FINAL REPORT ON

RESTORATION OF ORCHIDS IN HUMAN TRANSFORMED LANDSCAPE INVOLVING LOCAL COMMUNITY IN WAYANAD DISTRICT, KERALA, INDIA

Submitted to

San Diego County Orchid Society, USA

SAN DIEGO COUNTY ORCHID SOCIETY

SDCOS

Project Investigators: Ms. Jis Sebastian and Dr. Giby Kuriakose
Department of Botany, Sacred Heart College, Cochin-13, Kerala, India

Sebastian, J. and Kuriakose G. 2018. Restoration of Orchids in Human transformed landscape involving local community in Wayanad District, Kerala, India, SDCOS, USA.

Copy can be obtained from:

Jis Sebastian, Kalapurackal, Kudakkachira, Kottayam-686635, Kerala. E-mail: alkaeliza@gmail.com
Dr.Giby Kuriakose, Associate Professor, Department of Botany, Sacred Heart College, Thevara-682013, Cochin. Email: giby.kuriakose@shcollege.ac.in
San Deigo County Orchid Society USA P.O. Box 161020, San Diego, CA 92176

Photographs: Arun T.R., Bipin Chandran, Manu Mohan, Jis Sebastian and Dr.Giby Kuriakose

CONTENTS

ACKNOWLEDGEMENTS

We are very grateful to the San Diego County Orchid Society, United States of America for the conservation grant they provided to support our proposal on restoration of orchids in transformed landscapes involving students and local community. We thank Dr.Prasant Palackappillil, Principal Dr.Jose John, Vice Principal and Dr.M.S. Francis, Former Head of the Department of Botany of Sacred Heart College for their guidance and generous support during the entire project. The Principal of the host institution, Government Higher Secondary School, Vythiri Shri.K.K.Varghese, Headmasters Shri. Mohammed Subair and Smt. Sabitha T., Headmistress are highly acknowledged for their enthusiastic participation and cooperation. We thank all the other schools in Vythiri region for participating in the conservation workshop and inaugural session of the programme. The Parents Teachers associations of the partner schools, Junior Red cross Wayanad, Smt.Ushakumari, Panchayat President and other staff of Vythiri Grama panchayat, Shri. Anup Kumar, Forest Range Officer, Kalpetta and Department of Forests and Wildlife, Kerala, Shri. V.V.Sivan and Smt. C.S.Dhanya, Scientists from MS Swaminthan Research Foundation, Puthoorvayal, Wayanad are acknowledged for their contributions. Shri.Ravi of Krishnapriya estate, Vythiri and Shr.Balu of Ayyapanthottam, Vythiri are the key stakeholders played important role in making the project a big success. Further, Kaatunaikkar community of Vattakund Colony, plantation labourers, WakeUp members are deeply acknowledged for their active involvement. It wouldn't have been possible without Mr.Arun T.R who has been a major support on and off field throughout the programme. We cannot thank enough Shri. Manu S Mohan, Shri. Sreejith MG, Shri.Bipin Chandran, Shri.Harish, Shri.Vishnu, Ms.Chethana S.V for their creative support and assistance throughout the programme. Smt.Lissy Joseph, teacher at GHSS, Vythiri has been our first help throughout the programme and made things easy for us. Above all, we are greatly indebted to students of Government HG Secondary School, the participants of workshop, restoration programmes, data collection who made this programme a meaningful one.

EXECUTIVE SUMMARY

The Western Ghats is one of the eight hottest hotspots on earth. Further, Kerala is one of the states in the Western Ghats that enjoys vast array of biodiversity due to its geographic position and climatic conditions. Being a narrow stretch of land with a large population, the forest tracts in the hills has been converted into agricultural plantations in the northern and central Kerala. Therefore, this project was aimed at the people who lives in the altered landscapes yet close to the natural forests. These plantations still hold natural trees that serve as refugia for epiphytic orchids. Hence, the focus of the project was to increase awareness among this community and make them participate in preserving and restoring epiphytic orchids in the semi natural habitats in which they live. The field research was carried out in natural forests and adjacent plantations that are identical in elevation and other geographical features. Based on Linear line transect with selective tree scanning (Sebastian et al. 2017), data on epiphytic orchid diversity and fallen orchids, host trees and causes of fall were collected. Further, schools were selected from the region to become partners and workshops were arranged to increase awareness on orchids and their conservation. The selected students were taken to the semi natural forests and given training to identify orchids, basic data collection techniques and rescue and restoration of orchids. Further, plantation owners and their labourers, indigenous community, casual forest staff and local youth were also given awareness on rescue and restoration of orchids. Conservation workshops, orchid walks, pictorial brochures, photography exhibitions, demonstrations on rescue and restoration were used as the means to educate all the target groups. The rate of success of the restored orchids were recorded with the help of students and found as high as 90%. Therefore, rescue and restoration of fallen orchids are suggested as a conservation tool for habitats with orchid loss from natural and anthropogenic disturbances. Few results from the research and conservation was presented in local media, magazines and national conference on biodiversity conservation at Kuvempu University, Karnataka. A documentary was prepared to record the entire project and reach out to a larger mass. The impact of the programme was measured using student community as a sample. It was seen that they had an increased awareness and interest in biodiversity conservation and orchids at the end.

1. Introduction

The Western Ghats in India is a UNESCO world heritage site. It is also one of the eight most biodiverse regions in the world in terms of the endemic elements it harbours and is well known for its unique trove of flora and fauna. Being the most populated hotspot of the world, Western Ghats directly or indirectly supports the livelihoods of over 200 million people through ecosystem services. The Western Ghats contains more than 30% of the floral and faunal diversity found in India. This vast array of diversity is due to its climatic and topographic features. Although legally conscripted for protection, ever expanding population and its consequences possess serious threats to diversity in Western Ghats. The major hilly forest tracts of the Western Ghats have been transformed by human into Tea, Coffee or Cardamom estates by keeping few natural trees as shade plants. Orchids are one among largest endemic plant group (about 40% of total species) in the Western Ghats. They are fragile and are sensitive to changes in climate and habitat. The major threats that orchids face in their natural habitats are habitat loss due to logging, mining and overexploitation for market demands. For example, Flores-Palacios and Valencia-Diaz (2007) reported from Mexico that 47% of epiphytic orchids are traded illegally for ornamental purpose.

The present generation do not turn their interest in biodiversity and its conservation as they lack sound understanding of these issues and possible threats to ecological balance. This may result in ruthless approach towards biological diversity in the future. Awareness to the public is the basic solution to overcome this issue. Although there are efforts by various authorities from different corners to meet with this challenge, none of these attempts are aimed in giving the public a hands own training or field-oriented practices in conservation. Further, conservation practises and interest towards conservation may easily be generated in children when compared to adult community and will be carried forward to generations. Therefore, it is important to give training, both classroom and field-oriented, to the school going children in areas that lie close to forested areas where conservations issues may arise.

In light of these facts, the project aimed to address the displaced or fallen epiphytic orchids in the human managed estates by involving community and students in Wayanad district in Kerala part of the Western Ghats in South India. Wayanad district is known to have a rich diversity of orchids with endemic elements as it's in a gradient of elevation 700 to 2100msl. This geographic region enjoys a cool, moist climate that is significant for epiphytic orchids (Gentry and Dodson 1987). The climatic and geographical conditions provide conditions to diverse group of plants and animals to dwell. Cardamom and coffee plantations and other agricultural expansions gradually cleared most natural forest off in these hilly tracts. Further, these land use practices reduce plant diversity including orchids. Human altered landscapes generally hold high abundance but less diversity of orchids when compared to protected forests. High diversity of orchids has been recorded from these hilly areas of mid to high altitudes of Kerala (Sebastian et al. 2019 unpublished data). However, no detailed study has been carried

out to understand the diversity, threats and conservation of Orchids in different land use types in the Western Ghats. Being contiguous to natural forests, these plantations exhibit a similar natural/wild condition that supports diversity of orchids as well. The number of species, its abundance, life cycle traits, etc. is not known due to the lack of detailed studies in such plantations. Still, there is lot of anthropogenic activities happening in and around these plantations that might alter the ecosystem and its inhabitants. Since orchids are very sensitive to such disturbances in their habitat, they qualify to serve as an indicator in these habitats. A study on diversity of epiphytic orchids across different land use types in the Western Ghats of Kerala suggests that there is a lower rate of species accumulation in semi natural habitat compared to natural habitats (Maggi 2015, MSc dissertation). This might be due to different level of intervention from the people which includes deliberate removal of epiphytes, wood cutting etc. Therefore, the project was to protect orchids in the natural habitat where they belong and was done with the involvement of people. In order to track the diversity and threats in transformed landscapes, estates that contain natural trees as shade trees were selected. These sites are mostly being monitored by labour groups including man and women. Therefore, the project created awareness among this working group along with local students to participate in rescue and restoration.

2. Objectives of the project

1. Identifying causes of disturbance in the landscape for displacement of orchids
2. Assessment of fallen orchid and factors affecting orchid loss in human managed estates
3. Awareness about the importance of orchid conservation among local community and students
4. Restoration of displaced orchids in both natural habitat and estates where natural trees are growing as shade trees with the help of local community and students
5. Collaboration with local NGOs and voluntary bodies

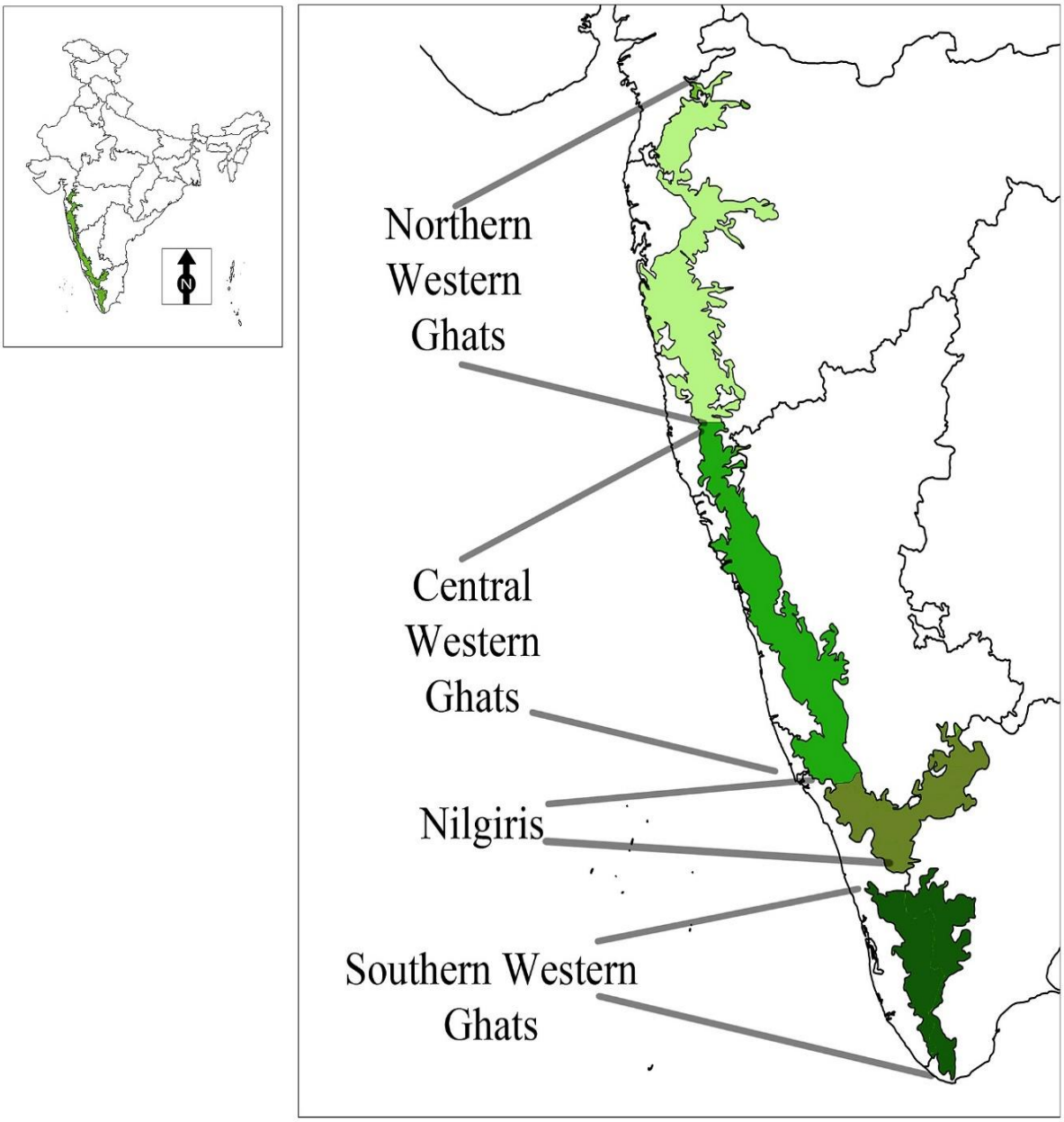
3. Project Sites:

Wayanad is the northern district of the state comprises hilly terrain with 83% forest cover of total geographic area. The district share border with TamilNadu and Karmataka holding richest tiger habitat in the Western Ghats, Wayanad-Mudumalai-Bandipur. This region is important in the southern Western Ghats (Figure1). The district has got mostly evergreen forests and shola forests and deciduous forests in the south east from 700MSL to 2100MSL. The biodiversity of the region is so rich that makes human wildlife conflict high in certain pockets. The altered forests, now plantations, still holds natural trees (Figure 2) such as *Syzygium cumini, Calphyllum polyanthum, Hopea parviflora, Palaquium ellipticum* etc. A natural forest in Meppadi forest range under Wayanad South Division (Figure 3) and adjacent

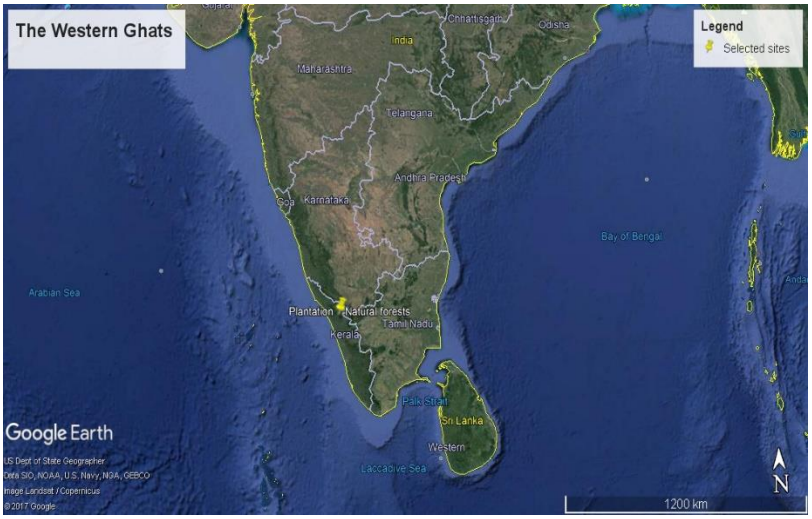
two semi natural plantations was selected in old vythiri based on the diversity of epiphytic orchids and accessibility. These sites had similar geographical gradients and that ensured a fair comparison.

Project sites in the Southern Western Ghats

A. Three zones of the Western Ghats



B



C

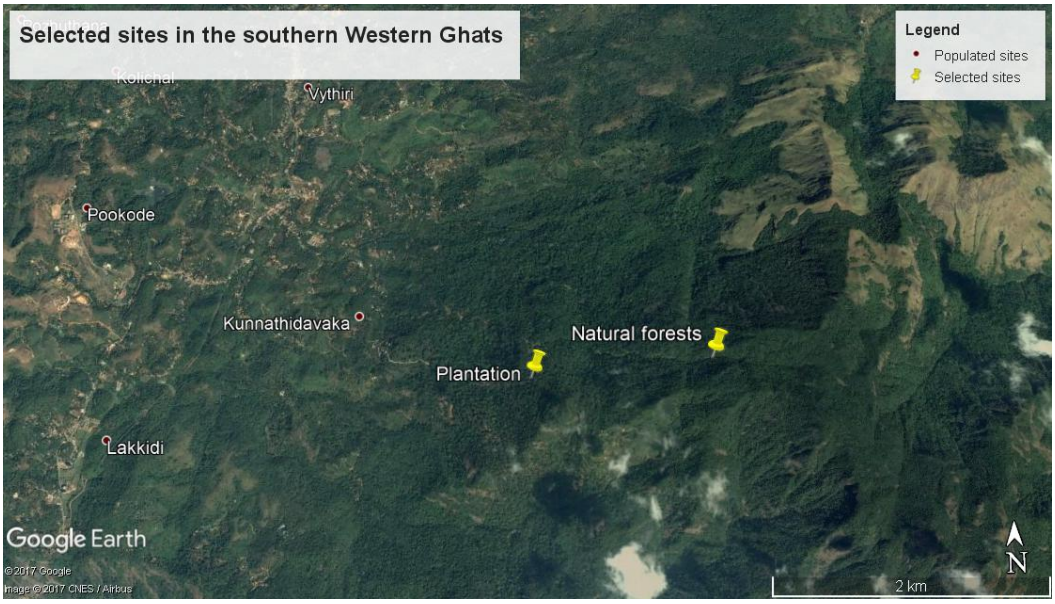


Figure 1. Map shows (A) southern Western Ghats, (B&C) location of project site in the southern Western Ghats

Project Timescale:

The project had the duration of one year. However, due to unforeseen reasons it took twenty months. The selection of homogeneous sites and survey of orchid diversity was carried out in April-May 2016. In the academic year of 2016 schools in the locality were visited and received great responses. Government Higher Secondary School, Vythiri was selected as host school and other four schools in the region were selected as participants. The local administration and public were also contacted during this time. The data on epiphytic orchids and data on fallen orchids and their causes were collected for next four months. The workshop on conservation of orchids and restoration was organised in October

2016. The first orchid trail for the students and teachers was arranged in January 2017 and second trail walk was organized in November 2017. Also, restoration and monitoring were carried out along from first to last trail walk. The assessment programme, among the students was carried out in November 2017 with a closing ceremony.

4. Methods:

The protected forested in the range, Meppadi under Wayanad Forest Division (South) and adjacent plantations/estates in the district of Wayanad was selected as two identical areas of same geographical features. The selection was based on proximity of estates to forest and orchid diversity. The Independent Research Institute, MS Swaminathan Research Foundation was consulted for suggestions and collaborated, in the later programmes. Data on dependency of local people for firewood, grazing etc., was collected in both natural and semi natural habitats. Also, data related to pattern of species richness and abundance of orchids in the study area was collected based on Linear line transect with selective tree scanning (LLTSTS), a method that integrated line transects and SVERA (Wolf et al. 2009; Sebastian et al. 2017). Characteristics of trees that support orchids was also investigated to understand possible host preferences of orchids to facilitate better restoration. Proper statistical tools were used to analyse data on natural and anthropogenic causes to understand the cause of displacement, percentage of orchid loss or death in estates and natural forests. This was plaid against the region's diversity of orchids and endemic elements for significance.

Schools located in and around the study area was selected for creating awareness on orchid conservation. The awareness program included detailed talk on biodiversity, plants and their significance, importance of orchids and their conservation. Selected students and their teachers were included in the process of data collection, restoration and interaction with local community. The local community that are in the proximity of the selected estates or the stakeholders of these estates was identified. Awareness programs and field trials about orchid conservation was arranged to generate the need of conservation and restoration of orchids. School going students along with their teachers, plantation labourers, local community(indigenous), local youth and forest staff were given hands on training in field identification, and rescue and rehabilitation of orchids.

Simple random walk in linear direction i.e. to avoid repetition of samples was used to record orchid fall with the participation of selected students and people from the local community under the supervision of PIs. Data pertaining to the fallen orchids, including species identity, abundance, cause/s of fall (if available), their host tree species (if available), evidences for human activity, etc. was recorded to understand the possible nature of orchid displacement. Fallen orchids were collected and properly handled so as to minimize further damage. If the orchid found damaged, we transferred the same to an

orchid nursery where they get rehabilitated. The collected orchids, if undamaged, was restored in the estates and natural wild habitats after evaluating the habitat, host tree specificity and other characteristics, if any, for the collected orchid. The survival of the restored orchids was monitored for six months with the involvement of the local people and students. This was recorded in a prescribed data sheet and analysed the data to find out the rate of success of the process of restoration. The result of the works was publicized through local print media, and National Conference on Biodiversity Conservation. Further, vernacular articles are submitted to monthly magazine 'Aranyam' of Kerala Forests and Wildlife Department and 'Koodu'. A detailed documentary has been prepared and has been displayed at Sacred Heart College, Cochin. Again, two papers are prepared out of this project and yet to be published in national journal and international orchid magazines.

Figure 2. Semi Natural crop Plantations (SNLP)

Figure 3. Semi evergreen Forests (SEVG)

5. Results

Objective 1.

Orchid Species diversity

It was observed that SNLP habitat has high number of orchid species (n=36) with 36% endemism (n=13). With equal number of transects, SNLP yielded high species diversity and abundance compared to neighbouring SEVG habitat (Table 1). This was shown by other biodiversity indices as well. Shannon-weiner and Simpson 1-D indices were plotted in boxplot to compare both habitats (Figure 4) and indicates greater sample diversity in SNLP. However, the difference was not statistically significant (Student's t-test for significance, p= 0.14**)**. SNLP habitats possess 22% of total endemic epiphytic orchids in the district (N=57, Table 2).

Table 1. Biodiversity Indices indicating the orchid diversity from natural (SEVG) and neighbouring seminatural crop plantations (SNLP)

Diversity Indices	**SEVG** (Transects=50)	**SNLP** (Transects=50)
Taxa_S	**17**	**36**
Individuals	567	3717
No. of endemics	4	13
Evenness_e^H/S	0.3042	0.3718
Margalef	2.511	4.258
Fisher alpha	3.275	5.528

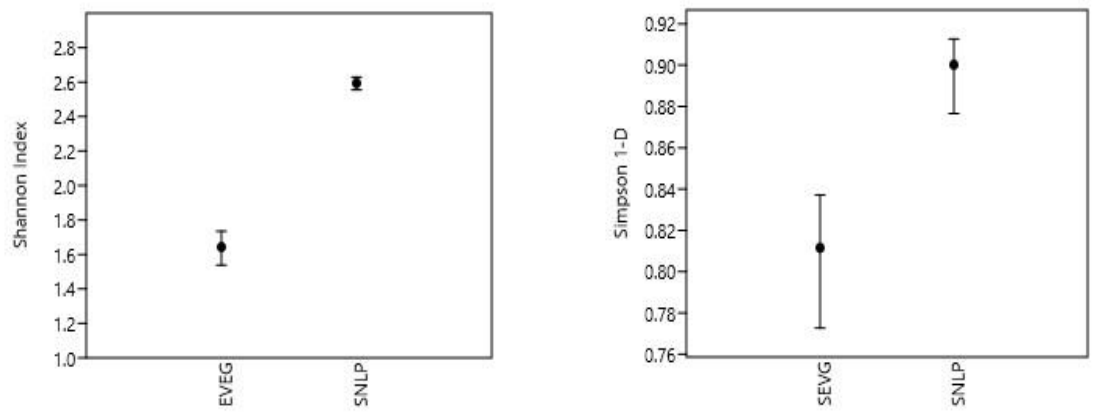


Figure 4. Shannon and Simpson 1-D indices across SEVG and SNLP. Error bars are 95% confidence intervals

Table 2. Comparison of epiphytic orchid diversity in Wayanad and study area

	Wayanad District*	Study area	
		Natural habitat (SEVG)	Seminatural plantations (SNLP)
Number of Epiphytic orchids	115	17	36
Number of terrestrial orchids	64	2	4
Number of endemic orchids (epiphytic and terrestrial) to the Western Ghats	(57+19)	4	14

(*data based on Narayanan 2013)

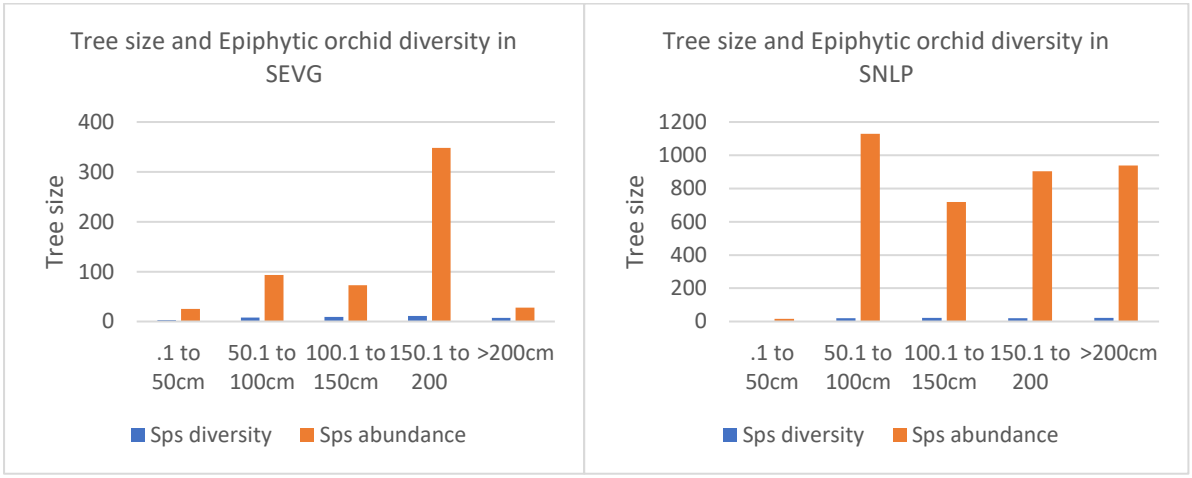


Figure 5. Graph showing tree size (girth) and epiphytic orchid diversity and abundance in SEVG and SNLP

The high diversity of epiphytic orchids in semi natural plantations could be attributed to large sized natural shade trees (Figure 5). Whereas due to previous disturbances, SEVG habitats do not possesses such tree habitats. Such trends have been observed in other tropical forests such as areas that have been long devoted to traditional coffee plantations (as in Central Veracruz, Mexico, Seles-Montero et al.2005). The natural shade trees still retain a significant portion of the native orchid flora. These shade

trees might allow filtered light through the less dense canopy and thus augment orchid diversity. The checklist of species is given in Table 3. Plate 1 features few epiphytic orchids recorded.

Table 3. Checklist of Orchids recorded from both habitats of the study area

Sl.No	Orchid species	SNLP	SEVG	Endemic	Epiphytic	Terrestrial
1	*Aerides crispa*	✓	✓		✓	
2	*Bulbophyllum aureum*	✓			✓	
3	*Bulbophyllum fischeri*	✓			✓	
4	*Bulbophyllum fuscopurpureum*	✓			✓	
5	*Bulbophyllum mysorense*	✓		✓	✓	
6	*Bulbophyllum neilgherrensis*	✓	✓		✓	
7	*Bulbophyllum sterile*	✓			✓	
8	*Bulbophyllum trimulum*	✓		✓	✓	
9	*Coelogyne breviscapa*	✓			✓	
10	*Coelogyne mossiahe*	✓		✓	✓	
11	*Coelogyne nervosa*	✓		✓	✓	
12	*Cymbidium aloifolium*	✓	✓		✓	
13	*Dendrobium aquem*	✓	✓	✓	✓	
14	*Dendrobium herbaceum*	✓			✓	
15	*Dendrobium macrostachyum*	✓	✓		✓	
16	*Dendrobium ovatum*	✓	✓	✓	✓	
17	*Eria albiflora*	✓		✓	✓	
18	*Eria exilis*	✓	✓	✓	✓	
19	*Kingidium niveum*	✓			✓	
20	*Liparis elliptica*	✓			✓	
21	*Liparis viridiflora*	✓	✓		✓	
22	*Luisia evanjelinae*	✓		✓	✓	
23	*Luisia zeylanica*	✓	✓		✓	
24	*Oberonia brunoniana*	✓	✓	✓	✓	
25	*Oberonia ensiformis*	✓	✓		✓	
26	*Oberonia platycaulon*	✓		✓	✓	
27	*Oberonia tenuis*	✓	✓		✓	
28	*Oberonia verticillata*	✓		✓	✓	
29	*Papilionanthe subulata*	✓			✓	
30	*Pholidota imbricata*	✓	✓		✓	
31	*Polystachya concreta*	✓			✓	
32	*Rhyncostylis retusa*		✓		✓	
33	*Schoenorchis gemmata*		✓		✓	
34	*Schoenorchis niveum*	✓			✓	
35	*Seidenfadeniella rosea*	✓		✓	✓	
36	*Sirhookera lanceolata*	✓	✓		✓	

37	*Trias stocksii*	✓			✓	
38	*Vanda thwaitesii*	✓	✓		✓	
39	*Cheirosylis flabellata*	✓	✓			✓
40	*Epipogium roseum*	✓				✓
41	*Ipsea malabarica*	✓		✓		✓
42	*Zeuxine longilabris*	✓	✓			✓

Figure 6. Shade tree for tea plantation as host tree for epiphytic orchid

Figure 7. Dead host tree with epiphytic orchids close to human settlements

Plate 1. Few epiphytic orchids from SEVG and SNLP

Eria albiflora

Aerides crispa

Bulbophyllum fischeri

Luisia evanjelinae

Dendrobium aquem

Schoenorchis gemmata

Oberonia verticillata

Causes of disturbance in the landscape for displacement of Orchids

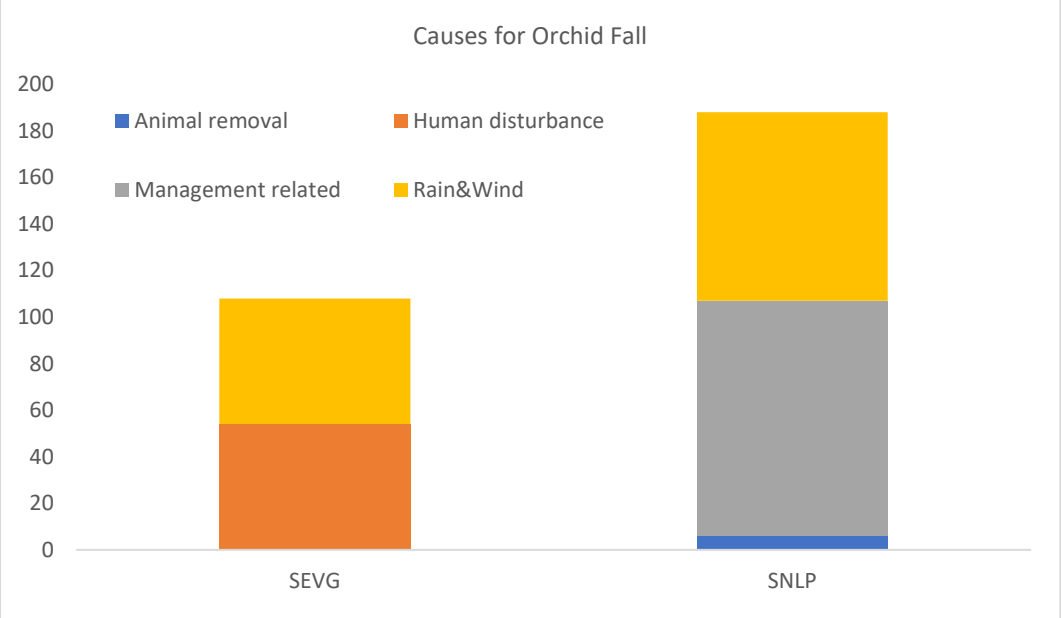


Figure 8. Disturbance in the landscape for displacement of orchids in SEVG and SNLP

Rain and wind, human disturbance, management related and animal removal were identified as major disturbance that causes displacement of orchids (Figure 8). SEVG habitats were close to semi natural plantations, village roads and developmental activities such as resorts. It is probably due to the frequent movements of people, signs of disturbance were observed. Since these forests have been taken over

from encroachers few decades back by the government, these SEVG forests do not possesses a mature stand. The trees are younger with low girth and some parts of the forests are degraded. However, signs of recent animal kills, scat etc were seen as evident of animal activity (Figure 9). Further, rain and wind equally caused orchid loss in this habitat.

Figure 9. Signs of predator presence/animal kill in SEVG habitat

SNLP habitats in the region are of tea, cardamom and coffee and mostly attended by plantation labourers except heavy SW monsoons. Both plantations studied found to have 15-20 labourers at times and sometimes up to 35. They are assigned with preparing the land, manuring the crops, weeding, pruning, picking tea leaves, harvesting cardamom and coffee. During these activities, they generally remove any other plant that may be seen unfavourable to them. Around 70% of the labourers agreed that, mostly, epiphytic orchids are removed classified under parasitic plants. Only two labourers also reported that they collect epiphytic orchids and plant at home once found in flowering. The plantations also have frequent animal movements such as Sambar deer, barking deer, wild dogs, leopards and sometimes Asian elephants. Herbivores and primates often destroy or sometimes feed on epiphytic orchids. Both the plantation owners were found to have great awareness about the ecological sensitivity of their lands and ensures the diversity. However, they said that they never have attempted to educate their labourers regarding conserving them. Apart from management activities, rain and wind wreck a havoc every monsoon season destroying a large number of trees and thereby causes orchid loss (Figure 10).

Figure 10. SNLP during a SW monsoon period

Objective 2.

Orchid Fall and factors affecting orchid loss in human managed estates

The abundance of fallen orchid were high in SNLP (n=188) belonging to 17 species whereas 108 individuals of fallen orchid in SEVG habitat belonged to 11 species (Figure 11). Still, the difference among habitats was not statistically significant (T-test for significance, *p*= 0.19).

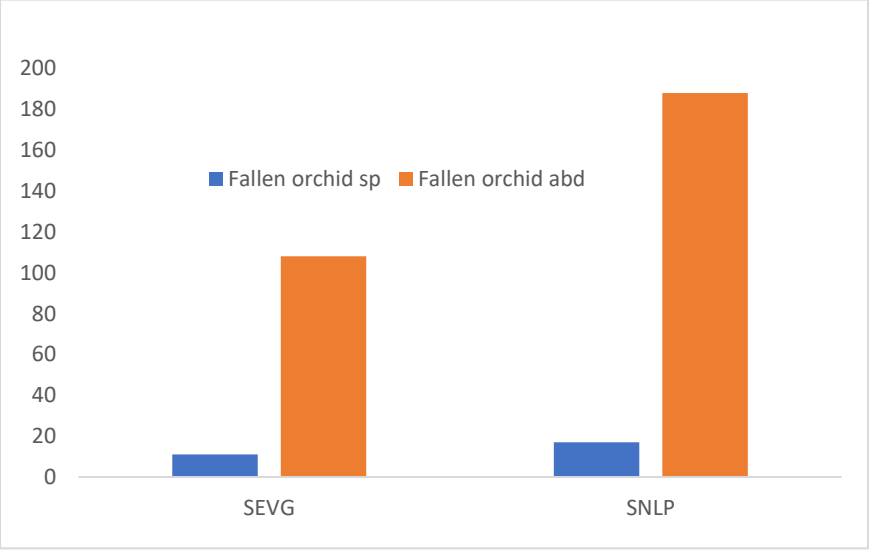


Figure 11. Trend of Orchid fall in terms of species and abundance across habitats during study period

In the SNLP habitats, orchid loss is rather high compared to SEVG habitats. Because fallen orchids mostly succumb themselves to death rather than thriving on ground. A few (3 clusters) of 72 clusters were found surviving the ground. Others could get eaten by animals, die or gets trampled in course of time.

Correlation coefficient returns value 1 when tested for correlation between species diversity of standing and fallen epiphytic orchids in both habitats. Likewise, standing species abundance and fallen orchid abundance also yielded correlation coefficient 1, indicating perfect positive correlation. It may be understood that the higher the diversity or abundance is, orchid fall becomes higher in the same magnitude.

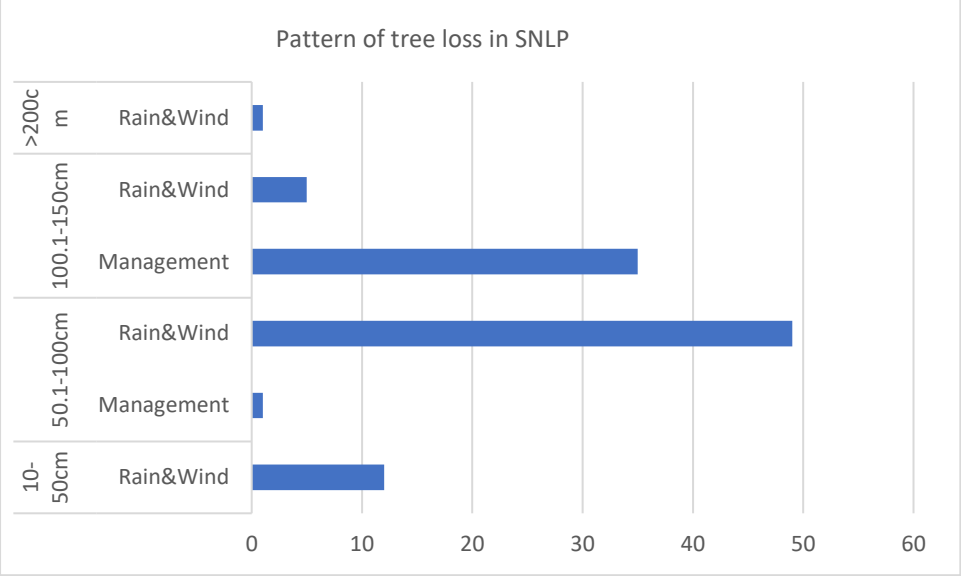
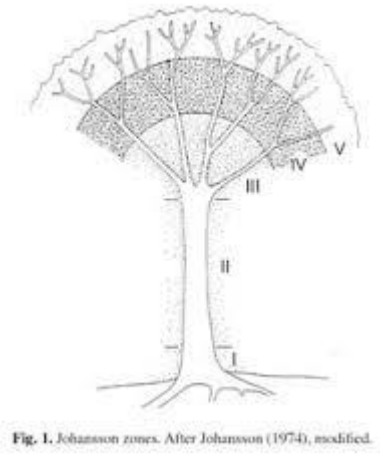


Figure 12. Girth of trees removed from SNLP habitats during the period from disturbances

The pattern of loss of tree habitat in SNLP was seen as a factor influencing the rate of orchid loss (Figure 12). Interestingly, the medium sized trees from 50cm to 150cm, most preferred size classes by epiphytic orchids are lost to rain and wind or management. It does not necessarily mean the entire tree is always lost, but again the preferred zone or substrate on a tree for an epiphytic orchid (Figure 15). It was seen that high species diversity and abundance was recorded from tree zone I and II combined (Figure 13). Most of the fallen orchid tree habitats were fallen entire trees, followed by fallen upper trunk to canopy (zones II-V), fallen middle canopy (zone IV), fallen upper canopy (zone V) and fallen lower canopy (zone III) (Figure 14). Therefore, it may be said that orchid loss from orchid fall in SNLP varies with the type and size of tree zones removed. Further, inability of epiphytes to thrive on ground and minor factors such as consumption by animals may also contribute to orchid loss. Dead trees or logs as orchid habitat sometimes leads to orchid loss in course of time (Figure 16).



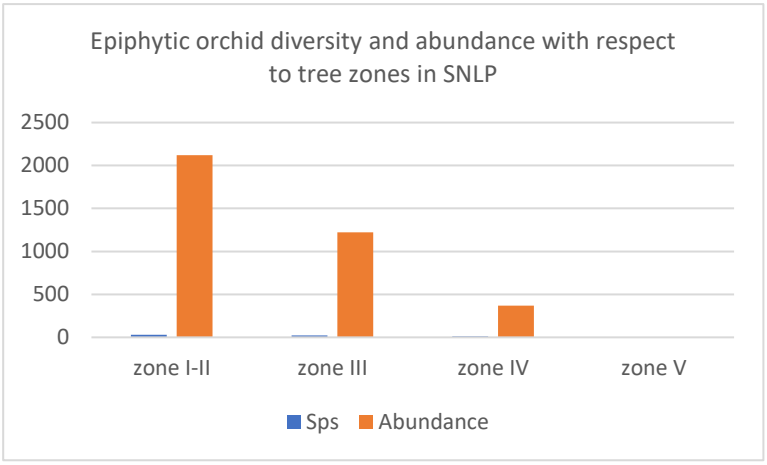


Figure 13. (Left)Tree zonation scheme used (Johansson 1974) and (right) the preference for tree zones by epiphytic orchids in SNLP

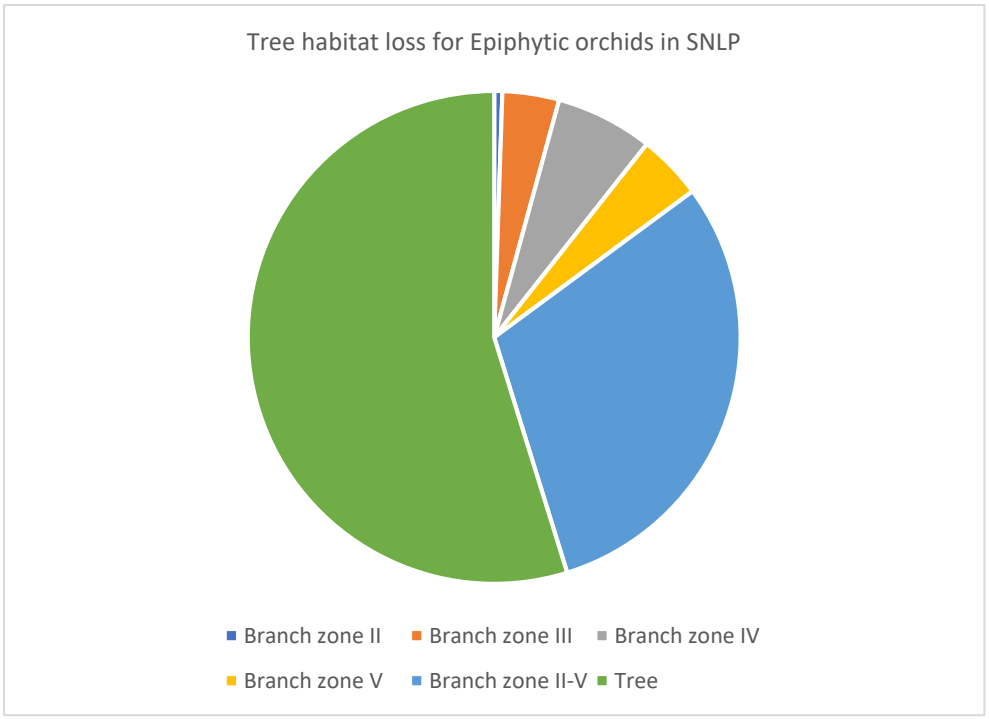


Figure 14. Pie diagram showing the pattern of loss of identified orchid zones on tree habitats

a.  b. 

c. 

Figure 15. a) Fallen middle canopy branches with orchids due to Rain & Wind (b) Middle canopy branches removed by Management activities and c) tree zone II-V loss due to rain & wind

Figure 16. *Schoenorchis niveum* on fallen and dead branch

Objective 3.

Awareness and Conservation Programme

Conservation workshop was arranged at Government Higher Secondary School, Vythiri (Figure 17 to 22). The workshop had guest lectures introducing orchids and their conservation. The same was attended by expertise in the subject, staff of host institution, local self-government representatives, Forests and Wildlife department, Kerala and collaborating institutes. This workshop was arranged mainly for five schools in the locality represented by 120 students, 10 teachers and other staff. Apart from information brochure with pictures of common orchids, a photo exhibition of 40 orchids that are common to the area was arranged for the participants. The students who answered questions during the session were encouraged with books as presents.

Figure 17. Student participants in conservation workshop

Figure 18. Inaugural session of the conservation workshop

Figure 19. Dr.Giby Kuriakose leading the training session during the workshop

Figure 20. Photo exhibition of Orchids in the southern Western Ghats at the Conservation workshop

Figure 21. Photo exhibition of Orchids in the southern Western Ghats at the conservation workshop

Figure 22. Ms.Jis Sebastian addressing the participants at Conservation workshop

Orchid trail walks: Two orchid trails walk in SNLP habitat introduced orchid identification techniques, rescue and restoration using coir ropes and coconut husks to 34 selected students and two teachers (Figure 23 &24).

Figure 23. Students during orchid trail walk

Figure 24. Students during orchid trail walk

Other stakeholders:

Figure 25. Awareness cum training to indigenous community (Kaattunaikkar) in a settlement (Vattakundu Colony) near natural forests near Chundel in Wayanad.

a.

b.

Figure 26. (a and b) Awareness cum training to plantation workers in two plantations (a.Krishnapriya Estate and b.Ayyappan thottam) and land owners

a.

b.

Figure 27. (a and b) Awareness cum training to pre-primary school staff in Vattakund Colony, Chundel

Further, forest department staff, local youth were also given awareness regarding epiphytic orchids. The entire conservation programme has been made into a film to be used as a publicizing material for large scale awareness regarding orchid conservation.

Objective 4

Rescue and restoration

Figure 28**.** Forest watchers in rescue of fallen epiphytic orchids in SEVG habitats

The fallen epiphytic orchids from both habitats were rescued during trail walks and restored after analysing health of the plant. Few damaged clusters of orchids were moved into land owners garden for rehabilitation. The restoration was done on trees with similar bark and size features in same habitat (Figure 28 & 29). Rescue and restoration were carried out by all stakeholders involved in the programme. Restoration involved direct placing of orchid on tree or with support such as coconut husks or coir out of coconut fibres. Each plant was tagged when restored for monitoring. Further, watering of plants by local people during unfavourable periods and monitoring of survival of orchids by students were carried out.

a.

b.

Figure 29. (a and b) Rescue, restoration and tagging of orchids in SNLP habitats

a. 

b. 

Figure 30. (a and b) Successfully established orchids following rescue and restoration

Restoration and Orchid survival rate:

Rate of survival was monitored for six months. In SEVG habitat, 63 orchid clusters were found fallen with 108 individuals. Of which 13 orchids were thriving, 50 were half perished and 35 were introduced back on trees without tagging. However, further monitoring was not done in natural habitat as work permit expired. Of 72 fallen orchid clusters with 188 individuals in SNLP habitat, around 12 were damaged, 3 clusters were surviving on structures on ground, 57 were restored and tagged. Among the latter 90% survived on new host trees. Restoration onto same tree or similar bark might have enhanced the rate of survival among restored orchids (Figure 30).

Objective 5

Collaboration with Local NGOs and Voluntary bodies

MS Swaninathan Research Foundation, Puthoorvayal was consulted during many stages of the programmes. Further, the institute participated in the conservation workshop and Dr.Sivan, Ms.Dhanya had interacted with the students through invited talks. Local youth representing 'WakeUp', a platform for environmental awareness had participated in orchid trail walks to learn and understand restoration (Figure 31,32).

Figure 31. 'WakeUp' members learning about orchids from resource person, Arun T.R

Figure 32. Dr.Sivan, talking to students at Conservation workshop, representing MS Swaminathan Research Foundation, Puthoorvayal, Wayanad.

6. Conclusions

Impact assessment: The impact created by the conservation programme among targeted group was assessed using a sample group, the students. Of 34 students, 79% of the students rated the programme as highly efficient in delivering the objectives, creating awareness about biodiversity in general and especially orchids. Interestingly, a 40% expressed interest in scientific research in orchid ecology and conservation. The school has given the expression of interest to be a participant in future biodiversity conservation programmes. An increased awareness, knowledge and interest was recorded amongst the target group at the end of the programme. The documentary that has been made narrating the entire project would reach a wider mass in the future.

The major findings/achievements may be briefed as:

- Semi natural crop plantations with natural trees as shade have more epiphytic orchids species compared to surrounding natural forests with degraded patches.
- The causes of orchid fall were identified into categories such as natural, animal and management related.

- The occurrence of fallen host trees or branches with living orchids was more in semi natural crop plantations mostly due to management related interventions.
- Orchid fall is influenced by the pattern of loss of tree zones on a tree habitat
- Orchid fall leads to high orchid loss unless reversed by conservation assistance
- Five schools participated in the basic awareness programme.
- Local youth, Other institutions collaborated in the programme.
- Field training was given to 34 selected students, two teachers, fifty indigenous people and twenty-five others.
- About 90% of restored orchids survived
- An increased awareness, knowledge and interest was recorded amongst the target group at the end of the programme.

Recommendations

The project succeeded in creating a new approach in Orchid conservation in the Western Ghats. It suggests

- Semi natural crop plantations are highly important in maintaining the epiphytic orchid diversity and endemism of the region.
- Orchid loss can be greatly reduced by conservation interventions.
- Rescue and restoration are an effective tool for fallen orchids.
- Identification and participation of stakeholders is equally important as field research in ecological conservation.
- Similar initiatives may be done in other ecologically sensitive areas in the state
- Findings and materials for learning may be shared with colleges and schools as material in nature education
- Species specific, area specific conservation strategies may be required with the involvement of Forests and Wildlife Department along with research and awareness

Publications regarding and out of the Project:

Local newspapers published the inaugural and ending event in the state

Regional (vernacular) magazines in forest conservation (Aaranyam and Koodu) have accepted articles for publication

A detailed conservation article is prepared for ‘Orchid Review’ by Royal Horticultural Society

One scientific paper is being prepared to be published in an internationally peer reviewed journal

Poster presentation at National Conference on Biodiversity Conservation-Recent Developments and Future Strategies at Kuvempu University, Shimoga, Karnataka grabbed best paper award (Figure 33). The full paper on the same will be published in the conference proceedings with ISBN number.

a

b

Figure 33. (a) Conference participants learning the poster (b) First author (Ms.Jis Sebastian) by the poster

7. References

Flores-Palacios A and Valencia-Diaz S. 2007. Local illegal trade reveals unknown diversity and involves a high species richness of wild vascular epiphytes. *Biological Conservation* 136: 372-387

Gentry, A. H., and C. H. Dodson. 1987. Diversity and biogeography of Neotropical vascular epiphytes. *Ann. Missouri Bot. Gard.* 74: 205–233.

Maggi Mariya. 2015. Diversity, abundance and distribution of epiphytic orchids in natural and semi natural habitats. MSc Thesis submitted to MG University, Kerala.

Narayanan M.K.R, Shaju T.,Sunil C.N., Abdussalam A.K. and Abdujalal V. 2013. Orchids of Wayanad. Lead Books. 106pp.

Sebastian et al.2019 unpublished data. Influence of Phorophyte, Habitat and climate on the diversity, spatial distribution and community structure of epiphytic rchids in the Southern Western Ghats. PhD thesis. Madurai Kamaraj University. Madurai

Sebastian, J., Rathinavel,S.R., Jayalakshmi,P.S.ad Kuriakose,G. 2017. An Experimental Approach to Study the Distribution of Endemic Orchids In The Southern Western Ghats. Proceedings of Ecology 2017 International Symposium. Turkey.

Seles-Montero L, Flores-Palacios,A and Cruz-Angon A. 2005. Shade-Coffee plantations for tropical wild orchids I Central Veracruz, Mexico. *Conservation Biology* 19(3):908-916

Wolf J H D, Gradstein SR, Nadkarni N M.2009. A protocol for sampling vascular epiphyte richness and abundance. *Journal of Tropical Ecology* 25:107-121

Few Orchids with their medicinal properties

Species	Vernacular name	Uses
Acampe praemorsa	Maravazha, Valiya maravazha	Earache, Asthma, anti-inflammatory
Crepidium purpurea	Jeevakam	Rejuvenating, Energy booster
Eulophia graminea, Eulophia spectabilis	Chilanthikizhangu	Spider bites
Nervilia aragoana, Nervilia crociformis, Nervilia plicata	Orilathamara	Eye diseases, Urinary tract infections, renal stones
Pholidota imbricata	Pannamaravazha	Skin diseases

Source: Dr.Ajayan Sadanandan, Department of Dravyaguna, Ayurveda College, Coimbatore

Vanilla is one of the best known and widely used flavors. It is extracted from the pod of Vanilla planifolia, which is a species of orchid

Source : http://bariballagriculture.com

Acknowledgements

Kerala Forests and Wildlife Department
Department of Science and Technology
San Diego County Orchid Society, USA (www.sdorchids.com)
Sacred Heart College, Cochin

Prepared by- Giby Kuriakose, Jis Sebastian & Arun T R

Dendrobium barbatulum

Geodorum densiflorum

Conservation of Wild Orchids of Kerala

Cottonia peduncularis

Although there are many beautiful flowers, orchids are the most unforgettable among them. There are more than thirty five thousand orchids in the world. They all belong to the family Orchidaceae. Orchids come in a great variety of shapes, sizes and colors. Orchids are distributed mostly in the tropical forests and prefer certain climatic conditions for growing. Chiefly, orchids are of two kinds - terrestrial (those that grow on the ground) and epiphytes (those that grow on other plants).

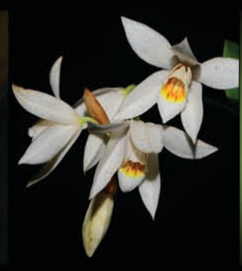
Orchids make excellent garden plants with their fascinating variety of pollination methods and flower structures. They are also long lasting and are very valuable in horticulture. Today, there are a lot of hybrid varieties available on the market with every imaginable color combination.

There is evidence that the Chinese used orchids for medicinal purposes as far back as 28 BC. There are many cultures around the world that use orchids for decoration, to make perfumes and in religious ceremonies and magic. Some species are even consumed as food!

Habenaria periyarensis

Chrysoglossum maculatum

Diploprora championii



Coelogyne nervosa

Bulbophyllum careyanum

In Kerala, orchids like *Nervilia aragoana* (*Orilathamara*), *Acampe praemorsa* (*Maravazha*) and *Malaxis versicolor* (*Jeevakam*) are used for their medicinal value among different indigenous people. There are more than 190 species of orchids so far reported from Kerala. We have so far identified the medicinal properties of only a handful among these.

The culture and life of our vibrant state have common names for plants and animals in a locality. Butterflies with names *Varayankomali* (Angled pierrot), *Neelaneeli* (Blue pansy) *Krishnasalabham* (Blue mormon) etc. are examples. A curious fact is that amongst orchids, only a few orchids have such names. This is true both for the Malayalam language as well as for English. However, some orchids seen naturally in Kerala have interesting names like *Theyyam flower* for *Habeneria crinifera* and *Kathakali pushpam* for *Luisia macrantha* because they resemble the masks worn during the performance of traditional art forms Theyyam and Kathakali respectively. Other interestingly named orchids are 'Ladies slipper orchid' (*Paphiopedilum druryi*), 'Indian bee orchid' (*Cottonia penduncularis*) and 'foxtail orchid' (*Rhynchostylis retusa*).

New orchids are being discovered all the time and around thousand species are being identified every year. A lot of effort is needed to conserve wild species in their native habitats. This is made difficult because different species require different conditions and there are a lot of species that are under threat of extinction. Deforestation due to human activities and due to natural causes such as forest fires also affects orchid survival in the natural forests. Another threat is that of climate change and global warming; most orchids are very sensitive to changes in their habitat. Successful conservation of orchids also requires their immediate environment (microhabitat) to be conserved as well.

In an Austrailan ground orchid, **Ophryz spp.**, better known as the bee orchid, the flower-lip mimics a female bee sitting on the flower. It attracts the male bee, thus helping in the pollination of the flower.

Source : Wikipedia

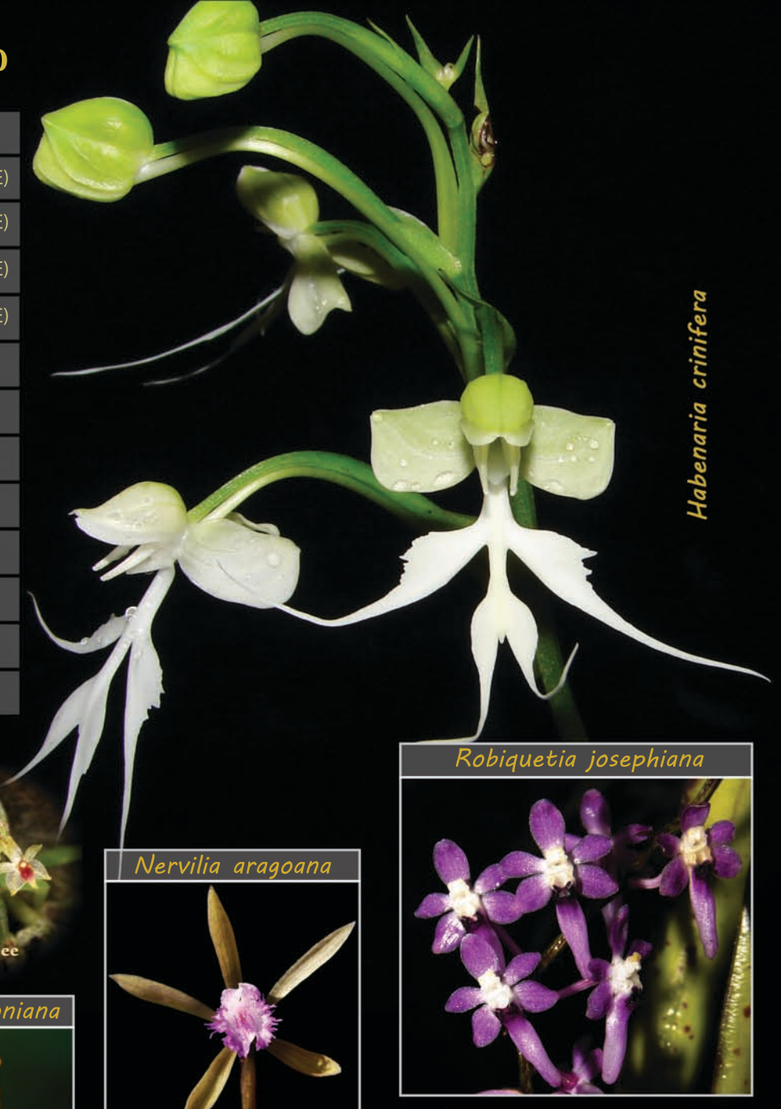
Seidenfadeniella filiformis

Oberonia chandrasekharanii

Porpax jerdoniana

Rare, Endangered & Thretened (RET) orchid species of Kerala

Orchid species	Status
Dendrobium panduratum	Critically Endangered (CE)
Eulophia flava	Critically Endangered (CE)
Paphiopedilum druryi	Critically Endangered (CE)
Tris bonaccordensis	Critically Endangered (CE)
Bulbophyllum aureum	Endangered (EN)
Bulbophyllum mysorense	Endangered (EN)
Dendrobium microbulbon	Endangered (EN)
Dendrobium nanum	Endangered (EN)
Retinanthus rheedii	Endangered (EN)
Habenaria barnesii	Endangered (EN)
Ipsea malabarica	Endangered (EN)
Nervilia aragoana	Endangered (EN)

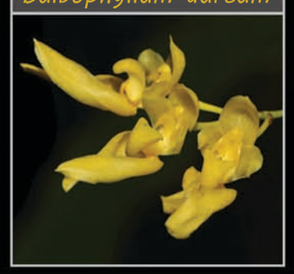


Habenaria crinifera

Platystele jungermannioides is believed to be the world's smallest Orchid
The flower size is hardly 1 -2mm!

©Gary Yong Gee

Bulbophyllum aureum

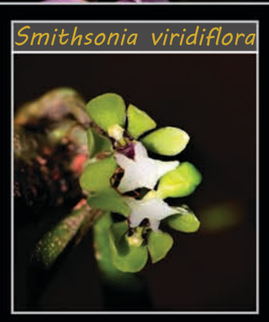


Oberonia brunoniana

Nervilia aragoana

Robiquetia josephiana

Smithsonia viridiflora



Flickingeria nodosa

Anoectochilus elatus

Liparis nervosa

Sirhookera latifolia

Xenikophyton smeeanum

Cleisostoma tenuifolium