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SHORT COMMUNICATION

DRAGONFLIES AND DAMSELFLIES OF UNIVERSITY OF NORTH BENGAL CAMPUS, WEST BENGAL, INDIA WITH NEW DISTRIBUTION RECORD OF *AGRIOCNEMIS KALINGA* NAIR & SUBRAMANIAN, 2014

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DRAGONFLIES AND DAMSELFLIES OF UNIVERSITY OF NORTH BENGAL CAMPUS, WEST BENGAL, INDIA WITH NEW DISTRIBUTION RECORD OF *AGRIOCNEMIS KALINGA* NAIR & SUBRAMANIAN, 2014

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Abstract: A study was made to determine the present status of the diversity of the dragonflies and damselflies from University of North Bengal campus and its surroundings. The study shows the presence of total 69 species of odonates belonging to 41 genera and nine families from the area. *Agriocnemis kalinga* Nair & Subramanian, 2014 is recorded for the first time from northern Bengal.

Keywords: Dragonflies, Damselflies, diversity, NBU, northern Bengal, Odonata.

Dragonflies (Anisoptera) and damselflies (Zygoptera) are two sub-orders belonging to the single order Odonata. They have a very wide range of distribution. They are found to occur in both terrestrial (as adults) and fresh water ecosystems (as larvae) and can easily be spotted in dense forests, grasslands or even from our balconies; in rivers, lakes or sea coasts (Fraser 1933; Subramanian 2005; Nair 2011). There are more than 6,250 species of odonates worldwide and India has 487 species (152 genera and 18 families) representing this group (Subramanian 2014; Schorr & Paulson 2016; Subramanian & Babu 2017). Their presence has a good impact on ecosystems. The adult insects lay their eggs on water bodies and the species are usually habitat-specific. The habitat specificity and sensitivity of odonates to environmental pollution helps us to

determine the health or fitness of the associated aquatic ecosystems (Subramanian 2005; Tiple et al. 2013). The larvae and the adults both are fantastic predators and they act to control the population of other insects. This also results in controlling the mosquito population.

Northern Bengal (Darjeeling, Kalimpong, Jalpaiguri, Alipurduar and Cooch Behar districts) is well known for its rich flora and fauna. Previous studies by Fraser (1933, 1934, 1935a,b,c,d, 1936, 1940) contained many records and descriptions of odonates from this area. Later, Srivastava & Sinha (1993) provided a checklist of 185 species of odonates of West Bengal with records of 137 species from northern Bengal. Recently, Dawn (2017) reported 66 species of odonates from two protected areas of northern Bengal. The present study reports status and diversity of odonates from the University of North Bengal and its surrounding areas.

MATERIALS AND METHODS

Study Area

The campus of the University of North Bengal (NBU) lies between 26.70500000–26.71583333 N and 88.50722222–88.36111111 E covering about 331 acres of land at the foothills of Darjeeling Himalaya (Siliguri Sub-Division, Darjeeling District) (Image 1). The campus

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Image 1. Location of University of North Bengal



Image 2. Habitat photographs of the studied area. A - Tanks for aquatic plants in S1; B & C - Stream1 in S3; D - Sal trees in S2; E - Overall scenario of the campus, F - Stream2 in S4; G - Ephemeral waterbodies in S5. © Aaratrik Pal

is home to several plants (e.g., Critically Endangered *Streptocaulon sylvestre* Wight), amphibians, reptiles, birds (Indian Grey Hornbill, Oriental Pied Hornbill, Green

Table 1. Representation of sampling sites, their locations and habitat types

Sampling site	Location	Description
S1	Centre for aromatic & medicinal plant garden, NBU	Well maintained population of trees, shrubs and herbs; tanks with different aquatic plants
S2	Sal forest, NBU	Area dominated by sal trees with a semi-perennial stream, other large trees, climbers etc. making good shade.
S3	Stream 1, NBU	Semi-perennial stream with variable sized boulders, a part is under bamboo shade
S4	Stream 2, NBU	Semi-perennial stream, rich in aquatic plants and grasses
S5	Outskirts of NBU (26.71666667 N & 88.36666667 E)	Ephemeral water bodies with the dense mat of aquatic plants and agricultural lands associated with human habitation

Imperial Pigeon) etc. There are two semi-perennial streams within the campus and a large area remains sub-merged during the monsoons. Apart from these, rubber plantations, bamboo groves, mixed forest of *Shorea*, *Lagerstroemia*, *Holarrhena* among others are also present; two large gardens and fields dominated by grasses, herbs and ferns provide excellent shelter and breeding habitat for the odonates (Image 2).

Data collection

The survey was conducted during 2014–2017 and observations were mainly done on four sites within the campus and a single site outside the campus (Table 1). Photographs of the odonates were taken using Canon Powershot sx510 HS and Canon EOS 1200d. In very few cases the odonates were captured to take some close

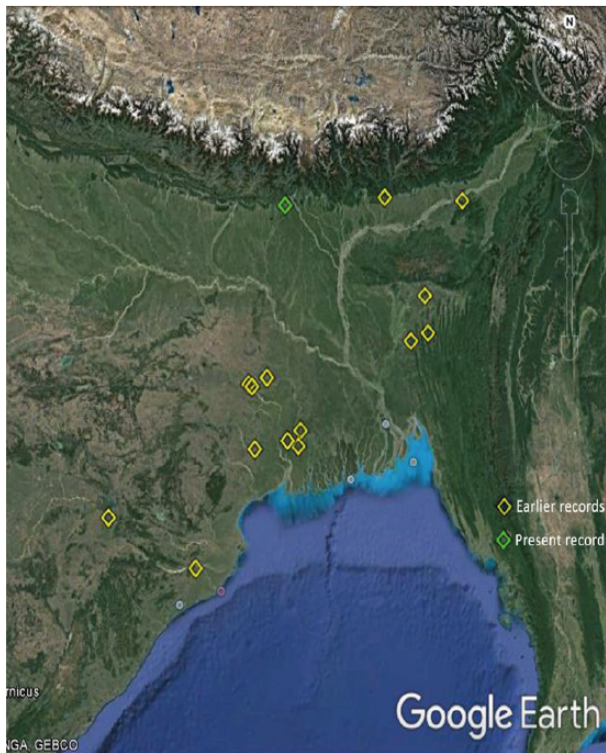


Image 3. Distribution map of *Agriocnemis kalinga* Nair & Subramanian, 2014

photographs and released immediately, in no cases were these insects harmed or killed. Odonates were identified using the keys provided by Fraser (1933, 1934, 1936), Subramanian (2005), and Nair (2011); some personal scientific interactions and websites were also useful.

RESULTS

A total of 69 species of odonates belonging to nine families and 41 genera were documented (Table 2) during the study, out of which 67 species were recorded from the campus and two species from the surroundings (Images 4–8). Among them, Libellulidae had the largest number of species (35) and also the largest number of genera (22) followed by Coenagrionidae having 21 species and eight genera. Aeshnidae had five species under three genera and Gomphidae and Platycnemididae had two species each. The families, Macromiidae, Calopterygidae, Chlorocyphidae and Lestidae are represented by a single species. A recently described damselfly, *Agriocnemis kalinga* Nair & Subramanian, 2014 (Image 7D) is reported for the first time from northern Bengal.

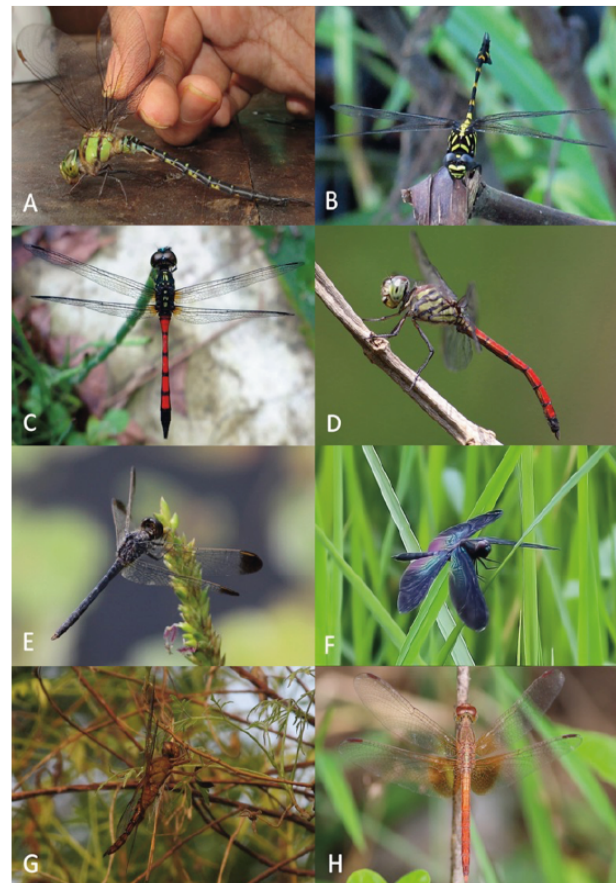


Image 4. Photographs of some odonates. A - *Gynacantha khasiaca* (male); B - *Ictinogomphus rapax* (m); C - *Agrionoptera insignis* (m); D - *Lathrecista asiatica* (m); E - *Diplacodes nebulosa* (m); F - *Rhyothemis plutonia* (m); G - *Hydrobasileus croceus* (m); H - *Neurothemis intermedia* (m). © Aaratrik Pal

DISCUSSION

Some interesting notes of Odonata behavior and habitat preference was taken during this survey. Among dragonflies, *Brachydiplax chalybea*, *Crocothemis servilia*, *Diplacodes trivialis*, *Neurothemis fulvia*, *Orthetrum pruinosum*, *O. sabina*, *Pantala flavescens*, *Potamarcha congener*, *Rhyothemis variegata*, *Rhodothemis rufa*, *Tholymis tillarga* and *Trithemis aurora* were the most abundant species.

Pantala flavescens, *Rhyothemis variegata*, *Tramea basilaris*, *T. limbata*, *Hydrobasileus croceus*, *Anax guttatus* and *A. indicus*, were found to have endless flight in the air and foraging on the flying insects, rest of the time these insects were found hanging under the shade of trees (*Rhyothemis* and *Tramea* did not show specific hanging behavior). *Trithemis pallidinervis* and *Urothemis signata* were found gliding sometimes and most of the time perching on twigs of small woody plants.

Table 2. Checklist of the Odonates reported from University of North Bengal Campus.

Odonates are grouped according to their abundance, viz: Most Abundant (M): Species with very frequent encounters from at least four sites; Locally Common (L): Species recorded from 2-4 sites considerably less frequently; Occasional (O): Species with individuals encountered from 1-3 sites but very few times; Rare (R): Species encountered single time during whole survey period.

	Species name	Observation sites	Notes on occurrence	IUCN status
	Suborder Anisoptera Seyles, 1854			
	Aeshnidae			
1	<i>Anaciaeschna jaspidea</i> (Burmeister, 1839)	S5	R	LC
2	<i>Anax guttatus</i> (Burmeister, 1839)	S2, S3, S4, S5	C	LC
3	<i>Anax indicus</i> Lieftinck, 1942	S1, S3, S4, S5	C	LC
4	<i>Gynacantha dravida</i> Lieftinck, 1960	S1	R	DD
5	<i>Gynacantha khasiaca</i> MacLachlan, 1896	S5	R	DD
	Gomphidae			
6	<i>Ictinogomphus rapax</i> (Rambur, 1842)	S1, S3, S5	O	LC
7	<i>Paragomphus lineatus</i> (Selys, 1850)	S1, S3, S5	O	LC
	Macromiidae			
8	<i>Epopthalmia sp.</i>	S1, S2	O	-
	Libellulidae			
9	<i>Acisoma panorpoides</i> Rambur, 1842	S1, S3, S4, S5	C	LC
10	<i>Aethriamanta brevipennis</i> (Rambur, 1842)	S1, S3, S4	C	LC
11	<i>Agrionoptera insignis</i> (Rambur, 1842)	S1	R	LC
12	<i>Brachydiplax chalybea</i> Brauer, 1868	S1, S3, S4, S5	C	LC
13	<i>Brachydiplax farinosa</i> Krüger, 1902	S1, S3, S5	C	LC
14	<i>Brachydiplax sobrina</i> (Rambur, 1842)	S1, S3, S5	C	LC
15	<i>Brachythemis contaminata</i> (Fabricius, 1793)	S1, S3, S4, S5	C	LC
16	<i>Bradinyopyga geminata</i> (Rambur, 1842)	S1, S3, S5	C	LC
17	<i>Crocothemis servilia</i> (Drury, 1770)	S1, S3, S4, S5	M	LC
18	<i>Diplacodes nebulosa</i> (Fabricius, 1793)	S3, S4, S5	C	LC
19	<i>Diplacodes trivialis</i> (Rambur, 1842)	S1, S3, S4, S5	M	LC
20	<i>Hydrobasileus croceus</i> (Brauer, 1867)	S2, S3, S5	O	LC
21	<i>Lathrecista asiatica</i> (Fabricius, 1798)	S1, S2, S3	O	LC
22	<i>Neurothemis fulvia</i> (Drury, 1773)	S1, S2, S3, S4, S5	M	LC
23	<i>Neurothemis intermedia</i> (Rambur, 1842)	S1, S2, S5	O	LC
24	<i>Neurothemis tullia</i> (Drury, 1773)	S1, S3, S5	C	LC
25	<i>Orthetrum chrysis</i> (Selys, 1891)	S1	O	LC
26	<i>Orthetrum glaucum</i> (Brauer, 1865)	S1, S3	O	LC

	Species name	Observation sites	Notes on occurrence	IUCN status
27	<i>Orthetrum luzonicum</i> (Brauer, 1868)	S1	O	LC
28	<i>Orthetrum pruinosum</i> (Burmeister, 1839)	S1, S2, S3, S4, S5	M	LC
29	<i>Orthetrum sabina</i> (Drury, 1770)	S1, S2, S3, S4, S5	M	LC
30	<i>Palpopleura sexmaculata</i> (Fabricius, 1787)	S3, S5	O	LC
31	<i>Pantala flavescens</i> (Fabricius, 1798)	S1, S2, S3, S4, S5	M	LC
32	<i>Potamarcha congener</i> (Rambur, 1842)	S1, S2, S3, S4, S5	C	LC
33	<i>Rhodothemis rufa</i> (Rambur, 1842)	S1, S3, S4, S5	C	LC
34	<i>Rhyothemis plutonia</i> Selys, 1883	S3	R	LC
35	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	S1, S3, S4, S5	M	LC
36	<i>Tholymis tillarga</i> (Fabricius, 1798)	S1, S3, S5	C	LC
37	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)	S3, S5	O	LC
38	<i>Tramea limbata</i> (Desjardins, 1832)	S2, S3	O	LC
39	<i>Trithemis aurora</i> (Burmeister, 1839)	S1, S3, S4, S5	M	LC
40	<i>Trithemis festiva</i> (Rambur, 1842)	S3, S4	O	LC
41	<i>Trithemis pallidinervis</i> (Kirby, 1889)	S1, S3, S5	C	LC
42	<i>Urothemis signata</i> (Rambur, 1842)	S1, S3	O	LC
43	<i>Zyxomma petiolatum</i> Rambur, 1842	S1, S5	O	LC
	Suborder Zygoptera Seules, 1854			
	Calopterygidae			
44	<i>Neurobasis chinensis</i> (Linnaeus, 1758)	S3	R	LC
	Chlorocyphidae			
45	<i>Libellago lineata</i> (Burmeister, 1839)	S1	R	LC
	Coenagrionidae			
46	<i>Aciagrion approximans</i> (Selys, 1876)	S3	R	LC
47	<i>Aciagrion pallidum</i> Selys, 1891	S1, S5	O	LC
48	<i>Agriocnemis clauseni</i> Fraser, 1922	S4	R	LC
49	<i>Agriocnemis femina</i> (Brauer, 1868)	S1, S3, S4, S5	M	LC
50	<i>Agriocnemis kalinga</i> Nair & Subramanian, 2014	S5	R	NE
51	<i>Agriocnemis lacteola</i> Selys, 1877	S1, S3, S4, S5	M	LC
52	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	S1, S3, S4, S5	M	LC
53	<i>Amphiallagma parvum</i> (Selys, 1876)	S1, S3, S4, S5	O	LC

	Species name	Observation sites	Notes on occurrence	IUCN status
54	<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)	S1, S3, S5	C	LC
55	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	S1, S3, S4, S5	M	LC
56	<i>Ceriagrion olivaceum</i> Laidlaw, 1914	S1, S2, S3, S5	C	LC
57	<i>Ceriagrion rubiae</i> Laidlaw, 1916	S1, S3, S5	O	NE
58	<i>Ischnura cf. aurora</i> (Brauer, 1865)	S1, S3, S4, S5	M	LC
59	<i>Ischnura rufostigma</i> Selys, 1876	S1	R	LC
60	<i>Mortonagrion aborensis</i> (Laidlaw, 1914)	S1, S3	O	LC
61	<i>Paracercion calamorum</i> (Ris, 1916)	S4	R	LC
62	<i>Paracercion malayanum</i> (Selys, 1876)	S4	R	NE
63	<i>Pseudagrion australasiae</i> Selys, 1876	S3, S4	O	LC
64	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	S3, S4	O	LC
65	<i>Pseudagrion rubriceps</i> Selys, 1876	S1, S3, S4, S5	C	LC
66	<i>Pseudagrion spencei</i> Fraser, 1922	S1, S3, S4, S5	C	LC
	Lestidae			
67	<i>Lestes praemorsus</i> Hagen in Selys, 1862	S1, S3, S5	O	LC
	Platycnemididae			
68	<i>Copera marginipes</i> (Rambur, 1842)	S1, S3	O	LC
69	<i>Onychargia atrocyana</i> (Selys, 1865)	S1, S3, S5	O	LC



Image 5. A - *Orthetrum glaucum* (female); B - *Orthetrum luzonicum* (m); C - *Orthetrum chrysis* (m); D - *Orthetrum pruinosum* (m); E - *Rhodothemis rufa* (m); F - *Tramea basilaris* (m); G - *Palpopleura sexmaculata* (m); H - *Trithemis festiva* (m). © Aaratrik Pal

Anax guttatus, *A. indicus*, *Ictinogomphus rapax*, *Aethriamanta brevipennis*, *Acisoma panorpoides*, *Agrionoptera insignis*, *Brachydiplax chalybea*, *B. farinosa*, *B. sobrina*, *Brachythemis contaminata*, *Diplacodes nebulosa*, *Neurothemis tullia*, *Rhodothemis rufa*, *Rhyothemis plutonia*, *R. variegata*, *Tramea basilaris*, *T. limbata* and *Trithemis festiva* were mainly distributed near waterbodies. *Trithemis festiva* was strictly associated with only streams.

Crocothemis servilia, *Diplacodes nebulosa*, *D. trivialis*, *Neurothemis intermedia*, *N. tullia*, *Orthetrum sabina*, *Palpopleura sexmaculata*, *Rhodothemis rufa*, *Trithemis aurora*, *T. festiva* and *T. pallidinervis* were found to prefer waiting on ground level grasses, herbaceous and dry plants, rocks etc. for their prey. On the other hand *Epophthalmia*, *Lathrecista asiatica*, *Orthetrum chrysis* and *Potamarcha congener* were found perching on higher branches, electric wires and boundary wires. Unlike these day-active dragonflies, species like *Gynacantha dravida*, *G. khasiaca*, *Anaciaeschna*

jaspidea and *Zyxomma petiolatum* were crepuscular in nature and during daylight were found hiding in dense bushes or under the shade of trees.

Most of the damselflies were found closely associated with waterbodies. Among them *Agriocnemis lacteola*, *Agriocnemis pygmaea*, *Agriocnemis femina*, *Ceriagrion coromandelianum* and *Ischnura aurora* were the most abundant species throughout the study area and recorded several times at a far distance from waterbodies. Species like *Neurobasis chinensis*, *Libellago lineata*, *Ceriagrion rubiae*, *Mortonagrion aborensis*, *Paracercion calamorum*, *P. malayanum*, *Pseudagrion australasiae*, *P. microcephalum*, *P. rubriceps*, *P. spencei*, *Lestes praemorsus*, *Copera marginipes* and *Onychargia atrocyana* were more or less confined to water nearby. *Neurobasis chinensis* and *Libellago lineata* were restricted to rocky streams. Some damselflies, *Ceriagrion cerinorubellum*, *Ceriagrion olivaceum*, *Mortonagrion aborensis* and *Copera marginipes* notably preferred shade.

Agriocnemis kalinga Nair & Subramanian, 2014: A single female damselfly (Image 7D) was recorded

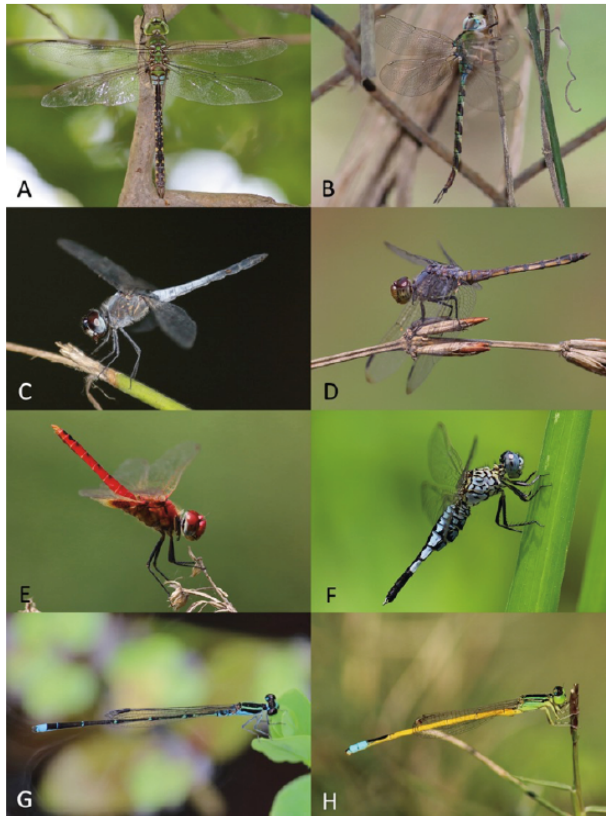


Image 6. A - *Anax guttatus* (female); B - *Gynacantha dravida* (m); C - *Brachydiplax farinosa* (m); D - *Potamarcha congener* (m); E - *Urothemis signata* (m); F - *Acisoma panorpoides* (m); G - *Mortonagrion aborensis* (m); H - *Ischnura cf. aurora* (m).
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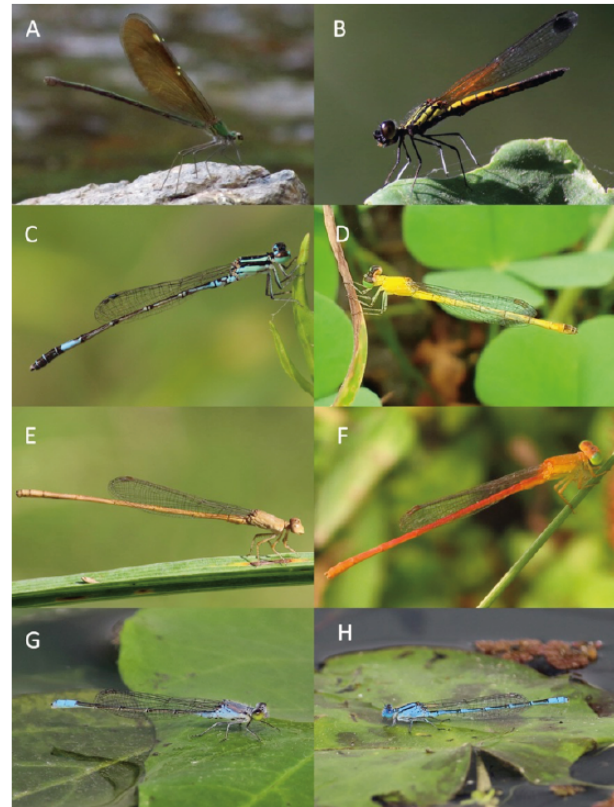


Image 7. A - *Neurobasis chinensis* (female); B - *Libellago lineata* (m); C - *Agriocnemis clauseni* (m); D - *Agriocnemis kalinga* (fm); E - *Ceriagrion olivaceum* (m); F - *Ceriagrion rubiae* (m); G - *Paracercion calamorum* (m); H - *Paracercion malayanum* (m).
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on 02/10/2016 from an ephemeral water body (26.70722222 N & 88.36916667 E). It was even smaller than *Agriocnemis pygmaea*, *A. lacteola* or *Enallagma parvum*, smallest representatives of the group (Coenagrionidae). According to Nair & Subramanian (2014), *A. kalinga* is distributed throughout southern Bengal and Odisha. Later on Khan (2015) reported *A. kalinga* from Bangladesh; Boruah et al. (2016) from Assam. A recent record from the study area shows range extension of the species. A map is provided with recent and earlier records of this species (Image 3) including records from Joshi & Kunte (2014), Kalita (2014), Nayak & Roy (2016) and Anonymous (2017).

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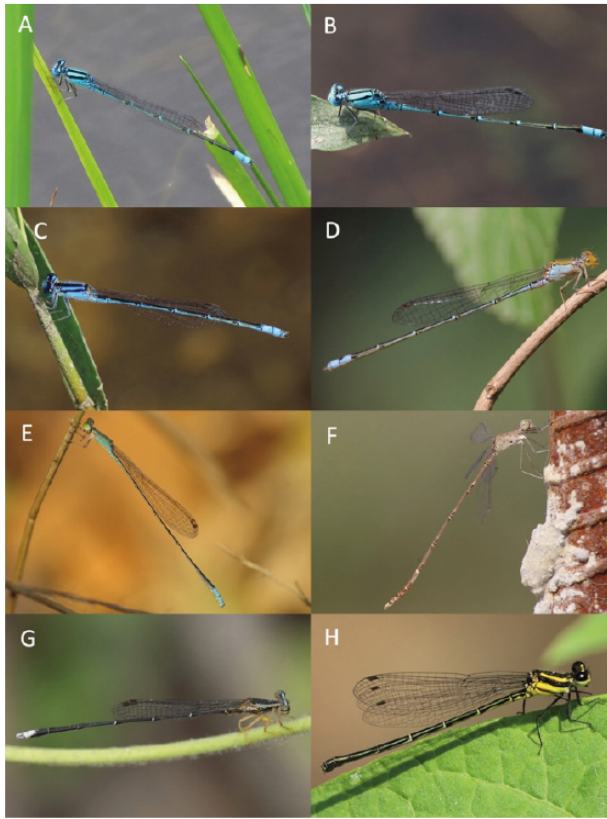


Image 8. A - *Pseudagrion australasiae* (m); B - *Pseudagrion microcephalum* (m); C - *Pseudagrion spencei* (m); D - *Pseudagrion rubriceps* (m); E - *Aciagrion pallidum* (m); F - *Lestes praemorsus* (m); G - *Copera marginipes* (m); H - *Onychargia atrocyana* (fm).
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