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Coleophora mareki Tabell & Baldizzone, sp. n., a new coleophorid moth of the serpylletorum species-group (Lepidoptera: Coleophoridae)

J. Tabell & G. Baldizzone*

Abstract

Coleophora mareki Tabell & Baldizzone, sp. n. is described and its larval case illustrated. The new species was hitherto confused with its sister species *C. chamaedriella* Bruand, 1851. *C. mareki* occurs at low altitudes, and it is widely distributed in Central and Southern Europe and Asia Minor. The larval host is *Teucrium chamaedrys* L. The molecular divergence of *C. mareki* and related species is shown.

KEY WORDS: Lepidoptera, Coleophoridae, *Coleophora mareki*, new species, *Teucrium chamaedrys*, Europe.

Coleophora mareki Tabell & Baldizzone, sp. n., un nuevo coleofórido del grupo de serpylletorum (Lepidoptera: Coleophoridae)

Resumen

Se describe *Coleophora mareki* Tabell & Baldizzone, sp. n. y se ilustra su saco larvario. La nueva especie ha sido confundida hasta ahora con su especie hermana *C. chamaedriella* Bruand, 1851. *C. mareki* se encuentra a baja altitud y se distribuye por el Centro y Sur de Europa y Asia Menor. La planta nutricia de la larva es *Teucrium chamaedrys* L. Se muestra la divergencia molecular de *C. mareki* y las especies emparentadas.

PALABRAS CLAVE: Lepidoptera, Coleophoridae, *Coleophora mareki*, nueva especie, *Teucrium chamaedrys*, Europa.

Introduction

The *Coleophora serpylletorum* species-group comprises four closely related Palaearctic taxa, namely *C. serpylletorum* E. Hering, 1889, *C. chamaedriella* Bruand, 1851, *C. virgatella* Zeller, 1849 and *C. struella* Staudinger, 1859. The moths of this group are characterized by white forewings with brownish stripes along veins, and the species cannot be strictly determined on the basis of the outer appearance alone. There have been difficulties as well when trying to determine specimens after genitalic study, using the available literature (RAZOWSKI, 1990; EMMET, 1996). In fact, the confusion has arisen from the poor knowledge of the identity of *C. chamaedriella*. This species has been considered to be easily recognizable due to its characteristic larval case and host plant, *Teucrium chamaedrys* L. However, we have found that there exists a further species of the *serpylletorum*-group with a similar biology but obvious differences in its genitalic structures. This taxon is described below as *Coleophora mareki* Tabell & Baldizzone, sp. n. Actually, most observations of *C. chamaedriella* at

*Contribution to the knowledge of Coleophoridae, CXXVIII.

low altitude refer to *C. mareki*, and the former is a montane species occurring at medium and high altitudes between 650-2200 m a.s.l.

In this paper the nomenclature of anatomical terms follows LANDRY & WRIGHT (1993).

Abbreviations

- LNK = Landessammlungen für Naturkunde, Karlsruhe, Germany
 MSNM = Museo Civico di Storia Naturale di Milano, Italy
 MSNT = Museo Regionale di Scienze Naturali, Turin, Italy
 MZH = Zoological Museum, Finnish Museum of Natural History, University of Helsinki, Finland
 MZUR = Museo di Zoologia dell'Università "La Sapienza", Rome, Italy
 NHMW = Museum of Natural History of Vienna, Austria
 USNM = National Museum of Natural History, Washington, U.S.A.
 ZMUC = Zoological Museum, University of Copenhagen, Denmark
 ZSM = Zoologische Staatssammlung München, Germany

Coleophora mareki Tabell & Baldizzone, sp. n.

Holotype ♀: Czech Rep., Moravia, Ratiskovice, larva 17-VI-1941, Rudolf Schwarz leg. (GP 4631 JT), coll. MZH.

Paratypes 85 ♂♂, 36 ♀♀: Italy: Piemonte, Parco Naturale Regionale Alpi Marittime (CN), dintorni di Entracque, Monte Ray, 1400 m, 18-VII-2000, 1 ♂ (PG Bldz 15160); 22-VI-2000, 1 ♂, Baldizzone leg. and coll.; Piemonte, Parco Naturale Regionale Alpi Marittime (CN), Entracque, Trinità, 1100 m, 2-11-VIII-2001 (lux), 1 ♂, Baldizzone leg. and coll.; Piemonte, Parco Naturale Regionale Alpi Marittime (CN), Entracque, Vallone Grande, 1300 m, 15-VII-1996, 1 ♂ (PG Bldz 11998); 4-VIII-2001 (lux), 1 ♀, Baldizzone leg. and coll.; Piemonte, Olmo Gentile (AT), 600 m, 13-VII-2009 (lux), 1 ♂ (PG Bldz 15306), P. Barberis leg., coll. Baldizzone; Piemonte, Serole (AT), Bric Puschera, 850 m, 21-VIII-2010 (lux), 1 ♂ (PG Bldz 15305), G. Allegro leg., coll. Baldizzone; Piemonte, Piancerreto (AL), 300 m, e.l., *Teucrium chamaedrys*, 23-V-1973, 1 ♂ (PG Bldz 15145); e.l., *Teucrium chamaedrys*, 6-VI-1973, 1 ♀ (PG Bldz 15146), Baldizzone leg. and Coll.; Piemonte, Basso Monferrato, Cardona (AL), 300 m, e.l., *Teucrium chamaedrys*, 18-VI-1970, 1 ♀ (PG Bldz 24); 3-VI-1979 (lux), 1 ♀ (PG Bldz 15153), Baldizzone leg. and coll.; Piemonte, Parodi Ligure, Rio Albedosa, 20-VI-2007 (lux), 1 ♂ (PG Bldz 15192), C. Cabella leg., coll. Baldizzone; Piemonte, Parco Naturale Regionale Capanne di Marcarolo (AL), località Cirimilla, 300 m, 22-VI-2005 (lux), 3 ♂♂ (PG Bldz 13811), Baldizzone leg. and coll.; Piemonte, Val Borbera (AL), Carrega Ligure, sopra Magioncalda, 1400 m, 10-V-2007 (lux), 1 ♂ (PG Bldz 15190), C. Cabella leg., coll. Baldizzone; Piemonte, Val Borbera (AL), Rocchetta Ligure, frazione Sisola, 400 m, 12-VI-2007 (lux), 1 ♂, C. Cabella leg., coll. Baldizzone; Veneto, Monte Pastello (VR), Stramonte, 500 m, 19-VI-1998, 1 ♂ (PG Bldz 7372), Triberti leg. and coll.; Trentino, Monte Baldo, Rifugio Ariano, 1000 m, 25-VII-1963, 1 ♀ (PG Jä 1921), E. Jäckh leg., coll. USNM; Trento, 7-VII-1945, 1 ♂ (PG Bldz 3042), J. Klimesch leg., Coll. ZSM; Collalbo (BZ), 1200 m, 30-VII-1947, 1 ♂ (PG Bldz 7372), F. Hartig leg., Coll. MZUR; Friuli, UD, Spilimbergo, Vivaro, Magredi, 130 m, 10-VI-2008 LF, 1 ♂ (PG Bldz 14838), H. Deutsch leg. and coll.; Friuli, UD, Tagliamento, Flussbett, Cornino, 150 m, 31-VIII-2009 - LF, 1 ♂ (PG Bldz 15163), H. Deutsch leg. and coll.; Bologna, Croara, 14-VI-1950, e.l., 1 ♀ (PG Bldz 1495), A. Fiori leg., Coll. MZUR; Bologna, Ravone, 10-VIII-1952, e.l., 1 ♂ (PG Bldz 1492), A. Fiori leg., coll. MSNM; Forlì, Corniolo, Mt. Fratte, 24-VIII-1989, 1 ♀ (PG Bldz 11874), G. Fiumi leg. and coll.; Romagna, Castrocara, Cozzi (FO), 8-VII-1990, 1 ♂ (PG Bldz 12121), Zagnoli leg., coll. Fiumi; Toscana, Badia della Valle (FI), sopra Lutirano, 16-VIII-1991, 1 ♂, Usvelli leg.; 30-VI-1992, 1 ♂ (PG Bldz 13132); 2-VII-1992, 1 ♂; 14-VII-1992, 1 ♂; 19-VIII-1992, 1 ♂; 18-VI-1993, 1 ♂ (PG Bldz 12164); 14-VII-1993, 1 ♂; 15-VIII-1993, 1 ♂; 9-VII-1994, 1 ♀ (PG Bldz 13131); 27-VII-1994, 1 ♂; 21-VII-1998, 1 ♂ (PG Bldz 12368), all in coll. Baldizzone; Toscana, Monti dell'Uccellina, 13-VI-1977, 1 ♂ (PG Bldz 1665), Baldizzone leg. and coll.; Umbria, Trasimeno, Mt. del Lago, 260 m,

5-VII-1964, 1 ♀ (PG Bldz 1495), F. Hartig leg., coll. MSNT; Lazio, Vallemare (RI), Colle Marcone, 1121m, 12-VII-2008, 1 ♂; 8-VII-2011 (PG COLE 42, M. Pinzari); 30-VII-2011, 1 ♂ (PG COLE 74, M. Pinzari); 8-VIII-2013, 1 ♂; 6-VIII-2012, 1 ♂ M. Pinzari leg., all in coll. Pinzari; Puglia, 4 km N Altamura, Murgia San Elia, 500 m, 27-29-V-2005, 1 ♂ (PG Bldz 14139), Skou leg., Coll. ZMUC; Sardinia: Sardegna centr., Aritzo, 8-VII-1936, 1 ♂ (PG Bldz 7363), F. Hartig leg., coll. MZUR; Sardegna centr., Br. Spina, 1400 m, 21-VII-1976, 1 ♂ (PG Bldz 1219), F. Hartig leg., coll. MSNT; Sardegna centr., Gennargentu, Genna e Nuxe, 5-VII-1975, 1 ♂ (PG Bldz 4538), Brandstetter leg. and coll.; Sardegna centr., Tascussi, 1350 m, 12-VII-1977, 1 ♀ (PG Bldz 4540), Brandstetter leg. and coll.; Croatia: Is. Krk, Str. Krk-Vrbnik, 18-VIII-1987 (lux), 1 ♀ (PG Bldz 9367), Baldizzone leg. and coll.; Is. Krk, Draga Baška, 15-VIII-1988, 1 ♂ (PG Bldz 15159), Baldizzone leg. & Coll.; Austria: Austria inf., Porta hungarica, Hundsheimer Berg, 17-VII-1977, 1 ♀, leg. Kasy; 14-VIII-1979, 1 ♀ (PG Bldz 15188); 17-VIII-1979, 1 ♀ (PG Bldz 15194), all in coll. Baldizzone; Niederösterreich, Hundsheimer Berg, Südhang, 7-VII-1980, 1 ♀ (PG Bldz 15197), E. Jäckh leg., coll. Baldizzone; Austria inf., Porta hungarica, Hundsheimer Berg, 6-VIII-1977, 1 ♀ (PG Bldz 3437), leg. Kasy; 5-VIII-1978, 1 ♀ (PG Bldz 3461); 1-VII-1979, 1 ♂ (PG Bldz 3943); 16-VIII-1980, 1 ♀ (PG Bldz 3883), all in coll. NHMW; Hundsheim, Spitzerberg, 18-VII-2011, 9 ♂♂, J. Tabell leg. and coll.; Hundsheim, Braunsberg, 13-VII-2011, 2 ♂♂, J. Tabell leg. and coll.; Czech Rep.: Moravia, c.-occ. Cebinka, 350 m, e.l., 18-VII-1972, *Teucrium cham.* V-1972, 1 ♀ (GP 4690 JT), F. Gregor leg., coll. Junnilainen; Moravia, Brno-lesná, e. l., 10-25-VII-1980, *Teucrium cham.*, 1 ♀ (GP 3634 JT), F. Gregor leg., coll. Tabell; e. l., VII-1980, 1 ♀, coll. Marek; Moravia mer., Nesovice, e. l., 18-VII-1973, larva 28-VI-1973, 1 ♂, J. Marek leg. and coll.; Čebín, e.l., 5-7-VIII-1974, larvae 26-V-1974, 3 ♂♂, 1 ♀, J. Marek leg.; 10-VI-1946, 1 ♀, F. Gregor leg.; e. l., 6-VIII-1972, larva VI-1972, 1 ♀, F. Gregor leg.; e. l., 18-VII-1973, larva VI-1973, 1 ♀, F. Gregor leg.; 10-VII-1973, 1 ♂, F. Gregor leg., all in coll. Marek; Újezd u Brna, e.l., 24-VII-6-VIII-1975, larvae 22-V-1975, 2 ♂♂, J. Marek leg. and coll.; Hodonín-Pánov, 27-VI-1992, 1 ♂, J. Marek leg.; 22-VIII-1996, 1 ♀, coll. Marek; Brno-Hády, 24-VI-2005, 1 ♂, J. Marek leg.; 30-VII-1945, 1 ♂, F. Gregor leg., coll. Marek; Brno-Jundrov, 22-VII-1945, 1 ♀, F. Gregor leg., coll. Marek; Brno-Hrad Veveří, 10-VIII-1973, 1 ♀, F. Gregor leg., coll. Marek; Pavlovské vrchy, Děvín, e.l., 21-VI-1973, 1 ♂, F. Gregor leg., Coll. Marek; Letonice-Větrnky, 27-VI-1975, 1 ♀, F. Gregor leg., coll. Marek; Bohemia, Velké Žernoseky, 19-VII-1953, 1 ♂, F. Gregor leg., coll. Marek; Bohemia, Koda u Suboka, VII-1976, 1 ♂ (PG Bldz 15149), 1 ♀ (PG Bldz 15150), Dr. B. Starý leg., coll. Baldizzone; Hungary: Hungaria centr. Isaszeg, 7-VII-1951, 1 ♂ (PG Bldz 6724), D. Issekutz leg., coll. Baldizzone; Kecskemet 20 km E, near Kerekegyhaza village, 18-VII-2006, 1 ♂ (GP 4136 JT, DNA sample MM16295), T. Nuppenen leg.; 13-VI-2007, 2 ♂; 17-VI-2007, 1 ♀, all in coll. T. & K. Nuppenen; Macedonia: Ohrid, 9-16-VI-1959, 1 ♂ (PG Bldz 15209), 1 ♀, J. Klimesch leg., coll. Baldizzone; Macedonia occ., Passo di Bukovo, 1190 m (Ohrid), 6-VIII-1979 (lux), 1 ♂ (PG Bldz 15161), Baldizzone leg. and coll.; Greece: Macedonia occ., Kastoria, 700 m, 2-VIII-1979 (lux), 1 ♀ (PG Bldz 3062), Baldizzone leg. and coll.; Ioannina, Katara Pass, 1600 m, 11-VIII-1985, 1 ♂ (PG Bldz 9454), M. Fibiger leg., coll. Baldizzone; Graecia sept., Litochoron, 300 m, 14-22-VI-1957, 1 ♂ (PG Bldz 15206), J. Klimesch leg., coll. Baldizzone; Graecia sept., Olympos, 2300 m, 13-30-VII-1957, 1 ♂ (PG Bldz 15206), J. Klimesch leg., coll. Baldizzone; Peloponnes, Arkadien, Umg. Vlaherna, 600 m, 5-IX-2004 (lux), 1 ♂ (PG Bldz 13896), G. Baisch leg., coll. Baldizzone; C. Macedonia, Kassandra, Paliori, e. p., 27-VI-1989, *Teucrium* sp. 21-VI-1989, 1 ♂ (GP 441 JT), J. Tabell leg. and coll.; Macedonia, Kozani NE, 23-24-V-2003, 1 ♂ (GP 3636 JT, DNA sample MM16301), J.-P. Kaitila leg., coll. Tabell; Bulgaria: SE-Bulgaria, Ropotamo by Black Sea, 19-VI-2001, 2 ♂♂ (GP 3639 JT), J.-P. Kaitila leg. and coll.; Sliven, 18-19-VI-2000, 1 ♂, 1 ♀, J. Junnilainen leg. and coll.; 20-VI-2000, 1 ♀; 23-VI-2000, 1 ♂, all in coll. Junnilainen; 23-VI-2000, 1 ♂, (GP 3641 JT), coll. Tabell; Turkey: Asia min. Occ., 100 km S. v. Izmir, Kužadası, Mocamp b. Hotel Tuzan, 5-13-V-1969, 1 ♂ (PG Bldz 14355), 1 ♀, U. Roesler leg., coll. Baldizzone; Iraq: Mosul, Mesopotamien, 16-V., 1 ♂ (PG Toll 15), Amsel leg., coll. LNK. The type specimens are deposited in LNK, MSNM, MSNT, NHMW, MZH, MZUR, USNM, ZMUC, ZSM and the private collections of G. Baldizzone (Italy), Brandstetter (Austria), H. Deutsch (Austria), G. Fiumi (Italy), J. Junnilainen

(Finland), J.-P. Kaitila (Finland), J. Marek (Czech Rep.), T. and K. Nupponen (Finland), M. Pinzari (Italy), J. Tabell (Finland) and P. Triberti (Italy).

Diagnosis: *C. mareki* Tabell & Baldizzone, sp. n. (Figs. 2-3) is a robust species of the *serpylletorum* species-group (EMMET, 1996). It can be distinguished from *virgatella* and *struella* by its larger size (wingspan 16.5-19 mm in *mareki*, 14-16 mm in *virgatella*, 11.5-14 mm in *struella*, in *chamaedriella* 15.5-20 mm), and broader and much shorter vesica in the male genitalia; from *chamaedriella* (Fig. 6) by the shape of cornuti (in one bundle in *mareki*, dispersed in *chamaedriella*), the broader and shorter cucullus and unfolded ventral edge of the sacculus; from *serpylletorum* (Fig. 7) by the shorter, broader club-shaped cucullus (parallel-sided in *serpylletorum*). In the female genitalia the anterior margin of the sterigma is straight in *mareki* (Figs. 8-9) but deeply concave in *chamaedriella* (Fig. 11) and *serpylletorum* (Fig. 12). The length of spinulate section of ductus bursae is shortest in *serpylletorum*, and longest in *chamaedriella*.

Molecular diagnosis: The DNA barcodes reveal a distinct divergence between the species of the *serpylletorum* species-group. The mean intraspecific K2P variation for *mareki* ($n = 3$) is 0.15%, while the mean interspecific divergence between *mareki* and other examined species is 5.44% - 9.07% (Table 1). Thus, the DNA barcodes correlate undeniably with the morphological differences.

Table 1.- Interspecific mean K2P divergences (>600 bp) based on the analysis of COI gene, maximum intraspecific variations marked grey. The number of examined specimens in parenthesis.

	<i>mareki</i>	<i>chamaedriella</i>	<i>serpylletorum</i>	<i>struella</i>	<i>virgatella</i>
<i>mareki</i> (3)	0,15	6,45	5,44	8,49	9,07
<i>chamaedriella</i> (1)	6,45		6,12	8,49	8,71
<i>serpylletorum</i> (2)	5,44	6,12	0,15	8,85	9,61
<i>struella</i> (4)	8,49	8,49	8,85	2,19	6,62
<i>virgatella</i> (1)	9,07	8,71	9,61	6,62	

Description: Imago (Figs. 2-3). Wingspan 16.5-19 mm. Head white to pale ochreous. Thorax white, with a narrow pale ochreous median line; outer edges of tegula narrowly pale ochreous, postocular scales white. Flagellum white, scape concolorous with head, beneath with white and pale ochreous scales forming a long tuft. Labial palpus whitish, mixed brown on outer surface, second segment 1.5 x longer than third. Forewing white, all veins marked fuscous in male, in female usually slightly paler; narrow line along middle of cell and fold; cilia pale greyish brown tipped whitish. Hindwing pale greyish brown. Abdomen lustrous, pale grey.

Male genitalia (Fig. 5): Gnathos knob transversely oval. Tegumen broad, expanded anteriorly, pedunculi moderately short. Cucullus club-shaped. Valvula broad, outer margin rounded, well delineated. Transtilla narrow, wedge-shaped. Sacculus well sclerotized; ventral margin rounded, apex sharply pointed; dorsal margin short, concave. Phallotheca arched, dorsally broadly sclerotized tube. Cornutus consists of two robust spines, basally fused with a large plate.

Female genitalia (Figs. 8-9): Papillae anales very broad, surface densely covered with bristles of different length. Anterior apophyses moderately short, as long as sterigma; posterior apophyses 2.5 x longer. Sterigma trapezoidal, twice wider than long, apically covered with several bristles, proximal margin straight. Tergum VIII narrowly sclerotized proximally. Ostium broadly U-shaped, colliculum chaliced, well sclerotized. Spinulate section of ductus bursae about 3 x longer than sterigma, median band sclerotized, extended almost to ductus seminalis, anterior section gradually widening into roundish corpus bursae, which contains one large signum.

Abdominal structures (Fig. 10): Anterolateral bars 3 x longer than posterolateral ones. Transverse bar arched, distal margin darkly sclerotized, proximal margin weakly delineated. Tergal patches (3rd segment) 3 x longer than wide, covered with 70-80 small conical spines.

Life history: The larva feeds on the leaves of *Teucrium chamaedrys* L., from autumn to the following June. The composite leaf case (Fig. 4) is made of several pieces of the host plant. Pupates inside the case, which is attached to stem of the plant.

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Distribution: So far known from Southern and Central Europe (France, Italy, Sardinia, Greece, Bulgaria, Hungary, Czech Republic, Austria, Ukraine), Turkey and Iraq. In Europe known only at low altitudes, between 50 and 400 m above sea level.

Derivation of name. The species is dedicated to Ing. Jaroslav Marek, a well-known Czech entomologist with a special interest on Coleophoridae.

Note: In RAZOWSKI (1990), figures 158-159 represent the male genitalia of *C. serpylletorum* (instead of *C. chamaedriella*) and figures 160-161 those of *C. mareki* (instead of *C. serpylletorum*); figures 427-430 represent the female genitalia of *C. mareki* (instead of *C. chamaedriella* and *C. serpylletorum*). Respectively, figures 46c and 73 a in EMMET (1996) represent the genitalia of *C. mareki* instead of *C. serpylletorum*.

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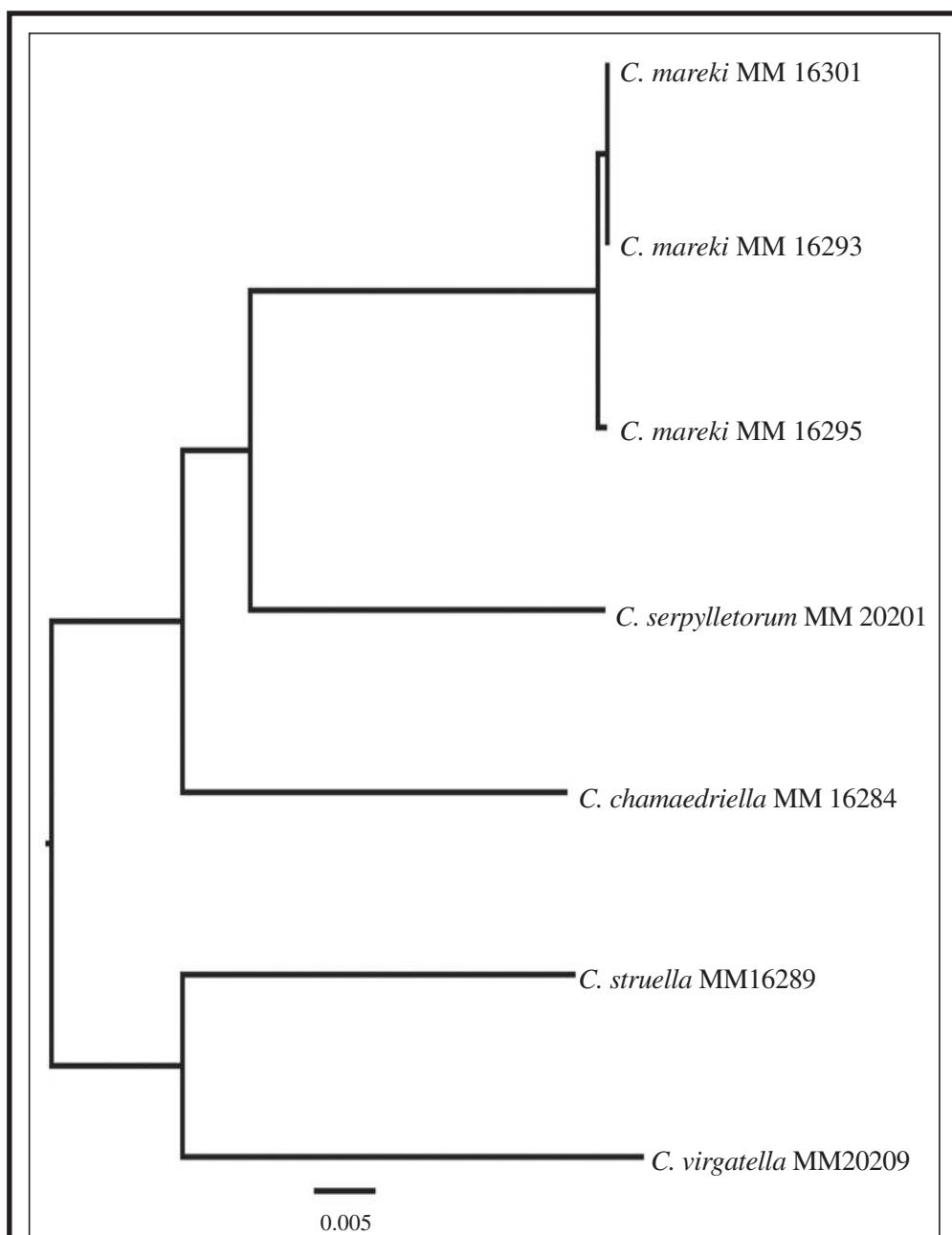


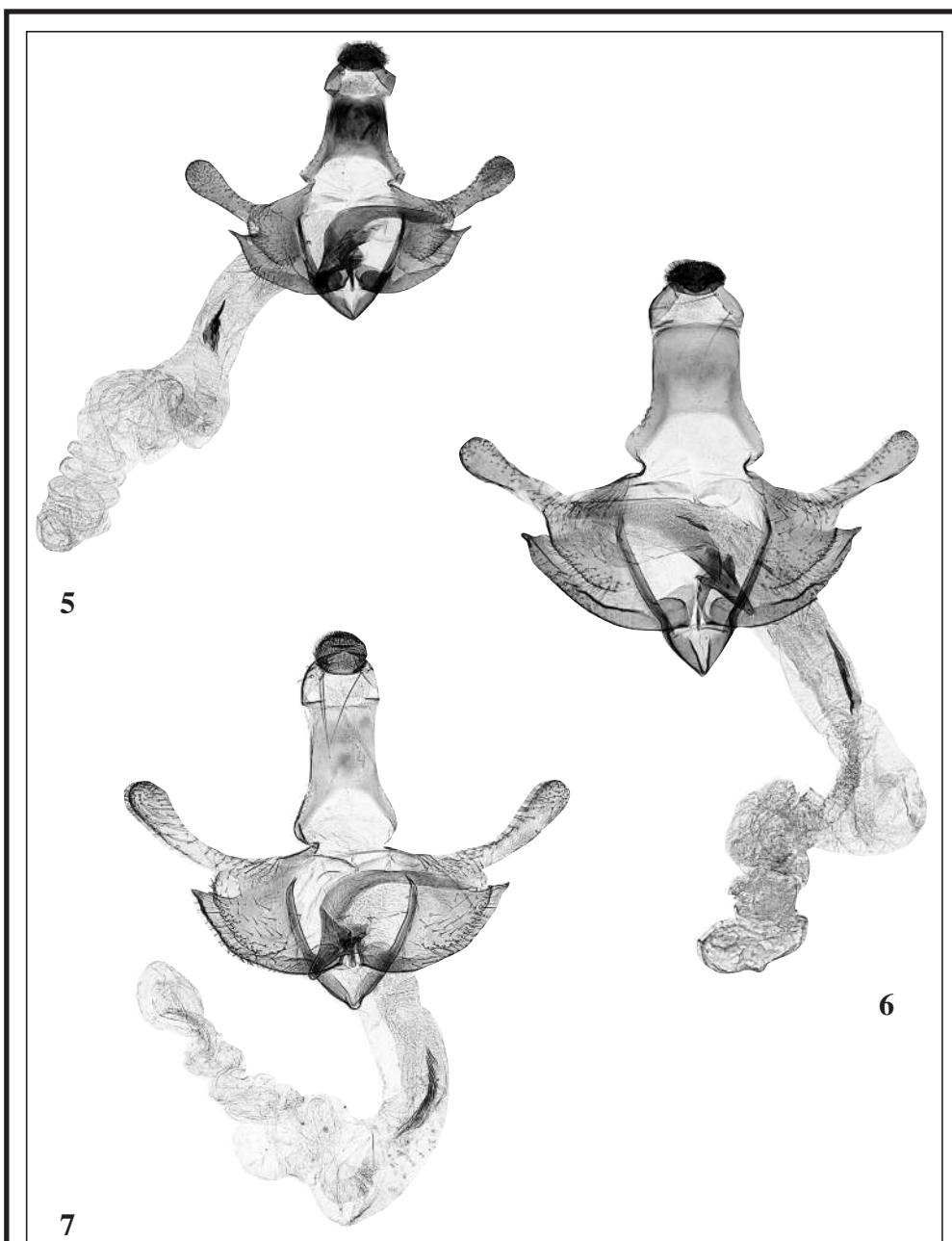
Fig. 1.— Neighbour joining tree of *C. mareki* Tabell & Baldizzone, sp. n. and adjacent species based on sequences of COI gene (658 bp).

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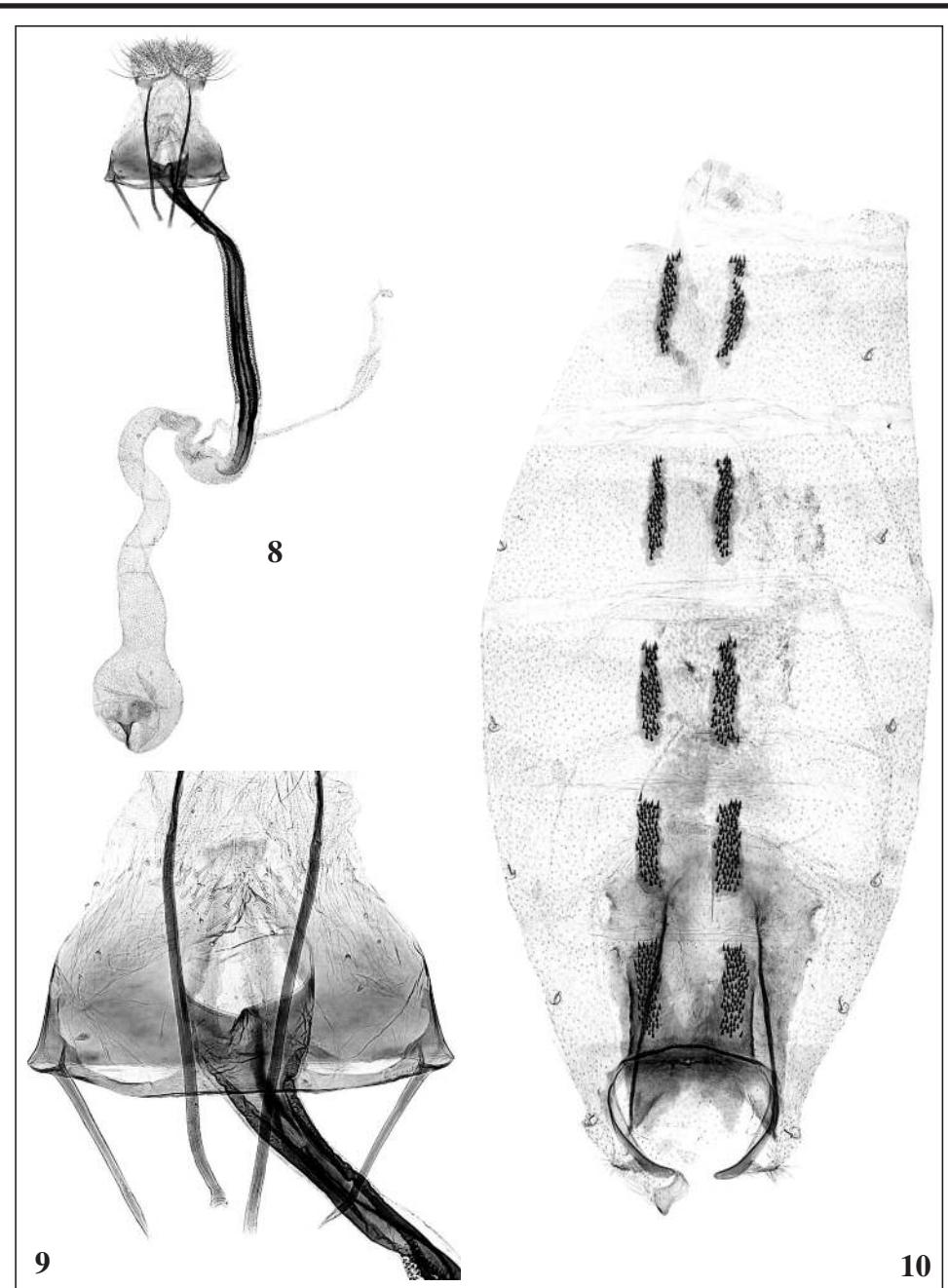
Figs. 2-4.—**2.** Imago (male) of *C. mareki* Tabell & Baldizzone, sp. n., paratype, Greece, Paliouri. **3.** Imago (female) of *C. mareki* Tabell & Baldizzone, sp. n., paratype, Czech Rep., Cebinka. **4.** Larval case of *C. mareki* Tabell & Baldizzone, sp. n. (Photos: R. Siloaho).

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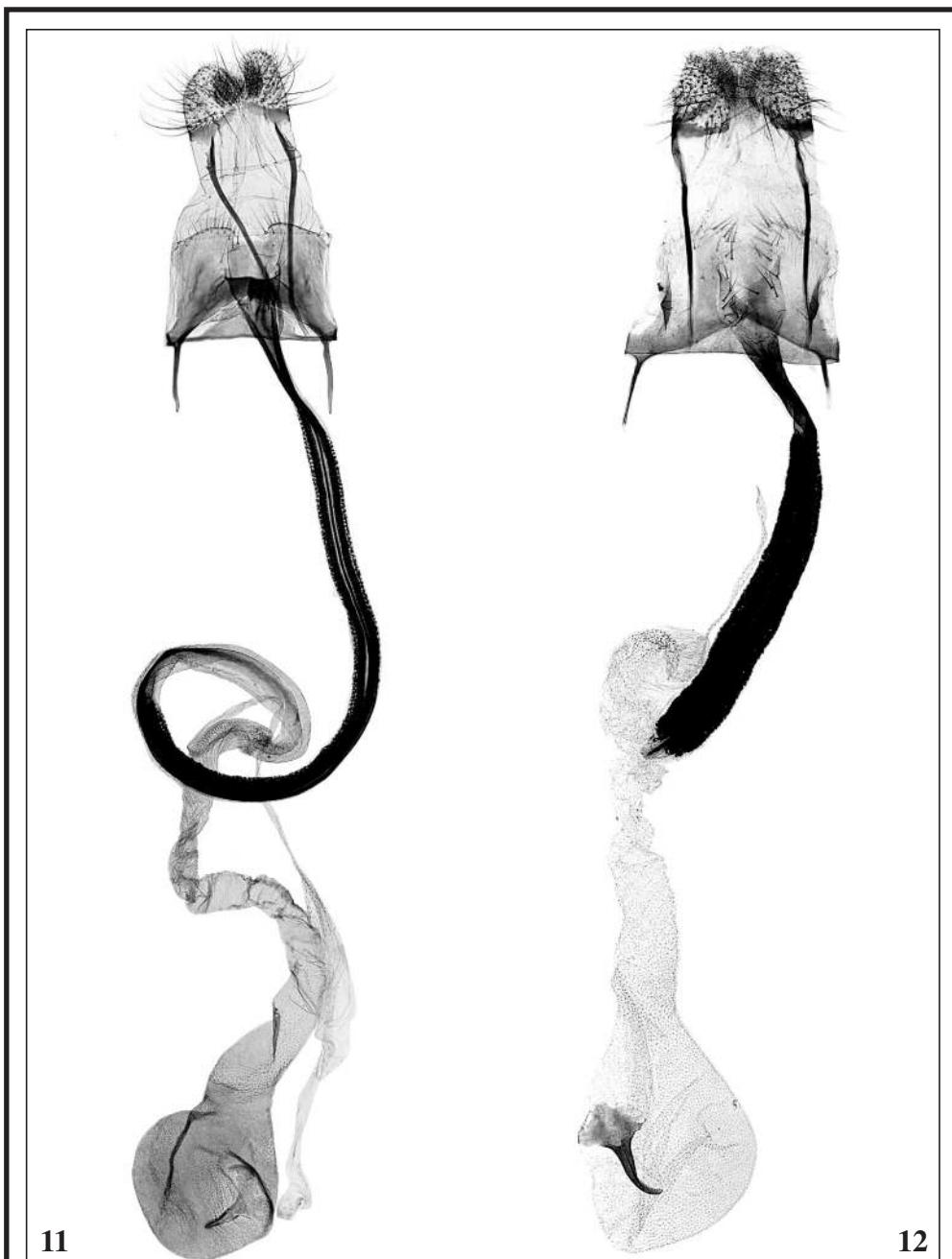
Figs. 5-7.— Male genitalia. 5. *C. mareki* Tabell & Baldizzone, sp. n. (GP 3639 JT, paratype, SE-Bulgaria, Ropotamo by Black Sea) 6. *C. chamaedriella* Bruand, 1851 (GP 4138 JT), France, Joncet. 7. *C. serpylletorum* E. Hering, 1889 (GP 4141 JT), Latvia, Silene, Ilgas (Photos: R. Siloaho).

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Figs. 8-10.—*C. mareki* Tabell & Baldizzone, sp. n. 8. Female genitalia (GP 4631 JT), holotype, Czech Rep., Moravia, Ratiskovice. 9. Sterigma enlarged. 10. Abdomen (Photos: R. Siloaho).

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Figs. 11-12.—Female genitalia. 11. *C. chamaedriella* Bruand, 1851 (GP 4157 JT), Spain, Lérida, Prats Bellver. 12. *C. serpyllorum* E. Hering, 1889 (GP 4609 JT), Denmark, Røsnæs (Photos: R. Siloaho).