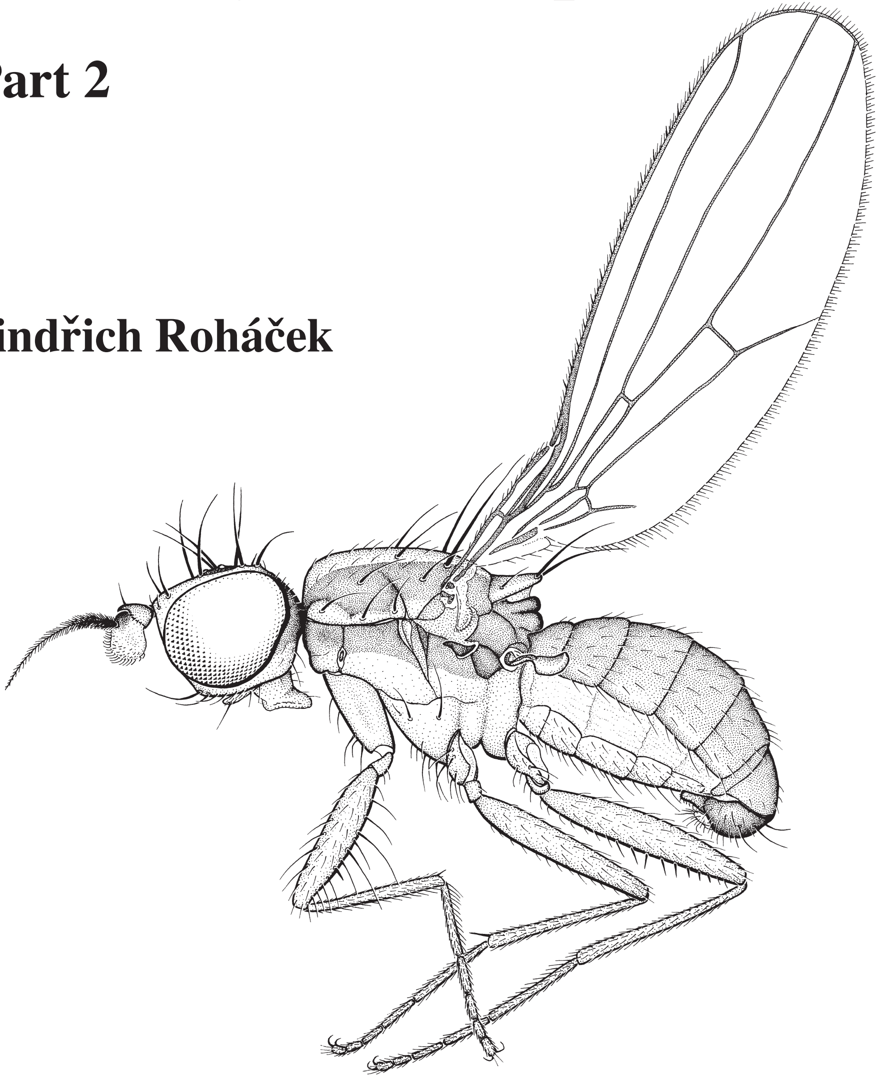
A monograph of Palaearctic Anthomyzidae (Diptera)

Part 2

Jindřich Roháček



Slezské zemské muzeum
Opava

A monograph of Palaearctic Anthomyzidae (Diptera), Part 2.

Čas. Slez. Muz. Opava (A), **58**, suppl.1: 1-180, 2009.

Abstract: In the second part of the monograph of Palaearctic Anthomyzidae, supplements to adult morphology and, particularly, to taxonomy, classification, nomenclature, preimaginal stages and distribution of species occurring in the Palaearctic Region are presented. Two new genera are established on the basis of phylogenetic analyses: *Arganthomyza* gen.n. (type species: *Geomyza socculata* Zetterstedt, 1847) comprising the former *Anthomyza socculata* group and the monotypic *Carexomyza* gen.n. (type species: *Paranthomyza caricis* Roháček, 1999). Seven new species (all from the E. Palaearctic area) are described, viz. *Amygdalops femorinus* sp.n. (Japan: Hahajima I.), *Anthomyza decolorata* sp.n. (Russia: Kamchatka, Kunashir I.), *A. tschirnhausi* sp.n. (Russia: Kamchatka), *Arganthomyza barbarista* sp.n. (Korea, Russia: Far East), *A. versitheca* sp.n. (Korea), *Epischnomyia merzi* sp.n. (Korea) and *Fungomyza cercata* sp.n. (Russia: Far East). A new female of *Anthomyza orineglecta* Roháček, 2006 and the preimaginal stages of *Anthomyza collini* Andersson, 1976 and *Paranthomyza nitida* (Meigen, 1838) are described. Three species are placed in new combinations: *Arganthomyza socculata* (Zetterstedt, 1847) comb.n., *A. setiplanta* (Roháček, 1987) comb.n. and *Carexomyza caricis* (Roháček, 1999) comb.n. A new key to identification of Palaearctic genera and new keys to species of genera where new species were described are given. Phylogenetic relationships among Palaearctic genera and of species within these genera are reconstructed on the basis of cladistic analyses of morphological characters and compared with reconstructions based on analyses of molecular data using mitochondrial 12S and 16S rRNA gene markers. Biology of Palaearctic Anthomyzidae is surveyed with data about their reproduction, life history, seasonal variation and periodicity, predators, parasites, commensals and associations with host plants, plant communities and habitats. Biogeography of Palaearctic Anthomyzidae is discussed based on analysis of their contemporary distribution. Bibliography of Anthomyzidae of the world is supplemented.

Keywords: Anthomyzidae, nomenclature, classification, morphology, preimaginal stages, taxonomy, phylogeny, biology, biogeography, keys, 2 gen.n., 7 spp.n., 3 comb.n., Palaearctic Region

Monografie palearktických druhů čeledi Anthomyzidae (Diptera), část 2.

Čas. Slez. Muz. Opava (A), **58**, suppl.1: 1-180, 2009.

Souhrn: Ve druhé části monografie palearktických druhů čeledi Anthomyzidae jsou prezentovány doplňky k morfologii imág, a především k taxonomii, klasifikaci, nomenklatuře, poznání preimaginálních stadií a rozšíření druhů vyskytujících se v Palearktické oblasti. Na základě fylogenetické analýzy jsou ustanoveny dva nové rody: *Arganthomyza* gen.n. (typový druh: *Geomyza socculata* Zetterstedt, 1847) zahrnující bývalou skupinu druhu *Anthomyza socculata* a monotypický rod *Carexomyza* gen.n. (typový druh: *Paranthomyza caricis* Roháček, 1999). Je popsáno 7 nových druhů (všechny z východního Palearktu): *Amygdalops femorinus* sp.n. (Japonsko: o. Hahajima), *Anthomyza decolorata* sp.n. (Rusko: Kamčatka, o. Kunašir), *A. tschirnhausi* sp.n. (Rusko: Kamčatka), *Arganthomyza barbarista* sp.n. (Korea, Rusko: Dálný východ), *A. versitheca* sp.n. (Korea), *Epischnomyia merzi* sp.n. (Korea) a *Fungomyza cercata* sp.n. (Rusko: Dálný východ). Poprvé je popsána samice druhu *Anthomyza orineglecta* Roháček, 2006 a preimaginální stadia druhů *Anthomyza collini* Andersson, 1976 a *Paranthomyza nitida* (Meigen, 1838). Pro tři druhy jsou navrženy nové kombinace: *Arganthomyza socculata* (Zetterstedt, 1847) comb.n., *A. setiplanta* (Roháček, 1987) comb.n. a *Carexomyza caricis* (Roháček, 1999) comb.n. Fylogenetické vztahy mezi palaearktickými rody a mezi druhy uvnitř těchto rodů jsou rekonstruovány na základě kladistických analýz morfologických znaků a srovnány s výsledky rekonstrukce založené na analýzách molekulárních dat za použití 12S a 16S rRNA mitochondriálních genových markerů. Je podán souhrnný přehled bionomie palearktických druhů čeledi Anthomyzidae, s údaji o jejich rozmnožování, ontogenetickém vývoji, sezónní dynamice a voltinismu, predátorech, parazitech, komensálech a vazbách na hostitelské rostliny, rostlinná společenstva a biotopy. Na základě analýzy současného rozšíření je diskutována biogeografie palearktických druhů čeledi Anthomyzidae. Je prezentován také doplněk celosvětové bibliografie čeledi Anthomyzidae.

Reviewers
K. N. Barber (Sault Ste. Marie, Canada)
R. Rozkošný (Brno, Czech Republic)

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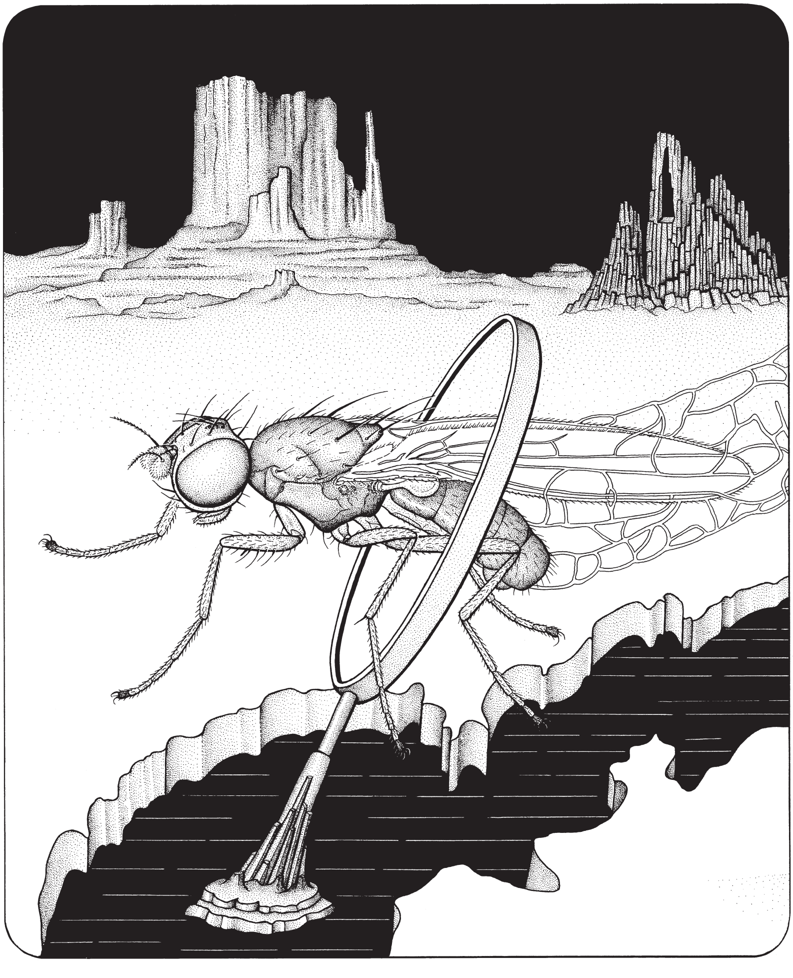


A detail (with *Anthomyza macra* Czerny) from the original pen-and-ink drawing "Emergence" (New Year Card 2009) by J. Roháček.

Introduction

The second part of the monograph of Palaearctic Anthomyzidae is formed partly by supplements, additions and updates to Part 1 (Roháček 2006a), partly by new chapters on topics not treated previously. The supplementary portions include new data about the morphology (descriptions of adult monstrosities), taxonomy (descriptions of new genus-group and species-group taxa, unknown sexes and preimaginal stages, new or corrected identification keys to genera and species), nomenclature (precision of usage of some names) and distribution (based on additional records obtained during the past 4 years) as well as the supplement to the world bibliography of Anthomyzidae.

New chapters in this part are devoted (1) to phylogenetic reconstructions of the relationships of genera and species of Palaearctic Anthomyzidae based on cladistic analyses of morphological characters which are compared with the phylogenetic hypothesis derived recently from molecular analyses of mitochondrial gene markers (Roháček et al. 2009), (2) to general review of their biology including reproduction, life history, seasonal variation and periodicity, predators, parasites and commensals of Anthomyzidae, host-plant affinities, habitat preferences and studies on anthomyzid communities and (3) to general analysis of the biogeography of Palaearctic Anthomyzidae based on data of the contemporary distribution of particular species.

In this manner, this second part of the monograph will further fill the gaps in the knowledge of Anthomyzidae in the Palaearctic Region. It is hoped that this update of taxonomic, phylogenetic, biological and biogeographical information will stimulate additional research of this dipterous family, not only in the insufficiently studied fields (like the preimaginal stages, phylogeny, life history, host-plant affinities) but also in basic taxonomic research in large, hitherto neglected, areas of the Palaearctic Region (e.g. Siberia, China). With this supplement the monograph can serve as a dependable identification tool, helping to recognize any additional undescribed taxa which are expected in these areas.

Acknowledgements

Research contributing towards the preparation of this monograph continued over two decades. The numerous dipterists, curators of collections, insect collectors, librarians and technicians who helped during this long period were acknowledged in Part 1 of this monograph (Roháček 2006a). Therefore only those directly contributing to the preparation of this Part 2 during the past four years are mentioned below. It is an agreeable duty to thank the following curators and owners of collections who kindly provided material of Anthomyzidae including specimens for molecular analyses, supplied biological information on samples they collected and assisted with obtaining literature: Prof. Dr. M. Barták (MBP), Dr. M. Buck and Prof. Dr. S. A. Marshall (DEBU), Dr. M. Carles-Tolrá (CTB), Mr. P. J. Chandler (PCM), Prof. Dr. M. Chvála (Praha, Czech Republic), Dr. J. C. Deeming (NMWC), Dr. K. Elberg and Dr. M. Mati (IAES), Dr. A. Freidberg (TAUI), Mr. D. Gavryushin (DGN), Mr. D. J. Gibbs (DGB), Dr. H-Y. Han (YSUW), Mr. J. Hogan (OXUM), Dr. J. Máca (JMB), Dr. B. Merz (MHNG), Dr. H. Meyer (Kiel, Germany), Dr. Emilia P. Nartshuk (ZISP), Dr. A. L. Ozerov and Dr. A. Shatalkin (ZMUM), Prof. Dr. H. Shima (BLKU), Dr. J.-H. Stuke (JSL), Dr. M. von Tschirnhaus (FBUB), P. Withers (PWS) and Dr. J. Ziegler (ZMHB).

My thanks are also extended to my friends who accompanied me on recent fly-collecting trips, discussed numerous problems during my research and helped in various other manners, viz. Doc. Dr. J. Starý and Dr. M. Vála (both from Olomouc) and Dr. J. Ševčík (Ostrava). Dr. A. Tóthová and Prof. Dr. J. Vaňahara (PFBC) are acknowledged for inviting me to participate in the molecular research of the relationships of Anthomyzidae and for performing the analyses of mitochondrial gene markers. Special thanks are given to specialists who kindly provided their magnificent photographs to be published in this monograph, particularly to Mr. D. Gavryushin (Naro-Fominsk, Russia) and Ing. M. Deml (Pražmo, Czech Republic) for unique macrophotographs of Anthomyzidae and Dr. V. Balner (Opava, Czech Republic) for photographs of fungi; additional photographs were provided by Mr. G. Bonnet and Mr. P. Gatt (Malta), Mr. J. Dvořák (Praha, Czech Republic), Mr. P. Häfliger (Delémont, Switzerland) and Dr. J. Ševčík (Ostrava, Czech Republic). I am also grateful to Prof. Dr. P. Štys (Praha, Czech Republic) and Doc. Dr. J. Starý (Olomouc, Czech Republic) for generous advice on nomenclatural problems, to Dr. V. Balner (Opava), Mgr. Šárka Cimalová (Ostrava, Czech Republic) and Mgr. J. Švarc (Třešť, Czech Republic) for identification of host plants and fungi, to Dr. M. Zachrada (České Budějovice, Czech Republic) for determination of mites found on adult Anthomyzidae and to Mr. Jiří Beneš (Opava, Czech Republic) for recognition of frass of moth caterpillars on *Typha* stems. Dr. M. von Tschirnhaus (FBUB) is specially thanked for his invaluable help with the update and additions to the world bibliography of Anthomyzidae.

I am particularly indebted to Mr. K. N. Barber (Sault Ste. Marie, Canada), a specialist in Anthomyzidae, for fruitful discussion, helpful criticism, suggestions and advice during the preparation of this manuscript and to the other reviewer of the monograph, Prof. Dr. R. Rozkošný (PFBC), who also contributed to the improvement of the presentation of this work.

The publication of the monograph (including basic research, data processing, editorial work and printing expenses) was only possible thanks to the financial support of grants No. 206/03/0020 and, particularly, No. 206/06/0287 of the Czech Science Foundation.

Material and methods

Material. The new material examined (more than 5,300 specimens) originated from the author's own collecting efforts and from various collections deposited in museums, research institutions or in private possession (see list of acronyms below).

Collecting methods, genitalia preparations, drawing and measurement techniques are described in detail in Part 1 of this monograph (Roháček 2006a).

Presentation of faunistic data. Label data of primary-type specimens are presented strictly verbatim including information on form and colour of all associated labels. Information about type specimens in which abdomens were detached and terminalia dissected are indicated by the abbreviation "genit. prep." in the text. Data from labels of paratypes and from all other specimens examined are presented in a standardized and most complete form, thus including all available phenological and other biological information which is subsequently referred to in the chapter Biology.

Morphological terminology. The terminology is described in detail in the chapter Morphology in Part 1 of this monograph (Roháček 2006a). For recognition of structures of the puparium, cephalopharyngeal skeleton of larva, male genitalia and female postabdomen and their terminology, Figs 45-49 and 56-69 can be consulted.

Phylogenetic reconstruction. The cladistic analyses of the phylogenetic relationships have been made manually with emphasis on the selection of the most parsimonious trees. Morphological characters used for analyses have been selected on the basis of knowledge of the distribution of their plesiomorphic and apomorphic states throughout the Palaearctic taxa and those with a high degree of homoplasy and/or parallelism have been avoided. Methods of obtaining and analysing molecular data as well as the method of the reconstruction of the phylogenetic relationships by means of Bayesian analyses are described in Roháček et al. (2009). Results from the latter paper are compared with the cladistic analyses of the morphological data in the chapter Phylogeny.

Determination of host-plant association. (1) Searching for preimaginal stages (larvae, puparia) in host plants and rearing them to adults (as in Figs 50-53, 164, 176, 179). (2) Rearing of adult anthomyzids from field-collected host plants. Individual (one-species) samples = tussocks of grasses and sedges including a root ball with soil (about 25 x 25 cm) were placed (single plant species per box) in plastic rearing boxes (Fig. 1) equipped with a collecting head of similar construction to that used in Malaise traps and containing a 0.5 l polyethylene bottle filled with 75% ethanol in which all emerged insects were caught, killed and preserved. A similar rearing method has been used by German dipterists (M. von Tschirnhaus, H. Meyer) and their reared specimens have also been examined. (3) Selective collections (by sweeping, tussocking, pootering/aspirating or using a suction sampler) in uniform (single-species) growths of prospective host plants. The method was tested several times on two neighbouring uniform growths of different plant species (see Figs 2, 197). This testing revealed that an anthomyzid species for which more than 10 specimens can be found has developed in the relevant host-plant species.

Fig. 1: Plastic boxes for rearing flies from tussocks of host plants. **Fig. 2:** Habitat with pure neighbouring growths of two monocotyledonous plants, viz. *Juncus effusus* and *Molinia caerulea* (a canal near Držník pond at Hradčany in N Bohemia, Czech Republic). Photo by J. Roháček.

Biogeographical analysis. Palaearctic species of Anthomyzidae are classified according to (often somewhat fragmentary) knowledge of their distribution into geoelements (sensu Walter 1954; de Lattin 1967). Based on this primary information the probable origins (= genoelements) of the species and also of higher taxa (species groups and genera) are estimated.

Acronyms and abbreviations

1. Acronyms of museums and collections

BLKU	Biosystematic Laboratory, Graduate Institute of Social and Cultural Studies, Kuyshu University, Fukuoka, Japan
CTB	Collection of Dr. Miguel Carles-Tolrá, Barcelona, Spain
DEBU	Department of Environmental Biology, University of Guelph, Guelph, Ontario, Canada
DGB	Collection of Mr. David J. Gibbs, Bristol, England, U. K.
DGN	Collection of Mr. Dmitry Gavryushin, Naro-Fominsk, Moscow region, Russia
FBUB	Biologische Sammlung, Fakultät für Biologie, Universität Bielefeld, Bielefeld, Germany
IAES	Institute of Agricultural and Environmental Sciences, Estonian Agricultural University, Tartu, Estonia (formerly ISBE - Institute of Zoology and Botany)
JMB	Collection of Dr. Jan Máca, České Budějovice, Czech Republic
JSL	Collection of Dr. Jens-Hermann Stuke, Leer, Germany
MBP	Collection of Prof. Dr. Miroslav Barták, Praha, Czech Republic
MHNG	Muséum d'Histoire Naturelle, Genève, Switzerland
MHNL	Museé d'Histoire Naturelle de Lyon, Lyon, France
NMBA	Naturhistorisches Museum des Stifts Admont, Admont, Austria
NMWC	National Museum of Wales, Cardiff, Wales, U. K.
OXUM	Hope Entomological Collections, University Museum, Oxford, U. K.
PCM	Collection of Mr. P. J. Chandler, Melksham, England, U. K.
PFBC	Department of Zoology and Ecology, Faculty of Sciences, Masaryk University, Brno, Czech Republic
PWS	Collection of Mr. Phil Withers, Sainte Euphémie, France
SMOC	Silesian Museum, Opava, Czech Republic
TAUI	National Collection of Insects, Tel Aviv University, Tel Aviv, Israel
YSUW	Department of Life Science, Yonsei University, Wonju, Korea
ZISP	Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
ZMHB	Zoologisches Museum an der Humboldt-Universität, Berlin, Germany
ZMUM	Zoological Museum of the Moscow State University, Moscow, Russia
ZSMC	Zoologische Staatsammlung, München, Germany

2. Abbreviations of morphological terms used in text and/or figures

A_1 - anal vein
ac - acrostichal (seta)
afa - aedeagal part of folding apparatus
ag - accessory gland
as - anus
bm - basal membrane
C - costa
ce - cercus
cp - caudal process of transandrium
cps - cephalopharyngeal skeleton
cs - connecting sclerite
Cs_3, Cs_4 - 3rd, 4th costal section
ct - ctenidial spine
CuA_1 - cubitus
cx_1, cx_2, cx_3 - fore, mid, hind coxa
da - dorsal apodeme
db - dorsal bridge
dc - dorsocentral (seta)
dcr - dorsal cornu
dm - discal medial cell
dm-cu - discal medial-cubital (= posterior, t_p) cross-vein
ds - dental sclerite
ea - ejacapodeme
ep - epandrium
es - epistomal plate
f - filum of distiphallus
f_1, f_2, f_3 - fore, mid, hind femur
fc - fulcrum of phallapodeme
gs - gonostylus
hl - hypandrial lobe
hu - humeral (= postpronotal) (seta)
hy - hypandrium
im - intermediate sclerite

is	- internal sclerite(s)
isp	- interspiracular process
M	- media
ma	- medandrium
mh	- mouthhooks
mspl	- mesopleural (= anepisternal)(seta)
npl	- notopleural (seta)
oc	- ocellar (seta)
ors	- orbital (seta)
pa	- postalar (seta)
pb	- parastomal bar
pg	- postgonite
pha	- phallapodeme
pp	- phallophore
ppl	- propleural (= proepisternal) (seta)
prg	- pregonite
prs	- presutural (seta)
psp	- posterior spiracle (or spiracular process)
pvt	- postvertical (seta)
R_1	- 1st branch of radius
R_{2+3}	- 2nd branch of radius
R_{4+5}	- 3rd branch of radius
r-m	- radial-medial (= anterior, t_a) cross- vein
s	- saccus of distiphallus
S2-S10	- abdominal sterna
sa	- supraalar (seta)
sc	- scutellar (seta)
Sc	- subcosta
sp	- spermatheca
ss	- spiracular slit
stpl	- sternopleural (= katepisternal) (seta)
T1-T10	- abdominal terga
t_1, t_2, t_3	- fore, mid, hind tibia
ta	- transandrium
va	- ventroapical (seta)
vcr	- ventral cornu
vi	- vibrissa
vr	- ventral receptacle
vte	- outer vertical (seta)
vti	- inner vertical (seta

3. Abbreviations for territories of Russia

CET	Central European territory
ES	East Siberia
FE	Far East
NET	North European territory
SET	South European territory
WS	West Siberia

4. Abbreviations used in the chapter Biology

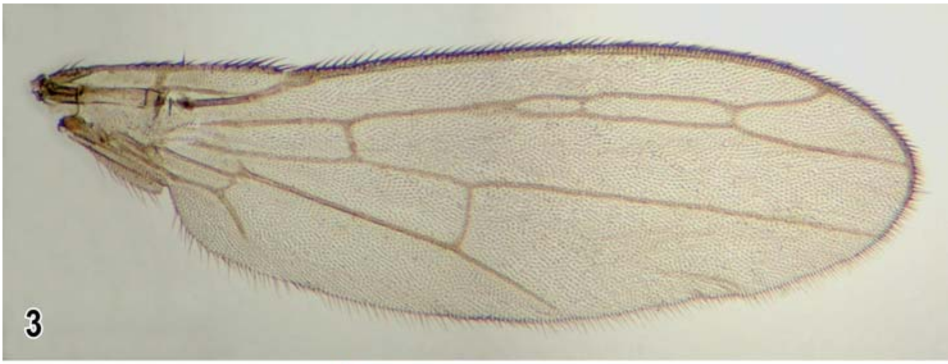
rr(l)	rearing record ex larva
rr(p)	rearing record ex puparium
rr(h)	rearing record ex host plant
cr	collecting record of adults
cr(s)	collecting record of adults from single-species plant growth (see p. 6 in Material and methods)

Supplement to morphology
(monstrosities)

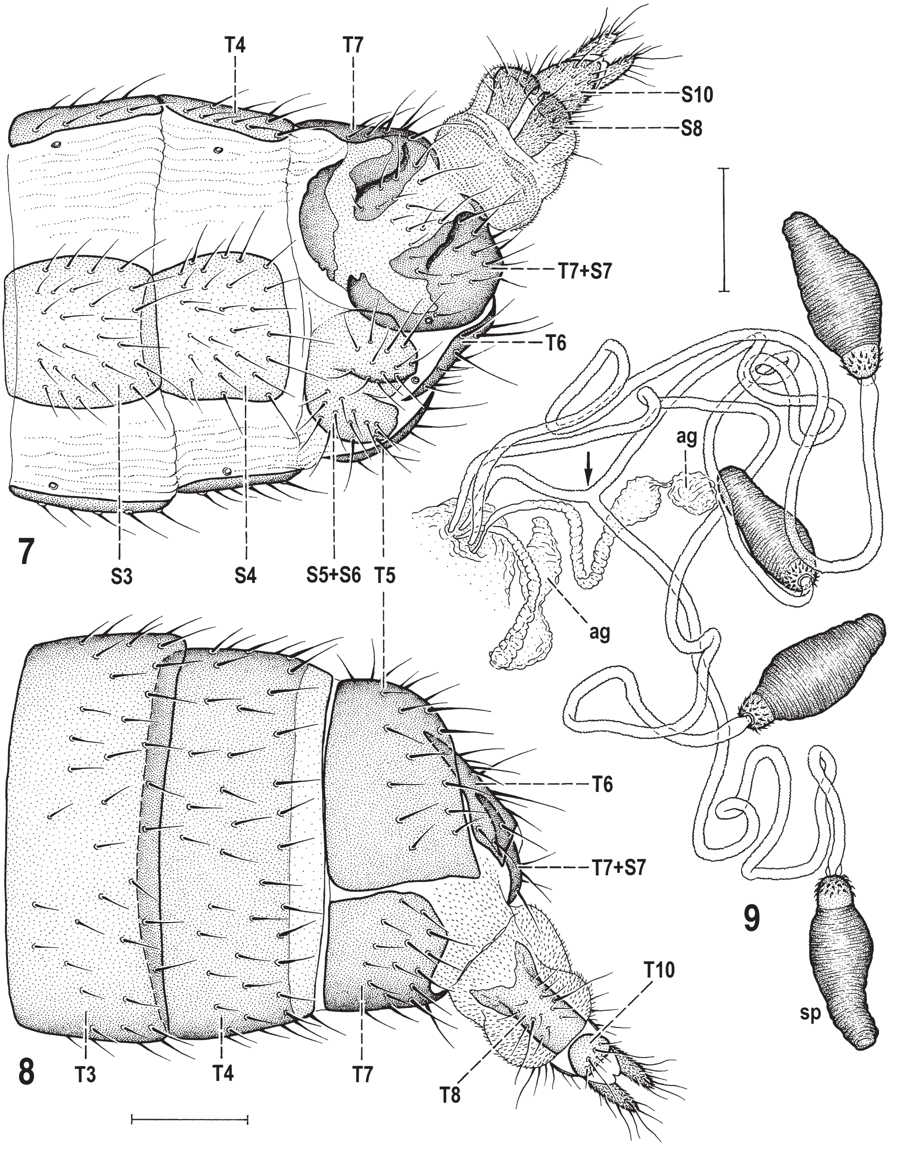
The external morphology of all stages of Anthomyzidae has been surveyed by Roháček (2006a: 10-27). In this supplement some notes on the morphological monstrosities of the anthomyzid adults are added to draw attention to the fact that sometimes aberrant specimens may occur among normal ones in populations which can mislead an inexperienced student during their identification.

(1) Chaetotaxies. Specimens with aberrantly modified setosity are not very rare. On the head an additional ors can sometimes be developed, either on only one (as in *Stiphrosoma laetum* on Fig. 4) or on both orbits. This additional ors may also be small (reduced to short setula – as found in a male paratype of *Anthomyza decolorata* sp.n.). Similarly, an additional dc seta on the thorax is rarely found. Some setae can also be doubled, arising closely attached or even from the same basal scar (a right pvt doubled in the latter way was seen in another male paratype of *A. decolorata* sp.n.). The double ctenidial spines on the fore femur (observed in *S. laetum* and *Anthomyza gracilis*) is the most striking chaetotaxal aberration.

(2) Wing venation. The most frequent modification of wing veins are surplus cross-veins, particularly in dm cell, where sometimes two dm-cu can occur. More rarely the distal part of R_{2+3} can be missing (the vein does not reach C) in fully winged species, similar to the condition



Figs 3-4: Monstrosities in Anthomyzidae. **3** - *Anthomyza gracilis* Fallén, female (Slovakia), wing with modified venation; **4 -** *Stiphrosoma laetum* (Meigen), female (Czech Republic), head with 3 ors on left orbit. **Figs 5-6:** Commensals and parasites of Anthomyzidae. **5 -** *Stiphrosoma sabulosum* (Haliday), female (Czech Republic) with phoretic deuteronymph of a mite of Uropodina; **6** - *Anthomyza dissors* Collin, female (Russia: CET) with parasitic mite larva of Parasitengona. Photo by J. Roháček (3), M. Deml (4, 5) and D. Gavryushin (6).



Figs 7-9: Monstrosities in Anthomyzidae. **7** - *Anthomyza gracilis* Fallén (Slovakia), modified female postabdomen, ventrally; **8 -** ditto, dorsally; **9** - *Anthomyza macra* Czerny, female (Slovakia) with doubled spermathecae. Scales: Fig. 9 = 0.1 mm, others = 0.2 mm. For abbreviations see p. 8.

known in macropterous forms of the wing-polymorphic *Stiphrosoma sabulosum*. The most distinctive wing aberration was found in a female specimen of *Anthomyza gracilis* (Slovakia: Belianske Tatry Mts.) where in both wings R_{2+3} is lost but R_{4+5} is forked at the level of the dm-cu into R_4 and R_5 and this fork is subsequently provided with 3 r-r cross-veins (see Fig. 3).

(3) Postabdominal structures. The monstrosities in the postabdominal structures of flies are usually due to intersex (or gynandromorph) modifications. The other possibilities are the doubled structures or the teratological malformations. A female of *Anthomyza gracilis* with a strikingly asymmetrical postabdomen (Figs 7-8) found in the Poľana Mts. (Slovakia) does not display any distinct male postabdominal character and is, therefore, considered to be the product of teratological damage. The specimen has S5 peculiarly fused with S6, T5 reduced to only the right half, T6 reduced to a small asymmetrical sclerite on the right side of the postabdomen and T7+S7 asymmetrical and modified (T7 part dorsally interrupted and its right portion reduced). An example of doubled structures was found in a female of *Anthomyza macra* (Slovakia: Boťany nr Latorica river) which bears 4 (2 x 2) spermathecae, one of which is doubled completely including the spermathecal duct, while the other has the duct split some distance from its beginning (see arrow in Fig. 9). The accessory glands of this female are two as usual (thus not doubled).

Systematic part supplement

The paragraph „Distribution“ under each species treated below summarizes all available information from the literature and material examined. Because the majority of published records with relevant references were already listed in Roháček (2006a) only those not captured in Part 1 are quoted in parentheses behind the names of the respective countries.

Family ANTHOMYZIDAE

ANTHOMYZIDAE Czerny, 1903a: 63. Type genus: *Anthomyza* Fallén, 1810. - Oosterbroek, 2006: 65, 73, 109 (key), 112-113 (diagnosis); Roháček, 2006a: 31-32 (diagnosis)

Key to identification of extant Palaearctic genera of Anthomyzinae

1 f_1 without ctenidial spine posteroventrally, only with a row of long setae 2

– f_1 with distinct posteroventral ctenidial spine (Fig.73) in addition to row of long setae 7

2(1) Only 1 ors long; thoracic chaetotaxy reduced, prs and sa absent, pa weak 3

– At least 2 ors long; thoracic chaetotaxy richer, sa and often also prs present 4

3(2) Wing (Roháček 2006a: Fig. 146) with venation complete, dm-cu present and r-m situated more distally than apex of R_1; frons velvety black or brown except for silvery whitish microtomentose orbits (Fig. 201); male cercus small, unmodified; female S7 separate from T7; spermathecae with short blunt projections on surface (Roháček 2006a: Fig. 130) .... *Anagnota* Becker, 1902

– Wing (Roháček 2006a: Fig. 430) without dm-cu and with r-m situated at level of apex of R_1; frons without velvety microtomentum, rather shining; male cercus enlarged, projecting anteriorly as acute process (Roháček 2006a: Fig. 435); female T7 and S7 fused to form short tergosternum; spermathecae without projections (Roháček 2006a: Figs 442, 445) .... *Cercagnota* Roháček & Freidberg, 1993

4(2) Wing abbreviated and narrowed (Roháček 2006a: Figs 553-554) or with incomplete venation (at least dm-cu absent, Roháček 2006a: Figs 551-552); filum of distiphallus robust and apically branched; female T7 and S7 fused into tergosternum which is dorsomedially divided and T8 triangular, anteriorly tapered (Roháček 2006a: Figs 566-568) .... *Stiphrosoma* Czerny, 1928, in part.

– Wing normal, with complete venation (Roháček 2006a: Figs 103, 535); filum of distiphallus slender, composed of 2 thin, twisted ribbon-like sclerites (Roháček 2006a: Figs 90, 528); female T7 and S7 separate; T8 never triangular 5

5(4) Arista very short-ciliate; head higher than long, rounded anterodorsally, with 3 strong ors (Roháček 2006a: Fig. 520); pregonite (Roháček 2006a: Fig. 527) with long, rod-like projection and gonostylus very slender, curved (Roháček 2006a: Fig. 526); female genital chamber without internal sclerites; spermathecae with surface smooth or with indistinct tubercles .... *Santhomyza* Roháček, 1984

– Arista pectinate or long-plumose; head longer than high, anterodorsally angular with only 2 ors strong; pregonite without projection; gonostylus simple, more robust; female genital chamber with distinct internal sclerites and surface of spermathecae with short spines 6

6(5) Wing transversely fumosely banded (Fig. 177); arista long-plumose (Roháček 2006a: Fig. 646); vti longer than vte; scutum flat dorsally; saccus of distiphallus reduced, without setulae or spines (Roháček 2006a: Fig. 653); female 8th abdominal segment with secondary lateral sclerotization and S8 longitudinally divided (Roháček 2006a: Figs 660-661) .... *Typhamyza* Roháček, 1992

– Wing with dark spot at apex (Fig 183) or unicolourous; arista pectinate (Roháček 2006a: Fig. 94); vti shorter than vte; scutum convex dorsally; saccus of distiphallus large, densely setulose or spinose (Roháček 2006a: Figs 72, 108); female 8th abdominal segment without pleural sclerotization; S8 short, undivided (Roháček 2006a: Figs 79, 112) .... *Amygdalops* Lamb, 1914

7(1) Wing with white marking along anterior third and longitudinal brown pattern in the middle widening at wing apex (Fig. 106). Head and thorax long-setose (Fig. 70), pvt, prs and sa particularly long. Male S6 unusually large (Roháček 2006a: Fig. 448); hypandrium and pregonites asymmetrical (Roháček 2006a: Fig. 451); phallophore long with large epiphallus (Fig. 113) ..... *Epischnomyia* Roháček, 2006

– Wing unicolourous, at most with darkened anterior marginal band. Setae pvt, prs and sa usually markedly shorter. Male S6 short; hypandrium and pregonites more symmetrical; phallophore short, without epiphallus 8

8(7) Wing shorter than body length, with r-m situated in basal third of dm cell (Fig. 639); arista distinctly but sparsely pectinate (Roháček 2006a: Figs 591-592); prs usually small or absent; female T7+S7 dorsomedially divided or unpigmented (Roháček 2006a: Figs 603, 615) ... *Stiphrosoma* Czerny, 1928

– Wing longer than body length; r-m situated at about middle of dm cell or slightly in front of it (Figs 25, 122); arista shortly ciliate (Fig. 72) or very densely haired (Fig. 73); prs distinct as a rule; female T7+S7 or T7 dorsally undivided 9

9(8) Mesonotum with 6 irregular rows of ac microsetae on suture; subvibrissa almost as long as vi; ventral receptacle extremely large and heavily sclerotized (Roháček 2006a: Figs 516-517) and spermathecae reduced and on short ducts (Roháček 2006a: Fig. 518); female cerci medially fused (Roháček 2006a: Fig. 512) .... *Receptrixa* Roháček, 2006

– Mesonotum at most with 4 rows of ac microsetae on suture; subvibrissa always shorter than vi; ventral receptacle small or long, tube-like and non-sclerotized; spermathecae well developed, duct length variable; female cerci disparate 10

10(9) At least one pair of femora variegated (bicolourous); subvibrissa not developed; cross-vein r-m situated distal to middle of dm cell (Fig. 122); male S8 strikingly long (Roháček 2006a: Fig. 465);

epandrium with anal fissure strongly narrowed (Fig. 123). Female genital chamber with weakly developed internal sclerites, annular sclerite almost indistinct (Roháček 2006a: Fig. 478) .... *Fungomyza* Roháček, 1999

– Femora unicolourous, at most somewhat darkened; subvibrissa distinct, longer than peristomal setulae; cross-vein r-m situated slightly proximal to or at middle of dm cell (Fig. 89); male S8 shorter; epandrium with anal fissure broad. Internal sclerites (including annular sclerite) of female genital chamber well developed 11

11(10) Thorax and abdomen with reduced microtomentum and strongly shining; mesopleuron bare and lustrous (Fig. 165); pvt setae absent and only 1 ors long (Roháček 2006a: Fig. 481); hypandrium with large, dorsally projecting and tuberculate anterior lobes (Roháček 2006a: Fig. 485); saccus basally coalesced with strongly asymmetrical aedeagal part of folding apparatus (Roháček 2006a: Figs 483, 487); female S10 large and of complex structure and pigmentation, with anterior dark strip (Roháček 2006a: Figs 491-492); spermathecae pyriform, with very narrowed and spinulose basal part (Roháček 2006a: Fig. 478) .... *Paranthomyza* Czerny, 1902

– Thorax and abdomen more ore less microtomentose, dull to shining; mesopleuron always microtomentose and never lustrous; pvt distinctly developed, convergent or crossed although small; at least 2 ors long; hypandrium with weak anterior lobes; aedeagal part of folding apparatus more symmetrical and separate from saccus; female S10 simply formed and pigmented; spermathecae different 12

12(11) Cross-vein distinctly oblique (Roháček 2006a: Figs 496); prs small but visible; filum of distiphallus slender and formed by two ribbon-shaped closely attached sclerites (Roháček 2006a: Figs 502); epandrium broad and dorsally straight (Roháček 2006a: Figs 497); ventral receptacle short, with small terminal tip sclerotized and rounded (Roháček 2006a: Figs 506); female S7 separate, dark-pigmented, not fused with T7 (Roháček 2006a: Figs 508) .... *Carexomyza* **gen.n.** [p. 75]

– Cross-vein r-m perpendicular or only slightly oblique; prs well developed, longer; filum of distiphallus either formed by single slender sclerite or robust (broad) and composed of single or two partly fused sclerites; epandrium dorsally rounded and usually narrower; ventral receptacle long, tube-like and hyaline membranous (see Figs 42, 98); female S7 either fused with T7 to form tergosternum T7+S7 or separate but pale and small or with overlapping margins of T7.. 13

13(12) Vertex (top of head) with silvery microtomentose spots or short stripes between frontal triangle and posterior part of orbits (Fig. 72). Saccus of distiphallus with only some tubercles (Figs 79, 95) and filum relatively short and robust, formed of two, closely attached or partly fused sclerites terminating in widened spinulose or denticulate apex (Figs 80, 94; Roháček 2006a: Fig. 421). Female T7 and S7 always fused into complete tergosternal ring (Figs 84, 102). Spermathecal ducts short (Fig. 101); if long, then arista strikingly densely haired (Fig. 73). Ventral receptacle shorter, without long twisted terminal slender part (Figs 83, 98; Roháček 2006a: Fig. 428).................. *Arganthomyza* **gen.n.** [p. 59]

– Vertex (top of head) usually without silvery microtomentose spot between frontal triangle and orbits; if similar whitish or silvery white microtomentose spots present, then female T7 and S7 disparate. Saccus of distiphallus at least with small spinulae, usually with short, robust and pigmented spines; filum long, slender and compact, formed by single sclerite being usually distally attenuated (Figs 32, 59), rarely expanded and provided with robust projections (cf. Roháček 2006a: Figs 360, 376, 390). Female T7 and S7 variable, disparate or fused into tergosternal ring. Spermathecal ducts very long. Ventral receptacle long or very long (Figs 38, 42), having elongate slender terminal part strongly curved, twisted or spirally coiled.. *Anthomyza* Fallén, 1810

Genus *Amygdalops* Lamb, 1914

Amygdalops Lamb, 1914: 357 [masculine]; Roháček, 2006a: 39-40 (redescription); Roháček, 2008a: 327-329 (redescription).

Type species: *Amygdalops thomasseti* Lamb, 1914: 358 (original designation)

Diagnosis: Roháček (2008a) somewhat modified and extended the diagnosis of the genus *Amygdalops* to cover several aberrant species discovered in the Oriental and Oceanian Regions. However, all species hitherto found in the Palaearctic region (including the new species described below) fall within the diagnosis given by Roháček (2006a) so it is unnecessary to present here the diagnosis modified by Roháček (2008a).

Discussion: The monophyly and relationships of the genus *Amygdalops* were discussed by Roháček (2006a) and, most recently, by Roháček (2008a), so nothing more can be added. It is apparent that the origin of the genus is to be sought in the Old World tropics and that its closest relatives are in the Afrotropical and, possibly, also Neotropical Regions (see Roháček 2008a). Therefore it is difficult to resolve its phylogenetic affinity to other Palaearctic genera of Anthomyzidae (see in the chapter Phylogeny below).

The best diagnostic characters of *Amygdalops* are the characteristic ellipsoid eyes, position of the ors and short vti, combined with the long-pectinate arista, the short prs, dc macrosetae in the prescutellar position, pleura with a dark dorsal band, wing with a subapical dark spot, a short and narrow dm cell and a shortened CuA_1. These are usually sufficient to affiliate a species with *Amygdalops*, with the exception of (most ancestral) species with unpatterned wings, *A. trivittatus* Frey, 1958 (Afrotropical: Cape Verde Is.) or *A. lineola* de Meijere, 1916 (Oriental: Thailand, Indonesia, Papua New Guinea). It is to be noted, that *A. femorinus* sp.n. (described here) has the subapical dark spot (apparently secondarily) much faded although it is not closely allied to the two species mentioned above.

The analysis of the relationships of the four Palaearctic species (see the chapter Phylogeny) confirmed that they are of different origin. While *A. thomasseti* Lamb, 1914 and *A. rufior* Roháček & Freidberg, 1993 occuring in the W. Palaearctic have their closest relatives in the Afrotropical Region, the species known from the E. Palaearctic, viz. *A. nigrinotum* Sueyoshi & Roháček, 2003 and *A. femorinus* sp.n., belong to a group originating from the Oriental Region.

The genus *Amygdalops* currently includes 22 described (and 9 undescribed) species most of which occur in the Afrotropical (Roháček 2004a) and Oriental (Roháček 2008a) Regions but this is probably only a fragment of the existing species diversity. An additional species is described below; consequently 4 species are known in the Palaearctic Region: *A. thomasseti* Lamb, 1914, *A. rufior* Roháček & Freidberg, 1993, *A. nigrinotum* Sueyoshi & Roháček, 2000 and *A. femorinus* sp.n. The Afrotropical species *A. obtusus* Roháček, 2004 is included in the key below because it has recently been recorded from Yemen (Deeming 2008), thus close to the southern border of the Palaearctic Region.

Key to identification of Palaearctic *Amygdalops* species

1 Frons including orbits all brown to dark brown in posterior two-thirds; orbit yellow to pale brown in anterior fourth or third, darker brown posteriorly, never silvery or whitish microtomentose. Mesonotum dark brown, with only humeral and notopleural areas yellow to orange. 2

– Frons yellowish ochreous or medially distinctly darker (brownish); orbit completely yellow to ochreous and covered by whitish or silvery microtomentum in anterior half (up to posterior ors).

Mesonotum brown with orange longitudinal bands, or orange with brown narrow longitudinal diffuse stripes. 3

2(1) Palpus yellow to orange. All femora uniformly yellow. Wing with distinct subapical brownish spot (Roháček 2006a: Fig. 104). Haltere with knob brown. Abdomen with T3-T6 (female) or T4-T5 (male) ornamented by pale-pigmented laterobasal spots. Gonostylus elongately suboblong, with tapered but rounded apex (Roháček 2006a: Fig. 109); male cercus large, almost as long as gonostylus (Roháček 2006a: Fig. 106); postgonite shorter and sinuate, with large basal sclerite (Roháček 2006a: Fig. 110); phallapodeme more robust and with apical part very shortened (Roháček 2006a: Fig. 108); saccus of distiphallus (Roháček 2006a: Fig. 108) with thick thorn-like spines. Female T7-T10 broader, more transverse (Roháček 2006a: Fig. 111); S7 wider anteriorly, narrower posteriorly and with large unpigmented central area (Roháček 2006a: Fig. 112); spermathecae with robust and curved dark spines on surface (Roháček 2006a: Fig. 113)........................ *A. nigrinotum* Sueyoshi & Roháček, 2003

– Palpus brown. Fore and mid femora with brown annulus in distal third to half (Fig. 17). Wing subapically only indistinctly darkened (Fig. 10). Haltere with knob yellowish white. Preabdominal terga all uniformly brown. Gonostylus suboval, with broad rounded apex (Fig. 16); male cercus very small, shorter than half length of gonostylus (Fig. 11); postgonite long and slightly bent, with basal sclerite greatly reduced (Fig. 13); phallapodeme slender and with long apical part (Fig. 15); saccus of distiphallus finely spinose (Fig. 15). Female T6 uniformly brown and T7-T10 narrower, less transverse (Fig. 18); S7 narrower anteriorly, wider posteriorly, slightly paler medially (Fig. 20); spermathecae with smaller and straight spines on surface (Fig. 19) .... *A. femorinus* **sp.n.** [p. 17]

3(1) Frons yellow to ochreous, with brown ocellar and frontal triangles and medial band extended from the latter to ptilinal suture; mesonotum brown, with 2 yellow or orange longitudinal bands (Roháček 2006a: Fig. 66). Male and female abdomen dark brown dorsally, at most with small pale spots on preabdominal terga; female T6 almost completely brown 4

– Frons yellowish ochreous, only ocellar triangle brown; mesonotum orange, with only 3 narrow longitudinal diffuse stripes and scutellum brown. Male abdomen reddish brown, with pale-spotted terga (Roháček 2006a: Fig. 95); female abdomen with small pale spots on T3 and large yellow spots on T4-T5. Gonostylus (Roháček 2006a: Fig. 88) subtriangular, with simple acute apex; posterior part of pregonite distinctly projecting ventrally (Roháček 2006a: Fig. 91); saccus of distiphallus basally setose, apically with thick spines (Roháček 2006a: Fig. 90). Female T6 yellow, with only narrow stripe along posterior and (partly) lateral margins brown; T8 yellow along margins, with dark central spot (Roháček 2006a: Fig. 97); S7 uniformly pale ochreous (Roháček 2006a: Fig. 98)........................... .... *A. rufior* Roháček & Freidberg, 1993

4(3) Gonostylus (Roháček 2006a: Figs 68, 99) proximally broad but distally strongly tapered, with a small anterior preapical tooth and narrow but not acute apex; saccus of distiphallus covered by fine long spines (Roháček 2006a: Fig. 72). Female S7 with bipartite (medially divided) dark pattern and poorly defined posterior margin (Roháček 2006a: Fig. 79)....................................... *A. thomasseti* Lamb, 1914

– Gonostylus (Roháček 2004a: Fig. 27) short, broad, blunt, not tapered apically; saccus of distiphallus with very short and dense spinulae (Roháček 2004a: Fig. 26). Female S7 simply dark-pigmented in anterior three-fourths and with unpigmented posterior margin (Roháček 2004a: Fig. 33) .... [*A. obtusus* Roháček, 2004] (Afrotropical)

Amygdalops thomasseti Lamb, 1914

(Fig. 183)

Amygdalops thomasseti Lamb, 1914: 358; Roháček, 2006a: 43-48 (redescription).

Distribution: *A. thomasseti* is widespread in the Afrotropical and southern Palaearctic Regions. In the Afrotropical Region and adjacent areas it has been reliably recorded from

Madagascar, Mauritius, Mozambique, Nigeria (Deeming 2008), Oman (Deeming 2008), Senegal, Seychelles, South Africa, Uganda, Yemen (Deeming 2008).

In the Palaearctic Region it is known from the Canary Is. (Gran Canaria, Tenerife – Báez & García 2004), Cyprus (Deeming 2008), Egypt, Greece (Crete), Israel, Italy (Calabria), Jordan, Malta, Saudi Arabia (Deeming 2008), Spain (Carles-Tolrá & Ventura 2008b; Balearic Is.: Carles-Tolrá & Ventura 2008a), Syria (Deeming 2008), United Arab Emirates (Deeming 2008).

Amygdalops rufior Roháček & Freidberg, 1993

Amygdalops rufior Roháček & Freidberg, 1993: 96; Roháček, 2006a: 49-54 (redescription).

Distribution: Israel (Dead Sea area).

Amygdalops nigrinotum Sueyoshi & Roháček, 2003

Amygdalops nigrinotum Sueyoshi & Roháček, 2003: 18; Roháček, 2006a: 54-58 (redescription); Roháček, 2008a: 363-369 (redescription).

Distribution: *A. nigrinotum* was originally an Oriental species which (probably recently and mostly by human introductions) has expanded its distribution into the eastern Afrotropical, northern Australasian, eastern Palaearctic and Oceanian Regions. Oriental Region: India (Assam), Indonesia (Flores, Java, Sulawesi), Japan (Okinawa), Philippines (Mindanao), Taiwan, Thailand, see Roháček (2008a). Afrotropical Region: Seychelles. Australasian Region: Australia (Queensland: Roháček 2008a). Palaearctic Region: Japan (Izu, Ogasawara, Ryukyu Is.). Oceanian Region: Hawaii (Oahu I., Kauai I., Molokai I., Hawaii I.).

Amygdalops femorinus **sp. n.**

(Figs 10-24)

TYPE MATERIAL: Holotype ♂ labelled: "Mt. Sakai, Ogasawara Vil., Tokyo, Hahajima Japan, 5. vii. 2002, M. Sueyoshi leg.", "HOLOTYPUS ♂ *Amygdalops femorinus* sp.n., J. Roháček det. 2007" (red label) (BLKU, intact). Paratypes: **Japan:** same data as for holotype, 1♂2♀ (BLKU, 1♀ intact; SMOC, 1♂1♀ genit. prep.).

Etymology: The name "femorinus" refers to the distinctly bicoloured femora of the new species; it is deemed to be and to be treated as a latinized adjective in nominative singular.

Description: Male. Total body length 1.51-1.83 mm. Body bicolourous, brown and yellowish white. Head somewhat higher than long. Occiput largely dark brown, only laterally to foramen somewhat lighter. Frontal triangle reaching to anterior fourth of frons, with very narrowed apex, largely bare and lustrous; also ocellar triangle shining, with very sparse microtomentum. Frons narrow, brown with ochreous to pale brown anterior fourth and yellow at anterior margin; stripes between frontal triangle and orbits dark greyish microtomentose and dull and laterally narrowly blackish brown margined. Orbit pale brown to ochreous in anterior fourth and becoming dark brown and more shining posteriorly (behind anterior ors). Face dirty yellow (dorsally) to white (ventrally); facialia and gena almost white, with silvery white microtomentum and very narrowly light brown margined; also postgena whitish yellow, contrasting with brown occiput. Mouthparts whitish yellow; palpus completely brown. Cephalic chaetotaxy: pvt distinct

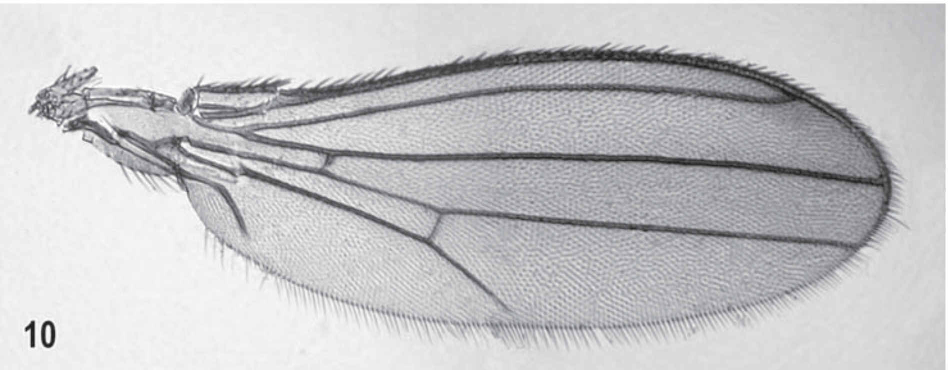
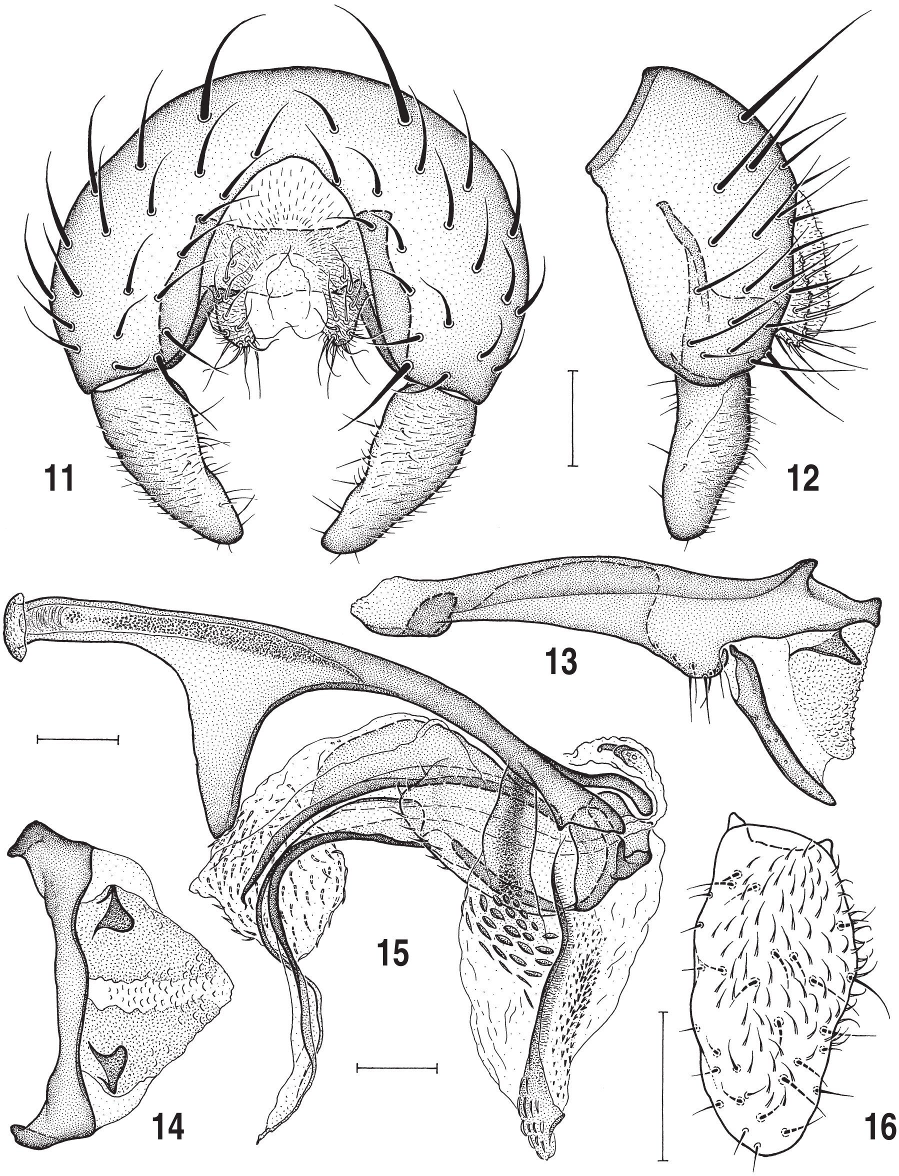


Fig. 10: Wing of *Amygdalops femorinus* sp.n., male paratype, wing length 1.7 mm. Photo by J. Roháček.

and strongly crossed; vti about three-fourths of length of vte, the latter and posterior ors longest of cephalic setae; oc slightly shorter than vti; 2 long ors, posterior as long as vte, anterior distinctly shorter but somewhat longer than oc; 2 microsetulae in front of anterior ors, anterior orbital microsetula less than half length of posterior one; 1-2 pairs of microsetulae medially in front of frontal triangle; 1 relatively weak vi (shorter than anterior ors) and 1 distinct subvibrissa (about three-fourths of vi); peristomal setulae (4-5) longer anteriorly, short posteriorly; postocular setulae very minute; palpus with usual subapical seta. Eye of roundedly rhomboid shape, very convex, with longest (oblique) diameter 1.4 times as long as shortest one. Gena anteriorly very narrow; its smallest height 0.08 times as long as shortest eye diameter. Antenna yellow to yellowish ochreous, 1st flagellomere more or less (ochreous to pale brown) darkened around base of arista. Arista 1.9-2.0 times as long as antenna, long pectinate.

Thorax distinctly narrower than head, bicolourous, brown and yellowish white. Mesonotum including scutellum brown. Humeral and notopleural areas somewhat lighter brown, yellowish only around bases of npl setae. Pleural part of thorax with very broad brown band covering its larger dorsal part and sharply delimited from pale yellowish white sternopleuron (= katepisternum) and hypopleuron (= meron). Thoracic chaetotaxy: 1 (relatively long) hu, 2 npl (posterior shorter), 1 small and weak sa, 1 longer pa, 1 very small and fine prs; 2 postsutural dc, but only posterior long (about as long as apical sc), anterior short and weak, only one-fourth of posterior dc and about twice as long as dc microsetae; ac microsetae in 4 rows on suture, only a few microsetae of medial rows situated behind level of anterior dc; 2 sc, apical long and strong, laterobasal short and weak (as anterior dc); 1 ppl, reduced to almost indistinct microsetula; 2 stpl, posterior slightly to distinctly longer; several additional setae on ventral portion of sternopleuron and some hair-like setulae inserted also close to stpl macrosetae. Scutellum rounded triangular with convex dorsal surface. Legs largely yellow to pale yellow but f_2 and f_3 with distinctive brown annulus in distal third to half leaving only apex (knee) yellowish. Pedal chaetotaxy very similar to that in *A. nigrinotum*; f_3 with about 14-15 erect posteroventral setae along entire length, some 7-8 in distal two-fifths shortened but only slightly thickened. Wing (Fig. 10) with dark pattern greatly reduced (similar in this respect to *A. silaceus* Roháček, 2008) and restricted to infuscation along Cs_3 and in front of apex of R_{2+3} (better visible in females, see below); wing membrane otherwise rather uniformly pale brownish hyaline, without white area between R_{2+3} and R_{4+5}. R_{4+5} and M subparallel, very slightly convergent proximally and distally; discal (dm) cell very narrow; r-m situated near its middle; distal sector of CuA_1 relatively long. Alula



Figs 11-16: *Amygdalops femorinus* sp.n., male paratype. **11** - external genitalia, caudally; **12 -** ditto, laterally; **13** - hypandrial complex, laterally; **14** - transandrium, caudally; **15** - aedeagal complex, laterally; **16** - gonostylus, lateroventrocaudally (widest extension). Scales: 0.05 mm.

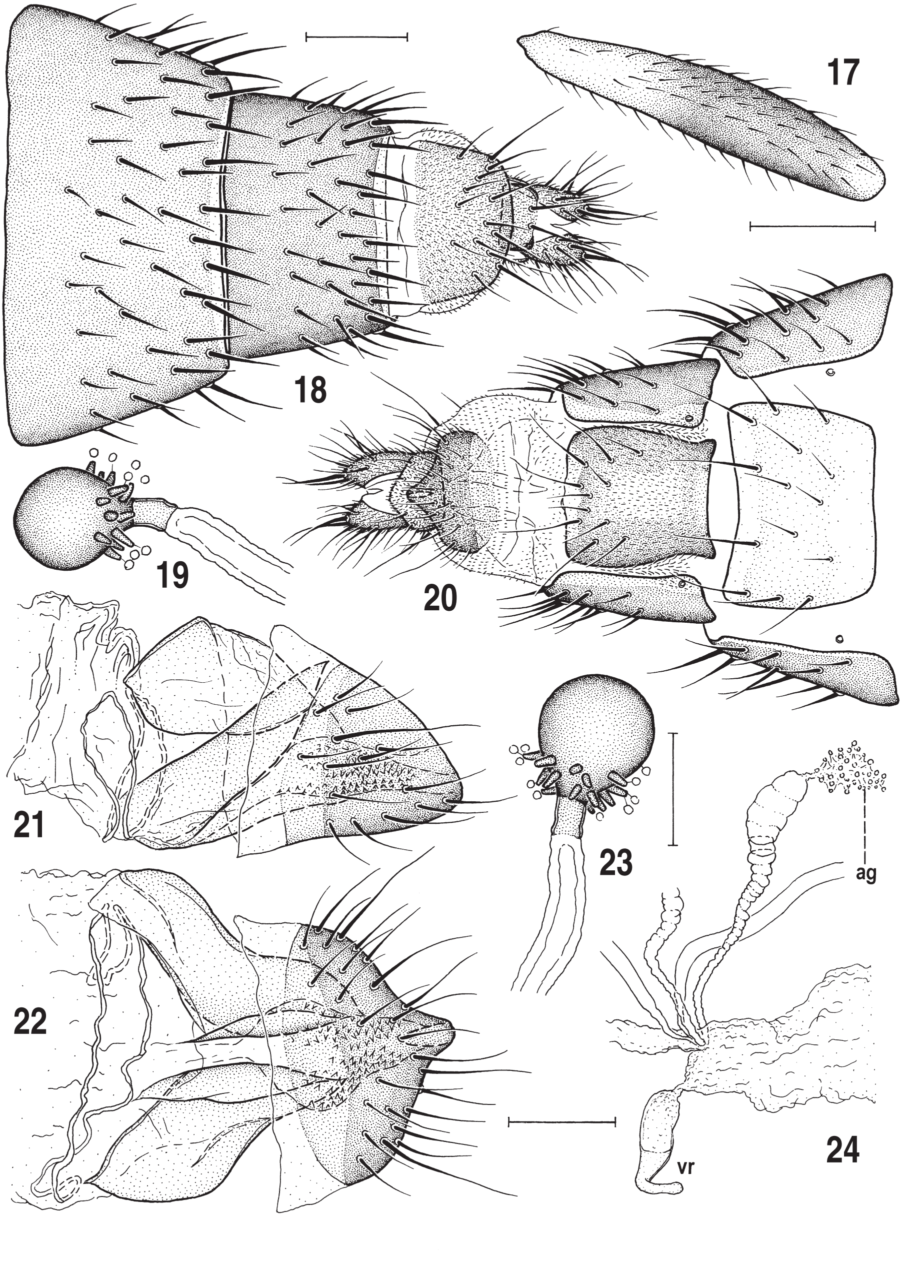
greatly reduced but anal lobe distinct. Wing measurements: length 1.55-1.79 mm; width 0.53-0.56 mm, $Cs_3 : Cs_4 = 1.87\text{-}1.94$, r-m\dm-cu : dm-cu = 4.12-4.14. Haltere with yellow stem and large yellowish white knob.

Abdomen. Preabdominal terga large, entirely brown to dark brown, without lighter spots and all with short but relatively thick setae. Preabdominal sterna small and narrow, pale brown and becoming somewhat wider posteriorly. S2-S4 about as long as broad, S5 widest, distinctly wider than long and posteriorly shallowly emarginate. T6 weakly sclerotized, short, transverse and very pale. Postabdominal sclerites (S6-S8) dark brown, dorsolaterally fused. S6 short, ventrally attenuated and transversely band-like, S7 more than twice as long as S6. Both S6 and S7 with 2 setae each and with anterior dark marginal ledge. S8 relatively long and more densely setose, particularly at posterior margin.

Genitalia. Epandrium (Figs 11-12) hemispherical, medium-long but broad, relatively long-setose, with 1 dorsomedial and 1-2 dorsolateral setae longer than others; anal opening relatively large, rounded semi-elipsoid (Fig. 11). Cercus small, not projecting below anal fissure, shorter than half length of gonostylus. Medandrium (Fig. 11) low but relatively wide. Gonostylus (Figs 11-12) small, markedly shorter than epandrial height, elongately suboval, with broadly rounded apex (Figs 16); most of its outer side with dense micropubescence but anterior and ventral marginal area bare; inner side of gonostylus with some weak setae. Hypandrium (Fig. 13) moderate, with weak unpigmented internal lobes; transandrium (Fig. 14) simple, slender, with finely sinuate ventral margin; caudal process represented by a pair of medially separate and weakly sclerotized plates each of which has a distinct, dark, posteriorly projecting and pointed lateral process. Pregonite (Fig. 13) low, fused with hypandrium, incurved but its posterior part somewhat projecting ventrally, separated by small posterior notch and bearing about 7 weak setae, 2-3 of them longer. Postgonite (Fig. 13) long and slender, very slightly bent, with pointed apex and only minute sensillae on outer side; basal sclerite attached to postgonite very reduced. Aedeagal part of folding apparatus attached to base of phallapodeme (Fig. 15) distinctly darkened dorsally, in the middle provided by flat lenticular tubercles; connecting sclerite very long and slender, dark-pigmented on anterior margin, finely densely spinulose on membranous posterior part and with some adpressed spinulae also apically. Basal membrane finely and sparsely tuberculate (Figs 13, 14). Aedeagal complex (Fig. 15) with very slender phallapodeme, having very deeply forked base, long apical part and apex with short lateral projections. Aedeagus with short U-shaped phallophore and large distiphallus. Base of distiphallus relatively weakly sclerotized in the middle. Saccus of distiphallus relatively large, membranous (except proximodorsal part) and provided by fine spines on lateroproximal lobe and (more) on right side of membranous distal part. Filum of distiphallus formed by 2 long, dark, strip-like twisted sclerites which are divergent in proximal and distal end and terminate in tapered and unpigmented apex. Ejacapodeme small, with small curved digitiform projection (Fig. 15).

Female. Similar to male unless mentioned otherwise. Total body length 2.06-2.18 mm. Antenna darker, 1st flagellomere with larger brownish area in dorsal half externally, also pedicel somewhat brownish orange. f_3 posteroventrally simply finely setulose, lacking shortened setae. Wing membrane with infuscation at apex better visible but not forming distinct subapical spot. Cross-vein r-m situated slightly in front of middle of dm cell. Wing measurements: length 2.08-2.18 mm, width 0.61-0.66 mm, $Cs_3 : Cs_4 = 1.78\text{-}1.84$, r-m\dm-cu : dm-cu = 3.54-4.11. Abdomen with preabdominal terga shorter, more transverse (T4 widest), all dark brown as in male. Preabdominal sterna smaller and lighter than in male, pale ochreous; S3 slightly narrower than S4 and S5, all about as long as wide, finely setulose.

Postabdomen (Figs 18, 20). T6 large, markedly broader than T7, densely shortly setose, brown except for unpigmented posterior margin. S6 slightly narrower than S5, pale but darker tinged in middle part, very sparsely setose. T7 narrow, darker brown than T6, with dense short setae in posterior two-thirds; 7th spiracle embedded in ventrolateral, paler marginal stripe of T7



Figs 17-24: *Amygdalops femorinus* sp.n., female paratype. **17** - hind femur anteriorly; **18** - postabdomen, dorsally; **19** - spermatheca; **20** - postabdomen, ventrally; **21** - internal sclerites and S8, laterally (micropubescence omitted); **22** - ditto, ventrally; **23** - spermatheca; **24** - terminal end of female genital chamber, laterally. Scales: Fig. 17 = 0.2 mm, Figs 18, 20 = 0.1, others = 0.05 mm. For abbreviations see p. 8.

(Fig. 20). S7 simply-shaped, elongately suboblong but anteriorly somewhat tapered and with prominent anterolateral corners, dark-pigmented except for unpigmented posterior marginal area and lighter brown medial band; its sparse setae restricted to posterior half. T8 brown but somewhat paler than T7, plate-shaped, with rounded posterior corners, indefinite anterior margin and sparse setae (those in posterior corners long) in posterior half. S8 dark, distinctly narrower than T8, finely densely setulose and pubescent, posteromedially narrowly bulging (or projecting), with narrow mediodorsal incision as usual. Internal sclerotization of genital chamber weak, pale-pigmented, composed of two pairs of partly connected sclerites the lateral of which being anterolaterally expanded (Fig. 22) and of indistinct transversely compressed annular sclerite. Genital chamber finely spinulose near genital opening (Fig. 22). Ventral receptacle (Fig. 24) short, membranous, with digitiform terminal projection. Spermathecae (1+1) very small, one smaller than the other, both shortly pyriform (Figs 19, 23), narrowed at duct insertion, with dense straight spines (with truncate apices) on basal third of spermatheca; duct cervix well developed, medium long; spermathecal duct long. T10 small, transversely suboblong, dark (particularly laterally), sparsely microtomentose and with a pair of long setae. S10 paler and wider than T10, transversely pentagonal, micropubescent, with setulae at posterior margin. Cercus (Fig. 18) moderate, dark, with a number of moderate setae (longest dorsopreapical as long as cercus).

Discussion: This is a small and easily recognizable species in the otherwise very uniform *A. nigrinotum* group (sensu Roháček 2008a) which is species-rich in the Oriental Region. It seems to belong to the *A. nigrinotum* subgroup (as delimited by Roháček 2008a) as evidenced by the large female S7 and pyriform spermathecae though the saccus of the distiphallus is rather finely spinose. Moreover, *A. femorinus* sp.n. has the caudal process of the transandrium with lateral projections, a character otherwise only known in *A. nigrinotum* Sueyoshi & Roháček, 2003 (see Roháček 2006a, 2008a). It differs from the latter species (and from all other species of the *A. nigrinotum* group) in having the subapical darkening of the wing almost invisible (thus similar to the distantly related *A. silaceus* Roháček, 2008 from Mariana Is. which is very dissimilar due to its largely yellow mesonotum) and whitish yellow halteres. There are numerous other differences (in external somatic as well as genitalic characters) between *A. femorinus* sp.n. and *A. nigrinotum*, the most striking of which are given in the above key.

Biology: Unknown. The type specimens were collected in VII.

Distribution: Hitherto, *A. femorinus* sp.n. is only known from Hahajima I. (Ogasawara Is.) in southern Japan.

Genus ***Anagnota*** Becker, 1902

Anagnota Becker, 1902: 309 [feminine]; Roháček 2006a: 60-63 (diagnosis, key).

Type species: *Opomyza bicolor* Meigen, 1838: 380 (monotypy).

Discussion: The relationships of *Anagnota* have hitherto not been clarified. Results of the molecular analysis (using mitochondrial 12S and 16S gene markers, see Roháček et al. 2009) only indicated its possible affinity to genera *Paranthomyza* and *Typhamyza*. There are only a few morphological features supporting this finding, particularly the small, similarly circular annular sclerite in the female genital chamber occurring in all these genera. Moreover, *Anagnota* seems to share further possible apomorphies with *Typhamyza*, e.g. the hyaline and finely sculptured aedeagal part of folding apparatus, the prolonged female genital chamber, the pyriform spermathecae with blunt spines on the surface and accessory glands with tuberculiform structures. However, the extensive dissimilarities in other (external in particular) body characters of all these genera demonstrate that their relationships are rather distant (see also chapter Phylogeny below).

Anagnota bicolor (Meigen, 1838)

(Figs 201-202)

Opomyza bicolor Meigen, 1838: 380.
Anagnota bicolor: Roháček, 2006a: 63-69 (redescription).

NEW MATERIAL EXAMINED: 45♂69♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, sweeping over boggy meadow, 14.vi.2006 1♀, J. Roháček leg. (SMOC). **Czech Republic**: N Bohemia: Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping *Juncus effusus* in boggy meadow, 23.vi.2008 10♂7♀, same, sweeping *Carex rostrata* in boggy meadow, 23.vi.2008 7♂12♀; Hradčany 1.2 km SE, Držník pond, 50°36´N, 14°43´E, sweeping *Carex paniculata* at brook, 26.vi.2008 1♀; Pavlovice 2 km W, Dolské údolí valley, 50°36´N, 14°30´E, sweeping *Juncus effusus* near brook, 25.vi.2008 4♂4♀, same locality, sweeping *Scirpus sylvaticus* in boggy meadow, 25.vi.2008 1♀; Staré Splavy 1.5 km NE, Máchovo jezero, 50°36´N, 14°39´E, sweeping *Phragmites australis* in peat-bog meadow, 23.vi.2008 1♀, all J. Roháček leg. (SMOC). W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 1♀, 21.vii.2006 1♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 21.vii.2006 1♂; Třešť 1.5 km SE, Vimvejr pond (distr. Jihlava), sweeping over *Carex riparia*, 23.vi.2006 1♂; Volevčice nr. Telč 1 km E, sweeping *Carex paniculata* tussocks in boggy meadow, 24.vi.2006 12♂10♀, 22.vii.2006 5♂1♀, all J. Roháček leg. (SMOC); N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Scirpus sylvaticus* in boggy meadow, 10.vii.2008 1♂; same, sweeping *Carex vesicaria* in boggy meadow, 16.vii.2008 5♀; same, sweeping *Glyceria maxima* in boggy meadow, 16.vii.2008 2♀; same, sweeping *Carex acuta* in boggy meadow, 16.vii.2008 4♀; Polanka nad Odrou, Přemyšov res., 48°47´24´´N, 18°11´23´´E, reared ex *Scirpus silvaticus* collected 10.vii.2008, 1♂4♀ emerged 10.vii.-19.viii.2008, same data but reared ex *Carex acuta*, 1♂5♀, same data but reared ex *Glyceria maxima*, 4♂2♀, all J. Roháček leg. (SMOC). **France:** Ain: Marais de Lavours, Ceyzérieu, etang/bois humide, reared ex *Lipara* gall, 8.v.-vi.2002 1♀, P. Withers leg. (PWS). **Germany:** Niedersachsen: Ldk Göttingen, Seeanger 1 km NW Seenurg, 15.vi.2007 1♀, Stuke leg. (JSL); Schleswig-Holstein: SW of Kiel, Steinfurth at river Eider, 10 m, 54°18'N 10°01'E (no. K807), reared from 2475 cm² x 5 cm soil with *Epilobium hirsutum, Cardamine amara, Phalaris arundinacea, Urtica dioica*, enclosed until 6.i.1988 under greenhouse conditions, 1♀, H. Meyer leg. (ZSMC). **Romania:** Naidăș 2 km W-Nera river, 44°53´03´´N, 21°34´00´´E, 110 m, sweeping over *Carex* boggy meadow, 2.vi.2008 1♀; Gornea nr. Sichevița 1 km S-Gornea river 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Carex acuta* in boggy meadow, 4.vi.2008 3♀, J. Roháček leg. (SMOC).

Distribution: *A. bicolor* is probably widespread in the Palaearctic Region but hitherto it has only been recorded from Europe and western Siberia in Russia: Austria (new), Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), France (new), Germany (Schneider 1898 sub *Balioptera bicolor*, Riedel 1919, Bährmann 2006, von Tschirnhaus 2007, 2008, Stuke 2009), Great Britain (England: Rotheray 1991; Scotland), Hungary, Italy, Lithuania (Lutovinovas et al. 2003; Pakalniškis et al. 2006), Netherlands, Poland, Romania (new), Russia (CET: Panteleeva & Razvorotnev 1996, Panteleeva 1997, 2005; WS), Slovakia: (Roháček 2006b), Sweden, Switzerland (Merz et al. 2001). Note: The records by Panteleeva & Razvorotnev (1996), Panteleeva (1997, 2005) from the Voronezh region of Russia and by Lutovinovas et al. (2003) and Pakalniškis et al. (2006) from Lithuania have not been revised and may refer to related *Anagnota* species, although *A. bicolor* is the most probable.

Anagnota oriens Roháček, 2006

Anagnota oriens Roháček, 2006a: 70-72.

NEW MATERIAL EXAMINED: 1♂1♀. **Greece:** Pieria, Olympos Mts., Karyá 3 km E, 39°59´N, 22°25´E, 800 m, sweeping over boggy meadow, 3.vi.2007, 1♂1♀, J. Roháček leg. (SMOC).

Distribution: Greece (new), Russia (WS). The new record from Greece (first from Europe) is very important because it demonstrates that the distribution of *A. oriens* overlaps not only with that of *A. bicolor* but also with that of *A. major*.

Anagnota major Roháček & Freidberg, 1993

Anagnota major Roháček & Freidberg, 1993: 75; Roháček, 2006a: 75-78 (redescription).

NEW MATERIAL EXAMINED: 1♂1♀. **Greece:** Pieria, Palaiópyrgos, Pineiós river, 39°55´N, 22°41´E, sweeping riverside vegetation, 2.vi.2007 1♀, J. Roháček leg. (SMOC). **Romania:** Gornea nr. Sicheviţa 1 km S-Gornea river, 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Carex acuta* in boggy meadow, 4.vi.2008, 1♂, J. Roháček leg. (SMOC).

Distribution: This species is known from Central Europe and the Mediterranean subregion (SE Europe and even North Africa): Bulgaria, Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Germany, Greece (new), Hungary, Italy, Morocco, Poland, Romania (new), Slovakia (Roháček 2006b).

Anagnota coccinea Roháček & Freidberg, 1993

Anagnota coccinea Roháček & Freidberg, 1993: 79; Roháček, 2006a: 79-81 (redescription).

Note: In the key to *Anagnota* species, Roháček (2006a: 62) erroneously stated that the female of *A. coccinea* has a yellowish palpus (as in male). However, it is brownish as correctly given in the description (Roháček 2006: 81). Thus the palpus is sexually dichroic in *A. coccinea* as in all other species of *Anagnota*. In contrast, the antenna is similarly coloured in both sexes of *A. coccinea* (scape and pedicel at most slightly lighter in male) while it is markedly sexually dichroic in all other congeners.

Distribution: *A. coccinea* has been recorded only from E. Mediterranean: Cyprus, Israel and Turkey.

Genus ***Anthomyza*** Fallén, 1810

Anthomyza Fallén, 1810: 20 [feminine]; Roháček 2006a: 83-89 (diagnosis, key).

Type species: *Anthomyza gracilis* Fallén, 1823: 8 (designated by Westwood, 1840: 152).

Diagnosis: (1) **Head** longer than high to slightly higher than long. (2) Eye large, suboval to ovoid, with longest diameter oblique. (3) Frons mostly dull, frontal triangle moderate or narrow, reaching to anterior half to third of frons. (4) Frontal lunule small but distinct. (5) Occiput slightly to distinctly concave. (6) Vertex (= top of head) usually without silvery microtomentose spots between frontal triangle and posterior part of orbits. (7) Antenna geniculate, pedicel simple; (8) arista short-ciliate to distinctly plumose. (9) Palpus usually yellow, with 1 subapical seta. Cephalic chaetotaxy: (10) pvt small, convergent to crossed; (11) vti usually longest, vte and oc also long; (12) 2-3 ors, but the anterior short, 0-1 microsetulae in front of the latter; (13) a single row of small postocular setulae; (14) 1 long vi; subvibrissa usually small, somewhat longer than peristomals; (15) peristomal setulae small and sparse. (16) Posterior corner of head rounded. (17) Antenna often with darker 1st flagellomere in female; face with same colouring in both sexes.

(18) **Thorax** as wide as or narrower than head. Thoracic chaetotaxy: (19) 1 hu; 2 npl (anterior longer); (20) 1 distinct prs; (21) 1 short sa, 1 pa; (22) 2-3 long dc (if 3 then anterior markedly shorter), posterior dc longer than apical sc; (23) ac microsetae in 4 (rarely 2) rows on suture, in 2 more posteriorly; (24) 2 sc, basal very short and weak; (25) 1 minute ppl; (26) 2 stpl, posterior usually longer. (27) Legs mostly yellow, often with dark apical tarsal segments, rarely with darkened femora. (28) f_1 with posteroventral ctenidial spine. (29) t_2 with usual ventroapical seta (rarely doubled). (30) Male f_3 simply setulose or with a posteroventral row of dense, short and thickened setae. (31) Wing long and relatively narrow; (32) wing membrane unicolourous, at most darkened at anterior margin. (33) C usually with distinct spinulae between apices of R_1 and R_{2+3}; (34) R_{2+3}, long, slightly sinuate, subparallel with C; (35) R_{4+5} straight, very slightly bent or sinuous, subparallel with M apically; (36) discal (dm) cell long, widened distally, with r-m situated near (usually in front of) its middle; (37) distal part of CuA_1 usually longer than dm-cu and almost reaching wing margin; A_1 short, not reaching wing margin. (38) Alula small and narrow.

Male abdomen. (39) T1 and T2 partly fused. (40) T2-T5 large and broad, usually all uniformly pigmented. (41) S2-S5 narrow and usually paler than terga. Male postabdomen: (42) T6 reduced, short transverse, pigmented, medially unpigmented or entirely unpigmented, and bare. (43) S6 and S7 strongly asymmetrical, with 0-4 setulae each. (44) S8 less asymmetrical, long, setose in posterior half.

Male genitalia. (45) Epandrium moderate, as wide as high to strongly wider than high, with 1-2 pairs of longer setae in addition to short setosity. (46) Medandrium of various form, usually broader ventrally and narrower dorsally. (47) Cercus small to medium long, weakly sclerotized, usually with fine pale setosity. (48) Gonostylus moderate to large, usually broad, with micropubescence on outer side, setose on inner side. (49) Hypandrium relatively robust, symmetrical and well sclerotized, with anterior inner lobes more or less developed; (50) transandrium of various form, without or with (sometimes extremely robust) caudal process. (51) Pregonite fused with hypandrial frame, low, often with 1 ventrally projecting lobe and with 2 (anterior and posterior) groups of setae; (52) postgonite slender, strap-like, with 1 anterior or lateral setula, usually in proximal half. (53) Phallapodeme slender to robust, basally (sometimes asymmetrically) bifurcate, apex usually bicuspidate. Aedeagus with (54) short and rather simple phallophore. (55) Distiphallus composed of largely membranous saccus and usually long, slender and sclerotized filum. (56) Saccus armed with robust to small and short spines; (57) filum sclerotized, formed by single sclerite, usually slender and distally attenuated but its apex may be secondarily widened and terminated in more projections. (58) Aedeagal part of folding apparatus with various structures externally and internally, usually spinose or tuberculate and striated; connecting sclerite usually distinct, rarely membranous. (59) Basal membrane usually densely spinose, unarmed when caudal process enlarged. (60) Ejacapodeme very small, usually with slender digitiform projection.

(61) **Female abdomen** with broader, more transverse preabdominal terga and narrower sterna than in male; T1-T5 usually uniformly pigmented dark brown to yellow. (62) Postabdomen long, tapered, telescopic. (63) T6 large, similar to T5, usually more trapezoidal; S6 largest sternum (even larger than S5), and usually paler than T6. (64) T7 and S7 forming or tending to form tergosternal ring-shaped cone, original S7 usually discernible by pale pigmentation; if S7 disparate, it is reduced or (rarely) widened and overlapping lateral margins of T7; (65) T8 usually narrow, elongate, sometimes strongly tapered posteriorly. (66) S8 longitudinally divided, in 2 often elongate sclerites, having posterior part more or less bent dorsally and recurved internally. (67) Female genital chamber with 1 to 3 pairs of internal sclerites (often fused together, rarely asymmetrical) and with (68) one curved and usually elongate (never transverse) annular sclerite; (69) ventral receptacle very long, tubular and hyaline, with apex slender and curved, vermicular or helicoid; (70) accessory gland small, hyaline, at most with finely granular structure and with

minute stalked globulae on surface, on slender, subterminally slightly widened duct. (71) Spermathecae (1+1) on very long ducts, subspherical to elongately pyriform, usually with transversely ringed surface and minute spinulae, often also with terminal invagination. (72) T10 small, variable in shape, usually shorter and narrower than S10, with 1 medial pair of long setae and (sometimes) with 1-4 pairs of additional setulae. (73) S10 usually longer and wider than T10. (74) Cercus long and slender, rarely more robust, with numerous fine setae (apical and dorsopreapical longest).

Discussion: As stated by Roháček (2006a) this largest genus of Anthomyzidae displays a considerable morphological diversity in the external as well as in the male and female genital characters. This continues to be true after the removal of the *Anthomyza socculata* group for which a new genus *Arganthomyza* is established below. The addition of two new species (described here) as well as the exclusion of *A. socculata* resulted in the necessity to re-diagnose the genus *Anthomyza* and to prepare a new key to the identification of its Palaearctic species. Although the genus *Anthomyza* can be identified by external characters (see key), it is always necessary to verify the placement of unknown species by checking the male genitalic and female postabdominal characters mentioned below. Because *Arganthomyza* species are externally very similar to *Anthomyza* species, they are all included in the new key to Palaearctic *Anthomyza* to enable their identification in cases when the genus is not recognized using the above key to Palaearctic genera of Anthomyzidae.

The monophyly of *Anthomyza* is only supported by several apomorphic characters in the male and female genitalia, the most important of which are the following: (56) saccus armed by spines; (57) filum of distiphallus compact, formed by a single sclerite; (60) ejacapodeme very small; (64) female T7 and S7 forming (or tending to form) a tergosternal ring; (66) female S8 longitudinally divided into 2 sclerites which are posteriorly partly invaginated; (68) annular sclerite more or less curved and elongate; (69) ventral receptacle very long, tubular, with apex attenuated and curved or twisted. None of these apomorphies are unique within the family Anthomyzidae and some (64, 66, 68) are shared with the closest relatives of *Anthomyza*, viz., *Arganthomyza* and *Fungomyza*. Despite this fact, the genus *Anthomyza* in the present concept seems to be a distinct monophyletic group as it was also demonstrated by molecular data analysis of 12S + 16S mitochondrial gene markers (Roháček et al. 2009). Its strongest synapomorphic features are in the male aedeagal complex (56, 57, 60), all being clearly derived states with respect to those found in the sister-group. Further, the very elongate ventral receptacle (69) also is considered a strong synapomorphy of *Anthomyza* as it is a derived state of a transformation series (the more ancestral but apomorphic state of this character, viz. shorter membranous ventral receptacle without prolonged tip, occurs in *Fungomyza* and *Arganthomyza* species; the plesiomorphic state, viz. very short membranous ventral receptacle, is known e.g. in the genus *Amygdalops*).

The sister-pair *Fungomyza* + *Arganthomyza* proved to form a sister clade to *Anthomyza* (see in the chapter Phylogeny below). These three genera are distinctly related. The poorly known genus *Receptrixa* (male of its only species, *R. receptrix*, unknown) resembles this group of genera in having the female S8 divided and the tergosternum T7+S7 well developed (and to *Fungomyza* + *Arganthomyza* also by the shortened spermathecal ducts) and may prove to be also related to this clade although it has a strongly modified female genital chamber with an extremely enlarged and sclerotized ventral receptacle and reduced spermathecae.

At present the genus *Anthomyza* includes 20 species in the Palearctic region. Most of them can be assembled in species groups which are delimited by synapomorphic features (see the chapter Phylogeny). The species [and species groups] are as follows: *A. decolorata* sp.n., *A. macra* Czerny, 1928, *A. pleuralis* Czerny, 1928 [*A. macra* group], *A. umbrosa* Roháček, 2006, *A. baezi* Roháček, 1999, *A. clara* Roháček, 2006 [*A. umbrosa* group], *A. pallida* (Zetterstedt, 1838), *A. dissors* Collin, 1944 [*A. pallida* group], *A. neglecta* Collin, 1944, *A. paraneglecta* Elberg, 1968, *A. orineglecta* Roháček, 2006 [*A. neglecta* group], *A. collini* Andersson, 1976, *A. anderssoni* Roháček, 1984, *A. tschirnhausi* sp.n. [*A. collini* group], *A. drachma* Sueyoshi & Roháček, 2003 [ungrouped], *A. flavosterna* Sueyoshi & Roháček, 2003 [ungrouped], *A. bellatrix* Roháček, 1984, *A. trifurca* Sueyoshi & Roháček, 2003 [*A. bellatrix* group], *A. gracilis* (Fallén, 1823), *A. elbergi* Andersson, 1976 [*A. gracilis* group].

Key to identification of *Anthomyza* species

(with inclusion of Palaearctic species of *Arganthomyza* gen.n.)

1 Wing membrane distinctly brown with darker brown band along anterior margin (Roháček 2006a: Fig. 212). Legs with darkened femora (f$_2$ and f$_3$ in particular) being brownish in male, darker ochreous in female. Haltere dark, with brownish knob. Gonostylus narrow, with distinct lateral keel (Roháček 2006a: Fig. 204). Female S7 enlarged and overlapping margins of T7 (Roháček 2006a: Fig. 211) .... *A. umbrosa* Roháček, 2006

– Wing membrane unicolourous, hyaline, light ochreous to pale brownish fumose. Other characters different or in another combination 2

2(1) Pleural part of thorax brown to dark brown, concolourous with mesonotum, at most sternopleuron with ventral corner yellowish 3

– Pleural part of thorax ochreous-yellow to yellowish white, at most with brown stripe along dorsal margin 14

3(2) Mesonotum sparsely greyish or brownish microtomentose and relatively shining when viewed from dorsal aspect 4

– Mesonotum densely grey or light grey microtomentose, dull and often matte bronze when viewed from dorsal aspect 8

4(3) Ventral portion of sternopleuron yellow. Head with distinctly projecting frons, receding face and hence angular in profile. vti unusually long, markedly longer than oc, vte or posterior ors; the 3 ors relatively short and becoming shorter anteriorly. Male genitalia with filum apically strongly expanded and with 2 processes (Roháček 2006a: Fig. 361). Female tergosternum T7+S7 with pale ligulate remnant of S7 (Roháček 2006a: Fig. 367) .... *A. flavosterna* Sueyoshi & Roháček, 2003

– Sternopleuron completely brown. Head with frons not projecting and face hardly receding, thus rounded in profile. vti slightly longer than oc, vte and ors; 2 long ors and 1 setula in front of them. Male and female genitalia different 5

5(4) Last tarsal segment with only apex brownish darkened. Most of frons yellow, only frontal triangle brown. Gonostylus very large, distally expanded and rounded (Roháček 2006a: Fig. 175). Female S7 small but separate from T7, S8 short (Roháček 2006a: Fig. 186) and spermatheca very elongate with separate spinose base (Roháček 2006a: Fig. 187) .... *A. macra* Czerny, 1928

– Last segment of all tarsi largely (half or more) blackish brown. Frons dark in at least upper half and/or with distinct silvery spot or stripe between posterior corners of frontal triangle and orbit. Gonostylus apically narrowed or very narrow and pointed. Female S7 separate and S8 long, or S7 completely fused with T7 6

6(5) No silvery spot between posterior corners of frontal triangle and orbit. C without spinulae between apices of R$_1$ and R$_{2+3}$. Gonostylus (Roháček 2006a: Fig. 344) very slender and pointed; aedeagal part of folding apparatus and (reduced) saccus with extremely robust spines (Roháček 2006a: Fig. 345). Female S7 separate, S8 elongate (Roháček 2006a: Fig. 352) and internal sclerotization of female genital chamber complex (Roháček 2006a: Fig. 351) .... *A. drachma* Sueyoshi & Roháček, 200

– Frons with a distinct silvery spot or short stripe between posterior corners of frontal triangle and orbit (Fig. 72). C with spinulae between apices of R_1 and R_{2+3}. Gonostylus robust, wider, flat and bent. Aedeagal part of folding apparatus with fine grain-like or flat tubercles and saccus without spines. Female tergosternum T7+S7 complete; S8 short, with posterior lobes invaginated (Fig. 101); internal sclerites simple (Figs 104-105) 7

7(6) Frons yellow in anterior half, with yellow stripes projecting between orbits and frontal triangle; frontal triangle short, reaching to anterior third of frons; pvt crossed. Hind basitarsus without thickened setae. For other characters see key on p. 62 ..... *Arganthomyza socculata* (Zetterstedt, 1847)

– Frons yellow in anterior fourth to third, blackish brown between orbits and frontal triangle except silvery stripe at posterior corners of frontal triangle; frontal triangle very long, reaching to anterior margin of frons (Fig. 72); pvt convergent but not crossed. Hind basitarsus with distinct thickened setae (Fig. 103). For other characters see key on p. 63 .... *Arganthomyza versitheca* **sp.n.** [p. 68]

8(3) Occiput medially behind pvt with a pair of whitish grey microtomentose stripes. Scutellum dorsally flattened. Male f_3 with shortened and thickened posteroventral setae (Roháček 2006a: Fig. 373). Phallapodeme basally strongly asymmetrical. Filum of distiphallus robust, apically expanded and projecting in several processes. Female genital chamber with asymmetrical sclerites and spermatheca with short terminal invagination 9

– Occiput medially behind pvt uniformly brown-grey microtomentose. Scutellum dorsally distinctly convex. Male f_3 simply setose posteroventrally. Phallapodeme basally less asymmetrical; filum of distiphallus slender, apically pointed. Female genital chamber with sclerites symmetrical and spermatheca with or without long terminal invagination 10

9(8) Frons with yellow stripes between frontal triangle and orbits. Ctenidial spine on f_1 longer than maximum width of t_1. Gonostylus (Roháček 2006a: Fig. 371) spoon-shaped, with rounded apex; saccus large and finely spinose, filum with palmate apex (Roháček 2006a: Fig. 374). Female T7+S7 entirely dark dorsally (Roháček 2006a: Fig. 381); annular sclerite (Roháček 2006a: Fig. 380) very elongate; spermatheca with lateral keel (Roháček 2006a: Fig. 383) .... *A. bellatrix* Roháček, 1984

– Frons without yellow stripes between frontal triangle and orbits. Ctenidial spine on f_1 shorter than maximum width of t_1. Gonostylus (Roháček 2006a: Fig. 387) suboblong, with angular posteroventral corner; saccus smaller, with dark spines dorsally; filum very robust, with peculiar trifid apex (Roháček 2006a: Fig. 389). Female T7+S7 with short dark transverse band dorsally (Roháček 2006a: Fig. 394); annular sclerite (Roháček 2006a: Fig. 392) short and broader; spermatheca without keel (Roháček 2006a: Fig. 395) .... *A. trifurca* Sueyoshi & Roháček, 2003

10(8) Mid tibia with a pair of short ventroapical setae. Epandrium with very small and low anal fissure; medandrium very high and dorsally tapered (Fig. 58). Gonostylus slender and apically pointed (Fig. 57). Female postabdomen unusually prolonged with long and narrow T7+S7 and extremely elongate T8 (Fig. 63). Female S8 lacking micropubescence (Fig. 68)..................... *A. tschirnhausi* **sp.n.** [p. 48]

– Mid tibia with single longer ventroapical seta. Epandrium with anal fissure larger and higher. Gonostylus different. Female postadomen less elongate, with T7+S7 and T8 shorter. Female S8 distinctly finely micropubescent 11

11(10) Head more elongate, with face strongly receding (Roháček 2006a: Fig. 34). Thorax with lighter grey microtomentum; scutellum more elongate; preabdominal terga pale brown. Gonostylus large and spoon-shaped, apically broad. Transandrium simple, without caudal process. Female T7+S7 ventrally homogeneously pigmented; T8 very narrow and strongly attenuated (Roháček 2006a: Fig. 304); internal sclerites of female genital chamber short (Roháček 2006a: Fig. 307) and spermatheca without invagination (Roháček 2006a: Fig. 306) 12

– Head shorter, with face slightly receding (Roháček 2006a: Fig. 33). Thorax dark grey microtomentose; scutellum shortly subtriangular; preabdominal terga dark brown. Gonostylus small (Roháček 2006a:

Figs 39, 405) and apically narrowed. Transandrium with large caudal process having ventral appendage. Female T7+S7 ventrally with pale-pigmented sternal part; T8 wider and not attenuated posteriorly; internal sclerites of genital chamber long (Roháček 2006a: Fig. 51) and spermathecae with digitiform invagination (Roháček 2006a: Fig. 57) 13

12(11) Gonostylus with deep anterior emargination (Roháček 2006a: Fig. 299); hypandrium (Roháček 2006a: Fig. 300) and phallapodeme more robust (Roháček 2006a: Fig. 302). Female T8 basally broader and S8 extended laterally to reach basal part of T8; T10 broader and transverse (Roháček 2006a: Figs 304, 307); annular sclerite strongly bent in lateral view and cercus wider (Roháček 2006a: Fig. 307) .... *A. collini* Andersson, 1976

– Gonostylus with shallow anterior emargination (Roháček 2006a: Fig. 312); hypandrium and phallapodeme more slender (Roháček 2006a: Fig. 314). Female T8 basally narrower (Roháček 2006a: Fig. 317) and S8 not reaching to its basal part laterally (Roháček 2006a: Fig. 316); T10 narrow (Roháček 2006a: Fig. 317); annular sclerite slightly bent in lateral view (Roháček 2006a: Fig. 321); cercus more slender (Roháček 2006a: Fig. 316) .... *A. anderssoni* Roháček, 1984

13(11) Frons medially largely brown (also in front of frontal triangle, see Roháček 2006a: Fig. 27), yellow only in anterior fourth to third. Legs bright yellow, only apical tarsal segment of all tarsi brown. Gonostylus (Roháček 2006a: Fig. 48) shorter, broader and less acute apically; appendage of caudal process of transandrium shorter and more rounded in ventral view (Roháček 2006a: Fig. 46); saccus of distiphallus with 4 robust spines. Female T7+S7 ventrally with unpigmented T-shaped area (Roháček 2006a: Fig. 55); T8 anteriorly widened and incised (Roháček 2006a: Fig. 53) .... *A. gracilis* Fallén, 1823

– Frons yellow in anterior half, also in front of frontal triangle. Femora (f_3 of male in particular) darker than yellow tibiae; tarsi with two terminal segments brown (preapical pale brown, apical dark brown). Gonostylus (Roháček 2006a: Fig. 411) longer, narrower and more acute apically; appendage of caudal process of transandrium longer and angular (Roháček 2006a: Fig. 406); saccus of distiphallus with 6-7 robust spines. Female T7+S7 ventrally with unpigmented irregularly trapezoidal area (Roháček 2006a: Fig. 415); T8 anteriorly narrow without distinct margin (Roháček 2006a: Fig. 412) .... *A. elbergi* Andersson, 1976

14(2) Mesonotum largely brown or blackish brown, at most with yellow or ochreous lateral marginal areas (humeral, notopleural, sides of scutellum) 15

– Mesonotum largely yellow, yellow with brown vittae, or greyish brown with yellow stripes 16

15(14) Frons yellow, with frontal triangle brown; occiput entirely dark brown. Mesonotum sparsely greyish microtomentose, subshining. Gonostylus (Roháček 2006a: Fig. 193) large, apically broad and rounded, only its posteroventral corner with small tooth (Roháček 2006a: Fig. 191); saccus of distiphallus with internal coiled structure and several pale teeth (Roháček 2006a: Fig. 194). Female S7 small but disparate; spermatheca elongate with separate spinose part near base (Roháček 2006a: Fig. 196) .... *A. pleuralis* Czerny, 1928

– Frons yellow, only ocellar tubercle brown; occiput only partly darkened, mostly yellow. Mesonotum more microtomentose and dull. Gonostylus (Roháček 2006a: Fig. 249) small, slender, apically tapered; saccus of distiphallus with numerous robust dark spines (Roháček 2006a: Fig. 248). Female S7 fused with T7 but pale with a pair of elongate dark-pigmented spots in middle (Roháček 2006a: Fig. 257); spermatheca broadly ovoid, with terminal invagination and dark spinulae on basal part (Roháček 2006a: Fig. 258) .... *A. dissors* Collin, 1944 (dark form)

16(14) Antenna with arista strikingly densely haired, particularly in proximal half (Fig. 73). Mesonotum yellow with broad brown vittae lateral to dc lines; pleuron with longitudinal dorsal brown stripe (Fig. 73). For other characters see key on p. 62 .... *Arganthomyza barbarista* **sp.n.** [p. 63]

– Arista simply sparsely short-ciliate to plumose. Mesonotal and pleural pattern variable 17

17(16) Mesonotum with 3 greyish brown vittae and yellow stripes between them. Occiput bicolourous, brown, with medial area and lateral margins yellow. Gonostylus (Roháček 2006a: Fig. 327) with broad apex having angular corners. Saccus of distiphallus with short spines (Roháček 2006a: Fig. 333). Female T7+S7 ventrally with distinctive pigmentation (Roháček 2006a: Fig. 337) and spermathecae with eversible apical projection (Roháček 2006a: Fig. 340) .... *A. baezi* Roháček, 1999

– Mesonotum either completely yellow, at most with some faint greyish elongate spots or indistinct bands, or yellow with 2 brown bands, each between dc and prs-sa lines. Occiput entirely yellow or bicolourous. Gonostylus, saccus, female postabdomen and spermatheca different 18

18(16) Antennal 1st flagellomere with long white ciliation on anteroventral margin (see Roháček 2006a: Fig. 274) 19

– Antennal 1st flagellomere shortly ciliate (Roháček 2006a: Fig. 260) 23

19(18) Arista with short ciliation (about as in Roháček 2006a: Fig. 260) 20

– Arista with long ciliation (almost as long as that of 1st flagellomere, Roháček 2006a: Fig. 274) 22

20(19) Occiput yellow. Mesonotum yellow, at most with pale ochreous-brown darkened area between dc and prs-sa lines. Preabdominal terga yellow. Gonostylus (Roháček 2006a: Figs 278, 281) strongly bent internally and slender, with lateral keel and rich setosity; postgonite with apex rounded (Roháček 2006a: Fig. 280). Female tergosternum T7+S7 (Roháček 2006a: Fig. 286) and sclerites in female genital chamber (Roháček 2006a: Fig. 290) short .... *A. paraneglecta* Elberg, 1968

– Occiput yellow with brown pattern, at least its lateral parts brown. Mesonotum with distinct brown vittae between dc and prs-sa lines. Abdominal terga at least partly brown 21

21(20) Antennal 1st flagellomere yellow with distinct brownish spot near insertion of arista. Preabdominal terga uniformly brown or pale brown. Epandrium of moderate width (Roháček 2006a: 137); gonostylus slightly bent, with narrowed and dentate distal part and distinctive laterocaudal flat lobe (Roháček 2006a: Fig. 297); postgonite apically pointed (Roháček 2006a: Fig. 293). Saccus of distiphallus with thick dark spines (Roháček 2006a: Fig. 295). Female postabdomen with T7+S7 fused to form tergosternum having ventrally distinctive anterolateral lobes (Fig. 43); female genital chamber with distinct posterior sclerites and short annular sclerite (Fig. 41-42). Spermathecae suboval, with small terminal invagination (Fig. 44) .... *A. orineglecta* Roháček, 2006 [p. 41]

– Antennal 1st flagellomere uniformly yellowish white. Preabdominal terga (at least T2-T3 in male) dorsomedially pale pigmented to unpigmented, laterally brown. Epandrium very broad (Fig. 26); gonostylus large, distally strongly dilated and provided with tooth-like internally bent corners (Figs 26, 31); postgonite apically blunt (Fig. 32). Saccus of distiphallus with internal coiled strip-like structure and short spines (Fig. 32). Female postabdomen with S7 disparate and pale-pigmented (Fig. 35); female genital chamber with reduced posterior sclerites, elongate annular sclerite and unusual strong sclerotization of its distal part (Figs 36, 38). Spermathecae elongate, transversely striated, with pale, plain but spinulose basal end (Fig. 37) .... *A. decolorata* **sp.n.** [p. 31]

22(19) Subvibrissa small, not longer than peristomals; mesonotum yellow. Gonostylus curved internally and with broadened and denticulate apex (Roháček 2006a: Fig. 266); filum of distiphallus apically slightly widened and with short blunt projection and small teeth (Roháček 2006a: Fig. 265). Female postabdomen with tergosternum T7+S7 (Roháček 2006a: Fig. 269); genital chamber with 1 pair of long dorsal sclerites and 1 short annular sclerite (Roháček 2006a: Fig. 271) ... *A. neglecta* Collin, 1944

– Subvibrissa unusually long (at least two-thirds of vi); mesonotum yellow with pale brown vittae between dc and prs-sa lines. Gonostylus with apex narrowed and acutely projecting (Roháček 2006a: Fig. 217); filum of distiphallus apically very slender and pointed (Roháček 2006a: Fig. 219). Female postabdomen with S7 separate, large and overlapping lateral margins of T7 (Roháček 2006a: Fig.

227); genital chamber with 2 pairs of short posterior internal sclerites and 1 very long annular sclerite (Roháček 2006a: Fig. 221) .... *A. clara* Roháček, 2006

23(15) Head anteriorly strongly angular in profile because of distinctly receding face (Roháček 2006a: Fig. 34). Thorax duller in consequence of dense pale grey microtomentum. Male f_3 simply setose. Gonostylus (Roháček 2006a: Figs 312, 315) large, spoon-shaped, apically broad. Female T8 very narrow and posteriorly strongly attenuated (Roháček 2006a: Figs 304, 317) .... *A. anderssoni* and *A. collini* (pale form), continue with couplet 12

– Head anteriorly rounded or slightly angular in profile, with hardly receding face. Thorax less densely microtomentose. Male f_3 with posteroventral row of shorter and thicker setae. Gonostylus (Roháček 2006a: Figs 232, 259) small, apically tapered. Female T8 wider, broad also posteriorly (Roháček 2006a: Figs 235, 251) 24

24(23) Occiput completely yellow; humeral callus partly brown. Male T4 and T5 unicolourous brown. Epandrium yellow or pale ochreous-brown contrasting with dark terga. Gonostylus (Roháček 2006a: Fig. 232) broader, apically tapered, with anterior margin straight in profile (Roháček 2006a: Fig. 229). Saccus of distiphallus with only 5-6 robust spines (Roháček 2006a: Fig. 234). Female with well-delimited S7 (Roháček 2006a: Fig. 240); genital chamber with 3 pairs of sclerites (Roháček 2006a: Fig. 238) .... *A. pallida* (Zetterstedt, 1838)

– Occiput with darker lateral spots; humeral callus yellow. Male T4 and T5 at least laterally yellow. Epandrium dark brown to black. Gonostylus (Roháček 2006a: Fig. 249) narrow and elongate, with anterior margin concave in profile (Roháček 2006a: Fig. 245). Saccus of distiphallus with 8 robust spines (Roháček 2006a: Fig. 248). Female tergosternum T7+S7 with completely integrated S7 (Roháček 2006a: Figs 252, 256); genital chamber with sclerites fused into one crooked plate (Roháček 2006a: Fig. 254). .... *A. dissors* Collin, 1944

Anthomyza decolorata sp. n.

(Figs 25-38)

TYPE MATERIAL: Holotype ♂ labelled: "RUSSIA: Kamchatka, 53,11.70 N, 158,27.91 E, X1395, Nalychevo Prir. Park, 22.5 km NNE' of [peak of] volcano 'Koryakskaja Sopka'", "area around tourist station; dense herbaceous veget. partly wet from rain, swept, aspirated, 27.vii.1999, M. v. Tschirnhaus leg.", "Holotypus ♂, *Anthomyza decolorata* sp.n., J. Roháček det. 2007" [red label] (ZSMC, intact, dried from ethanol). Paratypes: **Russia**: same data as for holotype, 3♂2♀; Kamchatka, around hot springs along Kluchevka River, about 9 km E Malki vill., about 80 km WNW' from Petropavlovsk, 53,19.51 N 157,31.93 E [X1401], 580 ft, birch forest, swept, aspirated, 14.viii.1999 2♂1♀, M. v. Tschirnhaus leg. (ZSMC, SMOC, all dried from ethanol, 2♂2♀ with genit. prep., 1♂ with wing detached and preserved with genit. prep. in glycerine); Kamchatka, Dachnoye, 8.viii.1976 1♀, Elberg leg. (IAES, genit. prep.); Kunashir I., okr. vlk. Mendeleeva [= environs of volcano Mendeleev], 4.vii.1985 1♀, 8.vii.1985 1♀, 20.vii.1985 1♀, all S. Churkin leg. (ZMUM, SMOC, 1♀ genit. prep.).

Description: Male. Total body length 2.34-2.74 mm. Body bicolourous, (largely) yellow and brown, sparsely pale-grey microtomentose, subshining. Head as long as high or slightly higher than long, anteriorly rounded in profile. Most of head yellow, only occiput (partly) and ocellar triangle brown. Occiput with distinctive brown pattern covering most of central area above and laterally to foramen (lateral parts darker); its large ventral parts, short stripes behind vte and vti and 2 short medial stripes behind pvt yellow (area between the latter brown); marginal stripe along posterior eye margin brown and more ventrally often confluent with large dark brown lateral parts. Frontal triangle with dirty whitish microtomentum, rather dull and reaching middle of frons. Ocellar triangle suboval, brown, with unusually large ocelli. Stripes between frontal triangle and orbits darker yellow, finely striated and subshing. Orbits pale yellow; face

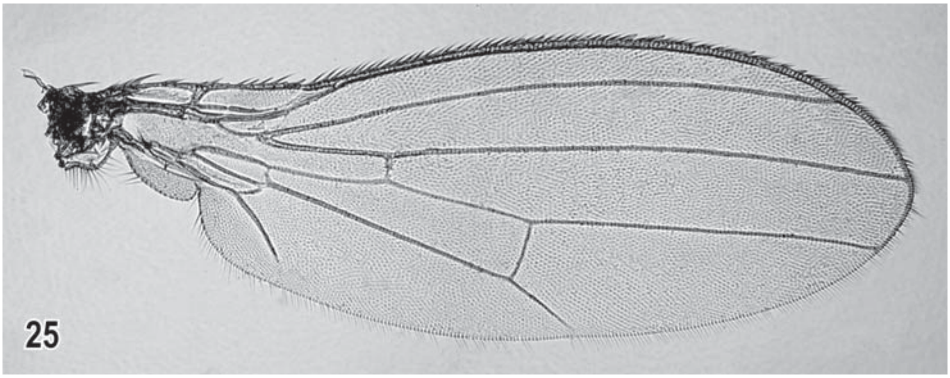
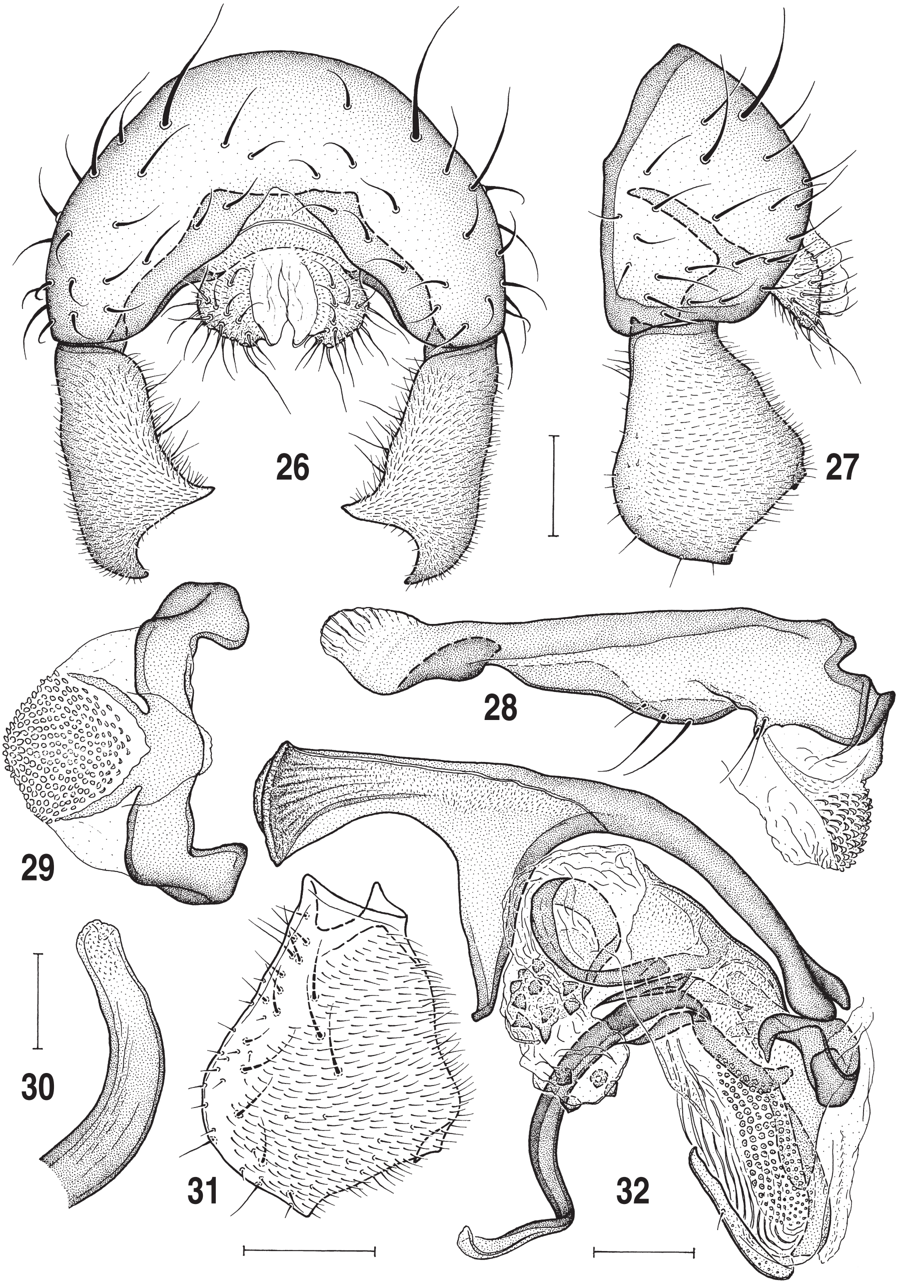


Fig. 25: Wing of *Anthomyza decolorata* sp.n., male paratype, wing length 2.9 mm. Photo by J. Roháček.

relatively broad and yellowish white with yellow medial stripe; gena and postgena whitish yellow with darker yellow marginal stripe, all whitish microtomentose. Mouthparts dark-yellow but palpus pale yellow. Cephalic chaetotaxy: pvt relatively long (half length of vti) and crossed in their middle; vti and oc subequal and longest of cephalic setae; vte and posterior ors slightly shorter than vti; 3 ors, 2 posterior long (middle usually only slightly shorter than hindmost ors), 1 anterior short, sometimes reduced to a weak setula; 2-4 pairs of medial microsetulae in anterior third of frons; postocular setulae (8-9) in one row, almost as long as peristomal setulae; 1 setula behind vte not longer than uppermost postocular setula; vi long (as long as middle ors) but subvibrissa reduced, hardly longer than anterior peristomal setula; posterior corner of occiput and postgena with scattered setulae plus 1 longer and 1 shorter ventral seta. Palpus pale yellow, with preapical seta and 6-7 short setulae ventrally. Eye large, broadly oval, its longest diameter oblique and about 1.3-1.4 times as long as shortest. Gena longer (higher) than in relatives, its height about 0.20 times as long as shortest eye diameter. Antenna with pale yellow scape and pedicel; 1st flagellomere yellowish white and with short white cilia; arista brown, with basal two thickened segments ochreous, about 1.9 times as long as antenna and shortly ciliate.

Thorax largely yellow (ventrally whitish yellow), but mesonotum with longitudinal brown vittae between dc and prs-sa lines extended from posthumeral area to basal corners of scutellum. Humeral and notopleural areas broadly yellow and concolourous with adjacent pleural part of thorax; the latter yellow (whitish yellow on sternopleuron and hypopleuron) except for brown or pale brown laterotergite and mediotergite. Mesonotum sparsely but distinctly greyish microtomentose, subshining, pleural part duller. Thoracic chaetotaxy: 1 hu, 2 npl (anterior longer), 1 distinct prs (as long as or longer than anterior npl), 1 shorter sa, 1 longer pa; 3(2) postusutural dc, but third (foremost, if distinct) short, representing enlarged dc microseta, posterior very long, longest of thoracic setae; 5-6 dc microsetae in front of anterior dc; ac microsetae fine, in 4 rows on suture and also between anterior dc, in 2 rows more posteriorly and reaching behind posterior dc, sometimes even to prescutellar area; 2 sc, apical strong, as long as posterior dc, laterobasal weak but longer than foremost dc; 2 strong stpl (anterior usually shorter), 3 upcurved setulae below them and several ventral setae on sternopleuron. Scutellum yellow, with only basal corner partly darkened but subscutellum brown. Legs yellow, coxae and trochanters yellowish white, only distal end of apical segment of all tarsi ochreous darkened. f_1 with ctenidial spine short, distinctly shorter than maximum width of t_1; t_2 with short ventroapical seta; other parts of legs simply setulose. Wing (see Fig. 25) long but not very narrow, with hyaline ochreous membrane and ochreous veins. C with sparse spinulae between apices of R_1 and R_{2+3}. R_{2+3} parallel to C, apically



Figs 26-32: *Anthomyza decolorata* sp.n., male paratype. **26** - external genitalia, caudally; **27** - ditto, laterally; **28** - hypandrial complex, laterally; **29** - transandrium, caudally; **30** - apex of filum of distiphallus, ventrally; **31** - gonostylus, sublaterally (widest extension); **32** - aedeagal complex, laterally. Scales: Fig. 30 = 0.05 mm, others = 0.1 mm.

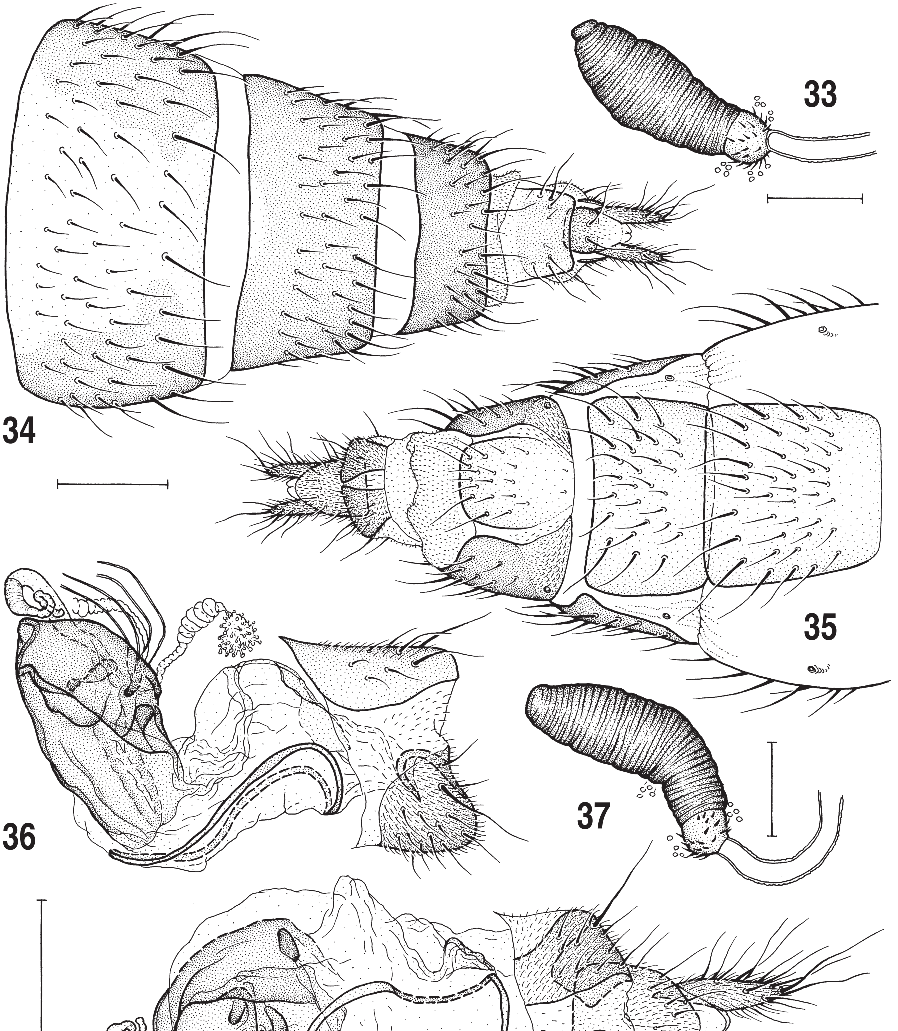
very slightly upcurved to almost straight. R_{4+5} very slightly bent (recurved) and apically parallel or slightly convergent to M. Discal (dm) cell not very narrow, with r-m situated slightly in front of its middle; terminal section of CuA_1 usually slightly longer than dm-cu and almost reaching wing margin; A_1 short, ending far from wing margin. Alula small, narrow. Wing measurements: length 2.86-3.02 mm, width 0.99-1.09 mm; $Cs_3 : Cs_4 = 1.53\text{-}1.68$, rm\dm-cu : dm-cu = 2.32-2.61. Haltere with whitish yellow stem and dirty yellow knob.

Abdomen with terga and sterna paler than in relatives, sparsely microtomentose, rather shining. Preabdominal terga large, extended onto pleural part of abdomen, brown but partly lightened; T1 dorsally separate from T2, pale yellow, only laterally brownish. T2-T5 (T2-T3 more so) dorsomedially pale-pigmented to partly depigmented, laterally brown. Preabdominal sterna narrow, pale yellowish ochreous. S2-S5 slightly transverse (wider than long). T6 bare, brown, seemingly bipartite because dorsomedially broadly unpigmented. S6-S8 dorsally fused. S6-S7 asymmetrical, pale ochreous, with only anterior ledge-like margins brown, S6 with 1-2, S7 with 1 setula. S8 situated dorsally, more symmetrical, darker brown, setose in posterior half.

Genitalia. Epandrium (Figs 26-27) very broad as in *A. macra*, with 2 pairs of longer setae besides short setae; anal fissure small, and (in contrast to both relatives) triangular. Cercus short, finely setose. Medandrium very wide and low, with rounded dorsolateral corners. Gonostylus (Figs 26-27, 31) large and similarly micropubescent to that of *A. macra*, as long as epandrial height, differing from the latter species in less bulging anteroventral side and in having a distinct ventral, internally bent corner in addition to posteroventral, sharply pointed corner (cf. Fig. 26). Hypandrium (Fig. 28) not very robust, with low internal anterior lobes and integrated pregonites. Transandrium (Fig. 29) closely resembling that of relatives but its flat caudal process more sessile, broader basally and having more slender divergent terminal arms. Pregonite (Fig. 28) similar in shape and chaetotaxy (3 anterior and 2 posterior setae) to both relatives but with posterior process more slender and projecting. Postgonite also much alike (including chaetotaxy), slightly bent and somewhat more slender (Fig. 32). Aedeagal part of folding apparatus with fine grain-like tubercles and striae (Fig. 32); connecting sclerite slender, bent and weakly sclerotized; basal membrane finely tuberculate (Figs 29-29) as in related species. Phallapodeme resembling that of *A. macra* and *A. pleuralis* in proximal half but its distal half (and apex in particular) markedly enlarged. Phallophore somewhat more robust than that of relatives (Fig. 32). Saccus (Fig. 32) voluminous, with internal coiled strip-like structure characteristic of the *A. macra* species-group well developed and its distal membranous part with armature resembling that of *A. pleuralis* but with robust spines darker and more numerous. Filum (Fig. 32) largely dark, ribbon-shaped, with bent and paler apex (Fig. 30). Ejacapodeme similar to that of relatives, with digitiform projection (not illustrated).

Female. Similar to male unless mentioned otherwise. Total body length 2.38-3.41 mm. Thoracic macrosetae longer and thicker. Ctenidial spine on f_1 longer and thicker than in male, almost as long as maximum width of t_1. Wing measurements: length 2.74-3.61 mm, width 0.87-1.25 mm; $Cs_3 : Cs_4 = 1.42\text{-}1.63$, rm\dm-cu : dm-cu = 2.15-2.65. Preabdomen with terga more transverse and dorsomedially with larger pale-pigmented araes; sterna narrower. T1 and T2 dorsally largely depigmented (pale yellow), only laterally brownish; also T3-T5 with medial third or more very pale-pigmented and also their lateral parts always distinctly paler brown than postabdominal terga. Preabdominal terga also differing from both *A. macra* and *A. pleuralis* by much denser setosity.

Postabdomen (Fig. 34-35) relatively long, tapered posteriorly, retractible. T6 brown but narrower and more setose than in that of *A. macra*, anteriorly hardly emarginate. S6 pale-pigmented, markedly wider (wider than long!) and with more setae than that of related species. Tergosternal complex with T7 dorsally dark, laterally extended onto ventral side and its anterior paler corners reaching far ventromedially but not fused with S7; the latter forming distinct sub-



Figs 33-38: *Anthomyza decolorata* sp.n., female paratype. **33** - spermatheca; **34** - postabdomen, dorsally; **35** - ditto, ventrally; **36** - 8th segment of postabdomen and female genital chamber, laterally; **37** - spermatheca; **38** - apex of postabdomen and female genital chamber, ventrally. Scales: Figs 33, 37 = 0.05 mm, others = 0.2 mm.

oval pale-pigmented sclerite covered with a number of setulae in addition to 4 longer setae at posterior margin. T8 small, rounded trapezoidal, pale, with lighter lateral margins. S8 short, longitudinally divided and posteromedially invaginated (Fig. 38) as in relatives. Genital chamber (Figs 36, 38) dissimilar to that of relatives in having 1 pair of internal posterior bent sclerites (Fig. 38) reduced and pale-pigmented, elongate annular sclerite below them large and, particularly, terminal part of genital chamber with enlarged, thickened and strongly sclerotized sclerite of complex construction (Figs 36). Ventral receptacle (Fig. 38) tubular, elongate, finely ringed in front of narrowed, vermicularly twisted terminal end. Accessory gland small, finely granulose, on rather short, ringed, subterminally dilated, duct. Spermathecae (1+1) elongate, more slender than in relatives (Figs 33, 37) and having basal part short, paler and spinulose but not distinctly narrower than terminal part being long, dark, densely transversely striated and with several more or less distinct constrictions; spermathecal ducts very long. T10 small, anteriorly darker, posteriorly pale, elongately rounded pentagonal, subtriangular, with 1 pair of long medial setae. S10 similar in shape but larger than T10, finely setulose and micropubescent. Cercus moderate, slender, with longer dorsopreapical, apical and some lateral setae and several shorter setulae.

Discussion: *Anthomyza decolorata* sp. n. is a close relative of *A. macra* Czerny, 1928 and *A. pleuralis* Czerny, 1928 representing so a further member of the *A. macra* group. Although it closely resembles both above species in the construction of the male and female terminalia it can be easily distinguished from them by means of the largely yellow colouring of head and thorax with some brown pattern and by the distinctive partial pale-pigmentation or depigmentation of the preabdominal terga (more distinct in female). In addition, some peculiarities in the male genitalia (gonostylus with ventral internally bent corner, robust distal end of the phallapodeme, saccus with dark spines) and female postabdomen (larger and densely setose T6, S6, S7, peculiar sclerotization of the terminal part of the genital chamber, form of the spermatheca) also confirm the validity of this species.

Biology: The majority of type specimens were collected in dense herbaceous vegetation in forested areas (some in a birch forest), in VII-VIII.

Distribution: Hitherto, the species is known only from the easternmost part of the Far East of Russia (Kamchatka, Kunashir I.).

Anthomyza macra Czerny, 1928

(Fig. 157)

Anthomyza macra Czerny, 1928: 4; Roháček, 2006a: 89-94 (redescription).

NEW MATERIAL EXAMINED: 5♂12♀. **Austria:** Steiermark: Frauenberg nr Admont, 1 km S, Enns valley, sweeping undergrowth of deciduous forest, 15.vi.2006 3♂1♀; Gesäuseeingang nr Admont, Enns valley, sweeping undergrowth of floodplain forest, 13.vi.2006 3♀, all J. Roháček leg. (SMOC); Steiermark: Seitenstetten, no date, 1♀, G. Strobl leg. and det. as *Leptomyza sordidella* (NMBA). **Czech Republic:** N Bohemia: Sosnová 1.5 km SW, Peklo res., 50°39´N, 14°31´E, sweeping *Impatiens parviflora* in forest, 27.vi.2008 1♀; N Moravia: Bystřice nad Olší 1 km SW, Olše river, sweeping riverside vegetation, 1.vi.2006 1♀; Starý Bohumín, Odra river, 46°56´N, 18°20´E, sweeping undergrowth of deciduous forest, 24.v.2006 2♀, all J. Roháček leg. (SMOC). **Great Britain:** England: Nottinghamshire, Pittance Park, Edwinstowe (Center Parcs), SK6364, 2.vii.2005 1♀, D. J. Gibbs leg. (DGB). **Russia:** CET: Moscow region, Naro-Fominsk, 5.vi.2008 1♂1♀, D. Gavryushin leg. and photographed (DGN); SET: Zap. Kavkaz [= W. Caucasus], Krasnaya Polyana, 16.vi.1970 1♀, V. Kovalev leg. (ZMUM); FE: Yuzh. Primorie, Lazovskij zap., 25 km Yu-V Lazo [= South Primorie, Lazovskij reserve, SE Lazo], 24.vii.1986 1♂, A. Ozerov leg. (ZMUM).

Distribution: *A. macra* is a widespread transpalaearctic species restricted to the zone of deciduous forest; it is known from: Austria, Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Finland, Germany, Great Britain (England), Italy, Japan, Poland, Romania, Russia (CET, NET, SET: new, FE: confirmed occurrence), Slovakia (Straka 2005, Roháček 2006b), Sweden, Switzerland and Ukraine.

Anthomyza pleuralis Czerny, 1928

(Fig. 161)

Anthomyza pleuralis Czerny, 1928: 4; Roháček, 2006a: 95-99 (redescription).

NEW MATERIAL EXAMINED: 13♂28♀. **Austria:** Steiermark: Frauenberg nr Admont, 1 km S, Enns valley, sweeping undergrowth of deciduous forest, 15.vi.2006 3♂5♀; Hall-Grieshof nr. Admont, Enns valley, sweeping over boggy meadow, 15.vi.2006 1♀; Gesäuseeingang nr Admont, Enns valley, sweeping undergrowth of floodplain forest, 13.vi.2006, 3♂3♀, all J. Roháček leg. (SMOC); Bad Gastein, Bellevue Alm, 1300 m, 16.vii.2004 2♀, A. Freidberg leg. (TAUI). **Czech Republic:** N Bohemia: Pavlovice 2 km W, Dolské údolí valley, 50°36´N, 14°30´E, sweeping *Carex paniculata* in spring, 25.vi.2008 1♀; same, sweeping *Stellaria nemorum* in alder forest, 2♀; Srní Potok nr Mimoň, Ploučnice river, 50°41´N, 14°44´E, sweeping in sand pit, 17.v.2006 1♀, all J. Roháček leg. (SMOC); N Moravia: Bystřice nad Olší 1 km SW, Olše river, sweeping riverside vegetation, 1.vi.2006, 1♂2♀; Moravskoslezské Beskydy Mts., Košařiska-Tominová, sweeping vegetation along brook, 1.vi.2006, 2♂2♀, J. Roháček leg. (SMOC). **Germany:** Niedersachesen: Ldk Osnabrück, Reremberg 1 km W Oesede, 13.vi.2004 1♀, Stuke leg. (JSL); Nordrhein-Westfalen: NW-Krefeld, Landschaftsschutzgebiet Orbroicher Bruch (no. 1914-16), Malaise trap, 18.vi.1989 1♂, Birnbrich, H. Schwan, M. Sorg & W. Stenmans leg. (ZSMC). **Italy:** Alto Adige, Tartscher Tal, south of Trafoi, 46°32´33.9N, 10°30´17.2E, 1630 m, Malaise trap, 13.-25.vii.2005 1♂1♀, 15.-24.viii.2005 1♀; Suldental, east of Gomagoi, 46°34´33.8N, 10°32´51.2E, 1220 m, Malaise trap, 11.-27.vi.2005 2♂2♀, 4.-13.vii.2005 1♀, 13.-25.vii.2005 1♀, all C. Lange & J. Ziegler leg. (ZMHB). **Russia:** CET: Moscow region: Naro-Fominsk, 27.v.2007 1♀, D. Gavryushin leg. and photographed (DGN). FE: Amurskaya obl., g. Zeya [= Amur region, Zeya town], 24.vii.1982 1♀, A. Shatalkin leg. (ZMUM).

Distribution: *A. pleuralis* is widespread in the northern and middle belts of the Palaearctic Region (ranging from Great Britain to the Far East of Russia): Austria (new), Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Estonia, Finland, Germany (Bährmann 2006), Great Britain (England, Wales, Scotland), Italy (Roháček 2008c), Norway, Poland, Romania, Russia (NET, CET, SET, WS, ES, FE: new), Slovakia (Roháček 2006b), Sweden, Switzerland, Ukraine.

Anthomyza umbrosa Roháček, 2006

Anthomyza umbrosa Roháček, 2006a: 99-104.

Discussion: A molecular analysis of 12S and 16S gene markers (Roháček et al. 2009) revealed that *A. umbrosa* is most closely allied to another Madeiran endemic species, *A. baezi*. This finding is in disagreement with a statement by Roháček (2006a) who considered *A. baezi* not to be closely related to *A. umbrosa*. This inconsistency initiated a subsequent re-examination of the morphological data (characters of the terminalia in particular) and a new analysis confirmed the sister-species relationship between these species (see in the chapter Phylogeny below). *A. umbrosa, A. baezi* and *A. clara* share (in contrast to other congeners) the dorsally projecting inner hypandrial lobes, a similar narrow caudal process of the transandrium (though less developed in *A. umbrosa* and in *A. clara*) and the simple posterior sclerites in the female genital chamber; moreover, *A. umbrosa* and *A. baezi* have spermathecae with a protruding tip.

The very large and separate female S7 of *A. umbrosa* (shared with *A. clara*) overlapping ventral margins of T7 obviously evolved secondarily instead of the more usual fusion of S7 with T7 into a tergosternal ring; this condition may be a synapomorphy of the *A. umbrosa* group which was subsequently reversed in *A. baezi*. For the above reasons *A. clara* is to be considered a member of the *A. umbrosa* group forming a sister-group to the *A. umbrosa* + *A. baezi* pair (see in the chapter Phylogeny). *A. clara* differs from the latter two species particularly in the structure of the female genitalia (viz. prolonged annular sclerite, narrowed ventral receptacle, simple spermathecae). Interestingly, the *A. umbrosa* group proved to be most closely allied to the *A. gracilis* group (see also Roháček et al. 2009). This relationship is supported by the supernumerary setulae on the female T10 (lost only in *A. clara*).

Distribution: *A. umbrosa* is endemic to Madeira (Roháček 2006a, 2008b).

Anthomyza baezi Roháček, 1999

(Fig. 169)

Anthomyza baezi Roháček, 1999c: 200; Roháček 2006a: 150-154 (redescription).

Discussion: As mentioned above the recent molecular (Roháček et al. 2009) and subsequent morphological analyses (see also chapter Phylogeny) revealed that *A. baezi* does not belong to the *A. collini* group (as suggested by Roháček 2006a: 144) because its closest relative proved to be *A. umbrosa*. Consequently, it is transferred to the *A. umbrosa* group here.

Distribution: A species endemic to Madeira (Roháček 2006a, 2008b).

Anthomyza clara Roháček, 2006

Anthomyza clara Roháček, 2006a: 104-109.

NEW MATERIAL EXAMINED: 1♂. **Russia:** CET: Moskovskaya obl., g. Naro-Fominsk, 55.392557°N 36.783718°E, 12.vii.2008 1♂, D. Gavryushin leg. (ZMUM).

Distribution: The species is known only from Switzerland, Lithuania, Estonia and Central European Territory of Russia (new, the easternmost record).

Anthomyza pallida (Zetterstedt, 1838)

Anthophilina pallida Zetterstedt, 1838: 785.
Anthomyza pallida: Roháček, 2006a: 110-116 (redescription).
Sapromyza unguicella Zetterstedt, 1838: 753.

NEW MATERIAL EXAMINED: 76♂65♀. **Austria:** Steiermark: Admont, without further data, 1♂, G. Strobl leg. and det. as *Leptomyza pallida* (NMBA). **Czech Republic:** W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 21.vii.2006 1♂; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond) (distr. Jihlava), sweeping *Calamagrostis canescens* in boggy meadow, 21.vii.2006 1♀, same, sweeping *Carex acuta* in boggy meadow, 23.vi.2006 1♀; Míchova skála nr. Řásná (distr. Jihlava), clearing in forest, 11.viii.2006 1♂; Řásná nr. Telč 1.5 km NW, Velký pařezitý rybník (pond), clearing in forest, sweeping *Calamagrostis villosa*, 7.viii.2008 15♂7♀; Řídelov nr. Telč, Lukšovská res., forest margin, sweeping *Calamagrostis villosa*, 7.viii.2007 6♂5♀; N Moravia: Hrubý Jeseník Mts., Velká kotlina glacial cirque, sweeping *Calamagrostis villosa* in subalpine meadow, 26.vi.2006 22♂32♀, 25.vii.2006 20♂9♀; Polanka nad Odrou, Přemyšov res., 48°47´N 18°11´E, sweeping *Carex vesicaria* in boggy meadow, 16.vii.2008 1♂, all J. Roháček leg. (SMOC). **Germany:** Bayern: river Isar (no. L2368), gravel and sand bank in the river, swept from *Salix*-shrubs, *Juncus bufonius*, *J. inflexus*, *Carex*, 15.vi.2002 2♂, M. v. Tschirnhaus leg. (ZSMC). **Italy:** Alto Adige, Tartscher Tal, south of Trafoi, 46°32´33.9N 10°30´17.2E, 1630 m, Malaise trap, 13.-25.vii.2005 1♀; Suldental, east of Gomagoi, 46°34´33.8N 10°32´51.2E, 1220 m, Malaise trap, 11.-27.vi.2005 1♂, C. Lange & J. Ziegler leg. (ZMHB). **Russia:** CET: Moskovskaya obl.„ okr. Kupavny, Moltevo, 10.vi.1979 1♂, V. Kovalev leg.; WS: S Ural, Chelyabinsk Reg., near Zlatoust, Taganay Mts., 18.-24.vii.2008 1♀, K. Tomkovich leg.; Central Altai, Usť-Koksa distr., Katunsky range, N slope, Oroktoi-Akkem, 1009 m, 50°06.240'N 86°28.815'E, 4.-8.vii.2007 1♀, O. Kosterin leg.; FE: Amurskaya obl., g. Zeya [= Amur region, town Zeya], 1.vii.1981 1♂2♀, 2.vii.1981 1♂, 19.vii.1981 1♂1♀, 30.vii.1982 1♀, A. Shatalkin leg.; same, 24.vii.1981 1♂, O. Gorbunov leg., 29.vii.1982 1♂, A. Ozerov leg. (all ZMUM). **Sweden:** Asarna, northern Baltic Sea, 60 km SSW' Östersund, 152 km WNW' Sundsvall at road no. 81, 62°39'N 14°20' E (no. X599), unmowed cattle pasture next to lake, swept, 16.vi.1988 1♀, M. v. Tschirnhaus leg. (ZSMC); Major road 343, Slagnäs, 65°40N 18°00'E (no. 600), open landsacape with birches, pines and mosses, swampy ditch next to road, small Cyperaceae-pasture, swept, 16.vi.1988 1♀, M. v. Tschirnhaus leg. (ZSMC). **Switzerland:** Valais, Visperterminen, GIW-Gebidempass, 46°16N 7°55´E, 1900-2200 m, 21.vii.2004 1♀, A. Freidberg leg. (TAUI).

Distribution: This transpalaearctic species occurs in the northern and middle belts of the Palaearctic Region (from Great Britain to the Far East) but in more southern areas it seems to be limited to mountains (Italy, Kirghizia); hitherto, it has been recorded from Austria, Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Denmark, Estonia, Finland, Germany (Bährmann 2006), Great Britain (England, Scotland: Skidmore 2008c), Italy (Roháček 2008c), Kirghizia, Latvia (Karpa 2008), Mongolia, Netherlands, Norway, Poland, Russia (CET, NET, WS, ES, FE), Slovakia (Roháček 2006b), Sweden, Switzerland, Ukraine.

Anthomyza dissors Collin, 1944

(Fig. 184)

Anthomyza dissors Collin, 1944: 271; Roháček, 2006a: 117-122 (redescription).
Anthomyza dissors var. *dorsata* Collin, 1944: 271; Roháček, 2006a: 117 (synonymy).

NEW MATERIAL EXAMINED: 79♂63♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, sweeping *Carex acuta* in boggy meadow, 14.vi.2006 25♂43♀, J. Roháček leg. (SMOC). **Czech Republic:** W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 1♀, 21.vii.2006 10♂3♀; Třešť 1.5 km N, Za mlejnem (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 21.vii.2006 9♂3♀, same, sweeping *Carex elata* in boggy meadow, 21.vii.2006 1♂; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 16♂3♀, 21.vii.2006 4♂1♀; W Moravia: Volevčice nr. Telč 1 km E, sweeping *Carex rostrata* in boggy meadow, 24.vi.2006 6♂, all J. Roháček leg. (SMOC). N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Carex acuta* in boggy meadow, 10.vii.2008 2♂, 16.vii.2008 1♀, J. Roháček leg. (SMOC). **Russia:** CET: Moscow region, Naro-Fominsk, 28.vi.2006 1♀, 2.vii.2006 1♂; Bekasovo-1 station (Naro-Fominsk distr.), 1.viii.2006 1♀, 8.viii.2006 1♀, all D. Gavryushin leg. and photographed (DGN); FE: Kamchatka, Nalychevo Prirodnyj Park, 22.5 km NNE' of peak of volcano "Koryakskaja Sopka", 53,11.70 N, 158,27.91 E [X1395], area around tourist station, dense herbaceous vegetation, partly wet from rain, swept, aspirated, 27.vii.1999 1♂ M. v. Tschirnhaus leg. (ZSMC). **Slovakia:** C Slovakia: Poľana BR, Hronček-Kramniská, 48°45´N, 19°34´E, 560 m, sweeping *Carex acuta* in boggy meadow, 5.vii.2006 4♂5♀, J. Roháček leg. (SMOC).

Distribution: *A. dissors* obviously is widespread in the northern belt of the Palaearctic Region because it has been recorded not only from Europe but also from the Far East of Russia (Kamchatka): Austria (new), Byelorussia, Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Estonia, Finland, Great Britain (England: Scotland: Skidmore 2008a,c), Latvia (Karpa 2008), Norway, Poland, Russia (CET: Panteleeva 1997, 2005, Panteleeva & Razvorotnev 1996, NET, FE: confirmed also here), Slovakia (Roháček 2006b), Sweden, Switzerland (Merz et al. 2006). Note: The records of Panteleeva (1997, 2005) and Panteleeva & Razvorotnev (1996) from the Voronezh region of Russia could not be revised but the occurrence of *A. dissors* in CET was confirmed by new records from the Moscow region (see above).

Anthomyza neglecta Collin, 1944

(Fig. 188)

Anthomyza neglecta Collin, 1944: 269; Roháček, 2006a: 124-129 (redescription).

OTHER MATERIAL EXAMINED: 361♂281♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, sweeping *Carex acuta* in boggy meadow, 14.vi.2006 1♂, same, sweeping over boggy meadow, 14.vi.2006 1♂; Admont-Krumau, Enns valley, sweeping over boggy meadow, 13.vi.2006 1♂4♀; Frauenberg nr Admont, 1 km S, Enns valley, sweeping over boggy meadow, 15.vi.2006 1♂, all J. Roháček leg. (SMOC). **Czech Republic:** N Bohemia: Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping *Juncus effusus* in boggy meadow, 23.vi.2008 7♂6♀, same, sweeping *Carex acuta* in boggy meadow, 23.vi.2008 26♂31♀, same, sweeping *Carex rostrata* in boggy meadow, 23.vi.2008 37♂18♀, same, sweeping over boggy meadow, 26.vi.2008 8♂2♀, same, sweeping undergrowth of alder forest, 23.vi.2008 1♂2♀; Hradčany 1.2 km SE, Držník pond, 50°36´N, 14°43´E, sweeping *Carex paniculata* at brook, 26.vi.2008 8♂11♀, same, sweeping *Schoenoplectus lacustris* on pond shore, 26.vi.2008 2♀, same, sweeping in *Juncus effusus* at canal, 26.vi.2008 2♀; Staré Splavy 1.5 km NE, Máchovo jezero, 50°36´N, 14°39´E, sweeping over peat-bog meadow, 23.vi.2008, 1♀; Pavlovice 2 km W, Dolské údolí valley, 50°36´N, 14°30´E, sweeping *Carex paniculata* in spring, 25.vi.2008, 15♂6♀, same, sweeping *Juncus effusus* near brook, 4♂4♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 24♂26♀; Doksy-Břehyňský rybník res., 50°35´N, 14°43´E, sweeping *Carex acuta* in boggy meadow, 24.vi.2008 9♂6♀; Obora nr. Doksy 0.5 km E, 50°33´N, 14°41´E, sweeping *Carex paniculata*, creek in forest, 24.vi.2008 5♂8♀, same, sweeping *Juncus effusus*, creek in forest, 24.vi.2008 1♂; Sosnová 1.5 km SW, Peklo res., 50°39´N, 14°31´E, sweeping *Carex acutiformis* in alder forest, 27.vi.2008 48♂25♀ (1 pair in copula), all J. Roháček leg. (SMOC); W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 6♂2♀, 21.vii.2006 3♂4♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 23.vi.2006 14♂11♀, 21.vii.2006 9♂6♀; Třešť 1.5 km N, Za mlejnem (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 21.vii.2006 2♂2♀, same, sweeping *Carex elata* in boggy meadow, 21.vii.2006 3♂, same, sweeping over boggy meadow, 21.vii.2006 1♂; Třešť 1.5 km SE, Vimvejr pond (distr. Jihlava), sweeping over *Carex riparia*, 23.vi.2006 3♂; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 1♀, 21.vii.2006 1♀; Volevčice nr. Telč 1 km E, sweeping *Carex paniculata* tussocks in boggy meadow, 24.vi.2006 4♀, all J. Roháček leg. (SMOC); N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Carex acuta* in boggy meadow, 10.vii.2008 5♂2♀, 16.vii.2008 2♂8♀; sweeping *Carex vesicaria* in boggy meadow, 16.vii.2008 11♂13♀; same, sweeping *Scirpus sylvaticus* in boggy meadow, 10.vii.2008 21♂4♀, 16.vii.2008, 7♂11♀; N Moravia: Chvalíkovice 1 km W (distr. Opava), sweeping *Scirpus sylvaticus* under willows, 24.viii.2008 1♂, all J. Roháček leg. (SMOC). **France:** Ain: Marais de Lavours, Ceyzérieu, Malaise trap, 1-8.viii.2008 1♂, P. Withers leg. (MHNL). **Germany:** Berlin, Wunsee, vi.1897 1♂3♀, ? leg., G. Strobl det. as *Leptomyza pallida* (NMBA); Kahlenberg, 5 km E Eberswalde, 4.ix.1999 1♀, A. Freidberg leg. (TAUI); Nordrhein-Westfalen: Bielefeld-Hoberge, Twellbachtal, 4.iii. and 3.iv.1991, reared ex 25 liters of *Carex gracilis* [= *C. acuta*] litter in eclector, 2♂2♀ emerged 25.iii.-14.vi.1991, F. Püchel leg. (ZSMC). **Romania:** Sfânta Elena 1 km E (Alibeg brook valley) 44°40´37´´N, 21°43´32´´E, 230 m, sweeping vegetation along brook, 31.v.2008 1♂; Gornea nr. Sichevița 1 km S, Gornea river 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Carex acuta* in boggy meadow, 4.vi.2008, 22♂19♀, all J. Roháček leg. (SMOC). **Russia:** CET: Moscow region: Bekasovo-1 station (Naro-Fominsk distr.), 23.viii.2007 1♀, D. Gavryushin leg. and photographed (DGN). **Slovakia:** C Slovakia: Poľana BR, Čierny Potok, sweeping over *Scirpus sylvaticus*, 4.vii.2006, 20♂14♀, same, sweeping over *Carex vesicaria*, 7.vii.2006 18♂12♀; Poľana BR, Hrochoťská dolina (valley), Hrochoť 3 km E, 48°39´N, 19°21´E, 570 m, sweeping over *Carex* in boggy meadow, 21.viii.2007 2♂1♀; Poľana BR, Hronček-Kramniská, 48°45´N, 19°34´E, 560 m, sweeping *Carex acuta* in boggy meadow, 5.vii.2006 9♂5♀, all J. Roháček leg. (SMOC).

Distribution: The species is known only from North, Central and the northern part of South Europe: Austria (new), Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), France (new), Germany (Bährmann 2006), Great Britain (England: Rotheray 1991), Hungary, Italy, Lithuania (Dumčius & Pakalniškis 2006; Pakalniškis et al. 2006), Netherlands, Poland, Romania (new), Russia (CET: new), Slovakia (Straka 2002, Roháček 2006b), Sweden, Switzerland.

Anthomyza paraneglecta Elberg, 1968

Anthomyza paraneglecta Elberg, 1968: 629; Roháček, 2006a: 130-135 (redescription).

NEW MATERIAL EXAMINED: 44♂34♀. **Czech Republic:** N Bohemia: Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping *Carex acuta* in boggy meadow, 23.vi.2008 1♂, same, sweeping *Carex rostrata* in boggy meadow, 23.vi.2008 1♂1♀, J. Roháček leg. (SMOC); W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 2♂1♀, 21.vii.2006 1♂1♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 23.vi.2006 2♂2♀, 21.vii.2006 1♂2♀; Třešť 1.5 km SE, Vimvejr pond (distr. Jihlava), sweeping over *Carex riparia*, 23.vi.2006 5♂6♀; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond) (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 14.viii.2006 1♂; Volevčice nr. Telč 1 km E, sweeping *Carex paniculata* tussocks in boggy meadow, 24.vi.2006 1♂4♀, same, sweeping *Carex rostrata* in boggy meadow, 24.vi.2006 4♂2♀, 22.vii.2006 1♂, J. Roháček leg. (SMOC); N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Carex acuta* in boggy meadow, 10.vii.2008 2♂, 16.vii.2008 1♀; same, sweeping *Scirpus sylvaticus* in boggy meadow, 1♂, J. Roháček leg. (SMOC). **Slovakia:** C Slovakia: Poľana BR, Čierny Potok, sweeping over *Scirpus sylvaticus*, 4.vii.2006, 19♂7♀, same, sweeping over *Carex vesicaria*, 7.vii.2006 1♂6♀; Poľana BR, Hronček-Kramniská, 48°45´N, 19°34´E, 560 m, sweeping *Carex acuta* in boggy meadow, 5.vii.2006 1♂1♀, J. Roháček leg. (SMOC).

Distribution: *Anthomyza paraneglecta* is known only from North and Central Europe: Czech Republic (Bohemia: Roháček 2006b, Moravia - Roháček 2006b), Denmark, Estonia, Finland, Germany (von Tschirnhaus 2007, 2008), Great Britain (England, Scotland: Skidmore 2008c), Latvia (Karpa 2008), Poland, Slovakia (Roháček 2006b), Sweden.

Anthomyza orineglecta Roháček, 2006

(Figs 38-44)

Anthomyza orineglecta Roháček, 2006a: 135-138.

NEW MATERIAL EXAMINED: 2♂1♀. **Russia:** FE: Vladivostok, Okeanskaya, 24.vii.1963 1♀, Kerzhner leg. (ZISP).; Yuzh. Primorie, Kedrovaya paď [= Southern Primorie, Pine Valley, a nature reserve in Khasansky District of Primorsky Krai], 25.viii.1980 1♂, A. Shatalkin leg.; Sakhalinskaya obl., o-v Iturup, bukhta Slavnaya [= Sakhalin region, Iturup I., Slavnaya bay], 45.504071°N 148.6383845°E, 11.viii.1998 1♂, A. Lelej & S. Storozhenko leg. (ZMUM).

Description: Female (new). Similar to male unless mentioned otherwise. Total body length 2.78 mm. Bordering stripe of parafacialia lighter. pvt longer and strongly crossed. 1st flagellomere of antenna with larger brownish spot covering anterodorsally more than quarter of its outer side. f_1 with ctenidial spine hardly longer than maximum width of t_1 and f_3 simply setulose posteroventrally. Wing measurements: length 2.94 mm, width 0.91 mm, $Cs_3 : Cs_4 = 1.63$, rm\dm-cu : dm-cu = 2.33. Abdomen with terga pale brown, subshining. T2-T5 shorter and more transverse than in male. T1 dorsally distinctly separate from T2. T3-T5 subequal in length but T5 slightly narrower than T4 or T3. Preabdominal sterna slightly narrower than in male, all whitish yellow. S1 short, with darker yellow posterior stripe. S2 about as long as wide, S3-S4 slightly longer than wide, S5 as long as wide but larger than S2.

Postabdomen (Figs 40, 43) relatively long, tapered posteriorly, telescopic, differing from related species in having T7+S7 much darker, largely brown. T6 simple, rounded trapezoidal, less transverse (longer) and with less dense setae than those of *A. neglecta* or *A. paraneglecta*, S6 most similar to that of *A. neglecta* but less densely setose. Tergosternum T7+S7 completely brown but short dorsally, with all setae in posterior half; its ventral part twice as long as dorsally, brownish laterally and pale-pigmented medially, with dark ledge-like anteromedial marginal swellings and with large anterolateral lobes projecting into 6th segment. 8th segment densely micropubescent laterally. T8 elongate, as in relatives, with fine exclinate setae; S8 convex, slightly shorter than T8, medially divided into 2 sclerites being posteriorly shortly invaginated into 8th segment. Genital chamber with internal sclerotization (Figs 41-42) formed by 1 pair of relatively short, flat sclerites (thus similar to those of *A. paraneglecta*) and 1 ovoid, somewhat bent, annular sclerite (Fig. 42) situated ventral to the latter. Central part of genital chamber also somewhat sclerotized and, in contrast to all relatives, provided with a number of dark short, thorn-like spines (Figs 41-42). Ventral receptacle (Fig. 42) membranous, tube-like, hyaline; its terminal two-thirds very slender with vermicular apex, proximal third much broader; accessory gland small, vesiculate, hyaline, with sparse minute granulae on surface, and borne on distally dilated and sparsely ringed duct. Spermathecae (1+1) suboval (Fig. 44), each with small terminal invagination (narrower than in relatives) and with small dark spinulae around duct insertion; duct very long and inserted centrally, opposite to terminal invagination. T10 very small (Fig. 40), about as long as wide, darkened on lateral margins, with 1 medial pair of long setae and very fine micropubescence in the middle. S10 markedly larger and wider than T10, rounded pentagonal (longer than in both relatives), finely setulose and micropubescent. Cercus moderate, slender, with numerous fine setae, apical and dorsopreapical longest.

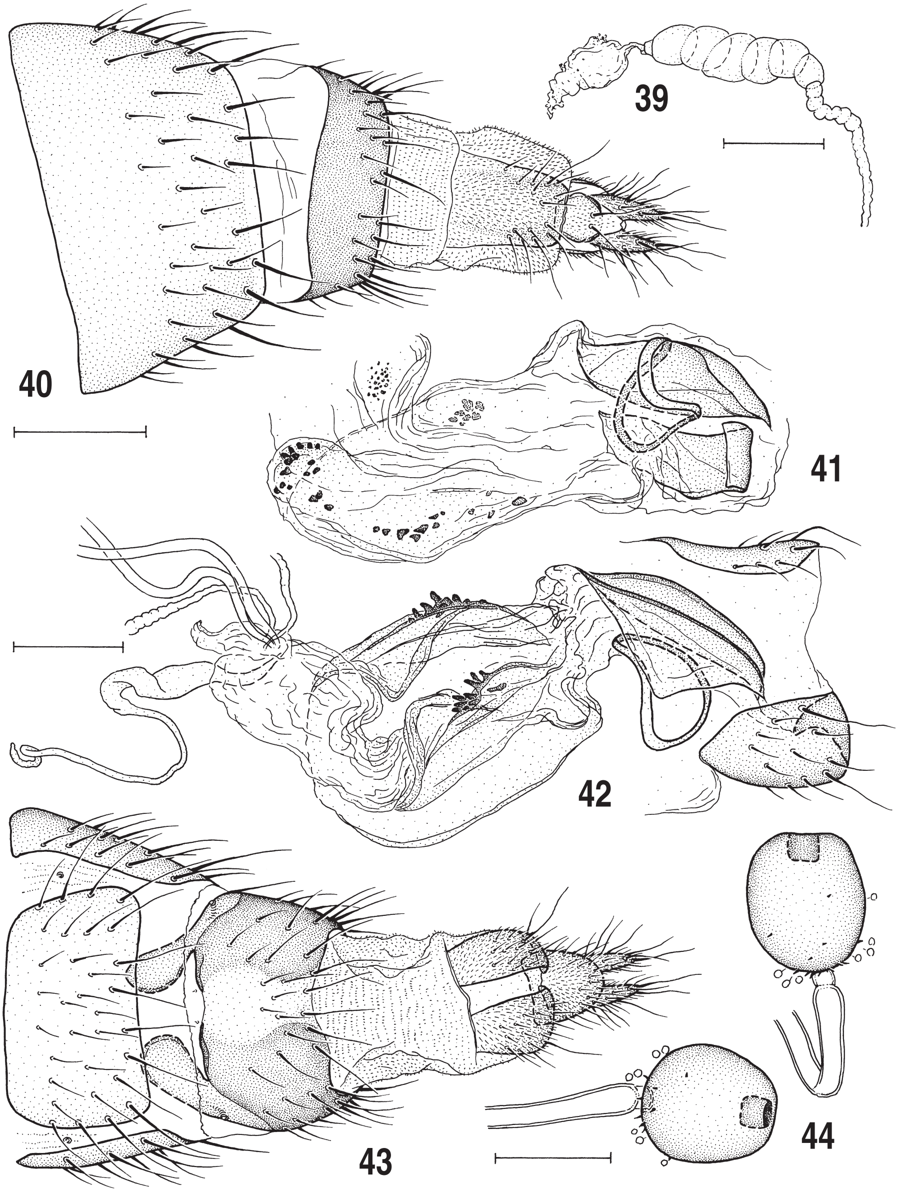
Variability of male: Body length 2.10-2.54 mm. Wing measurements: length 2.26-2.86 mm, width 0.65-0.91 mm, $Cs_3 : Cs_4 = 1.24-1.45$, rm\dm-cu : dm-cu = 2.25-3.00.

Discussion: The structures of the female postabdomen of *A. orineglecta* confirmed the close relationship of this species to *A. neglecta* and *A. paraneglecta*. The latter species obviously is its nearest ally – this is demonstrated not only by the shared characters in the male genitalia (see Roháček 2006) but also by the very similar formation of the internal sclerites in the female genital chamber (including the bent annular sclerite) and of the ventral receptacle (with broader proximal part).

Apart from external features (lateral parts of occiput and vittae on scutum brown; 1st flagellomere of antenna with small brown spot; preabdominal terga brown) and characters in the male genitalia (cf. Roháček 2006: 138), *A. orineglecta* differs from both its relatives also in having a largely brown female T7+S7 with large anteroventral lobes, a secondarily sclerotized central part of the female genital chamber with dark thorn-like spines and spermathecae with a small and narrow terminal invagination.

Biology: No additional data are available from the new material examined except for the widening of the flight period of adults (VII-VIII).

Distribution: The species was described from Iturup I. of the Kuril archipelago (Roháček 2006a). The two new records from the continental Far East (see material examined) indicate a wider distribution of *A. orineglecta* in the East Palaearctic area.



Figs 39-44: *Anthomyza orineglecta* Roháček, female (Russia: FE). **39** - accessory gland; **40** - postabdomen, dorsally; **41** - sclerotization of female genital chamber, ventrally; **42** - 8th segment of postabdomen and female genital chamber, laterally; **43** - postabdomen, ventrally; **44** - spermathecae. Scales: Figs 39, 44 = 0.05 mm, Figs 41-42 = 0.1 mm, others = 0.2 mm.

Anthomyza collini Andersson, 1976

(Figs 45-53)

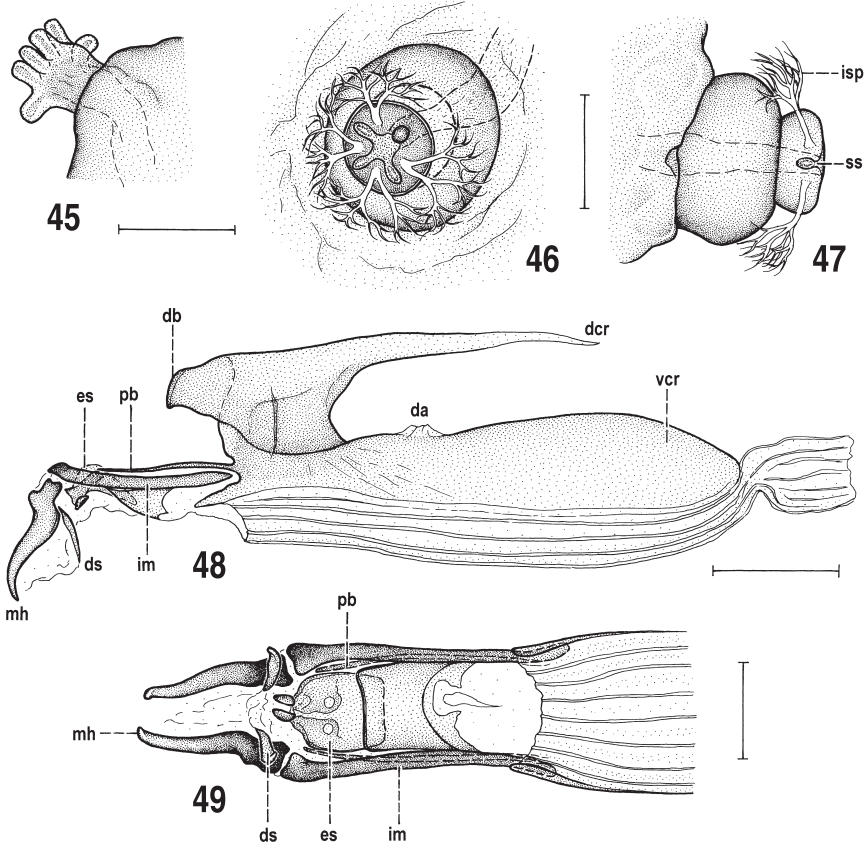
Anthomyza collini Andersson, 1976: 49; Roháček, 2006a: 138-142.
Anthomyza gracilis auctt.

NEW MATERIAL EXAMINED: 757♂800♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, sweeping undergrowth of alder forest, 12.vi.2006 1♂, same locality, sweeping *Carex acuta* in boggy meadow, 14.vi.2006 1♂, same, sweeping over *Carex vulpina* in boggy meadow, 14.vi.2006 3♂1♀; Hall-Grieshof nr Admont, Enns valley, sweeping over boggy meadow, 12.vi.2006 3♂1♀; same locality, sweeping over *Phragmites australis*, 15.vi.2006 14♂16♀; Admont-Krumau, Enns valley, sweeping over boggy meadow, 13.vi.2006 10♂6♀; Frauenberg nr Admont, 1 km S, Enns valley, sweeping over boggy meadow, 15.vi.2006 2♀, all J. Roháček leg. (SMOC); Admont, 12.viii. 1♂ (G. Strobl det. as *Leptomyza gracilis*), 20.vii.-25.viii.1896 1♂4♀ (G. Strobl det. as *Leptomyza sordidella*), all G. Strobl leg. (NMBA). **Czech Republic:** N Bohemia: Doksy-Břehyňský rybník res., sweeping over *Carex brizoides*, 16.v.2006 1♂; Velký Grunov 1.5 km S, Panenský potok (brook), 50°41´N, 14°43´E, sweeping over *Glyceria maxima*, 17.v.2006, 1♂; same, sweeping over *Phalaris arundinacea* 1♂; Srní Potok nr Mimoň, Ploučnice river, 50°41´N, 14°44´E, sweeping over *Alopecurus pratensis*, 17.v.2006 1♂, same, sweeping over boggy meadow, 17.v.2006 1♂; Hradčany 1.5 km W, sweeping over *Carex acuta*, 19.v.2006 1♂3♀; Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping *Juncus effusus* in boggy meadow, 23.vi.2008 1♂6♀, same, sweeping *Carex acuta* in boggy meadow, 23.vi.2008 3♀, same, sweeping *Phalaris arundinacea* in boggy meadow, 26.vi.2008 11♂9♀, same, sweeping *Calamagrostis villosa* in boggy meadow, 26.vi.2008 1♂1♀, same, sweeping undergrowth of alder forest, 23.vi.2008 1♂2♀; Hradčany 1.2 km SE, Držník pond, 50°36´N, 14°43´E, sweeping *Carex paniculata* at brook, 26.vi.2008 15♂12♀; same, sweeping *Schoenoplectus lacustris* on pond shore, 26.vi.2008 2♂8♀; Staré Splavy 1.5 km NE, Máchovo jezero, 50°36´N, 14°39´E, sweeping *Phragmites australis* in peat-bog meadow, 23.vi.2008, 7♂14♀, 27.vi.2008 9♂13♀; Doksy-Břehyňský rybník res., 50°35´N, 14°43´E, sweeping *Carex acuta* in boggy meadow, 24.vi.2008 30♂28♀, same, sweeping *Calamagrostis villosa* in boggy meadow, 24.vi.2008 3♂12♀; Holany 1.3 km NE, Jílovka pond, 50°38´N, 14°30´E, sweeping wheat (*Triticum aestivum*) damaged by *Opomyza florum* in field, 27.vi.2008 13♂16♀, same, sweeping *Glyceria maxima*, 27.vi.2008 16♂17♀, same, sweeping *Phalaris arundinacea*, 27.vi.2008 24♂22♀, all J. Roháček leg. (SMOC); N Moravia: Starý Bohumín, Odra river, 46°56´N, 18°20´E, sweeping over *Alopecurus pratensis*, 24.v.2006 1♀, same, sweeping riverside vegetation, 24.v.2006 1♀; Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Scirpus sylvaticus* in boggy meadow, 10.vii.2008 2♀; same, sweeping *Carex acuta* in boggy meadow, 16.vii.2008 2♂; same locality, reared ex *Glyceria maxima* collected 10.vii.2008, 1♂ emerged 10.vii.-19.viii.2008; same locality but reared ex *Carex acuta*, 1♀ emerged 10.vii.-19.viii.2008, all J. Roháček leg. (SMOC); W Moravia: Třešť 1 km E, Lávecká cesta, sweeping *Carex acuta* in boggy meadow, 23.vi.2006 5♂8♀, 18.viii.2006 1♂1♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 18.viii.2006 1♂; Třešť 1.5 km N, Za mlejnem (distr. Jihlava), sweeping *Glyceria maxima* in boggy meadow, 21.vii.2006 1♀; Třešť 1.5 km SE, Vimvejr pond, sweeping *Carex vesicaria* in boggy meadow, 23.vi.2006 2♀; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 14♂5♀, 14.viii.2006 7♂3♀, same, sweeping *Calamagrostis canescens* in boggy meadow, 23.vi.2006 1♂7♀, 14.viii.2006 1♀, all J. Roháček leg. (SMOC). **France:** Ain: Marais de Lavours, Ceyzérieu, etang/bois humide, ex *Lipara* gall, 8.v.-vi.2002 1♀, P. Withers leg. (PWS); same locality, Malaise trap, 24.vi-1.vii.2008 5♂, P. Withers leg. (MHNL). **Germany:** Niedersachesen: Ostfriesland, Hohegaster Vorland, 6.vi.2003 1♀, Stuke leg. (JSL); Schleswig-Holstein: Mielkendorf, SW of Kiel (no. A468), 26.ix.1971, ex 169 galls of *Lipara pullitarsis* on *Phragmites australis* (kept outside during cold winter), enclosed in single glasses 9.v.1972, emerged after this date, 82♂78♀ (some with puparia); northern coast of isle of Fehmarn, ditch behind dike near Altentheil, 54°32'N 11°06'E (no. A567a,b), 14.iv.1979, ex 146 galls of *Lipara pullitarsis* on *Phragmites australis*, emerged 15♂17♀; Kiel-Wellsee, 54°17'N 10°11'E (no. A516), 24.iv.1975, reed bed, ex 1000 undamaged galls of *Lipara lucens* on *Phragmites australis*, emerged 5♂7♀; same (no. A548), 13.v.1977, ex 418 galls of *Lipara lucens*, 21♂24♀ emerged until 10.vii.1977; same (no. A561), 21.iv.1978, ex 363 galls of *Lipara lucens*, 6♂4♀ emerged, same (no. A517g), 15.iv.1976, ex 334 undamaged galls of *Lipara lucens*, 2♂ emerged; Kiel-Wellsee, 54°17'N 10°11'E (nos A558, A560), 21.iv. and 15.v.1978, reed bed, ex galls of *Lipara similis* on *Phragmites australis*, 10♂11♀ emerged 19.v.-4.vi.1978; Sieversdorf at lake Postsee, Kreis Plön, 54°14'N 10°14'E (no. A628), 15.ii.1980, ex 14 galls of *Lipara pullitarsis* and *L. lucens* on *Phragmites australis* enclosed, 30♂27♀ emerged, all M. v. Tschirnhaus leg. (ZSMC, FBUB); Heiligenhafen at Baltic Sea (A530), 7.v.1976, one stem of *Phragmites australis* with 3 puparia, 1♂ emerged, H. Meyer leg. (ZSMC); Nordrhein-Westfalen: Bielefeld-Brackwede (no. A673), 6.iv.1984, ex 83 galls of *Lipara pullitarsis* on *Phragmites australis*, 1♂ emerged; Bielefeld-Brackwede, Niemöllers Teich (no. A674), 9.iv.1984, ex 530 galls of *Lipara pullitarsis* on *Phragmites australis*, 57♂75♀ emerged; same locality (no. A830), 19.iv.2000, ex 320 galls of *Lipara pullitarsis* on *Phragmites australis*, 207♂ 220♀ emerged; river Werre E of Bielefeld (no. A680), 15.vi.1984, 187 galls of *Lipara pullitarsis* on *Phragmites australis*, 76♂60♀ emerged; Bielefeld (no. A837), iv.1988, ex galls of *Lipara pullitarsis* on *Phragmites australis*, 2,-15.v.1988 26♂38♀ emerged, all M. v. Tschirnhaus leg. (ZSMC, FBUB); Kahlenberg, 5 km E Eberswalde, 4.ix.1999 1♀, A. Freidberg leg. (TAUI); Sachsen-Anhalt: "Ehemaliger Salziger See" 22 km W Halle/Saale, 10 km SE Lutherstadt-Eisleben, western end of lake area (no. L2496), salt spring NW "Oberröblingen am See" within meadows with salt vegetation, 17.vi.2006 3♂4♀; Bayern: river Isar (no. L2368), gravel and sand bank in the river, swept from *Salix*-shrubs, *Juncus bufonius, J. inflexus, Carex*, 15.vi.2002 3♂1♀, all M. v. Tschirnhaus leg. (ZSMC). **Romania:** Naidăş 2 km W-Nera river, 44°53´03´´N, 21°34´00´´E, 110 m, sweeping over boggy meadow, 30.v.2008 1♀, J. Roháček leg. (SMOC). **Russia:** CET: Moskva [= Moscow], Izmailovo, 5.vi.1983 1♂, A. Ozerov leg. (ZMUM); WS: Omsk, park 30-letia Pobedy, vegetation near water, 27.viii.2007 1♂, O. Kosterin leg. (ZMUM). **Sweden:** isle of Öland, SW coast, W of Resmo, N of Mörbylånga, 56°33.39'N 16°23.61'E (no. Se1926), grass cliff and creek mouth with *Phragmites, Sium, Nasturtium*, 2.vi.2008 1♀, M. v. Tschirnhaus leg. (ZSMC).

Preimaginal stages: Egg unknown. Last instar larva has apparently been first described and illustrated by Perris (1853: Figs 17-20) under the name „?*Anthomyza gracilis*“. This description of the larva was mistakenly ascribed to *A. gracilis* by Czerny (1928: 1). Séguy (1934: Figs 416-417), who also misidentified *A. collini* as *A. gracilis,* added schematical illustrations of its cephalopharyngeal skeleton and posterior spiracles. Based on Perris (l.c.), the *A. collini* larva has anterior spiracle slender, elongate, palmately branched in 6 slender digitiform projections which are also visible (but markedly shortened and widened) in the puparium, see below (Fig. 45). The cephalopharyngeal skeleton of the 3rd-instar larva, anterior and posterior spiracles are redescribed in more detail below based on structures taken from the puparium (Figs 48-49). The cephalopharyngeal skeleton is composed of the usual three parts: mouthhooks (mandibles), intermediate (hypostomal) sclerite and pharyngeal sclerite, most of them being relatively weakly sclerotized and pale-pigmented. Mouthhooks (mh) simple and very slender, proximally somewhat widened but without ventral process in the middle and distally yet more slender, slightly bent and apically pointed. Dental sclerite (ds) larger than known in described larvae of other genera of Anthomyzidae, elongate and very slender, attached to ventral side of posterior end of mouthhook and directed ventrally. Intermediate sclerite with arms slender, H-shaped in ventral view (Fig. 49), with connecting bridge relatively wide (about one-third of length of intermediate sclerite), convex ventrally, dark margined anteriorly and dentate posteriorly. Epistomal plate (Figs 48, 49, es) suboval, situated between arms of intermediate sclerite in front of its bridge and darker in anterior half and with a pair of minute round structures (perforations ?) near middle. In addition, there is a pair of minute, elipsoid, dark and closely attached sclerites between proximal parts of mouthhooks (Fig. 49). Pharyngeal sclerite (Fig. 48) relatively pale, with darkest pigmentation at anterior margin of dorsal cornua, on dorsal bridge, section connecting dorsal and ventral cornua and on parastomal bars. Dorsal cornu very slender and unpigmented posteriorly and not very separate from ventral cornu; dorsal bridge simple (not perforated), not separated from dorsal cornua and oriented rather anteriorly; parastomal bar very thin, distally finely attenuated. Ventral cornu large, rather uniformly pale-pigmented, only dorsally slightly darker, with very small pale-pigmented dorsal apodeme (Fig. 48 - da) and anteroventrally projecting in a short slender process directed below intermediate sclerite. Ventral cornua ventrally connected by finely longitudinally ridged downward-curving trough.

Puparium (Figs 50-53) elongately oval, somewhat dorsoventrally flattened (distinctly lower than wide), of suboval cross-section (ventrally flatter), laterally simply convex, without impressions, and with both ends tapered. The vacant puparium is comparatively pale, amber-yellow, darker orange-yellow only on both anterior and posterior end. Its ventral surface densely but finely transversely ribbed and wrinkled, most coarsely on anterior and posterior ends; its dorsal side with most of abdominal segments smoother, with ribs restricted to their anterior and posterior margins; anterior (cephalic and thoracic segments) and posterior ends more strongly and densely ribbed ventrally and dorsally. Measurements of the puparium: length 2.58-3.06 mm, maximum width 0.77-0.95 mm, maximum height (in the middle) 0.55-0.69 mm. Larval segmentation more or less recognizable despite contracted cuticle. Anterior end of puparium tapered and distinctly dorsoventrally compressed. Dorsal part of cephalic and thoracic segments (Fig. 51) including anterior spiracles relatively short, densely and more coarsely irregularly ribbed. Anterior spiracular process (Fig. 45) inserted on anterior corner of puparium, very short, palmately branched into 5-6 (usually 6) papillae. Ventral part of cephalic segment (see Fig. 53) with distinct palmately branched blackish (central spot) to brown (branches) ornamentation. Thoracic segments ventrally with very dense but more finely ribbed sculpture than on dorsal part. Larval transverse bands of fine spinulae (creeping welts) well preserved on ventral side of 8 abdominal segments of puparium and composed of a number (usually 8) of rows of minute spinulae. Dorsal side with creeping welts much reduced, better developed in only 4 anterior abdominal segments and composed of 3-4 rows of yet finer spinulae. Posterior end of puparium (Fig. 53) less tapered, dorsally more convex, more sparsely but more strongly ribbed; ventrally somewhat more truncate and with fine and very dense rib-like sculpture surrounding larval anus and covering also caudal area. Anus distinctive, in subtriangular, reddish orange-margined area (Fig. 53). Posterior spiracular processes situated posterolaterally, doubly stump-like, formed by wider basal tyre-shaped and narrower apical loaf-shaped part, the latter carrying larval posterior spiracles. When macerated (Figs 46, 47) these two parts become better visible because dilated and the apical part is found to preserve most of larval spiracular characters, viz. spiracular plate surrounded by peritreme, 4 interspiracular multiply branched spiracular processes (hairs), 3 oval spiracular slits in radial pattern and connected by common duct and 1 button-like tubercle.

Discussion: The cephalopharyngeal skeleton of the 3rd-instar larva of *Anthomyza collini* differs distinctly from those of the other described larvae (*Anagnota bicolor*, *Paranthomyza nitida*, *Stiphrosoma sabulosum* and *Typhamyza bifasciata*) in the construction of the mouth-hooks which are more slender and lacking the ventral process near middle (this being rather small only in *T. bifasciata*) and by the slender, unusually elongate dental sclerite. It also is characterized by weak sclerotization and pale pigmentation of the pharyngeal sclerite (similar in this way only to that of *S. sabulosum*) and by the dorsal bridge oriented anteriorly (not dorsally). The weakness of the cephalopharyngeal skeleton (including the light-pigmented mouthhooks) indicate that the larvae feed on relatively soft substrates (possibly partly decomposed tissues in the galls caused by *Lipara* species from which they were reared). The shape and surface structures of the puparium of *A. collini* most resemble those of *A. bicolor* but is distinctly more finely ribbed and with the abdominal segments dorsally with relatively smooth areas. The anterior spiracular process also is most similar to that of *A. bicolor* having 6 short, palmately branched papillae. The posterior spiracular process, on the other hand, more resembles that of *P. nitida* being composed of two parts (cf. Figs 47 and 133) but that of *A. collini* differs by the spiracular slits being distinctly connected on spiracular plate (Fig. 46). The peculiarities in the larval and puparial features of *A. collini* discussed above suggest that the genus *Anthomyza* is not closely allied to the genera *Anagnota*, *Paranthomyza*, *Stiphrosoma*, *Typhamyza* as represented by the species compared here. This presumption, however, is to be confirmed by the study of the larvae and/or puparia of further species of *Anthomyza* to verify if these (or some of these) peculiarities are indeed reliable generic characters.



Figs 45-49: *Anthomyza collini* Andersson, preimaginal stages (Germany). **45** - left anterior spiracular process of puparium, dorsolaterally; **46** - right posterior spiracular process of puparium, caudally; **47** - ditto, ventrally; **48** - cephalopharyngeal skeleton of 3rd instar larva, laterally; **49** - ditto, its anterior part, ventrally. Scales: Fig. 48 = 0.1 mm, others = 0.05 mm. For abbreviations see p. 8.

The *A. collini* group (after the transfer of *A. baezi* to the *A. umbrosa* group, see Roháček et al. 2009 and above) is comprised only by the *A. collini* + *A. anderssoni* sister-pair but *A. tschirnhausi* sp.n. may be an additional candidate to have a close relationship with this pair (for further detail see below and in the chapter Phylogeny).

Distribution: The species is widespread throughout Europe, reaching from Spain to W. Siberia in Russia; it was recorded from Austria, Belgium (de Bruyn 1985), Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Estonia (Remm 1959 sub *A. gracilis*), Finland (Hellén 1926, Krogerus 1932 both sub *A. gracilis*), France, Germany (Riedel 1919, Danielzik 1988 both sub *A. gracilis*, Tscharntke 1999, Bährmann 2006, von Tschirnhaus 2007, 2008), Great Britain (England, Wales, Scotland: Skidmore 2008a,c), Hungary, Ireland, Italy, Latvia (Karpa 2008), Netherlands, Poland, Romania, Russia (CET: Panteleeva & Razvorotnev 1996, Panteleeva 1997, 2005 all sub *A. gracilis*; NET, SET, WS: confirmed occurrence), Slovakia (Roháček 2006b), Spain (Carles-Tolrá 2001, incl. Balearic Is.), Sweden (Ringdahl 1950, 1951 both sub *A. gracilis*, Switzerland. Note: The records of Panteleeva & Razvorotnev (1996) and Panteleeva (1997, 2005) from the Voronezh region of Russia could not be revised and may be (partly) based on misidentification.

Anthomyza anderssoni Roháček, 1984

(Figs 309-314, 316-321, 323)

Anthomyza anderssoni Roháček, 1984a: 388; 2006a: 145-147 (redescription).

NEW MATERIAL EXAMINED: 19♂18♀. **Czech Republic:** W Moravia: Třešť 1.5 km SE, Vimvejr pond (distr. Jihlava), sweeping over *Typha latifolia*, 23.vi.2006 2♂4♀, J. Roháček leg. (SMOC). **Germany:** Bremen: Teiche W Neustädt Hafen, 14.vi.2007 1♂, Stuke leg. (JSL). **Greece:** N Greece, Palia Koití, Aliákmonas river delta, Aigínio env., 40°30´N, 22°36´E, sweeping over *Typha* growth, 4.vi.2007, 2♀, J. Roháček leg. (SMOC); NE Greece, Macedonia, delta of river Nestos, east of Keramoti, 40°52'05"N 24°47'31"E (no. Gr1725), meadows west of river mouth and near river mouth, swept, eclector, 14.v.2006 2♂1♀, M. v. Tschirnhaus leg. (ZSMC). **Great Britain:** England: Northumberland South, Blyth Power Station, NZ2983, sweep-net, 10.vii.2007, 1♂, 9.viii.2007, 1♀; Bristol UK ST5968, Hengrove Park, vc6, small wet flush in brownfield site with *Typha*, 21.viii.2008 1♀, D. J. Gibbs leg. (DGB). **Romania:** Gornea nr. Sichevița 1 km S, Gornea river, 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Typha latifolia*, 4.vi.2008, 12♂8♀; Naidăş 2 km W-Nera river, 44°53´03´´N, 21°34´00´´E, 110 m, sweeping over *Carex* boggy meadow, 2.vi.2008, 1♂, all J. Roháček leg. (SMOC). **Russia:** SET: Kavkaz, Sev. Osetiya, okr. g. Alagir [= Caucasus, N Osetiya, environs of town Alagir] (Alagirsky District of the Republic of North Ossetia-Alania), 18.v.1989 1♀, A. L. Ozerov leg. (ZMUM).

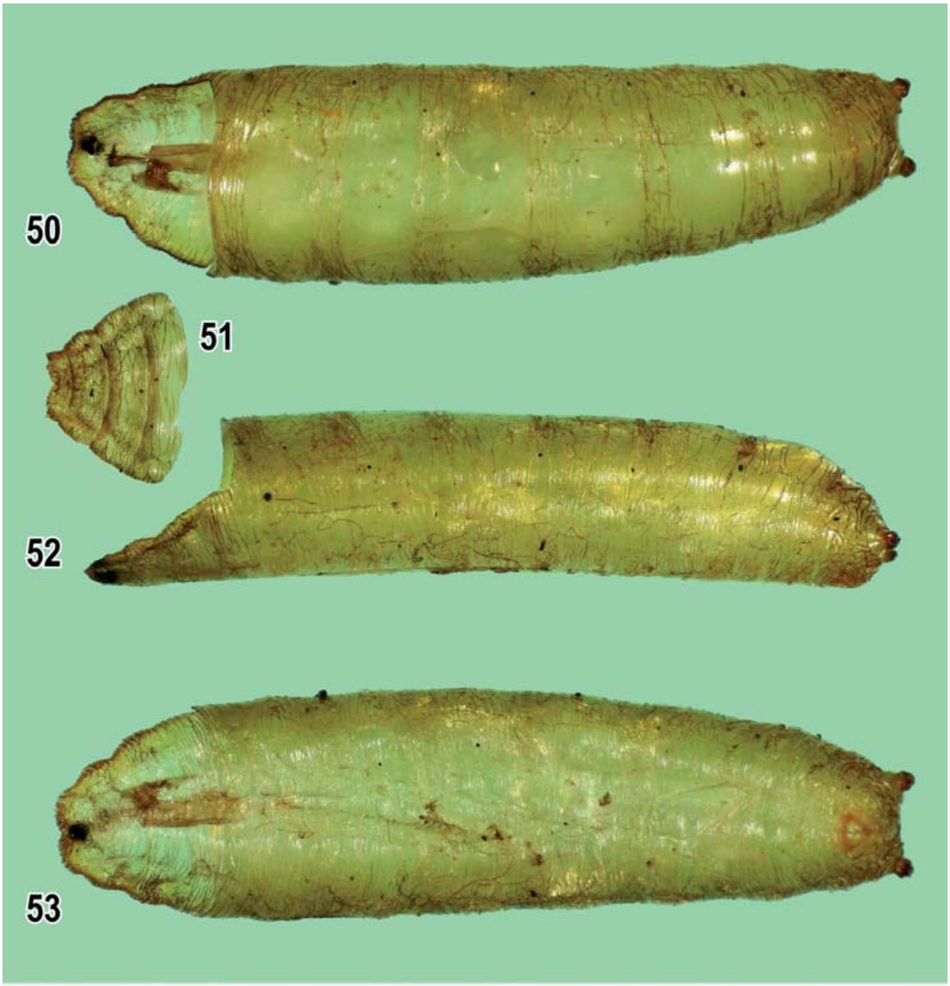
Distribution: *A. anderssoni* is probably a Submediterranean species spread from the Mediterranean to lowland areas in Central Europe, with northernmost records from southern Sweden. It has been recorded from: Azerbaijan, Bulgaria, Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Germany (new), Great Britain (England: new), Greece (continental: new, Corfu), Italy, Poland, Romania (new), Russia (SET: new), Slovakia (Roháček 2006b), Spain, Sweden and Switzerland.

***Anthomyza tschirnhausi* sp. n.**

(Figs 55-69)

TYPE MATERIAL: Holotype ♂ labelled: "Kamchatka, Petropavlosk, Elberg 7.7.1977", "Calamagrostis meadow, near a brook", "Holotypus ♂, *Anthomyza tschirnhausi* sp.n., J. Roháček det. 2007" [red label] (IAES, genit. prep., left wing detached, photographed and preserved with genit. prep. in glycerine). Paratypes: **Russia:** Kamchatka, Nalychevo Prirodnyj Park, 22.5 km NNE' of peak of volcano "Koryakskaja Sopka", 53,11.70 N, 158,27.91 E [X1395], area around tourist station, dense herbaceous vegetation, partly wet from rain, swept, aspirated, 27.vii.1999 6♂3♀, M. v. Tschirnhaus leg.; Kamchatka, northern edge of the city of Elisovo, W' River Avacha, 53,09.91 N, 158,08.20 E [X1399], S' traffic bridge, highway to Zarechnyj; gravel banks of the river, 11.viii.1999, 1♂1♀, M. v. Tschirnhaus leg. (ZSMC, SMOC, most paratypes dried from ethanol, 2♂2♀ with genit. prep., 1♂ paratype with wing detached and preserved with genit. prep.).

Description: Male. Total body length 2.34-2.66 mm; general colour dark brown to reddish brown, densely light grey microtomentose (lighter than in *A. gracilis*). Head somewhat higher than long, distinctly angular but with face little receding in profile. Occiput dorsomedially slightly concave, uniformly brown, dark grey microtomentose, only posteroventrally paler brown.



Figs 50-53: *Anthomyza collini* Andersson, empty puparium (Germany). **50** - puparium, dorsally; **51** - antero-dorsal part of puparium, dorsally; **52** - puparium laterally; **53** - ditto, ventrally. **Fig. 54:** *Paranthomyza nitida* (Meigen), empty male puparium dorsolaterally (Czech Republic). Photo by M. Deml.

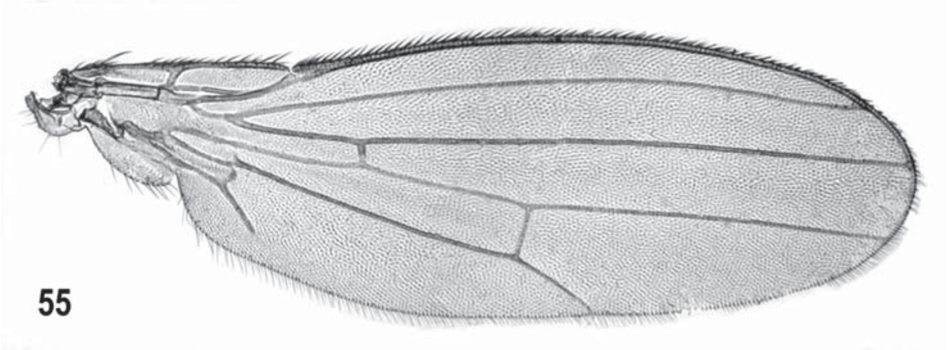
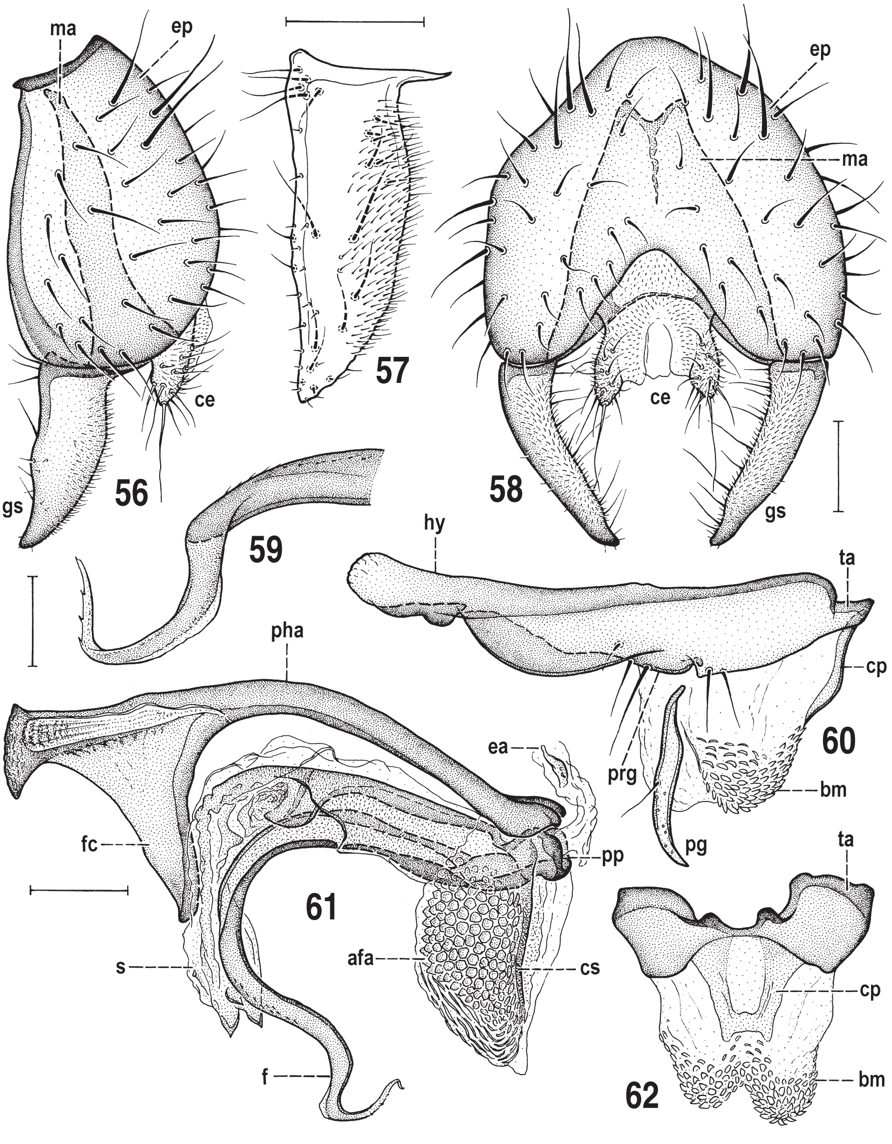


Fig. 55: Wing of *Anthomyza tschirnhausi* sp.n., male holotype, wing length 2.8 mm. Photo by J. Roháček.

Frons yellow in anterior third and gradually darkened to dark brown in posterior third, all microtomentose and dull. Frontal triangle brown, ocellar triangle blackish brown and both grey microtomentose; orbits pale yellow up to posterior ors, brownish more posteriorly and entirely whitish microtomentose; this whitish microtomentum continued narrowly also at eye margin along postocular setulae. Area (stripe) between frontal triangle and posterior part of orbit distinctly paler than neighbouring structures, yellowish brown. Frontal triangle relatively narrow, reaching to anterior third of frons. Frontal lunule distinct, yellow. Face narrow, dark yellow or ochreous, sparsely whitish microtomentose; parafacialia and gena pale yellow and silvery white microtomentose, gena ventrally with very narrow dark yellow to ochreous brown (more posteriorly) marginal stripe; postgena dark yellow to ochreous but posteriorly darkened, not delimited from posterior corner of occiput. Mouthparts dark yellow, palpus lighter. Cephalic chaetotaxy: pvt relatively long, strongly crossed; vti and oc longest of cephalic setae; vte distinctly, posterior ors slightly shorter than oc; 2 long, relatively widely spaced ors, anterior ors slightly shorter than posterior; 1 well-developed setula in front of the anterior ors and sometimes 1 microsetula in front of the latter; 2 pairs of medial microsetulae in the anterior third of frons; 1 weak setula behind vte; postocular setulae (7-8) relatively long, in single row; postgena with several setulae and 2 short (ventral distinctly longer) setae; 1 long vi (about as long as anterior ors); subvibrissa reduced, only as long as anterior peristomal setula; 4-5 fine peristomal setulae. Palpus of moderate width, yellow, with 1 longer preapical and 2 shorter ventral setulae. Eye suboval, with longest diameter strongly oblique and 1.5 times as long as the shortest. Smallest genal height about 0.18 times as long as shortest eye diameter. Antenna strongly geniculate, entirely yellow, with short white marginal pilosity. Arista brown, 1.8 times as long as antenna, shortly ciliate.

Thorax slightly narrower than head, unicolourous brown to dark brown, pale grey microtomentose and dull. Thoracic chaetotaxy: 1 relatively long hu (as long as anterior npl); prs only as long as or slightly shorter than sa; 2 npl, anterior distinctly longer than posterior; 1 sa and 1 pa, both well developed; 3 postsutural dc (only 2 dc when the foremost dc is considered to be an enlarged dc microseta) becoming shorter anteriorly, the foremost sometimes hair-like but as long as prs, middle dc longer than anterior npl, posterior dc very long, longest of thoracic setae; usually 4 dc microsetae in front of anterior dc; ac microsetae sparse, in 2-4 rows on suture but 2 rows more posteriorly and not reaching beyond level of posterior dc; ppl microseta relatively long though fine; 2 sc, laterobasal weak (as long as prs), apical almost as long as posterior dc; 2 relatively robust stpl, anterior only slightly shorter than posterior, plus 3-4 upcurved setulae



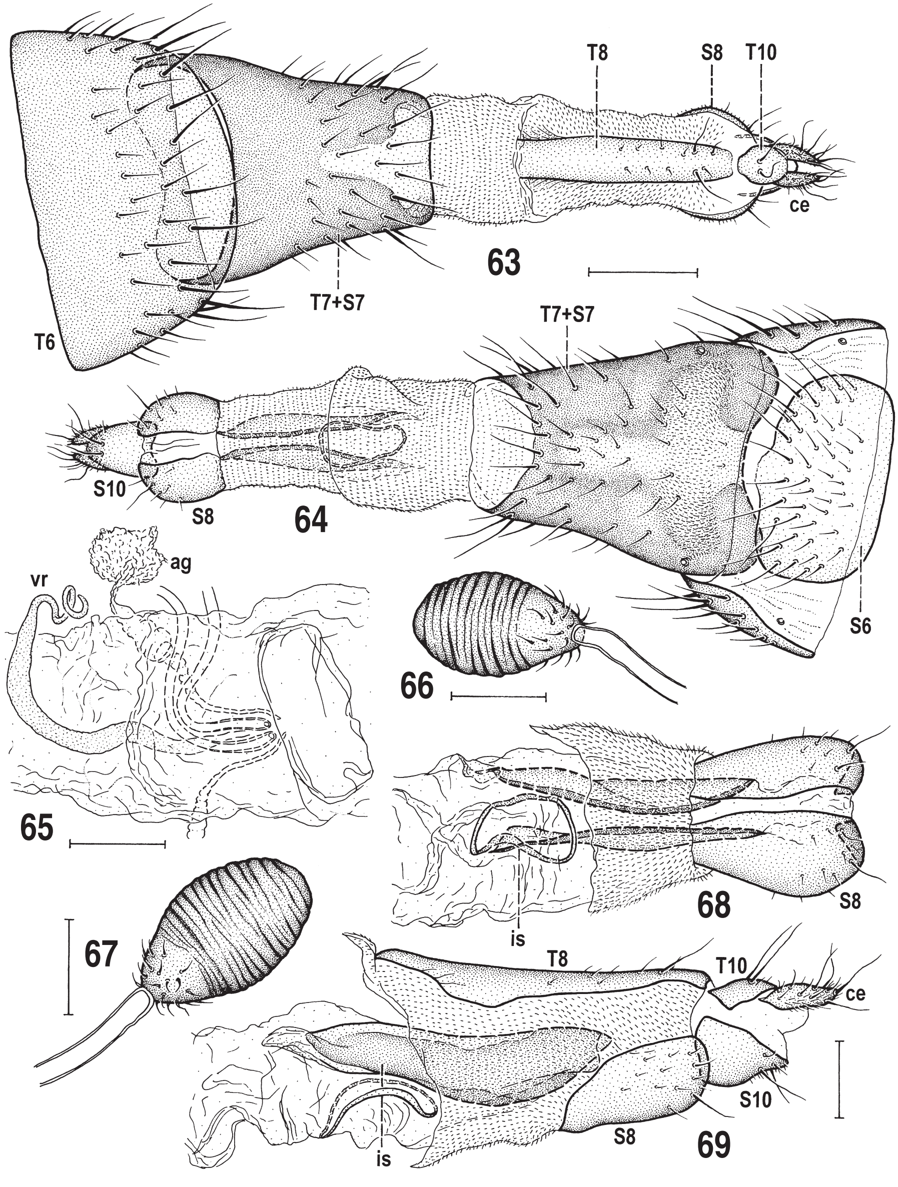
Figs 56-62: *Anthomyza tschirnhausi* sp.n., male paratype. **56** - external genitalia, laterally; **57** - gonostylus, laterocaudally (widest extension); **58** - external genitalia, caudally; **59** - apex of filum of distiphallus, anteroventrally; **60** - hypandrial complex, laterally; **61** - aedeagal complex, laterally; **62** - transandrium, caudally. Scales: Fig. 59 = 0.05 mm, others = 0.1 mm. For abbreviations see p. 8.

below stpl and 3 longer curved setae on ventral corner of sternopleuron. Scutellum rounded triangular, distinctly convex dorsally. Legs bright to pale yellow, only last tarsal segment of all tarsi pale brown. f_1 with ctenidial spine slightly to distinctly longer than maximum width of t_1; t_2 with unusually short and paired ventroapical setae (one often weaker than the other); f_3 with posteroventral row of fine, unmodified setae; fore and hind basitarsus with slightly longer proximoventral setulae. Claws relatively long. Wing (Fig. 55) elongate but not very narrow, with veins pale brown and membrane hyaline ochreous. C with sparse and minute spinulae between apices of R_1 and R_{2+3}. R_{2+3} very long, bent parallel to C and apically very slightly upcurved to it; R_{4+5} slightly bent along entire length and apically almost parallel to M; dm cell medium long, with r-m situated distinctly in front of its middle; apical portion of CuA_1 slightly to distinctly longer than dm-cu, almost reaching wing margin and A_1 ending far from it. Alula small but not very narrow. Wing measurements: length 2.46-2.78 mm, width 0.79-0.99 mm, $Cs_3 : Cs_4$ = 1.10-1.36, rm\dm-cu : dm-cu = 2.46-3.06. Haltere yellow, with stem whitish yellow.

Abdomen with preabdominal terga brown, less microtomentose and thus more shining than thorax. T1 distinctly separate from T2, both narrower than T3. T3-T5 subequal in size. Preabdominal sterna ochreous or pale brown. S1 undescribed. S2 without darkened transverse stripe, uniformly ochreous-yellow. S2-S5 similar in shape, about as long as wide, but becoming larger posteriorly, shortly and relatively densely setulose. T6 slightly longer than half of T5 (thus larger and less transverse than in congeners), bare and almost as dark as T5 but dorsomedially partly desclerotized and unpigmented. S6-S8 resembling those of *A. collini* but S6 posteriorly paler than S7; S6 with 2-3 setulae, S7 with only 1 short seta. S8 relatively long (as long as large epandrium), mainly setose at posterior margin.

Genitalia. Epandrium (56, 58) dark brown, moderately broad, distinctly tapered dorsally, densely but shortly setose and with 3 pairs of longer and thicker setae; anal fissure small and low, rounded triangular. Cercus as in *A. collini*, small, with fine setae, only apical longer. Medandrium (Fig. 58) distinctive in shape, very high, dorsally tapering and its narrow end dorsally emarginate. Gonostylus (Figs 56-58) shorter than epandrial height, slender, elongate, tapered and pointed apically, micropubescent in posterior half of outer side, with longer setae only on inner side. Hypandrium (Fig. 60) of moderate size, with anterior internal lobes low and its posterior parts coalesced with transandrium. Transandrium (Fig. 62) medially with a pair of distinct dark tubercle-shaped processes; caudal process developed but flat and pale-pigmented, ventrally narrowed and medially desclerotized. Pregonite (Fig. 60) fused with hypandrium, projecting posteroventrally in a small, flat, rectangular process carrying 2 setae; anterior flat part of pregonite with 3 setae (1 of them long). Postgonite (Fig. 60) elongate, very slender, slightly bent and apically pointed, with 1 anterior seta at midlength. Basal membrane ventrally bilobed (? always), covered with dense hyaline spines (Figs 60, 62). Aedeagal part of folding apparatus with dense numerous spine-like excrescences; connecting sclerite slender and weakly sclerotized. Phallapodeme slender with robust fulcrum and shortly forked base. Aedeagus relatively slender (Fig. 61) with small phallophore indistinctly separate from large distiphallus. Saccus sclerotized not only proximally but partly also distally and armed with only 3 thick spines on apex. Filum formed by single, long, twisted sclerite, dark except basal third and apical slender part, the latter terminating in curved, acutely pointed apex (Fig. 59) provided with 4 small spine-like teeth; middle part of filum with a row of microsetulae. Ejacapodeme very small, with slender projection ending in minute knob.

Female. Similar to male unless mentioned otherwise. Total body length 3.17-3.38 mm. f_1 with ctenidial spine markedly longer than maximum width of t_1. Wing measurements: length 2.94-3.38 mm, width 1.01-1.11 mm, $Cs_3 : Cs_4$ = 1.09-1.20, rm\dm-cu : dm-cu = 2.59-2.72. Abdomen with terga (T1-T5) markedly paler, pale brown to dark ochreous and shorter, more transverse than in male. T2-T5 subequal in length but T2 and T5 slightly narrower than T3-T4.



Figs 63-69: *Anthomyza tschirnhausi* sp.n., female paratype. **63** - postabdomen, dorsally; **64** - ditto, ventrally; **65** - ventral receptacle and accessory gland, ventrally; **66, 67** - spermatheca; **68** - S8 and internal sclerites of female genital chamber, ventrally; **69** - apex of postabdomen and internal sclerites of genital chamber, laterally. Scales: Figs 63-64 = 0.2 mm, Figs 66-67 = 0.05 mm, others = 0.1 mm. For abbreviations see p. 8.

Preabdominal sterna also lighter-pigmented, S1-S3 largely pale yellow (S2 somewhat darkened only anteriorly), S4-S5 darker, ochreous-yellow as is S6. S2-S5 becoming wider posteriorly but all distinctly transverse (wider than long).

Postabdomen (Figs 63, 64) unusually slender and elongate, tapered posteriorly, telescopic. T6 large, broad, tapered posteriorly, setose in posterior half, lighter brown than T7+S7. S6 transversely suboval, broader than S5, ochreous-yellow. Tergosternum T7+S7 longer and narrower than in all congeners, conically ring-shaped, dark brown dorsally and laterally but with pale-pigmented posteromedial subtriangular spot reaching to half of (original) T7; ventral part of T7+S7 somewhat prolonged to form anterolateral dark bulges (Fig. 64) and with large medioventral pale spot being anteriorly extended and covered by distinctive micropubescence. T8 (Fig. 63) extremely prolonged, very narrow and slightly tapered posteriorly, pale-pigmented and bearing a pair of laterally exclinate setae and several setulae, without micropubescence. S8 (Figs 68, 69) short (only one-third of length of T8) and convex, longitudinally divided into 2 sclerites being strikingly bare (without micropubescence) except for sparse and short setulae in posterior half; their posterior ends somewhat bent inside the postabdomen. Genital chamber (Figs 65, 68-69) with one pair of posterior elongate plate-shaped sclerites; annular sclerite slightly bent in profile, placed ventrally, below anterior part of plate-shaped sclerites. Ventral receptacle membranous, tubular, with broader proximal part (duct) being gradually attenuated and ending in slender twisted vermicular distal part. Accessory gland vesicular, finely granulose, on a subterminally dilated duct. Spermathecae (1+1) subequal (Figs 66-67), on very long ducts, sclerotized and dark brown, subovoid, with transversely wrinkled surface except narrower basal part bearing a number of fine spinulae. T10 (Fig. 63) small, elongately suboval, hardly broader than T8, with a pair of long medial setae and 0-2 microsetulae, otherwise without micropubescence. S10 (Figs 64, 69) larger than T10 but relatively narrow, distinctly longer than wide, posteriorly rounded, bare except for several setae (2 longer), setulae and microsetulae in its posterior fourth. Cercus (Figs 63, 69) moderate, with relatively short hair-like setae and reduced micropubescence, particularly dorsally.

Discussion: By the formation of the male and female terminalia *Anthomyza tschirnhausi* sp.n. is a distinctive species. It differs from all known Palaearctic congeners by the extremely high and dorsally tapered medandrium, the reduced (very short) male anal fissure, the somewhat frame-like caudal process of the transandrium, the unusually prolonged female postabdomen with long and narrow T7+S7 and extremely elongate T8 and by the strikingly reduced micropubescence on T8, S8, T10 and S10. Moreover, it has a pair of (short) ventroapical setae on t_2, while all known *Anthomyza* species have the usual single (and longer) seta there.

The relationships of this new species have not been unambiguously recognized. It may be related to the *A. collini* group (represented only by the *A. collini* + *A. anderssoni* sister-pair after removal of *A. baezi* – see Roháček et al. 2009) as indicated by the formation and armature of the saccus and filum of the distiphallus, the somewhat bulging female S8, the simple female internal sclerites and, particularly, by the very narrow female T8. However, none of these characters can be considered a strong synapomorphy definitely linking *A. tschirnhausi* sp.n. with this group. This species is therefore only tentatively associated with the *A. collini* group. *A. tschirnhausi* has a closely allied and very similar but unnamed relative in the Nearctic Region (K. N. Barber, personal communication, 2009).

Biology: Poorly known. The male holotype was caught in a *Calamagrostis* meadow near a brook and most of the paratypes were swept from dense herbaceous vegetation. All type specimens were collected in VII-VIII.

Distribution: The species is known only from Kamchatka in the Far East of Russia.

Anthomyza drachma Sueyoshi & Roháček, 2003

Anthomyza drachma Sueyoshi & Roháček, 2003: 23; Roháček 2006a: 156-161 (redescription).

OTHER MATERIAL EXAMINED: 1♀. **Japan:** Honshu: Kyoto, Kibune, 200-450 m, 26.ix.1993 1♀, A. Freidberg & F. Kaplan leg. (TAUI).

Biology: The additional female of this rare species was collected in IX so the known flight period of the species is extended (V-VI, VIII-IX).

Distribution: The species is known only from Japan (Hokkaido, Honshu) and the Far East of Russia (Kuril archipelago: Iturup I.).

Anthomyza flavosterna Sueyoshi & Roháček, 2003

Anthomyza flavosterna Sueyoshi & Roháček, 2003: 25; Roháček, 2006a: 161-165.

NEW MATERIAL EXAMINED: 1♀. Russia: FE: o. Kunashir, okr. vlk. Mendeleeva [= Kunashir I., environs of volcano Mendeleev], 17.vii.1985 1♀, S. Churkin leg. (ZMUM).

Distribution: Hitherto, *A. flavosterna* has only been found in Japan (Hokkaido, Honshu) and the adjacent Kunashir I. (Russia: FE, Kuril archipelago - new).

Anthomyza bellatrix Roháček, 1984

Anthomyza bellatrix Roháček, 1984a: 385; Roháček, 2006a: 167-171 (redescription).

Distribution: This uncommon species is known only from North Korea, Japan (Honshu) and the Far East of Russia (Kuril Is.: Iturup I.).

Anthomyza trifurca Sueyoshi & Roháček, 2003

Anthomyza trifurca Sueyoshi & Roháček, 2003: 28; Roháček, 2006a: 172-175.

NEW MATERIAL EXAMINED: 5♀. **Japan:** Honshu: Osaka Prefecture, Izumi Katswiagi, 800 m, 24.ix.1993 5♀, A. Freidberg & F. Kaplan leg. (TAUI).

Distribution: This species seems to be widespread in Japan (Hokkaido, Honshu, Shikoku, Kyushu) and the Korean peninsula (Korea, North Korea). Interestingly, it has not yet been found in the Far East of Russia.

Anthomyza gracilis Fallén, 1823

(Fig. 193)

Anthomyza gracilis Fallén, 1823: 8; Roháček, 2006a: 177-183 (redescription).
Anthophilina sordidella Zetterstedt, 1848: 2695.
Anthomyza trojani Elberg, 1968: 630.

NEW MATERIAL EXAMINED: 838♂759♀. **Austria:** Steiermark: Admont-Krumau, Enns valley, sweeping over boggy meadow, 13.vi.2006 3♂4♀; Weng in Gesäuse, sweeping over *Carex vulpina* in boggy meadow, 14.vi.2006 12♂8♀, all J. Roháček leg. (SMOC); Admont, 20.vii.-25.viii.1896 2♂5♀; Seitenstetten, no date, 3♀; Melk, 6.vi.1883 1♀, 5.vii.1885, all G. Strobl leg. and det. as *Leptomyza sordidella* (NMBA); Alland, 2.ix.1990 1♂, A. Freidberg leg. (TAUI). **Czech Republic:** N Bohemia: Bezděz env., 50°32´N, 14°39´E, forest margin, 18.v.2006 1♀; Vranov nr. Mimoň, 50°41´N, 14°45´E, sweeping over meadow, 17.v.2006 1♂, both M. Vála leg. (SMOC); Velký Grunov 1.5 km S, Panenský potok (brook), 50°41´N, 14°43´E, sweeping over *Glyceria maxima*, 17.v.2006 9♂11♀; same, sweeping over *Phalaris arundinacea*, 1♂9♀, same, sweeping over meadow, 4♂; Srní Potok nr Mimoň, Ploučnice river, 50°41´N, 14°44´E, in tufts of *Alopecurus pratensis*, 17.v.2006, 5♂2♀, same, sweeping riverside vegetation, 17.v.2006 2♂4♀, same, sweeping over boggy meadow, 17.v.2006 4♂2♀, same, sweeping in sand pit, 17.v.2006 1♂; Staré Splavy 1.5 km NE, Máchovo jezero, 50°36´N, 14°39´E, sweeping over peat-bog meadow, 16.v.2006 4♂4♀, 18.v.2006 1♂2♀, 19.v.2008 4♂2♀, 27.vi.2008 9♂13♀; Hradčany 1.6 km N, Ploučnie valley, 50°38´N, 14°43´E, sweeping riverside vegetation, 16.v.2006 4♂3♀, same, forest margin, 19.v.2006 1♂1♀, same, sweeping over *Carex* boggy meadow, 19.v.2006, 3♂2♀; Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping over *Carex acuta*, 19.v.2006, 27♂22♀, same, sweeping over *Carex* boggy meadow, 15.v.2006 14♂1♀, same, sweeping riverside vegetation, 15.v.2006 5♂1♀, same, sweeping forest margin, 15.v.2006 5♂2♀; same locality, sweeping *Juncus effusus* in boggy meadow, 23.vi.2008 2♂3♀; same, sweeping *Phalaris arundinacea* in boggy meadow, 26.vi.2008 1♂1♀, same, sweeping *Carex rostrata* in boggy meadow, 23.vi.2008 1♀; Hradčany 1.2 km SE, Držník pond, 50°36´N, 14°43´E, sweeping *Carex paniculata* at brook, 26.vi.2008 20♂15♀, same, sweeping *Schoenoplectus lacustris* on pond shore, 26.vi.2008 2♂, same, sweeping in *Juncus effusus* at canal, 26.vi.2008 43♂43♀; Doksy-Břehyňský rybník res., 50°35´N, 14°43´E, sweeping over *Carex brizoides*, 16.v.2006 9♂8♀, same, sweeping over meadow, 16.v.2006 2♂2♀, same, sweeping over peat-bog meadow, 16.v.2006 7♂; same locality, sweeping *Carex acuta* in boggy meadow, 24.vi.2008 8♂7♀, same, sweeping *Calamagrostis villosa* in boggy meadow, 24.vi.2008 8♂8♀, same, sweeping *Calamagrostis epigejos* in forest margin, 24.vi.2006 3♂4♀, same, sweeping *Juncus effusus* in boggy meadow, 24.vi.2008 29♂29♀; Obora nr. Doksy 0.5 km E, 50°33´N, 14°41´E, sweeping *Carex paniculata*, creek in forest, 24.vi.2008 5♂3♀, same, sweeping *Juncus effusus*, creek in forest, 24.vi.2008 5♂9♀; Pavlovice 2 km W, Dolské údolí valley, 50°36´N, 14°30´E, sweeping *Scirpus sylvaticus* in boggy meadow, 25.vi.2008 3♂5♀; Holany 1.3 km NE, Jílovka pond, 50°38´N, 14°30´E, sweeping wheat (*Triticum aestivum*) damaged by *Opomyza florum* in field, 27.vi.2008 2♀, all J. Roháček leg. (SMOC); W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 23.vi.2006 28♂17♀, 21.vii.2006 8♂4♀, 18.viii.2006 7♂7♀, same, sweeping *Scirpus sylvaticus* in boggy meadow, 12.v.2006 1♂, 23.vi.2006 2♂3♀, 21.vii.2006 1♂1♀; Třešť 1.2 km SE, sweeping *Calamagrostis epigejos* in meadow, 23.vi.2006 22♂21♀, 15.vii.2006 13♂20♀; Třešť 2.5 km SE, Šejby, sweeping *Trisetum flavescens* in meadow, 24.viii.2006 25♂12♀; Třešť 1.5 km SE, Vimvejr pond, sweeping *Carex vesicaria* in boggy meadow, 23.vi.2006 3♂2♀; Třešť 1.5 km N, Za mlejnem (distr. Jihlava), sweeping *Carex acuta* in boggy meadow, 21.vii.2006 4♂2♀, same, sweeping *Carex elata* in boggy meadow, 21.vii.2006 7♂5♀, same, sweeping *Glyceria maxima* in boggy meadow, 21.vii.2006 4♂8♀; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond) (distr. Jihlava), sweeping *Calamagrostis canescens* in boggy meadow, 23.vi.2006 29♂27♀, 21.vii.2006 4♂2♀, 14.viii.2006 7♂11♀, same, sweeping *Carex acuta* in boggy meadow, 23.vi.2006 12♂6♀, 21.vii.2006 9♂15♀, 14.viii.2006 7♂8♀; Volevčice nr. Telč 1 km E, sweeping *Carex paniculata* tussocks in boggy meadow, 24.vi.2006 5♂3♀, 22.vii.2006 4♂2♀, same, sweeping *Carex rostrata* in boggy meadow, 24.vi.2006 3♂3♀, 22.vii.2006 20♂7♀, same, sweeping *Juncus effusus* in boggy meadow, 24.vi.2006 7♂1♀; Řásná nr. Telč 1.5 km NW, Velký pařezitý rybník (pond), clearing in forest, sweeping *Calamagrostis villosa*, 7.viii.2008 6♂10♀, all J. Roháček leg. (SMOC); N Moravia: Bystřice nad Olší 1 km SW, Olše river, sweeping riverside vegetation, 1.vi.2006 1♀; Starý Bohumín, Odra river, 46°56´N, 18°20´E, sweeping over *Alopecurus pratensis*, 24.v.2006 17♂9♀, same, sweeping riverside vegetation, 24.v.2006 5♂3♀, same, sweeping undergrowth of deciduous forest, 24.v.2006 3♂2♀; Hrubý Jeseník Mts., Velká kotlina glacial cirque, sweeping *Calamagrostis villosa* in subalpine meadow, 26.vi. 1♀, 25.vii.2006 1♀; Chvalíkovice 1 km SE (distr. Opava), sweeping *Arrhenatherum elatius* in cultivated meadow, 23.viii.2008 12♂6♀; Opava, Stříbrné jezero, sweeping *Calamagrostis epigejos*, 12.viii.2008 7♂7♀, all J. Roháček leg. (SMOC). **Germany:** Bamberg Fun, no date, 1♀, G. Strobl leg. and det. as *Leptomyza gracilis* (NMBA); Kahlenberg, 5 km E Eberswalde, 4.ix.1999 2♂5♀; Altglietzen, NE Bad Freienwalde, 4.ix.1999 5♂2♀, all A. Freidberg leg. (TAUI); Schleswig-Holstein: northern coast of isle of Fehmarn, ditch behind dike near Altentheil, 54°32'N 11°06'E (no. A567), 14.iv.1979, ex 123 galls of *Lipara pullitarsis* on *Phragmites australis*, 2♂ emerged, M. v. Tschirnhaus leg. (ZSMC); Nordrhein-Westfalen: Bielefeld (no. A801), 1.iv.1992, ex dry stem of *Heracleum sphondylium*, 1♂ emerged together with many *Melanagromyza angeliciphaga* Spencer; Bielefeld (n. A837), iv.1988, ex galls of *Lipara pullitarsis* on *Phragmites australis*, 2.-19.v.1988 1♀ emerged, all M. v. Tschirnhaus leg. (ZSMC); Bielefeld-Hoberge, Twellbachtal, 4.iii. and 3.iv.1991, reared ex 25 liters of *Carex* *gracilis* [= *C. acuta*] litter in eclector, 1♀ emerged 25.iii.-14.vi.1991, F. Püchel leg. (ZSMC); Sachsen-Anhalt: "Ehemaliger Salziger See" 22 km W' Halle/Saale, 10 km SE Lutherstadt-Eisleben, western end of lake area (no. L2496), salt spring NW "Oberröblingen am See" within meadows with salt vegetation, 17.vi.2006 7♂6♀, M. v. Tschirnhaus leg. (ZSMC); Bayern, river Isar (no. L2368), gravel and sand bank in the river, swept from *Salix*-shrubs, *Juncus bufonius, J. inflexus, Carex*, 15.vi.2002 7♂9♀, M. v. Tschirnhaus leg. (ZSMC). **Great Britain:** England: Norfolk, W. Harling Common, 24.viii.1983 1♀, P. Withers leg. (PWS). **France:** Ain: Marais de Lavours, Ceyzérieu, Malaise trap, 29.vii-5.viii.2008 2♂, P. Withers leg. (MHNL). **Iceland:** SW Iceland, road no. 34, coast, dune line along beach south of lake Ölfusá, at a rest house, W' Eyrarbakki, 63°52'43"N 21°13'34"W (no. Is1666), bird colonies and toilet-gully within the dunes, swept, 13.vii.2005 11♂10♀; S Iceland, Seljavellir Camp Site, south of Eyjafjallajökull glacier, 63°33'33"N 19°37'21"W (no. Is1668), swept along ditches, river, gardens and on camp ground (moved and unmoved), 15.vii.2005 5♂3♀; Northern edge of village Fludir, near road no. 30, at small creek and edge of agricultural fields, 64°08'18"N 20°19'55"W (no. Is1683), swept on flowering plants and on lawn, 2.viii.2005 25♂14♀; Geysir Iceland, 68°18'49"N 20°17'50"W (no. Is1684), swept on touristic area, 2.viii.2005 4♀; 64°26'17"N 20°58'19"W (no. Is1686), shore of small lake west of junction below electric high power line, mainly *Eriophorum* and *Carex*, 3.viii.2005 1♀; Straumfjördur (west coast), landscape Myrar, small hill on beach, 64°28'49"N 22°13'42"W (no. Is1687), *Tripleurospermum, Taraxacum., Sanguisorba, Galium, Plantago, Equisetum, Juncus, Carex, Poaceae*, 4.viii.2005 2♂2♀; Straumfjördur (west coast), landscape Myrar, about 77 m to the east, towards inland, about 64°28'50"N 22°13'W (no. Is1688), swamps, lake shore, much bird droppings, 4.viii.2005 5♀; Iceland-West, farm houses Tradir at the sea shore of landscape Myrar, road no. 540, 64°35'22"N 22°21'07" W (no. Is1689), dense *Leontodon autumnale* and *Stellaria media* cover (flowering), *Potentilla a., Atriplex, Gentianella, Equisetum, Ranunculus, Tripleurospermum, Matricaria*, 5.viii.2005 1♀; Iceland-West, road no. 540, Church Akrar at the coast, landscape Myrar (no. Is1690), 64°38'26"N 22°21'07"W, swept on cemetery and around church on *Matricaria matricarioides, Potentilla anserina, Tripleurospermum maritimum, Capsella bursa-pastoris* and in ditch nearby on *Equisetum fluviatile*, 5.viii.2005 1♂; Raudfeldagar waterfall, 64°47'52"N 23°38'10"W (no. Is1692), swampy meadow below steep rocks, swept, eclector, 6.viii.2005 1♂1♀; Iceland-West, landscape Myrar, moorland / bogs west of road junction to Akrar near farm Alftarbakki and west of road 533 - bridge over river Uridarraá, 64°36'33"N 22°07'50"W (no. Is1697), swept in a long ditch densely covered by *Equisetum fluviatile* and *Carex*, some few *Calluna, Deschampsia cespitosa, Leontodon, Euphrasia* and *Eriophorum angustifolium* plants, 19.viii.2005 4♂16♀, M. v. Tschirnhaus leg. (ZSMC, FBUB). **Romania:** Lăţunaş 3 km W nr. Comorăşte 45°13´16´´N, 21°28´10´´E, 110 m, sweeping over meadow, 30.v.2008 1♂; Sfânta Elena 1 km E (Alibeg brook valley) 44°40´37´´N, 21°43´32´´E, 230 m, sweeping *Poa trivialis* in pasture meadow, 31.v.2006 9♂8♀; Gornea nr. Sicheviţa 1 km S-Gornea river 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Carex acuta* in boggy meadow, 4.vi.2008 2♂, same, sweeping over meadow, 4.vi.2008, 1♂1♀; Sasca Română 2 km E-Nera river 44°54´02´´N, 21°44´14´´E, 190 m, riverside vegetation, 2.vi.2008, 10♂11♀, all J. Roháček leg. (SMOC). **Russia:** CET: Moscow region: Naro-Fominsk, 22.v.2007 1♀, 27.v.2007 1♂1♀, 29.v.2008 1♂, 1.vi.2008 1♀; all D. Gavryushin leg. and photographed (DGN), same locality, 55.395547°N 36.782315°E, 29.v.2008 1♀; 55.392557°N 36.783718°E, 9.vii.2008 5♂, D. Gavryushin leg. (ZMUM); Moskva YUB, mezhdu MKAD i Vidnoe, skh polya, lesopolosa [= Moscow YUB, between MKAD and Vidnoe, from field, forest shelter belt], 26.v.2008 1♂1♀, K. Tomkovitch leg. (ZMUM); Kalinin [= Tver], 3.vii.1936 1♀, E. Smirnov leg. (ZMUM); Kursk region: Central Chernozem State Biosphere Reserve, Streletsky section, steppe, 11.viii.2008 1♂3♀, D. Gavryushin leg. (ZMUM); Baschkiriya: Lyakhovo, 23.vii.1931 1♀, Zachvatkin leg. (ZMUM); SET: Sev.-zap. Kavkaz, Guzeripl [= NW Caucasus, Guzeripl in Maykopsky District of the Republic of Adygea], 3.-4.vi.1970 1♂, V. Kovalev leg. (ZMUM); Kavkaz, Sev. Osetiya, okr. g. Alagir [= Caucasus, N Osetiya, environs of town Alagir], 19.v.1989 1♂1♀; Kavkaz, Sev. Osetiya, okr. pos. Buron, (Tseyskoe uschtschelye) [= Caucasus, N Osetiya, environs of settlement Buron (Tseya Gorge), Alagirsky District of the Republic of North Ossetia-Alania], 6.vi.1989 1♀, all A. L. Ozerov leg. (ZMUM); SET: Yu.-Z. Dagestan, ushch. Simbiriskhevi, bliz s. Bezhta [= SW Dagestan (Tsuntinsky District of The Republic of Dagestan), Simbiriskhevi gorge, near village Bezhta, 7.viii.1997 1♀, A. Gusakov leg. (ZMUM); WS: S Ural, Chelyabinsk Reg., near Zlatoust, Taganay Mts., 18.-24.vii.2008 3♂, K. Tomkovich leg. (ZMUM); FE: Amurskaya obl., g. Zeya [= Amur region, town Zeya], 20.vii.1981 1♂, O. Gorbunov leg. (ZMUM). **Slovakia:** C Slovakia: Poľana BR, Čierny Potok, sweeping over *Scirpus sylvaticus*, 4.vii.2006 4♂4♀; same, sweeping over *Deschampsia caespitosa*, 3.vii.2006 22♂18♀; same, sweeping over *Calamagrostis epigejos*, 7.vii.2006 6♂15♀, same, sweeping over *Carex vesicaria*, 7.vii.2006 1♂1♀; Poľana BR, Hrochoťská dolina (valley), Hrochoť 3 km E, 48°39´N, 19°21´E, 570 m, sweeping over *Carex* boggy meadow, 21.viii.2007 1♀; Poľana BR, Hrochoťská dolina (valley), Kyslinky, 48°39´N, 19°27´E, 750 m, sweeping over pasture meadow, 24.viii.2007 2♂6♀; Poľana BR, Kyslinky-Dolná Zálomská res., 48°39´N, 19°27´E, sweeping over boggy meadow, 22.viii.2007 1♂1♀; Poľana BR, Hronček-Kramniská, 48°45´N, 19°34´E, 560 m, sweeping *Carex acuta* in boggy meadow, 5.vii.2006 8♂5♀; Poľana BR, Sihla-Kamenistý potok valley, 48°41´N, 19°37´E, sweeping *Carex rostrata* in boggy meadow, 7.vii.2006 31♂22♀, same, sweeping *Juncus effusus* in boggy meadow, 7.vii.2006 45♂57♀; Poľana BR, Hronček ponds, 48°42´N, 19°32´E, sweeping *Glyceria fluitans* on pond shore, 5.vii.2006 9♂14♀; Poľana BR, Spády valley, 48°41´N, 19°31´E, sweeping *Glyceria declinata* nr brook, 4.vii.2006 13♂9♀, all J. Roháček leg. (SMOC). **Sweden:** Isle of Öland, Gardby sanstäpp, N of Eksboden, 56°37.23'N 16°38.83'E (no. Se1924), heather with very dry vegetation and grazed steppe, 31.v.2008 2♂; Isle of Öland (central south), Nature Reserve Möckelmossen, between Resmo and Stenåsa, 56°31.72'N 16°31.33'E (no. Se1925), limestone ground with large area of *Carex, Juncus, Eriophorum*, 1.vi.2008 1♀; Isle of Öland, SW coast, W of Resmo, N of Mörbylånga, 56°33.39'N 16°23.61'E (no. Se1926), grass cliff and creek mouth with *Phragmites, Sium, Nasturtium*, 2.vi.2008 26♂18♀, all M. v. Tschirnhaus leg. (ZSMC); Asarna, northern Baltic Sea, 60 km SSW' Östersund, 152 km WNW' Sundsvall at road no. 81, 62°39'N 14°20'E (no. X599), unmowed cattle pasture next to lake, swept, 16.vi.1988 1♀; Major road 343, Slagnäs, 65°40N 18°00'E (no. 600), open landsacape with birches, pines and mosses, swampy ditch next to road, small Cyperaceae-pasture, swept, 16.vi.1988 2♀, all M. v. Tschirnhaus leg. (ZSMC); Pite Lappmark: Revi N of Arjeplog, S of mount Galtisbuouda, shore of lake Kakel, 66°06.10'N 18°01.76'E (no. Se1946), 425 m, lawn with diverse wild flowers and *Betula* shrubs, Malaise trap, 2.-8.vii.2008, 2♂, K. Pape & M. v. Tschirnhaus leg. (ZSMC). **Turkey:** NE Turkey: Kara Göl [= „Black Lake“] near Borçka, 41°23.19'N 41°51.40'E (no. Tr1937), 1173 m, *Equisetum fluviatile* swamp; *Hesperis, Mattheuca, Veronica, Ranunculus, Aenus*, and other dicots, swept, eclector, 24.vi.2008 2♂, M. v. Tschirnhaus leg. (ZSMC).

Distribution: *A. gracilis* is widespread throughout the Palaearctic Region (ranging from northern Spain to Kamchatka) but is rare and restricted to mountains in the south (Italy, Turkey, Armenia) with northernmost known records from Iceland. It is known from: Armenia, Austria, Belgium (de Bruyn 1985), Bulgaria, Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Denmark, Estonia, Finland, France, Germany (Riedel 1919 sub *A. sordidella*, Bährmann 2006, von Tschirnhaus 2007, 2008), Great Britain (England: Wills 1968 sub *A. sordidella*, Rotheray 1991, Wales, Scotland: Skidmore 2008c), Hungary, Ireland (Smith 1952 sub *A. sordidella*), Italy, Latvia (Karpa 2008), Lithuania (Pakalniškis et al. 2006), Netherlands, North Korea, Norway, Poland, Romania, Russia (CET, NET, SET: new, WS, ES, FE), Serbia & Montenegro (Serbia), Slovakia (Roháček 2006b), Slovenia, Spain, Sweden (Ringdahl 1950 sub *A. gracilis* var. *sordidella)*, Switzerland, Turkey (new), Ukraine.

Anthomyza elbergi Andersson, 1976

(Fig. 204)

Anthomyza elbergi Andersson, 1976: 47; Roháček, 2006a: 185-189 (redescription).

NEW MATERIAL EXAMINED: 6♂10♀. **Russia:** CET: Moscow region: Naro-Fominsk, 55.392557°N 36.783718°E, 9.vii.2008 1♂, D. Gavryushin leg. and photographed (ZMUM); Moscow region: Golitsyno, 18.vi.1983 1♂, 19.vi.1977 1♀, A. Shatalkin leg. (ZMUM); WS: S Ural, Chelyabinsk Reg., near Zlatoust, Taganay Mts., 18.-24.vii.2008 1♂, K. Tomkovich leg. (ZMUM); Siberia, village Kurlek, bank of River Tom, about 30 km S' Tomsk, 56,13.58 N, 84,52.34 E [X1383], *Equisetum. Eleocharis, Lysimachia, Vicia, Mentha, Salix,* Poaceae*, Trifolium, Inula*, swept, aspirated, 5.viii.2000 2♀, M. v. Tschirnhaus leg. (ZSMC); FE: Amurskaya obl., g. Zeya [= Amur region, town Zeya], 16.vi.1978 1♀, A. Shatalkin leg., same locality, 29.vii.1981 1♂, 3.viii.1981 1♀, O. Gorbunov leg., 17.vii.1982 2♂, A. Ozerov leg. (ZMUM); Primorski krai, Kamenushka, 25.vii.1984 1♀, A. Shatalkin leg. (ZMUM); Primorski krai., Kedrovaya Pad, 2.vii.1984 2♀, A. Shatalkin leg. (ZMUM); o. Kunashir, okr. vlk. Mendeleeva [= Kunashir I., environs of volcano Mendeleev], 17.vii.1985 2♀, S. Churkin leg. (ZMUM).

Distribution: *A. elbergi* is widespread in the northern belt of the Palaearctic Region, with southernmost records from northern Germany and Poland in Europe and from Japan and North

Korea in the east. It was recorded from: Estonia, Germany, Great Britain (England, Wales, Scotland: Skidmore 2008a,c), Ireland, Japan (Hokkaido, Honshu), Latvia (Karpa 2008), Lithuania (Pakalniškis et al. 2006), North Korea, Norway, Poland, Russia (CET: Panteleeva & Razvorotnev 1996, Panteleeva 1997, 2005 all sub *A. sordidella*, NET, WS, ES, FE), Sweden. Note: The records of Panteleeva & Razvorotnev (1996) and Panteleeva (1997, 2005) from the Voronezh region (Russia: CET) may partly be based on misidentifications (no voucher specimens have been examined).

Genus ***Arganthomyza* gen. n.**

Type species: *Geomyza socculata* Zetterstedt, 1847: 2534.

Etymology: The name of this new genus is an abbreviated conjunction of *Arg*[entum] + *anthomyza* (gender feminine) and refers to the silvery (L. argentum = silver) microtomentose spots on the vertex of the head.

Diagnosis: (1) **Head** slightly longer than high to slightly higher than long. (2) Eye large, suboval to ovoid, with longest slightly oblique. (3) Frontal triangle subshining to shining. (4) Frontal lunule small but distinct. (5) Occiput slightly to distinctly concave. (6) Vertex (top of head) with silvery microtomentose spots between frontal triangle and posterior part of orbits. (7) Antenna geniculate, pedicel simple; (8) arista with sparse and short to medium long and very dense ciliation. (9) Palpus usually yellow, with 1 subapical seta and a few ventral setulae. Cephalic chaetotaxy: (10) pvt weak, convergent to crossed; (11) vti usually longest, vte, oc and posterior ors also long; (12) 2 long ors, anterior more or less shorter, 1-2 microsetulae in front of the latter; (13) a single row of small postocular setulae; (14) 1 long vi; subvibrissa weak, slightly to distinctly longer than peristomals; (15) peristomal setulae small and sparse. (16) Posterior corner of head rounded. (17) Antenna and face with same colouring in both sexes.

(18) **Thorax** slightly narrower than head. Thoracic chaetotaxy: (19) 1 hu; 2 npl (anterior longer); (20) 1 very long prs (longer than anterior npl); (21) 1 very long sa, 1 long pa; (22) 2 very long (postsutural) dc, posterior dc longest of thoracic setae; (23) ac microsetae in reduced number, at most in 2 short rows, sometimes almost absent; (24) 2 sc, basal short and weak; (25) 1 minute ppl; (26) 2 stpl, posterior usually longer. (27) Legs unicolourous yellow, only apical tarsal segments with distal part contrasting dark. (28) f_1 with posteroventral ctenidial spine. (29) t_2 with relatively short ventroapical seta. (30) Male f_3 with a posteroventral row of setae, having those in distal part shortened and thickened. (31) Wing relatively narrow but not very long; (32) wing membrane unicolourous. (33) C with small spinulae between apices of R_1 and R_{2+3}; (34) R_{2+3}, long, slightly sinuate, subparallel with C; (35) R_{4+5} slightly bent (recurved), subparallel with M apically; (36) discal (dm) cell long, widened distally, with r-m situated near its middle or slightly in front of it; (37) distal part of CuA_1 longer than dm-cu and almost reaching wing margin; A_1 short, ending far from it. (38) Alula small and narrow.

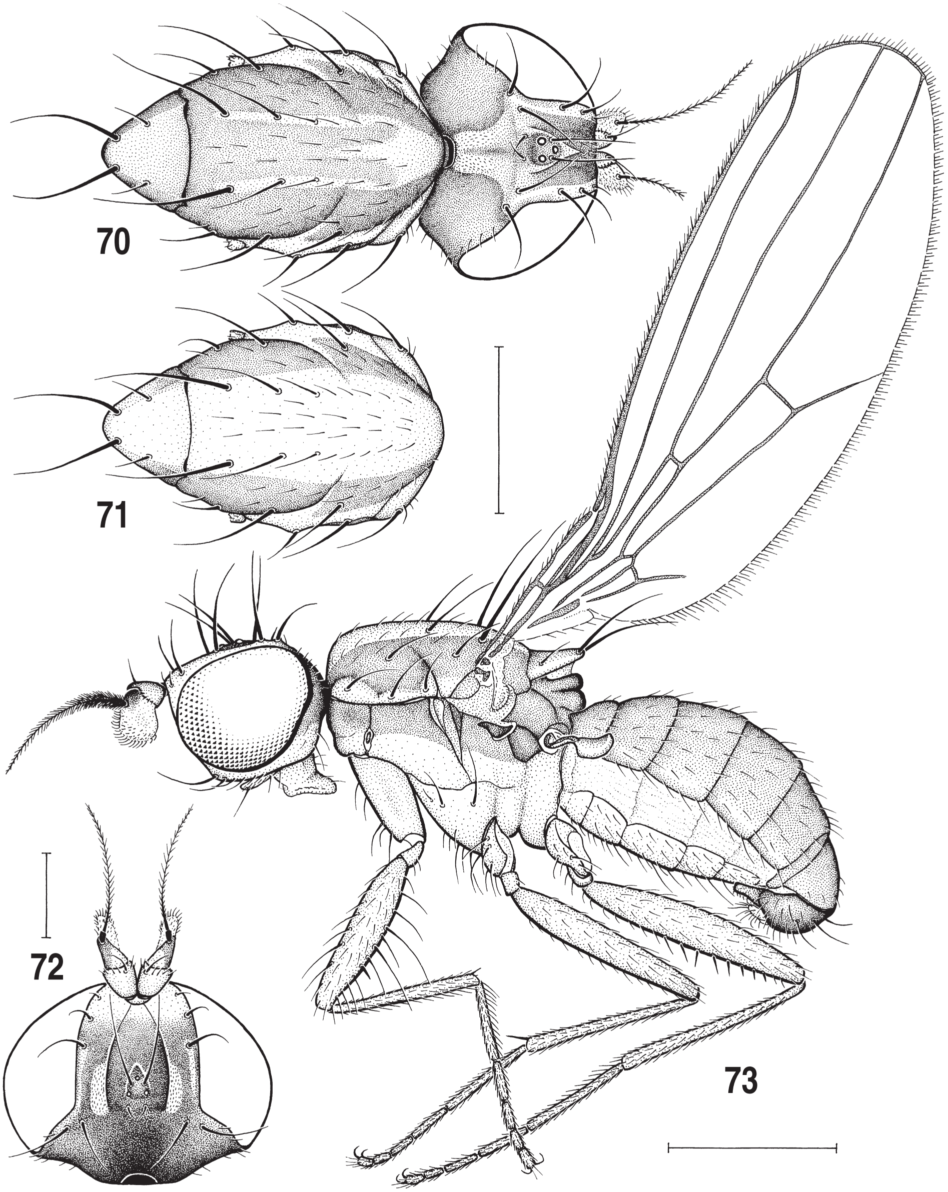
Male abdomen. (39) T1 and T2 only laterally fused. (40) T2-T5 large and broad, all uniformly dark-pigmented. (41) S2-S5 narrow, dark as or (secondarily) paler than terga. Male postabdomen: (42) T6 reduced, short transverse, pigmented, medially unpigmented or entirely unpigmented, and bare. (43) S6 and S7 strongly asymmetrical, with 1-2 setulae each. (44) S8 less asymmetrical, long, setose in posterior half.

Male genitalia. (45) Epandrium moderate, as wide as high to strongly wider that high, with 1-2 pairs of longer setae in addition to shorter setosity. (46) Medandrium relatively broad, distinctly widened ventrally and narrower dorsally. (47) Cercus relatively large but weakly sclerotized and pale-pigmented, with pale setosity. (48) Gonostylus moderate to large, broader proximally and tapered distally, micropubescent on outer side, setose on inner side. (49) Hypandrium relatively robust, symmetrical and well sclerotized, with anterior inner lobes small and incurved, never projecting dorsally; (50) transandrium simple and slender, with more or less distinct caudal process being forked or medially desclerotized. (51) Pregonite fused with hypandrial frame, low, posteriorly sometimes with small ventrally projecting lobe and with 2 (anterior and posterior) groups of setae; (52) postgonite slender, strap-like, with 0-1 anterior setula, usually in proximal half. (53) Phallapodeme moderate to robust, basally forked, apex always bicuspidate. Aedeagus with (54) small, short and rather simple phallophore. (55) Distiphallus composed of distally membranous saccus and elongate sclerotized filum. (56) Saccus with reduced armature, with only some tubercles (without spines); (57) filum relatively short and robust, formed by two, closely attached or partly fused sclerites terminating in widened spinulose or denticulate apex. (58) Aedeagal part of folding apparatus shortly spinose or tuberculate and always striated; connecting sclerite very slender, finely tuberculate or spinulose. (59) Basal membrane densely (dark or pale) spinose. (60) Ejacapodeme relatively large, with slender digitiform projection.

(61) **Female abdomen** with broader, more transverse preabdominal terga and narrower sterna than in male; T1-T5 uniformly dark-pigmented. (62) Postabdomen relatively short, strongly tapered, partly telescopic. (63) T6 large, similar to T5, usually more trapezoidal; S6 largest sternum (even larger than S5) and usually paler than T6. (64) T7 and S7 forming complete tergosternal ring-shaped cone (only sometimes pale-pigmented ventrally); (65) T8 about as long as broad, plate-shaped. (66) S8 rather short, longitudinally divided into 2 sclerites, having posterior bare parts bent dorsally, recurved and strongly invaginated. (67) Female genital chamber with 1-2 pairs of curved internal sclerites (if 2 then fused together) and with (68) one elongate (never transverse) annular sclerite (rarely modified to plate) lying below them; (69) ventral receptacle long (but not very long), tubular and hyaline, with apex slender and straight or somewhat curved; (70) accessory gland small, hyaline, at most with some fine grains on surface, on slender, subterminally slightly widened duct. (71) Spermathecae (1+1) on short ducts (except in *A. barbarista*), pyriform to ovoid, transversely ringed surface, basally with small spines or appendages, rarely also with terminal invagination. (72) T10 very small, transverse, dark, much shorter than S10, with 1 medial pair of very long setae. (73) S10 simple, markedly longer and slightly wider than T10. (74) Cercus moderate, unusually pale (in contrast to dark-pigmented T10), with numerous fine setae (apical and dorsopreapical longest).

Discussion: This new genus is established to accomodate two species formerly included in the genus *Anthomyza* and treated as the aberrant *A. socculata* group by Roháček (2006a) plus two new species described below. The analyses of the morphological (see in the chapter Phylogeny) as well as molecular data (Roháček et al. 2009) found that this group is most closely related to the genus *Fungomyza* and together with the latter forms a sister-group to the genus *Anthomyza* (see Figs 137, 138). For this reason it was necessary to remove the *A. socculata* group from the genus *Anthomyza* and to describe a new genus for it.

Arganthomyza gen.n. is best characterized as follows: (6) vertex (top of head) with silvery microtomentose spots between frontal triangle and posterior part of orbits; (20) 1 very long prs (longer than anterior npl); (21) 1 very long sa; (23) ac microsetae in reduced number, at most in 2 short rows, sometimes almost absent; (47) male cercus relatively large but weakly sclerotized and pale-pigmented; (56) saccus with reduced armature, with only some tubercles; (57) filum relatively short and robust, formed by two, closely attached or partly fused sclerites terminating in widened spinulose or denticulate apex; (62) female postabdomen relatively short; (64) T7 and S7 forming complete tergosternal ring; (68) annular sclerite in the female genital chamber elongate (rarely modified to elongate plate) and lying below internal sclerites; (72) female T10 very small, transverse, dark, much shorter than S10; (74) female cercus pale-pigmented. Most of



Figs 70-73: *Epischnomyia* and *Arganthomyza* species. **70** - *Epischnomyia merzi* sp.n., male paratype (dark form), head and thorax, dorsally; **71** - *E. merzi* sp.n., male paratype (pale form), thorax, dorsally; **72** - *Arganthomyza versitheca* sp.n., male paratype, head dorsally; **73** - *Arganthomyza barbarista* sp.n., male holotype, habitus (partly reconstructed). Scales: Fig. 72 = 0.2 mm, others = 0.5 mm.

these characters (viz. 6, 20, 23, 47, 56, 57, 62, 64, 68, 72) are apomorphic with respect to the states occurring in *Fungomyza* and demonstrate the monophyly of *Arganthomyza*. Species of the new genus have a sparsely microtomentose and hence relatively shining body and can be easily distinguished from similarly looking species of *Fungomyza, Anthomyza, Carexomyza* gen.n., *Paranthomyza* and *Receptrixa* by the comnination of the characters listed above. It should be noted that the silvery-white or whitish microtomentose spots (stripes) on vertex of the head are not unique to *Arganthomyza* because similar microtomentose pattern occurs also in the *Anthomyza macra* group but in members of this group the spots are confluent with similar microtomentum on orbits (in *Anthomyza pleuralis* they appears to be most distinctly separated because of sparser microtomentum and darker ground colour on adjacent part of orbit).

The following synapomorphies are interpreted to support the sister-group relationship between *Arganthomyza* and *Fungomyza*: (41) abdominal sterna well sclerotized and dark-pigmented; (50) transandrium with caudal process forked, medially desclerotized or reduced; (66) S8 relatively short, longitudinally divided and having posterior bare parts bent dorsally, recurved and strongly invaginated; (71) spermathecae on shortened ducts (long ducts in *A. barbarista* sp.n. are considered a reversal of this feature). *Arganthomyza* obviously is the more advanced of this sister-pair, particularly as evidenced by the distinctly modified filum of the distiphallus (sclerites widened and closely attached to partly fused) and the female T7 and S7 completely coalesced to form a compact syntergosternite (for other apomorphies see above).

Four species are included in the genus, viz. *A. socculata* (Zetterstedt, 1847) comb.n., *A. setiplanta* (Roháček, 1987) comb.n., *A. versitheca* sp.n. and *A. barbarista* sp.n. (both described below). The last mentioned species is most aberrant and seems to represent a sister-group to all remaining congeners; the Nepalese species *A. setiplanta* and *A. versitheca* sp.n. are closely allied and together form a sister-group to *A. socculata* (see the chapter Phylogeny below). Considering the fact that most of these species occur in the E. Palaearctic and that *A. setiplanta* is only known from the Oriental Region, it is presupposed that additional species of *Arganthomyza* will be discovered in the latter biogeographical region (particularly those related to *A. versitheca* sp.n. or *A. barbarista* sp.n.). Further undescribed species related of *Arganthomyza* are also known in the Nearctic Region (K. Barber, personal communication 2008).

Key to identification of *Arganthomyza* species

1 Antenna with arista strikingly densely haired, particularly in proximal half (Fig. 73). Mesonotum yellow with broad brown vittae lateral to dc lines; pleural part of thorax whitish yellow but dorsally with longitudinal brown stripe (Fig. 73). Preabdominal sterna pale ochreous. Epandrium with very broad subtriangular anal fissure (Fig. 75); gonostylus with a pair of denticles on apex (Fig. 78); transandrium with distinctive forked caudal process (Fig. 77). Female T7+S7 ventrally pale-pigmented (Fig. 84); annular sclerite modified to elongate, bent and pale plate (Fig. 85); spermathecae with small terminal invagination (Fig. 82) and on long ducts .... *A. barbarista* **sp.n.** [p. 63]

– Antenna with arista sparsely ciliate (Fig. 72). Mesonotum and pleural part of thorax brown to blackish brown, at most with humeral callus and medial part of scutellum pale brown to ochreous. Preabdominal sterna pale brown to brown. Epandrium with markedly narrower anal fissure; gonostylus with apex simple; transandrium with a weakly developed caudal process. Female T7+S7 entirely dark-pigmented and strongly sclerotized; annular sclerite well developed, elongate; spermathecae terminally simple and on short ducts (Fig. 101) 2

2(1) Frontal triangle shorter, at most reaching to anterior third of frons; pvt small but crossed. Hind basitarsus without thickened setae. Epandrium and medandrium relatively narrow (Roháček 2006a: Fig. 417); gonostylus (Roháček 2006a: Fig. 423) narrowly subtriangular, apically not very acute; filum of distiphallus slender, only apically dilated but membranous (Roháček 2006a: Fig. 422).

Spermathecae pyriform, with rosette of bell-shaped appendages on narrowed base (Roháček 2006a: Fig. 425); ventral receptacle gradually attenuated (Roháček 2006a: Fig. 428) .... *A. socculata* (Zetterstedt, 1847) **comb.n.**

– Frontal triangle long, reaching to anterior fourth to almost anterior margin of frons; pvt short, convergent but not crossed. Hind basitarsus with distinct thickened setae (Fig. 103). Male genitalia different. Spermathecae irregularly subovoid, basally with small, spine-like appendages around duct insertion; ventral receptacle broadly duct-like, apically suddenly attenuated to slender projection (Fig. 98) 3

3(2) Thorax entirely blackish brown. f_1 with ctenidial spine short, only slightly longer than maximum width of t_1 and markedly shorter than width of f_1. Male genitalia with large, ham-shaped, flat gonostylus (Fig. 96); saccus with armature reduced to minute tubercles and filum robust with complex spinulose apex (Fig. 94). Female T6, T8, S6 and S10 distinctly narrower (Figs 97, 102). Spermathecae irregular and one markedly larger than the other (Figs 99-100). Annular sclerite in female genital chamber unusually robust (Fig. 104) .... *A. versitheca* **sp.n.** [p. 68]

– Thorax dark brown but with humeral and notopleural areas ochreous and scutellum medially pale brown. f_1 with ctenidial spine long and robust, as long as width of f_1 at its insertion (Roháček 1987b: Fig. 17). Male unknown. Female T6, T8, S6 and S10 broader (Roháček 1987a: Figs 14, 16). Spermathecae more regularly ovoid and both of the same size (Roháček 1987a: Fig. 25). Annular sclerite in female genital chamber slender (Roháček 1987a: Fig. 24) .... [*A. setiplanta* (Roháček, 1987) **comb.n.**] (Oriental: Nepal)

Arganthomyza barbarista sp. n.

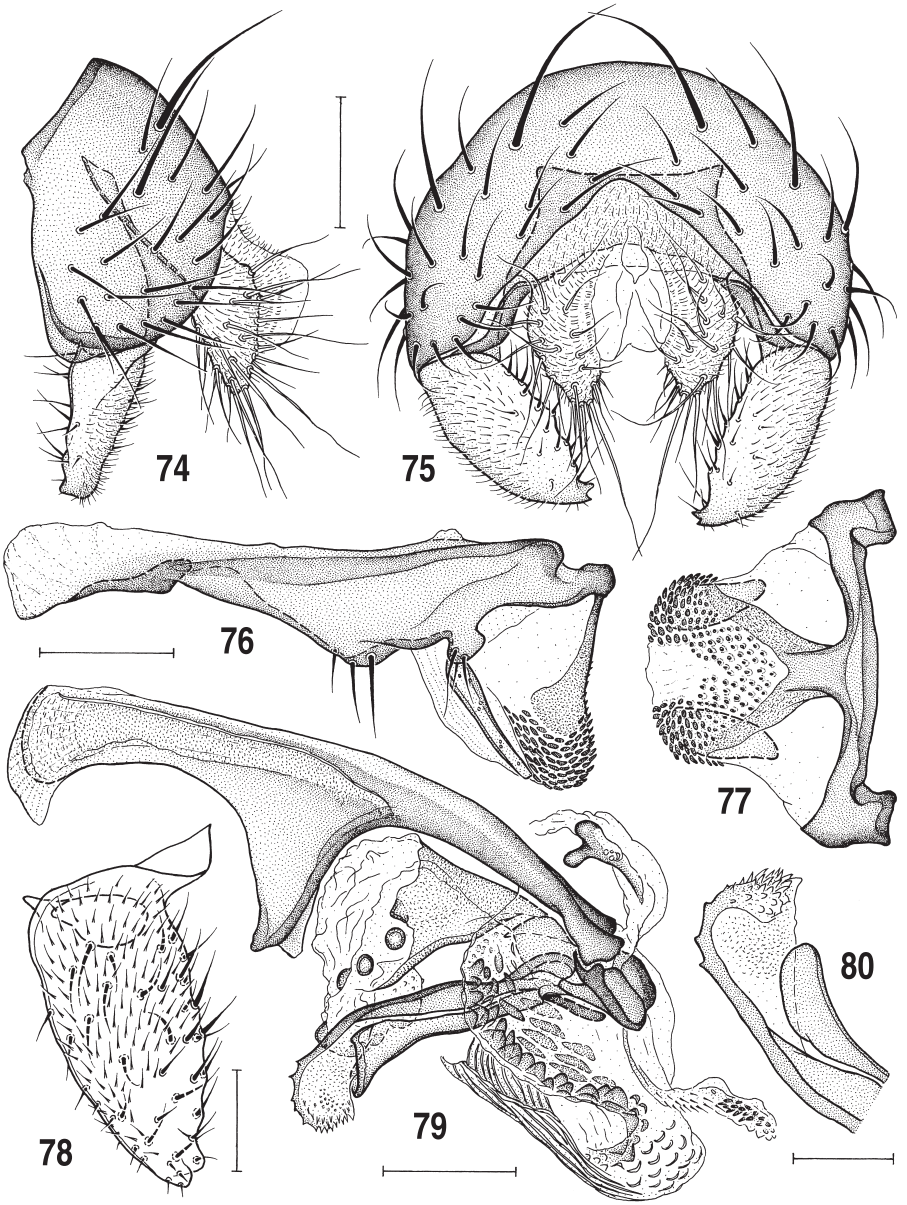
(Figs 73-88)

TYPE MATERIAL: Holotype ♂ labelled: "S KOREA 240 m/4a, Gangwon-do, Wonju, Yonsei Univ. Campus, Maeji-ri, 15.VI.2005", "37°16,5'N/127°54,0'E, Merz, Byun & Lee leg, forest, grassland behind institute/4a"; "HOLOTYPUS ♂, *Arganthomyza barbarista* sp.n., J. Roháček det. 2007" [red label] (YSUW; 1st flagellomere of left antenna broken off and preserved in glycerine mount together with genit. prep.). Paratype ♀: (**Russia**) labelled: "Юж. Приморье, Каменушка, 29.VII.1983, А. Шаталкин" [= Yuzh. Primorie, Kamenushka, 29.vii.1983, A. Shatalkin leg.], "Anthomyza sp., det. D. Gavryushin, 2008" and "PARATYPUS ♀, *Arganthomyza barbarista* sp.n., J. Roháček det. 2008" [yellow label]" (ZMUM, genit. prep.).

Etymology: The name "barbarista" (nominative singular) is formed by the combination of "barba" (L. = beard) and "arista" and refers to the very densely haired arista of the new species (resembling those of African species of the genus *Barbarista* Roháček, 1993).

Description: Male. Total body length 2.10 mm; bicolourous, yellow and brown, sparsely grey microtomentose and relatively shining. Head slightly longer than high and slightly angular in profile, yellow and brown. Occiput dorsomedially concave, with large lateral parts brown to dark brown, but medial subtriangular area between ocellar triangle and foramen and also ventrolateral corners yellow. Most of occiput sparsely light grey microtomentose and shining but sides of medial yellow spot narrowly silvery white microtomentose and connected with silvery spots on head vertex (between posterior parts of orbit and frontal triangle). Frons largely yellow to orange and microtomentose, only ocellar triangle (or also part of frontal triangle) brown. Frontal (including ocellar) triangle relatively shining despite sparse greish microtomentum. Orbits anteriorly (from fore margin up to posterior ors) sparsely silvery white microtomentose, posteriorly (between posterior ors and vti) distinctly shining; a silvery microtomentose stripe (spot) between posterior part of orbit and frontal triangle relatively long (but less apparent than in dark headed relatives due to yellow ground colour) and anteriorly (at posterior ors) connected with sparse orbital microtomentum. Frontal triangle small and short, slightly broader than ocellar triangle and reaching to half or anterior two-fifths of frons. Frontal lunule yellow, very narrow, visible between antennal scapes. Face very narrow, medially weakly sclerotized and folded, yellow and whitish microtomentose but narrowly ochreous-margined. Parafacialia and gena whitish yellow and silvery white microtomentose; ochreous marginal stripe continued on ventral margin of gena; postgena and ventrolateral corner of occiput unicolourous yellow and sparsely whitish microtomentose. Mouthparts light yellow including palpus, only clypeus (very small and narrow) ochreous. Cephalic chaetotaxy: pvt weak but relatively long and strongly crossed; vti, oc and posterior ors longest of cephalic setae; oc strikingly parallel or slightly divergent; vte distinctly shorter than vti; 2 long ors, anterior distinctly shorter than posterior but almost as long as vte; 2 microsetulae (anterior less than half length of posterior) in front of anterior ors; 2 pairs of minute medial microsetulae in front of anterior corner of frontal triangle; 1 setula behind vte reduced; postocular setulae relatively pale and sparse (only 6-7), in single row; lateroventral corner of occiput and postgena with scattered setulae and 2 (1 longer) posteroventral fine setae; 1 long vi (slightly longer but weaker than anterior ors); subvibrissa weak but about as long as two-thirds of vi; 5-6 fine peristomal setulae. Palpus slender, yellow, with 1 fine dark ventral preapical seta (shorter than subvibrissa) and about 4 dark ventral setulae. Eye large, broadly subovoid, with longest diameter slightly oblique and only 1.25 times as long as shortest. Smallest genal height about 0.14 times as long as shortest eye diameter. Antenna geniculate; scape and pedicel orange-yellow but the latter ochreous-brown on outer side; 1st flagellomere whitish but brown-darkened dorsally and around base of arista; its anterior margin with long white pilosity. Arista dark brown, with thickened basal segment, about 1.9 times as long as antenna, strikingly densely brown-haired, particularly in its proximal half (see Fig. 73).

Thorax slightly narrower than head, bicolourous, yellow and brown and relatively shining despite sparse greyish microtomentum. Mesonotum yellow with broad brown vittae lateral to dc lines; notopleural and (partly) humeral areas yellow but dorsal portion of humeral callus brownish. Pleural part of thorax with longitudinal brown stripe across the whole thorax and as wide as half of mesopleuron. Ventral (larger) area of pleural part whitish yellow. Mesonotum with somewhat reduced number of microsetae; macrosetae long. Thoracic chaetotaxy: 1 hu (slightly shorter than anterior npl); 2 npl (posterior shorter and weaker); 1 very long prs (distinctly longer than anterior npl); 1 very long sa (almost as long as prs); 1 relatively long pa; 2 very long postsutural dc (posterior longest of thoracic setae, anterior shorter but also very long, slightly longer than prs) and 5-7 dc microsetae in front of them; ac microsetae sparse and small, in 2 medial rows only (at most with single setulae lateral to them in front of suture) and reaching to level of posterior dc; 2 sc, laterobasal small, weak, as long as hu, apical very long, almost as long as posterior dc; 1 minute ppl; 2 relatively long but thin stpl, anterior somewhat shorter and weaker, and about 5 upcurved dark setulae below (1 in front of) them; ventral part of sternopleuron with 4 longer pale setae. Scutellum rounded triangular, somewhat convex dorsally. Legs whitish yellow, only distal half of apical tarsal segments pale brown. f_1 with ctenidial spine about as long as maximum width of t_1 and with a row of very long posteroventral setae (markedly longer than those in posterodorsal row). f_3 with a row of sparse (10) posteroventral setae along entire length, 4 of which in distal fourth being shorter and thicker; t_2 with relatively short ventroapical seta; mid basitarsus uniformly setulose; fore and hind basitarsus with somewhat prolonged proximoventral hair-like setulae (thus without thickened setae). f_2, t_1 and t_3 simply setulose. Wing (Fig. 88) relatively narrow, with pale ochreous veins and hyaline membrane. C with distinct but relatively sparse spinulae between apices of R_1 and R_{2+3}. R_{2+3} long, bent parallel to C with apex very slightly upcurved to C; R_{4+5} slightly bent (recurved) and apically slightly convergent to M. Discal (dm) cell moderate, with r-m situated in the middle of dm cell. Apical portion of CuA_1 distinctly longer than dm-cu, and reaching (its colourless end) wing margin; A_1 short, ending far from it. Alula small, narrow. Wing measurements: length 2.30 mm, width 0.75 mm, Cs3 : Cs4 = 1.62, rm\dm-cu : dm-cu = 2.37. Haltere dirty ochreous to pale brown, dorsal part of stem darkest.



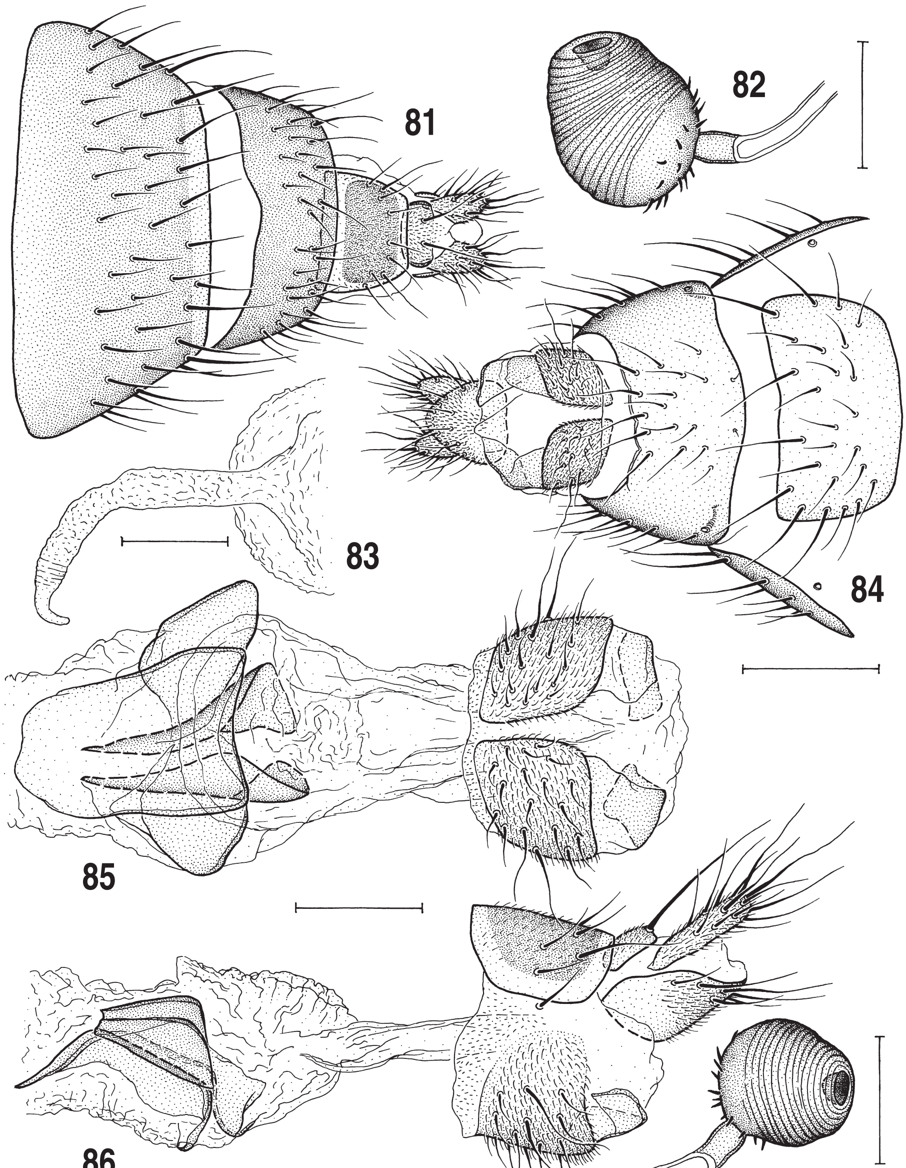
Figs 74-80: *Arganthomyza barbarista* sp.n., male holotype. **74** - external genitalia, laterally; **75** - ditto, caudally; **76** - hypandrial complex, laterally; **77** - transandrium, caudally; **78** - gonostylus, lateroventrocaudally (widest extension); **79** - aedeagal complex, laterally; **80** - apex of filum of distiphallus, ventrally. Scales: Figs 78, 80 = 0.05 mm, others = 0.1 mm.

Abdomen only dorsally (T1-T5, S8) dark brown, sparsely setose, greyish microtomentose and relatively shining. T1 and T2 partly (dorsally) separate. T3-T5 subequal in length but T5slightly narrower, all broad and bent onto ventral side of abdomen. Preabdominal sterna relatively broad, weakly sclerotized and pale-pigmented (ochreous). S1-S2 undescribed; S3-S5 becoming larger posteriorly, all wider than long, S5 largest and widest, all finely setose. T6 very short, transversely band-like but unpigmented and hence with borders poorly visible. S6-S8 dorsally fused together. S6 and S7 largely ochreous (only slightly darker than preabdominal sterna), both with sclerotized brown ledge at anterior margin and S7 somewhat brownish tinged also posterodorsally and posteroventrally; both S6 and S7 asymmetrical and each with 2 setae; S8 long (longer than epandrium), distinctly tapered posteriorly, dark brown as epandrium (so contrasting with pale S6 and S7) and with a number of setae in posterior two-thirds.

Genitalia. Epandrium (Figs 74-75) dark brown, moderately long but broad (wider than in *A. versicolor*) and long setose, with 2 pairs of thicker and very long setae (1 dorsomedial longest); anal fissure very broadly subtriangular. Cercus large and robust but pale-pigmented, densely and long setose, apical seta somewhat longer than others. Medandrium (Fig. 75) rather low but broad, dorsally tapered, dorsolateral corners angular. Gonostylus (Figs 74, 75) pale-pigmented, moderate, flat, slightly bent medially, of elongately suboval outline (in widest extension view – Fig. 78), apically narrower and terminating in 2 blunt teeth; its outer side (except for apical and anterior areas) micropubescent and inner side setose. Hypandrium (Figs 76) relatively robust (anteriorly and posteriorly less than in *A. versitheca* sp.n.), with small anterior internal lobes. Transandrium (Fig. 77) simple, band-like, with caudal process distinctive, well sclerotized and dark, forming a forked sclerite with apically dilated arms. Pregonite (Fig. 76) fused to hypandrium, low, slightly bulging and with 3 setae (1 longer) anteriorly but forming a clubbed process with another 3 setae (1 longer) posteriorly. Postgonite (Fig. 76) simple, elongate, gradually slightly tapered towards blunt apex; its outer side with several minute sensillae but without distinct setula. Basal membrane (Fig. 77) with dense and dark spine-like tubercles below caudal process. Aedeagal part of folding apparatus with relatively robust, dark and dense tooth-like excrescences (more internally) and also dark-pigmented striae. Connecting sclerite very slender, weakly sclerotized and pale, distally widened and armed with both fine and thick spinulae (Fig. 79). Phallapodeme long and robust, with basal part deeply forked, fulcrum robust and apex enlarged, laterally widened and bicuspidate. Aedeagus with short, frame-like phallophore. Distiphallus (Fig. 79) not very large (compared to phallapodeme), with rather short basal sclerites. Saccus proximally narrow and sclerotized, distally dilated and membranous and provided with several larger cup-like tubercles, otherwise unarmed. Filum unusually short and formed by a pair of broad, closely attached ribbon-like sclerites (darker proximally), shorter of them being distally dilated, longer one attenuate, curved and ending in membranous, densely finely spinulose and/or denticulate apex (Fig. 80). Ejacapodeme relatively large, with dark and thick digitiform projection.

Female. Similar to male unless mentioned otherwise. Total body length 2.66 mm. Face, parafacialia and gena paler, almost white. Laterobasal sc very weak, shorter than posterior npl. f_1 with ctenidial spine slightly shorter than maximum width of t_1. f_3 posteroventrally simply setulose. Wing measurements: length 2.90 mm, width 0.93 mm, $Cs_3 : Cs_4 = 1.41$, rm\dm-cu : dm-cu = 2.20. Abdomen with preabdominal sclerites distinctly shorter and more transverse. T1 and T2 distinctly narrower than T3-T5, T1 most narrow and very shortly setulose. T3-T5 of subequal length but T4 and T5 wider, all sparsely setose. Preabdominal sterna slightly narrower than in male, pale ochreous-yellow, finely setose. S3-S5 wider than long, becoming wider posteriorly, S5 largest and as broad as S6 which is shorter than S5 and, consequently, most transverse.

Postabdomen (Figs 81, 84) short and wide (more so than in *A. versitheca*). T6 large, brown, broad anteriorly and narrower, with paler margin, posteriorly. S6 distinctly transverse (almost twice wider than long) and as wide as S5, pale-pigmented and sparsely setose. T7 and S7



Figs 81-87: *Arganthomyza barbarista* sp.n., female paratype. **81** - postabdomen, dorsally; **82** - spermatheca; **83** - ventral receptacle, laterally; **84** - postabdomen, ventrally; **85** - S8 and internal sclerites, ventrally; **86** - apex of postabdomen and internal sclerites, laterally; **87** - spermatheca. Scales: Figs 81, 84 = 0.2 mm, Figs 85-86 = 0.1 mm, others = 0.05 mm.

completely fused into ring-shaped bicolourous tergosternum, dorsally markedly shorter and dark brown (Fig. 81), ventrally longer, pale ochreous-yellow and with long setae at posterior margin besides shorter ones in its middle. T8 plate-shaped, as long as wide, narrower posteriorly, brown-pigmented but with broad unpigmented margins (widest anteriorly), with fine setae at posterior and lateral margins. S8 (without posterior invaginated parts) shorter than T8, medially divided to form 2 finely setose sclerites being posteriorly bare, recurved and (at rest) deeply invaginated (extruded due to oviposition in Fig. 84). Genital chamber (uterus) with internal sclerotization pale-pigmented (Figs 85-86), formed by 2 pairs (dorsomedial and lateral) of flat, partly fused sclerites, and 1 unusually modified (to long, bent but poorly visible plate) annular sclerite (Fig. 85) lying below them. Ventral receptacle (Fig. 83) hyaline, simple, slender, but not very long, bent ventrally, with distal end narrowed and curved; accessory gland hyaline, poorly visible, on slender ringed duct. Spermathecae (1+1), broadly ovoid, one slightly larger than other, with ringed surface except for plain basal fourth being provided with a number of dark spinulae, with small terminal invagination, eccentric duct insertion (see Fig. 87) and distinct, pale-pigmented cervix; duct of spermatheca long (as in *Anthomyza* species). T10 small, transverse, micropubescent and with 1 pair of very long medial setae (see Fig. 81). S10 three-times larger than T10, rounded triangular, with characteristic micropubescent pattern and long fine setae at posterior margin. Cercus relatively short and robust, with fine setae, apical and dorsopreapical being longest.

Discussion: *A. barbarista* sp.n. seems to be a somewhat aberrant member of the genus *Arganthomyza* not only due to its peculiarly haired arista (similar to that in Afrotropical species of the genus *Barbarista* Roháček, 1993), bicolourous body (head and thorax yellow with brown pattern) longer, anteriorly more angular head (see Fig. 73) but also by the distinctive male and female genitalia. The epandrium with very broad anal fissure, the transandrium with large forked caudal process, the basal membrane and aedeagal part of folding apparatus armed with dark-pigmented spines, the saccus with cup-like tubercles, the short filum formed by two longitudinal sclerites terminating in spinulose apex and the relatively large ejacapodeme are considered the most distinctive characters of the male and the ventrally pale-pigmented T7+S7, the pale-margined T8, annular sclerite modified to pale plate and the spermathecae lacking basal appendages (with only small spinulae) and provided with shallow terminal invagination and borne on long ducts of the female. Because the filum clearly formed by two separate sclerites, the shape and armature of spermathecae, and also the membranous and simply formed ventral receptacle are considered plesiomorphic versus the state found in the remaining species of the genus *Arganthomyza*, *A. barbarista* sp.n. is placed as their sister-species in the cladogram (chapter Phylogeny, Fig. 140). However, its long spermathecal ducts (also plesiomorphic) is considered to be a character reversal because the strikingly shortened ducts is a synapomorphy of the *Arganthomyza* + *Fungomyza* clade (see in the chapter Phylogeny below).

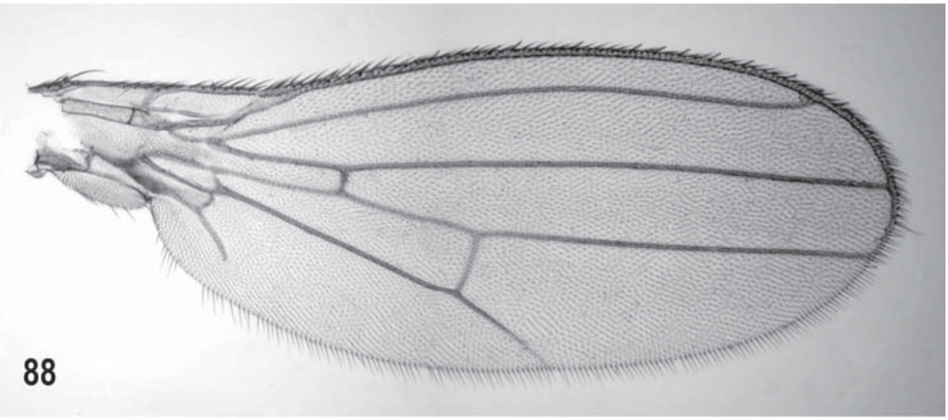
Biology: Unknown. The type specimens were collected in VI and VII, both at low altitudes.

Distribution: Korea and Russia (FE). It is possibly widespread in the E. Palaearctic but hitherto very rarely collected.

Arganthomyza versitheca sp. n.

(Figs 89-105)

TYPE MATERIAL: Holotype ♂ labelled: "S KOREA 750-900 m, Gangwon-do, Hongcheon-gun, Mt. Gachilbong /6", "37°52,0'N/128°28,0'E, 17.vi.2005 / 6, Merz, Choi, Lee & Hwang leg./forest"; "HOLOTYPUS ♂, *Arganthomyza versitheca* sp.n., J. Roháček det. 2007" [red label] (YSUW, intact). Paratypes: **Korea:** same data as for holotype, 4♂1♀; Gangwon-do, Hoeng-seon-gun, Mt. Cheongtaesan /9,



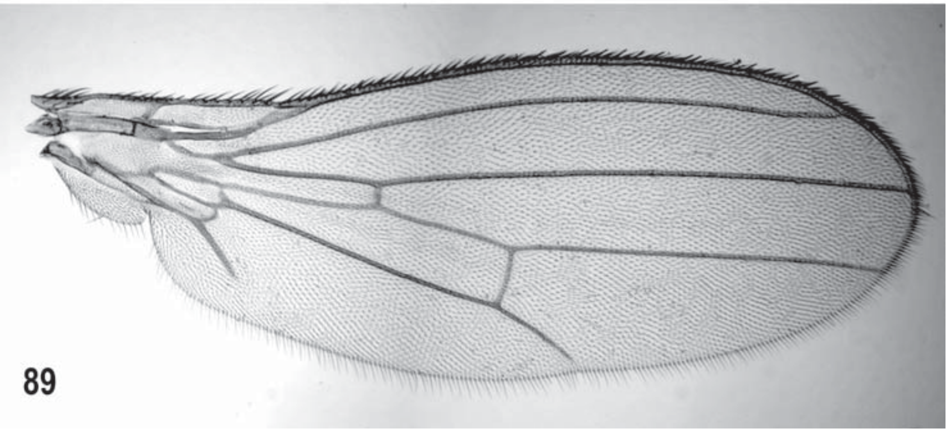


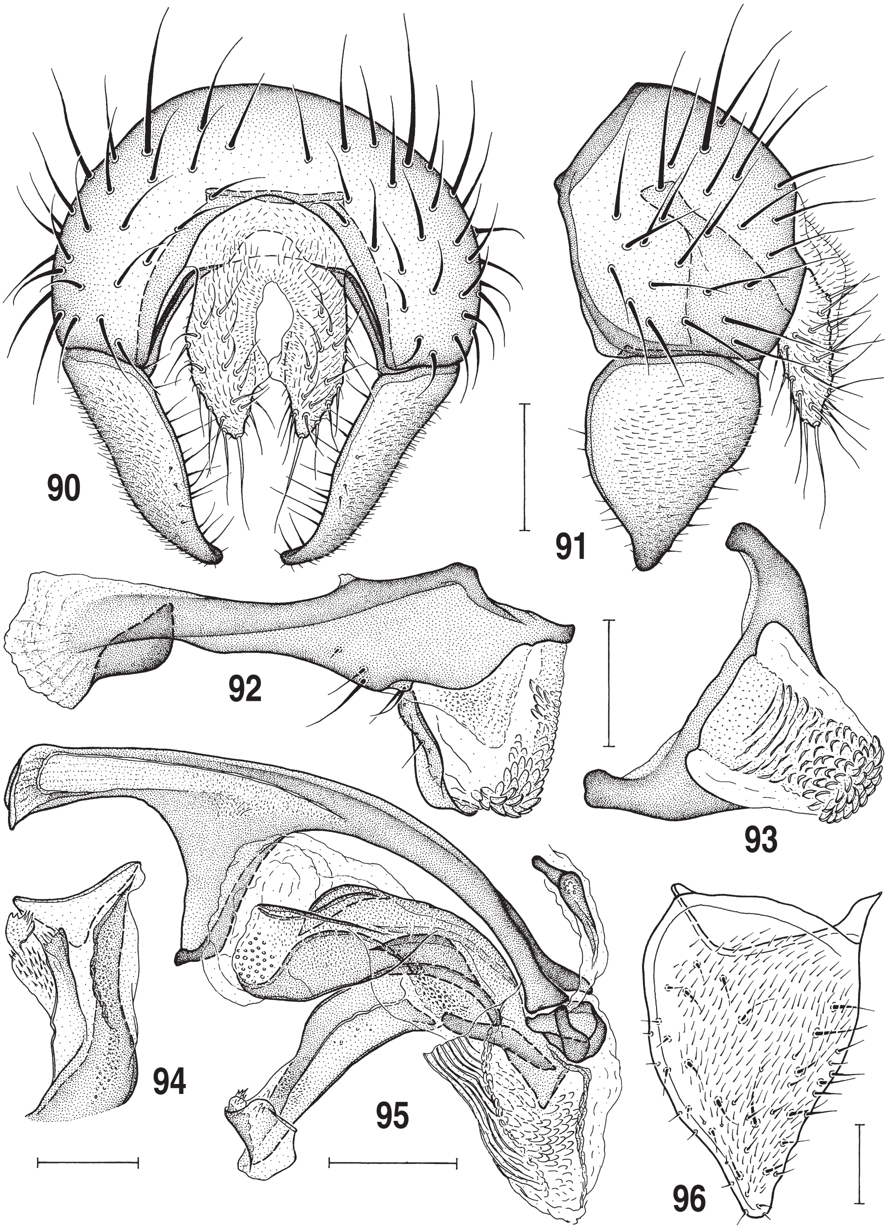
Fig. 88-89: Wings of *Arganthomyza* species. **88 -** *A. barbarista* sp.n., male holotype, wing length 2.3 mm. **89 -** *A. versitheca* sp.n., male paratype, wing length 2.5 mm. Photo by J. Roháček.

37°30,4'N/ 128°18,0'E, 900-1200 m, forest, hilltop, 18.vi.2005 1♀, Merz, Han, Choi, Lee & Hwang leg. (YSUW, MHNG, SMOC, 2♂2♀ with genit. prep.).

Etymology: This new species is named "versitheca" (L. name in nominative singular) because of its differently sized and shaped spermathecae (differing in this respect from the closely allied Nepalese species *A. setiplanta*).

Description: Male. Total body length 2.14-2.42 mm; general colour blackish brown, very sparsely grey microtomentose and distinctly shining. Head slightly higher than long, rounded anteriorly in profile. Occiput dorsomedially concave (Fig. 72), entirely blackish brown, medially behind ocellar triangle bare and glabrous, otherwise sparsely grey microtomentose but shining. Frons largely shining, with anterior third yellow to orange, rest blackish brown. Frontal triangle bare and lustrous except for anterior orange-yellow, whitish microtomentose and dull corner. Ocellar triangle also shining but with some microtomentum. Orbits anteriorly (from fore margin up to anterior ors) yellow and sparsely silvery white microtomentose, posteriorly blackish and more shining, only around bases of ors more microtomentose; a silvery microtomentose spot or short stripe between posterior part of orbit and frontal triangle well developed and anteriorly continued as very narrow line along margin of frontal triangle (Fig. 72). Frontal triangle very long, almost reaching to anterior margin of frons. Frontal lunule yellow, narrow, visible as deep recessed under anterior margin of frons. Face very narrow, medially weakly sclerotized and somewhat folded, yellow and whitish microtomentose but narrowly ochreous to pale brown-margined. Parafacialia and gena light yellow and densely silvery white microtomentose; pale brown marginal stripe continued on ventral margin of gena and posteriorly dilated and connected with brown and rather shining postgena. Mouthparts light yellow including palpus, only clypeus (very small and narrow) brownish. Cephalic chaetotaxy: pvt relatively long, convergent but not crossed; vti markedly longest of cephalic setae; oc slightly shorter than vti, proclinate, strikingly parallel or slightly divergent (Fig. 72); vte and posterior ors distinctly shorter than vti; 2 long ors, anterior markedly shorter (often less than half) than posterior; 1 microsetula (rather far) in front of the anterior ors; 1 (rarely 2) pair(s) of medial microsetulae inserted at sides of anterior corner of frontal triangle; 1 setula behind vte very reduced; postocular setulae relatively pale, not numerous (only 8-9), in single row; postgena with several setulae and 2 (1 longer) posteroventral setae; 1 long vi (shorter and weaker than posterior ors but much longer than anterior ors); subvibrissa reduced, not longer than anterior peristomal setula; only 4-5 fine peristomal setulae. Palpus slender, yellow, with 1 fine dark ventral preapical seta (distinctly longer than subvibrissa) and about 3 paler ventral setulae. Eye large, suboval, with longest diameter almost vertical and only 1.3 times as long as shortest. Smallest genal height about 0.10 times as long as shortest eye diameter. Antenna geniculate; scape and pedicel orange-yellow; 1st flagellomere whitish but pale brown darkened dorsally and around base of arista; its anterior margin with medium-long white pilosity. Arista brown, with thickened basal segment, about 2.0-2.1 times as long as antenna, with moderate cilia (as long as those on 1st flagellomere).

Thorax slightly narrower than head, entirely blackish brown and shining despite sparse greyish microtomentum, but mesonotum with a distinctive silvery-grey microtomentose lateral triangular spot between prs and both npl setae. Mesonotum with reduced number of microsetae; macrosetae very long. Thoracic chaetotaxy: 1 hu (usually shorter than anterior npl); 2 npl (posterior shorter and weaker); 1 very long prs (much longer than anterior npl); 1 very long sa (as long as prs); 1 pa (relatively long but shorter than sa); 2 very long postsutural dc (posterior longest of thoracic setae, anterior shorter but also very long, as long as prs) and 4-6 dc microsetae in front of them; ac usually absent, at most represented by 1-2 (often incomplete) pairs near suture; 2 sc, laterobasal small, shorter than hu, apical very long, almost as long as posterior dc; 1 unusally long but very thin ppl; 2 relatively long but thin stpl, anterior somewhat shorter and weaker, and 2 upcurved pale setulae below them; ventral part of sternopleuron with 3 longer pale setae. Scutellum rounded triangular, slightly convex dorsally. Legs yellow, coxae yellowish white, only distal half to two-thirds of apical tarsal segments dark to blackish brown and sharply contrasting with rest of tarsus. f_1 with ctenidial spine somewhat longer than maximum width of t_1 and with a row of very long posteroventral setae (twice longer than those in posterodorsal row). f_3 with a row of posteroventral setae, 6-7 of which in distal fourth to third distinctly shorter and thicker; t_2 with relatively short ventroapical seta; mid basitarsus with enlarged proximoventral setula; also fore basitarsus with longer proximoventral hair-like setulae and hind basitarsus (Fig. 103) with 2-3 short thickened setae (as in *A. setiplanta*). f_2, t_1 and t_3 simply setulose. Wing (Fig. 89) only slightly longer than body length (of air-dried specimens) and relatively narrow, with pale ochreous veins and hyaline membrane. C with very small but relatively dense spinulae between apices of R_1 and R_{2+3}. R_{2+3} long, bent parallel to C with apex very slightly upcurved to C; R_{4+5} slightly bent (recurved) and almost parallel to M. Discal (dm) cell moderate, with r-m situated in the middle of dm cell or slightly in front of it. Apical portion of CuA_1 slightly to distinctly longer than dm-cu, ending close to wing margin; A_1 short, ending far from it. Alula small, narrow. Wing measurements: length 2.34-2.52 mm, width 0.73-0.83 mm,



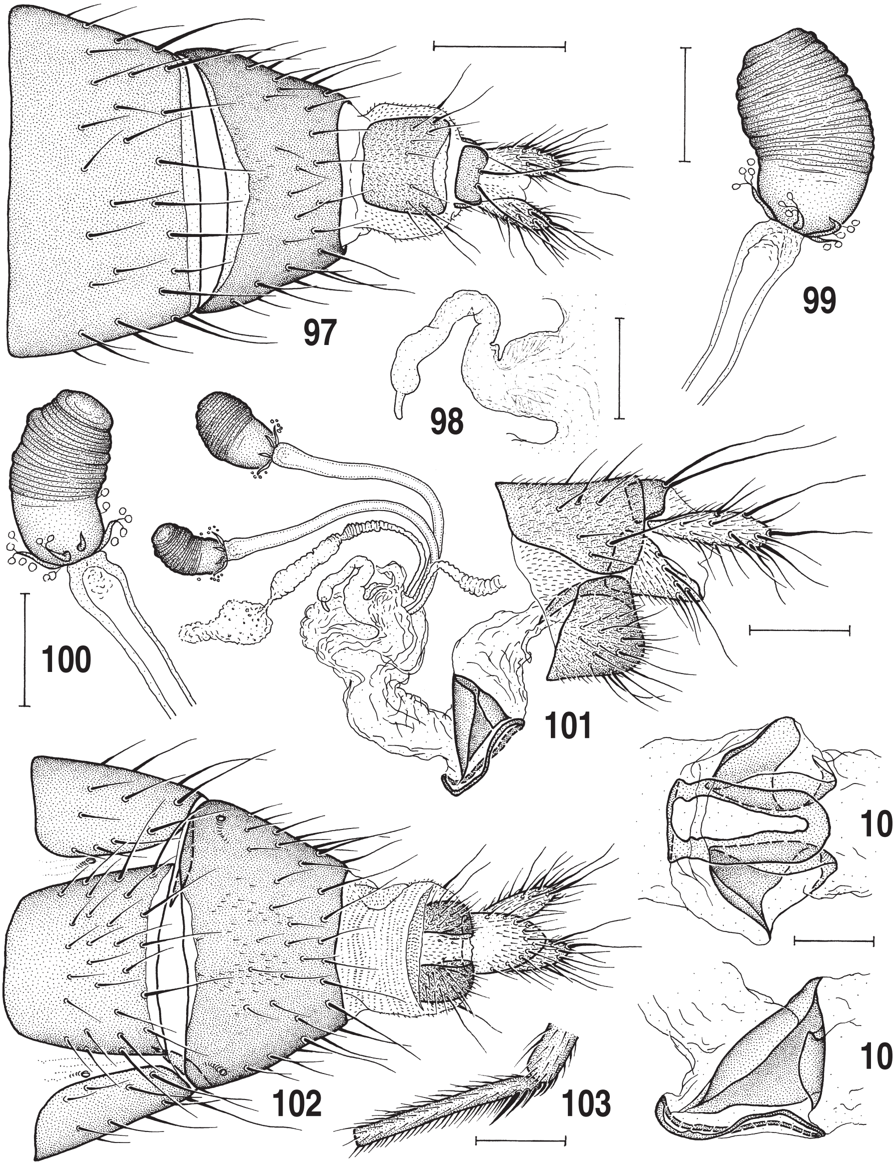
Figs 90-96: *Arganthomyza versitheca* sp.n., male paratype. **90** - external genitalia, caudally; **91** - ditto, laterally; **92** - hypandrial complex, laterally; **93** - transandrium, caudally; **94** - apex of filum of distiphallus, anteroventrally; **95** - aedeagal complex, laterally; **96** - gonostylus, lateroventrocaudally (widest extension). Scales: Figs 94, 96 = 0.05 mm, others = 0.1 mm.

$Cs_3 : Cs_4$ = 1.30-1.46, rm\dm-cu : dm-cu = 2.28-2.78. Haltere light yellow, stem basally darker yellow.

Abdomen with all terga and sterna dark to blackish brown, sparsely microtomentose, and distinctly shining. T1 and T2 almost separate, only laterally partly fused. T3-T5 subequal, broad, bent onto ventral side of abdomen. Preabdominal sterna relatively large, strongly sclerotized, S1 short and transverse, bare and with darker posterior marginal stripe; S2 and S4 as long as wide, S3 slightly longer than broad, S5 largest, broad, transversely trapezoidal (wider posteriorly). T6 very short, transversely band-like, bare, brown but medially partly (anteriorly) unpigmented but not divided. S6-S8 dorsally fused together. S6 (slightly shorter than S7 but ventrally band-like) and S7 strongly asymmetrical, both with strongly sclerotized and darker anterior margin, S6 with 2 setae, S7 with 1 seta; S8 long (longer than epandrium), tapered posteriorly, with sparse setae in posterior two-thirds.

Genitalia. Epandrium (Figs 90-91) dark brown, longer than in *A. socculata*, moderately broad, with relatively long and dense setae, including 2 (or 3) longer and thicker ones; anal fissure rather large, semi-ovoid. Cercus relatively large, robust but pale-pigmented, densely finely setose, apical seta slightly longer than others. Medandrium (Fig. 90) relatively high, but medioventrally broadly incised (copying the shape of anal fissure), dorsally narrowed and with small dorsolateral corners. Gonostylus (Figs 90-91, 96) as high as epandrium, broad but flat, bent medially, with ham-shaped outline and strongly tapered apex, finely micropubescent on most of outer side and relatively shortly setose on inner side. Hypandrium (Figs 92) relatively robust, with distal (anterior) end dilated but with internal lobes reduced; posterior broad parts of hypandrium fused with slender transandrium. Transandrium (Fig. 93) simple, band-like, with caudal process inconspicuous, represented by a flat, broad, weakly sclerotized oblong area reaching to basal membrane. Pregonite (Fig. 92) reduced and fused to hypandrium, very low, hardly projecting, with 1-2 posterior (set on very small pale lobe) and 3 (1 long) anterior setae, all inserted on its inner side. Postgonite (Fig. 92) elongate, somewhat twisted, darker only posterodorsally and with apex bent medially, with 1 anterior setula (in proximal third) and several sensillar microsetulae. Basal membrane (Fig. 93) with dense, pale, flat, spine-like excrescences. Aedeagal part of folding apparatus with elongate, flat and pale tubercles (most of them on inner wall) and usual anterior fine striae. Connecting sclerite very slender, of wrinkled structure (Fig. 95). Phallapodeme relatively robust, with basal part deeply forked, wide fulcrum and bicuspidate apex. Aedeagus with small, frame-like but anteriorly projecting phallophore (Fig. 95) and large distiphallus basally reinforced by elongate sclerites. Saccus moderate, with proximal part larger and distinctly sclerotized, and membranous distal part relatively small, with a group of minute hyaline tubercles, otherwise unarmed. Filum robust, formed by 2 flat, curved, closely attached ribbon-like sclerites, pale-pigmented; its apex widened, curved and mostly membranous, with several small processes, some of them very finely spinulose (Fig. 94). Ejacapodeme distinctly larger than usual in *Anthomyza* species, distinctly pigmented, including slender digitiform projection.

Female. Similar to male unless mentioned otherwise. Total body length 2.70-2.78 mm. Face, parafacialia and gena darker, orange-yellow to orange. Mouthparts with clypeus larger and darker brown. f_3 posteroventrally simply setulose. Wing measurements: length 2.85-2.96 mm, width 0.95-0.97 mm, $Cs_3 : Cs_4$ = 1.30-1.50, rm\dm-cu : dm-cu = 2.54-2.61. Abdomen with preabdominal sclerites distinctly shorter and more transverse. T2 narrower than T3-T5, the latter subequal in size, all sparsely setose. Preabdominal sterna distinctly narrower than in male, brown, finely setose. S1 slightly transverse, bare, with posterior transverse stripe; S2 always darker brownish than other sterna; S2-S5 becoming wider posteriorly, S2-S3 somewhat longer than wide, S4 as long as wide, S5 largest, slightly wider than long (but narrower than S6).



Figs 97-105: *Arganthomyza versitheca* sp.n., female paratype. **97** - postabdomen, dorsally; **98** - ventral receptacle, laterally; **99, 100** - spermatheca; **101** - apex of postabdomen and female genital chamber, laterally; **102** - postabdomen, ventrally; **103** - apex of t_3 and hind basitarsus posteriorly; **104** - internal sclerites, ventrally; **105** - ditto, laterally. Scales: Figs 97, 102-103 = 0.2, Fig. 101 = 0.1 mm, others = 0.05 mm.

Postabdomen (Figs 97, 102) relatively short, wide, dark-pigmented. T6 large, broad, far bent onto ventral side of abdomen, with pale posterior margin. S6 large, broader than S5 but not very transverse, dark and with paler posterior margin as in T6. T7 and S7 completely fused into dark brown ring-shaped tergosternum, dorsally distinctly shorter (Fig. 97) and with anterior pale submarginal area, ventrally longer (Fig. 102), with pale margin narrower and with slender anterolateral flanges. T7+S7 with very reduced (dorsally almost absent) micropubescence and with long setae at posterior margin. 8th segment densely micropubescent. T8 forming rounded square-shaped plate, dark except for posterior marginal area. S8 much shorter but slightly wider than T8, medially rather broadly divided to form 2 finely setose sclerites being posteriorly recurved and deeply invaginated (see Fig. 101). Genital chamber (uterus) slender (Fig. 101), with internal sclerotization (Figs 104-105) formed by 1 pair of relatively simple, flat but crooked sclerites and 1 somewhat longer, narrow, unusually flattened and robust (see ventral view – Fig. 104, in contrast to that of *A. setiplanta*) annular sclerite lying below them. Ventral receptacle (Fig. 98) relatively small, hyaline, slender, sinuously curved, proximally with duct gradually tapering but its distal half parallel-sided and its rounded end projecting in a slender finger-like projection. Accessory gland hyaline, vesiculate, with some grains on surface, on proximally slender and ringed, distally dilated duct. Spermathecae (1+1), of irregular subovoid (more or less bent) shape, one markedly larger and wider than the other, with ringed surface except for plain basal third provided with some 7-8 spine-like appendages around duct insertion (see Fig. 100) and with pale-pigmented separate cervix (shorter than in *A. barbarista* and *A. socculata*); duct of spermatheca short and broad (see Fig. 101). T10 small, transverse, dark, with reduced micropubescence and 1 pair of very long medial setae. S10 pale-pigmented, 3 times as long as T10, elongately pentagonal, micropubescent in posterior half, finely but rather long-setose. Cercus as pale as S10, of moderate length, relatively robust, with numerous fine setae, dorsopreapical being longest.

Discussion: *Arganthomyza versitheca* sp.n. is most closely allied to the Nepalese species *A. setiplanta* (Roháček, 1987) and forms with it a sister-pair of very similar species. Although the male of *A. setiplanta* is unknown, the striking resemblance of the female postabdominal structures of these two species (cf. the shape and setosity of postabdominal terga and sterna, cerci, internal sclerites in the genital chamber, spermathecae) clearly demonstrate their close relationships. A paratype of *A. setiplanta* (deposited in SMOC) has been re-examined and found that its ventral receptacle (undescribed by Roháček 1987) is of the same construction as in *A. versitheca* sp.n. differing only in having apical slender projection basally wider and gradually tapered towards apex. Apart from differences ennumerated in the above key, *A. versitheca* sp.n. differs from *A. setiplanta* also by the anteriorly (in profile) rounded head, yet longer (almost reaching to anterior margin of frons) frontal triangle, mid basitarsus with enlarged proximoventral setula, paired internal sclerites in the female genital chamber more crooked and female cerci somewhat more robust.

Biology: All type specimens were collected in montane forests, at 750-1200 m, in VI.

Distribution: *A. versitheca* sp.n. has hitherto been only found in Korea.

Arganthomyza socculata (Zetterstedt, 1847) comb. n.

Geomyza socculata Zetterstedt, 1847: 2534.
Anthomyza socculata: Andersson 1976: 50-51 (redescription); Roháček, 2006a: 191-196 (redescription and synonymy).
Anthomyza ungulata Loew, 1873: 301; Roháček, 1984a: 392 (synonymy).

NEW MATERIAL EXAMINED: 24♂34♀. **Austria:** Bad Gastein, Bellevue Alm, 1300 m, 16.vii.2004 1♂, A. Freidberg leg. (TAUI). **Kirghizia:** Tian-Shan Mts., Terskei (= probably Terskey Alatau Range of Tian Shan Mts.), 22.vii.1962 1♂, P. Vtorov leg. (ZMUM); N Kirghizia, Kysyl-Oi (=Red pit), Suusamyr-Too mountain range, Canyon of river Kökö-Mören (Mjeren) [Kg1567], swamp along river, ground covered by water, rich ungrazed vegetation, spring, swept, 20.viii.2003 4♂3♀; N Kirghizia, River Chüy, E' city of Kochkor, 42.13.77N 75.47.35E [Kg1570], 6037 ft, flat pasture land grazed by cattle - dominant plants *Thermopsis turkestanica*, *Carex stenophylloides*, *Potentilla anserina* and grass, swept, 22.viii.2003 1♀, all M. v. Tschirnhaus leg. (ZSMC). **Russia:** NET: Arkhangelskaya obl., Nenetskij AO, Narjan-Mar, 67.663531°N 53.114626°E, 9.vii.2008 1♂1♀, A. L. Ozerov leg.; same locality, 9.vii.2008 1♂, N. Vikhrev leg. (ZMUM); WS: Central Altai, Usť-Koksa distr., Katunsky range, N slope, Oroktoi-Akkem, 1009 m, 50°06.240'N 86°28.815'E, 4.-8.vii.2007 2♀, O. Kosterin leg. (ZMUM); FE: Kamchatka, northern edge of city of Elizovo, E' River Pinachevskaja, N' the traffic bridge, highway to Zarechnyj, 53,12.41 N, 158,23.75 E [X1400], birch forest (burnt about 2 year ago) with rich herbaceous vegetation, swept, aspirated, 11.viii.1999 1♂, M. v. Tschirnhaus leg. (ZSMC). **Sweden:** Pite Lappmark: Revi N of Arjeplog, S of mount Galtisbuouda, shore of lake Kakel, 66°06.10'N 18°01.76'E [Se1946], 425 m, lawn with diverse wild flowers and *Betula* shrubs, Malaise trap, 2.-8.vii.2008 5♂2♀, K. Pape & M. v. Tschirnhaus leg. (ZSMC); Asarna, northern Baltic Sea, 60 km SSW' Östersund, 152 km WNW' Sundsvall at road no. 81, 62°39'N 14°20' E [X599], unmowed cattle pasture next to lake, swept, 16.vi.1988 10♂25♀, M. v. Tschirnhaus leg. (ZSMC, 5♂10♀ SMOC).

Distribution: A Boreo-alpine species widespread in the northern belt of the Palaearctic Region (from Iceland to Kamchatka) and also occurring more southerly in mountains. It has been recorded from Austria (new), Czech Republic (Bohemia), Estonia, Finland, Great Britain (Scotland: Skidmore 2008a,c sub *Anthomyza*), Iceland (Lindroth et al. 1973 sub *Anthomyza*), Lithuania (Lutovinovas et al. 2003 sub *Anthomyza ungulata*; Pakalniškis et al. 2006), Kazakhstan, Kirghizia, Mongolia, North Korea, Norway, Poland, Russia (CET: Panteleeva & Razvorotnev 1996, Panteleeva 1997, 2005 all sub *Anthomyza ungulata*, NET, ES, WS, FE), Slovakia, Sweden, Switzerland, Ukraine. Note: The records of „*Anthomyza ungulata* Loew“ by Lutovinovas et al. (2003) from Lithuania and by Panteleeva & Razvorotnev (1996) and Panteleeva (1997, 2005) from the Voronezh region of Russia are not wholly reliable because they may also (or partly) refer to *Anthomyza macra* (no voucher specimen examined).

Genus ***Carexomyza* gen. n.**

Type species: *Paranthomyza caricis* Roháček, 1999d: 385.

Etymology: The name *Carexomyza* (= an abbreviated conjunction of *Carex* + [Anth]*omyza*, gender feminine) is derived from the strict association of its type species with *Carex paniculata*.

Diagnosis: (1) **Head** slightly higher than long or as long as high. (2) Eye large, rather narrowly suboval to reniform, covering most of head in profile, with longest diameter oblique. (3) Frons relatively broad despite large eyes; frontal triangle short, shining despite some microtomentum. (4) Orbits well delimited, silvery grey microtomentose up to vti. (5) Frontal lunule reduced but distinct. (6) Antenna geniculate between pedicel and 1st flagellomere, the latter laterally strongly compressed. (7) Arista sparsely shortly ciliate. (8) Palpus yellow, slender, with 1 longer subapical seta. Cephalic chaetotaxy: (9) pvt short and crossed; (10) vte, vti and oc long; (11) 2 long ors and 2 microsetulae in front of anterior ors; (12) a single row of short postocular setulae; (13) 1 long vi and 1 slightly shorter subvibrissa; (14) peristomal setulae small and few in number.

(15) **Thorax** slightly narrower than head, blackish brown and more or less shining, despite some microtomentum. Thoracic chaetotaxy: (16) 1 hu, 2 npl (anterior longer); (17) 1 small but distinct prs; (18) 1 short sa, 1 longer pa; (19) 3 postsutural dc becoming shorter anteriorly; (20) ac microsetae in only 2 rows in front of suture, ending in front of posterior dc; (21) 2 sc (apical

long, laterobasal small); (22) 1 small upcurved ppl; (23) 2 almost equally long stpl. (24) Legs, except for apical tarsal segments, unicolourous, yellow; (25) f_1 with ctenidial spine; (26) t_2 with distinct ventroapical seta; (27) male f_3 with posteroventral row of short thickened setae. (28) Wing long, narrow; (29) wing membrane unicolourous. (30) C with inconspicuous thicker setulae among fine hairs on Cs_2; (31) R_{2+3} long, parallel to C, ending slightly farther from wing apex than does M; (32) R_{4+5} almost straight; (33) cell dm medium-long; cross-vein r-m situated near middle of dm cell and unusually oblique. (34) CuA_1 not reaching wing margin, A_1 ending far from it. (35) Alula narrow.

Male abdomen. (36) T1 separate from T2, at least dorsally; (37) T2-T5 large, broad and subequal in length. (38) S1-S5 well sclerotized but much narrower and somewhat paler than associated terga. Male postabdomen: (39) T6 shortened but distinctly sclerotized, only medially unpigmented (seemingly divided into two plates). (40) S6 and S7 strongly asymmetrical, partly fused and situated laterally, (41) S8 medium-sized, less asymmetrical and situated dorsally.

Male genitalia. (42) Epandrium broad and dorsally straight, with sparse setae, 2 pairs of setae longer. (43) Medandrium small, only as broad as annal fissure; (44) cercus relatively large, simple in shape. (45) Gonostylus lobate, sparsely setose at anterior margin of inner side, micropubescent externally. (46) Hypandrium symmetrical, without anterior dorsally projecting flat lobes; (47) transandrium with peculiar caudal process provided with a pair of distinctive oval sclerites. (48) Pregonite fused to hypandrium, posteriorly with double, apically truncate process. (49) Postgonite simple, relatively long but not robust. (50) Phallapodeme with normal apex and shortly bifurcate base. (51) Aedeagus with short phallophore and (52) distiphallus composed of voluminous membranous saccus and slender sclerotized filum. (53) Saccus with robust internal sinuate sclerite, lateral (ventrally protruding) lobes and numerous spinulae on surface; (54) filum formed by 2 long, dark, band-like sclerites fused basally and apically, with simple apex. (55) Aedeagal part of folding apparatus densely covered by teeth and spines. (56) Connecting sclerite very slender and finely pilose. (57) Basal membrane without special sclerotized structures. (58) Ejacapodeme small, with well-developed digitiform projection.

(59) **Female abdomen** relatively shining, with broader terga (T2-T6) and narrower sterna (S2-S5). (60) Postabdomen relatively broad and short but telescopically retractable from 7th segment, with both terga and sterna unusually strongly sclerotized and dark. (61) T6 and also S6 relatively large. (62) T7 and S7 disparate, both darkly pigmented, S7 relatively large and long. (63) T8 plate-shaped, relatively large, about as long as broad; (64) S8 relatively short, with indistinct anterior margin, medially longitudinally divided but not invaginated into 8th segment. (65) Internal sclerotization of female genital chamber (uterus) well developed, formed by 2 pairs of sclerites (larger anterior and smaller posterior) and of (66) modified anteroventral annular sclerite being posteriorly dilated and fused with posterior internal sclerites. (67) Ventral receptacle small, sclerotized, shortly subcylindrical, on short duct. (68) Accessory gland small, of usual form, on terminally strongly dilated ducts. (69) Spermathecae (1+1) subsphaerical, with dark duct cervix, and with surface carrying dark spinulae. (70) T10 small, short and transverse, dark, with 1 pair of dorsal setae; (71) S10 simple, pale-pigmented, essentially longer than T10, with reduced micropubescence. (72) Cercus relatively short and broad, with comparatively sparse and fine setae.

Discussion: This new genus is established for *Paranthomyza caricis* Roháček, 1999, a species of uncertain generic affinity, which has been tentatively affiliated to the genus *Paranthomyza* Czerny, 1902 by Roháček (1999d). This act caused great heterogenity of the concept of the latter genus whose monophyletic origin becomes doubtful. The subsequent reconstruction of the phylogenetic relationships of European Anthomyzidae based on analysis of the mitochondrial 12S and 16S rRNA gene markers (Roháček et al. 2009) revealed that *P. caricis* is not allied to *P. nitida*, the type-species and only other member of *Paranthomyza*, nor to any other of the analysed species (representing all European genera of Anthomyzidae except for *Cercagnota* Roháček & Freidberg, 1993). Besides this finding the apparent dissimilarities of *P. caricis* and *P. nitida* in the structures of the male genitalia and female postabdomen have demonstrated that the retention of *P. caricis* in the genus *Paranthomyza* (as maintained by Roháček 2006a) is unjustified. Although both the new genus *Carexomyza* and the redefined genus *Paranthomyza* are now monotypic it is believed that this is a temporary state and that the related congeners will be discovered either in eastern and central Asia and/or in the Nearctic Region.

While the redefined genus *Paranthomyza* is distinquished by a number of distinctively derived (apomorphic) characters (see below), *Carexomyza* gen.n. seems to be mainly characterized by plesiomorphic features and its true autapomorphies proved to be scarce. These may include (4) orbits distinct and silvery grey microtomentose; (33) cross-vein r-m unusually oblique; (42) epandrium broad and dorsally straight (as in *Stiphrosoma* species); (43) medandrium small; (47) transandrium with peculiar caudal process provided with a pair of ventral sclerites; (56) connecting sclerite very slender and finely pilose; (64) female S8 medially longitudinally divided but not invaginated into 8th segment (similar to that of some *Anthomyza* species); (66) female genital chamber with modified anteroventral annular sclerite posteriorly dilated and fused to posterior internal sclerites. *Carexomyza* further differs from taxa of similar outer appearance by combination of following features: eye with longest diameter oblique; frontal triangle short; 2 long ors; 3 postsutural dc; male T6 well developed but medially unpigmented; saccus with lateral, ventrally projecting lobes; spermathecae with dark cervix on duct; female S10 simple and weakly sclerotized. The relationships of *Carexomyza* to other Palaearctic genera of Anthomyzidae remain obscure. Neither the morphological nor the molecular analysis revealed its sister-group (see the chapter Phylogeny below).

Only the type species is currently included in *Carexomyza*, viz. *C. caricis* (Roháček, 1999) comb.n.

Carexomyza caricis (Roháček, 1999) **comb. n.**

(Fig. 173)

Paranthomyza caricis Roháček, 1999d: 385 (description); Roháček, 2006a: 235-241 (redescription).

Description: The species is fully redescribed by Roháček (2006a) and defined also by analysis of its 12S and 16 rRNA gene markers (Roháček et al. 2009).

Discussion: *Carexomyza caricis* can be identified by means of the above generic diagnosis. Its differences from externally similar species of *Fungomyza*, *Arganthomyza* and *Anthomyza* species are given by Roháček (2006a) and/or are listed under respective species here. It differs from the most similar species, *Paranthomyza nitida*, not only by numerous dissimilarities in the male and female terminalia but also in having distinctly crossed pvt, the anterior ors long, the mesonotum less shining because of more microtomentum and the last tarsal segment partly darkened.

Distribution: The species is only known from Great Britain (England) and N. Sweden.

Genus **Cercagnota** Roháček & Freidberg, 1993

Cercagnota Roháček & Freidberg, 1993: 83 [feminine]; Roháček, 2006a: 197-198 (redescription).

Type species: *Anagnota collini* Czerny, 1928: 7 (original designation).

Discussion: Most recently, the relationships of *Cercagnota* have been discussed by Roháček & Barber (2009), who considered it a sister-group to the *Chamaebosca* group of genera which includes the genera *Chamaebosca* Speiser, 1903, *Mumetopia* Melander, 1913, *Stiphrosoma* Czerny, 1928, the *Mumetopia nigrimana* group and two unnamed Neotropical genera. Of these only *Stiphrosoma* is represented in the Palaearctic Region (all others seem to be restricted to the New World). Because *Cercagnota* has no close relative in the Palaearctic Region, it is possible that it was derived from an Afrotropical clade, represented by the insufficiently known apterous genus *Apterosepsis* Richards, 1962 (see also chapter Phylogeny below).

Cercagnota collini (Czerny, 1928)

(Fig. 212)

Anagnota collini Czerny, 1928: 7.
Cercagnota collini: Roháček, 2006a: 201-205 (redescription).

Distribution: This infrequently collected species is obviously widespread in the southern Palaearctic, ranging from Central Asia to Mediterranean and reaching as far as to southern England. It has been recorded from: France, Great Britain (England), Israel, Italy (Sardinia), Malta, Spain and Uzbekistan.

Genus ***Epischnomyia*** **Roháček, 2006**

Epischnomyia Roháček, 2006a: 205-208.

Type species: *Ischnomyia triarmigera* Sueyoshi & Roháček, 2003 (original designation).

Diagnosis: Some characters listed in the generic diagnosis by Roháček (2006) should be modified or refined owing to inclusion of an additional species as follows (numbering of characters is the same as in Roháček l.c.): **Head.** (3) Frons relatively narrow; frontal triangle small and narrow, reaching to posterior two-fifths to half of frons; ocellar triangle pale to dark brown. (5) Occiput slightly concave, dark yellow medially and brown laterally. (8) Palpus small, yellow to brown, with 1 longer and 1 shorter subapical setula.

(17) **Thorax** slightly narrower than head, yellow with brown vittae or brown also between mesonotal vittae. (31) Veins dark brown except for white Sc, R_1 and R_{2+3} and whitish yellow to yellow-ochreous C. (34) R_{4+5} slightly recurved, distally parallel to slightly divergent to M.

Male genitalia. (48) Gonostylus simple, flat, apically rounded to moderately acute; its outer side with dense micropubescence, inner side setose. (58) Aedeagal part of folding apparatus asymmetrical, with longitudinal striae and a group of tuberculiform to flat spines on each side; connecting sclerite peculiar, short, heavily sclerotized and spinose.

(61) **Female abdomen.** (65) T8 relatively broad, densely setose, micropubescent or bare. (66) S8 transversely suboval, convex, posteromedially with deep incision. (67) Female genital chamber with complex asymmetrical internal sclerotization, formed by 3 pairs plus one single anterodorsal sclerite fused together; (69) ventral receptacle sclerotized, curved like U (or hook-like) and proximally widened, set on broad and long duct; (70) accessory gland small, finely granulose, on subapically widened duct. (74) Cercus moderate, with dense fine setae, the lateral being as long as or longer than apical and/or dorsopreapical ones.

Discussion: The external resemblance of *Epischnomyia* species to members of the Nearctic genus *Ischnomyia* Loew, 1863 (see Roháček 2006a) became even more striking in the darkest specimens of *E. merzi* sp.n. (described below). The differences between these two genera given in Roháček (2006a: 208) should be refined only as regards the colour features of head and thorax, because frons and mesonotum could also be darkened in *Epischnomyia.* Similarly, in the list of apomorphies supporting the monophyly of *Epischnomyia* (see Roháček 2006a: 208-209) the character (3) is to be modified as follows: frons with very small frontal triangle.

No close relative of *Epischnomyia* was found among Palaearctic genera of Anthomyzidae. Roháček (2006a) suggested that despite a number of differences *Epischnomyia* and *Ischnomyia* might have been derived from the same clade. Their shared (probably) apomorphic features are: (19) prolonged prs and (20) very long sa (yet markedly longer than in *Anthomyza*), (30) wing with longitudinal white and brown markings and (31) dark and white veins, (44) male S8 long, (50) transandrium with short caudal process ventromedially unpigmented or incised and continued as partly sclerotized basal membrane, (55) postgonite having apex connected with basal membrane. Possibly, these two genera are related to the *Anthomyza* group of genera (containing *Anthomyza*, *Arganthomyza* gen.n. and *Fungomyza*, see the chapter Phylogeny) but probably branched early off this *Anthomyza* clade. This is indicated by some of the female postabdominal characters of *Ischnomyia*, e.g. by its duct-like membranous ventral receptacle (it could be subsequently modified and apically sclerotized in *Epischnomyia*), divided and internally recurved female S8 (secondarily fused and dilated in *Epischnomyia*) and internal sclerites symmetrical (changed to asymmetrical in *Epischnomyia*). A more precise evaluation of the phylogenetic relationships of the *Ischnomyia* - *Epischnomyia* pair will only be possible when *Ischnomyia* species are studied in detail. However, it is to be noted that there is an additional undescribed Afrotropical taxon externally similar to both above genera; examination of its terminalia also could help to understand better the affinities of *Ischnomyia* and *Epischnomyia*. Because *Epischnomyia* is highly derived and many of its features strongly modified it has become very dissimilar to other Palaearctic genera.

Besides the type species, *E. triarmigera* (Sueyoshi & Roháček, 2003), an additional, closely allied species has been discovered in (southern) Korea, viz. *E. merzi* sp.n. (described below). Consequently, *Epischnomyia* is only known from the extreme east of the Palaearctic Region.

Key to identification of *Epischnomyia* species

1 Head and mesonotum generally lighter. Frons entirely yellow, with only ocellar triangle pale brown. Occiput largely dark yellow with large lateral brown spots in dorsal half. Gonostylus apically broad and rounded (Roháček 2006a: Fig. 449); saccus of distiphallus with middle spike basally narrow (Roháček 2006a: Fig. 454); apex of filum wider and truncate (Roháček 2006a: Fig. 456). Female T6 more transverse and with pale-pigmented sublateral spots small and confluent with pale anterior marginal band (Roháček 2006a: Fig. 457); entire S6 pale-pigmented; T7+S7 ventrally with pale-pigmented parts large (Roháček 2006a: Fig. 460); T8 with posterior corners more angular and with distinctive micropubescence (Roháček 2006a: Fig. 457); S8 with posterolateral corners little protruding (Roháček 2006a: Fig. 456); T10 and S10 longer and narrower; ventral receptacle (Roháček 2006a: Fig. 462) on shorter duct .... *E. triarmigera* (Sueyoshi & Roháček, 2003)

– Head and mesonotum generally darker but dark pattern very variable (Figs 70, 71). Frons entirely orange or brown between orbits and frontal triangle; ocellar triangle brown to dark brown. Occiput largely brown, only medial area above foramen dark yellow (Fig. 70). Gonostylus apically narrowed, bent and more acute (Fig. 111); saccus of distiphallus with middle spike basally broadened (Fig. 110); apex of filum more slender and lanceolate (Fig. 114). Female T6 less transverse and with large pale-pigmented sublateral spots (Fig. 115); S6 darkened in anterior two-thirds; T7+S7 ventrally with pale-pigmented parts small (Fig. 118); T8 with posterior corners more rounded and lacking micropubescence (Fig. 115); S8 with posterolateral corners markedly protruding (Fig. 118); T10 and S10 shorter and broader; ventral receptacle (Fig. 120) on longer duct .... *E. merzi* **sp.n.** [p. 80]

Epischnomyia merzi sp. n.

(Figs 70-71, 106-121)

TYPE MATERIAL: Holotype ♂ labelled: "S. KOREA, 750-1087[m], Gangwon-do, Vonju-si, Mt. Baegunsan, 14.VI.2005 / 3", "37°15,0'N/127°57,5'E, Merz, Han, Lee & Hwang leg / 3, forest, hilltop" "HOLOTYPUS ♂, *Epischnomyia merzi* sp.n., J. Roháček det. 2007" [red label] (YSUW, intact, dark specimen). Paratypes: **Korea:** same data as for holotype, 3♂6♀ (1♂4♀ dark, 2♂2♀ pale); Gangwon-do, Hongcheon-gun, Mt. Gachilbong /6, 37°52,0'N/128°28,0'E, 750-900 m, forest, 17.vi.2005 1♂1♀ (both dark), Merz, Choi, Lee & Hwang leg.; Gangwon-do, Hoeng-seon-gun, Mt. Cheongtaesan /9, 37°30,4'N/128°18,0'E, 900-1200 m, forest, hilltop, 18.vi.2005 1♂ (dark), Merz, Han, Choi, Lee & Hwang leg.; Gangwon-do, Jeong-seon-gun, Mt. Mindungsan /11, 37°16,2'N/128°46,5'E, 900-1120 m, forest, meadow, 20.vi.2005 1♂1♀ (both pale); same locality /15, forest, meadow, 24.vi.2005 1♀ (dark), Merz, Han, Ro, Choi, Lee, Hwang & Sok leg.; (YSUW, MHNG, SMOC, 2♂2♀ with genit. prep.).

Etymology: The new species is named in honour of its collector and outstanding dipterist, specialist in a number of acalyptrate families of Diptera, Dr. Bernhard Merz (Genève).

Description: Male. Total body length 2.62-2.78 mm; body bicolourous, yellow and brown to dark brown, generally darker than in *E. triarmigera* but dark pattern of head and thorax very variable, ranging from pale colouration similar to that of *E. triarmigera* (= pale form) to distinctly darkened frons and mesonotum (= dark form). Head hardly or very slightly higher than long, bicolourous, yellow (orange) and brown. Occiput dorsally slightly concave, largely brown, with only medial area between pvt and foramen yellow to dark-yellow and silvery microtomentose (see Fig. 70); ventrolateral part of occiput also more (pale form) or less yellow or ochreous (dark form). Frons pattern variable – more or less brown darkened and striated between orbits and frontal triangle (Fig 70) in dark form to entirely orange in pale form, always dull. Frontal triangle relatively small, narrow and always pale (ochreous-orange to dark yellow) and reaching to middle of frons; ocellar triangle brown to dark brown; ocelli large. Orbits orange-yellow to ochreous, whitish microtomentose. Frontal lunule reduced, narrow, orange. Face narrow, medially less sclerotized, with colouring also variable, ranging from orange with darker (orange-brown) marginal stripe (reaching onto ventral margin of gena) to greyish brown with blackish brown marginal stripe. Parafacialia and gena yellow to ochreous (or parafacialia brownish in darkest specimens), both silvery white microtomentose. Postgena (and ventral part of occiput) pale yellow, whitish grey microtomentose. Mouthparts yellow to pale ochreous; colouring of palpus variable (see below). Cephalic chaetotaxy: pvt long and strongly crossed as in *E. triarmigera*; vti and oc very long, longest of cephalic setae; vte distinctly shorter than vti and exclinately curved; 3 ors, 2 posterior strong (hindmost ors slightly shorter than vti, middle somewhat shorter than vte), 1 anterior small, sometimes reduced to a short setula; 1 additional microsetula in front of the foremost ors; 2-3 pairs of medial microsetulae in the anterior half of frons; 1 short setula behind vte; postocular setulae short, numerous (11-12), in single row; postgena with several setulae and 1 usual posteroventral seta; 1 long vi (about as long as vte) but subvibrissa short and weak, not longer than anterior peristomal setula; 4-5 proclinate peristomal setulae. Palpus small, slender, orange (pale form) to partly or entirely brown (dark form), with 1 longer and 1 shorter dark subapical setula plus 3 ventral setulae. Eye suboval, with longest diameter oblique and about 1.4 as long as the shortest (thus wider than in *E. triarmigera*). Gena short, its smallest height about 0.13 times as long as shortest eye diameter. Antenna slightly geniculate, completely yellow (pale form) or with 1st flagellomere largely brownish darkened (dark form), the latter elongately oval and densely long white ciliate on anterior margin. Arista brown, with basal segment paler, 2.1-2.2 times as long as antenna, relatively shortly ciliate.

Thorax slightly narrower than head, yellow and brown or dark brown, almost dull due to greyish microtomentum. Mesonotum with very variable dark pattern; pale form (Fig. 71) similar to *E. triarmigera*, i.e. largely yellow (though darker than usual in *E. triarmigera*), with 2 broad

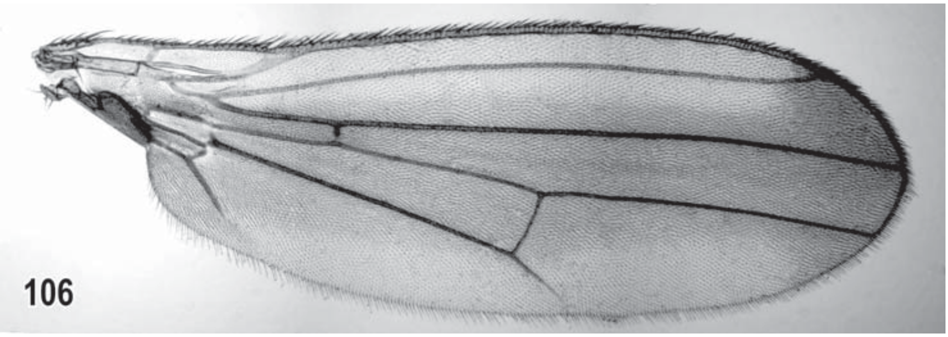


Fig. 106: Wing of *Epischnomyia merzi* sp.n., male paratype, wing length 3.0 mm. Photo by J. Roháček.

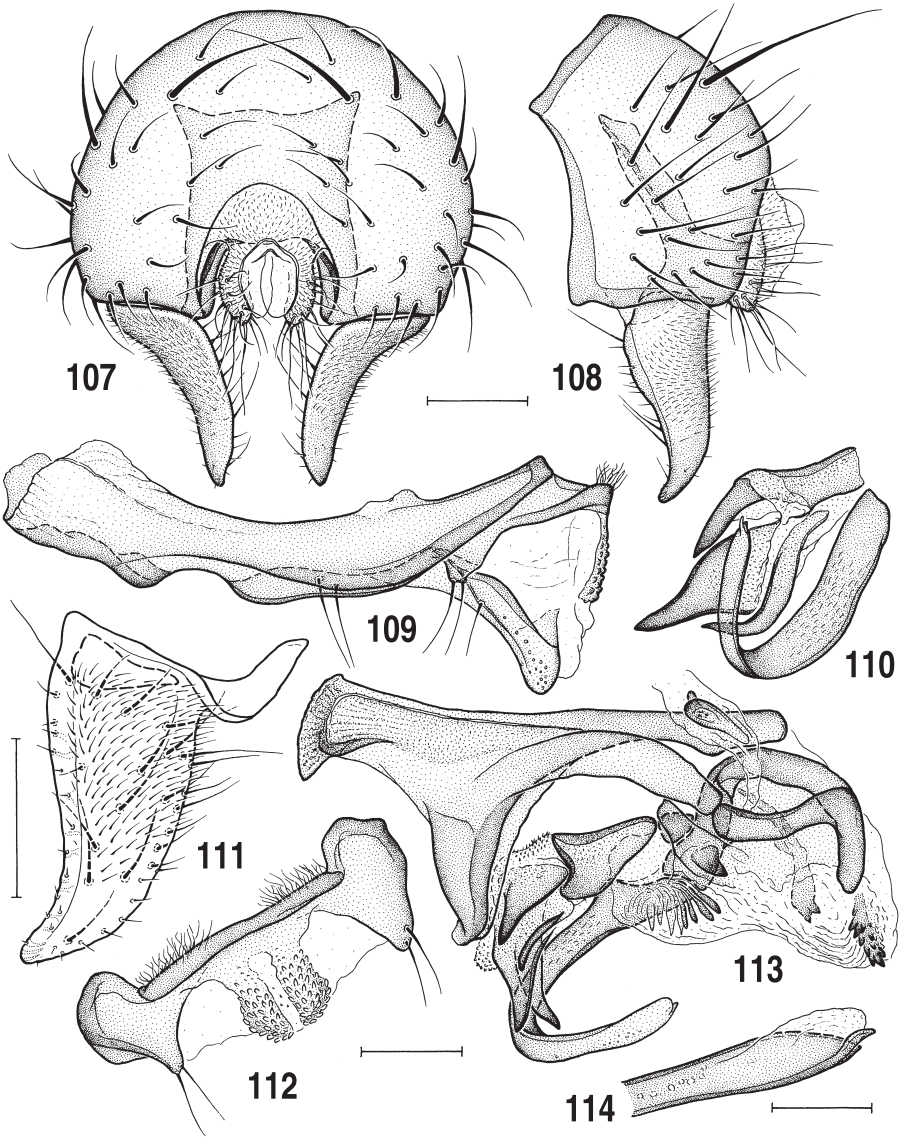
brown longitudinal bands between dc and prs-pa lines, reaching from humeral callus to sides of scutellum; dark form (Fig. 70) also with medial area between these vittae variously brown darkened and scutellum largely brown leaving only very narrow dc stripes, anterior medial area and small spots around bases of apical sc ochreous-yellow. Humeral and notopleural areas (laterally to prs-da line) dirty yellow to yellowish white (ventral part of notopleural band) but humeral callus laterally pale brown. Pleural part of thorax whitish yellow, with brown dorsal band extended from cervix to base of abdomen and its width equaling dorsal half of mesopleuron. Postscutellum pale brown to dark brown (in dark form). Thoracic chaetotaxy (Fig. 70): 1 long hu; 2 long npl (anterior longer); 1 very long prs; 1 (unusually) long sa; 1 long pa; 3 postsutural dc, 1 anterior short (less than twice as long as dc microseta in front of it), hindmost dc very long, as long as apical sc; 4 rows of ac microsetae on suture but only in 2 more posteriorly, hindmost ac situated on the level of posterior dc; 2 sc, laterobasal short and weak (much shorter than middle dc), apical sc very long; 1 ppl, weak but as long as half of height of propleuron; 2 relatively long stpl, anterior shorter, 1 setula in front of them and several (4-5) below them; ventral part of sternopleuron with 4-5 pairs of longer setae. Scutellum elongately triangular, flat dorsally. Legs yellow (coxae and trochanters yellowish white), only apical third to half of last tarsal segment brown. f_1 with ctenidial spine distinctly shorter than width of t_1 and with a number of long hair-like setae in posteroventral (longer setae) and posterodorsal row. f_2 with posteroventral row of erect setae becoming thicker in distal third. t_2 with relatively short ventroapical seta; f_3 with dense posteroventral row of setae (17-22) along entire length of femur, 4-7 in apical third shortened and thickened. Fore and hind basitarsus with somewhat prolonged hairs ventrobasally and mid basitarsus with a row of ventral setulae proximal of which may be thicker. Wing (Fig. 106) long, slightly narrower than in *E. triarmigera*, practically with the same brown and white pattern as that of *E. triarmigera*. Veins dark brown, except for whitish Sc, R_1 and R_{2+3} and largely (from base to apex of R_{2+3}) yellowish white C. C with distinct spinulae between R_1 and R_{2+3}. Shape of R_{2+3} and R_{4+5} closely resembling those of *E. triarmigera*; M somewhat divergent from R_{4+5} apically; discal (dm) cell, r-m, CuA_1, A_1, alula and anal lobe also very similar to those of *E. triarmigera.* Wing measurements: length 2.90-3.14 mm, width 0.89-0.95 mm, Cs_3 : Cs_4 = 1.51-1.89, rm\dm-cu : dm-cu = 3.00-3.56. Haltere dirty yellow, with brownish knob.

Abdomen long, with brown to dark brown (generally somewhat paler than in *E. triarmigera*) T1-T5, S6-S8 and epandrium; S1-S5 ochreous-yellow to pale brown (thus usually lighter than in *E. triarmigera*), all abdominal sclerites sparsely greyish microtomentose and more shining than thorax. Preabdominal terga large, broad, of similar shape and chaetotaxy as those of *E. triarmigera*. Preabdominal sterna markedly narrower than terga, becoming wider and darker posteriorly (S5 largest and darkest and distinctly wider than long). Postabdomen very large, closely resembling that of *E. triarmigera* including membranous, unpigmented and bare T6, extremely large S6 with distinctive anterior internal lobe (the latter darker than in *E. triarmigera*); large S7 (as long as S8), both S6 and S7 laterally strongly bulging and similarly setose S8.

Genitalia very similar to those of *E. triarmigera*. Epandrium (Figs 107-108) slightly broader than high, with rather dense and long setae, besides 2 pairs of longest and thick setae also several anterolateral setae markedly longer than in *E. triarmigera*. Anal fissure rounded semioval (Fig. 107). Cercus small, pale, laterally flattened, finely setose. Medandrium high, moderately wide, subrectangular (Fig. 107) as in *E. triarmigera*. Gonostylus (Figs 107, 111) resembling that of *E. triarmigera* but differing by more slender, distally tapered form and more acute apex; its chaetotaxy also slightly different (see 1 long anterodorsal seta on inner side). Hypandrium (Fig. 109) robust, asymmetrical, very similar in shape to that of *E. triarmigera*. Transandrium (Fig. 112), including caudal process, somewhat wider and lower but otherwise indistinguishable from that of *E. triarmigera*; also basal membrane with very similar armature formed by spine-like tubercles. Pregonites asymmetrical as in *E. triarmigera*; left pregonite (Fig. 109) with anterior lobe bent internally and its posterior part bulging ventrally but this process flatter than in *E. triarmigera*; both anterior and posterior parts of pregonite with only 2 long setae each (additional setulae lacking on the anterior part). Postgonite (Fig. 109) very similar to that of *E. triarmigera* but with longer seta in proximal fourth to third of anterior margin. Aedeagal part of folding apparatus (Fig. 113) asymmetrical, provided besides fine striae with a group of flat elongate spines (some pale, others dark) on left side and with longer sclerotized stripe terminated by a few dark spines on right side; connecting sclerites closely resembling those of *E. triarmigera*, short and heavily sclerotized but more densely spinose. Phallapodeme and aedeagus of the same construction as in *E. triarmigera* (Fig. 113) but apex of phallapodeme somewhat more robust, phallophore projecting into robust epiphallus with larger opening, saccus with 3 robust spikes somewhat differently formed (particularly, middle spike basally broadened, cf. Fig. 110) and apex of filum (Fig. 114) more slender and lanceolate, with small apical projection in addition to subapical membranous lobe. Ejacapodeme small, with simple digitiform projection (Fig. 113).

Female. Similar to male unless mentioned otherwise. Total body length 3.10-3.50 mm. Head and thorax with similarly variable colouring as in male, thus with both dark and pale forms. Pale form with head always darker (orange) than in *E. triarmigera*. Anterior ors, the foremost dc and often also dc microseta in front of the latter distinctly longer than in male. Ctenidial spine on f_1 slightly longer but always shorter than width of t_1; proximoventral setula on mid basitarsus distinctly thicker and longer than in male. f_2 with posteroventral setae fine; f_3 without postero-ventral row of shortened and thickened setae. Wing measurements: length 3.35-3.69 mm, width 1.05-1.15 mm, $Cs_3 : Cs_4$ = 1.56-1.78, rm\dm-cu : dm-cu = 2.91-3.30. Abdomen with preabdominal terga more transverse and more densely setose, brown, often with seemingly darker posterior marginal stripes; sterna narrower than in male, becoming progressively wider and darker posteriorly, ochreous to pale brown; S2-S3 distinctly longer than wide, S5 as long as wide and S6 wider than long.

Postabdomen (Figs 115, 118) somewhat narrower than in *E. triarmigera*. T6 large, but less transverse and with different pigmentation than in *E. triarmigera*, having large, pale-pigmented sublateral spots on anterior margin (Fig. 115). S6 large and similarly setose as that of *E. triarmigera*, but distinctly darkened in anterior two-thirds. Tergosternum T7+S7 dorsally (original T7) shorter and less densely setose than in *E. triarmigera*, ventrally (S7) differing from that of the latter species by pale-pigmented pattern restricted only to very small narrow spots surrounding spiracles and to posterolateral emarginations (Fig. 118). T8 (Fig. 115) with more rounded posterior corners (almost semicircular) and without distinctive micropubescence in contrast to that of *E. triarmigera*. S8 (Fig. 118) also somewhat different, with protruding postero-



Figs 107-114: *Epischnomyia merzi* sp.n., male paratype. **107** - external genitalia, caudally; **108 -** ditto, laterally; **109** - hypandrial complex, laterally; **110** - distiphallus posterolaterally; **111** - gonostylus, sublaterally (widest extension); **112** - transandrium, caudally; **113** - aedeagal complex, laterally; **114** - apex of filum, lateroventrally. Scales: Fig. 114 = 0.05 mm, others = 0.1 mm.

lateral lobes and with narrower posteromedial incision. Internal sclerotization of genital chamber (Figs 119, 121) complex but very closely resembling that of *E. triarmigera*, including shape of all sclerites and their pigmentation but the small sclerite in anterior part of genital chamber near insertion of ducts (see Fig. 121) different, spike-like. Ventral receptacle (Fig. 120) also similar to that of *E. triarmigera*, but its body more hook-like and less sclerotized and its broad duct (partly finely ringed) distinctly longer. Accessory gland (Fig. 117) small, vesiculate, with some minute granulae and globulae, on proximally widened but hardly ringed duct. Spermathecae (1+1) simple, one markedly larger (more than in *E. triarmigera*) than the other, spherical, with very finely ringed surface basally covered by numerous fine spinulae (Figs 116). T10 larger, shorter and broader than that of *E. triarmigera*, darkened in front of very long medial setae (Fig. 115). S10 also shorter and broader than that of *E. triarmigera* having more shallow, subtriangular anteromedial incision (Fig. 118). Cercus (Fig. 121) somewhat shorter and thicker and with shorter denser setae than those of *E. triarmigera*.

Discussion: *Epischnomyia merzi* sp.n. is very closely allied to *E. triarmigera* (Sueyoshi & Roháček, 2003). These species are very similar both in external and genital characters. The differences are relatively small and are enumerated in the above key and stressed in the description. Besides this, *E. merzi* seems be somewhat smaller on average and seems to have slightly narrower wings. The unusual variability in the dark pattern of head and thorax is a conspicuous feature of this species: pale form (most similar to *E. triarmigera*) and dark form (most dissimilar to *E. triarmigera*) were recognized among specimens examined (in two localities they occurred syntopically). This colouring variability seems to be discontinuous (every examined specimen could be assigned to either form) as no really intermediate specimen has been found. The dark form seem to prevail over the pale form (both sexes ratio 5:3, 16 specimens examined; male ratio 4:3, 7 specimens; female ratio 2:1, 9 specimens).

Biology: Poorly known. The majority of type specimens were collected in forests (often near hilltop) at higher altitudes (750-1,200 m). Adults were found in second half of VI.

Distribution: Hitherto, the species has only been recorded from Korea.

Epischnomyia triarmigera (Sueyoshi & Roháček, 2003)

Ischnomyia triarmigera Sueyoshi & Roháček, 2003: 31.
Epischnomia triarmigera: Roháček, 2006a: 209-213 (redescription)

NEW MATERIAL EXAMINED: **Russia:** FE: Yuzh. Primorie, 40 km SO [= Süd-Ost = SE] Ussuriysk, 26.vii.1983 1♀, A. Ozerov (ZMUM).

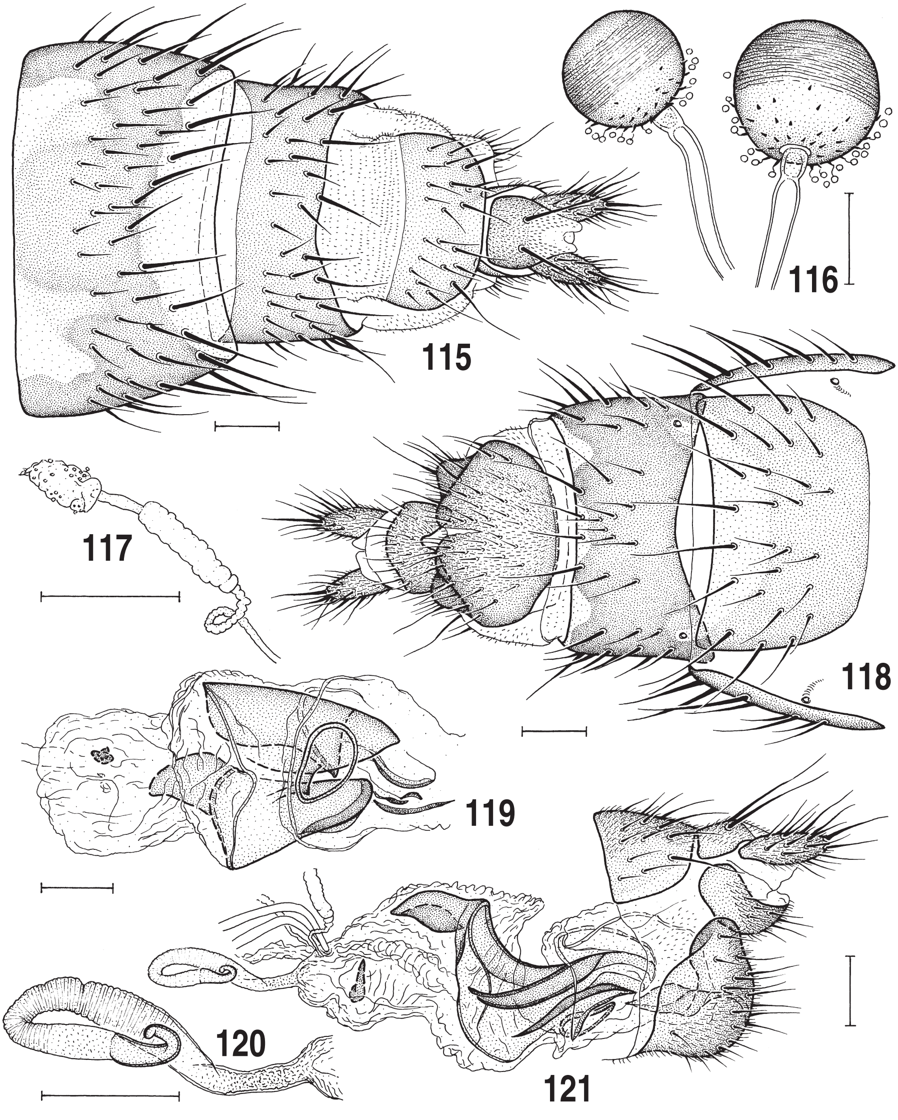
Distribution: Hitherto, the species has only been recorded from the Far East of Russia and from Japan (Hokkaido, Honshu).

Genus ***Fungomyza*** Roháček, 1999

Fungomyza Roháček, 1999d: 391 [feminine]; Roháček & Barber, 2004: 132-133 (redefinition); Roháček, 2006a: 214-215 (redescription).

Type species: *Opomyza albimana* Meigen, 1830: 107 (original designation).

Diagnosis: (1) **Head** distinctly higher than long. (2) Eye large, broadly oval, with longest diameter almost vertical. (3) Frons moderately broad; frontal triangle variable in length, shining



Figs 115-121: *Epischnomyia merzi* sp.n., female paratype. **115** - postabdomen, dorsally; **116** - spermathecae; **117 -** accessory gland; **118 -** postabdomen, ventrally; **119 -** internal sclerites, ventrally; **120** - ventral receptacle, laterally; **121 -** genital chamber and apex of postabdomen, laterally. Scales: Fig. 116 = 0.05 mm, others = 0.1 mm.

or sparsely microtomentose. (4) Frontal lunule small but always distinct. (5) Antenna geniculate between pedicel and 1st flagellomere, the latter strongly compressed laterally. (6) Arista short-ciliate. (7) Palpus yellow, slender but somewhat clavate, with 1 longer subapical seta. Cephalic chaetotaxy: (8) pvt relatively long, crossed or strongly convergent; (9) vte, vti and oc long; (10) 3 ors, anterior slightly or distinctly shorter; 1 microsetula in front of anterior ors; (11) postocular setulae short, in single row; (12) 1 relatively short vi, subvibrissa unrecognizable from peristomal setulae; (13) peristomal setulae small and variable in number.

(14) **Thorax** very slightly narrower than head, more or less shining, despite some microtomentum. Thoracic chaetotaxy: (15) 1 hu, 2 npl (anterior longer); (16) 1 moderate sa, 1 longer pa; (17) 1 distinct, relatively long prs; (18) 2 postsutural dc, both long and strong; (19) ac microsetae small and numerous, in 4 rows, ending in front of level of posterior dc; (20) 2 sc (apical strong, laterobasal short); (21) 1 minute upcurved ppl; (22) 2 distinct stpl (anterior shorter) and a few setulae in dorsal half of sternopleuron. (23) At least one pair of femora variegated (yellow and brown); (24) f_1 with relatively short ctenidial spine; (25) t_2 with distinct ventroapical seta; (26) male f_3 with posteroventral row of setae, distal of which are short and thick. (27) Wing long, moderately narrow; (28) wing membrane unicolourous. (29) C with inconspicuous thicker setulae among fine hairs on Cs_2; (30) R_{2+3} long, parallel to C, ending nearer than or at the same distance from apex of R_{4+5} as M; (31) R_{4+5} slightly bent to sinuate; (32) cell dm relatively long; cross-vein r-m situated distal to middle of dm cell. (33) CuA_1 ending near, A_1 far from wing margin. (34) Anal lobe and alula well developed, relatively large.

Male abdomen. (35) T1 separate from T2, at least dorsally; (36) T2-T5 large and broad. (37) S1-S5 of variable width, dark but slightly paler than associated terga. Male postabdomen: (38) T6 short, transverse, bare and well sclerotized although paler-pigmented than S6-S8. (39) S6 and S7 strongly asymmetrical, partly fused and situated laterally, each with a few setulae. (40) S8 unusually long, less asymmetrical, more setose and situated dorsally.

Male genitalia. (41) Epandrium relatively large, with a number of setae, 2-3 pairs of setae longer. (42) Anal fissure very small, narrowly rounded triangular. (43) Medandrium high, slightly to conspicuously narrowed dorsally. (44) Cercus simple in shape, variable in size. (45) Gonostylus with 2-3 denticles on apex, and with external micropubescence partly or entirely reduced. (46) Hypandrium with anterior flat lobes not or slightly projecting dorsally; (47) transandrium with a forked or medially divided caudal process. (48) Pregonite large, flat, fused to hypandrium, with 2 groups of setae. (49) Postgonite simple, slender, long and relatively straight. (50) Phallapodeme with normal apex and shortly bifurcate symmetrical base. (51) Phallophore short, with more or less distinct ventral process; (52) distiphallus composed of distally membranous saccus and slender sclerotized filum. (53) Saccus with relatively small membranous part, distinct basal and internal sclerites and armed with adpressed spinulae and/or setulae on surface or unarmed; (54) filum formed by 2 long, dark, band-like sclerites fused basally and apically, with simple apex. (55) Aedeagal part of folding apparatus with reduced connecting sclerite and its external wall provided with small grains, tubercles or short spines combined with dark striae. (56) Basal membrane below caudal process with dense small teeth or spines. (57) Ejacapodeme small to moderate, with subterminal digitiform process or modified (in more derived species).

(58) **Female abdomen** relatively shining, with broader terga (T2-T6) and narrower sterna (S2-S5). (59) Postabdomen long, basally broad, caudally strongly tapered, telescopically retractable from 7th segment, with less sclerotized and paler T8, S8, T10 and S10. (60) T6 broad, S6 relatively small, narrow. (61) T7 and S7 disparate, S7 small, narrow, paler than T7. (62) T8 simple, plate-shaped, pale-pigmented; (63) S8 narrow, medially longitudinally divided or (anteriorly) membranous, its posterior bare part dorsally curved and far invaginated into 8th segment. (64) Internal structures of female genital chamber (uterus) weakly sclerotized, formed by 1-2 pairs of partly fused posterior plates and (65) 1 anteroventral, broad but thin, looped

unpigmented sclerite. (66) Anterior part of uterus provided with an elongately vesicular weakly sclerotized ventral receptacle terminating in shortly projecting apex of various ending. (67) Accessory glands relatively small, on slightly dilated ringed ducts. (68) Spermathecae (1+1) roughly cup-like to pyriform, characterized by deep terminal invagination and narrowed basal part covered by fine spinulae. (69) T10 long and narrow, bare except for 1 pair of dorsal setae; (70) S10, simple, pale, slightly longer than T10, almost without micropubescence. (71) Cercus long and very slender, with a number of longer fine setae.

Discussion: Following the discovery of a third species of *Fungomyza* (viz. *F. cercata* sp.n., described below) it was necessary to re-diagnose the genus once more inasmuch as *F. cercata* appeared to bear more plesiomorphic features than both its allies plus several derived characters formerly unknown in this group. Despite several features indicating the similarity of *Fungomyza* to *Paranthomyza* and *Carexomyza* gen.n. (e.g. 1, 14, 53, 54, 58), the phylogenetic analyses (both morphological and molecular) confirmed its association with the *Anthomyza* clade (see Figs 137, 138 in the chapter Phylogeny below). Its closest relative proved to be the genus *Arganthomyza* gen.n. (described above and comprising the former *Anthomyza socculata* group and 2 new species, viz. *Arganthomyza barbarista* sp.n. and *A. versitheca* sp.n.) whose relationship to *Fungomyza* seems to be supported not only by several synapomorphies (caudal process of transandrium forked or medially desclerotized; female S8 longitudinally divided but with posterior bare parts recurved and deeply invaginated into 8th abdominal segment (strongest synapomorphy); spermathecal ducts markedly shortened; well-sclerotized abdominal sterna, similar construction of ventral receptacle) but also by molecular data (see Roháček et al. 2009 and Fig. 138). *Arganthomyza* seems to be a more derived group than *Fungomyza* considering the modified filum of distiphallus (sclerites expanded and attached or partly fused) and female T7 and S7 completely coalesced to form a compact syntergosternite. The poorly known genus *Receptrixa* Roháček, 2006 could also be a candidate for a closer (but highly modified) relative of *Fungomyza* and *Arganthomyza* (shared features: short spermathecal ducts, distally positioned cross-vein r-m) but because the male of its only species is unknown this hypothesis cannot be properly tested.

The most diagnostic characters of *Fungomyza* (those apomorphic are marked “A” in parentheses) are: (1) eye with longest diameter almost vertical; (12) subvibrissa not developed (A); (17) 1 long prs; (23) at least one pair of femora variegated (bicolourous) (A); (32) cross-vein r-m situated distal to middle of dm cell; (38) male T6 short but well sclerotized; (40) male S8 unusually long (A); (42) anal fissure very small, narrowly rounded triangular (A); (43) medandrium high, more or less narrowed dorsally; (51) phallophore short, with more or less distinct ventral process; (53) saccus of distiphallus with membranous part having adpressed surface spinulae (A); (63) S8 narrow, longitudinally divided and invaginated into 8th segment (A); (64) internal structures of female genital chamber (uterus) weakly developed; (65) internal looped structure fine, non-sclerotized (?A); (68) spermatheca with terminal invagination (A). However, most of the apomorphic features listed above are not unique for this genus – some of them are shared with related genera of the *Anthomyza* clade (*Arganthomyza* in particular). The larval mycetophagy of *Fungomyza* (not yet confirmed in *F. cercata* sp.n.) can be considered a non-morphological autapotypic feature of this genus (Roháček 2006a).

The *Fungomyza* species can also be distinguished from all externally similar (dark coloured) Palaearctic species of Anthomyzidae (i.e. some *Arganthomyza* and *Anthomyza* species, *Receptrixa receptrix*, *Carexomyza caricis* and *Paranthomyza nitida*) by external features, i.e. more or less variegated legs, combined with reduced subvibrissa, sparse ac microsetae and distally positioned r-m (the latter only known in *Receptrixa*).

Three species included: *Fungomyza cercata* sp.n. from the Far East of Russia is considered a sister species of the remaining two, viz. *F. albimana* (Meigen, 1830) and *F. buccata* Roháček & Barber, 2004 being distributed on opposite sides of the Atlantic Ocean – *F. buccata* in the eastern USA (see Roháček & Barber 2004), *F. albimana* in Europe and Near East of Asia (Turkey) (Roháček 2006a). The latter is an example of a sister-pair with a transatlantic type of distribution, where the more ancestral species is restricted to the eastern Nearctic Region. Relationships among these species are discussed and displayed in the chapter Phylogeny (Fig. 139).

Key to identification of *Fungomyza* species

1 Fore femur and tibia uniformly yellow. Gonostylus small, externally without micropubescence and its apex with 3 denticles (Fig. 125); male cercus large and with thick dark setae (Fig. 123). Aedeagal part of folding apparatus with dense dark-pigmented spines and striae (Fig. 127). Female unknown .... *F. cercata* **sp.n.** [p. 89]

– Fore femur and tibia dark brown variegated (Roháček 2006a: Fig. 466; Fig. 147). Gonostylus larger, externally at least partly micropubescent and its tapered apex with 2 denticles (Roháček 2006a: Fig. 468); male cercus small, finely and pale setose (Roháček 2006a: Fig. 467). Armature of aedeagal part of folding apparatus pale-pigmented, inconspicuous 2

2(1) Anterior ors long and gena unusually high (Roháček & Barber 2004: Fig. 1); frons, including most of frontal triangle, microtomentose and dull. Mid and hind femora darkened in distal half. Gonostylus with projecting apex and pregonite without posterior projection (Roháček & Barber 2004: Figs 3, 4). Female T8 short and transverse, spermathecae more rounded (Roháček & Barber 2004: Figs 8, 12) .... [*F. buccata* Roháček & Barber 2004] (Nearctic)

– Anterior ors short and gena very narrow (low) (Fig. 147); frontal triangle and posterior part of orbit bare and shining. Mid and hind femora uniformly yellow (Fig. 147). Gonostylus apically narrowed but not projecting and pregonite with distinct posterior projection (Roháček 2006a: Figs 468, 471). Female T8 long, longer than broad and spermathecae roughly pyriform, with narrowed basal part (Roháček 2006a: Figs 474, 476) .... *F. albimana* (Meigen, 1830)

Fungomyza albimana (Meigen, 1830)

(Figs 147, 148)

Opomyza albimana Meigen, 1830: 107.
Anthomyza albimana auctt.
Fungomyza albimana: Roháček, 1999d: 393-394, 2006a: 214-215 (redescription).
Opomyza glabra Meigen, 1838: 380.
Agromyza nigrimana Meigen, 1838: 400.
Anthophilina armillaris Rondani, 1875: 188.
Anthomyza albimana var. *rufa* Czerny, 1928: 3.

NEW MATERIAL EXAMINED: 67♂39♀. **Czech Republic**: W Moravia, Třešť 1.2 km NE, Březíčko, on decayed *Russula virescens*, forest margin, 3.viii.2008 8♂6♀; same locality, on decayed *Russula* cf. *xerampelina*, 3.viii.2008 30♂12♀; N Moravia, Šilheřovice-Černý les res. (distr. Opava), on decayed *Polyporus squamosus*, 10.viii.1992, 3♂; N Moravia: Karviná-Doly, Mokroš pond, 49°49´N, 18°30´E, mine dump, on decayed *Russula grisea*, 29.vii.2008 3♂6♀, all J. Roháček leg. (SMOC). **Russia:** Moscow region: Ozhigovo station (Naro-Fominsk distr.), on *Lactarius* sp., 26.vii.2008 1♂1♀, D. Gavryushin leg. and photographed (DGN). **Slovakia:** Ruské (distr. Humenné), on *Lactarius piperatus* in birch forest, 6.viii.1985 22♂14♀, J. Roháček leg. (SMOC).

Distribution: The species is widespread in Europe and Turkey. It has been recorded from Albania, Austria, Belgium, Bulgaria, Czech Republic (Bohemia: Roháček 2006b, Moravia: Roháček 2006b), Estonia, France, Germany (Riedel 1919 sub *Anthomyza*, Bährmann 2006, Stuke 2009), Great Britain (England), Hungary (Dely-Draskovits & Babos 1993 sub *Anthomyza*), Italy, Latvia (Karpa 2008), Netherlands, Norway, Poland, Russia (NET, CET), Serbia & Montenegro (Serbia), Slovakia (Roháček 2006b), Slovenia, Spain (Carles-Tolrá 2001), Sweden, Switzerland, Turkey, Ukraine.

***Fungomyza cercata* sp. n.**

(Figs 122-129)

TYPE MATERIAL: Holotype ♂ labelled: "Южн. Приморье, 40 км Ю-В Уссурийска, А. Озеров" [= Southern Primorie, 40 km SE Ussuriysk, A. Ozerov], "4. VIII. 1987", "Paranthomyza nitida (Meigen, 1938), det. D. Gavryushin, 2008", "Fungomyza cercata sp.n. ♂ , J. Roháček det. 2008" (red) (ZMUM, genit. prep., left wing severely damaged, right wing detached, photographed and preserved together with cleared abdomen and genitalia in glycerine in a sealed plastic tube pinned below specimen).

Etymology: The species is named "cercata" to reflect its distinctive male cercus being enlarged and strikingly dark setose (in contrast to all congeners).

Description: Male. Total body length 1.98 mm; general colour blackish brown, with extremities and fore head largely yellow; most of body distinctly shining despite sparse greyish brown microtomentum. Head distinctly higher than long (1.2 times as high as long), dorsally slightly broader than thorax; dorsal part of occiput distinctly concave. Occiput uniformly blackish brown and subshining due to brownish grey microtomentum. Frons moderately broad, slightly tapering anteriorly, orange-yellow anteriorly, ochreous-orange posteriorly (lateral to frontal triangle), dull except for frontal triangle and posterior parts of orbits. Orbit ochreous-yellow and dull anteriorly, brown, bare and lustrous posteriorly (behind posterior ors). Frontal triangle shorter than in *F. albimana*, reaching to anterior third of frons (up to level of middle ors), dark brown, bare and lustrous except for small part of anterior corner being orange-ochreous and microtomentose. Ocellar triangle and ocelli large, sparsely greyish brown microtomentose. Face (praefrons) moderately narrow, medially concave, dirty yellow and whitish microtomentose. Parafacialia and gena whitish yellow, with silvery white microtomentum and narrowly brown-bordered on ventral and anteroventral margins. Postgena brown but with paler, ochreous ventral margin, sparsely greyish brown microtomentose. Cephalic chaetotaxy: pvt relatively long, with apices crossed; vti slightly shorter than vte and oc, the latter two subequal and longest of cephalic setae; 3 ors, the hindmost longest (but distinctly shorter than oc or vte), the middle shorter, the foremost small (only one-third of middle ors); there is 1 orbital microsetula in front of the foremost ors and 3 pairs of microsetulae medially, in front of anterior corner of frontal triangle; postocular setulae (9) in a single row, short but uppermost (inclinate) setula behind vte enlarged; postgena with 1 usual longer ventral seta and a few shorter setulae; vi relatively short (as long as but weaker than middle ors) and subvibrissa reduced to setula indistinguishable from 3-4 short proclinate peristomals. Eye large, covering most of head in profile, with longest diameter (about 1.3 times as long as shortest) almost vertical. Gena higher than in *F. albimana*; its height 0.12 times as long as shortest eye diameter. Palpus short and distinctly clavate, with 3-4 setulae ventrally, the subapical markedly longer. Mouthparts, including palpus, dirty yellow. Antenna geniculate, uniformly orange-yellow; 1st flagellomere strongly laterally compressed and shortly ciliate on anterior margin. Arista brown, 1.85 times as long as antenna, with relatively small and slender basal segment and very short cilia.

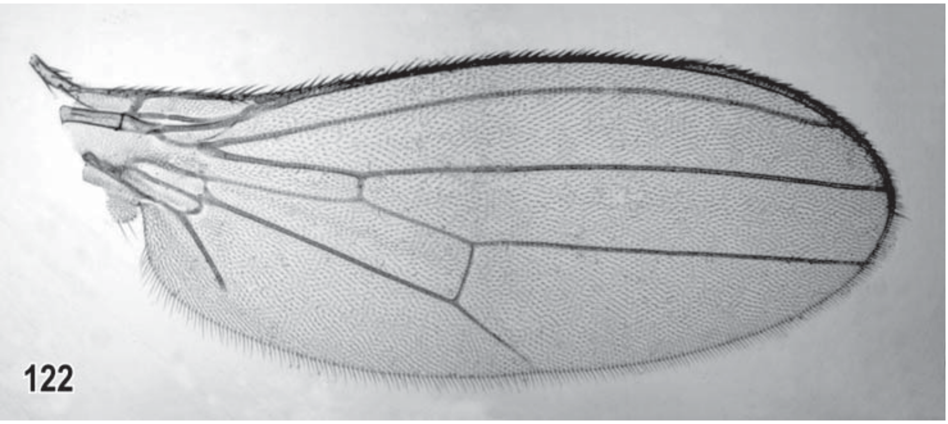
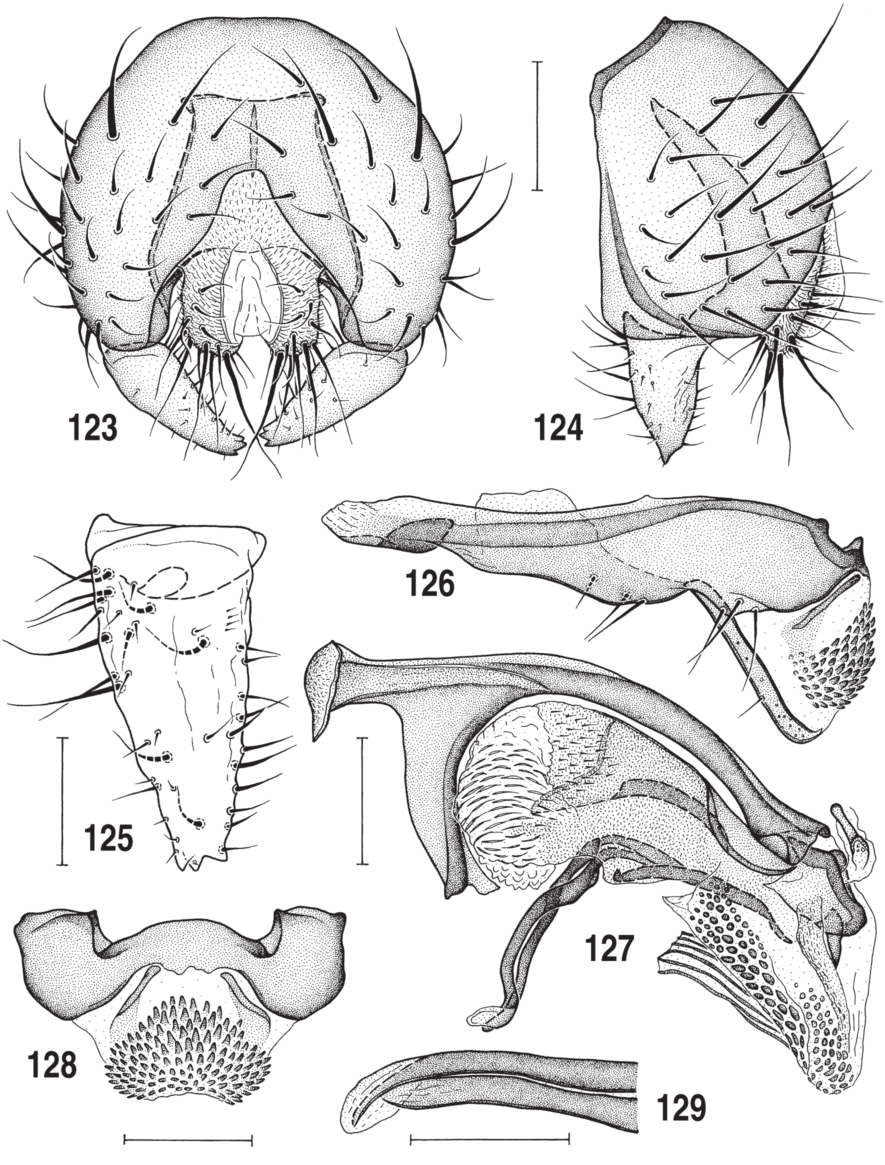


Fig. 122: Wing of *Fungomyza cercata* sp.n., male holotype, wing length 2.15 mm. Photo by J. Roháček.

Thorax slightly narrower than head, dark brown except for extreme ventral corner of sternopleuron. Mesonotum more shining than in *F. albimana* despite sparse dark grey microtomentum; no bare areas on scutum or scutellum; pleural part of thorax more densely microtomentose and distinctly duller. Thoracic chaetotaxy: 1 hu (as long as posterior npl), 2 npl (anterior longer), 1 sa (slightly shorter than pa), 1 pa (long), 1 well-developed prs (as long as pa); 2 dc (both postsutural), anterior shorter than half of posterior, the latter long and strong, numerous dc microsetae in front of anterior dc; ac microsetae short and relatively dense, in 4 rows, posteriorly almost reaching to level of posterior dc; 2 sc, apical strong and slightly longer than posterior dc (hence longest of thoracic setae), laterobasal short and weak; 1 minute upcurved ppl; 2 rather weak stpl (anterior shorter) and 2 microsetae in dorsal half of sternopleuron in addition to several setae on ochreous-yellow ventral corner of sternopleuron. Scutellum rounded triangular and strongly convex dorsally. Legs dirty yellow (coxae pale yellow), only f_3 with brown or pale brown subapical annulus in distal third (but knee yellow); also last tarsal segments partly or entirely brownish darkened. f_1 with ctenidial spine about as long as maximum width of t_1 and with usual rows of long thin posterodorsal and posteroventral setae; f_2 simply setulose; f_3 with posteroventral row of 9 erect setae, 4 of which in apical third shortened and somewhat thickened. t_1 and t_3 uniformly short-setulose; t_2 with usual but relatively short ventroapical seta. Tarsi without peculiarities; fore and hind basitarsus with somewhat longer setulae proximoventrally. Wing (Fig. 122) moderately wide, membrane and veins pale yellowish brown. C with thicker but short and sparse setulae among usual fine hairs on Cs_2. Sc well developed apically; preapical kink relatively small. R_{2+3} strongly bent, parallel to C and ending only slightly farther from wing apex than does M. R_{4+5} slightly bent, subparallel to M. Discal (dm) cell relatively long; its distal part (behind r-m) only slightly widened distally; anterior cross-vein (r-m) situated distally, distinctly behind middle of discal cell. CuA_1 almost reaching wing margin, A_1 ending far from it. Terminal section of CuA_1 about 1.7 times as long as posterior cross-vein (dm-cu). Alula small but relatively broad. Wing measurements: length 2.16 mm, width 0.71 mm, $Cs_3 : Cs_4 = 1.25$, r-m\dm-cu : dm-cu = 2.12. Halter orange-yellow, stem somewhat darker.

Abdomen blackish brown and shining despite sparse greyish brown microtomentum. T1 dorsally distinctly delimited, only laterally fused with T2, with shorter setulae than those on the following terga. T2-T5 large and broad (T2 and T3 widest), extended ventrolaterally, subequal in length but becoming somewhat narrower caudally, with simple sparse setosity. Preabdominal sterna slightly paler brown than terga and relatively broad; pleural membrane between terga and



Figs 123-129: *Fungomyza cercata* sp.n., male holotype. **123** - external genitalia caudally; **124** - ditto, laterally; **125** - gonostylus lateroventrally (widest extension); **126** - hypandrial complex, laterally; **127** - aedeagal complex, laterally; **128** - transandrium, caudally; **129** - apex of filum, ventrally. Scales: Figs 125, 129 = 0.05 mm, others = 0.1 mm.

sterna narrow. S1 damaged in holotype and therefore undescribed. S2 distinctly shorter and narrower than S3; S3-S4 subequal in length, S4 slightly wider, both markedly wider than long and hence transverse; S5 slightly narrower than S4 but also distinctly transverse. S2-S5 simply setulose. Postabdomen strongly sclerotized, shining blackish brown (including epandrium). T6 distinctly sclerotized, only slightly paler than others, medially undivided, forming a simple, strongly transverse sclerite. S6, S7 and S8 coalesced together but their borders distinctly delimited; S6 the shortest, strongly asymmetrical, ventrally band-like, with only a single seta; S7 longer, asymmetrical, situated on left lateral side of postabdomen and bearing 2 setae (but the ventral reduced to small setula); S8 long (as characteristic for *Fungomyza*), situated dorsally and slightly asymmetrical (larger on right side), with several setae in posterodorsal half.

Genitalia. Epandrium (Figs 123-124) relatively large, globose, slightly wider than high (Fig. 123), shining blackish brown, with 2 pairs of longer and more robust setae among a number of shorter ones some of which situated near anterior margin. Anal fissure very small, narrowly rounded triangular (Fig. 123), very similar to that of *F. albimana*; cercus below it strikingly larger than in congeners and with unusually robust and dark setae including 5 long ones (Figs 123, 124). Medandrium high (long), broad ventrally and (in contrast to relatives) only gradually narrowed dorsally (Fig. 123), with small posteromedial ridge (as in other *Fungomyza*). Gonostylus (Figs 123, 125) small, paler than epandrium, markedly smaller than in relatives, much shorter than epandrial height, with apices strongly inclinate, broadest proximally and gradually tapered apically and bearing 3 small teeth on apex; micropubescence practically absent on its outer convex side (only a minute remnant can be seen posterodorsally - see Fig. 125); setae relatively strong and mainly inserted on inner side at anterior margin. Hypandrium (Fig. 126) forming together with transandrium usual frame-shaped structure, moderately robust, with distinct but weakly sclerotized, flat and somewhat dorsally projecting anterior internal lobes. Transandrium relatively robust also medially (Fig. 128) and with caudal process represented by a pair of slender, distally widened sclerites (hence medially membranous); basal membrane below caudal process provided with a dense group of short thick and brown-pigmented spines. Pregonite large, fused to hypandrium, incurved, anteriorly flat and carrying 3 setae (as in relatives), posteriorly very weakly projecting (as in *F. buccata*) and with 3 setae (Fig 126). Postgonite long and slender (Fig. 126), with a single seta in distal third of anterior margin, with fine grain-like sensillae on outer surface and with pointed, somewhat bent apex. Aedeagal part of folding apparatus (Fig. 127) with dense and dark-pigmented grain-like spines and (more internally) dark striae; connecting sclerites weakly sclerotized but distinct, attenuated distally. Phallapodeme (Fig. 127) moderate, proximally more robust than in relatives; basal end of phallapodeme widened, shortly and relatively symmetrically forked and its posterolateral corners characteristically wing-like upturned; apex of phallapodeme strongly bicuspidate. Aedeagus (Fig. 127) with short phallophore (being only posteriorly dark and strongly sclerotized) provided with ventral acute process (also developed but less projecting in congeners); distiphallus bifid, composed of voluminous, distally membranous saccus and slender, sclerotized filum. Saccus internally reinforced with slightly bent sclerite and its proximal part weakly sclerotized; its surface in basal two-thirds finely pubescent while in apical dilated membranous part covered with fine adpressed spines (like that of *F. albimana*). Filum very similar to that of *F. albimana* but shorter, composed of two dark, band-like sclerites which are basally connected; apex of filum (Fig. 129) formed by fused band-like sclerites one which is projecting as small, flat, hyaline lobe (also similar to that of *F. albimana*). Ejacapodeme larger than that of both congeners, rather weakly sclerotized but with long digitiform process (Fig. 127).

Female unknown.

Discussion: This new species appears to be more ancestral than both its congeners, viz. *Fungomyza albimana* (Meigen, 1830) and *F. buccata* Roháček & Barber, 2004, in having only the hind femora brown annulated (fore leg unicolourous), a less modified medandrium (without suddenly narrowed dorsal part), a short caudal process of the transandrium and an unmodified and relatively large ejacapodeme (with plesiomorphic digitiform projection). Interestingly, apart from some genital characters (see below), the new species is very similar to allied species (*F. albimana* in particular) in surface structure and chaetotaxy of frons and thorax, abdominal sclerites (including dark sterna and construction of the male postabdomen) and even in such details as the shape of the anal fissure, ventral process of phallophore, the armature of the saccus of distiphallus and the apex of distiphallus. Besides the colouring of legs and other previously mentioned features, *F. cercata* sp.n. differs from both relatives by the markedly larger male cercus with long and dark-pigmented setae, the smaller and straight gonostylus lacking micropubescence and with 3 denticles on apex and the pigmented armature of the aedeagal part of folding apparatus.

Biology: Unknown. The holotype male was collected in beginning of VIII.

Distribution: Russia (Far East).

Paranthomyza Czerny, 1902

Paranthomyza Czerny, 1902: 254 [feminine]; Roháček, 2006a: 224-226 (redescription).

Type species: *Opomyza nitida* Meigen, 1838: 380 (monotypy).

Diagnosis (new): (1) **Head** distinctly higher than long. (2) Eye large, broadly suboval, covering most of head in profile. (3) Frons moderately broad despite large eyes; frontal triangle large, strongly shining. (4) Orbits indistinctly delimited on inner side. (5) Frontal lunule reduced but distinct. (6) Antenna geniculate between pedicel and 1st flagellomere, the latter laterally strongly compressed. (7) Arista shortly ciliate. (8) Palpus yellow in male, brown in female, slender, with 1 longer subapical seta. Cephalic chaetotaxy: (9) pvt absent; (10) vte, vti and oc long; (11) 2 ors but only posterior long, anterior very short; 1 microsetula in front of anterior ors; (12) a single row of short postocular setulae; (13) 1 long vi and 1 shorter subvibrissa; (14) peristomal setulae small and few in number.

(15) **Thorax** distinctly narrower than head, strongly shining with very reduced microtomentum; mesopleuron almost bare and lustrous. Thoracic chaetotaxy: (16) 1 hu, 2 npl (anterior longer); (17) 1 distinct prs (as long as hu); (18) 1 short sa, 1 longer pa; (19) 2 postsutural dc, the posterior very long, anterior short; (20) ac microsetae in 2-4 rows in front of suture, ending in front of posterior dc; (21) 2 sc (apical long, laterobasal small); (22) 1 very minute ppl; (23) 2 long stpl (anterior shorter). (24) Legs unicolourous, yellow; (25) f_1 with ctenidial spine; (26) t_2 with distinct ventroapical seta; (27) male f_3 with posteroventral row of short thickened setae. (28) Wing moderately narrow; (29) wing membrane unicolourous. (30) C with thicker setulae among fine hairs on Cs_2; (31) R_{2+3} long, parallel to C, ending distinctly farther from wing apex than does M; (32) R_{4+5} slightly sinuate; (33) cell dm short to medium-long; cross-vein r-m normal (slightly oblique), situated near middle of dm cell. (34) CuA_1 not reaching wing margin, A_1 ending far from it. (35) Alula narrow.

Male abdomen. (36) T1 separate from T2, at least dorsally; (37) T2-T5 large and broad. (38) S1-S5 much narrower and somewhat paler than associated terga. Male postabdomen: (39) T6 short, band-like, weakly sclerotized, pale-pigmented but undivided. (40) S6 and S7 strongly asymmetrical, partly fused and situated laterally, (41) S8 medium-sized, less asymmetrical and situated dorsally.

Male genitalia. (42) Epandrium relatively small and narrow, with sparse setae, 1-2 pairs of setae longer. (43) Medandrium dilated both dorsally and ventrally and with more complex (ventromedially incised) ventral half; (44) cercus very small, simple in shape. (45) Gonostylus relatively narrow, setose at anterior and posterior margins of inner side, micropubescent externally. (46) Hypandrium with distinctive anterior dorsally projecting and tuberculate flat lobes; (47) transandrium with a weakly sclerotized caudal process provided with small and a few tubercles. (48) Pregonite fused to hypandrium, incurved and very slightly projecting ventrally. (49) Postgonite relatively broad, distinctly sinuous in profile and with apex pointed; (50) Phallapodeme long and slender, with long apical part and shortly bifurcate base. (51) Aedeagus with short phallophore and (52) distiphallus composed of voluminous membranous saccus and slender sclerotized filum. (53) Saccus with dorsal internal paired sclerite, basally coalesced with aedeagal part of folding apparatus and its larger membranous part with numerous setulae on surface; (54) filum formed by 2 long, dark, very slender, band-like sclerites fused basally and ending divergently in membranous apex. (55) Aedeagal part of folding apparatus strongly asymmetrical, with lateral lobes differently formed and armed (spinulae vs. flattened tubercles) on left and right side. (56) Connecting sclerite slender, pigmented, with a few spinulae at apical part. (57) Basal membrane without special sclerotized structures. (58) Ejacapodeme small, with slender digitiform projection.

(59) **Female abdomen** shining, with broader terga (T2-T6) and narrower sterna (S2-S5), both well sclerotized. (60) Postabdomen relatively broad and short but telescopically retractable from 7th segment, with both terga and sterna unusually strongly sclerotized and dark. (61) T6 and S6 relatively large. (62) T7 and S7 disparate, both darkly pigmented, S7 unusually large, parallel-sided, anteriorly overlapping with corners of T7. (63) T8 plate-shaped, relatively large, about as long as broad, with reduced setosity; (64) S8 relatively short and broad, transversely oval, with a posteromedial cleft. (65) Internal sclerotization of female genital chamber (uterus) well developed, formed by 1 pair of large complex posterior sclerites and (66) 1 anteroventral, unusually small circular annular sclerite. (67) Ventral receptacle small, shortly subcylindrical with clavate tip, on short, basally dilated duct. (68) Accessory glands of usual form, small, on terminally strongly dilated ducts. (69) Spermathecae (1+1) of pyriform form, with very narrowed and spinulose basal part (described incorrectly as cervix by Roháček 2006a Fig. 490) and sphaerical to lemon-shaped main part; true duct cervix pale-pigmented. (70) T10 short and transversely bent, dark, with 1 pair of dorsal setae; (71) S10 very large, of complex structure and pigmentation, almost without micropubescence. (72) Cerci short, broad, widely separate and shortly setose.

Discussion: Roháček (1999d) extended the concept of the originally monotypic genus *Paranthomyza* Czerny, 1902 by the (tentative) inclusion of *P. caricis* Roháček, 1999. This caused its considerable heterogeneity and impossibility to delimit it by distinct synapomorphic characters and, subsequently, to demonstrate its monophyly. True, *P. caricis* differs strikingly from the type species (*P. nitida*) in the formation of the male and female terminalia where the shared characters proved to be plesiomorphic in the framework of the subfamily Anthomyzinae. Despite this, the generic concept of *Paranthomyza* was maintained by Roháček (2006a). Because of doubts about the generic affiliation of *P. caricis* both *Paranthomyza* species were included in the phylogenetic analysis based on molecular data (of the mitochondrial 14S and 16S rRNA gene markers) by Roháček et al. (2009), see also Fig. 138 in the chapter Phylogeny. This analysis resulted in finding that *P. nitida* and *P. caricis* are not sister-species, nor closely related, and that, consequently, they cannot be considered congeneric despite their superficial resemblance in some external features. This result thus confirmed what had already been known about genitalic dissimilarities of these species.

The only possible taxonomic solution of this problem is to remove *P. caricis* from the genus *Paranthomyza*, to return to the original monotypic concept of this genus and to redefine it accordingly. Because *P. caricis* cannot be relegated to any of described genera a new genus *Carexomyza* is established above to accomodate this species.

The genus *Paranthomyza* (the narrowed, monotypic concept) can be characterized by the following apomorphic features: (3) frontal triangle large and strongly shining; (9) pvt absent (unique within the Palaearctic genera of Anthomyzidae); (11) only 1 (posterior) ors long; (15) thoracic microtomentum very reduced, mesopleuron bare and lustrous; (43) medandrium dilated both dorsally and ventrally and with more complex (ventromedially incised) ventral half; (46) hypandrium with large, dorsally projecting and tuberculate anterior lobes; (53) saccus basally coalesced with aedeagal part of folding apparatus; (55) aedeagal part of folding apparatus strongly asymmetrical, differently formed and armed on each side; (62) female S7 separate but enlarged, anteriorly overlapping with corners of T7; (66) female genital chamber with annular sclerite unusually small and circular; (69) spermathecae pyriform, with very narrowed, long and spinulose basal part; (71) S10 large, of complex structure (with anterior dark strip) and pigmentation. In all these characters *Paranthomyza* differs from *Carexomyza* and also from all habitually similar (= shining dark-bodied) species of other Palaearctic genera of Anthomyzidae. Differences of *Paranthomyza* from the externally similar Nearctic species *Mumetopia terminalis* (Loew, 1863) [which apparently also belongs to an undescribed genus] are summarized in Roháček (2006a: 226).

The relationships of *Paranthomyza* to other genera of Anthomyzidae remain rather unclear. The molecular analysis (Roháček et al. 2009) clustered *Paranthomyza nitida* rather surprisingly with *Typhamyza bifasciata* (see Fig. 138) and both these taxa with *Anagnota*. However, both these branches are poorly supported which does not necessarily demonstrate the relationships of these genera. Subsequently, a few morphological apomorphies were found which can support affinities of *Paranthomyza* and *Typhamyza* despite their representatives are so much dissimilar externally (Phylogeny, Fig. 137). These include the similarly formed ventral receptacle, small circular annular sclerite and particularly, the modified female S10 with separate anterior dark strip. However, all these features are of the female; because no obvious synapomorphy has been found in the male genitalia, this fact may indicate that the relationship between these two genera is not very close.

Paranthomyza nitida (Meigen, 1838)

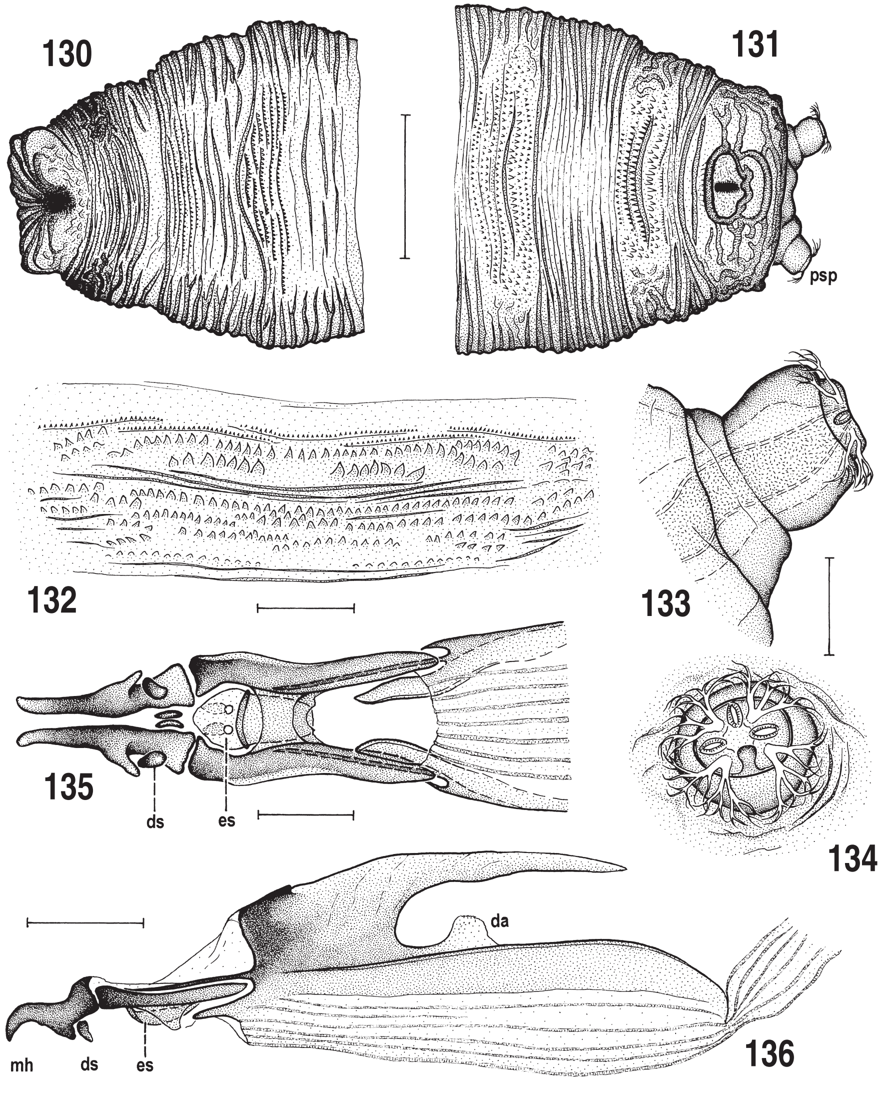
(Figs 54, 130-136, 164-165)

Opomyza nitida Meigen, 1838: 380.
Paranthomyza nitida: Roháček, 2006a: 227-233 (redescription).
Anthophilina flavipes Zetterstedt, 1848: 2696.
? *Opomyza asteia* Haliday, 1833: 177.

NEW MATERIAL EXAMINED: 73♂70♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, sweeping undergrowth of alder forest, 12.vi.2006 1♀; Gesäuseeingang nr Admont, Enns valley, sweeping undergrowth of floodplain forest, 13.vi.2006 9♂5♀; Hall-Donibas nr Admont, 650 m, sweeping vegetation near brook, 13.vi.2006 4♂6♀; Frauenberg nr Admont, 1 km S, Enns valley, sweeping undergrowth of deciduous forest, 15.vi.2006 4♂6♀, all J. Roháček leg. (SMOC); Steiermark: Admont, 17.vii.1892 1♂1♀; Styriae Alp., 28.viii. 1♂, all G. Strobl leg. and det. as *Geomyza nitida* (NMBA); Bad Gastein, Bellevue Alm, 1300 m, 16.vii.2004 2♂, A. Freidberg leg. (TAUI). **Czech Republic:** C. Bohemia: Kunice, meadow near forest, larva in pasture soil 18.iii.1978, pupated 25.iii.1978, 1♂ emerged 9.iv.1978, M. Barták leg. (SMOC); N Bohemia: Pavlovice 2 km W, Dolské údolí valley, 50°36´N, 14°30´E, sweeping *Juncus effusus* near brook, 25.vi.2008 1♀; same, sweeping *Stellaria nemorum* in alder forest, 25.vi.2008 31♂23♀; N Bohemia: Sosnová 1.5 km SW, Peklo res., 50°39´N, 14°31´E, sweeping *Impatiens parviflora* in forest, 27.vi.2008 6♂11♀, same, sweeping undergrowth of alder forest, 27.vi.2008 1♀; N Bohemia: Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping undergrowth of alder forest, 23.vi.2008 2♂1♀; N Moravia: Starý Bohumín, Odra river, 46°56´N, 18°20´E, sweeping undergrowth of deciduous forest, 24.v.2006 4♀, all J. Roháček leg. (SMOC). **Germany:** Schleswig-Holstein, Sieversdorf at lake Postsee, 54°14'N 10°14'E, no. 346, swept on large area covered with *Symphytum officinale* [without any Cyperaceae], 18.vi.1979 2♂3♀; Schleswig-Holstein, Stocksee (Kreis Plön), no. 359, swept, 9.vii.1982 1♀, all M. v. Tschirnhaus leg. (ZSMC). **France:** Rhone Alpes: Cublize, Lac des Sapins (Lambert Grid 757-2113), 6.vi.1993 1♂, P. Withers leg. (PWS). **Italy:** Alto Adige, Tartscher Tal, south of Trafoi, 46°32´33.9N, 10°30´17.2E, 1630 m, Malaise trap, 13.-25.vii.2005 1♂; Suldental, east of Gomagoi, 46°34´33.8N, 10°32´51.2E, 1220 m, Malaise trap, 11.-27.vi. 2♂1♀, 27.vi.-4.vii. 1♂, 1.-8.viii. 1♀, 8.-15.viii.2005 1♂; Suldental near Schmelz, southwest of Prad, 46°36´42.1N, 10°34´35.6E, 940 m, Malaise trap, 31.v.-11.vi.2005 1♀, C. Lange & J. Ziegler leg. (ZMHB). **Romania:** Transylvania, „Schu Gl“, 7.viii. 1♂ 1♀, ? leg., G. Strobl det. as *Leptomyza flavipes* (NMBA). **Russia:** CET: Moscow region: Naro-Fominsk, 2.vi.2007 1♂, 10.vi.2007 1♂, D. Gavryushin leg. and photographed (DGN); SET: Kavkaz, Sev. Osetiya, okr. g. Alagir, 12.vi.1989 1♀, A. L. Ozerov leg. (ZMUM). **Slovakia:** C Slovakia: Poľana BR, Hrochoťská dolina (valley), Hrochoť 3 km E, 48°39´N, 19°21´E, 570 m, sweeping undergrowth of alder forest, 21.viii.2007 1♂, J. Roháček leg. (SMOC). **Slovenia:** Suha, 1♀, Thalhammer leg., G. Strobl det. as *Geomyza nitida* (NMBA).

Preimaginal stages: Egg unknown. Last instar larva has been very briefly described by de Meijere (1944: 60-61, Figs 19-23) with schematic illustrations of the cephalopharyngeal skeleton, anterior and posterior spiracles. Unlike all other known anthomyzid larvae, *P. nitida* has anterior spiracle elongately fan-shaped with about 5 digitiform projections (de Meijere (1944: Figs 21). The cephalopharyngeal skeleton of 3rd-instar larva and posterior spiracles are re-described in more detail below based on structures taken from the puparium (Figs 130-136). The cephalopharyngeal skeleton is composed of three parts: mouthhooks (mandibles), intermediate (hypostomal) sclerite and pharyngeal sclerite. The paired mouthhooks (mh) relatively simple, proximally widened, distinctly ventrally projecting in the middle and distally slender, hook-like curved and apically pointed. Dental sclerite (ds) small (short) but distinctly developed and situated ventrally behind ventral process of mouthhook. Intermediate sclerite relatively slender, H-shaped in ventral view (Fig. 135), with connecting bridge medium wide but pale-pigmented. Epistomal plate (Figs 135-136, es) elongate, situated relatively ventrally between anterior arms of intermediate sclerite and weakly sclerotized except for transverse dark stripe in its middle, with a pair of minute round structures (perforations ?) anteriorly. In addition, there is a pair of minute, elongate, closely attached sclerites between proximal parts of mouthhooks (Fig. 135). Pharyngeal sclerite (Fig. 136) with darkest pigmentation at anterior margin of dorsal cornua and on dorsal bridge. Dorsal cornu becoming paler and slender posteriorly and not very separate from ventral cornu; dorsal bridge simple (not perforated) and not separated from dorsal cornua; parastomal bar very thin, distally finely attenuated. Ventral cornu rather uniformly pale-pigmented, dorsally delimited by darker slender ledge and with distinct but flat and pale-pigmented dorsal apodeme (Fig. 136 - da) and anteroventrally projecting in a slender process directed below intermediate sclerite. Ventral cornua ventrally connected by finely longitudinally ridged down-ward-curving trough.

Puparium (Figs 54, 130-134) elongately oval, rather cylindrical, hardly dorsoventrally flattened, with both ends somewhat tapered and with shallow dorsolateral impressions. The vacant puparium is comparatively dark, orange to reddish brown, densely transversely ribbed and wrinkled, most coarsely on anterior and posterior ends. Measurements of the puparium: length 3.26 mm, maximum width 0.97 mm, maximum height (in the middle) 0.91 mm. Larval segmentation more or less recognizable despite contracted cuticle. Anterior end of puparium tapered and distinctly dorsoventrally compressed. Dorsal part of cephalic and thoracic segments including anterior spiracles undescribed because not preserved (lost during emergence of adult). Ventral part of cephalic segment (see Fig. 130) with distinct palmately branched blackish (middle) to brown (branches) ornamentation (similar to that known in other Anthomyzidae but



Figs 130-136: *Paranthomyza nitida* (Meigen), male preimaginal stages (Czech Republic). **130** - anterior part of puparium, ventrally; **131** - posterior part of puparium, ventrally; **132** - creeping welt on ventral side of puparium; **133** - right posterior spiracular process, ventrally; **134** - ditto, caudally; **135** - cephalopharyngeal skeleton of 3rd instar larva, anterior part ventrally; **136** - ditto, complete, laterally. Scales: Figs 130-131 = 0.3 mm, Figs 133-135 = 0.05 mm, others = 0.1 mm. For abbreviations see p. 8.

differing in number and shape of branches). Thoracic segments with coarse sculpture, particularly laterally. The larval transverse bands of short and thick spinulae (creeping welts) are preserved on all abdominal segments of puparium both dorsally and ventrally and are composed of a number (5-10) of rows of spines of various size and shape (Fig. 132). Posterior end of puparium (Fig. 131) less tapered, both dorsally and ventrally convex and strongly ribbed, ventrally somewhat more truncate and with coarse crooked rib-like sculpture surrounding larval anus. Posterolaterally there are distinctive stump-like processes (formed by two parts – wider basal and narrower apical) carrying larval posterior spiracles (psp). When macerated (Figs 133, 134) the posterior spiracular process is found to preserve most of larval characters, viz. spiracular plate surrounded by peritreme, 4 interspiracular multiply branched spiracular processes (hairs), 3 oval spiracular slits in radial pattern and 1 button-like tubercle.

Discussion: The structures of the larval cephalopharyngeal skeleton of *Paranthomyza nitida* most resemble those of *Anagnota bicolor*. The formation of mouthhooks of these two species is particularly similar which can indicate a similar means of nourishment. Also pharyngeal sclerite of *P. nitida* resembles closely that of *A. bicolor* except for some detail such as the pigmentation pattern or the distance between dorsal and ventral cornua. On the other hand, the intermediate sclerite and epistomal plate seem to differ more, the former having a broader connecting bridge (although not as broad as that of *Typhamyza bifasciata*), the latter being much longer and differently pigmented in *P. nitida*. The shape and surface structures of the puparium also seem to be relatively similar in these two taxa, except being larger and coarser in *P. nitida* than in *A. bicolor*. However, the larval (and puparial) spiracles differ more distinctly: in *P. nitida* the anterior spiracular process is (according to de Meijere 1944) elongately fan-shaped (shortly palmately branched in *A. bicolor*) and the posterior spiracular process is composed of two parts and has longer, more branched interspiracular setae (simply stump-like and with short hairs in *A. bicolor*). The larval and puparial features discussed above that are shared by *P. nitida* and *A. bicolor* may support the close relationship between *Paranthomyza* and *Anagnota*. It is to be noted that *Typhamyza* does not differ significantly in these characters from the two genera above when its peculiarities resulting from the dorsoventrally compressed body of puparium are ignored.

Distribution: The species is widespread in temperate Europe and was recorded also from West Siberia (easternmost occurrence limit) by Roháček (2006a) and Caucasus (southernmost record, presented above). The known records are from Austria, Bulgaria, Croatia, Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Denmark, Estonia, Finland, France, Germany (Bährmann 2006, Stuke 2009), Great Britain (England: Wills 1968, Rotheray 1991; Wales; Scotland: Skidmore 2008b,c), Hungary, Ireland, Italy (Roháček 2008c), Latvia (Karpa 2008), Lithuania (Pakalniškis et al. 2006), Netherlands, Norway, Poland, Romania, Russia (NET, CET, SET: new, WS), Slovakia (Roháček 2006b), Slovenia, Spain, Sweden, Switzerland, Ukraine.

Genus ***Receptrixa*** Roháček, 2006**.**

Receptrixa Roháček, 2006a: 241-242.

Type species: *Anthomyza receptrix* Roháček & Freidberg, 1993: 105 (original designation)

Discussion: The relationships of *Receptrixa* to other genera of Anthomyzidae are obscure, partly because of the absence of information about its male genitalic characters. Some of its female postabdominal characters (e.g. the well-developed tergosternum T7+S7, longitudinally divided female S8 and shortened spermathecal ducts) indicate affinity to the *Anthomyza* clade (see chapter Phylogeny below).

Receptrixa receptrix (Roháček & Freidberg, 1993)

Anthomyza receptrix Roháček & Freidberg, 1993: 105.
Receptrixa receptrix Roháček, 2006a: 243-245 (redescription).

Distribution: Israel.

Genus ***Santhomyza*** Roháček, 1984

Santhomyza Roháček, 1984b: 532 [feminine]; Roháček, 2006a: 246-249 (redescription).

Type species: *Santhomyza inermis* Roháček, 1984b: 534 (original designation).

Discussion: The relationships of *Santhomyza* to other genera of Anthomyzidae remain unclear. As stated by Roháček (2006a) the genus is characterized by an interesting combination of plesiomorphic and highly derived (apomorphic) features. While the external features are largely plesiomorphic (including the form of head, complete cephalic and thoracic chaetotaxies etc.) there are numerous apomorphies unique within the Palaearctic (or world) Anthomyzidae in the male and female terminalia. The only distinctive external apomorphies seem to be the enlarged subvibrisssa, the very distal position of cross-vein r-m and the broadened alula. The other synapomorphies include: gonostylus very slender, hook-like curved, without micropubescence; pregonite with two projections, the anterior long and rod-like; postgonite unusually enlarged; female with 1-2 small additional sclerites in boundary area between 7th and 8th abdominal segment; annular sclerite in the female genital chamber absent. The absence of posterior internal sclerites in the female genital chamber (considered to be plesiomorphic by Roháček 2006a) is probably due to secondary reduction, and, hence, also apomorphic.

This distinctive genus could perhaps be distantly related to *Stiphrosoma*, *Cercagnota*, *Carexomyza*, *Anagnota*, *Paranthomyza* and *Typhamyza*; the only apomorphy indicating this affinity could be the construction of the ventral receptacle (short, with apex rounded and shortly sclerotized). This character is shared by all the above genera and by *Santhomyza*, though it seems to be somewhat modified (tip of ventral receptacle less or not sclerotized) in the latter genus and in *Cercagnota*.

Santhomyza inermis Roháček, 1984

(Fig. 213)

Santhomyza inermis Roháček, 1984b: 534; Roháček, 2006a: 250-254 (redescription).

Distribution: A typical Mediterranean species, hitherto recorded from Egypt, southern France, Greece, Israel, Malta, Tunisia and Spain.

Santhomyza bezzii (Czerny, 1902)

Anthomyza Bezzii Czerny, 1902: 252.
Santhomyza bezzii: Roháček, 2006a: 255 (translated original description).

Distribution: The species is only known from the type locality in northern Italy.

Santhomyza biseta Roháček & Báez, 1988

Santhomyza biseta Roháček & Báez, 1988: 296; Roháček, 2006a: 257-262 (redescription).

Distribution: The species is endemic to Canary Islands, known only from La Gomera I. and Tenerife I. (Báez & García 2004).

Genus ***Stiphrosoma*** Czerny, 1928

Stiphrosoma Czerny, 1928: 6 [neuter]; Roháček, 2006a: 262-264 (redescription).
Striphosoma: Séguy, 1934: 301, 304 (incorrect subsequent spelling).

Type species: *Stiphrosoma oldenbergi* Czerny, 1928: 6 (designated by Enderlein 1936: 167, by elimination) = *S. sabulosum* (Haliday, 1837).

Ptenotaenia Enderlein, 1936: 167 [feminine].

Type species: *Opomyza* (*Geomyza*) *sabulosa* Haliday, 1837: 151 (monotypy).

Nomenclatural note: According to Nomenclator Zoologicus (Vol. 4, p. 317, see www.ubio.org/NomenclatorZoologicus/) the genus *Stiphrosoma* Czerny, 1928 has an older homonym, viz. *Stiphrosoma* Fieber, 1858 (Heteroptera: Miridae). However, *Stiphrosoma*: Fieber, 1858b: 332 (published in November 1858) is an **unavailable name** because it was introduced as „incorrect subsequent spelling“ of the original *Stiphrosomus* Fieber, 1858a: 312 (published in October 1858) inasmuch as Fieber's (1858a,b) work is an „interrupted publication“ (ICZN 1999: Art 10.1.1.). The same interpretation of *Stiphrosoma* Fieber was also adopted in recent catalogs of Heteroptera (Schuh 1995: 71; Kerzhner & Josifov 1999: 229-230). Since the 2nd half of the 19th century the name *Stiphrosomus* Fieber (mostly incorrectly as *Stiphrosoma*) is considered a junior synonym of *Strongylocoris* Blanchard, 1840: 140. For the above reason the name *Stiphrosoma* Czerny, 1928 remains a valid name and cannot be considered a junior homonym.

Discussion: The phylogenetic affinities of *Stiphrosoma* have recently been clarified by Roháček & Barber (2009) who confirmed that this genus belongs to the morphologically well-delimited *Chamaebosca* group of genera of New World origin. *Stiphrosoma* proved to be a sister-group of the *Mumetopia nigrimana* group forming with it a separate branch within the *Chamaebosca* clade. The *Mumetopia nigrimana* group will have to be excluded from the genus *Mumetopia* Melander, 1913 because the latter genus is linked together with *Chamaebosca* Speiser, 1903 and 2 other unnamed Neotropical genera on another clade of the *Chamaebosca* group of genera (see Roháček & Barber 2009). Consequently, *Stiphrosoma*, represented in the Palaearctic Region by only 6 species, has no closely related genus in this area; only *Cercagnota* is considered to be its (rather distant) ally because this genus seems to form a sister-group to the whole *Chamaebosca* group of genera (see also the chapter Phylogeny below).

The relationships of species within the genus *Stiphrosoma* have been studied by Roháček & Barber (2005) and their results are also applicable to all Palaearctic species except for *Stiphrosoma fissum* whose affinity has been further clarified only recently by means of the analysis of the mitochondrial 12S+16S gene markers (Roháček et al. 2009). Following the latter study *S. fissum* is considered to be most closely related to *S. sabulosum* and this relationship also is supported by a few morphological synapomorphies (see the chapter Phylogeny).

Stiphrosoma sabulosum (Haliday, 1837)
(Fig. 5)

Opomyza (Geomyza) sabulosum Haliday, 1837: 151.
Anthomyza sabulosa auctt.
Stiphrosoma sabulosum: Roháček, 2006a: 268-273 (redescription).
Striphosoma sabulosum: Séguy, 1934: 304 (incorrect generic spelling)
Anthomyza (Stiphrosoma) sabulosa: Stackelberg, 1958: 166.
Geomyza brevipennis Zetterstedt, 1852: 4335.
Anthomyza saliens Loew, 1866: 5.
Stiphrosoma Oldenbergi Czerny, 1928: 6.
Anthomyza oldenbergi auctt.
Opomyza apterina Ruthe, in litt.: Czerny, 1902: 251 [nom. nudum].

NEW MATERIAL EXAMINED: 29♂28♀ f. brach. **Czech Republic:** N Moravia, Chvalíkovice 1 km SE (distr. Opava), aspirated from tuft of *Poa annua*, 20.vii.2008 3♂4♀ f. brach.; same locality, aspirated from tufts of *Lolium perenne*, 18.viii.2008 15♂11♀ f. brach.; same locality, aspirated from tuft of *Dactylis glomerata*, 18.viii.2008 5♂7♀ f. brach.; Opava, behind cemetery, margin of field path, aspirated from tuft of *Arrhenatherum elatius*, 26.vii.2008 6♂6♀ f. brach., all J. Roháček leg. (SMOC).

Distribution: Widespread in North and Central Europe but also found in western Siberia (Roháček 2006a). It is also known from the Nearctic Region: Canada (Ontario, Quebec), USA (Massachusetts, New York, Michigan), see Roháček & Barber (2004). In the Palaearctic there are records from Austria (Hofer & Waitzbauer 2000), Belgium, Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Denmark, Estonia, Finland, France, Germany (Neun & Weber 1985, Prescher & Büchs 1997, Bährmann 2006, von Tschirnhaus 2007, 2008), Great Britain (England: Hincks 1953, Rotheray 1991; Wales), Hungary, Ireland, Italy, Latvia (Karpa 2008), Netherlands, Poland, Russia (CET: Panteleeva & Razvorotnev 1996, Panteleeva 1997, 2005, all as *Anthomyza sabulosa*; NET, WS), Slovakia (Roháček 2006b), Sweden, Switzerland.

Stiphrosoma fissum Roháček, 1996

Stiphrosoma fissum Roháček, 1996a: 101; Roháček, 2006a: 275-280 (redescription).

NEW MATERIAL EXAMINED: 1♂4♀. **Russia:** FE: Yuzh. Primorie, 40 km SO Ussuriysk, 13.viii. 1983 1♀, 20.viii.1983 1♂, A. Ozerov leg. (ZMUM); Yuzh. Primorie, Kamenushka, 17.vii.1983 1♀, 19.vii.1983 1♀, 26.vii.1983 1♀, A. Shatalkin leg. (ZMUM, SMOC).

Discussion: As mentioned above, this distinctive species proved to be (despite some peculiar autapomorphies) most closely related to *S. sabulosum* (see Roháček et al. 2009 and the chapter Phylogeny).

Distribution: *S. fissum* seems to be restricted to the East Palaearctic: Russia (FE: Primorie, new records), Japan (Hokkaido, Honshu), Korea and North Korea.

Stiphrosoma cingulatum (Haliday, 1855)
(Fig. 195)

Geomyza cingulata Haliday, 1855: 64.
Anthomyza cingulata auctt..
Stiphrosoma cingulatum: Roháček, 2006a: 281-285 (redescription).

NEW MATERIAL EXAMINED: 137♂113♀. **Czech Republic**: N Bohemia: Hradčany 1.2 km SE, Držník pond, 50°36´N, 14°43´E, sweeping *Carex paniculata* at brook, 26.vi.2008 1♂; Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping *Calamagrostis villosa* in boggy meadow, 26.vi.2008 3♂1♀, all J. Roháček leg. (SMOC); W Moravia: Třešť 1 km E, Lávecká cesta (distr. Jihlava), sweeping *Scirpus sylvaticus* in boggy meadow, 21.vii.2006 3♂; Třešť 3.5 km E, Pouště-Stonařovský rybník (pond) (distr. Jihlava), sweeping *Calamagrostis canescens* in boggy meadow, 21.vii.2006 13♂15♀, 14.viii.2006 1♂1♀, same, sweeping *Carex acuta* in boggy meadow, 21.vii.2006 1♀, J. Roháček leg. (SMOC); N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Scirpus sylvaticus* in boggy meadow, 10.vii.2008 17♂11♀; same, sweeping *Carex acuta* in boggy meadow, 10.vii.2008 3♂3♀, 16.vii.2008 25♂15♀; same, sweeping *Glyceria maxima* in boggy meadow, 16.vii.2008 6♂7♀, all J. Roháček leg. (SMOC). **Germany:** Nordrhein-Westfalen, Bielefeld-Hoberge, Twellbachtal, 4.iii. and 3.iv.1991, reared ex 25 l of *Carex gracilis* [= *Carex acuta*] litter in eclector, 1♂ emerged 25.iii.-14.vi.1991, F. Püchel leg. (ZSMC); Schleswig-Holstein (west), Meggerkoog near river Sorge, 54°21'N 9°20'E (no. K780), 4 m, 16.ix.1986, reared ex 1200 cm² x 10 cm very wet soil with *Glyceria maxima*, containing some few plants of *Agrostis stolonifera*, enclosed until 30.iii..1987 under greenhouse conditions, 2♂1♀; same locality (no. K804), 2.vi.1987, reared ex 720 cm² x 9 cm soil with 90% *Agrostis stolonifera*, 10% *Juncus effusus*, and some few *Glyceria maxima* and *Ranunculus repens*, enclosed until 8.i.1988 under greenhouse conditions, 6♂5♀; same locality (no. K805), 2.vi.1987, ungrazed pasture: reared ex 3500 cm² x 10 cm soil with 60% *Agrostis stolonifera*, 20% *Poa pratensis*, 20% *Trifolium repens* and some few *Alopecurus geniculatus, Juncus effusus, Ranunculus lingua, R. repens*, enclosed until 8.i.1988 under greenhouse conditions, 7♂8♀; same locality (K806), 2.vi.1987, reared ex 3150 cm² x 10 cm soil with 90 % *Glyceria maxima*, 10 % *Agrostis stolonifera* and some few *Cardamine pratensis* and *Carex riparia*, enclosed until 8.i.1988 under greenhouse conditions, 49♂43♀, all H. Meyer leg. (ZSMC, FBUB); **Russia:** CET: Moscow region: Bekasovo-1 station (Naro-Fominsk distr.), 1.viii.2006 1♀, 8.viii.2006 1♀, D. Gavryushin leg. and photographed (DGN).

Distribution: Widespread in the Palaearctic Region, ranging from Ireland to W. Siberia, recorded from the Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Germany (von Tschirnhaus 2007, 2008), Great Britain (England: Rotheray 1991, as *Anthomyza cingulata*; Wales; Scotland: Skidmore 2008b,c), Ireland, Netherlands, Latvia (Karpa 2008), Russia (CET, WS), Slovakia (Roháček 2006b).

Stiphrosoma humerale Roháček & Barber, 2005

Stiphrosoma humerale Roháček & Barber, 2005: 89; Roháček, 2006a: 287-292 (redescription).

NEW MATERIAL EXAMINED: 5♀. **Czech Republic:** N Bohemia: Hradčany 1.5-2 km W, Ploučnice valley, 50°37´N, 14°41´E, sweeping undergrowth of alder forest, 23.vi.2008 1♀, J. Roháček leg. (SMOC). **Russia:** FE: Amurskaya obl., g. Zeya, 1.viii.1981 1♀, 17.viii.1981 1♀, 28.viii.1981 1♀, A. Shatalkin leg.; same locality, 24.viii.1981 1♀, A. Ozerov leg. (ZMUM, SMOC).

Distribution: A naturally Holarctic species widespread both in the Nearctic (Canada: Alberta, British Columbia, Manitoba, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan; USA: Michigan, New Hampshire, North Carolina, Tennessee, Vermont, Virginia, Washington) and the Palaearctic Region. The palaearctic records are scarce: Czech Republic (Bohemia: Roháček 2006b), Latvia (Karpa 2008), Russia (WS, FE: new), North Korea. The species may be more common in the eastern Palaearctic (see new records from Amur region of Russia). In Europe, *S. humerale* obviously is very rare; besides Latvia it was only found in the Czech Republic (Bohemia: Roháček 2006a - this single westernmost record is confirmed here by the finding of a second female, see material examined); in both these countries the species occurs sympatrically with *S. laetum*.

Stiphrosoma laetum (Meigen, 1830)

(Figs 4, 208)

Opomyza laetum Meigen, 1830: 111.
Anthophilina laeta auctt., *Anthomyza laeta* auctt.
Stiphrosoma laetum: Roháček, 2006a: 292-298 (redescription).
Anthomyza cingulata auctt.

NEW MATERIAL EXAMINED: 24♂44♀. **Czech Republic:** N Moravia, Chvalíkovice 1 km SE (distr. Opava), aspirated from tuft of *Dactylis glomerata*, 20.vii.2008, 1♂3♀, J. Roháček leg. (SMOC). **Germany:** Schleswig-Holstein: Lübeck east (no. A524), 20.vi.1976, ex 2 tussocks of *Dactylis glomerata*, 8♂10♀ emerged 24.vi.-2.vii.1976, H. Meyer leg. (ZSMC); Schleswig-Holstein (west): Meggerkoog near river Sorge, 54°21'N 9°20'E (no. K780), 4 m, 16.ix.1986, reared ex 1200 cm² x 10 cm very wet soil with *Glyceria maxima*, containing some few plants of *Agrostis stolonifera*, enclosed until 30.iii.1987 under greenhouse conditions, 5♂10♀; same locality (no. K805), 2.vi.1987, ungrazed pasture: reared ex 3500 cm² x 10 cm soil with 60% *Agrostis stolonifera*, 20% *Poa pratensis*, 20% *Trifolium repens* and some few *Alopecurus geniculatus, Juncus effusus, Ranunculus lingua, R. repens*, enclosed until 8.i.1988 under greenhouse conditions, 1♂1♀; same locality (K806), 2.vi.1987, reared ex 3150 cm² x 10 cm soil with 90 % *Glyceria maxima*, 10 % *Agrostis stolonifera* and some few *Cardamine pratensis* and *Carex riparia*, enclosed until 8.i.1988 under greenhouse conditions, 2♂9♀, all H. Meyer leg. (ZSMC). **Italy:** Alto Adige, Suldental, east of Gomagoi, 46°34´33.8N, 10°32´51.2E, 1220 m, Malaise trap, 11.-27.vi. 1♀, 8.-15.viii. 1♀, 24.viii.-1.ix.2005 1♀, C. Lange & J. Ziegler leg. (ZMHB). **Russia:** CET: Moscow region: Bekasovo-1 station (Naro-Fominsk distr.), 8.viii.2006 1♀, D. Gavryushin leg. and photographed (DGN); Moskva [= Moscow], Izmailovo, 9.vii.1983 1♀, A. Ozerov leg. (ZMUM). **Slovakia:** C Slovakia: Poľana BR, Čierny Potok, sweeping over *Scirpus sylvaticus*, 4.vii.2006, 1♂1♀; Poľana BR, Sihla-Kamenistý potok, sweeping over *Deschampsia caespitosa*, 7.vii.2006, 3♂1♀; Poľana BR, Beňova dolina (valley), Hrochoť 1.5 km E, 48°39´N, 19°21´E, 590 m, sweeping undergrowth of deciduous forest, 23.viii.2007 1♀; Poľana BR, Kyslinky-chata (vallet) Dudáš, 48°39´N, 19°28´E, 1100 m, under tufts of grass, 22.viii.2007 3♂3♀, all J. Roháček leg. (SMOC).

Distribution: *S. laetum* is reliably only known from North and Central Europe: Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Denmark, Finland, Germany (Bährmann 2006, von Tschirnhaus 2007, 2008), Great Britain (England, Scotland), Finland, N. Italy (Roháček 2008c), Latvia (Karpa 2008), Netherlands, Norway, Poland, Russia (CET: new, NET), Slovakia (Roháček 2006b), Sweden.

Stiphrosoma grande Roháček, 2006

Stiphrosoma grandis Roháček, 2006a: 299-302.

Correction of the name: The species name "grandis" (= L. large, big) is a Latin adjective in the nominative singular and must therefore agree in gender with the generic name (ICZN 1999: Art. 31.2, 33.2). Inasmuch as *Stiphrosoma* is neuter (ICZN 1999: Examples for Art. 30.1.2.) the species name must change to “grande”.

Distribution: *S. grande* is only known from Iturup I. (Russia, FE: Kuril Is.).

Genus *Typhamyza* Roháček, 1992

Typhamyza Roháček, 1992: 188 [feminine]; Roháček, 2006a: 302-306 (redescription).

Type species: *Anthomyza bifasciata* Wood, 1911: 40 (original designation).

Discussion: The genus is very distinctive among Palaearctic genera of Anthomyzidae but its relationships to them remain rather obscure. The molecular analysis of 12S+16S mitochondrial gene markers (Roháček et al. 2009) has indicated that its closest Palaearctic relative could be (rather surprisingly) the genus *Paranthomyza*, but this sister-group relationship is not supported strongly by the posterior probability value (see Fig. 138). As noted above under the genus *Paranthomyza,* some morphological apomorphies could indeed support the affinity of *Typhamyza* to *Paranthomyza*, viz. the similarly formed ventral receptacle, the small circular annular sclerite (also shared with *Anagnota*) and particularly, the modified female S10 with separate anterior dark strip. However, no distinct synapomorphy has been found in the male genitalia and, consequently, the relationship between these two genera cannot be considered very close.

Roháček (2006a) noted several striking resemblances of the male and female genital structures in *Typhamyza* and *Anagnota*. These include the hyaline and finely sculptured aedeagal part of folding apparatus, the prolonged female genital chamber with small circular annular sclerite and subcylindrical and weakly sclerotized ventral receptacle, the pyriform spermathecae with blunt spines on the surface and accessory glands with tuberculiform structures. Some of these shared features may be apomorphic and could indicate some relationship between these two genera because *Anagnota* was recognized as a possible sister-group of the *Typhamyza* + *Paranthomyza* pair by the molecular analysis mentioned above (Roháček et al. 2009) but again, this clade is very poorly supported.

Typhamyza bifasciata (Wood, 1911)

(Figs 176-177, 179)

Anthomyza bifasciata Wood, 1911: 40.
Typhamyza bifasciata: Roháček, 2006a: 307-314.
Anthomyza fasciipennis Oldenberg, 1927: 118.
Anthomyza fasciata (error) auctt.

NEW MATERIAL EXAMINED: 67♂97♀. **Austria:** Steiermark: Weng in Gesäuse nr Admont, Enns valley, 1 larva and 12 puparia in dead *Typha latifolia*, 14.vi.2006, larva pupated 19.vi.2006, adults emerged 18., 20., 22. and 24.vi.2006, 7♂6♀, J. Roháček leg. (SMOC). **Czech Republic:** W Moravia: Třešť 1.5 km SE, Vimvejr pond (distr. Jihlava), sweeping over *Typha latifolia*, 23.vi.2006 2♂1♀; N Moravia: Polanka nad Odrou, Přemyšov res., 48°47´N, 18°11´E, sweeping *Typha latifolia* in boggy meadow, 16.vii.2008, 4♂10♀, all J. Roháček leg. (SMOC). **France:** Ain: St. Jean de Thurigneux, 18.vii.2004 2♂1♀, P. Withers leg. (PWS). **Germany:** Mecklenburg-Vorpommern: Waldsee am Flugplatz Eberswalde-Finow, 42°59'26"N 13°40'54"E (no. L2495), Seeufer, *Phragmites/Typha*, Sumpfpflanzen angrenzend an Kiefernwald auf Sand, gestreift, 24.vi.2006 16♂31♀, M. v. Tschirnhaus leg. (ZSMC, FBUB). **Great Britain:** England: Suffolk, Homersfield, 9.viii.1986 1♀, 16.viii.1986 1♂, P. Withers leg. (PWS). **Greece:** N Greece, Palia Koití, Aliákmonas river delta, Aigínio env., 40°30´N, 22°36´E, sweeping over *Typha* growth, 4.vi.2007 1♂2♀, J. Roháček leg. (SMOC). **Romania:** Lăţunaş 3 km W nr. Comorăşte 45°13´16´´N, 21°28´10´´E, 110 m, in *Typha latifolia*, 30.v.2008 6♂7♀; Naidăş 2 km W-Nera river, 44°53´03´´N, 21°34´00´´E, 110 m, sweeping *Typha angustifolia*, 30.v.2008 6♂16♀, 2.vi.2008 7♂9♀; Gornea nr. Sicheviţa 1 km S-Gornea river 44°39´51´´N, 21°51´39´´E, 73 m, sweeping *Typha latifolia*, 4.vi.2008 14♂11♀; Moldova Veche 3 km SE, 44°42´28´´N, 21°39´49´´E, 80 m, sweeping over boggy meadow, 4.vi.2008 1♂, all J. Roháček leg. (SMOC). **Russia:** CET: Moscow region: Naro-Fominsk, 2.vii.2006 1♀, D. Gavryushin leg. and photographed (DGN). **Spain:** Mallorca: S'Albufera, Malaise trap, 20.-24.v.2008 1♀, P. Withers leg. (PWS).

Distribution: The species seems to be widespread in the Palaearctic Region, ranging from Great Britain to Kazakhstan and West Siberia: Austria (new), Czech Republic (Bohemia: Roháček 2006b; Moravia: Roháček 2006b), Finland, France (Withers 2007), Germany (Stuke 2009), Great Britain (England), Greece (new), Hungary, Kazakhstan, Netherlands, Poland, Romania (new), Russia (CET: new; WS), Slovakia (Roháček 2006b), Spain (Balearic Is.: new), Sweden, Ukraine.

Checklist of Palaearctic Anthomyzidae

All genus-group and species-group taxa are arranged alphabetically. Synonyms are printed in petite and indented.

PROTANTHOMYZINAE Roháček, 1998

Protanthomyza Hennig, 1965
- *collarti* Hennig, 1965

ANTHOMYZINAE Czerny, 1903

Amygdalops Lamb, 1914
- *femorinus* **sp.n.**
- *nigrinotum* Sueyoshi & Roháček, 2003
- *rufior* Roháček & Freidberg, 1993
- *thomasseti* Lamb, 1914

Anagnota Becker, 1902
- *bicolor* (Meigen, 1838)
- *coccinea* Roháček & Freidberg, 1993
- *major* Roháček & Freidberg, 1993
- *oriens* Roháček, 2006

Anthomyza Fallén, 1810
  - *Leptomyza* Macquart, 1835
  - *Anthophilina* Zetterstedt, 1837
- *anderssoni* Roháček, 1984
- *baezi* Roháček, 1999
- *bellatrix* Roháček, 1984
- *clara* Roháček, 2006
- *collini* Andersson, 1976
- *dissors* Collin, 1944
  - *dorsata* Collin, 1944
- *decolorata* **sp.n.**
- *drachma* Sueyoshi & Roháček, 2003
- *elbergi* Andersson, 1976
- *flavosterna* Sueyoshi & Roháček, 2003
- *gracilis* Fallén, 1823
  - *sordidella* (Zetterstedt, 1848)
  - *trojani* Elberg, 1968
- *macra* Czerny, 1928
- *neglecta* Collin, 1944
- *orineglecta* Roháček, 2006
- *pallida* (Zetterstedt, 1838)
  - *unguicella* (Zetterstedt, 1838)
- *paraneglecta* Elberg, 1968
- *pleuralis* Czerny, 1928
- *trifurca* Sueyoshi & Roháček, 2003
- *tschirnhausi* **sp.n.**
- *umbrosa* Roháček, 2006

Arganthomyza **gen.n.**
- *barbarista* **sp.n.**
- *socculata* (Zetterstedt, 1847)
  - *ungulata* (Loew, 1873)
- *versitheca* **sp.n.**

Carexomyza **gen.n.**
- *caricis* (Roháček, 1999)

Cercagnota Roháček & Freidberg, 1993
- *collini* (Czerny, 1928)

Epischnomyia Roháček, 2006
- *merzi* **sp.n.**
- *triarmigera* (Sueyoshi & Roháček, 2003)

Fungomyza Roháček, 1999
- *albimana* (Meigen, 1830)
  - *glabra* (Meigen, 1838)
  - *nigrimana* (Meigen, 1838)
  - *armillaris* (Rondani, 1875)
  - *rufa* (Czerny, 1928)
- *cercata* **sp.n.**

Paranthomyza Czerny, 1902
- *nitida* (Meigen, 1838)
  - *? asteia* (Haliday, 1833)
  - *flavipes* (Zetterstedt, 1848)

Receptrixa Roháček, 2006
- *receptrix* (Roháček & Freidberg, 1993)

Santhomyza Roháček, 1984
- *bezzii* (Czerny, 1902)
- *biseta* Roháček & Báez, 1988
- *inermis* Roháček, 1984

Stiphrosoma Czerny, 1928
  - *Ptenotaenia* Enderlein, 1936
- *cingulatum* (Haliday, 1855)
- *fissum* Roháček, 1996
- *grande* Roháček, 2006
- *humerale* Roháček & Barber, 2005
- *laetum* (Meigen, 1830)
- *sabulosum* (Haliday, 1837)
  - *brevipennis* (Zetterstedt, 1852)
  - *saliens* (Loew, 1866)
  - *oldenbergi* Czerny, 1928
  - *apterina* (Ruthe in Czerny, 1902)

Typhamyza Roháček, 1992
- *bifasciata* (Wood, 1911)
  - *fasciipennis* (Oldenberg, 1927)

Phylogeny

In Part 1 of this monograph (Roháček 2006a), the phylogenetic relationships of the family Anthomyzidae and its subfamilies (Protanthomyzinae and Anthomyzinae) have been discussed within the chapter „Systematic position and higher classification of Anthomyzidae“ (Roháček 2006a: 27-30). It is therefore unnecessary to repeat these results here. On the other hand, it should be stressed that the monophyly of recent Anthomyzidae (or more precisely, of recent Anthomyzinae) has recently been confirmed (as regards European representatives of the family) by the analysis of the molecular data using mitochondrial 12S and 16S rRNA gene markers (Roháček et al. 2009, see also Fig. 138). This chapter is devoted to studies of the phylogenetic relationships within the Palaearctic Anthomyzidae, both of genera represented in this biogeographical region and of species within these genera. The results achieved by the analysis of morphological data are compared (where possible) with those from the above molecular study (Roháček et al. 2009).

Phylogenetic relationships among the Palaearctic genera of Anthomyzidae

The cladistic reconstruction of the relationships among the Palaearctic genera of Anthomyzidae proved to be rather difficult. While the recognised genera are comparatively well characterized and their monophylies supported by apomorphic morphological features, uncovering the interrelationships proved to be more elusive. The difficulties in recognizing the affinities of most of these genera seem to have stemmed from two sources: (1) numerous morphological characters are affected by homoplasy, their apomorphic states being found scattered among distantly related groups; (2) the majority of Palaearctic genera do not have their closest relatives within the Palaearctic fauna – in some the nearest allies (sister groups) have been found in the Nearctic, Afrotropical or Oriental biogeographical regions but in others they remain unknown. Also, the molecular analysis of the mitochondrial 12S and 16S rRNA genes (Roháček et al. 2009) contributed to only a partial reconstruction of the phylogenetic relationships of the Palaearctic genera. For all the above reasons, the phylogenetic hypothesis achieved and presented below should be considered far from definite.

The most basal split of the cladogram (Fig. 137) showing the inferred relationships among the genera under study is poorly supported both by morphological apomorphies and molecular data (cf. Fig. 138). Only the *Anthomyza* clade, comprising genera *Fungomyza*, *Arganthomyza*, *Anthomyza*, *Epischnomyia*, the Nearctic *Ischnomyia* and perhaps also *Receptrixa* (see discussion below), seems to be better supported (by strong synapomorphic characters 1, 3, see Fig. 137). It is to be noted that the long, tube-like ventral receptacle (character 1) had to be subsequently modified in *Epischnomyia* and (yet more so) *Receptrixa* and the longitudinally split female S8 (character 3) was obviously reversed (secondarily fused) in *Epischnomyia*; moreover it occurs as a homoplasy having evolved in parallel in the distantly related genus *Carexomyza*.

The genus *Epischnomyia* appears to be a highly aberrant derivative of the more ancestral Nearctic genus *Ischnomyia*. The relationships of *Epischnomyia* to other Palaearctic genera of the *Anthomyza* clade have only been recognized after examination of its sister genus *Ischnomyia* which displays distinct affinities to *Anthomyza* and allied genera in its postabdominal features. The *Ischnomyia* + *Epischnomyia* clade probably branched rather early from the *Anthomyza* clade because the former is also supported by a synapomorphy in the wing pattern and venation. *Epischnomyia* is an example of a highly derived (and modified) genus which has its closest relative in the Nearctic Region, and, therefore, looks seemingly unrelated to other Palaearctic genera. It differs from *Ischnomyia* by numerous features (cf. Roháček 2006a) but only the strongest synapomorphies are used here to demonstrate its monophyly (27-30, Fig. 137).

The relegation of the genus *Receptrixa* to the *Anthomyza* clade remains uncertain because of the complete lack of knowledge of the male (only the female is known). It also seems to be highly modified so that its real affinities are obscured. It is tentatively considered a sister group to *Fungomyza* + *Arganthomyza* on the basis of the shortened spermathecal ducts (7) but it is to be stressed that this character is homplasious and also occurs in the (apparently unrelated) genera *Anagnota*, *Paranthomyza* and *Typhamyza*. The most striking modification of *Receptrixa* is the extremely enlarged fungoid ventral receptacle (15), unique within the whole family. The evolution of this modification from the membranous, long and tube-like form of ventral receptacle (as known in all other genera of the *Anthomyza* clade) would likely have been a slow and complex but not impossible process considering that a similar though not as extensive modification of the ventral receptacle occurs in *Epischnomyia*.

Without the problematic position of *Receptrixa*, the remaining genera of the *Anthomyza* clade, viz. *Anthomyza*, *Arganthomyza* and *Fungomyza* form a distinct monophyletic group which is also supported by the molecular data (see Fig. 138, where *Arganthomyza* is represented by *Anthomyza socculata*). The species-richest genus *Anthomyza* is, after the exclusion of the former *Anthomyza socculata* group, clearly a monophyletic unit characterized by several strong synapomorphies (see Fig. 137, 8-11); its monophyly was also confirmed by the molecular data (Fig. 138; Roháček et al. 2009). The genera *Fungomyza* and *Arganthomyza* proved to be sister groups although their relationship is relatively poorly supported both morphologically (the shared apomorphic features 12 and 13 are not unique within the Anthomyzidae) and genetically (Fig. 138). However, the structure of the ventral receptacle, spermathecae and their ducts exhibit considerable similarity in both these taxa and are deemed to be of the same origin.

The other main clade, comprising all remaining Palaearctic genera except for *Amygdalops*, is established on the basis of only one character, the apically sclerotized but short ventral receptacle (2). It is considered to have evolved independently from the short and entirely membranous ventral receptacle. However, because this structure is relatively simple, the possibility cannot be excluded that it could evolve several times. In that case this large clade would not be monophyletic and some of its genera may have different origins, e.g. *Stiphrosoma*, as is shown by the analysis of molecular data (see Fig. 138). All the genera linked in this clade are very distinct, well characterized and supported by a number of apomorphies. On the other hand, their interrelationships are very unclear.

The genera *Stiphrosoma* and *Cercagnota* are linked on the basis of synapomorphies (Fig. 137, 31-33) but their relationship is not very close because Roháček & Barber (2009) found that *Stiphrosoma* is most closely related to the New World *Chamaebosca* group of genera and that *Cercagnota* is probably a sister group to them yet may be of a different (possibly Afrotropical) origin. The Palaearctic species of *Stiphrosoma* form only a small part of the genus which otherwise is mainly distributed in the Nearctic Region. The relationships of the genera *Santhomyza* and *Carexomyza* have remained unresolved. No sister groups have been detected among the described genera of Anthomyzidae. The analysis of the mitochondrial 12S + 16S gene markers by Roháček et al. (2009) resulted in practically the same conclusion (see Fig. 138, where *Santhomyza* is represented by *S. inermis* and *Carexomyza* by *Paranthomyza caricis*). It is therefore probable that these two genera have their closest allies among hitherto undescribed Afrotropical (*Santhomyza*) and Nearctic (*Carexomyza*) genera, or that they may represent remnants of old clades whose closest relatives are extinct.

The genera *Anagnota*, *Paranthomyza* and *Typhamyza* are grouped in the same clade (Fig. 137) as supported by two synapomorphies (48, 49) in the female genital chamber and the short spermathecal ducts (7). Because these genera differ considerably in external body features and in the construction of the male genitalia, their relationships cannot be considered very close. This is also true for *Paranthomyza* and *Typhamyza* inasmuch as their sister-group relationship is based on only a single character, the female S10 with a separate anterior strip-like part (57). The molecular analysis of 12S + 16S mitochondrial rRNA genes (Roháček et al. 2009) reached the same result, with the discussed clades poorly supported by posterior probability values (Fig. 138).

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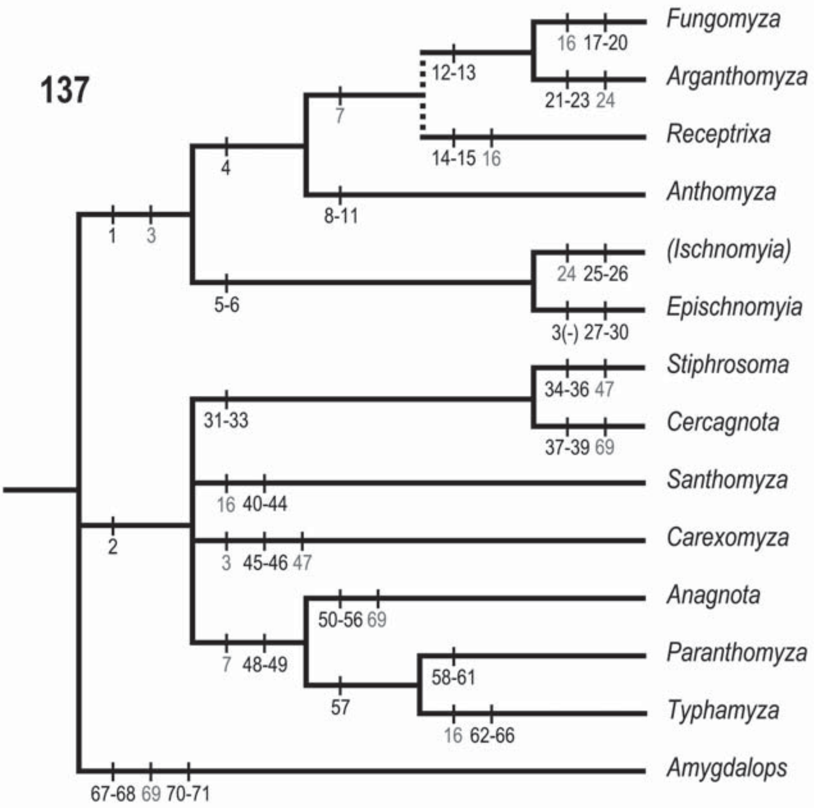

Fig. 137. Cladogram showing the inferred relationships among Palaearctic genera of Anthomyzidae. Non-palaearctic genera in parentheses. Numbers below branches refer to apomorphic states of characters. Dashed lines indicate questionable relationships. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P), reversal of character = (-), grey numbers denote homoplasious characters]:

1 – ventral receptacle prolonged, tube-like (A); ventral receptacle short (P). **2** – ventral receptacle short but with apex shortly sclerotized (A); ventral receptacle short and entirely membranous (P). **3** – female S8 longitudinally medially divided (A); S8 undivided, at most posteromedially incised (P). **4** – female postabdomen elongated (A); female postabdomen shorter (P). **5** – wing with longitudinal white and brown markings, also veins white and brown (A); wing membrane and veins more or less unicolourous (P). **6** – postgonite with apex fused with basal membrane (A); postgonite with apex free (P). **7** – spermathecal ducts short (A); spermathecal ducts long or very long (P). **8** – saccus of distiphallus with spines (A); saccus unarmed or at most with rounded tubercles (P). **9** – filum of distiphallus compact, formed by single sclerite (A); filum formed by 2 longitudinal sclerites (P). **10** – ejacapodeme reduced, very small (A); ejacapodeme larger (P). **11** – ventral receptacle very long, with terminal part long, attenuated and curved to coiled (A); ventral receptacle shorter, with terminal part short and slightly bent or straight (P). **12** – abdominal sterna well sclerotized and dark (A); abdominal sterna weakly sclerotized and pale (P). **13** – female S8 with posterior parts recurved and invaginated (A); female S8 without recurved posterior parts (P). **14** – female cerci fused (A); female cerci disparate (P). **15** – ventral receptacle extremely expanded and sclerotized (A); ventral receptacle slender and membranous (P). **16** – cross-vein r-m distal to middle of dm cell (A); r-m proximal to middle of dm cell (P). **17** – subvibrissa reduced, as long as peristomals (A); subvibrissa distinctly longer than peristomals (P). **18** – at least one pair of femora variegated (A); femora unicolourous (P). **19** – internal sclerites in female genital chamber reduced (A); internal sclerites well developed (P). **20** – anal fissure of epandrium very small (A); anal fissure larger (P). **21** – vertex of head with silvery microtomentose spots (A); vertex without microtomentose spots (P). **22** – filum of distiphallus with apex broadened and modified (A); filum with apex simple (P). **23** – female T7+S7 forming compact tergosternum (A); female T7 and S7 disparate (P). **24** – ac microsetae reduced in number (A); ac microsetae more numerous (P). **25** – R_{2+3} distinctly sinuate (A); R_{2+3} more straight (P). **26** – filum of distiphallus with apex widened and complex (A); filum with apex simple (P). **27** – phallophore with robust epiphallus (A); phallophore simple (P). **28** – saccus with robust spike-like armature (A); saccus at most with small spines (P). **29** – internal sclerites in female genital chamber strongly asymmetrical (A); internal sclerites symmetrical (P). **30** – ventral receptacle with apex hook-like curved and sclerotized (A); ventral receptacle with apex membranous, attenuated (P). **31** – r-m strongly proximal, in basal third of dm cell (A); r-m near middle of dm cell (P). **32** – filum of distiphallus relatively compact (with sclerites fused) and apex dilated and armed (A); filum with two separate longitudinal sclerites and its apex unarmed (P). **33** – annular sclerite transversely compressed (A); annular sclerite not compressed (P). **34** – female T7+S7 dorsomedially desclerotized or divided (A); female T7+S7 dorsally entire (P). **35** – spermathecae pyriform with robust surface spines (A); spermathecae sphaerical, without spines (P). **36** – ventral receptacle with subcylindrical sclerotized apex (A); ventral receptacle entirely membranous (P). **37** – head with posteroventral corner angular (A); head with posteroventral corner rounded (P). **38** – sa absent (A); sa present (P). **39** – male cercus enlarged and projecting anteriorly (A); male cercus normal (P). **40** – alula enlarged (A); alula smaller and narrow (P). **41** – pregonite with anterior rod-like projection (A); pregonite without anterior projection (P). **42** – postgonite very enlarged (A); postgonite small (P). **43** – gonostylus slender and hook-like curved (A); gonostylus simple (P). **44** – internal sclerites in female genital chamber (including annular sclerite) reduced (absent) (A); internal sclerites distinctly developed (P). **45** – r-m distinctly oblique (A); r-m more or less perpendicular (P). **46** – caudal process of transandrium with a pair of robust ventral sclerites (A); caudal process simple or absent (P). **47** – epandrium broad and dorsally straight (A); epandrium narrower and dorsally rounded (P). **48** – annular sclerite small and circular (A); annular sclerite larger, oval (P). **49** – female genital chamber prolonged (A); female genital chamber normal, shorter (P). **50** – frons largely dark velvety microtomentose (A); frons without such microtomentum (P). **51** – pedicel strongly overlapping 1st flagellomere (A); pedicel slightly overlapping 1st flagellomere (P). **52** – palpus sexually dichroic (A); palpus similar in both sexes (A). **53** – gonostylus slender, boot-like (A); gonostylus more robust, lobate (P). **54** – pregonite lobe-shaped and separate (A); pregonite short and fused with hypandrium (P). **55** – posterior internal sclerites in female genital chamber absent (A); posterior internal sclerites well developed (P). **56** – female cercus very short and broad (A); female cercus long and more slender (P). **57** – female S10 with anterior strip-like dark part (A); female S10 simple, entire (P). **58** – pvt absent (A); pvt present (P). **59** – mesopleuron bare and lustrous (A); mesopleuron microtomentose and duller (P). **60** – hypandrium with large tuberculate anterodorsal lobes (A); hypandrium with small, simple, non-projecting lobes (P). **61** – aedeagal part of folding apparatus strongly asymmetrical (A); aedeagal part of folding apparatus more or less symmetrical (P). **62** – mesonotum dorsally flattened (A); mesonotum normally convex (P). **63** – wing with transverse dark bands (A); wing unicolourous (P). **64** – gonostylus with robust short spines on inner side (A); gonostylus with fine setae on inner side (P). **65** – saccus small and largely sclerotized (A); saccus more voluminous and largely membranous (P). **66** – 8th female abdominal segment with sclerotized pleural part (A); this pleural part membranous (P). **67** – frontal lunule reduced (A); frontal lunule distinct (P). **68** – vti shorter than vte (A); vti longer than vte (P). **69** – arista long-pectinate (A); arista ciliate to plumose (P). **70** – ors widely separated (A); distance between long ors shorter (P). **71** – pregonite separated from hypandrium by posterior notch (A); pregonite coalesced with hypandrium also posteriorly (P).

The remaining genus *Amygdalops* has not been clustered with any other Palaearctic genera (Figs 137, 138). This is surely due to its tropical origin. Roháček & Barraclough (2003) and Roháček (2004) presupposed that its sister group is the Afrotropical genus *Margdalops* Roháček & Barraclough, 2003 but, as noted by Roháček (2008a), there is an unnamed Neotropical genus which probably represents a yet closer relative of *Amygdalops* than is *Margdalops*. Additional relatives are expected to be discovered among unnamed groups of exotic Anthomyzidae, particularly in Old World tropical areas. The Palaearctic species of *Amygdalops* clearly originate from two different areas, viz. the Afrotropical Region (species occurring in the southwest part of the Palaearctic Region) and the Oriental Region (species known from the extreme east of the Palaearctic Region). This may also contribute to the difficulties in searching for the closest Palaearctic relative of *Amygdalops*.

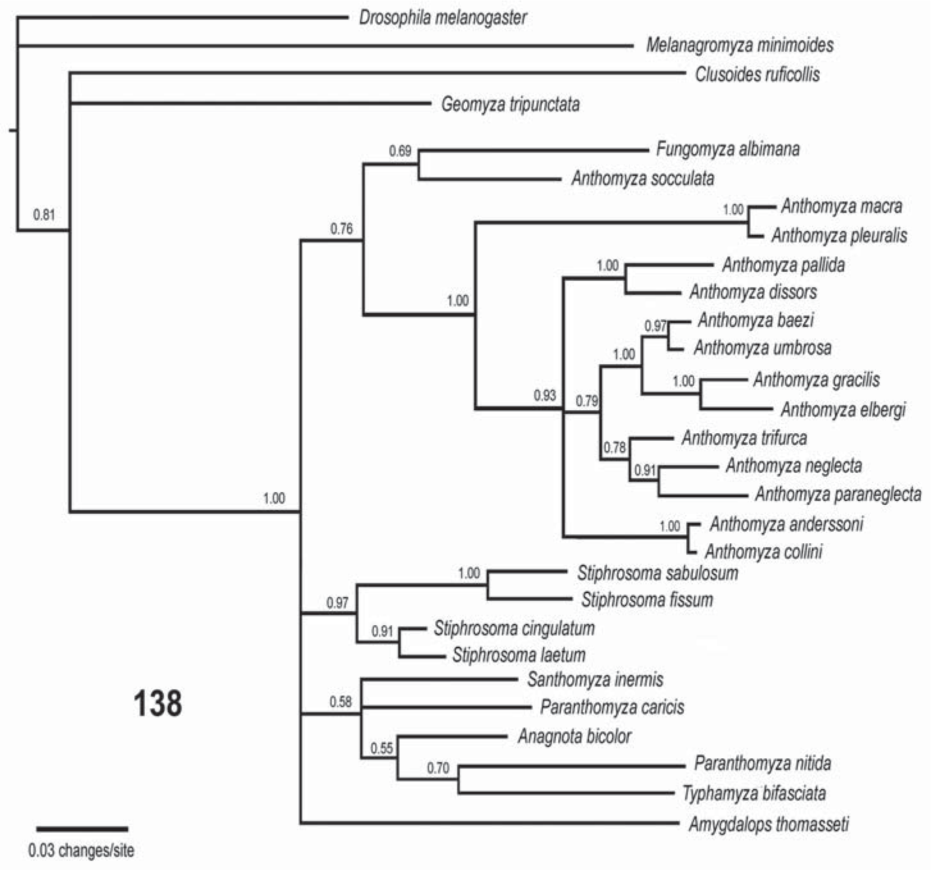

Fig. 138. Phylogram showing the relationships of European Anthomyzidae resulting from Bayesian analyses of the combined 12S and 16S rRNA gene sequences (after Roháček et al. 2009). The posterior probabilities (over 0.50) are shown above branches.

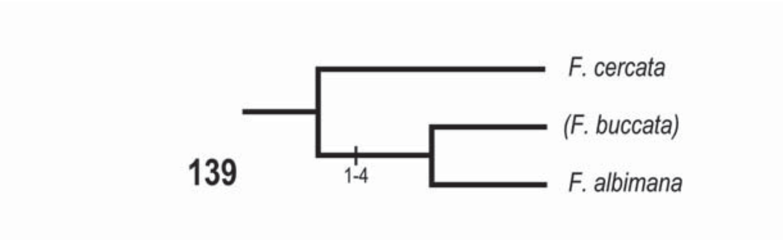

Fig. 139. Cladogram showing the inferred relationships among species of *Fungomyza*. Non-palaearctic species in parentheses. Numbers below branches refer to apomorphic states of characters. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P)]:

1 – f_1 and t_1 variegated yellow and brown (A); f_1 and t_1 unicolourous yellow (P). **2** – male cercus small, reduced (A); male cercus normal (P). **3** – caudal process of transandrium long and forked (A); caudal process short, divided into two parts (P). **4** – ejacapodeme modified and reduced (A); ejacapodeme normal, with usual digitiform projection (P).

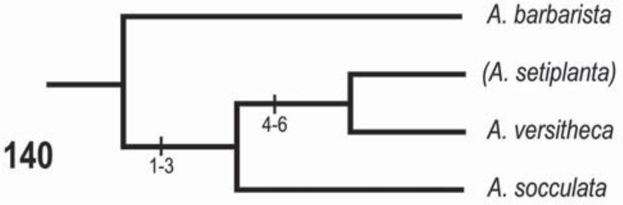

Fig. 140. Cladogram showing the inferred relationships among species of *Arganthomyza*. Non-palaearctic species in parentheses. Numbers below branches refer to apomorphic states of characters. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P)]:
1 – filum of distiphallus with longitudinal sclerites partly fused (A); filum with sclerites disparate, but closely attached (P). **2** – spermathecae with spine-like or bell-shaped basal appendages (A); spermathecae with only small spinulae (P). **3** – ventral receptacle with long narrow, or suddenly tapered apex (A); ventral receptacle simple, with short, gradually tapered apex (P). **4** – frontal triangle very long (A); frontal triangle short (P). **5** – hind basitarsus with thickened proximoventral setae (A); hind basitarsus uniformly finely setulose (P). **6** – ventral receptacle apically suddenly attenuated to slender projection (A); ventral receptacle gradually attenuated and curved (P).

Phylogenetic relationships among species within particular genera

***Fungomyza*.** The three known species of *Fungomyza*, the Palaearctic *F. cercata* sp.n., *F. albimana* and the Nearctic *F. buccata,* form a distinct monophyletic clade (genus) supported by several synapomorphies (Fig. 137, 16-20). *F. cercata* proved to be a sister group of the remaining pair by retaining some plesiomorphic features (e.g. fore leg unicolourous, large male cercus, normal ejacapodeme, short caudal process of the transandrium) not known in the other species. Unfortunately, the female of *F. cercata* is unknown so that the female postabdominal characters cannot be used to verify this relationship. The E. Nearctic *F. buccata* and the W. Palaearctic *F. albimana* are clustered on the basis of several synapomorphies, the strongest of them presented in the cladogram in Fig. 139 (1-4).

***Arganthomyza* gen.n.** With respect to its sister group *Fungomyza,* the genus *Arganthomyza* is delimited by a series of apomorphic features (see above in the description of the genus), the most important of which are used in the cladogram (Fig. 137, 21-24). It should be stressed that, besides the distinctly homoplasious character 24, some of these characters are not unique and can occur in a similar condition in certain groups of *Anthomyza*, e.g. the silvery spots on the vertex (21) in the *Anthomyza macra* group or the female T7 + S7 fused into a compact tergosternum (23) in most *Anthomyza* species. The relationships within the genus *Arganthomyza* are displayed in Fig. 140. All four known species of the genus are included despite the fact that the Nepalese *A. setiplanta* (Roháček 1987) is only known in the female sex. The most strikingly modified species, *A. barbarista* sp.n., was found to represent the sister group to all remaining species which are clustered on the basis of synapomorphies 1-3 (Fig. 140). Apart from distinctly derived morphological modifications (such as the densely haired arista or plate-shaped annular sclerite), *A. barbarista* has very long spermathecal ducts – a character considered to be a reversal of the shortened ducts otherwise synapomorphic for *Fungomyza*, *Arganthomyza* and *Receptrixa*. The E. Palaearctic *A. versitheca* sp.n. and the Nepalese *A. setiplanta* are closely allied (sister) species that are clustered on a clade supported by 3 distinct synapomorphies (Fig. 140, 4-6) and the transpalaearctic *A. socculata* forms a sister group of this pair. The latter species has yet closer (undescribed) relatives in the Nearctic Region.

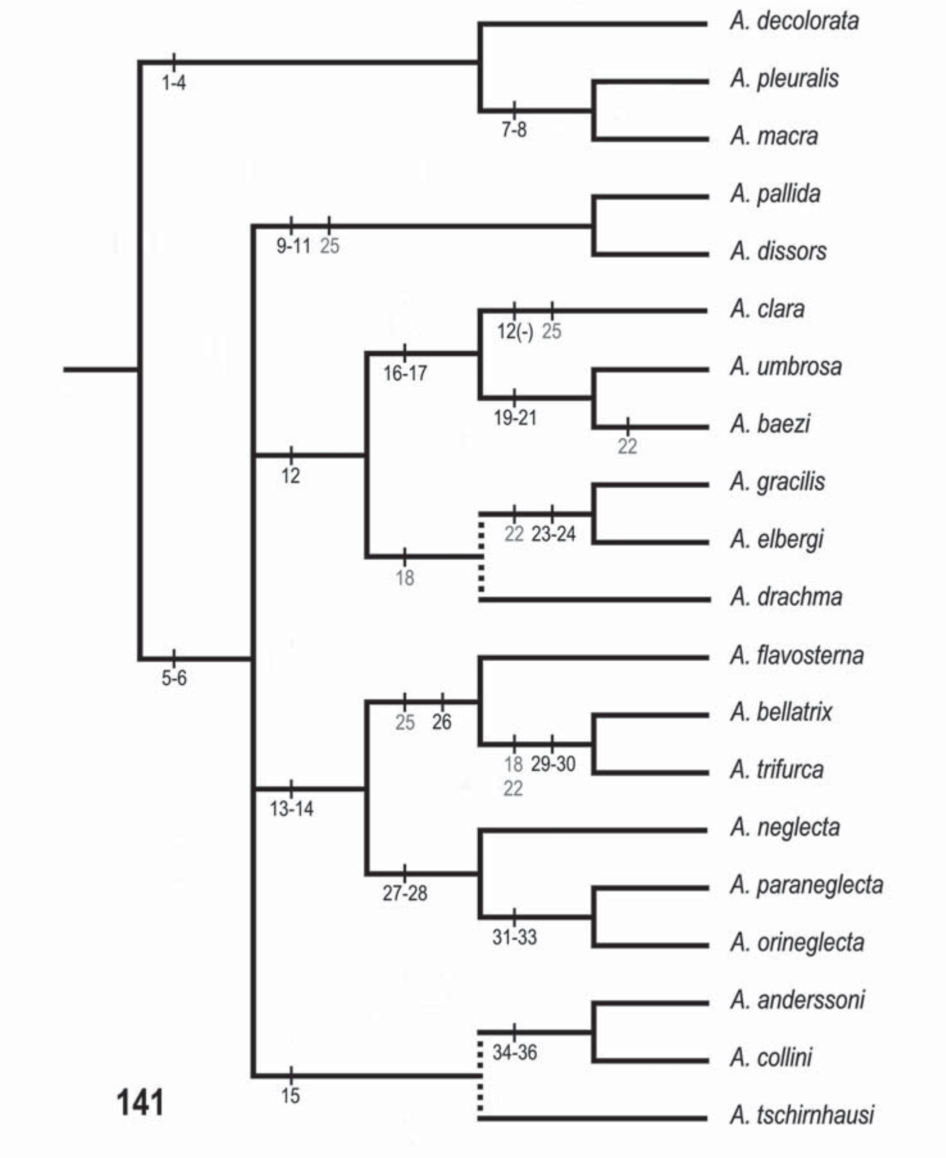

Fig. 141. Cladogram showing the inferred relationships among Palaearctic species of *Anthomyza*. For characters see also opposite page. Numbers below branches refer to apomorphic states of characters. Dashed lines indicate questionable relationships. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P), reversal of character = (-), grey numbers denote homoplasious characters]:

1 – epandrium very broad (A); epandrium narrower (P). **2** – gonostylus distally strongly dilated (A); gonostylus slightly dilated or narrow (P). **3** – saccus of distiphallus with coiled strip-like structure inside (A); saccus without coiled strip-like structure (P). **4** – spermathecae very elongate (A); spermathecae short and broad (P). **5** – filum of distiphallus with apex attenuated and pointed or (secondarily) expanded and with projections (A); filum with apex simple (P). **6** – ventral receptacle with apex very long, attenuated and twisted (A); ventral receptacle with apex shorter, attenuated and only curved (P). **7** – saccus with spines pale (A); saccus with spines pigmented (P). **8** – female S7 narrowed, sparsely setose (A); female S7 broader, densely setose (P). **9** – hypandrium with anterior ventral acute tooth (A); hypandrium without anterior tooth (P). **10** – filum of distiphallus with subapical tooth (A); filum simple, without subapical tooth (P). **11** – saccus prolonged, membranous (A); saccus shorter and more sclerotized (P). **12** – female T10 with surplus setulae in addition to pair of dorsal setae (A); female T10 with only pair of setae (P). **13** – filum of distiphallus with apex blunt or dilated (A); filum with apex simply attenuated and pointed (P). **14** – internal sclerites in female genital chamber asymmetrical (A); internal sclerites symmetrical (P). **15** – female T8 extremely narrowed (A); female T8 wider (P). **16** – anterior hypandrial lobes projecting dorsally (A); hypandrial lobes small, bent internally (P). **17** – female S7 broad, overlapping corners of T7 (A); female S7 narrow (P). **18** – aedeagal part of folding apparatus with strong spines (A); aedeagal part of folding apparatus without strong spines (P). **19** – aedeagal part of folding apparatus with pale tubercles (A); aedeagal part of folding apparatus with dark grain-like tubercles (P). **20** – female T8 narrow (A); female T8 broad (P). **21** – spermathecae with terminal evagination (A); spermathecae terminally simple (P). **22** – female T7+S7 fused into tergosternum (A); female T7 and S7 disparate (P). **23** – caudal process of transandrium with conspicuous ventral appendage (A); caudal process simple, flat (P). **24** – spermathecae with long digitiform invagination (A); spermathecae without invagination (P). **25** – male f_3 with a series of short and thick posteroventral setae (A); male f_3 uniformly setulose (P). **26** – filum of distiphallus with apex strongly dilated (A); filum with apex narrow (P). **27** – distal part of gonostylus strongly incurved (A); gonostylus simple (P). **28** – female T7 + S7 with anteroventral lobe-shaped appendages (A); T7 + S7 without appendages (P). **29** – basal fork of phallapodeme strongly asymmetrical (A); basal fork of phallapodeme slightly asymmetrical (P). **30** – apex of ventral receptacle spirally coiled (A); apex of ventral receptacle twisted (P). **31** – apex of filum of distiphallus hook-like bent (A); apex of filum slightly bent (P). **32** – annular sclerite strongly asymmetrically bent (A); annular sclerite slightly bent (P). **33** – ventral receptacle with broad proximal part (A); ventral receptacle proximally slender (P). **34** – female T8 strongly attenuated posteriorly (A); T8 not attenuated posteriorly (P). **35** – female S8 dorsolaterally extended (A); female S8 simple (P). **36** – posterior pair of internal sclerites in female genital chamber wing-like (A); posterior pair of internal sclerites not wing-like (P).

Anthomyza. The monophyly of this largest genus of Anthomyzidae is supported by several strong synapomorphies (Fig. 137, 8-11) and was also clearly demonstrated by the analysis of the mitochondrial 12S and 16S rRNA genes by Roháček et al. (2009), see Fig. 138. The latter molecular study (although limited to European species) also confirmed the monophylies of the majority of the species groups established by Roháček (2006a) and clarified their mutual affinities. In the present phylogenetic reconstruction (Fig. 141) based on a cladistic analysis of morphological characters, all 20 known Palaearctic species are included.

The *A. macra* group forms the most basal clade and the sister group to all remaining Palaearctic species. It is supported by several synapomorphic characters (Fig. 141, 1-4) and also by molecular data (Fig. 138). The E. Palaearctic species, *A. decolorata* sp.n. is found to be a sister group to the very closely allied sister pair, *A. pleuralis* and *A. macra* (see Fig. 141, 7-8). It is to be noted that the *A. macra* group is also represented [by *A. tenuis* (Loew, 1863) and two unnamed species] in the Nearctic Region.

The sister clade to the *A. macra* group comprises all the remaining (17) Palaearctic species and its monophyly seems to be demonstrated by two distinct synapomorphies (Fig. 141, 5-6) and is also supported by the molecular data analysis (Roháček et al. 2009). However, the relationships within this clade have not been clearly elucidated – the 4 main branches remain in an unresolved quadrichotomy. This result differs somewhat from that of the molecular data analysis (see Fig. 138) where this clade is trichotomous and the largest branch comprises all species-groups except for the *A. pallida* group and the *A. collini* group. However, no morphological synapomorphy has been found to support this clustering.

The *A. pallida* group, comprised of *A. pallida* and *A. dissors*, forms the first clade of this quadrichotomy. It is a distinctly delimited (Fig. 141, 9-11) group where *A. pallida* (with disparate female S7) is the more primitive species, while *A. dissors* is distinctly derived.

The next clade, the monophyly of which is supported by a single synapomorphic character (12 – female T10 with surplus setulae), includes two species-groups (the *A. umbrosa* group and the *A. gracilis* group) plus *A. drachma*, an E. Palaearctic species of uncertain affinity. Interestingly, this clade is also very strongly supported by the molecular data (Fig. 138). The *A. umbrosa* group includes *A. clara*, *A. umbrosa* and *A. baezi* clustered in a clade distinctly delimited by two synapomorphic features (Fig. 141, 16-17). *A. clara* forms a sister group to two Madeiran endemic species, viz. *A. umbrosa* and *A. baezi* which are clustered by synapomorphies 19-21 (Fig. 141). Also, the *A. gracilis* group (with *A. gracilis* and *A. elbergi*) is clearly a monophyletic cluster characterized by strong synapomorphies (23-24). The affinity of *A. drachma* to the latter group is not certain; the species is tentatively associated with the *A. gracilis* group on the basis of character 18 (strong spines in the aedeagal part of the folding apparatus) but this feature is not unique within *Anthomyza* and also occurs in the *A. bellatrix* group.

The third clade of the quadrichotomy, comprised of two species groups, is relatively well supported by two strong synapomorphies (Fig. 141, 13-14) and also (less strongly) by molecular data (Fig. 138). It is split into two clades, one clustering *A. flavosterna* and the *A. bellatrix* group, the other the *A. neglecta* group. *A. flavosterna* is linked with the *A. bellatrix* group on the basis of the dilated distal end of the filum of the distiphallus (26) although the female postabdominal structures of this species differ markedly from those in the *A. bellatrix* group. On the other hand, the *A. bellatrix* group is very distinct, well delimited by unique synapomorphies (Fig. 141, 29-30) and includes *A. cuneata* Roháček, 1987 from Nepal besides the E. Palaearctic species *A. bellatrix* and *A. trifurca*. The monophyly of the *A. neglecta* group also is without doubt (see Fig. 141, 27-28). Within this group, *A. neglecta* forms a sister group to the *A. paraneglecta* + *A. orineglecta* sister pair which is clustered by 3 synapomorphies (Fig. 141, 31-33).

The last clade of the quadrichotomy is comprised of the *A. collini* group. It is supported by a single synapomorphic character (15 – the modified, extremely narrowed female T8). The E. Palaearctic species *A. tschirnhausi* sp.n. differs rather markedly from the relatively homogeneous *A. anderssoni* + *A. collini* sister pair and is, therefore, considered only a tentative member of the *A. collini* group.

Epischnomyia. The genus *Epischnomyia* is represented by only two species, *E. merzi* sp.n. and *E. triarmigera*, both obviously restricted to the E. Palaearctic area. Because *Epischnomyia* is a highly modified taxon, there is no doubt about its monophyly (see Fig. 137, 27-30). Its two species are very closely allied differing only by colouring and some detail in the structures of the male genitalia and female postabdomen. *E. merzi* sp.n. could perhaps be considered the more derived species because its female postabdominal sternites appear to be more highly modified and its colour dimorphism (dichroism) may also be a derived character.

Stiphrosoma. As stated above the genus *Stiphrosoma* has its closest relatives in the New World – the *Mumetopia nigrimana* group was recognized as its sister group by Roháček & Barber (2009). Of the Palaearctic genera, only *Cercagnota* is found to be distinctly (although rather remotely) related to *Stiphrosoma* (see above and Fig. 137). The monophyly of *Stiphrosoma* was demonstrated by Roháček & Barber (2005, 2009) and is also confirmed by molecular data (see Fig. 138 and Roháček et al. 2009) for European species and by morphological data for the Palaearctic representatives here (Fig. 137, 34-36). The relationships within the genus were studied by Roháček & Barber (2005) who also included in the analysis all Palaearctic species (except for *S. grande* which was unknown at that time) and managed to recognize affinities except for *S. fissum*. The latter species was included in the analysis of the mitochondrial 12S + 16S gene markers (Roháček et al. 2009) which revealed its distinct affinity to *S. sabulosum* which had been considered to represent the most basal clade and sister species to all other known species of the genus (Roháček & Barber 2005). The close relationship between these two species

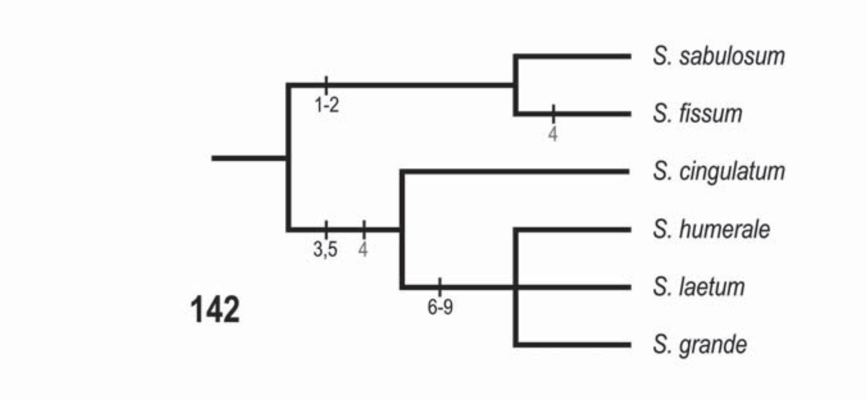

Fig. 142. Cladogram showing the inferred relationships among Palaearctic species of *Stiphrosoma*. Numbers below branches refer to apomorphic states of characters. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P), grey numbers denote homoplasious characters]:
1 – filum of distiphallus with preapical fission (A); filum preapically simple (P). **2** – only 1 pair of internal sclerites in female genital chamber (A); 2 pairs of internal sclerites (P). **3** – saccus with robust spines (A); saccus with small spinulae or tubercles (P). **4** – ventral part of female T7 + S7 pale-pigmented (A); ventral part of T7 + S7 dark (P). **5** – spermathecae elongately pyriform (A); spermathecae shortly pyriform (P). **6** – basal part of saccus with spines (A); saccus basally without spines (P). **7** – apex of filum of distiphallus setulose (A); apex of filum without setulae (P). **8** – spermathecae with long spines transversely attached to surface (A); spermathecae with spines oriented longitudinally (P). **9** – internal sclerites of female genital chamber enlarged and heavily sclerotized (A); internal sclerites smaller and weakly sclerotized (P).

can also be supported by morphological synapomorphies (Fig. 142, 1-2) if the ventral pale-pigmentation of the female T7+S7 (character 4) is considered to have evolved as a homoplasy in *S. fissum*.

The remaining four Palaearctic species of *Stiphrosoma* are clustered in a companion clade characterized by 3 synapomorphies (3-5). Within this branch *S. cingulatum* forms a sister group to the other 3 species which are very closely allied (see synapomorphies 6-9 in Fig. 142). These three species, *S. humerale*, *S. laetum* and *S. grande*, had to be retained in an unresolved trichotomy (Fig. 142) for lack of morphological data from the male genitalia of *S. grande*. The latter species was presupposed to be more closely related to *S. laetum* (perhaps its sister species) than to *S. humerale* by Roháček (2006a) but this statement has not been supported by any distinct synapomorphy in the present analysis.

Santhomyza. This genus represents a distinctive monophyletic lineage of unknown affinity to other Palaearctic genera. It may be related to some (of many) unnamed Afrotropical genera; the restriction of its distribution to the Mediterranean and Macaronesian subregions could support this suspicion. Unfortunately, one of its three species, viz. *S. bezzii* (Czerny, 1902), is only known from the original brief description of a female holotype (see Roháček 2006a) and cannot be included in the cladistic analysis because of lack of information about the structures of both the male and female genitalia. The comparison of the other two species, *S. inermis* and *S. biseta*, revealed that *S. biseta* (endemic to Canary Is.) is clearly the more derived species with a number of advanced modifications, particularly in the male genitalia (for more detail see Roháček 2006a).

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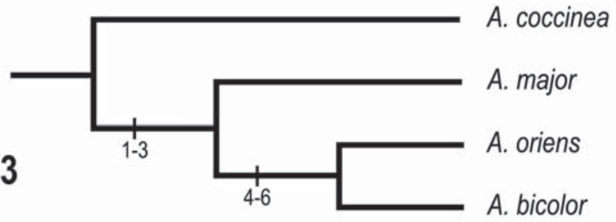

Fig. 143. Cladogram showing the inferred relationships among species of *Anagnota*. Numbers below branches refer to apomorphic states of characters. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P)]:

1 – antenna sexually dichroic (A); antenna similarly coloured in both sexes (P). **2** – face sexually dichroic (A); face with same colouring in both sexes (P). **3** – caudal process of transandrium medially narrow, keel-like (A); caudal process triangular and (also medially) flat (P). **4** – gonostylus angularly bent, with corner in the middle (A); gonostylus arch-like bent (P). **5** – filum of distiphallus with ribbon-shaped sclerites preapically crossed (A); filum with sclerites not crossed preapically (P). **6** – female S8 longer and narrower (A); female S8 shorter, broad and transverse (P).

Anagnota. This genus is another conspicuous group of Palaearctic Anthomyzidae with poorly known relationships. On the other hand, there is no doubt about its monophyly (see Fig. 137, 50-56). A total of 4 species are recognised, all from the Palaearctic Region. *A. coccinea*, a species restricted to the E. Mediterranean, proved to represent the sister group to the remaining three species which are externally very similar and closely allied. These species, viz. *A. major*, *A. oriens* and *A. bicolor*, are clustered on the basis of three characters, two of which are sexually dichroic structures (see Fig. 143, 1-2). While in *A. coccinea* only the palpus is sexually dichroic, these three species also have the antenna and face differently coloured in the male and female. *A. oriens* and *A. bicolor* are probably sister species as supported by characters 4-6 (Fig. 143) while *A. major* represents the sister group to this pair.

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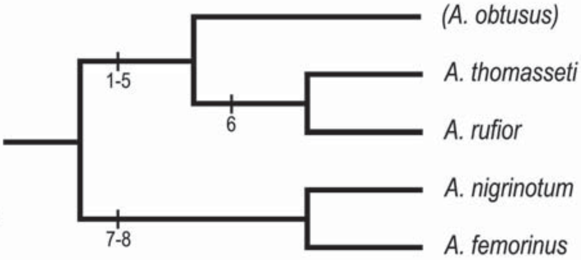


Fig. 144. Cladogram showing the inferred relationships among species of *Amygdalops*. Non-palaearctic species in parentheses. Numbers below branches refer to apomorphic states of characters. Characters mentioned in the cladogram [apomorphic state = (A), plesiomorphic state = (P)]:

1 – orbit with whitish silver microtomentum anteriorly (A); orbit without whitish silver microtomentum (P). **2** – wing with distinct white longitudinal area along R_{2+3} (A); wing without distinct white area along R_{2+3} (P). **3** – mesonotum at least partly orange ochreous (A); mesonotum entirely brown (P). **4** – pregonite separated from hypandrium by external posterior notch (A); posterior notch separating pregonite situated on inner side of hypandrium (P). **5** – aedeagal part of folding apparatus short (A); aedeagal part of folding apparatus long (P). **6** – gonostylus apically pointed (A); gonostylus apically obtuse (P). **7** – caudal process of transandrium with lateral projections (A); caudal process simple, without projections (P). **8** – spermathecae pyriform (A); spermathecae sphaerical (P).

Amygdalops. As discussed above, the four Palaearctic species of the genus *Amygdalops* represent only a small portion of this Old World tropical group which penetrated to the Palaearctic Region in the west from the Afrotropical Region and in the east from the Oriental Region (as reflected in their relationships). An Afrotropical species, *A. obtusus* Roháček, 2004, is included in the cladistic analysis (Fig. 144) because it has been recently found close to the southern border of the Palaearctic Region. The latter species is linked together with *A. thomasseti* and *A. rufior* on a well-supported lineage (Fig. 144, 1-5) of Afrotropical origin. These 3 species are very closely allied but *A. rufior* seems to be derived more recently from the widespread *A. thomasseti*. On the other hand, *A. femorinus* sp.n. and the widespread *A. nigrinotum* belong to another clade (Fig. 144, 7-8) clearly of Oriental origin (cf. also Roháček 2008a).

Biology

Biological information on Anthomyzidae can be found scattered in the literature (see below) but there is no comprehensive review of this knowledge. Even for the taxonomically well-studied European fauna (see Roháček 2006a), the biological data are rather fragmentary for the majority of species. The most recent general surveys of the biology of Anthomyzidae are given by Vockeroth (1987), Ferrar (1987) and Roháček (1998b) but these do not provide detailed information owing to the limited space available and also to insufficient knowledge at that time.

During the last decade numerous new biological data have been obtained while several valuable records have also been discovered in older or formerly overlooked literature. The information dealing with the biology (bionomics, autecology) of a few particular species is available in older (e.g. de Perris 1853; Grünberg 1810; Oldenberg 1927; Séguy 1934; Kröber 1935; Hering 1943; Meijere 1944; Nye 1958) as well as more recently published papers (Dely-Draskovits 1972; Andersson 1976; De Bruyn 1985; Wolf 1988; Dely-Draskovits 1991, 1998; Roháček 1992, 1996a, 1999c,d, 2006a; Roháček & Freidberg 1993; Nartshuk 1996; Panteleeva & Razvorotnev 1996; Panteleeva 1997; Dely-Draskovits & Bächli 1998; Tscharntke 1999; Roháček & Barber 2004, 2005). On the other hand, studies of the anthomyzid assemblages associated with particular habitats or plant communities are rather scarce (in Europe: Nye 1959; Krogerus 1960; Roháček & Máca 1982; Panteleeva 1997; Roháček & Barták 2000; Bährmann 2006; in N. America: Beaulieu & Wheeler 2001, 2002; Foote 2004).

The main aim of this chapter is therefore to provide a more detailed summary of available (published as well as resulting from the author's recent studies) knowledge of various aspects of the biology of the Palaearctic species of Anthomyzidae.

Reproduction

Only bisexual reproduction is known in Anthomyzidae and no swarming behaviour has been observed in members of this family. Large numbers of adults are sometimes found in tussocks of graminoids (known in some *Stiphrosoma* species) but this is likely caused by their mass emergence from breeding substrates under suitable conditions.

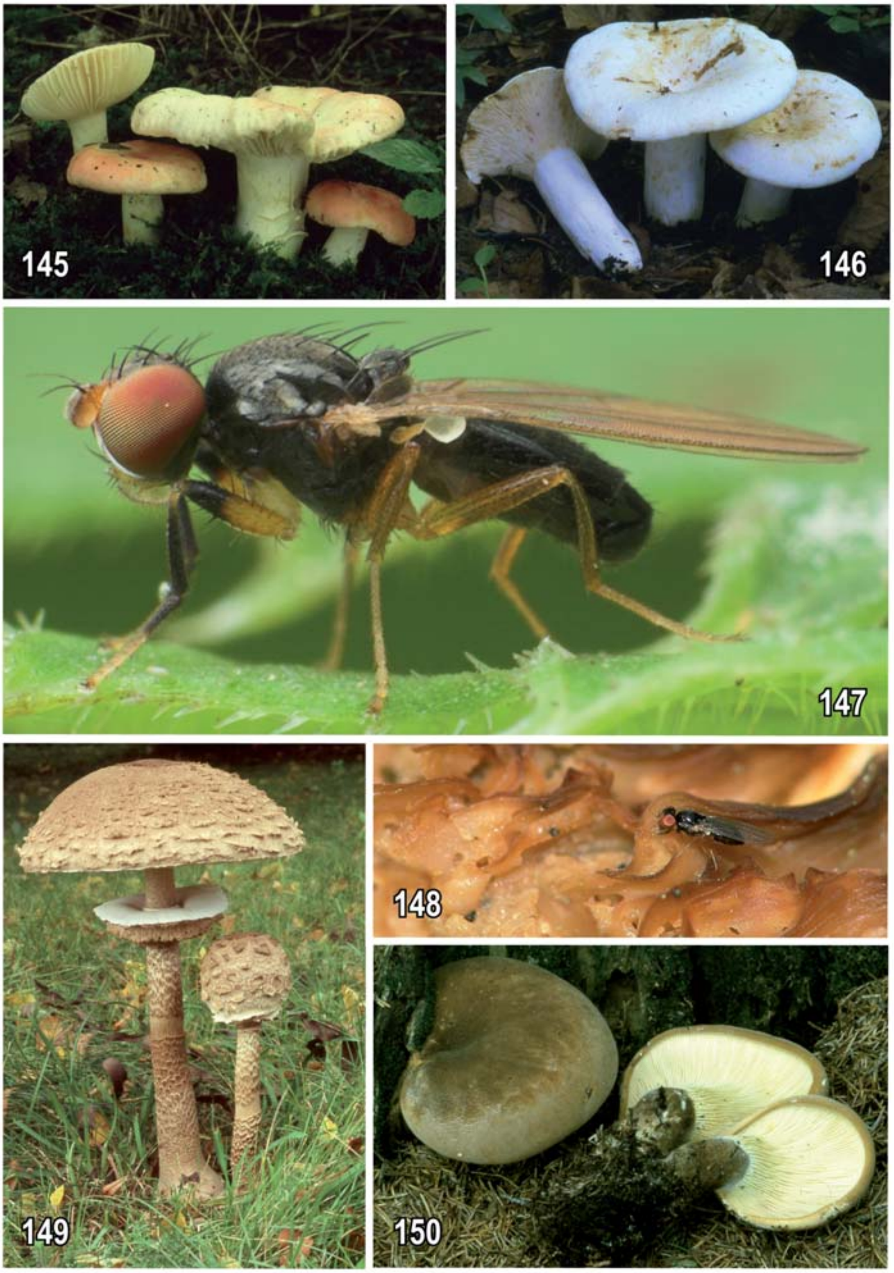
Mating. Adult Anthomyzidae mate in the superimposed position (observed many times in the wild as well as in collecting bottles) but the duration of copulation and its frequency has not been documented. Males of a number of species (in various genera) have a secondary sexual characteristic – a row of posteroventral setae on the hind femora which are shortened and thickened in the distal third. This structure likely facilitates holding of the female during copulation but the definitive part of the female body (? abdomen, ? legs) which is clenched by the male f_3 and t_3 has not been recognized.

Sex-ratio. The sex-ratio (R_s= N♂/N♀ · 100) obviously strongly varies within a population during the flight period of the adults. Therefore, its average value (calculated from total material examined) may be strongly affected by the period during which the majority of specimens was captured. It is apparent that the average value of the sex-ratio is more reliable in frequently collected species of which the highest numbers of specimens were examined. Thus, although the sex-ratio was calculated for all Palaearctic species, only those with more than 100 specimens examined are considered below. Theoretically, the value of the sex-ratio should approach 100 in most bisexual species but this is evident in only a few species of Palaearctic Anthomyzidae, viz. *Stiphrosoma cingulatum* R_s = 93, *Anthomyza pallida* R_s = 95, *Amygdalops thomasseti* R_s = 105, *Anthomyza collini* R_s = 108, *A. neglecta* R_s = 119. More frequently, females predominate slightly to strongly in the material examined: *Stiphrosoma laetum* R_s = 81, *Anthomyza pleuralis* R_s = 75, *Typhamyza bifasciata* R_s = 74, *Paranthomyza nitida* R_s = 70, *Stiphrosoma sabulosum* R_s = 70, *Anagnota bicolor* R_s = 65, *Santhomyza inermis* R_s = 64, *Anthomyza macra* R_s = 55. In addition to the above-listed species, a strikingly low sex-ratio also occurs in two other species of *Anagnota*, viz. *A. oriens* R_s = 50 and, particularly, *A. major* R_s = 29 but in these cases only 24 and 34 specimens, respectively, have been examined. The preponderance of females is usually explained by their longer survival which may also be true for Anthomyzidae. K. N. Barber found in his rearing experiments that significantly more females than males emerged from puparia of the Nearctic *Stiphrosoma stylatum* under laboratory condition so the sex-ratio (R_s = 67, n = 82) was already shifted to the benefit of the female sex during preimaginal development (Roháček & Barber 2005). This phenomenon could be caused by suboptimal rearing conditions as the reared specimens were also noticeably smaller than wild-caught ones. On the other hand, the preponderance of males is more difficult to explain. Following the present analysis, males are frequently predominant in Anthomyzidae as confirmed in a number of species including very common ones: *Anthomyza baezi* R_s = 120, *A. gracilis* R_s = 125, *A. anderssoni* R_s = 132, *Arganthomyza socculata* R_s = 134, *Anthomyza trifurca* R_s = 143, A. *elbergi* R_s = 147, *A. paraneglecta* R_s = 152, *A. dissors* R_s = 154, *Fungomyza albimana* R_s = 159. The males possibly predominate in samples of these species because they can be more readily collected owing to their higher activity level or because they are concentrated in places easily sampled while the females live more secretly or occur dispersed within vegetation.

Oviposition. There is no observation of oviposition by Anthomyzidae in the wild. The laboratory rearings of the Nearctic species *Stiphrosoma balteatum* Roháček & Barber, 2005 by K. N. Barber showed that oviposition of wild-caught females continued over a period of more than 2 months. Eggs were laid singly on short pieces of leaves of the host plant *Carex aquatilis* placed on moist white sand. Females of another Nearctic species, *Stiphrosoma stylatum* Roháček & Barber, 2005, also developing on the same sedge species, oviposited in a similar way and period of time (Roháček & Barber 2005).

Life history

The life history of Anthomyzidae has been very insufficiently reported upon. The only available data are those obtained from laboratory rearing experiments. However, they are very fragmentary as regards the Palaearctic species because the rearings have been accomplished using mature (= 3rd instar) larvae found in their host plants in the field (Hering 1943; Nye 1958; Roháček 1992). Only recently, K. N. Barber has successfully reared several Nearctic species from eggs oviposited by wild-caught fertilized females and provided more detailed information about their entire life history (data about two species of *Stiphrosoma* were published in Roháček & Barber 2005).



Figs 145-150: *Fungomyza albimana* (Meigen) and some of its host fungi. **145** - *Russula luteotacta*; **146 -** *Lactarius piperatus*; **147 -** *F. albimana*, male; **148** - *F. albimana*, female sitting on decayed *Russula grisea*; **149 -** *Macrolepiota procera*; **150 -** *Paxillus atrotomentosus*. Photo by V. Balner (145-146, 149-150), D. Gavryushin (147) and J. Ševčík (148).

Eclosion of the larva. The first-instar larva hatches from the egg within a few days in *Stiphrosoma stylatum* while in *Stiphrosoma balteatum* an egg diapause has been revealed by K. N. Barber (fully embryonated larvae visible in eggs did not eclose for a long time) and, therefore, these eggs were exposed to lower temperatures for 134 days (for more detail see Roháček & Barber 2005); upon return to normal (20°C) temperature, they hatched in 2-5 days.

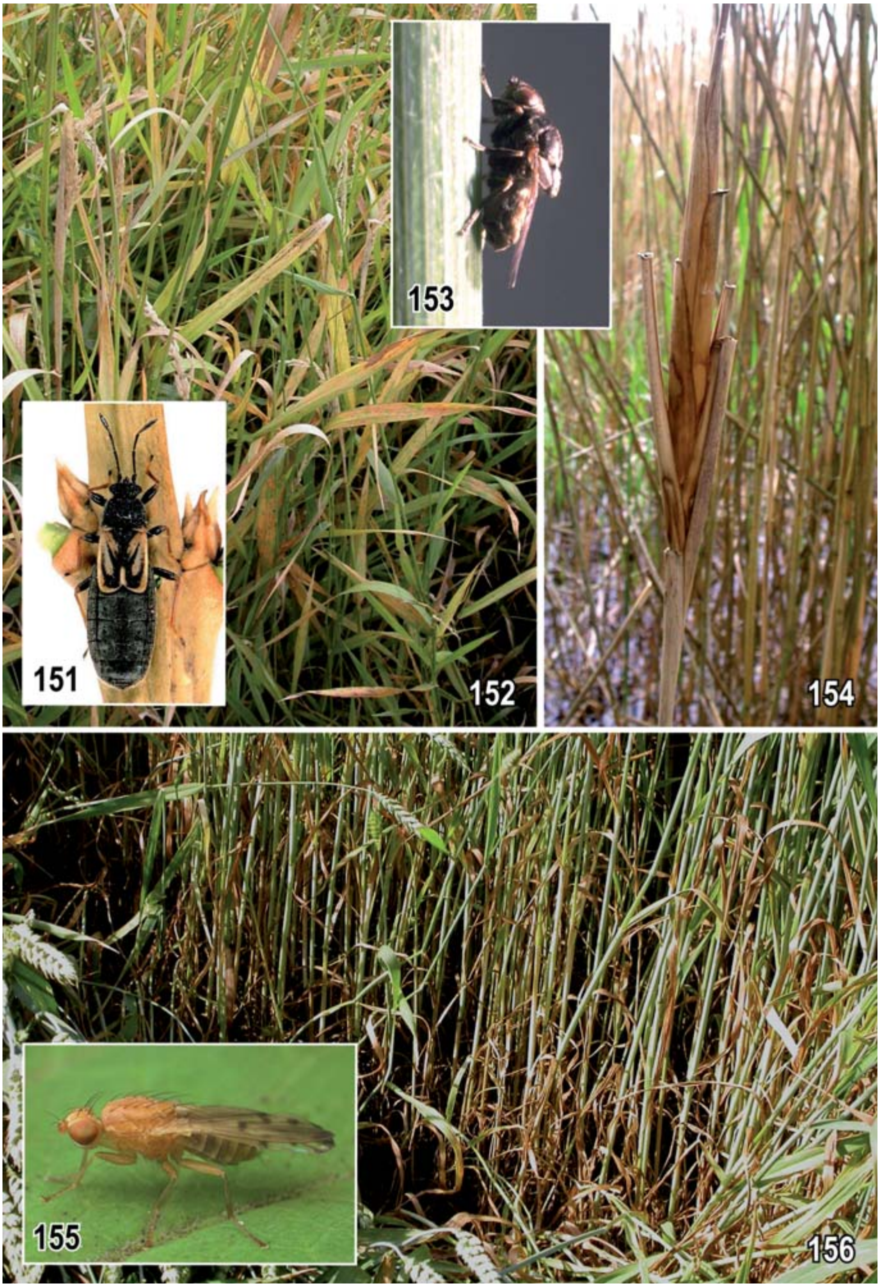
Larval development. Three larval instars occur in the Anthomyzidae (as known in related acalyptrates) but their duration remains unknown even in those species reared in the laboratory (Roháček & Barber 2005). K. N. Barber found that the whole larval development (from neonate larva to pupariation) of *Stiphrosoma balteatum* requires 18-27 days under laboratory conditions. However, this development period can be several times longer in the wild, even in the bivoltine and multivoltine species (having 3 or more generations per year, the shortest during the warmest months). In univoltine species, like *Typhamyza bifasciata* whose 3rd-instar larva overwinters, larval development may last more than 9 months (Roháček 1992). The available information indicates that the larva is usually the overwintering stage also in bivoltine or multivoltine Anthomyzidae; this was confirmed in *Paranthomyza nitida* (by Hering 1943), *Stiphrosoma sabulosum* (by Nye 1958) and *Anthomyza collini* (by rearing from *Lipara* galls on *Phragmites australis* collected in winter). However, as mentioned above, some species may overwinter in the egg stage (egg diapause was confirmed experimentally in the Nearctic *Stiphrosoma balteatum*, see Roháček & Barber 2005).

Pupariation. The puparium is formed in the feeding site of the last-instar larva in the host plant as found in *Paranthomyza nitida* (see Hering 1943; de Meijere 1944) and *Anthomyza collini* (cf. Perris 1853) or sometimes in nearby drier places as known in *Typhamyza bifasciata* (see Roháček 1992). However, the larva may also pupariate in soil or in rotten plant remnants when the host plant is decomposed during the winter (in *P. nitida* – Roháček 1999d, 2006a). The duration of the pupal stage is relatively short: in *T. bifasciata* it lasts 12-18 days (Roháček 1992), in the Nearctic species *Stiphrosoma balteatum* and *S. stylatum* 11-13 days and 8-11 days, respectively (Roháček & Barber 2005). Of course, this period may be extremely prolonged if the pupa is the overwintering stage. However, only Pokorný & Skuhravý (1981) have hitherto recorded overwintering in the pupal stage of *Anthomyza collini* (as *A. gracilis*).

Adult life. The length of adult survival has only been determined in the Nearctic species *Stiphrosoma balteatum* and *S. stylatum*. The wild-caught specimens of these species lived under laboratory condition up to 83 days (Roháček & Barber 2005); however, it is presumed that survival of adults is generally shorter in the wild. No data are available for the time from eclosion to the beginning of mating or oviposition.

Diurnal rhythm of activity

The majority of Palaearctic species of Anthomyzidae obviously are only active in the daytime. In Central Europe the increasing activity of adults of a number of species living in open marshland habitats (e.g. *Anagnota bicolor, Anthomyza neglecta, A. paraneglecta, A. gracilis, A. collini, Stiphrosoma cingulatum*) has been observed in the late afternoon and before dusk while the adults were slow and hidden in plant tussocks in the morning. The higher flight activity during afternoon is probably stimulated by suitable microclimatic conditions, temperature and humidity in particular. In more southern areas, the adult activity of Anthomyzidae is markedly decreased at midday and in the early afternoon, in the hottest part of the day when the air humidity is sharply reduced. However, the successful light-trapping of some species of Anthomyzidae in warmer areas (e.g. in subtropical and tropical belts) indicates that these species are also active during the night. For example, several species of *Amygdalops* (including *A. thomasseti*



Figs 151-156: Damaged host plants of Anthomyzidae and their primary phytophagous invaders. **151** – *Ischnodemus sabuleti* (Lygaeidae); **152** - *Phalaris arundinacea*; **153 -** *Lipara lucens*, male (Chloropidae); **154** - gall of *L. lucens* on *Phragmites australis*; **155** - *Opomyza florum*, male (Opomyzidae); **156** - wheat (*Triticum aestivum*). Photo by J. Dvořák (151), P. Häfliger (153), D. Gavryushin (155) and J. Roháček (others).

were repeatedly collected at light or caught in light traps (cf. Roháček 2004a, 2008a; Deeming 2008); similarly, two New World species of *Stiphrosoma* are also attracted to light sources (Roháček & Barber 2005).

Seasonal variation (dynamics) and periodicity (voltinism)

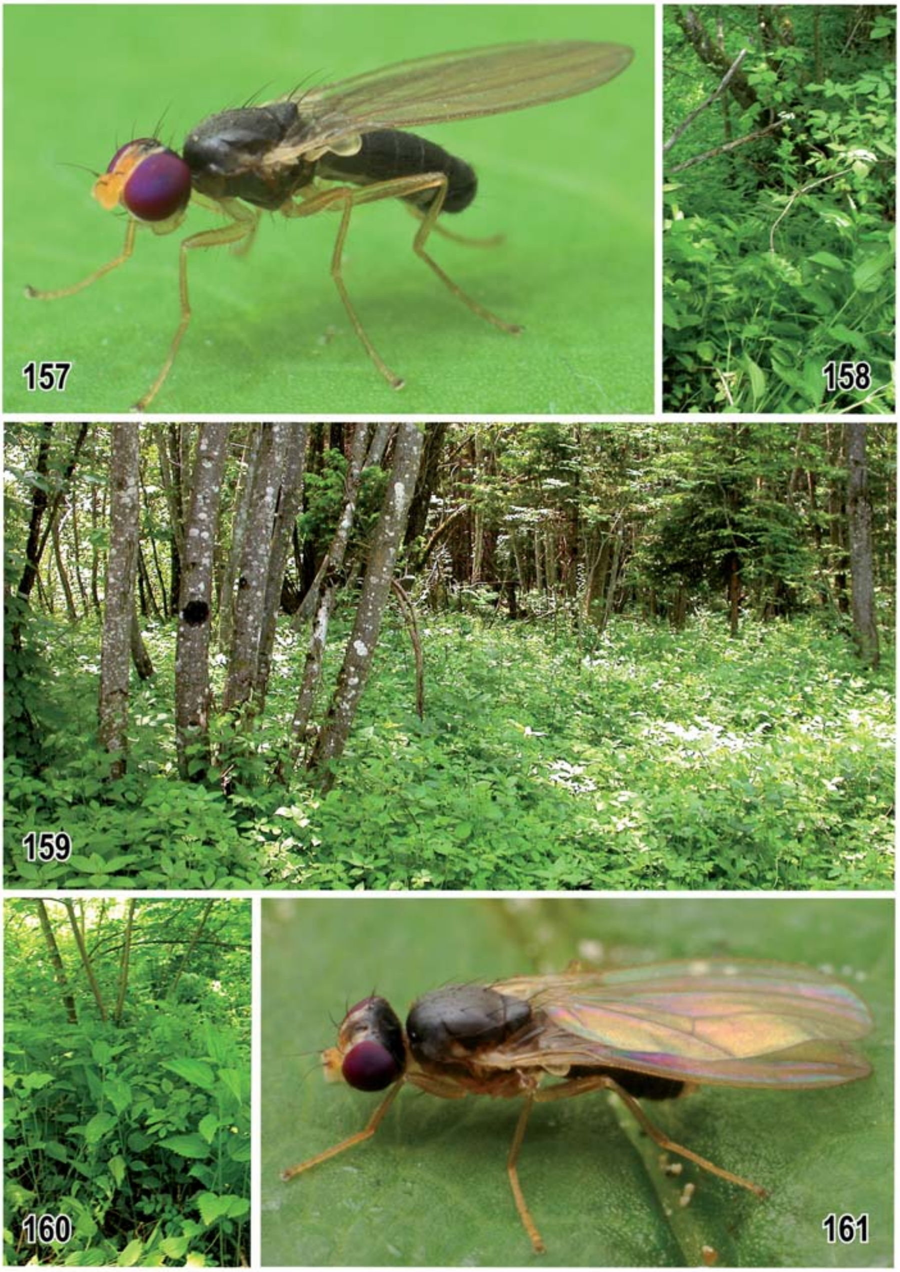
The seasonal dynamics of the occurrence of adults of (some commoner) Anthomyzidae have been studied by a few authors: Vaňhara (1981) provided data about the quantitative incidence of *Paranthomyza nitida* adults in regularly sampled plots in a floodplain forest; Bährmann (2006) presented data about seasonal variation of 6 species based on combined data from sampling in a number of habitats and localities. However, it should be stressed that the dynamics of adult occurrence may be somewhat different in various habitats and sites depending on local climatic and other abiotic circumstances as well as on trophic and other biotic conditions (e.g. on interspecific competition, number of regulators etc.). Analysis of the material examined revealed that there are two main types of seasonal occurrence in middle latitudes (temperate belt) of the Palaearctic Region: (1) species with a short occurrence span (VI-VIII), (2) species with a long occurrence span (III-/V-IX/-X).

(1) species with a short occurrence span normally have only one peak during the period of adult occurrence. Only univoltine species seem to belong to this type. They have a prolonged larval-development period because the 3rd-instar larvae overwinter and pupate in the spring of the following year; adults emerge in V-VI and can survive (ovipositing females in particular) up to VIII. Univoltinism was demonstrated in *Typhamyza bifasciata* (see Roháček 1992). Based on their short seasonal occurrence as adults the following species probably also have only one generation in a year: *Anthomyza macra, A. pleuralis, A. dissors, A. neglecta, A. paraneglecta, A. flavosterna, A. elbergi, Arganthomyza socculata*, *Carexomyza caricis*.

(2) species with a long occurrence span may have one or two peaks of occurrence. The species with two peaks probably have two generations in a year (bivoltine); those with a single peak may have 3 overlapping generations. Bivoltinism has been experimentally demonstrated in species which have mature larvae also present in the summer (e.g. *Stiphrosoma sabulosum* – see Nye 1958). It is obvious that all species with adults occurring from spring to autumn must have at least two generations per year. In *Paranthomyza nitida* the two-peak occurrence of adults (see Vaňhara 1981) indicates its bivoltinism. It is probable that in warmer (more southern) areas the bivoltine species can have 3 generations and only one generation in northern latitudes. In addition to *P. nitida* and *S. sabulosum,* the following species are also considered to be bi- or multivoltine: *Anagnota bicolor* (probably also *A. major* and *A. oriens*), *Anthomyza pallida, A. collini* (possibly also *A. anderssoni*), *A. trifurca, A. gracilis, Fungomyza albimana, Stiphrosoma cingulatum, S. laetum* and probably also *S. humerale*.

In southern latitudes the species with a long occurrence span are surely multivoltine because their ontogeny is more rapid in higher average temperature regimes. For this reason the following species are considered multivoltine: *Amygdalops thomasseti, A. nigrinotum* (and possibly the two other *Amygdalops* species occurring in the Palaearctic), *Anthomyza baezi* (possibly also *A. umbrosa*) and *Santhomyza inermis* (diapausing in summer).

Anagnota coccinea and *Cercagnota collini* adults have two short periods of occurrence (in spring and autumn) so appear to be bivoltine; however, their adult flight period may be longer and, in fact, also span the entire winter (with occurrence data hitherto missing). In this scenario, these species would also be classified as multivoltine like those mentioned above.



Figs 157-161: *Anthomyza* species and their habitat. **157** - *A. macra* Czerny, male; **158** - detail of forest undergrowth with probable dicotyledonous host plants; **159** - alluvial alder (*Alnus glutinosa*) forest at Enns river (Austria), a typical habitat of *A. macra* and *A. pleuralis*; **160** - detail of its undergrowth; **161** - *A. pleuralis* Czerny, female. Photo by D. Gavryushin (157, 161) and J. Roháček (others).

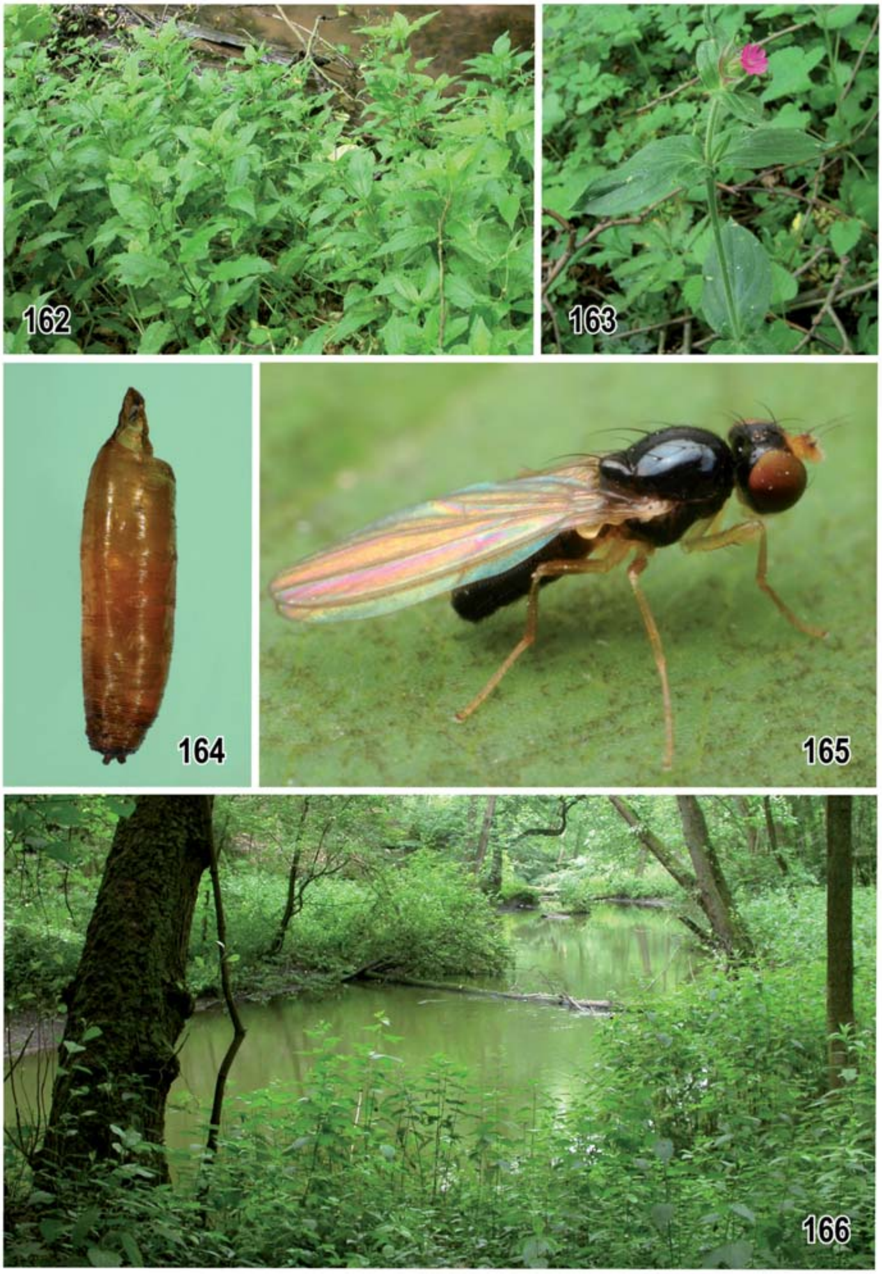
Predators, parasites and commensals

Generally, there are very limited data available about the predators, parasites or commensals of the flies of the family Anthomyzidae. Those few published reports are summarized here and supplemented with additional information obtained during the author's recent observations.

Predators. Adult flies of Anthomyzidae are surely eaten by various raptorial insects, spiders and other predators. Although there is no direct observation from the wild, they may serve as a frequent food for predatory flies living in the habitats where Anthomyzidae occur in higher density. Small species of Hybotidae, Empididae and Dolichopodidae certainly prey on adult anthomyzids because it has been observed several times that they attack and kill them in the collecting jar of an aspirator (pooter) when they are kept together for a longer time. The small Hybotidae of the genus *Platypalpus* were found to be particularly aggressive by perforating any part of the body of a victim specimen with their proboscis. It is believed they behave similarly in the wild, living together with Anthomyzidae in tussocks of graminoid plants. Roháček (1992) reported on predatory larvae of an unidentified species of Dolichopodidae which were found together with immature stages of *Typhamyza bifasciata* in rotting stems of *Typha* (*latifolia*) and which killed several *T. bifasciata* larvae in the rearing dish during rearing experiments. This indicates that there are also predators which can prey on preimaginal stages in their micro-habitats, e.g. between the sheathing leaves of the tillers and terminal shoots of partly damaged graminoids, under the epidermis of dying dicotyledonous plants or in the tissues of decomposing fungi.

Parasites. Hitherto, very little has been known about parasites of Anthomyzidae. Roháček (1992) reared an unidentified chalcidoid wasp from a puparium of *Typhamyza bifasciata* that emerged 11 days after the puparium had been collected. Adults of Anthomyzidae can sometimes be attacked by parasitic mites (Acari) or their preimaginal stages (larvae). An example of this parasitic relation can be seen in Fig. 6 where a red mite of the group Parasitengona clings to the membrane between the pleural sclerites near the insertion of the haltere of a female of *Anthomyza dissors*. Another parasitic mite was found attached to the abdomen of an *Anthomyza gracilis* female (Slovakia: Poľana BR); it proved to be a parasitic larva of the family Trombidiidae (order Prostigmata). Roháček & Barber (2005) reported on finding several specimens of the Nearctic species *Stiphrosoma balteatum* Roháček & Barber, 2005 and *S. setipleurum* Roháček & Barber, 2005 with attached specimens (up to 3 per imago) of unidentified mites. However, it cannot be excluded that these belonged to commensal species (cf. below).

Commensals. Commensal organisms are known to occur commonly on many species of Diptera but none have hitherto been recorded from the Anthomyzidae. The most characteristic commensals of adult flies are phoretic stages of mites (Acari) specially adapted to facilitate dispersal of these terricolous or edaphic arthropods. Not surprisingly a phoretic deuteronymph of a mite of the group Uropodina (order Mesostigmata) has been found on a female of *Stiphrosoma sabulosum*, a terricolous species living near the ground in tufts of grasses. This phoretic stage was attached by means of a special organ (pedicel) on the sternal side of the abdomen (see Fig. 5). Considering the terricolous habits of the majority of *Stiphrosoma* species, it is probable that the mites found on Nearctic species of *Stiphrosoma* mentioned above were phoretic commensals rather than parasites.



Figs 162-166: *Paranthomyza nitida* (Meigen) and some of its host plants and habitat. **162** - *Stellaria nemorum*; **163** - *Silene dioica*; **164** - *P. nitida*, empty male puparium, dorsolaterally; **165** - *P. nitida*, male; **166** - alluvial alder (*Alnus glutinosa*) forest in Peklo reserve nr Sosnová (Czech Republic), a typical habitat of *P. nitida*. Photo by M. Deml (163-164), D. Gavryushin (165) and J. Roháček (others).

Trophic associations of Anthomyzidae

It is obvious that the trophic demands of larvae are crucial to both host-plant and habitat associations of the species of Anthomyzidae. The food consumption of adults is probably limited to small amounts of protein-enriched substrates such as pollen grains (used in rearing experiments by K. N. Barber, personal communication 2007) and liquids from decayed tissues of the host plants of the larvae. Field observations have confirmed that adults do not move far from the breeding places of the larvae, with the exception of dispersal or colonizing flights to new oviposition sites. This is obvious in Malaise-trap or window-trap samples where females usually and distinctly predominate while the gender-ratio is roughly 1:1 in sites where the species carries through its life history.

The larvae (Fig. 179) of the majority of species of Anthomyzidae are microsaprophagous grazers feeding on (at least partly) rotten host plant tissues and putrifying microorganisms involved in this decay. This fact seems to be demonstrated (1) by the structure of the anthomyzid cephalopharyngeal skeleton being clearly of the "saprophagous" type, i.e. with slender intermediate sclerite and mouthhooks (the latter without denticles) and the pharyngeal sclerite having a ventral trough provided with longitudinal ridges for filtering the (semi)liquid food (see Roháček 2006a: Figs 6-7, 19-20); (2) by rearing the larvae on dead plant remnants (Hering 1943; de Meijere 1944; Roháček 1992; Roháček & Barber 2005); and (3) by their gut contents (Roháček 1992: 204). Hitherto, no species has been recorded as mining in living (fresh) and healthy plant tissues.

The species of Anthomyzidae can be classified according to trophic associations of their larvae as follows:

(1) myco(sapro)phagous species – developing in rotting sporocarps of fungi
(2) phyto(sapro)phagous species – developing in (at least partly) decaying plant tissues

(1) Myco(sapro)phagous species

Sporocarps of macrofungi (specifically their decaying parts) are substrates rarely utilized for larval development by species of Anthomyzidae. Only two species of the genus *Fungomyza* Roháček, 1999 are known to be associated with fungi. Whilst in the W. Palaearctic *F. albimana* (Meigen, 1830) the mycophagy of larvae has been demonstrated several times by rearing adults from various fungal species (see below), in the E. Nearctic *F. buccata* Roháček & Barber, 2004 the breeding in fungi is only presumed on the basis of indirect evidence (Roháček & Barber, 2004). Also *Fungomyza cercata* sp.n. (described above) is possibly associated with fungi although there is no indication of this fact in its label data. A fourth potential feeder of (tree) fungi is an unnamed species of unknown affiliation represented by a single female in OXUM and bearing the following information on its locality label: „Bracket fungus, Elm 15 VII 75, Oxford GCV" [note: G. C. Varley, who was interested in the ecology of insects associated with fungi, collected this specimen probably during his research on the insect fauna of elms (*Ulmus* sp.) with dutch elm disease – J. W. Ismay and J. Hogan, e-mail communication 2006]. The host species of fungi are known only in one (Palaearctic) species:

***Fungomyza albimana* (Meigen, 1830)** (Figs 147-148)

Host fungi:

Polyporus sp. – Chandler (1978) cr.
Polyporus squamosus – material examined, cr.
Tricholoma sp. – Chandler (1978) cr, further identified as *T. aurantium* (P. J. Chandler, personal communication 2008).
Hypholoma sp. – Chandler (1978) cr, further identified as *H. sublaterium* (P. J. Chandler, personal communication 2008).

Figs 167-170: *Anthomyza baezi* Roháček, its host plant and habitat. **167** - laurel forest near Chaõ da Cancela nr. Seixal, habitat of *A. baezi*; **168** - *Festuca donax*, host plant endemic to Madeira; **169** - *A. baezi*, male; **170** - detail of laurel forest undergrowth with *Festuca donax*. Photo by M. Deml (169) and J. Roháček (others).

Macrolepiota procera – Dely-Draskovits (1972) rr(h), repeated by Dely-Draskovits & Babos (1993) (Fig. 149).
Paxillus atrotomentosus – Dely-Draskovits (1972) rr(h), repeated by Dely-Draskovits & Babos (1993).
Boletus sp. – Chandler (1978) rr(h).
Lactarius piperatus – Roháček (1987b) cr(s), see also material examined (Fig. 146).
Russula foetens – Dely-Draskovits (1972) rr(h), repeated by Dely-Draskovits & Babos (1993).
Russula grisea – material examined, cr(s) (Fig. 148).
Russula luteotacta – Dely-Draskovits (1972) rr(h), repeated by Dely-Draskovits & Babos (1993) (Fig. 145).
Russula rosacea – Dely-Draskovits (1972) rr(h), repeated by Dely-Draskovits & Babos (1993).
Russula virescens – material examined, cr(s).
Russula cf. *xerampelina* – material examined, cr(s).

The above rearing records by Dely-Draskovits (1972) and Chandler (1978) are also summarized or repeated by Krivosheina et al. (1986), Yakovlev (1994) and Roháček (2006a). In addition, Kröber (1935) reported on a rearing record from a „tree fungus“. Considering the wide range of known host species (belonging to 4 orders and 7 families of fungi), *F. albimana* is to be considered a polymycophagous species.

(2) Phyto(sapro)phagous species

The overwhelming majority of Anthomyzidae have phytosaprophagous larvae developing in herbaceous plants (usually in their more or less decaying tissues of the leaves or stems), typically in those damaged by phytophagous insects or various diseases. Thus, anthomyzid larvae are considered secondary invaders utilizing tissues already injured and beginning to decay. Typical examples are: reed-mace (*Typha* spp.) with stems bored by caterpillars of the noctuid *Nonagria typhae* (Thunberg, 1784) (Fig. 175), large grasses having leaves damaged by heavy infestation of European chinch bug *Ischnodemus sabuleti* (Fallén, 1826) (Lygaeidae) (Figs 151-152), wheat with basal tillers injured by phytophagous larvae of *Opomyza florum* (Fabricius, 1794) (Opomyzidae) (Figs 155-156) or reed (*Phragmites australis*) with aborted growing points caused by the gall-forming *Lipara* species (Chloropidae) (Figs 153-154). As far as is known, most Anthomyzidae live in monocotyledons, usually graminoid plants. However, there are also species trophically associated with dicotyledonous herbs and, although rarely, even those developing in both these groups of plants. Therefore, in the following, the Palaearctic Anthomyzidae are divided into two groups:

(2.1) species associated with dicotyledonous plants
(2.2) species associated with monocotyledonous plants

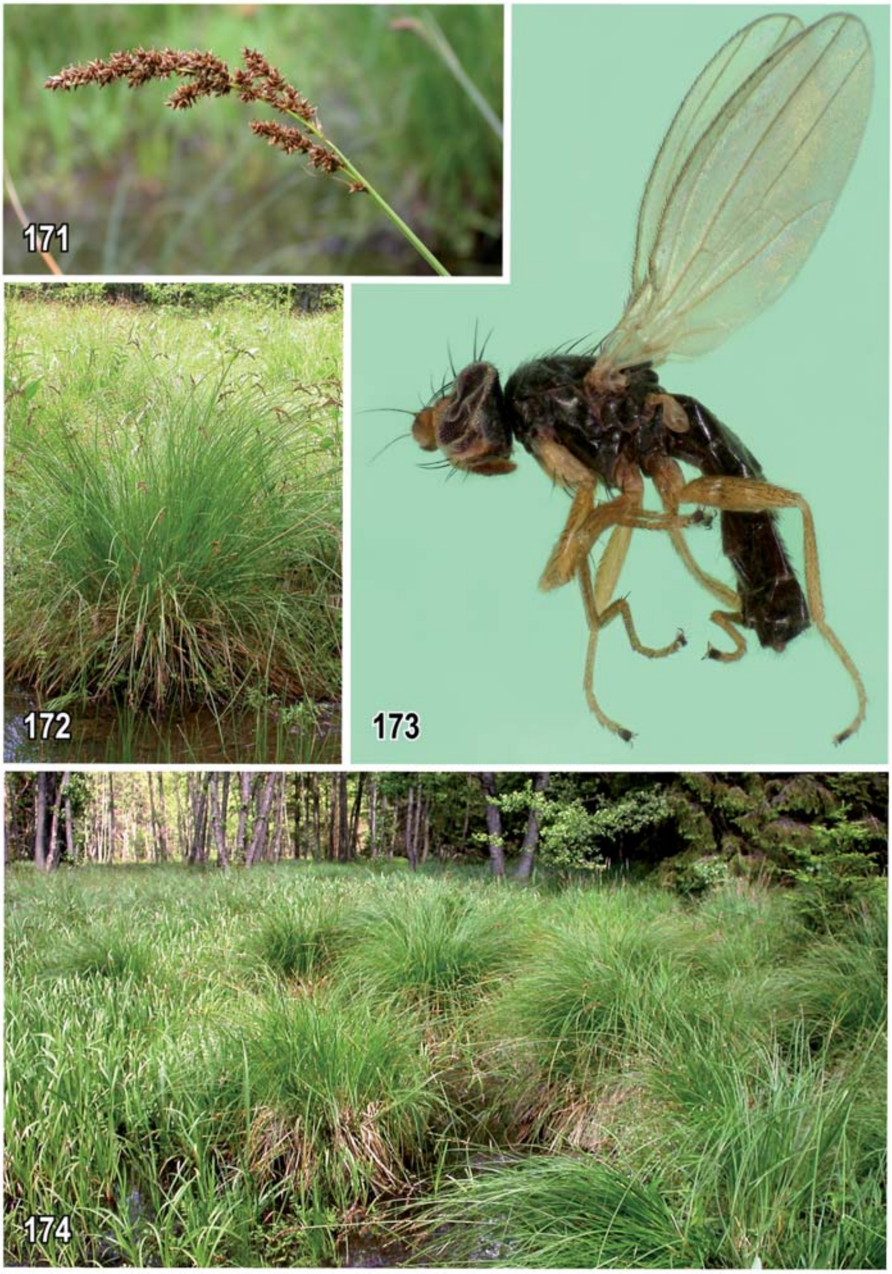
(2.1) Phyto(sapro)phagous species associated with dicotyledonous plants

To date, only three Palaearctic species of Anthomyzidae (see below) are known to be associated with (and hence apparently with larvae developing in) dicotyledonous plants. However, further species belonging to this group could be found among those with unknown biology, e.g. those from the E. Palaearctic area. In addition, there are a few species which can also carry out their life history in dicotyledonous herbs in addition to monocotyledonous host plants – these are treated later in this chapter as an example of extremely polyphagous species. Definite dicotyledonous host-plant species were only recorded for *Paranthomyza nitida*.

***Anthomyza macra* Czerny, 1928** (Fig. 157)
***Anthomyza pleuralis* Czerny, 1928** (Fig. 161)

Host plants:
Unrecognized dicotyledonous plants – material examined, cr.

These two species are thought to develop in dicotyledons on the basis of recent findings in the undergrowth of floodplain forests near Admont (Austria) where monocotyledons were entirely absent (Figs 158-160) and both these species co-occured there with *Paranthomyza nitida* (for records see material examined). Similarly, they were also found (although only single specimens) together with numbers of the latter species in monospecific growths of *Impatiens parviflora* (*A. macra*, 1 female) and *Stellaria nemorum* (*A. pleuralis*, 1 female) as listed below for *P. nitida*.



Figs 171-174: *Carexomyza caricis* (Roháček), its host plant and habitat. **171** - *Carex paniculata*, detail of inflorescence; **172** - *Carex paniculata* tussock; **173** - *Carexomyza caricis*, female; **174** - habitat of *C. caricis*, tussocks of *Carex paniculata* on boggy banks of a creek at margin of alder forest. Photo by M. Deml (173) and J. Roháček (others).

***Parathomyza nitida* (Meigen, 1830)** (Figs 164-165)

Host plants:

Silene dioica – Hering (1943, sub *Melandrium diurnum*) rr(l) (Fig. 163): „Larvae occur in withered stems, usually in 1-3 lowest internodes, grazing their parenchyma. In sufficient humidity they mine, often in numbers (up to 7 larvae in one internode) under the epidermis. With reduction of moisture the larvae move inside the stem and graze the parenchyma of the central cylinder. They pupate inside the stem and produce adults of both sexes in spring“ (translated from Hering 1943: 16). Apparently, de Meijere (1944) described the larva of *P. nitida* from the same specimens reared by Dr Buhr which he obtained from E. M. Hering but the host plant is treated under the synonym *Melandryum rubrum*. Similarly, the record of Uffen & Chandler (1978) from *Silene* probably also deals with the above rearing although they (maybe erroneously) listed the species as forming a leaf-mine. Roháček (1999d, 2006a) only repeated these records, listing the host plant as *Silene dioica* and *Silene latifolia alba*, respectively.

Stellaria nemorum – material examined, cr(s) (Fig. 162).

Impatiens parviflora – material examined, cr(s).

Lamium maculatum – Séguy (1934) rr(h). The same record is also mentioned by de Meijere (1944).

Symphytum officinale – material examined, cr.

The rearing record from the nest of a mole (*Talpa europaea*) (see Rotheray 1991) is obviously from a remnant of plant containing a larva or puparium drawn into the nest.

(2.2) Phyto(sapro)phagous species associated with monocotyledonous plants

Most of the Palaearctic species of Anthomyzidae with known host plants have larvae living in monocotyledonous herbs, more specifically in graminoids. Hitherto, no species has been known to live in more robust monocotyledons, such as Liliaceae or Orchideaceae, but this may not be true in tropical areas where the diversity of host families of Anthomyzidae is probably much greater. Anthomyzidae belonging to this trophic group can be divided further according to the degree of specificity of their host-plant association into:

(2.2.1) monophagous species – developing in one or several closely related host species
(2.2.2) oligophagous species – developing in species of related genera of a single family
(2.2.3) polyphagous species – developing in various species of two or more monocot families

(2.2.1) Monophagous species

A few Palaearctic species of Anthomyzidae are known to be associated with only a single or several allied host-plant species. Two such species were found to develop in reed-mace (*Typha* spp.), one in endemic Madeiran *Festuca* and two in species of sedge (*Carex* spp.):

***Anthomyza baezi* Roháček, 1999** (Fig. 169)

Host plant:

Festuca donax – Roháček (2006a) cr(s).

This species definitely develops in this endemic grass of Madeira, growing in the undergrowth of native laurel forests (Figs 167-168, 170).

***Anthomyza anderssoni* Roháček, 1984**

Host plants:

Typha sp. – Oldenberg (1927) rr(l). Oldenberg (l.c., p. 120) mentioned that Alex. Reichert reared from larvae collected 6.i.1908 between leaves of old *Typha* sp. [besides 1♀ of *Typhamyza bifasciata* (see below)] several *Anthomyza* adults which he identified as "*gracilis* oder *sordidella*". In fact, it is almost certain that these belonged to *A. anderssoni*. Roháček (1999c) rr(h) (a pair of specimens reared by H. Andersson from *Typha* sp. in S. Sweden, see also Roháček 2006a).

Typha latifolia – Roháček (1999c, as *Typha* growth) cr(s); material examined, cr(s) (Fig. 178).

The majority of formerly published records (Roháček 1999c, 2006a) also deal with specimens collected in growths of *Typha* spp. (mostly *T. latifolia*) but there were too few specimens (<10) to demonstrate the host-plant association.

Figs 175-179: *Typhamyza bifasciata* (Wood), its host plant and habitats. **175** - old stems of *Typha latifolia* damaged by larvae of *Nonagria typhae* (Noctuidae); **176** - *T. bifasciata*, puparia under leafsheat; **177** - *T. bifasciata*, female; **178** - habitat of *T. bifasciata*, growth of *Typha latifolia* at a pond shore (Vimvejr pond nr. Třešť, Czech Republic); **179** - *T. bifasciata*, larva. Photo by D. Gavryushin (177) and J. Roháček (others).

***Anthomyza dissors* Collin, 1944** (Fig. 184)

Host plants:

Carex sp. – Elberg (1968) cr; Andersson (1984a) cr; Roháček (1987b, 1995a) cr.

Carex acuta – Roháček (2006a, sub *C. gracilis*); material examined, cr(s) (repeated records) (Figs 186-187).

Carex rostrata – material examined, cr (Fig. 185).

This species surely develops in growth of *Carex acuta*; in other large *Carex* species it has been found less frequently (*C. rostrata*) or occasionally (*C. elata*, see material examined) although they may also serve as its host plants. Because it has not been recorded from related genera of Cyperaceae (not even *Scirpus*) it is considered a monophagous species. Note: Panteleeva & Razvorotnev (1996) and Panteleeva (2005) reported on specimens of *A. dissors* reared from *Bromus inermis* and even from the dicotyledonous *Libanotis intermedium* (Apiaceae) and Panteleeva (1997) on those from *Bromus* (as *Zerna*) *inermis* and *Bromus squarrosus*. All these records are surely based on misidentification, possibly of *A. pallida* which could perhaps develop in *Bromus* species. The rearing record of this anthomyzid from *Libanotis* is surely a mistake based on mixed samples.

***Carexomyza caricis* (Roháček, 1999)** (Fig. 173)

Host plant:

Carex paniculata – Roháček (1999d, as *Paranthomyza*) cr; Roháček (2006a, as *Paranthomyza*) cr(s).

This species seems to be exclusively associated with large tussocks of *Carex paniculata* (Fig. 171-172) in partly wooded, marshland habitats (Fig. 174).

***Typhamyza bifasciata* (Wood, 1911)** (Figs 176-177, 179)

Host plants:

Typha sp. – Oldenberg (1927, as *Anthomyza fasciipennis*) rr(l) (a single female reared from larva found on 6.i.1908 in previous year *Typha* leaf-sheath); Uffen & Chandler (1978) rr(?).

Typha angustifolia – Krogerus (1960) cr; Roháček (1992, 2006a) rr(l), cr(s); material examined, cr(s).

Typha latifolia – Ismay (1981) cr; Roháček (1992, 1999c, 2006a) rr(l), rr(p), cr(s); material examined, rr(l), rr(p), cr(s).

Larvae (Fig. 179) live in dead *Typha* plants (Fig. 175), often damaged by caterpillars of *Nonargia typhae* (Noctuidae) or other phytophagous insect, between the leaf-sheath and stem. The characteristically flattened puparia (Fig. 176) are formed in the same situation but higher, in the drier zone of the stem. For more detail about the life history and preimaginal stages see Roháček (1992, 2006a).

(2.2.1) Oligophagous species

Probably only a few species of Palaearctic Anthomyzidae belong to this category. They either develop in related genera of grasses (Poaceae) or in sedges (*Carex* and *Scirpus* species of Cyperaceae). So far, no species has been found to be strictly associated with Juncaeae – only polyphagous species of Anthomyzidae were found to develop in this family.

***Amygdalops thomasseti* Lamb, 1914** (Fig. 183)

Host plants:

Bolboschoenus maritimus – Roháček & Freidberg (1993, sub *Scirpus*) cr?

Arundo donax – Roháček (2006a) cr(s) (Figs 180-182).

Phragmites australis – Roháček & Freidberg (1993) cr.

Young growths of the giant reed (*Arundo donax*, Fig. 182) seem to be the preferred habitat of *A. thomasseti*. The association of *A. thomasseti* with *Bolboschoenus maritimus*, as suggested by Roháček & Freidberg (1993: 95), now seems to be less probable; its occasional occurrence in growths of this plant are now thought to originate from nearby *Phragmites* or *Arundo*.

***Anthomyza pallida* (Zetterstedt, 1838)**

Host plants:

Agrostis spp. – Andersson (1984a) cr.

Calamagrostis villosa – material examined, cr(s) (repeated records).

Deschampsia caespitosa – Andersson (1984a) cr.

Poa pratensis – Andersson (1984a) cr.

This species seems to prefer larger grasses in partly forested areas at higher altitudes or in more northern latitudes.

Figs 180-183: *Amygdalops thomasseti* Lamb, its host plant and habitats. **180** - mouth of a small river on northern coast of Crete with large growths of *Arundo donax*; **181** - *Arundo donax*; **182** - young growth of *Arundo donax* at a small creek in eastern Tenerife (Canary Is.); **183** - *A. thomasseti*, female. Photo by M. Deml (183) and J. Roháček (others).

***Anthomyza paraneglecta* Elberg, 1968**

Host plants:

Carex sp. – Roháček (2006a) cr.
Carex acuta – Roháček (2006a, sub *C. gracilis*) cr(s); material examined, cr (Figs 186-187).
Carex paniculata – material examined, cr (Fig. 172).
Carex riparia – material examined, cr(s) (Fig. 189).
Carex rostrata – material examined, cr (Fig. 185).
Carex vesicaria – material examined, cr.
Scirpus sylvaticus – material examined, cr(s) (Fig. 199).

A. paraneglecta probably develops in a wider spectrum of sedges than does *A. dissors*, as indicated by the above records, although it has occurred in significant numbers of specimens in only *C. acuta*, *C. riparia* and *S. sylvaticus*.

(2.2.3) Polyphagous species

Apparently this category of species developing in monocotyledonous plants comprises the majorit of Palaearctic species of Anthomyzidae. Based on the knowledge of European species it can be presupposed that this may also hold for the E. Palaearctic species whose trophic demands are largely unknown. At least one of the species (i.e. *Anagnota bicolor*) listed below proved to be yet more widely polyphagous because it is also able to develop in dicotyledonous plants.

***Anthomyza neglecta* Collin, 1944** (Fig. 188)

Host plants:

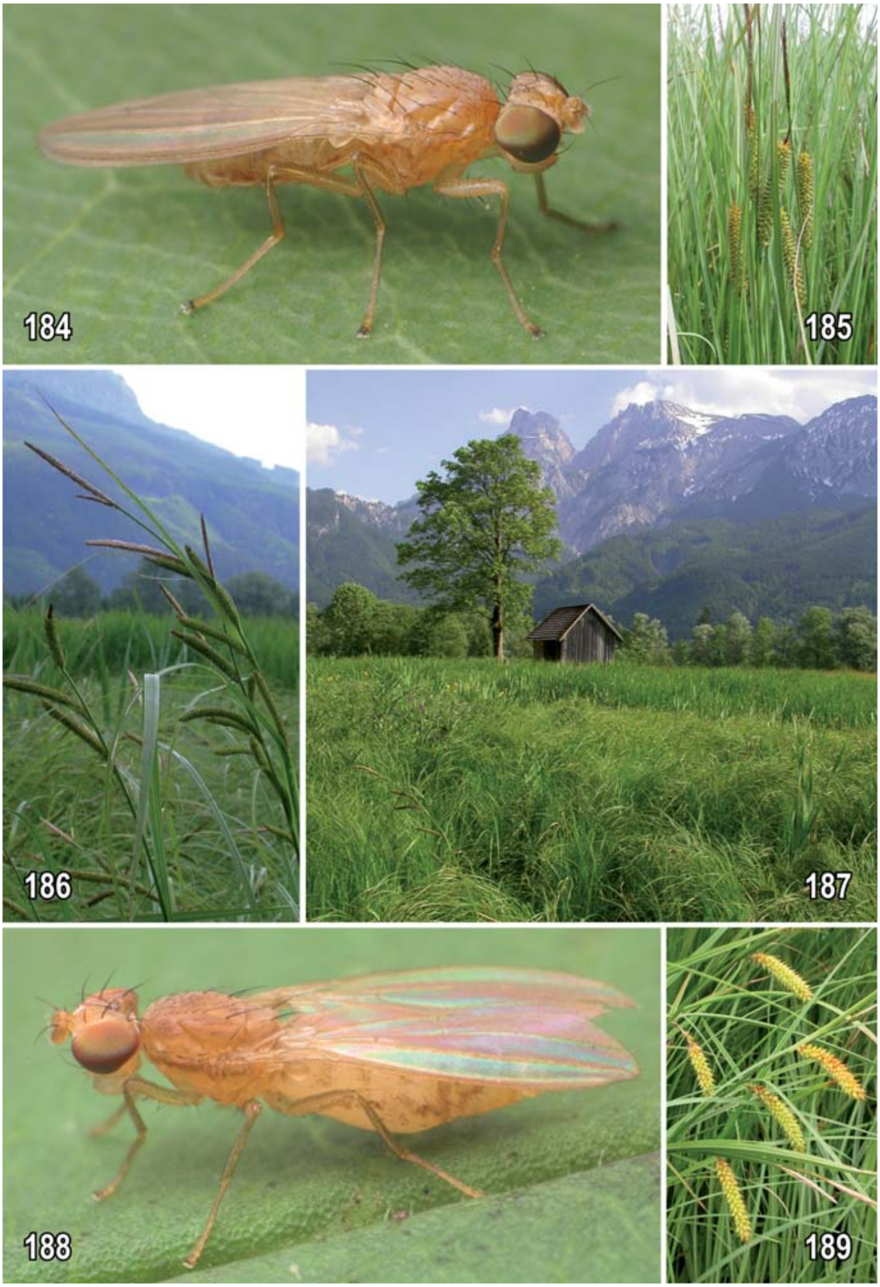
Carex sp. – Roháček (1999c) rr(h).
Carex acuta – Roháček (2006a, sub *C. gracilis*) cr(s); material examined, rr(h), cr(s) (numerous records).
Carex acutiformis – material examined, cr(s).
Carex paniculata – material examined, cr(s) (repeated records) (Fig. 172).
Carex rostrata – material examined, cr(s) (repeated records) (Fig. 185).
Carex vesicaria – material examined, cr(s).
Scirpus sylvaticus – material examined, cr(s) (numerous records) (Fig. 199).
Juncus effusus – material examined, cr(s) (Fig. 192).
Typha latifolia – Roháček (1992) rr(p).

The species is considered polyphagous because it develops in at least 3 plant families (Cyperaceae, Juncaceae, Typhaceae) but it has a marked preference for Cyperaceae, large *Carex* and *Scirpus* species in particular. A rearing record from a nest of *Fulica atra* (see Collin 1944 and Rotheray 1991) is probably from sedge used to build the nest.

***Anthomyza collini* Andersson, 1976**

Host plants:

Carex acuta – material examined, rr(h), cr(s).
Carex canescens – Krogerus (1960, as *Anthomyza gracilis*) cr.
Carex paniculata – material examined, cr(s) (Fig. 172).
Rhynchospora alba – Krogerus (1960, as *Anthomyza gracilis*) cr.
Schoenoplectus lacustris – Roháček (2006a) cr(s); material examined, cr(s).
Juncus subnodulosus – Grandi (1951, sub *Juncus obtusifolius*, as *Anthomyza gracilis*) rr(h).
Arundo donax – Grandi (1951, as *Anthomyza gracilis*) rr(h) (Figs 180-182).
Calamagrostis villosa – material examined, cr(s).
Elytrigia repens – Panteleeva (1997, as *Anthomyza gracilis*) rr(h).
Glyceria maxima – material examined, rr(h), cr(s).
Leersia oryzoides – Grandi (1951, sub *Oryza oryzoides*, as *Anthomyza gracilis*) rr(h).
Phalaris arundinacea – material examined, cr(s) (repeated records) (Fig. 152).
Phragmites australis – Perris (1853, as *Opomyza gracilis*) rr(l); Grünberg (1910, as *Anthomyza gracilis*) rr(l) ex galls of *Lipara similis, L. rufitarsis, L. lucens*; Karl (1930a, as *A. gracilis*) cr(s); Séguy (1934, as *A. gracilis*) rr(l) ex galls of *Lipara lucens* and *L. rufitarsis*; Kröber (1935, as *A. gracilis*) rr(l) ex galls of *Lipara* spp.; Grandi (1951, as *A. gracilis*) rr(h); Krogerus (1960, sub *Phragmites vulgaris*, as *A. gracilis*) cr; Andersson (1976) rr(h) ex galls of *Lipara lucens* and of mite *Steneotarsonemus phragmitidis*; Uffen & Chandler (1978) rr(h) ex galls of *Lipara* spp.; Pokorný & Skuhravý (1981, as *A. gracilis*) rr(l,p) ex galls



Figs 184-189: *Anthomyza* species, their host plants and habitat. **184** - *A. dissors* Collin, female; **185** - *Carex rostrata*, inflorescences; **186** - *Carex acuta*, inflorescences; **187** - boggy meadow in Enns valley (Austria) with *Carex acuta* growth in foreground, a typical habitat of *A. dissors* and *A. neglecta*; **188** - *A. neglecta* Collin, female; **189** - *Carex riparia*, inflorescences. Photo by D. Gavryushin (184, 188) and J. Roháček (others).

of *Lipara* spp.; von Tschirnhaus (1981) rr(h); De Bruyn (1985) rr(l,p) ex galls of *Lipara lucens, L. pullitarsis, L. rufitarsis*; Danielzik (1988, as *A. gracilis*) rr(h) ex galls of *Lipara rufitarsis*; Wolf (1988) rr(h) ex galls of *Lipara* spp.; Dely-Draskovits (1991, 1998) rr(h) ex galls of *Lipara* spp.; Dely-Draskovits & Bächli (1998) rr(h) ex galls of *Lipara* spp. (*L. lucens, L. pullitarsis, L. rufitarsis, L. similis*); Tscharntke (1999) rr(l) ex galls of *Lipara* spp. and of *Steneotarsonemus phragmitidis*; von Tschirnhaus (2007) rr(h) ex galls of 4 *Lipara* spp.; material examined, rr(h,p) ex galls of *Lipara lucens, L. pullitarsis*, *L. similis* (numerous specimens); material examined, rr(h,p), cr(s) (repeated records) (Figs 154, 231).

Triticum aestivum – material examined, cr(s) (Fig. 156).

Sparganium erectum – Krogerus (1960, sub *Sparganium ramosum*, as *Anthomyza gracilis*) cr.

Although this species is mainly known to develop in galls of *Lipara* species (Chloropidae) (see Fig. 153-154) on *Phragmites australis*, it is demonstrated here that it has a wide range of host plants not only in Poaceae but also in Cyperaceae, Juncaceae and possibly also Sparganiaceae. The three rearing records from nests of *Fulica atra* (see Rotheray 1991) are most probably from reed used by the bird to build the nest. The rearing records by Panteleeva (1997) are not completely reliable because she identified the species using the key by Stackelberg (1970).

***Anthomyza gracilis* Fallén, 1823** (Fig. 193)

Host plants:

Carex acuta – material examined, rr(h), cr(s) (numerous records) (Fig. 186-187).

Carex brizoides – material examined, cr(s) (Fig. 190).

Carex elata – material examined, cr(s).

Carex paniculata – material examined, cr(s) (Fig. 172).

Carex rostrata – Krogerus (1960, as *Anthomyza sordidella*) cr; material examined, cr(s) (repeated records).

Carex vulpina – material examined, cr(s).

Eriophorum angustifolium – Roháček & Máca (1982) cr(s) (Fig. 194).

Juncus effusus – material examined, cr(s) (numerous records) (Fig. 192).

Alopecurus pratensis – material examined, cr(s).

Arrhenatherum elatius – material examined, cr(s).

Calamagrostis canescens – material examined, cr(s).

Calamagrostis epigejos – material examined, cr(s) (repeated records).

Calamagrostis villosa – material examined, cr(s) (repeated records).

Deschampsia caespitosa – material examined, cr(s) (Fig. 205).

Glyceria declinata – material examined, cr(s).

Glyceria fluitans – material examined, cr(s) (Fig. 191).

Glyceria maxima – material examined, cr(s) (repeated records) (Fig. 198).

Molinia caerulea – Roháček & Máca (1982) cr(s) (Fig. 206).

Phalaris arundinacea – material examined, cr(s).

Phragmites australis – Andersson (1976) rr(l) ex galls of *Lipara lucens*; De Bruyn (1985) rr(l,p) ex galls of *Lipara* spp.; Nartshuk (1994a) rr(h); Nartshuk (1996) rr(l) ex galls of *Lipara* spp.; material examined, rr(h) ex galls of *Lipara pullitarsis* (only 2♂1♀ among hundreds of specimens of *A. collini*) (Fig. 154).

Poa trivialis – material examined, cr(s).

Trisetum flavescens – material examined, cr(s).

Heracleum sphondylium – material examined, rr(h) (one male emerged from dry stem).

A. gracilis is a widely polyphagous species; although there are very few rearing records available, it is clear that this species can develop in a number of species of Poaceae, Cyperaceae and Juncaceae. The single rearing record of one specimen from a dicotyledonous plant (*Heracleum sphondylium*) is to be considered occasional. Krogerus (1960, as *Anthomyza sordidella*) recorded this species also from *Typha angustifolia* growth but this is either an occasional finding or (more probably) the record is based on misidentification.

***Anthomyza elbergi* Andersson, 1976** (Fig. 204)

Host plants:

Carex elongata – Panteleeva (1997, as *Anthomyza sordidella*) rr(h).

Avenella flexuosa – Andersson (1976, sub *Deschampsia*) cr.

Bromus inermis – Panteleeva (1997, sub *Zerna inermis*, as *Anthomyza sordidella*) rr(h).

Dactylis glomerata – Roháček (2006a) cr.

Deschampsia caespitosa – Andersson (1976) cr; Uffen & Chandler (1978) cr (repeated data of Andersson 1976) (Fig. 205).

Figs 190-194: *Anthomyza gracilis* Fallén, some of its host plants and habitats. **190** - *Carex brizoides*; **191** - *Glyceria fluitans*; **192** - *Juncus effusus*; **193** - *A. gracilis* Fallén, female; **194** - lagg meadow of a raised bog Rejvíz (Czech Republic) with growth of *Eriophorum angustifolium*, extreme habitat of *A. gracilis*. Photo by D. Gavryushin (193) and J. Roháček (others).

Elytria intermedia – Panteleeva & Razvorotnev (1996, sub *Agropyron intermedium*, as *Anthomyza sordidella*) rr(h); Panteleeva (2005, sub *Agropyron intermedium*, as *Anthomyza sordidella*) rr(h).

Elytrigia repens – Panteleeva (2005, as *Anthomyza sordidella*) rr(h).

Melica altissima – Panteleeva & Razvorotnev (1996, as *Anthomyza sordidella*) rr(h); Panteleeva (2005, as *Anthomyza sordidella*) rr(h).

Molinia caerulea – Andersson (1976) cr; Uffen & Chandler (1978) cr (repeated data of Andersson 1976) (Fig. 206); Roháček (2006a) cr(s).

Triticum ?aestivum – Roháček (2006a) cr.

Andersson (1976) considered the above grasses to be probable host plants of *A. elbergi* but because he also collected this species in growths of *Scirpus* and *Juncus* and Panteleeva (1997) reared it from *Carex elongata* it is considered polyphagous like *A. gracilis*. The rearing records by Panteleeva & Razvorotnev (1996) and Panteleeva (1997, 2005) are not completely reliable because Panteleeva identified the species using the key by Stackelberg (1970) but because they are based on reared males they are included in the above list. On the other hand, the rearing record of three females of *A. elbergi* from *Typha latifolia* by Panteleeva (1997, as *A. sordidella*) is not listed here because it is surely based on misidentification (probably of *A. anderssoni*).

***Arganthomyza socculata* (Zetterstedt, 1847)**

Host plants:

Eriophorum angustifolium – Krogerus (1960, sub *Eriophorum polystachyum*, as *Anthomyza ungulata*) cr.

This species probably develops in (various) larger Poaceae (cf. Andersson 1976, Roháček 2006a) but there are no concrete rearing or collecting records from definite plant species, except for Krogerus (1960). Because the latter record is from Cyperaceae, *A. socculata* can also be considered a polyphagous species.

***Stiphrosoma sabulosum* (Haliday, 1837)** (Fig 5)

Host plants:

Carex praecox – Panteleeva (1997, as *Anthomyza*) rr(h).

Anthoxantum odoratum – Nye (1959) rr(l).

Arrhenatherum elatius – Nye (1958, 1959) rr(l), repeated by Uffen & Chandler (1978); Roháček (2006a) rr(h); material examined, cr(s) (Fig. 225).

Avenella flexuosa – Roháček (2006a, sub *Deschampsia flexuosa*) rr(h).

Bromus erectus – Hofer & Waitzbauer (2000), cr(s).

Calamagrostis epigejos – Panteleeva (1997, as *Anthomyza*) rr(h).

Dactylis glomerata – Roháček (1996a) rr(h); material examined, cr(s).

Deschampsia caespitosa – Elberg (1968) rr(h) (Fig. 205).

Elytrigia intermedia – Panteleeva (1997, as *Anthomyza*) rr(h).

Elytrigia repens – Bährmann (1987) cr(s); Panteleeva (1997, as *Anthomyza*) rr(h); Roháček (2006a, sub *Elymus*) rr(h).

Holcus lanatus – Nye (1959) rr(l); Roháček (1996a) rr(h).

Lolium perenne – Nye (1958) rr(l), repeated by Uffen & Chandler (1978); material examined, cr(s).

Poa annua – material examined, cr(s).

Poa nemoralis – Roháček (1996a) rr(h).

Urtica urens – Panteleeva (1997, as *Anthomyza*) rr(h) (one female emerged)

This species is clearly associated with smaller grasses of various genera both in dry (Hofer & Weitzbauer 2000; Bährmann 1987, 2006) and mesophilous meadows from lowland to subalpine altitudes. The rearing record from the nest of a mole (*Talpa europaea*) (see Rotheray 1991) obviously originates from a remnant of grass (with larva or puparium) drawn into the nest. Hitherto, only Panteleeva (1997) published rearing records of *S. sabulosum* from plants other than Poaceae; her record of 4 specimens reared from *Carex praecox* demonstrates the polyphagy of this species. On the other hand, her rearing of a single female from *Urtica urens* (Urticaceae) is either based on a mistake or the plant sample contained some other material (remnants of grasses, detritus) from which the species could emerge.

***Stiphrosoma cingulatum* (Haliday, 1855)** (Fig. 195)

Host plants:

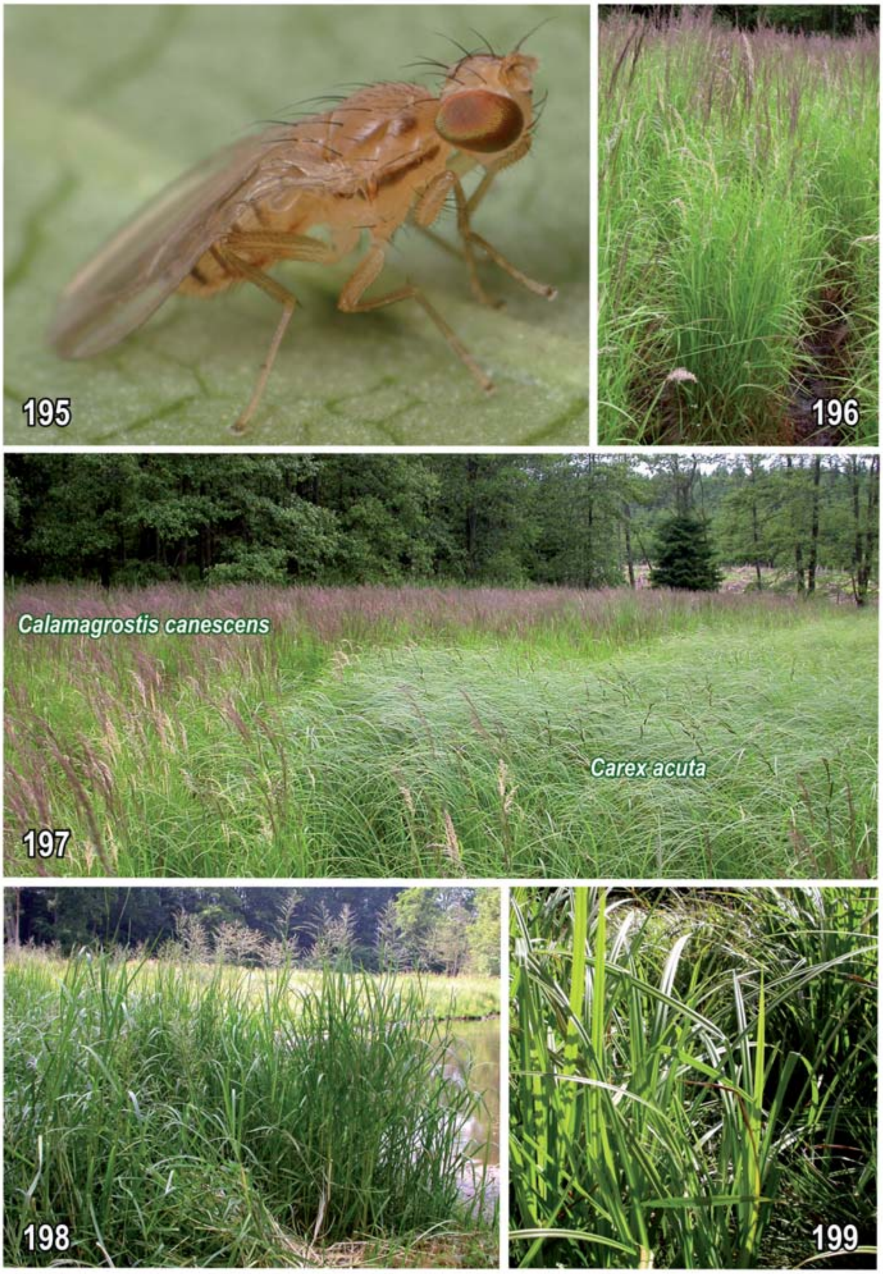
Carex acuta – material examined, rr(h), cr(s) (Fig. 186-187).

Carex acutiformis – Drake (2004) cr(s).

Scirpus sylvaticus – material examined, cr(s) (Fig. 199).

Agrostis stolonifera – Roháček (2006a) rr(h).

Calamagrostis canescens – material examined, cr(s) (Fig. 196).



Figs 195-199: *Stiphrosoma cingulatum* (Haliday), its host plants and habitats. **195** - *S. cingulatum*, female; **196** - *Calamagrostis canescens*, tussock; **197 -** boggy shore of a woodland pond with neighbouring growths of *Calamagrostis canescens* and *Carex acuta*; **198** - *Glyceria maxima*; **199** - *Scirpus sylvaticus*. Photo by D. Gavryushin (195) and J. Roháček (others).

Glyceria maxima – Drake (2004) cr(s); Roháček (2006a) rr(h); material examined, rr(h), cr(s) (Fig. 198).
Phragmites australis. – Haliday (1855) cr(s) (Fig. 231).

Based on present knowledge, this species is polyphagous – developing in two plant families (Poaceae, Cyperaceae). The rearing record from a nest of *Corvus frugilegus* (see Collin 1944 and Rotheray 1991) is obviously from a remnant of plant (containing larva or puparium) drawn into the nest.

***Stiphrosoma laetum* (Meigen, 1830)** (Fig. 208)

Host plants:
Carex sp. – Roháček (1996a) cr; Roháček (2006a) rr(h).
Scirpus sylvaticus – Roháček (1996a) cr (Fig. 199).
Juncus sp. – Roháček (1996a) cr.
Juncus effusus – Roháček (2006a) rr(h) (Fig. 192).
Agrostis sp. – Roháček (1996a) rr(h).
Agrostis stolonifera – Roháček (2006a) rr(h).
Arrhenatherum elatius – Roháček (2006a) rr(h).
Avenella flexuosa – Roháček (2006a, as *Deschampsia*) rr(h).
Dactylis glomerata – Roháček (1996a) rr(h); material examined, rr(h), cr(s).
Deschampsia caespitosa – Roháček (1996a) rr(h) (Fig. 205).
Festuca rubra – Roháček (2006a) rr(h).
Festuca ovina – Roháček (2006a) rr(h).
Glyceria maxima – Roháček (2006a) rr(h) (Fig. 198).
Holcus lanatus – Roháček (1996a) rr(h).
Poa nemoralis – Roháček (1996a) rr(h).

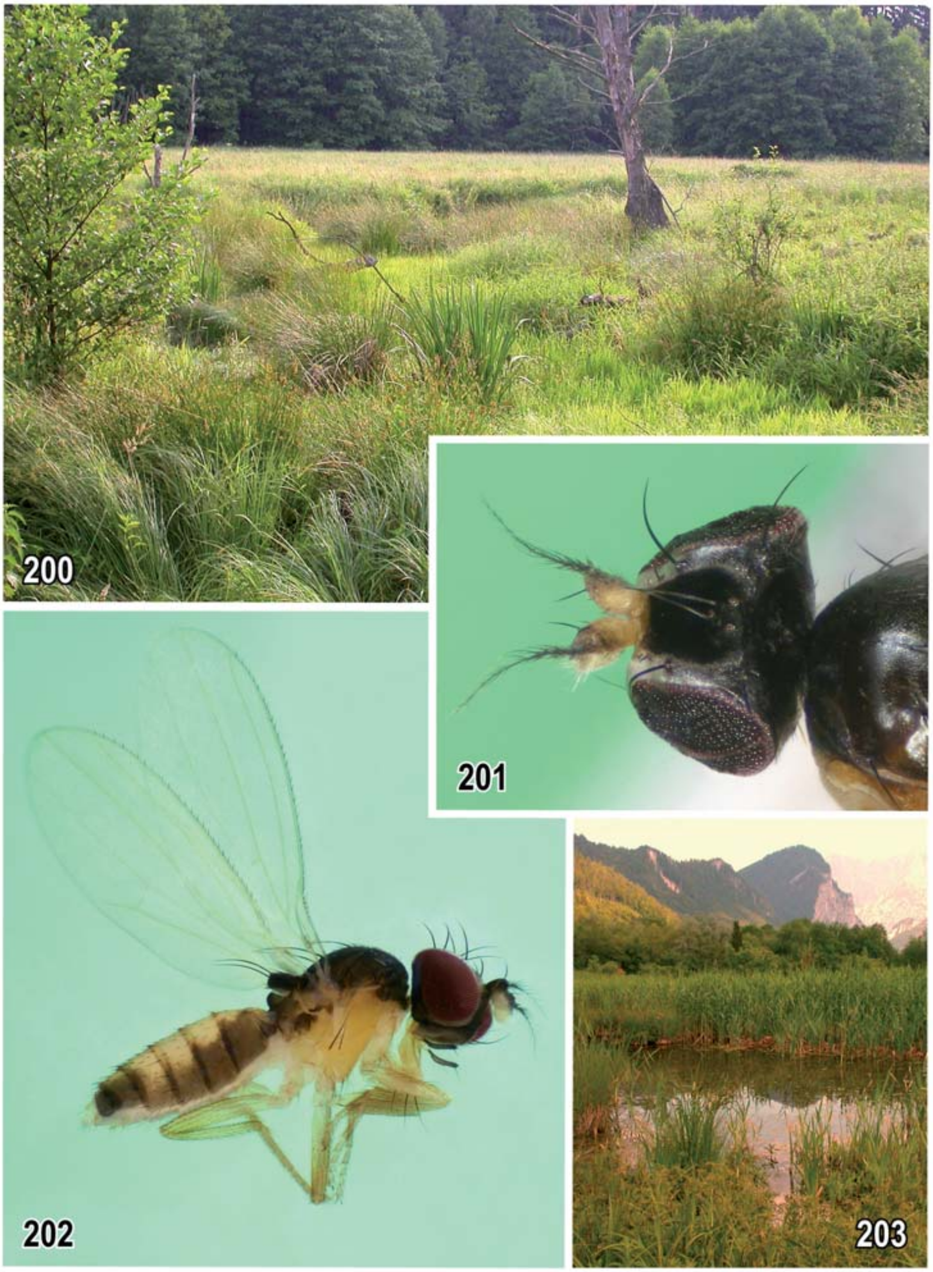
This species clearly prefers various grasses as host plants but was also reared from a few species of Cyperaceae and Juncaceae and is, therefore, considered to be polyphagous.

***Anagnota bicolor* (Meigen, 1838)** (Figs 201-202)

Host plants:
Carex acuta – Roháček (2006a, sub *C. gracilis*) cr(s); material examined, rr(h) (Figs 186-187).
Carex acutiformis – Drake (2004) cr(s).
Carex paniculata – Godfrey (1992, 1998) cr(s); Howe & Howe (2001) cr(s); Howe et al. (2001) cr(s); material examined, cr(s) (Fig. 174).
Carex rostrata – material examined, cr(s) (Fig. 185).
Scirpus sylvaticus – material examined, rr(h) (Fig. 199).
Juncus effusus – Drake (2004) cr(s); material examined, cr(s) (Fig. 192).
Deschampsia caespitosa – Roháček (2006a) cr(s) (Fig. 205).
Elytrigia repens – Bährmann (1987) cr(s).
Glyceria maxima – Drake (2004) cr(s); material examined, rr(h) (Fig.198).
Phragmites australis – material examined, rr(h) ex gall of *Lipara* sp. (Fig. 154).
Typha latifolia – Roháček (1992) and Roháček & Freidberg (1993), rr(p) (Fig. 178).
Silene dioica – de Meijere (1944, sub *Melandryum rubrum*) rr(p) (Fig. 163).
Silene sp. – Uffen & Chandler (1978) rr(l?), this is probably only the repeated record of de Meijere (1944).

This is a widely polyphagous species which can develop not only in monocotyledonous plants (Poaceae, Cyperaceae, Juncaceae, Typhaceae) but also in dicotyledonous ones (Caryophyllaceae). Although the single record from *Silene dioica* might be considered accidental, it is probably not because *A. bicolor* (and also *A. major*) was repeatedly found in undergrowth of a floodplain forest comprised of dicotyledonous plant species. The two rearing records (12 specimens) from the nests of moles (*Talpa europaea*) (see Collin 1944 and Rotheray 1991) are surely from plants drawn into the nest.

Note: Panteleeva (1997) reported on rearing of an additional species, *Anthomyza ungulata* Loew, from two plant species, viz. *Melica altissima* L. (Poaceae) and *Lavatera thuringiaca* L. (Malvaceae). The true identity of the reared specimens (4 females) remains unknown; they may belong to *Arganthomyza socculata* or *Anthomyza macra* or to both of them (*Argnathomyza socculata* probably develops in grasses, while *Anthomyza macra* in dicotyledonous plants). Because of this uncertainty, these records are not listed above.



Figs 200-203: *Anagnota bicolor* (Meigen) and its habitats. **200** - marshland habitats along a dead arm of the Ploučnice river (Czech Republic); **201** - *A. bicolor*, male (Czech Republic), head dorsally; **202 -** same, female (Czech Republic), laterally; **203** - marshes in the Enns river valley nr. Admont (Austria). Photo by M. Deml (201-202) and J. Roháček (others).

Sytematic list of fungi and plants with associated Palaearctic species of Anthomyzidae

The system and nomenclature of fungi are adopted from www.indexfungorum.org, those of vascular plants from Kubát et al. (2002) and Flora Europaea (http://rbg-web2.rbge.org.uk/FE/fe.html). Besides the distinct and occasional associations with host plants emanating from the above subchapter incidental records of occurrence of adults of additional species (based on Roháček 2006 and material examined) whose host plants are unknown, are also included.

FUNGI

Class BASIDIOMYCETES

Order **Polyporales**

Family Polyporaceae

***Polyporus squamosus* (Huds.) Fr.** – *Fungomyza albimana*
***Polyporus* sp.** – *Fungomyza albimana*

Order **Agaricales**

Family Tricholomataceae

***Tricholoma aurantium* (Schaeff.) Ricken** – *Fungomyza albimana*

Family Strophariaceae

***Hypholoma sublaterium* (Schaeff.) Quél.** – *Fungomyza albimana*

Family Agaricaceae

***Macrolepiota procera* (Scop.) Singer** – *Fungomyza albimana*

Order **Boletales**

Family Paxillaceae

***Paxillus atrotomentosus* (Batch) Fr.** – *Fungomyza albimana*

Family Boletaceae

***Boletus* sp.** – *Fungomyza albimana*

Order **Russulales**

Family Russulaceae

***Lactarius piperatus* (L.) Gray** – *Fungomyza albimana*
***Russula foetens* (Pers.) Pers.** – *Fungomyza albimana*
***Russula grisea* (Pers.) Fr.** – *Fungomyza albimana*
***Russula luteotacta* Rea** – *Fungomyza albimana*
***Russula rosacea* (Pers.) Gray** – *Fungomyza albimana*
***Russula virescens* (Schaeff.) Fr.** – *Fungomyza albimana*
***Russula* cf. *xerampelina* (Schaeff.) Fr.** – *Fungomyza albimana*

PLANTAE

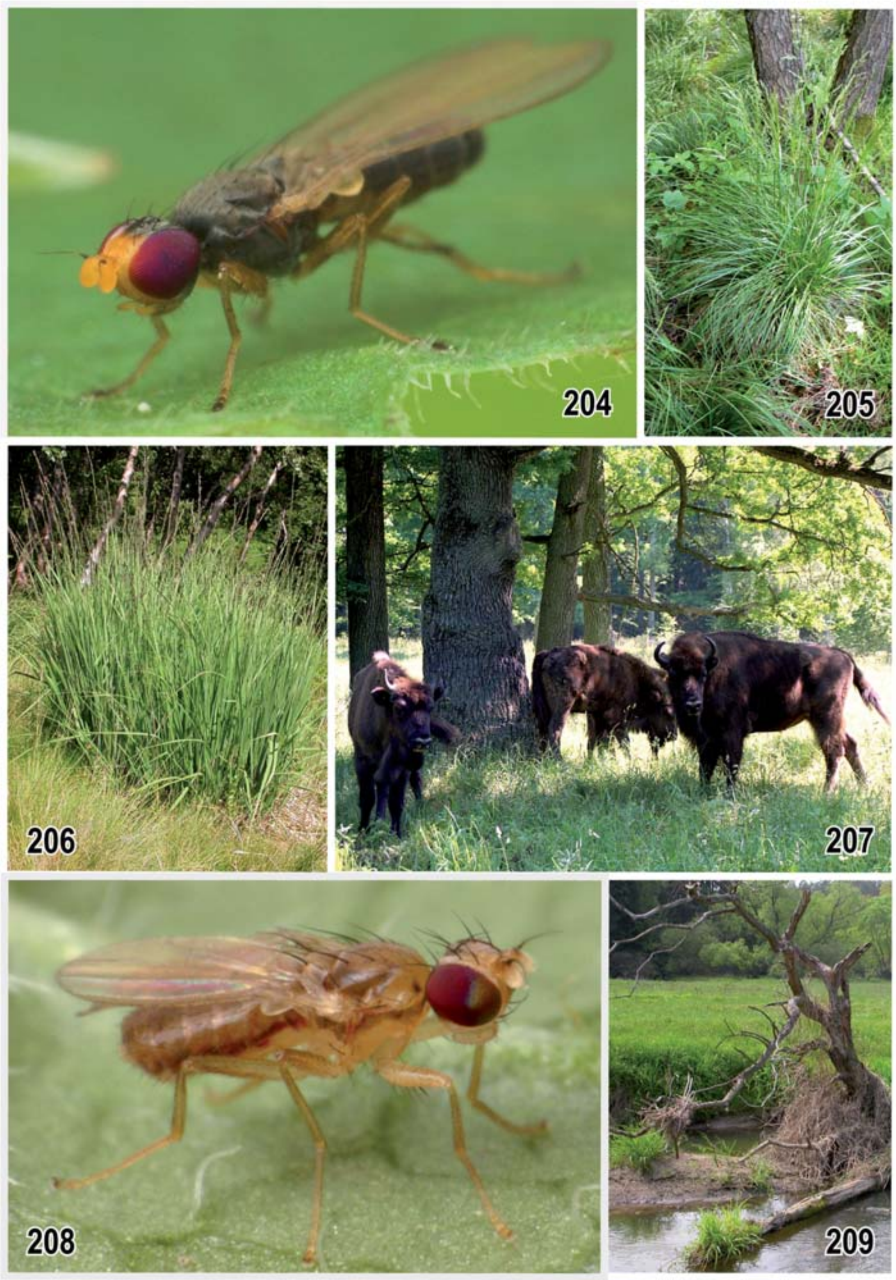
Division MAGNOLIOPHYTA

Class RHODOPSIDA

Order **Apiales**

Family Apiaceae

***Heracleum sphondylium* L.** – *Anthomyza gracilis* (occasional rearing record)



Figs 204-209: *Anthomyza* and *Stiphrosoma* species, their host plants and habitats. **204** - *A. elbergi* Andersson, male; **205** - *Deschampsia cespitosa*; **206** - *Molinia caerulea*; **207** - clearing in oak forest (*Bison bonasus* reserve in Bialowieza, Poland), habitat of *A. elbergi*; **208** - *S. laetum* (Meigen), female; **209** - wet meadow at Ploučnice river (Czech Republic), habitat of *S. laetum*. Photo by D. Gavryushin (204, 208) and J. Roháček (others).

Order **Caryophyllales**

Family Caryophyllaceae

***Silene dioica* (L.) Clairv.** – *Paranthomyza nitida, Anagnota bicolor*

***Stellaria nemorum* L.** – *Paranthomyza nitida*; occasionally *Anthomyza pleuralis*

Family Balsaminaceae

***Impatiens parviflora* DC.** – *Paranthomyza nitida*; occasionally *Anthomyza macra*

Order **Lamiales**

Family Lamiaceae

***Lamium maculatum* L.** – *Paranthomyza nitida*

Order **Rosales**

Family Urticaceae

***Urtica urens* L.** – *Stiphrosoma sabulosum* (occasional rearing record)

Rhodopsida incertae sedis

Family Boraginaceae

***Symphytum officinale* L.** – *Paranthomyza nitida*

Class LILIOPSIDA

Order **Poales**

Family Cyperaceae

***Bolboschoenus maritimus* (L.) Palla** – occasionally *Amygdalops thomasseti, Anagnota coccinea*

***Carex acuta* L.** – *Anthomyza dissors, Anthomyza paraneglecta, Anthomyza neglecta, Anthomyza collini, Anthomyza gracilis, Stiphrosoma cingulatum, Anagnota bicolor*; occasionally *Anagnota major*, *Anthomyza pallida*;

***Carex acutiformis* Ehrh.** – *Anthomyza neglecta, Stiphrosoma cingulatum, Anagnota bicolor*

***Carex brizoides* L.** – *Anthomyza gracilis*; occasionally *Anthomyza collini*

***Carex canescens* L.** – *Anthomyza collini*

***Carex elata* All.** – *Anthomyza gracilis*; occasionally *Anthomyza dissors, Anthomyza neglecta*

***Carex elongata* L.** – *Anthomyza elbergi* (?)

***Carex paniculata* L.** – *Carexomyza caricis, Anthomyza neglecta, Anthomyza collini, Anthomyza gracilis, Anagnota bicolor*; occasionally *Stiphrosoma cingulatum*

***Carex praecox* Schreber** – *Stiphrosoma sabulosum*

***Carex riparia* Curtis** – *Anthomyza paraneglecta*; occasionally *Anagnota bicolor, Anthomyza neglecta*

***Carex rostrata* Stokes** – *Anthomyza dissors, Anthomyza paraneglecta, Anthomyza neglecta, Anthomyza gracilis, Anagnota bicolor*

***Carex vesicaria* L.** – *Anthomyza paraneglecta, Anthomyza neglecta*; occasionally *Anthomyza pallida, Anthomyza collini, Anthomyza gracilis*

***Carex vulpina* L.** – *Anthomyza gracilis*; occasionally *Anthomyza collini*

***Carex* sp.** – *Anthomyza dissors, Anthomyza paraneglecta, Anthomyza neglecta, Stiphrosoma laetum*; occasionally *Anthomyza anderssoni*

***Eriophorum angustifolium* Honck.** – *Anthomyza gracilis, Arganthomyza socculata*

***Rhynchospora alba* (L.) Vahl** – *Anthomyza collini*

***Schoenoplectus lacustris* (L.) Palla** – *Anthomyza collini*; occasionally *Anthomyza neglecta, Anthomyza gracilis*

***Scirpus sylvaticus* L.** – *Anthomyza paraneglecta, Anthomyza neglecta, Stiphrosoma cingulatum, Anagnota bicolor*; occasionally *Anthomyza collini, Stiphrosoma laetum*

Family Juncaceae

***Juncus bufonius* L.** – occasionally *Anthomyza collini, Anthomyza gracilis, Anthomyza pallida*

***Juncus effusus* L.** – *Anthomyza neglecta, Anthomyza gracilis, Stiphrosoma laetum, Anagnota bicolor*

***Juncus subnodulosus* Schranck.** – *Anthomyza collini*

Family Poaceae

***Agrostis stolonifera* L.** – *Stiphrosoma cingulatum, Stiphrosoma laetum*

***Agrostis* sp.** – *Anthomyza pallida, Stiphrosoma laetum*

***Alopecurus pratensis* L.** – *Anthomyza gracilis*; occasionally *Anthomyza collini*
***Anthoxanthum odoratum* L.** – *Stiphrosoma sabulosum*
***Arrhenatherum elatius* (L.) J. Presl et C. Presl** – *Stiphrosoma sabulosum, Anthomyza gracilis, Stiphrosoma laetum*
***Arundo donax* L.** – *Amygdalops thomasseti, Anthomyza collini*, occasionally *Anagnota coccinea*
***Avenella flexuosa* (L.) Drejer** – *Stiphrosoma sabulosum, Anthomyza elbergi, Stiphrosoma laetum*
***Bromus erectus* Huts.** – *Stiphrosoma sabulosum*
***Bromus inermis* Leysser** – *Anthomyza elbergi* (?)
***Calamagrostis canescens* (Weber) Roth.** – *Anthomyza gracilis, Stiphrosoma cingulatum*; occasionally *Anthomyza pallida, Anthomyza collini*
***Calamagrostis epigejos* (L.) Roth.** – *Anthomyza gracilis, Stiphrosoma sabulosum*
***Calamagrostis villosa* (Chaix) J. F. Gmelin** – *Anthomyza pallida, Anthomyza collini, Anthomyza gracilis*; occasionally *Stiphrosoma cingulatum*
***Dactylis glomerata* L.** – *Stiphrosoma sabulosum, Stiphrosoma laetum*, occasionally *Anthomyza elbergi*
***Deschampsia caespitosa* (Weber) Roth.** – *Anthomyza pallida, Anthomyza gracilis, Anthomyza elbergi, Stiphrosoma laetum, Stiphrosoma sabulosum, Anagnota bicolor*
***Elytrigia intermedia* (Host) Nevski** – *Stiphrosoma sabulosum, Anthomyza elbergi* (?)
***Elytrigia repens* (L.) Nevski** – *Stiphrosoma sabulosum, Anagnota bicolor, Anthomyza collini*
***Festuca donax* Lowe** – *Anthomyza baezi*. This grass species has recently been treated as *Drymochloa donax* (Lowe) H. Scholz et Foggi, see Foggi et al. (2005).
***Festuca ovina* L.** – *Stiphrosoma laetum*
***Festuca rubra* L.** – *Stiphrosoma laetum*
***Glyceria declinata* Bréb.** – *Anthomyza gracilis*
***Glyceria fluitans* (L.) Br.** – *Anthomyza gracilis*
***Glyceria maxima* (Hartman) Holmberg.** – *Anthomyza collini, Anthomyza gracilis, Stiphrosoma cingulatum, Stiphrosoma laetum, Anagnota bicolor*
***Holcus lanatus* L.** – *Stiphrosoma sabulosum, Stiphrosoma laetum*
***Leersia oryzoides* Sw.** – *Anthomyza collini*
***Lolium perenne* L.** – *Stiphrosoma sabulosum*
***Melica altissima* L.** – *Anthomyza elbergi* (?)
***Molinia caerulea* (L.) Moench.** – *Anthomyza gracilis, Anthomyza elbergi*
***Phalaris arundinacea* L.** – *Anthomyza collini, Anthomyza gracilis*
***Phragmites australis* (Cav.) Steud.** – *Amygdalops thomasseti, Anthomyza collini, Anthomyza gracilis, Stiphrosoma cingulatum, Anagnota bicolor*
***Poa annua* L.** – *Stiphrosoma sabulosum*
***Poa nemoralis* L.** – *Stiphrosoma sabulosum, Stiphrosoma laetum*
***Poa pratensis* L.** – *Anthomyza pallida*
***Poa trivialis* L.** – *Anthomyza gracilis*
***Trisetum flavescens* (L.) P. B.** – *Anthomyza gracilis*
***Triticum aestivum* L.** – *Anthomyza collini, Anthomyza elbergi*; occasionally *Anthomyza gracilis*

Family Sparganiaceae
***Sparganium erectum* L.** – *Anthomyza collini*

Family Typhaceae
***Typha angustifolia* L.** – *Typhamyza bifasciata*
***Typha latifolia* L.** – *Typhamyza bifasciata, Anthomyza anderssoni, Anthomyza neglecta, Anagnota bicolor*
***Typha* sp.** – *Typhamyza bifasciata, Anthomyza anderssoni*

Habitat associations of Palaearctic Anthomyzidae

The association of a species of Anthomyzidae with a particular habitat depends first of all upon the trophic demands of its larvae (presence of suitable host-plant species). Certainly, micro- and mesoclimatic conditions of the site also influence its occurrence as do the presence and abundance of predators, parasites and other enemies. Unfortunately most of the data available allow detection of habitat association of only West Palaearctic species (based mostly on the author's own observations from Central and South Europe). There are only a few published data which can be utilised, such as those by Krogerus (1960) on nordic moorland habitats, by Hofer & Waitzbauer (2000) dealing with steppe habitats in Austria, by Bährmann (2006) on various habitats in central Germany, or a number of papers on reed-associated insects (or flies only). The habitats of Anthomyzidae are classified in two main groups:

(1) Woodland habitats
(2) Open habitats

(1) Woodland habitats

Only some types of forest provide suitable conditions for species of Anthomyzidae. Broadly, these are woods with host plants of Anthomyzidae in the undergrowth or forests with an abundance of fungi in which anthomyzid larvae can develop. Different communities of Anthomyzidae can be found in relatively dry woodland, forest clearings or margins and in wet to inundated forest.

(1.1) Dry woodland habitats

This group includes deciduous, mixed or coniferous forests, mainly at lower and middle altitudes. Special habitats associated with woodland can also be included here, viz. clearings, woodland paths, forest margins.

(1.1.1) Forests with macrofungi

Fungomyza albimana is associated with this habitat, developing in various rotting fungi on the ground (see above) but also in some growing on trees (e.g. *Polyporus*). Sparse deciduous forests (birch, oak, beech) or their margins are typical habitats of this species (Figs 216, 218).

(1.1.2) Forests with graminoid undergrowth

Graminoid undergrowth can be found in various sparse forests (Figs 207, 218), their margins, in clearings (Fig. 215) and along forest paths. *Calamagrostis* spp., *Molinia, Avenella, Carex brizoides* - Fig. 217, etc.) can grow there but only those occurring abundantly can host species of Anthomyzidae. The following species are associated with these habitats: *Anthomyza gracilis*, *A. elbergi* (northern latitudes), *A. pallida* (northern or at higher altitudes) and *Arganthomyza socculata* (northern latitudes).

(1.2) Moist woodland habitats

The following habitats in this group hosting Anthomyzidae differ by their type of undergrowth and by the amount of moisture.

(1.2.1) Floodplain and alluvial inundated forests with graminoid undergrowth

These habitats are characterized by a high water table and marshland sedges and grasses in the undergrowth. Alder alluvial forest with various species of *Carex*, *Scirpus sylvaticus, Glyceria maxima, Deschampsia caespitosa* and other graminoids is a typical example. (Figs 220, 221). These habitats are inhabited by *Anthomyza neglecta, A. collini, A. gracilis, Stiphrosoma laetum*, occasionally also *S. cingulatum* and *Anagnota bicolor.*

(1.2.2) Floodplain and alluvial forests with dicotyledonous undergrowth

These very wet habitats most commonly occur along meandering brooks and rivers in lowland or in valleys. In Central Europe most of these riparian habitats are formed by alder (*Alnus glutinosa*) forests (Fig. 166). The foodplain (oak, elm, poplar, willow) forests (Fig. 159)

Figs 210-214: Anthomyzidae associated with saltmarshes. **210** - Salina saltmarsh (Malta); **211** - same, microhabitat of *Cercagnota collini*, margin of reed growth; **212** - *C. collini* (Czerny), male (Malta), laterally; **213 -** *Santhomyza inermis* Roháček, female (Israel), laterally; **214** - Ghadira saltmarsh (Malta), habitat of *S. inermis*. Photo by G. Bonnet (210), M. Deml (212-213) and P. Gatt (others).

are another variant of this habitat. The anthomyzid community in these habitats typically includes *Paranthomyza nitida, Anthomyza pleuralis, A. macra*, sometimes also *Anagnota bicolor* or *A. major*.

(1.2.3) Montane wet forests with rich undergrowth

Montane mixed forests are humid because of high precipitation. Their rich undergrowth (Fig. 219) typically hosts *Paranthomyza nitida* and *Anthomyza pleuralis*.

(1.2.4) Laurel forests in Madeira

The laurel forests (laurisilva) in Madeira with *Festuca donax* in the undergrowth (see Figs 167, 170) is a characteristic habitat of *Anthomyza baezi*, the species endemic to this island.

(2) Open habitats

Various open habitats with grassy and other graminoid plant communities are the preferred habitats of the majority of species of Anthomyzidae. This group of habitats includes a wide range of different ecosystems at various latitutes, altitudes, differing by moisture and, first of all, by species composition of their plant cover. The open habitats of Anthomyzidae are classified under two main divisions, viz. dry open habitats and wetlands.

(2.1) Dry open habitats

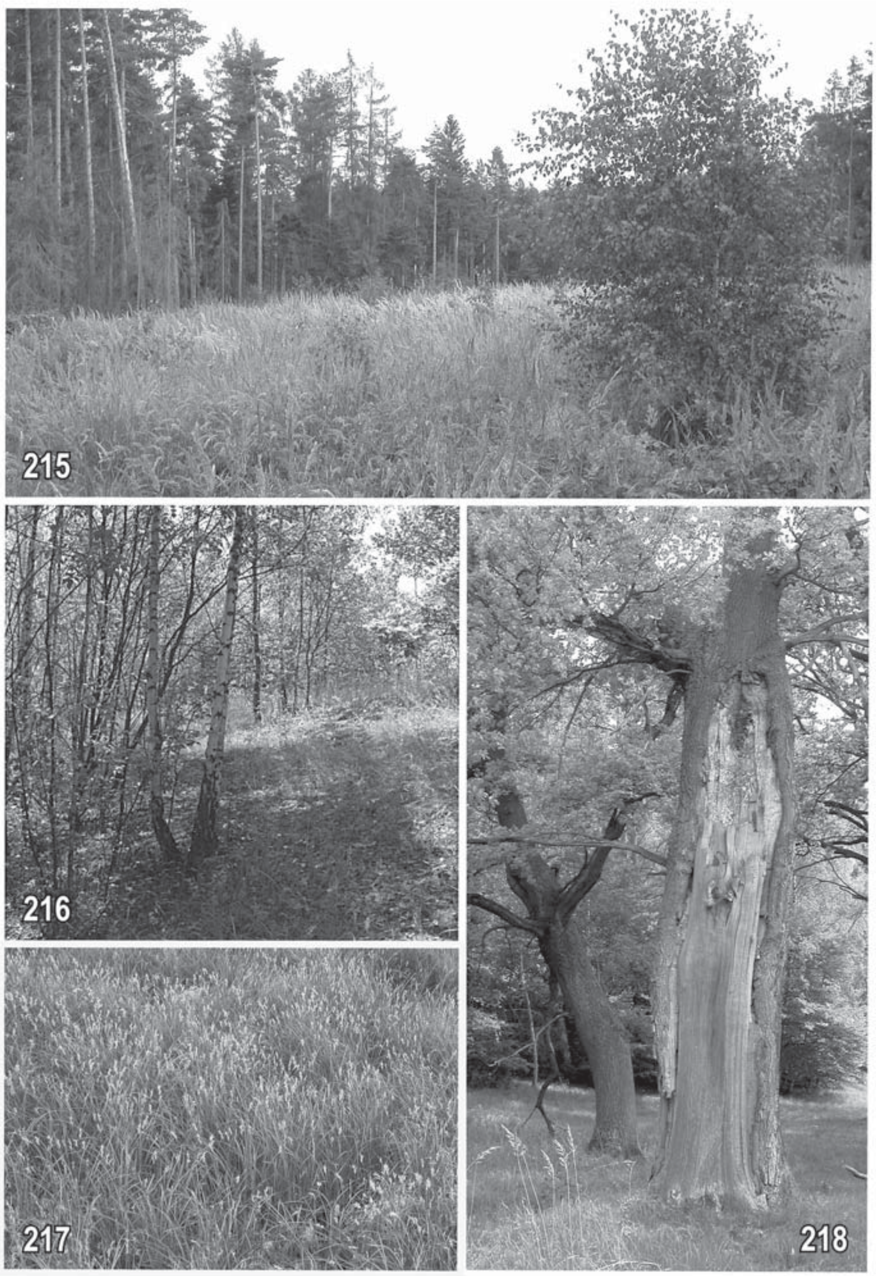
This group includes various grassland habitats, from various types of natural or wild meadows to cultivated meadows, hayfields and cereal fields; also small habitats, like grassy field paths, balks and lawns are included here.

(2.1.1) Steppe and xerophilous meadows

This group includes the grasslands with lowest humidity. Only a few species of Anthomyzidae are able to tolerate the dryness of steppes and xerophilous meadows and are usually found in them only in sites with higher moisture. Besides natural steppe meadows (Fig. 222), grazed xerophilous meadows (pastures - Fig. 223) are also classified here. These habitats are inhabited only by *Stiphrosoma sabulosum* and *S. laetum*, sometimes also by *Anagnota bicolor* in Central Europe (see Bährmann 2006), all of which live near to the ground in clumps of grasses. In more northern latitudes, *Anthomyza elbergi* and *Arganthomyza socculata* can also occur in dry meadows and pastures (Andersson 1976).

(2.1.2) Mesophilous meadows

Mesophilous meadows are common open habitats of the temperate belt of the Palaearctic Region with moderate humidity and rich composition of grasses. They are often used as hayfields (Fig. 224). The cultivated meadows (with a selected array of grasses such as *Arrhenatherum elatius, Festuca* spp., *Lolium* spp., *Poa pratensis, Phleum pratense, Dactylis glomerata* etc.) are another variant of this habitat (Fig. 225). Most small grassy habitats like field paths (Fig. 225), balks, grassy roadsides and lawns also belong here. Despite a rich spectrum of grass species growing in these habitats the diversity of Anthomyzidae is relatively low: only *Anthomyza gracilis, Stiphrosoma sabulosum, S. laetum*, and (less frequently) *Anthomyza collini*, are regular members; in more northern latitudes *Anthomyza elbergi* and *Arganthomyza socculata* may join this community.



Figs 215-218: Habitats of Anthomyzidae, dry woodland. **215** - clearing in coniferous forest dominated by *Calamagrostis epigejos*; **216** - birch forest on a mine dump nr Karviná, with sporocarps of fungi; **217** - *Carex brizoides* in undergrowth of an oak forest; **218** - an old oak forest with grassy undergrowth. All from the Czech Republic. Photo by J. Ševčík (216) and J. Roháček (others).

(2.1.3) Cereal fields

Very limited data are available about associations of Anthomyzidae with cultivated cereals. Usually no Anthomyzidae can be found in carefully grown cereals; this is surely caused by agrotechnical methods and chemical treatments of cereal fields. Anthomyzidae were only found in a field with wheat (*Triticum aestivum*) damaged by *Opomyza florum* (see Fig. 156): *Anthomyza collini* occurred here commonly and *A. gracilis* occasionally. In the E. Palaearctic, *A. elbergi* was swept from a wheat field (see Roháček 2006a).These poly(sapro)phagous species might also live in other cultivated cereals but probably only in those damaged by phytophagous pest insects or growing in abandoned fields.

(2.2) Open wetlands

This group of habitats comprises a number of types of marshland and other moist habitats ranging over various altitudes and latitudes. Many of them are highly specific as regards their plant communities, mesoclimate or soil composition. However, the species composition of their plant cover usually appears to be the most important factor influencing their colonization by the Anthomyzidae.

(2.2.1) Subalpine and alpine meadows

The higher altitude meadows (slightly below to above the tree line, Fig. 226) are humid habitats due to frequent rainfall. The Anthomyzidae occurring here include both species developing in grasses and those associated with lush dicotyledons growing in these species-rich meadows. *Arganthomyza socculata, Anthomyza pallida*, and (less frequently) *A. gracilis* and *Stiphrosoma sabulosum* belong to the former group and *Anthomyza pleuralis* to the latter.

(2.2.2) Peat bogs and their lagg meadows

These extreme habitats have special plant communities composed of species tolerating the high acidity of the peat substrate and the high water table. Very few species of Anthomyzidae are known to live here. Usually no anthomyzids can be found in the central parts of mires (raised bogs) but some occur in marginal lagg meadows (Fig. 194): *Anthomyza dissors* (in larger sedges only), *A. gracilis* (polysaprophagous in various monocotyledons including *Eriophorum* spp.), *Stiphrosoma laetum* (in monocot tussocks), and more rarely *Anthomyza pallida* (in larger grasses), see Roháček & Máca (1982) and Roháček & Barták (2000). In more northern latitudes *Anthomyza elbergi* can also be found on peat bogs, associated with *Molinia caerulea* and other grasses.

(2.2.3) Lower altitude marshlands (rich fens, alluvial, lake and pond shore marshes)

A number of marshland habitats can be classified in this group, differing mainly by their plant communities but also by water table, soil substrate and other physical conditions. Their anthomyzid communities can also be distinctly different, most significantly depending on the dominant plant species in the herbaceous cover. For this reason this group of habitats is divided as follows.

(2.2.3.1) Marshes and boggy meadows with large sedges (Magnocaricetalia)

These habitats can be found in the alluvium of rivers and brooks (Fig. 174, 187, 200) and on the shores of ponds or lakes (197, 232); they are probably the most species-rich communities of Anthomyzidae. In boggy (waterlogged) meadows with prevalent non-tussocking sedges like *Carex acuta, C. riparia, C. rostrata* etc. and *Scirpus sylvaticus* (Figs 187, 197), the following anthomyzid community can be found: *Anthomyza dissors* (only in higher altitude valleys), *A. neglecta, A. paraneglecta, A. collini, A. gracilis, Stiphrosoma cingulatum, Anagnota bicolor*, more rarely also *Stiphrosoma laetum* and *Anagnota major*; the first three species mentioned are the most characteristic of this community.

Figs 219-221: Habitats of Anthomyzidae, wet woodland. **219** - montane mixed forest with rich undergrowth of dicotyledonous plants (Hrončecký grúň, Slovakia); **220** - inundated alder forest with *Glyceria maxima* and other marshland monocotyledons (Přemyšov, Czech Republic); **221** - wet alder forest with *Carex acuta* in undergrowth (Břehyňský rybník nr Doksy, Czech Republic). Photo by J. Roháček.

A similar but somewhat poorer assemblage also occurs in habitat with large tussocking sedge species like *Carex paniculata* (Fig. 174). It includes *Anthomyza neglecta, A. collini, A. gracilis, Anagnota bicolor* and occasionally *Stiphrosoma cingulatum* but differs from the former (in more northern latitudes) by the inclusion of the (most characteristic) species *Carexomyza caricis*.

(2.2.3.2) Marshes and boggy meadows with dominant grasses

These habitats occur in similar situations to the latter (2.2.3.1) and are often partly mixed with them (Figs 197, 198, 228). Typically they are formed by large grasses like *Calamagrostis* spp., *Phalaris arundinacea*, *Glyceria* spp. and inhabited by an anthomyzid community including *Anthomyza gracilis, A. collini, Stiphrosoma cingulatum, S. laetum, Anagnota bicolor,* and at higher altitudes also by *Anthomyza pallida*.

(2.2.3.3) Marshes with reed growths (Phragmitetalia)

Large growths of common reed (*Phragmites australis*) occur frequently along the boggy shores of ponds, lakes and rivers (Figs 230, 231) and in marshland valleys or basins (Fig. 229). The dipterous fauna associated with reed is relatively well known (see references above). In most of Europe, the community of Anthomyzidae in this habitat includes *Anthomyza collini* and (less frequently) *A. gracilis*, both developing as inquilines in galls of *Lipara* spp. (Chloropidae) or in otherwise deformed terminal shoots of reed, and *Stiphrosoma cingulatum* living on the basal parts of this grass. However, in the Mediterranean coastal saltmarshes (see below, Figs 211, 214) the species assemblage inhabiting reed growths (in communities of the order Bolboschoenetalia maritimi) is different: besides *Anthomyza collini* only *Amygdalops thomasseti* (see Roháček & Freidberg 1993) and *Cercagnota collini* seem to be associated with *Phragmites australis* there but the host of the latter is still unknown.

(2.2.3.4) Marshes and boggy meadows with prevalent rushes

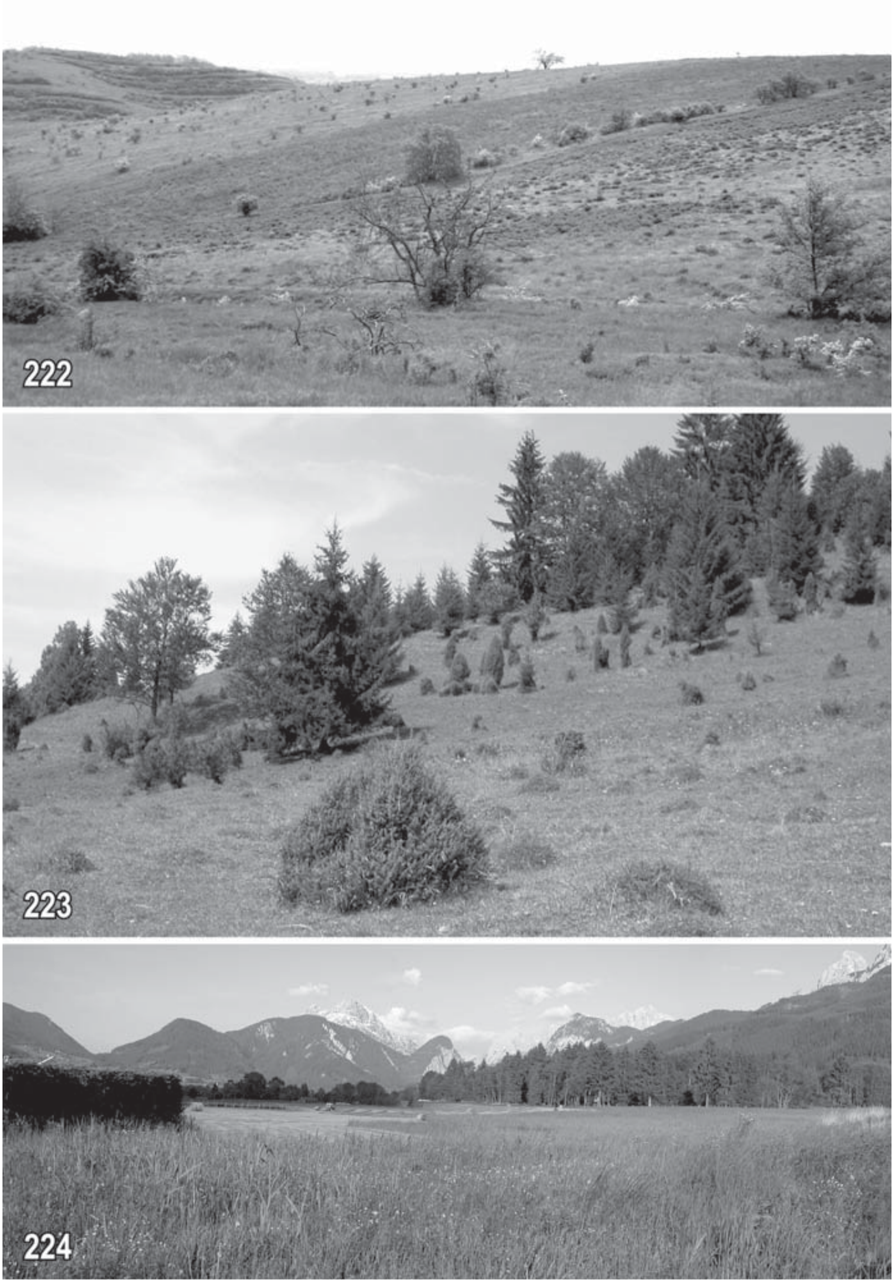
Rushes (*Juncus* spp.) usually do not occur in uniform growths but are mixed with sedges, grasses and other marshland plants (see Fig. 200, 228). Pure, uniform growths of *Juncus* spp. can sometimes be found along boggy shores of brooks, canals (Fig. 2), ponds or lakes. No particular species of Anthomyzidae is associated only with rushes and the anthomyzid community of habitats with prevalent or dominant *Juncus* species is relatively poor – only *Anthomyza gracilis* occurs there regularly but *Anthomyza neglecta, Stiphrosoma laetum* and *Anagnota bicolor* may also be frequently encountered; further species can be found only occasionally (*Anthomyza collini*).

(2.2.3.5) Marshes with reed-mace growths

Habitats with reed-mace growths (*Typha* spp.) occur in marshes on shores of standing (Fig. 178) and slowly running waters (Fig. 227). These *Typha*-covered boggy habitats host a highly specific community containing two species monophagous on reed-mace, viz. *Typhamyza bifasciata* and *Anthomyza anderssoni*. In addition to them, *Anthomyza neglecta* and *Anagnota bicolor* are also known to develop sometimes in *Typha* stems.

(2.2.4) Shores and mouths of river in southern latitudes

In southern Europe the shorelines and mouths of rivers, brooks and freshwater lakes are often overgrown by *Arundo donax* (Figs 180-182), sometimes mixed with *Phragmites australis*, *Bolboschoenus maritimus* and other plants. This is typical habitat of *Amygdalops thomasseti*; more rarely *Anthomyza collini* and *Anagnota coccinea* can also occur here.



Figs 222-224: Habitats of Anthomyzidae, dry grassland. **222** - dry steppe meadows (Dolnodunajovické kopce, Czech Republic); **223** - submontane pasture meadows (Kyslinky, Poľana Mts., Slovakia); **224** - mown meadows (hayfields) in the Enns valley (Austria). Photo by J. Roháček.

(2.2.5) Salt marshes

Salt marshes (Figs 210, 211, 214) are highly specific habitats. Plant communities growing in inland salt marshes of Central and North Europe do not have particularly different anthomyzid faunas compared with those of freshwater marshes (see above), usually with prevalent *Anthomyza collini* and a few other species depending on the presence of their host plants. On the other hand, the coastal salt marshes in the Mediterranean have a distinctive community of Anthomyzidae formed by *Santhomyza inermis*, *Amygdalops thomasseti* and (more rarely) *Cercagnota collini*. Unfortunately, the host plants of *Santhomyza inermis* (Fig. 213) and *Cercagnota collini* (Fig. 212) remain unknown but the affinity of these two species to salt marshes is beyond any doubt.

Biogeography

Descriptive biogeography of Palaearctic Anthomyzidae

According to Walter (1954), species with a similar type of distribution can be considered a particular geographical faunal element – a geoelement. The synoptic system of geoelements by Walter (1954) and Freitag (1962) is adopted with several alterations below. Based on the knowledge of their known distribution (see above) the Palaearctic species of Anthomyzidae can be classified into the following distributional types = geoelements (sensu Walter 1954) (only those recognized within the Anthomyzidae studied here are listed):

(1) Holarctic geoelement. Hitherto only 2 species are known to occur both in the Palaearctic and Nearctic Regions: *Stiphrosoma sabulosum* and *S. humerale*. Both these species are restricted to the temperate and northern belts of the Holarctic Region; while *S. sabulosum* is only known from the western half of the Palaearctic Region (to W. Siberia) and from several eastern provinces and states of Canada and the USA (where it may also be introduced – see discussion in Roháček & Barber 2005), *S. humerale* (being widespread in the Nearctic Region) is probably more common in the E. Palaearctic area and invaded from there westwardly up to Central Europe where it is extremely rare.

(2) Palaearctic geoelement. Only the most widespread transpalaearctic species belong here, occurring in northern, middle (temperate) and also in southern belts (at least in montane ranges). *Anthomyza gracilis, A. pleuralis*.

(3) Eurosiberian geoelement. Species with a geographic range covering the major part of the Palaearctic Region except for the northernmost (Arctic Region) and southern parts (Mediterranean, Central Asian and Sino-Japanese Regions) belong here. *Anagnota bicolor, Stiphrosoma cingulatum* and possibly also *Anthomyza collini, Paranthomyza nitida* and *Typhamyza bifasciata* (although all hitherto unrecorded from E. Siberia) may belong to this geoelement.

(4) Temperate Palaearctic geoelement is represented by a single species restricted to the temperate belt (the zone of deciduous forests) of the Palaearctic Region. *Anthomyza macra*.

(5) Boreal geoelement. Only one species, *Anthomyza elbergi*, can be attributed to this distribution type because it is only present in the northern belt of the Palaearctic Region, thus in the taiga zone, south of the Arctic Region.

(6) Boreo-montane geoelement. Two species, *Anthomyza pallida* and *A. dissors*, can be classified under this geoelement; they are widespread in northern and temperate belts of the Palaearctic Region but in the latter limited to higher (submontane to montane) altitudes below the tree line; consequently, they are species of the taiga forest zone.

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Figs 225-226: Habitats of Anthomyzidae, grassland. **225** - grassy field path and cultivated meadow (Chvalíkovice nr Opava, Czech Republic) with *Arrhenatherum elatius*; **226** - wet subalpine and alpine meadows with *Calamagrostis villosa* and other grasses (Velká kotlina, Hrubý Jeseník Mts., Czech Republic). Photo by J. Roháček.

(7) Boreo-alpine geoelement. Species widespread in the northern belt of the Palaearctic Region but also with insular distribution above the tree line in mountains of the temperate and southern belts. *Arganthomyza socculata*.

(8) European geoelement comprises species occurring throughout Europe including its Mediterranean areas but absent in North Africa. *Fungomyza albimana*.

(9) Central European geoelement in broader sense. Species distributed in Central Europe, in the zone of deciduous forests (also including the Atlantic coast, British Is. and submediterranean part of South Europe). *Anthomyza neglecta, A. paraneglecta, Stiphrosoma laetum.*

(9.1) Central European geoelement in narrower sense. Species restricted to Central and West Europe, without the Atlantic coast, British Is. and submediterranean part of South Europe. Only *Anthomyza clara* may belong here.

(9.2) Atlantic geoelement. Species with distributions along the Atlantic coast, from Portugal to S. Norway and Sweden, including British Is., in the zone of heaths with extreme oceanic climate. *Carexomyza caricis* may be a candidate for this type of distribution although it is currently only known from England and Sweden.

(9.3) Submediterranean geoelement. In contrast to true mediterranean species, these species are distributed in South Europe and expanded in the north to Central Europe. *Anagnota major, Anthomyza anderssoni*.

(10) Mediterranean geoelement. Species restricted to coastal areas of the Mediterranean Sea (belonging to three continents – Europe, Africa, Asia), in the zone of non-deciduous sclerophyllous forest. *Santhomyza inermis* is a typical example; three other species may be restricted to the E. Mediterranean area – *Amygdalops rufior, Anagnota coccinea, Receptrixa receptrix.*

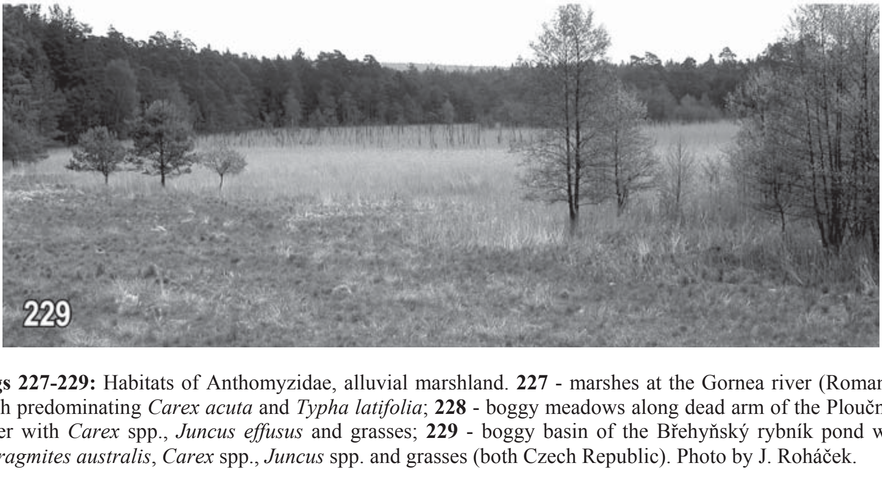
(11) Macaronesian geoelement. Species with ranges restricted to islands in the Atlantic Ocean (Canary Islands, Madeira, Azores, Cape Verde Islands). Three species belong here, one endemic to Canary Islands (*Santhomyza biseta*), two others endemic to Madeira (*Anthomyza baezi, A. umbrosa*).

(12) Southern Palaearctic geoelement is represented by *Cercagnota collini* which is widespread in the Mediterranean subregion but reaching westwardly to the Atlantic area (England) and eastwardly to Central Asia (Uzbekistan).

(13) Eastern Palaearctic geoelement. Species distributed in the Eastern part of the Palaearctic Region (from Mongolia eastward). Because no data about the occurrence of Anthomyzidae are available from China and also those from other parts of the E. Palaearctic are fragmentary, it is not possible to classify the species known from the E. Palaearctic more precisely. It is probable that some of them are more widespread and may belong to the Sino-Japanese geoelement (*Anthomyza decolorata* sp.n.*, A. orineglecta, A. bellatrix, A. trifurca, Arganthomyza barbarista* sp.n.*, Epischnomyia triarmigera, Stiphrosoma fissum*), while others could, in fact, be restricted to the islands of Japan, Sakhalin, Kuril Is. (*Anthomyza drachma, A. flavosterna, Stiphrosoma grande*) or to some continental parts, e.g. to Kamchatka (*A. tschirnhausi* sp.n.) or the Korean peninsula (*Arganthomyza versitheca* sp.n.*, Epischnomyia merzi* sp.n.). Inasmuch as these presuppositions are highly speculative, it is better to treat all of them as E. Palaearctic species for the time being.

Exotic geoelements within the Palaearctic fauna. At least two (possibly four) species occurring in the Palaearctic Region belong to tropical geoelements.

(14) Afrotropical geoelement is represented by *Amygdalops thomasseti* which expanded its range into southern areas of the W. Palaearctic (Mediterranean, Macaronesian subregions). *Amygdalops rufior* may also have a similar origin but this rare species is only known from Israel and is therefore tentatively listed under the Mediterranean geoelement.



Figs 227-229: Habitats of Anthomyzidae, alluvial marshland. **227** - marshes at the Gornea river (Romania) with predominating *Carex acuta* and *Typha latifolia*; **228** - boggy meadows along dead arm of the Ploučnice river with *Carex* spp., *Juncus effusus* and grasses; **229** - boggy basin of the Břehyňský rybník pond with *Phragmites australis*, *Carex* spp., *Juncus* spp. and grasses (both Czech Republic). Photo by J. Roháček.

(15) Oriental geoelement. *Amygdalops nigrinotum*, though originally described from Japan (and Hawaii and Java), has proven to be a widespread Oriental species which also penetrated to marginal areas of the Afrotropical, Australasian, Oceanian Regions and also to Japan in the E. Palaearctic (Roháček 2008a). It is not excluded that *Amygdalops femorinus* sp.n. (described above from Hahajima I. in southern Japan) can also belong to this geoelement.

Notes on the historical biogeography of Palaearctic genera of Anthomyzidae

Fungomyza. This genus is represented by two species in the Palaearctic Region, *F. cercata* sp.n. known only from Southern Primorie in the Far East of Russia, and *F. albimana* which is widespread in Europe but also occurs in Turkey in the Near East of Asia. Interestingly, the latter species has its closest relative, *F. buccata* Roháček & Barber, 2004, in the eastern USA. This transatlantic sister-pair relationship demonstrates that the ancestor of this pair had to be a (western) Laurasian species and that these descendent species evolved after the separation of Laurasia into the Nearctic and Palaearctic Regions. Because *F. cercata* sp.n. proved to form a sister clade to the above sister pair (see Fig. 139 in the chapter Phylogeny), it may represent a descendant of another, eastern Laurasian, clade.

***Arganthomyza* gen.n.** The above-described *Arganthomyza* gen.n. includes 3 species in the Palaearctic Region and 1 in the Oriental Region (from Nepal). However, because the Nepalese species *A. setiplanta* has been caught at high altitudes (2,400-2,800 m), it may also be derived from the Palaearctic fauna (see Roháček 1987a). The latter species forms, together with *A. versitheca* sp.n., a sister pair of closely allied species which may originate from the southeastern Palaearctic, like their more ancestral congener *A. barbarista* sp.n. On the other hand, *A. socculata*, representing a sister clade to *A. versitheca* sp.n. + *A. setiplanta* (cf. Fig. 140), is a widespread Boreo-alpine transpalaearctic species which has its closest (hitherto unnamed) relatives in the Nearctic Region. Consequently, this clade seems to be of northern (Boreal) origin. However, a more precise recognition of the biogeographical origin of *Arganthomyza* species will be possible only when the phylogenetic relationships of the undescribed Nearctic species are resolved.

***Receptrixa*.** The origin of this genus remains unclear as do its phylogenetic relationships (see above in the chapter phylogeny). Its only representative, *R. receptrixa*, remains known only from the female holotype originating from Israel. Therefore it is considered an E. Mediterranean species.

***Anthomyza*.** This is a species-rich genus in the Palaearctic Region as well as in the Nearctic Region where the overwhelming majority of species are undescribed (K. N. Barber, personal communication 2008); only a few species are known from adjacent tropical areas (e.g. *A. cuneata* Roháček, 1987 from Nepal and some other unnamed species from other parts of the Oriental Region). It is obvious that the evolutionary centre of the genus *Anthomyza* was in Laurasia because several of its species groups are represented by closely related species in both the Palaearctic and Nearctic Regions (see below). Subsequently, several clades (species groups) may have split off after colonizing some marginal areas of these or neighbouring (tropical) Regions. Insufficient knowledge of the distribution and phylogeny of the unnamed Nearctic species prevents more detailed analysis of the biogeographical origin of the species groups recognized in the Palaearctic Region. Despite this, an attempt is made here to discuss their origins on the basis of the available though incomplete information.

The most ancestral-looking (basal) clade of *Anthomyza* (see Fig. 141) is formed by the *A. macra* group which is comprised of 3 species in the Palaearctic Region, 2 transpalaearctic (*A. macra, A. pleuralis*) and 1 occurring in the extreme Far East of Russia (*A. decolorata* sp.n.). This group is also represented in the Nearctic Region by *A. tenuis* (Loew, 1863) and two unnamed species (K. N. Barber, personal communication 2009). Although their relationships to Palaearctic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Figs 230-232: Habitats of Anthomyzidae, pond shores (Czech Republic). **230** - boggy shores of the Držník pond with *Schoenoplectus lacustris*, *Carex* spp. and *Phragmites australis*; **231** - Máchovo jezero pond shore with *Phragmites australis*; **232** - shore marsh of the Stonařovský rybník pond with rich communities of *Carex*, *Scirpus*, *Calamagrostis*, *Phalaris* and *Typha* spp. Photo by J. Roháček.

species are unknown, their mere existence in this earliest-derived clade seems to indicate that the genus *Anthomyza* inhabited Laurasia before its division into the Nearctic and Palaearctic Regions. The *A. pallida* group, represented by the two Boreo-montane transpalaearctic species *A. pallida* and *A. dissors*, may have a similar origin. Interestingly, these closely allied species also resemble each other in their distribution type but differ markedly in their ecological demands. *A. dissors* is trophically associated with a few large species of sedge (*Carex* spp. - see above) in marshland habitats while *A. pallida* develops in grasses and therefore has a somewhat wider distribution, also occurring in drier habitats of more southern montane ranges.

The *A. umbrosa* group is an example of a clade whose species have restricted distributions in the Palaearctic Region. The group is formed by *A. clara*, a very local species known from a few localities in Central Europe, and by a sister pair of Macaronesian species endemic to Madeira (*A. baezi, A. umbrosa*). This distribution pattern indicates that these species may have been remnants of an (more widely distributed) ancestor which had penetrated from westernmost Europe to Madeira where it gave rise to two species endemic to this island. The sister group of the *A. umbrosa* group is the *A. gracilis* group (see Fig. 141). The affiliation of the E. Palaearctic species *A. drachma* to this group is uncertain (see chapter Phylogeny) so only the remaining two species, *A. gracilis* and *A. elbergi*, can be considered. These two species are closely related and widespread throughout the Paleaarctic Region but differ in their ecology. *A. gracilis* is a habitat- and climate-tolerant, poly(saprophagous) species while *A. elbergi* seems to be psychrophilous but intolerant of high humidity which has contributed to the shaping of its Boreal type of distribution. The *A. gracilis* group includes several closely allied (unnamed) species in the Nearctic Region. Because they are also distributed in more northern latitudes it is presupposed that the originally Holarctic fauna of this species group became disjunct only after the Beringian land bridge ceased to exist.

All known species of the *A. bellatrix* group plus its sister taxon, *A. flavosterna*, are only known from the E. Palaearctic or the Oriental Region (*A. cuneata* from Nepal). It is therefore probable that this clade (including *A. flavosterna*, Fig. 141) evolved in eastern Asia. Interestingly, the Nepalese *A. cuneata* proved to be less derived than the E. Palaearctic sister pair *A. bellatrix* + *A. trifurca*. This fact indicates that the *A. bellatrix* group (s. str.) may have evolved yet more southerly, around the southeastern border of the Palaearctic Region. The related *A. neglecta* group surely had a different origin. All its three members have rather restricted distributions in the temperate belt of the Palaearctic Region. *A. neglecta*, forming a sister group to other two species, occurs in Central and North Europe as does *A. paraneglecta*. However, the latter species is the nearest ally of the E. Palaearctic species, *A. orineglecta*. Thus, the distribution of this sister pair displays an interesting pattern of two widely separate areas – the western of *A. paraneglecta* and the eastern of *A. orineglecta*. Because the European *A. neglecta* and *A. paraneglecta* are sympatric and even syntopic species (often developing in the same host plants, see above) it is possible that *A. paraneglecta* evolved in Europe after a subsequent penetration of a member of the *A. neglecta* group from the E. Palaearctic area.

The E. Palaearctic species *A. tschirnhausi* sp.n. (from Kamchatka) has its closest relative, an undescribed but widespread species, in the Nearctic Region (K. N. Barber, personal communication 2009). Consequently, it may be derived from a Nearctic clade which colonized easternmost areas of the Palaearctic Region. On the other hand, the *A. collini* group could be of Eurosiberian origin like its more widespread and poly(sapro)phagous species *A. collini*. Its very close relative, the Submediterranean *A. anderssoni*, may have evolved relatively recently when it became specialized to develop in *Typha* species.

Epischnomyia. This genus contains two very closely allied E. Palaearctic species. Their nearest allies are the members of the Nearctic genus *Ischnomyia* (see Fig. 137 in the chapter Phylogeny). Because the Nearctic *Ischnomyia* is more similar to the hypothetical shared ancestor of these two genera, it is probable that *Epischnomyia* evolved after invasion of an *Ischnomyia*-like ancestor from the Nearctic Region into eastern areas of the Palaearctic Region. The two species of *Epischnomyia* have hitherto been known from limited areas in the E. Palaearctic: *E. triarmigera* from Japan and the Ussuriysk area in the Far East of Russia and *E. merzi* sp.n. from Korea. The latter species probably has a more southern distribution.

Stiphrosoma. The biogeography of this genus has been discussed by Roháček & Barber (2005). Because the majority of *Stiphrosoma* species are known from the temperate belt of the Nearctic Region, this area is considered the evolutionary centre of the genus. It is thus not surprising that all species occurring in the Palaearctic Region have close relatives in the Nearctic Region. Two species of *Stiphrosoma*, viz. *S. sabulosum* and *S. humerale* are Holarctic in distribution but, as stressed above, their ranges and their origins seem to be different. While the Holarctic distribution of *S. humerale* is considered natural and the species surely reached the Palaearctic Region via a Beringian land bridge (note that Palaearctic populations are somewhat different), the Nearctic occurrence of *S. sabulosum* may be the result of recent introductions (for more discussion see Roháček & Barber 2005). The E. Palaearctic (probably Sino-Japanese) species *S. fissum* was probably derived from *S. sabulosum* (see Fig. 142) but considering their dissimilarities this split must have occurred long ago. The Eurosiberian species *S. cingulatum* is most closely allied to *S. setipleurum* Roháček & Barber, 2005 which is restricted to eastern North America while the European *S. laetum* and the E. Palaearctic *S. grande* clearly belong to the same clade as the Holarctic *S. humerale*. Considering these facts *Stiphrosoma* species have to penetrate into the Palaearctic Region several times. The event leading to the evolution of *S. cingulatum* should have been older and, considering the absence of this species in the E. Palaearctic and restriction of *S. setipleurum* to the E. Nearctic, its ancestor could have moved across a North Atlantic land bridge. The invasion of a *S. humerale*-like ancestor probably occurred later via a Beringian land bridge but sufficiently long ago to split into two allopatric species, the western *S. laetum* and eastern *S. grande*. Apparently, *S. humerale* reached the E. Palaearctic via this land bridge much later when speciation of *S. grande* was already complete.

Cercagnota. The origin of *Cercagnota* is more difficult to explain. Although its relationship with *Stiphrosoma* has been recognized, these two genera are not closely allied (see in the chapter Phylogeny, Fig. 137). Also, the distribution of *Cercagnota collini* (the only species of the genus) in the Mediterranean and adjacent areas of the southern Palaearctic indicates that *Cercagnota* originated from an evolutionary centre separate from that of *Stiphrosoma*. Roháček & Barber (2009) speculate about its affinity to the African wingless genus *Apterosepsis* Richards, 1952. If this is true, *Cercagnota* may have been derived from an Afrotropical ancestor which invaded the Mediterranean subregion.

Santhomyza. This genus is an example of a group with restricted distribution within the Palaearctic Region. All its species occur in the Mediterranean (*S. inermis, S. bezzii*) or in the adjacent Macaronesian (*S. biseta*) subregion. The genus apparently is of Mediterranean origin (the more primitive species are restricted to that area) and subsequently penetrated to Canary Is. where *S. biseta* speciated. Because *Santhomyza* has no relative among Palaearctic genera it is presupposed that its nearest allies will be found among the (largely unknown) Afrotropical fauna of Anthomyzidae.

***Carexomyza* gen.n.** To date, no distinct relative (sister group) of this monotypic genus has been recognized (see above in the chapter Phylogeny). This fact makes it difficult to identify its biogeographical origin. Its only species, the monophagous *C. caricis*, probably has a restricted distribution in the Atlantic area of Europe. If this is really so (note: the species might also be found more eastwardly in the hitherto dipterologically neglected northern part of Siberia), *C. caricis* could represent a remnant of an old clade whose relatives are now extinct. The other possibility is that some of its relatives may survive in the northern belt of the Palaearctic and/or

Nearctic Regions. When such taxa are discovered it will be possible to analyse the biogeographical affinities of *Carexomyza* gen.n. in more depth.

Anagnota. This genus seems to be only remotely allied to *Paranthomyza* and *Typhamyza* (see chapter Phylogeny, Fig. 137); it is therefore expected that its closest relative (sister group) will be found in southernmost areas of the Palaearctic Region or even beyond this in the tropical belt of the Old World. The four known species of *Anagnota* differ distinctly in their distribution. Because *A. coccinea*, forming the sister group to the remaining three species (see Fig. 143), proved to be restricted to the Mediterranean (hitherto only known from the E. Mediterranean area), it is suggested that this subregion (serving as an important glacial refuge) may be the evolutionary centre of *Anagnota*. The common ancestor of the other three species (*A. major, A. oriens* and *A. bicolor*), which form a group of very closely allied species, probably branched off to expand northwardly into the temperate belt of the West Palaearctic area. Considering the contemporary distribution and relationships (Fig. 143) of these *Anagnota* species, *A. major* was obviously separated from this ancestor sooner and re-colonized more southern (Mediterranean and Submediterranean) areas while the remaining two species probably split later and in more eastern parts of the temperate belt. As soon as these species had been established they could expand their distribution so that their ranges became overlapping (*A. bicolor* and *A. oriens* in W. Siberia, *A. bicolor* and *A. major* in C. Europe, *A. oriens* and *A. major* in Balkan penninsula).

Paranthomyza. Although this monotypic genus was found to be (only distantly) allied to *Typhamyza* (see Fig. 137), this finding did not help to reveal its biogeographical origin or affinity. In the absence of knowledge of its true sister group, the distribution of its lone species (*P. nitida*) is the only available information to discuss this matter. *P. nitida* is a widespread and common Eurosiberian species southerly reaching northern parts of the Mediterranean subregion. It is suggested that its closest relative will eventually be found in the Nearctic Region, but this presumption has not been confirmed up to the present. Therefore *Paranthomyza*, with its single species, remains considered as a remnant of a Palaearctic clade of poorly known affinities.

Typhamyza. This genus is monotypic like *Paranthomyza*, represented by *T. bifasciata*, a species of exotic appearance having the Eurosiberian type of distribution like *Paranthomyza nitida*. Because it is mono(sapro)phagous on several species of reed-mace (*Typha*), *T. bifasciata* tracks these plants but it occurs within a markedly smaller range than that of these host plants. For example, *Typha latifolia*, the most important host plant of *T. bifasciata*, is a subcosmopolitan species also widespread in North America where *T. bifasciata* is absent. However, *Typhamyza* can have additional (hitherto unknown) species in the Old World tropical areas where *Typha* species also occur but where their dipterous fauna has never been investigated.

Amygdalops. This is an Old World tropical group which has no close relative in the Palaearctic Region. It is represented by only 4 species in the Palaearctic Region while the majority of its species are known from the Afrotropical (see Roháček 2004a) and Oriental (Roháček 2008a) Regions. One of its representatives, the Afrotropical *Amygdalops thomasseti*, clearly invaded the southwestern areas of the Palaearctic Region and became widespread in the Mediterranean and Macaronesian subregions. Its close relative, *A. rufior* from Israel, could either be its East Mediterranean derivative or it will be subsequently found also to live in the Afrotropical Region. The widespread Afrotropical species, *A. obtusus* Roháček, 2004, which has recently been recorded from the Afrotropical part of the Arabian penninsula (Deeming 2008: Yemen), may soon become another candidate of an invader into the Palaearctic Region. All three of these species are closely related (see Fig 144) and belong to a clade of Afrotropical origin.

On the other hand, the two species occurring in the E. Palaearctic (Japan) are derived from a clade of Oriental origin (see the chapter Phylogeny). *A. nigrinotum* was originally an Oriental species which has expanded (or was introduced by man's activities) into the easternmost part of the Afrotropical Region (Seychelles), northern Australia, several Oceanian islands and Japan. Its near ally, *A. femorinus* sp.n. (known only from Hahajima I. in southern Japan), possibly also originates from the Oriental Region where it simply remains unrecorded.

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Index 1

Names of Anthomyzidae

Both parts of the monograph (Part 1, see Roháček 2006a) are indexed. Because each is paginated separately they are distinguished by boldfaced numbers **1** or **2** preceding the colon. Italicised numbers in a grey rectangle indicate the principal page references (diagnoses, descriptions). Abstracts, contents, checklist (Part 2, p. 105) and bibliographies are not indexed.

Names are indexed as follows:

CAPITALS - valid family-group (and higher categories) names
ITALICISED CAPITALS - synonymous and unavailable family-group (and higher categories) names
Bold Roman - valid genus-group names
Italicised bold Roman - synonymous and unavailable genus-group names including misspellings
Roman - valid species-group names
Italics - synonymous and unavailable species-group names including misspellings

"Caught in the net" - original pen-and-ink drawing with *Anthomyza gracilis* Fallén (New Year Card 2006) by J. Roháček.

Index 2

Names of other animals, fungi and plants

Both parts of the monograph (Part 1, see Roháček 2006a) are indexed. Because each is paginated separately they are distinguished by boldfaced numbers **1** or **2** preceding the colon. Abstracts, contents and bibliographies are not indexed.

Names are indexed as follows:

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