



Original article

Taxonomic review of the tribe Junoniini (Lepidoptera: Nymphalidae: Nymphalinae) from Myanmar

Nan Zarchi Win^a, Eun Young Choi^a, Jinyoung Park^b, Jong Kyun Park^{a,*}^a College of Ecology and Environmental Science, Kyungpook National University, Sangju, Republic of Korea^b Department of Nature Survey, National Institute of Ecology, Seocheon, Republic of Korea

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ABSTRACT

This paper provides keys to the genera and species for the butterfly species belonging to the tribe Junoniini (Lepidoptera: Nymphalidae) from Myanmar. Species accounts include taxonomic description, synonymic lists, distributional ranges, and adult illustrations of nine species: *Junonia hierta* (Fabricius), *Junonia orithya* (Linnaeus), *Junonia almana* (Linnaeus), *Junonia lemonias* (Linnaeus), *Junonia atlites* (Linnaeus), *Junonia iphita* (Cramer), *Yoma sabina* (Cramer), *Hypolimnas bolina* (Linnaeus), and *Hypolimnas misippus* (Linnaeus).

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Introduction

The tribe Junoniini is one of the six major tribes in the subfamily Nymphalinae (Wahlberg et al 2005). The tribe Junoniini is a largely African tribe but some species of *Hypolimnas* and *Junonia* are mainly distributed in Asia and Australia. It is a diverse group, having different structural and biological features. Adults of these species are medium to large size with broad wings and fast-flying. They have reduced forelegs in both sexes and the caterpillars often have branched spines. The host plants are mainly in the families Urticaceae, Asteraceae, Acanthaceae, Plantaginaceae, and Scrophulariaceae (Wahlberg and Brower 2016). Species belonging to the tribe have received attention from systematists in recent years; moreover some species of the tribe such as buckeyes (*Junonia*), have been used as model organisms in ecological and evolutionary studies.

The Nymphalinae is the type subfamily of the diverse family Nymphalidae along with Apaturinae, Biblidinae, Calinaginae, Charaxinae, Cyrestinae, Danainae, Heliconiinae, Lybytheinae, Limentidinae, Pseudergolinae, and Satyrinae (Wahlberg et al 2009). The taxonomy and systematics of Nymphalinae butterflies have

been studied for more than a century (Bates 1861; Smart 1975; Ackery 1988; Harvey 1991; Wahlberg et al 2003; Wahlberg et al 2005). The circumscriptions of the subfamily Nymphalinae have changed many times, and the delineation of the subfamily Nymphalinae has not reached stability. Harvey (1991) recognized three tribes within the Nymphalinae: Nymphalini, Kallimini, and Melitaeini. The characters that he used to define this group were the arrangement of filiform setae on larvae. However, in previous classification, some authors have placed Nymphalinae to include only two tribes, Nymphalini and Coloburini (Ackery 1988), or Nymphalini and Melitaeine (Clark 1948). The classification of Harvey (1991) with the addition of the tribe Coeini provides the concept of Nymphalinae comprising a monophyletic group that includes the well-defined tribes Nymphalini, Coeini, Melitaeini, and Kallimini (Brower 2000; Wahlberg et al 2003; Freitas and Brown 2004). Subsequently, Wahlberg et al (2005) placed the species of Nymphalinae into six tribes: Coeini, Nymphalini, Junoniini, Victorinini, Kallimini, and Melitaeini based on DNA sequence data, but some clades were not stable.

Myanmar is one of Southeast Asia's largest countries. It forms part of the Indo-Burma biodiversity hotspot and it is one of the planet's most biologically rich and threatened regions. However, the data on the Myanmar's butterfly fauna are rather poor. Formerly, and taxonomy of some of Myanmar's butterflies have been studied by De Niceville (1886), Moore (1899) and Bingham (1905). Kinyon (2004) listed 10 species of the tribe Junoniini of

* Corresponding author. Tel.: +82 42 530 1215; fax: +82 42 530 1218.

E-mail address: entopark@knu.ac.kr (J.K. Park).

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Myanmar. The species were just recorded in the checklists and the recent references and the taxonomy and systematics at both genus and species levels for the butterflies were poorly reported.

The purpose of this study was to provide an overview of the species of the tribe Junoniini in Myanmar. The present paper provides keys to the genera and species of the tribe Junoniini, and included available information on the taxonomy as well as synonymic lists and distribution of the tribe Junoniini in Myanmar.

Systematic accounts

Order Lepidoptera Linnaeus, 1758

Family Nymphalidae Rafinesque, 1815

Subfamily Nymphalinae Rafinesque, 1815

Tribe Junoniini Reuter, 1896

The tribe comprises six genera: *Junonia*, *Salamis*, *Yoma*, *Protogoniomorpha*, *Precis*, and *Hypolimnas*. Three genera, *Junonia*, *Yoma*, and *Hypolimnas* have been reported in Myanmar.

Key to the genera of tribe Junoniini in Myanmar

1. Cells of both fore wing and hind wing open.
.....*Junonia* Hübner, 1819
- Cell of both fore wing and hind wing closed. 2
2. Hind wing with a short tail at apex 4.
.....*Yoma* Doherty, 1886
- Hind wing without a short tail at apex 4.
.....*Hypolimnas* Hübner, 1819

Genus *Junonia* Hübner, 1819 (Buckeyes and Pansies)

= *Alcyoneis* Hübner, 1819

= *Aresta* Billberg, 1820

= *Kamilla* Collins & Larsen, 1991

Type species: *Junonia lavinia* Cramer, 1775

Description. ♂♀. Fore wing: costa slightly arched, apex bluntly angular; termen up to below vein 6 straight, oblique outwardly, then angulate, and below strongly concave to vein 2, thence inwardly oblique; tornus rounded; dorsum straight; cell open, moderately long but less than half length of the wing; lower discocellular absent; vein 6 at base almost close to vein 7, veins 10 and 11 free. Hind wing: costa widely arched, apex rounded; termen arched; tonus produced, angulated, in the dry-season forms; cell open; distance at base of veins 6 and 7 about half that between 7 and 8. Antennae about half length of fore wing, club more or less abrupt, flattened; palpi subporrect, broad in front, second joint gradually incrassate, third joint short, acute. Eyes and palpi are smooth. Seasonal polymorphism is very common among this genus.

A cosmopolitan genus of about 33 species and of which six species can be recorded in Myanmar: *J. hierta* (Fabricius), *J. orithya* (Linnaeus), *J. almana* (Linnaeus), *J. lemonias* (Linnaeus), *J. atlites* (Linnaeus), and *J. iphita* (Cramer).

Keys to species of genus *Junonia* in Myanmar

1. Upper side: ground color yellow.
.....*J. hierta* Fabricius, 1798
- Upper side: ground color not yellow. 2
2. Upper side: ground color brown. 3
- Upper side: ground color not brown. 4
3. Forewing without yellow spots or discal band on upperside.
.....*J. iphita* Cramer, 1779
- Forewing with yellow spots on upper side
.....*J. lemonias* Linnaeus, 1758

4. Upper side: ground color; fore wing black, hind wing blue.
.....*J. orithya* Linnaeus, 1758
5. Upper side: ground color pale lavender-gray
.....*J. atlites* Linnaeus, 1758
6. Upper side: ground color rich orange yellow.
.....*J. almana* Linnaeus, 1758

***Junonia hierta* Fabricius, 1798** (Yellow pansy)

Papilio hierta Fabricius, 1798: 424

Junonia oenone Moore, 1881: 42.

Description (Figures 1A and 1B). Wingspan: 54–58 mm. ♂. Upperside bright yellow. Forewing: the costa with a broad jet-black downward projection at the discocellulars, the apex broadly, the terminal margin, and the dorsum with a triangular upwards projection near the tornus; the black margin narrows near the middle of the termen and bears two short transverse preapical white streaks crossed by the black veins on the apex. Hind wing with the basal half and the terminal margin black; the dorsum broadly shaded with ochraceous brown patch; a large brilliant blue spot placed at the center of the basal black area. Cilia of both fore and hind wings white alternating with brown. Underside: fore wing with pale yellow; the wing cell crossed by three black-margined brownish-yellow bars; beyond the cell a short, broad, irregular black oblique band from costa to base of vein 4; apex and margin of dorsum largely, middle of the termen narrowly, dusky brownish black with some obscure paler markings; a round black discal spot in interspace 2 and another smaller one in interspace 5. Hind wing with ground color grayish yellow; largely irrorated with dusky scales in the dry-season form; a transverse brown discal patch prominent, margins strongly sinuous; the middle of the termen broadly shaded with brownish; some obscure markings on the basal area, a postdiscal line of tiny dots, and submarginal and marginal zigzag slender lines light brown. Antennae pale, head, thorax, and abdomen dark brownish black; beneath the body pale ochraceous white. ♀ similar, but with duller colors. Upperside of fore wing: cell crossed with somewhat complete transverse black fascia and another at the discocellulars; well-defined ocelli with blue centered placed in interspaces 2 and 5 of the fore wing; and smaller ocelli in interspaces 2 and 5 on the hind wing. In both wings, with a fairly well-defined pale submarginal line, the blue spot on the anterior black area on the hind wing small or obscure and poorly defined; the rest are similar as the markings in the ♂. Underside as in the ♂, but with heavier and more clearly defined markings.

Material examined. Myanmar: 2♂, 3♀, 9 i 2015, Natmataung (J. K. Park leg.); 5♂, 2♀, 18 i 2015, Pin Laung (Z.W. Nan leg.); 2♂, 18 i 2015, Natmataung (J.K. Park leg.); 1♀, 24 ii 2013, Mount Popa (J.K. Park leg.); 4♂, 4 ii 2012, Natmataung (J.K. Park leg.)-coll. KNU.

Distribution. Myanmar, India, Sri Lanka, Thailand, Cambodia, Vietnam, Laos, China

Remarks. The species in Myanmar are considered to belong to the subspecies *J. hierta hierta* Fabricius, 1798 (Gasse 2013; Inayoshi 2015).

***Junonia orithya* Linnaeus, 1758** (Blue pansy)

Papilio orithya Linnaeus, 1758: 473

Junonia orithya Moore, 1881: 41

Junonia orithya de Nicéville, 1886: 73

Description (Figure 1C). Wingspan: 46–60 mm. ♂. Upperside: fore wing with dark blue-black from base to the discal, apical area dull fuliginous-black; a blue patch above the tornus; ochreous-white oblique band at the outer margin of the basal black area

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