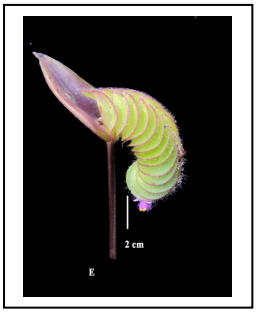
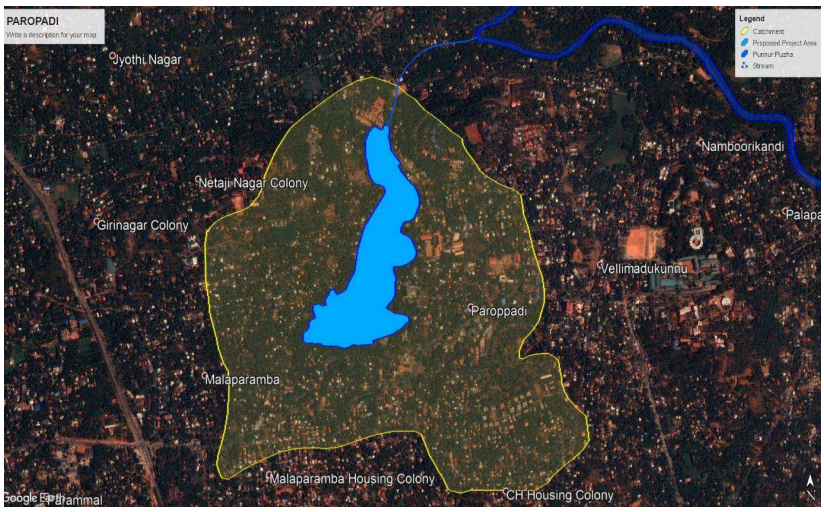
STUDIES ON THE BIODIVERSITY OF WATER BODY AREA AT PAROPADY-KANNADIKKAL AREA





Submitted to

KSCSTE - Centre for Water Resources Development and Management (CWRDM), Kozhikode

by

PROVIDENCE WOMEN'S COLLEGE,

(Reaccredited with A+ by NAAC,

College with Potential for Excellence status)

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INTRODUCTION

Paropady - Kannadikkal area under study is a combination of different ecosystems like aquatic, wetland etc. Aquatic ecosystems perform numerous valuable environmental functions. They recycle nutrients, purify water, attenuate floods, augment and maintain stream flow, recharge ground water, and provide habitat for wildlife and recreation for people. Rapid population increases accompanied by intensified industrial, commercial, and residential development— have led to the pollution of surface waters by fertilizers, insecticides, motor oil, toxic landfills etc.

Wetlands, one of the most productive ecosystems of the world, are rich in floral and faunal biodiversity and harbor great number of species including several endangered and threatened ones Wetlands form breeding and feeding ground for numerous resident and local and migratory water birds and several other lesser known species, and also have immense socio - economical, ecological, and aesthetical importance and provide a productive life supporting system. Wetlands are one of the most threatened ecosystems of the world (Turner, 1991), for various reasons (Conservation of Kottuli wetlands, Calicut, Kerala)

Given their abundance in many landscapes, small waters are likely to play an important role in ecosystem services, including mediating pollution control and carbon cycling, providing small scale water supply, and supporting healthy fisheries.

Small waterbodies, including ponds and small lakes, low-order streams, ditches and springs, are the most numerous freshwater environments globally, are critical for freshwater biodiversity and are increasingly recognised for their role in ecosystem service delivery. Small waters often represent the best remaining examples of intact freshwater habitats and are the most likely to remain unpolluted, often being a refuge for species which have disappeared from larger, more damaged, waterbodies. Practically all water-related ecosystem services are initially mediated by small waters and some, such as carbon cycling, may be dominated by them. Small waters are exposed to all the threats affecting larger waters, and some experienced only by small waters.

The area is promising in the sense, major part of it is undisturbed and is a perennial catchment area for water. In this context, a survey was undertaken to study the floral and faunal diversity

Field visits followed by surveys, collection, and preparation of specimens toward building an inventory of floral diversity of the area, was taken up. Phytosociological studies were conducted to assess the composition, diversity, distribution, and their status in the nature. During the study, the phenological aspects of trees and shrubs were taken into consideration. Apart from this, emphasis has been given on the plant species belonging to rare, threatened, and endangered categories included in the IUCN Red Data Book.

Objectives of the Present survey

- Obtain an understanding of the vegetation communities in the area
- Ascertain the heterogeneity of the study area and vegetation communities
- Record all floral and faunal diversity
- Find the potential distribution of threatened plants

MATERIALS AND METHODOLOGY

1.1 The study area - Waterbody at Paroppadi

Waterbody at Paroppadi forms part of Korappuzha River basin which drains through Kozhikode District of Kerala State. The waterbody is having a catchment area of about 2.0 Km2,drains to the nearby stream and then joins one of the tributaries of Korapuzha River known as Punur-puzha as shown in Figure. As per the drawing prepared along with the original proposal by the Town Planning Department, the total project area is about 60 acres and is spread in two villages namely Chevayoor and Vengeri

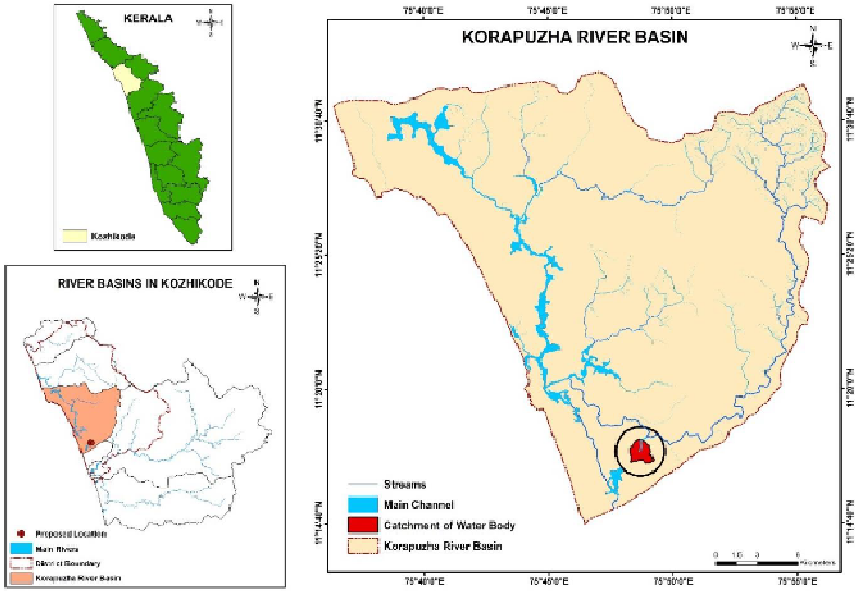


Fig. 1 Location map of waterbody at Paroppadi

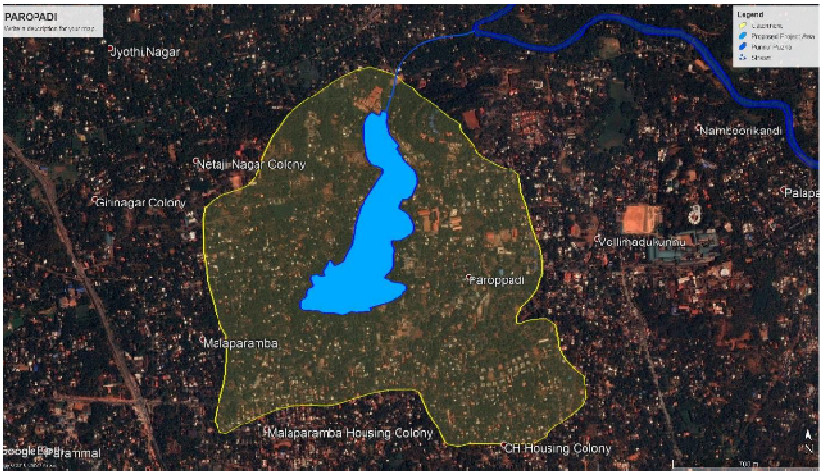


Fig. 2 Catchment area of waterbody at Paroppadi

1.2 METHODOLOGY

Documentation of biodiversity in a project area and its immediate surroundings is advisable in the case of any developmental projects, to ensure that ecological setup of the area do not degrade and in effect is improved. In the case of projects that aim at ecological value addition of a location, conservation of an ecosystem such as wetlands, and promoting non-consumptive use of environmental resources it is imperative to record the ecological baseline information. For understanding the impact of a proposed project, it is better to prioritize the conservation issue s, in terms of flora and fauna, in addition to other base line parameters.

To collect data and information on specific components of the ecological system and pertinent issues widely used standard scientific methods were adopted. Field surveys were undertaken for collecting relevant data.

To document the vegetation of the area and conduct floral enumeration, quadrant method was followed. However, the mangrove patches being discontinuous no quadrants were laid in those patches. All individual plants having more than 10 cm GBH (Girth at Breast Height) were included in the tree category. Plots of 1 x 1 m were laid within each tree quadrant at its each corner to record the shrubs and herbs respectively.

In each quadrant, species and their number were recorded. Plants were identified using the flora volumes such as Gamble (1916-1935, 1957), Matthew (1987, 1989), Manilal and Sivarajan (1982). Abundance, relative abundance, density and relative density of each species were calculated using the numerical data (Ludwig and Reynolds 1988). The data were used for analyzing secondary parameters such as density, frequency and abundance using standard phytosociological methods(Table1).The Shannon-Wiener's index of diversity (H') was calculated using the software 'Species diversity and richness (version 2.65)

1.3 Collection Methods

For studying floral diversity, specimen collection is one of the important aspects. All details related to each plant species were recorded including local name of species, family, altitude, habit and habitat, scientific name. Characteristics were recorded for developing a Digitized herbarium, for preserving the form, color and features in its originality.

1.4 Data Analysis : The data collected was computerized and maintained as excel worksheets and subjected to simple analysis. The important quantitative analysis such as density, frequency, and abundance of tree species were determined as per Curtis and McIntosh (1950).

A) Abundance : It is the study of the number of individuals of different species in the community per unit area. By quadrant method, samplings are made at random at several places and the number of individuals of each species was summed up for all the quadrants divided by the total number of quadrants in which the species occurred. It is represented by the equation:

Abundance =

$$\frac{Total\ number\ of\ quadrats\ in\ which\ the\ species\ occured}{Total\ number\ of\ individuals\ of\ a\ species\ in\ all\ quadrats}$$

B) Frequency: This term refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage of occurrence. It was studied by sampling the study areas at several places at random and recorded the name of the species that occurred in each sampling units. It is calculated by the equation:

Frequency (%) =

$$\frac{Number\ of\ quadrats\ in\ which\ the\ species\ occured}{Total\ number\ of\ quadrats\ studied}\ X\ 100$$

C) Density: Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrats is divided by the total number of quadrats studied. Density is given by the equation:

Density =

$$\frac{Total\ number\ of\ individuals\ of\ a\ species\ in\ all\ quadrats}{Total\ number\ of\ quadrats\ studied}\ X\ 100$$

Identification of Fauna

Identification of the various species was made following Balogh (1965, 1972), Balogh and Balogh (1990, 2002) and Haq and Ramani (2003). All scientific names followed in the present study are in accordance with Varsheny (1983) and common English names follow Wynter-Blyth (1957) . Identification of dragon flies is as per Fraser, 1993, Birds as per, Sashikumar et al. (2011) and fishes were identified, classified and arranged based on the works of Talwar and Jhingran (1991)

RESULTS AND DISCUSSION

Picturesque location

Kerala is said to be one among the fifty ‘ must see destination s’ in the world (Jacob 2003).Its unique landscape, climate, culture, festivities , and tradition coupled with varied, fascinating and splendorous environmental backdrop make Kerala one of the popular tourist destinations. In addition to the picturesque landscape, greenery, and backwaters, traditional ayurvedic rejuvenation centres labeled under ‘medical tourism’ make tourism a promising industry in the state.

Wetlands are extremely important areas throughout the world for wildlife protection, recreation, sediment control, flood prevention. Wetlands are important habitats for different species of fauna and use them for feeding, roosting, nesting and rearing young .Wetlands of Kerala are perhaps the least studied ecosystems, in Kerala, the wetlands are mainly used for agriculture, aquaculture, reclamation for harbouring and industrial purposes, disposing the waste materials, discharging the industrial effluents and municipal waste water, wood seasoning, dumping dredged soil, coir retting and for fishing. The side selected for the study is the area near the freshwater lake on the unused water-logged paddy field on the western side of the Paroppady-Kannadikkal road. The projected site is connected to the Kannadikkal River by a man-made canal. It gets flooded during monsoon due to overflow from the river. During dry seasons, water flows back to the river and little amount of water remains in the land even in the driest season and act as store the flood waters and storm waters.

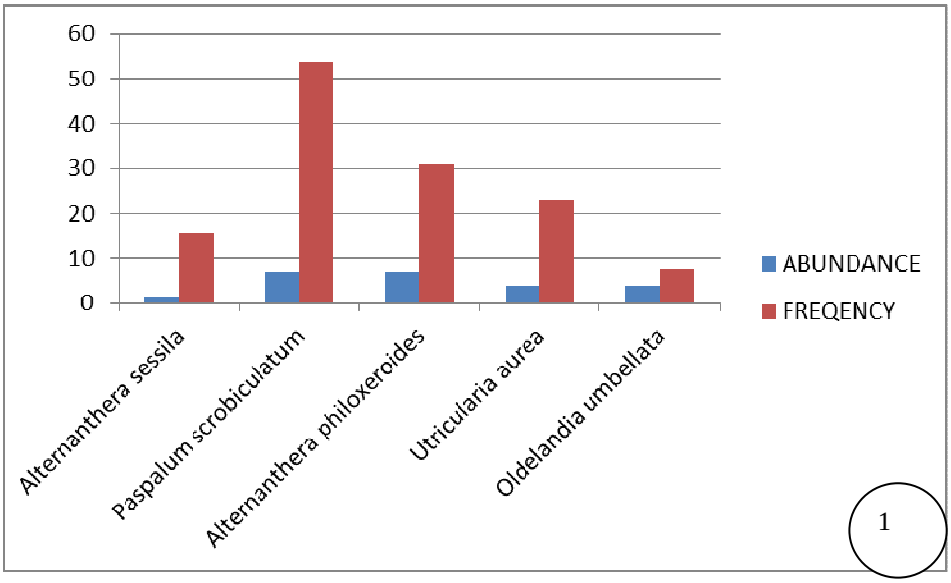
Habitat fragmentation and deterioration quality are two of the major threats to biodiversity5. These threats can be narrowed down to human dominated landscape which forms a substantial and ever increasing amount of the earth’s land surface6. However, even a minor change in the ecosystem may affect their survival and many species are likely to become extinct. It has been stated that extinction of a single species may trigger the extinction of several other species that are related to it. The objective of this study was to conduct preliminary observation of the diversity of species with large population .Systematic list of the different groups of this region is lacking. Hence the present study documented the different species mainly by direct observation and block count from July 2018 to October 2018

2. DOCUMENTATION OF DIVERSIY OF THE AREA

2.1 Vegetation diversity in the area

From the surveyed area, a total of 95 floral species, belonging to 25 families and carnivorous plant species like *Utricularia aurea* (Fig.4) were documented. Of the species of plants, habit diversity was also observed in that 60 species were herbs, 10 climbers, 2 ferns, 11 shrubs, 10 trees, pteridophytes 1, and rhizomatous plants 2. The family with largest number of species was Euphorbiaceae, having more than 8 members growing in the area.

Among the aquatic vegetation in the project area the most striking ones attention were mangrove species such as *Acanthus ilicifolius, Aegiceras corniculatum, Avicennia* sp., mangrove associates like *Clerodendron* sp *Clerodendrum paniculatum, Pandanus* sp, *Wedelia chinensis* etc, hydrophytes like *Salvinia molesta*, weedy spp *Acalypha indica, Mimosa invasa, Mimosa pudica* etc and cultivated species *Anacardium occidentale, Cocos nucifera Ficus hispida, Mangifera indica.* Only 10.5% of the total number of species recorded from the area were tree species. The common tree species recorded were *Anacardium occidentale, Artocarpus* sp., Herbs were dominant in the area with 63.15% of the documented population, two species of *Cyanotis*, one of which is reportedly threatened *Cyanotis cristata* was also documented from the area (Fig. 2,3)



The above graph, Fig.1, shows the abundance and frequency of most common herbs of the area. *Paspalum scrobiculatum* is a millet members which was used as food crop earlier in India**.** Table 1 lists the diversity of plants documented in the area

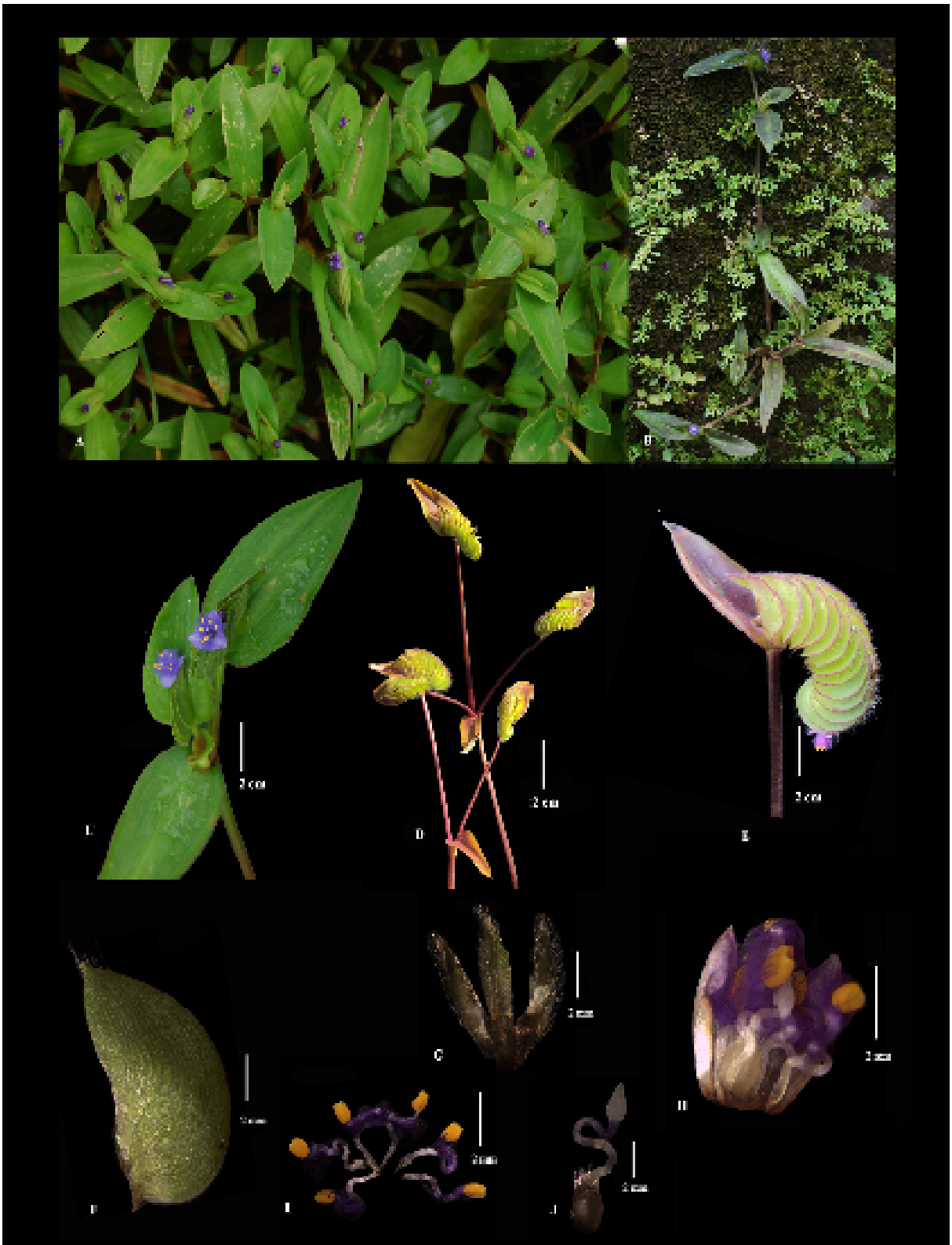
Table 1 Preliminary list of floral diversity :

	Name	Family	IUCN status	Relevance
1.	*Abelmoschus moschatus* (H)	Malvaceae	Cultivated	
2.	*Acalypha indica* L. (S)	Euphorbiaceae	Prolific weed	**Leaf area Index 4.5 (Shrub & Groundcover - Dicot**)
3.	*Adiantum caudatum* L. (Ferns & Allies)	Adiantaceae	Occassional	
4.	*Allopterosis cimicina* (H)	Poaceae		
5.	*Alternanthera bettzickiana* (Regel) G.Nicholson (H)	Amaranthaceae	Recurrent	**Environmental importance- erosion control**
6.	*Alternanthera brasiliana* (H)	Amaranthaceae		
7.	*Alternanthera tenella* var. *Tenella* (H)	Amaranthaceae	Prolific weed	Immunomodulatory and anti-inflamatory
8.	*Alternathera sessile* (H)	Amaranthaceae	Least concern	Herbal medicines
9.	*Alysicarpus ovalifolius* (H)	Fabaceae	Weed	Nitrogen fixation
10.	*Amaranthus spinosus* (H)	Amaranthaceae	Noxious weed	
11.	*Anacardium occidentale* (T)	Anacardiaceae	Cultivated	Food value
12.	*Bambusa bambos* (T)	Poaceae	Threatend	
13.	*Biophytum sensitivum* (H)	Oxalidaceae		Ethanobotanical importance
14.	*Calycopteris floribunda* (C	Combretaceae		Medicinal importance
15.	*Cardiospermum halicacabum* (H)	Sapindaceae	Weed	Medicinal importance
16.	*Cassia tora*(H)	Fabaceae	Weed	Nitrogen fixation
17.	*Centella asiataca* (H)	Apiaceae		Phytoremediation
18.	*Chesalia curviflora* (S)	Rubiaceae	Critically endangered	
19.	*Chromolaena odorata(S)*	Asteraceae	Invasive weed	Ethanopharmaceuticalm portance
20.	*Chrozophora plictata* (H)	Euphorbiaceae	Least concern	
21.	*Chrysopogon aciculatus* (H)	Poaceae	Invasive	Ethanobotanical
22.	*Cleome burmanii* (H)	Capparaceae	Cosmopolitan	Archeology
23.	*Cleome viscose* (H)	Capparaceae		Ethanobotanical
24.	*Clerodendron* sp (S)	Verbenaceae		Medicinal property
25.	*Clerodendrum paniculatum(S)*	Verbenaceae	Least	Medicinal property

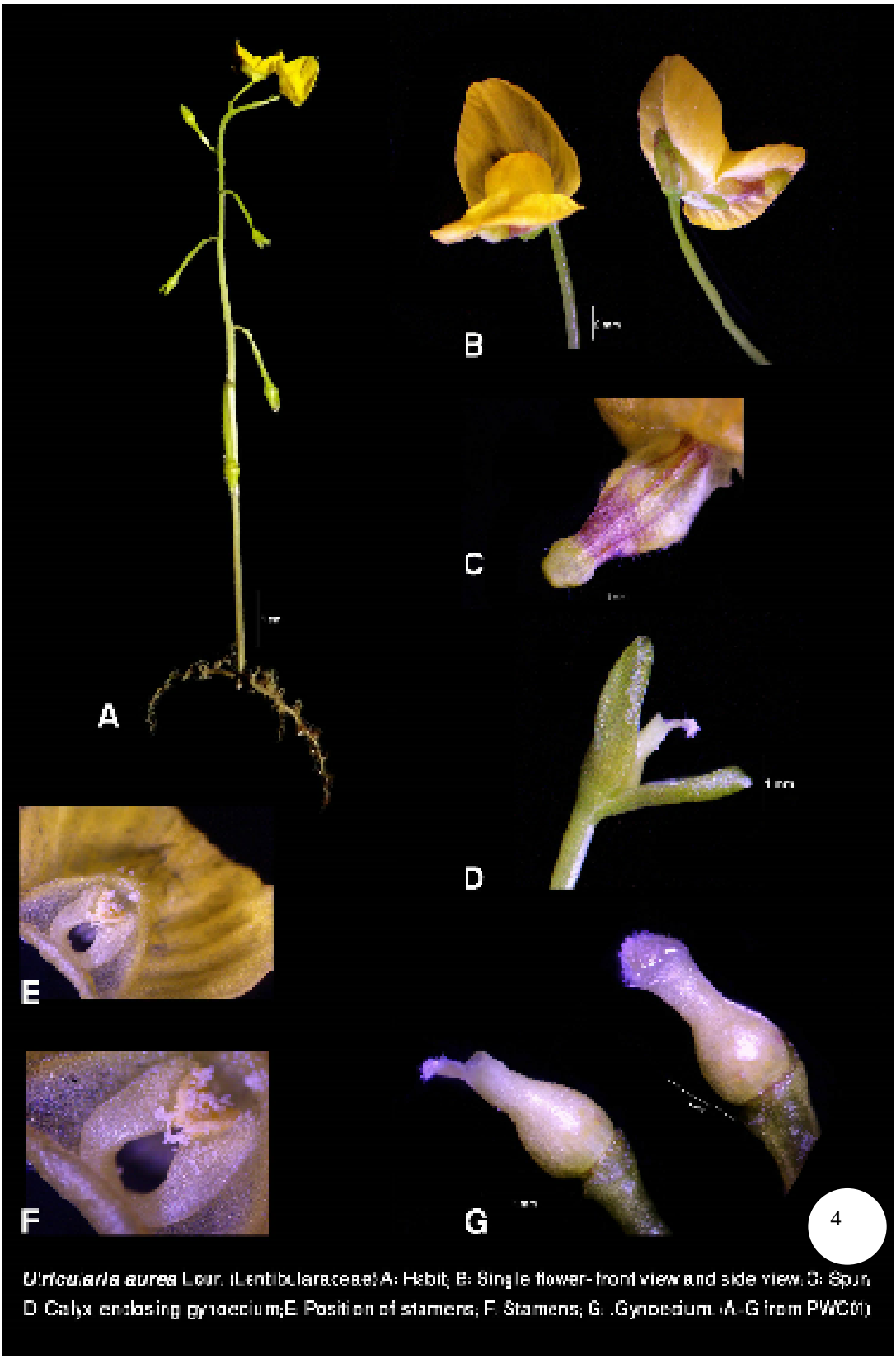
			concern	
26.	*Coccinia grandis* (C)	Cucurbitaceae		Food value
27.	*Tiliocora acuminata* (C)	Menispermaceae		Anti microbial Phytochemical
28.	*Cocos nucifera* (P)	Arecaceae		Food value Diuretic Cosmetics
29.	*Colocasia esculenta* (H-C)	Araceae		Food value
30.	*Commelina bengalensis* (H)	Commelinaceae		Medicinal property
31.	*Commelina diffusa* (H)	Commelinaceae	Threatened	Medicinal property
32.	*Convolvulus arvensis* (H)	Convolvulaceae	Threatened	Toxic effect
33.	*Costus speciosa* (RH)	Costaceae	Threatened	Medicinal importance
34.	*Curcuma aeruginosa* (RH)	Zingiberaceae	Threatened	Medicinal importance
35.	*Cyanotis cristata* (H)	Commelinaceae	Threatened	Food value
36.	*Cyclea peltata (*C)	Menispermaceae	Threatened	Medicinal plant
37.	*Cyperus compresses(*H)	Cyperaceae	Threatened	pharmacological
38.	*Cyperus rotundus* (H)	Cyperaceae	Threatened	Medicinal
39.	*Cyperus tenuispica* (H)	Cyperaceae	Least concern	Phytochemical importance
40.	*Dactyloctenium aegyptium* (H)	Poaceae	Near threatened	Pharmacological importance
41.	*Desmodium triflorum* (H)	Fabaceae	Threatened	Medicinal importance
42.	*Digitaria bicornis* (H)	Poaceae		
43.	*Digitaria ciliaris* (H)	Poaceae	Threatened	
44.	*Dipteracanthus prostrates* (H)	Acanthaceae	Endemic	Bioactive property Medicinal
45.	*Emilia sonchifolia* (H)	Asteraceae	Vulnerable	Phytochemical, Pharmacological
46.	*Eragrostis unioloides* (H)	Poaceae		**Control soil erosion**
47.	*Euphorbia hirta (H)*	Euphorbiaceae		Anti cancerous property
48.	*Evolvulus nummularis* (H)	Convolvulaceae		Controll soil erosion
49.	*Ficus hispida* (T)	Moraceae		Ethanomedical importance
50.	*Grewia nervosa* (S)	Tiliaceae		Medicinal property
51.	*Kyllinga triceps* (H)	Cyperaceae		Pharmacological effect
52.	*Leea indica* (S)	Leeaceae		Phytopharmacology
53.	*Lessingianthus elegans* (H)	Asteraceae		Medicinal property
54.	*Lindernia ciliata* (H)	Scrophulariaceae		Medicinal property
55.	*Macaranga peltata* (T)	Euphorbiaceae		Timber
56.	*Mallotus philippensis* (T)	Euphorbiaceae		Medicinal property
57.	*Mangifera indica* (T)	Anacardiaceae		Anti oxidant activity
58.	*Mariscus bulbosus* (H)	Cyperaceae		
59.	*Merremia vitifolia* (C)	Convolvulaceae		Medicinal property
60.	*Mikania micrantha* (C)	Asteraceae		**Prevent soil erosion**
61.	*Mimosa invasa (C)*	Mimosaceae		toxic
62.	*Mimosa pudica (*H)	Mimosaceae		Medicinal property
63.	*Mitracarpus villosus* (H)	Rubiaceae		Medicinal property
64.	*Mollugo nudicaulis* (H)	Aizoaceae		Medicinal property
65.	*Murdannia nudiflora* (H)	Commelinaceae		Analgesic activity

66.	*Mussanda frondosa(S)*	Rubiaceae		Medicinal property
67.	*Nephrolepis* sp (F)	Pteridaceae		Ornamental
68.	*Pandanus* sp (S)	Pandanaceae	Threatened	Ethanopharmacology
69.	*Paspalum scrobiculatum*(H)	Poaceae		Food value
70.	*Passiflora foetida(C)*	Passifloraceae		Pharmacology
71.	*Peperomia pellucida (H)*	Piperaceae		Ethanomedical
72.	*Phyllanthus niruri(H)*	Euphorbiaceae		Pharmacuitical importance
73.	*Phyllanthus urinaria* (H)	Euphorbiaceae		Anti-cancerous effect
74.	*Pilea microphylla* (H)	Urticaceae		Medicinal property
75.	*Pouzolzia zeylanica* (H)	Urticaceae		Medicinal property
76.	*Psidium guajava (T)*	Myrtaceae		Pharmacuitical importance
77.	*Racosperma auriculiforme* (T)	Fabaceae		Nitrogen fixation
78.	*Ruellia tuberose* (H)	Acanthaceae		Ethnobotanical importance
79.	*Saccharum officinarum (S)*	Poaceae	Not evaluated	**Stress indicator**
80.	*Salvinia molesta (H)*	Salvinicaeae		**Eutrophication**
81.	*Scoparia dulcis* (H)	Scrophulariaceae	Critically endagered	Medicinal property
82.	*Sebastiana chamaeliae*(H)	Euphorbiaceae	Endemic	
83.	*Sida acuta (H)*	Malvaceae	Threatened	Neuropharmacological effects. Medicinal properties
84.	*Sida rhombifolia (H)*	Malvaceae	Threatened	Pharmacuetical property
85.	*Smilax zeylanica* (CS)	Liliaceae		In vitro anti oxidant activity
86.	*Spermacoce latifolia* (H)	Rubiaceae		Cytotoxic
87.	*Synedrella nodiflora* (H)	Asteraceae		Anti proliferative
88.	*Tragia involucrata* (C)	Euphorbiaceae		Medicinal property
89.	*Trema orientalis* (T)	Urticaceae	Least concern	Medicinal property
90.	*Tridax procumbans (H)*	Asteraceae		Medicinal property
91.	*Utricularia aurea* (H)	Lentibulariaceae	Suspended aquatic carni vorous plant	**Pollution indicator**
92.	*Vinca minor* (H)	Apocyanaceae		**Prevent erosion**
93.	*Vitex negundo* (S)	Verbenaceae		Heptotoxic
94.	*Wedelia chinensis* (H)	Asteraceae		Medicinal property
95.	*Ziziphus oenoplia* (T)	Rhamnaceae		Medicinal

Cyanotis axillaris (L.) Sweet (Commelinaceae) A. Plants in the natural habit; B. Inflorescence; C. Single flower; D. Calyx; E. Corolla split opened; F. Stamens; G. Gynoecium; H. Fruit

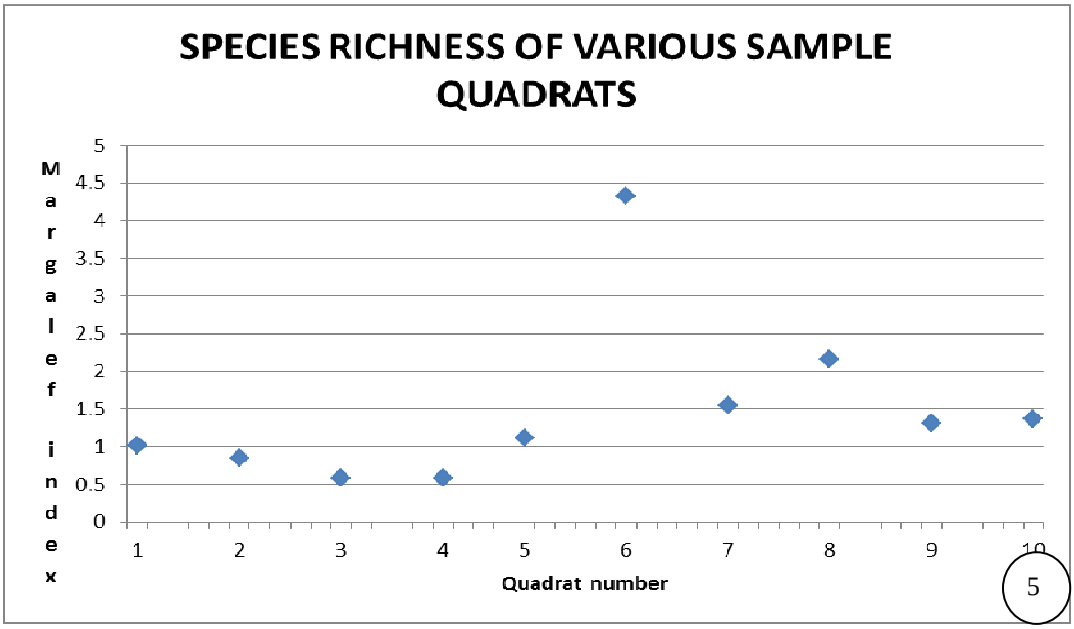


Cyanotis cristata (L.) D Don A & B. Plants in the natural habit; C & D. Inflorescence; E. Cincinnus; F. Bracteole; G. Calyx; H. Corolla split opened; I. Stamens; J. Gynoecium



Utricularia aurea Lour. (Lentibulariaceae) A: Habit; B: Single flower- front view and side view; C: Spur; D Calyx enclosing gynoecium;E Position of stamens; F. Stamens; G. .Gynoecium. (A -G from PWCM)

Data Analysis : Diversity indices divulge information about the composition of the plant community in addition to species richness (number of species), since the relative abundance of different species present in the area are also taken into account. Species diversity was indexed using Shannon diversity Index, which accounts for both abundance and evenness of the species present, and commonness and rarity of the species . This would help ecologists to understand the community structure. The proportion of species relative to the total number of species is calculated. The highest species richness observed is 4.5 in latitudes of 11.2938041”N, longitude 75.8289842”E. It suggests greater abundance in distribution pattern of plant species (Figs. 5,6). Shannon index of diversity and Margalef index for each quadrants were calculated separately and the total average was calculated. Thus it is to be concluded that these indexes are relatively high and indicating the urgent need to conserve this ecological fertile land.



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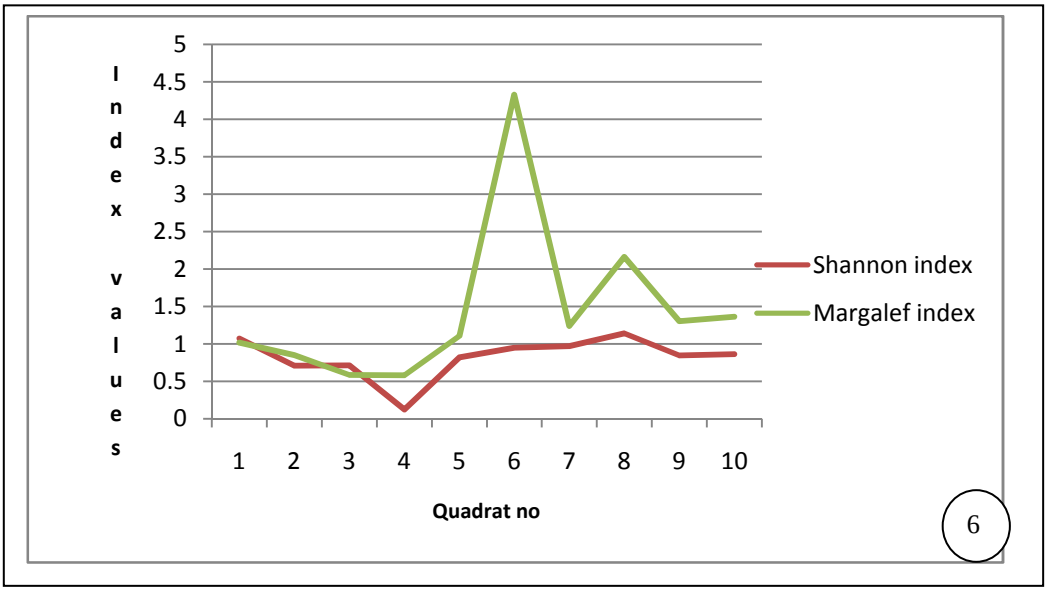


TOTAL	
SHANNON INDEX OF DIVERSITY	1.002
MARGALEF INDEX OF RICHNESS	4.859

2 Faunal Diversity of the Field Area

A rapid survey could be recorded and a total of 129 species belonging to a few selected fauna were the species of ants, oribatid mites ,plant mites butterflies (Fig. 7 a-f) , bees, dragon flies, crab, prawn, pisces, amphibians, reptiles aves and mammals, (Table 2)

Table 2. List of the number of species collected.

Sl.No	Fauna	No.of Species
1.	Ant	4
2.	Oribatid Mites	16
3.	Plant Mites	6
4.	Butterflies	27
5.	Bees	2
6.	Dragon Flies	17
7.	Crab	2
8.	Prawn	2
9.	Pisces	18
10.	Amphibians	4

11.	Reptiles	8
12.	Aves	20
13.	Mammals	5
Total		129

The detailed studies were concentrated on oribatid mites, butterflies, dragonflies of invertebrates and from vertebrate classes the ampbhibians, reptiles,aves and mammals

2.2.1 Oribatid mites

Many investigators have established a positive correlation between the organic matter of the soil and oribatid population density The distribution and abundance of oribatid mites are largely influenced by soil texture especially the organic content and vegetation. Soils rich in organic carbon content are known to support high diversity of these mites The oribatid mites exert diverse feeding trends which enable them to play significant role in bioprocessing of organic litter through their mechanical breakdown, microbial inoculation and also stimulation of micro flora The soil/litter samples were collected from various litter accumulated area from v. Samples were collected from the above sites frequently, with the aid of scoop/showel arous sites and transferred to polythene bags and transported to the laboratory. The collected soil samples were subjected to modified Berlese-Tullgren funnel extraction in the laboratory. The extracted mites were sought for taxonomical studies. A total of 16 species belonging to 9 genera, 7 families and 4 superfamilies could be collected from the various sites selected in this area (Table 3).

Table 3 :Systematic Position of the Oribatid Species Collected During the Study: Based on Subias 2007 World Oribatid Catalogue

Sl.no	**Superfamily**	**Family**	**Genus**	**Subgenus**	**Species**
1	Galumnoidea Jacot, 1925	Galumnidae Jacot, 1925	*Galumna* Von Heyden, 1826	*Galumna* (*Galumna*) Von Heyden, 1826	*Galumna flabellifera* Hammer, 1958
2	Microzetoidea Grandjean, 1936	Microzetidae Grandjean, 1936	*Berlesezetes* Mahunka, 1980		*Berlesezetes brazilozetoides* Balogh and Mahunka,1981
3	Oppioidea Sellnick, 1937	Oppiidae Sellnick, 1937	*Oppia* Koch,1936		*Oppia kuehnelti* Csizar,1961
4	“	“	*Ramusella*	*Ramusella*	*Ramusella*

			Hammer, 1962	*(Ramusella)* Hammer, 1962	*philippinensis* (Mahunka, 1982)
5	"	"	*Corynoppia* Balogh, 1983		*Corynoppia sp.*
6	Oripodoidea Jacot, 1925	Caloppiidae Balogh, 1960	*Chaunoproctus* Pearce, 1906		*Chaunoproctus abalai* Bhaduri, Bhattacharya & Chakrabarti, 1975
7	"	Haplozetidae Grandjean, 1936	*Trachyoribates* Berlese, 1908	*Trachyoribates (Rostrozetes)* Sellnick, 1925	*Trachyoribates* sp.
8	"	"			*T.(Rostrozetes) foveolatus* Sellnick, 1925
9	"	Scheloribatida e Jacot, 1935	*Scheloribates* Berlese, 1908	*Scheloribates* (*Scheloribates*) (Berlese, 1908)	*Scheloribates praeincisus interruptus* Berlese, 1916
10	"	"			*S.praeincisus* Berlese, 1910
11	"	"			*S. praeincisus rotundiclava* Perez indigo &Baggio, 1986
12	"	"			*S. praeincisus fijiensis* Hammer, 1971
13	"	Protoribatidae Balogh &Balogh,1984	*Protoribates* Berlese,1908		*Protoribates triangularis* Hammer, 1971
14	"	"	"		*P.bisculpturatus* Mahunka, 1988
15	"	"	"	"	*P .punctata* Grobler,1991
16	"	"	"	"	*P.seminudus* Hammer, 1978

2.2.2 Odonata (Dragon flies)

The data on the odonata (Insecta) fauna of Kerala state, south India has been limited to the study of Fraser (1933, 1934 & 1936) from Kerala part of the southern Western Ghats, Peters (1981) from the Thiruvananthapuram district, Rao and Lahiri (1982) from the Silent Valley National Park, Mathavan *et. al.* (1989) from the Periyar Tiger Reserve and Emiliyamma and Radhkrishnan (2000) from the Parambikulam Wildlife Sanctuary, the study on the odonata

fauna occurring in a paddy field habitat at Palakkad district of Kerala. Palot *etal.,(2005).* Rice fields are excellent habitats for the study of odoantes, as such areas are ideal foraging grounds, with more open environs, providing a large number of insect pests (prey-population) for the odonates to predate upon.

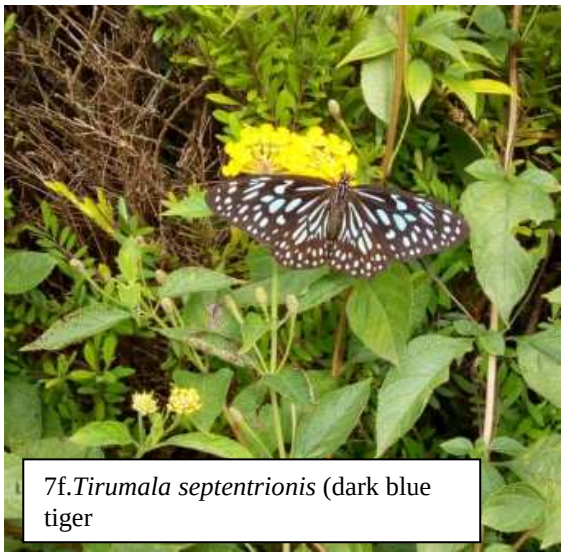
7a. EUPLOEA CORE

7.b *Neurothermis tullia*

7c *Rhyothemis variegata*

7d.*Graphium Aaamemnon* (tailed jay)

7e. Channa marullias



7f.*Tirumala septentrionis* (dark blue tiger

Altogether 17 species under 13 genera of 3 families were recorded during the study. During the study family Libellulidae dominated the odonate fauna in this study site with 11 genera and 15 species (Table 4).

Table 4. Systematic position of odonates (dragon flies)

Sl.no	Family	Genus	Species
1	Aeshnjdae	*Gynacantha*	*Gynacantha bayadera(* Selys)
2	Gomphidae	*Ictinogomphus*	*Ictinogomphus rapax*
3	Libellulidae	*Brachythemis*	*Brachythemis contaminata*
4		*Bradinopyga*	Bradinopyga geminata
5		*Crocothemis*	*Crocothemis servilia* (Drury)
6		*Diplacodes*	*Diplacodes trivialis* (Rambur)
7			*Diplacodes sp.*
8			*Diplacodes sp.*
9		*Indothemis*	*Indothemis carnatica*
10		*Orthetrum*	*Orthetrum sabina sabina* (Drury)
11			*Orthetrum taenio/atum* (Schneider)
12		*Neurothemis*	*Neurothemis tuIlia tuLlia* (Drury)
13			*Neurothemis intermedia intermedia* (Rambur)
14		*Trithemis*	*Trithemis aurora* (Burmeister)
15			*Trithemis pallidinervis* (Kirby)
16		*Rhyothemis*	*Rhyothemis variegata variegat* (Linnaeus)
17		*Pantala*	*Pantala flavescens* (Fabricius)

Butterflies (Lepidoptera: Rhopalocera) are one of the most plant dependent group of insects when compared to other mega diverse insect groups. They are one of the labour forces that help

in pollination; a key stone ecological process in natural sustainability throughout the world. They enhance the earth's beauty incontestably and add an aesthetic element to the ambient environment2. Butterflies bring about in nature a visual treat and are thus considered as the "fluttering jewels of nature.

A total 27 species belonging to 22 genera and 3 families were recorded during the study period**.** On the basisof number of collected species family Papilionidae with 10species and Nymphalidae was and with 7 species. Out of the species collected. *Troides minos (*Southern Birdwing), *Atrophaneura pandiyana* (Malabar Rose) and *Papilio dravidarum (*Malabar Raven) are endemic toWestern Ghats.The species *Euploea klugii, Appias albiniaa and Pachliopta hectornd* are rare species.The species *Euripus consimilis, Pachliopta aristolochiae* and Papilionidae are very rare species (Table 5).

Table 5. Systematic position of butterflies

Si.no	Family	Genus	Species
1	Papilionidae	*Troides*	*Troides minos*
2		*Atrophaneura*	*Atrophaneura pandiyana*
3		*Pachliopta*	*Pachliopta hector*
4			*Papilio dravidarum*
5			*Papilio polymnestor*
6			*Papilio polytes*
7			*Papilio budha*
8		*Pachliopta*	*Pachliopta aristolochiae*
9			*Pachliopta hector*
10		*Graphium*	*Graphium agamemnon*
11	Pierideae	*Eurema*	*Eurema hecabe*
12		*Delias*	*Delias eucharis*
13		*Leptosia*	*Leptosia nina*
14		*Eurema*	*Eurema blanda*
15		*Catopsilia*	*Catopsilia Pomona*
16		*Appias*	*Appias albinia*
17		*Catopsilia*	*Catopsilia pyranthe*
18	Nymphalide	*Pantoporia*	*Pantoporia hordonia*
19		*Tirumala*	*Tirumala limniace*
20		*Mycalesis*	*Mycalesis mineus*
21		*Acraea*	*Acraea violae*
22		*Tirumala*	*Tirumala septentrionis*

23		*Euploea*	*Euploea core*
24		*Hypilimnas*	*Hypilimnas bolina*
25		*Neptis*	*Neptis hylas*
26		*Euploea*	*Euploea klugii*
27		*Junonia*	*Junonia iphita*

Random surveys were conducted in almost all parts of the study area to document the Pisces, Amphibians, Reptiles Aves and Mammals. 18 species of Pisces, 4 species of Amphibians,8 species of reptiles,22 species of Aves,5 species of mammals were recorded (Table 6).

Table 6. Details of some of the classes studied under Vertebrates.

CLASS	**No of Species**	**SPECIES**
AMPHIBIANS	4	1.*Euphlyctis* 2.*Microhyla* 3.*Rana* 4.*Polypedates*
REPTILES	8 Species	1.*Calotes* 2.*Ptyas* 3.*Krait* 4.*Viper*
AVES	22	*1. Egretta garzetta* *2. Mesophoyx intermedia* *3.. Casmerodius albus* *4. Bubulcus ibis* *5. Egret Egretta gularis* *6. Ardeola grayii* *7. Ardea purpurea* *8. Ardea cinerea Br* *9. Nycticorax nycticorax* *10. Butorides striatus* *11.Phalacrocorax niger* *12. Phalacrocorax carbo* *13. Phalacrocorax fuscicollis* *14.Anhinga melanogaster* *15. Haliastur indus indus* *16. Pavo cristatus* *17. Amaurornis phoenicurus phoenicurus* *18. Columba livia intermedia* *19. Cuculus micropterus* *20. Alcedo atthis taporbana* *21. Orthotomus sutorius guzuratus* *22. Corvus splendens protegatus*

MAMMALS	5	1.*Herpestes* sp.(Common Mangoose) 2.*Paradoxerous*sp,(Toddy cat) 3.*Funambulus* sp.(Squirrel) 4. *Rattus* sp. 5.*Canis*(Jackal,Dog)

CONCLUSION

Without an active and ambitious restoration program, rising population and its increasing stress on aquatic ecosystems may affect the quality of human life especially for future generations. This aquatic ecosystem conservation program, can set an example to improve the management of other water bodies too. The present study area is resplendent with floral and faunal diversity. Plant carnivorous species like *Utricularia aurea*, mangroves and many aquatic species are present there and more than 100 plant species (representing more than 25 families), 13 classes and 37 faunal species diversity were documented. Threatened and Vulnerable species were also documented in the area. *Chesalia curviflora* an endangered species and many threatened species like *Cyanotis cristatus*, *Cyperus compresses* were found in the study area

Species diversity was indexed using Shannon diversity Index, which accounts for both abundance and evenness of the species present, and commonness and rarity of the species and to understand the community structure. These indexes are relatively high and indicate the urgent need to conserve this ecological fertile land.

The present study of the species is not conclusive and exhaustive therefore future exploration will be continued to update this checklist. And all the species has a significant and beneficial role to play in nature and it is necessary for protection of all life forms. Furthermore, long term research and monitoring on the diversity of species with special reference to ecological aspects may be taken up in the area.

A small area may be cordoned off as a ‘native vegetation buffer zone’ to perform numerous functions including maintaining microclimate, hydrology, filtering run-off, and providing habitat for fauna. It would provide a zone to absorb the impacts arising from adjacent development so that a core area is protected or maintained in a natural state. The core area could contain an area of ecologically sensitivity or significance including significant species,

ecological communities, roosting, nesting and breeding locations. A patch of mangroves seen in the area could be considered as a buffer zone. Studies on factors that might influence vegetation communities (slope, aspect. topographic position and elevation) could be taken up as the future course of work

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