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Fauna of Spilomelinae from Wuzhi Mountain Nature Reserve, Hainan Island, China (Lepidoptera: Pyraloidea, Crambidae)

X.-L. Wei, J.-P. Wan & X.-C. Du

Abstract

Fauna of Spilomelinae from Wuzhi Mountain was analysed. There are 95 species in 54 genera of Spilomelinae from this area. One species is newly recorded from China, three genera and thirteen species are recorded from Hainan Island for the first time. Fifty-four genera show 16 distributional patterns and ninety-five species show 14 distributional patterns in this Zoogeographical region of the world. One genus and seventeen species are endemic to the Oriental region. The indicates that Spilomelinae from this area are closely related to the Palaearctic region and next to the Australian and Afrotropical regions; specimens from the Oriental region constitute the majority and most genera and species show cross-region distribution.
KEY WORDS: Lepidoptera, Spilomelinae, fauna, Wuzhi Mountain Nature Reserve, Hainan Island, China.

Fauna de Spilomelinae de la Reserva Natural de la Montaña Wuzhi, Isla de Hainan, China (Lepidoptera: Pyraloidea, Crambidae)

Resumen

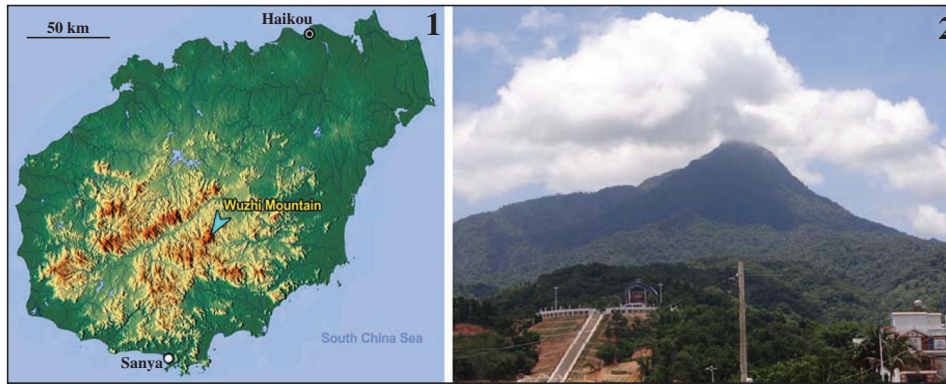
Fue analizada la fauna de Spilomelinae de la Montaña de Wuzhi. De esta área se encontraron 95 especies en 54 géneros de Spilomelinae. Una especie es un nuevo registro para China, tres géneros y trece especies son primeros registros para la isla de Hainan. Cincuenta y cuatro géneros muestran muestra 16 patrones de distribución y noventa y cinco especies muestra 14 patrones de distribución en las regiones zoogeográficas del mundo. Un género y diecisiete especies son endémicas de la región Oriental. Ello indica que los Spilomelinae de esta área, están próximos a los de la región Palaeártica y luego a los de las regiones Australiana y Afrotropical; los componentes de la región Oriental constituyen la mayoría de ellos y la mayoría de los géneros y especies tienen una distribución cruzada entre regiones.
PALABRAS CLAVE: Lepidoptera, Spilomelinae, fauna, Reserva Natural Montaña Wuzhi, isla de Hainan, China.

Introduction

Spilomelinae is subordinate to Crambidae (Lepidoptera: Pyraloidea). It comprises about 3780 described species in 262 genera in the world and 471 species in 111 genera are distributed in China (SOLIS & MAES, 2002; DU, 2008; DU & LI, 2008a; DU & LI, 2008b; DU & LI, 2008c; DU & LI, 2011; DU & LI, 2014; XU & DU, 2016; ZHANG & LI, 2016). Many species of this subfamily are important economical pests, larvae of them can cause major damage to agriculture and forestry (WANG, 1980).

Wuzhi Mountain National Nature Reserve is located in central Hainan Island (109º 39' 30"-109º 47' 50"E, 18º 49' 20"-18º 58' 54"N) and in the Oriental region within the Zoogeographical region of the world (ZHANG, 1999). It is the largest nature reserve and is one of the largest pristine tropical

forest areas in Hainan Island. Its altitude reaches 1867 m, the highest mountain of Hainan Island. Only some sporadic literatures are related to the fauna of insects from Wuzhi Mountain (FU, 2000; HOU & CHEN, 2011; SONG & HUANG, 2002). There is no report about the fauna of Spilomelinae from this area so far. The aim of this study is to find out species diversity and the fauna of Spilomelinae from Wuzhi Mountain.



Figures 1-2.– 1. The location of the Wuzhi Mountain Nature Reserve, Hainan Island, China (the map available from https://maps-for-free.com/). **2.** The highest peak of Wuzhi Mountain (photo by Jian-Yue Qiu).

Materials and Methods

Specimens were collected using high-pressure mercury lamps and were deposited in the College of Plant Protection, Southwest University, Chongqing, China and in the College of Life Sciences, Nankai University, Tianjin, China. The authors consider that there are six zoogeographical regions in the world, comprising the Oriental, Palearctic, Afrotropical, Australian, Nearctic and Neotropical regions. China extends across the Oriental and the Palearctic regions (ZHANG, 1996).

Results and Analysis

Species diversity of Spilomelinae from Wuzhi Mountain

Ninety-five species in 54 genera of Spilomelinae from Wuzhi Mountain were identified. *Rehimena cissophora* (Tumer, 1908) is newly recorded from China. *Bradina nigripunctalis* South, 1901, *Palpita curvispina* Zhang & Li, 2005 and *Palpita hypohomalia* Inoue, 1996 are endemic to China. *Nomophila* Hübner, 1825, *Notesia* Yamanaka, 1992 and *Poliobotys* Shaffer & Munroe, 2007 are newly recorded from Hainan Island. Thirteen species are recorded from Hainan Island for the first time. Based on specimen collection and investigation in the field, *Agrioglypta itysalis* (Walker, 1859), *Bradina diagonalis* (Guenée, 1854), *Lamprosema commixta* (Butler, 1879), *Palpita hypohomalia* Inoue, 1996 and *Parotis marginata* (Snellen, 1895) are dominant species in the population and distribution in Wuzhi Mountain. The statistics show that species diversity of Spilomelinae is abundant in this area (Table 1).

Table 1.– Species, genera and their distribution of Spilomelinae from Wuzhi Mountain in different Zoogeographical regions of the world.

Genera and Species	Oriental	Palearctic	Afrotropical	Australian	Nearctic	Neotropical
Agathodes Guenée, 1854	+	+	+	+	+	+
A. ostentalis (Geyer, 1837)	v	v		v		
Agrioglypta Meyrick, 1932	+	+	+	+		
A. eurytasalis (Walker, 1859)	v	v		v		
A. itysalis (Walker, 1859)	v	v		v		
A. zelimalis (Walker, 1859)	v					
Agrotera Schrank, 1802	+	+	+	+	+	
A. ornata Wileman & South, 1917	v					
Archernis Meyrick, 1886	+		+	+		
A. capitalis (Fabricius, 1794)	v					
Ategumia Amsel, 1956	+	+	+	+	+	+
A. adipalis (Lederer, 1863) ●	v	v				
Bocchoris Moore, 1885	+	+	+	+	+	+
B. inspersalis (Zeller, 1852)	v	v	v			
B. telphusalis (Walker, 1859)	v	v				
Botyodes Guenée, 1854	+	+	+	+		
B. principalis Leech, 1889	v	v				
Bradina Lederer, 1863	+	+	+	+		+
B. diagonalis (Guenée, 1854)	v	v				v
B. geminalis Caradja, 1927	v	v				
B. nigripunctalis South, 1901 ▲	v					
Camptomastix Warren, 1892	+	+		+		+
C. hisbonalis (Walker, 1859)	v	v		v		
Ceratarcha Swinhoe, 1894	+	+				
C. umbrosa Swinhoe, 1894	v	v				
Cirrhochrista Lederer, 1863	+	+		+		
C. brizoalis (Walker, 1859)	v	v		v		
C. kosemponialis Strand, 1859	v	v				
Cnaphalocrocis Lederer, 1863	+	+	+	+		
C. medinalis (Guenée,1854)	v	v	v	v		
Conogethes Meyrick, 1884	+	+		+		
C. punctiferalis (Guenée, 1854)	v	v		v		
Diaphania Hübner, 1818	+	+	+	+		
D. indica (Saunders, 1851)	v	v	v	v		
D. laticostalis (Guenée, 1854)	v					
Diasemia Hübner, 1825	+	+	+	+	+	+
D. accalis (Walker, 1859) ●	v	v		v		
D. reticularis (Linnaeus, 1761)	v	v				
Diplopseustis Meyrick, 1884	+	+		+		
D. perieresalis (Walker, 1859)	v	v		v		
Eurrhyparodes Snellen, 1880	+	+	+	+		+
E. bracteolalis (Zeller,1852)	v	v		v		
Filodes Guenée, 1854	+		+	+		
F. fulvidorsalis (Geyer, 1832)	v			v		
Glauconoe Warren, 1892	+					
G. deductalis (Walker, 1859)	v					
Glyphodes Guenée, 1854	+	+	+	+	+	+
G. actorionalis Walker, 1859	v	v	v	v		
G. bicolor (Swainson, 1821)	v		v	v		
G. bivitralis Guenée, 1854	v			v	v	
G. caesalis Walker, 1859	v					

G. canthusalis Walker, 1859	v	v		v		
G. crithealis (Walker, 1859)	v	v				
G. duplicalis Inoue, Munroe & Mutuura, 1981 ●	v	v				
G. onychinalis (Guenée, 1854)	v	v	v	v		
G. stolalis Guenée, 1854	v		v	v		
Goniorhynchus Hampson, 1896	+	+			+	+
G. butyrosa (Butler,1879)	v	v				
Haritalodes Warren, 1890	+	+	+	+	+	+
H. derogata (Fabricius, 1775)	v	v	v	v	v	v
Herpetogramma Lederer, 1863	+	+	+	+		
H. luctuosalis (Guenée, 1854)	v	v	v			
H. ochrimaculalis (South, 1901) ●	v	v				
Heterocnephes Lederer, 1863	+	+				
H. lymphatalis (Swinhoe, 1889)	v	v				
Hydriris Meyrick, 1885	+	+	+	+	+	+
H. ornatalis (Duponchel, 1832)	v	v	v	v	v	
Hymenia Hübner, 1825	+	+	+	+	+	+
H. perspectalis (Hübner, 1796)	v	v	v	v	v	v
Ischnurges Lederer, 1863	+		+	+		+
I. gratiosalis (Walker, 1859)	v					
Lamprosema Hübner, 1823	+	+	+	+	+	+
L. commixta (Butler, 1879)	v	v				
Leucinodes Guenée, 1854	+		+			+
L. apicalis Hampson, 1896	v					
Marasmia Lederer, 1863	+	+	+	+	+	+
M. poeyalis (Boisduval, 1833)	v		v	v		
Maruca Walker, 1859	+	+	+	+		+
M. vitrata (Fabricius, 1787)	v	v	v	v		
Mecyna Doubleday, 1849	+	+	+	+	+	+
M. dissipatalis (Lederer, 1863)	v	v				
M. quinquigera (Moore, 1888)	v	v				
Metoeca Warren, 1896	+	+	+	+	+	+
M. foedalis (Guenée, 1854)	v	v	v	v	v	
Neoanalthes Yamanaka & Kirpichnikova, 1993	+	+				
N. contortalis (Hampson, 1900)	v	v				
Nomophila Hübner, 1825 ♦	+	+	+	+	+	+
N. noctuella (Denis & Schiffermüller, 1775) ●	v	v			v	v
Nosophora Lederer, 1863	+	+		+		
N. albiguttalis Swinhoe, 1890 ●	v					
N. insignis (Butler, 1881)	v	v				
N. ningpoalis (Leech, 1889) ●	v					
N. semitritalis (Lederer, 1863)	v	v				
Notarcha Meyrick, 1884	+	+	+	+	+	+
N. quaternalis (Zeller, 1852)	v	v	v	v	v	v
Notesia Yamanaka, 1992 ♦	+	+		+		
N. tranquillalis (Lederer, 1863) ●	v	v		v		
Omiodes Guenée, 1854	+	+	+			+
O. tristrialis (Bremer, 1864)	v	v				
Omphisa Moore, 1886	+		+	+	+	+
O. anastomosalis (Guenée, 1854)	v		v	v	v	v
Palpita Hübner, 1808	+	+	+	+	+	+
P. curvispina Zhang & Li, 2005 ▲●	v	v				

P. hypohomalia Inoue, 1996 ▲	v	v				
P. nigropunctalis (Bremer, 1864)	v	v				
P. sejunctalis Inoue, 1997	v					
Parotis Hübner, 1831	+	+		+		
P. angustalis (Snellen, 1895)	v	v				
P. marginata (Hampson, 1893)	v					
P. nilgirica (Hampson, 1896) ●	v	v				
Patania Moore, 1888	+	+	+	+		+
P. chlorophanta (Butler, 1878)	v	v				
P. concatenalis (Walker, 1866)	v					
P. iopasalis (Walker, 1859)	v	v				
P. obfuscalis (Yamanaka, 1998)	v	v				
P. orissusalis (Walker, 1866)	v	v				
P. ruralis (Scopoli, 1763)	v	v				
P. scinisalis (Walker, 1859)	v	v				
P. sellalis (Guenée, 1854)	v	v				
Poliobotys Shaffer & Munroe, 2007 ♦	+			+		
P. ablactalis (Walker, 1859) ●	v			v		
Polygrammodes Guenée, 1854	+	+	+	+	+	+
P. sabelialis (Guenée, 1854)	v	v	v			
P. thoosalis (Walker, 1859)	v	v	v			
Polythlipta Lederer, 1863	+	+	+	+		
P. divaricata Moore, [1886]	v					
Prophantis Warren, 1896	+	+	+	+		
P. adusta Inoue, 1986	v	v		v		
P. octoguttalis (Felder, Felder & Rogenhofer, 1875)	v	v	v	v		
Pycnarmon Lederer, 1863	+	+	+	+		+
P. cribrata (Fabricius, 1794)	v	v	v			
P. marginalis (Snellen, 1890)	v		v			
P. radiata (Warren, 1896) ●	v	v				
Pygospila Guenée, 1854	+	+				+
P. tyres (Cramer, 1780)	v	v	v	v		
Rehimena Walker, 1866	+	+		+		
R. cissophora (Turner, 1908) ■●	v			v		
R. surusalis (Walker, 1859)	v	v				
Spoladea Guenée, 1854	+	+	+	+	+	+
S. recurvalis (Fabricius, 1775)	v	v	v	v	v	v
Stenia Guenée, 1845	+	+	+	+	+	+
S. charonialis (Walker, 1859)	v	v				
Syllepte Hübner, 1823	+	+	+	+	+	+
S. chalybifascia Hampson, 1896	v					
S. taiwanalis Shibuya, 1928	v	v				
S. tibialis (Moore, 1888)	v					
Syngamia Guenée, 1854	+	+	+	+	+	+
S. falsidicalis (Walker, 1859)	v	v				
S. floridalis (Zeller, 1852)	v	v	v			
Total genera	54	47	39	46	23	32
The proportion (%)	100	87.04	72.22	85.19	42.59	59.26
Total species	95	69	24	33	9	7
The proportion (%)	100.00	72.63	25.26	34.74	9.47	7.37
Genera and Species	**Oriental**	**Palearctic**	**Afrotropical**	**Australian**	**Nearctic**	**Neotropical**

Marks note: ▲: endemic species to China; ■: new record species for China; ♦: new record genus for Hainan Island; ●: new record species for Hainan Island.

THE DISTRIBUTION OF GENERA OF SPILOMELINAE FROM WUZHI MOUNTAIN IN ZOOGEOGRAPHICAL REGIONS OF THE WORLD

According to table 1 and table 2, some data of 95 species in 54 genera from Wuzhi Mountain can be summarized. Forty-seven genera, 87.04% of the fauna, are distributed in the Palearctic region; forty-six genera, 85.19%, in the Australian region; thirty-nine genera, 72.22%, in the Afrotropical region; thirty-two genera, 59.26%, in the Neotropical region and twenty-three genera, 42.59%, in the Nearctic region. Fifty-four genera of Spilomelinae from Wuzhi Mountain produce of 16 distributional patterns. Only one genus, *Glauconoe* Warren, 1892, is endemic to the Oriental region. Twenty genera distributed worldwide account for 37.04% of the total, the highest proportion of the fauna. Seven genera, 12.97% of the fauna, are distributed in Oriental, Palearctic and Australian region and the same data in the Oriental, Palearctic, Afrotropical and Australian regions; five genera, 9.26%, in Oriental, Palearctic, Afrotropical, Australian and Neotropical region; three genera, 5.56%, in the Oriental and Palearctic regions. The remaining eleven genera represent another ten distributional patterns respectively. In summary, most genera from Wuzhi Mountain, 98.15% of the fauna, show cross-region distribution, with those belonging to the Oriental region constituting the majority of Spilomelinae from this area, also closely related to the Palearctic and Australian regions, then less so to the Afrotropical and Neotropical regions, and least of all to the Nearctic region respectively.

Table 2.– Distributional patterns of genera of Spilomelinae from Wuzhi Mountain in Zoogeographical regions of the world.

Distribution	**Genera**	**The proportion**
Oriental	1	1.85
Oriental-Palearctic	3	5.56
Oriental-Australian	1	1.85
Oriental-Palearctic-Australian	7	12.97
Oriental-Palearctic-Neotropical	1	1.85
Oriental- Afrotropical-Australian	2	3.70
Oriental-Afrotropical-Neotropical	1	1.85
Oriental-Palearctic-Afrotropical-Australian	7	12.97
Oriental-Palearctic-Afrotropical-Neotropical	1	1.85
Oriental-Palearctic-Australian-Neotropical	1	1.85
Oriental-Palearctic-Nearctic-Neotropical	1	1.85
Oriental-Afrotropical-Australian-Neotropical	1	1.85
Oriental-Palearctic-Afrotropical-Australian-Nearctic	1	1.85
Oriental-Palearctic-Afrotropical-Australian-Neotropical	5	9.26
Oriental-Afrotropical-Australian-Nearctic-Neotropical	1	1.85
Oriental-Palearctic-Afrotropical-Australian-Nearctic-Neotropical	20	37.04
Total	54	100.00

THE DISTRIBUTION OF SPECIES OF SPILOMELINAE FROM WUZHI MOUNTAIN IN ZOOGEOGRAPHICAL REGIONS OF THE WORLD

According to table 1 and table 3, some data of 95 species from Wuzhi Mountain can be summarized. Sixty-nine species, 72.63% of the fauna, are distributed in the Palearctic region; thirty-three species, 37.74%, in the Australian region; twenty-four species, 25.26%, in the Afrotropical region; nine species, 9.47%, in the Nearctic region and seven species, 7.37%, in the Neotropical region. Ninety-five species show 14 distributional patterns. Seventeen species, 17.90% of the fauna, are endemic to the Oriental region; thirty-six species, 37.90%, are distributed in both the Oriental and Palearctic region; twelve species, 12.63%, in the Oriental, Palearctic and Australian region; four species, 4.21%, around the world widely. The rest of species represent another ten distributional patterns respectively. This indicates that most species from Wuzhi Mountain, 82.10% of the fauna, show cross-region distribution, and the members of Oriental region constitute the majority of Spilomelinae from this area. And

Spilomelinae from this area are closely related to the Palearctic region, then to the Australian and Afrotropical regions, and less so to the Nearctic and Neotropical regions.

Table 3.– Distributional patterns of species of Spilomelinae from Wuzhi Mountain in Zoogeographical regions of the world.

Distribution	Species	The proportion
Oriental	17	17.90
Oriental-Palearctic	36	37.90
Oriental-Afrotropical	1	1.05
Oriental-Australian	3	3.16
Oriental-Palearctic-Afrotropical	6	6.32
Oriental-Palearctic-Australian	12	12.63
Oriental-Palearctic-Neotropical	1	1.05
Oriental-Afrotropical-Australian	3	3.16
Oriental-Australian-Nearctic	1	1.05
Oriental-Palearctic-Afrotropical-Australian	7	7.37
Oriental-Palearctic-Nearctic-Neotropical	1	1.05
Oriental-Palearctic-Afrotropical-Australian-Nearctic	2	2.10
Oriental-Afrotropical-Australian-Nearctic-Neotropical	1	1.05
Oriental-Palearctic-Afrotropical-Australian-Nearctic-Neotropical	4	4.21
Total	95	100.00

Remarks

Specimens in this research have been collected from Wuzhi Mountain for many years by the research group and two other institutions, so that results reflect the situation of Spilomelinae from this area.

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