

## A new *Catocala* species (Lepidoptera, Noctuidae) from China

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**Abstract** A new species, *Catocala seibaldi*, from China is described. The new species clearly differs from externally close *C. butleri* Leech, 1900, *C. patala* Felder & Rogenhofer, 1874 and *C. formosana* Okano, 1958 by genitalia and DNA structure. The holotype of the new species is preserved in the collection of Nature research Centre Vilnius (Lithuania). The lectotype for *C. butleri* Leech, 1900, is designated.

A series of *Catocala* collected by E. Kučera, a Czech entomologist, in Shaanxi province China in 2000 and 2009 included a number of specimens that appeared similar to *Catocala butleri*. Further investigation of this series by the authors, including a review of the genitalia and *C. butleri* type material from the BMNH, revealed that a new species of *Catocala* is existing sympatrically with *C. butleri* in China (Ishizuka, 1986).

Abbreviations of depositories: AFM – collection of Alessandro Floriani (Milan, Italy); ASV – collection of Aidas Saldaitis (Vilnius, Lithuania); BMNH–The Natural History Museum, London; NRCV–Nature research Centre (Vilnius, Lithuania); HSV–collection of Helmut Seibald (Vienna, Austria).

### *Catocala seibaldi* Saldaitis, Ivinskis & Borth, sp. nov.

Holotype: ♂, China, Shaanxi, Lueyang, 26.6.–6.7.2009, leg. E. Kučera (deposited in collection of NRCV). Paratypes: 3 males, 1 female, the same data as the holotype, 1 male, China, Shaanxi, Lueang, 25.6–28.6.2000, leg. E. Kučera. Paratypes are deposited in BNHM and private collections of AFM, ASV and HSV.

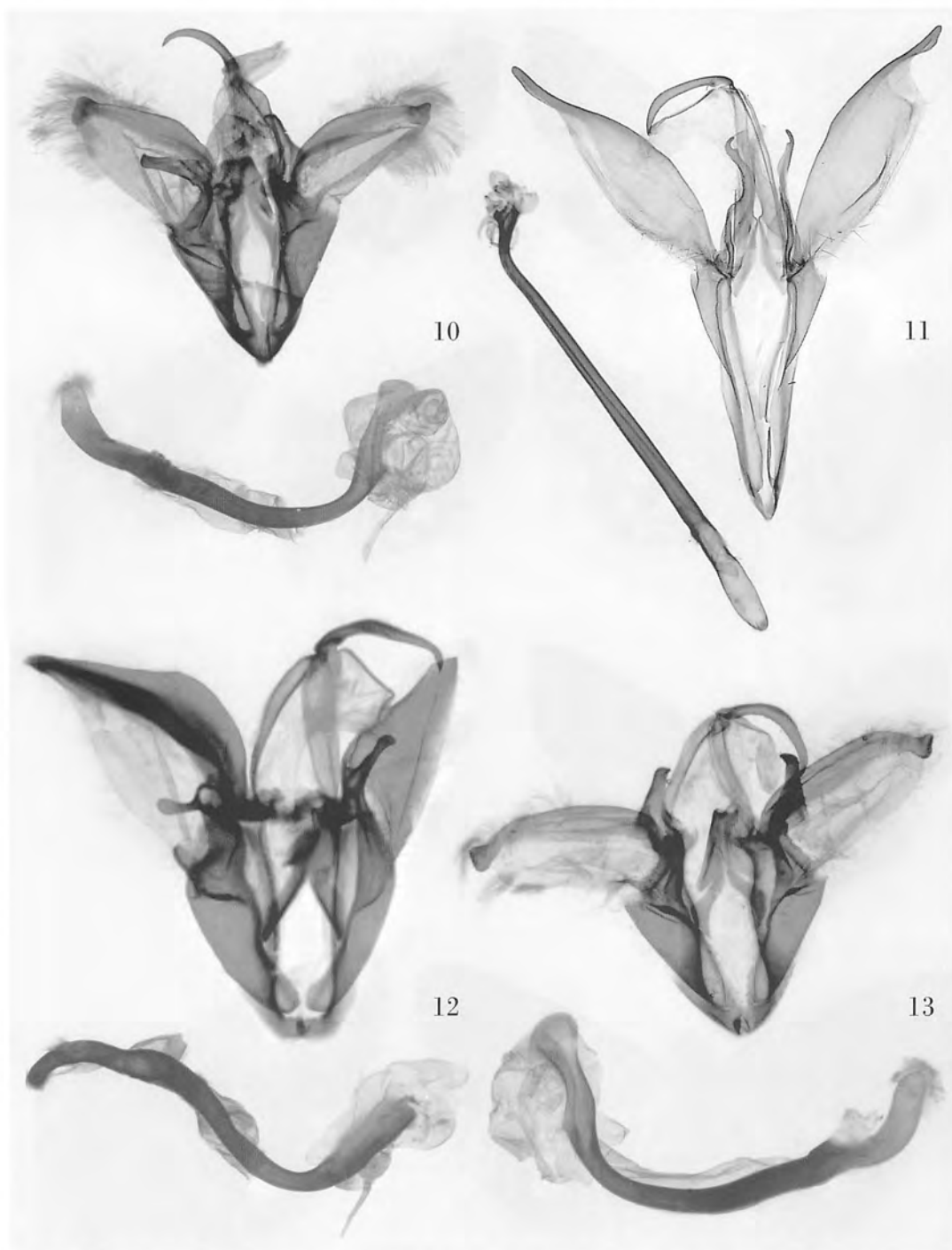
Description. Holotype (Fig. 1) forewing length 30 mm (paratypes 27–32 mm), wing span 68 mm (paratypes 58–68 mm). Forewing pattern is typical of the genus *Catocala*. Characteristic features of *Catocala seibaldi*: head, patagium and tegulae brown, abdomen dirty orange, forewings dark brown; wing pattern lines indistinct. Postmedial line with two long teeth, the black dash extends from the upper to marginal edge, hindwings orange; median black band forming a complete loop from wing base, subterminal band very broad, orange area between subterminal band and median band wide in the anal part forming two separate orange patches. Ventral surface: orange with black bands, typical of the *Catocala* genus.

Male genitalia (Fig. 10). Asymmetrical, uncus curved, scaphium slightly sclerotised and mandibulate with uncus. Valvae asymmetrical, only costal margin sclerotized. Right valva sclerotization visibly wider than left valva. Costa of right valve with blunt apex, slightly bilobed, harpe strong with rounded apex. Costa of left valve with hooked apex, harpe pointed at external angle of apex. Anterior part of juxta straight, tapering. Aedeagus hooked in the apical and distal portions, the apical part forming straight angle hook, widening towards apex, concavate.

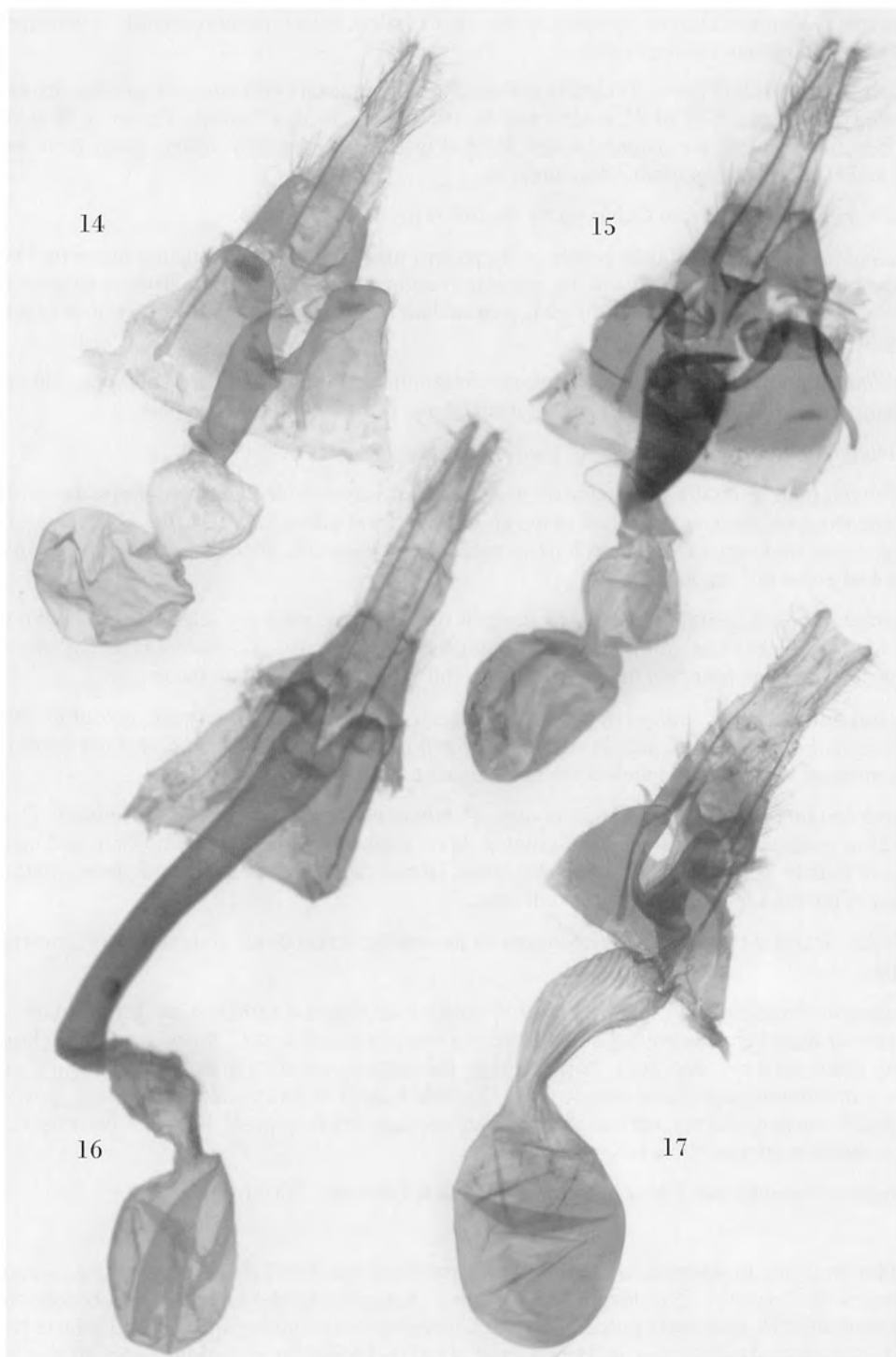
Female genitalia (Fig. 14) Papilla analis with long hairs, apophysis posterioris almost twice as long as anterioris and widening in apex. Postvaginal plate narrow, distinctly wasted at the middle, lodix plate strongly sclerotised, the lateral margins straight, ostium with two rounded folds, ductus bursae the same length as antrum. Bursa composed of two parts: upper portion not sclerotised and at



Figs 1–9. *Catocala* spp., external view. 1: *C. seibaldi* sp. nov., holotype (NRCV); 2: *C. seibaldi* sp. nov., paratype, male (AFM); 3: *C. butleri* Leech, 1900, lectotype, male (BMNH); 4: *C. butleri* Leech, 1900, paralectotype, female (BMNH); 5: *C. butleri* Leech, 1900, male, China (ASV); 6: *C. patala* Felder & Rogenhofer, 1874, male, China (AFM); 7: *C. patala* Felder & Rogenhofer, 1874, female, China (AFM); 8: *C. formosana* Okano, 1958, male, Taiwan (ASV); 9: *C. formosana* Okano, 1958, female, Taiwan (ASV).



Figs 10–13. Male genitalia, aedeagi extracted. 10: *C. seibaldi* sp. nov., holotype; 11: *C. butleri* Leech, 1900, lectotype; 12: *C. patala* Felder & Rogenhofer, 1874, Japan; 13: *C. formosana* Okano, 1958.



Figs 14–17. Female genitalia. 14: *C. seibaldi* sp. nov., paratype; 15: *C. formosana* Okano, 1958; 16: *C. butleri* Leech, 1900, China; 17: *C. patala* Felder & Rogenhofer, 1874, Japan.

junction with ductus seminalis forming to the small bullar, lower portion slightly sclerotised and significantly larger than the upper part.

Diagnosis. *C. seibaldi* (Figs 1, 2) clearly differs from the majority of *Catocala* species. Its external morphology resembles that of *C. butleri* Leech, 1900 (Figs 3–5), *C. patala* Felder & Rogenhofer, 1874 (Figs 6, 7) and *C. formosana* Okano, 1958 (Figs 8, 9), however it differs from them in wing pattern and especially its genitalic structures.

*Catocala seibaldi* differs from *C. butleri* by the following characteristics:

- 1) *C. seibaldi* wide forewing, dark brown, wing pattern lines indistinct, postmedial line with two long teeth, the black dash extending from the upper to marginal edge. *C. butleri* narrower forewing, with white-blue spots, antemedial band distinct, postmedial band with shorter teeth, without black dash running to marginal edge.
- 2) *C. seibaldi* hindwing orange area between subterminal band and median band wide and solid in the upper part, *C. butleri* hindwing band interrupted and forming two orange spots.
- 3) *C. seibaldi* abdomen dirty orange, *C. butleri* grey brown.
- 4) *C. seibaldi* male genitalia very massive, wide, costa of valvae wide and blunt, harpe massive, wide with flattened apex, aedeagus hooked in the apical and distal part, *C. butleri* (Fig. 11) costa of valve tapering, costa stick out valve, harpe long in apical part concavate, aedeagus straight, only in apical part hooked about 45° angle.
- 5) *C. seibaldi* female genitalia—the lateral margins of lodix plate strongly sclerotised, straight, ductus bursae the same length as antrum, bursa is composed of two parts. *C. butleri* (Fig. 16) the lateral margins of lodix plate rounded, ductus bursae sclerotised much longer than bursa.

*C. seibaldi* differs from *C. patala* in colour and pattern of forewing and hindwing, colour of abdomen and genitalia. Forewing of *C. patala* with light brown median band, with large, distinct tooth in anal margin directed at basal part, antemedial band distinct.

Hindwing brightly orange, anal margin orange. *C. patala* abdomen is lighter as *C. seibaldi*. *C. patala* (Fig. 12) in male genitalia valvae apex pointed, juxta branches wide, vinculum blunt, aedeagus “S” shape. In female genitalia (Fig. 17) lodix plate lateral patch in apex tapered, bursa bulb form, insertion of ductus seminalis in right lateral side.

*C. seibaldi* clearly differs from *C. formosana* in its smaller size, colour and pattern of forewing and genitalia.

*C. formosana* (forewing 39 mm, wingspan 85 mm)—forewing red brown with distinct dark area at costal part of wing between medial and postmedial bands. Genitalia of *C. formosana* male (Fig. 13)—costa of valve splaying into apex, harpe having the appearance of a bird beak, branches of juxta anterior part curved; genitalia of female (Fig. 15)—side branch of lodix plate are rounded, postvaginal plate slight waisted, ductus bursae shorter than antrum, lower part of bursa is prolonged, waist between different part of bursa is slight.

*C. formosana* recently was found in China (Ishizuka & Ohshima, 2003).

Molecular analysis. In addition to the morphological evidence, DNA corroborates the existence of a new species of *Catocala*. Full length 658 base pair ‘barcodes’ of the Cytochrome Oxidase Subunit 5’ Region (CO1-5P) gene were prepared by the University of Guelph’s barcode of Life Data Systems (BOLD) via methods described in Hebert et al. (2003). Molecular variation based on the Kimura two-parameter distance model for COI DNA barcodes between four specimens of *C. seibaldi* and seven specimens of *C. butleri* ranged between 4.90% and 5.06% and were even higher at 7.3% between *C. seibaldi* and *C. patala*. However, divergence rates between *C. seibaldi* and *C. formosana* were only 2.98%. No intra-specific variation occurred within our *C. seibaldi* or our *C. formosana* specimens while the maximum intra-specific variation within *C. butleri* was 46%. Genbank accession numbers are provided in Table 1.

Table 1. Voucher and GenBank numbers for barcoded individuals

<i>Catocala butleri</i>	QUNOB352-09	HM102209
<i>Catocala butleri</i>	QUNOC297-10	HM102219
<i>Catocala butleri</i>	QUNOC337-10	HM102218
<i>Catocala butleri</i>	QUNOC338-10	HM102217
<i>Catocala butleri</i>	QUNOC339-10	HM102216
<i>Catocala butleri</i>	QUNOC340-10	HM102215
<i>Catocala butleri</i>	QUNOC341-10	HM102214
<i>Catocala seibaldi</i>	QUNOC342-10	HM102213
<i>Catocala seibaldi</i>	QUNOC343-10	HM102212
<i>Catocala seibaldi</i>	QUNOC344-10	HM102211
<i>Catocala seibaldi</i>	QUNOC345-10	HM102210
<i>Catocala patala</i>	QUNOC312-10	HM102220
<i>Catocala formosana</i>	QUNOC138-09	GU678830

The lectotype for *Catocala butleri* Leech, 1900 is designated here for clarification and for taxonomic stability. In the original description, Leech (Proc. zool. Soc. Lond. 1900: 534) didn't designate the holotype for this taxon. A male and female from the original series are kept at the BMNH. One of them, male with the following labels (white circular with red ring (Type), white rectangle (Leech Coll. / 1900-64), white rectangle (Kwei-chow / (Province) / Native coll / June & July 1890), white rectangle, handwriting (*Catocala butleri* / Type ♂ sp. n.) is designated by us to be a lectotype with a red rectangle with black frame and printed text: LECTOTYPE / *Catocala butleri* / LEECH, 1900 / des. A. SALDAITIS & P. IVINSKIS, 2010). The second specimen, female should be therefore considered to be a paralectotype and is supplied with a corresponding red label.

Biology and distribution. Known from China. Only five specimens were collected in the Shaanxi province using artificial light source. At the same time there were collected other species of the genus *Catocala*: *C. butleri* Leech, 1900, *C. kuangtungensis* Mell, 1931, *C. largeitai* Oberthür, 1881, *C. duplicata* Butler, 1885, *C. columbina* Leech, 1900, *C. abamita* Bremer & Grey, 1853.

Etymology: Named after Helmut Seibald, a prominent expert on the Palaearctic Noctuidae.

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