

ORCHIDS OF
NEPAL

M. L. Banerji

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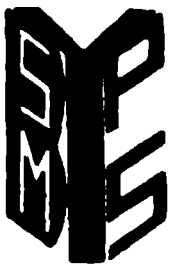
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ORCHIDS OF NEPAL

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Contents

Editor's Projection

Prologue

I. ORCHIDS IN GENERAL

A. Introduction	1
B. History	2
C. Common Names	2
D. General Account	3
E. Classification	9
F. Schlechter's classification in some details	10
G. Evolution	12
H. Distribution in the Himalayas	12
I. Explanation of Some Terms used	13
	1

II. ORCHIDS OF NEPAL

A. Basitonae	
Ophrydoideae	15
B. Acrotonae	
Polychondreae	33
Kerosphaereae	46
a. Acranthae	46
b. Pleuranthae	86
i—Sympodiales	86
ii—Monopodiales	110

III. EPILOGUE	125
---------------	-----

IV. SELECTED LITERATURE	128
-------------------------	-----

V. INDEX TO SCIENTIFIC NAMES	130
------------------------------	-----

Prologue

It has been quite often said that Schlechter's key to the Orchidaceae is one of the most recent and probably the most workable so far proposed. The system has several distinct advantages. It is a combination of the emphasis placed on the reproductive structures and the importance laid on the easily observed vegetative structures. Moreover this system follows a strictly dichotomous key throughout, thus helping one to trace down an unknown plant, but unfortunately only upto the subtribe and not to the individual genus.

It has been my endeavour to provide keys to identify the genera under each tribe, although quite often the keys are not strictly dichotomous. Under each genus, a key to the species is also provided and that too suffers from the fault of not being dichotomous everytime.

Accordingly the specimen to be identified, has to be examined in details from the base—be it a rhizome, pseudobulb or roots, to the inflorescence. The flowers need to be examined very thoroughly. No two specimens of the same species are exactly alike in all respects. Amongst orchids, specialists are of the view that variation is usually present in every species to a greater or lesser degree.

No species belonging to Diandrae has been so far found in Nepal.

EDITOR'S PROJECTION

Orchids form a fascinating group of angiosperms. The aesthetic beauty and attraction of orchid flowers are due to great diversity in the floral architecture. The characteristic features of orchids are the modification of one of the petals to a labellum, a platform for pollinating insects; grouping and fusion of pollen grains to pollinia or massulae; presence of gynostegium, a fusion product of style with stamens and modification of one of the stigmatic lobes called rostellum.

In recent years, there has been an increasing interest among the plant lovers especially horticulturists to grow orchids for ornamental purposes. One of the bottlenecks that stands on the way of propagation has been the difficulty of raising the plants from seeds, as the embryo inside is undifferentiated when the seeds are shed from the plant. Technique of plant tissue culture has proved to be a great boon to combat this problem. Through this technique, vegetative parts can be induced to form calli on a defined nutritive medium. The calli on transferring to a medium containing appropriate quantity of auxins and kinetins can be differentiated into large number of plants within a short period. Such plants can be later on transferred to the field conditions at ease. The technique has been greatly exploited by the nurserymen and horticulturists to earn valuable foreign exchange through the export of plants raised through this means.

Orchids need special environmental conditions for their growth. Nepal, being situated in the Himalayas, provides a congenial climate for the growth of this interesting group of plants. Every year a large number of 'orchid hunters' visit Nepal from different parts of the world. As there is no worth recommending literature to enable them to identify the orchids in this region, there is great justification and urgency of such a book dealing with this aspect. This book by Dr. M.L.

Banerji, a well known systematic botanist, is an outcome of the study of orchids of Nepal for a number of years when he was the Advisor to the Botanical Survey of Nepal.

The book provides a coherent account of the important characters of orchids of this region; with details of distribution, flowering period and a useful key for the identification of each species. The descriptions of species are based on his examination of living specimens found growing in natural habitats as well as those cultivated in the Government Botanic Gardens. To make the descriptions more authentic the author has made special efforts to compare the descriptions with those already available in literature.

The book is mainly based on a series of papers earlier published by the author in the journal 'Bombay Natural History Society'. The editor is thankful to the author for the pains he has taken in compiling this book.

Editor

Orchids In General

A. INTRODUCTION

The present book is in some way a reprint of a series of papers that were published in the Journal Bombay Natural History Society under the title of 'ORCHIDS OF NEPAL', under joint authorship.

In the present form the matter has been rearranged following a recognised system of classification, and material of general information and interest has been added with the sole objective of creating interest and to make the book useful to orchid lovers particularly of Nepal.

The author desires to express his gratitude to Bombay Natural History Society for the publication of the series of papers in the pages of the journal.

Most of the plants were grown in the garden of the Indian Co-Operation Mission, Kathmandu. (1964-1967) thus the descriptions and drawings have been based on living specimens. Many species growing in the neighbourhood of Kathmandu valley were cultivated in the Godavari Botanic Garden, Government of Nepal, and Mr. A D Schilling helped immensely by giving his recordings of the flowering time. besides the list of some orchids collected by Dr. G.A.C. Herklott who was in Kathmandu under the British Aid to Nepal to lay and develop the Godavari Botanic Garden, Government of Nepal. Grateful thanks are expressed to Mr. A.D. Schilling, the then Advisor for the Godavari Garden for his help and kindness. To Mr. B.B. Thapa, Horticultural Assistant, Indian Co-Operation Mission, Kathmandu, I am indebted for looking after the plants in the nursery, studying them and helping me in many diverse

ways' besides enriching the collection that was being raised in the nursery at Kathmandu.

B. HISTORY.

Theophrastus, a student of Plato, described a plant with paired roots that looked like testicles. He gave it the name *orchis* from the Greek word for testicles. Later, Greek botanist Dioscorides interpreted the description provided by Theophrastus as referring to an orchid. Carol Linne adopted the name orchid in his *Species Plantarum* published in 1753. The British botanist John Lindley introduced in 1836 the name Orchidaceae to the family.

German botanist Jacob Breynius undertook to gather information on plants that were unfamiliar to Europeans during the late 17th. century. In his *Exorticum Aliarum que Minus Cognitum Plantarum*, he wrote about the extraordinary diversity of orchids - "If nature ever showed her playfulness in the formation of plants, this is visible in the most striking way among the orchids, they take on the form of little birds, of lizards, of insects. They look like a man, like a woman, sometimes like an austere sinister fighter, sometimes like a clown who excites our laughter. They represent the image of a lazy tortoise, a melancholy toad, an agile, ever-chattering monkey. Nature has formed orchid flowers in such a way that unless they make us laugh, they surely excite our greatest admiration."

C. COMMON NAMES.

As Breynius wrote, the shape of the flowers are so varied that many of them inevitably seem to be imitating something else. *Habenaria blephariglottis* found in North America is called 'monkey face'; the genus *Cynoches*, a native of Central America, is known as 'swan orchid' because of its resemblance to a swan's neck. In Israel *Ophrys sintenisii* is called 'the velvet bee orchid'. In parts of Latin America the genus *Stanhopea* is often called as 'torrito' (little bull) because of the structure which resembles two horns. The genus *Cypri-*

pedium is called as 'lady's slipper', 'venus shoe' and by many other names. Members of the genus *Goodyera* are often called as 'rattle snake plant' because of the mottlings on the foliage. Some more are, 'the frog orchis' - *Habenaria viridis*; 'the Fly orchis' - *Ophrys mucifera*; 'the dove plant' - *Peristeria elata*; 'the lion's tongue orchis' - *Mansdevallia leontoglossum*. *Dipodium punctatum* is called the 'hyacinth orchid' because of the overall resemblance to a hyacinth inflorescence.. Species of *Thelymitra* are commonly known as 'Sun orchids' because of the relative open situation in which they grow and their tendency to open fully on bright sunny days and close in the evenings. There are many instances of mimicry that occur among orchids.

D. GENERAL ACCOUNT

They comprise the largest of all plant families, it contains according to various estimates some 500 to 600 genera, and some 20,000 to 35,000 species. Orchids are herbaceous perennials that occur as shrubs vines and even grass-like. The plants may be built up in one of several ways. Sometimes it is a *monopodium*, the main axis growing; sometimes it is a *sympodium* made up of successive portions, each of which first appears as a branch upon its predecessor, but takes up the straight line of axis, while what was previously the main axis goes off to one side or aborts altogether. The *sympodium* may be *acranthous*, the successive portions each in turn terminating in an inflorescence or *pleuranthous* in which the flowers are borne on short shoots and the temporarily main axis simply ends off short when it has given rise to the branch which will continue the straight line.

During the unfavourable season, many of the orchids drop their leaves and rest in the condition of *pseudobulbs* or fleshy swollen stem tubers, formed of one or more internodes until the advent of favourable conditions usually rains. As a rule they form one pseudobulb every year but usually many pseudobulbs may be seen alive side by side to tide over the period of leaflessness, but some form root-tubers which are

developed adventitiously from buds produced at the base of the season's shoot.

They may bear a single flower to many flowers. A specimen of *Oncidium carthaginense* may produce a stem of some 4 meters long with several hundreds of flowers.

Flowers range in size greatly. The flowers of *Platystele ornata* measure about a millimeter in diameter while certain hybrids of the genus *Cattleya* average 30 centimeters or more. There is no other family comparable in floral diversity to the Orchidaceae. The basic trimerous pattern common to most monocotyledons, displays such a vast array of modifications in this family that without serious study one could question the validity of calling them as monocotyledons. All the flowers have three sepals and alternating with them three petals, the unpaired petal being greatly modified into a labellum or lip, an evolutionary adaptation providing a landing platform for pollinating insects. In the centre of the flower ordinarily occupied by the style and encircled by alternating rows of stamens, orchids possess a novel structure called the gynostegium or column. The column is also an evolutionary innovation, the result of fusion of the style with the filament of various stamens. Concurrently with the development of the column, two additional innovations become operational. The first is the development of pollinia, in which the pollen grains at the time of maturity are shed either as free single grains or variously aggregated into tetrads or massulae. Each of these phases is very characteristic for a given sub-family. The second additional evolutionary innovation is the alternation of one of the stigmatic lobes into an organ, the *rostellum*. The rostellum produces either a viscid secretion or a viscous gland to which the pollinia are attached. It is, therefore, a device that ensures successful cross pollination by firmly anchoring the pollinia to vector for transportation. This evolutionary modification is observable in the more advanced members. In addition to anchorage, the rostellum also serves as a device that prevents self pollination. In a few species, however, at the end of anthesis the rostellum dries up,

thus allowing the pollinia to come into close contact with the stigma and facilitating self pollination.

Many orchids, both in their native habitats and under cultivation secrete copious amounts of floral and extrafloral exudates or nectar. Secretion occurs from organs of great diversity of position and structure. They were apparently first described as small droplets on the buds of *Cattleya mendelli* and called honey. A more specific description of the exudates was given and described as 'crystals of sugar of considerable size from the nectary'. The role of sugar content of exudates in the physiology or life cycle of the orchids is important. In some instances it serves to attract and feed pollinators. However, some orchid species do not produce nectar and depend on other means for attracting pollinators. Furthermore, there are orchids which produce sugar containing exudates at times or in places which may be of little value in the process of pollination even when they may attract potential pollinators. Exudates of some species of orchids contain fructose, glucose and sucrose, and the orchids are pollinated by a variety of bees, moths, wasps, birds, butterflies and flies which are attracted by sugars. Ordinarily the pollinator is species specific. While the flowers of most orchid species provide either nectar or edible tissue as an attractant for the visiting insect, there are a few which successfully mimic. Species of section *Micrantha* have labella with varying degree of hairiness and often a plant with open flowers appears to have insects hovering about as the labella move in breeze. Male eulgossine bees use special tarsal brushes and tibial pockets in gathering fragments of materials of unknown value to the insects as they pollinate tropical orchids. Some orchids enlist the sexual behaviour pattern of an insect to meet their own reproductive needs. Pouyanne, a French investigator, noted that the orchid *Ophrys speculum* assumes the shape and odour of an insect to facilitate its pollination. Its flowers resemble the female of the insect *Scolia ciliata*. The male insect attempts to copulate with the flower thus pollination is achieved. *Ophrys sintenisii*, which is found in Israel, is also pollinated in a similar manner. This phenomenon is called

pseudocopulation. Recognition of this unusual insect-orchid association is a recent addition to our knowledge of orchidology.

Orchid flowers are remarkable not only in their form and beauty or in their pollination mechanism, but also in their fruit-setting and even death. Pollination brings about many changes, some of which are visible to the naked eye, while others are hidden and occur within the ovary. Pollination effects were first observed by Robert Brown during his studies of nuclei and fertilisation. Fritz Muller attributed these effects of pollination to a 'poisonous' influence of the pollen grains. Later, investigations showed that dead pollinia and pollen-extracts can bring about similar effects as the post-pollination effects. Once the flower has been pollinated, its sepals and petals are of little use. In most orchids the sepals and petals wilt, dry and finally disintegrate. The sepals and petals of *Phalaenopsis* turn green, become fleshy and later photosynthesise. In *Cattleya* the sepals, petals and labella are lost but the column turns green and becomes fleshy and persists for some time.

The seeds of orchids are exceedingly small in size, varying in length from 0.25 to 1.2 mm. and width from 0.09 to .27 mm. consisting of a simple undifferentiated embryo within a transparent integument or seed coat. There is an opening in the base where the seed is attached to the capsule. There is a mass of simple cells which shows slight differentiation, neither an endosperm nor the cotyledon is present. Published counts range from 1,330 seeds per capsule in *Coelogyne viride* to some four million per capsule of *Cycnoches ventricosum*. Orchids with 750,000 to a million seeds per capsule and three or more capsule per plant are not uncommon. Charles Darwin estimated that if the seeds produced by a single *Orchis maculata* with 6,200 seeds per capsule and 186,300 per plant were to germinate and grow to maturity, they would cover an acre. The Order to which orchids are placed has been named as *Microspermae*, because of the small size of the seeds.

The growing of orchids from seeds was for a long time a secret

process. Some who claimed to know the secret, guarded them closely, while others divulged them. In 1900 the methods of seedling culture were largely a matter of trial and error. The common practice of the early orchid growers was to sow the seeds on the surface of the material in which the parent plant or some closely related species was growing. It was considered to select plants that were growing in baskets or hanging pots. The seeds were evenly distributed, a few seeds at a time on the surface material. Care was taken never to permit plants fostering seeds to become dry. This technique was moderately successful and was used widely. Some found success in sowing the seeds on squares of *Osmunda* fiber that had been soaked. Others used damp discs of softwood such as willow. Earlier workers believed that normal germination of orchid seeds was dependent on the infection of the embryo with a appropriate fungus. Noel Bernard discovered the requirement of fungal infection for germination of orchid seeds. The fungus was found to be *Rhizoctonia* sp. which occurs in the roots of orchid plants. It was also found that *Phytophthora* had the same effect-

As a result of his findings, Kundson proposed his now famous non-symbiotic culture. The original method has been modified, and at present "Kundson C" formula is the most widely used. Arditti has found it useful to make to additional changes in the 'Kundson C' formula. Instead of adding phosphate in the form of its monobasic potassium salt, he used a phosphate buffer. While still supplying the proper concentration of phosphate to the medium, this change has the practical advantage of eliminating most pH adjustments which consume not only the time but also the patience of the amatuer and professional alike. Arditti also enriches the basal medium with 1 ml/litre of a micronutrient solution. The complete formula as Arditti uses is—

Calcium nitrate ($\text{Ca}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$).....1.0 gm.
 Magnesium sulphate ($\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$).....0.25 gm.
 Ammonium sulphate ($(\text{NH}_4)_2\text{SO}_4$).....0.50 gm.
 Ferrous Sulphate ($\text{Fe SO}_4 \cdot 7 \text{H}_2\text{O}$).....0.025 gm.

Manganese sulphate ($\text{MnSO}_4 \cdot 4 \text{H}_2\text{O}$).....	0.0075 gm
Sucrose.....	20 00 gm
Agar.....	12-15 gm
Potassium phosphate buffer (0.1 M, pH 5.3)	18.0 m
Micronutrient solution.....	1.0 m
Distilled water.....	to one litre.

The potassium phosphate buffer can be prepared by combining 97.5 ml. of 0.1 M KH_2PO_4 solution (13.6 gm dissolved in water and diluted to one litre) The final pH of the solution should be checked to see that it is approximately 5.3.

The micronutrient solution contains 56 mg/litre Boric acid (H_3BO_3) 16 mg/litre Molybdic acid (MoO_3), 40 mg/litre anhydrous cupric sulphate (Cu SO_4), and 331 mg/litre zinc sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$).

Tissue culture has assumed an increasingly important role as a means of orchid propagation in recent years. Shoot tips, leaf bases and leaf tips have been used to produce callus cultures and whole plantlets. Unfortunately not all genera and species respond to the same conditions of tissue-culture. Mycorrhiza-free *Epidendrum* root tips when cultured *in vitro* became elongated, thinner and lost chlorophyll and exhibited apogeotropism. They did not form callus or plantlets. Bases of seedling leaves have also been used for vegetative propagation in *Cattleya*. Propagation of orchids from seedling tips have offered several advantages.

Medieval European herbalists collected what they called "dog stone roots" for the preparation of aphrodisiac potions. It was the belief of people that 'if men eat greater, they shall beget men children, and if women eat the lesser they shall bring women children'. In Indonesia a paste made from an orchid of the genus *Grammatophyllum* is used as a remedy for sores, and a preparation from *Dendrobium* is applied to skin infection in Malaya. The zulus in Africa employ a *Habenaria* as an emetic. In South America, *Epidendrum bifidum* is used to expel tapeworms. *Spiranthes* is used as a diuretic. In

AUTHORS

MAIN DIVISIONS OF SYSTEMS

LINDLEY	CYPRIPEDIEAE		OPHRYDEAE	ARETHUSAE	NEOTTIEAE	MALAXIDEAE	EPIDENDREAE	VANDEAE
BENTHAM	CYPRIPEDIEAE		OPHRYDEAE	NEOTTIEAE		EPIDENDREAE		VANDEAE
REICHENBACH	CYPRIPEDIEAE		OPHRYDEAE	OPERCULATAE				
				NEOTTIEAE	EUOPERCULATAE			
PFITZER	PLEONANDRAE		BASITONAE	MONANDRAE				
				ACROTONAE				
				Acranthae Convolutae	Acranthae-Duplicatae-Articulatae Pleuranthae-Sympodiales and Monopodiales			
ROLFE	DIANDRAE		MONANDRAE					
			OPHRYDEAE	NEOTTIEAE	EPIDENDREAE			VANDEAE
			MONANDRAE					
SCHLECHTER	DIANDRAE		BASITONAE	ACROTONAE				
				Polycandreae		Kerospaeraeae		
				THRAVOSPHAERAEAE		KEROSPHERAEAE		
MANSFELD	DIANDRAE		OPHRYDEAE	NEOTTIEAE	EPIDENDREAE			VANDEAE
HATCH	CYPRI-PEDIOI-DEAE		ORCHIOIDEAE					
			BASITONAE	ACROTONAE				
DRESSLER & DODSON	CYPRI-PEDIOIDEAE		ORCHIOIDEAE					
			ORCHIDEAE	NEOTTIEAE	EPIDENDREAE			
GARAY	APOSTASIOIDEAE	CYPRI-PEDIOIDEAE	ORCHIDOIDEAE	NEOTTIOIDEAE	EPIDENDROIDEAE			
			ORCHIDEAE DISEAE DISPERIDEAE	EPIDOGONEAE NEOTTIEAE CRANICHIDEAE	Phaiinae Dendrobinae	Epidendrinae Pleurothallidinae		Vandaeae Cypripodiinae Zygopetalinae Oncidiinae Vanillinae

Summary of various systems of classification of ORCHIDACEAE (after Garay, 1972).

Nepal the tuberous roots of *Satyrium nepalensis* are much sought after for they are reputed to act as rejuvenators. *Acampe* is used for rheumatism in India, probably because the roots contain a bitter resin. Tubers of *Orchis latifolia* are known as 'salap'. While the roots of *Orchis laxiflora* and *Orchis mascula* yield 'salap misri' in India. The roots of *Vanda* are useful in rheumatism, and allied disorders. Leaves of *Junella fragrans* are used to wrap cigars. Although stories regarding aphrodisiac properties of orchids are generally untrue, the most important orchid is *Vanilla planifolia* which is cultivated throughout the tropics. In 1838 Charles Morren gave a talk to the British Association on the production of *Vanilla* in Europe. What he tried to emphasise was that in Europe and India, *Vanilla* could not set fruits due to the absence of an insect which normally pollinated the flowers in Mexico. Morren had artificially pollinated the flowers of *Vanilla* and obtained large crops. Most dramatic events in the history of *Vanilla* occurred on island in Indian Ocean, lying to the east of Madagascar, known as the Reunion Island. A young black slave named Edmond observed flowers being pollinated. Later he developed a simple method for pollinating *Vanilla*. This technique of Edmond's is now widely used all over the world. *Vanilla* is still being grown in Mexico and Madagascar. *Vanilla* is not only used to flavour ice cream, pastries, chocolate, food and drink but it has provided profit and livelihood to many people. Thus *Vanilla* happens to be a very important orchid. It can be said that orchids have a significant place in modern commerce beyond their use in corsages and bouquets. Economically the orchids are not only important as ornamentals that they contribute to the florist's industry and to horticulture but also to earn foreign exchange. Some countries have restricted the export of orchids.

E. Classification

Since the time of Lindley, many systems of classification of Orchidaceae have been offered, and a summary to the different systems is given.

F. SCHLECTER'S: CLASSIFICATION.

The classification followed by Schultes and Pease is that of Schlecter with slight modifications. As reference to Schultes and Pease is very often made in the text, we give the classification (with all the alternations) made by Schultes & Pease for reference and for proper location of a genus.

Subfam. I	DIANDRAE (anthers 2 and lateral).
Tribe	<i>Cypripediloideae</i>
Tribe	<i>Apostasioideae</i>
Subfam. II	MONANDRAE (anther one and terminal)
Division I	<i>Basitonae</i> (Caudicle and viscidium arising from base of pollinia; pollen always granular)
Tribe	<i>Ophrydoideae</i>
Division II	<i>Acrotonae</i> (Caudicles and viscidia arising from apices of pollinia; pollen various)
Tribe	<i>Polychondreae</i> (Pollen granular, anther mostly persistent)
Tribe	<i>Kerosphaerae</i> (Pollen waxy or bony, anther commonly soon deciduous)
Series A	<i>Acranthae</i> (Inflorescence terminal or in axil of upper leaves)
Series B	<i>Pleuranthae</i> (Inflorescence lateral, from base of pseudobulb or axils of lower leaves or of the lower sheath)
Subseries A	<i>Sympodiales</i> (Old stem becoming thick, short and fleshy, forming pseudobulbs)
Subseries B	<i>Monopodiales</i> (Main stem growth continuous indefinitely, not forming pseudobulbs)

Tribe	Cypripedioideae	not separated into further subdivisions.
Tribe	Apostasioideae	not separated into further subdivisions.
Tribe	Ophrydoideae	
Subtribes	— Platantheraceae Habenariaceae Porolabiaceae	Androcorydeae Huttonaeae Disperideae
	Satyriaceae	
Tribe	Polychondroideae	
Subtribe	— Pterostylideae Diurideae Thelymitreace Prosopphyllaceae Caladeniaceae Aciantheae Corybadeae Cryptostylideae Pachyplectreae Chloraceae Listereae	Cephalanthereae Vanillaceae Sobraliaceae Bletillaceae Pogoniaceae Epipogoneae Gastrodieae Rhizanthelleae Cranichideae Spirantheae Erythroideae
	Torpoideae	
Tribe	Kerosphaeroideae	
Series -A	Acranthae	
Subtribe	Pleurothallideae Liparideae Vargasilleae Calysopeae Collabiaceae Coelogyneae	Calderiaceae Laeliaceae Dendrobiceae Glomereae Podochilaceae Galeandreae
	Epidantheae	
Series -B	Plcurantheae	
Subseries	— Sympodiales	
Subtribe	— Corallorhizeae Phajaeae Bulbophylleae Genyorchideae Cyrtopodieae Cymbideae Grobyeae Thelasiaceae Ridleyelleae	Gongoreae Lycasteae Sygopetaleae Huntleyeae Maxillariaceae Ionopsideae Onicidaeae Ornithocephaleae Notylieae

	Thecosteleae	Macradeniaceae
	Cataseteae	Cryptocentreae
	Telipogoneae	
Subseries	Monopodiales	
Subtribes	— Dichaeae	Peterostemmataeae
	Pachyphyllaeae	Sarcantheaee (with five sections)

G. Evolution

The family Orchidaceae originated in the area known phyto-geographically as Malaysia during the Cretaceous period, when most angiospermous families became differentiated. At that time all species were geophytes, for the epiphytic mode of life is a rather recent development, dating back to the Pliopleistocene. The geophytes and epiphytes express distinct evolutionary adaptations through morphological modifications in the roots. Species of *Thelymitra* are considered to be primitive as far as evolutionary advance in the orchid family is considered. They have showy flowers with 6 perianth segments very similar in shape, size and colour. However, the *Diandrae* with two or rarely three fertile stamens and three functional stigmas are primitive while the *Monandrae* with one fertile stamen and the median stigma forming the rostellum are advanced.

H. Distribution in the Himalayas

Sir George King and Robert Pantling described the orchids of Sikkim Himalaya. According to P. Bruhl there are some 460 species found in the area. The vast majority are epiphytic. In the east, it is said that Kalimpong area is a heaven for orchid lovers, where two nurseries maintain, sell and ship plants collected from the forests. One of the nurseries has also introduced hybridization and seed germination besides tissue culture of orchids.

The orchids of Northwestern Himalaya are remarkable in being mostly terrestrial. There are some 186 species in Kumaon and Garhwal, while in Simla area there are just 38 species.

The part of the Himalayas lying between 80° 15' E to 88 10' E is the kingdom of Nepal which occupies about one third of the length of the Himalaya. The entire kingdom of Nepal approximately corresponds to the Central Himalayas according to geographical division, but botanically this part of the Himalaya is of particular interest as the two differing vegetation of Eastern and Western Himalaya merge here. On the basis of present phytogeographical evidences, Long. 83° E is taken as the boundary between Eastern and Western Himalaya on general grounds. Thus, there are a good number of terrestrial as well as epiphytic orchids in Nepal.

As the flora of Nepal in general and orchids in particular are not fully known, the following pages are devoted to the orchids that are so far known from Nepal.

I. Explanation of Some Terms Used.

The third petal is modified into a *lip*. The lip is more or less folded over the column, more or less pointed or rounded smooth or cleft at the apex, crisped or plain on the margin. They also vary much in length, and in size and shape of the lower expanded part of disc. The *lip* or *labellum* frequently projects basally into a spur or sac with or without nectar within. The *labellum* is a remarkable organ of peculiar aspect, in which the tripartite structure is strongly marked—the three parts are usually distinguished as i) *hypochile*, the basal portion which is affixed to the base of the column; this is always saccate or hollowed out from above, sometimes elongated into the form of a boat; ii) *mesochile*, the middle portion consisting of two horn-like bodies either bent round and parallel with the side of the *epichile* or bent upwards at a considerable angle to it; iii) *epichile*, the apical portion, this is polymorphous; being cordate, ovate, sub-rhomboidal or even oblong. It may be cymbiform — having the form of a boat;

or dolabriform — axe-shaped, having one margin straight and thick and the opposite one enlarged rounded and thin.

- or **ensiform** — straight and narrow with the point acute like blade of a sword ;
- or **falcate** — curved like a reaper's sickle ;
- or **galeate** — helmet-shaped ;
- or **panduriform** — fiddle-shaped of obovate form with two recesses on each side ;
- or **subpandurate** — approaching pandurate or fiddle-shaped ;
- or **trapeziform** — having four sides, but the opposite sides not parallel nor the opposite angles equal ;
- or **infundibuliform** — funnel-shaped

both *mesochile* and *epichile* are wax-like in appearance usually white or colourless, but sometimes spotted.

Disk — Upper surface of the lip, which may be smooth or may have glands, calluses, papillae, beards, keels or plate-like lamellae.

The style, stigmas and the stamens are variously adnate into a highly complex structure which is called as the *column* or even as *gynandrium*. The base of the *column* is often elongated in front beyond its junction with the ovary, and this appendage is called the *foot*. The third stigma, infertile, is converted into a *rostellum*. In highly developed genera, the *rostellum* becomes an integral part of the *pollinium* and then modified into a viscid disc or discs known as *viscidia*. The pollen grains are either granular, often in tetrads, or usually agglutinated into mealy, waxy or bony masses which are called as *pollinia*. The distal end of the *pollinium* is sometimes attenuated into a sterile filamentous strand known as the *caudicle*. The chamber at the top of the *column* in which the *pollinia* lie is known as the *clinandrium*.

Terms like '*conduplicate*' meaning folded longitudinally down the middle the whole length ; '*secund*' meaning that flowers all turned in one direction ; and '*mentum*' i.e. the sac or spur-like base of the lateral sepals which may be short or long, have been frequently used in the text.

A. BASITONAE

I. OPHRYDIOIDEAE

ARTIFICIAL KEY TO THE GENERA

- A Lip not spurred, concave at base..... *Herminium* (Habenarieae)
- AA Lip Spurred—
 - B Stem bearing a single leaf *Hemipilia* (Platanthereae)
 - BB Stem leafy, at least at the base—
 - C Spurs two *Satyrium* (Satyrieae)
 - CC Spur one.....
 - D Glands of the pollinia naked—
 - E Stigmatic surface flat almost confluent *Platanthera*
(Platanthereae)
 - EE Stigmatic surface not flat, but separated as swellings or stand out as appendages.....*Habenaria* (Habenarieae)
 - DD Glands of pollinia enclosed in a pouch.....*Orchis*

a. *Habenaria* Willd.

One of the largest genera of Orchids. Terrestrial plants, usually growing from tubers, rarely from a short rhizome ; stem simple and erect ; bearing few to many basal and cauline leaves which are thin, usually broad, and sheathing at the base. Inflorescence is terminal, usually fairly long of many small or large flowers; dorsal sepal and petals usually form a hood over the column ; lateral sepals usually spreading or reflexed ; lip spurred and the blade variously shaped, simple, 3 lobed or 3 partite ; column short consisting mainly of anther, usually with a small auricle on either side ; pollinia 2, separate, clavate or pyriform, the caudicle enclosed in long or short often prominent tubes and separated more or less widely by the rostellum. Stigmas 2, usually separated, convex or on elongated processes on either side of the base of the column, often joined to the base of the lip and auricles, while in some others flat and joined below the rostellum

There is considerable variation in the details of the structure of the column, especially as regards to the stigmas, and some authors have adopted a division of the genus on the basis of the structure of the stigma. Thus, J.J. Smith (1905) divides *Habenaria* into three genera—*Platanthera*, *Peristylus* and *Habenaria* proper; Schlechter (1926) recognises only two divisions—*Peristylus* and *Habenaria*. According to Holttum (1953) though such divisions may appear distinct in a limited number of species, they are said not to be sharply separable when all the known species are considered. Summerhayes (1951) split the group into distinct genera. Santapau & Kapadia (1960) regard *Platanthera* and *Peristylus* as genera which are independent from *Habenaria*. In the words of Schultes & Pease (1963) “some prefer as in the case of *Habenaria*, to recognise large and inclusive generic concepts, while others more readily separate sections as good genera. There is here no question of right or wrong, but one of personal evaluation.” According to Hawkes (1965), *Gymnadenia* is often included in *Habenaria* Willd., and *Peristylus* is in actuality closer in relationship to *Herminium* R. Br. Quoting Schweinfurth (1959) “for instance *Leucorchis* E. Mey., *Gymnadenia* L.C. Rich., *Coeloglossum* Hart., *Platanthera* L.C. Rich., *Blephariglottis* Raf. and *Perularia* Lindl. should be regarded, we believe, as referable to the exceedingly polymorphic genus *Habenaria* Willd. as also *Pecteilis* Raf., *Gymnadeniopsis* Rydb., and doubtless others”. We have treated *Platanthera* as distinct from *Habenaria* on grounds of the character of the stigmatic surface.

Platanthera is a name given to those species which have a flat stigmatic surface, usually continuous but sometimes slightly divided beneath the rostellum, very much like the stigma of most orchids. The other divisions of *Habenaria* all have two separate stigmas, which are convex or more or less elongated often club-shaped. If the stigmas are convex and entirely united to the base of the lip and to the auricles of the column, we have the *Peristylus* condition; if the stigmas are long and cylindrical or club-shaped, we have *Habenaria* proper. In *Habenaria* proper, the stigmas are often quite long and promin-

ent, they are usually below and shorter than the tubes containing the caudicles of the pollinia.

ARTIFICIAL KEY TO THE SPECIES OF *Habenaria*¹

- A Lateral sepals spreading, deflexed—
- B Lip 3-partite almost to the base into 3 narrow lobes—
- C Sepals with filiform tips, spur equalling the ovary..... *stenopetala*
- CC Sepals obtuse, spur shorter than the ovary.....*aitchisoni*
- BB Lip 3-lobed and spurred—
- C' Side lobes lacerate to the middle, middle lobe linear—
- D Spur rather longer than the ovary—
- E Petals pubescent, broader than the dorsal sepal.....
..... *arietina*
- EE Petals glabrous, linear, narrower than the dorsal sepal
..... *pectinata*
- DD Spur twice as long as the ovary *intermedia*
- C'C' Sidelobes fimbriate, hardly longer than the lateral sepals—
- D' Spur twice as long as the ovary..... *conopsea*
- D'D' Spur longer than the ovary..... *dentata*
- C'C'C' Sidelobes much longer than the lateral sepals—
- D'' Spike lax flowered; lip flabelliform, sidelobes entire or toothed
..... *plantaginea*
- D''D'' Spike dense flowered; lip very large, sidelobes hatchet-shaped, crenulate *triflora*
- C'C'C'C' Sidelobes very narrow, filiform, horizontal, spur much shorter than the ovary *aristata*
- BBB Lip 3 lobed, spur almost absent or saccate; spike densely flowered, flowers small *fallax*
- BBBB Lip entire—
- E Spur shorter than the ovary *densa*
- EE Spur longer than the ovary, upturned *latilabris*
- AA Lateral sepals erect or ascending, parallel to the dorsal petal, rarely at length spreading or deflexed—
- B' Lip usually 3-fid or 3-partite; flowers usually small—
- F Spur longer than the sepals, incurved.....*bicornuta*
- FF Spur shorter than sepals—
- G Stem more than 60 cm long, leaves petioled. *constricta*
- GG Stem less than 60 cm long; leaves hardly petioled
.....*goodyeroides*
- B'B' Lip entire—
- H Flowers large c 1.2 cm across; lip shortly clawed, spur short, conical *galeandra*

HH Flowers small c 0.8 cm across; lip recurved, terminal half solid and terete, spur inflated.....*urceolata*

HHH Flowers large c 1.25 cm across; lip lanceolate, 3-nerved, entire; spur slender, curving and longer than the straight ovary *stenantia*

Habenaria nitchisoni Reichb. f. in Trans. Linn. Soc. Bot. 3:113, 1886 ; F. B. I. 6:152, 1890 ; King & Pantl. 311, t. 408, 1898 ; Kitamura, 102, 1955.

Flowers greenish, fragrant, c 1.2 cm in diam., bracts linear-lanceolate, shorter than the ovary ; sepals subequal, oblong-ovate, obtuse. 3-nerved, lateral sepals spreading, dorsal erect, petals as long as the sepals, ovate-lanceolate, 1 nerved. Lip straight, as the sepals, 3-partite above the base, side segment longest, spreading and recurved, mid segment, straight, spur shorter than the curved ovary, c 6 mm long and curved forwards. Flowering time from July to August. Collected from Bankukhola at 3500 m. Authority Kitamura.

H. arietina Hk. f. in Fl. Brit. Ind. 6 : 138. 1890 ; King & Pantl. 311, t. 407, 1898. *H. pectinata* Lindl Gen. et. Spec. Orch. 341, 1830. [non *H. pectinata* (Sm.) Don]

Flowers white or light greenish, fragrant, c 5 cm in diam.; sepals gibbously dilated on the outer margin ; petals broader than the sepals, pubescent. Lip lobed only for about $\frac{2}{3}$ of its length, sidelobes pectinate but with fewer teeth, midlobe shorter than the sidelobes, linear, spur much longer than the ovary, 25-3 cm long, tip swollen. Flowering during July and August. Collected from Sheopuri, Bagdoar Sundarikal-Manichur area. Distributed between 1800-2100 m. This species is very similar to *H. pectinata* (Sm.) Don, in habit and appearance but the pectinate lip is different.

H. aristata Hk. f. in Fl. Brit. Ind. 6 : 158. 1890 ; King & Pantl. 312, t. 409, 1898.

Flowers green, c 1.5 cm in diam.; sepals subequal, linear, lateral sepals turned upwards and spreading; petals conniving with the dorsal sepal to form a hood, ovate-lanceolate, base

oblique. Lip slightly longer than the sepals, hastately tripartite, sidelobes filiform and horizontally spreading, midlobe linear and shorter than the sidelobes, spur much shorter than the ovary, curved. Flowering time during July and August. Collected from Bagdoar at c 2290 m.

H. bicornuta Hk. f. in Fl. Brit. Ind. 6 : 156, 1890 ; Hara, 437, 1966. *Peristylus richardianus* Wight, Icon. t. 1097, 1851.

Spike dense flowered, flowers c 10-12 mm across; dorsal sepal oblong, faintly 5 nerved, lateral sepals linear, obtuse spreading; petals as long as the lateral sepals, elliptic, 1 nerved. Lip tripartite, segment filiform, side lobes longer than the sepals, recurved, midlobe shorter and straight, spur clavate, incurved. Collected from Phulchowki.

H. conopsea Benth. in Journ. Linn. Soc. 18 : 345, 1880 ; Butcher, A new Ill. Brit. Fl. pt. 2, 740, 1961. *Gymnadenia conopsea* R. Br. in Ait. Hort. Kew, ed. 2, 5 : 191, 1813 ; Kitamura, 102, 1955.

Spike rather long and dense flowered, flowers 10 mm across, fragrant; sepals reddish-lilac, lateral sepals spreading; petals linear-lanceolate, slightly united with the dorsal sepal. Lip red with 3 equal rounded lobes, spur filiform, twice as long as the ovary. Authority Kitamura.

H. constricta Hk. f. in Fl. Brit. Ind. 6 : 161, 1890 ; King & Pantl. 325, t. 429, 1898.

Flowers greenish, white, bracts lanceolate, equal to or longer than the ovary ; lateral sepals linear-lanceolate, dorsal sepal lanceolate, petals longer, ovate-oblong, gibbous on the lower side. Lip rather longer than the sepals, 3-lobed to the middle, sidelobes slender, longer than the midlobe, sometimes variable in size, spur broadly globular and very short, claw hardly any. Flowering during July and August. Collected from Nagarjung. Distributed at 1500 to 1600 m.

H. densa Wall. ex Lindl. Gen. et Spec. Orch. 326, 1835 ; F.B.I. 6 : 153, 1890 ; King & Pantl. 319, t. 420, 1898 ; Kitamura, 103, 1955 ; Hara, 437, 1966 ;

Flowers small, 4 mm across, erect, bracts ciliolate and longer than the ovary; sepals obtuse thick nerved, green puberulous; petals nearly as long, obliquely ovate or narrower, obtuse, fleshy, yellowish green. Lip linear, obtuse, as long as the sepals, spur half as long as the ovary. Flowering time July and August. Collected from Chandragiri, Lamjura.

H. dentata (Sw.) Schltr. Orch. Sino-Jap. 125, 1919; Kitamura, 103, 1955; Hara., 437, 1966. *Orchis dentata* Swartz. in Ved. Acad. Handl Stock. 207, 1800 *Platanthera dentata* (Sw.) Lindl. Gen. et Spec. Orch. 296, 1835. *Habenaria geniculata* D. Don, Prodr. Fl. Nep. 25, 1825; F.B.I. 6: 136, 1890; King & Pantl. 309, t. 405, 1898. (Fig. 1).

Spike dense, flowers dull greenish, c 2.5 cm across; lateral sepals acute; petals linear-oblong Lip suborbicular, sidelobe cuneate or rounded, fimbriate or crenate, midlobe small, much shorter, oblong, spur subclavate, longer than the ovary. Flowering during July and August. Collected from Nagarjung. Distributed at 1525 to 1675 m. In F.B.I. the colour of the flowers is given as white, but we have not seen any specimen with white flowers.

H. fallax (Lindl.) King & Pantl. in Ann. Roy. Bot. Gard. Cal. 8:325, t 428, 1898; Kitamura, 103, 1955. *Herminium fallax* Lindl. in Wall. Cat. (Nomen nudum); F.B.I. 6:129, 1890. *Peristylus fallax* Lindl. Gen et Spec Orch. 298, 1835.

Leaf solitary; spike lax flowered, flowers green, bracts equalling the ovary; sepals spreading, oblong or ovate-lanceolate, 1 nerved, broader than the petals; petals erect, falcate. Lip shorter than the sepals, hastately 3 lobed, sidelobes slightly diverging, midlobe longer than the sidelobes, spur saccate, tip inflated. Flowering during July and August. Collected from Sheopuri, Tarebhir, Lamjura. Distributed from 1650 to 2850 m.

H. galeandra (Reichb. f.) Benth. Fl. Hongk. 363, 1861; F.B.I. 6:163, 1890. *Platanthera galendra* Reichb. f. in Linnaea, 25:226, 1852.

Spike 5-8 cm long, flowers pale purple, c 1 cm across; dorsal sepal ovate or narrowly lanceolate, lateral sepals falcately

lanceolate, spreading; petals rather shorter and narrower than the sepals, obtuse. Lip broadly obovate or obcordate, sidelobes recurved, spur short, conical saccate. Flowering during June to August. Collected from Sheopuri at c 1825 m.

H. goodyeroides D. Don, Prodr. Fl. Nep. 25, 1825; F.B.I. 6:161, 1890; King & Pantl. 326, t. 430, 1898; Holttum 86, 1953. *Peristylus goodyeroides* (Don) Lindl. Gen. et Spec. Orch. 299, 1855; Sant. & Kapad. in Journ. Bom. nat. Hist. Soc. 57(1): 133, 1960-

Spike 15 to 20 cm long, flowers small, c 8-10 mm across, yellowish-green, crowded, bracts narrowly lanceolate; sepals green turning reddish with age, dorsal sepal 6 mm long, ovate oblong; lateral sepals a bit longer, obliquely obovate-oblong, obtuse, petals gibbously ovate, spreading, creamy or greenish-white. Lip as long as the sepals, trilobed at the anterior part, recurved, sidelobes linear-oblong, longer than the midlobe and diverging, midlobe broad, and tapering to blunt apex, spur minute, fusiform. Flowering during July. Collected from Chianpur to Mialay at c 1825 m, locality unrecorded (Banerji).

H. intermedia D. Don, Prodr. Fl. Nep. 24, 1825; F.B.I. 6:38, 1890.

Flowers few and distant, very large c 5 cm across, white or greenish-white; dorsal sepal recurved, white inside, lateral sepals falcately lanceolate; tips reflexed, narrower than the petals, acuminate, 5 nerved. petals falcate, obovate, strongly 5 nerved, glabrous. Lip longer than the sepals, 3 lobed to about 2/3rd of its length, green or yellowish-green, base narrow and white, sidelobes deeply fringed, midlobe entire, as long as the sidelobes, spur twice as long as the ovary, c 3 cm, very stout and swollen towards the tip. Flowering during August. Collected from Gumuraung to Sarti at 2300 m. Authority Kitamura.

H. latilabris (Lindl.) Hk. f. in Fl. Brit. Ind. 6:153, 1890; King & Pantl. 321, t. 423, 1898; Hara, 438, 1966. *Platanthera latilabris* Lindl. Gen. et Spec. Orch. 289, 1835. *P. acuminata* Lindl. loc. cit. 289, 1835.

Spike lax, flowers green, 8-14 mm across, bracts lanceolate longer than the ovary; sepals ciliolate, 3-5 nerved, dorsal sepal broadest, orbicular, lateral sepals ovate, deflexed; petals as long as the lateral sepals, broadly ovate, fleshy, base slightly gibbous. Lip linear, spur stout and upturned, longer than the ovary. Flowering during August. Collected from Bagdoar at c 2290 m.

H. pectinata (Sm.) D. Don, Prodr. Fl. Nep. 24, 1825; F.B.I. 6:137, 1890; King and Pantl. 310, t. 406, 1898. *Orchis pectinata* Smith, Exot. Bot. 2:77, 1805. *Habenaria ensifolia* Lindl. Gen. et Spec. Orch. 321, 1835.

Spike may be as long as 20 cm, flowers large c. 4 cm across, white or greenish-white, crowded; dorsal sepal lanceolate, erect, lateral sepals ovate-lanceolate; petals linear-falcate, narrower than the sepals, obtuse, 3-5 nerved, glabrous. Lip as long as the sepals, 3 lobed nearly to the base, sidelobes deeply fringed, comb-like, midlobe linear, longer than the sidelobes, spur as long as the ovary, 2.5-3 cm long, geniculate, swollen at the tip. Flowering during August. Collected from Bagdoar, Lokwa (Kitamura). Distributed at about 2300 m.

H. plantaginea Lindl. Gen. et Spec. Orch. 323, 1835; F.B.I. 6:141, 1890.

Spike 5-7.5 cm long, flowers white; sepals small; subequal, acute, 3 nerved, dorsal sepal ovate-oblong, lateral sepals falcate, oblong; petals linear-lanceolate. Lip broad, twice as long as the lateral sepals, flabelliform; sidelobes semi-ovate, entire or faintly toothed, midlobe as long, linear, spur as long as the ovary, green. Flowering during September, Collected from Banepa to Dolaghat at 916 m.

H. stenantha Hk. f. in Fl. Brit. Ind. 6:153, 1890; King & Pantl. 314, t. 412, 1898.

Flowers green with lip yellowish, c. 1.75-2.25 cm in diam., bracts linear-lanceolate, equalling the ovary in the lower flowers but shorter in the upper ones; sepals unequal, 3-nerved, dorsal sepal concave, broadly ovate, erect, lateral sepals small, ovate-

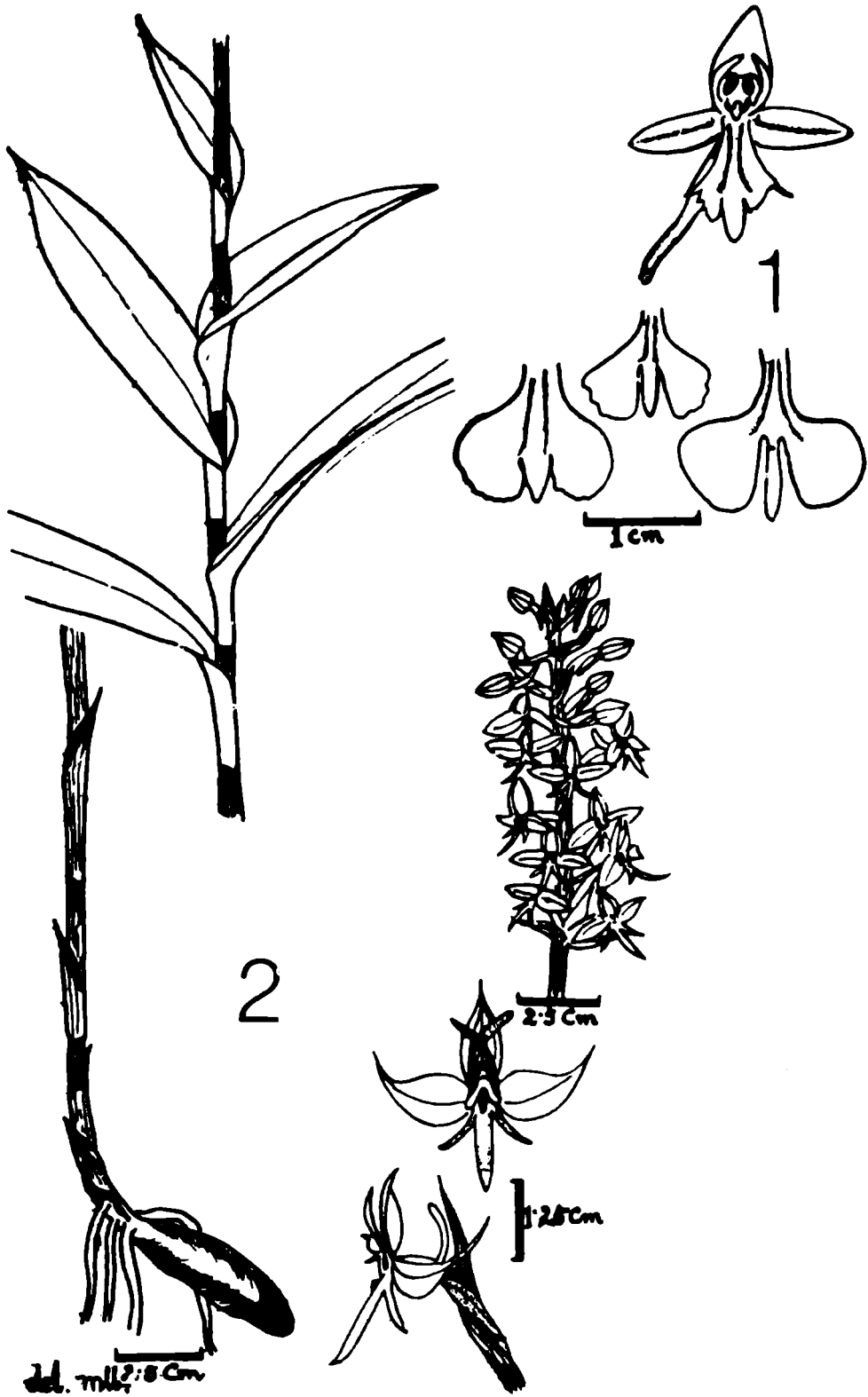


Fig. 1. Flower and tips of *Habenaria dentata* (Sw.) Schltr. Fig. 2. *Habenaria stenopetala* Lindl.

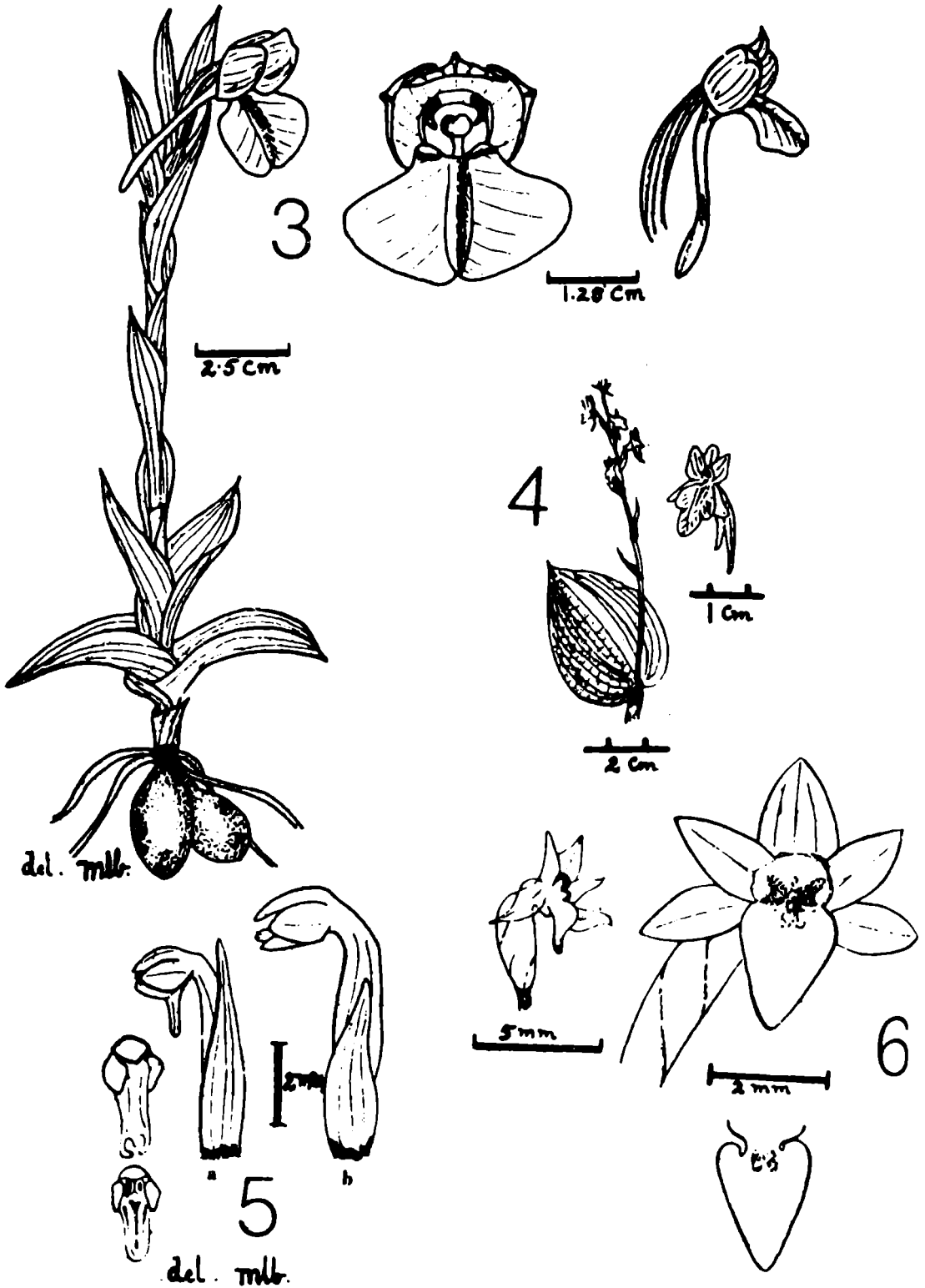


Fig. 3. *Habenaria triflora* D Don Fig. 4. *Hemipilia cordifolia* Lindl. Fig. 5. Flowers of *Herminium angustifolium* (Lindl.) Benth. a. normal flower; b. sepal and petals forming a hood, petals linear. Fig. 6 *Herminium duthiei* Hk. f.

elliptic, reflexed; petals longer than the dorsal sepal, erect, 1-nerved. Lip longer than the sepals. lanceolate, spur longer than the ovary, curved, slightly widening towards the tip. Flowering time during July and August. Collected from Junbesi to Taksindhu. This species closely resembles *H. latilabris* but differs in the shape of the petals which are erect and in the character of the bracts.

H. stenopetala Lindl. Gen. et Spec. Orch. 219, 1835; F.B.I. 6:134, 1890; King & Pantl. 308, t. 404, 1898. (Fig. 2).

Flowers greenish-yellow; sepals oblong-lanceolate, membranous, 3 nerved, tips filiform; segments of petals slender, equal or the lower shorter or even absent. Lip tripartite, lobes filiform, lateral lobes longer than the midlobe or as long as it, spur equalling the ovary. Flowering during August and September. Collected from Bagdoar, Sheopuri, Godavari, locality unknown (Herklotts). Distributed at c. 2430 m.

H. triflora D. Don, Prodr. Fl. Nep. 25, 1825; F.B.I. 6:142, 1890 (Fig. 3)

Sepals suberect, dorsal sepal oblong-ovate, lateral sepals oblong-lanceolate; petals small, linear-subulate, 1-nerved. Lip very large, sidelobes semi-oblong, hatchet-shaped, crenulate, midlobe shorter, linear, spur very slender, as long as the ovary, slightly thickened at the tip. Flowering from July to early September. Collected from Bagdoar, Lamjura, locality unknown (Herklotts). Distributed at 1525 to 2135 m.

H. urceolate C.B.Cl. in Journ. Linn. Soc. 25:73, t. 30, 1889; F.B.I. 6:165, 1890; King & Pantl. 316, t. 415, 1898.

Racemes 5-7.5 cm long, flowers white or rosy; sepals white or rosy; petals 1-nerved. Lip recurved, lanceolate, terminal half solid, acuminate, green, spur inflated and as long as the sepals. Flowering during August. Collected from Lamjura at 3650 m.

b. *Hemipilia* Lindl.

These are singularly attractive terrestrial orchids. The name probably alludes to the sparsely hirsute lip of the type

species. According to Hawkes, the flowers closely simulate, superficially at least, some sort of *Habenaria*. However, they are terrestrial, tuberous herbs with a single broad radical leaf. The flowers are in lax racemes. The lip is obscurely 3 lobed and the spur is trumpet-shaped.

Hemipilla cordifolia Lindl. Gen. et Spec. Orch. 296; 1835; F.B.I. 6:167, 1890; Kitamura, 103, 1955. (Fig. 4).

Plants 16-20 cm high, bearing a single leaf at the base. Leaf 7-8 by 4.5-6.5 cm, broadly ovate, fleshy. Racemes few to many flowered, flowers purple c 1.0-1.5 cm across. Bracts about half the length of the ovary; sepals equal in length, dorsal sepal oblong, obtuse, erect, lateral sepals spreading, falcate, oblong; petals smaller than the sepals, erect, forming a hood, broadly ovate, entire. Lip obscurely trilobed, sidelobes rounded, midlobe broad, subcrenate, spur shorter than the ovary, curved, tip faintly 2-lobed, upturned. Flowering during August and September. Collected from Tarehbir-Manichur area, Gurmurang (Kitamura). Distributed at 1825 m.

c. *Herminium* R. Br.

Herminium is a genus of mostly small flowered, rather insignificant terrestrial orchids. Although rare in cultivation these allies of *Habenaria* Willd. are attractive. Plants are small, erect, tuberous herbs with oblong tubers and with a solitary or few leaves. The *Herminia* can be distinguished from *Habenarias* by the characteristic lip, which is never with a spur but is provided with a saccate or gibbous base. It is mentioned by Hooker that the Indian *Herminia* attain the greatest elevation of any orchid.

ARTIFICIAL KEY TO THE SPECIES OF *Herminium*

- A Lip distinctly 3 lobed -
 - B Lip deeply 3 lobed near the apex..... *angustifolium*
 - BB Lip 3 lobed near the base and very minute.....*jaffreyanum*
- AA Lip quite entire (sidelobes very faint) -
 - C Sides of lip dilated, lip longer than sepals, flowers c 3-4 mm in diam., green *congestum*

- CC Sides of lip not dilated. Lip shorter than sepals, flowers c 2-3.5 mm in diam., yellowish *monophyllum*
- OCC Sides of lip not dilated, lip as long as the sepals; flowers c 4mm in diam. Waxy white or pale yellow *duthlei*

Hemmalium angustifolium (Lindl.) Benth. ex HK. f. in Fl. Brit. Ind. 6:129, 1890; King & Pantl. 332, t. 434. 1898; Kitamura, 103, 1955; Hara, 439, 1966. *Aceras angustifolia* Lindl. Gen. et Spec. Orch. 282, 1835. (Fig. 5).

Spike 5-10 cm long, flowers decurrent, small, 1.5 cm in diam.; sepals oblong, obtuse, dorsal sepal and petals forming a hood; petals linear, very narrow, 1-nerved, acute, membranous. Lip as long as the sepals, trifid beyond the middle, sidelobes filiform, curved, longer than the midlobe, midlobe very short. Flowering during July and August. Collected from Pheda to Charikot, Manichur, Sheopuri area, Aga (Kitamura). Distributed at 2050 to 2400 m.

H. congestum Lindl. Gen. et Spec. Orch. 305, 1835; F.B.I. 6:130, 1890; King & Pantl. 355, t. 440, 1898; Kitamura, 103, 1955.

Spike 3-7 cm long, dense flowered, flowers minute, c 3-4 mm in diam., decurved; sepals, obtuse, dorsal sepal broadly ovate to orbicular, lateral sepals oblong to broadly oblong; petals ovate, equalling the sepals, fleshy. Lip entire, ovate or triangular-ovate, fleshy, sides faintly dilated into lobes, base saccate. Authority Kitamura.

H. duthlei HK. f. Ic. Pl. 2199 A et Fl. Brit. Ind. 6: 130, 1890; Duthie 199, t. 147, 1906 (Fig. 6):

Plants 7-17 cm high, leaves two or three from below the middle of the stem. linear or oblanceolate. Spike 5-10 cm, many flowered, flowers deflexed waxy white or pale yellow; floral bracts much shorter than the curved ovary; lateral sepals smaller and subfalcate, dorsal sepal broadly oblong; petals ovate lanceolate, fleshy. Lip as long as the sepals, triangular, entire with a small globose spur, upper surface with two calli near the base. Flowering during July and August. Collected from

Junbesa to Taksindhu, c 2440 m, Thyangbochee to Phereche, c 4270 m.

Duthie included this species amongst the twentyfour species "not at present known to occur outside the area of the western Himalaya". We have had the opportunity of examining some of the recently collected material and we find the species has been collected from West Nepal—Polunin, Sykes & Williams, 4421 from South of Jumla at 3500 m, which is very robust, some 13 cm in height; P.S. & W—2328 from Jumla Bhngyang at 3960 m is about 10 cm in height, while P.S.& W.-1151 from Tukuche at 3700 m is just 6 cm in height. Our material collected from Junbesa to Taksindu as well as from Thyangbochee—Phereche area are 7-8 cm. in height and they match with P.S. & W. 1151 and also with King's material collected from Gharwal. The field notes of the three collections made by Polunin, Sykes & Williams give the colour of the flowers as white, while our material from Junbesa-Taksindhu had waxy white flowers and the Thyangbochee-Pherechee material had pale yellow flowers. Our materials have been collected further east.

H. jaffreyanum King & Pantl. in Journ. Asiat. Soc. Beng. 65:130, 1895; et Orch. Sikkim Himal. 333, t. 436, 1898.

Spike 3.5-7.5 cm long, densely flowered, flowers 2-2.5 mm in diam.: sepals broadly ovate-elliptic, concave, slightly spreading; petals narrowly oblong, obtuse, longer than the sepals. Lip 3 lobed near the base, side lobes very small and rounded, midlobe elongate with a blunt apex. Flowering during August and September. Collected from Charikot-Kalinchok area at 3200 m This species can be distinguished from *H. angustifolium* on the characters of the lip and sepals. It also resembles *H. monophyllum* which has a single leaf, floral bracts are longer than the flowers, and the lip is entire.

H. monophyllum (D. Don) P.F. Hunt & Summerhayes in Kew Bull. 20(1): 51, 1966. *Neottia monophyllum* D. Don, Prodr. Fl. Nep. 27, 1825. *Herminium gramineum* Lindl. Gen. et Spec. Orch. 305, 1835; F.B.I. 6:131, 1890

Spike lax flowered, flowers minute c. 2-3.5 mm in diam., yellowish, suberect; dorsal sepal oblong or broadly ovate, lateral sepals ovate, obtuse, spreading; petals erect, linear, falcate, as long as the sepals, thick. Lip flat, ovate, acuminate, equalling or shorter than the sepals, base concave, saccate. Flowering during August. Collected from Chaubas to Risingo, Buludanda to Risingo, Tarebhir. Common at 1985 m

d. *Orchis* 1

The name bears reference to the tuberoids which are of the shape of testicles, as Dioscorides used this name for a plant with tuberoids of that shape but some species bear palmate tubers having no such resemblance. Plants are terrestrial with two to many leaves. Flowers of *Orchis* are mostly pink or purple.

ARTIFICIAL KEY TO THE SPECIES OF *Orchis*.

Lip deeply 3 lobed; floral bracts as long as the ovary; stem slender; leaves 1-3.....*roborrowskyi*.

Lip shallowly 3 lobed; floral bracts exceeding the ovary—

Flowers smaller, pinkish; lip not spotted. Tubers digitate...*habenarioides*.

Flower large, purple; lip usually spotted. Tubers palmate...*latifolia*.

Orchis habenarioides King & Pantl. Ann. Roy. Bot. Gard. Calc. 8: 302, t. 401, 1898; Duthie, Orch. North-West Himal. 172, 1906. *Gymnadenia orchides* & *G. violacea* Lindl. Gen. et Spec. Orch. 272, 1835. *Habenaria orchides* Hk. f. in Fl. Brit. Ind. 6: 142, 1890 (Fig. 8).

Plants 12-20 cm high, stem with digitate tubers and 4-5 leaves; leaf elliptic-oblong to oblong lanceolate. Spike densely flowered, 6-9, bracts lanceolate, longer than the curved ovary. Flowers pinkish; lateral sepals spreading, acute, dorsal sepal forming a hood with the petals; petals shorter than the sepals. Lip broadly oblong, base truncate, apex broad, 3 lobed, erose, spur shorter than the ovary, curved and slightly clavate, Flowering during August. Collected from Namchee to Thyangbochee, c 3810 m.

O. latifolia Linn. Sp. Pl. 941, 1753; F.B.I. 6 : 127, 1890; Duthie, Orch North-West Himal. 172, 1906; Parker, Forr. Bull. bot. ser. 76, 8, 1931. *Orchis hitagire* D. Don, Prodr. Fl. Nep. 23, 1825.

Plants stout usually fistular with palmate tubers. Leaves many upto 12 cm long. Spike dense flowered. Flowers dull purple; sepals and petals acute or obtuse, lateral sepals ovate, reflexed. Lip oblong or rhomboid, crenate, entire or very obtuely 3 lobed, sides deflexed, spotted with darker purple, midlobe small or obsolete; spur straight or curved. Authority Parker.

O. roborowskyi (Max. m.) P.F. Hunt, in Kew Bull. 26 : 175, 1971. *Orchis chusua* D. Don, Prodr. Fl. Nep. 26, 1825 ; F.B.I. 6 : 127, 1890; King & Pantl. 303, t. 402, 1898; Hara, 191, 1971. *Gymnadenia chusua* (D. Don) Lindl. ex Wall. Cat. nomen nudum, et Lindl. Gen. et Spec. Orch. 208, 1835. *Orchis roborowskyi* Maxim in Bull. Acad. Petersb. 31- 104, 1887. (Fig.7)

Terrestrial plants, 15-20 cm high ; stem with usually two leaves; leaf oblong lanceolate, upper leaf smaller. Spike 3-5 flowered, bracts lanceolate and as long as the ovary. Flowers purple; lateral sepals lanceolate, acuminate, reflexed, dorsal sepal much smaller and resting on the petals; petals shorter, ovoid, obtuse. Lip longer than the sepals, variable in breadth but usually broader than long, 3 lobed, lobes spreading broad, rounded, erose or crenate, rarely oblong with the midlobe retuse, spur cylindric, slightly clavate, adpressed to the ovary and equalling it. Flowering during July-August. Collected from Lamjura, c 3048 m., Dorzhong to Tsumdung, 3500 m., Thulo Gompha khola, 3700 m., Tsunje 3610 m. (Kitamura).

King & Pantl. have described a var. *nana* [*nana* (King & Pantl.) P.F.Hunt] which differs from the typical by its much smaller size, having a single leaf and midlobe of lip less deeply lobed. Kitamura describes a *forma parva* collected from Manaslu, 3800 m.

e. *Platanthera* L.C. Rich.

This is a group of terrestrial orchids which are sometimes included in *Habenaria* Willd. from which it is separated on technical data. The name refers to the unusual width of the anthers.

ARTIFICIAL KEY TO THE SPECIES OF *Platanthera*

Lip pectinate, petals smaller than the sepals *susannae*
 Lip entire and blunt, petals equalling the sepals *bakeriana*

Platanthera bakeriana (King & Pantl.) Kraenzl. Orch. Gen. et Spec. 1 : 611, 1898; Hara. 448, 1966. *Habenaria bakeriana* King & Pantl. in Journ. Asiat. Soc. Beng. 65 : 102, 1895 et Ann. Roy. Bot. Gard. Calc. 314, t. 413, 1898; Hara, 181, 1971.

Spike 10-15 cm long, laxly flowered; sepals oblong-lanceolate, dorsal sepal conniving with the petals forming a hood, lateral sepals reflexed; petals as long as the sepals, broadly ovate, oblique, subacute, base broad. Lip fleshy, oblong, blunt, slightly broader towards the base, entire, equalling the lateral sepals, spur long, slender, twice as long as the ovary, curved forwards. Collected from Phulchowki.

P. susannae (Linn.) Lindl. Gen. et Spec. Orch. 295, 1895; Sant. in Rec. Bot. Surv. Ind. 16 (1) : 305, 1953; Sant. & Kupad. in Journ. Bomb. nat. Hist. Soc. 57(1) : 125, 1960. *Orchis susannae* Linn. Sp. Pl. 939, 1753. *Habenaria susannae* (Linn.) R. Br. ex Spreng, Syst. Veg. Veg. 3 : 622, 1826; F.B.I. 6:137, 1890; Holttum, 81. f. 13, 1955.

Flowers few and large, c 7.5-10 cm in diam., white, fragrant; sepals spreading, lateral sepals 3.6 by 2.4 cm, oblong, subquadrately ascending, obtuse, edges reflexed, dorsal sepal broad, rhomboid, spreading; petals small, linear, 1.5 cm long, acute. Lip not longer than the sepals, 3 lobed near to the base, sidelobes truncate, pectinate, midlobe 3 cm long linear or dilated downwards, spur twice as long as the ovary, 10-12 cm long. Flowering during August and September. Collected from Markhu at c. 1525 m.

f. *Satyrium* Sw.

Terrestrial leafy erect orchids with the root system consisting of several ovoid or globular tubers with numerous fleshy roots. When the large tubers perish after producing the flowering stem, the smaller tubers gradually increase in size, and later produce flowering stems. Because of the presumed aphrodisiacal properties possessed by the tubers the plants are much sought after and possibly it is for this reason that plants of *Satyrium nepalensis* are rather rare in the surroundings of Kathmandu valley.

Satyrium nepalensis D. Don, Prodr. Fl. Nep. 26, 1825; F.B.I. 6: 168, 1890; King & Pantl. 338, t. 444, 1898; Kitamura, 104, 1955.

Flowering stem even up to 60 cm long. flowers crowded, c. 8-16 mm in diam., from dark pink to white, fragrant; sepals linear oblong, obtuse, spreading and recurved; petals rather narrower than the sepals. Lip broadly oblong, concave, strongly keeled on the back, spurs two, longer than the sepals and as long as the ovary. Flowering during September and October. Collected from Chandragiri, Chaubas to Risingo, Nayapati to Risingo, Rolkhani to Tamchee, Kokwa (Kitamura), Bangukhola (Kitamura). Distributed between 2250 to 3500 m.

var. *ciliata* King & Pantl. 339, 1898. *S. ciliatum* Lindl. Gen. et Spec. Orch. 340, 1835.

Spur hardly longer than the sepals. Collected from Tarebhir to Nagi, Borlong forest at 1980 m.

forma *albiflora* has been described by Tuyama in Hara's Fl. Eastern Himal., but we are of the opinion that there is a great variation of colour, thus a *forma* on colour is not proper. However, plants with light pink flowers which were collected from Godavari Botanic Garden, Kathmandu, were grown in the Indian Co-operation Mission, Kathmandu garden and during the following year the flowers that appeared had a deeper colour. King & Pantl. (loc. cit.) have also mentioned that occasionally flowers are pure white.

B. ACROTONAE

1. POLYCHONDREAE

ARTIFICIAL KEY TO THE GENERA

- A. Stem with a thick underground part or a pseudobulb, or a stout subtuberous rootstock —
 - B. Inflorescence terminal; lip sessile not spurred, base concave and embracing the column. Terrestrial herbs, stem leafy, leaves distichous *Arundina* (Sobraliceae)
 - BB. Inflorescence lateral; lip spurred, sidelobes embracing the column..... *Thunia* (Sobraliceae)
- AA. Stem not bulbous, roots often bulbous —
 - C. Stem simple, erect, roots tuberous —
 - D. Spur long; lip exposed beyond the base of the lateral sepals
 - E. Lip connate to the sides of the column, limb spreading; spur long, naked within; column not appendaged in front..... *Herpysma* (Erythroideae)
 - EE. Lip clawed beyond the spur, limb 2-winged; spur glandular within; column appendaged in front.....
..... *Anoectochilus*
.....
 - DD. Spur short i.e. saccate; lip flat —
 - F. Lateral sepals not free; spike dense flowered and spiral; leaves several..... *Spiranthes* (Spirantheae)
 - EE. Lateral sepals free —
 - F. Two leaved herbs..... *Listera* (Listereae)
 - FF. Many leaved herbs —
 - G. Lip clawed beyond the spur; column with two linear appendages in front; stigmas 2.....
..... *Zeuxine* (Erythroideae)
 - GG. Lip not clawed beyond the spur; column not appendaged; stigma 1.....
..... *Goodyera* (Erythroideae)
- CC. Stem simple, erect from an underground tuber; 1-leaved; sepals erect or spreading; column elongate not winged.....

-*Nervilia* (Pogoniaceae)
- CCC. Stem simple, erect from an underground rootstock, leafy; leaves plicate—
- D.' Sepals conniving; lip hidden by the sepals, not clearly divided into epichile and hypochile.....*Cephalanthera* (Cephalanthereae)
- D'D.' Sepals free, spreading; lip clearly divided into epichile and hypochile. Anthers dorsal, caudicle rudimentary.....*Epipactis* (Cephalanthereae)

a. *Anoectochilus* Bl.

The name refers to the lip which is adnate to the column but while through a sharp bend in the isthmus, has its blades spreading to give the appearance of openness.

Anoectochilus crispus Lindl. in Journ: Linn. Soc. 1 : 180, 1857; King & Pantl. 297, t. 395, 1898. *Odontochilus crispus* Hk. f. in Fl. Brit. Ind. 6 : 99, 1890. (Fig. 9).

Plants decumbent, about 10-15 cm high, leaves few, ovate with undulate margins. Spike 4-6 flowered, flowers pink; bracts lanceolate, as long as the ovary; sepals unequal, lateral sepals spreading, oblong, dorsal sepal smaller with its apex turned backwards; petals conniving under the dorsal sepal. Lip deflexed from the base, apical lobe sub-rotund and divided into two broad lobules, with undulate margins. Flowering during August. Collected from Tarebhir to Nagi at c 1980 m.

King & Pantl. describe the sepals as green, petals and lip as white, and the lip as tinged with yellow on the sac. In our material the petals and lip are pink, like that of *A. roxburghii* but the lip is very different—the terminal lobe of the lip is divided into two lobules which are broad, have undulate margins and a mucronate apex, also the fimbriae are absent.

b. *Arundina* Bl.

These are terrestrial orchids some 1.5 to 2.0 m tall and having reed-like stems because of which the genus gets the name. Leaves are numerous, membraneous and narrow. Flowers are large in racemes with petals broader than the

sepals, and labellum large and semi shaped, which is bright red or pale violet while the sepals and petals are white.

Arundina graminifolia (Don) Hochr. in Bull. N.Y. bot. Gard. 6:270, 1910; Holttum, 186, 1953; Hara, 425, 1966. *Bletia graminifolia* Don, Prodr. Fl. Nep. 29, 1825. *Limodorum graminifolia* Buch. Ham. ex D. Don, loc. cit. *Arundina bambusifolia* Lindl. Gen. et Spec. Orch. 125, 1831; F.B.I. 5:857, 1890; King & Pantl. 113, t. 156, 1898. *Cymbidium bambusifolium* Roxb. Fl. Ind. ed. 2, 3:460, 1832, (Fig. 10).,

Flowers large, catleya-pink; sepals and petals c. 5.0 cm long, orbicular-obovate, apiculate; lip brighter red than the sepals, sidelobes short, midlobe small, bifid, crisped, disk with 3 lamellate nerves. Flowering time during late August to October, rarely in June or July. Collected from Nilkanth area, Suparitar, Pokhra, Phidim to Maktara, Pisapur (Kitamura), locality unknown (Herklotts).

c. *Cephalanthera* L.C. Rich.

Stem creeping, subterranean (rhizome), roots tuberous when the plant is leafless or they may be fibrous when the stem is leafy. Lower leaves lanceolate while the upper ones are linear. Flowers on a lax raceme, c. 1.5 cm long, white with yellow spots on the lip which has a short ridged epichile.

Cephalanthera ensifolia Rich. Orch. Annot. 29:1817; Lindl. Gen. et Spec. Orch. 412, 1840; F.B.I. 6:125, 1890; King & Pantl. 271, t. 362, 1898; Hara, 2nd. Rpt. 180, 1971.

Flowers white or lip spotted with yellow; sepals lanceolate, acute; petals elliptic, obtuse, ridges in lip, hypochile concave or saccate, embracing the column, epichile (midlobe) short, triangular, obtuse, 5-ridged, often marked with yellow spots. Flowering during April to June. Collected from Pisang to Tatopani (Kitamura), Dhunche-Gossainkund (Hara).

d. *Epipactis* Sw.

Large terrestrial erect orchids with sessile leaves. Flowers in racemes, pendulous, bracts leafy. The lip is short, sessile on

the base of the column. This orchid differs from *Cephalanthera* in structural details of the flowers which are rather large and showy.

ARTIFICIAL KEY TO THE SPECIES OF *Epipactis*

Flowers 2.5—3.75 cm in diam. ; hypochile narrow.....*constmills*
 Flowers c. 2.5 cm in diam, ; hypochile much broader than the epichile
*royleana*

Epipactis constmills Wall. ex Hook. f. in Fl. Brit. Ind. 6: 126, 1890; King & Pantl. 272, t. 364, 1898; Parker, Forr, Bull. bot. ser. 76: 8, 1931.

Terrestrial with fibrous roots; leaves sessile, broadest lower ones while the upper ones narrow. Flowers orange-green, rarely spotted, drooping; sepals and petals pubescent; lip as long as the sepals, hypochile (sidelobes) narrow, oblong and turned upwards, epichile (midlobe) longer, lanceolate, inflexed at the base and then recurved. Flowering during February and March. Collected from West Nepal (Parker).

E. royleana Lindl. in Royle, Ill. Himal. 368, 1839, et Gen. et. Spec. Orch. 461, 1840; F.B.I.6: 126, 1890.

Flowers green with yellow lip which is longer than the sepals; sepals and petals nearly equal, glabrous, hypochile of lip large, saccate and much broader than the ovate epichile. Collected from Thulo Gompha khola at 3100 m, authority Kitamura.

e. *Goodyera* R. Br.

The genus is named after an English botanist—J. Goodyer. These are known as ‘rattle snake plantains’, the name being given because of the mottlings on the foliage. There are also terrestrial leafy orchids with stem decumbent or creeping. Leaves are usually thick, petiolate and with a sheath. Flowers small on racemes, sepals often pubescent outside, dorsal sepal concave and along with the petals forming a hood over the column. Stigma is undivided.

ARTIFICIAL KEY TO THE SPECIES OF *Goodyera*

- A. Stem stout, 45-60 cm tall, many leaved; spike dense flowered, bracts equalling the flowers.....*procera*
 AA. Stem 10-20 cm tall, few leaved—
 B. Lip smooth, channelled, lamellate within, with no hairs or soft setae*repens*
 BB. Lip within setose and tubercled—
 C. Leaves 3-5 nerved, never reticulate; bracts exceeding the flowers; fls. pink *foliosa*
 CC. Leaves mottled with white—
 D. Bracts exceeding the flowers, sepals with pink tips...
*hemsleyana*
 DD. Bracts about equalling the flowers—
 E. Leaves ovate-lanceolate, fleshy (thick).....
vittata
 EE. Leaves cordate*cordata*
 DDD. Bracts shorter than the flowers; fls. white.....
secundiflora

Goodyera cordata (Lindl.) Bth. ex Hook. f. in Fl. Brit. Ind. 6:114, 1890; Holttum, 122, 1953; Hara, 2nd Rpt. 187, 1971.
Georchis cordata Lindl. Gen. et Spec. Orch. 496, 1840.

Plants slender, c. 15-30 cm long; leaves ovate-cordate, basal sinus variable in depth, petiole slender, 6-12 mm long. Inflorescence a lax-flowered spike, flower pubescent, bracts equalling or shorter than the flowers. Lip gibbous. Authority Hara.

According to Hara, the scape is shortly hairy, while the bracts are more densely hairy and the lip is also hairy on the lower half of inside.

G. foliosa (Lindl.) Bth. ex Hook. f. in Fl. Brit. Ind. 6:113, 1890; King & Pantl. 281. t. 374, 1898; Holttum, 121, 1953; Hara, 435, 1966. *Georchis foliosa* Lindl. Gen. et Spec. Orch. 496, 1840.

Bracts exceeding the flowers. Lip saccate, beak dilated, base setose within. According to Hara, the chief distinguishing characters are "blunt tipped papilla-like hairs on the bracts and scape". Authority Hara.

G. Hemsleyana King & Pantl. in Journ. Asiat. Soc. Beng. 64:342, 1895 et Ann. Roy. Bot. Cal. 8:281, 1898.

Plants 15-55 cm long; leaves 3 to 5 unequal, broadly ovate, acute; bracts lanceolate, exceeding the ovary. Flowers 1.5 cm long, white, sepals with long sparse hairs, tips pink, petals falcate. Lip with a sharp tooth on either side of the mouth of the saccate base, apical lobe oblong. Flowering time during July and early August. Extremely rare, only collected from Bagdoar at 2135 m.

G. procera Hk. f. Exot. Fl. 39; 1823; F.B.I. 6:111, 1890; King & Pantl. 282, t. 278, 1898; Hara 436, 1966, (Fig. 11).

Flowers minute, whitish, fragrant; sepals broadly ovate, obtuse, 1-nerved; petals spathulate. Lip not longer than the column, base saccate, softly setose within, 2 large calli within the obtuse recurved tip. Occasional in the topical region. Flowering during June. Collected from Eastern Nepal (Banerji).

G. repens (Linn.) R. Br. in Ait. Hort. Kew, ed. 2, 5:198, 1813; F.B.I. 6:111, 1890; King & Pantl. 282, t. 279, 1898; Hara, 436, 1966. *Satyrium repens* Linn. Sp. Pl. ed. 1, 945, 1753, *Goodyera marginata* Lindl. Gen. et Spec. Orch. 493, 1840.

Flowers whitish; lateral sepals ovate, acuminate, 1-nerved, dorsal sepal narrow; petals linear-falcate. Lip ventricose, shortly beaked, channelled within, rostellar arms short. Flowering during July and August. Collected from Bagdoar, Taksindhu forest, Chandragiri.

G. secundiflora Lindl. in Journ. Linn. Soc. 1:182, 1857; F.B.I. 6:113, 1890; King & Pantl. 283, t. 376, 1898; Hara, 2nd. Rpt. 188, 1971.

Plants c. 15-30 cm long, covered with loose sheathing leaf-petioles. Leaves few, ovate-lanceolate, lamina base rounded, petiole stout and sheathing, dark green with silvery white veins. Inflorescence many flowered, c. 15 cm long, bracts shorter than the flowers. Lip saccate with setae within. Authority Hara.

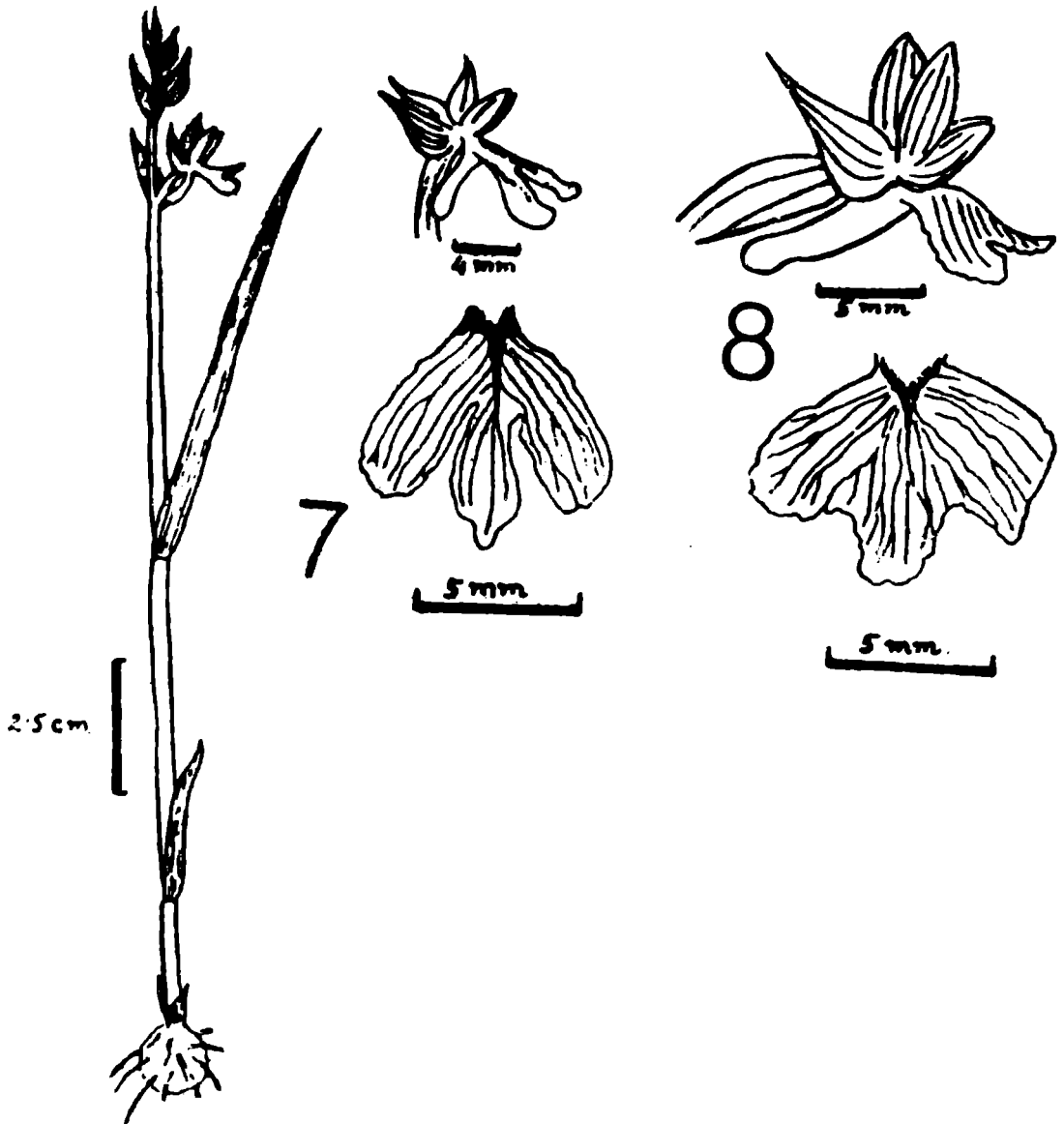


Fig. 7 *Orchis chusua* D. Don; Fig. 8 *Orchis habenarioides* King & Pantl ;

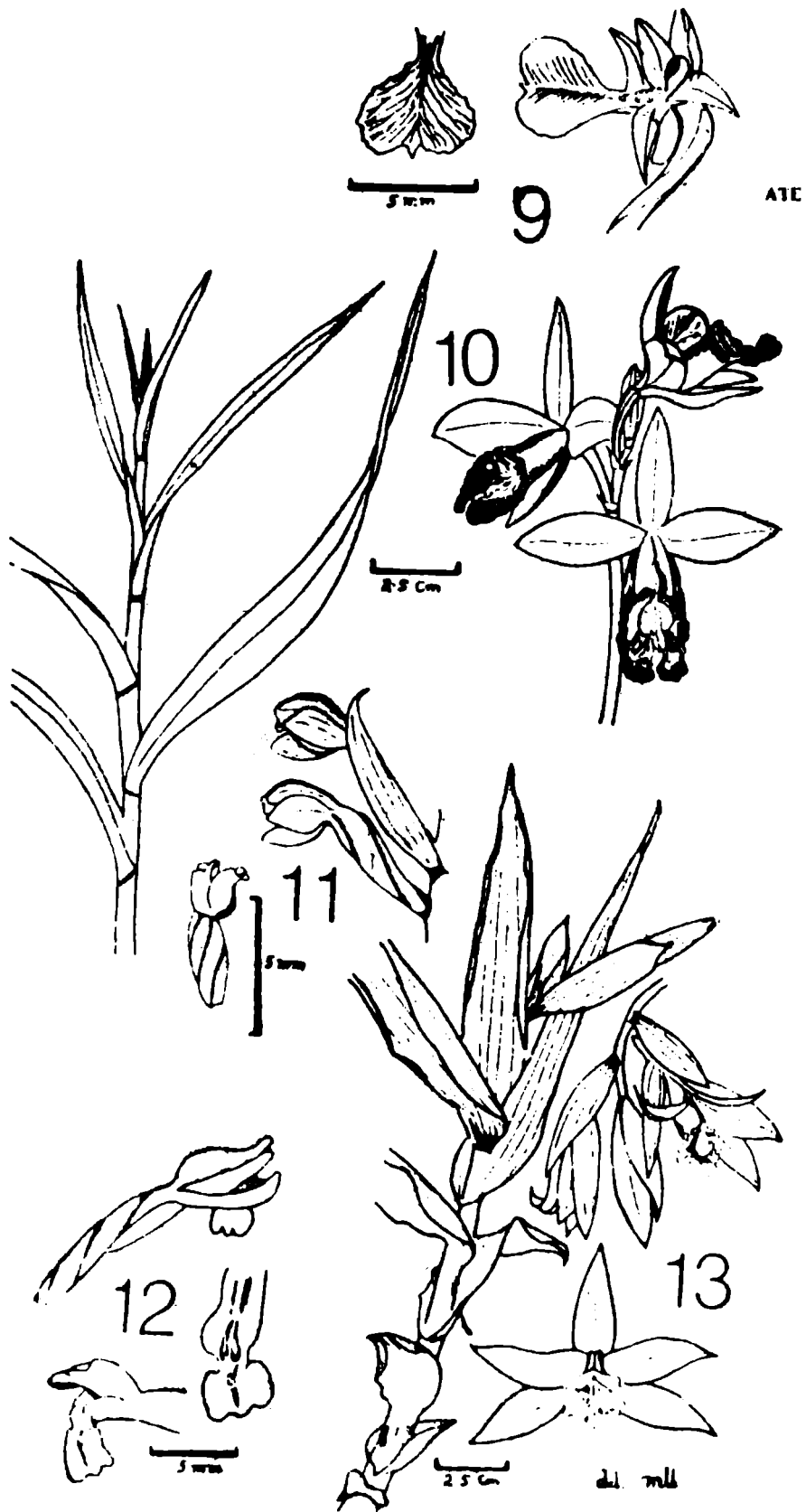


Fig. 9 *Anoctachilus crispum* (Lam.)
 Fig. 10 *Arundina graminifolia* (Don) Hochr.
 Fig. 11 *Goolycera procera* Hk. f.
 Fig. 12 *Hepysma loureianis* Lindl.
 Fig. 13 *Thunia alba* Reichb. f.

G. vittata (Lindl.) Bth. ex Hook. f. in Fl. Brit Ind. 6:113, 1890; King & Pantl. 280, t. 382, 1898; Hara, 437, 1966. *Georchis vittata* Lindl. in Journ. Linn. Soc. 1: 184, 1857.

“This is determined only by the unicate sterile specimen with leaves silvery striated on the midrib and white reticulated at the apex of the blade”—authority Hara.

f. *Herpysma* Lindl.

Due to the creeping habit, the orchid is named as such. The leaves are membranous with large hyaline tubular sheaths. Flowers are dense on a short raceme, white but the sepals and petals have a pinkish tint. Lip is deflexed from the middle, apical lobe is blunt and broad, spur is as long as the ovary and parallel to it.

Herpysma longicaulis Lindl. Gen. et Spec. Orch. 506 1840; F.B.I. 6:98, 1890; King & Pantl. 276, t. 367, 1892. (Fig. 12).

Flowers suberect, pale pink; sepals subequal, free, 5 nerved, dorsal sepal forming a hood with the petals; petals oblong, obtuse. Lip shorter than the sepals, subpanduriform, reflexed from the middle, adnate to the sides of the column, spreading, spur elongate and straight, tip bifid. Flowering during September to November. Collected from Bajrabarabi at c. 1370 m.

g. *Listera* R. Br.

The genus is named after an English physician—Martin Lister. These orchids are known as ‘Tway blades’ in the United States. These are rather insignificant terrestrial orchids with two leaves and fibrous roots. Flowers are small in racemes, with sepals and petals spreading, lip is pendulous from the base of the column.

Listera pinetorum Lindl. in Journ. Linn. Soc. 1:175, 1857; F.B.I. 6:104, 1890; King & Pantl. 256, t. 338, 1898; Kitamura, 104, 1955.

Terrestrial two leaved orchids. Inflorescence a few flowered raceme, flowers decurved, greenish-brown; sepals and petals

subequal, free, spreading or reflexed, yellowish green. Lip cuneately broadly obovate from a narrow base, deeply 2-lobed, twice or even thrice as long as the sepals, brownish, but deeper than the sepals. Collected from Thulo Gompha khola at 3500 m. Authority Kitamura.

h. *Nervilia* Comm. ex Gaud.

Perennial tuberous, coming into leaf after flowering. Tubers globose with small warty knobs. Leaf one, broadly cordate or orbicular. Sepals and petals subequal, spreading; lip adnate to the base of the column and embracing the same at its basal region, column broadened upwards. Schlechter and later Santapau & Kapadia consider *Nervilia* Comm. ex Gaud. as a distinct genus "primarily differing from *Pogonia* Juss. by the production of their flowers before the leaves and by having a separate stem which bears no leaves but may have scales or scaly sheaths"

ARTIFICIAL KEY TO THE SPECIES OF *Nervilia*

Flowers solitary, c. 2.5 cm long; sepals & petals white, anterior lobe of lip with 2 obscure sidelobes *macroglossa*

Flowers 7-15, c. 1.5 cm long; sepals & petals green, anterior lobe of lip undulate-crenate *scottii*

Nervilia macroglossa (Hk. f.) Schltr. in Engl. Bot. Jahrb. 45:402, 1911; Hara, 445, 1966. *Pogonia macroglossa* Hk. f. in Fl. Brit. Ind. 6:120, 1890; King & Pantl. 267, t. 356, 1898.

Leaf reniform, petiole c. 7.5 cm long; flowering stalk bearing a single nodding flower, c. 2.5 cm long; sepals and petals subequal, linear-lanceolate. Lip gibbous, apical half expanded with two obscure sidelobes near its base. Authority Hara.

N. scottii (Reichb. f.) Schltr. in Engl. Bot. Jahrb. 45:404, 1911. *Pogonia scottii* Reichb. f. Flora, 276, 1872; F.B.I. 6:120 1890; King & Pantl. 269, t. 360, 1898.

Leaf ovate-reniform, petiole 10-20 cm long. Inflorescence a raceme of 7-15 flowers, flowers horizontal; sepals and petals

connivent, linear-lanceolate, acuminate, dull green with red nerves. Lip 3 lobed to about the middle subclawed, base saccate, yellowish-white with purple nerves, sidelobes obtuse, midlobe suborbicular, velvety. Flowering time April to May. Collected from Ranibari at 1370 m.

i. *Spiranthes* L.C. Rich.

Terrestrial leafy orchids with tuberous roots. Flowers are small in spirally twisted spikes, due to which the genus gets the name. Sepals more or less connate and with the petals forming a hood, the lateral sepals are gibbous at base, thus the spur is short or saccate. The bracts are longer than the ovary.

Spiranthes sinensis (Pers.) Ames, Orch. 2:55, 1908. *Neottia sinensis* Pers. Syn. Pl. 2:511, 1807.

Flowers small, pink or white, crowded on a spiral spike; lateral sepals 3 mm long, obtuse, tips recurved, spreading, dorsal sepals combined with the petals to form a 3-lobed hood enclosing the column. Lip oblong, crisp, base saccate having 2 glands. Distributed widely at 1980 to 2285 m. Flowering during September to early November. Collected from Manichur, Chaubasa to Risingo, Nayapati to Risingo, Godavari, Gumurang to Sarti (Kitamura), Lokwa (Kitamura) King & Pantl. mention that the flowers produced in spring are white, while those appearing in autumn are often pink. Our observations do not support this seasonal change to effect the colour of the flowers. White flowered specimens are common in Godavari throughout the year except the cold months.

sub. sp. *australis* (R. Br.) Kitamura in Acta Phytotax. Geobot. 21:23, 1964, et Fl. Nep. Himal. 451, 1966. *Spiranthes australis* (R. Br.) Lindl. Bot. Reg. t. 823, 1824 et Gen. et Spec. Orch. 464, 1840; F.B.I. 6:102, 1890.

Kitamura has separated this subspecies from the nominate race by latter being glabrous on its inflorescence and ovary. The Himalayan species collected by Kitamura are all puberulous on the spikes and ovaries. Collected from Nagarkot by Kitamura.

j. *Thunia* Reichb. f.

The orchid is named in honour of Count von Thun Hohenstein of Bohemia. These are terrestrial with a tall and fleshy stem, leaves are numerous, membraneous and thin. The inflorescence is terminal, bracts persistent and pollen masses are in 4 pairs. The flowers turn brown or remain white on drying. This genus has been included under *Phajus* by many authors, but Reichenbach. f. distinguishes between *Thunia* and *Phajus*. Further, the genus *Phajus* is placed under subtribe Phajae of Symptodiales-Pleuranthae (Kerosphaeroideae according to the classification proposed by Schlechter.

Thunia alba Reichb. f. in Bot. Zeit. 764, 1825 ; F.B.I. 6: 818, 1890. *Phajus albus* Lindl. in Wall. Cat. 3749 (n.n.) et Pl. Asiat. Rar. 2. t. 198. 1831. (Fig. 13).

Flowers large, 3-5; sepals and petals erecto-patent, white. Lip white or pale yellow with purple red nerves, shovel-shaped with a broad toothed, crisp midlobe, disk with 5 crested ridges, spur short. Flowering from late May to early July. Collected from Godavari, Dhunibesi, Dhaitarbesi, Baseri (Kitamura), locality unknown (Herklotts).

k. *Zeuxine* Lindl.

The name refers to the partial union of the lip and the column and possibly also to the growing together of the pollinia. These are also terrestrial herbs with membraneous leaves. Flowers are in spikes and the posterior sepal is concave and lies on the petals forming a hood. The genus can readily distinguished in the field by the character of the leaves and the stigmas being two.

ARTIFICIAL KEY TO THE SPECIES OF *Zeuxine*

- A. Leaves sessile, linear-lanceolate ; scape dense flowered ; apical lobe of lip suborbicular *strateumatica*
- AA. Leaves shortly petioled ; scape lax-flowered—
 - B. Apical lobe of lip very small ; bracts equalling the ovaries ; leaves with a median stripe *goodyeroides*
 - BB. Apical lobe of lip 2-lobulate ; bracts exceeding the ovaries ; leaf sheath inflated, hyaline *flava*

***Zeuxine flava* (Lindl.) Benth. & Hook. f. Gen. Pl. 3: 600, 1883; F.B.I. 6:108, 1890; King & Pantl. 289, t. 386, 1898; Hara, 452, 1966. *Etperia flava* Lindl. in Wall. Cat. 7380 (nomen nud.).**

Scape lax flowered, bracts exceeding the ovaries. flowers small, white with a pink lip; sepals obtuse. Lip shorter than the sepals, terminal lobe of lip, sepals obtuse; lip shorter than the sepals, terminal lobe of lip winged, 2 wings broadly obovate or hatchet-shaped, sac with 2 long spurs. Flowering during April and May. Collected from Banepa to Dolaghat at c. 1220 m.

***Z. goodyeroides* Lindl. Gen. et Spec. Orch. 486, 1840; 1840; F.B.I. 6:107, 1890; King & Pantl. 287, t. 383, 1898.**

Scape lax flowered, bracts reddish, equalling the ovaries; flowers pinkish; sepal ovate, acute, lateral sepals lanceolate, 1 nerved; petals falcate, very obtuse. Lip slightly exceeding the sepals, cymbiform, terminal lobe orbicular, apex subtruncate, rolled inwards along the margins, membranous. Flowering during April and May. Collected from Dolaghat to Chaubas at c. 1830 m. Probably this species is rare as it has been collected only once.

***Z. strateumatica* (Linn.) Schltr. Orch. Deutch. N. Giun. 77, 1911. Holttum, 131, 1955. *Orchis strateumatica* Linn. Sp. Pl. 943, 1753. *Zeuxine sulcata* Lindl. Gen. et Spec. Orch. 485, 1840; F.B.I. 6:106, 1890; King & Pantl. 286, t. 381, 1898.**

Scape dense flowered, bracts much longer than the ovaries; flowers small, white or light yellow; sepals 3 mm long, oblong, membranous; petals oblong, obtuse. Lip yellow, equalling the sepals, cymbiform, contracted into short pubescent claw, bearing a terminal lobe or 2 small lobes. Flowering probably during December. Collected from the banks of Trisuli Khola area. (also Burkill).

2. KEROSPHAEREA

(a) *Acranthae*.

ARTIFICIAL KEY TO THE GENERA

- A. Pollinia without viscid disc, stipe or caudicle. Leaves flat, or equitant, if flat not jointed to the leaf sheaths. Flowers commonly membranous, sepals distinctly broader than petals. Stems usually short, often bulbous, thickened near the base—
- B. Petals very much smaller than the sepals. Labellum more or less flat with hollow auricled lobes. Column short, winged. Anther on the back of the column. Pollinia not deciduous. Plants terrestrial.....*MALAXIS*. (Liparideae)
- BB. Petals narrower than sepals. Labellum adnate to the base of the column, basal lobes nil, posteriorly placed by resupination, edge toothed or fringed. Column long, curved, slightly winged at the apex.
- BBB. Plants terrestrial or epiphytic.....*LIPARIS*. (Liparideae) Flowers minute. Sepals subequal, petals smaller than the sepals. Labellum usually 3 lobed, hypochile concave, column very short; caudicle absent. Plants epiphytic.....*OBERONIA*. (Liparideae)
- AA. Pollinia provided with a rudimentary viscid disc, sometimes with a caudicle which is glutinous at the apex.
- B. Leaves convolute and jointed to the sheath—
- C. Scape or peduncle with small sheaths at the apex of rudimentary leafless stems that alternate with 1-leaved stems. Leaves soft or thinly chartaceous. Column produced into a foot.....*CHRYSOGLOSSUM* (Collabiaceae)
- CC. Scape or peduncle without sheaths usually at the apex of leaf-bearing pseudobulbs. Pseudobulbs well developed, 1 or 2 leaved; leaves coriaceous. Flowers usually showy. Column footless or almost so—
- D. Flowers and leaves coriaceous —
- E. Pseudobulbs distinct 2-leaved.....*COELOGYNE*. (Coelogyneae)
- EE. Pseudobulbs solitary or superimposed—
- F. Column short with broad wings round the anther.....*PHOLIODOTA*. (Coelogyneae)
- FF. Column elongate.....*OTOCHILUS*. (Coelogyneae)
- EEE. Pseudobulbs crowded, 1-leaved.....*PANISEA*. (Coelogyneae)

- D. Flowers appearing before or after the leaves.....*PLEIONE*,
(Coelogynae)
- BB. Leaves conduplicate i.e. folded longitudinally into 2 halves—
- D. Inflorescence lateral or on a leafy or leafless stem or from the top of a 1-2 leaved pseudobulb. Pollinia 4, without caudicle—
- E. Flowers fugaceous.....*EPHEMERANTHA*,
(Dendrobieae)
- EE. Flowers not fugaceous (not falling early)—
- F. Rhizome of sympodial growth, each sympodium bearing one or more leaves ; inflorescence usually lateral of one or many flowers.....*DENDROBIUM*, (Dendrobieae)
- FF. Rhizome elongate, pseudobulbs monophyllous ; inflorescence solitary terminal.....*EPIGENEIUM*, (Dendrobieae)
- DD. Inflorescence lateral or on a leafless scape. Pollinia 8, with caudicle. Lip sessile on the foot of the column.....*ERIA*,
(Dendrobieae)
- DDD. Inflorescence spicate or racemose. Pollinia 8. Lip included, adnate to and incumbent on the foot of the column ; column erect, apex dilated and toothed.....
CRYPTOCHILUS (Dendrobieae)
- DDDD. Pollinia with a distinct viscid disc arising from the apex of the rostellum with well defined margins. Pollinia 4-8, attached to the viscid disc without any stipe. Stem leafy. Flowers in a dense head.....*AGROSTOPHYLLUM*, (Glomereae)

The genus gets name from the grass-like leaves of most of the species. It is placed under -the subtribe Glomereae by Schultes and Pease, but Hawkes calls the subtribe as Glomerinae. The plants have a leafy stem with leaves distichous and linear, persistent flattened sheaths. Flowers are very small crowded in terminal heads, bracts long and paleaceous. Lateral sepals broader and adnate to the foot of the column. Lip adnate to the foot of the column which is stout and more thickened above.

a. *Agrostophyllum*

Agrostophyllum callosum Reichb. f. in Seem, Fl. Vit. 296, 1865-68 ; F.B.I. 5 : 824, 1890; King & Pantl. 155, t. 212, 1898 ; Hara, 425, 1966.

Plants without pseudobulbs, stem flat. Leaves linear with an apical notch. Flowers dull reddish-green ; sepals 5-7-nerved; petals broad, many-nerved. Lip broadly ovate or oblong, obscurely 3-lobed, sometimes the lobes are distinct. midlobe

orbicular. *Flowering* during July and August. Collected from Mahadeophedi to Katonje; Lebang to Tenkhu; Bagdoar; Sheopuri. Distributed mostly at 1370 m.

b. *Chrysoglossum*

Terrestrial orchids with a creeping rhizome, pseudobulbs narrow or absent, with a solitary leaf which is elliptic-lanceolate. Flowering scape lateral from the rhizome, erect; flowers in a lax raceme, sepals subequal, lateral sepals connate into a mentum with the base of the lip, petals narrower than the sepals. Lip not jointed on the column, erect, broadly 3-lobed, sometimes the base auricled. Column incurved, margin 2 auricled or in some lobed to the middle; anthers 2-celled, pollinia 2, not connected.

***Chrysoglossum erraticum* Hk. f. Ic. Pl. t. 2062, 1891; F.B.I. 5: 784, 1890.**

Flowers green, spotted brown; sepals and petals falcately oblonganceolate, acute. Lip hastately 3-lobed, base with 2 auricles, sidelobes broad, recurved, mid-lobe orbicular, spur very short.

Flowering during July and August. Collected from Bajrabrahi at c. 1220 m. In F.B.I. Hooker mentions under the species as only one specimen seen; we have found this species only at one locality, and there were five plants growing. It may be a rare species.

c. *Coclogyne* Lindl.

Epiphytic, pseudobulbs with usually two; plicate, coriaceous or membranous leaves. Flowers in racemes or on short scapes. Sepals usually very concave, mentum or spur absent. Petals usually much narrower than the sepals. Labellum 3-lobed, lateral lobes broader, erect on both sides of the column, long, winged or hooded round the tip. Anthers pendulous by short filaments, tip resting on large rostellum which is divaricate. Pollinia 4.

ARTIFICIAL KEY TO THE SPECIES OF *Coelogyne*

- A. Flowers from an undeveloped pseudobulb at the base of the old pseudobulb. Sheaths of the scape all basal—

B. Racemes pendulous or decurved, many or few flowered—

C Flowers c. 1.5 cm in diam., side-lobes of lip large, rounded, disk with 3 yellow ridges..... *flaccida*

CC. Flowers large, side-lobes of lip large, rounded with yellow fimbriate lamellae between them, mid-lobe with 2 broad yellow plates..... *cristata*

BB. Racemes erect or inclined, rarely drooping, many or few flowered—

C. Lip white with 4 yellow spots, side-lobes erose, mid-lobe ovate or ovate-lanceolate, disk with 3 ridges..... *corymbosa*

CC. Lip white with confluent orange and yellow areas, side-lobes finely serrulate, mid-lobe ovate, disk with 2 ridges *ochracea*

CCC. Lip spotted with brown, side-lobes elongate, mid-lobe clawed, orbicular, disk with 3 brownish ridges..... *fuscescens*

AA. Flowers from the top of the mature pseudobulb—

B. Scape sheathed at the base only, lip white or yellowish, surface and margin of lobes with long brown hairs..... *ovalis*

BB. Scape with distichous imbricating sheaths below the racemes only—

C. Flowers large, 2.5 cm in diam. or more—

D. Lip white with yellow blotches, side-lobes narrow, mid-lobe rounded-ovate *elata*

DD. Lip white with 2 big orange coloured spots, side-lobes small and acute, midlobes subpanduriform..... *uniflora*

CC. Flowers small, c. 1.5 cm in diam., lip white, side-lobes obtuse, mid-lobe obcordate..... *flavida*

***Coelogyne corymbosa* Lindl. Fol. Orch. (Coelog.) 7, 1855 ; F.BI. 5 : 831, 1890 ; King & Pantl. in Ann. Roy. Bot-Gard. Calc. 8 : 134, t. 185, 1898 ; Hara Fl. Eastern Himal. 428, 1966, (Fig. 14)**

Flowers pure white, sweet smelling ; sepals and petals narrow, lanceolate, white Lip white with 4 yellow spots (eyes), side-lobes erose, mid-lobe ovate or ovate-lanceolate, disk with 3 ridges. *Flowering* during march and April ; distributed between 1,800 to 2,700 metres. Collected from Rhingmo to Jubin, Khera, Sheopuri, Borlong, Helembu ; locality unknown (Herklott).

C. cristata Lindl. Collect. Bot. t. 32, 1824; F.B.I. 5 : 829, 1890 ; King & Pantl. 132, t. 184, 1898 ; Hara, 429, 1966. (Fig. 15)

Flowers large with a shade-of yellow ; sepals and petals subequal, broad, obtuse, white. Lip with large side-lobes, rounded, yellow fimbriate lamellae between the side-lobes and the mid-lobe, mid-lobe orbicular with 2 broad yellow plates. *Flowering* during March and April, widely distributed between 1,500 to 1,800 metres. Collected from Simbhanjang, Mahavir, Godavari, Sheopuri, Chandragiri, Kakni ; locality unknown (Herklott, Parker).

C. elata Lindl. Gen. et Spec. Orch. 40, 1830 ; F.B.I. 5 : 838, 1890 ; King & Pantl. 136, t. 188, 1898 ; Hara, 429, 1966 (Fig. 16)

Flowers large, white ; sepals oblong-lanceolate; petals linear Lip white with yellow blotches, side-lobes narrow, mid-lobe rounded, ovate, acute, tipped with a reddish tint. *Flowering* during March and April ; distributed between 1,200 to 2,000 metres. Collected from Komaltar thumki, Sheopuri, Sundarijal; Shimbhanjang, Godavari ; locality unknown (Herklott).

C. flaccida Lindl. Gen. et Spec. Orch. 39, 1890 ; F.B.I. 5 : 829, 1890 ; King & Pantl. 133, t. 183, 1898. (Fig. 17)

Flowers white, c. 1.5 cm, cm. in diam., faint smelling ; sepals linearoblong, acute; petals narrower, acuminate ; side-lobes of the lip larger, rounded, brownish, mid-lobe small broad, ovate, disk with 3 yellow ridges. *Flowering* during April and May ; distributed in the subtropical belt. Collected from Sundarijal, Pokhra ; locality unknown (Herklott).

C. flavida Wall. ex Hk. f. in Fl. Brit. Ind. 5 : 839, 1890 ; King & Pantl. 139, t. 191, 1898 ; Hara, 422, 1966 (Fig. 18)

Flowers small, yellow ; sepals oblong, acute; petals filiform ; sidelobes of lip small, obtuse, slightly turned on the mid-lobe, mid-lobe obcordate, disk with two ridges. *Flowering* time during May and June ; distributed up to 1,500 metres. Collected from Namsaling to Gorkha, Lamidanda, below Sheopuri ; locality unknown (Herklott).

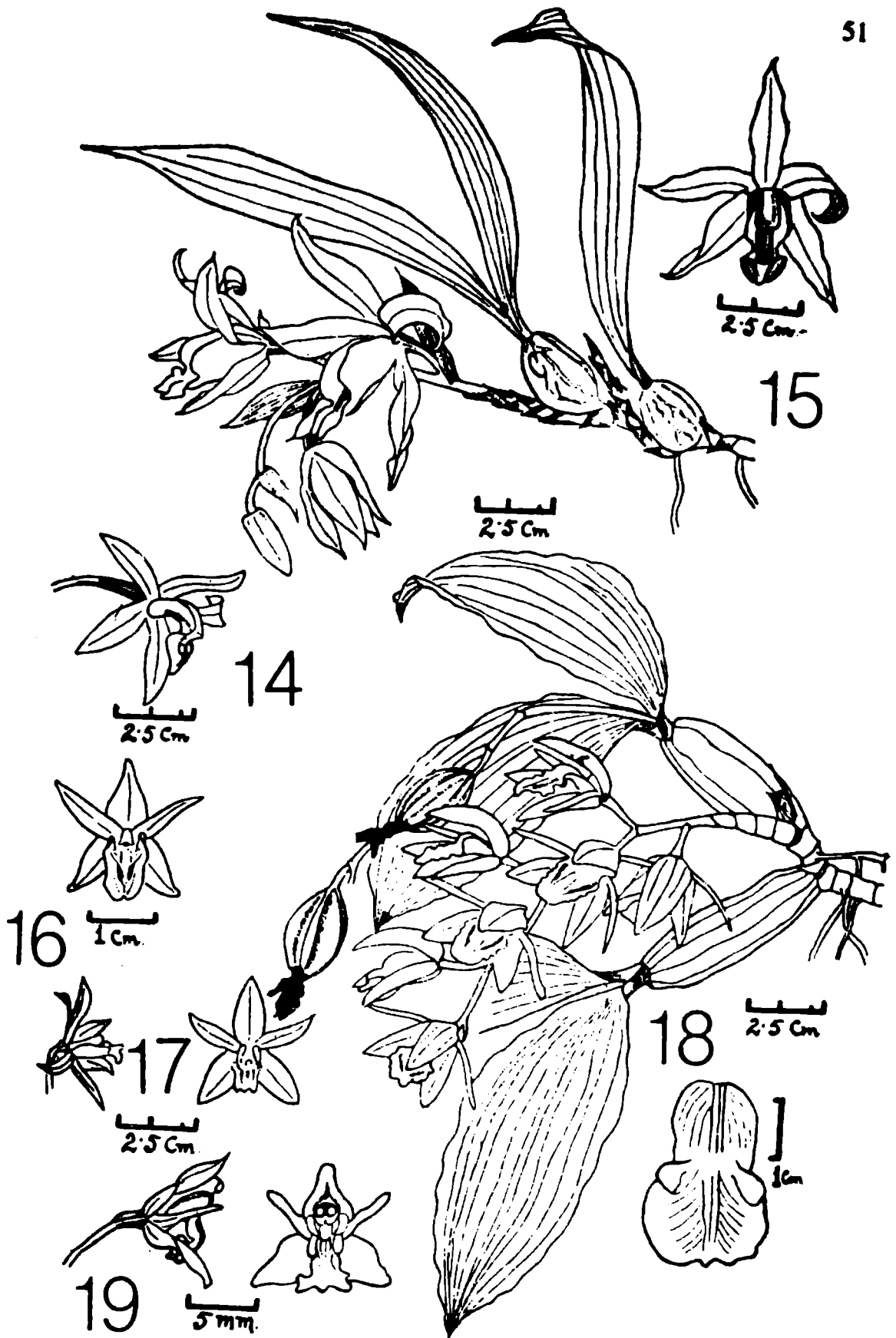


FIG. 14 *Coelogyne corymbosa* Lindl. FIG. 15 *C. cristata* Lindl. FIG. 16 *C. elata* Lindl. FIG. 17 *C. flaccida* Lindl. FIG. 18 *C. flavida* Wall. ex. Hk.f. FIG. 19 *C. fuscescens* Lindl.

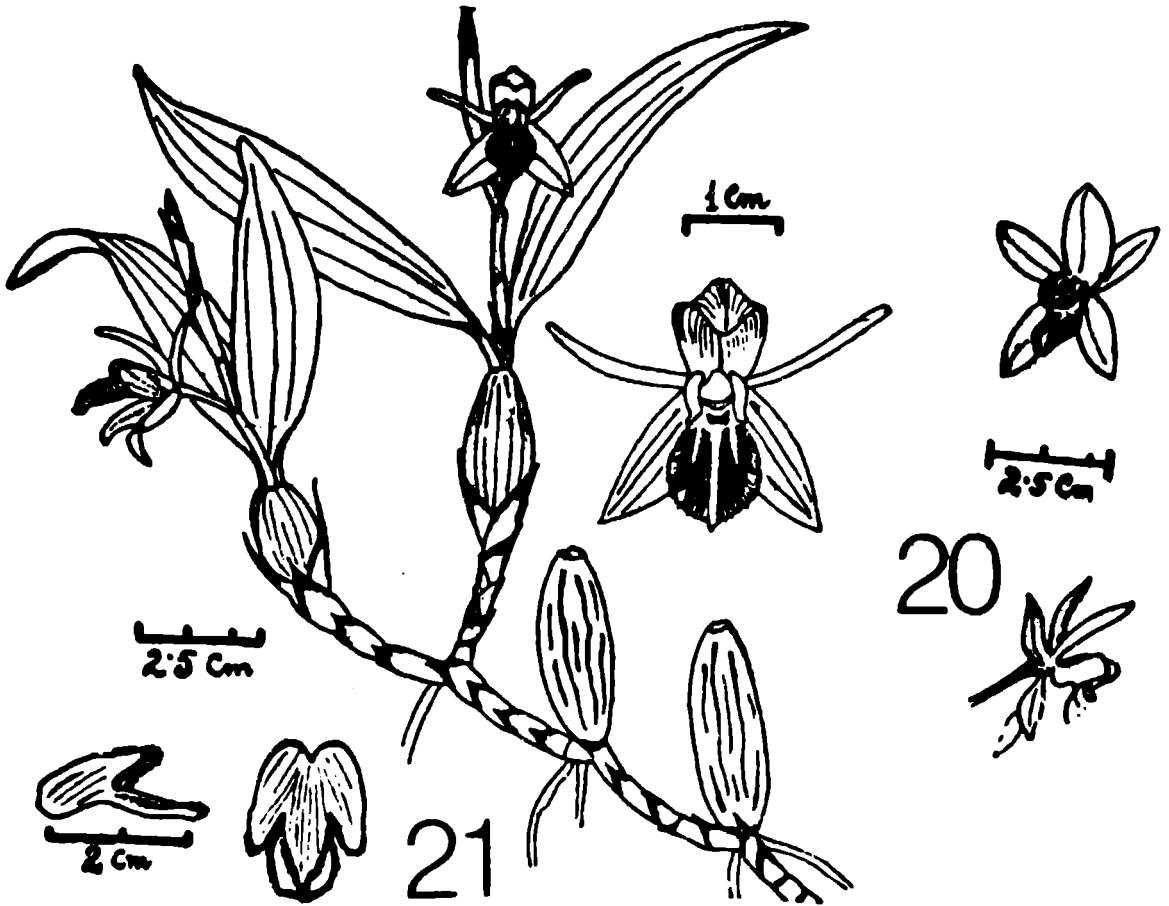


FIG 20 *Coelogyne ochracea* Lindl. FIG 21 *C. ovalis* Lindl.

C. fuscescens Lindl. Gen. et Spec. Orch. 41, 1830 ; F.B.I. 5 : 833, 1890 ; King & Pantl. 132, t. 181, 1898. (Fig. 19)

Flowers very variable in colour, usually greenish-yellow ; sepals oblong, acute, and very narrow, 1-3 nerved; petals greenish-yellow or slightly pinkish Lip spotted with brown, side-lobes elongate, free ends small, obtuse, mid-lobe clawed, orbicular, disk with 3 brownish ridges. *Flowering* during September to November ; distributed between 900 to 1,800 metres. Collected from Markhu, Sankhoo, Sundarikal, and Godavari.

C. ochracea Lindl. Bot. Reg. 1846, t. 69, 1846, et Fol. Orch. 5 : 1854 ; F.B.I. 5 : 831, 1890 ; King & Pantl. 132, t. 182, 1890 ; Hara, 429, 1966. (Fig. 20)

Flowers light yellow ; sepals linear-oblong, acute, petals narrower than the sepals ; lip white with confluent orange and yellow areas, sidelobes finely serrulate, mid-lobe broad, ovate, disk with 2 ridges. *Flowering* time April and May ; distributed between 1,500 to 2,500 metres. Collected from Chuwwa to Aisalukharka, Simbhanjang, Chandragiri ; locality unknown (Herklott).

C. ovalis Lindl. Bot. Reg. 1838, Misc. 91 ; F.B.I. 5 : 836, 1890 ; King & Pantl. 135, t. 187, 1898. (Fig. 21)

Scape 1-3 flowered, flowers white, rarely with a shade of purple ; sepals ovate-lanceolate, faintly yellowish, petals filiform ; lip white or yellowish, sometimes with a shade of purple, surface and margin of lobes with long brown hairs. *Flowering* time during September and October ; distributed between 1,200 to 1,800 metres. Collected from Sundarikal, Markhu, Chandragiri ; locality unknown (Herklott).

C. uniflora Lindl. Gen. et Spec. Orch. 42, 1830 ; F.B.I. 5 : 842, 1890 ; King & Pantl. 138, t. 192, 1898.

Flowers creamy-yellow ; sepals lanceolate; petals lanceolate; lip with acute side-lobe mid-lobe; subpanduriform, 3 big orange coloured spots. *Flowering* during April and May. Collected

only once from Lamidanda c. 1,500 metres. F.B.I. gives '3-7 orange spots' on the mid-lobe, but our specimens had only 3 spots.

d., *Cryptochilus* Wall.

Low epiphytes with crowded pseudobulbs; leaves 1-2, coriaceous. Flowers in a terminal scape, densely and distichously arranged, smaller than the persistent bracts. Sepals connate into an urceolate or gibbous tube, petals narrow; lip included, column erect, apex dilated and toothed.

ARTIFICIAL KEY TO THE SPECIES OF *Cryptochilus*

- Flowers yellow, calyx-tube urceolate; petals oblique; pollinia yellow...
*lutea*
- Flowers orange at base, red above; calyx-tube gibbous; petals obovate;
 pollinia green.....*sanguinea*

Cryptochilus lutea Lindl. Journ. Linn. Soc. 3:21, 1859; F.B.I. 5:827, 1890; King & Pantl. 163, t. 221, 1898; Hara, 430, 1966.

An epiphyte with crowded pseudobulbs. Flowers glabrous, yellow; calyx-tube urceolate; petals obliquely lanceolate. Lip obtuse; pollinia yellowish. *Flowering* during July. Collected from Sheopuri, at 1820 m. It appears to be a rare orchid.

C. sanguinea Wall. Tent. Fl. Nep. 36, t. 26, 1826; Lindl. Gen. et Spec. Orch. 193, 1833; F.B.I. 5:827, 1890; King & Pantl. 163, t. 220, 1898. Hara, 430, 1966.

Epiphytic. Flowers pubescent, bright red or orange at base, and red above; calyx-tube gibbous; petals obovate; lip also obovate; pollinia green. *Flowering* during July and August. Collected from Lebang to Tenkhu, also at Sundarikal where it is also rare as the previous species. Distributed at c. 1675 m.

e. *Dendrobium* Sw.

Schlechter estimated the total number of species of *Dendrobium* (in the broad sense) at 900, and of *Eria* at 400, and these

two genera to constitute almost the whole of the tribe *Dendrobium*. However, recently there have been some readjustments in the generic limits of *Dendrobium*, and Summerhayes (Kew Bull. 1957) adopted the name *Epigeneium* Gagnep. and discarded *Katherinea* Hawkes, and *Sarcopodium* Lindl. considering that *Epigeneium*, *Sarcopodium* and *Katherinea* are congeneric. Balakrishnan & Chowdhury [Bull. Bot. Surv. Ind. 8 (3 & 4): 312-318, 1966], however, feel that *Epigeneium* and *Katherinea* are two distinct genera with clear differences. We have followed Summerhayes.

The genus *Desmotrichum* was established by Blume in 1825, but Pfitzer (Pflanzfam. II, 6:173, 1889) treats it as a section of *Dendrobium*, an arrangement accepted by Schlechter, J.J. Smith and Holttum although Kranzlin in Pflanzfam. I: 343-358, 1910, had restored the genus. The name *Desmotrichum* has been conserved as a genus of the Phaeophyta, and P.F. Hunt & Summerhayes proposed a new name, *Ephemerantha* for the orchid genus (see Taxon 10:102, 1961). This genus is distinguished from *Dendrobium* by vegetative characters and the fugaciousness of the flowers.

The characters of the tribe *Dendrobium* may be broadly given as plants nearly all epiphytic, of sympodial growth, each branch of the sympodium bearing one or more leaves, its stem thin or fleshy throughout or fleshy in part, leaves of various shape, joined at the base; inflorescence usually lateral of one to many flowers which sometimes appear singly in succession from a small group of bracts; lateral sepals more or less triangular in shape, their bases joined to the column-foot forming a mentum; petals either smaller or larger than the sepals, usually thinner, lip more or less 3-lobed, the base often long and narrow, joined to the end of the column-foot and sometimes partly to the sides of the column-foot, often with longitudinal keels, column with distinct feet which is often longer than the column, anthers usually attached at its apex by the filament, pollinia 4 in two pairs, with or without caudicle, rostellum small.

Dendrobium, *Epigeneium* and *Ephemerantha* all have 4 pollinia, without caudicle, while *Eria* has 8 pollinia with short caudicles.

ARTIFICIAL KEY TO THE SPECIES OF *Dendrobium*

- A. Inflorescence terminal or both terminal and lateral—**
- B. Stem simple or nearly so, often a small pseudobulb, flowers small. Petals not broader than the dorsal sepal ;**
- C. Side-lobes of lip strongly incisoserrate—**
- D. Racemes elongate, drooping, many flowered. Lip much shorter than the sepals.....*denudans***
- DD. Racemes many flowered. Lip as long as the sepals...
.....*eriaeflorum***
- DDD. Racemes short, erect, 3-5 flowered. Lip shorter than the sepals.....*alpestre***
- CC. Sidelobes of lip entire or crenulate.....*pygmaeum***
- BB. Stem rather short, tufted, suberect. Flowers solitary or racemose, often large —**
- C. Mentum as long as the dorsal. Mid-lobe small, orbicular, fringed, disk with 3 wrinkled ridges.....*longicornu***
- CC. Mentum half as long as the dorsal sepal. Mid-lobe retuse, apiculate, disk with 2 ridges.....*formosum***
- AA. Inflorescence lateral on the stem or pseudobulb—**
- B. Stem flattened; leaves shortly ensiform, distichous, imbricating. Flowers on the leafless extremities of the branches, minute, greenish.....*anceps***
- BB. Stem tufted, elongate, stout or slender, distichous. Flowers usually large in lateral pairs, fascicles or racemes—**
- C. Mentum short, conical or rounded. Lip not calceolar—**
- D. Petals as narrow as the sepals or narrower. Lip narrower than broad. Flowers 2.5-3.0 cm, fragrant.....*candidum***
- DD. Petals as narrow or narrower than the sepals. Lip as broad as long. Flowers c. 6 cm in diam.....
.....*primulinum***
- DDD. Petals broad. Lip narrower than broad—**
- E. Flowers 1-3 on a short peduncle. Lip recurved, base with sides incurved.....*heterocarpum***

- EE. Flowers in pairs. Lip clawed, base convolute.....
*transparens*
- EEE. Flowers 2-3 on a short peduncle. Lip clawed,
 undulate.....*amoenum*
- DDDD. Petals much broader than the sepals. Lip as broad
 as long or broader—
- E. Flowers solitary or 2-3 on a short peduncle or
 simple pedicelled. Margin of lip entire or
 slightly crose—
- F. Lip orbicular, hairy inside. Flowers c. 5 cm
 in diam.*plerardi*
- FF. Lip broadly ovate, pubescent, margin wavy.
 Flowers 3.5 cm in diam.....*crepidatum*
- FFF. Lip broad, ovate, pubescent, base slightly
 convolute. Flowers 6-7 cm in diam.....
*nobile*
- EE. Flowers 5-12 in a raceme, large.....*pulchellum*
- CC. Mentum short. Lip not calceolare. Stem often swollen
 at the very base—
- D. Stem terete—
- E. Lip orbicular, margin fimbriate, 2 brownish spots
*gibsonii*
- EE. Lip with a small convolute base, pale yellow, disk
 deep red.....*clavatum*
- EEE. Lip clawed, orbicular, margin toothed, with
 2 deep red spots.....*chrysanthum*
- DD. Stem clavate, flowers crowded on decurved racemes.
 Lip large, funnel-shaped, very hairy.....*densiflorum*
- CCC. Mentum short. Lip calceolar, fimbriate with 2 purple
 blotches. Flowers light yellow.....*moschatum*

Dendrobium alpestre Royle, III. Himal. 370, t. 83, 1839;
 F.B.I. 5:715, 1890.

Flowers reddish-white; sepals ovate-lanceolate; petals
 oblanceolate, mentum short and obtuse, lip lanceolate, side-
 lobes serrate, mid-lobe small, crisp, disk with 2 lamellae.
 Collected from Talmuga at 2300 m.

P.F. Hunt & V. Summerhayes name the plant as *D. monticola* (TAXON) 10:110, 1961) while Hawknes & Heller call it as *D. Roylei* (ORQUIDEA 24:114, 1962).

D. amoenum Wall. ex Lindl. Gen. et Spec. Orch. 78, 1830; F.B.I. 5:738, 1890; *Limnodorium aphyllum* Roxb. Pl. Corom. 1:34, t. 41, 1795; *Dendrobium aphyllum* (Roxb.) C.E.C. Fischer in Gamble, Fl. Madras Pres. 1416, 1929 (Fig. 22).

Flowers white with violet tips and lip purple, scented; sepals oblong-lanceolate, obtuse; petals larger, ovate, mentum conic and stout; lip shortly clawed, ovate, obtuse, undulate, purplish, base yellow. *Flowering* in April and May; distributed between 900 to 1800 m. Collected from Nagarjung, Godavari, locality unknown (Herklott).

D. anceps Swartz in Vet. Acad. Handl. Stockh. 246:1800; F.B.I. 5:724, 1890; King & Pantl., in Ann. Roy. Bot. Gard. Calc. 8:41, t. 54, 1898; Hara, Fl. Eastern Himal. 431, 1966 (Fig. 23).

Flowers c. 1.2 cm long, greenish; mentum longer than the sepals; lip oblong, faintly 3-lobed, membraneous, margins stiff and crisp. *Flowering* during June or earlier; distributed in the subtropical belt. Collected from Hitaura, locality unknown (Herklott).

D. candidum Wall. ex Lindl. Bot. Reg. 1838, Misc. 54, 1838; F.B.I. 5:735, 1890; King & Pantl., 49, t. 63, 1898; Hara, 431, 1966.

Flowers 2.5-3.0 cm, fragrant, whitish or with little purplish shade; sepals and petals subsimilar, linear-oblong, obtuse, mentum rounded; lip ovate-lanceolate with cuneate base, side-lobes narrow, mid-lobe ovate, obtuse, disk with a long callus. *Flowering* during March and April, and again in September and October, distributed between 1500 to 2100 m. Collected from Manichur and Daman.

D. chrysanthum Wall. ex Lindl. Gen. et Spec. Orch. 80, 1830; F.B.I. 5:747, 1890 (Fig. 24).

Flowers about 5 cm across, fleshy, bright yellow; sepals broad; petals orbicular, fimbriate, mentum broad, crested; lip

clawed, orbicular, margin toothed with 2 deep red spots (F.B.I. mentions one spot, but our specimens had two spots). *Flowering* during June and mid-September; distributed at 900 to 1800 m. Collected from Pokhra, Dhankutta.

D. clavatum Wall. ex Lindl. in Paxton Fl. Gard. 2:104, 1850; F.B.I. 5:746, 1890.

Flowers glossy, large, yellow; sepals linear-oblong; petals much broader, suborbicular, mentum short; lip with a small convoluted base, pale yellow, disk deep red. *Flowering* during May and June; distributed between 1500 to 1800 m. Collected from Godavari.

D. crepidatum Lindl. in Paxton Fl. Gard. 1:63, t. 45, 1850-51; F.B.I. 5:740, 1890; King & Pantl., 48, t. 66, 1898 (Fig. 25).

Flowers about 3.5 cm across, yellow, waxy with purple pedicels; sepals oblong, obtuse; petals obovate mentum short, obtuse; lip clawed, broadly ovate, retuse, pubescent, margin wavy, base deeper yellow. *Flowering* during April and May; distributed between 300 to 900 m. Collected from Hitaura, locality unknown (Herklott).

D. densiflorum Lindl. ex Wall. Pl. Asiat. Rar. 1:43, t. 40, 1830; F.B.I. 5:748, 1890; King & Pantl., 56, t. 79, 1898; Hara, 432, 1966.

Flowers about 5 cm across, yellow; sepals obtuse, petals broader, erose, mentum large, sub-globose; lip large, funnel-shaped, retuse in front, very hairy inside, edge not fringed, deeper yellow. *Flowering* during April and May; distributed between 900 to 1500 m. Collected from Bajrabarahi, Pokhra, Dhankutta, locality unknown (Herklott).

D. denudans D. Don, Prodr. Fl. Nep. 34, 1825; F.B.I. 5:715, 1890.

Flowers white with reddish veins on the lip, rarely yellowish; sepals long, slender, dorsal sepal with 3 nerves and lateral sepals with 5 nerves; petals long and slender, 1-nerved; mentum

incurved; lip much shorter than the sepals, brownish, side-lobes serrate, mid-lobe small, disk with 2 lamellae. *Flowering* during August and September; distributed between 1500 to 2100 m. Collected from Chandragiri, Sundarikal, Sheopuri, and Suryabinak.

D. eriaeflorum Griff. Notul. 3:316, 1851; F.B.I. 5:715, 1890; King & Pantl., 44, t. 61, 1898; Holttum, Rev. Fl. Malaya 1:308, 1953; Hara, 432, 1966 (Fig. 26).

Flowers greenish-yellow; sepals lanceolate; lip as long as the sepals, side-lobes serrate, mid-lobe undulate, purple veined, mentum incurved, obtuse, disk with longitudinal crest. *Flowering* in March; distributed between 1370 to 1900 m. Collected from Lamidanda, Risings to Pheda, and Yangsabesi to Naudanda.

Examination of the material collected by us from Nepal shows a degree of variation in the lip and is not quite exactly as figured by King & Pantl. The midlobe is fimbriate like the sidelobes or it may be serrate along the margins (Fig. 26).

D. formosum Roxb. Fl. Ind. 3:485, 1832; F.B.I. 5:721, 1890.

Flowers large; sepals oblong-lanceolate, acuminate; petals much larger, about 4 cm. in diam., sub-orbicular, undulate, mentum half as long as the dorsal sepal, conical; lip 7 cm long, broadly obovate, entire, side-lobes rounded, mid-lobe retuse, apiculate, disk yellow, with two ridges from the base to the middle. *Flowering* during May and June; well distributed in the tropical belt. Collected from Trisuli, Hitaura, locality unknown (Herklott).

D. gibsonii Lindl. in Paxton, Mag. Bot. 5:169, 1838; F.B.I. 5:746. 1890.

Flowers small c. 3.5 cm across, orange-yellow; sepals sub-orbicular; petals broader, entire, mentum short; lip suborbicular, margin everted and fimbriate, 2 brownish spots, hairy. *Flowering* during April and May; distributed between 900 to 1050 m. Collected from Dhankutta.

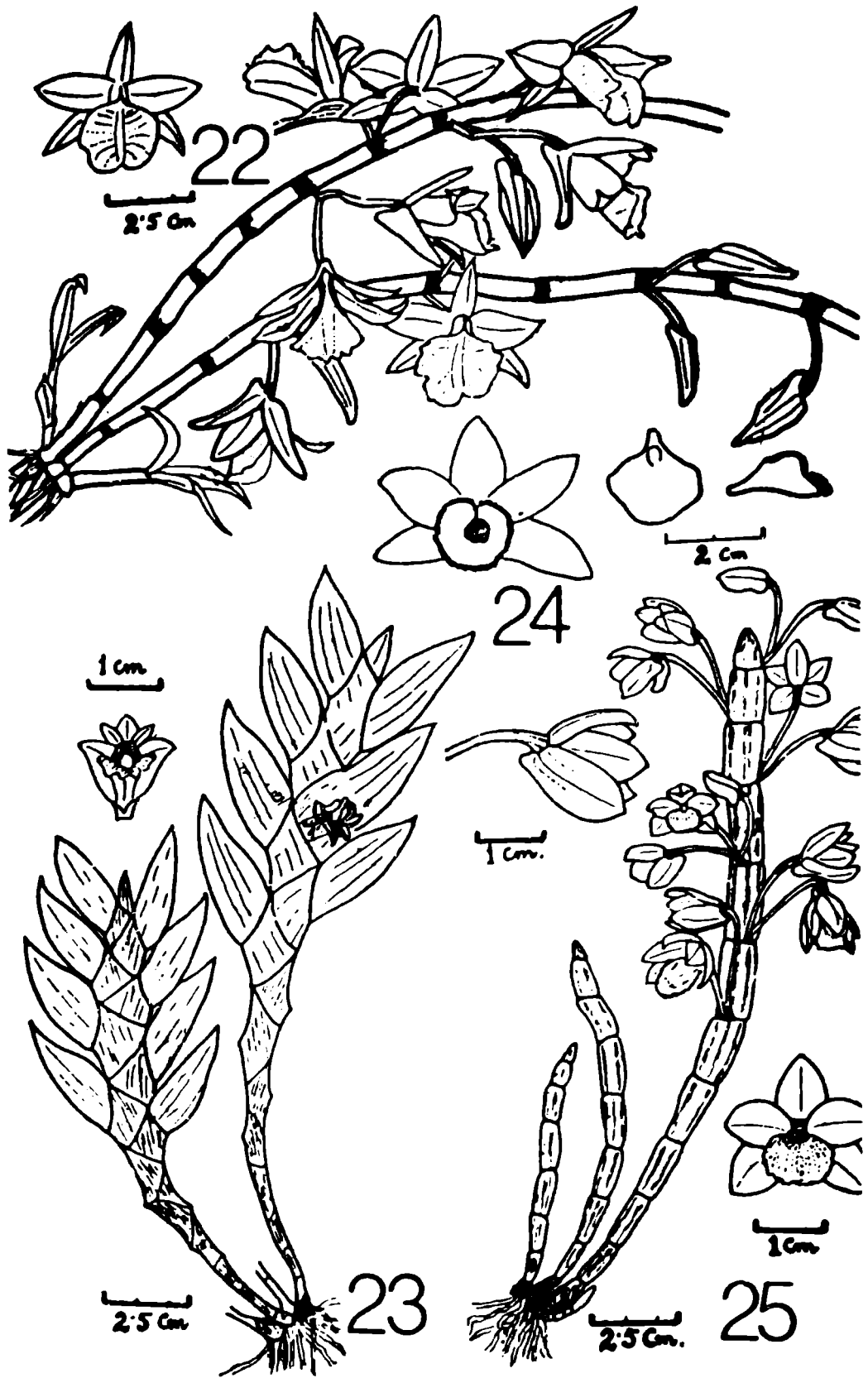


Fig. 22 *Dendrobium amoenum* Wall. ex Lindl.; 23 *D. anceps* Sw.;
 24 *D. chrysanthum* Wall. ex Lindl.; 25 *D. crepidatum* Lindl.

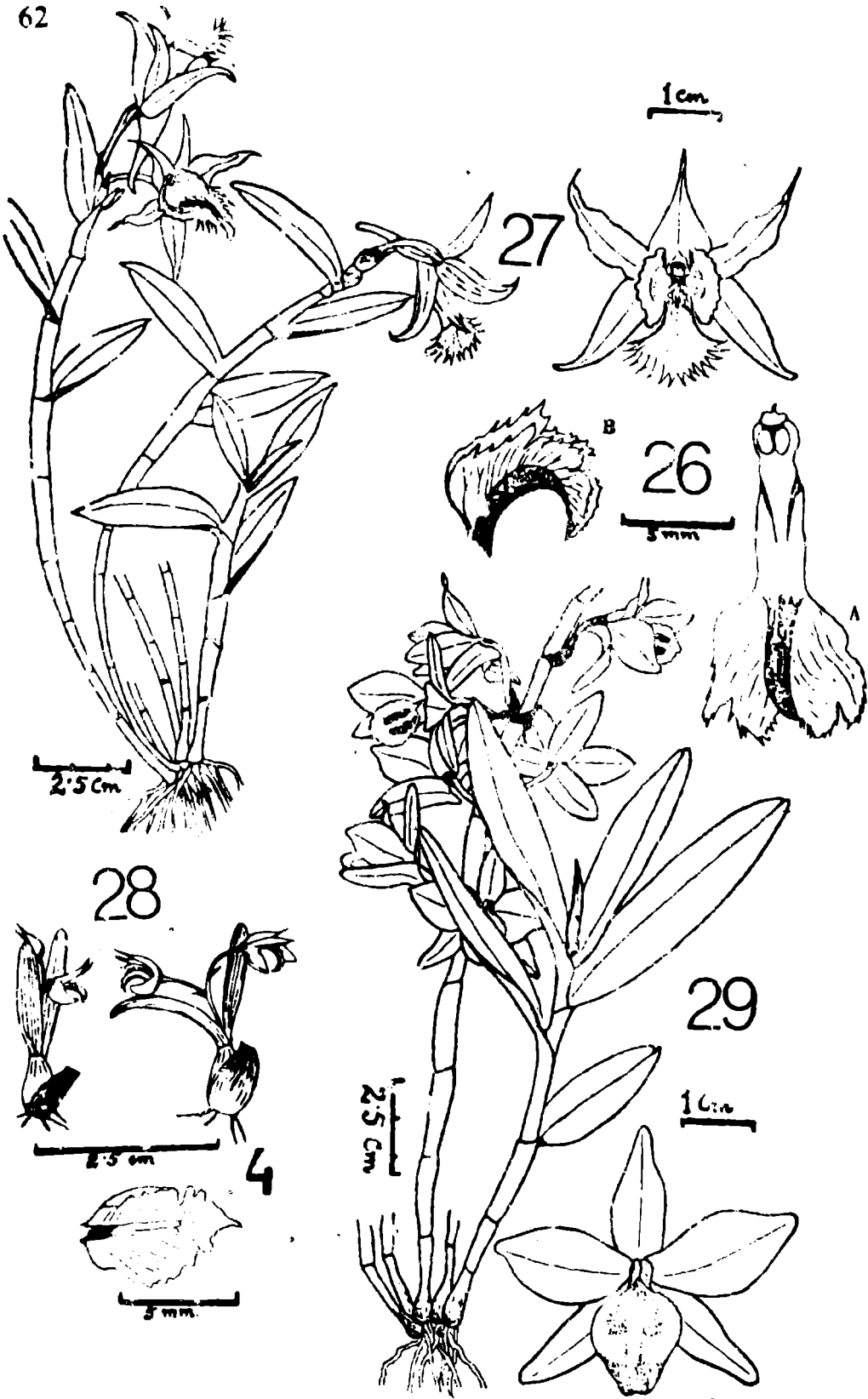


Fig. 26 a, b. *Dendrobium eriaeflorum* Griff. Fig. 27 *Dendrobium longicornu* Lindl.;
 28 *D. transparens* Wall. ex Lindl. Fig. 29 *Dendrobium pygmaeum* Lindl.

This species has a strong resemblance to *Ephemerantha fimbriata* (Bl.) Hunt & Summerhayes, but differs in having smaller flowers, petals not crose, lip not deeply fimbriate. The flowers are not fugacious.

D. heterocarpum Wall. ex Lindl. Gen. et Spec. Orch. 78, 1830; F.B.I. 5:737, 1890; King & Pantl., 53, t. 74, 1898; Holttum, 287, 1953.

Flowers c. 6 cm across, ochraceous-yellow or creamy-yellow, highly fragrant; sepals linear-oblong, acute, petals ovate-lanceolate, acuminate, mentum large, conical; lip ovate-lanceolate, recurved, base with incurved sides, yellowish, disk with 2 purplish spots. *Flowering* during March and April; distributed in the tropical belt. Collected from Sundarijal, near Tokha, locality unknown (Herklott).

D. longicornu Lindl. Gen. et Spec. Orch. 80, 1830; F.B.I. 5: 720, 1890; King & Pantl., 46, t. 64, 1898; Hara, 432, 1966 (Fig. 27).

Flowers faintly yellowish; sepals lanceolate, acuminate, not keeled, petals narrower, acuminate, mentum slender, funnel-shaped, straight and as long as the dorsal sepal, side-lobes of the lip rounded, mid-lobe small, orbicular, yellow in the middle, fringed disk with 3 wrinkled ridges. *Flowering* during September and October; distributed from 1200 to 2400 m. Collected from Chandragiri, Sheopuri, Godavari, and locality unknown (Herklott). A few specimens were collected from Shankhoo area c 1350 m, which had the lip densely fimbriate, and probably belonged to var. *hirsuta*.

D. moschatum Sw. in Schrad. Neues Journ. 1: 94, 1805; *D. calceolaria* Carey ex Hook. Exot. Fl. 184, 1828; F.B.I. 5: 744, 1890.

Flowers 6-8 cm across, light yellow with purplish lines; sepals elliptic-oblong; petals broader, mentum stout; lip cup-shaped, margin broad, incurved, fimbriate, 2 large purple blotches. *Flowering* during June and July; distributed at 900 to 1200 m. Collected from Hitaura, locality unknown (Herklott).

D. nobile Lindl. Gen. et Spec. Orch. 79, 1830 ; F.B.I. 5 : 740, 1890 ; King & Pantl., 51 t. 71, 1898 ; Holttum, 291, 1955 ; Hara, 432, 1966.

Flowers 6-7 cm across, in groups at the nodes, purple above and white below ; sepals linear-oblong; petals much broader; lip sessile, broad ovate, pubescent, margin recurved, bases lightly convolute, deep purple at the base. *Flowering* during April and May ; distributed at 1500 m , and collected from Dhankutta. F.B.I. gives the colour of the flower as variable, but as our collection has been from only one locality, we are unable to comment on this.

D. pierardi Roxb. in Hook. f. Exot. Fl. t. 9, 1828 ; F.B.I. 5 : 738, 1890 ; King & Pantl., 51, t. 72, 1898 ; Holttum, 292, 1953 ; Hara, 433, 1966.

Flowers 5 cm across, purplish ; sepals oblong-lanceolate, sub-acute; petals broader, oblong, mentum short ; lip orbicular, hairy throughout inside, base purple, light shade of yellow all over. *Flowering* during April to June and even July ; distributed from 600 to 1200 m. Collected from Deorali to Narkata, Dhunibesi, Pokhra, and Chatra.

D. primulinum Lindl. in Gard. Chron. 400, 1858 ; F.B.I. 5 : 735, 1890 ; Holttum, 293, 1953.

Flowers lilac, c. 6 cm in diam. ; sepals and petals subequal, 5-6 mm wide, linear-oblong, obtuse , lip 3 cm in diam., large, pubescent, base short and convolute, margins ciliated, purplish. *Flowering* during April and May ; distributed between 600 to 1200 m. Collected from Hitaura. This species is very similar to *D. pierardi*.

D. pulchellum Roxb. ex Lindl. Gen. et Spec. Orch. 82, 1830 ; Holttum, 293, 1953 ; *D. dalhousieanum* Wall.; F.B.I. 5 : 743, 1890.

Flowers large, c. 10 cm in diam., yellowish ; sepals oblong, acute; petals much broader, mentum crimson, tip and sides densely glandular-villous, disk with 2 lamellae which are slightly

fringed. *Flowering* during July and August; distributed from 1200 to 1800 m. Collected from Tarebhir area.

D. pygmaeum Lindl. Gen. et Spec. Orch. 85, 1835; F.B.I. 5 : 717, 1890; King & Pantl. 43, t. 58, 1898. (Fig. 29).

Pseudobulbs 1.25—2.0 cm long, covered with scarious sheaths; leaves 2, terminal, linear-oblong, c 3.75—6 cm long, sessile. Racemes terminal or subterminal, shorter than the leaves; floral bracts slightly exceeding the ovary. Flowers purplish; lateral sepals decurved, dorsal sepal erect; petals oblanceolate. Lip decurved at the apex, purple with veins of a deeper colour, sidelobes narrow and with a wavy margin, terminal lobe triangular, a fleshy ridge present on the lip. *Flowering* during October, only a few specimens collected from Trisuli khola area c 765 m.

Hara (1966, 1971) has not recorded this species and we have not been able to trace any specimen in Central National Herbarium (CAL). We take this species to be extremely rare and this is most probably the first record of the species from Nepal.

D. transparens Wall. ex Lindl. Gen. et Spec. Orch. 79, 1830; F.B.I. 5 : 738, 1890 (Fig. 28).

Flowers purplish or whitish with a shade of purple; sepals lanceolate acute; petals broader, ovate, mentum conical; lip clawed, elliptic-oblong, base convolute, lobes obtuse, purple, pubescent, 2 blotches. *Flowering* during April and May, or even June; distributed from 200 to 1350 m. Collected from Goarogaon to Chanipur, Bhainsa, Dhunibesi, Pokhra, locality unknown (Herklott).

f. *Ephemerantha* Hunt & Summerhayes

The genus is distinguished from *Dendrobium* principally in the fugaciousness of the flowers and secondarily on vegetative characters.

Ephemerantha macraei (Lindl.) P.F. Hunt & Summerhayes in Taxon, 10 : 105, 1961; *Dendrobium macraei* Lindl. Gen. et Spec. Orch. 75, 1830; F.B.I. 5 : 714, 1890; King & Pantl., 61, t. 86, 1898; Hara, 432, 1966. *Callista macraei* (Lindl.) O. Ktz. Rev. Gen. Pl. 655, 1891.

Flowers creamy-white, fugacious ; sepals and petals erecto-patent, linear-lanceolate, acute, mentum short, side-lobes of lip sprinkled with red, oblong, mid-lobe small with 2 lobules, crenulate, disk with 2 crests. Flowering during June and July ; distributed between 1650 to 2400 m. Collected from Godavari.

Hunt & Summerhayes consider this species to be quite different from *E. fimbriata* (Bl) Hunt & Summerhayes, and Narayanaswami (*Journ. Ind. Bot. Soc.* 25: 215, 1946) has discussed the differences of *macraei* and *fimbriatum*.

g. *Epigeneium* Gagnep.

Rhizome elongated, pseudobulbs numerous, moniliform, monophyllous; inflorescence solitary terminal ; flowers large, sepals subequal, spreading, dorsal sepal adnate to the column, lateral sepals large, attached laterally to the foot ; petals narrower, adnate to the sides of the column ; lip panduriform (fiddle-shaped), oblong, base cuneate, side-lobes erect, mid-lobe obovate to obcordate ; column short, foot long ; pollinia 4 in 2 pairs.

ARTIFICIAL KEY TO THE SPECIES OF *Epigeneium*

Leaves 10-12 cm long. Flowers with a shade of purple, 7-8 cm in diam. ; mid-lobe rhomboid and thick.....*amplum*
 Leaves 5.5-9.0 cm long. Flowers chestnut-brown, 4.0-4.5 cm in diam. ; mid-lobe orbicular and thin.....*rotundatum*

Epigeneium amplum (Lindl.) Summerhayes in Kew Bull. 1957 (2) : 260, 1957 ; *Dendrobium amplum* Lindl. Gen. et Spec. - Orch. 74, 1830 ; F.B.I. 5 : 711, 1890 ; Hara, 431, 1966 ; *Bulbophyllum amplum* Reichb. f. in Walp. Ann. 6 : 244, 1861 ; *Katherinea ampala* (Lindl.) Hawkes; Balak. & Chowdhury in Bull. bot. Surv. Ind. 8 (3 & 4) : 312, 1966 (Fig. 30).

Flowers large 7-8 cm in diam., white to dull green with a shade of purple ; sepals lanceolate, acuminate ; lip sessile, side-lobes short, midlobe broad, rhomboid, acute, crenulate, thick, purplish ventrally and purple spotted dorsally, disk with 3 lamellae Flowering during May and again during October and November ; distributed between 1200 to 1800 m. Collected from Sheopuri, Thokha, and Sundarijal area.

E. rotundatum (Lindl.) Summerhayes in Kew Bull. 1957 (2) : 264, 1957 ; *Sarcopodium rotundatum* Lindl. Fol. Orch. Sarcopod, 2, 1853 ; *Bulbophyllum rotundatum* (Lindl.) Reichb. f. in Walp. Ann. 6 : 244, 1861 ; *Dendrobium rotundatum* (Lindl.) Hk. f. in Fl. Brit. Ind. 5 : 712, 1890 ; *Katherinea rotundatum* (Lindl.)

Hawkes; Balak. & Chowdhury in Bull. bot. Surv. Ind. 8 (3 & 4): 312, 1966.

Flowers 4.0-4.5 cm in diam., pale chestnut-brown; sepals and petals erect, acute, fleshy; lip sessile, side-lobes small, mid-lobe large, orbicular and thin, 3 lamellae on the base. Flowering during April and May; distributed at 1800 m. Collected from Mahadephedi to Katonje.

h. *Eria* Lindl.

Long stem-like pseudobulbs. Flowers not large nor showy, flower structure as in *Dendrobium*, but the base of the lip not forming a spur by uniting with the edges of the column-foot; pollinia 8 with caudicles.

ARTIFICIAL KEY TO THE SPECIES OF *Eria*

- A. Pseudobulbs ovoid or depressed, 2-3 leaved. Leaves membranous. Scape longer than the leaves, filiform. Flowers very small, glabrous; lip narrow, lanceolate and slightly dilated in the middle.....
.....*muscicola*
- AA. Stem tall, terete, leafy. Leaves distichous, long, narrow, having crystalline concretions. Flowers minute, woolly in subterminal spikes, lateral sepals short, broad, mid-lobe of lip bilobed and crenulate*paniculata*
- AAA. Pseudobulbs short or long, 1-noded forming a fleshy stem or crowded on the creeping rhizome. Flowers small or medium sized, glabrous or pubescent, rarely woolly in lateral or subterminal spikes or racemes—
- B. Flowers small or minute in dense spikes, sub-globose, pilose.....
.....*convallarioides*
- BB. Flowers small or medium-sized, many-flowered spikes—
- C. Flowers sessile or subsessile—
- D. Mentum rounded, lip short.....*graminifolia*
- DD. Mentum nil; lip short, yellow and pink.....*excavata*
- DDD. Mentum rounded; lip oblong, yellow and red.....*alba*
- CC. Flowers pedicelled, bracts large—
- D. Side-lobes of lip incurved and with 3 thick ridges. Flowers c. 2.5 cm. in diam.....*confusa*

DD. Side-lobes of lip rounded. Flowers c. 1.5 cm in diam.....
.....*bractescens*

DDD. Side-lobes with 2 thick ridges between them. Flowers c.
2.5 cm in diam*coronaria*

AAAA. Pseudobulbs usually large. Leaves one or few, often loaded with
crystalline concretions. Flowers in terminal or subterminal spikes,
woolly or dense white tomentose, yellow with purplish markings
.....*flava*

Eria alba Lindl. Gen. et Spec. Orch. 67, 1830 ; F.B.I. 5 :
795, 1890.

Flowers white; sepals ovate-lanceolate, 3-5 nerved, glabrescent; petals linear-oblong, 3-nerved, mentum rounded ; lip oblong, broadly clawed, side-lobes pointed forwards, obtuse, mid-lobe yellow and red, disk with 2 ridges between the side-lobes *Flowering* time probably August. Collected from Dana at c. 1450 m.

E. bractescens Lindl. Bot. Reg. 27; Misc. 18, 1841 ; F.B.I. 5 : 796, 1890 ; King & Pantl., t. 166, 1898 ; Holttum, 388, 1953.

Flowers light pink, glabrous, puberulous ; lateral sepals ovate-lanceolate, falcate, acuminate; petals linear-oblong, 5-nerved, mentum conical, side-lobes deeper pink, rounded, mid-lobe creamy and papillose. *Flowering* during August and September ; distributed between 1500 to 1800 m. Collected from Rhingmo to Jubing and Suryabinak.

E. confusa Hk. f. in Hook. Icon. Pl. 19, t. 1850, 1889 et. F.B.I. 5 : 796, 1890.

Flowers whitish ; sepals broadly ovate-oblong, obtuse, 5-nerved, pubescent; petals elliptic-lanceolate, 3-5 nerved ; lip obovate, sides-lobes incurved 3 thick ridges, mid-lobe orbicular, thick. *Flowering* during April and May ; distributed between 1200 to 1800 m. Collected from Bajrabarahi. This species has a strong resemblance to *E. bractescens*.

E. convallarioides Lindl. Gen. et Spec. Orch. 70, 1830 ; F.B.I. 5 : 791, 1890.

Flowers greenish-yellow, subglobose, pilose; sepals very broad, 5-7 nerved; petals 3-nerved, mentum rounded; lip cuneate with a broad warty tip. *Flowering* during September and October; distributed at about 1800 m. Collected from Sheopuri, Godavari, and Sundarikal. F.B.I. gives the colour of the flowers as white or straw-yellow, but in all our material the colour was greenish-yellow.

E. coronaria (Lindl.) Reichb. f. in Walp. Ann. 6 : 272, 1861; King & Pantl., 124, t. 172, 1898, Hara, 433, 1966; *Coelogyne coronaria* Lindl. Bot. Reg. Misc. 83, 1841. *Trichosma suavis* Lindl. Bot. Reg. t. 21, 1824; F.B.I. 5 : 827, 1890.

Flowers whitish or yellowish, sweet smelling; sepals ovate-lanceolate; petals oblong; lip sub-sessile, streaked, with purple and yellow in the middle, disk with 2 ridges, slightly deeper yellow between the side-lobes, mid-lobe with 5 clear and 2 faint ridges. *Flowering* during October and November; distributed between 1500 to 2000 m. Collected from Okhaldunga and Sundarikal areas.

E. excavata Lindl. ex Hk. f. Icon Pl. t. 1846, 1889, et Gen. et Spec, Orch. 67, 1830 (p.p.); F.B.I. 5 : 795, 1890; King & Pantl., 124, t. 171, 1898; Hara, 434, 1966.

Flowers dull yellow; sepals ovate-lanceolate, falcate; petals 5-nerved, mentum nil; lip short with 3 central ridges, yellow, side-lobes pink with purple nerves, mid-lobe large, obovate. *Flowering* during June; collected from Sheopuri c. 1800 m.

E. flava Lindl. Gen. et Spec-Orch. 65, 1830; F.B.I. 5 : 801, 1890; Hara 434, 1966.

Flowers light yellow with purple markings on the lip; sepals ovate-lanceolate, 9-nerved, obtuse; petals obtuse, 3-nerved, mentum subcylindric; lip thick, puberulous, side-lobes short. *Flowering* during April and May, but in the orchid-house of the garden it sometimes flowers in December also, probably due to the plants being fully exposed to bright sun and effect of temperature; distributed at 450 to 750 m. Collected from Hitaura and Dhunibesi.

E. graminifolia Lindl. in Journ. Linn. Soc. 3 : 54, 1859 ; F.B.I. 5 : 794, 1890 ; King & Pantl., 119, t. 164, 1898 ; Hara, 434, 1966 (Fig. 31).

Flowers white, glabrous ; lateral sepals ovate-lanceolate, 3-5-nerved; petals linear-lanceolate, acute, mentum rounded ; lip short ; side-lobes oblong, recurved and with a short ridge, mid-lobe orbicular. *Flowering* during June and July ; collected from Sheopuri, c. 1800 m. The spreading and recurved side-lobes are very characteristic of this species.

E. muscicola Lindl. in Journ. Linn. Soc. 3 : 47, 1857 ; F.B.I. 5 : 789, 1890 ; Hara, 434, 1966 (Fig. 32).

Flowers very small ; sepals lanceolate, finely acuminate, lateral sepals falcate; petals narrowly lanceolate, mentum rounded ; lip narrow, lanceolate and slightly dilated in the middle. *Flowering* during April and May ; distributed between 1200 to 1500 m. Collected from Lamidanda and Dhankuta.

E. paniculata Lindl. in Wall. Pl. Asiat. Rar. I : 32, t. 36, 1829 ; F.B.I. 5 : 789, 1890.

Petals elliptic, obtuse, mentum rounded ; lip suborbicular, side-lobes oblong, mid-lobe bilobed and crenulate, disk thick. *Flowering* during April and May ; distributed at 750 to 1200 m. Collected from Dhunibesi and Bajrabarahi.

i. *Liparis* Reichb.

The genus is closely allied to *Malaxis* in its habit. Plants are terrestrial, rarely epiphytic, pseudobulbs usually present or absent. Leaves solitary or more, membranous or coriaceous either continuous with their sheath or jointed on the sheath. Flowers generally small or of medium size in a raceme, resupinate. Sepals spreading, recurved with margins often rolled inwards. Petals as long as the sepals, very slender. Lip adnate to the base of the column, usually broad; column long, curved with 2 small wings on the sides of the stigmatic surface.

ARTIFICIAL KEY TO THE SPECIES OF *Liparis*

A. Lip not crenulate ; leaves 2, 3 or 4—

B. Sepals 1-nerved —

- C. Flowering scape flattened or winged. Leaves 2 or 3.....
*platyrachis*
- CC. Flowering scape not flattened or winged—
- D. Leaves 3-4 ; column broadly winged at base and wings with a
 capillary tail.....*resupinata*
- DD. Leaves 3 ; column short, obscure.....*viridiflora*
- BB. Sepals 5-nerved. Lip with 2 calli.....*togashii*
- AA. Lip crenulate ; leaf solitary ; sepals 3-nerved—
- B. Leaf broad, rounded-ovate, deeply cordate, nerves few and
 faint.....*cordifolia*
- BB. Leaf oblong or linear-oblong, nerves many and slender.....
*glossula*

Liparis cordifolia Hk. f. Ic. Pl. t. 1811, 1889 ; F.B.I. 5 : 692, 1890 ; King & Pantl. 24, t. 28, 1898 ; Hara, Fl. Eastern Himal. 440, 1966.

Plants with short and stem, leaf sessile, broad, rounded-ovate, deeply cordate, nerves few and faint; sepals lanceolate, 3 nerved ; petals with recurved margins. Lip large, flat, obcordate or orbicula-obovate, apiculate, crenulate, yellowish green, base narrow, callus obscure. *Flowering* during July to September. Collected from Sundarikal below Sheopuri, Distributed at 1650 m.

L. glossula Reichb. f. in *Linnaea* 41 : 43, 1877 ; F.B.I. 5 : 693, 1890 ; Kitamura in *Fau. & Fl. Nep. Himal.* 104, 1955.

Plants 5-8 cm high; leaf solitary, sessile or shortly petioled oblong or linear-oblong, not jointed at the base on the leaf-sheath, nerves many, slender. Inflorescence stout, 10-15 cm long, many-flowered. Flowers c 1.5 cm across, light green with a purple tinge. Sepals lanceolate, acute, 3-nerved. Lip large, broadly obovate-oblong cuspidate, crenulate and overlying the lateral sepals, callus absent. Authority Kitamura.

L. platyrachis Hk. f. Ic. Pl. t. 1890 ; F.B.I. 5 : 706, 1890 ; King & Pantl. 33, t. 45, 1898 ; Hara, 441, 1966.

Plants small; leaves 2-3, jointed at the base upon the leaf-sheath. Inflorescence much longer than the leaves, scape flattened

or winged. Flowers *c.* 4 mm across; sepals falcate, oblong, 1-nerved. Lip much shorter than the sepals, recurved, basal portion of the lip with two auricles. Authority Hara.

L. resupinata Ridley in Journ. Linn. Soc. 22 : 290, 1886 ; Hk. f. Ic. Pl t. 1888, 1889 ; F.B.I. 5 : 705, 1890 ; King & Pantl. 36, t. 48, 1898 ; Hara, 441, 1966.

Plants small *c.* 2.5 cm high ; leaves 3-4, sessile, linear-lanceolate, acuminate, submembranous, 7-nerved. Inflorescence slender, more than 10 cm in length, many-flowered, bracts exceeding the length of the pedicels. Flowers *c.* 8 mm across, yellow, sepals broadly oblong, margin rolled inwards, 1-nerved. Lip broadly ovate-oblong, basal lobes rounded. Authority Hara.

L. togashii Tuyama in Hara. Fl. Eastern Himal. 441, 1966.

Plants small; leaves 3, linear-oblong, acute or acuminate. Inflorescence smaller than the leaves, bracts smaller. Flowers *c.* 4.5 mm across; sepals linear-oblong; lip much shorter than the sepals ovate-triangular, calli two. Authority Hara.

L. viridiflora (Bl.) Lindl. Gen. et Spec. Orch. 31, 1830 ; F.B.I. 5 : 704, 1890 ; Holttum, Fl. Malaya, 1 : 203, 1953 ; Hara, 443, 1966. *Malaxis viridiflora* Bl. Bijdr. 392, t. 54, 1825 ; *Liparis longipes* Lindl. ex Wall. Pl. Asiat. Rar. 1: 31, t. 35, 1830, et Gen. et Spec. Orch. 30, 1830 ; F.B.I. 5 : 703, 1890 ; King & Pantl. 29, t. 37, 1898.

Leaves 2, jointed at the base upon the leaf sheath. Inflorescence 10-15 cm long, many-flowered, flowers very small, yellowish or whitish green ; sepals flat, broad not widely spreading, 1-nerved. Lip as long as the sepals, orbicular-ovate, very obscurely 3-lobed, callus absent, column short and incurved. Authority Hara.

j. *Malaxis* Soland ex Sw.

Microstylis is a later name for *Malaxis*, thus according to the rules of Botanical Nomenclature, *Malaxis* should, therefore,

be used. These are terrestrial or rarely epiphytic orchids. The stem is creeping with erect leafy branches. Leaves broad, often unequal-sided at the base, thin, more or less plicate, sheathing at the base. The Inflorescence is terminal, few or many flowered raceme, flowers small; sepals free or the lateral ones connate Lip sessile, erect or spreading, entire or 3-lobed, concave to saccate, often with a hollow near the base usually with 2 large lobes, the auricles, close to the sides of the column and extending downwards; column very short, terete, at the top, apex toothed, with or without fleshy arms. Anthers terminal, sessile, erect on the back of the column with its tip pointed upwards, pollinia 4, waxy, Fruit is a capsule which is either ovoid or ellipsoid, The genus *Malaxis* is distinguished from *Liparis* in having a superior lip and a very short wingless column, while in *Liparis* the lip is inferior, and the column is long with its upper part winged.

ARTIFICIAL KEY TO THE SPECIES OF *Malaxis*

- A. Sides of lip not produced into auricles : leaves 2 ; flowers yellowish green *muscifera*
- AA Sides of lip produced into auricles—
- B. Bracts shorter than the ovary—
- C. Inflorescence scape 8-20 cm long ; flowers golden-yellow with reddish brown round the column, c. 1.8 cm in diam..... *josephiana*
- CC. Inflorescence scape 20-25 cm long ; flowers greenish-purple or yellowish, c. 8 mm in diam *acuminata*
- BB. Bracts equalling or longer than the ovary—
- C. Plants c. 4-5 cm high ; leaves 3-4 ; flowers 4 mm in diam..... *hasiana*
- CC. Plants c. 50 cm tall ; leaves 2 ; flowers 8 mm in diam..... *tamurensis*

Malaxis acuminata D. Don, Prodr. Fl. Nep. 29, 1825 ; Hara, 443, 1966. *Microstylis wallichiana* Lindl. Gen. et Spec Orch. 20, 1830 ; F.B.I. 5 : 686. 1890 ; King & Pantl. 15, 18, 1898.

Flowers pedicellate, pedicels c. 1 cm long, yellowish green, purplish near the centre, c. 8 mm in diam.; sepals oblong, lateral sepals oblong, 3-5-nerved, shorter than the dorsal, dorsal sepal 1-3-nerved; petals 3-nerved, linear, longer than the sepals. Lip shield-like, broadly ovate, tip notched, auricles straight and slightly overlapping. *Flowering* during July and August. Collected from Tarebhir to Nagi; Nagarjung; Kakni; Dhunibesi; below Sheopuri, Widely distributed at 1650 m.

In F.B.I. and also in Fl. East. Himal. a variety *biloba* is mentioned, which has bracts usually longer, shorter pedicels and the blade of the lip is contracted, but we have not been able to collect any specimen that would compare well with the description of the variety.

M. josephiana (Reichb. f.) O. Ktz. Rev. Gen. 2 : 673, 1891. *Microstylis josephiana* Reichb. f. in Hk. Bot. Mag. t. 6325, 1868; F.B.I. 5 : 687, 1890.

Inflorescence loosely-flowered, flowers large c. 1.8 cm in diam., golden yellow with reddish-brown round the column; sepals broad, connate at the base, 3-nerved, dorsal sepal saccate at the base; petals broadly linear. Lip deeply cupped, auricles short, broad, rounded, column very short, thickly winged. *Flowering* during June and July. Collected from Ranibari; Sankhu Distributed at 1200 m.

M. khasiana (Hk. f.) O. Ktz Rev. Gen. 2 : 673, 1891. *Microstylis khasiana* Hk. f. Ic. Pl. 19, t. 1831, 1889; F.B.I. 5 : 686, 1890.

Plants c. 4-5 cm high; leaves 3-4. Flowers brownish-red. c. 4 mm in diam., bracts equalling the ovary; sepals broad, hooded, auricle of the lip, obtuse, shorter than or equalling the blade, blade constricted into a broadly rounded terminal lobe. *Flowering* during June and July. Collected from Chainpur; below Sheopuri; Dhunibesi. Distributed at 1200 to 1525 m.

M. muscifera (Lindl.) O. Ktz. Rev. Gen. Pl. 2 : 673, 1891; Hara, 444, 1966. *Dienia muscifera* Lindl. Gen. et. Spec. Orch. 23, 1830. *Microstylis muscifera* (Lindl.) Ridley in Journ. Linn.

Soc. 24 : 333, 1888 ; F.B.I. 5 : 689, 1890 ; King & Pantl. 20, t. 25, 1898 ; Kitamura, *Fau. & Fl. Nep. Himal.* 104, 1955.

Plants usually 15-30 cm tall; leaves 2, sessile. Inflorescence a dense flowered raceme, flowers minute, c. 3 mm in diam., pale yellowish-green; sepals broadly lanceolate; petals linear. Lip ovate, acute, abruptly pointed, no auricles, column sessile. *Flowering* during July and August. Collected from Sheopuri to Bagdoar; also Chum Gompha (Kitamura). Distributed at 1825 to 3500 m.

M. tamurensis Tuyama in Hara, *Fl. Eastern Himal.* 444, 1966.

Plants c. 50 cm tall; leaves 2, nerves 7. prominent. Inflorescence dense-flowered, bracts longer than the ovary, flowers c. 8 mm in diam; sepals deflexed. Lip 5 mm long and 6 mm broad, more or less rounded quadrangular, sides produced into teeth or lobes, apex truncate and subirregular, column small, not appendiculate. Authority Hara.

k. *Oberonia* Lindl.

Erect or pendulous, tufted epiphytic orchids, which are unique. Holttum describes them as 'the plants are easy to recognise owing to their much flattened leaves, looking as though they have been put into a press. The leaves are so flattened laterally that they have practically no upper surface except at the sheathing base.' He adds 'the flowers are never more than 2 mm long and hardly more than 1 mm. The flowers are usually greenish to yellowish, orange or red, sometimes rich brown, they are often beautifully shaped. The inflorescence continues to grow at the base after the middle part is mature; the middle flowers open first and the basal flowers usually last of all. Usually many fruits are produced'. Sepals are equal among themselves; erect or reflexed; petals usually narrower and shorter. Lip is sessile, concave at the base, fimbriate, entire or more or less 3-lobed.

ARTIFICIAL KEY TO THE SPECIES OF *Oberonia*

A. Leaves ensiform—

B. Side-lobes or all lobes of the lip deeply toothed or laciniate—

C. Leaves more than 3 cm long ; flowers pale green ; mid-lobe of lip broadly bifid at tip.....*iridifolia*

CC. Plants small, leaves c. 2.5 cm long ; flowers reddish-yellow ; mid-lobe of lip truncate, side-lobes pectinately toothed.....
.....*clarkii*

BB. Lip entire or 3-lobed, margins quite entire or erose but never pectinate—

C. Petals broad, oblong or ovate—

D. Petals and lip pubescent ; lip longer than the sepals, mid-lobe obcordate.....*ensifomis*

DD: Lip longer than the sepals, mid-lobe deeply 2-lobed.....
myriantha

CC. Petals linear—

D. Lip orbicular or rounded-ovate, entire or obscurely lobed
.....*pachyrachis*

DD. Lip with very small side-lobe long—

E. Lip twice as long as the sepals, side-lobes obscure at the base ; bracts lanceolate.....*caulescens*

EE. Lip longer than the sepals, side-lobes filiform, bracts setaceous.....*rufilabris*

AA. Leaves falcate ; petals linear-oblong ; Lip twice as long as the sepals, side lobes small, directed upwards, mid-lobe deeply bifid
.....*falcata*

AAA. Leaves all radical, elongate, terete, fleshy. Lip with two curved spurs on each side of its tip.....*myosurus*

Oberonia caulescens Lindl. Fol. Orch. Oberon. 7, 1852 et Gen. et Spec. Orch. 15, 1830 ; F.B.I. 5 : 682, 1890.

Plants with slender stem; leaves ensiform. Flowers subwhorled, pale, bracts lanceolate ; petals narrow. Lip twice as long as the sepals, obscurely lobed at the base and with two parallel lobes at the tip. Flowering during May. Collected from Thos to Bhitrikhani. Distributed at c. 2250 m.

O. clarkel Hk. f. Ic. Pl. t. 1779, 1888 ; F.B.I. 5 : 676, 1890.

Plants small with leaves c. 2.5 cm., ensiform. Flowers very minute, whorled, reddish-yellow ; petals broadly ovate, obtuse, nearly as long as sepals. Lip 3-lobed, equalling the sepals, side-lobes pectinately toothed, midlobe small, truncate. *Flowering* during January to March. Collected from Hitaura-Bindraban forest area. Distributed at 510 m.

O. ensiformis (Sm. ex. Rees) Lindl. Fol. Orch. Oberon. 4, 1852 ; F.B.I. 5 : 679, 1890 ; King & Pantl. 9, t. 9, 1898. *Malaxis ensiformis* Sm. in Rees, Cycl. 22, n, 4, 1812.

Plants with ensiform leaves. Flowers c. 2 mm, orange yellow ; petals broad, ovate, pubescent. Lip longer than or equalling the sepals, pubescent, side-lobes broad, rounded, midlobe obcordate. *Flowering* during September and October. Collected from Larmidanda ; Pokhra. Distributed at 1220 m.

In F.B.I. Hooker mentions that the lip is hardly longer than the sepals. Our observations agree with those of Santapau & Kapadia (*J. Bombay nat. Hist Soc.* 57 : 257, 1960).

O. falcata King & Pantl. in Journ. Asiat. Soc. Beng. 64 (2) : 329, 1895 et. Ann. Roy. Bot. Gard. Calc. 8 : 12, t. 14, 1898 ; Hara, 445, 1966

Leaves falcate. Flowers minute, yellowish green ; petals linear oblong ; lip twice as long as the sepals, broadly oblong, slightly depressed below the column, side-lobes directed outwards, small, midlobe deeply bifid, divergent. *Flowering* during July. Distributed commonly at 2100-2300 m. Authority Hara.

O. iridifolia (Roxb.) Lindl. Gen. et Spec. Orch. 15, 1830 ; F.B.I. 5 : 675, 1890 ; King & Pantl. 8, t. 8, 1898 ; Holttum, 215, 1953 ; Hara 445, 1966. *Cymbidium iridifolium* Roxb. Fl. Ind. ed. 2, 3 : 458, 1832. *Malaxis iridifolia* (Roxb.) Reichb. f. in Walp. Ann. 6 : 208, 1861.

Plants with ensiform leaves more than 3 cm long. Flowers pale green in close whorls ; sepals subequal, reflexed ; petals

oblong, erose reflexed. Lip more or less quadrate being broader than long, glabrous or slightly pubescent, sides deeply toothed, tip broadly bifid. *Flowering* during August and September. Collected from Hitaura ; Pokhra ; Brajabarahi ; Sanku ; Dhuni-besi. Distributed at 510 to 1220 m.

We have not been able to make out the varieties as given by Hooker in F.B.I., as the lips are not only longer than their breadth but also the tip is bifid, thus the characters of the two var. have been combined.

O. myosurus Lindl. Gen. et Spec. Orch. 16, 1830 ; F.B.I. 5 : 685, 1890.

Plants with leaves elongate, linear, terete, slightly curved. Flowers pale ; petals narrow, linear ; lateral lobes of lip rounded, sinuate toothed, midlobe of lip oblong-quadrate with sides toothed, two curved spurs on each side of the tip truncate. *Flowering* during August and September. Collected from Nagarjung. Distributed at c. 1650 m.

O. myriantha Lindl. Fol. Orch. Oberon. 4, 1852 ; F.B.I. 5 : 679, 1890.

Plants with ensiform leaves. Flowers c. 2 mm , yellow-green ; petals broad, entire. Lip longer than the sepals, side-lobes broad and notched, mid-lobe oblong, deeply 2-lobed, lobules rounded. *Flowering* during August and September. Collected from Rhingmo to Jubing ; Pokhra. Distributed at c. 1650 m.

O. pachyrachis Reichb. f. ex Hk. f. Fl. Brit. Ind. 5 : 681, 1890 ; King & Pantl. 4, t. 3, 1898 ; Hara, 446, 1966.

Plants with ensiform leaves. Flowers minute, c. 0.8 mm or less, very compact on a thick spike ; petals linear ; lip rounded-ovate or orbicular, entire or obscurely lobed. Authority Hara.

O. rufilabris Lindl., Fol. Orch. Oberon. 5, 1852 ; F.B.I. 5 : 683, 1890.

Leaves ensiform. Flowers minute c. 8 mm ; petals linear-oblong ; lip longer than the sepals, oblong, reddish brown with filiform sidelobes, close to the narrow base. *Flowering* during

October and November. Collected from Lamidanda ; Nagarjung. Distributed at c. 1650 m.

1. *Otochilus* Lindl.

Epiphytic with articulate branched stems, formed by elongated superimposed pseudobulbs ; leaves on the uppermost pseudobulb, in pairs, elliptic or lanceolate. Flowers small, bracteate, in racemes ; bracts scarious with sides rolled inwards. Sepals and petals spreading, free, subequal. Lip short, sessile on base of column, base saccate, lateral lobes short, erect, midlobe entire ; column long and slender, foot absent.

ARTIFICIAL KEY TO THE SPECIES OF *Otochilus*

Lateral lobes of labellum large, midlobe lanceolate. Racemes drooping ;
bracts broad, acute..... *porrecta*
Lateral lobes of labellum very small, midlobe linear—

Racemes dropping ; flowers white ; sepals and petals acute ; bracts
acuminate. Flowering during May & June..... *alba*

Racemes short ; flowers pink ; sepals and petals obtuse ; bracts
truncate. Flowering during December & January..... *fusca*.

(We must admit that flowering time is not very reliable, yet it can possible be of some secondary importance.)

Otochilus alba Lindl. Gen. et Spec. Orch. 35, 1830 ; F.B.I. 5 : 843, 1890.

Flowers white with a pink or even greenish column ; sepals and petals acute ; lateral lobes or lip very small, obtuse, yellow or white, midlobe linear, oblong, acuminate. *Flowering* during May and June. Collected from Suparitar ; Cheesapanigarhi ; Sheopuri. Distributed at 1500 to 1800 m.

O. fusca Lindl. Gen. et Spec. Orch. 35, 1830 ; F.B.I. 5 : 844, 1890 ; King & Pantl. 143, t. 199, 1898 ; Hara, 447, 1966.

Flowers pale-pink ; sepals linear-oblong ; petals narrower, dilated upwards. Lip concave, lateral lobes as small teeth,

midlobe linear, oblong ; column red. Possibly flowering time is during December and January. Collected from Namsaling to Gorkhá ; Lamidanda ; foot of Sundarijal. Distributed at 1350 m. The material collected Namsaling to Gorkha during June had ruptured pods, and as such it is presumed that the flowering time is during the cold months, however, the Lamidanda material had flowers during the cold months.

O. porrecta Lindl. Gen. et Spec. Orch. 36, 1830; F.B.I. 5 : 844, 1890 ; King & Pantl. 142, t. 198, 1898 ; Hara, 447, 1966.

Flowers white or pale pink ; sepals linear, acuminate; petals linear ; lateral lobes of lip falcate, obtuse, midlobe lanceolate. Flowering during October and November. Collected from below Sheopuri ; Godavari ; Mulkharka. Distributed at 1500 to 1650 m.

Burkill collected an unidentified *Otochilus* from Hittaura. We have not been able to trace the sheet in the Central National Herbarium, Calcutta, as such we are unable to make any comments on that material. Nor have we been able to collect any *Otochilus* from Hittaura, although *O. alba* has been collected by us from that area (Supari Tar).

m. *Panisea* Lindl.

This genus is very near to *Coelogyne*, but differs in having the lip clawed. However, the scape is slender, and few flowered. Sepals are keeled with oblique base, free ; petals are subequal, free, also with oblique base, lanceolate ; lip narrow and as long as the sepals ; claw sigmoid, column slender, erect and slightly two-winged above.

Panisea parviflora Lindl. Fol. Orch. 1, 1854 ; F.B.I. 5 : 783, 1890 ; King & Pantl. 142, t. 197, 1898 ; Hara, 447, 1966 ; *Panisea demissa* (D. Don) Pftz. in Engl. Pfreich. Orch-Coelog. 141, 1907, *Dendrobium demissa* D. Don, Prodr. Fl. Nep. 34, 1825. *Coelogyne parviflora* Lindl. Gen. et Spec. Orch. 44, 1830.

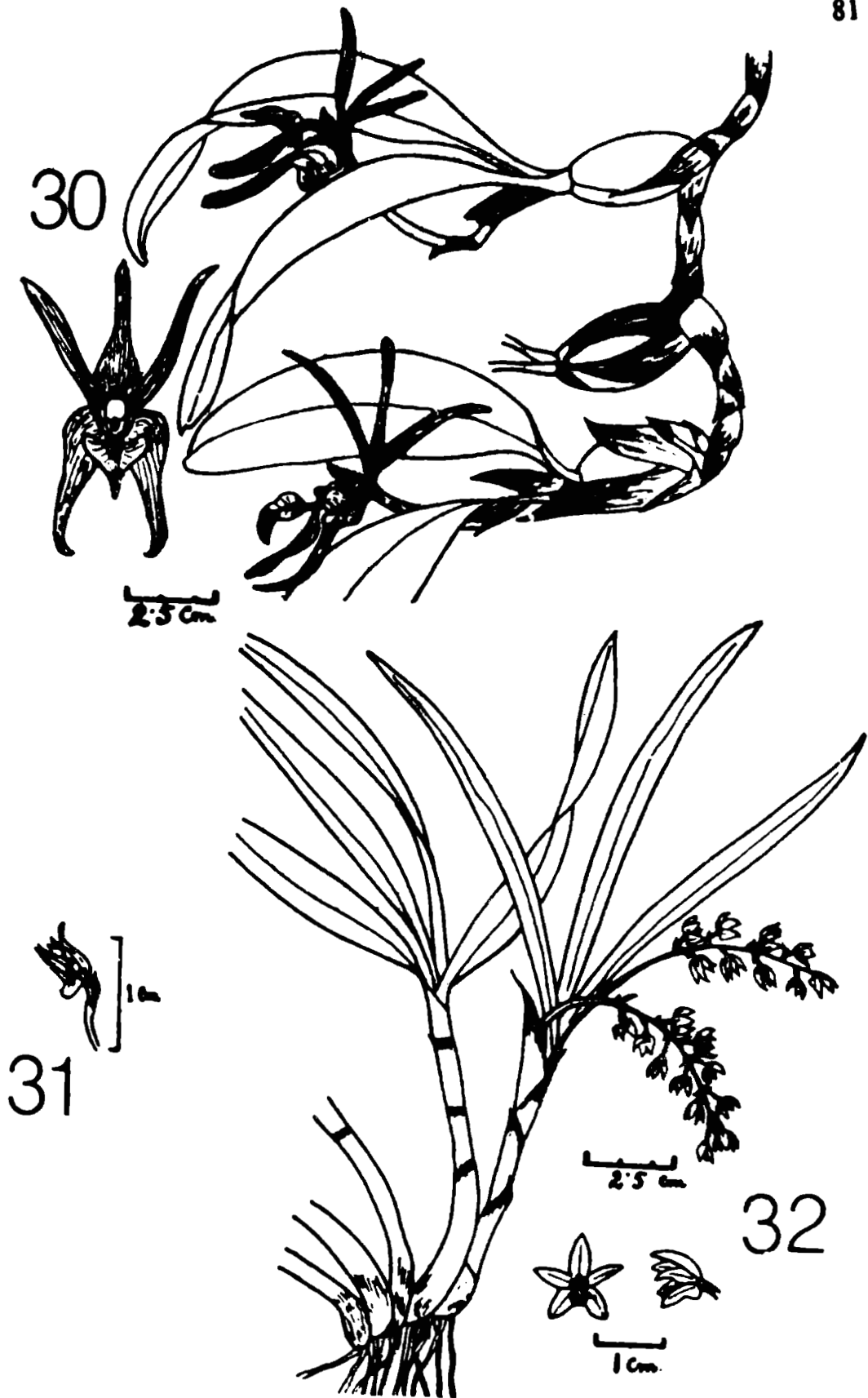


Fig 30 *Epigeneium amplum* (Lindl.) Summerhayes ; 31 *Eria graminifolia* Lindl. ;
32 *Eria muscicola* Lindl.

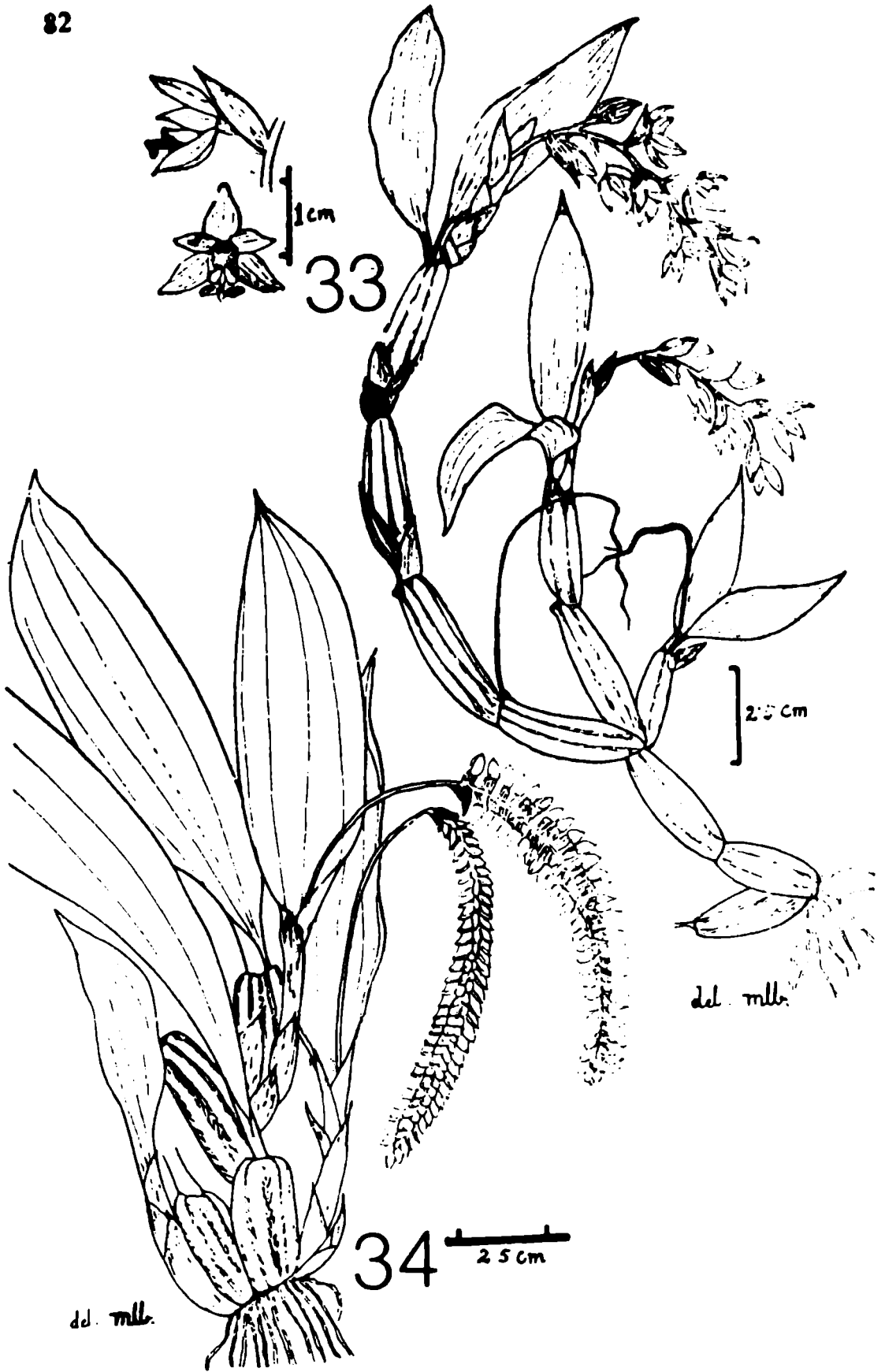


Fig. 33 *Pholidota articulata* Lindl.

Fig. 34 *Pholidota imbricata* (Roxb.) Lindl.

Flowers white ; dorsal sepal linear-oblong. lateral sepals membranous, lanceolate, 5-nerved; petals ovate-lanceolate, 3-nerved, base slightly gibbous ; lip subacute, tip of claw tuberculate, column brownish. *Flowering* during October and November ; distributed between 1,500 to 2,250 metres. Collected from Mulkharka, Sundarikal and Godavari.

n. *Pholidota* Lindl. ex. Hook.

Habit of *Otochilus*. Rachis of raceme flexous ; flowers small and bracteate, bracts stiff and distichous. Columa very short, with wide wings.

ARTIFICIAL KEY TO THE SPECIES OF *Pholidota*

Pseudobulbs uninodal ; flowering scapes from top of pseudobulbs ; inflorescence rachis thickened, not zigzag *imbricata*

Stem elongate, branched and formed of pseudobulbs internodes—

Flowering scape from top of pseudobulbs : dorsal sepal suborbicular—

Inflorescence rachis flexous, zigzag *griffithii*

Inflorescence rachis not flexous, zigzag *articulata*

Flowering scape from the sheath of the internodes..... *protracta*

Pholidota articulata Lindl. Gen. et Spec. Orch. 38, 1830 ; F.B.I. 5 : 844, 1890 ; King & Pantl. 146, t. 205-1898 ; Holttum 233, 1953. (Fig. 33).

Flowers c. 1.2 to 1.5 cm wide, cream coloured ; sepals and petals nearly equalling and widely spreading, dorsal sepal suborbicular, lateral sepals ovate, keeled. Lip cymbiform with a didymous midlobe, which is yellowish at the tip. *Flowering* during April and May. Collected from Sheopuri ; Godavari ; Chandragiri ; Hatia to Gola , Papung ; West Nepal (Parker) ; locality unknown (Herklotts). A common epiphytic orchid widely distributed between 1500 to 2400 m.

P. griffithii Hk. f. Ic. Pl. t. 1881, 1890 ; F.B.I. 5 : 845, 1890.

Dorsal sepal broadly ovate or suborbicular, lateral sepals ovate-lanceolate, acute, 5-nerved, keeled; petals elliptic-lanceolate, 3-5 nerved. Lip cymbiform with a didymous midlobe; no lateral lobes. *Flowering* time during May and June. Collected from Godavari; Chandragiri; Dhunibesi. Distributed at 300 to 1800 m.

P. imbricata (Roxb.) Lindl. in Hook. Exot. Fl. 2, t. 138, 1825, et Gen. et Spec. Orch. 38, 1830; F.B.I. 5: 845, 1890; Holttum, 234, 1953; Hara, 447, 1966. *Cymbidium imbricatum* Roxb. Hort. Beng. 63, 1814 (nom. nud.) et Fl. Ind. 3: 460, 1832. *Pitlocnema bracteatum* D. Don, Prodr. Fl. Nep. 33, 1825. (Fig. 34).

Flowers 6-7 mm wide, faintly pink; sepals 7 mm long, dorsal sepal orbicular, 3-nerved, lateral sepals cymbiform, connate at the base; petals linear-oblong, falcate. Lip 4-lobed, lateral lobes broad, rounded, midlobe deeply bilobed, with a deep or light yellow spot. *Flowering* during June and July. Collected from Murra to Dhupu; Sundarijal; Chandragiri; Godavari. Distributed at 900 to 1500 m.

P. protracta Hk. f. Ic. Pl. t. 1877, 1889; F.B.I. 5: 845, 1890; Hara, 448, 1966.

Flowers pale yellow; sepals ovate, obtuse, not keeled, very concave; petals elliptic, obtuse, 3-nerved. Lip cymbiform, midlobe suborbicular, gibbous above the base, orange within. *Flowering* during May and June. Collected from Godavari; Mulkharka. Distributed at 1500 m.

o. *Ptelone* D. Don

Mostly terrestrial, pseudobulbs with one or two leaves. Flowers arising from the base of the pseudobulbs. Sepals valvate, free or connate at the base. Labellum with obscure lateral lobes or the lateral lobes are absent, margin serrate or dentate, apically lobed. Foot of column absent. Anther with short filament, pollinia 4.

ARTIFICIAL KEY TO THE SPECIES OF *Pleione*

Flowers appearing before or after the leaves—

Lip lacinate or deeply fringed, bifid..... *praecox*

Lip fimbriate, speckled or striped with deep purple.....*humilis*

Flowering scape 1-leaved. Lip margin crisp and toothed *hookeriana*
.....

Pleione hookeriana (Lindl.) O. Ktze. Rev. Gen. Pl. 2 : 680, 1891 ; Hara 448, 1966. *Coelogyne hookeriana* Lindl. Fol. Orch. 14, 1854 ; F.B.I. 5 : 842, 1890 ; King & Pantl. t. 193, 1898 (Fig. 35).

Flowering scape with one flower, 5 cm in diam. ; sepals and petals subsimilar, oblong, lanceolate, acute, pale rose-purple ; lip with few blotches, disk with 5 yellow ciliate ridges, margin crisp, and toothed. Flowering during May and June ; distributed between 2,100 to 3,000 metres. Collected from Puyian, Reserve forest above Dingla, Topkegola area, Jiri ; locality unknown (Herklott).

P. humilis (Sm.) D. Don, Prodr. Fl. Nep. 37, 1825 ; Hara, 448, 1966. *Epidendrum humilis* Smith, Exot. Bot. 2 : 75, t. 98, 1804-1807. *Coelogyne humilis* Lindl. Gen. et. Spec. Orch. 53, 1830 ; F.B.I. 5 : 840, 1890 ; King & Pantl. 139, t. 194, 1898 (Fig. 36).

Flower pale purple. Lip obovate, fimbriate, speckled or striped with deep purple, disk with fringed lamellae, top of column truncate and toothed. Flowering during February and March ; distributed between 2,100 to 2,850 metres. Collected from Bagboar, Ghorepani, west face of Phulchowki ; locality unknown (Herklott).

F.B.I. gives the colour of the Flower as also white and the stripes or speckles on the lip as red, purple, orange or brown, but we have in all cases found the flowers of pale purple colour and the stripes or speckles of a deeper colour.

P. praecox (Sm.) D. Don, Prodr. Fl. Nep. 37, 1825 ; Hara, 449, 1966 ; *Epidendrum praecox* Smith, Exot. Bot. 2 : t. 97,

1804-1807, *Coelogyne praecox* (Sm.) Lindl. Fol. Orch. 16, 1863; F.B.I. 5: 840, 1890; King & Pantl. 141, t. 196, 1898 (Fig. 37).

Flower rose-purple, sweet smelling; sepals narrow, slightly curved, acute, petals broader than the sepals, lower slightly curved; lip lacinate or deeply fringed in front, bifid, disk with crested lamellae, top of column 4-toothed. Flowering during September and October; distributed between 1,700 to 2,700 metres. Collected from Kharidhunga, Kakni, Sheopuri, Daman; locality unknown (Herklott).

(b) *Pleuranthae*

i. *Sympodiales*

- A. Inflorescence lateral, borne near the base of the pseudobulbs or in the axils of the lower leaves of the stem—
- B. Pollinia without a stipe. Rhizome more or less elongated, pseudobulbs of a single internode, 1-2 leaved. Leaves flat. Lip fleshy, mobile—
- C. Flowers not whorled; posterior sepal rather shorter than the lateral sepals.....*Bulbophyllum*
(*Bulbophylleae*)
- CC. Flowers whorled (umbellate); posterior sepal much shorter than the much longer lateral sepals.....*Cirrhopetalum*
(*Bulbophylleae*)
- BB. Pollinia provided with a distinct stipe; viscid disc distinct. Pollinia waxy; lip without a spur. Petals much shorter than the sepals. Pseudobulbs of a single internode, epiphytic, usually creeping with 1 leaf.....*Sunipia* (*Genyorchideae*)
- AA. Inflorescence terminal; pollinia without appendage:
- B. Pollinia 8; sepals free:
- C. Nodose rhizome. Flowers hairy, small c. 1.25 cm in diam.; sepals conniving; column elongate produced into a foot; lip 3-lobed, disk with fimbriate ridges
.....*Pachystoma* (*Phajaeae*)
- CC. Creeping rhizome bearing pseudobulbs. Flowers c. 2.5-3.8 cm in diam.; sepals spreading, column elongate, foot absent; lip 3-lobed, disk pubescent
.....*Spathoglottis* (*Phajaeae*)

BB. Pollinia 4 ; terrestrial :

C. Sepals connate into a cylindrical tube ; petals linear, claws free within the sepals ; column elongate, foot absent. Flowers on a leafless lateral raceme.....
 *Anthogonium* (Phajace)

CC. Sepals and petals distinct, suberect ; column long. Terrestrial with 1 leaf..... *Oreorchis* (Cryptoideae)

AAA. Inflorescence terminal ; pollinia appendaged :

B. Lip spurred, claw connate into a tube with the column, bases of pollinia long resembling caudicles. Terrestrial with plicate leaves..... *Calanthe* (Phajace)

BB. Lip not spurred nor conspicuously saccate ; column not produced into a foot ; sepals petals subequal, spreading ; lobes of lip embracing the unwinged column
 *Cymbidium* (Cymbideae)

BBB. Sepals, petals and lip very narrow and conniving in a tube. Scape leafless ; flowers in a raceme...*Cremastra* (Cryptoideae)

a. *Anthogonium* Lindl.

According to Schultes & Pease, the name refers probably to the curious angle at which the tubular flower is joined to the pedicellate ovary.

***Anthogonium gracile* Lindl. Gen. et Spec. Orch. 426, 1840 ; F.B.I. 5 : 822, 1890 ; King & Pantl. 96, t. 134, 1898 ; Hara, 425, 1966. (Fig. 41).**

Terrestrial slender orchid with small pseudobulbs ; inflorescence a simple or branched raceme. Flowers resupinate i.e. labellum posterior due to the torsion of the flower, pink ; sepals united to form a tubular structure with tips free, short ; petals included, linear, long clawed. Lip adnate to the base of the column, long clawed, limb recurved, obscurely lobed, spotted red. Flowering during August and September. Distributed between 1220 to 1830 m. Collected from Dolaghat to Chaubas, Sundarijal, Buludanda and Sheopuri.

b. *Bulbophyllum* Thouars.

Rhizome usually long and creeping or hanging, somewhat short and bearing a series of pseudobulbs, each of a single joint and one leaf at the tip, very rarely 2-leaved ; pseudobulbs close

or distant and varying much in size. Inflorescence of one to many flowers, the scape usually arising at the base of a pseudobulb but sometimes at another node of the rhizome ; flowers in short or long racemes. Flowers very small to fairly large ; sepals almost equal, the laterals longer than the dorsal, lateral sepals joined to the column-foot to form a usually short mentum, often much longer than wide, free or with both edges more or less joined ; petals nearly always much smaller than the sepals, rarely about equal to the sepals ; lip hinged to the column-foot, in most cases mobile, often of complex structure, usually fleshy and more or less tongue-shaped, straight or curved, the sides usually somewhat raised at the base, the whole or part of the lip often papillose or warted or even hairy ; column short, usually with conspicuous arms or wings, which often rise like a pair of slender horns above the small anther, anther 2-chambered, containing 4 pollinia in pairs ; column-foot usually curved forwards beyond its junction with the bases of the sepals forming a pedestal in the flower upon which the lip hinges.

ARTIFICIAL KEY TO THE SPECIES OF *Bulbophyllum*

- A. Lateral sepals not connate ; lip recurved and shorter than the sepals
- B. Flowers solitary, rarely 2-3, usually large. Scape sometimes very short ; pedicel long
- C. Column truncate ; lip stipitate
- D. Scape long ; petals 1-nerved, $\frac{1}{2}$ shorter than the sepals.....*striatum*
- DD. Scape short ; petals 3-5, nerved $\frac{1}{2}$ shorter than the sepals*affine*
- CC. Column with two teeth or spines
- D. Flowers greenish or yellow and spotted. Lateral sepals and petals 7-nerved.....*leopardinum*
- DD. Flowers reddish brown. Lateral sepals 5-nerved ; petals 3-nerved ; column teeth very short*wallichii*
- BB. Flowers capitate or subumbellate
- C. Lip minute, sessile and papillose. Rhizome stout ; leaf 2.5 cm or more.....*odoratissimum*

C'C. Lip shortly stipitate. Rhizome thin and slender; leaf 2.5 cm. or less..... *caudatum*

BBB. Flowers racemose or spicate

C. Lip with recurved basal auricles. Raceme decurved.

D. Rhizome stout; bracts usually exceeding the flowers. flowers spotted.....*careyanum*

DD. Rhizome thread—like; bracts minute, flowers pale yellow (not spotted).....*polyrhizum*

D. Sepals pubescent. Flowers yellow or greenish yellow scented.....*hirtum*

CC. Lip without basal auricle

DD. Sepals and petals glabrous

E. Pseudobulbs ovoid or globose. Spike lax; flowers not flattened; lip yellow.....*reptans*

EE. Pseudobulbs very small. Spike erect; flowers dorsally flattened.....*cylindraceum*

AA. Lateral sepals connate. Lip rather large, straight and rigid

B. Lateral sepals 3-nerved. Flowers white; lip purple with a ridge.....*bicolor*

BB. Lateral sepals 5-7 nerved. Flowers greenish; lip purple with solid tip..... *paleaceum*

Bulbophyllum affine Lindl. Gen. et Spec. Orch. 48, 1830; F.B.I. 5 : 756, 1890; King & Pantl. in Ann. Roy. Bot. Gard. Calc. 8 : 67, t. 91, 1898; Hara Fl. Eastern Himal, 426, 1966.

Flowers greenish-yellow, streaked with red; petals ovate-lanceolate, acute, 5-nerved, about a third shorter than the reflexed falcate sepals; lip shortly stipitate, reddish-brown, column yellow. *Flowering* during May and June; widely distributed between 1000-2000 m. Collected from Chandragiri, Sundarjal, Sheopuri, Lamidanda, Goarigaon to Chainpur.

B. bicolor Lindl. Gen. et Spec. Orch. 49, 1830; F.B.I. 5 : 770, 1890.

Spike short, flowers crowded, membranous, small, dull white; sepals subequal, linear-lanceolate, acuminate, laterals connate at the bases, whitish with pink nerves, petals ovate or oblong, faintly serrate; lip traversed by a ridge which terminates in a short rigid emarginate point, purple or pinkish. *Flowering* during September and October; widely distributed between

1500 & 1800 m. Collected from Tarebhir (below Sheopuri), Chandragiri, Godavari, and Sundarijal. This species is very much like *B. reptans*.

B. careyanum Spr. Syst. 3 : 732, 1836 ; F.B.I. 5 : 760, 1890 ; King & Pantl. 71, t. 97, 1898 . *Pleurothalis purpurea* D. Don, Prodr. Fl. Nep. 33, 1825.(Fig. 38).

Flowers orange-yellow or with greenish shade, more or less spotted with reddish-brown or purple ; sepals oblong-ovate, acute, dorsal slightly shorter ; petals minute, broadly ovate, aristate, 1-nerved ; lip subentire, column spurs long, aristate and forming a broad base, reddish-brown. *Flowering* in October and November ; distributed between 900 & 1200 m. Collected from Pokhara, Dhankutta, locality unknown (Herklott). F.B.I. gives that sometimes the flowers are almost all blue, or purple, but we have not seen such flowers.

B. careyanum var. *ochraceum* Hook. f. in F.B.I, (loc. cit.) Flowers darker or deeper in colour and unspotted. Collected from Tokha, c 1500 m.

B. caudatum Lindl. Gen.et Spec. Orch. 56, 1830 ; F.B.I. 5 : 759, 1890 Hara Fl. Eastern Himal. 426, 1966. *Cirrhopetalum caudatum* King & Pantl. 93, t. 129, 1898.

Flowers small, 8 mm long, papillose ; sepals lanceolate, caudate, 3-nerved, lateral sepals longer than the dorsal and three times as long as the petals ; petals oblong, obtuse, 1-nerved ; lip shortly stipitate spurs slender. This species is recorded on the authority of Hara.

B. cylindraceum Lindl. Gen.et Spec. Orch. 53, 1830 ; F.B.I. 765, 1890 , king & Pantl. 70, t. 96, 1898 ; Hara Fl. Eastern Himal. 426. 1966.

Flowers dorsally flattened, greenish-yellow ; dorsal sepal triangular with sometimes a spirally coiled tip, lateral sepals oblong, obtuse; petals small, oblong, 1-nerved ; lip ovate, greenish-purple. *Flowering* during September and October ; collected from Sundarijal area c. 1800 m. In F.B.I. the colour

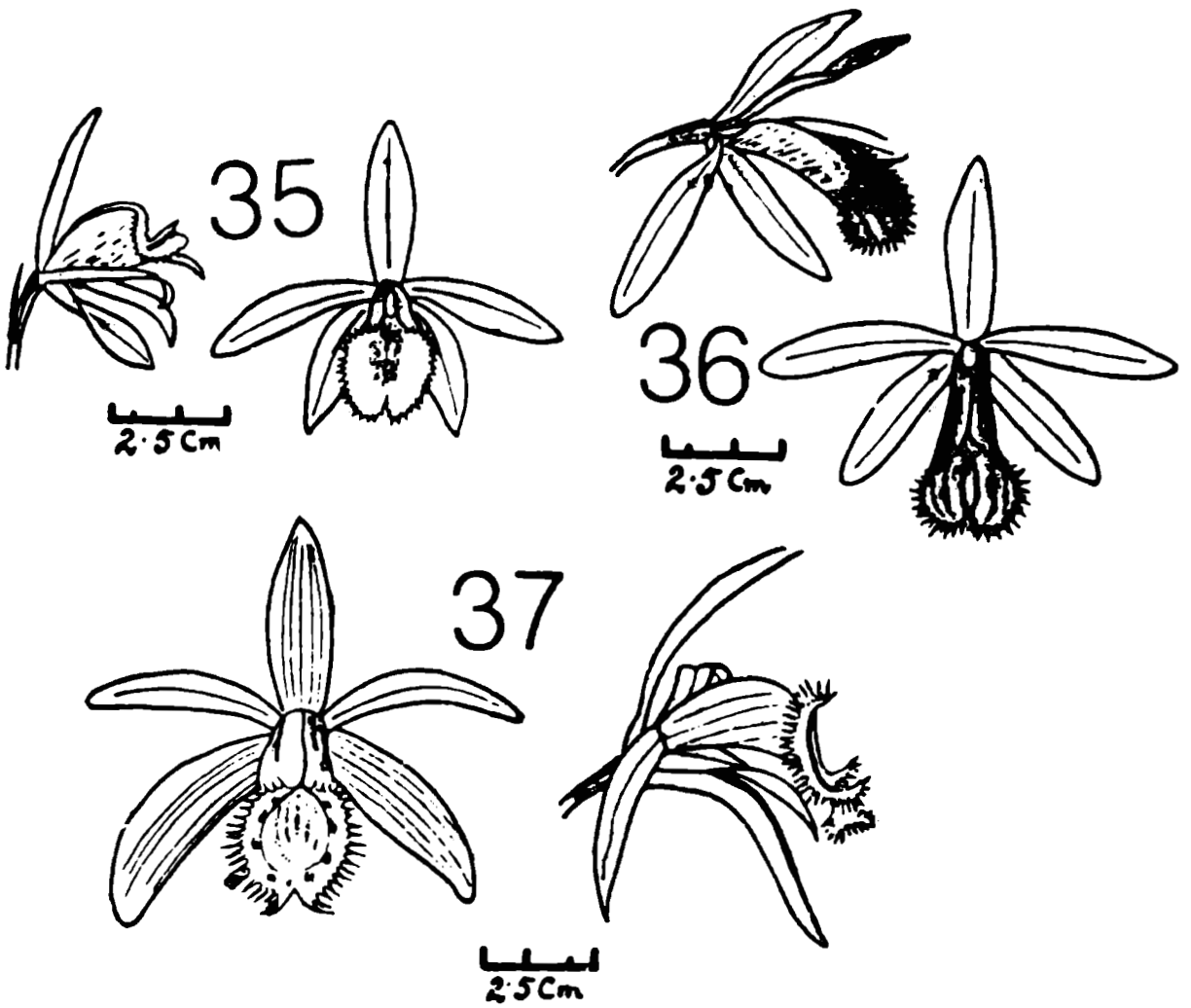


FIG. 35 *Pleione hookeriana* (Lindl.) O.Ktz. FIG. 36 *P. humilis* (Sm.) D. Don
 FIG. 37 *P. praecox* (Sm.) Don.

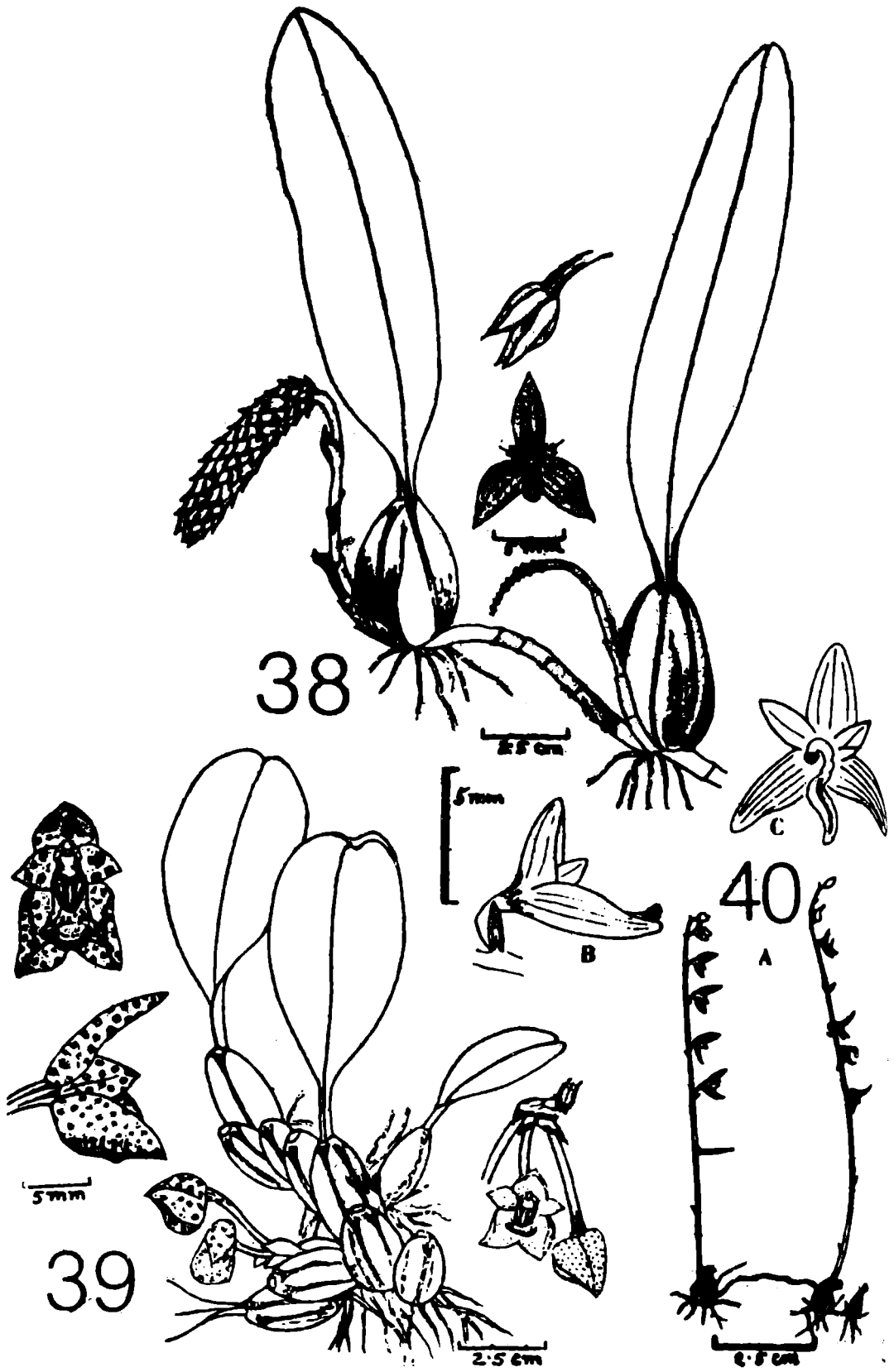


FIG. 38 *Bulbophyllum careyanum* Spr. FIG. 39 *B. leopardinum* (Wall.) Lindl.
 40 *Bulbophyllum polyrhizum* Lindl.

of the flower is given as white, pink or deep purple, but our material had flower which were greenish-yellow.

B. hirtum Lindl. Gen. et Spec. Orch. 51, 1830; F.B.I. 5 : 762, 1890; King & Pantl. 84, t. 117, 1898.

Flowers yellow or greenish-yellow, scented; dorsal sepal lanceolate 3-nerved, shorter and narrower, lateral sepals falcately lanceolate, 3-nerved, base broad; petals small, oblong, obtuse, ciliate; lip subsessile, clawed, linear-oblong, truncate, hispid below. *Flowering* in November and December; distributed at 1500 to 1800 m. Collected from Sheopuri and Sundarjal.

B. leopardinum (Wall.) Lindl. Gen. et Spec. Orch. 48. 1830; F.B.I. 5 : 756, 1890; King & Pantl. 67, t. 92, 1889; Hara in Fl. Eastern Himal. 427, 1966. *Dendrobium leopardinum* Wall. Tent. Fl. Nep. 39, t. 28, 1826. (Fig. 39).

Flowers subglobose, greenish or yellow, spotted purple; sepals broadly ovate, 9-nerved; petals broadly ovate, acute, 7-nerved; lip long stipitate, and with auricles at the base, base yellow, tip purple. *Flowering* during July and August; distributed at 1500 to 1800 m. Collected from Sundarjal, Sheopuri, Godavari, locality unknown (Herklott),

B. odoratissimum (Sm.) Lindl. Gen. et Spec. Orch. 55, 1830; F.B.I. 5 : 758, 1890; King & Pantl. 79, t. 109, 1898; Hara in Fl. Eastern Himal. 427, 1966. *Stelis odoratissima* Smith in Rees, Cyclop. 34, 1816. *S. caudata* D. Don, Prodr. Fl. Nep. 32, 1825.

Flowers yellow, sweet-scented; sepals subequal, lanceolate, caudate, 3-nerved, tips solid, petals minute, 1-nerved, sessile, papillose. *Flowering* during April and May, even upto mid August; and distributed at 900 to 1500 m. Collected from Yangsabessi-Pokhara area.

B. paleaceum Benth. & Hook. Gen. Pl. 3 : 503, 1883; F.B.I. 5 : 769, 1890.

Flowers drooping; sepals many nerved, laterals wholly connate, greenish, pink nerves; petals broadly oblong, spreading, sub-serrate, 1-3 nerved, membranous; lip ovate-lanceolate, purple, entire or slightly wavy, tip solid. *Flowering* during

October and November ; widely distributed at 1500 to 1800 m. Collected from Sheopuri, Sundarijal, Chandragiri, and Godavari.

B. polyrhizum Lindl. Gen. et Spec. Orch. 53, 1835 ; F.B.I. 5. 767, 1890 King & Pantl. 70, t. 45, 1898 ; Duthie, 104, 1906. (Fig. 40).

Rhizome thread-like, branched, pseudobulbs globular, c. 2.5 cm, apart ; leafless when in flowers ; racemes inclined, 5-6 flowered ; floral bracts minute, equalling the stalk of the ovary. Flowers pale yellow ; sepals spreading and unequal, lateral sepals longer, oblong-lanceolate, 3 nerved, dorsal sepal concave, ovate-oblong, smaller ; petals much shorter than the sepals, ovate, 1-nerved. Lip deflexed from the base, oblong basal half grooved, foot short and slightly curved. Flowering during October. Collected only once from Trishuli khola area at c. 765 m.

In F.B.I. the colour of the flower is given as green and it is also mentioned therein that the drawing of the Sikkim plant shows the colour to be pale yellow. Duthie gives the flower colour as yellow. The specimens that we have collected had flowers with a pale yellow colour. Hara (1966 & 1971) has not listed this species, and from other relevant literature it appears to us that the plant has not been collected many times. We have collected this only once and under the circumstances, we regard the species to be very rare in Nepal atleast. Further King & Pantl., on the basis of Gamble's material from Dehra Dun, give the flowering time as April, while Duthie basing on Mackinnon's material from Gharwal gives March as the flowering time. We collected the material in flowers during the month of October. Lastly, the shape of the lip of our material does not match with the drawings given by King & Pantl.

B. reptans Lindl. Gen. et Spec. Orch. 51, 1830 ; F.B.I. 5 : 768, 1890 ; King & Pantl. 77, t. 106, 1898 ; Hara Fl. Eastern Himal, 427, 1966.

Flowers sessile, spike lax ; sepals subequal, narrowly lanceolate, acute, 3-nerved, yellowish-purple, lateral sepals slightly

gibbous ; petals broadly obtuse, 1-3 nerved ; lip stipitate, recurved, yellow, column very small. *Flowering* during September and October, and again in February and March of the following year ; well distributed at 1800 to 2100 m. Collected from Sheopuri and Daman. This species is very much like *B. bicolor*.

B. striatum Reichb. f. in Walp. Ann. 6 : 257, 1861 ; F.B.I. 5 : 755, 1890 ; King & Pantl. 75, t. 102. 1898.

Flowers yellowish-green, striped with purple ; sepals subequal, oblong-lanceolate, 5-nerved ; petals ovate-lanceolate, acute, 1-nerved, half the length of the sepals ; lip linear-oblong, obtuse, thin, dull purple. *Flowering* during September and October ; distributed at 1500 to 1800 m. Collected from Sheopuri—above Narayanthan, and Shankhoo.

B. wallichii (Lindl.) Reichb. f. in Walp. Ann. 6 : 259, 1861 ; Hara Fl. Eastern Himal. 428, 1966. *Cirrhopetalum wallichii* Lindl. in Wal. Pl. Asiat. Rar. 1 : 53, t. 67, 1830 ; F.B.I. 5 : 776, 1890.

Flowers reddish-brown ; dorsal sepal oblong, tip rounded, 3-nerved, lateral sepals acuminate, falcately incurved, 5-nerved, 3-4 times longer than the dorsal sepal ; petals as long as the dorsal sepal and similar ; lip subacute. *Flowering* in March and April ; distributed at 2100 to 2400 m. Collected from Bagdwar-Sheopuri area, and Godavari. This species very much resembles *Cirrhopetalum hookeri* Duthie, but can be made out by the colour of the flower and the lax inflorescence ; the colour of the flower being yellow with reddish purple nerves.

c. *Calanthe* l. Br.

The name alludes to the beautiful flowers of most of the species. They are terrestrial with pseudobulbs and bear sizable distinctly folded leaves. The inflorescence is either erect or arching.

ARTIFICIAL KEY TO THE SPECIES OF *Calanthe*

- A. Spur absent ; flowers c. 1.8 cm in diam. ; lip brown-purple with 3 large eshy ridges.....*tricarinata*

AA. Spur present ; flowers large—c. 3 cm or more in diam.

B. Petals narrow ; lip longer than the sepals—

C. Lip with 3 basal lamellae..... *plantaginea*

CC. Lip without lamellae..... - *chloroleuca*

BB. Petals broad ; lip hardly exceeding the sepals..... *masuca*

***Calanthe chloroleuca* Lindl. Fol. Orch. 10, 1821-29 ; F.B.I. 5 : 852, 1890 ; King & Pantl. 231, 1898 ; Hara, 428 1966.**

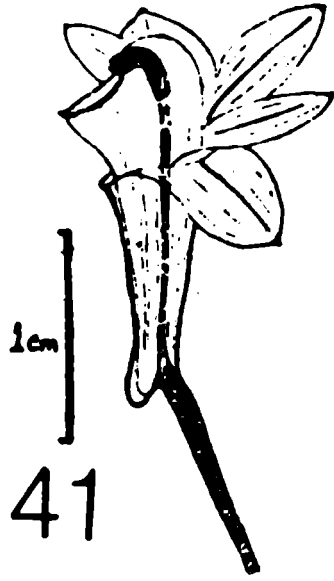
Scape stout, bracts very small. Sepals ovate-lanceolate, greenish, streaked with 3 red nerves ; petals lanceolate, 3-nerved, yellowish. Lip white, sidelobes small, rounded and folded on the middle lobe, midlobe obcordate, bilobed ; spur stout, longer than the sepals, puberulous. Authority Hara.

***C. masuca* (Don) Lindl. Gen. et Spec. Orch. 249, 1840 ; F.B.I. 5 : 851, 1890. *Bletia masuca* D. Don, Prodr. Fl. Nep. 30, 1825.**

Terrestrial ; flowers pale or dark purple. Sepals c. 2 cm long, lanceolate, acuminate, 5-nerved ; petals obovate or broadly oblong, 3-5-nerved. Lip exceeding the sepals 2.25 cm long, calli yellow, sidelobes falcate, oblong, middle much longer, broadly reniform, widened to c. 1.5 cm ; spur longer than the sepals. Flowering from July to September. Distributed at 1220 to 1980 m. Collected from Kakni hills, Brajrabarahi.

***C. plantaginea* Lindl. Gen. et Spec. Orch. 250, 1840 ; F.B.I. 5 ; 853. 1890 ; Duthie, Orch. North-West, Himal. 22, 1906. (Fig. 42).**

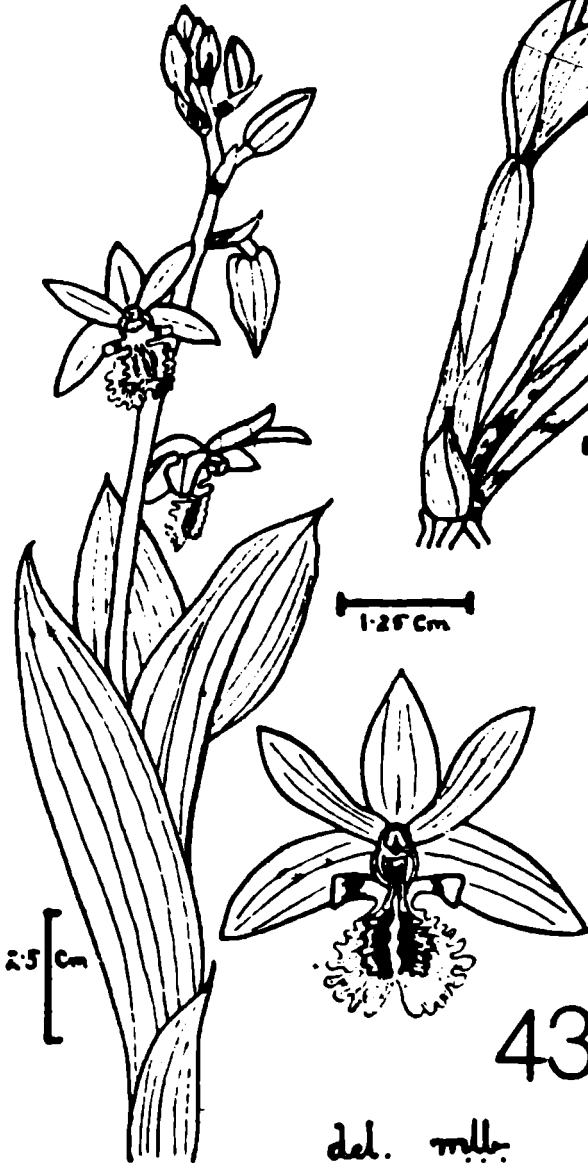
Flowers pale lilac ; sepals ovate-lanceolate, 35-nerved ; petals oblanceolate, acuminate, 3-nerved. Lip longer than the sepals with 3 small basal lamellae, sidelobes cuneat-obovate,



41



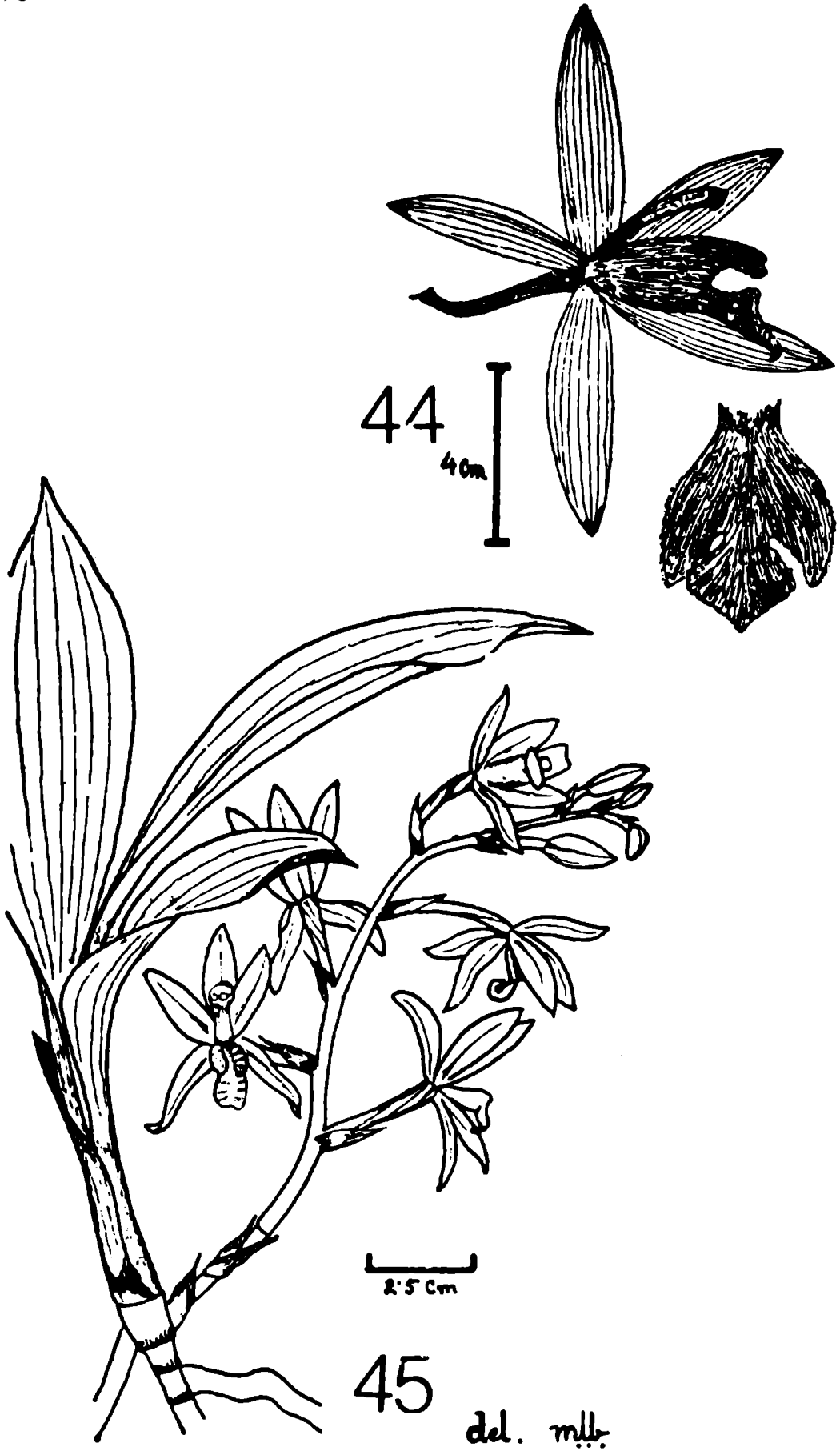
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Figs. 41 Flower of *Anthogonium gracile* Lindl.
 42 *Calanthe plantaginea* Lindl.; 43 *C. tricarinata* Lindl.



Figs. 44 Flower of *Cymbidium grandiflorum* Griff. (parts slightly displaced);
45 *C. lancefolium* Hook.

midlobe with 3 small ridges near the base, subtruncate, apiculate, spur longer than the sepals. Flowering during March and April. Distributed at 2135 to 2440 m. Collected from Papung to Topkegola, Godavari, locality unknown (Herklotts).

C. tricarinata Lindl. Gen. et Spec. Orch. 18, 1840 ; F.B.I. 5 : 847 1890 ; Duthie, Orch. North-West. Himal. 119, 1906. (Fig. 43).

Scape stout ; flowers greenish-red ; sepals lanceolate, acuminate, 7-nerved ; petals nearly as broad, acuminate, both green outside and whitish along the margins, 3-nerved. Lip sessile, brownish-purple, disk with 3 large crenulate ridges ; spur absent. Flowering during April and May. Collected from Ghorepani forest (Thakkhola area), Naukhola, locality unknown (Herklotts).

d. *Cirrhopetalum* Lindl.

The genus *Cirrhopetalum* has been considered a section of the genus *Bulbophyllum* by J.J. Smith (*Bull. Jard. Bot. Buitenz.* ser. 2, 8 : 19-29, 1912) and by Holttum (*REV. FL. MALAYA*, I, 1953) ; according to Pfitzer (*PFLANZENF.* 2 (6), 1889) and later Fischer, (*FL. MADRAS PRES.* 1928), *Cirrhopetalum* should be maintained an independent genus. Hooker (*FL. BRIT. IND.*-5 : 772, 1890) treated *Cirrhopetalum* as a separate genus although he adds 'the two genera might as well be regarded as one'. We follow those who have a preference for treating the genus separate and distinguish the genus as having flowers in whorled umbels, rarely in racemes or solitary. Posterior sepal as concave, much shorter than the lateral ones ; petals shorter than posterior sepal ; labellum small, tumid, entire and adnate to the foot of the column, and mobile, column short, apex with two tooth-like appendages.

ARTIFICIAL KEY TO THE SPECIES OF *Cirrhopetalum*

A. Flowers umbelled—

B. Dorsal sepal glabrous or nearly so. Petals crose and ciliate.
Flowers with a disagreeable smell.....*cornutum*

BB. Dorsal sepal and petals glabrous, quite entire

C. Lateral sepals 3-5 nerved

- D. Lateral sepals 3-nerved ; petals obliquely ovate...
*hookeri*
- DD. Lateral sepals 5-nerved ; petals broadly ovate
*elatum*
- CC. Lateral sepals 7-nerved, twice as long as the dorsal sepal
 D. Flowering scape shorter than the leaf. Flowers
 unspotted. Columnar spurs small, teeth-like
*maculosum*
- DD. Flowering scape exceeding the leaf. Flowers
 spotted. Columnar spurs long*guttulatum*
- AA. Flowers racemose. Lateral sepals many times longer than the
 dorsal sepal. Lip spotted with red.....*refractum*

Cirrhopetalum cornutum Lindl. Bot. Reg. Misc. 75, 1838 ;
 F.B.I. 5 : 774, 1890.

Flowers with an unpleasant smell ; dorsal sepal small, green and blotched with purple-brown, lateral sepals linear-lanceolate, obtuse, 5-nerved, many times longer than the dorsal sepal ; petals ovate, acute, ciliate, 3-nerved, green and blotched with purple-brown ; lip smooth. *Flowering* time during July and August ; distributed between 900 to 1200 m. Collected from Dhankutta.

C. elatum Hook. f. in F.B.I. 5 : 775, 1890. (Fig. 46)

Flowers yellow, sometimes speckled with purple, in umbels ; dorsal sepal small, orbicular, broadly ovate, obtuse, lateral sepals 2.5-3 cm. long, linear-lanceolate, acute, 5-nerved, 3-4 times longer than the dorsal sepal; petals ovate, tip apiculate ; lip convex. *Flowering* in June Collected from Jiri, locality unknown (Herklott).

C. guttulatum Hook. f. in F.B.I. 5 : 776, 1890

Sepals spreading, dorsal sepal broadly obtuse, 5-nerved, lateral sepals ovate-lanceolate, base broad, 7-nerved, twice as long as the dorsal sepal, yellow or greenish-yellow, speckled with purple ; petals ovate, 3-nerved ; lip short, as long as broad, purplish. *Flowering* in September and October ; distributed between 1500 & 1800 m. Collected from Sheopuri and Sundarijal area. This species resembles *C. maculosum* but can be made out by the size of the scape, flowering time etc.

C. bookeri Duthie in Journ. Asiat. Soc. Bengal 71 (2) : 38 1902.

Flowers 3 to 6, yellow ; dorsal sepal ovate, emarginate, concave, pale yellow with 3 purple veins, lateral sepals united at their bases and joined to the foot of the column, acuminate, tips cupulate, yellow with 3 purple veins which are more prominent towards the base ; petals shorter than the dorsal, sepal, obliquely ovate, rounded, yellow with bases slightly purple ; lip deflexed, fleshy, yellow with purplish spots. *Flowering* during September and October ; distributed between 2100 to 2400 m. Collected from Daman and Borlong forests.

C. maculosum Lindl. Bot. Reg. Misc. 81, 1841 ; F.B.I. 5 : 776, 1890.

Flowers pale yellowish-green, unspotted ; dorsal sepal broadly ovate, acute, lateral sepals ovate-lanceolate, base broad, 7-nerved, twice as long as the dorsal sepal ; petals small, ovate, acute, 3-nerved ; lip short, broad, stipitate. *Flowering* during March and April ; distributed between 1500 & 1800 m. Collected from Godavari only.

C. maculosum var. *fuscescens* Hook. f. in F.B.I. 5 : 776, 1890.

Flowers dull in colour, slightly pinkish. Only one specimen collected from Godavari.

C. refractum Zollinger in Flora 30 : 457, 1847 ; F.B.I. 5 : 779, 1890.

Flowers orange yellow or even deeper ; dorsal sepal lanceolate, acute, finely ciliate, 3-nerved, lateral sepals strap-shaped, acuminate, slightly cohering at the tips, many times longer than the dorsal sepal, orange-yellow or deeper ; petals lanceolate, finely ciliate, 3-nerved ; lip spotted red. *Flowering* time during September and October ; collected at 1800 m from Sheopuri.

e. **Cremastra** Lindl.

The generic name refers to the pedicellate ovary. They are terrestrial orchids and are small and insignificant plants.

Cremastra appendiculata (D. Don) Makino, in Bot. Mag. Tokyo, 18 : 24, 1904 ; Schlechter, Orch. Sino-Japan 225, 1919 ; Hara, 429, 1966. *Cymbidium appendiculata* D. Don, Prodr. Fl. Nep. 36, 1825. *Cremastra walllichiana* Lindl. Gen. et Spec. Orch. 173, 1833 ; F.B.I. 6 : 16, 1890 ; King & Pantl. 182, t. 246, 1898.

Terrestrial with a solitary leaf and the flowering scape about 50 cm long. Flowers purple c. 3.8 cm in diam.; sepals and petals very long, narrow, conniving into a tube below, lanceolate, acuminate and spreading, recurved above. Lip adnate to the base of the column, erect, linear, base saccate, tip dilated and 3-lobed, lobes linear ; column long and straight with top dilated and 3-lobed: Flowering during June. Collected from Hongaon to Sempung at c. 1980 m.

f. *Cymbidium* Sw.

The name alludes of the boat-shaped lip. These are mostly epiphytic but some are terrestrial as well. Leaves are usually very long, narrow and coriaceous. Inflorescence is pendulous, arching or erect. Floral shape is diversified so also is the coloration.

ARTIFICIAL KEY TO THE SPECIES OF *Cymbidium*

- A. Labellum broad, rostellum usually not beaked—
 - B. Leaves elliptic-lanceolate, 15-25 cm long ; scape shorter than the leaves, few-flowered : fls. c. 3.5 cm in diam. *lanceifolium*
 - BB. Leaves, very long, tips usually lobed ; scape many-flowered ; fls. c. 3.5 cm in diam. *simulans*
 - BBB. Leaves linear or linear-lanceolate—
 - C. Flowers c. 5-6 cm in diam.
 - D. Bracts large, equalling or exceeding the ovary ; leaves 60-95 cm long. *cyperifolium*
 - DD. Bracts small—
 - E. Lip pubescent ; leaves c. 65-75 cm by 1.5-2 cm, not notched ; fls. 3.5-5 cm in diam. *pendulum*
 - EE. Lip pubescent and ciliate all over ; leaves c. 30-65 cm by 2-4 cm ; fls. c. 5-6 cm in diam. *giganteum*

EBE. Lip papillose within and not ciliate ; leaves
c. 60-95 cm by 1-2 cm ; fls. c. 5-6 cm in
diam. *longifolium*

CC. Flowers c. 8-10 cm in diam., long fimbriate hairs on the
margin of the lip *grandiflorum*

AA. Labellum narrow ; rostellum beaked ; bracts small. *elegans*

***Cymbidium cyperifolium* Wall. ex Hk. f. in Fl. Brit. Ind. 6 :
13, 1890.**

Epiphytic ; flowers greenish and fragrant ; sepals and petals
linear lanceolate, acute pale green and yellow streaked with red ;
lip narrow, glabrous, greenish or greenish- white, spotted red.
Flowering during March and April. Collected from Godavari
at c. 2135 m.

***C. elegans* Lindl. Gen. et Spec. Orch. 163, 1833 ; Hara 430,
1966. *Cypererchis elegans* Bl. Rumphia 4 : 47, 1836 ; F.B.I. 6 :
14, 1890 ; King & Pantl. 159, t. 259, 1898.**

Epiphytic. Flowers white or pale yellow ; sepals and petals
linear oblong, acute, tips recurved. Lip as long as the petals,
slightly recurved, sparsely hairy towards the base, central ridges
terminating below in 2 long pubescent calli, hypochile narrowly
cuneate, sidelobes spreading but apically incurved, obtuse nearly
as long as the midlobe, midlobe suborbicular, margin undulate.
Flowering from september to November. Distributed at 1825 to
2135 m. Collected from Sheopuri and Kakni.

***C. giganteum* Wall. ex Lindl. Gen. et Spec. Orch. 163, 1833 ;
F.B.I. 6 : 12, 1890.**

Epiphytic, inflorescence longer than the leaves. Flowers
smaller than *C. grandiflorum*, c. 5-6 cm in diam. ; floral bracts
minute ; sepals and petals oblong-lanceolate, acute, green
streaked with purple all over, midlobe large, orbicular. *Flower-*
ing September and October. Distributed between 1220-1525 m.
Collected from Godavari, Sundarijal Nall near Banepa.

***C. grandiflorum* Griff. Icon. Pl. Asiat. t. 321, 1874 ; F.B.I.
6 : 12, 1890 ; King & Pantl. 192, t. 256, 1896 ; Hara, 430, 1966.
(Fig. 44).**

Epiphytic. Flowers sweet smelling, c. 10 cm in diam., sepals and petals oblong-lanceolate acute, green, dorsal incurved lateral sepals recurved. Lip yellowish, pubescent and ciliate, midlobe large, suborbicular, waved and crenulate, speckled with purple spots, two hairy ridges on the disk between the sidelobes. *Flowering* during May and June. Distributed between 1525 to 2300 m. Collected from Rhingmo to Jubing, Bokejunde near Trisuli, Bhojpur.

The presence of long fimbriate hairs on the margin of the lip is a very characteristic feature of this species.

C. lancefolium Hook. Exot. Fl. t. 51, 1828 ; F.B.I. 6 : 9, 1890. (Fig. 45).

Epiphytic ; scape erect and usually shorter than the leaves. Flowers fragrant ; c. 3.5 cm ; sepals yellowish or pale green, lanceolate, acuminate ; petals rather broader, white or paler, with a pink midrib. Lip white and spotted purple, sidelobes narrow and rounded, midlobe ovate, obtuse, slightly curved downwards, 2 median lamellae between the sidelobes, column greenish with purple markings. Flowering during June to August. Distributed at 1220 to 1525 m. Collected from Sheopuri, Sundarjal, Nagarjung, locality unknown (Herklotts).

C. longifolium D. Don, Prodr. Fl. Nep. 36, 1825 ; Lindl. Gen. et Spec. Orch. 163, 1833 ; F.B.I. 6 : 13, 1890 ; King & Pantl. 196, t. 254, 1898 ; Hara, 430, 1966 . *Cymbidium erythraeum* Lindl. Journ. Linn. Soc. 3 : 30, 1859.

Epiphytic ; with the inflorescence curved in the upper part. Flowers smaller than that of *C. giganteum*, c. 5-6 cm in diam., mildly scented, floral bracts minute. Sepals and petals linear-oblong or even lanceolate, acute, greenish and streaked with red or purplish lines. Lip papillose within not ciliate ; midlobe broadly ovate or orbicular, white and spotted with red. Flowering from late September to November. Distributed at 1830 m. Collected from Sheopuri above Tokha.

The smaller sized flowers and the absence of marginal fimbriate hairs on the lip are characteristic features.

C. pendulum (Roxb.) Sw. in Nov. Act. Soc. Sci. Upsal. 6 : 73, 1799 ; King & Pantl. 188, t. 251, 1898 ; Duthie, Orch. North-West. Himal. 136, 1906 ; Hara, 431, 1966 . *Epidendrum pendulum* Roxb. Pl. Corm. 1 : 35, t. 44, 1795 . *Cymbidium aloifolium* Lodd. Bot. Cat. 10, t. 967, 1825 non Swartz, F.B.I. 6 : 10, 1890 (pp).

Epiphytic with inflorescence decurved from base, and covered by many imbricate sheaths, shorter than leaves. Flowers not crowded, light yellow, c. 3.5-5 cm in diam., floral bracts minute. Sepals slightly dilated near their apices, oblong, petals as long as sepals, margins yellow. Lip oblong, dilated and sub-saccate at base, midlobe blunt, emarginate, decurved, side-lobes with blunt apices and erect, disk with two lamellae which are divergent at the base. Flowering during May to July. Distributed at 305 to 915 m. Collected from Hittaura and Dhankutta.

C. pendulum Sw. and *C. aloifolium* Sw. are distinct species and the differences have been shown by King & Pantl. Similarly *C. simulans* is also confused with *C. aloifolium* Sw and this has been clarified by Cooper (Dist. Gard. 2 : 610, 1915).

C. simulans Rolfe, in Orch. Rev. 25 : 175, 1917 ; Holttum, 519, 1953 ; Hara, 413, 1966 . *C. aloifolium* Sw., sensu Hk. f. in F.B.I. 6 : 10, 1890 ; King & Pantl. 189, t. 252, 1898.

Epiphytic with inflorescence usually 25 cm long and pendulous. Flowers variable in colour and size, usually dull purplish-brown with pale borders, c. 3.5 cm in diam. ; sepals and petals linear-oblong, subacute. Epichile broadly oblong and equalling the hypochile, disk with two curved thick lamellae. Flowering during May and June. Distributed in the tropical region, particularly in the terai at 300 to 915 m. Collected from Dingla Khandbari, Hittaura, Dhunibesi, Dhaitarbesi.

g. *Geodorum* Jacks.

Also known as 'Gift of the earth'. It gets the name from the terrestrial habit. It has tuberous bulb-like rootstock. The

leaves are large, scape bearing a densely flowered drooping raceme. It belongs to the same tribe as *Cyrtopodium* and *Eulophia*.

***Geodorum densiflorum* (Lam.) Schltr.** in Fedde-Report-Beih 4 : 259, 1929. *Linodorum densiflorum* Lam. Encyl. 3 : 516, 1791-1792. *Geodorum purpureum* R.Br. in Ait. Hort. Kew (ed. 2.) 5 : 207, 1813 ; F.B.I. 6 : 17, 1890 ; King & Pantl. 181, t. 245, 1898 ; Duthie, 130, 1906. *C. dilatatum* R.Br. in Ait. Hort. Kew (ed. 2.) 5 : 207, 1813 ; F.B.I. 6 : 17, 1890. (Fig.47).

Terrestrial, rhizome subglobose ; leaves elliptical and tapering into sheaths which form a pseudostem, broad, plicate. Inflorescence shorter than the leaves, dense flowered ; bracts lanceolate and longer than the ovary. Flowers pale purple, linear oblong, 3 nerved ; petals 5 nerved with the midrib thick, slightly broader than the sepals. Lip thickened towards the base as well at the apical lobe, bark purple markings on the lip, disk with bright yellow callus, apical lobe notched. Flowering during May to early July. Collected from Trishuli khola area at c. 765 m.

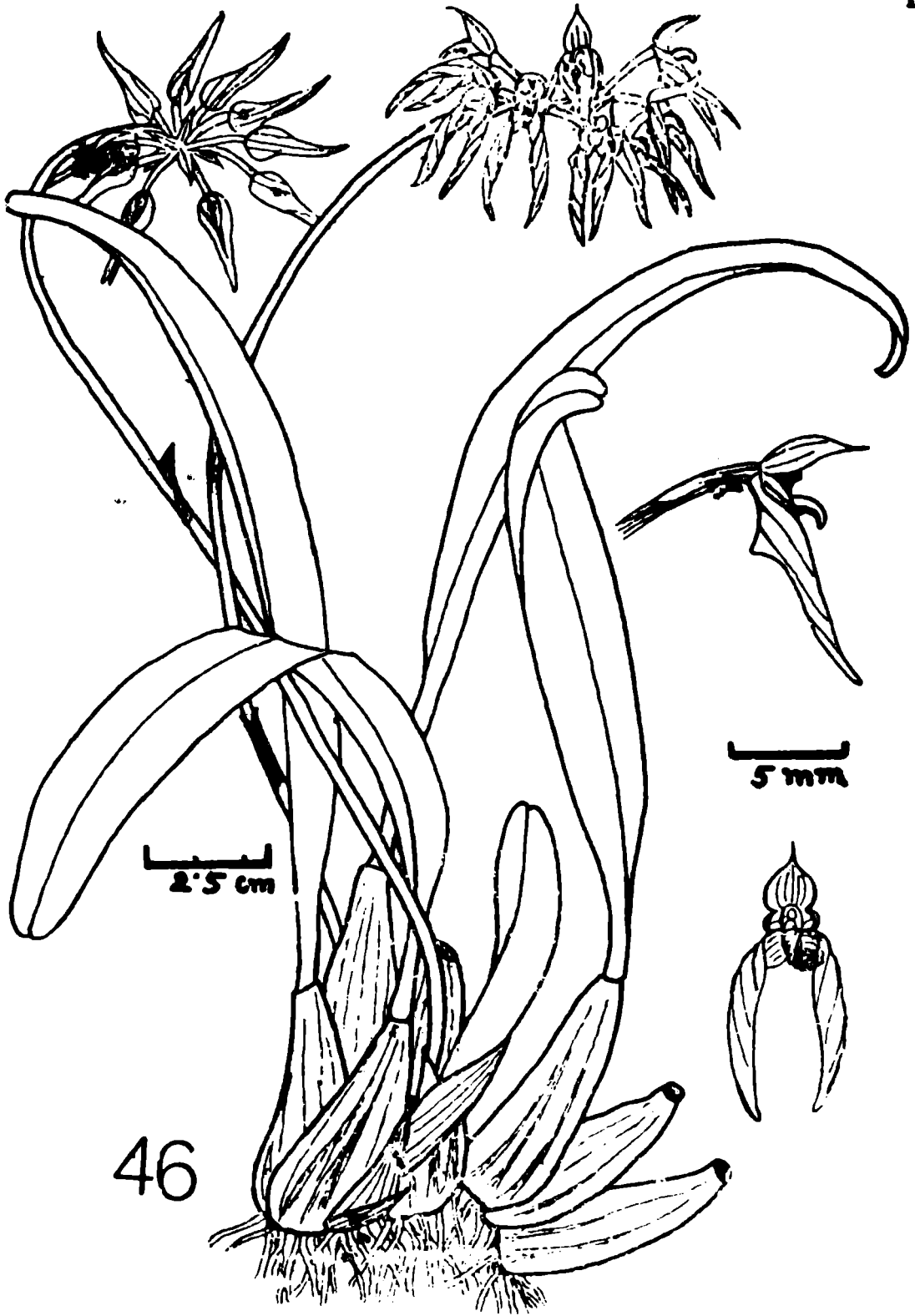
h. *Oreorchis* Lindl.

Terrestrial and saprophytic orchids with 1 or 3 leaves which are narrow. Flowering stem erect with small flowers.

***Oreorchis foliosa* (Lindl.) Lindl.** Journ. Linn. Soc. 3 : 27, 1859 ; F.B.I. 5 : 709, 1890 ; King & Pantl. 183, t. 137, 1898 ; Duthie, Orch. North-West. Himal. 131, 1906 ; Hara, 446, 1966 *Carallorhiza foliosa* Lindl. Gen. et Spec. Orch. 535, 1840.

Leaf solitary, oblong-lanceolate and with prominent nerves. Flowers red or reddish c. 1 cm in diam ; dorsal sepal linear-oblong, subacute, straight, lateral sepals falcately oblong, acuminate ; petals broadly oblong, obtuse. Lip many-nerved, base produced into a sac, lateral lobes erect, rounded and short, midlobe as large as both the side lobes, notched.

Flowering during July. Collected from Bangukhola, Sama (Kitamura).



46

FIG. 46 *Cirrihopetalum elatum* Hk.f

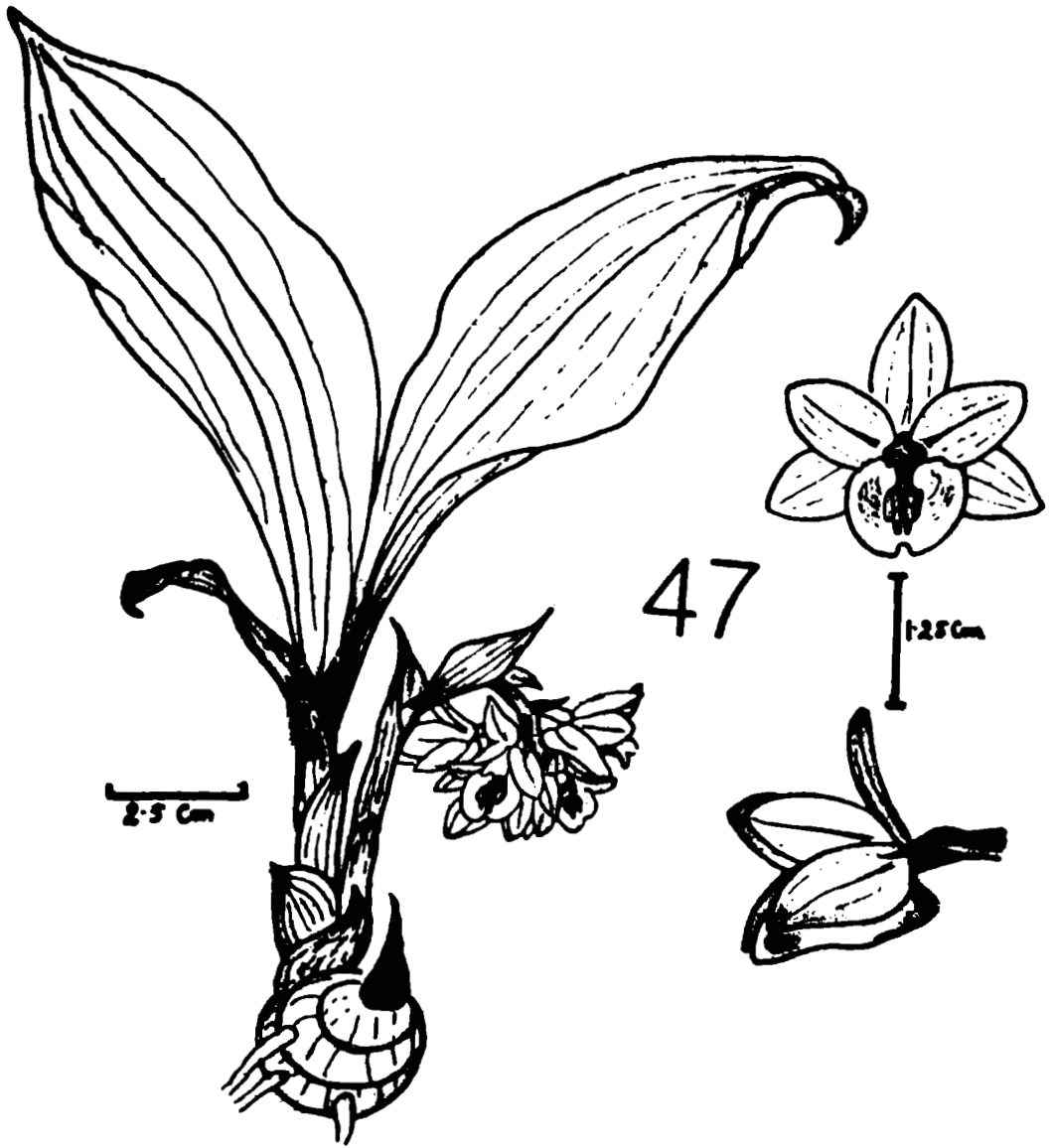


Fig. 47 *Geodorum densiflorum* (Lam.) Schltr.

1. *Pachystoma* Bl.

Terrestrial orchids with thick rhizome. Leaf solitary or in pairs and appearing after the flowers. Inflorescence is crowded with small flowers that are tinted pink. The apex of the lip is thick.

Pachystoma senile (Lindl.) Reichb. f. in *Boplandia*, 3 : 250, 1858 ; F.B.J. 5 : 812, 1890 ; King and Pantl. 101, t. 140, 1898 ; Duthie, *Orch. North-West. Himal.* 108, 1906 . *Apaturia senilis* Lindl. *Gen. et Spec. Orch.* 130, 1831.

Terrestrial orchid with usually a solitary leaf. Flowers white or greenish-white and tinted pink, glandular, puberulous. sepals c. 1 cm long, membranaceous, acute 5-nerved, lateral sepals adnate to the base of the column. Lip greenish-yellow, sessile on the base of the column, erect, side lobes oblong, midlobe small and turned downwards, disk with 5 fimbriate ridges from the base to the midlobe and then thickened. Flowering in April and May . Authority Parker.

1. *Spathoglottis* Bl.

Orchids with creeping rhizome from which pseudobulbs arise. According to Hawkes the structure of the blossoms is a characteristic one, not to be readily confused with any of the related genera. The lip is strongly 3-lobed and the column is winged.

Spathoglottis ixloides (D. Don) Lindl. *Gen. et Spec. Orch.* 120, 1831 ; F.B.J. 5 : 814, 1890 . *Cymbidium ixloides* D. Don , *Prodr. Fl. Nep.* 36, 1825.

Creeping terrestrial orchid with a scape c. 10-15 cm long. Flowers yellow, c. 3-3.5 cm in diam., sepals and petals about equal, sepals hairy, spreading. Lip 3-lobed, midlobe of subsaccate lip cuneate or obcordate with an auricle on each side at its base, side lobes very broad, ablong disk pubescent. Flowering time April-May; distributed between 2895 to 3810 m. Collected from Puyia forest Chempua ridge ; Gumurang to Sarti (Kitamura).

k. *Sunipia* Lindl.

Tufted epiphytes with creeping rhizomes and narrow pseudobulbs. Leaf one, subsessile, many-nerved and coriaceous. Spike curved; flowers distichous, concealed by scarious or coriaceous bracts, rosypink; lip sessile on the base of the column, tongue-shaped and with an oblong callus; column very short; anthers sessile, distant or turned away from the rostellum.

Sunipia scariosa Lindl. Gen. et Spec. Orch. 179, 1830; F.B.I. 5 : 772, 1890. *Ione scariosa* King & Pantl. 161, 1898.

Flowers small, subsessile, rosy and concealed by the bracts; sepals very broad, spreading, subequal, faintly 3-nerved; petals minute, rounded, ovate fleshy; lip small, erect, broadly tongue-shaped, mid-lobe thick, oblong and with recurved margins. Flowering time May to June; distributed at 1200 to 1800 m. Collected from Sundarijal and Godavari.

ii. *Monopodiales*ARTIFICIAL KEY TO THE GENERA (*tribe Sarcantheae*)

- A. Lip not spurred. Column without a foot, short and not winged—
 - B. Sepals & petals not spreading widely; lip not jointed at base, lower part of lip (hypochile) concave, apical part (epichile) broad and decurved.....*Luisia*
 - BB. Sepals and petals spreading widely—
 - C. Lip not jointed at the base and shorter than the sepals; fls. of medium size.....*Vandopsis*
 - CC. Lip jointed at the base and differentiated into a hypochile and epichile.....*Esmeralda*
- AA. Lateral sepals adnate to the foot of the column, forming a mentum; spur when present distant from the base of the lip—
 - B. Lip with a long claw, 3-lobed, not spurred; column winged. Lateral sepals adnate with the foot of the column to form a conical mentum.....*Doritis*
 - BB. Lip saccate at its union with the foot of the column; column wingless; basal part of lip (hypochile) forming a hairy sac; lateral lobes of lip absent.....*Rhynchostylis*
 - BBB. Lip adnate to the base of the column, gibbous or shortly spurred; sidelobes of lip large and erect; leafless when flowering, stem absent.....*Chiloschista*

- BBBB.** Lip jointed to the foot of the column, spurred.....*Aerides*
AAA. Lip saccate or spurred at the base ; column wingless—
D. Sepals and petals fleshy and widely spreading—
E. Flowers large ; labellum large, sidelobes large, base saccate or spurred.....*Vanda*
EE. Flowers small ; labellum adnate to the base of the column, spurred.....*Sarcanthus*
EEE. Flowers small ; base of labellum with a long or short and wide spur, sidelobes absent or very small.....*Gastrochilus*
DD. Sepals and petals not spreading—
F. Flowers small and fleshy, sepals and petals concave.....*Acampe*
FF. Flowers large, sepals spreading, lateral sepals connate at the base of the lip and together forming the mentum.....
.....*Ornithochilus*

a. *Acampe* Lindl.

The name probably refers to the small and brittle flowers. Plants are epiphytic and the leaves are fleshy and slightly recurved. The floral structures are very much like those of *Sarcanthus*, and in fact the genus is treated as a section of *Saccolabium* by Hooker. According to Lindley this genus is characterised by the small, brittle and inflexible flowers.

ARTIFICIAL KEY TO THE SPECIES OF *Acampe*

- Leaves more than 15 cm long ; flowers pale yellow.....*longifolia*
 Leaves c. 10 cm long, obliquely notched ; flowers dark yellow.....
 *papillosa*

***Acampe longifolia* (Lindl.) Lindl.** Fol. Orch. 1 : 1853 ; Holttum, 621, 1953. *Vanda longifolia* Lindl. in Lindl. & Paxt. Flow. Gard. 2 : 21, 1851-52. *Saccolabium longifolium* Hk. f. in Fl. Brit. Ind. 6 : 662, 1890 ; King & Pantl. 220, t. 292, 1898.

Stem robust and densely leafy; leaves more than 15 cm long, upper part broader than the lower. Flowers fleshy c. 1.5 cm in diam., delicately fragrant ; sepals and petals pale yellow with deep brown stripes, dorsal sepal 1.3 cm long,

obtuse, lateral sepals slightly keeled, petals slightly smaller than the sepals. Lip 1 cm long, fleshy, white with a few purple spots, base saccate, sidelobes erect, midlobe reflexed and hairy at the base. *Flowering* during September and October. Distributed at 305 to 1075 m. Common.

A. papillosa (Lindl.) Lindl. Fol. Orch. 2, 1853. *Saccolabium papillosum* Lindl. Bot. Reg. t. 1552, et Gen. et Spec. Orch. 222, 1830 ; F.B.I. 6 : 63, 1890.

Leaves about 10 cm long, obliquely notched. Scape 2.5-5 cm long ; flowers 1.5 cm in diam ; sepals and petals dark yellow spotted with dull brown. Midlobe of lip ovate, rosy, spur conical, pubescent within. *Flowering* during September to November. Distributed at about 610 m. Collected from Kuroanadi at Hittaura, Bindraban forest, Hittaura, Narayani.

b. *Aerides* Lour.

In vegetative appearance these orchids resemble the Vandas. The inflorescence is an elongated pendulous raceme bearing a number of flowers.

ARTIFICIAL KEY TO THE SPECIES OF *Aerides*

- Terminal lobe of lip large, hastate-rounded ; spur short and straight
*multiflorum*
- Terminal lobe of lip small, oblong-lanceolate, incurved ; spur long and incurved
*odoratum*
- Terminal lobe of lip slightly dilated and bifid ; spur long and straight
*longicornu*

Aerides longicornu Hk. f. Icon. Pl. 22, t. 2127, 1889 et F.B.I. 6 : 44, 1890.

Flowers white; sepals and petals with crisp margin, lateral sepals much larger than the petals, petals orbicular or oblong. Lateral lobes of lip curved forwards, shorter than the long spur, mid lobe narrow, clawed, tip slightly dilated, bifid. *Flowering* during September and October. Collected from Sundarijal area c. 1525 m.

A. multiflorum Roxb. Pl. Corm. 6 : 63, t. 271, 1820 ; F.B.I. 6 : 44, 1890 ; King & Pantl. 212, t. 283, 1898 ; Duthie, 142, 1906 ; Holttum 694, 1953 ; Hara, 425, 1966. (Fig. 48).

Inflorescence very densely flowered, longer than the leaves; flowers white or rose-purple, spotted with darker purple spots, c. 2 cm in diam., fragrant. Sepals and petals subequal, tips rounded. Lip twice as long as the sepals, purple but darker in the middle, lateral lobes small and recurved, midlobe hastate, c. 1.7 cm long, tip rounded, spur short and straight. *Flowering* during June and July. Distributed at 304 to 915 m. Collected from Dhupu to Wana, Hittaura, locality unknown (Herklotts).

A. odoratum (Poir) Lour. Fl. Cochinch. 525, 1790; F.B.I. 6 : 47, 1890. *Epidendrum odoratum* Poir. Encycl. Supp. 1 : 385, 1811.

Inflorescence many-flowered equalling or longer than the leaves. Flowers purple or whitish purple, sweet smelling, 2.5 to 3.8 cm in diam.; sepals and petals 1.2 cm long, lateral sepals much longer than the dorsal sepal and petals. Lip funnel-shaped, prolonged at the base to form a spur, lateral lobes erect, white midlobe linear, marginate, greenish at its apex and spotted all over, tip 3-lobed. *Flowering* during July and August. Distributed at 304 to 915 m. Collected from Hittaura area.

c. *Chiloschista* Lindl.

Dwarf, epiphytic orchids, leafless when flowering. The name alludes to the cleft lip. Hooker (Fl. Brit. Ind.), and King & Pantl., placed it as a section under *Sarcochilus*. Pfitzer and J.J. Smith recognised the genus as an independent one. Later Schlechter (1927) again united it with *Sarcochilus*.

ARTIFICIAL KEY TO THE SPECIES OF *Chiloschista*

Flowers white	...	...	...	...	...	...	...<i>usneoides</i>
Flowers yellow, spotted with purple	...	...	...	...	...	...	...<i>lunifera</i>

Chiloschista lunifera (Reichb. f.) J.J. Sm. Fl. Buitenz. 6 : 553, 1905. *Thrixspermum luniferum* Reichb. f. in Gard. Chron. 1886, 786, 1886. *Sarcochilus luniferus* (Reichb. f.) Bth. ex Hk. f. in Bot. Mag. 115, t. 7044, 1889 et Fl. Brit. Ind. 6 : 37, 1890; King & Pantl. 207, t. 276, 1898.

Roots tufted and stem much reduced. Inflorescence elongate 7-15 cm long, many-flowered; flowers c. 1.5 cm in diam., yellow spotted with purple. Sepals spreading, oblong, obtuse. Lip 3-lobed, sidelobes linear-oblong, obtuse, midlobe truncate, emarginate. *Flowering* during February and March. Distributed at 1300 to 1980 m. Collected from Bhadgaon to Dhulikhel, Hittaure.

Hooker remarks 'except in the colour of the flower, no difference from *usneoides*'.

C. usneoides (Don) Lindl. Gen. et Spec. Orch. 219, 1830 et Bot. Reg sub. t. 1522, 1831. *Epidendrum usneoides* D. Don, Prodr. Fl. Nep. 37, 1825. *Sarcochilus usneoides* Reichb. f. in Walp. Ann. 6 : 497, 1861 ; F.B.I. 6 : 37, 1890.

Roots tufted and stem absent. Inflorescence 7 to 15 cm long, densely flowered. Flowers c. 1.3 cm in diam., white; sepals spreading, oblong, obtuse. Sidelobes of lip erect, linear-oblong, obtuse, disk between the lobes pubescent, midlobe truncate and emarginate. *Flowering* during February and March. Distributed at 1525 to 1830 m. Collected from Sundarikal, Sheopuri area, locality unknown (Herklotts).

d. *Doritis* Lindl.

According to Schultes and Pease the name refers to the hastate lip or perhaps to *Doritis*, one of the names of the goddess Aphrodite. The column is winged, and its foot forms a spur-like mentum with the sidelobes of the lip. The plants have short stem and the few leaves are clustered.

Doritis taenialis (Lindl.) Benth. in Benth. & Hook. f. Gen. Pl. 3 574, 1883 ; F.B.I. 6 : 31, 1890 ; King & Pantl. 199, t. 266, 1898 ; Duthie, 138, 1906 ; Hara, 433, 1966. *Aerides taenialis* Lindl. Gen. et Spec. Orch. 239, 1833.

Inflorescence few-flowered (about 6), pendulous; flowers mauve-purple. c. 2 cm in diam., dorsal sepal oblong, lateral sepals broader; petals shorter than the sepals. Lip adnate to the foot of the column, sidelobes of lip very narrow, spatulate, reflexed on the disk, midlobe dark red. *Flowering* during May

and June. Distributed at 915 to 1830 m. Collected from Chainpur to Mialay, Naudhara, Nagarjung.

e. *Esmeralda* Reichb. f.

Schultes and Pease giving the etymology of the name mention that it may possibly refer to the overwhelming beauty of the flower which makes this orchid a jewel in collections or perhaps to the very deep green hue of the foliage. Hawkes considered *Esmeralada* a synonym of *Arachnanthe*.

Esmeralda clarkei Reichb. f. Gard. Chron. 2 : 552, 1886. *Arachnanthe clarkei* Rolfe, Gard. Chron. 2 : 567, 1888 ; F.B.I. 6 : 28, 1890. *Arachnis clarkei* (Reichb. f.) J.J. Sm. in Nat. Tijdschr. Ned. Ind. 72 : 76, 1912 (Fig. 49).

Inflorescence c. 20 cm long, few-flowered (3-4), flowers c. 7.5 cm in diam., fleshy, very fragrant ; sepals and petals falcate, bright chestnut brown with yellowish stripes, dorsal sepal erect. Lip almost the length of the petals, base narrowed, sidelobes short, broad, erect, midlobe ovate-cordate, obtuse, a small lobule at apex, surface with a number of ridges. Flowering during February and March and again in November. Collected from Sundarijal at 1830 m, locality unknown (Herklotts).

f. *Gastrochilus* D. Don

As the lip is belly-shaped, the name refers to that character, J.J. Smith who had previously treated *Gastrochilus* as a section of *Saccolabium*, raised it to generic level. *Gastrochilus* can be differentiated from *Sarcochilus* R. Br. and *Saccolabium* Bl. by the fleshy flowers. Lip immovable; midlobe, flat, hairy, and fringed column very short, footless. The pollinia are shorter than the caudicles.

ARTIFICIAL KEY TO THE SPECIES OF *Gastrochilus*

Spur short—

- | | |
|--|------------------------|
| Sidelobes of lip present, midlobe fringed, papillose-hairy..... | <i>calceolaris</i> |
| Sidelobes of lip absent, midlobe entire, surface more or less glabrous (not hairy) | <i>distichus</i> |
| Spur long with a bilobed apex | <i>affine</i> |

Gastrochilus affine (King & Pantl.) Schltr. Fedd; Rep. 12 : 314, 1913 ; Hara, 434, 1966. *Saccolabium affine* King & Pantl. Ann. Roy Bot. Gard. Cal. 8 : 228, t. 304, 1898.

Flowers smaller than those of *G. distichus*; lip not sub-orbicular but transversely elongated, tip of midlobe obtuse, lateral margins with irregular dentation, two lamellae in the centre of the midlobe ; spur conical with a slightly bilobed apex. Authority Hara.

G. calceolaris D. Don, Prodr. Fl. Nep. 32, 1825 ; Holttum, 675, 1953 ; Hara, 453, 1966. *Aerides calceolare* Ham. ex Smith, Rees, Cyclop. 39 (11), 1818. *Saccolabium calceolare* Lindl. Gen. et Spec. Orch. 223, 1833 ; F.B.I. 6 : 60, 1890 ; King & Pantl. 225, t. 300, 1898. (Fig. 50).

Scape spotted purple, stout and fleshy, shorter than the leaves, flowers yellow or greenish, speckled with red-brown, waxy c. 1.5 cm in diam., mildly fragrant ; sepals and petals 6 mm long. Lip yellow and speckled with brown spots, side-lobes 1 mm, white, midlobe 3 mm long, twice as wide the base, margin white, fringed, central part yellow, hairy all over, spur short also yellow. Flowering during February and March. Distributed at 1525 to 1830 m. Collected from Rhingmo to Jubing, Sheopuri, Godavari.

G. distichus (Lindl.) O. Ktz. Rev. Gen. Pl. 2 : 661, 1891 ; Hara, 435, 1966. *Saccolabium distichum* Lindl. in Journ. Linn. Soc. 3 : 36, 1859 ; F.B.I. 6 : 64, 1890 ; King & Pantl. 227, t. 303, 1898 ; Duthie, 148, 1906.

Inflorescence equalling the leaves, flowers greenish and spotted with brown. Sepals and petals obovate-oblong, green spotted with brown. Lip with a saccate spur, sidelobes absent, midlobe small, semicircular, fleshy with two calli at the base. Flowering during January and February. Collected from Bor-long forest at c. 2285 m.

g. ***Luisia*** Gaud.

This orchid is named after a Spanish botanist Don Luis de Torres.

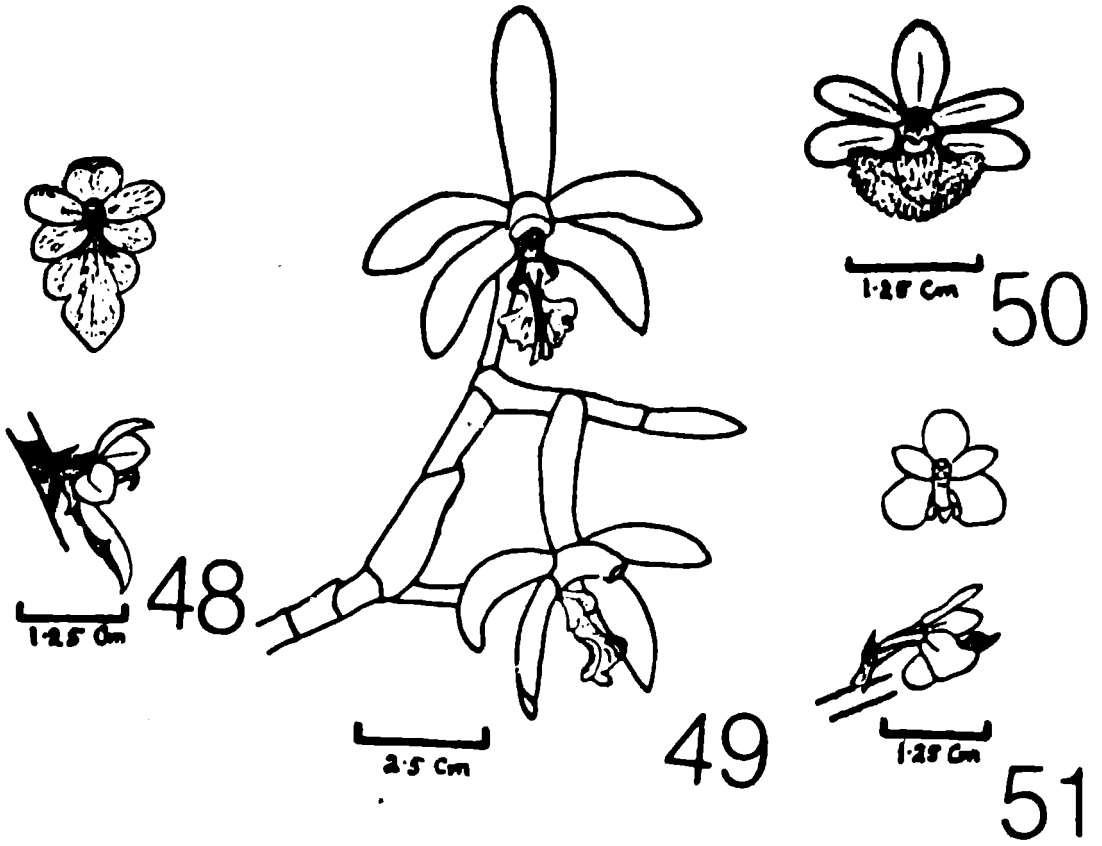


Fig. 48 *Aerides multiflorum* Roxb. Fig. 49 *Esmeralda clarkii* Reichb. f. Fig. 50 *Gastrochilus calceolaris* D. Don Fig. 51 *Rhynchostylis retusa* (Linn.) Bl. Fig. 52 *Vanda cristata* (Wall.) Lindl.

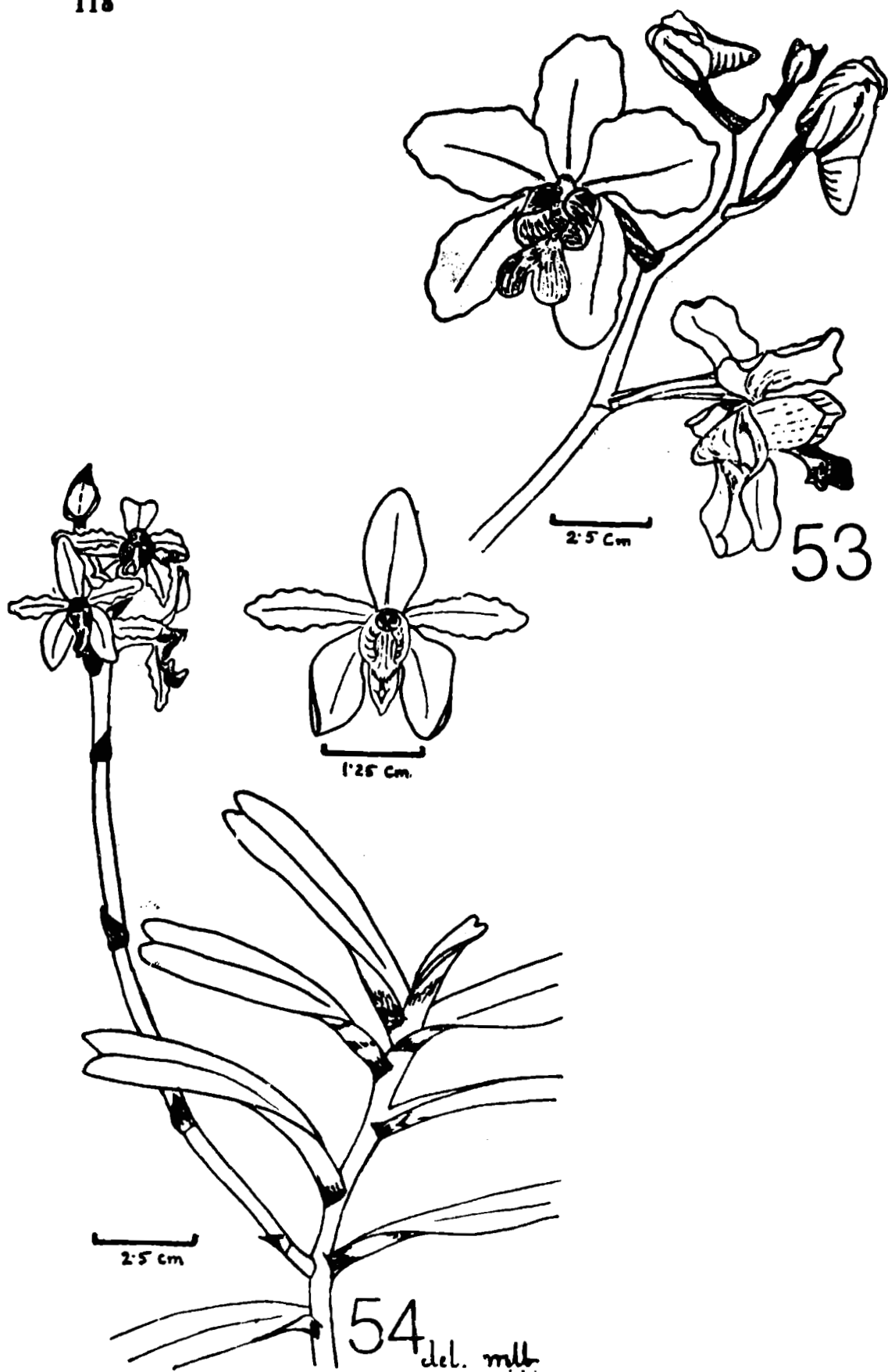


Fig. 53 *Vanda teres* (Roxb.) Lindl. Fig. 54 *Vandopsis undulata* (Lindl.) J.J. Sm.

ARTIFICIAL KEY TO THE SPECIES OF *Luisia*

Flowers 10 mm long	...	...	...	...	...	<i>trichorrhiza</i>
Flowers 6 mm long	...	...	...	...	...	<i>teretifolia</i>
Flowers 4 mm long	...	...	...	...	...	<i>micrantha</i>

Luisia micrantha Hook. f. in Fl. Brit. Ind. 6 : 23, 1890.

Flowers small, c. 8 mm in diam., and 4 mm long, greenish; lateral sepals ovate, subacute, midrib very stout, dorsal sepal similar to the petals; petals oblong, obtuse, 1-nerved. Lip as long as the sepals, hypochile oblong, concave, two strong teeth, epichile fleshy, small. *Flowering* during August and September. Collected from Hittaura at c. 510.

L. teretifolia Gaud. Bot. Freyc. Voy. 427, t. 37, 1826 ; F.B.I. 6 : 22, 1890 ; King & Pantl. 202, t. 271, 1898 ; Duthie, 140, 1906 ; Hara, 443, 1966.

Inflorescence few-flowered (2-3), flowers small, c. 1.8 cm in diam., and 6 mm long, foul smelling. Lateral sepals subacute; petals linear-oblong, obtuse, hardly longer than the sepals, yellow-green. Lip equalling the sepals, usually dull purple and with 5 vertical lines. *Flowering* during March and April. Collected from Dhunibesi, Nagarjung at c. 1650 m.

L. trichorrhiza Bl. Rumphia 4 : 50, 1848 ; F.B.I. 6 : 23, 1890 ; Duthie, 140, 1906.

Inflorescence 4-5 flowered, flowers c. 2.5 cm in diam., and 1 cm long. Sepals unequal with faint purple lines, petals as long as the lateral sepals. Lip obovate-oblong, rather longer than the sepals, flat, dull purple, constricted at the base of the cordate epichile, marking the hypochile. *Flowering* during March and April. Distributed at c. 750 m. Collected from Dhulikhel to Kuwapani, Pokhra.

h. *Ornithochilus* Wall. ex Lindl.

The name is descriptive of the bilobed lip with the tips divaricate and verticle resembling a bird in flight.

Ornithochilus difformis (Wall. ex Lindl.) Schltr. Orch. Sino-Jap. 227, 1919 ; Hara, 446, 1966. *Aerides difforme* Wall. ex Lindl. Gen. et Spec. Orch. 242, 1833. *Ornithochilus fusca*

Wall. ex Lindl. Gen. et Spec. Orch. 242, 1833 (pro. syn.); F.B.I. 6 : 76, 1890 ; King & Pantl. 200, t. 268, 1898 ; Duthie, 139, 1906.

Inflorescence somewhat pendulous, twice or thrice longer than the leaves, many-flowered, flowers c. 1.25 cm in diam. Sepals and petals greenish-yellow with reddish stripes. Lip much longer than the sepals, clawed, yellow, sidelobes quadrate, striped with brown, midlobe clawed and two lobulate, reddish or purple lower down, spur long, yellow. Flowering time June. Collected from Nagarjung at 1650 m.

i. *Rhynchostylis* Bl.

Usually stout and short-stemmed epiphytic orchid. Allied to *Saccolabium* Bl. and *Aerides* Lour. but can be distinguished by the scarcely lobed lip and the not sharply distinguished from the column-foot ; the laterally compressed spur is directed backwards, and the rostellum is beaked. These orchids are popularly known as 'Fox-tail Orchids'.

Rhynchostylis retusa (Linn.) Bl. Bijdr. 286, 1825 ; F.B.I. 6 : 32, 1890 ; King & Pantl. 213, t. 284, 1898 ; Duthie, 143, 1906 ; Holttum, 697, 1953 ; Hara 449, 1966. *Epidendrum retusum* Linn. Sp. Pl. 953, 1753, *Saccolabium guttatum* Lindl. (in Wall. Cat. 7308) Gen. et Spec. Orch. 220, 1833. (Fig. 51).

Stem robust and completely hidden by the imbricating leaf-bases ; leaves arching gracefully, very close together, leathery, apex obliquely bilobed. Inflorescence c. 25-30 cm long, densely flowered. Flowers white, spotted with pink or purple, c. 1.8 cm in diam., fragrant, waxy ; lateral sepals c. 1 cm long, gibbously orbicular-ovate, obtuse or apex drawn out, dorsal sepal c. 1.2 cm long, oblong ; petals 1.2 cm long, elliptic, obtuse. Epichile of lip usually cuneiform, emarginate, saccate, purple. Flowering during May and June. Distributed from 304 to 1830 m but commonly at about 915 m. Collected from Naikot, Dhupu to Wana, locality unknown (Herklotts).

j. *Sarcanthus* Lindl.

The name refer to the very fleshy flowers of most of the species. According to Holttum (1953) 'this is the largest genus

of the small-flowered orchids of this group. The flowers are always rather fleshy and last several days. Their most distinctive feature is the large callus at the back of the spur. The back callus also sometimes interlocks with the front callus.... The flowers are complex in structure and difficult to describe.

ARTIFICIAL KEY TO THE SPECIES OF *Sarcanthus*

Leaves filiform ; raceme 15 — 20 cm long, curved *filiformis*
 Leaves flat ; racemes branched (panicle), 30 - 35 cm long..... *racemifer*

Sarcanthus filiformis Lindl. Bot. Reg. isc. 61, 1838 ; F.B.I. 6 : 66, 1890.

Epiphytic with leaves filiform and narrowly cylindrical. Inflorescence rather dense, many-flowered, curved 15-25 cm long ; flowers c.8 mm in diam. ; sepals oblong, obtuse, petals smaller and narrower, both dark purple with margin and midrib green. Lip broadly conical, fleshy, white with a broad yellow base, sidelobe acute, incurved, midlobe short, white, callus very large. Flowering time during August and September. Collected at 9 10 m at Hittaura and Narayani.

S. racemifer (Wall.) Reichb. f. in Walp. Ann. 6 : 891, 1861.
Aerides racemiferum Wall. ex Hook. f. in Fl. Brit. Ind. 16 : 68, 1890. *Sarcanthus pallidus* Lindl. Bot. Reg. 78, 1840 ; F.B.I. 6 : 69. 1890.

Epiphytic with leaves flat and broad, obtusely bilobed, very thick. Inflorescence erect, branched, loosely-flowered, flowers c. 8 mm in diam. Sepals and small petals oblong, obtuse, dark purple with edges yellow. Lip white, sidelobes triangular, acuminate, midlobe small and incurved, reniform, fleshy beak, spur cylindrical, obtuse, saccate, thick-walled, as long as the sepals but shorter than the ovary, callus bilobed. Flowering during June and July. Distributed at 1220 to 1525 m. Collected from Dhankutta, Pokhra.

k. *Vanda* Jones.

The name refers to the Sanskrit word 'banda' which means an epiphyte but also used for parasitic plants. The *Vanda* orchids can be distinguished by the flesh 3-lobed lip. The

inflorescence is normally simple and erect it usually arises from the leaf-axils or from opposite the leaf-bases and near the upper part of the plant but not at its apex.

ARTIFICIAL KEY TO THE SPECIES OF *Vanda*

- A. Lip spurred at the base—
- B. Sepals & petals spreading—
 - C. Flowers small, disk of lip without ridges..... *parviflora*
 - CC. Flowers c. 3.5-5 cm in diam., disk of lip with fleshy ridges, sidelobes small and rounded .. *tessellata*
 - CCC. Flowers c. 7.5—10 cm in diam., disk of lip with sidelobes broad and incurved..... *teres*
- BB. Sepals and petals incurved—
 - D. Sidelobes erect and triangulars ; flowers 5 cm in diam. ... *cristata*
 - DD. Sidelobes rounded ; flowers 2.5 cm in diam *pumila*
- AA. Lip gibbous, not spurred or saccate. flowers c. 2.5 cm in diam. . . . *alpina*

Vanda alpina Lindl. Fol. Orch. 10, 1853 ; F.B.I. 6 : 53, 1890 ; King & Pantl. 217, t. 289, 1898 ; Duthie, 146, 1906 ; Hara, 452, 1966. *Luisia alpina* Lindl. Bot. Reg. 1858, misc. 56, 1858.

Racemes with usually 2 flowers ; flowers nodding, faintly fragrant, c. 2.5 cm in diam., sepals and petals narrow, yellowish-green. Lip fleshy, sidelobes rounded, purplish inside. midlobe concave, ovate, retuse, pale yellow with purple shallow ridges, spur absent but gibbous. Flowering during May, one specimen collected from Sheopuri area at c. 1370 m.

V. cristata (Wall.) Lindl. Gen. et Spec. Orch. 216, 1833 ; F.B.I. 6 : 53, 1890 ; King & Pantl. 216, t. 287, 1898 ; Duthie, 146, 1906. *Aerides cristatum* Wall. ex Hook. f. in Fl. Brit. Ind. 6 : 53, 1890. (Fig. 52).

Inflorescence erect, 3-5 flowered, flowers c. 5 cm in diam., waxy, fragrant. Sepals and petals narrow, incurved yellowish-green. Lip green on the underside, upper surface marked with purple stripes and spots, sidelobes of lip erect, triangular, truncate ; midlobe oblong, golden yellow and striped with

purple, tip with two divaricate oblong lobes and a fleshy beak pointed downwards, spur short and conical. *Flowering* time during March and April, even on to June. Collected from West Nepal (Parker), locality unknown (Herklotts). (The description and the flowering time have been based on the study of plants growing in Botanic Garden, Godavari).

V. parviflora Lindl. in Bot. Reg. 30. Misc. 45, 1844 ; F.B.I. 6 . 50, 1890 ; King & Pantl. 215, t. 286, 1898 ; Duthie, 145, 1906. *Aerides testaceum* Lindl. Gen. et Spec. Orch. 238, 1833 ; *Vanda testacea* (Lindl.) Reichb. f. in Gard. Chron. 2 : 166, 1877.

Inflorescence arising below the leaves, rather loosely 5-7 flowered, flowers c. 1.5-2 cm in diam. Sepals and petals usually flesh-coloured, subequal, obovate-spathulate, obtuse, spreading. Lip 3-lobed, sidelobes small, incurved, midlobe large, broadly oblong, fleshy, crenate at the apex, white, surface blue and purple-spotted, spur long and curved. *Flowering* during May and June. Distributed at 305-915 m. Collected from Simalbasa, Hittaura.

V. pumila Hk. f. in Fl. Brit. Ind. 6 : 53, 1890, et in Ann. Roy. Bot. Gard. Calc. 5 : 45. 1895.

Inflorescence about 15 cm long, loosely 2-4-flowered, flowers c. 2.5 cm in diam., fragrant ; sepals and petals narrow, pale yellow or greenish-white. Lip 3-lobed, sidelobes erect and rounded, midlobe broadly ovate, concave, obtuse, pale and streaked purple, spur conical and as long as the midlobe. *Flowering* during April and May. Distributed at 1220 to 1525 m. Collected from Dhunibesi, Hokse.

V. tessellata (Roxb.) Hook. ex G. Don, Loud. Hort. Brit. 372, 1830. *Epidendrum tessellatum* Roxb. Pl. Corom. 1 : 34, t. 42, 1795. *Vanda roxburghii* R. Br. in Bot. Reg. 6, t. 506, 1820 ; F.B.I. 6 : 52, 1890 ; Duthie, 116, 1906. *V. tesselloides* Reichb. in Walp. Ann. 6 : 864, 1861.

Inflorescence 5-10-flowered, longer than the leaves. Flowers c. 5 cm in diam., tessellated with brown, sepals c 2.5 cm long, petals 2.3 cm long, clawed, obovate, waxy, tessellations

yellowish-green or slightly bluish, margins white. Lip nearly as long as the sepals, sidelobes small, purple-spotted, midlobe panduriform, dull violet and paler at the base, tip dilated, truncate, 2-lobed, disk with fleshy ridges, spur conical. *Flowering* during July and August. Distributed in the sub-Himalayan region. Collected from Bhairwa, Hittaura, Narayanghat.

V. teres (Roxb.) Lindl. Gen. et Spec. Orch. 217, 1830; F.B.I. 6 : 49, 1890. *Dendrobium teres* Roxb. Fl. Ind. 3 : 485, 1832 (Fig. 53). 3)

Inflorescence 15-30 cm long and with 3-6 flowers. Flowers c. 7.5-10 cm in diam., white or mauve, fragrant. Sepals and petals undulate, lip hairy towards the base, side lobes broad, incurved, deep yellow or lighter and spotted crimson, midlobe much larger, deeply cleft, purple, spur conical. *Flowering* during May and June. Distributed at 305 to 610 m. Collected from Hittaura, locality unknown (Herklotts).

1. *Vandopsis* Pfitz.

These are robust and spectacular orchids. The name implies that these orchids resemble *Vanda*. According to Hawkes they are allied to *Renanthera* Lour. and *Arachnis* Bl.

Vandopsis undulate (Lindl.) J. J. Sm. in Nat. Tijdschr. Ned. Ind. 72 : 77, 1912. *Vanda undulata* Lindl. Journ. Linn. Soc. 3 : 42, 1859. *Stauroopsis undulata* (Lindl.) Benth. ex Hk. f. Fl. Brit. Ind. 6 : 27, 1890 ; King & Pantl. 205, t. 257, 1898. (Fig. 54). 4)

Inflorescence long, rachis thickened, 8-12-flowered, flowers c. 3.25 cm in diam., white, flushed with pink, waxy, fragrant ; sepals oblanceolate, acuminate, margins undulate, lateral sepals deflexed; petals similar but smaller. Lip greenish-yellow or light yellow, base saccate, adnate to the sides of the column, sides pink, midlobe laterally compressed, 3-ridged, tip truncate, purplish. *Flowering* during March and April. Distributed at about 2135 m. Collected from Kaituka, Chandragiri, Godavari. locality unknown (Herklotts).

III EPILOGUE

Orchids from Nepal have been listed since 1825, and due to continuous changes in taxonomy of orchid species and discovery as also record of new species which has been going on since long, it is rather difficult to state the exact number of genera and species that are present in the Nepal flora. It would appear from published records that there are 57 genera found in Nepal of which 27 are terrestrial and the remainder (30) being epiphytic with a few lithophytes. Genera which have the largest number of species are *Dendrobium* with 21, *Habenaria* with 19 and *Bulbophyllum* with 13 species, while those have only one species are many eg. *Agrostophyllum*, *Anthogonium*, *Arundinaria*, *Chrysoglossum*, *Cremastra*, *Doritis*, *Ephemerantha*, *Epigenium*, *Esmeralda*, *Hemipilia*, *Herpysma*, *Lusia*, *Ornithochilus*, *Panisea*, *Pachystoma*, *Rhynchostylis*, *Satyrium*, *Spahoglottis*, *Spiranthes*, *Sunipia* and *Thunia*. There are some genera, the presence of which in Nepal is given in Landon's NEPAL only, they being *Ascocentrum* Schltr., *Ceratostylis* Bl., *Diplomeris* Don, *Eulopia* R.Br., *Monomeria* Lindl., and *Podocnilus* Bl.

Out of the species that we have ourselves collected and have accounted, we attach special significance to the following—

Anoectochilus crispus Lindl. This species has been known from Sikkim and Khasia. Our material has been collected from 27° 40' : 85° 25', thus the westward limits of the species is extended.

Bulbophyllum polyrhizum Lindl. This species is previously known from Sikkim, Nepal and Dehra Dun. As regards the presence of this species in Nepal, no recent work on Nepal flora records it. We, thus, regard the species to be exceedingly rare.

Dendrobium pygmaeum Lindl. It is from Sikkim that this species is known. We feel that this species is also exceedingly

rare in Nepal, and this is the first record of the species from Nepal.

Goodyera hemsleyana King & Pantl. The species is known from Sikkim. Our collection is from $27^{\circ} 40' : 85^{\circ} 25'$, thus the westward limit is extended.

Herminium duthiei Hk. f. This has been collected from Kumaon-Kali valley, Gori valley and in recent years from Nepal. Our two gatherings are from $27^{\circ} 33' : 86^{\circ} 32'$ and $27^{\circ} 47' : 86^{\circ} 45'$, thus the eastern limit is extended.

Herminium jaffreyanum King & Pantl. This Sikkim plant having been collected by us from $27^{\circ} 45' : 86^{\circ} 00'$ has its limit extended westwards.

Hemipilia cordifolia Lindl. Although it is mentioned that the species extends from Western Himalayas to Nepal, we do not know how far eastwards the species extends, as we take "extends to Nepal" a rather vague statement. However our collection was made at $27^{\circ} 40' : 85^{\circ} 25'$.

Nervillia scottii (Reichb. f.) Schltr. This is a species known from Sikkim. Our collection having been made at $27^{\circ} 45' : 85^{\circ} 15'$, shows the westwards extension.

Orchis habenarioides King & Pantl. This species extends from Bhutan, Sikkim, Nepal on to Kashmir. Our observations are that the species is rare in Nepal.

Zeuxine goodyeroides Lindl. As our collection is from a locality at $27^{\circ} 38' : 85^{\circ} 45'$, the westwards limit is extended, as previously the species was known from Sikkim.

Until the complete orchid flora of Nepal is known, it is not possible to give the altitudinal distribution of the species. However, the species that occur at 3048 m. (10,000 ft.) and above are few, namely *Habenaria urceolata* C.B.Cl. (3650 m.), *Herminium duthiei* Hk. f. (4270 m.), *Herminium jaffreyanum* King & Pantl. (4200 m.), *Orchis roborowskyi* (Maxim) P.F. Hunt, (3048 to 3700 m), *Orchis habenarioides* King & Pantl. (3810 m.), and *Spathoglottis ixioides* (D. Don) Landl. (3810 m.).

As regards the flowering time, we find that there are three periods, namely March to May or early June, June to August and September to November. This we attribute principally to changes in the atmospheric temperature, and light of course rainfall and other methods of precipitation also have an effect. Plants that were grown in the Indian Co-Operation Mission garden and at Godavari Botanic Garden, Government of Nepal showed remarkable response to temperature changes.

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INDEX OF PLANT NAMES

A			
Acampe	111	striatum	95
longifolia	111	wallichii	95
papillosa	112		
Aceras angustifolia	27	C	
Aerides	112	Calanthe	95
caceolare	116	chloroleuca	96
cristatum	122	masuca	96
difforme	119	plantaginea	96, 97
longicoru	112	tricarinata	95, 97, 99
multiflorum	112	Callista macraei	65
odoratum	112, 113	Carallorhiza foliosa	106
taenalis	114	Cattleya mendelli	5
Agrostophyllum	33, 34	Cephalanthera	34, 35
callosum	47	ensifolia	35
Anoectochilus	33, 34	Ceratostylis	125
crispus	34, 125	Chiloschista	113
Arundina	33, 34	lunifera	113
graminifolia	35, 40	usneoides	114
Anthogonium	87, 125	Chrysoglossum	46, 48, 125
gracile	87	erraticum	48
Arachnanthe clarkei	115	Cirrhopetum	99
Arachnis clarkei	115	cornatum	99, 100
Arundinaria	125	elatum	100
Ascocentrum	125	guttulatum	100
		hookeri	100, 101
		masculosum	100, 101
		refractum	100, 101
B		Coleoglossum	16
Blephariglottis	16	Coleogyne	48
Bletia graminifolia	35	coronaria	69
Bulbophyllum	86, 87, 99, 125	corymbosa	49, 51
affine	88, 89	cristata	49, 50, 51
amplum	66	elata	49, 50, 51
bicolor	89	flaccida	49, 50, 51
careyanum	89, 90, 92	flavida	49, 50, 51
cylindraceum	89, 90, 92	fuscens	49, 51
hirtum	93	humilis	85
leopardinum	92, 93	ochracea	53
odoratissimum	93	ovalis	49, 53
reptans	94	uniflora	49, 53
rotundatum	66	viride	6
pleaceum	93	Cremastra	10, 125
polyrhizum	92, 94, 125	appendiculata	102

<i>Cryptochilus</i>	54	<i>humilis</i>	85
<i>lutea</i>	54	<i>pendulum</i>	105
<i>sanguinea</i>	54	<i>praecox</i>	85
<i>Cycnoches ventricosum</i>	6	<i>retusum</i>	120
<i>cyperifolium</i>	102, 103	<i>tesselatum</i>	123
<i>elegans</i>	103	<i>Epigeneium</i>	55, 66, 81
<i>erythaeum</i>	109	<i>amplum</i>	66, 81
<i>giganteum</i>	102, 104	<i>rotundatum</i>	66
<i>grandiflorum</i>	98	<i>Epipactis</i>	34, 35
<i>ixoides</i>	109	<i>consimilis</i>	36
<i>lancefolium</i>	98, 102, 104	<i>royleana</i>	36
<i>pendulum</i>	102, 105	<i>Eria</i>	67
<i>longifolium</i>	103, 104	<i>alba</i>	67, 68
D			
<i>Dendrobium</i>	8, 54, 55, 56, 125	<i>bractescens</i>	68
<i>alpestre</i>	56, 57	<i>convallaroides</i>	67, 68
<i>amoenum</i>	57, 58, 61	<i>confusa</i>	67, 68
<i>ancepts</i>	56, 58, 61	<i>coronaria</i>	68, 69
<i>aphyllum</i>	58	<i>excavata</i>	67, 69
<i>candidum</i>	56, 58	<i>flava</i>	68, 69
<i>chrysanthum</i>	57, 58, 61	<i>graminifolia</i>	67, 70, 81
<i>clavatum</i>	57, 59	<i>musicola</i>	67, 70, 81
<i>crepidatum</i>	56, 57, 59, 61	<i>paniculata</i>	67, 70
<i>densiflorum</i>	56, 60, 62	<i>Esmeralda</i>	115, 125
<i>denudens</i>	56, 59	<i>clarkei</i>	115, 117
<i>eriaeflorum</i>	56, 60, 62	G	
<i>formosum</i>	56, 60	<i>Gastrochilis</i>	115
<i>gibsonii</i>	57, 60	<i>affine</i>	115, 116
<i>heterocarpum</i>	56, 60	<i>calcolaris</i>	115, 116, 117
<i>longicoru</i>	56, 62, 63	<i>distichus</i>	115, 116
<i>macraei</i>	65	<i>Geodorum</i>	105
<i>moschatum</i>	63	<i>densiflorum</i>	106, 108
<i>nobile</i>	57, 64	<i>purpureum</i>	106
<i>prerardi</i>	57, 64	<i>Georchis cordata</i>	37
<i>primulinum</i>	56, 64	<i>foliosa</i>	37
<i>pulchellum</i>	57, 64	<i>Goodyera</i>	3, 33, 36
<i>transparens</i>	56, 63	<i>cordata</i>	37
<i>Dienia muscifera</i>	74	<i>foliosa</i>	37
<i>Diplomeris</i>	125	<i>hemsleyana</i>	37, 38, 126
<i>Dortis</i>	114, 125	<i>procera</i>	37, 38, 40
<i>taenialis</i>	114	<i>repens</i>	37, 38
E			
<i>Ephemerantha</i>	65, 125	<i>secundiflora</i>	37, 38
<i>macraei</i>	65	<i>vittia</i>	37, 41
<i>Epidendrum</i>	8	<i>Grammatophyllum</i>	8
<i>bifidum</i>	8	<i>Gymnadenia</i>	16
		<i>chusia</i>	30
		<i>conpsea</i>	19

orchides	29	glossula	71
violacea	29	longipes	72
H		platyrachis	71
Hebenaria	15, 16, 17, 125	resupinata	71, 72
aitchinsoni	17, 18	togashii	71, 72
arientina	17, 18	viridiflora	71, 72
aristata	17, 18	Listera	41
bicornata	17, 18	pinetorium	41
blephariglottis	2	Luisia	116, 125
conopsea	17, 18	alpina	122
constricta	17, 18	micrantha	119
densa	17, 18	teretifolia	119
dentata	17, 20, 23	trichorrhiza	119
ensifolia	22	M	
fallax	17, 20	Malaxis	46, 72
galeandra	17, 20	acuminata	73
goodyeroides	17, 21	iridifolia	77
latilabris	17, 21	josephina	73, 74
orchides	29	khasiana	73, 74
plantaginea	17, 21	musifera	73, 74
stenanthera	18, 22	tamurensis	73, 75
stenopetalae	17, 23, 25	Mansdervallia leontoglossum	3
triflora	17, 24, 25	Micrantha	5
urcleolata	18, 25, 26	Microstylis muscifera	74
Hemipilia	15, 25, 125	Monomeria	125
cordifolia	24, 26, 126	N	
Herminium	15	Neottia monophyllum	28
angustifolium	24, 26, 126	sinensis	43
congestum	26	Nervillea	34, 42
duthei	24, 27, 126	microglossa	42
fallax	20	scottii	42, 126
graminieum	28	O	
jaffreyanum	26, 28, 126	Oberonia	46, 75
monophyllum	27, 28	caulescens	76
Herpysma	33, 125	clarkei	76, 77
longicaulis	40, 41	ensifformis	76, 77
K		falcata	76, 77
Katherinea	55	myriantha	78
amplum	66	myosurus	76, 78
rotundatum	66	pachyrachis	76, 78
L		Octochilis alba	79
Limnodorum aphyllum	58	fusca	79
graminifolia	35	porrecta	79, 80
Liparis	46, 70	Oncidium carthaginense	4
cordifolia	71		

<i>Ophrys sintensii</i>	2, 5	<i>Pogonia macroglossa</i>	42
<i>speculum</i>	5	<i>scottii</i>	42
Orchis	29		
<i>chusua</i>	30, 39	R	
<i>dentata</i>	20	<i>Rhizoctonia</i>	7
<i>hebenarioides</i>	29, 39, 126	<i>Rhynchostylis</i>	120, 125
<i>latifolia</i>	9, 30	<i>retusa</i>	117, 120
<i>laxifolia</i>	9		
<i>maculata</i>	6	S	
<i>mascula</i>	9	<i>Saccolabium affine</i>	116
<i>roborowskyi</i>	30, 126	<i>calceolare</i>	116
<i>strateumatica</i>	45	<i>distichum</i>	116
Oreorchis	106	<i>guttatum</i>	120
<i>foliosa</i>	106	<i>longiflorum</i>	111
Ornothochilus	119, 125	<i>papillosum</i>	112
<i>difformis</i>	119	<i>Saracanthus</i>	120
<i>fusca</i>	119	<i>filiformis</i>	121
Osmunda	7	<i>lancemifer</i>	121
		<i>pallidus</i>	121
P		<i>Sarcopodium</i>	55
<i>Pachystoma</i>	109, 125	<i>rotundatum</i>	66
<i>senile</i>	109	<i>Satyrium</i>	15, 125
Panisea	80, 125	<i>ciliatum</i>	32
<i>parviflora</i>	80	<i>nepalensis</i>	9, 32
Pectecklis	16	<i>Spathoglottis</i>	109, 125
Peristylus	16	<i>ixioides</i>	109, 126
<i>fallax</i>	20	<i>Spiranthes</i>	8, 33, 43, 125
<i>goodyeroides</i>	21	<i>sinensis</i>	43
Phalenopsis	6	<i>Stanhopea</i>	2
Pholidota articulata	82, 83	<i>Stauropsis undulata</i>	124
<i>imbricata</i>	82, 83, 84	<i>Sunipia</i>	110, 125
<i>griffithii</i>	83	<i>scariosa</i>	110
<i>protracta</i>	83, 84		
Phytophthora	7	T	
Platanthera	15, 16	<i>Thelymitra</i>	3
<i>acuminata</i>	21	<i>Thunia</i>	33, 125
<i>bakeriana</i>	31	<i>alba</i>	40, 44
<i>dentata</i>	30	<i>Trichosoma suavis</i>	69
<i>galleandra</i>	20		
<i>latilabris</i>	21	V	
<i>susanne</i>	31	<i>Vanda</i>	121
Platystele ornata	4	<i>alpina</i>	122
Pleione	84	<i>crinata</i>	117, 122
<i>hookeriana</i>	85	<i>longifolia</i>	122, 123
<i>humilis</i>	85	<i>parviflora</i>	122, 123
<i>procox</i>	85	<i>pumila</i>	122, 123
Podochilus	125	<i>roxburghii</i>	123
		<i>terres</i>	118, 124

tessellata	122, 123		Z	
testacea	123			
Vandopsis	124	Zeuxine		33
undulata	118, 124	flava		44, 45
Vanilla	9	goodyeroides		44, 45, 126
planifolia	9	strateumatica		44, 45

*Numbers in bold letters indicate the page containing the figure of the species.