

On the taxonomic status of *Cephimallota angusticostella* (Zeller) and *C. crassiflavella* Bruand (Tineidae)

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Abstract. *Cephimallota angusticostella* (Zeller, 1839) and *C. crassiflavella* Bruand, 1851 are two Palearctic Tineidae species which have been recognised as well differentiated taxa. The observation of variability in the male saccus caused doubt about the status of the two taxa and prompted us to initiate a detailed study of the male genital morphology. In this study we found a distinct variability in the shape of the saccus only in *C. crassiflavella*, and not in *C. angusticostella*. The differences in external and genital morphology are corroborated by molecular analyses (DNA barcoding). The morphological and molecular data are discussed in the context of the determined distribution of the two taxa.

Zusammenfassung. *Cephimallota angusticostella* (Zeller, 1839) und *C. crassiflavella* Bruand, 1851 stellen zwei palaearktische, als gut unterscheidbar angesehene Tineidae-Arten dar. Die Beobachtung von Variabilität im männlichen Saccus ließ Zweifel zum Status der beiden Taxa aufkommen und war Anlass einer detaillierten Untersuchung der morphologischen Strukturen der männlichen Genitalien. Es konnte eine klare Variabilität in der Form des Saccus nur bei *C. crassiflavella* gefunden werden, während *C. angusticostella* in dieser Hinsicht keine Variabilität zeigt. Die äußerlichen und genitalmorphologischen Unterschiede bestätigten sich in molekularen Analysen (DNA-Barcoding). Die morphologischen und molekularen Ergebnisse werden im Kontext der hier ermittelten Verbreitung der zwei Taxa diskutiert.

Introduction

The tineid genus *Cephimallota* Bruand, 1851 comprises 11 described species with a Palearctic distribution. The genus belongs to the subfamily Myrmecozelinae (Robinson 2009). The wingspan of the specimens varies from 10 mm in *C. tunesiella* (Zagulajev, 1966) to 30 mm in *C. colonella* (Erschoff, 1874). The genus is characterised by having specialised male genitalia with the valvae fused, tegumen and vinculum connected to a ring-shaped sclerotisation, and the uncus reduced or characteristically modified. Superficially, *Cephimallota* moths are more or less unicolourous brown, with some species having yellow dots or short stripes. Their biology is still unknown (Robinson 2009), but there are some indications that the larvae may live in nests of aculeate Hymenoptera or in decomposing grass litter (Petersen 1969, Zagulajev 1975).

Cephimallota angusticostella (Zeller, 1839) and *C. crassiflavella* Bruand, 1851 have been treated as vicariant species in the past, whose distributional areas overlap in the region of the Balkan Peninsula and Italy. They can be easily discriminated from each other in both external characters and in the constitution of the male genitalia. However, routine investigations of male genitalia revealed a particular variability of the saccus in specimens from various locations from within the range of both taxa. This finding stimulated a more comprehensive examination of as many specimens as possible from the entire range of the two taxa. This was done in order to clarify the amount

of variability and the so far reliable discrimination of the two taxa based on external and genital characters. It was a possibility that the variability was restricted only to the overlapping distributional area or that the variability hides the differences between the two taxa. In addition to the investigation of the morphological structures, partial DNA sequences of the *cytochrome c oxidase subunit 1* (*coxI*) gene were obtained from a few specimens of each species and analysed in order to compare these results with the morphological data. Mapping of collected material and literature records of *C. angusticostella* and *C. crassiflavella* resulted in a distribution map, which provides a visualisation of the distribution of the two taxa and the area of their distributional overlap.

Material and Methods

The examined material originates from numerous collections and was provided by museum custodians as well as by private collectors. When no reference is given, the distribution records in the species redescrptions rely on studied material. A list of material examined can be found in the appendix. The specimen origins of the pictured genitalia are given in the legends of the figures.

Morphological methods

Genitalia of both sexes were dissected in order to study morphological variability. Phallus and valvae were removed from the genitalia capsule (uncus-tegumen-vinculum with saccus) during dissection. The ring-shaped connection of tegumen-vinculum was not cut laterally but kept intact. Drawings at the same scale were made from genitalia of the two taxa and compared in terms of variability.

Molecular methods

The method suggested by Knölke et al. (2005) was used for investigation of both molecular and morphological characters in the same specimen. DNA was extracted from the abdomen of dried specimens using the Macherey-Nagel NucleoSpin Tissue kit according to the manufacturer's suggestions. PCR amplification of a 587 bp fragment of the *coxI* barcode sequence was done with the primer pair HybLCO/Nancy or in the case of fragmented DNA with the primer pairs HybLCO/K699 and Ron/Nancy, respectively (Wahlberg & Wheat 2008). The amplified *coxI* fragment corresponds to basepairs 50–636 of the 658 bp barcode sequence of Hebert et al. (2003). The sequences were amplified either with SAWADY *taq* DNA polymerase (PeqLab) or with BIO-X-ACT Short DNA polymerase (Bioline). The following PCR program in case of the SAWADY *taq* DNA polymerase was used: initial denaturation for 5 min at 95°C, 40 cycles with denaturation for 30 s at 94°C, primer annealing for 30 s at 48°C, and strand extension for 90 s at 72°C, terminal strand extension for 10 min at 72°C. The PCR program for BIO-X-ACT Short DNA polymerase corresponds to the manufacturer's guidelines in conjunction with the respective primer annealing temperature of 48°C. The PCR products were then analysed with respect to amplification success via gel electrophoresis on a 1% agarose gel, subsequent staining with GelRed, and final examination un-

Table 1. DNA-barcoding voucher data.

taxon	DNA specimen voucher	origin, collection date, collector	coxI GenBank accession no.
<i>C. angusticostella</i>	Lep699	Italy, Tuscany, Province of Florence, surrounding of Dicomano, 17–23.vi.2006, leg. F. Theimer	JN130000
	Lep703	Italy, Piedmont, Capanne di Marcarolo Natural Park, 370 m, 5.vii.2005, leg. G. Baldizzzone	JN130001
	Lep720	Greece, West Macedonia, Kastoria prefecture, 5 km NW of Kastoria, 10.vii.2007, leg. W. Schmitz	JN130006
	Lep721	Greece, Epirus, Preveza prefecture, Parga, 13.v.2007, leg. W. Schmitz	JN130007
<i>C. crassiflavella</i>	Lep707	France, Provence-Alpes-Côte d'Azur, Alpes-Maritimes, Mandelieu-la-Napoule, 28.v.2005, leg. H. Hendriksen	JN130002
	Lep715	France, Languedoc-Roussillon, Hérault, St. Pons-de-Thomières, 450 m, 24.vi.2005, leg. E. van Nieukerken	JN130003
	Lep717	Italy, Trentino-Alto Adige, South Tyrol, Prad am Stilfser Joch, 930 m, 27.vii.2005, leg. E. van Nieukerken	JN130004
	Lep718	Switzerland, Valais, Brig, Ried-Brig, 800 m, 17.vii.2007, leg. W. Schmitz	JN130005
<i>C. tunesiella</i>	Lep731	Tunisia, Jendouba Governorate, W of Sidi el Barrak lake, 30 m, 04.x.2007, leg. B. Schacht	JN130008

der UV light. Clean-up of the PCR products was carried out with ExoSAP-IT (USB Corporation). The sequence PCR was performed with BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems). After final clean-up of the samples, sequencing was carried out on a 3130 Genetic Analyzer (Applied Biosystems). For all PCR amplifications, ExoSAP-IT clean-up and sequence PCRs either a Mastercycler ep gradient S (Eppendorf) or a PCR System 9700 (GeneAmp) were used.

Sequence alignment was carried out manually with PhyDE0995 (Müller et al. 2008). Calculation of the genetic distances as well as of the dendrogram using the Neighbor-Joining (NJ) method (Saitou & Nei 1987, Studier & Keppler 1988) were performed under the Kimura-2 Parameter (K2P) model (Kimura 1980) in PAUP* 4.0b10 (Swofford 2000). *Cephimallota tunesiella* (Zagulajev, 1966) was included in the analysis in order to compare the genetic distances of the two investigated taxa to a more distantly related species. All obtained barcode sequences have been submitted to GenBank (for accession numbers see Tab. 1).

Distribution

In order to examine the distributional pattern of *Cephimallota angusticostella* and *C. crassiflavella*, collection localities were compiled from labels of studied specimens and from literature. Geographical coordinates of these collection localities were obtained



Fig. 1. *Cephimallota crassiflavella*, imago.

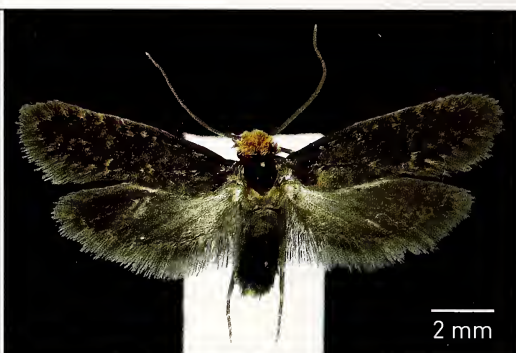


Fig. 2. *Cephimallota angusticostella*, imago.

via Google Earth, Version 5.2.1.1588 and subsequently plotted on a map using DIVA-GIS, Version 7.2.3 (Hijmans et al. 2004).

Results

Morphological results

Figures 3–5, 6–27, 28–30 (male genitalia), and 31–34 (female genitalia) are drawn at identical scale in order to illustrate clear differences in size and to be comparable in terms of morphological variation.

Cephimallota crassiflavella

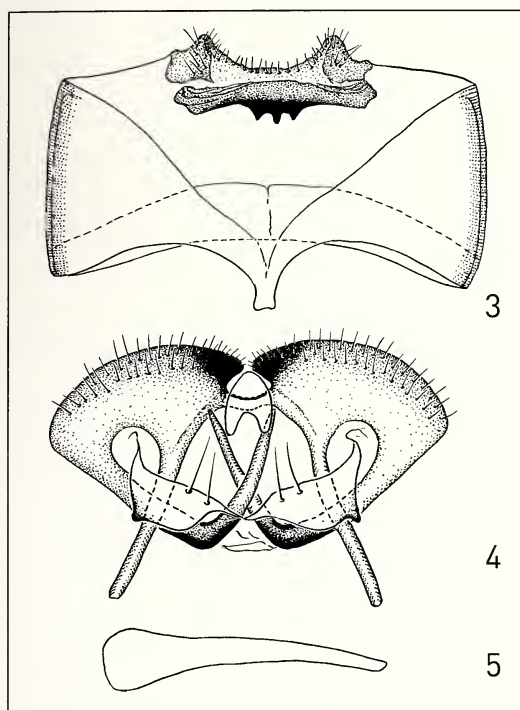
Cephimallota crassiflavella Bruand, 1851

[= *Tinea simplicella* Zeller, 1852; = *Tinea simplicella* Herrich-Schäffer, 1854]

Fig. 1

Redescription. Wingspan 13–16 mm ($n = 219$); head brush golden-yellow, antenna filiform, ca. 2/3 of forewing length, brown-grey, labial palps golden-yellow, second segment along the inner side and at outer apex with protruding short bristles; thorax and forewing brown to dark brown, shimmering slightly violet, without any maculation, only costal margin slightly lighter; hindwing a little lighter than forewing.

Male genitalia (Figs 3–27). Uncus with two obtuse setaceous protuberances, firmly attached to the tegumen, below uncus a strongly sclerotised clasp (gnathos?) with three acute small protuberances; tegumen broad, ventrally narrowing, saccus short, variable in shape, either cut straight or stretched out to a more or less short tip (see Figs 6–27); valva compact, broad, semi-circular, with very long and slender transtilla, with strongly sclerotised obtuse tip, below the tip connected to the other valva; lateral side of valva stretched out in a long curved and strongly sclerotised appendix; phallus no longer than width of tegumen, rounded basally, apex narrower, almost straight. The whole genital apparatus in situ compact, valvae fitted into the teguminal invagination, hardly mobile separately.



Figs 3–5. *C. crassiflavella*, ♂ genitalia: 3. uncus-tegumen; 4. valvae; 5. phallus (from the same specimen: Dept. Provence, France).

Female genitalia (Figs 31–32). Anterior apophyses with a very short lateral fork/spine, the inner branch ending in a strong-sclerotised ostium plate with a deep central split, apical part of split acute or rounded, subapical part broader, with rectangular edges, opening of the split more or less constricted.

Distribution. Hitherto known from Morocco, Algeria, Canary Islands, continental Spain, France (incl. Corsica), Belgium, Great Britain, Germany, Switzerland, Austria, Italy (incl. Sardinia), Czech Republic, Poland, Ukraine (Schille 1931), Russia, Hungary, the Balkan peninsula (Slovenia, Croatia, Bosnia and Herzegovina), and Turkey.

Remarks. For Turkey only one male from Isparta is known. More material is needed to verify this record.

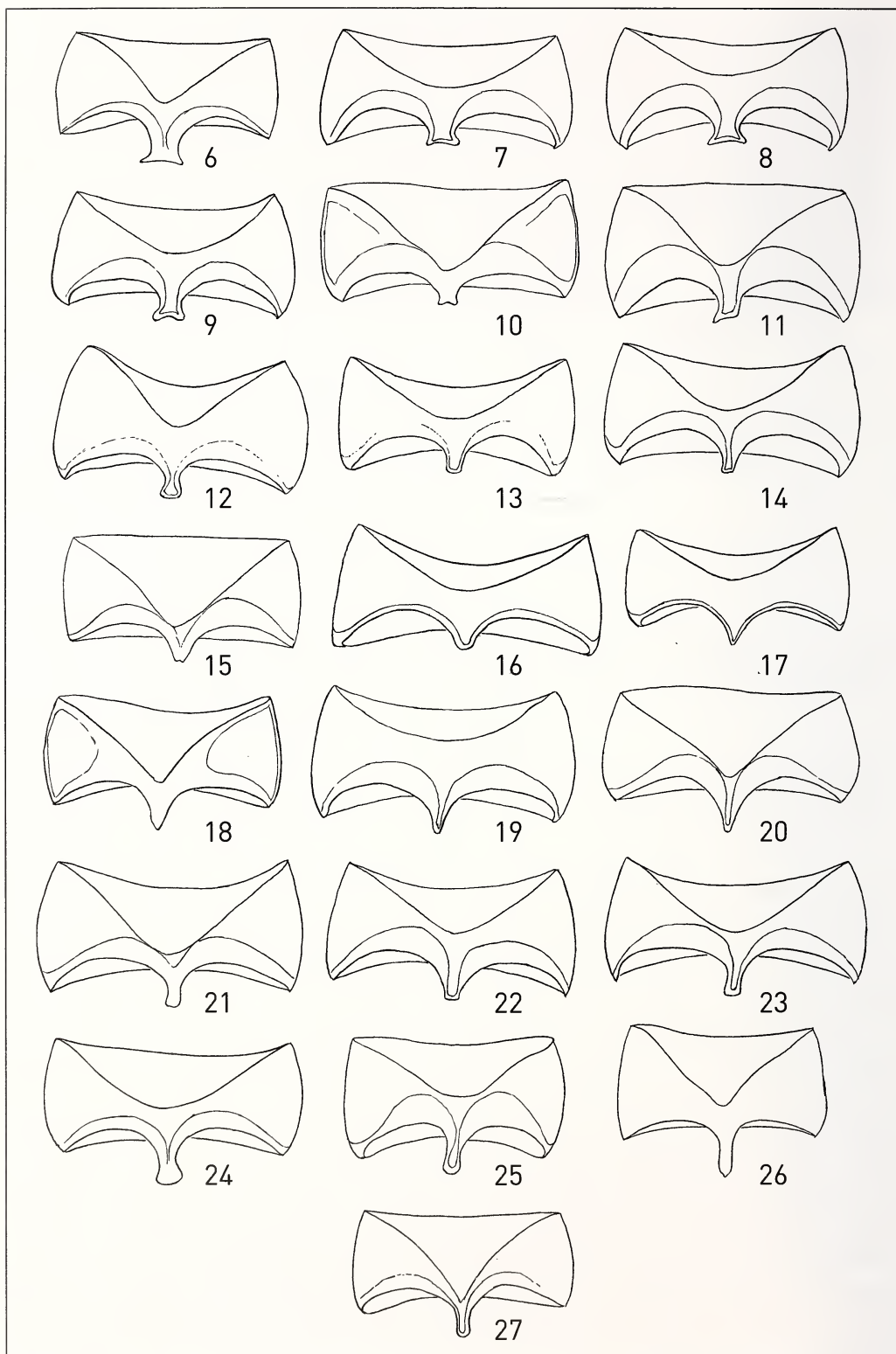
Cephimallota angusticostella (Zeller, 1839)

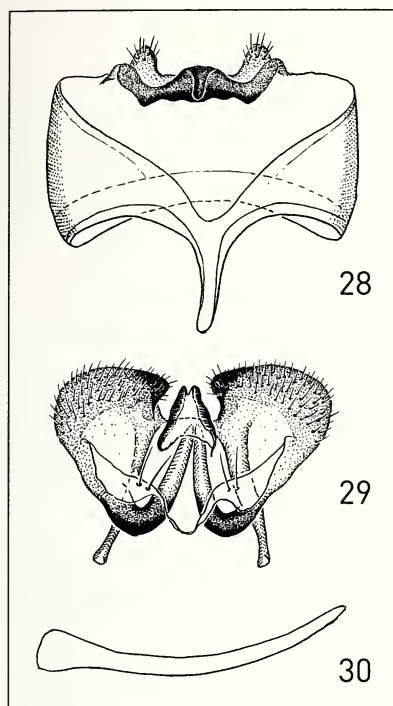
Fig. 2

[= *Cephimallota libanotica* Petersen, 1959; = *Tinea angusticostella* Herrich-Schäffer, 1854; = *Cephimallota hasarorum* Zagulajev, 1965]

Redescription. Wingspan 11–16 mm ($n = 398$); head brush golden-yellow, sometimes more grey-yellow, antenna filiform, ca. 2/3 of forewing length, brown-grey, labial palps golden-yellow, sometimes grey-yellow, second segment at outer apex with protruding short bristles, at the inner side only few bristles; thorax and forewing dark brown, slightly shimmering violet, the whole area covered with small light spots, accumulating along the costal and dorsal margin; hindwing slightly lighter brown-grey.

Male genitalia (Figs 28–30). Uncus with two setaceous oblong protuberances, firmly attached to the tegumen, below uncus a strongly sclerotised clasp (gnathos?) with a slender digitiform appendix; tegumen broad, narrowing ventrally, saccus almost as long as width of tegumen; valva compact, semi-circular, overall more slender than in *C. crassiflavella*, with very long, slender transtilla, with strongly sclerotised obtuse tip, inward-directed, below the tip connected with the other valva; lateral side of valva stretched out in a long curved and strongly sclerotised appendix; phallus as long as tegumen and saccus together, slightly curved over total length. The whole genital apparatus in situ compact, valvae fitted into the teguminal invagination, hardly mobile separately.





Figs 28–30. *C. angusticostella*, ♂ genitalia: 28. uncus-tegumen; 29. valvae; 30. phallus (from the same specimen: Sandanski, Bulgaria).

Female genitalia (Figs 33–34). Anterior apophyses furcated, ventral part ending in a large ostial plate, which is deeply split in the area of the ostium, laterally edged, split with rounded end; in the centre of the split a small, strongly sclerotised appendix.

Distribution. Hitherto known with certainty from Italy (incl. Elba), Balkan Peninsula (Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Macedonia, Albania, Greece, Romania, Bulgaria), Cyprus, Ukraine (Bidzilya & Budashkin 1998), Russia, Austria (Kasy 1987; Wieser 1998, 2003; Wieser & Kofler, 2000; the record from East Tyrol in Deutsch (2003) is erroneous and the specimen belongs to *C. crassiflavella*), Czech Republic (Laštůvka et al. 1994, genitalia dissection by Liška; Vavra 2002), Slovakia, Hungary, Lebanon, Turkey, and Armenia. In addition, one confirmed record from Spain and two confirmed records from Germany are known.

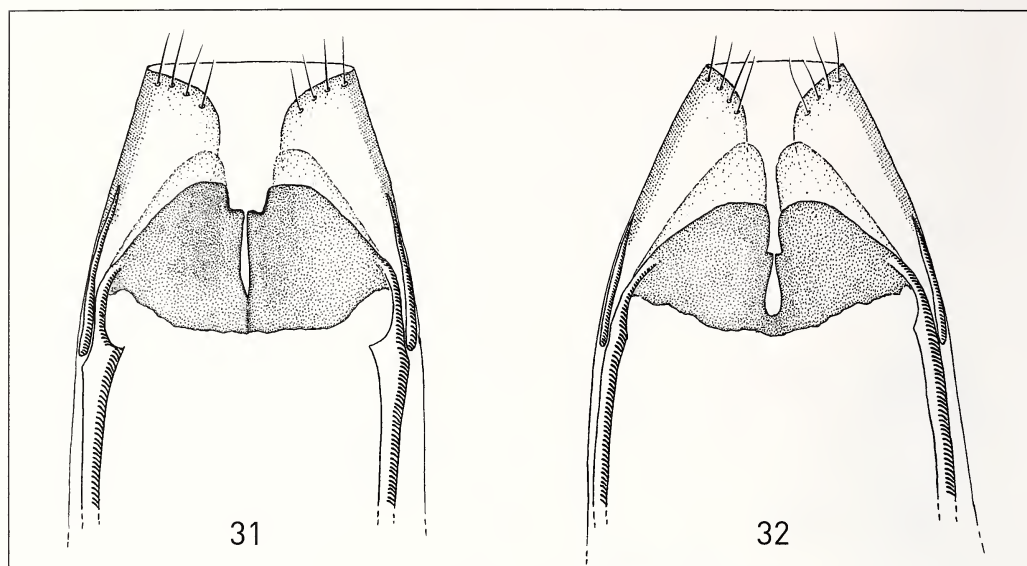
Remarks. No variability was found in the male genitalia. In comparison with *C. crassiflavella*, the genital apparatus is always smaller, even in specimens of the same size. Records from Spain (Sierra Nevada, one specimen) and Germany (Brandenburg, two specimens) are outside the general distribution of this species.

Differential diagnosis

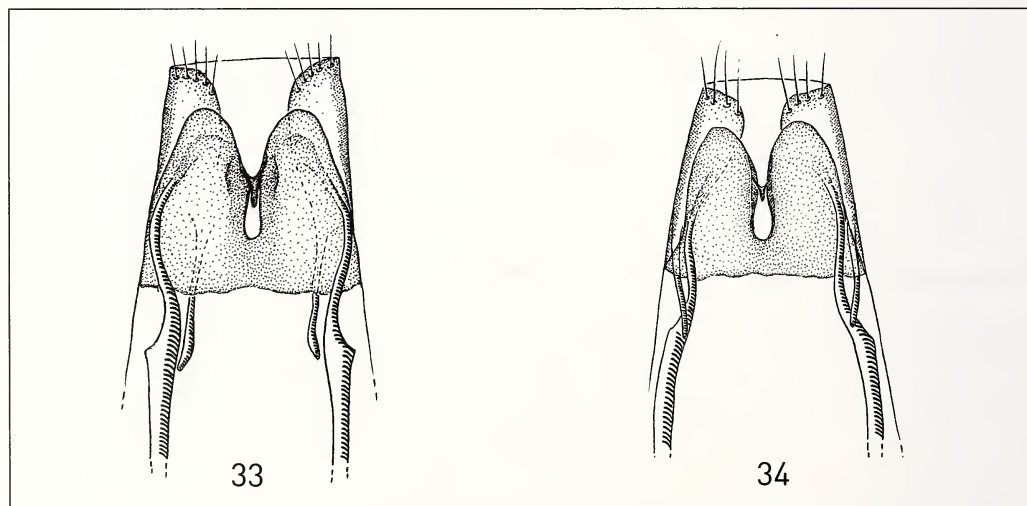
Imago. In contrast to *C. crassiflavella*, *C. angusticostella* bears only a few short bristles at the inner side of second segment of the labial palps. The forewings of *C. crassiflavella* are without maculation and only the costal margin is slightly lighter, whereas forewings of *C. angusticostella* are covered with small light spots, accumulating along the costal and dorsal margin.

Male genitalia. In *C. crassiflavella* the clasp (gnathos?) below the uncus has three acute small protuberances, while in *C. angusticostella* the clasp bears a slender digitiform appendix. The saccus of *C. crassiflavella* is short and variable in shape, being

Figs 6–27. *C. crassiflavella*, ♂ genitalia: variability in saccus shape: 6. Kaiserstuhl, Germany; 7. Berlin, Germany; 8. Grünstadt, Germany; 9. Port Bou, Spain; 10. Grünstadt, Germany; 11. prov. Verona, Italy; 12. Sardinia, Italy; 13. Lombardia, Italy; 14. Dept. Provence, France; 15. Freiburg, Germany; 16. Oreison, France; 17. Trentino, Italy; 18. Mannheim, Germany; 19. Lucania, Italy; 20. Sarajevo, Bosnia and Herzegovina; 21. Dept. Var, France; 22–23. Piedmont, Italy; 24. Krasnodarskij kraj, Russia; 25. Isparta, Turkey; 26. "Oswitz", Poland; 27. Russia; type of *C. hasarorum*.



Figs 31–32. *C. crassiflavella*, ♀ genitalia (with variability): **31.** Wrocław [labelled: Breslau, 1896], Poland; **32.** Bocognano, Corsica, France.



Figs 33–34. *C. angusticostella*, ♀ genitalia (with variability): **33.** Petrina, Macedonia; **34.** Nom. Chania, Crete, Greece.

either cut straight or stretched out to a more or less short tip. In *C. angusticostella* the saccus is almost as long as the width of tegumen and invariable in shape. The valva of *C. angusticostella* is overall more slender than that of *C. crassiflavella*.

Female genitalia. In *C. angusticostella* the ventral part of the anterior apophyses ends in a large ostial plate, which is deeply split in the area of the ostium and laterally edged. The split has a rounded end and bears a small, strongly sclerotised appendix in its centre.

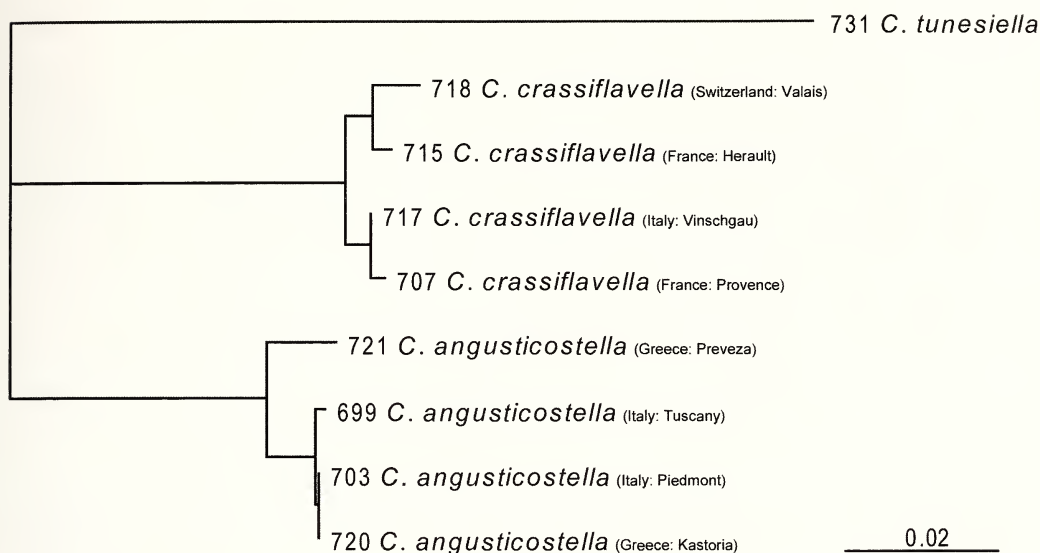


Fig. 35. Neighbor Joining (K2P) dendrogram.

Contrary to *C. angusticostella*, the inner branch of anterior apophyses of *C. crassiflavella* ends in a stronger sclerotised ostial plate, which also has a deep central split. The split is very narrow in its posterior portion and widens to an acute or rounded, broad apex.

Molecular results

All barcode sequences are 587 base pairs (bp) in length. No indels have been observed in any of the sequences. The sequences of *C. angusticostella* and *C. crassiflavella* form two distinct clusters, each comprising only conspecific samples (Fig. 35). According to the K2P distance matrix (Tab. 2), intraspecific genetic distances are low for both taxa: 0%–1.73% (mean 0.865%) for *C. angusticostella*, and 0.17%–1.55% (mean 0.975%) for *C. crassiflavella*. In comparison, the mean interspecific genetic distances between *C. angusticostella* and *C. crassiflavella* are 10-fold higher (8.70%–9.88%; mean 9.15%). A comparison of the maximum intraspecific distances of *C. angusticostella* and *C. crassiflavella* with their minimum interspecific distance leads to a “barcoding gap” ratio of 1:5 for *C. angusticostella* and 1:5.6 for *C. crassiflavella*. The barcode distance of the two taxa in question to the “outgroup” taxon *C. tunesiella* comes to 14.67%–14.68% (mean 14.68%) for *C. angusticostella*, and to 15.49%–15.71% (mean 15.55%) for *C. crassiflavella*.

Distribution mapping

In the map (Fig. 36) the two taxa show a pattern of vicariance, with *C. angusticostella* being mainly distributed in the eastern half of Europe and *C. crassiflavella* mainly in the western half of Europe. Their distributional areas broadly overlap in Italy, Slovenia,

Table 2. Kimura-2 Parameter (K2P) distance matrix with distances in %. * maximum intraspecific distance; # minimum interspecific distance for species pair *C. angusticostella* – *C. crassiflavella*

	<i>angust.</i> 699	<i>angust.</i> 703	<i>angust.</i> 720	<i>angust.</i> 721	<i>crassifl.</i> 707	<i>crassifl.</i> 715	<i>crassifl.</i> 717	<i>crassifl.</i> 718
<i>angusticostella</i> 703	0.17	–						
<i>angusticostella</i> 720	0.17	0.00	–					
<i>angusticostella</i> 721	1.73*	1.56	1.56	–				
<i>crassiflavella</i> 707	8.89	8.90	8.90	9.30	–			
<i>crassiflavella</i> 715	9.09	9.10	9.10	9.49	1.03	–		
<i>crassiflavella</i> 717	8.70#	8.71	8.71	9.10	0.17	0.86	–	
<i>crassiflavella</i> 718	9.48	9.49	9.49	9.88	1.55*	0.86	1.38	–
<i>tunesiella</i> 731	14.67	14.68	14.68	14.68	15.71	15.49	15.50	15.50

Austria, and Hungary. Three findings strongly depart from a typical specific distribution: a single *C. angusticostella* specimen was collected in southern Spain; one specimen each of *C. crassiflavella* was collected in western Turkey and in southeastern Russia. Although different explanations for such distributions are possible, the best assumption appear to be that there are simply large gaps in our knowledge of the distribution of both taxa in these regions.

Discussion

The male genitalia of *C. crassiflavella* show significant variability in the shape of the saccus, which is typically very short, broad, and cut straight (see Fig. 3). The saccus shape varies throughout the whole distribution in being more elongate and slender, with the acute apex rounded (see Figs 6–27). No geographic gradient or pattern of degree of saccus slenderness and elongation could be determined (see Figs 6–27), suggesting that genital variation likely depends on factors other than distribution. On the other hand, the male genitalia of *C. angusticostella* show no tendency towards variation.

The mean interspecific K2P distance of 9.145% between *C. angusticostella* and *C. crassiflavella* found in our analysis by far exceeds the 3% mean interspecific barcode distance proposed by Hebert et al. (2003) as threshold for the distinction of Lepidoptera species. Our data also fulfil the “standard screening threshold” of 10x the average intraspecific distance proposed by Hebert et al. (2004). In contrast, if the highest (instead of mean) intraspecific distances are compared with the smallest (instead of mean) interspecific distances as suggested by Meier et al. (2008), the “barcoding gap” is reduced to a 1:5 ratio for *C. angusticostella* and a 1:5.6 ratio for *C. crassiflavella*. We believe that this ratio is much more valuable in describing the real interspecific distances than the mean interspecific barcode distance, which neglects the (sometimes huge) intraspecific variation of the examined taxa.

Our investigations strongly suggest that both taxa are distinct species. They are distributed in the West Palaearctic, with *C. crassiflavella* covering the western part of this area, and *C. angusticostella* being found in the eastern. Their ranges broadly meet in

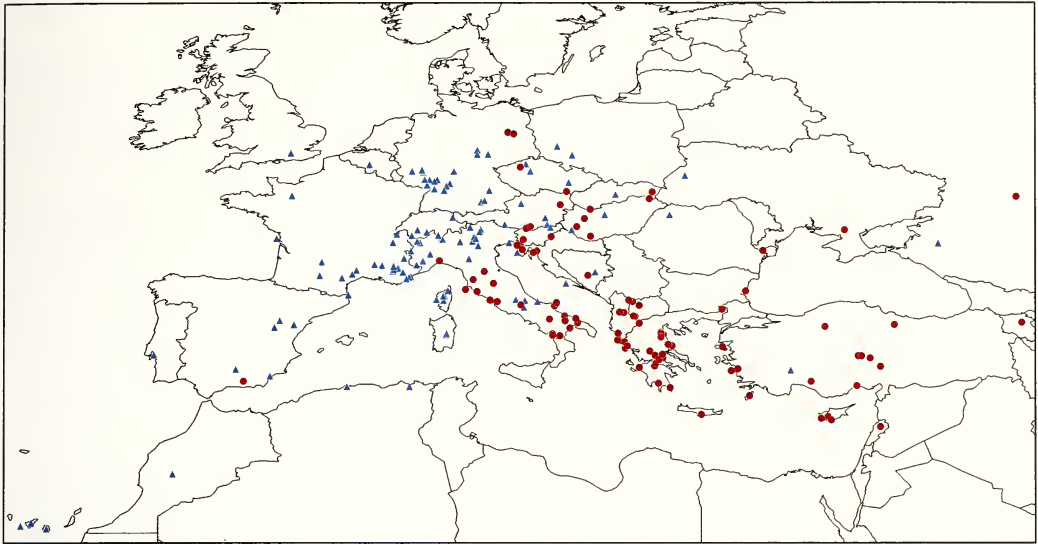


Fig. 36. Distribution map of *Cephimallota angusticostella* (red circles) and *C. crassiflavella* (blue triangles) in the West Palearctic.

Central Europe, where both species can be found at the same locations. This “contact zone” is located in Italy, Slovenia, Austria, Hungary, Czech Republic, and Russia. In Italy, both species have been found at the same locality (Lucania: Mt. Pollino).

Three confirmed records (one *C. crassiflavella* finding from Turkey and two *C. angusticostella* findings from Spain and Germany) are somewhat inconsistent with the status of vicariant species. Further studies are necessary to solve these contradictions.

Acknowledgements

Through the kindness of numerous colleagues it was possible to loan a large number of specimens of the two investigated taxa for detailed studies: Ernst Arenberger (Vienna), Günter Baisch (Biberach), Giorgio Baldizzone (Asti), Graziano Bassi (Torino), Helmut Deutsch (Lienz), Manfred Gerstberger (Berlin), Stanislav Gomboc (Kranj), Peter Huemer (Innsbruck), Lauri Kaila (Helsinki), Ole Karsholt (Copenhagen), Mojmir Lasan (Ljubljana), Wolfram Mey (Berlin), Joel Minet (Paris), Erik van Nieukerken (Leiden), Willibald Schmitz (Bergisch-Gladbach), Andreas Segerer (Munich), Rudi Seliger (Schwalmtal), Sergej Sinjev (St. Peterburg), Franz Theimer (Berlin), Zdenko Tokar (Šal’a), Robert Trusch (Karlsruhe), Andreas Werno (Nunkirchen), and Wolfgang Wittland (Dalheim-Wegberg). Herewith we express our gratitude for this possibility. We would like to address special thanks to Matthias Nuss for his valuable comments and discussions during the work on this study, and for the possibility to undertake the molecular analyses in the DNA laboratory of the Museum für Tierkunde Dresden. Christian Kutzscher (Senckenberg Deutsches Entomologisches Institut Müncheberg) kindly made the colour plates.

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Appendix

A list of examined specimens of *Cephimallota crassiflavella* Bruand, 1851 and *C. angusticostella* (Zeller, 1839) follows below. All specimens were determined by G. Petersen or R. Gaedike. The list contains material examined from ca. 1955 to 2011. The localities in this list are recorded as they appear on the labels. The current depository of the material (if available) is provided using the abbreviations listed below.

Collection Information and Abbreviations

Aalto	Aanti Aalto, Hyvinkää, Finland
Baldizzone	Giorgio Baldizzone, Asti, Italy
Bassi	Graziano Bassi, Avigliana, Italy
De Lattin	Gustav de Lattin, Zentrum für Biodokumentation des Saarlandes, Landsweiler-Reden, Germany
Deutsch	Helmut Deutsch, Lienz, Austria
FMNH	Finnish Museum of Natural History, Helsinki, Finland
Gerber	Hermann Gerber, Bern, Switzerland
Gerstberger	Manfred Gerstberger, Berlin, Germany
Gomboc	Stanislav Gomboc, Kranj, Slovenia
T. Grünewald	Theo Grünewald, Landshut, Germany
Hollingworth	No information available
Langohr	G. R. Langohr, The Netherlands
Lasan	Mojmir Lasan, Ljubljana, Slovenia
LMAD	Löbbecke Museum und Aquazoo, Düsseldorf, Germany
NMEG	Naturkundemuseum, Erfurt, Germany
NMW	Naturhistorisches Museum, Vienna, Austria
Parenti	Umberto Parenti, Torino, Italy
RMNH	Nationaal Natuurhistorische Museum (“Naturalis”), Leiden, The Netherlands
Roweck	Hartmut Roweck, Kiel, Germany
Schmitz	Willibald Schmitz, Bergisch-Gladbach, Germany
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
Seliger	Rudi Seliger, Schwalmthal, Germany
SMNK	Staatliches Museum für Naturkunde, Karlsruhe, Germany
Strobl/Admont	Gabriel Strobl, Benediktiner-Stift Admont, Austria
Theimer	Franz Theimer, Berlin, Germany
TLMF	Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria
Tokar	Zdenko Tokar, Sal’a, Slovakia
Werno	Andreas Werno, Nunkirchen, Germany
ZMHB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
ZMUC	Zoological Museum, Copenhagen, Denmark
ZSM	Zoologische Staatssammlung, Munich, Germany

Cephimallota crassiflavella Bruand, 1851

Algeria: 1♂, 1♀, Alger, Aout 1907 (MNHN); 1♂, Algerié, St. Charles, leg. A. Théry (SDEI).

Morocco: 1♂, Marakesch-Tensift-El Haouz Asguine, 970 m, 4.vi.2010, leg. Werno (coll. Werno).

Spain, Canary Islands: Tenerife: 1 specimen without abdomen, Las Mercedes, 18.vi.1971, leg. J. Klimesch (ZSM); 1♂, Vilaflar, 1400 m, leg. Pinker; La Gomera: 1♂, Hermigua, El Convento, 600 m, 6–13. iv.2007, leg. W. Losert (coll. Schmitz); 1♀, Alujera, 400 m, 16.iv.1998, leg. K. Larsen (coll. Roweck); Gran Canaria: 1♀, S. Bartolomé d. T., 8.v.1965, leg. J. Klimesch (ZSM).

Spain, mainland: 1♂, Granada, Fuente d. l. Mona, 1350 m, 10.vii.1981, leg. St. Nielsen; 1♀, Sierra Nevada, Camino de la Velela, 1600 m, 22.vii.1985, leg. G. Baldizzone & E. Traugott-Olsen (coll. Baldizzone); 1♂, same location, 2.viii.1986, leg. E. Traugott-Olsen; 1♂, Lanjaron, Sierra Nevada, 1895, leg. Korb (SDEI); 1♂, Prov. Teruel, Sra. Alta, 1600 m, 14–15.vii.1979, leg. Hahn; 3♂, Teruel, Cosa, 9.vii.1985, leg. C. Gielis (RMNH); 1♂, Teruel, Albarracin, 1000–1200 m, 4–8.viii.1989, leg. C. Gielis (RMNH); 1♂,

Teruel, Albarracin, Val de Vecar, 1250 m, 17–18.vii.1988, leg. M. Fibiger (ZMUC); 1♂, Radio Must, 5 km W of Werja, 5.v.1995, leg. R.T.A. Schouten (RMNH); 1 specimen without abdomen, Cintoires, Castellon, 15.viii.2002, leg. B. Niemeyer (coll. Schmitz); 1♂, 1♀, Cataluna, Port Bou, 13.vi.1971, leg. W. Glaser (SMNK, SDEI).

Portugal: 1♂, Extremadura, Ericeira, 5 km N of Lisboa, 4–8.vii.1986, leg. O. Karsholt (ZMUC).

France: 1♂, Aix-les-Bains, vii.1898, leg. Tutt; 1♀, Basses Alpes, vii.1913, leg. Walsingham; 1♂, Durance-Tal: St. Crepin, 900 m, 24–30.vi.1959, leg. H. G. Amsel (SDEI); 4♂, Basses Alpes, Oraison, vii.1962, leg. K. Burmann (ZMNK, SDEI); 3♂, Digne, La Dourbes, 700 m, 9–11.vii.1962, leg. E. Arenberger (ZMNK); 1 specimen Valbonette near oraison, 25.vii.1973, leg. Groß (LMAD); 1♀, Island Oleron, 7.viii.1920; 1♂, Mougins, env. of Cannes, 30.vi.1922; 1♂, Drôme: St. Restitut, St. Paul Trois Chateaux, 250 m, 2.ix.1984, leg. Fibiger & Moberg (ZMUC); 1♂, Drôme: La Penne-s-l-Ouvèze, 20–22.vii.1986, leg. H. W. van der Wolf; 2♂, Haute Provence: Les Mees, 4.viii.1985, 25.vii.1979, leg. Langohr (coll. Langohr); 3♂, Umgebung Castellane, 17.vi–3.vii.1999, leg. S. Steegers (coll. Seliger, SDEI); 1♂, Umgebung Sisterone, Opiere, 10.v.2001, leg. A. Blumberg (coll. Schmitz); 21♂, 1♀, Provence: Domaine de Maure Vieille, v–vi 2000–2005, leg. H. Hendriksen (ZMUC, SDEI); 1♂, Haute Garonne: Blagnac, 4.viii.1988, leg. Hollingworth (coll. Hollingworth); 1♂, Gard: Roquedur, Ganges, 28.vi–6.vii.1980, leg. K. Schnack (ZMUC); 6♂, Dept. Var: Frejus, Roquebrune, 12–17.vi.2002, 17–19.vi.2004, leg. H. Hendriksen (ZMUC); 2♂, Dept. Herault: St. Pons de Thomieres, Artenac, 24.vi.2004, leg. E. van Nieukerken (RMNH); 1♂, Dept. Var: Loiras, 25.vi.2009, leg. Z. Lastuvka (SDEI); 1♂, Dept. Lot: Arcambal (Cahors), 6.viii.1981, leg. R. T. A. Schouten (RMNH).

France, Corsica: 1♀, Bocognano, vi.1905, leg. Leonhard (SDEI); 1♂, Castirla, 12 km N Corté, 400 m, 20.vi.1994, leg. Skule & Skou (ZMUC); 1♂, Ascalot, 800 m, Umg. Asco, 6.vi.1993, leg. N. Keil; 1♂, Saint Florent, Marfines du Soleil, 1–12.vi.1993, leg. N. Keil; 1♂, above Lozzi, 1150 m, 18.vii.2004, leg. P. Skou (ZMUC); 1♂, Cargèse, 15–16.v.1999, leg. O. Karsholt (ZMUC).

Italy: 1♂, Friuli: Tagliamento, 4.viii.2002, leg. H. Deutsch (TLMF); 1♂, Abruzzan: Ovindoli, 1400 m, 3–13.vii.1959, leg. Gross (LMAD); 1♀, Abruzzi, Passo di Lanciano, vii.1960, leg. Parenti (coll. Parenti); 1♂, Trentino: Pietramurata, viii.1959, leg. K. Burmann (SDEI); 1♂, Prov. Trient: Pomarolo, 19.vii.1995, leg. P. Huemer (TLMF); 2♂, Süd-Tirol, Praderfeld, 5.viii.1991, leg. P. Huemer (TLMF); 1♂, Südtirol, Vintschgau, Prad am Stilfser Joch, 27.vii.2005, leg. E. van Nieukerken (RMNH); 1♀, Bozen, 19.vi.1911, leg. Lenthe (SDEI); 1♂ Auer [=Oral], 15–16.vi.1958, leg. K. Burmann (ZMNK); 1♂, Monte Baldo, env. of. Spiazzi, 600 m, 22.vii.1983, leg. P. Skou & B. Skule (ZMUC); 1♂, 1♀, Reggio/Emilia, vi.1929; 7♂, 2♀, Piemonte: Monferr. Alfiano N. 300 m, 29.vi., 8.vii.1979; leg. Baldizzone (coll. Baldizzone); Asti-Boschi di Valmanera, 14.vii.1976; leg. Baldizzone (coll. Baldizzone); Asti; fraz. Valmanera, Oasi WWF, 13.vii.2006; leg. Baldizzone (coll. Baldizzone); V. Curone, Poggio di Casasco, 300 m, 11.vii.1981; leg. Baldizzone (coll. Baldizzone); Trinità, Vallone Grande, 1400 m, 15.vii.1996; 13–24.vii.1998; leg. Baldizzone (coll. Baldizzone); Valdieri, Riserva Nat. Spec., 12., 17.vii.1999; leg. Baldizzone (coll. Baldizzone); 6♂, 3♀, Valsusa, Giaglione, 14.viii.1986, 2., 8., 16.vii.1983, 26.vi.1985, 20.vii.1984, leg. Bassi (coll. Bassi); 1♂, Piemonte, S. Carlo Canse, Vanda di Nole, 1.vii.1991, leg. Delmastro, (coll. Baldizzone); 2♂, Valle d'Aosta: Parco Nat. Monte Avic, 17.vii.1993, 25.vii.1994, leg. Baldizzone (coll. Baldizzone); 2♂, Valle d'Aosta, Quart, 700 m, 18–31.vii.1989, leg. M. Bocca; 2♂, Castello d'Annone, Bosco del Lago, 9.vii.2000, leg. Baldizzone (coll. Baldizzone, SDEI); 1♂, Lombardia: Lago d'Iseo, Montisola, 1.viii.1985, leg. M. Gerstberger (coll. M. Gerstberger); 1♂, Lombardia, Brusimpiano, Ardena, 20–22.vii.2002, leg. Aalto & Räsänen (coll. Aalto); 1♂, Molise: Petacciato, Marina CB, vii.1980, leg. Langohr (coll. Langohr); 1♂, Molise, Pizzone, 920 m, 17.vii.1990, leg. Baldizzone (coll. Baldizzone); 1♂, Prov. Verona: Monte, 25.vi.1981, leg. K. Burmann (ZMNK); 2♂, Lucania: Mt. Pollino, sotto Rif. Pisanelli, 13.vii.1991, leg. Baldizzone (coll. Baldizzone).

Italy, Sardinia: 2♂, Mts Genargentu, Belvi, 700 m, 20., 29.vii.1975, leg. Gozmány (SDEI); 1♂, Genargentu, 1000 m, Arcu Tascussu, 28.vii.1981, leg. Baldizzone (coll. Baldizzone).

Germany: 1♂, Berlin-Bohnsdorf, 1.vii.2006, leg. Gerstberger (coll. Gerstberger); 1♂, Bremm/Mosel, 8.vii.2002, leg. Schmitz (coll. Schmitz); 1♂, Kyffhäuser, Kosakenstein, vii.1912, leg. Petry, Mus. Erfurt; 1♂, Tilleda, vii.1891, leg. Petry (NMEG); 1♀, Umgebung Naumburg, leg. Bauer (ZSM); 2♂, Grünstadt, 1874, 1879, leg. Eppelsheim (SDEI); 1♀, Mannheim, 30.vii.1948, leg. K. Müller (SDEI); specimens, Speyer, leg. Disque (ZSM, SDEI); Frankfurt/Main, leg. von Heyden; Nollig bei Lorch, leg. Gross; Loreley, leg. Stamm et Jäckh; St. Goarshausen, leg. Tetens; Annweiler; Albersweiler, Falkenstein, leg. Jöst; Weinheim/Bergstraße, leg. Lienig; Durlach bei Karlsruhe, leg. Reutti; Markgröningen, leg. Wörz; Kehlheim/Donau, leg. Osthelder (ZSM); Gröbenzeller Moor bei München, leg. Osthelder (ZSM); Eching bei München, leg. Pfister (ZSM);

Poland: 1♂, 1♀, Breslau-Oswitz, 28.vii., 4.viii.1896.

Czech Republic: 1♀, Suchdol bei Praha, 16.vii.1953, leg. F. Gregor.

Austria: 1♂, Gumpoldskirchen, 4.vii.1939; 1♂, Mödling, leg. Mann (coll. Strobl/Admont); 2♀, Steiermark, bei Klagenfurt, 15.vi.1948, leg. J. Klimesch (ZSM); 1♂, Osttirol: Lavant, 21.vii.1995, leg. Deutsch (coll. Deutsch).

Switzerland: 3 specimens, Wallis: Lenk, 900 m, 20.vii.1973, leg. Groß (LMAD); 6♂, Wallis, Umgebung Lenk, Erschmatt, 1200–1300 m, 8., 11., 13.vii.2010, leg. Seliger (coll. Seliger, SDEI); 2♂, Wallis: Dar-

nona d'en Bas, 9., 14.vii.2010, leg. Gerber (coll. Gerber); 1♂, Wallis, Simplon, Schallberg, 1900 m, 15–17.vii.2007, leg. Schmitz (SDEI); 1♂, Wallis, Brig/Ried, 800 m, 17.vii.2007, leg. Schmitz (SDEI); Genf, leg. Frey, leg. Rehous; Tessin, leg. Schmidlin; leg. Krüger, leg. Nägeli. **Hungary:** 1♀, Budapest; 1♀, Ofen (ZMHB); 1♂, Budafok, viii.1911; 1♂, 2♀, Hadad, vii.1914, leg. Kleisi; 3♂, Nagykanisza, vi.1961, leg. Karolyi.

Slovenia: 1♂, Podgorski Kras, 21.vi.2003, leg. Gomboc (coll. Gomboc).

Croatia: 1♂, Insel Lesina, leg. Novak; 6 specimens, Istrien/Rovinj, vii.1967, leg. Daniel (ZSM).

Turkey: 1♂, Isparta, Bagkonak, 22.vii.1996, leg. Skovgaard (ZMUC).

Cephimallota angusticostella (Zeller, 1839)

Spain, mainland: 1♂, Sierra Nevada, Ruta de Veleta, 2000 m, 1.vii.1990, leg. Schütze (coll. T. Grünewald).

Italy: 27♂, 1♀, Piemonte: Capanne di Marcarolo, 7., 21., 22., 28.vi., 5., 6., 12.vii.2005; Cirimilla-Capanne, 21.vi.2005; colle d. Eremit, 24.vi.2003; leg. Baldizzone (coll. Baldizzone, SDEI); 1♂, Appenin centr., Mtgna Grande, 1000 m, 1.viii.1928, leg. Dannehl (SDEI); 17♂, 1♀, Toscana: Umg. Dicomano, 17–23.vi.2006; Umg. Voltera, 10–16.vi.2006, leg. Theimer (coll. Theimer, SDEI); 4♂, Monti Uccellina, 12.vi.1977, leg. Baldizzone (coll. Baldizzone, SDEI); 1♂, Umbria: Lago Trasimeno, 18.vii–8.viii.1987, leg. Theimer (coll. Theimer); 1♂, Roma: Ogliata, 6.vii.1965, leg. F. Hartig (SDEI); 1♂, Lazio: Monti di Tolfa, dint. Manziana, 23–28.vi.1989, leg. Baldizzone (coll. Baldizzone); 7♂, Lucania: Mt. Pollino, Versante Lucano, 11–12.vii.1991, leg. Bassi & Baldizzone (coll. Baldizzone); 4♂, Lucania, Mte Pollino, Rotonda, 8.vii.1991, leg. Baldizzone (coll. Baldizzone); 1♂, Lucania, Mte Vulture, Groticelle, 300–500 m, 9.vi.1966, leg. F. Hartig; 3♂, Lucania, Monticchio, Valle dell' Ofanto, 300 m, 15., 17., 21.vi.1970, leg. F. Hartig (SDEI); 1♂, Lucania, Lago di Monticchio, 750 m, 18.vii.1967, leg. F. Hartig; 1♂, Lucania, F. Bradano, Santa Lucia, 1.vi.1976, leg. F. Hartig; 2♂, 1♀, Basilicata: Trecchina, 320 m, 25.v., 24.vi.1993, leg. Hausmann (ZSM); 1♂, Puglia, San Paolo, Martine Franca (Taranto), 400 m, 13.vi.1969, leg. Parenzan (SDEI); 3♂, 1♀, Puglia, Terlizzi, 20.vi.1978, leg. Parenzan (SDEI); 4♂, Puglia, Polignano, 16.vi.1978, leg. Baldizzone (coll. Baldizzone); 1♂, Puglia, 4 km N of Altamura, 27–29.v.2005, leg. P. Skou (ZMUC); 1♂, Calabria, Fiumicella (Tortora), 6.vi.1993, leg. Hausmann (ZSM); 1♂, Gargano, Peschici, 29.vi.1980, leg. Baldizzone (coll. Baldizzone); 1♂, Elba, Porto Azzurro, 15–18.vi.1967, leg. P. Müller (coll. De Lattin).

Germany: 1♂, Brandenburg: Ferbitzer Bruch, 3.vi.2003, 1♀, Berlin-Marienfelde, 30.vi.2010, leg. Theimer (coll. Theimer).

Slovakia: 1♂, 1♀, Vinianska stran, 19.vi.1993, leg. Tokar (coll. Tokar); 1♂, 1♀, Komarno, 15.viii.1984, 14.vii.1992, leg. Pastoralis (coll. Pastoralis); 8 specimens, Vihorlat mts. Senderov, 9., 12.vi.1994; Ladmovce, 2.vii.1993, leg. Tokar (coll. Tokar).

Hungary: 1♂, Vörs, Com. Somogy, vii.1931, leg. Osthelder (SDEI); 1♂, Veszprem county, Bakony mts 47°01'N, 17°53'E, 18.vi.2005, leg. B. Skule et al. (ZMUC).

Slovenia: 1♂, Fruska Gora, 28.vi–12.vii.1935, leg. Daniel (ZSM); 1♂, Portoroz, Secovije, 2.vi.1999, leg. Lasan (SDEI); 6♂, Oresje, Kozja pec, 26.vi.2003, leg. Gomboc (coll. Gomboc, SDEI); 1♂, Slovensko Primorje, Osp, 4.vii.2004, leg. Gomboc (coll. Gomboc, SDEI); 2♂, Piran, Strunjan, 24.v.2000, leg. Lasan (coll. Lasan, SDEI); 1♂, Vipava, 27.vii.2000, leg. Lasan (SDEI); 2♂, SW-Slovenia, below Nanos Mts, near Vipava, 1.vii.2003, leg. B. Skule & C. Hviid (ZMUC); 1♂, Nanos, 3.viii.1999, leg. Lasan (coll. Lasan); 1♂, Lom near Topolsca, 9.vii.2002, leg. Gomboc (coll. Gomboc); 2♂, Vetmik near Podsreda, Kozjanski park, 24.vi.2003, leg. Gomboc (coll. Gomboc, SDEI); 2♂, Slowenien-Karst, Prflesnica, 23.vi.2003, leg. Deutsch (coll. Deutsch); 1♂, Sentilj, Sladki Vrh, 1.viii.2003, leg. Lasan (coll. Lasan); 1♂, Crni Kol, Petrinje, 5.vii.2000, leg. Lasan (coll. Lasan).

Croatia: Krk Island: 1♂, Misucaynica, 3.vii.1978, leg. Baldizzone (coll. Baldizzone); 1♂, Malmasuta, 17.vii.1999, 1♂, Konobe near Punat, 5.vi.1999, 1♂, env. of Punat, 14.vi.1999, leg. Gomboc (coll. Gomboc); 2♂, Mali Ham, 18.vi.2004, leg. Gomboc (SDEI); 1♂, Stara Baska, 6.vi.2003, leg. M. & E. Arenberger (NMW). 1♂, Plitvice, 17–20.vii.1984, leg. K. Schnack (ZMUC). 1♂, Porec, 26.vii–13.viii.2009, leg. A. Blumberg (coll. Schmitz). 3♂, Vinodolski, 12–14.vi.2004, leg. Theimer (coll. Theimer, SDEI). 1♂, Limski Kanal, 3.vii.2002, leg. Lasan (coll. Lasan). 1♂, Barban, Melnica, 24.vi.2001, leg. Lasan (SDEI).

Serbia: 2♂, Shar Planina, Pena-Fluss bei Brodec, 16–19.vii.1939, leg. Daniel, Forster et. Pfeiffer (ZSM, SDEI).

Bosnia and Herzegovina: 1♂, Konjica, 18.vii.1898, leg. Rebel (NMW).

Macedonia: 3♂, Ochrida, vii.1936–1939, leg. Wolfschläger (ZSM, SDEI); 1♀, Petrina, 3–15.viii.1936, leg. Wolfschläger (SDEI); 2♂, Mt. Asan Djura (Prespa), 5.viii.1979, leg. Baldizzone (coll. Baldizzone, SDEI); 2♂, Mt. Asan Djura (Ochrida), 4., 7.viii.1979, leg. Baldizzone (coll. Baldizzone); 1♂, Treska-Schlucht, 23–27.vi.1955, leg. Klimesch (ZSM).

Albania: 1♀, Bize bei Shengjergjhi, 10–15.vii.1961, leg. G. Friese (SDEI); 1♂, Borshi, südl. Vlora, 14–27.v.1961, leg. G. Friese (SDEI); 1♂, Dajti, Shkall Prisk, 850 m, 27.vi–2.vii.1961, leg. G. Friese (SDEI); 1♂, Kula e Lumes, 18–28.v.1918, leg. Predota & Zerny (NMW).

Greece: some specimens, Peloponnisos, 5 km N of Kalavrita, 24.vi.1991, leg. Schouten (RMNH, SDEI); 1♂, Peloponnisos: Zachlorou bei Kalavryta, 1–14.vii.1959, leg. Noack (LMAD); 1♂, Peloponnisos, Yithion, 14.v.1990, Exp.Mus. Kop. (ZMUC); 21♂, 3♀, Peloponnisos, Ilia, Loutra Kilinis, vi.1981, leg. Grotenfelt (FMNH, SDEI); 2♂, Loutra Kilinis, 22.v.2006, leg. Schmitz (coll. Schmitz, SDEI); 2♂, Desfina Ilea, 29.v.2006, leg. Schmitz (coll. Schmitz); 12♂, Peloponnisos, Achaia Diakopto, Kerynia, 11., 13., 16., 20.v.2009, leg. Seliger (coll. Seliger, SDEI); 3♂, Peloponnisos, Elis Kastro-Kyllini, Loutra Kyllinis, 14.v.2009, leg. Seliger (coll. Seliger, SDEI); 3♂, Peloponnisos, Elis Manolada, Kounoupeli, 21.v.2009, leg. Seliger (coll. Seliger, SDEI); 7♂, Lakonia, Monemvasia, v.1978/1979, leg. Gozmany; leg. Christensen (ZMUC, SDEI); 2♂, 5 km S. Monemvasia, 17.v.1985, leg. Christensen (ZMUC); 12♂, Lakonia, Taygetos, vii.1978, vi.1979, leg. Gozmany; leg. Christensen (ZMUC, SDEI); 4♂, waterfall b. Nomia-Lyra, 17.v.1979, leg. Gozmany & Christensen (ZMUC); 6♂, Lakonia, Mt. Taygetos, 27.vii.1982, leg. Baldizzone (coll. Baldizzone); 1♂, Lakonia, Mt. Taygetos, 8.viii.1979, leg. Christensen (ZMUC); 2 specimen, Taygetos, 1100 m, 20.vii.1977, leg. Groß (LMAD); 4 specimen, Taygetos, Mt. Elias, 1400 m, 21.vii.1977, leg. Groß (LMAD); 1♂, Chalkidiki, Olympiada, 21.vi.2006, leg. R. Keller (SDEI); 1♂, Mt. Taygetos, Alagonia, 1000 m, 1.viii.1987, leg. van der Wolf; 6♂, Prov. Katerine, Platomon, 7–14. vi.1968, leg. U. Roesler (SMNK); 3♂, Parnassos, N. Arakhova, 22.vii.1984, leg. E. Arenberger (NMW); 1♂, Parnass, Amfiklia, 30.v.2006, leg. Schmitz (SDEI); 4♂, Olymp, Karfia, 12.viii.1973, 15.vii.1974, leg. E. Arenberger (NMW); 2♂, Epiros, Pindos-geb., östl. Konitsa, 17.vii.1985, leg. E. Arenberger (NMW); 2♂, Epiros, Polyneri near Igoumenitsa, 18., 20.vi.2000, leg. Gomboc (coll. Gomboc, SDEI); 7♂, Sivota, 10 km S Igoumenitsa, 30.v.2009, 22.v.2010, leg. Schmitz (coll. Schmitz, SDEI); 2 specimen, Rumelien, Tunfristos, 18–21.vii.1971, leg. Groß (LMAD); 1 specimen, Rumelien, Vardussia, S. Marmara, 15–18. vii.1971, leg. Groß (LMAD); 1♂, NW-Griechenland, Gomenitsa, 2.v.1982, leg. Bassi; 1♂, Makedhonia/Olympos, Litokhoron, 21–26.v.1990, leg. Exp.M.Kop. (ZMUC); 1♂, Parnassos Oros, Paßstraße, 2000 m, 24.viii.2003, leg. Baisch (coll. Baisch); 7♂, Parnaßgebirge, Litea-Polidrosos, 27.v.2006, leg. Schmitz (coll. Schmitz); 5♂, Parga, 12.v.2006, leg. Schmitz (coll. Schmitz, SDEI); specimens, Kastoria, 10.vii.2007, leg. Viehmann (coll. Schmitz, SDEI); 1♂, Fokida, SW Itea, 10–11.v.1999, leg. Ch. Wieser (coll. Ch. Wieser); 1♂, Arta, Strongiti, 9–10.v.1999, leg. Ch. Wieser (coll. Ch. Wieser); 1♂, Magnissia, Afetis, 16–17.u.v.1999, leg. Ch. Wieser (coll. Ch. Wieser); 1♂, Olympos, 5 km NW Leptokaris, 5.vii.1990, leg. M. Fibiger (ZMUC); 1♂, Cas Lampi, 21.v.1989, leg. Grotenfelt (FMNH); 3♂, Drama Valas, 19.vii.1985, leg. Grotenfelt (FMNH); 5♂, Pindos Konitsa Pades, 6.vii.1981, leg. Grotenfelt (FMNH); 16♂, 2♀, Florina Vatochoron, vii.1985, viii.1987, leg. Grotenfelt (FMNH, SDEI); 2♂, Kallidromo-Gebirge, Tithroni, 11.v.2010, leg. Schmitz (coll. Schmitz); 1 specimen, Rhodos Island, 2 km NW Lindos, 22.v.1993, leg. R. Sutter (ZMNK); 4♂, Corfu, Benitese, 6–14.vi.1978, leg. Vesa varis (FMNH, SDEI); 1♂, Korfu, Kommeno, 10 km N Kerkira, 17.vii.1984, leg. Arenberger (NMW); 7♂, Lesbos Island: various locations, vi.2009, leg. Kaila & Kullberg (FMNH).

Crete: 1♂, Kreta, 1966, leg. H. Reisser; 5♂, Straße Malia-Neapolis, v.1980, leg. W. Glaser (ZMNK, SDEI); 1♂, Agia Pelagia, 20–26.iv.1995, leg. M. Fibiger (ZMUC); 1♂, 1♀, Nom. Chania, 6.vi.2004, leg. Skule et al. (ZMUC); 1♂, Kristallenia, leg. H. Rebel (NMW); 1♂, Mt. Ida, Goniai, 24.vii.1984, leg. Baldizzone (SDEI).

Bulgaria: 26♂, Pirin-Gebirge: Sandanski, Liljanovo, v–vi.1981–1989, leg. F. Eichler (ZSM, SDEI); 5♂, Pirin, Sandanski, 5 km N, 19.vi–1.vii.2009, 17.31.v.2010, leg. N. Savenkov (coll. Roweck); 1♂, Nessebar, 24.vi–5.vii.1960, leg. Soffner (SDEI).

Cyprus: 1♂, Troodos-Gebirge, Platres, 1200 m, 20.vii–1.viii.1981, leg. M. & E. Arenberger (NMW); 10♂, Umgebung Paphos, 8–20.v.1993, 29.iv–13.v.1994, leg. J. Wimmer (coll. J. Wimmer, SDEI); 7♂, Moniatis, N. Limassol, 23–29.vi.1997, leg. M. Fibiger et al. (ZMUC, SDEI).

Turkey: 4♂, Kusadasi, 65 km S von Izmir, 17–24.v.1968, leg. Roesler (ZMNK); 2♂, Prov. Kayseri, 5 km NW Ercios Dag, 2000 m, 22.vii.1986, leg. M. Fibiger (ZMUC); 1♂, Prov. Ankara, 20 km nw Kizilcahamam, 1200 m, 24.vii.1986, leg. M. Fibiger (ZMUC); 1♂, Mersin, bei Arsanköy, Bolkar Daglari, 4.vi.1974, leg. Groß (LMAD); 1 specimen, 10 km östl. Nevşehir, 1300 m, 21.vii.1979, leg. Groß (LMAD); 1♀, Prov. Nevşehir, 10 km of ürgüp, 1300 m, 30.vii.1996, leg. Stovgaard (ZMUC); 2♂, Antalya, Akseki, 1500 m, 28.vii.1994, leg. K. Larsen (coll. Roweck, SDEI); 1♂, Adana, Salmbeyli, 1700 m, 6.viii.1997, leg. K. Larsen (SDEI); 1♀, Tokat, Niksar, Kcentes, 13.vii.2000, leg. K. Larsen (coll. Roweck).

Lebanon: 1♂, Libanon (without exact location)[holotype of libanotica], 1897 (ZMHB); 1 specimen, Zedern bei Becharré, 1900–2000 m, 14–16.vi.1969, leg. Groß (LMAD).

Armenia: 1♀, Dilican, 1600–2100 m, 21.vii.1977, leg. Felix (SDEI).

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Zeitschrift/Journal: [Nota lepidopterologica](#)

Jahr/Year: 2011

Band/Volume: [34](#)

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Artikel/Article: [On the taxonomic status of *Cephimallota angusticostella* \(Zeller\) and *C. crassiflavella* Bruand \(Tineidae\) 115-130](#)