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Establishment of a Butterfly Garden in the Teak Museum Complex, Nilambur for Promoting Eco - Tourism and Public Awareness on Nature Conservation

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Abstract of Project Proposal

1. Project No. : KFRI 423/2003

2. Title of the project: Establishment of a butterfly garden at the Teak Museum Complex, Nilambur for promoting eco-tourism and public awareness on nature conservation.

3. Objectives:

- To promote public awareness on nature conservation, and
- To facilitate biodiversity conservation.

4. Date of commencement: March 2003

5. Scheduled date of completion: March 2006

6. Project team:

Principal Investigator: Dr. George Mathew

Associates: Dr. T.V. Sajeev and Dr. K. Mohanadas

7. Study area: KFRI sub centre, Nilambur

8. Duration of the project: Three Years

9. Project budget: Rs.1, 92,000/ -

10. Funding agency: Plan Grants, KFRI

Abstract

The role of Butterfly Gardens as a conservation cum environmental educational programme is well appreciated. With a view to achieve these objectives, a Butterfly Garden was set up in a 0.5 ha area of degraded moist deciduous forest patch in the Teak Museum campus of the KFRI subcenter at Nilambur. As a result of introduction of butterfly host plants and enrichment of habitats, there was a tremendous enhancement in the butterfly population in the garden. Altogether, 50 species of butterflies were recorded from the area which included 8 species having protected status under the Indian Wildlife Act and another 6 species which are endemic to the Western Ghats. The beautifully landscaped garden with its rich butterfly fauna was an attraction to the public, particularly the students. Besides conserving the butterfly fauna, the garden was also a success in generating conservation awareness among the public.

1. Introduction

Among the various organisms present on earth, butterflies are special because of their appeal to attract people of all ages and walks of life. Butterflies are also ecologically important as pollinators of several wild and domesticated plants and depletion of their population could adversely affect the regeneration of plants they pollinate. Because of their great aesthetic value, they have been widely used in Zoos and Museums to promote environmental awareness. It is in this context that attempts are being made to maintain butterflies in appropriately landscaped gardens termed as "Butterfly Gardens", where the visitors can observe them in their natural settings.

Kerala, with its diverse ecosystems has a rich butterfly fauna. So far, about 322 species have been recorded from Kerala (Jaffer Palot *et al.* 2003). Recently, many of the species that were once very common in our homesteads and countryside have vanished as a result of large scale developmental activities going on in the State. Species loss has tremendous implications on the sustenance of life forms in this Universe. Hence, we need to develop strategies to conserve our biota. No conservation activity will be successful without the active participation of local communities. In this regard, educating students and the public on the significance of conserving biodiversity is the only effective means of implementing conservation activities. Establishment of a garden of flowering and ornamental plants that attract butterflies, bees and birds will be a novel idea and can form a theme of ecological and economic benefit under ecotourism programmes. Various Governmental and non governmental agencies are working towards this goal and Museums have an important role to play in conveying the conservation message to the public. The Teak Museum at Nilambur being a place of interest to both the students and the public alike, it was proposed to set up a butterfly garden in the museum campus at KFRI sub centre, Nilambur.

2. Materials and Methods

2.1. Site selection

The site selected for establishing the garden was a highly degraded moist deciduous forest patch within the KFRI sub centre campus which has been under protection since 1975. Total area of the garden comes to about 0.5 ha. The terrain was plain and the vegetation included a few trees of *Ailanthus triphysa*, *Tectona grandis*, *Grewia tiliifolia* and *Terminalia bellirica* with dense overgrowth of creepers particularly *Calycopteris floribunda*. The ground vegetation comprised mostly of shrubs like *Lantana camara* and *Chromolaena odorata*.

2.2. Landscaping and recreation of butterfly habitats

Foraging and breeding are the important activities of butterflies and hence the basic design of the garden was prepared based on the behavioural pattern of butterflies. For instance, many papilionid butterflies prefer to fly at canopy level feeding at flowers of lianas or trees. Lycaenids generally prefer damp locations and danaids prefer open spaces having bright sunshine. These butterfly habitats were created through careful landscaping and by setting up ponds, streams, waterfalls, lawns, rock gardens, streams, bushes, lianas, creepers and hedges at appropriate locations. In order to facilitate observation of butterflies that will be colonizing the various recreated habitats, a nature trail traversing the different habitats (Plate 1) was also proposed.

2.3. Introduction of host plants

Introduction of suitable host plants is very important for sustaining various butterflies in the garden. For this, basic information on the local fauna was generated after conducting a preliminary survey. Based on the data generated, a list of larval and adult host plants of local butterflies was prepared and attempts were made to procure the plants. As far as possible, the existing vegetation was retained and native plants such as

Wattakaka volubilis, Thottea siliquosa, Tylophora indica, T. camosa, Asclepias sp., *Calotropis gigantea, Carissa caranda, Ruta graveolens, Aegle marmelos, Albizia lebbeck, Cassia* spp., *Citrus* spp., *Murraya koenigii, Mussaenda luteola, M. laxa,* Cycas, palms, *Cuphea miniata, Cassia tora, Jatropha podogirica, Kalanchoe blossfieldiana, K pinnata, Ixora, Heliotropium keralense* and *Crotalaria retusa* were selected for introduction. *Heliotropium keralense* and *Crotalaria retusa* were found to attract many danaine butterflies which started roosting on the plants. The tall trees present in the vicinity of the garden were found to be a good habitat for many swift flying butterflies especially the papilionids.

3. Results

3.1. Landscaping

The project area was fenced using pre-fabricated steel frames, over which various creepers such as *Aristolochia indica, Thottea siliquosa, Passiflora edulis, Ipomoea* sp., *Wattakaka volubilis, Tylophora indica, T. camosa* etc., were introduced. These plants are known to be larval hosts of a number of butterflies. The garden was designed in such a way that different butterfly habitats such as lawns, rock gardens, streams, bushes, lianas, creepers and hedges were set up on either side of a 100m long trek path traversing the garden (Plate 1, Figs. 1-6). The width of the path was of 1.2 m. Land on either side of the path was developed into gardens by planting various nectar plants such as *Ixora* spp., *Cassia* spp., *Allamanda cathartica. Hibiscus rosa-sinensis, Cuphea miniata, Zinnia haageana,* Marigold, *Clerodendrum capitatum, Lantana camara, Murraya koenigii, Mussaenda luteola, M. laxa, Asclepias* sp., *Calotropis gigantea, Carissa caranda, Ruta graveolens, Aegle marmelos, Albizia lebbeck,* Cycas palms *Kalanchoe blossfieldiana* and *K. pinnata* were also planted within the garden to favour colonization of different butterflies. All along the outer boundary adjacent to the fence, additional larval host plants such as *Michelia champaca, Cinnamom zeylanicum, Zanthoxylum rhetsa, Strobilanthes lawsonii. Aegle marmelos. Citrus aurantium* and *Hydnocarpus pentandra* were planted. In order to create more surface area for retaining high humidity within the

garden, the terrain was made undulating through landscaping. The ground vegetation and the leaves accumulated on the ground were left undisturbed in order to favour colonization by various ground dwelling organisms. Ground litter is known to be a very favourable habitat to satyrid butterflies. A list of important butterfly host plants is given in Appendix I.

Most butterflies require high atmospheric humidity and for this, cascades, streams and ponds were also set up within the garden. There were three ponds, which were interconnected by a network of streams and a cascade set up on a mound about 4 m high. The sides of the ponds and streams were packed with river boulders. In order to facilitate circulation of water, a 375 W (0.5 HP) motor operated by a photovoltaic system was set up. Plants such as screw pine, reed, water lily and aquatic plants were planted along the sides of streams and ponds to give a natural setting. Cement benches were erected at various places for enabling the visitors to relax or make observations.

3.2. Butterfly population within the garden

Altogether about 50 species of butterflies were recorded from the garden during the period of study as presented in Appendix II. During the rainy season (June-October), large butterflies such as *Troides minos, Papilio paris, Chilasa clytia, Papilio demoleus, P. polytes, Tros hector* and *T. aristolochiae* were frequently present within the garden in addition to the large scale aggregation of the danaine butterflies *Parantica aglea, Tirumala limniace, Danaus chrysippus* and *Euploea core* on *Crotalaria retusa*. A single Crotalaria plant hosted 30-40 butterflies belonging to different danaine species. With the onset of dry condition from December onwards, there was a decline in the number of these butterflies. During the months of January to April, emigrants, grass yellow (*Eurema* spp.) and red pierrot (*Talicada nyseus*) were the common butterflies in the garden. The latter was breeding on *Kalanchoe blossfieldiana* and *K. pinnata* while the remaining two species were developing on the saplings of *Sesbania* and *Cassia fistula* respectively.

4. Conclusions

During recent years, butterfly farming has grown into a flourishing industry in several countries. In many tropical countries, butterfly farming is absolutely dependent on the native vegetation and the butterfly farmer has an inherent mutual relationship with native habitats. In Papua New Guinea, local farmers encourage the wild insects to colonise and breed in their gardens or farms by establishing the appropriate food plants. A certain proportion of the pupae are allowed to remain in the field and the remaining are collected. When the imagoes emerge, they are processed for commercial purposes. The same methods may be easily followed in our country. The project provides income for the villagers and at the same time helps to ensure the continued survival of butterflies.

The apprehension that butterfly trade might lead to depletion of the fauna is baseless. Butterfly farming is done with material made available through captive breeding in the same way as silk moth rearing. For thousands of years, the silk industry has been performing without depleting the silk moth population in the wild . In fact, the genetic diversity of the silk moth has been enriched and several races of silk moths are available. Butterfly farming will benefit people in rural areas, as it will augment their income. Also, the local dependence of local population on native species will strengthen efforts for protection of nature and natural resources. To ensure that wild butterfly population is not exploited, appropriate authority may be set up for certification of the source of material.

5. Acknowledgements

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6. References

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Appendix I. A list of larval food plants of butterflies*

No.	FAMILY / Scientific name PAPILIONIDAE	Common name	Host plant
1.	*Troides minos*	Southern Birdwing	*Aristolochia indica, Aristolochia tagala, Thottea siliquosa*
2.	*Pachliopta pandiyana*	Malabar Rose	*Thottea siliquosa*
3.	*Pachliopta aristolochiae*	Common Rose	*Aristolochia indica, Aristolochia bracteolata*
4.	*Pachliopta hector*	Crimson Rose	*Aristolochia indica, Thottea siliquosa*
5.	*Graphium sarpedon*	Common Blue Bottle	*Polyalthia longifolia, Persea macrantha, Alseodaphne semicarpifolia, Cinnamomum camphora. C. malabatrum, C. macrocarpum, Litsea chinensis, Miliusa tomentosa*
6.	*Graphium doson*	Common Jay	*Polyalthia longifolia, Miliusa tomentosa. Cinnamomum macrocarpum, C.malabatrum, Michelia champaca, Annona lawii, Magnolia grandiflora*
7.	*Graphium agamemnon*	Tailed Jay	*Polyalthia longifolia,*

			Uvaria narum, Michelia champaca, Artabotrys hexapetalus, Polyalthia cerasoides. Annona reticulata, Annona squamosa, Annona muricata, Cinnamomum spp.
8.	*Graphium antiphates*	Five bar Sword - tail	*Annona elegans, Annona lawii. Annona zeylanica. Miliusa* sp., *Uvaria* sp.
9.	*Papilio clytia*	Common Mime	*Cinnamomum zeylanicum, Cinnamomum camphora, Cinnamomum macrocarpum, Litsea chinensis, Persea macrantha, Alseodaphne semicarpifolia*
10.	*Papilio demoleus*	Lime Butterfly	*Aegle marmelos, Glycosmis arborea, Murraya koenigii, Ruta graveolens, Chloroxylon* sp., *Swietenia* sp. , *Citrus* spp.
11.	*Papilio polytes*	Common Mormon	*Atalantia racemosa, Aegle marmelos, Glycosmis arborea, Murraya koenigii, Zanthoxylum rhetsa, Citrus* spp., *Triphasia* spp.
12.	*Papilio polymnestor*	Blue Mormon	*Glycosmis arborea, Atalantia racemosa, Atalantia wightii, Paramigny monophylla,*

			Citrus spp.
13.	*Papilio helenus*	Red Helen	*Zanthoxylum rhesta, Thoddalia asiatica, Evodia roxburghiana, Clausena heptaphylla, Citrus limon, Phellodendron* sp.
14.	*Papilio liomedon*	Malabar Banded Swallowtail	*Evodia roxburghiana, Acronychia pedunculata*
15.	*Papilio dravidarum*	Malabar Raven	*Glycosmis arborea*
16.	*Papilio paris*	Paris Peacock	*Evodia roxburghiana, Thoddalia asiatica, Zanthoxylum ovalifolium, Citrus* spp.
17.	*P. buddha*	Buddha peacock	*Zanthoxylum rhetsa*
18.	*P. crino*	Common Banded Peacock	*Chloroxylon swietenia*
	PIERIDAE		
19.	*Catopsilia pomona*	Lemon Emigrant/Common Emigrant	*Bauhinia racemosa, Butea monosperma, Cassia fistula, Cassia tora, Cassia siamea, Cassia alata*
20.	*Catopsilia pyranthe*	Mottled Emigrant	*Cassia fistula, Cassia alata, Cassia tora, Cassia occidentalis, Cassia auriculata, Cassia siamea, Gnidia glauca, Sesbania grandiflora, Sesbania bispinosa*
21.	*Eurema brigitta*	Small Yellow	*Cassia kleinii, C. mimusoides*

22.	*Eurema laeta*	Spotless Grass Yellow	Leguminosus plant
23.	*Eurema blanda*	Three- spot Grass Yellow	*Albizia* spp., *Cassia fistula*, *Delonix regia*, *Mouluva spicata*, *Pithecellobium dulce*, *Cassia* sp.
24.	*Eurema hecabe*	Common Grass Yellow	*Cassia fistula*, *Cassia tora*, *Albizia spp.*, *Moullava spicata*, *Cassia alata*, *Cassia sophera*, *Cassia mimosoides*
25.	*Colias nilgiriensis*	Nilgiri Clouded Yellow	*Parochetus communis*
26.	*Delias eucharis*	Common Jezebel	*Dendrophthoe falcata*, *Helianthes elastica*, *Scurrula parasitica*, *Viscum* spp.
27.	*Leptosia nina*	Psyche	*Cleome rutidosperma*, *Cleome viscosa*, *Capparis spinosa*, *Capparis zeylanica*, *Crateva adansonii*, *Capparis rheedi*
28.	*Prioneris sita*	Painted sawtooth	*Capparis zeylanica*, *Capparis tenera*
29.	*Pieris canidia*	Indian Cabbage White	*Brassica oleracea* (Cabbage), *Rorippa dubia*, *Sisymbrium* sp.
30.	Cepora nerissa	Common Gull	*Capparis decidua*, *C. sepiaria*, *C. rheedii*, *C. zeylanica*, *Cadaba fruticosa*, *Maerua oblongifolia*

31.	*Cepora nadina*	Lesser Gull	*Capparis moonii, C. cleghornii, C. rheedii, C. roxburghii*
32.	*Anaphoeis aurota*	Caper white/Pioneer	*Cadaba fruticosa, Capparis spinosa, C. sepiaria, C. zeylanica, C. decidua, C. rheedii, C. pyrifolia, Maerua oblongifolia*
33.	*Anapheis aurota*	Caper White/ Pioneer	*Cadaba fruticosa, Capparis decidua, C. rheedii, C. sepiaria, C. zeylanica,*
34.	*Appias indra*	Plain Puffin	*Drypetes oblongifolia, Drypetes roxburghii*
35.	*A. libythea*	Striped Albatross	*Capparis cleghornii,* C. *sepiaria,* C. *zeylanica, Crateva adansonii*
36.	*Appias lyncida*	Chocolate Albatross	*Crateva adansonii, Capparis cleghornii*
37.	*Appias albina*	Common Albatross	*Drypetes oblongifolia, D. roxburghii, Drypetes venusta*
38.	*A. wardii*	Lesser Albatross	*Capparis rheedii, Drypetes venusta*
39.	*Colotis amata*	Salmon Arab	*Salvadora persica,* S. *oleoides, Azima tetracantha*
40.	C. *etrida*	Small Orange Tip	*Cadaba fruticosa, Maerua oblongifolia*
41.	*C. eucharis*	Plain Orange Tip	*Cadaba fruticosa*
42.	C. *danae*	Crimson Tip	*Cadaba fruticosa, Capparis divaricata,* C. *sepiaria,*

			Maerua oblongifolia
43.	*C. fausta*	Salmon Arab	*Capparis spinosa, Maerua oblongifolia*
44.	*Ixias pyrene*	Yellow Orange Tip	*Capparis sepiaria, C. zeylanica*
45.	*Pareronia valeria*	Common Wanderer	*Capparis zeylanica, C. rheedii*
46.	*P. ceylanica*	Dark Wanderer	*Capparis rheedii*
47.	*Hebomoia glaucippe*	Great/Giant Orange Tip	*Capparis moonii, C. spinosa, C. sepiaria, C. zeylanica, Crateva adansonii*
	NYMPHALIDAE		
48.	*Discophora lepida*	Southern Duffer	Bamboos
49.	*Parantirrhoea marshalli*	Travancore Evening Brown	*Ochlandra scriptoria*
50.	*Melanitis leda*	Common Evening Brown	Grasses
51.	*M. zitenius*	Great Evening Brown	Bamboos
52.	*M. phedima*	Dark Evening Brown	*Apluda* spp., *Cyrtococcum* spp., *Eleusine* spp., *Oplismenus ompositus, Oryza sativa, Panicum* spp., *Sorghum* spp., *Zea* spp.,
53.	*Elymnias hypermenstra*	Common Palmfly	*Cocos mucifera, Areca catechu, Arenga wightii, Calamus rotang, Phoenix* sp., *Ornamental palms*
54.	*Lethe europa*	Bamboo Tree	Bamboos

		Brown	
55.	*L. drypetis*	Tamil Tree Brown	*Bambusa arundinacea* and other bamboos
56.	*L. rohria*	Common Tree Brown	*Apluda* sp. *Capillipedium* sp., *Microstegium* sp.
57.	*M. anaxias*	White Bar Bush Brown	*Oplismenus compositus*
58.	*Mycalesis perseus*	Common Bush Brown	Grasses
59.	*M. mineus*	Dark-brand Bushbrown	Grasses
60.	*M. subdita*	Tamil Bush Brown	Grasses
61.	*M. igilia*	Small Long-brand bush brown	Grasses
62.	*M. visala*	Long-brand Bush Brown	Grasses
63.	*M. khasia*	Pale-Brand Bush Brown	Grasses
64.	*M. adolphei*	Red Eye Bush Brown	Grasses
65.	*Mycalesis patnia*	Glad Eye Bush Brown	Grasses
66.	*M. oculus*	Red Disc Bush Brown	Grasses
67.	*M. davisoni*	Lepecha Bush Brown	Grasses
68.	*Zipoetis saitis*	Tamil Cat's Eye	*Ochlandra* sp.
69.	*Orsotrioena medus*	Nigger	Grasses
70.	*Zipoetis saitis*	Tamil Cat's Eye	*Ochlandra* sp.
71.	*Ypthima asterope*	Common Three	Grasses

		Ring	
72.	*Ypthima huebneri*	Common Four-ring	Grasses
73.	*Ypthima ceylonica*	White/Ceylon Four-ring	Grasses
74	*Y. avanta*	Jewel Four-ring	Grasses
75.	*Ypthima baldus*	Common Five-ring	Grasses
76.	*Y. chenui*	Nilgiri Four-ring	Grasses
77.	*Y. philomela*	Baby Five-ring	Grasses
78.	*Y. yphthimoides*	Palni Four-ring	Grasses
79.	*Polyura athamas*	Common Nawab	*Adenanthera pavonina, Caesalpinia sappa.*
80.	*P. schreiber*	Blue Nawab	*Moulluva spicata, Rorea santaloides. Nephelium lappaceum, cynometra cauliflora*
81.	*Charaxes bernardus*	Tawny Rajah	*Tamarindus indica, Miliusa tomentosa, Aglaia elaegnoidea*
82.	*Charaxes solon*	Black Rajah	*Tamarindus indica, Moullava spicata*
83.	*Acraea violae*	Tawny Coster	*Passiflora edulis, Adenia bondala, Hibiscus cannabinus, Passiflora foetida, Passiflora subpeltata*
84.	*Cethosia nietneri*	Tamil Lacewing	*Adenia bondala, Passiflora edulis, Passiflora subpeltata*
85.	*Vindula erota*	Cruiser	*Adenia bondala, Passiflora*

			edulis. Passiflora subpeltata
86.	*Cupha erymanthis*	Southern Rustic	*Flacourtia montana Flacourtia indica. Flacourtia* sp.
87.	*Phalanta phalantha*	Common Leopard	*Flacourtia indica,Flacourtia montana, Smilax* sp., *Salix* sp., *Xylosma longifolium*
88.	*Phalanta alcippe*	Small Leopard	*Rinorea bengalensis*
89.	*Cirrochroa thais*	Tamil Yeoman	*Hydnocarpus pentandra, Hydnocarpus alpina*
90.	*Argyreus hyperbius*	Indian Fritillary	*Viola* sp.
91.	*Rohana parisatis*	Black Prince	*Celtis tetrandra*, C. *lycodoxylon*
92.	*Euripus consimilis*	Painted Courtesan	*Trema orientalis*
93.	*Neptis jumbah*	Chestnut-streaked Sailor	*Moullava spicata, Xylia xylocarpa. Thespesia populnea, Pongamia pinnata, Bombax ceiba, Bytteneria* sp., *Dalbergia* sp., *Elaeocarpus* sp., *Grewia* sp.,*Hibiscus* sp., *Ziziphus* sp.
94.	*Neptis hylas*	Common Sailor	*Xylia xylocarpa, Bombax ceiba, Helicteres isora, Mucuna pruriens, Nothapodytes nimmoniana, Vigna cylindrica, V. unguiculaba, Canavalia gladiata. Paracalyx scariosa, Corchorus* sp., *Grewia* sp., *Flemingia* sp., *Lathyrus* sp.

95.	*N. viraja*	Yellow Jack Sailor	*Dalbergia latifolia, D racemosa*
96.	*N. columella*	Short Banded Sailor	*Dalbergia* sp.
97.	*Pantoporia hordonia*	Common Lascar	*Acacia intsia, Albizia odoratissima*
98.	*Athyma nefte*	Colour Sergeant	*Glochidion velutinum*, G. *zeylanica. Mussaenda frondosa*
99.	*A. selenophora*	Staff Sergeant	*Adina cordifolia*
100.	*Athyma ranga*	Blackvein Sergeant	*Chionanthus mala –elengi, Olea dioica*
101.	*A. perius*	Common Sergeant	*Glochidion lanceolarum*, G. *velutinum, Phyllanthus* sp.
102.	*Limenitis procris*	The Commander	*Cadaba fruticosa, Hedyotis orixense, Mitragyna Mussaenda frondosa, Neolamarckia cadamba,*
103.	*Parthenos sylvia*	Clipper	*Adenia hondala, Tinospora cordifolia*
104.	*Tanaecia lepidea*	Grey Count	*Careya arborea, Melastoma malabathricum*
105.	*E aconthea*	Common Baron	*Anacardium occidentale, Mangifera indica, Loranthus scurrula, Trophis aspera, Scurrula parasitica*
106.	*E. lubentina*	Gaudy Baron	*Anacardium occidentale, Bryonia* sp., *Mangifera indica, Morus* sp.
107.	*E. nais*	Red Baron	*Diospyros melanoxylon, Shorea robusta*

108.	*Dophla evelina*	Red Spot Duke	*Anacardium occidantale, Diospyros candolleana, D. melanoxylon*
109.	*Byblia ilithyia*	Joker	*Trugia plunkenetii*
110.	*Ariadne merione*	Common Castor	*Ricinus communis, Tragia involucrata, T. plukenetii*
111.	*Ariadne ariadne*	Angled Castor	*Ricinus communis, Tragia involucrate, T. plukenetii*
112.	*Libythea myrrha*	Club Beak	*Celtis tetrandra*
113.	*Libythea lepita*	Common Beak	*Celtis tetrandra*
114.	*Junonia hierta*	Yellow Pansy	*Hygrophila auriculata, Barleria* spp.
115.	*Junonia orithya*	Blue Pansy	*Hygrophila auriculata, Lepidagathis prostrata, L. keralensis, Justicia neesii. J.procumbens*
116.	*Junonia lemonias*	Lemon Pansy	*Corchorus capsularis, Hygrophila auriculata, Sida rhombifolia, Cannabis sativa, Barleria* spp., *Nelsonia canescens*
117.	*Junonia almana*	Peacock Pansy	*Hygrophila auriculata, Phyla nodiflora, Barleria* sp., *Acanthus* sp.,*Gloxinia* sp.
118.	*Junonia atlites*	Grey Pansy	*Hygrophila auriculata, Barleria* spp.
119.	*Junonia iphita*	Chocolate Pansy	*Hygrophila auriculata. Carvia callosa, Justicia neesii*

120.	*Vanessa indica*	Indian Red Admiral	*Girardinia diversifolia. Urtica* spp.
121.	*Cynthia cardui*	Painted Lady	*Artemisisa* sp., *Blumea* sp., *Debregeasia bicolor. Gnaphalium* sp.
122.	*Kaniska canace*	Blue Admiral	*Smilax* sp., *Dioscorea* sp.
123.	*Cynthia cardui*	Painted Lady	*Artemisia* spp., *Blumea* spp., *Debregeasia bicolor*
124.	*Hypolimnas bolina*	Great Egg-fly	*Laportea interrupta. Portulaca oleracea, Sida rhombifolia*
125.	*Hypolimnas misippus*	Danaid Egg-fly	*Portulaca oleracea, Abutilon* sp., *Abelmoschus* sp., *Asystasia lawiana. Barleria cristata. Hibiscus* spp.
126.	*Doleschalia bisaltidae*	Autumn-leaf	*Gratophyllum hortrense. Urtica* sp.
127.	*Kallima horsfieldi*	Blue Oak-leaf	*Carvia callosa, Strobilanthes callosus, Lepidagathis cuspidata*
128.	*Cyrestis thyodamas*	Common Map	*Ficus* spp.
129.	*Parantica aglea*	Glassy Blue Tiger	*Calotropis gigantea, Cryptolepis buchananii, Tylophora indica, T. tenuis. Ceropegia oculata, C. bulbosa, C. fantastica. Ceropegia* sp., *Vincaefolia* sp.
130.	*Tirumala limniace*	Blue Tiger	*Asclepias curassavica.*

			Calotropis gigantea, *Tylophora indica*, *Wattakaka volubilis*, *Hoya* sp.
131.	*Tirumala septentrionis*	Dark Blue Tiger	*Wattakaka volubilis*, *Vallaris heynei*
132.	*Danaus chrysippus*	Plain Tiger/Common Tiger	*Calotropis gigantea*, *Asclepias curassavica*, *Cryptolepis buchananii*, *Frerea indica*, *Caralluma adscendens*
133.	*Danaus genutia*	Striped tiger	*Asclepias curassavica*, *Ceropegia intermedia*, *C. oculata*, *C. fantastica*, *Tylophora tenuis*, *Stephanotis* sp.
134.	*Euploea core*	Common Indian Crow	*Ficus* sp., *Hemidesmus indicus*, *Cryptolepis buchananii*, *Tylophora indica*, *Mimusops elengi*, *Asclepias curassavica*, *Nerium oleander*, *N. odorum*, *Streblus asper* *Carissa carandas*
135.	*E. klugii*	Brown King Crow	*Ficus* spp., *Ichnocarpus frutescens*
136.	*Idea malabarica*	Malabar Tree Nymph	*Aganosma cymosa*, *Parsonsia spiralis*
	LYCAENIDAE		
137.	*Abisara echerius*	Plum Judy	*Embelia robusta*, *Aralia* sp.

138.	*Spalgis epius*	Ape fly	Scale insects
139.	*Castalius rosimon*	Common Pierrot	*Ziziphus mauritiana. Z rugosa, Z. xylopyrus*
140.	*Caleta caleta*	Angled Pierrot	*Ziziphus rugosa*
141.	*Discolampa ethion*	Blue Banded Pierrot	*Ziziphus mauritiana. Z xylopyrus, Z. oenoplia*
142.	*Tarucus ananda*	Dark Pierrot	*Ziziphus xylopyrus. Dendrophthoe falcata*
143.	*T. nara*	Striped Pierot	*Ziziphus mauritiana*
144.	*Leptotes plinius*	Zebra Blue	*Albizia lebbeck, Plumbago zeylanica, Indigofera* sp., *Mimosa sp., Dyerophytum indicum*
145.	*Azanus ubaldus*	Bright Babul Blue	*Acacia nilotica, A. leucocephala*
146.	*A. uranus*	Dull Babul Blue	*Acacia arabica, A.senegalensis*
147.	*A. jesous*	African Babul Blue	*Acacia farnesiana, A leucopholea*
148.	*Everes lacturnus*	Indian Cupid	*Lotus corniculatus*
149.	*Actolepis puspa*	Common Hedge Blue	*Xylia xylocarpa. Schleichera oleosa, Paracalyx scariosa. Hiptage benghalensis. H madablota. Cratoxylum ligustinum, Cyclista scariosa*
150.	*Neopithecops zalmora*	Quaker	*Glycosmis arborea*
151.	*Magisba malaya*	Malayan	*Allophylus cobbe, Erioglosum* sp.. *Hemigyrosa* sp.

152.	*Pseudozizeeria maha*	Pale Grass Blue	*Nelsonia canescens, Oxalis corniculata, Strobilanthes* spp., *Tephrosia pauciflora*
153.	*Zizeeria karsandra*	Dark Grass Blue	*Amaranthus viridis, Zornia gibbosa*
154.	*Zizina otis*	Lesser Grass Blue	*Alysicarpus vaginalis, Sesbania bispinosa*
155.	*Zizula hylax*	Tiny Grass Blue	*Hygrophila auriculata, Lantana camara, Nelsonia canescens, Phaulopsis dorsiflora, Strobilanthes* sp., *Viola* sp.
156.	*Freyeria trochylus*	Southern Grass Jewel	*Oxalis corniculata, Pisum sativum, Lotus corniculatus, Indigofera* sp., *Goniogyna hirta, Rhynchosia minima, Vicia* sp.
157.	*Euchrysops cnejus*	Gram Blue	*Butea monosperma, Ougeinia oojeinensis, Pisum sativum, Vigna cylindrica, V. trilobata, Paracalyx scariosa, Acacia* sp.
158.	*Catochrysops strabo*	Forget me not	*Desmodium sp., Ougenia oojeinesis, Paracalyx scariosa, Schleichera oleosa*
159.	*Lampides boeticus*	Pea Blue	*Butea monosperma, Pisum sativum, Vigna sinensis, Crotalaria* sp.
160.	*Jamides alecto*	Metallic Cerulean	*Elettaria cardamomum*
161.	*Jamides celeno*	Common Cerulean	*Abrus precatorius, Butea monosperma, Pongamia*

			pinnata, Saraca asoca, Trichilia connaroides, Xylia xylocarpa, Elettaria cardamomum
162.	*Nacaduba pactolus*	Large Four-line Blue	*Entada sp.*
163.	*N. kurava*	Transparent Six-line Blue	*Embelia robusta, Ardisia humilis, Waltheria indica*
164.	*N. beroe*	Opaque Six-line Blue	*Moulluva spicata*
165.	*Prosotas nora*	Comon Line Blue	*Acacia catechu, A. torta, Pithecellobium dulce* and few unspecified families Combertaceae, Myrtaceae and Sapindaceae
166.	*P. dubiosa*	Tail less Line Blue	*Acacia* sp., *Mimusa pudica, Leucaena* sp.
167.	*Jamides bochus*	Dark Cerulean	*Butea monosperma, Millettia peguensis, Crotalaria* sp., *Pongamia pinnata, Tephrosia candida*
168.	*Talicada nyseus*	Red Pierrot	*Kalanchoe pinnata, K. laciniata*
169.	*Arhopala pseudocentaurus*	Western Centaur Oak Blue	*Lagerstoemia microcarpa, L. reginae, Terminilia alata, T. paniculata, T. catappa, Xylia xylocarpa, Hopea jucunda*
170.	*A. amantes*	Large Oak Blue	*Lagrestoemia microcarpa, Schleichera oleosa, Terminilia alata, T*

			paniculata, Xylia xylocarpa
171.	*A. abseus*	Aberrant Oak Blue	*Shorea robusta*
172.	*Thaduka multicaudata*	Many tailed Oak Blue	*Trewia nudiflora*
173.	*Surendra quercetorum*	Common Acacia Blue	*Acacia polycantha, Acacia intstia*
174.	*Iraota timoleon*	Silver Streak Blue	*Ficus benghalensis, F. racemosa, F. religiosa, Punica granatum*
175.	*Amblypodia anita*	Leaf Blue	*Olax imbricata, O. scandens*
176.	*Spindasis vulcanus*	Common Silver-line	*Allophylus cobbe, Canthium coromandelicum, Ziziphus mauritiana, Clerodendrum inerme Cadaba fruticosa, C indicum*
177.	*S. lohita*	Long-banded Silver-line	*Discorea pentphylla, Terminalia paniculata, Xylia xylocarpa*
178.	*Catapaecilma major*	Common Tinsel	*Terminalia paniculata*
179.	*Loxura atymnus*	Yam-fly	*Dioscorea pentaphylla Smilax* sp.
180.	*Cheritra freja*	Common Imperial	*Xylia xylocarpa, Saraca asoka, Ixora sp. Cinnamomum sp.*
181.	*Rathinda amor*	Monkey Puzzle	*Ixora coccinea, Eugenia zeylanica, Hopea* sp., *Loranthus* sp.
182.	*Horaga onyx*	Common Onyx	*Coriaria nepalensis*
183.	*H. viola*	Violet Onyx	*Coriaria nepalensis*

184.	*Zesius chrysomallus*	Red spot	*Terminalia paniculata. Anacardium occidentale. Psidium guava. Pterocarpus marsupium*
185.	*Rapala manea*	Slate Flash	*Antidesma acidum, A ghaesembilla, Camellia sinensis. Quisqualis indica. Ziziphus sp., Acacia pennata, A. torta, A megaladena*
186.	*Curetis thetis*	Indian Sun beam	*Abrus precatorius. Pongamia pinnata. Derris scandens, Xylia dolabriformis*
187.	*Thoressa honorei*	Madras Ace	Bamboos
188.	*Tajuria cippus*	Peacock Royal	*Dendrophthoe falcata, Helicanthes elastica. Helixanthera*
189.	*T. melastigma*	Branded Royal	*Helicanthes elastica*
190.	*Chliaria othona*	Orchid Tit/Orchard	*Cottonia macrostachys Aerides crispa, Rhynchostylis retusa*
191.	*Zeltus amasa*	Fluffy Tit	*Orchidaceae plants*
192.	*Deudorix epijarbas*	Carnelian	*Punica granatum, Cannarus ritchiei, Aesculus indicus*
193.	*D. isocrates*	Common Gauva	Inside the fruits of *Punica wanatum. Psidium fava*
194.	*D. perse*	Large Gauva Blue	Fruits of *Randia dumetorum*
195.	*Blindahara phocides*	Plane	Inside the fruits of *Salacia macrosperma. S reticulata*

196.	*Rapala manea*	Slate Flash	*Acacia megaladena, A pennata, A. torta, Antidesma acidum, A. ghaesembilla Camelia sinensis*
197.	*Rapala varuna*	Indigo Flash	*Lantana camara, Oyuisqualis indica, Sapindus laurifolia, Ziziphus rugiosa, Z. xylopyrus*
198.	*Curetis thetis*	Indian Sunbeam	*Pongamia pinnata, Derris scandens, Abrus precatorius, Xylia xylocarpa, Trichilia connaroides*
199.	C. *siva*	Shiva Sunbeam	*Ougenia dalberoides, Desmodium oojeinense*
	HESPERIIDAE		
200.	*Hasora chromus*	Common Banded Awl	*Pongamia pinnata, Ricinus communis, Trichilia connaroides*
201.	*Hasora taminatus*	White – banded Awl	*Derris scandens, Pongamia pinnata*
202.	*H. vitta*	Plain Banded Awl	*Milettia extensa, M vallida*
203.	*Badamia exclamationis*	Brown Awl	*Terminalia bellerica Combretum latifolium, C. albidum, Linociera* sp
204.	*Celaenorrhinus leucocera*	Common spotted Flat	*Carvia callosa, Echolium ligustrinum, Eranthemum roseum, Thelepaepate ixiocephala*
205.	C. *ambareesa*	Malabar Spotted Flat	*Carvia callosa, Daeda-lacanthus purpura-scens,*

			Eranthemum roseum
206.	C. *ruficornis*	Tamil Spotted Flat	*Carvia callosa*
207.	*Tagiades obscurus*	Immaculated / Suffused Snow Flat	*Dioscorea oppositifolia*
208.	*T. gana*	Suffused Snow	*Dioscorea oppositifolia*
209.	*Tagiades litigiosa*	Water snow Flat	*Dioscorea oppositifolia. Dioscorea* sp.
210.	*Pseudocoladenia dan*	Fulvous Pied Flat	*Achyranthes aspera*
211.	*Sarangesa desahara*	Common Small Flat	*Asystasia* sp., *Blepharis asperima*
212.	*Sarangesa purendra*	Spotted Small Flat	*Asystasia* sp.
213.	*Odontophilium angulata*	Banded/Chestnut Angle	*Allophylus cobbe. Ceiba pentandra, Hibiscus tiliaceus, Urena lobata*
214.	*O. ranosonnetti*	Golden Angle	*Helicteres isora*
215.	*Spialia galba*	Indian Grizzled Skipper	*Sida rhombifolia, Hibiscus sp., Waltheria indica*
216.	*Halpe homolea*	Indian Ace	Bamboos
217.	*Gomalia elma*	African marbled or mallow Skipper	*Abutilon indicum*
218.	*Psolos fuligo*	Coon	*Stachyphrynium spicatum*
219.	*Notocrypta paralysos*	Common Banded Demon	*Curcuma* sp.. *Zingiber* sp
220.	*Notocrypta curvifascia*	Restricted Demon	*Costus speciosus, Hedychium coronarium, Kaempferia rotunda Zingiber montana, Curcuma decipiens*
221.	*Udaspus folus*	Grass Demon	*Curcuma aromatica C. decipiens. Hedychium* spp

222.	*Suastus gremius*	Indian Palm Bob	*Calamus spp.,. Caryota urens, Cocos nucifera. Phoenix acaulis, P. loureirii*
223.	*Cuphita purrees*	Wax Dart	*Combretum ovalifolium. Terminalia bellirica. T paniculata, Ehretia laevis*
224.	*Baracus vittatus*	Hedge Hopper	Grasses
225.	*Hyarotis adrastus*	Tree Flitter	*Phoenix aculis*, Palms
226.	*Gangara thyrsis*	Giant Red Eye	*Calamus rotang, Caryota urens, Cocos nucifera, Phoenix acaulis. P. loureii. Licuala grandis. Ornamental* palms
227.	*Erinota thrax*	Palm Red Eye	*Cocos nucifera, Musa Saccharum* sp.
228.	*Matapa aria*	Common Red Eye	*Bambusa arundinacea*
229.	*Taractrocera maevius*	Common Grass Dart	Grasses
230.	*T. ceramas*	Tamil Grass Dart	*Oryza sativa* and other grasses
231.	*O. g!oloides*	Indian Dartlet	Grasses
232.	*Potanthus pallida*	Pallid Dart	*Oryza* spp., *Saccharum* sp., Bamboos
233.	*Telicota colon*	Pale Palm Dart	Oryza spp., Sacharum sp.. *Bamboos*
234.	*T. ancilla*	Dark Palm	*Oryza* spp.. *Sacharum* sp. Bamboos
235.	*Barbo cinnara*	Rice Swift	*Andropgon* sp.. *Cymbopogon* sp.. *Eragrostis* sp

236.	*B. bevani*	Bevan's Swift	*Imperata cylindrica* *Paspalum conjugatum* *Saccharum* spp.
237.	*Pelopidas mathias*	Small Branded Swift	Grasses
238.	*P. coniuncta*	Conjoined Swift	Bamboos and Grasses
239.	*Polytermis lubricans*	Contiguous Swift	Grasses
240.	*Baoris farri*	Paintbrush Swift	Bamboos
241.	*Caltoris kumara*	Blank Swift	Grasses

*Balakrishnan and Jaffer Palot, 2004

Appendix 11. List of butterflies sighted in study area.

PAPILIONIDAE

Troides minos Cramer*

Pachliopta hector Linnaeus *+

Pachliopta aristoloehiae Fabricius

Papilio paris Linnaeus

Papilio buddha Westwood*+

Papilio crino Fabricius

Papilio demoleus Linnaeus

Papilio helenus Linnaeus

Papilio polytes Linnaeus

Papilio polymnestor Cramer*

Papilio liomedon Moore*+

Chilasa clytia Linnaeus +

Graphium sarpedon Linnaeus

PIERIDAE

Leptosia nina Fabricius

Delias eucharis Drury*

Appias libythea Fabricius+

Catopsilia pyranthe Linnaeus

Catopsilia pomona Fabricius

Eurema hecabe Linnaeus

Eurema blanda Boisduval

ACRAEIDAE

Acraea violae Fabricius

SATYRIDAE

Melanitis leda Linnaeus

Mycalesis anaxias Hewitson +

Elymnias caudata Butler

NYMPHALIDAE

Cupha erymanthis Drury

Junonia lemonias Linnaeus

Junonia atlites Linnaeus

Junonia almana Linnaeus

Neptis hylas Moore

Hypolimnas bolina Linnaeus

Hypolimnas misippus Linnaeus +

Moduza procris Cramer

Euthalia aconthea Cramer

Ariadne merione Cramer

LYCAENIDAE

Jamides celeno Cramer

Jamides alecto Felder

Talicada nyseus Guerin-Meneville

Loxura atymnus Cramer

Rathinda amor Fabricius

HESPERIDAE

Tagiades litigiosa Moschler

Celaenorrhinus leucocera Kollar

Pelopidas mathias Fabricius

Badamia exclamationis Fabricius

Gangara thyrsis Fabricius

DANAIDAE

Danaus genutia Cramer

Danaus chrysippus Linnaeus

Tirumala limniace Cramer

Tirumala septentrionis Butler

Parantica aglea Stol

Euploea core Cram.+

+ Species included in the Wildlife (Protection) Act, 1972

* Species endemic to Western Ghats

Plate 1. Various components of the Butterfly Garden established at Nilambur