longi, pubescentes; bractae 5-6 mm. longae, ovatae, apice obtuso acuminatae, ciliolatae; pedicelli 2-3 mm. longi; sepala fructifera 10 mm. longa,

oblanceolata, acuta, brevi-ciliata; corolla 9-10 mm. longa, externe glanduloso-puberulens, imagine *Scrophulariae* formata, lobis posterioribus longioribus, omnino junctis, horizontaliter projectis, lobis antero-lateralibus verticalibus minoribus, lobo mediano-anteriore minimo lanceolato; filamenta 5 mm. longa, posterioribus glabris, anterioribus glanduloso-puberulentibus; antherae 1 mm. longae, ovae; capsula 10 mm. longa, ovoidea, loculicide dehiscens; semina 2 mm. lata, reticulata, nitida.

Type, at 4300 meters altitude, Zemu Valley, Sikkim, collected in flower July 13, 1909, by Smith and Cave, no. 1343; in Herb. Academy of Natural Sciences of Philadelphia.

Alpine slopes, seen from altitudes of 4300 to 5200 meters, eastern Himalayas to mountains of Yunnan.

Sikkim: Naku Chu, *Smith & Cave* 1965 (UCLA); Zemu Valley, *Smith & Cave* 1343 (ANSP).

24. WULFENIA Jacquin

Wulfenia Jacq., Misc. Austr. 2: 60, 1781. Genotype, *W. carinthiaca* Jacq., the only original species.

Falconeria Hook. f., Icon. Plant. 15: 30, 1883. Genotype, *F. himalaica* Hook. f., the only original species. Not *Falconeria* Royle, Ill. Bot. Himal. Mts. 354, tab. 84a, 1839.

Genus comprising a few Palaearctic mountain species, from the Alps to the Himalayas.

Different as are the two Himalayan species that are now being associated in *Wulfenia*, so contrasted as to lead so conservative a botanist as Sir Joseph D. Hooker to place them in separate genera, neither approaches closely (although each resembles) the genotype, *W. carinthiaca* of Europe. That has corolla-lobes rounded, with the upper united and wider than long as in *W. himalaica*, but differs from both these in having the proximal part of the lower lip (pseudopalate) hirsute and in having the anther-cells divaricately, rather than merely divergently spreading. Its sepals are lance-attenuate, similar to but longer than those of *W. amherstiana*. I think that there can be little question of the generic association of these three plants, among which *W. amherstiana* is hardly so close to the genotype as *W. himalaica*.

KEY TO SPECIES

- A. Upper lip of corolla wider than long, merely notched between petals, much shorter than the lower lip, the rounded lobes all retuse; sepals oblong, glandular-pubescent and -ciliate¹⁰; inflorescence in anthesis not exceeding the obovate-oblong, irregularly and doubly deeply crenate leaves.....1. *W. himalaica*
- AA. Upper lip of corolla much longer than wide, equaling and similar to the three anterior lobes of the corolla, the lobes all attenuate; sepals linear-lanceolate, glabrous; inflorescence in anthesis much exceeding the oblanceolate-oblong, sinuately rounded-dentate leaves.....2. *W. amherstiana*

¹⁰ If correctly shown on Hooker's plate; his description does not mention glandularity.

1. *Wulfenia himalaica* (J. D. Hooker) comb. nov.

Falconeria himalaica Hook. f., *Icon. Plant.* 16: 30, pl. 1438, 1883. "Western Himalaya; Kumaon, *Falconer*; Madhari pass, alt. 8000 feet, *Strachey & Winterbottom* (*Mazus* n. 4 in herb.)." Between these, the generic name selects the former as the type.

Known only from the mountains of Kumaun, but probably occurring eastward in Nepal.

2. *Wulfenia amherstiana* (Wallich) Bentham

Paederota amherstiana Wall., *Numer. List Spec. Ind. Mus.* n. 410, 1829, ined. "Prope Simla legit Sarah Amherst 1827."

Wulfenia amherstiana (Wall.) Benth., *Scroph. Indicae* 46, 1835. "*Paederota amherstiana*, Wall. Cat. n. 410 Hab. in Kamaon, *Wallich*, Kanaour, *Royle*." I suppose that Bentham's reference is to Wallich's publication, and so to Amherst's specimen.

Corolla violet-blue, opening from late June to August.

Gregarious on cliffs in shady forest, at altitudes of 1200 to 3000 meters, Outer Ranges of the western Himalayas from northeastern Afghanistan to Kumaun.

AFGHANISTAN. Kurram Valley, *Aitchison* 811 (GH).

INDIA. Hazara: Chappri, Kagan, *Inayat* 22068; Sachan, Dara Punjal, Saran Ridge, *Inayat*. Rawalpindi: Changla Gali, *Stewart* 10211 (Gord); Gharial, *Stewart* 3816; Murree, *Stewart* 1590. Muzaffarabad: Shilan, *Inayat*; Titwal to Surkhala, *Stewart* 17446 (ANSP, GH, USNH). Kashmir: Banihal Pass, *Stewart* 10723; Dangarpur, *Stewart* 14841b (NYBG). Chamba: Alwas, *Stewart* 2509. Kangra (Kulu): Jalori Pass, *Nath* 84 (ANSP, NYBG); above Puling, *Koelz* 307 (ANSP, NYBG). Bashahr: Siraham, *Parmanand* 363; Sungri, *Parmanand* 334. Dehra Dun: Deoban, *C. G. Rogers* (ANSP). Kumaun: Bonsai, *Strachey & Winterbottom* (GH).

25. LAGOTIS Gaertner

Lagotis J. Gaertn., in *Nov. Comm. Acad. Sci. Petrop.* 14: 533, 1770. Genotype, *L. glauca* Gaertn., of Kamchatka, the only original species.

Gymnandra Pall., *Reise Prov. Russ. Reiche* 3: 710, 1776. Genotype, *G. borealis* Pall., of Dahuria.

A genus of some 20 species, from Asia Minor to Alaska.

KEY TO SPECIES

- A. Petioles well defined from the leaf-blades, deciduous with them, the blades oblong to ovate in outline; rhizomes not strongly thickened, nor the plants stoloniferous; spikes as long as or longer than the leaves.
- B. Bracts oval or obovate, not reticulate-veiny, acute to acuminate, about 5 mm. long, shorter than the corolla; calyx gamophyllous below, longer than and enclosing the acute capsules; corolla-tube strongly decurved; spikes slender, more than twice as long as wide; leaf-blades shallowly crenate or dentate; rhizome well developed.
- C. Corolla dark violet-blue, 8 mm. long, the projecting notched upper lip shorter than the deflexed lower lobes; filaments free distally and equaling the upper lip of the corolla; anthers slightly exerted, the cells as wide as long, divaricate; leaf-blades crenate. 1. *L. cashmeriana*
- CC. Corolla white, appearing 11 mm. long (actually longer, as the equal rounded lips are both widely recurved); filaments wholly adnate to the corolla-tube; anthers sessile at the base of the upper lip, the cells longer than wide, approximate; leaf-blades irregularly dentate or denticulate.
2. *L. kunawurensis*

BB. Bracts widely ovate or nearly circular, rounded, reticulate-veiny, 8-10 mm. long, longer than and concealing the corolla; calyx cleft apparently to base, so diphyllous, its lanceolate segments lateral to and both shorter and narrower than the obtuse capsules; corolla 7-8 mm. long, the tube straight; spikes head-like, less than twice as long as wide; leaf-blades deeply incised-crenate or lobed; rhizome more slender.

C. Leaf-blades incised-crenate; inflorescence longer than wide, the bracts widely ovate, about 8 mm. long; corolla 8 mm. long, its lower lip 3-4-fid; anthers sessile at base of upper lip of corolla; stems (rhizomes) slightly developed, decumbent. 3. *L. decumbens*

CC. Leaf-blades pinnately lobed; inflorescence wider than long, the bracts nearly circular, about 10 mm. long; corolla 6 mm. long, its lower lip 2-fid (as in all our other species); anthers on filaments extending to apex of upper lip; stems (rhizomes) very short, hardly developed.

4. *L. globosa*

AA. Petioles indistinguishable from the gradually narrowed bases of the leaf-blades, persisting and shredded on the short thickened caudex of old plants; leaf-blades linear-lanceolate, dentate; plants developing slender stolons; spikes and peduncles shorter than the leaves. 5. *L. blatteri*

1. *Lagotis cashmeriana* (Royle) Ruprecht

Gymnandra cashmeriana Royle, ex Benth., Scroph. Indicae 47, 1835. "Hab. in Cashmeria, Royle." Illustrated in color in J. F. Royle's Illustrations of the Botany of the Himalayan Mountains, and of the Flora of Cashmere 2: pl. 73, 1839.

Lagotis cashmeriana (Royle) Rupr., in Mem. Acad. Sci. St. Petersburg VII, 14: n. 4: 64, 1869.

Lagotis glauca cashmeriana (Royle) Hook. f., Fl. Brit. India 4: 559, 1885.

Alpine meadows and slopes, summits, at altitudes of 3000 to 4500 meters, in the western Himalayas from Kashmir to Lahul. Flowering from early July to mid-August.

Kashmir: Mt. Aparwat, *Stewart* 8589 (Gord); Gulmarg, *Stewart* (ANSP, NYBG); Pahlgam, *Stewart* 5633; Sonamarg, *Stewart* (GH); Zojibal Pass, *Stewart* 18221. Chamba: Kukti Pass, *Koelz* 8622, 10153 (NYBG); Sach Pass, *Stewart* 2552. Lahul: Khokhsar, *Koelz* 766 (ANSP, NYBG); Rotang Pass, *Koelz* 5045 (USNH), *Nath* 226 (ANSP, GH, NYBG, USNH), 346 (USNH), *Schlagintweit* 3961 (GH).

2. *Lagotis kunawurensis* (Royle) Ruprecht

Gymnandra kunawurensis Royle, ex Benth., Scroph. Indicae 47, 1835. "Hab. in Kannaour [Kunawur], Royle."

Lagotis kunawurensis (Royle) Rupr., in Mem. Acad. Sci. St. Petersburg VII, 14, n. 4: 64, 1869.

Lagotis glauca kunawurensis (Royle) Hook. f., Fl. Brit. Ind. 4: 560, 1885.

Flowers white, fragrant. Flowering in late July and early August.

Bare alpine plateaus and heights, often gravelly, at altitudes of 3600 to 4900 meters, in the western Himalayas from Baltistan to Bashahr, and in adjacent Tibet.

INDIA. Baltistan: Chota Deosai, *Stewart* 19915 (ANSP, DD, Gord, GH, NYBG, USNH); Sarsanjeri, *Koelz* 9468. Bashahr: Hangla, *Parmanand* 841 (ANSP, GH, NYBG).

TIBET. Rajhoti (north of Kumaun), *Strachey & Winterbottom* (GH).

3. *Lagotis decumbens* Ruprecht

Lagotis decumbens Rupr., in Mem. Acad. Sci. St. Petersb. ser. VII, 14, n. 4 (Sertum Tianschanicum): 64, 1869. "21, 25 Jul. flor." Collected by *Baron Fr. v. d. Osten-Sacken* in 1867: on July 21 on the Dschaman-daban-Pass (p. 15), and on July 25 on the Taschrobat-Pass (3930 m. alt.) (p. 18), both in the Tian Shan Mountains.

Lagotis glauca australis Maxim., in Bull. Acad. Sci. St. Petersb. 27: 524, 1881. Apparently based mainly on the preceding, although combining with it Royle's two species from the Himalayas.

Recorded by J. D. Hooker in the Flora of British India (4: 559, 1885) from "Karakoram, alt. 16-18000 ft., Thomson, Henderson", evidently from elevations of about 5000 meters in the Karakoram Range north of Kashmir.

4. *Lagotis globosa* (Kurz) J. D. Hooker

Gymnandra globosa Kurz, in Journ. Asiat. Soc. Bengal 39, pt. II: 80, t. 7, f. 1, 1870. "Western Tibet, Therichan Pass, at 15 to 16,000 ft. elevation, amongst slaty rocks, &c. (*Revd. Heyde*)."

Lagotis globosa (Kurz) Hook. f., Fl. Brit. Ind. 4: 558, 1885.

"Very fragrant, lemon verbena fragrance", Koelz. Flowering in August.

On shaly and slaty rock debris (scree), at altitudes of 4500 to 5200 meters, Kashmir and western Tibet.

Kashmir: mount south of Har Nag, *Stewart* 9347. Baltistan: Lal Pir, *Koelz* 9517 (ANSP, NYBG, USNA). Ladakh: Bragnag, *Koelz* 2800a (NYBG, USNH); Chortren Chen, *Koelz* 2700a (NYBG, USNH).

5. *Lagotis blatteri* Schulz

Lagotis blatteri O. E. Schulz, in Repert. Spec. Nov. Regn. Veg. 31: 161, t. 134, 1933. "Waziristan: on Razmak plain, on gravel-sand forming dense patches, flower purple, lying flat on ground, alt. 6750 ft. (blühend am 20, März 1930—*Blatter* and *Fernandez* n. 47)"

Known to me only from this Waziristan collection, but to be expected in adjacent Baluchistan and southern Afghanistan. In contrast to all the preceding species, this appears to be a plant of arid plateaus, the type coming from only 2050 meters altitude.

This species is nearly akin to *Lagotis korolkowi* (Regel & Schmalh.) Maxim. of Turkestan, which it resembles in habit, narrow dentate leaves, fibrous sheathing petiole-bases, short few-flowered spikes, in calyx, and in the proportions of the corolla, but differs from it in the anthers not being so sessile nor the lobes of the corolla so rounded (both these in *L. korolkowi* being as shown by Schulz for *L. stolonifera* (C. Koch) Maxim.). Schulz compared his plant only with the last species, probably so induced by Prain's key to *Lagotis* (in Journ. Asiat. Soc. Bengal 65, pt. 2: 62, 1896), wherein *L. korolkowi* is treated as lacking stolons and as having a winged calyx. But neither character is sustained, if I am correct in taking as that species the following collections in the Academy's herbarium: *Fedtschenko* 91 and 1833, *Komarov* in 1893, and *Regel* in 1881 and 1893. These show *L. korolkowi* to be sometimes stoloniferous, just as is the case with *L. blatteri*.

26. *VERONICA* [Bauhin] Linnaeus

Veronica L., Spec. Plant. 9, 1753; Gen. Plant. ed. V. 10, 1754. Genotype, *V. officinalis* L. of Europe; see Proc. Acad. Nat. Sci. Phila. 82: 12, 1930.

A genus of some 250 species, mostly Palaearctic.

KEY TO SPECIES

- A. Main stem terminating in inflorescence, the upper bracts alternate.
(I. VERONICELLA)
- B. Plant perennial, from subterranean rhizomes; only the upper leaf-axils flower-bearing, so that the inflorescence is formed of definite racemes.
- C. Capsule as long as or longer than wide, shallowly or not notched; corolla uniformly colored on all sides, its tube glabrous within; leaf-blades sessile or nearly so; stems erect nearly or quite from base.
- D. Uppermost sepal nearly or quite as large as the other four; corolla-lobes 5, the upper wider and more or less distinct; style as long as or longer than the slightly hairy or glabrous capsule; leaf-blades ovate or oval, nearly or quite as wide as long.
- E. Corolla 7-8 mm. long, its lobes rounded, the upper distinct to base of upper lip; capsule slightly hairy distally; sepals hirsute; leaf-blades crenate-serrate to entire, hirsute.
1. *V. capitata*
- EE. Corolla 5 mm. long, its lobes acutish, the upper distinct less than $\frac{1}{2}$ length of upper lip; capsule wholly glabrous; sepals loosely ciliate; leaf-blades crenately dentate, pilose.
2. *V. cachemirica*
- DD. Uppermost sepal much smaller than the other four or altogether lacking; corolla-lobes seemingly 4, the two upper petals being wholly joined to form the rounded or truncate upper lip of the corolla*; leaf-blades lanceolate to elliptic, longer than wide.
- E. Style nearly as long as or longer than the capsule, which is finely pubescent, acutish to retuse, and longer than wide; corolla 6-8 mm. long.
- F. Leaf-blades lanceolate to ovate, acute to acuminate, serrate, loosely lanose to glabrous (usually with hairs on margins and under surface of midrib); stems 1.5-4 dm. tall; racemes terminal, or partly (or even at times wholly) axillary.3. *V. lanosa*
- FF. Leaf-blades rounded-ovate, obtuse, serrate to nearly entire, villose-pubescent; stems 1-1.5 dm. tall; racemes terminal to main stem and well-developed branches.
4. *V. macrostemon*
- EE. Style less than $\frac{1}{2}$ the length of the capsule, which is hirsute, truncately rounded to somewhat notched, about as wide as long; corolla 5 mm. long; leaf-blades oval, crenate to nearly entire.5. *V. lasiocarpa*
- CC. Capsule obviously wider than long, notched $\frac{1}{2}$ depth; corolla pale violet-bluish, with darker lines on posterior side, its tube pubescent within; leaf-blades ovate-oblong or oval, obscurely crenate, petioled; stems extensively repent.6. *V. serpyllifolia*
- BB. Plant annual; most leaf-axils flower-bearing, so that the inflorescence appears to consist of axillary flowers.
- C. Leaf-blades oval to lanceolate, dentate to entire; sepals ovate to lanceolate, shortly or not ciliate; capsule more or less flattened, notched; seeds 0.5-2 mm. long.
- D. Pedicels shorter than the lanceolate or linear-lanceolate sepals; capsule strongly flattened; seeds many, less than 1 mm. long, flat, smooth or nearly so; plants erect.

* This is the condition in all the following groups of species.

- E. Capsule 3.5-4 mm. long, retuse, the cells rounded to base, yellowish or reddish, much wider than long; style exerted; bracts, pedicels, and sepals densely hispidulous, the lower part of the stem appressed-pubescent; bracts deeply lobed; stem stiff, 0.4-0.6 dm. tall, the inflorescence dense.....7. *V. verna*
- EE. Capsule 2.5-3 mm. wide, deeply notched, cuneate at base, greenish yellow, scarcely wider than long; style about equaling capsule-cells; bracts, pedicels, sepals, and stem softly pubescent with fine spreading hairs; bracts shallowly lobed, or merely crenate-dentate; stem lax, 0.5-3 dm. tall, the inflorescence rather dense or often very lax.....8. *V. arvensis*
- DD. Pedicels as long as or longer than the sepals; capsule moderately flattened; seeds few, larger; stems lax.
- E. Style exerted beyond the capsule-cells, which are united most of length; corolla violet-blue, lined, its pale throat pubescent within, its lobes broadly orbicular; leaf-blades ovate, crenate-dentate; stems repent, ascending at apex.
- F. Capsule 3-4 mm. wide, minutely grayish pubescent, plane, notched $\frac{1}{3}$ depth, the cells rounded; style 1 mm. long; corolla 5 mm. wide; sepals ovate, ciliate; pedicels recurving, shorter than the subtending bracts. 9. *V. didyma*
- FF. Capsule 6-7 mm. wide, slightly ciliate-hairy, with raised reticulations, the cells divergent, flaring so that the most distal point of each is toward the lateral margin; style 2.5 mm. long; corolla 8-9 mm. wide; sepals narrowly ovate, ciliate; pedicels ascending-spreading, longer than the subtending bracts.10. *V. persica*
- EE. Style 0.3-1.5 mm. long, nearly or quite hidden between the capsule-cells which are rounded and (except in *V. uncinata*) project over twice the length of their united basal portion; corolla pale throughout (so far as known), its throat glabrous within, its lobes oval or ovate; leaf-blades narrower; stems ascending or erect.
- F. Calyx-lobes elliptic, obtuse or rounded, shorter than the capsule; capsule glabrous, the cells hemispheric so that the sinus is very narrow and the style quite hidden; seeds 1 mm. long, smooth, flattened ventrally; bracts oblanceolate; plant glabrous or the stem slightly puberulent, simple or diffusely branched, 0.2-1 dm. tall.
11. *V. perpusilla*
- FF. Calyx-lobes ovate (often narrowly so), longer than the capsule; capsule not glabrous, the cells oval or obovate in outline, more or less flaring so that the sinus is open; seeds 1.5 mm. long, channeled ventrally; bracts narrowly elliptic; plant finely pubescent, simple or laxly branched below, 0.1-1.5 dm. tall.
- G. Capsule ciliate on the sutures with stout recurved or hooked hairs, its cells united 1.5 mm. at base, widely oval, widely flaring, the sinus short; style 0.2-0.3 mm. long, semi-exserted; sepals obtuse, little exceeding the capsule; bracts obtuse, shorter than the upcurved pedicels.....12. *V. uncinata*
- GG. Capsule pubescent over entire surface with fine straight (or slightly incurved) hairs, its cells usually united less than 1 mm. at base, hemispheric or narrower, slightly flaring, the sinus long and gradually opening; style longer, enclosed between the capsule-cells; sepals acuminate, reticulate-veined, usually much exceeding the capsule; bracts acute, equaling or longer than the straight or recurved pedicels.

- H. Seeds smooth or obscurely roughened; capsule with short glandless hairs, its cells hemispheric-obovoid and united 0.5-1 mm. at base; style 0.5 mm. long, less than $\frac{1}{2}$ length of capsule-cells; sepals ovate; pedicels spreading.
13. *V. biloba*
- HH. Seeds transversely rugose ("caterpillar-like"); capsule pubescent with longer hairs, some of which are usually gland-tipped, its cells narrower and united less than 0.5 mm. at base; style 1-1.5 mm. long, over $\frac{1}{2}$ length of capsule-cells; sepals lanceolate; pedicels recurving, at least in fruit.14. *V. campylopoda*
- CC. Leaf-blades wider than long, shallowly 3-lobed, the lobes rounded and entire; sepals ovate, long-ciliate; capsule turgid, rounded or slightly notched at apex; seeds 2.5 mm. long.15. *V. stewartii*
- AA. Main stem never terminating in an inflorescence, the leaves opposite throughout and the flowers all in axillary racemes. (See also no. 3, above.) (II. EUVERONICA)
- B. Capsule 4-7 mm. long, more or less pubescent; stem, pedicels, leaves, and sepals pubescent; leaf-blades dentate to nearly entire; not aquatic, usually plants of dry soil.
- C. Capsule longer than wide, pubescent over entire surface; uppermost sepal usually evident; leaf-blades crenate-serrate to nearly entire; stem erect, 1-3 dm. tall, not continuing beyond the bases of the uppermost pair of erect, hirsute racemes.
- D. Racemes elongating, densely several- to many-flowered; leaf-blades rounded to the sessile base, or the lowest somewhat narrowed and slightly petiolate; stem 0.5-3 dm. tall.
- E. Capsule 4-5 mm. long; sepals linear-oblong, the uppermost $\frac{1}{2}$ to $\frac{3}{4}$ the length of the others; racemes relatively slender; main leaf-blades 1-2 cm. long, often becoming glabrate.
- F. Style 1.3-2 mm. long; capsule 4 mm. long, oblong in contour; racemes relatively lax and sometimes elongating; leaf-blades elliptic-oblong, slightly crenate-denticulate proximally to usually entire throughout.16. *V. koelzii*
- FF. Style 0.8-1 mm. long; capsule 5 mm. long, flattened-ovoid; racemes dense, head-like or slightly elongating; leaf-blades ovate or nearly so, crenate-dentate nearly or quite throughout.17. *V. cephaloides*
- EE. Capsule 6-7 mm. long; style 0.5-0.8 mm. long; sepals oblong, four about $\frac{2}{3}$ length of capsule, the uppermost minute or lacking; racemes relatively stout; leaf-blades 1.5-5 cm. long, oblong-lanceolate to nearly ovate, denticulate-serrate, permanently pilose-pubescent on both surfaces.18. *V. hirta*
- DD. Racemes 1-2-flowered; leaf-blades narrowed to the more or less petioled base; stem 0.1-0.5 dm. tall; capsule 6-7 mm. long, style 0.7-1 mm. long, and sepals $\frac{2}{3}$ length of capsule, the uppermost about $\frac{1}{2}$ the length of the others.19. *V. nana*
- CC. Capsule wider than long, glabrous on sides, ciliate on distal orifice; uppermost sepal lacking; leaf-blades serrate to crenate-dentate; stem (except in *V. umbelliformis*) normally taller and more laxly ascending, and with spreading, less hairy racemes.
- D. Inflorescence of elongated racemes, the pedicels much shorter than the peduncle and rachis; leaf-blades ovate, longer than wide.
- E. Cells of capsule rounded and somewhat dehiscent laterally; leaf-blades nearly sessile (the petioles rarely reaching 4-5 mm. long).

- F. Style 4-5 mm. long; capsule 4-5 mm. wide, little wider than long; corolla exceeding the calyx; sepals acutish, becoming 5 mm. long; racemes secund, 5-20 cm. long; leaves 2.5-7 cm. long; plant erect, above the usually slightly decumbent base.20. *V. melissaeifolia*
- FF. Style 0.4-0.5 mm. long; capsule 3-4 mm. wide, nearly twice as wide as long; corolla not exceeding the calyx; sepals obtuse or rounded, becoming 3 mm. long; racemes not secund, 2-5 cm. long; leaves 1-2.5 cm. long; plant diffuse or laxly erect.21. *V. javanica*
- EE. Cells of capsule laterally acute or acutish, dehiscent only on distal suture; style 3 mm. long; leaf-blades all petioled, the middle 0.5-1.5 cm. long.22. *V. cana*
- DD. Inflorescence of umbel-like few-flowered racemes, the pedicels longer than the abbreviated peduncle and rachis; style 2 mm. long; capsule shallowly bilobed, little wider than long, the cells rounded; leaf-blades oval, crenate-dentate, as wide as long.23. *V. umbelliformis*
- BB. Capsule 2-3 mm. long, glabrous or pubescent with slightly glandular hairs; stems, pedicels, leaves, and sepals glabrous or finely glandular-pubescent; leaf-blades serrulate to entire; aquatic or plants of wet soil.
- C. Leaf-blades all petioled, oblong-oval, obscurely crenate, rounded at apex; racemes 6 to 15 flowered; stem repent and decumbent; plant glabrous throughout.24. *V. beccabunga*
- CC. Leaf-blades, at least the upper on the flowering stems, sessile and clasping, lanceolate to nearly ovate, acute; racemes 10 to 40 flowered; stem erect, or repent at base.
- D. Pedicels strongly ascending, making the raceme less than 1 cm. wide; capsule acutish or obtuse; upper leaf-blades serrate, the lower and those of the freely developed basal shoots petioled.
- E. Rachis, pedicels, sepals, and capsules glabrous or nearly so; capsule oval in contour, strongly flattened, equaling or slightly exceeding the sepals; seeds dull brown.25. *V. anagallis-aquatica*
- EE. Rachis, pedicels, sepals, and capsules glandular-pubescent; capsule pyramidal-ovoid, about $1\frac{1}{2}$ times the length of the sepals; seeds brighter brown.26. *V. secunda*
- DD. Pedicels spreading, usually distally upcurved, making the raceme over 1 cm. wide; capsule usually rounded or slightly retuse, occasionally even acutish; upper leaf-blades remotely and often obscurely crenate-serrate, the lowest sometimes slightly petiolate; basal shoots scarcely developed; rachis, pedicels, and sepals glandular-pilose, the capsule sparsely so.
- E. Capsule 3-3.5 mm. long; style 1-1.7 mm. long, usually $\frac{1}{2}$ as long as the capsule or more; leaves obscurely serrulate to entire.27. *V. salina*
- EE. Capsule 2-2.5 mm. long; style 0.5-1 mm. long, usually less than $\frac{1}{2}$ as long as the capsule; leaves usually more serrate, often undulately so.28. *V. undulata*

1. *Veronica capitata* Royle

Veronica capitata Royle, ex Benth., Scroph. Indicae 45. 1835. "Hab. in Kanaour, Royle."

In his Flora of British India (4: 295, 1884), J. D. Hooker has mistakenly associated with this some other species of the eastern Himalayas, thus accounting for his description of the capsule as obcordate, for the leaves as sometimes shortly petioled, and for the extension of the range to Bhotan.

Reported from 4400 meters altitude, alpine zone, in the Himalayas from Bashahr to Kumaun. Flowering in July.

Bashahr: Chhit Kul, *Parmanand* 1126 (ANSP, Gord, GH, NYBG); Hangla Pass, *Parmanand* 674 (ANSP, Gord, GH); Pieri Pass, *Parmanand* 520 (ANSP, Gord, GH, NYBG). Kumaun: Baiji Kang, *Strachey & Winterbottom* 3 p.p. (GH).

2. *Veronica cachemirica* Gandoger

Veronica cachemirica Gand., in Bull. Soc. Bot. France 66: 219, 1919. "Hab. India orient., Kashmir ad Musa Muzafaradad [Muzaffarabad] (*Inayat!*)."
Description, especially by mention of "foliis profunde crenatis" and "staminibus corollam duplo superantibus", denotes the species now considered. It is surprising that the describer missed noting the remarkably acute corolla-lobes.

Alpine grass zone, at altitudes of 3300 to 4000 meters, in the western Himalayas of Hazara and Kashmir. Flowering in July.

Hazara: Chapran, *Inayat* (DD). Kashmir: Gulmarg, *Stewart* 8745 (Gord), 10330a (USNH), 14045a; Killanmarg, *Stewart* (ANSP, Gord, NYBG); Sonamarg, *Stewart* (ANSP, Gord, GH).

3. *Veronica lanosa* Royle

Veronica lanosa Royle, ex Benth., Scroph. Indicae 45, 1835. "Hab. in Kanaour, *Royle*."
Description distinctive.

Veronica rupestris Aitchison & Hemsley, in Journ. Linn. Soc., Bot. 19: 180, pl. 25, 1882. "Kuram district [Afghanistan], on shaded moist localities, at from 8000 to 11,000 feet altitude." *J. E. T. Aitchison* 198 in 1880, 238 and 331 in 1879. Isotype, *Aitchison* 198, collected July 24, seen in Gray Herbarium of Harvard University. Although described as with 4-parted calyx and obtuse capsule, this proves to be the species now considered; the specimen shows its habit, while the illustration depicts its capsule.

Name inappropriate, because the amount of hairiness varies considerably and, while sometimes abundant, it is never conspicuous.

Corolla bright violet-blue. Flowering in July and August.

Rocky clefts and slopes, at altitudes of 2500 to 3700 meters, through the western Himalayas from northeastern Afghanistan to Garhwal.

AFGHANISTAN. Kurram Valley, *Aitchison* 198 (GH), *Harsukh* 15418.

INDIA. Northwest Frontier: Buri, *Duthie*. Chitral: Drosch, *Harriss* (DD); Guigertigol, *Harriss* (DD). Kashmir: Aru to Nafran, *Stewart* 12542; Badwan, *Stewart* 19259 (ANSP, GH, NYBG); Banihal Pass, *Stewart* 12110 (USNH), 12541, 14068 (Gord, NYBG); Burzil Pass, *Stewart* 19045 (DD), 19100a (ANSP, Gord, GH, NYBG); Gadsar, *Stewart* 18324 (ANSP, NYBG); Gangabal Lakes (Trunkal), *Stewart* 18147 (ANSP, Gord); Kamri Pass, *Stewart* 18666 (ANSP, GH, NYBG, USNH); Mt. Kolahoi, *Stewart* 9404 (Gord); Kun Patthar, Masjidnar, *Stewart* 18474 (ANSP, NYBG); Pahlgam, *Stewart* 5419 (NYBG), 5561, 7866, 9290 (Gord, NYBG, USNH); Rajdhiangan Pass, *Stewart* 19490; to Shish Nag, upper Liddar Valley, *Stewart* 8417; Sonamarg, *Stewart* 6787, 7304 (NYBG), 9750 (ANSP, Gord, GH, NYBG, USNH); Taubat, *Stewart* 17852 (ANSP, Gord, GH, NYBG, USNH); Traghal (Tarakbal), *Koelz* 9156 (GH, NYBG), *Stewart* 4612; Zoji Pass, *Stewart* 21244 (ANSP, GH, NYBG). Baltistan: Mir Panzil Pass, *Stewart* 19912a. Purig: Matayan to Mitsahoi, *Stewart* 10008 (ANSP, Gord, GH, NYBG, USNH). Chamba: Padoban to Chandan, *Harsukh* (DD); Pangli, *Harsukh*. Lahul: Bhaga Valley (Kardong to Dartse), *Schlagintweit* 2814 (GH); Khoksar, *Nath* 219 (ANSP, NYBG); Kolung, *Koelz* 10038 (NYBG); Kvelang, *Koelz* 10146; Sisu, *Koelz* 5123 (USNH). Bashahr: Chhit Kul, Kinnawar, *Parmanand* 1060 (ANSP, GH, NYBG); Chuling, *Parmanand* 690 (ANSP, Gord, NYBG); Hangla, *Parmanand* 579. Garhwal: Niti, *Strachey & Winterbottom* (GH).

This species varies from the terminal inflorescence of *Veronicella* to the axillary type of *Euveronica*, *Veronica lanosa* having been described in the

former and *V. rupestris* in the latter condition. Collections vary freely and without racial significance. The fifth sepal is either small or absent.

At first I had thought that a wider-leaved and more hairy state would prove to be specifically distinct, but more ample material convinces me that what had seemed a correlation of characters is really an association of individual traits, each of which varies independently and which together show no geographic isolation. The supposed species, which was to have been typified by *R. R. Stewart* 12542 from the upper Liddar Valley in Kashmir, was thought to have more rounded capsules, smaller seeds, the uppermost sepal more suppressed, wider leaf-blades, and greater hairiness, but each character fluctuates independently. The capsules are narrowed distally to rounded apices; the seeds are usually about 1 mm. long; the uppermost sepal usually present, though small; the leaf-blades lanceolate, but varying to ovate-lanceolate, and hairy only on midrib, although the lower ones or all may be pilose to slightly villose over most of surface.

In Hooker's Flora of British India (4: 292, 1884), which has been followed by Römpf (in Repert. Spec. Nov. Regn. Veg. Beih. 50: 24, 1928), both *Veronica lanosa* and *V. rupestris* were placed under *V. deltiagera* Wall., also first described in Bentham's Scrophularineae Indicae 45, 1835. But the account of that species, which came from much farther east at Gossain Than in Nepal, differs from both these and the following by its stem being glabrous (except for bifarious lines of hairs below the leaves), its leaves glabrous, crenate-serrate, and its capsules subrhombic, transversely widened, while the racemes were axillary. *V. deltiagera* I would identify as *V. javanica* Blume.

4. *Veronica macrostemon* Bunge

Veronica macrostemon Bunge, ex Ledeb., Fl. Altaica 1: 35, 1829. "Hab. rarior in lapidosis asperis summarum alpium ad fl. Tschuja (*B[unge]*)." Possible topotype, from "Herbar. Bunge." and "Flor. orient. altaica 1839", seen in Gray Herbarium of Harvard University. Apparently our plant agrees in all details with Bunge's description, although there may be more than a single species of this group as is suggested by the describing of a second species, *V. luetkeana* Rupr. (Sertum Tianschanicum 62, 1869) from the intervening Tian-Shan Mountains.

At altitudes of 4800 to 5000 meters, high mountains of central Asia. Flowering in July.

Ladakh: Timti La Pass (via Timti Do to Kharbu Koma), *Schlagintweit* 6546 (GH). "Tibet occ.", *Thomson* (GH).

5. *Veronica lasiocarpa* spec. nov.

Plate 7. A.

Root perennial. Rhizome short, slender, much branched. Stem simple, slightly decumbent, 1-2 dm. tall, lanulose. Leaves opposite, the blades oval, rounded (or obtuse) at apex, crenate to nearly entire, pilose on both surfaces, 0.7-2 cm. long, 0.5-1 cm. wide, the lower narrowed, the middle and upper rounded to sessile bases. Raceme terminal, hirsute, in anthesis dense and short, in fruit becoming 2-3 cm. long. Bracts scattered, oblanceolate,

entire, becoming 4-5 mm. long. Pedicels becoming 1.5-2 mm. long, ascending. Uppermost sepal minute or sometimes lacking; the others oblong or elliptic, obtuse, hirsute (especially distally and toward margins), becoming 3.5-4 mm. long, nearly or quite as long as the capsule. Corolla slightly exceeding the sepals in anthesis, 4 mm. long, the lobes widely orbicular, erose-truncate, the posterior united throughout, the mid-anterior scarcely smaller; corolla glabrous throughout, tube white, lobes deep blue or violet-blue, unstreaked. Filaments about 1 mm. long, shorter than the corolla-lobes. Anthers 0.3-0.4 mm. long. Style about 0.5 mm. long. Stigma persisting, about twice width of style. Capsule 4 mm. long, slightly compressed, sulcate between carpels, obcordate-oval, hirsute-pubescent or lanulose. Seeds 0.5-0.6 mm. long, oval, plano-convex, yellow-brown.

Perennis; caulis simplex lanulosus 1-2 dm. altus; folia opposita, ovalia, rotundata, crenata integrave, pilosa, 1-2 cm. longa; racemus hirsutus densus; bracteae integrae; pedicelli 1-2 cm. longi; sepala quatuor oblonga ellipticave, hirsuta, 3.5-4 mm. longa, quinto minuto vel nullo; corolla 4 mm. longa, violaceo-caerulea, lobis late orbicularibus, posterioribus omnino junctis; filamenta 1 mm. longa; stylus 0.5 mm. longus; capsula 4 mm. longa, obcordato-ovalis, hirsuto-pubescent vel lanulosa; semina 0.5 mm. longa, ovalia.

Type, at an altitude of 3700 meters, near Mt. Kolahoi, Kashmir, collected in flower and fruit August 1927, by Ralph R. Stewart, no. 9433; in Herb. Academy of Natural Sciences of Philadelphia.

High alpine ridges, at altitudes of 3000 to 4500 meters, through the western Himalayas from Chitral to Kumaun. Flowering in July and August.

Chitral: Dumuk Khalas, *Harriss* (DD). Hazara-Kagan: Chapri, *Inayat* (DD); Ganja Nila, *Inayat* (DD); Karru Nila, *Inayat*; Raji Chogi Nila, *Inayat* (DD); Sarool, *Inayat* (DD). -Shinkiyari: Bhatiyar, Saran, *Inayat* (DD). Muzaffarabad: Musa Ka Musalla, *Inayat* (DD). Kashmir: Apharwat, above Gulmarg, *Stewart* (ANSP, NYBG); Burzil Pass, *Stewart* 18999 (ANSP, Gord, GH, NYBG); Gulmarg, *Stewart* 10362 (Gord), 10408 (GH), 10499, 15526 (NYBG, USNH); Har Nog, upper Liddar, *Stewart* 9432, 12543 (Gord, NYBG); Kamri Pass, *Stewart* 18666b; Killanmarg, *Stewart* 8662 (Gord, GH, NYBG); Mt. Kolahoi, *Stewart* 9433 (ANSP, NYBG); Masjid Gali, *Stewart* 18428 (ANSP, GH, USNH); Nichanai Pass, near Sonamarg, *Stewart* 9906 (ANSP, DD, Gord, GH, NYBG, USNH); Sonamarg, *Stewart* 6422, 9833 (ANSP, DD, Gord, GH, NYBG, USNH); Tulion, Pahlgam, *Stewart* 7919; Zojibal Pass, *Stewart* 18271 (ANSP, NYBG). Baltistan: Burji La, above Skardu, *Stewart* (NYBG); Deosai, *Stewart* 19921 (ANSP, NYBG); Lal Pir, *Koelz* 9506; Thalle La, *Stewart* 20736 (ANSP, Gord, GH, NYBG). Chamba: Kukti Pass, *Koelz* 8615. Lahul: Khoksar, *Koelz* 788 (NYBG). Kumaun: Barji Kang, *Strachey & Winterbottom* 3 (GH).

Of the group of *Veronica alpina* L. of Europe, which differs from the present species in its larger glabrous and less notched capsule, its longer style, its merely ciliate sepals and bracts, and its glabrate or glabrous foliage. *V. lasiocarpa* is nearer related to *V. pumila* All. of the Alps (see *Rhodora* 23: 14, 1921), with which it agrees in glandless pubescent hairs on capsule and over the whole back of the sepals, but that European species differs in its less notched capsule, its longer style, its slightly longer corolla, its shorter sepals, its glabrate foliage, and its usually lower growth.

Veronica lasiocarpa is evidently the "Veronica alpina" of Benthams's Scrophularineae Indicae (p. 45, 1835), but I fail to identify it in J. D. Hooker's Flora of British India (4: 292-296, 1884).

6. *Veronica serpyllifolia* Linnaeus

So far as I can decide from field-observations in various parts of North and South America, *Veronica humifusa* Dickson should hardly be treated as specifically distinct from this. In my "Scrophulariaceae of Eastern Temperate North America" (Monog. Acad. Nat. Sci. Phila. 1: 335, 1935) I maintained both as species, but more recent collections in western North America, especially in California, have shown that the supposed darker color of the flowers of *humifusa* is not constant. In both the corolla has darker lines posteriorly, but is pale or white anteriorly. There seems little distinction except a tendency to larger size and more spreading pubescence in *humifusa*. This is the more wide-ranging, occurring on mountains through the Palaearctic, Nearctic, and Neotropical regions, while *serpyllifolia* seems only native to Europe. Both, however, are so weedlike as to suggest that the original ranges may have been actually quite restricted. As both occur in the western Himalayas, it becomes necessary to distinguish them subspecifically now.

KEY TO SUBSPECIES

- A. Stem throughout and pedicels minutely pubescent with upcurved hairs; corolla about 2 mm. long, pale violet-blue.....6a. *V. s. typica*
 AA. Stem distally and pedicels finely pubescent with longer mostly spreading hairs; larger throughout, the corolla mostly about 3 mm. long, often darker.
 6b. *V. S. humifusa*

6a. *Veronica serpyllifolia typica*

Veronica serpyllifolia L., Spec. Plant. 12, 1753. "Habitat in Europa & America septentrionali ad vias, agros." Application of name explained in Monog. Acad. Nat. Sci. Phila. 1: 335, 1935.

Waysides and fields, below 2000 meters, apparently an occasional naturalization in northwestern India.

Hazara: Chapri, Kagan, *Inayat*. Rawalpindi: Murree Hills, *Stewart* 8587a (Gord), 13896 (ANSP, GH, NYBG).

6b. *Veronica serpyllifolia humifusa* (Dickson) Vahl

Veronica humifusa Dickson, in Trans. Linn. Soc. 2: 288, 1794. "I found [it] upon very high mountains, and under wet shady rocks [in the Highlands of Scotland, *James Dickson* in 1792]." Application of name explained with preceding.

Veronica serpyllifolia humifusa (Dickson) Vahl, Enum. Plant. 1: 65, 1805.

Moist places and along paths, at altitudes of 2100 to 4000 meters, throughout the western Himalayas. Flowering from May to August.

Kashmir: Apharwat, *Stewart* (ANSP, Gord); Aru, Liddar Valley, *Inayat* 25733 (ANSP, DD); Banihal Pass, *Stewart* 12214; Bhagtaur, *Stewart* 17932; Burzil Pass, *Stewart* 19890; Gulmarg, *Stewart* 10491a (NYBG), 14808 (ANSP, Gord, GH, NYBG); Kajenag Range, Hamal Basin, *Keshavanand* 832 (DD); Keran, *Stewart* 17636; Minimarg to Burzil Chawki, *Stewart* 19818 (GH); Nagmarg, *Keshavanand* 1197 (DD); Pahlgam, *Stewart* 5548, 5666; Rajdhiangan Pass, *Stewart* 18032, 19312 (Gord, NYBG); Sonamarg, *Stewart* 6548, 9804 (DD, Gord, GH, NYBG, USNH); Zoji Pass, *Stewart* 7577 (Gord); Zojibal Pass, *Stewart* 18263 (ANSP, NYBG). Baltistan: Deosai, *Stewart* 20035; Mir Panzil Pass, *Stewart* 19911a (NYBG). Chamba: Dalhousie to Kajeer, *Stewart* 2206; Silrundi, Sach Pass, *Stewart* 2538 (Gord). Kangra: Dharmasala, *Stewart* 10313; Kasol,

Parbati Valley, *Koelz* 4896 (USNH); Naggar, Kulu, *Koelz* 1805 (NYBG). Garhwal: Chamsir, *Parmanand* 228. Kumaun: Ralam, *Inayat* 24768 (DD); *Strachey & Winterbottom* 5 (GH).

7. *Veronica verna* Linnaeus

Veronica verna L., Spec. Plant. 14, 1753. "Habitat in Sueciae, Germaniae, Hispaniae aridis apricis." Type, seen in Linnean Herbarium at London, England, sustains the current application of the name.

Corolla bluish violet, nearly unlined. Flowering in April and May.

Occasional, waysides and fields, below 2000 meters; naturalized from Europe.

Kashmir: Srinagar, *Stewart* 8584a (ANSP, Gord, GH, NYBG, USNH). Kangra: Raissan, Kulu, *Koelz* 1855 (NYBG).

8. *Veronica arvensis* Linnaeus

Veronica arvensis L., Spec. Plant. 13, 1753. "Habitat in Europae arvis, cultis." Type, seen in Linnean Herbarium, sustains the current application of the name.

Corolla violet-blue. Flowering in April.

Waysides and fields, below 2200 meters; naturalized from Europe.

Hazara: Abbottabad, *Stewart* 9025 (GH), 10797 (USNH), 14618, 16338. Muzaffarabad: Garhi, *Stewart* 8281a (ANSP, Gord). Punch: Punch, *Stewart* 12008. Kashmir: Keran Nullah, *Stewart* 17541 (NYBG); Pahlgam, *Stewart* 9212a (ANSP, Gord); Tangmarg, *Stewart* (NYBG).

9. *Veronica didyma* Tenore

Veronica didyma Ten., Prod. Fl. Nap. 6, 1811. For applicability of this name see Monog. Acad. Nat. Sci. Phila. 1: 348, 1935.

Veronica polita Fries, Novit. Fl. Suec. 63, 1819. "Ubique in arvis Scaniae." Clearly the species now considered.

Corolla pale violet, posteriorly with darker lines. Flowering in March and April.

Waysides and fields, at altitudes below 2500 meters; naturalized from Europe.

Peshawar: Peshawar, *Qazilbash* (Isl). Attock: Hasan Abdal, *Stewart* (ANSP, NYBG). Hazara: Abbottabad, *Stewart* 13665 (ANSP, GH), 14657 (NYBG), 16334 (USNH). Rawalpindi: Dharmyal, *Nath* (ANSP, Gord); Rawalpindi, *Stewart* 16247 (ANSP, Gord, USNH), 16264 (GH). Muzaffarabad: Domel, *Stewart* 16222. Baltistan: Shigar, *Stewart* 20537 (ANSP, GH, NYBG); Tolti, *Stewart* 20952a. Dehra Dun: Dehra Dun, *E. K. Krishnan* 24 (GH). Almora: Almora, *Strachey & Winterbottom* 7 (GH).

10. *Veronica persica* Poiret

Veronica persica Poir., Encyc. Meth., Bot. 8: 542, 1808. "Croît dans la Perse. On la cultive au Jardin des Plantes de Paris." For consideration of the type see Journ. Bot. 56: 55, 1918. and *Rhodora* 23: 20, 1921.

Corolla bright violet-blue, lined with deeper color, anteriorly pale. Flowering from March to July.

Waysides and fields, at altitudes of 1000 to 2800 meters, throughout the western Himalayas; thence westward to southern Europe.

Kurram: Kurram Valley, *Harsukh* 14924. Hazara: Abbottabad, *Stewart* 13666 (USNH), 14619 (ANSP, Gord), 16333 (GH, NYBG); Bhonja, Kagan, *Inayat* (DD); Changla Gali, Murree Hills, *Stewart* 10231 (ANSP, NYBG); Mansera to Abbottabad,

Stewart 9639. Rawalpindi: Murree, *Stewart* 1553. Muzaffarabad: Chenari, *Stewart* 8583a (ANSP, GH); Kel, *Stewart* 17839 (ANSP, GH, NYBG). Punch: Hegira above Punch, *Stewart* 12004. Kashmir: Aru, Liddar Valley, *Stewart* 8248; Pahlgam, *Stewart* 5954, 9201; Sonamarg, *Stewart* 6530½ (Gord); Srinagar, *Stewart* (NYBG); Tangmarg, *Stewart* 10582. Kangra: Chachogee, *Koelz* 1484 (NYBG); Dharmsala, *Stewart* 1865; Kulu, *Koelz* 4686 (USNH); Negrota, *Koelz* 1732 (ANSP, NYBG); Raissan, *Koelz* 1853 (NYBG). Dehra Dun: Landour, *Stewart* (NYBG); Mussoorie, *H. A. Wood*.

11. *Veronica perpusilla* Boissier

Veronica perpusilla Boiss., *Diagn.* 7: 43, 1845. "Hab. in humidis alpis Kuh-Delu Persiae australis, *Kot[s]chy* No. 531 et 717. *V. pusilla* *Kot[s]chy* in pl. Pers. austr. exs. Febr. 1845 . . ." Whether this be really earlier than the publication of the same species credited to Boissier in Bentham's revision in DC., *Prod. Syst. Nat. Regn. Veg.* 10: 490, 1846, is immaterial, since the same original collections were cited. The description is well fitted by small individuals of the collections cited below.

Corolla white or whitish. Flowering in July and August.

Gravelly river-bottoms and meadows, at altitudes from 2800 to 5500 meters, alpine western Himalayas from Kashmir to Lahul and Zaskar; thence westward to Persia.

Kashmir: Kajnag Range, *Duthie* 10998 (DD); Sonamarg, *Stewart* 9726 (ANSP, Gord, NYBG). Baltistan: Deosai Plains, *Stewart* 19924 (ANSP, DD, Gord, GH, NYBG, USNH), 20007 (GH, NYBG), 20061 (ANSP, DD, GH, NYBG, USNH). Ladakh: Chang La, *Koelz* 2483 (NYBG, USNH). Zaskar: Lakong, *Koelz* 3016 (NYBG). Lahul: Chandra Tal, *Koelz* 6932 (USNH).

All these collections agree as shown on the analytical key, and differ from *Veronica nudicaulis* Kar. & Kir. from Songaria, with which Boissier himself (*Fl. Orient.* 4: 458, 1879) later placed his plant. The detailed original description of *V. nudicaulis* (in *Bull. Soc. Nat. Moscou* 15: 415, 1842) depicted that plant as glandulose, with stem bare to middle, leaves glandular-ciliate, pedicels shorter than the bracts, and capsules ciliate, a little shorter than the calyces—all features at contrast to *V. perpusilla*. These species were later joined by Trautvetter (in *Bull. Soc. Nat. Moscou* 39, pt. II: 439, 1866) to *V. acinifolia* L. as varieties *karelini* (*V. nudicaulis*) and *glabrata* (*perpusilla*). This view was continued by Römpp (in *Repert. Spec. Nov. Regn. Veg. Beih.* 50: 63, 1928), who further united the varieties into *V. acinifolia nudicaulis* (Kar. & Kir.) Römpp, although in his key, using as distinctive the length of the style, he placed the variety far from the species. Length of style relative to capsule is a constant character in those species of *Veronica* that I know, and, on the basis of their long styles, less flaring capsule-lobes, and different foliage, I have no hesitation in removing both *V. nudicaulis* and *V. perpusilla* from *V. acinifolia*. Also the former seem to be distinct from each other, *V. nudicaulis* being known as yet only from Songaria, but *V. perpusilla* occurring over high central Asia from western Persia to the western Himalayas and to Songaria.

12. *Veronica uncinata* spec. nov.

Plate 7, B.

Annual. Stems laxly ascending, 0.6-0.9 dm. long, minutely pubescent with upcurved hairs, branched at base. Leaves opposite, the blades elliptic

to oval, obtuse, entire or nearly so, 0.3-0.5 cm. long, 1-2 mm. wide, narrowed to shortly petiolar bases. Racemes terminal and lateral (nearly entire length of plant). Bracts scattered, elliptic, entire, shorter than the pedicels. Pedicels becoming 2-3 mm. long, spreading, distally upcurved, finely pubescent. Posterior sepal lacking; those present ovate or elliptic-ovate, acuminate to a blunt tip, sparsely pubescent with minute incurved hairs, becoming 4 mm. long, slightly ridged medianly, spreading in equivalent posterior and anterior pairs, united slightly laterally. Corolla 1.2 mm. long, the lobes widely oval, rounded, the mid-anterior slightly smaller; corolla probably white, apparently glabrous throughout. Filaments about as long as the circular anthers, both together about 0.5 mm. long, much shorter than the corolla. Style 0.3 mm. long, about equaling sinus of capsule. Capsule 3 mm. long, compressed, the carpels united about 2 mm., the lobes flaring so as to appear semicircular-oval in contour, ciliate with short incurved hairs, the sides glabrous. Seeds probably 2 to a cell, 1.5 mm. long, turgid, yellow, smooth or nearly so.

Annual; caulis 0.6-0.9 dm. longa, laxa; folia opposita, elliptica ovaliave. obtusa, integra, 0.3-0.5 cm. longa; racemus elongatus; bracteae integrae: pedicelli 2-3 mm. longi; sepala 4 ovata vel elliptico-ovata, minute pubescentia, 4 mm. longa; corolla 1.2 mm. longa, albida (?), lobis late ovalibus, posterioribus omnino junctis; filamenta 0.2-0.3 mm. longa; stylus 0.3 mm. longus; capsula 3 mm. longa, lobis (carpellis) semicirculari-ovalibus, uncinato-ciliatis; semina pauca (4?), 1.5 mm. longa, turgida, laevia.

Type, in bed of torrent, 4300 meters altitude, Chortren Chen (Tog Nulla), Ladakh, collected in flower and fruit August 18, 1931, by Walter Koelz, no. 2654a; in Herb. New York Botanical Garden, isotype in Herb. Academy of Natural Sciences of Philadelphia. Only collection seen.

Apparently nearest to *Veronica ferganica* Popov (in Trans. Turkest. Univ. 4: 64, 1922), of the mountains of Ferghana, which, however, was described as having the rachis, sepals, and capsules glandular, the sepals being acute and about equaling the capsule which is pilose-hirtous as well as glandular.

13. *Veronica biloba* Linnaeus

Veronica biloba L., Mant. Plant. 172, 1771. "Habitat inter Cappadociae segetes. D. Schreber." Description subscribed "D. Schreber", who is possibly author of name also. No type in Linnean Herbarium at London, England. Both the species now considered and *V. campylopoda* grow in Asia Minor, but the detailed description, although applying better to the latter in the phrases "pedicelli cernui", "calyx ovato-lanceolatus", and "calyx lanceolatus". fits the former in the further phrases "capsula . . . lobis semi-orbiculatis" and especially "semina plana". The last point is absolutely distinctive, and so, although the original collection may possibly have had some admixture, the name must be given to the species now considered.

Quite variable in size of plant, width of leaves, and other vegetative features. Sometimes minute.

Corolla violet or violet-blue, with darker veins, the throat white. Flowering from April to September, according to altitude and rainfall.

Gravelly or sandy soil, fields, river bottoms, etc., at altitudes of 600 to 4500 meters, throughout the western Himalayas. Occurs westward to south-eastern Europe.

Hazara: Abbottabad, *Stewart* 13654 (ANSP, DD, USNH), 14629 (ANSP, Gord, GH, NYBG), 16338 (USNH). Rawalpindi: Ghora Gali, *Stewart* 9587; Murree, *Stewart* 10754 (USNH). Muzaffarabad: Domel, *Stewart* (NYBG); Keran Nullah, *Stewart* 17542 (ANSP, GH). Kashmir: Aparawat, *Stewart* (Gord, NYBG); Banihal Pass, *Stewart* 12195a; Burzil Chowki, *Stewart* 19776 (ANSP, Gord, NYBG); Ferozepur Nullah, *Stewart* 14756 (ANSP, Gord, GH, NYBG, USNH); below Ningal Nullah from Gulmarg, *Stewart* 14844 (ANSP, Gord, GH, NYBG); Purana Tilel, *Stewart* 4397; Sonamarg, *Stewart* 6301 (Gord); Taklung La, *Koelz* 6481 (USNH); Tragbal Pass, *Stewart* 4907 (ANSP, NYBG); Trunkal, Gangabal Lakes, *Stewart* 18160 (ANSP, NYBG, USNH); Zoji Pass, *Stewart* 21260 (ANSP, NYBG). Baltistan: Deosai, *Stewart* 20027 (ANSP, DD, Gord, GH, NYBG, USNH); Thalle La, *Stewart* 20682 (Gord); below Tolti, *Stewart* 20952b (Gord). Chamba: Almi Pass, *Lace* 1955 (DD); Alwas, *Stewart* 2397. Purig: Dras, *Schlagintweit* 7219 (GH); Mitsahoi, *Stewart* (ANSP, USNH). Ladakh: Chang La, on upper Indus, *Koelz* 2484 (NYBG); Nima Mud, *Koelz* 2339 (ANSP, NYBG). Zaskar: Bok, *Koelz* 2960 (NYBG, USNH); Kargia, *Koelz* 5522 (USNH). Kangra: Dharmasala, *Stewart* (ANSP, Gord, GH, NYBG). Lahul: Kardong to Dartse (in Bhaga Valley), *Schlagintweit* 2838 (GH); Khoksar, *Koelz* 5062 (USNH), 8360 (Gord, GH, NYBG, USNA); Kolung, *Koelz* 5251 (USNH); Kanzam La, *Koelz* 6962 (USNH); Kye-lang, *Koelz* 529 (ANSP, NYBG); Serchu, *Koelz* 2095 (ANSP, NYBG); Shipting Nullah, *Koelz* 934 (NYBG); Sisu, *Koelz* 5113 (USNH). Kulu: Chandrakani, *Koelz* 131 (NYBG). Spiti: Losar. — 79 (USNA). Bashahr: Chhit Kul, *Parmanand* 997 (ANSP, GH, NYBG, USNH). Kumaun: Milam, *Strachey & Winterbottom* 9 (GH).

14. *Veronica campylopoda* Boissier

Veronica campylopoda Boiss., *Diagn.* 4: 80, 1844. "Hab. in Arabia Petrea *Schimper*, Syria ad Aleppum *Kotschy*, Assyria ad Mosul *Aucher* No. 1945 et Persia boreali No. 5090." *Kotschy's* collection presumably type, since this name seems to have been first proposed in his *exsiccateae*.

Veronica hallbergii Blatter, *Beaut. Fl. Kashmir* 2: 83, 1928. "Srinagar on the banks of the Jhelum, near the Residency." Description clearly of the species now considered, the characteristic seeds being well described.

A species of the Levant, from Asia Minor eastward to Kashmir, where seen only from an altitude of 1700 meters. Flowering from March to May.

BALUCHISTAN. Quetta, *Vcd Parkash* 16412 (NYBG), 16415, 16461 (ANSP, NYBG).

AFGHANISTAN. Paghman, *Koelz* 11398.

INDIA. Tirah: Khyber Pass, *Stewart*. Kashmir: Srinagar, *Stewart* 8585a (ANSP, GH), 8586b (NYBG).

15. *Veronica stewartii* spec. nov.

Plate 7, C.

Annual. Stems prostrate, elongated, 1.5-2 dm. long, pilose or finely villose with spreading or reflexed hairs, usually with a few long branches. Leaves opposite, the blades widely oval or subrotund, rounded, with 1 (or 2) pairs of short obtuse lobes, slightly pubescent or glabrate, 1 cm. long, 1.2 cm. wide, truncate narrowed to petioles 1-1.5 cm. long. Bracts wholly similar or often larger (the blades reaching 1.5 cm. long and wide), long-petioled, alternate, mostly shorter than the internodes. Flowers "axillary". Pedicels 2-4 mm. long, spreading, finely villose, shorter than the petioles of the subtending bracts. Sepals 4, equal, ovate, acuminate, rounded or slightly cuneate at base, ciliate with long white hairs, the sepals becoming 4 mm. long and reticulate-veiny. Corolla 1 mm. long, whitish, apparently glabrous throughout. Stamens shorter than the corolla. Style 0.25 mm. long. Capsule 2-2.5 mm. long, glabrous, turgid, slightly notched, the lobes semi-circular-rounded. Seeds 1 to a cell, reaching 2.5 mm. wide, strongly cylindrical-rounded, glabrous, brown.

Annual; caulis 1.5-2 dm. longa, prostrata, villosa; folia opposita, laminae late ovalibus subrotundisve lobatis 1 cm. longis et latis, petiolis 1-1.5 cm. longis; flores axillares bracteis foliaceis sustenti; pedicelli 2-4 mm. longi, villosuli; sepala quatuor ovata acuminata ciliata 4 mm. longa; corolla 1 mm. longa, albida, glabra, filamenta corolla breviora; stylus 0.25 mm. longus; capsula 2-2.5 mm. longa, glabra, turgida, emarginata, lobis rotundatis; semina duo, 2.5 mm. longa, cyathiformi-rotundata.

Type, wayside, at 1700 meters altitude near Srinagar, Kashmir, collected in flower and fruit, May 1926, by Ralph R. Stewart, no. 8586a; in Herb. Academy of Natural Sciences of Philadelphia.

Fields and roadsides, at altitudes of 1200 to 2000 meters, through the western Himalayas from Hazara to Kangra. Flowering in April and May.

Hazara: Abbotabad, *Stewart 13672* (ANSP, Gord, GH, NYBG, USNH). Muzaffarabad: above Uri on road to Punch, *Stewart 12007* (ANSP, Gord, GH, NYBG, USNH). Kashmir: Srinagar, *Stewart 8586a* (ANSP, Gord, GH, NYBG). Kangra: Naggar, Kulu, *Koelz 1787* (ANSP, NYBG).

Near *Veronica hederifolia* L. of Europe, which differs by leaf-blades with usually 5 lobes that are more prominent, by pedicels much longer than the petioles (often as long as or longer than the bracts), sepals cordate at base, style 0.5 mm. long, and seeds 3 mm. wide; and nearer *V. triloba* Opiz which contrasts with *V. hederifolia* in its shorter pedicels and its usually 3-lobed leaf-blades, but which has pedicels much exceeding the petioles and leaf-blades more deeply lobed. Although Römpp (in *Repert. Spec. Nov. Regn. Veg. Beih.* 50: 92, 1928) mentions many varieties that have been proposed under *V. hederifolia*, this falls outside of his definition of that species.

J. D. Hooker (*Fl. Brit. India* 4: 294, 1884), while listing a specimen from Kashmir (alt. 6000 ft., *Thomson*), gives a description that fits only the European *Veronica hederifolia*; but his collection, cited as "Herb. Ind. or. *Hook. fl. and Thomson. V. hederifolia* L. Hab. Himalaya occ. alt. 6500 ped. Reg. temper. coll. J. J.", has been studied by Ernst Lehmann, who discusses it in *Bibliotheca Botanica* (99: 38, 1930) as akin to *V. sibthorpioides* Deb. & Degen of the western Mediterranean region. That, while agreeing with our plant in short pedicels and smaller seeds (only 2 mm. wide), has the cordate sepals and longer style of *V. hederifolia* and *V. triloba*; moreover, it is a more hairy plant, with much more prominent ciliation of the sepals and less expanded leaves, the petioles being so short as to be nearly equaled by the pedicels.

16. *Veronica koelzii* spec. nov.

Plate 8, B.

Root perennial, the caudex scarcely forming a rhizome. Stems simple below the inflorescence, erect or slightly decumbent, 0.5-2 dm. tall, bifariously pubescent. Leaves opposite, the blades elliptic to elliptic-oval, obtuse, slightly crenate-denticulate proximally to entire throughout, above pilose toward margins and distally over width of blade, beneath pubescent over entire surface, or usually so only on the midrib and main veins, or even

wholly glabrate, 1-1.5 cm. long, 0.4-0.8 cm. wide, narrowed to a sessile (or lowermost semi-petiolate) base. Racemes 2 or 4, axillary to leaf-like bracts (the stem not elongating beyond uppermost pair), hirsute with purple-brown hairs, in anthesis dense and short, in fruit usually elongating (1-3 cm. long). Bracts narrowly oblanceolate, entire, becoming 3-4 mm. long. Pedicels becoming 1.5-2 mm. long, ascending. Posterior sepal small (usually $\frac{1}{3}$ to $\frac{2}{3}$ length of others); the others lanceolate-linear or linear, obtuse, hirsute or merely ciliate, becoming 3.5 mm. long, nearly as long as the capsule. Corolla exceeding the sepals in anthesis, 3.5-4 mm. long, the lobes ovate, obtuse or rounded, the posterior widest (its petals united throughout), the mid-anterior slightly or much smaller than the antero-lateral lobes; corolla glabrous throughout, purple or violet-purple ("royal blue"), scented. Filaments 1 mm. long, shorter than the corolla. Anthers 0.5 mm. long. Style 1.3-2 mm. long; stigma over twice width of style. Capsule 4 mm. long, somewhat compressed, sulcate between carpels, oblong in contour, pubescent, finely so on the sides, longer-ciliate on the margins and on the narrowed apex that is rounded and slightly notched. Seeds 0.3-0.4 mm. long, oval, lenticular-flattened, brown.

Perennis; caulis 0.5-2 dm. altus, erectus, bifariam pubescens; folia opposita, laminis ellipticis vel elliptico-ovalibus crenato-denticulatis integrivessilibus; racemi 2 vel 4, axillares; pedicelli 1.5-2 mm. longi; sepala quatuor lanceolato-lineararia vel lineararia obtusa hirsuta ciliatave 3.5 mm. longa, sepalo quinto minimo; corolla 3.5-4 mm. longa, violaceo-purpurea, glabra; filamenta corolla breviora; stylus 1.3-2 mm. longus; capsula 4 mm. longa, pubescens, oblonga, apice rotundato emarginato; semina 0.3-0.4 mm. longa, ovalia, lenticulari-compressa.

Type, along stream, 4500 meters altitude, Tsakzhun Tso Pass, Ladakh, collected in flower July 21, 1931, by Walter Koelz, no. 2400; in Herb. New York Botanical Garden, isotypes in United States National Herbarium, Gray Herbarium of Harvard University, and the Academy of Natural Sciences of Philadelphia.

Along streams, alpine zone, at altitudes of 4100 to 4900 meters, in the western Himalayas from Ladakh to Rupshu. Flowering in July and August.

Ladakh: Mud, *Koelz* 2357 (GH, NYBG, USNH); Tsakzhun Tso, *Koelz* 2400 (ANSP, Gord, GH, NYBG, USNH); Tso Nyak region, *Hellmut de Terra & Sonam Tergas* 212 (GH); Zingrul, *Koelz* 2493 (GH, NYBG). Zaskar: Kargia, *Koelz* 5509 (USNH). Rupshu: Debring, *Koelz* 6541 (USNH); Rogshiu, *Stewart* 186 (NYBG).

Allied to *Veronica ciliata* Fisch., under which has been associated a group of related species from Kashmir to Yunnan and Transbaicalia (Dahuria). That species,²⁰ from the last-named region, differs from *V. koelzii* by its leaf-blades being lanceolate and crenate-serrate, its sepals and bracts longer-ciliate, its corolla-lobes obovoid-rounded, its style 0.8 mm. long, and its capsules 6-7 mm. long, more tapering and much exceeding the sepals.

²⁰ As represented by Turczaninow's plant collected "in humidis saxosis ad rivulum Korolte" (Dahuria) in 1832; this was in the Bonati Herbarium and will be represented both at the Academy of Natural Sciences of Philadelphia and at the University of California at Los Angeles.

17. *Veronica cephaloides* spec. nov.

Plate 8, A.

Root perennial, the caudex not rhizomatous. Stems simple or branched below, erect or slightly decumbent, 0.5-2.5 dm. tall, bifariously pubescent. Leaves opposite, the blades ovate or nearly so, obtuse, crenate-dentate nearly or quite throughout, pilose on both surfaces, varying to hirsute or to glabrate with hairs only on main ribs and margin, 1-1.7 cm. long, 0.8-1 cm. wide, rounded to a sessile base. Racemes 2 or 4, axillary to leaf-like bracts (the stem not elongating beyond uppermost pair), hirsute, in anthesis dense and short, in fruit similar or slightly elongating (1-2 cm. long). Bracts narrowly oblanceolate, entire, becoming 3-4 mm. long. Pedicels becoming 1.5-2 mm. long, ascending. Posterior sepal smallest (usually about $\frac{1}{2}$ length of others); the others linear-lanceolate, obtuse, hirsute (rarely merely ciliate), becoming 3-3.5 mm. long, about $\frac{2}{3}$ the length of the capsule. Corolla exceeding the sepals in anthesis, glabrous externally, 3-4 mm. long, the lobes obtuse or rounded. Filaments shorter than the corolla. Anthers 0.5 mm. long. Style 0.8-1 mm. long; stigma less than twice width of style. Capsule 5 mm. long, somewhat compressed, sulcate between carpels, ovoid, finely pubescent, the narrowed apex rounded, slightly emarginate. Seeds 0.5-0.7 mm. long, oval, lenticular-flattened, brown.

Perennis; caulis 0.5-2.5 dm. altus, erectus, bifariam pubescens; folia opposita, laminis ovatis obtusis crenato-dentatis sessilibus hirsutis vel ciliatis; racemi 2 vel 4, densi, multiflori, axillares; pedicelli 1.5-2 mm. longi; sepala quatuor lineari-lanceolata obtusa hirsuta 3-3.5 mm. longa, sepalo quinto minimo; corolla 3-4 mm. longa, glabra; filamenta corolla breviora; stylus 0.8-1 mm. longus; capsula 5 mm. longa, minute pubescens, ovoidea, apice rotundato emarginato; semina 0.5-0.7 mm. longa, ovalia, lenticulari-compressa.

Type, alpine region, between 3300 and 4600 meters altitude, Sikkim, collected in flower and fruit, by J. D. Hooker; in Gray Herbarium of Harvard University.

At altitudes of 4000 to 5800 meters, on the Himalayas from Kumaun to Sikkim. Flowering in August.

INDIA. Kumaun: Juling King, *Inayat* 24769 (DD); Ralam Valley, *Inayat* 24771 (DD); Surajkund, Gori Valley, *Inayat* 24770 (DD).

TIBET. Topidhunga, *Strachey & Winterbottom* 4 (GH).

SIKKIM. Naku Chu, *Smith & Cave* 1994 (ANSP, UCLA); ——. *J. D. Hooker* (GH).

18. *Veronica hirta* spec. nov.

Plate 9, A.

Root perennial, the caudex scarcely forming a rhizome. Stems simple below the inflorescence, erect, 1-3 dm. tall, lanulose with spreading or somewhat recurved hairs. Leaves opposite, the blades oblong-lanceolate to nearly ovate, obtuse, crenate-serrate to crenate, permanently pilose-pubescent on both surfaces, 1.5-5 cm. long, 0.7-1.5 cm. wide, rounded to a nearly or quite sessile base. Racemes 2 or 4, axillary to leaf-like bracts (the stem not elongating beyond uppermost pair), densely hirsute with purple-brown hairs, in anthesis dense and short, in fruit becoming 2-4 cm. long. Bracts scattered, irregularly elliptic or oblanceolate, entire or nearly so, becoming

6-8 mm. long. Pedicels becoming 2-3 mm. long, ascending. Posterior sepal minute (less than $\frac{1}{3}$ length of others) or lacking; the others oblong, acutish, hirsute and also ciliate, becoming 5-6 mm. long, from $\frac{1}{4}$ to nearly the whole length of the capsule. Corolla exceeding the sepals in anthesis, 3.5-4 mm. long, glabrous, probably purplish; the lobes oval, rounded, the posterior much the widest and retuse, the mid-anterior scarcely smaller than the antero-lateral lobes. Filaments 0.7 mm. long, shorter than the corolla-lobes. Anthers 0.5 mm. long. Style 0.5-0.7 mm. long; stigma about twice width of style. Capsule 6-7 mm. long, slightly compressed, sulcate between carpels, pyramidal-ovoid, brown-pubescent, the apex rounded or slightly notched. Seeds 0.8-1 mm. long, oval, flattened, brown.

Perennis; caulis 1-3 dm. altus, erectus, lanulosus; folia opposita, laminis oblongo-lanceolatis vel ovatis, obtusis crenato-serratis crenatisve piloso-pubescentibus sessilibus; racemi 2 vel 4, multiflori, axillares; pedicelli 2-3 mm. longi; sepala quatuor oblonga acutiuscula hirsuta ciliataque 5-6 mm. longa, sepalo quinto minuto vel nullo; corolla 3.5-4 mm. longa, glabra; filamenta corolla breviora; stylus 0.5-0.7 mm. longus; capsula 6-7 mm. longa, pyramidali-ovoidca, brunneo-pubescentia, apice rotundato vel emarginato; semina 0.8-1 mm. longa, ovalia, compressa.

Type, alpine meadow, 4000 meters altitude, Nichanai Pass, Kashmir, collected in flower and fruit August 16, 1928, by Ralph R. Stewart, no. 9896; in Herb. Academy of Natural Sciences of Philadelphia.

High alpine meadows, at altitudes of 3300 to 4600 meters, in the western Himalayas from Hazara to Lahul. Flowering from mid-July to mid-August.

Hazara (Kagan): Nila, *Inayat* (ANSP, DD); Raji Bhogi, *Duthie*; Sarul, *Inayat* 22067 (DD). Kashmir: Apharwat, *Stewart* 8792 (Gord, GH, NYBG), 10324; Killanmarg, above Gulmarg, *Stewart* 8662a; Nichanai Pass, above Sonamarg, *Stewart* 9896 (ANSP, Gord, NYBG); Rajdhiangan Pass, *Stewart* 17956 (ANSP, GH, NYBG), 17968 (Gord); Sonamarg, *Stewart* 6629; Zojibal Pass, *Stewart* 18218 (ANSP, Gord, GH, NYBG, USNH). Chamba: Kukti Pass, *Koelz* 10154. Lahul: Rotang Pass, *Nath* 198.

Akin to and intermediate between its neighbors, *Veronica hirta* to the west and *V. koelzii* to the east, and so combining their characters as to lead me to consider this solitary collection as a hybrid between them, is a plant that from its silvery indumentum may be called *V. leucothrix* hybr. nov. It resembles *V. koelzii* in the development of the posterior sepal, the small size of the capsule, and the narrowness of the spikes, and *V. hirta* in the shortness of the style and in the leaf-serrulation, while the leaf-size is somewhat intermediate. Unlike either is the silvery whiteness of the indumentum. (Perennis; caulis 1.5-2.5 dm. altus, lanoso-pubescent; folia ovalia vel ovato-ovalia obtusa crenulato-serrata albo-pilosa; sepala quatuor oblanceolato-lineararia vel lineararia 5 mm. longa, capsulae aequalia, sepalo quinto minimo²¹; corolla 4-4.5 mm. longa; filamenta brevissima; stylus 0.7-0.8 mm. longus; capsula 4.5 mm. longa, anguste ovoidea, minute brunneo-pubescentia, apice rotundato truncatove; semina 0.5 mm. longa. Type, high alpine

²¹ Posterior sepal linear, slightly over $\frac{1}{2}$ the length of the others.

meadow, 3700 meters altitude, Pahlgam, Kashmir, collected in late flower and fruit August 10, 1927, by Ralph R. Stewart, no. 9302; in Herb. Academy of Natural Sciences of Philadelphia, isotypes at New York Botanical Garden, Gray Herbarium of Harvard University, and Gordon College in India. The only collection seen.)

19. *Veronica nana* spec. nov.

Plate 9, B.

Perennial. Stems simple below the inflorescence, erect or nearly so, 1-5 cm. tall, bifariously finely villose. Leaves opposite, the blades narrowly elliptic, obtuse, entire or the upper crenately to sharply dentate proximally, pilose-lanose above and at least on midrib and margins beneath, 0.9-1.6 cm. long, 0.4-0.7 cm. wide, cuneately narrowed to slightly, or the lower strongly, petiolate bases (2-5 mm. long). Racemes 2 or 4, axillary to leaf-like bracts (the stem not elongating beyond the uppermost pair), loosely villose, usually 2-flowered. Peduncles reaching 10 mm. long. Bracts narrowly oblanceolate, entire, becoming 4 mm. long. Pedicels becoming 3 mm. long, ascending. Posterior sepal small, linear (about $\frac{1}{2}$ length and $\frac{1}{3}$ width of others); the others ovate-oblong, obtuse, hirsute, becoming 4 mm. long, about $\frac{2}{3}$ length of capsule. Corolla not seen. Style 0.7-1 mm. long. Stigma about twice width of style. Capsule 6-7 mm. long, somewhat compressed, sulcate between carpels, narrowly pyramidal-ovoid, hirsute-pubescent, the narrowed apex rounded or slightly erose. Seeds not seen.

Perennis; caulis 0.1-0.5 dm. altus, erectus, bifariam villosulus; folia opposita, laminis anguste ellipticis obtusis integris dentatisve supra pilosolanosis 0.9-1.6 cm. longis et petiolis 2-5 mm. longis; racemi 2 vel 4, saepissime biflori, axillares; pedicelli 3 mm. longi; sepala quatuor ovato-oblonga obtusa hirsuta 4 mm. longa, sepalo quinto minimo; corolla non visa; stylus 0.7-1 mm. longus; capsula 6-7 mm. longa, anguste pyramidali-ovoidea, hirsuto-pubescentia, apice rotundato vel eroso; semina non visa.

Type, Debring, Rupshu, altitude 4500 meters, collected in immature fruit August 15-16, 1933, by Walter Koelz, no. 6528; in United States National Herbarium; isotypes at Academy of Natural Sciences of Philadelphia, New York Botanical Garden, and Gordon College. Only collections seen.

20. *Veronica melissaefolia* Poiret

Veronica melissaefolia Poir., in Encyc. Meth., Bot. 8: 526, 1808. "Cultivée au Jardin des Plantes de Paris. Son lieu natal m'est inconnu. (V. s. in herb. Desfont.)"

Named for the resemblance of the leaves to those of *Melissa officinalis* L., especially evident being their nearly truncate bases. Our plants agree with the description in all details excepting that the capsules, instead of being glabrous over the whole surface, are so on the sides but ciliate on the orifices. I think that these hairs must have been overlooked, an opinion evidently shared by Römpp (in Repert. Spec., Nov. Beih. 50: 132, 1928), who describes the capsules as hairy. He distinguishes this from the following only by its longer inflorescence versus the short fewer-flowered raceme of *V. laxa*, a contrast that, if valid, would place most Himalayan material with *V. melissaefolia*. There seems to be indefinite variability in this character, the probable situation being that most inflorescences elongate with flowering.

Veronica laxa Benth., Scroph. Indicae 45, 1835. "Hab. ad Kidarkonta, Royle."

In forests at altitudes of 2100 to 3400 meters, throughout the Himalayas; ranging from Asia Minor to China and Japan. Flowering from June to August, the corolla violet.

Hazara: Changla Gali, Murree Hills, *Stewart* 4092; Chor, Kagan, *Inayat* 22064 (DD); Dogah, Nilo Panjul Shinkiar, *Duthie*; Kagan Valley, *Stewart* 6018; Kuthyali, Kagan, *Inayat* 22064a (DD); Richmori, Dara Panjul, *Inayat* (DD); Silan, *Inayat* (DD); Siran Valley, *Inayat* 20026; Urai, Saran Ridge, *Inayat* (DD). Rawalpindi: Murree, *Stewart* (Gord, NYBG). Muzaffarabad: Keran, *Stewart* 17625 (ANSP, Gord, GH, USNH); Mechhiara Danna, *H. Singh* 1702 (DD). Kashmir: Banihal Pass, *Stewart* 12199; Kangan, *Inayat* 25734 (ANSP, DD); Kel to Taubat, *Stewart* 17361; Pahlgam, *Stewart* 5461, 5566; Sinthan Pass, *Stewart* 3133 (Gord); Tangmarg, *Stewart* (ANSP, NYBG); Tragbal Pass, *Stewart* 4725 (Gord). Chamba: Alwas, *Stewart* 2422, 2568. Kulu: Malena slope, *Koelz* 190 (NYBG). Simla: Jalori Pass, *Nath* 86. Kumaun: Ralam Valley, *Inayat* 24767 (DD).

Nearly related to *Veronica chamaedrys* L., but easily distinguishable by the following contrast:

Stem below strongly bifariously pubescent; lower pedicels about as long as or longer than the sepals; stem 1-3 dm. tall, and racemes 5-15 cm. long. *V. chamaedrys*
 Stem below more evenly pubescent, only obscurely or imperfectly bifariously; lower pedicels shorter than the sepals; stem 3-6 dm. tall, and racemes 10-30 cm. long.

V. mclissaeifolia

21. *Veronica javanica* Blume

Veronica javanica Blume, Bijdr. Fl. Nederl. India 742, 1826. "Crescit in cacumine Sederato et ad cataractas fluvii Tjikundul montis Gedo."

Veronica deltiigera Wall., Numer. List Spec. Ind. Mus. n. 402, 1829, ined., with locality as next cited; ex Benth., Scroph. Indicae 45, 1835. "Hab. ad Gossain Than Emodi, Wallich." Mt. Gosai Than is in the Himalayas above eastern Nepal, but this plant presumably came from its southern foothills in Nepal. This was identified by J. D. Hooker, Fl. Brit. Ind. 4: 292, 1884, as *V. lanosa* Benth., and Wallich's name substituted for that. But the description differs from that species in describing the leaves as crenate- (rather than sharply) serrate, the racemes as axillary, and the capsules (though immature) as rhombic-dilated, all points favoring the identification now suggested. Even though Hooker may be presumed to have seen the type, the difference of leaf-margin and capsule-form seem conclusive. The further feature of stem glabrous, only bifariously lanate below the leaves, is matched by specimens of *V. javanica* in the Academy's herbarium.

A wide-ranging Oriental weed-like species, in our territory occurring from the Simla district eastward. Flowering in summer.

Dehra Dun: Woodstock, Landour, *Stewart* 15916 (ANSP, Gord, GH, NYBG). Almora: Almora, *Strachey & Winterbottom* 8 (GH).

22. *Veronica cana* Wallich

Veronica cana Wall., Numer. List Spec. Ind. Mus., n. 401, 1829, ined., with localities as next cited; ex Benth., Scroph. Indicae 45, 1835. "Hab. in Gossain Than Emodi et Napalia, Wallich . . ." Mt. Gosai Than is in the Himalayas above eastern Nepal; both this and *V. deltiigera* must really be from lower southern foothills in Nepal. Isotype, *Wallich* 401, seen in Herb. Academy of Natural Sciences of Philadelphia.

Occasional in the Western Himalayas at altitudes of 2500 to 3000 meters; ranging from India to China. Flowering in summer.

Muzaffarabad: Shila, *Inayat* (DD). Kangra: Dharmshala, *Stewart* 10315 (ANSP, NYBG). Kumaun: Saba, *Strachey & Winterbottom* 6 (GH).

23. *Veronica umbelliformis* spec. nov.

Plate 10, B.

Perennial, from slender rhizomes. Stems simple, slightly decumbent or erect, 0.5-1.5 dm. tall, bifariously villose, especially at and below upper nodes. Leaves opposite, the blades oval, rounded at apex, crenate-dentate, pilose-hirsute on both surfaces, 1-1.5 cm. long and wide, truncately rounded to short-petioled bases (1-2 mm. long). Racemes usually a single pair,

axillary to leaf-like bracts (the stem not elongating farther), hirsute, 3- or 5-flowered, seeming umbelliform by the suppression of the peduncles and the secondary bracts. Pedicels becoming 4-7 mm. long, ascending. Sepals 4, alike, lanceolate-oblong, entire, obtuse, hirsute, becoming 4 mm. long, slightly shorter than the capsule. Corolla not seen. Style 2 mm. long; stigma less than twice width of style. Capsule 4 mm. long, somewhat compressed, slightly wider than long, emarginate to notched at apex, the orifice ciliate. Seeds 1-1.2 mm. long, flattened, smooth, dark brown.

Perennis; caulis 0.5-1.5 dm. altus, erectus, bifariam villosus; folia opposita, laminis ovalibus rotundatis crenato-dentatis utrinque piloso-hirsutis brevipetiolatis; racemi saepissime duo pauciflori umbelliformes oppositi axillares; pedicelli 4-7 mm. longi; sepala quatuor lanceolato-oblonga obtusa hirsuta 4 mm. longa, quinto nullo; corolla non visa; stylus 2 mm. longus; capsula 5 mm. longa, glabrata, ovoidea, apice emarginato ciliato; semina 1 mm. longa, compressa, laevia.

Type, alpine, 4100 meters altitude, Barji Kong Pass, Kumaun, collected in fruit August 1848, by R. Strachey and J. E. Winterbottom, no. 10; in Gray Herbarium of Harvard University. (Date supplied from Strachey & Duthie's Catalogue of the Plants of Kumaon, pp. iii & 128, 1906.)

Alpine, at altitudes of 3700 to 4500 meters, through the middle Himalayas from Kumaun to Sikkim; although not seen from Nepal, it is presumably most abundant there. Fruiting in August.

Kumaun: Barji Kang Pass, *Strachey & Winterbottom* 10 (GH).

This is the species that J. D. Hooker in the Flora of British India (4: 295, 1884) mistakenly identified as *Veronica capitata* Benth.

24. *Veronica beccabunga* Linnaeus

Veronica beccabunga L., Spec. Plant. 12, 1753. "Habitat in Europa ad rivulos." Type seen in the Linnean Herbarium in London, England.

Corolla bright violet-blue. Flowering in July and August.

Brooks and springs, very common in alpine zone, at 2100 to 3500 meters altitude, through the western Himalayas. Extends through most of the Palaearctic Region of Eurasia.

Hazara: Rajwal, Kagan, *Inayat* 2206. Kashmir: Bandipur, *Koelz* 9110; Gadsar, *Stewart* 18347 (ANSP, GH); Gulmarg, *Gammie*; Pahlgam, *Stewart* 5935; Sonamarg, *Stewart* 6260; Srinagar, *Schlagintweit* 4593 (GH); Tragbal, *Stewart* 4261, 19459 (GH); Tulion, *Stewart* 7864 (NYBG); Weyil, *Stewart* 18099 (ANSP, USNH). Baltistan: Kuru to Kiris, Shyok Valley, *Stewart* 20872; Thalle La, *Stewart* 20668 (Gord). Ladakh: Leh, *Koelz* 2599 (ANSP, DD, NYBG, USNH); Mulbekh, *Koelz* 6183 (USNH). Lahul: Kvelang, *Koelz* 505 (NYBG); Sisu, *Koelz* 5098 (USNH). Bashahr: Hangla, *Parmanand* 622 (ANSP, GH, NYBG).

All Himalayan collections seen are small-leaved, but, just as with similar states of *Veronica americana* (Raf.) Schwein., this would appear to be the result of altitude. Such a condition is well matched in *V. beccabunga* by specimens gathered by Dr. John M. Macfarlane in the Geisser Alps,

Tyrol or Switzerland, July 6, 1906, and especially labeled "alpine." It is evidently what has been described from Pamir as *V. hjuleri* Paulsen (in Bot. Tidskr. 27: 212, 1906).

25. *Veronica anagallis-aquatica* Linnaeus

Veronica anagallis-aquatica L., Spec. Plant. 12, 1753. "Habitat in Europa ad fossas." Description quoted from Linnaeus' Flora Suecica 5, no. 10, 1745, where the plant was stated to occur in Sweden "in fossis ad vias & paludes Uplandiae, Scaniae, &c." Type, seen in Linnean Herbarium at London, England, shows all the features of the glabrous species now considered; it is well matched by recent collections from Sweden. For further discussion see Monog. Acad. Nat. Sci. Phila. 1: 362, 1935.

Corolla pale violet. Flowering through most of the year.

Streams and irrigation ditches, at altitudes up to 2100 meters, throughout the western Himalayas, where possibly naturalized. A widespread Palaearctic plant, now extensively naturalized in temperate North America and in southern South America.

Kurram: Kurram Valley, *Harsukh* 15417. Peshawar: Peshawar, *Qazilbash* (Isl), *Schlagintweit*. Hazara: Abbottabad, *Stewart* 9053, 13698 (ANSP, GH); Dugabela. Shinkiyari, *Inayat* (DD); Mansehra, *Stewart* 9637 (ANSP, Gord); Nuri. Kagan, *Inayat* (DD); Silan, Kagan, *Inayat* (DD). Rawalpindi: Murree, *Stewart* 12360 (Gord), 13903 (ANSP, NYBG). Muzaffarabad: Domel-Garhi Hababullah, *Stewart* 9611a. Kangra: Kasol, Parbati Valley, *Koelz* 4897 (USNH). Bashahr: Rarang, Kunawur, *Parmanand* 541 bis (USNA).

26. *Veronica secunda* spec. nov.

Plate 10, A.

Annual, or probably biennial, scarcely forming a rhizome. Stem simple or branched, erect, 2-9 dm. tall, glabrous below or glandular-pilose throughout, often with prostrate basal shoots. Leaves opposite: those on the erect stems elliptic-oblong to oblong-lanceolate, acute or acutish, more or less closely serrate with low teeth, glandular-pubescent on both surfaces or the lower glabrate, sessile, the largest 3-6 cm. long, 1.5-2.5 cm. wide; those of the prostrate basal shoots small, oval, rounded, cuneate to petioled bases. Racemes from middle and upper axils, densely finely glandular-pilose throughout, secund, becoming 10-20 cm. long. Bracts scattered, linear-lanceolate, entire, usually all but the lower exceeded by the pedicels. Pedicels becoming 2-5 mm. long, filiform, ascending. Posterior sepal lacking, the four present oblong-lanceolate, acute, about $\frac{2}{3}$ the length of the capsule. Corolla 3 mm. long, the lobes ovate and acutish, the compound posterior wider than long, the mid-anterior slightly narrower than the antero-laterals; corolla glabrous throughout, "lavender, veined deeper, small petal paler." Filaments 1.5 mm. long, shorter than the corolla-lobes. Anthers 0.7 mm. long. Style 2 mm. long, and stigma capitate, about twice width of style (or sometimes the two component stigmas distinct or even the two component styles distally distinct). Capsule 3-3.5 mm. long, slightly compressed, sulcate between carpels, pyramidal-ovoid, acute or acutish, finely glandular-pubescent. Seeds 0.4-0.5 mm. long, oval in contour, turgid, smooth, brown.

Annua vel biennis; caulis 2-9 dm. altus, crectus, glandulari-pilosus, basi ramos prostratos saepe emittens; folia opposita, caulium crectorum laminis elliptico-oblongis vel oblongo-lanceolatis, acutis acutiusculisve, serratis.

glandulari-pubescentibus, 3-6 cm. longis sessilibus, caulium prostratorum laminis parvis ovalibus rotundatis petiolatis; racemi numerosi glandulari-pilosi secundi 10-20 cm. longi; pedicelli 2-5 mm. longi, ascendentes; sepala quatuor oblongo-lanceolata acuta, sepalo quinto nullo; corolla 3 mm. longa, glabra, pallide violacea; filamenta corolla breviora; stylus 2 mm. longus; capsula 3-3.5 mm. longa, acuta, pyramidali-ovoidea, minute glandulari-pubescentis; semina 0.5 mm. longa, ovalia, turgida.

Type, Hang, Bashahr, collected in fruit and late flower July 31, 1934, by Negi Parmanand, no. 771; in Herb. Academy of Natural Sciences of Philadelphia.

Along streams, at altitudes of 2900 to 4000 meters, in the western Himalayas from Gilgit to Bashahr. Flowering in July and early August.

Astor (Gilgit Wazarat): Chillam, *Stewart* 18994 (ANSP, NYBG). Baltistan: Khapalu, on Shyok R., *Schlagintweit* 5742 (GH). Purig: Dras, *Stewart* 9987a, 21169a (NYBG); Kharbu to Dras, *Stewart* 21134 (ANSP, Gord, GH). Ladakh: Lamayuru, *Koelz* 2757 (DD, NYBG, USNH), 6222 (NYBG). Zaskar: Char, *Koelz* 5707 (USNH). Spiti: Guling, Pin Valley, *Koelz* 7211 (NYBG); Mane, *Koelz* 7224. Bashahr: Hang, *Parmanand* 771 (ANSP, NYBG); Kangun, *Parmanand* 581; Rarang, *Parmanand* 541 (ANSP, Gord, GH).

Veronica secunda is related to *V. michauxii* Lam. of Persia and Afghanistan, but that seems to differ in its corolla being smaller, its capsule smaller, scarcely longer than the sepals, and its racemes being shorter, with less ascending pedicels. It is less closely related to *V. oxycarpa* Boiss. of Persia, which has an oblique glabrous capsule and inflorescence less glandular.

27. *Veronica salina* Schur

Veronica aquatica Bernhardt, Ueber Begriff der Pflanzenart und seine Anwendung 66, 1834. Presumably from Germany. A running account, from which it appears that this has red flowers, smaller growth, smaller flowers, and longer bracts than *V. anagallis*-*aquatica*, all points suggesting the species now considered. Not *V. aquatica* S. F. Gray, 1821.

Veronica salina Schur, Enum. Pl. Transsylv. 492, 1866. "Auf schlammigen, etwas salzhaltigen Thonboden, auf der Salzwiese zwischen Hermannstadt, Hammersdorf und dem alten Berg." I follow recent authors in using this name, although I am not convinced of its applicability. Certainly the description of the leaves as serrate-dentate and of the capsules as elliptic does not accord with the species now considered.

Corolla pale purple. Flowering in July and August.

Along streams, at altitudes of 800 to 3300 meters, locally common through the western Himalayas from Muzaffarabad to Kangra. Though so localized in the Himalayas, our plant appears to pertain to this widespread Palearctic species of Eurasia.

Muzaffarabad: Chenari, *Stewart* 12173; Dhanni, *Stewart* 17331 (Gord); Domel-Garhi Habebullah, *Stewart* 9611 (GH); Keran, *Stewart* 17693; Sharda, *Stewart* 17766 (USNH); Titwal-Surkhala, *Stewart* 17454 (NYBG). Kashmir: Baltal to Sonamarg, *Stewart* 21278 (GH); Baramulla, *Keshavanand* 1171 (DD); Ferozepur Nullah, *Stewart* 14758; Ganderbal, *Stewart* 9691; Gund to Kangan, Sind Valley, *Stewart* (ANSP, USNH); Gurais, *Stewart* 4346; Jhelum Valley, *Stewart* 13987 (GH, NYBG); Pahlgam, *Stewart* 5466, 7903 (NYBG); Shalimar, *Stewart* 10614 (Gord); Sonamarg, *Stewart* 9726 (ANSP, Gord, GH, USNH); Srinagar, *Schlagintweit* 4572, *Stewart* 14056 (ANSP, USNH); Tangmarg, *Stewart* 8896a (ANSP, GH), 10649, 12141; Tragbal, *Stewart* 19464;

Wangat, *Stewart* 18078 (ANSP, NYBG); Waziri Thal, Tilel Valley, *Stewart* 18578. Baltistan: Kasurmik to Doghani, *Stewart* 20809; Kiris to Parkutta, *Stewart* 20921 (Gord, NYBG); Skardu, *Stewart* 20418. Purig: Dras, *Stewart* 9987 (ANSP, Gord), 10031, 21169 (NYBG). Ladakh: Leh to Dah, *Schlagintweit* 1448; Pitug, *Koelz* 6349 (USNH); Sakti, *Koelz* 2510 (NYBG, USNH). Chamba: Palumpur, *Gammie* 18736; Tarlok Nath, *Koelz* 1137 (NYBG).

This wide-spread Palaearctic species is closely related to the Nearctic *Veronica connata* Raf., but appears to differ constantly in its capsule being nearly circular in contour and only slightly notched, the capsule of the American plant being wider than long and normally more deeply notched.

28. *Veronica undulata* Wallich

Veronica undulata Wall., in Roxb., Fl. Ind., ed. Carey & Wallich 1: 147, 1820. "Discovered in the Turraye by Mr. W. Jack", whose description is inserted. William Jack was long at Dinapore on the Ganges in Patna, Bihar. A verifying specimen, labeled in Schweinitz' hand "*Veronica undulata* 406 Hindostan Wallich", is in the Academy's herbarium. It is clearly the species now considered.

Corolla pale purple or whitish. Flowering from March to May.

In slow streams and marshes, at altitudes below 1600 meters, at the base of the Himalayas and in their lower valleys, from Peshawar to Garhwal, and eastward to southern China.

Peshawar: Peshawar, *Qazilbash* (Isl), *Stewart* 19378. Attock: Campbellpur, *Stewart*; Hasan Abdal, *Stewart* 10135 (GH). Hazara: Abbottabad, *Stewart* 14660 (ANSP, NYBG, USNH). Rawalpindi: Ghora Gali, *Stewart* 9570 (NYBG); Golra, *Stewart* 15869 (Gord); Khanna, *Stewart* 13866 (ANSP, NYBG); Murree to Kohala, *Stewart* 15203a (Gord, NYBG); Nurpur, *Stewart* 16275 (ANSP, DD, GH, NYBG, USNH); Rawal, *Stewart* 19405 (USNH); Rawalpindi, *Stewart* 9148 (GH, NYBG), 13821 (ANSP, GH, NYBG), 13840 (ANSP, Gord, GH, NYBG), 14600 (Gord, GH, NYBG), 16246 (ANSP, Gord, GH, NYBG, USNH); Saidpur, *Stewart* 375. Punch: Mandi, *Stewart* 12005 (ANSP, Gord, NYBG). Kashmir: Sopor, *Koelz* 9023 (ANSP, Gord, USNA). Udhampur: Kashmir-Jammu Road, *Stewart* 10689. Gurdaspur: Gurdaspur, *Stewart* 1364; Pathankot, *Stewart* 1691, 1750½. Kangra: Bhadwar, *Koelz* 4207 (USNH), 4209 (USNH); Keshapur, *Koelz* 1649 (NYBG). Saharanpur: Saharanpur, *Duthie*. Garhwal: Sita Bani, Kotah Range, *Duthie* 25964.

Tribe VIII. *BUCHNEREAE*

A tribe of the tropical and warm temperate portions of both the Old and New Worlds.

KEY TO GENERA

- A. Anthers two-celled, the cells equal or one slightly smaller; corolla campanulate, the open throat glabrous or nearly so within; calyx open-campanulate, with 5 or 10 faint ribs.
- B. Capsule both loculicidal and septicidal, the carpels parting distally; corolla 9-15 mm. long, the throat wide; bracteoles present beneath calyx; leaf-blades oblong-lanceolate to -ovate, not divided; plants with slender hairs.
- C. Corolla yellow, 9-10 mm. long, the lower exceeding the upper lobes; anther-cells equal; capsule globose; calyx symmetrical, its lobes ovate, attenuate; leaf-blades and bracts ovate-lanceolate, slightly pubescent, dentate with caudate teeth, and each cuneately narrowed to a semi-petiolate base; plants loosely pubescent, the hairs of the stem recurved.

27. *Melasma*

CC. Corolla purple, 13-15 mm. long, the lobes all about equal; anther-cells slightly unequal; capsule ovoid; calyx asymmetrical, deeply cleft anteriorly, the tube distally upcurved so that the short free lobes appear as tips on the upper side of corolla and capsule; leaf-blades and bracts oblong-lanceolate, entire, pustulate-scabrous, each shortly narrowed to a sessile base; plants scabrous-hispid, the hairs of the stem ascending.

28. *Centranthera*

BB. Capsule wholly loculicidal, the carpels not parting; corolla 5-6 mm. long, the throat relatively narrow; leaf-blades entire to pinnatifid, the main blade and segments linear or nearly so; plants puberulent to glabrous.

C. Anther-cells all alike; corolla lavender, its lobes spreading, notched; calyx-lobes triangular-lanceolate, nearly equaling the capsule; bracteoles none; pedicels ascending, only the lowermost as long as the capsules; inflorescence glandular-puberulent. 29. *Leptorhabdos*

CC. Anther-cells of one pair unequal, one cell much smaller and abortive; corolla yellow or purple, its lobes rounded; calyx-lobes widely triangular, lanulose-ciliate, not equaling the capsule; bracteoles present beneath calyx; pedicels spreading, longer than the capsules; inflorescence puberulent, not glandular. 30. *Sopubia*

AA. Anthers one-celled (by abortion of other cell); corolla salverform, the narrow throat hairy within; calyx tubular-campanulate, with 5, 10, or 15 ribs, and bi-bracteolate at base.

B. Corolla-tube straight, externally glabrous; ribs of calyx faint; leaf-blades oblong to oblong-lanceolate. 31. *Buchnera*

BB. Corolla-tube decurved near apex, externally puberulent to pubescent; ribs of calyx forming ridges; leaf-blades linear-lanceolate to subulate. 32. *Striga*

27. MELASMA Bergius

Melasma Berg., Deser. Plant. Cap. Bonae Spei 162, 1767. Genotype, *M. scabrum* Berg. of South Africa, the only original species.

A genus of about 30 species, in the warmer parts of both hemispheres.

1. *Melasma avense* (Bentham) comb. nov.

Hymenospermum dentatum Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3963, 1829, ined., "Toong Dang (Andr.) 1826". On this nomen nudum have been based *Alectra dentata* Kuntze (1891) and *Melasma dentatum* K. Schum. (1900), neither validated by descriptions. This name was cited by Bentham in the synonymy of both the following. Wallich credited "Andr." as collector of no. 3959 on Taong Dong in 1826, and so I suppose that he was the collector of this also.

Glossostylis avensis Benth., Scroph. Indicae 49, 1835. "Hab. ab Taong Dong monte ("montem") Avaе, Wallich." Ava is near the present Mandalay in Burma, and it is evident that Bentham intended to form a geographic adjective from this place; unfortunately, because of its resemblance to a very common Latin adjective, the name has been habitually cited as "arvensis", and so even by Bentham himself in the synonymy of our next entry.

Alectra indica Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 339, 1846. "In Asiae indicæ montibus, in Himalayæ herbidiis (*Edgeworth!*), Napalia (*Wallich!*), mont. Khasiya (*Griffith!*)²² n. 232, 233, 234), in mont. Taong Dong Avaе (*Wallich!*)."
This is the name most generally used subsequently, as in Hooker's Flora of British India (4: 297, 1834) where the plant is assigned a range from Kumaun eastward.

Corolla yellow. Flowering in September.

Grassy plains and slopes, below 2000 meters altitude, from Garhwal east to Yunnan and Siam.

Garhwal: Diwal, *Duthie 4265a* (DD).

²² As elsewhere, actually *Griffith*.

28. **CENTRANTHERA** R. Brown

Razumovia, Spreng., Fl. Hal. Tent. Nov. Mant. 45, 1807. Genotype, *R. tranquebarica* Spreng., of southern India, the only original species. Not *Razumovia* Spreng., Allgem. Lit.-Zeit. Intelligenzbl. 136, 1805, of the Asteraceae.

Centranthera R. Br., Prod. Fl. Nov. Holl. 438, 1810. Genotype, *C. hispida* R. Br., of northern Australia, the only original species.

A genus of 7 species of the Oriental Region, one extending to northern Australia.

1. **Centranthera nepalensis** D. Don

Centranthera nepalensis Don, Prod. Fl. Nep. 88, 1825. "Hab. in Nepalia, Hamilton [in 1802-03]."

Digitalis stricta Roxb., Fl. Ind. 3: 99, 1832. "Found in pasture ground over Bengal."

Corolla purple. Flowering in September.

Open ground, plains and lower mountain slopes, at altitudes below 1600 meters, northern India.

Mirpur: Saidabad, *Gammie*. Kangra: Dharmsala, *Duthie* 18660. Tehri: Ganges Valley between Dharassu and Dhomba, *Duthie* 1878 (DD). Almora: Almora, *Strachey* & *Winterbottom* (GH).

Both the descriptions, as well as notes on two of the collections just cited, give the corolla as purple,²³ Roxburgh calling the tube "a deep purplish red" and the lobes "rose-coloured." This furnishes the most obvious difference from *Centranthera cochinchinensis* (Lour.) Merr. (*C. hispida* R. Br.), with which it has long been placed, the two more fully contrasting:

Corolla yellow, 17-20 mm. long; both pairs of filaments villose-ciliate; seeds spirally ridged, not reticulate; bracts shorter than the calyces; stem 4-10 dm. tall.

C. cochinchinensis

Corolla purple, 13-15 mm. long; filaments less hairy, the posterior pair glabrate, the anterior villose-ciliate; seeds evidently reticulate, not spirally marked; bracts (unless occasionally the uppermost) longer than the calyces; stem 0.5-5 dm. tall.

C. nepalensis

29. **LEPTORHABDOS** Schrenk

Leptorhabdos Schrenk, ex Fisch. & Mey., Enum. Plant. Nov. Schrenk. 1: 23, 1841. Genotype, *L. micrantha* Schrenk.

Dargeria Decaisne, in Jacquemont, Voy. dans l'Inde, Bot. 115, 1844. Genotype, *D. limifolia* Decaisne.

Species few, or perhaps only the following that ranges through arid central Asia from Turkestan and Persia to Songaria and the Himalayas. I had at first thought that there were at least three species in the western Himalayas, but now I incline to treat them all as forms of a single variable one. The genus is remarkable in this family for the reduction of the seeds to only two or one to each cell of the capsule.

1. **Leptorhabdos parviflora** (Bentham) Bentham

Gerardia parviflora Benth., in Wall., Numer. List Spec. Ind. Mus. n. 3888, 1830, ined. "Kamaon R. B."; Scroph. Indicae 48, 1835. "Hab. in Kamaon, *Wallich*." Description clearly of the most usual state, the leaves being subpinnatifid and the bracts very small, although the calyx-lobes have never been observed to be really "very short" (as they were described).

²³ Actually, *Duthie* terms the color "pink" and *Gammie* "rose-red."

Leptorhabdos micrantha Schrenk, l. c. 24, 1841. "Lecta in ripa fluvii Tentek, d. 10 Junii m. [1840 Schrenk]." In the Academy's herbarium is A. G. Schrenk, no. 1064, collected in 1840 "ad ripas fl. Gei", bearing this name of Schrenk's, and also his 1064B collected in 1843 "ad ripas fluvii Tentek", but named *L. brevidens* F. Mey. Both are tall plants, the former with little-divided stem-leaves and very lax racemes, the latter with more divided leaves and denser racemes. Both seem to me variants of the same species, as might be expected from the later plant coming from the type locality assigned the earlier, and they seem in no way separable from the plant of the Himalayas.

Dargeria linifolia Decaisne, l. c. 116, t. 121, 1844. "In laricetis altissimis supra Poyé et Rici, at 3,300 ad 3,500 metr." The map of the Himalayas in the atlas of the Voyage shows that these localities lie near the Sutlej River north of the main chain of the Himalaya Mountains, the former on the western bank just below the mouth of the Spiti River, the latter some distance to the southeast and so east of the river; they are placed in Kanaor (Kunawar), which seems about equivalent to Bashahr. This is a form with less cut leaves, although the lower cauline blades seem to be always lobed; while not mentioned in the description, this feature is clearly shown on the accompanying drawing. Decaisne distinguished this species from *Gerardia parviflora* Benth., which he renamed *Dargeria pinnatifida*, also by the bracts equaling or exceeding the flowers, and by the calyx-lobes being lanceolate rather than ovate; both are features that show much fluctuation. Both species were in 1845 transferred to *Leptorhabdos* by Walpers (Repert. Bot. Syst. 3: 387-388), as *L. linifolia* (Decne.) and *L. benthamiana*, respectively.

Leptorhabdos parviflora (Benth.) Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 510, 1846. From this, which he defined as with cauline leaves pinnatisect, pedicels subequaling the calyx, and calyx-lobes nearly equaling the tube, Bentham now distinguished yet another species, *L. virgata*, by its pedicels shorter than the calyx and its calyx-lobes nearly equaling the tube. It seems to me that both variations occur freely, and without taxonomic significance. While he knew only *L. parviflora* in the Himalayas, Bentham gave *L. virgata* a wider range: "In montibus Asiae centralis, in Persiae mont. Elamont (*Aucher!* n. 5065), in regno Cabulico (*Griffith!*), in jugo Himalayano (*Edgeworth!* *doma Dalhousie!*)."

Corolla lavender, with bright yellow anthers. Flowering in August and September.

Open sunny places, at altitudes of 1700 to 3300 meters, through the western Himalayas east to Garhwal.

Kurrum: Khawis Khili, *Harsukh* 15427 (DD); Malana Bagh, *Harsukh* 15426 (DD). Kohat: Mirkuheli, *Drummond* (DD). Hazara: Changla Gali, Murree Hills, *Stewart* 3950; -Kagan: Bhimbal, *Inayat* 19975 (DD); Kanari, *Inayat* 22059 (DD). Rawalpindi: Ghora Gali, *Stewart* 12534 (ANSP, GH); Murree, *Stewart* 15380 (NYBG). Astor: Rattu, *Stewart* 18836 (ANSP, NYBG). Kashmir: Chorwan ("Chorbam"). *Koelz* 9316 (ANSP, USNA); mt. behind Dal Lake, *Stewart* 3298; Gurez to Chorwan, *Stewart* 19649; Pahlgam, *Stewart* 5724; Sonamarg, *Stewart* 6917, 9859 (ANSP, GH, NYBG). 12535 (Gord). 21343 (USNH); Srinagar Waterworks, *Stewart* 3359; Tangmarg, *Stewart* 10551; Tilel Valley, *Stewart* 18622 (ANSP, NYBG). Baltistan: Skardo, *Schlagintweit* 795 (GH). Lahul: Jispa, *Koelz* 955 (NYBG); Sumdo, *Stewart* 140 (NYBG). Kulu: Borsu, *Nath* 415 (ANSP). Spiti: Guling, Pin Valley, *Koelz* 7205 (USNH); Kioto, Ladarse, *Koelz* 7049 (USNH); Mane, *Koelz* 7216 (USNH). Simla: Simla Hills, *Drummond* 615 (ANSP, DD). Bashahr: Li, *Koelz* 7284 (USNH); Sangla, *Parmanand* 906 (ANSP, NYBG, USNA); Taling, *Parmanand* 846 (ANSP, GH, NYBG, USNH). Dehra Dun: Benog, *Stewart* 16095 (ANSP, NYBG); Landour, *Stewart* 14535 (ANSP, NYBG). 15219, 15789 (ANSP, GH, NYBG). Gahrwal: Panskesar, *Strachey & Winterbottom* (GH).

30. SOPUBIA Buchanan-Hamilton

Sopubia Buch. Ham., ex D. Don, Prod. Fl. Nepal. 88, 1825. Genotype, *S. trifida* Buch. Ham., the only original species.

A genus of more than 20 species, in tropical Africa and Asia.

1. *Sopubia trifida* Buchanan-Hamilton

Sopubia trifida Buch. Ham. l. c. 88, 1825. "Hab. ad Suambu Nepaliae superioris."
Hamilton (in 1802-03)."

Gerardia scabra Wall., Numer. List Spec. Ind. Mus. n. 3889, 1829, ined., "A Napalia 1821. B. Kamaon R. B. C. [illegible]"; ex Benth., Scroph. Indicae 49, 1835. "Hab. in Napalia et Kamaon, *Wallich* . . ." Isotype, marked "*Gerardia scabra* 3889 *Wallich*", in Herb. Academy of Natural Sciences of Philadelphia.

Corolla "varying from yellow to purple (Clarke)", according to J. D. Hooker (Fl. Brit. Ind. 4: 302, 1884). The species was originally described as purple, but is recorded as yellow by R. R. Stewart, nos. 16089 and 16726. Flowering in August and September.

Grassland, below 2200 meters altitude, plains and lower mountain slopes from Dehra Dun eastward; widespread through the Oriental Region.

Simla: Simla Hills, *Drummond* 627 (ANSP, DD). Dehra Dun: Benog, *Stewart* 16089 (ANSP, NYBG); Chakrata, Jaunsar, *Gammie*; Jahberkhat, *Stewart* 16726 (GH); Mussooree, *Royle*, *Stewart* 11422. Almora: Almora, *Strachey & Winterbottom* (GH). Kumaun: Takola, *Inayat* 24780 (DD); "Kumaon", *Wallich* 3889 (ANSP, GH).

31. **BUCHNERA** Linnaeus

Buchnera L., Spec. Plant. 630, 1753; Gen. Plant. ed. V, 278, 1754. Genotype, *B. americana* L., of eastern North America see Proc. Acad. Nat. Sci. Phila. 82: 25, 1930.

A genus of about 100 species, nearly wholly tropical and chiefly in the Old World.

1. *Buchnera hispida* Buchanan-Hamilton

Buchnera hispida Buch. Ham., ex Don, Prod. Fl. Nepal. 91, 1825. "Hab. ad Narainhetty [prope Kathmandu] Nepalensium. *Hamilton* [in 1802-03]."

Corolla "rose." Flowering from September to November.

Open grassland, at altitudes of 1500 to 1900 meters, along the lower slopes of the Himalaya Mountains, at least from Chamba to Nepal.

Chamba: Dharmasala, *Gammie* 18662. Kangra: Arsu, Kulu, *Koelz* 7495. Kumaun: *Duthie*. —: *Royle*, *Wallich* 3875.

32. **STRIGA** Loureiro

Striga Lour., Fl. Cochinch. 22, 1790. Genotype, *S. lutea* Lour., the only original species. The generic name alludes to the strigose habit, the Latin word meaning "thin", "lank", or "weak".

A genus of some 50 species, in tropical Africa and Asia.

This summary is provisional, since the material at hand is slight and the genus needs much field-study. Differences in development of upper lip of corolla and of flower-color may prove of considerable taxonomic value.

KEY TO SPECIES

A. Calyx 10-15 ribbed; corolla yellow, purple, or white; inflorescence of scattered flowers.

B. Pubescence of ascending hairs, the linear-lanceolate leaves densely covered by the wide scabrous tubercular bases of the hairs; calyx-lobes lanceolate, clearly tricostate from base; corolla purple or white, its tube externally pubescent.

1. *S. asiatica*

BB. Pubescence of spreading hairs, the linear leaves only slightly, if at all, tuberculate-scabrous, since the hairs are mostly slender to base; calyx-lobes filiform, not evidently tricostate.

C. Corolla white, the tube externally pubescent; stems much branched.

2. *S. euphrasioides*

CC. Corolla yellow, the tube externally glabrous or merely puberulent; stems simple or little branched. 3. *S. lutea*

AA. Calyx 5-ribbed; corolla white, purplish, or bluish; inflorescence often much denser.

B. Leaves linear; bracts exceeding calyces; plant scabrous. 4. *S. densiflora*

BB. Leaves subulate (scale-like); bracts hardly equaling calyces; plant slightly hairy (with slender hairs) or glabrate. 5. *S. gesnerioides*

1. *Striga asiatica* (Linnaeus) Kuntze

Buchnera asiatica L., Spec. Plant. 630, 1753. "Habitat in Zeylona, China." That the material under this name in Linnaeus' Herbarium included several species is told us by Bentham, who in 1846 (in DC., Prod. Syst. Nat. Regn. Veg. 10: 502-3) cited it "ex parte" under *Striga densiflora*, *S. thunbergii*, *S. hirsuta*, and *S. euphrasioides*.²⁴ However, all of this material may not have been at hand for framing the special description of 1753; while, although it could perhaps pertain to more than a single element, I think that the description of the stem as obtusely tetragonous, of the leaves as linear-lanceolate and scabrous, and of the corolla-limb as purple, best denotes the species now considered, the plant that Bentham called *S. euphrasioides*.

Striga asiatica (L.) Kuntze, Rev. Gen. 1: 466, 1891.

Corolla white. Flowering in September.

Grassy stream banks below 1300 meters altitude, plains and lower mountain-slopes, from Dehra Dun eastward; widespread through the Oriental Region.

Dehra Dun: Dehra Dun, Stewart 15746 (ANSP, NYBG), 16160 (GH, USNH).
Kumaun: Tejam, Strachey & Winterbottom 1 (GH).

2. *Striga euphrasioides* (Vahl) Bentham

Buchnera euphrasioides Vahl, Symb. Bot. 3: 81, 1794. "Habitat in India orientali [Peter Forskal]." Contrasted with *B. asiatica* L. by having shorter leaves which are scabrous by reason of hairs rather than scales, the latter each with a central short hair. This character is exactly that on which I would distinguish the two species. Also distinguished by the corolla being villose-cinerascent and the branching being opposite and abundant, features that I also sustain.

Striga euphrasioides (Vahl) Benth., in Compan. Bot. Mag. 1: 364, 1836 ["1835"].

Corolla white.

Lowland India, in our territory collected only in grain fields at Rawalpindi (Stewart 16211) (ANSP, Gord, GH, NYBG). Seen also from the Nilgiris District of Madras in southern India, where collected by J. S. Gamble in 1884, his no. 14403 (DD).

3. *Striga lutea* Loureiro

Striga lutea Lour., Fl. Cochinch. 22, 1790. "Habitat inculta in suburbiis Cantonien-sibus." Type, said by Merrill (in Trans. Amer. Philos. Soc. II, 24, pt. II: 353, 1935) to be preserved in Paris, but unfortunately it was not redescribed by him. Merrill also states that the plant is "common in open grassy places near Canton." I am now applying the name to the widely distributed yellow-flowered species, the corollas of which are externally glabrous or merely puberulent. However, this has short spreading hairs over all vegetative parts, whereas Loureiro mentions hairiness only on the calyx-lobes, and he described the leaves as glabrous.

²⁴ In Compan. Bot. Mag. 1: 364, 1835, Bentham says: "I find from his herbarium that [Linnaeus] applied that name [*Buchnera asiatica*] to all the *Strigae* he was acquainted with."

Buchnera angustifolia Don, Prod. Fl. Nepal. 91, 1825. "Hab. in Nepalia, Wallich." Color of corolla not stated, but simple stem, linear leaves, linear-subulate calyxlobes, and smooth corolla would denote the species now considered.

Buchnera hirsuta Wall., Numer. List Spec. Ind. Mus. n. 3869, 1830, ined. Name credited to "Hb. Madr.": ex Benth., Scroph. Indicae 41, 1835. "Hab. in Peninsula, Wight, Bengala, Wallich, Saharanpur, Royle." Described as very scabrous-hirsute, with elongate-linear leaves, 10-15 striate calyces, and glabrous yellow corollas, a correlation denoting the species now considered.

Striga glabrata Benth., in Compan. Bot. Mag. 1: 364, 1836 ["1835"]. "East India, Nepal, and mountains of Ava, Wallich." Description of elongate-linear leaves and glabrous corollas would denote the species now considered.

Corolla yellow. Flowering in late August and September.

Open grassland, below 1400 meters altitude, plains and low mountain-slopes, from Dehra Dun eastward; widespread through the Oriental Region.

Simla: Simla Hills, *Drummond* 806 (DD), 807 (DD), 808 (ANSP, DD), 809 (ANSP, DD). Dehra Dun: Deosari beyond Mussoorie, *Stewart* 11303; Dhobi Ghat, east of Landour, *Stewart* 14443 (ANSP, NYBG). Kheri: Saratophata, *Duthie* 22419.

4. *Striga densiflora* (Bentham) Bentham

Buchnera densiflora Benth., Scroph. Indicae 41, 1835. "Hab. in Peninsula, Heyne, &c. in India septentrionali, Royle."

Striga densiflora (Benth.) Benth., in Compan. Bot. Mag. 1: 363, 1836 ["1835"].

According to J. D. Hooker (Fl. Brit. Ind. 4: 299, 1884) this was collected by Dr. Royle at Saharanpur ["Saharumpore"], on the upper Gangetic Plain, whence it occurs southward across India.

5. *Striga gesnerioides* (Willdenow) Vatke

Buchnera gesnerioides Willd., cur L., Spec. Plant. ed. IV, 3: 338, 1800. "Habitat in India orientali prope Pondepillj."

Buchnera hydrabadensis Roth., Nov. Plant. Spec. 292, 1821. "Circa Hydrabad, urbem provinciae Golcondae, in India orientali detexit.... *Benj. Heyne*."

Orobanche indica Spreng., cur L., Syst. Veg. ed. XVI, 2: 817, 1825. "Ind. or. (*Büchnera hydrabadensis* Roth.)."

Buchnera orobanchoides R. Br., Append. Salt. Voyage Abyssin., LXXIV, 1814, nomen nudum; ex Endl. in Flora 2: 387, tab. 2, 1832. "Habitat in Senegambia (Kohaut)."

Striga orobanchoides (R. Br.) Benth., in Compan. Bot. Mag. 1: 361, t. 19, 1836 ["1835"]. The name that has been generally used.

Striga gesnerioides (Willd.) Vatke, ex Engl. in Abhandl. Preuss. Akad. Wissensch. 28, 1894.

According to Bentham this species was gathered by Dr. Royle at Saharanpur, but Hooker cites the specimen to Suhunsudhara. Presumably this is the collection that is in the Academy's Herbarium, where it is labeled "Foot of Himalayas (Dr. Royle)." The species is widespread in tropical Africa and Asia, through the Ethiopian and Oriental Regions.

Tribe IX. EUPHRASIEAE

Tribe mostly of the North Temperate Zone (Palaeartic and Nearctic), but occurring at higher mountain elevations through the tropics of both hemispheres (Neotropical and Oriental), and reaching the South Temperate Zone in South America and New Zealand.

KEY TO GENERA

- A. Corolla small (5-10 mm. long), the upper lip of the corolla arched, the margins not approaching anteriorly so that the awned anthers are covered above rather than enclosed; capsule 2-6 mm. long, symmetrical, hirsute distally; seeds with fine white longitudinal ridges; leaf-blades dentate or dentate-lobed; plants annual.
- B. Anthers yellow, glabrous, distinct, all with both cells equally short-awned; corolla rose-purple, unlined, the lower slightly shorter than the upper lip; leaf-blades lanceolate, closely dentate; plants softly pubescent throughout.
33. *Odontites*
- BB. Anthers violet-gray, hirsute-ciliate with white hairs at base, cohering, the awn of one cell of one pair 3 to 4 times the length of the others; corolla white or violet-tinged, with darker violet lines, the lower longer than the upper lip; leaf-blades ovate, dentate-lobed, the teeth rounded to attenuate; plant finely pubescent to glabrous. 34. *Euphrasia*
- AA. Corolla usually larger (7-40 mm. long), yellow, red, purple, or white, the upper lip of the corolla with margins closing anteriorly around the anthers until they are forced apart by the insect-visitants; capsule 7-25 mm. long, from symmetrical with both cells dehiscing to usually ensiform and dehiscing only on posterior side; seeds smooth; leaves usually pinnatifid or bipinnatifid, rarely crenate-toothed; plants perennial, or rarely annual. 35. *Pedicularis*

33. ODONTITES [Rivinius] Zinn

Odontites Zinn, Catal. Plant. Horti Götting. 289, 1757. Genotype, *Euphrasia odontites* L., of Europe.

Over 20 Palearctic species, most numerous in Europe, but a few eastward to central Asia.

1. *Odontites himalayica* spec. nov.

Plate II, A.

Stem 2-5 dm. tall, branched, canescent-pubescent with reflexed hairs. Leaves linear-lanceolate, crenate-dentate, obtuse, slightly rounded to sessile bases, canescent-pubescent with ascending hairs, the main cauline leaves 1.5-2.5 cm. long, 3-5 mm. wide. Bracts lanceolate, obscurely dentate to entire, canescent, about equaling the subtended flowers. Pedicels becoming 5 mm. long, grayish-pubescent, with ascending or ascending-spreading hairs, the lobes ovate, obtuse, 2-2.5 mm. long. Corolla 7-8 mm. long, "rose-purple": tube and throat about equaling calyx; upper lip slightly decurved, somewhat hooded, finely villulose on back, and ciliate so distally; lower lip slightly shorter, deflexed, finely villulose, especially distally and even on upper surface. Anthers exerted beneath upper lip of corolla, yellow, 1.2 mm. long, glabrous except for minute hairiness at apex of filament or at end of orifice next the short white awn. Style 5 mm. long. Capsule 5-6 mm. long, narrowly ellipsoid, truncate-rounded. Seeds 1.5-1.7 mm. long, pale, striate.

Caulis 2-5 dm. altus ramosus canescens; folia lineari-lanceolata crenato-dentata obtusa basi rotundata canescentia 1.5-2.5 cm. longa; bracteae lanceolatae fere integrae integerrimaeve; pedicelli 1-2 mm. longi; calyx 5 mm. longus pubescens. lobis ovatis obtusis 2-2.5 mm. longis; corolla 7-8 mm. longa, villulosa purpurascens, labio anteriore quam galeam parum cucullatam paulum brevior; antherae flavae; stylus 5 mm. longus; capsula 5-6 mm. longa, anguste ellipsoidea, truncato-rotundata; semina 1.5 mm. longa, striata.

Type, damp soil, 2350 meters altitude, Skardu, Baltistan, collected in flower and young fruit August 5, 1940, by Ralph R. Stewart, no. 20401; in Herb. Academy of Natural Sciences of Philadelphia.

Road-ditches, at altitudes of 2000 to 2500 meters, in the western Himalayas in Baltistan. Flowering in August.

Baltistan: Shigar to Skardo, *Schlagintweit*, Stewart 20507 (ANSP, NYBG); Skardu, Koelz 9606 (ANSP, USNA), Stewart 20401 (ANSP, DD, Gord, GH, NYBG, USNH).

Nearest to *Odontites breviflora* Regel, the only other species described from central Asia (from the Pamirs to Songaria and Kansu), which differs however in more dentate leaves, longer bracts, longer calyces (7 mm. long), longer corollas (9-10 mm. long) that are merely puberulent externally and glabrate within lips, and a less densely and closely pubescent growth. Both have dull purple corollas, against which the yellow anthers must contrast sharply.

34. EUPHRASIA [Bauhin] Linnaeus

Euphrasia L., Spec. Plant. 604, 1753; Gen. Plant. ed. V, 263, 1754. Genotype, *E. officinalis* L., of Europe, the historic species and that which best fits the generic diagnosis.

A genus of possibly 200 species, mostly Palaearctic and most numerous in western Eurasia; also in northern North America, and across the mountains of the East Indies to New Zealand and southern South America.

The Holarctic species of this genus are closely alike in habit, leaves, corollas, anthers, capsules, and seeds, but there is a remarkable development of local races distinguishable by relatively slight differences in leaves, bracts, indumentum, and corolla-color. These are so numerous and difficult to distinguish, as to lead certain European botanists to become special students of *Euphrasia*. In 1939 I was so fortunate as to have a visit from Dr. Eric Callen, of the Edinburgh Botanic Garden, whose stay, however, was very brief due to the outbreak of hostilities just after his arrival in this country. He carried home with him various duplicates of Dr. Stewart's Himalayan collections, and has subsequently given me the benefit of his identifications.

Had Dr. Callen been able to continue his studies here, with the ample series of specimens at hand, I am confident that we should have reached fuller agreement to the great benefit of this report. Since his visit my re-study of the Himalayan specimens has led me to a fundamentally different outlook on the genus from that which was seemingly his. He assumed that the species were relatively few and wide-ranging through the Himalayas, and that there was considerable hybridism. My decision is that the species are surprisingly numerous, and each confined to its peculiar section of the Himalayan highland. Also, in this as in other genera studied, there are different species, even at alpine levels, in the arid western and the moist

eastern Himalayas. Consequently I present the following series of local species, each pertaining to its slight portion of the alpine Himalayas, conscious of the fact that there must remain, yet undetected, many more such local units. Only for Kashmir may the record really approach completeness.

KEY TO SPECIES

- A. Herbage distally with glandless hairs, but also sometimes with interspersed glandular ones.
- B. Bracts with lateral lobes rounded to barely acute, the mid-lobe broadly rounded (in *E. platyphylla* upper bracts somewhat acute-lobed); leaves with broadly rounded lobes; stem simple or with a few erect-ascending branches.
- C. Leaves longer than wide, oblong or elliptic, finely pubescent to puberulent; corolla violet (with dark lines), from base of tube to tip of upper lip 5-7 mm. long; stem normally less than 1 dm. tall.1. *E. paucifolia*
- CC. Leaves as wide as or wider than long, rotund-ovate, pubescent; corolla white, with dark violet lines, from base of tube to tip of upper lip 6-8 mm. long; stem mostly 1-1.5 dm. tall.2. *E. platyphylla*
- BB. Bracts with lateral lobes acuminate to attenuate or aristate, the mid-lobe acute (or lower bracts with lobes obtuse to acute in *E. microcarpa*).
- C. Corolla dorsally 8-9 mm. long, its lower lip 5 mm. long; leaf-blades ovate, the largest 6-11 mm. long and about as wide; stem 1-2 dm. tall, simple or laxly branched.3. *E. jaeschkei*
- CC. Corolla dorsally 5-7(-8) mm. long, its lower lip less than 5 mm. long; leaf-blades smaller.
- D. Capsule 3.5-6 mm. long; lateral lobes of bracts acuminate to aristulate; stem finely pubescent.
- E. Bracts with evident spreading hairs (pubescent), with 2 to 6 pairs of lobules.
- F. Leaves and bracts spreading; stems slender, laxly ascending, 2-5 dm. tall, loosely branched.4. *E. incisa*
- FF. Leaves and bracts ascending, at least in drying; stems erect, less than 3 dm. tall.
- G. Stems 1-3 dm. tall, stiff, usually branched (branches stiffly ascending to erect); bracts with 4-6 pairs of lobules; flowers slightly or not secund.
- H. Lower much exceeding upper corolla-lip; corolla dorsally 6-8 mm. long; bracts with 5 to 6 pairs of lobules; leaves slightly paler beneath; stems branched through much of length.
5. *E. schlagintweitii*
- HH. Lower slightly exceeding upper corolla-lip; corolla dorsally 5-6 mm. long.
- I. Bracts with 4 to 5 pairs of lobules; leaves semi-glaucous beneath; stems simple or only branched below.6. *E. kurramensis*
- II. Bracts with 3 (to 4) pairs of lobules; leaves slightly paler beneath; stems with many elongated slender branches.
7. *E. multiflora*
- GG. Stems less than 1 dm. tall, slender, simple or slightly branched below; bracts with 2 to 4 pairs of lobules; flowers strongly secund.8. *E. secundiflora*
- EE. Bracts puberulent to glabrate, with 3 to 4 pairs of lobules.

F. Hood of galea externally finely pubescent; corolla dorsally 4-5 mm. long; bracts becoming 4-6 mm. long, with cuspidate teeth; stems slender, mostly much branched.

9. *E. laxa*

FF. Hood of galea externally glabrous or nearly so; corolla dorsally 6-7 mm. long; bracts becoming 6-9 mm. long, with acute to acuminate teeth; stems relatively stout, simple or somewhat branched.

G. Corolla purple-violet, darker-lined, with the lobes of the lower lip rounded to erose; bracts and calyx distally glandular-puberulent; stem simple, or slightly branched below.10. *E. kashmiriana*

GG. Corolla white, the lobes not or only faintly lined, the lower notched at apex; bracts and calyx distally pubescent with glandless hairs (or slightly puberulent with sessile glands on sides below apex); stem somewhat branched.11. *E. alba*

DD. Capsule 2-2.5 mm. long; lateral lobes of bracts obtuse to acute, in only the uppermost bracts acuminate; stem becoming glabrate.

12. *E. microcarpa*

AA. Herbage distally puberulent with gland-tipped hairs, or nearly to quite glabrous.

B. Corolla dorsally 8-10 mm. long, upper much exceeded by lower lip, both lips violet, with dark violet lines; bracts varying from glandular-puberulent to glabrous, the lateral lobes acute to acuminate-attenuate; leaves (except lower cauline) persisting until anthesis, so plant relatively leafy.13. *E. foliosa*

BB. Corolla dorsally 6-8 mm. long, upper somewhat exceeded by lower lip; bracts glandular-puberulent, often strongly so; leaves and lower bracts usually fallen by anthesis.

C. Bracts 4-5 mm. long, with 5 to 7 pairs of obtuse to acutish lobules; stem 1-4 dm. tall, erect, simple or branched.14. *E. himalayica*

CC. Bracts usually longer, with 4 to 5 pairs of acute to attenuate-aristulate lobules; stems lower (only in *E. flabellata* reaching 3 dm. long, but then lax or decumbent).

D. Stems normally bushy-branched, the branches ascending-spreading; bracts not wider than long.

E. Inflorescence relatively lax, the lower or most of the flowers separated by internodes longer than the associated bracts; corolla violet, lined with darker color; plant usually much branched.

F. Lateral lobes of bracts 3 pairs (or with a fourth imperfect pair), the teeth acute or some acuminate; plant 1 dm. tall, the inflorescence of a close cluster of flowers, the fruits by subsequent development of internodes (15-25 mm. long) becoming remote; corolla pale.15. *E. remota*

FF. Lateral lobes of bracts 4 to 5 pairs, the teeth attenuate to aristulate-tipped; plant 1.5-2.5 dm. tall, the inflorescence evenly elongated, the fruits becoming separated by internodes not over 15, usually about 10 mm. long; corolla bright violet.16. *E. aristulata*

FE. Inflorescence dense, the flowers closely placed, even the lowest with bracts that overlap the bases of the next ensuing; corolla white, the galea only faintly lined anteriorly with violet; plant 1-1.5 dm. tall, the branches stiff and more ascending.

17. *E. densiflora*

DD. Stems simple, or slightly branched near base and the branches mostly long and ascending-erect; bracts wider than long.

18. *E. flabellata*

1. *Euphrasia paucifolia* Wettstein

Euphrasia paucifolia Wettst., Monog. Euphrasia 198, tab. 12, fig. 4, 1896. "Exsiccaten: *Schlagintweit Herb.* from India and High Asia No. 5939 und 8939 . . . ; Nr. 8647 . . ." Among these specimens the first mentioned, 5939, may be taken as type; an isotype in the Academy's Herbarium bears locality: "Thale La to Bagmaharal (northeast of Skardo and Shigar)." This seems to fit the original description well, showing both several simple and one branched plant, both glandless and obscurely glandiferous bracts, etc. Wettstein considered this species to be normally glandiferous, but "more rarely with little glands nearly none"; it seems to me to be prevalently glandless, though at times with obscure interspersed gland-bearing hairs. The leaves are always small, but in dwarf plants are closer on the stems.

Open alpine slopes, at altitudes of 3000 to 4000 meters, ranges of the western Himalayas from Kashmir and Astor to Spiti. Flowering in late July and August.

Kashmir: Sorus above Pahlgam, *Stewart* 8049 (Gord); Tulion above Pahlgam, *Stewart* 8163; Sonamarg, *Stewart* 6621, 9766, 9870a (ANSP, Gord, NYBG). Astor: Burzil Pass (northwest slope), *Stewart* 19059, 19930 (NYBG). Baltistan: Deosai, *Stewart* 20024 (Gord, GH, NYBG), 20095 (ANSP, Gord, NYBG, USNH); Thalle La, *Schlagintweit* 5939, *Stewart* 20656 (ANSP, Gord, GH, NYBG, USNH). Zaskar: Seni, *Koelz* 5769 (USNH). Spiti: Losar, *Koelz* 6941 (USNH).

2. *Euphrasia platyphylla* spec. nov.

Plate II, B.

Stems erect, (0.5-) 1-1.5 dm. tall, simple or somewhat branched (branches short, ascending), finely villose with reflexed white hairs, foliose, but the lower leaves somewhat deciduous. Leaf-blades rotund-ovate, larger 5-9 mm. long, 6-10 mm. wide, rounded at apex, with 4 to 5 pairs of rounded lobules; blades ciliate on the margins, and pubescent on both surfaces, or the hairs only on the veins beneath, the lower rounded or cordate to petioles about 1 mm. long. Bracts slightly shorter and wider, hirsutulous (often with some hairs obscurely gland-tipped), the lobules of the lower bracts rounded, of the upper acute (or of all bracts and even of the uppermost leaves sometimes acute). Pedicels very short. Calyx 4-5 mm. long, pubescent with fine hairs, many of which are obscurely gland-tipped, the lobes lanceolate-attenuate, the tips darkened and aristulate. Corolla dorsally 6-8 mm. long: upper lip 3-3.5 mm. long, finely pubescent externally, its free lobes short, porrect; lower lip 5-6 mm. long, deflexed-spreading, the lobes erose to strongly notched; corolla white, lined especially laterally with dark violet, the throat yellow. Anthers dark brown, with white villous hairs nearly equaling the shorter awns, which are 3 to 4 times exceeded by the longer awn. Capsule 4 mm. long, 2 mm. wide, truncate or nearly so, distally finely ciliate.

Caulis erectus, simplex aut breviramulosus, villosulus, 1-1.5 dm. altus; folia rotundo-ovata, pubescentia, lobulis rotundatis, 5-9 mm. longa, 6-10 mm. lata; bracteae pilis partim glanduliferis hirsutulae, inferiores lobulis rotundatae, superiores lobulis acutae; calyx 4-5 mm. longus, pilis partim glanduliferis pubescens, lobis lanceolato-attenuatis; corolla 6-8 mm. longa, alba, lineata, labio superiore minute pubescente, labio inferiore lobis erosis aut emarginatis; capsula 4 mm. longa.

Type, grassy alpine land, 3350 meters altitude, Trunkal, Gangabal Lakes, Kashmir, collected in flower August 9, 1939, by Ralph R. and Isabelle D. Stewart, no. 18175; in Herb. Academy of Natural Sciences of Philadelphia.

Alpine grassy slopes, near streams, at altitudes of 3000 to 4000 meters, Kashmir and Lahul. Flowering in August. (Plants variable, as indicated by symbols as follows: * low and relatively hairy; ** tall and more branched; *** bracts, especially the upper, more obviously acute.)

Kashmir: * to Gadsar, *Stewart* 18323a (GH); * Sat Sar, *Stewart* 18279 (ANSP, Gord); ** Sonamarg, *Stewart* 9378 (NYBG), 9378a (ANSP, Gord, NYBG); Trunkal, *Stewart* 18175 (ANSP, DD, Gord, GH, NYBG, USNH); *** Tulion above Pahlgam, *Stewart* 8182. Lahul: *** Bailing Nullah, *Koelz* 1270 (NYBG).

3. *Euphrasia jaeschkei* Wettstein

Euphrasia jaeschkei Wettst., Monog. *Euphrasia* 80, tab. 11, fig. 5, 1896. Of the four collections cited by Wettstein, two were made by *Jaeschke*, both in Lahul, and one of them should be counted the type. Until the material actually seen by Wettstein can be checked, preference may be given to the first mentioned, which came from Kailing and which makes *Koelz* 5166, also from near Kyelang, a topotype. It well fits the description, the bracts and calyx showing obscurely gland-tipped as well as glandless hairs.

Open alpine slopes, at altitudes of 3000 to 3300 meters, upper Chenab Valley in Chamba and Lahul, northwestward to Kashmir. Flowering in July and August.

Kashmir: to Gadsar, *Stewart* 18323 (ANSP, Gord, GH, NYBG). Chamba: Sach Valley, *Harsukh* (DD). Lahul: Gundla, Kyelang, *Koelz* 5166 (USNH); Pukar, *Koelz* 9985; Sisu, *Koelz* 8371, *Nath* 309 (ANSP, Gord, GH, NYBG).

4. *Euphrasia incisa* spec. nov.

Plate 12, B.

Stems erect, lax, (1.5-) 2-5 dm. tall, mostly branched (branches long, ascending), finely villose with recurved white hairs, foliose, but the lower leaves deciduous. Leaf-blades (mostly fallen before anthesis) ovate-oblong, the larger 8-12 mm. long, 5-7 mm. wide, obtusely rounded, with 3 to 4 pairs of acutish lobules; blades finely pubescent on both surfaces, not glandular, the lower cuncate to ill-defined petioles about 1 mm. long. Bracts shorter and wider, finely pubescent, not glandular, acute to acuminate, the lobules (3 to 4 pairs) attenuate, the bracts often cut nearly $\frac{1}{2}$ to midrib and the teeth sometimes slightly callose. Pedicels 1 mm. long. Calyx 5.5 mm. long, finely pubescent with ascending glandless hairs, the lobes lanceolate-attenuate. Corolla dorsally 6-7 mm. long; upper lip 3-3.5 mm. long, finely pubescent externally, its free lobes short, porrect; lower lip 4-5 mm. long, deflexed-spreading, the lobes erose to strongly notched; corolla white, lined especially laterally with dark violet, the throat yellow. Anthers dark brown, with white villose hairs nearly equaling the shorter awns, which are 3 to 4 times exceeded by the longer awn. Capsule 4.5-5 mm. long, 2-2.5 mm. wide, truncate or nearly so, finely and rather sparsely pubescent. Seeds 1.2 mm. long, brown, with white thin low wings.

Caulis erectus laxis ramosus tenuiter villosus 2-5 dm. altus; folia ovato-oblonga tenuiter pubescentia, lobulis acutiusculis, 8-12 mm. longa, 5-7 mm. lata; bracteae tenuiter pubescentes acutae aut acuminatae inter lobulos incisae; calyx 5.5 mm. longus, pubescens, lobis lanceolato-attenuatis; corolla 6-7 mm. longa, alba, lineata, labio superiore minute pubescente, labio inferiore lobis erosis aut emarginatis; capsula 4.5-5 mm. longa; semina 1.2 mm. longa.

Type, among plants on edge of irrigation ditches, at 2550 to 2600 meters altitude, Godai, Gilgit Road, Astor, collected in flower and fruit August 24, 1939, by Ralph R. and Isabelle D. Stewart, no. 18934; in Herb. Academy of Natural Sciences of Philadelphia.

In herbage along streams, at altitudes of 2500 to 2900 meters, in the Western Himalayas, as yet known only from Astor.

Astor: Godai, *Stewart* 18934 (ANSP, Gord, GH, NYBG), 19143 (ANSP, Gord, GH, NYBG).

5. *Euphrasia schlagintweitii* Wettstein

Euphrasia schlagintweitii Wettst., Monog. Euphrasia 181, tab. 4, fig. 296-300, 1896. Six numbers of *Schlagintweitii* cited, of which I have seen only no. 13133, from some locality between Simla and Kashmir, the label stating that the memoranda of actual localities were lost; this specimen, mostly in fruit, is in the Academy's Herbarium. A better specimen in the Gray Herbarium, *Schlagintweit* 2957, although not originally cited, seems wholly the same and is in better condition; it came from Kishtvar, from the section where the Schlagintweits gathered one of the cited specimens. Both the collections seen match well Wettstein's description and illustration.

Euphrasia setulosa Pugsley, in Journ. Bot. 74: 279, 1936. "Exsicc. J. H. Barbour, Gulmarg ['Gulmaig'], Cashmere (10,000' alt.), Aug. 1922 . . . (Type in Herb. Mus. Brit.)" Description mostly matched by *Stewart* 10519 from Gulmarg, an opinion confirmed by Eric Callen, *Stewart's* collection becoming a topotype. This species was named for the leaf-indumentum of setulose glandless and gland-bearing hairs, precisely as described and illustrated by Wettstein for *E. schlagintweitii*. But Pugsley seems to have seen dwarfed plants, these showing an unnaturally low habit for this species and having bracts with only 3 to 4 (instead of 5 to 6) pairs of lobules; such plants are also present in *Stewart's* recent collections along with larger normal individuals.

Alpine grassland, at altitudes of 3000 to 3700 meters, through the western Himalayas from Hazara to Garhwal. Flowering from late July to September.

Hazara: Deoli, *Inayat* (DD). Kashmir: Mt. Agharwat, *Stewart* 8864 (Gord, NYBG); Gulmarg, *Stewart* 10418, 10519; Pahlgam, *Stewart* 8434 (ANSP, NYBG). Udhampur: Kishtvar, *Schlagintweit* 2957 (GH). Kulu: Jammu Tatch, *Nath* 442 (ANSP, Gord, GH, NYBG). Simla: Simla Hills, *Drummond* 618 (DD). Garhwal: Badrinath, *Schlagintweit* 10044.

6. *Euphrasia kurramensis* spec. nov.

Plate 12, A.

Stems erect, 1.2-2 dm. tall, simple or somewhat branched below (branches long, erect), minutely villose with recurved to reflexed white hairs, the true leaves and the lower bracts deciduous during anthesis. Bracts rotund-ovate, the larger 6-7 mm. long, 5 mm. wide, acute, with 4 to 5 pairs of acuminate or mostly acuminate-cuspidate lobules, hirsutulous above and on the veins beneath, slightly paler beneath. Pedicels 0.5 mm. long. Calyx 4-4.5 mm. long, finely pubescent (especially on ribs), not glandular; the lobes oblong- to lanceolate-attenuate, acute to aristulate. Corolla dorsally 5-6 mm. long: upper lip 2.5 mm. long, finely pubescent externally, its free lobes short, porrect; lower lip 3 mm. long, deflexed-spreading, the lobes notched; corolla apparently white or pale, lined posteriorly. Anthers brown, with white villose hairs equaling the shorter awns, which are 3 to 4 times exceeded by the longer awn. Capsule 4-6 mm. long, 2-2.5 mm. wide, truncate or nearly so, distally ciliate with very slender hairs.

Caulis erectus simplex aut inferne ramosus minute villosus 1.2-2 dm. altus; folia circa anthesim decidua; bracteae rotundato-ovatae acutae 4-5 paria lobulorum acuminato-cuspidatorum gerentes hirsutulae, majores 6-7 mm. longae, 5 mm. latae; calyx 4-4.5 mm. longus, minute pubescens, lobis lanceolato-attenuatis aristulatis; corolla 5-6 mm. longa, albida, lineata, labio superiore minute pubescente, labio inferiore lobis emarginatis; capsula 4-6 mm. longa.

Type, Kurram Valley, Afghanistan, collected in flower and fruit in 1879 by Dr. J. E. T. Aitchison, no. 990; in Herb. Academy of Natural Sciences of Philadelphia. Only collection seen.

This, originally named *Euphrasia officinalis* L., was cited by Wettstein (Monog. *Euphrasia* 179, 1896) as *E. hirtella* Wettst., but it differs from that European species in its sharper-cut and aristulate-toothed bracts, its smaller corolla with shorter lower lip, its narrower capsules, and its lack of glandularity.

7. *Euphrasia multiflora* spec. nov.

Plate 13. B.

Stems ascending-erect, 3.5-4 dm. long, much branched below (branches long, ascending-erect), finely villose with reflexed white hairs, the true leaves deciduous by anthesis. Bracts cuneate-rounded, the larger 4-5 mm. long and wide, mucronate-acute, with 3 to 4 pairs of acute to acuminate lobules, pilose above and beneath. Pedicels 0.5 mm. long. Calyx 4 mm. long, finely pubescent (especially on ribs), not glandular: the lobes lance-attenuate, aristulate. Corolla dorsally 5-6 mm. long: upper lip 2 mm. long, finely pubescent externally, its free lobes very short, porrect; lower lip 2-2.3 mm. long, deflexed-spreading; corolla pale, lined, the hood more violet. Anthers brown, proximally with white villose hairs equaling the shorter awns. Capsule 5-5.5 mm. long, 1.8-2 mm. wide, truncate or nearly so, distally pilose-ciliate with very slender hairs.

Caulis erectus ramosissimus villosulus 3.5-4 dm. altus; bracteae cuneato-rotundatae mucronato-acutae, 3-4 paria lobulorum acutorum acuminatorumve gerentes; calyx 4 mm. longus, minute pubescens, lobis lanceolato-attenuatis aristulatis; corolla 5-6 mm. longa pallida lineata, labio superiore violaceo pubescente, labio inferiore parum longiore; capsula 5-5.5 mm. longa.

Type, Solling, Bashahr, collected in flower and fruit September 12, 1934, by Negi Parmanand, no. 1212; in Herb. Academy of Natural Sciences of Philadelphia, isotypes at New York Botanical Garden, Gray Herbarium of Harvard University, and Gordon College in India. Only collection seen.

8. *Euphrasia secundiflora* spec. nov.

Plate 13. A.

Stems erect, slender, 0.5-0.9 dm. tall, simple or slightly branched below (branches short, ascending), minutely villose with recurved white hairs, the cauline leaves mostly dehiscent by anthesis. Leaf-blades oblong or ovate-oblong, 2-3 mm. long, 1-2 mm. wide, obtuse to rounded, with 1 or 2 pairs of obtuse or rounded lobules; blades minutely pubescent on both surfaces, cuneate to nearly sessile bases. Bracts larger (the largest 5-6 mm. long and wide), acute, with 2 to 4 pairs of acuminate or slightly cuspidate lobules, minutely pubescent (mostly ciliolate), not glandular, the teeth tending to

be strongly callose. Stems floriferous nearly throughout, the flowers secund and the bracts appressed-crowded. Pedicels 0.5 mm. long. Calyx 4-4.5 mm. long, finely pubescent (especially ciliolate), not glandular; the lobes narrowly lanceolate-attenuate, aristulate. Corolla dorsally 5-6 mm. long: upper lip 2.5-3 mm. long, finely pubescent externally, its free lobes short, porrect; lower lip 4.5-5 mm. long, deflexed-spreading, the lobes erose; corolla with galea violet, lower lip pale or white, both lined, especially laterally, with dark violet. Anthers brown, with white villose hairs nearly equaling the shorter awns, which are over twice exceeded by the longer awn. Capsule 4 mm. long, 1.8 mm. wide, truncately rounded, mucronate, finely pubescent. Seeds 1 mm. long, brown, with white thin low ridges.

Caulis erectus simplex aut inferne parce ramosus minute villosus 0.5-0.9 dm. altus; folia oblonga aut ovato-oblonga, obtusa aut rotundata, 1-2 paria lobulorum obtusorum gerentia, 2-3 mm. longa; bracteae quam folia majores, acutae, 2-4 paria lobulorum acuminatorum gerentes; calyx 4-4.5 mm. longus, minute pubescens, ciliolatus, lobis anguste lanceolato-attenuatis aristulatis; corolla 5-6 mm. longa, lineata, labio superiore minute pubescente violaceo, labio inferiore lobis erosis pallido albove; capsula 4 mm. longa; semina 1 mm. longa.

Type, wet meadow or along stream, 2450 meters altitude, between Kiris and Parkutta, Indus Valley, Baltistan, collected in flower and fruit August 20, 1940, by Ralph R. Stewart, no. 20918; in Herb. Academy of Natural Sciences of Philadelphia, isotypes at New York Botanical Garden and Gordon College in India. Only collection seen.

9. *Euphrasia laxa* spec. nov.

Plate 14, A.

Stems very lax, 1-2.5 dm. long, branched, finely pubescent throughout with recurved white hairs, not glandular. Leaf-blades (lower not seen) ovate, 3-5 mm. long, 2-3 mm. wide, acute, with 2 to 4 pairs of obtuse or acutish lobules; blades glabrous or nearly so, mostly fallen by anthesis, slightly revolute, narrowed to margined petioles 0.5-1 mm. long. Bracts larger and more sharply cut, glabrous or slightly glandular-puberulent on margins, the apex and teeth acuminate, cuspidate to aristulate, more or less indurated. Pedicels less than 1 mm. long. Calyx 5-6 mm. long, obscurely glandular-puberulent to glabrate, the lobes lanceolate-attenuate. Corolla dorsally 4-5 mm. long: upper lip 2-3 mm. long, its lobes short, slightly or not porrect; lower lip 4 mm. long, deflexed-spreading, the lobes erose to emarginate; corolla externally finely pubescent, most densely so on the upper lip, color apparently dull violet on galea, pale anteriorly, laterally lined with dark violet. Anthers brown, with white villose hairs shorter than the shorter awns which are 2 to 3 times exceeded by the longer awn. Capsule 3.5-4 mm. long, truncate, distally finely ciliate. Seeds 0.7-0.8 mm. long, dark, with relatively strongly raised white winged ridges.

Caulis laxissimus ramosus tenuiter villosus 1-2.5 dm. longus; folia ovata acuta glabrata 2-4 paria lobulorum obtusorum gerentia, 3-5 mm. longa; bracteae quam folia majores et magis incisae, acuminatae aut cuspidatae; calyx 5-6 mm. longus, glabratus, lobis lanceolato-attenuatis; corolla 4-5 mm. longa, lineata, labio superiore minute pubescente violaceo, labio inferiore lobis erosis emarginatisque pallido; capsula 3.5-4 mm. longa; semina 0.8 mm. longa.

Type, moist grassy place, about 2900 meters altitude, near Kharbu, Ladakh, collected in flower and fruit August 7, 1940, by Ralph R. Stewart, no. 21069; in Herb. Academy of Natural Sciences of Philadelphia.

Moist grassy places, at altitudes of 2100 to 3000 meters, western Himalayas of Ladakh and Chamba. Flowering in August.

Purig: Dras to Matayan, *Stewart* 21195 (ANSP, GH). Ladakh: Kharbu, *Stewart* 21069 (ANSP, Gord, NYBG). Chamba: between Tisa and Alwas, *Gammie* 18280.

10. *Euphrasia kashmiriana* Pugsl

Euphrasia kashmiriana Pugsl., in Journ. Bot. 74: 283, 1936. "Exsicc. IV. *Koelz*, in meadows, Bragnag, Ladakh, Kashmir (13,000' alt.), 1. 9. 31, no. 2795. (Type in Herb. Kew.)" Isotype in Herb. Academy of Natural Sciences of Philadelphia. In 1933 I made a description of this as a new species, which I intended to name for the collector. The collection is of a glandular extreme of the species now considered.

Stem erect, 0.3-2.5 dm. tall, simple or with a few ascending branches, finely pubescent throughout with recurved white hairs, not or only slightly glandular. Leaf-blades (mostly fallen by anthesis) oval or ovate-oval, 3-6 mm. long, 2-4 mm. wide, rounded at apex, with 2 to 4 pairs of obtuse or rounded lobules; blades slightly pilose or glabrous, the margin thickened and puberulent with glandless and also sometimes with obscurely gland-tipped hairs, blades narrowed to scarcely defined very short petioles. Bracts 6-8 mm. long, ovate, with 3 or 4 pairs of acute or acutish lobules, above finely scabrous-pubescent toward margins, beneath glabrate or somewhat glandular-puberulent especially on main veins and margins proximally, the margin of the bract revolute and thickened, finely ciliate, usually glandular-puberulent. Pedicels becoming 1-4 mm. long. Calyx 5.5-6.5 mm. long, sparsely glandular-puberulent, the lobes lanceolate-attenuate, with dark green margins and mid-rib, glandular-puberulent (especially on margins). Corolla dorsally 6-7 mm. long: upper lip 3 mm. long, its lobes porrect, distally crenate-denticulate, the free apices short, rounded; lower lip 3.5 mm. long, the lobes rounded to crose; corolla glabrous (except for slight pubescence on upper side of tube), purple-violet, with rather coarse dark violet lines on both upper and lower lips, and a "yellow spot in throat around lip and a yellow spot at base of middle division of lip." Anthers brown, with slender white villose hairs shorter than the shorter awns, which are about thrice exceeded by the longer awn. Capsule 5-6 mm. long, truncate, finely ciliate. Seeds 1.5 mm. long, brownish, with many relatively strongly raised white wing-like ridges.

Alpine meadows and open slopes, at altitudes of 3900 to 4000 meters, western Himalayas of Ladakh. Flowering in August and September.

Ladakh: Bragnag, *Koelz* 2795; Gya, *Koelz* 6416 (USNH).

11. *Euphrasia alba* spec. nov.

Plate 14, B.

Stem erect, 0.5-1.5 dm. tall, simple or with ascending branches, finely pubescent throughout with reflexed white hairs, not glandular. Leaf-blades ovate or oblong-oval, 3-8 mm. long, 2-5 mm. wide, obtuse or rounded at apex, with 3 or 4 pairs of triangular obtuse lobules; blades finely pilose, especially toward margin, glabrate or glabrous medianly, revolute, narrowed

to scarcely defined petioles less than 1 mm. long. Bracts ovate-flabelliform, longer than wide, more glabrate (chiefly pilose on veins and margins), the apex and lobules acuminate, scarcely cuspidate. Pedicels becoming 2-3 mm. long. Calyx 5.5-6.5 mm. long, finely pilose, the lobes linear-lanceolate. Corolla dorsally 5-6 mm. long: upper lip 2-2.5 mm. long; lower lip slightly longer, 2.5-3 mm. long, the lobes notched; corolla glabrous (except for slight pilosity externally on upper side of tube), white, with 3 yellow blotches in throat. Anthers brown, with white villose hairs as long as the shorter awns, which are about thrice exceeded by the long awn. Capsule 5 mm. long, truncate-emarginate, distally very finely ciliate. Seeds 1-1.2 mm. long, brown, with hardly evident wing-like ridges.

Caulis erectus simplex aut ramosus (ramis longis adscendentibus) minute pubescens 0.5-1.5 dm. longus; folia ovata aut oblongo-ovalia obtusa rotundatave pilosella, 3-4 paria lobulorum obtusorum gerentia, 3-8 mm. longa; bracteae ovato-flabelliformes glabratae apice lobisque acuminatae; calyx 6 mm. longus, pilosellus, lobis lineari-lanceolatis; corolla 5-6 mm. longa, alba, fere glabrata, labio superiore 2-2.5 mm. longo, labio inferiore 2.5-3 mm. longo lobis emarginatis aucto; capsula 5 mm. longa; semina 1 mm. longa.

Type, along stream, 3300-3400 meters altitude, Hemis, Ladakh, collected in flower and fruit August 6, 1931, by Walter Koelz, no. 2551; in Herb. Academy of Natural Sciences of Philadelphia, isotypes in Herb. New York Botanical Garden and the United States National Museum. Only collection seen.

Plant still foliose at anthesis, the leaves narrower and more deeply cut than in *Euphrasia kashmiriana*.

12. *Euphrasia microcarpa* spec. nov.

Plate 15, B.

Stem erect, lax, 1-2 dm. tall, slightly finely bifariously pubescent, apparently soon glabrate, not glandular. Leaf-blades (mostly fallen by anthesis) ovate-oval, 5-6 mm. long, 3-4 mm. wide, rounded at apex, with 2 to 3 pairs of obtuse or rounded lobules; blades obscurely finely pubescent, not glandular. Bracts 4-5 mm. long, with 3 to 4 pairs of obtuse to acute (or on uppermost bracts, acuminate) lobules, finely pubescent with glandless hairs, the margin not thickened. Pedicels becoming 1-2 mm. long. Calyx 4 mm. long, the lobes lanceolate, finely pubescent, not glandular. Corolla dorsally 4-5 mm. long, externally glabrous: upper lip about 2 mm. long; lower lip about 3 mm. long, deflexed-spreading, the lobes rounded to erose; not seen with color. Anthers with white villose hairs as long as the shorter awns, which are about thrice exceeded by the long awn. Capsule 2-2.5 mm. long, emarginate-obcordate, slightly ciliate. Seeds 1 mm. long, dark, with many slightly raised thin wings.

Caulis erectus laxus glabratus 1-2 dm. altus; folia ovato-ovalia rotundata. 2-3 paria lobulorum obtusorum gerentia, 5-6 mm. longa; bracteae minute pubescentes apice lobisque obtusae aut acutae; pedicelli 1-2 mm. longi; calyx 4 mm. longus, minute pubescens, lobis lanceolatis; corolla 4-5 mm. longa, glabra, labio superiore 2 mm. longo, labio inferiore 3 mm. longo lobis rotundatis aut erosis aucto; capsula 2-2.5 mm. longa; semina 1 mm. longa.

Type, at 2600 meters altitude, Sach ("Sauch") Valley, Chamba, collected in flower and fruit August 9, 1899, by Inayat; in Dehra Dun Herbarium. Only collection seen.

13. *Euphrasia foliosa* spec. nov.

Plate 15, A.

Stem erect or ascending, 1-5 dm. tall, freely branching (branches ascending), finely pubescent with recurved white hairs. Leaf-blades ovate or nearly so, the cauline 10-18 mm. long, 6-10 mm. wide, rounded at apex, with 3 or 4 pairs of acute or acutish lobules; bracts minutely pubescent to glabrate, cuneately narrowed to scarcely defined petiolar bases. Bracts ovate, acuminate, glandular-puberulent to glabrous, with acuminate or slightly attenuate lobules. Pedicels becoming at least 1 mm. long. Calyx 5-6 mm. long, glandular-puberulent to glabrous (or lowermost slightly hairy), the lobes lanceolate-attenuate or slightly aristulate. Corolla dorsally (7-) 8-10 mm. long: upper lip 4-5 mm. long; lower lip 6-8 mm. long, the lobes notched; corolla externally finely pubescent, especially on the upper lip, white or lavender, with yellow throat. Anthers brown, the orifices villose-ciliate, the slender white hairs longer than the shorter awns, but not equaling the nearly thrice longer long awn. Capsule 5 mm. long, truncate, distally slightly ciliate, not seen mature.

Caulis erectus aut ascendens, minute pubescens, 1-5 dm. altus; folia ovata rotundata, 3-4 paria lobulorum acutorum gerentia, 10-18 mm. longa; bracteae ovatae, glandulari-puberulentae aut glabrae, lobis acuminatis; pedicelli 1 mm. longi; calyx 5-6 mm. longus, glandulari-puberulentus aut glaber, lobis lanceolato-attenuatis; corolla 8-10 mm. longa, externe minute pubescens, labio superiore 4-5 mm. longo, labio inferiore 6-8 mm. longo, lobis emarginatis aucto; capsula 5 mm. longa.

Type, damp soil, in herbage, 2600-2700 meters altitude, above Chorwan, Kashmir, collected in flower July 25, 1940, by Ralph R. Stewart, no. 19278; in Herb. Academy of Natural Sciences of Philadelphia.

Moist soil, in grass and thin herbage, at altitudes of 2100 to 3300 meters, valley of Kishanganga River, northern Kashmir. Flowering in late July and August.

Kashmir: Chorwan, *Stewart* 19697, 19728 (ANSP, Gord, NYBG); Gurez to Chorwan, *Stewart* 19655 (GH); Kel to Taubat, *Stewart* 17873 (ANSP, NYBG); Korakbal to Badwan, *Stewart* 19587; Lohan Gali, *Stewart* 1853 (NYBG); Minimarg to Burzil, *Stewart* 19790; Taubat, *Stewart* 17917 (GH, NYBG); Tilel Valley, *Stewart* 18621.

Among Himalayan *Euphrasiae* this species is remarkable for the large proportion of leaves retained at anthesis, giving the plant an unusually foliose aspect.

14. *Euphrasia himalayica* Wettstein

Euphrasia himalayica Wettst., Monog. *Euphrasia* 180, tab. 4, fig. 291-295, 1896. "Exsiccata: *Duthie*, Pl. of Kumaun. Nr. 5851 . . . *Hooker et Thomson* Herb. Ind. or. . . . z. T. . . . 'N. W. India. Kumaun. Mulapa Gadh Darma.' 11,000-12,000' (*Duthie*; H. Berl., H. U. W., H. Petr.). -Himal bor. occ. Regio Temp. 7000-13,000' (*Hooker f. et Thoms.*; H. Hofm., H. Berl.). -'Cheenee' (*Royle*; H. Petr.)." The last would seem to be a third collection, the other two being *Duthie's* plant from Kumaun, and *Hooker & Thomson's* (doubtless actually gathered by *Thomson* alone), without definite locality. Because of the more exact record I take *Duthie's*

as type. (Hooker & Thomson's collection, as repeatedly in their series of exsiccatae, was a mixture, and so noted by Wettstein; the duplicate in the Gray Herbarium appears to be not this species, although it is mounted on the same sheet with a collection of *E. himalayica*.)

In the Himalayas from Bashahr to Kumaun.

Bashahr: Ragchram, *Parmanand* 942 (ANSP, Gord, GH, NYBG, USNH); Runang, *Parmanand* 472 (ANSP, Gord, NYBG). Kumaun: Pindari, *Strachey & Winterbottom* (GH).

15. *Euphrasia remota* spec. nov.

Plate 16, B.

Stem erect or ascending, 1 dm. tall, freely branching (branches ascending-spreading), finely pubescent with recurved white hairs. Leaf-blades mostly fallen by anthesis, those seen oval, 5-7 mm. long, 3-4 mm. wide, rounded at apex, with 2 pairs of obtuse lobes; blades minutely pubescent, more pilose on the veins beneath, cuneately narrowed to scarcely petiolar bases. Bracts ovate, acute, glandular-puberulent, with 3 (to 4) pairs of acute to acuminate lobules. Inflorescence semi-capitate in anthesis, then elongating so that its lower internodes may be 15 to 25 mm. long. Pedicels less than 1 mm. long. Calyx (5-) 6-7 mm. long, glandular-puberulent, the lobes lanceolate-attenuate. Corolla dorsally 7-8 mm. long: upper lip 4-5 mm. long; lower lip 5-7 mm. long, the lobes widely notched; corolla externally finely pubescent, especially on the upper lip, apparently with hood of galea pale violet and lip white or whitish, both laterally with dark purple-violet lines (fresh color not noted). Anthers brown, proximally finely villose, the white hairs about equaling the shorter awns. Capsule 5-6 mm. long, truncate or erose, distally finely pilose-ciliate. Seeds 1.2 mm. long, with white low wing-like ridges.

Caulis erectus aut ascendens, minute pubescens, ramosus, 1 dm. altus; folia ovalia rotundata minute pubescentia, 2 paria lobulorum obtusorum gerentia, 5-7 mm. longa; bracteae ovatae glandulari-puberulentae, lobulis acutis aut acuminatis; pedicelli brevissimi; calyx 6-7 mm. longus, glandulari-puberulentus, lobis lanceolato-attenuatis; corolla 7-8 mm. longa, lineata, externe minute pubescens, labio superiore 4-5 mm. longo violaceo, labio anteriore 5-7 mm. longo albo aut albido; capsula 5-6 mm. longa; semina 1.2 mm. longa.

Type, moist soil, about 2700 meters altitude, above Rattu, Astor Valley, Astor, collected in flower and fruit August 19-20, 1939, by Ralph R. and Isabelle D. Stewart, no. 18792; in Herb. Academy of Natural Sciences of Philadelphia.

In herbage along streams, at altitudes of 2700 to 3500 meters, Astor and northern Kashmir, in the western Himalayas.

Astor: above Rattu. *Stewart* 18792 (ANSP, Gord, NYBG). Kashmir: Zoji Pass, *Stewart* 21203 (ANSP, GH).

The semi-capitulate flower-clusters of *Euphrasia remota* recall those of *E. paucifolia*, but the present species differs from that in its acute bracts, greater glandularity, and branched habit.

16. *Euphrasia aristulata* spec. nov.

Plate 16, A.

Stems erect, 1.5-2.5 dm. tall, simple or usually much branched (branches ascending-spreading), finely pubescent with reflexed white hairs, distally

with slightly longer and denser hairs and with occasional short-stalked glands. Leaf-blades ovate-oval, 6-11 mm. long, 4-8 mm. wide, rounded (or the upper acute) at apex, with 4 to 5 pairs of triangular lobules that are rounded on the lower, and acuminate to acuminate-aristulate on the upper leaves; blades glandular-puberulent on both surfaces, the margin revolute; proximally rounded or slightly cuneate to petioles about 0.5 mm. long. Bracts widely ovate, glandular-puberulent, more ridge-veined beneath, the apex and all the teeth attenuate, cuspidate, or mostly aristulate. Inflorescence uniformly elongating, the lower internodes 8-15 mm. long. Pedicels very short, not over 0.5 mm. long in fruit. Calyx 4-5 mm. long, glandular-puberulent especially distally, the lobes 2-2.5 mm. long, lanceolate-attenuate, aristulate. Corolla dorsally 5-7 mm. long: upper lip about 3 mm. long, its lobes widely porrect, denticulate or angled; lower lip about 4 mm. long, widely deflexed-spreading, the lobes wide, emarginate or widely notched; corolla externally finely pubescent, most densely so on the upper lip, purple-violet, darkest on upper lip and lobes of lower lip, occasionally pale throughout, pale or yellowish over palate of lower lip, with 2 narrow dark purple-violet lines near each margin of upper lip and 1 marginal on lower lip. Anthers brown, cohering wholly or in lateral pairs, horizontally turned, each cell opening by distal slit which is surrounded by white villose hairs (so placed that anther-mass is glabrous externally, hairy and pollen-discharging medianly), each anther-cell short-awned, the lowest (on posterior filaments) with awn of double or treble length. Capsule 4-5 mm. long, truncate or nearly so, distally finely ciliate. Seeds 1.2-1.5 mm. long, brown, with slightly raised white wing-like ridges.

Caulis erectus, minute pubescens, saepissime ramosus, 1.5-2.5 dm. altus; folia ovato-ovalia rotundata (supremis acutis) glandulari-puberulentia, 4-5 paria lobulorum, inferium rotundatum, superium acuminatum aut acuminato-aristulatum gerentia; bractae late ovatae glandulari-puberulentae, apice et lobulis attenuatae aut saepissime aristulatae; pedicelli brevissimi; calyx 4-5 mm. longus, glandulari-puberulentus, lobis lanceolato-attenuatis aristulatis; corolla 5-7 mm. longa, purpureo-violacea, lineata, externe minute pubescens, labio superiore 3 mm. longo atrovioleaceo, labio inferiore 4 mm. longo pallido lobis atrovioleaceis emarginatis; capsula 4-5 mm. longa; semina 1.2-1.5 mm. longa.

Type, moist grassy place along stream, 2750 meters altitude, Sonamarg, Kashmir, collected in flower and fruit August 4, 1928, by Ralph R. Stewart, no. 9856; in Herb. Academy of Natural Sciences of Philadelphia.

Moist grassy places along streams, at altitudes of 1700 to 3000 meters, in the western Himalayas from Muzaffarabad to Purig. Flowering in July and August.

Muzaffarabad: Uri to Aliabad. *Stewart* 13957 (ANSP, Gord, GH, NYBG). 14020 (NYBG, USNH). Kashmir: Baltal to Sonamarg. *Stewart* 21285 (ANSP, GH); Ferozepur Nullah, below Gulmarg. *Stewart* 14763 (ANSP, NYBG); Ganderbal. *Stewart* 179 (NYBG); Kangan, *Inayat* 25731 (ANSP, DD), *Stewart* 21336 (ANSP, Gord, GH); Pahlgam. *Stewart* 5695, 7987 (NYBG), 9341a (ANSP, NYBG); Sonamarg, *Stewart* 9856 (ANSP, DD, Gord, GH, NYBG, USNH); Tangmarg. *Stewart* 12223; Wangat, *Stewart* 18096 (GH); Weyil, Sind Valley. *Stewart* 18087 (ANSP, Gord). Purig: Dras. *Stewart* 21141 (ANSP, Gord, GH, NYBG).

17. *Euphrasia densiflora* spec. nov.

Plate 17, A.

Stem erect, 1-1.5 dm. tall, simple or stiffly branched (branches ascending), finely pubescent with recurved white hairs. Leaf-blades nearly all fallen by late anthesis, those seen nearly oval, 5-8 mm. long, 3-5 mm. wide, obtuse, with 3 to 4 pairs of acutish lobules; blades finely pubescent, cuneately narrowed to scarcely petiolar bases. Bracts widely ovate, finely glandular-pubescent, acuminate or slightly cuspidate, with 4 to 5 pairs of acuminate-cuspidate or aristulate lobules. Inflorescence uniformly elongating, the lowest internodes not over 6 mm. long. Pedicels less than 1 mm. long. Calyx 6 mm. long, finely glandular-pubescent, the lobes lanceolate-attenuate. Corolla dorsally 6-7 mm. long; upper lip 3 mm. long; lower lip 4 mm. long, the lobes strongly notched; corolla externally finely pubescent, especially on the upper lip, white, or the galea slightly violet, the galea laterally with faint violet lines. Anthers brown, orifice villose-ciliate, the white hairs about equaling the shorter awns. Capsule 5 mm. long, truncately rounded, finely pilose-ciliate. Seeds 1 mm. long, brown, with white low wing-like ridges.

Caulis erectus, minute pubescens, simplex aut ramosus, 1-1.5 dm. altus; folia ovalia obtusa minute pubescentia, 3-4 paria lobulorum acutiusculorum gerentia, 5-8 mm. longa; bracteae late ovatae minute glandulari-pubescentes, 4-5 paria lobulorum acuminato-cuspidatorum aut aristulatorum gerentes; pedicelli brevissimi; calyx 6 mm. longus, minute glandulari-pubescent, lobis lanceolato-attenuatis; corolla 6-7 mm. longa, alba, obscure lineata, externe minute pubescens, labio superiore 3 mm. longo interdum violacescente, labio inferiore 4 mm. longo lobis emarginatis aucto; capsula 5 mm. longa; semina 1 mm. longa.

Type, moist grassy places near stream, 2600 meters altitude, Rattu to Rupal Nullah, Astor, collected in late flower and in fruit August 22, 1939, by Ralph R. and Isabelle D. Stewart, no. 18852; in Herb. Academy of Natural Sciences of Philadelphia, isotypes at New York Botanical Garden, United States National Herbarium, Gray Herbarium of Harvard University, and Gordon College in India. Only collection seen.

18. *Euphrasia flabellata* spec. nov.

Plate 17, B.

Stem erect or decumbent-ascending, 1-3 dm. tall, simple or with a few ascending-erect branches from base, finely pubescent with recurved white hairs. Leaf-blades nearly all fallen by anthesis, those seen nearly oval, 5-6 mm. long, 3-4 mm. wide, obtuse, with 3 to 4 pairs of obtuse or acutish lobules; blades finely pubescent, cuneately narrowed to nearly sessile bases. Bracts flabellately ovate, wider than long, finely glandular-pubescent, acuminate, with 4 to 5 pairs of acuminate-attenuate, cuspidate lobules. Inflorescence elongated, the stem fructiferous most of length, the internodes about twice exceeding the capsule and divergent bracts. Pedicels less than 1 mm. long. Calyx 5-7 mm. long, finely glandular-pubescent, the lobes lanceolate-attenuate. Corolla dorsally 6-7 mm. long; upper lip 2.5 mm. long; lower lip 4-5 mm. long, the lobes strongly notched; corolla white, the galea light violet and with dark violet lines. Anthers brown, proximally (as ciliation of orifices) finely villose, the white hairs equaling the shorter awns.

Capsule 4-5.5 mm. long, truncately rounded, finely pilose-ciliate. Seeds 1 mm. long, brown, with white wing-like ridges.

Caulis erectus aut decumbenti-adscendens, minute pubescens, simplex aut longe ramosus, 1-3 dm. altus; folia fere ovalia obtusa minute pubescentia, 3-4 paria lobulorum obtusorum aut acutiusculorum gerentia, 5-6 mm. longa; bracteae flabellato-ovatae minute glandulari-pubescentes, lobulis acuminato-attenuatis et cuspidatis; pedicelli brevissimi; calyx 5-7 mm. longus, minute glandulari-pubescens, lobis lanceolato-attenuatis; corolla 6-7 mm. longa, alba, labio superiore 2.5 mm. longo violaceo et lineato, labio inferiore 4-5 mm. longo lobis emarginatis aucto; capsula 4-5.5 mm. longa; semina 1 mm. longa.

Type, moist grassy place near stream, 2400 to 2500 meters altitude, Shigar, Baltistan, collected in flower and fruit August 9, 1940, by Ralph R. Stewart, no. 20540; in Herb. Academy of Natural Sciences of Philadelphia.

Moist grassy places near streams, at altitudes of 2400 to 3700 meters, Baltistan, in the western Himalayas.

Baltistan: Shigar, *Stewart* 20540 (ANSP, Gord, GH, NYBG); Thalle La, above Khusomik, *Stewart* 20701 (ANSP, Gord, GH, NYBG, USNH).

35. **PEDICULARIS** [Bauhin] Linnaeus

Pedicularis L., Spec. Plant. 607, 1753; Gen. Plant. ed. V, 266, 1754. Genotype, *P. sylvatica* L., of Sweden; see Proc. Acad. Nat. Sci. Phila. 82: 18, 1930.

A genus of more than 600 species of the Northern Hemisphere, mostly Palaearctic and most numerous in the mountains of southwestern China.

For the Indian species of this genus we are fortunate in having Sir David Prain's elaborate and beautifully illustrated account, that appeared in the Annals of the Botanical Garden of Calcutta (3: 1-196, 37 pl., 1890) while he was director of that institution. It followed closely on Maximowicz' careful study of the genus, that reached its final expression in his summary in the Bulletin of the Academy of Sciences of St. Petersburg in 1888 (32: 515-619, 7 tab.). Excellent as these accounts were, it is but natural that a half century's further collections, especially when so intensive as have been Dr. Stewart's, should show somewhat to be changed as well as much to be added.

In one respect *Pedicularis* is a marvellous genus of plants. I doubt if any other shows such exceeding diversity in the form of the corolla, and yet there can be no question of the actual close relationship of its many species. It seems impossible to divide it even into subgenera. Such diversity, with the presence today of all stages of intermediate corolla-forms, can only mean abundant recent evolutionary change. Since differences of corolla-form must correlate directly with processes of pollination, this is a genus in which field-observations and the collecting of the pollinators would be especially worth-while. I know of no such studies for the Himalayan species, and can only state that, while primarily pollinated by bees, at least the long-tubed species must be restricted to certain Lepidoptera.

Size of capsule is given for the few species in which the capsules have been seen. It is thought that the relative dimensions between species will prove correct. But *Pedicularis* is nearly always gathered in flower.

KEY TO SPECIES

- A. Leaves opposite or whorled; inflorescence of fasciculate clusters.
- B. Galea not or slightly beaked (beak not longer than wide); leaves whorled (or in *P. pycnantha* the lower opposite).
- C. Lower lip of corolla as long as or longer than the ascending galea; corolla purple, its tube strongly deflexed from calyx.
- D. Tube of corolla decurved to 90°, the horizontal corolla 10 mm. long; calyx-tube pale between ridges; inflorescence elongated, of many fascicles; leaf-blades bipinnatifid, the ultimate segments dentate to lobed.1. *P. nodosa*
- DD. Tube of corolla less decurved, the ascending corolla longer; calyx green or nearly so throughout; inflorescence short, of 1 or 2 approximate fascicles; leaf-blades pinnatifid, the segments dentate or denticulate.
- E. Corolla 12-15 mm. long, the galea straight or only slightly arched, truncately rounded to apex.....2. *P. roylei*
- EE. Corolla 18-22 mm. long, the galea widely arched, cuneately rounded to apex.....3. *P. ophiocephala*
- CC. Lower lip of corolla shorter than the galea; corolla-tube only slightly deflexed from calyx.
- D. Corolla 12-20 mm. long, yellow, white, or purple, glabrous throughout; anther-cells proximally acute to acuminate; capsule 10-15 mm. long; stems less than 3 dm. tall; root perennial.
- E. Capsule 10-12 mm. long (nearly wholly within calyx), globose-ovoid, dehiscent both posteriorly and anteriorly and its cells nearly equal; corolla 12-15 mm. long, yellow to purplish, the galea rounded-truncate; calyx-lobes 3-5 mm. long.
- F. Pedicels much shorter than calyces, the infrutescence a dense spike; bracts short, narrow, unlobed, not leaf-like; pinnae irregularly dentate and lobed (so leaf-blades somewhat bipinnatifid).4. *P. pycnantha*
- FF. Pedicels becoming about as long as the capsules, the short inflorescence semi-corymbose; lower bracts completely foliar, constituting the main leaves, the blades of which are more uniformly and less sharply bidentate.
5. *P. maximowiczii*
- EE. Capsule 15 mm. long, lance-attenuate, dehiscent almost wholly posteriorly, the anterior longer than the posterior cell; corolla 18-20 mm. long, white or purple, the galea cuneately rounded to usually acute or slightly beaked; calyx-lobes shorter.
- F. Apex of galea beakless or scarcely beaked, the galea purple-spotted or confluent purple, the lower lip purple-spotted or -lined; calyx-lobes 1-2 mm. long, sharply callose-toothed; pinnae from $\frac{1}{2}$ to nearly as wide as long, callose-toothed.6. *P. svenhedini*
- FF. Apex of galea slightly beaked, the corolla not spotted; calyx-lobes usually shorter and less callose; pinnae usually narrower and the teeth less callose.
- G. Corolla white throughout or the galea purplish, its beak truncate or rounded; capsule distally cuneately rounded to the base of the short and slender beak-like apex; margin of calyx-lobes recurved so as to show a densely lanulose pseudo-ciliation; pinnae less deeply and irregularly lobed.7. *P. albida*

GG. Corolla purple throughout (only the throat pale), its beak tapering anteriorly to an acutish or narrowly rounded apex; capsule distally cuneate-attenuate, more gradually contracted; margin of calyx dark green, erect, hiding lanulose inner surface; pinnae more deeply and irregularly lobed.

8. *P. purpurea*

DD. Corolla 7-9 mm. long, red, its anterior lobes ciliate; anther-cells proximally obtuse; capsule 7-10 mm. long, ovoid-attenuate; stems 3-6 dm. tall; root annual.9. *P. mollis*

BB. Galea prolonged into a slender beak.

C. Beak of galea straight or slightly decurved, porrect; filaments glabrous; capsule ensiform, dehiscing mainly or wholly on posterior suture; calyx-lobes lobulate-dentate to rounded-entire; bracts all foliaceous, deeply lobed; corolla purple.

D. Lower lip of corolla shorter than the galea; leaf-blades more than thrice as long as wide, the pinnae 10 to 20 pairs; root perennial, the stem 0.5 to 1 dm. tall.10. *P. heydei*

DD. Lower lip of corolla as long as the galea; leaf-blades less than or about thrice as long as wide, the pinnae about 6 pairs.

E. Calyx-lobes as long as or longer than wide, not ciliate (except in *P. brunoniana*); capsule less than $\frac{1}{2}$ as wide as long; root perennial, the stems several from base, slender, simple to moderately branched, less than 4 dm. tall.

F. Inflorescence relatively dense, villose; pinnae of leaf-blades expanding from a relatively narrow base; stem simple, and calyx-lobes lobulate, not ciliate.

G. Galea from bend to tip 7-8 mm. long, the beak distally 0.3 mm. wide, its apex not or scarcely expanded, obtuse; lower lip 10-12 mm. wide; leaf-blades mostly about thrice as long as wide; stem 0.5-1.5 dm. tall.11. *P. chitralensis*

GG. Galea from bend to tip 9-10 mm. long, the beak distally 0.5 mm. wide, its apex slightly expanded, truncate or truncately rounded; lower lip about 15 mm. wide; leaf-blades mostly $1\frac{1}{2}$ to 2 times as long as wide; stem 1-3 dm. tall.12. *P. brevifolia*

FF. Inflorescence relatively lax, glabrate; pinnae of leaf-blades uniform in width throughout; galea from bend to tip 7-8 mm. long.

G. Corolla-tube more than $1\frac{1}{2}$ times the length of the calyx; calyx-lobes lobulate-toothed; leaves all opposite; stem simple, bifurcately puberulent, 1-3 dm. tall.13. *P. porrecta*

GG. Corolla-tube scarcely longer than the calyx; leaves ternate or opposite; stem branched, mostly 2-4 dm. tall, with lanulose lines.14. *P. brunoniana*

EE. Calyx-lobes wider than long, rounded, ciliolate; capsule $\frac{1}{2}$ as wide as long or wider; root annual, the stems solitary or few from base, usually much-branched and 3 to 7 dm. tall.

15. *P. gracilis*

CC. Beak of galea strongly decurved or coiled; filaments pubescent, the mid-portion glabrous; capsule nearly symmetrical, equally dehiscent posteriorly and anteriorly; calyx-lobes entire, acute to acuminate; bracts (except the lowermost) entire or nearly so.

D. Corolla yellow, the beak of the galea decurved to incurved; bracts ciliolate to tip, the external surface only slightly hirsute to base; leaf-blades lanceolate, cut $\frac{1}{4}$ distance to midrib into 12 to 20 pairs of pinnae, the cauline blades sessile; stem usually 6-9 dm. tall.

16. *P. tenuirostris*

DD. Corolla purple, the beak of the galea longer, often coiled; bracts villose on external surface, or distally (or even wholly) glabrous; leaf-blades ovate-lanceolate to ovate, cut more deeply (pinnately-partite) into 8 to 12 pairs of pinnae, the blades all petioled.

E. Galea with basal erect portion (hood) about as long as corolla-tube, then abruptly projecting with the tapering base about as long as the incurved or slightly coiled beak; lower lip widely spreading from base, 15 mm. wide, projecting beyond the galea; corolla-tube wide, little exceeding the calyx, its proximal half with thickened tissue, at apex of which anteriorly slightly sacculate externally and internally hairy over bases of filaments and intervening surface, thence abruptly contracted to distal half.

F. Calyx-tube straight, widely ribbed, not or scarcely cleft anteriorly, its lobes broadly lanceolate to triangular-ovate; corolla-tube straight or decurved above calyx; pinnae of leaf-blades strongly dentate-lobed.

17. *P. pectinata*

FF. Calyx-tube decurved, narrowly ribbed, deeply cleft anteriorly, its lobes usually narrowly lanceolate; corolla-tube tending to decurve through anterior slit of calyx; pinnae of leaf-blades slightly to deeply dentate.

18. *P. stewartii*

EE. Galea with basal widened portion (hood) about $\frac{1}{2}$ as long as the corolla-tube, thence abruptly decurved with cuneately contracted base that is shorter than the slender usually coiled beak; corolla-tube slightly or not hairy within, the tissue not thickened proximally.

F. Beak of galea 6-7 mm. long, strongly upcurved and coiled, the wide anther-containing part decurved over 130° from the erect basal portion of galea; lower lip widely spreading from base; base of filaments hairy; stem 1-4 dm. tall.

19. *P. cyrtorhyncha*

FF. Beak of galea longer, more projecting and coiled, the wide anther-containing part less strongly decurved from the ascending basal portion of the galea; lower lip cuneately spreading from a semi-stipitate base; base of filaments glabrous or nearly so; leaf-blades ovate-lanceolate to ovate; stem taller.

G. Inflorescence thick, of 5 to 15 fascicles, usually villose-hirsute; beak of galea usually more than 10 mm. long; calyx 10-12 mm. long, its tube inflated, mostly pale, its lobes 5, ovate; capsule 12 mm. long; seeds 4 mm. long; stem 2 to 6 dm. tall.

20. *P. pyramidata*

GG. Inflorescence slender, of 10 to 30 fascicles, loosely villose to glabrous; beak of galea less than 10 mm. long; calyx-tube less or not inflated, its lobes ovate-lanceolate to lanceolate; capsule 10-12 mm. long; seeds smaller; stem often taller.

H. Calyx 9-12 mm. long, its lobes 5, less strongly unequal; seeds 3 mm. long, slightly winged; inflorescence of 10 to 20 fascicles.

21. *P. kashmiriana*

HH. Calyx 7-9 mm. long, by unequal fusion appearing 4 or 3 (rarely 5); seeds 2 mm. long, alveolate-reticulate; inflorescence usually longer, of 15 to 30 fascicles.....22. *P. multiflora*

AA. Leaves alternate; inflorescence more continuous.

- B. Galea wholly beakless, rounded at apex, erect, much longer than the spreading lower lip; leaf-blades linear-oblong, simply pinnatifid, the pinnae oval, with rounded dentations.23. *P. oederi*
- BB. Galea narrowed to a more or less beak-like apex, exclusive of beak not longer than the lip; leaf-blades wider.
- C. Beak of galea straight, relatively short.
- D. Leaf-blades bipinnatisect, the midrib scarcely margined; corolla yellow, the galea externally glabrous, its beak less than 3 mm. long; capsule nearly symmetrical, both cells dehiscent; calyx-lobes entire to slightly denticulate, not splitting deeply anteriorly; crown of plant thickened.
- E. Beak of galea 1 mm. long, no longer than wide, with 2 slender teeth on anterior side of apex; filaments, above base, all glabrous; capsule 13 mm. long, narrowed from near the base; inflorescence villose with longer hairs; leaf-blades with relatively wide segments, finely villose beneath; stem 3-4 dm. tall.
24. *P. brevisrostris*
- EE. Beak of galea 2-2.5 mm. long, longer than wide, shortly bifid at apex and only secondarily with slender mucronate tips; anterior filaments pilose; capsule 10-11 mm. long, ellipsoid-acuminate; inflorescence loosely lanose, the hairs usually shorter; leaf-blades finely cut, the segments lanceolate, minutely pubescent to glabrous beneath; stem 3-6 dm. tall.
25. *P. dolichorhiza*
- DD. Leaf-blades simply or doubly crenately toothed; corolla rose-colored, the galea externally finely pubescent, its beak very slender, 3-4 mm. long; capsule dehiscent only on posterior side, the cells unequal; calyx-lobes lobulate-dentate, the tube deeper-cleft medianly, anteriorly eventually to base; crown of plant slender, often as if annual, but the roots distally thickened.26. *P. bifida*
- CC. Beak of galea slender, curved or coiled.
- D. Proximal widened portion of galea densely hirsute, the beak glabrous, incurved over 180°; corolla dark purple; capsule ovoid, acute, the cells nearly equal and both dehiscent; leaves (except the lowermost) sessile, the blades linear-lanceolate, with more than 20 pairs of rounded lobules (cut less than $\frac{1}{2}$ distance to midrib), each crenate-dentate.27. *P. trichoglossa*
- DD. Proximal widened portion of galea puberulent to glabrous; capsule ensiform-acuminate, the cells unequal and only the posterior fully dehiscent; leaves all petioled, the blades wider, with less than 20 pairs of oblong to ovate-rounded lobules (cut over $\frac{1}{2}$ distance to midrib), each irregularly dentate or dentate-lobed.
- E. Beak of galea exerted well beyond the deeply cleft lower lip of the yellow corolla; corolla-tube 1-1.5 mm. wide; filaments all glabrous; calyx 15-20 mm. long; inflorescence elongated, occupying most of the length of the stout stem, its flowers opening from the summit down (uppermost buds and bracts small, abortive).
- F. Beak of galea ascending-projecting, much longer than the basal portion, its component petals united posteriorly throughout; corolla-tube often shorter than, and at most $1\frac{1}{2}$ times the length of the calyx; calyx-lobes ovate-foliose, sharply toothed; pinnae of leaf-blades with several pairs of sharply dentate lobes, glabrate.28. *P. elephantoides*
- FF. Beak of galea eventually outcurved, little longer than the widened basal portion, its component petals parted distally about 3 mm.; corolla-tube usually $1\frac{1}{2}$ to 2 times the length of the calyx, sometimes shorter; calyx-lobes more flabellately foliose, with lower and less sharp teeth; pinnae of leaf-blades with shallower teeth, more pubescent.29. *P. bicornuta*

EE. Beak of galea incurved (or in *P. rhinanthoides* distally outcurving), not longer than the lower lip of the corolla; corolla-tube 0.5-1 mm. wide; at least the anterior pair of filaments hairy; calyx shorter (except in *P. hoffmeisteri*); inflorescence shorter, on upper half of plant, its flowers opening from below distally, the raceme normally indefinite.

F. Calyx-lobes clearly 5, all foliose and dentate; lower lip of corolla 25-30 mm. wide; pedicels less than 10 (-15) mm. long; leaf-blades large (lower 10-15 cm. long), the pinnae 9 to 18 pairs; stem stout, 2-5 dm. tall.

G. Corolla pale yellow or rose-red, the tube not exceeding the calyx, the galea uncinately curved, the lobes of the lower lip eciliate; filaments all pilose; capsule 15 mm. long, little exceeding the calyx; leaf-blades deeply pinnatifid, the pinnae usually deeply lobed and sharply dentate.30. *P. macrantha*

GG. Corolla yellow, the tube 2 to 4 times the length of the calyx, the galea falciform, the lobes of the lower lip ciliate; only the anterior pair of filaments pilose; capsule 20-25 mm. long, a third exserted from the calyx; leaf-blades less deeply pinnatifid, the pinnae crenately dentate.31. *P. hoffmeisteri*

FF. Calyx-lobes, if 5, with the posterior one narrow and entire, often by fusion of the lateral ones seemingly fewer; lower lip of corolla at most 20 mm. wide; lower pedicels usually becoming more than 20 mm. long; leaf-blades small (lower 1-4 cm. long), the pinnae 4 to 12 pairs; stem slender, 0.5-3 dm. tall.

G. Corolla yellow, the tube over 4 times the length of the calyx, the lobes of the lower lip all retuse, ciliate; filaments all pilose; leaf-blades linear-oblong, the pinnae crenately dentate-lobed. 32. *P. longiflora*

GG. Corolla purple, the tube less than 4 times the length of the calyx, the lateral lobes of the lower lip rounded; only the anterior pair of filaments pilose; leaf-blades wider.

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

33. *P. rhinanthoides*

HH. Lower lip of corolla 12-16 mm. wide, its lobes ciliate; hood of galea twisted, strongly gland-dotted, the beak upcurved-exserted; tube of corolla 2 to 3 times the length of the calyx; calyx-lobes apparently less than 5, those of each side fused and foliose, the posterior one much smaller or lacking.

I. Pinnae of leaf-blades 4 to 6 pairs, ovate-oblong, the teeth acute or somewhat rounded; proximal $\frac{1}{3}$ of the lower corolla-lobes and the anterior part of the galea-base white, the latter with straight or rounded margin; stems erect or ascending, usually 1.5 to 4 dm. tall. 34. *P. punctata*

- II. Pinnae of leaf-blades 6 to 12 pairs, oblong, pinnately lobed, the lobules irregularly acuminate-toothed; proximal $\frac{1}{2}$ or less of the lower corolla-lobes and the anterior one white, the latter acutely triangular-toothed on the anterior margin; stems ascending or erect, usually 1-3 dm. tall, sometimes lower and more diffuse.

35. *P. hookeriana*

1. *Pedicularis nodosa* spec. nov.

Plate 18, B.

Perennial-rooted. Stem erect or ascending, much branched below, 1-1.5 dm. tall, with 4 lines of villose hairs from the contacting sides of the petiole-bases, the intervening glabrous surface ridged and the nodes slightly swollen and darkened. Leaves verticillate in fours, the lower 2-2.5 cm. long, slightly pilose or glabrate, the rachis very narrowly winged, the pinnae about 6 pairs, mostly about 5 mm. long, acute, with broadly winged rachilla and about 3 pairs of deeply cut obtuse to acute lobes, which may in turn be dentate-lobed; bracts, lowest wholly leaf-like, upper smaller, not equaling the calyces. Inflorescence $\frac{1}{2}$ or nearly the whole height of the plant, of 6 or more 4-flowered fascicles, which are mostly shorter than the internodes. Pedicels in anthesis 2-3 mm. long, evidently longer in fruit. Calyx villose-hirsute, in anthesis prominent, the tube 5 mm. long, pale, with 10 dark green ribs, not reticulate, the lobes 3-4 mm. long, dentate-lobed. Corolla glabrous throughout, purple, 10 mm. long, the tube decurved about 90° from calyx, the galea slightly ascending, obtusely rounded, its apex wholly beakless, slightly exceeded by the widely spreading and somewhat reticulate lower lip. Anther-cells glabrous, proximally acuminate; anterior filaments glabrous, posterior pubescent. Capsule not seen.

Perennis; caulis 1-1.5 dm. altus, inferne ramosissimus, quadrifariam villosus; folia 4-nata bipinnatifida, pinnis 6-jugis; inflorescentia elongata multifasciculata; pedicelli 2-3 mm. longi; calyx villosus-hirsutus, lobis 3-4 mm. longis dentato-lobatis; corolla omnino glabra, purpurea, 10 mm. longa, tubo decurvo, galea eroste obtusa quam labium inferiorem patentem brevior; antherae glabrae, cellulis acuminatis; filamenta posteriora pubescentia; capsula non visa.

Type, at 5000 meters altitude, Kyungar, Almora District (Head of Ganges), collected in flower July 14, 1924, by H. G. Champion, no. 67; in Dehra Dun Herbarium. Only collection seen.

2. *Pedicularis roylei* Maximowicz

Pedicularis roylei Maxim., in Bull. Acad. Petersb. 27: 517, 1881. "Himalaya occidentali (Royle!). Tibeto occidentali ad Tschangra (Heide!)." Royle's specimen, in Dehra Dun Herbarium, bears label: "125/11 *Pedicularis microphylla* Appa[?] Kunour," with further illegible lines. It is the usual Himalayan plant, with corolla only 12-14 mm. long. I am unable to identify the locality, which may lie east of the present Bashahr district since Royle appears to have been most familiar with the headwaters of the Ganges and Prain cites his specimen as from Kamaun. The sheet at Dehra Dun bears annotation with Prain's signature, and so I presume that it is the one that he cites.

Corolla pale purple or rose-purple, with galea darker purple. Flowering from late June to late August.

Moist open rocky soil, at altitudes of 3600 to 4600 meters, through the western Himalayas from Hazara to Chumbi.

Hazara: Khanda, Saran Range, *Inayat* (DD); Musa Ka Musalla, *Inayat* (DD); Musalla Shinkhari, *Inayat* 20005 (DD); -Kagan: Besar, *Inayat* (DD); Chipran, *Inayat* (DD); Karru Nila, *Inayat* (DD); Makra, *Inayat* (DD); Sarul, *Inayat* 22045 (ANSP, DD, UCLA); Uruk Nila, *Inayat* (ANSP, DD). Muzaffarabad: Chobsar, *Inayat* (DD, UCLA); Musa, *Inayat* (DD); Thora, *Inayat* 22045a (DD). Kasmir: Mt. Apharwat, above Gulmarg, *Stewart* 8781 (ANSP, Gord), 10332 (NYBG); Sonsal Nullah, Liddar Valley, *Duthie* 13386 (DD). Chamba: head of Hudan Valley, *Harsukh* (DD); Kukti Pass, *Koelz* 8624 (ANSP, NYBG); Pangi, *Duthie* (ANSP, UCLA), *Heyde* (DD). Lahul: Bailing Nullah, *Koelz* 1250 (NYBG); Dropka Gongma, *Koelz* 6872 (USNH); Rotang Pass, *Drummond* 8919 (UCLA). Bashahr: Hangla Pass, *Parmanand* 679 (ANSP, GH, NYBG, USNA, USNH); Pieri Pass, *Parmanand* 528 (ANSP, GH, NYBG, USNA, USNH); Rupan Pass, *Parmanand* 1171 (Gord, GH, NYBG, USNA, USNH). Tehri: Duda Gadh, under Srikanta, *Duthie* 564 (DD); Gangotri, *Keshavanand* (DD); Ourie Gadh, in Nila Valley, *Duthie* 564a (DD).

Also seen from Nepal, Sikkim, Chumbi, and Tibet.

3. *Pedicularis ophiocephala* Maximowicz

Pedicularis ophiocephala Maxim., in Bull. Acad. Petersb. 32: 583, tab. 5, fig. 94, 1888. "Himalaya: Kumaon, valle Ralam, 13-15,000', Augusto 1884 (*Duthie!* n. 3225 . . .), Barji-kang, 14,700' (*Strachey & Winterbottom!* n. 8, -spec. pessima)." Both collections seen as indicated below. Since the second was stated to be very bad, the type collection is clearly *Duthie* 3225, gathered in flower August 25, 1884, of which the type or an isotype is in the Dehra Dun Herbarium.

Corolla pink-purple. Flowering in late July and August.

Alpine, at altitudes of 3400 to 4500 meters, through the Himalayas of Kumaun and Nepal.

Kumaun: Barji Kang Pass, *Strachey & Winterbottom* 8 (GH); Ralam Valley, *Duthie* 3225 (DD), 3228 (DD), *Inayat* 24785 (DD). Nepal: Nampa Gadh, *J. R. Reid* 5837 (DD); Palang Gadh, *Reid* 5837a (DD).

4. *Pedicularis pycnantha* Boissier

Corolla described in different accounts as white or pink, but on labels as yellow, or as explained on that with *Koelz* 5177: "yellow, becoming madder pink with age." Possibly the color differs in the various subspecies, this observation being of *cuspidata*.

As a species *Pedicularis pycnantha* occurs over arid central Asia from Turkestan and western Persia to Bashahr in the Himalayas. The following subspecies, though to some degree intergrading, seem recognizably distinct structurally and geographically.

KEY TO SUBSPECIES

- A. Anther-cells proximally acute or acutish; lower lip of corolla about $\frac{1}{2}$ length of the galea; calyx-lobes lanceolate, distally attenuate-subulate, entire or nearly so; leaves glabrous or slightly pubescent. 4a. *P. p. typica* ²⁵

²⁵ In Turkestan is another representative of *Pedicularis pycnantha* that in calyx, corolla, and anthers is as *typica*, but differs by its strongly lanulose foliage. It may be described as follows: *Pedicularis pycnantha lanulosa* subsp. nov. Leaves, stem, and inflorescence lanulose with white hairs. Stem 1 dm. tall. Leaf-blades irregularly bipinnatifid-lobed and -cut. Inflorescence dense. Bracts lance-ovate, entire, longer than calyces, conspicuously lanose-ciliate. Calyx-lobes lanceolate, attenuate, entire. Corolla 13-14 mm. long, the lower lip spreading, about $\frac{1}{2}$ the length of the rounded galea. (cont. at bottom of p. 121.)

AA. Anther-cells proximally acuminate; lower lip of corolla more than $\frac{1}{2}$ length of, often equaling the galea; leaves slightly to strongly lanulose.

B. Calyx-lobes linear-subulate, entire or nearly so; inflorescence usually somewhat interrupted.....4b. *P. p. semenowii*

BB. Calyx-lobes ovate-lanceolate to lanceolate, obtusish to callose-cuspidate, serrulate-denticulate; inflorescence usually dense throughout. 4c. *P. p. cuspidata*

4a. *Pedicularis pycnantha typica*

Pedicularis pycnantha Boiss., *Diagn. ser. I*, 12: 45, 1853. "Hab. in monte Totschal prope Teheran ad nives *Kot[s]lchy* pl. exs. Pers. bor. No. 166." Topotype, collected "in alpinis Totschal", June 4, 1902, by J. & A. Bornmüller, no. 7809, seen in Herb. Academy of Natural Sciences of Philadelphia and the University of California at Los Angeles. This was originally named var. *glabrata*, but seems to answer the specific description, except that the calyx-lobes are triangular-lanceolate to lanceolate rather than shortly triangular, a detail in which the original description should probably be emended. Boissier gave the color of the corolla as pink ("pallide carnea"), but none of the following specimens bears record of color.

Pedicularis pycnantha glabrata Bornm., in *Repert. Nov. Spec. Regn. Veg.* 3: 75, 1906. "Bornmüller, exsicc. no. 1652 (Kurdistan, Sakri-Sakran)." This was distinguished from the species by the subglabrous leaves and stems, Bornmüller evidently assuming that the latter was strongly pubescent in true *pycnantha*; since Boissier's description does not mention the indumentum of either stem or leaves, we may assume that Kotschy's type was the inconspicuously pilose plant that Bornmüller later gathered himself on Mt. Totschal.

Arid alpine locations, open or in pine forests, western Persia to Baltistan, eastward at altitudes of 2700 to 3500 meters. Flowering from late May to August.

PERSIA. Teheran: M. Elburs, in alpinis Totschal, *Bornmüller* 7809 (ANSP, UCLA). Khorasan: Khorasan, *Aitchison* 679 (DD).

AFGHANISTAN. Khash Dt., *Koelz* 13005; Sirotai, *Koelz* 11943; Kurram & Hariab districts, *Aitchison* 108 (DD).

INDIA. Hazara: Besar, *Inayat* (DD); Kagan Valley, *Inayat* 19985 (ANSP, DD, UCLA). Gilgit (?): "Gilgit Expedition", *Giles* 3 (DD). Astor: "Astor", *Tanner* 248 (DD). Purig: Marpu Nullah, *Duthie* 11771 (DD); Matayan, Dras Valley, *Duthie* 11747 (DD).

4b. *Pedicularis pycnantha semenowii* (Regel) Prain

Pedicularis semenowii Regel, in *Bull. Soc. Nat. Moscou* 41, pt. I: 108, 1868. "Auf dem Berge Bajan-Djuruk bei Kopal im Alatau cisiliensis bei 7000 Fss. Höhe (*Semenow*) [in 1857]."

Pedicularis pycnantha semenowii (Regel) Prain, in *Journ. Asiat. Soc. Bengal* 58, pt. II: 264, 1889.

So far as the limited material at hand shows, the plants of the Kurram Valley, marked below by asterisks, while in other details like this subspecies, differ by having the inflorescence dense throughout, as in the other subspecies. The length of the lower relative to the upper lip of the corolla seems also intermediate.

Pine forests on dry mountain slopes, Alatau Mountains of eastern Turkestan to the western Hindu Kush Range of Chitral and Gilgit in north-western India, where at altitudes of 2700 to 4500 meters.

(Planta lanulosa: calycis lobi lanceolati, attenuati, integri; corolla 13-14 mm. longa.) Type, Turkestan, collected in flower June 21, 1881, by A. Regel; in Herb. Academy of Natural Sciences of Philadelphia, isotype at University of California at Los Angeles.

AFGHANISTAN. Badakshan: Dorah Pass, ——— 247 (DD). * Kurram Valley: Sikaram, *Aitchison* 487 (DD, GH), *Harsukh* 14841.

INDIA. * Kurram: Sufaid Koh, above Parachunar, *Hare Ihis* 33302 (DD). Chitral: Achal Gur, Rumbur, *Harriss* (DD); Chitral, *Harriss* 16441 (DD); Tarashmir, *Harriss* (DD). Dir: Gujjar ("Guger"), *Harriss* 16440 (DD). Gilgit: "Gilgit Expedition (No. of Hindu Kush)", *Giles* (DD).

4c. *Pedicularis pycnantha cuspidata* subsp. nov.

Plate 18, C.

Leaves, stems, and inflorescence lanulose to lanose with white hairs. Stem 0.5-1.5 dm. tall, usually floriferous nearly throughout. Leaves 5-10 cm. long, irregularly sharply bipinnatifid-lobed or -toothed, teeth becoming cuspidate with sharp callose tips. Inflorescence densely flowered. Bracts simple, oblong-lanceolate, proximally entire and ciliate, distally cuspidate-dentate, all except the lower equaled by the fruiting calyces. Pedicels very short (in fruit 1-2 mm. long). Calyx becoming 12-14 mm. long, the lobes 5-7 mm. long, ovate-lanceolate to lanceolate, tending to serrulate-denticulate, becoming callose-cuspidate. Corolla "yellow, becoming madder pink with age", 18-20 mm. long, the deflexed-spreading lower lip nearly as long as the galea. Anther-cells proximally acuminate. Capsule becoming 10 mm. long, 8 mm. wide, its apex slightly decurved. Seeds 2-2.5 mm. long, white-reticulate.

Planta lanulosa; caulis 0.5-1.5 dm. altus; folia 5-10 cm. longa bipinnatifida dentibus cuspidatis; inflorescentia densa; calyx 12-14 longus, lobis 5-7 mm. longis ovato-lanceolatis dentibus cuspidatis auctis; corolla 18-20 mm. longa; cellulis antherae acuminatis; capsula 10 mm. longa; semina 2-2.5 mm. longa.

Type, Gundla,²⁶ Kulu Valley, Kangra, collected in flower June 26-29, 1933, by Walter Koelz, no. 5177; in United States National Herbarium, isotype at Academy of Natural Sciences of Philadelphia.

Dry rocky places, at altitudes of 3000 to 4000 meters, through the western Himalayas from Lahul to Bashahr.

Lahul: Kyelang, *Koelz* 502 (NYBG); Patseo to Tsingtsingbar (on s. w. foot of Bara Latsa Pass), *Schlagintweit* 4021 (GH); between Sisu and Gondla, *Drummond* 8902 (DD); Zanskar-Tsu, *Drummond* 8921 (DD). Kangra: Gundla, Kulu Valley, *Koelz* 5177 (ANSP, USNH). Bashahr: Hangla ("Hangoo"), *Parmanand* 642 (ANSP, Gord, GH, NYBG, USNA), *Royle* 125/10 (DD); Poze, Chini, *Parmanand* 775 (Gord, GH, NYBG, USNA).

5. *Pedicularis maximowiczii* Krassnow

Plate 18, A.

Pedicularis maximowiczii Krassnow, in *Scripta Bot. Hort. Univ. Petrop.* 2: 18, 1889. Tian-Shan Mountains, gathered by Andreas Krassnow in 1886. Exact locality apparently accidentally omitted. As I have seen neither type nor any authentic specimens, the identification of the species now considered as this is provisional. The original description gave no dimensions, but our plant agrees with it in habit, leaves, foliar bracts, short inflorescence, spatulate dentate calyx-lobes, and corolla, but the capsule is wider than described, a discrepancy easily understood since Krassnow's capsules were immature. On that account may likely be explained Krassnow's failure to mention the most striking feature of our plant, its long pedicels. Finally, Krassnow says that the subfloral leaves (bracts) are never verticillate, whereas Koelz' material shows them sometimes so. Such differences seem to demand merely an emendation of Krassnow's description.

Apparently from the Tian Shan to the western Himalayas, the altitude in the latter not stated. Seen in fruit in late July.

Purig: ———, *Koelz* 6017 (USNH).

²⁶ May this not be "Gondla" in Lahul?

Midway between this and *Pedicularis pycnantha semenowii* appears to be *P. pulchra* Paulsen (in Bot. Tidskr. 27: 211, f. 1, 1906), also a low plant with lanceolate leaves and similarly long fruiting pedicels, but with irregularly sinuate-pinnatifid leaf-blades and entire lanceolate calyx-lobes. This was gathered by Lieut. Olufsen in the Pamir in 1898.

6. *Pedicularis svenhedinii* Paulsen

Pedicularis svenhedinii Pauls., in Sven Hedin, Southern Tibet 6 pt. III: 44, f. 2 & pl. 7, 1921. "S. W. Tibet, Height above the source of Tsangpo, northern foot of Himalaya, 5015 m., 13th July 1907 [Sven Hedin]."

Apparently, while usually spotted, eastward the galea may become dorsally purple and the lip reticulate; likely the type bore such flowers. The most spotted collection seen is *Koelz* 2522 from Ladakh, while *Parmanand* 1806 from Bashahr has galea purple-flecked to dorsally solid purple and lower lip with purple reticulum.

Gravelly or stony soil, along streams at altitudes of 3000 to 5500 meters, in the western Himalayas from Chamba and Ladakh to Bashahr. Flowering from mid-July to mid-August. Flowers fragrant.

Chamba: Pangi, *Heyde* (DD). Nubra: Leatsung to Panamik, Nubra Valley, *Schlagintweit* 2042 (GH). Ladakh: Chortren Chen, *Koelz* 2665 (ANSP, NYBG); Griensthal, *Heyde* (DD); Himis, *Stewart* (NYBG); opposite Ke La, *Koelz* 2522 (ANSP, DD, NYBG, USNH); Khalotse-Leh, *Stewart* (NYBG); Khardong Pass, *Stewart*; Leh, *Schlagintweit* (ANSP, USNH); Likir, *Koelz* 6273 (USNH); Nima Mud, *Koelz* 2332b (NYBG); Sputuk, *Stewart*; Tsakzhun Tso, *Koelz* 2397a (ANSP, NYBG). Rupshtu: Hanle, *Koelz* 2282, 2305j (NYBG). Bashahr: Poze, *Parmanand* 806 (Gord. GH, NYBG, USNA, USNH).

7. *Pedicularis albidia* spec. nov.

Plate 19, A.

Perennial, with thick roots descending from the crown. Stems several, erect, simple, 1.5-2.5 dm. tall, loosely villose over entire surface or the hairs shorter and in 4 lines. Leaves basal and in remote whorls of 4, the basal long-petioled, the cauline short-petioled or sessile, above glabrate, beneath finely pubescent, the rachis narrowly winged (usually 0.5-1 mm. wide), the pinnae about 9 to 12 pairs, 2-3 mm. long, with about 3 pairs of obtuse or callose-cuspidate lobes, which are also so and which are not or hardly wider than the mid-blade; bracts, lowest sometimes leaf-like, upper or all smaller, lanceolate, with wide entire proximal and pinnately lobulate distal portions. Inflorescence of 3 to 5 fascicles, the lowest usually slightly isolated, in anthesis villose throughout, in fruit glabrescent. Pedicels in anthesis 2-3 mm., in fruit the lower 3-5 mm. long. Calyx in anthesis 6-7 mm., in fruit 8-9 mm. long: tube pale, with dark green villose ribs median to each sepal and to the postero-lateral sinuses, cleft $\frac{1}{3}$ depth anteriorly, posteriorly only slightly so; the lobes irregularly developed, the mid-posterior short or lacking, the postero-laterals longest and with lobulate margin, the antero-laterals shorter, all lobes and margins of calyx purplish, the margins becoming recurved so that the densely lanulose projecting portion of the interior surface of the calyx seems a ciliation. Corolla glabrous throughout, white, 18-20 mm. long: the tube decurved about 45° from the calyx; the galea 9-10 mm.

long, white or purplish, recurving-arched above the lower lip, distally contracted anteriorly to the truncate or rounded apex; lower lip 5-7 mm. long, the antero-lateral lobes wider than long and spreading laterally, the mid-anterior longer than wide and deflexed-spreading. Anthers glabrous, the cells acute to acuminate at base; filaments all glabrous. Capsule 14-15 mm. long, ensiform, distally cuneate-rounded to the mucronate beak, dehiscing entire length on posterior side. Seeds 1.7 mm. long, pale, minutely alveolate-reticulate.

Perennis; caules plurimi simplices 1.5-2.5 dm. alti villosi aut quadrifariam pubescentes; folia basalia et 4-nata caulina, pinnis 9-12-jugis dentibus obtusis cuspidatisve lobulatis; inflorescentia 3-5-fasciculata; pedicelli 3-5 mm. longi; calyx villosus, lobis lobulatis posteriore minimo aut nullo; corolla undique glabra, alba, 18-20 mm. longa, tubo decurvo, galea erostre truncata quam labium inferiorem patentem longiore; antherae glabrae, cellulis acutis; filamenta glabra; capsula 15 mm. longa, ensiformis, latere posteriore dehiscens; semina 1.7 mm. longa.

Type, meadow, 3700 meters altitude, Shigar Nulla, Baltistan, collected in flower August 22, 1936, by Walter Koelz, no. 9731; in Herb. Academy of Natural Sciences of Philadelphia.

Moist places on alpine steppe, at altitudes of 3000 to 4500 meters, through the western Himalayas and Hindu Kush ranges, from the Pamir Border to Spiti. Flowering in July and August.

Pamir Boundary: Banks of R. Aksu and its affluents, *Capt. Alcock 17752* (DD). Tibet: Karakorum, *Clarke 30187* (UCLA). Gilgit: Gilgit, *Tanner* (DD). Kashmir: Burzil, *Koelz 9382* (NYBG, USNA). Baltistan: Alampi La, *Duthie* (DD); Deosai Plains, *Koelz 9496* (ANSP, GH, NYBG, USNA, USNH), *Stewart 19942* (DD, Gord, GH, NYBG, USNH), *20062* (ANSP, Gord, GH, NYBG); Deosai ("Deotsu"), *Strachey & Winterbottom 876* (DD); Karpuche Valley, *Duthie 11962* (DD); Shigar Nulla, *Koelz 9731* (ANSP, Gord, GH, NYBG, USNA, USNH); Thalle La, *Stewart 20651* (ANSP, NYBG). Purig: Gyama Tongdze, *Koelz 6007* (USNH); Lamiran Nullah, above Dras, *Duthie 13785* (DD). Ladakh: Kharbu, *Schlagintweit 5862* (GH), *Stewart* (Gord); Hanu Yagma via Handamir up Chorbat La (pass between Indus and Shayok valleys), *Schlagintweit 6501* (GH). Mangrik: Panamik to Tsanglung, Nubra Valley, *Schlagintweit*. Spiti: Jah, *H. A. C. Gill 2042* (DD).

TIBET. Chaldu, n. of Untadhure Pass, east of Almora, *Champion 66* (DD).

Of the three segregates from *Pedicularis cheilanthifolia* Schrenk now recognized from the western Himalayas, *P. svenhedinii*, *P. albida*, and *P. purpurea*, the second is likely nearest to that species of Songaria. Unfortunately, I have seen no authentic specimen of the Songarian plant, and, as the original description could apply in every detail either to the present or the following species, I can not point out its distinctive characters. That it will prove different from either of these seems indicated by the occurrence in the intervening Pamirs of yet another plant, which shows thicker and more purple galea than *P. albida* and has its leaf-pinnae about as wide as long. That the last is also different from *P. cheilanthifolia* is in turn indicated by its strongly decurved galea, whereas the galea of that species was described as rather straight ("rectiuscula"). With so little material at hand I hesitate, however, actually to describe it.

8. *Pedicularis purpurea* spec. nov.

Plate 19, B.

Perennial, with thick roots descending from the large crown. Stems many, erect or slightly decumbent, simple, 1-2.5 dm. tall, finely villose in 4 lines, or somewhat villose with longer hairs at base of inflorescence. Leaves basal and in whorls of 4, the basal long-petioled, the cauline short-petioled or sessile, above glabrate, beneath finely pubescent, the rachis scarcely winged proximally, somewhat so distally (about 0.5 mm. wide), the pinnae about 7 to 10 pairs, 2-5 mm. long, with 2 or 3 pairs of lobes, which are obtuse or sometimes callose-cuspidate but are definitely wider than the midrib; bracts, lowest usually leaf-like, upper or all smaller, lanceolate or oblong-lanceolate, with entire proximal and pinnately lobulate distal portions. Inflorescence of 2 to 4 fascicles, often so congested as to appear a single head-like cluster, villose throughout, or ultimately the rachis and pedicels glabrous, and the calyx loosely villose. Pedicels in anthesis 1-2 mm., in fruit the lower 3-4 mm. long. Calyx in anthesis 6-7 mm., in fruit 8-9 mm. long: tube pale, with dark green villose ribs median to each sepal, cleft $\frac{1}{3}$ depth anteriorly, posteriorly not cleft; the lobes slightly irregularly developed, 4 lobulose-dentate, the postero-laterals longest, the mid-posterior entire and about equaling the postero-laterals, lobules and margin of calyx dark green, remaining erect and concealing its lanulose inner surface. Corolla glabrous throughout, purple, with pale throat, 18 mm. long: tube decurved 30° to 60° from the calyx; the galea 10-11 mm. long, ascending-arched above the lower lip, distally contracted anteriorly to the narrowly rounded or acutish apex; lower lip 7 mm. long, the lobes all rounded, the antero-laterals wider than the mid-anterior. Anthers glabrous, the cells acuminate at base; filaments all glabrous. Capsule 15 mm. long, ensiform, distally cuneately acuminate, dehiscing entire length on posterior side. Seeds 1.5-2 mm. long, pale, minutely alveolate-reticulate.

Perennis; caules multi simplices 1-2.5 dm. alti quadrifarium villosuli; folia basalia et 4-nata caulina, pinnis 7-10-jugis dentibus saepissime obtusis lobulatis; inflorescentia 2-4 fasciculata, saepe congesta; pedicelli 3-4 mm. longi; calyx villosus, lobis lobuloso-dentatis, posteriore aequilongie integro; corolla undique glabra, purpurea, 18 mm. longa, tubo decurvo, galea erostre apice obcuneata, quam labium inferiorem patentem longiore; antherae glabrae, cellulis acuminatis; filamenta glabra; capsula 15 mm. longa, ensiformis, latere posteriore dehiscens; semina 1.5-2 mm. longa.

Type, 4600 meters altitude, Drokpo Gongma, Lahul, collected in flower August 29-30, 1933, by Walter Koelz, no. 6895; in United States National Herbarium, isotype in Herb. Academy of Natural Sciences of Philadelphia.

Presumably in moist places, at altitudes of 3600 to 5000 meters, in the western Himalayas from Kashmir to Lahul. Flowering in July and August.

Kashmir: Amernath, upper Liddar, *Canon Stokoe* (Stewart 9460a) (Gord.); Kargch Valley, above Tilail, *Duthie* 13920 (DD). Baltistan: Hushe via Haldi to Tsoorkonda, *Schlaqintwicit* 5647 (GH). Purig: Chatpani Nullah, w. of Dras, *Duthie* 13864 (DD). Zaskar: Kargia, *Koelz* 5444 (USNH); Pensi La, *Koelz* 5848 (USNH). Lahul: Bara Lacha La, *Koelz* 6835 (USNH); Chandratal, *Koelz* 6933 (USNH); Dilburig, *Parmannand* 47 A (Gord, NYBG, USNA); Drokpo Gongma, *Koelz* 6860 (USNH), 6895 (ANSP, USNH); Mt. Kardang, *Drummond* 8907 (UCLA); Pangi, *Heyde* (DD); Serchu, *Koelz* 6690 (USNH).

9. *Pedicularis mollis* Wallich

Pedicularis mollis Wall., Numer. List Spec. Ind. Mus. n. 415, 1829, ined. "Gossain Than"; ex Benth., Scroph. Indicae 53, 1835. "Hab. ad Gossain Than, Wallich." Mt. Gosai Than is in the Himalayas above eastern Nepal.

At altitudes of 3000 to 4500 meters, through the Himalayas from Bashahr to Chumbi. Flowering from July to September.

Bashahr: Palikchi to Kiari P., *Lace* 1020 (DD); Ragchham, *Parmanand* 933 (ANSP, Gord, GH, NYBG, USNA, USNH). Kumaun: Nipchang Valley, *Duthie* 3229 (DD); Palang Gadh, Byans, *Duthie* 5844 (DD); Ralam Valley, *Duthie* 3230 (DD), *Inayat* 24804 (ANSP, DD, UCLA).

Also seen from Nepal, Sikkim, and Chumbi.

This resembles in annual growth, doubly pinnatifid leaf-blades, and soft-hairy pubescence *Pedicularis gracilis* Wall., but may be distinguished by its taller stems with always verticillate leaves and ascending branches, its longer and dentate calyx-lobes, and its smaller corollas with beakless galea.

10. *Pedicularis heydei* Prain

Pedicularis heydei Prain, in Journ. Asiat. Soc. Bengal 58, pt. II: 258, 1889. "Western Himalaya: Lahul (*Watt!*); Pangi (*Heyde!*)."

Of these the specific name would select Heyde's for type. This contains a reference to Prain's forthcoming account, which appeared with illustration in Ann. Bot. Gard. Calcutta 3: 140, pl. 27, 1890. A specimen of this collection, in the Dehra Dun Herbarium, gives the year as 1874 and the source as "Leg. & comm. Rev^d. A. W. Heyde." It is but a small piece, very like that shown on Prain's plate but hardly able to show such a transition in leaf-shape from the lower to the upper blades as is there depicted. Accordingly, I take it for an isotype, and presume that the type itself is in the Calcutta Herbarium.

"Flowers rose, paling in folds of throat only, hood darker; very fragrant" (*Koelz* 2414g). Flowering in July and August.

Wet gravelly soil, along streams, at altitudes of 4500 to 5500 meters, in the western Himalayas from Kashmir to Bashahr.

Kashmir: Tiamah, Taklung La, *Koelz* 6491 (USNH). Ladakh: Ke La, *Koelz* 2508c (ANSP, NYBG); Tsakzhun Tso, *Koelz* 2370 (ANSP, NYBG). Chamba: Pangi, *Heyde* (DD). Bashahr: "In regno Bassahir", *Baksh* (UCLA).

11. *Pedicularis chitralensis* spec. nov.

Plate 20, A.

Perennial, perhaps somewhat rhizomatous, with many thin roots from the caespitose crown. Stems several or perhaps many, erect or slightly decumbent at base, simple, 0.5-1.5 dm. tall, bifariously pubescent, hairs longer on upper part of plant. Leaves basal and opposite on the stem: the basal blades long-petioled, the cauline short-petioled (1 or 2 pairs, and these often subbasal, so that the stems appear scape-like), 1-1.5 cm. long, glabrate above, beneath paler, sparsely pubescent or glabrate, the rachis broadly winged (about 1-2 mm. wide), the pinnae 5 to 6 pairs, 1.5-3 mm. long, irregularly denticulate with acute to rounded lobules, in width about equaling the mid-blade; petioles flat and narrowly winged, those of the upper cauline leaves and bracts relatively wide and ciliate, the blades of the bracts small, not over 5 mm. long. Inflorescence of 1 to 3 fascicles, which at first are closely congested, semi-capitate, but eventually become well-separated, loosely villose throughout. Pedicels in anthesis about 2 mm. long, in fruit at least 4 mm. long. Calyx in anthesis 5-6 mm. long, later becoming at least 8-9 mm. long: tube villose, pale, with dark green ribs; lobes all equally

distinct, sharply dentate-lobed, the postero-laterals longest, 3 mm. long, the antero-laterals a little shorter, the mid-posterior smallest, 1 mm. long, as wide as long (or the lobes at times more irregularly joined). Corolla glabrous throughout, purple, about 15 mm. long: tube straight or nearly so, 7-8 mm. long, about $1\frac{1}{2}$ times the length of the calyx; galea erect about 5 mm., then abruptly decurved about 105° to form anther-case, thence cuneately narrowed to the gradually tapering (often slightly upcurved) filiform beak 6-7 mm. long, its slightly bifid apex narrow and barely obtuse; lower lip 8 mm. long, spreading 10 mm. wide, the lobes rounded, the middle one only slightly narrower than the antero-laterals.²⁷ Anthers glabrous, the cells acute at base; filaments glabrous. Capsule not seen.

Perennis; caules plurimi simplices 0.5-1.5 dm. alti bifariam pubescentes; folia basalia et opposita caulina, pinnis 5-6-jugis lobulis acutis rotundatisve denticulatis; inflorescentia 1-3-fasciculata, congesta, tarde elongata, villosa; pedicelli 4 mm. longi; calyx villosus, lobis lobuloso-dentatis, posteriore minimo; corolla undique glabra, purpurea, 15 mm. longa, tubo recto calyce longiore, galea erecta tum valde decurva rostrum rectum tenuem emittente, labio anteriore 10 mm. lato; antherae glabrae, cellulis acutis; filamenta glabra; capsula non visa.

Type, at 3700 meters altitude, Lawarai Pass, Chitral, collected in flower June 26, 1899, by S. A. Harriss; in Dehra Dun Herbarium, isotype in Herb. Academy of Natural Sciences of Philadelphia.

At altitudes of 3600 to 4500 meters, mountains of Chitral. Flowering in June and July.

Chitral: Bumboret ("Bamoreth", "Bimoreth", "Bomboutee"), Harriss (DD, UCLA); "Chunistan" ("Chimistan"), above Rumbur, Harris (DD); Lawarai Pass ("Luwiri Gol", "Sunwari Gol"), Harriss (ANSP, DD); Shishi Kuh ("Purit Gal" = Parpit Pass?), Harriss (DD).

12. *Pedicularis brevifolia* Don

Pedicularis brevifolia D. Don, Prod. Fl. Nepal. 94, 1825. "Hab. in Gosaingsthan Nepalensium. Wallich." Mt. Gosai Than is in the Himalayas above eastern Nepal.

High alpine meadows, at altitudes of 3000 to 4500 meters, through the Himalayas from Hazara to eastern Nepal. Flowering from mid-July to early September.

Hazara (Kagan): Chapri, Inayat (DD); Sar Saifar Maluk Ka Kattha, Inayat 19993 (DD, UCLA); Sarul, Inayat 22044 (DD), 22047 (DD). Muzaffarabad: Musa, Inayat (DD, UCLA). Kashmir: Apharwat, above Gulmarg, Stewart 8854a (ANSP, NYBG, USNH), 10377 (ANSP, GH); Burzil Pass, Stewart 19087 (ANSP, Gord), 19891 (Gord); Kamri Pass, Stewart 18726 (ANSP, NYBG); Nafran, upper Liddar, Stewart 5796 (NYBG); Pahlgam, Stewart 7338; Sonamarg, Stewart 7338a (ANSP, GH), 9869a (ANSP, Gord, NYBG); Tillel ("Tilail"), Duthie 13900 (DD, UCLA); Zoji Pass, Stewart; Zojibal Pass, Stewart 18235 (ANSP, GH). Baltistan: Lal Pir, Koelz 9528 (ANSP, Gord, GH, NYBG); Mir Panzil Pass, Stewart 19934a. Chamba: Brahmour, Koelz 10152 (NYBG, USNA); Tarloknath, Koelz 1070 (NYBG). Lahul: Khokhsar, Koelz 799 (NYBG); via Kukti Pass, Koelz 1216 (NYBG). Garhwal: Palang Gadh, Byans, J. R. Reid (DD). Kumaun: Ralam Valley, Inayat 24794 (DD).

NEPAL: opposite Budhi village, Duthie 5836 (DD).

²⁷ In the single collection of *Pedicularis brevifolia* softened for study (Stewart 9789a from Sonamarg, Kashmir), although the corolla is larger, with more uniformly cylindrical and wider galea-beak that is truncately rounded at apex, I find the mid-anterior lobe of the large lower lip about as large relative to the others as in *P. chitralensis*, rather than $\frac{1}{2}$ the width as portrayed on Prain's plate 26.

In the Annals of the Botanic Garden of Calcutta (3: 134, 1890) Prain gives two forms of this species: *vera*, "tall, erect, leaves 4-nate lanceolate pinnatipartite[,] petioles 0 for upper leaves[,] short for lower, spikes elongated in flower, whorls 3-5 cm. distant"; and *tibetica*, "shorter, ascending, petioles longer, leaves 3-nate or opposite, ovate-oblong, pinnatisect, spikes subcapitate in flower, only slightly elongated in fruit." The former would include the plants of Nepal and Kumaun, the latter those farther west. While I have little material from Kumaun and Nepal, I find it impossible to sustain the suggested contrasts, since tall individuals with 3-leaved whorls and isolated fascicles occur in Hazara (*Inayat* 1993) and Kashmir (*Stewart* 18726), shorter individuals with 4-leaved whorls in Kashmir (*Stewart* 5796, 8854a, and 10326a) and Chamba (*Koelz* 1070 and 1216), while my only Nepal collection (*Duthie* 5836), although relatively tall, bears on the same plant leaves on one stem opposite, on another quaternate (Don's description gave them as either). Finally, the supposed subcapitateness of the inflorescence of *tibetica* seems no more than the natural condition at the beginning of anthesis, and not to be correlated with habit. On these accounts I am not distinguishing as racially different the plants from the eastern and western Himalayas, but consider that the smaller stature of *tibetica* is that usual in the more arid western part of the range, although even there under optimum conditions for growth the larger (*vera*) state may be reached. Naturally, the larger state is that usual in the moist eastern Himalayas.

13. *Pedicularis porrecta* Wallich

Pedicularis porrecta Wall., Numer. List Spec. Ind. Mus. n. 423, 1829, ined.; ex Benth., Scroph. Indicae 52, 1835. "Hab. in Kumaon, *Wallich* . . ." Isotype, labeled by Schweinitz with specific name only, seen in Herb. Academy of Natural Sciences of Philadelphia.

Along streams, at altitudes of 3300 to 4300 meters, through the Himalayas from Chamba to Chumbi. Flowering from late June to September.

Chamba: Kukti Pass, *Koelz* 10182 (NYBG, USNA). Lahul: Khoksar, *Koelz* 745 (NYBG); Rotang Pass, *Nath* 381 (ANSP, NYBG). Dehra Dun-Tehri: Chamsir Pass, *Parmanand* 284 (ANSP, Gord, GH, NYBG, USNA, USNH). Garhwal: above Bhowani, *Duthie* 4264 (DD); Lebang Glacier, *Duthie* 5839 p. p. (DD); Palang Gadh, Byans, *Duthie* 5836 (DD). Kumaun: Ralam Valley, *Duthie* 3226 (DD), *Inayat* 24786 (ANSP, DD, UCLA).

Also seen from Sikkim and Chumbi.

14. *Pedicularis brunoniana* Wallich, spec. nov.

I propose the establishment of this species, suggested by Wallich in his "Numerical List" but never validated by a description. Of this there seem to be two subspecies similar in habit, but showing two stages of evolutionary change in the reduction of the calyx-lobes. In *ctenodonta* the toothed lobes are normally expanded, but in *typica* they are so everted that the pubescent inner surface appears instead forming a seemingly ciliated profile; then, by actual reduction of the everted margin to a nearly or quite entire edge or eventually to its disappearance, the sepal becomes a simple

rounded ciliate projection. Still further reduction has produced the mere low rounded calyx-lobes of *Pedicularis gracilis*. The subspecies of *P. brunoniana* are distinguishable as follows:

KEY TO SUBSPECIES

- A. Calyx-lobes sharply lobulate-toothed, the margin not recurved and so appearing ciliate; bracts doubly and sharply toothed; stems about 1.5 dm. tall.
 14b. *P. b. ctenodonta*
- AA. Calyx-lobes usually less sharply or obscurely lobulate-toothed, the margin tending to be recurved so that the hairs on the inner surface of the calyx appear as a ciliation; bracts similar or with incurved or bluntish teeth; stem 2-4 dm. tall.
 14a. *P. b. typica*

14a. *Pedicularis brunoniana typica*

Pedicularis brunoniana Wall., Numer. List Spec. Ind. Mus. n. 422, 1829, ined. "Kam-aon". Name placed in synonymy of *P. gracilis* Wall. by Bentham, Scroph. Indicae 52, 1835.

Pedicularis gracilis typica f. *prostrata* Prain, in Ann. Bot. Gard. Calcutta 3: 138, 1890. Undescribed, but specimens cited with comment: "spp. haec omnia cum *P. Brunoniana* Wall. consentanea." The name adopted for this form can only designate the plant now considered, while the allusion to *P. brunoniana* characterizes that also.

Pedicularis gracilis macrocarpa Prain, l. c. 138, pl. 21, 1890. "In Himalaya orientali: . . . Phullalooong . . . et Singalelah, 10,000 p. s. m., Clarke (13418)! (12732)! . . ." Six collections cited, of which three were illustrated, and among these Clarke 12732 from Singalelah is that of which the fruit was depicted. Since the variety was distinguished and named for its fruit, this specimen should be accounted type.

While both the names *prostrata* and *macrocarpa* could be used for this plant as a species, neither is appropriate; the plant is not truly prostrate nor is the capsule long for a *Pedicularis*, although it does slightly exceed that of *P. gracilis*. Accordingly, I have reverted to Wallich's original name, which was intended for the plant as a species, and I select as type his number 422 as it occurs in the Calcutta Herbarium and has therefrom been illustrated on Prain's plate 19. Prain's figure C seems this in habit, although the stem is shown as surprisingly thick and strongly angled, and the calyx-lobes are not adequately depicted. That Prain should have included this subspecies in two different varieties of *P. gracilis* is due to the emphasis placed in the one upon the roundness and ciliation of the calyx-lobes, in the other upon the evident presence of teeth on the calyx-margins, both states being present in this subspecies. He distinguished them further by the correlations of sessile bracts with capsules half-exserted from the calyces in *macrocarpa*, and of petioled bracts with capsules slightly exserted in *gracilis typica*, but I fail to sustain either association; the petiolation in all might be counted a somewhat cuncate leaf-base, while the capsules vary from $\frac{1}{4}$ to $\frac{1}{2}$ free in the same plant, according to their maturity.

Perennial. Stems several, lax, somewhat decumbent, usually with some short branches, 2-4 dm. tall, with lines of lanulose pubescence throughout. Leaves ternate or opposite: the lower with longer-petioled blades, the upper short-petioled, glabrate, finely pubescent on both surfaces, except for the white lanulose midrib above, the rachis winged (1-3 mm. wide), the pinnae

5-6 pairs, 2-7 mm. long, more or less doubly denticulate or denticulate-lobed, in width about equaling the mid-blade, those of the bracts linear to obversely cuneate; the blades of the bracts foliose, the upper smaller, wider and shorter, obtusely lobed. Inflorescence lax, of 6 to 8 fascicles on main stem, fewer on branches. Pedicels 1-2 mm. long. Calyx 4-5 mm. long: tube externally villulose to glabrous with narrow green ribs, internally pubescent; lobes 5, equally distinct, mostly as long as wide, all denticulate with acute or acutish teeth or with these obsolescent or obsolete, usually the margin so everted as to show in contour the inner hairy surface of the calyx, that forms seemingly a short dense ciliation. Corolla glabrous throughout (or galea sparsely glandular-puberulent), purple: the tube straight, 4 mm. long, slightly exceeding the calyx; the galea erect about 4 mm., then expanded and abruptly decurved 90° or slightly more to form anther-case, cuneately narrowed, next attenuate to a tapering filiform beak about 7 mm. long, its apex slightly widened; lower lip 8-10 mm. long, the lobes rounded, the mid-anterior distally placed and much smaller. Anthers glabrous, the cells acute at base; filaments glabrous. Capsule 7 mm. long, 3 mm. wide, narrowly ovoid-ensiform, dehiscing posteriorly and also distally anteriorly.

Perennis; caules plurimi ramosi 2-4 dm. alti 2-4 fariam pubescentes; folia ternata vel opposita, pinnis 5-6 jugis denticulatis sive denticulato-lobulatis; inflorescentia laxa; pedicelli 1-2 mm. longi; calyx villosulus aut glaber, lobis 5 omnis denticulatis vel subintegris et dense ciliatis; corolla undique glabra, purpurea, tubo recto calycem parum excedente, galea erecta valde decurva rostrum rectum filiformem emittente, labio anteriore 8-10 mm. longo; antherae glabrae, cellulis acutis; filamenta glabra; capsula 7 mm. longa, anguste ovoideo-ensiformis.

Moist open places, at altitudes of 3000 to 4000 meters, through the Himalayas from Bashahr to Chumbi. Flowering in August.

Bashahr: Chitkal Pass, *Parmanand* 987 (ANSP, Gord. GH, NYBG, USNH); Kashang, *Lace* 481 (DD); Pangi, *Baksh* 5177 (UCLA). Tehri: Dangulla, *Duthie* 1874 (DD); Jangla, *Duthie* 233 (DD); Jumnotri, *Duthie* 810 (DD). Garhwal: Badrinath, *Schlagintweit* 10063 (GH); Gathang, *Strachey & Winterbottom* 11 (GH). Kumaun-Gori Valley: Parbhu, *Inayat* 24788 (ANSP, DD); Rilkote, *Inayat* 27489 (DD); Surajkund, *Inayat* 24802 (DD). -Kali Valley: Budhi, *Inayat* 24797 (DD); -Ralam Valley, *Duthie* 3224 (DD), *N. Gill* 594 (ANSP, UCLA).

Also seen from Sikkim and Chumbi.

14b. *Pedicularis brunoniana ctenodonta* subsp. nov.

Plate 20, B.

Stems 1.5-2 dm. tall. Calyx-lobes all deeply and sharply lobulate-dentate, planely expanded and concealing the hairy inner surface of the calyx. Galea of corolla more strongly glandular-puberulent.

Caules 1.5-2 dm. alti; lobi calycis valde lobulato-dentati erecti; galea corollae magis glandulari-pubescens.

Type, at 4900 meters altitude, Kukti Pass, east of Brahmour, Chamba, collected in flower in early July 1936, for Walter Koelz, no. 10180; in Herb. United States National Arboretum, isotype at Gordon College in India. Only collection seen.

Akin to *Pedicularis brunoniana*, with similar corolla and calyx, is *P. khasiana* (J. D. Hooker) comb. nov., based upon *P. gracilis khasiana* Hook.

f., Fl. Brit. India 4: 307, 1884, its type being from "Khasia Mts.; alt. 5-6000 ft., Griffith." Collections in the Dehra Dun Herbarium from Khasia (*J. D. Hooker & T. Thomson*) and from Assam (*Upendranath Kanjibal 4494* from "22nd mile China Rd.") fit well Hooker's and Prain's descriptions, the elongated slender stems, the small sessile leaves, bracts shorter than calyces, very short-pediceled flowers, ovate and ciliate calyx-lobes, and slender up-curving beak of galea being quite as in Prain's illustration (in *Ann. Bot. Gard. Calcutta* 3: 138, pl. 21, 1890). The plant seems best considered as a separate species.

15. *Pedicularis gracilis* Wallich

Pedicularis gracilis Wall., Numer. List Ind. Mus. n. 413, 1829, ined. "Nepalia 1821 Gossain Than"; ex Benth., *Scroph. Indicae* 52, 1835. "Hab. in Napalia, Gossain Than et Kamaon, Wallich, Mussooree, Royle." Type should be Wallich 413 as represented at Kew Gardens. This is evidently the number that should accompany what must be an isotype in the Academy's Herbarium that was labeled by Schweinitz merely "*Pedicularis gracilis* Wallich." Wallich had also considered as species *P. stricta* and *P. brunoniana*, based on his numbers 414 and 422, respectively, but both were treated by Bentham as variants of *P. gracilis*. An isotype of the former, marked by Schweinitz "*Pedicularis stricta* 414 Kamaon Wall.", is in the Academy's herbarium; it represents the state of *P. gracilis* in which the terminal raceme is well developed; this is maintained as a form by Prain (in *Ann. Bot. Gard. Calcutta* 3: 137, 1890), but it does not seem to me worth taxonomic recognition. The latter, *P. brunoniana* Wall., is, however, now taken up as a valid species.

Steep dry slopes, at altitudes of 1800 to 2700 meters, through the outer Himalayas from Hazara to Chumbi. Flowering in August and September.

Hazara: Changla Gali, Murree Hills, *Stewart* 4049, 4064a; Galimusalla, cur. *Duthie* (UCLA); Deoli & Richmori, Saran Range, *Inayat* (DD). Rawalpindi. Murree Hills, — (UCLA). Chamba: Brahmour, *Koelz* 10187 (USNA); Dalhousie, *Clarke* 22354 (USNH); between Tisa and Alwas, *Gammie* 18258 (ANSP, DD, UCLA). Kangra: Kothi ("Kathi"), Kulu, *Nath*; Rotang Pass, *Stewart* (Gord); from Teelie to Naga (Nagar), *Dr. Falconer's collectors* (DD). Simla: Mattiana, *Drummond* (DD); Simla, *Drummond* 576 (DD), *Duthie* 8808 (DD), *Gamble* 4775 (DD). Bashahr ("Bhusawur", "Bursahir"): Pauwi, *Brandis* 3157 (DD); Raghgham, *Parmanand* 932 (ANSP, Gord, GH, NYBG, USNA, USNH); Tarnanda to Semhan, *Lace* 452. Dehra Dun: Deoban, Chakrata, *Champion* (DD); Deosari beyond Mussoorie, *Stewart* 11335; Jaunsar, *Rai-zada* 7156 (DD); Mussoorie, *Duthie* (DD), *Gupta* (DD, USNH), *Royle* 125/4 (DD). Tehri: Tihri road beyond Landour, *Duthie* (DD). Almora (Kumaun): Almora, — (DD); Bhim Tal ("Bheemtali"), near Almora, — 503 (DD); Cheena, *Davidson* (DD); Biupato, Gori Valley, *Inayat* 24798 (DD); Kali Valley, Byans, *Duthie* 3223 (DD); Shafandiyar, Ralam Valley, *Inayat* 24784 (DD); "Kumaon", *Wallich* 414.

Also seen from Nepal, Sikkin, and Chumbi.

The range of this coarse annual species seems to be not as extensive as supposed by Prain. Within the Himalayas nearly all specimens from high altitudes pertain to the lower-growing perennial *Pedicularis brunoniana* Wall. Eastward in Yunnan what has been termed *P. gracilis*, although annual and much branched as is that species, has its calyx-lobes as long as wide (as in *P. brunoniana*), and evidently represents yet another entity with characters that I shall not attempt to elaborate now.

16. *Pedicularis tenuirostris* Bentham

Pedicularis tenuirostris Benth., Scroph. Indicae 52, 1835. "Hab. ad Pyr Pundjal, *Royle*." Description distinctive.

Corolla pale yellow, beak darker or purple. Flowers faintly fragrant. Flowering from late July to late August.

In rank herbage in open, at altitudes of 2300 to 3700 meters, through the Himalayas nearly from the Afghan border to Tehri.

Dir: Mirga, *Gatacre* 17387 (DD). Hazara (Kagan Valley): Charnat, *Inayat* 22046 (ANSP, DD); Karkun, *Inayat* 19998 (DD); Naran, *Inayat* 19997 (DD). Gilgit (or perhaps on expedition to Gilgit): —, *Biddulph* (DD), *Giles* (DD). Kashmir: Chorwan. *Stewart* 19738 (GH, NYBG); Gadsar, *Stewart* 18299 (ANSP, USNH); Ichnarnala, Liddar Valley, *Inayat* 25726 (DD); Kaghban, *Duthie* (DD); Kamri Valley, *Duthie* 12536 (DD); Koragbal, *Koelz* 9224 (GH, USNA); Pahlgam, *Stewart*; Peshwari, *Koelz* 9328 (NYBG, USNA); Sonamarg ("Sunamarg"), *Gammie* (DD), *Stewart* 6641; Tanin, Liddar Valley, *Duthie* 13318 (DD); Tragbal, *Stewart* 4815. Chamba: Hodan Valley, *Harsukh* (DD). Pangi: Chenab, *Brandis* 3145 (DD); Pargraon, *Lace* 1632 (DD). Lahul: Shipting Nullah, *Koelz* 910 (NYBG). Bashahr ("Bassahir"): Kilba, *Baksh* 5175 (UCLA); Sangla, *Parmanand* 925 (GH, NYBG, USNA). Tehri: Nila Valley, *Duthie* 561a (DD); upper Ganges: between Bhaironghati ("Byramghati") and Gangotri, *Duthie* 1873 (DD); near Darali ("Derali"), *Duthie* 561 (DD).

17. *Pedicularis pectinata* Wallich

One of the dominant and characteristic species of the western Himalayas. In its various subspecies the inflorescence passes from glabrous to hirsute, the tendency to hairiness increasing westward. *Typica*, which is of more eastern distribution, is generally glabrous as to calyx (although the bracts may be ciliate), while *bipinnatifida*, mostly more western, is usually quite hairy. Such an eastern occurrence of *bipinnatifida* as *Parmanand* 698 from Bashahr is glabrous, while for *typica*, *Stewart* 5363 from Kashmir is strongly hirsute. These subspecies may be distinguished as follows:

KEY TO SUBSPECIES

- A. Inflorescence of 4 to 12 disjunct fascicles, elongated; lower bracts lanceolate, pinnatifid-lobed to often entire; stem normally over 3 dm. tall, with 2 to 5 whorls (or pairs) of leaves below inflorescence.
 - B. Leaf-blades pinnatifid, the pinnae linear-lanceolate, slightly to strongly or saliently serrate-dentate; stem usually 4-8 dm. tall.....17a. *P. p. typica*
 - BB. Leaf-blades bipinnatifid, the pinnae with strongly developed sharply toothed lobes; stem 3-4 dm. tall.....17b. *P. p. palans*
- AA. Inflorescence of 2 to 4 usually approximate fascicles, often condensed and head-like; lower bracts ovate in general outline, usually strongly or doubly pinnatifid-lobed; leaf-blades pinnatifid, the pinnae often deeply and doubly cut; stem 1.5-3 dm. tall, with 1 or 2 whorls (or pairs) of leaves below inflorescence.
 - 17c. *P. p. bipinnatifida*

17a. *Pedicularis pectinata typica*

Pedicularis pectinata Wall., Numer. List Spec. Ind. Mus. n. 420, 1829, ined. "Kamaon": ex Benth., Scroph. Indicae 52, 1835. "Hab. in Kamaon, *Wallich*, ad Choor, Pyr Pundjal, et versus Cashmere. *Royle*." To be typified by Wallich's plant from Kumaon; this not studied but all collections seen from so far east are the subspecies now considered. The description favors this in describing the plant as tall, and the leaf-segments as lanceolate.

Stem usually 4 to 8 dm. tall, erect or slightly decumbent at base, bearing 2 to 5 whorls or pairs of leaves. Leaf-blades pinnatifid, the pinnae

serrate to pinnatifid-dentate, not or obscurely toothed. Inflorescence in anthesis elongated, appearing spike-like, of about 4 to 12 fascicles, in fruit yet longer, usually glabrate or glabrous, but sometimes hirsute, the lower bracts lanceolate, slightly foliose-lobed to entire.

Corolla purple, with white throat. Flowering from mid-July to early September.

Meadows and moist rocks, at altitudes of 2300 to 4300 meters, through the Himalayas from Muzaffarabad and Gilgit to Kumaun.

Muzaffarabad-Punch: Uri to Aliabad, Pir Panjal Range, *Stewart* 13936. Gilgit: Gilgit, *Biddulph* (DD), *Duthie* 12402 (DD), *Tanner* 253 (DD), 254 (DD). Astor: Doyan, Astor Valley, *Duthie* 12461 (DD). Kashmir: Ganderbal, *Drummond* 14375 (UCLA); Kalhoi, Liddar Valley, *Inayat* 25729 (DD); Pahlgam, *Stewart* 5363, 5528a, 9229 (NYBG); Sonamarg, *Gammie* (DD), *Stewart* 9711 (ANSP, GH, NYBG); Tragbol ("Tarakbal"), *Koeltz* 9126 (ANSP, NYBG, USNA). Udhampur-Dzama: Padri Pass to Bhadrar, *Schlagintweit* 3136. -Kishtvar: Kishtvar to Pir Patsaski, *Schlagintweit* 3718 (ANSP, Gord), 3719 (USNH). Baltistan: Kapalu, *Hunter-Weston* 10259 (DD). Chamba ("Tsamba"): Chamba to Padri Pass, *Schlagintweit* 3601; between Dalhousie and Chamba, *Gammie* 18070 (DD); between Kilar and Luj, *cur. Duthie* (ANSP, UCLA). Lahul: Dilburig, Chenab Valley, *Chand* 47a p. p. (USNH), *Parmanand* 47b (USNA); Rotang Pass, *Nath*. Simla: —, *Drummond* 588 (DD), 614 (DD), 621 (DD), *Gamble* 6493b (DD), *Royle* 125/5 (DD). Bashahr: near Harang Pass, *Lace* 318 (DD); "Bassahir", *Baksh* 5171 (UCLA); "Kunawar", *Baksh* 5172 (UCLA). Dehra Dun (Jaunsar): between Deoban and Kinam Pani, *C. Singh* 1203 (DD); near Kharamba, *Raizada* 7275 (DD); Uinam Pass, *Duthie* 12041 (DD). Tehri: across Bamsura and Chaia passes (between Bhagiratti and Jamna valleys), *Schlagintweit* 901a (GH); Gangotri ("Gangoltau"), *Keshavanand* (DD); Jumnotri, — 33 (DD); Rhudughera, *Duthie* 238 (DD); Srikanta, *Duthie* 560 (DD), 560a (DD). Garhwal: Dombitra Gadh, *Duthie* 4260 (DD); Kidarnath, *Strachey & Winterbottom* 15 (GH); Mana to Sarsutti, *Schlagintweit* 7793 (GH), 8635 (GH). Almora: Pindari Glacier, *C. E. Parkinson* 5982 (DD). Kumaun-Byans: Chalek, *Duthie* 5840 (DD), near Kuth, *Duthie* 3218 (DD), Palang Gadh, *Duthie* 5840 (DD). -Darma: Mulapa Gadh, *Duthie* 5840 (DD). -Gori Valley: Parbhu, *Inayat* 24807 (DD), Rilkote, *Inayat* 24801 (DD), 24803 (DD); Ralam Glacier, *Duthie* 3217 (DD); Saba, *Strachey & Winterbottom* 5 (GH).

17b. *Pedicularis pectinata palans* Prain

Plate 21, A.

Pedicularis pectinata palans Prain, in Journ. Asiat. Soc. Bengal 58, pt. II: 255, 1889.

"*P. pyramidata* Herb. Ind. or. H. f. & T. T. (nec Royle)." Isotypes, bearing form-label stating "Hab. Himal. Bor. Occ. Regio temp. Alt. 7-12,000 ped. Coll. T. T." seen in Gray Herbarium of Harvard University and in Herb. New York Botanical Garden. Like so many of Hooker & Thomson's distribution (which comprised pooled collections of each species that were distributed without statement of localities), this proves to be a mixture of entities. There are present on the two sheets seen *P. pectinata typica* (NYBG), *P. p. bipinnatifida* (GH), and *P. kashmiriana* (GH). None of these show the "leaves pinnatisect" with "segments pinnatipartite", as claimed in Prain's brief description. Nor indeed are they so illustrated a year later on plate 23 of Prain's revision of the Indian species of *Pedicularis* (in Ann. Bot. Gard. Calcutta, vol. 3); thereon the segments are shown as linear and but little more cut than in *P. pectinata typica*, while on page 130 they are described as linear. The only part of the original description now stressed and depicted is that the calyx-lobes should be ovate rather than lanceolate, a distinction that I find quite invalid. The illustrations on plate 23, supposedly of *typica* and *palans*, seem to me both of *typica*. But there does appear to be a rare or local plant of the western Himalayas in which the primary segments of the leaves are truly pinnatipartite, and it may be that Thomson collected it on some side excursion from Rawalpindi, although the map of his travels appearing as frontispiece to the "Itinerary Notes" published at Calcutta in 1848 shows no visit to the Muree Hills. That such a lax plant with long inflorescence was meant is proved by the combination of the varietal name chosen, signifying "straggling", with the allusion to the description of *P. pectinata pyramidata* in Hooker's Flora of British India (4: 306, 1884) where the most distinctive character is "spikes sometimes 1 ft. long."

Stem 3-4 dm. tall, erect, bearing 2 to 4 whorls (or pairs) of leaves. Leaf-blades bipinnatifid, the pinnae narrowly elliptic, with narrow mid-vein exceeded by the lanceolate, incised-denticulate lobes. Inflorescence elongated, of about 7 fascicles, not seen in fruit, hirsute, the lower bracts slightly foliose, lanceolate. Otherwise as in subsp. *typica*.

Corolla described by collector as "pale pink, white in center of lower lobe". It was gathered by Dr. Stewart on October 3, 1931.

Rawalpindi: Ghora Gali, Murree Hills, *Stewart* 12419 (ANSP, Gord).

17c. *Pedicularis pectinata bipinnatifida* subsp. nov.

Plate 21, B.

Stem 1.5-3 dm. tall, slightly decumbent at base, bearing 1 or 2, rarely 3, whorls or pairs of leaves. Leaf-blades pinnatisect, the pinnae oblong, mostly pinnatifid, with incised-dentate teeth. Inflorescence at anthesis short, at first appearing as one or a few heads, but of 2 to 4 fascicles, not seen in fruit, usually hirsute but varying to glabrate, the lower bracts usually foliose, ovate in general outline and much lobed. Otherwise as in subsp. *typica*.

Caulis 1.5-3 dm. altus; folia saepissime bipinnatifida; inflorescentia 2-4 fasciculata congesta plerumque hirsuta, bracteis inferioribus latis.

Type, Sarul, Kagan, Hazara, collected in flower August 13, 1897, by Inayat, no. 22051; in Herb. Academy of Natural Sciences of Philadelphia.

In flower wholly as subsp. *typica*, but usually well contrasted by the characters given. However, occasionally the lower bracts are relatively narrow as in *typica*, while the leaf-cutting of that in its secondary lobing may at times approach *bipinnatifida*. Though all specimens may be satisfactorily assigned to one or the other, the distinguishing characters so fluctuate as to lead me to place both under the same species.

Corolla purple ("deep rose"), with throat white and a white spot on lip. Fragrant. Flowering from late June to early September.

Wet soil, meadows and in pine forests, at altitudes of 3000 to 4400 meters, through the western Himalayas from Hazara to Bashahr.

Hazara (Kagan): Bagnu, *Inayat* (DD); Bhurj, *Inayat* 22051b (DD); Chapran ("Chipran"), *Inayat* (DD, UCLA); Chapri, *Inayat* (ANSP, DD, UCLA); Gali Musalla, Saran Range, *Inayat* (DD); Gittidas ("Gitidass"), *Inayat* (DD); Makra, *Inayat* (ANSP, DD, UCLA); Musa Ka Musalla, Saran Range, *Inayat* (DD); Nila-Ganja, *Inayat* (DD), Kharru, *Inayat* (DD), Raji Bhogi, *Inayat* 22051a (DD); Sar Saifar Maluk Ka Kattha, *Inayat* 19994 (DD, UCLA); Sarul, *Inayat* 22051 (ANSP, DD, Gord, UCLA, NYBG); Silan, *Inayat* (DD). Muzaffarabad: Bangas, *Inayat* 22050b (DD, UCLA); Chobsar, *Inayat* (ANSP, DD, UCLA); Kala Jabra, *Inayat* 22050a (DD); Musa, *Inayat* 22050 (ANSP, DD, UCLA); Sarsangarh ("Sarsangar", "Sarsangarb"), *Inayat* (ANSP, DD, UCLA); Thora, *Inayat* 22050c (UCLA). Astor: Suth Snee, beyond Burzil ("Barzil") Pass, *Strachey & Winterbottom* 589 (DD). Kashmir: Apharwat, *Gammie* (DD), *Stewart* 10326a (ANSP, USNH); Babam Pass, between Jagran and Kishanganga valleys, *Keshavanand* 389 (DD); Badzulkod Nullah, *Duthie* 13422 (ANSP, DD, UCLA); Gangabal Lakes, *Stewart* 18203 (Gord); Gulmarg, *Duthie* 11294 (DD), *Stewart* 10326 (NYBG), 10505; Kajenag, Hamal basin, *Keshavanand* 853 (DD); Killanmarg, above Gulmarg, *Stewart* 8742 (Gord); Liddarwat, *Duthie* 13549 (DD); Shakhara Pass, Jagram basin, Kishanganga Valley, *Keshavanand* 340 (DD), 345 (DD); Sonamarg, *Stewart* 6883, 9788a (Gord, GH, USNH); Trunkal, near Gangabal Lakes, *Stewart* 4501. Chamba: Sach ("Sauch") Pass, — (DD); Satrundi, *Harsukh* (DD, UCLA); Tarlok Nath, *Koelz* 1055 (NYBG). Lahul: Kukti Nullah, *Koelz* 8563 (ANSP, NYBG).

USNA); via Kukti Pass. *Koelz* 1200 (NYBG); Kyelang, *Koelz* 498 (NYBG), 572 (NYBG); Pukar, *Koelz* 10001 (NYBG, USNA); Sisu, *Koelz* 651 (NYBG, USNH). Bashahr: Chuling Chini, *Parmanand* 698 (ANSP, Gord, GH, NYBG, USNA).

18. *Pedicularis stewartii* spec. nov.

Plate 22, A and B.

Perennial. Stems several, erect or ascending, simple below the inflorescence, about 4 to 8 dm. tall, with fine lines of pubescence from leaf-bases or glabrous below. Leaves whorled in threes or fours, the basal longer-petioled ones deciduous by anthesis, the cauline of 3 to 7 whorls, short-petioled, ample, glabrous or nearly so, beneath finely reticulate-veined, elliptic in general outline, pinnatipartite (the rachis narrowly winged) into 10 to 15 pairs of lance-linear pinnae 1.5-3 cm. long, 2-4 mm. wide, doubly dentate or dentate-lobed, the leaf distally attenuate to an obtuse tip. Bracts lanceolate, the lower foliose, the upper much smaller, dentate or denticulate, acuminate-tipped. Inflorescence lax, terminating stem and short upper branches, that of the main stem of 6 to 12 disjunct fascicles, the rachis with 3 or 4 lines of brown recurving hairs. Pedicels 1-2 mm. long. Calyx 10-12 mm. long, with 5 narrow green ribs to the lobes and with 5 intervening narrower ribs, the lobes 1 mm. long, broadly triangular at base, distally becoming lanceolate or lanceolate-attenuate, the tube split anteriorly more than $\frac{1}{2}$ to base. Corolla glabrous nearly throughout, purple: tube 7-8 mm. long, decurved through anterior slit of calyx; galea erect 10 mm., forming distally an ample anther-case, thence abruptly decurved, porrect, and gradually narrowing 8-10 mm. into the slender decurved or slightly coiled beak 6-7 mm. long; lower lip 10-12 mm. long, the lobes rounded, the mid-anterior distally placed and much smaller. Filaments pubescent at base (as is the adjacent surface of corolla, together forming a hairy ring about summit of ovary and marking the upper limit of the thickened basal part of the corolla-tube), thence glabrous until the hirsute portion just below anthers; anthers glabrous, the cells acute at base. Capsule ovoid, glabrous, blackish, abruptly acute, 11-13 mm. long, 8 mm. wide, the cells nearly equal. Seeds 4 mm. long, 1.3 mm. wide, loosely alveolate-reticulate.

Perennis; caules plurimi sub inflorescentiam simplices 3-4-fariam pubescentes aut inferne glabri; folia ternata vel quaternata pinnatipartita, pinnis 10-15-jugis lanceolato-linearibus dentatis vel dentato-lobulatis; inflorescentia laxa; pedicelli 1-2 mm. longi; calyx 10-12 mm. longus, lobis triangulari-lanceolatis, tubo antico fisso; corolla purpurea, tubo decurvo, galea erecta 10 mm., valde decurva, porrecta, et acuminato-attenuata 8-10 mm., rostrum tenuem decurvum contortumve 6-7 mm. longum emittente, labio inferiore 10-12 mm. longo; antherae glabrae, cellulis acutis; filamenta basi pubescentia, inde glabra, apice hirsuta; capsula 11-13 mm. longa, ovoidea, cellulis subaequalibus; semina 4 mm. longa.

Type, dry ridge in forest, 2400-2800 meters altitude, Pahlgam, Kashmir, collected in flower July 30, 1927, by Ralph R. Stewart, no. 9248; in Herb. Academy of Natural Sciences of Philadelphia.

Open forest, at altitudes of 2400 to 3700 meters, in the western Himalayas from Hazara to Chamba. Flowering from mid-July to early September.

Hazara (Kagan Valley): between Malkandi and Shogram, *A. Hafjsthan* (DD). Kashmir: -Liddar Valley: above Kainmul, *Duthie* 13161 (DD); above Tanin, *Duthie* 13319 (DD); Pahlgam, *Stewart* 9248 (ANSP, Gord); Tulion above P., *Irshad Ullah* (ANSP, NYBG). -Sind Valley: above Kullian, *Duthie* 13583 (DD); Zaiwan, *Stewart* 12533 (Gord), 12545 (ANSP, NYBG); Sonamarg, *Stewart* 6717, 6856. Chamba: between Alwas and Sach Pass, *Gammie* 18401 (ANSP, DD, UCLA). -Pangi: Chenab, *Brandis* 3158 (DD); between Kilar and Luj, *Harsukh* (ANSP, UCLA). -Rangi Forest, *Lace* 1651 (DD); Urnu Forest, *Inayat* (DD).

19. *Pedicularis cyrtorhyncha* spec. nov.

Plate 23, B.

Perennial. Stems several, erect, simple, 1-4 dm. tall, with lines of pubescence from nodes or glabrous below. Leaves ternate or opposite, the basal long-petioled (petioles as long as or longer than the blades), persisting at anthesis, the cauline of 2 nodes, short-petioled, all glabrous, not evidently reticulate, ovate-lanceolate to ovate in general outline, 1.5-5 cm. long, pinnatifid (the rachis narrowly winged) into 5 to 9 pairs of nearly oblong to linear pinnae, 3-5 mm. long, 1-3 mm. wide, irregularly dentate-lobed with denticulate, often callose margins, the leaf-blades distally with short indistinct pinnae, at apex obtuse or acutish. Bracts ovate, entire or denticulate, the lower longer and pinnately lobed, somewhat villose-hirsute, the upper becoming glabrate or glabrous. Inflorescence elongated, of 10 to 15 fascicles, lower disjunct or usually all densely aggregated, the rachis with 3 lines of brown recurving hairs. Pedicels in anthesis 1-2 mm. long. Calyx in anthesis 6-7 mm. long, narrowly 10-ribbed, glabrate or glabrous, the lobes ovate, acute, laterally 1 mm. long, the tube slightly more cleft medianly. Corolla glabrous nearly throughout, doubtless purple (no record of color): tube 8 mm. long, straight; galea erect 5 mm., forming a widened anther-case, then abruptly decurved over 130°, thence abruptly contracted into a slender up-curved and slightly coiled beak 6-7 mm. long; lower lip 8-10 mm. long, flabellately expanding 12-14 mm. wide, the lobes rounded, the mid-anterior distally placed and narrowest. Filaments hirsute at base, and strongly so distally, but glabrous most of length; anthers glabrous, the cells acute at base. Capsule not seen.

Perennis; caules plurimi simplices 2-3-fariam pubescentes aut inferne glabri; folia ternata vel opposita pinnatifidita, pinnis 5-9 jugis oblongis aut linearibus dentato-lobulatis; inflorescentia elongata 10-15-fasciculata; pedicelli 1-2 mm. longi; calyx 6-7 mm. longus, glabratus, lobis ovatis acutis; corolla purpurea, tubo recto, galea erecta 5 mm., valde decurva, abrupte contracta, rostrum tenuem surrectum et contortum 6-7 mm. longum emitente, labio anteriore flabellato 8-10 mm. longo; antherae glabrae, cellulis acutis; filamenta basi pubescentia, inde glabra, apice hirsuta; capsula non visa.

Type, at 4000 meters altitude, Pustuson, Beori, Chitral, collected in flower July 9, 1899, by S. A. Harriss; in Dehra Dun Herbarium.

At altitudes of 2000 to 4300 meters, mountains of Chitral (west of the Indus gorges). Flowering in July and August.

Chitral: Arnawei Valley, *Gatacre* 17386 (DD); Pustuson, Beori, *Harris* (DD); Lowari Range, *Gatacre* 17389 (DD); Puri Gol, Shishi Kuh, *Harriss* (DD, UCLA). Dir: Mirga, *Gatacre* 17388 (DD).

20. *Pedicularis pyramidata* Royle

Pedicularis pyramidata Royle, ex Benth., Scroph. Indicae 52, 1835. "Hab. in Himalaya versus Cashmere, Royle." Description distinctive.

One of the most stately and beautiful species of its genus. Flowers purple, recorded by Koelz as "old rose", "lavender rose", and "rose purple", but without further detail. Flowering from mid-July to early September.

Mountain meadows and slopes, and openings in birch forest, at altitudes of 2700 to 5000 meters, through the western Himalayas from Chitral to Lahul.

Chitral: Bumboret ("Bamboreth"), *cur. Duthie* (UCLA); Zakanah Pass, Arnawei Valley, *Gatacre* 17384 (DD). Hazara: -Kagan: Nila, *Inayat* 22049a (DD); Sarul, *Inayat* 22049 (DD); Zer Bhurj Bhonja Ka Kattha, *Inayat* 20000 (DD). -Saran Range: Gali Mussalla, *Inayat* (DD); Urni, *Inayat* (DD, UCLA). Gilgit (or Gilgit Expedition): —. *Giles* (USNH). Astor: Tarshing ("Tirshing") Pass, *Strachey & Winterbottom* 539 (DD). Kashmir: Mt. Agharwat, *Stewart* 10451 (NYBG); Baltal, Sind Valley, *Duthie* 11550 (DD), *Stewart*; Banihol Pass, *Nasir*; Barzalkod Nullah, Liddar Valley, *Duthie* 13433 (DD); Burzil Pass, *Stewart* 19057; pass between Chitra Nag and Jaodar village, *Keshavanand* 1405 (DD); Gadsar, *Stewart* 18343; Gulmarg, *Stewart* 10344 (ANSP, USNH); Gurez ("Gures"), *Schlagintweit* 12031; Kalapani, Kamri Valley, *Duthie* 12568 (DD); Kamri Pass, *Duthie* (DD), *Stewart* 18733; Kargeh Valley above Tilel ("Tilail"), *Duthie* 13898 (DD); Kolahoi ("Kalhoi"), Liddar Valley, *Inayat* 25724 (DD), *Stewart* 9452; Pahlgam, *Stewart*; Sarkal, below Hadmukh, *Keshavanand* 1357 (DD); Sonamarg, *Duthie* 11482 (DD), *Stewart* 6806, 6822 (NYBG), 6894, 7280 (NYBG), 7384 (NYBG), 9787a (Gord, USNH), 9828 (DD, Gord, GH), 9918 (Gord, GH, USNH); above Tanin, Liddar Valley, *Duthie* 13320 (DD, UCLA); Tragbol ("Tarakbal") Pass, *Koelz* 9204 (NYBG, USNA), *Stewart* 4627; above Waziri Thal, *Stewart*; Yamhar ("Yamharu") Pass, *Duthie* 13564 (DD), *Stewart* 12527; Zoji Pass to Mitsahoi, *Stewart* (Gord); Zojibal Pass beyond Gangabal Lakes, *Stewart* 18203. Udhampur: Bhadrar to Kishtvar, *Schlagintweit* 3466. Baltistan: Satpura La, *Stewart* 20207 (Gord, GH); Satpura Nullah, above Skardu, *Stewart* 20262; Thalle La, *J. R. Graham* (Gord). Ladakh: ²⁸ above Bragnag, *Koelz* 2803 (ANSP, NYBG, USNH). Lahul: ²⁸ Kardong to Dartse, Bhaga Valley, *Schlagintweit* 2865 (UCLA, USNH); Kolung, *Koelz* 5242 (Mich), 10077 (ANSP, Gord, USNA); Kyelang, *Koelz* 396 (NYBG). Nath 289 (ANSP, NYBG); Pakar, *Koelz* 8467 (USNA); Sisu to Gondla, *Nath*. Zaskar: Rangdum, *Koelz* 5966 (USNH), A33 (ANSP, NYBG).

21. *Pedicularis kashmiriana* spec. nov.

Different in aspect from *Pedicularis pyramidata*, but perhaps intergrading with it from Baltistan to Lahul. Seemingly composed of two subspecies, to be distinguished as follows:

KEY TO SUBSPECIES

- A. Lower lip of corolla 10-12 mm. wide, the beak of the galea slender.
21a. *P. k. typica*
- AA. Lower lip of corolla 15 mm. wide, the beak of the galea relatively stout.
21b. *P. k. ornata*

21a. *Pedicularis kashmiriana typica*

Plate 23, A.

Perennial. Stems several, erect, simple below the inflorescence, 3 to 7 dm. tall, with lines of pubescence from nodes or glabrous below. Leaves whorled in fours or sometimes opposite, the basal longer-petioled, persisting or deciduous at anthesis, the cauline of 2 to 5 nodes, shorter-petioled, all

²⁸ Plants from Lahul and Ladakh are relatively small-flowered.

glabrous, beneath finely reticulate-venose, elliptic-ovate in general outline, mostly 3-6 cm. long, pinnatipartite (the rachis narrowly winged) into 8 to 12 pairs of lance-linear pinnae 1-2 cm. long, 2-4 mm. wide, dentate or dentate-lobed with denticulate, often cuspidate teeth, the leaf-blades distally with short and indistinct lobes, gradually narrowed to an obtuse tip. Bracts lanceolate to ovate-lanceolate, entire or nearly so throughout, attenuate, ciliate with long hairs (but the tapering apex eciliate and often callose), often loosely villose on back. Inflorescence elongated, terminating stem and upper branches, that of the main stem of 10 to 20 somewhat disjunct or crowded fascicles, the rachis villose with 4 lines of brown hairs. Pedicels becoming 1-2 mm. long. Calyx 9-12 mm. long, narrowly 10-ribbed, the ribs to the sinuses fainter, all ribs loosely villose, the lobes ovate-lanceolate to lanceolate, acute, 1-2 mm. long, the tube slightly more deeply cleft anteriorly. Corolla glabrous throughout, purple: tube 9-10 mm. long, nearly straight; galea ascending 5 mm., forming an ample anther-case, then abruptly decurved, porrect and strongly contracted 3-4 mm. into the slender decurved and usually coiled beak about 8 mm. long; lower lip spreading, 10 mm. long, 12 mm. wide, the mid-anterior lobe small and distally placed. Filaments all hirsute distally, proximally and medianly glabrous; anthers glabrous, the cells acute at base. Capsule ellipsoid, glabrous, blackish, acute, 10-12 mm. long, 5-6 mm. wide, the cells nearly equal. Seeds 3 mm. long, 2 mm. wide, alveolate-reticulate, the longitudinal ridges raised into thin wings less than $\frac{1}{3}$ width of seed-body.

Perennis; caules plurimi 3-7 dm. alti sub inflorescentiam simplices in lineis pubescentes aut inferne glabri; folia quaternata vel opposita pinnatipartita, pinnis 8-12-jugis lanceolato-linearibus dentatis vel dentato-lobulatis; inflorescentia elongata 10-20 fasciculata; pedicelli 1-2 mm. longi; calyx 9-12 mm. longus, villosus, lobis ovato-lanceolatis vel lanceolatis; corolla purpurea, tubo fere recto, galea adscendente 5 mm., abrupte decurva, porrecta et valde contracta 3-4 mm., rostrum tenuem decurvum et saepissime contortum 8 mm. longum emittente, labio anteriore 12 mm. lato; antherae glabrae, cellulis acutis; filamenta solo ad apicem hirsuta; capsula 10-12 mm. longa, ellipsoidea, cellulis subaequalibus; semina 3 mm. longa.

Type, at 2500 meters altitude, 6 miles south of Karagbal, Kashmir, collected in flower August 1, 1936, by Walter Koelz, no. 9233; in Herb. United States National Arboretum, isotype at New York Botanical Garden.

Moist open, at altitudes of 2000 to 4500 meters, mountains from eastern Afghanistan to westernmost Tibet. Flowering from mid-July to early September.

AFGHANISTAN. Kurram Valley: Kaiwas ("Khawas Khili"), *Aitchison* 735 (DD), *Harsukh* 15419 (DD); Shendtoi, *Aitchison* 796 (DD, GH).

INDIA. Hazara (Kagan Valley): Bhimbal, *Inayat* 19999 (DD), 22049b (DD); Chapri, *Inayat* (DD); Karkin, *Inayat* 20001 (DD). Muzaffarabad: Keran to Reshna, *Stewart* 17708. Astor: Kala Pani, *Giles* (DD). Kashmir: Badwan, *Stewart* 19544 (NYBG); Gulmarg, *Stewart* 10401; Gurez ("Goorai", "Gurais"), *Clarke* 29283 (USNH), *Strachey & Winterbottom* 485 (DD); Karagbal, *Koelz* 9233 (NYBG, USNA); Kukarnag, *cur. Duthie* 25724 (UCLA); Minimarg, *Stewart* 19203 (Gord); Pahlgam, *Stewart* 5690a, 9849 (NYBG); Sarsanjeri, *Koelz* 9461 (ANSP, Gord, GH, NYBG); Shakhara stream, Jagran basin, *Keshavanand* 353 (DD).

TIBET. Mangrik (Nubra): Panamik to Tsanglung, Nubra Valley, *Schlagintweit* 2245 (USNH).

21b. *Pedicularis kashmiriana ornata* subsp. nov.

Corolla larger, the beak of the galea stouter and the lower lip 15 mm. wide.

Corolla majora, rostro galeae validiore et labio anteriore 15 mm. lato.

Type, high plain, at altitude of 4000 meters, Deosai, Baltistan, collected in flower July 29, 1910, by Ralph R. Stewart, no. 20015; in Herb. Academy of Natural Sciences of Philadelphia.

High plains, above 3000 meters altitude, Deosai Plains of southern Baltistan and the Dras Valley (Purig) of western Ladakh.*

Baltistan: Burji La ("Burzalah") to Deosai ("Doosoo"), *Dr. Falconer's collector* (DD), *Stewart* 20158; Deosai, *Stewart* 19965 (ANSP, Gord, NYBG), 20015 (ANSP, Gord, GH, NYBG); Shingo Valley, Gultari ("Golteri") Nullah, *Duthie* (DD); Thale La to Bagmaharal (n. e. of Skardo and Shigar), *Schlagintweit* 5965 (GH, UCLA). Ladakh (Purig): Dras, *Duthie* 11690 (DD), 11784 (DD), *Gammie* (DD, USNH); Gyama Tongdze, *Koelz* 6003 (USNH), 6006 (USNH).

22. *Pedicularis multiflora* spec. nov.

Plate 24, A.

Perennial. Stems one or several, erect, simple below the inflorescence, 5-10 dm. tall, with lines of pubescence from nodes or glabrous below. Leaves whorled in fours or sometimes opposite, the basal long-petioled, the cauline of 4 to 6 nodes, shorter-petioled, all glabrate, beneath finely reticulate-venose, elliptic-ovate in general outline, mostly 3-9 cm. long, pinnatifid (the rachis narrowly winged) into 9 to 13 pairs of lance-linear pinnae 1-2 cm. long, 2-5 mm. wide, dentate-lobed with denticulate, callose and often cuspidate teeth, the leaf-blade distally with short and indistinct lobes, and gradually narrowed to an acute tip. Bracts lanceolate to ovate-lanceolate, entire or nearly so throughout, attenuate, ciliate with long hairs (but the tapering apex eciliate), often loosely villose on back. Inflorescence elongated, terminating stem and upper branches, that of the main stem of 15 to 30 disjunct or slightly crowded fascicles, the rachis pubescent with 4 lines of brown hairs. Pedicels becoming 1-2 mm. long. Calyx 7-9 mm. long, narrowly 10-ribbed, the ribs loosely villose to glabrous, the lobes ovate to ovate-lanceolate, by unequal fusion appearing 3 or 4 (rarely 5), the longest 2-3 mm. acute, the tips of each side approximating, the tube slightly more deeply cleft anteriorly. Corolla glabrous throughout, purple: tube 6-8 mm. long, straight; galea ascending 3-4 mm., forming an ample anthercase, then abruptly decurved, porrect and strongly contracted 3 mm. into the slender upcurved and sigmoidally coiled beak about 5-6 mm. long; lower lip ample, deflexed-spreading, 9 mm. long and wide, the mid-lobe medianly glabrous; anthers glabrous, the cells acute at base. Capsule obliquely ellipsoid, glabrous, acute, 10-11 mm. long, 5-6 mm. wide, the cells slightly unequal. Seeds 2 mm. long, 1.2 mm. wide, alveolate-reticulate, the longitudinal ridges raised into thin wings less than $\frac{1}{2}$ width of seed-body.

Perennis; caules pauci vel unci 5-10 dm. alti sub inflorescentiam simpliciter lineatim minute pubescentes vel glabrescentes; folia quaternata vel opposita pinnatifida, pinnis 9-13-jugis lanceolato-linearibus dentato-lobulatis; inflorescentia elongata multiflora (fasciculis 15-30 paris); pedicelli 1-2 mm. longi; calyx 7-9 mm. longus, lobis irregularibus (saepissime 3-4) ovatis vel ovato-lanceolatis; corolla purpurea, tubo recto, galea adscendente

* Also perhaps an anomalous collection from upper Kagan in Hazara: Gittidas ("Gili Dass"), *Inayat* 19996 (DD, UCLA).

3-4 mm., valde decurva, porrecta, et constricta 3 mm., rostrum tenuem sur-
 rectum sigmoideum contortum 5-6 mm. longum emittente, labio inferiore 9
 mm. lato; antherae glabrae, cellulis acutis; filamenta distaliter hirsuta; cap-
 sula 10-11 mm. longa, oblique ellipsoidea, cellulis subaequalibus; semina 2
 mm. longa, subalata.

Type, along stream, at 2100 meters altitude, Tangmarg, Kashmir, col-
 lected in flower July 1929, by Ralph R. Stewart, no. 10648; in Herb. Acad-
 emy of Natural Sciences of Philadelphia.

Corolla purple ("rose pink," "pink with a dark spot where the curved
 beak comes off"). Flowering from mid-July to early September.

Along streams, and especially on borders of rice fields, at altitudes of
 1700 to 2600 meters, Jhelum Valley in mountains of Kashmir.

Kashmir: Chorwan, *Stewart* 19630 (ANSP, Gord); Ganderbal to Kangan, *Stewart*
 6230; Mamur, near Sonamarg, *Stewart* 6931; lower Sind ("Scinde") Valley, *Stewart*
 10062 (ANSP, Gord, USNH), 21337; near Srinagar, *Schlagintweit* 4408 (ANSP, GH);
 Tangmarg, below Gulmarg, *Stewart* 10556 (ANSP, Gord), 10648; Weyil, Sind Valley,
Stewart 18088 (ANSP, GH, NYBG).

23. *Pedicularis oederi* Vahl

Striking as is the association of characters under each of the following
 subspecies, each feature fluctuates and may approach the condition in the
 other subspecies. The most obvious contrast, the apparently narrow, en-
 tire, and pointed pinnae of *heteroglossa*, as against the wider and round-
 lobed pinnae of *typica*, actually results from the decurving of the margins
 of such pinnae as *typica* has. The capsules may not be actually smaller in
heteroglossa, since only one mature collection of it has been seen.

No note of flower-color accompanies the collections of *heteroglossa* that
 I have seen, but in Prain's careful contrast of these two (in Ann. Bot. Gard.
 Calcutta 3: 181-186, with plate 34, 1890) it is stated (p. 184) to be "uni-
 formly yellow", while *typica* tends to have part of the galea "reddish-
 brown."

KEY TO SUBSPECIES

- A. Calyx-lobes attenuate, entire or distally dentate; galea 7-9 mm. long, at apex
 rounded so that the most distal point is near the posterior bend; capsule 15 mm.
 long; leaf-blades 2-6 cm. long, the pinnae plane, evidently dentate with rounded
 lobules.....23a. *P. o. typica*
- AA. Calyx-lobes with spatulate dentate-lobulate tips; galea 9-11 mm. long, at apex
 with the most distal point frequently toward anterior side; capsule 13 mm. long;
 leaf-blades 3-9 cm. long, the pinnae with the dentate-lobulate margin so incurved
 as to appear superficially triangular-acute.....23b. *P. o. heteroglossa*

23a. *Pedicularis oederi typica*

Pedicularis oederi Vahl, in Hornem., Dansk Oeck. Plantel., ed. II, 580, 1806. "Den vorer
 paa Fjeldene i Norge men sjelden, f. Er. paa Bangsfjeldet i Opdalen, paa Devre
 imellem Fogstuen og Toste."

Long known under the later name of *Pedicularis versicolor* Wahl.

Widespread through mountains and on Arctic shores and tundras of both
 Palaearctic and Nearctic regions. In alpine meadows of the western Hima-

layas, at altitudes of 3300 to 5800 meters, eastward to Rupshu. Flowering from late June to early September.

Punch: from Aliabad ("Alliyabad") to Pir Panjal ("Peerpinjal"), *Dr. Falconer's collectors* (DD). Kashmir: Burzil, *Koelz* 9457 (GH, NYBG, USNA); Gangabal Lakes, *Stewart* 4444; above Gulmarg, *Duthie* 11334 (DD); Gurais ("from Weejeandur to Gourase"), *Falconer's collectors* (DD); Kajinag, Hamal basin, *Keshavanand* 864 (DD); Masjid Gali, *Stewart* 18376 (ANSP, NYBG); Masjid Valley, *Duthie* 13235 (DD); Pahlgam, *Stewart* 5783, 9311 (USNH); Sonamarg, *Stewart* 6886 (Gord), 7263; Tilainala, Gurais Valley, *Duthie* (UCLA); Zojibal Pass, *Stewart* 18237. Baltistan: Deosai ("Deot-soo"), *Strachey & Winterbottom* 323 (DD), 324 (DD); Shatung La, *Duthie* (DD). Chamba: between Satrundi ("Satrandi") and Sach ("Sauch") Pass, *Harsukh* (DD); Sach Pass, *Lace* 1614 (DD), *Stewart* 2598; Tarloknath, *Koelz* 1072 (NYBG). Purig: Kargainala, Dras Valley, *Inayat* 25729b (DD). Lahul: Khokhsar, *Koelz* 802 (NYBG); Rotang La, *Koelz* 5044 (USNH). Rupshu: Kyensa La, *Koelz* 2237 (ANSP, DD, NYBG, USNH).

23b. *Pedicularis oederi heteroglossa* Prain

Pedicularis oederi heteroglossa Prain, in Journ. Asiatic Soc. Bengal 58, pt. II: 276, 1889. "Western and Central Himalaya: -Kamaon (*Roylet!*, *Wallich!*, *Collett!*, *Duthie!*, *Roid!*); Nepal (*Scully!*). Of these specimens the last was said to differ "considerably", so that some collection from Kumaun must be taken as type. In Ann. Bot. Gard. Calcutta 3: 183, 1890, Prain cited the first four of the five Kamaun collectors, giving exact localities for Collett's and Duthie's collections, but, unfortunately for typification, he chose another collection of Duthie's from Tehri-Garhwal for illustration. The last, Duthie's 232, collected July 3, 1883, in the Damdar Valley, is an admirable specimen that I have seen in the Dehra Dun Herbarium. But as actual type must be selected one of those originally cited, and preferably one for which we know the precise origin. This limits the choice to Collett's specimen from the glacier at Pindir, 14000 feet altitude, or Duthie's gathered near Bidang in Dhauli, at 14 to 15000 feet altitude. As neither of these has been seen by me, I leave the final choice to be made at the Calcutta Herbarium.

Doubtless also in moist alpine situations, at altitudes of 3200 to 4500 meters, in the central Himalayas from Tehri to western Tibet. Flowering from mid-June to mid-August.

INDIA. Tehri: Damdar Valley, *Duthie* 232 (DD); Harke Dun, *Gamble* (DD), *C. G. Rogers* (DD). Almora: head of Ganges-Laptal, *Champion* 68 (DD). Kumaun: Kali Valley, *cur.* *Duthie* 24795 (ANSP, UCLA); Palang Gadh, Byans, *Duthie* 5838 (DD); below Pindari, *Strachey & Winterbottom* 9 (GH); Ralam Valley, *Duthie* 3225 p. p. (DD).

NEPAL. Opposite Budhi village, *Duthie* 5838 (DD).

Also to be considered as a derivative of *Pedicularis oederi* Vahl and replacing it in the eastern Himalayas is another plant differing yet more from that wide-ranging species. So that this group may be better understood throughout the Himalayas it seems advisable to characterize this new entity, too. That gives three representatives in the Himalayas: *P. oederi typica* in the western part of the range; *P. o. heteroglossa* in the middle part of the range; and the plant, that from its remarkably gill-like leaf-pinnac I am calling *P. branchiophylla*, in the mid-eastern part of the range. The last may be distinguished from *P. oederi*, including both subspecies, as follows:

- A. Pinnac of leaf-blades about 15 to 20 pairs, horizontally disposed; inflorescence loosely villose, glabrate in fruit; capsule 13-15 mm. long.....*P. oederi*
- AA. Pinnac of leaf-blades 25 to 30 pairs, vertically disposed; inflorescence lanose-villose, the hairs persisting on fruiting calyces; capsule 17-18 mm. long
P. branchiophylla

***Pedicularis branchiophylla* spec. nov.**

Plate 25, A.

Perennial. Stems few or solitary, erect, simple, 0.3-0.9 dm. tall, at first densely lanose-villose, becoming glabrate. Leaves mostly basal or near the base of the stem, petioled, the cauline few, alternate, shorter-petioled, petioles channeled and villose-hirsute above, pinnae about 30 pairs, glabrous, thick, irregularly rounded, about 3 mm. long and wide, with a few low crenate lobes, at first plane and slightly overlapping at base, soon transversely raised and rugosely more thickened so as to stand on end to the light (in aspect resembling gills). Inflorescence in anthesis lanose-villose, the hairs covering the bracts and calyces. Bracts shorter than the flowers, lanceolate, entire, hirsute and ciliate, distally with a few short rounded pinnae, glabrate or glabrous. Pedicels becoming 5 mm. long. Calyx-tube 5-6 mm. long, permanently lanose-villose, its lobes unequal, lance-linear, 3-4 mm. long, each distally with slightly enlarged, lobed, and glabrous apex. Corolla 20 mm. long, yellow, glabrous: galea erect, as wide as tube, 12 mm. long, distally reddish, slightly decurved to the rounded apex; lower lip abruptly spreading, with 3 rounded lobes, the antero-laterals larger. Anterior filaments pilose distally, posterior glabrous throughout; anthers glabrous, cells obtuse at base. Capsule 17-18 mm. long, straight, ensiform, anteriorly mucronate-acuminate, posterior cell narrower and opening throughout. Seeds 2.3 mm. long, narrowed at each end, finely striate.

Perennis; caules pauci vel unici 0.3-0.9 dm. alti simplices dense lanoso-villosi deinde glabrescentes; folia basalia vel alterna pinnatifida, pinnis 30-jugis irregulariter rotundatis verticale positis; inflorescentia densa brevis; bracteae lanceolatae floribus breviores; pedicelli 5 mm. longi; calyx 8-10 mm. longus, lanoso-villosus, lobis inaequalibus lanceolato-linearibus apice glabro lobato terminantibus; corolla 20 mm. longa flava glabra, galea erecta distaliter rubescente erostre apice rotundata, labio anteriore trilobo patente; antherae glabrae, cellulis obtusis; filamentorum par anterius pilosum; capsula 17-18 mm. longa, ensiformis, latere posteriore dehiscens; semina 2.3 mm. longa.

Type, at 4900 meters altitude, Uachezali, Sikkim, collected in flower July 22, 1909, by W. W. Smith and G. H. Cave, no. 1714; in Herb. Academy of Natural Sciences of Philadelphia, isotype in Herb. University of California at Los Angeles.

At altitudes of 4500 to 5400 meters, in the Himalayas of Sikkim.

Sikkim: Chhorleucena La, *Smith & Cave* 2306 (UCLA); Lonok, *Smith & Cave* 1901 (UCLA), *Younghusband* 203 (UCLA); Naku La, *Smith & Cave* 1948 (ANSP, UCLA); The La, *Smith & Cave* 2172 (UCLA); Uachezali, *Smith & Cave* 1714 (ANSP, UCLA).

24. *Pedicularis brevirostris* spec. nov.

Plate 24, B.

Perennial. Stems few or solitary, erect, 3-4 dm. tall, loosely lanose, becoming glabrate. Leaves alternate, the lower long-petioled, the upper nearly or quite sessile, the blades all pinnatisect, with the pinnae irregularly and doubly pinnatifid, somewhat cuspidate-toothed, glabrous above, finely lanose to glabrate beneath, the lower leaf-blades narrowly elliptic in general outline, with 12 to 15 pairs of pinnae. Inflorescence densely flowered, lanose-villose, the bracts linear-lanceolate, proximally with 1 or 2 shorter entire lateral lobes, the mid-bract distally pinnately toothed or

sharply lobed. Pedicels in anthesis about 1 mm. long, lower apparently becoming 4-5 mm. long in fruit. Calyx 9-10 mm. long, the tube externally lanose-villose, internally not obviously reticulate, the lobes irregular, acute to acuminate, entire or slightly denticulate, 1-2 mm. long, separating slightly more deeply medianly than laterally, and the posterior lobe the shortest. Corolla yellow, nearly glabrous throughout: tube 9 mm. long, near apex slightly pubescent at and below the bases of the free filaments; galea ascending-arcuate, 12-13 mm. long, at apex decurved and drawn into a wide cuneately narrowing beak 1 mm. long or less, truncate, but developing anteriorly and irregularly 2 short teeth; lower lip deflexed-spreading, 9-10 mm. long, the lobes rounded, the mid-anterior smallest and distally placed. Filaments glabrous above the slightly hairy bases; anthers glabrous, the cells lanceolate, obtuse at base. Capsule 13 mm. long, straight, flattened-ovoid but distally caudately slightly elongate, attenuate-acuminate. Seeds not seen.

Perennis; caules pauci vel unici 3-4 dm. alti simplices lanosi deinde glabrescentes; folia alterna (infimis longepetiolatis, superioribus sessilibus) pinnatisecta, pinnis 12-15 jugis duplo pinnatifidis; inflorescentia densa lanoso-villosa; bractee lineari-lanceolatae; pedicelli 4-5 mm. longi; calyx 9-10 mm. longus lanoso-villosus, lobis inaequalibus acutis acuminatisve integribus denticulatisve; corolla flava, tubo 9 mm. longo, galea arcuata 12-13 mm. longa distaliter decurva et rostrum cuneatum 0.5-1 mm. longum emittente, labio anteriore 9-10 mm. longo; antherae glabrae, cellulis obtusis; filamenta glabra; capsula 13 mm. longa recta ovoidea attenuato-acuminata; semina non visa.

Type, at 3000 to 3400 meters, Dras Valley, Baltistan (now Purig, Ladakh), collected in flower June 29, 1892, by J. F. Duthie, no. 11640; in Dehra Dun Herbarium.

At altitudes of 3300 to 5000 meters, in the inner western Himalayas from Gilgit to Zaskar. Flowering from late June to early August.

Gilgit: Sai, *Tanner* 252 (DD). Braldah: "Zeercoalescaro near Baraldoo", *Falconer's collectors* (DD). Purig (Dras Valley): *Duthie* 11640 (DD); Matayan, *Gammie* (DD, UCLA); Suh Mullah, *Duthie* 11676 (DD); Zoji-Matayan, *Stewart*; Zoji La, *Gammie* (UCLA). Zaskar: Pensi La, *Koelz* 5857 (USNH).

In the Flora of British India J. D. Hooker identified this questionably as *Pedicularis fissa* Turcz., a species described from Dahuria. An isotype of that species in the Academy's herbarium shows it to be less hairy, with more finely divided leaf-blades, shorter calyx-lobes, and purple galea that is practically beakless and shows more clearly the two anteriorly placed slender teeth. Prain (in *Ann. Bot. Gard. Calcutta* 3: 167, 1890) placed it confidently with *P. dolichorhiza* Schrenk, a species described from Songaria. His account includes both this and the next, while his illustration, based upon *Tanner* 256 from Sai, Gilgit, is of the next. The two seem to me well distinct.

In deciding the status of the present plant it has been necessary to consider several recent segregates of this group, *Pedicularis dubia* and *P. schugnana* described by Fedtschenko (in *Trav. Mus. Bot. Acad. Sci. St. Petersburg* 1: 155-156, 1902) from Shighoan (Schugnan), northwest of the Pamirs, and *P. fedtschenkoi* Bonati (in *Bull. Soc. Bot. France* 61: 233, pl. 4,

1914), attributed simply to Turkestan. The first differs from our plant by its laxer inflorescence, reticulate calyx-tube, and presumably more glabrous growth (since indumentum was not mentioned); the second by its less divided leaf-blades, interrupted inflorescence, and again its more glabrous growth; and the last by its beakless galea, reticulate calyx, and less cut leaf-blades. All these lie on the far side of the range of *P. dolichorhiza* from our plant, with intervening high mountains, so that there is ample geographic warrant for supposing them different.

25. *Pedicularis dolichorhiza* Schrenk

Pedicularis dolichorhiza Schrenk, in Bull. Phys.-Math. Acad. Sci. St. Petersburg 1: 80, 1842. "Inventa in montibus Dschabyk [Songaria], d. 16 Julii [A1. Schrenk]." Although described from an area so remote from the western Himalayas, Schrenk's careful diagnosis in all details applies to the Gilgit plant now considered as well as to that drawn for Prain (in Ann. Bot. Gard. Calcutta 3: pl. 30B, 1890).

(?) *Pedicularis cabulica* Benth., in DC., Prod. Syst. Nat. Regn. Veg. 10: 575, 1846. "In regno Cabulico (*Griffith* n. 637) . . . (v. in herb. Hook.)." Description calls for a glabrous plant (whereas the inflorescence of the species now considered is lanose), strongly oblique (instead of straight and nearly symmetrical) apex of capsule, and depauperate (instead of ample) leaves. The type should be restudied. Certainly, the present species is that illustrated for *cabulica* by Maximowicz in Bull. Acad. Sci. St. Petersburg 32: tab. IV, fig. 80, 1888, where the galea shown fits the original description of *P. dolichorhiza* better than that shown for it on tab. VI, fig. 146. Possibly this illustration was the basis of Prain's confident placing of *cabulica* in the synonymy of *dolichorhiza*, in Ann. Bot. Gard. Calcutta 3: 168, 1890. Or perhaps Maximowicz was correct in applying Bentham's name, the latter having described an extremely glabrous individual (such as one of the six specimens of *Koelz* 12629 before me), and having mistakenly associated with it the fruit of some other species.

From Afghanistan to Songaria; in our territory only in Gilgit.

AFGHANISTAN. Sanglich, *Koelz* 12629 (ANSP, NYBG).

INDIA. Hunza: north of Hindu Kush, *Giles* (DD). Gilgit: south of Hindu Kush. *Giles* (DD).

26. *Pedicularis bifida* (Buchanan-Hamilton) comb. nov.

Rhinanthus bifidus Buch. Ham., ex D. Don, Prod. Fl. Nepal. 94, 1825. "Hab. ad Nairinhetty [prope Kathmandu] Nepalensium. *Hamilton* [in 1802-03]." Identified as the species now considered by Prain (in Ann. Bot. Gard. Calcutta 3: 152, 1890), who reports that in the Calcutta Herbarium is a sheet "with 4 specimens and with Dr. Buchanan-Hamilton's manuscript description affixed." The published original description is inappropriate for usual states of this species in giving the flowers as usually shorter than the bracts, the galea as hirsute with its apex incurved as well as beaked (whereas the incurved slightly pubescent galea is tipped by a straight beak), the calyx as truncate (whereas, while anteriorly appearing so, definite lobes are developed to the posterior side), and the leaves as linear-oblong, only 2-3 lines (5-7 mm.) wide (whereas they are usually oblanceolate or narrowly elliptic), nor is the species actually annual, although apparently so if sufficient care has not been taken to gather the tuber-like roots. However, either through imperfection of observation or a recognition of the considerable variability of this species, it seems possible to account for all these discrepancies, and with Prain's positive identification of the Calcutta material it becomes necessary to adopt Buchanan-Hamilton's specific name. That Royle so understood its application is shown by a specimen preserved in the Dehra Dun Herbarium. Apparently "bifidus" refers to the strongly cleft calyx.

Pedicularis carnosa Wall., *Plant. Asiat. Rar.* 2: 44, tab. 154, 1831. "I found this handsome species only on Mount Sheopur in Nipal, toward its summit, where it blossoms in the rainy season about August. The flowers are . . . of a bright rose-colour, with a white tube; the point [beak] of the upper lip crimson, almost purple." Named for the fleshy root-fibers ("fibris . . . carnosus, ad extremitates subtuberoso-dilatatis"), portions usually lost in collecting, but evident on some specimens.

Open grass-land, at altitudes of 1200 to 2700 meters, through the central and eastern Himalayas from Kangra to Sikkim, and in Khasia. Flowering in late August and September.

Kangra: Laka (above Dharmsala), *Gammie* 18631 (DD). Simla: Simla Hills, *Drummond* 595 (DD), 609 (DD); Theog, *Gamble* 6492 (DD). Dehra Dun: Deoban-Kanaur road, Jaunsar, *Raizada* 7179 (DD); Jabberkhet, *Stewart* 15705 (ANSP, Gord. NYBG); Landour, *Stewart* 15609 (GH); Mussoorie, *Raizada* 236 (DD), 284 (DD), *Stewart* 11408. Tehri: Aglar Valley, near Mussoorie, *Duthie* 809 (DD); Pehdi ("Phaidi"), *Duthie* 1875 (DD). Garhwal: ———, *Duthie* 4261 (DD). Kumaun: Dhunseila, *N. Gill* 186; Girgan, *Strachey & Winterbottom* 3 (GH); Kalamoni, *Inayat* 24783 (DD); Nagling, Darma Valley, *Inayat* 24790 (DD).

Also seen from Nepal, Sikkim, and Khasia.

27. *Pedicularis trichoglossa* J. D. Hooker

Pedicularis trichoglossa Hook. f., *Fl. Brit. Ind.* 4: 310, 1884. "Sikkim and E. Nepal Himalaya: Wallanchoon, Momay and Tangu, alt. 12-13,000 ft. *J. D. H[ooker]*." "*Pedicularis* n. 27, *Herb. Ind. Or., H. f. & T.*" Description distinctive.

Birch forest, at altitudes of 3600 to 5000 meters, through the central and eastern Himalayas from Kumaun eastward eventually to Yunnan.

Kumaun:—Dhauri Valley: Bidang, *Duthie* 3222 (DD); Rama, *Duthie* 3222 (DD); -Kuthi Valley: above Nabi ("Nabbi"), *Duthie* 3222 (DD).

Also seen from Nepal, Sikkim, Chumbi, and Yunnan.

28. *Pedicularis elephantoides* Bentham

Pedicularis elephantoides Benth., *Scroph. Indicae* 53, 1835. "Hab. ad Pyr Pundjal, *Royle*." Description distinctive.

Corolla described by Koelz as "pale green yellow with madder spot on horn [beak]," and by Stewart as "a creamier yellow than *bicornuta*." Flowering from late July to early September.

Forest and thickets, at altitudes of 2600 to 3400 meters, in the western Himalayas from Hazara to Kashmir.

Hazara: -Kagan: Bala Bhurj, *Inayat* 19990 (DD); Chapran, *Inayat* (DD, UCLA); Nila, *Inayat* 19988 (Calc, DD); Zer Bhurj Bhonja Ka Kattha, *Inayat* 19987 (DD), 19989 (DD); -Saran Range: Batal, *Inayat* (DD); Gali Musalla, *Inayat* (DD). Muzaffarabad: Pir Chanasi, *H. Singh* 1808 (DD). Kashmir: Banihal Pass, *Stewart* 12530; Gulmarg, *Duthie* (UCLA), *Stewart* 12532 (ANSP, GH); Killanmarg, *Stewart* 8712 (ANSP, Gord, USNH), 8843a, 8879 (ANSP, NYBG); Shakhara stream, Jagran basin, *Keshavanand* 308 (DD); Tragbal ("Tarakhal"), *Koelz* 9127 (NYBG, USNA), *Stewart* 4814.

29. *Pedicularis bicornuta* Klotzsch

Pedicularis bicornuta Klotzsch, ex Klotzsch & Garcke, *Bot. Ergebn. Reise Waldemar* 109, t. 61, 1862. "Von Dr. [Werner] Hoffmeister im Himalaya entdeckt [in 1846]." As a consequence of the death of the physician-collector, killed in a fight with the Sikhs, no exact records of places of collection have survived, but the precise route of this expedition is known. Commencing at Naini Tal it entered the Himalayas across Garhwal to climb Kedarnath, thence north over Tehri to Gangotri, thence down the Baspa to the Sutlej River, up it to Shipki ("Schipka") through upper

Kunawar ("Kunauer"), and lastly down the Sotlej to Kotgarh ("Kotghuhr") through lower Kunawar. This plant would have come from the upper mountains, Kedarnath to upper Kunawar. The illustration shows excellently the species now considered, and depicts the long beak of the galea that is distally bifid by the parting of its component petals, thus forming the two-horned structure for which the species was named.

Pedicularis ezimia Watt, in Journ. Linn. Soc., Bot. 18: 381, pl. 13, 1881. "North-west Himalaya, 8500-13,000 feet (Thomson, 23; Falconer, 793; Jaeschke, 200; Watt, 49A, 97B, 210G." One of Watt's own collections should be selected as type, but the choice must be made by some one having access to them. From the modified title of his paper, it is evident that he had visited "Chamba State and British Lahoul", territory where the species now considered is especially abundant. The description and illustration clearly denote this plant.

Corolla "yellow to gold with white tube and horn [beak]," according to Koelz. Flowering from mid-June to early September.

Lower to higher alpine meadows, at altitudes of 2400 to 4500 meters, in the mountains from eastern Afghanistan through the western Himalayas to Tehri.

AFGHANISTAN. Ishtakul, Koelz 12589 (ANSP, NYBG); Shendtoi, Kurram Valley, Aitchison 779 (DD, GH).

INDIA. Chitral: Arnawai ("Arnawei") Valley (Zakanah Pass), Gatacre 17383 (DD); Bumboret ("Bumborette"), Harriss (DD); Lawarai ("Lowari") Pass, Gatacre 17382 (DD), Harriss 16443 (DD); "Chunustan", above Rumbur Nullah, Harriss (DD). Hazara (Kagan): Kachh Gali ("gally"), Inayat 19983 (DD); Sar Saifar, Inayat 19992 (DD); Sarul, Inayat 22043 (ANSP, DD); Urak Nila, Inayat (DD, UCLA). Muzaffarabad: Bangas, Inayat 22043a (DD). Punch: Aliabad ("Alliyabad") to Pir Panjal ("Peerpanjal"), Falconer's collectors (DD). Gilgit: Burmar Nullah, near Gilgit, J. R. Roberts (DD); Sai, Tanner 250 (DD). Astor: above Doian ("Doyen"), Duthie (DD); Kalapani, Kamri Valley, Duthie (DD). Kashmir: Batakut ("Badzalkod nullah"), Liddar valley, Duthie 13416 (DD); Baltal, Sind valley, Duthie (DD); Burzil, Koelz 9378 (GH, USNA), Strachey & Winterbottom 641 (DD); Burzil Pass, Stewart 19850 (ANSP, GH); above Gulmarg, Duthie 11336 (DD), Stewart 15524 (NYBG); Gurez ("Gurais"), Duthie (DD); Harmukh, Keshavanand 1110 (DD), 1358 (DD); upper Jagran basin, Kishanganga valley, Keshavanand 303 (DD); Kajenag, Hamal basin, Keshavanand 854 (DD); Killanmarg, below Gulmarg, Stewart 8850a; toward Mt. Kolahoi from Liddar valley, Drummond 14143 (UCLA); Mergandob, beyond Gangabal Lakes, Stewart 18224 (ANSP, GH, NYBG, USNH); Pahlgam, Stewart 5778, 9228a; Panchtarni, I. Ullah; Sonamarg, Sind Valley, Inayat 25725 (DD), Stewart 6842a; Tiled ("Tilail"), Keshavanand 1445 (DD); Tragbol Pass, Stewart 4607. Baltistan: Deosai, A. C. Forests 58 (DD); Gultari ("Golteri nullah"), Shingo valley, Duthie (DD); Thale La to Bagmaharal (n. e. of Skardu and Shigar), Schlagintweit 5946 (USNH). Braldah: "Braldoo", Falconer's collectors (DD). Purig: Dras, Gammie (DD); Dras Valley, Duthie (DD); Marpa nullah, above Dras, Duthie (DD); Matayan, Gammie (DD, UCLA); Mitsahoi, Stewart (Gord). Ladakh: Yuru Kiom via Kandzi up the Timti La, Schlagintweit 5268 (GH). Chamba: Chenab Valley, R. Ellis (DD); Kukti Pass, Koelz 8611 (ANSP, USNA); Parmaus Valley, Pangi, Lacey 1248 (DD); Sitrundi ("between Satrundi and the Sauch Pass"), Harsukh (DD); head of Sural Valley, Harsukh (DD). Zaskar: Kargia, Koelz 5441 (USNH); Pensi La, Koelz 5841 (USNH), 5887²⁰ (USNH); Rangdum, Koelz 2850 (NYBG), 2924 (NYBG). Lahul: Dilburig, Chand 48a (USNH); Mt. Kardong, Baksh 8911; Kukti Pass, Koelz 1178 (NYBG); Kyelang, Koelz 521 (NYBG); Loth, Koelz 10098 (USNA); Sisu, Baksh 8904 (UCLA). Spiti: Kichu, H. A. C. Gill 1928 (DD). Bashahr: Chitkal Pass, Parmanand 994 (ANSP, GH, NYBG, USNA); Pangi, Kunawar, Baksh 5184 (UCLA); Pieri Pass, Parmanand 525 (NYBG, USNA, USNH); Poze ("Poz, near Poy"), Parmanand 801 (ANSP, GH, USNA); Puke, Parmanand 463a (NYBG, USNA). Tehri: Rhudughera, Duthie 237 (DD).

²⁰ Abnormal, the upper corolla-lobes being wholly distinct, not forming a beak.

30. *Pedicularis macrantha* Klotzsch

Pedicularis macrantha Klotzsch, ex Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar 108, t. 59, 1862. "Von Dr. [Werner] Hoffmeister im Himalaya entdeckt [in 1846]." As stated under *P. bicornuta*, records of collecting-localities were lost due to the violent death of Dr. Hoffmeister while in the field. The present species must have come from Garhwal. There is no statement of the flower-color.

Pedicularis ochroleuca Duthie, ex Maxim. in Bull. Acad. Sci. St. Petersburg 32: 530, tab. 1, fig. 5, 1888. "Kumaon: Darma, valle Niptschang, 14-15000' s. m. (Duthie n. 3219 . . .)." Another collection with this number, gathered by J. F. Duthie "near Bidang in Dhauli Valley, 14-15000', in flower and fruit Sept. 4, 1884", seen in Dehra Dun Herbarium. Maximowicz distinguished this from *P. macrantha* by the color of the corolla, the galea not being twisted at base, and the middle lobe of the lower lip being no narrower than the two lateral ones. Prain continued both entities in Ann. Bot. Gard. Calcutta 3: 126, pl. 7, 1890, where *ochroleuca* appears as *P. macrantha* var. *lutescens*, with citation of six collections by Duthie in Kumaun and western Nepal, among which that from Darma is listed first. But the characters now are that in *macrantha* var. *typica* the middle lobe of the lower lip is as wide as the laterals, while in *lutescens* it is slightly narrower; in *typica* the galea is regularly contorted at base, but in *lutescens* very rarely so; and in *lutescens* the galea is more abruptly contracted to the beak. These distinctions are scarcely evident on the accompanying plate, the flower of *typica* showing no more contortion of the galea than that of *lutescens*. Comparing Duthie's specimens in the Dehra Dun Herbarium, his number 3216, from the Ralam Glacier, with its flowers "rosy red", does show the galea so twisted that its beak faces away from the lower lip, whereas number 3219 from Bidang, with flowers "cream coloured with purple falcate upper lip", shows the beak decurved over the lower lip, but number 5845, with flower-color of 3219, shows the galea oriented as in 3216. Certainly this character is not constant, nor can I see aught of difference in either of the other characters adduced as to the form of the galea and lower lip. Apparently there is some color difference, but I can only apply that to Duthie's own collections, since he alone has noted it, and on all other specimens seen color has long ago disappeared. Accordingly, although ignorant as to what was the color of genuine *macrantha*, I am using Duthie's name for the pale-flowered plant as f. **ochroleuca** (Duthie), its known collections being marked by asterisk on the following list.

At altitudes of 3600 to 4500 meters, in the central Himalayas from Garhwal to western Nepal. Flowering from June to September.

INDIA. Kumaun: Bhappa Duldal (Johar), *N. Gill* 539 (ANSP, UCLA); * Bidang, Dhauli Valley, *Duthie* 3219 p. p. (DD); * near Lebang Glacier, *Duthie* 5845 (DD); * Palang Gadh, Byans, *Duthie* 5845 (DD); Ralam, *Strachey & Winterbottom* 7 (GH); Ralam Glacier, *Duthie* 3216 (DD); Ralam Valley, *Inayat* 24793 (ANSP, DD, UCLA).

NEPAL. Nampa Gadh, *Duthie* 5845 (DD).

31. *Pedicularis hoffmeisteri* Klotzsch

Pedicularis hoffmeisteri Klotzsch, ex Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar 108, tab. 60, 1862. "Dr. [Werner] Hoffmeister fand diese Art im Himalaya [in 1846]." As stated under *P. bicornuta*, records of collecting-localities were lost due to the violent death of Dr. Hoffmeister while in the field. Collections were made in the Himalayas from Garhwal to Bashahr, and the type must have come from that territory. The plate shows well the flowers and leaves of the species now considered, but only the anterior pair of filaments should have been depicted as pilose, the posterior pair being glabrous.

Pedicularis megalantha hoffmeisteri (Klotzsch) Sealy, in Curtis' Bot. Mag. 162: tab. 1570. 1939.

Corolla yellow, being noted by Koelz as "bright sulfur" and "gold yellow." Flowering from June to September.

Moist places, along streams, in open or shade, at altitudes of 2100 to 3700 meters, in the western Himalayas from Chamba to Kumaun.

Chamba: between Alwas and Sach Pass, *Gammie* 18412 (ANSP, DD, UCLA). Kangra (Kulu): Jammu Tatch, *Nath* 436 (ANSP, GH, NYBG); Malana, *Koelz* 209 (NYBG); Puling, *Koelz* 1427 (NYBG). Simla: Choor, *Royle* (DD); near Kot, in Lloraj, *Baksh* 8913 (UCLA), *Drummond* 8912; Nagkanda, etc., *Baksh* 5178 (UCLA); between Mattiana and Narkonda, *Drummond* 589 (ANSP, DD); near Simla, *Baksh* 5180. Bashahr: Chini ("Chenie"), *Parmanand* 475 (ANSP, NYBG, USNA), *J. L. Stewart* 2687 (DD), 2884 (DD); Chitkal, *Parmanand* 1043 (ANSP, Gord, NYBG, USNA); Kanahi, *Lace* 350 (DD); Nachar, *Baksh* 5179 (UCLA). Tehri: Kidarkonta, *Drummond's collector* 14839 (DD, UCLA); Muldar, behind Nag Tibbi ("Tiba"), *Ramonkh* (?) (DD). Dehra Dun (Jaunsar): near Deoban, *Duthie* 1202 (DD), *Raizada* 7168 (DD). Garhwal: Kedarnath ("Koodurnath"), — 821 (DD); above Ramu, *Duthie* 4262 (DD); near Shinkola, *Duthie* 5843 (DD). Kumaun: Garbiyang, Kali Valley, *Inayat* 24796 (DD); Kathi ("Kutti"), in Byans, *Duthie* 3220 (DD), 3221 (DD). *Strachey & Winterbottom* 1 (GH); Munshiyari, *Inayat* 24808 (DD); Ralam, *Duthie* 3231 (DD).

Sir J. D. Hooker, in the Flora of British India (4: 312, 1884), placed *Pedicularis hoffmeisteri* in the synonymy of *P. siphonantha* Don, an obvious error. In 1890 Dr. Prain (in Ann. Bot. Gard. Calcutta 3: 118, pl. 46) transferred it to the synonymy of *P. megalantha* Don, to the near affinity of which it correctly belongs. Both authors treated *P. megalantha* as geographically diverse in color, Hooker stating that while the flowers in Sikkim were rose-purple, they were elsewhere yellow or rose-pink, an interpretation amplified by Prain: "In all western Himalayan specimens [the corolla] is pale yellow; Don speaks doubtfully, but probably correctly, of the lip in Nepalese specimens as being yellowish-red, the rest of the corolla being purple; Hooker describes the corolla in Sikkim specimens as rose-purple." Don actually called the galea purple, while I think that his question about the color of the lip was due to Wallich's specimen, on which *P. megalantha* was based, showing its mid-portion pale or yellowish, but being too faded to show the main width as actually purple; this at least is the detail in such a Sikkim collection as *Smith & Cave* 1003 now before me. Prain included yet another variety in his comprehensive understanding of *P. megalantha*, while my resolution of the situation would be the recognition of three distinct species along the Himalayan Range. It may be well to pass beyond our area so as to present these clearly, first distinguishing them by a key as follows:

- A. Corolla yellow,³⁰ the tube 30 mm. long, 2 to 2½ times the length of the calyx; capsule 25 mm. long; pedicels 5-15 mm. long; leaf-blades ovate in general outline, the pinnae close, oblong, dentate-lobed, the lobules denticulate; inflorescence becoming rather elongated, occupying most of the distal half of the stout erect stem. *P. hoffmeisteri*
- AA. Corolla purple, the tube longer; leaf-blades oblong-lanceolate in general outline, the pinnae more remote and irregular, short-oblong to triangular-ovate, usually more sharply dentate.
 - B. Mid-lobe of lower lip of corolla ovate, about ½ width of the rounded lateral lobes; corolla-tube 2½ to 3 times the length of the calyx; capsule 25-30 mm. long, narrowed from near base, shortly oblique at apex; pedicels less than 10 mm. long; flowers nearly all in a dense inflorescence at summit of the stout erect stem.....*P. megalantha*

³⁰ The recent plate in the Botanical Magazine (no. 9570), painted from fresh flowers raised from seed at Kew Gardens in England, shows the corolla as partially a deeper yellow. Sealy seems as convinced as I of the constancy of the color contrast between *hoffmeisteri* and *megalantha*, although he is unaware of other differences. I have chanced upon his account since my own text was written.

- BB. Mid-lobe of lower lip of corolla oblong, about $\frac{1}{2}$ width of the lateral lobes, which are truncate or notched medianly; corolla-tube over 5 times the length of the calyx; capsule 20 mm. long, scarcely narrowed below the widely oblique apex; pedicels becoming 15-20 mm. long; flowers laxly disposed along the whole length of the diffuse stems. *P. pauciflora*

Pedicularis megalantha Don

Pedicularis megalantha Don, Prod. Fl. Nepal. 94, 1825. "Hab. in Gosaingsthan Nepalensium. Wallich." Mt. Gosai Than is in the Himalayas above eastern Nepal. Description of leaf-blades as interruptedly bipinnatifid, the segments ovate, and the corolla purple (at least as to galea) denotes the species now considered. (As to the detailed description of flower-color see above.) The account of the short and wide flower-cluster (3 x 4 inches) also fits this.

At altitudes of 2800 to 4300 meters, in the eastern Himalayas from eastern Nepal to Bhutan. Flowering from June to September.

SIKKIM. Changu, *W. W. Smith* 4274 (ANSP, Gord, UCLA); Seratong, *Ribu & Rhomoo* 4563 (ANSP, NYBG, UCLA); Zemu Valley, *Smith & Cave* 1003 (ANSP, UCLA); "Sikkim", *J. D. Hooker* (GH).

CHUMBI. Lu-Marpo, *Dr. King's collector* (DD); Rinchingong, *Dungboo* 4253³¹ (Calc), *G. King* 4253³¹ (DD); Sashethang, *R. Lepcha* 200 (ANSP, UCLA); Yuo-So, near Chumbi, *Dungboo* (USNH); "Chumbi", *C. H. Bell* (UCLA, USNH).

BHUTAN. Rishi La, *Capt. Elwes* (DD).

Pedicularis pauciflora (Prain) comb. nov.

Pedicularis megalantha pauciflora Prain, ex Maxim. in Bull. Acad. Sci. St. Petersburg 32: 532, 1888. "Himalaya orientali: Jongri ad Bloktan (herb. Calcutt!), Jaunsar-Bahar: Deoban Range (*Duthic!* n. 1202)." Maximowicz considered this as differing from *P. megalantha* only in its low, diffuse habit, scarcely 3-flowered racemes, and ("fide Prain") truncate lateral lobes of the corolla-lip. Of the two collections cited, that from Jaunsar is actually from the western Himalayas, and a large-growing duplicate of it in the Dehra Dun Herbarium has already been cited as *P. hoffmeisteri*; evidently the specimen at Calcutta is a dwarf of that species. It was not included by Prain in his own accounts of his variety, in Journ. Asiat. Soc. Bengal 58, pt. II: 269, 1889, and in Ann. Bot. Gard. Calcutta 3: 118, pl. 4, 1890. Therein the variety is restricted to Chumbi and Jongri, and only noted as gathered by Dr. King's collectors. In the Dehra Dun Herbarium are two collections, one (lacking name of collector) gathered at Jongri, Sikkim in fruit Oct. 15, 1875, and the other at "Bhohtan n^r Tagi [?]" in flower July 1887, by Dr. King's collector. The latter bears Prain's initialed note: "This is part of the type gathering of var. *pauciflora*." That being so, it sheds light on the supposed place-name "Bloktan", as that can hardly be other than a mis-reading of "Bhohtan." Making another plausible interpretation of the other name, I would read the Dehra Dun label as "Bhotan, near Tashi." This appears to be the actual type locality.

A little-known species, perhaps occurring extensively through the moist eastern Himalayas, but as yet known only from Sikkim and Bhutan.

SIKKIM. Jongri. — 26121B (DD).

BHUTAN. Near Tashi ("Tagi?"), *Dr. King's collector* (DD).

32. **Pedicularis longiflora** Rudolph

As a comprehensive species this occurs over the highlands of eastern Asia from Dahuria to Yunnan, west to Baltistan. From Dahuria to Yunnan are several subspecies, including *Pedicularis longiflora typica*, all with lower lip of corolla relatively wide (15-20 mm.) and with a narrow maroon stripe

³¹ Both collected on the same day, July 21, 1877, from which fact I suppose them to be the same and gathered by Dr. King's collector named Dungboo.

on each antero-lateral ridge of palate; and also with calyx-lobes relatively longer and more deeply cut. Subsp. *typica*, *Pedicularis longiflora* Rudolph (in Mem. Acad. Sci. St. Petersburg 4: 345, t. 2, 1811)³² came from the vicinity of Lake Baikal, Dahuria, and differs in only the above characters from subsp. *tubiformis*, about to be considered; it occurs at least from Dahuria and Chili to Kansu. *P. tubiflora* Fisch. (in Mem. Soc. Natur. Moscou 3: 58, 1812), also from near Lake Baikal, is a synonym.

From these eastern plants the one occurring through the Himalayas differs by having the lower lip of its corolla narrower (13-15 mm. wide) and with a wide maroon stripe covering each antero-lateral ridge of the palate; and by having its calyx-lobes smaller (1-2 mm., or rarely 3 mm. long) and less deeply cut. It should bear the following name:

32b. *Pedicularis longiflora tubiformis* (Klotzsch) comb. nov.

Pedicularis tubiformis Klotzsch, in Bot. Ergebn. Reise Waldemar 106, tab. 57, 1862. "Dr. [Werner] Hoffmeister sammelte diese Art im Himalaya [in 1846]." As stated under *P. bicornuta*, records of collecting-localities were lost due to the violent death of Dr. Hoffmeister in the field. Collections were made in the Himalayas from Garhwal to Bashahr, and the type must have come from that territory. Klotzsch's name is retained for historical continuity, though it has no special applicability.

Corolla "gold-yellow with 2 madder [or] crimson-madder spots in throat," according to Koelz; but all fresh material seen shows the madder or maroon areas as covering the entire ridges of the palate. Flowering from early July to September.

Springheads, seeps, and along streams, at altitudes of 2700 to 5300 meters, through the Himalayas from Baltistan eastward, eventually to Yunnan.

Baltistan: Khusomik ("Kasurmik"), *Stewart* 20827 (GH); Shigar Nullah, *Koelz* 9705 (ANSP, GH, NYBG, USNA); Thalle La, *Schlagintweit* 5950 (GH, USNH). *Stewart* 20619 (ANSP, Gord. GH, NYBG, USNH). Ladakh: Bad Kharbu, *Koelz* 6179 (USNH); Gya, *Koelz* 6421 (USNH); Leh, *Schlagintweit* 1360 (USNH); Mashow, *Brandis* (DD); Mulbekh ("Moolbeek"), *Koelz* 6179 (USNH), *Stewart* (NYBG); Saspola, *Stewart* (NYBG); Tsakzhun Tso, *Koelz* 2415c (ANSP, DD, NYBG, USNH). Spiti: Kioto, *H. A. C. Gill* 1984 (DD); Ladarse, *Koelz* 7072 (NYBG, USNA); Pin Valley, *Koelz* 7184 (USNH). Rupshu: Hanle, *Koelz* 2303 (ANSP, DD, NYBG, USNH); Khanglazzdar, *Koelz* 6631 (USNH). Bashahr: Chitkal, *Parmanand* 957 (ANSP, Gord. GH, NYBG, USNA, USNH). Kumaun: Kutti, Byans, *Duthie* 5841 (DD); Parbhu, Gori Valley, *Inayat* 24799 (DD), 24806 (ANSP, DD, UCLA); Ralam Valley, *Duthie* 3232 (DD); Rilcot, *N. Gill* 540 (ANSP, UCLA).

Also seen from eastern Nepal, Sikkim, Chumbi, Tibet, and Yunnan.

33. *Pedicularis rhinanthoides* Schrenk

As a comprehensive species this occurs widely over the central highland of Asia. It seems to fall into several geographic subspecies, those of the Himalayas being distinguishable as follows:

³² The copy of this at the Academy of Natural Sciences lacks the illustrative plate, and is dated 1813, but Rudolph's paper was read March 1, 1809, and the reference to it by Steven in Acta Soc. Caes. Nat. Scrut. 6: 30, 1822 gives the date as 1811.

KEY TO SUBSPECIES

- A. Beak no longer than the hood of the galea, simply incurved; lip 14-17 mm. wide.
- B. Lip purple, the beak of the galea dark; galea slightly sharply toothed anteriorly proximally; lateral calyx-lobes foliaceous-dentate; pinnae of leaf-blades not or only slightly longer than wide, sharply and often callosely dentate (cuspidate)..... 33a. *P. r. typica*
- BB. Lip whitish, tinged rose, the beak of the galea rose-purple; galea rounded-toothed anteriorly proximally; lateral calyx-lobes slightly denticulate or entire; pinnae of leaf-blades ovate or oblong, distinctly longer than wide, dentate, not callose..... 33b. *P. r. rotundata*
- AA. Beak longer than the hood of the galea, incurved, but distally often also upcurved; corolla purple throughout, or often with white orifice.
- B. Leaf-blades with pinnae horizontal, plane, becoming separated, the lobes rounded to acute or slightly cuspidate-tipped; lower lip 17-20 mm. wide; stem usually 1-3 dm. tall.
- C. Pinnae with blades nearly as wide as long, dentate or dentate-lobed, the teeth sharp and usually cuspidate; corolla "old rose" or "rose purple" (drying magenta)..... 33c. *P. r. speciosa*
- CC. Pinnae with blades longer than wide, more deeply lobed, the teeth not, or only slightly, cuspidate; corolla paler purple.
33d. *P. r. labellata*
- BB. Leaf-blades with pinnae oblique or even transverse, revolute, strongly overlapping, scarcely longer than wide, slightly cut and more simply dentate; lower lip about 15 mm. wide; stem 0.5 dm. tall..... *P. r. revoluta*

33a. *Pedicularis rhinanthoides typica*

Pedicularis rhinanthoides Schrenk, ex Fisch. & Mey., Enum. Plant. Nov. Schrenk 22, 1841. "In albus Alatau ad fl. Baskan decerpta d. 29 Junii m. [1840, *Alexander Schrenk*]." Isotype, labeled "Songaria Exp. A. G. Schrenk 1840", in Herb. Academy of Natural Sciences of Philadelphia.

Pedicularis rhinanthoides angulata Vved., in Bull. Univ. Asie Centr. 11, Suppl.: 25, 1925. Name given to the typical subspecies, in allusion to the relatively sharp angles near the base of the galea.

Stem 0.5-3 dm. tall, bifariously slightly pubescent to glabrous. Leaves, basal 2-4 cm. long, with 9 to 12 pairs of pinnae, each ovate or nearly so, irregularly dentate-lobed, the teeth sharp, often cuspidate. Inflorescence sparsely villose or glabrate (more villose in collections marked by asterisk, perhaps transitional to *speciosa*). Lower pedicels becoming 8-10 mm. long. Posterior calyx-lobe subulate, about 1 mm. long, the others foliaceous, dentate, about 2 mm. long. Corolla-tube externally minutely pubescent, lower lip 14-17 mm. wide, purple, medianly proximally white; beak of galea slender, rather gradually contracted, strongly incurved, and nearly as long as the hood. Capsule 15 mm. long.

Moist places, especially along streams, at altitudes of 3000 to 5000 meters, in the western Himalayas from Kashmir to Zaskar, and thence northward across the Asiatic highland to Songaria. Flowering in July and August.

Kashmir: Burzil, *Koelz* 9458 (ANSP, Gord, NYBG, USNA). Baltistan: * Burji La (Deosai side), *Stewart* 20170 (NYBG); * Deosai, *Stewart* 20047; * Kasurmik, *Stewart* 20710 (ANSP, Gord, NYBG); Shigar, *Duthie* 11923 (DD); Thalle La, *Stewart* 20774 (ANSP, GH). Lahul: Drokpo Gongma, *Koelz* 6852³³ (USNH); Khokhsar, *Koelz* 747 (NYBG). Zaskar: Kargia, *Koelz* 5533a (Mich); Pensi La, *Koelz* 5842 (USNH); Rangdum, *Koelz* 5947 (USNH).

Also seen from Turkestan and Songaria.

³³ Approaching *P. rhinanthoides speciosa*.

33b. *Pedicularis rhinanthoides rotundata* Vvedensky

Pedicularis rhinanthoides rotundata Vved., in Bull. Univ. Asie Centr. 11, Suppl.: 25, 1925. "Se rencontre sur le versant meridional de Talas-Alatau (Karshantau!, la vallee d'Angren!) et dans Pamiro-Alaj (la vallee de Zeravschan! monts Hissari!)."

Stem 0.5-1.5 dm. tall, glabrous. Leaves, basal 2-2.5 cm. long, of about 12 pairs of pinnae, each oblong in general outline, strongly dentate-lobed, the teeth sharp, slightly or not cuspidate. Inflorescence glabrous. Lower pedicels becoming 10 to 13 mm. long or more. Posterior calyx-lobe linear-subulate, about 1 mm. long, the others oblong or slightly dentate, about 2 mm. long. Corolla-tube externally sparsely puberulent, lower lip 14-17 mm. wide, whitish, tinged rose, beak of galea rose-purple, slender, rather gradually contracted, strongly incurved, shorter than the hood. Capsule not seen.

At altitudes of 3600 to 4300 meters, in the mountains of eastern Afghanistan and of Chitral in northwesternmost India. Flowering at least in July.

AFGHANISTAN. Minjan Pass, *Koelz* 12694 (ANSP, NYBG).

INDIA. Chitral: Bumboret ("Bimboreth", "Bomborette"), *Harriss* (DD).

33c. *Pedicularis rhinanthoides speciosa* subsp. nov.

Plate 25, B.

Stem 1-2 dm. tall, bifariously slightly pubescent. Leaves, basal 2-4 cm. long, with 10 to 15 pairs of pinnae, each ovate or nearly so, irregularly dentate-lobed, the teeth sharp, usually cuspidate, the cauline shorter. Inflorescence, especially calyces, loosely lanose-villose. Lower pedicels becoming at least 5-10 mm. long. Posterior calyx-lobe subulate, 0.6-0.8 mm. long, the others somewhat foliaceous, dentate, 1.5-2 mm. long. Corolla-tube externally loosely pubescent with appressed hairs, lower lip 20 mm. wide, rose-purple (or "old rose"), medianly white proximally and on anterior side of tube; beak of galea dark purple, slender, gradually contracted from and slightly longer than the hood. Capsule not seen.

Foliorum pinnae ovatae irregulariter dentibus cuspidatis dentato-lobatae; inflorescentia lanoso-villosa; corollae labium inferius 20 mm. latum.

Type, damp meadow, at 4500 meters altitude, Tsakzhun Tso, Ladakh, collected in flower July 29, 1931, by Walter Koelz, no. A30; in Herb. Academy of Natural Sciences of Philadelphia. The flowers were described as "rose pink, large white spot in throat, fragrant."

Along streams, at altitudes of 4200 to 5300 meters, in the western Himalayas from Ladakh to Rupshu. Flowering in July and August.

Ladakh: Tianak, *Koelz* 6468 (USNH); Tsakzhun Tso, *Koelz* 2414p (ANSP, NYBG, USNH), 2417b (NYBG), A30 (ANSP, NYBG). Spiti: Kichu, *H. A. C. Gill* 1940 (DD); Losar, *Gill* 1974 (DD). Rupshu: between Da and Hanle, *Koelz* 2283 (NYBG).

33d. *Pedicularis rhinanthoides labellata* (Jacquemont) Prain

Pedicularis labellata Jacquem., Voy. dans l'Inde, Bot. 118, pl. 123, 1844. "In humidis ab Yurpo ad Lamoutché, Gatang-Ghauti; 18,300 ped. angl." Jacquemont's map of the Himalayas shows the Yarpo River as an affluent of the Sutlej in upper Bashahr, flowing west from the Col de Gantong, which I take to be the Gatong of the text. Also I presume that this is the "Gatheng", Tibet, from which R. Strachey and J. E. Winterbottom gathered this subspecies, as shown by their no. 12 at the Gray Herbarium of Harvard University.

Pedicularis rhinanthoides labellata (Jacquem.) Prain, in Ann. Bot. Gard. Calcutta 3: 110, 1890.

Stem 0.5-3 dm. tall, glabrous or slightly bifariously pubescent. Leaves, basal 1.5-7 cm. long, of 6 to 15 pairs of pinnae, each oblong or ovate-oblong in general outline, irregularly deeply dentate-lobed, the teeth acute, sometimes somewhat cuspidate. Inflorescence, especially calyces, loosely lanose-villose to glabrate. Lower pedicels becoming at least 10-15 mm. long. Posterior calyx-lobe subulate, 0.7-1 mm. long, the others dentate, 2 mm. long. Corolla-tube externally loosely pubescent, lower lip about 20 mm. wide, light purple, beak of galea slender, rather abruptly contracted, incurved, but distally usually upcurved, longer than the hood.

The usual state of this subspecies may be distinguished from *Pedicularis rhinanthoides typica* by its leaf-cutting, its longer and more outcurving galea-beak, and its wider lower lip, but locally in Kashmir is a smaller state, in which the lower lip of the corolla is only 15 mm. wide and the leaf-pinnae more cut, although the beak is characteristically that of *labellata*. This intermediate is indicated by asterisk on the following list.

Wet places, especially in high alpine valleys, at altitudes of 3000 to 4500 meters, through the Himalayas from Gilgit and Kashmir eastward, eventually to Yunnan. Flowering from mid-July to early September.

Gilgit: Sai, *Tanner* 257 (DD). Kashmir: * Mt. Apharwat, above Gulmarg, *Stewart* 10336 (GH); Badjulkod Nullah, Liddar Valley, *Duthie* 13397 (ANSP, DD, UCLA), 14172 (DD); * Killanmarg, *Stewart* 8719 (ANSP, Gord, NYBG); Mt. Kolahoi ("Kal-hoi"), *Inayat* 25729a (DD), *Stewart* 9415 (ANSP, Gord); Liddar, *Drummond* 14307 (DD); Liddarwat (Sangam Valley), *Duthie* 13538 (DD); Mergandeb, *Stewart* 18264 (ANSP, Gord); Musjid Valley, *Duthie* 13206 (DD); Nafran, upper Liddar, *Stewart* 12528 (ANSP, NYBG); Nichanai Pass, beyond Gulmarg, *Stewart* 9892 (ANSP, GH, NYBG), 9903; Pahlgam, *Stewart* 5670, 5785; Zoji La, *Stewart* 6710, 7578. Chamba: Sach Pass, *Lace* 1236 (DD); Pangi, *Hcyde* 24 (Calc, DD). Lahul: Rotang Pass, *Nath* 435 (ANSP, USNH), *Stewart* 152. Spiti: Kibor, *H. A. C. Gill* 2068 (DD). Bashahr: Gatheng, *Strachey & Winterbottom* 12 (GH); Rupan Pass, *Parmanand* 1166 (ANSP, Gord, GH, NYBG, USNA). Tehri: Bamsor Pass, *Duthie* 576 (DD). Garhwal: Mana to Sarsutti ("to foot to glaciers"), *Schlagintweit* 8649 (GH).

Also seen from Chumbi, Yunnan, and Kansu.

Pedicularis rhinanthoides revoluta subsp. nov.

Plate 25, C

Stem 0.3-0.5 dm. tall, glabrous or nearly so. Leaves, basal 1-1.5 cm. long, of about 10 pairs of oblique and somewhat overlapping pinnae, each ovate, irregularly dentate-lobed, the teeth mostly obtuse, appearing more rounded by the revolution of the margin. Inflorescence loosely hirsute. Lower pedicels exceeding upper, though in anthesis only 5 mm. long. Posterior calyx-lobe acute, slightly shorter than others (ca. 1.5 mm. long), all slightly denticulate, revolute. Corolla-tube externally pubescent, lower lip about 15 mm. wide, purple or red-purple (much discolored); beak of galea slender, abruptly contracted from and as long as hood. Capsule not seen.

Foliorum pinnae obliquae imbricatae revolutae ovatae irregulariter dentibus obtusis dentato-lobatae; inflorescentia laxe hirsuta; calycis lobus posterior pauci-denticulatus; corollae purpureae labium inferius 15 mm. latum.

Type, at 5000 to 5500 meters altitude, Naku Chu, Llonok, Sikkim, collected in flower August 3, 1909, by W. W. Smith and G. H. Cave, no. 1945; in

33b. *Pedicularis rhinanthoides rotundata* Vvedensky

Pedicularis rhinanthoides rotundata Vved., in Bull. Univ. Asie Centr. 11, Suppl.: 25, 1925. "Se rencontre sur le versant meridional de Talas-Alatau (Karshantau!, la vallee d'Angren!) et dans Pamiro-Alaj (la vallee de Zeravschan! monts Hissar!)."

Stem 0.5-1.5 dm. tall, glabrous. Leaves, basal 2-2.5 cm. long, of about 12 pairs of pinnae, each oblong in general outline, strongly dentate-lobed, the teeth sharp, slightly or not cuspidate. Inflorescence glabrous. Lower pedicels becoming 10 to 13 mm. long or more. Posterior calyx-lobe linear-subulate, about 1 mm. long, the others oblong or slightly dentate, about 2 mm. long. Corolla-tube externally sparsely puberulent, lower lip 14-17 mm. wide, whitish, tinged rose, beak of galea rose-purple, slender, rather gradually contracted, strongly incurved, shorter than the hood. Capsule not seen.

At altitudes of 3600 to 4300 meters, in the mountains of eastern Afghanistan and of Chitral in northwesternmost India. Flowering at least in July.

AFGHANISTAN. Minjan Pass, *Koelz* 12694 (ANSP, NYBG).

INDIA. Chitral: Bumboret ("Bimboreth", "Bomborette"), *Harriss* (DD).

33c. *Pedicularis rhinanthoides speciosa* subsp. nov.

Plate 25, B.

Stem 1-2 dm. tall, bifariously slightly pubescent. Leaves, basal 2-4 cm. long, with 10 to 15 pairs of pinnae, each ovate or nearly so, irregularly dentate-lobed, the teeth sharp, usually cuspidate, the cauline shorter. Inflorescence, especially calyces, loosely lanose-villose. Lower pedicels becoming at least 5-10 mm. long. Posterior calyx-lobe subulate, 0.6-0.8 mm. long, the others somewhat foliaceous, dentate, 1.5-2 mm. long. Corolla-tube externally loosely pubescent with appressed hairs, lower lip 20 mm. wide, rose-purple (or "old rose"), medianly white proximally and on anterior side of tube; beak of galea dark purple, slender, gradually contracted from and slightly longer than the hood. Capsule not seen.

Foliorum pinnae ovatae irregulariter dentibus cuspidatis dentato-lobatae; inflorescentia lanoso-villosa; corollae labium inferius 20 mm. latum.

Type, damp meadow, at 4500 meters altitude, Tsakzhun Tso, Ladakh, collected in flower July 29, 1931, by Walter Koelz, no. A30; in Herb. Academy of Natural Sciences of Philadelphia. The flowers were described as "rose pink, large white spot in throat, fragrant."

Along streams, at altitudes of 4200 to 5300 meters, in the western Himalayas from Ladakh to Rupshu. Flowering in July and August.

Ladakh: Tianak, *Koelz* 6468 (USNH); Tsakzhun Tso, *Koelz* 2414p (ANSP, NYBG, USNH), 2417b (NYBG), A30 (ANSP, NYBG). Spiti: Kichu, *H. A. C. Gill* 1940 (DD); Losar, *Gill* 1974 (DD). Rupshu: between Da and Hanle, *Koelz* 2283 (NYBG).

33d. *Pedicularis rhinanthoides labellata* (Jacquemont) Prain

Pedicularis labellata Jacquem., Voy. dans l'Inde, Bot. 118, pl. 123, 1844. "In humidis ab Yurpo ad Lamoutché, Gatang-Ghauti; 18,300 ped. angl." Jacquemont's map of the Himalayas shows the Yarpo River as an affluent of the Sutlej in upper Bashahr, flowing west from the Col de Gantong, which I take to be the Gatong of the text. Also I presume that this is the "Gatheng", Tibet, from which R. Strachey and J. E. Winterbottom gathered this subspecies, as shown by their no. 12 at the Gray Herbarium of Harvard University.

Pedicularis rhinanthoides labellata (Jacquem.) Prain, in Ann. Bot. Gard. Calcutta 3: 110, 1890.

Stem 0.5-3 dm. tall, glabrous or slightly bifariously pubescent. Leaves, basal 1.5-7 cm. long, of 6 to 15 pairs of pinnae, each oblong or ovate-oblong in general outline, irregularly deeply dentate-lobed, the teeth acute, sometimes somewhat cuspidate. Inflorescence, especially calyces, loosely lanose-villose to glabrate. Lower pedicels becoming at least 10-15 mm. long. Posterior calyx-lobe subulate, 0.7-1 mm. long, the others dentate, 2 mm. long. Corolla-tube externally loosely pubescent, lower lip about 20 mm. wide, light purple, beak of galea slender, rather abruptly contracted, incurved, but distally usually upcurved, longer than the hood.

The usual state of this subspecies may be distinguished from *Pedicularis rhinanthoides typica* by its leaf-cutting, its longer and more outcurving galea-beak, and its wider lower lip, but locally in Kashmir is a smaller state, in which the lower lip of the corolla is only 15 mm. wide and the leaf-pinnae more cut, although the beak is characteristically that of *labellata*. This intermediate is indicated by asterisk on the following list.

Wet places, especially in high alpine valleys, at altitudes of 3000 to 4500 meters, through the Himalayas from Gilgit and Kashmir eastward, eventually to Yunnan. Flowering from mid-July to early September.

Gilgit: Sai, *Tanner* 257 (DD). Kashmir: * Mt. Apharwat, above Gulmarg, *Stewart* 10336 (GH); Badjulkod Nullah, Liddar Valley, *Duthie* 13397 (ANSP, DD, UCLA), 14172 (DD); * Killanmarg, *Stewart* 8719 (ANSP, Gord, NYBG); Mt. Kolahoi ("Kal-hoi"), *Inayat* 25729a (DD), *Stewart* 9415 (ANSP, Gord); Liddar, *Drummond* 14307 (DD); Liddarwat (Sangam Valley), *Duthie* 13538 (DD); Mergandeb, *Stewart* 18264 (ANSP, Gord); Masjid Valley, *Duthie* 13206 (DD); Nafran, upper Liddar, *Stewart* 12528 (ANSP, NYBG); Nichanai Pass, beyond Gulmarg, *Stewart* 9892 (ANSP, GH, NYBG), 9903; Pahlgam, *Stewart* 5670, 5785; Zoji La, *Stewart* 6710, 7578. Chamba: Sach Pass, *Lace* 1236 (DD); Pangi, *Heyde* 24 (Calc, DD). Lahul: Rotang Pass, *Nath* 435 (ANSP, USNH), *Stewart* 152. Spiti: Kibor, *H. A. C. Gill* 2068 (DD). Bashahr: Gatheng, *Strachey & Winterbottom* 12 (GH); Rupan Pass, *Parmanand* 1166 (ANSP, Gord, GH, NYBG, USNA). Tehri: Bamsor Pass, *Duthie* 576 (DD). Garhwal: Mana to Sarsutti ("to foot to glaciers"), *Schlagintweit* 8649 (GH).

Also seen from Chumbi, Yunnan, and Kansu.

***Pedicularis rhinanthoides revoluta* subsp. nov.**

Plate 25, C

Stem 0.3-0.5 dm. tall, glabrous or nearly so. Leaves, basal 1-1.5 cm. long, of about 10 pairs of oblique and somewhat overlapping pinnae, each ovate, irregularly dentate-lobed, the teeth mostly obtuse, appearing more rounded by the revolution of the margin. Inflorescence loosely hirsute. Lower pedicels exceeding upper, though in anthesis only 5 mm. long. Posterior calyx-lobe acute, slightly shorter than others (ca. 1.5 mm. long), all slightly denticulate, revolute. Corolla-tube externally pubescent, lower lip about 15 mm. wide, purple or red-purple (much discolored); beak of galea slender, abruptly contracted from and as long as hood. Capsule not seen.

Foliorum pinnae obliquae imbricatae revolutae ovatae irregulariter dentibus obtusis dentato-lobatae; inflorescentia laxe hirsuta; calycis lobus posterior pauci-denticulatus; corollae purpureae labium inferius 15 mm. latum.

Type, at 5000 to 5500 meters altitude, Naku Chu, Llonok, Sikkim, collected in flower August 3, 1909, by W. W. Smith and G. H. Cave, no. 1945; in

Herb. Academy of Natural Sciences of Philadelphia; isotype at University of California at Los Angeles. Only collection seen.

While lying beyond the area of our study this remarkable plant should be brought to attention. It is like *Pedicularis branchiophylla* in the curiously thickened and oblique pinnae of its leaves, while it is also noteworthy that the two should come from the same geographic area.

34. *Pedicularis punctata* Decaisne

Pedicularis punctata Decne., in Jacquem., Voy. dans l'Inde, Bot. 117, pl. 122, 1844. "In humidis circa Gombour." Description and illustration show admirably the species now considered. An accompanying map locates Gombour as in Ladakh just across the main Himalayan range east of the source of the Sind River in Kashmir.

Pedicularis siphonantha brevituba Prain, in Journ. Asiat. Soc. Bengal 58, pt. II: 271, 1889. Inclusive of both *P. punctata* and *P. elephas*, but the description only fitting the former, which would also be the plant known to Prain in India. *P. elephas* Boiss., Diagn. 4: 81, 1844, from Mt. Elamout in northern Persia, a dwarf plant, with widely linear leaf-blades composed of very small and crowded pinnae, stems only 3-4-flowered, lower pedicels equaling or exceeding the calyces, and corolla with tube strongly incurved at apex and with beak of galea very long and circinnately incurved, seems to me more akin to *P. rhinanthoides* Schrenk, as was the opinion of Maximowicz in Bull. Acad. Sci. St. Petersburg 32: 527, 1888.

Gregarious in wet places, by springs, stream-courses, and in swales, at altitudes of 2500 to 4500 meters, through the western Himalayas from eastern Afghanistan to Bashahr. Flowering from mid-June to early September.

AFGHANISTAN. Kurram Valley: Shendtoi, *Aitchison* 769 (DD, GH).

INDIA. Chitral: Beori ("Paitaron", "Pastason"), *Harriss* (DD); Drosh, *Harriss* (DD); Lawarai ("Lowari") Pass, *Gatacre* 17391 (DD); Shishi Kuh (Purit Gol), *Harriss* (DD); Zarkanah Pass, *Gatacre* (DD). Dir: Mian Kalai, *Harriss* 16442 (DD). Hazara (Kagan Valley): Bhimbal Ka Kattha, *Inayat* 19982 (DD, UCLA); Chapran, *Inayat* (UCLA); Gittidas ("Gitidass", "Giti Dass"), *Inayat* (DD, UCLA); Karkun, *Inayat* 19981 (ANSP, DD, UCLA). 19995 (DD); Lulusar, *Inayat* 19984 (DD); Makra, *Inayat* (ANSP, DD, UCLA); Naran, *Inayat* (DD); Nila, *Inayat* 22048a (ANSP, DD, UCLA); Rajwal, *Inayat* 22048 (DD, UCLA); Saifar Maluk, *Inayat* 19981b (ANSP, DD, UCLA); Sarul, *Inayat* 22048b (DD); Shadal, *Inayat* (DD). Hazara (Saran Range): Gali Musalla, *Inayat* (ANSP, DD, UCLA); Urni, *Inayat* (DD). Muzaffarabad: Chobsar, *Inayat* (DD); Thilan, *Inayat* (DD); Thora, *Inayat* 22048c (DD). Gilgit: Chamngarh ("Chugarh"), *Giles* 47 (DD). Astor: above Doian ("Doyen"), *Duthie* (DD). Kashmir: Gulmarg, *Stewart* 10357; Gurez ("Goorase"), *Falconer's collector* (DD); Kalgam, Haripur, *Inayat* 25724b (DD). -Kishanganga Valley: Jagran River, between Kund and Shakhara villages, *Keshavanand* 364 (DD); Kel to Taubat, *Stewart* 17842 (ANSP, Gord, GH, NYBG); head of Keran Nala, *Keshavanand* 470 (DD); Narda Range, *Keshavanand* 763 (DD); below Sonapind Pass, *Keshavanand* 812 (DD). -Liddar Valley: Aru, *Drummond* 14130 (UCLA), *Stewart* 9489a (GH); Badzulkod Nullah, *Duthie* 13432 (DD); above Kainmul, *Duthie* 13132 (DD, UCLA); Pahlgam, *Stewart* 5459, 5670, 5934; Pir Panjal, *Inayat* 25727 (DD); Ramu, *Gammie* (ANSP, DD, UCLA); Shisha Nag, *Duthie* 14171 (DD); Saugam Valley above Liddarwat, *Duthie* 13537 (DD, UCLA). -Sind Valley: below Baltal, *Duthie* 11551 (DD); Gund, *Gammie* (USNH); Sonamarg, *Gammie* (DD), *Stewart* 3466, 6739; Traghal ("Tarakhal"), *Koelz* 9125 (ANSP, GH, NYBG, USNA), *Stewart* 4807. Udhampur: near Kishtvar, *Schlagintweit* 2999 (ANSP, GH). Baltistan: Bagicha to Olding, *Stewart* 21010 (ANSP, USNH); Deosai Plains (near Yusi Mar), *Stewart* 20108 (ANSP, NYBG); Shingo Valley, *Duthie* (DD). Purig: Dras, *Stewart* 151; Dras Valley below Matayan, *Duthie* 11718 (DD); Marpu Nullah, above Dras, *Duthie* 11773 (DD). Ladakh: Bod Kharbu, *Koelz* 6216 (USNH); Dah, *Schlagintweit* 1201 (USNH); Kaltse to Damkar, *Schlagintweit* 1106 (GH); Kharbu, *Stewart* (Gord); Timti La via Timti Do to Kharbu Koma, *Schlagintweit* 1201 (USNH). Chamba: between Alwas and Sach Pass, *Gammie* 18368 (DD), 18410 (ANSP, DD, UCLA); Brahmour, *Koelz* 10152a (NYBG, USNA). -Pangi: between

Kilar and Luj, *Harsukh* (DD); Sach ("Sauch") Valley, *Harsukh* (ANSP, DD, UCLA); Sural Valley, *Harsukh* (DD); "Pangee", *Brandis* 4207 (DD), 4217 (DD). Zaskar: Seni, *Koelz* 5792 (USNH), 5844 (USNH). Lahul: along Bhaga River, *Drummond* 8910 (ANSP, UCLA); Kardong to Dartse, in Bhaga Valley, *Schlagintweit* 2866 (GH, USNH); Khoksar, *Koelz* 801 (NYBG), *Nath* 263; Kolung, *Koelz* 10073 (ANSP, USNA); Kyelang, *Koelz* 520 (NYBG); Lugru (Ghoshal), *Chand* 129a (USNH); Rotang Pass, *Nath*; Tinu, *Koelz* 8482 (NYBG, USNA). Bashahr ("Bassahir"): Kilba, *Baksh* 5185 (UCLA).³⁴

35. *Pedicularis hookeriana* Wallich

Pedicularis hookeriana Wall., Numer. List Ind. Mus. n. 421, 1829, ined. "Kamaon"; ex Benth., Scroph. Indicae 53, 1835. "Hab. in Kamaon, Wallich, ad Simla et in Cashmeria, Royle." Presumably named for Professor William Jackson Hooker of Scotland. Distinguished from *P. siphonantha* Don by the corolla-tube being hardly three, instead of four times the length of the calyx. Evidently it included both *P. punctata* Decne. and the species now considered, but as the name was adopted from Wallich, it seems well to take his collection cited, that from Kumaun, as type. On geographical grounds it must have been the present species.

Pedicularis himalayca Klotzsch, in Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar 107, tab. 58, 1862. "Dr. [Werner] Hoffmeister fand diese Art im Himalaya [in 1846]." As stated under *P. bicornuta*, records of collecting-localities were lost due to the violent death of Dr. Hoffmeister in the field. Collections were made in the Himalayas from Garhwal to Bashahr, and the type must have come from that territory. The illustration of *P. himalayca* shows well the small and cut leaf-pinnæ and the sharp teeth on the anterior side of the base of the galea, two of the distinguishing marks of the species now considered.

Glacial moraines, and probably elsewhere, at altitudes of 2700 to 4500 meters, in the central Himalayas from Simla to Nepal. Flowering from June to September.

INDIA. Simla: Bharog (Chur Mt.), *Baksh* 5187 (ANSP, UCLA); Simla, *Royle* (DD). Bashahr ("Bassahir"): Kunawar, *Baksh* 5186 (UCLA); Mehbar to Harang P., *Lace* 317 (DD); Rakeham ("Rakchham"), *Parmanand* 947 (ANSP, Gord, GH, NYBG, USNA). Dehra Dun: Chamsir Pass, *Parmanand* 292 (ANSP, Gord, GH, NYBG, USNA). Tehri: Srikanta, *Duthie* 562 (DD), 565 (DD). Garhwal: above Bhowani, *Duthie* 4263 (DD); Kidarnath, *Schlagintweit* 7796 (GH); near Kuari Pass, *Duthie* 4265 (DD). Kumaun: -Byans: Palang Gadh, *Duthie* 5839 (Calc); -Darma: Mulapa Gadh, *Duthie* 5839 (DD), *J. R. Reid* 5846 (DD); -Gori Valley: Parblu, *Inayat* 24787 (DD); -Ralam Valley, *Duthie* 3227 (DD), *Inayat* 24792 (DD).

NEPAL. Opposite Budhi in Nepal, *Duthie* 5839 (DD); Khaptar forest, *Bis Rain* 536 (DD).

In the Annals of the Royal Botanic Garden, Calcutta (p. 115) in 1890 Dr. Prain associated *Pedicularis hookeriana* and *P. himalayca* as I would now do, but he considered "hookeriana-himalayca" to be a tall and longer-leaved form of *P. siphonantha* var. *typica*, contrasting them together against his other form "vera" which was the true *siphonantha* Don of eastern Nepal and Sikkim, a dwarf and spreading plant with leaf-segments nearly contiguous. Var. *typica* he in turn contrasted with var. *brevituba*, giving the essential characters of *typica* as corolla-tube four to five times the length of the calyx and the anterior teeth at the base of the galea sharp. This combination of characters fits well genuine *P. siphonantha*, but only the latter

³⁴ In the Bonati Herbarium, and to be at the University of California at Los Angeles, is a collection of this credited to "Sikkim W. W. Smith in 1912", with the name "*Pedicularis siphonantha* Don v. *brevituba*." This is all written in Bonati's hand on one of his own form labels, and I have no doubt that he was mistaken as to the source of this material.

character applies to *hookeriana*, while in no case does the corolla-tube of the last attain the proportions given by Prain. Moreover, through a failure to appreciate the accompanying leaf-distinctions of *P. punctata*, his var. *brevituba*, some specimens of that were identified as forma "*hookeriana-himalayca*," thus carrying its range west to Kashmir. I think, however, that the problem clears on the lines I am now indicating, and that *P. punctata*, *P. hookeriana*, and *P. siphonantha* are all valid species, each pertaining to its own part of the Himalayas.

Pedicularis siphonantha Don, with which Prain so closely associated *P. hookeriana*, may be readily distinguished by its corolla-tube being four to seven times the length of the calyx, its leaves being smaller with shorter and less deeply cut pinnae (although relative to their diminutive size the proportions may not be dissimilar) that are more closely set along the midrib, and its habit dwarfed, the stems less than 1 dm. tall and usually shortly or extensively procumbent. The type was collected by Wallich on Gosain Than in eastern Nepal, and various collections, all from altitudes of 3300 to 5000 meters, are at hand as follows:

SIKKAM. Chamnago, *W. W. Smith* 3804 (ANSP, GH. UCLA); Changu, *Smith* 4247 (ANSP, Gord, NYBG, UCLA); Zemu Valley, *Smith & Cave* 1127 (UCLA), 1156 (UCLA), 1260 (ANSP), 1546 (UCLA).

CHUMBI. Chaerlung, *R. Lepcha* 389 (UCLA); Dotha, *Lepcha* 162 (ANSP); Hooma-py-a, *Dr. King's collector* 621 (USNH).

Pedicularis siphonantha, at least in its typical form, does not occur in Yunnan and Szechuan, western China, although close relatives there show corollas of similar great length.

EXPLANATION OF PLATES

- PLATE 1. A—*Lindernia hookeri kumaunensis*, Kali Valley, Kumaun, *Duthie* 3239, in 1884.
B—*Scrophularia cserta*, Lowarai Pass, Chitral, *Harriss* 16456, in 1895.
- PLATE 2. A—*Scrophularia robusta*, Mak, Afghanistan, *Koelz* 14075, in 1939.
B—*Scrophularia scoparia*, Sirotai, Afghanistan, *Koelz* 11922, in 1937.
- PLATE 3. A—*Scrophularia nudata*, Chunagand to Kharbu, Ladakh, *Stewart* 21086, in 1940.
B—*Scrophularia stewartii*, Phullaren, Jhelum, *Stewart* 13784, in 1934.
- PLATE 4. A—*Scrophularia stenothyrsa*, Aina Mela, Afghanistan, *Harsukh* 15421, in 1894.
B—*Scrophularia suffruticosa*, Kibor, Spiti, *Koelz* 7127, in 1933.
- PLATE 5. A—*Scrophularia koelzii*, Kukti Pass, Lahul, *Koelz* 1229, in 1930.
B—*Scrophularia moniliformis*, Kacha Garhi, Peshawar, *Qazilbash* in 1928.
- PLATE 6. A—*Kickxia subsessilis*, Baramulla, Kashmir, *Stewart* 14053, in 1934.
B—*Picrorhiza scrophulariaeflora*, Zemu Valley, Sikkim, *Smith & Cave* 1343, in 1909.
- PLATE 7. A—*Veronica lasiocarpa*, Mt. Kolahoi, Kashmir, *Stewart* 9433, in 1927.
B—*Veronica uncinata*, Chortren Chen, Ladakh, *Koelz* 2654a, in 1931.
C—*Veronica stewartii*, Srinagar, Kashmir, *Stewart* 8586a, in 1926.

- PLATE 8, A—*Veronica cephaloides*, Sikkim, *Hooker*.
B—*Veronica koelzii*, Tsakzhun Tso, Ladakh, *Koelz* 2400, in 1931.
- PLATE 9, A—*Veronica hirta*, Nichanai Pass, Kashmir, *Stewart* 9896, in 1928.
B—*Veronica nana*, Debring, Rupshu, *Koelz* 6528, in 1933.
- PLATE 10, A—*Veronica secunda*, Hang, Bashahr, *Parmanand* 771, in 1934.
B—*Veronica umbelliformis*, Barji Kong Pass, Kumaun, *Strachey & Winterbottom* 10, in 1848.
- PLATE 11, A—*Odontites himalayica*, Skardu, Baltistan, *Stewart* 20401, in 1940.
B—*Euphrasia platyphylla*, Gangabal Lakes, Kashmir, *Stewart* 18175, in 1939.
- PLATE 12, A—*Euphrasia kurramensis*, Kurram Valley, Afghanistan, *Aitchison* 990, in 1879.
B—*Euphrasia incisa*, Godai, Astor, *Stewart* 18934, in 1939.
- PLATE 13, A—*Euphrasia secundiflora*, Kiris to Parkutta, Baltistan, *Stewart* 20918, in 1940.
B—*Euphrasia multiflora*, Solling, Bashahr, *Parmanand* 1212, in 1934.
- PLATE 14, A—*Euphrasia laxa*, Kharbu, Ladakh, *Stewart* 21069, in 1940.
B—*Euphrasia alba*, Hemis, Ladakh, *Koelz* 2551, in 1931.
- PLATE 15, A—*Euphrasia foliosa*, Chorwan, Kashmir, *Stewart* 19278, in 1940.
B—*Euphrasia microcarpa*, Sach Valley, Chamba, *Inayat* in 1899.
- PLATE 16, A—*Euphrasia aristulata*, Sonamarg, Kashmir, *Stewart* 9856, in 1928.
B—*Euphrasia remota*, Rattu, Astor, *Stewart* 18792, in 1939.
- PLATE 17, A—*Euphrasia densiflora*, Rattu to Rupal Nullah, Astor, *Stewart* 18852, in 1939.
B—*Euphrasia flabellata*, Shigar, Baltistan, *Stewart* 20540, in 1940.
- PLATE 18, A—*Pedicularis maximowiczii*, Purig, *Koelz* 6017, in 1933.
B—*Pedicularis nodosa*, Kyungar, Almora, *Champion* 67, in 1924.
C—*Pedicularis pycnantha cuspidata*, Gundla, Kulu, *Koelz* 5177, in 1933.
- PLATE 19, A—*Pedicularis albida*, Shigar Nulla, Baltistan, *Koelz* 9731, in 1936.
B—*Pedicularis purpurea*, Drokpo Gongma, Lahul, *Koelz* 6895, in 1933.
- PLATE 20, A—*Pedicularis chitralensis*, Lawarai Pass, Chitral, *Harriss* in 1899.
B—*Pedicularis brunoniana ctenodonta*, Kukti Pass, Chamba, *Koelz* 10180, in 1936.
- PLATE 21, A—*Pedicularis pectinata palans*, Ghora Gali, Rawalpindi, *Stewart* 12419, in 1931.
B—*Pedicularis pectinata bipinnatifida*, Sarul, Hazara, *Inayat* 22051, in 1897.
- PLATE 22, A—*Pedicularis stewartii* (fruiting), Sonamarg, Kashmir, *Stewart* 6717, in 1921.
B—*Pedicularis stewartii* (flowering), Pahlgam, Kashmir, *Stewart* 9248, in 1927.
- PLATE 23, A—*Pedicularis kashmiriana*, s. of Karagbal, Kashmir, *Koelz* 9233, in 1936.
B—*Pedicularis cyrtorhyncha*, Pustuson, Beori, Chitral, *Harriss* in 1899.
- PLATE 24, A—*Pedicularis multiflora*, Tangmarg, Kashmir, *Stewart* 10648, in 1929.
B—*Pedicularis brevirostris*, Dras Valley, Purig, *Duthie* 11640, in 1892.
- PLATE 25, A—*Pedicularis branchiophylla*, Uachezali, Sikkim, *Smith & Cave* 1714, in 1909.
B—*Pedicularis rhinanthoides speciosa*, Tianak, Ladakh, *Koelz* 6468, in 1933.
C—*Pedicularis rhinanthoides revoluta*, Naku Chu, Llonok, Sikkim, *Smith & Cave* 1945, in 1909.

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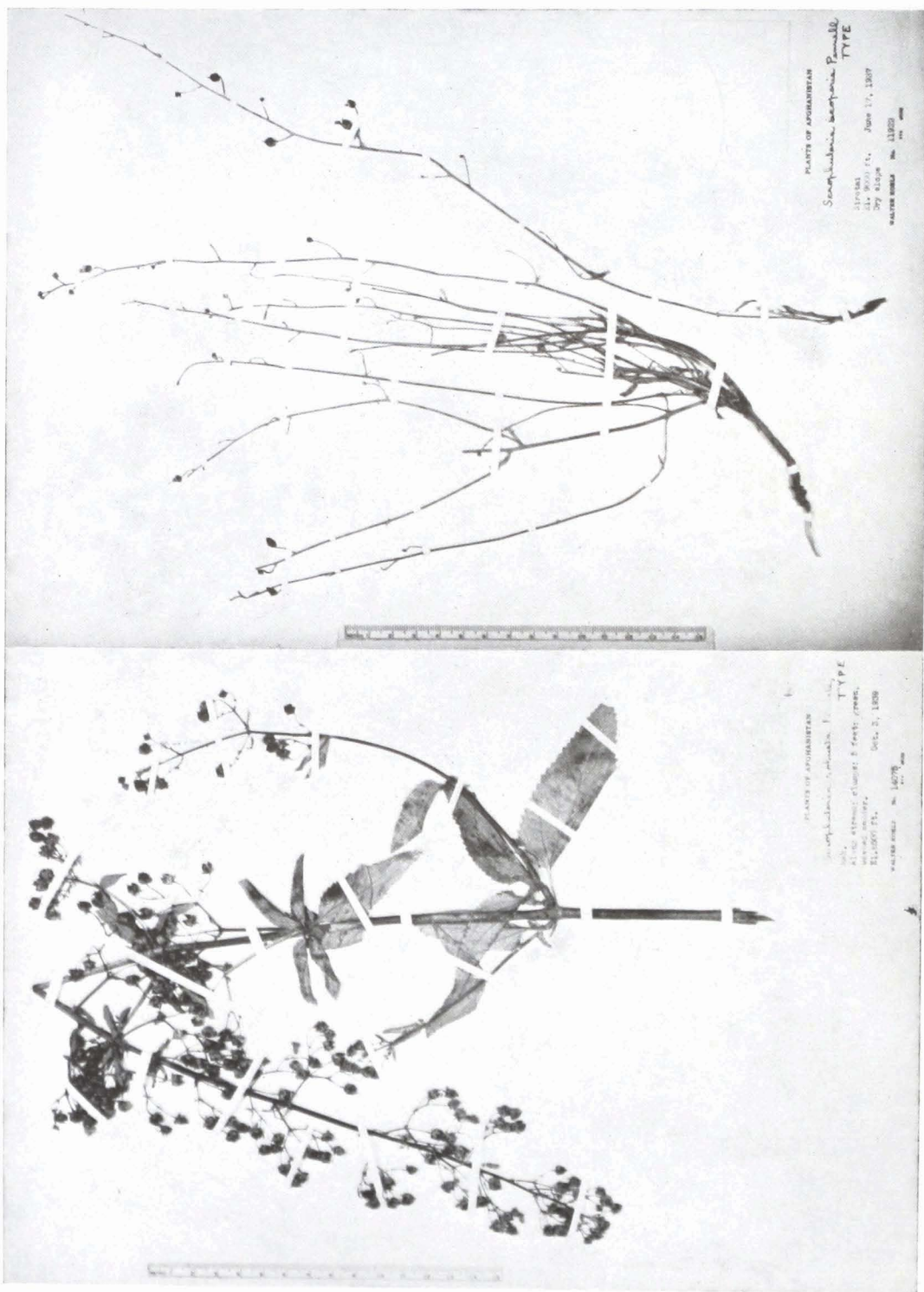
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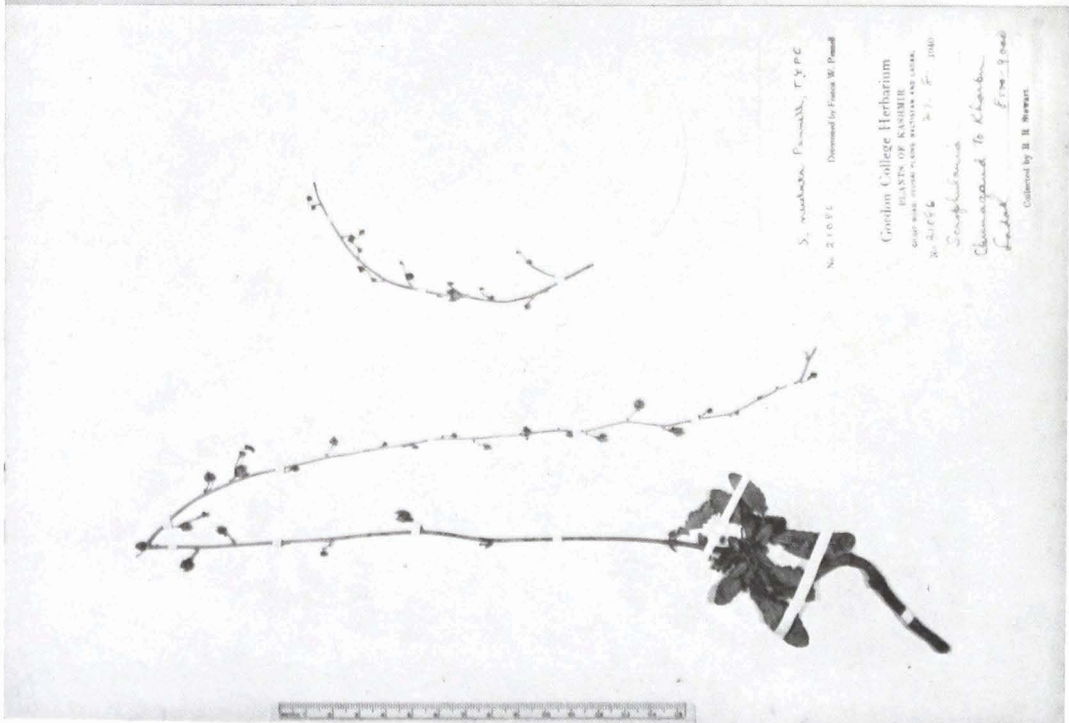
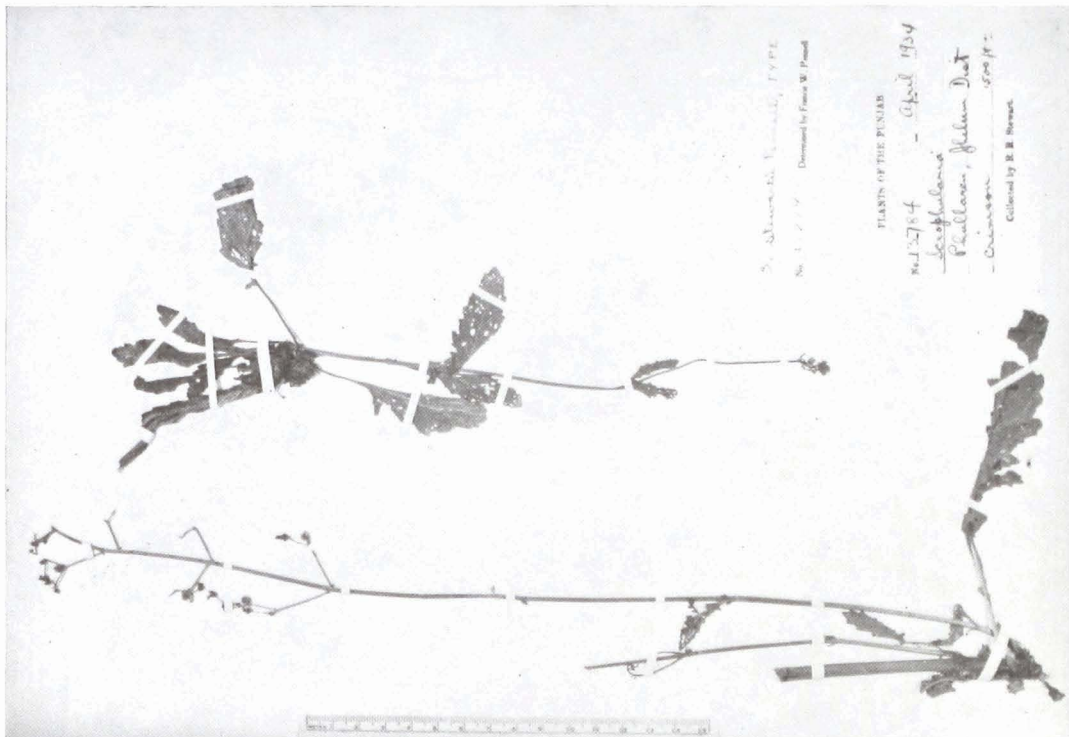
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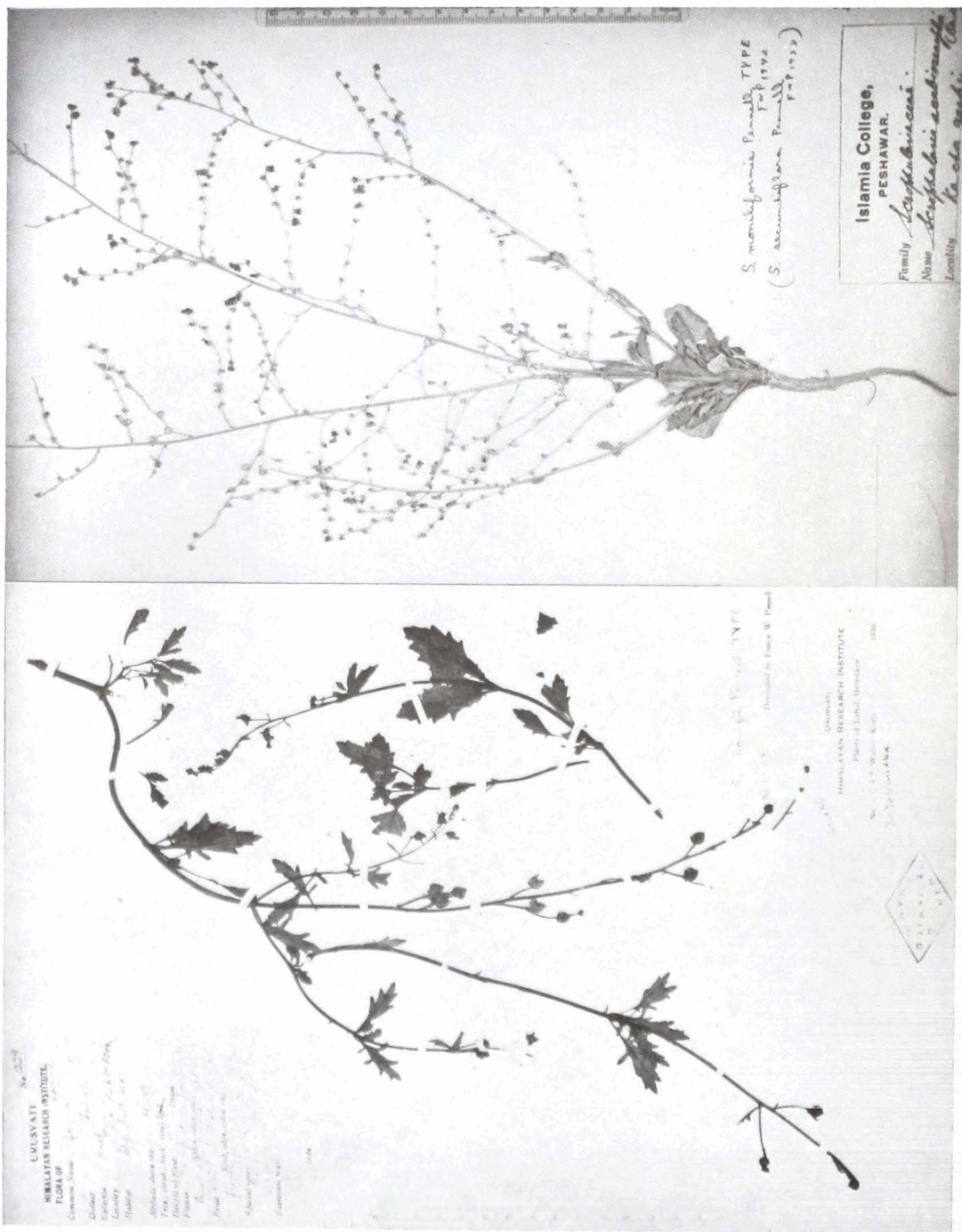




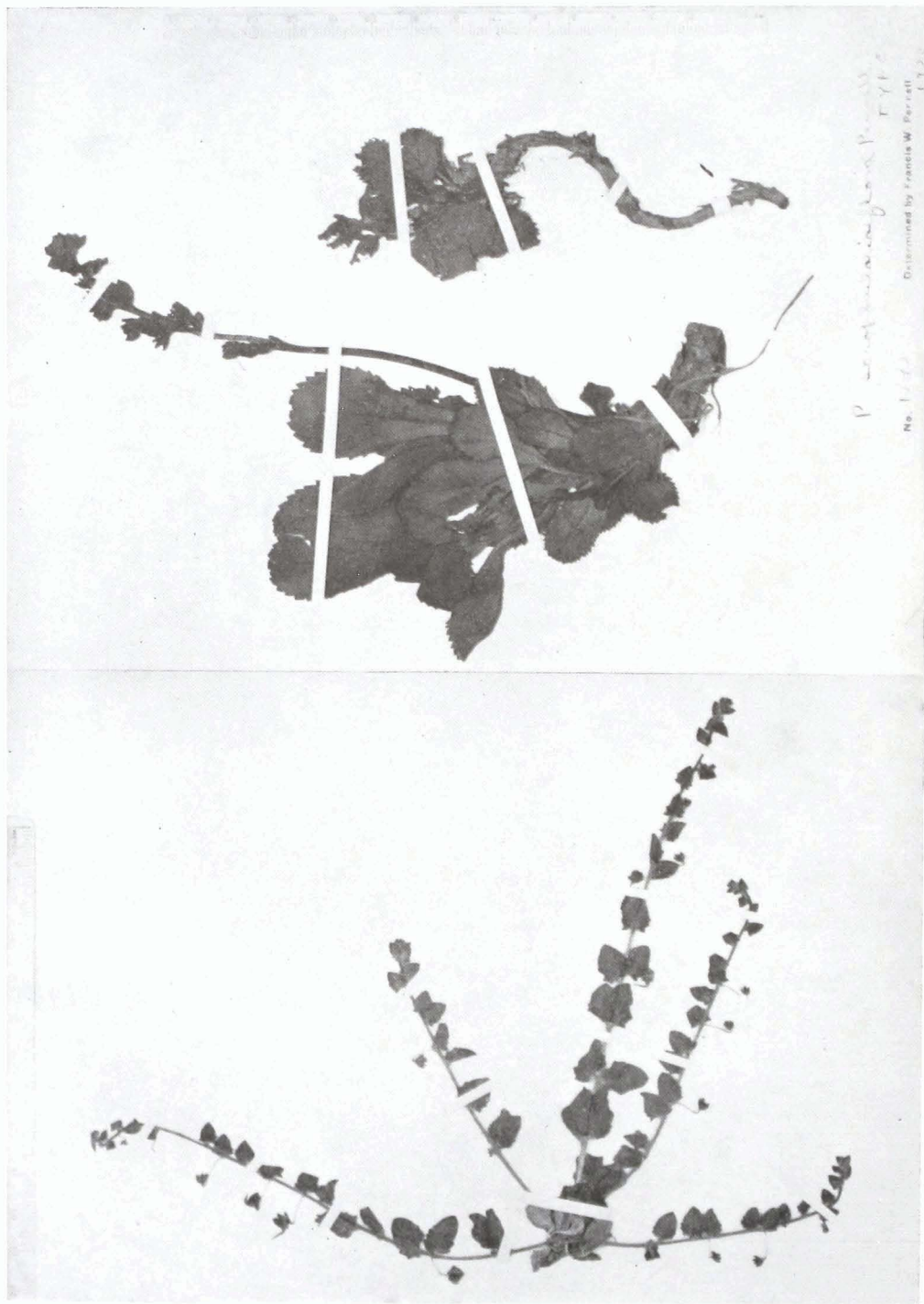
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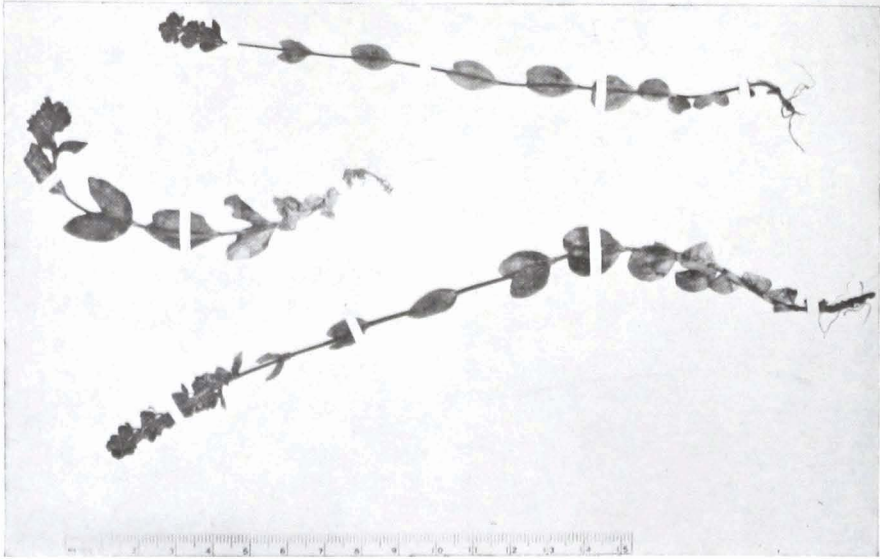
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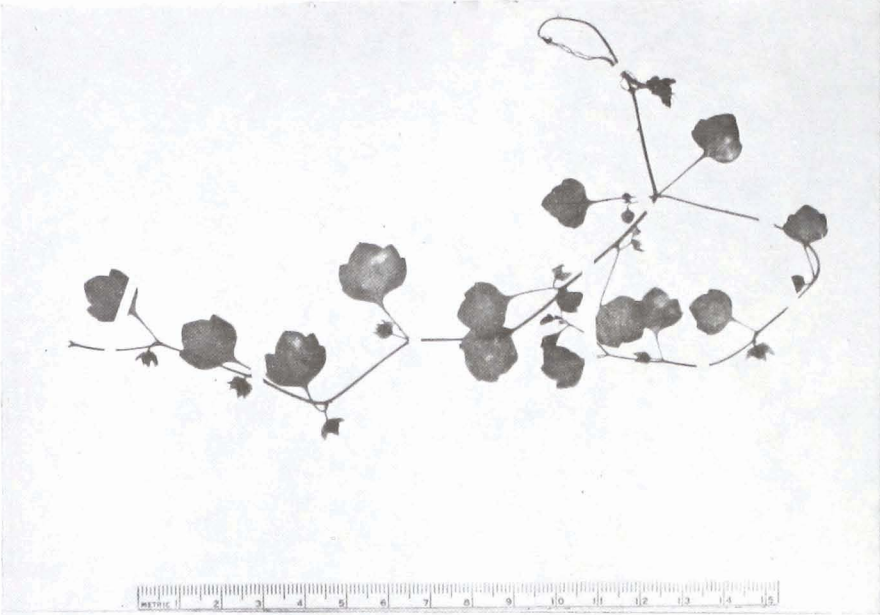
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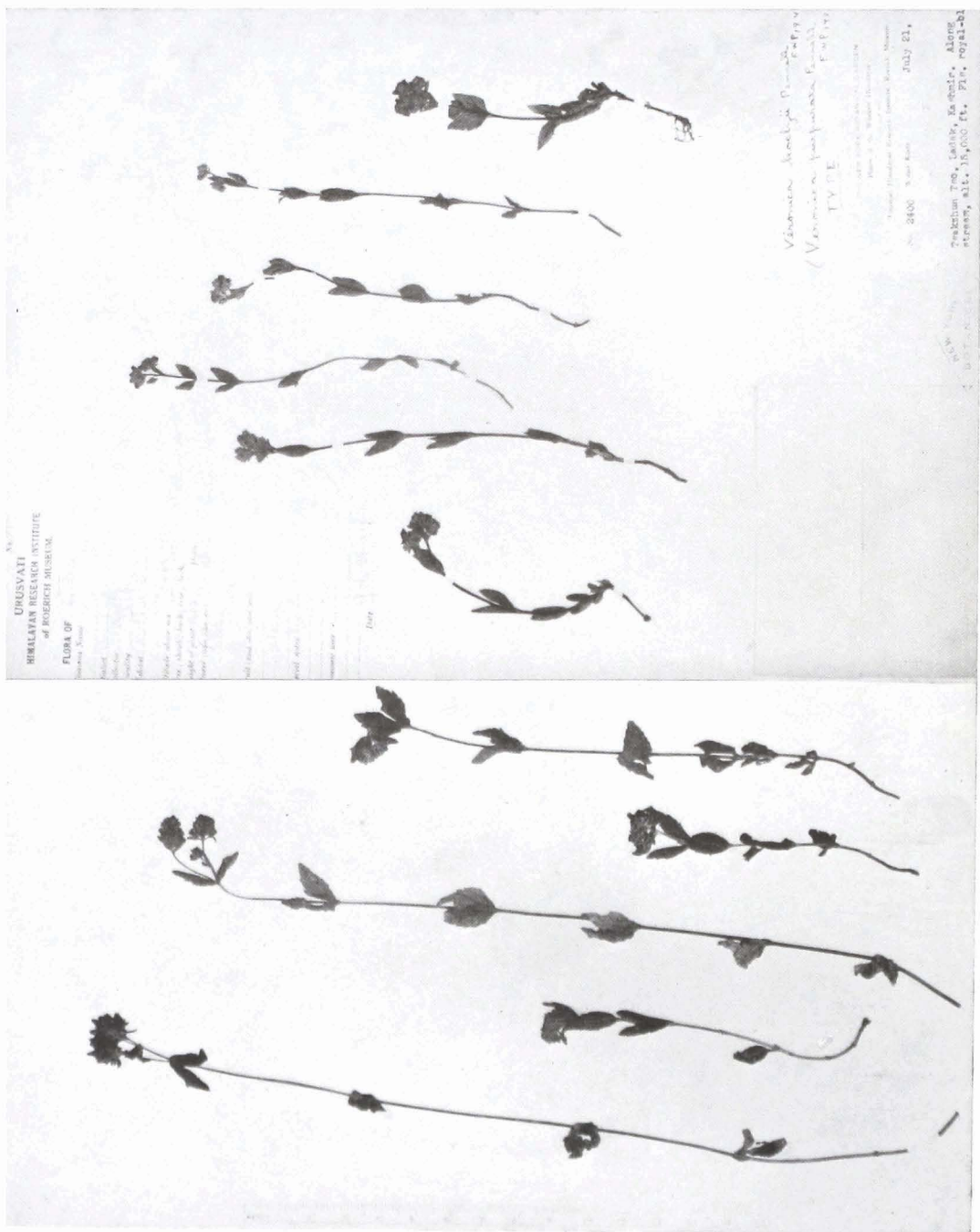
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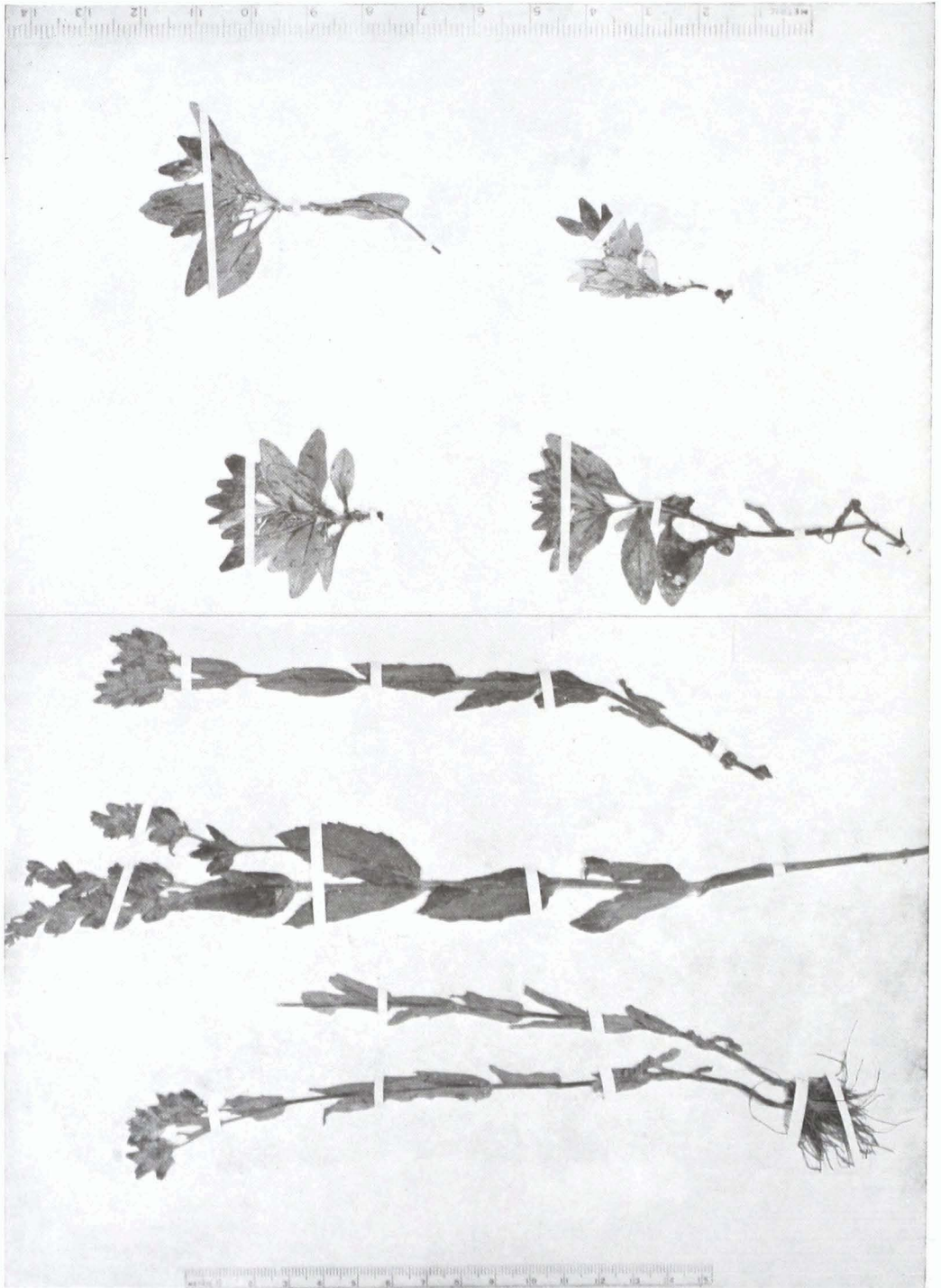
B



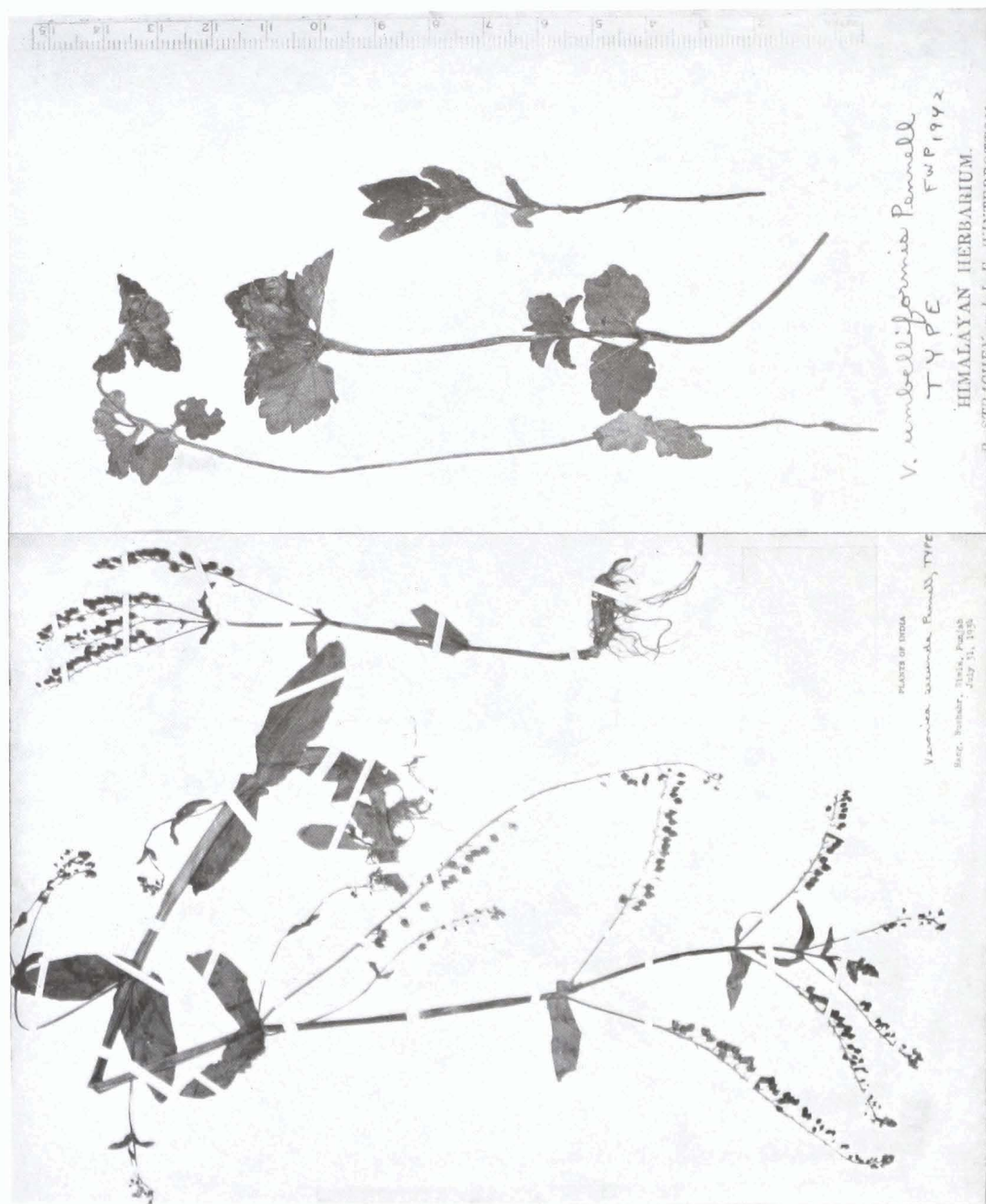
C



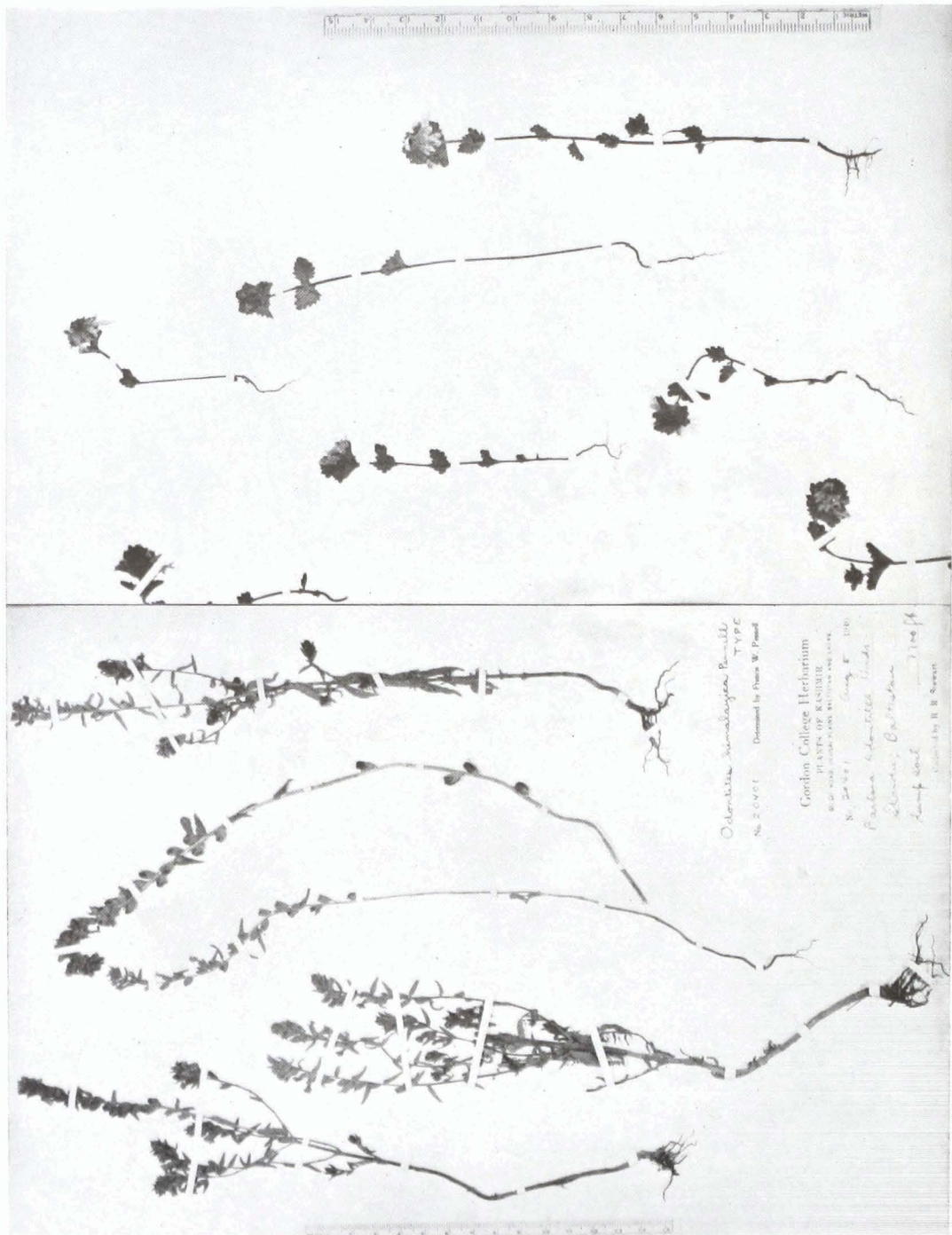
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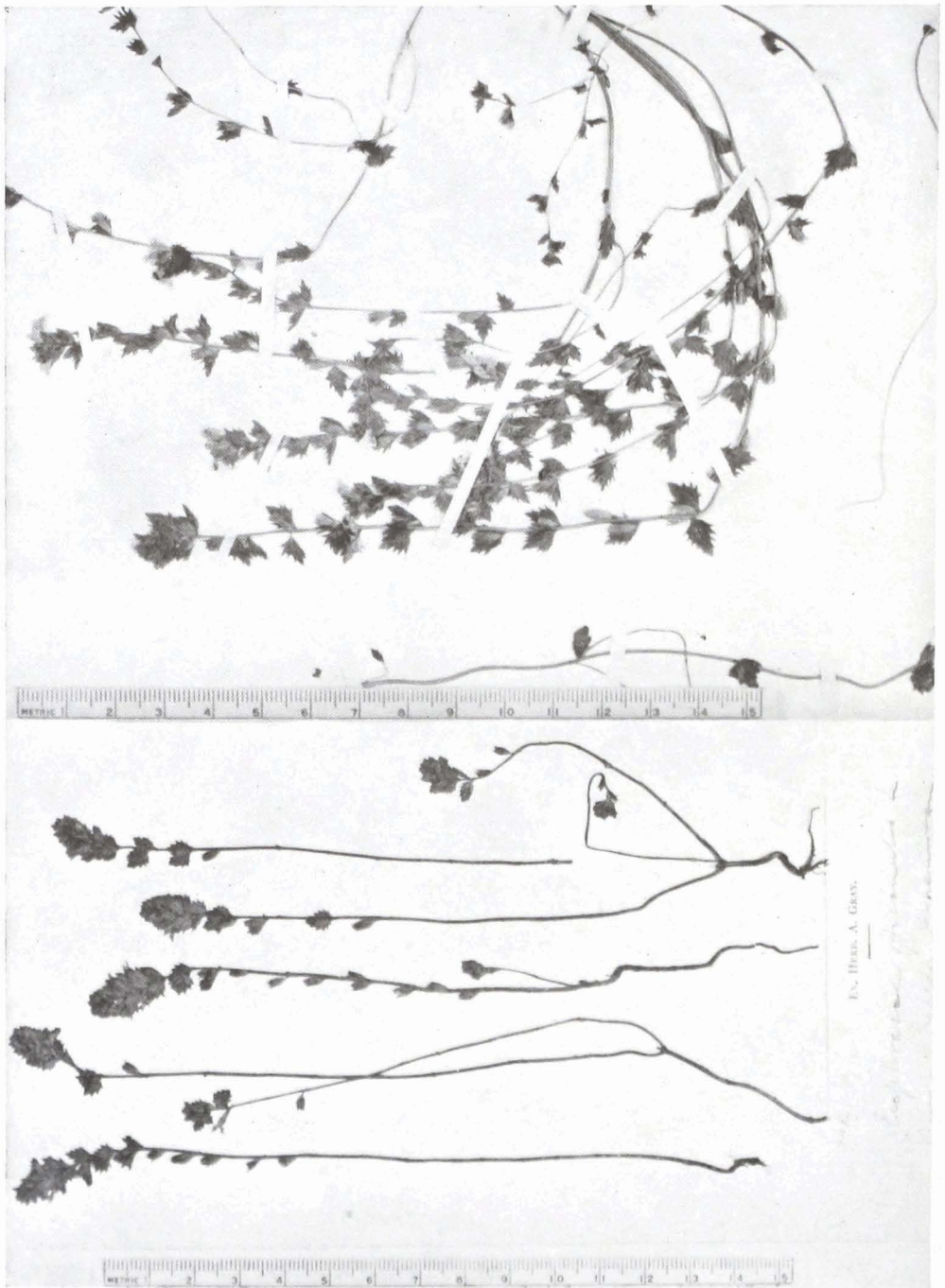


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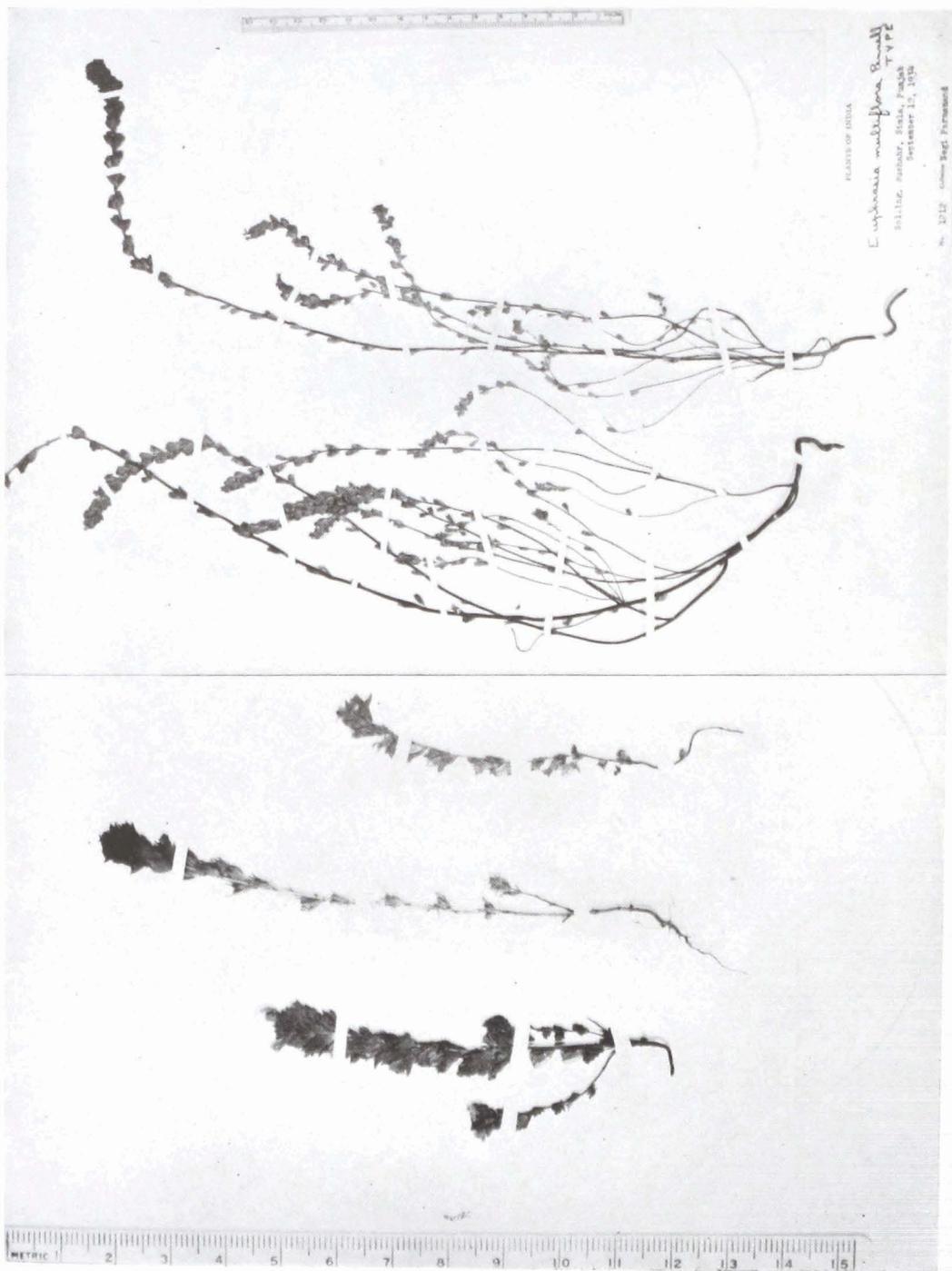


Oenothera biennis Pursh
TYPE
No. 20001 Determined by Fernald, W. P. Merrill
Gordon College Herbarium
PLANTS OF MASSACHUSETTS
No. 20001 Aug 8 1900
Parsippany, N. J.
L. C. Merrill
Aug 10 1900
Collected by R. R. Sargent

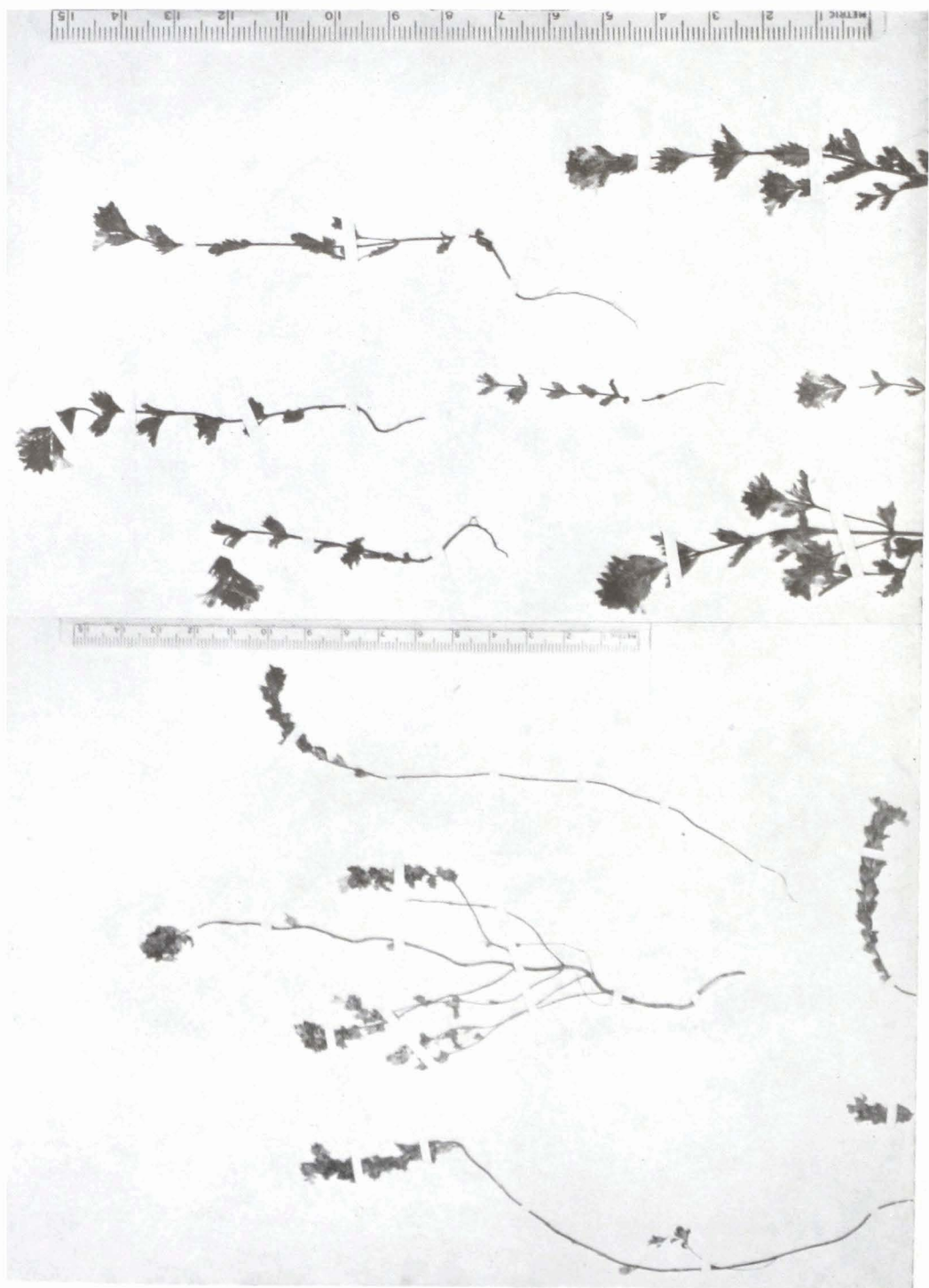
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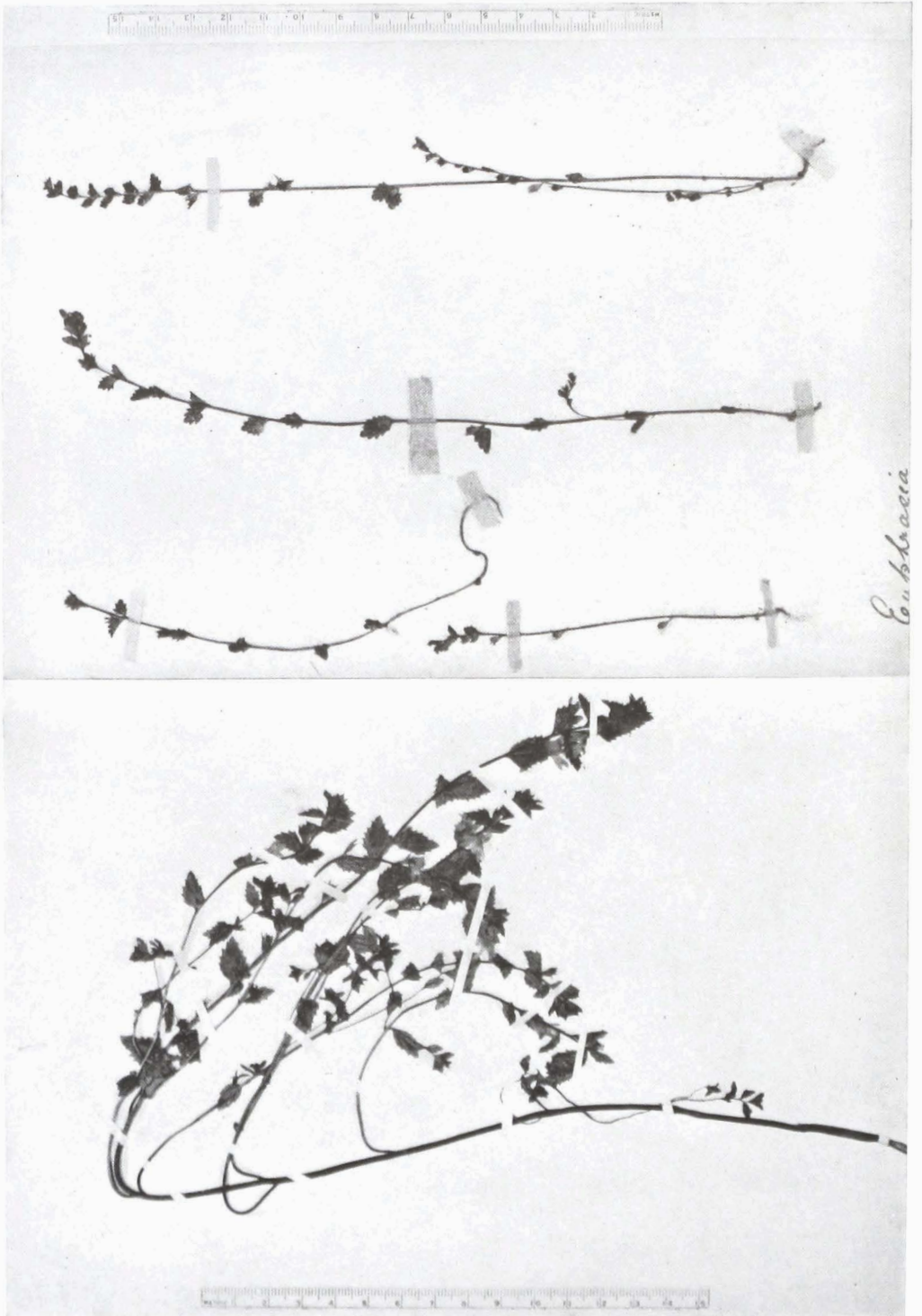
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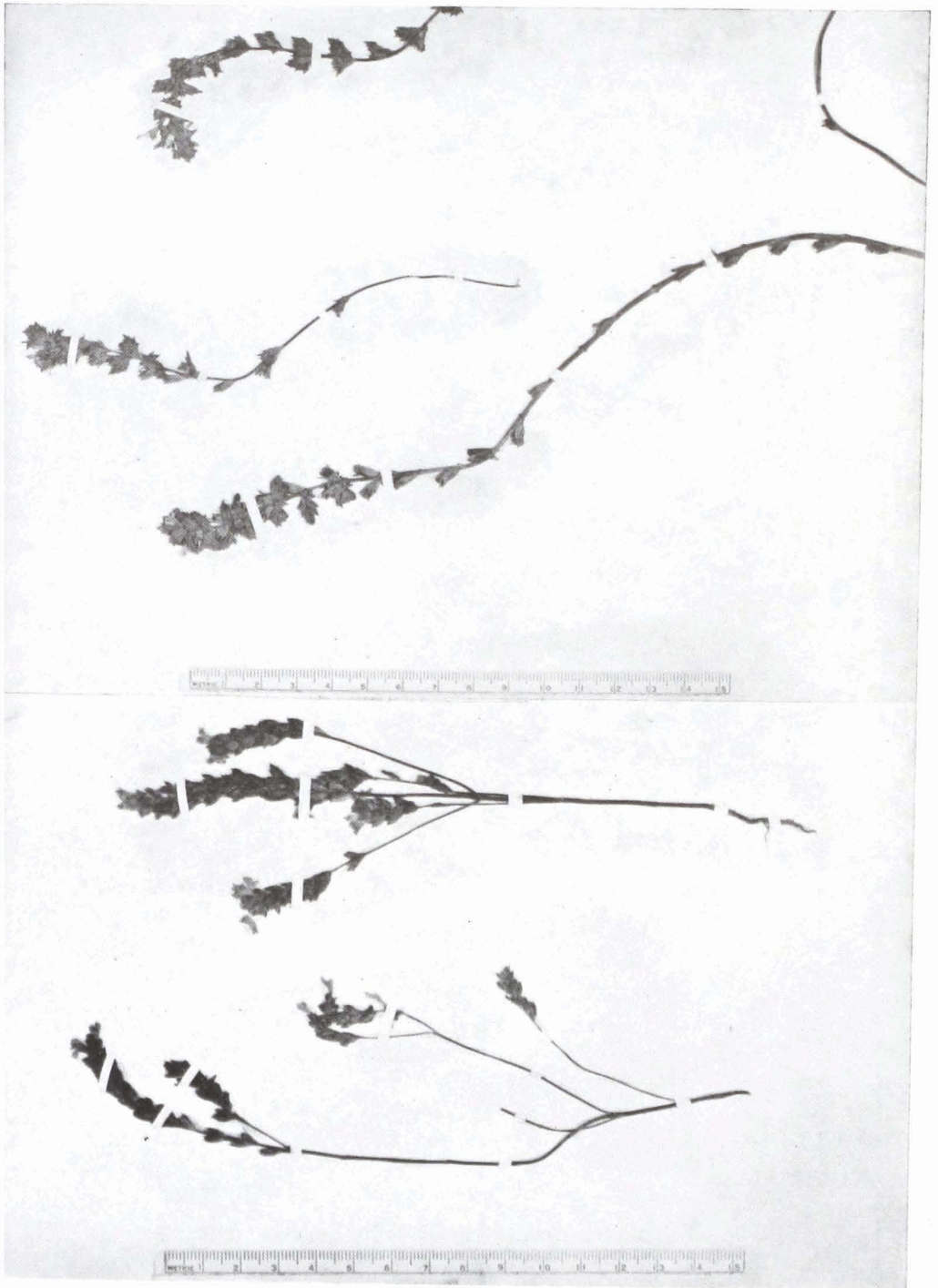
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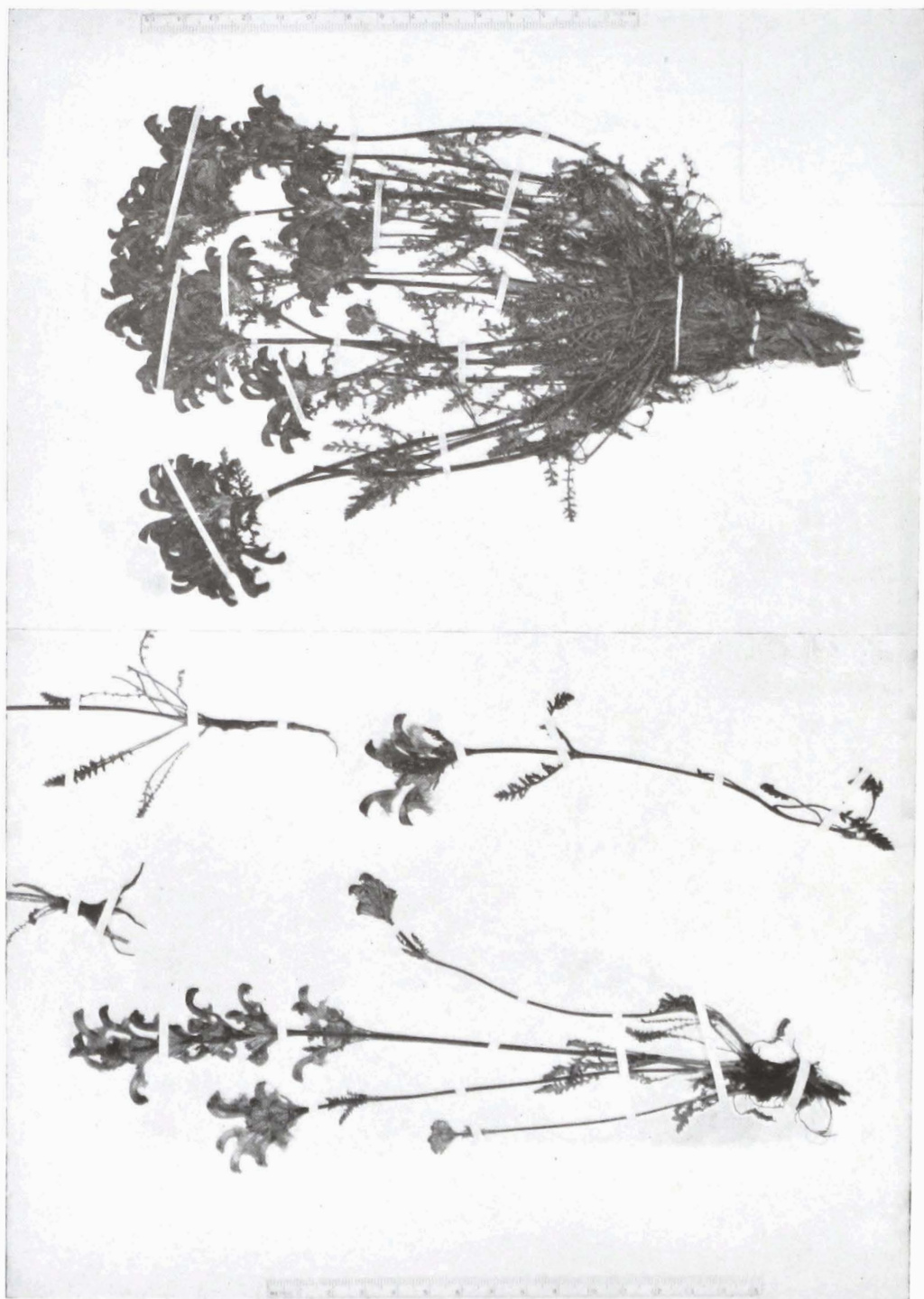
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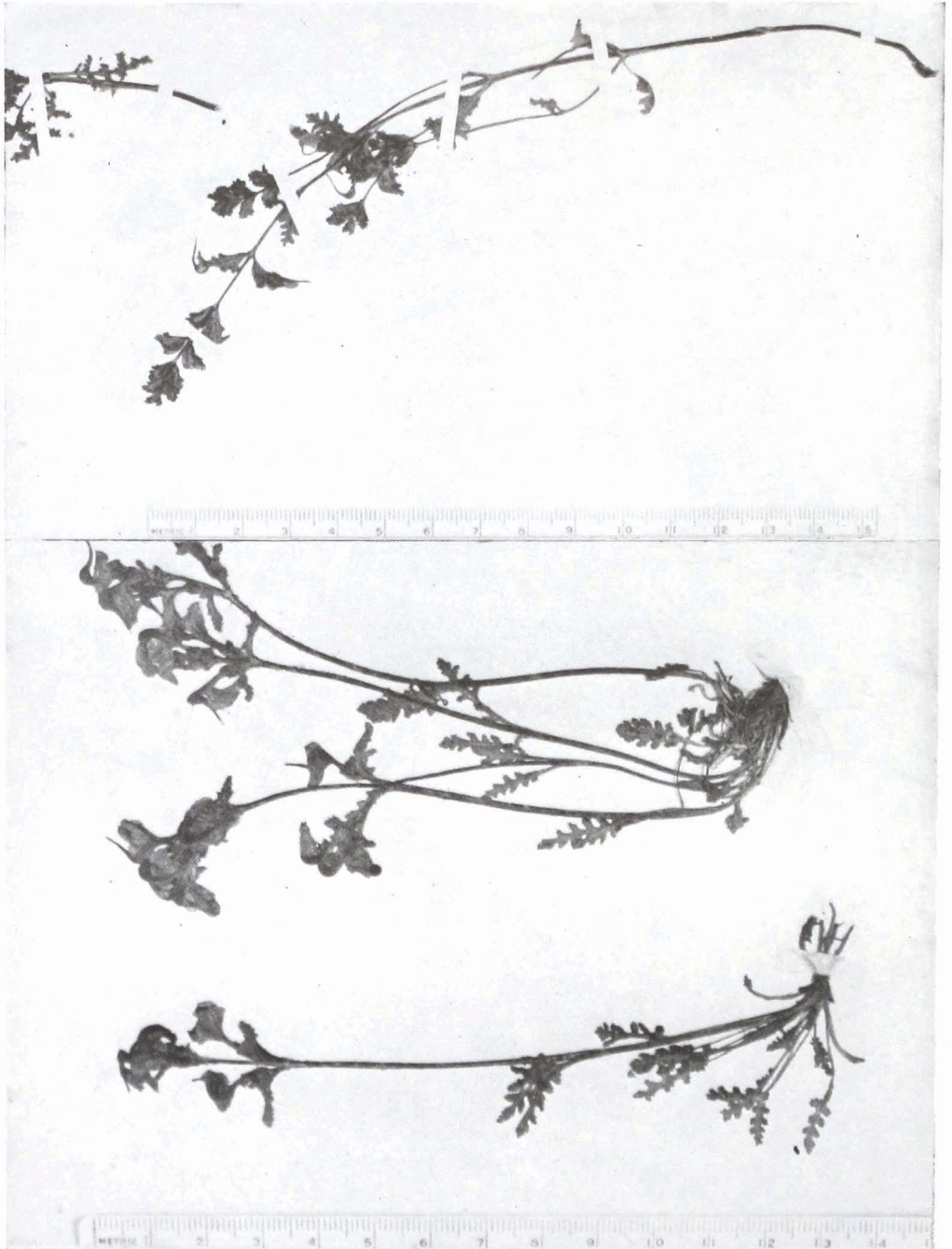
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B

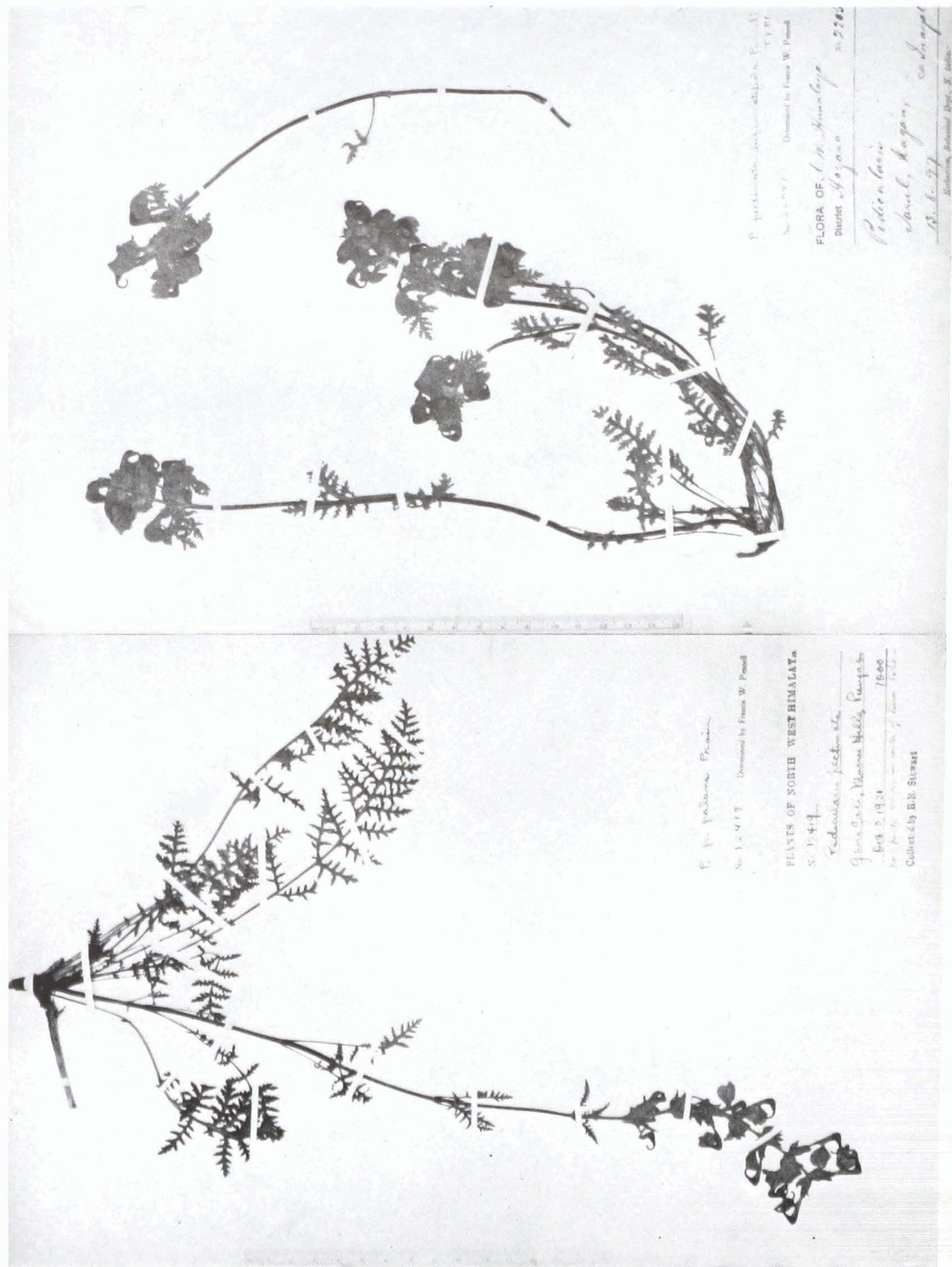
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A, below. B, above.



A. below. B. above.



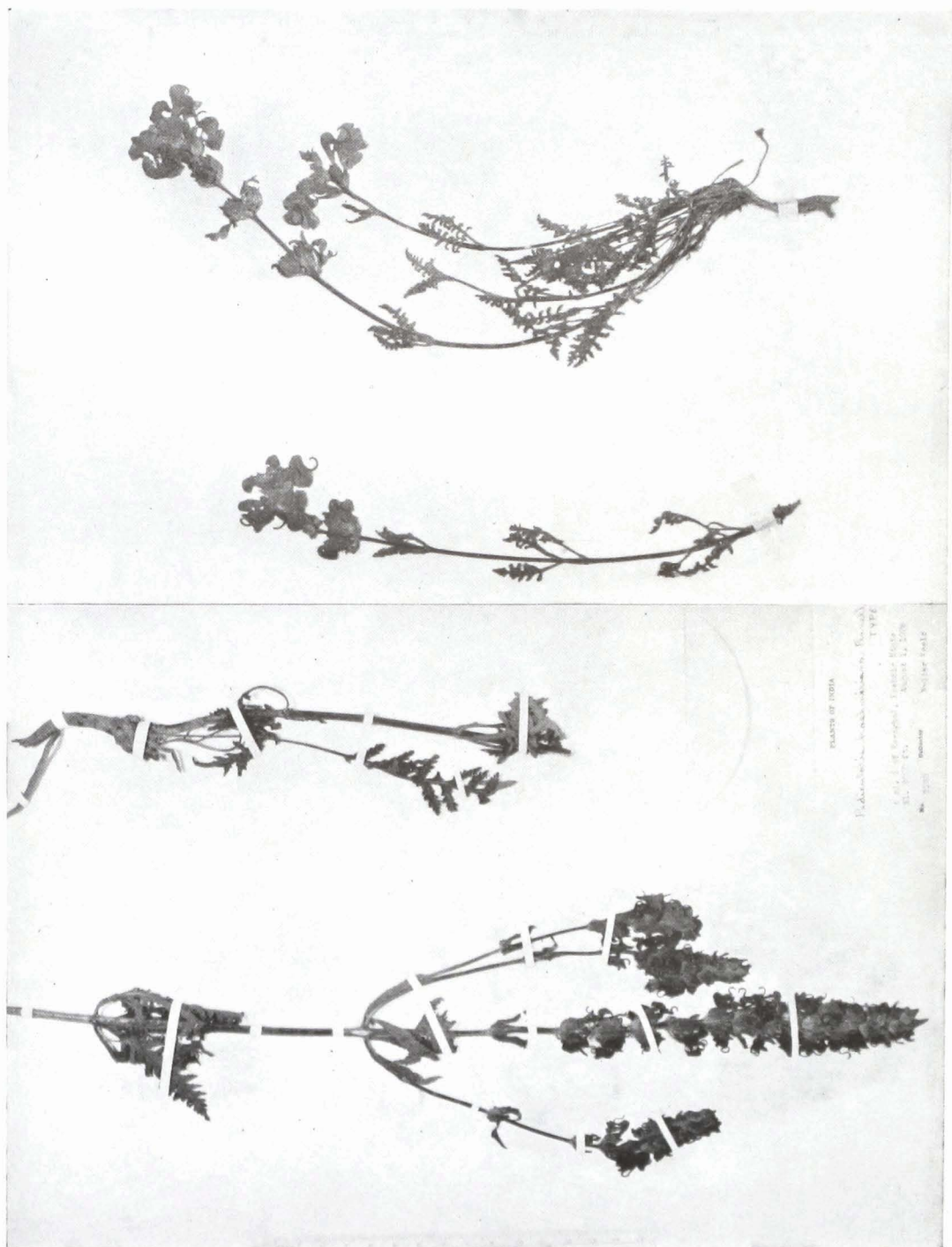
FLORA OF NORTH WEST HIMALAYA
 District *Uttaranchal* No. 2260
Polygonum
obovatum *Boiss.*
Boiss.
 Himalayas, *Uttaranchal* Dist. *Uttaranchal*

Polygonum *Pruriens*
 No. 12419 Determined by *Francis W. Pennell*
 FLORAS OF NORTH WEST HIMALAYA
 No. 12419
Polygonum *Pruriens* *Boiss.*
Pruriens *Boiss.*
 Dist. *Uttaranchal* *Uttaranchal*
 Collected by *B.H. Stewart*

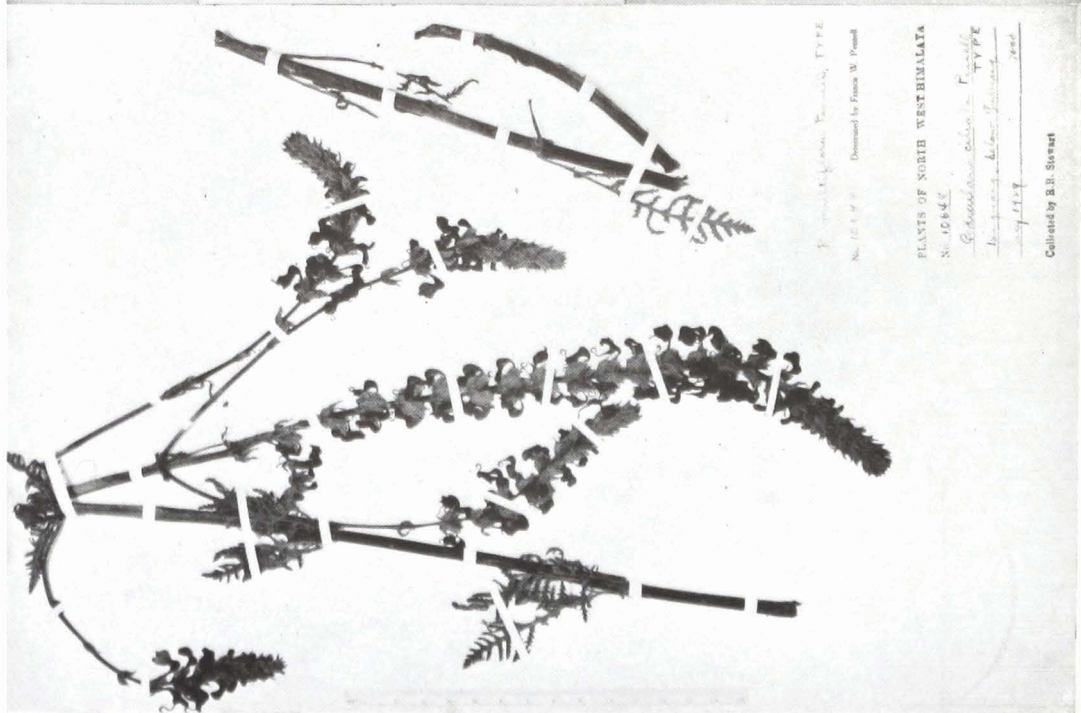
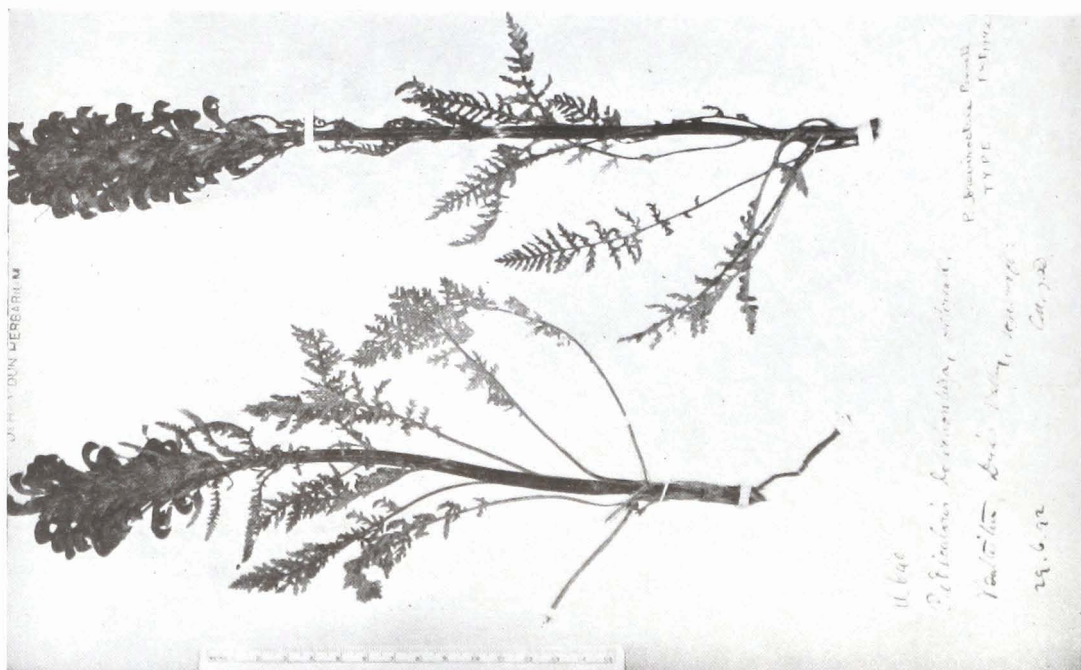
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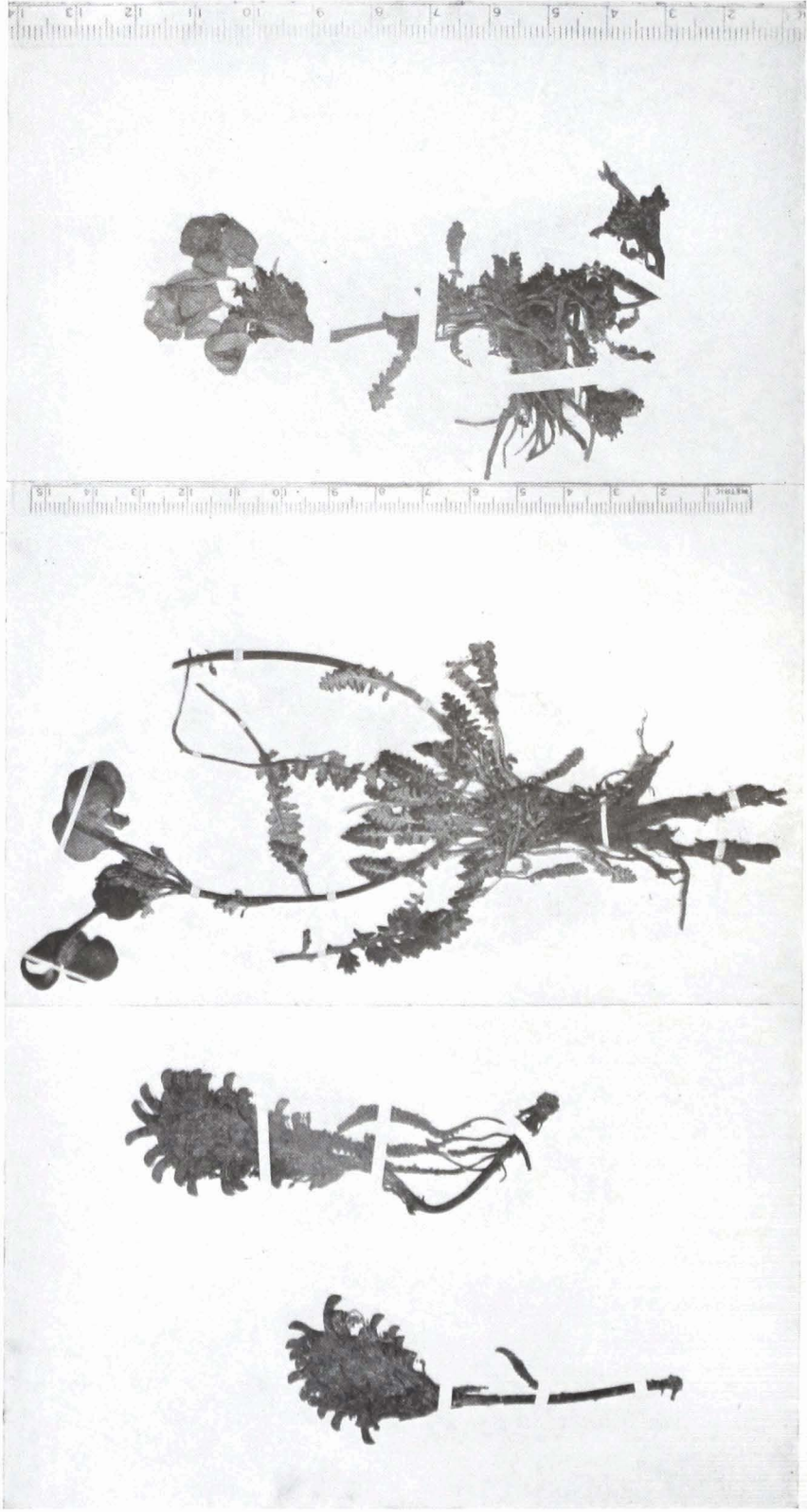
A. below. B. above.



A. below. B. above.



A. below. B. above.



A

B

C

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