

Odonata of Siargao and Bucas Grande islands, The Philippines

Reagan Joseph T. Villanueva

D3C Gahol Apartment, Lopez Jaena St., Davao City, 8000 Philippines

Email: rjtvillanueva@gmail.com

Abstract

Odonata were recorded and voucher specimens were collected between August 3-13 and August 16-20, 2011. This account lists 51 species of Odonata for both islands, 47 species in Siargao and 24 species in Bucas Grande. Thirty seven species are new island records for Siargao Island while the 24 species recorded in Bucas Grande represent the first island records. Three species are new to science, and two of which (*Drepanosticta schorri* n. sp., *Pseudagrion schieli* n. sp.) are described in the present paper. Four species previously listed (Hämäläinen & Müller, 1997) remained elusive during the present survey.

Introduction

The sea between Mindanao and Dinagat islands is dotted by several islands and islets. The majority of these land masses are karstic in geology, and a few are ultrabasic which are currently under mining concessions or mineral reserves. Siargao Island (Fig. 1) situated south east of Dinagat and north east of Mindanao Island, is the largest of the group and the fourth largest island (ca. 436 km²) in Mindanao biogeographic sub-region. This island is mainly flat and the highest elevation is only 274m asl.

Another bigger island in the area, Bucas Grande is situated south west of Siargao Island. This flat island with a sinuous coastline has a land area of around 130 km² and the second largest of the group. This island is famous for its Sohoton cove that is so isolated that its jelly fish lost its poisonous sting having no predators around. The northern part of this island is mainly pygmy forest due to its ultrabasic soil. The southern part is mainly karstic.

Large tract of mangrove forest (Fig. 2) covers the serpentine coast of these islands. In some areas, this mangrove connects the island with its smaller neighbouring islet. The elevated areas have karstic geology and its porous rock does not hold freshwater thus no river system is present in the island. Few streams occur that flows for a few meters before drying into the ground, which resurface a few hundred meters down-



stream. Majority of the surface freshwater is locked within swamps, ponds and lakes which are abundant in Siargao Island.

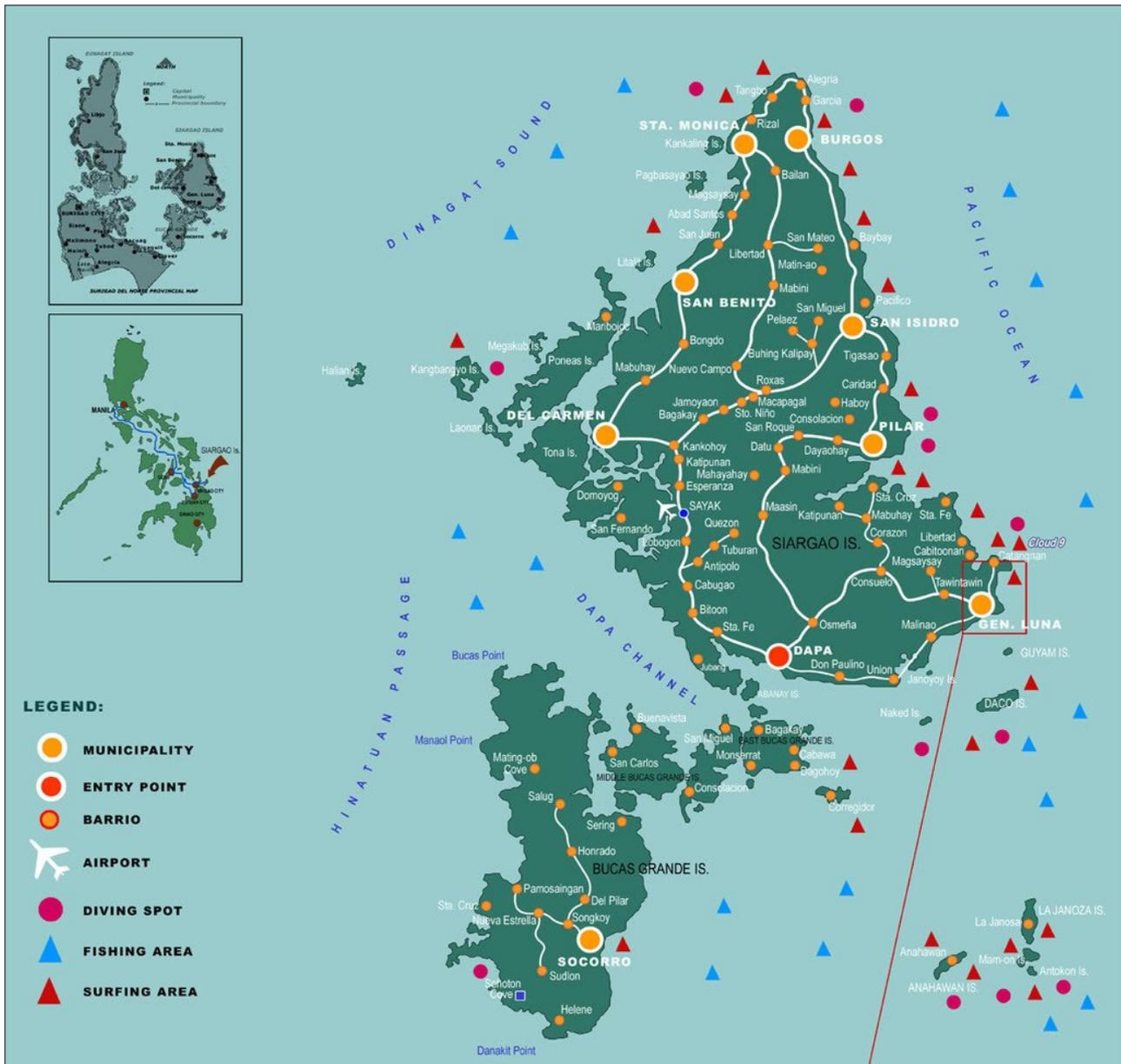


Figure 1. Map of Siargao and Bucas Grande islands (taken from: http://www.islandmotortours.com/images/places/Siargao_Island/siargao_map.jpg)

Siargao and Bucas Grande are biologically rich. The large mangrove forest is one of few remaining large coastal forest in the archipelago. The vertebrate fauna shows a high diversity (Heaney & Rabor, 1982; Ross & Lazell, 1990) but the insect diversity is poorly known. The Odonata fauna, for instance, is based only on material collected in 1916 by Dr. Boettcher in Siargao Island (Hämäläinen & Müller, 1997), while for Bucas Grande no data is available at all.

The present paper attempts to fill that gap and provides a list of Odonata recorded in August 2010.





Figure 2. Mangrove forest in Siargao Island

Method

Odonata were recorded and voucher specimens were collected between August 3-13 and August 16-20. The weather was relatively fine during the survey with occasional cloud cover and rain. Some sites were visited for 2-3 days to find more cryptic species, or to secure both sexes of potential new species.

Logistics

From Davao City, Bucas Grande is reached by travelling to Surigao City by a 10 hour bus ride. Another 3hr boat ride was taken before arriving in Soccoro, the political centre of the island. Six days were spent in this island. Several sites were visited but only one site hosted a good number of species (Sudlon (Figs. 3-5)). The island is relatively dry despite the occasional rain, therefore, all freshwater sources are being utilized by local people.





Figure 3. Sampling site (Sudlon) in Bucas Grande Island



Figure 4. Sampling site (Salug) in Bucas Grande Island





Figure 5. Water source on the sampling site in Salug, Bucas grande island

Siargao Island was reached by taking a 3hr boat ride from Socorro to Del Carmen, Siargao. It is also possible to reach Dapa, Siargao Island from Surigao City by a 4hr boat. Several sites were visited on this island but mostly ponds, swamps and lake (Figs. 6-8).



Figure 6a. Swampy sampling site in Siargao Island





Figure 6b. Swampy sampling site in Siargao Island



Figure 7a. Pond sampling site in Siargao Island





Figure 7b. Pond sampling site in Siargao Island



Figure 8a. Lake sampling site in Siargao Island





Figure 8b. Lake sampling site in Siargao Island

Taktak waterfall (Figs. 9) in Sta. Monica is the only surface water in the island that runs for over few kilometres. However, agricultural activity altered the habitat making it unsuitable for strict forest species.



Figure 9. Taktak waterfalls, Sta. Monica, Siargao Island



Use of Money from the IDF

Due to his medical training, the author is presently not able to do extensive fieldwork. However, there is an urgency to explore poorly explored areas in the Philippines while some potential habitat is still present. This urgency is shared by Martin Schorr who suggested that fieldwork should continue. Thus, I applied for fieldwork support for my assistant (Hilario Cahilog) to travel to Siargao and Bucas Grande. He has been my assistant for three years now, and was able to collect several interesting species including new species to science.

The money granted by the IDF was used for the wage of my assistant and his field guide, daily cost of living and transportations. All of the expenses incurred during the assessment came from IDF grant.

Results

The present account lists 51 species of Odonata for both islands, 47 species in Siargao (4 based on old list) and 24 species in Bucas Grande. Thirty seven species are new island record for Siargao Island while the 24 species recorded in Bucas Grande represents the first island record. Three species are new to science, and two of which is described in the present paper. Four species previously listed (Hämäläinen & Müller, 1997) remained elusive during the present survey.

Annotated List of species: (*) new island record for Siargao, () old record for Siargao**

Platystictidae

1. *Drepanosticta schorri* spec. nov. (Figures. 10-13)

Material Studied. Holotype ♂ – Kabus-an, San Benito, Siargao Is, P.I., 9.viii.2010, Hilario Cahilog (to be deposited in RMNH). **Paratype** – 2♂, 1♀, Kabus-an, San Benito, Siargao Is, P.I., 9.viii.2010, HC; 5♂, 1♀, Taktak Falls, Sta. Monica, Siargao Is., P.I., 7.viii.2010, HC (in author's collection). **Other materials** – 13♂, 2♀, Sudlon, Socorro, Bucas Grande Is., P.I., 4.viii.2010, HC (in author's collection).

Etymology – named after Martin Schorr to appreciate his support and help and making the Odonata survey in Siargao and Bucas Grande possible.





Figure 10. *Drepanosticta schorri* spec. nov.

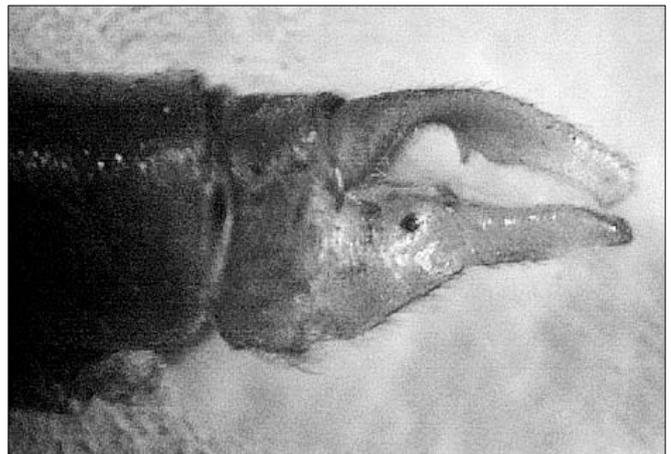
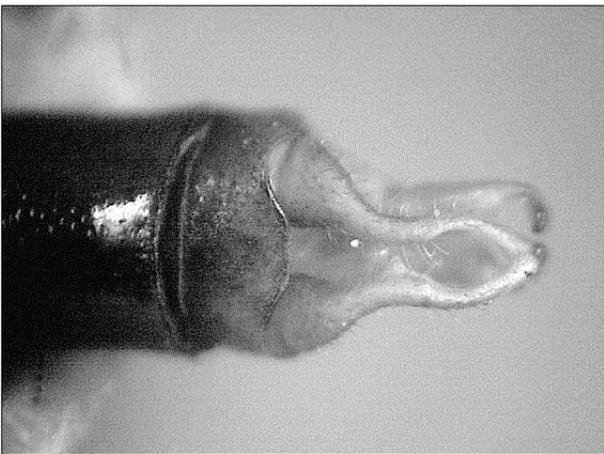


Fig. 11-12. *Drepanosticta schorri* spec. nov.: 11. Dorsum of cerci, 12. Lateral view of cerci

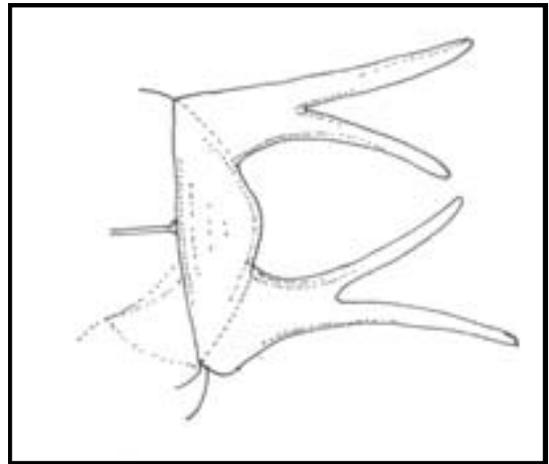
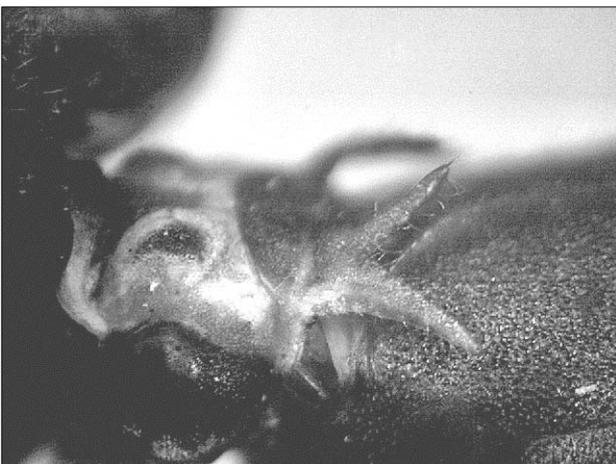


Fig. 13a, b. *Drepanosticta schorri* spec. nov.: Posterior lobe of prothorax slightly oblique lateral view



Male description

Labium yellowish. Mandible is brownish. Labrum is creamish except for the distal margin that is brownish. Genae is whitish. Anteclypeus is cream except for the black posterior margin and confluent with the black postclypeus. The frons has shade of brown between the antennae, otherwise matt black. The rest of the head is matt black except for pale antennae. Transverse occipital ridge with distinct angulate sharp corner.

Thorax – anterior lobe of prothorax is short, erect and creamish in color. Median lobe is gently dome and creamish. Lateral lobe is brownish. Posterior lobe is light brown except for the black medial portion. Laterally produced into paired, flat, elongate, branched process nearly V-shaped in configuration with blunted apices. Synthorax is dark brown except for the lighter shade at the distal half of mesepimeron and metepimeron, without distinct pale markings. Coxa, trochanter, femur and tibiae are yellowish with brownish spines and tarsi.

Wings – hyaline with brown veins. Arc is beyond Ax2, Ab vein forming Y with Ac, Pnx 14/13 in forewing and hind wing respectively. R4+5 is beyond Sn; IR3 further distad, and over half the cell's length. The pterostigma is brownish, rectangular, more than twice longer than wide.

Abdomen – S1 is brownish. S2 brownish with a small dorso-basal white spot. S3-S7 dark brown except for the white baso-dorsal mark, that extend laterally as a shade of pale brown. S8-S9 brown. S10 brown but a little paler than S8 and S9. The cerci are yellowish except for a slight basal brownish tint. Basal third directed oblique dorsad and the rest caudad when viewed lateral. The basal portion of the distal 2/3rd is equipped with large sharp ventral tooth well visible laterally. Its tip is sub-squarish. Viewed dorsally an inconspicuous tubercle a little distal from the sharp tooth. Paraproct has similar length as the cerci. Its tip is clasper-like.

Measurements for holotype, variation given in parenthesis [mm]: hind wing: 16 (15-20); Abdomen + cerci: 27 (25-34)

Female: similar to the male except for the bluish labrum and anterior portion of anteclypeus. The posterior lobe is produced into short tubercle that is sparsely covered by hairs.

Measurements [mm]: Hind wing: 19 (18-20); Abdomen + cerci: 28 (27-30)

Variation: Specimens from Bucas Grande are relatively larger than those in Siargao. This perhaps explains the slightly larger prothoracic process of Bucas Grande population. Otherwise no other structural difference is noted.

Remarks: The new species belongs to the *Drepanosticta lymetta* group (van Tol 2005). The group now contains six species (*D. clados*, *D. furcata*, *D. hermes*, *D. lymetta*, *D. taurus* and *D. schorri* spec. nov.). *Drepanosticta furcata* from Siquijor Island has a slender posterior lobe process of the prothorax while *D. lymetta* has a short process. It differs from *D. taurus* since this species lacks the distinct branching of the posterior lobe process. *Drepanosticta clados* has bifid posterior lobe process



similar to *D. schorri* spec. nov. However, the bifid process is clearly short in *D. clados* and its cerci are distinctly curved. It is close to *Drepanosticta hermes* but differs from that species by having a shorter stalk of the posterior lobe process before splitting. The two branches have similar length whereas in *D. hermes* the outer branch is longer.

Platycnemididae

2. **Risiocnemis appendiculata* (Brauer, 1868)

Records: Siargao Island: Kabus-an, San Benito; Libertad, Sta. Monica; Magsaysay, Sta. Monica; Taktak Falls, Sta. Monica. Bucas Grande Island: Sudlon, Socorro.

3. **Risiocnemis flammea* (Selys, 1882)

Records: Siargao Island: Taktak Falls, Sta. Monica.
This species is not very abundant in the island.

4. **Risiocnemis fuligifrons* Hämäläinen, 1991 (Figure 14)

Records: Siargao Island: Taktak Falls, Sta. Monica; Magsaysay, Sta. Monica.



Figure 14. *Risiocnemis fuligifrons* in tandem

5. ***Risiocnemis erythrura* (Brauer, 1868)

The present survey did not reveal this species. The absence of undisturbed rheophilous habitat makes this species harder to find in the island.



Protoneuridae

6. **Prodasineura integra* (Selys, 1882)

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; Libertad, Sta. Monica; Taktak Falls, Sta. Monica; San Mateo, Burgos.

Coenagrionidae

7. **Agriocnemis f. femina* (Brauer, 1868)

Records: *Siargao Island:* Brgy. Neuvo Campo, San Benito; Kabus-an, San Benito; Libertad, Sta. Monica; Mabuhay, Del Carmen; San Mateo, Burgos; Taytay, Del Carmen; Tuburan, Del Carmen. *Bucas Grande Island:* Sudlon, Socorro.

8. **Agriocnemis pygmaea* (Rambur, 1842)

Records: *Siargao Island:* Brgy. Neuvo Campo, San Benito; Kabus-an, San Benito; Libertad, Sta. Monica; Mabuhay, Del Carmen; San Mateo, Burgos; Taytay, Del Carmen; Tuburan, Del Carmen. *Bucas Grande Island:* Sudlon, Socorro.

9. **Amphicnemis spec. nov.*

Records: *Siargao Island:* Kabus-an, San Benito; Taktak Falls, Sta. Monica.

A manuscript of a revision of the Philippine species assigned to the genus *Amphicnemis* has recently been submitted (Villanueva, in prep.). Therefore, I prefer not to describe this species until the review paper will be published.

10. *Amphicnemis dentifer* (Needham & Gyger, 1939) (Figures 15-16)

Records: *Siargao Island:* Brgy. Neuvo Campo, San Benito; Kabus-an, San Benito; Libertad, Sta. Monica; Mabuhay, Del Carmen; San Mateo, Burgos; Taytay, Del Carmen; Tuburan, Del Carmen.

This is the most dominant damselfly in Siargao. All habitats explored hosted this species. The Siargao populations have a close affinity with Dinagat Island population.



Figure 15. *Amphicnemis dentifer* male





Figure 16. *Amphinemesis dentifer* female

11. **Amphinemesis lestoides* (Brauer, 1868) (Figure 17)

Records: *Siargao Island:* Kabus-an, San Benito; Magsaysay, Sta. Monica; Tak-tak Falls, Sta. Monica; Taytay, Del Carmen. *Bucas Grande Island:* Sudlon, Socorro.

This is more widespread than the undescribed species no. 9 listed above. Further taxonomic study and comparison with several populations from Surigao and Dinagat Island is needed.



Figure 17. *Amphinemesis lestoides*



12. *Argiocnemis rubescens intermedia* Selys, 1877

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; San Mateo, Burgos. *Bucas Grande Island:* Sudlon, Socorro.

13. **Ceriagrion lieftincki* Asahina, 1967

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; Taytay, Del Carmen; Tuburan, Del Carmen. *Bucas Grande Island:* Sudlon, Socorro.

14. **Pseudagrion schieli* **spec. nov.** (Figures 18-22)

Material Studied. Holotype ♂ – Tuburan, Del Carmen, Siargao Is., P.I., 8.viii.2010, HC (to be deposited in RMNH). **Paratype** – 4 ♂, 2 ♀: Tuburan, Del Carmen, Siargao Is., P.I., 8.viii.2010, HC; 2 ♂: San Mateo, Burgos, Siargao Is., P.I., 12.viii.2010, HC.



Figure 18. *Pseudagrion schieli* **spec. nov.**



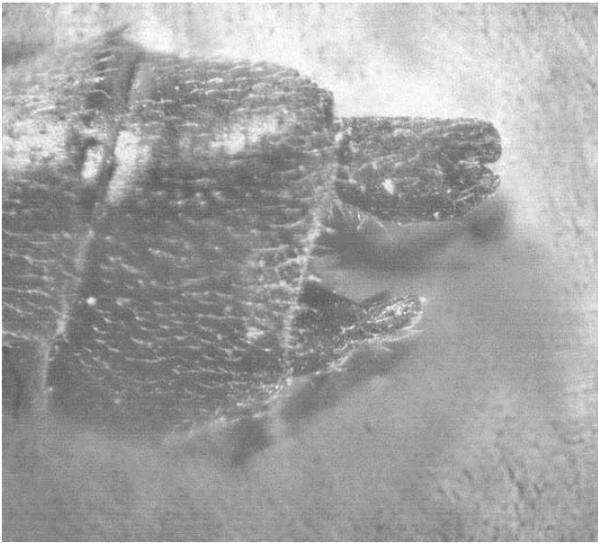


Figure 19. *Pseudagrion schieli* spec. nov.:
Lateral view of cerci



Figure 20. *Pseudagrion schieli* spec. nov.:
Dorsal view of cerci

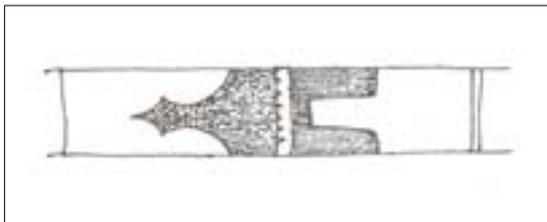


Figure 21. *Pseudagrion schieli* spec. nov.:
Dorsum of S8-S9 male



Figure 22. *Pseudagrion schieli* spec. nov.: Posterior lobe of prothorax female



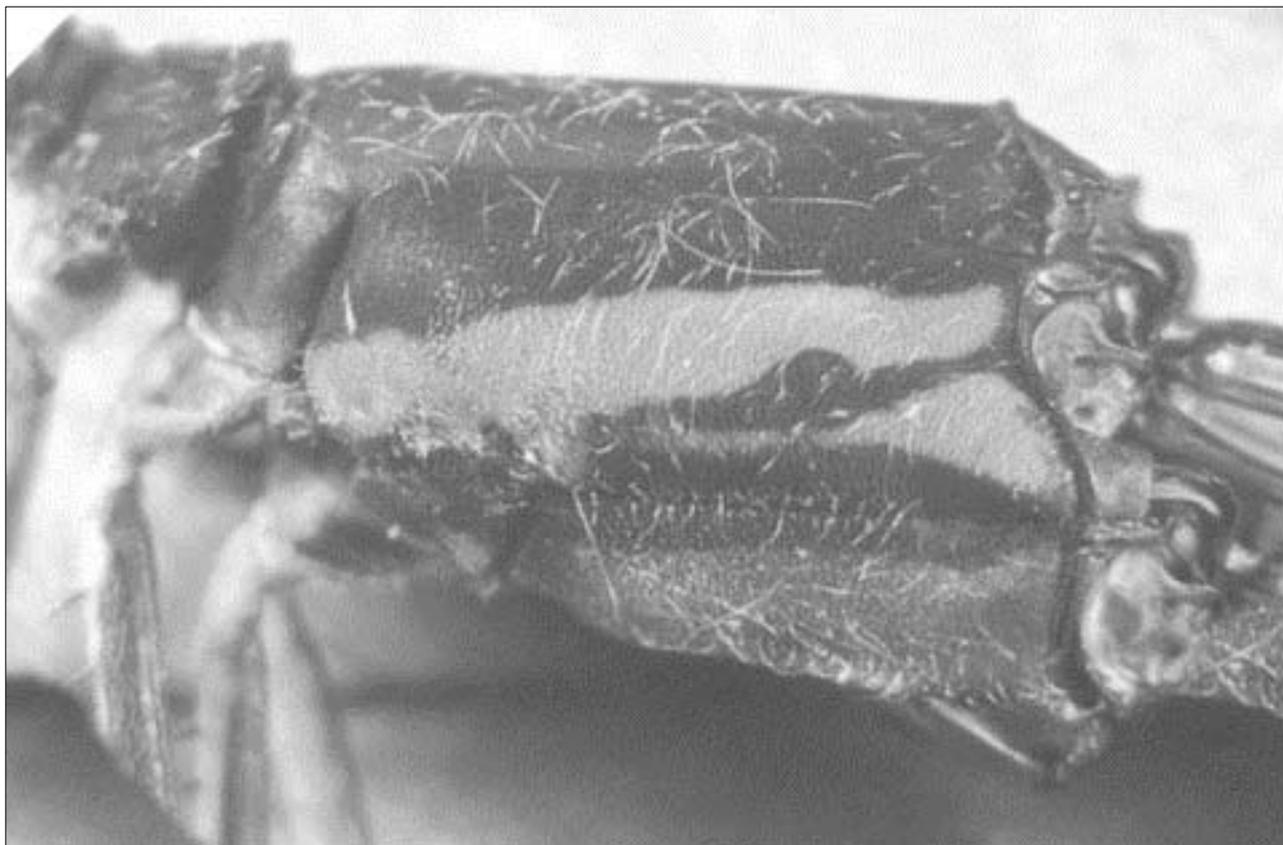


Figure 23. *Pseudagrion schieli* spec. nov.: female thorax, lateral view

Etymology – named after Jupp Schiel, Sasbach for his contribution to this study and to German odonatology.

Description male:

The labium is yellowish, the mandible is blackish. The labrum is blue except for the black baso-medial streak. Genae, anteclypeus, anterior eye margin and frons is blue. Postclypeus is blue except for the black basal margin that is broader on each lateral portion. The Rest of the head is black except for bluish post-ocular area that is paler centrally.

Thorax – The prothorax is matt black except for a pale patch at the baso-medial portion of posterior lobe and the central portion of the crest of anterior lobe. The anterior lobe is short and erect. Middle lobe is gently domed medially with a prominently bulging lateral side. Posterior lobe is short, collar-like. Synthorax – the mesinfraepisternum is black. Mesepisternum is black except for a large blue stripe beside the humeral suture and a small circular spot near the ante-alar area. Mesepimeron black except for pale posterior margin. Metepisternum is blackish except near the spiracle that is bluish and pale streak running in the middle. Metepimeron is pale. Legs – coxa blackish. Trochanter is brownish. Femur black except for the pale antero-basal portion. Tibiae are black except for pale posterior margin. Tarsi brown with black tip. Spines black.

Wings – hyaline with black veins. Arc at Ax2, Ac near Ax2, petiolation reaches Ac. Pnx



15/13 in forewing and hind wing respectively, R4 just before Sn, IR3 at Sn, R3 7/6 in forewing and hind wing respectively, IR2 at 11/10 in forewing and hind wing respectively. Pterostigma black; sub-squarish, a little higher than long.

Abdomen – S1 black except for squarish pale lateral streak. S2 black except for blue baso-dorsal patch. S3-S7 entirely black. S8 blue except for black dorso-apical third (shaped as in figure 21) that extends laterally. S9 blue except for black basal half (shaped as in figure 21). S10 is black except for a small dorso-basal spot. Cerci is black; viewed lateral rectangular with bilobate tip, viewed dorso-medially with a groove that divide the tip into two and sub apical into three portions. Paraproct is black, over half the length of cerci, broad base with taper rounded tip.

Measurements for the holotype [mm]: Abdomen + cerci: 34; Hind wing: 25

Variation male: Mesepimeron entirely black. Metepisternum bluish except for black posterior margin. Metepimeron is also bluish except for black anterior margin. S1 pale lateral streak extends forming an apical ring.

Female: Similar to male except for the blue labrum that is bordered by black, broadest postero-medially. Genae, anteclypeus and frons blue. The rest of the head is matt black except for a large blue post-ocular spot. Prothorax is black except for a large dorsal blue patch at the crest of anterior lobe and small pair rectangular patch medially at the middle lobe. Posterior lobe short, fan-shaped, at each side of the middle with a large ridge that runs across reaching the center of the middle lobe. Metepisternum is bluish with large black streak running oblique from posterior margin near the middle towards the wing base just below the antero-distal corner. S2-S7 is black except for pale lateral sides. S8 blue except for blackish apical half. S9 blue except for black baso-lateral half. S10 blue.

Measurements [mm]: Abdomen: 32; Hind wing: 26

Remarks: Six species of *Pseudagrion* have so far been described for the Philippine archipelago (Hämäläinen & Müller, 1997). They fall into two color groups. The reddish species are represented by *P. p. pilidorsum* and *P. buenafei*. The bluish/yellow-green group where the new species belong are represented by *P. azureum*, *P. evanidum*, *P. microcephalum*, *P. r. rubriceps* and *P. schieli* spec. nov. *Pseudagrion schieli* spec. nov. differs from *P. r. rubriceps* on the presence of orange face of the latter. The new species differs from the remaining bluish species by its predominantly black abdomen and legs besides the shapes of the cerci.

15. **Pseudagrion microcephalum* (Rambur, 1842)

Records: Siargao Island: Brgy. Mag-aso, San Isidro; San Mateo, Burgos.

This species shows variation between islands and needs further careful study.

16. **Pseudagrion p. pilidorsum* (Brauer, 1868)

Records: Siargao Island: Brgy. Mag-aso, San Isidro; Libertad, Sta. Monica.



17. *Teinobasis olivacea* Ris, 1915 (Figure 24)

Records: *Siargao Island:* Brgy. Neuvo Campo, San Benito; Mabuhay, Del Carmen; San Mateo, Burgos; Taytay, Del Carmen. *Bucas Grande Island:* Sudlon, Socorro.



Figure 24. *Teinobasis olivacea* male

18. **Teinobasis filamentum* Needham & Gyger, 1939

Records: *Siargao Island:* Magsaysay, Sta. Monica; Taktak Falls, Sta. Monica. The distal portion of the cerci seems to differ compared to the Mindanao population. Further study is needed to elucidate the taxonomic status of Siargao population.

19. **Xiphiagrion cyanomelas* Selys, 1876 (Figure 25)

Records: *Siargao Island:* Abad Santos, Sta. Monica.



Figure 25. *Xiphiagrion cyanomelas* male



Lestidae

20. ***Lestes p. praemorsus* (Selys, 1862)

This species was extensively searched. Unfortunately, it could not be found amid plenty of potential sites.

Chlorocyphidae

21. **Rhinocypha colorata* (Hagen in Selys, 1869)

Records: *Siargao Island:* Kabus-an, San Benito; Libertad, Sta. Monica; Taktak Falls, Sta. Monica. *Bucas Grande Island:* Sudlon, Socorro.

Aeshnidae

22. *Anax* sp.

Records: *Bucas Grande Island:* Sudlon, Socorro.

A single male was found patrolling.

23. **Gynacantha bayadera* Selys, 1882

Records: *Siargao Island:* Mabini, Sta. Monica.

Gomphidae

24. **Heliogomphus bakeri* Laidlaw, 1925

Records: *Siargao Island:* Taktak Falls, Sta. Monica.

Libellulidae

25. **Acisoma p. panorpoides* Rambur, 1842

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro. *Bucas Grande Island:* Sudlon, Socorro.

26. *Agrionoptera insignis* (Rambur, 1842)

Records: *Siargao Island:* Brgy. Neuvo Campo, San Benito; San Mateo, Burgos. *Bucas Grande Island:* Sudlon, Socorro.

27. **Brachydiplax c. chalybea* Brauer, 1868

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; San Mateo, Burgos; Tuburan, Del Carmen.

28. ***Camacinia gigantea* (Brauer, 1867)

This species was extensively searched unfortunately could not be found.



29. ***Cratilla lineata assidua* Lieftinck, 1953

This species was extensively searched unfortunately could not be found.

30. **Crocothemis s. servilia* (Drury, 1770)

Records: *Siargao Island:* Brgy. Mag-aso, San Isidro.

31. **Diplacina bolivari* Selys, 1882

Records: *Siargao Island:* Kabus-an, San Benito.

Despite the very limited running water in the island, three of the four known species of *Diplacina* occurs.

32. **Diplacina braueri* Selys, 1882

Records: *Siargao Island:* Kabus-an, San Benito. *Bucas Grande Island:* Sudlon, Socorro.

33. **Diplacina nana* Brauer, 1868

Records: *Siargao Island:* Kabus-an, San Benito. *Bucas Grande Island:* Sudlon, Socorro.

34. **Diplacodes trivialis* (Rambur, 1842)

Records: *Siargao Island:* Taktak Falls, Sta. Monica. *Bucas Grande Island:* Sudlon, Socorro.

35. *Hydrobasileus croceus* (Brauer, 1867)

Records: *Bucas Grande island:* Sudlon, Socorro.

This species was encountered but no voucher sample was obtained.

36. *Lathrecista asiatica* (Fabricius, 1798) (Figure 26)

Records: *Bucas Grande island:* Sudlon, Socorro.



Figure 26. *Lathrecista asiatica* male



37. *Nannophya pygmaea* Rambur, 1842
Records: *Bucas Grande island:* Sudlon, Socorro.
38. **Neurothemis r. ramburii* (Brauer, 1866)
Records: *Siargao Island:* San Mateo, Burgos.
39. **Neurothemis t. terminata* Ris, 1911
Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; Tuburan, Del Carmen.
Bucas Grande Island: Sudlon, Socorro.
40. *Orthetrum pruinosum clelia* (Selys, 1878)
Records: *Bucas Grande island:* Sudlon, Socorro.
41. **Orthetrum sabina sabina* (Drury, 1770)
Records: *Siargao Island:* Libertad, Sta. Monica.
42. *Orthetrum t. testaceum* (Burmeister, 1839)
Records: *Siargao Island:* San Mateo, Burgos. *Bucas Grande Island:* Sudlon, Socorro.
43. **Pantala flavescens* (Fabricius, 1798)
Records: *Siargao Island:* Brgy. Mag-aso, San Isidro. *Bucas Grande Island:* Brgy. Rizal, Socorro.
44. **Potamarcha congener* (Rambur, 1842)
Records: *Siargao Island:* Brgy. Mag-aso, San Isidro; San Mateo, Burgos. *Bucas Grande Island:* Sudlon, Socorro.
45. **Rhyothemis phyllis subphyllis* Selys, 1882
Records: *Siargao island:* Brgy. Mag-aso, San Isidro.
46. **Tetrathemis i. irregularis* Brauer, 1868
Records: *Siargao island:* Brgy. Mag-aso, San Isidro; Taytay, Del Carmen.
47. **Tholymis tillarga* (Fabricius, 1798)
Records: *Siargao Island:* Tuburan, Del Carmen.
48. **Trithemis adelpha* Selys, 1878 (Figure 27)
Records: *Siargao Island:* Tuburan, Del Carmen; Kabus-an, San Benito.
49. **Trithemis festiva* (Rambur, 1842)
Records: *Siargao Island:* Kabus-an, San Benito. *Bucas Grande Island:* Sudlon, Socorro.
50. **Zyxomma obtusum* Albarda, 1881
Records: *Siargao Island:* Mabini, Sta. Monica.
51. **Zyxomma petiolatum* Rambur, 1842
Records: *Siargao Island:* Taytay, Del Carmen.



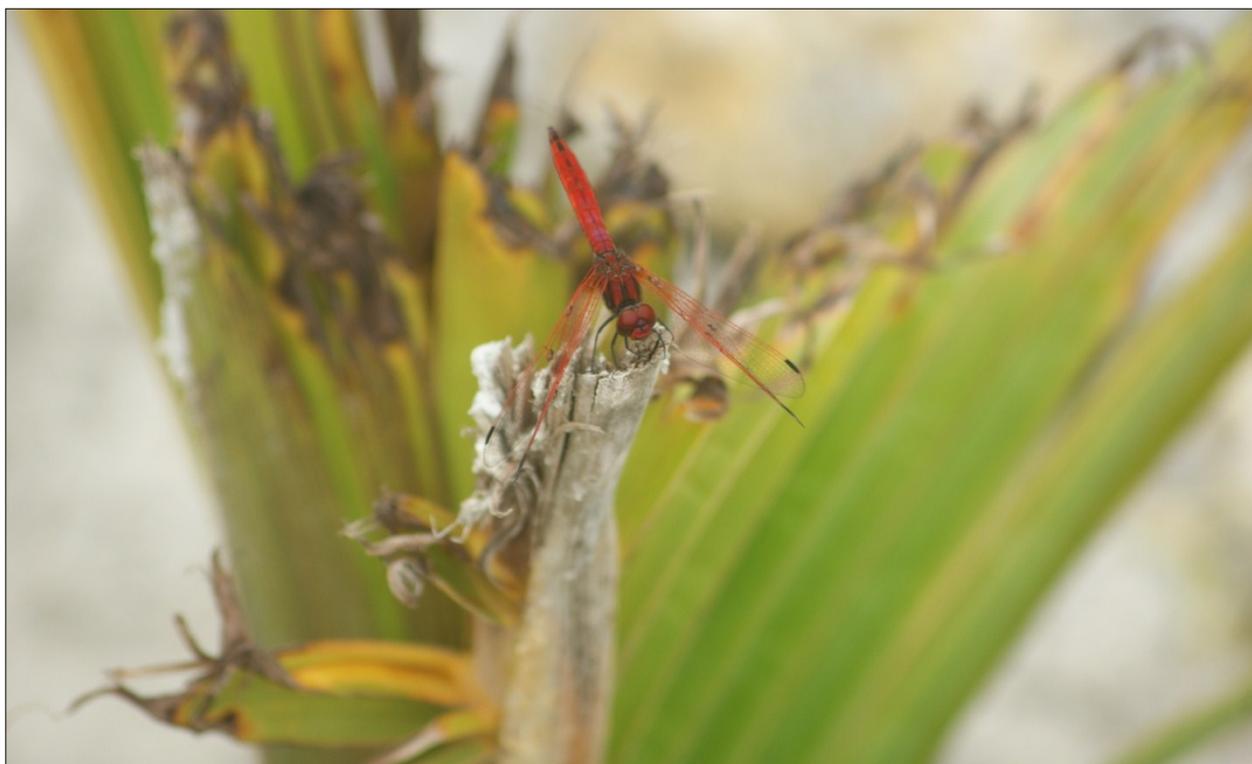


Figure 27. *Trithemis adelpha* male

Discussion

The present survey revealed 37 new records for the island of Siargao - a clear sign of the inadequacy of our knowledge on this island's Odonata fauna. Likewise, the discovery of three species new to science suggests many surprises can be expected in poorly explored areas in the Philippines. Several parts of the archipelago's main islands are virtually unexplored, not to mention the number of smaller islands.

The discovery of a new species on a small island implies the need to explore other small islands in the archipelago. Based on the current information, on average, an island with a total land area of around 100 km² hosts an endemic species (Hämäläinen & Müller, 1997; Villanueva, in prep). The islands in the north (Batanes group) and in the south need extensive survey. More species from Taiwan and other northern elements are likely to be found in the Batanes group of islands, while undocumented Bornean elements can be expected on the island of Balabac and the Tawi-tawi group of islands. However, this is an urgent task since many of these islands are now heavily denuded, and the majority have no more pristine habitat.

The number of swamps and ponds in Siargao Island and the limited number of recorded species thriving on these habitats suggests that more species can still be expected from this island. For example, it is likely that more than one species of *Gynacantha* is present on the island, and several other elusive and seasonal species. Species with special habitat requirements are also poorly represented and more can be expected. As one example, *Amphicnemis cantuga*, a species that lives in the leaf axils of *Pandanus* spp. remained unrecorded though several potential habitats are



present (Figure 28). This species shows seasonal pattern based on several observations, thus its presence in the island is not unlikely.



Figure 28. Potential habitat for *Amphicnemis cantuga*

Acknowledgement

The author is indebted to Martin Schorr for various help, and to Hilario Cahilog for the impressive samples he collected. I am also thankful to Matti Hämäläinen for his support on my Odonata study and comments on the manuscript. This study is supported by International Dragonfly Fund.

References

- Hämäläinen, M & R.A. Müller, 1997. Synopsis of the Philippine Odonata, with lists of species recorded from forty Islands. *Odonatologica* 26(3): 249-315.
- Heaney, L.R. & D.S. Rabor, 1982. Mammals of Dinagat and Siargao Islands, Philippines. Occasional papers of the Museum of Zoology, University of Michigan 699: 1-30.
- Ross, C. & J. Lazell, 1990. Amphibians and Reptiles of Dinagat and Siargao Islands, Philippines. *Philippine Journal of Science* 119(3): 257-286.



van Tol, J., 2005. Revision of the Platystictidae of the Philippines (Odonata), excluding the Drepanosticta halterata-group, with description of twenty-one new species. Zoologische Mededelingen 79(2): 195-282.

Villanueva, R.J.T., in prep. Review on the Philippine taxa formerly assigned to the genus *Amphicnemis* Selys, with descriptions of three new genera and thirty new species (Odonata: Coenagrionidae), (Manuscript submitted).

