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

Van Vinh Nguyen1, Quang Huy Nguyen1, Thi Minh Hue Nguyen1, Sang Woo Jung2, Jeong Mi Hwang3 and Yeon Jae Bae2

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2Division of Life Science, College of Life Sciences and Biotechnology, Korea University, Seoul, Korea
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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 quantitatively 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 & 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-
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, 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 martins* (Heptageniidae) (Table 2). *Baetis* sp.1 (Baetidae) and *Thalerosphyrus vietnamensis* (Heptageniidae) were

### Table 1. Environmental parameters of the study sites

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

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

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

Fig. 3. Individual abundance of aquatic insects in the study sites.
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 *Ordo brevia* 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. *Trephotomus* sp. (Helotrepidae) 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 2. First and second dominant species of aquatic insects from the study sites

<table>
<thead>
<tr>
<th>Sites</th>
<th>1st dominant species</th>
<th>2nd dominant species</th>
</tr>
</thead>
<tbody>
<tr>
<td>St.1</td>
<td><em>Choroterpes trifurcata</em></td>
<td><em>Isca</em> sp.</td>
</tr>
<tr>
<td>St.2</td>
<td><em>Iron martinus</em></td>
<td><em>Choroterpes trifurcata</em></td>
</tr>
<tr>
<td>St.3</td>
<td><em>Iron martinus</em></td>
<td><em>Baetis</em> sp.1</td>
</tr>
<tr>
<td>St.4</td>
<td><em>Iron martinus</em></td>
<td><em>Choroterpes trifurcata</em></td>
</tr>
<tr>
<td>St.5</td>
<td><em>Chironomus</em> sp.</td>
<td><em>Baetis</em> sp.1</td>
</tr>
<tr>
<td>St.6</td>
<td><em>Chironomus</em> sp.</td>
<td><em>Choroterpes trifurcata</em></td>
</tr>
</tbody>
</table>
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-filters (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”.

References


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. Choroterespes proba
2. Choroterespes trilobata
3. Choroterespes major
4. Haplophlebiodes prominens
5. Isca fascia
6. Isca janicicae
7. Isca sp.

Family Ephemeridae
8. Ephemerera sarica
9. Ephemerera sp.1
10. Cincticostella gosai
11. Cincticostella insolta
12. Cincticostella sp.1
13. Cincticostella sp.2
14. Drunella perculta
15. Epharacella commoda
16. Epharacella longicaudata
17. Serratella albostrata
18. Serratella sp.
19. Tonleya arenosa
20. Tonleya sp.1
21. Tonleya sp.2

Family Teloganodidae
22. Teloganodes tristis

Family Caenidae
23. Caenis sp.1
24. Caenis sp.2

Family Heptageniidae
25. Afronurus mnicong
26. Afronurus philippinensis
27. Afronurus sp.1
28. Asionurus primus
29. Compsonuria thienermanni
30. Ecdyonurus cervina
31. Ecdyonurus lanca
32. Epeorus aculatus
33. Epeorus bifurcatus
34. Epeorus carinatus
35. Epeorus hieroglyphicus
36. Epeorus tibialis
37. Iron longtibus
38. Iron martius
39. Paegniodes sp.
40. Rhithrogenia parva
41. Rhithrogenia tonkinensis
42. Thalaspereus vietnamensis
43. Trichogenia maximaris

Family Baetidae
44. Acentrella sp.
45. Baetella sp.1
46. Baetis sp.1
47. Baetis sp.2
48. Baetis sp.3
49. Centroprella sp.1
50. Labiobaetis sp.1
51. Labiobaetis sp.2
52. Nigrobaetis sp.1
53. Nigrobaetis sp.2
54. Platthybaetis bishopi
55. Platthybaetis edmundsi

Order Odonata
Family Zygoptera
56. Sineolestes sp.1
57. Mnais sp.1
58. Pholoceryxidae
59. Anisopleura sp.
60. Bayadera sp.1
61. Bayadera sp.2
62. Bayadera sp.3

Family Anisoptera
63. Boyeria sp.1
64. Planeschna sp.1
65. Anotogaster sp.1
66. Cordulegaster sp.1
67. Lamelligomphus sp.1
68. Lamelligomphus sp.2
69. Lamelligomphus sp.3
70. Melloleucon sp.
71. Stylomopogon sp.1

Family Amphiptygidae
72. Philoganga sp.1
73. Macromia sp.1

Order Plecoptera
Family Nemouridae
74. Amphinemoura sp.1
75. Amphinemoura sp.2
76. Nemoura sp.
77. Protonemura sp.
78. Sphaeroneum sp.

Family Leuctridae
79. Paraleucra sp.
80. Perkonyia sp.1
81. Rhyhopsole subnigra

Family Perlidae
82. Cryptoperla bisaeata
83. Cryptoperla meo
84. Cryptoperla sp.1

Family Perlidae
85. Acroneuria sp.
86. Eutorcorema nigrigenculatum
87. Eutorcorema sp.1
88. Kamimura sp.
89. Kiotina sp.
90. Neoperla lishana
91. Phanoerla sp.1
92. Phanoerla sp.2
93. Tetrophina sp.1
94. Togoperla noncoloris
95. Togoperla sp.1
96. Togoperla sp.2
97. Togoperla sp.3

Order Hemiptera
Family Gerridae
98. Rhyacobates sp.1

Family Hemiptera
99. Trephomorpha sp.1
100. Anisops sp.1
101. Microvelia sp.1

Order Coleoptera
Family Gropyriidae
102. Gropyris sp.1
103. Orectochilus sp.1

Family Hydrophilidae
104. Hydrophilus sp.1
105. Copelatus sp.

Family Hydrophilidae
106. Berosus sp.
107. Stenocoris sp.1
108. Stenocoris sp.2

Family Psephenidae
109. Mataeopes pl.1
110. Mataeopes sp.2

Family Hydropsychidae
111. Eubrianax sp.1
112. Eubrianax sp.2

Family Eleochroidae
113. Prodonacia sp.1
114. Prodonacia sp.2

Family Eleochroidae
115. Orchoebria sp.

Family Scirtidae
116. Cyphon sp.

Order Megaloptera
Family Corydalidae
117. Neochanodes 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 Eryphonidae
124. Ephydra sp.1

Family Athericidae
125. Atherix sp.1
126. Atrichops sp.

Family Chironomidae
127. Chironomus sp.1
128. Chironomus sp.2

Family Ceratopogonidae
129. Bazia 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. Macrostromum sp.1
**Appendix 1. Continued**

<table>
<thead>
<tr>
<th>Number</th>
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<th>Family</th>
<th>Number</th>
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<td><em>Pseudoneureclipsis</em> sp.1</td>
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<td><em>Ugandatrichia</em> sp.1</td>
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