

# Morphology of the preimaginal stages of *Carcinopyga lichenigera* C. Felder & R. Felder, 1874 (Lepidoptera: Erebiidae: Arctiinae)

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## Abstract

In this paper, we describe the preimaginal stages of *Carcinopyga lichenigera* C. Felder & R. Felder distributed in the mountain regions of eastern Afghanistan, northern Pakistan, and northwestern India (Ladakh; Jammu and Kashmir). Additionally, we illustrate adults of both sexes as well as their genitalia. Illustrations of female genitalia are provided for the first time.

## Keywords

Larvae, Pakistan, biodiversity, ecology, biology, tiger moths

## Introduction

The genus *Carcinopyga* Felder, 1874 is widely distributed in the mountain systems of Central Asia and has a range from southern Kazakhstan in the north to northern Pakistan and northwestern India in the south (Dubatolov 2010). The genus comprises the following three species: *C. proserpina* (Staudinger, 1887) occurring in the mountain regions of southern Kazakhstan (western Tien Shan), Uzbekistan, Kyrgyzstan, Tajikistan, and eastern Afghanistan (spp. *lindti* Cerny, 1986 is distributed in Tien Shan); *C. gurkoi* Kautt & Saldaitis, 1997 known from Tajikistan and Afghanistan (Pamir); and *C. lichenigera* C. Felder & R. Felder, 1874 distributed in the mountain regions of eastern Afghanistan, northern Pakistan, and northwestern India (Ladakh; Jammu and Kashmir) (spp. *nuytenae* de Freina, 1982 is known from Khyber Pakhtunkhwa Province, Pakistan) (Dubatolov 2010; de Freina 1982; Kautt and Saldaitis 1997). Due to a scarcely accessible range and geopolitical problems, *C. lichenigera* is the least studied species in the genus and data on the morphology of its preimaginal stages remained hitherto absent. In this paper, we describe and illustrate the preimaginal stages of *C. lichenigera*. Additionally, we provide photos of the male and female genitalia. Previously, the drawings of the male genitalia were presented in de Freina (1982) and Kautt & Saldaitis (1997). The female genitalia are illustrated for the first time.

## Materials and methods

The study is based on material from the collection of the Russian Museum of Biodiversity Hotspots (RMBH), the N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences (Arkhangelsk, Russia). The genitalia were dissected, mounted on temporary glass slides with 70% ethanol, and photographed using a Leica M165C stereomicroscope with a FLEX-ACAM C1 digital camera, then preserved in glycerin in microtubes pinned to the specimens. Images of the eggs, the 1<sup>th</sup> and 2<sup>nd</sup> instar larvae were taken using a Canon EOS 6D camera with a Canon MP-E 65mm f/2.8 1-5X Macro lens while the remaining instar larvae, pupae, and adults were photographed using a Canon EOS 7D camera with a Canon EF 100mm f/2.8L Macro IS USM lens.

Eggs were collected from a single female on August 16, 2022 in the village of Babusar, Pakistan. The larvae were reared in plastic containers. After reaching ca. 2 cm in size, they were transferred to cages with fine mesh. The larvae were fed on *Artemisia vulgaris* L., 1753 (Asteraceae) and the leaves were replaced with fresh ones daily.

## Results

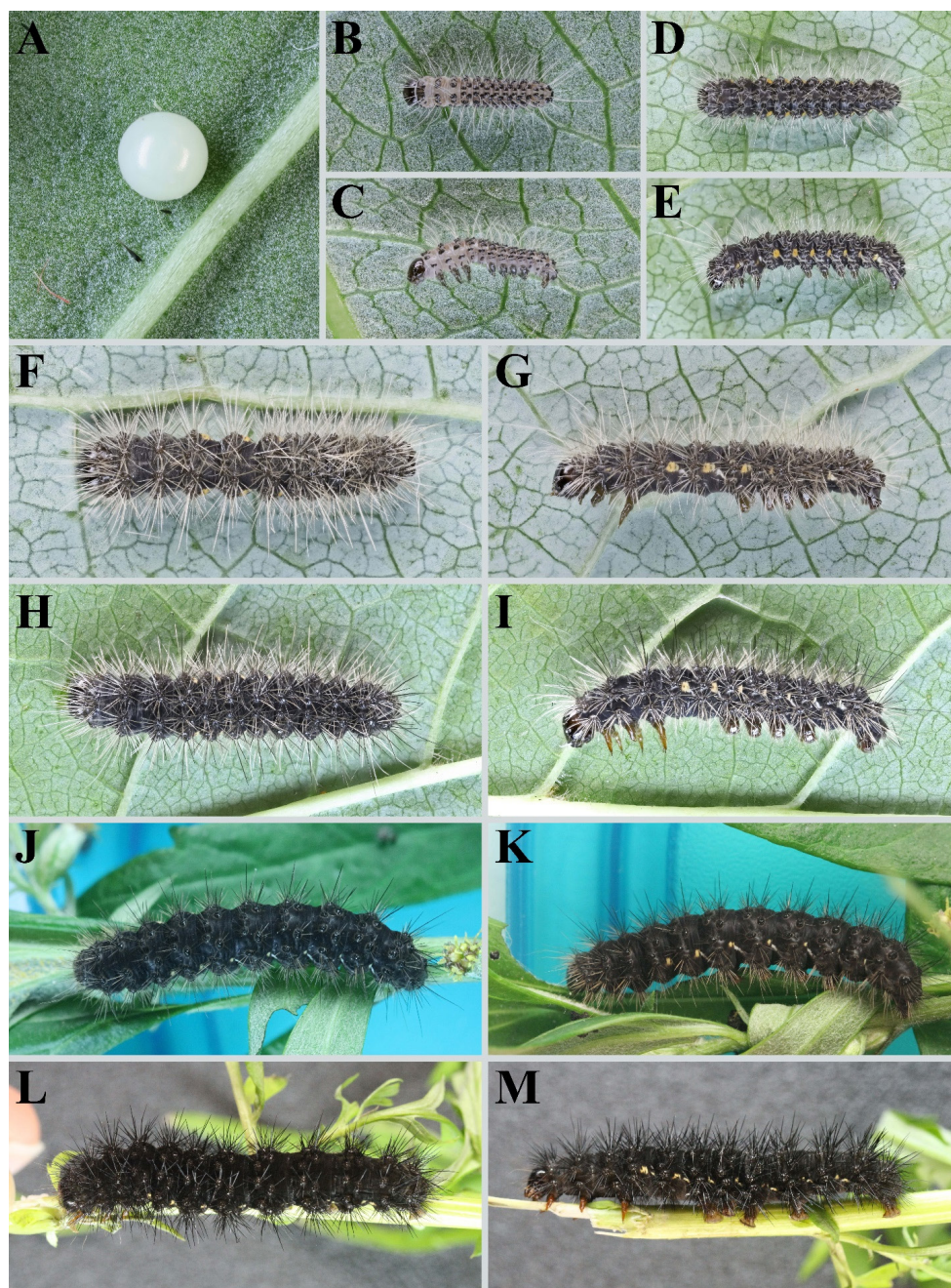
### *Carcinopyga lichenigera* C. Felder & R. Felder, 1874

Figs 1–3

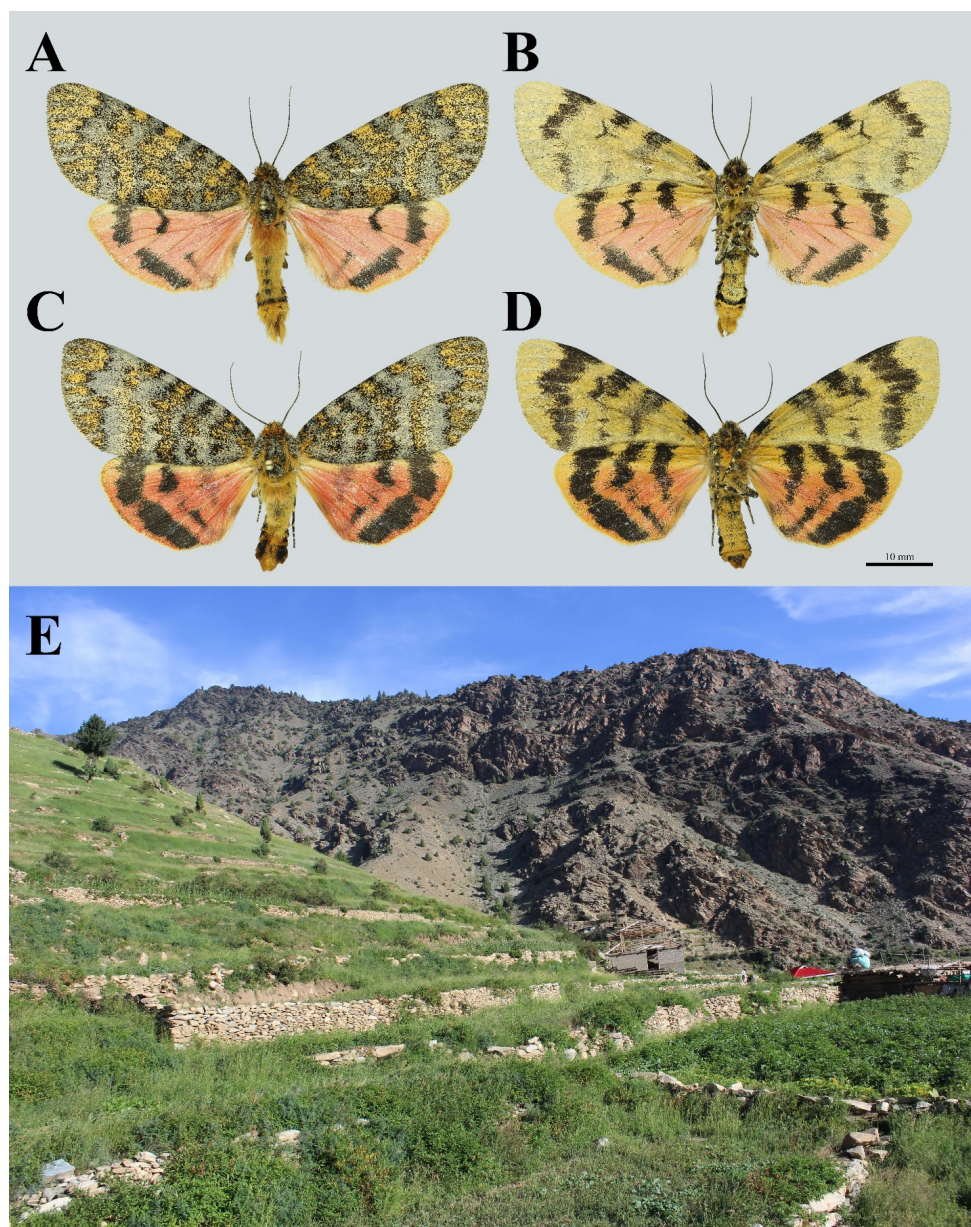
**Material examined:** PAKISTAN: Babusar village, dry mountain meadows, h 3020 m, 35°12'07"N, 74°02'44"E, 10–11.viii.2022, V. Spitsyn leg. – 5♂; Astore, meadows with deciduous trees, h 2543 m, 35°14'55"N, 74°54'07"E, 13–15.viii.2022, V. Spitsyn leg. – 2♂; Babusar village, dry mountain meadows, h 3020 m, 35°12'07"N, 74°02'44"E, 15–16.viii.2022, V. Spitsyn leg. – 5♂3♀; Gilgit Baltistan, Astor River, Chilam, h ~ 3050 m, 35°08'N, 75°02'E, 01–04.viii.2019, Evdoshenko & Siniaev leg. – 1♂.

**Morphology of the preimaginal stages:** The egg incubation period takes 5–6 days. **L1:** length at hatching 2 mm; length before first molting 4 mm; head capsule black-brown; eyes black; prothoracic shield black-brown; ground color gray-creamy; legs brown; thoracic segment T1 bears 6 black verrucae, while all remaining segments bear 10 to 16 black verrucae; verrucae with one or two long white hairs. **L2:** length after molting 4 mm, length before second molting 7 mm; head capsule black; ground color black; legs brown; ring-shaped gray suffusion at base of each verruca; verrucae black, larger than in L1 and having average of 4 to 8 white hairs; row of rounded yellow-orange spots running along body laterally (one row from each side). **L3:** length after molting 7 mm, length before third molting 10 mm; similar to L2, but differs by having larger black-brown verrucae and more numerous hairs; ring-shaped gray suffusion at base of each verruca less visible; elongated white spot situated near each lateral rounded yellow spot. **L4:** length after molting 10 mm, length before fourth molting 23 mm; similar to L3, but differs by having larger black-brown verrucae and more numerous hairs; hairs white, light gray, and dark gray; legs light brown, somewhat lighter than in L3; lateral rounded spots creamy-yellow. **L5:** length after molting 23 mm, length before fifth molting 27 to 32 mm; similar to L4; thoracic legs brown, abdominal prolegs creamy-brown; most hairs dark gray; lateral rounded spots smaller than in L4 and yellow-orange; elongated white spots narrower. **L6:** maximum length 50 mm; similar to L5; thoracic legs reddish-brown, abdominal prolegs light brown; verrucae larger; hairs black; lateral spots irregular, yellow-orange; spiracles black. **Pupa:** total length 25–27 mm; maximum width 8–9 mm; color dark brown; antennae and legs clearly visible; abdominal spiracles narrow, not rising above cuticular surface.

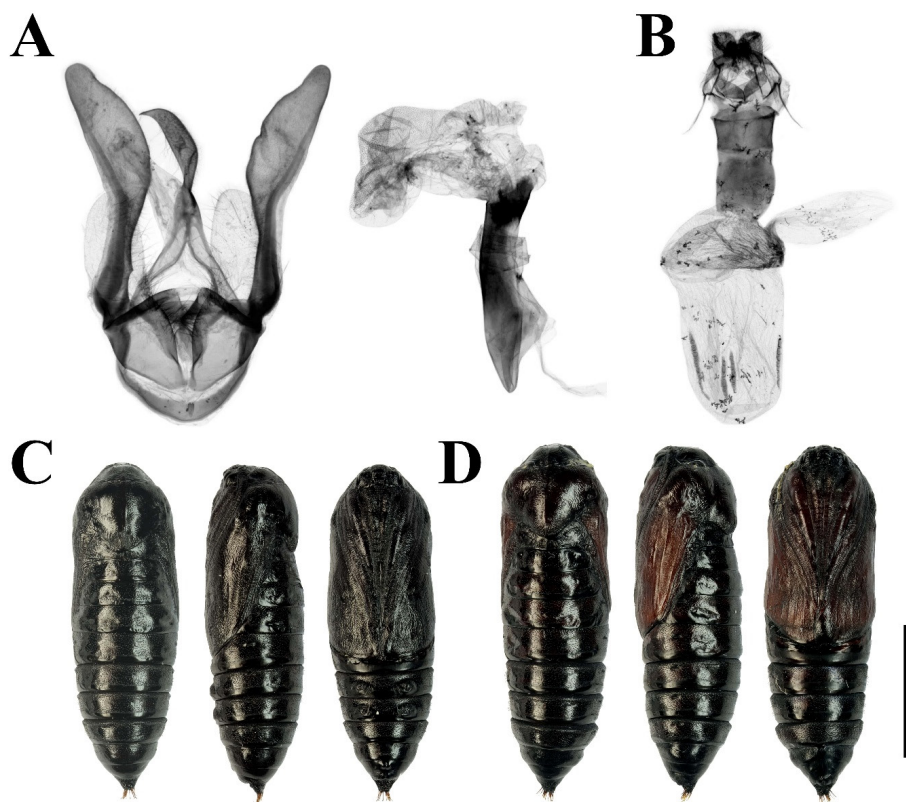
**Larval feeding in the breeding experiment:** The larvae fed on *Artemisia vulgaris* L., 1753 (Asteraceae).



**Figure 1.** Egg and larvae of *Carcinopyga lichenigera*: A – egg; B, C – first instar larva; D, E – second instar larva; F, G – third instar larva; H, I – fourth instar larva; J, K – fifth instar larva; L, M – sixth instar larva.



**Figure 2.** Adults and habitat of *Carcinopyga lichenigera*: A, B – male; C, D – female; E – habitat.



**Figure 3.** Genitalia and pupae of *Carcinopyga lichenigera*: **A** – male genitalia; **B** – female genitalia; **C** – male pupa (dorsal, lateral, and ventral views, respectively); **D** – female pupa (dorsal, lateral, and ventral views, respectively). Scale bar = 10 mm (for pupae).

## Acknowledgements

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