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## DIVERSITY OF THE ORCHIDS FLORA OF WEST BENGAL, INDIA

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### ABSTRACT

The state of West Bengal is about one third in area of the pre-partitioned Bengal province of British India. In the present work analyzing the data, it is found, the state of West Bengal harbor 460 Species & 6 varieties of Orchids, belonging to 110 genera. Out of the 466 taxa of Orchids, 321 are epiphytic, 2 are mycophytes, 1 saprophyte and the residual 142 taxa are terrestrial. Among these 466 taxa of Orchids present in the state of West Bengal 147 species of Orchids are in the Threatened category of which 11 species are already been in the pages of the RED DATA book of Rare Endangered & Threatend and the others are in waiting to introduced in the list of the same book if the proper measure for the conservation is not taken just now. It is also reveals in the present study that there are 42 species of the Orchids of the state are in the Endemic category, but there is no exotic species except a few hybrid taxa of the genus *Cymbidium* which was introduced by the Britishers.

**Keywords:** Orchid flora, Diversity, West Bengal, Rare, Endangered, Endemic.

### INTRODUCTION

The state of West Bengal lies between 21° 5 to 27° 16 N latitude and 85° 55 to 89° 56 E longitude, covering an area of 87, 676 sq. km. which is about one third in area of the pre-partitioned Bengal province of the British ruled India. At present the state of West Bengal is administratively divided in to 23 districts comprising of more than 400 blocks and over 4300 villages<sup>(1)</sup>.

This is the only state of the India which have a flora ranging from the most impressive littoral Mangrove Forest of the Sundarbans to the luxuriant vegetation of the Himalayan foothills of the Terai region and the vegetation upward culminating to the temperate zone in the District of Darjeeling Himalayas<sup>(2)</sup>. It is bounded by the Bangladesh and State of Assam in the East, Sikkim state and a portion of the Nepal and Bhutan configure its Northern Boundary, the western Boundary is demarcated by the state of Bihar, Jharkhand, and Orissa and the rolling waves of Bay of Bengal bordered the Southern boundary of the state.

Except the Western districts (Purulia, West Bardhaman, and Jhargram, & part of the West Medinipur) which are the extension of the Chota Nagpur Plateau, the residual part of the state geographically can be divided in to three natural geographical region *viz.* the northern Himalayan region included the Darjeeling Himalaya and the Northern Plain land extended from the South of the Darjeeling district up to the Malda District and the Southern massive Gangetic plain extended from the South of the Malda District to the creeks of the Sundarban Delta of the South 24–Parganahs<sup>(3)</sup>.

The state can be divided into five geographical regions<sup>(4)</sup> *viz.* - the Darjeeling, the Terai–Duars, the Western

undulating highland plateau, North & Bengal plain and Gangetic Delta. Among these five vegetational zone the Darjeeling–Himalayan zone is belongs to the East–Himalayan Hotspots zone and it is the richest floristic zone of the state.

The Family Orchidaceae is a fascinating group of plants with a rich genus as well as species diversity. With its 779 genera and more than 22,500 species<sup>(5)</sup> is the second most diversified flowering plants family followed by the Asteraceae. Theophrastus (370 BC), in his “*Enquiry into Plants*” first coined the term “*Orchid*” based on a Greek word “*Orkhis*” meaning testes and refer to the paired tubers of the terrestrial orchid genus *Orchis* which he examined and named.

Majority of the Orchid species are distributed between 30° North and South of the Equator. They grow vigorously under various environmental condition, some of such environmental condition influence the growth of the orchid species are High rain fall (150 – 200 cm per year) distributed over prolonged time from April to October, relative humidity ranges between 70% – 90% and the temperature which lies between 10°–25° C, etc. So, from the point of view of the orchid flora richness the Darjeeling Himalayan region and Terai–Duars region of the Northern half of the state is the richest area because they providing the most suitable environmental condition for the growth of the orchids.

Starting from the work of William Roxburgh’s *Hortus Bengalensis* (1814), the “Orchid flora” of the West Bengal state has been explored by various workers before independence as the flora of Bengal province under British

rule and after independence as the state flora of West Bengal<sup>6</sup>  
- 65 & 87

## MATERIALS AND METHODS

In this present work comprises a comprehensive study of the diversity of the Orchid Flora of West Bengal. The entire work is based on all available literature and the scrutiny of Herbarium specimens deposited at Llyod Botanical Garden Herbarium, Central National Herbarium (CAL), Industrial Section of the Indian Museum (BSIS), BSI, Sikkim Himalayan Circle (BSHC), and the data obtained from the different districts flora of the state. Often field trips are taken into consideration whenever it is required and the adequate data about the Orchid flora is also gathered from the field. Some of the specimens collected during the field trips are treated following the standard treatment process<sup>66</sup>. Herbarium is deposited at the Botany Department Herbarium of Taxonomy Section of University of Kalyani, Kalyani, Nadia – 741235.

## RESULT AND DISCUSSION

In India Orchidaceae is the second largest family represented by 1195 species under 177 genera<sup>67</sup>. From the then Bengal Province<sup>53</sup> reported 110 species of Orchids under 37 genera, but that work of Prain<sup>53</sup> (*l.c.*) is not a complete enlistment of the Orchids of West Bengal as the flora of Darjeeling Himalayan region, most richest floristic zone of the state was not completely explored in that Prain's work. After independence from the State of West Bengal according to Chakravarty<sup>4</sup> the family Orchidaceae is represented by 112 species under 43 genera. Recently<sup>43</sup> it is estimated that the state of West Bengal comprises of 468 Orchid species under 111 genera. After a critical scrutiny of all available literature, Herbarium specimen deposited in different Herbarium as mentioned above and personal observation it is found that the state of West Bengal comprises of 460 species, 6 variety of orchids belongs to 110 genera grouped into 13 tribes, under 5 subfamilies<sup>(86)</sup>.

A comparative account of the Orchid genera and species as recorded by Prain<sup>53</sup>, Chakravarty<sup>4</sup>, Mitra<sup>43</sup> and in the present study is given in the table – I (Figure - I).

The Orchid flora of the state of West Bengal is shows a high level of Generic as well as species diversity. In comparison to the global as well as Indian Orchid genera the state of West Bengal possesses 14.12% and 62.15% genera in its credit, by the same way in case of species diversity the state of West Bengal have 2.07% and 38.49% of the Orchid species in its credit respectively. A comparative account of the orchid genera and species available in the state of West Bengal as well as that of the Indian and world aspects is given in the table – II below.

From the table – I, it is observed that the state of West Bengal comprises of 110 genera and 460 species with 6 – variety. A conspectus of the Genera and species and varieties there under is given in the table – III.

For a vivid observation of the diversity of the family of Orchidaceae analysis of the subfamilies, tribes, genera and species there in is given in the table – IV.

It is observed from the table IV that on the basis of the numbers of Tribes genera and species Epidendroideae is the most diversified subfamily comprises of 373 taxa, under 84 genera belongs to 10 Tribes followed by subfamily

Orchidoideae with 2 tribes, 22 genera and 83 taxa in its credit.

It is evident from the Table III that on the basis of number of species *Bulbophyllum* is the most diversified genus bearing 52 species followed by *Dendrobium* and *Eria* with 49 and 21 species respectively. The six dominant Orchid genera are presented in Table V which constitutes about 38.26% of total orchid species grown in the state.

By analyzing the data presented in the table – III, make it clear that in the state of West Bengal the maximum numbers of genera of the Orchids belongs to the 1, 2, 3, 4, 4, 5, 6- 10 and 11 – 20 species categories. Genera with 21 – 30, 41 – 50 and 51 – 60 species contains only one genus each in their credit respectively. A brief analysis of the species diversity within genera is given in the table – VI.

## Habitat Diversity

In the introductory portion this present paper it has already been mentioned that the state of West Bengal is divided into 5–broad geographical region which helps to developed a wide range of vegetation ranges from the Mangrove forest in the Sundarban delta of Southern Bengal part to the sub–alpine vegetation in the hill slopes of Darjeeling and Kalimpong districts of the state. Besides this the foot hills Terai Duars region of the state comprises the districts of Jalpaiguri, Alipurduar, Kochbehar, and part of Darjeeling district possesses Tropical evergreen to subtropical mixed deciduous forests. These wide range of vegetational composition helps to harbor a huge numbers of Orchid species in the state. Orchids are normally perennial plants and found to grows on a variety of the substratum. They may found to grows as epiphytes (on the tree trunk), as lithophytes or rupicolous (on the rocks), or often as saprophytes (on decaying matter). When the Orchids are found to grow on the tree trunk as epiphytes they did not draw any nutrition from the host plants instead of that they absorb moisture from the environment through a special absorbing root system and also developed a special clinging root system for attachment. The Orchid wealth of the state of West Bengal also shows wide ranges of habitat diversity. There are 67 genera (63.64% in respect of total genera) comprises of 307 taxa (66.31% in respect to total taxa) epiphytic in nature, 44 genera (34.55% in respect to total genera) with 161 taxa (34.55% in respect to total taxa) are terrestrial in nature and 2 genera with 2 species are Saprophytic in nature. A detail statistical analysis of the epiphytic, terrestrial and saprophytic Orchid genera and species is given in the table – VII, VIII, & IX respectively, figure – IIA & B.

From the table VII, VIII & IX it is clear to us that there are some genera like *Cymbidium* Swartz., *Dienia* Lindl., *Diplomeris* D. Don, *Liparis* C. Richard, etc are found to grow in both the habitat like epiphytic as well as terrestrial, so, these genera are grouped in both the table. There are only two genera *Galeola* Lour. and *Lecanorchis* Bl. which are saprophytes or mycophyte in nature.

## Phytogeographical affinity:

Plants life is entirely controlled by the climatic condition and the edaphic factors of the growing regions of the plants. Distributional pattern and the growing of the plant species based on the ecological condition of the growing region is called as the Phytogeography. It in a broad sense

means the study of distribution of plant species and elucidation of origin of flora.

Several workers have attempted to divide the world's flora in to different phytogeographic zones or divisions based on the comparative study. Takhtajan<sup>68</sup> based on the climatic parameter, geographic position, evolutionary history and taxonomic affinities divided the world's flora into six kingdoms. Indian floristic elements are distributed in to the 2-kingdom as per these phytogeographical regions of the world by Takhtajan<sup>68</sup>. Later on Mitra<sup>69</sup> et al., on the basis of the distribution of the members of Asteraceae divided the Indian subcontinent in to 13 phytogeographical zones. The state of West Bengal phytogeographically comes under three phytogeographical regions of the Indian region these are – Indo – Gangetic Plains, Eastern Himalaya, and Lower Assam regions.

Hooker<sup>70</sup> commented over the flora of the Indian subcontinent that “..... to the immigration of the plants from widely different bordering countries, notably Chinese and Malayan on the East and South of Oriental, European, and African on the West and of Tibetans and Siberian on the North”. Later on Chatterjee<sup>71</sup> and Rao<sup>72</sup> pointed out that India has floristic components of its own but besides this, Indian floristic elements are admixture of three major global biogeography realms, viz. the Afro-tropical, Eurasian and Indo – Malayan regions. The territorial contiguity of the India with the countries like – Middle East, Central Asia, China, and Eastern Asiatic regionals resulted in to a closer affinity between the floristic elements of these regions, as a result of which the Orchadian members of West Bengal are well represented by the members of Orchids of these areas.

So, the Orchids of state of West Bengal on their distributional similarity are grouped under following categories. It is also mentionable here that this migration of the Orchids took place prior to the advent of the Britishers during the nineteenth century. A detail analysis of the phytogeographical affinity of the Orchids of West Bengal state with that of the other region of the globe are given in the table – X below -

By observing the distributional record of the Orchid species of the state of West Bengal it may conclude that the Orchid flora of the state is significantly diverse and peculiar in its composition, it bears a wide range of distributional diversity and shows diversity specifically with the flora of more or less every biogeography regions of the world. So, it is an interesting floristic composition in deed.

Besides these there are some species like *Zeuxine reflexa* which shows discontinuous distribution in Eastern Himalaya (Darjeeling Sikkim part of India) and Thailand.

#### **Rare, Endangered and Threatened Species of the state:**

The state of West Bengal is one of the densely populated states of India. Though the part of Darjeeling district is in the Eastern Himalayan Biodiversity Hotspots Zone, which is one of the four Biodiversity hotspots zones of the country. It is the region of the state with highest concentration of the Orchid flora. With the time due to innumerable reasons the overall habitat conditions of the plant species are changes. In the present situation due to rapid pace of industrialization, destruction of the forests for establishment of the Agricultural lands, urbanization etc. are playing a dangerous role against the survival of the different

floral as well as faunal species. Besides these the natural forces of evolution are also acting on the existing species and the species are forced to change and to adopt with the changed habitat conditions. During all these process of natural and anthropogenic induced forces many of the existing species are fails to cope up with the changed condition and in turn their survival becomes in front of question. As a result of which we found a lot of Species throughout the globe becomes Rare, Threatened and Endangered. Rao<sup>73</sup> estimated that about 10% of the flowering plants species in India are threatened. In the state of West Bengal also many environmental degradation processes are in active condition which causes a great loss to the existing Biodiversity; some of such natural as well as anthropogenic reasons of Biodiversity loss are – overgrazing, naturalization of many exotic species, pressure of tourism, overexploitation of the natural resources<sup>74-76</sup> as a result of which many Orchid species of the state are lost or in verge of extinction. Rao<sup>73</sup>, estimated that about 300 Orchid species of the Eastern Himalaya are in endangered condition and it is estimated that about 20 species are feared to have become extinct from the Indian Subcontinent<sup>77</sup>.

All the enumerated species of the Orchid flora of the State of West Bengal are checked with the data of the Threatened species of India, under Red Data Books of Indian Plants<sup>78-81</sup> and on the basis of the degree of threat they may be accounted according to Red List of Threatened Vascular Plant Species in India<sup>82</sup> in to following categories as mentioned in the table – XI below.

Though only 11 species (2.39%) of the Orchid flora wealth of the West Bengal state are in the IUCN RED list plant categories, but a critical scrutiny of the available literature<sup>8, 35, 50, 65, 76</sup> and on the basis of the personal field observation it reveals that, there are 147 Orchid species belongs to 61 - genera which are also Rare (R), Endangered (En) and Threatened (Th) categories on the basis of their availability and if a proper care is not taken just now then within a short time they will also included in the list of IUCN RED DATA Book. These species are enumerated alphabetically in the table – XII.

After a critical scrutiny of the data presented in the table – XII, it is reveals that among these 147 species of Orchids 115 species (24.79% in respect to total species of the state) are rare and by the same way 25-species (5.36%) are threatened, 5 – species (1.07%) are Endangered, and 1 species (0.21%) each is critically rare and critically endangered respectively. Numerical analysis of the Rare, Endangered and threatened Orchid species are shown in the figure – III.

#### **Endemism of the Orchids of West Bengal:**

The word ‘*endemic*’ was coined by de Candolle<sup>83</sup> and it is defined as “a taxonomic unit of any rank or taxa of organism is confined to a particular geographical region or its distribution is restricted to a particular area, isolated from its surrounding region through geographical barriers”.

Hooker (1904), in his “A sketch of the flora of British India” commented that “..the flora of British India is more varied than that of any other country of equal area in the Eastern Hemisphere, if not in the globe. .... and to the immigration of plants from widely different bordering countries notably of Chinese and Malayan on the east and

south of Oriental, European and African on the west and the Tibetan and Siberian on the north". In the concluding remarks he commented that "Whether India is richer in number of genera and species than any other area on the globe of equal dimensions is doubtful; it is certainly far poorer in endemic genera and species than many others, specially China, Australia, and South Africa". Later on Chatterjee<sup>84</sup> estimated that 60% of the Indian flora is indigenous in nature of which about 40% is its endemic floristic elements.

Endemic taxa of any region indicate its floristic richness and uniqueness as well as its biogeographic characters of that region. So from this point of view it is an essential need to document the endemic orchids taxa of the state of West Bengal to shows its Orchid flora richness as well as the Biogeography uniqueness of the area.

Perusing all the available literature and the deposited species in different herbaria of the state here the endemic taxa of the Orchids found to grow in the Political boundary of the state of the West Bengal, in India and West Bengal and West Bengal state and its adjoining areas are enumerated in the table – XIII, all the species are enumerated here in alphabetical order.

From the table XIII, it is clear that the state of West Bengal consists of 42 endemic Orchid species (9.01%), belonging to 26 genera (23.64%) which are grouped into 5 – categories which are –

1. Species Endemic to West Bengal state only,
2. Species Endemic to Indian Subcontinent as well as state of West Bengal
3. Species endemic to Eastern Himalaya and in West Bengal.
4. Species endemic to West Bengal and North Eastern states
5. Species Endemic to West Bengal and Adjoining countries like Nepal, Bhutan, Myanmar, & China.

A numerical analysis of the distribution of the species in each group along with their respective percentage is given in the table – XIV, figure – IV below.

At present exotic species bears an important value to assess the biological diversity of any region. This exotic species may cause several harmful effects to the local species. After a critical scrutiny of the literature on the exotic plant species of Himalayan region<sup>7,30,31,49,42,21,85</sup> reveals that the exotic species of the Himalayan region are of the two types – **i.** migratory species and **ii.** introduced exotic species. But after perusal of the collected Orchid species data it is confirm that except a few cultivated species of the *Cymbidium* there is no exotic species which naturalized in this Eastern Himalayan region. So, it may conclude that the state of West Benagl has no exotic Orchid species in its floristic composition.

### CONCLUDING REMARKS

The Family Orchidaceae is a fascinating group of plants with a rich species diversity found to occur in the state of West Bengal. There is a large numbers of Orchid species which are with of economic potentiality and they can be exploited for the socioeconomic development of the local populace. All the medicinal orchids which are available in the state also can be exploited in the Pharmaceutical Industries. Though in this present study only the diversity of the Orchid species of the state of West Bengal is assess and it reveals that the state of West Bengal possesses a rich Orchid Gneric, Species, as well as Genetic diversity which is fascinating in every respect. But due to rapid urbanization, deforestation and habitat destruction the natural population of Orchids of the state of West Bengal are under threat at present, especially in the Darjeeling Himalayan & the Terai Duars region. It is observed that there are 147 Orchid species which are in the category of Rare Endangered and Threatened. So, population study and status evaluation of the Orchids grown in the political boundary of the West Bengal are urgently needed for making conservation strategies to protect the beautiful creatures of the nature.

**Table I :** Comparative Account of the Genus and Species of Orchids reported by different workers

Sl. No.	Rank of Taxa	Present study	Prain (1903)	Chakravarty et al. (1999)	Mitra (2016)
1	Genera	110	37	43	111
2	Species	460 (+6 variety)	110	112	468

**Table II :** Comparative Account of the Genus and Species of Orchids found in state as well as in India and world

Sl. No.	Plant Group	West Bengal (Under Present Study)	India (Singh et al., 2004)	%	World (Mabberly, 2008)	%
1	Genera	110	177	62.15	779	14.12
2	Species	466	1195	38.49	22,500	02.07

**Table III :** Conspectus of the genera and species of orchids of westbengal.

Sl. No.	Name of the Genus	Species	Variety	Total taxa
1	<i>Acampe</i> Lindl.	4	1	5
2	<i>Acanthephippium</i> Bl.	2		2
3	<i>Acrochaene</i> Lindl.	1		1
4	<i>Aerides</i> Lour.	3		3
5	<i>Agrostophyllum</i> Bl.	4		4
6	<i>Androcorys</i> Schltr	2		2

7	<i>Ania</i> Lindl.	1		1
8	<i>Anoectochilus</i> Bl.	3		3
9	<i>Anthogonium</i> Wall.ex Lindl.	1		1
10	<i>Aphyllorchis</i> Bl.	2		2
11	<i>Apostasia</i> Bl.	1		1
12	<i>Appendicula</i> Bl.	1		1
13	<i>Arachnis</i> Bl.	2		2
14	<i>Arundina</i> Bl.	1		1
15	<i>Ascocentrum</i> Schlechter ex J.J. Smith	1		1
16	<i>Biermannia</i> King & Pantl.	1		1
17	<i>Bulbophyllum</i> Thouras	50	2	52
18	<i>Calanthe</i> R. Brown	16		16
19	<i>Callostylis</i> Bl.	1		1
20	<i>Cephalanthera</i> Rich.	1		1
21	<i>Ceratostylis</i> Bl.	2		2
22	<i>Cheirostylis</i> Bl.	2		2
23	<i>Chiloschista</i> Lindl.	3		3
24	<i>Chrysoglossum</i> Bl.	1		1
25	<i>Cleisocentron</i> Bruhl	1		1
26	<i>Cleisostoma</i> Bl.	6		6
27	<i>Coelogyne</i> Lindl.	17		17
28	<i>Conchidium</i> Griffith	1		1
29	<i>Corymborkis</i> Thouras	1		1
30	<i>Cremastra</i> Lindl.	1		1
31	<i>Crepidium</i> Bl.	7		7
32	<i>Cryptochilus</i> Wall.	2		2
33	<i>Cymbidium</i> Swartz.	18	1	19
34	<i>Dendrobium</i> Swartz	46	3	49
35	<i>Didymoplexis</i> Griffith	1		1
36	<i>Dienia</i> Lindl.	1		1
37	<i>Diphylax</i> Hook. f.	1		1
38	<i>Diplomeris</i> D. Don	1		1
39	<i>Epigeneium</i> Gagnep	2		2
40	<i>Eria</i> Lindl.	21		21
41	<i>Eriodes</i> Rolfe	1		1
42	<i>Erythrodes</i> Bl.	1		1
43	<i>Esmeralda</i> Reichenbach f.	2		2
44	<i>Eulophia</i> R. Br. ex Lindl.	5		5
45	<i>Flickingeria</i> A.D. Hawkers	1		1
46	<i>Galeola</i> Lour.	2		2
47	<i>Gastrochilus</i> D. Don	9		9
48	<i>Geodorum</i> Jackson	2		2
49	<i>Goodyera</i> R. Brown	9		9
50	<i>Gymnadenia</i> R. Brown	1		1
51	<i>Habenaria</i> Willd.	11		11
52	<i>Herminium</i> R. Brown	6		6
53	<i>Herpysma</i> Lindl.	1		1
54	<i>Ione</i> Lindl.	1		1
55	<i>Lecanorchis</i> Bl.	1		1
56	<i>Liparis</i> C. Richard	20		20
57	<i>Luisia</i> Gaudichaud	5		5
58	<i>Malaxis</i> Solander ex Swartz	2		2
59	<i>Micropera</i> Lindl.	3		3
60	<i>Monomeria</i> Lindl.	1		1
61	<i>Myrmechis</i> (Lindl.) Bl.	1		1
62	<i>Nephelaphyllum</i> Bl.	2		2
63	<i>Nervilia</i> Commerson ex Gaudichaud	6		6
64	<i>Oberonia</i> Lindl.	15		15
65	<i>Odontochilus</i> Bl.	5		5
66	<i>Oreorchis</i> Lindl.	1		1
67	<i>Ornithochilus</i> (Lindl.) Benth.	1		1

68	<i>Otochilus</i> Lindl.	3		3
69	<i>Pachystoma</i> Bl.	1		1
70	<i>Panisea</i> (Lindl.) Steudel	2		2
71	<i>Papilionanthe</i> Schlechter	3		3
72	<i>Paphiopedilum</i> Pfitz	6		6
73	<i>Pecteilis</i> Rafinesque	1		1
74	<i>Pelatantheria</i> Lindl	1		1
75	<i>Peristylus</i> Bl.	12		12
76	<i>Phaius</i> Lour.	5		5
77	<i>Phalaenopsis</i> Bl.	4		4
78	<i>Pholidota</i> Lindl. <i>ex</i> Hook.	6		6
79	<i>Phreatia</i> Lindl.	1		1
80	<i>Platanthera</i> C. Richard	10		10
81	<i>Pleione</i> D. Don	4		4
82	<i>Podochilus</i> Bl.	2		2
83	<i>Pomatocalpa</i> Breda.	2		2
84	<i>Ponerorchis</i> Rchb. f.	1		1
85	<i>Porpax</i> Lindl.	1		1
86	<i>Pteroceras</i> Hassk	1		1
87	<i>Rhomboda</i> Lindl.	1		1
88	<i>Rhynchosstylis</i> Bl.	1		1
89	<i>Robiquetia</i> Gaudichaud	1		1
90	<i>Saccolabiopsis</i> J.J. Sm.	1		1
91	<i>Satyrium</i> Swartz	1		1
92	<i>Schoenorchis</i> Bl.	1		1
93	<i>Smitinandia</i> Holttum	1		1
94	<i>Spiranthes</i> C. Richard	2		2
95	<i>Staurochilus</i> Ridley <i>ex</i> Pfitzer	1		1
96	<i>Stereochilus</i> Lindl.	1		1
97	<i>Sunipia</i> Lindl.	2		2
98	<i>Tainia</i> Bl.	3		3
99	<i>Thelasis</i> Bl.	2		2
100	<i>Thrixspermum</i> Lour.	1		1
101	<i>Thunia</i> Reichenbach <i>f.</i>	2		2
102	<i>Tipularia</i> Nuttall.	1		1
103	<i>Trichoglottis</i> Bl.	1		1
104	<i>Trichotosia</i> Bl.	2		2
105	<i>Tropidia</i> Lindl.	2		2
106	<i>Tylostylis</i> Lindl.	1		1
107	<i>Uncifera</i> Lindl.	2		2
108	<i>Vanda</i> W. Jones <i>ex</i> R. Brown	4		4
109	<i>Vandopsis</i> Pfitzer	1		1
110	<i>Zeuxine</i> Lindl.	10		10
Total		460	6	466

**Table IV :** Numerical analysis of the Subfamilies, Tribes, Genera and Species of Orchidaceae of West Bengal

Sl. No.	Name Sub – Family	Tribe	Genera	Species
1	Apostasioideae		1	1
2	Cypripedioideae	1	1	6
3	Epidendroideae	10	84	373
4	Orchidoideae	2	22	83
5	Vanilloideae	1	2	3

**Table V :** Conspectus of the Most Diversified Orchid Genera of West Bengal

Sl. No.	Name of the Genus	Numbers of Species
1	<i>Bulbophyllum</i>	52
2	<i>Dendrobium</i>	49
3	<i>Eria</i>	21
4	<i>Liparis</i>	20
5	<i>Cymbidium</i>	19
6	<i>Coelogyne</i>	18

**Table VI :** Categorization of the Orchid Genera based on the Numbers of Species

Sl. No.	Group	Number of Genera
1	Genera with 1 Species	50
2	Genera with 2 Species	24
3	Genera with 3 Species	07
4	Genera with 4 Species	04
5	Genera with 5 Species	05
6	Genera with 6 - 10 Species	10
7	Genera with 11 – 20 Species	07
8	Genera with 21 – 30 Species	01
9	Genera with 41 – 50 Species	01
10	Genera with 51 – 60 Species	01

**Table VII :** Numerical analysis of the epiphytic species with each genus along with respective percentage

Sl. No.	Name of the Epiphytic Genera	No. of Species	% of spp.	Sl. No.	Name of the Epiphytic Genera	No. of Species	% of spp.
1	<i>Acampe</i> Lindl.	5	1.07	35	<i>Liparis</i> C. Richard	11	2.36
2	<i>Acrochaene</i> Lindl.	1	0.22	36	<i>Luisia</i> Gaudichaud	5	1.07
3	<i>Aerides</i> Lour.	3	0.61	37	<i>Micropera</i> Lindl.	3	0.61
4	<i>Agrostophyllum</i> Bl.	4	0.86	38	<i>Monomeria</i> Lindl.	1	0.22
5	<i>Androcorys</i> Schltr	2	0.43	39	<i>Oberonia</i> Lindl.	15	3.21
6	<i>Aphyllorchis</i> Bl.	2	0.43	40	<i>Ornithochilus</i> (Lindl.) Benth.	1	0.22
7	<i>Apostasia</i> Bl.	1	0.22	41	<i>Otochilus</i> Lindl.	3	0.61
8	<i>Appendicula</i> Bl.	1	0.22	42	<i>Panisea</i> (Lindl.) Steudel	2	0.43
9	<i>Arachnis</i> Bl.	2	0.43	43	<i>Papilionanthe</i> Schlechter	3	0.61
10	<i>Ascocentrum</i> Schlechter ex J.J. Smith	1	0.22	44	<i>Pelatantheria</i> Lindl	1	0.22
11	<i>Biermannia</i> King & Pantl.	1	0.22	45	<i>Phalaenopsis</i> Bl.	4	0.86
12	<i>Bulbophyllum</i> Thouras	52	11.16	46	<i>Pholidota</i> Lindl. ex Hook.	6	1.29
13	<i>Callostylis</i> Bl.	1	0.22	47	<i>Phreatia</i> Lindl.	1	0.22
14	<i>Cephalanthera</i> Rich.	1	0.22	48	<i>Podochilus</i> Bl.	2	0.43
15	<i>Ceratostylis</i> Bl.	2	0.43	49	<i>Pomatocalpa</i> Breda.	2	0.43
16	<i>Chiloschista</i> Lindl.	3	0.61	50	<i>Ponerorchis</i> Rchb. f.	1	0.22
17	<i>Cleisocentron</i> Bruhl	1	0.22	51	<i>Porpax</i> Lindl.	1	0.22
18	<i>Cleisostoma</i> Bl.	6	1.29	52	<i>Pteroceras</i> Hassk	1	0.22
19	<i>Coelogyne</i> Lindl.	17	3.65	53	<i>Rhynchostylis</i> Bl.	1	0.22
20	<i>Conchidium</i> Griffith	1	0.22	54	<i>Robiquetia</i> Gaudichaud	1	0.22
21	<i>Corymborkis</i> Thouars	1	0.22	55	<i>Saccolabiopsis</i> J.J. Sm.	1	0.22
22	<i>Cryptochilus</i> Wall.	2	0.43	56	<i>Schoenorchis</i> Bl.	1	0.22
23	<i>Cymbidium</i> Swartz.	17	3.65	57	<i>Smitinandia</i> Holttum	1	0.22
24	<i>Dendrobium</i> Swartz	49	10.30	58	<i>Stereochilus</i> Lindl.	1	0.22
25	<i>Diphylax</i> Hook. f.	1	0.22	59	<i>Sunipia</i> Lindl.	2	0.43
26	<i>Epigeneium</i> Gagnep	2	0.43	60	<i>Thelasis</i> Bl	2	0.43
27	<i>Eria</i> Lindl.	21	4.51	61	<i>Thrixspermum</i> Lour.	1	0.22
28	<i>Eriodes</i> Rolfe	1	0.22	62	<i>Thunia</i> Reichenbach f.	2	0.43
29	<i>Erythrodes</i> Bl.	1	0.22	63	<i>Trichoglottis</i> Bl.	1	0.22
30	<i>Esmeralda</i> Reichenbach f.	2	0.43	64	<i>Trichotomia</i> Bl.	2	0.43
31	<i>Eulophia</i> R. Br. ex Lindl.	5	1.07	65	<i>Uncifera</i> Lindl.	2	0.43
32	<i>Flickingeria</i> A. D. Hawkers	1	0.22	66	<i>Vanda</i> W. Jones ex R. Brown	4	0.86
33	<i>Gastrochilus</i> D. Don	9	1.93	67	<i>Vandopsis</i> Pfitzer	1	0.22
34	<i>Ione</i> Lindl.	1	0.22				

**Table VIII :** Numerical analysis of the Terrestrial species with each genus along with respective percentage

Sl. No.	Name of the Epiphytic Genera	No. of Species	% of spp.	Sl. No.	Name of the Epiphytic Genera	No. of Species	% of spp.
1	<i>Acanthephippium</i> Bl.	2	0.43	23	<i>Malaxis</i> Solander ex Swartz	2	0.43
2	<i>Ania</i> Lindl.	1	0.22	24	<i>Myrmechis</i> (Lindl.) Bl.	1	0.22
3	<i>Anoectochilus</i> Bl.	3	0.61	25	<i>Nephelaphyllum</i> Bl.	2	0.43
4	<i>Anthogonium</i> Wall.exLindl.	1	0.22	26	<i>Nervilia</i> Commerson ex Gaudichaud	6	1.29
5	<i>Arundina</i> Bl.	1	0.22	27	<i>Odontochilus</i> Bl.	5	1.07
6	<i>Calanthe</i> R. Brown	16	3.43	28	<i>Oreorchis</i> Lindl.	1	0.22
7	<i>Cheirostylis</i> Bl.	2	0.43	29	<i>Pachystoma</i> Bl..	1	0.22
8	<i>Chrysoglossum</i> Bl.	1	0.22	30	<i>Paphiopedilum</i> Pfitz	6	1.29



9	<i>Cremastra</i> Lindl.	1	0.22	31	<i>Pecteilis</i> Rafinesque	1	0.22
10	<i>Crepidium</i> Bl.	7	1.50	32	<i>Peristylus</i> Bl.	12	2.57
11	<i>Cymbidium</i> Swartz.	1	0.22	33	<i>Phaius</i> Lour.	5	1.07
12	<i>Didymoplexis</i> Griffith	1	0.22	34	<i>Platanthera</i> C. Richard	10	2.15
13	<i>Dienia</i> Lindl.	1	0.22	35	<i>Pleione</i> D. Don	4	0.86
14	<i>Diplomeris</i> D. Don	1	0.22	36	<i>Rhomboda</i> Lindl.	1	0.22
15	<i>Eulophia</i> R. Br. ex Lindl.	5	1.07	37	<i>Satyrium</i> Swartz	1	0.22
16	<i>Geodorum</i> Jackson	2	0.43	38	<i>Spiranthes</i> C. Richard	2	0.43
17	<i>Goodyera</i> R. Brown	9	1.93	39	<i>Staurochilus</i> Ridley ex Pfitzer	1	0.22
18	<i>Gymnadenia</i> R. Brown.	1	0.22	40	<i>Tainia</i> Bl.	3	0.61
19	<i>Habenaria</i> Willd.	11	2.36	41	<i>Tipularia</i> Nuttall.	1	0.22
20	<i>Herminium</i> R. Brown	6	1.29	42	<i>Tropidia</i> Lindl.	2	0.43
21	<i>Herpysma</i> Lindl.	1	0.22	43	<i>Tylostylis</i> Lindl.	1	0.22
22	<i>Liparis</i> C. Richard	09	1.93	44	<i>Zeuxine</i> Lindl.	10	2.15

**Table IX :** Numerical analysis of the Saprophytic species with each genus along with respective percentage

Sl. No.	Name of the Genus	Number of Species	Percentage
1	<i>Galeola</i> Lour.	2	0.43
2	<i>Lecanorchis</i> Bl.	1	0.22

**Table X :** Conspectus Phytogeographical affinity of the Orchids of West Bengal State

Sl. No.	Phytogeographic region	Orchid Species Growing in the State as well as in the areas	Example of the Representing genera
1	Cosmopolitan	Throughout the globe	<i>Appendicula cornuta</i> Bl., <i>Arundina graminifolia</i> (D. Don) Hochreutiner, <i>Cleisostoma subulatum</i> Bl.,
2	Asiatic elements	The Orchid species representing from the regions of Afganistan, Iran, Pakistan, and including some distant parts of the Western India, Russia, and China.	<i>Herminium lanceum</i> (Thunberg ex Swartz) Vuijkin, <i>Nervilia gammieana</i> (Hook. f.) Schlechter, <i>Spiranthes sinensis</i> (Pers.) Ames, <i>Trichotosia pulvinata</i> (Lindl.) Kranz., etc.
3	Australian elements	From the state of West Bengal there are 6 – such Australian species are recorded.	<i>Didymoplexis pallens</i> Griff., <i>Dienia ophrydis</i> (J. Koenig) Seidenfaden, <i>Nervilia aragoana</i> Gaud., <i>Nervilia plicata</i> (Andrews) Schlechter, etc.
4	Sinu – Himalayan elements	In these group the members are generally Chinese in origin and the main representing species of this group belongs to the genera like -	<i>Coelogyne</i> , <i>Habenaria</i> , <i>Liparis</i> , <i>Peristylis</i> , <i>Platanthera</i> , etc. and also some species like - <i>Odontochilus crispus</i> (Lindl.) Hook. f., <i>Satyrium nepalense</i> var. <i>ciliatum</i> (Lindl.) Hook. f
5	Japanese element	Species of this group are Japanese element also reported from the West Bengal state	<i>Calanthe puberula</i> Lindl., <i>Cremastra appendiculata</i> (D. Don) Makino, etc.
6	South east Asian – Pacific Island – Myanmar Elements	These are the species found to grow in the state as well in the regions of South East Asia, Pacific Island and Myanmar.	<i>Oberonia mucronata</i> (D. Don) Ormerod & Seidenfaden.
7	Vietnamese elements	Species grows in Vietnam as well as in the West Bengal state.	<i>Bulbophyllum appendiculatum</i> (Rolfe) J. J. Smith, <i>Phaius flavus</i> (Bl.) Lindl., <i>Thelasis pygmaea</i> (Griff.) Bl., etc.
8	Species extending to Myanmar, Vietnam, Thailand	Species grows in Myanmar, Vietnam, Thailand as well as in the West Bengal state.	<i>Coelogyne viscosa</i> Reichb. f., <i>Dendrobium aduncum</i> Lindl. <i>Liparis odorata</i> (Willd.) Lindl., <i>Panisea demissa</i> (D. Don) Pfitz., <i>Papilionanthe teres</i> (Roxb.) Schlechter, <i>Vanda pumila</i> Hook. f., etc.
9	Sumatran Element	This region including Myanmar, Thailand, Vietnam, Philippines and Sumatra.	<i>Aerides odorata</i> Lour., <i>Appendicula cornuta</i> Bl., <i>Crepidium acuminatum</i> (D. Don) Szlachetko, <i>Cymbidium dayanum</i> Reichb. f., etc.
10	Malaysian elements	This group included the species from Myanmar, Thailand, Vietnam, Malaysia.	<i>Acampe rigida</i> (Buch. – Ham. ex J.E. Smith) P.F. Hunt, <i>Aerides multiflora</i> Roxb., <i>Anthogonium gracile</i> Lindl., <i>Bulbophyllum odoratissimum</i> (J.E. Smith) Lindl. ex Wall., Numer. List 1987. 1828. Var. <i>odoratissimum.</i> , <i>Bulbophyllum reptans</i> (Lindl.) Lindl. ex Wall., <i>Dendrobium</i> Species, etc.



11	Cambodian elements	This group included the species from Myanmar, Thailand, Vietnam, Laos, Cambodia.	<i>Bulbophyllum wallchii</i> Reichb. f., <i>Cleisostoma fliforme</i> (Lindl.) Garay, <i>Dendrobium chrysanthum</i> Wall. exLindl., <i>Eria bractescens</i> Lindl., <i>Liparis cathcartii</i> Hook. f., etc.
12	Sumatran elements	This group included the species from Myanmar, Java, Sumatra.	<i>Coelogyne ovalis</i> Lindl., <i>Peristylus goodyeroides</i> (D. Don) Lindl., etc.
13	Vietnam Elements	This group included the species from Myanmar, Borneo, Cambodia, Thailand, Vietnam.	<i>Dendrobium cumulatum</i> Lindl., <i>Otochilus fuscus</i> Lindl., <i>Peristylus constrictus</i> (Lindl.) Lindl., <i>Pholidota articulata</i> Lindl., etc.
14	South East Asian elements	This group included the species from Myanmar, Borneo, Cambodia, Java, Malaysia, South East Asia, Thailand, Vietnam.	<i>Ceratostylis subulata</i> Bl., <i>Cymbidium aloifolium</i> (Linn.) Swartz, <i>Eria pannea</i> Lindl., <i>Goodyera procera</i> (Ker Gawler) Hook., etc.
15	Malay archipelago elements	This group included the species from Malay Archipelago, Taiwan, Thailand, Sri Lanka.	<i>Chrysoglossum ornatum</i> Bl., <i>Phaius tankervilleae</i> (Banks) Bl., <i>Porpax elwesii</i> (Rchb. f.) Rolfe, etc.
16	Philippians elements	This group included the species from Malaysia, Australia, New Guinea, Philippines, Japan, others Asiatic region.	<i>Didymoplexis pallens</i> Griff., <i>Dienia ophrydis</i> (J. Koenig) Seidenfaden, <i>Nervilia aragoana</i> Gaud., <i>Pteroceras teres</i> (Bl.) Holtt., <i>Phaius mishmensis</i> (Lindl. & Paxton) Reichenbach. f. etc.
17	Species common with Nepal and Bhutan	This group included the species from West Bengal with Nepal, Bhutan, etc. adjoining country.	<i>Acampe ochracea</i> (Lindl.) Hochr., <i>Bulbophyllum affine</i> Lindl., <i>Bulbophyllum careyanum</i> (Hook.) Sprengel, <i>Coelogyne fimbriata</i> Lindl., <i>Dendrobium aphyllum</i> (Roxb.) C.E.C. Fischer, etc.
18	Himalayan Elements	This group included the species from Western Himalaya & eastern Himalaya	<i>Anoectochilus brevilabris</i> Lindl., <i>Bulbophyllum bisetum</i> Lindl., <i>Bulbophyllum cariniflorum</i> Reichenbach. f., <i>Ceratostylis himalaica</i> Hook. f., <i>Calanthe sylvatica</i> (Thouars) Lindl., etc.
19	North Eastern elements	North Eastern states of the Indian subcontinent are included in this group.	<i>Acampe rigida</i> (Buch. – Ham. exJ.E. Smith) P.F. Hunt, <i>Acrochaene punctata</i> Lindl., <i>Bulbophyllum gamblei</i> (Hook. f.) Hook. f., <i>Bulbophyllum guttulatum</i> (Hook. f.) N.P. Balakrishnan, <i>Bulbophyllum rolfei</i> (Kuntze) Seidenfaden, <i>Goodyera vittata</i> (Lindl.) Benth. exHook. f., <i>Vanda cristata</i> Lindl., etc.

**Table XI : Threatened Orchid Species of West Bengal**

Sl. No.	IUCN – Categories	Name of the Species	Distributional area	Reference	Total No. of Species	%
1	Extinct / Endangered (Ex/ E)	-	-	-	-	-
2	Endangered (E)	<i>Paphiopedilum fairrieatum</i> (Lindl.) Stein,	Duars (BTR), 850 – 2200 m.	Nayar & Shastri (1987).	1	0.22
3	Vulnerable (V)	-	-	-	-	-
4	Rare (R)	<i>Coelogyne cristata</i> Lindl.	Duars (BTR)	Arora & Gupta (1983)	4	0.86
		<i>Coelogyne nitida</i> (Wall.ex D. Don) Lindl.	Kurseong to Ghoom- Lebong,	Arora & Gupta (1983)		
		<i>Esmeralda clarkei</i> Reichb. f.	Sukiapokhari, Lava, 700 – 2300 m.	Arora & Gupta (1983)		
		<i>Paphiopedilum hirsutissimum</i> (Lindl. ex Hook.) Stein,	Darjeeling, 850 – 2300 m.	Arora & Gupta (1983)		
5	Indeterminate (I)	<i>Anoectochilus brevilabris</i> Lindl.,	BTR, Duars, Darjeeling	Arora & Gupta (1983)	6	1.30
		<i>Coelogyne barbata</i> Lindl. ex Griff.	Darjeeling, Kurseong, Kalimpong; 1500-2200 m	Arora & Gupta (1983)		

	<i>Coelogyne flaccida</i> Lindl.	Darjeeling, Kalimpong,	Arora & Gupta (1983)
	<i>Coelogyne prolifera</i> Lindl.,	Kalimpong town Duars (BTR), 600 – 1900 m.	Arora & Gupta (1983)
	<i>Liparis duthiei</i> Hook. f.	Relli river sides, Kumsi, Darjeeling, 400 – 1500 m.	Jain & Sastry (1983)
	<i>Phaius mishmensis</i> (Lindl. & Paxton) Reichenbach. f.	Tista river valley; up to 700 m.	Arora & Gupta (1983)

**Table XII :** Numerical Analysis of the Rare, Endangered, Threatened Orchid Species

Sl. No.	Name of the Orchid Species	Place of Availability in the state (Collected / Observed during Study)	Field status
1	<i>Acanthephippium striatum</i> Lindl.	Godak, Darjeeling	R
2	<i>Agrostophyllum planicaule</i> (Wall, ex Lindl.) Reichb. f.	Kalijhora, Darjeeling	Th
3	<i>Anoectochilus brevilabris</i> Lindl.,	BTR, Duars, Darjeeling,	R
4	<i>Anoectochilus grandiflorus</i> Lindl.,	Algarah forest, Echey Busty, 900 – 1600 m.	Th
5	<i>Apostasia wallichii</i> R. Brown	Najoke (Tista river valley); upto 600 m.	R
6	<i>Appendicula cornuta</i> Bl.	Teesta, Hydro Electric Power Project sides,	R
7	<i>Biermannia bimaculata</i> King & Pantl.	Teesta Bridge Sides,	R
8	<i>Bulbophyllum apodum</i> Hook.f. in Hook.f.,	Duars (BTR),	Th
9	<i>Bulbophyllum appendiculatum</i> (Rolfe) J. J. Smith	Kumsi, 300 – 1200 m.	En
10	<i>Bulbophyllum eublepharum</i> Reichb. f.	Rambi forest, 1400–2500 m.	R
11	<i>Bulbophyllum gracilipes</i> King & Pantl.	Duars (BTR),	R
12	<i>Bulbophyllum guttulatum</i> (Hook. f.) N. P. Balakrishnan	Godok, Darjeeling 650 – 1800 m.	R
13	<i>Bulbophyllum hymenanthum</i> Hook. f. in Hook. f.	Rambi forest, Baggonra, Darjeeling 1400 – 2800 m.	Th
14	<i>Bulbophyllum interpositum</i> J. J. Verm., Schuit. & de Vogel	Chimney-Kurseong, 1300 – 2000 m.	R
15	<i>Bulbophyllum polyrhizum</i> Lindl.,	Rangit Valley, Darjeeling 300 – 800 m.	Th
16	<i>Bulbophyllum pteroglossum</i> Schlechter,	Kolbong, Darjeeling, around 1050 m.	R
17	<i>Bulbophyllum rolfei</i> (Kuntze) Seidenfaden	Rimbick, 1900 – 2800 m.	Th
18	<i>Bulbophyllum roxburghii</i> (Lindl.) Reichb. f.	Lesh khola, Darjeeling 300 – 700 m.	En
19	<i>Bulbophyllum sarcophylloides</i> Garay, Hamer & Siegerist	Gorkhey- Samanden; 2000 - 2500 m.	R
20	<i>Bulbophyllum stenobulbon</i> Parish & Reichb. f.	Sepkhola, Rongo, 250 – 700 m.	R
21	<i>Bulbophyllum sunipa</i> J. J. Verm., Schuit. & de Vogel,	Todey, Takdah Darjeeling	R
22	<i>Bulbophyllum thomsonii</i> Hook. f. in Hook. f.,	Dabaipani-Takdah, Algarah, Kalimpong 800–2100 m.	R
23	<i>Bulbophyllum tortuosum</i> (Blume) Lindl.,	Kalijhora, Ryang, 200 – 450 m.	Th
24	<i>Bulbophyllum triste</i> Reichb. f.	Mirik, 1000 – 1800 m.	R
25	<i>Bulbophyllum umbellatum</i> Lindl.,	Rambi forest, 1000–2100 m.	R
26	<i>Bulbophyllum wallichii</i> Reichb. f.	Ramam, 1500–2900m.	R
27	<i>Bulbophyllum yoksunense</i> J.J. Smith	Gorkhey- Samanden; 2000- 2500 m.	R
28	<i>Calanthe plantaginea</i> Lindl.	Darjeeling; around 2000 m	R
29	<i>Calanthe puberula</i> Lindl.	Maneybhanjyang; 1200-3000 m.	R
30	<i>Calanthe sylvatica</i> (Thouars) Lindl.,	Algarh, Kalimpong.	R
31	<i>Calanthe tripicata</i> (Willemet) Ames	Mungpoo, Darjeeling	R
32	<i>Cephalanthera longifolia</i> (Linn.) Fritsch	Todey, Darjeeling	R
33	<i>Ceratostylis himalaica</i> Hook. f.	Sonada, 1200–2000 m.	Th
34	<i>Ceratostylis subulata</i> Bl.,	Duars (BTR – Tobagaon, 850m)	R
35	<i>Cheirostylis griffithii</i> Lindl.,	Durpin Hill – Kalimpong	Th
36	<i>Cheirostylis yunnanensis</i> Rolfe,	Kalimpong 8th Mile,	R
37	<i>Chiloschista parishii</i> Seidenfaden	Mahananda Wildlife Sanctuary,	R
38	<i>Chiloschista usneoides</i> (D. Don) Lindl.	Singtam area; around 1700 m.	R
39	<i>Cleisocentron pallens</i> (Cathcart ex Lindl.) Pearce & Cribb.	Samsing, Mangmaya, 300–700 m.	Th
40	<i>Cleisostoma aspersum</i> (Reichb. f.) Garay	Guling forest, 300 – 1900 m.	R
41	<i>Cleisostoma racemiferum</i> (Lindl.) Garay	Sangsay Bhalukhop, Darjeeling ; Duars	R

		(BTR), 800 – 2200 m.	
42	<i>Cleisostoma subulatum</i> Bl.	Solok-Kalimpong, 250 – 900 m.	Th
43	<i>Coelogyne occultata</i> Hook. f.	Senchal Darjeeling	R
44	<i>Coelogyne pantlingii</i> Lucksom,	Serikhola, 2000–2600 m	R
45	<i>Coelogyne pempahisheyana</i> H.J. Chowdhery,	Kalimpong, 900 – 950 m.	R
46	<i>Coelogyne stricta</i> (D. Don) Schlechter	Senchal area; 1800-2300 m	R
47	<i>Coelogyne viscosa</i> Reichb. f.,	Samsing, 500–1800 m.	R
48	<i>Cremastra appendiculata</i> (D. Don) Makino	N eora Valley; 1800-2500 m.	R
49	<i>Crepidium josephianum</i> (Reich · enbach f) Margonska	Balasan river valley; 500-1500 m.	R
50	<i>Crepidium mackinnoni</i> (Duthi) Schaltz.	Mungpoo, Darjeeling	R
51	<i>Cryptochilus lutea</i> Lindl.	Megma, Palmajua, 1100 – 2900 m.	R
52	<i>Cryptochilus sanguinea</i> Wall.,	Birch hill, Senchale, 1600 – 2600 m.	Th
53	<i>Cymbidium dayanum</i> Reichb f..	Jaldhaka, Darjeeling	R
54	<i>Cymbidium eburneum</i> Lindl.	Duars, BTR (Adma, 600 – 1200m)	Th
55	<i>Cymbidium erythraceum</i> Lindl.	Algarh, Kalimpong	R
56	<i>Cymbidium hookerianum</i> Reichenb. f.	Darjeeling; 2000-2800 m.	R
57	<i>Cymbidium lancifolium</i> Hook.,	Mungsung, Darjeeling,	R
58	<i>Cymbidium mastersii</i> Griff, ex. Lindl.	Rimbi forest area Kalimpong,	Th
59	<i>Dendrobium aduncum</i> Lindl.	Geil-Deorali, 27 Mile area, Kalimpong; 400- 700 m	R
60	<i>Dendrobium amplum</i> Lindl.	Dow Hill, Kurseong; around 1600- 1700 m	R
61	<i>Dendrobium bicameratum</i> Lindl.	Purulia,	R
62	<i>Dendrobiutn cathcartii</i> Hook. f.	Jholung, Tindharey, 150 – 800 m.	R
63	<i>Dendrobium farmeri</i> Paxton	Kumsi, 200 – 1000 m. Duars (BTR).	Th
64	<i>Dendrobium parishii</i> Reichenb. f.	Mahananda Wildlife Sanctuary; upto 500 m.	R
65	<i>Dendrobium porphyrochillum</i> Lindl.	Samalbong; 1100-2200 m.	R
66	<i>Dendrobium praecinctum</i> Reichenb. f.	Tangta, 1000 – 1900 m.	En
67	<i>Dendrobium stuposum</i> Lindl.	Rambi forest, Duars (BTR) 1400 – 2300 m.	R
68	<i>Dendrobium sulcatum</i> Lindl.	Valley, 550 – 1000 m.	R
69	<i>Didymoplexis pallens</i> Griffith	N. Bengal & C. Bengal Plains, around 1200 m.	R
70	<i>Diplomeris hirsuta</i> (Lindl.) Lindl.	Rungdung Valley, Duars (BTR); upto 800 m.	Cr.En
71	<i>Eria bambusifolia</i> Lindl.	Rambi forest,	R
72	<i>Eria biflora</i> Griff.,	Majitar, Duars (BTR) 400 – 900 m.	Th
73	<i>Eria bractescens</i> Lindl.,	Dow hill, Nimbong, 300 – 1700 m.	R
74	<i>Eria pannea</i> Lindl.	Chisang-Godok, 600 – 1000 m.	R
75	<i>Eria pumila</i> Lindl.,	Mungpong, 200 – 600 m.	R
76	<i>Eria vittata</i> Lindl.	Duars (BTR) 800 – 2600 m.	R
77	<i>Esmeralda clarkei</i> Reichb. f.	Lava, 700 – 2300 m.	R
78	<i>Galeola falconeri</i> Hook.f.	Gorkhey, Darjeeling; 2000 - 2800 m.	R
79	<i>Gastrochilus acutifolius</i> (Lindl.) Kuntze	Rambi forest, 1400 – 2400 m.	R
80	<i>Gastrochilus calceolaris</i> (Buch. –Ham.ex J.E. Smith) D. Don.	Duars (BTR); 500- 1200 m.	R
81	<i>Gastrochilus corymbosus</i> A.P. Das & Chanda,	Darjeeling; around 2200 m.	R
82	<i>Geodorum densiflorum</i> (Lamk.) Schltr. var. <i>kalimpongense</i> Rajendra Yonzone, D. Lama, R. B. Bhujel and Samuel Rai,	Lathpanjar, Peshok, 750 – 1300 m.	R
83	<i>Goodyera biflora</i> (Lindl.) Hook. f.,	Damsang forest, 1900 – 2850 m.	R
84	<i>Goodyera fumata</i> Thw.	Suruk, Dello Hill, Kalimpong	CrR
85	<i>Goodyera hemsleyana</i> King & Pantling	Rambhi Forest; 2000-2500 m.	R
86	<i>Goodyera hispida</i> Lindl.,	Pedong, 350 – 2300 m.	R
87	<i>Goodyera vittata</i> (Lindl.) Benth. ex Hook. f.,	Jaunbari, Dhotrey, Darjeeling 1500 – 3000 m.	R
88	<i>Gymnadenia orchidis</i> Lindl.,	Phalut, 3000 – 4300 m.	Th
89	<i>Habenaria dentata</i> (Sw.) Schltr.,	15th Mile-Kalimpong, 600 – 1600 m.	R
90	<i>Habenaria furcifera</i> Lindl.,	Pudung-Sendaybong, 600 – 1100 m.	R

91	<i>Habenaria pectinata</i> (J.E. Sm.) D. Don	Damsangforest, 1500 – 2700 m.	R
92	<i>Herminium kalimpongense</i> Pradhan	Kalimpong	R
93	<i>Herminium mackinnonii</i> Duthie	Durpin-Kalimpong, 1100 – 1600 m.	R
94	<i>Herminium quinquelobum</i> King & Pantl.,	Dhotrey, Rambh forest, 1800 – 2600 m.	R
95	<i>Herpysma longicaulis</i> Lindl.	Neora Valley National Park; 2200 - 2550 m.	R
96	<i>Lecanorchis sikkimensis</i> N. Pearce & P.J. Cribb	Kainjalay; 1200 m	R
97	<i>Liparis cathcartii</i> Hook. f.,	Senchale, 2000 – 3100 m.	R
98	<i>Liparis dongchenii</i> Lucksom	Sittong, 600 – 1000 m.	R
99	<i>Liparis duthiei</i> Hook. f.,	Duars (BTR), Kumsi, 400 – 1500 m.	Th
100	<i>Liparis gamblei</i> Hook. f.,	Jalapahar, Megma, 1600 – 2400 m.	R
101	<i>Liparis nervosa</i> var. <i> khasiana</i> (Hook.f.) P.K. Sarkar,	Birch Hill area; 2000 -2300 m.	R
102	<i>Liparis platyrachis</i> Hook. f	Durpin-Kalimpong, Kafer,	R
103	<i>Liparis somai</i> Hayata	Algarah forest, Lungshel, 450 – 1100 m.	R
104	<i>Liparis tigerhillensis</i> A.P. Das & Chanda	Tiger Hill area; 2400 - 2500 m.	R
105	<i>Monomeria barbata</i> Lindl.,	Gumbadara, 900 – 2500 m.	R
106	<i>Nephelaphyllum cordifolium</i> (Lindl.) Bl.,	Duars (BTR) 800 – 1600 m.	Th
107	<i>Nephelaphyllum pulchrum</i> Bl.,	Duars, (BTR), Tarkhola, 500 – 1200 m.	Th
108	<i>Nervilia gammieana</i> (Hook. f.) Schlechter	Tista & Rangit river valleys; 300- 1000 m.	R
109	<i>Oberonia ensiformis</i> (J.E. Sm.) Lindl.,	Balasan, 450 – 700 m.	R
110	<i>Oberonia falcata</i> King & Pantl.,	Dabaipani-Takdah, 1300 – 1800 m.	R
111	<i>Odontochilus crispus</i> (Lindl.) Hook. f.,	Mungpoo, 300 – 2800 m.	R
112	<i>Odontochilus elwesii</i> C.B. Clarke ex Hook. f.,	Tangta forest, Gumbadara, 1900 – 2600 m.	R
113	<i>Papilionanthe vandarum</i> (Reichenb. f.) Garay	Darjeeling; 1500-2200 m.	R
114	<i>Pelatantheria insectifera</i> (Reichenb. f.)	Gorubathan, 150 – 900 m.	En
115	<i>Peristylus affinis</i> (D. Don) Seidenf.,	Seokbir khani, 600 – 1900 m.	R
116	<i>Peristylus aristatus</i> Lindl.	Tiger Hill; 1500-2300 rn.	R
117	<i>Peristylus fallax</i> Lindl.,	Sandakphu forest, Jaunbari, 2200 – 3800 m.	Th
118	<i>Peristylus goodyeroides</i> (D. Don) Lindley,	Kalimpong; 500-2000 m.	R
119	<i>Peristylus nematocaulon</i> (Hook. f.) M.L. Banerji & P. Pradhan	Sandakphu, 2400–3600 m.	R
120	<i>Peristylus parishii</i> Reichenb. f.	Sittong, 500 – 800 m.	R
121	<i>Phaius flavus</i> (Bl.) Lindl.	Duars (BTR); upto 1000 m.	R
122	<i>Phaius mishmensis</i> (Lindl. & Paxt.) Reichenb. f.	Dilaram, 1100 – 2700 m.	R
123	<i>Phalaenopsis lobbii</i> (Reichenb. f.) H.R. Sweet,	Gasoke, Duars (BTR) 250 – 700 m.	R
124	<i>Pholidota recurva</i> Lindl.,	Echey Busty, 600 – 2000 m.	R
125	<i>Phreatia elegans</i> Lindl.	Damsanggari, 1500 – 2000 m	R
126	<i>Platanthera bakeriana</i> (King & Pantl.) Kranz.	Neora Valley, 2200 – 3400 m.	R
127	<i>Platanthera biemanniana</i> (King & Pantling) Kranz.	Tiger Hill; around 2300 m.	R
128	<i>Platanthera edgeworthii</i> (Hook. f. ex Collett) R.K. Gupta	Gorkhey, 2400 – 2900 m.	R
129	<i>Platanthera stenantha</i> (Hook. f.) Soo	Jalapahar, 1900 – 3500 m.	R
130	<i>Pleione maculata</i> (Lindl.) Lindl.,	Duars (BTR); 500 – 1800 m.	Th
131	<i>Podochilus cultratus</i> Lindl.,	Yangmakum, 300–1700 m.	R
132	<i>Podochilus khasianus</i> Hook. f.,	Sonada-Pacheng, Duars (BTR) 1000 – 2000 m.	R
133	<i>Pomatocalpa armigerum</i> (King & Pantl.) Tang & Wang	Sukuna, 27th Mile N.H.P.C. Project sides,	Th
134	<i>Porpax elwesii</i> (Rchb. f.) Rolfe,	Toonang, 500 – 1400 m.	R
135	<i>Pteroceras teres</i> (Bl.) Holtt	Suruk, Gasoke, 300 – 1100 m.	R
136	<i>Saccolabiopsis pusilla</i> (Lindl.) Seidenf. & Garay,	Sepkhola, Kambal, 200 – 500 m.	R
137	<i>Staurochilus ramosus</i> (Lindl.) Seidenfaden	Terai; upto 500 m.	R
138	<i>Stereochilus hirtus</i> Lindl.,	Tangta, Nockdara, 1800–2500m.	R
139	<i>Tainia megalantha</i> Tang & Wang	Kumai, Jholung, 250 – 700 m.	Th
140	<i>Thelasis longifolia</i> Hook. f.,	Panbu, Nimbong, 600 – 1000 m.	R
141	<i>Tipularia josephi</i> Reichenb. f. ex Lindl.,	Tonglu, Dhotrey, 1900 – 3100 m.	R
142	<i>Trichotosia dasyphylla</i> (Par. & Reichenb. f.) Kranz	Mungpoo, Paiyung, 800 – 1200 m.	R

143	<i>Trichotosia pulvinata</i> (Lindl.) Kranz	Chibo Busty Gasoke, 400 – 800 m.	R
144	<i>Uncifera obtusifolia</i> Lindl.,	Duars (BTR) 1100 – 1900 m.	R
145	<i>Zeuxine affinis</i> (Lindl.) Benth. exHook. f.	Rungdung valley; 700- 2000 m.	R
146	<i>Zeuxine flava</i> (Wall. ex Lindl.) Trim.,	Lopchu, Takdah, 800 – 2100 m.	En
147	<i>Zeuxine reflexa</i> King & Pantl.	Mungpoo, 1000 – 1600 m.	Th

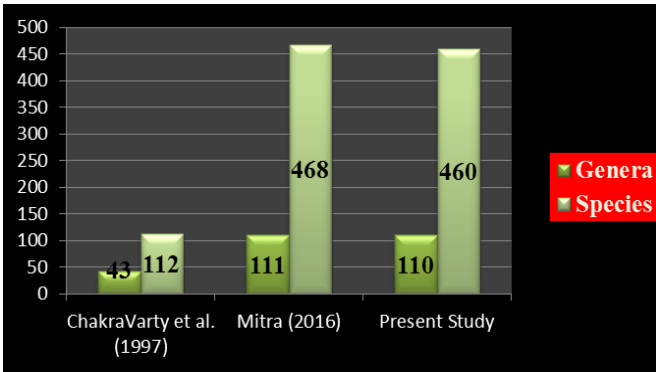
**Table XIII :** Conspectus of the Endemic taxa of the Orchids in the State

Sl. No.	Name of the taxa	Distribution		Status
		In State	In General	
1	<i>Acampe praemorsa</i> (Roxburgh) Blatter & McCann, var. <i>flava</i> (AP. Das, T.K. Katham et S. Nirola) AP. Das et S. Nirola	Endemic for the Duars region of West Bengal.	Known only from the Type collection.	R
2	<i>Agrostophyllum brevipes</i> King & Pantl.	Soom, Darjeeling, 27th mile, Algarah, Panbu-Kalimpong 400- 1600 m	Eastern Himalaya, N.E. India,	S
3	<i>Anoectochilus grandiflorus</i> Lindl.	Algarah forest, Echey Busty, 900 – 1600 m.	Endemic to Darjeeling – Sikkim Himalaya	Th
4	<i>Aphyllorchis aipina</i> King & Pantl.	Senchal, Darjeeling	Sikkim, Darjeeling West Bengal; NEPAL, CHINA. (2100- 4200 m).	S
5	<i>Bulbophyllum cauliflorum</i> Hook. f. var. <i>sikkimense</i> N. Pearce & P.J. Cribb.	Lava, Algarah, Kalimpong; Darjeeling	Darjeeling & Sikkim Himalaya to Assam.	S
6	<i>Bulbophyllum gamblei</i> (Hook. f) Hook. f.	Senchal Wildlife Sanctuary; 1500-2050 m	Darjeeling-Sikkim, Bhutan and NE India;	S
7	<i>Bulbophyllum helenae</i> (Kuntze) J. J. Sm.	Kafer, Sonada, Darjeeling	Endemic to Darjeeling	C
8	<i>Bulbophyllum odoratissimum</i> (J. E. Sm.) Lindl. ex Wall. var. <i>racemosum</i> N. P. balakris.	Kalimpong	Endemic to Darjeeling	S
9	<i>Bulbophyllum roxburghii</i> (Lindl.) Reichb. f.	Lesh khola, 300 – 700 m.	Sikkim, West Bengal, Arunachal Pradesh, Nagaland; NEPAL (300 - 400 m).	S
10	<i>Bulbophyllum sarcophylloides</i> Garay, Hamer & Siegerist.	Gorkhey- Samanden; 2000 - 2500 m.	Duars (BTR), Darjeeling-NE India;	S
11	<i>Bulbophyllum yoksunense</i> J.J. Sm.	Gorkhey- Samanden; 2000- 2500 m.	Endemic to Eastern Himalaya	R
12	<i>Calanthe plantaginea</i> Lindl.	Victoria falls, Darjeeling; around 2000 m	temperate Himalayas (Kashmir to Bhutan), S China (Tibet)	R
13	<i>Chiloschista usneoides</i> (D. Don) Lindl.	Singtam area; around 1700 m.	Endemic to NW to E Himalayas.	R
14	<i>Coelogyne pempahisheyana</i> H.J. Chowdhery.	Kalimpong, 900 – 950 m.	Darjeeling Hills (Endemic).	R
15	<i>Crepidium josephianum</i> (Reichb. f) Margonska.	Balasan river valley; 500- 1500 m.	Endemic to Darjeeling.	S
16	<i>Crepidium maximowiczianum</i> (King & Pantl.) Szlach.	Mungpoo, Chisang-Godok, 600 – 1100 m.	India (Sikkim and West Bengal) Mongpu Cinchona Plantation). 850m	C
17	<i>Dendrobium darjeelingense</i> Pradhan.	Darjeeling	Darjeeling	S
18	<i>Dendrobium transparens</i> Wallich ex Lindley.	Duars (BTR), Purulia (Ajodhya hills).	Endemic to C to E Himalayas, (Kumaon to Bhutan), Assam.	R
19	<i>Esmeralda cathcartii</i> (Lindl.) Reichenb. f.	Damsang Garhi; upto 1500 m.	Darjeeling-Sikkim Himalaya to NE India.	S
20	<i>Gastrochilus corymbosus</i> A.P. Das & Chanda	Jalapahar area, Darjeeling; around 2200 m.	Endemic to Darjeeling- Sikkim Himalayas.	R
21	<i>Gastrochilus dasypogon</i> (J.E. Smith) Kuntze	Mahananda Wildlife Sanctuary, St. Marry's Hill, Duars (BTR); upto 1600 m	Endemic to Eastern Himalaya.	C
22	<i>Gastrochilus distichus</i> (Lindley) Kuntze	Rammam to Samanden; 2000- 2500 m.	Temperate Eastern Himalayas; Meghalaya and Manipur;	S

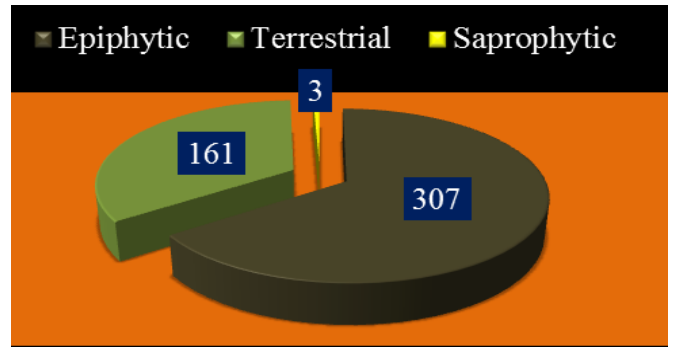
23	<i>Gastrochilus inconspicuus</i> (Hooker f.) Kuntze	Sukna, Sevoke, Kainjalay, Duars (BTR); up to 1100 m.	Endemic to Subtropical & tropical W to E Himalayas	S
24	<i>Gastrochilus sonamii</i> Lucksom	Neora Valley, Manaybhanjang, 1800 – 2600m.	Endemic to Darjeeling & Sikkim Himalaya	S
25	<i>Goodyera hemsleyana</i> King & Pantl.	Rambhi Forest; 2000-2500 m.	Endemic to temperate Sikkim & Darjeeling Himalayas	R
26	<i>Habenaria longifolia</i> Buch. – Ham. ex Lindl.	Mongpu, Darjeeling, Duars (BTR),	North Bengal, India; Bangla Desh,	S
27	<i>Herminium jaffreyanum</i> King & Pantl.	Tonglu, Meghma, Gairibas, Jaunbari, 2200 – 3400 m.	Endemic to Eastern Himalaya	R
28	<i>Herminium kalimpongense</i> Pradhan.	Kalimpong, Darjeejing,	Kalimpong, Darjeejing, Sikkim, Eastern Himalay Upper Assam up to 200m; Nepal, Bhutan,	R
29	<i>Lecanorchis sikkimensis</i> N. Pearce & P.J. Cribb.	Kainjalay; 1200 m	Endemic to Darjeeling-Sikkim and Bhutan Himalayas.	R
30	<i>Liparis nervosa</i> var. <i>khasiana</i> (Hooker f.) P.K. Sarkar.	Birch Hill area; 2000 -2300 m.	Endemic to Darjeeling Hills.	R
31	<i>Liparis tigerhillensis</i> A.P. Das & Chanda.	Tiger Hill area; 2400 - 2500 m.	Endemic to Darjeeling Hills.	R
32	<i>Nervilia gammieana</i> (Hooker f.) Schlechter.	Tista & Rangit river valleys; 300- 1000 m.	Endemic to Darjeeling-Sikkim Himalaya.	R
33	<i>Oberonia angustifolia</i> Lindl.	Mahananda Wildlife Sanctuary, Tista river valley; upto 500m.	Endemic to EH (Darjeeling, Meghalaya).	S
34	<i>Oberonia recurva</i> Lindl.	Pareng, Panbu, Chuikhim, Darjeeling 200 – 900 m.	India (Sikkim, West Bengal) Bhutan.	S
35	<i>Paphiopedilum villosum</i> (Lindl.) Pfitz.,	Llyod Botanical Garden, Darjeeling	India (Assam, Meghalaya); Burma.	R
37	<i>Papilionanthe unijlora</i> (Lindley) Garay.	Damsang Garhi; 1500- 2500 m.	Endemic to Eastern Himalaya.	S
38	<i>Platanthera biermanniana</i> (King & Pantling) Kranz.	Birch Hill & Tiger Hill; around 2300 m.	Endemic to E Nepal, Darjeeling Himalaya.	R
39	<i>Phreatia elegans</i> Lindl.	Lava, Algarah, Gumbadara, Toroyok, Damsangari, 1500 – 2000 m	India (North East India, Sikkim, West Bengal); Sri Lanka.	R
40	<i>Robiquetia bambusara</i> (King & Pantling) R. Rice.	Darjeeling (Nimbong); 500m	Endemic to Eastern Himalaya; Darjeeling (Nimbong); 500m, NE India	S
41	<i>Satyrium nepalense</i> var. <i>ciliatum</i> (Lindl.) Hook. f.	Tiger Hill, Senchal, Lepchagaj at; 1700 - 2200 m.	Endemic to Eastern Himalaya; (Temperate areas of Sikkim & Darjeeling Himalayas; Bhutan).	S
42	<i>Thelasis longifolia</i> Hook. f	Lathpanjar forest, Suruk, Pudung, Panbu, Nimbong, 600 – 1000 m.	India (Sikkim, West Bengal).	R

**Table XIV : Numerical Analysis of the Endemic Species of West Bengal**

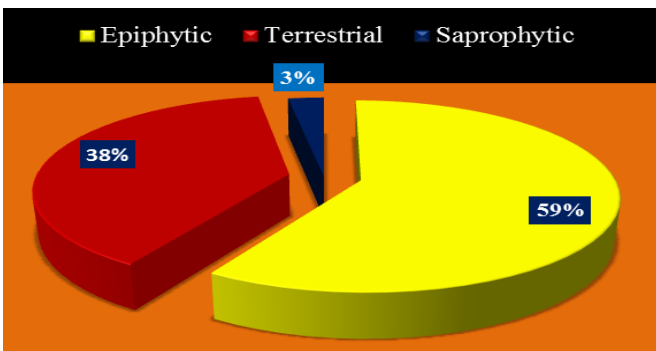
Sl. No.	Name of the Endemic Group	Number of Genera	%	Number of Species	%
1	Species Endemic to West Bengal state only,	6	23.17	8	19.05
2	Species endemic to Eastern Himalaya and in West Bengal.	8	30.76	12	28.57
3	Species Endemic to Indian Subcontinent as well as state of West Bengal	7	26.92	7	16.66
4	Species endemic to West Bengal and North Eastern states	4	15.38	4	9.52
5	Species Endemic to West Bengal and Adjoining countries like Nepal, Bhutan, Myanmar, & China.	10	38.46	11	26.19



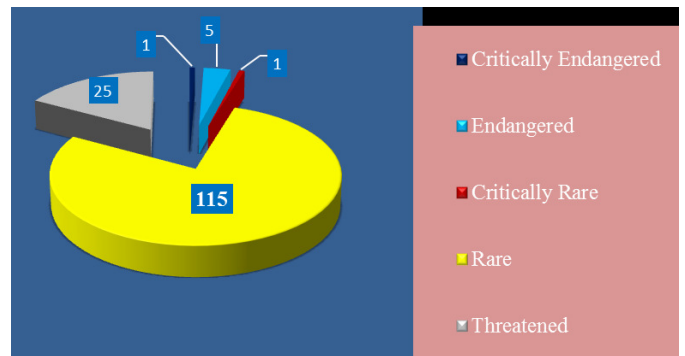
**Fig. I :** Conspectus of the Genera & Species of Orchids in West Bengal



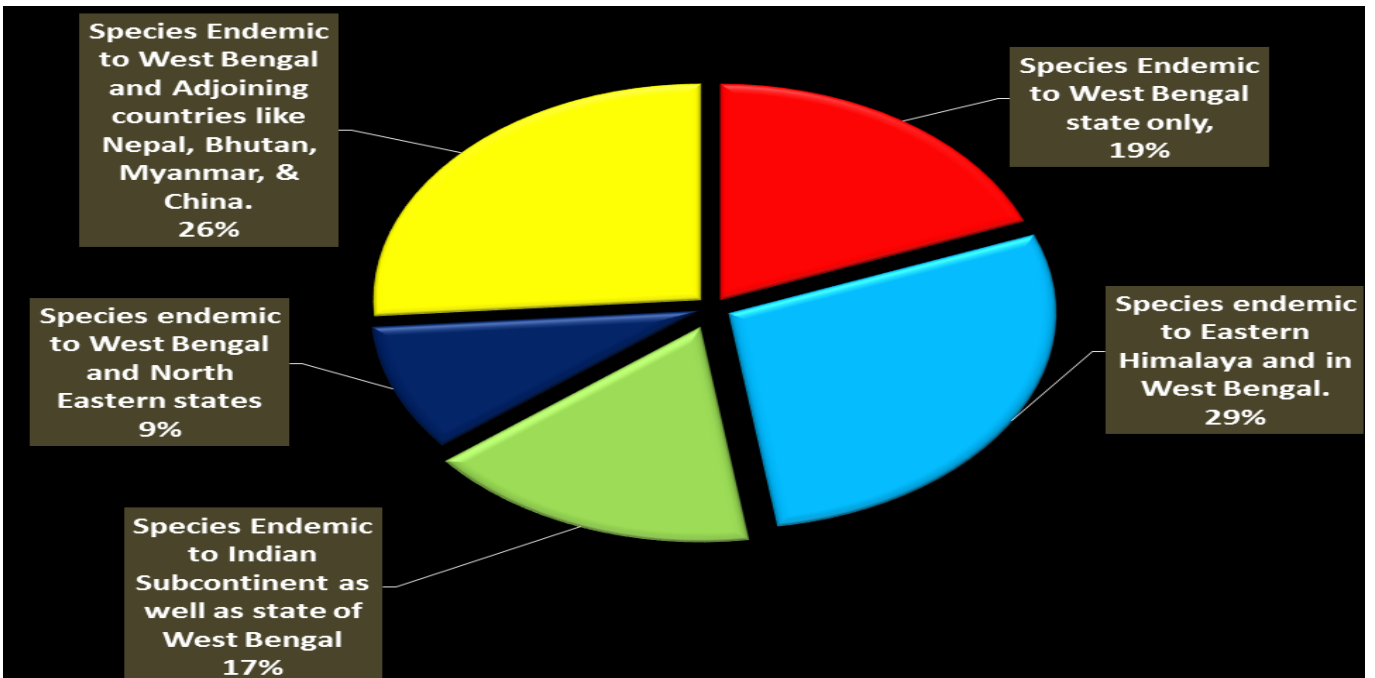
**Fig. IIB :** Numerical Analysis of Orchid Species of different Habitat



**Fig. IIA :** Numerical Analysis of Orchid Genera of different Habitat



**Fig. III :** Numerical Analysis of Rare, Threatened & Endangered Orchid Species



**Fig. IVA :** Numerical Analysis of the genera in each category of Endemic Orchids of West Bengal

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