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Records of dragonflies from western Bhutan collected in October 2015

Vincent J. Kalkman¹ & Thinley Gyeltshen²

¹Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands

E-mail: Vincent.kalkman@naturalis.nl

²School of Life Sciences, Sherubtse College, Kanglung, Bhutan

E-mail: thinleytshen@gmail.com

Abstract

Distribution data of dragonflies and damselflies from western Bhutan collected during a trip from 10 October 2015 to 22 October 2015 are presented. In total 53 species were recorded of which eleven are new to the country (*Aciagrion pallidum*, *Anisopleura lestoides*, *Megalestes irma*, *Gynacantha incisura*, *Gynacantha khasiaca*, *Gynacanthaeschna sikkima*, *Lamelligomphus risi*, *Somatochlora daviesi*, *Crocothemis erythraea*, *Sympetrum fonscolombii*, *Tholymis tillarga*). Another three species, one *Megalestes* and two *Cephalaeschna*, were not identified to species level but are also addition to the list of species recorded from Bhutan.

Key words: Odonata, faunistics, taxonomy, Bhutan

Introduction

Bhutan is a relatively small country in the eastern Himalayas. The kingdom of Bhutan is dominated by mountains intersected by often narrow valleys. Most parts of Bhutan lie at high elevation and most of its main towns are found at higher altitude with the capital Thimphu at 2.200-2.700 m. a.s.l. and Paro at 2.200 m a.s.l. Due to its strong gradient most of its land surface is still covered by natural vegetation and the country boost large areas with natural forest. Access to many of the areas is however difficult due to lack of road connections. The lower parts of Bhutan reach down to 200 meters where the mountains of Bhutan abruptly end and the plains of India begin. These areas are hot and humid and are strongly impacted by the Monsoon rains which run from June to August. The fauna in the region below 1000 meters is

probably the most species rich as many typical and often widespread Oriental species can be found.

A checklist and bibliography of the dragonflies and damselflies of Bhutan is in preparation (Gyeltshen et al. 2016). Only 12 papers containing original data on Bhutan have been published the first dating back to 1936 (Fraser 1936) and with the second only appearing in 1977 (Lieftinck 1977). The odonate fauna of Bhutan is still incompletely documented although good progress has been made during the last decade mainly by the work of Amit Mitra. Information on habitat, flight period and distribution within the country are scarce. Currently around 100 species are known from Bhutan but it seems likely that close to 150 species occur in the country. In this paper the results of field work conducted in October 2015 are presented.

Material and Methods

Field work was conducted from 10 October 2015 to 22 October 2015 by Vincent Kalkman and Thinley Gyeltshen. During this period the following districts in Bhutan were visited: Chukha, Tsirang, Gasa, Sarpang, Paro, Shemgang, Thimphu, Tongsa, Wangdi Phodrang (Figure 1-4). Large parts of Bhutan are difficult to access and field work was conducted by driving along the roads connecting villages and stopping at suitable sites. In most cases the roads follows the course of the main rivers. These rivers are large, have a high current and run over a bed of stones and boulders with stretches of sand or detritus being near absent (Figure 5). Dragonflies are largely lacking in these rivers although at sparse places small standing pools are suitable for reproduction, a situation probably mostly occurring during late summer when the water table is low. In most cases suitable habitats consist of smaller brooks running towards

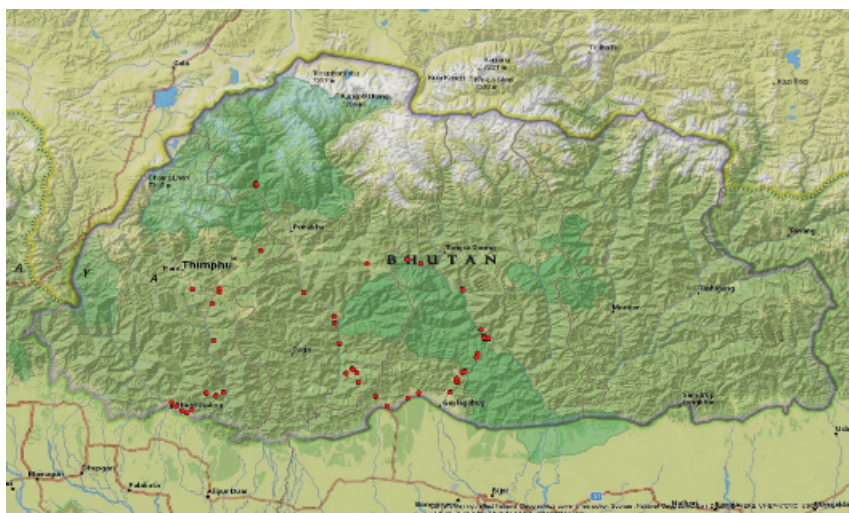


Figure 1. Localities sampled between 10 October 2015 to 22 October 2015.

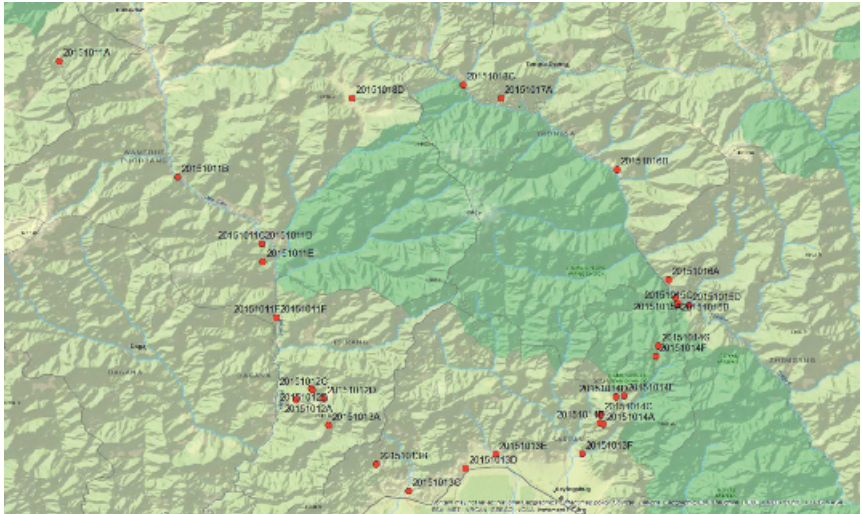


Figure 2. Sampling localities, eastern section.

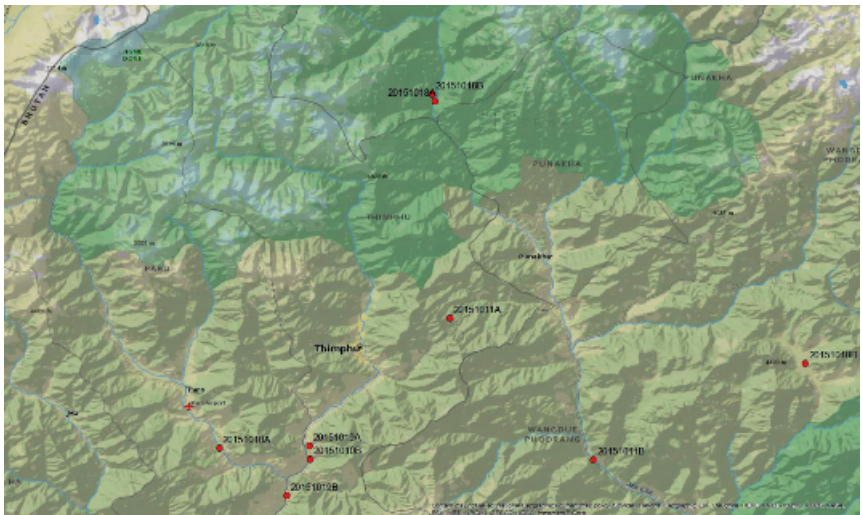


Figure 3. Sampling localities, northwestern section.

the main rivers (Figure 6 & 7). Such smaller brooks are surprisingly scarce in some regions. Many of the brooks visited were steep and were often only accessible for a short stretch with the brook on one side of the road being too steep to climb and on the other side plunging down into the valley. Only at site 27 a larger brook with a less steep gradient holding stretches of sand and detritus could be sampled (Figure 8). Some of the brooks we sampled in the lowland close to India strongly suffered from

human impact (Figure 9) although undoubtedly many good streams are still present slightly away from human habitation. Stagnant waters are rare. Larger natural standing waters were only visited at site 26 (Figure 10) and 42, although at the later the weather conditions were poor for field work. Artificial standing waters included ponds at Lamperi Royal Botanical Park (site 3), a pond at a university complex (site 43) and fishponds at site 11 and 29. A large portion of the cultivated lands are in use as rice paddies but these are largely dry in autumn.

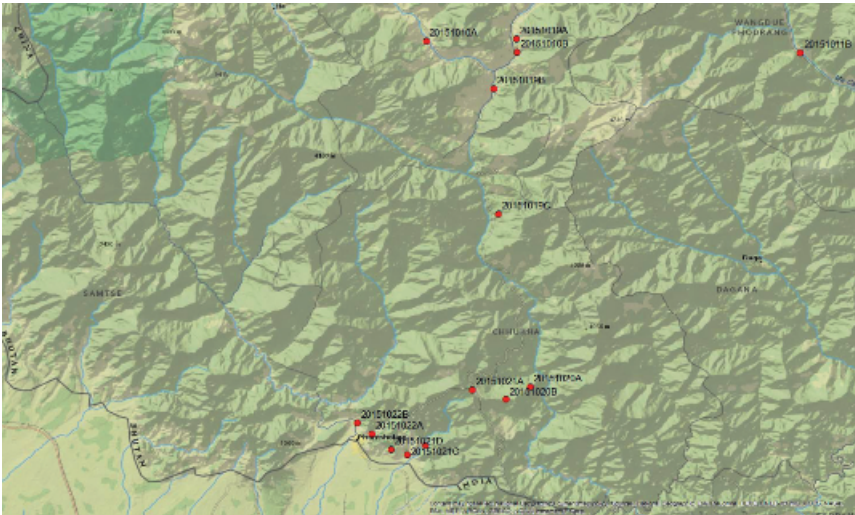


Figure 4. Sampling localities, southwestern section



Figure 5. Many of the larger rivers in Bhutan have a strong current, cold water and lack sections with sand or detritus rendering them poor in dragonflies. Confluence of the Phu Chu and Mo Chu at Punakha Dzong.



Figure 6. Brook at location 2 (20151010B). At this site *Cephalaeschna triadica*, *Cephalaeschna spec A*, *Cephalaeschna spec B*, *Indolestes cyaneus* and *Sympetrum hypomelas* were found.

Figure 7. Brook at location 13 (20151012D). At this site *Anisopleura lestoides*, *Calicnemia eximia*, *Ceriagrion fallax*, *Gynacantha incisura*, *Gynacanthaeschna sikkima*, *Megalestes irma*, *Orthetrum glaucum* and *O. glaucum* were found.



Figure 8. Brook at location 27 (20151015A) the only larger brook with a less steep gradient holding stretches of sand and detritus encountered. The following species were found: *Anisogomphus spec.*, *Calicnemia eximia*, *Macromia moorei*, *Neurobasis chinensis*, *Lamelligomphus risi*, *Orthetrum glaucum*, *O. pruinatum*, *O. triangulare*, *Pantala flavescens*, *Pseudagrion rubriceps*, *Trithemis aurora* and *T. festiva*.



Figure 9. Location 45 (20151021C). Many brooks and streams in the lowland were found to be strongly impacted by humans and their dragonfly fauna was strongly dominated by common and widespread oriental species. At this location the following species were found: *Argiocnemis pygmaea*, *Argiocnemis rubescens*, *Ceragrion coromandelianum*, *Crocothemis servilia*, *Neurobasis chinensis*, *Orthetrum glaucum*, *O. sabina*, *Pantala flavescens*, *Paragomphus lineatus*, *Pseudagrion rubriceps*, *Tramea spec.*, *Trithemis aurora* and *T. festiva*.



Figure 10. Natural standing waters are rare in Bhutan. At this small natural lake at 2042 m (location 26, 20151014G) the following species were found: *Aeshna petalura*, *Ceragrion fallax*, *Indolestes cyaneus* and *Sympetrum hypomelas*.

The collected material will be stored in National Biodiversity Centre, Bhutan. Part of the material will be used for molecular work at the Naturalis Biodiversity Center (RMNH). All records were uploaded to Observado.org.

Sampling localities

All sampling localities are within Bhutan; the coordinates are in decimal degrees.

1. 20151010A, Paro District, Shapa, standing water on shingle along river, (27,3516, 89,4636): 10-10-2015
2. 20151010B, Thimphu District, Mewang, small steep brook, partly shaded, (27,3381, 89,5756): 10-10-2015
3. 20151011A, Thimphu District, Lamperi Royal Botanical Park, ponds at botanical garden, (27,5115, 89,7474; 2685m a.s.l.): 11-10-2015
4. 20151011B, Wangdi Phodrang District, Gase Tsho Aom, restaurant, (27,3374, 89,9239): 11-10-2015
5. 20151011C, Wangdi Phodrang District, Daga, degraded stream near road, (27,2381, 90,0495; 741m a.s.l.): 11-10-2015
6. 20151011D, Wangdi Phodrang District, Daga, steep brook, (27,2381, 90,0495; 741m a.s.l.): 11-10-2015
7. 20151011E, Wangdi Phodrang District, Daga, steep brook, (27,2110, 90,0510): 11-10-2015
8. 20151011F, Wangdi Phodrang District, Daga, rice paddy, (27,1283, 90,0718): 11-10-2015
9. 20151011F, Wangdi Phodrang District, Daga, rice paddy, (27,1283, 90,0718): 11-10-2015
10. 20151012A, Tsirang District, Tshokhana, large brook (to early in the morning), (27,0048, 90,1006; 1100m a.s.l.): 12-10-2015
11. 20151012B, Tsirang District, Goseling, fishpond, (27,0221, 90,1232): 12-10-2015
12. 20151012C, Tsirang District, Kikhorthang, small brook in largely open area, (27,0198, 90,1253; 1400m a.s.l.): 12-10-2015
13. 20151012D, Tsirang District, Kikhorthang, large steep brook with large boulders, (27,0071, 90,1423): 12-10-2015
14. 20151013A, Tsirang District, Beteni, brook in forest, (26,9664, 90,1493): 13-10-2015
15. 20151013B, Sarpang District, Hile, Large stony brook in largely cultivated area, (26,9090, 90,2206): 13-10-2015
16. 20151013C, Sarpang District, Sarpangtrar, large stony brook in degraded forest, (26,8687, 90,2689): 13-10-2015
17. 20151013D, Sarpang District, Leopani, large stony brook in degraded forest, (26,9024, 90,3536): 13-10-2015

18. 20151013E, Sarpang District, Bhur, road side verge, (26,9234, 90,3991): 13-10-2015
19. 20151013F, Sarpang District, Serzhong, brook, (26,9246, 90,5279): 13-10-2015
20. 20151014A, Sarpang District, Surey, brook in forest, (26,9683, 90,5592): 14-10-2015
21. 20151014B, Sarpang District, Surey, brook in forest, (26,9704, 90,5550; 1165m a.s.l.): 14-10-2015
22. 20151014C, Sarpang District, Surey, brook, (26,9822, 90,5559; 1312m a.s.l.): 14-10-2015
23. 20151014D, Sarpang District, Surey, brook, (27,0092, 90,5783): 14-10-2015
24. 20151014E, Sarpang District, Surey, brook, (27,0106, 90,5904; 1079m a.s.l.): 14-10-2015
25. 20151014F, Sarpang District, Surey, brook, (27,0696, 90,6379; 1820m a.s.l.): 14-10-2015
26. 20151014G, Zhemgang District, Trong, natural pool in small open area within forest, (27,0857, 90,6420; 2042m a.s.l.): 14-10-2015
27. 20151015A, Zhemgang District, Trong, large sandy brook, largely unshaded, (27,1574, 90,6675; 545m a.s.l.): 15-10-2015
28. 20151015B, Zhemgang District, Trong, brook, (27,1474, 90,6712): 15-10-2015
29. 20151015C, Zhemgang District, Trong, fishponds, (27,1486, 90,6712): 15-10-2015
30. 20151015D, Zhemgang District, Trong, brook, (27,1463, 90,6874): 15-10-2015
31. 20151016A, Zhemgang District, Trong, brook, (27,1840, 90,6570; 791m a.s.l.): 16-10-2015
32. 20151016B, Trongsa District, Langthi, , (27,3488, 90,5803; 1078m a.s.l.): 16-10-2015
33. 20151017A, Trongsa District, Tangsibji, brook, (27,4553, 90,4071; 2403m a.s.l.): 17-10-2015
34. 20151018A, Gasas District, Goenkham, brook, (27,7784, 89,7288; 1094m a.s.l.): 18-10-2015
35. 20151018B, Gasas District, Goenkham, brook, (27,7868, 89,7249; 1983m a.s.l.): 18-10-2015
36. 20151018C, Trongsa District, Tangsibji, brook, (27,4755, 90,3502; 2425m a.s.l.): 17-10-2015
37. 20151018D, Wangdi Phodrang District, Gangte, Phobhjikha valley, marshy area along brook area in large open valley, (27,4555, 90,1844; 2846m a.s.l.): 17-10-2015
38. 20151019A, Thimphu District, Mewang, (27,3546, 89,5748): 19-10-2015
39. 20151019B, Paro District, Doga, brook, (27,2928, 89,5467; 2054m a.s.l.): 19-10-2015
40. 20151019C, Chukha District, Chabchha, , (27,1391, 89,5521; 2290m a.s.l.): 19-10-2015

41. 20151020A, Chukha District, Bongo, road side verge, no visible open water, (26,9260, 89,5917): 20-10-2015
42. 20151020B, Chukha District, Bongo, natural lake in forest, wheather limiting, (26,9114, 89,5620): 20-10-2015
43. 20151021A, Chukha District, Gedu, pond at university campus, (26,9226, 89,5204): 21-10-2015
44. 20151021B, Chukha District, Pasakha, large degraded stream, (26,8543, 89,4623; 346m a.s.l.): 21-10-2015
45. 20151021C, Chukha District, Pasakha, , (26,8425, 89,4401): 21-10-2015
46. 20151021D, Chukha District, Phuentsholing, large brook in degraded forest, (26,8491, 89,4202; 348m a.s.l.): 21-10-2015
47. 20151022A, Chukha District, Phuentsholing, large brook in rural area, (26,8685, 89,3970; 259m a.s.l.): 22-10-2015
48. 20151022B, Chukha District, Phuentsholing, brooks running towards large river on gravel plain, (26,8816, 89,3787; 149m a.s.l.): 22-10-2015

Recorded species

Euphaeidae

Anisopleura lestoides Selys, 1853 - Localities: 6, 13, 28

Anisopleura subplatystyla Fraser, 1927 - Localities: 32, 35, 36, 37

Chlorocyphidae

Aristocypha cuneata (Selys, 1853) - Localities: 6, 15, 28

Aristocypha quadrimaculata (Selys, 1853) - Localities: 16, 48

Calopterygidae

Neurobasis chinensis (Linnaeus, 1758) - Localities: 16, 17, 19, 27, 45, 48

Synlestidae

Megalestes irma Fraser, 1926 - Localities: 13, 21

Megalestes major Selys, 1862 - Locality: 6

Megalestes spec. - Locality: 35

Lestidae

Indolestes cyaneus (Selys, 1862) - Localities: 2, 3, 26, 37 fresh, larvae, 38, 39, 40, 43

Platycnemidae

Calicnemia eximia (Selys, 1863) - Localities: 6, 7, 13, 15, 27, 30, 32, 48

Coenagrionidae

- Aciagrion olympicum* Laidlaw, 1919 - Localities: 36, 39
Aciagrion pallidum Selys, 1891 - Locality: 28
Agriocnemis clauseni Fraser, 1922 - Locality: 47
Agriocnemis pygmaea (Rambur, 1842) - Locality: 45
Agriocnemis spec. - Localities: 43, 47
Agriocnemis rubescens Selys, 1877 - Localities: 45, 47
Ceriagrion coromandelianum (Fabricius, 1798) - Locality: 45
Ceriagrion fallax Ris, 1914 - Localities: 4, 13, 26, 30
Ischnura rubilio (Brauer, 1865) - Localities: 3, 8
Pseudagrion rubriceps Selys, 1876 - Localities: 27 copula, 45



Figure 11. Female *Aeshna petalura*.

Aeshnidae

- Aeshna petalura* Martin, 1908 - Localities: 26 (Figure 11)
Anax nigrofasciatus Oguma, 1915 - Locality: 29
Anax spec. - Locality: 1 ovipositing
Cephalaeschna spec. A. - Localities: 2, 21, 34, 37, 39
Cephalaeschna spec. B. - Locality: 2
Cephalaeschna triadica Lieftinck, 1977 - Locality: 2 (Figure 12)



Figure 12. Male *Cephalaeschna triadica*.



Figure 13. A female *Polycanthagyna erythromelas* was found ovipositing at the muddy walls along the road. There was no obvious surface water nearby but the walls were kept wet by a small filter of seepage water (location 41, 20151020A)



Figure 14. Male *Anotogaster nipalensis*.

Gynacantha incisura Fraser, 1935 - Locality: 13

Gynacantha khasiaca McLachlan, 1896 - Locality: 19

Gynacanthaeschna sikkima (Karsch, 1891) - Localities: 13, 21, 35

Polycanthagyna erythromelas (McLachlan, 1896) - Locality: 41 ovipositing (Figure 13)

Cordulegastridae

Anotogaster nipalensis (Selys, 1854) - Locality: 35 (Figure 14)

Cordulegastridae sp. - Localities: 14 larvae, 20 larvae, 21 larvae, 37, 39

Gomphidae

Anisogomphus spec. - Localities: 12, 27

Gomphidae spec - Localities: 14 larvae, 20 larvae, 22 larvae, 23 larvae, 24 larvae, 25 larvae, 31 larvae, 32 larvae, 33 larvae

Lamelligomphus risi Fraser, 1922 - Localities: 27, 30

Paragomphus lineatus (Selys, 1850) - Locality: 45

Macromiidae

Macromia moorei Selys, 1874 - Locality: 27

Macromia spec. - Localities: 14 larvae, 20 larvae, 23 larvae, 25 larvae, 31 larvae

Corduliidae

Somatochlora daviesi Lieftinck, 1977 - Localities: 36, 37

Libellulidae

Acisoma panorpoides Rambur, 1842 - Localities: 11, 42

Crocothemis erythraea (Brullé, 1832) - Localities: 1, 11

Crocothemis erythraea/servilia - Localities: 12, 29, 32, 47

Crocothemis servilia (Drury, 1770) - Localities: 5, 45

Diplacodes trivialis (Rambur, 1842) - Localities: 1, 3, 5, 7, 8, 11, 16, 18, 30, 32, 36, 37, 44, 46, 47, 48

Neurothemis fulvia (Drury, 1773) - Localities: 16, 46

Orthetrum glaucum (Brauer, 1865) - Localities: 5, 12, 13, 15, 17, 27, 29, 30, 32, 44, 45, 47

Orthetrum prunosum (Burmeister, 1839) - Localities: 5, 11, 12, 27, 29, 35, 47,

Orthetrum sabina (Drury, 1770) - Localities: 11, 16, 29, 32, 44, 45, 47

Orthetrum taeniolatum (Schneider, 1845) - Localities: 1, 48

Orthetrum triangulare (Selys, 1878) - Localities: 5, 10, 12, 13, 27, 29, 32, 47, 48

Palpopleura sexmaculata (Fabricius, 1787) - Localities: 5, 8, 12, 18, 32, 36, 47,

Pantala flavescens (Fabricius, 1798) - Localities: 5, 17, 28, 27, 29, 45, 47, 48

Sympetrum commixtum (Selys, 1884) - Locality: 39

Sympetrum fonscolombii (Selys, 1840) - Localities: 1 fresh, 3, 11 laying egg, 42, 43

Sympetrum hypomelas (Selys, 1884) - Localities: 1 ovipositing, 2, 3, 26, 36 copula, 38, 39, 43 exuviae & freshly emerged

Tholymis tillarga (Fabricius, 1798) - Locality: 48

Tramea spec. - Localities: 29, 45

Trithemis aurora (Burmeister, 1839) - Localities: 12, 15, 16, 27, 29, 44, 45, 47, 48

Trithemis festiva (Rambur, 1842) - Localities: 12, 15, 16, 17, 27, 29, 44, 45, 47, 48

Discussion

In total 53 species were recorded of which eleven are new to the country (*Aciagrion pallidum*, *Anisopleura lestoides*, *Megalestes irma*, *Gynacantha incisura*, *Gynacantha khasiaca*, *Gynacanthaeschna sikkima*, *Lamelligomphus risi*, *Somatochlora daviesi*, *Crocothemis erythraea*, *Sympetrum fonscolombii*, *Tholymis tillarga*). Another three species, one *Megalestes* and two *Cephalaeschna*, were not identified to species level but are also addition to the list of species recorded from Bhutan. This brings the list of species recorded from the country to 101 (Gyeltshen et al. 2016). The ease with which new species were found in a relatively short period shows that there are still many species to be discovered in Bhutan. The records of *Cephalaeschna triadica* is only the third record published of this species since its description from Bhutan by Lieftinck (1977) (Figure 12). Relatively little is known on the seasonality of odonates in the eastern Himalayans. Although the fieldwork was undertaken in autumn the number of species found above 1000 meter or even above 2000 meter was surprisingly high. This included not only common and widespread species of

stagnant water but also the less wide ranging species of running water. For instance *Anotogaster nipalensis* was found active around 2000 meter (Figure 14). However at many sites the numbers were relatively low. *Calicnemia eximia* for instance was found at a large number of sites with running water ranging from 149 to 1078 meter but in many cases only one or two specimens were seen. Even at higher altitudes the winters are relatively mild and it seems likely that some Libellulids are capable of being active throughout the winter in the high valleys. *Sympetrum fonscolombii* and *S. hypomelas* were still emerging suggesting that their flight period continues well into the winter. *Indolestes cyanea* was commonly encountered and was at 2846 m still emerging (Figure 15). Most pictures published on internet show this species to have the pale pattern being blue. However all specimens we encountered lacked blue and were pale brownish. Also at some places the species was found in numbers in open spots in forest. We speculate that this species overwinters as adult and only turns blue in spring when reproductive activity starts.



Figure 15. *Indolestes cyanea* was still emerging at 2846 m (location 37, 20151018D). This might indicate that this species spends the winter as adult and resumes activity in the following spring.

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Tillyard, R., 1924. The dragonflies (Order Odonata) of Fiji, with special reference to a collection made by Mr. H.W. Simmonds, F.E.S., on the Island of Viti Levu. Transactions of the Entomological Society London 1923 III-IV: 305-346.

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