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Short Notes

Diversity of Odonata Species at Kangkawat, Imbak Canyon, Sabah

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Abstract

The Odonata fauna of Kangkawat Research Station in Imbak Canyon was surveyed during the Borneo Biogeographic Expedition from 28 September to 9 October 2018. A total of 56 species in 12 families were recorded – 18 species in Libellulidae, eight species in Platycnemididae, six species in Coenagrionidae, five species in Calopterygidae, four species each in Chlorocyphidae and Platystictidae, three species each in Euphaeidae and Gomphidae, two species in Synthemistidae and one species each in Devadattidae, Philosinidae and Aeshnidae. Of these, 10 species are new records for Imbak Canyon. The total number of species known from Imbak Canyon is now 83. Generally, Imbak Canyon is rich in Odonata, and it is a refuge for many uncommon species. Nevertheless, many more parts of the area still need to be explored for a more comprehensive picture of the Odonata of Imbak Canyon

Keywords: Biodiversity, Imbak Canyon, Kangkawat, Odonata, Sabah

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Introduction

Dragonflies and damselflies, collectively known as Odonata, form an important biological component of fresh water ecosystems. Their distribution is more concentrated in the tropics and subtropics. The adult insects are terrestrial while the nymphs are aquatic. Therefore, they could be found at various fresh water bodies such as streams, ponds, lakes and swamps. Many Odonata species are good biological indicators for water quality. Close to 6,000 Odonata species are distributed throughout the world (Dijkstra et al., 2013). In Malaysia, more than 400 species have been recorded (Choong et al., 2017), with the state of Sabah harbouring over 160 species (Dow per. com).

Imbak Canyon is located in the central part of Sabah, to the north of Maliau Basin. The canyon consists of ridges up to 1,120 m (Yayasan Sabah, 2014). The main part of Imbak Canyon is within the Imbak Canyon Conservation Area (ICCA) which has an approximate total area of 27,599 ha (Yayasan Sabah 2014). The published Odonata records for Imbak Canyon mainly come from a few recent publications (Choong, 2011; Dow & Orr, 2012; Chung et al., 2013; Choong & Chung, 2019). Choong (2011) recorded 38 species from Mt. Kuli Research Station (within ICCA), Dow & Orr (2012) mentioned the record of *Telosticta janeus* and Chung et al. (2013) recorded 24 species from Sungai Imbak Forest Reserve (adjacent to ICCA). The latest publication for Imbak Canyon came from Choong & Chung (2019), and they reported 61 Odonata species from Batu Timbang Research Station and Imbak Canyon Studies Centre. With the records from all the publications, 73 species are known from Imbak Canyon. It is always of immense interest to further survey the Odonata in different parts of Imbak Canyon to document the species richness of the area. In this paper we report the Odonata species found at Kangkawat Research Station, Imbak Canyon. At the same time, we produce an Odonata checklist for Imbak Canyon.

Methodology

Odonata of Imbak Canyon was surveyed during the Borneo Biogeographic Expedition from 28 September to 9 October 2018. The survey was done at aquatic habitats in the vicinity of Kangkawat Research Station (5°4’40.3”N, 117°3’27.3”E). The research station is situated by Sg. Kangkawat. During the expedition period, the water level of Sg. Kangkawat was low enough that the river could be crossed easily. Sampling was done at all types of aquatic habitats (streams, rivers, swamps, ponds, puddles, waterfalls etc.) at the research station and adjacent areas with an altitude range of 150–600 m above

sea level. Adult insects were caught using an aerial net. Collected specimens were treated with acetone and then dried in silica gel. The identification of specimens down to species was done based on references and comparison with specimens from other places. The specimens are kept in Centre for Insect Systematics (Universiti Kebangsaan Malaysia), the Sabah Forestry Department and BORNEENSIS (Universiti Malaysia Sabah).

Results

A total of 56 species in 12 families were recorded during the Borneo Biogeographic Expedition 2018: 18 species in Libellulidae, eight species in Platycnemididae, six species in Coenagrionidae, five species in Calopterygidae, four species each in Chlorocyphidae and Platystictidae, three species each in Euphaeidae and Gomphidae, two species in Synthemistidae and one species each in Devadattidae, Philosinidae and Aeshnidae (Table1; column E). Of these, 10 species are new records for Imbak Canyon, i.e. *Vestalis amabilis*, *Libellago phaethon*, *Libellago semiopaca*, *Rhinocypha cucullata*, *Dsyphaea dimidiata*, *Pseudagrion pillidorsum*, *Drepanosticta rufostigma*, *Macromidia fulva*, *Megalogomphus* sp. and *Phaenandrogomphus safei*. Some of the species photographed at Kangkawat Research Station are shown in Figure 1. All the published records were compiled to produce a checklist of Odonata for Imbak Canyon. The total number of species known to Imbak Canyon is now 83 (Table 1).

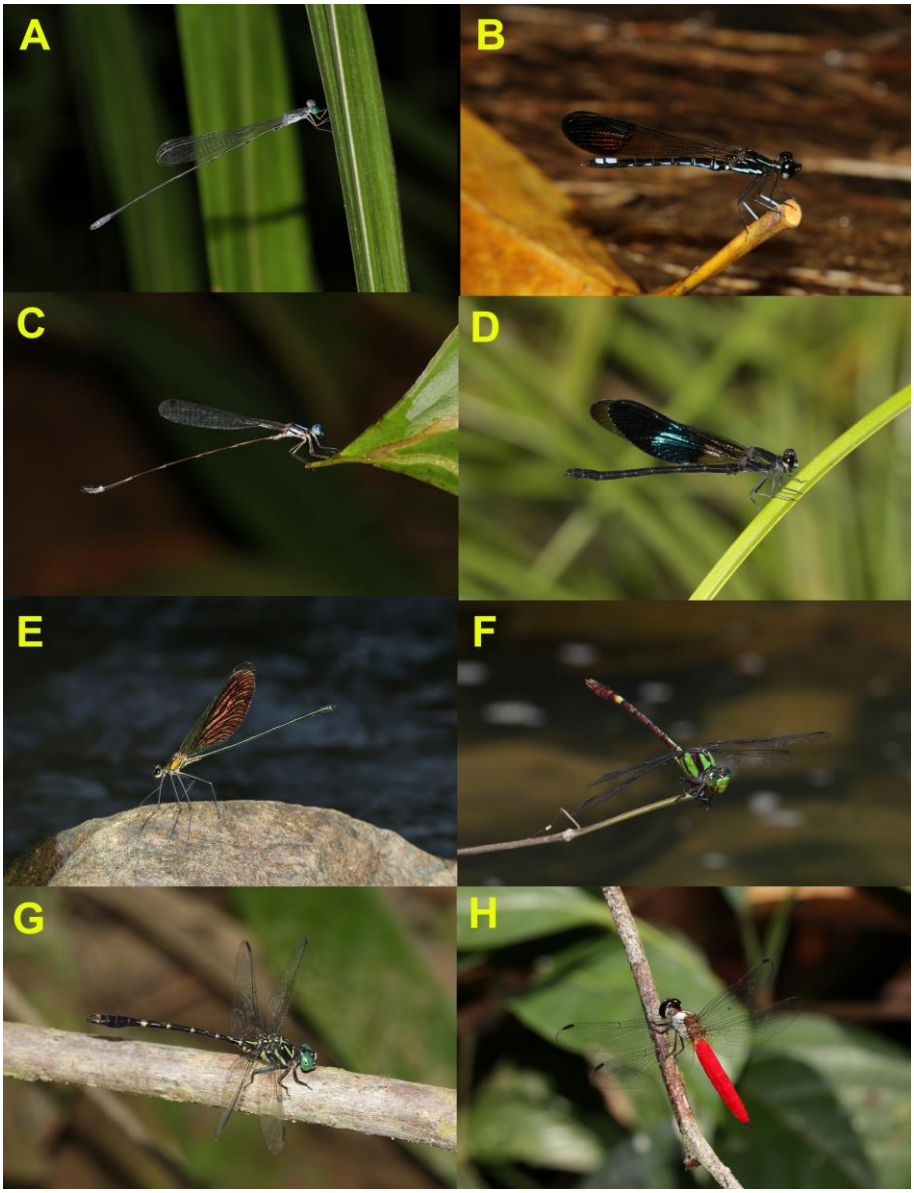

Figure 1. Some of the Odonata species photographed at Kangkawat Research Station. A. *Teinobasis laidlawi*, B. *Rhinocypha cucullata*, C. *Telosticta janeus*, D. *Euphaea subcostalis*, E. *Neurobasis longipes*, F. *Megalogomphus* sp., G. *Phaenandrogomphus safei* and H. *Lyriothemis biappendiculata*.

Table 1. Odonata species recorded at Imbak Canyon. Column A: data from Choong (2011), B: data from Chung et al. (2013), C: records for Imbak Canyon Studies Centre, D: records for Batu Timbang Research Station (Choong & Chung, 2019); E: records for Kangkawat Research Station. * indicates new records for Imbak Canyon.

No.	Species	A	B	C	D	E	IUCN status
	Family Devadattidae						
1	*Devadatta tanduk* Dow, Hämäläinen & Stokvis 2015	/		/	/	/	DD
	Family Calopterygidae						
2	*Neurobasis longipes* Hagen, 1887	/	/	/	/	/	LC
*3	*Vestalis amabilis* Lieftinck, 1965					/	LC
4	*Vestalis amaryllis* Lieftinck, 1965	/		/	/	/	LC
5	*Vestalis amoena* (Hagen, 1853)			/		/	LC
6	*Vestalis anacolosa* Lieftinck, 1965	/		/	/	/	LC
7	*Vestalis beryllae* Laidlaw, 1915	/			/		LC
	Family Chlorocyphidae						
8	*Heliocypha biseriata* (Selys, 1859)		/				LC
*9	*Libellago phaethon* (Laidlaw, 1931)					/	NT
*10	*Libellago semiopaca* (Selys, 1873)					/	LC
11	*Rhinocypha aurofulgens* Laidlaw, 1931	/	/		/		LC
12	*Rhinocypha stygia* Förster, 1897		/				NT
*13	*Rhinocypha cucullata* Selys, 1873					/	LC
14	*Rhinocypha humeralis* Selys, 1873	/	/	/	/	/	LC
	Family Euphaeidae						
*15	*Dysphaea dimidiata* (Selys, 1853)					/	LC
16	*Euphaea impar* (Selys, 1959)		/			/	LC
17	*Euphaea subcostalis* (Selys, 1873)	/	/	/	/	/	LC
	Family Lestidae						
18	*Lestes praevius* Lieftinck, 1940			/			NA
19	*Orolestes wallacei* (Kirby, 1889)	/		/			LC
	Family Philosinidae						
20	*Rhinagrion elopurae* (McLachlan, 1886)	/	/	/		/	LC
	Family Coenagrionidae						
21	*Agriocnemis femina* (Brauer, 1868)			/		/	LC
22	*Argiocnemis rubescens rubeola* Selys, 1877			/			LC
23	*Argiocnemis* sp.	/		/		/	-
24	*Ceriagrion bellona* Laidlaw, 1915			/			LC
25	*Pseudagrion microcephalum* (Rambur, 1842)			/			LC
*26	*Pseudagrion pillidorsum* Brauer, 1868					/	Draft LC
27	*Stenagrion dubium* (Laidlaw, 1912)	/		/	/	/	LC
28	*Teinobasis laidlawi* Kimmins, 1936	/		/	/	/	LC

29	*Teinobasis rajah* Laidlaw, 1912			/	/	LC
30	*Xiphiagrion cyanomelas* (Selys, 1876)		/	/		LC
	Family Platycnemididae					
31	*Coeliccia nigrohamata* Laidlaw, 1918	/		/	/	LC
32	*Coeliccia* cf *nemoricola* Laidlaw, 1912	/		/	/	NA
33	*Coeliccia arcuata* Lieftinck, 1940	/		/	/	LC
34	*Copera vittata* (Selys, 1863)	/		/	/	LC
35	*Prodasineura dorsalis* (Selys, 1860)	/			/	LC
36	*Prodasineura hosei* (Laidlaw, 1913)	/			/	LC
37	*Prodasineura hyperythra* (Selys, 1886)	/			/	LC
38	*Prodasineura verticalis* (Selys, 1860)			/	/	LC
	Family Platystictidae					
39	*Drepanosticta actaeon* Laidlaw, 1934	/		/	/	LC
40	*Drepanosticta versicolor* Laidlaw, 1913	/		/	/	LC
*41	*Drepanosticta rufostigma* (Selys, 1860)				/	LC
42	*Protosticta joepani* Dow, Phan & Choong, 2020			/		Draft VU
43	*Telosticta janeus* Row & Orr, 2012	/		/	/	NT
	Family Aeshnidae					
44	*Anax panybeus* Hagen, 1867			/		LC
45	*Indaeschna grubaueri* (Forster, 1904)	/		/	/	LC
46	*Tetracanthagyna degorsi/brunnea* (female)			/		-
	Family Corduliidae					
47	*Epophthalmia vittigera* (Rambur, 1842)			/		LC
	Family Synthemistidae					
48	*Idionyx* sp. (female)	/			/	-
*49	*Macromidia fulva* Laidlaw, 1915				/	LC
	Family Macromiidae					
50	*Macromia corycia* Laidlaw, 1922	/		/		NT
	Family Gomphidae					
*51	*Megalogomphus* sp.				/	-
52	*Microgomphus chelifer* (Selys, 1858)	/			/	LC
*53	*Phaenandrogomphus safei* Dow & Luke, 2015				/	VU
	Family Libellulidae					
54	*Agrionoptera insignis* (Rambur, 1842)			/	/	LC
55	*Agrionoptera sexlineata* Selys, 1879			/	/	LC
56	*Brachydiplax chalybea* Brauer, 1868			/		LC
57	*Camacinia gigantea* (Brauer, 1867)		/	/		LC
58	*Cratilla lineata* (Brauer, 1878)			/	/	LC

59	*Cratilla metallica* (Brauer, 1878)	/		/	/	/	LC
60	*Diplacodes trivialis* (Rambur, 1842)			/			LC
61	*Hylaeothemis clementia* Ris, 1909			/			LC
62	*Lyriothemis biappendiculata* (Selys, 1878)	/		/	/	/	LC
63	*Lyriothemis cleis* Brauer, 1868	/				/	LC
64	*Nesoxenia lineata* (Selys, 1868)			/		/	LC
65	*Neurothemis fluctuans* (Fabricius, 1793)			/	/	/	LC
66	*Neurothemis ramburii* (Brauer, 1866)		/	/	/	/	LC
67	*Neurothemis terminata* Ris, 1911		/	/	/		LC
68	*Orthetrum chrysis* (Selys, 1891)	/	/	/	/	/	LC
69	*Orthetrum glaucum* (Brauer, 1865)	/	/	/	/	/	LC
70	*Orthetrum pruinosum schneideri* Forster, 1903	/	/	/	/	/	LC
71	*Orthetrum sabina* (Drury, 1773)		/	/			LC
72	*Orthetrum testaceum* (Burmeister, 1839)		/	/	/	/	LC
73	*Pantala flavescens* (Fabricius, 1798)		/	/	/		LC
74	*Rhyothemis phyllis* (Sulzer, 1776)		/				LC
75	*Rhyothemis regia regia* (Brauer, 1867)		/				LC
76	*Rhyothemis triangularis* Kirby, 1889		/	/			LC
77	*Tetrathemis* cf *irregularis hyalina* Kirby, 1889	/		/		/	LC
78	*Tramea transmarina euryale* Selys, 1878		/	/			LC
79	*Trithemis aurora* (Burmeister, 1839)	/		/		/	LC
80	*Trithemis festiva* (Rambur, 1842)	/	/	/	/	/	LC
81	*Tyriobapta torrida* Kirby, 1889	/		/	/	/	LC
82	*Zygonyx iris errans* Lieftinck, 1953	/			/	/	LC
83	*Zyxomma petiolatum* Rambur, 1842			/			LC
	Total number of species	**38**	**23 +1[#]**	**54**	**35**	**56**	

Chung et al. (2013) identified a taxon (female) as *Vestalis* sp. This taxon could be any of the four *Vestalis* species with similar abdominal length found at Imbak Canyon (*V. amabilis*, *V. amaryllis*, *V. amoena* and *V. anacolosa*).

Discussion

The number of species recorded from the Borneo Biogeographic Expedition was moderately high (56 species), representing 35% of the species known to Sabah. This is partly due to the various types of aquatic habitats found at the Kangkawat Research Stations and its surrounding areas – river, streams, streamlets, swamps and waterfalls. The number of species recorded was equivalent to that from Batu Timbang Research Station (Choong & Chung, 2019) but much higher than Mt. Kuli Research Station (Choong, 2011) and Imbak Canyon Studies Centre (Choong & Chung, 2019), indicating the richness of Odonata fauna in Kangkawat Research Station.

Some interesting species recorded during the expedition were *Telosticta janeus*, *Protosticta joepani*, *Libellago phaethon*, *Rhinocypha cucullata*, *Megalogomphus* sp. and *Phaenandrogomphus safei*. All of these species are endemic to Borneo. *Telosticta janeus* was also recorded at Mt. Kuli Research Station (Choong, 2011) and Batu Timbang Research Station (Choong & Chung, 2019). So far, this species is endemic to Sabah and only known from Danum Valley and Imbak Canyon (Dow & Orr, 2012), and also SAFE project area (Dow per. comm.). *Protosticta joepani* was treated as *Protosticta* cf. *kinabalunensis* in Choong & Chung (2019), and it was recently described as a new species (Dow et al. 2020). *Libellago phaethon* is a rare and localized species which is only recorded in Sabah and also in the adjacent part of Kalimantan, Indonesia (Dow, 2020). In the expedition, only two male individuals of *L. phaethon* were spotted at the riverbank of Sg. Kangkawat. *Rhinocypha cucullata* was found to be abundant at two of the small tributaries to Sg. Kangkawat (Figure 1B). At the small streams, males of *R. cucullata* were frequently observed engaging in territorial fighting. The taxonomy of *Megalogomphus* from Sundaland is being revised (Dow per. comm.), and the *Megalogomphus* species recorded here is treated as *Megalogomphus* sp. Two individuals of *Megalogomphus* sp. were spotted at Sg. Kangkawat (Figure 1F). *Phaenandrogomphus safei* is one of the most interesting findings from the expedition (Figure 1G). Two males *P. safei* were spotted hovering over the surface of a small rapid at Sg. Kangkawat. This species was described from a specimen collected at Kalabakan Forest Reserve, Sabah (Dow & Luke, 2015), and later on it was found at two locations in Lanjak Entimau Wildlife Sanctuary, Sarawak (Dow et al., 2018). Therefore, Sg. Kangkawat is the fourth location of this rare species.

It is worthwhile to note that 10 of the species recorded from Kangkawat Research Station are new records for Imbak Canyon (Table 1, marked with *). Nevertheless, some of these new records are common species such as *Vestalis amabilis*, *Libellago semiopaca*, *Dysphaea dimidiata* and *Drepanosticta rufostigma*. These new records were compiled together with the existing published records to give a tally of 83 species known to Imbak Canyon (Table 1). This represents more than 50% of the species known to Sabah, indicating the extremely high diversity of Odonata fauna of Imbak Canyon. It must be noted that only a small part of Imbak Canyon has been surveyed for Odonata. Therefore, further surveys on other parts of the canyon are vital for a more comprehensive database.

Conclusion

At present the Odonata checklist of Imbak Canyon has 83 species, and a few are novel species to Borneo. It must be stressed that this species list is far from complete. Nevertheless, it provides baseline data for a future strategic management plan to manage Imbak Canyon, and it also acts as a reference for the study of Odonata diversity of Sabah.

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