



A rapid assessment of orchid flora in Anakkulam range, Mankulam Forest Division, Idukki in the Western Ghats of Kerala, India

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Orchid diversity in the state of Kerala is very unique and the highest in the country after the north-eastern states (Singh et al. 2019). The number of orchids in the state is around 265 species with high endemism (Jalal & Jayanthi 2012; Sasidharan 2013). Increasing habitat diversity with increasing area can predict orchid diversity in the tropics (Keppel et al 2016). Interestingly, the dominant forest type in the state is the evergreen forest. Evergreen habitats exhibit a diverse array of climatic and habitat conditions within, providing micro-environmental conditions thereby, favoring the diversity and abundance of orchids (Sebastian 2020). In India, ecological studies on orchids are only a handful leaving a huge gap in orchid science. Interestingly, global research on orchids warns us that a large number of orchids from the tropics are going to be majorly threatened due to changes in habitat and climate. Hence, it is high time orchid science in the country initiated seasonal observations and spatial and temporal long-term ecological studies from all biogeographical zones. The current study

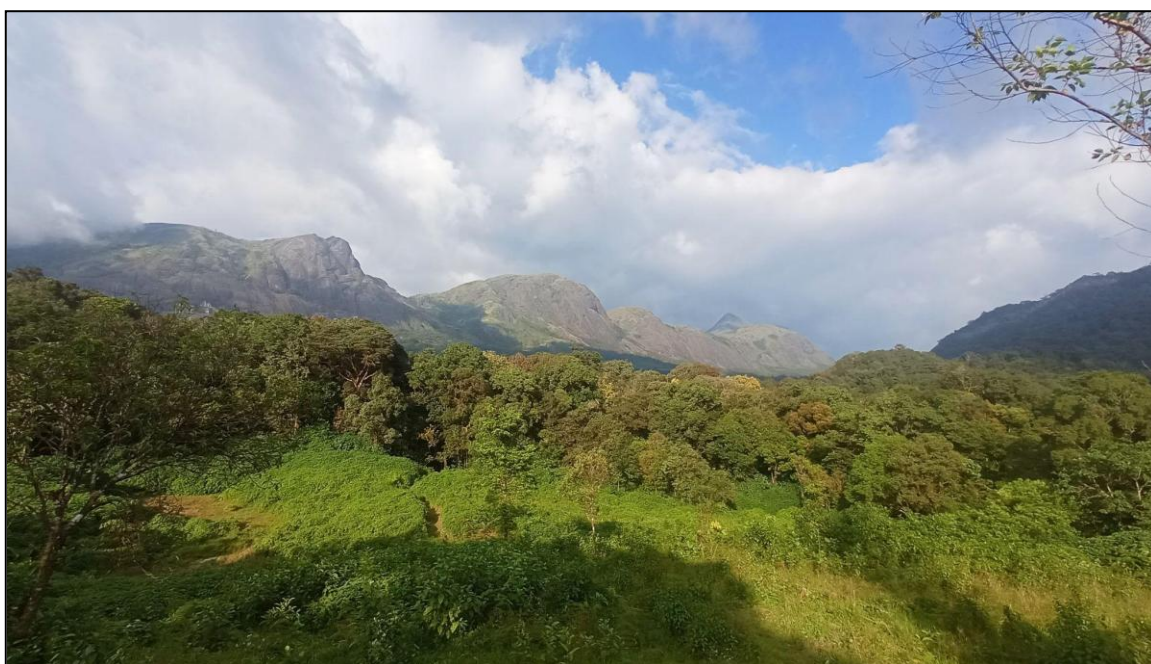


Figure 1. Montane evergreen forests in Anakkulam range, Mankulam Forest Division



was part of a rapid biodiversity assessment carried out by the forest department. The orchid flora recorded from the rapid biodiversity assessment in the Anakkulam range is discussed in this article.



Figure 2. Some orchids recorded from the Anakkulam range, Mankulam Forest Division, Idukki district, Kerala

Field observations:

As part of a rapid floral assessment, the authors visited the Anakkulam range of the Mankulam forest division for the forest department on the 11th and 12th of December 2021. Mankulam forest division is a territorial forest division in Kerala located in the high ranges of the Anamalai Hills in the Western Ghats. Anamalai hills surround Anamudi, the highest peak in south India. These hills are mostly protected with the largest contiguous montane shola grasslands and serve as a conservatory for endemic flora and fauna, that includes flagship species like Nilgiri tahr (*Nilgiritragus hylocrius*), Neelakurinji (*Strobilanthes kunthiana*) etc. The Mankulam division shares borders with Eravikulam national park in the northeast, the Munnar forest division in the southwest, and the Malayattur forest division in the northwest (Image 1). The total area under the Mankulam forest division is 90.05 sq km, of which 52 sq km falls in the Mankulam range and 38sq km in the Anakkulam range. ‘Anakkulam’ range is named after the regular sighting of a herd of elephants by the ponds in the area. The division



has perennial rivers such as the Karinthiyar river and Menachery river flowing through the range. There are several peaks such as Parvathimala, Bhagavathypara, Oosi mala, and the highest peak in the division is known as Sanku mala. The elevational gradient of the Anakkulam range is from 900MSL to 1600 MSL. The range experiences an average rainfall of 2700mm in a year and the temperature here varies between 5° C in winter to 30° C in summer. The forest type in the lower ranges is montane evergreen forests and it slowly transitions into shola forests in the higher ranges.

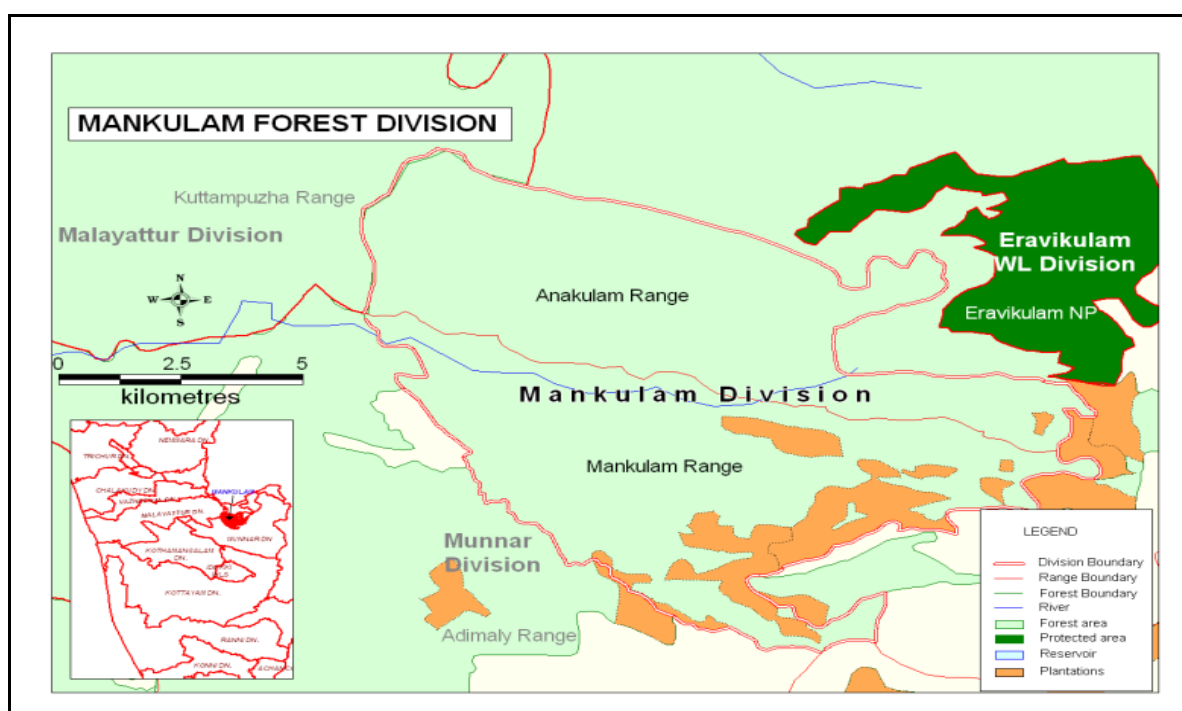


Figure 1. Map of Mankulam Forest division (Source: Kerala forests and wildlife department).

Transect walk was followed for 12km to record the vegetation in the range. These transects are established by the forest department for survey and monitoring. The transect length was roughly around 1km and the width was 5m. A total number of 33 orchids have been recorded from 12 transects. Of which 25 are epiphytic and 8 are terrestrial orchids. Interestingly, of them, 14 are endemic to the Western Ghats. The orchids surveyed from the Anakkulam range are given in Table 1.

**Table 1. Orchids observed in Anakkulam range, Mankulam forest division**

Sl no.	Species	Endemic**	Epiphytic/ Terrestrial	Status of Conservation **
1	<i>Anoectochilus elatus</i> Lindley	✓	T	EN
2	<i>Bulbophyllum aureum</i> (Hook. f.) J.J. Smith	✓	E	EN
3	<i>Bulbophyllum careyanum</i> (Hook.) Spreng.	-	E	
4	<i>Bulbophyllum sp *</i>	-	E	
5	<i>Bulbophyllum sp 2*</i>	-	E	
6	<i>Bulbophyllum sterile</i> (Lam.) Suresh	-	E	
7	<i>Calanthe sylvatica</i> (Thouars) Lindl.	-	T	
8	<i>Cheirostylis flabellata</i> (A.Rich.) Wight	-	T	
9	<i>Coelogyne nervosa</i> A. Rich.	✓	E	EN
10	<i>Conchidium braccatum</i> (Lidl.) Ormerod	-	E	
11	<i>Dendrobium herbaceum</i> Lindl.	-	E	
12	<i>Dendrobium jerdonianum</i> Wight	✓	E	EN
13	<i>Dendrobium heterocarpum</i> Wall. ex Lindl.	-	E	
14	<i>Dendrobium macrostachyum</i> Lindl.	-	E	
15	<i>Didymoplexis pallens</i> Griff.	-	T	
16	<i>Disperis neilgherrensis</i> Wight	✓	T	CR
17	<i>Eria mysorensis</i> Lindley	✓	E	EN



18	<i>Eria nana</i> A. Rich.	✓	E	EN
19	<i>Eria pauciflora</i> Wight	✓	E	
20	<i>Eria polystachya</i> A. Rich.	✓	E	
21	<i>Eria pseudoclavicaulis</i> Blatter	✓	E	
22	<i>Gastrochilus flabelliformis</i> (Blatter & McCann) Saldanha	✓	E	EN
23	<i>Liparis elliptica</i> Wight	-	E	
24	<i>Liparis viridiflora</i> (Blume.) Lindl.	-	E	
25	<i>Malaxis sp*</i>	-	T	
26	<i>Oberonia brunoniana</i> Wight	✓	E	
27	<i>Papilionanthe subulata</i> (Willd.) Garay	-	E	
28	<i>Pholidota imbricata</i> (Roxb.) Lindl.	-	E	
29	<i>Seidenfia crenulata</i> (Ridley) Szlachetko	✓	E	CR
30	<i>Sirhookera lanceolata</i> (Wight) Kuntze	-	E	
31	<i>Spiranthes sinensis</i> (Pers.) Ames	✓	T	
32	<i>Trichoglottis tenera</i> Lindl. (Rchb.) f.	-	E	
33	<i>Zeuxine gracilis</i> (Breda) Blume.	-	T	

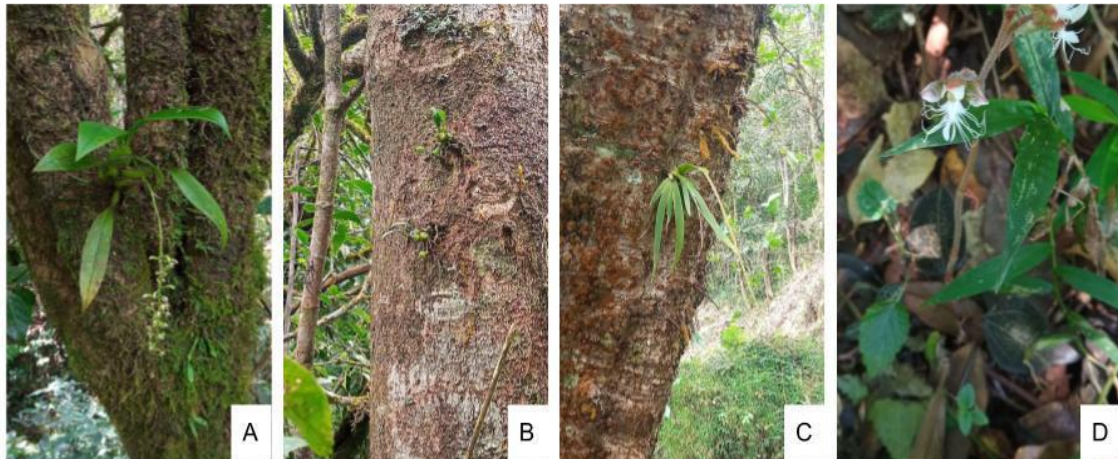
Abbreviations used: E- Epiphytic, T- Terrestrial *species not confirmed due to lack of phenological developments; **Endemic orchids, Status of conservation- Kumar et al. 2001

Interestingly, most of the recorded orchids are habitat-specific (Sebastian 2020) and are rare in the Western Ghats (Kumar et al 2001). It may be noted that the population and ecological aspects of these species are not yet known. *Didymoplexis pallens* was the only orchid



recorded as mycoheterotrophic, which grows in leaf litters and completely depends on fungi for survival (Jalal & Jayanti 2013). The presence of mycoheterotrophic orchids indicates the availability of undisturbed primary forests. Based on the Conservation Assessment and Management Plan Workshop (Kumar et al. 2001), the Anakkulam range has 9 species of orchids that need immediate conservation interventions. The presence of these orchids advocates the availability of specific (micro)habitat and (micro)climatic conditions montane evergreen forests provides to orchids (Sebastian 2020) and therefore invites scientific attention. Orchids such as *Dendrobium macrostachyum*, *Liparis sp*, *Bulbophyllum sterile*, *Malaxis sp*, and *Pholidota imbricata* are seen as generalists i.e., distributed across habitats. Species such as *Anectochilus elatus*, *Liparis elliptica*, *Oberonia brunoniana* were in flowering. Also, it may be noted that some genera of orchids could not be identified without flowers leaving uncertainties in relation to exact taxa. So rapid assessments or short-term studies may not always yield the required data on species and their ecology. Ecological understanding of endemic orchids in the Western Ghats is almost nonexistent. The presence of 14 endemic orchids (42%) suggests the high endemic floral elements in the region, Anamalai Hills in the Western Ghats.

Orchids are known to be indicators of specific habitat and climatic conditions. The lack of taxonomic and ecological studies in India makes our orchids hitherto unknown to practicing conservationists. Therefore, it is very important to immediately initiate large-scale spatial and temporal studies to understand the ecological aspects of orchids against seasons or changes in climate, especially in regions of importance such as areas of endemism and in the high ranges of the Western Ghats. Otherwise, the lack of understanding may lead us to witness orchids succumb to potential threats possessed by changes in climate and habitat.



From left: A. *Liparis elliptica* Wight, B. *Bulbophyllum* sp., C. *Oberonia* sp., D. *Anectochilus elatus* Lindl. in flowering



Clockwise:

- A. *Anectochilus elatus* Lindl.
- B. *Disperis neilgherrensis* Wight
- C. *Seidenfadeniella filiformis* (Rchb.f.) Christenson & Ormerod
- D. *Eria braccata* Lindl.

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