Lady's Slipper ORCHIDS of India

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Cover photo : *Paphiopedilum fairieanum* (Lindl.) Pfitz.

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FOREWORD

The Flora of India is rich in diversity and about 15,000 species of vascular plants are estimated to occur within the present boundaries of our country. About 5,000 of these species are endemic. The family Orchidaceae is one of the largest families of flowering plants in India and is represented by about 1,000 species. Orchids are important primarily in horticulture and many Indian species and varieties are prized in international horticultural trade.

Knowledge about the biology of most of our orchids is still incomplete.

The group has recently attracted much attention and it is heartening that work on collection, study and conservation of orchids has now been taken up by several institutions like Botanical Survey of India, Indian Institute of Horticultural Research and the Orchid Research Stations of Arunachal and West Bengal Governments.

Detailed accounts of different genera or groups of orchids are wanted for familiarising horticulturists, traders and laymen about their structure and distribution.

Dr. S. K. Kataki, Orchidologist in the Botanical Survey of India (POSSCEF) has been engaged in the study of orchids of north-eastern India for more than a decade and in the present publication, he has dealt with one of the most fascinating groups of orchids, namely, the "Lady's Slipper" He has provided details of the morphological characters, distribution, notes on cultivation and measures for conservation of these orchids. Most of the species dealt in the book are illustrated with line-drawings or coloured photographs.

It is hoped that the book will help in better appreciation of the orchid wealth of our country and its eventual conservation as well as the appropriate methods for their multiplication for trade.

T. N. Khoshoo
Secretary
Department of Environment
Governmenf of India

Bikaner House,
New Delhi,
February 3, 1984

PREFACE

The Lady's Slipper Orchids are well known for their beautiful and usually long lasting flowers by virtue of which they are being overexploited in our country. They have become rare and endangered in the wild state also due to the destruction of their natural habitats.

This booklet presents a short account of the well known Lady's Slipper Orchids in India with a key to the species, distribution data and their present status in the wild. The natural hybrids and the less known species of this group in India are not included here. The study is based upon the observations of the live plants in the field and orchidaria as also the historical collections of different herbaria of Botanical Survey of India. This work was undertaken in the Eastern Circle of Botanical Survey of India, Shillong, under a 'Project on Study, Survey and Conservation of Endangered Species of Flora' (POSSCEF).

The aim of bringing out this booklet is to create an awareness amongst the common folk in conserving these beautiful orchids. Practically, a few unauthorised plant collectors are reportedly responsible for dwindling of these orchid species in the wild to fulfil outside demand in trade. So, it is appealed to our plant lovers not to buy these orchids, in order to save them in their natural habitats.

I express my sincere gratitude to Dr. S. K. Jain, Director & Principal Investigator, Posscef, Botanical Survey of India, Howrah, for his valuable suggestions during preparation of this work. My thanks are due to Sri A. R. K. Sastry, Project Coordinator, Posscef, Howrah for his continued interest and encouragement. My grateful thanks are due to my several colleagues especially to Sri E. Vajravelu and Dr. P. K. Hajra, Project Officers, Posscef, for their valuable suggestions. Thanks are also due to the U. S. Fish and Wildlife Service for supporting the Project on Endangered Species of Flora.

Shillong

S. K. Kataki

INTRODUCTION

Orchids have had their fascinating names besides their scientific names from the earliest times throughout the world by the common folk, which emphasized on their peculiar structure in the flowers and vegetative parts.

The species of the earlier known genus *Cypripedium* L. were popularly called Lady's Slipper Orchids due to the striking slipper shaped lip or labellum of the flower (Plate 2A-5).

The generic names *Cypripedium* L. and *Paphiopedilum* Pfitz. are derived from the Greek words 'Kypris' (Venus) and 'Paphia' (epithet of Venus) respectively and 'Pedilon' (sandal) refers to the beautiful slipper-like-form of the lip or labellum.

Subsequent studies have shown that there are four distinct genera, viz., *Selenipedium* Reichb. f., *Cypripedium* L., *Phragmipedium* Royle, and *Paphiopedilum* Pfitz. of which the genera *Cypripedium* and *Paphiopedilum* are represented in India. The species of the Indian genera are distinguished by the presence of the unilocular ovary (Plate 2E) instead of the trilocular ovary of the species of *Selenipedium* and *Phragmipedium* (Plate 2 F-G).

The species of this group can easily be differentiated from other species in the family Orchidaceae by the presence of 2 anthers instead of the single anther, a sheild like structure—the staminode and the pouched lip or labellum (Plate 2, C & D 6-7). The conspicuous dorsal or upper sepal (A-2), the two connate lateral sepals (A-3) with beautiful combination of colours of the flowers attract the attention of orchid lovers.

Distribution in India : 7 species of *Paphiopedilum* and 4 species of *Cypripedium* are distributed in India out of about 70 species in both the genera in the world. Besides, *Paphiopedilum wardii* Summerh. from Arunachal Pradesh and the Burmese species *P. charlesworthii* (Royle) Pfitz. in Mizoram are also reported from India (Pradhan, 1976). (Plate 1)

The species occur at a considerable elevation where the rainfall is frequent. They are usually found to grow on steep rocky surface covered with moss or in rock crevices, preferably in partially shady areas. *Paphiopedilum villosum* grows on moss covered horizontal tree branches as epiphyte, whereas *P. venustum* grows in very moist shady areas near water sources.

In India, all the species of *Paphiopedilum* except *P. druryi,* are distributed in North-eastern India and Sikkim. Whereas the species of *Cypripedium* are confined to north-western Himalayas and Sikkim. The species of Lady's Slipper Orchids had existed in large populations in the past than are at present in wild. Now, they occur in small numbers in certain pockets and some species are fast disappearing in their original habitats, due to various factors. For example, *Paphiopedilum druryi,* the only isolated species from South India could not be located again even after repeated search in its original localities.

It was recorded by Beddome as "very abundant on the top of the Calcad Hills (Travancore) in flower in January" Similarly, the other species are also gradually being depleted in nature.

The main reason for decline of the Lady's Slipper Orchids is the large scale commercial exploitation. There is no well established tissue culture laboratory in India to propagate orchids and as such, the main source of supply happens to be the forest to fulfil outside demand. The clearing and burning of forest areas for cultivation and other developmental projects have affected these species in wild. *Paphiopedilum fairieanum,* 'The lost orchid' has been badly affected in its natural habitats due to constant clearance and burning of forests in Arunachal Pradesh. The other reason for their gradual decline in wild may be due to lack of fertilization.

Conservation measures proposed : It is observed that the small number of population in wild makes the species very vulnerable. The species are so far not known to occur in reserve forests. Some of the species are grown commercially in some private gardens. In limited number, few species are under cultivation in government gardens and orchidaria. At present, there is an urgent need to recover some individuals of some of these species from wild and to plant them directly in some protected reserve forests. The threatened species may even be protected in their natural habitats by law. Some of the endangered species like *Paphiopedilum druryi* may again be replanted in their original habitats.

With this background, some of the species of Lady's Slipper Orchids were collected and are kept under cultivation in the National Orchidarium and Posscef House of Botanical Survey of India, Shillong. Occasionally, the species are displayed in public places to create awareness about the need for their conservation amongst common people.

Cultivation note : The best method to cultivate the Lady's Slipper Orchids is to put the plants directly on the ground (if available), where they will get sufficient temperature (about 30°C) and humidity (about 70%) under some broad leaved trees to get partial sunlight. The plants can be put even in rock crevices. Species like *Paphiopedilum villosum* and *P. hirsutissimum* prefer more sunlight than *P. venustum* which grows well in moist areas near water sources.

The species can also be grown well in well drained pots in a mixture of leaf-mould, river-sand and powdered charcoal in the proportion of 6:2:2 respectively. The pots should be kept in a place where they get diffused light. Watering has to be done almost daily during summer and dry period and twice or thrice weekly during winter period. The best time for potting and repotting of these orchids is during April or just after flowering, i.e., June-July in case of *Paphiopedilum hirsutissimum.* The potting medium of the old pots has to be changed preferably in two alternate years. The mother plant can be separated into 2 or 3 plantlets depending on the growth of the new shoots. Care must be taken so that each plantlet carries a new shoot with the part of the old plant.

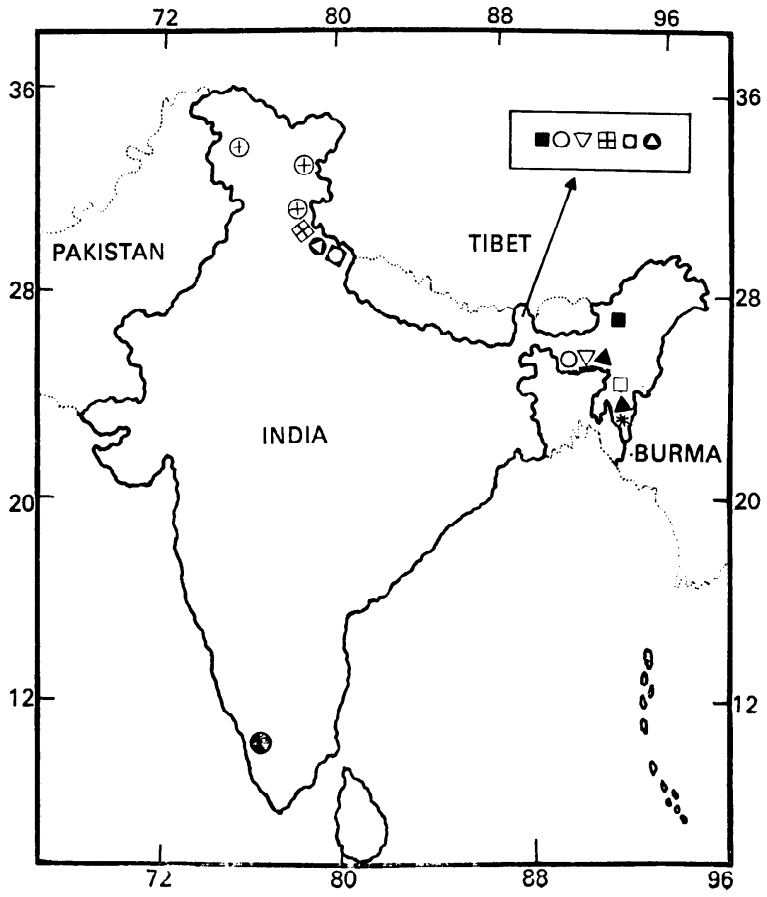
Generic description : Terrestrial, or rarely epiphytes perennial. *Roots* arise from the short rhizome, fleshy, fibrous, long.

Stems long, slender or stout in *Cypripedium* species and almost absent in *Paphiopedilum* species. *Leaves* 2 many, radical, distichous, opposite or alternate, plicate, linear-lanceolate or oblong-lanceolate to oblanceolate, acute or bifid at apex, green throughout or tesselated. *Scapes* arise between the leaves, erect or sub-erect, hairy, 1 few flowered. *Bracts* persistent, shorter or longer than the ovary. *Flowers* usually large with spreading perianth parts; sepals 3; dorsal sepal conspicuous, erect, free; lateral sepals smaller, connate at-least at apex; petals free, margin entire, undulate or crisped; lip or labellum obscurely 3 lobed; midlobe inflated, slipper-shaped; lateral lobes small, incurved. *Column* short, terete; anthers 2, on either side of the column, behind the large stami-node disc; ovary unilocular; capsule elongate, spindle-shaped.

About 70 species distributed in tropical & temperate Asia, Europe and America.

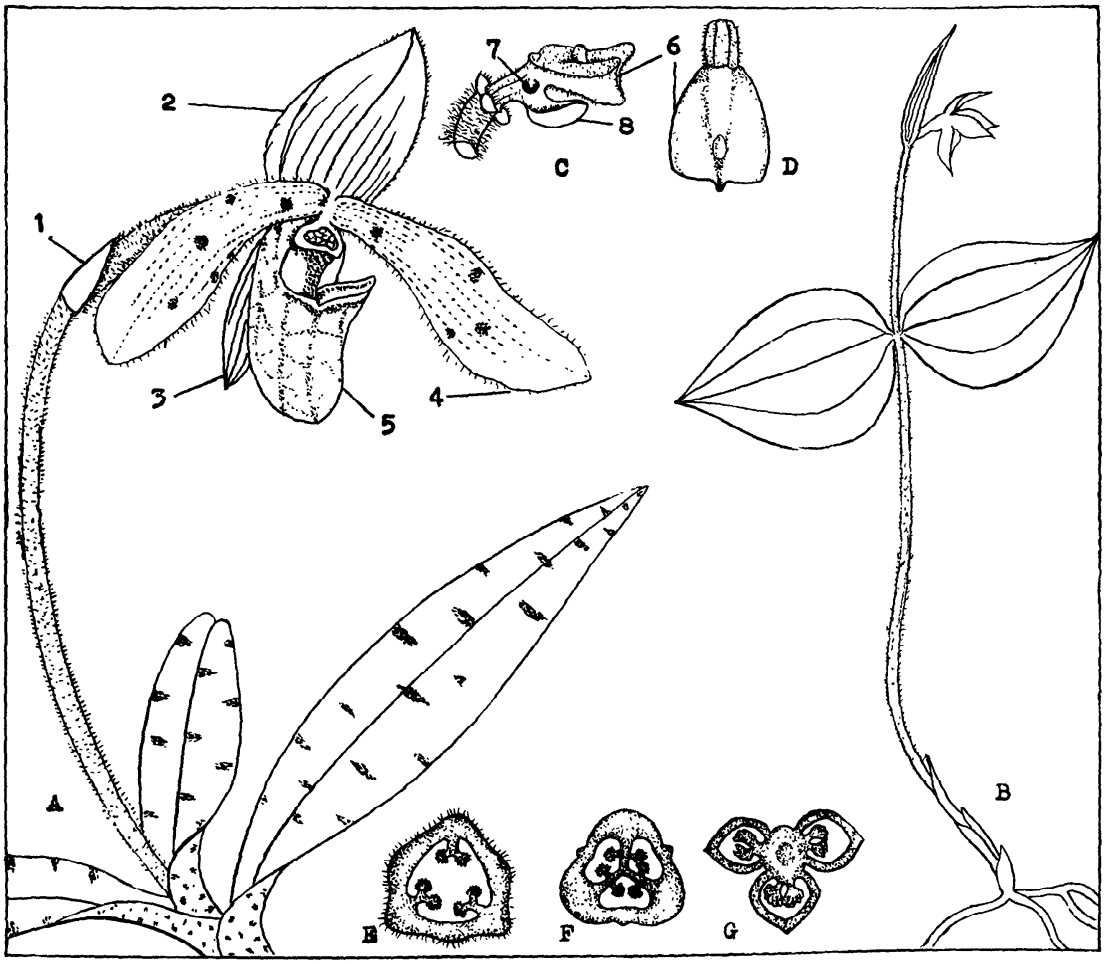
PLATE 1

Distribution of LADY'S SLIPPER ORCHIDS in India



- ● Paphiopedilum druryi (Bedd.) Stein
- ■ P. fairieanum (Lindl.) Stein
- ▲ P. hirsutissimum (Lindl.) Stein
- ○ P. insigne (Wall. ex Lindl.) Pfitz.
- □ P. spicerianum (Reichb. f.) Pfitz.
- ▽ P. venustum (Wall. ex sims.) Pfitz.
- * P. villosum (Lindl.) Stein
- ⊕ Cypripedium cordigerum D. Don
- ⊞ C. elegans Reichb. f.
- ◘ C. himalaicum Rolfe
- ◘ C. tibeticum King ex Rolfe

PLATE 2



A. Habit of *Paphiopedilum venustum* showing its different parts; bract (1), dorsal sepal (2), lateral sepals (3), petal (4) and lip (5); B. *Cypripedium elegans*—a plant C & D. Two views of staminode (6), showing anther (7) and stigma (8) E.-G. T.S. of ovary; E. *Cypripedium & Paphiopedilum*; F. *Selenipedium*; G. *Phragmipedium*.

KEY TO THE SPECIES OF LADY'S SLIPPER ORCHIDS IN INDIA

A. Stems absent; leaves radical, distichous, oblong, not plicate. Winter blooming (except *Paphiopedilum hirsutissimum*) *Paphiopedilum*

B. Stems more than 5 cm. long, slender or stout; leaves opposite or alternate, plicate *Cypripedium*

Paphiopedilum

1a. Leaves tessellated; dorsal sepal whitish with dark green lines *Paphiopedilum venustum*

1b. Leaves green throughout; dorsal sepal not with green lines

2a. Bracts equalling or longer than the ovary

3a. Dorsal sepal ovate-orbicular, upper part white, lower part greenish-white with purple spots or blotches *Paphiopedilum insigne*

3b. Dorsal sepal spathulate, greenish with lower part brown purple, without spots or blotches *Paphiopedilum villosum*

2b. Bracts half or much shorter than the ovary

4a. Sepals with a dark prominent median band *Paphiopedilum druryi*

4b. Sepals without any dark median band

5a. Petals horizontal; margin crisped, lower half violet purple. Summer blooming *Paphiopedilum hirsutissimum*

5b. Petals horizontal or not, sometimes deflexed, margin wavy, yellowish-green with spots or veins. Winter blooming

6a. Dorsal sepal white, base greenish-white with purple dots *Paphiopedilum spicerianum*

6b. Dorsal sepal greenish-white with dark purple veins *Paphiopedilum fairieanum*

Cypripedium

7a. Leaves 2, opposite ; flowers small not showy *Cypripedium elegans*

7b. Leaves more than 2, alternate; flowers large, showy

8a. Lip globose, white, flashed with red *Cypripedium tibeticum*

8b. Lip oblong or sub-globose, white or purplish

9a. Sepals and petals greenish *Cypripedium cordigerum*

9b. Sepals and petals yellowish with purple lines *Cypripedium himalaicum*

Paphiopedilum venustum (Wall. ex Sims.) Pfitz. in Engler, Bot. Jahrb. 19:41.1894. *Cypripedium venustum* Wall. in Bot. Mag. t. 2129. 1820; Hook. f. Fl. Brit. Ind. 6 :173. 1890. *PLATE 3*

Description: Leaves elliptic-oblong, greyish green mottled with dark green patches above and pale green mottled with purple beneath. Scape erect, 1-flowered. Bract half as long as ovary. Flowers *ca* 12 cm across; dorsal sepal whitish-green with dark green veins; petals greenish with black warts at base, margin ciliate; lip yellowish-green with green reticulation.

Flowering: December-February.

Distribution: INDIA (Meghalaya, Sikkim); BANGLADESH.

Notes: Grows in moist shady areas. It was first discovered by Wallich in 1819 in Sylhet (Bangladesh). Plants are under cultivation in National Orchidaria, of B.S.I., at Shillong and Yercaud. This delicate species is disappearing in wild due to destruction of its habitat.

Status: Rare.

Paphiopedilum insigne (Wall. ex Lindl.) Pfitz. in Engler & Prantl. Pflzfam. II. 6 :84. 1889; *Cypripedium insigne* Wall. ex Lindl. Collect. botan. t. 32. 1821; Hook. f. Fl. Brit. Ind. 6 :172. 1890. *PLATE 4*

Description: Leaves linear-ligulate, green. Scape 1-flowered, rarely 2-flowered. Bract equalling the ovary. Flowers *ca* 12 cm across; dorsal sepal oval, apical part white with irregularly brownish-purple dots; lateral sepals smaller, greenish; petals linear-oblong, yellowish-green with purple veins; lip yellowish-green with brownish shade.

Flowering: October-December.

Distribution: INDIA (Meghalaya); NEPAL, BANGLADESH (Sylhet).

Notes: Grows on hilly slopes or in rock crevices. It was first discovered by Wallich in 1819 in Sylhet. Later it was collected by Griffith in Khasi Hills (Meghalaya). The size and colour of the dorsal sepal is variable. Plants are under cultivation in National Orchidaria, B.S.I., at Shillong and Yercaud. Once common, the species has become rare due to large scale collection and habitat destruction.

Status: Rare.

Paphiopedilum villosum (Lindl.) Stein, Orchideen buch. 490. 1892; *Cypripedium villosum* Lindl. Gard. Chron. 125. 1854; Hook. f. Fl. Brit. Ind. 6 :171. 1890. *PLATE 5*

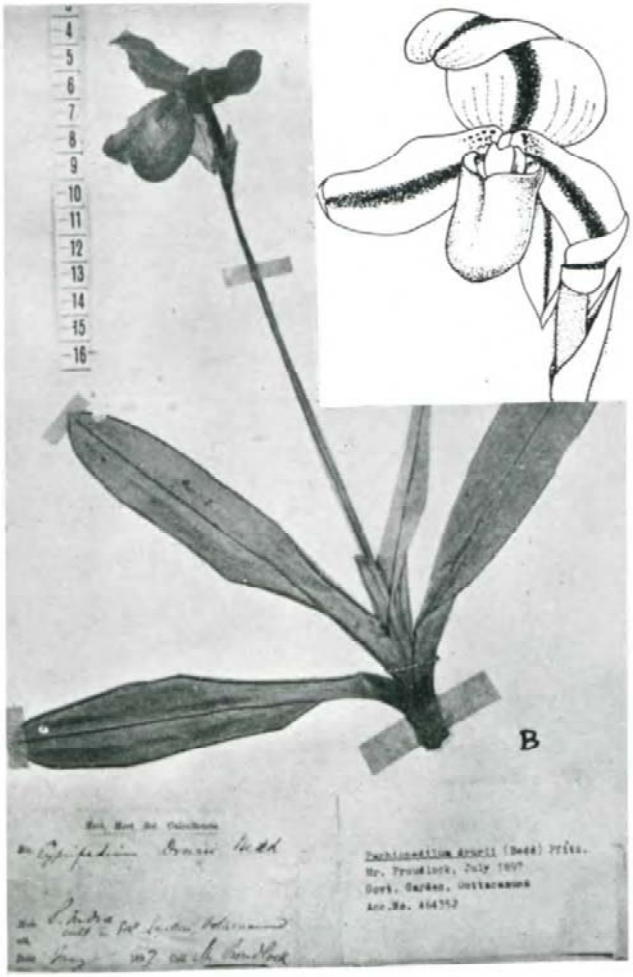
Description: Leaves linear-ligulate, green, apex acute or bifid. Scape hirsute, 1-flowered. Bract equalling the ovary. Flowers *ca* 15 cm across; dorsal sepal broadly ovate, apical part greenish-white, basal part revolute, ciliate, brown purple; lateral sepals yellowish green; petals brownish purple; lip brownish-yellow.

Flowering: October-February.

Distribution: INDIA (Mizoram); BURMA.

Notes: Grows on humus-covered soil or moss-covered branches of trees as epiphyte. It was first discovered by Thomas Lobb in 1853 near Moulmein (Burma). Very variable in colour. Plants are under cultivation in National Orchidaria, B.S.I., at Shillong and Yercaud. Fast depleted in wild due to overcollection and also its habitat destruction.

Status: Rare.



Paphiopedilum druryi (Bedd.) Stein, Orchideen buch. 466. 1892; *Cypripedium drurii* Bedd. Icon. Plant. Ind. Orient. 23. t. 112. 1868; Hook. f. Fl. Brit. Ind. 6 :172. 1890.

PLATE 6

Description: Leaves ligulate, acute, green. Scapes as long as the leaves, 1-flowered. Bract much shorter than the ovary. Flowers large; sepals greenish-yellow, hairy; petals golden-yellow; the black median band on the sepals and petals form an important character to distinguish this species from other species of this group; lip yellow with red-purple spots inside.

Flowering: January-March.

Distribution: INDIA (Western ghats, Kerala). Endemic.

Notes: Reported to be growing in rock crevices. It was first discovered by Col. Drury in 1865 on the Travancore Hills (South India) at an elevation of 1700-2000 m. Later, Beddome found it in abundance on the top of the Calcad Hills, Travancore. One of the most isolated species of *Paphiopedilum*. One live plant is introduced into the Experimental Garden of Botanical Survey of India, Yercaud (Salem District), Tamilnadu. The most immediate threat is due to its apparently exceedingly small size of population which may result in complete loss of this species in wild.

Status: Endangered.

Paphiopedilum hirsutissimum (Lindl.) Stein, Orchideen buch. 470. 1892; *Cypripedium hirsutissimum* Lindl. in Bot. Mag. t. 4990. 1857; Hook. f. **Fl.** Brit. Ind. 6 :171. 1890.

PLATE 7

Description: Leaves linear-oblong, green. Scape erect, green, hairy, 1-flowered. Bract much shorter than the ovary. Flowers *ca* 10 cm across; sepals greenish with black dots at base; petals broadly spathulate, spreading, hirsute, margins crisped, greenish with deep purple at base; lip dull green with faint black dots.

Flowering: April-May.

Distribution: INDIA (Meghalaya, Mizoram, Nagaland); BURMA.

Notes: Grows on steep rock surfaces or in rock crevices in shady areas. It was first recorded from Assam side of Khasi Hills (Meghalaya) in 1857 but 'the precise locality has not been divulged' Later it was collected from Mizoram and Meghalaya. Plants are under cultivation in National Orchidarium and Posscef house, B.S.I., Shillong. Probably abundant in past. Large scale collection from wild resulted this species to be a rare one in its natural habitat.

Status: Rare.

Paphiopedilum spicerianum (Reichb. f.) Pfitz. in Engler, Bot. Jahrb. 19 :41, 1894: *Cypripedium spicerianum* Reichb. f. in Gard. Chron. II. 40 :363. 1880; Hook. f. Fl. Brit. Ind. 6 :172. 1890. *PLATE 8*

Description: Leaves linear-oblong, green above, pale green with purple dots at base beneath. Scape 1-flowered. Bract half as long as the ovary. Flowers *ca* 8 cm across; dorsal sepal broadly obcordate, apical part white, basal part greenish with dull red spots; lateral sepals greenish; petals ligulate, margin undulate, yellowish-green with reddish spots; lip brownish.

Flowering: October-December.

Distribution: INDIA (Assam). Endemic.

Notes: Grows on steep rocky surface or in rock crevices. It was first recorded in 1878 from a collection made in Assam but the exact locality of its origin was not known. Later it was recorded from Cachar district of Assam. Plants are under cultivation in private gardens at Shillong. Its gradual depletion in wild is mainly due to overcollection.

Status: Rare.

Paphiopedilum fairieanum (Lindl.) Stein, Orchideenbuch 467. 1892; *Cypripedium fairieanum* Lindl. in Gard. Chron. 740. 1857; Hook. f. Fl. Brit. Ind. 6 :173. 1890.
PLATE 9

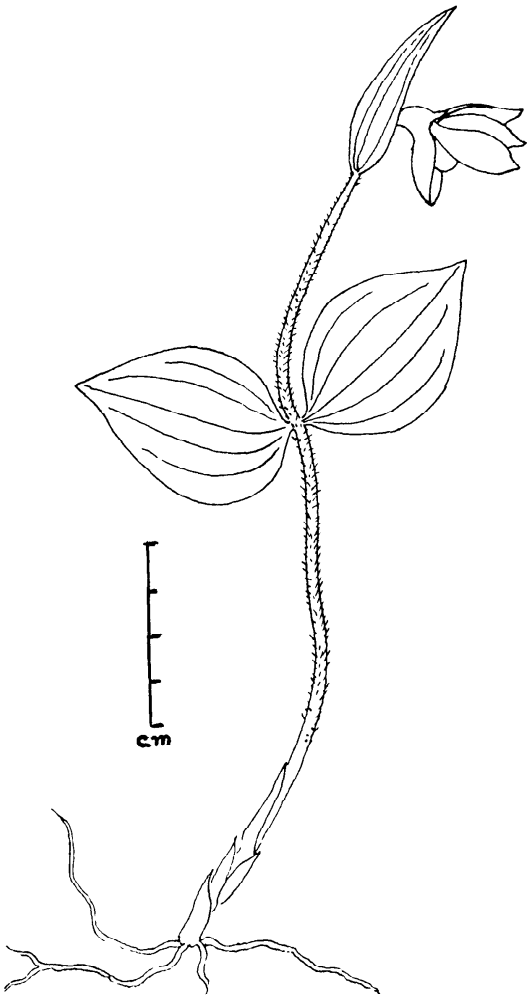
Description: Leaves oblong, ligulate, green. Scapes longer than the leaves, usually 1-flowered, rarely 2. Bract much shorter than the ovary. Flowers *ca* 8 cm across; sepals pale green with dark purple lines; dorsal sepal cordate-oblong, erect, reflexed at apex; petals oblong, ligulate, deflexed and recurved like a buffalo's horn; lip brownish-green with purple veins.

Flowering: October-December.

Distribution: INDIA (Arunachal Pradesh, Sikkim); BHUTAN.

Notes: Grows on hilly slopes in open grassy places or in rock crevices. It was first recorded from Assam without any exact locality. It has been a rare plant and it was known as the 'Lost Orchid' Plants are under cultivation in National Orchidarium, B.S.I., Shillong. A quarter century ago, this species was abundant in wild but frequent disturbance of its habitat and constant collection reduced the individuals to a very limited number in the wild.

Status: Vulnerable.



Cypripedium elegans Reichb. f. Flora 561. 1886, Hook. f. Fl. Brit. Ind. 6 :169, 1890; King & Pantl. in Ann. Roy. Bot. Gard. Calcutta 5 :341. t. 448. 1898. *PLATE 10*

Description: Leaves 2, opposite, plicate. Scape 1-flowered. Bract ovate-lanceolate, longer than the ovary. Flowers brownish with dark brown lines; sepals ovate; petals lanceolate, as long as the sepals; lip short, depressed.

Flowering: July-August.

Distribution: INDIA (Garhwal & Kumaon, Sikkim); NEPAL, BHUTAN, S.E. TIBET.

Notes: Grows on moss-covered humus soil at higher elevation. It is depleted in wild due to habitat destruction.

Status: Rare.

Cypripedium tibeticum King ex Rolfe in Journ. Linn. Soc. 29. 320. 1892; King & Pantl. in Ann. Roy. bot. Gard. Calcutta 8 :341. t. 447. 1898. *PLATE 11*

Description: Leaves few, plicate, alternate. Flowers at the apex of the stem, 1-flowered. Bract broadly ovate, longer than the ovary; sepals elliptic, 7-nerved, brownish; petals linear-lanceolate, brownish; lip longer, much inflated, brownish with light-purple at mouth.

Flowering: July-August.

Distribution: INDIA (Sikkim); BHUTAN, S.E. TIBET.

Notes: Grows in moist shady areas at higher elevation. Gradual depletion in wild is probably due to its habitat destruction.

Status: Threatened.

Cypripedium cordigerum D. Don, Prodr. Fl. Nepal. 37. 1825; Hook. f., Fl. Brit. Ind. 6 :170. 1890. *PLATE 12*

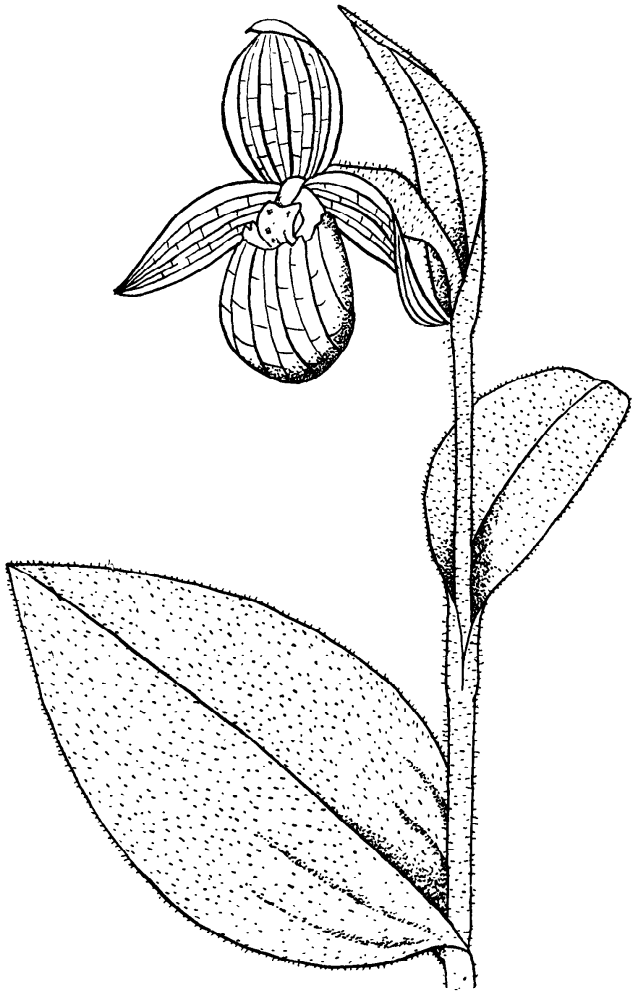
Description: Leaves few, plicate, alternate, orbicular-lanceolate. Scape 1-flowered. Flowers greenish-white. Bract leafy, longer than the ovary; sepals and petals ovate-lanceolate; lip oblong white.

Flowering: June-July.

Distribution: INDIA (Jammu & Kashmir, to Uttar Pradesh); BHUTAN, NEPAL.

Notes: Grows on moss-covered forest floor. Gradual depletion is due to habitat destruction.

Status: Threatened.



Cypripedium himalaicum Rolfe in Journ. Linn. Soc. 29 :319. 1893; King & Pantl. in Ann. Roy. Bot. Gard. Calcutta 5 :342, t. 418. 1898; *C. macrantha* Sw. p.p. Hook. f., Fl. Brit. Ind. 6 :170. 1890. *PLATE 13*

Description: Leaves few, plicate, alternate, orbicular-lanceolate, acute. Flowers at the apex of the stem, solitary, greenish-brown. Bracts elliptic-lanceolate, longer than the ovary; dorsal sepals ovate, acute; petals narrowly oblong, longer than the dorsal sepal; lip sub-cylindric.

Flowering: July.

Distribution: INDIA (Garhrwal-Kumaun & Sikkim); NEPAL, BHUTAN, S.E. TIBET.

Notes: Grows on humus-covered soil. Gradual depletion in wild is mainly due to habitat destruction.

Status: Threatened.

Selected References

Hegde, S. N. (1981): Cultivation and Conservation of 'Lost Orchid' in *Indian Horticulture* 25(4): 7-9.

Hooker, J. D. (1890) . *Flora of British India,* vol. 6. London.

Jain, S. K. & Kataki, S. K. (1976) . National Orchidarium at Shillong, in *American Orch. Soc. Bull.* 45(11)

Jain, S. K. & Kataki, S. K. (1977) . Orchid Culture with afforestation Programme, in *Indian Farmer,* 26 : 99-101.

Jain, S. K. & Sastry, A. R. K. (1980) *Threatened Plants of India—A State-of-the-Art Report,* Botanical Survey of India. Howrah.

Kataki, S. K. (1963) . Notes on Systematics, Cytology & Culture of *Paphiopedilum venustum* (Wall.) Pfitz., in *Bull. Bot. Surv. India,* 5:32-34.

Kataki, S. K. (1975) Notes from the Orchid Station, Tipi, Arunachal Pradesh, in *Indian Forester,* 101(2):137

Kataki, S. K. (1976) Indian Orchids—a note on Conservation, in *American Orch. Soc. Bull.* 45(10):912-914.

Kataki, S. K. (1977)—The Beautiful Orchids of Meghalaya—Let us Conserve them, (a pamphlet), Shillong.

Kataki, S. K. & Joseph, J. (1979) . An Introduction to the cultivation of Native Orchids, Shillong.

King, G. & Pantling, R. (1898) . Orchids of Sikkim Himalaya, in *Ann. Roy. Bot. Gard.* Calcutta, 8.(1&4).

Mammen, V. (1974) Rediscovering *Paphiopedilum druryi* (Bedd.) Pfitz. in South India, in *Orch. Dig.* 1 :38.

Pradhan, U. C. (1976 & 1979): *Indian Orchids-Guide to identification & culture,* vols. 1 & 2. Calcutta.

Rao, A. S. & Hajra, P. K. (1977) . *Paphiopedilum fairieanum* (Lindl.) Pfitz.—Habitat, Description and Cultural Notes, in *Indian Foester* 103(1):29-32.

Veitch, J. (1887-94) . *A Manual of Orchidaceous Plants* 2:1-108.

About the Project POSSCEF in the Botanical Survey of India

The 11th Technical Meeting of the International Union for Conservation of Nature and Natural Resources (IUCN) in 1969 at New Delhi, setting up of a National Committee on Environmental Planning and Coordination (NCEPC), the National Man and Biosphere Committee (MAB), the flora Wing in the Indian Board for Wild-Life (IBWL), India joining the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), contributed to increased concern for conservation of both flora and fauna in our country.

The Botanical Survey of India (BSI) which is primiarily engaged in the study of taxonomy and allied aspects of flora and vegetation of the country, gathered data on certain rare and endangered species of flowering plants, particularly to supply information to various government departments (e.g. The Directorate of Wild-Life for appendices of CITES or Schedules of Wild-Life Act).

An illustrated book-let : *Threatened Plants of India-A-State-of the-Art Report,* (Jain and Sastry) was published by BSI in 1980.

A five year project entitled : Project on Study, Survey and Conservation of Endangered Species of Flora (POSSCEF) was initiated in the BSI since Feb., 1980, in its Headquarters at Howrah and in the Regional Circles at Dehradun, Shillong and Coimbatore under the overall supervision of Dr. S. K. Jain, Director, BSI as its Principal Investigator. The Project with financial support from the United States Fish and Wild-Life Service, primarily aims at bringing out illustrated accounts of rare, and endangered plants of India. Lists of rare, endemic and endangered species on regional bases have been drawn from literature, herbarium specimens and field observations.

The Project has started publishing a *Plant Conservation Bulletin.*

The Project assists the Government by providing information on threatened species for Schedules on Wild-Life Act and Appendices of CITES. The subject of conservation is also popularised through displays, exhibitions and greeting cards, etc.

A. *Some Important Publications by POSSCEF :*

1. **Plant Conservation Bulletin** No. 1. June, 1981 (1-13 pp.).

Contains a detailed article on *Conservation of Threatened Plants in India* (by S. K. Jain) : deals with causes of threats, data for planning conservation, the IUCN categories on threatened plants, proforma for inclusion of species in appendices of CITES and IUCN Plant Red Data Book.

2. **Plant Conservation Bulletin** No. 2. Feb., 1982 (1-9pp.)

Contains the Article on : *Threatened Plants and Habitats—A Review of work done in India* (by S. K. Jain & A. R. K. Sastry). With brief introduction of flora and vegetation of India, endemism, work on rare and threatened plants, recent Seminars and Symposia & selected bibliography of 58 references.

3. **Plant Conservation Bulletin** No. 3. May, 1983 (1-16 pp.).

Deals with an article on *Endemic and Threatened Plants of Western India* (by R. S. Raghavan and N. P. Singh). Deals with phytogeography of the region, lists 27 species which are apparently extinct/not collected since their types and several other threatened and narrow endemics.

4. **Plant Conservation Bulletin** No. 4. August, 1983 (1-30 pp.).

It has two articles: *Rare, threatened and endemic plants of the Western Himalayas-Monocotyledons* (by P. K. Hajra) and *Rare, threatened and endemic flowering plants of South India* (pt. 1, by E. Vajravelu). About 100 sepcies of monocotyledons are listed in the first article and 212 species are given in the second paper.

5. **A contribution to the Botany of Nanda Devi National Park, Uttar Pradesh, India.** March, 1983 (1-38 pp.) (by P. K. Hajra)

Has a brief account of physical and climatic features and vegetation and flora; 312 taxa are enumerated with 10 B & W photographs and 3 line drawings.

6. **Materials for Catalogue of Threatened Plants of India.** August, 1983 (1-70 pp.) (Ed. S. K. Jain & A. R. K. Sastry)

Deals with factors of threats to plants, the Red Data Book categories, proforma for IUCN RDB, and work on threatened plants in India. In all about 850 threatened and endemic taxa are enumerated on phytogeographical basis, viz., Peninsular India (by E. Vajravelu & P. Daniel) ; Gujrat and Rajasthan (by M. J. Kothari & P. K. Hajra) ; Western Himalaya (by P. K. Hajra) and North-Eastern India (by A. R. K. Sastry, S. K. Kataki & A. S. Chauhan).

7. **Materials for a Green-Book of Botanic Gardens in India (Endangered Species under cultivation in the BSI Gardens).** Aug., 1983 (1-10 pp.)

A mimeographed account of about 100 threatened taxa which are under cultivation in the BSI gardens.

8. **Botany of some Tiger Habitats in India.** Nov., 1983 (1-71 pp.) (compiled by S. K. Jain and A. R. K. Sastry).

Deals with vegetation types and salient features of flora of 23 Tiger Habitats; it has 21 B & W photographs.

9. **Lady's Slipper Orchids in India** (by S. K. Kataki).

The booklet deals with Indian species of the genera *Cypripedium* and *Paphiopedilum* with a key, brief descriptions and distribution notes etc. Illustrated with 6 colour plates & line drawings.

B. *Under Publication/Preparation :*

1. **Threatened and endemic orchids of North-eastern India** (by S. K. Kataki, S. K. Jain and A. R. K. Sastry). Has illustrated account of 76 threatened orchids.

2. **Rare, endangered and endemic monoctyledons of North-western Himalaya** (by P. K. Hajra). Illustrated.

3. **Plant Conservation Bulletin** No. 5.

An enumeration of the Orchids of Sikkim and North-eastern India (by S. K. Kataki, S. K. Jain and A. R. K. Sastry).

4. **A Preliminary Inventory of Orchidaceae in India.** (by S. K. Jain and Ajoy Mehrotra).

Lists about 1000 taxa of orchids with important synonyms and range of distribution.

5. **Threatened Palms of India** (by S. K. Basu)

Account of about 45 threatened & endemic species.

6. **A Census of Indian Palms** (by S. K. Basu)

An account of 92 species with keys, short descriptions and some illustrations.

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