

A new subspecies of *Catocala pudica* MOORE, 1879 (Lepidoptera: Noctuidae (sensu lato): Erebiniae) from Mongolia

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Abstract. We describe a new subspecies, *Catocala pudica sabine* **subspec. nov.** from western Mongolia, resending a significant northeastern range extension of *Catocala pudica* MOORE, 1879. *C. pudica pudica* **stat. nov.** is elevated to species rank. Adults and genitalia of both sexes for the new subspecies and its relatives are illustrated.

Key words

Catocala, new subspecies, Mongolia, taxonomy.

Introduction

A series of *Catocala* resembling *C. pudica* MOORE, 1879, but smaller and with paler hindwings, was recently collected at ultraviolet lights from three localities in western Mongolia. This allopatric Mongolian population is northeast of and geographically isolated from the known range of *C. pudica* and from its northern India type locality. It is unknown how disjunct these new occurrences are from the actual range of the nominate species so documented differences in wing pattern, genitalia, and COI 5' mitochondrial DNA are not currently sufficient to warrant higher status.

ISHIZUKA (1982) suggested that *C. pudica* may be a distinct species and not merely a subspecies of *C. puerpera* GIORNA, 1791. In their 2003 Palaearctic *Catocala* species list, however, GOATER et al. designated *C. pudica* as a "syn?" of *Catocala orientalis* STAUDINGER, 1877. KLYUCHKO & MATOV (2006) and SALDAITIS et al (2008) had doubts about the ranking of *C. orientalis* and KONONENKO (2010) synonymized it with *C. puerpera* (= *orientalis* STAUDINGER, 1877) and designated *C. pudica* as a synonym of *C. puerpera*. Much of the taxonomic confusion arises from the extreme variability of *C. puerpera*, which varies in size and color, having forewings deviating from pale grey brown to dark blackish brown and hindwings from yellow to orange red. *C. pudica* has a more uniform pattern and evenly colored forewings with indistinct transverse lines compared to *C. puerpera* which has extensive fine irroration on its forewings and a rounded reniform more clearly outlined in black.

The wingspan and genitalia of *C. pudica* average about 1.3 times larger than *C. puerpera*. *C. pudica*'s male genitalia have a longer valva, thicker and longer harpe and proportionally stronger uncus and female genitalia have a wider ostium, longer anterior part of the antrum, longer posterior part of the ductus bursa and more elongated posterior part of the corpus bursa than *C. puerpera*. We raise *C. pudica* **stat. nov.** to bona species level based on these wing pattern differences (Plate 1, figs 5, 6) correlated with genitalia differences (gen. figs 3, 4a) and two COI 5' character state differences: 289(G) and 562(C). The 5' region of the mitochondrial gene Cytochrome Oxidase Subunit I (658 base pairs) was sequenced by Paul Hebert's lab at the University of Guelph as described in Hebert et al (2003), with sequences aligned by eye in Mesquite version 2.75 (Madison & Madison 2011). The unique combination of diagnostic COI 5' characters for *C. pudica sabine* was obtained via the map characters function of WinClada (NIXON 2002).

Abbreviations of depositories

AFM = Alessandro FLORIANI (Milan, Italy); BMNH = British Museum Natural History, (London, England); JBN = Johann BRANDSTETTER (Neuötting, Germany); KIS = Katsumi ISHIZUKA (Saitama, Japan); NRCV = Nature Research Centre (Vilnius, Lithuania); OPB = Oleg PEKARSKY (Budapest, Hungary); RJB = Robert J. BORTH, (Milwaukee, U.S.A); ZSM = Zoologische

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Systematic part

Catocala pudica sabine subsp. nov.

(Plate 1, figs 1, 2; Plate 2, fig. 2; gen. figs 1, 2b, 4c)

Type material:

Holotype: ♂ (Plate 1, fig. 1), Mongolia West, Khovd, Buyant river, N 48°09.11', E 091°45.16', h-1270 m, 1–6.ix.2013, in ZSM collection.

Paratypes: 22 ♂♂ and 8 ♀♀ (Plate 1, fig. 2; Plate 2, fig. 2), with the same labels as holotype in the collections of AFM, JBN, NRCV, OPB, RJB, WSM and WIGJ; Slide Nos OP2616m, OP2617f; ♂, SW Mongolia, Gobi-Altai aimak, Dzhungarian Gobi, 40 km NW of Altai somon, 12.vii.2009, 1300 m, leg. R. YAKOVLEV, E. GUSKOVA, coll. R. YAKOVLEV, ♂, the same but 12.vii.2009, coll. A. VOLYNKIN, ♂, SW Mongolia, Gobi-Altai aimak, Dzhungarian Gobi, 15–20 km N of Alag-Nuur lake, Takhajehin-Gol river Valley, 11.vii.2010, 1300 m, 45°19'N, 94°28'E; leg. R. YAKOVLEV, E. GUSKOVA, coll. NRCV, Slide No. JB1704m; ♂ Mongolia, Govi-Altai aimak, 30 km SE. Bugat somon, 1250m, 5.vii.2003. CHURKIN S. leg, coll. KIS, Slide No. KJ090601b-1a3.

Diagnosis. *C. pudica sabine* differs from *C. pudica pudica* (Plate 1, figs 3, 4; Plate 2, fig. 1) by having a smaller wingspan, 56–64 mm versus 60–81 mm, grey-brown forewings with a faint yellowish tint versus grey-brown with a pinkish sheen, light orange-yellow hindwings versus pinkish-orange, more distinct transverse lines and a more variable and uneven hindwing marginal band. *C. pudica sabine* male genitalia (Figs 1, 2b) differ from those of *C. pudica pudica* (Fig. 2a) by being smaller with a shorter uncus, and having less pointed valvae and a narrower harpe. In *C. pudica sabine* the aedeagus is shorter and slightly narrower with a less curved caecum. Female genitalia of the new subspecies (Fig. 4c) are similar to *C. pudica pudica* (Fig. 4b) but are smaller with shorter apophyses anteriores, apophyses posteriores, and antrum.

Description. Wingspan 56–64 mm. Head, collar, tegulae, thorax and abdomen grey. Ground color of forewing grey irrorated with a few black scales. Forewing medium-long, dilated towards outer edge; costa straight; apex pointed. Wing pattern well expressed: basal line absent; subbasal line oblique, curved; antemedial line oblique, zigzagged; medial shadow dark, well developed; postmedial line curved, dentate; subterminal line dark, wide; terminal line as a row of tiny blackish dots. Hindwing ground color orange-yellow; medial black band moderately curved; subterminal band black, varying in width and uneven, in some cases broken at tornus forming separate small patch; apical patch small, narrow; fringe as ground color. Underside of forewings light-greyish and hindwings with orange-yellow tint.

Male genitalia (Figs 1, 2b): Uncus relatively short, narrow, evenly curved, apex with fine hook; tegumen as long as vinculum; juxta sclerotized, medium-sized arrowhead shape; vinculum with short saccus; valva slightly asymmetrical, elongated with rounded apex; costal margins heavily sclerotized. Harpe straight, heavily sclerotized, with club-like tip; aedeagus elongated, more or less cylindrical, medially curved; caecum evenly curved ventrally; carinal plate slightly curved, twisted; vesica globular, multidiverticulate, distal tube long with sclerotized section at base.

Female genitalia (Fig. 4c): Ovipositor relatively short; papilla anales elongated, strong, slightly hairy; apophyses posteriors two times longer than apophyses anteriores with long spatulate tips; apophyses anteriores short, straight; ostium bursae relatively wide, v-shaped; ductus bursae short, cylindrical with sclerotized posterior part and membranous anterior part; corpus bursae membranous with cylindrical upper part and globular main part.

Molecular analysis. Our molecular analysis which separates *C. puerpera* from the related *C. pudica pudica* and *C. pudica sabine* is based on COI 5' Mitochondrial DNA. *C. pudica* and *C. puerpera* form a clade within a Salicaceae specialist group diagnosed by the following combination of seven character states: 157(C), 334(T), 451(C), 470(C), 532(C), 616(C) and 619(A). *C. puerpera* forms a clade diagnosed by the following combination of eight unambiguous synapomorphies: 37(G), 124(C), 206(C), 346(C), 427(C), 574(C), 646(C) and 652(C). Character state 37(G) shows no homoplasy in the data set. There were eight haplotypes represented from 13 *C. puerpera* samples, each differing by no more than two character states from its closest haplotype. It is worth noting that within these 13 samples were three specimens of *C. puerpera* (= *orientalis*) collected by Kari NUPPONEN in the southern Urals of Russia which were within one base pair of *C. puerpera* sequences

from Hungary. *C. pudica* is diagnosable by the following combination of eight unambiguous synapomorphies: 103(C), 304(C), 352(C), 364(C), 391(C), 454(G), 463(C), 478(C), 508(G), 538(A) and 544(C). COI 5' results for *C. pudica pudica*, all from Tajikistan, were remarkably consistent with 28 specimens in one haplotype and only one in another haplotype diagnosed by non homoplastic character 125(A). Two sequenced specimens of *C. pudica sabine* differ from *C. pudica pudica* by the following unique combination of just two character states: 289(G) and 562(C). Of the 28 *C. pudica pudica* sequences, 27 are on GenBank including GU678711 and GU678713-GU678738. Five of the *C. puerpera* sequences are on GenBank including GU678706, GU678792, GU678806, GU678810 and GU678853.

Biology and distribution. All specimens were collected at ultraviolet light from 1–6 September 2013 in west Mongolia's Khovd Province except for two males collected in the adjacent Gobi-Altai region. The new subspecies was primarily collected in the Buyant river floodplain which is sparsely covered by Turanga poplar, oleaster and willow. Other *Catocala* species collected there at that time include *Catocala repudiata* STAUDINGER 1888, *Catocala pacta* (LINNAEUS, 1758) and *Catocala neonympha* (ESPER, [1805]).

Etymology: The new subspecies is named in honour of Mrs Sabine BRANDSTETTER of Neuötting who we consider "number one" in Germany.

Acknowledgements

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Plate 1



1.



OP2681m 61mm ♂

Catocala pudica sabine ssp. n., holotype, ♂



2.



OP2617f 61mm ♀

Catocala pudica sabine ssp. n., paratype, ♀



3.

PAKISTAN, Kashmir
Himalaya Mts, Bubin Valley
3280 m, 30. VII. 2011
leg. Italka Beneditk

OP2620m 73mm ♂

Catocala pudica pudica Moore, 1879, ♂



4.

Pakistan
Shandur pass
3-5.08.2004.
h-3200m
Giorno leg.

OP2621f 81mm ♀

Catocala pudica pudica Moore, 1879, ♀



5.

ITALIEN
FRIAUL, Alesso
5 - 11.8.2011
leg. W. BRUER

collection
O. Pekarsky

57mm ♂

Catocala puerpera puerpera (Giorna, 1791), ♂



6.

ITALIEN
FRIAUL, Alesso
6 - 11.8.2011
leg. W. BRUER

collection
O. Pekarsky

63mm ♀

Catocala puerpera puerpera (Giorna, 1791), ♀

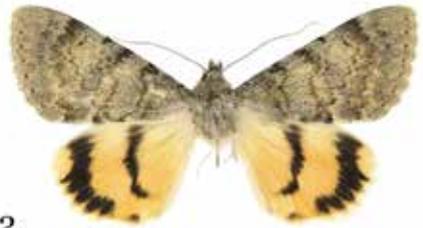
1. *Catocala pudica sabine* subspec. nov., holotype, ♂, Mongolia West, Khovd, Buyant river (coll. ZSM);
2. *Catocala pudica sabine* subspec. nov., paratype, ♀, Mongolia West, Khovd, Buyant river (coll. NRCV);
3. *Catocala pudica pudica* MOORE, 1879, ♂, Pakistan, Kashmir, Bubin Valley (coll. NRCV);
4. *Catocala pudica pudica* MOORE, 1879, ♀, Pakistan, Shandur pass (coll. NRCV);
5. *Catocala puerpera puerpera* (GIORNA, 1791), ♂, Italy, Friaul, Alesso (coll. OPB);
6. *Catocala puerpera puerpera* (GIORNA, 1791), ♀, Italy, Friaul, Alesso (coll. OPB).



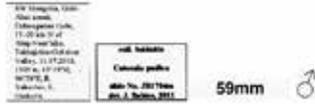
1.



Catocala pudica pudica Moore, 1879, holotype, ♂



2.



Catocala pudica sabine ssp. n., paratype, ♂

1. *Catocala pudica pudica* MOORE, 1879, holotype, ♂, Kashmir, Lasdak, Paskyam (coll. BMNH)
2. *Catocala pudica sabine* **subspec. nov.**, paratype, ♂, SW Mongolia, Gobi-Altai aimak, Dzhungarian Gobi, 15–20 km N of Alag-Nuur lake (coll. NRCV);

Genitalia Figures



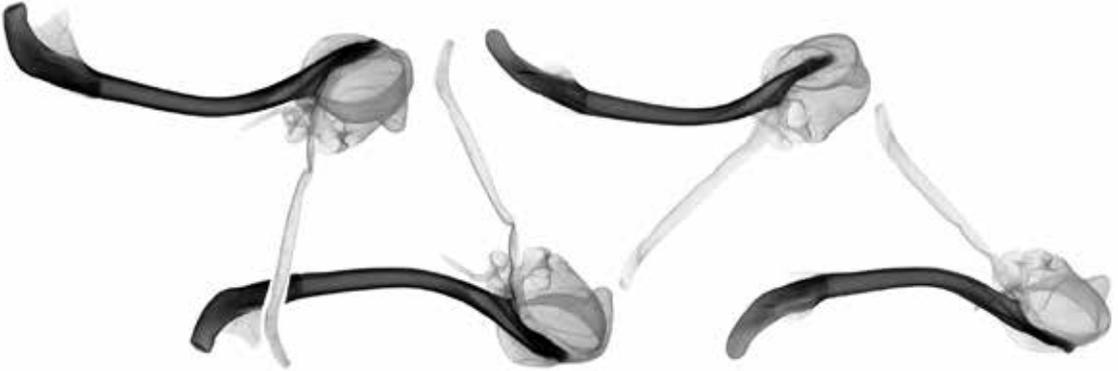
Fig. 1. *Catocala pudica sabine* **subspec. nov.**, holotype, ♂



A.



B.



PAKISTAN, Kashmir
Himalaya Mts, Rubin Valley
3200 m, 30. VII. 2011
leg. Balázs Benedek

OP2620m 73mm



Mongolia West
Khovd,
Buyant river
N 48°08.11'
E 091°45.58'
h: 1270 m.
01-06.Ix.2013.

OP2616m 59mm



Fig. 2.

- A. *Catocala pudica pudica* Moore, 1879, ♂
B. *Catocala pudica sabine* **subspec. nov.**, paratype, ♂



I. TALLER
FRIALL, Amedeo
8. 11. 2011 collection OP2682m 57mm ♂
Ing. W. BRUER O. Pekarsky

Fig. 3. *Catocala puerpera puerpera* (GIORNA, 1791), ♂

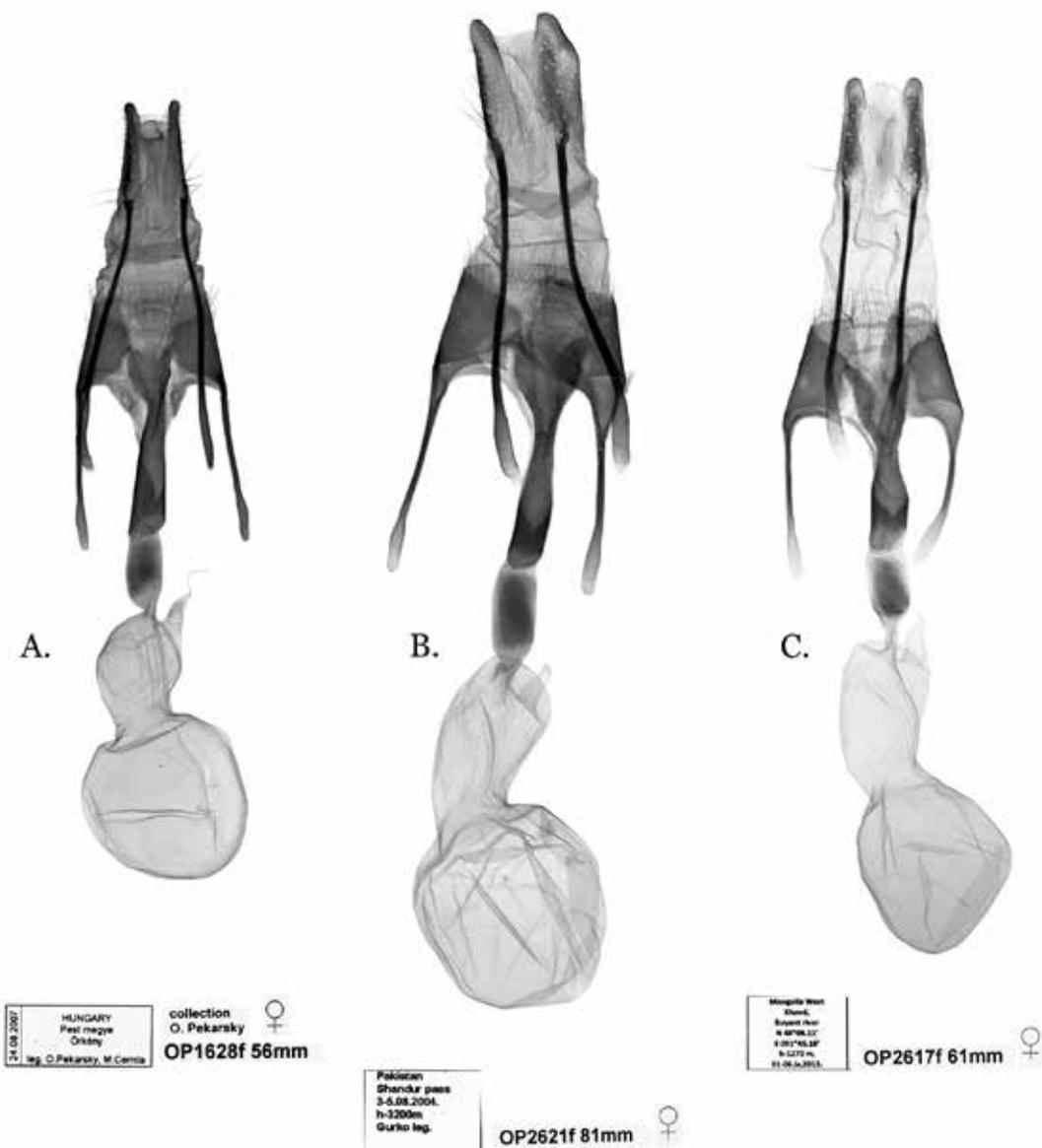


Fig. 4.
 A. *Catocala puerpera puerpera* (GIORNA, 1791), ♀
 B. *Catocala pudica pudica* MOORE, 1879, ♀
 C. *Catocala pudica sabine* **subspec. nov.** paratype, ♀