

DIVERSITY OF SWALLOWTAIL BUTTERFLY SPECIES (RHOPALOCRA, PAPILIONIDAE) IN THREE PROTECTED AREAS OF THUA THIEN HUE PROVINCE

Vu Van Lien¹, Le Quynh Trang¹, Christoph L. Häuser², Vo Dinh Ba³, Bui Dinh Duc⁴

¹Vietnam National Museum of Nature, VAST

²Natural History Museum Berlin, Germany

³University of Science, Hue University

⁴Vietnam National University of Forestry

SUMMARY

The study on swallowtail butterflies (Papilionidae) of three protected areas of Thua Thien Hue province was carried out sometimes between April and June from 2015 to 2018, at different habitats and altitudes in Bach Ma National Park (NP), Phong Dien Nature Reserve (NR), and Sao La Nature Reserve (NR). Butterflies were observed and collected randomly by insect nets in the surveyed areas. In addition, butterfly species were also referred from previous works on butterflies in the area to make a list of Papilionidae species. The similarity of species composition between three protected areas was analyzed with Cluster Analysis by Primer V5. Total 36 species of the Papilionidae family has been recorded in three protected areas. There are 4 species listed in the Red Data Book of Vietnam (2007): *Troides helena*, *T. aeacus*, *Teinopalpus aureus*, and *Papilio noblei*. Among them, first three species are listed in the CITES (2018). *Teinopalpus aureus* is in the Red List of IUCN (2018). The similarity of species composition between protected areas is rather high (67%), highest between Phong Dien NR and Sao La NR (69.8%). The species composition of Bach Ma NP is slightly different from Phong Dien NR and Sao La NR as Bach Ma NP has 7 species not found in two other protected areas. Bach Ma NP has high conservation value of butterfly species as where has the most species number (32 species) and the most protected species (4 species).

Keywords: Bach Ma, Papilionidae, Phong Dien, Protected species, Sao La.

1. INTRODUCTION

Among butterflies, Swallowtails (Papilionidae) are the most studied and preserved because of their large size, beautiful color, scientific, economic and environmental value. Some species are endangered. These butterflies are considered "representatives" for the diversity of butterflies (Vane-Wright, 2005). In Sri Lanka, the Papilionidae are used as representative of all butterfly diversity in Sri Lanka (Vane-Wright, 2005).

According recent works of butterflies of Vietnam, so far there are about 64 species of Papilionidae of Vietnam. There are 22 insect species listed in the Vietnam Red Book of Vietnam, including 10 species of butterflies. Among these species, Papilionidae has 7 species (accounting for 70% total butterfly species in the Red Data Book of Vietnam).

Thua Thien Hue, a province in the central region, is one of the localities with high biodiversity, especially protected areas of Bach

Ma National Park (NP), Phong Dien Nature Reserve (NR), and Sa La Nature Reserve (NR). Large natural forest, diverse terrain, habitat is home to many insects, including butterflies.

There are some works on butterflies of Thua Thien Hue. Monastyrskii et al. (2006) recorded 402 species in Nam Dong, A Luoi, Huong Thuy, Phong Dien NR, and Bach Ma NP. Phong Dien NR has 161 and Bach Ma NP has 195 species. There are 32 species of Papilionidae: 21 species in A Luoi, 17 species in Phong Dien, and 23 species in Bach Ma. Le Trong Trai & Richardso (1999) listed 143 species from Phong Dien with 16 species of Papilionidae. Huynh Van Keo & Tran Thien An (2011) listed 222 butterfly species in Bach Ma NP, including 29 species of Papilionidae.

This paper aims to present butterfly species of Papilionidae of Thua Thien Hue in three protected areas of Bach Ma NP, Phong Dien NR, and Sao La NR.

2. RESEARCH METHODOLOGY

The study on butterflies was carried out at different habitats and altitudes in Phong Dien NR, Sao La NR, and Bach Ma NP of Thua Thien Hue province. The study was conducted sometimes for a week between April and June from 2015 to 2018: April 2015 and 2017, May 2017, and June 2018.

Study sites

Phong Dien NR is located in Phong Dien and A Luoi districts. The area of the core zone is 41,433 ha; the buffer zone is 43,600 ha. The primary habitat is lowland forest.

Sao La NR, located in Nam Dong district on the Ho Chi Minh Highway, has a total area of 15,519.93 ha of forest.

Bach Ma NP is located in Nam Dong and Phu Loc districts with many mountain ranges with peaks above 1,000m. In 1991, Bach Ma NP was 22,031 ha. In 2008, Bach Ma NP was expanded with a total area of 37,487ha.

Butterflies were observed and collected randomly by insect nets at different habitats of sites of the surveyed areas. Each site with three typical transects were shrub and grass, secondary forest, primary forest, from lowland about 100 m a.s.l. up to Bach Ma peak (1450 m a.s.l.). The transects were from 500 to 1000 m. Butterflies were also recorded at any point

they were seen. In addition, butterfly species were referred from previous works on butterflies in the area (Huynh Van Keo & Tran Thien An, 2011; Le Trong Trai & Richardson, 2005; Monastyrskii et al., 2006; Vu Van Lien, 2010; Vu Van Lien et al., 2013).

Identification and nomenclature of butterflies was followed Chou (1994), D A'brera (1982), Monastyrskii (2007), Monastyrskii & Devyatkin (2003), Kimura et al. (2011), D'Abrera (1982).

The similarity of species composition between protected areas was analyzed with Cluster Analysis using Similarity Tree software of Primer v5 (Primer-E Ltd., 2001).

3. RESULTS AND DISCUSSION

Total 36 species of the Papilionidae family has been recorded in three protected areas of Bach Ma NP, Phong Dien NR, and Sao La NR (Table 1). It consists of 56% total Papilionidae species of Vietnam. There are 4 species listed in the Red Data Book of Vietnam (2007), consisting 57% total species in the Papilionidae family. They are *Troides helena*, *T. aeacus*, *Teinopalpus aureus*, and *Papilio noblei*. Among them, first three species are listed in the CITES (2018). *Teinopalpus aureus* is in the Red List of IUCN (date deficient).

Table 1. Species of the Papiionidae family in protected areas of Thua Thien Hue province

No.	Species	Bach Ma	Phong	Sao La
		NP	Dien NR	NR
1	<i>Troides helena cerberus</i> (C. & R. Felder, 1865)	x	x	
2	<i>Troides aeacus aeacus</i> (Felder & Felder, 1860)	x	x	x
3	<i>Atrophaneura vurunna astorion</i> (Westwood, 1842)	x	x	x
4	<i>Atrophaneura aidoneus aidoneus</i> (Doubleday, 1845)	x	x	
5	<i>Byasa polyuctes polyuctes</i> (Doubleday, 1842)	x	x	
6	<i>Losaria coon doubledayi</i> (Wallace, 1865)	x	x	x
7	<i>Pachliopta aristolochiae goniopeltis</i> (Rothschild, 1908)	x	x	
8	<i>Papilio clytia clytia</i> (Linnaeus, 1758)	x	x	x
9	<i>Papilio paradoxa telearchus</i> (Hewitson, 1852)			x
10	<i>Papilio demoleus demoleus</i> (Linnaeus, 1758)	x	x	x
11	<i>Papilio noblei noblei</i> (Niceville, 1889)		x	x
12	<i>Papilio nephelus chaon</i> (Westwood, 1844)	x	x	x

No.	Species	Bach Ma	Phong	Sao La
		NP	Dien NR	NR
13	<i>Papilio helenus helenus</i> (Linnaeus, 1758)	x	x	x
14	<i>Papilio polytes romulus</i> (Cramer, 1776)	x	x	x
15	<i>Papilio memnon agenor</i> (Linnaeus, 1758)	x	x	x
16	<i>Papilio alcmenor alcmenor</i> (Felder & Felder, 1865)	x		x
17	<i>Papilio protenor euprotenor</i> (Fruhstorfer, 1908)	x		x
18	<i>Papilio dialis doddsi</i> (Janet, 1896)	x		
19	<i>Papilio bianor gladiator</i> (Fruhstorfer, 1901)	x		
20	<i>Papilio paris paris</i> (Linnaeus, 1758)	x	x	
21	<i>Papilio arcturus arcturus</i> (Westwood, 1842)	x		
22	<i>Meandrusa lachinus sukkiti</i> (Nakano, 1995)	x		
23	<i>Meandrusa payeni langsonensis</i> (Fruhstorfer, 1901)	x	x	x
24	<i>Teinopalpus aureus shinkaii</i> (Morita, 1998)	x		
25	<i>Graphium sarpedon sarpedon</i> (Linnaeus, 1758)	x	x	x
26	<i>Graphium doson axion</i> (Felder & Felder, 1864)		x	x
27	<i>Graphium evemon albociliatis</i> (Fruhstorfer, 1901)	x		
28	<i>Graphium eurypylus cheronus</i> (Fruhstorfer, 1903)		x	x
29	<i>Graphium chironides chironides</i> (Honrath, 1884)	x		x
30	<i>Graphium agamemnon agamemnon</i> (Linnaeus, 1758)	x		x
31	<i>Graphium arycles arycles</i> (Boisduval, 1836)	x	x	
32	<i>Graphium aristeus hermocrates</i> (Felder & Felder, 1865)	x		
33	<i>Graphium antiphates pompilius</i> (Fabricius, 1787)	x	x	x
34	<i>Graphium macareus indochinensis</i> (Fruhstorfer, 1901)	x		
35	<i>Lamprotera meges annamiticus</i> (Fruhstorfer, 1909)	x		x
36	<i>Lamprotera curius curius</i> (Fabricius, 1787)	x		x

Note: x – species present; empty cell – species absent.

In three protected areas, Bach Ma NP has the most species number (32 species), following Phong Dien NR and Sao La NR with the same species number (22 species). Bach

Ma NP also has the most protected species listed in the Red Data Book of Vietnam, CITES, and Red List of IUCN (Table 2).

Table 2. Species number of Papilionidae in three protected areas of Thua Thien Hue

Protected areas	Species number	Red Data Book (2007)	CITES (2018)	IUCN (2018)
Bach Ma NP	32	4	3	1
Phong Dien NR	22	3	2	0
Sao La NR	22	2	1	0
Total	36	4	4	1

The similarity of species composition between protected areas is rather high (67%). The similarity is highest between Phong Dien NR and Sao Lao NR (69.8%), between Phong Dien NR and Bach Ma NP (67.9%), and

between Bach Ma NP and Sao La NR (66.7%). The species composition of Bach Ma NP is slightly different from Phong Dien NR and Sao La NR as Bach Ma NP has 7 species not found in two other protected areas (Table 1).

Meanwhile, Sao La NR has only one species not found in BachMa NP and no any species is only found in Phong Dien NR (Table 1). The species only found in Bach Ma NP are *Papilio*

dialis, *P. bianor*, *P. arcturus*, *Meandrusa lachinus*, *Teinopalpus aureus*, *Graphium evemon*, *G. macareus*.

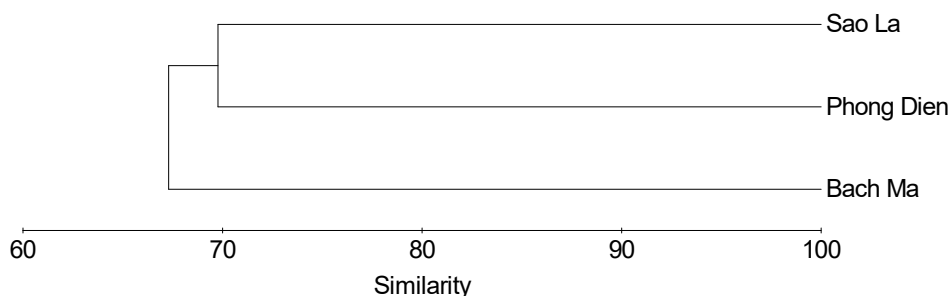


Figure 1. The similarity of species composition between three protected areas of Thua Thien Hue

In the list of butterfly species of Bach Ma NP (Huynh Van Keo & Tran Thien An, 2011), there are some species are not distributed in the area: *Graphium stratocles* Linnaeus, *Pachliopta hector* (Linnaeus), and *Papilio rethenor* Westwood. As *Graphium stratocles* is found in the Philippines; *Pachliopta hector* distributes in Sri Lanka and south India. *Papilio rethenor* is synonyms of *Papilio alcmenor*. *Papilio polytes* has 2 subspecies: *Papilio polytes alcindor* Linnaeus and *Papilio polytes stichius* Linnaeus. It seems impossible that a species has two subspecies flying in the same location.

Species *Teinopalpus aureus* was recorded first time in a mountain of Bach Ma NP. The species were observed on a mountain peak of Bach Ma NP at an altitude of 1,450m a.s.l. Several males of *T. aureus* were observed in April and May in 2017 and 2018, but no observation was recorded in June. *T. aureus* occurs in Vietnam, from the the Northwest (Yen Bai province) to the Center (provinces of Thanh Hoa, Nghe An, Ha Tinh, and Thua Thien Hue), and the South (provinces of Khanh Hoa, Lam Dong and Dak Nong) (Vu et al, 2019).



Figure 2. Mountain forest of Bach Ma, Thua Thien Hue where *Teinopalpus aureus* flies

Among three studied protected areas of Thua Thien Hue province, Bach Ma NP has the most species number of the Papilionidae family (32 species) and the most protected species (4 species). Among 4 protected species, 4 species are listed in the Red Data Book of Vietnam, 3 species in the CITES, and 1 species in The Red List of IUCN. Bach Ma NP has high conservation value of butterfly species.

4. CONCLUSION

Total 36 butterfly species of the Papilionidae family were recorded in three protected areas of Bach Ma NP, Phong Dien NR, and Sao La NR of Thua Thien Hue province. There are 4 species are in the Red Data Book of Vietnam: *Troides helena*, *T. aeacus*, *Teinopalpus aureus*, and *Papilio noblei*. Three species are in the list of CITES: *Troides helena*, *T. aeacus*, *Teinopalpus aureus*. One species in the Red List of IUCN is *Teinopalpus aureus*. Among protected areas, Bach Ma NP has the most species number (32 species) and most protected species (4 protected species: 4 species of Red Data Book, 3 species of CITES, 1 species of IUCN. Bach Ma NP has high conservation value of butterfly species.

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ĐA DẠNG CÁC LOÀI BƯỚM PHƯỢNG (RHOPALOCRA, PAPILIONIDAE) Ở BA KHU BẢO TỒN TỈNH THỪA THIÊN HUẾ

Vũ Văn Liên¹, Lê Quỳnh Trang¹, Christoph L. Häuser², Võ Đình Ba³, Bùi Đình Đức⁴

¹Bảo tàng Thiên nhiên Việt Nam

²Bảo tàng Lịch sử tự nhiên Berlin

³Trường Đại học Khoa học Huế

⁴Trường Đại học Lâm nghiệp

TÓM TẮT

Nghiên cứu về bướm Phượng (Papilionidae) ở các sinh cảnh và độ cao khác nhau của Vườn quốc gia (VQG) Bạch Mã, Khu bảo tồn Thiên nhiên (KBTTN) Phong Điền và Khu bảo tồn Thiên nhiên Sao La trong khoảng thời gian từ tháng 4 đến tháng 6 của năm 2015 - 2016. Bướm được quan sát và thu thập mẫu ngẫu nhiên bằng vợt côn trùng ở các khu vực khảo sát. Ngoài ra, nghiên cứu cũng được tham khảo từ các công trình nghiên cứu trước đây về loài bướm trong khu vực để lập danh sách thành phần loài bướm Papilionidae. Sự tương đồng về thành phần loài giữa ba khu bảo tồn được phân tích bằng phần mềm Primer V5. Kết quả đã ghi nhận ở 3 khu vực nghiên cứu có 36 loài thuộc họ bướm Phượng Papilionidae, có 4 loài có trong Sách đỏ Việt Nam: *Troides helena*, *T. aeacus*, *Teinopalpus aureus* và *Papilio noblei*, ba loài (*Troides helena*, *T. aeacus*, *Teinopalpus aureus*) có trong Phụ lục CITES. Loài *Teinopalpus aureus* có trong Danh lục Đỏ IUCN. Sự tương đồng về thành phần loài giữa các khu bảo tồn khá cao (67%), cao nhất giữa KBTTN Phong Điền và KBTTN Sao La (69,8%). Thành phần loài của VQG Bạch Mã hơi khác với KBTTN Phong Điền và KBTTN Sao La, có 7 loài chỉ thấy ở VQG Bạch Mã. VQG Bạch Mã có giá trị bảo tồn cao của các loài bướm là nơi có số loài nhất (32 loài) và các loài bảo tồn nhiều nhất (4 loài).

Từ khóa: Bạch Mã, loài bảo tồn, Papilionidae, Phong Điền, Sao La.

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