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## Odonata collected at Usun Apau National Park, Miri Division, Sarawak, Malaysia in April and May 2012

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### Abstract

Results of a collecting expedition to the remote Usun Apau plateau in Sarawak are presented. Interesting records include *Telosticta kajang* (previously only known from the holotype), *Coeliccia* new species, *Amphicnemis* new species.

**Key words:** Sarawak, Borneo, Malaysia

### Introduction

Usun Apau is a remote and relatively inaccessible volcanic plateau located at the headwaters of the Rajang and Baram rivers, in the southern part of the State's Miri Division (Figs. 1, 2). It was gazetted as a National Park in September 2005. At just over 49,000 ha, Usun Apau is the third largest terrestrial National Park in Sarawak, after Gunung Mulu and Pulong Tau. It is also one of the least visited.

As recorded by Arnold (1957), the area was first made known to the outside world when the Curator of the Sarawak Museum, Mr Tom Harrisson, and Mr David Leach, Director of Sarawak Lands and Surveys, journeyed from the Upper Baram to the Pli-eran valley and then down to the Rajang, in 1951. They found that a blank on the map of more than 4,000 km<sup>2</sup> was in reality an upland area of mountains, plateau and deep river valleys. They were the first Europeans to cross the Usun Apau (Arnold *ibid.*).

Subsequently, an Oxford University Expedition went to Sarawak in July 1955 to spend six months exploring and surveying Usun Apau and neighbouring areas (Arnold 1957).



Mountainous, thickly forested and drained by numerous streams and rivers, the expedition found Usun Apau to be uninhabited except for a few groups of nomadic Penan, a fact which Arnold (*ibid.*) ascribed to the rivers flowing from it passing through great series of cataracts and gorges, falling 300 m or more before reaching navigable stretches of water; the area was in fact so remote and inaccessible that the Oxford expedition had to rely on air drops for supplies. The activities of the expedition members apparently included zoological collecting, but we are not aware of any Odonata having been collected.

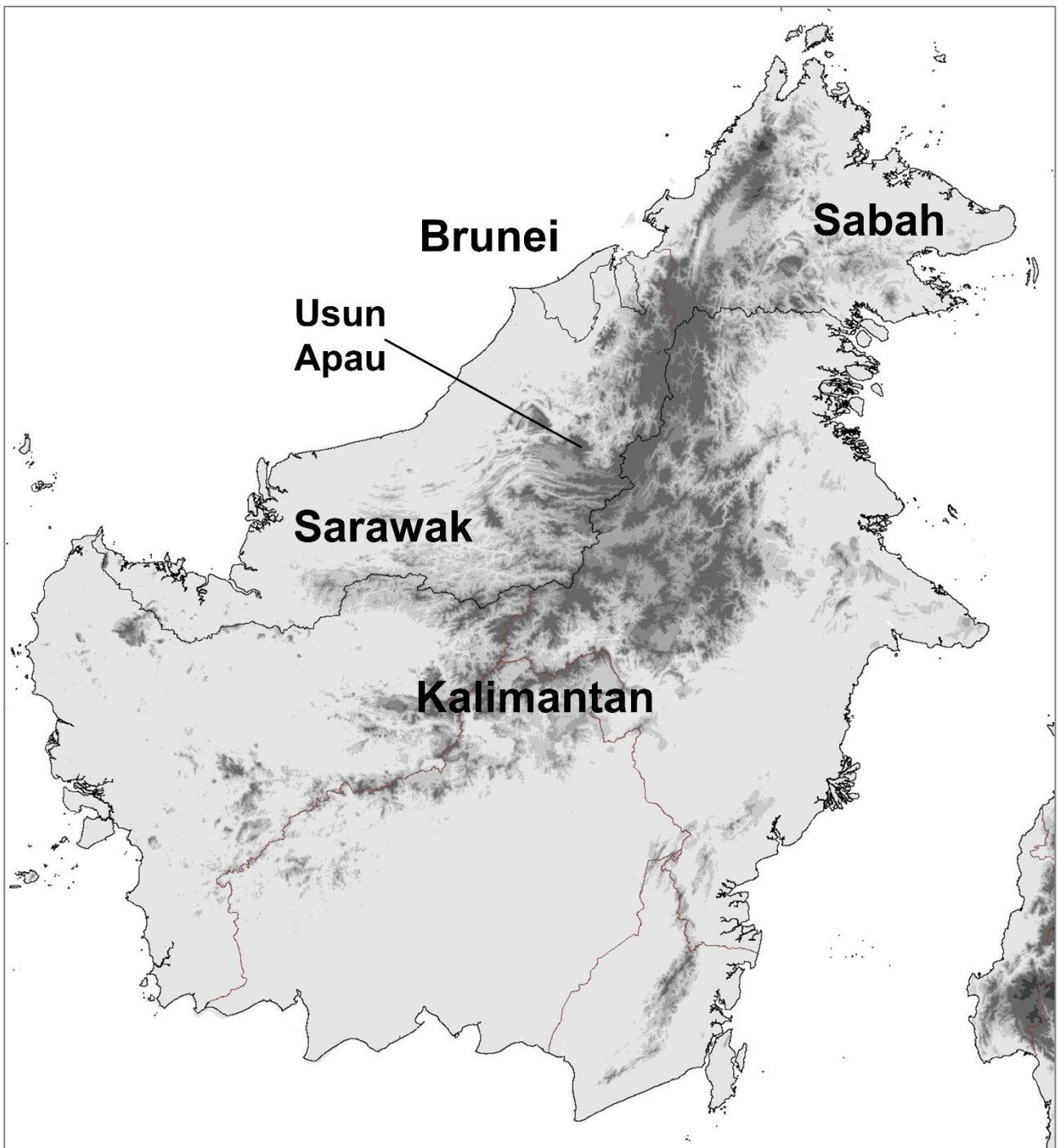
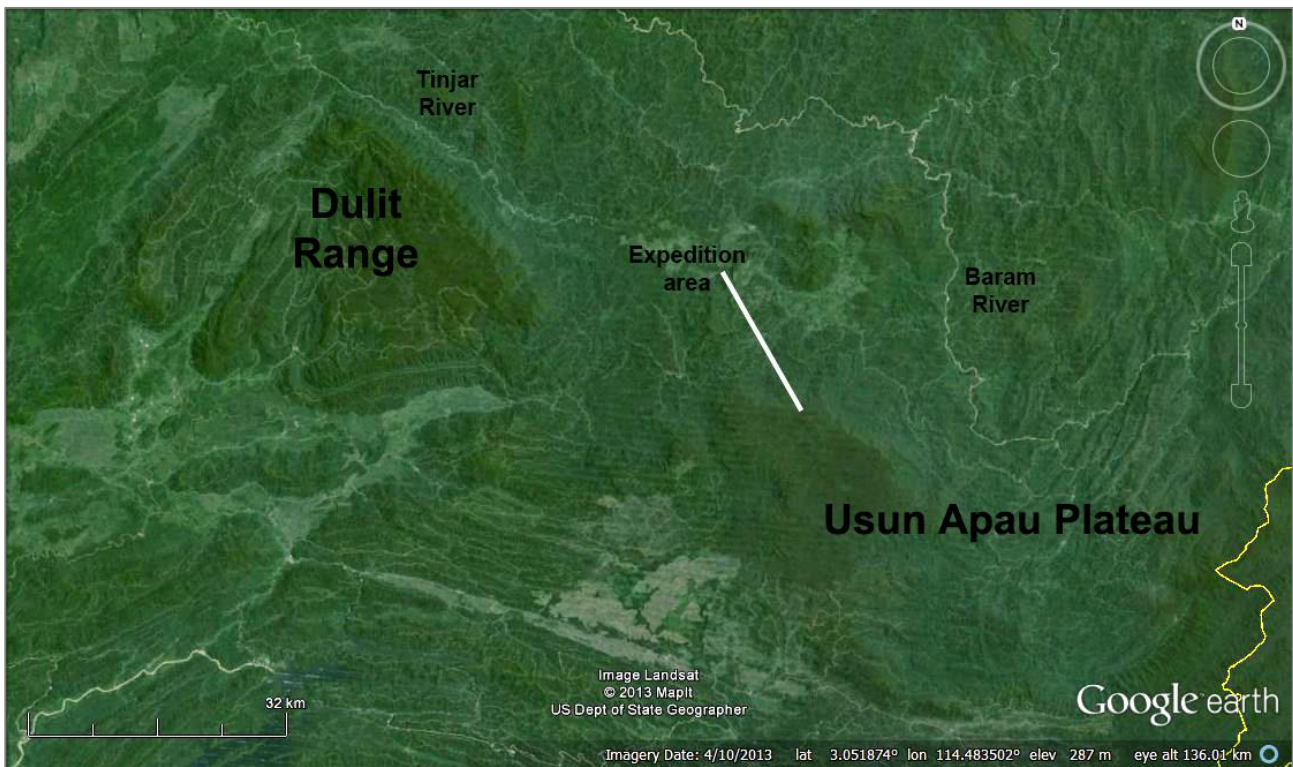


Figure 1. Map of Borneo showing the location of Usun Apau.





**Figure 2. Satellite map showing the location of Usun Apau in relation to the Dulit Range and the Baram and Tinjar Rivers.**

To quote / paraphrase Arnold's (1957) very precise descriptions of the area the expedition encountered: "The plateau is volcanic, a flat expanse of about 600 square miles [1,550 km<sup>2</sup>] dominated in the centre by three extinct volcanoes: Selidang 4,500 feet [1,370 m], Kenawang 4,200 feet [1,280 m], and Mabun 4,200 feet. Selidang is geographically the centre of the plateau, which averages 3,500 feet [1,070 m] in height. The northern, eastern and western edges of the tableland end in sheer escarpments of nearly 1,000 feet [305 m] and along the northern edge three rivers tumble off in 800 foot [245 m] waterfalls... On the southern side there are steep-sided valleys extending like fingers southwards... The plateau is split in two by a steep-sided valley, the Dapoi, running due north from Selidang: possibly this valley was a volcanic lake. The river cuts a deep gorge through the northern escarpment and then flows into the great Tinjar tributary of the Baram... The three extinct volcanoes form a triangle in the centre of the plateau and between them clouds gather so that the Dapoi valley receives enormous quantities of rain... One of the rivers originating near Selidang is the Julan, which flows north across the plateau and falls over the escarpment in a sheer drop of 800 feet... Along the top of the escarpment are many small hills covered with a peculiar mixture of primary forest and *kerapa* or *kerangas* jungle. Travel in these hills was extremely difficult. *Kerapa* is a peculiar form of stunted jungle growth, forming on poor soil with bad drainage, and characterised by small trees with gnarled trunks and huge roots reaching far over the ground. *Kerangas* is found on volcanic soils in which the trees are tall but with very thin trunks."





Usun Apau has remained essentially uninhabited to the present day, although in the 1980s there was apparently a brief, abortive attempt to establish a 'Millionaires' Club' golfing facility at the top of the northern escarpment, using helicopters, close to the spectacular Julan Waterfall. The remains of some small developments are visible close to the edge of the plateau not far from the Sungai Julan. An alternative explanation for these is that they were accommodation for a film crew making a film about the Orang Ulu; it is not clear which, if either, is the correct explanation. It appears that the Penan are now very scarce on the plateau, and the local Kenyah people living below the plateau rarely venture onto it. The Julan Waterfall (Fig. 3) is, however, the tallest in Malaysia and is slowly becoming a tourist destination for intrepid sight-seers, driving down from Miri along the logging road. There is no road access to the plateau itself, which can still only be reached by arduous hill trails.



**Figure 3.** The Julan waterfall seen from a distance. Photo by Robin Ngiam.

### **The 2012 expedition**

In 2012 the first author Rory Dow secured funding from the International Dragonfly Fund and the Mohamed bin Zayed Species Conservation Fund which, in combination with funds brought in by Robin Ngiam, enabled the planning and execution of an 11-day dragonfly collecting expedition to Usun Apau, from 23 April to 4 May 2012. The two were joined in Miri by Graham Reels and expedition organisers Luke Southwell and Yusof Tegong.





On 23 April the group drove south from Miri along the Lapok Road and the Samling logging road, passing Mt Kalulong and Mt Dulit before arriving at Long Silat, Yusof's longhouse, near to the northern escarpment of Usun Apau. The following morning the group drove a further two hours to the starting point of the trekking route up the northern escarpment, a kilometre or so from the main Julan Waterfall, rendezvousing with our team of six guides and porters (Fig. 4 shows almost the entire team). Various delays meant we were unable to ascend the escarpment on this day, and had to make camp only a few kilometres from where we had left the vehicles.



**Figure 4. Most of the expedition members at the partly dismantled base camp on the Usun Apau plateau. Photo taken by Calvin Wilfred with R. Ngiam's camera.**

The following day the expedition reached the top of the escarpment (ca 1,200 m) and then turned eastward and battled through difficult terrain (as noted by Arnold 1957; the narrow-trunked trees in this *kerangas* forest do not provide a closed canopy, permitting much light to reach the forest floor and a dense, often impenetrable, understorey to develop) in the direction of the Julan Waterfall, passing scattered remnants of the ill-fated 'Millionaires' Club' development (or whatever this really was) and eventually building a makeshift camp in fading light beside a tributary of the Julan. The next morning the group moved a kilometre further before establishing base camp (Fig.





5) at the tributary's confluence with the Julan. Dragonfly surveying then commenced in earnest, focusing on the river and nearby streams and seepages. A few days later a small additional camp was established some way from the base camp, to facilitate better penetration of the plateau, although the difficulty of the terrain made it impossible to establish this camp as far in as had been hoped. Nevertheless the camp provided a second focal point for dragonfly collecting activities and brought an interesting area of swamp forest within collecting range. The expedition lasted until 4 May, on which day the group descended from the plateau, the core members returning to Miri late that night.



**Figure 5. Base camp on the Usun Apau plateau. Photo by Robin Ngiam.**

A total of 55 odonate species was collected during the period 24 April to 4 May. Details are provided below. Very unfortunately, the majority of the specimens collected in Usun Apau National Park were lost while being sent back to Europe. The writing of this report was delayed in the hope that the specimens might be located, but at this point in time that seems to be highly unlikely and we decided to proceed without them. Because of this, some species cannot be identified with certainty.

#### **Usun Apau Locations (Fig. 6):**

1. In the national park, but below the plateau (trailside and at pools).
2. Sungai Julan (Fig. 7) and its tributaries, excluding the 'Millionaires's Club' stream





system and sub camp stream system. On average higher gradient than sites included under location 4. Coordinates for base camp at Sungai Julian: 3.025N, 114.648 E.

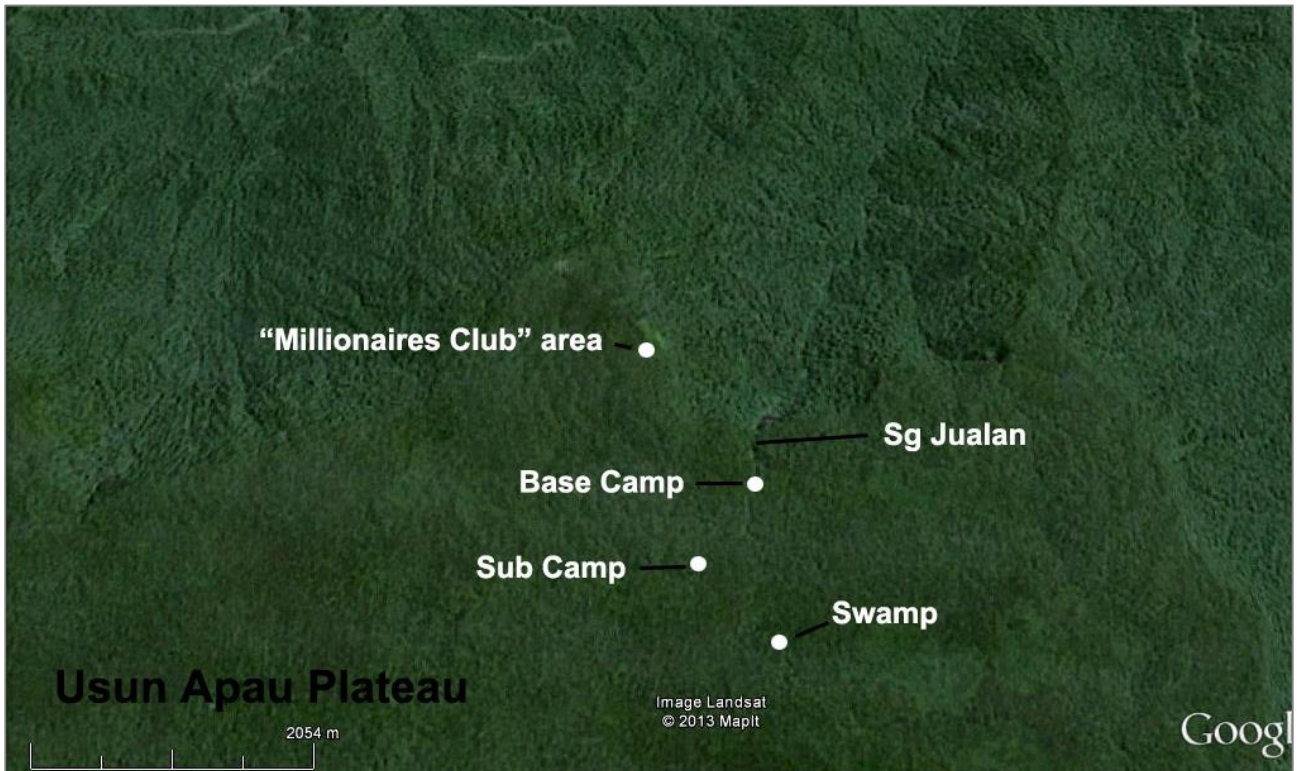


Figure 6. Satellite map showing the area of the 2012 expedition.



Figure 7. The Sungai Julian near base camp. Photo by Robin Ngiam.





3. 'Millionaires' Club' stream system – a stream system in a montane forest formation, some of it disturbed by a failed attempt to build an exclusive resort (the so-called Millionaires' Club) in the mid-1980s (but see Introduction) (Fig. 8). Coordinates: 3.035N, 114.641E.
4. Subcamp stream system. Coordinates for subcamp: 3.019N, 114.644E.
5. Swamp by Sungai Julan. Coordinates: 3.014N, 114.649E.

Names of collectors are abbreviated as follows: CW – Calvin Wilfred, BA – Benny and Aspar, YT – Yusof Tegong, RN – Robin Ngiam, RD – Rory Dow, GR – Graham Reels, LS – Luke Southwell.

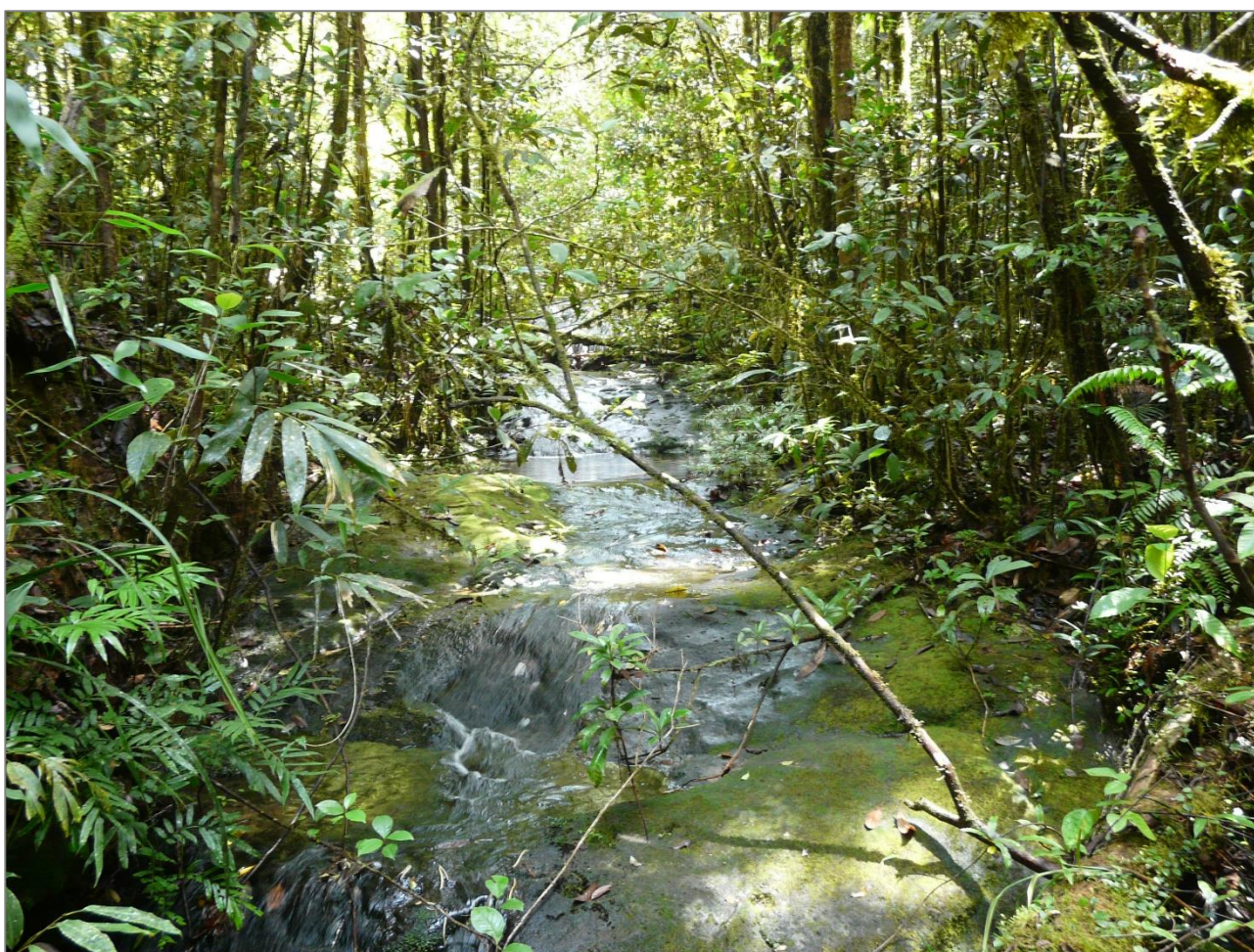


Figure 8. A stream in the 'Millionaire's Club' area. Photo by Robin Ngiam.

## Zygoptera

### Platystictidae

1. *Drepanosticta* species cf *dentifera* Kimmins, 1936

Remarks about the *dentifera* complex have been made elsewhere (e.g. Dow 2012).

Loc 2. Loc 3: ♀, 28/4/2012, RD.





2. *Drepanosticta ?forcifcula* Kimmins, 1936

It is particularly unfortunate that all specimens of this species were lost. Usun Apau is not far from Mount Dulit, the type locality of *D. forcifcula* (Kimmins 1936), and so the Usun Apau taxon might be the true *D. forcifcula*, but there is at least one other species, closely related to, but distinct from, *D. forcifcula* in northern Borneo.

Loc 2, 3.

3. *Drepanosticta rufostigma* (Selys, 1886)

Loc 2: 5 ♂♂, 2 ♀♀, 1/5/2012, BA; ♂, 1/5/2012, RN; ♂, 1/5/2012, CW. Loc 3, 4.

4. *Telosticta kajang* Dow & Orr, 2012 (Fig. 9)

Until now this species was known only from the holotype male (Dow & Orr 2012), discovered in the Hose Mountains in 2011 (Dow & Ngiam 2011). It was moderately common on small high gradient tributaries of the Sungai Julan.

Loc 2: ♂, ♀, 1/5/2012, BA; 3 ♂♂, 1/5/2012, RN. Loc 3.



Figure 9. *Telosticta kajang* male, photo taken at Usun Apau by G.T. Reels.





## Argiolestidae

### 5. *Podolestes* species

This large sized species is closely allied to *P. orientalis* Selys, 1862, and is also known from Batang Ai National Park (Dow, Reels & Ngiam in preparation) and Lanjak Entimau Wildlife Sanctuary (Dow & Choong in preparation). Most individuals were found in a swamp area, but one male was also found in a smaller muddy area beside a stream.

Loc 2. Loc 5: 2 ♂♂, 1/5/2012, GR; ♂, 1/5/2012, LS.

## Calopterygidae

### 6. *Matronoides cyaneipennis* Förster, 1897

This upland and montane species was moderately common on streams close to the lip of the Usun Apau plateau. Interestingly at some locations it occurred together with the next species; the two are normally strictly segregated by gradient with *Neurobasis longipes* on low gradient streams and *Matronoides cyaneipennis* on higher gradient streams.

Loc 2: ♂, 1/5/2012, CW; 2 ♀♀, 2/5/2012, CW.

### 7. *Neurobasis longipes* Hagen, 1887

Loc 2. Loc 4; ♂, 30/4/2012, YT.

### 8. *Vestalis amaryllis* Lieftinck, 1965

Loc 2: 2 ♂♂, 1/5/2012, BA. Loc 4: ♂, 30/4/2012, RN; 2 ♂♂, 30/4/12, YT.



Figure 10. *Rhinocypha spinifer* male, photo taken at Usun Apau by G.T. Reels.



9. *Vestalis amnicola* Lieftinck, 1965

Loc 2: ♂, 29/4/2012, RN; ♂, 1/5/2012, BA. Loc 3, 4.

10. *Vestalis beryllae* Laidlaw, 1915

Loc 1, 2.

**Chlorocyphidae**11. *Rhinocypha aurofulgens* Laidlaw, 1931

Loc 2.

12. *Rhinocypha spinifer* Laidlaw, 1931 (Fig. 10)

This upland species dominated the chlorocyphid fauna of the sampled part of Usun Apau almost to the exclusion of all other members of the family.

Loc 2: ♂, 29/4/2012, RN; 14 ♂♂, 1/5/2012, BA; 2 ♂♂, 1/5/2012, RN. Loc 3, 4.

**Devadattidae**

Unnamed *Devadatta* species from Sarawak are labelled as A-C; this scheme is consistent with that used in Dow & Reels (2013) and Dow *et al.* (2013b, 2015). However species B was not found on Usun Apau, and species C was not reported in the articles cited above. Material will be listed elsewhere; only the general locations where each species was found are listed here.

13. *Devadatta* species A

All specimens of this species are among those that were lost.

Loc 2, 3, 4.

14. *Devadatta* species C

This unnamed species is most common at higher altitudes in the north eastern part of Sarawak and in the Crocker Range in Sabah.

Loc 2, 4.

**Euphaeidae**15. *Dysphaea* species

This species is described in Hämäläinen, Dow & Stokvis (2015); material is listed in that publication.

Loc 2, 4.

16. *Euphaea impar* Selys, 1859

Loc 2: 2 ♂♂, ♀, 29/4/2012, RN; 9 ♂♂, 1/5/2012, BA. Loc 3. Loc 4: ♂, 30/4/2012, RN.

17. *Euphaea subcostalis* Selys, 1873

Loc 2: ♂, 29/4/2012, RN; 4 ♂♂, 1/5/2012, BA; 2 ♂♂, 1/5/2012, RN; ♂, 1/5/2012, CW.

18. *Euphaea subnodalis* (Laidlaw, 1915)

Loc 2.



## Philosinidae

19. *Rhinagrion borneense* (Selys, 1886) (Fig. 11)

Loc 2: ♂, 29/4/2012, RN; ♂, 1/5/2012, BA. Loc 4: ♂, 30/4/2012, RN; ♂, 30/4/2012, YT; ♂, 30/4/2012, CW; ♂, 1/5/2012, LS.



Figure 11. *Rhinagrion borneense* female, photo taken at Usun Apau by G.T. Reels.

## Platycnemididae

20. *Coeliccia* new species *borneensis*-group

A small sized member of the *borneensis*-group, differing in its anal appendages from all other species (named and unnamed) known from the group, but otherwise typical. Loc 2: ♂, 1/5/2012, RN; ?♀, 1/5/2012, CW.

21. *Coeliccia cyaneothorax* Kimmins, 1936

Loc 2: ♂, 28/4/2012, RN; ♂, 1/5/2012, RN. Loc 3, 4.

22. *Coeliccia* species cf *nemoricola* Laidlaw, 1912

Loc 2: 2 ♂♂, 1/5/2012, BA; 2 ♂♂, 1/5/2012, RN; 2 ♂♂, 1/5/2012, CW. Loc 3, 4.





23. *Coeliccia nigrohamata* Laidlaw, 1918

Loc 2: ♂, 28/4/2012, RN; 9 ♂♂, 1/5/2012, BA. Loc 3. Loc 4: ♂, 30/4/2012, YT. Loc 5: 2 ♀♀, 2/5/2012, LS.

24. *Elattoneura analis* (Selys, 1860)

Loc 2. Loc 4: ♂, 30/4/2012, YT.

25. *Onychargia atrocyana* (Selys, 1865)

Loc 5: ♂, 2 ♀♀, 2/5/2012, LS.

26. *Prodasineura dorsalis* (Selys, 1860)

Loc 2, 3. Loc 4: 3 ♂♂, ♀, 30/4/2012, YT; ♂+♀, 30/4/2012, CW.

27. *Prodasineura hosei* (Laidlaw, 1913)

Loc 2: ♂, ♀, 29/4/2012, RN. Loc 4.

28. *Prodasineura hyperythra* (Selys, 1886)

Loc 2: ♂, 1/5/2012, BA; ♂, 1/5/2012, RN. Loc 4: ♂, 30/4/2012, RN.

**Coenagrionidae**29. *Amphicnemis* new species

This new species was found in a swamp close to the Sungai Julan, and has also been found at a similar altitude in small sections of swamp forest in old river beds in the Tama Abu range to the north of Usun Apau. It may be a genuinely upland species, the first such species known from *Amphicnemis sensu stricto*; all other known species inhabit lowland swamp forest.

Loc 5: 2 ♂♂, 2 ♀♀, 2/5/2012, LS.

30. *Archibasis tenella* Lieftinck, 1949

Loc 2. Loc 4: ♀, 30/4/2012, YT.

31. *Argiocnemis* species

Loc 5.

32. *Ceriagrion bellona* Laidlaw, 1915

Loc 5.

33. *Stenagrion dubium* (Laidlaw, 1912)

Loc 2: ♂, 1/5/2012, BA. Loc 3, 4.

34. *Teinobasis laidlawi* Kimmins, 1936

The *Teinobasis* species known from Sundaland are mostly associated with lowland habitats, but *T. laidlawi* also occurs in upland areas, and was moderately common on the Usun Apau plateau, especially at location 5, where it occupied a niche that would be more typical for *T. rajah* Laidlaw, 1912 or *T. ruficollis* (Selys, 1877) in the lowlands of Borneo.

Loc 2: ♀, 1/5/2012, BA; ♂, 1/5/2012, RN; ♀, 1/5/2012, CW. Loc 5.



**Anisoptera****Aeshnidae**

35. *Heliaeschna ?idae* (Brauer, 1865)

See Orr *et al.* (2013)

Loc 2.

36. *Indaeschna grubaueri* (Förster, 1904)

Loc 2.

**Gomphidae**

37. *Gomphidia* species

A female was collected, but is amongst the lost specimens; probably *G. maclachlani* (Selys, 1873).

Loc 2.

38. *Heliogomphus* species

All individuals of this species collected were either teneral or female (or both), rendering identification impossible. Loc 2: ♂, 1/5/2012, BA; ♀, 1/5/2012, RN; ♀, 3/5/2012, RD.

Loc 3, 4.

39. *Leptogomphus* species

Loc 2.

**Macromiidae**

40. *Macromia ?cydippe* Laidlaw, 1922

Loc 2: ♀, 1/5/2012, RN. Loc 3.

41. *Macromia westwoodi* Selys, 1874

*Macromia euterpe* Laidlaw, 1915 and *M. westwoodi* are extremely similar to each other, differing most notably in size. Many *Macromia* that could not be reliably separated in field conditions were collected, but the surviving specimens all match *M. westwoodi*.

Loc 2: ♂, 1/5/2012, BA; ♂, 1/5/2012, RN; 2 ♂♂, 1/5/2012, CW.

**Libellulidae**

42. *Cratilla metallica* (Brauer, 1878)

Loc 1.

43. *Hylaeothemis clementia* Ris, 1909

Loc 2: ♂, 2/5/2012, YT.

44. *Lyriothemis biappendiculata* (Selys, 1878)

Loc 2: 3 ♂♂, 2/5/2012, YT. Loc 4.



45. *Lyriothemis cleis* Brauer, 1868

Loc 1.

46. *Nesoxenia lineata* (Selys, 1879) (Fig. 12)

Loc 5: ♂, 1/5/2012, LS.



Figure 12. *Nesoxenia lineata* male, photo taken at Niah National Park, Sarawak, by G.T. Reels.

47. *Orchithemis pulcherrima* Brauer, 1878

Loc 5.

48. *Orthetrum chrysis* (Selys, 1891)

Loc 5.

49. *Orthetrum pruinatum schneideri* Förster, 1903

Loc 2: ♂, 2/5/2012, YT. Loc 4, 5.

50. *Pornothemis serrata* Krüger, 1902

This is normally thought of as a species of lowland swamp forest, so it was interesting to find it at an upland site.

Loc 5: ♂, ♀, 1/5/2012, LS.

51. *Tyriobapta torrida* Kirby, 1889

Loc 2, 5.





52. *Zygonyx iris errans* Lieftinck, 1953

Loc 2. Loc 4: ♂, 30/4/2012, CW.

53. *Zygonyx ?ida* Selys, 1869

A single female collected on the Sungai Julan was probably *Z. ida*, a species that seems to be very elusive in Borneo. Loc 2.

### Incertae sedis

54. *Idionyx* species

Loc 2: 2 ♀♀, 2/5/2012, YT.

55. *Macromidia fulva* Laidlaw, 1915

Loc 2: ♂, 28/4/2012, RN.

### Acknowledgements

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Figure 13. Something else encountered on the plateau. Photo by Robin Ngiam.





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Swezey, O. & F. Williams, 1942. Dragonflies of Guam. Bernice P. Bishop Museum Bulletin 172: 3-6.

Rebora, M., Piersanti, S. & E. Gaino. 2004. Visual and mechanical cues used for prey detection by the larva of *Libellula depressa* (Odonata Libellulidae). *Ethology, Ecology & Evolution* 16(2): 133-144.

Citations of internet sources should include the date of access.

The manuscript should end with a list of captions to the figures and tables. The later should be submitted separately from the text preferably as graphics made using one of the Microsoft Office products or as a high resolution picture saved as a .jpg or .tif file. Hand-made drawings should be scanned and submitted electronically. Printed figures sent by the post could be damaged, in which case authors will be asked to resubmit them.

Manuscripts not arranged according to these instructions may also be accepted, but in that case their publication will be delayed until the journal's standards are achieved.

Nr.	Jahr	geförderte Person bzw. Körperschaft	Fördergegenstand
90	2013	Oleg Kosterin, Russia	Progress study Cambodia 2013
91	2013	Dejan Kulijer, Bosia & Herzegovina	Odonata fauna of karst streams and rivers of South Herzegovina (Bosnia and Herzegovina, West Balkan)
92	2013	Saeed, Muhammad & Fazlullah Gujjar, Haripur, Pakistan	Distribution and diversity of Odonata with emphasis on Gomphidae and Cordulegastridae in the border region of Pakistan and Afghanistan
93	2013	Villanueva, Reagan, Philippinen	Odonata from Balabac Islands, Palawan, Philippines
94	2013	Villanueva, Reagan, Philippinen	Fieldwork to survey the odonatologically unstudied islands of Balut and Sarangani (The Philippines) and Talaud (Indonesia)"
95	2013	Garrison, Rosser/von Ellenrieder, Natalia, Sacramento, USA	The genus Argia in Costa Rica
96	2013	Villanueva, Reagan, Philippinen	Odonata of Surigao del Sur, Philippines
97	2014	Dawn, Prosenjit, Kolkata, India	Rheophilous Odonata diversity of protected areas of Chhattisgarh, India
98	2014	Dow, Rory, UK/The Netherlands	Sarawak Odonata – documenting the status quo Odonata diversity prior logging"
99	2014	Xu, Xin, Nankai University, Tianjin, China	Odonata of Mt Dabieshan in centre of eastern China
100	2014	Rychla, Anna, Polen	Untersuchung der Libellen von westpolnischen Mooren.
101	2014	Dow, Rory, UK/The Netherlands	Naming an Onychogomphus from Malaysia
102	2014	Vincent Kalkman/A.B. Orr, The Netherlands/Australia	Field guide New Guinea Anisoptera
103	2014	Marinov, Milen, Christchurch, New Zealand	Odonata of Samoa, revisiting the localities from Fraser 1925, 1926, 1927, 1953 and 1956
104	2014	Ahmed Zia, Pakistan	Species Complex of Zygoptera in Himalayan Foot Hills of Pakistan
105	2014	Garrison, Rosser, USA	Odonata of Guangdong and Hainan Provinces in China
106	2014	Saeed, Muhammad & Fazlullah Gujjar, Haripur, Pakistan	Progress study: Distribution and diversity of Odonata with emphasis on Gomphidae and Cordulegastridae in the border region of Pakistan and Afghanistan and China
107	2014	Dejan Kulijer, Bosia & Herzegovina	Dragonfly fauna of the Posavina region of Bosnia with special emphasis on the species of European conservation concern
108	2014	Oleg Kosterin, Russia	Odonata of Sen Monorom, Mondulkiri, Cambodia
109	2014	Schröter, A., Deutschland	Documentation and reorganisation of the Odonata collections of Georgian museums
110	2014	Tennessen, K., USA	Parasitation of Macromiidae nymphs by Mermithidae (Nematoda) in northern Wisconsin lakes
111	2015	Dow, Rory, UK/The Netherlands	Odonata of Ulu Moh, Sarawak, Malaysia