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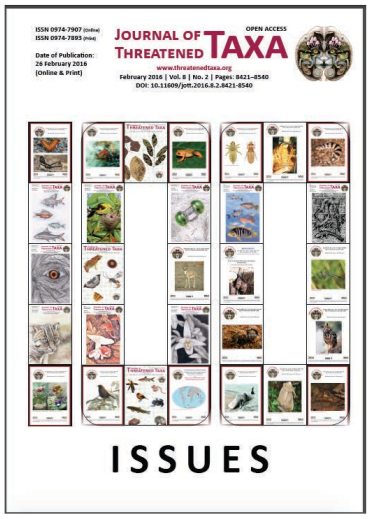

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SHORT COMMUNICATION

AN OBSERVATION ON THE ODONATA FAUNA OF THE ASANSOL-DURGAPUR INDUSTRIAL AREA, BURDWAN, WEST BENGAL, INDIA

Amar Kumar Nayak & Utpal Singha Roy

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An observation on the Odonata fauna of the Asansol-Durgapur Industrial Area, Burdwan, West Bengal, India

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Abstract: The present investigation was undertaken as a pilot study to examine the diversity, occurrence and distribution pattern of dragonflies and damselflies (Odonata) from the selected study sites of the Asansol-Durgapur industrial area of Burdwan District of West Bengal, India from January 2012 to December 2015. A combination of direct search and opportunistic sighting methods were applied to record 57 different Odonata species (38 dragonflies and 19 damselflies). Among the dragonflies the most diverse family was Libellulidae represented by 36 species while among damselflies Coenagrionidae was the most diverse family represented by 16 species. In spite of the Asansol-Durgapur region being an industrial urban area, the present study revealed a handsome diversity of odonates. A suitable geographic location, favourable climatic conditions, heterogeneous habitat types that included ponds, wetlands, riverbeds, grasslands and agricultural lands along with the presence of appropriate vegetation provided a comfortable shelter for Odonata species to flourish in this ecoregion. All the odonates noted in the present study belong to the Least Concerned category as designated by IUCN.

Keywords: Abundance, Asansol, Burdwan, damselfly, diversity, dragonfly, Durgapur, habitat types, odonates, West Bengal.

A total of 5,952 species belonging to 652 genera of odonates have been recorded worldwide of which India contributes with 475 species belonging to 142 genera and 18 families (Subramanian 2014; Tiple & Koparde 2015). They are one of the most dominating aquatic (larval stage) and terrestrial (mature stage) insects, flying over ponds, streams, rivers, forest, meadows and crop fields. Odonates have a great economic importance as described by Lt. Col. F.C. Fraser, the father figure of Indian Odonatology in his "The Fauna of British India - Odonata Vol. I" (Fraser 1933). The presence of dragonflies is thought of as an important indicator of ecological stability since they only lay eggs in or around freshwater sources (Corbet 1999). Adult odonates feed on mosquitoes, house flies and other bloodsucking flies and act as an important bio-control agent of these harmful insects (Andrew et al. 2009). Mandal et al. (2008) have reported the efficiency of odonate nymphs in controlling *Culex quinquefasciatus* mosquito larvae while Faithpraise et al. (2014) have shown that odonates can be effectively used in controlling *Anopheles* mosquito. They also control other pests that affect crops (Nair 2011). Odonates are considered as good biological indicators of an ecosystem. Ditch Jewel *Brachythemis contaminata* has been recognized as a good indicator of environmental pollution. A recent study on Odonata ecology from Western Ghats indicate

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Conflict of Interest: The authors declare no competing interests.

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families like Bamboo tails, Reed tails, Glories, Torrent darts, Torrent hawks and Club tails are good indicators of riverine ecosystems (Andrew et al. 2009). Studies on odonate diversity and ecology from West Bengal are on record (Fraser 1933, 1934, 1936; Mitra 2006; Mitra & Mitra 2009). The present study is the first attempt to prepare a checklist of odonates from the Asansol-Durgapur industrial area with an eye to their distribution and seasonal occurrence pattern.

Materials and Methods

Study area

The present study was conducted at 11 different study points of the Asansol-Durgapur area (23°53'–22°56'N & 88°25'–86°48'E), an important industrial urban zone of the Burdwan District of West Bengal, India (Fig. 1). Geographically the city is situated at the juxtaposition of two different geographical regions of the Indian subcontinent, i.e., the Lower Gangetic Plain and the Deccan Peninsula. The study area is dotted with a large number of small and heavy industries like the Durgapur Steel Plant, Alloy Steel Plant, Durgapur Thermal Power Station, Durgapur Projects Limited at Durgapur and IISCO Steel Plant, Hindustan Cables Ltd., Burn Standard Co., The Indian Iron and Steel Co. Ltd. at Asansol.

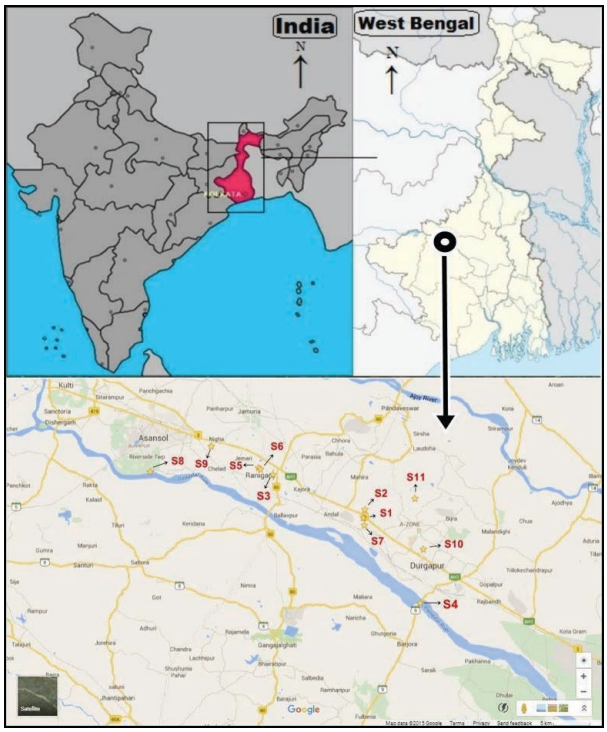

Figure 1. Study sites (S1–S11) under present investigation from the Asansol-Durgapur area of Burdwan District from West Bengal, India.

Two famous rivers of West Bengal, Ajay and Damodar rivers, run almost parallel to each other to border the present study location in the north and south directions respectively (Fig. 1). The newly built Kazi Nazrul Islam Airport is under the study site at Andal block. The selection of study sites were made based on the range of habitat types and ease of sampling for the observation of Odonata diversity. The focal points of sampling were - Nehru Park, Burnpur, Raniganj, Andal Aerodrome, villages like Dubchururia, Andal and Gopalmath, Ambuja Wetland, Durgapur and Durgapur Barrage and adjoining wetland areas. Soils of this area are mainly of three types - laterite soil with gravel, silty clayey soil and sandy clayey soil. The primary vegetation of the study area is represented by tropical dry deciduous plants dominated by *Shorea robusta* (Champion & Seth 1968). A brief

Table 1. A brief description of the selected study sites including geo-coordinates and habitat types.

Location (study site)	Latitude (N)	Longitude (E)	Habitat type
S1 - Dubchururia Village	23°34'40.9"	87°13'39.7"	Remnants of dry deciduous forests with more than 20 large water bodies
S2 - Andal old aerodrome	23°35'17.53"	87°13'48.41"	Open grassland and agricultural land with a slow flowing perennial stream
S3 - Searsole junior basic school	23°37'48.64"	87°6'33.36"	Planted trees with four large water bodies surrounded by agriculture land
S4 - Durgapur barrage	23°28'30.61"	87°18'8.20"	Wetland depended mixed vegetation with a perennial river
S5 - Nimcha Village	23°38'18.03"	87°05'22.03"	Remnants of dry deciduous forests with eight large water bodies, interspaced with agricultural land
S6 - Nimcha coal mine area	23°38'10.58"	87°05'34.06"	Mixed forest with a slow flowing perennial stream and open coal pits
S7 - Gopalmath rail colony	23°34'09.19"	87°13'43.87"	Open grassland and agricultural land with more than 10 large water bodies
S8 - Nehru park	23°38'01.19"	86°56'50.39"	Remnants of dry deciduous forests with a slow flowing perennial stream and a river
S9 - Gunjan ecological park	23°39'51.42"	87°01'41.19"	Wetland dependant mixed vegetation with a large water body
S10 - Ambuja wetland	23°32'25.82"	87°18'23.15"	Wetland dependent mixed vegetation with a large water body
S11 - Rana Pratap, A–Zone, Durgapur	23°36'04.52"	87°17'43.65"	Remnants of dry deciduous forests with a slow flowing perennial stream

description of the geographical location and different habitat types of the individual study sites (S1–S11 (Images 58–68) have been given in Table 1. Much of the areas still remain unexplored so far as the study of biodiversity is concerned. Among the notable studies undertaken in the recent past, Mukherjee et al. (2011) have reported 56 butterfly species during their one-year study period while Pal & Roy (2011) have noted 110 bird species during their two years of study. Pal et al. (2012) have reported nine species of amphibians and 24 species of reptiles during their two years of study from the present study location while Dey et al. (2013) have reported 36 fish species belonging to 14 different families during their six months of study from Durgapur barrage and adjacent wetland areas.

Data collection

A combination of direct search technique (Sutherland 1996) and opportunistic sighting methods were applied during the present study (January 2012 to December 2015) to record odonate diversity and abundance. Observations were made for consecutive four years covering each study site twice a month (a total of 96 samples from each study site) involving different habitat types of odonate colonization. During each sampling, efforts were made to enlist the encounter frequencies of different odonates from different sampling sites. Encounter rates of each species has been represented as A, B, C or D to indicate the most common to the rarest Odonata species based on sighting frequencies. A, B, C and D denoted 75–100 %, 50–74.99%, 25–49.99% and ≤24.99% of sighting from the sites of their occurrence throughout the entire study period respectively. The identification of odonates was done following Fraser (1933, 1934, 1936), Mitra (2006), Subramanian (2005, 2009, 2014) and Nair (2011). CANON Power Shot SX 40 HS digital camera was used for documentation and photographic record of the Odonates.

Results and Discussion

The diversity of odonate species varied widely during the present study both site and season-wise and has been presented in Table 2. Undisturbed areas away from human settlements and direct anthropogenic interventions were favoured by most of the dragonflies and damselflies. The maximum odonate diversity was recorded in the rainy season followed by the summer and winter seasons. A total of 57 different odonate species that involved both dragonflies (Anisoptera) and damselflies (Zygoptera) were recorded during the present study which was represented by 39 genera from seven families (Images 1–57). Among these seven families three were represented by damselflies (Zygoptera), viz., Coenagrionidae (10 species and 7 genera), Lestidae (1 species and 1 genus) and Platycnemididae (2 species and 1 genus) (Table 2). The rest of the four families were represented by dragonflies (Anisoptera), viz., Aeshnidae (2 species and 2 genera), Gomphidae (8 species and 6 genera), Macromiidae (1 species and 1 genus) and the most dominant family Libellulidae (36 species and 19 genera) (Table 2). The present findings of Libellulidae being the most dominant dragonfly family is well supported from previous studies from other geographic locations of India (Arulprakash & Gunathilagaraj 2010; Tiple et al. 2012; Sahoo et al. 2013). The dominance in zygopterans by the Coenagrionidae family could be attributed to the fact that members of this family are the largest among zygopterans and have a wide geographic distribution (Norma-Rashid et al. 2001).

Among the 19 zygopterans two species of coenagrionids were found near the riverbeds of Ajay and Damodar Rivers which were *Ischnura nursei* and *Enallagma parvum*. Among the 38 anisopterans recorded in the present study the three most dominant species were *Ictinogomphus rapax*, *Paragomphus lineatus* and *Epophthalmia vittata* (Table 2). The most abundant of damselflies (Zygoptera) were coenagrionids and this group was dominated by *Ceriagrion coromandelianum* and *Agriocnemis pygmaea* (Table 2). The well-known bioindicator, *Brachythemis contaminata* was most abundantly found near human settlements surrounded by polluted ditches and drains. *Gynacantha dravida* and *Zyxomma petiolatum* showed the maximum appearances at dusk or night; also they were observed to prefer to rest in old abandoned houses or dense forests. In the rainy season *Pantala flavescens* and *Macrodiplax cora* were found in maximum numbers near fresh water bodies. The life cycle of *Bradinopyga geminata*, well known for its camouflage abilities were observed in an artificial water reservoir during the present study. The most important predator and abundant dragonfly (Anisoptera) recorded during the present study was *Orthetrum sabina* (Table 2) while the least common damselflies recorded during the present study were *Ischnura nursei*, *Enallagma parvum* and *Copera marginipes* (Table 2). Photographs of recorded odonates are given in images 1–57.

All the dragonflies and damselflies recorded in the present study are classified as Least Concerned as per the IUCN Red List of Threatened Species (Molur et al. 2011; IUCN 2013).

Table 2. Checklist of Anisoptera and Zygoptera from selected spots of Asansol – Durgapur area with respective sites and seasons of occurrence. Encounter rates of each species A, B, C and D stands for sighting frequencies where "A" stands for most common while, "D" stands for least common/rare Odonata. Encounter rates A (75–100 %), B (50–74.99%), C (25–49.99 %) and D (≤24.99%) from the sites of their occurrence throughout the entire study period.

	Species	Sites of Occurrence	Season of Occurrence	Encounter Rates
Suborder: Anisoptera Selys, 1854				
Family: Aeshnidae Leach, 1815				
01	*Anax guttatus* (Burmeister, 1839)	S2, S4, S5, S6, S7	May – November	C
02	*Gynacantha dravida* Lieftinck, 1960	S3, S5	Throughout the year	B
Family: Gomphidae Rambur, 1842				
03	*Cyclogomphus ypsilon* Selys, 1854	S4	June – August	C
04	*Cyclogomphus wilkinsi* Fraser, 1926	S4	June – August	C
05	*Ictinogomphus distinctus* (Ram, 1985)	S2	June	D
06	*Ictinogomphus rapax* (Rambur, 1842)	S1, S2, S3, S4, S5, S8, S10	Throughout the year	A
07	*Macrogomphus annulatus* (Selys, 1854)	S1, S4	May – June	D
08	*Megalogomphus sp.*	S2	June	D
09	*Paragomphus lineatus* (Selys, 1850)	S2, S3, S4, S7	March – December	C
10	*Platygomphus dolabratus* Selys, 1854	S4	July	D
Family: Macromiidae Needham, 1903				
11	*Epophthalmia vittata* Burmeister, 1839	S1, S3, S5	Throughout the year	C
Family: Libellulidae Leach, 1815				
12	*Acisoma panorpoides* Rambur, 1842	S3, S4, S7, S10	May – September	B
13	*Aethriamanta brevipennis* (Rambur, 1842)	S3, S4, S10	May – September	B
14	*Brachydiplax chalybea* Brauer, 1868	S4	October	D
15	*Brachydiplax sobrina* (Rambur, 1842)	S1, S3, S4, S5, S7, S8, S10	Throughout the year	A
16	*Brachythemis contaminata* (Fabricius, 1793)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11	Throughout the year	A
17	*Bradinopyga geminate* (Rambur, 1842)	S1, S3, S5, S6, S10	Throughout the year	A
18	*Crocothemis servilia* (Drury, 1773)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11	Throughout the year	A
19	*Diplacodes nebulosa* (Fabricius, 1793)	S2, S3, S7, S10	May – August	D
20	*Diplacodes trivialis* (Rambur, 1842)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	Throughout the year	A
21	*Macrodiplax cora* (Brauer, 1867)	S2, S4	June – September	B
22	*Neurothemis intermedia* (Rambur, 1842)	S3, S8	April – June	D
23	*Neurothemis tullia* (Drury, 1773)	S1, S2, S3, S4, S7, S8, S9, S10	April – October	B
24	*Orthetrum glaucum* (Brauer, 1865)	S3	March, April	D
25	*Orthetrum luzonicum* (Brauer, 1868)	S3, S8	July, August	C
26	*Orthetrum pruinosum* (Burmeister, 1839)	S3, S4, S8	April – October	C
27	*Orthetrum Sabina* (Drury, 1770)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11	Throughout the year	A
28	*Pantala flavescens* (Fabricius, 1798)	S1, S2, S3, S4, S5, S7	May – November	B
29	*Potamarcha congener* (Rambur, 1842)	S1, S2, S3, S4, S7, S8, S9, S10	February – November	B
30	*Rhodothemis rufa* (Rambur, 1842)	S1, S2, S3, S7, S8, S9	March – November	B
31	*Rhyothemis variegate* (Linnaeus, 1763)	S1, S2, S3, S4, S7, S8, S10	March – November	B
32	*Tholymis tillarga* (Fabricius, 1798)	S1, S2, S3, S4, S5	Throughout the year	B
33	*Tramea basilaris* (Palisot de Beauvois, 1805)	S1, S2, S3, S5	September – February	B
34	*Tramea limbata* (Desjardins, 1832)	S1, S2, S3, S5	September – February	B
35	*Trithemis festiva* (Rambur, 1842)	S3, S4	August – November	D
36	*Trithemis pallidinervis* (Kirby, 1889)	S1, S2, S3, S4, S7, S10	February – November	B
37	*Urothemis signata* (Rambur, 1842)	S1, S2, S3, S4, S7, S10, S11	March – November	B

	Species	Sites of Occurrence	Season of Occurrence	Encounter Rates
38	*Zyxomma petiolatum* Rambur, 1842	S1, S3, S4, S7	March – November	C
Suborder: Zygoptera Selys, 1854				
Family: Coenagrionidae Kirby, 1890				
39	*Agriocnemis kalinga* (Nair & Subramanian, 2014)	S1	May	D
40	*Agriocnemis pygmaea* (Rambur, 1842)	S1, S2, S3, S4	Throughout the year	A
41	*Ceriagrion cerinorubellum* (Brauer, 1865)	S1, S2, S3, S4	February – November	C
42	*Ceriagrion coromandelianum* (Fabricius, 1798)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11	Throughout the year	A
43	*Enallagma parvum* Selys, 1876	S1	February	D
44	*Ischnura aurora* (Brauer, 1865)	S1, S2, S3, S4, S6	March – November	B
45	*Ischnura rufostigma* Selys, 1876	S4	March	D
46	*Ischnura senegalensis* (Rambur, 1842)	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11	Throughout the year	A
47	*Onychargia atrocyana* Selys, 1865	S1, S3, S4	February – November	B
48	*Paracercion calamorum* (Ris, 1916)	S11	June	D
49	*Paracercion malayanum* (Selys, 1876)	S4	May – October	C
50	*Pseudagrion decorum* (Rambur, 1842)	S1, S2, S3, S4	February – November	B
51	*Pseudagrion microcephalum* (Rambur, 1842)	S4, S6	February – November	C
52	*Pseudagrion rubriceps* Selys, 1876	S1, S2, S3, S4, S6	February – November	B
53	*Pseudagrion spencei* Fraser, 1922	S4	July, November	B
54	*Ischnura nursei*(Morton, 1907)	S2, S4	October, March	D
Family: Lestidae Calvert, 1901				
55	*Lestes umbrinus* Selys, 1891	S4	October	D
Family: Platycnemididae Yakobson & Bainchi, 1905				
56	*Copera ciliate* (Selys, 1863)	S1, S3, S4	February – November	B
57	*Copera marginipes* (Rambur, 1842)	S1	March	D

Although none of the study sites in the present investigation were devoid of anthropogenic disturbance, they varied in their degrees of disturbances and could be grouped under the most disturbed (study sites S6, S8, S9 and S11), moderately disturbed (study sites S2, S5, S7 and S10) and less disturbed (study sites S1, S3 and S4) habitats. What came as no surprise was that the maximum Odonata species diversity was recorded from the less disturbed study sites followed by the moderately disturbed study sites, while the most disturbed study sites contributed to a minimum of Odonata species diversity (Fig. 2). These findings corroborate well with findings made by other researchers who have already reported the negative influence of habitat alteration and disturbances on Odonata diversity (Subramanian 2010; Molur et al. 2011). The present findings are important since these can be used in monitoring ecosystem health, stability and functioning from the present study area. A higher abundance of *Brachythemis contaminata* in the present study is a clear indication of elevated pollution levels. However, a simultaneous occurrence of species

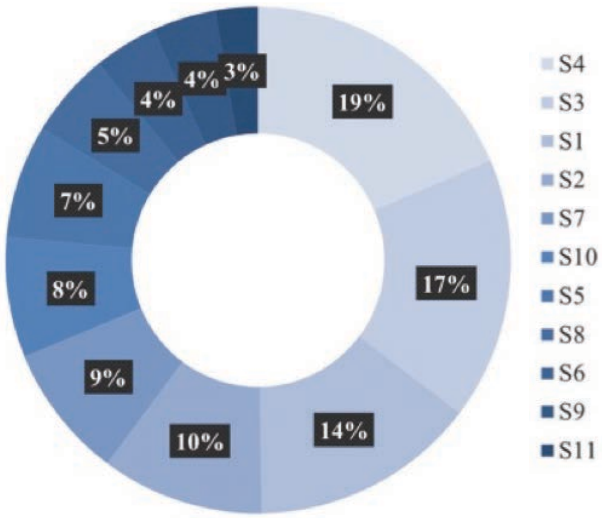

Figure 2. Diagram showing percentage contribution of Odonata species from different study sites under the present investigation. Study sites with maximum disturbances have been presented in darker shades while sites with moderate to low disturbances have been depicted in gradual lighter shades.

Image 1. *Anax guttatus* (male)
S7 / 25-09-2015

Image 2. *Gynacantha dravida* (female)
S5/ 28-02-2012

Image 3. *Cyclogomphus ypsilon* (mating)
S4 / 19-07-2015

Image 4. *Cyclogomphus wilkinsi* (female)
S4 / 19-07-2015

Image 5. *Ictinogomphus distinctus* (female)
S2 / 25-06-2014

Image 6a. *Ictinogomphus rapax* (male)
S8 / 20-04-2014

Image 6b. *Ictinogomphus rapax* (female)
S3 / 20-07-2012

Image 7. *Macrogomphus annulatus* (female)
S1/ 14-06-2014

Image 8. *Megalogomphus* sp. (female)
S2 / 25-06-2014

Image 9a. *Paragomphus lineatus* (male)
S3 / 17-06-2014

Image 9b. *Paragomphus lineatus* (female)
S3 / 25-06-2015

Image 10. *Platygomphus dolabratus* (male)
S4 / 19-07-2015

Image 11. *Epophthalmia vittata* (female) S5 / 24-09-2012

Image 13a. *Aethriamanta brevipennis* (male) S3 / 14-08-2012

Image 14b. *Brachydiplax chalybea* (female) S4 / 02-10-2015

Image 17a. *Bradinopyga geminata* (male) S1 / 22-04-2012

Image 12a. *Acisoma panorpoides* (male) S10 / 16-06-2013

Image 13b. *Aethriamanta brevipennis* (female) S3 / 17-06-2014

Image 15a. *Brachydiplax sobrina* (male) S8 / 20-04-2014

Image 16a. *Brachythemis contaminata* (male) S1 / 19-05-2012

Image 12b. *Acisoma panorpoides* (female) S10 / 16-06-2013

Image 14a. *Brachydiplax chalybea* (male) S4 / 16-10-2014

Image 15b. *Brachydiplax sobrina* (female) S1 / 29-03-2013

Image 16b. *Brachythemis contaminata* (female) S1 / 18-05-2012

Image 17b. *Bradinopyga geminata* (female)
S3 / 07-12-2012

Image 19a. *Diplacodes nebulosa* (male)
S2 / 26-06-2014

Image 21a. *Macrodiplax cora* (male)
S2 / 21-07-2013

Image 21b. *Macrodiplax cora* (female)
S2 / 26-06-2014

Image 18a. *Crocothemis servilia* (male)
S8 / 28-04-2013

Image 19b. *Diplacodes nebulosa* (female)
S3 / 21-05-2013

Image 22a. *Neurothemis intermedia* (male)
S8 / 28-04-2013

Image 23a. *Neurothemis tullia* (male)
S2 / 29-08-2013

Image 18b. *Crocothemis servilia* (female)
S3 / 25-06-2013

Image 20. *Diplacodes trivialis* (mating)
S6 / 03-10-2014

Image 22b. *Neurothemis intermedia* (female) S3 / 05-09-2014

Image 23b. *Neurothemis tullia* (female)
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Image 25a. *Orthetrum luzonicum* (male)
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S3 / 01-08-2014

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Image 28a. *Pantala flavescens* (male)
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Image 29a. *Potamarcha congener* (male)
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Image 33b. *Tramea basilaris* (female)
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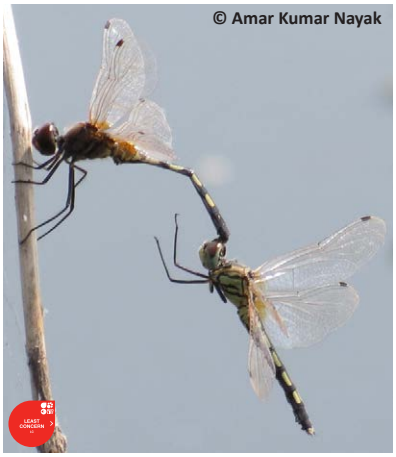

Image 36. *Trithemis pallidinervis* (mating)
S4 / 03-04-2015

Image 40. *Agriocnemis pygmaea* (mating)
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Image 41. *Ceriagrion cerinorubellum* (female) S3 / 15-06-2012

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Image 44b. *Ischnura aurora* (female) S1 / 15-11-2013

Image 47a. *Onychargia atrocyana* (male) S3 / 12-04-2012

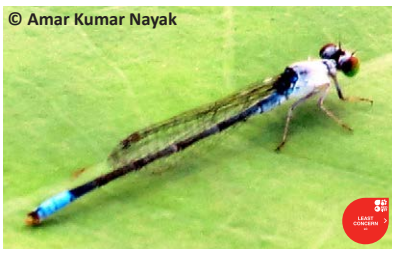

Image 48. *Paracercion calamorum* (male) S11 / 18-06-2014

Image 42. *Ceriagrion coromandelianum* (mating) S1 / 15-03-2013

Image 45. *Ischnura rufostigma* (female) S4 / 07-03-2015

Image 47b. *Onychargia atrocyana* (female) S3 / 05-09-2013

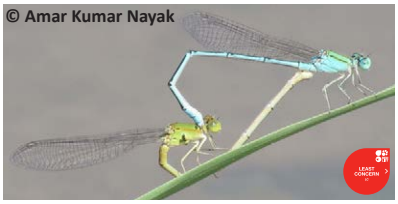

Image 50. *Pseudagrion decorum* (mating) S4 / 03-04-2015

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Image 51b. *Pseudagrion microcephalum* (female) S4 / 07-03-2015

Image 54a. *Ischnura nursei* (male) S2 / 10-09-2014

Image 53. *Pseudagrion spencei* (female) S4 / 15-11-2015

Image 55. *Lestes umbrinus* (female) S4 / 02-10-2015

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Image 52. *Pseudagrion rubriceps* (mating) S1 / 18-12-201

Image 54b. *Ischnura nursei* (female) S4 / 30-03-2014

Image 57. *Copera marginipes* (male) S1 / 28-03-2013

Image 58. S1 – Dubchururia village

Image 59. S2– Andal old aerodrome

Image 60. S3 – Searsole junior basic school

Image 61. S4 – Durgapur barrage

Image 62. S5 – Nimcha Village

Image 63. S6 – Nimcha coal mine area

like *Ictinogomphus rapax* and *Paragomphus lineatus* are noteworthy and most importantly attests to the presence of some undisturbed and unpolluted water bodies from the present study area. Future investigations covering more study areas will certainly enrich our knowledge and understanding of odonate diversity and ecology.

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Image 64. S7 – Gopalmath rail colony

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Image 65. S8 – Nehru park

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Image 66. S9 – Gunjan ecological park

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Image 67. S10 – Ambuja wetland

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Image 68. S11 – Rana Pratap, A–Zone, Durgapur

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