

## DIVERSITY AND HOST SPECIFICATION OF ORCHIDS IN DIFFERENT TYPES OF VEGETATIONS IN SRINGERI TALUK, KARNATAKA

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### Abstract

A survey was conducted on diversity of orchids in different types of vegetations in Sringeri taluk during 2009-2010. A total of 62 species belonging to 31 genera were recorded, of which 53 were epiphytic and nine were terrestrial. Maximum numbers of orchid species were found in moist deciduous forest. Grasslands contribute 16 species of orchids belonging to 6 genera. *Dendrobium* and *Habenaria* are the largest genera representing seven species. The *Sarcanthus pauciflorus* is the most abundant species (22.40), having highest SIV (60.53) and has highest density (14.00). The recorded orchid species in different forests showed Shannon diversity value, 2.19 and Simpson's species richness value 0.18. The epiphytic orchids belonging to 26 species within the transect of different type of forests preferred 434 individuals of supporting trees as host plant belonging to 34 species of 22 families.

### Introduction

INDIA IS considered as one of the Mega Biodiversity regions in the world with two major Biodiversity Hot-spots – The Eastern Himalayas and the Western Ghats. One precious gift we inherit in our country in these hot spots is perhaps the orchids – the loveliest of all the flowering plants. They are highly evolved and represent one of the largest group of flowering plants, the Orchidaceae with 20,000 to 25,000 species. The orchids display adaptive excellence and ingenuity in reproductive mechanism to lure the pollinators (Hegde, 1984).

In India, more than 1200 species of orchids are met in 167 genera (Manilal and Sathish Kumar, 2004). Abraham and Vatsala (1981) recorded 150 species under 70 genera from South India, but a recent estimate suggests the occurrence of as many as 320 orchid species in South India (Bhat, 1999). Of these, nearly 176 species are reported from Karnataka alone (Krishnaswamy, et al., 2004, Rao, and Hegde, 2006; Rao and Sridhar, 2007). The orchid diversity in a given forest is significantly affected by the vegetation type. The tree canopy, light intensity, humidity, nature of bark of the phorophytic hosts markedly influence the range and frequency of orchid distribution. This communication attempts to statistically analyse the effect of vegetation types on the orchid diversity in Sringeri Taluk (Karnataka) using belt transect method. Such an analysis have remained elusive in Indian orchids.

### Material and Methods

#### Study Area

Sringeri, one of the seven taluks of Chikmagalore district,

is known for its scenic beauty and rich vegetation. It is located between 13°30'50" to 13°11'34" N and 75°04'35" to 75°19'53" E in the Western Ghats and is traversed by the holy river Tunga and its tributaries. The taluk receives both the South West and North East monsoons; the average annual rain fall here, is around 3000 mm. The Kuduremukha National Park, a pristine shola forest abuts Sringeri taluk on the Western side and Agumbe in Shivamogga district, a wettest place in the South India on Southern side.

#### Methods

The present study was undertaken in Sringeri taluk, during the year 2009-10. Different types of available vegetations i.e. evergreen, moist deciduous, dry deciduous, scrubby, acacia plantation, and grasslands were selected, and in each selected vegetation, two (2m x 100 m belt) transects were laid at random using ropes in such a way that one transect was laid in the area harboring rich orchid diversity and the other in the area with low orchid diversity.

In the transect area, the Girth at Breast Height (GBH) of orchid phorophytes and the location of the orchids on the hosts trees were documented. The species growing in a group particularly in the genera *Bulbophyllum*, *Porpax*, and *Trias* were considered as a single entity. The fragmented groups were however, counted separately. The species in the vicinity of the transects were also recorded. The orchids and their phorophytic abodes were identified with the help of available manuals and floras (Abraham and Vatsala, 1981; Gamble, 1935; Joseph, 1987; Rao, 1998).

The frequency (F), Re-frequency (RF), Density (D), Re-

density (RD), Abundance (A), and Species Important Value (SIV) of each species was recorded within the transects and analysed statistically. Shannon diversity value and Simpson's species richness value of orchids in different vegetation types was calculated following Shannon and Wiener (1963) and Simpson (1949).

### Results and Discussion

A total of 62 species of orchids belonging to 31 genera were recorded from within and outside the transects in Sringeri Taluk. *Dendrobium* and *Habenaria* are the largest genera represented by seven species, each, and these are followed by *Eria* with 5 species. Eighteen genera have single species each (Table 1). As many as 29 species in 21 genera were recorded from all the selected vegetations types.

#### Distribution of Orchids in Different Vegetations

Moist deciduous forest supports the highest orchid diversity (249 individuals) followed by the scrubby forests (42); it also harbors the highest density of trees (566 individuals) as compared to that in other vegetation types (Table 2; Fig. 1). Interestingly, the evergreen forests are poor in orchid diversity, 5 individual of *Aerides crispera* were recorded; such forests are also low in the number of trees. *A. crispera* is the dominant orchid found in the evergreen vegetation and *Sarcanthus pauciflorus* is dominant in remaining types of vegetation.

The grasslands contribute 106 individuals of terrestrial orchids i.e. *Habenaria heyneana* (87), *Satyrium nepalense* (11), and *Platanthera susannae* (8) with in the transect (Table 2). The other orchids found in grassland outside the transect are *Habenaria perrottetiana*, *H. crinifera*, *H. grandifloriformis*, *H. longicorniculata*, *Peristylus aristatus*, and *P. spiralis*.

The documented 62 species of orchids in the taluk represents 35.23 % of the orchids reported from the Karnataka state and 5.2 % of those reported from India (Hegde, 1997; Rao and Hegde, 2006). During the present survey, 10 species are not recorded out of 40 species reported in Sringeri flora (Balakrishna Gowda, 2004) and thirty two species are addition to this flora. Among the orchids documented during the present work, *Dendrobium herbaceum*, *D. macrostachyum*, *Phalenopsis decumbens*, *Luisia zeylanica*, *Pholidota pallida*, *Rhynchostylis retusa*, *Vanda testacea*, and *Platanthera susannae* are also recorded in Jharkhand (Guptha and Ajay Kumar, 2007).

#### Statistical Analysis

The transect study in selected different forests reveals

Table 1. Genus and species diversity of orchids in Sringeri taluk.

| Genus                | Species                     |
|----------------------|-----------------------------|
| <i>Aerides</i>       | <i>A. crispera</i>          |
|                      | <i>A. ringens</i>           |
| <i>Bulbophyllum</i>  | <i>B. fimbriatum</i>        |
|                      | <i>B. fischerii</i>         |
|                      | <i>B. neilgherrense</i>     |
|                      | <i>B. tremulum</i>          |
| <i>Chilochista</i>   | <i>C. pusilla</i>           |
| <i>Coelogyne</i>     | <i>C. breviscapa</i>        |
| <i>Cotonia</i>       | <i>C. peduncularis</i>      |
| <i>Cymbidium</i>     | <i>C. aloifolium</i>        |
|                      | <i>C. bicolor</i>           |
| <i>Dendrobium</i>    | <i>D. aquem</i>             |
|                      | <i>D. barbatulum</i>        |
|                      | <i>D. herbacium</i>         |
|                      | <i>D. macrostachyum</i>     |
|                      | <i>D. nanum</i>             |
|                      | <i>D. ovatum</i>            |
|                      | <i>D. peguanum</i>          |
|                      | <i>D. championii</i>        |
| <i>Diploprora</i>    | <i>E. albiflora</i>         |
| <i>Eria</i>          | <i>E. mysorensis</i>        |
|                      | <i>E. microchilus</i>       |
|                      | <i>E. nana</i>              |
|                      | <i>Eria sp.</i>             |
| <i>Flickingeria</i>  | <i>F. nodosa</i>            |
| <i>Gastrochilus</i>  | <i>G. pulchellus</i>        |
|                      | <i>G. flabelliformis</i>    |
| <i>Habenaria</i>     | <i>H. crinifera</i>         |
|                      | <i>H. heyneana</i>          |
|                      | <i>H. longicorniculata</i>  |
|                      | <i>H. grandifloriformis</i> |
|                      | <i>H. perrottetiana</i>     |
|                      | <i>H. marginata</i>         |
|                      | <i>H. sp.</i>               |
| <i>Luisia</i>        | <i>L. macrantha</i>         |
|                      | <i>L. zeylanica</i>         |
| <i>Malaxis</i>       | <i>M. versicolor</i>        |
| <i>Nervilia</i>      | <i>N. discolor</i>          |
|                      | <i>N. crocifformis</i>      |
| <i>Oberonia</i>      | <i>O. chandrasekharanii</i> |
|                      | <i>O. santapau</i>          |
|                      | <i>O. brunoniana</i>        |
|                      | <i>O. proudlockii</i>       |
| <i>Peristylus</i>    | <i>P. aristatus</i>         |
|                      | <i>P. spiralis</i>          |
|                      | <i>P. decumbens</i>         |
| <i>Phalenopsis</i>   | <i>P. pallida</i>           |
| <i>Pholidota</i>     | <i>P. susannae</i>          |
| <i>Platanthera</i>   | <i>P. flavescense</i>       |
| <i>Polystachya</i>   | <i>P. reticulata</i>        |
| <i>Porpax</i>        | <i>P. jerdoniana</i>        |
|                      | <i>R. retusa</i>            |
| <i>Rhynchostylis</i> | <i>R. gracilis</i>          |
| <i>Robiquetia</i>    | <i>S. jerdoniana</i>        |
| <i>Saccolabium</i>   | <i>S. pauciflorus</i>       |
| <i>Sarcanthus</i>    | <i>S. nepalense</i>         |
| <i>Satyrium</i>      | <i>S. lanceolata</i>        |
| <i>Sirhookera</i>    |                             |

2011)

Table 1. Genus and species diversity of orchids in Sringeri taluk (Contd...)

|                     |                      |
|---------------------|----------------------|
| <i>Sirhookera</i>   | <i>S. latifolia</i>  |
| <i>Taniophyllum</i> | <i>T. khashianum</i> |
| <i>Trias</i>        | <i>T. stocksii</i>   |
| <i>Vanda</i>        | <i>V. testacea</i>   |

that *Sarcanthus pauciflorus* is the most abundant species (22.40), having highest SIV (60.53) and has highest density (14.00). *Aerides crispa* has highest

frequency (0.75) and is followed by *Sarcanthus pauciflorus* (0.50). (Table 3). The recorded orchid species in different forest in Sringeri taluk showed Shannon diversity value, 2.19 and Simpson's species richness value 0.18 which indicates rich orchid diversity in the taluk.

#### Host-Orchid Interactions

The recorded 347 individuals of epiphytic orchids

Table 2. Distribution of orchids within the transects area in different vegetations.

| Types of vegetation | Name of the orchids                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evergreen           | <i>Aerides crispa</i>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Dry deciduous       | <i>A. crispa</i> , <i>Chilochista pusilla</i> , <i>Cottonia peduncularis</i> , <i>Cymbidium bicolor</i> , <i>Dendrobium macrostachyum</i> , <i>Oberonia chandrasekharanii</i> , <i>Pholidota pallida</i> , <i>Rhynchostylis retusa</i> , <i>Sarcanthus pauciflorus</i>                                                                                                                                                                                              |
| Moist deciduous     | <i>A. crispa</i> , <i>Bulbophyllum tremulum</i> , <i>Coelogyne breviscapa</i> , <i>C. peduncularis</i> , <i>Dendrobium herbaceum</i> , <i>D. macrostachyum</i> , <i>Dendrobium ovatum</i> , <i>Eria mysorensis</i> , <i>Gastrochilus pulchelus</i> , <i>Luisia macrantha</i> , <i>Luisia zeylanica</i> , <i>O. chandrasekharanii</i> , <i>O. santapau</i> , <i>Phalenopsis ducumbens</i> , <i>Pholidota pallida</i> , <i>S. pauciflorus</i> , <i>Trias stocksii</i> |
| Scrubby             | <i>Eria microchilos</i> , <i>T. stocksii</i> , <i>O. brunoniana</i> , <i>A. crispa</i> , <i>Dendrobium aquem</i> , <i>Dendrobium macrostachyum</i> , <i>D. microbulbon</i> , <i>Polystachya flavescense</i> , <i>O. chandrasekharanii</i>                                                                                                                                                                                                                           |
| Acacia Plantation   | <i>A. crispa</i> , <i>A. ringens</i> , <i>D. macrostachyum</i> , <i>D. ovatum</i> , <i>P. pallida</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i>                                                                                                                                                                                                                                                                                                                  |
| Grass land          | <i>Habenaria heyneana</i> , <i>Satyrium nepalense</i> , <i>Platanthera susannae</i>                                                                                                                                                                                                                                                                                                                                                                                 |

Table 3. Species composition and their Importance Value of epiphytic orchids with in the transects of selected forests in Sringeri taluk

| Species                        | F    | RF    | D     | RD    | A     | SIV   |
|--------------------------------|------|-------|-------|-------|-------|-------|
| <i>Aerides crispa</i>          | 0.75 | 28.57 | 1.25  | 3.28  | 1.67  | 31.85 |
| <i>A. ringens</i>              | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Bulbophyllum tremulum</i>   | 0.13 | 4.76  | 0.38  | 0.98  | 3.00  | 5.75  |
| <i>Chilochista pusilla</i>     | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Coelogyne breviscapa</i>    | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Cottonia peduncularis</i>   | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Cymbidium bicolor</i>       | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Dendrobium aquem</i>        | 0.13 | 4.76  | 1.50  | 3.93  | 12.00 | 8.70  |
| <i>D. herbaceum</i>            | 0.13 | 4.76  | 1.50  | 3.93  | 12.00 | 8.70  |
| <i>D. macrostachyum</i>        | 0.50 | 19.05 | 2.38  | 6.23  | 4.75  | 25.28 |
| <i>D. nanum</i>                | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>D. ovatum</i>               | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Eria microchilos</i>        | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>E. mysorensis</i>           | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Gastrochilus pulchelus</i>  | 0.25 | 9.52  | 2.38  | 6.23  | 9.50  | 15.75 |
| <i>Luisia macrantha</i>        | 0.25 | 9.52  | 0.50  | 1.31  | 4.00  | 6.07  |
| <i>L. zeylanica</i>            | 0.13 | 4.76  | 2.50  | 6.56  | 20.00 | 11.32 |
| <i>Oberonia brunoniana</i>     | 0.13 | 4.76  | 1.50  | 3.93  | 4.00  | 8.69  |
| <i>O. chandrasekharanii</i>    | 0.13 | 4.76  | 1.50  | 3.93  | 4.00  | 8.69  |
| <i>O. santapau</i>             | 0.13 | 4.76  | 1.50  | 3.93  | 4.00  | 8.69  |
| <i>Phalenopsis decumbens</i>   | 0.13 | 4.76  | 1.50  | 3.93  | 4.00  | 8.69  |
| <i>Pholidota pallida</i>       | 0.50 | 19.05 | 2.63  | 6.89  | 5.25  | 25.93 |
| <i>Polystachya flavescense</i> | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Rhynchostylis retusa</i>    | 0.13 | 4.76  | 0.13  | 0.33  | 1.00  | 5.09  |
| <i>Sarcanthus pauciflorus</i>  | 0.63 | 23.81 | 14.00 | 36.72 | 22.40 | 60.53 |
| <i>Trias stocksii</i>          | 0.38 | 14.29 | 5.13  | 13.44 | 13.67 | 27.73 |

F: Frequency, RF: Relative Frequency, D: Density, RD: Relative Density, A: Abundance, SIV: Species Important Value

Table 4 .Relationship between orchids and their supporting host plants with in the transect area.

| Orchid                         | Total number of host plant | Host plant with family                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Aerides crista</i>          | 22                         | <i>Lagerstroemia lanceolata</i> (Lythraceae)<br><i>Maulava spicata</i> (Caesalpiniaceae)<br><i>Rapania wightiana</i> (Myrsinaceae)<br><i>Syzygium caryophyllatum</i> (Myrtaceae)<br><i>Aporosa lindleyana</i> (Euphorbiaceae)<br><i>Careya arborea</i> (Lecythidaceae)<br><i>Randia dumetorum</i> (Rubiaceae)<br><i>Olea dioica</i> (Oleaceae)<br><i>Breynia retusa</i> (Euphorbiaceae)<br><i>Wandlandia thyrsoides</i> (Rubiaceae) |
| <i>A. ringens</i>              | 1                          | <i>Acacia auriculiformis</i> (Mimosaceae)                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>Bulbophyllum tremulum</i>   | 3                          | <i>Hopea ponga</i> (Dipterocarpaceae)                                                                                                                                                                                                                                                                                                                                                                                               |
| <i>Chilochista pusilla</i>     | 1                          | <i>M. spicata</i>                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <i>Coelogyne breviscapa</i>    | 1                          | <i>S. caryophyllatum</i>                                                                                                                                                                                                                                                                                                                                                                                                            |
| <i>Cottonia peduncularis</i>   | 5                          | <i>H. ponga</i><br><i>Memecylon malabaricum</i> (Melastomataceae)<br><i>S. caryophyllatum</i>                                                                                                                                                                                                                                                                                                                                       |
| <i>Cymbidium bicolor</i>       | 1                          | <i>Terminalia bellirica</i> (Combretaceae)                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Dendrobium aquem</i>        | 1                          | <i>T. bellirica</i>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <i>D. herbaceum</i>            | 12                         | <i>H. ponga</i><br><i>Scleropyrum pentandrum</i> (Santalaceae)                                                                                                                                                                                                                                                                                                                                                                      |
| <i>D. macrostachyum</i>        | 22                         | <i>H. ponga</i><br><i>Madhuca nerifolia</i> (Sapotaceae)<br><i>M. spicata</i><br><i>S. caryophyllatum</i><br><i>Flacourtia montana</i> (Flacourtiaceae)<br><i>T. bellirica</i><br><i>Ziziphus rugosa</i> (Rhamnaceae)                                                                                                                                                                                                               |
| <i>D. microbulbon</i>          | 1                          | <i>R. dumetorum</i>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <i>D. ovatum</i>               | 7                          | <i>H. ponga</i><br><i>S. caryophyllatum</i><br><i>Syzygium cumini</i> (Myrtaceae)<br><i>R. wightiana</i><br><i>Terminalia peniculata</i> (Combretaceae)                                                                                                                                                                                                                                                                             |
| <i>Eria microchilus</i>        | 1                          | <i>Z. rogosa</i>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>E. mysorensis</i>           | 1                          | <i>S. pentandrum</i>                                                                                                                                                                                                                                                                                                                                                                                                                |
| <i>Gastrochilus pulchellus</i> | 19                         | <i>A. lindleyana</i><br><i>Elaeocarpus serratus</i> (Elaeocarpaceae)<br><i>Holigarna arnottiana</i> (Anacardiaceae)<br><i>H. ponga</i><br><i>Memecylon umbellatum</i> (Melastomataceae)<br><i>S. caryophyllatum</i><br><i>S. cumini</i><br><i>Syzygium lateum</i> (Myrtaceae)                                                                                                                                                       |
| <i>Luisia macrantha</i>        | 4                          | <i>H. ponga</i><br><i>S. pentandrum</i><br><i>S. caryophyllatum</i>                                                                                                                                                                                                                                                                                                                                                                 |
| <i>L. zeylanica</i>            | 20                         | <i>H. ponga</i>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <i>Oberonia brunoniana</i>     | 9                          | <i>O. dioica</i><br><i>R. dumetorum</i><br><i>W. thyrsoides</i>                                                                                                                                                                                                                                                                                                                                                                     |
| <i>O. chandrasekharanii</i>    | 24                         | <i>A. lindleyana</i><br><i>B. retusa</i><br><i>Glochidion zeylanicum</i> (Euphorbiaceae)<br><i>H. arnottiana</i><br><i>H. ponga</i><br><i>M. umbellatum</i> ,<br><i>S. caryophyllatum</i>                                                                                                                                                                                                                                           |

Table 4 .Relationship between orchids and their supporting host plants with in the transect area. (Contd...)

|                                |     |                                           |
|--------------------------------|-----|-------------------------------------------|
| <i>Oberonia santapau</i>       | 1   | <i>S. caryophyllatum</i>                  |
| <i>Peristylus decumdens</i>    | 1   | <i>H. ponga</i>                           |
| <i>Pholidota pallida</i>       | 22  | <i>A. lindleyana</i>                      |
|                                |     | <i>Diospyros Montana</i> (Ebenaceae)      |
|                                |     | <i>Ficus tsjahela</i> (Moraceae)          |
|                                |     | <i>H. ponga</i>                           |
|                                |     | <i>Mangifera indica</i> (Anacardiaceae)   |
|                                |     | <i>M. malabaricum</i>                     |
|                                |     | <i>Mimusops elengi</i> (Sapotaceae)       |
|                                |     | <i>S. caryophyllatum</i>                  |
|                                |     | <i>S. cumini</i>                          |
|                                |     | <i>T. paniculata</i>                      |
| <i>Polystachya flavescense</i> | 4   | <i>C. arborea</i>                         |
|                                |     | <i>R. dumetorum</i>                       |
|                                |     | <i>Z. rugosa</i>                          |
| <i>Rhynchosyris retusa</i>     | 1   | <i>R. dumetorum</i>                       |
| <i>Sarcanthus pauciflorus</i>  | 112 | <i>A. auriculiformis</i>                  |
|                                |     | <i>A. lindleyana</i>                      |
|                                |     | <i>Artocarpus hirsutus</i> (Moraceae)     |
|                                |     | <i>Calophyllum apetalum</i> (Clusiaceae)  |
|                                |     | <i>M. indica</i>                          |
|                                |     | <i>E. serratus</i>                        |
|                                |     | <i>F. montana</i>                         |
|                                |     | <i>H. arnottiana</i>                      |
|                                |     | <i>H. ponga</i>                           |
|                                |     | <i>M. malabaricum</i>                     |
|                                |     | <i>M. umbellatum</i>                      |
|                                |     | <i>M. elengi</i>                          |
|                                |     | <i>M. spicata</i>                         |
|                                |     | <i>R. wightiana</i>                       |
|                                |     | <i>S. caryophyllatum</i>                  |
|                                |     | <i>S. cumini</i>                          |
|                                |     | <i>S. lateum</i> ,                        |
|                                |     | <i>Zanthoxylum ovalifolium</i> (Rutaceae) |
| <i>Trias stocksii</i>          | 44  | <i>A. hirsutus</i>                        |
|                                |     | <i>H. arnottiana</i>                      |
|                                |     | <i>H. ponga</i>                           |
|                                |     | <i>M. indica</i>                          |
|                                |     | <i>M. elengi</i>                          |
|                                |     | <i>O. dioica</i>                          |
|                                |     | <i>S. aryophyllatum</i>                   |
|                                |     | <i>T. bellirica</i>                       |
|                                |     | <i>T. paniculata</i>                      |
|                                |     | <i>W. thyrsoides</i>                      |

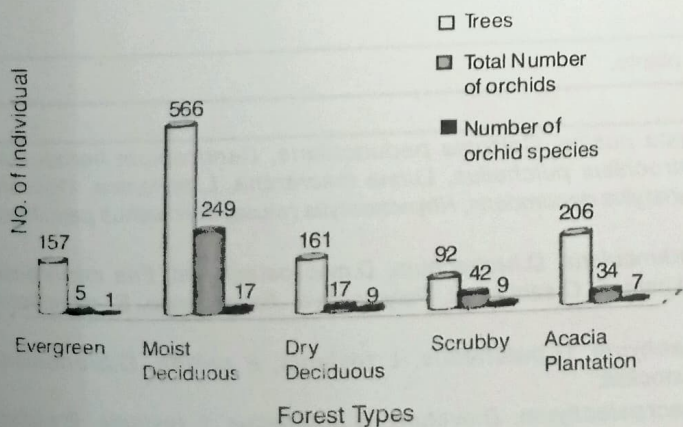


Fig. 1 Number of orchids and trees in different forests within the transects.

belonging to 26 species within the transect of different type of forests preferred 434 individuals of supporting trees as host plant belonging to 34 species of 22 families. *S. pauciflorus* preferred highest number of host plants (112). It may be due to its high abundance and is followed by *Trias stocksii* (44). In the study area, the orchid *Luisia zeylanica* (20) observed only on *Hopea ponga* (Table 4).

Among the recorded host plant, *Hopea ponga* supports large number of orchids (178 individuals) belonging to 13 species. It may be due to its rough bark texture with crustose lichen infestation which helps in the germination of non endospermic orchid seeds. Out of 178 numbers of orchids on *Hopea ponga*, *S. pauciflorus* represents

highest number (47) and is followed by *T.stocksii* (28).  
Nine host plants represent only single orchid species

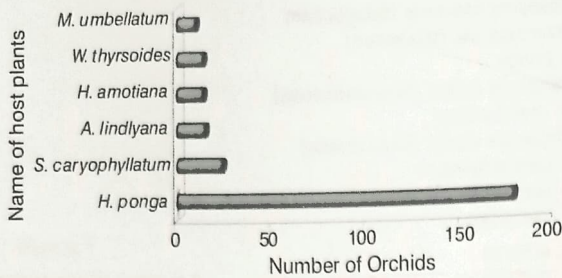


Fig. 2. Host plants that supports the highest number of orchid individuals.

(Fig 2 and 3).

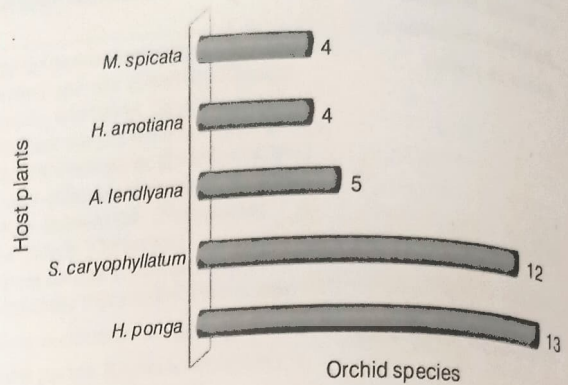


Fig 3 Host plants harbor highest number of orchid species.

Table 5. Correlation between Girth at breast height of the host plants and distribution of orchids within the transect.

| GBH (cm) | Number of orchids | Species                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-20     | 128               | <i>Aerides crispera</i> , <i>Bulbophyllum tremulum</i> , <i>Cottonia peduncularis</i> , <i>Dendrobium herbaceum</i> , <i>D. macrostachyum</i> , <i>D. ovatum</i> , <i>Gastrochilus pulchellus</i> , <i>Luisia macrantha</i> , <i>L. zeylanica</i> , <i>Oberonia brunoniana</i> , <i>O. chandrasekharanii</i> , <i>Pholidota pallida</i> , <i>Polystachya flavescens</i> , <i>Sarcanthus pauciflorus</i> , <i>Trias stocksii</i> . |
| 20-40    | 99                | <i>A. crispera</i> , <i>B. tremulum</i> , <i>C. peduncularis</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>D. ovatum</i> , <i>G. pulchellus</i> , <i>L. zeylanica</i> , <i>O. chandrasekharanii</i> , <i>O. santapau</i> , <i>Rhynchostylis retusa</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                  |
| 40-60    | 60                | <i>A. crispera</i> , <i>B. tremulum</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>Eria mysorensis</i> , <i>L. macrantha</i> , <i>L. zeylanica</i> , <i>O. brunoniana</i> , <i>O. chandrasekharanii</i> , <i>Phalenopsis decumbens</i> , <i>P. pallida</i> , <i>P. flavescens</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                        |
| 60-80    | 20                | <i>A. crispera</i> , <i>A. ringens</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>L. zeylanica</i> , <i>O. chandrasekharanii</i> , <i>P. pallida</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                                                                                                     |
| 80-100   | 16                | <i>A. crispera</i> , <i>C. pusilla</i> , <i>D. macrostachyum</i> , <i>D. ovatum</i> , <i>E. microchylis</i> , <i>O. chandrasekharanii</i> , <i>P. pallida</i> , <i>P. flavescens</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                                                                               |
| 100-120  | 12                | <i>A. crispera</i> , <i>Dendrobium aquem</i> , <i>D. macrostachyum</i> , <i>D. microbulbon</i> , <i>P. pallida</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                                                                                                                                                 |
| 120-140  | 3                 | <i>A. crispera</i> , <i>O. brunoniana</i> , <i>T. stocksii</i>                                                                                                                                                                                                                                                                                                                                                                    |
| 140-160  | 3                 | <i>A. crispera</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i>                                                                                                                                                                                                                                                                                                                                                                   |
| 160-180  | 6                 | <i>C. breviscapa</i> , <i>C. bicolor</i> , <i>S. pauciflora</i> , <i>T. stocksii</i>                                                                                                                                                                                                                                                                                                                                              |
| 180-200  | 1                 | <i>P. pallida</i>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| > 200    | -                 | -                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 6. Relationship between orchids and their height on the supporting plants.

| Height (m)  | Orchids                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| upto 1.5    | <i>Aerides crispera</i> , <i>Bulbophyllum tremulum</i> , <i>Chilochista pusilla</i> , <i>Cottonia peduncularis</i> , <i>Dendrobium herbaceum</i> , <i>D. macrostachyum</i> , <i>D. microbulbon</i> , <i>D. ovatum</i> , <i>Gastrochilus pulchellus</i> , <i>Luisia macrantha</i> , <i>L. zeylanica</i> , <i>Oberonia brunoniana</i> , <i>O. chandrasekharanii</i> , <i>Pholidota pallida</i> , <i>Peristylus decumbens</i> , <i>Rhynchostylis retusa</i> , <i>Sarcanthus pauciflorus</i> , <i>Trias stocksii</i> . |
| > 1.5 - 3.0 | <i>A. crispera</i> , <i>B. tremulum</i> , <i>Coelogyne breviscapa</i> , <i>C. peduncularis</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>Eria mysorensis</i> , <i>L. macrantha</i> , <i>P. pallida</i> , <i>O. brunoniana</i> , <i>O. chandrasekharanii</i> , <i>O. santapau</i> , <i>Polystachya flavescens</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                         |
| > 3.0 - 4.5 | <i>A. crispera</i> , <i>B. tremulum</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>G. pulchellus</i> , <i>L. zeylanica</i> , <i>P. pallida</i> , <i>O. brunoniana</i> , <i>O. chandrasekharanii</i> , <i>P. flavescens</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                                                                                                                |
| > 4.5 - 6.0 | <i>A. crispera</i> , <i>A. ringens</i> , <i>D. aquem</i> , <i>D. herbaceum</i> , <i>D. macrostachyum</i> , <i>D. ovatum</i> , <i>G. pulchellus</i> , <i>L. zeylanica</i> , <i>P. pallida</i> , <i>O. chandrasekharanii</i> , <i>S. pauciflorus</i> , <i>T. stocksii</i> .                                                                                                                                                                                                                                          |
| > 6.0 - 7.5 | <i>Cymbidium bicolor</i> , <i>L. zeylanica</i> , <i>T. stocksii</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| > 7.5 - 9.0 | <i>P. pallida</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

2011)

The GBH of the host plants documented in the transect area ranges between 6-200 cm. Among these 6-20 cm girth plants supports the growth of highest number of orchids (127) belonging to 10 genera compared to higher girth class plants. This represents small host plants highly supports the growth of the orchids. *S. pauciflorus* found in all girth classes (Table 5). The pooled data of the height of the orchids on a host plant indicates the highest growth of the orchids at 1-5 feet (18 species). *T. stocksii* found in all height classes (Table 6).

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### References

- Abraham, A. and P. Vatsala, 1981. *Introduction to Orchids*. TBGRI, Trivandrum, India.
- Balakrishna, G. 2004. *Plant Wealth of Sringeri, Karnataka*. Kalpatharu Research Academy, Bangalore, India.
- Bhat, K. G. 1999. Studies on Orchidaceae of Dakshina Kannada and Udupi districts of Karnataka. In: *Biodiversity, Taxonomy and Conservation of Flowering Plants* (eds. Sivadasan and Philip Mathew). Mentor Books, Calicut, India.
- Gamble, J. S. 1935. *Flora of Presidency of Madras*. II parts. London (parts 8-11 by C.E.C. Fischer) 2<sup>nd</sup> rep. ed. In 3 Vols 1967. BSI, Calcutta, India.
- Gupta, H. S. and Ajay Kumar. 2007. A Catalogue of Orchids Recorded in Saranda Forest Division, West Singhbhum district, Jharkhand. *Indian Forester*, 870-76.
- Hegde, S. N. 1984. *Orchids of Arunachal Pradesh*. Forest Department, Arunachal Pradesh. Itanagar, India.
- Hegde, S. N. 1997. *Orchid Wealth of India*. Proc. Indian Natn. Sci. Acad., B63 No. 3 pp 229-44.
- Joseph, J. 1987. *Orchids of Nilgiris*. BSI, Howrah, India.
- Krishna Swamy, K., H. N. Krishnakumar, T.M. Ramakrishna, and S.N. Ramaswamy, 2004. Studies on seed morphometry on epiphytic orchids from Western Ghats of Karnataka. *Taiwania* 49 : 1-12.
- Manilal K. S. and C. Sathish Kumar, 2004. *Orchid Memoirs - A Tribute to Gunnar Seidenfaden*. IAAT, Calicut, India.
- Pradhan U. C. 1976, 1979. *Indian Orchids- Guide to Identification and Culture*. Vols. I-II. Primulaceae Books, Kalimpong, West Bengal, India.
- Rao, T. A. 1998. *Conservation of Wild Orchids of Kodagu in the Western Ghats*. Centre for technology development and the agricultural technologies and services Pvt. Ltd. Karnataka association for the advancement of science, Bangalore and world wide fund for nature, India, New Delhi, India.
- Rao, T. A. and S. N. Hegde, 2006. Biodiversity of Orchids in the Western Ghats: Their *In-situ* and *Ex-situ* Conservation for Sustainable Development. In: *Proc. National Seminar on Plant Resources of Western Ghats: Ecology, Economics and Conservation*. Karnataka Biodiversity Board, Bangalore, India.
- Rao, T. A. and S. Sridhar. 2007. *Wild Orchids in Karnataka*. INCERT, Sheshadhipuram, Bangalore, India.
- Shannon, C. E. and W. Wiener, 1963. *The Mathematical Theory of Communication*. pp. 320. University of Illinois Press, Champaign IL.
- Simpson, E. H. 1949. Measurement of Diversity. *Nature*, 163:688.
- Withner, C. L. 1959. The orchid physiology. In: *The Orchids: A Scientific Survey*. (ed C. L. Withner). pp. 315-60, Ronald Press, New York and London.
- Yoganarasimhan, S. N., K. Subramanyam, and B. A. Razi. 1982. *Flora of Chikmagalore District*, Karnataka, India. International Book Distributors, Dehradun, India.