Remarks on Tortricidae species with unknown and little known females

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Abstract. The females of *Cnephasia heringi* Razowski, 1958 and *Gypsonoma obraztsovi* Amsel, 1959 are described and illustrated. Females of *C. daedalea* Razowski, 1983 are associated with males of *C. hellenica* Obraztsov, 1956, resulting in a new synonymy: *C. daedalea* syn. n. of *C. hellenica*. The formerly unknown female of *Dichrorampha rilana* Drenowsky, 1909 is described and illustrated.

Introduction

In Tortricidae, as in many other insect groups, the morphology of the male genitalia is well-studied and frequently used for taxonomic and phylogenetic purposes, whereas the female genitalia often are less characteristic, receiving relatively limited attention. The females of many species are rarely collected in comparison with their conspecific males, and in some species females are still unknown. Consequently, many tortricid species are either incompletely described or their alleged females actually belong to different species.

Field research in Bulgaria over the last few years has resulted in abundant material for various members of the family Tortricidae, including females of four species that were unknown or dubiously assigned to their male counterparts. The purpose of this paper is to describe and illustrate the females of these species and discuss the taxonomic and/or nomenclatural implications of these discoveries.

Methods

Moths were collected by netting and sweeping with an aerial net in afternoon and twilight and by light-trapping. Several types of lamps were used for collecting at light: MBFT 160 W, "actinic" tubes 8 W and 13 W, and "blacklight" tubes 8 W, all powered by batteries and/or a generator. The material was spread immediately following its collection, and abdomens subsequently were dissected in the laboratory following the standard procedure of Robinson (1976). The material is preserved in the author's collection, a part of the entomological collection of the Faculty of Biology, Sofia University.

Results

Cnephasia heringi Razowski, 1958 — Figs 1, 2, 11

Material. **Bulgaria**, Struma valley, Rupite area near Petrich, the volcanic hill of Kozhuh, 200 m, N 41°27′39″ E 23°15′24”, 1♂ 13.vi.2008, leg. B. Zlatkov & O. Sivilov (coll. B. Zlatkov); Pirin Mts, near Ilindentsi, 470–540 m, N 41°39′05–10″ E 23°14′43–47″, 1♀ 14.vi.2008, leg. B. Zlatkov & O. Sivilov (coll. B. Zlatkov); 1♀ 3.vi.2012; 4♂♂, 3♀♀ 13.vi.2012.

Razowski (1958, 1959) described and illustrated the female genitalia of *C. heringi*, but later reversed his opinion (Razowski 2002), assuming that the illustrated females probably were not conspecific with the male of *C. heringi*. Thus the female of this species was in need of further investigation. Material collected recently from southwestern Bulgaria provided resolution to this problem. Males collected on several occasions from different localities were initially associated with a synchronous and syntopic female, the genitalia of which demonstrated similarity with the female genitalia of *C. heringi* illustrated by Razowski (1958). A longer series of male and female specimens (all collected on the same date and locality in 2012) confirmed that these females are indeed conspecific with the males of *C. heringi*.

Females are larger (forewing length 8.0–9.2 mm, median 8.4; n = 5) than males (forewing length 6.6–8.3 mm, median 7.5; n = 5). In both sexes the shape and markings of the forewing are very similar, with some variation (Figs 1, 2). The female genitalia (Fig. 11) have relatively slender lateral arms of the sterigma and a very short sclerite at the ostium with longer lateral parts. The colliculum is rather long, with a narrower and asymmetrical anterior end, ca. 1/2 the length of the entire ductus bursae, separated from the sterigma by a membranous area. The ductus seminalis originates from the anterior half of the portion of ductus bursae located between the colliculum and the corpus bursae. The signum is narrow, ca. 3/4 the length of the corpus bursae.

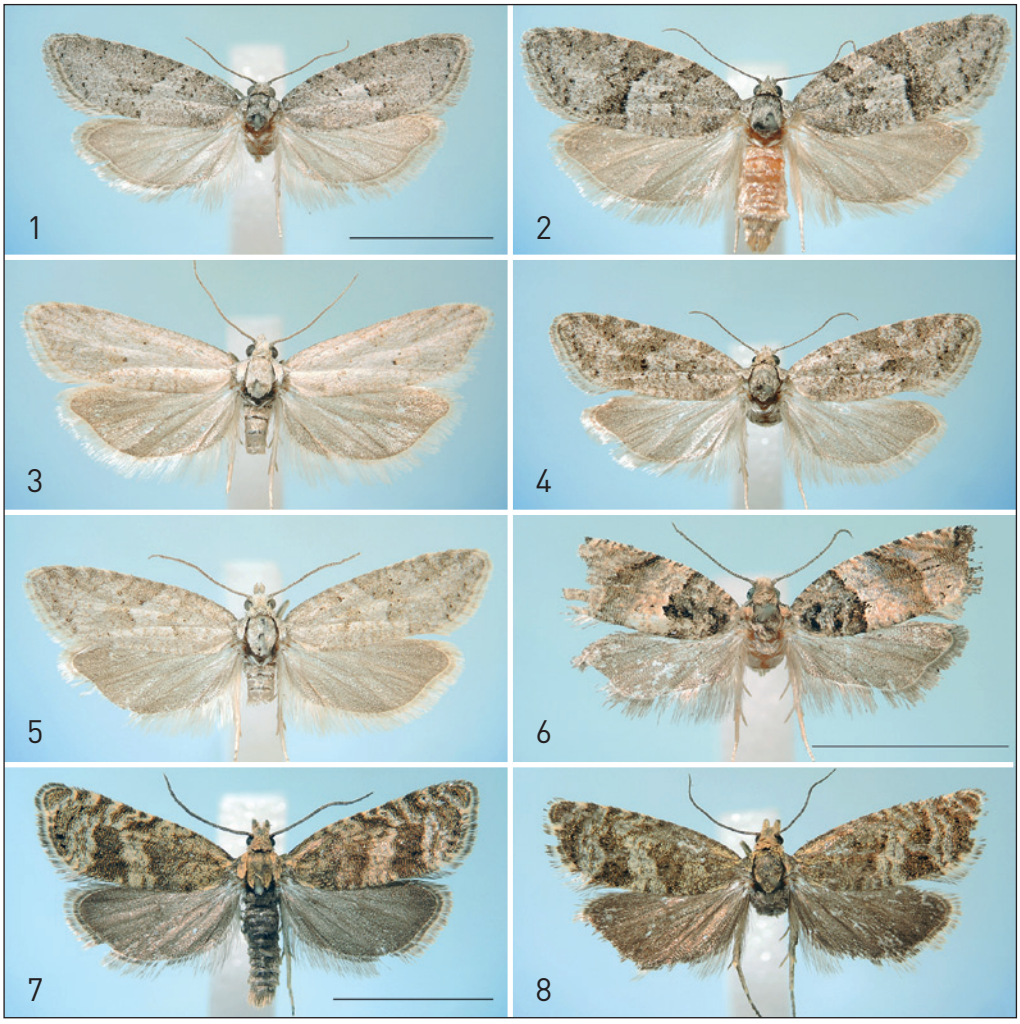
Habitat in Bulgaria: Dry, rocky areas up to 550 m a. s. l. in the southwestern part of the country.

Cnephasia hellenica Obraztsov, 1956 — Figs 3–5, 12

Cnephasia daedalea Razowski, 1983 **syn. n.**

Material. NE **Bulgaria**, Black Sea coast, Topola village near Balchik, 100 m, 1♀ 29–30.v.2010, leg. O. Karsholt (Zoological Museum of the University of Copenhagen); near Kaliakra Cape, Bolata place, 50 m, N 43°22′59″ E 28°28′03″, 7♂♂, 2♀♀ 24.v.2012, leg. B. Zlatkov & O. Sivilov (coll. B. Zlatkov).

C. helenica <sic> was described by Obraztsov (1950) from a single male collected in Greece. Obraztsov (1957) later emended the name to *hellenica*. The female was unknown until now. This species was reported recently from Bulgaria from males only (Beaumont 2011), which led me to search for females. In May 2012, I collected a long series of *Cnephasia* from a steppe habitat at the Northern Black Sea coast of Bulgaria. The characteristic male genitalia confirmed my supposition that they were *C. hellenica*, but among the series were two female specimens with the same wing pattern as male



Figs 1 – 8. Adults. **1, 2.** *Cnephasia heringi* Razowski, male (1) and female (2) (Bulgaria, Ilindentsi). **3 – 5.** *Cnephasia hellenica* Obraztsov, males (3, 5) and female (4) (Bulgaria, Kaliakra cape). **6**. *Gypsonoma obraztsovi* Amsel, female (Bulgaria, Primorsko). **7, 8.** *Dichrorampha rilana* Drenowsky, male (7) and female (8) (Bulgaria, Vitosha mountain). Figs 1 – 5 and 7 – 8 are proportional. Scale bar = 5 mm.

C. hellenica. However, the dissected female genitalia appeared identical with those of *C. daedalea* illustrated by Razowski (1983, 2002). *C. daedalea* was described from a single female from Sardinia (Razowski 1983), and no further localities were known until 2011. In fact Šumpich (2011) reported *C. daedalea* from Spain (as new to the Spanish fauna and first record for the European mainland) from two females and four males, and described the "unknown" male genitalia. It should be mentioned that *C. hellenica* was already known from Spain (Razowski 2002). However, the male genitalia illustrated by Šumpich (2011) are a perfect fit with those of *C. hellenica*. Based on these observations, I conclude that *hellenica* and *daedalea* are conspecific and that *C. daedalea* is a junior synonym of *C. hellenica*.

Figs 9, 10. Larval host plant and habitat of *Dichrorampha rilana* Drenowsky. **9.** *Achillea clusiana* Tausch (Bulgaria, Rila mountain, 5.vii.2012); inset: close-up of inflorescence (photograph by O. Sivilov). **10.** Habitat (Bulgaria, Rila mountain near Kalin summit, 2500 m a.s.l.) (photograph by O. Sivilov).

Females are smaller than males (forewing length 7.0–8.3 mm, median 7.6 mm; n = 3 in females and 7.4–8.5 mm, median 7.8 mm; n = 7 in males), with relatively narrower wings. Seemingly, they are rarely collected in comparison with the males. The wing markings are reduced in males, some specimens are nearly monochromous gray or whitish; in contrast, females have more distinct markings (Figs 3–5). Both the male and female genitalia are very characteristic; the male has a thorn-like process near the middle of the sacculus, and the colliculum of the female is wide, more or less reminiscent of a grape cluster (Fig. 12). The moths are active in late afternoon and at twilight and are also attracted to light.

Habitat in Bulgaria: Western Pontic steppes in the north-eastern part of the country near the sea coast where the very limited association *Paeonio tenuifoliae-Koelerietum brevis* (Tzonev et al. 2006) occurs.

Gypsonoma obraztsovi Amsel, 1959 — Figs 6, 13

Material. **Bulgaria**, Black Sea coast, Atanasovsko lake, 0 m, N 42°34′43″ E 27°29′39″, 1♀ 30.vii.2011, leg. S. Beshkov & M. Beshkova (coll. B. Zlatkov); near Primorsko, 0 m, N 42°17’00″ E 27°44′42″, 1♀ 30.vi.2009, leg. B. Zlatkov & R. Bekchiev (coll. B. Zlatkov).

This species was described from Asia (Iran) and subsequently reported from several European countries. It is a rare species and the females are found on rare occasions. Razowski (2003) mentioned that the female is unknown, but the same author (Razowski 1966) provided a schematic illustration and a very short description of the female genitalia of a specimen collected in Syria. Here I provide a more detailed description and illustration of the female of *G. obraztsovi* based on two relatively well-preserved specimens.

The wing pattern of the female resembles that of the male (Fig. 6). Forewing length 5.0–5.2 mm (median 5.1; n = 2). In the female genitalia (Fig. 13) the genital plate has round edges and a shallow incision at the distal edge. The sterigma is more or less ellipsoid, with a sclerotized ring around the ostium bearing lobes on both sides. The ostial

sclerite is weak, consisting of two parts, and the colliculum is trapezoidal. The ductus bursae is moderate, with a very short membranous posterior part preceded by a comparatively long wrinkled cingulum and a membranous anterior part with approximately the same length of the cingulum. The corpus bursae has two equal, large, flat signa with rounded ends. The ductus seminalis is inserted dorsolaterally at the proximal end of the cingulum.

Habitat in Bulgaria: Wet areas with *Salix* and *Populus* (Salicaceae) at low altitude in the southern parts of the country.

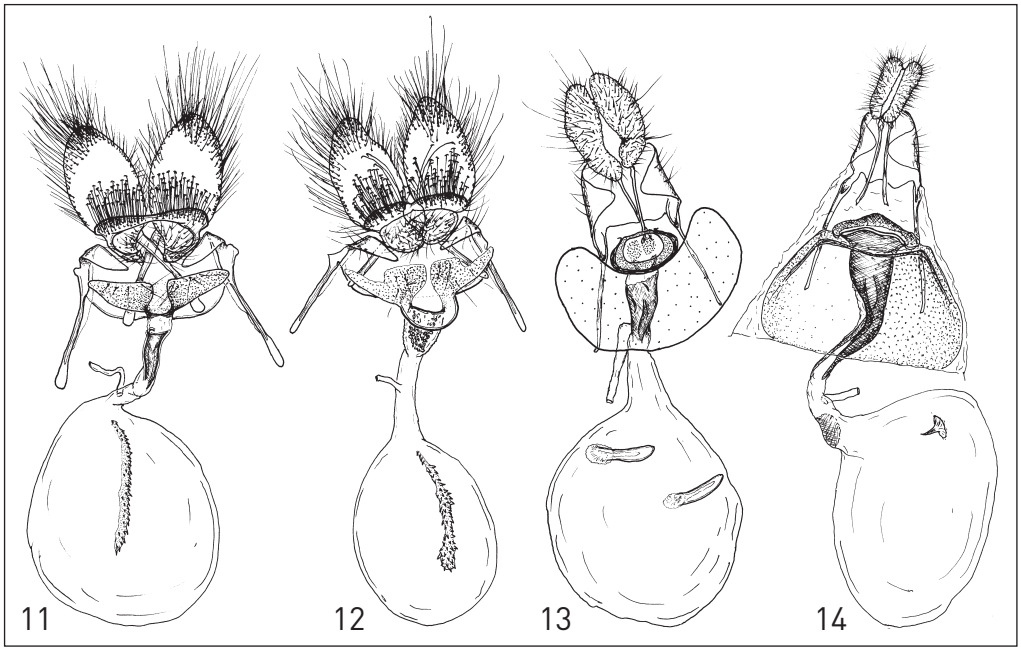
Dichrorampha rilana Drenowsky, 1909 Figs 7 – 10, 14

M a t e r i a l . **Bulgaria**, Rila Mts, above Borovets resort, the path Yastrebets-Musala, 2300 m, N 42° 13′15″ E 23° 34′43″, 1♀ 5.vii.2012, leg. B. Zlatkov & O. Sivilov (coll. B. Zlatkov); near Kalin summit, 2500 m, N 42°10’56″ E 23°15’33″, 1♀ 7.vii.2012, leg. B. Zlatkov & O. Sivilov (coll. B. Zlatkov); Vitosha Mts, the path Aleko-Cherni vrah, 2100 m, N 42°34′23″ E 23°17′05″, 2♀ 13.vii.2012, leg. B. Zlatkov (coll. B. Zlatkov).

This species was poorly known and of questionable taxonomic status for a long time. A recent study based on male specimens revealed that it is distinct (Huemer et al. 2012); however, the females remained unknown. Field work in Bulgaria resulted in the discovery of the female and some data on the biology of *D. rilana*.

For a detailed description of the male see Huemer et al. (2012). Females are slightly smaller than males, with forewing length 6.1 – 6.5 mm (median 6.3; n = 4), but the wing pattern is identical with those of the males (Figs 7, 8). In the female genitalia (Fig. 14) the subgenital (antevaginal) plate is trapezoidal with rounded anterior angles and weakly concave posterior margin. The sterigma is sclerotized, with a large lip-like, medially incised, anterior lobe and a narrow arched posterior part. The ostium is very wide followed by a sclerotized infundibular part of ductus bursae; the sclerotization is asymmetrical, with longitudinal folds, and bent to the left. The proximal 1/3 of the ductus bursae is membranous, with the ductus seminalis inserted nearby the sclerotized area. The signum is short. The female genitalia are considerably different from those of two closely related species, *D. ligulana* (Herrich-Schäffer, 1851) and *D. dinarica* Huemer, Zlatkov & Baixeras, 2012, especially in the shape of the sterigma.

The larval host plant of *D. rilana* was unknown, although it was presumed to be *Achillea* (Asteraceae). The most common representative of this plant genus occurring in the subalpine habitats of the moth in Rila mountains is *A. clusiana* Tausch (Fig. 9), which proved to be the food plant. Numerous individuals were collected by sweeping *A. clusiana* in the daytime. Other *Achillea* spp. were also searched for *D. rilana* without positive results, so the species is likely to be monophagous. The discovery of the food plant allowed targeted investigation for this species in two neighbouring mountain massifs: Pirin (the northern part) and Vitosha, and it was found in both. It should be emphasized that *A. clusiana* occurs only on siliceous soils and never on carbonate; correspondingly, *D. rilana* was found only on silicates. It is probable that the distributional range of this species is limited by the rock composition of the high mountain massifs – the middle and southern parts of Pirin consist of limestone, and *D. rilana* was not found there.



Figs 11–14. Female genitalia. **11**. *Cnephasia heringi* Razowski; **12**. *Cnephasia hellenica* Obraztsov; **13**. *Gypsonoma obraztsovi* Amsel; **14**. *Dichrorampha rilana* Drenowsky.

D. rilana does not appear to be a rare species at altitudes of 1800–2600 m, but it is closely associated with its food plant. The former impression of rarity arose from some behavioural features of the species. As a rule, the moths are not very active and fly occasionally for very short distance in late afternoon. Numerous flying individuals (males) were observed only once, just before sunset and under perfect weather conditions (calm weather and temperature about 18°C), which is rare at high altitudes in the highest Bulgarian mountains. Females were collected much more rarely than males (total of 26♂, 4♀). The species is now known from the Vitosha, Rila and Pirin mountains.

Habitat (Fig. 10): Subalpine herbaceous formations on siliceous soils, sometimes mixed with *Pinus mugo* Turra (Pinaceae), at altitude 1800–2600 m, with *Achillea clusiana*.

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