

Entomological Research Bulletin

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Volume 28 2012

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Entomological Research Bulletin

곤충연구지 28권 2012



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Aquatic Insect Fauna of Bidoup-Nui Ba National Park in Lam Dong Province, Southern Vietnam

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Abstract

Aquatic insect fauna of Bidoup-Nui Ba National Park in Lam Dong Province, Southern Vietnam, was investigated in February 2006. Aquatic insects were quantitatively collected from 6 stream sites using Surber sampler (50 cm × 50 cm, riffle and pool) as well as qualitatively using hand net. As a result, 153 species belonging to 101 genera, 49 families, and 9 orders were identified: Ephemeroptera 55 species (35.95%), Plecoptera 24 species (15.69%), Trichoptera 23 species (15.03%), Odonata 18 species (11.76%), Coleoptera 15 species (9.8%), Diptera 12 species (7.84%), Hemiptera 4 species (2.61%), Megaloptera 1 species (0.66%), and Lepidoptera 1 species (0.66%). The EPT-group (Ephemeroptera, Plecoptera, and Trichoptera) was predominant in terms of species richness and diversity. This is the first investigation of aquatic insect fauna in Bidoup-Nui Ba National Park in Southern Vietnam.

Key words: aquatic insects, Bidoup-Nui Ba National Park, biodiversity, Southern Vietnam, tropical stream

Introduction

Bidoup-Nui Ba National Park belongs to Lam Dong Province, Southern Vietnam, with the location of N: 12° 00'00"~12° 52'00" and E: 108° 17'00"~108° 42'00" (Fig. 1). It contains high mountain areas including Mt. Lang Bian (2,189 m), Mt. Bidoup (2,278 m), and Mt. Cong Troi (2,272 m) and is called the roof of the Indochinese Peninsula. The climate is tropical with rainy and dry seasons. The yearly average temperature is around 16~18°C with high humidity over 80%. Owing to its geographical location, topography and climate, and protected tropical rain forest, the park possesses a higher degree of biodiversity including many endemic and rare species. Consequently, this area is considered as biological "hot spot" in Vietnam. This is the first comprehensive investigation of aquatic insect fauna in Bidoup-Nui Ba National Park in Southern Vietnam.

Materials and Methods

Field survey was conducted during February 17~19, 2006 at 6 collecting sites from major streams in Bidoup-Nui Ba

National Park as shown in Fig. 1. Aquatic insects were quantitative sampled using a Surber sampler (50 × 50 cm, riffle and pool), and were also qualitatively sampled from diverse habitats using hand nets. Sampled aquatic insects were preserved in plastic vials with 80% ethanol. They were identified to species or higher taxonomic categories based on available references such as Merritt & Cummins (1996) for families and genera, Nguyen (2003) and Nguyen & Bae (2003, 2004a, b) for Ephemeroptera, Cao (2002) and Cao *et al.* (2008) for Plecoptera, and Hoang (2005) and Hoang & Bae (2006) for Trichoptera. Studied materials are housed in the Department of Invertebrate Zoology, Faculty of Biology, Hanoi University of Science in Hanoi and in the Entomological Museum of Korea University in Seoul.

Results and Discussion

The habitats along the streams were dominated by the riparian forest, consisting of a variety of vegetation, including bamboos, palms, herbs, and vines. The bottom of the streams was covered mainly by cobble and boulder-sized stones mixed with various substrates such as pebbles, gravel, sand, leav-

Table 1. Environmental parameters of the study sites

Sites	Altitude (m)	River width (m)	Water width (m)	Depth (cm)		Air temp. (°C)	Water temp. (°C)	pH
				Riffle	Pool			
St.1	1705	25	10	13	36	23	18.2	7.02
St.2	1738	50	35	21	23	23	17.8	7.01
St.3	1639	30	13	28	42	23	19.3	7.00
St.4	1543	20	13	20	24	23	16.9	7.04
St.5	1225	25	5	11	17	22	17.3	7.02
St.6	1119	15	13	14	39	31	19.3	6.99
Mean ±SD	1495±261	28±12	15±10	18±6	30±10	24±3	18±1.0	7±0.02

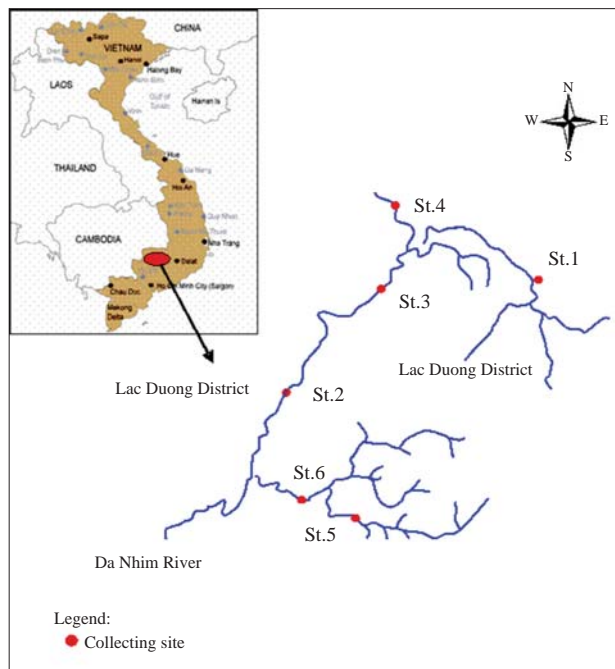


Fig. 1. Study sites in Bidoup-Nui Ba National Park in Lam Dong Province, Southern Vietnam.

es, mosses, and attached algae. The environmental parameters at the sampling sites, such as habitat topology, water width, water temperature, pH, and other conditions showed a gradual change along the sites (Table 1). Typically, the average water temperature was about 18°C, reaching the maximum at Site 3 (19.3°C) and the minimum at Site 6 (16.9°C). The values of pH varied around 7, showing a neutral condition of the stream water.

As a result of the investigation, a total of 153 species of aquatic insects belonging to 101 genera, 49 families, and 9 orders (Fig. 2). The EPT-group predominated the aquatic insect fauna: Ephemeroptera 55 species (35.95%), Plecoptera 24 species (15.69%), and Trichoptera 23 species (15.03%). Other orders showed a lower degree of species diversity including Odonata (18 species, 11.76%), Coleoptera (15 species, 9.8%), Diptera (12 species, 7.84%), Hemiptera (4 species,

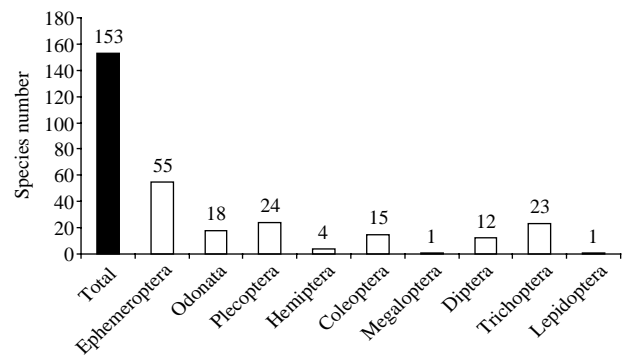


Fig. 2. Species richness of aquatic insects in the study sites.

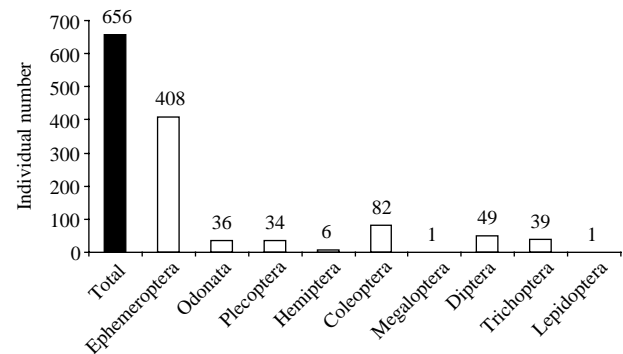


Fig. 3. Individual abundance of aquatic insects in the study sites.

2.61%), Megaloptera (1 species, 0.66%), and Lepidoptera (1 species, 0.66%).

Ephemeroptera

Ephemeroptera showed the highest species richness and individual abundance at all the study sites (Figs. 2, 3). The families Leptophlebiidae and Heptageniidae were relatively more abundant compared to other families due to the 2 dominant species, *Choroterpes trifurcata* (Leptophlebiidae) and *Iron martinus* (Heptageniidae) (Table 2). *Baetis* sp.1 (Baetidae) and *Thalerosphyrus vietnamensis* (Heptageniidae) were

Table 2. First and second dominant species of aquatic insects from the study sites

Sites	1st dominant species	2nd dominant species
St.1	<i>Choroterpes trifurcata</i>	<i>Isca</i> sp.
St.2	<i>Iron martinus</i>	<i>Choroterpes trifurcata</i>
St.3	<i>Iron martinus</i>	<i>Baetis</i> sp.1
St.4	<i>Iron martinus</i>	<i>Choroterpes trifurcata</i>
St.5	<i>Chironomus</i> sp.	<i>Baetis</i> sp.1
St.6	<i>Chironomus</i> sp.	<i>Choroterpes trifurcata</i>

limited only to the lower streams. The genus *Torleya* was rarely found.

Plecoptera

The second predominant order was the Plecoptera with 24 species occurred from the study area. The family Perlidae was abundant throughout the study sites. *Acroneuria* sp. and *Phanoperla* sp. (Perlidae) were found only in riffle habitats.

Trichoptera

Trichoptera was the third predominant order, consisting of 23 species, and showed a wide range of occurrence from various types of habitats. Net-spinning caddisflies such as *Cheumatopsyche*, *Ceratopsyche*, and *Hydropsyche* were abundant in the riffle habitats.

Diptera

Diptera occurred in all available habitats, and the lower stream reaches and pools were probably more favorable for them. The families Tipulidae and Athericidae were particularly abundant.

Coleoptera

Fifteen species from the larvae and adults were identified in this order. *Stenocolus* sp. (Ptilodactylidae) and *Ordobrevia* sp. (Elmidae) occurred only in the riffles, while Psephenidae was found in both riffles and pools. The larvae of Dytiscidae and Gyrinidae were rarely found.

Odonata

Eighteen species of Odonata were identified in this study. The species richness and abundance of Odonata were relatively low in most study sites except for the family Gomphidae. *Anisopleura* sp. (Euphaeidae) and *Stylogomphus* sp. (Gomphidae) were found only in the riffles.

Hemiptera

Only 4 species belonging 4 families were found in this study. *Microvelia* sp. (Veliidae) occurred only in pools, while *Rhyacobates* sp. (Gerridae) occurred only in riffles. *Trepotomas*

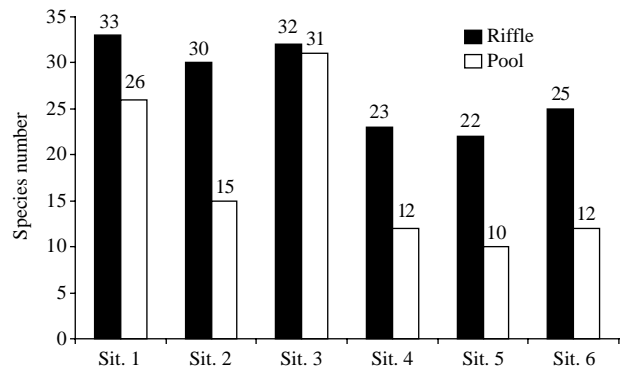


Fig. 4. Species richness of aquatic insects between riffle and pool habitats.

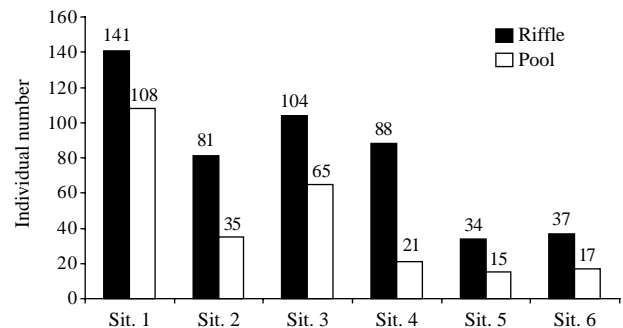


Fig. 5. Individual abundance of aquatic insects between riffle and pool habitats.

sp. (Helotrephidae) was rare.

Megaloptera

One species, *Neochanliodes* sp. (Corydalidae), commonly occurred in the riffles of the study sites.

Lepidoptera

The larvae of *Elophila* sp. (Pyralidae) rarely occurred from the study area.

Based on the quantitative analysis, 3 major orders, Ephemeroptera, Coleoptera, and Diptera, represented 81.2% of the total individual abundance, whereas other orders were relatively less abundant (Fig. 3). The result also showed that Ephemeroptera (62.2%) was the most abundant order represented by the 2 dominant species *Iron martinus* and *Choroterpes trifurcata*. Chironomids (Diptera) also predominated at the lower reaches of the study streams (Site 5 and Site 6).

Dominance indices (DI), richness indices (RI), and diversity indices (H') are shown in Table 3. The average values of DI, RI, and H' are 0.26, 8.16, and 2.56, respectively, with the highest values at the Site 3. In general riffle habitats con-

Table 3. Dominance indices (DI), richness indices (RI), and diversity indices (H') from the study sites

Sites	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Average
Altitude (m)	1705	1738	1639	1543	1225	1119	1495±261
DI	0.27	0.26	0.36	0.26	0.14	0.24	0.26±0.07
RI	8.26	7.94	8.93	8.92	6.36	8.54	8.16±0.96
H'	2.74	2.67	3.12	2.13	2.58	2.63	2.56±0.32

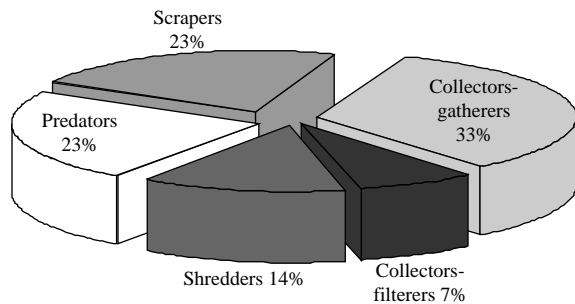


Fig. 6. Functional feeding groups of aquatic insects in the study sites.

tain a larger species richness, whereas pool habitats a larger individual abundance (Figs. 4, 5). Collector-gatherers (33%) represented the largest portion of functional feeding groups followed by predators (23%), scrapers (23%), shredders (14%), and collectors-filterers (7%) (Fig. 6).

Acknowledgements

This work was supported by the research project from “National Foundation for Science and Technology Development (NAFOSTED-106.15.149.09)” and “The Conservation of Biodiversity and Habitat of World Biomes”.

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Appendix 1. Aquatic insect taxa in Bidoup-Nui Ba National Park in Lam Dong Province, Southern Vietnam, in February 2006

Order Ephemeroptera

- Family Leptophlebiidae
 1. *Choroterpes proba*
 2. *Choroterpes trifurcata*
 3. *Choroterpides major*
 4. *Habrophlebiodes prominens*
 5. *Isca fascia*
 6. *Isca janiceae*
 7. *Isca* sp.
 Family Ephemeridae
 8. *Ephemera serica*
 9. *Ephemera* sp.1
 Family Ephemerellidae
 10. *Cincticostella gosei*
 11. *Cincticostella insolta*
 12. *Cincticostella* sp.1
 13. *Cincticostella* sp.2
 14. *Drunella perculta*
 15. *Epharacella commodema*
 16. *Epharacella longicaudata*
 17. *Serratella albostrata*
 18. *Serratella* sp.
 19. *Torleya arenosa*
 20. *Torleya* sp.1
 21. *Torleya* sp.2
 Family Teloganodidae
 22. *Teloganodes tristis*
 Family Caenidae
 23. *Caenis* sp.1
 24. *Caenoculis* sp.
 Family Heptageniidae
 25. *Afronurus mnong*
 26. *Afronurus philippinensis*
 27. *Afronurus* sp.1
 28. *Asionurus primus*
 29. *Compsoeuria thienenmanni*
 30. *Ecdyonurus cervina*
 31. *Ecdyonurus landai*
 32. *Epeorus aculatus*
 33. *Epeorus bifurcatus*
 34. *Epeorus carinatus*
 35. *Epeorus hieroglyphicus*
 36. *Epeorus tiberius*
 37. *Iron longitibus*
 38. *Iron martinus*
 39. *Paegniodes* sp.
 40. *Rhithrogena parva*
 41. *Rhithrogeniella tonkinensis*
 42. *Thalerosphyrus vietnamensis*
 43. *Trichogenia maxillaris*
 Family Baetidae
 44. *Acentrella* sp.
 45. *Baetiella* sp.1
 46. *Baetis* sp.1
 47. *Baetis* sp.2
 48. *Baetis* sp.3
 49. *Centroptella* sp.1
 50. *Labiobaetis* sp.1
 51. *Labiobaetis* sp.2
 52. *Nigrobaetis* sp.1
 53. *Nigrobaetis* sp.2
 54. *Platyaetis bishopi*

55. *Platyaetis edmundsi*

Order Odonata

- Zygoptera**
 Family Chlorolestidae
 56. *Sinolestes* sp.1
 Family Calopterygidae
 57. *Mnais* sp.1
 Family Chlorocyphidae
 58. *Rhinocypha* sp.
 Family Euphaeidae
 59. *Anisopleura* sp.
 60. *Bayadera* sp.1
 61. *Bayadera* sp.2
 62. *Bayadera* sp.3
Anisoptera
 Family Aeshnidae
 63. *Boyeria* sp.1
 64. *Planaeschna* sp.1
 Family Cordulegastridae
 65. *Anotogaster* sp.1
 66. *Cordulegaster* sp.1
 Family Gomphidae
 67. *Lamelligomphus* sp.1
 68. *Lamelligomphus* sp.2
 69. *Lamelligomphus* sp.3
 70. *Melligomphus* sp.
 71. *Stylogomphus* sp.1
 Family Amphipterygidae
 72. *Philoganga* sp.1
 Family Macromiidae
 73. *Macromia* sp.1

Order Plecoptera

- Family Nemouridae
 74. *Amphinemoura* sp.1
 75. *Amphinemoura* sp.2
 76. *Nemoura* sp.
 77. *Protonemura* sp.
 78. *Sphaeronemura* sp.
 Family Leuctridae
 79. *Paraleuctra* sp.
 80. *Perlomyia* sp.
 81. *Rhopalopsola subnigra*
 Family Peltoperlidae
 82. *Cryptoperla bisaeta*
 83. *Cryptoperla meo*
 84. *Cryptoperla* sp.1
 Family Perlidae
 85. *Acroneuria* sp.
 86. *Etrocorema nigrogeniculatum*
 87. *Etrocorema* sp.1
 88. *Kamimura* sp.
 89. *Kiotina* sp.
 90. *Neoperla lushana*
 91. *Phanoperla* sp.1
 92. *Phanoperla* sp.2
 93. *Tetropina* sp.
 94. *Togoperla noncoloris*
 95. *Togoperla* sp.1
 96. *Togoperla* sp.2
 97. *Togoperla* sp.3

Order Hemiptera

- Family Gerridae

98. *Rhyacobates* sp.1
 Family Helotrepidae
 99. *Trephotomas* sp.1
 Family Notonectidae
 100. *Anisops* sp.1
 Family Veliidae
 101. *Microvelia* sp.1
Order Coleoptera
 Family Gyrinidae
 102. *Gyrinus* sp.1
 103. *Orectochilus* sp.1
 Family Dytiscidae
 104. *Hyphydrus* sp.1
 105. *Copelatus* sp.
 Family Hydrophilidae
 106. *Berosus* sp.
 Family Ptilodactylidae
 107. *Stenocolus* sp.1
 108. *Stenocolus* sp.2
 Family Psephenidae
 109. *Mataeopsephus* sp.1
 110. *Mataeopsephus* sp.2
 111. *Eubrianax* sp.1
 112. *Eubrianax* sp.2
 Family Chrysomelidae
 113. *Prodonacia* sp.1
 114. *Prodonacia* sp.2
 Family Elmidae
 115. *Ordobrevia* sp.
 Family Scirtidae
 116. *Cyphon* sp.
Order Megaloptera
 Family Corydalidae
 117. *Neochanilodes* sp.
Order Diptera
 Family Tipulidae
 118. *Hexatoma* sp.
 119. *Pedicia* sp.1
 120. *Pedicia* sp.2
 121. *Tipula* sp.1
 122. *Tipula* sp.2
 123. *Tipula* sp.3
 Family Ephydriidae
 124. *Ephydra* sp.1
 Family Athericidae
 125. *Atherix* sp.1
 126. *Atrichops* sp.
 Family Chironominae
 127. *Chironomus* sp.1
 128. *Chironomus* sp.2
 Family Ceratopogonidae
 129. *Bezzia* sp.
Order Trichoptera
 Family Hydropsychidae
 130. *Arctopsyche* sp.1
 131. *Arctopsyche* sp.2
 132. *Ceratopsyche* sp.1
 133. *Ceratopsyche* sp.2
 134. *Diplectrona* sp.1
 135. *Hydropsyche* sp.1
 136. *Hydropsyche* sp.2
 137. *Macrosternum* sp.1

Appendix 1. Continued

138. <i>Potamyia</i> sp.1	Family Phryganeidae	149. <i>Leptocerus</i> sp.
139. <i>Stenopsyche</i> sp.1	144. <i>Ptilostomis</i> sp.1	Family Lepidopstomatidae
Family Rhyacophilidae	145. <i>Ptilostomis</i> sp.2	150. <i>Lepidopstoma</i> sp.
140. <i>Rhyacophila</i> sp.1	Family Stenopsychidae	Family Calamoceratidae
141. <i>Rhyacophila</i> sp.2	146. <i>Stenopchus</i> sp.	151. <i>Anisocentropus</i> sp.1
Family Limnephilidae	147. <i>Stenopsyche</i> sp.	152. <i>Anisocentropus</i> sp.2
142. <i>Pseudostenophylax</i> sp.1	Family Hydroptilidae	Order Lepidoptera
Family Dipseudopsidae	148. <i>Ugandatrichia</i> sp.1	Family Pyralidae
143. <i>Pseudoneureclipsis</i> sp.1	Family Leptoceridae	153. <i>Elophila</i> sp.
