

Philippine Plecopteran with four new records in Compostela Valley Province

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ABSTRACT

The present paper is the updated list of Philippine Plecoptera starting from the 1940's Philippine Zoological Expedition up to the recent discoveries of Sivec and Stark on 2011. A poorly known group, there is scanty literature and several part of the Philippine archipelago is poorly explored. In order to address this information gap particularly in Compostela Valley Province, a provincial survey was conducted from January to November 2012. Opportunistic sampling using hand netting and standard light trapping methods were used to collect species from nine municipalities. There were 181 individuals collected representing two genera and four species comprising about 11.76% of the recorded species to occur in the archipelago. This paper reports the first record of Plecoptera in the province.

Keywords. Compostela Valley, conservation, new record, Plecoptera.

INTRODUCTION

The Philippines is one of the 17 Mega-biodiversity countries in the world with over 52,000 described species of plants and animals. However it is also one of the biodiversity hotspots where species extinction happens at an alarming rate. Reports from the Department of Environment and Natural Resources (DENR) revealed that Philippine forests have been shrinking at an average rate of 2% per annum or a deforestation rate of 550,000 hectares a year equivalent to 63 hectares per hour, one of the highest in the world (Heaney and Regalado, 1998). The top most common causes of this are logging, conversion of the forest into agricultural purposes, and mining (Jumawan et al., 2012).

The first faunistic survey of Plecoptera in the Philippines was conducted by a group of American naturalists and some American soldiers of World War II distained in the Philippines on 1940's. They conducted the first zoological survey, the so-called Philippine Zoological Expedition of 1940s. At least 8-9 species were collected from the different areas of the country mostly from Mindanao (Jewett, 1958). Most of the species collected belongs to genus *Neoperla* and *Phanoperla*, these two genera are considered the most abundant groups in Southeast Asia (Sivec & Stark, 2011).

Recent study conducted by Jumawan et al. (2012) revealed that biodiversity in Compostela Valley are beginning to diminished due to mixture of socio-economic activities like mining, rampant timber harvesting, conversion of the protected areas into agricultural purposes, forest clearing (logging), and increasing solid waste pollution. Although there are still areas with pristine watershed with patches of secondary forests observed. Surprisingly, new fauna species are still discovered in the province (Jumawan, et al, 2012) particularly on areas not yet reached by mining or logging activities.

Adult stoneflies are always found near freshwater (preferably pristine water) as they have aquatic larvae. Since adults are not powerful fliers they have poor dispersal capabilities and rarely move far from the place where they were born. Because of this habit, this group is very prone to extinction especially due to habitat destruction. Furthermore these species are extremely sensitive to water pollution (Sivec & Stark, 2011) requiring clean and well-oxygenated water to survive hence they are excellent water indicators. With fear that these species would be gone to extinction before they are even recorded, a provincial-wide survey conducted. This project funded by the Rufford Small Grant Foundation (RSGF) is the first extensive survey of Plecoptera fauna in Compostela Valley Province.

METHODOLOGY

This study was conducted in the province of Compostela Valley Philippines (Fig. 1). Opportunistic sampling, using hand netting and standard light trapping was conducted on selected fluvial systems of the following municipalities: Montevista (07° 47' 53" N; 125° 54' 183"E), Monkayo (07° 56' 605" N; 125° 58' 881"E), New Bataan, Compostela (07° 41' 021" N; 126° 08' 890"E), and Laak (07° 50' 824" N; 125° 53' 158"E), Maragusan (07° 20' 064" N; 126° 11'

092"E), Mabini (No GPS data), and Nabunturan ($07^{\circ} 36' 880''$ N; $125^{\circ} 57' 329''$ E) between the months of January and November 2012. The municipalities of Pantukan, Maco, and Mawab were not visited due to security reasons. All specimens were preserved using 90% ETOH and identified by the second author.

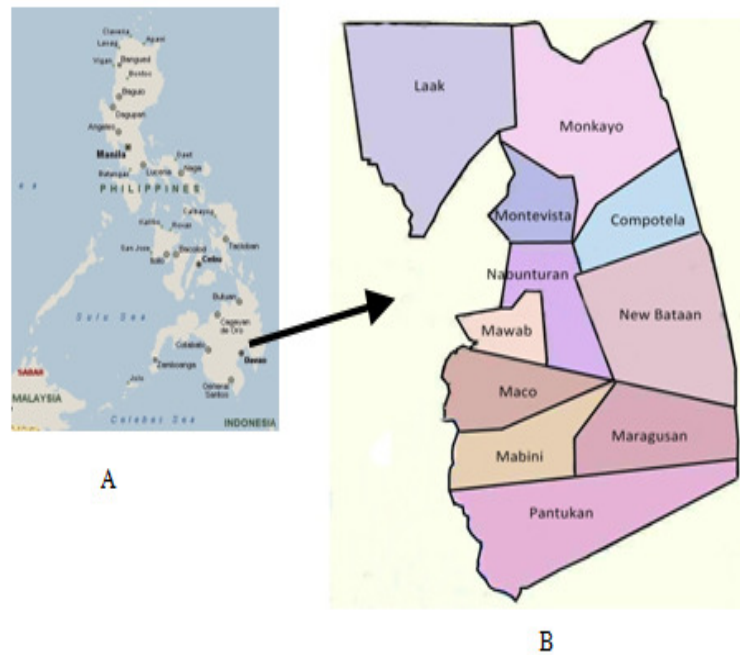


Fig. 1 Map of the Philippines (A); Map of Compostela Valley (B)

RESULTS AND DISCUSSION

Table 1. Plecoptera fauna in the Philippines based on Jewett (1958), Sivec (1984), and Sivec & Stark (2011) records.

| Genera | List of species | Area collected | References |
|-----------------|--|--|-------------------------------|
| <i>Leuctra</i> | 1. <i>Leuctra (Rhopalopsole) malayana</i> Banks 1920 | Mt. Apo, Lake Linau, North Slope, Mindanao | Jewett, S.G. (1958). |
| | 2. <i>Leuctra palawana</i> Jewett, 1958 | Palawan, Mt. Balabag, Mantalingahan Range, Philippines | Jewett, S.G. (1958). |
| <i>Neoperla</i> | 3. <i>Neoperla agusani</i> Sivec 1984 | Los Arcos, Agusan; Surigao | Sivec, I. (1984) |
| | 4. <i>Neoperla agtouganon</i> Sivec & Stark, 2011 | Mt. Agtouganon, Mindanao | Sivec, I. & Stark, B. (2011). |
| | 5. <i>Neoperla andreas</i> Sivec & Stark, 2011 | Salakoy and Estrella Falls, Palawan | Sivec, I. & Stark, B. (2011). |
| | 6. <i>Neoperla apoana</i> Banks, 1937 | Mainit river, Mt. Apo | Jewett, S.G. (1958) |
| | 7. <i>Neoperla atripennis</i> Banks, 1924 | Surigao; Tangcolan, Bukidnon; Balason, Mis.Or; Matibog Creek, Esperanza, Agusan; Mt. Malindang, Mis. Occ; Manucan, Zamboanga del Norte; and Tigbao, Leyte. | Jewett, S.G. (1958) |
| | 8. <i>Neoperla dentata</i> | 4 km N San | Sivec, I. |

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| | Sivec, 1984 | Nicolas, Busuanga Island, Philippine Islands ; Amoyan Creek, Litso, Puerto Princessa Palawan | (1984) |
| | 9. <i>Neoperla flinti</i> Sivec 1984 | Baclayan, Mt. Apo; Galog River, Mt. Apo | Sivec, I. (1984) |
| | 10. <i>Neoperla hermosa</i> Banks, 1924 | Surigao and Davao | Jewett, S.G. (1958) |
| | 11. <i>Neoperla incerta</i> Klapalek | Mindanao | Jewett, S.G. (1958) |
| | 12. <i>Neoperla jewetii</i> Sivec 1984 | Mt Makiling, Los Banos | Sivec, I. (1984) |
| | 13. <i>Neoperla nigra</i> Sivec 1984 | Mt. Isarog, Pili, Camarines Sur | Sivec, I. (1984) |
| | 14. <i>Neoperla nishidai</i> Sivec, 1984 | Km 4 San Nicolas, Busuanga Island, Palawan; | Sivec, I. (1984) |
| | 15. <i>Neoperla obliqua</i> Banks, 1913 | Mt. Makiling; Mt. Apo; Bukidnon prov.,Tangcolan; Surigao; Misamis Or., Minalwang; Misamis Or., Minubanan; Misamis Or., Mt. Empagatao; Esperanza, Agusan; MiisamLs Or., Mt. Balatukan, Gingoog; Mt. Pamalihi, Gingoog, Mis. Or.; Zamboanga del Norte, Gundawan; and | Jewett, S.G. (1958); This study |

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|--|---|--|---------------------------------------|
| | | Milbuk, Zamboanga del Sur; Mt. Candalaga, Maragusan Compostela Valley, Mindanao | |
| | 16. <i>Neoperla oculata</i> Banks, 1924 | Surigao, Migum, Mabini; Ngan, Compostela; Cagan, New Bataan, Compostela Province Mindanao | Jewett, S.G. (1958); This study |
| | 17. <i>Neoperla palawan</i> Sivec & Stark, 2011 | Salakot Falls Palawan | Sivec, I. & Stark, B. (2011). |
| | 18. <i>Neoperla pallescens</i> Banks, 1937 | Kolambugan, Lanao del Norte; Zamboanga del Norte, Manucan; | Jewett, S.G. (1958) |
| | 19. <i>Neoperla pallicornis</i> Banks 1937 | Mt. Makiling, Los Banos; Leyte; Samar; and Mt. Montalban Rizal, Wa-wa Dam | Jewett, S.G. (1958) |
| | 20. <i>Neoperla philippina</i> Sivec 1984 | Busuanga Island, San Nicolas | Sivec, I. (1984) |
| | 21. <i>Neoperla pseudorecta</i> Sivec, 1984 | Camp 7, Cebu; Salakot Falls, Palawan; Mt. Cuernos, Negros; Dumaguete; Mt. Makiling, Los Banos; Km.4 San | Sivec, I. (1984) |

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|-------------------|---|--|---------------------------------------|
| | | Nicolas, Busuanga, Palawan | |
| | 22. <i>Neoperla recta</i> Banks, 1913 | Los Banos, Luzon | Jewett, S.G. (1958) |
| | 23. <i>Neoperla sabang</i> Sivec & Stark, 2011 | Sabang; Salakot Falls; El Nido Stream; San Rafael Batac Village, Ulangan, Palawan | Sivec, I. & Stark, B. (2011). |
| | 24. <i>Neoperla salakot</i> Sivec & Stark, 2011 | Salakot Falls, Palawan | Sivec, I. & Stark, B. (2011). |
| | 25. <i>Neoperla zwicki</i> Sivec 1984 | Bayugan, Esperanza, Agusan; (P)Mt.Balatukan, Mis.Or; (OM)Los Banos; Samar | Sivec, I. (1984) |
| | 26. <i>Neoperla wagneri</i> Sivec 1984 | Alanib, Malaybalay, Bukidnon | Sivec, I. (1984) |
| | 27. <i>Neoperla viscayana</i> Klapalek | Imugin, Northern Viscaya | Sivec, I. (1984) |
| <i>Peltoperla</i> | 28. <i>Peltoperla mindanensis</i> Banks 1924 | Mt. Apo, Sibulan River, Todaya, Mindanao | Jewett, S.G. (1958) |
| | 29. <i>Phanoperla batac</i> Sivec & Stark, 2011 | San Rafael, Batac Village, Ulangan, Palawan | Sivec, I. & Stark, B. (2011). |
| | 30. <i>Phanoperla bakeri</i> Banks, 1924 | Mayaon, Montevista; Baluarte, Laak; Awao, Monkayo, Compostela Valley | Jewett, S.G. (1958); This study |

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|--|---|--|---------------------------------|
| | 31. <i>Phanoperla clarissa</i> Banks, 1913 | Philippines | Jewett, S.G. (1958) |
| | 32. <i>Phanoperla circumspina</i> Sivec & Stark, 2011 | Salakot Falls Road; San Rafael, Ulanguan, Palawan | Sivec, I. & Stark, B. (2011). |
| | 33. <i>Phanoperla flaveola</i> Klapalek 1910 | Cabalinan Creek, Nabunturan; Baluarte, Laak; Awao, Monkayo, Compostela Valley | Jewett, S.G. (1958); This study |
| | 34. <i>Phanoperla magnaspina</i> Sivec & Stark, 2011 | Salakot Falls Road; San Rafael, Ulanguan, Palawan | Sivec, I. & Stark, B. (2011). |

Since the Philippine Zoological Expedition in 1940's only four genera of Plecoptera is recorded in the Philippines: *Leuctra*, *Neoperla*, *Peltoperla*, and *Phanoperla*. Species of *Leuctra* and *Peltoperla* were among the earliest recorded and approximately 75 years no additional records for these genera in the country. *Phanoperla* is the most abundant group with approximately 25 species including two new records in Compostela Valley, *N. oculata* Banks 1924 and *N. obliqua* Banks 1913 followed by *Phanoperla* group with 6 species with two new records from Compostela Valley, *P. flaveola* Klapalek 1910 and *P. Bakeri* Banks 1924. The present list suggest that this group is one of the poorest studied insect group in the Philippines and more collection efforts must be done especially to areas not reached by expeditions to increase this list. According to Sivec Philippine Plecoptera have a very large diversity of species but in extremely low abundance. Hence it is important to continue our collection efforts especially to different micro habitats.

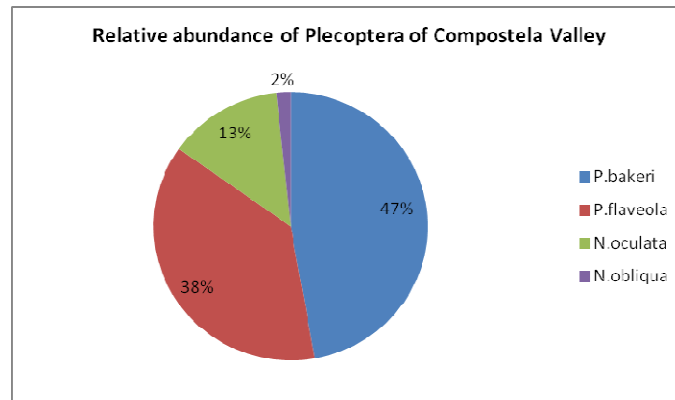


Fig. 2 Abundance of Plecopteran species collected in Compostela Valley

Survey revealed a total of 181 individuals belonging to Genus *Neoperla* and *Phanoperla* were collected from different fluvial systems in Compostela Valley Philippines using hand netting and standard light trapping method. Four species under genera *Neoperla* and *Phanoperla* were identified: *Phanoperla bakeri* Banks 1924 (Fig. 2A), *Phanoperla flaveola* Klapalek 1910 (Fig. 2B), *Neoperla obliqua* Banks, 1913 (Fig. 2C) and *Neoperla oculata* Banks 1924 (Fig. 2D) and are reported here as new record. *P. bakeri* has the most number of individuals with 84 or 48.066% and widely disperse in the province, followed by *P. flaveola* with 67 individuals or 37.017%. Under *Neoperla* group, *N. oculata* have 24 or 13.260% which is mostly found in relatively pristine fluvial system of Mabini, Compostela, Awao, Monkayo, and Baluarte, Laak. With only 3 individuals or 1.657% of population, the least found is *N. obliqua* at Mt. Candalaga, Maragusan. These specimens were rediscovered from the first Philippine Zoological Expedition in 1940 (Jewett, 1958) and represents the first provincial record of Compostela Valley.



Fig. 3 *Phanoperla bakeri* Banks 1924 (A); *Phanoperla flaveola* Klapalek 1910 (B); *Neoperla obliqua* Banks 1913 (C); *Neoperla oculata* Banks 1924 (D).

CONCLUSION AND RECOMMENDATION

The present list suggest that this group is one of the poorest studied insect group in the Philippines. More collection efforts must be done especially to other areas in Mindanao not visited by the expeditions team.

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