A review of *Barsine* (Lepidoptera: Erebidae: Arctiinae: Lithosiini) from the East Nusa Tenggara Islands, Indonesia, with description of a new genus

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Abstract
The Lepidoptera fauna of the East Nusa Tenggara Islands in Indonesia was thought to comprise two species in the genus *Barsine* Walker, 1854, i.e. *B. dohertyi* (Rothschild, 1913) and *B. podbolotskayae* Spitsyn & Bolotov, 2018. However, we found that *B. podbolotskayae* is a member of its own monotypic genus, *Albarrania* Bolotov, Spitsyn & Kondakov gen. nov. The new combination is proposed as follows: *Albarrania podbolotskayae* (Spitsyn & Bolotov, 2018) gen. & comb. nov.

Key words: Lithosiini, Wallacea, Lesser Sunda Archipelago, Flores Island, island biogeography, new genus.

Introduction
*Barsine* Walker, 1854 is an exceptionally species-rich lichen moth genus, which mainly occurs in the Old World tropics, with the maximum level of species diversity in the Oriental Region, i.e. Malaysia and Greater Sunda Islands (Holloway 2001; Černý and Pinratana 2009; Bucsek 2012; Volynkin and Černý 2017a, 2017b, 2018; Volynkin 2018; Volynkin et al. 2018; Bayarsaikhan et al. 2018; Spitsyn et al. 2018a). However, this large genus in its current understanding seems to be a polyphyletic entity that contains representatives of several genus-level units. This assumption is supported by a description of a novel genus for *Barsine nubifascia* Walker, 1864 (Volynkin 2017; Volynkin et al. 2017).

The *Barsine* fauna on the East Nusa Tenggara Islands was almost unknown, with the only *B. dohertyi* (Rothschild, 1913) described from the Sumbawa Island (Rothschild 1913; Holloway 1982, 2001). However, *Barsine podbolotskayae* Spitsyn & Bolotov, 2018 has recently been discovered on the Flores Island (Spitsyn and Bolotov, 2018). In general, the Erebidae fauna of the East Nusa Tenggara Islands has rather moderate levels of endemism, with a few remarkable endemic elements (Spitsyn et al. 2016; Bolotov et al. 2017, 2018; Spitsyn and Bolotov, 2018) and numerous widespread species (Bolotov et al. 2018; Spitsyn et al. 2018b).
In this correspondence, we present an overview of *Barsine* species from the East Nusa Tenggara Islands within a broad taxonomic context. We discuss the taxonomic status of two *Barsine* species inhabiting the East Nusa Tenggara, and introduce a new genus for *B. podbolotskayae*.

**Materials and methods**

The study is based on the material from the collection of the Russian Museum of Biodiversity Hotspots (RMBH thereafter), Federal Center for Integrated Arctic Research of the Russian Academy of Sciences, Arkhangelsk, Russia. The genitalia were dissected, mounted on temporary glass slides with 70% ethanol and photographed using a research stereomicroscope (AXIO Zoom.V16, Carl Zeiss, Germany). The genitalia are kept in micro-tubes with glycerin pinned to each specimen. The images of the specimens were taken with a Canon EOS 80D camera (Canon, Tokyo, Japan).

**Results**

Based on the review of a body of available literature (Rothschild 1913; Holloway 1982, 2001; Spitsyn and Bolotov, 2018) and original data, we found that the fauna of the East Nusa Tenggara Islands contains only two *Barsine* species: *B. dohertyi* from Sumbawa and Flores and *B. podbolotskayae* from Flores (Figs. 1-4). The male genitalia structure of *Barsine podbolotskayae* strongly differs from those of the other *Barsine* species by a dorsally directed, robust, spine-like central costal process of the valve and a bundle of dorsally directed, long setae proximal to it (vs lack of such features) (Fig. 4).

**Figure 1.** Occurrences of *Barsine* Walker, 1854 and *Albarrania gen. nov.* from the East Nusa Tenggara Islands. *Barsine dohertyi*: (1) Mount Tambora, Sumbawa (type locality), (2) Lake Sano Nggoang, West Flores (our record). *Albarrania podbolotskayae gen. & comb. nov.*: (2) Lake Sano Nggoang, West Flores (type locality). The base of the map was modified from Lohman et al. (2011).
Discussion

A morphological re-analysis of the two members of the genus *Barsine* from the East Nusa Tenggara Islands reveals that *B. podbolotskayae* is distant from the other members of *Barsine*. An external similarity between *Barsine podbolotskayae* and *B. exclusa* pointed out in our original description (Spitsyn and Bolotov 2018) seems to be a result of convergence, because these taxa are distant from each other by the male genitalia structure. In the absence of an available generic name for this species, we placed *Barsine podbolotskayae* into its own monotypic genus, *Albarrania* gen. nov. While this genus is currently unknown beyond the West Flores, our knowledge of the Arctiinae fauna on the East Nusa Tenggara Islands is extremely poor (Černý 2016; Bolotov et al. 2018; Spitsyn and Bolotov 2018), and records of additional *Albarrania* taxa from other islands could not be excluded.

*Barsine dohertyi* was described from Sumbawa (Rothschild 1913), and we recorded it from Flores for the first time. Holloway (1982, 2001) placed this species within the ‘roseororatus’ species complex (=the ‘cuneonotatus’ group) based on a morphological study alone. Three more species, i.e. *Barsine sanguitincta* (Hampson, 1900) from Moluccas, *B. scripta* Walker, [1865] and *B. celebesa* (Tams, 1935) from Sulawesi, may also be members of this group (Holloway 1982).

In summary, our novel data confirm the hypothesis of Bolotov et al. (2018) that the Arctiinae fauna of the East Nusa Tenggara Islands represents a mix of elements with different origin, i.e. relatively recent immigrants from Sundaland and putative ancient relict lineages. Both *Barsine dohertyi* and *Albarrania podbolotskayae* gen. & comb. nov. seem to be rather representatives of the latter group.

Taxonomy

**Family Erebidae** Leach, [1815]
Subfamily Arctiinae Leach, [1815]
Tribe Lithosiini Billberg, 1820

Genus *Barsine* Walker, 1854
Type species: *Barsine defecta* Walker, 1854

*Barsine dohertyi* (Rothschild, 1913)
*Miltochrista dohertyi* Rothschild, 1913: 215. – Hampson (1914): 781, pl. 40, fig. 33; Holloway (1982): 214.
*Barsine dohertyi* (Rothschild, 1913). – Holloway (2001): 368.
Figs. 2A-B, 4A-C

**Type series.** Two syntypes (male and female); Rothschild’s collection, NHMUK – Natural History Museum, London, UK (Rothschild 1913; Hampson 1914). The male specimen illustrated by Hampson (1914).

**Type locality.** “Tambora, Sambawa, 2,500-4,000 ft., June 1896 (W. Doherty)” [Indonesia, Lesser Sunda Islands: Mount Tambora, a stratovolcano in the northern part of Sumbawa Island, alt. 762-1219 m, approx. 8.1725° S, 119.9900° E] (Rothschild 1913).

**Material examined.** INDONESIA, Lesser Sundas, East Nusa Tenggara, Flores Island: shore of Lake Sano Nggoang, secondary mountain forest with old nutmeg trees, 8.70917° S, 119.9975° E, 21-22.i.2015, 4♂, 6♀, Bolotov leg. [RMBH, voucher nos. Sph0684, Sph0685, Sph0687, Sph0688, Sph0773–Sph0778]; shore of Lake Sano Nggoang, primary mountain rainforest, 8.7169° S, 120.0028° E, 23.i.2015, 1♀, Bolotov leg. [RMBH, voucher no. Sph0779].

**Diagnosis.** This species is externally similar to *Barsine roseororatus* and *B. cuneonotatus* but can be distinguished from these species by the vesica structure. *Barsine dohertyi* has a markedly scobinate vesica, with two adjacent central fields of small cornuti, while *B. roseororatus* does not have a clear scobination of vesica, with one field of cornuti, which are larger, less numerous and more densely packed than in *B. dohertyi*. Vesica of *Barsine cuneonotatus* has a patch of scobitation and two fields of cornuti: (1) with densely packed, moderately-sized cornuti, and (2) with one to four large triangular cornuti near a spot of very

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small cornuti. An external diagnostic feature of *Barsine dohertyi* is a yellow ground coloration of the female forewings (vs red or red-orange).

**Figure 2.** Specimens of *Barsine dohertyi* (upper side), West Flores, Indonesia. (A) Male [RMBH no. Sph0774]. (B) Female [RMBH no. Sph0779]. Scale bar = 5 mm. (Photos: V. M. Spitsyn).

**Male morphology.** Wingspan 28–32 mm, forewing length 13–15 mm (*N* = 4). Vertex, tegula, and patagium orange with solitary black points, eye gray with black spots. Labial palpus red-orange, short (equal to eye diameter), antenna red-orange, filiform, with two short setae on each segment. Abdomen reddish, legs red-orange. Upperside of forewing red-orange, with black markings: three basal dots, concave antemedial and zigzag median wide black bands joined at middle in shape of broad 'X' figure with an orange spot in the middle, concave black postmedial band in shape of broad 'U' figure with wide streaks along veins to termen, narrow black line along outer margin. Underside of forewing red-orange, slightly lighter than upperside, with dark marks near the apex. Upperside and underside of hind wing yellowish-white, tinged with pale rose near the apex.
Female morphology. Wingspan 35–39 mm, forewing length 17–18 mm (N = 7). The general pattern resembles that of male, but head, torax, and abdomen yellow, forewing also yellow, with dark brown markings. Hind wing yellowish white.

Male genitalia. Uncus long, narrow, laterally flattened, incurved, with acute claw-like apex. Tegumen long, V-shaped. Juxta rather narrow, W-shaped with a deep recess medially, markedly sclerotized. Saccus rounded and rather narrow. Valve long and broad, costa markedly sclerotized, with long, finger-like medial process directed ventrally, and slightly curved and apically pointed medial costal extension; medial membranous lobe of valve broad; sacculus narrow, strongly sclerotized, slightly setose, with short and thick distal process curved dorsally, basal saccular process absent. Aedeagus short and broad, straight. Vesica large, broad; basal diverticulum small, sack-like, membranous; 1st medial diverticulum rather large, broad, sack-like, membranous, with dense scobination proximally; 2nd medial diverticulum very large, broad, sack-like, membranous, distally with sparse scobination, and with two fields of thick, short cornuti of different size; 3rd medial diverticulum long, broad, with dense scobination; 4th medial diverticulum short, sack-like, tapering distally, with dense scobination.

Figure 3. Specimens of Albarrania podbolotskayae gen. & comb. nov. (upper side), West Flores, Indonesia. (A) Male paratype [RMBH no. Sph0733]. (B) Female paratype [RMBH no. Sph0731]. Scale bar = 5 mm. (Photos: V. M. Spitsyn).
**Female genitalia.** Ovipositor narrow, conical; papillae anales (ovipositor lobes) broad, short, apically rounded, covered densely with short fine setae; apophyses anteriores and posteriores elongated, thin, of the same length. Antrum broad, funnel-shaped, sclerotized laterally, with large lateral rounded lobes; ductus bursae long, cylindrical, membranous, with narrow anterior section. Corpus bursae elongate-elliptical, sack-like, with dense granulation, appendix bursae broad, with two large sack-like lobes thickly covered with strong spinulose scobination.

**Distribution.** Sumbawa (type locality), Lombok (Holloway 1982) and Flores (first record).

**Comments.** Our series from the West Flores fits well with the original description (Rothschild, 1913) and re-description of Hampson (1914). The morphology of aedeagus and vesica agrees with a brief description of Holloway (1982).

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**Figure 4.** Male and female genitalia of *Barsine dohertyi* and *Albarrania podbolotskayae* gen. & comb. nov., West Flores, Indonesia. (A) *B. dohertyi*, male genitalia [RMBH no. Sph0773]. (B) *B. dohertyi*, aedeagus (ae) with vesica everted: *bd* – basal diverticulum, *md1*, *md2*, *md3*, and *md4* – 1st, 2nd, 3rd, and 4th medial diverticulum, respectively, *bp* – basal plate of ductus ejaculatorius [RMBH no. Sph0773]. (C) *B. dohertyi*, female genitalia [RMBH no. Sph0775]. (D) *A. podbolotskayae*, holotype male genitalia [RMBH no. Sph0682]. (E) *A. podbolotskayae*, holotype aedeagus with vesica everted [RMBH no. Sph0682]. (F) *A. podbolotskayae*, paratype female genitalia [RMBH no. Sph0683]. Scale bars = 1 mm. (Photos: V. M. Spitsyn).
Genus *Albarrania* Bolotov, Spitsyn & Kondakov gen. nov.
Type species: *Barsine podbolotskayae* Spitsyn & Bolotov, 2018

**Etymology.** This genus is named in honor of Mr. Mikel Albarran Valle, an enthusiastic amateur naturalist, who lives on Flores Island.

**Diagnosis.** The primary autapomorphic features of this novel genus are in the male genitalia structure: a dorsally directed, robust, spine-like central costal process of the valve and a bundle of dorsally directed, long setae proximal to it (vs lack of such features in *Barsine*).

**Distribution.** West Flores.

**Comments.** A new monotypic genus for *Albarrania podbolotskayae* gen. & comb. nov.

*Albarrania podbolotskayae* (Spitsyn & Bolotov, 2018) gen. & comb. nov.
= *Barsine podbolotskayae* Spitsyn & Bolotov, 2018: 106, figs. 1-2.
Figs. 3A-B, 4D-F

**Type series.** Holotype male no. RMBH Sph0682; paratypes: 3♂, 2♀ [vouchers nos. RMBH Sph0683, Sph0731, Sph0732, Sph0733 and Sph0734]; in the type collection of the RMBH – Russian Museum of Biodiversity Hotspots, Federal Center for Integrated Arctic Research of the Russian Academy of Sciences, Arkhangelsk, Russia.

**Type locality.** “INDONESIA, Lesser Sundas, East Nusa Tenggara, Flores Island: Sano Ngoang Lake, camp site, secondary mountain forest with old nutmeg trees on a hill slope, 8.7092° S, 119.9975° E, 21–22 January 2015, Bolotov leg.”.

**Distribution.** Known only from the type locality on the West Flores.

**Comments.** Spitsyn and Bolotov (2018) described and illustrated this species in detail.

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