

On the taxonomy of the *Lygephila* BILLBERG, 1820-*Autophila* HÜBNER, [1823] -*Apopestes* HÜBNER, [1823] generic complex (Lepidoptera, Noctuidae, Erebiniae) with the description of three new taxa and *Katyusha* raised to generic status

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Abstract

The genera *Lygephila* BILLBERG, 1820, *Autophila* HÜBNER, [1823] 1816 and *Apopestes* HÜBNER, [1823] 1816 are revised. Two new species, *Lygephila vargai* spec. nov. (China, Yunnan), and *Lygephila aphroditae* spec. nov. (China, Yunnan), plus one new subspecies *Autophila libanotica xsayarsa* subsp. nov. (Iran, Binaloud Mountains) are described. The status of the subgenus *Katyusha* KEMAL et KOÇAK, 2009 is discussed. The systematic relationships of the genera *Lygephila*, *Autophila* and *Apopestes* are discussed, on the basis of features of their external and genitalia morphology.

Key words

Noctuidae, Catocalinae, *Lygephila*, *Autophila*, *Apopestes*, new species, new subspecies, *Katyusha* stat. rev., China, Iran

Introduction

The higher taxonomy of the *Noctuoidea* has been changed (LAFONTAINE et SCHMIDT 2010) radically; the *Catocalinae* trunk is currently placed as a tribe of the subfamily *Erebinae* LEACH, [1815] within the wide sense family *Erebidae* LEACH, [1815]. In the present work this concept is followed and the *Lygephila*-*Autophila*-*Apopestes* generic complex is considered to belong in the tribe *Toxocampini* GUENÉE, 1852.

A general examination of *Toxocampini* (BABICS et RONKAY 2011, RONKAY 2009) proved the close relationships of the genera *Lygephila* BILLBERG, 1820, *Autophila* HÜBNER, [1823] and *Apopestes* HÜBNER, [1823]. The detailed characterisation of their morphological features and taxonomic diversity is provided in the present paper.

Because of this characterisation *Tathorchyncus* HAMPSON, 1894 treated as a genus distinct from *Lygephila*; additionally it is necessary to place *Lygephila longicoecum* KONONENKO et FIBIGER, 2008 within subgenus *Katyusha* KEMAL et KOÇAK, 2009 and to erect *Katyusha* as a genus distinct from *Lygephila* (see Taxonomic notes).

In this study the author deals only with three Palaearctic genera; Nearctic or Sub-Saharan relatives of the tribe are taken into consideration only when it seems to be appropriate. Therefore the aims of the present paper are as follows:

- 1, To define and to characterize the species-groups and revise their taxonomy of those present in the Palaearctic region;
- 2, To provide a key for all the species groups formed within the genera;
- 3, To list all the species in their respective species groups;
- 4, To diagnose and compare the new taxa discovered by the author and place them within the tribe.

Abbreviations

BJ – slide of János BABICS, Budapest
BMNH – British Museum Natural History, London
EIHU – Entomological Institute, Hokkaido Imperial University, Sapporo
HNHM – Hungarian Natural History Museum, Budapest
LS – Linnean Society, London
LSNK – Landessammlungen für Naturkunde, Karlsruhe
MNHP – Muséum National d'Histoire Naturelle, Paris

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NHMW – Naturhistorisches Museum, Wien
 NRS – Naturhistoriska Riksmuseet, Stockholm
 OMNH – Osaka Museum of Natural History, Osaka
 SZM – Siberian Zoological Museum, Novosibirsk
 ZFMK – Zoologisches Forschungsinstitut und Museum Alexander König, Bonn
 ZIN – Zoological Institute, Russian Academy of Science, St. Petersburg
 ZMHU – Zoologisches Museum der Humboldt Universität, Berlin
 ZMUH – Zoologisches Institut und Zoologisches Museum der Universität von Hamburg, Hamburg
 ZSM – Zoologische Sammlung des Bayerischen Staates, München

Morphology

The three genera under discussion, *Lygephila*, *Autophila* and *Apopestes*, form a compact clade, based upon their morphological and bionomical features: the characteristic features of the external morphology and genitalia of this clade, which are typical of the three genera are given below.

External morphology:

- head, thorax and abdomen covered with smooth, medium long, easily removable hair-like scales;
- antenna filiform in both sexes;
- head unremarkable, eyes large, globular, palpi slender, upturned;
- thorax relatively slender (*Lygephila*, *Autophila*) or somewhat robust (*Apopestes*);
- forewing more or less triangular, sometimes elongated, apically finely rounded or somewhat hooked (*Lygephila*), hindwing broad and rounded;
- forewing patterned characteristically in *Lygephila* and *Autophila*, strongly rippled in *Apopestes*;
- hindwing generally with distinct marginal suffusion.

Male genitalia

- uncus long and curved, middle third flared, especially in *Autophila* and *Apopestes*, or rather slender (mostly in *Lygephila*), usually hooked apically;
- tegumen more or less symmetrical in *Lygephila* and *Apopestes* or slightly asymmetrical (*Autophila*) with characteristic penicular lobes in *Autophila*;
- vinculum more or less absent, saccus well-developed, U-shaped, slightly sclerotised;
- valvae more or less symmetrical in *Autophila* and *Apopestes*, asymmetrical in *Lygephila*;
- sacculus well-developed with more or less parallel margins;
- harpe sclerotised, elongated but narrow, reaching or extending beyond the tip of the valva (*Lygephila*, *Apopestes*), but mostly quadrangular or only slightly elongated in *Autophila*;
- editum more or less absent in *Autophila*; weakly sclerotised, conical, slightly hairy in *Lygephila* and *Apopestes*;
- aedeagus elongated in *Lygephila* and *Apopestes*, or short (*Autophila*), cylindrical with fine, medium-long carinal plates with fine spinula fields or with ventrally sclerotised tooth-like carinal bars in *Autophila*;
- vesica everted ventrally in *Lygephila* and *Apopestes* but often dorsally in *Autophila*, with two to six variably shaped diverticula;
- vesica covered with characteristic spiculi fields;

Female genitalia

- ovipositor short, conical, papillae anales short, slightly rounded apically;
- apophyses posteriores thin, medium long and straight, apophyses anteriores somewhat broader but shorter than posteriores;
- ostium bursae (antrum) sclerotised, with variously developed, sinuous-wave shaped excision, variably broad;
- ductus bursae sclerotized, sometimes heavily so *Autophila* and *Lygephila*, tubular or funnel-shaped, anterior part membranous, variable in length;
- corpus bursae membranous, distal part usually distended, with characteristic signum (*Apopestes*) or signum-bands (*Autophila*);
- cervix (appendix-) bursae dorsal positioned, slightly helicoid.

Taxonomic notes

Tathorynchus has elongated and narrowly triangular, predominantly brown forewing without characteristic reniform stigma, but with submedian fold; collar and thorax concolorous brown. The male genitalia have characteristically large, triangular, heavily sclerotized harpe; terminal diverticulum of vesica composed of characteristic rasp-like cornuti-field. The female genitalia has a characteristic sclerotization on the cervix bursae. Because of these characters, the author considers *Tathorynchus* to be a genus distinct from *Lygephila*, and excludes it from this work.

Superficially, the subgenus *Katyusha*, as *L. (Katyusha) longicoecum*, is hardly distinguishable from other *Lygephila*, but the genitalia are distinctly different, and therefore the author raises *Katyusha* to generic status: *Katyusha* KEMAL et KOÇAK, 2009 **stat. rev.** The relevant characters are as follows: the new, at present monotypic genus differs conspicuously from *Lygephila* in features of the male and female genitalia (KONONENKO & FIBIGER 2008): in male genitalia, valve is characteristically triangular, heavily sclerotized, with notably elongated apex and relatively large sacculus; uncus relatively narrow and elongated, stripe-shaped. Aedeagus characteristically elongated, with narrow, conspicuously large and elongated coecum. In the female genitalia, ostium bursae more or less funnel-shaped with characteristically sinuous margins.

Bionomics

- the wings are held horizontal in resting position, with tips of forewings overlapping or one of the forewing more fully covered by the other one;
- the adults hibernate (*Autophila*);
- two annual generations (*Lygephila* and *Autophila*);
- host plants various Fabaceae

Lygephila – species of *Astragalus*, *Colutea*, *Coronilla*, *Lathyrus*, *Onobrychis* and *Vicia*

Autophila – species of *Genista*, *Hedisarum*, *Medicago*, *Onobrychis*, *Ulex* and other Fabaceae

Apopestes – species of *Cytisus*, *Genista*, *Lygos* and *Spartium*;

- the moths occur in a wide range of habitats:

- *Lygephila* species are found in the Northwestern Himalaya region (e.g. the *vicioides* species-line) and the Pacific coastal region (e.g. *maxima* species-line). There is also species-richness in the arid continental region, especially in the mountains of Asia Minor and the highlands of Iran (e.g. the *lusoria* species-line).

The northern, boreal forest region supports relatively few species, including *L. craccae* and some of the *L. procax*- and *L. ludicra* species-lines. Species are found from sea level to low and medium-high altitudes (1000-2000 m), mountain steppes, to the humid, mostly monsoonic higher mountain regions (up to 3500 m).

- *Autophila* species prefer the arid- and semiarid regions. Only one species, *A. inconspicua* (BUTLER, 1881), is known from the humid and boreal regions of the Russian Far East and Northern China (KONONENKO 2005)). No more than eight species have been found in the western part of Palaearctic Region. The genus ranges through the internal-continental, arid regions of Kopet-Dagh, Hindukush and Tien-Shan massifs, and reaches the Xinjiang Uygur Autonomous Region in northernmost China, with the endemic *A. eremochroa* BOURSIN, 1940. A large number of species occur commonly in the arid territories of Mongolia. The monsoonic Himalayan, Eastern and Southeastern Chinese mountain regions contain few, but characteristic species such as *A. curiosa* (KONONENKO & FIBIGER, 2008)).

- *Apopestes* species are widespread along the northern slopes of major massifs, connected to the shrubby deciduous forest semi-arid regions in the Palaearctic. The moths prefer low (1000-2000 m) to medium (2500 m) altitudes.

- the moths generally are strong fliers, and specimens are frequently observed and collected away from their usual habitat. Moths can be collected at ultraviolet-light at night, and species of *Autophila* and *Apopestes* conceal themselves in caves and dark recesses of old buildings, where they can be located with the aid of a torch..

Key to the genera

1. a, head and collar conspicuously black or intensely brown:.....*Lygephila*, 1.
b, head and collar concolorous with, or slightly darker than thorax:.....2.
2. a, hindwing with prominent marginal suffusion:.....*Autophila*, 13.
b, hindwing lacking marginal suffusion:.....*Apopestes*, 18.

Key to the species-groups

3. a, fairly large and robust body with triangular-shaped forewing:.....8.
b, slender to somewhat robust body:.....4.
4. a, somewhat robust body with elongated; triangular-shaped forewing:.....10.
b, slender body; with triangular-shaped forewing:.....5.
5. a, relatively small and slender body, forewing mostly dark chocolate brown, with characteristic darker costa, and costal margin:.....*procax* species-group.