

The description of the female of *Ceratoxanthis rakosyella* WIESER & HUEMER, 2000 (Lepidoptera, Tortricidae), with notes on the genus *Ceratoxanthis* RAZOWSKI, 1960

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Summary: The adult female of *Ceratoxanthis rakosyella* WIESER and HUEMER, 2000 is compared to the male, the female genitalia is described and all are figured. Data are added to the knowledge of the species. Inconsistencies in the literature regarding the species of the genus *Ceratoxanthis* RAZOWSKI, 1960 are shown. Hypotheses of the authors referring to some taxa of the genus are discussed.

Key words: *Ceratoxanthis rakosyella*, Tortricidae.

Introduction

The West-Palaeartic genus *Ceratoxanthis* RAZOWSKI, 1960 currently comprises seven species, five of them were already treated in the latest monograph of the Palaeartic Cochylini (RAZOWSKI 2009: 58–59) and a further two were described later: *C. saratovica* TREMATERRA, 2010 from south-east European Russia, Saratov Province (TREMATERRA 2010: 20–23) and *C. giansalottii* BASSI, 2014 from Greece, Peloponnesus Peninsula, Corinzia, Kyllini Mountains (BASSI 2014). The latter was also recorded later from Greece, Magnisia, Pelion Mountains (Portaria, Chania) by TREMATERRA and COLACCI (2017: 469) and from Albania, Qark Gjirokastra, Rrjuga Cajupit by F. Graf (in Lepiforum). Most of them are only known from males, although the females of *C. externana* (EVERSMANN, 1844) and *C. giansalottii* are known. The distribution range of the individual species is usually restricted, some are only known from their type localities. Two species have each been recorded from widely separated countries, which we question, see Discussion.

Ceratoxanthis rakosyella WIESER and HUEMER, 2000 was described from Romania, Dobrogea, Hagieni forest (about 8 km W–SW of Mangalia), based on three males collected on 21.V.1995 and 18.VI.1996 (WIESER and HUEMER 2000: 5). It is still poorly known, only a few publications deal with the species. KOVÁCS and KOVÁCS (2007: 22) mentioned five further males from the type locality collected by L. Rákósy. BIDZILYA *et al.* (2014: 11) and KAVURKA *et al.* (2021: 13) recorded two males from the easternmost part of Ukraine, Luhansk region, Provallya (about 950 km NE of the type locality) and S. Demyanenko (in Lepiforum) illustrates one specimen. ZLATKOV and SIVILOV (2023: 309) provided data of two recently collected males from north-eastern Bulgaria, Dobrich

region, Kapitan Dimitrovo (about 70 km W–NW of the type locality). Additionally the species was mentioned also in the Romanian checklists (RÁKOSY *et al.* 2003: 79, 273; RÁKOSY and GOIA 2021: 68, 226). These data were also included in different European or world databases e.g. Fauna Europaea (KARSHOLT and NIEUKERKEN 2017) and T@RTS (GILLIGAN *et al.* 2018). The species is restricted to warm and arid steppe habitats at low altitude (Fig. 8). Its biology is unknown.

Material examined of *Ceratoxanthis rakosyella* WIESER and HUEMER, 2000

Romania: 1 ♂, Dobrogea, Mangalia, Hagieni, [43°48'N, 28°28'E], 28/29.V.2000, genit. prep. Rákósy 2421, L. Rákósy leg., S. & Z. Kovács coll.; 2 ♂, Dobrogea, Hagieni forest, 27.V.2007; 1 ♂, same locality as the previous, 3.VI.2014; 1 ♀, 2.VII.2015, genit. slide Buchner w3553; 13 ♂, 1 ♀, 22.VI.2016, genit. prep. Kovács 1916/♀ (= slide Buchner w3551), DNA sample ♀ TLMF Lep 32651 (658[0n]), all S. & Z. Kovács leg. & coll.

Description of the female

The wingspan of the two females varies between 16–19.5 mm, compared to the male the forewing is only slightly shorter and wider, pattern similar, hindwing slightly darker brownish-grey (Figs 1–2).

The female genitalia (Figs 3–7). Papillae anales narrow and 2/3 the length of segment VIII, densely covered with long setae. Apophyses posteriores strongly sclerotised, basally bulged and slender the remainder, slightly longer than segment VIII. Segment VIII longer than wide, trapezoidal (a conical frustum as shown in the free floating figures 5–7) and has a complex structure: posterior margin edged by

a row of long setae, dorsally thickened and strongly sclerotised, ventrally their sides are fused forming a weakly sclerotised funnel-shaped sclerite; anterior margin ventrally fused with sterigma, laterally, at the bases of apophyses anteriores, bears ear-like folds, dorsally thickened between the apophyses forming a wide semicircular concavity. Apophyses anteriores slightly shorter than segment VIII, strongly sclerotised, basally wide and slender, the remainder slightly divergent and with inwardly curved ends. Sterigma with lamella antevaginalis forming a posteriorly orientated finger-like process, anteriorly attached to lamella postvaginalis with weakly sclerotised lateral lobes; and the slightly sclerotised lamella postvaginalis fused with the antero-ventral edges of segment VIII. Ostium oval, at posterior end of the finger-like process. Ductus bursae a narrow membranous tube, as long as segment VIII, its posterior end fills the finger-like process. Corpus bursae is ellipsoidal, signum a slightly sclerotised ring-shaped sclerite in the posterior half of bursa. In the area encircled by the signum the following are connected: posteriorly the ductus bursae, postero-laterally the accessory bursa and ventrally the ductus seminalis. The internal surface of the corpus bursae is densely covered with a large group of minute thorns within the area surrounded by the signum, and outside the signum with a large group of large thorns dispersed densely in the left side and the median part of the bursa, in the right side only very few scattered thorns. On the external surface of the bursa 2–4 long setae are dispersed along the right side. The accessory bursa is 2/3 as long, 1/3 as wide and its narrow connection is 1/2 as long as the length of the bursa.

Additions and annotations to the knowledge of *Ceratoxanthia rakosyella*

In the original description the wingspan of the males was given as 17.5–18.3 mm; this varies between 17.5–21 mm in the males of the above mentioned material examined.

The hindwing of the male lacks the costal roll, which is in accordance with that already stated about the genus by PÉREZ SANTA-RITA *et al.* (2022: 6).

The current known range of the flight period is between 21 May and 2 July, males were collected in the period of 21 May and 22 June and females between 22 June and 2 July. It seems that females emerge much later than males.

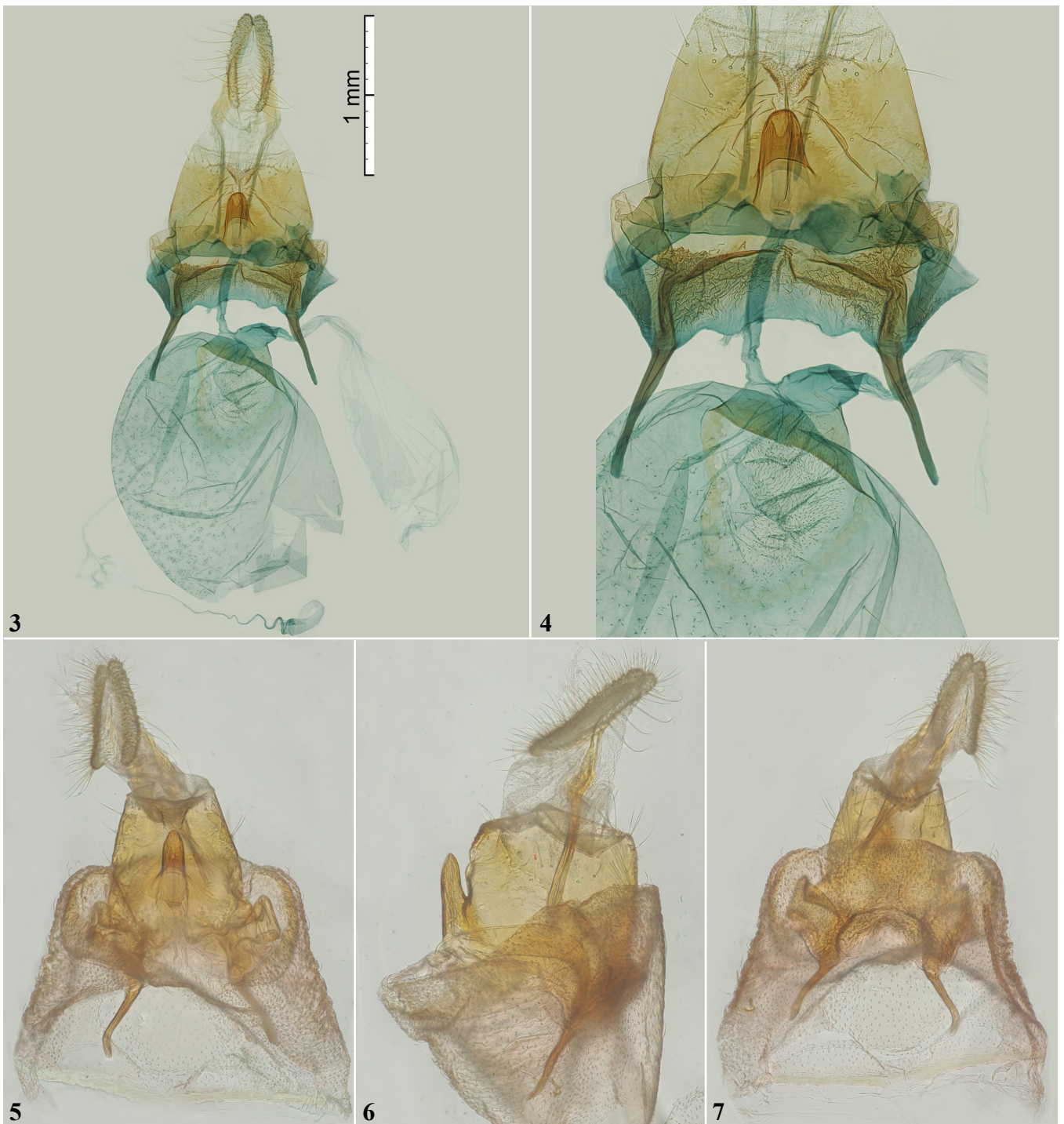
One female was sequenced and associated with the BIN BOLD:AEX4327 (BOLD). In the taxonomy browser of the BOLD figures also a sequence of *C. giansalottii*, but a comparison of the two taxa was not possible, because details of the latter are not available. Figure 9 shows the Neighbour-joining tree of *C. rakosyella* and public data of the European representatives of the related genera *Agapeta* HÜBNER, [1825] and *Fulvoclysis* OBRATSOV, 1943.

In the original description the Ch. Wieser collection in Klagenfurt is specified as the depository collection of the holotype (WIESER and HUEMER 2000: 5). Razowski (2009: 145 pl. 16) erroneously gives its collector and depository as “leg. & coll. L. Rákosi, Cluj-Napoca”. According to Ch. Wieser (pers. comm.) the holotype is currently deposited in the collection of the Landesmuseum Kärnten in Klagenfurt, Austria.

In the original description the juxta was described as having two processes: a short dorsal and a long lateral (WIESER and HUEMER 2000: 6). This approach was followed by RAZOWSKI (2009: 58). However, ZLATKOV and SIVILOV (2023: 310, fig. 1 C, E) interpreted them in a different manner: “the juxta bears flat triangular lateral processes pointed dorsally; the valva is modified with two long, rod-like lateral processes exceeding the length of the valva, with a longitudinal stripe and apex covered with acanthae (Fig. 1 E); the processes are basally connected with the processes of juxta and the juxta proper”. In our opinion the approach of WIESER and HUEMER (op. cit.) is correct. This opinion is based both on our personal observations of free floating genitalia and also on the genitalia figures of the holotype. In the latter the connection of the left valva with the juxta



Figs 1–2: Adults of *Ceratoxanthia rakosyella*, 1. female, Dobrogea, Hagieni forest, 22.VI.2016, genit. prep. Kovács 1916/♀ (= slide Buchner w3551), DNA sample ♀ TLMF Lep 32651 (658[0n]), S. & Z. Kovács leg. & coll., 2. male, same collecting data as the female; photographs P. Buchner.



Figs 3-7: Female genitalia of *Ceratoxanthia rakosyella*, 3-4: Dobrogea, Hagieni forest, 2.VII.2015, genit. slide Buchner w3553, S. & Z. Kovács leg. & coll., 3. general aspect in ventral view, 4. enlarged segment VIII, ductus bursae and signum of corpus bursae; 5-7: free floating papillae anales, segment VIII, apophyses and ductus bursae, same data as fig. 1, 5. ventral view, 6. lateral view, 7. dorsal view; photographs P. Buchner.

has been broken during the preparation (WIESER and HUEMER 2000: figs 3, 9), the valva became displaced from the juxta, but the long process was not, only the dorsal margin of the sacculus was damaged and both the basal margin of the valva and the long process were left unharmed. This means that the long process belongs to the juxta, it is its lateral part, and is not connected at all with the base of the valva, connections are only between the lateral margin of the juxta and the base of the sacculus. These inconsistencies in the terminology used for this process are present also in the descriptions of the other taxa of the genus,

probably all should be defined as being the process of the juxta.

Similarly, the process of the lateral part of the transtilla of the *Ceratoxanthia* species is defined differently, as part of the transtilla (BAIXERAS 1992: 295; WIESER and HUEMER 2000: 6; TREMATERRA 2010: 21; ZLATKOV and SIVILOV 2023: 310) or as part of the valva, under the names: dorso-basal process of valva (RAZOWSKI 1970: 230-233; 2002: 51; 2009: 58; ELSNER and JAROŠ 2003: 222; KOVÁCS and KOVÁCS 2007: 20) or basal costal process (BASSI 2014: 490). The correct approach is that it belongs to the transtilla.



Fig. 8. The habitat of *Ceratoxanthis rakosyella*, Dobrogea, Hagieni forest, 12.V.2016; photograph Z. Kovács.

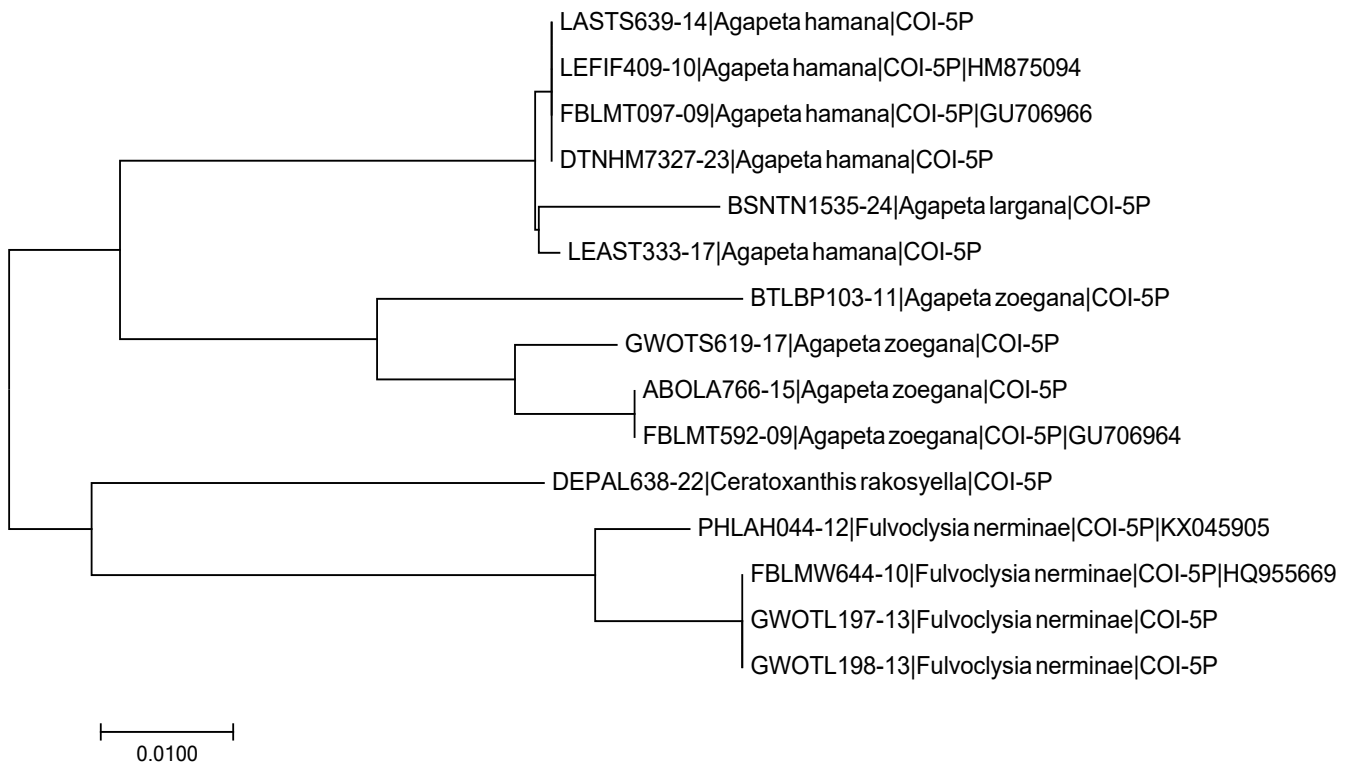


Fig. 9. The Neighbour-joining tree of *Ceratoxanthis rakosyella* and the European representatives of the related genera *Agapeta* and *Fulvoclysia*.

This was clearly demonstrated e.g. in the original description of *C. rakosyella* by WIESER and HUEMER (op. cit.): in the genitalia figures of the holotype the transtilla is dorsally orientated (figs 3, 9), in those of the paratypes the transtilla is ventrally orientated (figs 4–5), and the lateral parts of the transtilla together with their processes constantly follow the orientation of the median process of the transtilla.

The shape of the valva proved to be variable in the few *Ceratoxanthis* species to which variability should be assessed; it might be a characteristic of the genus.

Sterigma, forming a posteriorly orientated process fused with segment VIII, seems to characterise the female genitalia of the genus. The form of lamella antevaginalis is finger-like in *C. rakosyella* (Figs 3–7), conical in *C. externana* (RAZOWSKI 2009: 174 pl. 45 fig. 175) and arrowhead-like in *C. giansalottii* (BASSI 2014: 492 fig. 4). This confirms RAZOWSKI's (2009: 58) statement that this special configuration of the sterigma should be an autapomorphy of the genus *Ceratoxanthis*.

Discussion

During the study of the genus several questions arose and two hypotheses were formulated.

1) The range of distribution of the individual species in the genus *Ceratoxanthis* is usually not extensive, often restricted only to their type locality (RAZOWSKI 2009: 58–59). Two species have each been recorded from widely separated countries. *Ceratoxanthis argentomixtana* (STAUDINGER, 1870) is known from the southern Ural and lower Volga areas of south European Russia (RAZOWSKI 2009: 58). PFEIFFER (1927: 80) recorded it from Eğirdir (1 ♂, Egerdir, 12.V.1926, as *Euxanthis*), and OSTHELDER (1935: 69) published it from Kahramanmaraş and its surroundings (1 ♂, Marasch, 1.VI.1928; 1 ♀, Yüksch Dagħ, 1–15.V.1932, as *Euxanthis*), both in Turkey. In our opinion the voucher specimens from Turkey need re-examination. *Ceratoxanthis iberica* BAIXERAS, 1992 was described from Spain, Teruel, Guadalaviar (BAIXERAS 1992: 294) and considered endemic to Teruel (RAZOWSKI 2009: 59) until ALIPANAH (2009: 18) recorded two males from Iran, West Āzarbāijān Province, Bāzargān. The status of the Iranian specimens as *C. iberica* was considered to be doubtful by BASSI (2014: 491). We agree with Bassi's opinion.

2) *Ceratoxanthis saratovica* TREMATERRA, 2010 is only known from south-east European Russia, Saratov Province (TREMATERRA 2010: 20–23). In the original description it was considered to be externally similar to *C. argentomixtana* and the genitalia compared with those of *C. argentomixtana*, *C. iberica* and *C. rakosyella*. In our opinion both externally and the structure of genitalia are similar to *C. argentomixtana*. We compared the figures of the original description of *C. saratovica*, adults figs 1–2 and genitalia figs 3–5, with those of *C. argentomixtana* given by RAZOWSKI

(2009: 119, adult pl. IV fig. 174, 145 male genitalia pl. 16 fig. 174), and WIESER and HUEMER (2000) figs 6, 8, 10 for *C. iberica* and figs 3–5, 7, 9 for *C. rakosyella*: the shape of the transtilla, socii and lateral process of juxta are all similar to *C. argentomixtana*, the single difference consists of the twisting of the lateral process of juxta in Razowski's *C. argentomixtana* figure, as a result of the incorrect embedding in the genitalia slide. Therefore we consider that *C. saratovica* might be synonymous with *C. argentomixtana*. Also, the distribution ranges of the latter two taxa adjoin, as both are part of the same south-east European Russian steppe habitat.

Further studies are necessary to prove or refute these hypotheses.

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