

ODONATA (INSECTA) OF PARAMBIKULAM WILDLIFE SANCTUARY, KERALA, INDIA

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INTRODUCTION

The Odonata (Insecta) fauna of India is known by 3 suborders, 17 families, 139 genera and 499 species and subspecies (Prasad and Varshney, 1995). A perusal of literature (Fraser, 1933, 1934, 1936; Peters, 1981; Rao and Lahiri, 1983 and Mathavan and Miller, 1989) reveals that 112 species of Odonata occur in Kerala. Of these, however, only one species viz. : *Epithemis mariae* (Laidlaw) (synonym : *Amphithemis mariae* Laidlaw) is known so far in literature from the Parambikulam wildlife sanctuary (Fraser, 1936). The present study deals with 25 species and subspecies of Odonata belonging to 18 genera and 5 families collected from this sanctuary.

Occupying 285 sq. km. area of the Parambikulam valley between Anaimalai and Nelliampathy hill ranges, the sanctuary lies in the Palakkad district of Kerala between 10°21'-10°32' N lat. and 76°35'-76°51' E long. The types of vegetation found in the sanctuary belong to tropical evergreen and semievergreen forests, moist teak-bearing forests, south Indian moist deciduous forests and riparian fringing forests. The rivers, Karappara, Parambikulam, Thekkadiyar and their tributaries form the drainage system in this sanctuary. The altitudes range from 459m to 1439m above msl.

The material studied forms part of a general faunal collection procured during faunistic surveys conducted in the sanctuary area during 1995, 1996 and 1997. The specimens are deposited in the faunal depository of the Western Ghats Field Research Station, Zoological Survey of India, Calicut.

SYSTEMATIC LIST

- Order : ODONATA
- 1. Suborder : ZYGOPTERA
- 1. Superfamily : COENAGRIONOIDEA
- 1. Family : COENAGRIONIDAE
- 1. *Agriocnemis pygmaea* (Rambur)
- 2. Family : PLATYCNEMIDIDAE
- 2. *Copera vittata deccanensis* Laidlaw

2. Superfamily : CALOPTERYGOIDEA
 3. Family : CALOPTERYGIDAE
 3. *Neurobasis chinensis chinensis* (Linnaeus)
 4. *Vestalis apicalis apicalis* Selys
 5. *Vestalis gracilis gracilis* (Rambur)
 6. *Vestalis gracilis montana* (Fraser)
4. Family : CHLOROCYPHIDAE
 7. *Rhinocypha (Heliocypha) bisignata* (Selys)
2. Suborder : ANISOPTERA
 1. Superfamily : LIBELLULOIDEA
 1. Family : LIBELLULIDAE
8. *Cratilla lineata calverti* Foerster
 9. *Diplacodes trivialis* (Rambur)
 10. *Epithemis mariae* (Laidlaw)
 11. *Orthetrum pruinosum neglectum* (Rambur)
 12. *Orthetrum sabina sabina* (Drury)
 13. *Potamarcha congener* (Rambur)
 14. *Crocothemis servilia servilia* (Drury)
 15. *Neurothemis fulvia* (Drury)
 16. *Neurothemis intermedia intermedia* (Rambur)
 17. *Neurothemis tullia tullia* (Drury)
 18. *Trithemis aurora* (Burmiester)
 19. *Trithemis festiva* (Rambur)
 20. *Trithemis kirbyi kirbyi* Selys
 21. *Palpopleura sexmaculata sexmaculata* (Fabricius)
 22. *Rhyothemis variegata variegata* (Linnaeus)
 23. *Pantala flavescens* (Fabricius)
 24. *Tholymis tillarga* (Fabricius)
 25. *Zygonyx iris malabaricus* Fraser

Key to the Odonata of Parambikulam Wildlife Sanctuary, Kerala

Key to the Suborders of Odonata

1. Wings petiolate, sub-petiolate or non-petiolate; discoidal cell in both wings simple, entire or traversed by nervures, closely similar in fore and hind wings.Zygoptera

- Wings never petiolate; discoidal cell in both wings subdivided into a triangle plus supratriangle.
..... Anisoptera

Key to the Superfamilies of Zygoptera

1. Only 2 antenodal nervures present; postnodals in strict alignment with the veins below; IR_{iii} and R_{iv + v} beginning much nearer to the nodus than to arculus. Coenagrionoidea
- Never less than 5 antenodals present; postnodals not in line with the veins below them. ..
..... Calopterygoidea

Key to the families of Coenagrionoidea

1. Discoidal cell short, anterior side considerably shorter than posterior; anal vein separating from wing border at various levels either proximal to, at or distal to the vein Ac; veins MA and IR_{iii} markedly zigzagged for the greater part of their length. Coenagrionidae
- Discoidal cell elongate, anterior and posterior sides subequal, apex rather obtuse; anal vein separating from wing border proximal to Ac; veins MA and IR_{iii} running straight for a greater part of their length, only zigzagged apically or not at all. Platycnemididae

Key to the genus and species of Coenagrionidae

1. Arc situated distal to the level of the distal antenodal nervure; the junction of ab and 1A (medio-anal link) markedly angulated; labrum metallic blue; superior anal appendages longer than inferior. Genus : *Agriocnemis* Selys species : *A. pygmaea* (Rambur)

Key to the genus and species of Platycnemididae

1. Costal and posterior sides of discoidal cell equal or nearly so; second segment of antennae as long as the third; legs bright citron-yellow; the two hind pairs of tibiae slightly dilated; superior anal appendages at least half the length of inferiors; posterior lobe of prothorax of female with a pair of divergent, slender, forwardly directed spines.
..... Genus : *Copera* Kirby species : *C. vittata deccanensis* Laidlaw

Key to the families of Calopterygoidea

1. The primary antenodals indistinguishable from the secondaries; basal antenodals present; vein R_{ii + iii} fused with R_i near its origin; discoidal cell long and traversed by many veins; 1st lateral thoracic suture complete. Calopterygidae
- The primary antenodals easily distinguishable from the secondaries; basal antenodals absent; clypeus produced in the form of a prominent uptilted snout; tibiae of males often dilated or brightly coloured. Chlorocyphidae

Key to the genera of Calopterygidae

1. Arc angulated; basal space traversed; sectors of arc separated at origin; main sectors not forked; Pterostigma absent in male, false or absent in female; fore-wings of both sexes hyaline; hind-wings opaque or hyaline. *Neurobasis* Selys
- Arc oblique, not angulated; basal space entire; sectors of arc arising from a single point; most main sectors forked; Pterostigma absent. *Vestalis* Selys.

Key to the species of *Neurobasis* Selys

1. Thorax brilliant metallic green; humeral and antero-lateral stripes blackish-brown in male; humeral and lateral sutures finely white with black borders in female; all wings of female with an opaque creamy yellow patch at node which usually covers one cell distal to node.
..... *N. chinensis chinensis* (Linnaeus)

Key to the species of *Vestalis* Selys

1. Tips of wings black; labrum yellow, marked with black. *V. apicalis apicalis* Selys
- Tips of wings hyaline; wings tinted variably, not uniformly with greenish yellow. 2
2. Two rows of cells between origins of Cuii and 1A; 3-4 rows of cells between 1A and the posterior margin of the wing. *V. gracilis gracilis* (Rambur)
- Only a single row of cells separating 1A and Cuii; 3-4 rows of cells between 1A and the posterior margin of wings as in *V. g. gracilis*. *V. gracilis montana* (Fraser)

Key to the genus and species of Chlorocyphidae

1. Sectors of arc separated at origin; pterostigma present in fore-wings of both sexes; hind-wing nearly of equal width as fore-wing and not broader; in male, nearly apical third of fore and hindwings opaque; a single row of vitreous spots; in female, wings entirely hyaline tinted palely with yellow and apices narrowly enfumed; mesothoracic triangle extending from one-third to half-way up dorsum.
..... Genus : *Rhincocypha* subgenus : *Heliocypha* species : *R. (H.) bisignata* (Selys)

Key to the Superfamily of Anisoptera

1. Discoidal cell differing in size and shape in fore and hind-wings, that of fore-wing situated far distal of the arc; costal and subcostal antenodal nrvure coinciding; the robust primary antenodals absent; middle lobe of labium very small, not fissured, broadly overlapped by the lateral lobes. Libelluloidea

Key to the family of Libelluloidea

1. Tibiae of male without keels; bases of hind-wing rounded in both sexes; body usually coloured non-metallic; sectors of arculus fused at their origin and arising from a common stalk; primary antenodals absent. Libellulidae

Key to the genera of Libellulidae

1. Claw hooks equal in length to claws, which thus appear bifid; thorax metallic. *Zygonyx* Selys
 - Claw hooks shorter than claws and arising from about middle of latter; thorax rarely metallic. 2
2. Borders of anal loop running on to meet posterior border of wing, apex of loop open; abdomen broad at base, then tapering gradually to the end; male with an opalescent white spot in centre of hindwing which is absent in female. *Tholymis* Hagen
 - Borders of anal loop converging and meeting before posterior border of wing, apex of loop closed. 3
3. Distal antenodal nervure in fore-wing complete. 4
 - Distal antenodal nervure in fore-wing incomplete. 6
4. Lobe of prothorax large and fringed with long hairs; frons non-metallic above, never less than 12 antenodal nervures in fore-wing. *Orthetrum* Newman
 - Lobe of prothorax small, inconspicuous and usually naked. 5
5. Only 1 cubital nervure in all wings, anal loop very long and overlapping distal end of discoidal cell. *Cratilla* Kirby
 - More than 1 cubital nervure in hind-wing, anal loop very short, of not more than 6 cells; discoidal cell in fore-wing entire. *Epithemis* Laidlaw
6. Lobe of prothorax large and fringed with long hairs; Cuii arising from posterior angle of discoidal cell in hind-wing; borders of discoidal field in fore-wing diverging widely at wing border. 7
 - Lobe of prothorax small, usually naked. 8
7. Discoidal cell in hind-wing entire; costal border of fore-wing straight; frons non-metallic above; discoidal field in fore-wing beginning with a row of 2 cells. *Diplacodes* Kirby
 - Discoidal cell in hind-wing traversed; costal border of fore-wing sinuous near base; frons metallic above; discoidal field beginning with at least 3 rows of cells. *Palpopleura* Rambur

8. Sectors of arc in fore-wing separated and diverging at origin; body very dark metallic; frons metallic above; discoidal field in fore-wing with borders parallel or strongly converging at wing border; wings generally broadly coloured black or black and golden amber.
..... *Rhyothemis* Hagen
- Sectors of arc in fore-wing arising from a common and rather long stalk. 9
9. Discoidal field with borders converging strongly at wing margin. 10
- Discoidal field with borders parallel or widely divergent at wing margin. 11
10. Discoidal cell in fore-wing very narrow, its costal side only about one-fourth to one-third the length of basal; a conspicuous supplementary nervure, IR_{ii} present between R_{ii} and R_{iii}.....
..... *Pantala* Hagen
- Discoidal cell in fore-wing broader, its costal side about one-half the length of basal; no supplementary nervure IR_{ii} present between R_{ii} and R_{iii}..... *Trithemis* Brauer
11. Wings coloured amber-yellow at base or more broadly dark reddish-brown, and often with a development of close secondary reticulation, especially proximal to node; more than 1 cubital nervure in all wings..... *Neurothemis* Brauer
- Wings usually uncoloured or with but a small basal yellow marking in hind-wing; no secondary reticulation in the wings; only 1 cubital nervure in all wings. 12
12. Red or ochreous species; face and frons red; wings with yellow markings at extreme base.
..... *Crocothemis* Brauer
- Variably coloured and darker species; never or only partly red or ochreous; arc situated between the first and second antenodal nervures; 2 rows of cells between IR_{iii} and Rspl. ..
..... *Potamarcha* Karsch

Key to the species of *Cratilla* Kirby

1. Wings hyaline, apices sometimes tipped with brown but never with black; thorax non-metallic.
..... *C. lineata calverti* Foerster

Key to the species of *Diplacodes* Kirby

1. Adults black, marked with yellow or pruinosed dark-blue throughout; wings uncoloured except at base with a minute yellow point in cubital space of hindwing. *D. trivialis* (Rambur)

Key to the species of *Epithemis* Laidlaw

1. Abdomen ruby-red at base; discoidal field beginning with only a single row of cells.
..... *E. mariae* (Laidlaw)

Key to the species of *Orthetrum* Newman

1. Coloured violaceous-red, reddish brown or dull ochreous; discoidal cell in hind-wing 2 celled.
..... *O. pruinosum neglectum* (Rambur)
- Coloured brown or black with yellow markings; abdomen enormously swollen at base and then abruptly slimmed and compressed laterally to the end. *O. sabina sabina* (Drury)

Key to the species of *Potamarcha* Karsch

1. Wings hyaline with extreme apices tipped with brown in adults, but the costal area of both wings tinted with pale yellow in sub-adults; distal antenodal nervure of fore-wing incomplete.
..... *P. congener* (Rambur)

Key to the species of *Crocothemis* Brauer

1. Eyes but shortly contiguous; usually 9 1/2 to 10 1/2 antenodal nervures in fore-wing; bases of wings with amber-yellow marking in male, paler in female. *C. servilia servilia* (Drury)

Key to the species of *Neurothemis* Brauer

1. Wings dark reddish-brown from base to about middle of pterostigma; apex of wings also narrowly opaque brown to partly enclose a clear window in each wing at apex.
..... *N. fulvia* (Drury)
- Wings golden-yellow at base, not very sharply defined and rather pale in colour; costal border of wings pale yellow to as far as pterostigma; a pale brown humeral stripe on thorax.
..... *N. intermedia intermedia* (Rambur)
- Base of wings of male broadly black and the black basal area edged outwardly with an opalescent white band; base of wings of female, to as far as two or three cells distal to node bright amber-yellow and subcostal space from base of wing to node blackish-brown broadening at node into a very large blackish brown spot which traverses wings nearly to posterior border.
..... *N. tullia tullia* (Drury)

Key to the species of *Trithemis* Brauer

1. Thorax and abdomen bright vermilion - red; base of hind-wing bright orange; neuration yellow.
..... *T. kirbyi kirbyi* Selys
- Thorax and abdomen violaceous-black; base of hind-wing with a small dark brown spot; neuration black. *T. festiva* (Rambur)
- Thorax and abdomen violaceous-crimson; base of hind-wing with a small reddish-brown spot; neuration crimson. *T. aurora* (Burmiester)

Key to the species of *Palpopleura* Rambur

1. Wings hyaline, marked with black or blackish-brown; fore-wing with a black spot at node covering from 1/2 to 1 1/2 cells proximal to node.
..... *P. sexmaculata sexmaculata* (Fabricius)

Key to the species of *Rhyothemis* Hagen

1. Wings marked with black only or with black and brown with metallic reflex; wings widely different in the sexes; male with whole of wings tinted yellow; fore-wings with spots at node, discoidal cell, apex and at middle of Riii; hind-wing with similar dark spots and two broad longitudinal basal bands; female with broader, shorter wing; fore-wing hyaline from node to apex, basal half with broad black markings, hind-wings with broad irregular markings to as far distal as pterostigma, apex hyaline. *R. variegata variegata* (Linnaeus)

Key to the species of *Pantala* Hagen

1. Wings hyaline with base of hind-wing in male pale golden-yellow as far distal as anal loop and with a narrow apical brown spot limited to posterior border of wing; wings in female often evenly more or less deeply enfolded and without the apical brown spot.
..... *P. flavescens* (Fabricius)

Key to the species of *Tholymis* Hagen

1. Wings hyaline, with a broad fan-shaped smoky, golden-brown fascia extending from node to base of hind-wing bordered distally by a broad oval opalescent white spot about 4 cells deep in male; in female, the golden brown fascia very pale, obscure and the opalescent white spot wanting. *T. tillarga* (Fabricius)

Key to the species of *Zygonyx* Selys

1. Thorax with only a small round yellow spot at lower part of humeral region; mid-dorsal spot on segment 7 scutellate, broadening apically. *Z. iris malabaricus* Fraser

DISTRIBUTION OF ODONATA IN PARAMBIKULAM WILDLIFE SANCTUARY

Based on the specimens examined, the collection data depicting the distribution of each species in different localities of Parambikulam wildlife sanctuary is presented in Table. 1.

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Table -1

Distribution of Odonata in Different Localities of Parambikulam Wildlife Sanctuary

Names of species & Dates of collection	Localities														
	A						B	C			D				
	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv
1. <i>Agriocnemis pygmaea</i> 18.iii.1996							1M								
2. <i>Copera vittata deccanensis</i> 18.iii.1996							2F,1M								
3. <i>Neurobasis c. chinensis</i> 27.x.1995								1F							
4. <i>Vestalis a. apicalis</i> 30.x.1995	1M														
5. <i>Vestalis g. gracilis</i> 29.x.1995, 14.iii.1996, 18.iii.1996		1F	1M				1M								
6. <i>Vestalis gracilis montana</i> 26.i.1997				1M,1F											
7. <i>Rhinocypha (H.) bisignata</i> 29.x.1995, 27.x.1995, 3.xi.1995		1M,1F													
8. <i>Cratilla lineata calverti</i> 5.xi.1995												1F			
9. <i>Diplacodes trivialis</i> 30.x.1995, 14.iii.1996, 4.xi.1995	1M		1M,1F										1F		
10. <i>Epithemis mariae</i> 30.iii.1997, 6.xi.1995														2M	1F
11. <i>Orthetrum pruinosum neglectum</i> 29.x.1995, 31.x.1995, 6.xi.1995		1M								2M					1M
12. <i>Orthetrum s. sabina</i> 2.xi.1995, 3.xi.1995, 6.xi.1995					1M						1M	1M			
13. <i>Potamarcha congener</i> 24.iii.1997				1F											

Names of species & Dates of collection	Localities														
	A						B	C		D					
	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv
14. <i>Crocothemis s. servilia</i> 27.x.1995								1M							
15. <i>Neurothemis fulvia</i> 29.i.1997, 23.i.1997, 24.iii.1997 3.xi.1995, 20.iii.1996, 5.xi.1995						1F		1M		1F	2M,2F	1F			
16. <i>Neurothemis i. intermedia</i> 23.i.1997								1F							
17. <i>Neurothemis t. tullia</i> 14.iii.1996			1M,1F												
18. <i>Trithemis aurora</i> 2.xi.1995, 3.x.1995, 3.xi.1995 5.xi.1995, 6.xi.1995					1M				1M		2M,1F	2M			1M,1F
19. <i>Trithemis festiva</i> 30.iii.1997														3M	
20. <i>Trithemis k. kirbyi</i> 23.i.1997								1F							
21. <i>Palpopleura s. sexmaculata</i> 22.iii.1997, 3.xi.1995					3F						1F				
22. <i>Rhyothemis v. variegata</i> 29.x.1995, 20.iii.1996		2F									1M,1F				
23. <i>Pantala flavescens</i> 17.iii.1996, 30.iii.1997							1M							1M	
24. <i>Tholymis tillarga</i> 29.x.1995		1F													
25. <i>Zygonyx iris malabaricus</i> 31.x.1995	1M														

A-D : Forest Ranges
i-xv : Collection sites
M Male
F : Female

A - Sungam,
i - Kamathalachi,
vi - Thellickal,
xi - Orukomban,

B - Karimala,
ii - Sirkarpathy,
vii - Karimala,
xii - Muthuvarachal,

C - Parambikulam,
iii - Cheechali,
viii - Venkoli,
xiii - Pezhakunnu,

D - Orukomban.
iv - Peruvaripallam,
ix - Anchupoola,
xiv - Pulickal,

v - Thunakadavu
x - Parambikulam
xv - Muthalakayam