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The Odonata collected in October 2019 on Patnanungan Island, Jomalig Island and Panukulan (northeastern Polillo), Philippines, with a checklist of the Polillo Odonata fauna

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Abstract

The paper presents new odonatological data from the formerly unstudied islands Patnanungan and Jomalig as well from the northeastern part of Polillo, The Philippines. Four species are new for the Polillo-Island group, including one new taxon - *Anax parthenope julius* – for The Philippines. Currently, 78 odonate taxa are known from the Polillo-group.

Key words: dragonfly, damselfly, Polillo islands, new record, *Anax parthenope julius*

Introduction

The Philippine Sea east of Central Luzon, the biggest island in the Philippine Archipelago, is dotted with more than two dozen islands called the Polillo Group of Islands. Polillo Island is the biggest of the group comprising three municipalities. The other big islands are Patnanungan Island, Jomalig Island and Palasan Island (situated between Polillo and Patnanungan). The rest of the islands are very small, and most of them lack freshwater sources. The island group is generally flat and its highest peak – located on the main island of Polillo – reaches less than 800 m above sea level (a.s.l).

Polillo group is noteworthy for its rich biodiversity including Odonata. Previous works showed high odonatological diversity in the main island of Polillo (Villanueva, 2010a, b, 2012a, b; Villanueva & Schorr 2011; Villanueva, van Weerd & Cahilog, 2012; Villanueva & Dow 2014; Villanueva & Dow 2019). The other islands remained unexplored with no Odonata records. However, fluvial ecosystems are present there, making them interesting for a study. This prompted odonatological surveys in these unexplored islands as well as in less explored portions of Polillo Island.

Methods

Odonatological surveys were conducted from October 16 to October 31, 2019. Fieldwork in Patnanungan and Jomalig was blessed with good weather. However, the trip to the municipality of Panukulan, the northern town of Polillo Island, was met with a low-pressure area in the Pacific, resulting in heavy downpour during the entire time in the field. Palasan Island was not visited since locals informed us about the absence of fresh-

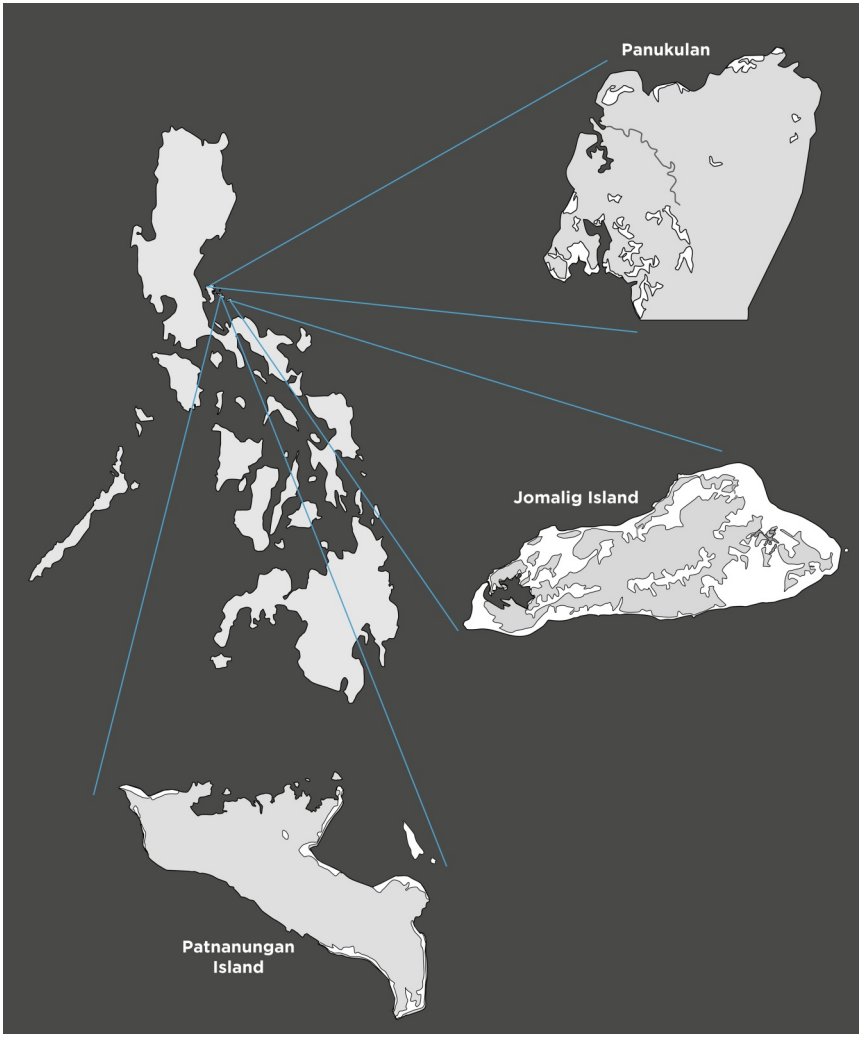

Figure 1. Map of Polillo group of islands.

water bodies due to a prolonged dry spell. The rest of the smaller islands, too, were not visited due to lack of freshwater bodies.

Areas Explored (Figure 1)

Patnanungan Island (Figure 2)

This is a shoe-shaped island situated east of the main island of Polillo. It has a total land area of approximately 139 km². The island is generally flat and the highest elevation

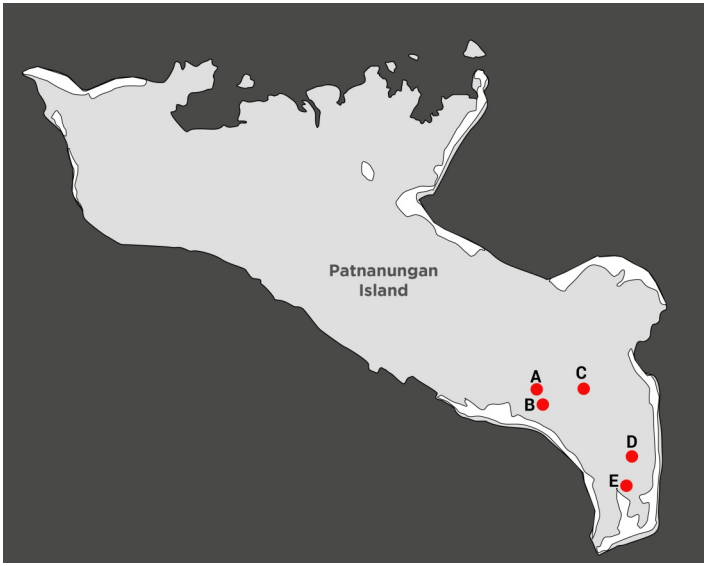

Figure 2. Map of Patnanung and sampling sites.

is less than 50 m a.s.l., located on the western side of the island. It is considered a fifth-class municipality with less than 20,000 inhabitants. The main source of income is fishing and agriculture, but tourism is gaining popularity.

There are no previous Odonata data from this island. The odonatological survey was focused on the eastern side of the island. Fieldwork lasted for six days from October 16 to October 21. The fluvial areas on the western side were very dry during the visit. Locals claimed that there had been no rain in the island for several weeks due to El Nino. Freshwater sources were dammed at the very source and piped for household use, thereby drying up the small rivulets. Many households relied on wells for their freshwater needs. However, several of these wells were no longer functional as well, since salt water was coming out of them.

Sites visited: (Figures 3 - 15)

1. Albi (14.763295N, 122.226058E)

   The main stretch of this secondary forest stream was very dry due to the long drought. Freshwater bodies were standing pools scattered along the stream.

2. Albi (14.758618N, 122.227235E)

   This stream was mainly rain-fed since there was no distinct source. The stream was adjacent to a rice field. Pesticide containers were found in the standing pool.

3. Auring (14.761434N, 122.34258E)

   The creek discharged into a mangrove area. Mangrove trees grew along the bank of the stream. The creek area had brackish water. The main stretch of the stream was also dry.

Figure 3. Local Transportation in the island.

Figure 4. One of the accommodations.

Figure 5a, b Dried rice fields.

Figure 6a-d. Standing pool in forested streams.

Figure 7a-g. Forested stream.

Figure 8a, b. Dried-up forest stream.

Figure 9. Creek near the mangrove area.

Figure 10. Coastal creek.

Figure 11. Reed area near the shore.

Figure 12. Sandbar with brackish water.

Figure 13. Logging near streams.

4. Banasi (14.745392N, 122.254041E)

This was a bigger stream. Again, there was no distinct running water noted. There were several pools about two to three meters away from the stream. Some of the pools were connected by a narrow strip of flowing water. The area was surrounded

Figure 15. Pesticide bottle floating in forested pool.

by thick vegetation composed mainly of ferns and *Pandanus* spp. The dry stream bed was covered with a thick layer of fallen leaves. The site was the nearest to the coastal area.

5. Pulang Lupa (14.734445N, 122.253079E)

This rocky creek was found without clear running water as most of the feeding creeks were dried up. Several areas of standing pools were present; some of which were connected to each other by a narrow strip of water. The area was covered with a rich secondary old growth. This was the site were most of the island damselflies were found.

Jomalig Island (Figure 16)

Jomalig Island is the easternmost island in the Polillo group with a total land area of approximately 56 km². The island is mainly flat with almost no noticeable hills. It is considered a fifth-class municipality with less than 9,000 inhabitants. The main sources of income are fishing and agriculture.

Figure 16. Jomalig sampling site.

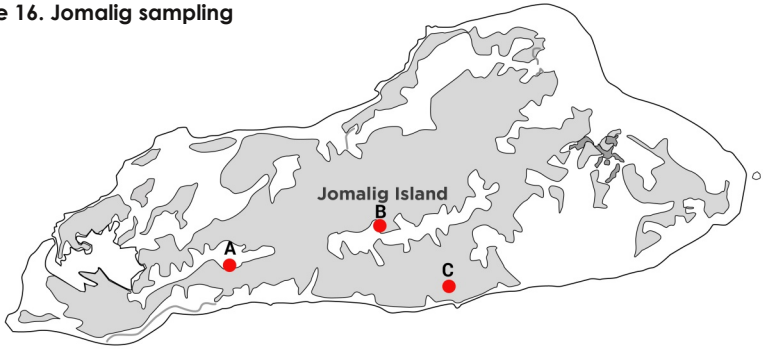

Figure 17. Port of Jomalig.

Figure 18. Boat ride from Patnanungan to Jomalig.

Figure 19. Dried ricefield.

Figure 20a, b. Forest stream.

Figure 21 a, b. Reed area.

Figure 22a, b. River.

Figure 23. Swamp.

There is no extensive fluvial system in the island. Although there are rice fields in the island, it is dependent on rainfall for farming. Household freshwater came from deep wells. Rivers and creeks were mainly rain-fed.

There existed no Odonata data from this island until this survey. Fieldwork lasted for four days from October 22 to October 25, 2019.

Sites visited: (Figures 17 - 23)

1. Gango (14.688449N,122.353277E)

This site was situated quite close to the shore. It was surrounded by secondary growth

forest. The sloping stream was completely dry in most parts. Standing water with a thick layer of fallen leaves suggested the absence of recent rainfall.

2. Bonton, Gango-Bukal Mangrove Trail (14.692974N,122.374421E)

   The studied area encompassed agroforests and rice fields. A river situated close to the rice field had fallen dry completely. Numerous irrigation ditches branched off from the river to the rice fields, however, these were also dried-up.

3. Pinaglaputan (14.681241N,122.385739E)

   The winding river cut across a thick mangrove stand before it discharged into the ocean. The water was brackish as high tide water can flow back into the river. There was a large pool surrounded by thick reed vegetation. This was where the majority of the dragonflies were collected in this island. A fair number of *Anax parthenope julius* (Fig. 24) were seen flying.

Figure 24 a. Habitus of *Anax parthenope julius*, b. Dorsum head and side of thorax, c. Dorsum of S7-S10 with anal appendages.

Panukulan, Polillo Island (Figure 25-26)

The municipality of Panukulan is the northernmost town on the island of Polillo. It is embedded in the most extensive continuous forest on the island. The presence of these forests is due to the presence of insurgents in its mountains. However, the forest is also under pressure from slash and burn farming methods. An extensive freshwater system in the municipality drains to the eastern side of the island, and to some extent to the northern part.

Odonatologically, Polillo is very rich with 74 recorded species so far. Previous works had focused on the southern part of the island along the municipality of Polillo and partly in Burdeos. This was caused by the difficulty to conduct fieldwork in the forest of Panukulan due to the presence of insurgents. In 2019, the situation had calmed down, and it was possible to do fieldwork in this region, too.

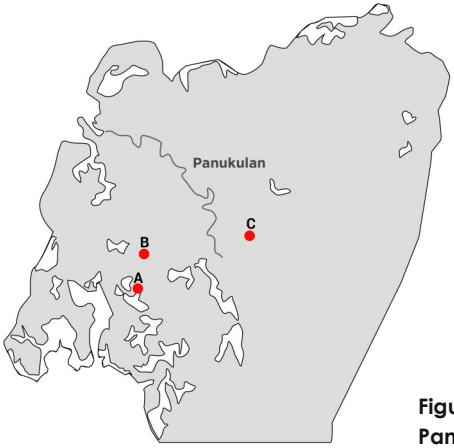

Figure 25. Map of sampling sites in Panukulan.

Figure 26. Port of Panukulan.

Sampling was done from October 27 to 31. But it was unfortunate that a low-pressure area from the Pacific arrived during the fieldwork period. Hence, fieldwork was cut short since it was no longer practical to stay and wait for better weather. The heavy downpour was a blessing to the locals after the long drought, but significantly limited our odonatological survey.

Sites visited: (Figures 27 - 29)

1. Milawid (14.953730N, 121.850104E)

   This agro-forested site in the western part of the municipality was located quite near to the town proper of Panukulan. The stream was generally rocky with thick vegetation surrounding it. The water in the stream was clear despite the rain.

Figure 27. Abandoned rice field.

Figure 28a, b. Road leading to the interior of the municipality.

2. Bato (14.966856N, 121.848322E)

This was the second explored site in the municipality. It contained a large creek or even small river. In contrast to the situation on Patnanungan Island, this river had deeper water that could be navigated by small motorized boats. The river was situated in an agro-forested area. Its embankment was covered with mangrove trees. There was a nearby rice field, and in some areas there were standing pools used by carabaos (water buffalos) for bathing. This was supposedly the most promising site, but heavy downpour was encountered during the two days spent in the community.

Figure 29. Looking for Odonata despite the rain.

3. Kinalagti (14.972558N, 121.883180E)

This easternmost site explored was an old secondary forest with several springs and streams. It was unfortunate that heavy downpour was encountered during the fieldwork. Heavy rains caused flooding of the many waterways. This resulted in a very low number of species encountered.

Results

Lists of species for Polillo group of islands and new additions from the October 2019 survey

The following Table 1 summarises the current knowledge on the Odonata fauna of the Polillo Island group. The checklist includes formerly published species and new additions found during the October 2019 survey. Species in Table 1 with an asterisk "*" are new additions to the list of Polillo-Odonata. The table contains annotations which are listed at the end of this chapter.

Discussion

The Odonata fauna of Polillo island was relatively well-studied in the past decades in comparison with the other areas of Luzon. The present survey resulted in the discovery of an additional new island record – *Anax parthenope julius* – that is also even a new country record. This raised the total number of species to 78 for the island group. It denotes that there is still a large gap in the knowledge of Philippine Odonata, since new country records are still being found.

There are 22 species out of 17 genera out of six families recorded from Patnanungan Island. This represents the first odonatological record from the island. Half of the recorded species are pioneer species with oriental distribution. The remaining species are endemics including a Polillo endemic species. The most noteworthy discovery in this island was *Anax parthenope julius*; it was the first record of this species in the Philippines.

There were eight species out of eight genera and three families recorded from Jomalig Island. This represents the first odonatological record from the island. All are pioneer species with oriental distribution. Although *Anax parthenope julius* was also recorded on Patnanungan Island, there was a sizeable population observed flying on Jomalig island.

Table 1: Checklist of Polillo-Odonata with new records from the October 2019 survey. Column 1 checklists all Polillo-Odonata, column 2 the records from Jomalia Island, column 3 records from Panukulan, northern Polillo and column 4 records from Patnanungan Island.

Pollilo Island	J = Jomalig Island	P2 = Panukulan, northern Polillo Island	P3 = Patnanungan.
Zygoptera			
Platystictidae			
Drepanosticta cf. *philippa/trimaculata* [i]			
Drepanosticta wildermuthi Villanueva & Schorr, 2011			
Sulcosticta vantoli Villanueva & Schorr, 2011 [ii]		X	
Platycnemididae			
Igneocnemis atropurpurea (Brauer, 1868)			
Igneocnemis haematopus (Selys, 1882)		X	X
Igneocnemis polilloensis Hämäläinen,1991		X	
Prodasineura integra (Selys, 1881)			
Risiocnemis serrata (Hagen, 1863)		X	X
Risiocnemis confusa Hämäläinen, 1991			
Coenagrionidae			
Agriocnemis f. femina (Brauer, 1868)			
Agriocnemis pygmea (Rambur, 1842)			
Argiocnemis rubescens intermedia Selys, 1877			X
Ceriagrion lieftincki Asahina, 1967			X
Ischnura senegalensis (Rambur, 1842)[iii]*	X		X
Pericnemis sp1[iv]			
Pericnemis sp2			
Pericnemis sp3[v]			
Pseudagrion microcephalum (Rambur, 1842)[vi]*	X		X
Pseudagrion p. pilidorsum (Brauer, 1868)		X	X
Pseudagrion r. rubriceps (Selys, 1876)			
Sangabasis carmelae Villanueva & Dow, 2014			
Teinobasis corolla Needham & Gyger, 1939		X	X
Teinobasis filiformis (Brauer, 1868)		X	X
Teinobasis samaritis Ris, 1915			
Teinobasis strigosa Needham & Gyger, 1939			
Teinobasis olivacea Ris, 1915			X
Teinobasis martinschorri Villanueva 2010		X	X
Xiphiagrion cyanomelas Selys, 1876			
Philosinidae			
Rhinagrion philippinum (Selys, 1882)			
Lestidae			
Lestes p. praemorsus (Selys, 1862)			X
Chlorocyphidae			
Cyrano unicolor (Hagen in Selys, 1869)			
Rhinocypha colorata (Hagen in Selys, 1869)		X	X
Rhinocypha turconii Selys, 1891			
Euphaeidae			
Euphaea refulgens Hagen in Selys, 1853			
Calopterygidae			
Neurobasis luzoniensis Selys, 1879			

Pollilo Island	J = Jomalig Island	P2 = Panukulan, northern Polillo Island	P3 = Patnanungan.
Anisoptera			
Gomphidae			
Gomphidia kirschii Selys, 1878			
Heliogomphus bakeri Laidlaw, 1925			
Paragomphus balneorum (Needhan & Gyger, 1937)			
Macromiidae			
Macromia sp.[vii]			
Aeshnidae			
Anax guttatus (Burmeister, 1839)			
Anax parthenope julius Brauer, 1865 (Fig. 26-28)*	X		X
Anax sp.[viii]			
Gynacantha sp.[ix]			
Tetracanthagyna bakeri Campion & Laidlaw, 1928			
Corduliidae			
Hemicordulia sp.[x]			
Heteronaias heterodoxa (Selys, 1878)			
Synthemistidae			
Idionyx salva Needham & Gyger, 1937			
Libellulidae			
Acisoma p. panorpoides Rambur, 1842			
Agrionoptera insignis (Rambur, 1842)			
Brachydiplax c. chalybea Brauer, 1868			
Camacinia gigantea (Brauer, 1867)			
Cratilla lineata assidua Lieftinck, 1953			
Crocothemis s. servilia (Drury, 1770)			
Diplacina holgerhungeri Villanueva, 2012			
Diplacina lisa Needham &Gyger, 1941		X	
Diplacina nana Brauer, 1868			
Diplacodes trivialis (Rambur, 1842)			X
Hydrobasileus croceus (Brauer, 1867)			
Lathrecista asiatica (Fabricius, 1798)	X		X
Macrodiplax cora (Brauer, 1867)[xi]*	X		
Neurothemis r. ramburii (Brauer, 1866)			X
Neurothemis t. terminata Ris, 1911			X
Orthetrum chrysis (Selys, 1891)			
Orthetrum pruinosum clelia (Selys, 1878)			
Orthetrum t. testaceum (Burmeister, 1839)			
Orthetrum s. sabina (Drury, 1770)	X		X
Pantala flavescens (Fabricius, 1798)			X
Potamarcha congener (Rambur, 1842)			
Raphismia bispina (Hagen, 1867)[xii]*	X		X
Rhyothemis phyllis subphyllis Selys, 1882			
Rhyothemis r. regia (Brauer, 1867)			
Rhyothemis resplendens Selys, 1878			
Rhodothemis rufa (Rambur, 1842)			
Tetrathemis irregularis Brauer, 1868			X
Tholymis tillarga (Fabricius, 1798)	X	X	

Annotations to Table 1

i: It is interesting to note the absence of this species on all islands except for Polillo Island, where it was very common and abundant in the municipalities of Polillo and Burdeos. Despite the rain, we had expected to encounter this species at least perching in sites protected from the rain. The *Drepanosticta halterata* - group where this species belongs is in need of review.

ii: A single teneral male of this species was collected.

iii: This is a widely distributed species in the country. It was recorded for the first time in the Polillo island group.

iv: This species same with the succeeding one need further study. It will be dealt with properly in another paper dealing with this species group.

v: Villanueva & Dow (2019) mentioned this species. There is need to collect more material of this species.

vi: This is a widely distributed species in the country. It is recorded for the first time in Polillo island group.

vii: Villanueva (2010b) mentioned this species. However, the material is based on a single female specimen, hence there is need to study and compare it with known species in the country and in Borneo where the genus is abundant.

viii: This species was only sighted during earlier fieldwork in Polillo, Polillo Island, hence no species identification was made. It was most likely that the species was either *Anax parthenope julius* which was recorded in the nearby islands, or *A. panybeus*, a widely distributed species in the country.

ix: Villanueva (2010b) mentioned this species. Presently, the genus is in need of proper revision at least for the oriental members.

x: Villanueva (2010b) mentioned this species and noted the difference in a single collected male from the widespread *H. mindana*.

xi: This is a widely distributed species in the country. It is recorded for the first time in Polillo island group.

xii: This is a widely distributed species in the country. It is recorded for the first time in Polillo island group.

The majority of the species found on the islands of Patnanungan and Jomalig was also found in Polillo. Five more species had been expected to be present in Polillo Island having more suitable habitat for Odonata, but were not found. This is attributed to sampling gaps in many potential areas.

The survey in the northern part of Polillo was the main goal of the study, unfortunately, bad weather prevented extensive fieldwork. The number of 12 species out of nine genera and five families recorded during the survey was very low compared to the 73 documented species on the island.

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