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Dragonflies and damselflies (Insecta: Odonata) of western Nepal: A checklist

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Abstract

This paper deals with the first comprehensive checklist of odonate species recorded in western Nepal. The present checklist is based on field survey from May 2017 to October 2018 in six different locations of western Nepal which reveals that there are 61 odonata species belonging 40 genera and 11 families. Family Libellulidae was dominant representing 28 species. Recorded species were common in all regions of Nepal except *Epopthalmia frontalis* which was reported from western and central regions. Local status of recorded species also identified. Accordingly, two species were very common, 26 common, 30 fairly common species and 3 rare species to this region.

Keywords: odonata, diversity, species, western region, Nepal

Introduction

Odonata are fascinating aquatic insects. They are excellent biological indicators of environmental conditions, play important role in development of wetlands as well as predators of different vectors of human diseases. They are completely associated with riparian vegetation, it due to their complex life cycle. Globally 6256 species in 686 genera belonging to 40 families are known (Schorr and Paulson, 2017) ^[5]. Among them Nepal harbors 195 species of 87 genera belonging to 18 families (Thapa, 2015) ^[8].

Nepal is well known for its odonata diversity and is an explorer's paradise. Since the time of earliest record of dragonflies by Selys in 1854 ^[6] from Nepal, there are significant researches carried out in Nepal. Later on Vick (1989) ^[9] listed out 172 species for the first time with altitudinal distribution in Nepal. Most of the studies were done from Kathmandu valley, central and eastern region of Nepal by different researchers. However few data were collected from western Nepal, any concrete study was not done in western region of Nepal. Thus, the study was conducted to explore odonate species from western Nepal.

Materials and Methods

Study area

The study was carried out at different localities of six districts of western Nepal viz. Kanchanpur, Kailali, Surkhet, Mugu, Dang and Rukum district (Fig. 1; Table 1).

Most of the study sites fall under Tropical climate zone which is characterized by outer terai in lower tropical zones (< 300 m), Shiwalik hills mostly in upper Tropical zone and inner terai valley span both tropical zones. Study sites of Rukum district lies in subtropical climate zone which is most prevalent climate of mid hill. Rara Lake is in border of temperate climate and subalpine zone in mountain region. The greatest species richness was recorded in the tropical to temperate climatic zone.

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Table 1: Study localities in detail.

Locations / Surveyed area	Elevation (m asl*)	GPS
Kanchanpur district		
Sukhlaphanta National Park	185	28° 50' 24.72" N & 80° 13' 44.4" E
Dodhara Chadani	193	28° 52' 45.97" N & 80° 04' 19.34" E
Kailali district		
Ghodaghodi Lake	205	28° 41' 02.07" N & 80° 56' 44.71" E
Godawari Municipality	282	28° 52' 33.83" N & 80° 34' 23.98" E
Tikapur Municipality	169	28° 36' 26.72" N & 81° 07' 12.17" E
Surkhet district		
Bulbule Lake	660	28° 34' 52.93" N & 81° 37' 10.06" E
Kakrebihar forest	725	28° 33' 51.70" N & 81° 37' 16.91" E
Bheri river (at Gurbakot)	470	28° 26' 28.01" N & 81° 51' 18.48" E
Satakhani	485	28° 29' 46.09" N & 81° 44' 52.46" E
Mugu district		
Rara Lake	3000	29° 30' 58.47" N & 82° 05' 06.81" E
Dang district		
Jakhera Tal	270	27° 52' 34.12" N & 82° 34' 21.54" E
Purnadhara waterfall	550	28° 11' 09.82" N & 82° 03' 45.02" E
Babai river	315	28° 21' 09.70" N & 81° 43' 12.37" E
Rapti river	470	28° 21' 09.70" N & 81° 43' 12.37" E
Rukum district		
Syarpu Lake	1325	28° 41' 31.06" N & 82° 29' 01.48" E
Kamal Pokhari	1580	28° 36' 56.55" N & 82° 37' 30.91" E
Chhipri Pond	1490	28° 37' 00.08" N & 82° 37' 03.58" E

* asl = Above sea level

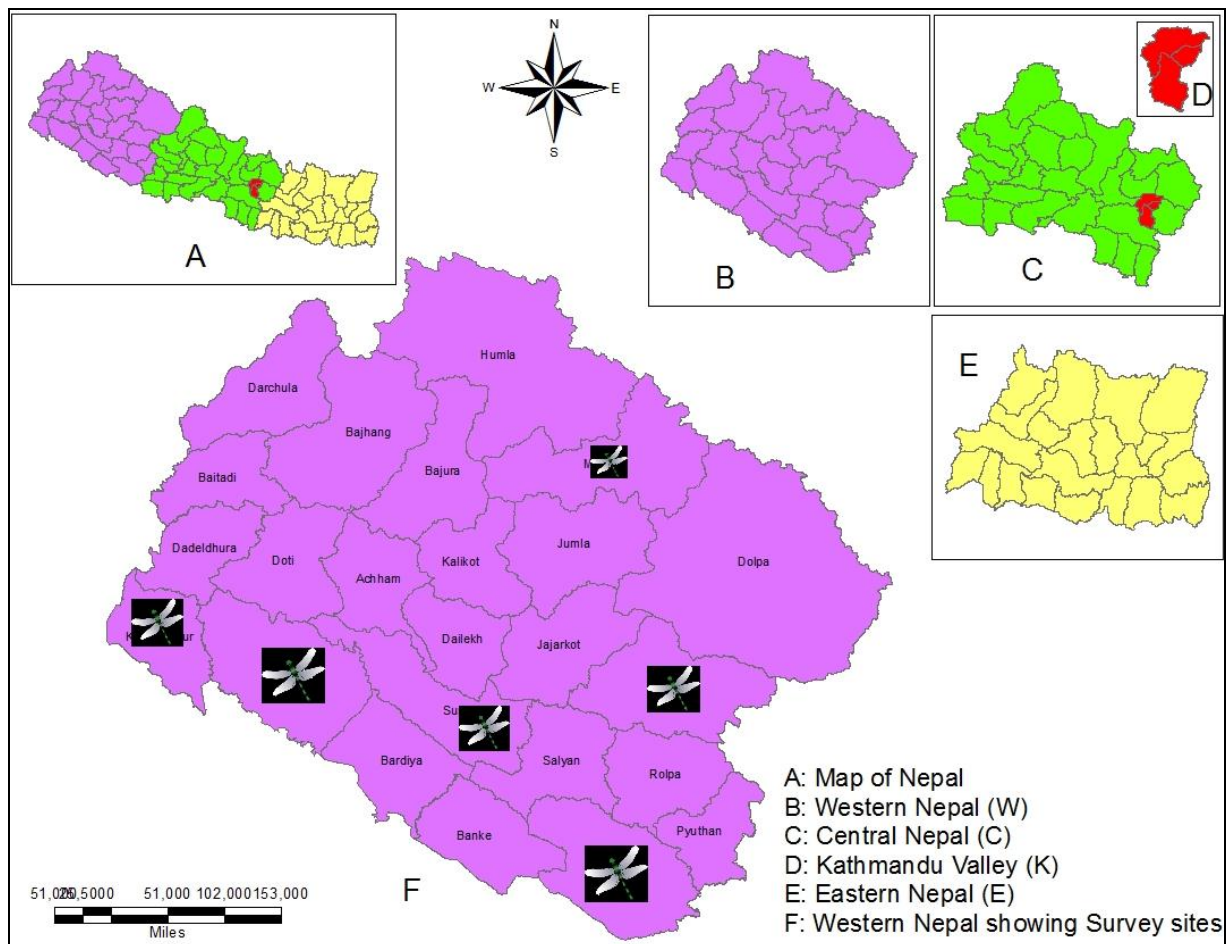


Fig 1: Study area, Western Nepal.

Field Sampling

Adult odonates were sampled from May 2017 to October 2018. In each sampling sites, line transect method was applied for data collection. Line transect was ranges from 100 m to

500 m depending upon the size of sampling sites. Odonates were observed by adopting ocular observation method during an active time period of 8:00 h to 16:00 h and photographed using Nikon D3400 camera. Number of each odonate species

were also counted for their local status. For the identification a standard book was used (Nair, 2011) [4], (Subramanian, 2009) [7], (Fraser, 1933; 1934; 1936) [1-3] and (Thapa, 2015) [8].

Data Analysis

Local status of odonate species are categorized as very common ($\geq 10\%$), common (≥ 1 to $< 10\%$), fairly common (≥ 0.1 to $< 1\%$) and rare ($< 0.1\%$) based on relative frequency of species encountered from survey sites. We divided Nepal in four regions- W (West), C (Central), K (Kathmandu Valley) and E (East) to indicate distribution of species in Nepal (Fig. 1). Distributions of each species were given on the basis of literature review in checklist.

Results and Conclusions

The checklist comprised of data from our own field works. During present study a total 8488 individual of odonata of 61 species belonging to 40 genera representing 11 families (4

anisopteran and 7 Zygopteran) were recorded from western Nepal. The data shows 29.19 % of total Nepalese species are found in western Nepal. Among all recorded species *Epophthalmia frontalis* is reported from western and central parts only and rest of all are distributed throughout all parts of Nepal. *Epophthalmia frontalis* was previously reported from Central region by Vick in 1987 [9] and now it is also recorded from western Nepal. *Paragomphus lineatus* is recorded throughout Nepal except in Kathmandu valley.

The family Libellulidae was dominant representing 28 species in study region whereas family Synlestidae and family Lestidae shows lowest diversity represents 1 species in each (Chart 1).

In the checklist, families are arranged in alphabetical order in each suborder followed by species in alphabetical order too. In each species, author citation, recorded number (σ , ρ), habitat, local status and distribution in Nepal are provided.

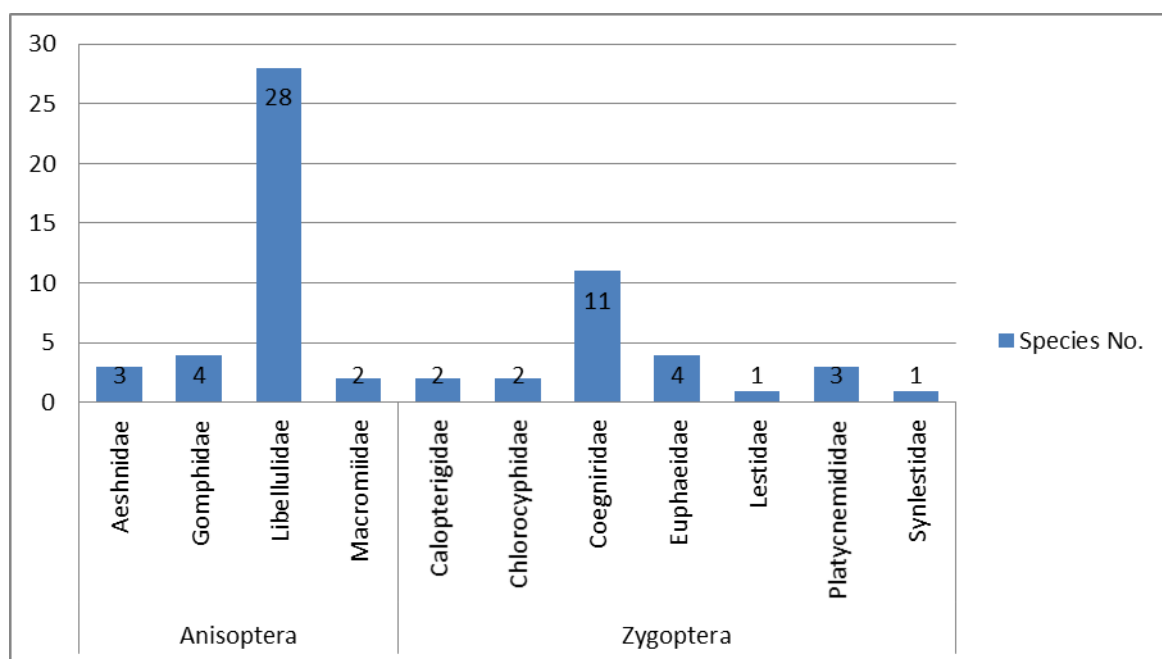


Chart 1: Family composition of Odonate species of Western Nepal.

Checklist of Odonata of Western Nepal

Suborder Anisoptera

Family Aeshnidae

1. *Anaciaeschna jaspidea* (Burmeister 1839)

Record; 30 σ , 6 ρ Habitat; slow flowing hill streams and check dams in forest areas, mostly mid-elevation hills. Local status; fairly common. Distribution; W, C, K, E.

2. *Anax immaculifrons* Rambur 1842

Record; 69 σ , 18 ρ Habitat; slow flowing hill streams and check dams in forest areas, mostly mid-elevation hills. Local status; common. Distribution; W, C, K, E.

3. *Gynacantha bayadera* Selys 1891

Record; 75 σ , 9 ρ Habitat; overgrown and weedy ponds and lakes. Local status; common. Distribution; W, C, K, E.

Family Gomphidae

1. *Anisogomphus occipitalis* (Selys 1854) [6]

Record; 51 σ , 6 ρ Habitat; riparian vegetation of wetlands Local status; fairly common. Distribution; W, C, K, E.

2. *Ictinogomphus rapax* (Rambur 1842)

Record; 60 σ , 12 ρ Habitat; all type of wetlands except hill stream along dense forest Local status; fairly common. Distribution; W, C, K, E.

3. *Paragomphus lineatus* (Selys 1854) [6]

Record; 27 σ , 18 ρ Habitat; lakes, reservoir- edges, ponds and river-sides. Local status; fairly common. Distribution; W, C, E.

4. *Platygomphus dolabratus* (Selys 1854) [6]

Record; 12 σ Habitat; lakes, reservoir- edges, ponds and river-sides. Local status; fairly common. Distribution; W, C, K, E.

Family Libellulidae

1. *Acisoma panorpoides* Rambur 1842

Record; 48 σ , 12 ρ Habitat; found along paddy field, reeds in edges of all kinds of water bodies. Local status; fairly common. Distribution; W, C, K, E

2. *Brachydiplax sobrina* (Rambur 1842)

Record; 18 ♂, 30 ♀Habitat; marshes, ponds and sluggish rivers. Local status; fairly common. Distribution; W, C, K, E

3. *Brachythemis contaminata* (Fabricius 1793)

Record; 522 ♂, 336 ♀Habitat; all kind of water bodies including ditches Local status; very common. Distribution; W, C, K, E. it is also refers as dragonfly of polluted water.

4. *Bradinopgya geminata* Kirby 1893

Record; 24 ♂, 12 ♀Habitat; rocky gorges, pools or urban tanks or walls. Local status; fairly common. Distribution; W, C, K, E. it is also known as urban pest controller.

5. *Cratilla lineata* (Brauer 1878)

Record; 57 ♂, 12 ♀Habitat; canopy gaps, sunlight forest in plain and mid-hills. Local status; fairly common. Distribution; W, C, K, E. It is often associated with *Neurothemis fulvia*.

6. *Crocothemis erythraea* (Brulle 1832)

Record; 18 ♂, 6 ♀Habitat; almost all water bodies and also in paddy field. Local status; fairly common. Distribution; W, C, K, E

7. *Crocothemis servillia* (Drury 1770)

Record; 336 ♂, 231 ♀Habitat; almost all water bodies and also in cultivated land. Local status; common. Distribution; W, C, K, E

8. *Diplacodes nebulosa* (Fabricius 1793)

Record; 15 ♂, 42 ♀Habitat; weedy swamps and ponds. Local status; fairly common. Distribution; W, C, K, E

9. *Diplacodes trivialis* (Rambur 1842)

Record; 180 ♂, 159 ♀Habitat; widely array of wetlands, open fields and urban gardens. Local status; common. Distribution; W, C, K, E

10. *Neurothemis fulvia* (Drury 1773)

Record; 165 ♂, 132 ♀Habitat; open patches, tree fall gaps and marshes within or edge of moist forested area. Local status; common. Distribution; W, C, K, E

11. *Neurothemis intermediata* Rambur 1842

Record; 57 ♂, 51 ♀Habitat; grass land-forest edge, meadows or open patches inside forests. Local status; common. Distribution; W, C, K, E.

12. *Neurothemis tullia* (Drury 1773)

Record; 39 ♂, 3 ♀Habitat; wetland edges, weedy marshes and paddy fields. Local status; fairly common. Distribution; W, C, K, E

13. *Orthetrum glaucum* (Brauer 1865)

Record; 120 ♂, 84 ♀Habitat; marshes and swamps inside or at the edge of forested area. Local status; common. Distribution; W, C, K, E

14. *Orthetrum japonicum* (Uhler 1858)

Record; 6 ♂, 3 ♀Habitat; small fresh water ponds, reed beds or lily pads in wetlands. Local status; fairly common. Distribution; W, C, K, E

15. *Orthetrum luzonicum* (Brauer 1865)

Record; 60 ♂, 78 ♀Habitat; marshes, swamps and edges of wet lands in well wooded area, prefers mid elevation. Local status; common. Distribution; W, C, K, E

16. *Orthetrum pruinosum neglectum* (Rambur 1842)

Record; 354 ♂, 201 ♀Habitat; most kind of standing and flowing water bodies including cultivated lands in plain and mid elevation. Local status; common. Distribution; W, C, K, E

17. *Orthetrum sabina sabina* (Drury 1770)

Record; 267 ♂, 138 ♀Habitat; all type of water bodies, open ground and garden from plain to hill. Local status; common. Distribution; W, C, K, E

18. *Orthetrum taeniolatum* (Schneider 1845)

Record; 78 ♂, 42 ♀Habitat; sand and rocky beds of rivers and streams in dry region, drying pools in large rivers. Local status; common. Distribution; W, C, K, E

19. *Orthetrum triangulare* (Selys 1878)

Record; 261 ♂, 159 ♀Habitat; along edges of streams, trickles and seepages in the mid elevation hills. Local status; common. Distribution; W, C, K, E

20. *Palpopleura sexmaculata* (Fabricius 1787)

Record; 84 ♂, 96 ♀Habitat; swamps and marshes of moist forest edge, paddy fields and ponds. Local status; common. Distribution; W, C, K, E

21. *Pantala flavescens* (Fabricius 1798)

Record; 558 ♂, 342 ♀Habitat; almost all habitats except inside dense forests. Local status; very common. Distribution; W, C, K, E

22. *Potamarcha congener* (Rambur 1842)

Record; 81 ♂, 45 ♀Habitat; marshes, weedy ponds, edges of slow flowing rivers. Local status; common. Distribution; W, C, K, E

23. *Sympetrum commixtum* (Selys 1884)

Record; 84 ♂, 51 ♀Habitat; marshes, weedy ponds, edges of slow flowing rivers, reservoirs, lakes in mid elevation hills. Local status; common. Distribution; W, C, K, E

24. *Tholymis tillarga* (Fabricius 1798)

Record; 2 ♂, 7 ♀Habitat; standing water bodies, seems to prefer weedy ponds and lakes. Local status; fairly common. Distribution; W, C, K, E

25. *Tramea basilaris* Kirby 1889

Record; 9 ♂, 3 ♀Habitat; lakes, ponds, marshes and edges of rivers, seems to prefer tall riparian vegetations for perching. Local status; fairly common. Distribution; W, C, K, E

26. *Trithemis aurora* (Burmeister 1839)

Record; 84 ♂, 45 ♀Habitat; standing and flowing water bodies, seems to prefer slow-flowing streams. Local status; common. Distribution; W, C, K, E

27. *Trithemis festiva* (Rambur 1842)

Record; 171 ♂, 45 ♀Habitat; almost all flowing water bodies

including irrigation canals. Local status; common. Distribution; W, C, K, E

28. *Trithemis pallidinervis* (Kirby 1889)

Record; 12 ♂, 3 ♀ Habitat; standing water bodies, most wetlands having weeds and reeds. Local status; fairly common. Distribution; W, C, K, E

Family Macromiidae

1. *Epopthalmia frontalis* Selys 1871

Record; 6 ♂ Habitat; prefers large reservoirs, lakes, ponds check-dams in plains. Local status; rare. Distribution; W, C.

2. *Macromia moorei* Selys 1874

Record; 39 ♂ Habitat; fast flowing hill streams in dense forests. Local status; fairly common. Distribution; W, C, K, E.

Suborder Zygoptera

Family Calopterygidae

1. *Neurobasis chinensis* (Linnaeus 1758)

Record; 39 ♂, 21 ♀ Habitat; hill streams and rivulets in forests. Local status; fairly common. Distribution; W, C, K, E.

2. *Vestalis gracilis* (Rambur 1842)

Record; 12 ♂ Habitat; edges of rivulets and streams in dense forest areas. Local status; fairly common. Distribution; W, C, K, E.

Family Chlorocyphidae

1. *Rhinocypha bifasciata* (Selys 1879)

Record; 102 ♂, 57 ♀ Habitat; hill streams and rivulets in forests or well wooded landscapes. Local status; common. Distribution; W, C, K, E.

2. *Rhinocypha unimaculata* Selys 1853

Record; 27 ♂, 18 ♀ Habitat; hill streams and rivulets in forests or well wooded landscapes. Local status; fairly common. Distribution; W, C, K, E.

Family Coenagrionidae

1. *Aciagrion olympicum* Laidlaw 1919

Record; 33 ♂, 24 ♀ Habitat; marshes in grasslands within forest, lakes, ponds, found in mid to high elevation hills. Local status; fairly common. Distribution; W, C, K, E.

2. *Aciagrion pallidum* Selys 1891

Record; 21 ♂, 15 ♀ Habitat; dry habitat like dry deciduous forest, dry wetlands with good vegetation. Local status; fairly common. Distribution; W, C, K, E.

3. *Agriocnemis pygmaea* (Rambur 1842)

Record; 30 ♂, 30 ♀ Habitat; almost all kind of water bodies having slow water flow. Local status; fairly common. Distribution; W, C, K, E.

4. *Ceriagrion coromandelianum* (Fabricius 1790)

Record; 46 ♂, 39 ♀ Habitat; swampy edges, slow water flow aquatic habitats including urban garden tanks. Local status; common. Distribution; W, C, K, E.

5. *Ceriagrion falax* Ris 1914

Record; 147 ♂, 123 ♀ Habitat; marshes, streams and rivulets in mid elevation hills. Local status; common. Distribution; W, C,

K, E.

6. *Ceriagrion olivaceum* Laidlaw 1914

Record; 15 ♂, 9 ♀ Habitat; marshes, lakes, ponds, streams and backwater of rivulets in forests in mid elevation. Local status; fairly common. Distribution; W, C, K, E.

7. *Ischnua aurora* (Brauer 1865)

Record; 177 ♂, 123 ♀ Habitat; paddy fields, wet meadows, short weeds and small riparian vegetation bearing both standing and flowing water bodies from plain to hill. Local status; common. Distribution; W, C, K, E.

8. *Ischnua forcipata* Morton 1907

Record; 54 ♂, 42 ♀ Habitat; cultivated lands, marshes and swampy areas from plain to mid elevation hills. Local status; common. Distribution; W, C, K, E.

9. *Pseudagrion decorum* (Rambur 1842)

Record; 105 ♂, 99 ♀ Habitat; edges of reservoirs, lakes, ponds and rivers wetlands of dry areas. Local status; common. Distribution; W, C, K, E.

10. *Pseudagrion rubriceps* Selys 1876

Record; 39 ♂, 21 ♀ Habitat; rivers, ponds, reservoirs, slow flowing streams and canals from plain to mid elevation hills. Local status; fairly common. Distribution; W, C, K, E.

11. *Enallagma parvum* Selys 1876

Record; 9 ♂, 3 ♀ Habitat; paddy fields, ponds, reservoirs, slow flowing streams and canals from plain to mid elevation hills. Local status; fairly common. Distribution; W, C, K, E.

Family Euphaeidae

1. *Anisopleura comes* Selys 1880

Record; 30 ♂, 18 ♀ Habitat; hill streams and rivulets in forests or well wooded landscapes in mid elevation. Local status; fairly common. Distribution; W, C, K, E.

2. *Anisopleura lestoides* (Selys 1853)

Record; 54 ♂, 48 ♀ Habitat; hill streams and rivulets in forests in mid elevation. Local status; common. Distribution; W, C, K, E.

3. *Anisopleura subplatystyla* Fraser 1927

Record; 6 ♂ Habitat; hill streams and rivulets in forests or well wooded landscapes in mid elevation. Local status; rare. Distribution; W, C, K, E.

4. *Bayadera indica* (Selys 1853)

Record; 30 ♂, 24 ♀ Habitat; hill streams and rivulets in forests or well wooded landscapes in mid elevation. Local status; fairly common. Distribution; W, C, K, E.

Family Lestidae

1. *Lestes praemorsus* Selys 1862

Record; 6 ♂ Habitat; marshes, swamps, seasonal puddles and check-dams in forested landscapes. Local status; rare. Distribution; W, C, K.

Family Platycnemididae

1. *Calicnemia nipalica* Kimmins 1958

Record; 9 ♂, 6 ♀ Habitat; ponds, streams and rivulets in shady

surrounding vegetation. Local status; fairly common. Distribution; W, C, K, E.

2. *Calicnemia pulverulans* Selys 1886

Record; 15 ♂, 9 ♀ Habitat; ponds, hill streams and rivulets in shady forests or well wooded landscapes in mid elevation. Local status; fairly common. Distribution; W, C, K, E.

3. *Coeliccia renifera* (Selys 1886)

Record; 48 ♂, 36 ♀ Habitat; seepages, slow streams in shady

dense forested area of mid elevation. Local status; common. Distribution; W, C, K, E.

Family Synlestidae

1. *Megalestes major* Selys 1862

Record; 81 ♂, 69 ♀ Habitat; hill streams and rivulets in forests and also in stagnant water bodies in dry season. Local status; common. Distribution; W, C, K, E.



Fig 1: *Orthetrum pruinosum* (♂)



Fig 2: *Rhinocypha bifasciata* (♂)



Fig 3: *Neurobasis chinensis* (♂)



Fig 4: *Pseudagrion decorum*



Fig 5: *Trithemis festiva* (♂)



Fig 6: *Anisopleura lestoides*



Fig 7: *Trithemis aurora* (♂)



Fig 8: *Bradinopyga geminata* (♂)



Fig 9: *Ictinogomphus rapax*



Fig 10: *Pantala flavescens* (♂)



Fig 11: *Orthetrum triangulare* (♂)



Fig 12: *Bayadera indica*

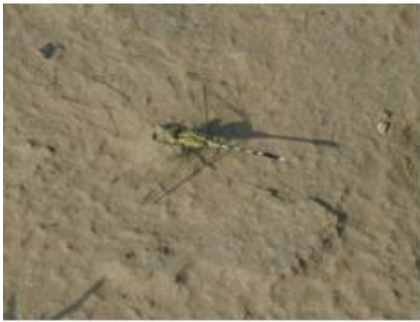


Fig 13: *Diplacodes trivialis*



Fig 14: *Orthetrum sabina*



Fig 15: *Ceriagrion fallax* (♂)



Fig 16: *Crocothemis servilia* (♀)



Fig 17: *Neurothemis fulvia* (♀)



Fig 18: *Ceriagrion coromandelianum* (♂)



Fig 19: *Ischnura forcipata*

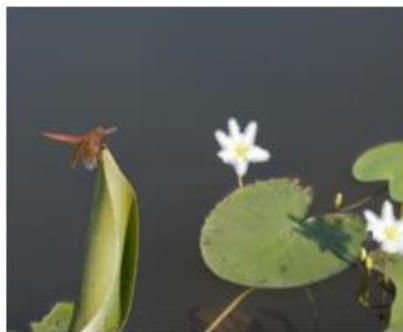


Fig 20: *Brachythemis contaminata* (♂)

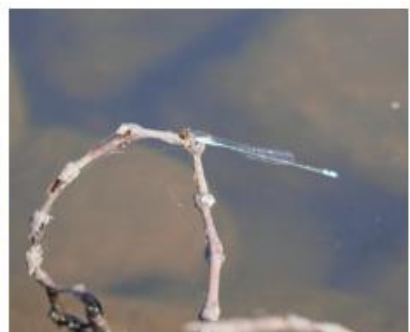


Fig 21: *Pseudagrion rubriceps* (♂)

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