Unique wood nymphs from China and Vietnam: Devyatkinia singularis gen. et spec. nov.
(Lepidoptera, Nymphalidae)
by
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Abstract: Mycalesis unica Leech, 1893, distributed in W. China (Sichuan) and E. China (Fujian and Zhejian), and its undescribed Vietnamese relative are shown to be members of a new genus, Devyatkinia gen. nov.; description of both is presented. This new genus is characterised by unusual wing pattern and venation, the genital structure of both sexes, the ♀ secondary sexual characters distinguishing it from other representatives of Asian Mycalesis. There are also significant behavioural differences.

Introduction: J. H. Leech (1893), when describing Mycalesis unica Leech, a new wood nymph species from Sichuan, noted some unusual wing pattern characters that show that this species is not closely allied to any other representatives of the genus. One of the most distinctive characters is presence of an enlarged white-pupilled subapical ocellus in cell M1 on the forewing, combined with absence of the large ocellus in cell Cu1a that is typical of all other Mycalesis (fig. 1 a, b, d, e).

Another remarkable feature is a large ocellus in cell Cu1a on the hindwing and series of small white-pupilled eye spots presenting in cells Cu1b, M3-M1, R5; these are, unusually for Mycalesis, represented on both surfaces of the wing. The description of M. unica was based on one female specimen so the author was therefore unable to study the ♀ secondary sexual characters such as the hair tuft or the brand in the nacreous area on the hindwing that are characteristic a number of Mycalesis species. Nevertheless, he was generally right in supposing that unica was best placed the genus Mycalesis. Now it is possible to assess this feature in the related Vietnamese species. Also, Leech did not refer to the extent of inflation of the veins in basal area of the forewing.

The rarity of M. unica Leech is indicated by the fact that, after the original description, only a few further specimens of this species have been collected. These finds were unpublished, so the species has not been studied for more than a century. The main stimulus for us to resume studies is the discovery of a similar species in 2005 in Central Vietnam, initially attributed to M. unica Leech (Monastyrskii, 2007; 2010; Monastyrskii & Holloway, 2013). Our current study shows that the Chinese and Vietnamese populations are different species belonging to a genus distinct from Mycalesis.

Description

Devyatkinia gen. nov.

Type species: Devyatkinia singularis spec. nov. (see description below)

Antennae less than half (about two-fifths) length of forewing costa, reaching the discal cell apex, club normal, well developed. Eyes hairy. Terminal segment of labial palpus short and slightly pointed. Leg structures typical of Mycalesinis (Miller, 1968): foretarsus bears spines, absent from dorsal part of midtibia; tibial spurs present and well developed, although the midtibia and hindtibia bear double spurs. Forewing costa and termen evenly rounded (typical of Mycalesis); long cilia greyish.

Venation (fig. 2a): Forewing discal cell ½ length of costa; vein Sc and cubitus strongly swollen at base; vein 1A+2A much less strongly swollen at base than the others; discocellulars rather straight in comparison with a number of Asian Mycalesis and its relatives (e.g. Lohora), where the discocellulars are distinctly excavated between the bases of veins M1 to M3 (figs 2b and 2c). Hindwing vein Sc+R1 slightly longer than 3A (shorter in the other genera); veins M3 and Cu1a are widely separated and M2 arises much nearer M1 than M3.

Wing pattern: Upperside ground colour of both wings dark brown with slightly paler broad postmedian areas; dull yellowish subterminal and terminal fasciae on the upperside of the forewing and brighter yellowish fasciae on the upperside of the hindwing. The species show unusual enlargement of the ocellus over the forewing cell M1, whereas most of Mycalesis species have a well developed large ocellus in forewing cell Cu1a. The hindwing bears a very large ocellus in cell Cu1a and, varying in size, small ocelli in cells Cu1b, M3, M2, and M1 that rarely appear on the upperside in Mycalesis species even when well developed on the underside. Underside ground colour of both wings uniformly brown with bright creamy-yellowish postmedian bands and subterminal and terminal fasciae. Generally both wings have similar patterns on both surfaces, however some small ocelli are present in cells Cu1b, M3, M2, M1, Rs only on the underside.
Secondary sexual characters: Hindwing without brand in the nacreous area, and with somewhat long blackish brown hair-pencil within the base of discocellulaces.

Length of forewing: Species of the new genus are usually larger than most species of Mycalesis: ♂ from Vietnam: 29; 29.5 mm (n = 2); ♀ 30.5; 33.0; 33.5; 34 mm (n = 4); specimens from China: ♀ 26.5; 28.0; 30; 30 mm (n = 4).

♂ genitalia (figs. 3a-c): Generally the ♂ genitalia of the new genus have shapes and sizes of claspers, tegumen, uncus and brachium similar to those of a number of Mycalesis species (Talbot, 1947). However, the saccus (fig. 3a) is unusually long, equal to length of clasper (fig. 3b); clasper narrow, incurved ventrally with pointed apex. In the long tapering aedeagus the fultura superior in dorsal part of anellus well sclerotised and covered with a series of six teeth (fig. 3c). Such structures have no analogues amongst other members of the Asiatic Mycalesis fauna. However similar teeth may be seen in some Palaearctic satyrines, e.g. Pararge, Lasiommata (Nekrutenko, 1985).

♀ genitalia (fig. 3d, 3e): Both species with very similar genitalia. Intersegmental trapezoid membrane (IM) between 7th and 8th segments well sclerotised; lamella antevaginalis includes pair of lateral oval processes (LOP) blades of which surround the ostium copulatrix (OC); lamella postvaginalis is absent; ductus bursae (DB) as long as corpus bursae copulatrix (BC); the latter has ovoid shape with unpaired U- (in Chinese populations) or V-shaped (in Vietnamese) signum: a spined band; papilla analis (PA) abnormally reduced up to base at lower part, which is well sclerotized; both apophysis anterior and apophysis posterior are absent.

Bionomics: The Vietnamese species of the new genus is seasonal, recorded in montane tropical forest of Central Vietnam from the end of May to the beginning of July. Peak abundance has been observed in mid-June. In comparison with Asiatic species of the genus Mycalesis, the Vietnamese member of the new genus is characterized by very unusual behaviour. The peak of flying activity occurs in midday between 10 am and 15 pm. Both sexes fly in undergrowth around 1.5-3.5 m from the ground but never fly close to the ground vegetation. They fly rather swiftly, preferring sunlit forest edges with bushy trees. Perching on the tips of branches, they await peacefully for the arrival of a potential partner, but have not been observed to display territorial aggressiveness. This type of behaviour is not a characteristic of any Mycalesis species, which are usually slow and low-flying butterflies preferring the shade of forest undergrowth around 0.5-1.0 m from the ground.

Etymology: The new genus is named after our late friend and co-author, a talented Russian entomologist, Alexey L. Devyatkin (1957-2012).

Devyatkinia singularis spec. nov. (fig. 1 g-j)

Holotype ♀ (fig. 1 g, 1 h): Central Vietnam, Khanh Hoa Province, Dien Khanh District, Hon Ba Nature Reserve, 1500 m, 17.VI.2013, leg. A.L. Monasteryskii.


♀: Upperside brown. Forewing with an ocellus extending over space M1 with yellow outer ring; postmedian and subterminal and terminal lines pale; cilia yellowish brown. Hindwing with a series of five ocelli, each with a yellow outer ring; the one in space Cu1a large; post discal line pale; subterminal line prominent and terminal line pale; cilia yellowish brown. Underside. Ground colour slightly paler than on upperside. Both wings with a postmedian broad creamy-yellow line. Forewing with a large ocellus in spaces M1 and M2; a series of three dots like ocelli in spaces M3, Cu1a, Cu1b, and the whole group is enclosed by sinuous pale line; subterminal and terminal lines pale, much more distinct than on upperside, the former sinuous; cilia yellowish brown. Hindwing with seven ocelli which are similarly enclosed by a pale line as on forewing; the ocellus in space Cu1a large; subterminal and terminal lines as on forewing; cilia yellowish brown. ♀ genitalia as for the genus.

♂: Colour (shades of brown) and the wing pattern in both sides of the wings similar to the ♀, just slightly darker, with the bands and ocelli more contrasted and prominent. Secondary sexual characters on the upperside of the hindwing as for the genus ♀ genitalia as for the genus.

Discussion: The new species is similar to D. unica (Leech, 1893) comb. nov., but may to be distinguished from the Chinese species on characters as follows: the female larger in size and darker; termen of forewing more or less straight; a series of ocelli enclosed by pale line on underside of both wings more distinct than in D. unica (Leech) and more likely to be seen also on the upperside; subterminal line more developed on the underside of both wings; terminal line more distinct on the underside of both wings. The ♀ genitalia of D. singularis spec. nov. similar to D. unica (Leech), however the Chinese species has the spined signum slightly longer and U-shaped rather than V-shaped.

Depository: The ♀ holotype will be deposited in Natural History Museum, London (NHML); 1 ♂, 3 ♀ in John O’Dell’s private collection (UK) (1 paratype ♀ will be delivered to the Lepidoptera collection of NHML); 1 ♂, 1 ♀ in Toyosato Museum of Entomology (Ibaraki, Japan); 1 ♂ Tokyo University Museum (Tokyo, Japan).
Etymology: The Latin name singularis may be translated as “unique” or “extraordinary”, demonstrating the uniqueness of the new species.

Devyatkinia gen. nov. contains the following taxa:

*singularis* spec. nov. - C. Vietnam (Khanh Hoa, Thua Thien Hue Provinces).
*unica* (Leech, 1893) comb. nov. - China (Sichuan, Fujian and Zhejian Provinces).

Comparative analysis and comments: Features of the wing venation such as the inflation of the veins at the base of the forewing and the length and shape of discal cell provide the most stable and invariable generic synapomorphic character states in Satyrinae (Nymphalidae) (Pena et al., 2006; Marin et al., 2011). Whilst sometimes genital structures in both sexes of satyrines provide diagnostic features at the specific level, they are rarely useful for higher classification. The main reason for this is high variability in the structures and features that may be found in a few taxa in several allied groups - homoplasy (Kuznetsov & Stekolnikov, 2001). Nevertheless, there are a few autapomorphic features of wing pattern and genitalia that may add support to the generic concept proposed here.

The data represented in Table 1 show combinations of venation, wing patterns and secondary sexual characters to some genera of the tribe Satyrini, including the new genus Devyatkinia. Both Chinese and Vietnamese representatives of Devyatkinia show strong inflation of veins Sc and Cu at the base of the forewing, but inflation in vein 1A+2A is barely evident (fig 2 a). This combination of inflated veins clearly separates Devyatkinia species from Asian Mycalesis (fig. 2 b) and Lohora (fig. 2 c), where all three veins are swollen at base in all species. Also the genus Orsotriaena is distinct in having only vein Sc inflated (fig. 2 d). It should be mentioned here that Pena (2009) treated Orsotriaena as a member of the subtribe Coenonymphina (= Hypocystina), not Mycalesina, based on results of DNA analysis. At the same time, according to a recent molecular study (Yang & Zhang, 2015) Orsotriaena should be represented as a member of the subtribe Eritina. The last system is accepted in the current work, though we admit that the true status of this genus needs additional morphological study. Similar differences in the patterns inflated veins is seen between Devyatkinia and other Satyrini subtribes, including Parargina (Lopinga) (fig. 2 e), Lethina (Lethe, Neope) (figs. 2 f, 2 g), Eritina (Orsotriaena and Ertes) (fig. 2 i) and representative of the tribe Elymnini (Elymnias) that have only vein Sc swollen.

The Palaeartic genera Mamiola, Hipparchia, Brintesia and Pseudochazara, and the tropical genus Ypthima (all Satyrini) have a similar pattern of swollen veins to Devyatkinia, together relatively straight discocellulars. They also have a similar relationship between lengths of discal cells and length of the forewing. However, of these genera have a distinct type of secondary sexual character: a large androconial patch (or patches) on the upper surface of the forewing.

Species of Devyatkinia have genitalia similar in general structure to those of other Satyrinae, but both sexes show some unique and distinctive features unknown in allied genera. In particular, the have a long saccus, a specialised feature (A. A. Stekolnikov, pers. com.). The series of teeth on the dorsal side of the aedoeagus is a very distinctive character that is extremely rare in Mycalesis, but may indicate phylogenetic links to some groups of Palaeartic satyrines. The combination of a long saccus and the series of dorsal teeth in the aedoeagus is also characteristic of some Sundanian Ragidia (Ragadiini), but this genus has only the base of Sc swollen in the forewing, and the hindwing venation is highly abnormal (Miller, 1968).

The genitalia of Devyatkinia also exhibit rather distinctive structures. The unpaired V-shaped signum and the reduction of the papilla analis are so far are unknown in other Mycalesina, indeed in Satyrinae generally.

A detailed study of morphological features in both Chinese and Vietnamese populations of the taxon formerly treated as Mycalesis unica Leech led us to conclude that it represents a separate genus consisting of two species and sharing various features with genera of tribes Elymnini and Satyrini. However, several morphological characters of the new genus, especially the scheme of the wing venation, secondary sexual characters, wing colour, spot and fasciae pattern, undoubtedly place it in the tribe Elymnini. In addition, the unusual behaviour and seasonal phenology of Devyatkinia species make it difficult to come to a final conclusion on the precise higher classificatory status of this taxon; this may only be clarified by additional molecular studies.

Biogeography: Analysis of the geography of the butterfly fauna of the Indochinese Peninsula indicates wide disjunctions in the ranges of some Sino-Himalayan wood nymphs (Monastyrskii, 2010; Monastyrskii & Holloway, 2013). Such disjunctions provide good evidence for an evolutionary scenario of expansion, isolation and speciation occurring in response to Pleistocene processes of glaciation and warming. In cooler periods, the geographical ranges of a number of Sino-Himalayan species extended southwards to reach the Indochinese Peninsula where they survived and diverged in more montane areas (Monastyrskii, 2010). The next warming period caused the altitude of their Indo-Chinese habitats to move upwards, forming disjunctions in ranges of these species. The distribution of the modern representatives of Devyatkinia provides an example of such a scenario. It is remarkable that similar disjunctions and endemism are unknown amongst the Mycalesis distributed in China and Indochina, but perhaps this genus is more characteristic of lowland forest habitats that contracted in cooler periods. Thus today the genus Devyatkinia exhibits relict status but possibly was more diverse and wide-ranging in “premycalesis” times. In spite of high local mobility and the complicated behaviour observed in both sexes, the genus Devyatkinia has been unable to occupy the majority of tropical and subtropical niches. On the contrary, chemoreceptor behaviour of Mycalesis has proved to be more advantageous. The continuous ranges of Mycalesis species have no disjunctions, but are sometimes characterised by a
number of contiguous subspecies. Endemicity among continental Asiatic *Mycalesis* is rather rare.

**Rarity:** Both Chinese and Vietnamese representatives of *Devyatkinia* are clearly very rare butterflies in comparison to other species of *Mycalesis* in mainland South East Asia. The original description of unica was based on 1 ♀ (B.M. Type No.Rh 2723) now preserved in the Lepidoptera collection of the NHML. In China, *D. unica* (Leech) is now known from Sichuan Province (western population; Leech, 1893; Chou, 1999) and in Zhejiang Province (eastern population; Chou, 1999). The ♀ deposited in the Zoologisches Museum A. Koenig, Bonn. was collected in 1938 in the eastern Fujian (Fukien) Province.

*Devyatkinia unica* (Leech) has been recorded in Central Vietnam (Khanh Hoa and Thua Thien Hue Provinces) and may be seen seasonally within more montane biotopes of coastal evergreen forest.

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**Table 1**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Mycalesina</th>
<th>Mycalesis</th>
<th>Mycalesis</th>
<th>Eritrina</th>
<th>Eritrina</th>
<th>Parargina</th>
<th>Lethina</th>
<th>Lethina</th>
<th>Elymnias</th>
</tr>
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<tbody>
<tr>
<td>Adult wing venation</td>
<td>Fig. 2a</td>
<td>Fig. 2b</td>
<td>Fig. 3a</td>
<td>Fig. 2c</td>
<td>Fig. 2d</td>
<td>Fig. 2e</td>
<td>Fig. 2f</td>
<td>Fig. 2g</td>
<td>Fig. 2h</td>
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<tr>
<td>most prominent forewing</td>
<td>cell M1</td>
<td>cell Cu1a</td>
<td>cell Cu1a</td>
<td>cells M1</td>
<td>cells M1</td>
<td>cell Cu1a</td>
<td>a series of small ocelli</td>
<td>a series of ocelli</td>
<td>cell Cu1a + a series of ocelli</td>
</tr>
<tr>
<td>most prominent forewing</td>
<td>cell Cu1a + a series of small ocelli</td>
<td>rarely in cell Cu1a</td>
<td>absent</td>
<td>absent</td>
<td>a series of ocelli</td>
<td>cells M3 + Cu1a</td>
<td>cell Cu1a + a series of ocelli</td>
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</tr>
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<td>strongly curved inwardly</td>
<td>strongly curved inwardly</td>
<td>strongly curved inwardly</td>
<td>rather straight</td>
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<td>discoidal scales vein</td>
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<tr>
<td>forewing vein Sc</td>
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<td>forewing vein 1A+2A</td>
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<td>strongly swollen at base</td>
<td>not swollen at base</td>
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<td>not swollen at base</td>
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<tr>
<td>Male secondary sexual</td>
<td>long blackish brown hair-pencil on Up HW</td>
<td>Up HW costal nacrescent area with hair tufts</td>
<td>UpFW with glandular fold on vein 1A+2A</td>
<td>blackish brown hair-pencil at base of FW</td>
<td>elongate fold enclosing a hair-pencil in space Cu1b on Up/FW</td>
<td>Absent</td>
<td>wedge-shaped androconial area on Up-FW</td>
<td>androconial patch on Up FW or both wings</td>
<td>androconial brand from dorsum of vein M3</td>
</tr>
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</table>

**References**


Fig. 1: *Mycalesis unica* Leech, 1893, holotype ♂. Forewing length 30 mm. Collected by Kricheldorff at Moupin, [W. China, Sichuan] in July, 1890. B.M. Type No.Rh. 2723, BMNH #141945. (a) Upperside, (B) underside, (c) labels; *Mycalesis unica* Leech, 1893, ♂; forewing length 28 mm. Collected by H. Hone at Kuatun, 2300 m (E. China, Fukien) 27, 40 n.Br/117, 40 ö.L., 11.7.1938, the Zoologisches Musem A. Koenig, Bonn (Germany). (d) Upperside, (e) underside, (f) labels; *Devyatkinia singularis* gen. et spec. nov., holotype ‡; forewing length 33 mm; Central Vietnam, Khanh Hoa Province, Dien Khanh District, Hon Ba Nature Reserve, 1500 m, 17.VI.2013, leg. A. L. Monastyrskii. (g) Upperside, (h) underside; *Devyatkinia singularis* gen. et spec. nov., paratype ♂; forewing length 29.5 mm; Central Vietnam, Khanh Hoa Province, Dien Khanh District, Hon Ba Nature Reserve, 1500 m, 27.V.2005, leg. A. L. Monastyrskii. (i) Upperside, (j) underside.
Fig. 2: *Devyatkinia* and allied Satyrinae species wing venation: (a) *Devyatkinia singularis* gen. et spec. nov.; (b) *Mycalesis gotama* Moore, 1857; (c) *Lohora dexamena* Hewitson, 1862; (d) *Orsotriaena medus* (Fabricius, 1775); (e) *Lopinga deidamia* (Eversmann, 1851); (f) *Lethe chandica* (Moore, 1857); (g) *Neope muirheadi* (C. & R. Felder, 1862); (h) *Elymnias hypermnestra* (Linnaeus, 1763); (i) *Erites angularis* Moore, 1878.
Fig. 3: ♂ and ♀ genitalia of *Devyatkinia singularis* gen. et spec. nov. (a) General view at the ♂ genitalia armature in lateral aspect without aedoeagus; (b) right clasper in lateral view; (c) aedoeagus in lateral view. ♀ genitalia of *Devyatkinia singularis* gen. et spec. nov. (d) General plan in lateral view; (e) in ventral view.