KFRI Research Report 145

STUDIES ON THE FERN FLORA OF KERALA WITH SPECIAL REFERENCE TO SYLVAN VALLEY, MUNNAR

M.S. Muktesh Kumar

KERALA FOREST RESEARCH INSTITUTE
PEECHI, THRISSUR

April 1998 Pages: 46

CONTENTS

ABSTRACT

From the known 236 species of ferns and fern-allies in the Western Ghats, 159 species have been enumerated from the Munnar Forest Division. Among these, 109 species are terrestrial and 50 epiphytic. These 159 species are enumerated with brief descriptions. Live specimens of 125 species of ferns and fern-allies collected from different forests of Kerala were supplied to the Forest Department to be maintained in the fern house. Presently 138 species are being maintained in the Sanctuary. Suitable planting methods were suggested for growing them in the fern house. A checklist of rare and endangered species found in the different forests of Munnar region is also provided. Rare and endangered species like, *Isoetes coromandelina*, *Lygodium microphylla*, *Anemia wightiana*, *Acrostichum aureum* *Pronephrium articulatum*, *P. triphyllum*, *Blechnum colensoi* and *Microsorium linguaforme* which are collected from other parts of Kerala forests are also maintained in the sanctuary. *Ctenopteris subfalcata* and *Asplenium laciniatum* collected from Munnar are found to be new records to Kerala. *Asplenium auritum* and *A. temuifolium* have been collected from Munnar forests after a lapse of over a hundred years.

1. INTRODUCTION

The pterdophytes are the earliest vascular plants which first colonised on land. This group is characterised by the absence of flower/seeds and have independant gametophytic generations.

The Western Ghat region is one of the richest centeres of pteridophytes lodging over 236 spies in the Kerala region alone (Nayar 1997). The pteridophytes (Ferns and Fern allies) represent a broad spectrum of biological types from small filmy ferns to arborescent tree ferns and from submerged aquatics to epiphytes and xerophytes.

Though, some of the pteridophytes prefer to a warm ciimate. majority of them are restricted to sheltered. densely-shaded. humid areas of the forests. The great difference which occur in the altitude. temperature, humidity, heavy rainfall and varied soil conditions have resulted in a rich and varied pteridophytic vegetation in Kerala. Since most of the spies arc: found in the remote forest areas. we have little knowledge on this group of plants and their economic potential is not fully exploited.

Conservation of endangered species. both *in situ* and *ex situ* preservations. are important. The *in situ* conservations, as in National Parks and Bioreserves. provide natural protection and intact environment. the *ex situ* conservation as in the Green houses and Botanical Gardens can give materials for closer observations and detailed studies. both for academic purposes and economic utilization.

In order to promote the importance of pteridophytes and to create an awareness among the public for conservation and to develop a fern sanctuary, the Kerala Forest Department (Development) identified Kuttiyar Valley near Munnar. presently known as Sylvan Valley for the establishment of a Fem Sanctuary.

1.1 Sylvan Valley Fern Sanctuary

The Sylvan Valley Fern Sanctuary is situated near Munnar town in the Devicolam Forest Range of Munnar Forest Division of Idukki District (Fig. 1). . But for the administrative purposes the sanctuary is being maintained by the Munnar Range.

The fern sanctuary is 12 km away and from Munnar Town near Munnar - Nettikudy Estate Road of Tata Tea Ltd. (Fig. 2). The entire sanctuary has an area of 8.6 hectare and has an average altitude of 1450 mabove from sea level. The area is an open slopy grassland which is flanked on all sides by Eucalyptus plantations intermixed With patches of evergreen shola forests and a true patch of marshy land on the southern end of the sanctuary (Fig. 3).

The main entrance of the sanctuary is at the north western side and on the western side a trench has been taken to prevent the entry of wild elephants which are frequent in the nearby areas. Inside the sanctuary plants like pine, cupressus, some bamboo sp. and some flowering plants have been planted. A green house for maintaining live specimens of pteridophytes and a fish pond for raring rare fishes have been established inside the sanctuary by the Forest Department.

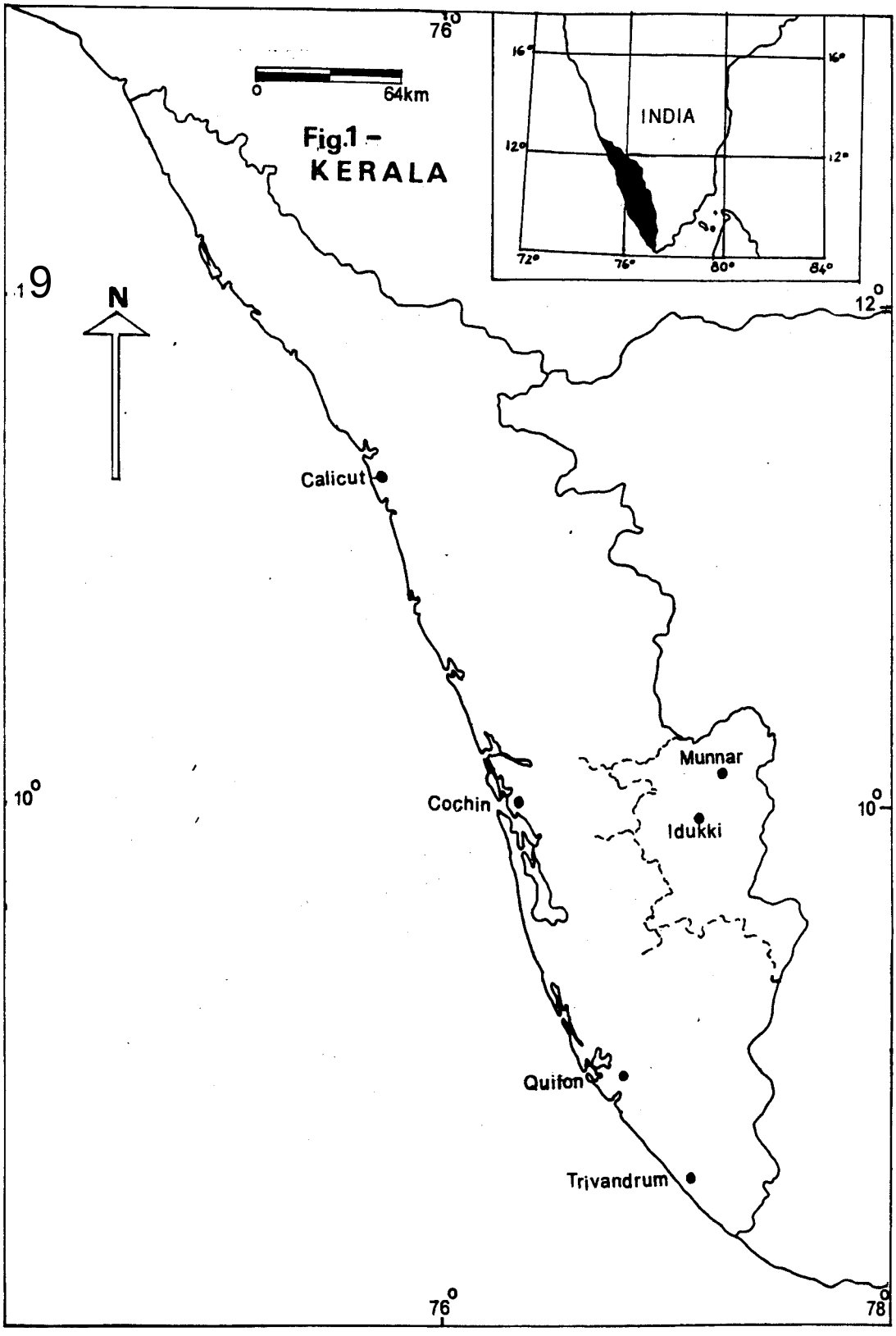
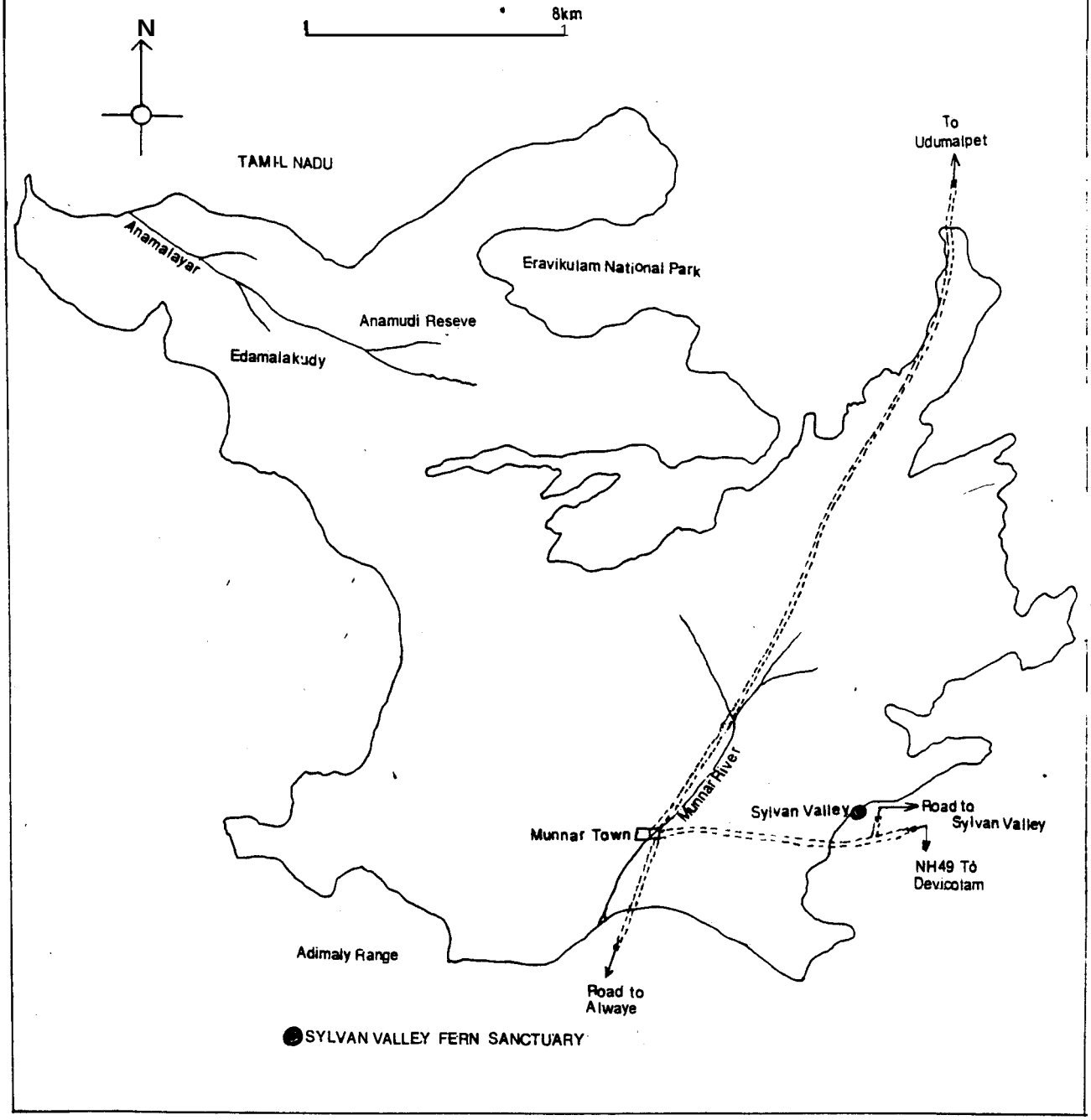
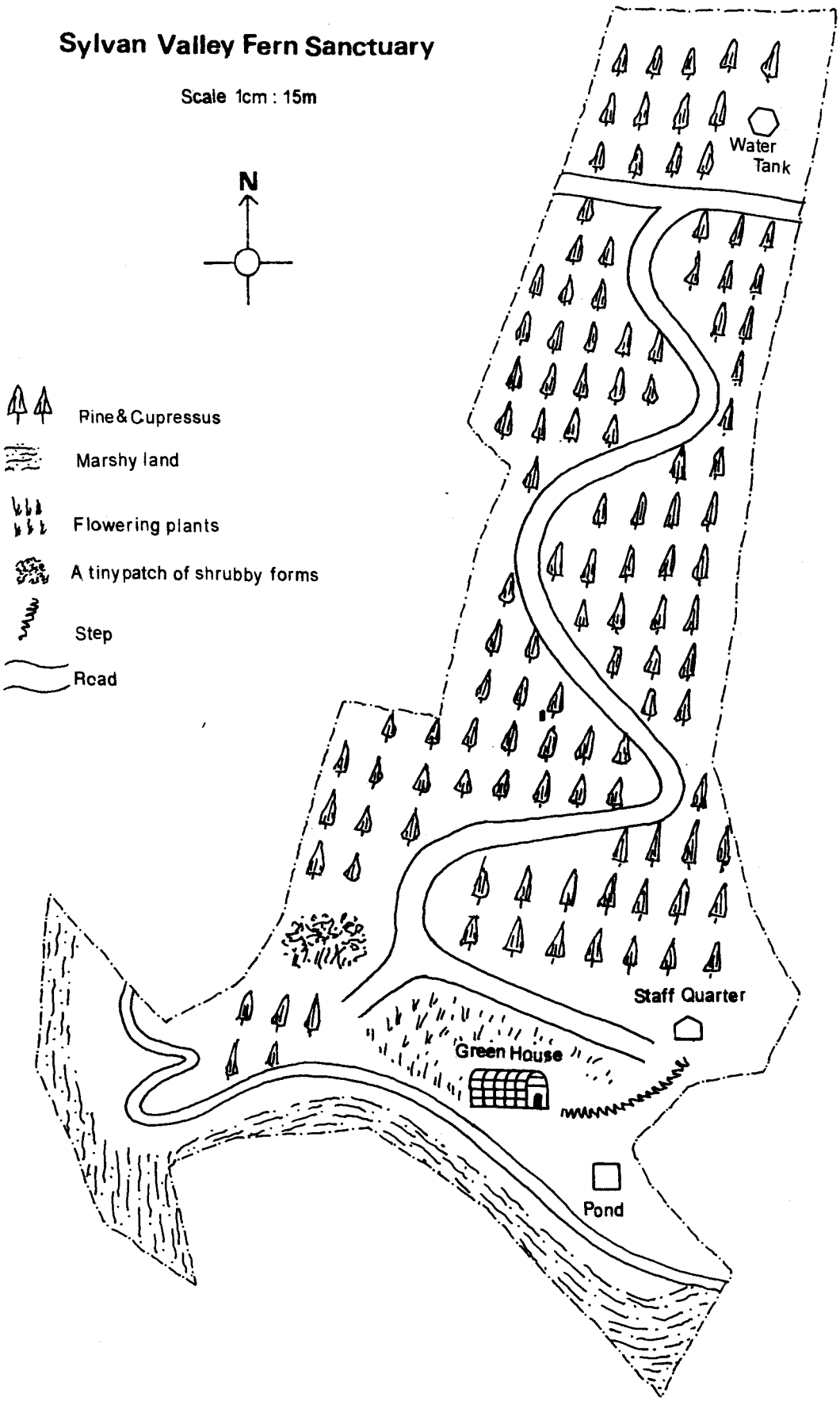

76°
0
64km
Fig.1 –
KERALA
INDIA
16°
12°
72°
76°
80°
84°
9
N
12°
Calicut
Cochin
Munnar
Idukki
10°
10°
Quilon
Trivandrum
76°
78°

Fig.2 Map of Munnar Range Locating Sylvan Valley Fern Sanctuary



Sylvan Valley Fern Sanctuary

Scale 1cm : 15m



In the grassland plants like *Chrysopogon hackellii*, *C. zeylanicum* and *Tripogon sp.* are found dominant in the Valley. Orchids like *Habenaria longicornu* and *Liparis wightiana* are also found growing inside the sanctuary. Pteridophytes like *Pteridium aquilinum*, *Equisetum ramosissimum*, *Blechnum orientale*, *Dicranopteris linearis* and *Hypolepis glandulifera* are naturally occurring in Sylvan Valley.

2. MATERIALS AND METHODS

Ferns from the various forest ranges of Munnar Forest Division were surveyed and collected during the study period. All the ferns occurring within the area have been enumerated. The specimens were identified with the help of relevant literature and authentic specimens. The collection of ferns and fern-allies are maintained inside the green house. Pteridophytes collected from different parts of the Kerala were also added to the collection at the sanctuary and all the ferns that are maintained in the Fern House are arranged as per the classification of Pichi - Sermolli (1958).

3. REVIEW OF LITERATURE

The earliest record on the ferns and fern allies of Western Ghats is perhaps the one by Van Rheede(1678-1703) in his classical work *Hortus Malabaricus* in which 20 ferns and fern allies were illustrated and described. The first survey of South Indian Ferns was made by Col. R.H.Beddome (1863-1873) who gave a brief description and illustration of these plants, After Beddome's work, emphasis was given to intensive exploration of other areas. Since then numerous publications (Ravi& Joseph, 1976; Nair & Bhargavan, 1981; Nair & Dixit, 1981; Vohra, *et al.*, 1982; Nair *et al.*, 1988, 1992a, 1992b & 1994; Madhusoodanan 1991; Manickam & Irudayaraj, 1992; Nampy & Madhusoodanan, 1992; Madhusoodanan & Nampy, 1993; Nayar & Geevargheese, 1993; Madhusoodanan & Nampy, 1993; Leena & Madhusoodanan, 1993; Majeed *et al.*, 1994; Augustine, *et al.*, 1994; Azeez, *et al.*, 1996; Leena & Madhusoodanan, 1996) were published from Kerala region pertaining to their taxonomic and other related studeis. In some of the above publications collection of pteriodophytes from Munnar region were also included. Recently Raju Antony, *et al.*, (1996) described a new variety of *Grammitis* from Munnar forest.

4. RESULTS

4.1 Floristic analysis

During the survey of ferns and fern allies as weil as from the published literature it has been estimated that 159 species under 70 genera are known to occur in Munnar region.

The pteridophytic flora of the Munnar region is enumerated as Table 1.

Table 1 Enumeration of pteridophytic flora

Pteridophytes	Family	Genera	Species
Fern allies	4	6	23
Ferns	25	64	136
Total	29	70	159

In fern allies the family Selaginellaceae with a single genus *Selaginella* dominates with 13 species. In ferns, the family Aspleniaceae dominates with 17 species under 1 genus followed by Thelypteridaceae (15 species under 9 genera), Polypodiaceae (14 species under 8 genera), Dryopteridaceae (12 species under 5 genera), etc.. In fern allies the family Lycopodiaceae has 8 species under 3 genera. Among these three genera, the genus *Huperzia* has 5 species which are all found to be epiphytic. The relative dominance of the 10 families occurring in the Munnar region is shown in Fig. 4.

Among the 159 species under 70 genera, 50 are epiphytic members and the rest 109 species are either terrestrial or lithophytic. Among 23 fern allies occurring in Munnar 7 species are epiphytic and among 136 species of ferns, 52 are epiphytic. Relative abundance among ferns and fern allies occurring in Munnar is shown in Fig. 5.

Endemic, rare and endangered plants

In India there are 1022 spies (24.5%) of pteridophytes that areknown to be endemic (Nayar. 1996). Kerala situated in the 'hottest' of hot spots of endemism in india is one of the world's outstanding areas of natural beauty with diversity of ecosystem, spies and genetic resources. Munnar region which comes under the Anamala - High Ranges and one of the thre'Hot Spots' of endemic centres of Kerala. This region is considered as one of the richest botanical regions in Kerala with high degree of endemism. Of the 159 spies of pteridophytes recorded from Munnar region. 3 spies. 1 hybrid variety and 2 varieties are endemic to South India. About 15 species of ferns and fern allies are confined to South India and Sri Lanka.

The list of ferns occurring exclusively to South India and Sri Lanka are given as Table II.

Table II. List of endemic species

Endemic to South India	**Confined to SouthIndia and Sri Lanka**
1. *Selaginella tenera* (Hook. & Grev.) Spring	1. *Selaginella brachystachya* (Hook.&Grev.) Spring
2. *Dryopsis scabrosa* Holtt. & Edw.	2. *S. wightii* Heiron.
3. *Elaphoglossum beddomei* Sledge	3. *Pteris argyraea* T. Moore
4. *E. nilgiricum* Krajina ex Sledge	4. *P. confusa* T.G. Walker
5. *Bolbitis X prolifera* (Bory) C.Chr. &	5. *Cyathia crinita* (Hook.) Copel.Tardieu- Blot
6. *Grammitis pilifera* var. *munnarensis* Antony Raju *et al.*	6. *Christella meeboldii* (Rosenst.) Holtt.

Fig. 4. Relative dominance of 10 pteridophytic families in the study area

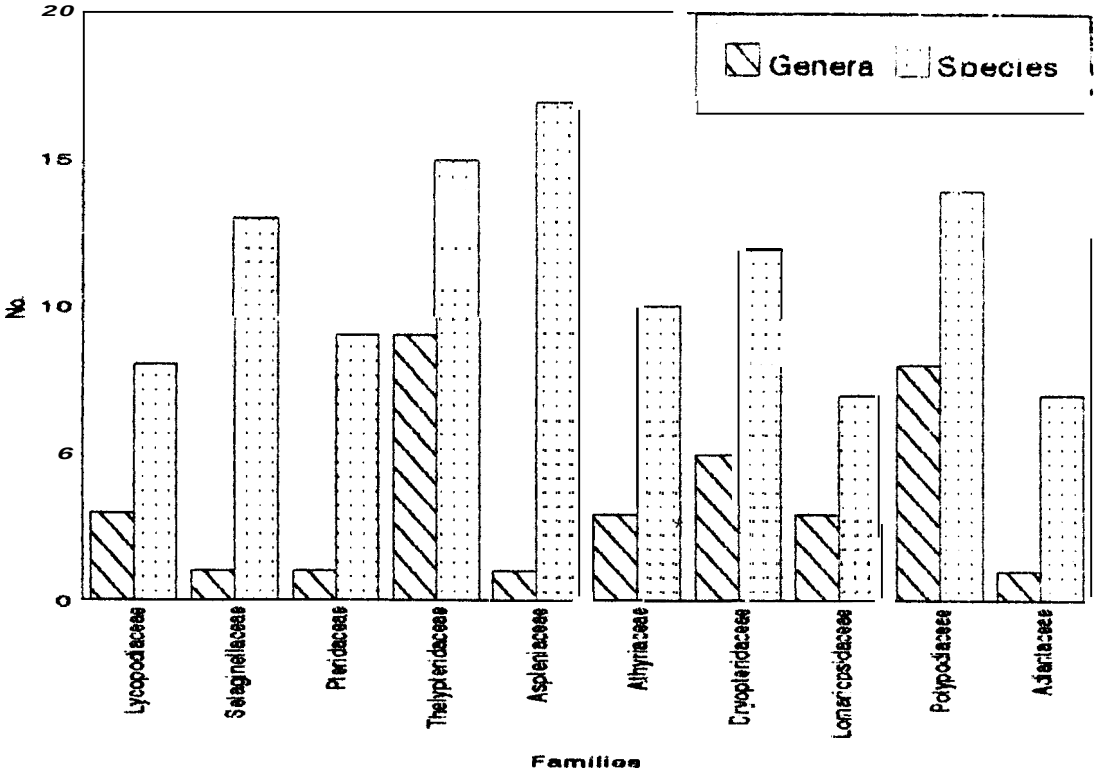
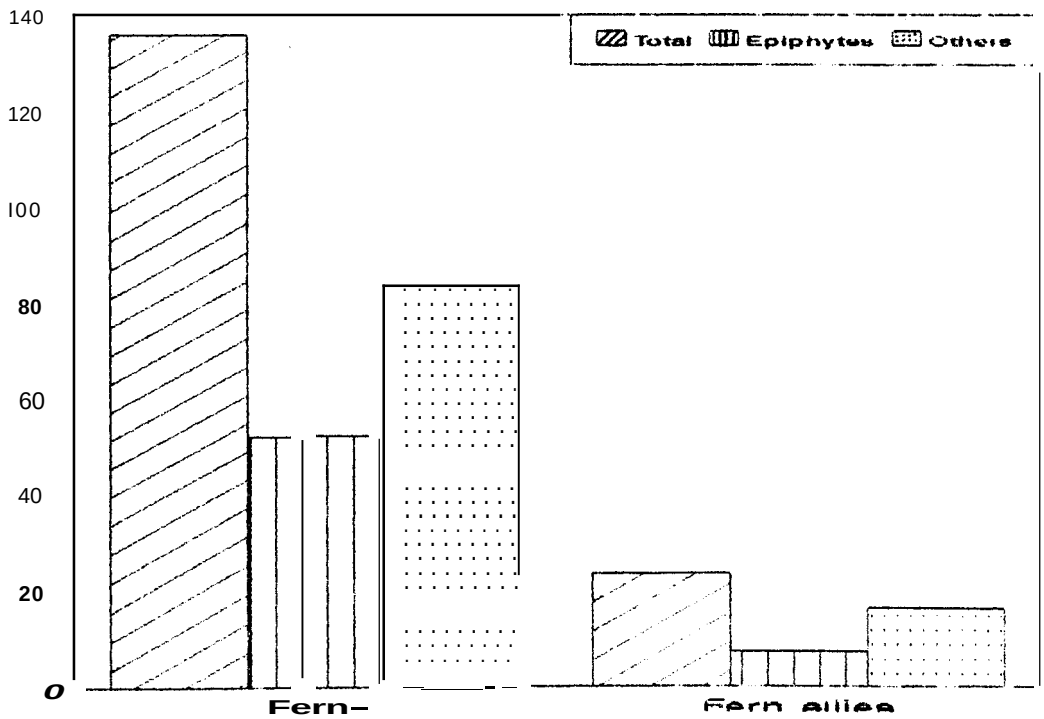


Fig. 5. Relative abundance of Ferns and Fern allies



7. *Dicranopteris linearis* var. *sebastiana* Panigrahi & Dixit

7. *Asplenium decrescens* Kunze

8. *A. zenkarianum* Kunze
9. *Athyrium hohenackerianum* (Kunze) T. Moore
10. *Diplazium cognatum* (Heiron.) Sledge
11. *D. travancoricum* Bedd.
12. *Dryopteris approximata* Sledge
13. *Polystichum harpophyllum* (Zenker ex Kunze) Sledge
14. *Crypsinus montanus* Sledge
15. *Lepisorus amaurolepidus* (Sledge) Bir & Trikha
16. *Microsorium pteropus* (Bl.) Copel.
17. *Phymatosorus nigrescens* (Bl.) Copel.
18. *Grammitis attenuata* Kunze
19. *G. medialis* (Bak.) Sledge

In the Munnar forests 29 genera of rare pteridophytes have been located. The rare and endangared ferns and fern allies occurring in the area has been enumerated in Table III.

Table III. Rare and endangered ferns and fern-allies
(In Munnar Forest Division)

1. *Huperzia* - 5 species have been recorded in the area. Among these *H. phlegmaria, H. squarrosa, H. hamiltonii* and *H. hilliana* are rare.

2 *Lycopodium wightianum* - In Munnar it is confined Eravikulam.

3 *Selaginella inaequalifolia* and *Selaginella wightii* - Rare.

4. ***Equisetum ramosissimum*** - Found naturally growing in the fern sanctuary, rare.

5 ***Psilotum nudum*** - Found in the Mannavan shola. rare

6. ***Botrychium lanuginosum*** - Found in the Eravikulam hills. rare.

7. *Angiopteris evecta* - Large fern, rarely found in Neriamangalam and Adimaly - Munnar road side forests.

8. *Osmunda hugeliana* - Once common along stream banks, now very rare.

9. *Pteris* - Nine species of *Pteris* are found in Munnar. *Pteris aspericaulis, P. kleiniana* and *P. scabripes* are rare.

10. *Actinopteris radiata* - Found only in the Chinnar Wildlife Sanctuary, rare.

11. *Cheilanthes farinosa* and *Cheilanthes bullosa* - Rare.

12. *Pellaea boivinii* - Extremely rare. not located from the area after Levinge's collections (1883).

13. *Adiantum* - Seven species are found in the Munnar forests. *A. hispidulum* is very rare.

14. *Davallia bullata* - Once a common epiphytic herb, now rare.

15. *Oleandra muscifolia* - Epiphytic or lithophytic fern once common in the ghats. now restricted to some pockets of the shola forests.

16. *Trichomanes obscurum* - Very rare in the Munnar forests.

17. *Cyathea crinita* - Beautiful tree fern now fast dissappearing from the forests.

18. *Asplenium* - About 17 species are present in the Munnar forests. *A. aethiopicum. A laciniatum, A. polyodon* var. *bipinnatum* are rare and seen only in the higher altitudes. *A. serricula, A. tenerum, A. tenuifolium and A. auritum* are seen only in Edamalakudy Among *Asplenium, A. luciniatum* is new record to Kerala. *A. auritum* and *A. tenuifolium* have been relocated during the present study after a lapse of 100 years very rare.

19. *Athyrium nigripus* - Very rare, seen only in higher altitudes.

20. *Diplazium* - About 7 species present in Munnar. *D. cognatum, D. travancoricum* and *D. sylvaticum* are rare and found only in one or two pockets of the forests.

21. *Dryopsis scabrosa* - Endemic to S. India, very rare.

22. *Polystichum harpophyllum* and *P. moluccens* are found only in higher altitudes, rare.

23. *Arachnioides aristata* Beautiful dark green fern once common in the lower altitude evergreen forests, now found to be rare.

24. *Elaphoglossum beddomei* and *Elaphoglossum, nilgiricum* are endenmic to S. India, very ram.

25. *Loxogramme* - 2 species present in Munnar. *L. parallela* is very rare.

26. *Crypsinus montanus* - Rare, found only in the higher altitudes.

27. *Microsorium* - 3 species present, *M. membranaceum* facing extinction.

28. *Ctenopteris subfalcata* - Very rare, new record to Kerala from Munnar.

29. *Prosaptia contigua* - Very rare, located only in Edamalakudy. Collected after a lapse of 100 years.

Ferns and Fern allies of Sylvan Valley Fern Sanctuary

During the end of the project period 138 species of ferns and fern allies have been maintained in the green house established at Sylvan Valley (Appendix I). Among these 125 species collected from various localities in Kerala (including Munnar region) were added to the collection made by the Forest Department (Appendix II). The collection includes rare species like, *Nistarika bahupunctika, Prosaptia contigua, Lygodium microphylla, Acrostichum aureum, Blechnum colensoi, Anemia wightiana, Isoetes coromandelina, Pronephrium articulatum, P. triphyllum* and *Microsorium linguaforme*.

5. DISCUSSION

The Munnar region lies in the highest reaches of the hilly tracts of high ranges (Nair. 1994) with an average elevation of ca 1500 msl. The unique physiography with high altitude. high rain fall and diurnal temperature fluctuations of the area resulted in a microclimatic green house in its several folds of mountains for the luxuriant flora of the area

During thte study period 159 species of ferns and fern allies under 70 genera belonging to 29 families were recorded. Among these 4 species one hybrid species and two varieties were recorded as endemic to south India and another 19 spies were recorded as spies confined to south India and Sri Lanka. During the study two spies viz., *Asplenium laciniatum* and *Ctenopteris subfalcata* collected from Devicolam and Mannavan shola respectively were found to be new records to Kerala. Ferns like. *Asplenium auritum. Asplenium tenuifolium.* and *Prosaptia contigua* collected from Munnar forest were relocated from Kerala after a lapse of over 100years. About 30 spies were recorded as rare species occurring in Munnar. Species like. *Pteridium aquilinum, Adiantum* sp, etc.. are widespread in and around Munnar.

Eventhough tropical climate having high rain fall during monsoon and warm climate during the summer season provides a natural greeen house for the pteridophytic flora of Munnar. some species are found to be very rare now, though they were common in the past. Species Like, *Osmunda hugeliana, Angiopteris evecta, Cyathea spp , Diplazium spp . Polystichum spp., Arachnioides spp, etc*., once common in the forests of Munnar. are very rare due to man made or natural fire, difforestation and destruction of the plants by the local people. Local people in Munnar extracted the pinnae of *Cyathea, Angiopteris*. etc., for decorating purposes for their wide range of celebrations. Shifting cultivation method followed by the tribals settled in and around Munnar region also cause the damage to plants in the natural condition. Landslides due to heavy rain during monsoon also affects the rarity of plants.

As a fragile topography and ecosystem, Munnar is now gaining importance as a tourist spot in the high ranges. In order to create an awareness of the importance of pteridophytes among public and to conserve tho rare and endangered spies, the Forest Department selected the picturesque spot near Munnar. Sylvan Valley fern Sanctuary with a green house inside the sanctuary for maintaining live collection of pteridophytes. The early stages of establishment of the sanctuary is shown in Plates I to III. During the construction of the approach road and the green house several pteridophytes were cullected and maintained. After the construction of the green house several pteridophytes. ornamental plants and trees like, Pinus and Cupressus were planted on the exposed barren lands in the sanctuary for

beautification. A fish pond has also been constructed for breeding beautiful and rare fishes (Plates IV to IX). At the end of the project period 138 species of ferns and fern allies were maintained in the green house as live specimens (Plate X). Of the collections made from different areas of Kerala, include terrestrial forms, lithophytes, water lithophytes, epiphytes, partial epiphytes, climbers, filmy ferns, marshy pteridophytes, coastal pteridophytes, etc.. *Blechnum colensoi*, a rare fern new record for Kerala is also maintained in the sanctuary (Plate XXIV). Some of the rare pteridophytes maintained in the sanctuary are shown in Plate XI to XXVII.

Appendix I

Ferns and Fern - Allies maintained in the Green House

1. Acrostichum aureum L.
2. Actinopteris radiata (Sw.) Link
3. Adiantum aethiopicum L.
4. A. caudatum L.
5. A. hispidulum Sw.
6. A. latifolium Lamk.
7. A. lunulatum Burm.
8. A. zollingiri Mett. *ex* Kuhn
9. Anemia wightiana Gard.
10. Angiopteris evecta (Forst.) Hoff.
11. Antrophyum plantagineum (Cav.) Kaulf.
12. Arachniodes amabilis (Bl.) Tindale
13. A. aristata (Forst. f.) Tindale
14. A. tripinnata (Goldm.) Sledge
15. Araiostegia pulchra (Don) Copel.
16. Asplenium aethiopicum (Burm. f.) Becherer
17. A. auritum Sw.
18. A cheilosorum Kunze
19. A. crinicaule Hance
20. A. decrescens Kunze
21. A. erectum Bory *ex* Willd.
22. A. formosum Willd.
23. A. inaequilaterale Willd.
24. A. indicum Sledge
25. A. laciniatum Don
26. A. normale D. Don
27. A. obscurum Bl.
28. A. phyllitidis Don
29. A. polyodon Forst.
30. A. polyodon Forst. var. bipinnatum (Sledge) Sledge
31. A. serricula Fee.
32. A. tenerum Forst.

33. A. tenuifoliumD. Don
34. A. unilaterale Lam.
35. A. unilaterale var. majus (C. Chr.) Sledge
36. A. zenkaranum Kunze
37. Athyrium hohenackeranum (Kunze) Moore
38. Blechnum colensoi (Hook. f.) Wakef.
39. R.orientale L.
40. Bolbitis X prolifera (Bory) C. Chr. et Tardieu-Blot
41. B. semicordata (Baker, Ching
42. Botrychium daucifolium Wall. ex Hook. et Grev.
43. B. lanuginosum Wall. ex Hook. et Grev.
44. Ceratopteris thalictroides (L.) Brong.
45. Cheilanthes farinosa (Forsk.) Kaulf.
46. C. mysurensis Wall. ex Bedd.
47. C. tenuifolia (Burm. f.) sw.
48. Christella papilo (Hope) Holtt.
49. Crypsinus montanus Sledge
50. Ctenopteris subfalcata (B1.) Kunze
51. Cyathea gigantea (Wall. ex Hook.) Holtt.
52. C . crinita (Hook.) Copel.
53. Davallia bullata Wall. ex Hook.
54. Deparia petersonii (Kunze) M. Kato.
55. Dicranopteris linearis (Burm. f.) Underwood
56. Diplazium. brachylobum (sledge) Manickam & Irudayaraj
57. D. muricatum (Mett.) Aldrew.
58. D. polypodiodes Bl.
59. D. sylvaticum (Bory) Sw.
60. Doryopteris concolor (Langsd. et Fish.) Kuhn
61. Drymoglossum heterophyllum (L.)Trimen
62. Drynaria quercifolia (L.) J. Sm.
63. Dryopsis scabrosa I Kunze Holtt.
64. Dryopteris cochleata (Buch. Ham. ex D. Don)C. Chr.
65. D. hirtipes (B1.) Kunze
66. D. madrasensis Fraser-Jenkins
67. Egenolfia appendiculata (Willd.) J. Smith
68. E. asplenifolia (Bory) Fee
69. Elaphoglossum beddomei Sledge
70. E. nilgiricum Krajina ex Sledge
71. Equisetum ramosissimum Desf.
72. Glaphyropteridopsis erubescens (Hook. Ching
73. Grammitis attenuata Kunze
74. G. medialis (Bak.) Sledge
75. Hemionitis arifolia (Burmf.) Moore
76. Huperzia hamiltonii (Spreng.) Trev.
77. H. hilliana (Nessel) Holub.
78. H.phlegmaria Roth
79. H. phyllantha (Hook. et Arnott.) Holub.
80. H. squarrosa (Forst.) Trev.

81. Hypolepis glandulifera Brownsey et Chinnock
82. Isoetes coromandelina L. f.
83. Leptochilus decurrens Bl.
84. L. thwaitesianus Fee
85. Lepisorus amaurolepidus (Sledge)Bir &Trikha
86. L. nudus (Hook.) Ching
87. Leucostegia immersa (Wall.) Presl
88 Lindsaea odorata Roxb. ex Griff.
89. L. ensifolia Sw.
90. Loxogramme involuta (D. Don) C. Presi
91. Lycopodiella cernua (L.) Pic. Ser.
92. Lycopodium winhtianum Wall. ex Hook. et Grev.
93. Lygodium flexuosum (L.) sw.
94. L. microphyllum (Cav.) R. Br.
95. Marattia Fraxinea Sm.
96. Marsilea minuta L.
97. Microgonium bimarginatum v.d.B.
98. Microlepia speluncae (L.) Moore
99. Microsorium linguaforme (Mett.) Copel
100. M. Membranaceum (D. Don) Ching
101. M. pteropus (Bl.) Copel
102. M. punctatum (L.) Copel
103. Nephrolepis auriculata (L.) Trimen
104. N . multiflora (Roxb.) Janet
105. Nistarika bahupunctica Nayar. Madusoodan et Molly
106. Oleandra musifolia (Bl.) Presl
107. Ophioglossum reticulatum L.
108. Osmunda hugeliana Presl
109. Pellaea malabarica Nayar et Geevargh.
110. Phymatosorus lucidus (Roxb.ex Griff.) Pic. Ser.
111. P. nigrescens (B1)Pic. Ser.
112. Pityrogramma calomelanos (L.) Link var. calomelanos Link
113. Polystichum harpophyllum (Zenker ex Kunze) Sledge
114. P. subinerme (Kunze) Fraser-Jenkins
115. Pronephrium articulatum (Houlst. et Moore) Hoitt.
116. P. triphyllum (Sw) Holtt .
117. Pseudocyclosorus ochthodes (Kunze) Holtt.
118. Psilotum nudum (L.) P. Beauv.
119. Pteris argyraea T. Moore
120. P. linearis Poir.
121. P. longipes D. Don
122. P. quadriaurita Retz.
123. P. vittata L.
124. Pyrrosia lanceolata (L.) Farewell
125. Pyrrosia porosa var. porosa Hovenkamp
126. Selaginella delicatula (Desv. ex Poir.) Alston
127. S. inequalifolia (Hook. et Grev. Spring
128. S. involvens (Sw.)Spring

129. s. rapanda (Desv.) spring
130. Sphaerostephanos subtruncatus (Bory) I Holtt.
131. Stenochlaena palustris (Burm. f.) Bedd.
132. Stenogramma pozoi (Lagasca)r K. Iwats.
132. Tectaria coadunata (J. Sm.) C. chr.
134. T. paradoxa (Fee) Sledge
135. T. wightii (Clarke)Ching
136. Trichomanes obscurum B1.
137. Trignospora caudipinna (Ching) Sledge
138. Vittaria elongata Sw.

Appendix II

Ferns collected by KFRI from various forest localities in Kerala

1. Acrostichum aureum L.
2. Actinopteris mdiata (Sw.) Link
3. Adiantum aethiopicum L.
4. A. caudatum L.
5. A. hispidulum Sw.
6. A. latifolium Lamk.
7. A. lunulatum Burm.
8. A. zollingiri Mett. ex Kuhn
9. Anemia wightiana Gard.
10. Angiopteris evecta (Forst.) Hoff.
11. Antrophyum plantagineum (Cav.)Kaulf.
12. Arachniodes amabilis (Bl.) Tindale
13. A. aristata (Forst. f.)Tindale
14. Araiostegia pulchra (Don) Copel.
15. Asplenium aethiopicum (Burm., f.)Becherer
16. A.auritum Sw.
17. A cheilosorum Kunze
18. A. crinicaule Hance
19. A. decrescens Kunze
20. A. formosum Willd.
21. A. inaequilaterale Willd.
22. A. indicum Sledge
23. A. obscurum B1.
24. A. polyodon Forst.
25. A. semcula Fee.
26. A. tenerum Forst.
27. A. tenuifolium D. Don
28. A. unilaterale Lam.
29. A. unilaterale var. majus (C. Chr.) Sledge
30. A. zenkaranum Kunze
31. Athyrium hohenackeranum (Kunze)

32. A. nigripes (B1.) T. Moore
33. Blechnum colensoi (Hook. f.) Wakef.
34. B. orientale L.
35. B. semicordata (Baker)Ching
36. Botrychium daucifolium Wall. ex Hook. et Grev.
37. B. lanuginosum Wall. ex Hook. et Grev.
38. Ceratopteris thalictroides (L.) Brong.
39. Cheilanthes farinosa (Forsk.)Kaulf.
40. C. mysurensis Wall. ex Bedd.
41. C. tenuifolia (Burm. f.) Sw.
42. Crypsinus montanus Sledge
43. Ctenopteris subfalcata (B1.) Kunze
44. Cyathea gigantea (wall. ex Hook.) Holtt.
45. Davallia bullata Wall. ex Hook.
46. Dicranopteris linearis (Burm. f.) Underwood
47. Diplazium. esculentum (Retz.) Sw.
48. D.dialatulum Bl.
49. D. polypodiodes B1.
50. D. sylvaticum (Bory) Sw.
51. Doryopteris concolor (Langsd. et Fish.) Kuhn
52. Drymoglossum heterophyllum (L.) Trimen
53. Drynaria quercifolia (L.) J. Sm.
54. Dryopteris cochleata (Buch. Ham. ex D. Don) C. Chr.
55. Elaphoglossum beddomei Sledge
56. E. oilgiricum Krajina ex Sledge
57. Equisetum ramosissimum Desf.
58. Hemionitis arifolia (Burm. f.) Moore
59. Huperzia hamiltonii (Spreng.) Trev.
60. H. hilliana (Nessel) Holub.
61. H. phlegmaria Roth
62. H. phyilantha (Hook. et Arnott.) Holub.
63. H. squamosa (Forst.) Trev.
64. H. ceylanica (Spring) Trev.
65. Hypolepis glandulifera Brownsey et Chinnock
66. Isoetes coromandelina L. f.
67. Leptochilus decurrens Bl.
68. L . thwaitesianus Fee
69. Lepisorus amaurolepidus (Sledge) Bir & Trikha
70. L. nudus (Hook.) Ching
71. Lindsaea odorata Roxb. ex Griff.
72. L. ensifolia Sw.
73. Loxogramme involuta (D. Don) C. Presl
74. L. parallela Copel.
75. Lycopodiella cernua (L.) Pic. Ser.
76. Lycopodium wightianum Wall. ex Hook. et Grev.
77 Lygodium flexuosum (L.) Sw.
78. L. microphyllum (Cav.) R. Br.
79. Marsilea minuta L.

80. Microlepia strigosa (Thunb.) Presl
81. Microsorium linguaforme (Mett.) Cope1
82. M. membranaceum (D. Don) Ching
83. M. pteropus (Bl.) Copel
84. M. punctatum (L.) Copel
85. Nephrolepis auriculata (L.)Trimen
86. N. multiflora (Roxb.) Jarret
87. Odontosoria chinensis (L.) J. Sm.
88. Oleandra musifolia (Bl.) Presl
89. Osmunda hugeliana Presl
90. Pellaea falcata Bedd.
91. P. malabarica Nayar et Geevargh.
92. Phymatosorus lucidus (Roxb. ex Griff) Pic. Ser.
93. P. nigrescens (B1.)Pic. Ser.
94. Pityrogramma calomelanos (L.)Link var. calomelanos Link
95. P. calomelanos (L.) Link var. aureoflava (Hook.)Weath. ex Baily
96.. Polystichum harpophyllum (Zenker ex Kunze) Sledge
97.. P. subinerme (Kunze) Fraser-Jenkins
98. Pronephrium articulatum (Houlst. et Moore) Holtt.
99. P. triphyllum (Sw.) Holtt.
100. Prosaptia contigua (Forst. f.) Presi
101. Pseudocyclosorus tylodes (Kunze) Ching
102. Psilotum nudum (L) P. Beauv.
103. Pteridium aquilinum (L.) Kuhn
104. Pteris argyraea T. Moore
105. P.confusa T.G. Walker
106. P.kleiniana (presl ex Bedd.) Christ
107. P. longipes D.,Don
108. P. otaria Bedd.
109. P. pellucida Presl
110. P. quadriaurita Retz.
111. P.scabripes Wall. ex Ag.
112. P. vittata L.
113. Pyrrosia lanceolata (L.) Farewell
114. Pyrrosia porosa var. porosa Hovenkamp
115. Selaginella delicatula (Desv. ex Poir.) Alston
116. S. inequalifolia (Hook.et Grev.) Spring
117. S. involvens (Sw.)spring
118. Stenochlaena palustris (Burn. f.) Bedd.
119. Stenogramma pozoi (Lagasca) K. Iwats.
120. Tectaria coadunata (J. Sm.)C. Chr.
121. T. paradoxa (Fee), Sledge
122. T. wightii (Clarke) Ching
123. Trichomanes obscurum B1.
124. Trignospora ciliala (Benth.)Holtt.
125. Vittaria elongata Sw.

6. ENUMERATION OF FERNS AND FERN ALLIES OCCURRING IN THE MUNNAR FOREST DIVISION

Lycopodiaceae

Huperzia hamiltonii (Spreng) Trev., Atti. Sci. Ital. Sci. nat. 17: 248 (1875); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 192 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 27-28 Pl. 6 (1992). *Lycopodium hamiltonii* Spreng, Syst. Veg. 5: 425 (1988).

Pendulous epiphytic herbs, dichotomously branched; leaves adnate, glabrous, coriaceous; sporangia on the axis of sporophylls; sporophylls similar to the vegetative leaves.

Huperzia hilliana (Nessel) Holub., Folia Geobot. Phytotax. 20: 73 (1985); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 28, Pl. 7 (1992).

Pendulous epiphytic herbs, dichotomously branched; leaves adnate, ascending, glabrous, herbaceous; sporangia at the axis of the leaves.

Huperzia phlegmaria (L.) Rothmaler, in Feddes Repert. Sp. Nov. 54: 64 (1944); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 24-25. Pl. 3 (1992). *Lycopodium phlegmaria* L., Sp. Pl. 2: 1101 (1753).

Pendulous epiphytic herbs, isodichotomously forked; leaves sessile or subsessile, glabrous, subcoriaceous; cone terminal on the ultimate branch, forked; sporophylls opposite, decussate.

Huperzia phyllantha (Hook. et Arn.) Holub., Ollgaard, Opera Botanica 92: 166 (1987); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 25-26. Pl. 4 (1992). *Lycopodium phyllanthum* Hook. et Arn., Bot. Capt. Belg. Vog. 102 (1841).

Erect epiphytic herbs, dichotomously forked; leaves sessile, glabrous, glossy, coriaceous; cone terminal on the ultimate branches; sporophylls opposite, decussate.

Huperzia squarrosa (Forst.) Trev., Atti. Soc. Ital. Sci. nat. 17: 247 (1875); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 193 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 26-27 Pl. 5 (1992). *Lycopodium squarrosum* Forst., Prodr. Fl. Ind. Austr. 479 (1786).

Pendulous epiphytic herbs, dichotomously branched; leaves adnate, glabrous, herbaceous; sporangia on sporophylls; sporophylls smaller than the vegetative leaves.

Lycopodiella cernua (L.) Pic. Ser., Webbia 23: 166 (1968); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 31-32 Pl. 10 (1992). *Lycopodium cernum* L., Sp. Fl. 2: 1103 (1753).

Erect, terrestrial herbs, main branches forked into three or four times; leaves linear, herbaceous; cones terminal, sporophylls broadly ovate, acuminate, margin fimbriate.

Lycopodium japonicum Thunb., Fl. Japonica 341 (1784); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 197 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 30-31 Pl. 9 (1992).

Terrestrial herbs; stem prostrate, anisodichotomously branched; leaves spirally arranged, overlapping, acuminate, entire; cones borne on the ultimate branches, pedunculate; sporophylls ovate, membranaceous.

Lycopodium wightianum Wall. ex Hook. et Grev., Enum. Fil. 85 (1824); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 29-30 Pl. 8 (1992). *Diphasiastrum wightianum* (Wall ex Hook. et Grev.) Holub, Presliana 47: 108 (1975); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 195 (1988).

Terrestrial herbs; main stem prostrate; main branch bend at the base, erect; secondary and tertiary branch erect; leaves appressed, opposite, decussate, glabrous, coriaceous; cones on the ultimate branchlets, pedunculate, forked once or twice; sporophylls broadly ovate, acuminate.

Selaginellaceae

Selaginella brachystachya (Hook. & Grev.) Spring in Bull. Ac. Brux. 10 149: 232 (1843); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 41-42 Pl. 21 (1992). *Lycopodium brachystachyum* Hook. & Grev. in Hook. Bot. Misc. 3 (180): 107 (1833).

Terrestrial herbs; stem suberect to prostrate; leaves dimorphic, arranged in four rows, sparsely on main stem and dense on laterals; lateral leaves alternate, oblanceolate, entire; cones flattened; sporophylls dimorphic.

Selaginella chrisorrhizos Spring in Mem. Ac. Sci. Brux. 24: 244 (1850); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 204 (1988).

Terrestrial herbs; stem erect, branching from the base; lateral leaves ovate, subobtuse, denticulate; median leaves ovate, acute to acuminate, denticulate; larger sporophylls ovate, oblong, dentate; smaller sporophylls ovate, acuminate, ciliate.

Selaginella chrysocaylos (Hook. et Grev.) Spring in Bull. Ac. Brux. 10: 232 (1843); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 206 (1988).*Lycopodium chrysocaulon* Hook. et. Grev. in Hook. Misc. 2: 40 (1831).

Terrestrial herbs; stem erect; lateral leaves ascending, ovate, acute, denticulate, proximal side imbricated on the stem at base only; median leaves small, ovate, cuspidate; larger sporophylls ovate, lanceolate; smaller sporophylls ovate, acuminate.

Selaginella ciliaris (Retz.) Spring in Bull. Ac. Brux. 10: 231 (1843); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 204-205 (1988). *Lycopodium ciliare* Retz. Obs. 5: 32 (1789).

Terrestrial herbs; stem prostrate, branched from the base; lateral leaves ovate, dentate; median leaves ovate, acute; larger sporophylls broadly ovate, oblong; smaller sporophylls ovate, acute.

Selaginella delicatula (Desv.) Alston in J. Bot. 70: 282 (1932); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 203 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 40-41 Pl. 19 (1992).

Terrestrial herbs; stem erect or sub erect; leaves scattered on main stem; lateral leaves ovate, obtuse; median leaves ovate, aristate; cone quadrangular; sporophylls uniform, ovate, acuminate.

Selaginella inequalifolia (Hook. et Grev.) Spring in Bull. Ac. Brux. 10 (71): 145 (1843); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 204 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 37-38 Pl. 15 (1992).

Terrestrial herbs, stem scandant; leaves scattered on main stem; lateral leaves ovate-lanceolate, acute; median leaves acuminate; cones quadrangular; sporophylls uniform, ovate, acuminate.

Selaginella intermedia (Bl.) Spring in Bull. 10 (66): 144 (1983); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 203 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 39 Pl. 17 (1992).

Terrestrial herbs; stem erect or sub erect; leaves dimorphic; lateral leaves oblong-lanceolate, subacute or obtuse, ciliolate or entire; median leaves ovate, denticulate; sporophylls uniform, ovate.

Selaginella involvens (Sw.) Spring in Bull. Ac. Brux. 10 (6): 136 (1843); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 201 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 35-36 Pl. 12 (1992).

Epiphytic or lithophytic herbs; stem erect, one to three times branched; primary leaves uniform, scattered; lateral leaves ovate-lanceolate, slightly oblique; cones terminal, quadrangular; sporophylls uniform, ovate, acuminate.

Selaginella monospora Spring, Monog. Lyc. 2: 135 (1810); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 206 (1988).

Terrestrial herbs, stem semierect; branched from the base; lateral leaves ascending, dentate; median leaves small, contigous, dentate; larger sporophylls oblong, lanceolate, obtuse; smaller sporophylls ovate, acuminate.

Selaginella radicata (Hook. & Grev.) Spring in Mem. Ac. Brux. 24 (60): 114 (1850); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 36-37 Pl. 14 (1992). *Lycopodium radicatum* Hook. & Grev. in Hook. Bot. Misc. 2 (160): 397 (1831).

Terrestrial herbs; stem prostrate; primary leaves uniform, ovate, acute, entire; lateral leaves patent, ovate, sub acute, denticulate; cones quadrangular; sporophylls uniform, ovate, dentate.

Selaginella semicordata (Wall.) Spring in Mart. Fl. Braz. 1: 122 (1840); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 202 (1988).

Trailing herbs; rhizophores almost through out the stem; leaves heteromorphic, denticulate at apex; lateral leaves oblong-lanceolate; median leaves imbricate, oblong; cones tetrangular; sporophylls uniform.

Selaginella tenera (Hook & Grev.) Spring in Bull. Ac. Brux. 10 (144): 232 (1843); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 205 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 41 Pl. 20 (1992).

Terrestrial herbs; stem erect; leaves dimorphic, contiguous on main stem; lateral leaves oblong, ovate, denticulate or entire; median leaves ovate, aristate; cones dorsiventral; sporophylls dimorphic.

Selaginella wightii Hieron. in Hedw. 39 (26): 319 (1900); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 201 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 34-35 Pl. 11 (1992).

Terrestrial herbs; main stem terete, bearing branches irregularly; leaves spirally arranged, apex acuminate, margins ciliate and mebranaceous; cones quandrangular; sporophylls spirally arranged, ovate, dentate.

Equisetaceae

Equisetum ramosissimum Desf., Fl. Atlant. 2: 398 (1800); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 198 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 44-45 Pl. 24 (1992).

Terrestrial marshy herbs; rhizome long creeping, branched; aerial stem with nodes and internodes with many ridges and furrows; cones at the tip of the main stem or branches; sporangia borne on underside of sporophylls.

Psilotaceae

Psilotum nudum (L.) P. Beauv., Prod. Fam. Aetheog. 106, 112 (1805); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 190 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 45-46 Pl. 25 (1992).

Epiphytic or terrestrial herbs; rhizome creeping; stem erect with ridges and furrows, iso or aniso dichotomously branched; true leaves absent; sporangia trilocular; synangia borne at the axis of scale leaves, sessile.

Ophioglossaceae

Botrychium lanuginosum Wall. ex Hook. & Grev., Icon. Fil. 1: Pl. 79 (1831); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 208 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 53-54 Pl. 31 (1992).

Terrestrial herbs; rhizome erect; stipe pale green, terete, sparsely covered by unicellular hairs; lamina angulate, ovate, divided into three sterile bipinnatifid or tripinnatifid branches; fertile branches arising from the sterile branch, tripinnate or quadripinnate.

Ophioglossum nudicaule L.f., Suppl. Syst. Pl. 443 (1781); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 48-49 Pl. 27 (1992).

Terrestrial herbs; rhizome erect, bearing sterile and fertile leaves; blades spathulate, ovate-elliptic, base cuneate; spike linear, oblong, elliptic with sterile acuminate apex.

Angiopteridaceae

Angiopteris evecta (Forst.) Hoff., Comm. Soc. Reg. Gott. 12: 29, t. 5 (1796); Nair *et al.*, J. Econ. Tax. Bot. 12(1): 208 (1988); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 56-57 Pl. 34 (1992).

Terrestrial herbs; rhizome erect, apex densely covered by dark brown hairs; stipes abaxially rounded, adaxially flattened; lamina deltoid, bipinnate; pinnules oblong-lanceolate, acuminate, serrate; sori submarginal, ellipsoid.

Osmundaceae

Osmunda hugeliana Presl, Suppl. Tent. Pterid. 64 (1845); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 59-60 Pl. 36 (1992).

Terrestrial marshy herbs; rhizome erect or suberect; stipes tufted, glabrous, glossy, shallowly grooved above, rounded below; lamina lanceolate, bipinnate, sterile pinnae ascending, narrowly deltoid; pinnules oblong-lanceolate; margin finely serrulate; fertile pinnules cylindrical, bearing spherical sporangia all over the branches.

Schizaeaceae

Lygodium flexuosum (L.) Sw. in Schrad. J. Bot. 1800 (2): 7, 106 (1801); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 253 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 61-62 Pl. 38 (1992).

Terrestrial climbing herbs, rhizome short creeping; stipes densly hairy at the base; fronds oblong-lanceolate, tripinnate; primary pinnae alternate, oblong-lanceolate; margin regularly or irregularly serrulate in sterile pinnules; sporangia arranged adaxially along the margin of the pinnules.

Pteridaceae

Pteris argyraea T. Moore in Gard. Chron. 671 (1859); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 262 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 78-79 Pl. 54 (1992).

Terrestrial herbs; rhizome erect; stipe tufted, scaly at base, glossy above; lamina bipinnate; pinnae oblong-lanceolate, acuminate, cuneate; sori all along the margin of the pinna except at apex.

Pteris aspericaulis Wall. ex Ag., Rec. Sp. Gen. Pterid. 22 (1939); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 75-76 Pl. 51 (1992).

Terrestrial herbs; rhizome erect; stipes glabrous and glossy; lamina bipinnate; pinnae ascending, sessile, oblong-lanceolate, long, acuminate, truncate; pinnules oblong, entire with very narrow

pinkish, membraneous border; sori all along the margin leaving one fifth of the basal and distal part of the pinnule.

Pteris biaurita L., Sp. Pl. 2: 1076 (1753); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 263 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 73-74 Pl. 49 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, glabrous; lamina lanceolate, bipinnatifid; pinnae subopposite, lanceolate; sori borne all along the margin except at the base of the sinus and at the apex of the lobe.

Pteris confusa Walker in Kew Bull. 14: 329, fig 5, t. 58 (1960); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 262 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 80-81 Pl. 57 (1992).

Terrestrial herbs; rhizome erect; stipes densly scaly at base, glabrous above; lamina bipinnate; pinnae ascending, long, acuminate, truncate; pinnules linear-oblong, slightly falcate, entire; sori all along the margin except at the apex.

Pteris furunculata Nair et Ghosh in J. Indian Bot. Soc. 55: fig. 1-4. 38 (1976); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 260 (1992).

Terrestrial herbs; rhizome erect; stipe and rachis grooved on the adaxial surface, glabrous; lamina bipinnate; pinnae oblong with well marked furuncula; margin of lobes straight, apex entire, rounded, sinus with a caducous spinule; sori extending above from the base to the apex.

Pteris kleiniana Christ, Bull. Boiss. 4: 666 (1896); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 74-75 Pl. 50 (1992).

Terrestrial herbs; rhizome erect or suberect; stipes scaly at base, glabrous and glossy above, abaxially rounded and adaxially grooved; lamina broadly ovate, bipinnate; pinnae ascending, opposite; pinnules lanceolate, acute, serrate at the distal part, crenate in the rest; sori borne along the margin except at base and serrated apices.

Pteris longipes D. Don, Prod. Fl. Nepal 15 (1825); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 263 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 72-73 Pl. 47 & 48 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, rounded abaxially and grooved adaxially; lamina ovate, bipinnatifid; pinnae oblong-lanceolate, subsessile, margin serrate at the sterile part, entire at the rest; prominent spinules at the junction of the rachis and costa; sori all along the margin except at the base and apex of the lobes.

Pteris scabripes Wall. ex Ag., Rec. Pterid. 11 (1839); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 71-72 Pl. 46 (1992).

Terrestrial herbs; rhizome erect; stipes numerous, tufted, glabrous, glossy; lamina broadly obovate, simply pinnate; pinnae upto five pairs, linear-lanceolate; costa slightly raised and grooved above; sori all along the margin except at the base and apex.

Pteris quadriaurita Retz., Obs. Bot. 6: 38 (1971); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 260 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 79 Pl. 55 (1992).

Terrestrial herbs; rhizome suberect or erect; stipes glabrous, glossy above; lamina bipinnate; pinnae lanceolate, acuminate, cuneate; spinules at the junction of the costa and the rachis; sori all along the margin of the pinnule except at the apex and base.

Actinopteridaceae

Actinopteris radiata (Sw.) Link, Fil. Sp. Hort Ref. Bot. Berol. 80 (1841); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 255 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 81-82 Pl. 58 (1992).

Terrestrial or lithophytic herbs; stipes tufted; fronds fan like having several dichotomous segments, rough; sterile segments shorter than fertile; sori submarginal, linear.

Sinopteridaceae

Cheilanthes bullosa Kunze in Linnaea, 24: 274 (1851); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 88-89 Pl.64 (1992).

Lithophytic herbs; rhizome erect; stipes tufted, scaly at base; lamina ovate or oblong lanceolate, bipinnate; pinnae opposit, oblong-lanceolate; pinnules oblong; sori submarginal; indusia entire or subentire.

Cheilanthes farinosa (Forsk.) Kaulf., Enum. Fil. 212 (1824); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 267 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 87-88 Pl. 63 (1992).

Lithophytic herbs; rhizome erect; stipes tufted, sparsely scaly at base, glossy; lamina ovate-lanceolate, bipinnate; pinnae slightly ascending, opposite, ovate-oblong; pinnules alternate, oblanceolate, crenate; sori submarginal, discrete when young, continuous when mature.

Doryopteris concolor (Langsd. et Fisch.) Kuhn in V. Decken Reisen Ostafr. 3 (3): 19 (1879); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 269 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 83 Pl. 59 (1992).

Terrestrial or lithophytic herbs; rhizome erect or suberect; stipes tufted, shallowly grooved above, densely scaly at base; lamina cordiform; primary lobes pinnatifid, later lobes longer than the median lobe; sori marginal, continuous, concolorous with the lamina surface.

Pellaea boivini Hook., Sp. Fil. 2 : 147, t. 118 A (1858); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 269 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 85-86 Pl. 61 (1992).

Terrestrial or lithophytic herbs; rhizome erect or suberect; stipes tufted, black, brittle, glossy and glabrous; lamina tripinnate; primary pinnae subopposite; secondary pinnae opposite or subopposite; pinnule deltoid-ovate or cordate; sori all along the margin.

Hemionitidaceae

Hemionitis arifolia (Burm.) Moore. Ind. Fil. 114 (1859); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 266 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 93 Pl. 68 (1992).

Terrestrial herbs; rhizome erect when young, creeping when mature; stipes compact, black or dark brown, brittle, densely scaly when young, sparsely when mature; lamina dimorphic, cordiform; sori continuous along the veins filling the entire surface of the lamina.

Pityrogramma calomelanos (L.) Link. var. ***calomelanos*** Handb. Gew. 3: 20 (1833); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 254-255 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 94-95 Pl. 69 (1992).

Terrestrial or lithophytic herbs; rhizome erect; stipes tufted, scaly at very base, glabrous and glossy above, abaxially rounded, adaxially grooved; lamina lanceolate, bipinnate; pinnae progressively reduced towards the apex, ovate-lanceolate, covered by silver colour waxy powder below; pinnules ovate, acute, entire; sori along veins.

Pityrogramma calomelanos var. ***aureoflava*** (Hook.) Weath. ex Bailey, Man. Cult. P. 64 (1924); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 95 Pl. 70 (1992). *P. chrysophylla* (Sw.) Link, Handb. Erken Gew. 3: 19 (1833); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 254 (1992).

Terrestrial or lithophytic herbs. The plants differ from *P. calomelanos* var.*calomelanos* by its smaller size and presence of yellow powder under surface of the pinnae.

Adiantaceae

Adiantum aethiopicum L., Syst. nat. (ed. X) 2: 1329 (1759); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 101-102 Pl. 77 (1992).

Terrestrial herbs; rhizome creeping; stipes tufted, scaly at base, dark brown, glossy; lamina bipinnate, deltoid; pinnule suborbicular, fan-shaped, base cuneate or rounded; sori in marginal notches.

Adiantum cuneipinnulum Nair et Ghosh in Acta Bot. Indica 2: 78 (1974); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 274 (1992).

Terrestrial herbs; rhizome erect; stipes slender, polished; lamina tripinnate, thin, cuneate; sori on the margin of the each leaflets.

Adiantum hispidulum Sw., Schrad. J. 1800 (2): 82 (1801); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 275 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 99-100 Pl. 75 (1992).

Terrestrial herbs; rhizome erect or suberect; stipes compact, black, polished, triangular with flattened side below, grooved on the lateral sides, scaly at the base; lamina obovate, bipartite, pedately divided, tripinnate; rachis and petioles of pinnules densely covered by light brown appressed hairs all over; pinnae dull green, glabrous above; sori marginal on each lobe.

Adiantum incisum Forssk., Fl. Aeg. 187 (1775); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 273 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 97-98 Pl. 72 (1992).

Lithophytic herbs; rhizome erect; stipes tufted, glossy, rounded below, grooved above, sparsely covered by pale brown hairs; lamina oblong-lanceolate, simply pinnate; pinnae subopposite, glabrous above and below; adaxial side of the rachis sparsely or densely covered by hairs; sori marginal, oblong or reniform.

Adiantum latifolium Lam., Enc. 1: 43 (1783); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 275 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 103-104 Pl. 80 (1992).

Terrestrial herbs; rhizome long creeping, often branched; stipes arranged in two alternate rows, abaxially rounded, adaxially grooved, stiff, glossy, glabrous below, pubescent above; lamina broadly ovate, bipinnate; pinnae dark green, glabrous above and below; sterile pinnule finely serrulate; sori distributed all along the upper margin and unexcised part of the lower margin.

Adiantum lunulatum Burm., Fl. Ind. 235 (1768); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 272-273 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 98-99 Pl. 73 (1992).

Terrestrial herbs; rhizome erect or suberect; stipes tufted, dark brown or black, scaly at the basal part, glabrous above; lamina lanceolate, simply pinnate; pinnae fan-shaped, dimidiate, entire or subcrenate, glabrous above and below; sori continuous along the edges of the lobe.

Adiantum raddianum Presl. Tent. Pterid. 158 (1836); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 102-103 Pl. 79 (1992).

Terrestrial or lithophytic herbs; rhizome short creeping; stipe compact, terete or shallowly grooved above, scaly at base, glossy and glabrous above; lamina deltoid-ovate, tripinnate; pinnules obovate, deeply bilobed or trilobed, lobes serrulate when sterile; sori on the semiorbicular or circular notches.

Vittariaceae

Antrophyum plantagineum (Cav.) Kaulf., Enum. 197 (1824); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 277 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 107-108 Pl. 85 (1992).

Epiphytic or lithophytic herbs; rhizome creeping; fronds closely arranged, simple, falcate-elliptic, entire, acuminate, base cuneate; fertile fronds slghtly thicker than the sterile ones, dark green, glabrous above and below; sori borne along the longitudinal groove along the netted veins.

Vittaria elongata Sw., Syn. Fil. 109, 302 (1806); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 277 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 107 Pl. 84 (1992).

Epiphytic herbs; rhizome creeping; fronds simple, dark green, linear-oblong, lanceolate, apex acuminate, margin entire; sori marginal, groove extrorse when young, erect when mature.

Dennstaedtiaceae

Pteridium acquilinum (L.) Kuhn, v. Reis. 3 (3): 11 (1879); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 501 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 109-110 Pl. 86 (1992).

Terrestrial herbs; rhizome long creeping, subterranean; stipes scattered, hairy at the base, glabrous above, abaxially rounded, adaxially grooved; lamina deltoid-ovate, acute, tripinnatifid; pinnules acute or acuminate; lobes deltoid, oblique, soft, whitish, appressed hairs densely on secondary rachis and lower surface of the pinnules; sori linear, submarginal.

Histiopteris incisa (Thunb.) J. Sm., Hist. Fil. 295 (1875); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 111-112 Pl. 87 (1992).

Terrestrial herbs; rhizome long creeping, subterranean; stipes scattered, rounded below, slightly flattened above, glossy and glabrous; lamina broadly deltoid, tripinnate at base, bipinnate at apex; tertiary pinnae opposite-lanceolate, acuminate, lobed; stipule like reduced pinnule present at the axis of main rachis and primary pinnae, secondary rachis and secondary pinna; sori linear, submarginal all along the margin of the leaflets except at the apices.

Hypolepis glandulifera Brownsey et Chinnock, J. Adelaide Bot. Gard. 10 (1): 16, fig. 2.8 (1987); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 113-114 Pl. 88 (1992). *H. punctata* (Thb.) Mett. ex Kuhn, Fil. Afr. 120 (1868); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 282 (1992).

Terrestrial herbs; rhizome long creeping; stipes scattered, abaxially rounded, adaxially grooved, densely hairy at the base; lamina deltoid, abruptly narrowed towards the apex, tripinnate at base, bipinnate at apex; pinnules subopposite, oblong, margin crenate or lobed; lobes broadly deltoid or oblong, entire; sori upto four pairs per pinnule, submarginal to the lobes.

Microlepia rhomboidea Prantl, Arb. Bot. Cart. Breslau, 1: 31 (1892); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 118-119 Pl. 92 (1992).

Terrestrial herbs; rhizome long creeping, subterranean; stipes scattered, rounded below, grooved above, glabrous; lamina lanceolate, tripinnate, acuminate; pinnules obovate or trapezoid or rhomboid, apex rounded, uniserrate, acicular hairs on the primary and secondary pinnae; sori two pairs per pinnule, submarginal; indusia hairy.

Microlepia speluncae (L.) Moore, Ind. Fil. 93 (1857); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 280 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 119-120 Pl. 93, 94 (1992).

Terrestrial herbs; rhizome long creeping, branched; stipes scattered, rounded below, grooved above, hairy at base; lamina deltoid, ovate, tri or quadripinnate, pubescent above and below; primary pinnae ascending; secondary pinna slightly ascending, anadromous, lanceolate; tertiary pinna assymetrical, oblique, subacute; sori submarginal; indusia cup-shaped, hairy.

Microlepia strigosa (Thunb.) Presl, Epim. Bot. 95 (1849); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 280 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 116-117 Pl. 90 (1992).

Terrestrial herbs; rhizome erect, covered by uniseriate brown hairs; fronds oblong-lanceolate, bipinnate; pinnules rhomboidal, crenate; sori below marginal sinuses of lateral lobes; indusium half cup-shaped, hairy;

Lindsaeaceae

Odontosoria chinensis (L.) J. Smith, Bot. Voy. Herald, 430 (1857); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 121-124 Pl. 95 (1992). *Sphenomeris chinensis* (L.) Maxon in J. Wash. Acad. Sci. 3: 144 (1913); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 502 (1992).

Terrestrial herbs; rhizome short creeping; stipes scattered, densely scaly at very base; lamina lanceolate, acuminate, tri or quadripinnate; primary and secondary pinna ascending; tertiary pinnae anadromous, obliquely obovate or obconical, deeply dissected into two to four lobes; sori submarginal at the vein end of each lobe.

Lindsaea odorata Roxb. ex Griff., Calc. J. nat. Hist. 14: 511 (1846); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 505 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 125 Pl. 97 (1992).

Terrestrial or lithophytic herbs; rhizome creeping; stipes scattered, glossy, glabrous, rounded below, grooved above; lamina linear-lanceolate, simply pinnate; pinnae dimidiate, narrowly triangular, acute, lower margin entire, upper margin shallowly lobed; sori along the margin of the each lobe.

Lindsaea ensifolia Sw. in Schrad. J. Bot. 1800 (2): 77 (1801); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 503-504 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 125-127 Pl. 98 (1992).

Terrestrial herbs; rhizome short creeping; stipes dark; fronds simple when young, later simply pinnate; pinnae upto eleven pairs below a terminal lanceolate or pinnatifid pinna; veins copiously anastomosing; sori in continuous marginal line.

Davalliaceae

Araiostegia pulchra (Don) Copel., Philipp. J. Sci. 31: 241 (1927); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 524-525 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 135-136 Pl. 104 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, branched, scales ovate; stipes abaxially rounded, adaxially grooved, scaly at very base, glabrous above; lamina lanceolate, deltoid, three to four pinnatifid, indusia semicircular.

Davallia bullata Wall. ex Hook., Sp. Fil. 1: 169, f. 50 B. (1864); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 132-134 Pl. 103 (1992). *D. trichomanoides* Bl. Enum. Pl. Jav. 283 (1828); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 525 (1992).

Epiphytic herbs; rhizome creeping, branched, scale acuminate with peltate base; stipes abaxially rounded, adaxially flattened, glabrous; lamina triangular, three to four pinnatifid; indusia elongate or oblong.

Leucostegia immersa (Wall.) Presl, Tent. Pterid. 95. t. 4, fig. 11 (1936); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 524 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 131-132 Pl. 102 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, covered by scales and hairs. scales lanceolate: stipes glabrous, abaxially rounded, adaxially grooved; lamina two to three pinnatifid; pinnules deeply lobed into two to three unequal segments; sori submarginal, indusia orbicular.

Oleandraceae

Nephrolepis auriculata (L.) Trimen, J. Linn. Soc. London Bot. 24: 152 (1887); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 140-141 Pl. 108 (1992).

Epiphytic or lithophytic herbs; rhizome erect, scales lanceolate, pale brown, acuminate, margin fimbriate; roots bearing spherical tubers; lamina lanceolate; pinnae sessile, alternate, apex subacute or rounded; sori submarginal in two rows.

Nephrolepis multiflora (Roxb.) Jarret in Morton, Contrib. Us. nat. Herb. 38: 309 (1974); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 142 Pl. 109 (1992).

Terrestrial herbs; rhizome erect of suberect; stipes tufted, abaxially rounded, adaxially grooved, densely scaly at base, sparsely scaly above; lamina oblong-lanceloate, simply pinnate; pinnae sessile, oblong-lanceolate, acute or acuminate, serrate; sori submarginal at the vein end.

Oleandra musifolia (Bl.) Presl, Epim. Bot. 42 (1849); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 521 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 139-140 Pl. 107 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, densely covered by golden coloured scales all over; scales with dark spot at the subbasal region; fronds simple; stipes articulate; lamina oblong-lanceolate; sori in two rows along the midrib.

Hymenophyllaceae

Hymenophyllum denticulatum Sw., Schrad J. Bot. 1800 (2): 100 (1801); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 144-145 Pl. 110 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, covered by pale brown hairs; lamina ovate, bipinnate, acute, cuneate; rachis winged; fronds glabrous, denticulate; sori at the tip of the basal acroscopic segment; involucre two lipped, apex rounded, margin toothed.

Hymenophyllum gardneri v.d.B., Ned. Kruid. Arch. 4: 417 (1859); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 145-146 Pl. 111 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, sparsely covered by pale brown slender septate hairs; lamina ovate or oblong, bipinnate, apex sub-acute or rounded, margin entire; vein hairy; sori at the end of the vein; involucre bilabiate, apex rounded, margin entire.

Microgonium bimarginatum v.d.B., Hymen. Jav. 7 (1861); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 453 (1994).

Epiphytic herbs; rhizome long creeping, filiform, densely covered by brownish hairs; lamina ovate or oval or oblong, rounded to obtuse at apex, margin more or less crisped; lateral veins few to many; false veinlets many; sori one to many on the apical part of the frond; involucre tubular with dilated mouth.

Trichomanes obscurum Blume. Enum. Pl. Jav. 227 (1828); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 148-149 Pl. 113 (1992). *Selenodesmium obscurum* (Blume) Copel. Phil. J. Sci. 67: 81 (1938); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 450 (1994).

Terrestrial or lithophytic herbs; rhizome suberect; stipe clustered, brittle, densely hairy at very base, sparsely hairy above; lamina ovate, acuminate, cuneate, tripinnate; secondary pinnae lanceolate, acuminate; tertiary pinnae lobed upto the center; rachis and costa and veins bear dark brown hairs below; sori on the axis of the basal acroscopic lobes.

Trichomanes plicatum (v.d.B.) Beddome, Ferns Br. India, t. 285 (1868); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 152-154 Pl. 117 (1992).

Epiphytic or lithophytic herbs; rhizome creeping; lamina oblong or ovate, tripinnatifid; veins distinct above and below, reaching the margin, free, numerous false veins scattered on either side of the true veins; sori terminal on each lobe; involucre bluntly triangular; receptacle extruded.

Trichomanes proliferum Blume, Enum. Pl. Jav. 224 (1828); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 150-151 Pl. 115 (1992). *Gonocormus prolifera* (Bl.) Prantl, Hymen. Jav. 11. t. 6 (1861); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 451 (1994).

Epiphytic or lithophytic herbs; rhizome creeping, slender, sparsely covered with dark hairs; stipes upto 1-3 cm long, wingless; lamina ovate, oblong, usually pinnate to decompound; veins slightly distinct above and below, false veins absent; sori terminal on the apices of the segments; involucre tubular, mouth truncate, receptacle extruded.

Gleicheniaceae

Dicranopteris linearis (Burm. f) Underwood **var.** ***sebastiana*** Panigrahi & Dixit in Bull. Bot. Surv. India, 13: 163 (1971); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 157-158 Pl. 120 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 454 (1994).

Terrestrial herbs; rhizome creeping; stipes scattered, hairy at base, glabrous above; lamina forked three or four times; stipules clasping the rachis, pinnatifid; sori submedian on the acroscopic veinlet.

Cyatheaceae

Cyathea crinita (Hook.) Copel. in Philipp. J. Sci. Ser. C: 440 (1909); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 279 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 163-164 Pl. 127 (1992).

Terrestrial trunk bearing tree like; closely set leaf base; scales densely covering the apex of the trunk; stipes rounded abaxially, shallowly grooved adaxially, swollen at base, brown, glossy spines on abaxial and lateral side of the stipes and rachis; lamina bipinnate, oblong-lanceolate; pinnae and pinnules oblong-lanceolate, acuminate; scales on abaxial and adaxial side of the costa and costule; sori on the forks of four veins.

Cyathea gigantea (Wall. ex Hook.) Holttum in Gard. Bull. Str. Settl. 8: 318 (1935); Nair *et al.*, J. Econ. Tax. Bot. 16(2): 278 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 162-163 Pl. 126 (1992).

Terrestrial, trunk bearing tree like; scales densely covering the younger fronds; stipes swollen at the base, bearing appressed hairs throughout; lamina bipinnate, oblong-lanceolate; pinnae oblong-lanceolate, acuminate; pinnules acuminate; hairs densely on upper surface of the costa and costule; sori at the vein forks of the pinnule.

Thelypteridaceae

Stegnogramma pozoi (Lagasca) K. Iwats. in Acta Phytotax Geobot., 19 : 124 (1963); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 539 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 173-174 Pl. 132 (1992).

Terrestrial herbs; rhizome short creeping; stipes abaxially rounded, adaxially grooved, scaly at base; lamina elliptic-lanceolate, subacute; pinnae acuminate, pinnae lobes slightly oblique, apex obtuse or rounded, covered by acicular or capitate unicellular hairs; sori linear.

Pseudocyclosorus tylodes (Kunze) Ching in Acta Phytotax. Sin 324 (1963); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 546 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 175-176 Pl. 133 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, scaly at base, abaxially rounded, adaxially grooved; lamina oblong-lanceolate; pinnae ascending, linear, oblong-lanceloate, acuminate, margin lobed; lobes oblong, falcate, acute, entire; hairs on the adaxial side of the costa and rachis; sori infra median on all veins.

Pseudocyclosorus ochthodes (Kunze) Holttum in Nayar & Kaur Comp. Beddome. Handb. 204 (1974); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 545 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 176-177 Pl. 134 (1992).

Terrestrial herbs; rhizome short creeping or suberect; stipes sparsely scaly at base, rounded below, grooved above; lamina ovate or lanceolate, acuminate; pinnae sessile, basal pinnae abruptly reduced; linear lanceolate, acuminate; lobes oblong, slightly ascending and oblique, acute or rounded, entire; hairs densely distributed all over the rachis; sori supramedian on each vein.

Trignospora caudipinna (Ching) Sledge, Bull. Br. Mus. nat. Hist. Bot. 8 (1): 15, fig. 2 A (1981); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 182-183 Pl. 138 (1992).

Aquatic or lithophytic herbs; rhizome erect; stipes tufted, scaly at very base, densely scaly all over; lamina ovate-lanceolate; pinnae slightly ascending, oblong-lanceolate, acuminate, margin lobed almost to the costa; lobes oblong, acute, overlapping the rachis; costa slightly raised and grooved above; hairs all over the rachis and on adaxial and abaxial side of the costa; sori upto six pairs in parallel rows, median on the veins.

Trignospora ciliata (Wall. ex Benth.) Holttum in Blumea 19: 29 (1971); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 183-184 Pl. 139 (1992).

Aquatic or lithophytic herbs; rhizome erect; stipes sparsely covered by hairs at the basal part, densely above; lamina simple pinnate, ovate with caudate apex; pinnae oblong-ovate, acute or acuminate; margin lobed two-third way to the costa; lobes oblong, falcate, subacute; costa slightly raised above and below; sori upto four pairs, median on the veins.

Cyclosorus interruptus (Willd.) H. Ito. in Bot. Mag. Tokyo, 51: 714, fig. 9 (1937); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 537 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 187-188 Pl. 142 (1992).

Terrestrial marshy herbs; rhizome creeping; stipes scaly at base, flattened below, grooved above; lamina elliptic-lanceolate, simply pinnate; pinnae oblong-linear-lanceolate, cuneate, acuminate, margins lobed one third to half way to the costa; lobes deltoid, apex rounded; costa slightly raised above and below, flattened below, grooved above; sori median on the veins, upto eight pairs in two rows arranged in 'V' -shape.

Amphineuron terminans (Hook.) Holttum in Am. Fern. J. 63: 82 (1973); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 538 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 189-190 Pl. 143 (1992).

Terrestrial herbs; rhizome wide, creeping; stipes densely scaly at base, glabrous above; lamina broadly ovate, simply pinnate; pinnae linear lanceolate, long, acuminate, attenuate, margin lobed one third to half way to the costa; lobes oblong with subacute or rounded apex; costa indistinctly raised and rounded below; sori upto ten pairs, supramedian, on the margin of the lobe.

Sphaerostephanos unitus (L.) Holttum, J. S. Afr. Bot. 40 (2): 165 (1974); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 547 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 191-192 Pl. 144 (1992).

Terrestrial herbs; rhizome wide, creeping; stipes grooved above and below, scaly at very base, soft hairs along the groove above; lamina lanceolate, ascending; basal pinnae reduced to tubercles; rachis grooved above, rounded below; pale brown hairs densely on the rachis and on lower surface of pinnae and upper suface of the costa; sori submarginal mostly on all veins.

Sphaerostephanos subtruncatus (Bory) Holttum in Kew Bull. 26: 80 (1971); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 193-194 Pl. 146 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, grooved deeply above, shallowly on the lateral sides, flattened below, hairs sparsely distributed along the groove above; lamina oblong-

lanceolate, simply pinnate; rachis densely covered by long auricular hairs all over; pinnae ovate-lanceolate, lobed or half way to the costa; lobes oblong, falcate, subacute or rounded; sori median on veins, upto ten pairs.

Christella parasitica (L.) H. Lev., Fl. Kouy-Tcheou, 475 (1915); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 542 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 195-197 Pl. 147 (1992).

Terrestrial herbs; rhizome long creeping; stipes scaly at base; lamina deltoid, broadly ovate or cordate; rachis linear-lanceolate, acuminate, cuneate, margin lobed one third to two third to the costa; lobes oblique; costa densely covered by long and short hairs above and below; sori median or submarginal on the veins, upto five pairs.

Christella dentata (Forssk.) Brownsey & Jermy in Br. Fern Gaz., 10: 338 (1973); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 543 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 198-199 Pl. 149 (1992).

Terrestrial herbs; rhizome short creeping; stipe scaly at the base; lamina oblong-lanceolate; pinnae acuminate, cuneate, margin lobed about half way to the costa; lobes free; acicular hairs densely distributed all over the rachis and upper surface of costa; sori median on veins, upto six pairs.

Christella papilio (Hope) Holttum in Nayar & Kaur Comp. Beddome, Handb., 208 (1974); Kew Bull. 31 (2): 32 (1976); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 544 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 200-201 Pl. 151 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, scaly at base; lamina lanceolate; pinnule linear-lanceolate, acuminate, cuneate, margin lobed less than half way to the costa; abaxial side of the rachis and costa densely hairy, sparsely on the costules above; sori median in two to six pairs of basal veins.

Christella meeboldii (Rosenst.) Holtt. in Nayar & Kaur, Comp. Beddome, Handb. 208 (1974); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 197-198 Pl. 148 (1992).

Terrestrial herbs; rhizome short creeping; stipes glabrous; lamina lanceolate; pinnae oblong-lanceolate, acuminate, cuneate, lobed half way, long acicular hairs distributed densely on rachis, sparsely on costa; sori median on veins.

Pneumatopteris truncata (Poir.) Holttum, Blumea 21 (2): 314 (1973); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 547 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 202-203 Pl. 152 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, scaly at base; lamina narrowly triangular, simply pinnate; pinnae linear-lanceolate, truncate or cuneate, margin lobed half way to the costa; lobes oblong; costa conspicuously raised above and below; long acicular hairs sparsely distributed on rachis and upper surface of costa; sori median on the veins, upto six pairs arranged in two parallel rows.

Macrothelypteris torresiana (Gaudich.) Ching in Acta. Phytotax.Sin. 8: 310 (1963); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 536 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 172-173 Pl. 131 (1992).

Terrestrial herbs; rhizome short creeping; stipes glaucous, swollen and fleshy at base, covered with narrow dark brown scales, glabrescent; lamina ovate, bipinnate to pinnatifid; pinnules cut almost to midrib into oblique dentate to deeply lobed segments; sori small; indusia very small bearing a few capitate hairs.

Aspleniaceae

Asplenium aethiopicum (Burm. f.) Becherer in Candollea, 6: 23, fig. 1 (1935); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 529 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 228-229 Pl. 176 (1992).

Epiphytic herbs; rhizome erect or suberect, densely clothed by scales all over; scales linear-lanceolate, margin slightly toothed; stipes tufted, dark brown, abaxially rounded, deeply grooved above, densely clothed by scales all over; lamina ovate-lanceolate, bipinnate; pinnae and rachis covered by long , slender, soft scales; sori formed only in acroscopic veins.

Asplenium auritum Sw., Schrad, Journ. Bot. 1800 (2): 52 (1801); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 528 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 227 Pl. 174 (1992).

Epiphytic or lithophytic herbs; rhizome suberect, densely scaly; scales lanceolate; stipes glabrous; lamina ovate to ovate-lanceolate, bipinnate; pinnae lanceolate, apex acute or acuminate, pinnules ovate or oblong, margin crenate; sori in two oblique rows, linear along the veins.

Asplenium crinicaule Hance in Annal. Sci. nat. Ser. V. 5: 259 (1866); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 533 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 216-217 Pl. 164 (1992).

Epiphytic or lithophytic herbs; rhizome erect, densely clothed by scales all over, scales lanceolate, apex gland tipped, margin entire with a few filamentous hairs; stipes abaxially rounded, adaxially grooved, densely covered by hair like scales; lamina oblong-lanceolate, unipinnate; pinnae ovate-lanceolate, margin deeply incised; sori linear, in two oblique rows along acroscopic veinlets.

Asplenium decrescens Kunze in Linnaea 24 (1881); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 531 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 210 Pl. 157 (1992).

Epiphytic or lithophytic herbs; rhizome long creeping, densely covered by scales; scales ovate-lanceolate, clathrate, margin slightly toothed, apex long, acuminate; stipes dark brown, abaxially rounded, adaxially grooved, glabrous; lamina unipinnate, oblong-lanceolate; pinnae falcate, lanceolate, acuminate at apex, margin irregularly lobed, apices serrate; sori on the branch of the vein nearest to the costa.

Asplenium ensiforme Wall. ex Hook. & Grev., Ic. Fil. t. 71 (1829); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 528 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 207-208 Pl. 154 (1992).

Epiphytic herbs; rhizome suberect, short clothed with ovate-lanceolate scales; scales acuminate and entire; lamina simple; lanceolate or linear-lanceolate; stipe reduced, apex acuminate, margin entire or slightly wavy; sori arranged in two rows on either side of the midrib, sori produced from the extreme tip of the lamina.

Asplenium formosum Willd. in L., Sp. Pl. ED. 4. 5: 329 (1810); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 530 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 208-209 Pl. 155 (1992).

Epiphytic or lithophytic herbs; rhizome erect, densely scaly at apex; scales oblong-lanceolate, acute, entire; stipes tufted, glabrous and glossy; lamina oblong-lanceolate, unipinnate; pinnae sessile, apex acute, upper margin deeply incised, apex rounded, lower margin unexcised, basal pinnae progressively reduced; sori two or three along the veinlet on the lower unexcised part.

Asplenium indicum Sledge in Bull. Br. Mus. nat. Hist. Bot. 3: 264 (1965); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 215-216 Pl. 163 (1992).

Epiphytic or lithophytic herbs; rhizome erect, densely covered by ovate-lanceolate scales; scales dark brown, tip acute, entire; stipes tufted, rounded below, grooved above, sparsely covered by scales all over; lamina linear-lanceolate, unipinnate, dimidiate, ovate, base truncate, apex obtuse, margin irregularly lobed, basal pinnae reduced; sori spreading along the veins from near the costa.

Asplenium laciniatum Don, Prodr. Fl. Nepal 8 (1825); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 224-225 Pl. 172 (1992).

Epiphytic or lithophytic herbs; rhizome erect, scaly; scales ovate-lanceolate, apex long, acuminate, margin slightly toothed; stipes tufted, scaly near base, glabrous above; lamina ovate-lanceolate, bipinnate; pinnules obovate, toothed above; sori long, three to four per pinnule.

Asplenium phyllitidis Don, Prodr. Fl. Nepal 7 (1825); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 527 (1992).

Epiphytic herbs; rhizome erect, densely scaly all over; lamina simple, acuminate, entire, wavy, midrib prominent below, almost flattened above; veins forked showing intramarginal fusion; sori elongated, linear, arranged in close oblique rows in either sides of the costa, usually distributed only on the upper side of the costa.

Asplenium polyodon G. Forster, Prod. 80 (1786); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 218-219 Pl. 166 (1992).

Epiphytic or lithophytic herbs; rhizome erect, densely scaly; scales lanceolate, long, acuminate, entire; stipes tufted, rounded below, grooved above, scaly near base, glabrous

above; lamina ovate-lanceolate, simply pinnate, apex of the lamina ends in bilobbed or trilobbed pinna; lower base of the pinnae slightly excised, upper base cuneate, acuminate; sori linear, median or submedian along the vein, parallel.

Asplenium polydon G. Forster **var. *bipinnatum*** (Sledge) Sledge, Bot. J. Linn. Soc. 34: 6 (1982); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 219-220 Pl. 167 (1992).

Epiphytic or lithophytic herbs; rhizome suberect, densely scales all over; stipes tufted, rounded below, grooved above, scaly near the base, glabrous above; lamina oblong-lanceolate, acuminate, crenate, one third to half distal part of the primary pinna shallowly lobed without bearing distinct pinnules; sori numerous, all along the veins except the extreme apex.

Asplenium serricula Fee, Mem. Fam. Fough. 5: 196 (1952); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 532 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 221-222 Pl. 169 (1992).

Epiphytic or lithophytic herbs; rhizome suberect, scaly at apex; scales lanceolate, apex acuminate, margin fimbriate; stipes tufted, glabrous; lamina ovate, unipinnate, ending in a terminal pinnae; pinnae lanceolate, apex acuminate, margin serrate; sori many on each pinna, arising just above the costa.

Asplenium tenerum Forst. f. Florul. Ins. Austr. Prodr. 80 (1786); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 222-223 Pl. 170 (1992).

Lithophytic herbs; rhizome erect; stipes tufted, rounded abaxilally, shallowly grooved adaxially; lamina elliptic, oblong-lanceolate, simply pinnate; pinnae lanceolate, falcate, acute, cuneate, lobed; sori linear along the veins.

Asplenium tenuifolium Don, Prodr. Fl. Nepal 8 (1825); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 529 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 223-224 Pl. 171 (1992).

Epiphytic or lithophytic herbs; rhizome erect, scaly at apex; scales ovate-lanceolate, margin entire; stipes tufted, scaly at base, glabrous above; lamina ovate, tripinnate, primary pinnae ovate; pinnule obovate, bilobbed or trilobbed, apex of the lobes rounded or subacute; sori one or two per pinnule.

Asplenium unilaterale Lam. in Encycl. Mett. Bot. 2: 305 (1786); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 531 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 212-213 Pl. 160 (1992).

Terrestrial herbs; rhizome long creeping, scaly; stipes scattered, glossy, glabrous, rounded abaxially, grooved above; lamina oblong-lanceolate, simply pinnate; pinnae shortly reduced, trapezoid, dimidiate, apex obtuse or rounded, two third part of the basiscopic base of the pinnae excised; sori two or three pairs confined to distal part of the pinnae.

Asplenium unilaterale var. ***majus*** (C. Chr.) Sledge, Bull. Br. Mus. nat. Hist. Bot. 3 (6): 246 (1965); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 531 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 213-214 Pl. 161 (1992).

Terrestrial herbs; rhizome long creeping, scaly; stipes scattered, glossy and glabrous, rounded below; grooved above; lamina simply pinnate, oblong-lanceolate; pinnaee oblanceolate, falcate, acuminate, one seventh to two seventh of the basal basiscopic part excised, upper margin and unexcised part of the lower margin coarsely serrate; sori linear, median or submedian along the veins.

Asplenium zenkaranum Kunze in Linnaea 24: 259 (1851); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 532 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 214-215 Pl. 162 (1992).

Terrestrial herbs; rhizome short creeping or prostrate, scaly; stipes crowded, rounded below, grooved above, scaly; lamina oblong-lanceolate, truncate, acuminate, simply pinnate, imparipinnate; pinnae oblong-lanceolate or lanceolate, acuminate, serrate towards distal part; sori along basal part of the acroscopic veinlet forming two oblique rows along the costa.

Athyriaceae

Athyrium hohenackeranum (Kunze) T. Moore, Ind. Fil. 49 (1857); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 510 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 233-234 Pl. 179 (1992).

Terrestrial or lithophytic herbs; rhizome erect; stipes tufted, densely scaly below, sparsely above; lamina elliptic or lanceolate, simply pinnate; pinnae oblong, acute or subacute, truncate, irregularly dentate-serrate or lobed, shallowly upto the costa; lobes ascending, oblong or deltoid, serrate; sori median or submedian on the veins.

Athyrium lanceum (Kunze) T. Moore, Ind. Fil. 185 (1860); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 238 Pl. 184 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, scaly at base, glabrous above, abaxially rounded, adaxially grooved; lamina ovate to lanceolate, bipinnate; pinnae oblong or narrowly ovate, acute, cuneate; pinnules rhomboid, inciso-crenate or serrate; sori submedian in the veins.

Athyrium nigripes (Bl.) T. Moore, Ind. Fil. 49, 98 (1858); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 235-236 Pl. 181 (1992).

Terrestrial herbs; rhizome erect; stipes sparsely scaly at very base; lamina lanceolate, bipinnate; pinnae lanceolate; pinnules oblong, dentate, shallowly lobed; sori seated on acroscopic basal part of all the veins.

Diplazium cognatum (Hieron.) Sledge, Bull. Br. Mus. nat. Hist. Bot. 2 (2): 308 (1962); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 246-247 Pl. 191 (1992).

Terrestrial herbs; rhizome short creeping or suberect; stipes compact, abaxially rounded, adaxially grooved, sparsely scaly below; lamina broadly ovate to deltoid, acute, cuneate, tripinnate; pinnae oblong-lanceolate, acuminate; lobes oblong, slightly falcate, serrate or shallowly lobed; sori linear along the veins.

Diplazium dilatatum Bl. Enum. Pl. 30, fig. 15 (1828); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 507 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 248-249 Pl. 193 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, sparsely scaly at base, glabrous above, abaxially rounded, adaxially grooved; lamina ovate, bipinnate or tripinnate; primary pinnae ovate-lanceolate; secondary pinnae oblong-lanceolate, acuminate; lobed one third to three fifth way to costa; lobes oblong, entire; sori median or submedian along all the veins except the few pairs in the distal part of the lobe.

Diplazium esculentum (Retz.) Sw. in Schrad. J. Bot. 1801 (1): 312 (1803); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 506 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 241-243 Pl. 187 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, sparsely scaly at base, glabrous above, purplish band on stipes and rachis; lamina deltoid, acuminate, truncate, bipinnate; pinnae narrowly deltoid, acuminate, truncate; pinnule oblong-lanceolate, acuminate, truncate, serrate at the apex, lobed or crenate in the rest; lobes broadly deltoid, oblique, serrate; sori linear, all along the veins except the base and apex.

Diplazium polypodioides Bl. Enum. Pl. Jav. 2: 194 (1828); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 508 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 250-252 Pl. 195 (1992).

Terrestrial herbs; rhizome erect, subarborescent; stipes tufted, sparsely scaly at base; lamina broadly lanceolate, bipinnate; pinnae oblong-lanceolate, acuminate, truncate, serrate, lobed; lobes oblong, serrate; sori straight, on all the veins except from the distal pairs.

Diplazium sylvaticum (Bory) Sw., Synops. Fil. 92 Fl. 30, Fig. 14 (1806); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 507 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 243-244 Pl. 188,189 (1992).

Terrestrial herbs; rhizome erect or ascending; fronds scaly, scale dark, margin toothed; stipes upto 40 cm; lamina simply pinnate; pinnae twelve to twenty pairs, margin subentire or dentate, serrate.

Diplazium travancoricum Beddome, Handb. Ferns Br. India 188 (1883); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 508 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 249-250 Pl. 194 (1992).

Terrestrial herbs; rhizome erect; stipes scaly at base, glabrous above; lamina ovate-lanceolate, bipinnate; pinnae ascending, lanceolate, acuminate and serrate, the distal half to two third part of the pinna shallowly lobed and narrowed towards the apex; pinnules lanceolate or oblong-lanceolate, entire or crenate or serrate; sori from the costa and not reaching the margin.

Dryoathyrium boryanum (Willd.) Ching in Bull. Fan. Mem. Inst. Biol. Bot. 11: 81 (1941); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 516 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 230-231 Pl. 177 (1992).

Terrestrial herbs; rhizome suberect or prostrate; stipes abaxially rounded, adaxially grooved, densely scaly at base, glabrous above; lamina broadly deltoid, tripinnate; pinnae oblong-lanceolate, acuminate, truncate; pinnules decussent, oblong, entire or crenate or shallowly lobed; sori at the vein forke, rounded.

Dryopteridaceae

Arachniodes aristata (Forst. f.) Tindale in Contr. N.S. Nales Nation. Herb. 3: 89 (1961); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 511 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 274-275 Pl. 211 (1992).

Terrestrial herbs; rhizome creeping, covered with long, brown scales; rachis and pinnae sparsely scaly; lamina tripinnate to quadripinnate below; pinnule apex aristate, margin spinulose, serrate or lobed or divided to the costa, lower surface with scattered fibrils on the veins, upper surface glabrous; sori in a single row on either side, closer to costa than to margin; indusium orbicular.

Arachniodes tripinnata (Goldm.) Sledge, Bull. Br. Mus. nat. Hist. (Bot.) 5: 41 (1973); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 273-274 Pl. 210 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, glossy; lamina broadly ovate, tripinnate; primary pinna ascending, slightly falcate; secondary pinnae slightly falcate, tertiary pinnae oblong or ovate-lanceolate; pinnules parellelogram like, apex rounded with a spinule, serrate or shallowly lobed; sori on the acroscopic basal veins which does not reach the margin.

Dryopsis scabrosa (Kunze) Holttum & Edwards, Kew Bull. 41 (1): 199 (1986); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 261-263 Pl. 201 (1992).

Terrestrial herbs; rhizome subererct; stipes tufted, abaxially flat, adaxially grooved, densely scaly at base; lamina broadly deltoid, tripinnate; primary and secondary pinnae oblong-lanceolate, acuminate; pinnules oblong, entire or crenate; hairs on upper side of rachis, rachules and costa; sori median on the basal acroscopic veins of each lobe.

Dryopteris approximata Sledge, Bull. Br. Mus. nat. Hist. Bot. 5 (1): 11 (1973); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 282-283 Pl. 217 (1992).

Terrestrial herbs; rhizome suberect; lamina ovate, acute, cuneate, bi or tripinnate; primary pinnae oblong-lanceolate, acuminate; secondary pinnae oblong-lanceolate, acuminate; pinnules oblong, subacute or rounded, crenate; sori median or submedian on the veinlets.

Dryopteris cochleata (Buch. Ham. ex D. Don) C. Chr., Ind. Fil. 258 (1905); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 513 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 279-281 Pl. 215 (1992).

Terrestrial herbs; rhizome short creeping; stipes scaly below, glabrous and glossy above; lamina lanceolate, bipinnate; pinnae ascending, oblong-lanceolate, acute, truncate; fertile pinnule isodromous, oblong, lobed; lobes oblong, serrulate; sori one per lobe.

Dryopteris hirtipes (Bl.) Kuntze, Rev. Gen. Pl. 2: 813 (1891); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 512 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 277-278 Pl. 213 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, densely scaly at base, sparsely above; lamina oblong-lanceolate, simply pinnate; pinnae oblong-lanceolate, distal half progressively narrowed towards the apex; acuminate, margin lobed; lobes oblong or deltoid, subacute or rounded, entire or crenulate; sori median on the veins.

Dryopteris sparsa (Buch. Ham. ex D. Don) Kuntze, Rev. Gen. Pl. 2: 813 (1891); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 513 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 281-282 Pl. 216 (1992).

Terrestrial herbs; rhizome erect; lamina ovate-lanceolate, bipinnate, acuminate, cuneate; primary pinnae ascending, falcate, ovate-lanceolate; secondary pinnae ovate-lanceolate, lobed; lobes oblong, acute or rounded, entire or toothed; sori median on the veinlets.

Polystichum harpophyllum (Zenker ex Kunze) Sledge, Bot. J. Linn. Soc. 84: 7 (1982); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 512 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 265-266 Pl. 203 (1992).

Terrestrial herbs; rhizome erect or suberect; stipes tufted, abaxially rounded, adaxially grooved; lamina simply pinnate, oblong-lanceolate; pinnae oblong-lanceolate, falcate, acuminate, serrate; sori at the end of eeach acroscopic basal veinlet, submedian to the margin and costa of the pinna.

Polystichum moluccense (Bl.) T. Moore, Ind. Fil. 88 (1858); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 268-269 Pl. 206 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, abaxially rounded, adaxially grooved, densely clothed by brown scales at the very base and large scales on the subbasal part; lamina ovate-lanceolate, bipinnate; pinnae oblong-lanceolate; pinnules ascending, ovate-lanceolate, acuminate, serrate, lobed; lobes oblong, elliptic; sori upto four pairs per lobe, terminal on the veinlets.

Tectaria coadunata (J. Sm.) C. Chr. in Contr. U.S. nat. Herb. 26: 331 (1931); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 515 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 260-261 Pl. 200 (1992).

Terrestrial herbs; rhizome short creeping; stipes scattered, rounded abaxially, grooved adaxially; lamina ovate, bipinnate; primary pinnae ascending, obliquely ovate, acuminate; secondary pinnae oblong-lnceolate, acute, crenate in the distal pairs, lobed in the basal pairs; lobes ascending, oblong, subacute, entire; sori on the end of secondary pinna.

Tectaria paradoxa (Fee) Sledge in Kew Bull. 27 (3): 413 (1972); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 515 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 256-258 Pl. 198 (1992).

Terrestrial herbs; rhizome erect; stipes tufted; lamina lanceolate, bipinnate at base, simply pinnate above; pinnae ascending, oblong-lanceolate, acuminate, cuneate, lobed; lobes oblong, falcate, acute, margin cuneate; sori submarginal on the veins.

Tectaria wightii (Clarke) Ching, Sin. 2: 28 (1931); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 514 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 258-259 Pl. 199 (1992).

Terrestrial herbs; rhizome short creeping; stipe clustered, densely scaly at base; lamina ovate, simply pinnate; pinnae ascending, lanceolate, entire; fertile pinnae contracted; sori borne on the netted veins in two rows along each costule.

Lomariopsidaceae

Bolbitis X prolifera (Bory) C. Chr. & Tardieu-Blot in Tardieu-Blot & C. Chr., Not. Syst. 7: 102 (1938); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 295-296 Pl. 226 (1992).

Lithophytic herbs; rhizome short creeping; stipes densely scaly at base, rachis narrowly winged and scaly throughout; sterile lamina ovate, simply pinnate; pinnae lanceolate or elliptic, acuminate, lobed or serrate; fertile fronds longer, oblong-lanceolate; pinnae wavy or shallowly lobed; sori acrostichoid.

Bolbitis semicordata (Baker) Ching in C. Chr., nat. Bot. Gard. Ind. Fil. Suppl. 3: 50 (1934); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 518 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 296-297 Pl. 227 (1992).

Lithophytic herbs; rhizome short creeping; stipes crowded, narrowly winged; lamina simply pinnate; pinnae oblong or lanceolate, subentire, crenate or serrate; fertile pinnules alternate, entire; sori acrostichoid.

Egenolfia appendiculata (Willd.) J. Sm., Fern Br. & Forign III (1866); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 520 (1992).

Lithophytic herbs; rhizome short creeping; stipes in two closely arranged alternate rows; sparsely scaly; sterile lamina lanceolate, simply pinnate; pinnae oblong, acute or acuminate, crenate or shallowly lobed; long, pointed bristle form the base of the sinus; fertile fronds oblong-lanceolate; pinnae oblong, crenate; sori acrostichoid.

Egenolfia asplenifolia (Bory) Fee, Gen. Fil. 358 (1852); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 520 (1992).

Terrestrial or lithophytic herbs; rhizome short creeping; stipes crowded, sparsely scaly below; sterile lamina lanceolate; pinnae oblong, dimidiate, acute, lobed; fertile fronds oblanceolate; pinnae oblong to suborbicular, crenate; sori acrostichoid.

Egenolfia keralensis Nayar et Kaur in Bull. nat. Bot. Gard. 94: 4 (1964); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 521 (1992).

Terrestrial herbs; rhizome scale ovate-lanceolate, bearing unicellular marginal hairs; stipe

profusely paleate; lamina elongate, ovate; lateral pinnae about 20 pairs, subopposite or alternate; prominent seta present; fertile frond as long as the sterile; fertile pinnae subsessile.

Elaphoglossum beddomei Sledge, Bull. Br. Mus. nat. Hist. Bot. 4: 88 (1967); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 518 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 288 Pl. 221 (1992).

Epiphytic or lithophytic herbs; rhizome short creeping, linear scales on the rhizome; fertile stipe larger than the sterile stipe; lamina simple, coriaceous, entire with cartilagenous border, sparsely covered by fimbriate scales; sori achrostichoid.

Elaphoglossum nilgiricum Krajina ex Sledge, Bull. Br. Mus. nat. Hist. Bot. 4: 94 (1967); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 517 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 290 Pl. 223 (1992).

Epiphytic or lithophytic herbs; rhizome short creeping, scaly; scales ovate-lanceolate with long, marginal teeth, fronds caespitose with a short stipe; fertile stipe is longer than the sterile, fronds lanceolate to oblong-lanceolate, apex acute, margin entire without cartilagenous border, densely clothed by toothed scales; sori achrostichoid.

Blechanaceae

Blechnum orientale L., Sp. Pl. 2: 1077 (1753); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 550 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 299-300 Pl. 229 (1992).

Terrestrial herbs; rhizome erect; stipes tufted, scaly at very base and glabrous above; lamina ovate to linear-lanceolate; pinnae oblong-linear, lanceolate, cuneate, oblique, long, acuminate, entire; sori linear along either side of the costa.

Stenochlaena palustris (Burm.) Beddome, Ferns Br. India, Suppl. 26 (1876); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 549 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 303-304 Pl. 232 (1992).

Climbing herbs; rhizome long creeping; fronds scattered, dimorphic; sterile frond stramineous; lamina ovate or oblong-lanceolate; pinnae lanceolate, acuminate, cuneate, serrate; fertile fronds borne at the distal part of the plant; sori all over the lower surface of the fertile segments.

Polypodiaceae

Crypsinus montanus Sledge in Bull. Br. Mus. nat. Hist. Bot. 2 (5): 145 (1960); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 318-319 Pl. 243 (1992). *Phymatopteris montana* (Sledge) Pic. Ser., Webbia, 28: 463 (1973); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 465 (1994).

Epiphytic herbs; rhizome long creeping, densely scaly; scales ovate-lanceolate, abruptly narrowed to a long acuminate apex, margin slightly dentate; stipes abaxially rounded, adaxially grooved, scaly at base, glabrous and glossy; lamina broadly ovate, pinnatifid; pinnae oblong-lanceolate, apex acuminate, margin broadly notched; sori median along the pinnae per areole.

Drynaria quercifolia (L.) J. Sm. in Hook. J. Bot. 3: 398 (1841); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 312-313 Pl. 238 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 456 (1994).

Epiphytic herbs; rhizome short creeping, scaly; scales linear-lanceolate, apex long, acuminate, margin dentate-ciliate, nest leaves ovate; fronds oblong, pinnately lobed, oblong-lanceolate, apex acute, margin entire; sori borne on juncture of veins in two rows along each pinnae.

Lepisorus amaurolepidus (Sledge) Bir & Trikha in Vasudeva. J. Bombay nat. Hist. Soc. 68: 192 (1971); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 334-335 Pl. 253 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 463 (1994).

Epiphytic herbs; rhizome long creeping, scaly; scales peltate, clathrate, ovate-lanceolate, margin dentate; lamina elliptic- lanceolate, base decurrent on stipes, apex acute, rarely subacute, glabrous, margin entire, midrib slightly raised; sori globose, medianly on either side of the midrib.

Lepisorus nudus (Hook.) Ching, Bull. Fan. Mem. Inst. Biol. 4: 83 (1933); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 332-333 Pl. 252 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 464 (1994).

Epiphytic herbs; rhizome long creeping, scaly; scales ovate-lanceolate, acuminate, margin entire; fronds linear elliptic to linear-lanceolate, tapering at base, margin entire, apex acuminate, glabrous, midrib slightly raised; veins indistinct; sori on either side of the costa and generally in the upper half of the lamina.

Leptochilus decurrens Bl., Enum. Pl. Jav. 206 (1828); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 307-308 Pl. 234 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 462 (1994).

Epiphytic or lithophytic herbs; rhizome creeping, scaly; scales clathrate, margin toothed; sterile fronds ovate-lanceolate, base abruptly decurrent.

Leptochilus thwaitesianus Fee. Mem. Fam. Fouger. 10: 7, Pl. 24 (1865); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 309-310 Pl. 236 (1992).

Epiphytic or lithophytic herbs; rhizome creeping, scaly; scales ovate-lanceolate, apex acuminate, margin entire or subentire; sterile frond lanceolate, apex blunt, fertile frond oblong, margin entire, base cuneate.

Loxogramme involuta (D. Don) C. Presl, Tent. Pterid. 215 (1836); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 314 Pl. 239 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 449 (1994).

Epiphytic or lithophytic herbs; rhizome short creeping, scaly; scales broad, lanceolate; fronds simple, lanceolate, attenuate at both ends, margin entire, glabrous; veins obscure; sori linear, oblique.

Microsorium membranaceum (D. Don) Ching, Bull. Fan. Mem. Inst. Biol. 4: 309 (1933); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 327-328 Pl. 248 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 466 (1994).

Epiphytic or lithophytic herbs; rhizome short creeping, scaly; scales ovate, clathrate, apex and margin glandular; fronds membranaceous, thin, lanceolate with blunt apex, margin wavy or undulate, venation reticulate, lateral vein distinct and flattened between lateral veins.

Microsorium pteropus (Bl.) Copel., Univ. Calif. Publ. Bot. 16: 112 (1929); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 326-327 Pl. 247 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 467 (1994).

Aquatic or lithophytic herbs; rhizome long creeping; fronds scattered, lanceolate, entire, wavy; sori in two rows between the midrib and margin of the frond one per longer areole.

Microsorium punctatum (L.) copel. in Univ. Calif. Publ. Bot. 16: 111 (1929); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 328-329 Pl. 249 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 467 (1994).

Epiphytic herbs; rhizome creeping, scaly; scales ovate-lanceolate, clathrate, apex and margin glandular, margin sparsely toothed; fronds oblanceolate, elongated, base attenuate, apex blunt; venation reticulate; lateral vein slightly distinct; mid vein raised in both surface; sori rounded, scattered on two or three part of the anterior area.

Phymatosorus lucidus (Roxb. ex Griff.) Pic. Ser., Webbia 28: 459 (1973); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 316-317 Pl. 241 (1992).

Epiphytic or lithophytic herbs; rhizome long creeping, fleshy, greenish, sparsely scaly; scales broadly ovate; stipes scattered, abaxially rounded, grooved adaxially; lamina pinnate; pinnae oblong-lanceolate, apex acuminate, glabrous, margin entire; midvein raised both above and below; veins distinct; sori median between the margin of the pinnae and costa, superficial, sunken.

Phymatosorus nigrescens (Bl.) Pic. Ser. in Webbia 28: 459 (1973); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 317-318 Pl. 242 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 465 (1994).

Epiphytic or lithophytic herbs; rhizome creeping, fleshy, greenish, sparsely scaly; stipes scattered; lamina pinnate, pinnae oblong-lanceolate, glabrous, margin entire; midvein slightly raised above and below; veins indistinct; sori rounded, superficial, extruded above by raised cavity.

Pyrossia lanceolata Farewell, Amer. Middl. nat. 12: 245 (1930); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 322-323 Pl. 245 (1992); Nair *et al.*, J. Econ. Tax. Bot. 18(2): 459 (1994).

Epiphytic or lithophytic herbs; rhizome long creeping, slender, scaly; scales lanceolate, apex acuminate, margin entire; stipes scattered, flattened, winged along the margin, densely scaly

at base, sparsely covered by stellate hairs above; fronds simple- lanceolate, elliptic or linear-lanceolate, apex acute, margin entire or wavy; midvein marked by a shallow groove above; lower surface of the frond densely covered by stellate hairs; sori irregularly distributed mainly in the distal part of the pinnae.

Pyrossia porosa* var. *porosa Hovenkamp, Blumea 30: 208 (1984); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 323-325 Pl. 246 (1992).

Epiphytic or lithophytic herbs; rhizome short creeping, densely covered by scales: scales appresed, lanceolate, apex acuminate, margin fimbriate; stipe indistinct; lamina linear, elliptic to lanceolate, margin entire, midrib slightly distinct, lower surface of the frond densely clothed by stellate hairs of two types; sori numerous, towards the distal half of the frond, protected by stellate hairs.

Grammitidaceae

Grammitis attenuata Kunze in Linnaea 34: 251, fig. 3 (1851); Nair *et al.*, J. Econ. Tax. Bot. 16(3): 548 (1992); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 336-337 Pl. 254 (1992).

Epiphytic herbs; rhizome short creeping; fronds tufted, elliptic or linear or oblong-elliptic, apex acute, margin entire, hairy on both surfaces; sori median in position between costa and margin, sori linear or oblong, oblique to the midrib, non setose.

Grammitis pilifera Ravi et Joseph **var.** ***munnarensis*** Raju Antony *et al.* J. Econ. Tax. Bot. 20 (3): 697-98 (1996).

Epiphytic herbs; rhizome erect; stipes tufted, densely covered by dark brown hairs all over; fronds simple, linear, oblong, undulate, bristly hairy above and glabrous below; sori median between midrib and margin.

Ctenopteris subfalcata (Bl.) Kunze, Bot. Zeit. 6: 120 (1848); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 338-339 Pl. 256 (1992).

Epiphytic or lithophytic herbs; rhizome erect, densely scaly; scales ovate-lanceolate, apex with one or two cilia, margin entire; lamina elliptic to oblanceolate, margin pinnatifid; midrib scaly below; pinnules herbaceous, pale brown slender hairs distributed densely all over the surface; sori median between the margin and costules of the pinnule seated at the end of the veins.

Prosaptia contigua (Forst. f.) Presl, Tent. Pterid. 166 (1836); Manickam & Irudayaraj, Pterid. Fl. Western Ghats 341-342 Pl. 258 (1992).

Lithophytic herbs; rhizome short creepiing; stipes crowded, narrowly winged on edges, sparsely hairy all over; lamina elliptic, margin pinnatifid upto midrib, wavy above; lobes oblong, subacute or rounded, entire; sori marginal or terminal in a deep bilipped cavity.

7. REFERENCES

Augustine Jomy, N. Sasidharan & A. Bharadwaj 1994. *Ophioglossum penchulum* L. (Ophioglossaceae) From The Main Land of India. *J. Econ. Tax. Bot.* 18(2) : 445-447.

Azeez, K, K.R. Leena & P. V. Madhusoodanan. 1996. Spleenworts (Aspienium - Pteridophyta) of Kerala. *J. Econ. Tax. Bot.* 20(2) : 435-453.

Beddome, R.H. 1863 - 1873. *The Ferns of South India*, Madras.

Leena, K.R. & Madhusoodanan,P.V. 1993. Taxonomy and distribution of the genus *Pseudocyclosorus* Ching (Thelypteridaceae) in South India. *J.Econ. Tax. Bot.* 17(3).

Leena, K.R & Madhusoodanan. P.V. 1996. The genus *Macrothelypteris* (Thelypteridaceae) in South India. *J. Econ. Tax. Bot.* 20(2): 423-428.

Madhusoodanan P.V. & Santhosh Nampy 1993. The genus *Microsorum* Link in South India *J. Econ. Tax. Bot.* 17(1) : 43-47.

Madhusoodanan, P.V. 1991. Rare and endangered Ferns and Fern allies of Western Ghats of Kerala. *Proc. Symp. Rare/Endangered/Endemic plants of Western Ghats, Tvm.*

Madhusoodanan, P.V. 1993. Taxonomy and Ecology of the Aquatic Pteridophytes of Kerala. *J. Econ. Tax. Bot.* 17 (3).

Majeed Abdul, K.K., K.R. Leena & P.V Madhusoodanan 1994. Ecology and distribution of Lomariopsidoid Ferns of Kerama. *Res J. Pl. Environ.* 10 : 71-74.

Manickam. V.S. & V. Irudayaraj 1992. *Pteridophyte flora of the Western Ghats - South India.* B.I. Publications, New Delhi.

Nair, N.C. & P. Bhargavan 1981. The studies on the ferns of Peninsular India: A review. *Bull. Bot. Surv. India.* 23: 170-190.

Nair, N.C. & R.D. Dixit 1981. A list of taxa of Indian ferns not included in Beddome's handbook to the ferns of British India and a suppliment to the handbook to the ferns of British India. *J. Bombay nat. Hist. Soc.* 78(3): 443-462.

Nair, N.C., S. R. Ghosh & P. Bhargavan 1988. Fern - Allies and Ferns of Kerala, India - Part I. *J Econ. Tax. Bot.* 12(1) : 171-209.

Nair, N.C., S. R. Ghosh & P. Bhargavan 1992a. Fern Allies and Ferns of Kerala - Part II. *J. Econ. Tax. Bot.* 16(2) : 251-282.

Nair, N.C., S. R. Ghosh & P. Bhargavan 1992b. Fern Allies and Ferns of Kerala - Part III. *J. Econ. Tax. Bot.* 16(3) : 501-550.

Nair, N.C., S. R. Ghosh & P. Bhargavan 1994. Fern Allies and Ferns of Kerala - Part IV. *J. Econ. Tax. Bot.* 18(2) : 449-476.

Nair, S.C. 1994. High Ranges - Problems & Potential of a hill region in the Southern Western Ghats. Intach Southern Western Ghats Environment Series. *INTACH*, New Delhi.

Nampy, S. & P.V. Madhusoodanan 1992. Polyploid ferns of South India. *Indian Fern J.* 9: 204-220.

Nayar, B. K. & K.K. Geevarghese 1993. *Fern Flora of Malabar.* Indus Publishing Company, New Delhi.

Nayar, M.P. 1996. *Hot Spots of endemic plants of India, Nepal and Bhutan.* Tropical Botanic Garden & Research Institute, Palode, Thiruvananthapuram.

Nayar, M.P. 1997. *Biodiversity challenges in Kerala and science of conservation biology.* In Pushpangadan & K.S.S. Nair (Eds.) Biodiversity and Tropical Forests - A Kerala Scenario. pp. 7-80. STEC, Trivandrum.

Pichi- Sermolli, R.E.G. 1958. The higher taxa of the pteridophyta and their classification *In: Hedberg, O. (Ed.) Systematics of today.* Uppsala Univ. Arsskr. Almiquist and Wiksells, Uppsala 6: 70-90.

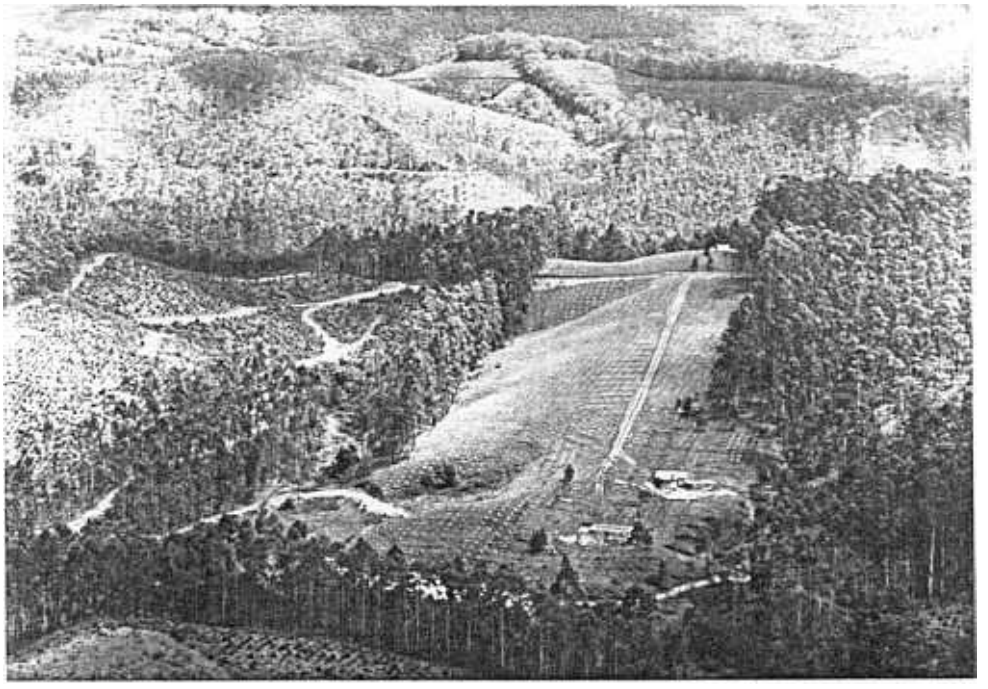
Raju Antony, A.E.Shanavas Khan, E.S. Santhosh Kumar & Jacob Thomas 1996. A new variety of *Grammitis pilifera* Ravi & Joseph (Grammitidaceae : Pteridophyta) from Kerala, South India. *J. Econ. Tax. Bot.* 20(3): 697-698.

Ravi, N. & J. Joseph 1976. A new species of fern from South India. *J. Bombay nat. Hist. Soc.* 76: 348-350.

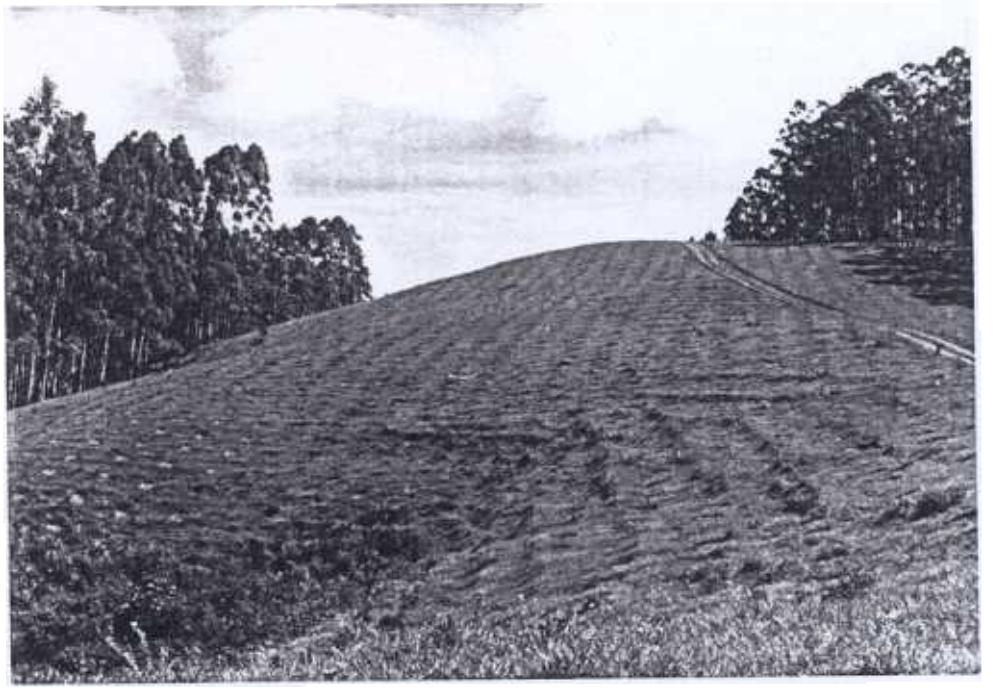
Rheede, H.A. Van. 1678 - 1703. *Hortus indicus malabaricus. Vols. 1-12 Amsterdam.*

Vohra, J.N., K.N. Roychoudhary, R.K. Ghosh, B.D. Kar & K.P. Singh 1982. Botanical Studies on Silent Valley (Cryptogams and Soil study) Howrah.

PLATE I

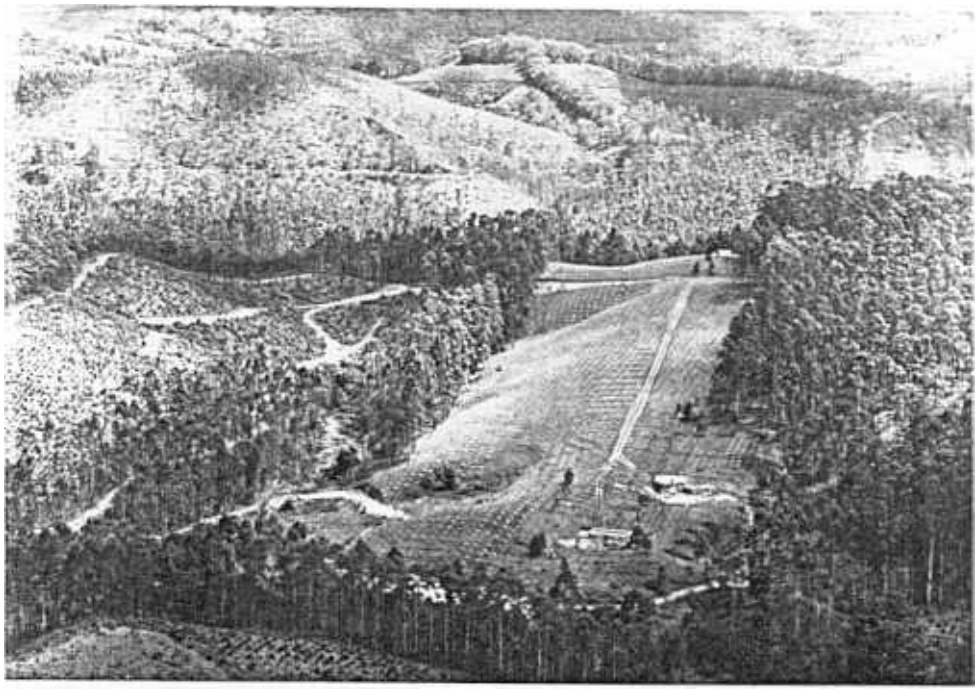


Birds eye view of the sanctuary from the Munnar-Nettikudi Road during the early stage of development

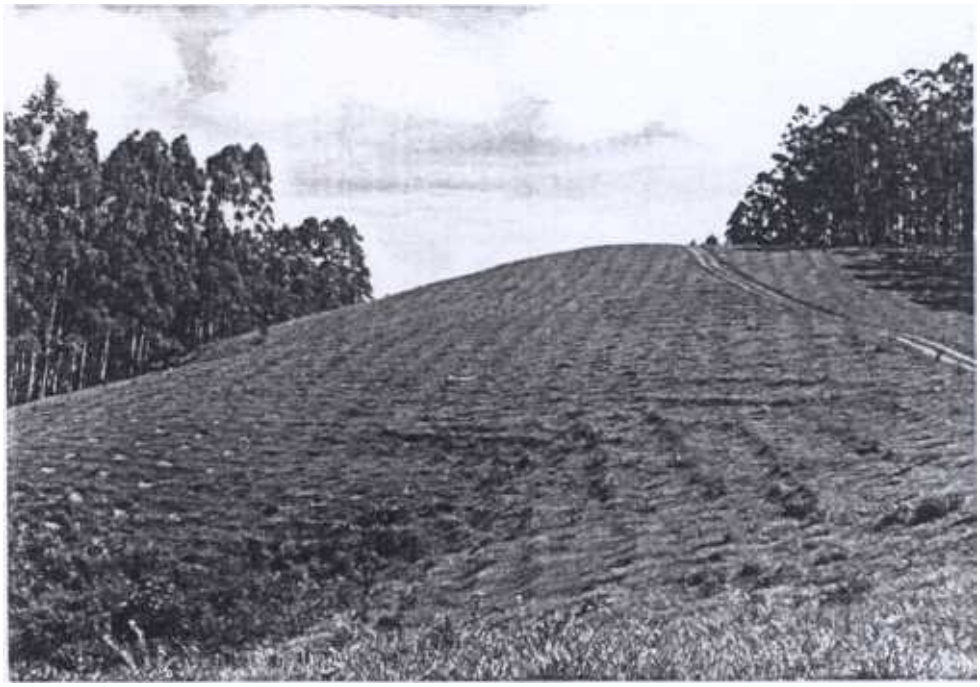


Pine & Cupressus seedlings planted inside the sanctuary

PLATE



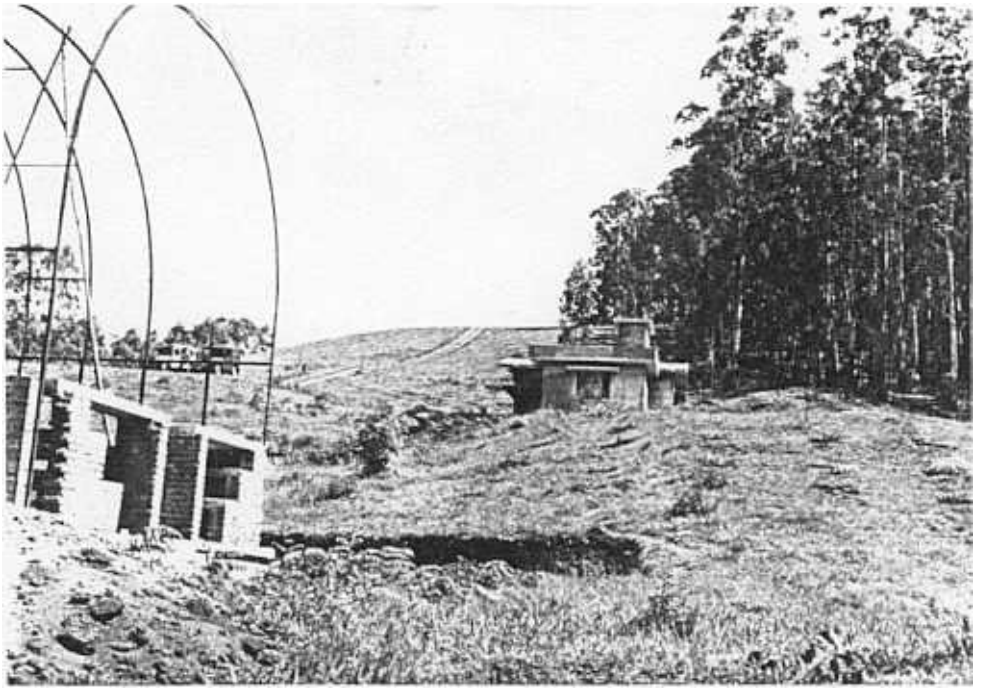
Birds eye view of the sanctuary from the Munnar-Nettikudi Road during the early stage of development



Pine & Cupressus seedlings planted inside the sanctuary

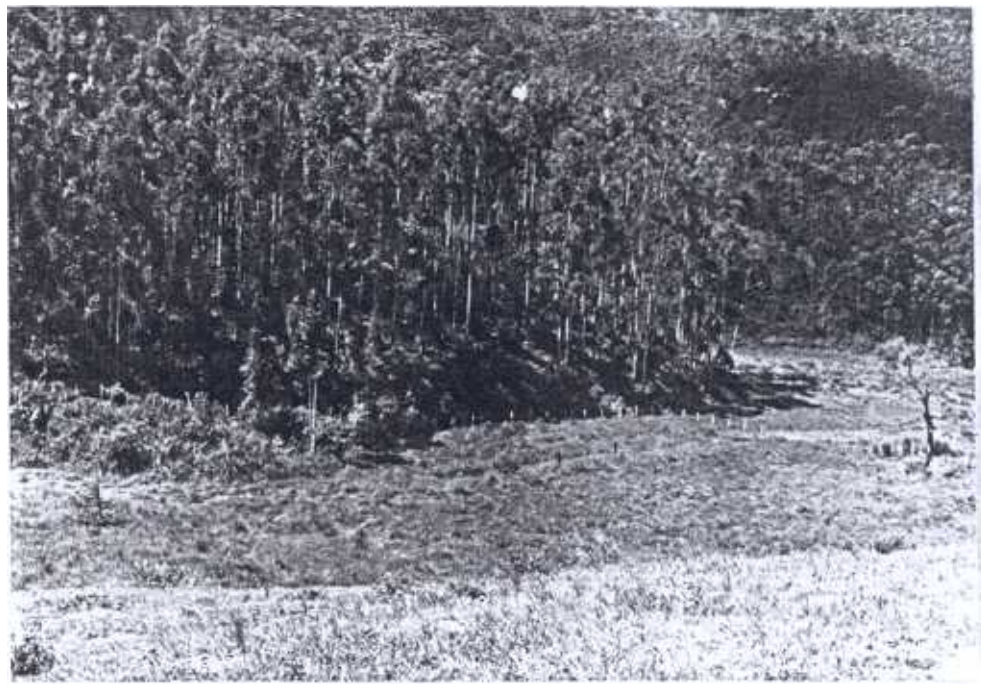
PLATE II

A view from North Western entrance of the sanctuary



A view from South Western corner of the sanctuary

PLATE III

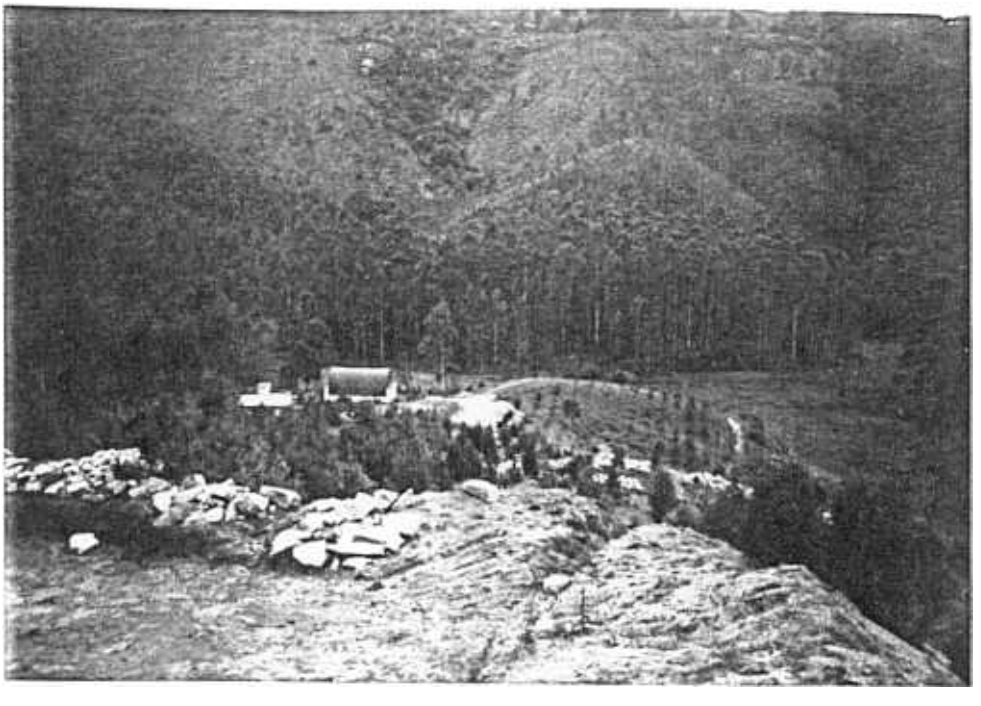


Marshy land on the South Eastern corner of the sanctuary

View of the entrance to the sanctuary

PLATE IV

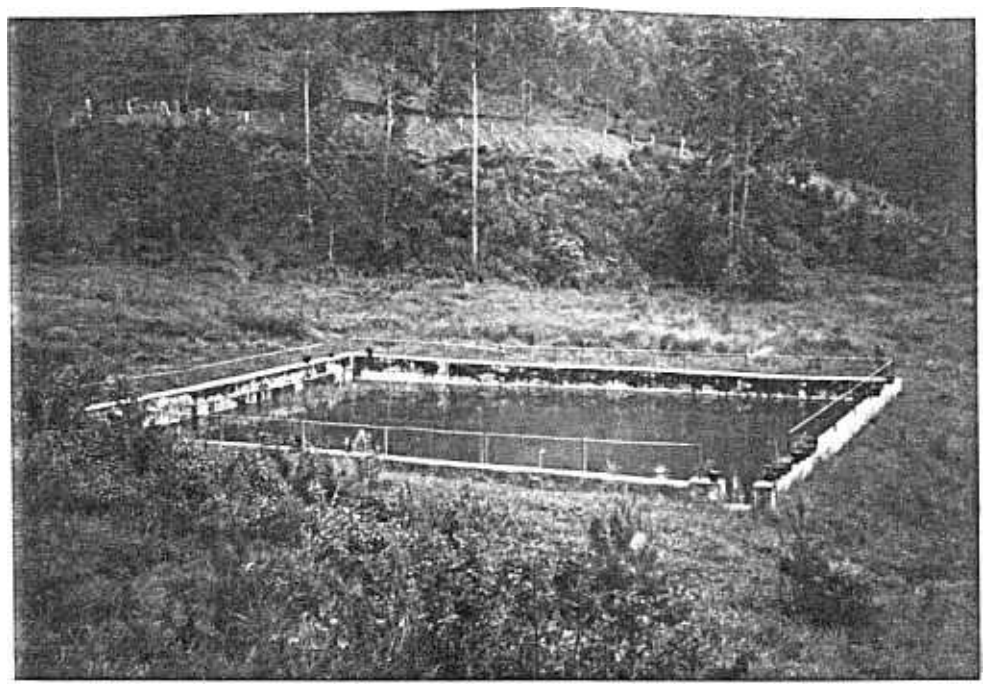
Birds eye view of the sanctuary from Munnar-Nettikudy Estate Road after the construction of Green House



View of the sanctuary from Northern side during the zig-zag construction of the road

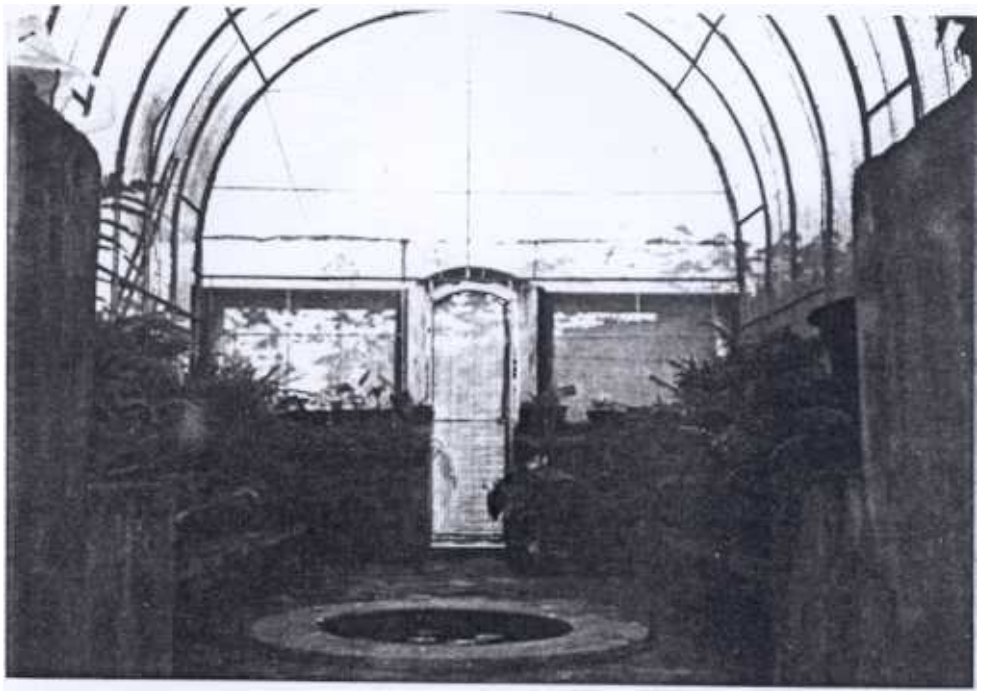
PLATE V

Green House inside the sanctuary

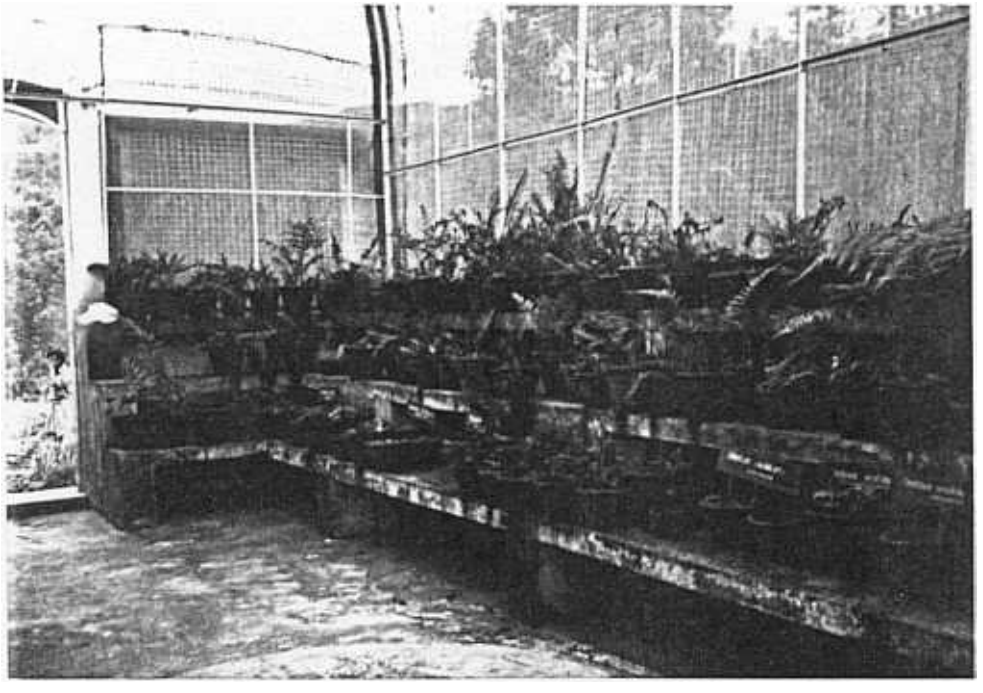


Fish pond inside the sanctuary

PLATE VI



Inside view of the Green House with the collections



Inside view of the Greeen House

PLATE VII

Inside view of the Green House

Inside view of the Green House

PLATE VIII

Blechnum orientale, *Odontosoria chinensis* planted outside the Green House

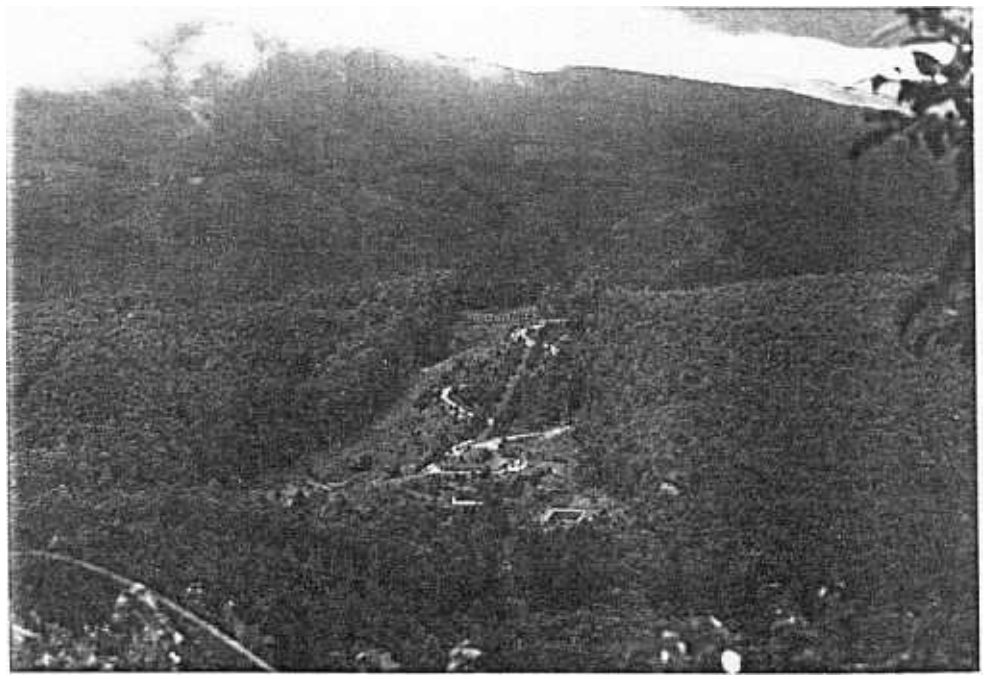
Nephrolepis auriculata planted outside the Green House

PLATE IX

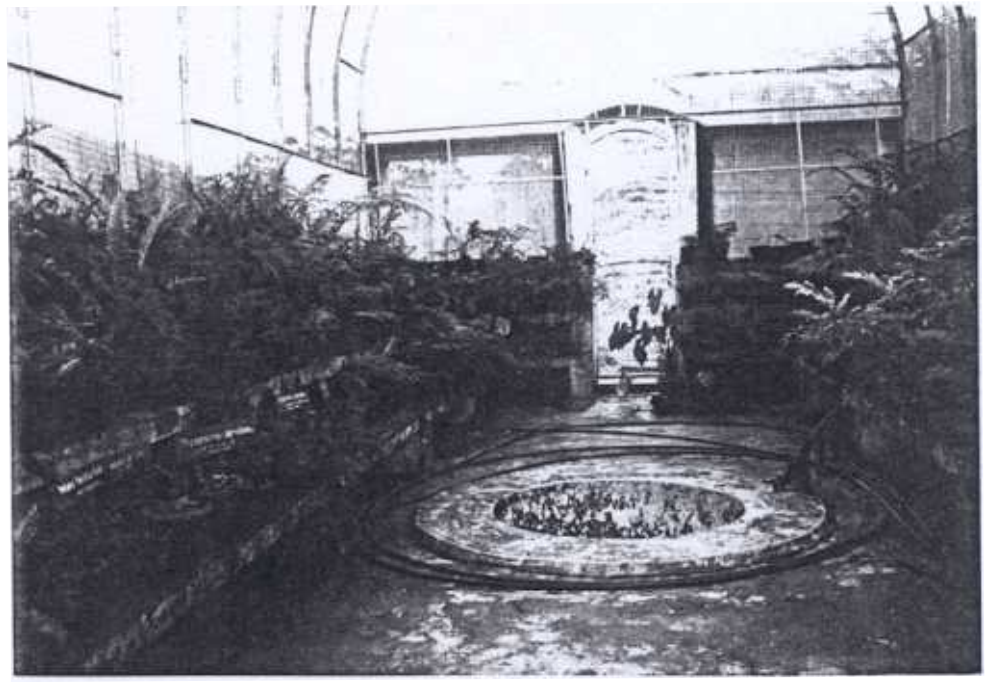
Marshy land on the South eastern corner of the sanctuary, Grass land in the early growth of Pine & Cupressus plants

Marshy land on the South Western corner of the sanctuary

PLATE X



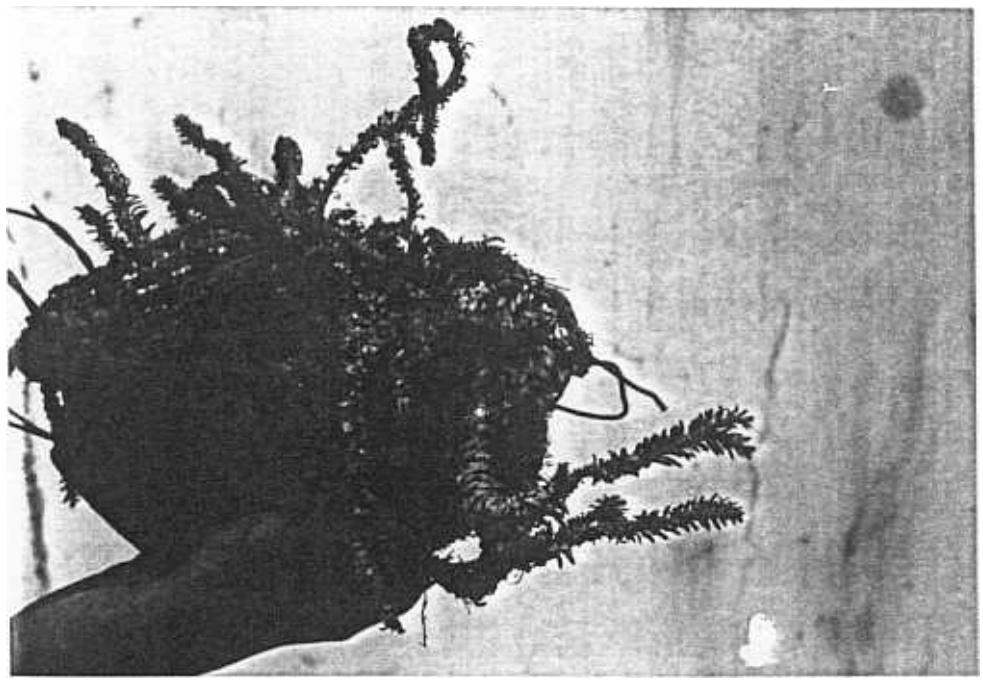
Birds view of the Sanctuary during the end of the project period



Inside of the Green House

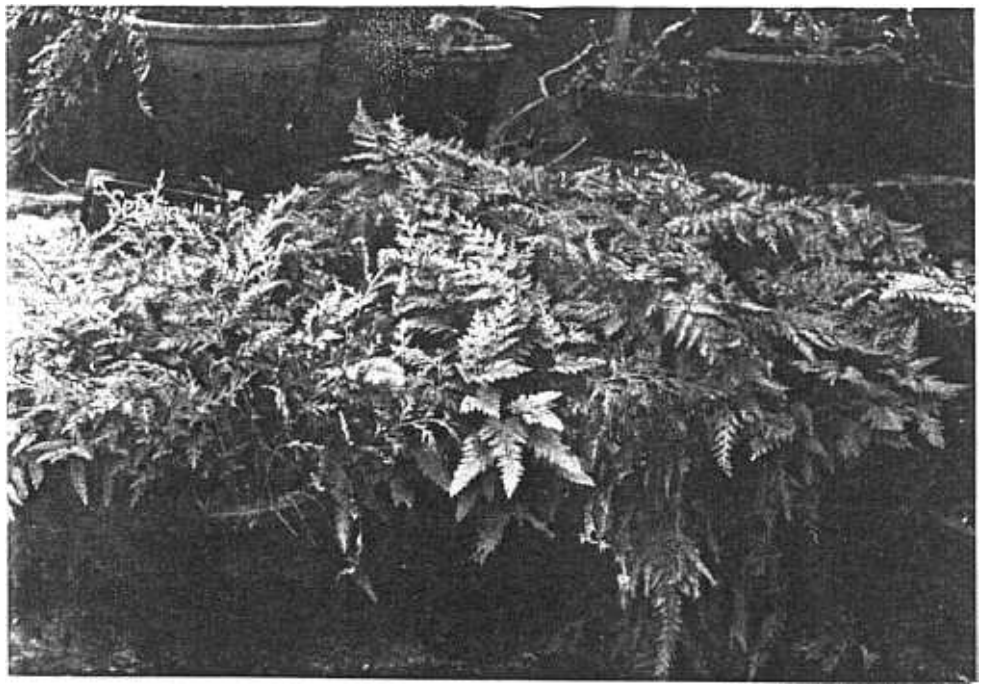
PLATE XI

Huperzia squarrosa (Forst.) Trev.

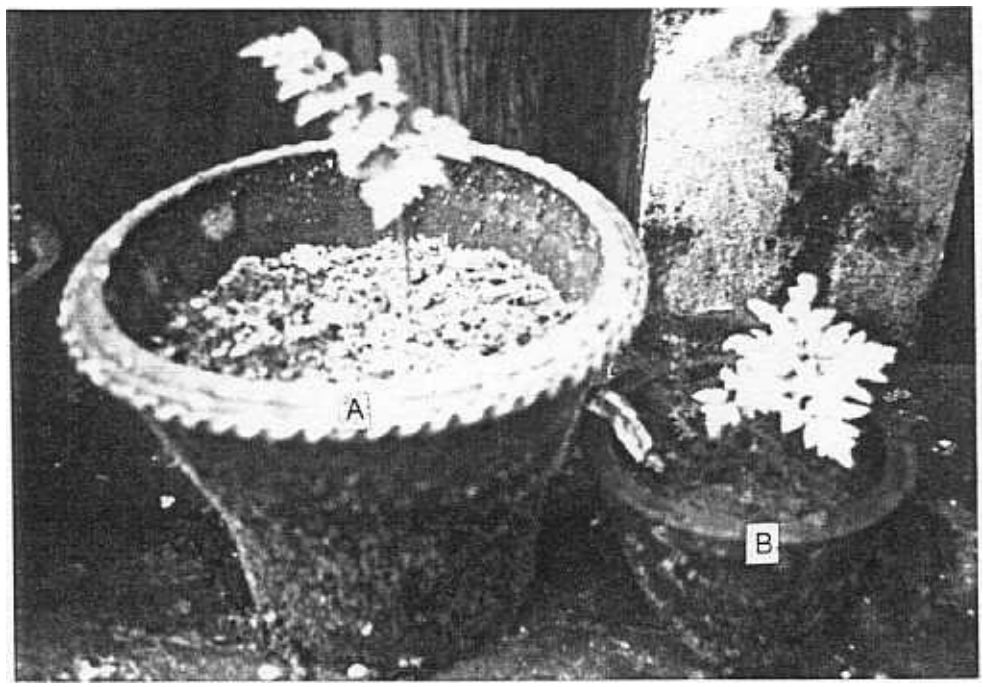


Huperzia nilagirica (Spring) Dixit

PLATE XII

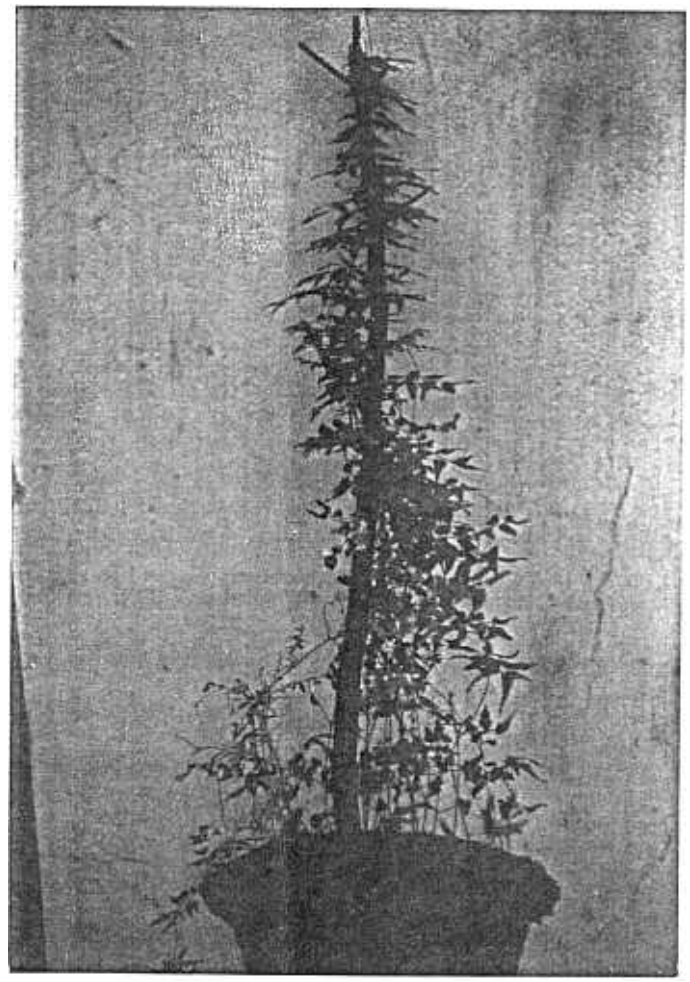


Selaginella involvens (Sw.) Spring

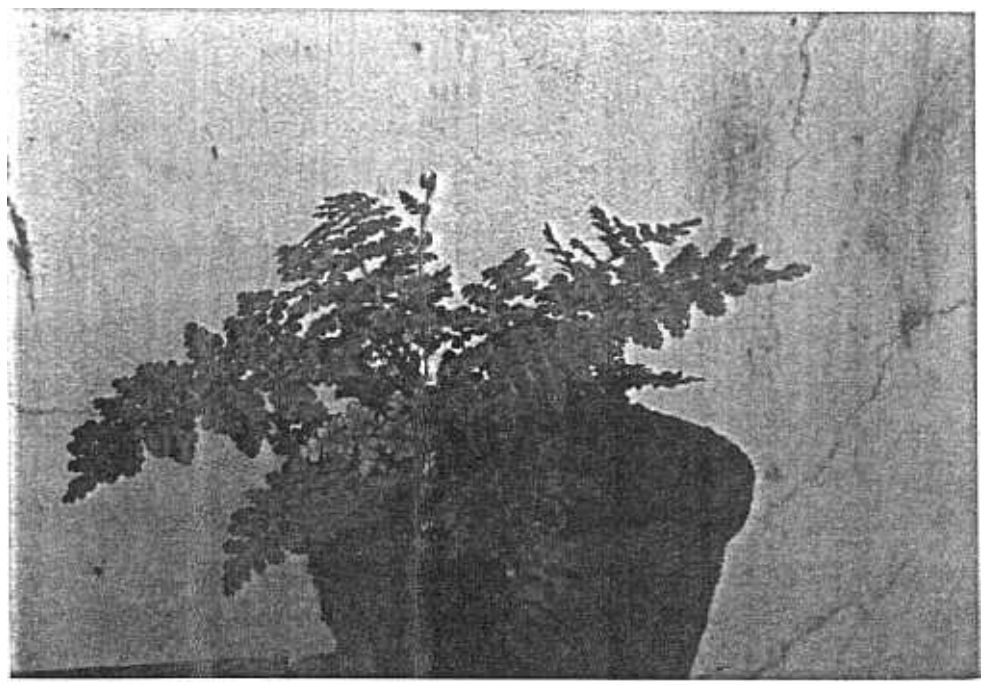


A. *Botrychium lanuginosum* Wall. ex Hook. & Trev.
B. *Botrychium daucifolium* Wall.

PLATE XIII

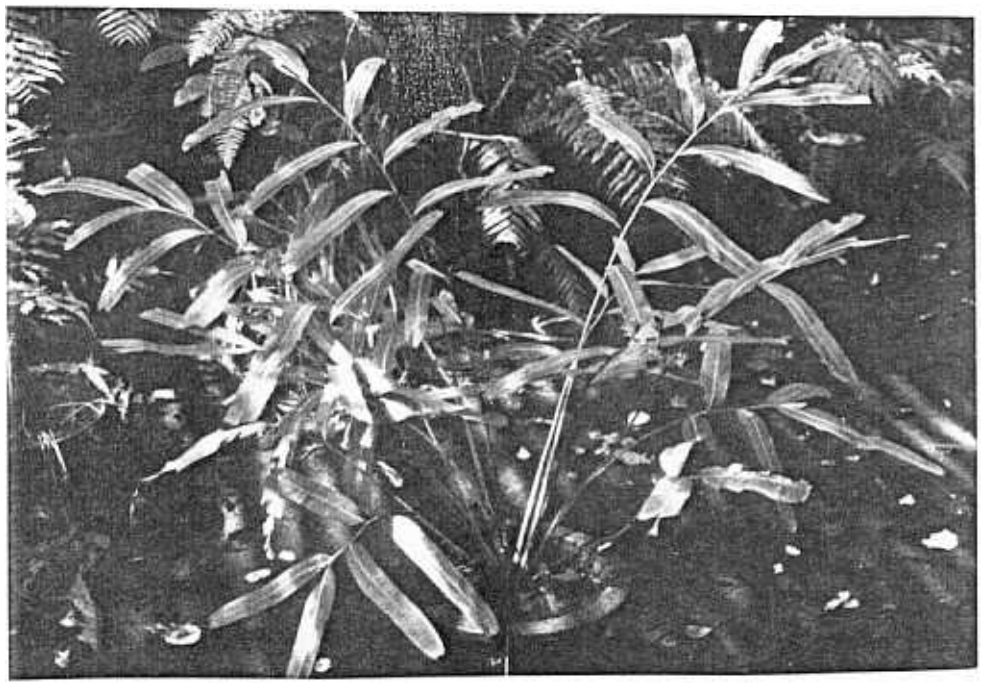


Lygodium microphyllum (Cav.) R. Br.

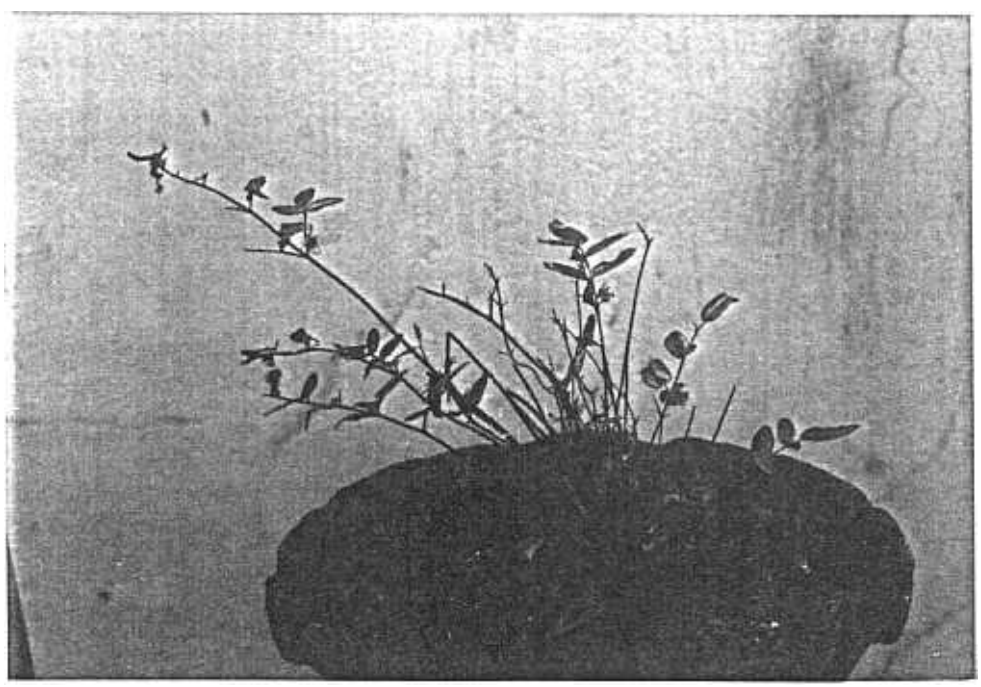


Anemia wightiana Gard.

PLATE XIV

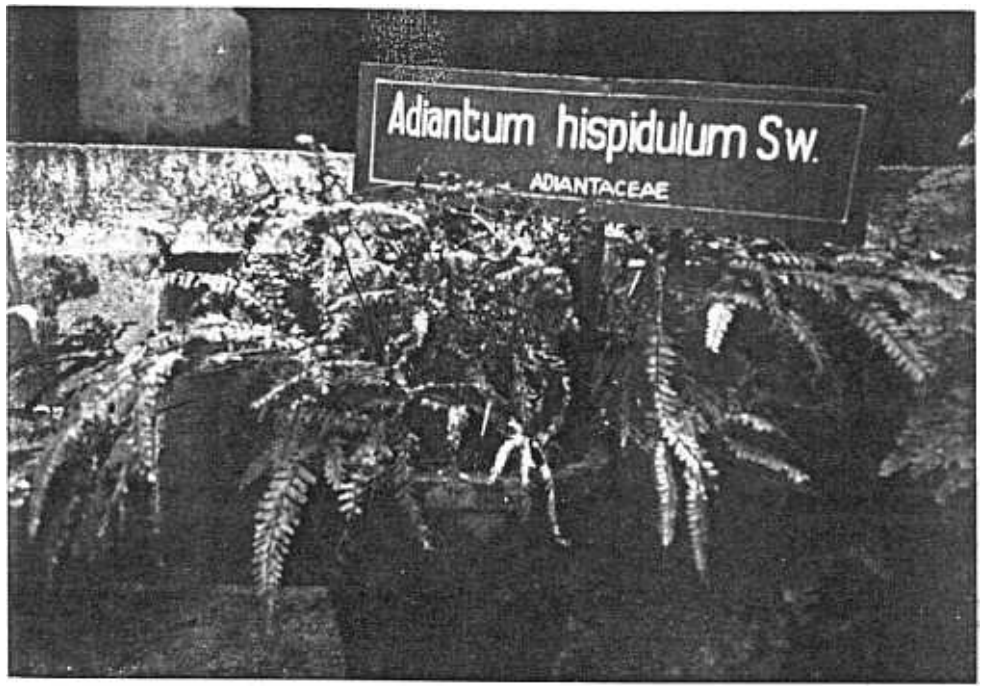


Acrostichum aureum L.



Pellaea malabarica Nayar *et* Geevargh.

PLATE XV



Adiantum hispidulum Sw.

Davallia bullata Wall. *ex* Hook.

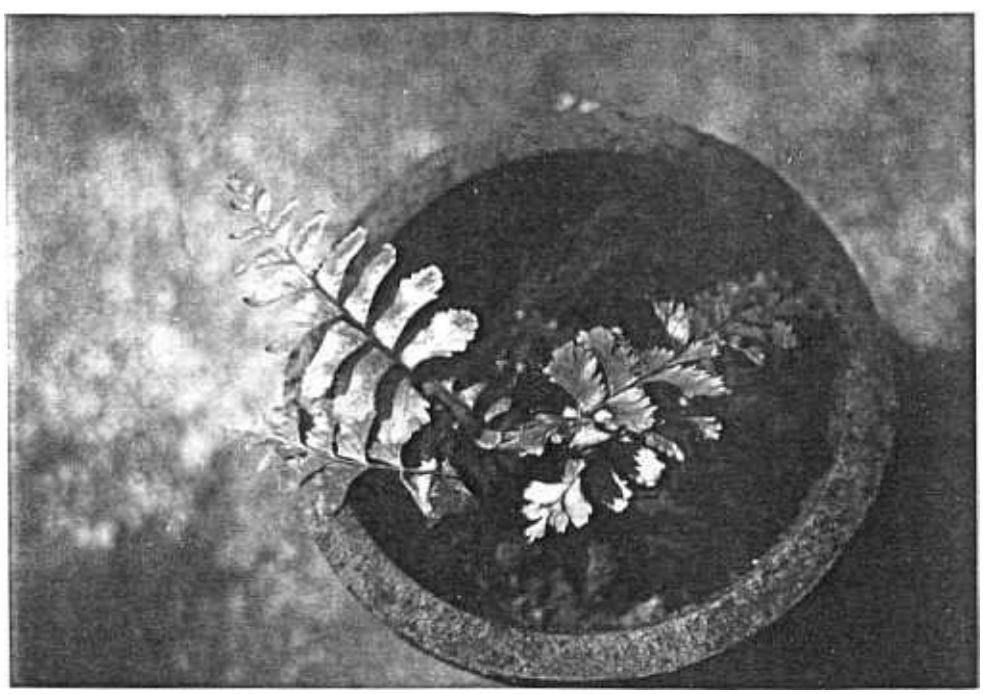
PLATE XV

Trichomanes obscurum Bl.

Trignospora liata Benth. Holtt.

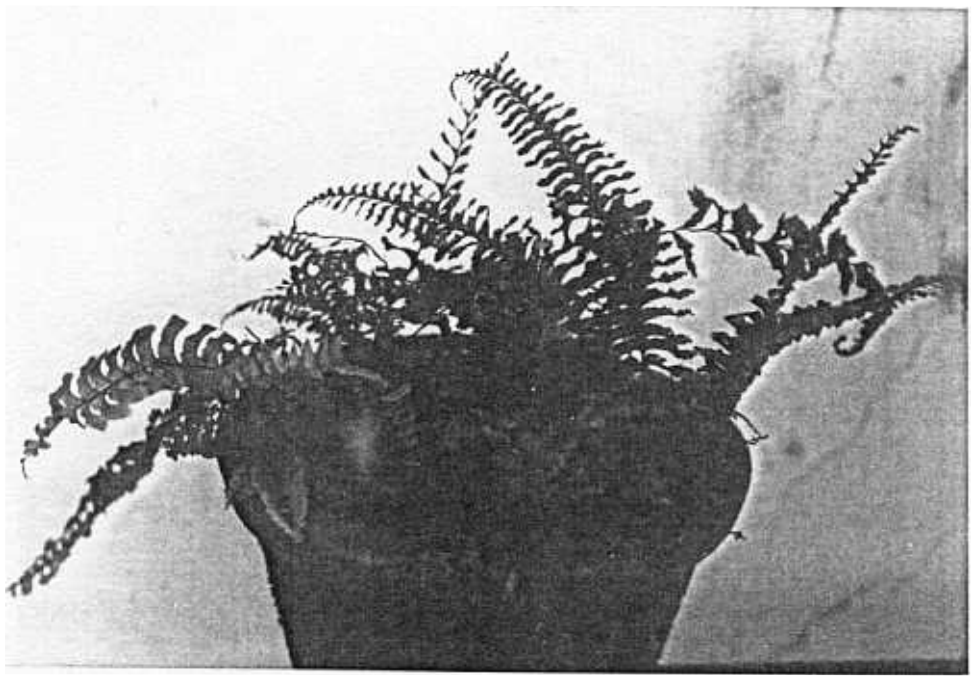
PLATE XVII

Pronephrium triphyllum (Swartz.) Holtt.

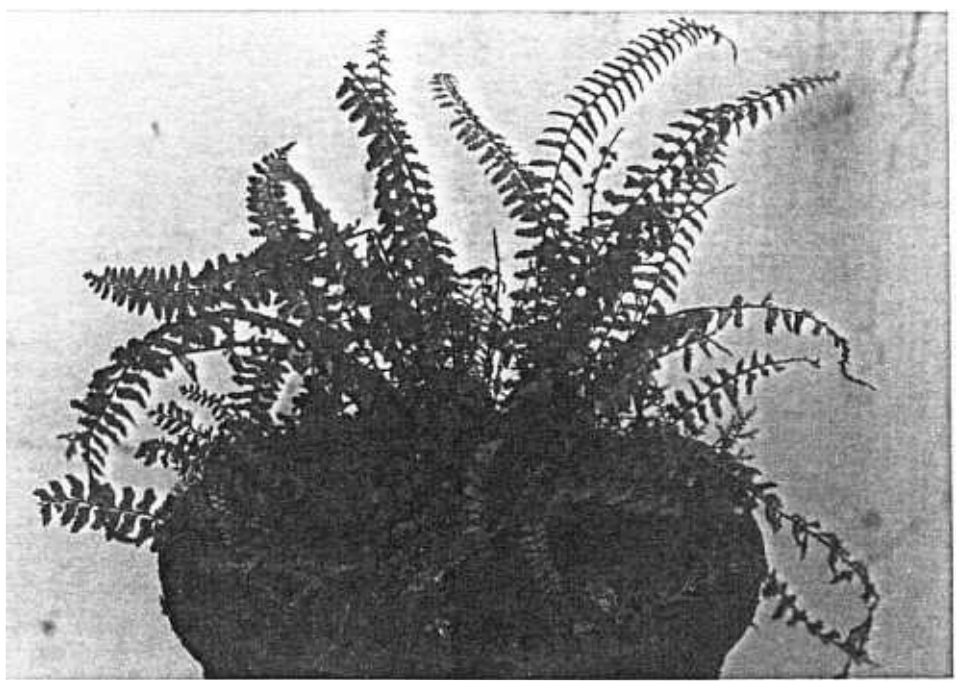


Asplenium erectum Bory *ex* Willid.

PLATE XVIII



Asplenium unilaterale Lam. var. *unilaterale* Lam.



Asplenium inæquilaterale Willd.

PLATE XIX

Asplenium tenuifolium D. Don

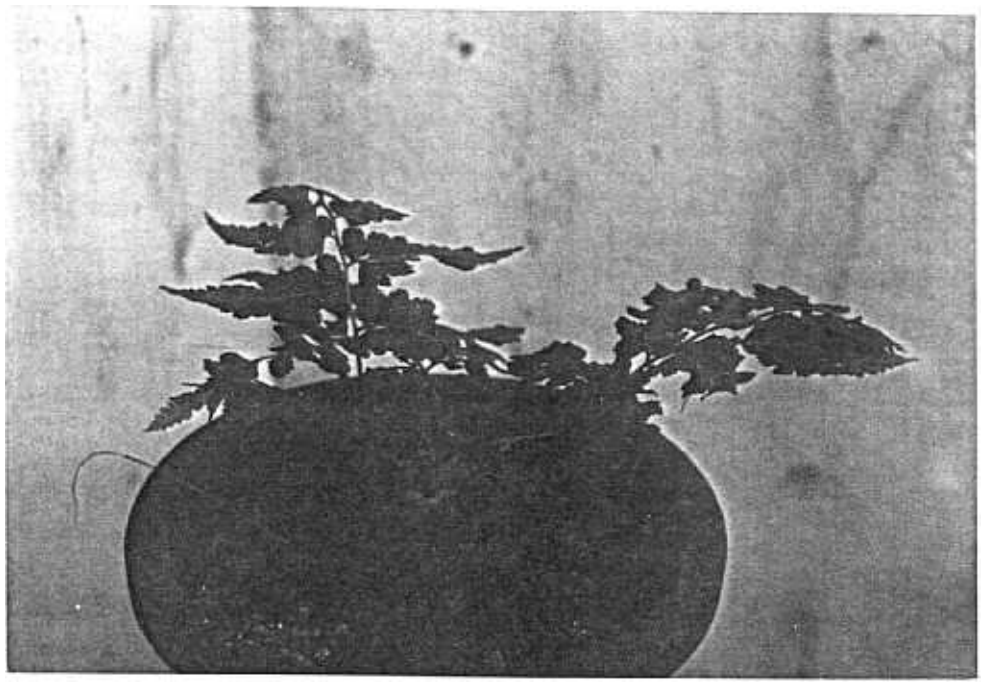
Asplenium auritum Sw.

PLATE XX

Asplenium tenerum Forst.

Polystichum harpophyllum
(Zenker *ex* Kunze) Sledge

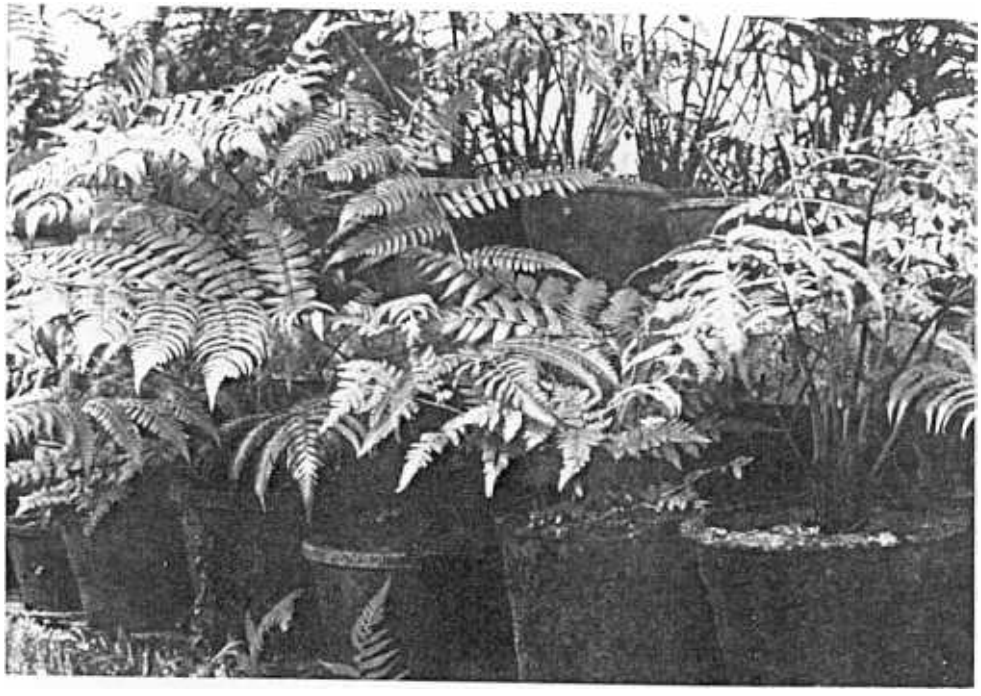
PLATE XXI



Deparia petersonii (Kunze) M. Kato

Diplazium sylvaticum (Bory) Sw.

PLATE XXII

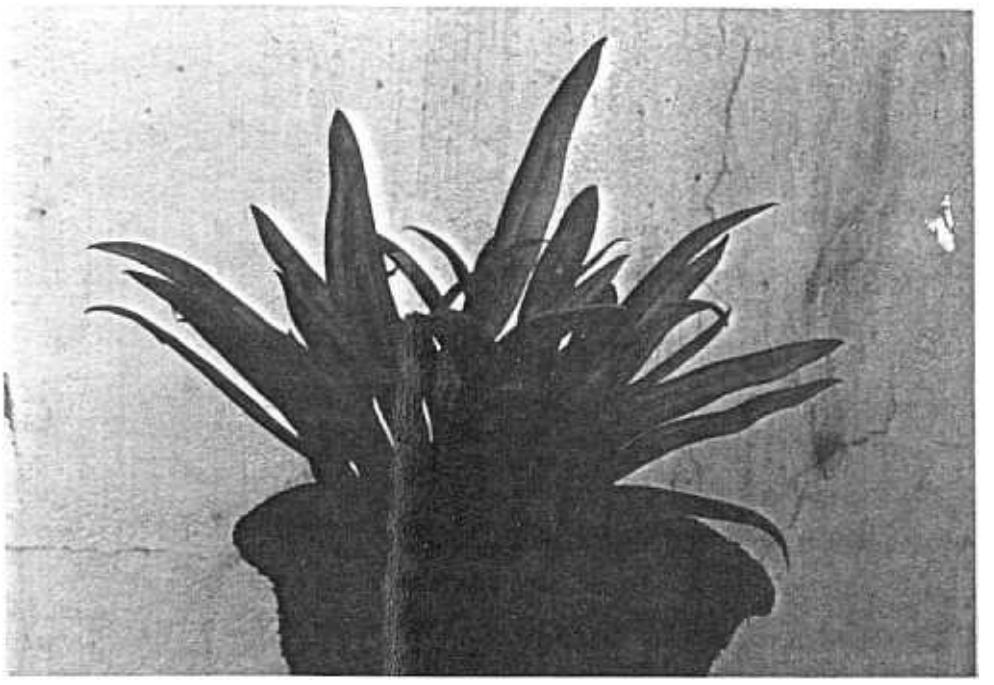


Diplazium muricatum (Mett.) Alderw.

Diplazium brachylobum (Sledge) Manickam & Irudayaraj

PLATE XXIII

Dryopsis scabrosa (Kunze) Holtt.



Elaphoglossum beddomei Sledge

Plate XXIV

Blechnum colensoi (Hook. f.) Wakef.

Microsorium linguaforme (Mett.) Copel.

PLATE XXV

Microsorium pteropus (Bl.) Copel.

Microsorium punctatum (L.) Copel.

PLATE XXVI

Phymatosorus lucidus (Roxb. ex Griff.) Pic. Ser.

Leptochilus decurrens Bl. forma *lanceolatus*

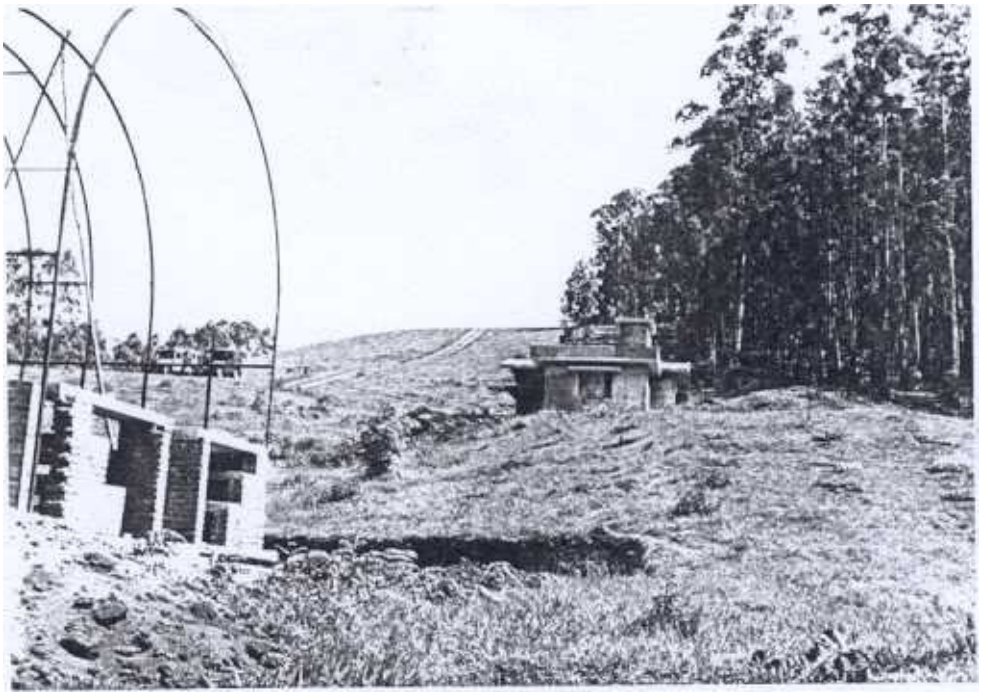
PLATE XXVII

Pyrrosia porosa var. *porosa* Hovenkamp

Loxogramme involuta (D. Don) Presl

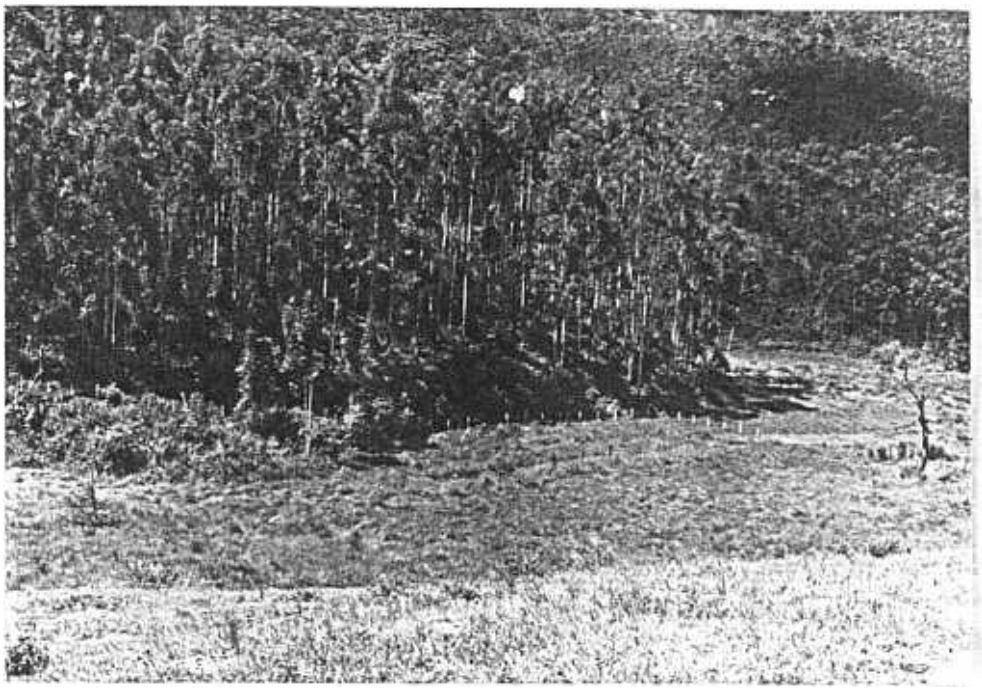
PLATE II

A view from North Western entrance of the sanctuary



A view from South Western corner of the sanctuary

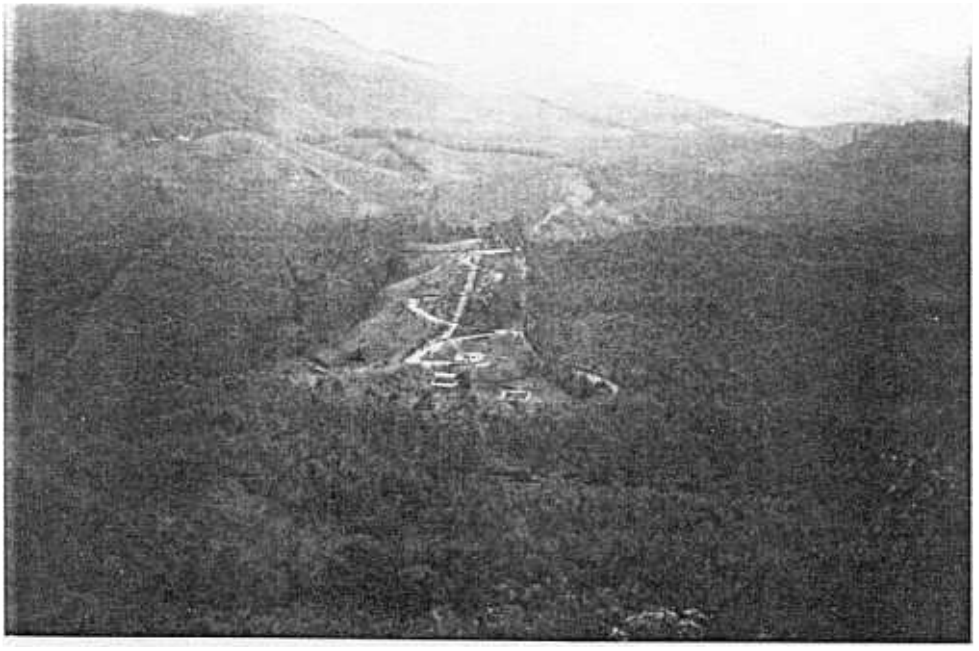
PLATE III



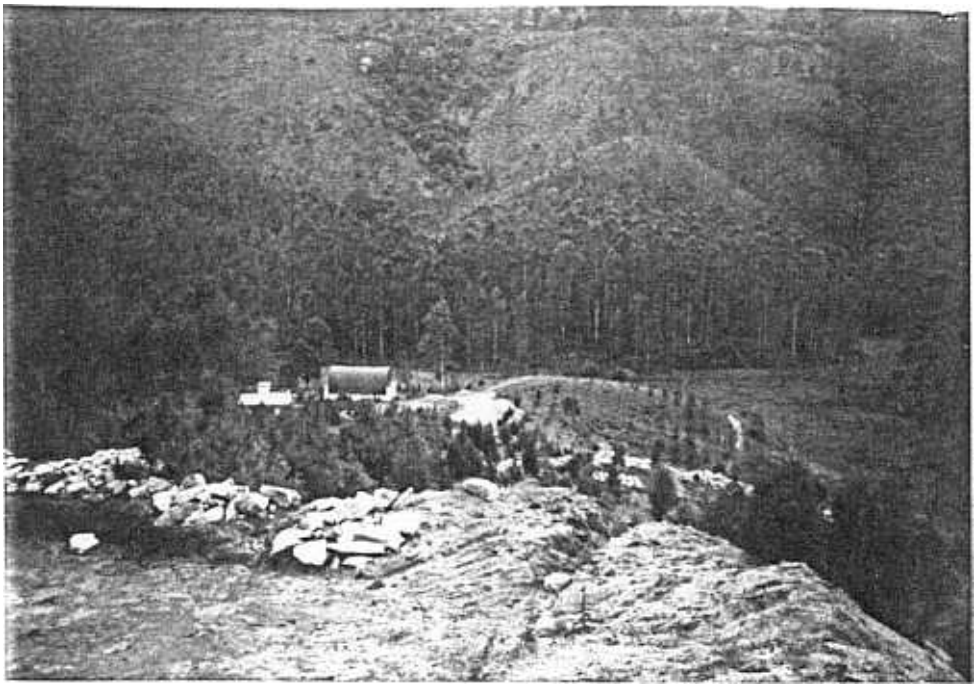
Marshy land on the South Eastern corner of the sanctuary

View of the entrance to the sanctuary

PLATE IV



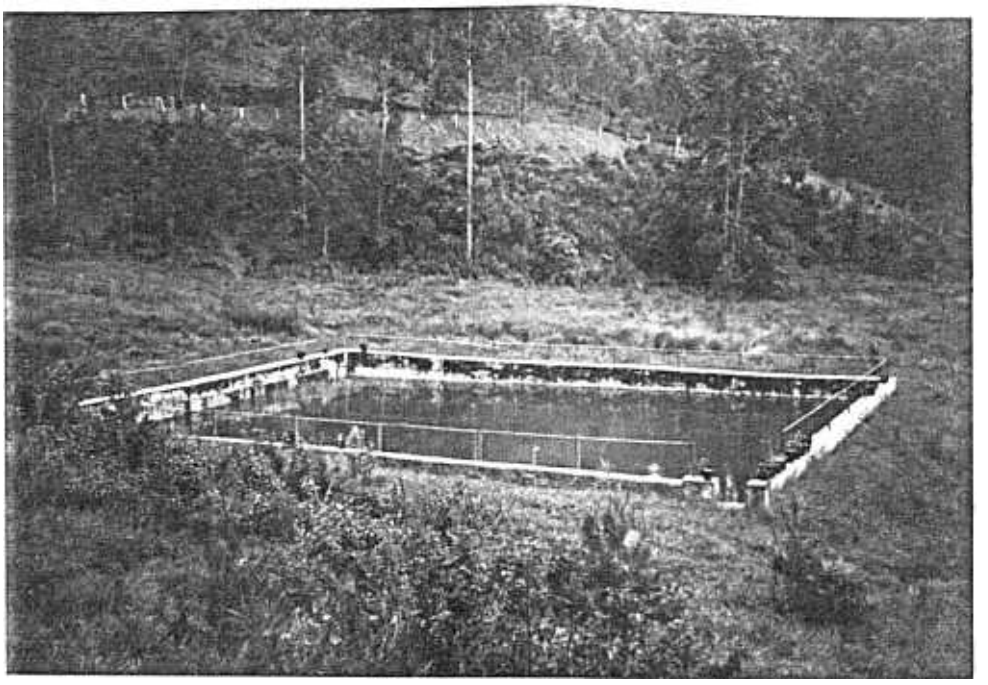
Birds eye view of the sanctuary from Munnar-Nettikudy Estate Road after the construction of Green House



View of the sanctuary from Northern side during the zig-zag construction of the road

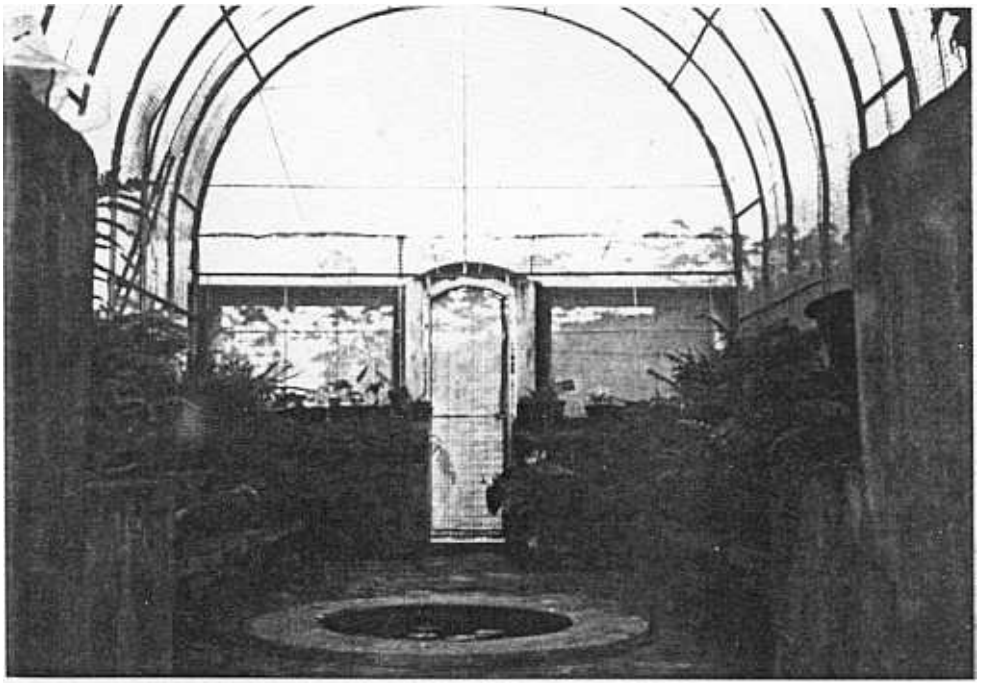
PLATE

Green House inside the sanctuary

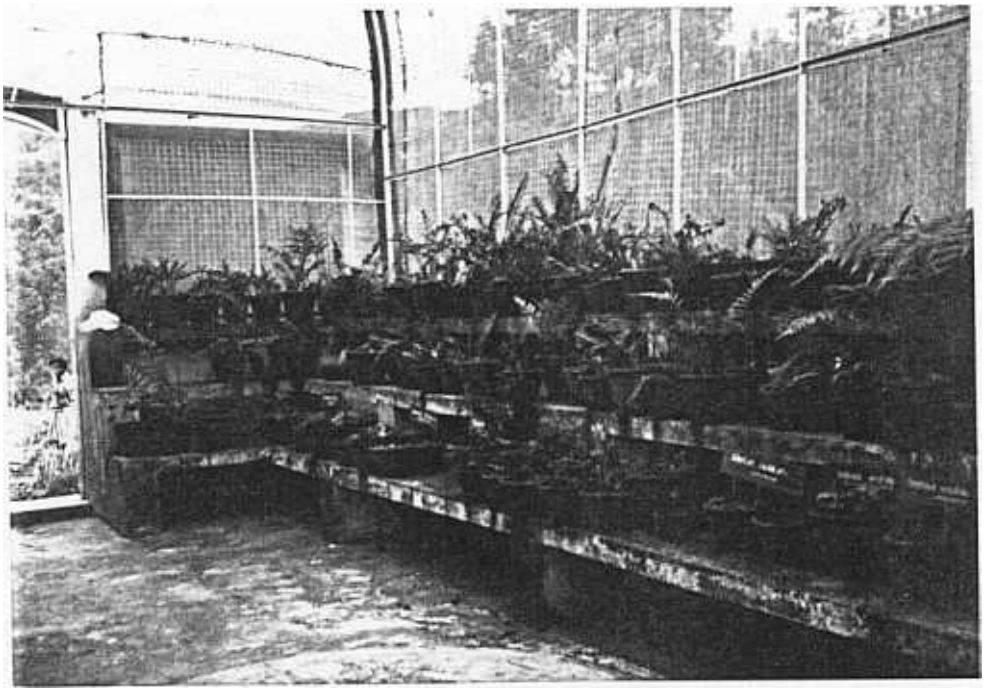


ish pond de the

PLATE VI



Inside view of the Green House with the collections



Inside view of the Greeen House