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The Drosophilidae (Diptera)
of Fennoscandia and Denmark

by

*Gerhard Bächli, Carlos R. Vilela,
Stefan Andersson Escher
and Anssi Saura*



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Drosophila funebris (Fabricius, 1787)

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Abstract

This volume gives an account of the taxonomy of 17 genera and 128 species of Western European Drosophilidae. Keys are provided for all the European genera as well as for some 120 of the more common species. The distribution and biology of all the species is summarised. Full redescriptions and standardised, original illustrations of the male terminalia are provided for the 80 species occurring in Scandinavia, northwestern Russia, the Baltic countries and the adjacent areas of Poland, Germany, the Netherlands,

and Great Britain. For some species, original illustrations of the female terminalia are also included. The classification of the species is revised, and the terminology updated, wherever appropriate.

The aim of this book is to facilitate field work by providing identification keys and by suggesting ideas for further studies on the biology, distribution and other aspects of Scandinavian drosophilids.

Introduction

In almost every field of biological research, many species of *Drosophila* are very important laboratory animals. They are easy to culture on artificial media and develop rapidly. For almost a century, their experimental use has been of fundamental importance to mankind. In this context, the study of natural populations, including their living conditions, has become more and more important.

The great majority of European drosophilids were described by eminent zoologists, entomologists and dipterists, dating back to Linnaeus, Fabricius, Fallén, Meigen, Zetterstedt, etc. The most important older contribution is the comprehensive revision by Duda (1934–1935) in Lindner's "Die Fliegen der paläarktischen Region". Later work has been done by G. Bächli, E.B. Basden, H. Burla, J.E. Collin, R. Frey, W. Hackman, S. Lakovaara, J. Máca, M. Monclús, L. Papp, M.T. Rocha Pité, and F.H. Sobels, and also by non-European specialists such as A.H. Sturtevant, M.R. Wheeler, C.R. Vilela, etc.

A new era of taxonomic studies was inaugurated by Burla (1951) who established a modern classification and provided not only descriptions, illustrations, and data on biological aspects but also the most useful key to Central European species. Regional keys, some of

them for species of the genus *Drosophila* only, were published by Basden (1954) for Scotland, Hackman (1954) for Finland, Herting (1955) for Westphalia (Germany), Frydenberg (1956) for Denmark, Monclús (1964) for Catalonia (Spain), d'Assis-Fonseca (1965) and Shorrocks (1972) for Great Britain, Papp (1973) for Hungary, Máca (1982) for the Czech and Slovak Republics, Bächli & Burla (1985) for Switzerland, and Gornostayev (2001) for European Russia. As there is still no comprehensive key available, we decided to include almost every species recorded from Europe in the present work, as suggested by the "Fauna Europaea" project [<http://www.faunaeuro.org/>].

Detailed descriptions or redescriptions have been published for most of the species recorded from Europe. However, some of them do not employ a modern, comprehensive terminology and, in particular, many illustrations of the terminalia are not detailed enough and are therefore of little use. We therefore decided to provide standardised illustrations of the male terminalia, and, whenever possible, also of the female terminalia, of all the Northern European species, as these species-specific morphological features are currently mandatory for the identification of almost all species.

The keen interest in species of *Drosophila* is also reflected in the dozen volumes of the series entitled “The Genetics and Biology of *Drosophila*” by Ashburner and his co-workers (Ashburner & Novitsky, 1976a, b, c; Ashburner & Wright, 1978a, b, c, 1980; Ashburner et al., 1981, 1982, 1983a, b, 1986). A comprehensive overview of general aspects, including taxonomy and distribution, is available in Ashburner’s “*Drosophila. A Laboratory Handbook*” (1989); a new updated edition is being prepared. Comprehensive information is currently available (2004) at the following internet sites: <http://flybase.bio.indiana.edu/>, focusing on genetics and molecular biology, and <http://taxodros.unizh.ch>, concentrating on taxonomy and distribution. Additional sites are expected.

Compared to the roughly 3800 drosophilid species known worldwide, the number of European species may appear to be rather insignificant, even though they have been relatively well studied. But in terms of certain biological aspects, the European fauna must still be considered poorly known, leaving a wide field open for further studies.

The aim of this book is to facilitate field work by providing keys for the identification of about 120 European species, as well as detailed redescriptions, including original male terminalia illustrations, of the 80 Northern European species recorded in Fennoscandia (Norway, Sweden, and Finland), Denmark, north-western Russia, and the Baltic states. In addition, data on their biology, distribution and other aspects may give ideas for further studies.

Acknowledgements

To Dr. R. Danielsson, Lund, Dr. A. Dübendorfer, Zürich, Dr. A. Fjellberg, Tromsö, Dr. L. Greve Jensen, Bergen, Dr. A. Hoikkala, Oulu, Dr. A. Karpa, Salaspils (Latvia), Dr. S. Lakovaara, Oulu, Dr. P. Lankinen, Oulu, Dr. J. Lumme, Oulu, Dr. J. Máca, České Budějovice, Dr. R. Meier, Copenhagen, Dr. B. Merz, Genève, Dr. E. Nartshuk, St. Petersburg, Dr. S. Pakalniškis, Vilnius, Dr. J. E. Raastad, Oslo, Dr. L. Serra, Barcelona, Dr. L. Tsacas, Paris, Dr. B. Viklund, Stockholm, and Dr. P. Vilkamaa, Helsinki, for

the loan of material, for useful information, for comments on earlier versions, and for testing certain keys.

To P. Brauchli, K. Hutter, and J. Stauffer, Zoologisches Museum, Zürich, for help with digital image processing.

The English text was revised by Elsa Obrecht, Bern.

To all these persons we offer our grateful thanks.

Material and methods

Collecting the flies. – The standard collecting method for species of *Drosophila* is baiting with alcoholic liquids, spoiled fruit, or any other fermenting material (Carson & Heed, 1983; Ashburner, 1989). It is well known, however, that samples collected on bait are biased, because baiting is selective, and, under certain climatic conditions, inefficient. Thus, depending on the purpose of collecting, and/or local circumstances, alternative methods have been suggested, especially for collecting other drosophilids, e.g. net sweeping in bushy and grassy areas, Malaise traps, canopy traps, etc. In addition, eggs, larvae and pupae can be collected directly from the breeding substrate, where this is known.

Keeping the flies alive. – Many species, particularly of *Drosophila*, can be kept in cultures; various kinds of culture media have been used (Ashburner & Thompson, 1978; Yoon, 1985a, b; Ashburner, 1989). The standard medium is commercially available or can be prepared with ingredients available everywhere: agar, crushed maize, baker's yeast, sugar. Certain species need malt or other adapted media, or even some special manipulation, to be cultured successfully (Yoon, 1985a, b, Ashburner, 1989). Flies can usually be kept alive for a few days even if it is impossible to establish a continuous culture.

Killing the flies. – Live specimens can be killed with sulphuric ether fumes or by deep-freezing under controlled conditions.

Preserving the flies. – Depending on the purpose for which they are collected, dead flies can be preserved in three different ways:

- In a deep-freezer. Flies must be placed inside a microcentrifuge tube or medicine capsule, and frozen shortly after being killed. Such specimens can be used later for various purposes, particularly for molecular biological (PCR) studies.
- In ethanol. There is an old tradition of storing specimens in 70% ethanol. However, in agreement with Shorrocks (1972:106), we suggest the addition of 5% of glycerine to retain a certain

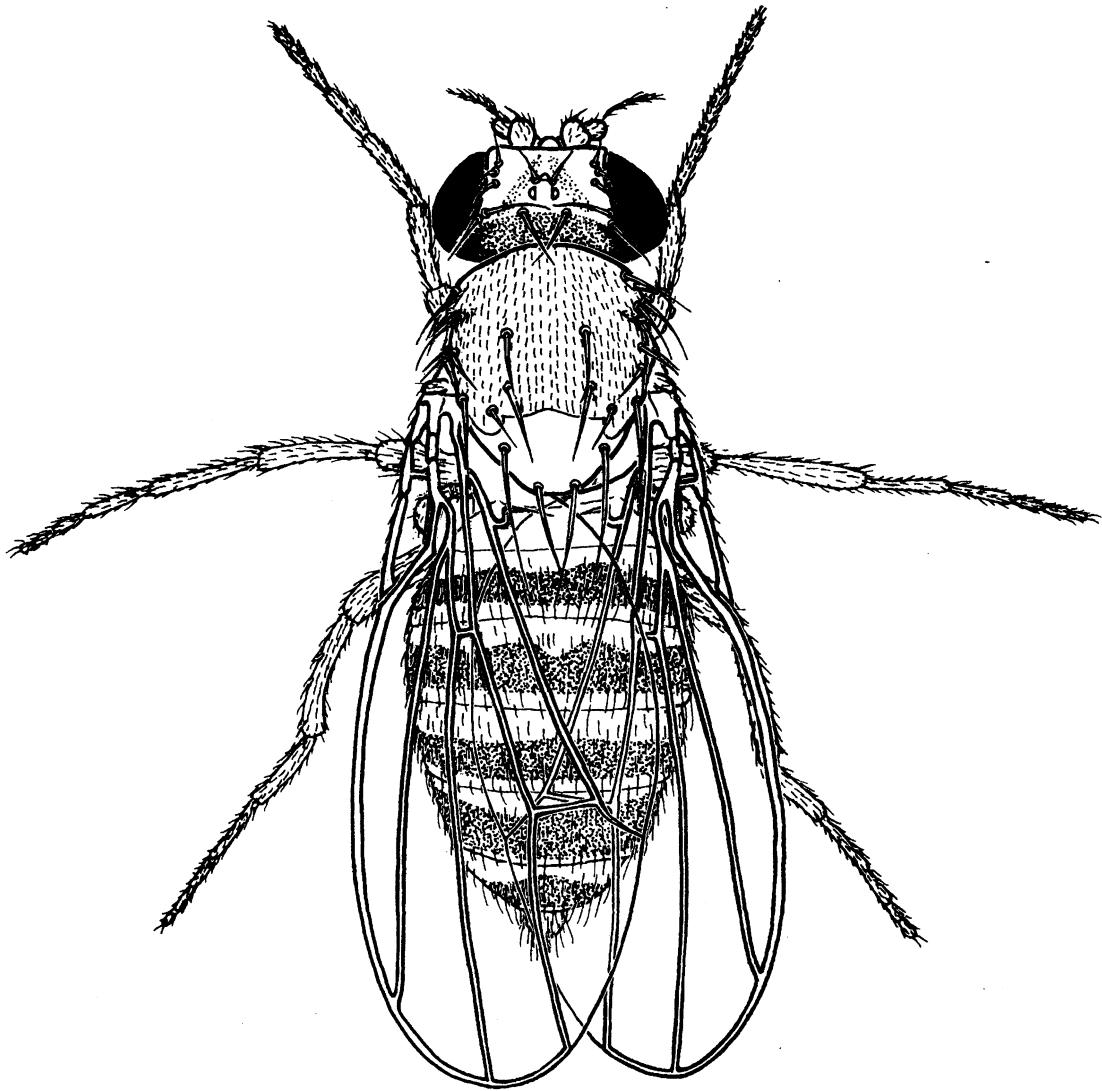
flexibility in the stored specimens and to stop them from drying out. In general, such specimens can still be used for PCR studies.

– On pins. Newly killed flies are either glued to the tip of cardboard triangles, e.g. by using colourless nail varnish, or are micropinned before drying with non-rusting minutem pins, preferably in a lateral position through the membranous pleural cleft below the wing base (Fig. 8), so that the minutem pin cannot damage any important dorsal characters. For flies collected into ethanol, the best drying results are achieved with a Critical Point Dryer; other methods are freeze-drying or treatment with liquids. Two alternatives of the latter method can be recommended. Both consist in transferring the fly from 70% ethanol (with or without glycerine), through a series of three chemicals: a) 100% ethanol, cellosolve acetate (ethylene glycol diacetate), xylene; or b) 100% ethanol, tertiary butanol, hexane. In both cases, each of the three treatments should be applied for at least 2 hours, depending on the size of the flies. In both cases, the flies must be pinned with minutem pins before the treatment, to avoid damaging the specimens when dry; or, alternatively, they can be glued to cardboard tips soon after drying. After the last treatment with xylene or hexane, the flies must be placed on filter paper or a Kleenex tissue to remove excess liquid, and must then be checked for their appearance. Legs, wings, etc. can still be arranged in the desired position, with the aid of an insect pin, before the articulations are completely dry. Warning: some of the chemicals might be carcinogenic or otherwise harmful.

It is important to store the specimens in the dark, as most colour pigments can be destroyed by light.

Preparing the male terminalia. – For preparations of the male terminalia, we have used and recommend the following method, slightly modified from Wheeler & Kambsellis (1966) and Kaneshiro (1969):

1. Soften the pinned flies by placing them in a humid chamber at room temperature (ca. 24°C), for ca. 6 hours if naturally dried, or 24 hours if chemically dried. Longer wetting may cause the wings to stick to each other or to the body. Before relaxing a specimen, it is important to take note of some surface features (brightness, ornamentation, etc.) which may change during the process. In addition, labels fixed to the pins should be temporarily removed and substituted by coded numbers, to avoid a possible smudging of the text. We recommend that flies stored in ethanol be pinned and dried before preparation.
 2. Clip the distal 2/3 of the abdomen with a pair of microscissors, then pick it up with the slightly wet tip of a piece of soft paper and place it in a small glass tube (ca. 1.5 ml) with 10% KOH [to maintain transparency always store KOH solution in a plastic vial, never in a glass container]. For specimens of *Stegana* the entire abdomen must be removed, because their terminalia, especially the aedeagal apodeme, are sometimes only slightly shorter than the whole abdomen. Before being returned to the collection, the pinned specimen must be air-dried.
 3. Place the tube in a bath of boiling water for ca. 30 min. Do not overheat the KOH solution over a direct flame.
 4. Carefully wash out the KOH completely by pouring the contents of the tube into a funnel lined with filter paper and then squirting distilled water ad libitum over the abdomen.
 5. After washing the tube with distilled water, add a small amount (ca. 0.5 ml) of stain (four parts of Gage's Stain with one part of glacial acetic acid), put the abdomen back into the tube, and keep it in a bath of boiling water for ca. 30 min. For Gage's Stain mix 0.5 g of acid fuchsin, 25 ml of 10% HCl and 300 ml of distilled water. Use very soft aluminium tweezers to pick the abdomen out of the liquids, and never let it dry out or stick to the filter paper lining the funnel.
 6. Wash the abdomen with 95% ethanol as in item 4.
 7. Transfer the abdomen to a cavity slide containing a minute drop of creosote (obtained by just touching the cavity with the tip of a pipette filled with creosote).
 8. Disarticulate first the tergites and sternites from the terminalia. After carefully locating the membranous articulation points, separate the epandrium from the hypandrium, and finally the aedeagus from the hypandrium, if necessary. For the disarticulation of the structures and the removing of membranous tissues, use a pair of micro dissecting needles consisting of minutens pins inserted into a shortened wooden chopstick or matchstick.
 9. Overstaining that is discovered when the abdomen is in creosote can be reversed by returning it to ethanol, then distilled water and back to 10% KOH, and then restarting the staining procedure.
 10. For preparing ink drawings or for photographs, the sclerites are individually mounted on glass slides using natural Canada balsam as the medium. Before adding the coverglass, place four small pieces of broken coverglass around the small drop of balsam. For thicker objects, e.g. the epandrium of most species, use two strips of cardboard (ca. 5 mm × 20 mm) instead; two index cards gummed together are about the right thickness. Allow some days for the balsam to get a little denser. Gently push the coverglass to move the structure into the desired position. Afterwards, use xylene to soften the Canada balsam and to remove the objects from the slides; transfer them first to creosote for some minutes, or even some hours, then to 95% ethanol for some minutes, then pour a drop of glycerine over the sclerites, and finally transfer them to pure glycerine.
 11. Put the sclerites in a microvial filled with pure glycerine and attach it by the stopper to the pin of the specimen from which the abdomen originated.
- At least steps 1 to 7 should be carried out for identification; however, step 5 may be skipped for non-teneral, dark specimens. Anaesthetized flies can often be identified without dissection, by using the method proposed by Spassky (1957). Gentle pressure on the subdistal area of the abdomen [insect laterally positioned, left side up], with the aid of a pair of insect pins, causes the aedeagus and associated structures to evert, and then the species can be identified.



Identifying the flies. – Keys are provided for all the genera and most of the species occurring in the Western Palaearctic region. The characters used for genera are restricted to those of the species included, and do not cover all species on a worldwide basis. In the couplets, some helpful additional characters are given in parentheses, whenever appropriate. The accompanying illustrations have been redrawn from various sources and are simplified to emphasize the most important characters.

It is virtually impossible to prepare a key covering the full individual variability of the flies as well as the differences between live and dried

specimens, or specimens kept in ethanol. In particular, colour characters are likely to change with age, mode of preservation, etc. The keys cover only a part of this variability. This means that any identification is provisional and should be checked against the detailed descriptions and illustrations provided.

Taxonomic layout. – For each species treated in detail, the following information is given: diagnosis, redescription of male and female (if appropriate), general distribution, biology, comments, and standardised original illustrations of the male, and sometimes the female, terminalia.

As a great deal of information is available on the internet (see above), the facts given are summarised.

Measurements and counts were taken on a stereomicroscope with an ocular micrometer. The length of a character is determined by a straight line between its end points, when both are in focus (without considering the real outline of the object). In general, averages of 5 males and 5 females analysed per species are given (ranges in parentheses).

All the illustrations of terminalia included in the present work are originals (by C.R. Vilela) and are usually arranged in standardised plates, as follows: ♂♂, one plate per species, external and internal terminalia in left lateral and posterior views; ♀♀, several species in one plate, left oviscapte valve in external lateral view. All illustrations in a given plate were drawn to the same scale, unless more than one scale bar is present.

Specimens examined. – This study is based on a set of 10 specimens (5 ♂♂, 5 ♀♀) per species, whenever available. They were used for preparing the redescriptions, and from them 1 ♂, and sometimes 1 ♀, was selected, dissected, and used for the terminalia illustrations. We added an identification label to every specimen analyzed, ending with the statement “Bächli & Vilela det. 2004”. The data associated with the dissected specimen, and recorded on their labels, are cited in full in Table 1; one additional label stating “terminalia illustrated by Bächli et al. 2004” was added to all of them. Data associated with the remaining specimens are simplified under the

heading “additional specimens examined” under each binomial, and, unless the depository acronyms listed below are cited in brackets, they are deposited in the Zoologisches Museum der Universität Zürich.

The specimens analysed belong to the following collections:

MHNG	Muséum d'Histoire naturelle, Genève, Switzerland
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden
ZMUB	Zoologisk Institut, Bergen, Norway
ZMUH	Eläinmuseo, Helsingin Yliopisto, Helsinki, Finland
ZMUL	Zoologiska museet, Lunds Universitet, Lund, Sweden
ZMUO	Zoologisk museum, Universitetet i Oslo, Oslo, Norway
ZMSP	Zoological Institute, Russian Academy of Science, St. Petersburg, Russia
ZMTH	The Museum, Trondheim, Norway
ZMTS	Tromsö Museum, Tromsö, Norway
ZMUC	Zoological Museum, University of Copenhagen, Copenhagen, Denmark
ZMUZ	Zoologisches Museum, Universität Zürich, Zürich, Switzerland

Additional specimens have kindly been made available by A. Karpa, Seppo Lakovaara, Saulius Pakalniškis, and Bernhard Merz.

General part

Morphology

The morphological terms are based mainly on the “Contributions to a Manual of Palaearctic Diptera” (Merz & Haenni, 2000), with some additions (e.g. terminalia) and qualifications (see also Wheeler, 1968, 1981a, 1987; McAlpine, 1981; Grimaldi, 1987b, 1990; Ashburner, 1989; McEvey, 1990; Vilela & Bächli, 1990). In a few cases, we follow the traditional terms applied by *Drosophila* geneticists. Frequently used synonyms are added in parentheses. The signal plus (+) links two supposedly fused sclerites.

Adult. – Head: The frons (Fig. 1) is delimited by the eyes, the vertex, and the ptilinal suture. The main parts are frontal vittae, orbital plates and ocellar triangle. The frontal vittae form the main part of the frons; they bear microscopic longitudinal structures and scattered or dense interfrontal setulae. The orbital plates extend from the vertex along the eye margin, usually without reaching the ptilinal suture. The lower end is turned slightly inwards, away from the eye. One proclinate and two reclinate orbital setae are present, as well as a few setulae. The proclinate seta is usually foremost, followed by the anterior reclinate one, but the relative position of these two setae differs in certain species. The proclinate orbital seta is usually more distant from (never closer to) the eye margin than either of the reclinate ones. The ocellar triangle, an almost triangular area between the frontal vittae, is often restricted to the ocellar tubercle which bears the three more or less equidistant ocelli. The two ocellar setae are usually large, but in *Acletoxenus* species they are absent; some additional minor interocellar setae may be present. Behind the ocellar triangle, there are two postocellar (postvertical) setae which are never divergent and rarely minute. Two large vertical setae arise from the vertex in the corner near each eye, followed by a row of smaller postocular setulae along the posterior eye margin.

The face (Fig. 2) is the area extending from the ptilinal suture to the clypeus border, bear-

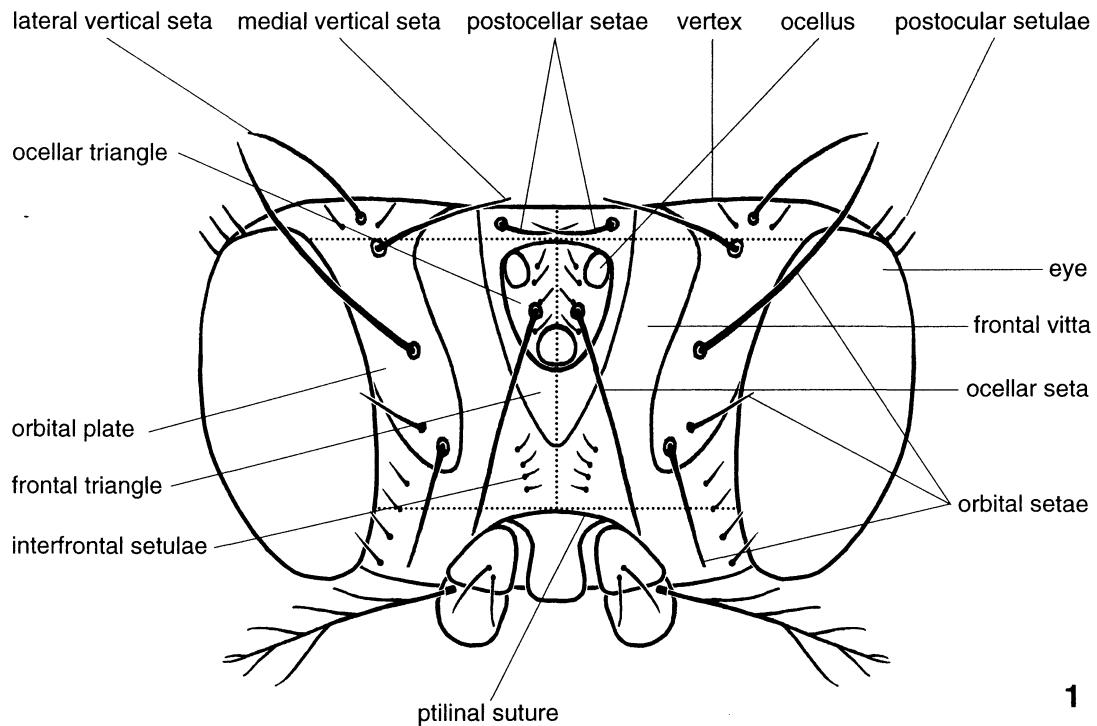
ing the antennae and laterally bordered by the narrow parafacialia. In some species the face is medially flat, but usually it is prominent to some degree, resulting in a nose-like carina. The lower lateral edge of the face has one long vibrissa, with a row of genal (subvibrissal) setae extending backwards from it; the first seta may be as long as the vibrissa. The antenna (Fig. 3) has discrete parts: the small, only partly visible scape, the pedicel, and the flagellum, i.e. flagellomere 1, plus the arista. The pedicel has two larger and some smaller setae. Flagellomere 1, the largest of the antennal parts, is longer than wide, up to three times as long as wide in a few species, and covered with setulae which in certain species are very long, particularly along the margin. The arista is usually plumose with long branches both dorsally and ventrally, some short inner branches medially, and a terminal fork; in a few species it is microtrichose or has some other variation.

The eye (compound eye) is roundish-oblong (Fig. 4); its main axis is, with few exceptions, nearly vertical. It usually has short pile (rarely bare). The gena lies ventrally to the eye margin and is often narrow, with a single row of genal (subvibrissal) setae, but in some species it is distinctly broadened and/or there is an additional row of fine genal setae. Some setae are scattered on its posterior part, the postgena. The occiput (Figs 4, 6) bears one row of postocular setulae adjacent to the eye margin and small supracervical setulae arranged in groups above the occipital foramen.

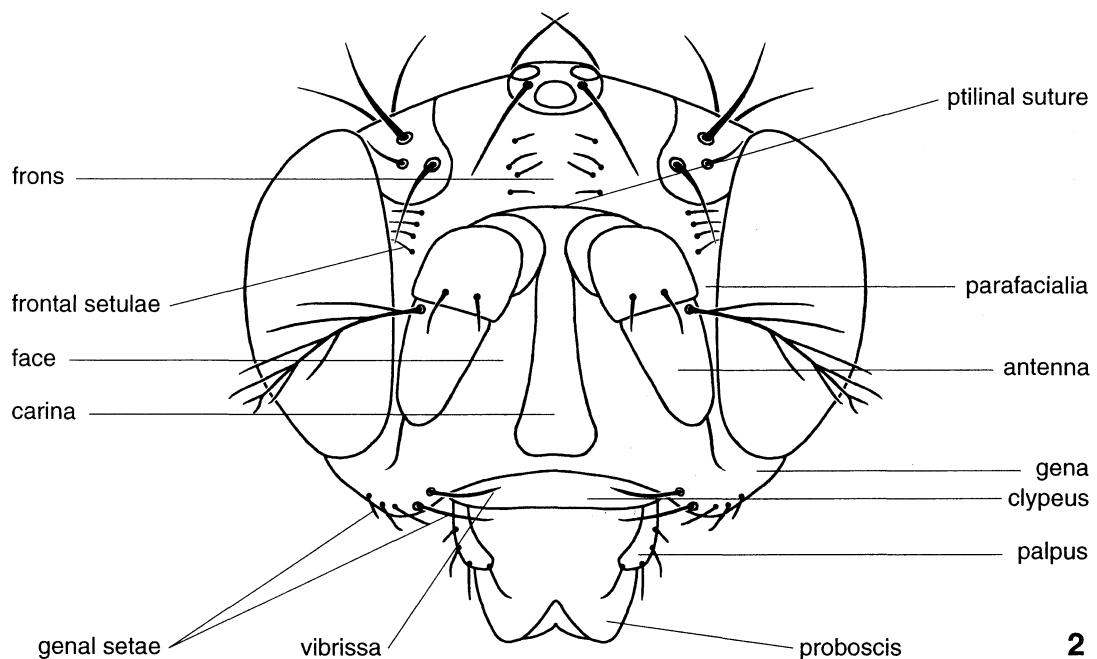
The proboscis (Fig. 5) has several distinguishable parts; the labrum, the labellum and, most importantly, the palpi (maxillary palpi), which vary in shape and setal arrangement. The clypeus is usually visible below the face.

Abbreviations: or1, or2, or3 = proclinate, anterior reclinate, and posterior reclinate orbital seta; vtm = medial vertical seta; vtl = lateral vertical seta; vi = vibrissa.

Measurements: Frontal length as well as upper and lower width are measured as indicated by the dotted lines (vertically and horizontally re-

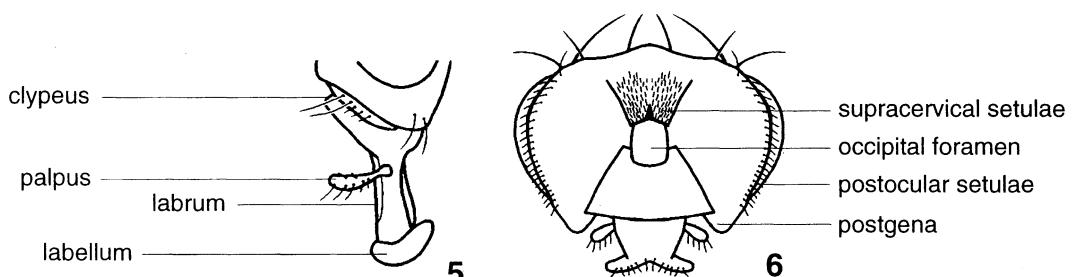
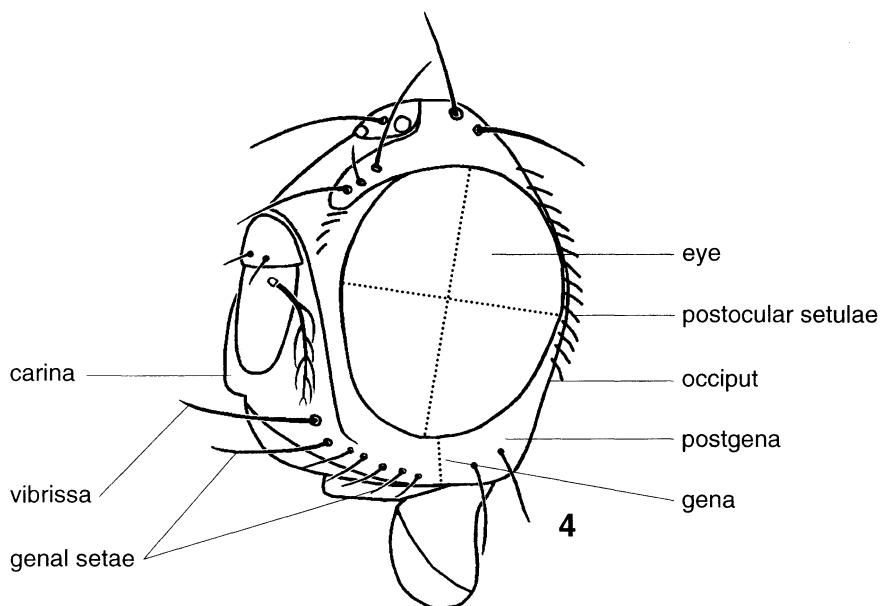
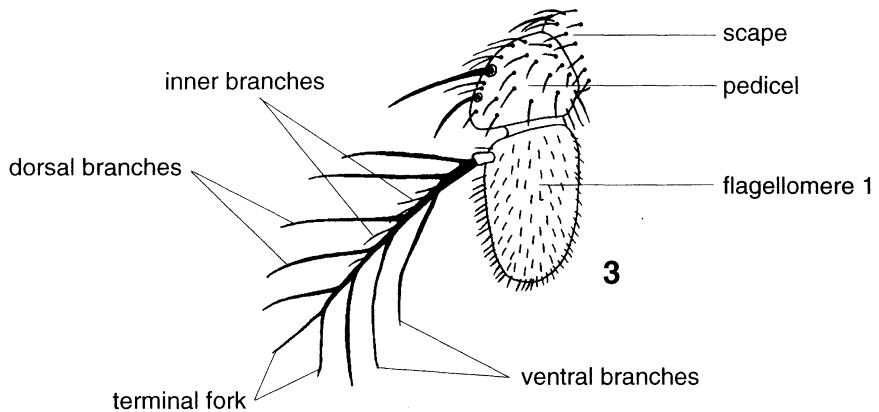


1



2

Figs. 1-2. *Drosophila funebris* (Fabricius). 1: head, dorsal view. 2: head, frontal view. Measuring lines are dotted.



Figs. 3-6. *Drosophila funebris* (Fabricius). 3: antenna, frontal view. 4: head, left lateral view. 5: proboscis, left lateral view. 6: occiput (posterior surface of head, postcranium). Measuring lines are dotted.

spectively) in Fig. 1; eye length and width (vertically and horizontally respectively) as shown in Fig. 4; cheek (gena) width at lowest eye margin as shown in Fig. 4.

Indices: frontal index = frontal length / frontal width just above ptilinal suture; frontal tapering ratio = frontal width between upper eye corners / frontal width just above ptilinal suture; vt index = vtm / vtl length ratio; vibrissal index = first genal seta / vi; cheek index = eye length / cheek width; eye index = eye length / eye width at right angle to length.

Thorax: The scutum and scutellum occupy practically the whole dorsal surface of the mesonotum (Fig. 7). In addition to colour features, a series of important setae are present, differing in size and position. The scutum usually bears two pairs of postsutural dorsocentral setae, rarely one or more than two pairs; one pair of small presutural dorsocentral setae occur in a few species; the acrostichal setulae are usually arranged in discrete rows, longitudinal to the length of the thorax; the rows are counted between the two anterior dorsocentral setae (in a few species there are two rows but usually four, six, or eight rows are present); in some genera, numerous and irregular rows are present; prescutellar acrostichal setulae are well-developed in some species; among several smaller setae laterally on the scutum, there are one or two larger postpronotal (humeral) setae. On the scutellum, one basal and one apical scutellar seta are present.

The pleura (Fig. 8) are mainly composed of anepisternum, anepimeron, and katepisternum, and have characteristic colours and some important setae. The largest setae are the two or three usually strong katepisternal setae. A vertical row of shorter katepisternal setae is arranged below the median katepisternal seta. One or two small proepipisternal (propleural) setae are present in certain species; the anepisternum (mesopleuron) and anepimeron are always bare. The colour pattern of the haltere knob and stalk may be important, ranging from whitish to almost black.

Abbreviations: h = postpronotal (humeral) seta; dc = dorsocentral seta; scut = scutellar seta; stpl = katepisternal (sternopleural) seta.

Indices: h index = upper / lower postpronotal seta; dc index = anterior / posterior dc; scut index = basal / apical scut; sterno index = anterior / posterior stpl.

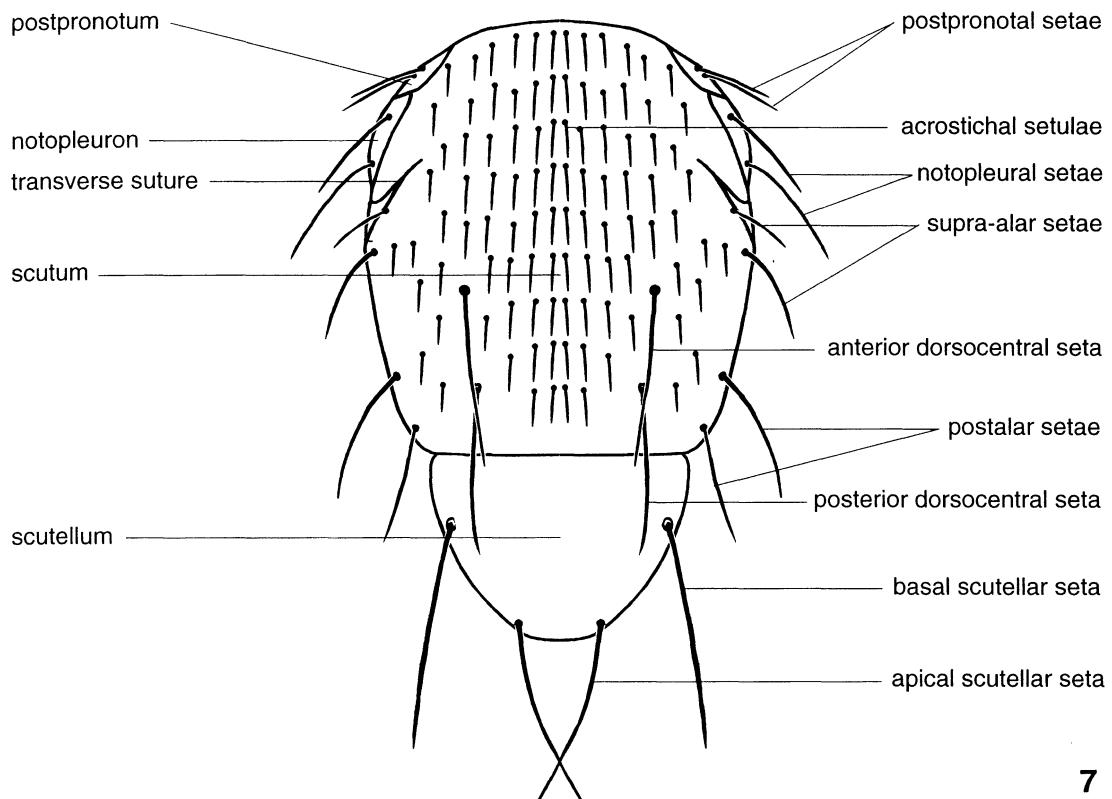
The legs (Figs 9-11) are moderately long and slender, with colour characters and some important setae mainly on femora, tibiae, and tarsi, such as combs of dark, long, peg-like setae, or rows of dark, short, and sharp peg-like setae (spines or cuneiform setae). The prefixes pro-, meso-, and meta- are added to the segmental terms of front leg, middle leg and hind leg respectively (e.g. procoxa, mesofemur, metatibia). All tibiae have one dorsal preapical seta (missing in some species and variable in size), and the mesotibia in addition with one strong apical seta. The wing (Fig. 12) is hyaline or, in a minority of species, has darker areas (shadows). The costal vein has humeral and subcostal breaks and, in some species, a large costal lappet; the subcosta is apically vestigial (beyond the humeral crossvein H), but is fused with vein R₁ in *Stegana*; the main crossveins R-M and dM-Cu are always present; the anal vein is present but usually rather short; in a few genera the bm and dm cells are separated by the crossvein bM-Cu. Traditionally, several vein sections are recognised. The fringe of stronger costal setulae ("heavy bristles") ends in the costal section C-III.

Abbreviations: Sc = subcosta; C = costa; R₁, R₂₊₃, R₄₊₅ = radial veins; M = media; CuA = cubital-anal vein; A₁ = anal vein; bm, dm = (basal and discal) medial cells; similarly, other closed cells take the abbreviation of their preceding longitudinal veins but in lower case; hb = fringe of "heavy bristles"; H, R-M, dM-Cu, bM-Cu = crossveins; I, II, III, IV = vein sections.

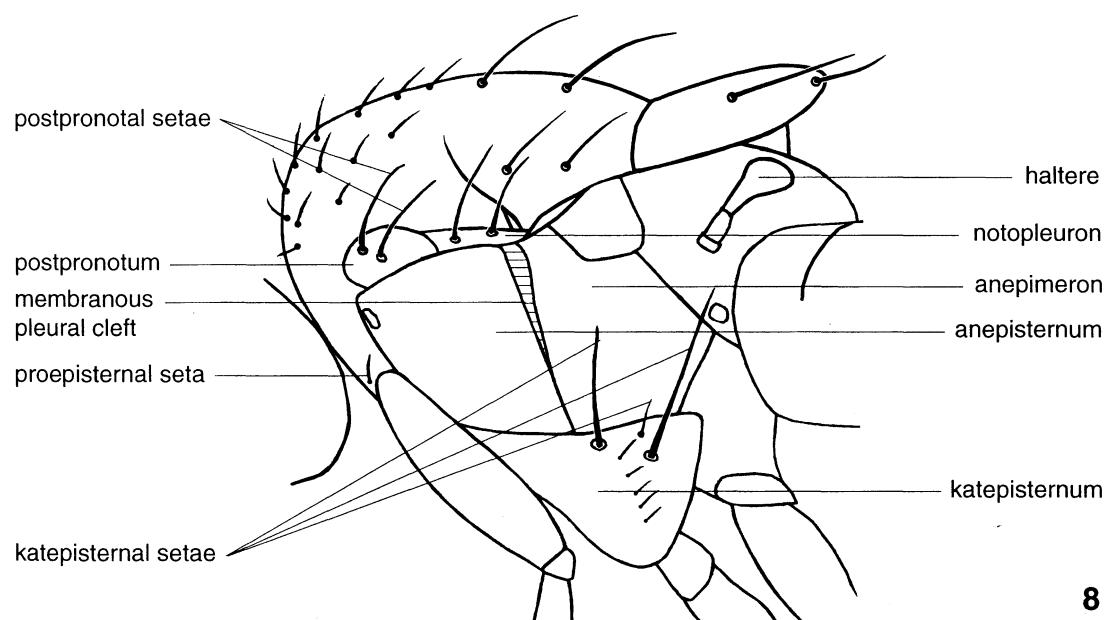
Measurements: Wing length, between basal M bifurcation and wing tip; wing width, maximum width, usually between crossveins R-M and dM-Cu.

Indices: wing index = wing length / width; C-index = C-II / C-III; ac-index = C-III / C-IV; hb-index = C-III with "heavy bristles" / total C-III; 4C-index = C-III / M-III; 4v-index = M-IV / M-III; 5x-index = CuA (apical section) / dM-Cu; M-Index = CuA (apical section) / M-III; prox. x = basal R₄₊₅ / M-III

Abdomen. The abdomen (Figs 13, 14) is composed of 6-7 visible tergites and the corresponding sternites, connected by the pleural membrane; six spiracles are usually present in males, seven in females (Fig. 14). The abdominal pattern is one of the most useful specific character, apart from the terminalia structures.

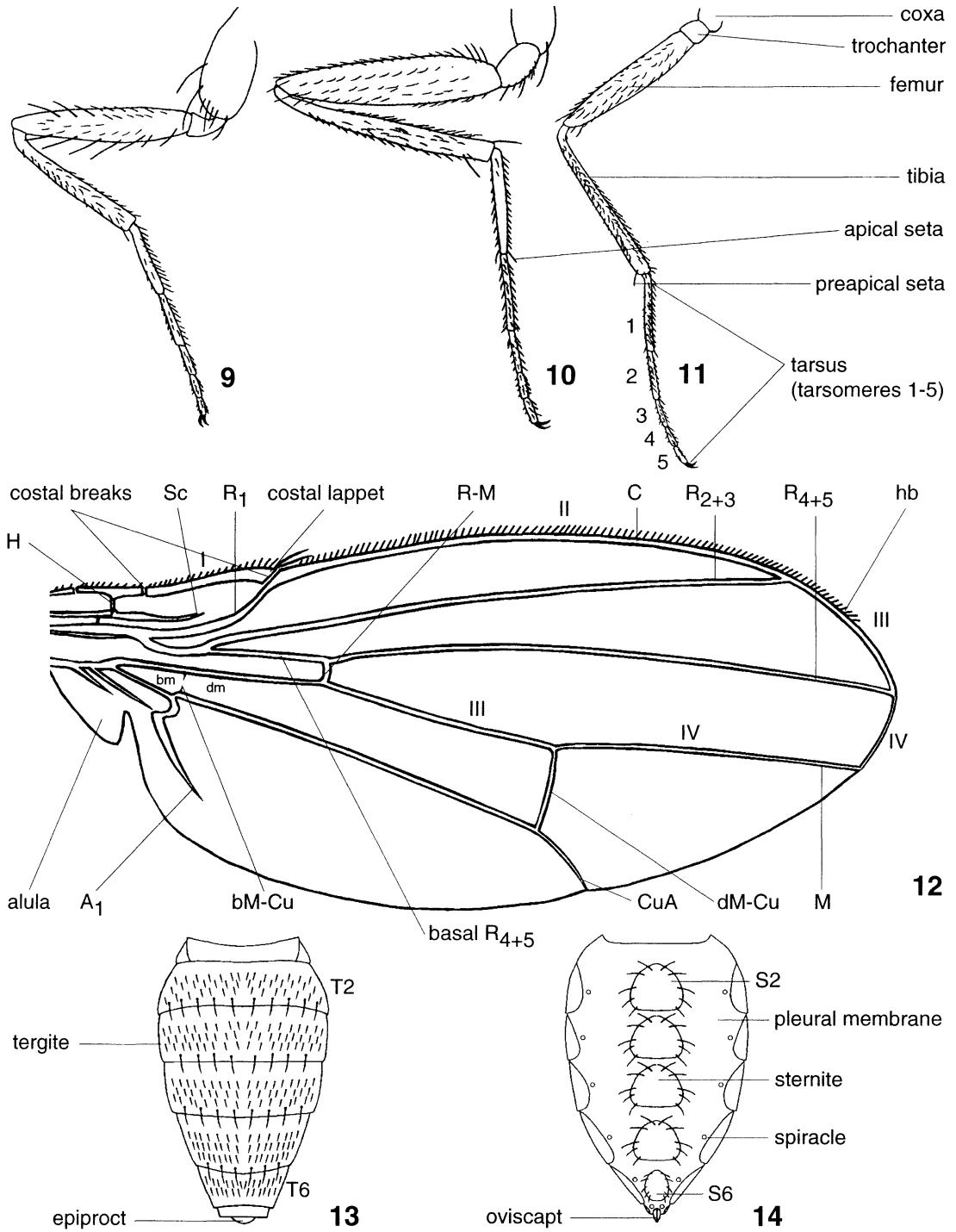


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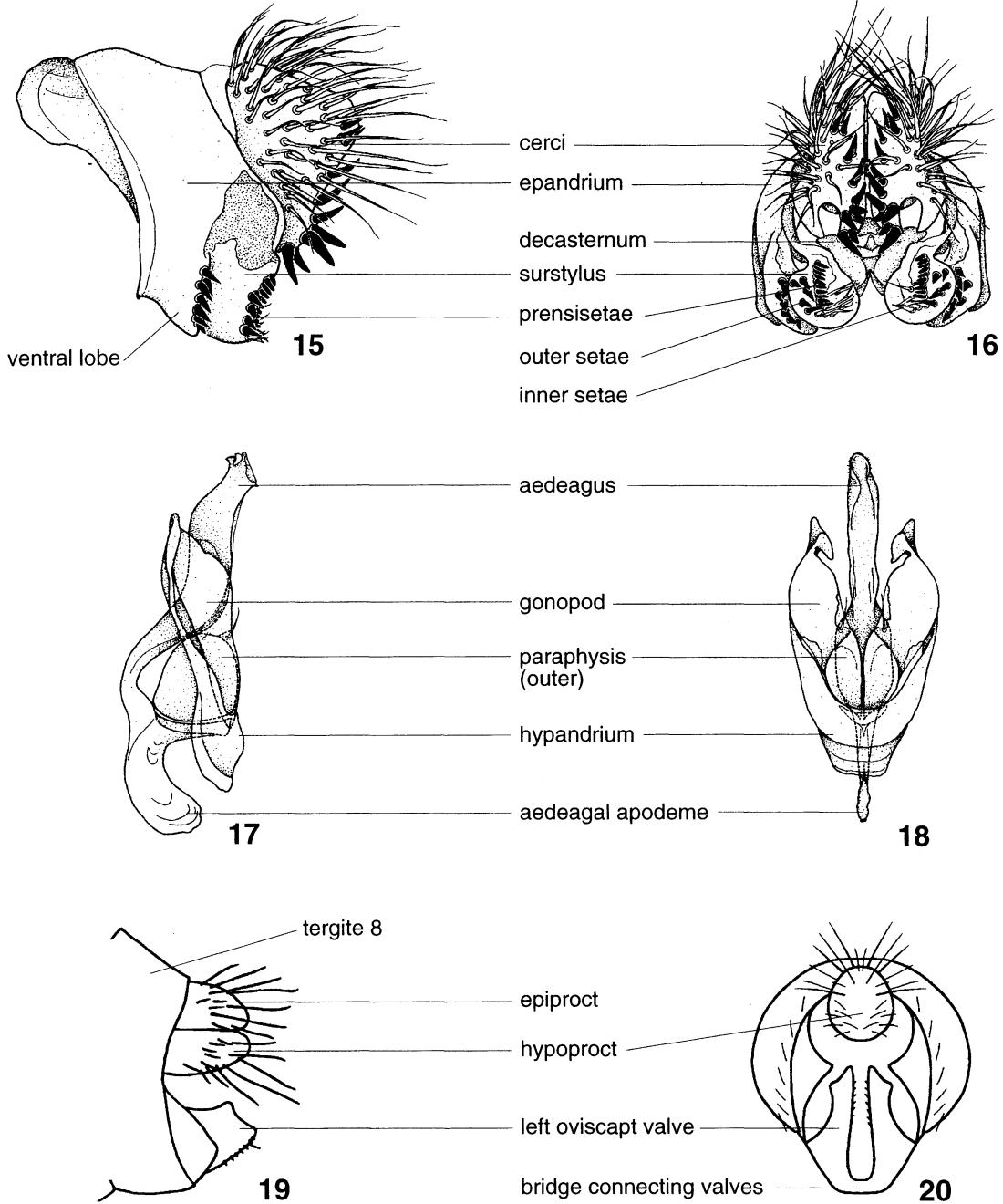


8

Figs. 7-8. *Drosophila funebris* (Fabricius). 7: mesonotum, dorsal view. 8: thorax, left lateral view.



Figs. 9-14. *Drosophila funebris* (Fabricius). 9-11: fore leg, mid leg, hind leg, posterior views. 12: wing, I-IV, sections of costal and medial veins; for abbreviations, see text. 13: female abdomen, dorsal view. 14: female abdomen, ventral view. Abbreviations: T2, T6, tergites 2 and 6; S2, S6, sternites 2 and 6.



Figs. 15-20. Male and female terminalia of *Drosophila funebris* (Fabricius). 15-16: external male terminalia, left lateral and posterior views. 17-18: internal male terminalia, left lateral and posterior views. 19-20: female terminalia, left lateral and posterior views.

Male terminalia (Figs 15–18) are usually bilaterally symmetric, highly complex and differentiated; they were described in detail e.g. by Hsu (1949), Wheeler & Takada (1966), Wheeler (1968, 1987), McAlpine (1968) and more recently by Grimaldi (1986, 1987a, b, 1990), who corrected most of the misinterpretations of earlier authors. Usually, external and internal terminalia are distinguished. In general, the (male) terminalia are species-specific, differing in number, shape and size of their sclerites (elements, components). Several attempts have been made to homologise the sclerites present in the male terminalia of species belonging to different genera of Drosophilidae. Given the absence of data regarding the fate of individual cells, or groups of cells, of the male genital imaginal disc during metamorphosis, only some indirect evidence has been used, such as their relative position, their articulation points, and the route taken by the ejaculatory duct among them (e.g. Okada, 1968a; Grimaldi, 1990; Tsacas & Chassagnard, 1991). For this reason, the terms used in the descriptions (according to our current interpretation) which are additional to the features mentioned below are shown in illustrations for at least one species per genus. It should be stated that we consider the following sclerites as external male terminalia: epandrium, cerci, surstyli and decasternum. We regard the following sclerites as internal male terminalia: hypandrium, gonopods, aedeagus, aedeagal apodeme and paraphyses.

External terminalia (Figs 15, 16): epandrium narrow or broad, usually with upper setae (above the connection surstylus-epandrium) and lower setae (below the connection surstylus-epandrium), in some species with ventral epandrial lobes which may be adpressed or pendulous, entire or bifurcate into outer and inner branches, or dorsal and ventral branches, with or without trichoid-like or peg-like setae; paired setose cerci (anal plates) which may be lobate, elongate or conical, often with a tuft of finer or stronger setae or even spines over the ventral part; surstylum usually double walled, placed posteroventrally to the epandrium, sometimes subdivided into lateral (primary) and medial (secondary) lobes, usually with outer setae (on outer wall), inner setae (on inner wall), as well as prensisetae (teeth) on the mesal surface which are arranged in a diagnostic row, differing in number, size, and shape; decasternum (sterneite 10),

which connects surstyli anteriorly, usually reduced and simple, but sometimes with huge and complex lobes or processes which may be linked by membranous tissue to the distal margin of inner paraphyses.

Internal terminalia (Figs 17, 18): hypandrium, narrow to broad, mostly with highly differentiated anterior, posterior, and lateral margins, and with more or less distinct connecting processes; one pair of simple, bilobed or occasionally reduced gonopods, mostly fused dorsomedially, forming a dorsal arch (bridge), with a characteristic ventral surface and often with pointed projections; 1 or 2 pairs of paraphyses (parameres) flanking the aedeagus: outer paraphysis (anterior paramere) usually with a stout apical seta and several finer medial setulae, inner paraphysis (posterior paramere) bare and adjacent to aedeagus, with which it is probably fused in many species, e.g. in those of the subgenus *Drosophila*; aedeagus usually present, sclerotised, short and simple to elongate and very complex, in which case it can be highly differentiated in size, structure, shape and vestiture, enveloping a membranous endophallus which ends in a single gonopore; aedeagal apodeme posteriorly fused or linked by membranous tissue to aedeagus, usually elongate, laterally or dorsomedially flattened, mostly with a ventral rod, which can be short and rigid or very long and flexible, sometimes distally linked by membranous tissue to posterior margin of hypandrium, with which it may, in a few cases, also be fused. It should be noted that the structure we are calling the “dorsal arch of hypandrium” could have two different origins. According to our interpretation, in species belonging to some Steganinae genera it probably originated from, and is part of, the decasternum, whereas in species belonging to some Drosophilinae genera it originated from the basal arm (gonocoxite) of the primitively two-segmented gonopod. Additional details will be given where appropriate.

Female terminalia (Figs 19, 20) with tergite 7 free of sternite 7; in some primitive genera a pair of slender, lateral cerci is present posterior to the epiproct and hypoproct, but in most genera the cerci are lost, and epiproct and hypoproct (dorsal and ventral “anal plates”) are retained as apical structures; perineal plates (subanal plates, homology uncertain) are sometimes present between oviscapt and hypoproct; sternite 8 is usu-

ally modified into a prominent pair of oviscapt valves, which are partially double walled ventrally and/or distally in some species, apically characteristic in shape, basally connected by a sclerotised bridge and with outer (marginal and discal) and inner ovisensilla, which vary characteristically in number, arrangement and size; an eversible membranous ovioprovector (through which the eggs pass) lies between oviscapt valves which are covered with more or less numerous scales or denticles. For certain species, additional details will be given in the descriptions.

Anatomy: Drosophilids have the same internal features as most Diptera. Only a few parts have been used for systematic purposes, namely parts of the digestive system and the internal reproductive organs.

The Malpighian tubules, excretory organs which are connected to the intestine between midgut and hindgut, consist of two anterior and two posterior pairs; their length, and whether the pairs are apically fused or not, are defining characters for certain species groups in *Drosophila*. The four rectal papillae, introverts of the rectum, can also be diagnostically useful.

Male internal reproductive organs (Figs 21, 23): The testes are paired organs which differ greatly from species to species. In some groups the testes are thick and compact, whereas in others they are thin and highly coiled. They are usually pale, but in some species are reddish-yellow in colour and are clearly visible through the body wall in mature live males. Additional elements are the vas deferens, the paragonia (male accessory gland), the ejaculatory duct and the ejaculatory bulb, containing the strongly sclerotised ejaculatory apodeme (Fig. 23) which varies considerably in size and shape among some species.

Female internal reproductive organs (Figs 22, 24): The ovaria comprise a bunch of ovarioles that are variable in number. Other features are the fused oviduct, the parovaria (female accessory glands), the long, thin, highly coiled ventral (seminal) receptacle, the vagina, and two spermathecae, the core of which are the usually sclerotised inner capsules (Fig. 24) that vary in size, shape and surface texture; additionally, basal and/or apical introverts may be present within the inner capsules.

Early stages

In most species, details of the immatures are virtually unknown, which is connected with the lack of ecological information in general. However, some species which can be cultured, particularly *Drosophila melanogaster*, have been studied in detail (Demerec, 1950; Hennig, 1952; Okada, 1968b; Ferrar, 1987; Smith, 1989).

The egg (Fig. 25) is whitish, elongate, with an apical micropyle and usually with a series of filaments close to the anterior end, which may be useful for identification. In a few cases, two longitudinal ridges run across the egg shell. The chorion surface texture is usually a characteristic network of hexagons, visible under high magnification.

There are three stages of whitish-transparent larvae (Fig. 26) with distinct posterior spiracles, ventral crawling hooklets and a pattern of denticles close to the posterior end; in any given stage, the species differ mainly in the shape and size of the cephalopharyngeal skeleton (mouth-parts) and the caudal denticles.

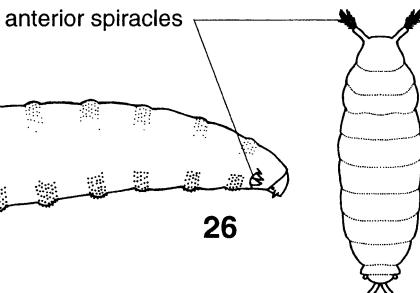
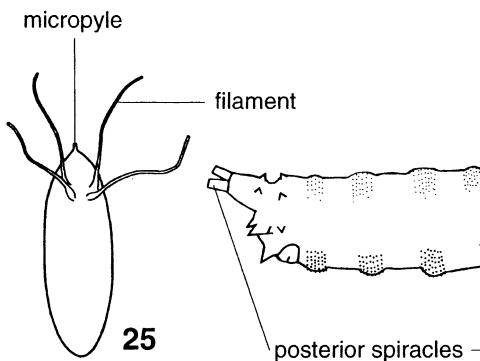
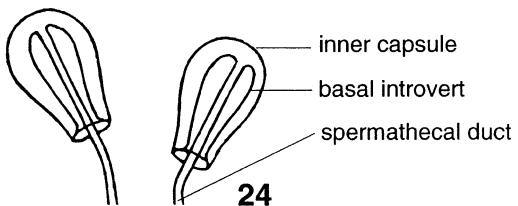
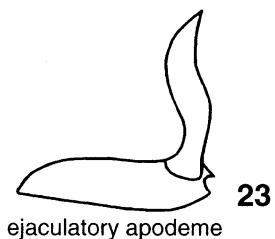
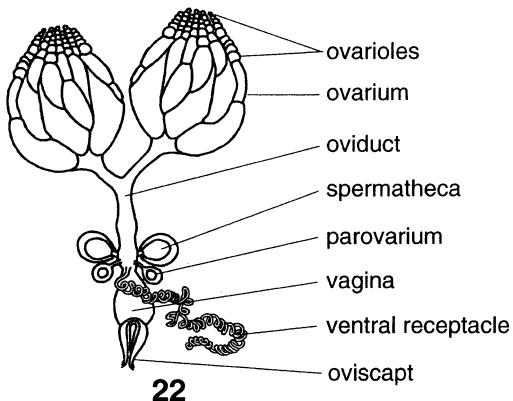
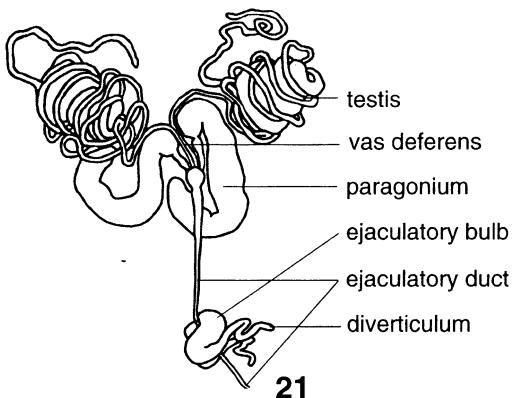
The puparium (pupal sheath) (Fig. 27) is usually brownish, compact and with anterior and posterior spiracles which are characteristic in their shape and the number of tracheal branches.

Phylogeny

Various attempts have been made to find an acceptable solution to the phylogenetic problems within the family Drosophilidae. Some of these studies were restricted to the large and most interesting genus *Drosophila*, whilst others have tried to include as many species as possible.

A detailed summary of phylogenetic procedures and results was published by Powell (1997). At this point we just wish mention certain aspects, and additional results will be given under the genera and species groups below, as appropriate.

For decades, the arrangement of *Drosophila* species into species groups and subgenera which was proposed by Sturtevant (1942) and Patterson & Stone (1952) was generally accepted. Not only taxonomists but also the wider community of *Drosophila* workers in various fields of study were keen to keep the convenient, well-known and stable system that they were used to through tradition and literature. It was feared



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Figs. 21-27. *Drosophila funebris* (Fabricius) (redrawn from Patterson, 1943: 111). 21: male internal reproductive organs. 22: female internal reproductive organs. 23: ejaculatory apodeme. 24: spermathecae. 25: egg, dorsal view. 26: larva, third stage, right lateral view. 27: puparium, dorsal view.

that any change would produce more confusion than progress.

This traditional system was based on similarities in two complexes of features: on the one hand, the external morphology, almost always excluding details of the male and female terminalia; and on the other hand, anatomical characters, such as the male and female inner reproductive organs as well as the digestive system.

Anatomical features were studied in more detail by Throckmorton (1962, 1975). In addition to a large series of drawings showing various specific details, he produced a series of graphs showing the relationships of genera and species groups in the form of genealogical trees. In many cases his findings contradicted the traditional view. The main result was that the genus *Chymomyza* and some other genera were placed

as subunits within the genus *Drosophila*. As a result, the genus *Drosophila*, as it was understood at the time, was shown to be clearly paraphyletic.

Throckmorton did not discuss in detail the decisions he had taken and how he had achieved his results, and so it is impossible to test his results. However, thanks to him, further studies by a variety of authors were undertaken in order to corroborate or to question his results, thus giving rise to a new era of phylogenetic studies. On the one hand, various new features were studied, e.g. cytological data; on the other hand, new methods were introduced to analyse the data sets, e.g. cladistic procedures.

For the past three-quarters of a century, some 70 genera of Drosophilidae have been arranged in two subfamilies, Steganinae and Drosophilinae. Okada (1989) was the first to suggest a finer hierarchical subdivision by arranging the genera into tribes. The 19 genera of Steganinae were placed in 2 tribes and the 40 genera of Drosophilinae in 5 tribes, leaving 4 genera unplaced. These results were based on only 14 characters of external morphology. It is quite clear that this small data set was inadequate for such fundamental decisions.

Important progress was made by Grimaldi (1990) who undertook a comprehensive cladistic study of almost all the genera, based on an important set of features. In general, each genus (and subgenus) was represented by its type species, giving a total of 120 species. The set of 217 characters included features traditionally used for taxonomic decisions but also many additional and previously overlooked characters. For all of them, the plesiomorphic or apomorphic states were determined. The result corroborated in certain details the views of Sturtevant (1942) and Throckmorton (1975), but in many areas the proposed phylogeny was strikingly different from the traditional views: for example, new or previously overlooked relationships among certain genera, previously thought to be closely related to the genus *Drosophila*, were established, and some former subgenera of *Drosophila*, e.g. *Lordiphosa* or the endemic Hawaiian drosophilids, were raised to generic status. The family subdivision included infratribes, subtribes, and tribes, a view contrasting with that of Okada (1989).

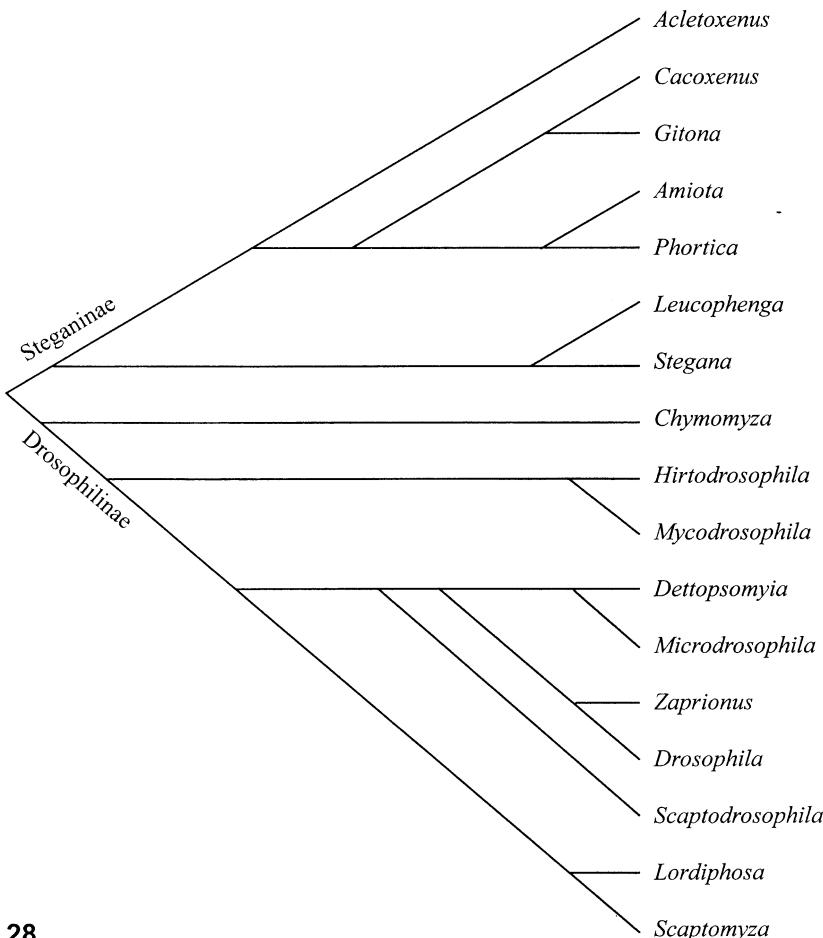
This phylogenetic system proposed by Grimaldi (1990) found wide acceptance – as a com-

prehensive system covering the whole family – but was also severely criticised. Doubts were raised mainly because of the selection only of adult morphological characters and also because of the conclusions giving a different phylogenetic position for certain genera, e.g. the Hawaiian drosophilids. Different phylogenetic views were proposed, based mainly on molecular characters.

It was considered *a priori* that morphological, cytological, molecular etc. data were not directly comparable and could not therefore be not designed as a common basis for phylogenetic studies. To find a comprehensive background for phylogenetic hypotheses, additional efforts were made by e.g. DeSalle & Grimaldi (1992), Kwiatowski et al. (1994), Remsen & DeSalle (1998), Kwiatowski & Ayala (1999), Remsen & O'Grady (2002); however, the results are not coherent. For the European genera, a dendrogram can be arbitrarily composed (Fig. 28), based on the phylogenetic relationships suggested by different authors.

There are other ways of collecting information about the steps and directions of evolution. One commonly used way is the study of fossils. However, the only useful material for drosophilids originates from a few amber specimens from various geographical origins, ranging back to the Eocene, some 50 million years ago. Some of the specimens are in excellent condition, allowing the study of many details of the external morphology. However, one cannot expect to acquire a great deal of information from the small total number of 13 species (including 2 from flint layers; Statz, 1940) that have been described so far. But it is quite clear that some extant genera are already represented in these amber fossils.

Fortunately, the endemic drosophilid fauna of the Hawaiian archipelago provides much better information (Carson & Yoon, 1982). The geological history of the present islands, but also of the now submerged, undersea mountain chain, originating in Kamtchatka and ranging southwards to Hawaii, is fairly well known, giving a fixed time scale. Plate tectonics push the Pacific plate over a fixed hot spot in the mantle of the earth. The plate moves to the north-east, and the movement generates new islands through volcanic activity. The older islands are eroded and finally form atolls and seamounts. An ancestral drosophilid population colonised the island



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Fig. 28. Dendrogram of the hypothetical phylogeny of the European genera of Drosophilidae, based on various sources.

chain early in its history, and the dipteran ecological niche is now occupied by hundreds of endemic drosophilid species in what now is the most isolated archipelago in the world.

There is a wealth of chromosomal, morphological and molecular data collected mainly by Hampton Carson and his colleagues that indicate that new species originate along with the process of building-up and colonisation of new islands. The oldest large island, Kauai (5.5 million years) has served as a starting point, and the pattern

of colonisation and speciation from there to the younger islands can be followed. Evidently this process has been going on for tens of millions of years. There are two main lineages, *Drosophila* and *Scaptomyza*. In fact, *Scaptomyza* diversity is highest on the Hawaiian islands, and there is ample evidence, both molecular and biogeographical, that appears to indicate that the genus *Scaptomyza* originated in the Hawaiian archipelago and from there colonised the rest of the world.

Classification

The following checklist is a systematic arrangement of the 128 species occurring in the Western Palaearctic, including Turkey, the Mediterranean islands, and the Spanish and Portuguese Atlantic islands; some doubtful and a few endemic species recorded from North Africa and the near East are intentionally omitted. The species treated in the systematic part that follows are set in **boldface**.

Family DROSOPHILIDAE

Subfamily STEGANINAE

Genus *Acletoxenus* Frauenfeld, 1868

***Acletoxenus formosus* (Loew, 1864)**

Genus *Amiota* Loew, 1862

Subgenus *Amiota* Loew, 1862

Amiota alboguttata species group

***Amiota albilabris* (Roth in Zetterstedt, 1860)**

***Amiota alboguttata* (Wahlberg, 1839)**

Amiota allemandi Bächli, Vilela & Haring, 2002

Amiota filipes Máca, 1980

***Amiota flavopruinosa* Duda, 1934**

***Amiota subtusradiata* Duda, 1934**

Amiota basdeni species group

***Amiota basdeni* d'Assis-Fonseca, 1965**

Amiota rufescens species group

***Amiota rufescens* (Oldenberg, 1914)**

ungrouped:

Amiota collini Beuk & Máca, 1995

Genus *Cacoxenus* Loew, 1858

Subgenus *Cacoxenus* Loew, 1858

***Cacoxenus indagator* Loew, 1858**

Subgenus *Gitonides* Knab, 1914

Cacoxenus perspicax (Knab, 1914)

Subgenus *Paracacoxenus* Hardy, 1960

***Cacoxenus argyreator* Frey, 1932**

Cacoxenus exiguus Duda, 1924

Cacoxenus inquilinus Hendel, 1933

Cacoxenus kaszabi (Okada, 1973)

Genus *Gitona* Meigen, 1930

Gitona beckeri Duda, 1924

Gitona canariensis Duda, 1934

Gitona distans Bezzi, 1924

***Gitona distigma* Meigen, 1830**

Gitona microchaeta Séguy, 1941

Genus *Leucophenga* Mik, 1886

Leucophenga maculata species group

***Leucophenga maculata* (Dufour, 1839)**

Leucophenga ornata species group

***Leucophenga quinquemaculata* Strobl, 1893**

Leucophenga sorii species group

Leucophenga helvetica Bächli, Vilela & Haring, 2002

Leucophenga hungarica Papp, 2000

Genus *Phortica* Schiner, 1862

Phortica erinacea Máca, 1977

Phortica goetzi Máca, 1987

Phortica oldenberghi (Duda, 1924)

***Phortica semivirgo* Máca, 1977**

Phortica variegata (Fallén, 1823)

Genus *Stegana* Meigen, 1830

Subgenus *Stegana* Meigen, 1830

***Stegana furtia* (Linnaeus, 1767)**

Subgenus *Steganina* Wheeler, 1960

Stegana baechlii Laštovka & Máca, 1982

***Stegana coleoptrata* (Scopoli, 1763)**

Stegana consimilis Papp & Máca in Papp, 2000

***Stegana hypoleuca* Meigen, 1830**

***Stegana longifibula* Takada, 1968**

***Stegana mehadiae* Duda, 1924**

***Stegana nigrithorax* Strobl, 1898**

***Stegana similis* Laštovka & Máca, 1982**

Subfamily DROSOPHILINAE

Genus *Chymomyza* Czerny, 1903

Chymomyza aldrichi species group

Chymomyza procnemoides Wheeler, 1952

Chymomyza costata species group

***Chymomyza caudatula* Oldenberg, 1914**

***Chymomyza costata* (Zetterstedt, 1838)**

Chymomyza fuscimana species group

***Chymomyza amoena* (Loew, 1862)**

***Chymomyza distincta* (Egger, 1862)**

***Chymomyza fuscimana* (Zetterstedt, 1838)**

Chymomyza wirthi Wheeler, 1954

Chymomyza procnemis species group

***Chymomyza procnemis* (Williston, 1896)**

Genus *Dettopsomyia* Lamb, 1914

***Dettopsomyia nigrovittata* (Malloch, 1924)**

Genus *Drosophila* Fallén, 1823

Subgenus *Dorsilopha* Sturtevant, 1942

- Drosophila busckii* Coquillett, 1901**
- Subgenus *Drosophila* Fallén, 1823
- Drosophila funebris* species group
 - Drosophila funebris* (Fabricius, 1787)**
 - Drosophila histrio* species group
 - Drosophila histrio* Meigen, 1830**
 - Drosophila immigrans* species group
 - Drosophila immigrans* Sturtevant, 1921**
 - Drosophila melanica* species group
 - Drosophila tsigana* Burla & Gloor, 1952
 - Drosophila nigrosparsa* species group
 - Drosophila nigrosparsa* Strobl, 1898
 - Drosophila subarctica* Hackman, 1969**
 - Drosophila vireni* Bächli, Vilela & Haring, 2002**
 - Drosophila picta* species group
 - Drosophila picta* Zetterstedt, 1847**
 - Drosophila polychaeta* species group
 - Drosophila hirtipes* Lamb, 1914
 - Drosophila polychaeta* Patterson & Wheeler, 1942
 - Drosophila quinaria* species group
 - Drosophila curvispina* Watabe & Toda, 1984
 - Drosophila kuntzei* Duda, 1924**
 - Drosophila limbata* von Roser, 1840**
 - Drosophila phalerata* Meigen, 1830**
 - Drosophila schachti* Bächli, Vilela & Haring, 2002
 - Drosophila transversa* Fallén, 1823**
 - Drosophila repleta* species group
 - Drosophila buzzatii* Patterson & Wheeler, 1942
 - Drosophila hydei* Sturtevant, 1921**
 - Drosophila mercatorum* Patterson & Wheeler, 1942
 - Drosophila repleta* Wollaston, 1858**
 - Drosophila robusta* species group
 - Drosophila unimaculata* Strobl, 1893
 - Drosophila testacea* species group
 - Drosophila testacea* von Roser, 1840**
 - Drosophila virilis* species group
 - Drosophila ezoana* Takada & Oka-
da, 1958**
 - Drosophila littoralis* Meigen, 1830**
 - Drosophila lummei* Hackman, 1972**
 - Drosophila montana* Patterson &
Wheeler, 1942**
 - Drosophila virilis* Sturtevant, 1916
 - Subgenus *Sophophora* Sturtevant, 1939
- Drosophila melanogaster* species group**
- Drosophila ananassae* Doleschall, 1858**
 - Drosophila melanogaster* Meigen, 1830**
 - Drosophila simulans* Sturtevant, 1919**
 - Drosophila obscura* species group
 - Drosophila alpina* Burla, 1948**
 - Drosophila ambigua* Pomini, 1940**
 - Drosophila bifasciata* Pomini, 1940**
 - Drosophila eskoi* Lakovaara & Lan-
kinen, 1974**
 - Drosophila guanche* Monclús, 1976**
 - Drosophila helvetica* Burla, 1948**
 - Drosophila madeirensis* Monclús, 1984
 - Drosophila obscura* Fallén, 1823**
 - Drosophila subobscura* Collin in Gor-
don, 1936**
 - Drosophila subsilvestris* Hardy &
Kaneshiro, 1968**
 - Drosophila tristis* Fallén, 1823**
 - Drosophila populi* species group
 - Drosophila ingrica* Hackman, 1957**
 - ungrouped:
 - Drosophila schmidti* Duda, 1924
- Genus *Hirtodrosophila* Duda, 1923
- Hirtodrosophila hirticornis* species group
 - Hirtodrosophila lundstroemi* (Duda,
1935)**
 - Hirtodrosophila oldenbergi* (Duda,
1924)**
 - Hirtodrosophila melanderi* species group
 - Hirtodrosophila cameraria* (Haliday,
1833)**
 - Hirtodrosophila quadrivittata* species
group
 - Hirtodrosophila confusa* (Staeger,
1844)**
 - Hirtodrosophila toyohiokadai* (Sidoren-
ko, 1990)
 - Hirtodrosophila trivittata* (Strobl, 1893)**
- Genus *Lordiphosa* Basden, 1961
- Lordiphosa fenestrarum* species group
 - Lordiphosa acuminata* (Collin, 1952)**
 - Lordiphosa andalusiaca* (Strobl, 1906)**
 - Lordiphosa fenestrarum* (Fallén, 1823)**
 - Lordiphosa hexasticha* (Papp, 1971)**
 - Lordiphosa miki* species group
 - Lordiphosa miki* (Duda, 1924)
 - Lordiphosa nigricolor* species group
 - Lordiphosa nigricolor* (Strobl, 1898)**
- Genus *Microdrosophila* Malloch, 1921
- Subgenus *Microdrosophila* Malloch, 1921
 - Microdrosophila congesta* (Zetterstedt,**

1847)

Subgenus *Oxystyloptera* Duda, 1924

Microdrosophila zetterstedti Wheeler,
1959

Genus *Mycodrosophila* Oldenberg, 1914

Mycodrosophila poecilogastra (Loew,
1874)

Genus *Scaptodrosophila* Duda, 1923

Scaptodrosophila rufifrons species group

Scaptodrosophila abdita Papp, Rácz &
and Bächli, 1999

Scaptodrosophila lebanonensis (Wheeler,
1949)

Scaptodrosophila rufifrons (Loew,
1873)

Scaptodrosophila victoria species group

Scaptodrosophila deflexa (Duda, 1924)

Genus *Scaptomyza* Hardy, 1849

Subgenus *Hemiscaptomyza* Hackman, 1959

Scaptomyza trochanterata Collin, 1953

Scaptomyza unipunctum (Zetterstedt,
1847)

Subgenus *Mesoscaptomyza* Hackman, 1959

Scaptomyza vittata (Coquillett in Johnson, 1895)

Subgenus *Parascaptomyza* Duda, 1924

Scaptomyza adusta (Loew, 1862)

Scaptomyza clavigera Frey, 1954

Scaptomyza impunctata (Frey, 1945)

Scaptomyza pallida (Zetterstedt,
1847)

Subgenus *Scaptomyza* Hardy, 1849

Scaptomyza atlantica Hackman, 1955

Scaptomyza consimilis Hackman, 1955

Scaptomyza flava (Fallén, 1823)

Scaptomyza graminum (Fallén, 1823)

Scaptomyza griseola (Zetterstedt, 1847)

Scaptomyza montana Wheeler, 1949

Scaptomyza teinoptera Hackman, 1955

Genus *Zaprionus* Coquillett, 1901

Zaprionus armatus species group

Zaprionus indianus Gupta, 1970

Zaprionus tuberculatus Malloch, 1932

Zaprionus inermis species group

Zaprionus ghesquierei Collart, 1937

SYSTEMATIC PART

The context

In the tradition of the 19th century, the family Drosophilidae was part of a complex of families that included the Asteiidae, Aulacigastridae, Camillidae, Curtonotidae, Cryptochaetidae, Diastatidae and Periscelididae, some of which were sometimes treated as subfamilies of the Drosophilidae. These rather small acalyprate flies were considered to be related to each other, mainly because the majority of species have a plumose arista and one proclinate orbital seta. This view was shared by Duda (1934-1935), who did not give any weight to certain other features (e.g. the presence of a complete subcostal vein) which exclude the Periscelididae and other families from a close relationship with the Drosophilidae.

A new era began with Hennig (1958) who for the first time applied cladistic methods to evaluate the relationships of the Diptera families. He established a new superfamily Drosophiloidea, comprising the families Drosophilidae, Camillidae, Curtonotidae, Diastatidae (incl. Campichoetidae), and including also the Ephydriidae as the most closely related family. This monophyletic group of families was based on a series of shared apomorphies, mainly in the external morphology. This conclusion was accepted by Griffiths (1972) who included additional synapomorphies identified in the postabdomen. Later on, Chandler (1987b) and Grimaldi (1990) also applied cladistic methods to this complex but questioned some of Griffiths' decisions.

A new effort to evaluate the relationships among the higher Diptera was undertaken by

McAlpine (1989). According to his cladistic analysis of known and additional characters, he proposed the following grouping of the former complex of related families: Asteiidae, Aulacigastridae and Periscelididae are included in the superfamily Opomyzoidea, Cryptochaetidae in the superfamily Carnoidea, and Camillidae, Curtonotidae, Diastatidae and Drosophilidae in the superfamily Ephydroidea.

All these authors agree that the family Drosophilidae is monophyletic. However, it should be pointed out that there is no single character which is shared by all species of Drosophilidae and absent in all other species.

Some species of similar size and habitus, whether closely related or not, are likely to be confused with drosophilids; they can only be identified correctly after careful analysis of a combination of characters. The following features, in particular, have to be checked:

- presence of an incomplete subcostal vein (complete in Aulacigastridae and Curtonotidae);
- arista pubescent or plumose (bare in Cryptochaetidae);
- costal vein with two breaks (complete in Asteiidae and Periscelididae);
- anepisternum bare (setose in Aulacigastridae, Camillidae, Curtonotidae and Diastatidae);
- proclinate orbital seta never closer to eye margin than either of the reclinate setae (equidistant or closer in all other families);
- anal cell and anal vein present (absent in Chloropidae).

Family DROSOPHILIDAE

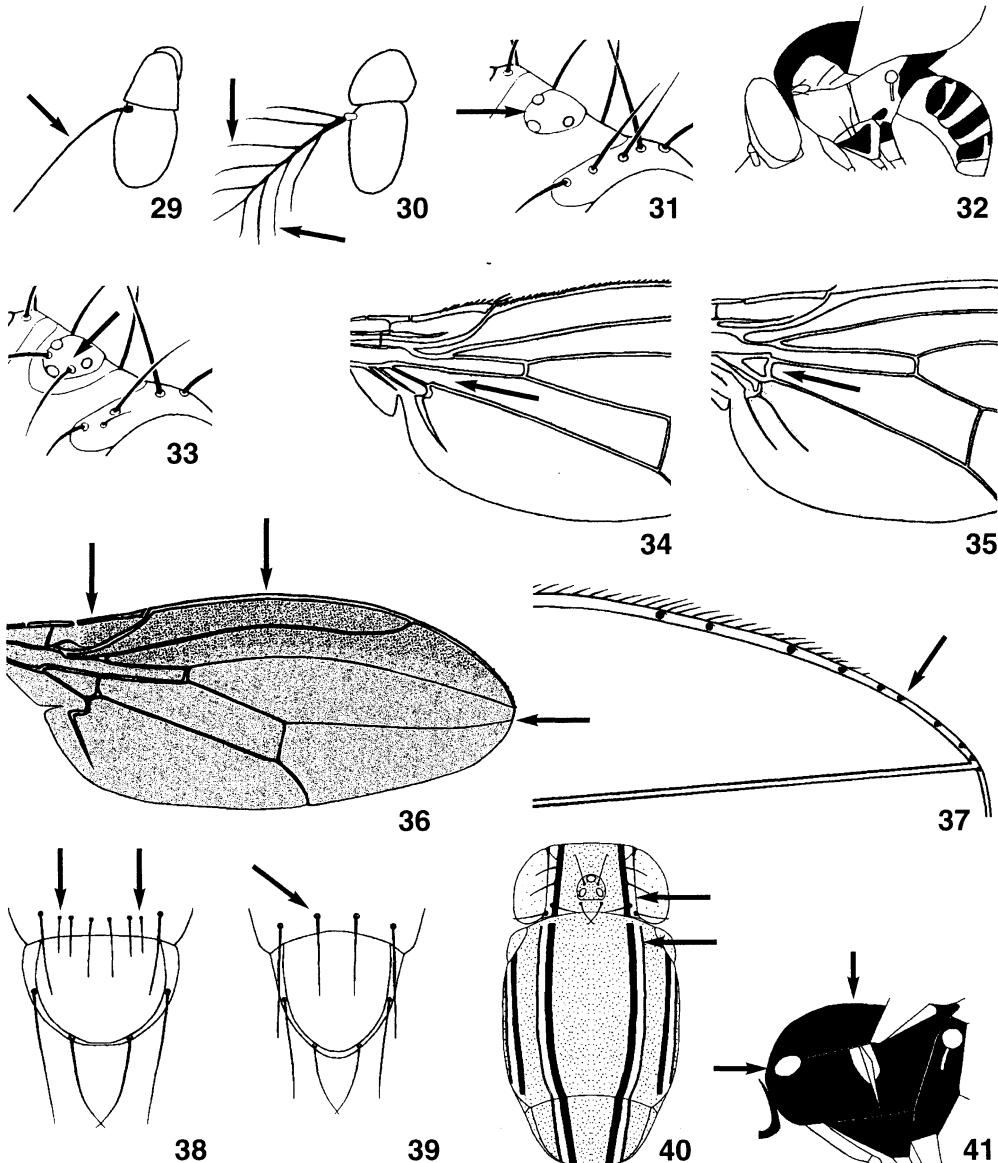
Diagnosis. – West Palaearctic drosophilids are small to moderately large flies, 1.5-7 mm long, usually with bright red eyes when alive. Body microtrichose or shining; colour varying from nearly yellow to brown or brownish-black, often with thoracic stripes or spots, and a pattern of bands or spots on the abdomen. Wing hyaline or with distinct darkened areas. Sexual dimorphism rare but when present involving differences in

body colour or pattern, body size, wing markings, head shape, or secondary sexual traits such as armature of fore leg. Otherwise, the general characters of the Ephydriodea apply.

Taxa included. – In Europe the subfamily Steganinae is represented by 7, the subfamily Drosophilinae by 10 genera. All authors agree that the Steganinae are more primitive.

Key to the European genera

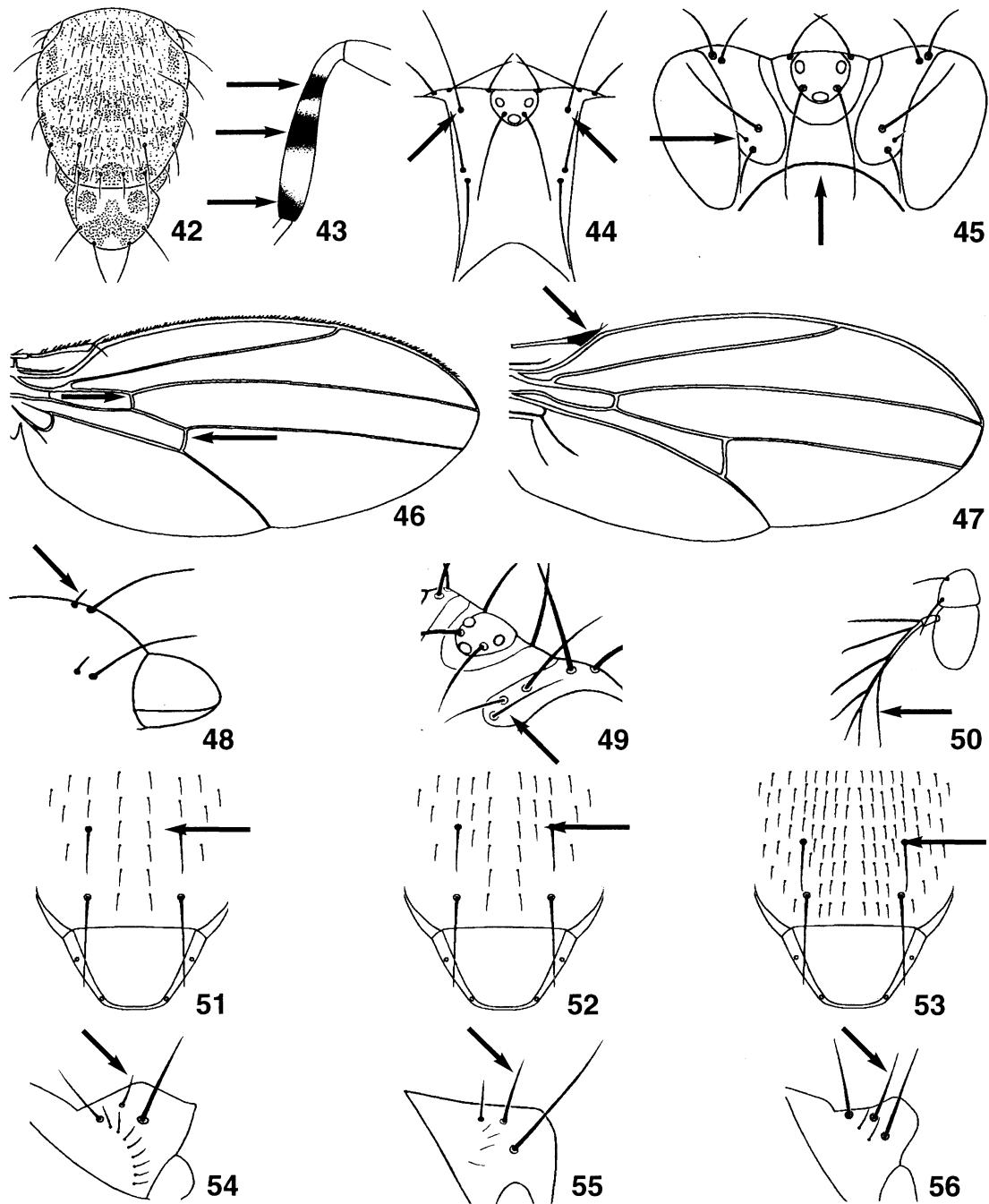
- 1 Scutum, scutellum, and orbital plates with white longitudinal stripes, bordered by black lines (Fig. 40). (Posterior orbital seta closer to medial vertical seta than to proclinate orbital seta; profemur usually with large or small tubercles with one or two setae; 2-4 mm long) *Zaprionus* Coquillett
- Scutum, scutellum and orbital plates without such stripes 2
- 2(1) Arista microtrichose, without any distinct branches (Fig. 29) 3
- Arista plumose, at least dorsal branches as long as width of flagellomere 1 (Fig. 30) 5
- 3(2) Ocellar setae absent (Fig. 31). Basal scutellar setae convergent; black and yellow patterned flies (Fig. 32). (Frons narrow; eye very large; gena linear, almost invisible; postocellar setae minute; carina absent; wing hyaline; costa reaching M; cells bm and dm confluent; 1.5 mm long) *Acletoxenus* von Frauenfeld
(1 Palaearctic species: *A. formosus* Loew)
- Ocellar setae present (Fig. 33). Basal scutellar setae divergent. Colour different 4
- 4(3) Carina prominent. Wing hyaline or with dark spot around tip of R₂₊₃. Cells bm and dm confluent, crossvein bM-Cu almost invisible (Fig. 34). Acrostichal setulae in at most 8 rows. (Anterior dorsocentral setae small, close to posterior; yellowish-brown flies; 2-4 mm long) *Gitona* Meigen
- Carina small. Acrostichal setulae in at least 12 rows (8-10 in subgenus *Paracoxenus*). Wing hyaline. Cells bm and dm clearly separated by crossvein bM-Cu (Fig. 35). (Usually dark flies; 2-4 mm long) *Cacoxenus* Loew
- 5(2) Entire wing darkened, particularly along anterior margin, in resting position folded over abdomen; R₄₊₅ and M distally strongly convergent (Fig. 36); subcosta



Figs. 29-41. 29: *Gitona distigma* Meigen, antenna. 30: *Drosophila funebris* (Fabricius), antenna. 31: *Acletoxenus formosus* (Loew), ocellar setae absent. 32: *Acletoxenus formosus* (Loew), habitus. 33: *Drosophila funebris* (Fabricius), ocellar setae. 34: *Drosophila funebris* (Fabricius), wing base. 35: *Phortica semivirgo* (Máca), wing base. 36: *Stegana coleoptrata* (Scopoli), wing. 37: *Stegana coleoptrata* (Scopoli), ventral view of wing tip. 38: *Stegana furta* (Linnaeus), prescutellar setae. 39: *Leucophenga maculata* (Dufour), prescutellar setae. 40: *Zaprionus indianus* Gupta, dorsal view. 41: *Amiota alboguttata* (Loew), left lateral view.

apically fused with R_1 ; curved costal pegs (warts) on ventral side of C-III (Fig. 37). Additional prescutellar setae present (Fig. 38). (Middle tibia dorsally

usually with a row of stout, distinctly hooked setae; palpi narrow (broad in *S. hypoleuca*), concave above; 2-7 mm long).....



Figs. 42-56. 42: *Phortica semivirgo* (Máca), mesonotum. 43: *Phortica semivirgo* (Máca), tibia. 44: *Leucophenga maculata* (Dufour), frons. 45: *Microdrosophila congesta* (Zetterstedt), frons. 46: *Microdrosophila congesta* (Zetterstedt), wing. 47: *Mycodrosophila poecilogastra* (Loew), wing. 48: *Mycodrosophila poecilogastra* (Loew), dorsocentral setae. 49: *Chymomyza distincta* (Egger), orbital setae. 50: *Scaptomyza pallida* (Zetterstedt), arista. 51: *Scaptomyza pallida* (Zetterstedt), acrostichal setulae. 52: *Scaptomyza graminum* (Fallén) acrostichal setulae. 53: *Drosophila funebris* (Fabricius), acrostichal setulae. 54: *Drosophila melanogaster* Meigen, katepisternal setae. 55: *Lordiphosa fenestrarum* (Fallén), katepisternal setae. 56: *Scaptodrosophila rufifrons* (Loew), katepisternal setae.

- *Stegana* Meigen
Wing hyaline or with a distinct dark pattern, in resting position held flat above abdomen; R₄₊₅ and M apically at most slightly convergent; subcosta apically vestigial; curved costal pegs (warts) on ventral side of C-III absent (present in most species of *Leucophenga* Mik). At most 1 pair of prescutellar setae (Fig. 39) 6
- 6(5) Pleura unicolourous blackish or reddish-brown, with contrasting white spots at postpronotum and ventral to wing base (Fig. 41). Face ventrally with a curved, white, transverse band. Cells bm and dm separated (Fig. 35). (2-4 mm long)
- *Amiota* Loew
Pleura and lower half of face never with contrasting white spots 7
- 7(6) Scutum brownish, with an irregular pattern of greyish spots (Fig. 42). All tibiae with 3 dark bands (Fig. 43). Cells bm and dm separated (Fig. 35). (3-5 mm long)..
- *Phortica* Schiner
Colour of scutum different, if with irregular pattern, then tibiae without dark bands. Cells bm and dm confluent (Fig. 34) 8
- 8(7) Prescutellar setae present, reaching centre of scutellum (Fig. 39). Ventral curved costal pegs (warts) on C-III near wing tip usually present (Fig. 37). (Carina absent. Frons often narrow; posterior reclinate orbital seta usually close to vertex (Fig. 44). Eye very large, vertical. Gena linear, almost invisible. Basal scutellar setae divergent. Costa reaching apex of R₄₊₅. Males sometimes with some silvery-whitish shimmer on frons, mesonotum and abdomen; 2-4 mm long)
- *Leucophenga* Mik
If prescutellar setae present, then not reaching centre of scutellum. No curved costal pegs (warts) on C-III. Costa narrowly reaching apex of M 9
- 9(8) Orbital plates large, greatly broadened anteriorly (Fig. 45). (Anterior reclinate orbital seta minute; frons much broader than long (Fig. 45); carina at most half as long as face, narrow, high; gena narrow; anterior dorsocentral seta near suture; 6 rows of acrostichal setulae; second costal break usually deep, without lappet; crossveins close together; 4V-index about 4.0 (Fig. 46); 1.5-2.0 mm long) ..
- *Microdrosophila* Malloch
Orbital plates at most slightly broadened anteriorly (Fig. 33) 10
- 10(9) Costal break just preceding R₁ deep. Costal lappet large, black (Fig. 47). Body length 1.5-2 mm 11
- Costal break just preceding R₁ shallow. Costal lappet normal or flies longer than 2 mm 12
- 11(10) Anterior dorsocentral seta indistinct or absent, close to posterior one (Fig. 48). (Arista with only one ventral branch; anterior reclinate orbital seta small, other frontal setae large; frons more or less silvery; scutum and dorsal part of pleura contrasting black, shining; anterior scutellar seta short; 2 mm long)
- *Mycodrosophila* Oldenberg
(1 Palaearctic species: *M. poecilogastra* (Loew), Central and South Europe)
- Anterior dorsocentral seta large, distinct, closer to suture than to scutellum. (Frons broader than long; carina large, bulbous; 4 rows of acrostichal setulae; 1.5 mm long)
- *Dettopsomyia* Lamb
(1 Palaearctic species: *D. nigrovittata* (Malloch, 1924): Canary Islands, introduced)
- 12(10) Anterior reclinate orbital seta subequal to proclinate orbital seta, situated well anterior to it (Fig. 49). Face without distinct carina. (Postocellar seta minute; 6-8 rows of acrostichal setulae; 2 mm long).....
- *Chymomyza* Czerny

Subfamily STEGANINAE

- Anterior reclinate orbital seta at most half as long as proclinate one, placed behind or laterally but never anterior to it (Fig. 33). Carina usually distinct, but sometimes small 13
- 13(12) 2-4 rows of acrostichal setulae (Figs 51, 52). Arista with 1 or 2 ventral branches (Fig. 50). Anterior dorsocentral seta closer to suture than to posterior one. Only 2 katepisternal setae. (Body slender; 2 mm long) *Scaptomyza* Hardy 4-8 rows of acrostichal setulae (Fig. 53); if with 4 rows, then with 3 distinct katepisternal setae. Anterior dorsocentral seta closer to posterior one than to suture. Arista usually with at least 2 ventral branches (Fig. 30); if with one ventral branch then with at least 6 rows of acrostichal setulae. (Body usually stout; 2-4 mm long) 14
- 14(13) Median katepisternal seta weak, at most about half as long as anterior one (Fig. 54). (Face with a distinct carina. Prescutellar seta absent) *Drosophila* Fallén (the former subgenus *Hirtodrosophila* included) Median katepisternal seta almost as long as, or even longer than, anterior one (Figs 55, 56) 15
- 15(14) Median katepisternal seta longer than anterior one (Fig. 55). Face flat, carina almost absent. Prescutellar seta absent. (2.5-3 mm long) *Lordiphosa* Basden Median katepisternal seta strong, almost as long as anterior one (Fig. 56). Face with a bulbous carina. Short prescutellar seta present. (2.5 mm long) *Scaptodrosophila* Duda

Diagnosis. — Small to large flies (2-8 mm long); arista microtrichose (in *Acletoxenus*, *Cacoxenus* and *Gitona*) or plumose; all three orbital setae of almost the same length, posterior reclinate orbital seta usually closer to the median vertical seta than to the proclinate orbital seta; prescutellar setae long; 2 subequal katepisternal setae; wing cells *bm* and *dm* usually separated by a (sometimes pale) crossvein; costa usually ending at R_{4+5} ; epandrium and surstyli completely fused (in *Gitona* spp.) or linked by membranous tissue; females with cerci; oviscapt, if present, hardly sclerotised.

Taxa included. — 7 out of some 20 known genera are present in Europe: *Acletoxenus*, *Amiota*, *Cacoxenus*, *Gitona*, *Leucophenga*, *Phortica*, and *Stegana*.

Comments. — The subfamily characters mentioned above are not present in all members of the Steganinae, nor are they absent in all members of the Drosophilinae (see also Ashburner, 1989). The subfamily as currently interpreted is considered to be monophyletic, on the basis of a few, not very distinctive synapomorphies (Grimaldi, 1990).

Genus *Acletoxenus* Frauenfeld, 1868

Acletoxenus Frauenfeld, 1868: 152. Type species: *Acletoxenus syrphoides* Frauenfeld, 1868.

Diagnosis. — Arista microtrichose; carina absent; frons narrow; eye very large, bare; gena very narrow; all orbital setae long; ocellar setae absent; vibrissa longer than genal setae; post-ocellar setae minute; prescutellar setae long; wing clear; costa reaching to apex of *M*; cells *bm* and *dm* confluent; legs without preapical or apical setae.

Taxa included. — Only four species have been described: *Acletoxenus formosus* (Loew, 1864) (Europe, Israel, Japan, Australia, probably widespread but rarely collected), *A. indicus* Malloch, 1929 (India, Java), *A. meijerei* Duda, 1924 (Java), and *A. quadristriatus* Duda, 1936 (Thursday Island, Australia).

Comments. – The larvae of all species appear to be predacious on whiteflies (Homoptera, Aleyrodidae), as mentioned by Ashburner (1981). The systematic position of *Acletoxenus* was discussed by Okada (1956, 1970), Máca (1980), and Grimaldi (1990).

Acletoxenus formosus (Loew, 1864)

(Figs 31, 32, 57-60)

Gitona formosa Loew, 1864: 366.

Acletoxenus syrphoides Frauenfeld, 1868 :152.

Diagnosis. – Small flies with a contrasting, remarkable colour pattern: whitish-yellow (in life greenish) ground-colour; ocellar triangle black; gena almost invisible, scutum, except for lateral margin, shining black; katepisternum with a large black patch; tergites with a more or less broad, medially and laterally narrowed or interrupted black basal band; surstylus reduced and completely bare; dorsal arch well-developed, conspicuously asymmetric, with left half with a long, distally striate, ventrally-directed process, which is missing on right half; inner paraphysis mediadorsally expanded backwards and anteriorly fused to distal branch of aedeagal apodeme; outer paraphysis globose; aedeagus apparently absent.

Redescription. – ♂. Head about twice as high as long. Frons narrow, parallel-sided, pale yellowish, subshining, frontal length 0.46 (0.40-0.48) mm; frontal index = 1.97 (1.87-2.00), top to bottom width ratio = 1.02 (1.00-1.08). Frontal triangle indistinct; ocellar triangle prominent, black, about 23-25% of frontal length. Orbital plates narrow, slightly shining, about 79-81% of frontal length. Medial vertical setae about 130-160% of the lateral ones. Orbital setae black, almost in a row, or2 distinctly closer to or1 than to or3. Distance of or3 to or1 = 144% of or3 to vtm, or1 / or3 ratio = 0.77, or2 / or1 ratio = 1.32 (1.20-1.44), postocellar setae crossed, about 29 (25-33)% of frontal length, ocellar setae absent (Fig. 31); all genal setae behind vibrissa tiny. Face yellowish. Carina broad, rather flat. Gena extremely narrow, linear. Eye index = 1.40 (1.33-1.43). Occiput concave, black except for a narrow area behind ocellar triangle. Antennae yellowish-white, seen from above. Flagellomere 1 slightly darker, length to width ratio =

1.1-1.3. Arista microtrichose. Proboscis yellow. Clypeus narrow, black.

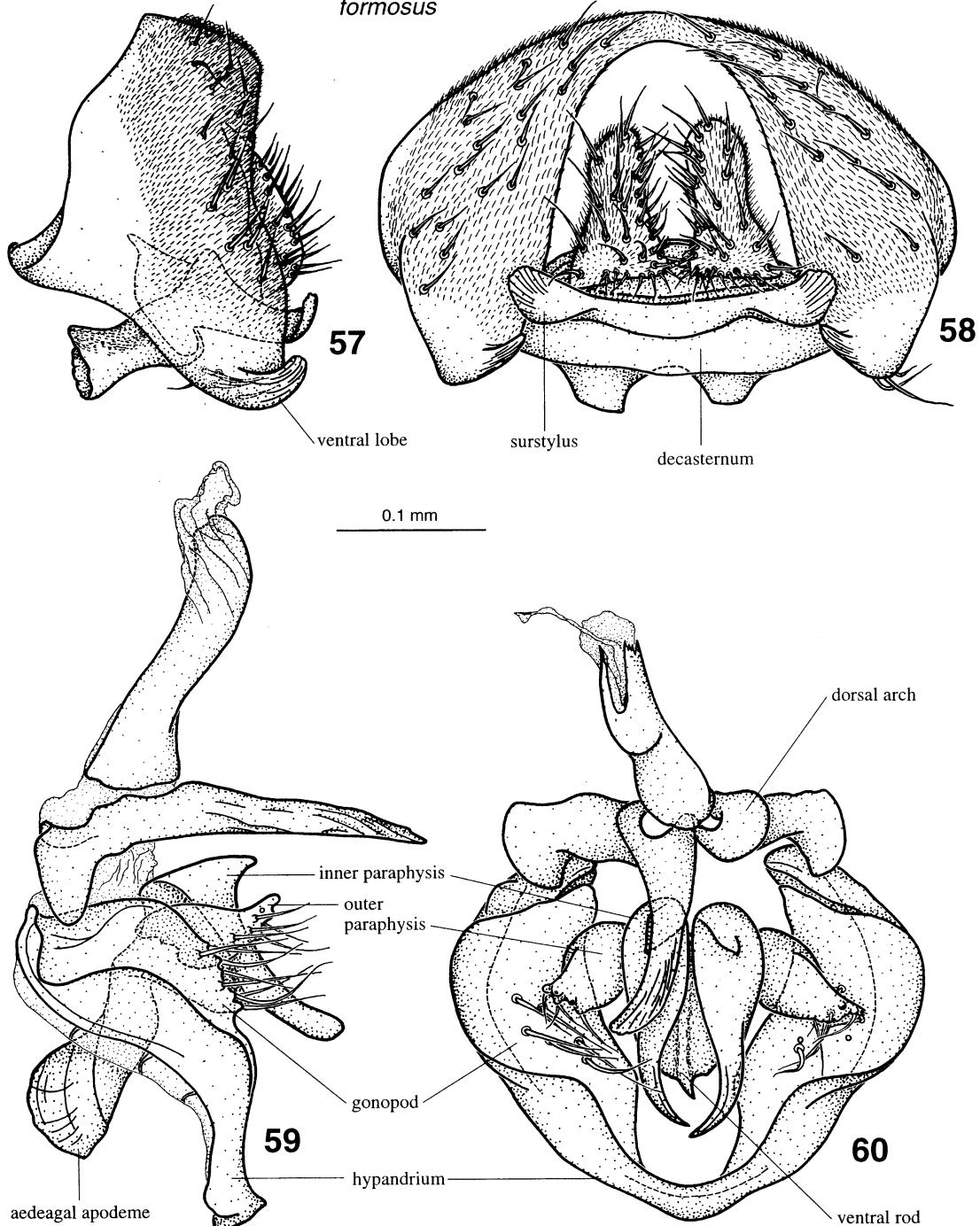
Thorax length 1.21 (1.05-1.36) mm. Scutum black, shining, laterally broadly and contrastingly (greenish-)whitish-yellow. 12 rows of acrostichal setulae. Only one posthumeral seta. Transverse distance of dorsocentral setae 575% of longitudinal distance; dc index = 0.24. Prescutellar setae = 190% of anterior dorsocentral setae. Scutellum whitish-yellow, shining, apically slightly pointed, scutellar setae nearly equidistant; basal ones divergent; scut index = 0.96 (0.84-1.08). Pleura (Fig. 32) (greenish-) whitish-yellow, katepisternum predominantly black, only two main katepisternal setae present, sterno index = 0.89 (0.84-0.91). Haltere white. Legs whitish, all tibiae without preapical and apical setae.

Wing hyaline, veins R₄₊₅ and M slightly divergent, length 2.33 (2.13-2.63) mm, length to width ratio = 2.35 (2.29-2.38). Indices: C = 5.71 (4.89-6.43), ac = 1.04 (0.88-1.29), hb = 0.22, 4C = 0.46 (0.41-0.50), 4v = 1.59 (1.47-1.74), 5x = 1.41 (1.00-1.80), M = 0.42 (0.33-0.53), prox. x = 0.52 (0.44-0.63).

Abdomen predominantly yellowish, shining, tergite 2 usually with a diffuse brownish basal band and 2 black lateral spots, tergites 3 to 5 with a blackish basal band which is medially slightly narrowed, and a median, triangular, backwardly-pointed spot, which is short on tergite 3, and reaches apical margin on tergite 5.

♂ Terminalia (Figs 57-60). Epandrium dorsodistally microtrichose, with ca. 5 lower, inwardly positioned and ca. 18 upper setae; ventral lobe finger-shaped, pointed inwards in posterior view, striate, neither microtrichose nor covering surstylus. Cercus reduced, ventrally expanded laterally, anteriorly connected to epandrium by membranous tissue, microtrichose and without ventral lobe. Surstyli reduced to a pair of small, spatulate, bare, distally striate, and slightly serrate processes, fused to each other and to decasternum, and probably without their usual grasping function. Decasternum strongly developed, protruding anterad in lateral view, and fused to surstyli, as in Figs 57, 58. Hypandrium twice as long as epandrium, anterior margin convex; posterior hypandrial process absent; dorsal arch well-developed, linked to hypandrium by membranous tissue, conspicuously asymmetric, dorsally with a long, bent, rod-shaped, apically membranous, backwardly-

formosus



Figs. 57-60. *Acletoxenus formosus* (Loew). 57: epandrium, cerci, decasternum, and surstyli, left lateral view; 58: idem, posterior view. 59: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 60: idem, posterior view.

directed process, left half with a long, distally striate, ventrally-directed process, absent in right half; gonopod partially fused to hypandrium, with ca. 8 setae medially, linked to outer paraphysis by membranous tissue. Aedeagus apparently absent. Two pairs of paraphyses, each of the inner ones anteriorly fused to a distal branch of the aedeagal apodeme, distally blunt and anterodorsally pointed backwards in lateral view, sharply pointed and directed inwards in posterior view; outer ones globose, distally with ca. 6 setulae and linked both to gonopod and to aedeagal apodeme by membranous tissue. Aedeagal apodeme distally bifurcate, laterally flattened, anteriorly expanded. Ventral rod wide, dorsoventrally flattened, and distally sharp-tipped in posterior view.

♀. Differences from male: Black bands on abdomen narrower.

Measurements: Frontal length 0.49 (0.42-0.55) mm; frontal index = 2.01 (1.87-2.13), top to bottom width ratio = 1.03 (1.00-1.08). Ocellar triangle about 24-26% of frontal length. Orbital plates about 78-84% of frontal length. Distance of or3 to or1 = 145-162% of or3 to vtm, or1 / or3 ratio = 0.67 (0.65-0.69), or2 / or1 ratio = 1.50 (1.44-1.56), postocellar setae = 24 (22-26)% of frontal length. Eye index = 1.39 (1.34-1.44). Thorax length 1.26 (1.05-1.50) mm. Transverse distance of dorsocentral setae 575-867% of longitudinal distance; dc index = 0.24 (0.22-0.26). Distance between apical scutellar setae about 93-106% of that of apical to basal one; scut index = 1.06 (1.04-1.09), sterno index = 0.88 (0.83-0.96). Wing length 2.36 (2.06-2.63) mm, length to width ratio = 2.34 (2.26-2.39). Indices: C = 5.92 (5.56-6.13), ac = 1.00, hb = 0.15 (0.11-0.25), 4C = 0.44 (0.42-0.45), 4v = 1.55 (1.45-1.67), 5x = 1.28 (1.17-1.33), M = 0.41 (0.37-0.44), prox. x = 0.55 (0.53-0.57).

Terminalia. Cerci horizontally flat, medially fused, forming a duck-bill shaped structure, as shown by Máca (1980).

Distribution. – Widespread in the Palaearctic (and Australia), from the Canary Islands to Japan but not yet recorded in Scandinavia; the flies are generally overlooked because of their small size and their overall resemblance with some Agromyzidae. The northernmost records are from England, the Netherlands, and Poland; most probably also present in Scandinavia.

Biology. – The larvae are predaceous on various species of Aleyrodidae (Homoptera) (Ashburner, 1981, Bock, 1982) and may be useful in fighting whitefly pests of pears etc.

Additional specimens examined. – 4 ♂♂ (ITALY: Sicily, 1 ♂, 1999. SERBIA AND MONTENEGRO: Radovicéi, 3 ♂♂, 1982), 5 ♀♀ (ANDORRA: S. Coloma, 1 ♀, 1993. ITALY: Verona, 1 ♀, 2001. SWITZERLAND: Jura, 1 ♀, 1974; Graubünden, 1 ♀, 1994; Zürich, 1 ♀, 1997).

Comments. – Large numbers of flies can be observed locally, probably because the hosts are present (B. Merz, pers. comm.).

Genus *Amiota* Loew, 1862

Amiota Loew, 1862: 229. Type species: *Amiota leucostoma* Loew, 1862.

Diagnosis. – Generally blackish flies; lower half of face, postpronotum and anepimeron usually with a contrasting whitish spot; arista plumose but with ventral branches of variable length (microtrichose in some Oriental species); prescutellar setae large; acrostichal setulae in about 8 rows; cells bm and dm separated; tibiae without dark bands; hypandrium reduced to a U-shaped strip; dorsal arch strongly developed, mostly saddle-shaped in lateral view; aedeagus absent; aedeagal apodeme highly developed, conspicuously dorsoventrally flattened, anteriorly expanded laterally and distally bifid; two pairs of paraphyses present; females without spiracle pair 7 but with a pair of lateral cerci.

Taxa included. – There are about 80 species, half of them described from the Palaearctic, and they are divided into two subgenera. In addition to the species mentioned below, *Amiota filipes* Máca, 1980 is recorded from the Czech Republic, Slovakia, Germany, Serbia, and Switzerland, *A. collini* Beuk & Máca, 1995 from Great Britain, the Czech Republic and Slovakia. In addition, *A. allemandi* Bächli, Vilela and Harling, 2002, was described from southern Turkey. *A. lacteoguttata* (Portschinsky, 1892), described from Belarus, is considered to be a doubtful species, and a few old records may refer to any *Amiota* species.

Comments. – Revisions and phylogenetic analyses were made by Chen & Toda (2001) and Máca (2003). The taxon *Phortica* Schiner, once

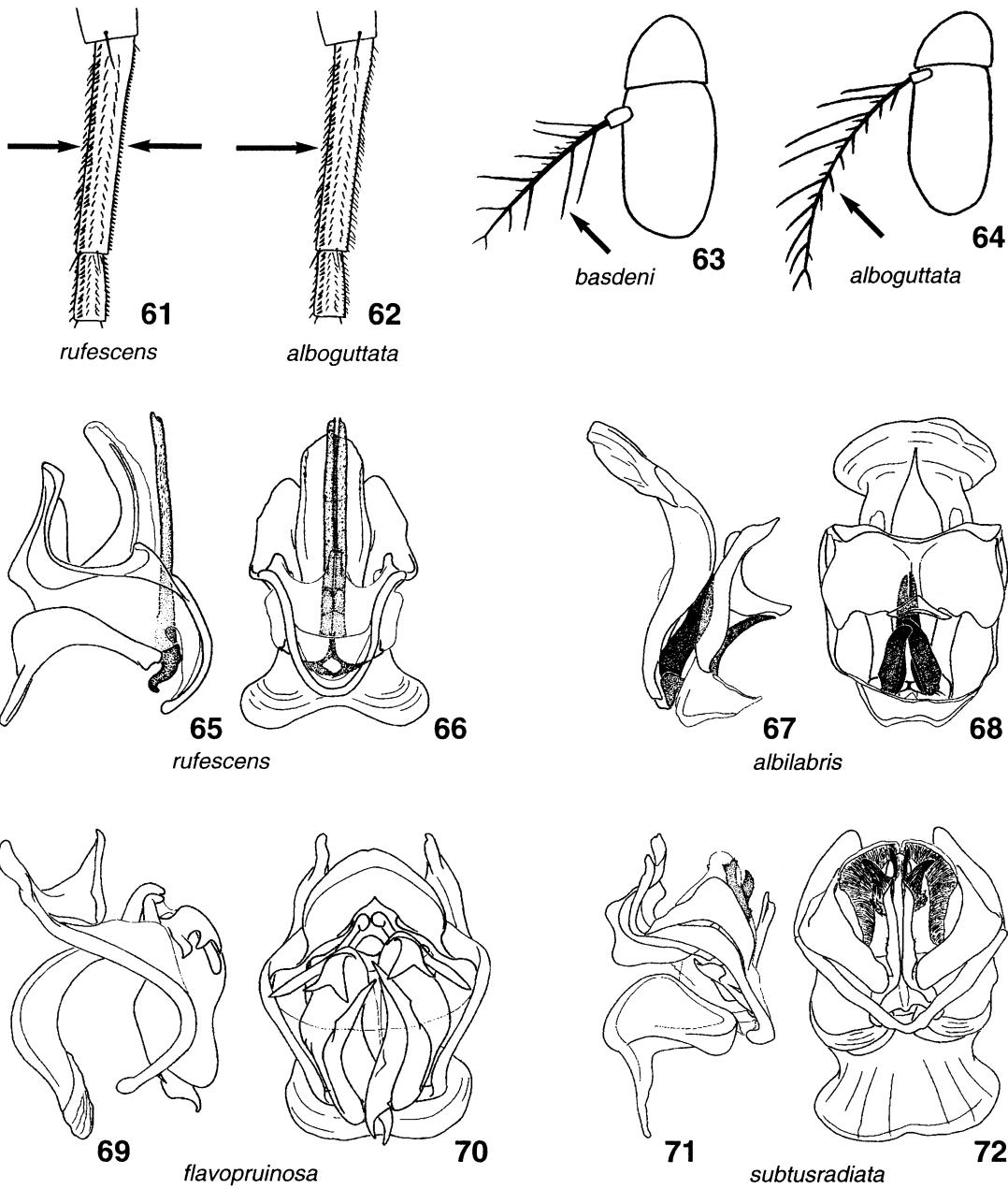
considered to be a subgenus of *Amiota*, was raised to its original status by Máca (2003), following suggestions previously made by Bock (1982). While both genera share a few characters, the differences in the external morphology and in the male terminalia support this decision. In addition, the former subgenera *Ap-siphortica* Okada, *Erima* Kertész and *Paraphorticata* Duda were also raised to generic status by Máca (2003), the latter two as originally proposed. The strongly developed dorsal arch present in species of *Amiota* is probably derived from the anterior region of the decasternum, as it also occurs in species of *Phortica*, where this condition is more evident.

Terminalia. We concur with Grimaldi (1990) and Máca (2003) that the aedeagus is absent in species of *Amiota*, as the ejaculatory duct, although not always clearly visible, is not distally enveloped by a sclerite that could be homologous to the aedeagus found in most other genera of Drosophilidae. Moreover, in *Amiota rufescens* there is a loose membranous tube which could be the endophallus, as it is apparently linked anteriorly to the ejaculatory duct and ends apically in a supposed gonopore that protrudes between the hypandrial posterior margin and the two paired sclerites. The paired, inner sclerites that Chen & Toda (2001) termed the aedeagus constitute, in our opinion, the inner paraphysis (posterior parameres of Okada), as they are usually bare, positioned inside of the outer paraphysis (anterior parameres of Okada), and articulate proximally with the distal branches of the aedeagal apodeme; they do not form a tube-shaped structure enveloping the distal ejaculatory duct (endophallus).

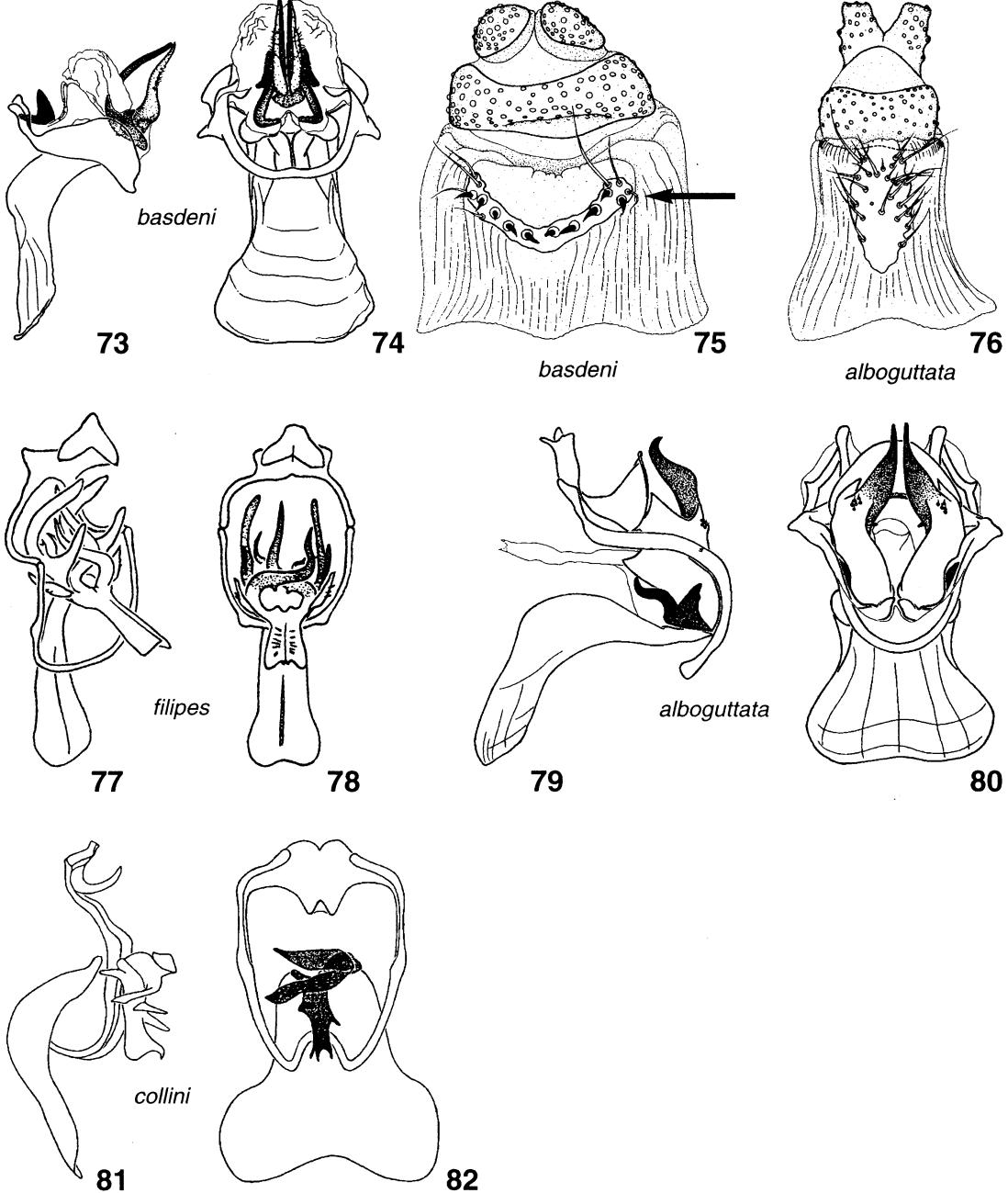
Biology. – As mentioned by Ashburner (1989), the biology of *Amiota* species is poorly known. The species are usually not attracted to fruit bait and cannot be cultured, but some can be collected in large numbers in beer-wine-traps (Allemand & Aberlenc, 1991) exposed in the forest canopy, particularly in oak trees. It should be noted that they are often attracted to the eyes of humans and other mammals (Chen & Toda 2001), like the well-known eye gnats (*Hippelates* spp., Chloropidae). According to J. Máca (pers. comm.), this behaviour is found not only in the species now considered as belonging to the genus *Phortica* but also in at least two species of *Amiota* sensu strictu: *A. albilabris* and *A. basdeni*.

Key to European species of *Amiota*

- 1 Larger flies, wing usually longer than 3 mm. Mesotarsus (particularly mesotarsomere 1) with anteroventral and posteroventral rows of black, short and sharp setulae (cuneiform setulae) (Fig. 61). Ventral branches of arista almost as long as dorsal ones (as in Fig. 63) 2
- Smaller flies, wing usually shorter than 3 mm. Mesotarsus with only a posteroventral row of black, short and sharp setulae (Fig. 62). Ventral branches of arista almost as long as (Fig. 63), or shorter than dorsal ones (Fig. 64) 3
- 2(1) Scutum reddish-brown, shining. Legs yellow. Frons yellowish-brown, with at least 10 small interfrontal setulae and about 10 setulae along anterior margin. Male: metafemur normal; internal male terminalia Figs 65, 66 *A. rufescens* (Oldenberg)
- Scutum blackish, subshining. Femora and tibiae blackish, tarsi yellow. Frons blackish with brown anterior margin, about 6 interfrontal setulae and not more than 6 setulae along anterior margin. Male: metafemur basally expanded; internal male terminalia Figs 67, 68 *A. albilabris* (Roth)
- 3(1) Frons and scutum brown, distinctly yellowish microtrichose. Thoracic setae and setulae golden-yellowish. Male: internal terminalia Figs 69, 70 *A. flavopruinosa* Duda
- Frons and scutum blackish, subshining. Thoracic setae and setulae blackish 4
- 4(3) Ventral branches of arista almost as long as dorsal ones (Fig. 63) 5
- Ventral branches of arista shorter than dorsal ones (Fig. 64) 7
- 5(4) hb-index about 0.75. Male: internal terminalia Figs 71, 72 *A. subtusradiata* Duda



Figs. 61-72. 61, 62: tarsomere 1, rows of black, short, sharp setulae (cuneiform setulae). 63, 64: antenna with different lengths of ventral branches of arista. 65-72: internal male terminalia, left lateral view (left), posterior view (right).



Figs. 73-82. Internal male terminalia, left lateral view (left), posterior view (right), except 75 and 76, female terminalia, ventral view.

- hb-index less than 0.7 6
- 6(5) Legs and first two antennal segments pale.
Male: internal terminalia Figs 73, 74. Female with a transverse row of stout and sharp peg-like setae on sternite 8 (Fig. 75).
..... *A. basdeni* d'Assis-Fonseca
- Legs and first two antennal segments somewhat brownish. Male: internal terminalia Figs 77, 78. Female: no transverse row of stout and sharp peg-like setae on sternite 8 (as in Fig. 76).
..... *A. filipes* Máca
- 7(4) hb-index less than 0.5. Male: metafemur and tibia each with a row of more or less erect setae; all tarsomeres yellowish; male internal terminalia Figs 79, 80
..... *A. alboguttata* (Wahlberg)
- hb-index more than 0.6. Male: metafemur and tibia without conspicuous erect setae; apical tarsomeres darkened; male internal terminalia Figs 81, 82; female unknown...
..... *A. collini* Beuk & Máca

Subgenus *Amiota* Loew, 1862

Diagnosis. – Brown to blackish flies; ventral part of face, postpronotum and anepimeron contrasting milky white; arista plumose, but ventral branches may be short; aedeagal apodeme very broad, distally deeply bifid; dorsoventrally flat; aedeagus apparently absent.

Taxa included. – Around 70 species divided into 7 species groups (Chen & Toda, 2001). The European species belong to three groups.

alboguttata species group Chen & Toda, 2001

Diagnosis. – Metatibia of males ventrally with a row of long setae, and second to fifth metatarsomeres broadened (Chen & Toda, 2001).

Taxa included. – 18 Palaearctic species.

Amiota albilabris (Roth in Zetterstedt, 1860)

(Figs 67, 68, 83-86)

Drosophila albilabris Roth in Zetterstedt, 1860:
6425.

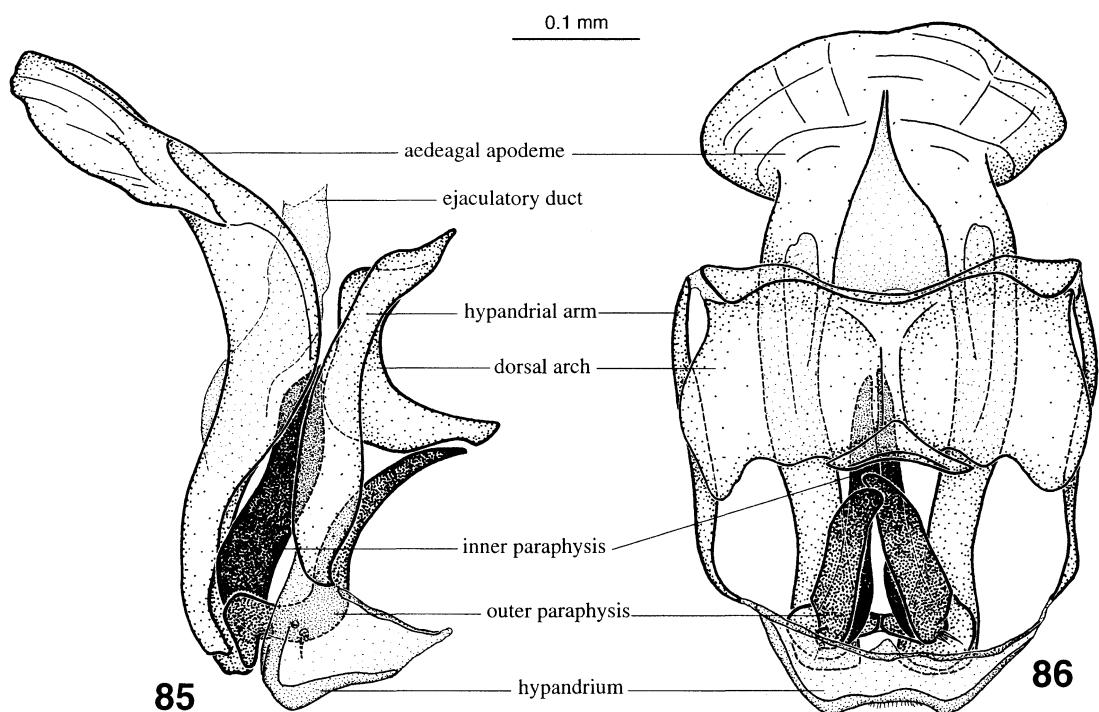
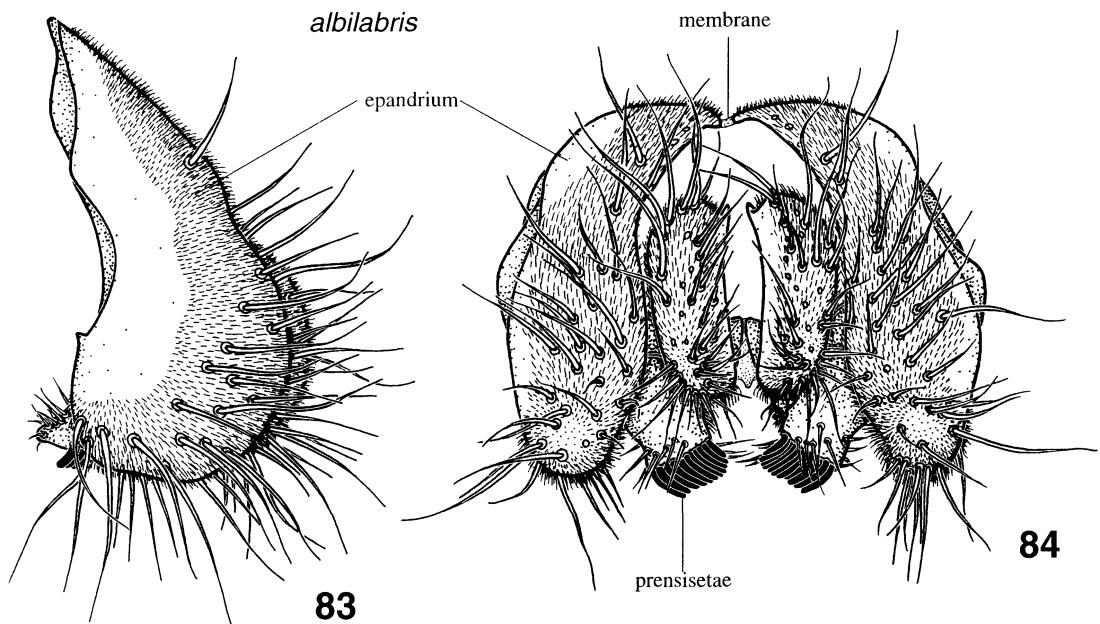
Amiota obscuripes Strobl, 1910: 210.

Leucophenga leucostoma Becker, 1908: 320
(according to Máca, 2003: 263).

Diagnosis. – All femora and mesotibia and metatibia dark brown; dorsal arch of hypandrium somewhat rectangular in posterior view; hypandrium and aedeagal apodeme parallel, closely touching each other; aedeagus apparently absent; two pairs of strongly sclerotised paraphyses (modified from Chen & Toda, 2001).

Redescription. – ♂. Head. Frons blackish-brown in upper half, pale yellowish below, greyish microtrichose, frontal length 0.47 (0.40-0.53) mm; frontal index = 1.12 (1.04-1.20), top to bottom width ratio = 1.45 (1.38-1.60). Frontal triangle indistinct; ocellar triangle slightly prominent, blackish, subshining in hind corners, about 29-43% of frontal length. Orbital plates narrow, yellowish-brown, apically slightly diverging from eye margin, about 58-67% of frontal length. Orbital setae black, strong, virtually in a line, distance of or3 to or1 = 129-220% of or3 to vtm, or1 / or3 ratio = 0.98 (0.94-1.00), or2 / or1 ratio = 0.73 (0.59-0.82), postocellar setae = 33 (26-40)%, ocellar setae = 74 (63-85)% of frontal length; vibrissal index = 0.50 (0.43-0.57). Face yellowish-brown in upper half, shining white below. Carina prominent, broadly keeled, not nose-like. Cheek index about 7-12. Eye index = 1.19 (1.13-1.25). Occiput blackish-brown. Pedicel yellowish-brown. Flagellomere 1 dark brown, length to width ratio = 1.89. Arista with 3-6 dorsal, 2-4 ventral, relatively short branches in basal half, and about 10-15 inner branches, basally in more than one row, without terminal fork. Proboscis yellowish. Clypeus narrow, black. Palpus brown, medially broad, apically narrowed, with about 10 black setae along lower margin.

Thorax length 1.71 (1.46-1.99) mm. Scutum black, shining, postpronotum white, about 14 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 300-390% of longitudinal distance; dc index = 0.56 (0.46-0.60), 2 distinct prescutellar



Figs. 83-86. *Amiota albilabris* (Roth). 83: epandrium, cerci, and surstyli, left lateral view; 84: idem, plus decasternum, posterior view; 85: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 86: idem, posterior view.

setae, length about 104-127% of that of anterior dorsocentral setae. Scutellum greyish microtrichose, distance between apical scutellar setae about 87-100% of that between apical and basal one; basal setae divergent; scut index = 1.08 (1.06-1.14). Pleura dark brown, with a distinct, triangular, white spot below wing base, sterno index = 0.88 (0.82-0.94), median katepisternal seta about 17-25% of anterior one. Two minute proepisternal setae. Haltere white. Legs pale brown, protibia pale yellowish-brown, knees slightly yellowish, all tarsi pale yellowish, tibia slightly thickened apically, metatibia with a double row of slightly elongated ventral setae, preapical setae on all tibiae (small on protibia), apical seta on mesotibia.

Wing hyaline, veins R_{4+5} and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with 12-18 minute, curved costal pegs, length 3.02 (2.62-3.50) mm, length to width ratio = 2.21 (2.05-2.63). Indices: C = 2.32 (2.18-2.39), ac = 3.69 (3.50-4.00), hb = 0.72 (0.68-0.78), 4C = 1.41 (1.29-1.71), 4v = 2.66 (2.35-3.50), 5x = 1.00 (0.80-1.29), M = 0.58 (0.47-0.79), prox. x = 1.30 (1.14-1.64).

Abdomen blackish-brown, with a diffuse, yellowish median area on tergite 1+2, tergites 1-4 subshining, tergites 5-6 shining; some tergites sometimes with a narrow, pale apical band.

Terminalia ♂ (Figs 83-86). Epandrium distally microtrichose, not sclerotised in dorsomedian region, with about 31 lower, and 11 upper setae, ventral lobe indistinct, mostly microtrichose, completely covering surstylos. Cercus linked to hypandrium by membranous tissue, microtrichose. Surstylos slightly microtrichose on inner surface, with a straight row of 11 long, compact, roundish-tipped prensisetae, about 6 long outer, and ca. 7 long inner setae, ventrally with a lobe in lateral view. Decasternum as in Fig. 84. Hypandrium mostly membranous, as long as epandrium, thin, U-shaped; dorsal arch strongly developed, unusually parallel to, and linked with aedeagal apodeme, saddle-shaped in lateral view, ventromedially expanded backwards, like a roof above tip of outer paraphyses; gonopod indistinct, probably completely membranous and/or fused to hypandrial arm, without seta, linked to outer paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses, although no gonopore is vis-

ible. Aedeagal apodeme strongly developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid, each rod-shaped branch articulating with an outer paraphysis. Ventral rod absent. Outer paraphysis strongly developed and sclerotised, sinuate and sharply pointed in lateral view, distally curved inwards in posterior view, subproximally with ca. 2 setulae, linked both to distal branch of aedeagal apodeme and to posterior hypandrial margin by membranous tissue; outer paraphyses narrowly fused to each other and encircling inner paraphyses proximally. Inner paraphyses highly developed and sclerotised, slightly sinuate, bare.

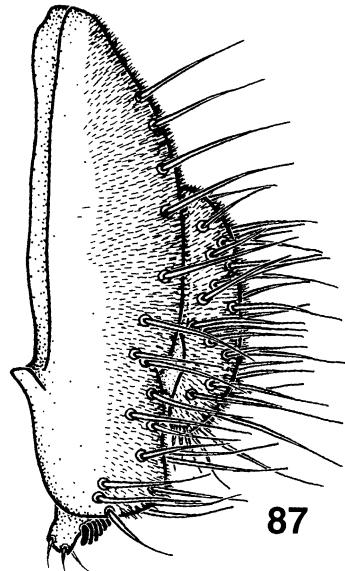
♀. Differences from male: metatibia normal.

Measurements: Frontal length 0.48 (0.45-0.49) mm; frontal index = 1.00 (0.97-1.04), top to bottom width ratio = 1.29 (1.23-1.35). Ocellar triangle about 34-44% of frontal length. Orbital plates about 52-63% of frontal length. Distance of or3 to or1 = 157-167% of or3 to vtm, or1 / or3 ratio = 1.02 (1.00-1.05), or2 / or1 ratio = 0.65 (0.59-0.71), postocellar setae = 32 (28-37)%, ocellar setae = 78% of frontal length; vibrissal index = 0.45 (0.43-0.47). Cheek index about 6-10. Eye index = 1.15 (1.12-1.18). Thorax length 1.89 (1.87-1.90) mm. Transverse distance of dorsocentral setae 250-380% of longitudinal distance; dc index = 0.60. Distance between apical scutellar setae about 93-100% of that of apical to basal one; scut index = 1.10, sterno index = 0.90, median katepisternal seta about 40% of anterior one. Wing length 3.25 (3.15-3.36) mm. Indices: C = 2.35 (2.28-2.42), ac = 3.00, hb = 0.65 (0.60-0.71), 4C = 1.44 (1.33-1.56), 4v = 2.61, 5x = 1.22, M = 0.61, prox. x = 1.22 (1.29-1.38).

Distribution. – A widespread but rarely collected Palaearctic species; northernmost locality: Uppsala (Sweden).

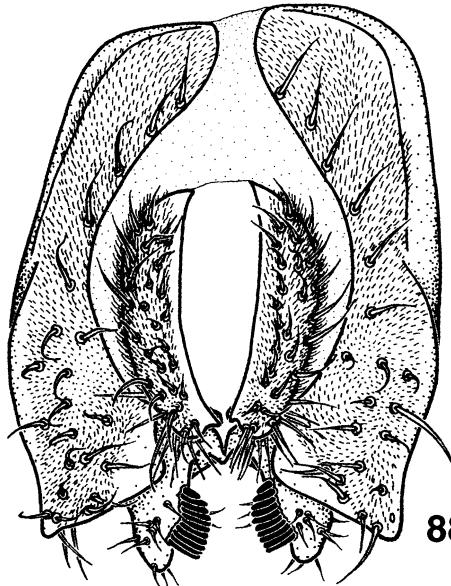
Additional specimens examined. – 4 ♂♂ (RUSSIA: Amur, 1 ♂, 1988; Primorskiy Kray, 1 ♂, 1988; ? [handwriting in Russian], 1 ♂, 1987. SWITZERLAND: Aargau, 1 ♂, 1973), 2 ♀♀ (RUSSIA: Primorskiy Kray, 1 ♀, 1988. SWITZERLAND: Zürich, 1995).

alboguttata

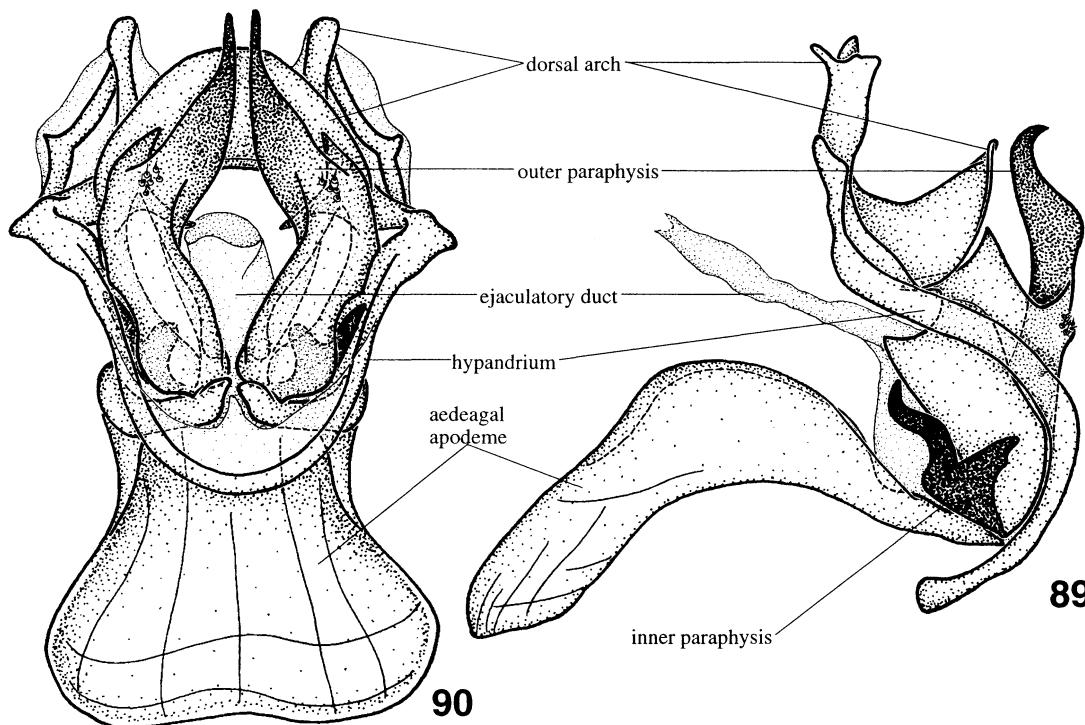


87

0.1 mm



88



90

89

Figs. 87-90. *Amiota alboguttata* (Wahlberg). 87: epandrium, cerci, and surstyli, left lateral view; 88: idem, plus decasternum, posterior view; 89: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 90: idem, posterior view.

Amiota alboguttata (Wahlberg, 1839)

(Figs 41, 62, 64, 76, 79, 80, 87-90)

Drosophila alboguttata Wahlberg, 1839: 22.

Diagnosis. – Metatibia with about four long setae ventrally; in male, abdominal tergites 4 and 5 elongated lateroventrally, tergite 6 as long as broad; outer paraphysis trifurcate, with five to six setulae on mesal surface; inner paraphysis strongly sclerotised, bifurcate (modified from Chen & Toda, 2001).

Redescription. – ♂. Head. Frons blackish, dull, with a very narrow pale anterior border, frontal length 0.40 (0.39-0.41) mm; frontal index = 1.46 (1.35-1.60), top to bottom width ratio = 1.55 (1.47-1.73). Frontal triangle indistinct; ocellar triangle prominent, blackish, subshining in hind corners, about 29-35% of frontal length. Orbital plates narrow, blackish-brown, subshining, about 61-65% of frontal length. Orbital setae black, strong, virtually in a line, distance of or3 to or1 = 167-250% of or3 to vtm, or1 / or3 ratio = 1.09 (1.00-1.21), or2 / or1 ratio = 0.74 (0.65-0.81), postocellar setae = 24 (13-35)%, ocellar setae = 70 (67-74)% of frontal length; vibrissal index = 0.39 (0.33-0.44). Face dark brown, usually with a more or less white band above clypeus. Carina somewhat prominent between the pedicels, flat lower down, not nose-like. Cheek index about 7-10. Eye index = 1.19 (1.12-1.25). Occiput black. Pedicel yellowish-brown. Flagellomere 1 dark brown, length to width ratio = 1.43. Arista (Fig. 64) in basal half with 3-5 dorsal branches, in apical half dorsally and ventrally with some short branches, and about 10-15 inner branches which are relatively long in apical half, short in basal half, and arranged in more than one row, without terminal fork (Fig. 64). Proboscis yellowish. Clypeus black. Palpus pale brownish, medially broad, apically narrowed, with about 5 black and several small, pale setae along lower margin.

Thorax length 1.22 (1.16-1.28) mm, setae black with a golden reflection. Scutum black, shining, postpronotum white, about 8-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 250-278% of longitudinal distance; dc index = 0.67 (0.61-0.73), prescutellar setae distinct, length about 70-100% of that of anterior dorsocen-

tral setae. Distance between apical scutellar setae about 83-110% of that between apical and basal one; basal setae divergent; scut index = 1.14 (1.11-1.17). Pleura (Fig. 41) dark brown, with a distinct, triangular white spot below wing base, sterno index = 0.88 (0.86-0.90), median katepisternal seta about 17-24% of anterior one. Two minute proepipisternal setae. Haltere white. Legs pale brown, all femora and tibiae pale yellowish-brown at tips, all tarsi pale yellowish, tibia slightly thickened apically, metatibia with a single row of 4-8 elongated ventral setae, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins R₄₊₅ and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with a few hardly visible, curved costal pegs, length 2.14 (2.06-2.21) mm, length to width ratio = 2.14 (2.07-2.22). Indices: C = 2.17 (2.00-2.44), ac = 3.36 (3.20-3.60), hb = 0.55 (0.50-0.59), 4C = 1.43 (1.23-1.55), 4v = 2.59 (2.31-2.73), 5x = 1.49 (1.33-1.60), M = 0.68 (0.62-0.73), prox. x = 1.17 (1.15-1.18).

Abdomen blackish-brown, some specimens with a diffuse, yellowish median area on tergite 1+2, tergites 1-4 subshining, tergites 5-6 shining; some tergites sometime with a narrow, pale apical band; tergites 4 and 5 lateroventrally prolonged below level of tergites 2 and 3, tergite 6 dorsally about as broad as long.

Terminalia ♂ (Figs 87-90). Epandrium distally microtrichose, not sclerotised in dorsomedian region, with about 12 lower setae, and 11 upper setae, ventral lobe reduced, distally microtrichose, partially covering surstylos. Cercus linked to hypandrium by membranous tissue, microtrichose. Surstylos with a slightly curved row of 11 long, compact prensisetae, roundish at tip, about 6 long outer, and ca. 8 long inner setae, ventrally with a finger-shaped lobe in lateral view. Decasternum as in Fig. 88. Hypandrium as long as epandrium, thin, U-shaped; dorsal arch strongly developed, unusually parallel to aedeagal apodeme and saddle-shaped in lateral view, ventromedially expanded backwards, like a roof above tip of outer paraphyses; gonopod indistinct, probably completely membranous and/or fused to hypandrium, without seta, linked to anterior paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses, although no gonopore is vis-

ible. Aedeagal apodeme strongly developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid, each rod-shaped branch distally articulating with one outer paraphysis. Ventral rod absent. Outer paraphysis strongly developed and sclerotised, anteroposteriorly flattened, trifurcate, inner branch longer, distally curved inwards, ventrally sinuate, and sharply pointed in lateral view, with ca. 6 setulae subdistally, linked both to distal branch of aedeagal apodeme and to posterior margin of hypandrium (to which the fused gonopods are probably joined) by membranous tissue; inner paraphyses even more sclerotised, bare, bifurcate, and distally slightly encircling base of outer paraphyses, dorsal branch rod-shaped, sinuate and sharply pointed in lateral view.

♀. Differences from male. Metatibia normal. White band of lower face more distinct.

Measurements: Frontal length 0.42 (0.39-0.46) mm; frontal index = 1.13 (1.09-1.23), top to bottom width ratio = 1.35 (1.32-1.38). Ocellar triangle about 33-39% of frontal length. Orbital plates about 56-68% of frontal length. Distance of or3 to or1 = 167-200% of or3 to vtm, or1 / or3 ratio = 0.98 (0.89-1.06), or2 / or1 ratio = 0.83 (0.78-0.88), postocellar setae = 25 (17-30)%, ocellar setae = 80 (74-88)% of frontal length; vibrissal index = 0.42 (0.33-0.50). Cheek index about 7-10. Eye index = 1.20 (1.14-1.22). Thorax length 1.49 (1.42-1.55) mm. Transverse distance of dorsocentral setae 214-242% of longitudinal distance; dc index = 0.64 (0.62-0.67). Distance between apical scutellar setae about 77-100% of that between apical and basal one; scut index = 1.11 (1.06-1.15), sterno index = 0.90 (0.88-0.91), median katepisternal seta about 19-30% of anterior one. Wing length 2.92 (2.80-3.05) mm, length to width ratio = 2.20 (2.11-2.29). Indices: C = 2.42 (2.38-2.45), ac = 3.22 (3.00-3.50), hb = 0.46 (0.43-0.50), 4C = 1.30 (1.18-1.40), 4v = 2.57 (2.39-2.75), 5x = 1.39 (1.29-1.43), M = 0.62 (0.53-0.69), prox. x = 1.07 (0.88-1.20).

♀ Terminalia (Fig. 91). Cerci present, weakly fused to each other anteriorly. Oviscapts absent; sternite 8 simple, with ca. 25 setae, smaller but somewhat resembling preceding sternites, and not protruding beyond epiproct/hypoproct.

Distribution. – Widespread in Europe and East Asia and locally very common; the most abundant *Amiota* species in canopy traps. Recorded

from all Scandinavian countries (Fig. 93), from Estonia and northwestern Russia (St. Petersburg area).

Biology. – Reared from fungi (Smith, 1989).

Additional specimens examined. – 4 ♂♂ (FRANCE, 1988: Ste-Foy-les-Lyon, 2 ♂♂; Aucelon, 2 ♂♂), 4 ♀♀ (SWITZERLAND, 1978: Graubünden).

Amiota flavopruinosa

Duda, 1934

(Figs 69, 70, 94-97)

Amiota flavopruinosa Duda, 1934: 33.

Diagnosis. – Ground-colour golden-brownish; all setae yellowish; outer paraphysis strongly developed, somewhat folded over itself and unusually hanging ventrad.

Description. ♂. Head. Frons greyish-brown in upper half, golden-yellowish below, greyish microtrichose, frontal length 0.39 (0.35-0.41) mm; frontal index = 1.31 (1.17-1.41), top to bottom width ratio = 1.50 (1.33-1.65). Frontal triangle indistinct; ocellar triangle slightly prominent, blackish, subshining in hind corners, about 32-38% of frontal length. Orbital plates narrow, yellowish-brown, apically slightly diverging from eye margin, about 61-76% of frontal length. Orbital setae yellowish-brown, strong, virtually in a line, distance of or3 to or1 = 167-200% of or3 to vtm, or1 / or3 ratio = 1.06 (1.00-1.23), or2 / or1 ratio = 0.80 (0.73-0.87), postocellar setae = 13 (9-19)%, ocellar setae = 73 (67-82)% of frontal length; vibrissa minute, vibrissal index = 0.42 (0.36-0.45). Face yellowish in upper half, shining white below. Carina slightly prominent between pedicels, flattened lower down, not nose-like. Cheek index about 9-20. Eye index = 1.21 (1.18-1.27). Occiput blackish-brown. Antennae yellowish-brown. Flagellomere 1 with diffuse brown border, length to width ratio = 1.43. Arista in basal half with 3-5 dorsal and 1-3 ventral branches, in apical half dorsally and ventrally with some short branches, and about 15 inner branches which are in apical half relatively long, in basal half short and arranged in more than one row, without terminal fork. Proboscis yellowish. Clypeus narrow, brownish-black. Palpus

alboguttata

91

0.1 mm

sternite 8

hypoproct

cercus

basdeni

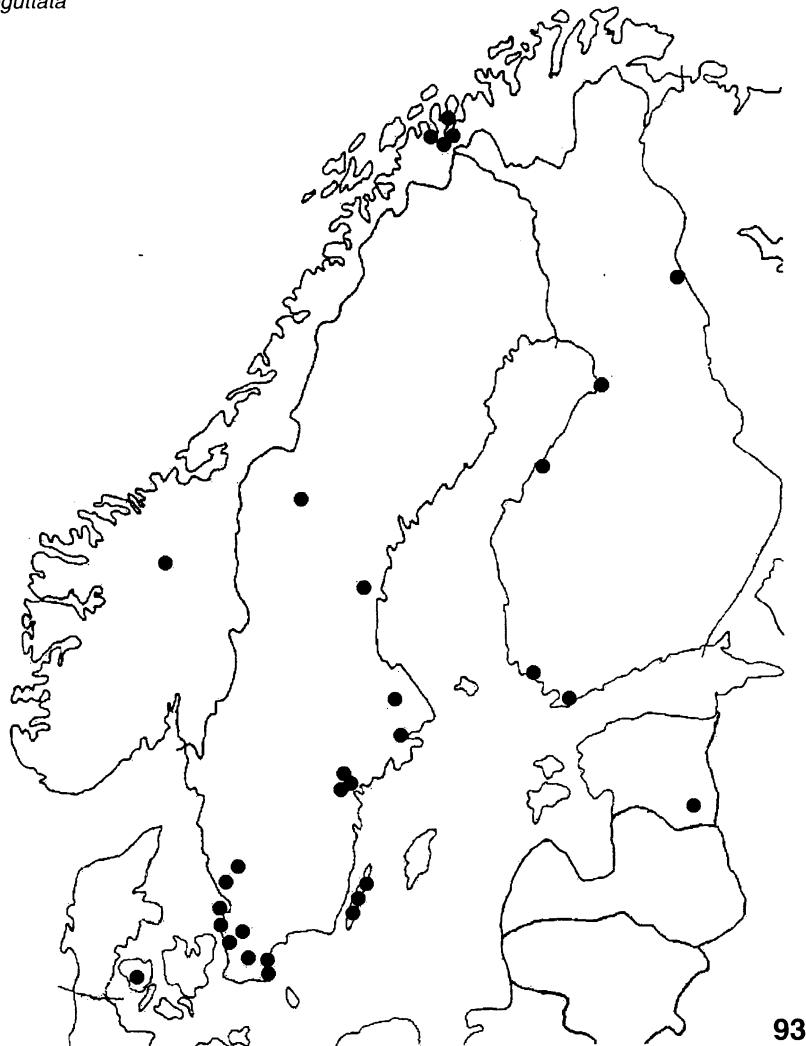
92

Figs. 91-92. Sternite 8, hypoproct and cerci, ventral view of: 91, *Amiota alboguttata*; 92, *Amiota basdeni*.

yellowish-brown, medially broad, apically narrowed, with about 10 black setae along lower border.

Thorax length 1.20 (1.08-1.28) mm. Scutum blackish-brown, paler above wing bases, golden-brownish microtrichose, postpronotum white, about 10 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 250-325% of longitudinal distance; dc index = 0.56 (0.45-0.64), 2 distinct prescutellar setae, length about 70-110% of that of anterior dorsocentral setae. Scutellum pale brownish, microtrichose, distance be-

tween apical scutellar setae about 82-100% of that between apical and basal one; basal setae divergent; scut index = 1.14 (1.11-1.17). Pleura brownish-yellow, with a distinct, triangular white spot below wing base, anepisternum darker, upper border of katepisternum yellowish, sterno index = 0.78 (0.71-0.86), median katepisternal seta minute or missing. Two minute proepisternal setae. Haltere white. Legs yellowish, metafemur with a double row, metatibia with a single row of about 15 yellowish ventral setae, which are about as long as width



93

Fig. 93. Known distribution of *Amiota alboguttata* (Wahlberg) in Scandinavia.

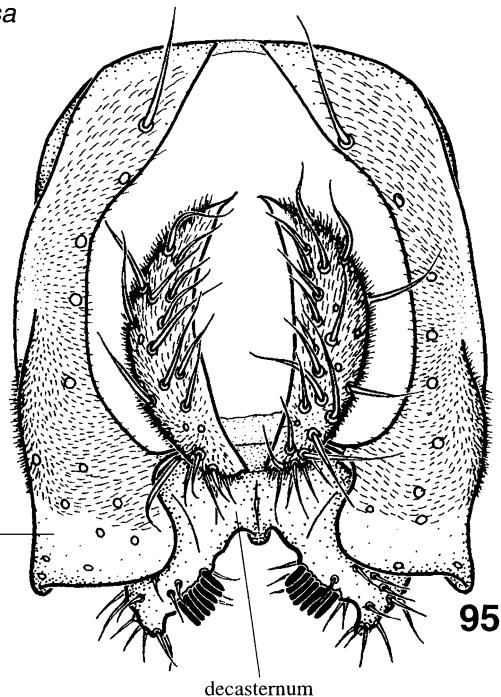
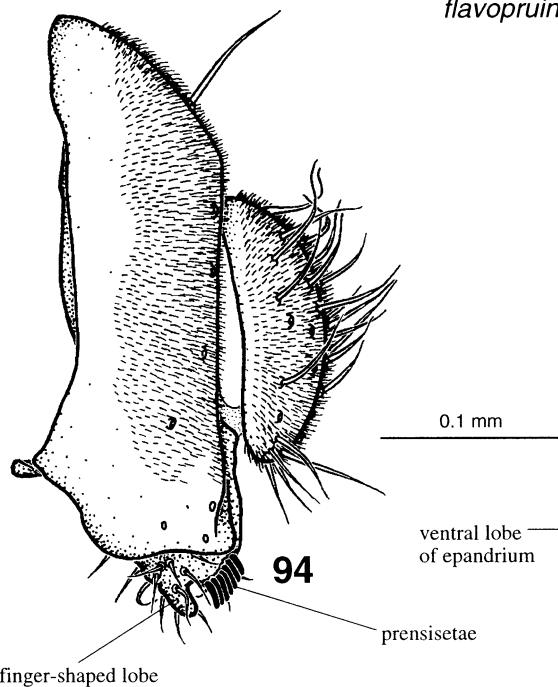
of femur, preapical setae on all tibiae (minute on protibia), apical seta on mesotibia.

Wing hyaline, veins R_{4+5} and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with a few hardly visible, curved costal pegs, length 2.40 (2.27-2.56) mm, length to width ratio = 2.17 (2.09-2.28). Indices: C = 2.34 (2.05-2.71), ac = 3.94 (3.40-4.75), hb = 0.60 (0.53-0.67), 4C = 1.37 (1.13-1.58), 4v = 2.54 (2.20-2.83), 5x = 1.47 (1.29-1.67), M = 0.68 (0.57-0.75), prox. x = 1.19 (0.03-1.33).

Abdomen brownish, subshining, basally, apically and ventrally yellowish, tip roundish.

Terminalia ♂ (Figs 94-97). Epandrium distally microtrichose, not sclerotised in dorso-median region, with about 9 lower setae, and 5 upper setae, ventral lobe dorsodistally microtrichose, partially covering surstylos. Cercus linked to hypandrium by membranous tissue, microtrichose. Surstylos with a straight row of 7 long, compact, roundish-tipped prensisetae, about 9 long outer setae and ca. 9 long inner setae, ventrally with a finger-shaped lobe in lateral view. Decasternum as in Fig. 95. Hypan-

flavopruinosa

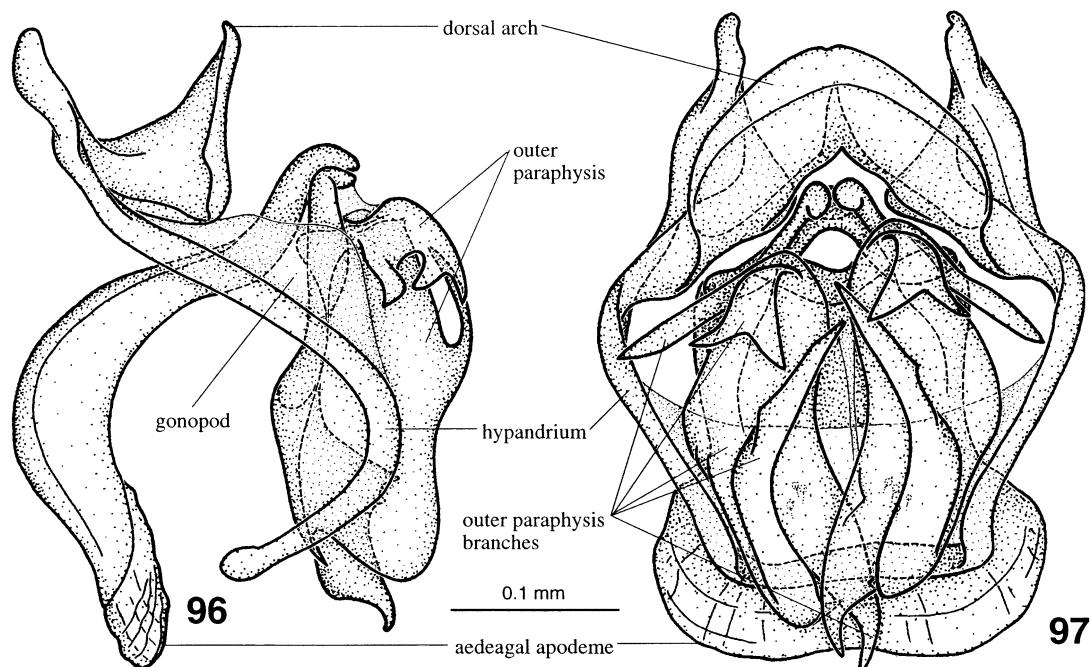


finger-shaped lobe

94

prensistetae

95



Figs. 94-97. *Amiota flavopruinosa* Duda. 94: epandrium, cerci, and surstyli, left lateral view; 95: idem, plus decasternum, posterior view; 96: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 97: idem, posterior view.

drium as long as epandrium, thin, U-shaped; dorsal arch strongly developed, saddle-shaped in lateral view, ventromedially expanded backwards, like a roof above tip of outer paraphyses; gonopod indistinct, probably completely membranous and/or fused to hypandrial arm, without setae, linked to anterior paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses, although no gonopore is visible. Aedeagal apodeme strongly developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid, rod-shaped branches fused apically, where they articulate with outer paraphyses. Ventral rod absent. Outer paraphysis strongly developed and sclerotised, completely bare, anteroposteriorly flattened, somewhat folded over itself, unusually hanging ventrad, trifurcate, proximalmost inner branch bifurcate, inner branches long, slightly sinuate, distally sharp and pointed inwards, linked both to distal margins of aedeagal apodeme and to posterior margin of hypandrium (to which the fused gonopods are probably joined) by membranous tissue; inner paraphyses not recognisable, probably fused either to distal arms of aedeagal apodeme or to outer paraphyses.

♀. Differences from male. Without prolonged ventral setae on hind leg. Mesonotum subshining.

Measurements: Frontal length 0.39 (0.32-0.43) mm; frontal index = 1.12 (1.00-1.27), top to bottom width ratio = 1.32 (1.23-1.40). Ocellar triangle about 32-37% of frontal length. Orbital plates about 63-70% of frontal length. Distance of or₃ to or₁ = 175-200% of or₃ to vtm, or₁ / or₃ ratio = 0.99 (0.89-1.09), or₂ / or₁ ratio = 0.78 (0.71-0.88), postocellar setae = 16 (8-24)%, ocellar setae = 76 (63-87)% of frontal length; vibrissal index = 0.40 (0.36-0.43). Cheek index about 8-15. Eye index = 1.20 (1.14-1.23). Thorax length 1.35 (0.93-1.53) mm. Transverse distance of dorsocentral setae 225-282% of longitudinal distance; dc index = 0.63 (0.59-0.69). Distance between apical scutellar setae about 87-92% of that of apical to basal one; scut index = 1.21 (1.16-1.25), sterno index = 0.77 (0.73-0.85). Wing length 2.61 (1.89-2.91) mm, length to width ratio = 2.10 (2.08-2.13). Indices: C = 2.22 (1.82-2.43), ac = 3.82 (3.00-4.25), hb = 0.51 (0.47-0.57), 4C = 1.52 (1.31-1.70), 4v =

2.77 (2.56-2.90), 5x = 1.52 (1.38-1.80), M = 0.79 (0.69-0.90), prox. x = 1.20 (1.10-1.29).

Distribution. – Probably widespread in Europe but rarely collected. Northernmost locality: Kullaberg (Sweden).

Additional specimens examined. – 6 ♂♂ (SWEDEN [ZMUL]: Kullaberg, 1 ♂, 1975; Sturefors, 1 ♂, 1990. SWITZERLAND: Genève, 2 ♂♂, 1996; Valais, 2 ♂♂, 1993), 4 ♀♀ (SWEDEN [ZMUL]: Sturefors, 1 ♀, 1990. SWITZERLAND: Ticino, 1 ♀, 1995; Valais, 1 ♀, 1997; Zürich, 1 ♀, 1992).

Amiota subtusradiata

Duda, 1934

(Figs 71, 72, 98-101)

Amiota subtusradiata Duda, 1934: 32.

Amiota chungi Okada, 1971: 85.

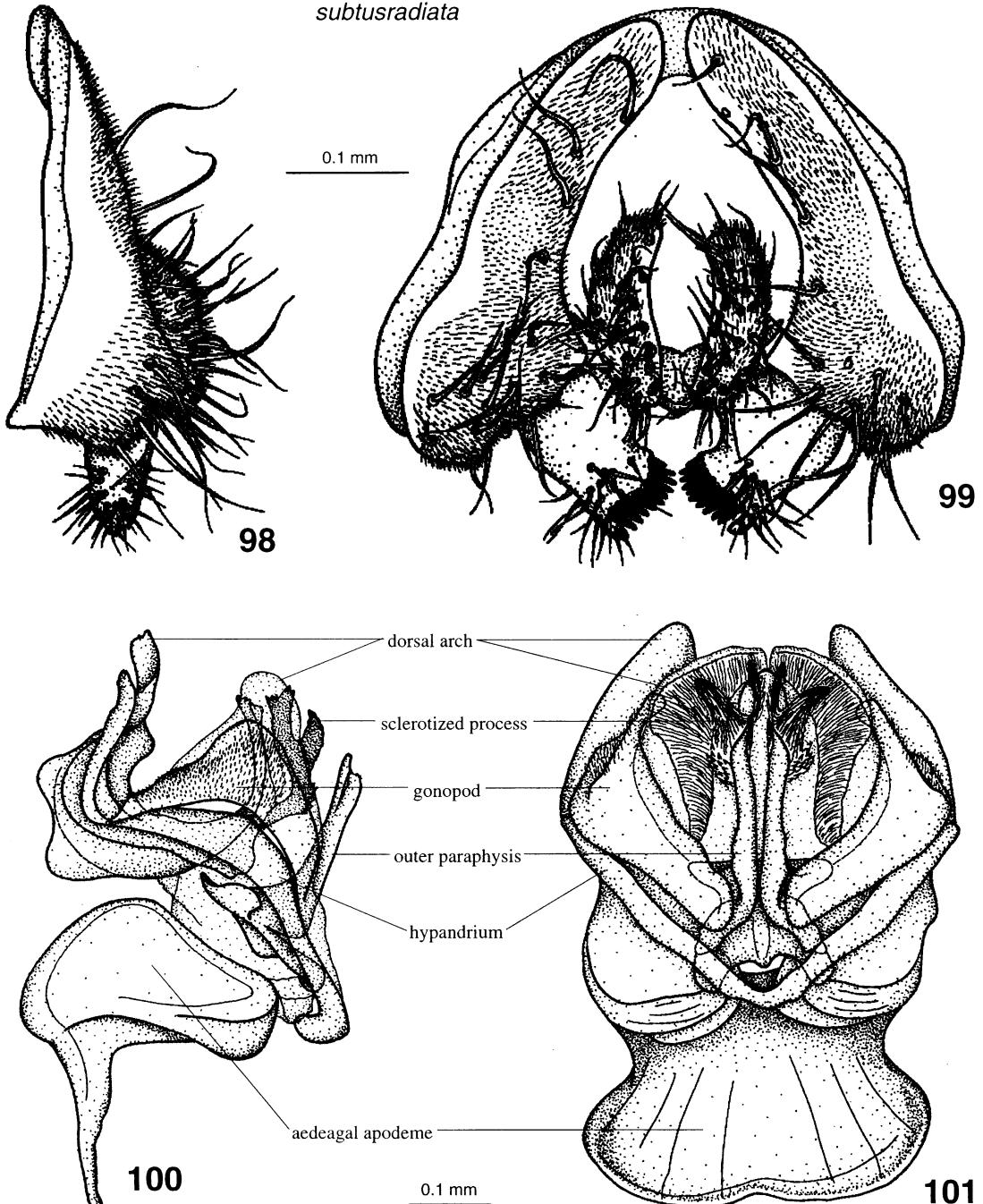
Amiota neochungi Takada, Beppu & Toda, 1979: 110.

Amiota quadrata Takada & Toda, 1981: 2 (subspecies).

Diagnosis. – Fourth sternite large, black; epandrium anteroposteriorly remarkably flattened, especially dorsally; dorsal arch distally with a pair of strongly sclerotised, trifurcate, roughly serrate and striated processes, dorsolaterally bordered by a pair of broad, membranous, pleated processes; distal branches of aedeagal apodeme remarkably broad in lateral view (modified from Chen & Toda, 2001).

Redescription. – ♂. Head. Frons blackish-brown, dull, darker and subshining at vertex, paler above antennae, frontal length 0.49 mm; frontal index = 1.21, top to bottom width ratio = 1.33. Frontal triangle indistinct; ocellar triangle slightly prominent, blackish, subshining, about 41% of frontal length. Orbital plates narrow, brownish, subshining, about 69% of frontal length. Orbital setae black, strong, virtually in a line, distance of or₂ to or₁ = 50% of or₂ to or₃; distance of or₃ to or₁ = 133% of or₃ to vtm; vibrissal index = 0.54. Face brown in upper two-thirds, shining white below. Carina visible between pedicels, dorsally flat, short. Genal whitish, index about 12. Eye bare, roundish. Occiput concave, blackish-brown. Pedicel brownish. Flagellomere 1 dark brown, length to width ratio = 1.44. Arista with 4 dorsal and 3 ventral

subtusradiata



Figs. 98-101. *Amiota subtusradiata* Duda. 98: epandrium, cerci, and surstyli, left lateral view; 99: idem, plus decasternum, posterior view; 100: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 101: idem, posterior view.

branches, and about 20 inner branches which are arranged in more than one row in basal half, plus a small terminal fork. Clypeus narrow, dark brown. Palpus brownish, flat, broad, apically narrowed, with about 3 black setae along lower margin.

Thorax length 1.84 mm. Scutum black, subshining, postpronotum white, about 14-16 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 285% of longitudinal distance; dc index = 0.67. 2 distinct prescutellar setae, length about 96% of anterior dorsocentral setae. Scutellum greyish microtrichose, distance between apical scutellar setae about 87% of that between apical and basal one; Pleura brownish, with a distinct, triangular, white spot below the wing base, median katepisternal seta about 27% of anterior one. 2 minute proepisternal setae. Haltere whitish-yellow. Legs pale yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins R₄₊₅ and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with a few hardly visible curved, costal pegs, length about 3.5 mm, length to width ratio = 2.28. Indices: C = 1.96, ac = 3.48, hb = 0.75, 4C = 1.57, 4v = 2.51, 5x = 1.10, M = 0.65, prox. x = 1.37.

Abdomen blackish-brown, shining, with a diffuse, yellowish median area at base, tergites 1-4 subshining; some tergites sometimes with a more or less narrow, pale apical band.

Terminalia ♂ (Figs 98-101). Epandrium distally microtrichose, not sclerotised in dorso-median region, anteroposteriorly flattened, with about 17 lower setae, and ca. 5 upper setae, ventral lobe reduced, distally microtrichose, not covering surstyli. Cercus small, linked to hypandrium by membranous tissue, microtrichose. Surstyli large with a curved row of ca. 10 long, compact, roundish-tipped prensisetae, about 14 long outer, and ca. 12 long inner setae, ventrally with a finger-shaped lobe in posterior view. Decasternum as in Fig. 99. Hypandrium shorter than epandrium, thin, V-shaped; dorsal arch strongly developed, ventromedially weakly sclerotised, expanded backwards, like a roof above tip of outer paraphyses, medially with a pair of strongly sclerotised, trifurcate, proximally scaled, distally striate processes, dorsolaterally bordered by a pair of membranous and finely pleated processes; gonopod dorsally microtrichose, without seta, linked to ante-

rior paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses, although no gonopore is visible. Aedeagal apodeme strongly developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid. Ventral rod absent. Outer paraphyses proximally fused to each other, dorsolaterally expanded outwards subproximally, distally pointed backwards, subapically slightly serrate ventrally, each plate submedially with ca. 3 tiny setulae laterally and linked both to inner corner of branch of aedeagal apodeme and to median inner margin of gonopod by membranous tissue; inner paraphyses not recognisable, probably fused ventrally to outer paraphyses.

Distribution. – A few records from Europe and East Asia, where this species has been recorded under the three junior synonyms mentioned above. One record from Finland (Tvärminne, type locality) and one from the St. Petersburg area.

Additional specimens examined. – None.

***basdeni* species group**

Chen & Toda, 2001

Diagnosis. – Surstylus with a microtrichose and well-developed dorsal lobe, with distal margin conspicuously sinuate, with one to five setulae which almost reach prensisetae; dorsal arch anteriorly with a pair of strongly sclerotised, horn-shaped processes, distally loosely membranous; outer paraphysis slender, pointed apically, weakly sclerotised, with a row of ca. 8-10 setulae medially; inner paraphysis curved, strongly sclerotised, anteriorly encircling outer paraphysis; female terminalia with a conspicuously V-shaped sternite 8, with a row of peg-like, sharply pointed setae (modified from Chen & Toda, 2001).

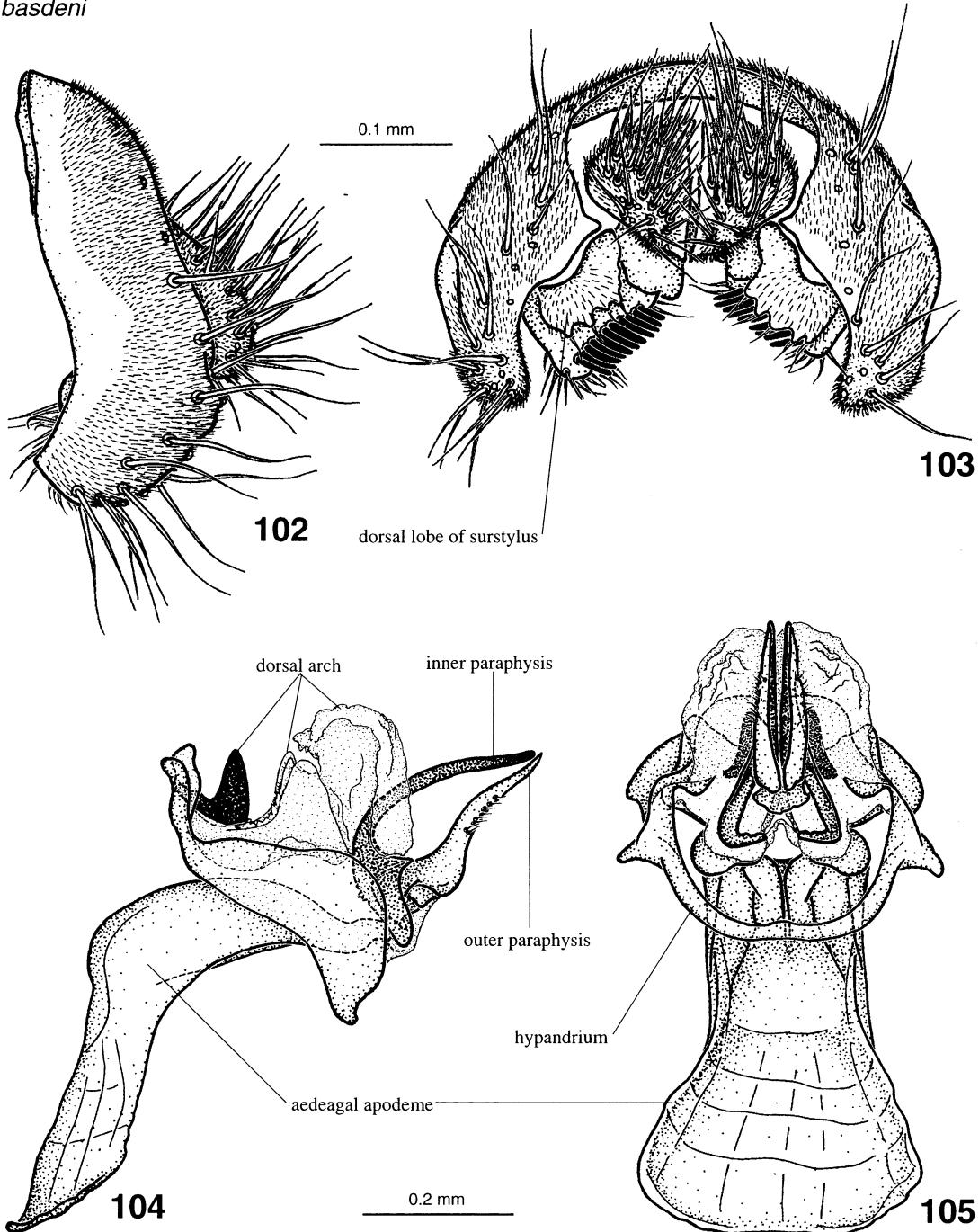
Taxa included. – 8 Palaearctic species.

Amiota basdeni

d'Assis-Fonseca, 1965

(Figs 63, 73-75, 102-105)

Amiota basdeni d'Assis-Fonseca, 1965: 243.



Figs. 102-105. *Amiota basdeni* d'Assis-Fonseca. 102: epandrium, cerci, and surstyli, left lateral view; 103: idem, plus decasternum, posterior view; 104: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 105: idem, posterior view.

Diagnosis. – Ventral branches of arista almost as long as dorsal ones: surstyli with a microtrichose and well-developed dorsal lobe, which is distomarginally conspicuously undulate, with 3-4 setulae which almost reach prensisetae; outer paraphysis slender, pointed apically, weakly sclerotised, with 9-10 long sensilla medially; inner paraphysis curved, strongly sclerotised, anteriorly encircling outer paraphysis; female sternite 8 with a row of ca. 10 stout setae (Chen & Toda, 2001, modified).

Redescription. – ♂. Head. Frons brown, dull, frontal length 0.39 (0.35-0.41) mm; frontal index = 1.14 (1.05-1.21), top to bottom width ratio = 1.46 (1.41-1.50). Frontal triangle indistinct; ocellar triangle prominent, blackish, subshining in hind corners, about 35-43% of frontal length. Orbital plates brownish, subshining, about 62-67% of frontal length. Orbital setae black, strong, distance of or3 to or1 = 129-167% of or3 to vtm, or1 / or3 ratio = 0.96 (0.94-1.00) or2 / or1 ratio = 0.82 (0.78-0.93), postocellar setae = 18 (17-19)% , ocellar setae = 79 (0.71-0.83)% of frontal length; vibrissal index = 0.49 (0.38-0.67). Face yellowish-brown, lower margin of face with a usually shining white band which is 1/4-1/3 face height. Carina narrow and prominent between pedicels, broad and flat downwards. Cheek index about 8-11. Eye index = 1.23 (1.19-1.28). Occiput blackish-brown. Antennae yellowish-brown. Arista (Fig. 63) in basal half with 2-5 dorsal and 1-3 ventral branches, in apical half dorsally and ventrally with some short branches, and about 10-15 inner branches which in apical half are relatively long, in basal half short and arranged in more than one row, without distinct terminal fork. Proboscis yellowish. Clypeus narrow, black. Palpus yellowish-brown, medially broad, apically narrowed, with about 5 blackish setae along lower margin.

Thorax length 1.43 (1.32-1.48) mm. Scutum black, shining, postpronotum white, about 10-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 291-375% of longitudinal distance; dc index = 0.61, 2 distinct prescutellar setae, length about 80-90% of anterior dorsocentral setae. Scutellum brownish, subshining, distance between apical scutellar setae about 92-120% of that between apical and basal one; basal setae divergent. Pleura dark brown, with a distinct, triangular white spot below wing base, usually with

some diffuse yellowish areas, mostly along upper margin of katepisternum and below postpronotum, sterno index = 0.83 (0.81-0.88), median katepisternal seta about 26-36% of anterior one. 2 minute proepisternal setae. Haltere white. Legs yellowish-brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins R₄₊₅ and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with a few hardly visible, curved, costal pegs, length 2.52 (2.41-2.63) mm, length to width ratio = 2.08 (2.00-2.18). Indices: C = 1.86 (1.78-1.95), ac = 4.03 (3.50-4.60), hb = 0.64 (0.57-0.71), 4C = 1.51 (1.40-1.64), 4v = 2.37 (2.13-2.64), 5x = 1.25 (1.13-1.29), M = 0.61 (0.56-0.64), prox. x = 1.03 (0.94-1.07).

Abdomen blackish-brown, with a diffuse, median yellowish area on tergite 1+2, tergites 1-4 subshining, tergites 5-6 shining; some tergites sometimes with a narrow, pale apical band.

Terminalia ♂ (Figs 102-105). Epandrium distally microtrichose, with about 20 lower setae, and ca. 6 upper setae, ventral lobe microtrichose, covering surstyli. Cercus densely setose, linked to hypandrium by membranous tissue, microtrichose. Surstyli large with an almost straight row of ca. 11 long, compact, roundish-tipped prensisetae, with 1 outer, and ca. 14 inner setae, dorsally expanded and folded over itself as a microtrichose lobe, with distal margin conspicuously sinuate and with 4-5 setae, which almost reach prensisetae. Decasternum as in Fig. 103. Hypandrium shorter than epandrium, thin, U-shaped; dorsal arch strongly developed, ventromedially with a pair of strongly sclerotised, horn-shaped processes proximally, distally mostly membranous and expanded backwards, like a roof above tip of outer paraphyses; arms medially expanded outwards; gonopod not recognisable, probably membranous and/or fused to hypandrial arm, linked to anterior paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses, although no gonopore is visible. Aedeagal apodeme strongly developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid. Ventral rod absent. Outer paraphysis sinuate, distally pointed backwards, medially with a row of ca. 8 setae ventrolaterally, and linked both to distal branch of

aedeagal apodeme and to median inner margin of gonopod by membranous tissue; inner paraphyses strongly sclerotised, bare, anteriorly expanded and curved inwards and somewhat encircling base of outer paraphysis in posterior view, distally bow-shaped, sharply pointed and reaching tip of outer paraphysis in lateral view.

♀. Measurements: Frontal length 0.41 (0.39-0.44) mm; frontal index = 1.14 (1.00-1.35), top to bottom width ratio = 1.31 (1.22-1.41). Ocellar triangle about 35-43% of frontal length. Orbital plates about 61-68% of frontal length. Distance of or3 to or1 = 114-183% of or3 to vtm, or1 / or3 ratio = 0.97 (0.89-1.00), or2 / or1 ratio = 0.83 (0.71-0.94), postocellar setae = 22 (16-25)%, ocellar setae = 78 (74-80)% of frontal length; vibrissal index = 0.54 (0.43-0.83). Cheek index about 8-12. Eye index = 1.27 (1.20-1.33). Thorax length 1.49 (1.27-1.62) mm. Transverse distance of dorsocentral setae 300-320% of longitudinal distance; dc index = 0.61 (0.59-0.64). Distance between apical scutellar setae about 83-92% of that between apical and basal one; scut index = 1.52 (1.38-1.67), sterno index = 0.86, median katepisternal seta about 21-30% of anterior one. Wing length 2.74 (2.38-3.15) mm, length to width ratio = 2.02 (1.98-2.09). Indices: C = 2.17 (1.92-2.39), ac = 3.75 (3.50-4.00), hb = 0.62 (0.56-0.67), 4C = 1.40 (1.29-1.50), 4v = 2.41 (2.18-2.59), 5x = 1.39 (1.25-1.50), M = 0.66 (0.59-0.71), prox. x = 1.11 (1.00-1.25).

♀ Terminalia (Fig. 92). Cerci present, not fused anteriorly. Oviscapts absent; sternite 8 conspicuously V-shaped, curved, with a central row of ca. 10 sharp-tipped, peg-like setae, and ca. 4 long setae at each lateral margin. As stated by Grimaldi (1990: 97), this seems to be intermediate between a plesiomorphic state with a simple sternite 8 (resembling the preceding sternites, as in *Amiota alboguttata*, Fig. 91), which is horizontally positioned and does not protrude beyond epiproct/hypoproct, and an apomorphic state with sternite 8 distally bifurcate into the two valves present in a typical drosophilid oviscapts, which is vertically positioned and protrudes backwards as a lobe.

Distribution. – Central Europe, reaching Serbia in the south, Denmark, southern Sweden and Great Britain in the north. Very common in canopy traps in Switzerland.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Bern, 1 ♂, 1973; Solothurn, 1 ♂,

1973; Vaud, 2 ♂♂, 1970), 4 ♀♀ (SWITZERLAND: Schaffhausen, 1 ♀, 1992; Zürich, 3 ♀♀, 1992, 1994, 1996).

rufescens species group

Chen & Toda, 2001

Diagnosis. – Prensisetae on surstylus long, pointed apically (Chen & Toda, 2001).

Taxa included. – *A. rufescens* (Oldenberg, 1914), *A. stylopyga* Wakahama and Okada, 1958, *A. magniflava* Chen & Toda, 2001.

Amiota rufescens (Oldenberg, 1914)

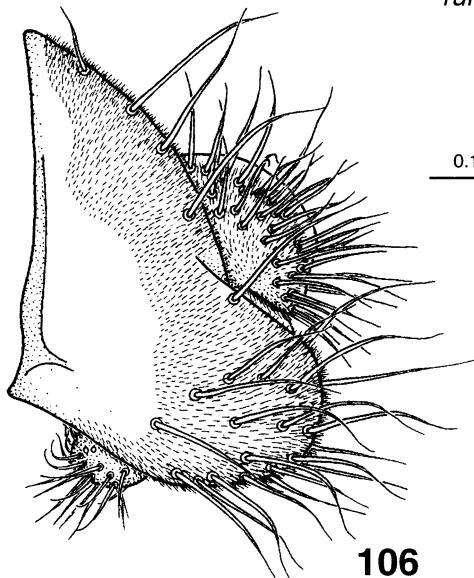
(Figs 61, 65, 66, 106, 109)

Phortica rufescens Oldenberg, 1914: 21.

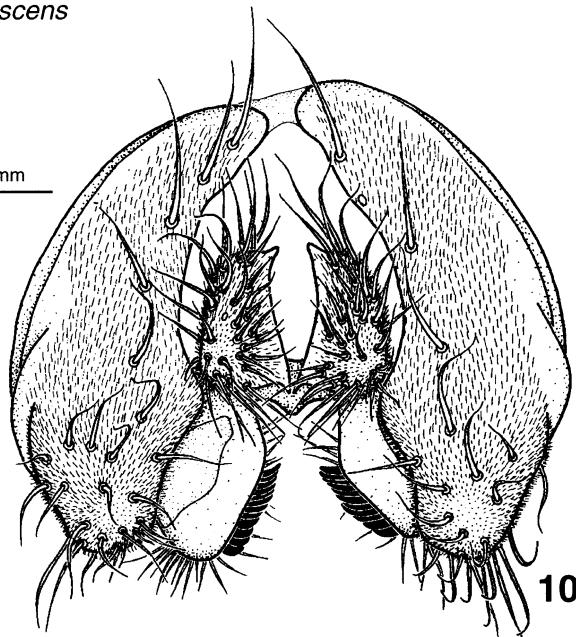
Diagnosis. – Epandrium dorsally very narrow, with a well-developed ventral lobe projecting backwards and apically roundish in lateral view; surstylus with 10-12 prensisetae; outer paraphysis long, straight, rod-shaped, slightly microtrichose distolaterally, anteriorly bent laterad; dorsal arch strongly developed, distally expanded backwards and longer than wide in posterior view.

Redescription. – ♂. Head. Frons brownish-yellow, paler below, dull, frontal length 0.60 (0.56-0.51) mm; frontal index = 1.12 (1.07-1.20), top to bottom width ratio = 1.37 (1.30-1.42). Frontal triangle indistinct; ocellar triangle prominent, brown, blackish on inner sides of ocelli, subshining in hind corners, about 32-43% of frontal length. Orbital plates narrow, pale yellow, apically slightly diverging from eye border, about 55-64% of frontal length. Orbital setae black, strong, distance of or3 to or1 = 143-200% of or3 to vtm, or1 / or3 ratio = 1.00 (0.90-1.11), or2 / or1 ratio = 0.65 (0.57-0.78), postocellar setae = 24 (21-29)%, ocellar setae = 71 (62-79)% of frontal length; vibrissal index = 0.44 (0.36-0.50). Face yellowish-brown in upper half, shining white below. Carina prominent, broadly keeled, not nose-like. Cheek index about 7-11. Eye index = 1.20 (1.17-1.24). Occiput blackish-brown, paler above foramen, with a narrow yellowish border. Antennae yellowish. Flagellomere 1 slightly darker, length to width ratio =

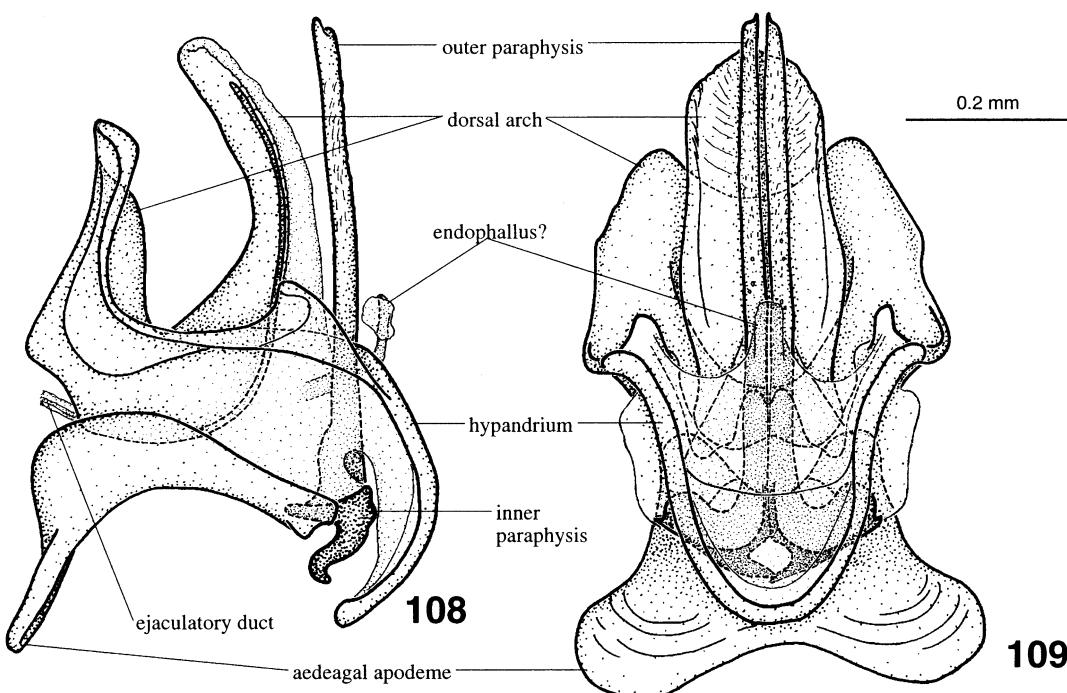
rufescens



106



107



Figs. 106-109. *Amiota rufescens* (Oldenberg). 106: epandrium, cerci, and surstyli, left lateral view; 107: idem, plus decasternum, posterior view; 108: hypandrium, dorsal arch, paraphyses, and aedeagal apodeme, left lateral view; 109: idem, posterior view.

2.00. Arista in basal half with 5-6 dorsal and 2-4 ventral branches, in apical half dorsally and ventrally with some short branches, and about 15-20 inner branches which are relatively long in apical half, in basal half short and arranged in more than one row, without terminal fork.

Thorax length 1.81 (1.70-1.87) mm. Scutum yellowish-brown, dark brown in posterior third, shining, postpronotum white, about 12-14 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 250-345% of longitudinal distance; dc index = 0.54 (0.50-0.57), 2 distinct prescutellar setae, length about 108-129% of that of anterior dorsocentral setae. Scutellum greyish microtrichose, distance between apical scutellar setae about 80-107% of that between apical and basal one; basal setae divergent; scut index = 1.06 (1.05-1.07). Pleura pale brownish, with a distinct, triangular white spot below wing base and a diffuse blackish spot on anepisternum, sterno index = 0.82 (0.73-0.89), median katepisternal seta about 15-32% of anterior one. Two minute proepisternal setae. Haltere white. Legs yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins R₄₊₅ and M apically distinctly converging, discal and second basal cells separated, C-III apicoventrally with a few hardly visible, curved, costal pegs, length 3.15 (2.97-3.22) mm, length to width ratio = 2.18 (2.14-2.24). Indices: C = 2.35 (2.12-2.55), ac = 3.73 (3.29-4.17), hb = 0.72 (0.68-0.77), 4C = 1.20 (1.10-1.47), 4v = 2.24 (2.05-2.65), 5x = 1.32 (1.11-1.50), M = 0.57 (0.48-0.65), prox. x = 1.09 (0.90-1.35).

Abdomen blackish-brown, with a diffuse, yellowish median area, shining; some tergites sometimes with a more or less broad, pale, apical band.

Terminalia ♂ (Figs 106-109). Epandrium distally microtrichose, with about 22 lower setae, and ca. 5 upper setae, ventral lobe distally microtrichose, expanded backwards in lateral view and mostly covering surstyli. Cercus small, linked to hypandrium by membranous tissue, microtrichose. Surstylus large, medioanteriorly membranous, with a straight row of ca. 12 long, compact, sharp-tipped prensisetae, with no outer, and ca. 23 inner setae. Decasternum as in Fig. 107. Hypandrium longer than epandrium, thin, V-shaped; dorsal arch strongly developed, distally strongly expanded backwards, like a roof above tip of outer paraphyses; gono-

pod not recognisable, probably membranous and/or fused to hypandrium, linked to anterior paraphysis by membranous tissue. Aedeagus absent; ejaculatory duct apparently running between aedeagal apodeme and paraphyses and apparently ending as a pale membranous tube (probably the endophallus), just visible in lateral as well as in posterior view. Aedeagal apodeme well-developed, bent, plate-like (dorsoventrally flattened), anteriorly expanded laterally, ventromedially concave, medioposteriorly bifid. Ventral rod absent. Outer paraphysis rod-shaped, straight, anteriorly bent laterad, pointed backwards, dorsodistally slightly expanded and sharply pointed, distolaterally slightly microtrichose, ventromedially with ca. 4 tiny setulae and linked both to distal branch of aedeagal apodeme and to median inner margin of gonopod by membranous tissue; inner paraphyses strongly sclerotised, bare, dorsally fused to outer paraphysis, anteriorly expanded, sharply pointed inwards, with tips touching each other.

♀. Measurements: Frontal length 0.52 (0.51-0.53) mm; frontal index = 1.01 (1.00-1.03), top to bottom width ratio = 1.27. Ocellar triangle about 35-37% of frontal length. Orbital plates about 60-61% of frontal length. Distance of or3 to or1 = 143-157% of or3 to vtm, postocellar setae = 26 (23-29)% of frontal length; vibrissal index = 0.41. Cheek index about 8-11. Eye index = 1.32 (1.30-1.33). Thorax length 2.06 mm. Transverse distance of dorsocentral setae 286-383% of longitudinal distance. Distance between apical scutellar setae about 88-106% of that of apical to basal one; scut index = 1.11, sterno index = 0.90 (0.89-0.92), median katepisternal seta about 18-21% of anterior one. Wing length 3.73 (3.67-3.78) mm, length to width ratio = 2.01 (2.04-2.06). Indices: C = 2.56 (2.50-2.62), ac = 3.79 (3.25-4.33), hb = 0.65 (0.62-0.69), 4C = 1.24, 4v = 2.45 (2.43-2.48), 5x = 1.35 (1.30-1.40), M = 0.64 (0.62-0.67), prox. x = 1.26 (1.24-1.29).

Distribution. – Widespread in Europe but rarely collected. Northernmost record from Oulu (Finland), also found in Russia (St. Petersburg area) and Belarus.

Additional specimens examined. – 4 ♂♂ (BELARUS: Gomel, 1 ♂, 1983. SWITZERLAND: Valais, 3 ♂♂, 1997), 2 ♀♀ (FINLAND: Oulu, 1 ♀, 1979. SWITZERLAND: Valais, 1 ♀, 1995).

Comments. – This species has been misidentified as *A. leucostoma* Loew by several authors.

Genus *Cacoxenus* Loew, 1858

Domomyza Rondani, 1856: 121 (suppressed).
Cacoxenus Loew, 1858: 217. Type species: *Cacoxenus indagator* Loew, 1858.
Paragitona Kröber, 1912: 235.
Gitonides Knab, 1914: 165 (subgenus).
Eudrosophila Malloch, 1924: 63.
Nankangomyia Máca & Lin, 1993: 7 (subgenus).

Diagnosis. – Arista microtrichose; carina, if present, prominent but not nose-like; all frontal setae large; prescutellar setae large; crossvein bM-Cu present, but may be faint; Costa faint behind tip of R₄₊₅.

Taxa included. – 37 species included in 5 subgenera. One subgenus, *Nankangomyia* Máca & Lin, originally included in the genus *Leucophenga*, has recently been transferred to *Cacoxenus* (Sidorenko, 2002). Five species have been recorded in Europe.

Comments. – For many years this genus was considered as belonging to the Agromyzidae. The monotypic genus *Domomyza* Rondani and the species *Domomyza cincta* Rondani were both described in 1856 in the Agromyzidae (Rondani, 1856). The type specimen was revised by Deeming (1988), who realized that the latter is a senior synonym of *Cacoxenus indagator*, the type species of the genus *Cacoxenus*. Accordingly the genus *Cacoxenus* proved to be a junior synonym of the genus *Domomyza*. However, for the sake of nomenclatural stability, the International Commission for Zoological Nomenclature decided to suppress both the generic and the specific senior synonyms (ICZN, 1997).

According to phylogenetic studies, *Cacoxenus* is closely related to the genus *Gitona* (see Grimaldi, 1990; Sidorenko, 2002). There are no clearcut external characters to separate all the species of the two genera.

The larvae of some *Cacoxenus* species are reportedly found as commensals in the nests of solitary bees (*Osmia* spp., Megachilidae) (Tsacas & Desmier de Chenon, 1976; Ashburner, 1981; Tsacas & Chassagnard, 1999); others have been reported as being entomopha-

gous. The flies are rarely attracted to fruit baits but are often found together with their hosts.

Cacoxenus (Gitonides) perspicax (Knab, 1914) (and siblings of this species) have been recorded in sugar cane production areas, where the larvae are predacious on sugar cane mealy bugs. Records nearest to Europe are from Israel and Egypt. The flies are easily recognisable by a narrow, horizontal band across the eyes.

Several new species of *Cacoxenus* belonging to the subgenus *Gitonides* were recently described from India and Australia (Chassagnard & Tsacas, 2003).

Key to European species of *Cacoxenus*

- 1 14-20 irregular rows of acrostichal setulae. Scutum unicolourous blackish-brown, greyish microtrichose, without darker spots. All tibiae without preapical seta. Mesocoxa with 2 strong setae, besides a few smaller ones. Metatarsomere 1 with a brush-like structure beneath, broad and swollen in male (Fig. 110). (Male terminalia Figs 113, 114) (subgenus *Cacoxenus*)
..... *C. indagator* Loew (widespread in Central and South Europe)
- 8-10 rows of acrostichal setulae. Scutum with or without darker spots. At least mesotibia with a (sometimes short) preapical seta. Mesocoxa with several setae of nearly equal size. Metatarsomere 1 normal (subgenus *Paracacoxenus*)
..... 2
- 2(1) Frons greyish microtrichose. (Male: mesotibia with a distinctly prolonged preapical seta (Fig. 111). Terminalia Figs 115, 116. Syntergite 7 (Fig. 117) ventrally with a claw-like extension)
..... *C. argyreator* Frey
- Frons, except orbital plates, velvety black
..... 3
- 3(2) Posterior reclinate orbital seta nearer to medial vertical seta than to anterior reclinate one (Fig. 112). (Male terminalia Fig. 118).
..... *C. exiguus* Duda (Central Europe)

- Posterior reclinate orbital seta sometimes nearer to anterior reclinate one than to medial vertical seta 4
- 4(3) Scutum subshining. Haltere brown *C. inquilinus* Hendel
(Central Europe)
- Scutum microtrichose, black. Haltere yellow *C. kaszabi* (Okada)
(Mongolia; recorded from the Czech Republic [Bohemia] and Slovakia)

Subgenus *Cacoxenus* Loew, 1858

Diagnosis. – Acrostichal setulae in at least 14 irregular rows; scutum without dark spots; mesocoxa with 2 prominent setae; dorsal preapical setae absent.

Taxa included. – *C. indagator* Loew, 1858, monotypic.

Cacoxenus indagator Loew, 1858

(Figs 110, 113, 114, 119-122)

Domomyza cincta Rondani, 1856: 121 (suppressed).

Cacoxenus indagator Loew, 1858: 218.

Paragitonina obscura Kröber, 1912: 236.

Diagnosis. – Generally blackish flies, mesonotum with greyish microtrichosity. Male: surstyli very broad, somewhat roundish, not microtrichose.

Redescription. – ♂. Head. Frons blackish, dull; frontal length 0.50 (0.47-0.53) mm; frontal index = 1.37 (1.32-1.43), top to bottom width ratio = 1.28 (1.22-1.32). Frontal triangle indistinct, ocellar triangle prominent, black, about 26-39% of frontal length. Orbital plates slightly greyish microtrichose, narrow, not diverging from eye margin, about 58-66% of frontal length. Orbital setae black, strong, in a line, or2 distinctly closer to or1 than to or3, distance of or3 to or1 = 200-233% of or3 to vtm, or1 / or3 ratio = 1.08 (0.94-1.21), or2 / or1 ratio = 0.92 (0.81-1.00), postocellar setae = 21 (14-30)%, ocellar setae = 54 (50-57)% of frontal length, vibrissal index =

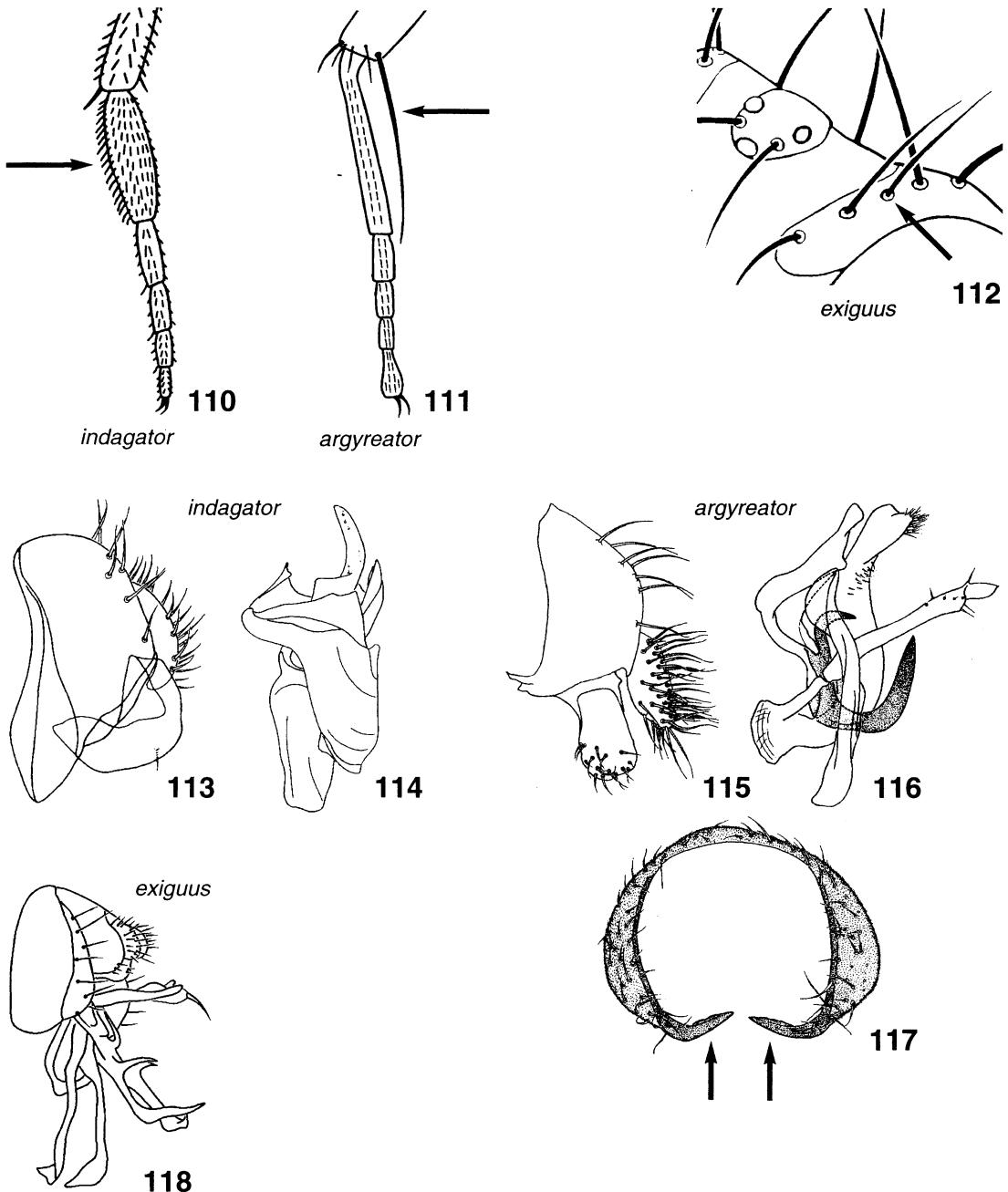
0.55 (0.40-0.93). Face blackish-brown, dull. Cårina flat, almost invisible. Cheek index about 10-17. Eye bare, index = 1.28 (1.23-1.40). Occiput blackish. Pedicel dark brown. Flagellomere 1 blackish, length to width ratio = 1.00-1.30. Arista microtrichose. Proboscis blackish. Palpus with about 8 black, short setae along ventral margin, apical one longer than the others.

Thorax length 1.54 (1.46-1.65) mm. Scutum black, almost greyish dull, spots at bases of setae very small, 12-14 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 333-517% of longitudinal distance; dc index = 0.53 (0.52-0.54). 2 distinct prescutellar setae, length about 90-110% of anterior dorsocentral setae. Scutellum black, dull greyish, distance between apical scutellar setae about 92-100% of that between apical and basal one, basal setae divergent; scut index = 1.06 (0.86-1.22). Pleura blackish, brownish microtrichose, sterno index = 0.91 (0.82-0.95), median katepisternal seta minute. Haltere yellowish, knob white. Legs black, tarsi slightly paler, metatarsomere 1 (Fig. 110) swollen, dorsoventrally slightly depressed, with a ventral brush, preapical setae absent, apical seta on mesotibia, but hardly distinguishable from other setae.

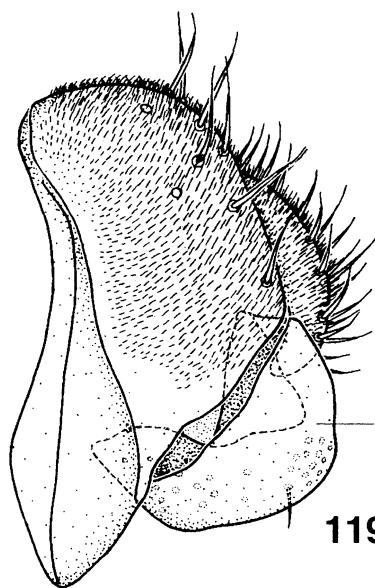
Wing almost hyaline, some specimens with a diffuse shadow along costa, C-IV distinctly thinner than C-III, dM-Cu present, length 2.37 (2.17-2.62) mm, length to width ratio = 2.25 (2.21-2.28). Indices: C = 3.10 (2.92-3.43), ac = 1.63, hb = 0.30 (0.23-0.38), 4C = 1.14 (1.00-1.30), 4v = 2.89 (2.31-3.40), 5x = 1.61 (1.43-2.00), M = 0.93 (0.77-1.00), prox. x = 1.19 (1.00-1.50).

Abdomen blackish, subshining, some tergites with narrow, yellowish, marginal bands; sternite 6 glossy yellowish-brown.

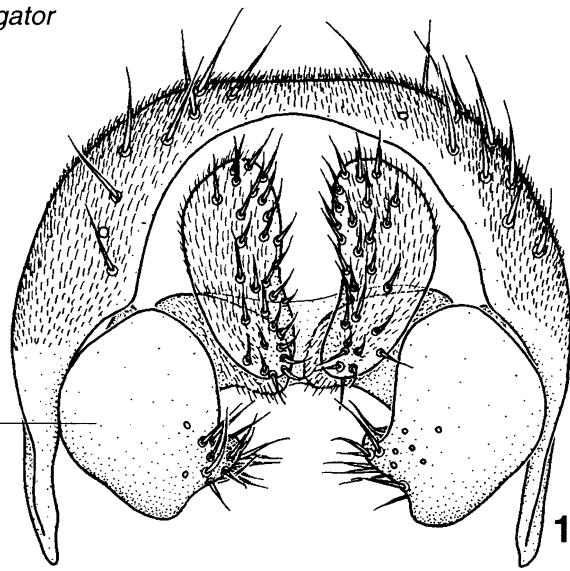
♂ Terminalia (Figs 119-122). Epandrium mostly microtrichose, anteriorly remarkably projecting ventrad, with no lower, and ca. 10 upper setae; ventral lobe absent. Cercus reduced, anteriorly connected to epandrium by membranous tissue, microtrichose and without ventral lobe. Surstylus strongly developed, somewhat roundish in posterior view, without prensisetae, medially projected inwards with ca. 10 outer setae near median inner margin, and ca. 26 inner setae, narrowly connected to epandrium by membranous tissue. Decasternum medially membranous, and unusually microtrichose submedially, as in Fig. 120. Hypandrium longer



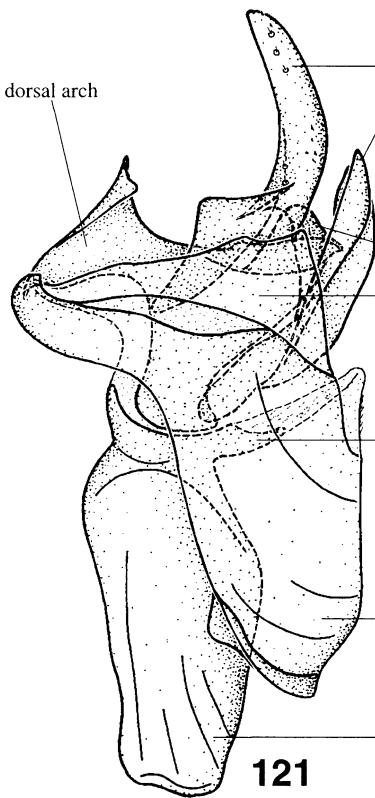
Figs. 110-118. 110: metatarsomere 1. 111: elongated apical seta on distal margin of mesotibia. 112: position of posterior reclinate orbital seta. 113-116: external male terminalia (left), internal male terminalia (right), left lateral view. 117: male tergite 6, posterior view. 118: male terminalia, oblique posterior view.

indagator

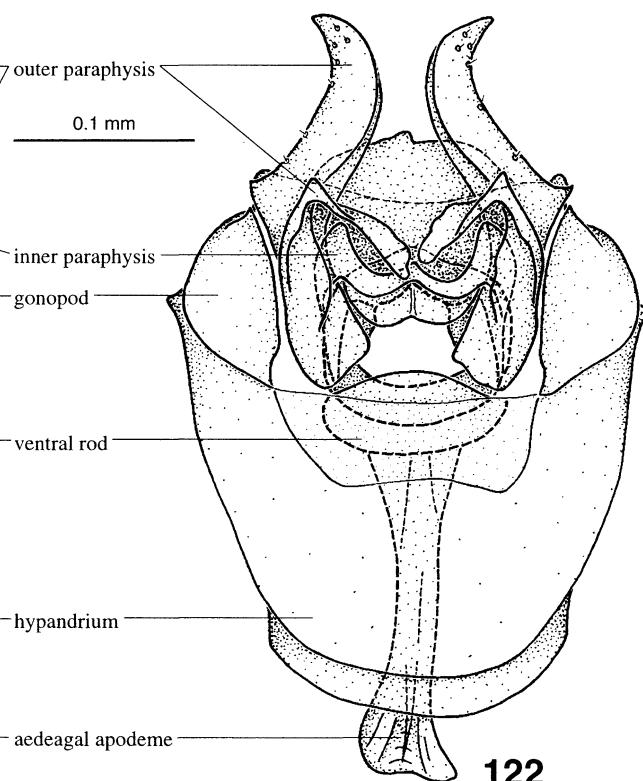
119



120



121



122

Figs. 119-122. *Cacoxenus indagator* Loew. 119: epandrium, cerci, and surstyli, left lateral view; 120: idem, plus decasternum, posterior view; 121: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 122: idem, posterior view.

than epandrium, laterally strongly curved dorsad, mediodistally membranous, anterior margin convex; posterior hypandrial process absent; dorsal arch well-developed, linked to hypandrium by membranous tissue; gonopod bare, linked to outer paraphysis by membranous tissue. Aedeagus apparently absent. Two pairs of paraphyses. Outer paraphysis medially bifurcate, dorsal branch long, mediodistally with a row of ca. 7 tiny setulae, distally curved and pointed outwards, ventral branch shorter, distally expanded, folded over itself, encircling inner paraphysis, and linked both to gonopod and to aedeagal apodeme by membranous tissue. Inner paraphyses anterodorsally fused to each other and apparently connected to dorsal arch. Aedeagal apodeme distally bifurcate, laterally flattened, submedially slightly expanded ventrad in lateral view, anteriorly slightly expanded laterally. Ventral rod anteriorly sclerotised, distally membranous and microtrichose, longer than adjacent aedeagal apodeme is wide, and distally linked to medioposterior margin of hypandrium by membranous tissue.

♀. Differences from male: Metatarsomere 1 not swollen, without ventral brush.

Measurements: Frontal length 0.54 (0.49-0.56) mm; frontal index = 1.17 (1.10-1.29), top to bottom width ratio = 1.02 (0.94-1.10). Ocellar triangle about 31-35% of frontal length. Orbital plates about 65-69% of frontal length. Distance of or3 to or1 = 200-243% of or3 to vtm, or1 / or3 ratio = 1.01 (0.94-1.15), or2 / or1 ratio = 0.94 (0.80-1.06), postocellar setae = 26 (22-31%), ocellar setae = 57 (52-63)% of frontal length; vibrissal index = 0.59 (0.50-0.69). Cheek index about 8-13. Eye index = 1.24 (1.22-1.27). Thorax length = 1.75 (1.58-1.96) mm. Transverse distance of dorsocentral setae 327-388% of longitudinal distance; dc index = 0.58 (0.52-0.64). Distance between apical scutellar setae about 92-114% of that between apical and basal one; scut index = 1.13 (1.11-1.15), sterno index 0.90 (0.86-0.96). Wing length 2.72 (2.42-2.98) mm, length to width ratio = 2.15 (2.09-2.23). Indices: C = 3.06 (2.88-3.31), ac = 1.53 (1.45-1.60), hb = 0.33 (0.31-0.38), 4C = 1.24 (1.00-1.45), 4v = 3.10 (2.38-3.55), 5x = 1.42 (1.10-1.75), M = 0.99 (0.75-1.20), prox. x = 1.25 (0.94-1.55).

Terminalia. Tergite 7 and sternite 7 are tube-like in shape. Cercus short, stumpy, short-haired.

Distribution. – Widespread in Europe but not yet found in Scandinavia; the northernmost

records are from Germany (Rügen) and Poland (Pomerania).

Biology. – The larvae have been found in the cells of “mason bees” (*Osmia* spp., Apidae, Megachilinae) and the adults have been observed swarming around their nests (Julliard, 1947, 1948; Ashburner, 1981). There is no proof that the larvae are entomophagous; more probably they are commensals of the bee larvae which, however, may starve and die because of a food shortage. It is also unknown how the emerging fly is able to break through the hard cell wall of the bee nest. The majority of specimens have been collected by solitary bee specialists.

Additional specimens examined. – 4 ♂♂ (ISRAEL: Fazael, 2 ♂♂, 1983. SWITZERLAND: Valais, 2 ♂♂, 1995), 5 ♀♀ (GERMANY: Schöngeising, 1 ♀, 1973. HUNGARY: Pacsa, 1 ♀, 1964. ISRAEL: Fazael, 2 ♀♀, 1983. SWITZERLAND: Basel, 1 ♀♀, 1947).

Subgenus *Paracacoxenus* Hardy, 1960

Paracacoxenus Hardy in Hardy & Wheeler, 1960: 358. Type species: *Paracacoxenus guttatus* Hardy & Wheeler, 1960.

Diagnosis. – Acrostichal setulae in at most 12 rows; scutum usually with more or less visible dark spots; mesocoxa with several short setae only; mesotibia with a short dorsal preapical seta.

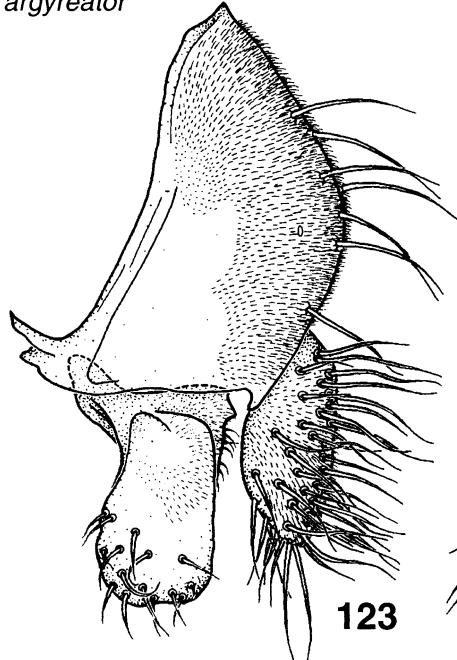
Taxa included. – Six species are known in the Palaearctic.

Comments. – In addition to the species described below, the following species have been recorded in Europe: *Cacoxenus exiguus* Duda, 1924, widespread in Central Europe, but rarely collected; *C. inquilinus* Hendel, 1933, recorded in Central Europe, again in small numbers; *C. kaszabi* (Okada, 1973), found in the Czech Republic (Bohemia).

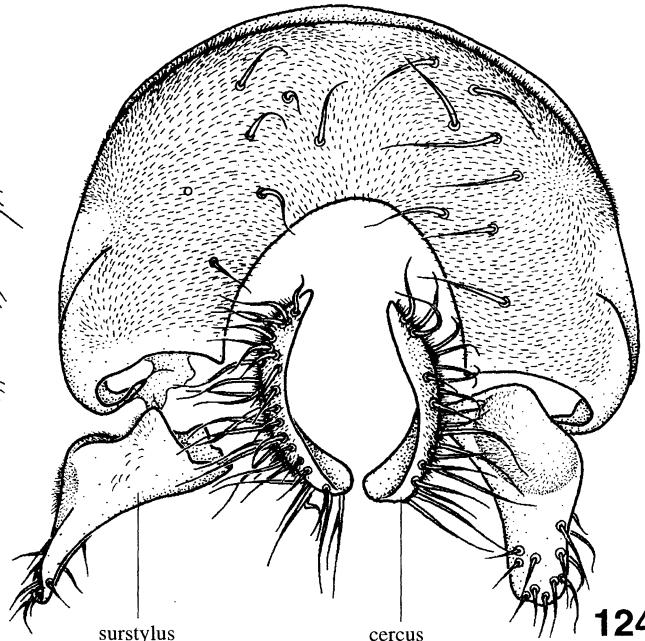
Cacoxenus argyreator Frey, 1932

(Figs 111, 115-117, 123-126)

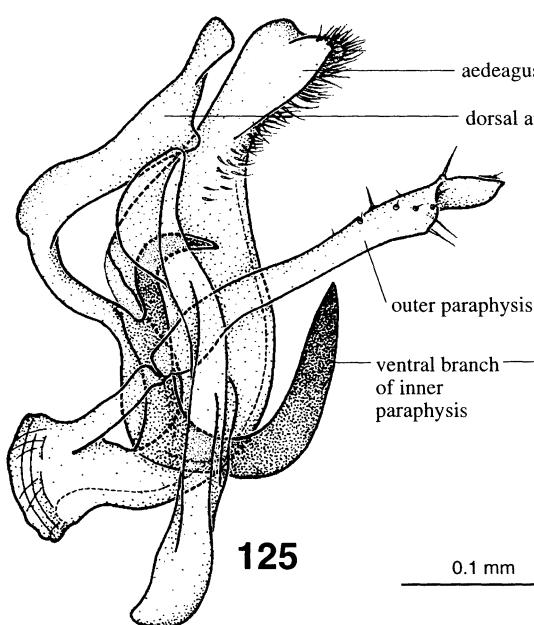
Cacoxenus argyreator Frey, 1932: 84.



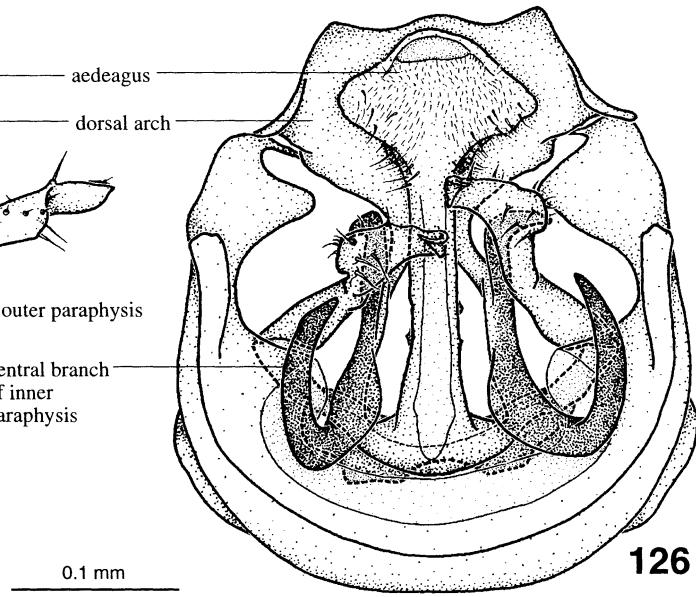
123



124



125



126

Figs. 123-126. *Cacoxenus argyreator* Frey. 123: epandrium, cerci, and surstyli, left lateral view; 124: idem, posterior view; 125: hypandrium, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 126: idem, posterior view.

Diagnosis. – Generally dark flies, males silvery microtrichose on mesonotum, females more greyish; large dark spots visible from a certain angle; male with an extremely long dorsal preapical seta on mid leg. Male: tergite 6 lateroventrally with a claw-like appendix (Fig. 117); surstylus longish, narrow; cerci lower-positioned; aedeagus sinuate, subapically strongly expanded laterally and microtrichose ventrally; decasternum apparently absent (is probably the dorsal arch itself).

Redescription. – ♂. Head. Frons blackish, pale brownish above antennae, greyish microtrichose; frontal length 0.41 (0.39-0.43) mm; frontal index = 1.25 (1.04-1.41), top to bottom width ratio = 1.36 (1.17-1.44). Frontal triangle indistinct; ocellar triangle prominent, black, about 33-40% of frontal length. Orbital plates pale brownish, broad, not diverging from eye margin, about 68-75% of frontal length. Orbital setae black, strong, in a line, distance of or3 to or1 = 129-220 % of or3 to vtm, or1 / or3 ratio = 1.08 (1.00-1.18), or2 / or1 ratio = 0.69 (0.62-0.79), postocellar setae = 28 (24-30)%, ocellar setae = 62 (56-70)% of frontal length; vibrissal index = 0.40 (0.29-0.45). Face blackish-brown, dull. Carina prominent but not nose-like. Cheek index about 5-12. Eye index = 1.21 (1.10-1.29). Occiput blackish. Antennae yellowish-brown. Flagellomere 1 slightly darker along margin, length to width ratio = 1.25. Arista microtrichose. Clypeus blackish. Palpus pale yellowish, with about 10 black, rather short setae along ventral margin.

Thorax length 1.34 (1.19-1.45) mm. Scutum black, dull, greyish-white in frontal view, with indistinct dark spots at bases of setae, 8-10 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 267-337% of longitudinal distance; dc index = 0.54 (0.52-0.55). 2 distinct prescutellar setae, length about 80-100% of anterior dorsocentral setae. Scutellum black, dull greyish, distance between apical scutellar setae about 90-100% of that between apical and basal one, basal setae divergent; scut index = 1.00 (0.97-1.03). Pleura blackish-brown, dull, sterno index = 0.97 (0.91-1.00), median katepisternal seta minute, about 10-26% of anterior one. Two minute proepipisternal setae. Haltere whitish. Legs dark brown, knees and tarsi pale brownish, preapical setae on mesotibia and metatibia, the one on mesotibia

extremely long (Fig. 111), not much shorter than basitarsus, mesotarsomeres 1 and 2 apicoventrally each with a transverse comb; apical seta on mesotibia, but hardly distinguishable from other setae.

Wing hyaline, apically slightly pointed, C-IV distinctly thinner than C-III, dM-Cu present, length 2.60 (2.45-2.77) mm, length to width ratio = 2.22 (2.18-2.26). Indices: C = 2.91 (2.72-3.00), ac = 1.80 (1.60-2.00), hb = 0.37 (0.31-0.40), 4C = 0.99 (0.88-1.07), 4v = 2.01 (1.82-2.33), 5x = 1.17 (1.00-1.50), M = 0.51 (0.41-0.60), prox. x = 0.99 (0.94-1.00).

Abdomen dark brown, subshining, some tergites with narrow, yellowish marginal bands; syntergite 6 + 7 posteriorly strongly sclerotised, with a yellowish-brown, claw-like, glossy appendix at the lateroventral margin (Fig. 117).

♂ Terminalia (Figs 123-126). Epandrium microtrichose, except for the anteroventral region, with no lower, and ca. 8 upper setae; ventral lobe absent. Cercus remarkably ventrally positioned, anterodorsally connected to epandrium by membranous tissue, microtrichose and without ventral lobe. Surstylus strongly developed, laterally foot-shaped, without prensisetae, with ca. 10 outer, and ca. 15 inner setae, partially microtrichose, dorsoanteriorly slightly depressed on outer surface, narrowly connected to anteroventral corner of epandrium by membranous tissue. Decasternum apparently absent (is probably the dorsal arch itself). Hypandrium as long as epandrium, anterior margin strongly convex, somewhat circular in posterior view; posterior hypandrial process absent; dorsal arch well-developed, plate-like, linked to hypandrium by membranous tissue, and connected to inner paraphyses by a pair of sclerotised strips; gonopod not recognisable, probably fused to hypandrium. Aedeagus sinuate, subapically microtrichose ventrally, covered with setula-like scales laterally, and greatly expanded laterally in posterior view. Two pairs of paraphyses. Outer paraphysis long, subapically enlarged, curved inwards and with ca. 12 setulae, apically slightly folded over itself, and linked both to lateral inner margin of hypandrium medially, and to anterodorsal arm of aedeagal apodeme anteriorly, by membranous tissue. Inner paraphyses strongly sclerotised, bare, medially bifurcate, dorsal branch shorter, hook-shaped, and anteriorly fused to dorsal arch by a sclerotised strip, ventral branch longer, hook-shaped, distally di-

rected outwards, mediolaterally linked to aedeagal apodeme by membranous tissue. Aedeagal apodeme 4x shorter than aedeagus, dorsoventrally flattened, dorsally bifurcate medially, each branch linked to outer paraphysis by membranous tissue, ventrally fused to aedeagus. Ventral rod absent.

♀. Differences from male: Mesonotum dull but not greyish-white, spots around bases of setae more distinct, middle tibia with preapical seta of normal length and tarsomeres without combs.

Measurements: Frontal length 0.41 (0.32-0.46) mm; frontal index = 1.05 (0.95-1.13), top to bottom width ratio = 1.20 (1.17-1.26). Ocellar triangle about 35-42% of frontal length. Orbital plates about 65-79% of frontal length. Distance of or₃ to or₁ = 160-220% of or₃ to vtm, or₁ / or₃ ratio = 1.13 (0.88-1.46), or₂ / or₁ ratio = 0.60 (0.42-0.67), postocellar setae = 28 (26-32)%, ocellar setae = 73 (70-79)% of frontal length, vibrissal index = 0.44 (0.36-0.50). Cheek index about 6-8. Eye index 1.24 (1.20-1.30). Thorax length 1.37 (1.15-1.45) mm. Transverse distance of dorsocentral setae 387-400% of longitudinal distance; dc index = 0.53 (0.43-0.60). Distance between apical scutellar setae about 70-110% of that between apical and basal one; scut index = 1.04 (1.00-1.09), sterno index = 0.94 (0.92-0.96), median katepisternal seta minute, about 18-33% of anterior one. Wing length 2.78 (2.62-2.94) mm, length to width ratio = 2.28 (2.08-2.42). Indices: C = 3.03 (2.72-3.29), ac = 1.92 (1.80-2.00), hb = 0.38 (0.35-0.41), 4C = 1.07 (0.94-1.20), 4v = 2.12 (1.94-2.27), 5x = 1.03 (1.00-1.13), M = 0.51 (0.41-0.56), prox. x = 1.14 (0.94-1.31).

Terminalia. Tergite 7 and sternite 7 of normal shape. Cercus slender, longish, with long setae.

Distribution. – Recorded from Finland (northernmost locality: Oulanka), Norway, Sweden, German, Austrian and Swiss Alps, which suggests a boreo-alpine distribution type. All Swiss specimens were collected in canopy traps, whereas the specimens recorded from Scandinavia were attracted to bait intended for the collection of butterflies.

Additional specimens examined. – 4 ♂♂ (FINLAND: Oulanka, 3 ♂♂, 1990; Oulu, 1 ♂, 1994), 5 ♀♀ (FINLAND: Oulanka, 1 ♀, 1990. SWITZERLAND: Graubünden, 4 ♀♀, 1995).

Genus *Gitona* Meigen, 1830

Gitona Meigen, 1830:429. Type species: *Gitona distigma* Meigen, 1830.

Diagnosis. – Arista microtrichose; eye oval, greatest diameter vertical; gena rather broad, about 1/5 of eye length; carina large; orbital setae smaller than ocellar and vertical setae; front with scattered setulae; prescutellar seta large; anterior dorsocentral seta close to posterior one; 1 large proepisternal seta; crossvein bM-Cu absent or hardly visible; costa ending at tip of R₄₊₅ or very faint behind; epandrium and surstyli fused.

Taxa included. – 13 *Gitona* species have been described; however, as the limits of the genus are rather ambiguous, additional species may have to be included. The New World species, tentatively included in *Gitona*, are better treated as belonging to *Rhinoleucophenga* Hendel.

Comments. – *G. microchaeta* Séguin, 1941, was described from Morocco, but has never been recorded since. *G. pruinosa* Bigot, 1888, described from Tunisia, is considered a doubtful species, due to its vague description and the lack of type material.

Gitona beckeri Duda, 1924, was described from Turkestan (China). It has also been recorded from Cyprus; however, there is some doubt regarding this identification, as there are additional undescribed species known from the Near East.

Gitona canariensis Duda, 1924, was described from the Canary Islands. The type material has been studied by Tsacas (1995).

Gitona distans Bezzi, 1924, was described from Cyprus. The species has not yet been revised within a modern context.

Key to European species of *Gitona*

- | | |
|---|---|
| <p>1 Tip of vein R₂₊₃ with a roundish, dark spot; an additional faint spot also on tip of vein R₄₊₅ (Fig. 127)</p> <p>– Wing without dark spots. (Scutum brownish, with 3 darker stripes. Abdominal tergites yellowish with brown bands. Male terminalia Figs 133, 134)</p> | <p>2</p> <p>..... <i>G. canariensis</i> Duda
(Canary Islands)</p> |
|---|---|

- 2(1) Small flies, wing length about 2 mm. Wing spot at tip of R_{2+3} enclosing a short rudimentary vein. (Male terminalia Figs 131, 132).....
..... *G. beckeri* Duda
(Turkestan; recorded from Cyprus but probably misidentified)
- Large flies, wing length more than 3 mm. Wing spot at tip of R_{2+3} without a vein rudiment..... 3
- 3(2) Scutum: dark spots completely isolated. Wing: crossveins close together, 4V-index about 3.2. (Tergites 3 and 4 with a narrow marginal band fused to a dark stripe on midline; male terminalia Figs 129, 130)
..... *G. distigma* Meigen
(Central and South Europe)
- Scutum: dark spots partly confluent and arranged in 5 stripes. Wing: crossveins more distant, 4V-index about 1.2 (Fig. 128). Tergites with a narrow, interrupted marginal band which is not in contact with hind margin of tergite
..... *G. distans* Bezzii
(Cyprus)

Gitona distigma Meigen, 1830

(Figs 29, 127, 129, 130, 135-138)

Gitona distigma Meigen, 1830: 430.

Diagnosis. – Generally yellowish flies; scutum with dark, isolated spots around the bases of setae and setulae; wing with a conspicuous dark spot at tip of R_{2+3} .

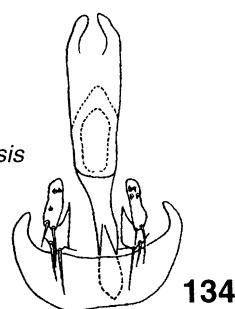
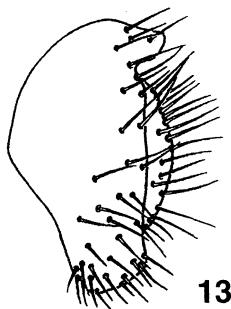
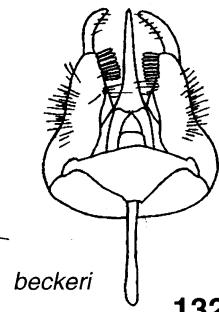
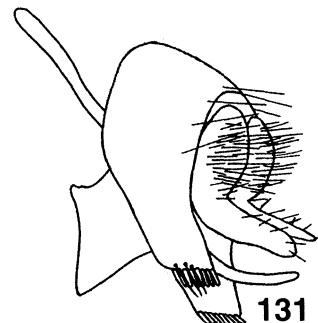
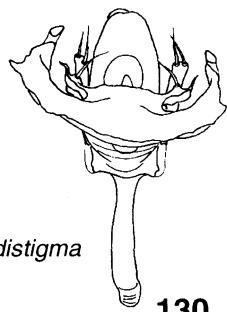
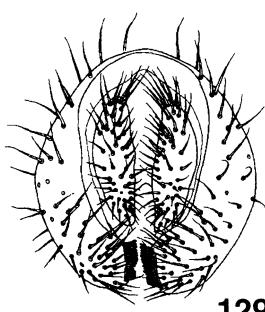
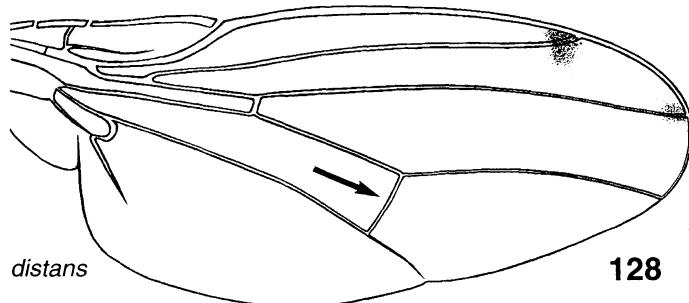
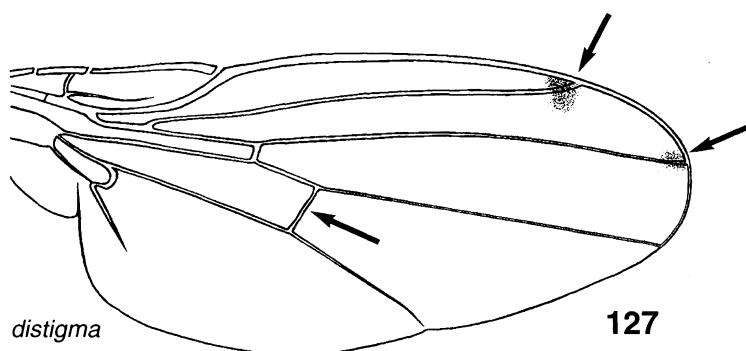
Redescription. – ♂. Head. Frons reddish-brown, dull, almost parallel-sided, with about 20 scattered interfrontal setulae, frontal length 0.52 (0.47-0.56) mm; frontal index = 1.04 (0.97-1.12), top to bottom width ratio = 1.09 (1.03-1.20). Frontal triangle slightly greyish, apically narrow and elongated, about 61-68% of frontal length; ocellar triangle prominent, dark brown, about 36-37% of frontal length. About 30 distinct but evenly dispersed interorbital setae. Orbital plates slightly greyish microtrichose, about

72-79% of frontal length. Orbital setae black, almost in a row, or 2 usually closer to or 1 than to or 3, distance of or 3 to or 1 = 120-162% of or 3 to vtm, or 1 / or 3 ratio = 0.98 (0.94-1.00), or 2 / or 1 ratio = 0.66 (0.59-0.71), postocellar setae = 28 (25-32)%, ocellar setae = 75 (70-79)% of frontal length; vibrissal index = 0.41 (0.36-0.46); genal setae uniserial. Face yellowish-brown, microtrichose. Carina distinct but not nose-like. Cheek index about 4-7. Eye index = 1.23 (1.16-1.31). Occiput yellowish-brown, centrally dark brown. Antennae yellowish. Flagellomere 1 whitish-yellow, length to width ratio = 1.40. Arista (Fig. 29) microtrichose, about as long as frons. Proboscis brownish-yellow. Palpus yellowish slightly flattened, with about 4 fine setae along lower margin.

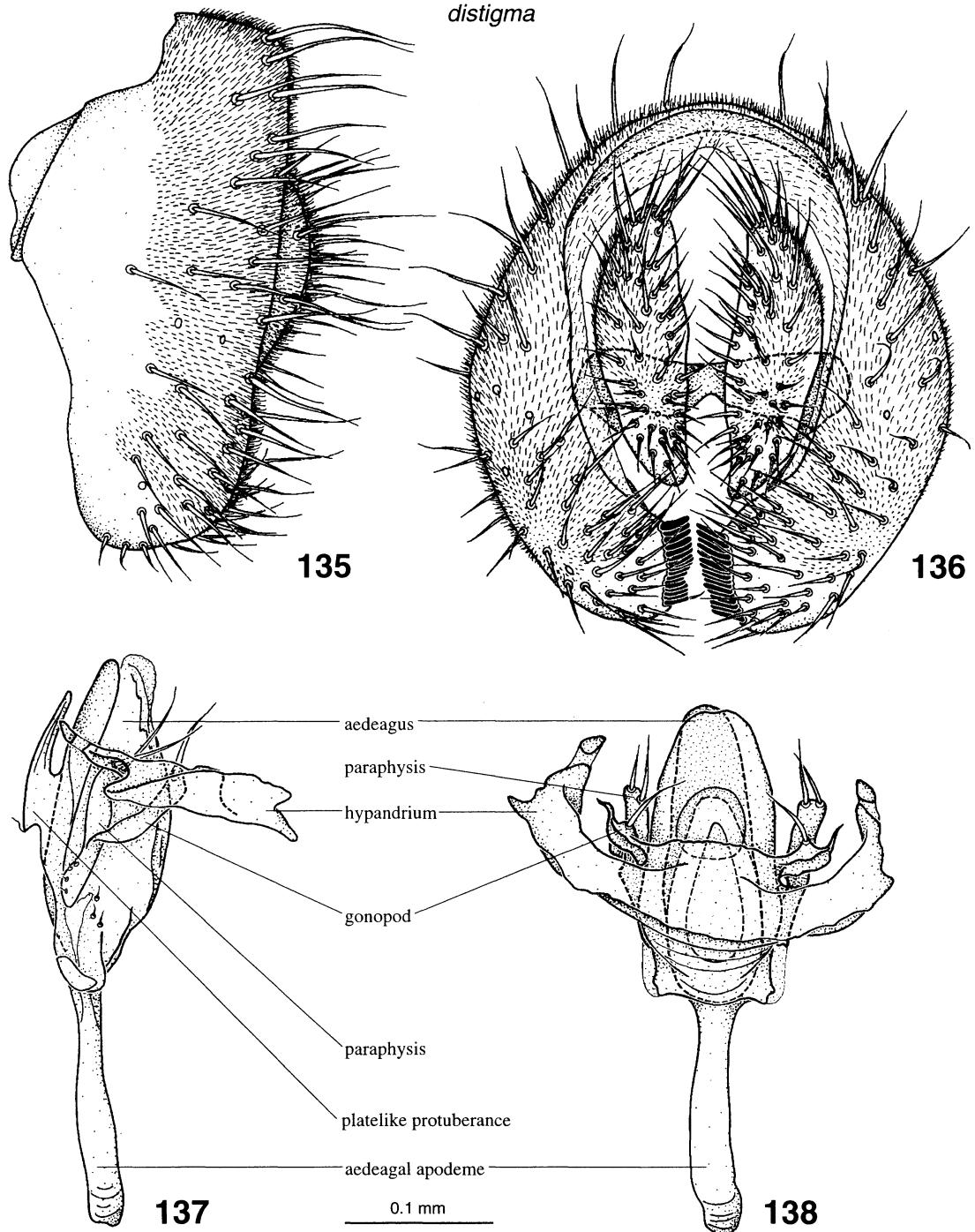
Thorax length 1.78 (1.61-1.99) mm. Scutum blackish-brown, microtrichose, with small black spots around bases of almost all setae; postpronotal area yellowish. 8-10 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 238-275% of longitudinal distance; dc index = 0.58 (0.56-0.63). Prescutellar setae strong, about 100-140% of anterior dorsocentral setae. Scutellum basally blackish-brown, apical third yellowish, distance between apical scutellar setae about 108-120% of that between apical and basal one; basal setae divergent; scut index = 1.09 (1.05-1.11). Pleura brownish-yellow, with diffuse blackish areas, sterno index = 0.96 (0.87-1.00), median katepisternal seta about 19-30% of anterior one. Haltere brownish-yellow. Legs unicolourous brownish-yellow, mesocoxa with 2 strong setae; preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 127) hyaline with a small roundish or oblong spot at tip of R_{2+3} and an even smaller, longish spot on tip of R_{4+5} , costa ending at tip of M, but faint beyond R_{4+5} , R_{4+5} and M slightly diverging, crossveins R-M and dM-Cu close together, length to width ratio = 2.10 (2.02-2.17). Indices: C = 2.56 (2.43-2.80), ac = 1.78 (1.67-1.91), hb = 0.45 (0.39-0.52), 4C = 1.84 (1.77-1.92), 4v = 4.63 (4.31-5.00), 5x = 3.68 (3.38-4.00), M = 2.28 (2.08-2.55), prox. x = 1.37 (1.23-1.55).

Abdomen shining with yellowish ground-colour; tergites 2-5 each with a narrow blackish marginal band, which is medially interrupted at tergite 2 and medially extended on tergites 3-5, usually reaching basal margin and then forming



Figs. 127-134. 127, 128: right wing, dorsal view; 129, 130: external and internal male terminalia respectively, posterior view; 131, 132: male terminalia, left semilateral and ventral view; 133: external male terminalia, left lateral view; 134: internal male terminalia, posterior view.



Figs. 135-138. *Gitona distigma* Meigen. 135: epandrium + surstyli, and cerci, left lateral view; 136: idem, plus decasternum, posterior view; 137: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 138: idem, posterior view.

a narrow median stripe, tergite 6 variable, usually with a diffuse marginal band and a small median spot.

♂ Terminalia (Figs 135-138). Epandrium distally microtrichose, with ca. 53 lower and upper setae, mostly distally positioned; ventral lobe not recognisable; anteroventrally folded over itself internally, therefore with a double wall (probably the inner wall of the surstylius). Cerci long, narrow, anteriorly connected to epandrium by membranous tissue, microtrichose and without ventral lobe. Surstylus apparently completely fused to epandrium, dorsally microtrichose, with a row of ca. 17 compact, prensisetae, outer and inner setae not recognisable. Decasternum positioned higher up behind cerci, medially narrowed and linked to epandrium by membranous tissue, as in Fig. 136. Hypandrium reduced, bow-shaped, half as long as aedeagus, perpendicular to aedeagus, longer than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod strip-shaped, with a seta near inner margin, mostly fused to medioposterior margin of hypandrium, narrowly fused to paraphysis. Aedeagus somewhat ovoid, weakly sclerotised and anteromedially rugose ventrally, anterolaterally with ca. 3 setulae, strongly sclerotised dorsally, dorsomedially with a plate-like, laterodorsally fused, parallel and distally projecting protuberance, which is probably a remnant of the dorsal arch and/or the inner paraphyses. Paraphysis apically with ca. 2 long setae, mediolaterally narrowly fused to gonopod, dorsoanteriorly with a curved row of ca. 4 setae, and anteriorly linked to lateral margin of aedeagal apodeme by membranous tissue. Aedeagal apodeme rod-shaped, fused to aedeagus. Ventral rod absent.

♀. Measurements: Frontal length 0.53 (0.45-0.58) mm; frontal index = 1.04 (0.91-1.10), top to bottom width ratio = 1.14 (1.09-1.24). Frontal triangle about 59-76% of frontal length; ocellar triangle about 32-41% of frontal length. Orbital plates about 73-79% of frontal length. Distance of or3 to or1 = 120-167% of or3 to vtm, or1 / or3 ratio = 1.08 (1.00-1.20), or2 / or1 ratio = 0.59 (0.50-0.67), postocellar setae = 26 (21-31)%, ocellar setae = 75 (73-79)% of frontal length; vibrissal index = 0.37 (0.29-0.43). Cheek index about 4-7. Eye index = 1.21 (1.16-1.28). Thorax length 1.87 (1.71-1.94) mm. Transverse distance of dorsocentral setae 257-360% of longitudi-

dinal distance; dc index = 0.59 (0.51-0.66). Distance between apical scutellar setae about 100-125% of that between apical and basal one; scut index = 1.03 (0.98-1.08), sterno index = 0.98 (0.93-1.04), median katepisternal seta about 20-31% of anterior one. Wing length 3.54 (3.18-3.85) mm, length to width ratio = 2.07 (1.96-2.17). Indices: C = 2.61 (2.48-2.75), ac = 1.62 (1.53-1.77), hb = 0.45 (0.30-0.52), 4C = 1.72 (1.43-1.85), 4v = 4.22 (3.57-4.54), 5x = 3.18 (2.67-3.44), M = 2.17 (1.71-2.38), prox. x = 1.37 (1.14-1.54).

Terminalia. Cercus narrow, with short setae.

Distribution. – Widespread in Europe, but more common in the south. The northernmost records are from Latvia, Germany and Poland.

Biology. – The larvae have been observed in flowerheads of *Sonchus arvensis* L. (Asteraceae) and adults have been bred from these flowers (Tsacas & Desmier de Chenon, 1976; Ashburner, 1981; B. Merz, pers. comm.). However, it is not known whether the larvae are predators of Tephritidae spp. larvae living in the same flowerheads.

Additional specimens examined. – 4 ♂♂ (FRANCE: Lauzon, 1 ♂, 1981. HUNGARY: Repashuta, 1 ♂, 1963; Vecses, 1 ♂, 1981; Zirc, 1 ♂, 1973), 5 ♀♀ (HUNGARY: Repashuta, 1 ♀, 1966; Vecses, 2 ♀♀, 1981. SWITZERLAND: Basel, 1 ♀, 1956. TURKEY: Yüksekova, 1 ♀, 1983).

Comments. – The flies are rarely attracted to fruit bait; the majority of specimens have been observed by tephritid specialists whilst keeping flowerheads to rear tephritids.

Genus *Leucophenga* Mik, 1886

Leucophenga Mik, 1886: 317. Type species:

Drosophila maculata Dufour, 1839.

Oxyleucophenga Hendel, 1913: 386.

Drosomyiella Hendel, 1914: 113.

Paraleucophenga Oldenberg, 1914: 18 (preocc.).

Neoleucophenga Oldenberg, 1915: 93.

Ptyelusimyia Séguay, 1932: 93.

Drosophilopsis Séguay, 1951: 310.

Diagnosis. – Arista with several long branches both above and below terminal fork; frons narrow, usually narrower in male than in female;

carina almost absent; gena very narrow, about 1/30 eye length, with one vibrissa; eyes very large, bright red, bare; all orbital setae large, posterior reclinate typically closer to inner vertical than to proclinate orbital seta; postocellar setae small; mesonotum usually with numerous rows of acrostichal setulae and a pair of large prescutellar setae; median katepisternal seta minute, anterior and posterior ones large; anterior scutellar setae large, divergent; minute proepisternal setae present; costa usually reaching only apex of vein R_{4+5} , very faint beyond; costal section C-III usually with minute, ventral, curved, costal pegs; preapical setae present on mesotibia and metatibia; many species with considerable sexual dimorphism in the amount and intensity of silvery surface, shape of frons, and abdominal pattern; male: surstyli double-walled, without prensisetae; inner paraphysis strongly sclerotised, flat, bare, bent, basally fused to anterodorsal margin of aedeagus, apically linked to ventralmost layer of dorsal arch by membranous tissue; aedeagus tube-shaped, folded over itself, anterior region channel-shaped and dorsally entirely membranous; aedeagal apodeme anteriorly vestigial, posteriorly bifid, with two long arms.

Taxa included. – Four out of almost 200 described species occur in Europe: *Leucophenga maculata* (Dufour, 1839), *L. quinquemaculata* Strobl, 1893, *L. hungarica* Papp, 2000, and *L. helvetica* Bächli, Vilela and Haring, 2002. The latter two species are included in the *sorii* species group, whereas *L. maculata* is a member of the *maculata* species group and *L. quinquemaculata* may belong to the *ornata* species group. This is one of the genera containing a large number of species which are distributed mainly in tropical areas.

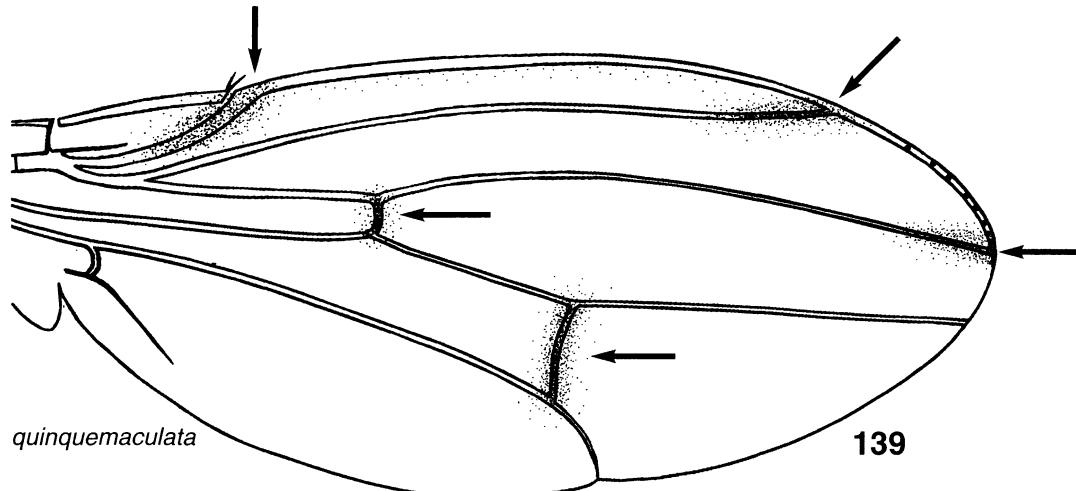
Comments. – Traditionally, the species of *Leucophenga* are divided into two subgenera and a series of species groups, almost all based on external characters only. The subgenus *Neoleucophenga* was erected for *L. quinquemaculata* Strobl. The distinguishing characters, e.g. wing tip pointed, veins R_{4+5} and M apically convergent, costa reaching M, are shared with many species of the subgenus *Leucophenga*. As already mentioned by Duda (1934) and Bock (1979), there is no justification for separating a subgenus *Neoleucophenga*. We have now shown that the male terminalia of the species included

in *Neoleucophenga* do not support such a separation either (see below).

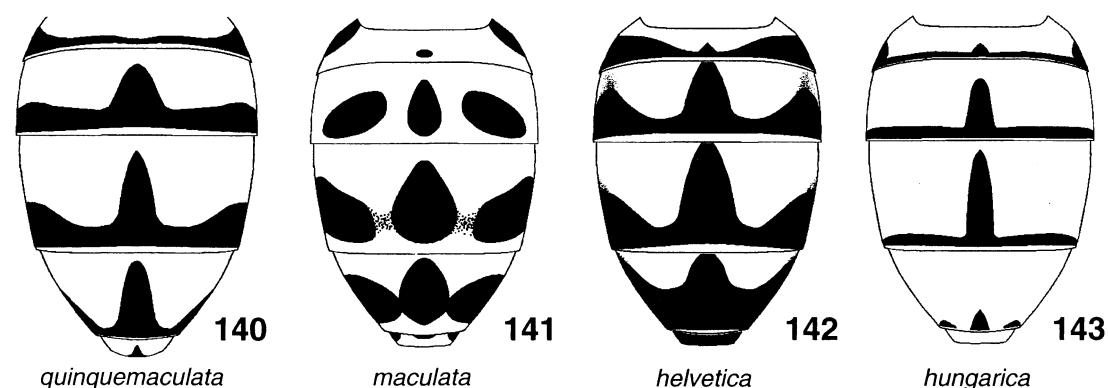
As a provisional solution, the species of *Leucophenga* are assigned to species groups, which are not based on phylogenetic reasoning.

The internal male terminalia of the species of *Leucophenga*, although rather complex and remarkably modified, have remained very conservative among species from different biogeographical regions. Tsacas & Chassagnard (1991) indirectly proposed homologies between the sclerites and those usually present in species of other genera of drosophilids, especially *Drosophila*, based mainly on the route followed by the ejaculatory duct and the articulations between the sclerites. We concur with them regarding several sclerites (their nomenclature in parentheses), i.e. hypandrium, outer paraphyses (paramères antérieures), and inner paraphyses (phallapodème, in the sense of “posterior parameres” of Okada, 1968a). However, we have a different interpretation (as indicated in Figs 146, 147, 150, 151) for the following sclerites: basal region of inner paraphyses (basiphallus), aedeagal apodeme (phragme de l’hypandrium?), aedeagus (distiphallus [not including basiphallus]). The origin of the dorsal arch (pont), which is roughly sinuate in lateral view, has not been discussed. As Grimaldi (1990) suggested for a similar, although much more complex, structure present in the species of *Amiota* (sensu lato), we are of the opinion that the dorsal arch in species of *Leucophenga* originated from a strong modification of the anterior region of the decasternum, which is folded thrice over itself, as it is clearly linked to the posterior region of the decasternum (making it difficult to separate the epandrium from the hypandrium without damaging them), which in turn is more tightly linked to the surstyli than the latter are to the posteroventral margin of the epandrium. Additionally, the ventral layer of the dorsal arch articulates with the apical area of the fused inner paraphyses, playing an important role during erection.

The larvae of *Leucophenga* species are thought to be mushroom feeders; however, some Afro-tropical species are known to be predators and/or commensals of Homoptera. All in all, our knowledge of the biology of *Leucophenga* species is very scanty and no species has yet been kept in culture.



139

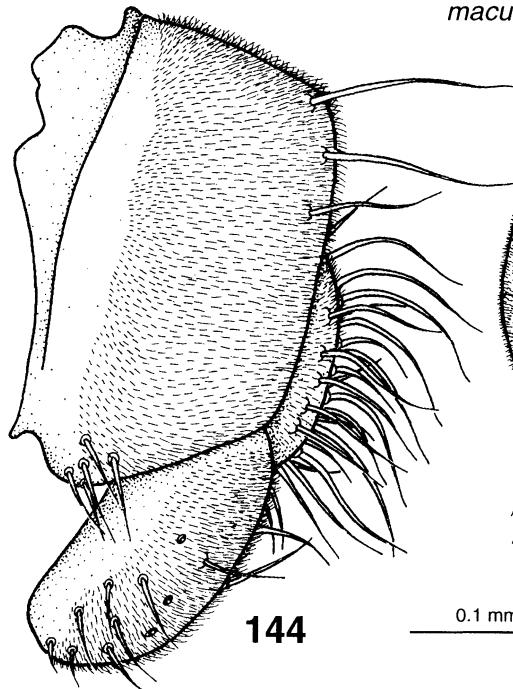


Figs. 139-143. 139, right wing, dorsal view. 140-143, abdomen, dorsal view.

Key to European species of Leucophenga

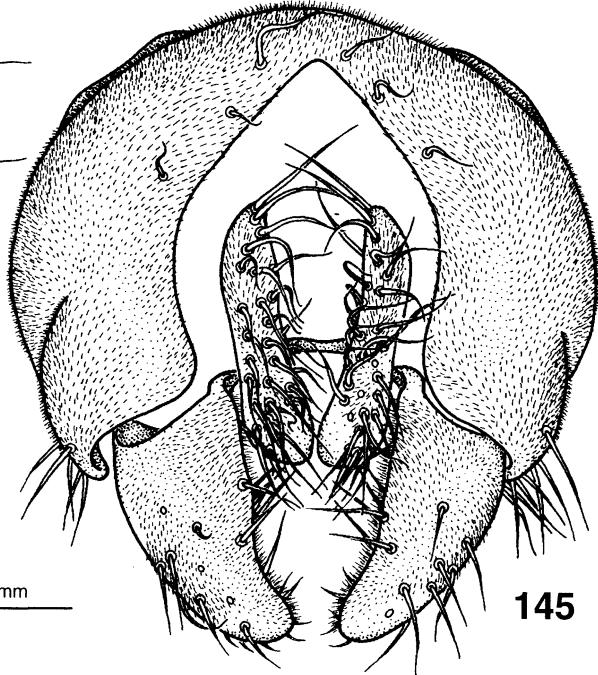
- 1 Wings hyaline. Costa almost absent beyond tip of vein R_{4+5} 2
- Wings with brownish shadows around tips of veins R_1 , R_{2+3} , and R_{4+5} as well as along both main crossveins (Fig. 139) (Costa reaching tip of vein M but very weak beyond tip of vein R_{4+5} . Scutum yellowish, not silvery. Tergites yellowish, with confluent dark marginal bands and dark midlines (Fig. 140), yellow areas only slightly silvery) *L. quinquemaculata* Strobl

- 2(1) Tergites yellow, with rounded blackish spots which are variable in size and partly confluent (Fig. 141). (Male: scutum blackish and, seen from front, silvery-white; clear areas of abdomen also silvery. Female: scutum yellowish-brown, not silvery; light areas of abdomen only slightly silvery) *L. maculata* (Dufour)
- Tergites yellow, with apical bands and a median stripe (Figs 142, 143) 3
- 3(2) Tergites with broad marginal bands and a broad median stripe (Fig. 142)

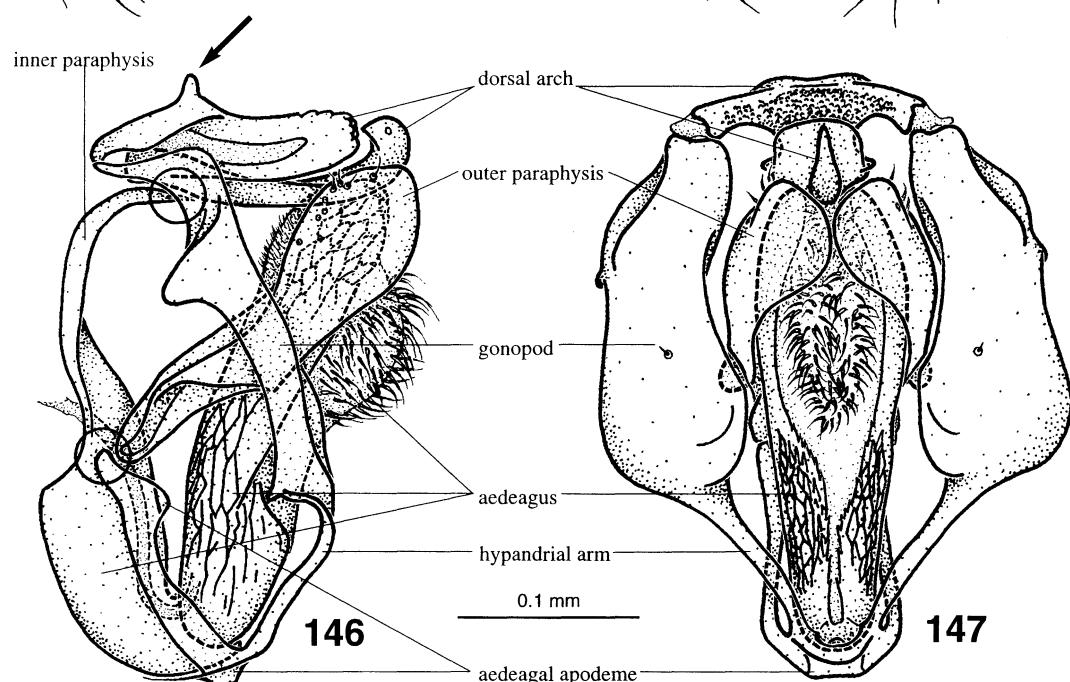


144

0.1 mm



145



Figs. 144-147. *Leucophenga maculata* (Dufour). 144: epandrium, cerci, and surstyli, left lateral view; 145: idem, plus decasternum, posterior view; 146: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 147: idem, posterior view. Circles indicate articulation points (upper one between inner paraphysis and dorsal arch; lower one between aedeagal apodeme arm and inner paraphysis + aedeagus). The arrow points to the region of the connection between dorsal arch and posterior region of decasternum.

.... *L. helvetica* Bächli, Vilela and Haring
(Switzerland)

- Tergites with narrow marginal bands and a narrow median stripe (Fig. 143)
 - *L. hungarica* Papp
(Hungary, Czech Republic, Slovakia,
Switzerland)

***Leucophenga maculata* (Dufour, 1839)**

(Figs 39, 44, 141, 144-147)

Drosophila maculata Dufour, 1839: 50.

Diagnosis. – Male mesonotum strongly silvery on a predominantly blackish background (yellowish and not silvery in female), some areas on the abdomen also silvery; wing hyaline; tergites with roundish dark spots; distal region of aedeagus ventrally covered with setula-like scales submedially, and expanded ventrad in lateral view.

Redescription. – ♂. Head. Frons (Fig. 44) completely dull silvery-white on a yellow background, frontal length 0.63 (0.61-0.65) mm; frontal index = 1.41 (1.23-1.52), top to bottom width ratio = 1.29 (1.23-1.38). Frontal triangle invisible, ocellar triangle prominent, black, about 22-26% of frontal length. Orbital plates indistinct, apically slightly diverging from eye margin, about 59-63% of frontal length. Orbital setae black, strong, or 2 close to, but slightly outside of, or 1, distance of or 3 to or 1 = 243-316% of or 3 to vtm, or 1 / or 3 ratio = 0.71 (0.67-0.77), or 2 / or 1 ratio = 0.99 (0.96-1.05), postocellar setae = 32 (27-39)%, ocellar setae = 69 (65-73)% of frontal length; vibrissal index = 0.21 (0.17-0.24). Face brownish-yellow, parafacalia may be whitish. Carina missing. Cheek index about 30-33. Eye bare, index = 1.31 (1.30-1.33). Occiput black. Antennae yellowish. Flagellomere 1 brownish on back side, length to width ratio = 1.78. Arista with 6-7 dorsal, 2 ventral, and about 15 very small inner branches, plus terminal fork. Proboscis pale yellowish. Palpus yellow, with about 6 black setae along lower margin plus several yellowish setulae.

Thorax length 2.18 (2.10-2.30) mm. Scutum silvery-white on a yellowish background with a broad, blackish median area and a whitish-yellow lateral stripe above notopleural setae, 6

rows of acrostichal setulae. h index = 1.21 (1.13-1.25). Transverse distance of dorsocentral setae 256-273% of longitudinal distance; dc index = 0.58 (0.56-0.60). 1 pair of distinct prescutellar setae (Fig. 39), length about 90-120% of anterior dorsocentral setae. Scutellum yellow, silvery-white in central area, with large blackish-brown lateral corners, distance between apical scutellar setae about 60-71% of that between apical and basal one; basal setae divergent; scut index = 1.23 (1.20-1.26). Pleura blackish-brown, slightly silvery, 2 small proepisternal setae, sterno index = 0.81 (0.79-0.84), median katepisternal seta minute, about 16-27 % of anterior one. Haltere whitish-yellow. Legs pale yellow, slender, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, costa ending at R₄₊₅, C-III with 5-7 curved, costal pegs ventrally; length 3.96 (3.85-4.20) mm, length to width ratio = 2.18 (2.15-2.20). Indices: C = 3.30 (3.09-3.48), ac = 1.78 (1.69-1.83), hb = 0.67 (0.64-0.70), 4C = 0.86 (0.81-0.92), 4v = 1.88 (1.78-1.96), 5x = 1.25 (1.17-1.36), M = 0.55 (0.52-0.56), prox. x = 0.92 (0.88-0.96).

Abdomen (Fig. 141) yellowish, slightly silvery, at least on tergites 2-3, shining on posterior tergites, all tergites with blackish-brown, roundish spots: tergites 1+2 with large lateral spots, median spot usually absent, tergites 3-6 each with a longish median spot, two lateral, and two ventral spots; lateral spots usually largest, all 5 spots sometimes isolated or partially confluent.

Terminalia ♂ (Figs 144-147). Epandrium mostly microtrichose, with ca. 3 lower setae, and 7 upper setae; ventral lobe not distinguishable. Cercus small, narrow, positioned low, weakly linked to hypandrium by membranous tissue, mostly microtrichose. Surstyli well-developed, double-walled, mostly microtrichose, weakly linked to epandrium by membranous tissue, with no prensisetae, ca. 12 outer setae and ca. 22 inner setae. Decasternum well-developed anteriorly, sinuate, folded thrice over itself, forming a dorsal arch (Figs 146, 147), laterally linked to arms of hypandrium by membranous tissue, posteriorly reduced and linked to surstyli by membranous tissue (Fig. 145). Hypandrium as long as epandrium, reduced to a narrow V-shaped strip, arms anteriorly fused to ventral rod of aedeagal apodeme; dorsal arch (developed from decasternum) roughly sinuate

in lateral view, three-layered, medial surface of dorsalmost layer [disregarding anterior region of decasternum] covered with tiny scales recalling goose-flesh, ventralmost layer protruding, hook-shaped and directed forwards at tip in lateral view, perpendicular to aedeagus, and linked both to apical region of inner paraphyses ventrally, and to hypandrial arms laterally, by membranous tissue; gonopod well-developed, fused to distal region of hypandrial arm, medially narrowly linked to outer paraphysis by membranous tissue, and with 1 tiny setula. Aedeagus tube-shaped, folded over itself, anterior region channel-shaped and dorsally entirely membranous, anteriorly fused to inner paraphysis, distal region dorsodistally microtrichose, laterally reticulate, recalling the chorion of a drosophilid egg, ventrally membranous, covered with setula-like scales, and submedially expanded ventrad in lateral view. Aedeagal apodeme anteriorly vestigial, posteriorly bifid, with two long, subapically expanded arms, ventrally fused to hypandrial arms, encircling anterior region of aedeagus. Ventral rod not discernible, fused to anterior hypandrial arms. Outer paraphyses encircling aedeagus distally, dorsodistally with ca. 9 setulae; linked both to aedeagal apodeme arm anteriorly, and to gonopod medially, by membranous tissue. Inner paraphyses strongly sclerotised, flat, bare, bent, distally linked to each other by membranous tissue, basally fused to dorsodistal margin of anterior region of aedeagus; linked by membranous tissue both to apical region of aedeagal apodeme arm laterally and to ventralmost layer of dorsal arch apically.

♀. Differences from male: Not silvery-white except slightly on tergites 2 and 3, frons broader; scutum and scutellum yellowish, subshining, abdominal spots smaller.

Measurements: Frontal length 0.56 (0.52-0.60) mm; frontal index = 1.05 (1.03-1.06), top to bottom width ratio = 1.16 (1.13-1.22). Ocellar triangle about 24-26% of frontal length. Orbital plates about 61-70% of frontal length. Distance of or3 to or1 = 175-214% of or3 to vtm, or1 / or3 ratio = 0.66 (0.62-0.69), or2 / or1 ratio = 1.04 (1.00-1.10), postocellar setae = 42 (39-47)%, ocellar setae = 74 (65-79)% of frontal length; vibrissal index = 0.25 (0.21-0.29). Cheek index about 14-20. Eye index = 1.34 (1.31-1.43). Thorax length 2.22 (2.12-2.31) mm. h index = 1.25 (1.18-1.30). Transverse distance of dorsocen-

tral setae 260-307% of longitudinal distance; dc index = 0.57 (0.52-0.62). Distance between apical scutellar setae about 65-71% of that between apical and basal one; scut index = 1.20 (1.08-1.27), sterno index = 0.82 (0.80-0.84), median katepisternal seta about 24-28% of anterior one. Wing length 4.15 (3.85-4.38) mm, length to width ratio = 2.14 (2.07-2.23). Indices: C = 3.19 (2.92-3.59), ac = 1.67 (1.57-1.79), hb = 0.63 (0.61-0.64), 4C = 0.91 (0.85-1.04), 4v = 1.96 (1.84-2.08), 5x = 1.21 (1.07-1.50), M = 0.59 (0.52-0.72), prox. x = 1.02 (0.96-1.08).

Distribution. – Widespread in the Palaearctic region, recorded also from Denmark, Latvia, Lithuania, Norway (northernmost locality: Kvam), and Sweden.

Biology. – Many records are known of flies reared from mushrooms. Males have been observed in dark, humid habitats, hovering like silvery specks.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Uri, 1973), 5 ♀♀ (SWITZERLAND: Bern, 2 ♀♀, 1973; Uri, 3 ♀♀, 1973).

Leucophenga quinquemaculata Strobl, 1893

(Figs 139, 140, 148-151)

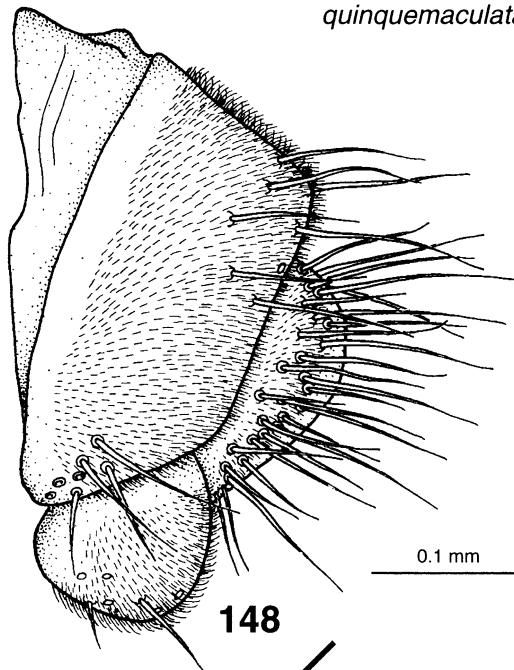
Leucophenga quinquemaculata Strobl, 1893: 283

Leucophenga marginalis (Oldenberg, 1914: 18)

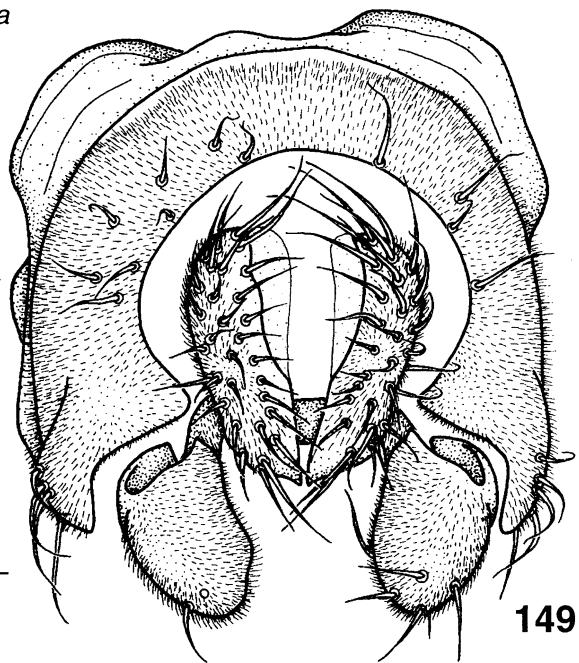
Diagnosis. – Generally yellowish flies; no silvery areas in either sex; wing with brownish spots along both crossveins and tips of R veins; tergites with dark marginal bands which are medially broadened, forming a median stripe; ventral margin of distal region of aedeagus straight in lateral view.

Redescription. – ♂. Head. Frons brownish-yellow, dull, frontal length 0.51 (0.46-0.54) mm; frontal index = 1.15 (0.97-1.39), top to bottom width ratio = 1.26 (1.16-1.39). Frontal triangle indistinct, pale yellowish, strongly narrowed in front of ocellar triangle, narrowly reaching lower margin of frons, ocellar triangle prominent, brown, blackish on inner sides of ocelli, about 30-34% of frontal length. Frontal vitiae brownish. Orbital plates narrow, subshining, apically slightly diverging from eye margin,

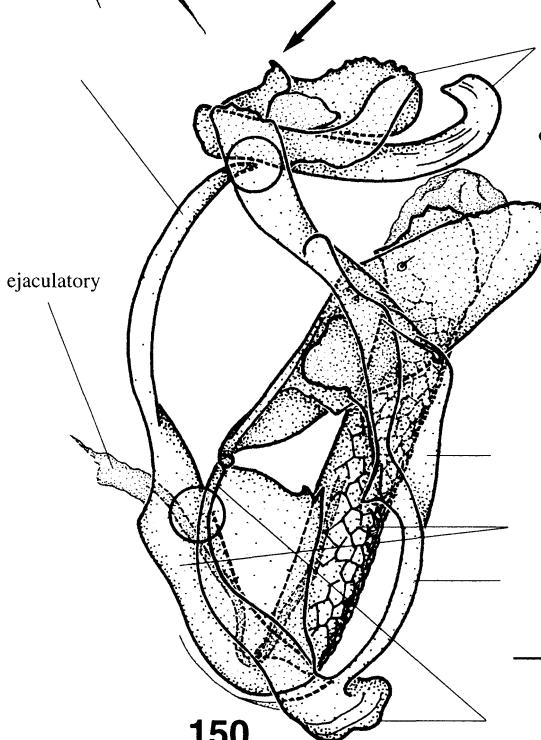
quinquemaculata



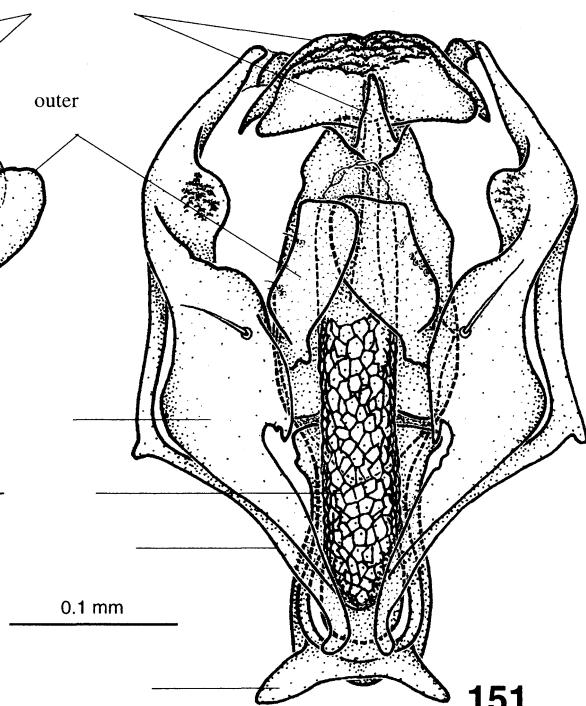
148



149



150



151

Figs. 148-151. *Leucophenga quinquemaculata* Strobl. 148: epandrium, cerci, and surstyli, left lateral view; 149: idem, plus decasternum, posterior view; 150: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 151: idem, posterior view. For circles and arrow, refer to the caption of Figs 144-147.

about 62-74% of frontal length. Orbital setae black, strong, or2 close to, but slightly outside of, or1, distance of or3 to or1 = 175-250% of or3 to vtm, or1 / or3 ratio = 0.69 (0.64-0.72), or2 / or1 ratio = 0.90 (0.83-0.94), postocellar setae = 50 (47-61)%, ocellar setae = 81 (75-93)% of frontal length; vibrissal index = 0.36 (0.31-0.41). Face whitish-yellow. Carina absent. Cheek index about 12-18. Eye bare, index = 1.34 (1.26-1.41). Occiput blackish with yellowish border. Antennae yellowish-brown. Flagellomere 1 usually paler, length to width ratio = 1.40. Arista with 4-6 rather short dorsal, 2-3 ventral, and about 7-10 very small inner branches, plus terminal fork. Proboscis pale yellowish. Palpus yellow, with about 5 black setae along lower margin, plus several yellowish setulae.

Thorax length 2.14 (2.00-2.28) mm. Scutum brownish-yellow, shining, 8-10 rows of acrostichal setulae. h index = 2.63 (2.30-3.25). Transverse distance of dorsocentral setae 321-500% of longitudinal distance; dc index = 0.49 (0.46-0.54). 1 pair of distinct prescutellar setae, length about 100-110% of anterior dorsocentral setae, Scutellum pale yellow, subshining, distance between apical scutellar setae about 90-100% of that between apical and basal one; basal setae virtually parallel; scut index = 1.19 (1.12-1.24). Pleura yellowish, subshining, 2 minute proepisternal setae, sterno index = 0.80 (0.75-0.85), median katepisternal seta about 19-28% of anterior one. Haltere whitish-yellow. Legs pale yellow, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 139) slightly pointed at tip, costa ending at tip of R₄₊₅, with an oblique brown shadow along R₁, a narrow shadow along both crossveins, a large but diffuse shadow along apical part of vein R₂₊₃ and a narrow shadow along apical part of vein R₄₊₅; R₄₊₅ and M distinctly convergent, C-III apically with 6-10 curved costal pegs (warts) ventrally; length 4.16 (3.85-4.55) mm, length to width ratio = 2.15 (2.09-2.20). Indices: C = 2.67 (2.41-2.85), ac = 3.07 (2.89-3.22), hb = 0.83 (0.79-0.86), 4C = 1.06 (1.00-1.12), 4v = 1.77 (1.72-1.85), 5x = 0.93 (0.85-1.08), M = 0.47 (0.42-0.54), prox. x = 1.14 (1.08-1.22).

Abdomen (Fig. 140) yellowish, shining, tergite 2 with a brown marginal band which is medially narrowed, tergites 3-5 each with a brown marginal band which is medially narrowly extended to anterior margin of tergite, forming

a distinct median stripe, and covering more or less the whole tergite lateroventrally; tergite 5 in some specimens completely dark; tergite 6 usually only with a lateroventral spot.

Terminalia ♂ (Figs 148-151). Epandrium mostly microtrichose, with ca. 7 lower setae, and 6 upper setae; ventral lobe not distinguishable. Cercus small, positioned low, linked weakly to hypandrium by membranous tissue, mostly microtrichose. Surstyli well-developed, double-walled, mostly microtrichose, weakly linked to epandrium by membranous tissue, with no prensisetae, ca. 7 outer, and ca. 24 inner setae. Decasternum well-developed anteriorly, folded thrice over itself, forming a dorsal arch (Figs 150, 151), laterally linked to arms of hypandrium by membranous tissue, posteriorly reduced, laterally microtrichose and linked to surstyli by membranous tissue (Fig. 149). Hypandrium longer than epandrium, reduced to a narrow V-shaped strip, arms anteriorly fused to ventral rod of aedeagal apodeme; dorsal arch (developed from decasternum) roughly sinuate in lateral view, three-layered, medial surface of dorsalmost layer [not considering anterior region of decasternum] covered with tiny scales recalling gooseflesh, ventralmost layer protruding, hook-shaped and directed forwards at tip in lateral view, perpendicular to aedeagus, and linked both to apical region of inner paraphyses ventrally, and to hypandrial arms laterally, by membranous tissue; gonopod well-developed, fused to distal region of hypandrial arm, medially weakly linked to outer paraphysis by membranous tissue, and with 1 seta. Aedeagus tube-shaped, folded over itself, anterior region channel-shaped and dorsally entirely membranous, anteriorly fused to anterior margin of inner paraphysis, straight, distally membranous, ventrolaterally reticulate, recalling the chorion of a drosophilid egg, dorsodistal, sclerotised margin serrate. Aedeagal apodeme bifid, with two posterior plate-shaped arms, weakly sclerotised (except for anterior margin), ventrally fused to hypandrial arms, adpressed, embracing anterior region of aedeagus. Ventral rod not discernible, fused to anterior hypandrial arms. Outer paraphyses encircling each other and aedeagus distally, with ca. 3 setulae dorso-medially; linked both to dorsoapical region of aedeagal apodeme arm anteriorly, and to gonopod medially, by membranous tissue. Inner paraphyses strongly sclerotised, flat, bare, bent,

distally linked to each other by membranous tissue, basally fused to dorsodistal margin of anterior region of aedeagus, linked by membranous tissue both to apical region of aedeagal apodeme arm laterally, and to ventralmost layer of dorsal arch apically.

♀. Measurements: Frontal length 0.47 (0.45-0.51) mm; frontal index = 1.14 (0.96-1.25), top to bottom width ratio = 1.31 (1.21-1.38). Ocellar triangle about 33-37% of frontal length. Orbital plates about 64-74% of frontal length. Distance of or3 to or1 = 171-200% of or3 to vtm, or1 / or3 ratio = 0.71 (0.65-0.81), or2 / or1 ratio = 0.95 (0.88-1.00), postocellar setae = 56 (52-63)%, ocellar setae = 84 (77-89)% of frontal length; vibrissal index = 0.33 (0.28-0.38). Cheek index about 9-17. Eye index = 1.38 (1.31-1.44). Thorax length 2.05 (1.93-2.13) mm. h index = 2.18 (1.86-2.70). Transverse distance of dorsocentral setae 323-400% of longitudinal distance; dc index = 0.50 (0.45-0.54). Distance between apical scutellar setae about 89-95% of that between apical and basal one; scut index = 1.25 (1.18-1.32), sterno index = 0.82 (0.76-0.86), median katepisternal seta about 21-32% of anterior one. Wing length 4.07 (3.99-4.20) mm, length to width ratio = 2.21 (2.14-2.28). Indices: C = 2.66 (2.38-2.96), ac = 2.86 (2.45-3.22), hb = 0.79 (0.76-0.81), 4C = 1.08 (1.00-1.16), 4v = 1.88 (1.77-1.96), 5x = 0.94 (0.92-1.00), M = 0.45 (0.42-0.48), prox. x = 1.16 (1.08-1.24).

Distribution. – A widespread Palaearctic species, more common in mountainous and northern areas which suggests a boreo-alpine distribution type. Scandinavian records are from Norway, Sweden, and Finland (northernmost record: Hattula), but it is also found in the Baltic countries.

Biology. – Adults have been bred from mushrooms (e.g. Bächli & Thunes, 1992).

Additional specimens examined. – 4 ♂♂ (GERMANY: Schöngesing, 1 ♂, 1991. NORWAY: Lindås, 3 ♂♂, 1991), 5 ♀♀ (AUSTRIA: Neuhau, 1 ♀, 2000. NORWAY: Lindås, 4 ♀♀, 1991)

Comments. – *L. quinquemaculata marginalis* was originally described as a variety with a less visible wing pattern and is currently treated as a subspecies. However, considering the variability observed across the whole distribution area, this “subspecies” is best treated as only a local variety.

Genus *Phortica* Schiner, 1862

Phortica Schiner, 1862: 433. Type species: *Musca variegata* Fallén, 1823.
Sinophthalmus Coquillett, 1904: 190 (subgenus).
Allophortica Máca, 2003: 251 (subgenus).

Diagnosis. – Dorsal and ventral branches long at base of arista, shorter towards tip, without terminal fork; anterior reclinate orbital seta at most half as long as posterior reclinate one; all orbital setae in dorsal half of frons; mesonotum variegated with dark spots around bases of setae and a brownish microtrichosity; tibiae yellowish with 3 dark bands; white spots on head and thorax absent; decasternum highly developed, dorsoventrally flattened, strongly bent medially, and ventrodistally protruding posterad above aedeagus, as a dorsal arch; aedeagus strongly developed, mostly covered with a membranous sheath, strongly curved ventrad and apically pointed anterad, reaching posterior margin of aedeagal apodeme; ventral rod positioned medially, not apically; two pairs of very long and bizarre paraphyses; aedeagal apodeme anteriorly flattened laterally.

Taxa included. – At present, about 70 mostly East Asian species are included; about half of them are placed in the *magna*, *omega*, and *variegata* species groups. The relationships of *Phortica* with some other genera or former subgenera of *Amiota* have been studied by Máca (2003).

Comments. – In addition to the species mentioned below, the two following have been described from Europe: *Phortica erinacea* (Máca, 1977) from Bulgaria, and *P. oldenbergi* (Duda, 1924) from around Berlin, Germany. The latter species has not been recorded since then; its closest relatives were described from the Afrotropical region (subgenus *Allophortica*), which suggests an unsuccessful introduction. In addition, *P. goetzi* (Máca, 1987) has been described from Turkey.

We should emphasize that in the following key males and females can be provisionally identified mainly by some colour characters, but there is a lot of variation in such characters which may result in misidentifications. In the case of males, the results can be corroborated by study of their terminalia.

The flies have been recorded as a nuisance, trying to enter the eyes and/or ears of humans.

Key to European species of Phortica

- 1 Scutellum with a fine supplementary setula proximal to basal scutellar seta. Abdominal tergites dark, with lighter patches in posterior half; last segment of pretarsus almost yellow
..... *P. oldenbergi* (Duda)
(Afrotropical species; a few old records from eastern Germany, but most probably introduced)
- Scutellum only with the usual scutellar setae. Abdominal tergites predominantly light, with dark bands in posterior half; last segment of pretarsus darkened 2
- 2(1) Scutellum brownish-yellow, paler than ground-colour of scutum
..... *P. erinacea* Máca
(Bulgaria)
- Scutellum dark, of same ground-colour as scutum 3
- 3(2) Tarsus yellowish; tarsomere 5, at least apical half of tarsomere 4, and often also other tarsomeres apically darkened (Fig. 152). Occiput pale along whole eye margin (Fig. 154). Male terminalia: aedeagus enveloped by a tracheolated, dorsally wrinkled, membranous sheath; inner paraphysis complex but not very large, apically slightly bifid, flanking aedeagus only on its basal half (Figs 156, 157).....
..... *P. semivirgo* Máca
- Tarsus yellowish, at most tip of tarsomere 5 slightly darkened (Fig. 153). Occiput dark along eye margin in upper half, lighter yellowish below (Fig. 155). Male terminalia: aedeagus enveloped by a small, neither tracheolated nor wrinkled, membranous sheath; inner paraphysis complex, huge, apically strongly bifid, flanking aedeagus basally and distally (Figs 158, 159).....
..... *variegata* (Fallén)

Phortica semivirgo (Máca, 1977)

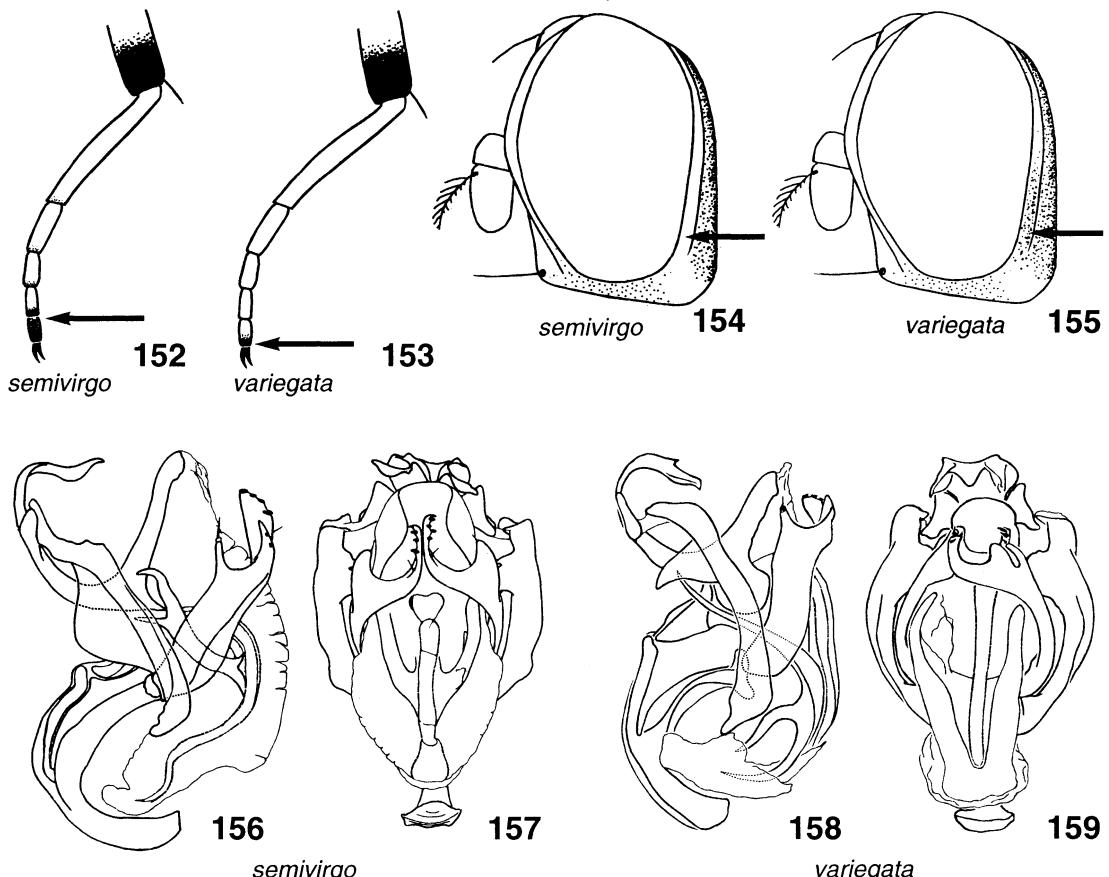
(Figs 35, 42, 152, 154, 156, 157, 160-163)

Amiota semivirgo Máca, 1977: 123.

Diagnosis. – Generally pale brownish flies; aedeagus long, anteriorly flanked by a pair of long, curved, complex, inner paraphyses; membranous sheath of aedeagus conspicuously inflated and full of tiny tracheal branches, which arise from two main larger tracheae entering the internal male terminalia by an anteromedial foramen.

Redescription. – ♂. Head. Frons dull, brownish, black between ocellar triangle and orbital plates, golden-yellow above antennae, pale yellow along eyes (whitish in frontal view) and behind the black area, frontal length 0.45 (0.42-0.49) mm; frontal index = 0.84 (0.79-0.89), top to bottom width ratio = 1.39 (1.32-1.43). Frontal triangle indistinct, ocellar triangle prominent, blackish-brown, subshining, about 38-44% of frontal length. Orbital plates pale yellow, subshining, narrow, not contiguous with eye margin, about 52-64% of frontal length. Orbital setae black, in a line, distance of or3 to or1 = 125-157% of or3 to vtm, or1 / or3 ratio = 1.05 (1.00-1.10), or2 / or1 ratio = 0.42 (0.36-0.48), postocellar setae = 23 (18-24)%, ocellar setae = 88 (79-96)% of frontal length; vibrissal index = 0.42 (0.33-0.50). Face pale yellowish, dull, brownish behind antennae. Carina not prominent but visible between pedicels, flat, short. Cheek index about 6-10. Eye index = 1.33 (1.26-1.38). Occiput black, brownish above foramen, pale yellow along whole eye margin (Fig. 154). Antennae brownish-yellow, pedicel slightly darker. Flagellomere 1 whitish-yellow when seen from above, length to width ratio = 1.30. Arista with 4-5 relatively short dorsal branches which decrease distinctly in length towards tip, virtually no or very minute ventral, and about 12 small inner branches, without terminal fork. Clypeus broad, dark brown except for a median yellowish interval. Palpus yellowish, medially broad, apically narrow, with 1 strong apical, and about 4 ventral black setae.

Thorax length 1.83 (1.73-1.92) mm. Scutum (Fig. 42) with a greyish pattern around bases of setae, consisting of more or less roundish, partially confluent or connected dark brown spots,



Figs. 152-159. 152, 153: distal part of mid leg, posterior view; 154, 155: head, left lateral view; 156-159: internal male terminalia, left lateral view (left), posterior view (right).

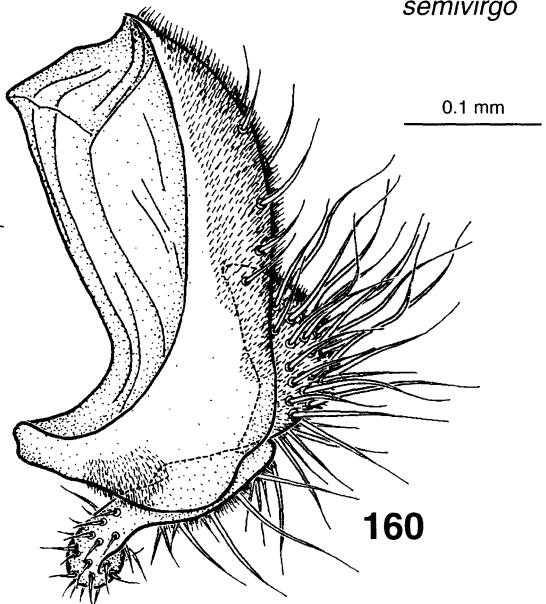
shining, laterally partly yellowish, black along sutures and behind prescutellar setae, contrasting yellow in upper half of postpronotum, 10-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 292-380% of longitudinal distance; dc index = 0.50 (0.38-0.57). 2 distinct prescutellar setae, length about 100-150% of anterior dorsocentral setae. Scutellum dark brown, subshining, basally and between apical scutellar setae yellowish, greyish dull in basal half except for a narrow median stripe, distance between apical scutellar setae about 100-113% of that between apical and basal one; basal setae divergent; scut index = 1.06 (1.00-1.11). Pleura predominantly blackish-brown, partly pale yellowish, particularly below wing base, sterno index = 0.92 (0.87-0.94), median katepisternal seta about 14-26 %

of anterior one. Haltere whitish. Legs (Fig. 43) with a characteristic pattern: coxa brown, femur brown but base and apex yellow, tibia yellow with 3 brown rings, tarsus (Fig. 152) yellow, at most some tarsomeres apically brownish, fine preapical setae on all tibiae, apical seta on mesotibia.

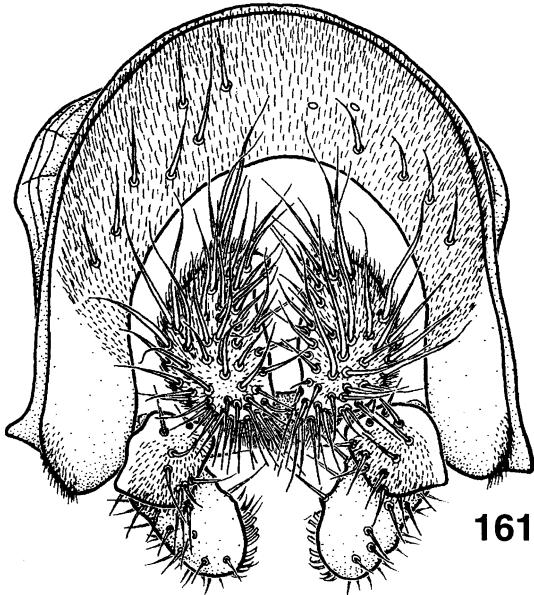
Wing hyaline, but both crossveins brown, slightly shadowed, veins R_{4+5} and M apically distinctly converging, discal and second basal cells separated, length 3.19 (3.04-3.33) mm, length to width ratio = 2.30 (2.26-2.36). Indices: C = 2.58 (2.42-2.80), ac = 3.11 (2.50-3.50), hb = 0.69 (0.67-0.71), 4C = 1.58 (1.38-1.71), 4v = 3.12 (2.79-3.50), 5x = 1.02 (0.91-1.11), M = 0.76 (0.63-0.85), prox. x = 1.92 (1.69-2.17).

Abdomen with yellow ground-colour and dark brown bands, shining; tergite 2 with an oblique

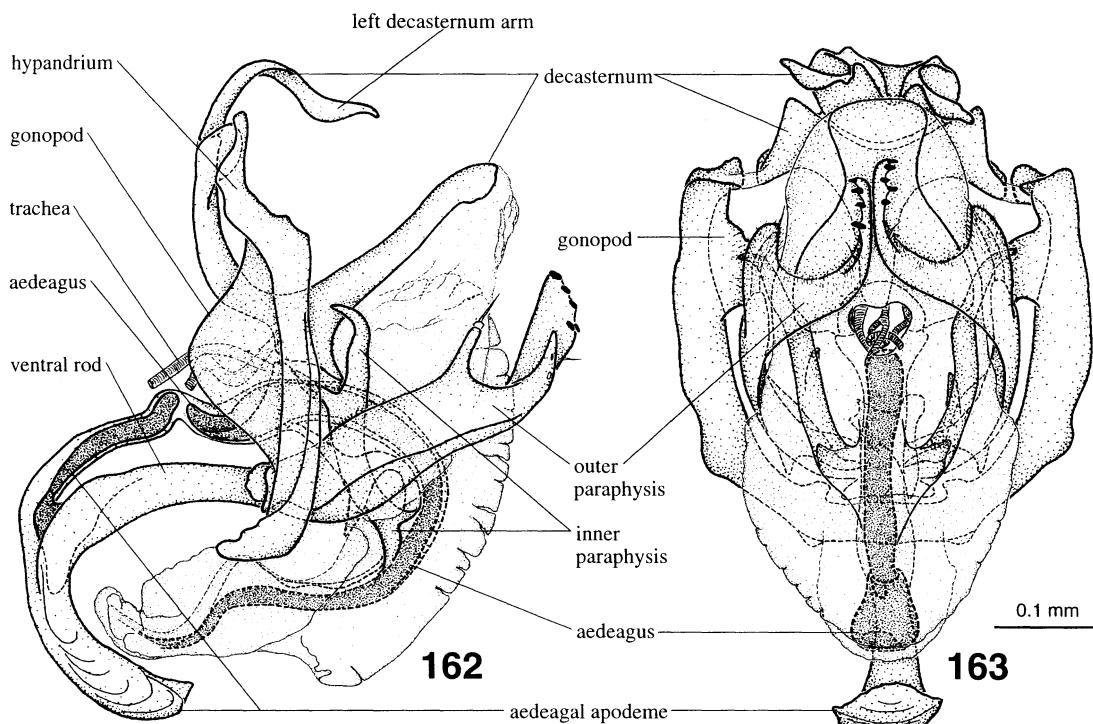
semivirgo



160



161



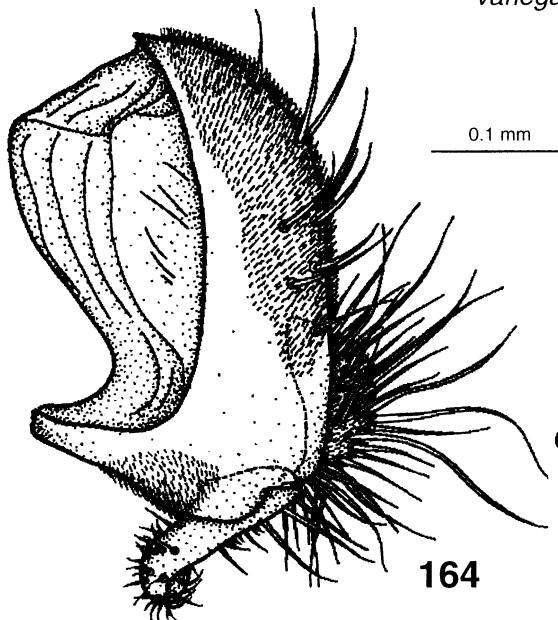
Figs. 160-163. *Phortica semivirgo* (Máca). 160: epandrium, cerci, and surstyli, left lateral view; 161: idem, plus basal region of decasternum, posterior view; 162: hypandrium, gonopods, paraphyses, aedeagus, aedeagal apodeme, and distal region of decasternum, left lateral view; 163: idem, posterior view.

lateral band and a lateroventral dark spot; tergites 3-5 with a dark marginal band, medially and laterally broadened, forming a median stripe and broad lateral areas which lateroventrally leave open at most a diffuse yellowish spot; tergite 6 usually dark, at most with a median, conical yellowish stripe; spiracles on pleura near mediolateral margin of each tergite, except last one which is near anterolateral margin of tergite 6, spiracle 7 absent; sternite 6 strongly sclerotised, pouch-shaped, mediolaterally expanded dorsad, without setae, interiorly positioned beneath sternite 5, probably sheathing the tip of the extremely developed and apically expanded aedeagus.

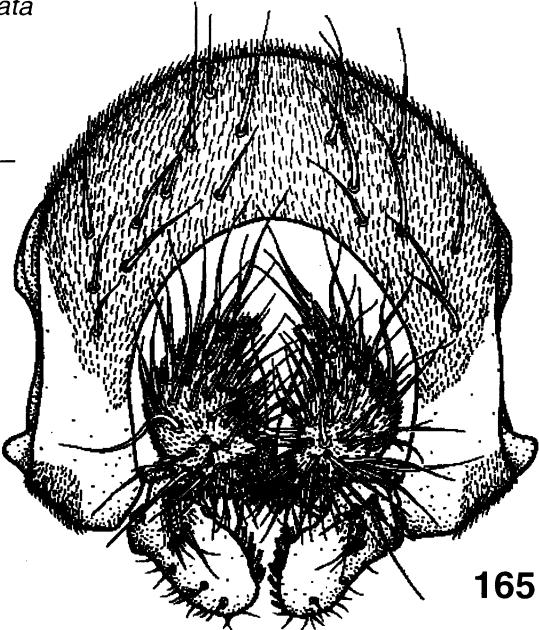
Terminalia ♂ (Figs 160-163). Epandrium anteroventrally expanded forwards, dorsally and ventromedially microtrichose, with usually no lower, and ca. 7 upper setae, ventral lobe partially covering surstylos, slightly microtrichose; apodeme strongly sclerotised, dorsally expanded forwards. Cercus microtrichose, in a low position, linked both to hypandrium laterally, and to decasternum ventrally, by membranous tissue. Surstylus long, dorsomedially membranous, posteriorly concave, directed forwards and then curved inwards, slightly microtrichose dorsally, with no prensisetae, and ca. 15 long, dorsal, outer setae, ca. 12 short, ventral, outer setae, and on the inner side with ca. 40 sharp setae and a narrow patch of ca. 14 strip-like, blunt setae adjacent to inner margin. Decasternum highly developed, dorsoventrally flattened, basally projecting anterad, then narrower and strongly bent medially, ventrodistally expanded laterally and protruding posterad, margin widely membranous, enveloping aedeagus like a pale mantle dorsally, basal margin linked to ventral margin of cerci by membranous tissue, followed by a triangular, membranous, densely microtrichose area, basolaterally sclerotised and with one arm distally fused to inner wall of surstylus, linked by membranous tissue both to inner corner of hypandrium submedially, and to anterodorsal process of inner paraphysis medially. Hypandrium as long as epandrium, reduced, anteroposteriorly flattened, U-shaped, anterolaterally angular; gonopod membranous, triangular, medially microtrichose, directed slightly anterad, completely fused to subdistal hypandrial arm, without setae, linked to anterior paraphysis by membranous tissue. Aedeagus very long, narrow, sinuate, medially

folded over itself, reaching ventral margin of aedeagal apodeme, anterodorsally strongly sclerotised, subapically spatulate, apically, laterally and ventrally membranous, basally and lateromedially flanked and linked by membranous tissue to a pair of large, extremely complex, inner paraphyses, dorsobasally slightly incised and linked to aedeagal apodeme by membranous tissue; additionally, the aedeagus is conspicuously enveloped by a tracheolated, and dorsally mostly wrinkled membrane, the unusual tracheal branches springing from two larger tracheae that enter the anterior foramen between the mediolateral margin of the decasternum and the dorsobasal process of the inner paraphyses, and reach the membranous envelope. Aedeagal apodeme rod-shaped, curved, distally strongly sclerotised and linked to aedeagus by membranous tissue, anteriorly expanded laterally. Ventral rod strongly developed, curved, dorsally deeply sulcate, apically bifurcate, with branches turned outwards. Two pairs of bizarrely developed paraphyses. Outer paraphysis strongly developed and sclerotised, distally curved inwards, slightly microtrichose and trifurcate, anterodorsal branch pointed dorsad and apically with one seta, median branch apically sharp and ventrally with 2 setulae, apical branch ventroproximally with one thin seta, and ventrodistally with ca. 5 peg-like setae marginally, which are more or less parallel to margin instead of perpendicular as usual, recalling bracket fungi on a trunk, and with ca. 2 setulae subproximally, linked both to distal margin of aedeagal apodeme and to ventral area of gonopod by membranous tissue. Inner paraphysis basally linked by membranous tissue to base of aedeagus, highly developed and sclerotised, bare, sinuate and extremely complex, with three branches, one dorsanteriorly, one ventroanteriorly and one ventromedially, shaped as follows: first one short, blunt, dorsoventrally flattened, directed dorsad, second one broad, distally sharp and directed posterad, third one long, curved and directed dorsad, which is in turn branched submedially, posterior branch long, slightly sinuate and sharply pointed, anterior branch short, straight, and sharp-tipped.

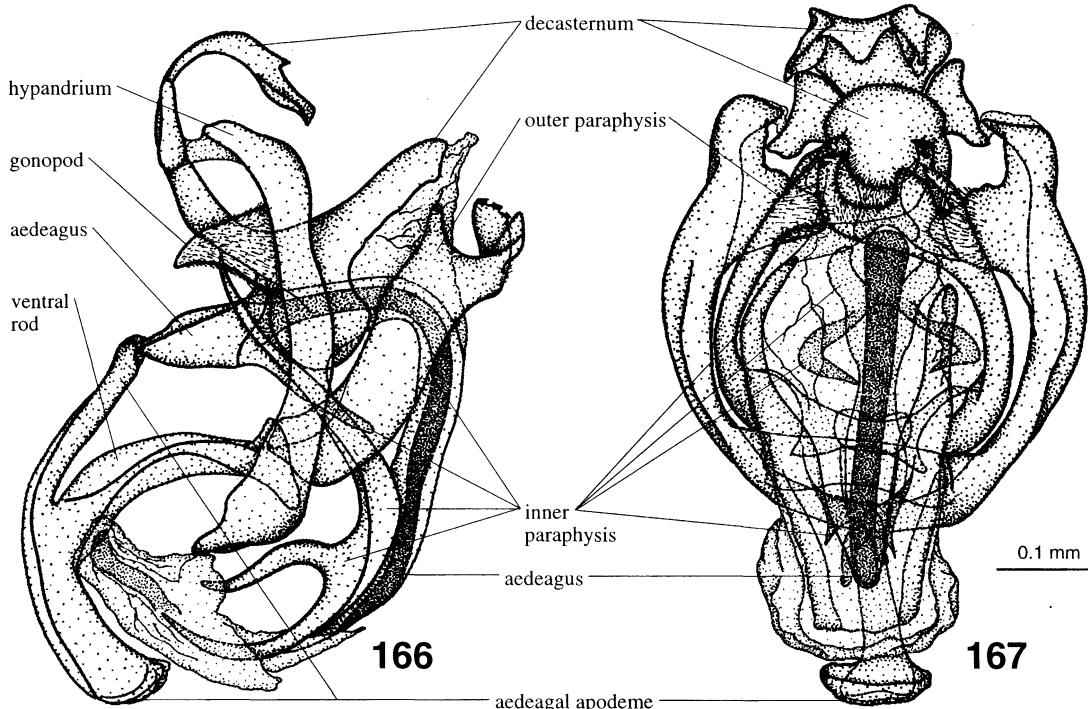
Distribution. — Widespread in Europe and Eastern Asia but often confused with the species treated below. Northernmost record: Sweden (Stockholm), but also found in Russia (around St. Petersburg, etc.).

variegata

164



165



Figs. 164-167. *Phortica variegata* (Fallén). 164: epandrium, cerci, and surstyli, left lateral view; 165: idem, plus basal region of decasternum, posterior view; 166: hypandrium, gonopods, paraphyses, aedeagus, aedeagal apodeme, and distal region of decasternum, left lateral view; 167: idem, posterior view.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Ticino, 1970).

Phortica variegata (Fallén, 1823)

(Figs 153, 155, 158, 159, 164-167)

Drosophila variegata Fallén; 1823: 5.

Diagnosis. – Generally dark brown flies; aedeagus very long, curved, and only apically covered with a membranous sheath, without tracheal branches; flanked by a pair of huge and extremely complex inner paraphyses, which are distally trifurcate, distal branches being hook-shaped.

Redescription. – ♂. Head. Frons dull, brownish, black between ocellar triangle and orbital plates, golden-yellow above antennae, pale yellow along the eyes (whitish in frontal view) and behind the black area, frontal length 0.44 (0.40-0.48) mm; frontal index = 0.87 (0.81-0.96), top to bottom width ratio = 1.44 (1.39-1.56). Frontal triangle indistinct, ocellar triangle prominent, blackish-brown, subshining, about 39-42% of frontal length. Orbital plates pale yellow, subshining, narrow, not contiguous with eye margin, about 52-61 % of frontal length. Orbital setae black, in a line, distance of or3 to or1 = 129-143% of or3 to vtm, or1 / or3 ratio = 1.07 (0.95-1.20), or2 / or1 ratio = 0.45 (0.33-0.60), postocellar setae = 26 (24-32)%, ocellar setae = 83 (80-85)% of frontal length; vibrissal index = 0.47 (0.40-0.58). Face pale yellowish, dull, brownish behind antennae. Carina not prominent but visible between pedicels, flat, short. Cheek index about 6-9. Eye index = 1.30 (1.24-1.36). Occiput black, brownish above foramen, pale yellow along eye margin, but more or less brownish along lower half of eye (Fig. 155). Antennae brownish-yellow, pedicel slightly darker. Flagellomere 1 whitish-yellow when seen from above, length to width ratio = 1.22. Arista with 3-5 relatively short dorsal branches which decrease distinctly in length towards tip, virtually no or very minute ventral, and about 12 small inner branches, without terminal fork. Clypeus broad, dark brown except for a median yellowish interval. Palpus yellowish, medially broad, apically narrow, with 1 strong apical and about 3 ventral black setae.

Thorax length 1.77 (1.70-1.80) mm. Scutum with a greyish pattern around bases of setae, consisting of more or less roundish, partially confluent or connected dark brown spots, shining, laterally partly yellowish, black along sutures and behind prescutellar setae, contrasting yellow in upper half of postpronotum, 10-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 292-336% of longitudinal distance; dc index = 0.53 (0.48-0.56). 2 distinct prescutellar setae, length about 90-110% of anterior dorsocentral setae. Scutellum dark brown, subshining, basally and between apical scutellar setae yellowish, greyish dull in basal half except for a narrow median stripe, distance between apical scutellar setae about 93-107% of that between apical and basal one; basal setae divergent; scut index = 1.06 (1.02-1.11). Pleura predominantly blackish-brown, partly pale yellowish, particularly below wing base, sterno index = 0.91 (0.87-0.96), median katepisternal seta about 19-22% of anterior one. Haltere whitish. Legs with characteristic pattern: coxa brown, femur brown but base and apex yellow, tibia yellow with 3 brown rings, tarsus (Fig. 153) yellow, at most tarsomere 5 brownish, fine preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline but both crossveins brown, slightly shadowed, veins R₄₊₅ and M apically distinctly converging, discal and second basal cells separated, length 2.98 (2.94-3.05) mm, length to width ratio = 2.26 (2.21-2.30). Indices: C = 2.35 (2.13-2.57), ac = 3.12 (3.00-3.29), hb = 0.73 (0.67-0.81), 4C = 1.66 (1.50-1.77), 4v = 3.05 (2.93-3.15), 5x = 1.03 (0.90-1.11), M = 0.73 (0.64-0.77), prox. x = 1.79 (1.71-1.85).

Abdomen with yellow ground-colour and dark brown bands, shining; tergite 2 with an oblique lateral band and a lateroventral dark spot; tergites 3-5 with a dark marginal band which is medially and laterally broadened into a median stripe and broad lateral areas which lateroventrally leave open at most a diffuse yellowish spot; tergite 6 usually dark, at most with a median, conical yellowish stripe; spiracles on pleura near mediolateral margin of each tergite, except last one, which is near anterolateral margin of tergite 6, spiracle 7 absent; sternite 6 strongly sclerotised, pouch-shaped, mediolaterally expanded dorsad, without setae, interiorly positioned beneath sternite 5, probably sheath-

ing the tip of the extremely developed and apically expanded aedeagus.

Terminalia ♂ (Figs 164-167). Epandrium anteroventrally expanded anterad, dorsally and ventromedially microtrichose, with usually no lower, and ca. 10 upper setae, ventral lobe slightly microtrichose and partly covering surstylos; apodeme strongly sclerotised, dorsally expanded anterad. Cercus microtrichose, lower-positioned, linked both laterally to hypandrium and ventrally to decasternum by membranous tissue. Surstylus long, dorsomedially membranous, posteriorly concave, directed anterad and then curved inwards, slightly microtrichose dorsally, with no prensisetae, and ca. 9 long, dorsal outer setae, ca. 10 short, ventral outer setae, and on the inner side with ca. 40 sharp setae and a narrow patch of ca. 14 strip-like, blunt setae adjacent to inner margin. Decasternum highly developed, dorsoventrally flattened, basally projected anterad, then narrower and strongly bent medially, and ventrodistally expanded laterally and protruding posterad, marginally membranous, enveloping aedeagus like a pale mantle dorsally, basal margin linked to ventral margin of cerci by membranous tissue, followed by a triangular, membranous, anterad directed, densely microtrichose area, basolaterally sclerotised and with one arm distally fused to inner wall of surstylus, linked by membranous tissue both to inner corner of hypandrium submedially and to anterodorsal process of inner paraphysis medially. Hypandrium as long as epandrium, reduced, anteroposteriorly flattened, U-shaped; gonopod basally weakly sclerotised, triangular, medially microtrichose, directed slightly anterad, completely fused to subdistal hypandrial arm, without setae, linked to anterior paraphysis by membranous tissue. Aedeagus, very long, narrow, sinuate, ventrally folded over itself, reaching ventral margin of aedeagal apodeme, anterodorsally strongly sclerotised, apically membranous, basally and lateromedially flanked and linked by membranous tissue to a pair of huge, extremely complex, inner paraphyses, dorsobasally slightly incised and linked to aedeagal apodeme by membranous tissue. Aedeagal apodeme rod-shaped, curved, anteriorly and posteriorly expanded laterally, dorsodistally weakly sclerotised in middle line, linked to aedeagus by membranous tissue. Ventral rod strongly developed, curved, dorsally deeply sulcate, apically bifurcate, with

branches strongly turned outwards. Two pairs of bizarrely developed paraphyses. Outer paraphysis strongly developed and sclerotised, proximally expanded outwards, distally curved inwards, slightly microtrichose and trifurcate, anterodorsal branch pointed dorsad and apically with one seta, median branch apically sharp and without setulae, apical branch ventroproximally with one thin seta and dorsodistally with ca. 3 peg-like setae marginally, which are more or less parallel to margin instead of perpendicular as usual, recalling bracket fungi on a trunk, linked both to distal margin of ventral rod, and to ventral area of gonopod, by membranous tissue. Inner paraphysis basally linked both to base of aedeagus/tip of aedeagal apodeme and to mediolateral margin of decasternum by membranous tissue, highly developed and anteriorly and posteriorly strongly sclerotised (weakly sclerotised in median region), bare, sinuate and extremely complex, with three main branches, one dorsoanteriorly, one ventroanteriorly and one ventromedially, shaped as follows: first one short, blunt, dorsoventrally flattened, directed dorsad and slightly outwards (Fig. 167, second arrow from top), second one anteriorly broad, distally narrow, sharp, curved inwards and directed posterad (Fig. 167, third arrow from top), third one very long, curved, and trifurcate, first branch longest, slightly curved, sharp and directed anterodorsad (Fig. 167, topmost arrow), second one shortest, slightly sinuate, sharp, distally turned inwards and cruciate (Fig. 166, lowest arrow), third one dorsoventrally flattened, hook-shaped in lateral view, distally slightly turned outwards; the latter two are directed anterad, flanking aedeagus distally.

Distribution. – Widespread in Europe and Eastern Asia, but often confused with the preceding species. In Scandinavia a few mostly doubtful records from Sweden and Finland.

Additional specimens examined. – 4 ♂♂ (GERMANY: Lüchow, 1 ♂, 1983. SERBIA AND MONTENEGRO: Popovica, 3 ♂♂, 1980).

Genus *Stegana* Meigen, 1830

Stegana Meigen, 1830: 79. Type species: *Drosophilida curvipennis* Fallén, 1823.

Orthostegana Hendel, 1913: 631 (subgenus).

Protostegana Hendel, 1920: 53.

Ceratosystylus Enderlein, 1922: 296 (subgenus).
Oxyphortica Duda, 1923: 34 (subgenus).
Chaetocnema Duda, 1926: 242.
Anastega Sidorenko, 2002: 14 (subgenus).

Diagnosis. – Arista plumose, usually with numerous branches; carina usually narrow and confined to upper part of face; postpronotal setae small; scutum and scutellum flattened; basal scutellar setae divergent; acrostichal setulae usually in numerous rows; prescutellar setae typically large (but absent in several species); pleura usually pale yellowish with a distinct blackish stripe below wing base; mesotibia with a row of stout setae; wing typically darkened or patterned at least along costal margin, in life curved down over sides of the abdomen, giving a beetle-like aspect; subcosta fused with R_1 , not ending free; veins R_{4+5} and M apically distinctly convergent; cells bm and dm separate; costa extending beyond apex of vein R_{4+5} ; 3rd costal section ventrally with small curved costal pegs (warts); inner paraphysis absent; outer paraphysis reduced.

Taxa included. – There are more than 100 described species, divided into 6 subgenera. The European species belong to the subgenera *Stegana* and *Steganina*. Two additional former Oriental subgenera, *Parastegana* Okada, and *Pseudostegana* Okada are now treated as separate genera (Sidorenko, 2002).

Comments. – The biology of *Stegana* species is almost unknown: one species is reported from “beech bark bearing *Hypoxylon*” (Chandler, 1987a), the larvae of another have been found beneath bark (Morge, 1956: 134–135), and one species has been reared from flowers of *Erythrina abyssinica* Lam. (Fabaceae); adults can be collected by sweeping over cut bark. The flies are rarely attracted to fruit baits and cannot be kept in culture.

The members of this genus are easily recognised by the dark, down-curving wings. However, for males and females of Western Palaearctic species (except for *S. furta* Linnaeus) there are only a few colour characters, but no well defined, external, structural features, that are available for species identification, which is reliable only if based on study of the male terminalia. We find the females virtually indistinguishable, although Laštovka & Máca (1982: 10, 11; in the identification key) thought it possible to tell

them apart mainly on the basis of details of the cercus, such as its shape, size and the presence of microtrichia, and, additionally, on the shape of the posterior margin of the oviscapts. The European *Stegana* species were revised by Laštovka & Máca (1982), who described new species and re-established some old synonyms of *S. coleoptrata* as good species. Many records of *S. coleoptrata* before 1982 may be misidentifications (see below).

We should emphasize that in many species the internal male terminalia are almost as long as the abdomen, and so the whole abdomen should be removed for preparations.

Stegana annulata Haliday, 1833, was described from Ireland; this has been considered a nomen dubium, and the records from Sweden by Boheman (1853) must have been misidentifications.

Key to European species of Stegana

- 1 Eye narrow, longer axis vertical (Fig. 168).
Palpus blackish (subgenus *Stegana*)
..... *S. furta* (Linnaeus) 3
- Eye roundish, longer axis oblique (Fig. 169).
Palpus pale yellowish (subgenus *Steganina*)
..... 2
- 2(1) Large flies: wing length usually more than 4 mm. 14 or more rows of acrostichal setulae
..... 3
- Smaller flies: wing length usually less than 4 mm. At most 12 rows of acrostichal setulae. Males only (females often indistinguishable)
..... 4
- 3(2) Scutum predominantly yellowish-brown, at most with a median darker stripe; palpus as broad as flagellomere 1; male terminalia Fig. 172
..... *S. hypoleuca* Meigen
- Scutum blackish-brown, somewhat paler laterally; palpus narrower than flagellomere 1; male terminalia Fig. 173
..... *S. mehadiae* Duda
- 4(2) Frons distinctly narrowed anteriorly, anterior width less than about 2/3 length (Fig. 170). (Terminalia Figs 174, 175)
..... *S. baechlii* Laštovka & Máca

- Frons anteriorly not much narrower than posteriorly, nearly parallel-sided, anterior width more than about 3/4 length..... 5
- 5(4) Gena very broad posteriorly (Fig. 171), about 1/3 of smaller eye diameter. (Terminalia Figs 176, 177)..... *S. nigrithorax* Strobl
- Gena narrow posteriorly, about 1/5 of smaller eye diameter (as in Fig. 169) 6
- 6(5) Generally very dark flies; wing veins dark brown. Haltere brownish. (Terminalia Figs 178, 179) *S. coleoptrata* (Scopoli)
- Somewhat paler flies, particularly wing veins more yellowish. Haltere pale 7
- 7(6) Flagellomere 1 more roundish dorsoapically (Fig. 182). Second abdominal tergite often paler than the other ones. (Terminalia Figs 180, 181) *S. longifibula* Takada
- Flagellomere 1 slightly pointed dorsoapically (Fig. 183). Abdominal tergites virtually unicolourous 8
- 8(7) Length to width ratio of flagellomere 1 about 1.5; arista with 6-7 dorsal branches; terminalia Figs 184, 185 *S. similis* Laštovka & Máca
- Length to width ratio of flagellomere 1 about 1.7; arista with 4-5 dorsal branches; terminalia Figs 186, 187 *S. consimilis* Papp & Máca

Subgenus *Stegana* Meigen, 1830

Diagnosis. – Main axis of the eye almost vertical; face usually without dark transverse band; palpus blackish; surstylus anterodorsally fused with epandrium.

Taxa included. – The 20 species belonging to this subgenus are mainly Palaearctic.

Comments. – Only the following species of this subgenus occurs in the West Palaearctic; it is easily recognisable by the shape of the eyes.

Stegana furtula (Linnaeus, 1767)

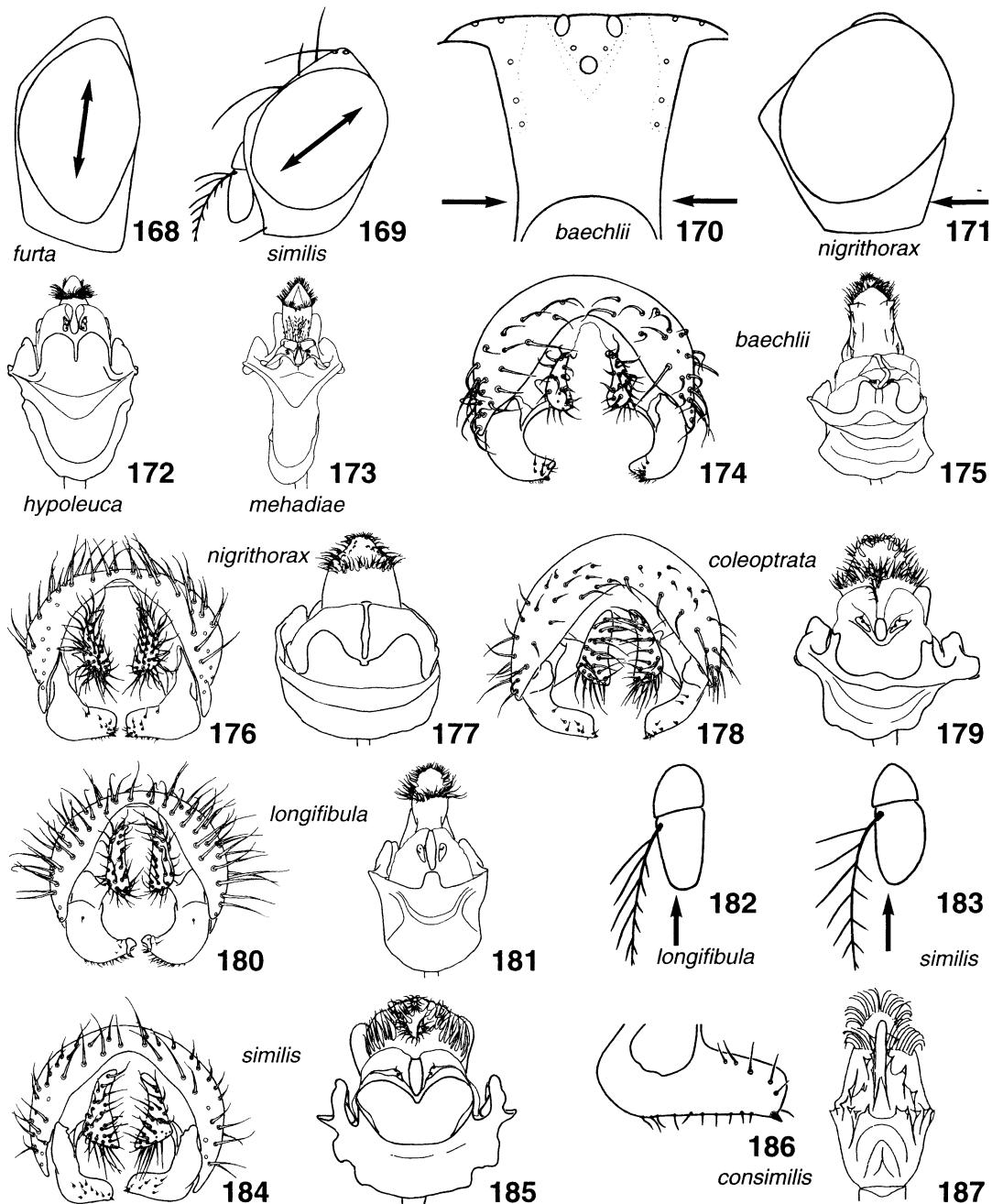
(Figs 38, 168, 188-193)

Musca furtula Linnaeus, 1767: 991.
Drosophila curvipennis Fallén, 1823: 4.
Stegana nigra Meigen, 1830: 79.

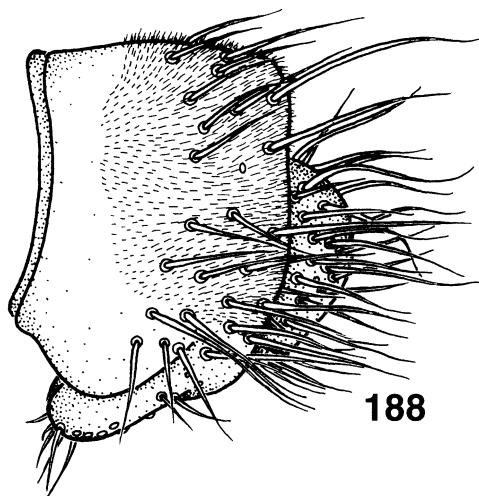
Diagnosis. – As there is only one species known in Europe, the characters of the subgenus apply.

Redescription. – ♂. Head. Frons flat, brownish-yellow, dull, frontal length 0.45 (0.40-0.49) mm; frontal index = 1.19 (1.16-1.23), top to bottom width ratio = 1.28 (1.20-1.39). Frontal triangle indistinct, pale brown; ocellar triangle slightly prominent, black, shining, about 30-33% of frontal length. Frontal vittae brown in upper half, paler below. Orbital plates narrowing downwards, brown, shining, lower half paler, about 59-69% of frontal length. Orbital setae black, virtually in a row, distance of or3 to or1 = 114-200% of or3 to vtm, or1 / or3 ratio = 1.24 (1.06-1.38), or2 / or1 ratio = 0.65 (0.56-0.70), postocellar setae virtually absent, ocellar setae = 82 (74-93)% of frontal length; vibrissal index = 0.57 (0.45-0.67). Face yellowish, with a diffuse brown band and a brown patch below carina, margin above clypeus whitish-yellow, line of genal setae black. Carina short, narrow and prominent between pedicels, flattened lower down. Cheek index about 5-8. Eye (Fig. 168) with longest axis almost vertical, index = 1.43 (1.35-1.47). Occiput black, with a diffuse brownish area in upper half. Antennae yellowish. Flagellomere 1 with a brownish margin, length to width ratio = 1.83. Arista with 4-6 dorsal, 3-4 ventral, relatively short branches, and about 10 short inner branches, plus small terminal fork. Proboscis yellowish, clypeus black. Palpus black, thickened, with about 5 black apical, and several smaller, yellowish setae along lower margin.

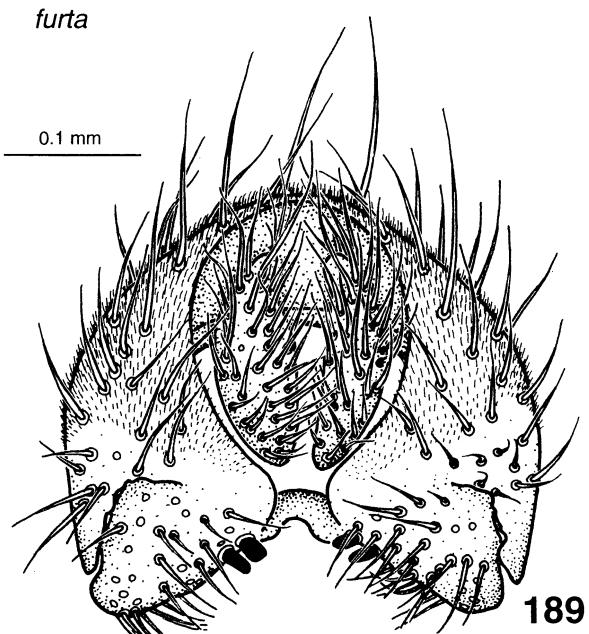
Thorax length 1.48 (1.29-1.58) mm. Scutum black, shining, with 2 pale areas above wing base, 8-10 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 278-389% of longitudinal distance; dc index = 0.55 (0.46-0.59). Two distinct prescutellar setae (Fig. 38), length about 130-150% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum



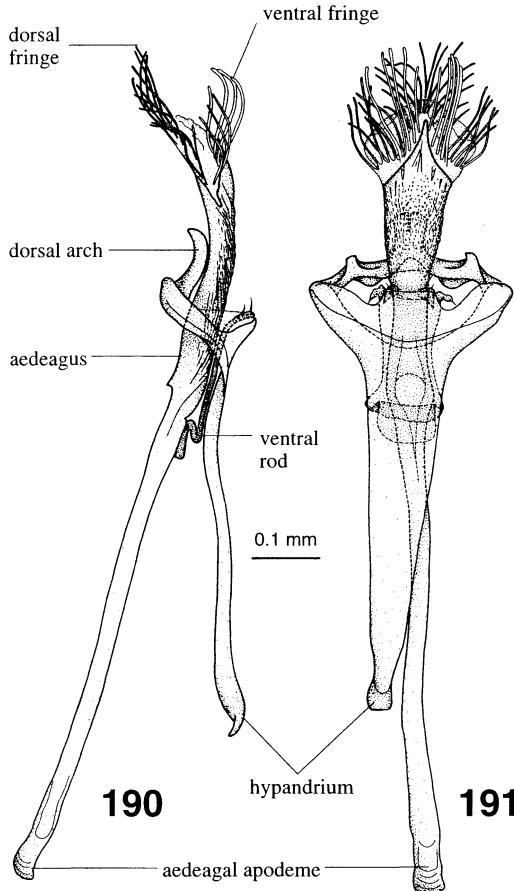
Figs. 168-187. 168, 169: heads, lateral view, main axis of eye. 170: frons, dorsal view. 171: head, lateral view, width of gena. 172, 173: hypandrium and aedeagus, posterior view. 174-181: external male terminalia, posterior view (left), hypandrium and aedeagus, posterior view (right). 182, 183: antenna, anterior view. 184: external male terminalia, posterior view. 185: hypandrium and aedeagus, posterior view. 186: surstylos, posterior view. 187: aedeagus, posterior view.



188

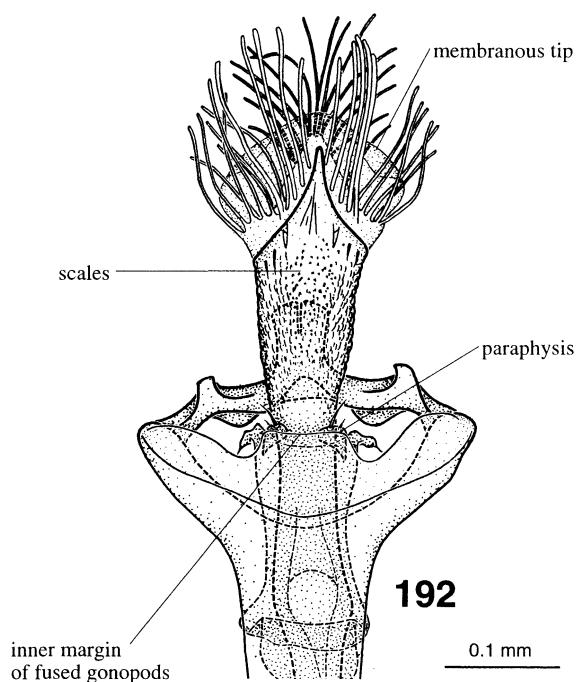


189



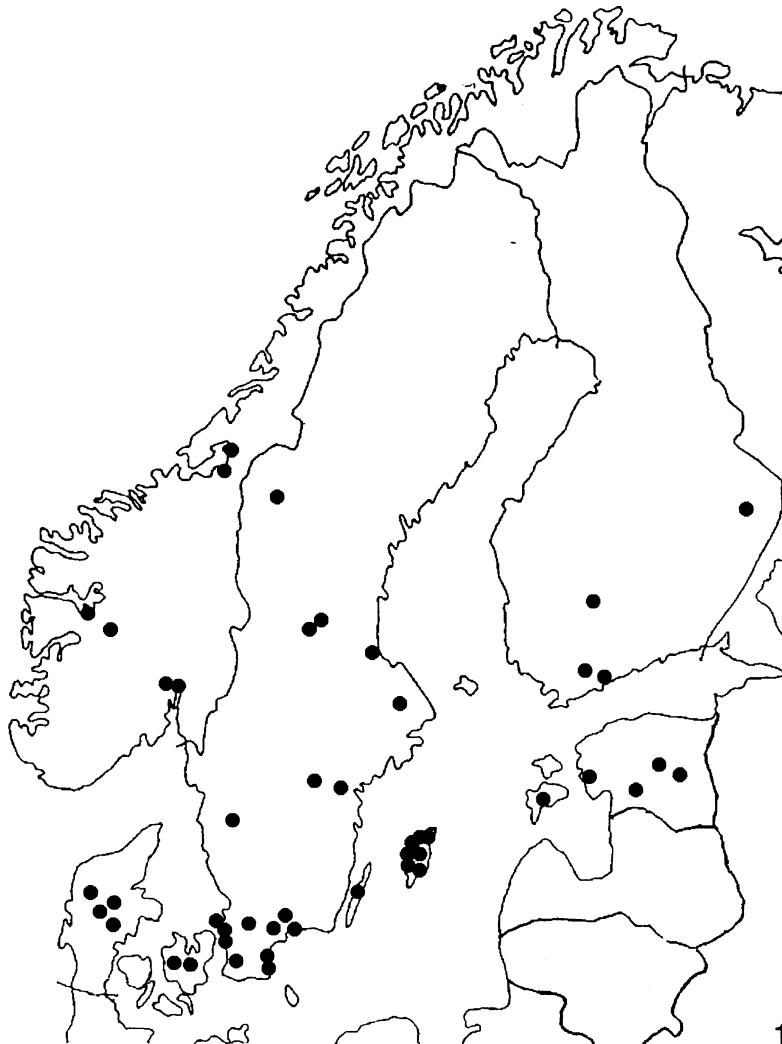
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192

Figs. 188-192. *Stegana furta* (Linnaeus). 188: epandrium, cerci, and surstyli, left lateral view; 189: idem, plus decasternum, posterior view; 190: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 191: idem, posterior view; 192: tip of aedeagus, posterior view.



193

Fig. 193. Known distribution pattern of *Stegana furta* (Linnaeus) in Scandinavia.

microtrichose, distance between apical scutellar setae about 60-82% of that between apical and basal one; basal setae strongly divergent; scut index = 1.38 (1.24-1.46). Pleura blackish-brown in lower half, brownish in upper half, with a distinct black stripe from above precoxa to base of haltere, sterno index = 0.89 (0.82-0.95), median katepisternal seta about 23-26% of anterior one. Two minute proepisternal setae. Haltere whitish. Legs pale yellowish, mesofemur and metafemur mostly dark brown except base and tip, mesotibia and metatibia with a diffuse brown basal band, fine preapical setae on mesotibia and

metatibia, apical seta on mesotibia. Mesofemur with about 5 prominent dorsal setae at base.

Wing usually bent over abdomen, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 4-7 curved costal pegs (warts) ventrally, length 2.42 (2.13-2.59) mm, length to width ratio = 2.04 (1.86-2.18). Indices: C = 2.10 (1.87-2.35), ac = 5.48 (4.75-6.00), hb = 0.72 (0.68-0.78), 4C = 1.18 (1.11-1.28), 4v = 1.99 (1.79-2.25), 5x = 1.23 (1.13-1.43), M = 0.53 (0.47-0.67), prox. x = 0.80 (0.74-0.87).

Abdomen blackish-brown, shining.

Terminalia ♂ (Figs 188-192). Epandrium distally microtrichose, with ca. 4 lower and 23 upper setae; ventral lobe reduced, not microtrichose, partially covering surstylus. Cercus anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus not microtrichose, anterodorsally fused to epandrium, with a row of only 2 peg-like prensisetae, distally somewhat blunt, ca. 8 inner and 18 outer setae. Decasternum as in Fig. 189. Hypandrium remarkably elongate, 2.4x longer both than wide and than epandrium, anterior margin narrow, straight; posterior hypandrial process absent; dorsal arch more or less straight, posteriorly with 3 backwardly-directed projections, lateral ones very short and apically blunt, median one larger, medially bifurcate, and blunt in posterior view, curved and slightly pointed dorsad in lateral view; gonopods bare, fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the rectangular medial expansion of the hypandrial posterior margin, which is linked to paraphysis by membranous tissue. Aedeagus long fused to aedeagal apodeme, slightly bent dorsad, lateroventrally mostly covered with tiny scales distally, apically membranous and with 1 dorsal and 1 ventral fringe of long, blunt-tipped, sinuate strips. Aedeagal apodeme very long, straight, rod-shaped, longer than aedeagus. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, twice as wide as adjacent width of aedeagal apodeme in posterior view, and distally linked both to inner margin of fused gonopods medially, and to paraphysis laterally, by membranous tissue. Paraphysis reduced, apically with ca. 2 setulae, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

♀. Measurements: Frontal length 0.45 (0.37-0.53) mm; frontal index = 1.00 (0.93-1.08), top to bottom width ratio = 1.11 (0.93-1.20). Ocellar triangle about 32-36% of frontal length. Orbital plates about 48-68% of frontal length. Distance of or3 to or1 = 129-180% of or3 to vtm, or1 / or3 ratio = 1.29 (1.20-1.47), or2 / or1 ratio = 0.59 (0.50-0.68), ocellar setae = 80 (76-85)% of frontal length; vibrissal index = 0.45 (0.38-0.55). Cheek index about 4-6. Eye index = 1.41 (1.37-1.46). Thorax length 1.54 (1.39-1.77) mm.

Transverse distance of dorsocentral setae 291-388% of longitudinal distance; dc index = 0.55 (0.50-0.62). Distance between apical scutellar setae about 62-82% of that between apical and basal one; scut index = 1.37 (1.35-1.39), sterno index = 0.92 (0.87-0.96), median katepisternal seta about 23-29% of anterior one. Wing length 2.59 (2.27-2.91) mm, length to width ratio = 1.98 (1.88-2.09). Indices: C = 2.29 (2.14-2.44), ac = 5.67 (5.00-6.33), hb = 0.78 (0.72-0.84), 4C = 1.14 (1.00-1.27), 4v = 1.99 (1.83-2.07), 5x = 1.23 (1.11-1.30), M = 0.58 (0.53-0.65), prox. x = 0.84 (0.74-0.93).

Distribution. – (Fig. 193). Widespread Palaearctic species, recorded in all the Scandinavian countries and also in Estonia and Lithuania; the northernmost locality is Levanger (Norway).

Additional specimens examined. – 4 ♂♂ (BOSNIA AND HERZEGOVINA: Dobro Polje, 1 ♂, 1984. GERMANY: Etterschlag, 1 ♂, 1988; Schöngesing, 1 ♂, 1992. ROMANIA: Mehádia, 1 ♂, no date), 5 ♀♀ (SWITZERLAND: Aargau, 1 ♀, 1973; Valais, 2 ♀♀, 1996; Zürich, 1 ♀, 1996. [Country?]: Heimar, 1 ♀, 1977).

Subgenus *Steganina* Wheeler, 1960

Steganina Wheeler, 1960:110 (subgenus). Type species: *Musca coleoptrata* Scopoli, 1763.

Diagnosis. – Eye roundish, largest diameter oblique; face usually with a broad, dark transverse band; palpus usually pale; surstylus not fused with epandrium, usually crescent-shaped with only one peg-like prensiseta on inner ventral corner, aedeagus long and distally with a fringe of seta-shaped scales near or along apical margin.

Taxa included. – 45 species are included in this subgenus; most of them are Palaearctic and Oriental. In addition to the species mentioned below, *Stegana consimilis* Papp & Máca, 2000, was described from Hungary and the Czech Republic.

Comments. – All the European species belong to the *coleoptrata* species group. As the females of this group are almost indistinguishable, we do not give descriptions of them; however, certain morphological characters of the males may also apply to their females.

Two species, *Stegana hypoleuca* and *S. mehariae*, are distinctly larger than all the other European *Stegana* species; they are the largest drosophilids in Europe.

Stegana baechlii

Laštovka & Máca, 1982

(Figs 170, 174, 175, 194-197)

Stegana baechlii Laštovka & Máca, 1982: 12.

Diagnosis. – Lateral margins of frons distinctly converging anterad; aedeagus basally wider than apically in posterior view, ovoid and distally sinuate in lateral view; dorsal arch distally more or less straight and slightly incised medially.

Redescription. – ♂. Head. Frons (Fig. 170) flat, brownish-black, shining. Frontal triangle indistinct, apically pointed, ocellar triangle slightly prominent, subshining, about 30% of frontal length. Orbital plates narrowing downwards, apically only slightly diverging from eye margin, about 66% of frontal length. Orbital setae black, almost in a row, or2 slightly closer to or1 than to or3. Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin. Carina short, narrow and prominent between pedicels, flattened below. Occiput brownish, with a large blackish area above foramen.

Thorax brownish-black, shining. Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above procoxa to base of haltere. Haltere with brownish knob. Legs pale yellow, femora slightly brownish in apical half, tibiae in basal half, preapical setae on all tibiae, apical seta on mesotibia. Mesotibia with about 6 prominent dorsal setae at base.

Wing usually bent over side of abdomen, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent.

Terminalia ♂ (Figs 194-197). Epandrium dorso-distally microtrichose, with ca. 5 lower and 18 upper setae; ventral lobe reduced, neither microtrichose nor covering surstyli. Cercus reduced, anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus crescent-shaped, distally pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, with only 1 small, roundish-

tipped, peg-like prensiseta, on inner ventral corner, ca. 28 inner and 7 outer setae. Decasternum as in Fig. 195. Hypandrium as long as wide, slightly longer than epandrium, anterior margin broad, sinuate; posterior hypandrial process absent; dorsal arch distally more or less straight and medially slightly incised in anterior view, dorsodistally slightly projecting forwards in lateral view; gonopods bare, fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the double-peaked, medial expansion of the hypandrial posterior margin, which is linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, sinuate in lateral view, distally membranous and with a fringe of sinuate, seta-shaped scales along apical margin, proximally broad and subproximally slightly expanded in posterior view, laterally covered with scales, which are ventrally stronger and dorsally smaller, and give a serrate aspect to the margins in lateral view. Aedeagal apodeme long, straight, rod-shaped, almost twice as long as aedeagus. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally as broad as width of adjacent apodeme in posterior view, distally narrower and linked both to posterior concave margin of hypandrium, between gonopods, and laterally to paraphysis by membranous tissue. Paraphysis reduced, apically with ca. 4 setulae, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

Distribution. – Recorded from Finland, Hungary, Switzerland, Far East Russia and Japan. Northernmost locality: Lohja (Finland).

Additional specimens examined. – None

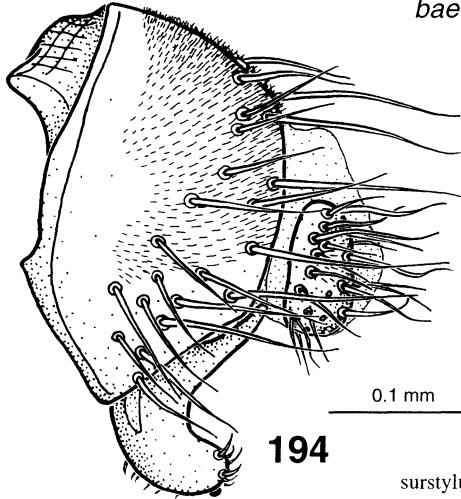
Stegana coleoptrata

(Scopoli, 1763)

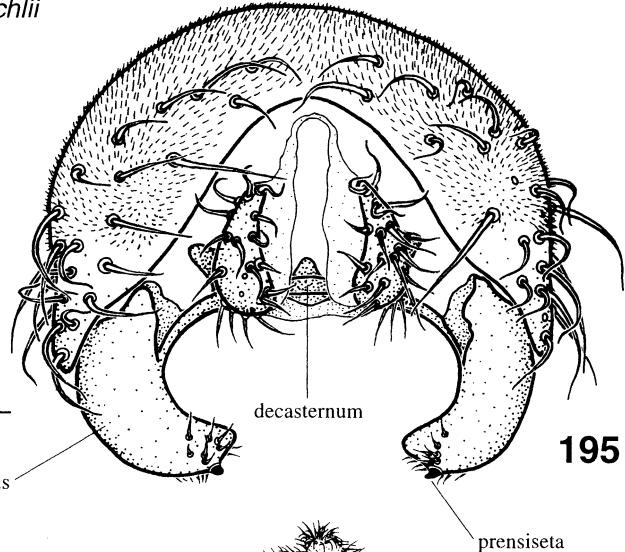
(Figs 36, 37, 178, 179, 198-201)

Musca coleoptrata Scopoli, 1763: 338.

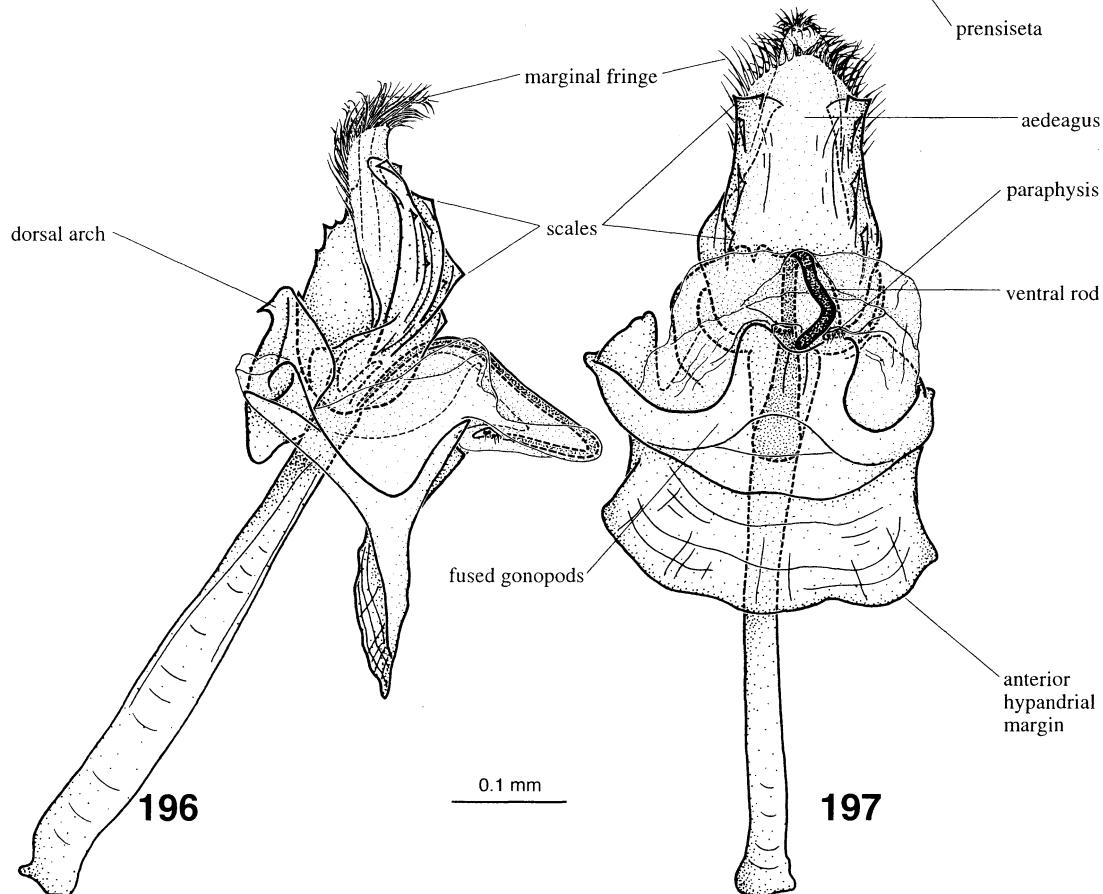
Diagnosis. – Haltere knob usually brownish; aedeagus dorsoapically prominent, and subdistally expanded; base narrower than apex in posterior view; dorsal arch distally more or less straight, and paramedially with a double row of blunt scales.

baechlii

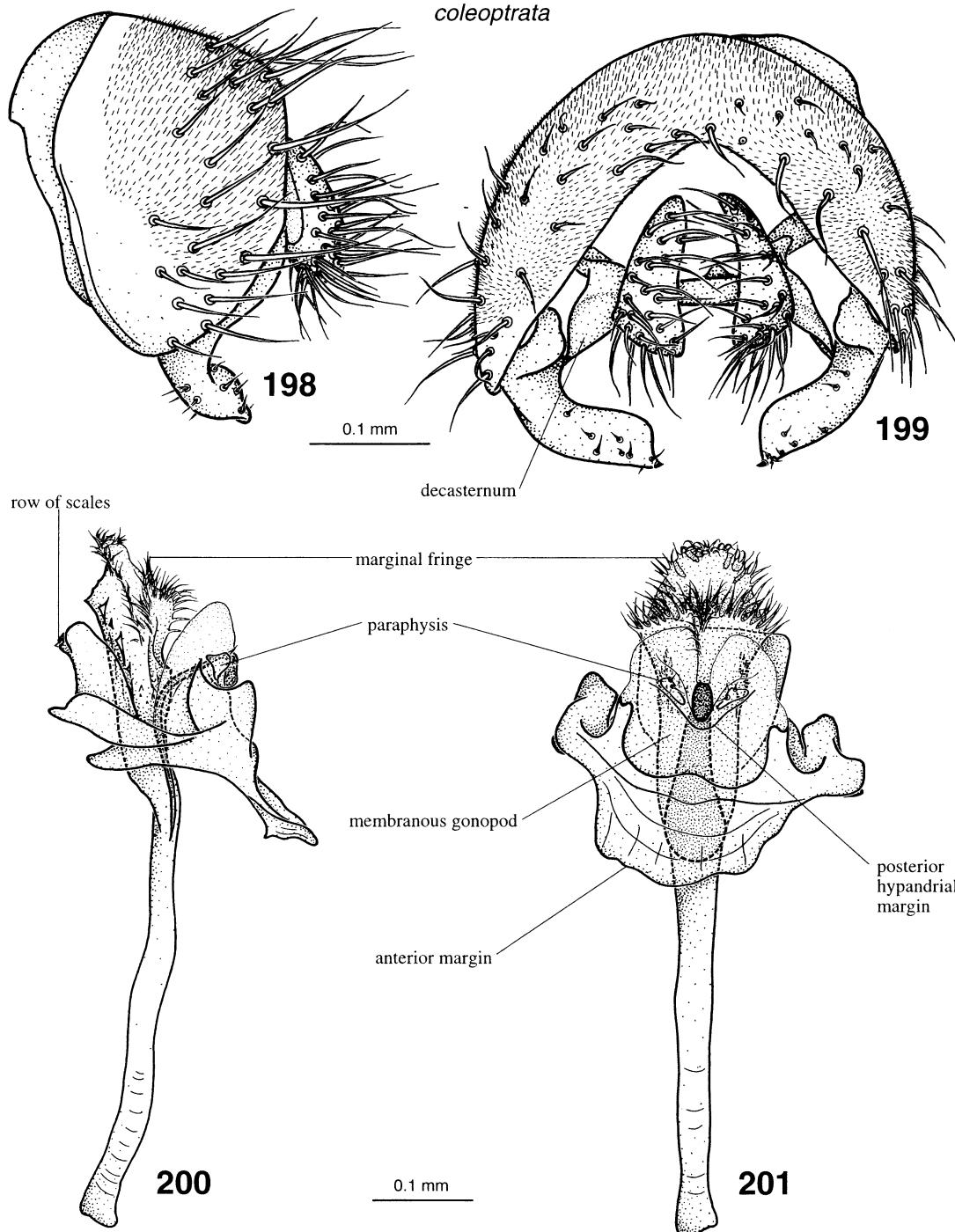
194



195



Figs. 194-197. *Stegana baechlii* Laštovka & Máca. 194: epandrium, cerci, and surstyli, left lateral view; 195: idem, plus decasternum, posterior view; 196: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 197: idem, posterior view.



Figs. 198-201. *Stegana coleoptrata* (Scopoli). 198: epandrium, cerci, and surstyli, left lateral view; 199: idem, plus decasternum, posterior view; 200: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 201: idem, posterior view.

Redescription. – ♂. Head. Frons flat, brownish-black, shining, frontal length 0.49 (0.39-0.55) mm; frontal index = 1.27 (1.08-1.53), top to bottom width ratio = 1.28 (1.17-1.43). Frontal triangle indistinct, apically pointed, about 37-43% of frontal length; ocellar triangle slightly prominent, subshining, about 29-35% of frontal length. Orbital plates narrowing downwards, about 59-67% of frontal length. Orbital setae black, in a row, distance of or3 to or1 = 167-220% of or3 to vtm, or1 / or3 ratio = 1.18 (0.95-1.80), or2 / or1 ratio = 0.68 (0.56-0.80), postocellar setae = 21 (10-26)%, ocellar setae = 73 (63-81)% of frontal length; vibrissal index = 0.42 (0.29-0.53). Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin. Carina short, narrow and prominent between pedicels, flattened below. Cheek index about 5-8. Eye roundish-oblique, longest axis parallel to frons, index = 1.24 (1.15-1.40). Occiput brownish, with a large blackish area above foramen. Pedicel yellowish, dorsally dark brown. Flagellomere 1 blackish, length to width ratio = 1.30. Arista with 4-8 dorsal, 5-8 relatively short ventral, and about 15 rather long inner branches, basally in more than one row, and there as long as dorsal branches, plus small terminal fork. Proboscis yellowish. Palpus with 2-3 black apical and several smaller, yellowish setae along lower margin.

Thorax length 1.46 (1.08-1.85) mm. Scutum slightly flattened, brownish-black, shining, with 2 paramedian yellowish spots anteriorly and 2 indistinct yellowish stripes outside of dorsocentral setae, 12-14 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 322-533% of longitudinal distance; dc index = 0.53 (0.48-0.56). 2 inner prescutellar setae, length about 90-150% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum microtrichose, distance between apical scutellar setae about 46-61% of that between apical and basal one; basal setae strongly divergent; scut index = 1.47 (1.27-1.63). Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above preoxa to base of haltere, sterno index = 0.89 (0.74-1.00), median katepisternal seta about 25-37% of anterior one. Two minute proepisternal setae. Haltere with brownish knob. Legs yellowish, femora slightly brownish in apical half, tibiae in basal half, preapical setae on all

tibiae, apical seta on mesotibia. Mesotibia with about 5 prominent dorsal setae at base.

Wing (Fig. 36) usually bent over side of abdomen, broadest near base, narrowing towards tip, brownish, with a dark brown costal margin particularly in costal cell, all veins brown, costa ending at tip of R₄₊₅, C-III with 5-12 curved costal pegs (warts) ventroapically (Fig. 37), veins R₄₊₅ and M strongly convergent, length 2.59 (2.10-2.98) mm, length to width ratio = 2.05 (1.97-2.14). Indices: C = 1.98 (1.78-2.26), ac = 9.27 (8.33-11.00), hb = 0.69 (0.47-0.78), 4C = 1.16 (1.11-1.29), 4v = 1.99 (1.80-2.21), 5x = 1.68 (1.33-1.80), M = 0.53 (0.42-0.64), prox. x = 0.75 (0.71-0.79).

Abdomen blackish-brown, shining.

Terminalia ♂ (Figs 198-201). Epandrium dorsodistally microtrichose, with ca. 9 lower and 18 upper setae; ventral lobe reduced, dorsally slightly microtrichose, not covering surstylos. Cerci reduced, anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus crescent-shaped, distally pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, with only 1 tiny, sharp-tipped, peg-like prensiseta on inner ventral corner, ca. 28 inner and 8 outer setae. Decasternum as in Fig. 199. Hypandrium as long as wide, as long as epandrium, anterior margin wide, sinuate; posterior hypandrial process absent; dorsal arch distally more or less straight and with two compact rows of short, strongly sclerotised, blunt-tipped scales submedially; gonopods bare, mostly membranous, fused to each other and to posterior margin of hypandrium, recognisable because they are represented by a large membranous area bordering the hypandrial posterior margin, which is linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, submedially covered with scales, ventrally and distally membranous, with 1 fringe of sinuate, seta-shaped scales along apical margin. Aedeagal apodeme long, slightly sinuate, rod-shaped, almost twice as long as aedeagus. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally as wide as width of adjacent aedeagal apodeme in posterior view, distally narrower and linked both to concave medioposterior margin of hypandrium, between gonopods, and laterally to paraphysis by membranous tissue. Paraphysis

reduced, apically with ca. 2 setulae, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

Distribution. – A Holarctic species, recorded from all the Scandinavian countries and Estonia; the northernmost locality is Korpilombolo in Sweden (Basden, 1956).

Additional specimens examined. – 4 ♂♂ [ZMUH] (FINLAND: Helsinki, 1 ♂, no date; Kakemäki, 1 ♂, 1953; Lojo, 1 ♂, no date; Vichtis, 1 ♂, no date).

Comments. – This is the most commonly recorded *Steganina* species; however, as the flies of the *coleoptrata* group can hardly be identified without preparation of the male terminalia, the older records at least are doubtful because they could refer to any species of the group.

Stegana hypoleuca Meigen, 1830

(Figs 172, 202-206)

Stegana hypoleuca Meigen, 1830: 80.

Stegana stroblii Mik, 1898: 216.

Diagnosis. – Large, generally yellowish-brown, relatively large flies; palpus about as broad as antennae; posterior margin of epandrium deeply notched; surstyli dorsomedially microtrichose; aedeagus anteriorly enveloped by a scaled membranous sheath; base of aedeagus twice as broad as its tip.

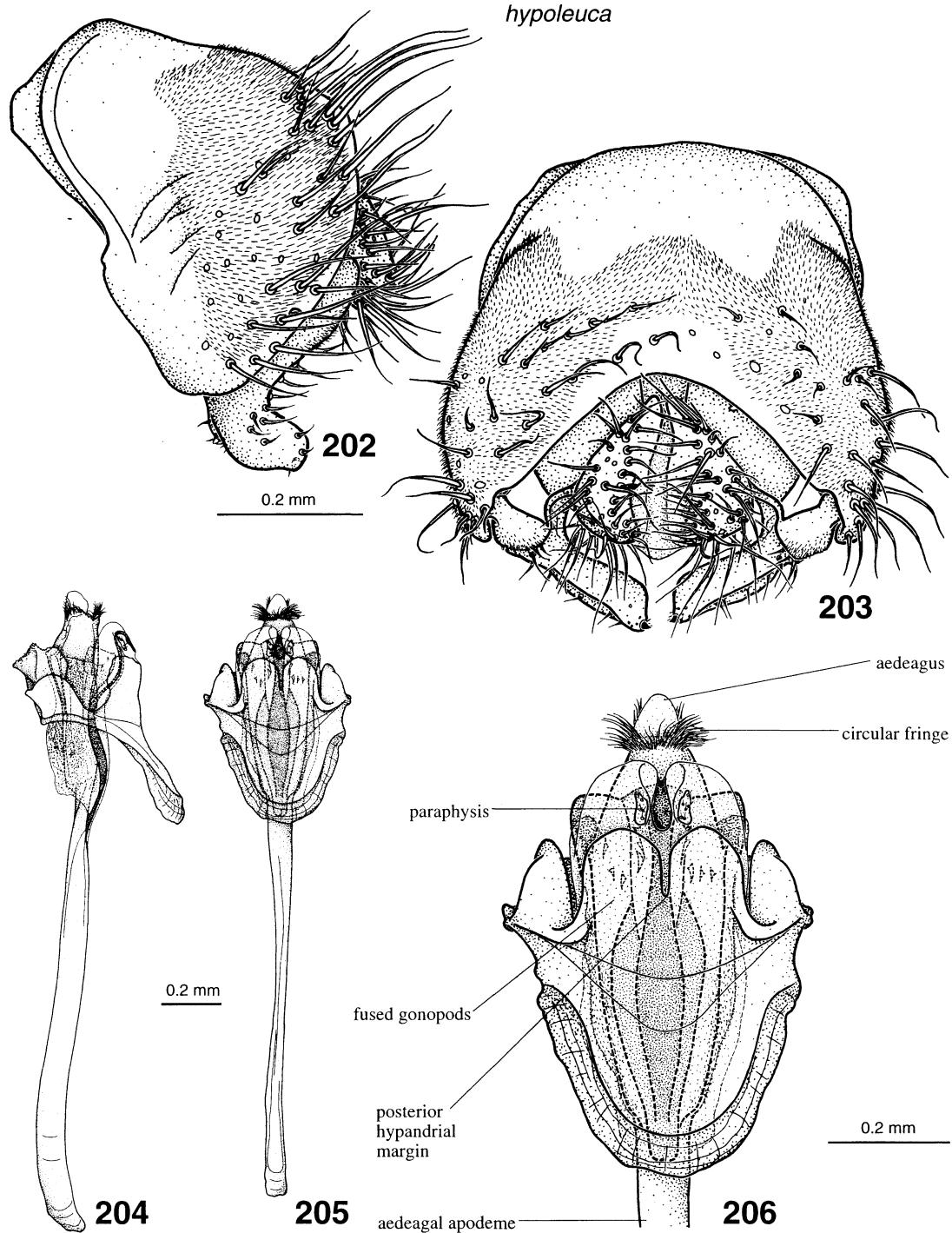
Redescription. – ♂. Head. Frons mainly brownish, shining, medially and laterally yellowish, frontal length 0.89 (0.88-0.91) mm; frontal index = 1.49 (1.37-1.68), top to bottom width ratio = 1.27 (1.19-1.42). Frontal triangle indistinct; ocellar triangle slightly prominent, subshining, about 21-25% of frontal length. Orbital plates narrowing downwards, about 54-62% of frontal length. Orbital setae black, in a row, distance of or3 to or1 = 188-225% of or3 to vtm, or1 / or3 ratio = 1.33 (1.30-1.39), or2 / or1 ratio = 0.58 (0.47-0.67), postocellar setae = 21 (17-23)%, ocellar setae = 61 (57-65)% of frontal length; vibrissal index = 0.43. Face brownish in upper third, whitish below and also, very narrowly, just above clypeus margin, divided by a black band. Carina short, narrow and prominent between

pedicels, flattened below. Cheek index about 4-6. Eye index = 1.27 (1.26-1.29). Occiput yellowish, with a large brownish area above foramen. Pedicel yellowish, dorsally darker. Flagellomere 1 blackish, apically slightly pointed, length to width ratio = 1.75-2.20. Arista with 10-14 dorsal, 7-9 relatively short ventral, and about 40 rather long inner branches in more than one row, plus small terminal fork. Proboscis yellowish. Palpus flat, almost half as broad as long, with 3-4 pale apical, and several shorter, whitish setae along the lower margin.

Thorax length 2.66 (2.61-2.72) mm. Scutum rather flat, yellowish, shining, in some specimens with a diffuse paramedian and 2 indistinct brownish stripes outside dorsocentral setae, 10-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 445-640% of longitudinal distance; dc index = 0.47 (0.43-0.51). Two inner prescutellar setae, length about 135% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum medially brownish, laterally paler, microtrichose, distance between apical scutellar setae about 60-64% of that between apical and basal one; basal setae strongly divergent; scut index = 1.47 (1.31-1.63). Pleura pale yellow in lower half, brownish in upper half, with a distinct black stripe from above procoxa to base of haltere, sterno index = 1.00 (0.97-1.03), median katepisternal seta minute, about 14% of anterior one. Haltere with whitish-yellow knob. Legs whitish-yellow, femora slightly brownish in apical half, tibiae in basal half, minute preapical setae on all tibiae, short apical seta on mesotibia. Mesotibia with about 6 prominent dorsal setae at base. Tarsomeres 4 and 5 brownish.

Wing usually bent over side of abdomen, slightly brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 7-11 curved costal pegs (warts) ventrally, length 4.19 (4.02-4.34) mm, length to width ratio = 2.22 (2.18-2.25). Indices: C = 2.46 (2.43-2.50), ac = 5.67 (5.60-5.80), hb = 0.77 (0.75-0.79), 4C = 0.94 (0.91-0.97), 4v = 1.81 (1.75-1.86), 5x = 0.96 (0.92-1.00), M = 0.36 (0.34-0.38), prox. x = 0.70 (0.63-0.79).

Abdomen blackish, anterolaterally slightly brownish, shining.



Figs. 202-206. *Stegana hypoleuca* Meigen. 202: epandrium, cerci, and surstyli, left lateral view; 203: idem, plus decasternum, posterior view; 204: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 205: idem, posterior view; 206: detail of hypandrium, aedeagus, and associated structures, posterior view.

Terminalia ♂ (Figs 202-206). Epandrium dorsally expanded anteroposteriorly, dorsodistally microtrichose, with ca. 10 lower and 29 upper setae; ventral lobe reduced, dorsally slightly microtrichose, not covering surstylus. Cercus reduced, anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus crescent-shaped, distally pointed inwards in posterior view, dorsomedially microtrichose, weakly linked to epandrium by membranous tissue, with only 1 tiny, sharp-tipped, peg-like prensiseta on inner ventral corner, ca. 42 inner, and 19 outer setae. Decasternum as in Fig. 203. Hypandrium longer than wide, as long as epandrium, anterior margin convex; posterior hypandrial process absent; dorsal arch distally somewhat wavy and medially covered with short scales; gonopods bare, mostly fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the double-peaked posterior margin of hypandrium, which is linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, subdistally covered with scales, distally narrowed and membranous, subapically with a circular fringe of sinuate, seta-shaped scales, anteriorly conspicuously enveloped by a membranous sheath, covered with tiny scales. Aedeagal apodeme huge, rod-shaped, slightly flattened laterally, almost twice as long as aedeagus. The fused structure aedeagus+aedeagal apodeme is ca. 2.2 mm long, and, remarkably, occupies most of the abdominal length, and is probably the relatively longest of all known species of Drosophilidae. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally half as wide as width of adjacent aedeagal apodeme in posterior view, distally narrower and linked to medioposterior, concave margin of hypandrium medially, between gonopods, and to paraphysis laterally, by membranous tissue. Paraphysis reduced, apically with ca. 6 setulae, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

Distribution. – A few records from Central Europe and from all the Scandinavian countries; northernmost locality: Muonio (Finland).

Additional specimens examined. – 3 ♂♂ (GERMANY: Schöngesing, 1 ♂, 1991. SWEDEN:

Kullaberg, 1 ♂, 1983. [Country?]: no locality, 1 ♂; no date).

Stegana longifibula Takada, 1968

(Figs 180-182, 207-210)

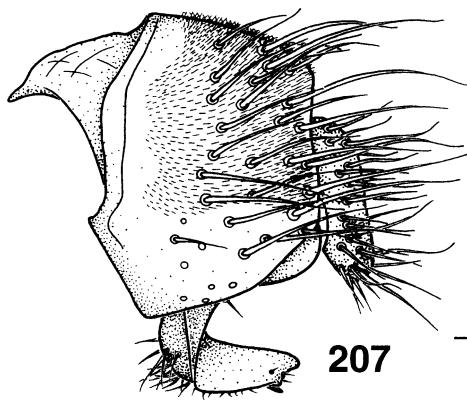
Stegana longifibula Takada, 1968: 123.

Diagnosis. – Apex of flagellomere 1 roundish; dorsal arch strongly developed and shaped somewhat like an arrowhead; posterior hypandrial process square; aedeagus medially narrowed in posterior view.

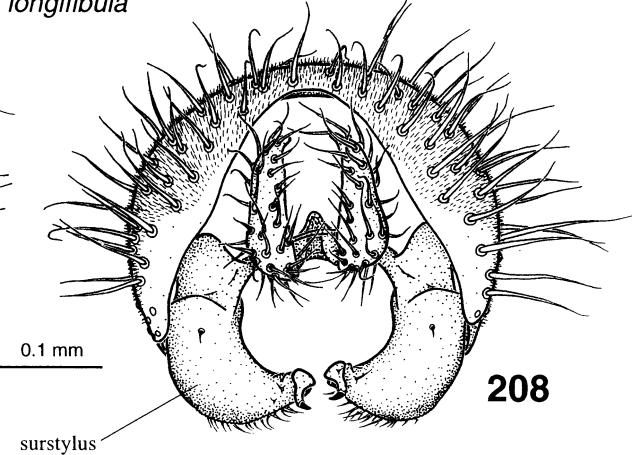
Redescription. – ♂. Head. Frons flat, brownish-black, shining, frontal length 0.48 (0.45-0.51) mm; frontal index = 1.38 (1.30-1.50), top to bottom width ratio = 1.38 (1.35-1.40). Frontal triangle indistinct, apically pointed, about 37-44% of frontal length; ocellar triangle slightly prominent, subshining, about 27-33% of frontal length. Orbital plates narrowing downwards, about 61-70% of frontal length. Orbital setae black, in a row, distance of or3 to or1 = 183-220 % of or3 to vtm, or1 / or3 ratio = 1.05 (0.89-1.23), or2 / or1 ratio = 0.70 (0.59-0.82), postocellar setae = 23 (19-30)%, ocellar setae = 76 (70-83)% of frontal length; vibrissal index = 0.44 (0.40-0.47). Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin. Carina short, narrow, slightly prominent between pedicels, flattened below. Cheek index about 5-9. Eye roundish-oblique, longest axis parallel to frons, index = 1.25 (1.21-1.30). Occiput brownish, with a large blackish area above foramen. Pedicel yellowish, dorsally dark brown. Flagellomere 1 (Fig. 182) brownish with blackish margin, length to width ratio = 1.57. Arista with 6-8 dorsal, 5-6 relatively short ventral, and about 15 rather long inner branches, basally in more than one row, and there as long as dorsal branches, plus small terminal fork. Proboscis yellowish. Palpus with 2 black apical, and several smaller, yellowish setae along lower margin.

Thorax length 1.48 (1.27-1.70) mm. Scutum brownish to brownish-black, shining, with 2 paramedian yellowish spots anteriorly and 2 indistinct yellowish stripes outside dorsocentral setae, 10 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 400-500% of longitudinal dis-

longifibula

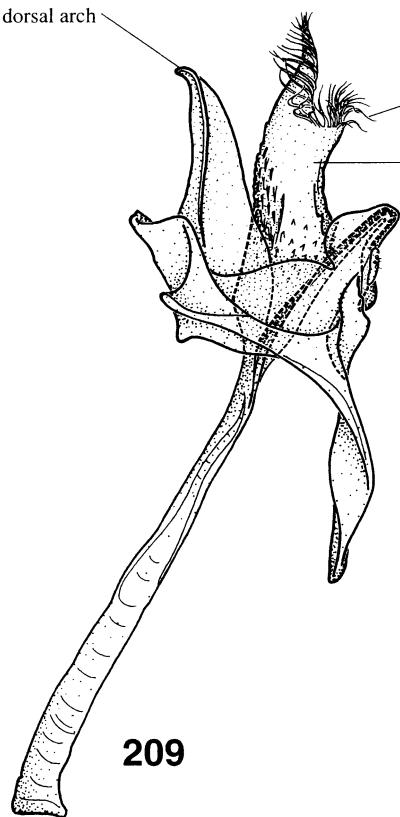


207



208

dorsal arch



209

marginal fringe

paraphysis

ventral rod

membranous gonopod

posterior hypandrial process

aedeagal apodeme

210

0.1 mm

Figs. 207-210. *Stegana longifibula* Takada. 207: epandrium, cerci, and surstyli, left lateral view; 208: idem, plus decasternum, posterior view; 209: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 210: idem, posterior view.

tance; dc index = 0.50 (0.47-0.52). Two inner prescutellar setae, length about 80-120% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum microtrichose, distance between apical scutellar setae about 53-60% of that between apical and basal one; basal setae strongly divergent; scut index = 1.41. Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above procoxa to base of haltere, sterno index = 0.92 (0.86-0.96), median katepisternal seta about 33-36% of anterior one. Two minute proepisternal setae. Haltere yellowish-white. Legs yellowish, femora slightly brownish in apical half, tibiae in basal half, preapical setae on all tibiae, apical seta on mesotibia. Mesotibia with about 6 prominent dorsal setae at base.

Wing usually bent over side of abdomen, broadest near base, narrowing towards tip, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 5-10 curved costal pegs (warts) ventrally, length 2.57 (2.45-2.87) mm, length to width ratio = 1.99 (1.87-2.06). Indices: C = 2.09 (1.96-2.28), ac = 8.96 (6.00-12.00), hb = 0.64 (0.56-0.71), 4C = 1.08 (0.95-1.19), 4v = 1.81 (1.58-2.13), 5x = 1.67 (1.57-1.83), M = 0.52 (0.42-0.63), prox. x = 0.79 (0.68-0.81).

Abdomen blackish-brown, shining.

Terminalia ♂ (Figs 207-210). Epandrium dorsodistally microtrichose, with ca. 10 lower, and 24 upper setae; ventral lobe reduced, neither microtrichose nor covering surstylos. Cercus reduced, anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus crescent-shaped, distally pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, apically slightly folded over itself, with only 1 tiny, peg-like prensiseta, ca. 29 inner, and 4 tiny outer setae. Decasternum as in Fig. 208. Hypandrium longer than wide, longer than epandrium, anterior margin convex; posterior hypandrial process square; dorsal arch strongly developed, shaped somewhat like an arrowhead, and roundish-tipped in anterior view; gonopods bare, membranous, fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the membranous area bordering the posterior margin of hypandrium, which is linked to para-

physis by membranous tissue. Aedeagus fused to aedeagal apodeme, medially expanded and covered with tiny scales, distally membranous and dorsally protruding backwards, with a fringe of sinuate, seta-shaped scales along apical margin. Aedeagal apodeme long, rod-shaped, longer than aedeagus. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally as wide as width of adjacent aedeagal apodeme in posterior view, distally narrower and linked both to posterior hypandrial process, and laterally to paraphysis, by membranous tissue. Paraphysis reduced, apically with ca. 4 setulae, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

Distribution. – A widespread Palaearctic species, described from Japan, more common in northern areas; northernmost locality: Lohja (Finland).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Aargau, 1 ♂, 1965/1966; Valais, 1 ♂, 1963; Zürich, 2 ♂♂, 1995, 1996).

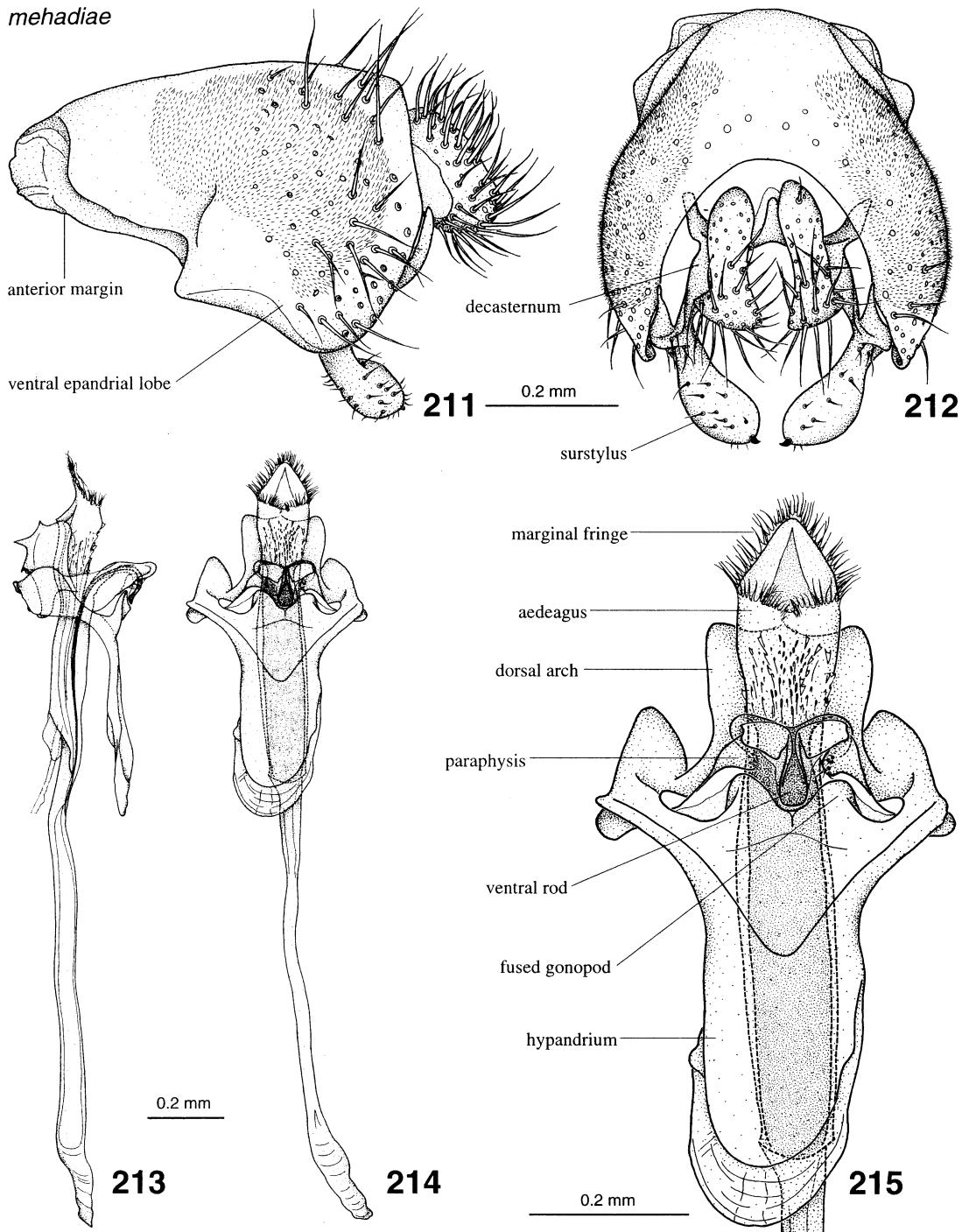
Stegana mehadiae Duda, 1924

(Figs 173, 211-215)

Stegana mehadiae Duda, 1924: 181.

Diagnosis. – Generally blackish-brown, relatively large flies; epandrium protruding forwards dorsally; surstylus distally globular in posterior view; dorsal arch distally slightly wavy and medially pointed in posterior view; aedeagus very long and paramedially narrowed.

Redescription. – ♂. Head. Frons brownish, shining, frontal length 0.66 mm; frontal index = 1.39, top to bottom width ratio = 1.29. Frontal triangle black, about 49% of frontal length; ocellar triangle slightly prominent, blackish-brown, subshining, about 28% of frontal length. Orbital plates narrowing downwards, yellowish, about 62% of frontal length. Orbital setae black, virtually in a row, distance of or3 to or1 = 250% of or3 to vtm, or1 / or3 ratio = 1.28, or2 / or1 ratio = 0.65, postocellar setae = 23%, ocellar setae = 69% of frontal length; vibrissal index = 0.41. Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin, with a black band in between. Carina brown,



Figs. 211-215. *Stegana mehadiae* Duda. 211: epandrium, cerci, and surstyli, left lateral view; 212: idem, plus decasternum, posterior view; 213: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 214: idem, posterior view; 215: detail of hypandrium, aedeagus, and associated structures posterior view.

short, prominent between pedicels, flattened below. Cheek index about 4.5. Eye index = 1.24. Occiput brownish-yellow, with a large blackish area above foramen. Pedicel brownish, dorsally dark brown. Flagellomere 1 brownish, with black margin, length to width ratio = 1.45. Arista with 8-10 dorsal, 6-7 relatively short ventral, and about 20 rather long inner branches, basally in more than 1 row, plus small terminal fork. Proboscis yellowish. Palpus with 2-3 black apical and several smaller, yellowish setae along lower margin.

Thorax length 2.03 (1.95-2.11) mm. Scutum black, shining, with 2 paramedian yellowish spots anteriorly which may be extended over the whole postpronotum, and 2 indistinct yellowish stripes along sutures; 14-18 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 433-463% of longitudinal distance; dc index = 0.43 (0.36-0.50). 2 inner prescutellar setae, length about 127-158% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum microtrichose, distance between apical scutellar setae about 50-59% of between apical and basal one; basal setae strongly divergent; scut index = 1.54. Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above procoxa to base of haltere, sterno index = 0.91 (0.90-0.92), median katepisternal seta about 22-30% of anterior one. Two minute proepisternal setae. Haltere yellowish-white. Legs yellowish, femora with a dark brown ring in apical half, tibiae in basal half, preapical setae on all tibiae, apical seta on mesotibia. Mesotibia with about 5 prominent dorsal setae at base.

Wing usually bent over side of abdomen, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 6-11 curved costal pegs (warts) ventrally, length 2.98 mm, length to width ratio = 2.13. Indices: C = 2.26 (2.26-2.27), ac = 5.62 (5.50-5.75), hb = 0.71 (0.68-0.74), 4C = 0.88 (0.85-0.92), 4v = 1.53 (1.42-1.64), 5x = 1.19 (1.14-1.25), M = 0.36 (0.31-0.40), prox. x = 0.59 (0.50-0.68).

Abdomen blackish-brown, shining.

Terminalia ♂ (Figs 211-215). Epandrium remarkably expanded forwards dorsally, broader than long in lateral view, mediolaterally microtrichose, with ca. 29 lower and 35 upper setae; ventral lobe dorsomedially microtrichose,

not covering surstyli. Cercus reduced, ventrally slightly expanded laterally, anteriorly linked to epandrium by membranous tissue, not microtrichose, without ventral lobe. Surstylus crescent-shaped, distally globular and pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, with only 1 tiny, sharp-tipped, peg-like prensiseta, ca. 44 inner, and 14 outer setae. Decasternum as in Fig. 212. Hypandrium twice as long as wide, 1.5x longer than epandrium, anterior margin convex; posterior hypandrial process absent; dorsal arch distally somewhat wavy, medially pointed in posterior view, and dorsomarginally with three spine-like projections in lateral view; gonopods bare, mostly fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the double-peaked, posterior margin of hypandrium, which is linked to paraphysis by membranous tissue. Aedeagus very long, fused to aedeagal apodeme, subdistally covered with scales of different sizes, distoventrally marginally serrate and subapically pointed dorsad in lateral view, distolaterally membranous, with a fringe of sinuate, seta-shaped scales along apical margin. Aedeagal apodeme huge, rod-shaped, slightly flattened laterally, ca. 1.5x longer than aedeagus. The fused structure aedeagus+aedeagal apodeme is ca. 2 mm long, and, remarkably, occupies most of abdominal length, and is probably one of the relatively longest of all known species of Drosophilidae. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally slightly narrower than width of adjacent aedeagal apodeme in posterior view, distally narrower and linked both to the concave, medioposterior hypandrial margin, between gonopods, and laterally to paraphysis, by membranous tissue. Paraphysis small, apically with ca. 6 setula, linked both to inner margins of fused gonopods, and to apicolateral margin of ventral rod, by membranous tissue.

Distribution. – Recorded from Central Europe and all the Scandinavian countries; northernmost locality: Liperi (Finland).

Additional specimens examined. – [ZMUH] 1 ♂ (FINLAND: Hattula [Helsinki], no date).

Stegana nigrithorax

Strobl, 1898

(Figs 171, 176, 177, 216-219)

Stegana nigrithorax Strobl, 1898: 266.

Stegana excavata Okada, 1971: 86.

Diagnosis. – Gena broad, particularly postgenal part, about 1/4 of eye length; aedeagus narrow anteriorly, broad posteriorly; hypandrium somewhat circular in posterior view; paraphyses apparently absent.

Redescription. – ♂. Head. Frons flat, brownish-black, shining, frontal length 0.48 (0.37-0.60) mm; frontal index = 1.30 (1.22-1.43) top to bottom width ratio = 1.26 (1.17-1.29). Frontal triangle indistinct, ocellar triangle slightly prominent, subshining, about 29-36% of frontal length. Orbital plates narrowing downwards, about 60-68% of frontal length. Orbital setae black, in a row, distance of or3 to or1 = 180-217% of or3 to vtm, or1 / or3 ratio = 1.19 (1.08-1.29), or2 / or1 ratio = 0.71 (0.63-0.79), postocellar setae = 22 (15-29)%, ocellar setae = 73 (70-79)% of frontal length; vibrissal index = 0.34 (0.29-0.38). Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin. Carina short, narrow and slightly prominent between pedicels, flattened below. Cheek index about 4-6 (Fig. 171). Eye roundish-oblique, longest axis parallel to frons, index = 1.23 (1.13-1.30). Occiput brownish, with a large blackish area above foramen. Pedicel yellowish, dorsally dark brown. Flagellomere 1 blackish, length to width ratio = 1.30. Arista with 6-7 relatively short dorsal, 4-6 relatively short ventral, and about 10 rather short inner branches, basally in more than 1 row, plus small terminal fork. Proboscis yellowish. Palpus with 2-3 apical and several smaller setae along lower margin.

Thorax length 1.41 (1.12-1.72) mm. Scutum brownish-black, shining, with 2 paramedian yellowish spots anteriorly and 2 indistinct yellowish stripes outside dorsocentral setae, 10-12 rows of acrostichal setulae. Two postpronotal setae. Transverse distance of dorsocentral setae 275-417% of longitudinal distance; dc index = 0.48 (0.39-0.59). 2 inner prescutellar setae, length about 80-120% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum microtrichose, distance between

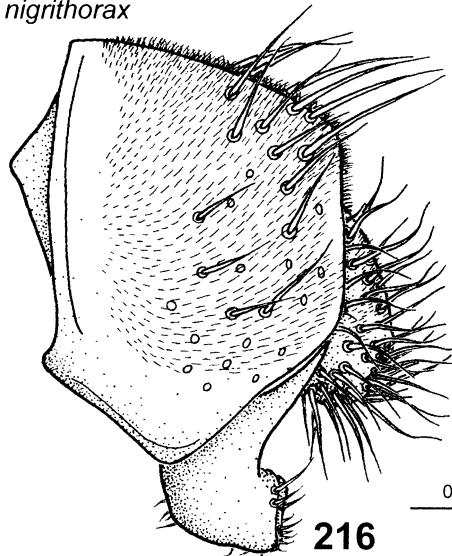
apical scutellar setae about 50-67% of that between apical and basal one; basal setae strongly divergent; scut index = 1.57. Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above procoxa to base of haltere. Two minute proepisternal setae. Sterno index = 0.96 (0.89-1.00), median katepisternal seta about 24-35% of anterior one. Haltere yellowish-white. Legs yellowish, femora slightly brownish in apical half, tibiae in basal half, preapical setae on all tibiae, apical seta on mesotibia. Mesotibia with about 6 prominent dorsal setae at base.

Wing usually bent over abdomen, broadest near base, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 7-10 curved costal pegs (warts) ventrally, length 2.44 (2.03-2.91) mm, length to width ratio = 1.97 (1.89-2.06). Indices: C = 1.97 (1.83-2.11), ac = 9.29 (7.67-11.50), hb = 0.61 (0.56-0.65), 4C = 1.08 (0.96-1.20), 4v = 1.71 (1.58-1.82), 5x = 1.41 (1.25-1.57), M = 0.49 (0.46-0.53), prox. x = 0.65 (0.60-0.71).

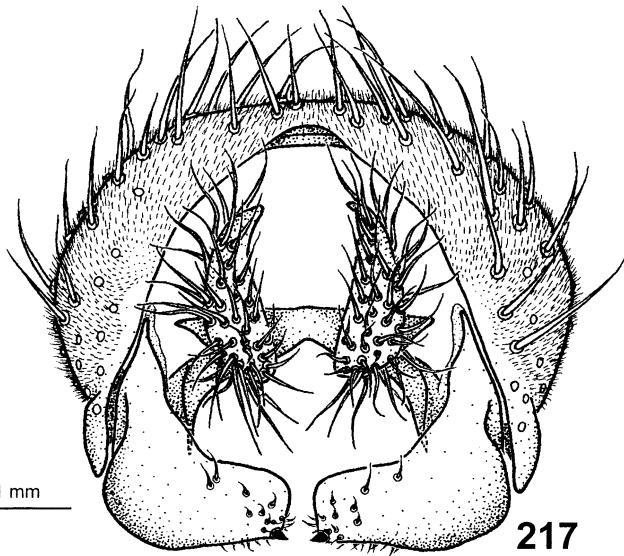
Abdomen blackish-brown, shining.

Terminalia ♂ (Figs 216-219). Epandrium dorsodistally microtrichose, with ca. 8 lower and 24 upper setae; ventral lobe reduced, dorsodistally microtrichose, not covering surstyli. Cercus reduced, anteriorly linked to epandrium by membranous tissue, slightly microtrichose, without ventral lobe. Surstylus crescent-shaped, distally pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, with only 1 tiny, peg-like prensiseta on inner ventral corner, ca. 35 inner, and 10 outer setae. Decasternum as in Fig. 217. Hypandrium somewhat circular in posterior view, as long as epandrium, anterior margin convex; posterior hypandrial process absent; dorsal arch slightly pointed at tip in posterior view; gonopods bare, fused to each other and to posterior margin of hypandrium, recognisable because they are distally represented by the double-peaked posterior margin of hypandrium. Aedeagus broad in posterior view, fused to aedeagal apodeme, covered with large scales, subapically pointed dorsad in lateral view, distally membranous and dorsally protruding dorsad, with a fringe of sinuate, seta-shaped scales along apical margin. Aedeagal apodeme long, sinuate, laterally flattened, longer than aedeagus. Ventral rod anteroposteriorly flattened, conspic-

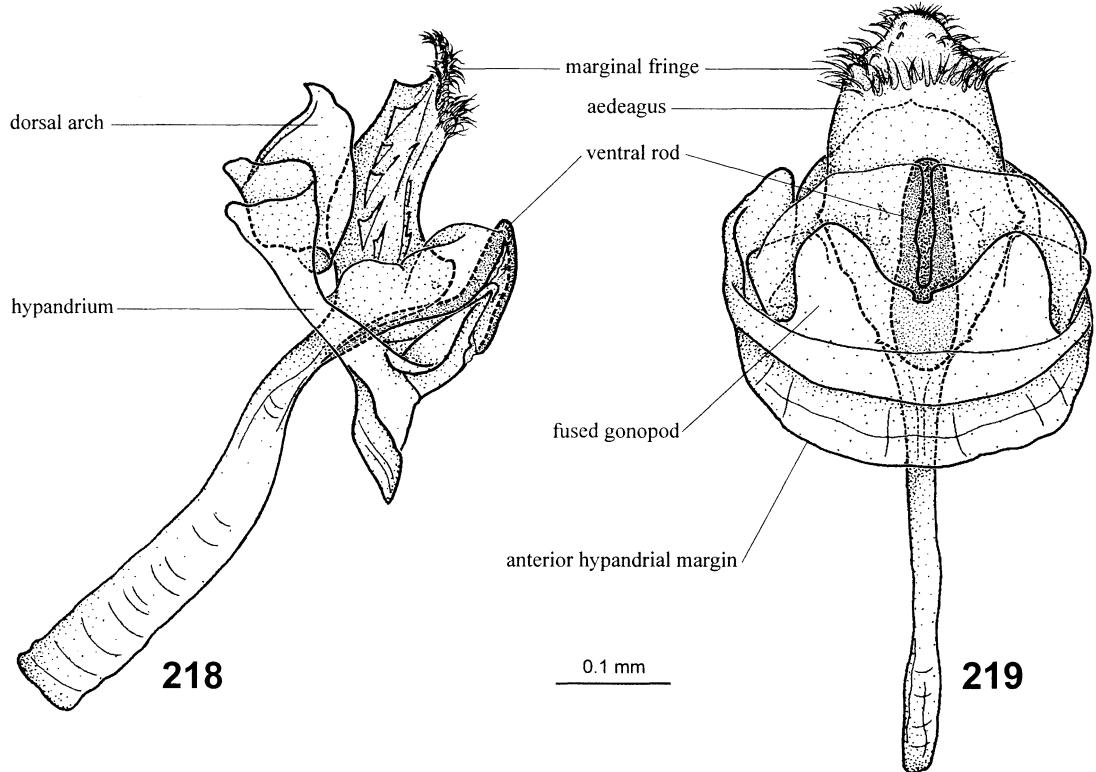
nigrithorax



216



217



Figs. 216-219. *Stegana nigrithorax* Strobl. 216: epandrium, cerci, and surstyli, left lateral view; 217: idem, plus decasternum, posterior view; 218: hypandrium, gonopods, aedeagus, and aedeagal apodeme, left lateral view; 219: idem, posterior view.

uously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally as wide as width of adjacent aedeagal apodeme in posterior view, distally narrower and linked to the concave medioposterior margin of hypandrium, between fused gonopods, by membranous tissue. Paraphysis apparently absent.

Distribution. – A widespread Palaearctic species, found in all the Scandinavian countries (except Denmark); northernmost locality: Bergen (Norway).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Aargau, 1 ♂, 1965/1966; Ticino, 1 ♂, 1995; Vaud, 1 ♂, 1970; Zürich, 1 ♂, 1996).

Stegana similis

Laštovka & Máca, 1982

(Figs 169, 183-185, 220-223)

Stegana similis Laštovka & Máca, 1982: 29.

Diagnosis. – Apex of flagellomere 1 asymmetric; aedeagus anteriorly narrow, distally ca. 5x broader in posterior view; dorsal arch distally more or less straight, with two compact rows of blunt scales submedially.

Redescription. – ♂. Head. Frons flat, brownish-black, shining, with a narrow yellow margin along the eye in lower half and above antennae, frontal length 0.48 (0.42-0.56) mm; frontal index = 1.37 (1.18-1.55), top to bottom width ratio = 1.35 (1.27-1.50). Frontal triangle indistinct; ocellar triangle slightly prominent, subshining, about 26-35% of frontal length. Orbital plates narrowing downwards, about 58-63% of frontal length. Orbital setae black, in a row, distance of or3 to or1 = 200-217% of or3 to vtm, or1 / or3 ratio = 1.13 (1.07-1.17), or2 / or1 ratio = 0.70 (0.62-0.79), postocellar setae = 24 (20-27%), ocellar setae = 70 (64-80)% of frontal length; vibrissal index = 0.56 (0.46-0.75). Face brownish, yellowish below carina and also, very narrowly, just above clypeus margin. Carina short, narrow and prominent between pedicels, flattened below. Cheek index about 4-8. Eye (Fig. 169) roundish-oblique, longest axis parallel to frons, index = 1.26 (1.21-1.42). Occiput brownish, with a large blackish area above foramen. Pedicel yellowish, dorsally dark brown. Flagellomere 1 (Fig. 183) blackish, length to

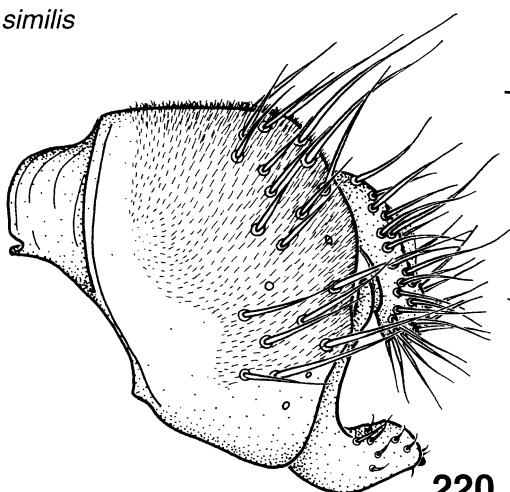
width ratio = 1.30. Arista with 5-8 dorsal, 3-6 relatively short ventral, and about 15 inner branches, basally in more than one row, plus small terminal fork. Proboscis yellowish. Palpus with 2-3 black apical and several smaller, yellowish setae along lower margin.

Thorax length 1.51 (1.36-1.77) mm. Scutum brownish-black, shining, with 2 paramedian yellowish spots anteriorly and 2 indistinct yellowish stripes outside dorsocentral setae, 10-12 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 386-500% of longitudinal distance; dc index = 0.52 (0.45-0.55). 2 inner prescutellar setae, length about 100-120% of anterior dorsocentral setae, and 2-3 shorter setae on each side between prescutellar and posterior dorsocentral setae. Scutellum microtrichose, distance between apical scutellar setae about 50-62% of that between apical and basal one; basal setae strongly divergent; scut index = 1.51 (1.46-1.57). Pleura pale yellow in lower half, dark brown in upper half, with a distinct black stripe from above procoxa to base of haltere, sterno index = 0.88 (0.83-0.90), median katepisternal seta about 29-35 % of anterior one. Two minute proepisternal setae. Haltere yellowish. Legs yellowish, femora slightly brownish in apical half, tibiae in basal half, preapical setae on all tibiae, apical seta on mesotibia. Mesofemur with about 5 prominent dorsal setae at base.

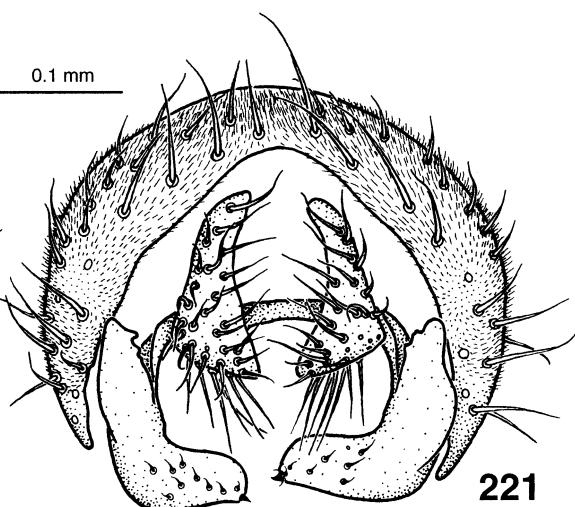
Wing usually bent over abdomen, broadest near base, brownish, with a dark brown costal margin, particularly in costal cell, all veins brown, veins R₄₊₅ and M strongly convergent, C-III with 6-9 curved costal pegs (warts) ventrally, length 2.56 (2.31-3.01) mm, length to width ratio = 2.06 (2.00-2.09). Indices: C = 1.99 (1.95-2.05), ac = 10.50 (9.50-12.50), hb = 0.70 (0.63-0.78), 4C = 1.13 (1.06-1.19), 4v = 1.87 (1.72-2.06), 5x = 1.50 (1.29-1.67), M = 0.51 (0.45-0.62), prox. x = 0.75 (0.67-0.88).

Abdomen blackish-brown, shining.

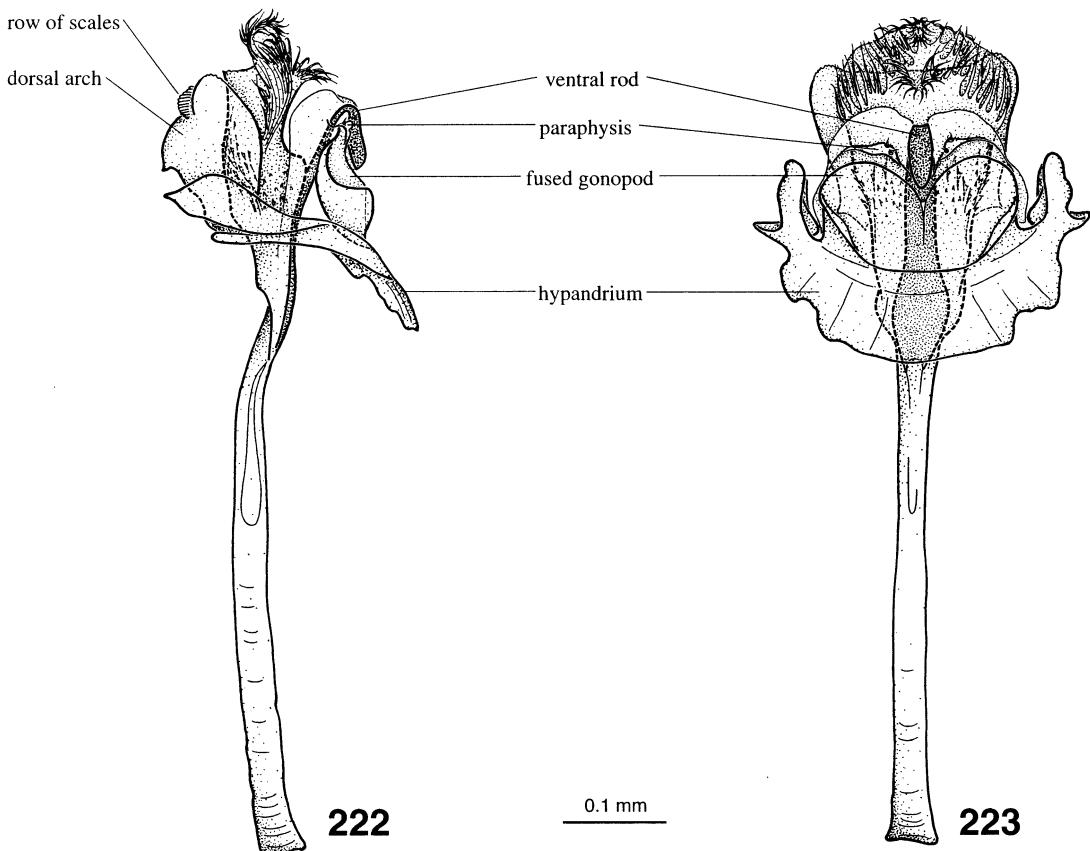
Terminalia ♂ (Figs 220-223). Epandrium dorsodistally microtrichose, with ca. 10 lower and 18 upper setae; ventral lobe reduced, dorsodistally microtrichose, not covering surstylos. Cercus reduced, anteriorly linked to epandrium by membranous tissue, ventrally expanded laterally, without ventral lobe. Surstylos crescent-shaped, distally pointed inwards in posterior view, not microtrichose, weakly linked to epandrium by membranous tissue, with only 1 tiny,



220



221



Figs. 220-223. *Stegana similis* Laštovka & Máca. 220: epandrium, cerci, and surstyli, left lateral view; 221: idem, plus decasternum, posterior view; 222: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 223: idem, posterior view.

peg-like prensiseta on inner ventral corner, ca. 25 inner, and 10 outer setae. Decasternum as in Fig. 221. Hypandrium as long as wide, shorter than epandrium, anterior margin convex and laterally sinuate; posterior hypandrial process absent; dorsal arch distally more or less straight, dorsolaterally covered with tiny scales, and submedially with a compact row of short, strongly sclerotised, blunt-tipped scales, in lateral view; gonopods bare, fused to each other and to posterior margin of hypandrium, recognisable because they are represented by the double-peaked posterior margin of hypandrium, which is linked to paraphysis by membraneous tissue. Aedeagus anteriorly narrow, distally 5x broader in posterior view, fused to aedeagal apodeme, submedially covered with tiny scales, dorsoapically protruding, sinuate and pointed ventrad in lateral view, distally membraneous, with a fringe of sinuate, seta-shaped scales along apical margin. Aedeagal apodeme long, rod-shaped, longer than aedeagus. Ventral rod anteroposteriorly flattened, conspicuously ribbon-shaped, weakly sclerotised, very long and flexible, able to fold over itself, proximally as wide as width of adjacent aedeagal apodeme in posterior view, distally narrower and linked both to the concave, medioposterior hypandrial margin, between gonopods, and to paraphysis laterally, by membraneous tissue. Paraphysis small, strip-shaped, dorsoapically with 2 setulae.

Distribution. – Recorded in Central Europe and all the Scandinavian countries; northernmost locality: Jakobstad (Finland).

Additional specimens examined. – 5 ♂♂ (GERMANY: Edersee, 1 ♂, 1984; Schöngesing, 1 ♂, 1992. HUNGARY: Kunfeherto, 1 ♂, 1981. SWITZERLAND: Zürich, 2 ♂♂, 1988, 1991).

Subfamily DROSOPHILINAE

Diagnosis. – Small to medium-sized flies (2–4 mm long); arista plumose with at least one ventral branch, in addition to terminal fork; anterior reclinate orbital seta distinctly shorter than the other two, uppermost orbital seta closer to proclinate orbital seta than to medial vertical seta; prescutellar setae absent; 3 unequal katepisternal setae, wing cells bm and dm fused; costa ending at M; surstyli partially fused to epandrium; females with sclerotised oviscapt, and without cerci.

Taxa included. – In Europe, 10 out of some 50 described genera are present: *Chymomyza*, *Dettopsomyia*, *Drosophila*, *Hirtodrosophila*, *Lordiphosa*, *Microdrosophila*, *Mycodrosophila*, *Scaptodrosophila*, *Scaptomyza* and *Zaprionus*.

Comments. – The subfamily characters mentioned above are not shared by all the included species. As already mentioned under the Steganinae, there are no features which enable a clearcut separation of the two subfamilies to be made at either genus or species level.

Genus *Chymomyza* Czerny, 1903

Chymomyza Czerny, 1903: 199. Type species: *Drosophila fuscimana* Zetterstedt, 1838. *Amphoroneura* de Meijere, 1911: 423. *Zygodrosophila* Hendel, 1917: 43.

Diagnosis. – Arista plumose; or2 large, placed well in front of or1; or3 more distant to or1 than to vtm; ocellar seta present; postocellar seta small; vibrissa present, genal setae large; eyes bare or nearly so; carina usually small, confined to upper part of face; a few enlarged ommatidia in lower front part of eye; 6–8 rows of acrostichal setulae; two dorsocentral setae; posterior scutellar setae crossed; a small proepisternal setula sometimes present; preapical setae on all tibiae; profemur of males usually with numerous strong setae below; costa reaching M; anal cell and vein present; epandrium with very protruding ventral lobe; surstylus small, globular, partially hidden behind epandrium, with a compact row of long, slightly curved, roundish-tipped prensisetae; dorsal arch strongly developed; aedeagus distally asymmetric; oviscapt valve with trichoid-like, not peg-like, outer ovisensilla; slender flies.

Taxa included. – The 57 described species are arranged in 5 species groups: the *aldrichi* group (Nearctic / Neotropical), with *Chymomyza procnemoides* Wheeler, 1952, recorded from Hungary (Papp, 1992), the *costata* group (widespread), the *fuscimana* group (Holarctic), the *obscura* group (Oriental), and the *procnemis* group (widespread), with the Nearctic species *C. procnemis* (Williston, 1896) recorded from the Canary Islands (Baez, 2000).

The four native West Palaearctic species belong to the *costata* and *fuscimana* groups. Four Neotropical species have been introduced into

Europe in recent decades, but, so far as we are aware, only *Chymomyza amoena* (Loew) is fully established.

Comments. – The flies exhibit wing-waving while moving. So far as is known, the larvae of most *Chymomyza* species live under the bark of various trees and the adults are usually attracted to the peeled areas of trees and to cut logs, where the males show lekking behaviour, moving the front legs like boxers against rivals.

In spite of the fact that the larvae (except for *C. amoena*) live under bark, the species can be cultured on a special malt food.

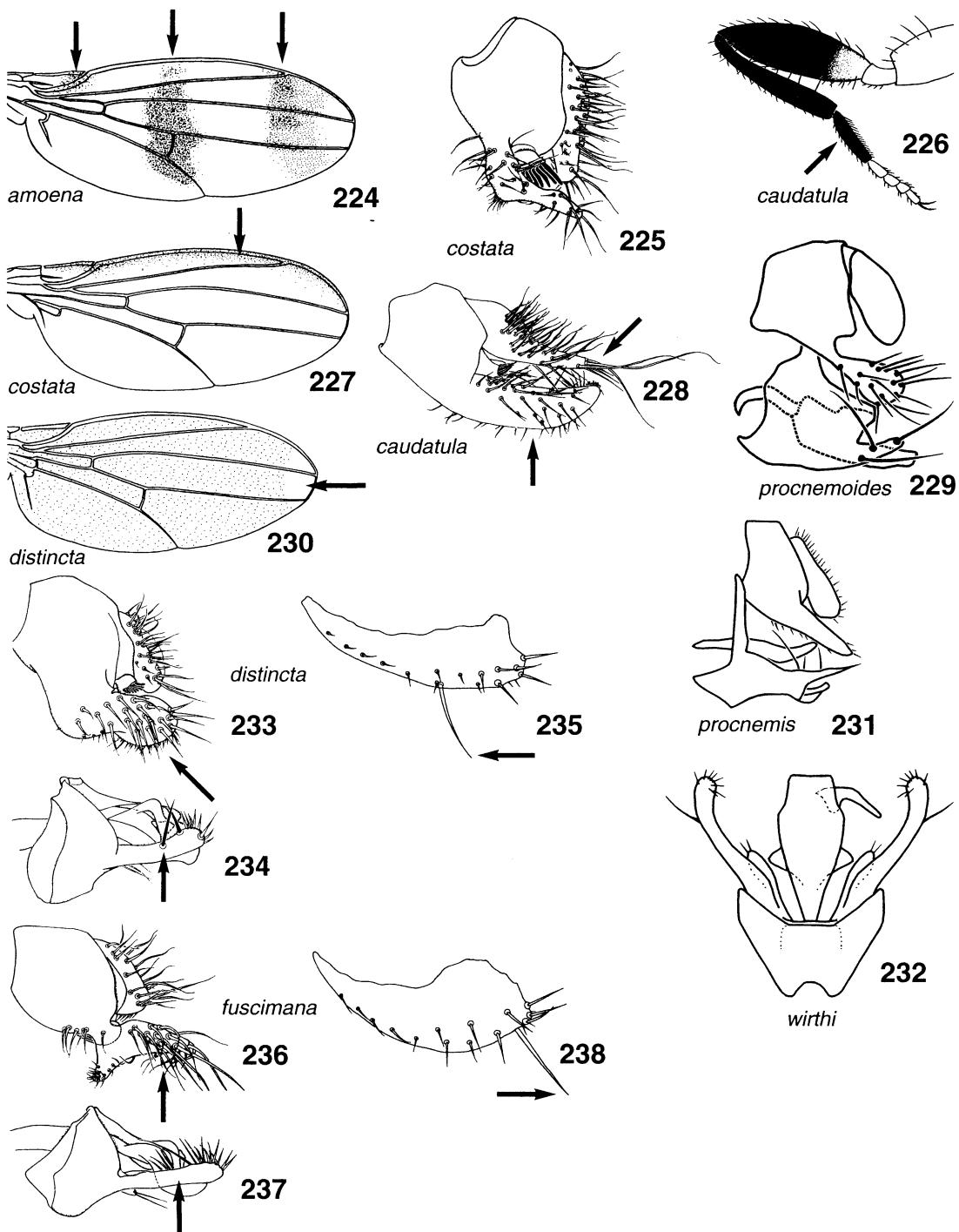
Key to European species of *Chymomyza*

- 1 Wing with 2 distinct dark brown transverse bands and a dark spot along R_1 (Fig. 224). All legs yellowish *C. amoena* (Loew)
(Nearctic species, now widespread in Europe)
- Wing hyaline, at most with small dark areas in costal cell, and/or at tip of R_{2+3} , or along costa. Fore leg at least partially dark 2
- 2(1) Frons and scutum predominantly blackish 3
- Frons and scutum predominantly yellowish 4
- 3(2) Wing with dark costal cell and a diffuse black shadow along costa, which is blackish (Fig. 227). Fore leg: all protarsomeres unicoloured dark in male, partially paler apicad in female. External male terminalia Fig. 225, cercus distinctly protruding ventrad *C. costata* (Zetterstedt)
- Wing hyaline, costa yellow, at most a shadow along R_1 . Fore leg: protarsomere 1 blackish, other tarsomeres whitish-yellow (Fig. 226). External male terminalia Fig. 228, cercus and ventral lobe well-developed and distinctly protruding posterad *C. caudatula* Oldenberg
- 4(2) Wing unicoloured, tip not milky white (Male terminalia Fig. 229, ventral lobe of epandrium globose in lateral view) 5

- *C. procnemoides* Wheeler
(Nearctic species, recorded from Hungary)
- Wing tip (Fig. 230) milky white (visible over a dark background) 5
- 5(4) Fore leg: protarsomere 1 entirely black, other tarsomeres contrasting yellow (as in Fig. 226). (Male terminalia Fig. 231, ventral lobe of epandrium straight and protruding posterad) *C. procnemis* (Williston)
(Nearctic species, recorded from the Canary Islands)
- Fore leg: all protarsomeres unicoloured yellow to brownish, without contrast; protarsomere 1 at most brownish on dorsal side 6
- 6(5) Tip of vein R_{2+3} clear. (Male: aedeagus (Fig. 232) with dorsoapical projection on right side, pointed outwards) *C. wirthi* Wheeler
(Nearctic species, recorded from England)
- Tip of R_{2+3} with a diffuse shadow, contrasting with the white tip 7
- 7(6) Male: inner side of procoxa with many long, silky white setulae; epandrial ventral lobe broad in lateral view, with setae of standard size (Fig. 233); gonopod with one outer, distinct, long, medial seta (Fig. 234). Female: a long, subterminal, trichoid-like inner ovisensillum well before tip of oviscapt valve (Fig. 235, arrow) *C. distincta* (Egger)
- Male: procoxa with a few dark setae only; epandrial ventral lobe with several long setae (Fig. 236); hypandrial process with setae of standard size (Fig. 237, arrow). Female: a long, subterminal, trichoid-like inner ovisensillum in standard position, near tip of oviscapt valve (Fig. 238, arrow) *C. fuscimana* (Zetterstedt)

costata species group Okada, 1976

Diagnosis. – Frons and mesonotum blackish; wing tip not milky white; protarsus bicoloured,



Figs. 224-238. 224, 227, 230: right wing; 225, 228: external male terminalia, left lateral view; 226: left fore leg, posterior view; 229, 231: male terminalia, left lateral view; 232: internal male terminalia, posterior view; 233, 236: external, 234, 237: internal male terminalia, left lateral view; 235, 238: left ovipscapt valves, lateral view.

at least protarsomere 1 black; aedeagus bilaterally symmetric or asymmetric; dorsal arch well-developed, symmetric.

Comments. – 12 species included; the following two are widespread in Europe.

Chymomyza caudatula Oldenberg, 1914

(Figs 226, 228, 239-243, 247)

Chymomyza caudatula Oldenberg, 1914: 14.

Diagnosis. – Generally blackish, slender flies, wing with a faint shadow along costa, fore leg with wholly blackish protarsomere 1, other protarsomeres whitish (Fig. 226); cercus and ventral lobe of epandrium strongly protruding posterad; aedeagus very long, curved, subapically expanded, and asymmetric; gonopod reduced; paraphysis symmetric, well-developed, covering aedeagus medially.

Redescription. – ♂. Head. Frons brownish-black, dull, pale brownish above antennae, frontal length 0.29 (0.27-0.31) mm; frontal index = 0.86 (0.84-0.90), top to bottom width ratio = 1.31 (1.26-1.37). Frontal triangle indistinct, paler, about 50-64% of frontal length; ocellar triangle prominent, about 31-44% of frontal length. Orbital plates broad, pale brown, subshining, about 106-112% of frontal length. Orbital setae black, strong, or1 behind or2 and bent inwards, distance of or3 to or1 = 62-71% of or3 to vtm, or1 / or3 ratio = 0.75 (0.71-0.79), or2 / or1 ratio = 1.35 (1.25-1.55), postocellar setae minute, about 27 (22-31%), ocellar setae = 68 (59-72)% of frontal length; vibrissal index = 0.94 (0.83-1.00). Face whitish-yellow. Carina absent. Cheek index about 5-9. Eye roundish, index = 1.11 (1.08-1.17). Occiput convex, dark brown. Antennae brownish, flagellomere 1 short, length to width ratio about 1.15. Arista with 3 short dorsal, 2 ventral, and about 6 small inner branches, plus terminal fork. Proboscis pale yellowish. Clypeus brown. Palpus with 2-3 black setae near tip.

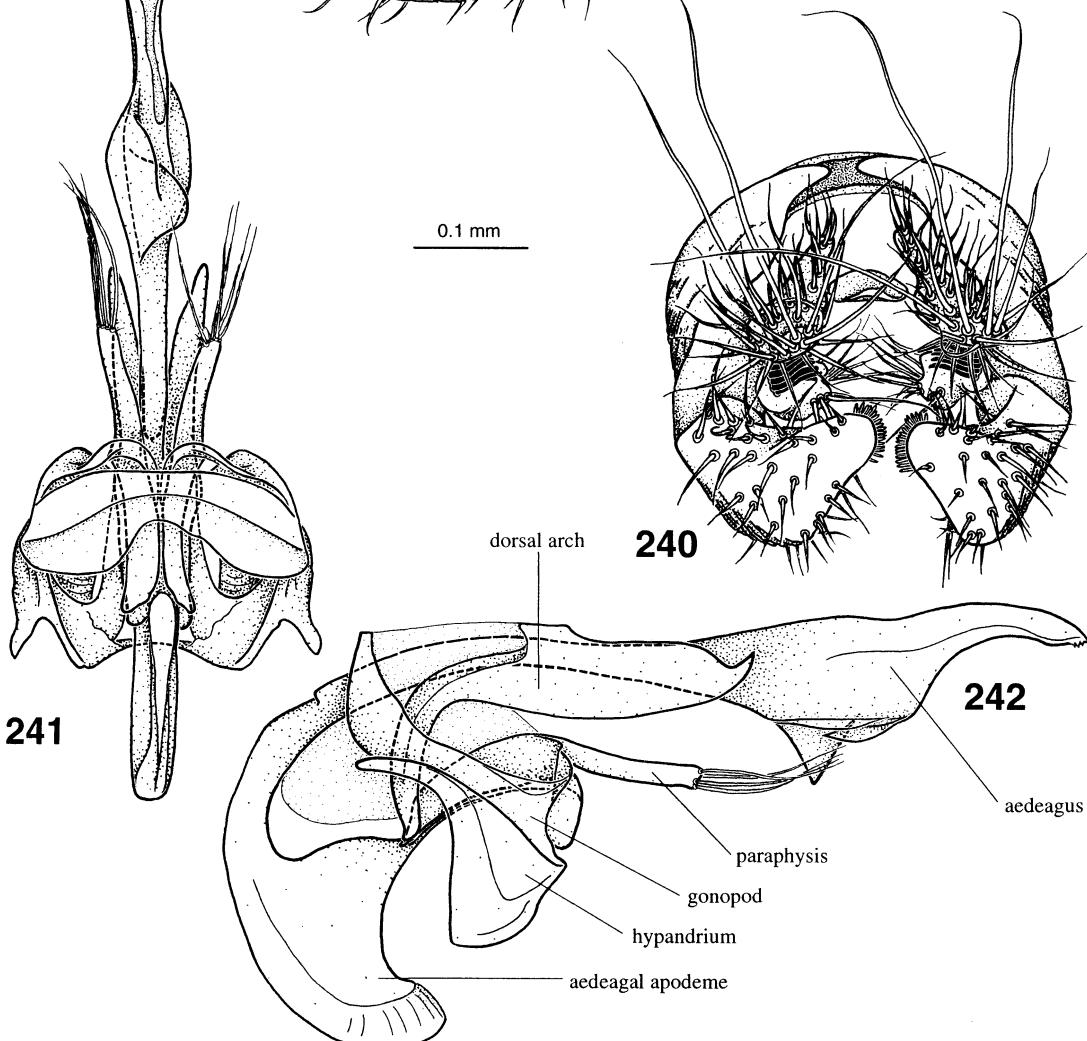
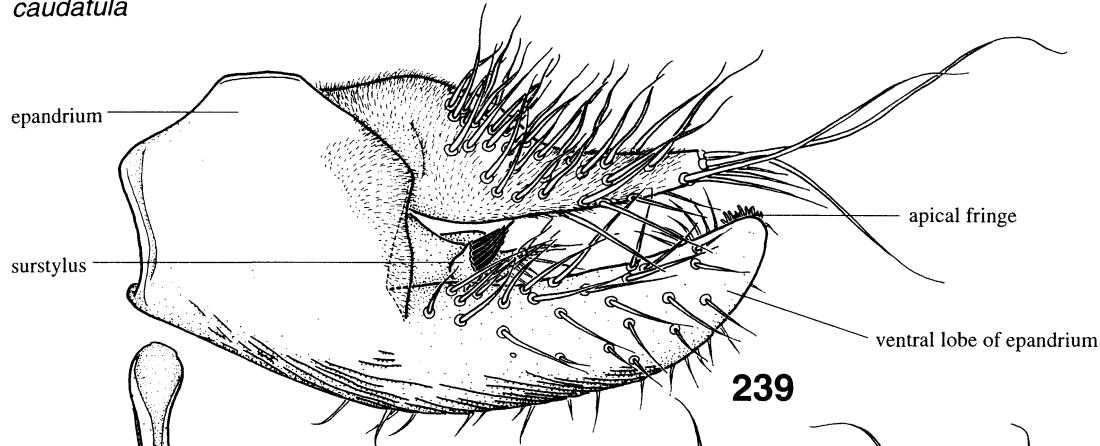
Thorax length 1.08 (1.03-1.14) mm. Scutum blackish-brown, subshining, postpronotum yellowish, 8 rows of acrostichal setulae. h index = 1.72 (1.44-1.88). Transverse distance of dorsocentral setae 164-220% of longitudinal distance; dc index = 0.63 (0.56-0.69). Prescutel-

lar setae slightly elongated, length about 30-50% of anterior dorsocentral setae. Scutellum dark brownish, distance between apical scutellar setae about 91-110% of that between apical and basal one; scutellar setae nearly equidistant; basal ones convergent; scut index = 0.71 (0.67-0.79). Pleura brownish-yellow, with a blackish-brown stripe in upper half, sterno index = 0.51 (0.48-0.52), median katepisternal seta about 27-58% of anterior one. One minute proepisternal seta present. Haltere pale yellow. Legs yellowish, but fore leg blackish except for a narrow yellowish area at base of protibia and yellow tarsomeres 2-5 (Fig. 226), preapical seta on metatibia, apical seta on mesotibia.

Wing hyaline, all veins yellowish, R₄₊₅ and M apically slightly converging, length 2.60 (2.48-2.66) mm, length to width ratio = 2.35 (2.29-2.50). Indices: C = 2.06 (1.83-2.21), ac = 3.27 (2.86-3.83), hb = 0.75 (0.70-0.80), 4C = 1.37 (1.25-1.53), 4v = 2.47 (2.27-2.64), 5x = 2.43 (2.20-2.60), M = 0.83 (0.73-0.93), prox. x = 0.81 (0.73-0.93).

Abdomen blackish-brown, subshining, with a pale yellowish, diffuse median area on tergites 1+2 and a median, yellow, marginal triangle on tergite 6.

Terminalia ♂ (Figs 239-242). Epandrium mediodistally slightly microtrichose, mediodorsally strongly sclerotised, with 27 lower, and no upper setae; ventral lobe conspicuously protruding posterad, not microtrichose, mostly rugose ventromedially, slightly covering surstylos, backwardly-directed, distally pointed inwards, apically with a fringe of ca. 21 short, blunt-tipped strips, and unusually with ca. 26 setae on inner surface. Cercus remarkably protruding posterad, as long as epandrial ventral lobe, anteriorly connected to epandrium by membranous tissue, microtrichose, without ventral lobe and apically with ca. 3 setae as long as itself, in addition to some smaller ones. Surstylos not microtrichose, small, globular, with a compact row of ca. 9 quite long, sinuate, peg-like prensisetae, ca. 12 long inner, and no outer setae. Decasternum as in Fig. 240. Hypandrium as long as epandrium, anterior margin concave; posterior hypandrial process absent; dorsal arch remarkably well-developed, anteriorly membranous, backwardly-directed, almost completely covering aedeagus medially, and apically sharply pointed in lateral view; gonopod reduced, bare, fused to paraphysis. Aede-

caudatula

Figs. 239-242. *Chymomyza caudatula* Oldenberg. 239: epandrium, cerci, and surstyli, left lateral view; 240: idem, plus decasternum, posterior view; 241: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, posterior view; 242: idem, left lateral view.

gus very long, proximally bent, parallel to ventral rod, mostly narrow, subdistally inflated and asymmetric, with a ventral triangular expansion on its left side, fused to aedeagal apodeme, ventroapically slightly serrate marginally. Aedeagal apodeme distally broad, 4x as short as aedeagus, strongly flattened laterally. Ventral rod as long as aedeagal apodeme is wide. Paraphysis very long, finger-shaped, fused to gonopod, apically with ca. 4 long setae, connected to distal margin of aedeagal apodeme by membranous tissue.

♀. Measurements: Frontal length 0.29 (0.25-0.32) mm; frontal index = 0.85 (0.79-0.95), top to bottom width ratio = 1.25 (1.16-1.32). Frontal triangle about 50-63% of frontal length; ocellar triangle about 33-41% of frontal length. Orbital plates about 100-113% of frontal length. Distance of or₃ to or₁ = 62-75% of or₃ to vtm, or₁ / or₃ ratio = 0.81 (0.73-0.87), or₂ / or₁ ratio = 1.25 (1.17-1.36), postocellar setae = 26 (21-33)%, ocellar setae = 75 (65-83)% of frontal length; vibrissal index = 0.98 (0.90-1.10). Cheek index about 6-9. Eye index = 1.07 (1.04-1.09). Thorax length 1.11 (1.00-1.24) mm. h index = 1.97 (1.63-2.17). Transverse distance of dorsocentral setae 177-210% of longitudinal distance; dc index = 0.66 (0.64-0.69). Distance between apical scutellar setae about 91-100% of that between apical and basal one; scut index = 0.72 (0.70-0.75), sterno index = 0.52 (0.50-0.57), median katepisternal seta about 64-69% of anterior one. Wing length 2.60 (2.45-2.80) mm, length to width ratio = 2.26 (2.10-2.33). Indices: C = 1.99 (1.92-2.09), ac = 3.29 (3.00-3.67), hb = 0.78 (0.76-0.80), 4C = 1.37 (1.29-1.50), 4v = 2.38 (2.31-2.56), 5x = 2.39 (1.83-3.00), M = 0.81 (0.73-0.88), prox. x = 0.81 (0.80-0.82).

♀ Terminalia (Fig. 243). Valve of oviscapt elongate, distally slightly pointed, ventrally slightly convex, with ca. 3 discal and ca. 11 marginal, trichoid-like outer ovisensilla, dorsalmost discal one longer; trichoid-like inner ovisensilla: 3 thin, ventrodistally positioned and 1 very long, slightly curved, subterminal, abnormally inserted in outer instead of the usual inner surface.

Distribution. – (Fig. 247). A Holarctic species; usually rather rare. Also recorded from Estonia. Northernmost locality: Rovaniemi (Finland).

Biology. – Larvae and pupae have been found under the bark of beeches (*Fagus sylvatica* L.; Fagaceae) in Switzerland (Burla, 1995, 1997).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Ticino, 1977), 4 ♀♀ (SWITZERLAND: Neuchâtel, 1 ♀, 1982; Ticino, 1 ♀, 1981; Zürich, 1 ♀, 1986. BOSNIA AND HERZEGOVINA: Dobro Polje, 1 ♀, 1984).

***Chymomyza costata* (Zetterstedt, 1838)**

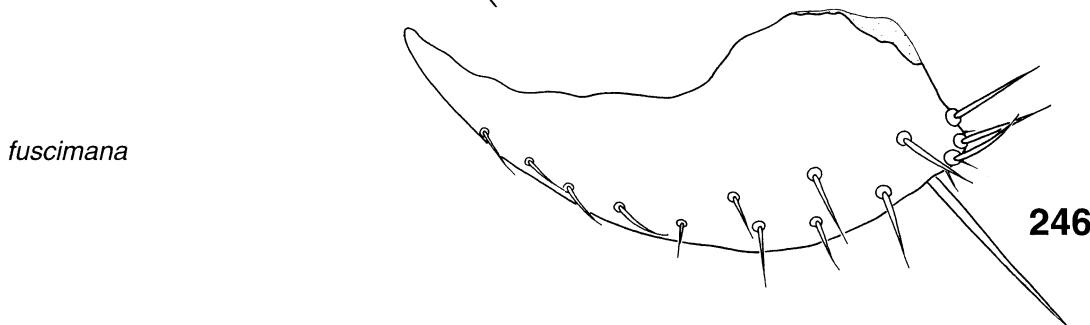
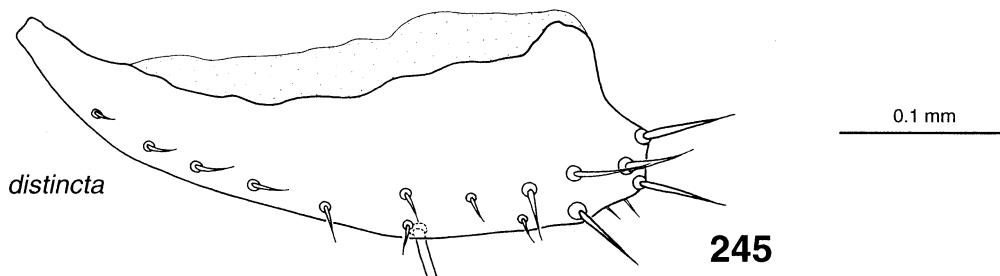
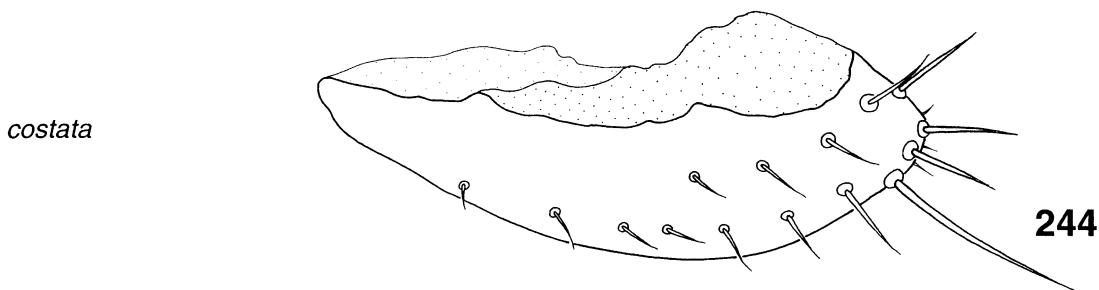
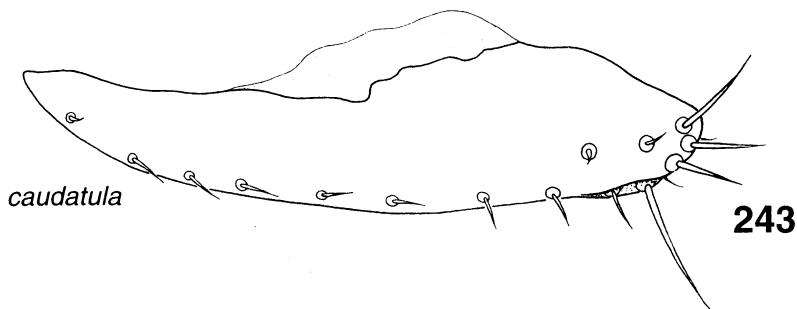
(Figs 225, 227, 244, 248-251, 252)

Drosophila costata Zetterstedt, 1838: 776.

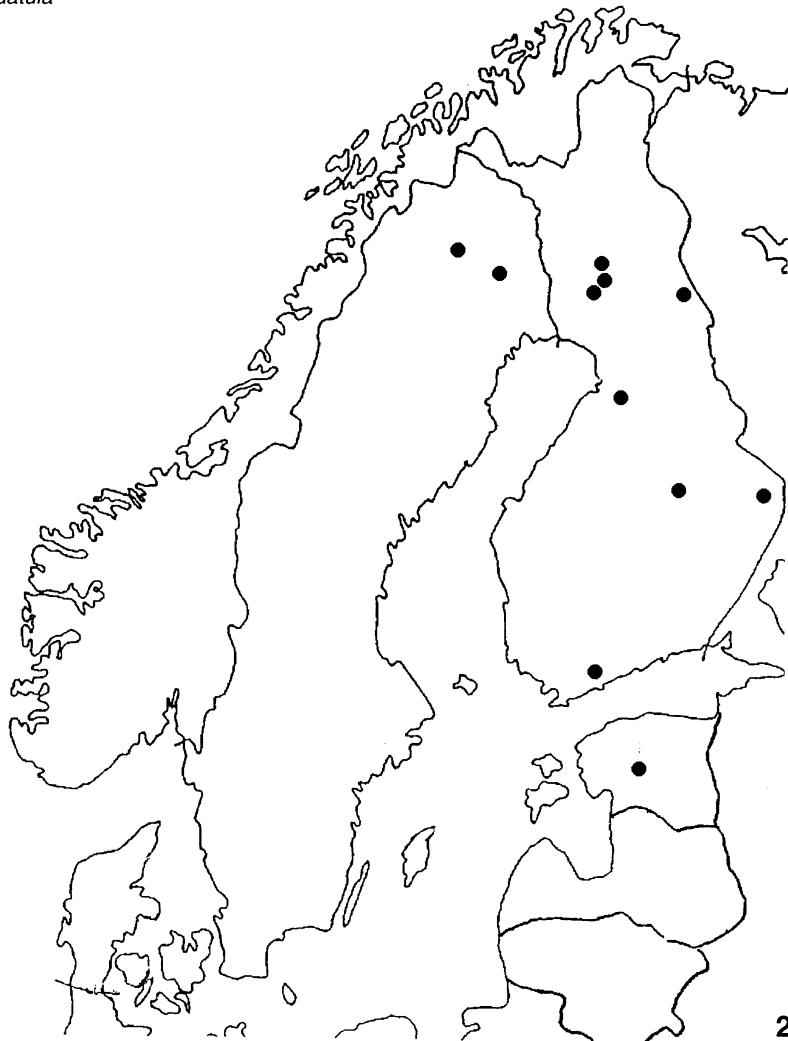
Diagnosis. – Generally blackish flies, wing hyaline but with a shadow along R₁, protarsomere 1 blackish, other protarsomeres whitish, profemur of male with 2-3 anteroventral rows of stout setae; ventral lobe of epandrium medially bent; cercus projecting ventrad in lateral view, ventrally expanded laterally; aedeagus distally sinuate, dorsally membranous; gonopod huge, distally expanded dorsoventrally in lateral view.

Redescription. – ♂. Head. Frons brownish-black, dull, pale brownish above antennae, frontal length 0.27 (0.23-0.34) mm; frontal index = 0.83 (0.74-0.94), top to bottom width ratio = 1.34 (1.21-1.42). Frontal triangle indistinct, paler, subshining, about 50-71% of frontal length; ocellar triangle prominent, about 35-38% of frontal length. Orbital plates broad, pale blackish-brown, subshining, about 100-112% of frontal length. Orbital setae black, strong, or₁ behind or₂ and bent inwards, distance of or₃ to or₁ = 56-100% of or₃ to vtm, or₁ / or₃ ratio = 0.83 (0.75-0.94), or₂ / or₁ ratio = 1.02 (0.90-1.11), postocellar setae minute, about 28 (25-31)%, ocellar setae = 71 (63-81)% of frontal length; vibrissal index = 0.68 (0.56-0.75). Face whitish-yellow. Carina absent. Cheek index about 7-11. Eye roundish, index = 1.21 (1.14-1.30). Occiput slightly convex, dark brown. Antennae yellowish, flagellomere 1 short, length to width ratio = 1.20. Arista with 3 short dorsal, 2 ventral, and about 6 small inner branches, plus terminal fork. Proboscis pale yellowish. Clypeus brownish. Palpus with 2-3 short black setae near tip.

Thorax blackish-brown, slightly greyish microtrichose, length 1.00 (0.87-1.22) mm. 6 rows



Figs. 243-246. Left oviscapts valves, lateral view. 243: *Chymomyza caudatula*; 244: *Chymomyza costata*; 245: *Chymomyza distincta*; 246: *Chymomyza fuscimana*.



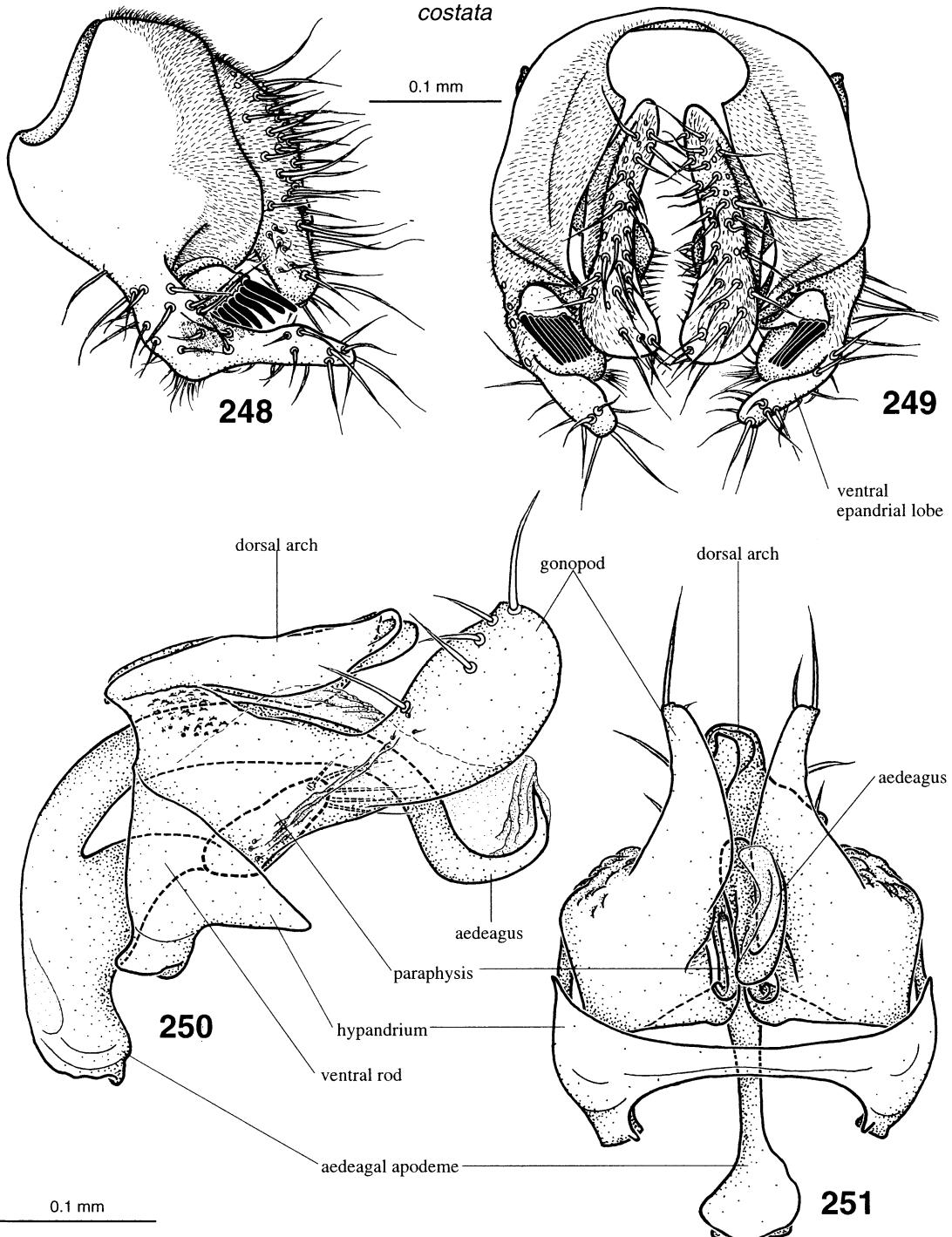
247

Fig. 247. Known distribution pattern of *Chymomyza caudatula* Oldenberg in Scandinavia.

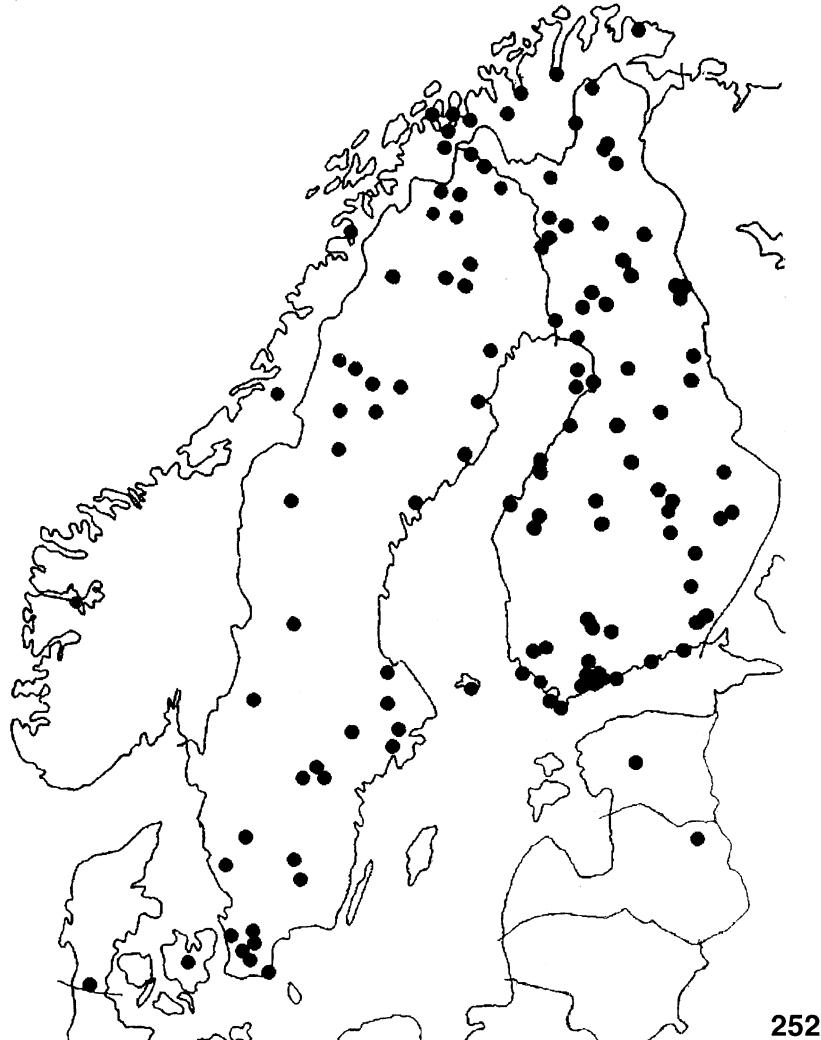
of acrostichal setulae. h index = 3.58 (2.75-4.33). Transverse distance of dorsocentral setae 150-212% of longitudinal distance; dc index = 0.65 (0.60-0.70). Prescutellar setae slightly elongated length about 30-60% of anterior dorsocentral setae. Distance between apical scutellar setae about 100-125% of that between apical and basal one; basal setae convergent; scut index = 0.62 (0.56-0.70). Sterno index = 0.75 (0.69-0.79), median katepisternal seta about 17-27% of anterior one. One minute proepisternal seta present. Haltere pale yellow. Legs brownish, fore leg except procoxa blackish, profemur with

2 anteroventral rows of short, black sharp setae, preapical seta on metatibia, apical seta on mesotibia.

Wing (Fig. 227) hyaline, veins yellowish, with a diffuse dark shadow along costal margin (Fig. 227), and C, R₁ and tip of R₂₊₃ brown, R₄₊₅ and M apically slightly converging, length 2.28 (2.03-2.73) mm, length to width ratio = 2.34 (2.30-2.44). Indices: C = 2.00 (1.91-2.11), ac = 3.57 (3.40-3.83), hb = 0.72 (0.65-0.82), 4C = 1.42 (1.21-1.55), 4v = 2.60 (2.29-3.00), 5x = 2.42 (2.17-2.75), M = 0.84 (0.79-0.91), prox. x = 0.81 (0.71-0.91).



Figs. 248-251. *Chymomyza costata* (Zetterstedt). 248: epandrium, cerci, and surstyli, left lateral view; 249: idem, decasternum intentionally omitted, posterior view; 250: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 251: idem, posterior view.



252

Fig. 252. Known distribution pattern of *Chymomyza costata* (Zetterstedt) in Scandinavia.

Abdomen completely black, except for very narrow, yellowish, hind margins of tergites.

Terminalia ♂ (Figs 248-251). Epandrium distally microtrichose, with 19 lower, and no upper setae, distal margin lobate submedially above surstyli in posterior view; ventral lobe protruding posterad, medially bent, dorsolaterally microtrichose on proximal inner surface, slightly encircling surstylus, backwardly-directed, distally pointed inwards, and unusually with ca. 26 setae on inner surface. Cercus projecting ventrad in lateral view, ventrally expanded laterally and curved inwards, where its margin bears a row

of stiff setae, anteriorly connected to epandrium by membranous tissue, microtrichose, without ventral lobe. Surstylus not microtrichose, small, globular, with a compact row of ca. 9 quite long, slightly curved, roundish-tipped, peg-like prensisetae, and neither inner nor outer setae. Decasternum well-developed but intentionally omitted in Fig. 249. Hypandrium as long as epandrium, anterior margin concave; posterior hypandrial process absent; dorsal arch remarkably well-developed, backwardly-directed, almost completely covering aedeagus medially, distally slightly asymmetric and bifid in ventral

view; gonopod conspicuously large, anterodorsally rugose, distally expanded in lateral view, and laterodorsally with ca. 5 long setae, in addition to ca. 6 setulae (3 near ventral margin and 3 near dorsal margin), linked to paraphysis by membranous tissue. Aedeagus long, distally sinuate, more or less parallel to ventral rod, dorsodistally membranous and apically sharp in lateral view, slightly curved to the right in posterior view, fused to aedeagal apodeme. Aedeagal apodeme 3x shorter than aedeagus, flattened laterally, proximally expanded laterally. Ventral rod twice as long as width of adjacent aedeagal apodeme. Paraphysis linked both to gonopod and to apical margin of aedeagal apodeme by membranous tissue, apically with ca. 5 setae.

♀. Differences from male: protarsus paler towards tip.

Measurements: Frontal length 0.27 (0.23-0.32) mm; frontal index = 0.89 (0.79-0.95), top to bottom width ratio = 1.36 (1.26-1.44). Frontal triangle about 57-73% of frontal length; ocellar triangle about 33-43 % of frontal length. Orbital plates about 93-107% of frontal length, Distance of or3 to or1 = 67-83% of or3 to vtm, or1 / or3 ratio = 0.83 (0.69-1.00), or2 / or1 ratio = 1.05 (0.80-1.22), postocellar setae = 30 (21-33)%; ocellar setae = 71 (60-80)% of frontal length; vibrissal index = 0.74 (0.67-0.78). Cheek index about 7-10. Eye index = 1.13 (1.04-1.26). Thorax length 1.00 (0.85-1.16) mm. h index = 3.26 (3.20-3.33). Transverse distance of dorsocentral setae 200-243% of longitudinal distance; dc index = 0.55 (0.50-0.59). Distance between apical scutellar setae about 100-129% of that between apical and basal one; scut index = 0.68, sterno index = 0.68 (0.59-0.85), median katepisternal seta about 25-30% of anterior one. Wing length 2.30 (2.06-2.73) mm, length to width ratio = 2.32 (2.27-2.36). Indices: C = 1.94 (1.70-2.00), ac = 3.91 (3.40-4.25), hb = 0.71 (0.65-0.76), 4C = 1.52 (1.31-1.73), 4v = 2.86 (2.44-3.30), 5x = 2.76 (2.40-3.00), M = 0.99 (0.75-1.20), prox. x = 0.78 (0.69-0.90).

♀ Terminalia (Fig. 244). Valve of oviscap distally slightly pointed, ventrally convex, with ca. 5 discal, and ca. 9 marginal, trichoid-like outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 very long, slightly curved, subterminal, abnormally inserted in outer instead of the usual inner surface, and included in the row of marginal ovisensilla.

Distribution. – (Fig. 252). A widespread Palaearctic species, more common in northern areas. Recorded from all the Scandinavian and Baltic countries, and from Iceland; northernmost locality: Lyngen (Norway).

Biology. – The larvae and flies are more common in mountainous localities, suggesting a boreo-alpine distribution type. The larvae have been found under the bark of logs and stumps of spruce (*Picea abies* (L.) Karst.; Pinaceae) in Switzerland (Burla, 1997). For larval diapause, see the section "Ecology".

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Glarus, 2 ♂♂, 1974; Graubünden, 2 ♂♂, 1988), 4 ♀♀ (SWITZERLAND: Glarus, 1 ♀, 1974; Graubünden, 2 ♀♀, 1975, 1996; Zürich, 1 ♀, 1988).

***fuscimana* species group**

Okada, 1976

Diagnosis. – Frons and mesoscutum yellowish-brown; wing tip milky white; fore leg with unicoloured protarsus, protarsomere 1 not black; aedeagus bilaterally asymmetric; dorsal arch complex, bizarrely developed, asymmetric, submedially branched, right branch always more developed and apically intertwined with aedeagus tip (better understood if studied in dorsal view).

Comments. – A Holarctic group, with 5 species included; four of them have been recorded in Europe. The Nearctic *C. wirthi* Wheeler, 1954 has been found in England (Gibbs, 1994).

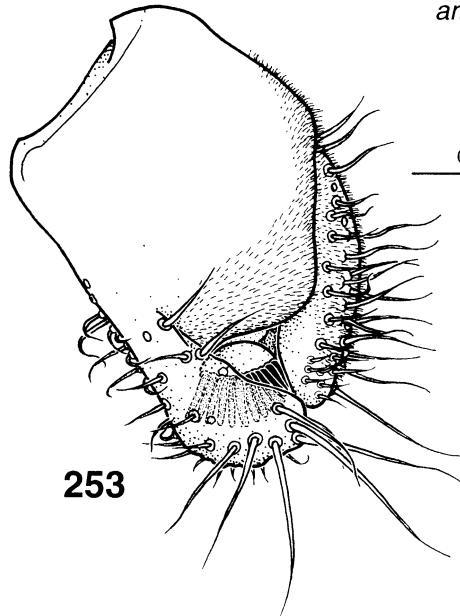
Chymomyza amoena

(Loew, 1862)

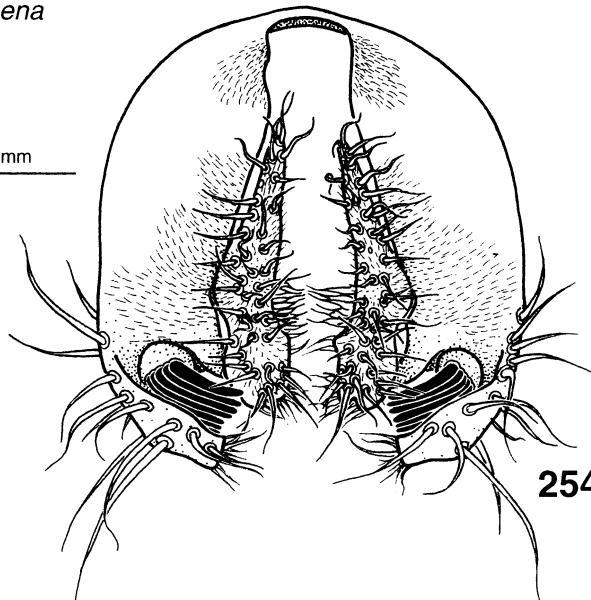
(Figs 224, 253-256)

Drosophila amoena Loew, 1862: 230.

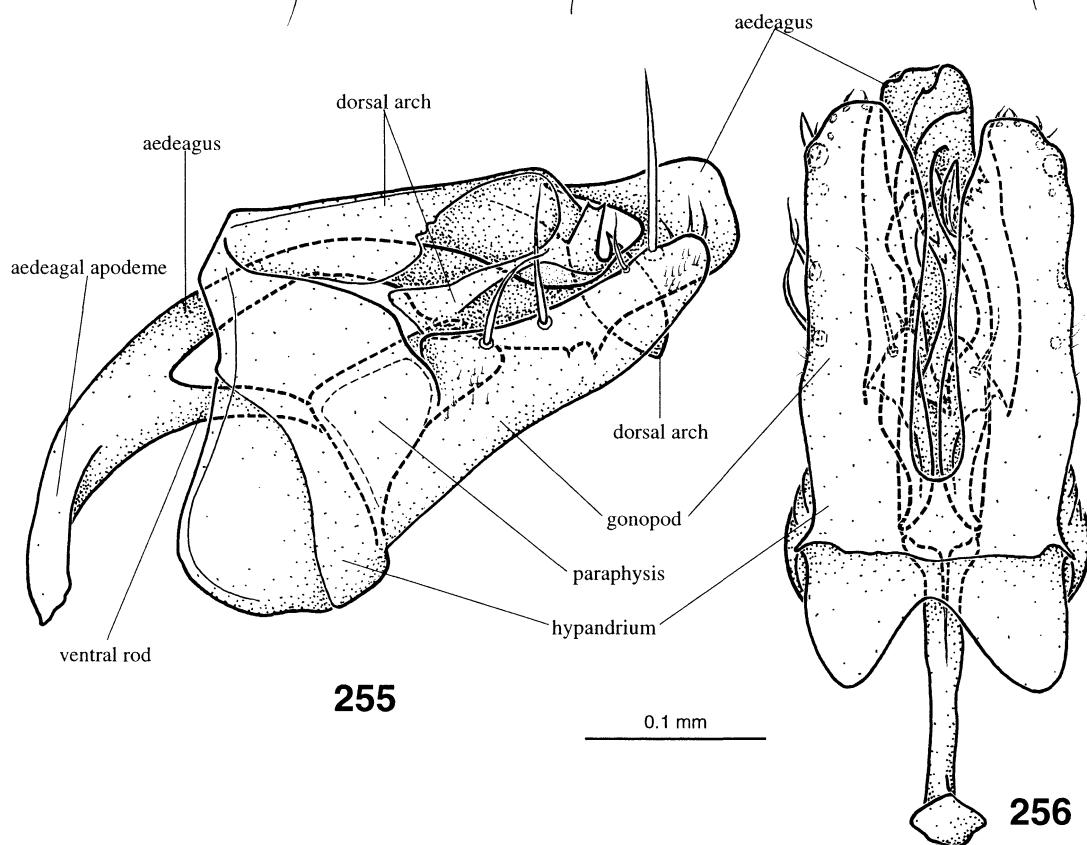
Diagnosis. – Generally yellowish flies, wing uniquely showing 3 broad, transversal, dark bands, a basal one across R₁, a median one along crossvein dM-Cu, and an apical one beginning just before tip of R₂₊₃, leaving open the whitish wing tip, legs pale yellowish, profemur with 2 rows of anteroventral setae.



253



254



Figs. 253-256. *Chymomyza amoena* (Loew). 253: epandrium, cerci, and surstyli, left lateral view; 254: idem, decasternum intentionally omitted, posterior view; 255: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 256: idem, posterior view.

Redescription. – ♂. Head. Frons variable yellowish to pale brownish, dull, paler above antennae, frontal length 0.31 (0.27-0.33) mm; frontal index = 0.98 (0.90-1.06), top to bottom width ratio = 1.34 (1.29-1.39). Frontal triangle indistinct, subshining, about 47-56% of frontal length; ocellar triangle prominent, brownish, about 32-44% of frontal length. Orbital plates broad, greyish-brown, shining, about 100-116% of frontal length. Orbital setae black, strong, or1 behind or2, bent inwards, distance of or3 to or1 = 50-70% of or3 to vtm, or1 / or3 ratio = 0.79 (0.72-0.85), or2 / or1 ratio = 1.08 (0.91-1.17), postocellar setae minute or absent, at most 22%, ocellar setae = 69 (58-94)% of frontal length; vibrissa short, vibrissal index = 0.69 (0.67-0.71). Face flat, whitish-yellow, dark brown above clypeus. Carina absent. Cheek index about 13-17. Eye roundish-oblique, main axis almost parallel to face, index = 1.23 (1.11-1.32). Occiput medially convex, dark brown, with yellowish margin. Antennae yellowish, flagellomere 1 whitish, short, length to width ratio about 140. Arista with 3 dorsal, 2 ventral, and about 8 small inner branches, plus terminal fork. Proboscis pale yellowish. Palpus with 1 short black seta at tip. Thorax length 0.99 (0.85-1.11) mm.

Scutum shining, yellowish, with a diffuse median stripe and also diffuse brownish lateral areas which may cover the whole dorsal surface. 6 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae 150-180% of longitudinal distance; dc index = 0.62 (0.60-0.65). Scutellum brownish, subshining. Distance between apical scutellar setae about 90-100% of that between apical and basal one; basal setae slightly convergent; scut index = 0.81 (0.74-0.85). Pleura yellowish, with a broad, diffuse, brownish stripe below wing, sterno index = 0.61 (0.58-0.68), median katepisternal seta minute, about 29% of anterior one. Haltere whitish with brownish stalk. Legs pale yellow, profemur with 2 anteroventral rows of sharp black setae which are at most as long as width of femur, preapical seta on metatibia, apical seta on mesotibia.

Wing (Fig. 224) hyaline, tip whitish, with a brownish, diffuse shadow along R₁, and 2 more or less diffuse brownish bands: a broad, triangular inner one along crossvein dM-Cu and a narrow outer one between inner band and white wing tip; around crossvein dM-Cu inner band is

as broad as half of wing width, then narrowing towards costa where it is very narrow; R₂₊₃ may have a crossvein-stump within this band; R₄₊₅ and M apically slightly converging, length 2.35 (2.06-2.59) mm, length to width ratio = 2.46 (2.41-2.52). Indices: C = 2.16 (1.85-2.37), ac = 3.74 (3.17-4.00), hb = 0.78 (0.68-0.81), 4C = 1.34 (1.23-1.43), 4v = 2.67 (2.46-2.79), 5x = 2.33 (2.17-2.50), M = 0.83 (0.77-0.87), prox. x = 0.67 (0.62-0.71).

Abdomen blackish-brown, subshining, basally somewhat paler.

Terminalia ♂ (Figs 253-256). Epandrium distally slightly microtrichose, with 18 lower, and no upper setae, distal margin lobate submedially above surstyli in posterior view; ventral lobe not microtrichose, medially bent, slightly protruding posterad and encircling surstyli, distally pointed inwards, and unusually with ca. 18 setae on inner surface. Cercus ventrally expanded and curved inwards, inner margin ventrally with a row of abruptly narrowed setae, anteriorly connected to epandrium by membranous tissue, mostly microtrichose, without ventral lobe. Surstylus not microtrichose, small, globular, with a compact row of ca. 13 quite long, slightly curved, roundish-tipped, peg-like prensisetae, and neither inner nor outer setae. Decasternum well-developed but intentionally omitted in Fig. 254. Hypandrium as long as epandrium, anterior margin concave; posterior hypandrial process absent; dorsal arch remarkably well-developed, expanded backwards, distally strongly asymmetric, medially covering aedeagus, with which it is distally intertwined, medially branched and followed by a slightly serrate, dorsad directed process, right branch apically sharp, and directed ventrad, subapically sharp, and directed dorsad, much more developed than left branch, which is directed forwards, apically blunt and slightly expanded, reaching apicodorsal margin of left paraphysis; gonopod remarkably well-developed, and laterodorsally with ca. 3 long, and 3 small setae, in addition to ca. 21 setulae on inner surface (8 medially and 13 on distal margin), linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, long, sinuate, distally somewhat asymmetric and parallel to ventral rod, apically blunt although dorsally curved and sharply pointed forwards in lateral view, submedially with 2 scales ventrally. Aedeagal apodeme ca. half as long as aedeagus, proxi-

mally expanded laterally. Ventral rod twice as long as width of adjacent aedeagal apodeme. Paraphysis linked both to gonopod and to dorsoapical margin of aedeagal apodeme by membranous tissue, apically with ca. 2 setae and 1 setula.

♀. Measurements: Frontal length 0.32 (0.31-0.34) mm; frontal index = 0.92 (0.86-1.00), top to bottom width ratio = 1.24 (1.14-1.33). Frontal triangle about 50-68% of frontal length; ocellar triangle about 35-39% of frontal length. Orbital plates about 100-106% of frontal length. Distance of or3 to or1 = 50-60% of or3 to vtm, or1 / or3 ratio = 0.79 (0.71-0.87), or2 / or1 ratio = 1.24 (1.15-1.33), postocellar setae = 24 (20-28), ocellar setae = 75 (72-78)% of frontal length; vibrissal index = 0.71 (0.55-0.80). Cheek index about 11-18. Eye index = 1.30 (1.26-1.35). Thorax length 1.10 (1.02-1.16) mm. Transverse distance of dorsocentral setae 146-167% of longitudinal distance; dc index = 0.74 (0.71-0.76). Distance between apical scutellar setae about 91-100% of that between apical and basal one; scut index = 0.80 (0.79-0.81), sterno index = 0.66 (0.64-0.68), median katepisternal seta about 31-36% of anterior one. Wing length 2.59 (2.52-2.63) mm, length to width ratio = 2.50 (2.42-2.57). Indices: C = 2.37 (1.91-2.71), ac = 3.53 (2.83-4.00), hb = 0.74 (0.70-0.77), 4C = 1.31 (1.21-1.43), 4v = 2.78 (2.29-3.00), 5x = 2.46 (2.17-2.60), M = 0.88 (0.76-0.93), prox. x = 0.71 (0.59-0.80).

Distribution. – This Nearctic species has been recorded in Europe over the last few decades; it is now probably widespread but rather rare; the flies can be collected locally in large numbers over fruit bait. So far not recorded in Scandinavia, but found in The Netherlands, Germany, Poland, Estonia, Lithuania and Russia. Northernmost locality: Tartu (Estonia).

Biology. – In contrast to the general biology of *Chymomyza* species, the larvae of *C. amoena* breed in the frass produced by parasitizing caterpillars, borers etc., particularly in nuts such as sweet chestnuts (*Castanea sativa* Mill.; Fagaceae) etc. (Band et al., 1998, 1999, 2003), which is a very uncommon substrate for a drosophilid species. The main food source most probably consists of the microorganisms growing in the frass.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Schaffhausen, 1 ♂, 1992; Zürich,

3 ♂♂, 1991), 5 ♀♀ (SWITZERLAND: Zürich, 2 ♀♀, 1997, 1999; Genève, 1 ♀, 1996. AUSTRIA: Vienna, 1 ♀, 1995. CZECH REPUBLIC: Val/Veselí, 1 ♀, 1998).

Chymomyza distincta (Egger, 1962)

(Figs 49, 230, 233-235, 245, 257-261)

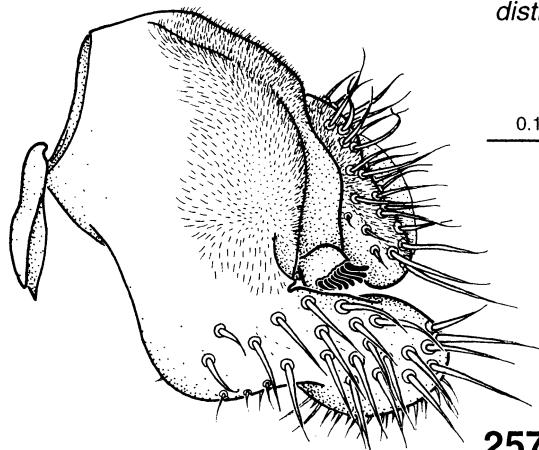
Drosophila distincta Egger, 1962: 780.
Chymomyza oldenbergi Duda, 1934: 45.

Diagnosis. – Generally yellowish flies, legs usually slightly brownish; ventral epandrial lobe long, broad and apically spatulate in lateral view; gonopod very long and medially with a remarkably strong, outwardly-directed seta on outer surface; dorsal arch strongly asymmetric, distally branched and expanded laterally.

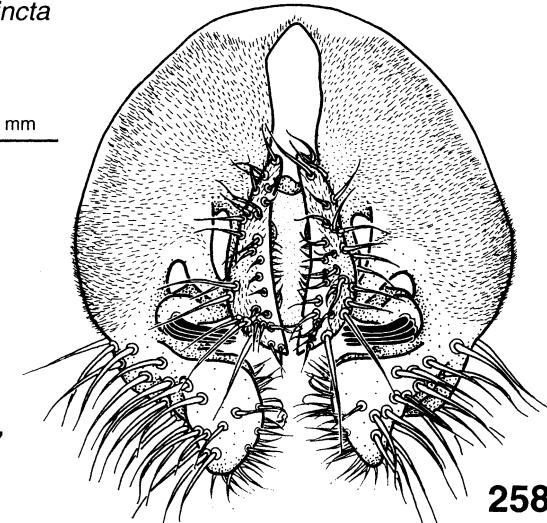
Redescription. – ♂. Head. Frons variable yellowish to pale brownish, dull, paler above antennae, frontal length 0.32 (0.30-0.32) mm; frontal index = 0.81 (0.76-0.83), top to bottom width ratio = 1.31 (1.24-1.36). Frontal triangle indistinct, subshining; ocellar triangle prominent, brownish, about 37-39% of frontal length. Orbital plates broad, greyish-brown, shining, about 105-111% of frontal length. Orbital setae (Fig. 49) black, strong, or1 behind or2 and slightly bent inwards, distance of or3 to or1 = 55-70% of or3 to vtm, or1 / or3 ratio = 0.76 (0.69-0.87), or2 / or1 ratio = 1.21 (1.15-1.27), postocellar setae minute or absent, at most 15%, ocellar setae = 77 (74-83)% of frontal length; vibrissal index = 0.74 (0.70-0.80). Face whitish-yellow, dark brown above clypeus. Carina absent. Cheek index about 10-12. Eye roundish-oblique, index = 1.17 (1.11-1.27). Occiput convex, dark brown, with yellowish border. Antennae yellowish, flagellomere 1 short, length to width ratio = 1.20-1.30. Arista with 3 dorsal, 2 ventral, and about 7 small inner branches, plus terminal fork. Proboscis pale yellowish. Palpus with 1 short black seta at tip.

Thorax length 1.25 (1.19-1.39) mm. Scutum brownish-yellow, shining, 6 rows of acrostichal setulae. h index = 3.57 (3.00-4.25). Transverse distance of dorsocentral setae 150-220% of longitudinal distance; dc index = 0.56 (0.52-0.59). Scutellum brownish, subshining. Prescutellar setae slightly elongated, length about 30-40% of anterior dorsocentral setae. Distance between

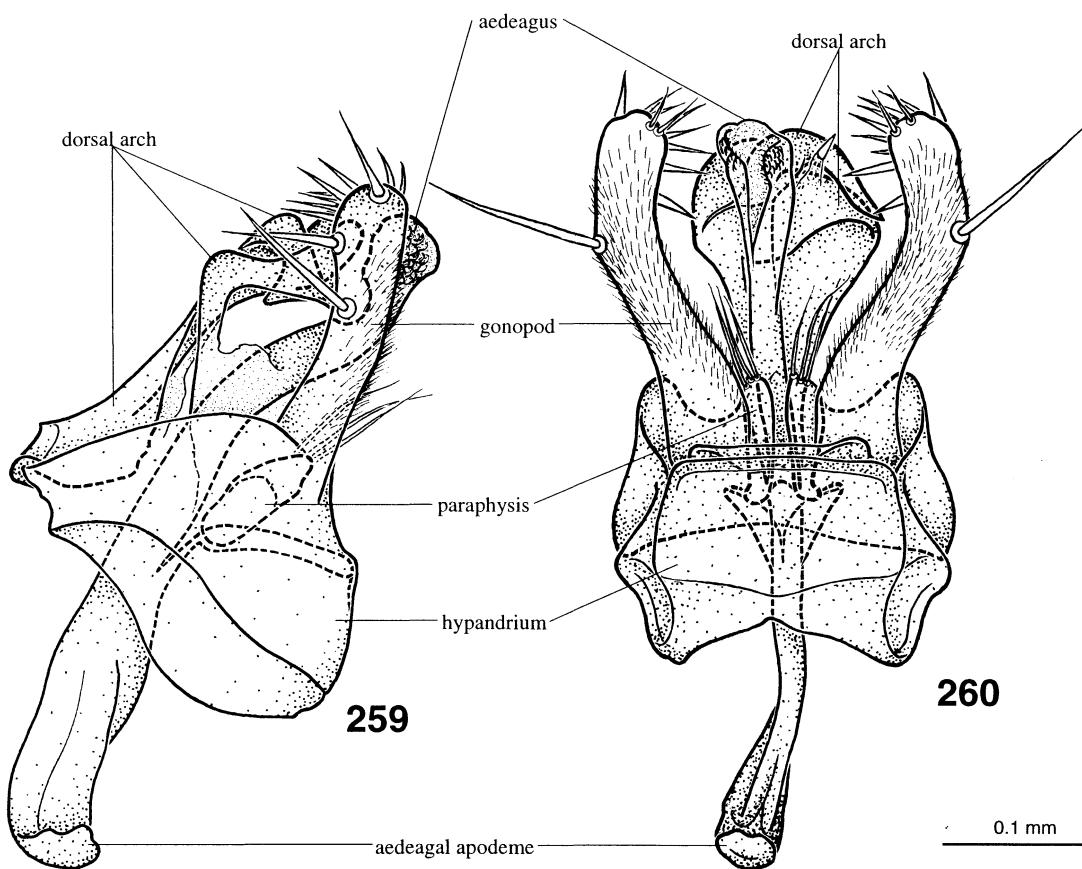
distincta



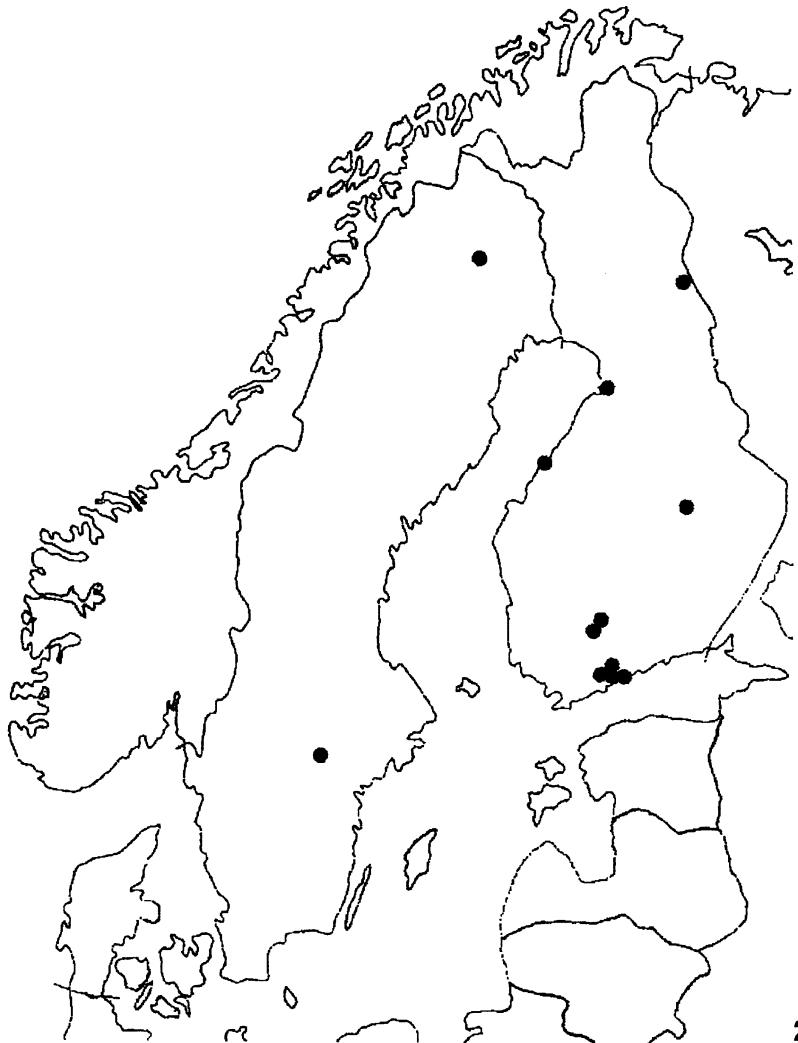
257



258



Figs. 257-260. *Chymomyza distincta* (Egger). 257: epandrium, cerci, and surstyli, left lateral view; 258: idem, plus decasternum, posterior view; 259: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 260: idem, posterior view.



261

Fig. 261. Known distribution pattern of *Chymomyza distincta* (Egger) in Scandinavia.

apical scutellar setae about 109-120% of that between apical and basal one; basal setae convergent; scut index = 0.63 (0.61-0.67). Pleura yellowish, with a diffuse brownish stripe below wing, sterno index = 0.62 (0.59-0.64), median katepisternal seta about 29-43% of anterior one. One minute proepisternal seta present. Haltere pale yellow. Legs brownish-yellow, but profemur brown in apical half, also protibia and protarsus somewhat darkened; profemur with 2 anteroventral rows of sharp, black setae as long as width of femur, preapical seta on metatibia, apical seta on mesotibia.

Wing (Fig. 230) hyaline, tip whitish, with 2 brownish, diffuse shadows along R_1 and C and, more distinct, apical third of R_{2+3} ; R_1 and C brown, other veins pale yellow, R_{4+5} and M apically slightly converging, length 2.65 (2.62-2.66) mm, length to width ratio = 2.31 (2.27-2.38). Indices: $C = 2.32$ (2.20-2.42), $ac = 3.13$ (2.71-3.33), $hb = 0.70$ (0.68-0.75), $4C = 1.28$ (1.19-1.33), $4v = 2.60$ (2.38-2.73), $5x = 2.81$ (2.40-3.25), $M = 0.90$ (0.81-1.07), prox. $x = 0.93$ (0.81-1.07).

Abdomen blackish-brown, subshining, with a pale yellowish, diffuse, median area on tergites

1+2, and pale, narrow marginal bands on some tergites.

♂ Terminalia (Figs 257-260). Epandrium distally microtrichose, with 25 lower, and no upper setae, distal margin lobate medially above surstylus in posterior view, ventral lobe protruding, medially bent and distally spatulate in lateral view, not microtrichose, slightly encircling surstylus, backwardly-directed, distally pointed inwards, and unusually with ca. 26 setae on inner surface. Cercus ventrally expanded and curved inwards, inner margin ventrally with a row of small setae, anteriorly slightly fused to epandrium, mostly microtrichose, without ventral lobe. Surstylus not microtrichose, small, globular, with a compact row of ca. 11 quite long, slightly curved, roundish-tipped, peg-like prensetae, and neither inner nor outer setae. Decasternum narrow, as in Fig. 258. Hypandrium as long as epandrium, anterior margin concave; posterior hypandrial process absent; dorsal arch remarkably well-developed, backwardly-directed, almost completely covering aedeagus, strongly asymmetric, subapically strongly twisted and branched, left branch long, directed forwards, apically membranous, reaching base of left paraphysis, right branch longer, apically bifurcate, the ventral branchlet pointed ventrad, crossing under the dorsal branchlet (in posterior view), and with a small lateral spine (in posterior view); gonopod remarkably well-developed, finger-shaped, ventrally microtrichose, distally with ca. 3 long, stiff setae laterodorsally, the foremost very large and pointed outwards in posterior view, in addition to ca. 8 small setae on inner surface, linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, tube-shaped, subapically covered with tiny scales laterally, apically roundish in lateral view and slightly asymmetric in ventral view. Aedeagal apodeme shorter and broader than aedeagus, laterally flattened. Ventral rod dorsoventrally flattened, thrice as long as width of adjacent aedeagal apodeme. Paraphysis linked both to gonopod and to dorsoproximal margin of aedeagal apodeme by membranous tissue, apically with ca. 3 long setae.

♀. Differences from male: Fore leg distinctly brown except procoxa, knee and base of profemur.

Measurements: Frontal length 0.33 (0.32-0.34) mm; frontal index = 0.84 (0.80-0.87), top

to bottom width ratio = 1.27 (1.20-1.36). Ocellar triangle about 35-40% of frontal length. Orbital plates about 105-110 % of frontal length. Distance of or3 to or1 = 45-60% of or3 to vtm, or1 / or3 ratio = 0.81 (0.75-0.88), or2 / or1 ratio = 1.18 (1.14-1.33), ocellar setae = 78 (70-84)% of frontal length; vibrissal index = 0.78 (0.73-0.82). Cheek index about 8-11. Eye index = 1.19 (1.15-1.22). Thorax length 1.23 (1.19-1.28) mm. h index = 3.72 (2.83-5.33). Transverse distance of dorsocentral setae 162-209% of longitudinal distance; dc index = 0.59 (0.55-0.63). Distance between apical scutellar setae about 110% of that between apical and basal one; scut index = 0.62 (0.58-0.68), sterno index = 0.66 (0.63-0.68), median katepisternal seta about 27-44% of anterior one. Wing length 2.74 (2.66-2.87) mm, length to width ratio = 2.22 (2.20-2.24). Indices: C = 2.53 (2.42-2.63), ac = 2.86 (2.71-3.17), hb = 0.68, 4C = 1.22 (1.12-1.36), 4v = 2.67 (2.56-2.86), 5x = 2.93 (2.60-3.20), M = 0.94 (0.88-1.00), prox. x = 0.82 (0.71-0.93).

♀ Terminalia (Fig. 245). Valve of oviscapt subapically expanded dorsad, distally blunt, ventrally convex, with ca. 6 discal and ca. 9 marginal, outer trichoid-like ovisensilla; inner trichoid-like ovisensilla unusually more anteriorly positioned: 3 thin, ventrodistally and 1 very long, slightly curved, submedially (subterminal in other species).

Distribution. – (Fig. 261). A widespread Palaeoarctic species. Recorded also from Sweden (northernmost locality: Tyresta National Park), Finland, and Russia.

Biology. – The larvae have been found under the bark of beeches (*Fagus sylvatica* L.; Fagaceae) and spruce (*Picea abies* (L.) Karst.; Pinaceae) in Switzerland (Burla, 1995, 1997).

Additional specimens examined. – 4 ♂♂ and 4 ♀♀ (SWITZERLAND: Ticino, 1981).

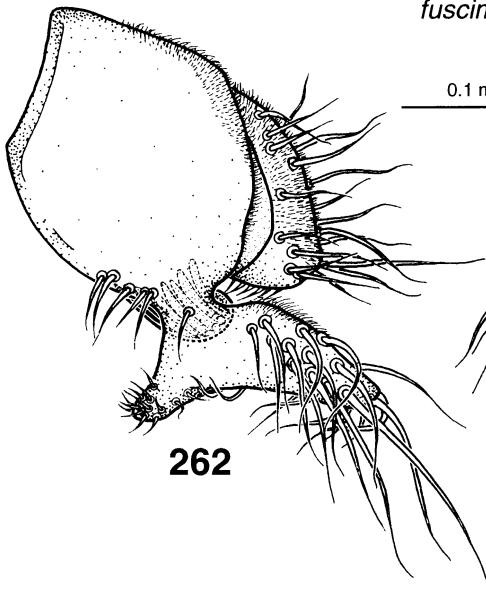
Chymomyza fuscimana (Zetterstedt, 1838)

(Figs 236, 238, 262-266)

Drosophila fuscimana Zetterstedt, 1838: 776.

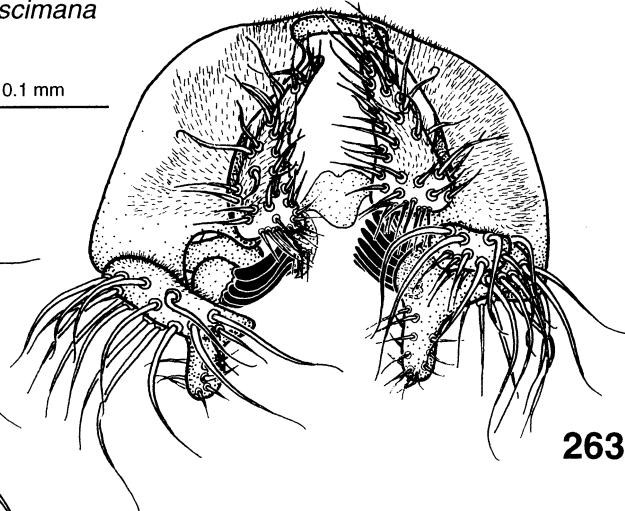
Drosophila albopunctata Becker, 1900: 64.

?*Drosophila nigrimana* Meigen, 1830: 87.

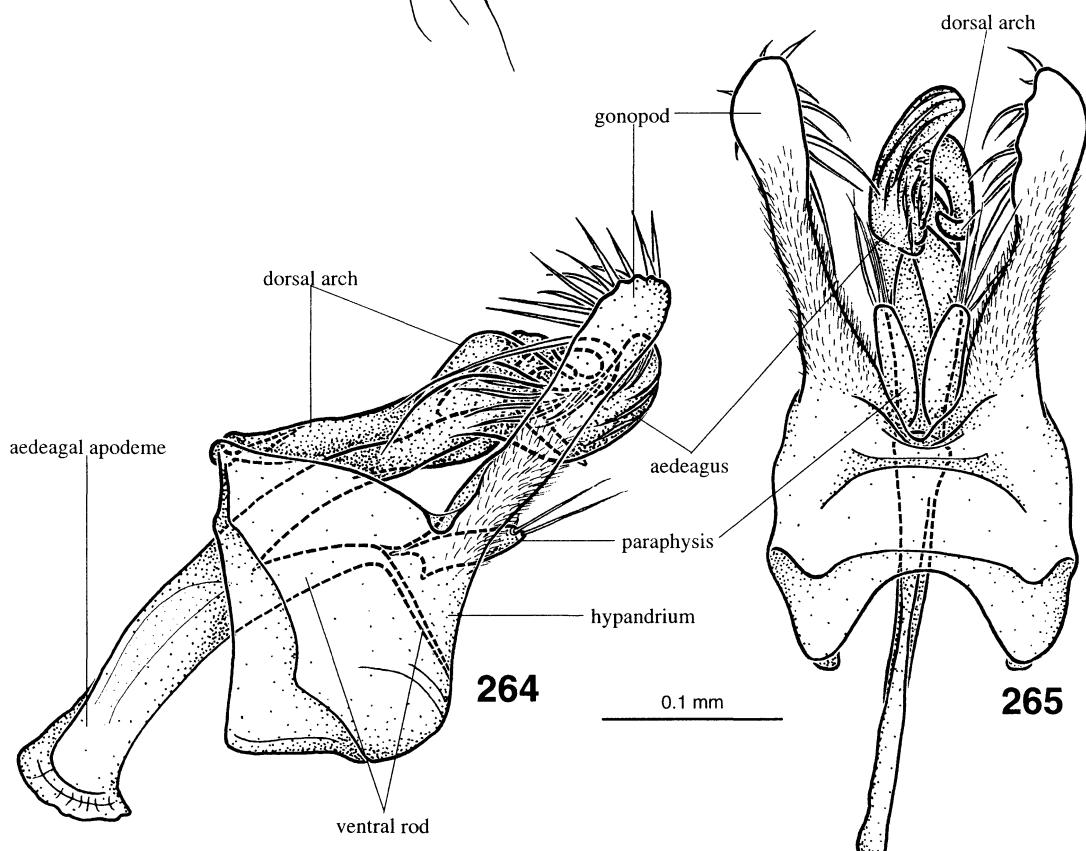
fuscimana

262

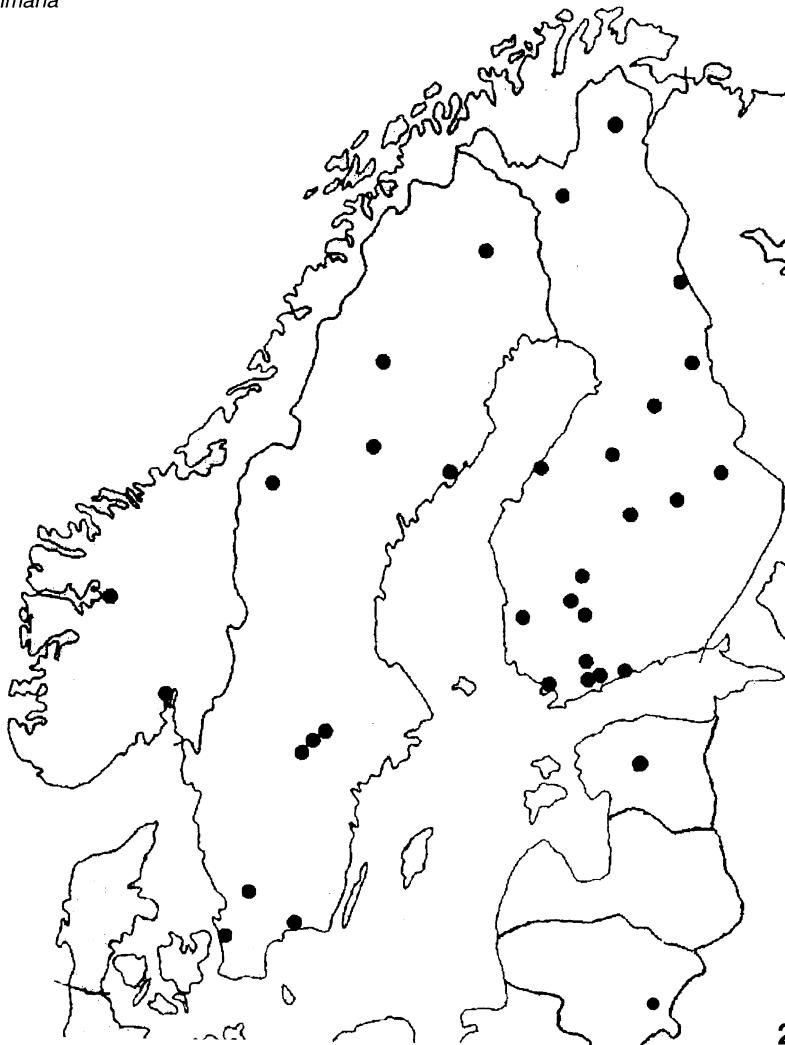
0.1 mm



263



Figs. 262-265. *Chymomyza fuscimana* (Zetterstedt). 262: epandrium, cerci, and surstyli, left lateral view; 263: idem, plus decasternum, posterior view; 264: hypandrium, gonopods, paraphyses, aedeagal apodeme, and ventral rod, left lateral view; 265: idem, posterior view.



266

Fig. 266. Known distribution pattern of *Chymomyza fuscimana* (Zetterstedt) in Scandinavia.

Diagnosis. — Generally yellowish flies; legs predominantly yellowish; ventral epandrial lobe strongly developed, protruding posterad, crescent-shaped in lateral view, and with very long setae distally; gonopods very long and without setae on outer surface; aedeagus asymmetric, distally sinuate; dorsal arch asymmetric, distally narrow, ribbon-shaped, coiled and entangled with aedeagus tip.

Redescription. — ♂. Head. Frons variable yellowish to dark brownish, dull, pale yellowish above antennae, frontal length 0.25 (0.23-

0.27) mm; frontal index = 0.81 (0.74-0.89), top to bottom width ratio = 1.31 (1.25-1.35). Frontal triangle indistinct, subshining, about 50-60% of frontal length; ocellar triangle prominent, blackish, about 36-47% of frontal length. Orbital plates broad, contrasting greyish-black, shining, about 100-113% of frontal length. Orbital setae black, strong, or1 behind or2 and slightly bent inwards, distance of or3 to or1 = 50-71% of or3 to vtm, or1 / or3 ratio = 0.72 (0.67-0.77), or2 / or1 ratio = 1.18 (1.10-1.25), postocellar setae minute, about 23 (19-27)%, ocellar setae = 62 (56-67)% of frontal length; vibrissal index =

0.58 (0.44-0.70). Face whitish-yellow, brownish above clypeus. Carina absent. Cheek index about 8-9. Eye roundish, index = 1.04. Occiput convex, dark brown. Antennae brownish, flagellomere 1 short, length to width ratio about 1.20. Arista with 3 dorsal, 2 ventral, and about 6 small inner branches, plus terminal fork. Proboscis pale yellowish. Clypeus brown. Palpus with 1 short black seta at tip.

Thorax length 0.97 (0.90-1.02) mm. Scutum brownish-yellow, shining, 6 rows of acrostichal setulae. h index = 4.35 (3.25-6.00). Transverse distance of dorsocentral setae 170-187% of longitudinal distance; dc index = 0.61 (0.57-0.67). Prescutellar setae slightly elongated, length about 40% of that of anterior dorsocentral setae. Scutellum brownish, subshining. Distance between apical scutellar setae about 78-111% of that between apical and basal one; basal setae convergent; scut index = 0.70 (0.64-0.74). Pleura yellowish, with a diffuse brownish stripe in upper half, sterno index = 0.67 (0.62-0.74), median katepisternal seta about 21-31% of anterior one. One minute proepisternal seta present. Haltere pale yellow. Legs brownish-yellow, but profemur brown in apical half, also protibia and protarsus somewhat darkened; profemur with 2 anteroventral rows of prolonged, black, sharp setae, preapical seta on metatibia, apical seta on mesotibia.

Wing hyaline, tip whitish, with 2 brownish, diffuse shadows along R_1 and C and, more distinct, apical third of R_{2+3} ; R_1 and C brown, other veins pale yellow, R_{4+5} and M apically slightly converging, length 2.39 (2.27-2.52) mm, length to width ratio = 2.33 (2.24-2.40). Indices: C = 2.16 (2.05-2.26), ac = 3.47 (3.00-3.80), hb = 0.61 (0.56-0.67), 4C = 1.39 (1.27-1.50), 4v = 2.76 (2.53-2.92), 5x = 2.44 (2.40-2.60), M = 0.91 (0.86-1.00), prox. x = 0.81 (0.71-0.92).

Abdomen blackish-brown, subshining, with a pale yellowish, diffuse median area on tergites 1+2 and pale, narrow, marginal bands on some tergites.

Terminalia ♂ (Figs 262-265). Epandrium dorsodistally microtrichose, with about 30 lower, and no upper setae, distal margin lobate submedially above surstylus in posterior view, ventral lobe protruding posterad, proximally quite narrow, crescent-shaped in lateral view, ventrally slightly expanded forwards, dorsally strongly expanded backwards, distally with ca. 15 very long setae; not microtrichose, slightly encircling

surstylus, and unusually with ca. 12 setae on inner surface. Cercus small, anteriorly weakly fused to epandrium, mostly microtrichose, without ventral lobe. Surstylus not microtrichose, small, globular, with a compact row of ca. 8 quite long, slightly curved, roundish-tipped peg-like prensisetae, and neither inner nor outer setae. Decasternum mostly membranous, narrow, as in Fig. 263. Hypandrium longer than epandrium, anterior margin concave; posterior hypandrial process absent; dorsal arch remarkably well-developed and strongly asymmetric, anteriorly weakly and posteriorly strongly sclerotised, backwardly-directed, almost completely covering aedeagus, medially branched, right branch longer, laterally flattened, distally narrow, ribbon-shaped, coiled and entangled with aedeagus tip, left branch forwardly directed and apically membranous; gonopod remarkably well-developed, finger-shaped, distally slightly expanded, lateroventrally microtrichose proximally, dorsodistally with ca. 12 long setae on inner surface, linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, distally asymmetric and pleated ventrolaterally, apically sinuate, and roundish in lateral view. Aedeagal apodeme shorter than aedeagus laterally flattened. Ventral rod medially strongly bent, ca. 5x as long as width of adjacent aedeagal apodeme. Paraphysis linked both to gonopod and to dorsomedian margin of aedeagal apodeme by membranous tissue, apically with ca. 4 long setae and 1 setula.

♀. Differences from male: Fore leg distinctly brown except procoxa and base of profemur.

Measurements: Frontal length 0.30 (0.27-0.32) mm; frontal index = 0.77 (0.71-0.83), top to bottom width ratio = 1.23 (1.04-1.32). Frontal triangle about 53-62% of frontal length; ocellar triangle about 37-44 % of frontal length. Orbital plates about 100-106% of frontal length. Distance of or3 to or1 = 60-75% of or3 to vtm, or1 / or3 ratio = 0.74 (0.64-0.81), or2 / or1 ratio = 1.22 (1.00-1.35), postocellar setae = 32 (24-39), ocellar setae = 77 (65-88)% of frontal length; vibrissal index = 0.68 (0.64-0.75). Cheek index about 7-10. Eye index = 1.14 (1.08-1.21). Thorax length 1.20 (1.08-1.26) mm. h index = 4.27 (3.20-5.67). Transverse distance of dorsocentral setae 177-230% of longitudinal distance; dc index = 0.64 (0.50-0.73). Distance between apical scutellar setae about 100-120% of that between apical and basal one; scut in-

dex = 0.72 (0.65-0.83), sterno index = 0.68 (0.64-0.73), median katepisternal seta about 25-31% of anterior one. Wing length 2.89 (2.62-3.08) mm, length to width ratio = 2.34 (2.24-2.42). Indices: C = 2.38 (2.20-2.57), ac = 3.29 (3.00-3.67), hb = 0.61 (0.59-0.65), 4C = 1.38 (1.24-1.69), 4v = 2.93 (2.69-3.54), 5x = 2.54 (2.14-2.80), M = 0.96 (0.88-1.15), prox. x = 0.89 (0.81-1.15).

♀ Terminalia (Fig. 246). Valve of oviscapt submedially expanded dorsad, distally slightly pointed, ventrally convex, with ca. 4 discal and ca. 10 marginal, outer trichoid-like ovisensilla; inner trichoid-like ovisensilla: 3 thin, distally positioned and 1 very long, straight, subterminal.

Distribution. – (Fig. 266). A widespread Palaeoarctic species. Recorded from all the Scandinavian countries, and also from Estonia, Lithuania, Belarus and Russia; northernmost locality: Inari (Finland).

Biology. – The larvae have been found under the bark of beeches (*Fagus sylvatica* L.; Fagaceae) and spruce (*Picea abies* (L.) Karst.; Pinaceae) in Switzerland (Burla, 1995, 1997).

Additional specimens examined. – 4 ♂♂ and 4 ♀♀ (SWITZERLAND: Glarus, 1974).

Genus *Dettopsomyia* Lamb, 1914

Dettopsomyia Lamb, 1914: 349. Type species: *Dettopsomyia formosa* Lamb, 1914.
Pictostyloptera Duda, 1924: 192.

Diagnosis. – Generally yellowish flies; arista plumose; eye axis oblique and gena width about 1/3 of eye length; mesonotum with a characteristic pattern of spots and/or stripes; carina prominent; acrostichal setulae in 2-4 rows; wings hyaline or with discrete pattern; costal incision deep, costal lappet thickened, blackish; R₂₊₃ short, strongly curved towards costa; C-index about 1; tibiae with dark rings.

Taxa included. – 13 mostly Oriental species have been described. One widespread species, *Dettopsomyia nigrovittata* (Malloch, 1924) has been recorded from the Canary Islands.

Genus *Drosophila* Fallén, 1823

- Drosophila* Fallén, 1823: 4. Type species: *Musca funebris* Fabricius, 1787.
Idiomyia Grimshaw, 1901: 50 (subgenus).
Hypenomyia Grimshaw, 1901: 53.
Chaetodrosophilella Duda, 1923: 40.
Spinulophila Duda, 1923: 47.
Chaetodrosophila Duda, 1924: 180.
Spinodrosophila Duda, 1924: 202.
Acrodrosophila Duda, 1924: 203.
Acanthopterna Duda, 1925: 200.
Acanthophila Duda, 1925: 200.
Macropalpus Duda, 1926: 63 (preocc.).
Phloridosa Sturtevant, 1942: 28 (subgenus).
Dudaica Strand, 1943: 212 (subgenus).
Siphlodora Patterson and Mainland, 1944: 25 (subgenus).
Sordophila Wheeler, 1949: 171.
Chusqueophila Brncic, 1957: 100 (subgenus).
Antopocerus Hardy, 1965: 42 (subgenus).
Ateledrosophila Hardy, 1965: 62 (subgenus).
Trichotobregma Hardy, 1965: 532.
Nudidrosophila Hardy, 1965: 564 (subgenus).
Psilodorha Okada, 1968: 334 (subgenus).
Engiscaptomyza Kaneshiro, 1969: 80 (subgenus).

Diagnosis. – Anterior reclinate orbital seta opposite or above proclinate one, distinctly shorter than the other 2 orbital setae; posterior reclinate orbital seta closer to proclinate orbital, than to medial vertical seta; postocellar seta well-developed; antenna not porrect; two or more ventral branches on arista; gena often broad; mesonotum usually with 6 or more rows of acrostichal setulae, and 2 pairs of dorsocentral setae; usually two pairs of postpronotal setae; prescutellar seta absent; sterno index usually 0.5 or more; costa reaching apex of vein M, cells bm and dm confluent; dark posterior bands on abdomen usually narrowed or interrupted in mid-dorsal line (except in subgenus *Sophophora*); posterior Malpighian tubules forming a closed loop around gut, their distal ends sometimes merely adjoined, but usually fused and with a continuous lumen; surstylus with a row of prensisetae; testes long, spiralled; oviscapt valve sclerotised, conspicuous, and with numerous, distinct ovisensilla; ventral receptacle long, fine, usually coiled; usually two to four egg-filaments (two in the *melanica*, *melanogaster* and *obscura* groups), at least anterior ones tapering; anterior spiracles often more than 1/6 length of puparium.

Taxa included. – There are about 2000 described species, arranged into 13 subgenera of which 3 are present in Europe.

Comments. – This is by far the largest drosophilid genus. Almost all the drosophilid species used in experimental studies belong to the genus *Drosophila*, and this is mainly because many species, particularly the fruit-breeders, can be cultured by standard methods; fungus-breeders usually need a malt medium.

Only a few of the subdivisions (subgenera, species groups, etc.) are based on phylogenetic analyses. Most species groups were established by Sturtevant (1942), who used mainly characters of the abdominal anatomy and of the early stages. Because such data are available for only a minority of species, the grouping followed here is mostly based on morphological characters of the terminalia, as well as on certain results from cytological and other studies.

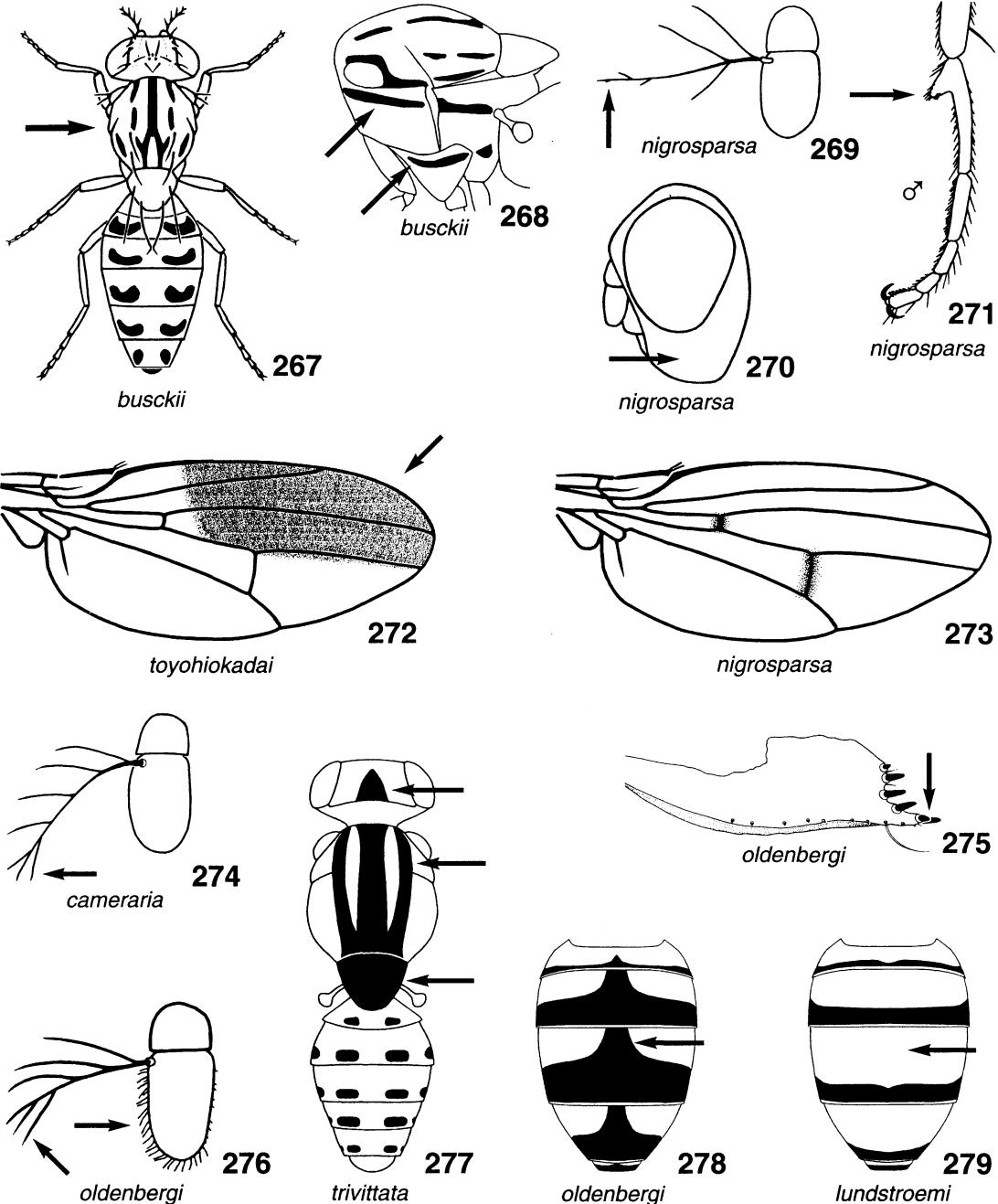
A first comprehensive phylogenetic analysis was made by Throckmorton (1975), who included 3 subgenera comprising 15 species groups in the “*virilis-repleta*-radiation”, 3 subgenera comprising 13 species groups in the “*immigrans-tripunctata*-radiation”, and 9 subgenera in the “*Hirtodrosophila*-radiation”, thus demonstrating the paraphyletic background of the genus *Drosophila*. This analysis does not agree with e.g. morphological, cytological or molecular hypotheses (Stalker, 1972; Grimaldi, 1990; Tatarenkov & Ayala, 2001).

In addition, certain taxa have been studied in recent years, e.g. the *melanogaster* group (Schawaroch, 2002), the *obscura* group (O’Grady, 1999) and the subgenus *Sophophora* (O’Grady & Kidwell, 2002).

Key to European species of *Drosophila* and *Hirtodrosophila*

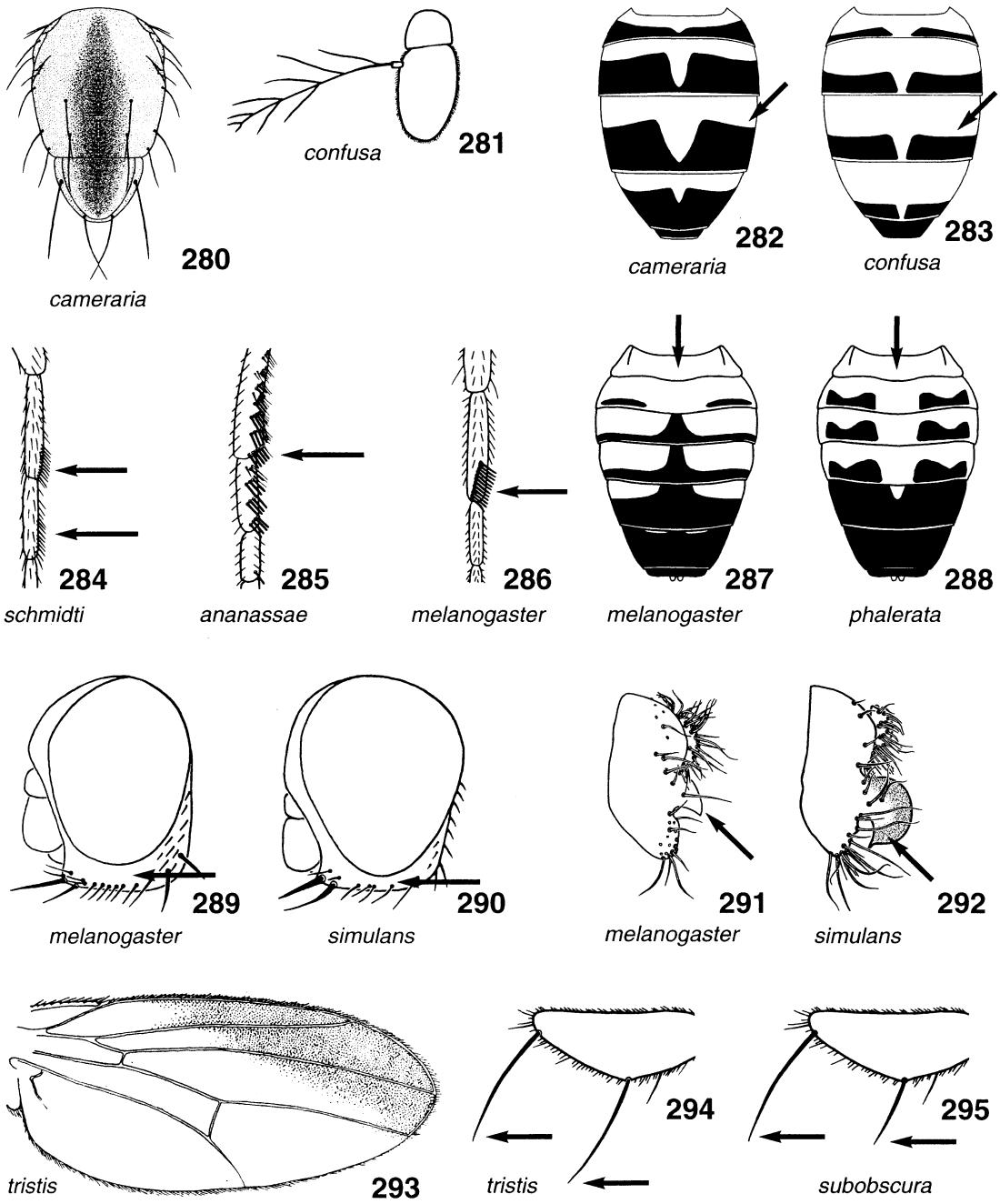
1 Scutum yellowish, with 3 dark stripes, median one forked in posterior half (Fig. 267). Pleura yellowish, with 2 dark horizontal stripes (Fig. 268). Eye roundish, broader than long. Abdominal tergites yellowish, each with 4 more or less isolated dark spots. Slender flies (subgenus *Dorsilopha*) *D. busckii* Coquillett

- If scutum, pleura and abdomen yellowish, then without such a pattern of bands and spots. Eye usually longer than broad 2
- 2(1) Arista atypical: no terminal fork, only 2 dorsal and 1 ventral branches in basal half (Fig. 269). Eye roundish, gena very broad and yellowish (Fig. 270). Wing: crossveins with dark shadows (Fig. 273). Scutum brown, with an irregular pattern of darker spots. Male: metatarsomere 1 with a basal, thorn-like expansion (Fig. 271) *D. nigrosparsa* Strobl
(recorded at higher altitudes in various European mountains from Spain to Slovakia)
- Arista usually with at least 3 dorsal and 2 ventral branches and a distinct terminal fork; if there is only 1 ventral branch it is just behind terminal fork (Figs 274, 276). Eye more vertical, gena narrow 3
- 3(2) Male: wing anteriorly brownish in apical 2/3 (Fig. 272). Yellowish flies. Female unknown *H. toyohikadai* (Sidorenko)
(East Palaearctic species, recorded from Slovakia)
- Wing hyaline or with other markings. If wing apically largely brownish, then flies blackish 4
- 4(3) Scutum yellowish, with 3 dark stripes which are confluent well in front of the predominantly blackish scutellum (Fig. 277). Frons medially with a large blackish triangle. Each tergite with 4 small spots *H. trivittata* (Strobl)
- If scutum yellowish then at most one median dark stripe present, and frons without such a triangle 5
- 5(4) No preapical seta on mesotibia. Arista with only one ventral branch just behind terminal fork (two branches in *H. confusa*) (*Hirtodrosophila*)



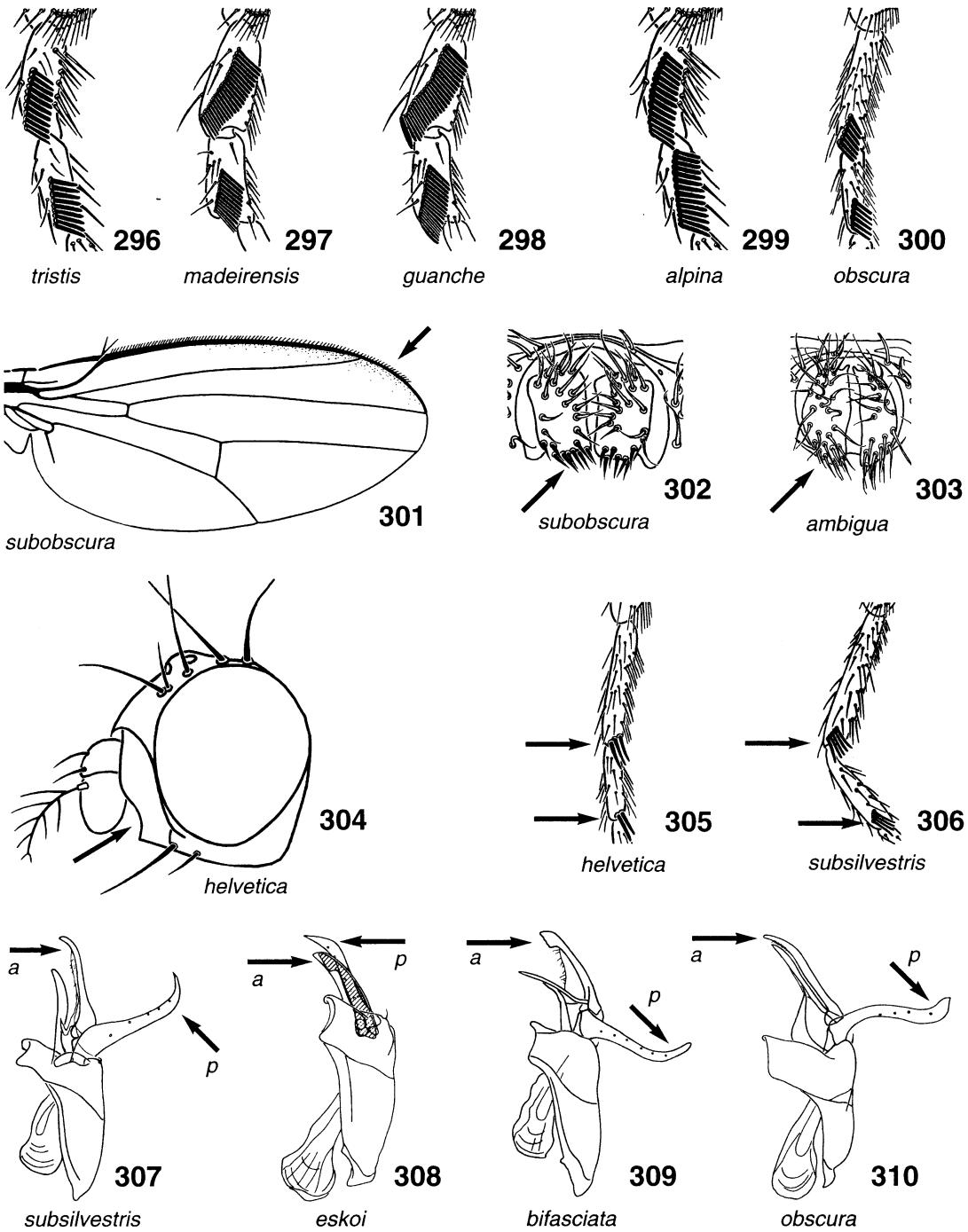
Figs. 267-279. 267, 277: habitus, dorsal view; 268: pleura, lateral view; 270: head, lateral view; 269, 274, 276: antenna, frontal view; 271: metatarsus, posterior view; 272, 273: right wing; 275: left oviscapit valve, lateral view; 278, 279: abdomen, dorsal view.

	Scutum and abdomen not much differing in general colour. Preapical seta on mesotibia distinct. Carina nose-like, reaching clypeus (except in <i>D. helvetica</i>)	11
6(5)	Antenna: flagellomere 1 with elongated setulae along anterior margin (Fig. 276). Female: oviscap valve ventrally projecting backwards, with a distinct pair of lower apical ovisensilla (Fig. 275).....	9
	Antenna: flagellomere 1 without elongated setulae. Female: oviscap valve apically roundish.....	7
7(6)	Abdominal tergites with an apical band which is medially enlarged in the form of a triangle, forming a partial median stripe (Fig. 278). Upper postpronotal seta not much longer than lower one (h index about 1.1).....	8
 <i>H. oldenbergi</i> (Duda) (Central European species)	
	Abdominal tergites with an apical band which is medially not enlarged (Fig. 279). Upper postpronotal seta distinctly longer than lower one (h index about 1.5)	
 <i>H. lundstroemi</i> (Duda)	
8(6)	Arista with only one ventral branch just behind terminal fork (Fig. 274). Scutum usually with a dark median stripe (Fig. 280). Abdominal tergites 2-5 with a very broad, medially more or less interrupted apical band (Fig. 282).....	
 <i>D. cameraria</i> (Haliday) (Central and South European species)	
	Arista with 2 ventral branches (Fig. 281). Scutum unicolourous yellowish. Wing faintly yellowish. Abdominal tergites 2-5 with a medially interrupted apical band (Fig. 283)	
 <i>H. confusa</i> (Staeger)	
9(5)	Scutum brownish, abdomen blackish. Preapical seta on mesotibia short. Carina very small in lower half.....	10
 <i>D. schmidti</i> Duda (Hungary and Serbia)	
	Smaller flies: wing length about 2 mm. Palpus with several subequal setae. Male: no sex combs	
 <i>H. ingrica</i> Hackman (Scandinavia and northwestern Russia)	
11(9)	Abdominal tergites with dark marginal bands which are medially not narrowed or interrupted (as in Fig. 287). If the abdomen is dark and no contrasting bands can be distinguished, then main wing crossveins not shadowed, palpus with 1-2 strong setae and usually one strong first genal seta present	12
 <i>H. lundstroemi</i> (Duda)	
	Abdominal tergites with dark marginal bands which are usually medially narrowed or interrupted (as in Fig. 288). If the abdomen is dark and no contrasting bands can be observed, then main wing crossveins more or less shadowed, palpus with several subequal setae and first genal seta usually shorter than vibrissa, or hb-index more than 0.8	36
12(11)	Generally yellowish flies (<i>melanogaster</i> group)	13
 <i>H. confusa</i> (Staeger)	
	Generally blackish flies (<i>obscura</i> group)	15
13(12)	Male: protarsus ventrally with several short, transverse rows of dark, peg-like setae underneath, forming a very indistinct sex comb (Fig. 285). Female: tergites with indistinct marginal bands	
 <i>D. ananassae</i> Doleschall (circumtropical species; often	



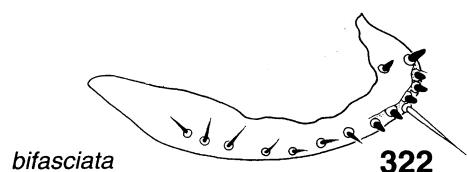
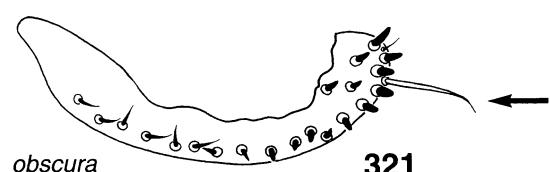
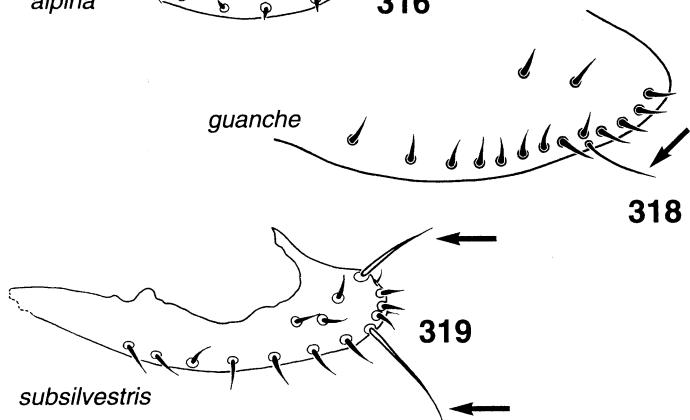
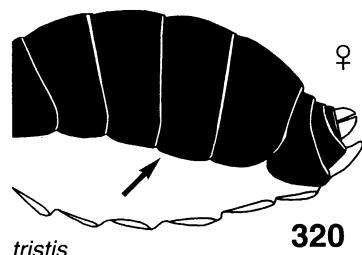
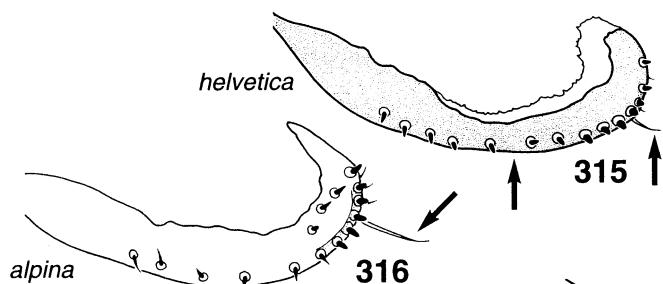
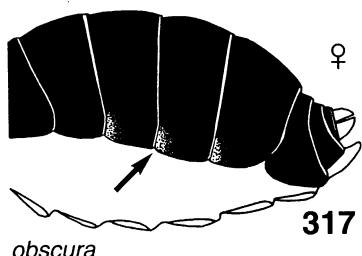
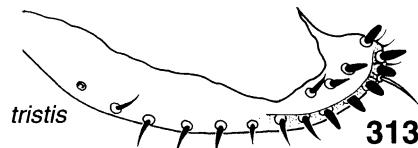
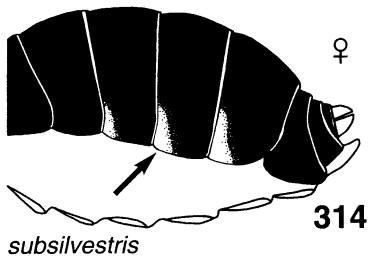
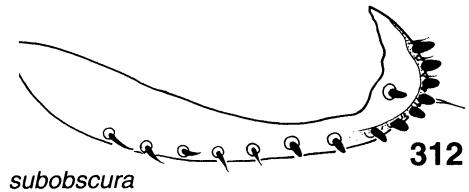
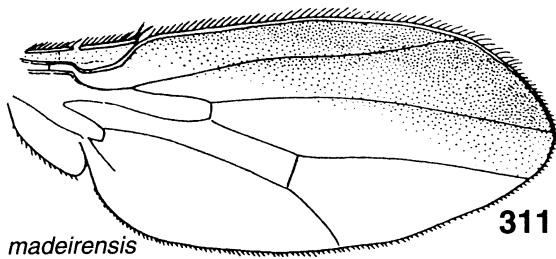
Figs. 280-295. 280: mesonotum, dorsal view; 281: antenna, frontal view; 282, 283, 287, 288: abdomen, dorsal view; 284-286: protarsomeres 1 and 2, lateral view; 289, 290: head, lateral views; 291, 292: epandrium, left lateral view; 293: right wing, dorsal view; 294, 295: palpus, lateroventral view.

introduced but probably not established in some South European countries)	22
Male: protarsomere 1 with a distinct sex comb (Fig. 286). Female: tergites with distinct marginal bands	-	20
.....	-	21
14(13) Gena relatively broad, about 1/10 of large eye diameter (Fig. 289). Male: dorsal branch of ventral epandrial lobe small, nearly triangular and pale in lat- eral view (Fig. 291).....	14	
..... <i>D. melanogaster</i> Meigen		
Gena relatively narrow, about 1/20 of large eye diameter (Fig. 290). Male: dor- sal branch of epandrial ventral lobe very large, roundish and amber in lateral view (Fig. 292)	-	
..... <i>D. simulans</i> Sturtevant (cosmopolitan species, rare in cooler areas)		
15(12) Males (protarsomeres 1 and 2 with sex combs).....	16	
- Females	26	
16(15) Wing with a distinct dark area along dis- tal costa and wing tip (as in Fig. 293)...	17	
- Wing hyaline, at most a faint dark margin along costa in apical half.....	18	
17(16) Sex combs moderately long, with 7-10 peg-like setae (Fig. 296). Palpus with 2 ventral setae of almost equal length (Fig. 294)		
..... <i>D. tristis</i> Fallén		
- Sex combs very long, with 15-20 peg- like setae (Fig. 297). Palpal setae unequal (as in Fig. 295)		
..... <i>D. madeirensis</i> Monclús (Madeira)		
18(16) Protarsomere 1 not much longer than protarsomere 2 (ratio about 1.1). Sex combs long (as in Figs 296-299)	19	
- Protarsomere 1 distinctly longer than protarsomere 2 (ratio about 1.5). Sex combs short (as in Fig. 300)		
19(18) Pleura and 2 basal tergites yellowish, sex combs very long	20	
- Pleura and abdomen completely dark. Sex combs moderately long		
20(19) Sex combs with more than 17 peg-like setae (24-29 on upper and 18-26 on lower comb) (Fig. 298)	21	
..... <i>D. guanche</i> Monclús (Canary Islands)		
- Sex combs with less than 19 peg-like se- tae (12-18 on upper and 10-14 on lower comb) (Fig. 299)		
..... <i>D. alpina</i> Burla		
21(19) Wing: costal margin faintly darkened (Fig. 301). hb-index more than 0.5. Lower margin of cercus blunt, with a patch of short dense setae (Fig. 302)....		
..... <i>D. subobscura</i> Collin		
- Wing: costal margin clear. hb-index less than 0.5. Lower margin of cercus pointed, with long setae (Fig. 303)		
..... <i>D. ambigua</i> Pomini		
22(18) Sex combs very small, indistinct, with 3(-4) and 2(-3) peg-like setae, respec- tively (Fig. 305). Carina flattened in ven- tral third (Fig. 304)		
..... <i>D. helvetica</i> Burla (widespread in Central Europe)		
- Sex combs distinct, with more than 4 peg-like setae. Carina long	23	
23(22) Sex combs with 4-7 and 2-3 peg-like setae, respectively, obliquely arranged, both external setae diverging (Fig. 306). Tip of aedeagus roundish and tip of outer paraphyses sharp (Fig. 307)		
..... <i>D. subsilvestris</i> Hardy & Kaneshiro		
- Sex combs with more than 7 peg-like setae, arranged more parallel to protar- someres		
.....	24	
24(23) Tip of outer paraphysis sharp, tip of aedeagus blunt (Fig. 308)		
..... <i>D. eskoi</i> Lakovaara & Lankinen		

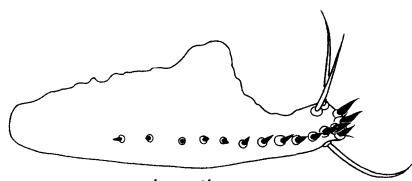
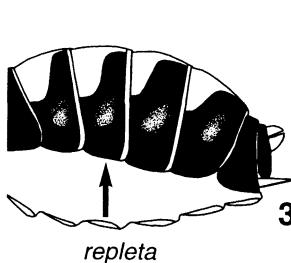
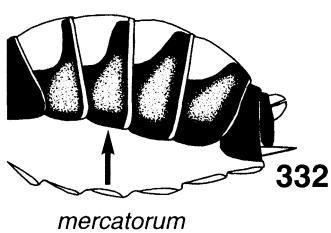
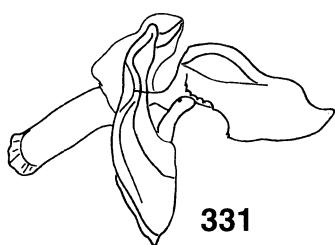
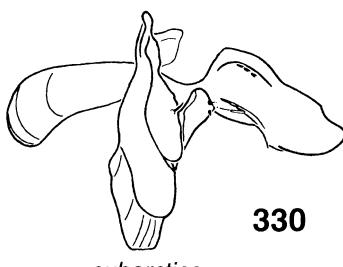
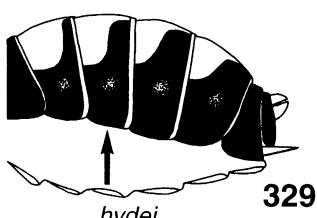
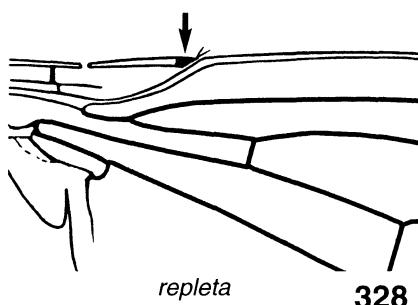
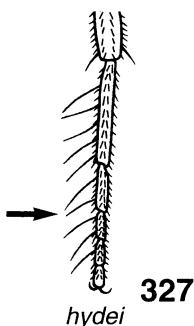
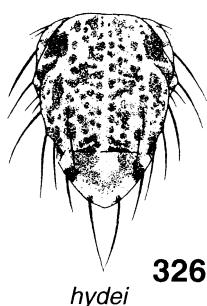
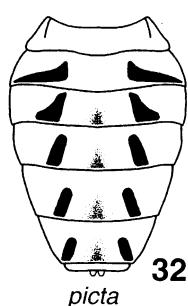
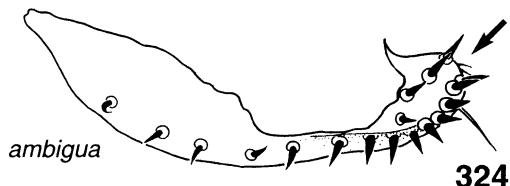
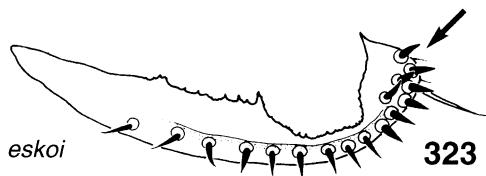


Figs. 296-310. 296-300, 305, 306: protarsomeres 1 and 2, frontal view; 301: right wing, dorsal view; 302, 303: cerci, posterior view; 307-310: internal male terminalia, lateral view (aedeagus is hatched in Fig. 308, as it was covered by the paraphyses on this slide mount). a, aedeagus; p, outer paraphysis.

- Tip of outer paraphysis not sharp, tip of aedeagus blunt or roundish (Figs 309, 310) 25
- 25(24) Outer paraphysis gradually narrowing towards tip, which is roundish; aedeagus distally shaped like a telephone receiver (Fig. 309) *D. bifasciata* Pomini
- Outer paraphysis broad, not narrowing towards tip, which is clearly blunt; tip of aedeagus roundish (Fig. 310) *D. obscura* Fallén
- 26(15) Wing with a distinct dark shadow along cells c, r_{2+3} , and distal r_{4+5} (Fig. 311) .. *D. madeirensis* Monclús (Madeira)
- Wing hyaline, at most a faint dark margin along cell c in apical half 27
- 27(26) hb-index more than 0.5. Wing with a faint shadow along costal margin. Oviscapt valve as in Fig. 312 *D. subobscura* Collin
- hb-index less than 0.5. Wing hyaline 28
- 28(27) Palpus with 2 setae of almost equal length (Fig. 294). Oviscapt valve as in Fig. 313 *D. tristis* Fallén
- The 2 palpal setae distinctly unequal in length (as in Fig. 295) 29
- 29(28) Oviscapt valve broadly rounded at tip (Figs 315, 316, 318) 30
- Oviscapt valve narrowed at tip (Figs 319, 321-324) 32
- 30(29) Oviscapt valve with a broad, dark margin, marginal outer ovisensilla very small, apically roundish, discal ones absent; subterminal inner trichoid-like ovisensilla very short (Fig. 315) *D. helvetica* Burla
- Oviscapt valve yellowish, with a long subterminal inner trichoid-like ovisensillum (Figs 316, 318) 31(30) Oviscapt valve with short marginal ovisensilla, which are trichoid-like in anterior region and peg-like along distal margin Fig. 316 *D. alpina* Burla
- Oviscapt valve with relatively long and trichoid-like ovisensilla (Fig. 318) .. *D. guanche* Monclús (Canary Islands)
- 32(29) Oviscapt valve with a long subterminal inner trichoid-like ovisensilla, and, additionally, with an unusually long uppermost discal outer ovisensilla (Fig. 319). Abdominal tergites 4-6 with a large pale area at the lateroventral corners (Fig. 314) *D. subsilvestris* Hardy and Kaneshiro
- Uppermost discal outer ovisensilla of oviscapt valve of standard size 33
- 33(32) Oviscapt valve with short, apically roundish, peg-like ovisensilla on distal margin (Figs 321, 322) 34
- Oviscapt valve with long, apically sharp, peg-like ovisensilla on distal margin (Figs 323, 324) 35
- 34(33) Tergites 2-3 usually with a small pale area at the lateroventral corners (Fig. 317). Oviscapt valve as in Fig. 321 *D. obscura* Fallén
- Tergites laterally dark (as in Fig. 320). Oviscapt valve as in Fig. 322 *D. bifasciata* Pomini
- 35(33) Oviscapt valve apically with discal ovisensilla very close to marginal ones; dorsal sclerotised margin serrate (Fig. 323) *D. eskoi* Lakovaara & Lankinen (Scandinavia)
- Oviscapt valve apically with a gap between discal and marginal ovisensilla; dorsal sclerotised margin smooth (Fig. 324) *D. ambigua* Pomini



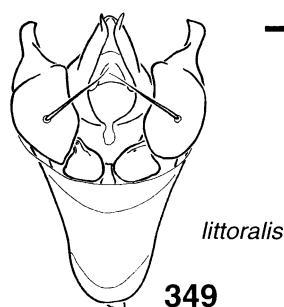
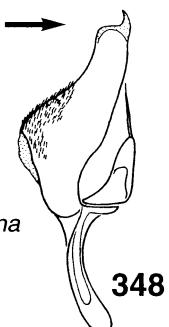
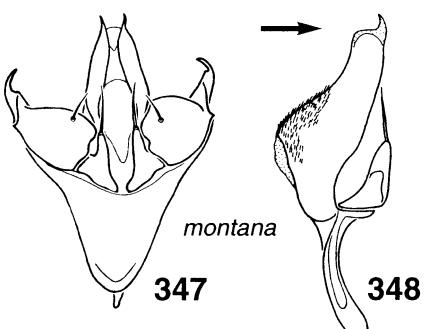
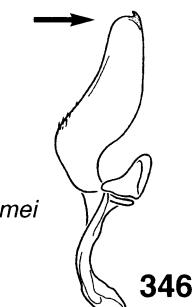
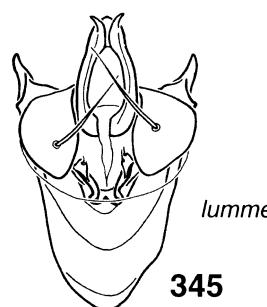
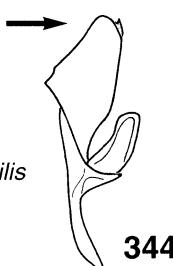
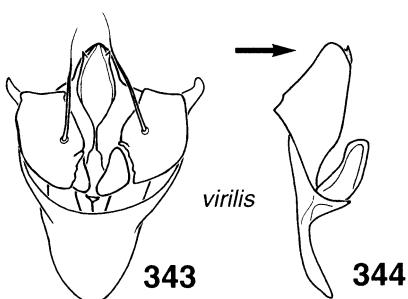
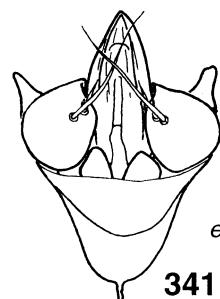
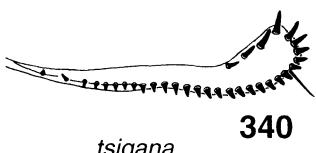
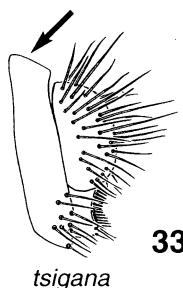
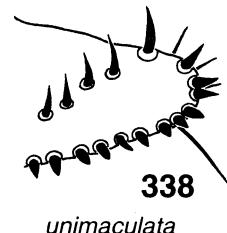
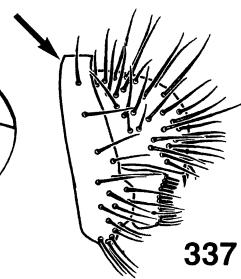
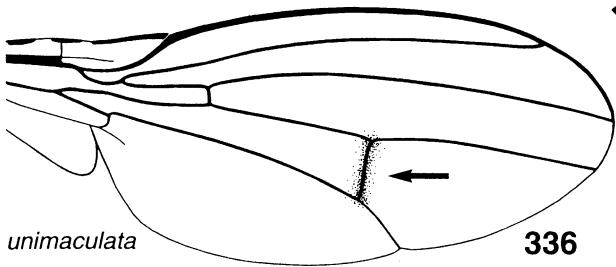
Figs. 311-322. 311: right wing; 312, 313, 315, 316, 318, 319, 321, 322: left oviscapt valve, lateral view; 314, 317, 320: abdomen, lateral view.



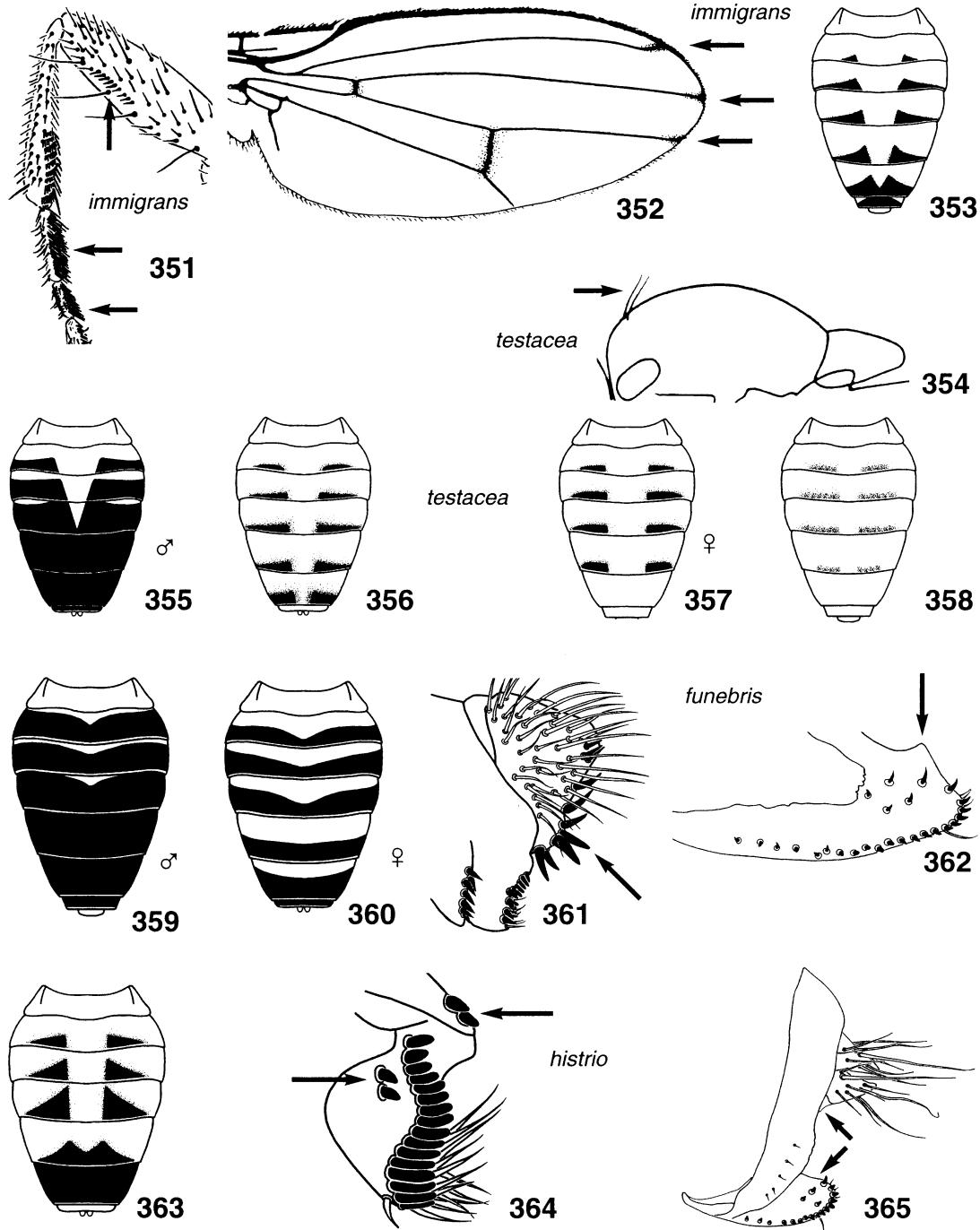
Figs. 323-335. 323, 324, 335: left oviscapit valve, lateral view; 325, 334: abdomen, dorsal view; 326: mesonotum, dorsal view; 327: protarsus, frontal view; 328: detail of right wing; 329, 332, 333: abdomen, lateral view; 330, 331: internal male terminalia, left lateral view.

- 36(11) Pleura yellow, with a dark median stripe. Abdominal tergites, besides distinct oblique lateral spots, with faint median spots (Fig. 325) *D. picta* Staeger
- Pleura unicoloured pale or dark. If abdominal tergites with lateral spots, then never with median spots 37
- 37(36) Pleura generally dark brownish to blackish 2850
- Pleura generally pale yellowish 42
- 38(37) Mesonotum yellowish-brown, with an irregular pattern of darker spots at bases of most setae and setulae, sometimes forming stripes (Fig. 326) (*repleta* group) ...
- Mesonotum yellowish to brownish, without such a pattern 5042
- 39(38) Abdominal tergites with medially interrupted, laterally broadened bands, without distinct lighter spots in lateral dark areas (Fig. 329). Apical part of first costal section not darkened. Procoxa light brown. Males with elongated setae on inner side of protarsus (Fig. 327). Live specimens with dark red eyes and yellow testes; generally dark coloured flies *D. hydei* Sturtevant
- Abdominal tergites with lighter spots in lateral dark areas (Figs 332, 333). Apical part of first costal section pale or darkened. Males never with elongated setae on protarsus 40
- 40(39) Apical part of first costal section not dark. Mesonotum yellowish-brown, with brown spots. Abdominal tergites brownish, with a yellowish dorsal pattern and rather large lateral spots (Fig. 332), marginal bands of tergites narrow, ca. 1/3 width of tergite. Live specimens with red eyes and yellow testes; generally light coloured flies 8
- *D. mercatorum* Patterson and Wheeler
(Widespread subtropical species; recorded from the Netherlands and from South Europe)
- Apical part of first costal section dark (Fig. 328). Mesonotum dark greyish-brown, with dark greyish-brown spots. Abdominal tergites dark brownish, dorsally yellowish, marginal bands of tergites 1/2 to 3/4 width of tergite, with rather small lateral spots (Fig. 333)..... 41
- 41(40) Procoxa slightly dark; tibiae without black band. Wing in proportion. Width of gena about 1/4 eye length. Live specimens with dark red eyes and white testes; generally dark coloured flies *D. repleta* Wollaston
- Procoxa clear; tibia with a narrow black band near base. Wing obviously short, apically rounded. Width of gena about 1/3 eye length. Live specimens with red eyes and dark red testes; generally light coloured flies *D. buzzatii* Patterson and Wheeler
(Widespread subtropical species; recorded from the Mediterranean area, where prickly pears [mainly *Opuntia ficus-indica* (L.) Mill; Cactaceae] are present)
- 42(37) Basal scutellar setae convergent. Abdominal tergites dark brownish, with more or less visible pale areas at bases of some tergites. Carina nose-like 43
- Basal scutellar setae divergent. Abdomen completely dark brown to black. Carina longitudinally grooved. Males only (females are virtually indistinguishable) (*virilis* group) 46
- 43(42) Wing completely hyaline. Abdominal tergites with indistinct marginal bands (Fig. 334). Females indistinguishable... 44
- Wing: at least posterior crossvein slightly infuscate (Fig. 336). Abdominal bands distinct 129

- 45
- 44(43) Aedeagus narrower and apically roundish in lateral view (Fig. 330). Female: oviscap Fig. 335
- *D. subarctica* Hackman
(Northern Scandinavia)
- Aedeagus broader and apically sharp in lateral view (Fig. 331)
- *D. vireni* Bächli, Vilela and Haring
(Northern Scandinavia)
- 45(43) Large flies: wing length at least 3 mm. Scutum predominantly yellowish-brown. Epandrium dorsally and ventrally setose (Fig. 337). Female: oviscap Fig. 338 ...
- *D. unimaculata* Strobl
(Central Europe)
- Smaller flies: wing length at most 3 mm. Scutum brownish to blackish. Epandrium setose only on ventral lobe (Fig. 339). Female: oviscap Fig. 340
- *D. tsigana* Burla and Gloor
(recorded from Spain, France, Austria,
and Japan)
- 46(42) Aedeagus without a pair of sharp, apical processes (Figs 341, 342)
- *D. ezoana* Takada and Okada
- Aedeagus with a pair of sharp, apical processes (Figs 343-350)..... 47
- 47(46) Aedeagus anteriorly broad, without mediodorsal microtrichia, with dorsal margin straight in lateral view (Figs 343, 344)
- *D. virilis* Sturtevant
- Aedeagus anteriorly narrow, mediodorsally microtrichose distally, with a slightly concave dorsal margin in lateral view (Figs 345, 346)..... 48
- 48(47) Aedeagus sinuate, not enlarged medially, with very few mediodorsal microtrichia (Figs 345, 346).....
- *D. lummei* Hackman
- Aedeagus conspicuously hunchbacked, with a large patch of mediodorsal microtrichia
- 49
- 49(48) Pair of apical processes of aedeagus directed backwards; paraphysis longer than broad, apically sharp and with a long seta (as long as paraphysis) (Figs 347, 348) .
- *D. montana* Patterson and Wheeler
- Pair of apical processes of aedeagus directed dorsad; paraphysis about as long as broad, subapically blunt and with a minute setula on dorsal margin (Figs 349, 350)
- 7 *D. littoralis* Meigen
- 50(3) Profemur with a row of dark, short, and sharp peg-like setae (cuneiform setae) on inner side (Fig. 351); protarsomeres 1 and 2 in male ventrally with a brush of long and thin setae. Wing with crossveins and tips of longitudinal veins dark (Fig. 352). (Abdominal tergites with rather diffuse, slightly triangular marginal bands, Fig. 353)
- *D. immigrans* Sturtevant
- Profemur without such setulae. Wing: tips of veins usually not dark
- 51
- 51(50) One pair or of presutural acrostichal setulae distinctly enlarged, better seen in lateral view (Fig. 354). Small flies: wing length usually less than 2.5 mm. (Abdominal tergites with marginal bands, variable in size and contrast, Figs 355-358)
- *D. testacea* von Roser
- No such enlarged presutural acrostichal setulae. Larger flies: wing length usually at least 3 mm
- 52
- 52(51) Wing completely hyaline. Abdominal tergites with broad, dark, medially narrowed, but not interrupted apical bands (Figs 359, 360). Male: cercus ventrally with ca. 12 strongly developed peg-like setae near inner margin (Fig. 361). Female: oviscap valve brownish with a subapical, triangular, dorsal expansion (Fig. 362)
- *D. funebris* (Fabricius)
- Wing darkened along both crossveins. Oviscap yellowish



Figs. 336-350. 336: right wing, dorsal view; 337, 339: external male terminalia, left lateral view; 338, 340: (part of) left oviscapit valve, lateral view; 341, 343, 345, 347, 349: internal male terminalia, posterior view; 342, 344, 346, 348, 350: aedeagus, paraphysis, and aedeagal apodeme, lateral view.



Figs. 351-365. 351: right fore leg, anterior view; 352: right wing, dorsal view; 353, 363: abdomen, dorsal view; 354: mesonotum, oblique lateral view; 355-360: abdomen, dorsal view, dark (left) and light (right) colour expressions; 361: external male terminalia, left lateral view; 362: left oviscapit valve, lateral view; 364: left surstyli, oblique posterior view; 365: female terminalia, left lateral view.

- 53
- 53(52) Abdominal tergites 2-5 each with a pair of large, triangular spots (Fig. 363). Male: cercus with 2 small peg-like setae on ventroposterior margin, surstyli with 2 dorsolateral peg-like setae adjacent to row of prensisetae (Fig. 364). Female: oviscapt apically broad, roundish (Fig. 365), distant from hypoproct.....
..... *D. histrio* Meigen
- Abdominal tergites 2-4 each with a pair of posterolateral dark bands which may be anteriorly concave or even divided (on each side) into two spots. Male without additional peg-like setae on cercus. Female: oviscapt close to hypoproct (except in *D. phalerata*) 54
- 54(53) Abdominal tergites with posterolateral bands which are straight or at most anteriorly slightly concave (Figs 366, 367, 370, 371) 55
- Abdominal tergites with anteriorly distinctly concave posterolateral bands or even isolated spots (Figs 374, 375, 378, 379, 382, 383) 56
- 55(54) Abdomen: median gap of posterolateral bands forming an almost parallel-sided, yellow stripe; anterior margin of bands clearcut, not fading forwards (Figs 366, 367). Male: surstyli with a single row of 3-5 outer setae (Fig. 368). Female: oviscapt valve as in Fig. 369.....
..... *D. kuntzei* Duda
(widespread in Central and South Europe)
- Abdomen: median gap of posterolateral bands forming a forwardly widening stripe; anterior margin of bands gradually fading forwards (Figs 370, 371). Male: surstyli with small outer setae spread over the whole surface (Fig. 372). Female: oviscapt valve as in Fig. 373) ..
..... *D. limbata* von Roser
- 56(54) Abdomen: lateral spots always completely isolated (Figs 374, 375). Male:
protarsus with a ventral brush of long setulae; surstylus with about 10 outer setae in two irregular rows (Fig. 376). Oviscapt valve Fig. 377
..... *D. transversa* Fallén
- Abdomen: lateral spots marginally connected, at least on tergite 3 (Figs 378, 379) 382, 383). Male: surstyli with several rows of long outer setae (Figs 380, 384) 57
- 57(56) Male protarsus with a ventral brush of long setulae, abdomen with a dark apical tip (Fig. 378). Female: oviscapt valve apically roundish, without dorsal lobe, a dark pair of perineal plates visible between oviscapt and hypoproct (Fig. 381)
..... *D. phalerata* Meigen
- Male with larger spots towards tip of abdomen, but tip not darkened (Fig. 382). Female: oviscapt valve distally with a dorsal lobe (Fig. 385)
..... *D. curvispina* Watabe & Toda

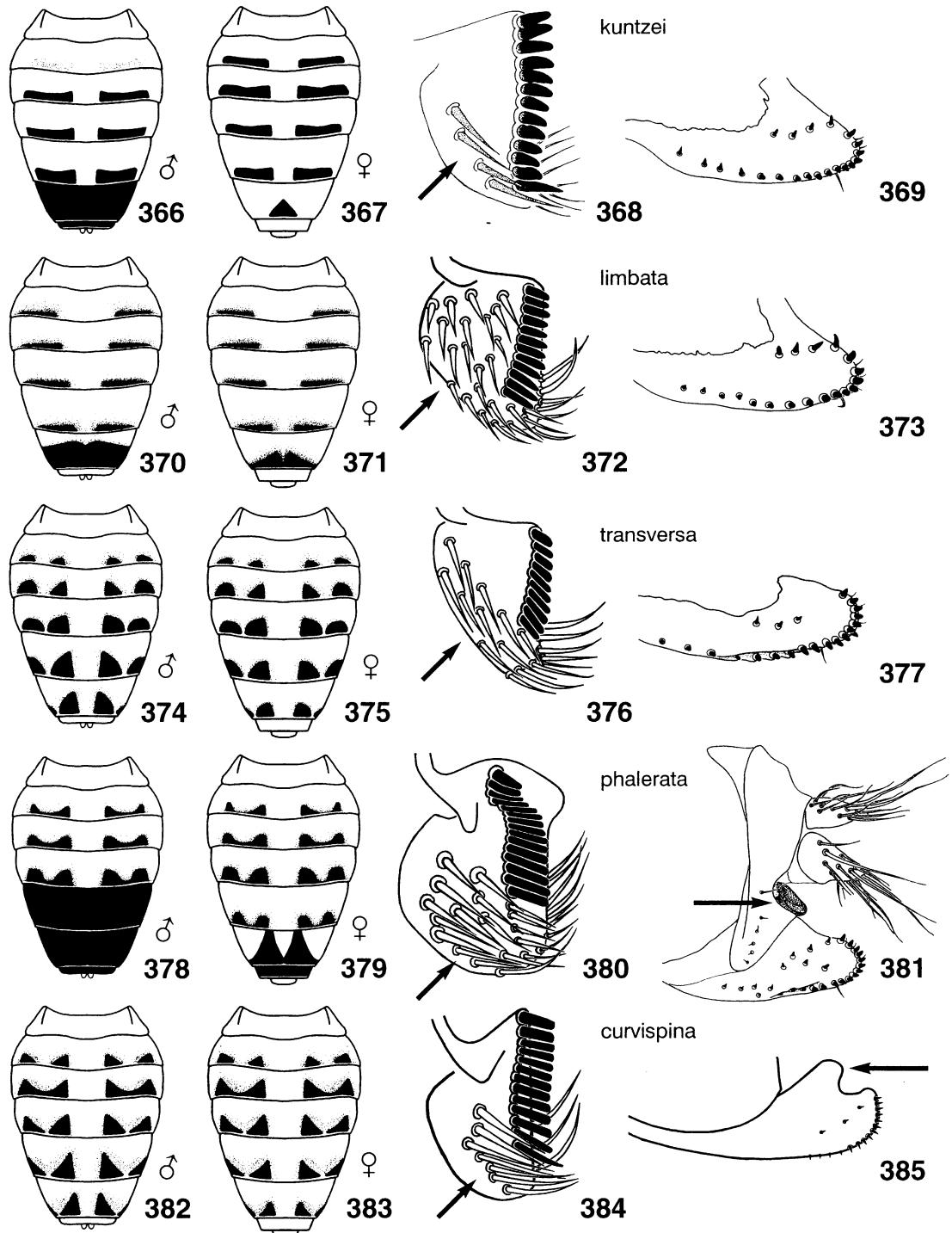
Subgenus *Dorsilopha* Sturtevant, 1942

Dorsilopha Sturtevant, 1942: 28 (subgenus).
Type species: *Drosophila busckii* Coquillett, 1901.

Diagnosis. — Yellowish flies; mesonotum and pleura with narrow, blackish stripes; median stripe of mesonotum posteriorly bifid; short preapical setae on all tibiae; sterno index about 0.5; median katepisternal seta small; third costal section with heavy setation on basal 0.25; abdominal tergites yellowish with broad, dark posterior bands which are interrupted on midline and laterally; 4 egg filaments; larvae with dorsal processes.

Taxa included. — *Drosophila busckii* Coquillett, *D. linearidentata* Toda, *D. neobusckii* Toda.

Comments. — For almost half a century, the cosmopolitan domestic species *D. busckii* was the only species included in the then monotypic subgenus *Dorsilopha*. Two additional species, *D. linearidentata* Toda and *D. neobusckii* Toda, were described rather recently (1986) from



Figs. 366-385. 366, 367, 370, 371, 374, 375, 378, 379, 382, 383: male (left) and female (right) abdomen, dorsal view; 368, 372, 376, 380, 384: left surstylus, oblique lateral view; 369, 373, 377, 385: left oviscap valves, lateral view; 381: female terminalia, left lateral view.

Myanmar (Burma), and the latter species was also later recorded from Vietnam (Sidorenko, 1998b), suggesting that the centre of evolution of the subgenus is in this area and that just the one species, *D. busckii*, has become cosmopolitan. A comparison of the male terminalia characteristics of the three *Dorsilopha* species with most other species in *Drosophila* suggests that it would be reasonable to include them as a *busckii* species group within the subgenus *Drosophila*, and no longer to recognise the subgenus *Dorsilopha*, as has already been suggested by Bock (1976) and Toda (1986).

Drosophila busckii Coquillett, 1901

(Figs 267, 268, 386-389)

Drosophila busckii Coquillett, 1901: 18 (as *busckii*, lapsus).

Drosophila rubrostriata Becker, 1908: 155.

Drosophila plurilineata Villeneuve, 1911: 83.

Diagnosis. – The characters of the subgenus apply, but see the male terminalia.

Redescription. – ♂. Head. Frons yellow, dull, frontal length 0.32 (0.30-0.32) mm; frontal index = 0.98 (0.95-1.06), top to bottom width ratio = 1.23 (1.15-1.35). Frontal triangle pale yellow, microtrichose, not very distinct, about 63-74% of frontal length; ocellar triangle prominent, blackish, about 42-44% of frontal length. Frontal vittae brownish-yellow. Orbital plates greyish-yellow, microtrichose, broad, slightly diverging from eye margin at tip, about 79-89% of frontal length. Orbital setae black, distance of or3 to or1 = 100-120% of or3 to vtm, or1 / or3 ratio = 0.96 (0.82-1.10), or2 / or1 ratio = 0.62 (0.55-0.67), postocellar setae = 48 (47-50%), ocellar setae = 51 (47-53%) of frontal length; vibrissal index = 1.00. Face yellow. Carina prominent, nose-like, narrow. Cheek index about 5-7. Eye roundish, main axis oblique, index = 1.18 (1.10-1.25). Occiput dark brown with narrow yellowish margin. Pedicel yellowish. Flagellomere 1 brownish-yellow, length to width ratio = 1.17. Arista with 4-5 dorsal, 2 ventral, and about 5 small inner branches, plus terminal fork. Proboscis yellowish. Palpus club-shaped, with 1 apical black and several yellowish setae.

Thorax length 0.91 (0.88-0.97) mm. Scutum (Fig. 267) yellowish, subshining, with 5 dark

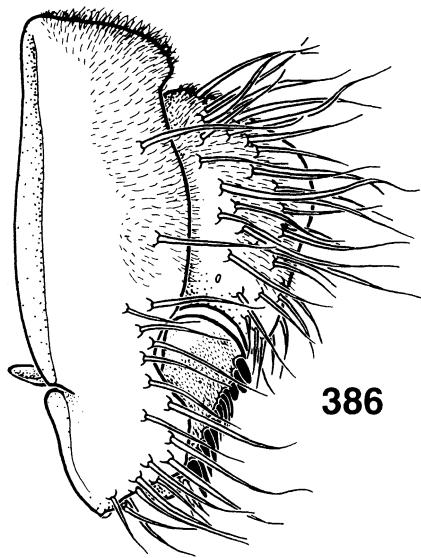
brown stripes: 1 median which is bifurcate before reaching scutellum, 2 mediolateral, not reaching scutellum, along the dorsocentral setae, and 2 lateral, beginning above postpronotum, 6-8 rows of acrostichal setulae. h index = 1.15 (1.00-1.22). Transverse distance of dorsocentral setae 189-262% of longitudinal distance; dc index = 0.62 (0.61-0.63). Scutellum brownish-yellow, laterally paler, distance between apical scutellar setae about 91-111% of that between apical and basal one; basal setae parallel; scut index = 0.81 (0.78-0.84). Pleura (Fig. 268) yellowish, with 2 stripes, a dark brown one beginning below postpronotum, broadest along anepisternum and reaching haltere, and a paler brown one in upper half of katepisternum, sterno index = 0.47 (0.38-0.55), median katepisternal seta about 36-67 % of anterior one. Haltere whitish-yellow, with partly brown stem. Legs pale yellow, short preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.33 (2.24-2.42) mm, length to width ratio = 2.19 (2.13-2.30). Indices: C = 3.20 (3.00-3.43), ac = 2.14 (1.86-2.50), hb = 0.23 (0.15-0.29), 4C = 0.87 (0.78-0.93), 4v = 2.00 (1.82-2.20), 5x = 2.02 (1.67-2.20), M = 0.66 (0.56-0.73), prox. x = 0.61 (0.50-0.67).

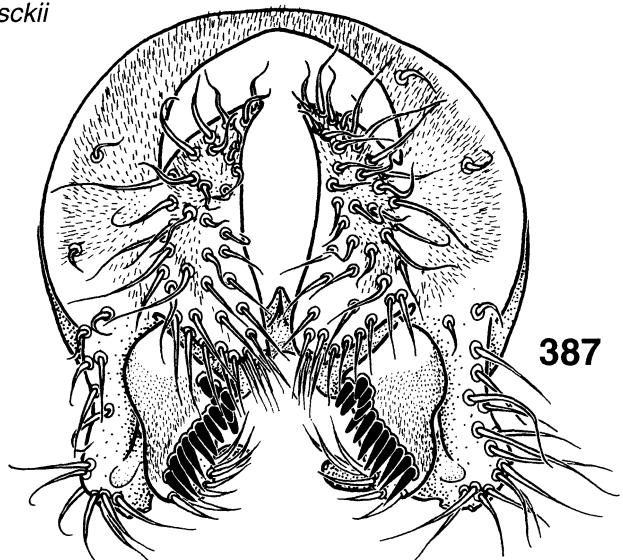
Abdomen (Fig. 267) longish, yellowish, shining, tergite 1 with lateral brownish bands, tergites 2-6 with medially interrupted marginal bands and lateroventral spots; each marginal band more or less complete and parallel-sided on tergite 2 and split into 2 semicircular-triangular spots on tergite 6; bands on the remaining tergites intermediate between the two extremes.

♂ Terminalia (Figs 386-389). Epandrium dorsodistally microtrichose, with ca. 18 lower, and 2 upper setae; ventral lobe not microtrichose, and ventrally with a finger-shaped process which encircles surstylius anteroventrally. Cercus anteriorly fused to epandrium, dorsally microtrichose, without ventral lobe. Surstylius mostly microtrichose, with a sinuate row of ca. 13 strong peg-like prensisetae, dorsally shorter and round-tipped, gradually becoming longer and sharper ventrad, ca. 2-3 of the upper prensisetae outside the row, ca. 7 inner and no outer setae. Decasternum horizontally positioned as in Fig. 387. Hypandrium longer than epandrium, in lateral view slightly sinuate, anterior margin narrow; posterior hypandrial process and dorsal arch absent; gonopod anteriorly membranous, distally sclerotised and mostly microtrichose.

busckii

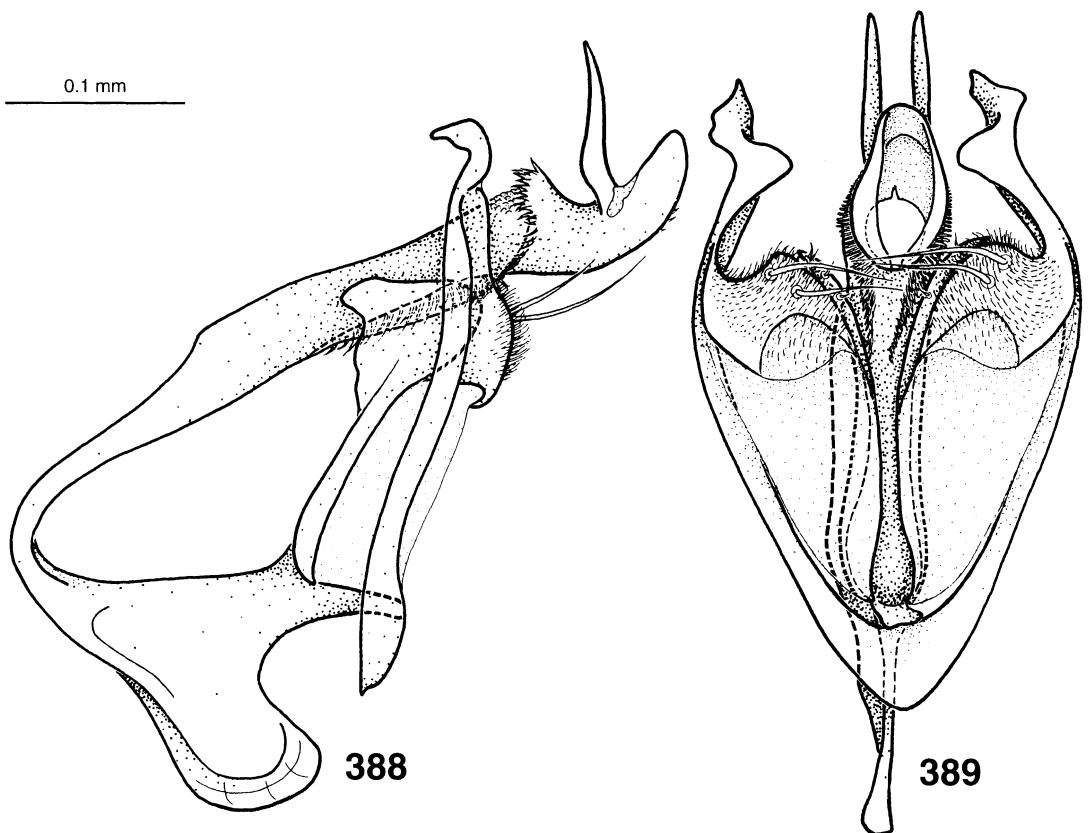


386



387

0.1 mm



388

389

Figs. 386-389. *Drosophila busckii* Coquillett. 386: epandrium, cerci, and surstyli, left lateral view; 387: idem, plus decasternum, posterior view; 388: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 389: idem, posterior view.

chose, fused to paraphysis, with two long setae near median inner margin. Aedeagus fused to aedeagal apodeme, tube-shaped, anteriorly narrow and strongly bent; dorsally with a pair of long, slightly bent, subapical, dorsad projecting processes, and a fringed collar of scales extending laterally from dorsal area to submedial ventral margin. Aedeagal apodeme 1/3 length of aedeagus, laterally strongly flattened. Ventral rod as long as width of adjacent aedeagal apodeme, medially slightly projected dorsad, distally weakly fused to hypandrium. Paraphysis mostly fused to gonopod, distally with ca. 4 setulae near dorsal margin, proximally connected to distal half of ventral rod by membranous tissue.

♀. Measurements: Frontal length 0.31 (0.28-0.32) mm; frontal index = 0.88 (0.81-0.95), top to bottom width ratio = 1.19 (1.14-1.32). Frontal triangle about 74-83% of frontal length; ocellar triangle about 47-53% of frontal length. Orbital plates about 83-89% of frontal length. Distance of or3 to or1 = 62-83% of or3 to vtm, or1 / or3 ratio = 0.76 (0.67-0.83), or2 / or1 ratio = 0.80 (0.70-0.89), postocellar setae = 58 (53-61)%, ocellar setae = 73 (71-74)% of frontal length; vibrissal index = 0.77 (0.58-0.92). Cheek index about 4-5. Eye index = 1.13 (1.09-1.19). Thorax length 1.00 (0.91-1.05) mm. h index = 1.20 (1.10-1.33). Transverse distance of dorsocentral setae 200-250% of longitudinal distance; dc index = 0.68 (0.64-0.72). Distance between apical scutellar setae about 90-109% of that of apical to basal one; scut index = 0.83 (0.75-0.88), sterno index = 0.50 (0.48-0.55), median katepisternal seta about 42-60% of anterior one. Wing length 2.33 (2.20-2.45) mm, length to width ratio = 2.16 (2.03-2.33). Indices: C = 3.14 (2.93-3.36), ac = 2.16 (2.00-2.33), hb = 0.26 (0.21-0.29), 4C = 0.92 (0.88-1.00), 4v = 2.16 (2.00-2.29), 5x = 1.88 (1.67-2.00), M = 0.73 (0.69-0.80), prox. x = 0.66 (0.59-0.71).

♀ Terminalia (Fig. 390). Valve of oviscapt distally rounded, more or less straight ventrally, with only 1 discal, and ca. 15-16 marginal, roundish-tipped, peg-like, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned and 1 long, straight, subterminal.

Distribution. – (Fig. 393). A cosmopolitan, domestic species, more abundant in southern areas. Recorded from Russia, Estonia, Latvia, Lithuania and all the Scandinavian countries, but more

common in southern, densely inhabited areas; northernmost locality: Oulanka (Finland).

Biology. – The larvae have been observed in decaying organic matter, e.g. in rotting onions, potatoes, milk, eggs, etc. (Séguy, 1934: 383).

Additional specimens examined. – 4♂♂ (SWITZERLAND: Bern, 1♂, 1973; Uri, 1♂, 1973; Vaud, 2♂♂, 1970), 4♀♀ (SWITZERLAND: Aargau, 1♀, 1973; Ticino, 1♀, 1970; Vaud, 1♀, 1970; Zürich, 1♀, 1972).

Comments. – Laboratory culture is possible when banana is added to the standard medium.

Subgenus *Drosophila* Fallén, 1823

Diagnosis. – Generally large flies; first genal seta relatively large; gena often broad; prescutellar and proepisternal setae absent; dark marginal bands of abdomen usually narrowed or broken on midline or split into separate spots; long, spiralled testes; ventral receptacle long, fine and usually twisted; inner paraphysis absent, probably fused to aedeagus; eggs usually with 4 filaments.

Taxa included. – There are around 1000 species, most of which are arranged in 42 species groups; 12 of these are represented in Europe.

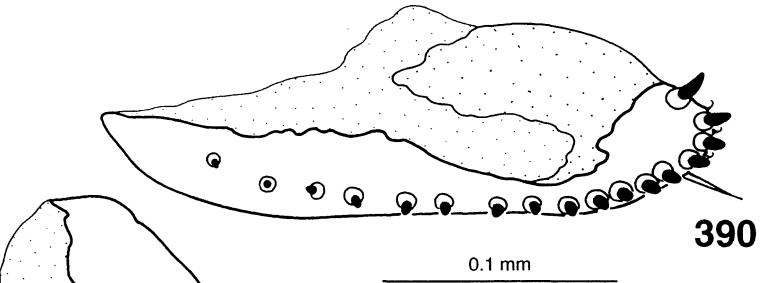
Comments. – This is by far the largest and most complex of all the subgenera.

funebris species group Stalker & Spencer, 1939

Diagnosis. – Reddish-brown flies. Carina prominent; arista with 10 to 11 branches; gena broad. Sterno index about 0.7. Male abdomen almost completely shining black; female abdomen with broad posterior dark bands on each tergite, narrowly interrupted on midline. Male cercus conspicuous, with stout, black, peg-like setae along ventral half of posterior margin. Spiracles about one fifth length of puparium.

Taxa included. – In addition to the almost circumtemperate *D. funebris*, 6 species with very restricted distribution areas have been described from North America and Asia.

busckii



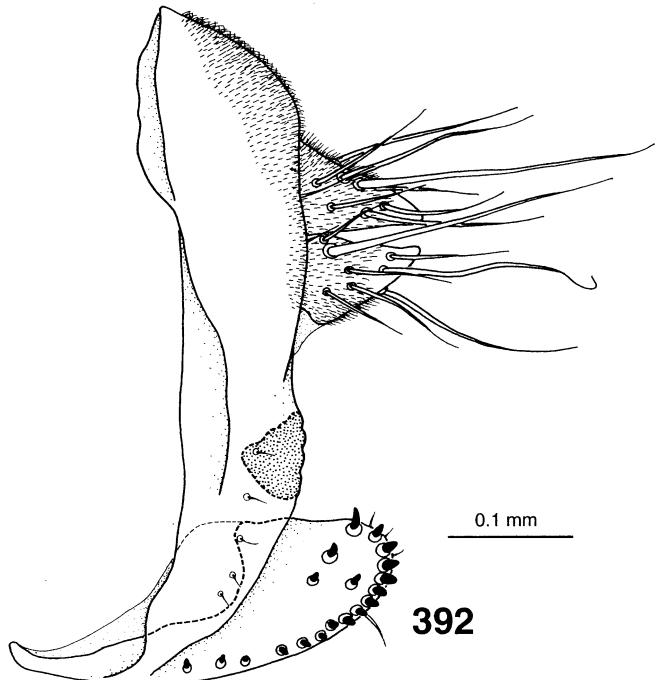
390

funebris



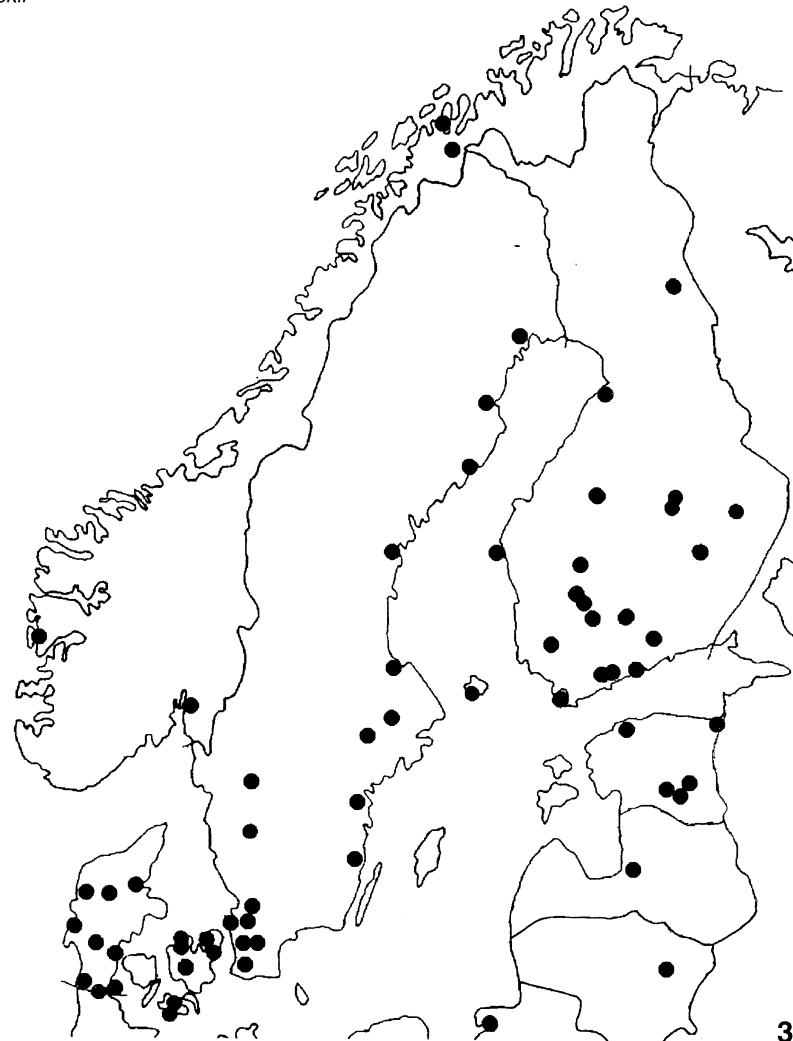
391

histrio



392

Figs. 390-392. 390, 391: left oviscapt valves, lateral view; 392: female terminalia, left lateral view.



393

Fig. 393. Known distribution pattern of *Drosophila busckii* Coquillett in Scandinavia.

Drosophila funebris (Fabricius, 1787)

(Figs 359, 360, 391, 394-398)

Musca funebris Fabricius, 1787: 345.

Musca erythrophthalma Panzer, 1794: 24
(nomen dubium).

Drosophila aceti Kollar, 1851: 205 (nomen
dubium).

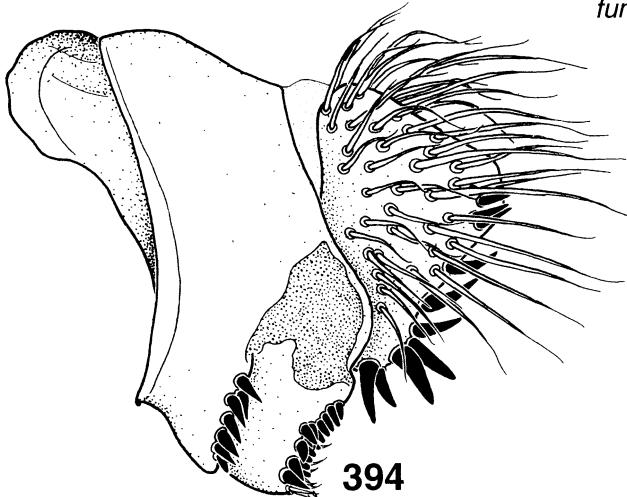
Drosophila clarkii Hutton, 1901: 91.

Leucophenga atkinsoni Miller, 1921: 302.

Drosophila dudai Malloch, 1934: 444.

Diagnosis. — The characters of the *funebris* group apply, but see the male terminalia.

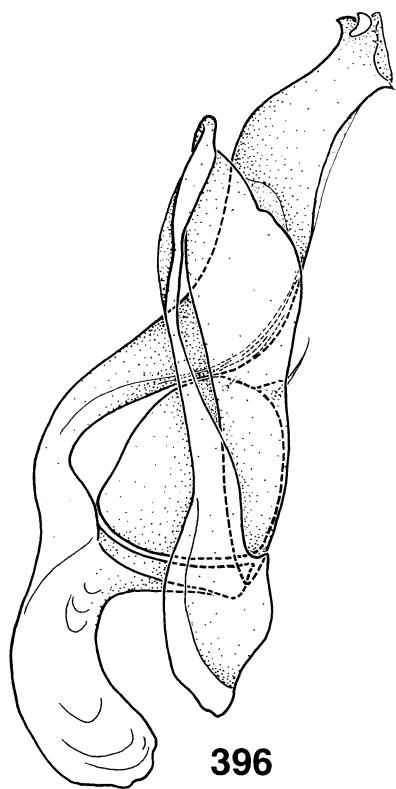
Redescription. — ♂. Head. Frons yellowish-brown, dull, frontal length 0.35 (0.32-0.41) mm; frontal index = 0.72 (0.68-0.76), top to bottom width ratio = 1.21 (1.12-1.29). Frontal triangle pale brown, not very distinct, about 58-89% of frontal length; ocellar triangle brown, prominent, about 46-55% of frontal length. Orbital plates brown, subshining, broad, slightly prominent, apically somewhat diverging from eye margin, about 74-90% of frontal length. Orbital



394

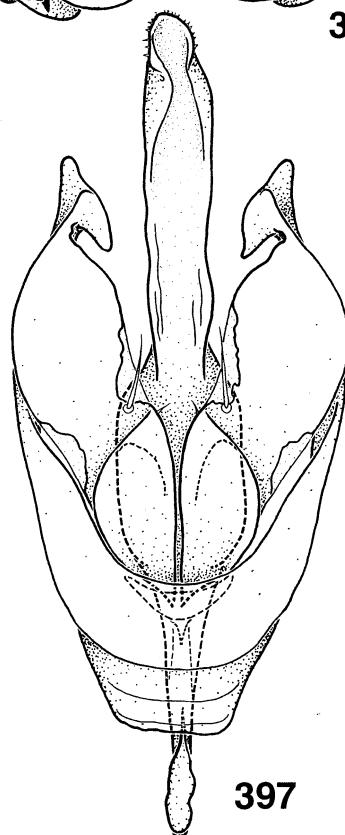


395



396

0.1 mm



397

Figs. 394-397. *Drosophila funebris* Fabricius. 394: epandrium, cerci, and surstyli, left lateral view; 395: idem, plus decasternum, posterior view; 396: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 397: idem, posterior view.

setae black, distance of or3 to or1 = 56-67% of or3 to vtm, or1 / or3 ratio = 0.56 (0.52-0.61), or2 / or1 ratio = 0.69 (0.64-0.82), postocellar setae = 79 (67-89)%, ocellar setae = 98 (88-105)% of frontal length; vibrissal index = 0.76 (0.71-0.80). Face yellowish. Carina prominent but not distinctly nose-like, broadening downwards, dorsally flat. Cheek index about 4-6. Eye index = 1.19 (1.11-1.28). Occiput brown. Pedicel yellowish. Flagellomere 1 brownish. Arista with 5-7 dorsal, 2-4 ventral, and about 7 inner branches, plus terminal fork. Proboscis yellow. Palpus with 4 black setae along lower margin.

Thorax length 1.28 (1.21-1.36) mm. Scutum yellowish-brown, brown in front of scutellum, usually with a narrow brown median stripe, shining, 8 rows of acrostichal setulae. h index = 0.90 (0.88-0.93). Transverse distance of dorsocentral setae 157-177% of longitudinal distance; dc index = 0.63 (0.59-0.67). Scutellum brown, subshining, distance between apical scutellar setae about 69-79% of that between apical and basal one, basal setae divergent; scut index = 0.95 (0.92-0.99). Pleura pale brownish, subshining, sterno index = 0.70 (0.57-0.82), median katepisternal seta about 42-56% of anterior one. Haltere pale yellowish. Legs brownish-yellow, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, all veins yellowish, length 3.06 (2.87-3.29) mm, length to width ratio = 2.19 (2.14-2.26). Indices: C = 3.26 (3.11-3.39), ac = 1.96 (1.89-2.00), hb = 0.44 (0.37-0.56), 4C = 0.67 (0.64-0.69), 4v = 1.36 (1.31-1.40) 5x = 1.05 (1.00-1.25), M = 0.36 (0.34-0.37), prox. x = 0.54 (0.50-0.56).

Abdomen (Fig. 359) dark brown, shining, tergites 2-4 each with a very broad marginal band which is medially narrowed, leaving only a small yellowish area basally. Size of bands variable, in shrunken specimens yellowish area sometimes missing or reduced to a narrow median stripe. Tergites 5 and 6 almost completely dark, at most with narrow, basal, paramedian pale areas.

♂ Terminalia (Figs 394-397). Epandrium not microtrichose, conspicuously with 7 lower peg-like setae in an irregular row along ventrodorsal margin of ventral lobe, which is neither microtrichose nor covering surstylos. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose, with two pairs of ventral lobes, and ca. 12 strongly developed

peg-like setae arranged in an irregular row near ventroposterior margin of inner lobe. Surstylos not microtrichose, dorsoanteriorly mostly membranous, with an almost straight row of 10 peg-like prensisetae on mesal surface, ca. 9 thin inner and 5 peg-like outer setae. Decasternum as in Fig. 395. Hypandrium longer than epandrium, in lateral view slightly sinuate, anterior margin narrow; posterior hypandrial process and dorsal arch absent; gonopod linked to paraphysis by membranous tissue, with one seta near median inner margin. Aedeagus fused to aedeagal apodeme, tube-shaped, anteriorly narrow, strongly sinuate, apical margin with tiny scales; subapically with a pair of tiny, dorsad directed, dorsal processes, preceded by one tiny, dorsad curved projection. Aedeagal apodeme bent, ca. 1/3 length of aedeagus, strongly flattened laterally. Ventral rod slightly grooved medially, longer than width of adjacent aedeagal apodeme. Paraphysis linked to gonopod by membranous tissue, with one tiny setula near dorsodistal margin, connected to distal margin of ventral rod by membranous tissue.

♀. Differences from male: Abdominal bands (Fig. 360) generally narrower, i.e. leaving distinct yellowish areas at the bases of most tergites.

Measurements: Frontal length 0.36 (0.32-0.41) mm; frontal index = 0.69 (0.59-0.76), top to bottom width ratio = 1.17 (1.11-1.24). Frontal triangle about 83-86% of frontal length; ocellar triangle about 50-53 % of frontal length. Orbital plates about 79-84% of frontal length. Distance of or3 to or1 = 54-62% of or3 to vtm, or1 / or3 ratio = 0.54 (0.50-0.65), or2 / or1 ratio = 0.69 (0.64-0.73), postocellar setae = 80 (71-95)%, ocellar setae = 94 (83-111)% of frontal length; vibrissal index = 0.74 (0.65-0.81). Cheek index about 3-6. Eye index = 1.18 (1.15-1.22). Thorax length 1.35 (1.27-1.45) mm. h index = 0.91 (0.87-0.93). Transverse distance of dorsocentral setae 157-192% of longitudinal distance; dc index = 0.76 (0.71-0.84). Distance between apical scutellar setae about 73-80% of that between apical and basal one; scut index = 0.96 (0.91-1.00), sterno index = 0.68 (0.64-0.71), median katepisternal seta about 50-67% of anterior one. Wing length 3.21 (3.11-3.43) mm, length to width ratio = 2.18 (2.07-2.28). Indices: C = 3.08 (3.00-3.15), ac = 2.23 (2.11-2.38), hb = 0.48 (0.45-0.50), 4C = 0.70 (0.65-0.74), 4v =

1.35 (1.23-1.41), $5x = 1.09$ (1.00-1.11), $M = 0.36$ (0.32-0.41), prox. $x = 0.50$ (0.46-0.54).

♀ Terminalia (Fig. 391). Valve of oviscapt brownish, distally rounded, ventrally slightly convex, mediadorsally widely expanded and subdistally pointed dorsad, with ca. 6 discal and ca. 19-20 marginal, peg-like, outer ovisensilla, first ones sharp and latter ones roundish at tip; trichoid-like inner ovisensilla: 3 thin, distally positioned and 1 long, curved, subterminal; inwardly with ca. 25 setulae about 1/2 length of distal inner ovisensilla, between discal and marginal ovisensilla (not seen in Fig. 391).

Distribution. – (Fig. 398). A circumtemperate, domestic species, more abundant in cooler areas, absent from the tropics. Recorded from all the Scandinavian and Baltic countries, and also from Iceland and Greenland; northernmost locality: Longyearbyen (Spitsbergen Island, Norway).

Biology. – Flies appear to be associated with stables, toilets etc., and can be cultured with some difficulty on the standard medium.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Solothurn, 1 ♂, 1973; Uri, 3 ♂♂, 1973), 4 ♀♀ (SWITZERLAND: Glarus, 2 ♀♀, 1974; Graubünden, 2 ♀♀, 1974).

***histrionis* species group Okada, 1966**

Diagnosis. – Large, yellowish flies. Anterior reclinate orbital seta small. Wing with both main crossveins slightly shadowed. Abdominal tergites with large, blackish, paramedian triangles. Male cercus with a narrow ventral lobe, with about 2 strong peg-like setae near apex. Surstylus with 2 lateral, isolated, peg-like setae, in addition to a sigmoid row of prensisetae. Oviscapt broad, apically rounded, separated from hypoproct by a distinct gap.

Taxa included. – This is a Palaearctic and Oriental species group containing 14 species, of which only *Drosophila histrionis* occurs in Europe.

***Drosophila histrionis* Meigen, 1830**

(Figs 363, 392, 399-403)

Drosophila histrionis Meigen, 1830: 85.

Drosophila pokornyi Duda, 1924: 218.

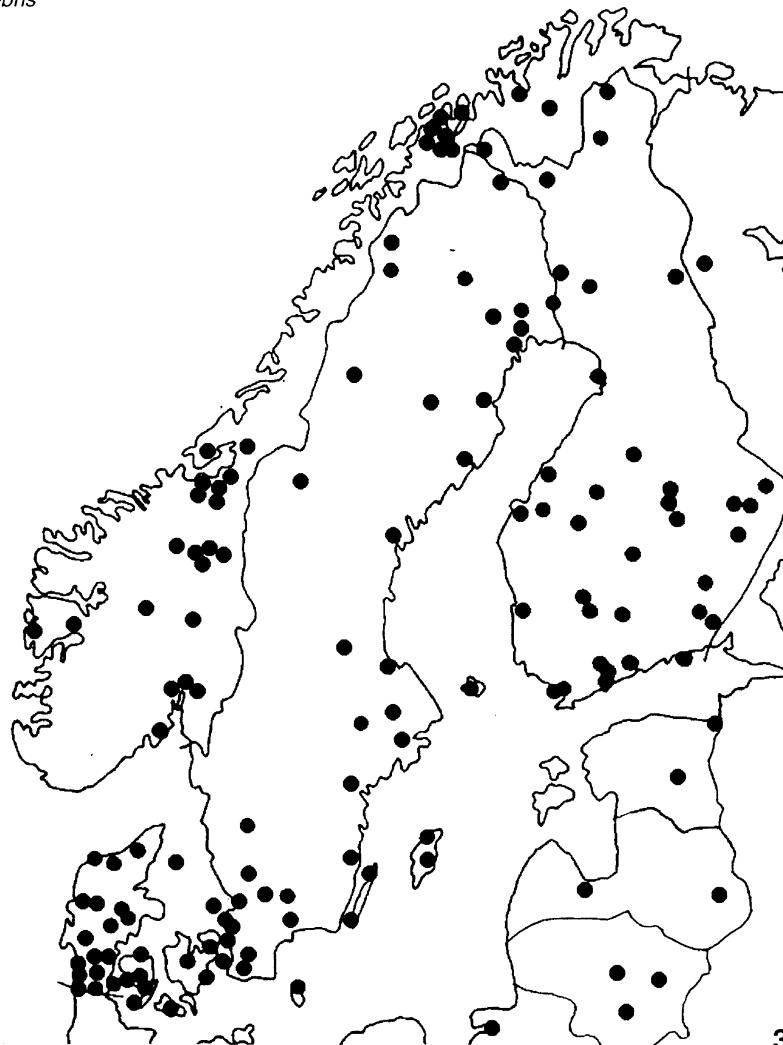
Diagnosis. – The group diagnosis applies, but see the male terminalia.

Redescription. – ♂. Head. Frons brownish-yellow, dull, frontal length 0.37 (0.34-0.39) mm; frontal index = 0.86 (0.79-0.91), top to bottom width ratio = 1.31 (1.25-1.41). Frontal triangle indistinct, pale yellow, about 73-86% of frontal length, ocellar triangle slightly darker between ocelli, somewhat prominent, about 41-45 % of frontal length. Frontal vittae somewhat darker brownish. Orbital plates broad, pale yellow, slightly shining, diverging from eye margin, about 67-82% of frontal length. Orbital setae blackish, distance of or3 to or1 = 50-67% of or3 to vtm, or1 / or3 ratio = 0.74 (0.69-0.80), or2 / or1 ratio = 0.37 (0.31-0.45), postocellar setae = 74 (65-83)%, ocellar setae = 85 (71-95)% of frontal length; vibrissal index = 0.71 (0.50-0.86). Face pale yellowish. Carina distinct, nose-like, narrow, slightly broader downwards. Cheek index about 5-9. Eye index = 1.22 (1.12-1.33). Occiput pale brown with broad yellowish margin. Antennae yellowish. Arista with 2-5 dorsal, 2-3 ventral, and about 5-6 inner branches, plus terminal fork. Proboscis yellow. Palpus with 2 setae and several fine setulae.

Thorax length 1.43 (1.29-1.58) mm. Scutum brownish-yellow, shining, in front of scutellum medially darker brownish, 6-8 rows of acrostichal setulae. h index = 0.97 (0.94-1.00). Transverse distance of dorsocentral setae 218-322% of longitudinal distance; dc index = 0.62 (0.59-0.65). Scutellum paler than scutum, distance between apical scutellar setae about 72-93% of that between apical and basal one, basal setae slightly convergent; scut index = 0.94 (0.90-0.97). Pleura pale yellowish, slightly shining, sterno index 0.66 (0.58-0.74), median katepisternal seta about 35-73% of anterior one. Haltere yellow. Legs yellow, rather slender, preapical setae on all tibiae, small on protibia, apical seta on mesotibia.

Wing hyaline, veins yellow, but both crossveins brown and shadowed, length 3.31 (3.01-3.64) mm, length to width ratio = 2.26 (2.17-2.32). Indices: C = 3.84 (3.47-4.22), ac = 1.92 (1.70-2.13), hb = 0.45 (0.41-0.53), 4C = 0.61 (0.55-0.68), 4v = 1.45 (1.35-1.54), 5x = 1.15 (1.00-1.25), M = 0.39 (0.35-0.42), prox. x = 0.49 (0.42-0.52).

Abdomen (Fig. 363) yellow, shining; tergites 2-4 each with 2 brown, triangular spots which



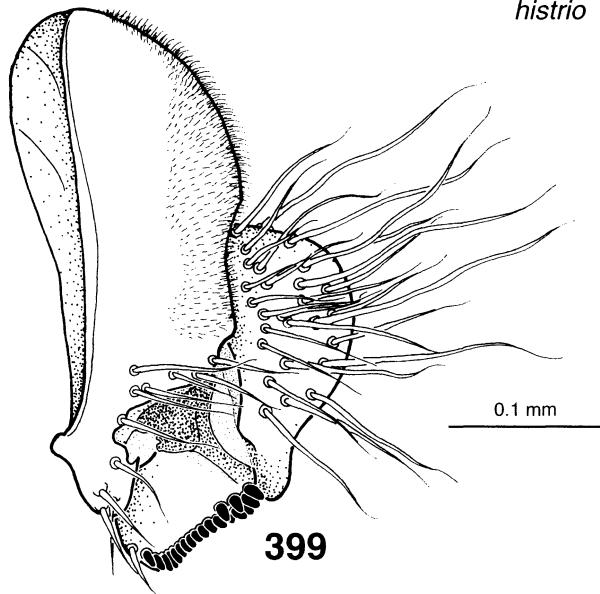
398

Fig. 398. Known distribution pattern of *Drosophila funebris* Fabricius in Scandinavia.

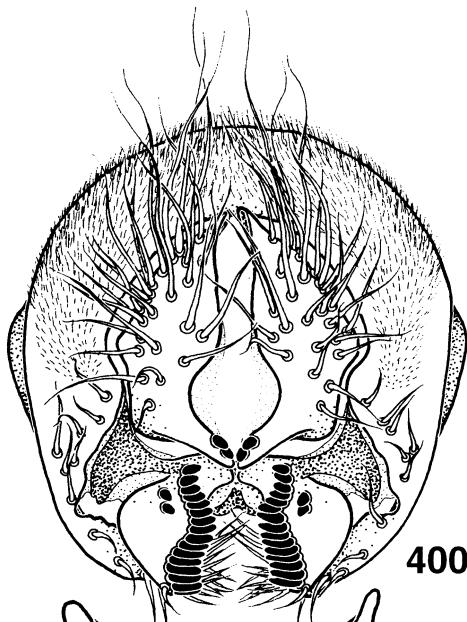
are more blackish-brown and larger towards tip of abdomen, tergite 5 also with 2 large spots, which may be confluent, medially forming one large triangle, tergite 6 dorsally completely dark. Size and colour of spots variable, but usually well defined.

♂ Terminalia (Figs 399-402). Epandrium posteriorly microtrichose, with ca. 11 lower, and no upper setae; ventral lobe reduced, neither microtrichose nor covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose; ventral lobes remarkably convergent, each subapically with

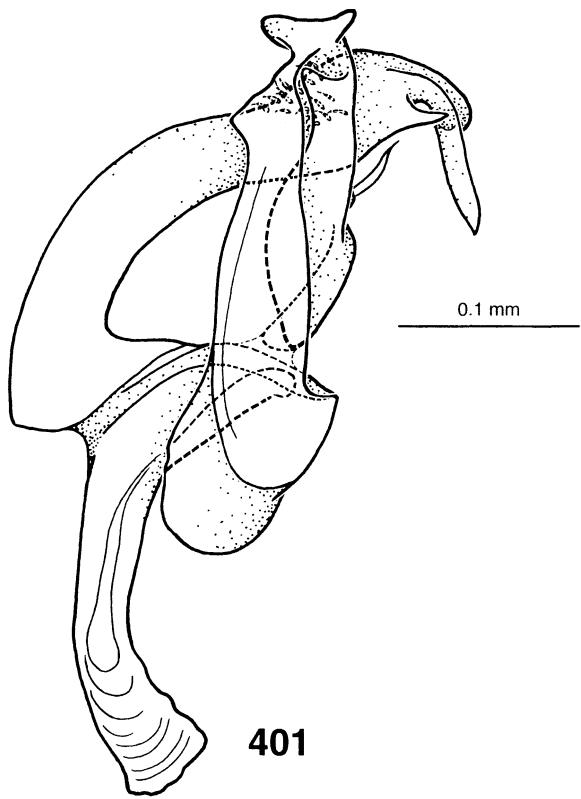
two small peg-like setae on ventroposterior margin. Surstylus not microtrichose, dorsoanteriorly strongly sclerotised, with a sinuate row of ca. 17 peg-like prensisetae on mesal surface, ca. 14 thin inner, and 2 upper-positioned peg-like outer setae. Decasternum as in Fig. 400. Hypandrium as long as epandrium, more or less square in posterior view, anterior margin conspicuously concave; posterior hypandrial process and dorsal arch absent; gonopod partially fused to paraphysis, with 1 seta near median inner margin. Aedeagus fused to aedeagal apodeme, tube-shaped, bent, anteriorly slightly protruding for-



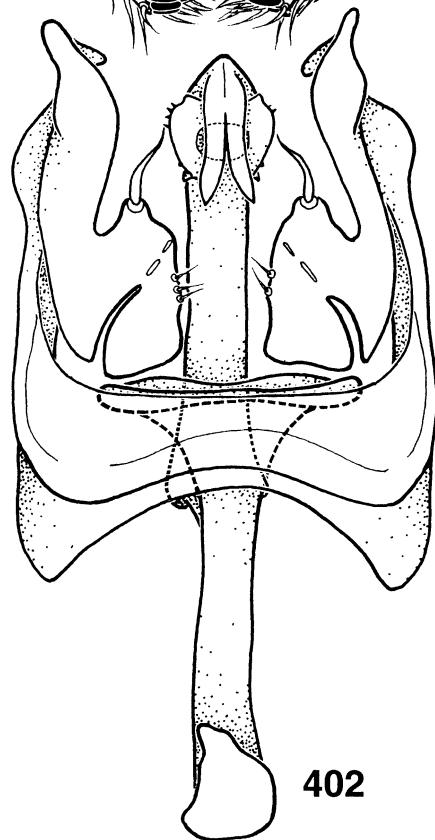
399



400

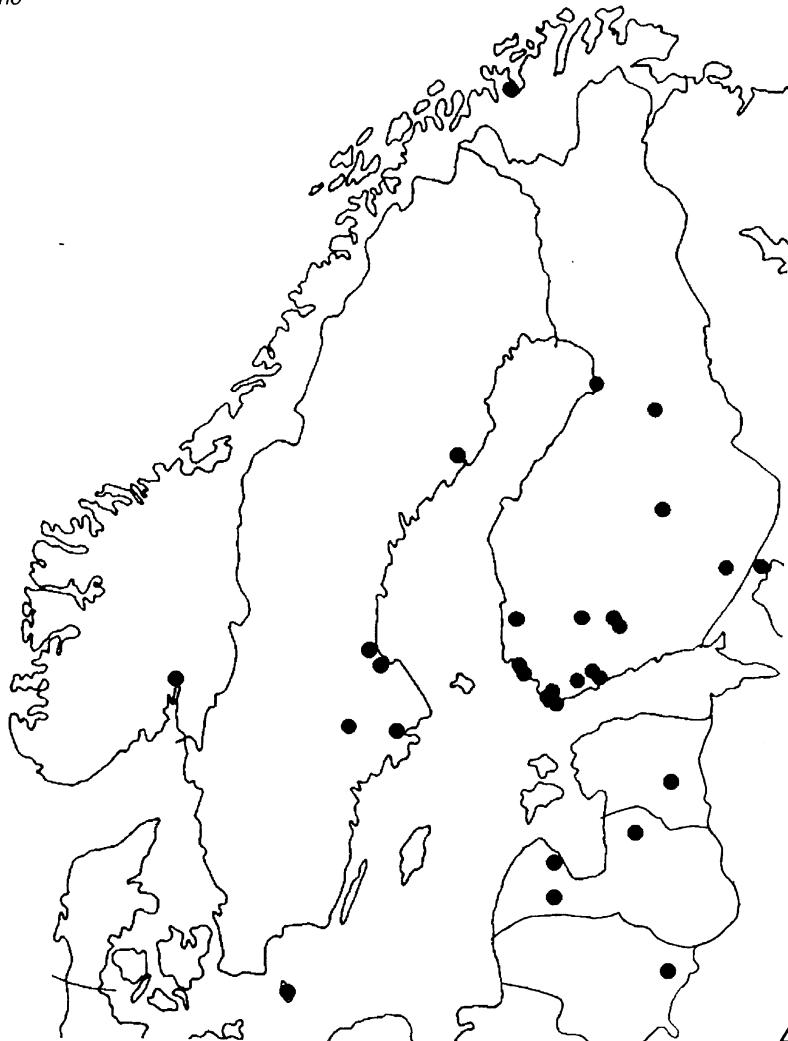


401



402

Figs. 399-402. *Drosophila histrio* Meigen. 399: epandrium, cerci, and surstyli, left lateral view; 400: idem, plus decasternum, posterior view; 401: hypandrium, gonopods, paraphyses, aedeagal apodeme, left lateral view; 402: idem, posterior view.



403

Fig. 403. Known distribution pattern of *Drosophila histrio* Meigen in Scandinavia.

wards; subapically with a pair of long, distally slightly divergent ventral processes, preceded by a pair of outer, small, curved, posterad projecting processes, submedially covered with tiny scales dorsolaterally. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme, distally expanded and dorsoventrally flattened. Paraphysis partially fused to gonopod, with ca. 3 setulae, not parallel but unusually perpendicular to aedeagus, connected to the very distal, expanded margin of the ventral rod by membranous tissue.

♀. Differences from male: Abdominal spots becoming smaller or disappearing towards tip of abdomen; a small, median triangle may be present on tergite 6.

Measurements: Frontal length 0.38 (0.36-0.41) mm; frontal index = 0.80 (0.75-0.89), top to bottom width ratio = 1.28 (1.21-1.37). Frontal triangle about 62-76% of frontal length; ocellar triangle about 38-48% of frontal length. Orbital plates about 71-74% of frontal length. Distance of or3 to or1 = 50-75% of or3 to vtm, or1 / or3 ratio = 0.72 (0.71-0.74), or2 / or1 ratio = 0.46 (0.42-0.54), postocellar setae = 76 (75-78)%.

ocellar setae = 92 (86-96)% of frontal length; vibrissal index = 0.61 (0.47-0.71). Cheek index about 5-7. Eye index = 1.16 (1.13-1.20). Thorax length 1.66 (1.49-1.79) mm. h index = 0.97 (0.90-1.06). Transverse distance of dorsocentral setae 225-273% of longitudinal distance; dc index = 0.64 (0.62-0.67). Distance between apical scutellar setae about 72-87% of that between apical and basal one; scut index = 0.93 (0.91-0.94); sterno index = 0.70 (0.68-0.71), median katepisternal seta about 50-57% of anterior one. Wing length 3.36 (3.29-3.71) mm, length to width ratio = 2.29 (2.24-2.33). Indices: C = 4.27 (4.12-4.50), ac = 2.06 (1.89-2.29), hb = 0.50 (0.44-0.56), 4C = 0.56 (0.53-0.58), 4v = 1.47 (1.40-1.55), 5x = 1.12 (1.00-1.22), M = 0.38 (0.33-0.41), prox. x = 0.50 (0.47-0.52).

♀ Terminalia (Fig. 392). Tergite 8 very long, 5x longer than wide, submedially with a pair of strongly sclerotised structures adjacent to distal margin, just above oviscap valves, a conspicuously broad gap between hypoproct and valves of oviscap, ventrally with ca. 5 setulae medially. Valve of oviscap distally rounded, ventrally strongly convex, with ca. 4 discal and ca. 15 marginal, peg-like, roundish-tipped outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned and 1 long, curved, subterminal.

Distribution. – (Fig. 403). A widespread Palaearctic species. Recorded from Estonia, Latvia, Lithuania and all the Scandinavian countries; northernmost locality: Alta (Norway).

Biology. – The larvae are mushroom breeders. Laboratory culture is possible on a malt medium.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Aargau, 1 ♂, 1973; Genève, 1 ♂, 1973; Uri, 2 ♂♂, 1973), 4 ♀♀ (RUSSIA: Krasnodar, 1 ♀, 1983. SERBIA AND MONTENEGRO: Durmitor, 1 ♀, 1983; Popovica, 1 ♀, 1980. SWITZERLAND: Ticino, 1 ♀, 1981).

immigrans species group

Sturtevant, 1942

Diagnosis. – Yellowish flies, many species with a silvery shimmering frons. A row of short, sharp, and thick setae (cuneiform setae) on inner side of profemur; costal index over 3.0. Ventral

receptacle short with about 25 loose coils. Ejaculatory bulb with 2 twisted posterior diverticula. Anterior spiracles about one-half length of puparium.

Taxa included. – About 90 mostly South Asian species; of these, *Drosophila immigrans* has a cosmopolitan distribution and *D. nasuta* Lamb occurs around the Indian Ocean. The majority of the species are recorded from South Asia which is thought to be the centre of the group's evolution.

Drosophila immigrans

Sturtevant, 1921

(Figs 351-353, 404-408, 412)

Drosophila brunni Hutton, 1901: 91 (suppressed).

Drosophila immigrans Sturtevant, 1921: 83.

Drosophila cilifemur Villeneuve, 1923: 28.

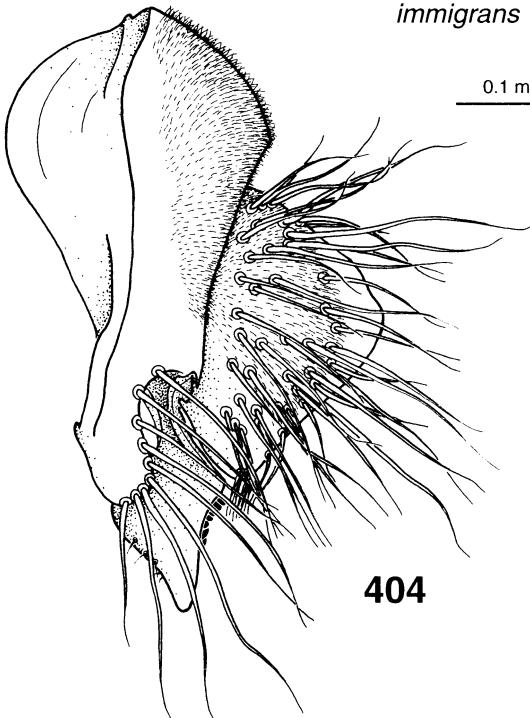
Drosophila flexipilosa Pipkin, 1963: 238.

Diagnosis. – The group diagnosis applies, but see the male terminalia.

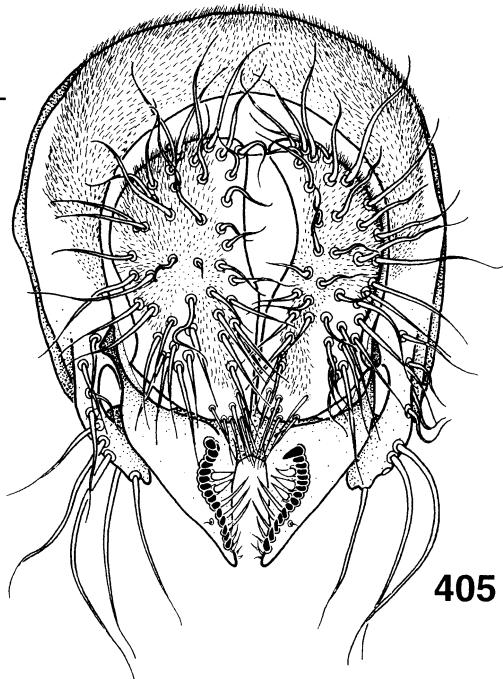
Redescription. – ♂. Head. Frons yellowish, dull, frontal length 0.41 (0.37-0.42) mm; frontal index = 0.90 (0.86-0.96), top to bottom width ratio = 1.31 (1.26-1.34). Frontal triangle indistinct, pale yellow, about 75-83% of frontal length; ocellar triangle dark brown, slightly prominent, about 41-46% of frontal length. Frontal vittae brownish-yellow. Orbital plates narrow, brownish, subshining, divergent from eye margin, about 72-79% of frontal length. Orbital setae black, distance of or3 to or1 = 100-175% of or3 to vtm, or1 / or3 ratio = 0.82 (0.73-0.87), or2 / or1 ratio = 0.49 (0.45-0.55), postocellar setae = 59 (54-64)%, ocellar setae = 64 (58-72)% of frontal length; vibrissal index = 0.83 (0.69-0.92). Face yellowish. Carina prominent, nose-like, broadened downwards. Cheek index about 3-5. Eye index = 1.24 (1.21-1.30). Occiput yellowish-brown, medially darker. Antennae yellowish. Arista with 5-7 dorsal, 2-3 ventral, and about 6 small inner branches, plus terminal fork. Proboscis yellow. Palpus medially broadened, with about 5 small black setae and several fine, pale setulae.

Thorax length 1.39 (1.26-1.53) mm. Scutum yellowish to yellowish-brown, dull, 8 rows of acrostichal setulae. h index = 1.02 (0.94-1.06).

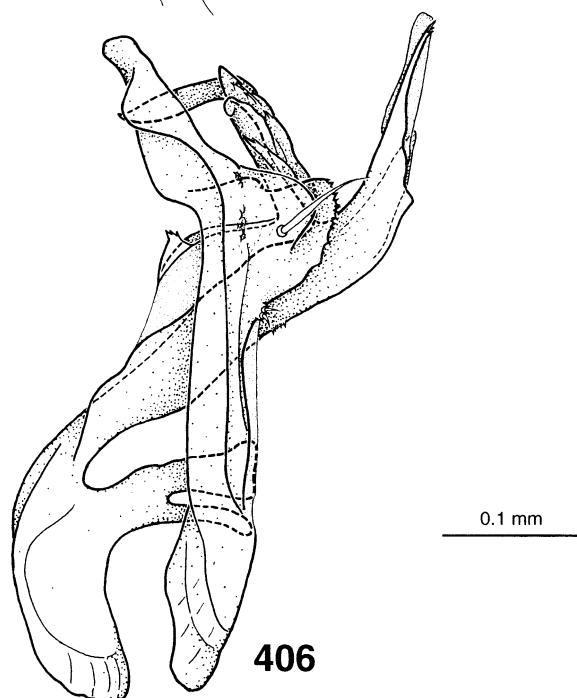
immigrans



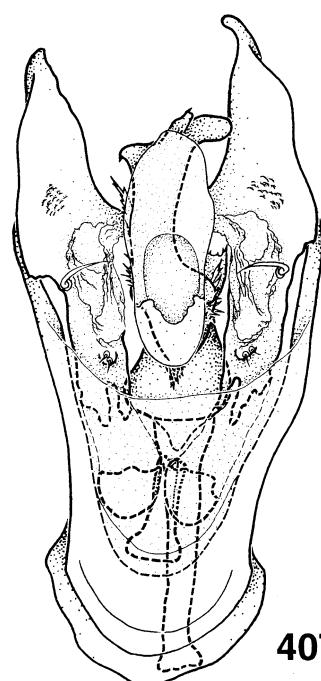
404



405



406



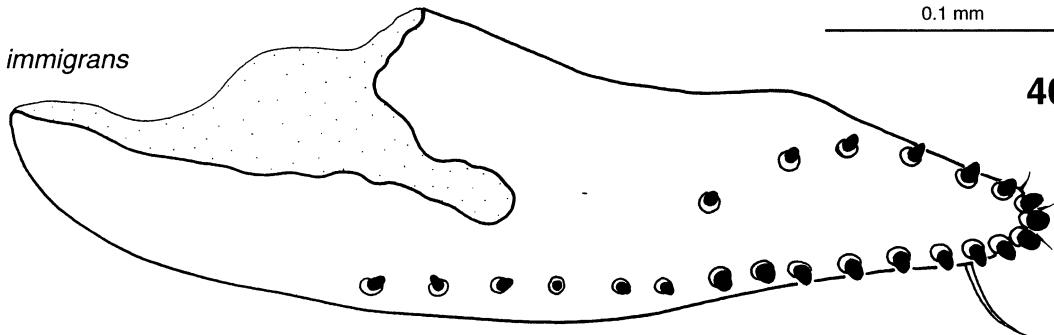
407

Figs. 404-407. *Drosophila immigrans* Sturtevant. 404: epandrium, cerci, and surstyli, left lateral view; 405: idem, plus decasternum, posterior view; 406: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 407: idem, posterior view.

0.1 mm

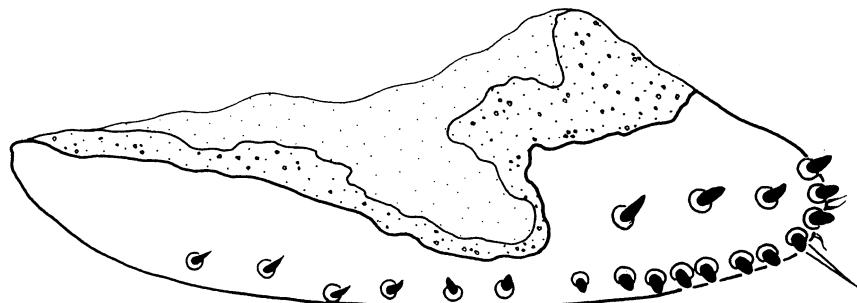
immigrans

408



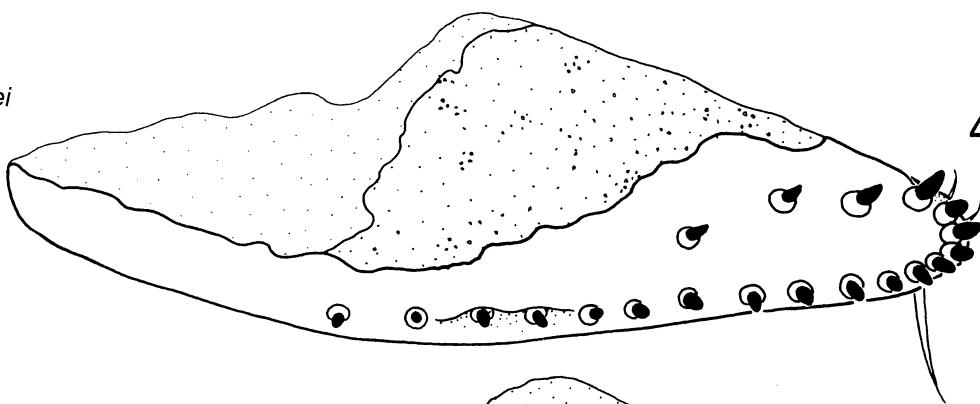
picta

409



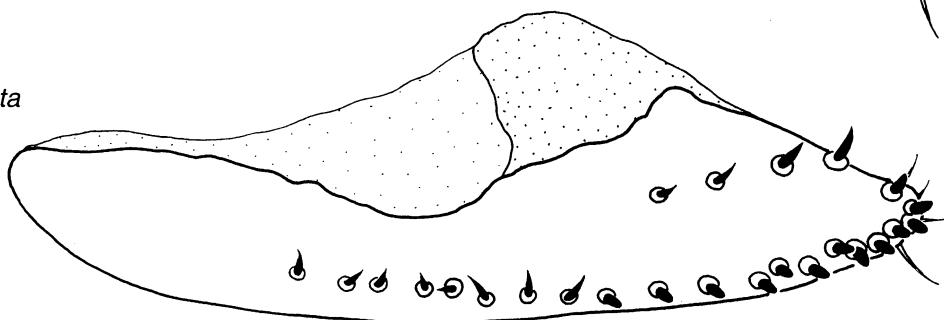
hydei

410

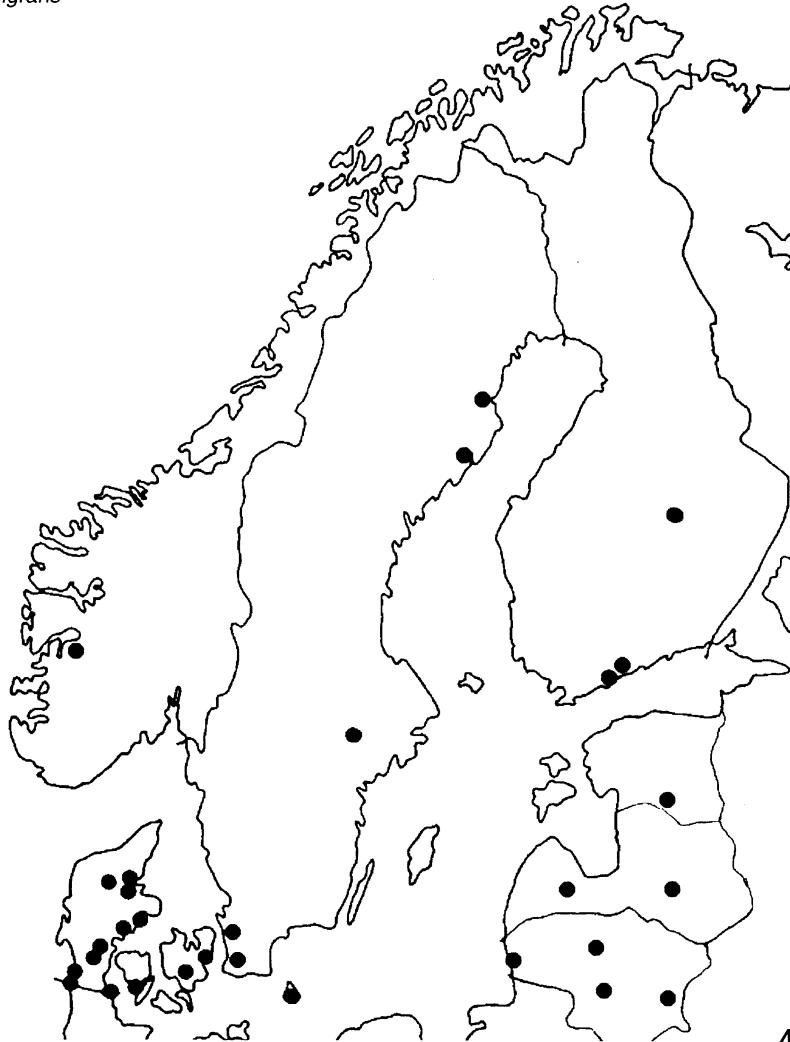


repleta

411



Figs. 408-411. Left oviscapta valves, lateral view.



412

Fig. 412. Known distribution pattern of *Drosophila immigrans* Sturtevant in Scandinavia.

Transverse distance of dorsocentral setae 218-254% of longitudinal distance; dc index = 0.65 (0.59-0.71). Scutellum brownish-yellow, subshining, distance between apical scutellar setae about 67-100% of that between apical and basal one; basal setae divergent; scut index = 0.91 (0.87-0.94). Pleura yellowish, subshining, sterno index = 0.63 (0.60-0.64), median katepisternal seta about 44-83% of anterior one. Haltere pale yellow. Legs (Fig. 351) yellowish, subshining, all femora distinctly thickened, profemur on anteroventral side with a distinct row of

10-15 black, short, sharp setae in apical half, protarsomeres 1 and 2 ventrally with dense, short, dark setae forming a kind of brush, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 352) hyaline, veins yellowish, both crossveins brownish and shadowed, tips of longitudinal veins also slightly darkened and shadowed, particularly R_{2+3} and R_{4+5} , length 2.93 (2.59-3.08) mm, length to width ratio = 2.25 (2.18-2.29). Indices: C = 4.37 (4.00-4.73), ac = 1.33 (1.08-1.50), hb = 0.38 (0.31-0.40), 4C = 0.49 (0.44-0.54), 4v = 1.23 (1.14-1.30), 5x =

1.08 (0.89-1.25), M = 0.32 (0.29-0.36), prox. x = 0.45 (0.39-0.50).

Abdomen (Fig. 353) yellowish, subshining on tergites 2 and 3, becoming more and more shining towards tip of abdomen, tergites 2-5 with lateral, brown, triangular bands, broadest paramedially and becoming broader towards tip of abdomen, inner margins diverging and anterior margin rather diffuse, tergite 6 dorsally almost completely dark.

♂ Terminalia (Figs 404-407). Epandrium posteriorly microtrichose, with ca. 9 long, lower, and no upper setae; ventral lobe narrow, neither microtrichose nor covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, mostly microtrichose, without ventral lobe, with a tuft of small, stiff setae at inner ventral margin. Surstyli not microtrichose, remarkably sharp and pointed ventrad, dorsoanteriorly more strongly sclerotised, with a concave row of ca. 16 peg-like prensisetae on mesal surface, ca. 8 thin ventral, and 3 stout median inner setae, plus 1 outer, lower-positioned setula. Decasternum as in Fig. 405. Hypandrium longer than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod fused to paraphysis, with one seta between median membranous area and outer margin, submedially slightly rugose. Aedeagus fused to aedeagal apodeme, submedially slightly bent dorsad, dorsomedially with a large, asymmetric, anterad projecting, branched process (which probably originated from inner paraphyses); distally slightly membranous. Aedeagal apodeme ca. 1/3 length of aedeagus, laterally flattened. Ventral rod as long as width of adjacent aedeagal apodeme, dorsoventrally flattened. Paraphysis (outer) anteriorly apparently broadly fused to ventral rod, medially completely membranous, distally perpendicular to aedeagal apodeme, fused to gonopod, and with 2 setulae.

♀. Differences from male: Fore legs without ventral brush. Abdominal bands generally narrower.

Measurements: Frontal length 0.37 (0.34-0.42) mm; frontal index = 0.83 (0.79-0.88), top to bottom width ratio = 1.29 (1.27-1.32). Frontal triangle about 68-78% of frontal length; ocellar triangle about 40-50 % of frontal length. Orbital plates about 65-77% of frontal length. Distance of or3 to or1 = 75-100% of or3 to vtm, or1 / or3 ratio = 0.85 (0.84-0.86), or2 / or1 ratio = 0.58

(0.55-0.60), postocellar setae = 68 (60-74)%; ocellar setae = 78 (75-80)% of frontal length; vibrissal index = 0.81 (0.71-0.87). Cheek index about 3-6. Eye index = 1.20 (1.14-1.24). Thorax length 1.41 (1.22-1.55) mm. h index = 1.00 (0.94-1.05). Transverse distance of dorsocentral setae 240-267% of longitudinal distance; dc index = 0.68 (0.63-0.75). Distance between apical scutellar setae about 69-85% of that between apical and basal one; scut index = 0.83 (0.82-0.84), sterno index = 0.68 (0.63-0.72), median katepisternal seta about 57-80% of anterior one. Wing length 3.01 (2.83-3.47) mm, length to width ratio = 2.28 (2.13-2.58). Indices: C = 4.57 (4.31-4.85), ac = 1.35 (1.20-1.50), hb = 0.40 (0.38-0.42), 4C = 0.53 (0.46-0.73), 4v = 1.38 (1.18-1.86), 5x = 1.01 (0.89-1.14), M = 0.34 (0.29-0.41), prox. x = 0.47 (0.38-0.68).

♀ Terminalia (Fig. 408). Valve of oviscaptriangular, long, distally rounded, submedially slightly expanded dorsad, ventrally slightly sinuate, with ca. 6 discal and ca. 17 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned and 1 long, curved, subterminal.

Distribution. – (Fig. 412). A cosmopolitan, domestic species. Old specimens preserved in collections show that the species was introduced into North America in the early 20th century (Sturtevant, 1921), as suggested by the species epithet; this also applies for Europe. Recorded from all the Scandinavian and Baltic countries.

Biology. – The larvae are most probably fruit breeders but have also been found in other decaying plant material; adults are attracted to fruit bait. Laboratory culture is possible with a standard medium.

Additional specimens examined. – 4 ♂♂ (BELARUS: Gomel, 3 ♂♂, 1983. SWITZERLAND: Zürich, 1 ♂, 1977), 4 ♀♀ (BELARUS: Gomel, 2 ♀♀, 1983. RUSSIA: Goryatchiy Klyuch, 2 ♀♀, 1979).

melanica species group

Sturtevant, 1942

Diagnosis. – Dark flies; first genal seta at most half as long as vibrissa; arista with 7 to 8 branches; sterno index 0.7 to 0.8; ventral receptacle spiralled, and in some species ejaculatory

bulb with four diverticula; egg with two filaments, each about as long as egg.

Taxa included. – 13 North American and East Asian species. One species, *Drosophila tsigana* Burla & Gloor, 1952, has been recorded in Hungary, Austria, France and Portugal, as well as in East Asia.

Comments. – The species are thought to be sap breeders (Levitán, 1982; Toda et al., 1990).

***nigrosparsa* species group**

Basden, 1961

Diagnosis. – Both main crossveins shadowed; epandrium ventrally swollen or expanded distad in lateral view; surstyli laterally almost covered by epandrium; hypandrium anteriorly broad.

Taxa included. – *Drosophila nigrosparsa* Strobl, 1898, *D. secunda* Máca, 1992, *D. subarctica* Hackman, 1969, *D. vireni* Bächli, Vilela and Haring, 2002. In addition, *D. bondarenkoi* Sidorenko, 1993, and *D. maculinotata* Okada, 1956, may belong here (Máca, 1992; Toda et al., 1992).

Comments. – For a long time, *D. nigrosparsa* was the only member of the monotypic subgenus *Spinodrosophila*. It seems that there is no good reason for retaining this subgenus, and so the *nigrosparsa* species group, already mentioned by Basden (1961), is here considered as belonging to the subgenus *Drosophila*. It should be pointed out that although *D. subarctica* and *D. vireni* have recently been included in the *robusta* species group by Bächli et al. (2002), they fit in better with the *nigrosparsa* group to which they are herewith transferred.

D. nigrosparsa has been recorded from various mountainous areas in Central and Western Europe.

Drosophila subarctica

Hackman, 1969

(Figs 334, 413, 417, 463)

Drosophila subarctica Hackman, 1969: 69.
Nesiodrosophila sufflava Takada, Beppu & Toda, 1979: 117.

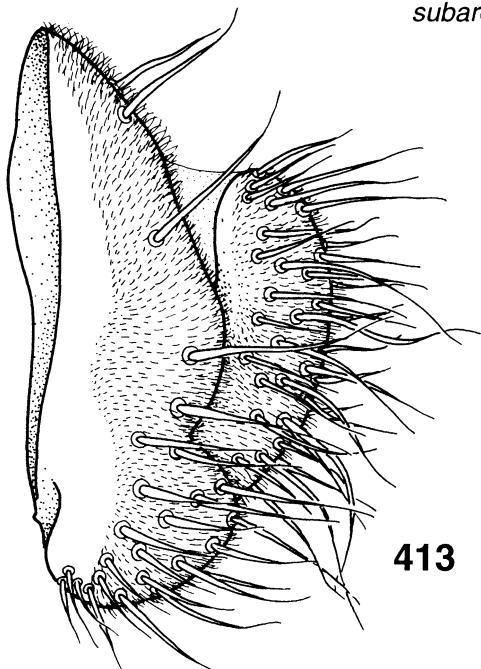
Diagnosis. – Generally dark greyish-brown flies; scutum with faint darker stripes; crossvein dM-Cu shadowed; aedeagus apically roundish in lateral view, distally bifid and narrowed in dorsal view, with three pleats anterodorsally, outer ones smaller and slightly serrate; oviscapte valve dorso-distally with ca. 2 very long, unusually seta-like, discal outer ovisensilla.

Redescription. – ♂. Head. Frons blackish, microtrichose, pale yellowish-brown above antennae, frontal length 0.42 (0.39-0.44) mm; frontal index = 0.92 (0.85-1.04), top to bottom width ratio = 1.35 (1.29-1.41). Frontal triangle greyish, about 60-87% of frontal length; ocellar triangle prominent, black, about 28-48% of frontal length. Orbital plates broad, brownish, about 81-91% of frontal length. Orbital setae black, or2 slightly outside and closer to or1 than to or3, distance of or3 to or1 = 80-89% of or3 to vtm, or1 / or3 ratio = 0.88 (0.75-0.93), or2 / or1 ratio = 0.60 (0.54-0.69), postocellar setae = 61 (54-72)%; ocellar setae = 86 (76-100)% of frontal length; vibrissal index = 0.49 (0.40-0.71). Face brownish. Carina prominent, distinctly diverging downwards, almost nose-like but roundish dorsally. Cheek index about 4-5. Eye roundish, index = 1.08 (1.03-1.12). Occiput blackish-brown. Antennae brown. Flagellomere 1 greyish, length to width ratio = 1.10-1.30. Arista with 3-5 short dorsal, 2-3 short ventral, and about 8 very short inner branches, plus small terminal fork. Proboscis brown. Palpus slightly broadened, with 2 strong, black and a few short, pale setae along lower margin.

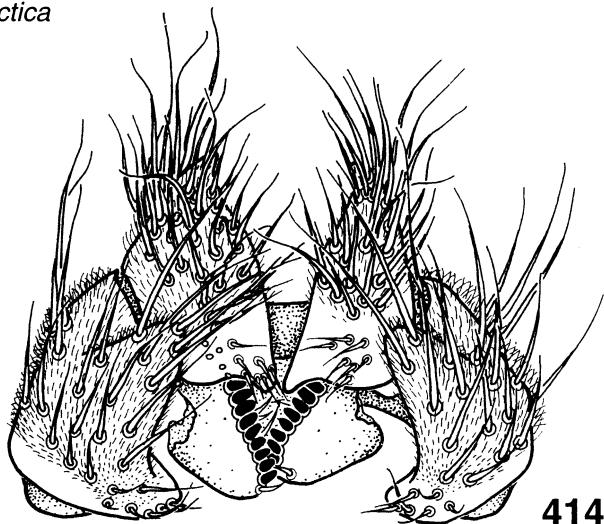
Thorax length 1.40 (1.34-1.53) mm. Scutum brownish-yellow, more or less brownish in front of scutellum, subshining. 6 rows of acrostichal setulae. h index = 1.51 (1.35-1.75). Transverse distance of dorsocentral setae 171-215% of longitudinal distance; dc index = 0.75 (0.67-0.80). Scutellum brown with pale yellowish margin, distance between apical scutellar setae about 69-87% of that between apical and basal one; scut index = 1.01 (0.94-1.11). Pleura dark brown with diffuse paler areas, sterno index = 0.78 (0.76-0.87), median katepisternal seta fine, about 35-48% of anterior one. Haltere whitish-yellow. Legs brown, femora basally pale, preapical seta on metatibia, apical seta on mesotibia. Procoxa with a conspicuous blunt seta at posterior end.

Wing almost hyaline, crossvein dM-Cu faintly shadowed, length 3.46 (3.22-3.68) mm, length

subarctica

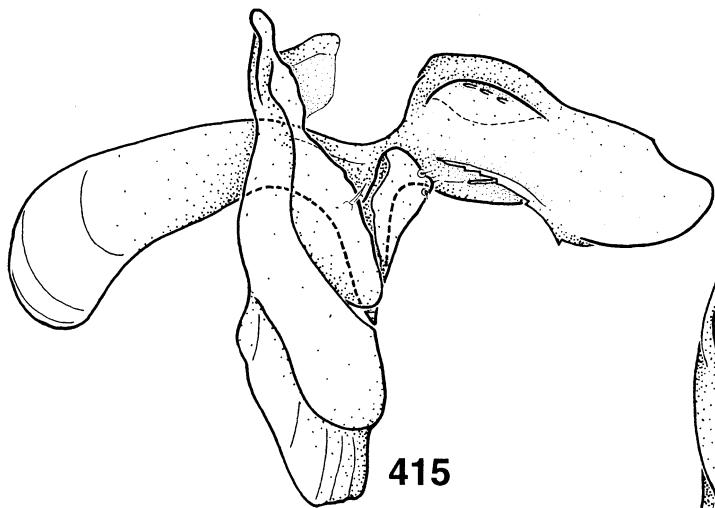


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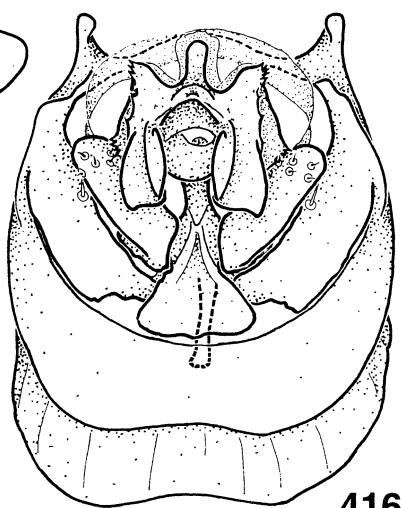


414

0.1 mm



415



416

Figs. 413-416. *Drosophila subarctica* Hackman. 413: epandrium, cerci, and surstyli, left lateral view; 414: idem, plus decasternum, posterior view; 415: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 416: idem, posterior view.



417

Fig. 417. Known distribution pattern of *Drosophila subarctica* Hackman in Scandinavia.

to width ratio = 2.27 (2.19-2.33). Indices: C = 3.13 (3.05-3.27), ac = 2.31 (2.00-2.62), hb = 0.37 (0.23-0.45), 4C = 0.76 (0.71-0.83), 4v = 1.56 (1.45-1.75), 5x = 1.05 (0.91-1.33), M = 0.40 (0.34-0.46), prox. x = 0.61 (0.55-0.71).

Abdomen (Fig. 334) predominantly blackish-brown, ground-colour yellowish-brown; tergites 3-5 with medially more or less interrupted, or at least medially narrowed, dark marginal bands.

♂ Terminalia (Figs 413-416). Epandrium posteriorly microtrichose with about 23 lower setae, and 4 upper setae; ventral lobe broad, roundish,

posteriorly microtrichose, and covering surstyli. Cercus linked to hypandrium by membranous tissue, mostly microtrichose. Surstylus not microtrichose, with ca. 9 cone-shaped, roundish-tipped prensisetae, several inner, and no outer setae. Hypandrium slightly shorter than epandrium, more or less square in posterior view; anterior margin slightly concave, dorsal arch present, medially weakly sclerotised; gonopod partially fused to hypandrium, with one small seta near median inner margin. Aedeagus short, distally slightly bifid, distally broad in dorsal

view, apically roundish in lateral view, anteriorly and submedially serrate on ventral margin; anterodorsal half conspicuously bearing three pleats, outer ones smaller and slightly serrate. Aedeagal apodeme longer than aedeagus, strongly bent, laterally flattened. Ventral rod as long as width of adjacent aedeagal apodeme, dorsoventrally flattened, distally expanded. Paraphysis linked both to gonopod and to distal margin of aedeagal apodeme by membranous tissue, distally convex, with ca. 5 setulae dorsally.

♀. Differences from male: Marginal bands on tergites 3-5 narrower, usually leaving broader yellowish basal areas.

Measurements: Frontal length 0.44(0.42-0.46) mm; frontal index = 0.92 (0.89-0.96), top to bottom width ratio = 1.31 (1.28-1.41). Frontal triangle about 69-80% of frontal length; ocellar triangle about 38-46% of frontal length. Orbital plates about 77-88% of frontal length. Distance of or3 to or1 = 60-80% of or3 to vtm, or1 / or3 ratio = 0.81 (0.76-0.88), or2 / or1 ratio = 0.65 (0.53-0.77), postocellar setae = 66 (60-73)%, ocellar setae = 92 (88-96)% of frontal length; vibrissal index = 0.44 (0.39-0.50). Cheek index about 3-5. Eye index = 1.08 (1.03-1.14). Thorax length 1.44 (1.37-1.48) mm. h index = 1.47 (1.40-1.57). Transverse distance of dorsocentral setae 173-225% of longitudinal distance; dc index = 0.67 (0.61-0.71). Distance between apical scutellar setae about 75-100% of that between apical and basal one; scut index = 0.98 (0.97-1.00), sterno index = 0.70 (0.63-0.73), median katepisternal seta about 41-68% of anterior one. Wing length 3.42 (3.22-3.61) mm, length to width ratio = 2.17 (2.04-2.31). Indices: C = 3.07 (2.90-3.35), ac = 2.30 (2.20-2.44), hb = 0.38 (0.32-0.43), 4C = 0.77 (0.68-0.88), 4v = 1.60 (1.38-1.83), 5x = 1.10 (1.00-1.30), M = 0.42 (0.38-0.50), prox. x = 0.60 (0.52-0.71).

♀ Terminalia (Fig. 463). Valve of oviscapt dorsomedially expanded dorsad, distally narrowed dorsoventrally, apically rounded, ventrally almost straight, with ca. 2 very long, unusually seta-like, and 1 peg-like, discal, and 14-16 sharp-tipped, peg-like, marginal, outer ovisensilla; inner ovisensilla: 3 thin, trichoid-like, distally positioned and 1 long, seta-like curved, subterminal, which is as long as the 2 anteromost discal setae.

Distribution. – (Fig. 417). Northern Finland, Sweden and Norway, Northern Russia includ-

ing Siberia. Northernmost locality: Utsjoki (Finland).

Biology. – This species has a larval diapause which can be broken under a regime of constant daylight (P. Lankinen, pers. comm.).

Additional specimens examined [type specimens in ZMUH]. 5 ♂♂ (FINLAND: Kuusamo, 1 ♂, no date; 1 ♂ paratype, no date; Muonio, 1 ♂ paratype, no date; Oulanka, 1 ♂ holotype, 1968, 1 ♂ paratype, 1968), 5 ♀♀ (FINLAND: Kuusamo, 1 ♀, no date; Muonio, 2 ♀♀ paratypes, no date; Oulanka, 2 ♀♀ paratypes, no date).

Comments. – Basden & Harnden (1956) reported a single male specimen from Rosta, Northern Norway. According to the male terminalia illustrated, this specimen clearly belongs to *D. subarctica*.

Drosophila vireni Bächli, Vilela & Haring, 2002

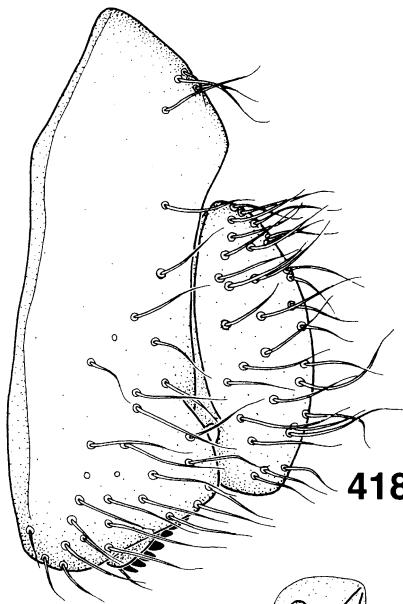
(Figs 418-421)

Drosophila vireni Bächli, Vilela & Haring, 2002: 312.

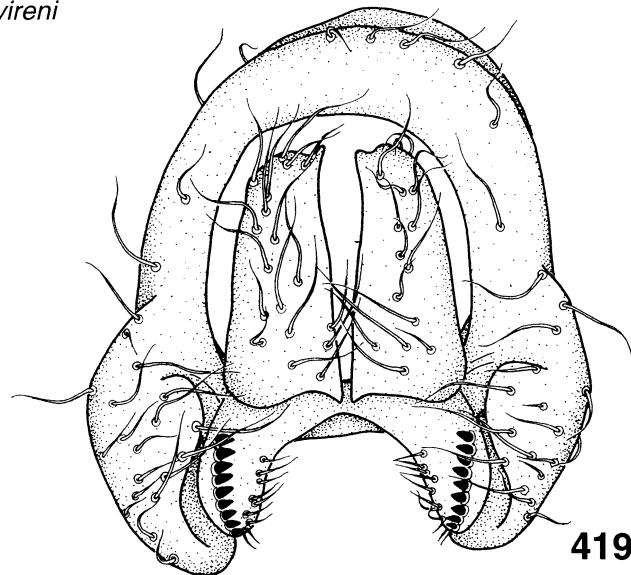
Diagnosis. – Extremely similar to *D. subarctica* but aedeagus broader and apically sharp in lateral view, apically narrowed in dorsal view.

Redescription. – ♂. Measurements: Frontal length 0.41 mm; frontal index = 0.96, top to bottom width ratio = 1.40. Ocellar triangle about 42% of frontal length. Orbital plates about 92% of frontal length. Distance of or3 to or1 = 100% of or3 to vtm, or2 / or1 ratio = 0.33, postocellar setae = 63% of frontal length; vibrissal index = 0.85. Cheek index about 3-5. Eye index = 1.09 (1.07-1.11). Thorax length 1.25 (1.17-1.34) mm. 6-8 rows of acrostichal setulae. Transverse distance of dorsocentral setae 169-180% of longitudinal distance. Distance between apical scutellar setae about 69-71% of that between apical and basal one: Wing length 3.08 (2.94-3.29) mm. Indices: ac = 2.11, 4C = 0.66 (0.63-0.70), 4v = 1.33, 5x = 1.22, prox. x = 0.47 (0.43-0.52).

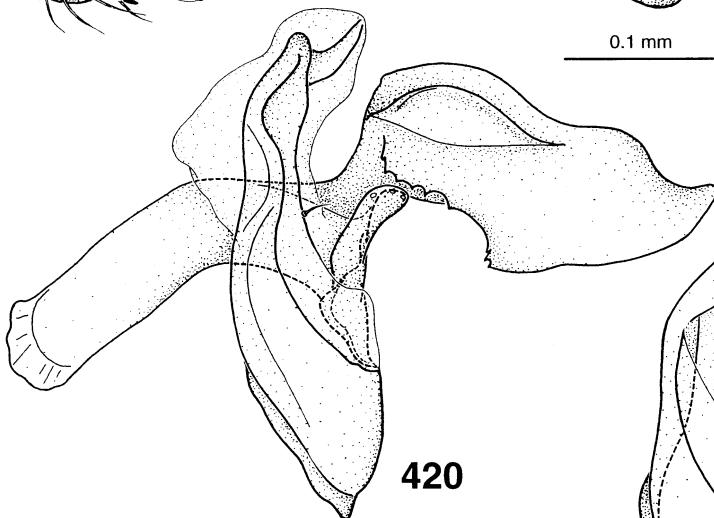
♂ Terminalia (Figs 418-421). Epandrium posteriorly microtrichose (based on holotype, not seen in specimen illustrated in the present paper; see Comments), with about 24 lower and 6 upper setae; ventral lobe broad, roundish, posteriorly microtrichose, covering most of surstylius. Cercus linked to hypandrium by membra-



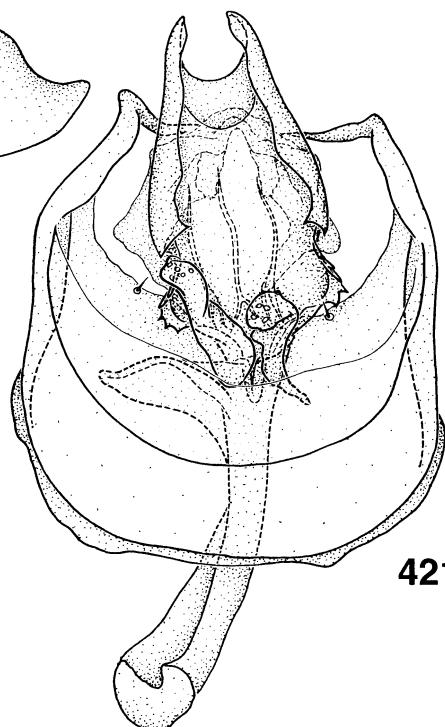
418



419



420



421

Figs. 418-421. *Drosophila vireni* Bächli, Vilela and Haring. 418: epandrium, cerci, and surstyli, left lateral view; 419: idem, plus decasternum, posterior view; 420: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 421: idem, posterior view.

neous tissue, mostly microtrichose (not seen in illustrated specimen). Surstylus not microtrichose, with ca. 9 cone-shaped, roundish-tipped setae, ca. 10 inner and no outer setae. Hypandrium slightly shorter than epandrium, slightly square; dorsal arch present, medially membranous; gonopod partially fused to paraphysis and to hypandrium, with one small seta near median inner margin. Aedeagus short, distally slightly bifid, narrowed at distal end in dorsal and ventral view, apically sharply pointed in lateral view, anteriorly and submedially serrate on ventral margin; anterodorsal half conspicuously bearing three pleats, outer ones smaller. Aedeagal apodeme longer than aedeagus, strongly bent, laterally flattened. Ventral rod as long as width of adjacent aedeagal apodeme, dorsoventrally flattened, distally expanded. Paraphysis linked both to gonopod and to distal margin of aedeagal apodeme by membranous tissue, distally convex, with ca. 5 setulae.

Distribution. – Northern Finland, but it might be widespread in the northern Palaearctic.

Biology. – This species has a larval diapause which cannot be broken (P. Lankinen, pers. comm.).

Additional specimens examined. – 4 ♂♂ (FINLAND: Oulanka, 1986).

Comments. – As stated in the original description of *D. vireni*, all the available specimens, except for the holotype, are completely colourless, probably due to inadequate storage. For this reason, the microtrichia have become virtually invisible.

picta species group Makino & Kanehisa, 1951

Diagnosis. – Yellowish flies; pleura with 3 brown stripes; veins R₄₊₅ and M strongly divergent; abdominal tergites 2-5 each with 5 brown spots, median one very faint, forming an interrupted median abdominal stripe.

Taxa included. – This is a monotypic species group, without clear relationships within the subgenus *Drosophila* (Tsacas, 1969).

Drosophila picta Zetterstedt, 1847

(Figs 325, 409, 422-425)

Drosophila picta Zetterstedt, 1847: 2367.

Drosophila macularis Villeneuve, 1921: 159.

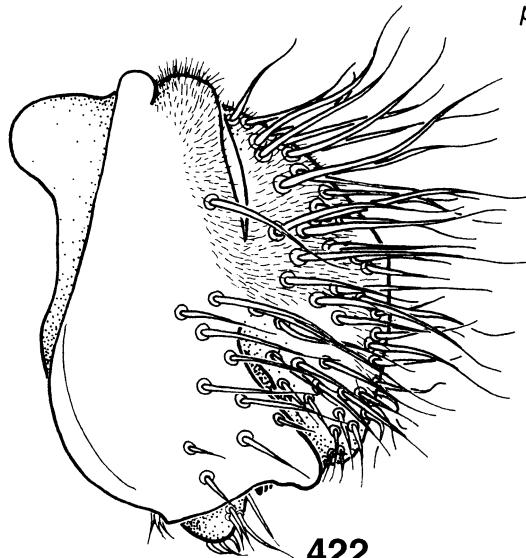
Drosophila pleurofasciata Duda, 1924: 213.

Diagnosis. – See diagnosis for the group.

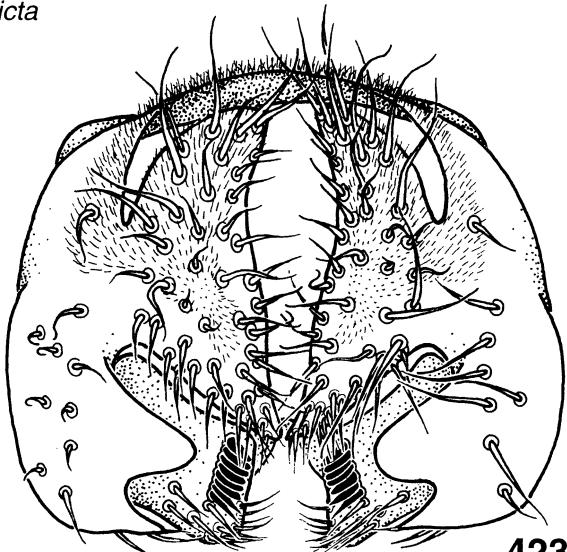
Redescription. – ♂. Head. Frons yellowish, dull, frontal length 0.26 (0.24-0.31) mm; frontal index = 0.66 (0.61-0.75), top to bottom width ratio = 1.18 (1.13-1.22). Frontal triangle yellowish, indistinct, subshining, about 86-89% of frontal length; ocellar triangle slightly prominent, yellowish, brownish around inner margin of ocelli, about 40-44% of frontal length. Frontal vittae brownish, more golden-yellow in upper part. Orbital plates narrow, subshining, completely divergent from eye margin, about 80-87% of frontal length. Orbital setae black, or2 just outside of or1, distance of or3 to or1 = 50-57% of or3 to vtm, or1 / or3 ratio = 0.62 (0.56-0.65), or2 / or1 ratio = 0.58 (0.45-0.78), postocellar setae = 77 (69-86)%, ocellar setae = 110 (94-129)% of frontal length; vibrissal index = 0.59 (0.50-0.67). Face yellowish. Carina nose-like, diverging downwards, dorsally slightly grooved. Cheek index about 7-10. Eye index = 1.18 (1.12-1.22). Occiput yellowish, brown above foramen. Antennae yellowish, pedicel slightly darker. Arista with 4-5 dorsal, 3 ventral, and about 7 small inner branches, plus terminal fork. Proboscis yellowish, clypeus brownish. Palpus yellowish, with about 3 black setae along lower margin, apical one strongest.

Thorax length 1.11 (1.07-1.16) mm. Scutum yellowish to yellowish-brown, subshining, 6 rows of acrostichal setulae. h index = 0.96 (0.88-1.00). Transverse distance of dorsocentral setae = 146-167% of longitudinal distance; dc index = 0.75 (0.69-0.78). Scutellum yellowish, shining, distance between apical scutellar setae about 100-110% of that between apical and basal one; basal setae divergent; scut index = 1.16 (1.11-1.19). Pleura yellowish, shining, with a narrow, dark brown stripe from upper margin of katepisternum to below procoxa, a faint brown stripe visible along upper margin of anepisternum and below postpronotum, sterno index = 0.84 (0.82-0.88), median katepisternal seta about 52-61% of anterior one. Haltere yel-

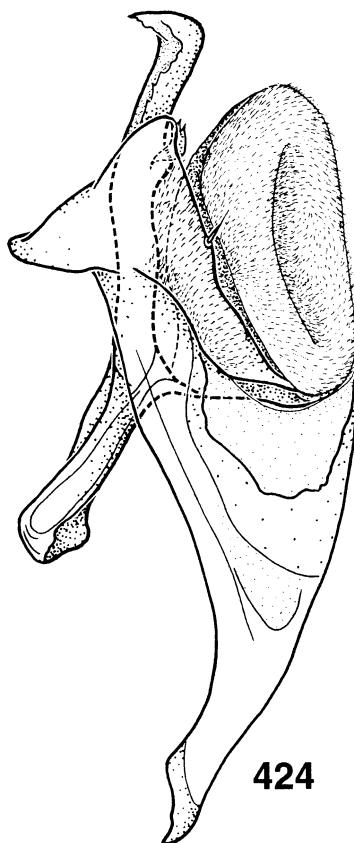
picta



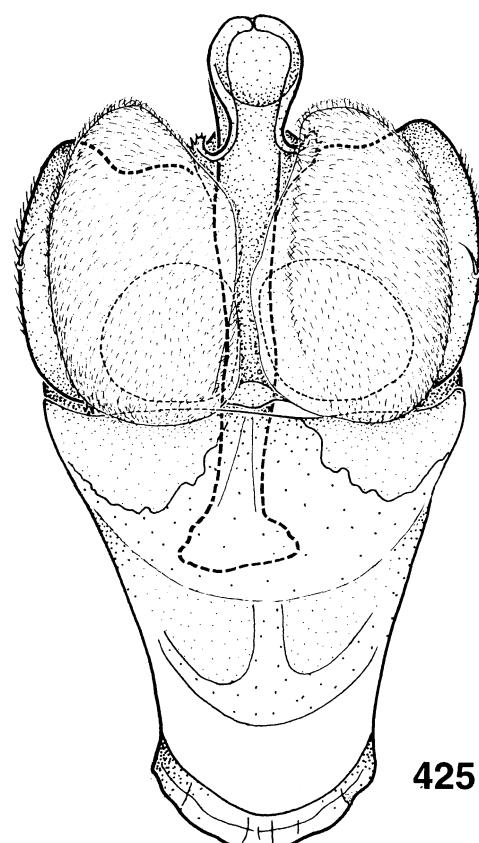
422



423



424



425

Figs. 422-425. *Drosophila picta* Zetterstedt. 422: epandrium, cerci, and surstyli, left lateral view; 423: idem, plus decasternum, posterior view; 424: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 425: idem, posterior view.

low, brownish on upper side of knob. Legs yellow, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, crossvein dM-Cu slightly shadowed, also a small brownish area on R₁, veins R₄₊₅ and M distinctly diverging; length 2.31 (2.27-2.35) mm, length to width ratio = 2.34 (2.20-2.41). Indices: C = 2.87 (2.67-3.00), ac = 1.41 (1.27-1.50), hb = 0.58 (0.53-0.64), 4C = 0.80 (0.78-0.83), 4v = 1.45 (1.42-1.50), 5x = 0.98 (0.86-1.17), M = 0.35 (0.33-0.39), prox. x = 0.55 (0.50-0.61).

Abdomen (Fig. 325) yellowish, laterally somewhat brownish, shining, tergites 1-5 each with brown spots: a triangular, rather pale median spot, a dark brown paramedian, more or less triangular spot which may have an oblique shape, a dark brown, roundish, lateral spot, usually connected to the paramedian spot by a narrow marginal band; lateroventral margin of tergite 6 narrowly brown.

♂ Terminalia (Figs 422-425). Epandrium dorsodistally microtrichose, with 7 lower and 4 upper setae; ventral lobe broad, distally bifurcate, dorsally roundish and ventrally sharply pointed at tip in posterior view, not microtrichose, covering most of surstyli. Cercus anteriorly fused to epandrium, mostly microtrichose and without ventral lobe. Surstylus not microtrichose, with an upper-positioned straight row of ca. 8 peg-like prensisetae, whose tips gradually change from the dorsalmost roundish to the ventralmost sharply pointed, ca. 9 inner and 3 outer setae. Decasternum reduced, as in Fig. 423. Hypandrium longer than epandrium, in lateral view bent anterad, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod fused to paraphysis, partially microtrichose on outer half, with one tiny seta near median inner margin. Aedeagus fused to aedeagal apodeme, slightly sinuate, distally sharply pointed and turned dorsad, distally with a pair of apically serrate, in posterior view outwardly-curved, processes. Aedeagal apodeme slightly longer than aedeagus, rod-shaped. Ventral rod more than twice as long as width of aedeagal apodeme. Paraphysis very large, conspicuously membranous, microtrichose, and bag-shaped, fused to gonopod, apparently without setulae, connected to distal margin of aedeagal apodeme by membranous tissue.

♀. Measurements: Frontal length 0.28 (0.25-0.31) mm; frontal index = 0.62 (0.59-0.69), top

to bottom width ratio = 1.17 (1.11-1.23). Frontal triangle about 80-87% of frontal length; ocellar triangle about 39-47% of frontal length. Orbital plates about 78-94% of frontal length. Distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.55 (0.53-0.58), or2 / or1 ratio = 0.64 (0.60-0.73), postocellar setae = 82 (78-88)%; ocellar setae = 114 (106-119)% of frontal length; vibrissal index = 0.51 (0.50-0.53). Cheek index about 6-8. Eye index = 1.20 (1.15-1.22). Thorax length 1.28 (1.21-1.36) mm. h index = 0.98 (0.93-1.06). Transverse distance of dorsocentral setae 127-167% of longitudinal distance; dc index = 0.73 (0.67-0.78). Distance between apical scutellar setae about 85-93% of that between apical and basal one; scut index = 1.11 (1.07-1.24), sterno index = 0.84 (0.81-0.88), median katepisternal seta about 45-62% of anterior one. Wing length 2.81 (2.62-3.01) mm, length to width ratio = 2.32 (2.12-2.40). Indices: C = 3.36 (3.13-3.53), ac = 1.56 (1.50-1.64), hb = 0.60 (0.50-0.69), 4C = 0.67 (0.64-0.72), 4v = 1.39 (1.35-1.43), 5x = 0.96 (0.89-1.13), M = 0.35 (0.32-0.39), prox. x = 0.49 (0.43-0.56).

♀ Terminalia (Fig. 409). Valve of oviscapt distally rounded, ventrally almost straight, with ca. 5 discal and 14-15 marginal, peg-like, mostly roundish-tipped, outer ovisensilla; inner ovisensilla: 3 thin, trichoid-like, distally positioned, and 1 long, straight, subterminal.

Distribution. – Widespread in Europe; found in Denmark, Sweden and Finland (northernmost locality: Kyrkslätt).

Biology. – Almost all the flies have been collected in reedland areas; however, the ecological background is unknown.

Additional specimens examined. – 4 ♂♂ (SPAIN: Bordils, 1982, ex-strain), 4 ♀♀ (SWITZERLAND: Fribourg, 1994).

***polychaeta* species group**

Sturtevant, 1942

Diagnosis. – Large reddish brown flies; 3(-4) pairs of postsutural dorsocentral setae; costal index about 2.0; 4v index 1.8 to 2.3.

Taxa included. – Eight tropical/subtropical species; two of them, *Drosophila hirtipes* Lamb, 1914, and *D. polychaeta* Patterson and Wheeler,

1942, have been recorded as accidentally introduced in the harbours of Great Britain. There is no evidence that a stable population has been established.

Comments. – As it is not very probable that these two species will be recorded again, they have been excluded from the key to *Drosophila* species.

***quinaria* species group**

Sturtevant, 1942

Diagnosis. – Shining, yellowish flies; arista with 9 to 11 branches; main crossveins clouded; dark, variable abdominal bands, often broken into more or less isolated spots; eggs with 3 filaments; epandrium and cercus without microtrichia; epandrium setose only on lower half, dorsally expanded anterad, ventral lobe narrow, dorsally membranous, not covering surstyli; dorsal arch present, membranous in a few species.

Taxa included. – In the Holarctic, 33 species have been recorded; in Europe, 5 species are known, including the East Palaearctic *D. curvospina* Watabe & Toda, 1984, recently recorded in Switzerland. In addition, *D. schachti* Bächli, Vilela and Haring, 2002, has been described from southern Turkey.

Comments. – Based on the male terminalia, *D. nitida* Tsacas and Chassagnard, 1994, clearly belongs to the *quinaria* group, but does not show the typical clouded crossveins and the abdominal pattern. This is the first record of a *quinaria* group species in the Afrotropical region.

Generally, the larvae are fungus-breeders (even in poisonous fungi), but breeding in flowers and decaying plant material has also been reported. Most species can be cultured using a malt medium, which suggests that (at least in part) microorganisms on decaying fungi are utilized.

Drosophila kuntzei

Duda, 1924

(Figs 366, 367, 426-430)

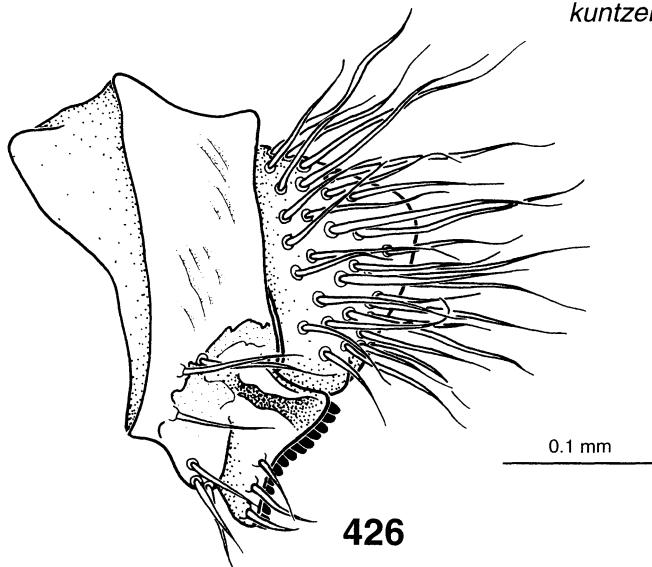
Drosophila kuntzei Duda, 1924: 218.

Diagnosis. – Tergites with laterally at most slightly narrowed bands; median gap in the bands forming an almost parallel-sided yellow stripe; surstylus ventrolaterally with 3-4 outer setae in a row; aedeagus with a V-shaped process ventrodistally, which is marginally covered with tiny scales.

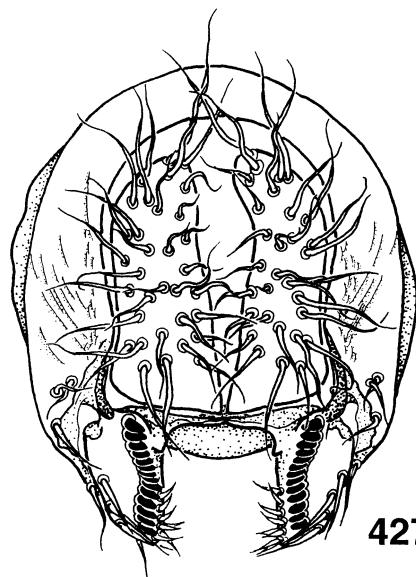
Redescription. – ♂. Head. Frons brownish-yellow, somewhat dull, frontal length 0.31 (0.29-0.34) mm; frontal index = 0.81 (0.76-0.90), top to bottom width ratio = 1.32 (1.24-1.45). Frontal triangle indistinct, 72-84% of frontal length, ocellar triangle slightly darker between ocelli, somewhat prominent, about 33-47% of frontal length. Orbital plates narrow, brown, shining, slightly diverging from eye margin, about 67-76% of frontal length. Orbital setae blackish, distance of or3 to or1 = 50-71% of or3 to vtm, or1 / or3 ratio = 0.60 (0.59-0.61), or2 / or1 ratio = 0.40 (0.36-0.45), postocellar setae = 77 (68-85)%, ocellar setae = 93 (78-100)% of frontal length; vibrissal index = 0.57 (0.50-0.64). Face pale yellowish. Carina distinct, nose-like, narrow, broader below. Cheek index about 7-9. Eye index = 1.23 (1.17-1.30). Occiput yellowish-brown with yellowish margin. Antennae yellowish. Arista with 4-5 dorsal, 2-3 ventral, and about 7-8 inner branches, plus terminal fork. Proboscis yellow. Palpus with 4-5 fine setae and several fine setulae.

Thorax length 1.24 (1.17-1.34) mm. Scutum brownish-yellow, shining, darker towards scutellum which is brownish, (6)-8 rows of acrostichal setulae. h index = 0.84 (0.80-0.88). Transverse distance of dorsocentral setae 183-236% of longitudinal distance; dc index = 0.66 (0.64-0.67). Scutellum brown, less shining than scutum, distance between apical scutellar setae about 100-117% of that between apical and basal one; basal setae slightly divergent; scut index = 1.07 (1.06-1.07). Pleura yellowish-brown, slightly shining, sterno index 0.66 (0.60-0.69), median katepisternal seta about 51 (44-63)% of anterior one. Haltere yellow. Legs pale yellowish, preapical setae on all tibiae, apical seta on mesotibia.

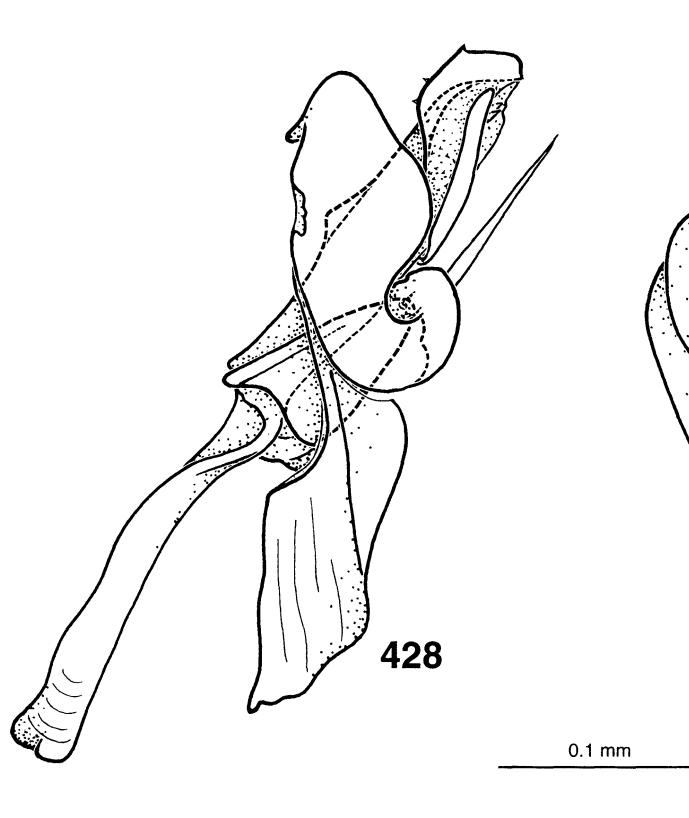
Wing hyaline, veins yellow, but both crossveins brown and narrowly shadowed, length 2.94 (2.80-3.08) mm, length to width ratio = 2.22 (2.15-2.31). Indices: C = 3.32 (3.00-3.80), ac = 2.16 (1.88-2.43), hb = 0.50 (0.47-0.53), 4C = 0.72 (0.63-0.78), 4v = 1.57 (1.52-1.65),



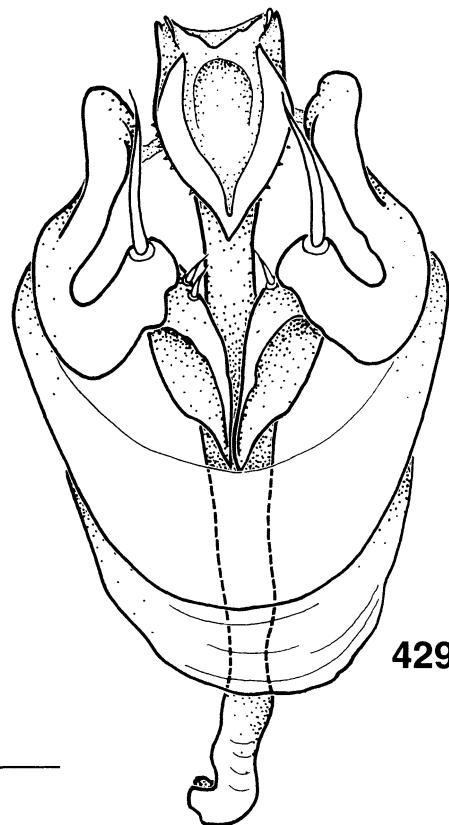
426



427



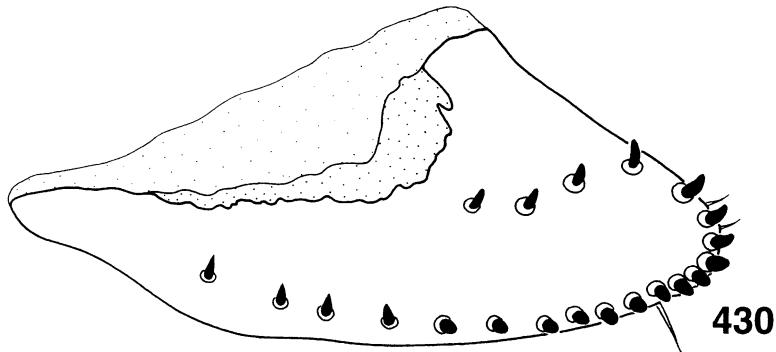
428



429

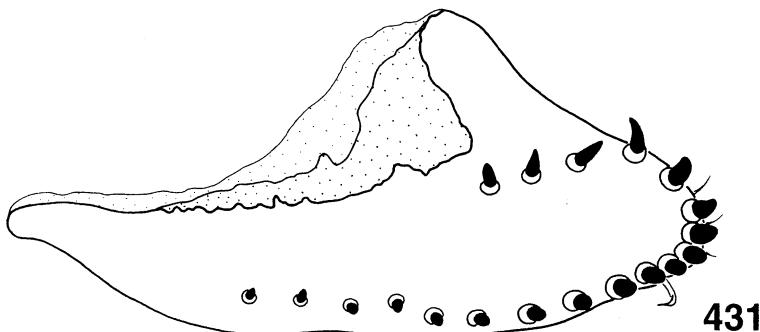
Figs. 426-429. *Drosophila kuntzei* Duda. 426: epandrium, cerci, and surstyli, left lateral view; 427: idem, plus decasternum, posterior view; 428: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 429: idem, posterior view.

kuntzei

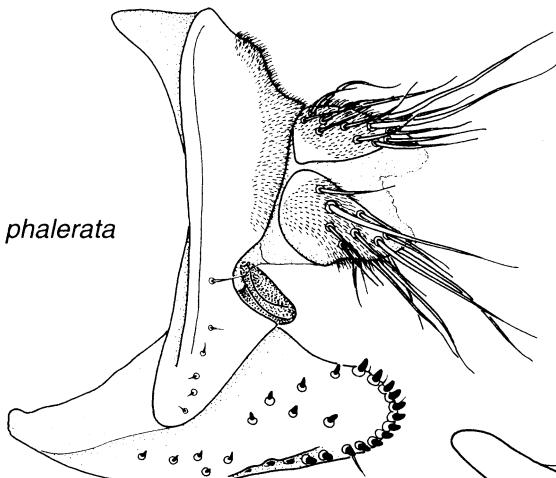


0.1 mm

limbata



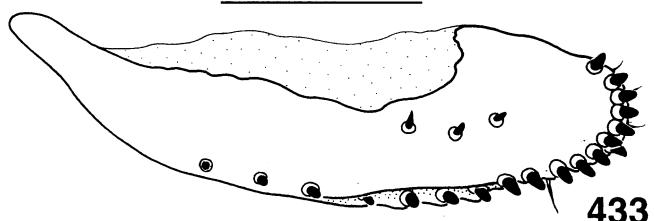
phalerata



0.1 mm

0.1 mm

transversa



Figs. 430-433. 430, 431, 433: left oviscapta valves, lateral view; 432: female terminalia, left lateral view.

$5x = 1.22$ (1.00-1.38), $M = 0.45$ (0.42-0.48),
prox. $x = 0.60$ (0.52-0.67).

Abdomen (Fig. 366) yellow, shining, laterally in some specimens becoming more brownish to dark brown; tergites 2-5 each with 2 brown, more or less straight bands which are darker and larger towards tip of abdomen, i.e. tip of abdomen somewhat darkened, paramedian parts of bands very broad, reaching up to 3/4 of tergite breadth, then laterally narrowed but broad again at lateral margin; median yellow gap between bands only slightly narrowing towards tip of abdomen; tergite 6 completely dark brown. Shape of bands variable, narrow parts in some specimens distinctly tapering, but bands never completely interrupted to form two isolated spots.

♂ Terminalia (Figs 426-429). Epandrium not microtrichose, with 6 lower, and no upper setae; ventral lobe narrow, dorsally membranous, neither microtrichose nor covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, dorso-proximally strongly sclerotised, with a slightly convex row of ca. 14 peg-like prensisetae, ca. 8 small inner, and 4 long outer setae in a row. Decasternum as in Fig. 427. Hypandrium longer than epandrium, anterior margin convex; dorsal arch membranous; posterior hypandrial process absent; gonopod linked to paraphysis by membranous tissue, with one strong seta near median inner margin. Aedeagus fused to aedeagal apodeme, straight; dorsoapically expanded with serrate margins, ventrodistally with a V-shaped process encircling gonopore, marginally covered with tiny scales in posterior view. Aedeagal apodeme as long as aedeagus, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme. Paraphysis linked to gonopod by membranous tissue, distally with 2 setulae near dorsal margin, connected to distal margin of aedeagal apodeme by membranous tissue.

♀. Differences from male: Abdominal bands (Fig. 367) on tergites 2-5 usually narrower, tergite 6 yellow with a median brown triangle, i.e. tip of abdomen not darkened.

Measurements: Frontal length 0.33 (0.31-0.36) mm, frontal index = 0.80 (0.75-0.83), top to bottom width ratio = 1.29 (1.23-1.36). Frontal triangle about 67-80% of frontal length; ocellar triangle about 38-44% of frontal length. Orbital plates about 72-79% of frontal length. Distance

of or3 to or1 = 44-57% of or3 to vtm, or1 / or3 ratio = 0.61 (0.58-0.67), or2 / or1 ratio = 0.41 (0.36-0.45), postocellar setae = 78 (68-89)%, ocellar setae = 95 (79-105)% of frontal length; vibrissal index = 0.62 (0.53-0.69). Cheek index about 6-11. Eye index = 1.21 (1.19-1.24). Thorax length 1.38 (1.29-1.56) mm. 6(8) rows of acrostichal setulae. h index = 0.85 (0.80-0.94). Transverse distance of dorsocentral setae 192-250% of longitudinal distance; dc index = 0.65 (0.62-0.68), distance between apical scutellar setae about 93-120% of that of apical to basal one; scut index = 1.08 (1.06-1.11), sterno index = 0.66 (0.56-0.74), median katepisternal seta about 50-65% of anterior one. Wing length 3.02 (2.76-3.39 mm, length to width ratio = 2.18 (1.98-2.30). Indices: C = 3.35 (3.17-3.63), ac = 2.12 (2.00-2.25), hb = 0.52 (0.47-0.56), 4C = 0.73 (0.70-0.75), 4v = 1.58 (1.48-1.67), 5x = 1.16 (1.00-1.25), M = 0.44 (0.41-0.46), prox. x = 0.59 (0.54-0.63).

♀ Terminalia (Fig. 430). Valve of oviscapt somewhat triangular, submedially expanded basad, distally rounded, ventrally slightly convex, with ca. 5 discal, and 15-16 marginal, peg-like, mostly roundish-tipped, outer ovisensilla; inner ovisensilla: 3 thin, trichoid-like, distally positioned, and 1 short, curved, subterminal.

Distribution. – Widespread in Europe, also recorded from Estonia, Lithuania, North Africa, the Near East and East Asia; rarely found in northern areas; northernmost locality: Petrozavodsk (northwestern Russia).

Biology. – The larvae are mushroom feeders.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Aargau, 3 ♂♂, 1973; Zürich, 1 ♂, 1974), 4 ♀♀ (SWITZERLAND: Aargau, 1973).

Drosophila limbata von Roser, 1840

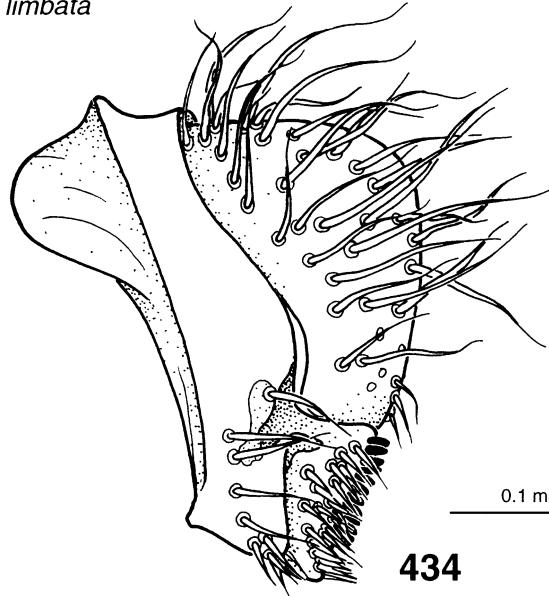
(Figs 370, 371, 431, 434-438)

Drosophila limbata von Roser, 1840: 62.

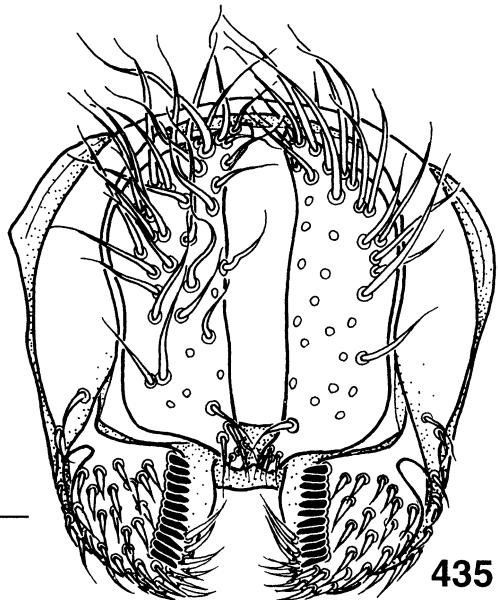
Drosophila mutandis Tan, Hsu & Sheng, 1949: 198.

Diagnosis. – Tergites with rather faint, laterally narrowed, posterolateral bands; median gap between bands forming a yellow stripe which becomes broader basad; surstylus laterally completely covered with rather short outer setae.

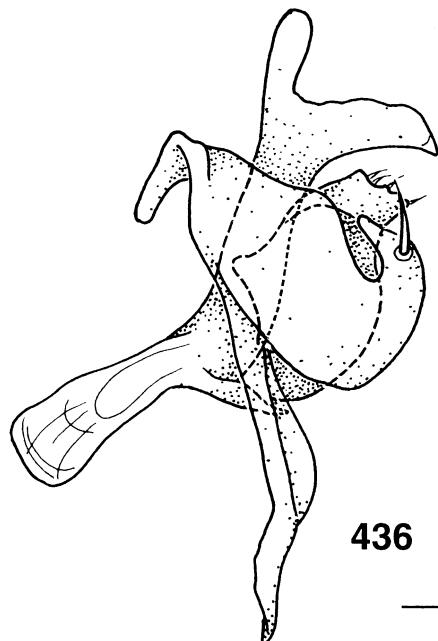
limbata



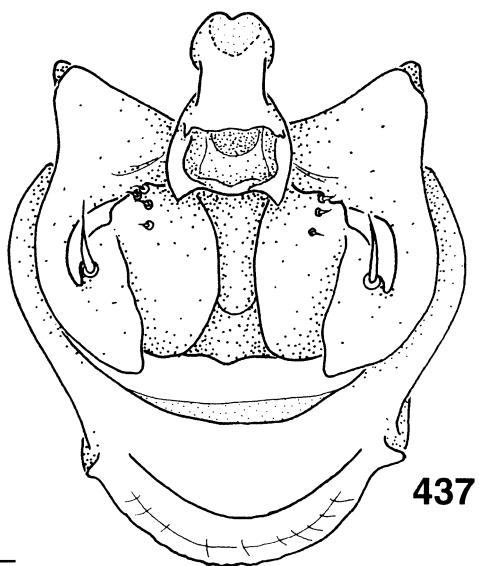
434



435

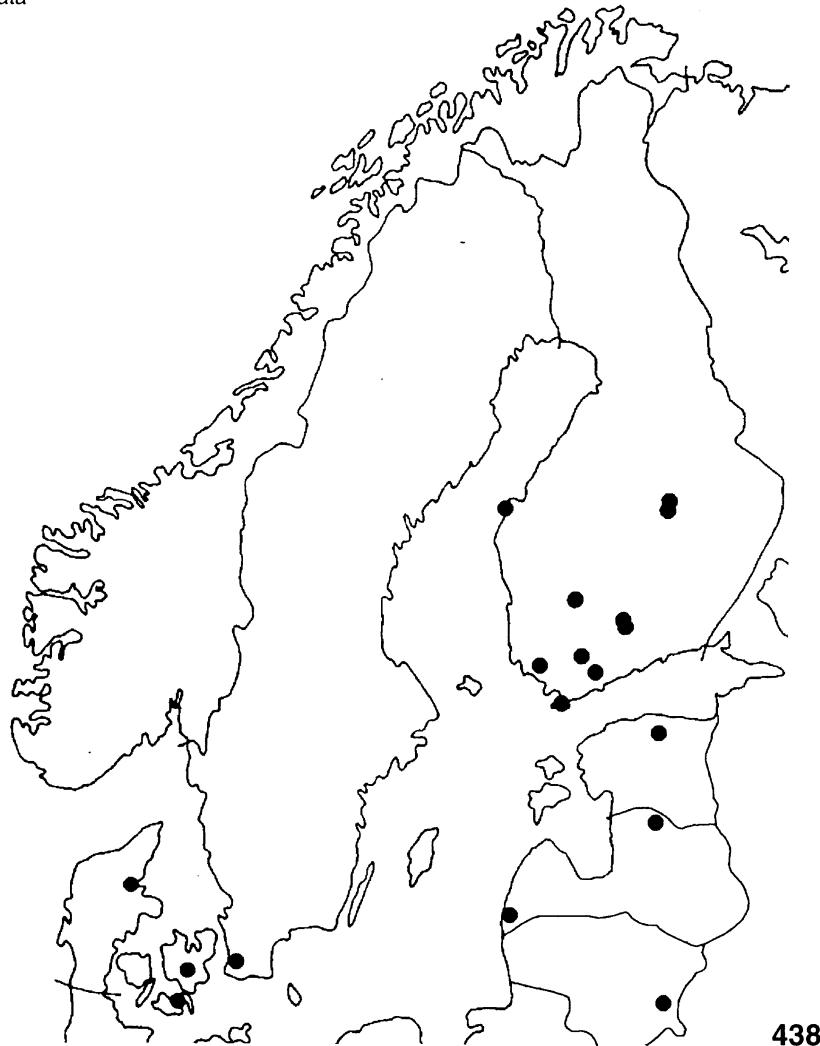


436



437

Figs. 434-437. *Drosophila limbata* von Roser. 434: epandrium, cerci, and surstyli, left lateral view; 435: idem, plus decasternum, posterior view; 436: hypandrium, gonopods, paraphyses, aedeagal apodeme, left lateral view; 437: idem, posterior view.



438

Fig. 438. Known distribution pattern of *Drosophila limbata* von Roser in Scandinavia.

Redescription. — ♂. Head. Frons brownish-yellow, somewhat dull, frontal length 0.30 (0.27-0.32) mm; frontal index = 0.73 (0.70-0.77), top to bottom width ratio = 1.22 (1.17-1.27). Frontal triangle paler yellow, not very distinct, about 67-89% of frontal length; ocellar triangle slightly darker between ocelli, somewhat prominent, about 39-50% of frontal length. Frontal vittae somewhat darker brownish. Orbital plates narrow, somewhat darker, shining, slightly diverging from eye margin, about 74-83% of frontal length. Orbital setae blackish, distance of or3 to or1 = 44-71% of or3 to vtm, or1 / or3 ratio =

0.73 (0.71-0.79), or2 / or1 ratio = 0.42 (0.36-0.50), postocellar setae = 72 (68-75)%; ocellar setae = 92 (84-100)% of frontal length; vibrissal index = 0.82 (0.82-0.83). Face pale yellowish. Carina distinct, nose-like, narrow, broader with yellowish margin. Antennae yellowish. Arista with 4-5 dorsal, 2-3 ventral, and about 7 rather short inner branches, plus terminal fork. Proboscis yellow. Palpus with about 3 fine setae and several fine setulae.

Thorax length 1.22 (1.14-1.27) mm. Scutum brownish-yellow, shining, more brownish towards scutellum, 6 rows of acrostichal setulae.

h index = 0.75 (0.71-0.80). Transverse distance of dorsocentral setae 200-230% of longitudinal distance; dc index = 0.62 (0.55-0.67). Scutellum less shining than scutum, distance between apical scutellar setae about 86-92 % of that between apical and basal one; basal setae slightly divergent; scut index = 0.97 (0.90-1.00). Pleura pale yellow, slightly shining, sterno index 0.64 (0.58-0.68), median katepisternal seta about 59-88% of anterior one. Haltere yellow. Legs yellow, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins yellow, but both cross-veins brown and distinctly shadowed, length 2.92 (2.76-3.18) mm, length to width ratio = 2.26 (2.21-2.33). Indices: C = 3.27 (3.06-3.41), ac = 2.19 (2.13-2.38), hb = 0.45 (0.41-0.53), 4C = 0.74 (0.68-0.81), 4v = 1.65 (1.46-1.76), 5x = 1.10 (1.00-1.22), M = 0.42 (0.39-0.43), prox. x = 0.58 (0.46-0.67).

Abdomen (Fig. 370) yellow, shining; tergites 2-4 each with 2 pale brown bands which usually fade laterally, tergite 5 with an indistinct, pale brown triangle or even completely darkened. Tergite 6 fully brownish. Size of bands variable, but usually not well defined and rarely darker towards tip of abdomen. Median gap between bands distinctly increasing forwards.

♂ Terminalia (Figs 434-437). Epandrium not microtrichose, with 9 lower, and no upper setae; ventral lobe narrow, dorsally membranous, neither microtrichose nor covering surstylos. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe, although slightly pointed downwards. Surstylus not microtrichose, dorsoproximally more sclerotised, with a straight row of ca. 12 peg-like prensisetae, ca. 10 inner, and 19 outer setae scattered over the whole outer surface. Decasternum as in Fig. 435. Hypandrium as long as epandrium, anterior margin convex; posterior hypandrial process absent, dorsal arch present, concave; gonopod partially fused to paraphysis, with one seta near median inner margin. Aedeagus fused to aedeagal apodeme, distally bent ventrad, apically sharp in lateral view, submedially with a dorsal process, roundish-tipped in lateral view. Aedeagal apodeme shorter than aedeagus, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme. Paraphysis mostly fused to gonopod, distally with 4 setulae near dorsal margin, connected to dorsal margin of ventral rod by membranous tissue.

♀. Differences from male: Abdominal pattern (Fig. 371) not much different, but bands may be very indistinct.

Measurements: Frontal length 0.32 (0.29-0.34) mm, frontal index = 0.70 (0.66-0.74), top to bottom width ratio = 1.20 (1.17-1.22). Frontal triangle about 80-89% of frontal length; ocellar triangle about 41-45% of frontal length. Orbital plates about 74-79% of frontal length. Distance of or3 to or1 = 44-62% of or3 to vtm, or1 / or3 ratio = 0.66 (0.60-0.71), or2 / or1 ratio = 0.42 (0.33-0.50), postocellar setae = 77 (70-84)%, ocellar setae = 103 (95-111)% of frontal length; vibrissal index = 0.71 (0.62-0.85). Cheek index about 4-5. Eye index = 1.17 (1.14-1.19). Thorax length 1.32 (1.16-1.46) mm. h index = 0.71 (0.63-0.87). Transverse distance of dorsocentral setae 192-230% of longitudinal distance; dc index = 0.66 (0.62-0.72), distance between apical scutellar setae about 75-100% of that between apical and basal one; scut index = 1.01 (0.97-1.04), sterno index = 0.61 (0.54-0.67), median katepisternal seta about 60-75% of anterior one. Wing length 3.03 (2.66-3.28) mm, length to width ratio = 2.32 (2.16-2.52). Indices: C = 3.37 (2.89-3.67), ac = 2.13 (2.00-2.25), hb = 0.47 (0.39-0.53), 4C = 0.75 (0.67-0.90), 4v = 1.66 (1.56-1.80), 5x = 1.16 (1.09-1.25), M = 0.44 (0.37-0.50), prox. x = 0.58 (0.52-0.60).

♀ Terminalia (Fig. 431). Valve of oviscapt submedially expanded dorsad, apically rounded, ventrally slightly convex, with 4-5 discal, and 13-14 marginal, peg-like, roundish-tipped, outer ovisensilla; inner ovisensilla: 3 thin, trichoid-like, distally positioned, and 1 short, curved, subterminal.

Distribution. – (Fig. 438). A widespread Palaeoarctic species. Also recorded from Denmark, Sweden, Finland (northernmost locality: Kuopio), all the Baltic countries and northwestern Russia.

Biology. – The larvae have been found in mushrooms, but more often in decaying plant matter.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: St. Gallen, 1 ♂, 1973; Zürich, 1 ♂, 1975. AUSTRIA: Purgstall, 1 ♂, 1977; Stams, 1 ♂, 1974), 4 ♀♀ (SWITZERLAND: St. Gallen, 1 ♀, 1973; Solothurn, 2 ♀♀, 1973; Uri, 1 ♀, 1973).

Drosophila phalerata

Meigen, 1830

(Figs 288, 378-381, 432, 439-443)

Drosophila phalerata Meigen, 1830: 83.

Drosophila laeta Zetterstedt, 1847: 2553 (as *transversa* var. *laeta*).

Diagnosis. – Tergites with laterally distinctly narrowed or even interrupted bands; bands in males become broader apicad, resulting in an almost black-tipped abdomen; surstyli laterally with about 18 long, outer setae; female with a pair of slightly prominent, strongly sclerotised, fused plates between hypoproct and the apically broad and rounded oviscapts valves; aedeagus ventrodistally with a long, sclerotised, sinuate and sharp process, which is pointed forwards and has a pair of long, weakly sclerotised, dorsad directed, scaled processes subdistally.

Redescription. – ♂. Head. Frons brownish-yellow, somewhat dull, frontal length 0.31 (0.30-0.32) mm; frontal index = 0.84 (0.82-0.86), top to bottom width ratio = 1.27 (1.22-1.32). Frontal triangle paler yellow, not very distinct, about 74-84% of frontal length; ocellar triangle slightly darker between ocelli, somewhat prominent, about 42-47% of frontal length. Frontal vittae somewhat darker brownish. Orbital plates narrow, somewhat darker, shining, slightly diverging from eye margin, about 78-83% of frontal length. Orbital setae blackish, distance of or3 to or1 = 50-62% of or3 to vtm, or1 / or3 ratio = 0.77 (0.71-0.85), or2 / or1 ratio = 0.41 (0.36-0.50), postocellar setae = 63 (58-67)%, ocellar setae = 88 (84-89)% of frontal length; vibrissal index = 0.59 (0.50-0.64). Face pale yellowish. Carina distinct, nose-like, narrow, broader below. Cheek index about 6-9. Eye index = 1.21 (1.19-1.26). Occiput pale brown with yellowish margin. Antennae yellowish. Arista with 4-5 dorsal, 2-3 ventral, and about 6-10 inner branches, plus terminal fork. Proboscis yellow. Palpus with about 4 fine setae and several fine setulae.

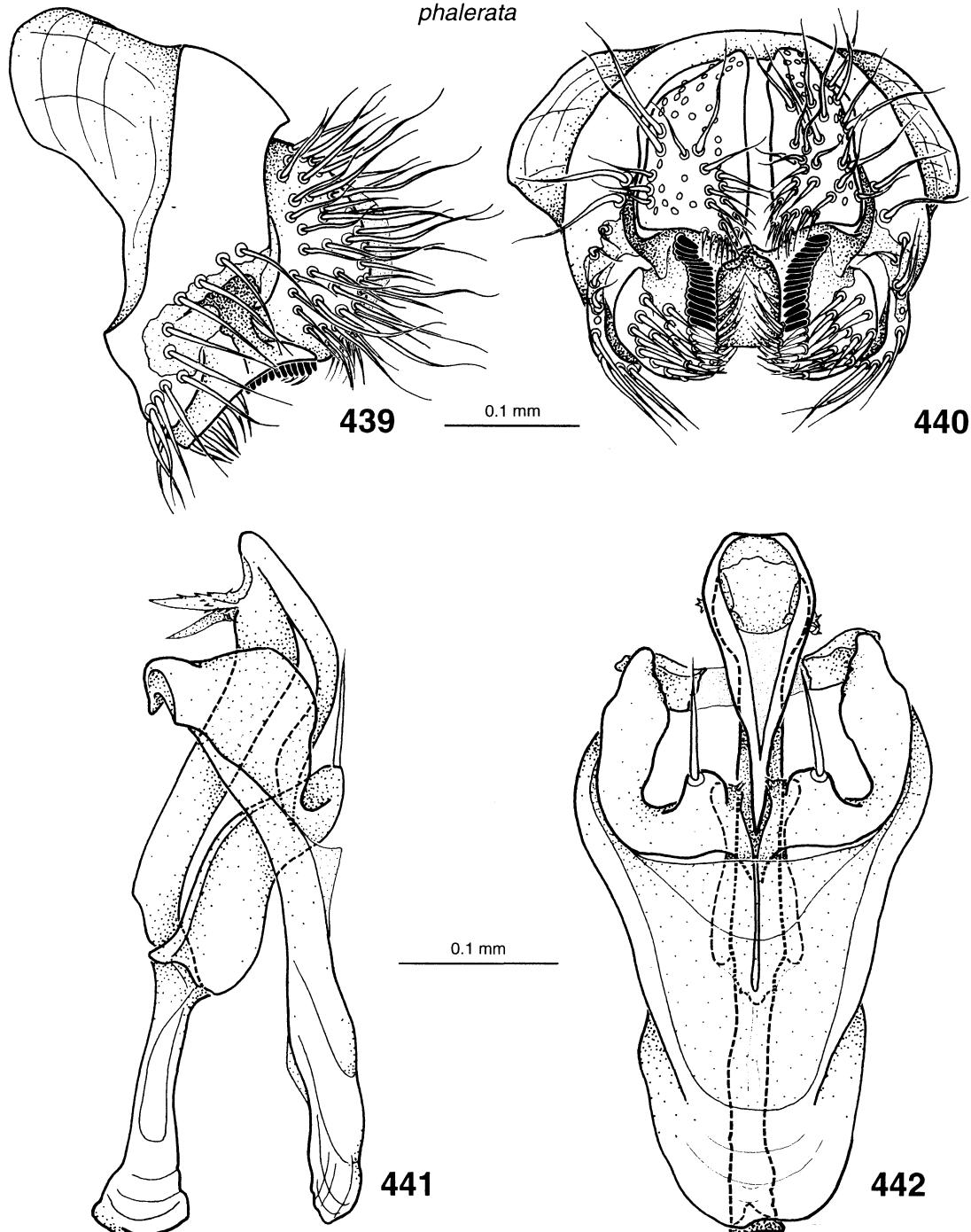
Thorax length 1.17 (1.07-1.22) mm. Scutum brownish-yellow, shining, slightly brownish towards scutellum, 6(-8) rows of acrostichal setulae. h index = 0.83 (0.75-0.92). Transverse distance of dorsocentral setae 173-220% of longitudinal distance; dc index = 0.62 (0.52-0.70). Scutellum less shining than scutum, distance between apical scutellar setae about 100-122% of

that between apical and basal one, basal setae slightly divergent; scut index = 1.00 (0.96-1.03). Pleura pale yellow, slightly shining, sterno index 0.55 (0.48-0.60), median katepisternal seta about 31-58% of anterior one. Haltere yellow. Legs yellow, protarsomere 1 ventrally covered with elongated setulae, preapical setae on all tibiae, apical seta on mesotibia.

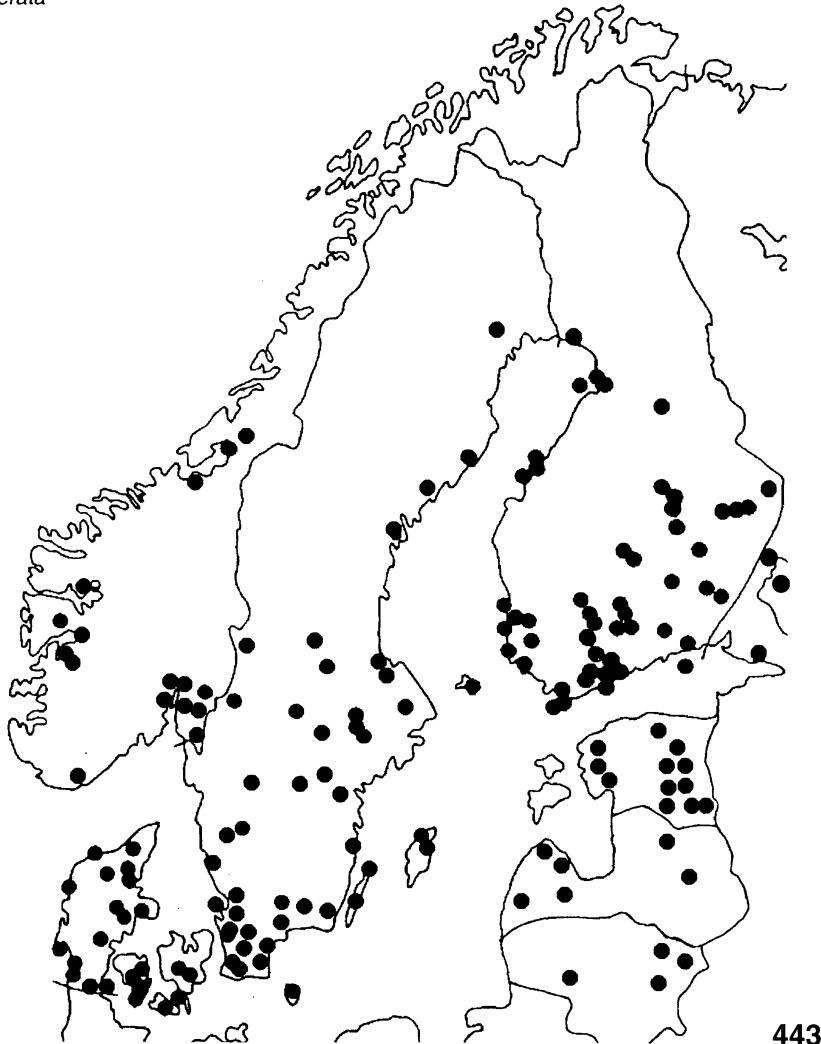
Wing hyaline, veins yellow, but both cross-veins brown and narrowly shadowed, length 2.74 (2.48-2.83) mm, length to width ratio = 2.17 (2.13-2.25). Indices: C = 3.43 (3.24-3.73), ac = 2.07 (1.75-2.29), hb = 0.45 (0.40-0.50), 4C = 0.71 (0.67-0.77), 4v = 1.58 (1.50-1.68), 5x = 1.18 (1.00-1.38), M = 0.42 (0.35-0.50), prox. x = 0.53 (0.46-0.59).

Abdomen (Fig. 378) yellow, shining; tergites 2-4 each with 4 partially isolated or narrowly connected, brown, more or less triangular spots which are darker and larger towards tip of abdomen, paramedian spots larger than lateral ones, ventral margins of tergites also with a narrow patch; tergite 5 with a large triangular spot, tergite 6 completely dark. Tergites 5 and 6 together form a very dark brownish abdominal tip. Size of spots variable, lateral pairs more or less connected by a band along hind margin of tergite.

♂ Terminalia (Figs 439-442). Epandrium not microtrichose, with 11 lower setae in a sinuate row, and no upper setae; ventral lobe narrow, dorsally membranous, neither microtrichose nor covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstyli not microtrichose, dorsoproximally strongly sclerotised, dorsodistally slightly membranous, with a convex row of ca. 15 high-positioned, peg-like prensisetae, ca. 11 thin inner, and 18 thicker outer setae arranged in about 3 irregular rows along lateral margin. Decasternum as in Fig. 440. Hypandrium longer than epandrium, anterior margin convex; posterior hypandrial process absent, dorsal arch present, more or less straight; gonopod linked to paraphysis by membranous tissue, with one strong seta near median inner margin. Aedeagus fused to aedeagal apodeme, slightly sinuate distally; subdistally with a pair of long, dorsally projecting processes which are covered with tiny scales, ventrodistally with a long, weakly sclerotised, sharp, anteriorly pointed, slightly sinuate process, and apically partially encircled by para-



Figs. 439-442. *Drosophila phalerata* Meigen. 439: epandrium, cerci, and surstyli, left lateral view; 440: idem, plus decasternum, posterior view; 441: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 442: idem, posterior view.



443

Fig. 443. Known distribution pattern of *Drosophila phalerata* Meigen in Scandinavia.

physes. Aedeagal apodeme shorter than aedeagus, rod-shaped, anteriorly expanded dorsoventrally. Ventral rod vestigial. Paraphysis linked both to distal margin of aedeagal apodeme, and to gonopod, by membranous tissue, distally with 2 setulae near dorsal margin.

♀. Differences from male: Protarsomere 1 normal. Abdominal spots (Fig. 379) not larger towards tip of abdomen. Tergite 5 with a small triangular spot, tergite 6 usually yellow; tip of abdomen therefore rather light.

Measurements: Frontal length 0.33 (0.32-0.34) mm, frontal index = 0.78 (0.76-0.83), top

to bottom width ratio = 1.29 (1.24-1.38). Frontal triangle about 74-85% of frontal length; ocellar triangle about 40-47% of frontal length. Orbital plates about 74-84% of frontal length. Distance of or3 to or1 = 50-56% of or3 to vtm, or1 / or3 ratio = 0.74 (0.69-0.80), or2 / or1 ratio = 0.39 (0.31-0.45), postocellar setae = 72 (65-79)%, ocellar setae = 90 (74-95)% of frontal length; vibrissal index = 0.51 (0.46-0.62). Cheek index about 6-7. Eye index = 1.20 (1.15-1.27). Thorax length 1.31 (1.21-1.43) mm. h index = 0.84 (0.81-0.88). Transverse distance of dorsocentral setae 179-208% of longitudinal distance;

dc index = 0.67 (0.65-0.72), distance between apical scutellar setae about 100-109% of that between apical and basal one; scut index = 0.99 (0.94-1.07), sterno index = 0.64 (0.59-0.69), median katepisternal seta about 47-56% of anterior one. Wing length 3.12 (2.97-3.22) mm, length to width ratio = 2.19 (2.17-2.24). Indices: C = 3.48 (3.26-4.13), ac = 2.10 (2.00-2.38), hb = 0.46 (0.44-0.53), 4C = 0.69 (0.59-0.76), 4v = 1.51 (1.42-1.60), 5x = 1.12 (1.10-1.20), M = 0.42 (0.38-0.44), prox. x = 0.53 (0.46-0.56).

♀ Terminalia (Fig. 432). Tergite 8 not as long as in *D. histrio*, ca. 3x longer than wide at dorsal connection with epiproct, submedially with a pair of fused and strongly sclerotised perineal plates between hypoproct and valves of oviscapts, ventrally with ca. 6 setulae medially. Valve of oviscapts distally rounded, ventrally slightly convex, with 5-7 discal and 18-20 marginal, peg-like, roundish-tipped, outer ovisensilla, except for the five most anterior ones, which are trichoid-like; inner, trichoid-like ovisensilla: 3 thin, distally positioned, and 1 short, straight, subterminal.

Distribution. – (Fig. 443). A widespread Palaearctic species, also recorded from North Africa and the Near East; common in all the Scandinavian countries, northwestern Russia and all the Baltic countries; northernmost locality: Balsfjord (Norway).

Biology. – The larvae are fungus-breeders.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Zürich, 1974), 4 ♀♀ (SWITZERLAND: Aargau, 1973).

Drosophila transversa Fallén, 1823

(Figs 374, 375, 444-447)

Drosophila transversa Fallén, 1823: 6.

Drosophila subquinaria Spencer, 1942: 59 (subspecies).

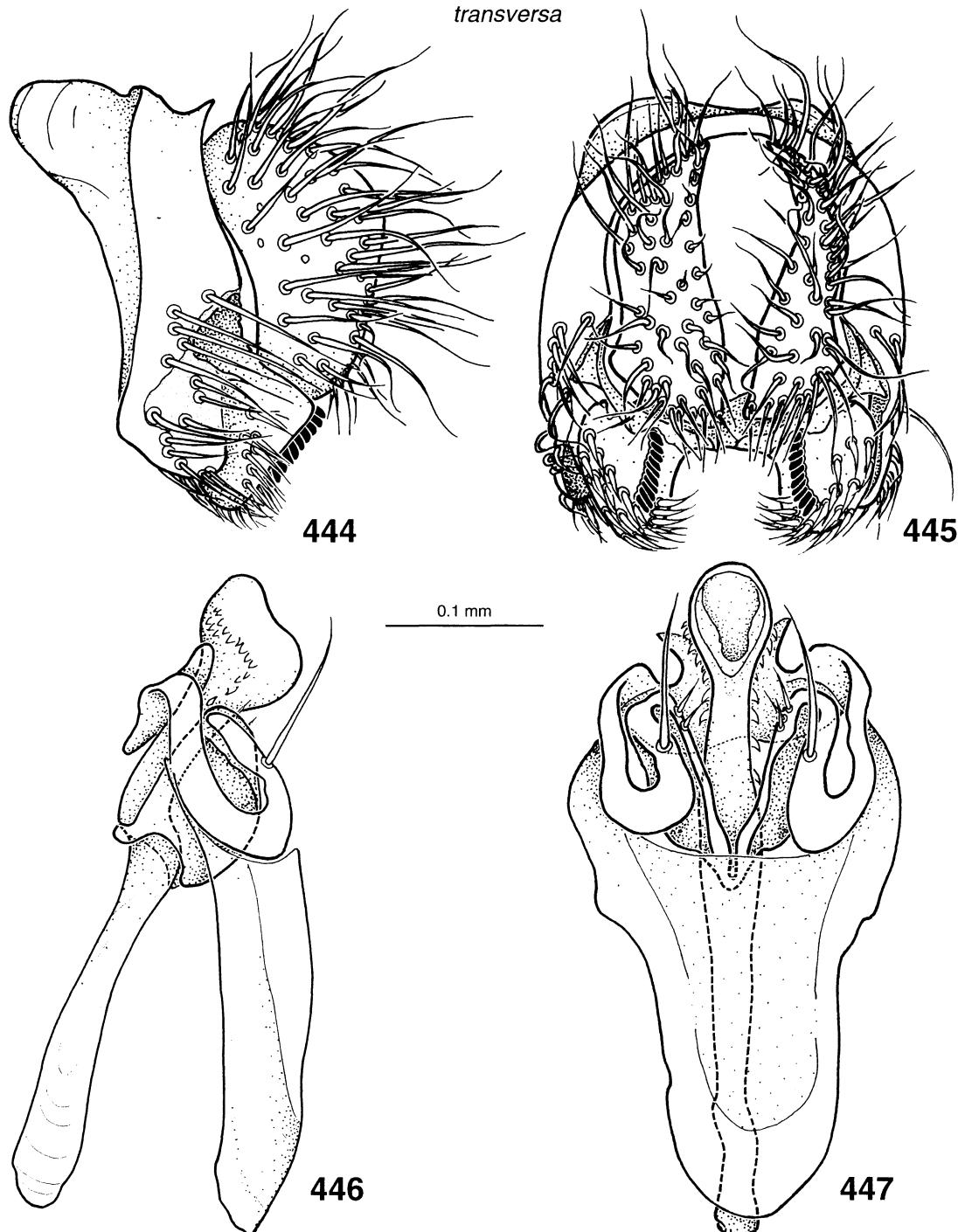
Diagnosis. – Tergites with laterally completely interrupted bands, forming isolated triangular spots; surstylus laterally with about 7 short, outer setae in about 2 irregular rows; aedeagus distally expanded, laterally covered with scales, which marginally look like saws in posterior view; oviscapts valve narrow, dorsomedially not expanded dorsad.

Redescription. – ♂. Head. Frons brownish-yellow, somewhat dull, frontal length 0.28 (0.25-0.29) mm, frontal index = 0.72 (0.71-0.74), top to bottom width ratio = 1.21 (1.17-1.24). Frontal triangle paler yellow, 76-82% of frontal length; ocellar triangle slightly darker between ocelli, somewhat prominent, about 32-33% of frontal length. Frontal vittae somewhat darker brownish. Orbital plates narrow, somewhat darker, shining, slightly diverging from eye margin, about 76-80% of frontal length. Orbital setae blackish, distance of or3 to or1 = 57-83% of or3 to vtm, or1 / or3 ratio = 0.70 (0.67-0.73), or2 / or1 ratio = 0.40 (0.36-0.44), postocellar setae = 68 (65-71)%; ocellar setae = 98 (94-100)% of frontal length; vibrissal index = 0.77 (0.69-0.90). Face pale yellowish. Carina distinct, nose-like, narrow, slightly broader below. Cheek index about 4-6. Eye index = 1.20 (1.19-1.20). Occiput brown with yellowish margin. Antennae yellowish. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 4 dorsal, 2 ventral, and about 5-6 inner branches, plus terminal fork. Proboscis yellow. Palpus with about 5 fine setae and several fine setulae.

Thorax. Length 1.02 (0.93-1.16) mm. Scutum brownish-yellow, shining, 6 rows of acrostichal setulae. h index = 0.66 (0.60-0.73). Transverse distance of dorsocentral setae 155-200% of longitudinal distance; dc index = 0.64 (0.62-0.70). Scutellum less shining than scutum, distance between apical scutellar setae about 100-122% of that between apical and basal ones; basal setae slightly divergent; scut index = 1.00 (0.96-1.04). Pleura pale yellow, slightly shining, sterno index 0.59 (0.52-0.63), median katepisternal seta 47-67% of anterior one. Haltere yellow. Legs yellow, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins yellow, but both cross-veins brown and distinctly shadowed, length 2.44 (2.17-2.73) mm, length to width ratio = 2.28 (2.14-2.36). Indices: C = 3.33 (2.93-3.71), ac = 2.16 (1.86-2.33), hb = 0.59 (0.56-0.64), 4C = 0.84 (0.76-1.00), 4v = 1.86 (1.68-2.14), 5x = 1.21 (1.00-1.50), M = 0.50 (0.42-0.64), prox. x = 0.74 (0.71-0.79).

Abdomen (Fig. 374) yellow, shining; tergites 2-5 each with 4 isolated, brown, more or less triangular spots which are darker and larger towards tip of abdomen, i.e. tip of abdomen darkened, paramedian spots larger than lateral ones, ventral margins of tergites also with a narrow



Figs. 444-447. *Drosophila transversa* Fallén. 444: epandrium, cerci, and surstyli, left lateral view; 445: idem, plus decasternum, posterior view; 446: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 447: idem, posterior view.

patch; tergite 6 with large paramedian spots and very small lateral ones. Size of spots variable, but neither touching nor confluent with neighbouring spots.

♂ Terminalia (Figs 444-447). Epandrium not microtrichose, with 18 lower setae, and no upper setae; ventral lobe narrow, dorsally membranous, neither microtrichose nor covering surstylos. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, dorsoproximally more sclerotised, with a slightly convex row of ca. 10 peg-like prensisetae, ca. 9 inner and 11 outer setae arranged in 2 lateral rows. Decasternum as in Fig. 445. Hypandrium longer than epandrium, anterior margin convex; posterior hypandrial process absent, dorsal arch well-developed, distally slightly bifurcate; gonopod linked to paraphysis by membranous tissue, with one strong seta near median inner margin. Aedeagus fused to aedeagal apodeme, short, distally expanded, laterally covered with scales, which marginally look like saws in ventral view. Aedeagal apodeme longer than aedeagus, rod-shaped. Ventral rod absent. Paraphysis linked both to distal margin of aedeagal apodeme and to gonopod by membranous tissue, anteriorly expanded and distally with ca. 2 setulae near dorsal margin.

♀. Differences from male: Abdominal spots (Fig. 375) not larger towards tip of abdomen, i.e. tip of abdomen not darkened.

Measurements: Frontal length 0.28 (0.25-0.31) mm, frontal index = 0.71 (0.67-0.74), top to bottom width ratio = 1.23 (1.14-1.39). Frontal triangle 73-83% of frontal length; ocellar triangle 35-43% of frontal length. Orbital plates 69-81% of frontal length. Distance of or3 to or1 = 50-57% of or3 to vtm, or1 / or3 ratio = 0.66 (0.60-0.71), or2 / or1 ratio = 0.45 (0.40-0.50), postocellar setae = 72 (65-81%), ocellar setae = 104 (100-112)% of frontal length; vibrissal index = 0.84 (0.77-0.91). Cheek index 4-5. Eye index = 1.18 (1.13-1.24). Arista with 4-6 dorsal, 2-3 ventral and about 7-8 small inner branches, plus terminal fork. Thorax length 1.14 (1.02-1.29) mm. h index = 0.63 (0.53-0.69). Transverse distance of dorsocentral setae 175-211% of longitudinal distance; dc index = 0.66 (0.62-0.69), distance between apical scutellar setae 100-110% of that between apical and basal one; scut index = 1.02 (0.97-1.08), sterno index = 0.60 (0.55-0.64), median katepisternal

seta 32-67% of anterior one. Wing length 2.67 (2.31-2.87) mm, length to width ratio = 2.28 (2.24-2.31). Indices: C = 3.21 (2.88-3.50), ac = 2.35 (2.29-2.43), hb = 0.59 (0.53-0.65), 4C = 0.83 (0.73-0.89), 4v = 1.79 (1.59-1.94), 5x = 1.14 (1.00-1.33). M = 0.45 (0.41-0.50), prox. x = 0.68 (0.64-0.70).

♀ Terminalia (Fig. 433). Valve of oviscapt narrow, apically rounded, ventrally convex, not expanded dorsad, with ca. 4 discal and 17-18 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 short, straight, subterminal.

Distribution. – A widespread Holarctic species, abundant in northern areas, less so in southern areas where it is more abundant in the mountains, suggesting a boreo-alpine distribution type; recorded in all the Scandinavian and Baltic countries; northernmost locality: Alta (Norway).

Biology. – The larvae are mushroom feeders.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: St. Gallen, 2 ♂♂, 1973; Zürich, 2 ♂♂, 1974), 4 ♀♀ (SWITZERLAND: Glarus, 2 ♀♀, 1974; Neuchâtel, 1 ♀, 1974; Schwyz, 1 ♀, 1975).

repleta species group

Sturtevant, 1942

Diagnosis. – Carina prominent, more or less grooved longitudinally; arista with 6 to 9 branches; mesonotum pale greyish, each seta arising from a dark spot, these spots may be indistinct or more or less confluent; prescutellar seta sometimes slightly enlarged; costal index from 2.5 to 3.5; anterior spiracles usually more than 1/4 length of puparium; hypandrium without dorsal arch.

Taxa included. – This is the largest species group in the subgenus *Drosophila*, with about 100 described species (Wasserman, 1982; Vilela, 1983). Six subgroups are recognised. *Drosophila hydei* and *D. repleta* are cosmopolitan species; in addition, populations of *D. buzzatii* Patterson and Wheeler, 1942, have become established in many areas with prickly pears (particularly *Opuntia ficus-indica* (L.) Mill; Cactaceae), and *D. mercatorum* Patterson and Wheeler, 1942,

seems to have been accidentally introduced into the Mediterranean countries with the transport of fruit.

Comments. – Most species of the *repleta* group are endemic to the Nearctic and Neotropical regions. The group evidently originated in this region and many species are adapted to particular ecological conditions. *D. hydei* and *D. repleta* are ecological generalists and have become cosmopolitan.

Drosophila hydei Sturtevant, 1921

(Figs 326, 327, 329, 410, 448-452)

Drosophila marmorata Hutton, 1901: 91 (suppressed).

Drosophila hydei Sturtevant, 1921: 101.

Drosophila yucatanensis Spencer, 1940: 160 (subspecies).

Drosophila setosa Dobzhansky & Pavan, 1943: 46.

Diagnosis. – Lateral areas of posterolateral abdominal bands with diffuse pale areas only; male protarsus with prominent, fine setae on inner side; tip of costal section C-I pale.

Redescription. – ♂. Head. Frons partly yellowish, with dark brown patches and stripes, dull, frontal length 0.36 (0.32-0.45) mm; frontal index = 0.86 (0.79-1.00), top to bottom width ratio = 1.23 (1.16-1.32). Frontal triangle narrow, pale brown, as long as frons, ocellar triangle almost completely dark brown, about 42-48% of frontal length. Frontal vittae dark brown. Orbital plates broad, yellowish, with dark brown spots around or3 and vtm and vtl, about 77-85% of frontal length. Orbital setae black, or2 slightly outside and behind or1, distance of or3 to or1 = 50-86% of or3 to vtm, or1 / or3 ratio = 0.85 (0.79-0.87), or2 / or1 ratio = 0.63 (0.58-0.67), postocellar setae = 53 (50-56)%, ocellar setae = 76 (72-85)% of frontal length; vibrissal index = 0.56 (0.50-0.63). Face yellowish. Carina brownish-yellow, prominent, nose-like, broadened downwards, longitudinally grooved dorsally. Cheek index about 4.5. Eye index = 1.17 (1.13-1.19). Occiput dark brown, narrowly yellow along eye margins. Pedicel yellowish with a large brown spot dorsally. Flagellomere 1 pale brown. Arista with 3-4 dorsal, 2 ventral, and

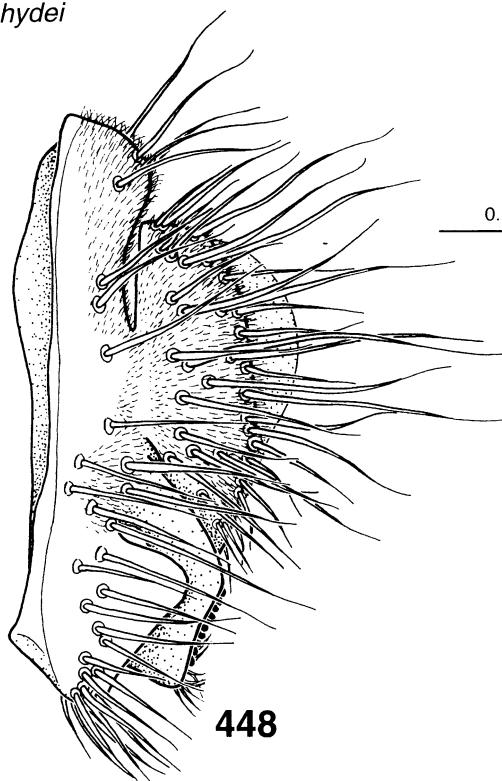
about 6 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus brown, with about 3 small setae and several setulae.

Thorax (Fig. 326) length 1.27 (1.12-1.39) mm. Scutum with a characteristic pattern of dark, partially confluent brown spots arranged more or less around bases of setae on a greyish and yellowish microtrichosity. This pattern is not easy to see in specimens stored in fluid. 6-8 rows of acrostichal setulae. h index = 1.06 (1.00-1.14), Transverse distance of dorsocentral setae 208-236% of longitudinal distance; dc index = 0.67 (0.63-0.70). Prescutellar setae elongated, length about 20% of anterior scutellar setae. Scutellum dark brown, subshining, with small yellowish areas between scutellar setae, distance between apical scutellar setae about 67-85% of that between apical and basal one, basal setae slightly convergent; scut index = 0.80 (0.78-0.85). Pleura partly yellowish, predominantly brown, subshining, sterno index = 0.82 (0.78-0.83), median katepisternal seta about 26-33% of anterior one. Haltere brownish-yellow. Legs yellowish-brown, protarsus (Fig. 327) with long, fine, sigmoid setae on anteroventral side, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, all veins yellowish, length 2.60 (2.41-2.80) mm, length to width ratio = 2.10 (2.06-2.17). Indices: C = 3.25 (2.82-3.53), ac = 2.04 (1.75-2.29), hb = 0.48 (0.44-0.53), 4C = 0.81 (0.75-0.89), 4v = 1.72 (1.62-1.88), 5x = 1.11 (1.00-1.29), M = 0.46 (0.40-0.53), prox. x = 0.80 (0.76-0.84).

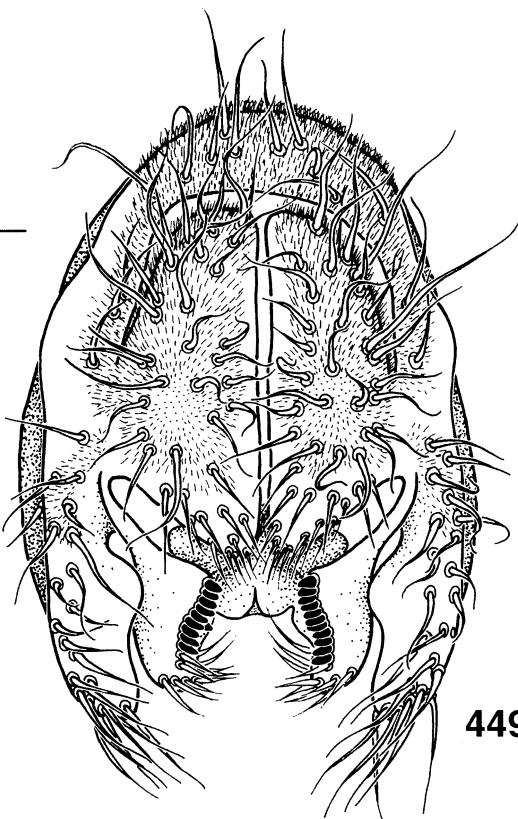
Abdomen (Fig. 329) yellowish, tergites 2-6 with a characteristic dark brown, marginal band, which is broad besides median yellow stripe, then narrowed laterally but broadened again, reaching anterior margin of tergite; in the dark lateroventral area a small oblique yellowish area sometimes present.

♂ Terminalia (Figs 448-451). Epandrium narrow, distally microtrichose, with ca. 22 lower and 9 upper setae; ventral lobe not microtrichose, dorsally expanded and partially covering surstylos. Cercus anteriorly fused to epandrium, mostly microtrichose, without ventral lobe. Surstylos not microtrichose, with a slightly concave row of ca. 11 peg-like prensisetae, ca. 8 inner and 2 outer setae. Decasternum as in Fig. 449. Hypandrium shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod linked

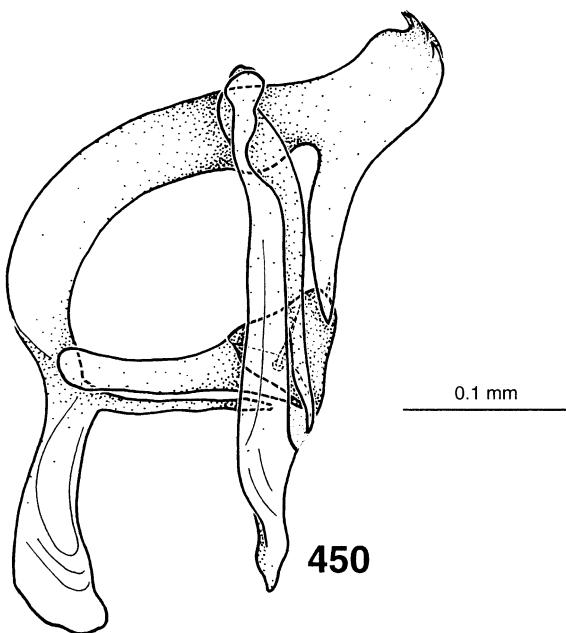


448

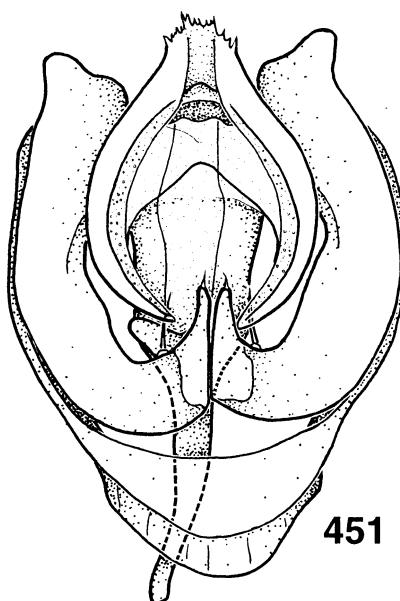
0.1 mm



449



450



451

Figs. 448-451. *Drosophila hydei* Sturtevant. 448: epandrium, cerci, and surstyli, left lateral view; 449: idem, plus decasternum, posterior view; 450: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 451: idem, posterior view.



452

Fig. 452. Known distribution pattern of *Drosophila hydei* Sturtevant in Scandinavia.

to paraphysis by membranous tissue, with one seta anteriorly near inner margin. Aedeagus fused to aedeagal apodeme, strongly bent, dorsoapically serrate, subapically with a pair of long, ventrally directed processes which converge at tip, and distally slightly encircle paraphyses. Aedeagal apodeme half as long as aedeagus anteriorly expanded dorsoventrally, laterally flattened. Ventral rod long, 4x as long as width of adjacent aedeagal apodeme. Paraphysis anteriorly narrow, apically expanded and linked both to distal margin of aedeagal apodeme and

to gonopod by membranous tissue, distally with 1 setula near dorsal margin.

♀. Differences from male: protarsus only with normal setae.

Measurements: Frontal length 0.39 (0.37-0.41) mm; frontal index = 0.82 (0.79-0.89), top to bottom width ratio = 1.19 (1.15-1.22). Ocellar triangle about 42-45% of frontal length. Orbital plates about 74-82% of frontal length. Distance of or3 to or1 = 60-87% of or3 to vtm, or1 / or3 ratio = 0.86 (0.82-0.93), or2 / or1 ratio = 0.57 (0.50-0.62), postocellar setae = 58(54-64)%,

ocellar setae = 75 (61-82)% of frontal length; vibrissal index = 0.52 (0.47-0.59). Cheek index about 4-5. Eye index = 1.15 (1.10-1.20). Thorax length 1.41 (1.31-1.46) mm. h index = 1.11 (1.00-1.15). Transverse distance of dorsocentral setae 186-225% of longitudinal distance; dc index = 0.70 (0.67-0.72). Distance between apical scutellar setae about 65-79% of that between apical and basal one; scut index = 0.82 (0.79-0.84), sterno index = 0.79 (0.75-0.85), median katepisternal seta about 32-38% of anterior one. Wing length 2.84 (2.76-2.91) mm, length to width ratio = 2.13 (2.10-2.16). Indices: C = 3.30 (3.00-3.60), ac = 1.87 (1.67-2.13), hb = 0.51 (0.41-0.65), 4C = 0.79 (0.71-0.85), 4v = 1.68 (1.52-1.80), 5x = 1.03 (0.89-1.25), M = 0.42 (0.38-0.48), prox. x = 0.78 (0.71-0.85).

♀ Terminalia (Fig. 410). Valve of oviscaptriangular, apically rounded, ventrally convex, with ca. 4 discal, and ca. 16 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal.

Distribution. – (Fig. 452). A cosmopolitan, domestic species, more common in warmer areas. Recorded all over Scandinavia and the Baltic countries, but mostly indoors.

Biology. – The larvae are predominantly fruit breeders.

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Valais, 2 ♂♂, 1977; Zürich, 1 ♂, 1986. SERBIA AND MONTENEGRO: Popovica, 1 ♂, 1980; Goč 1 ♂, 1980), 3 ♀♀ (SWITZERLAND: Zürich, 1986).

Drosophila repleta Wollaston, 1858

(Figs 328, 333, 411, 453-456)

Drosophila repleta Wollaston, 1858: 117.

Drosophila punctulata Loew, 1862: 232.

Drosophila adspersa Mik, 1886: 328.

Drosophila nigropunctata van der Wulp, 1892: 216.

Drosophila maculiventris van der Wulp, 1897: 142.

Drosophila pygmaea Duda, 1927: 125 (preocc.).

Drosophila melanopalpa Patterson & Wheeler, 1942: 77.

Drosophila betari Dobzhansky & Pavan, 1943: 48.

Drosophila austrorepleta Dobzhansky & Pavan, 1943: 50.

Drosophila brunneipalpa Dobzhansky & Pavan, 1943: 53.

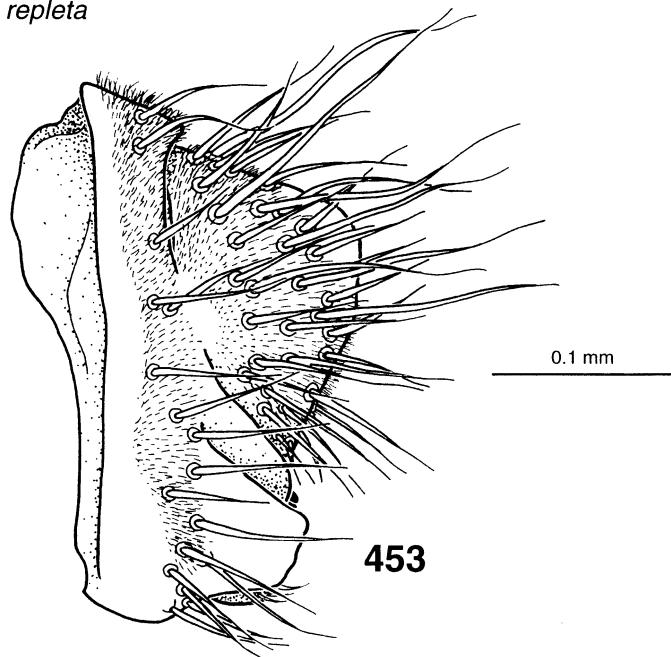
Drosophila pumiliaris Wheeler, 1981: 48 (subspecies).

Diagnosis. – Lateral areas of abdominal bands with large, distinct pale areas; male fore tarsus without prominent setae on inner side; tip of costal section C-I black; spermathecal capsule long, subdistally slightly angular, apically blunt.

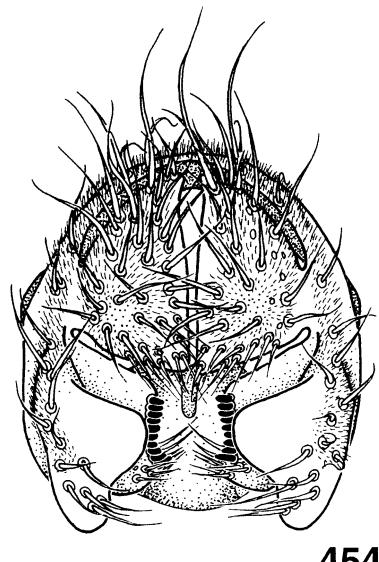
Redescription. – ♂. Head. Frons partly yellowish, with dark brown patches and stripes, dull, frontal length 0.41 (0.39-0.49) mm; frontal index = 0.99 (0.92-1.09), top to bottom width ratio = 1.30 (1.27-1.36). Frontal triangle narrow, pale brown, as long as frons, ocellar triangle almost completely dark brown, about 52-57% of frontal length. Frontal vittae dark brown. Orbital plates broad, yellowish, with dark brown spots around or₃ and vtm and vtl, about 75-91% of frontal length. Orbital setae black, or₂ slightly outside and behind or₁, distance of or₃ to or₁ = 70-78% of or₃ to vtm, or₁ / or₃ ratio = 0.93 (0.81-1.00), or₂ / or₁ ratio = 0.54 (0.46-0.57), postocellar setae = 51 (46-57)%; ocellar setae = 70 (63-78)% of frontal length; vibrissal index = 0.52 (0.40-0.62). Face yellowish. Carina brown, prominent, nose-like, broadened downwards, dorsally slightly grooved longitudinally. Cheek index about 5-7. Eye index = 1.16 (1.11-1.19). Occiput dark brown, narrowly yellow along eye margins. Pedicel yellowish with a large brown spot dorsally. Flagellomere 1 pale brown. Arista with 3-4 dorsal, 2 ventral, and about 7 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus brown, with about 3 small setae and several setulae.

Thorax length 1.37 (1.27-1.50) mm. Scutum with a characteristic pattern of dark brown, partly confluent spots around bases of most setae and setulae on a greyish and yellowish, microtrichose ground-colour. This pattern is not easy to see in specimens stored in fluid. 8 rows of acrostichal setulae. h index = 1.06 (0.93-1.15), Transverse distance of dorsocentral setae 177-225% of longitudinal distance; dc index = 0.66 (0.59-0.69). Prescutellar setae elongated, length about 39% of anterior scutellar setae. Scutel-

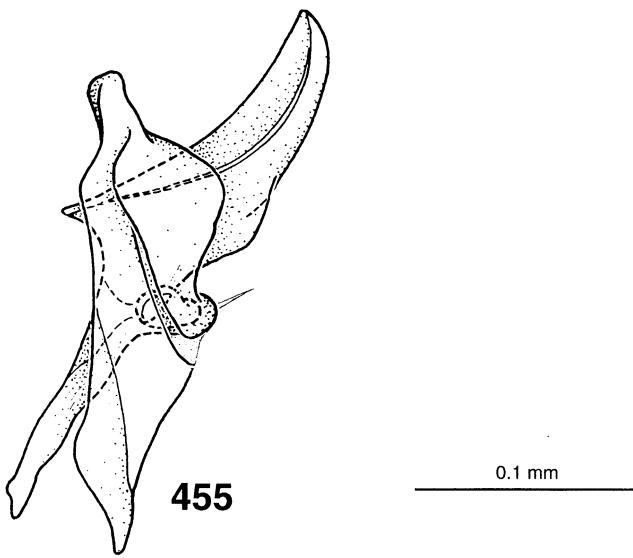
repleta



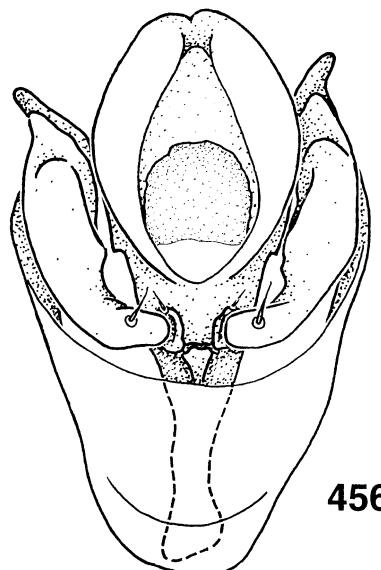
453



454



455



456

Figs. 453-456. *Drosophila repleta* Wollaston. 453: epandrium, cerci, and surstyli, left lateral view; 454: idem, plus decasternum, posterior view; 455: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 456: idem, posterior view.

lum dark brown, subshining, with small yellowish areas between scutellar setae, distance between apical scutellar setae about 79-86% of that between apical and basal one, basal setae slightly convergent; scut index = 0.72 (0.61-0.78). Pleura partly yellowish, predominantly brown, subshining, sterno index = 0.81 (0.78-0.86), median katepisternal seta about 33-42% of anterior one. Haltere brownish-yellow. Legs yellowish-brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 328) hyaline, all veins yellowish but apex of C-I blackish, length 2.81 (2.66-3.04) mm, length to width ratio = 2.10 (2.03-2.18). Indices: C = 3.12 (2.89-3.41), ac = 2.24 (2.13-2.38), hb = 0.40 (0.32-0.47), 4C = 0.82 (0.77-0.86), 4v = 1.69 (1.64-1.77), 5x = 1.27 (1.10-1.38), M = 0.51 (0.47-0.55), prox. x = 0.79 (0.68-0.85).

Abdomen (Fig. 333) yellowish, tergites 2-6 with a characteristic dark brown marginal band, broad adjacent to a median yellow stripe, then narrowed laterally but broadened again, reaching anterior margin of tergite; in dark lateroventral area an oblique yellowish area of variable size present.

♂ Terminalia (Figs 453-456). Epandrium distally microtrichose, with ca. 12 lower and 5 upper setae; ventral lobe dorsally broad, ventrally narrow, medially microtrichose, partially covering surstylos. Cercus anteriorly fused to epandrium, mostly microtrichose, without ventral lobe. Surstylus not microtrichose, with a slightly concave row of ca. 10 peg-like prensisetae, ca. 6 inner and 4 outer setae. Decasternum as in Fig. 454. Hypandrium shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod linked to paraphysis by membranous tissue, with one seta anteriorly near inner margin. Aedeagus fused to aedeagal apodeme, dorsoventrally flattened, slipper-shaped in lateral view, mediolaterally with a fusion line along its length, antero-lateral margin of dorsal cleft clearly projecting anterad. Aedeagal apodeme shorter than aedeagus, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme. Paraphysis linked both to ventrodistal margin of aedeagal apodeme and to gonopod by membranous tissue, medially with 1 setula near dorsal margin.

♀. Measurements: Frontal length 0.41 (0.37-0.44) mm; frontal index = 0.94 (0.92-0.96), top to bottom width ratio = 1.24 (1.19-1.28). Ocellar

triangle about 44-52% of frontal length. Orbital plates about 64-82% of frontal length. Distance of or3 to or1 = 60-78% of or3 to vtm, or1 / or3 ratio = 0.87 (0.81-0.93), or2 / or1 ratio = 0.65 (0.54-0.71), postocellar setae = 52 (48-59)%, ocellar setae = 69 (65-73)% of frontal length; vibrissal index = 0.55 (0.50-0.60). Cheek index about 4-6. Eye index = 1.18 (1.15-1.19). Thorax length 1.32 (1.10-1.43) mm. h index = 1.04 (1.00-1.08). Transverse distance of dorsocentral setae 178-230% of longitudinal distance; dc index = 0.69 (0.61-0.76). Distance between apical scutellar setae about 71-86% of that between apical and basal one; scut index = 0.82 (0.80-0.87), sterno index = 0.77 (0.73-0.80), median katepisternal seta about 30-42% of anterior one. Wing length 2.93 (2.48-3.12) mm, length to width ratio = 2.10 (2.07-2.15). Indices: C = 2.98 (2.85-3.11), ac = 2.25 (2.00-2.67), hb = 0.44 (0.38-0.50), 4C = 0.87 (0.82-0.94), 4v = 1.75 (1.64-2.00), 5x = 1.27 (1.13-1.38), M = 0.50 (0.45-0.53), prox. x = 0.82 (0.77-0.86).

♀ Terminalia (Fig. 411). Valve of oviscap triangular, apically rounded, ventrally slightly convex, with 4-5 discal, and 21-22 marginal, peg-like, roundish-tipped outer ovisensilla, except for the most anterior discal and marginal ones which are sharp: trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 short, curved, subterminal.

Distribution. – A cosmopolitan, domestic species, almost absent in cooler areas where the flies may be found only indoors. Northernmost locality: Raahe (Finland).

Biology. – The larvae have been found in decaying plant material and mushrooms; a “dirty” fly, common in stables and not very clean toilets, where they may become a nuisance.

Additional specimens examined. – 4 ♂♂ (BULGARIA: Varna, 1 ♂, 1985. FRANCE: Sailhans/Drôme, 1 ♂, 1988. SWITZERLAND: Zürich, 2 ♂♂, 1988), 4 ♀♀ (BULGARIA: Varna, 3 ♀♀, 1985. SPAIN: Mallorca, 1 ♀, 1986).

***robusta* species group**

Sturtevant, 1942

Diagnosis. – Large, dark flies; arista with about 9 branches; costal index about 4.0; ventral receptacle with about 35 loose coils; spermathecal

capsule vase-shaped and highly sclerotised; anterior spiracles about 2/5 length of puparium.

Taxa included. – 16 species placed in three subgroups, mostly described from the Nearctic region and East Asia. There is just one European species in this group, *Drosophila unimaculata* Strobl, 1893, which is absent in northern areas.

Comments. – The *melanica* and *robusta* species groups are closely related (Levitana, 1982; Watabe & Nakata, 1989). The flies are sap breeders and can be kept in cultures.

***testacea* species group**

Sturtevant, 1942

Diagnosis. – Yellowish or brownish flies; a pair of fine but long presutural acrostichal setulae; abdominal tergites with a dark marginal band; ventral receptacle with no minor coils.

Taxa included. – *Drosophila testacea* von Roser, 1840, *D. putrida* Sturtevant, 1921, *D. neotestacea* Grimaldi, James and Jaenike, 1992, *D. orientacea* Grimaldi, James and Jaenike, 1992.

***Drosophila testacea* von Roser, 1840**

(Figs 354, 358, 457-461, 464)

Drosophila testacea von Roser, 1840: 62.
Drosophila nigrithorax Strobl, 1894: 132.
Drosophila setosa Villeneuve, 1921: 160.

Diagnosis. – The group characters apply, but see the male terminalia. There is an impressive colour variability, from very pale to almost completely blackish specimens.

Redescription. – ♂. Head. Frons yellowish to dark brownish, dull, frontal length 0.24 (0.22-0.27) mm; frontal index = 0.78 (0.72-0.80), top to bottom width ratio = 1.20 (1.15-1.28). Frontal triangle brown, not very distinct, about 71-85% of frontal length; ocellar triangle dark brown, prominent, about 40-46% of frontal length. Frontal vittae golden-brown. Orbital plates dark brown, subshining, broad, prominent, apically slightly diverging from eye margin, about 79-86% of frontal length. Orbital setae black, or2 very small, distance of or3 to or1 = 57-71%

of or3 to vtm, or1 / or3 ratio = 0.73 (0.69-0.75), or2 / or1 ratio = 0.32 (0.25-0.38), postocellar setae = 69 (63-79)%, ocellar setae = 90 (81-100)% of frontal length; vibrissal index = 0.98 (0.88-1.00). Face brownish-yellow. Carina narrow, somewhat nose-like. Cheek index about 6-9. Eye index = 1.17 (1.13-1.20). Occiput dark brown. Pedicel yellowish. Flagellomere 1 brownish. Arista with 3-4 dorsal, 2 ventral, and about 5 small inner branches, plus terminal fork. Proboscis yellowish. Palpus with about 5 black setae and several pale setulae.

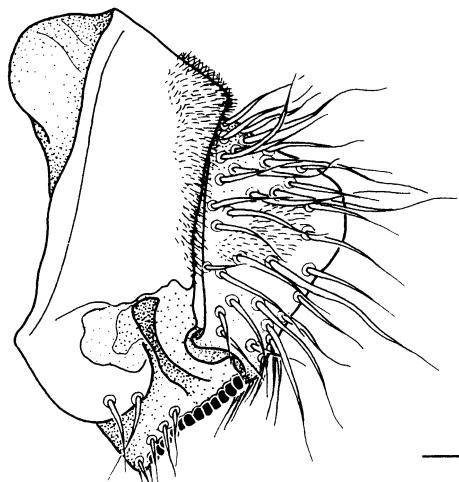
Thorax (Fig. 354) usually variable yellowish to brown, length 0.94 (0.88-1.00) mm. Scutum brownish, shining, darker towards scutellum, remarkably with a pair of fine, long, presutural setae; acrostichal setulae in 6 rows. h index = 0.59 (0.55-0.64). Transverse distance of dorsocentral setae 211-229% of longitudinal distance; dc index = 0.56 (0.55-0.57). Scutellum dark brown, distance between apical scutellar setae about 82-100% of that of apical to basal one, scut index = 0.93 (0.83-1.00). Pleura yellowish-brown, sterno index = 0.62 (0.47-1.00), median katepisternal seta about 44-60% of anterior one. Haltere pale yellow. Legs brownish-yellow, preapical setae on mesotibia and metatibia, apical seta on mesotibia.

Wing hyaline, veins brownish-yellow, both crossveins brown and slightly shadowed, length 2.60 (2.41-2.70) mm, length to width ratio = 2.20 (2.09-2.31). Indices: C = 2.90 (2.75-3.07), ac = 2.35 (2.14-2.50), hb = 0.37 (0.29-0.44), 4C = 0.76 (0.74-0.79), 4v = 1.56 (1.45-1.68), 5x = 1.35 (1.14-1.50), M = 0.43 (0.40-0.47), prox. x = 0.46 (0.42-0.50).

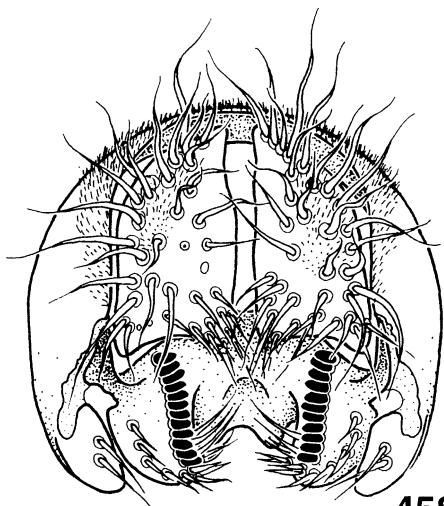
Abdomen (Fig. 355, 356) usually yellowish, shining, tergites 2-5 with dark brown lateral bands which increase in width apicad, usually slightly narrowed laterally but covering whole width ventrally. Tergites 5 and 6 often completely dark, forming a dark abdominal tip. In dark specimens, bands are broadened, leaving only small pale areas at base of tergites.

♂ Terminalia (Figs 547-560). Epandrium distally slightly microtrichose, with 2 lower and no upper setae; ventral lobe not microtrichose, dorsally membranous, roundish at tip, not covering surstyli. Cercus anteriorly linked to epandrium by membranous tissue, mostly microtrichose, without ventral lobe. Surstyli not microtrichose, dorsoanteriorly strongly sclerotised, with a straight row of ca. 11 peg-like prensisetae, ca.

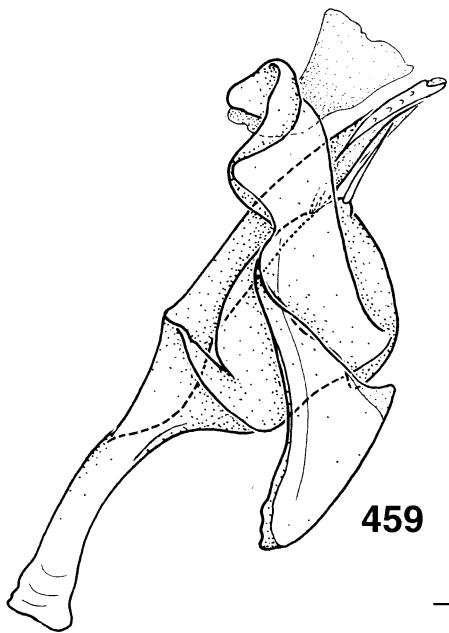
testacea



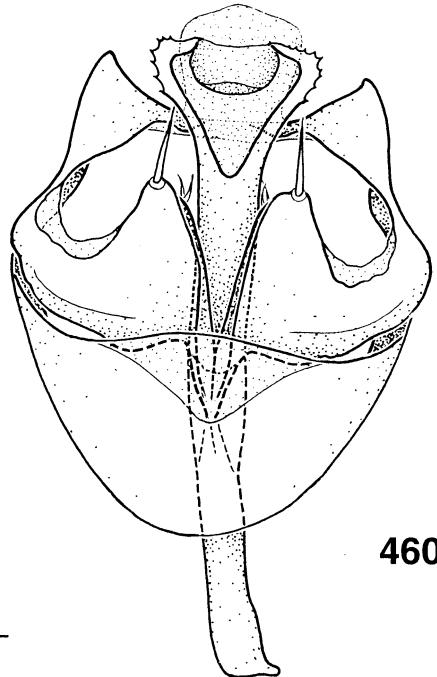
457



458



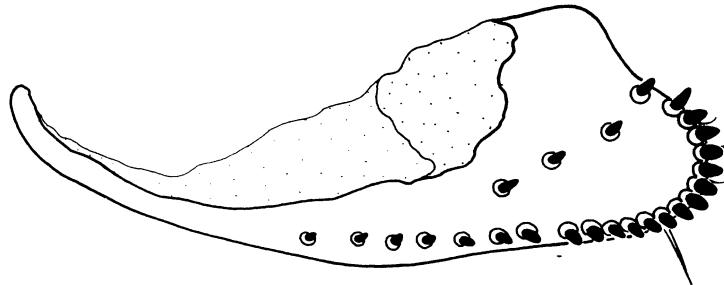
459



460

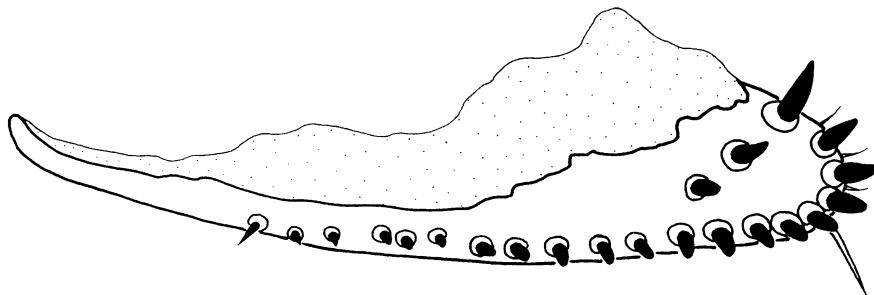
Figs. 457-460. *Drosophila testacea* von Roser. 457: epandrium, cerci, and surstyli, left lateral view; 458: idem, plus decasternum, posterior view; 459: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 460: idem, posterior view.

testacea



461

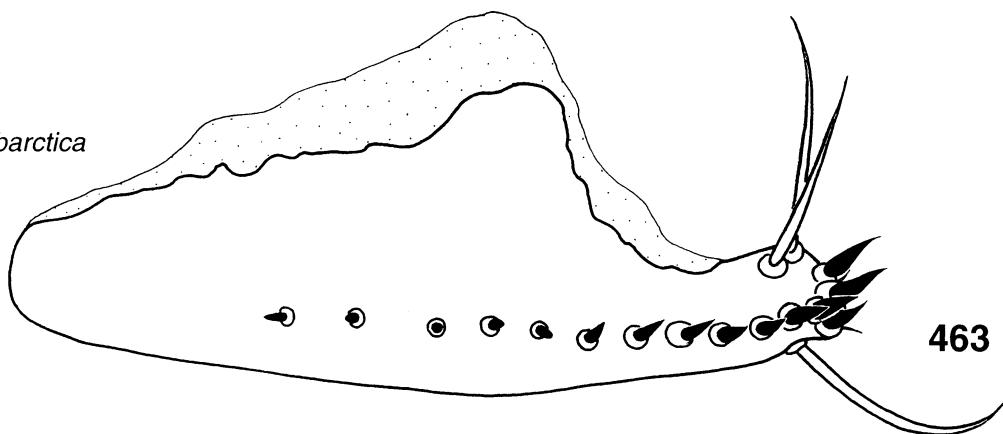
littoralis



462

0.1 mm

subarctica

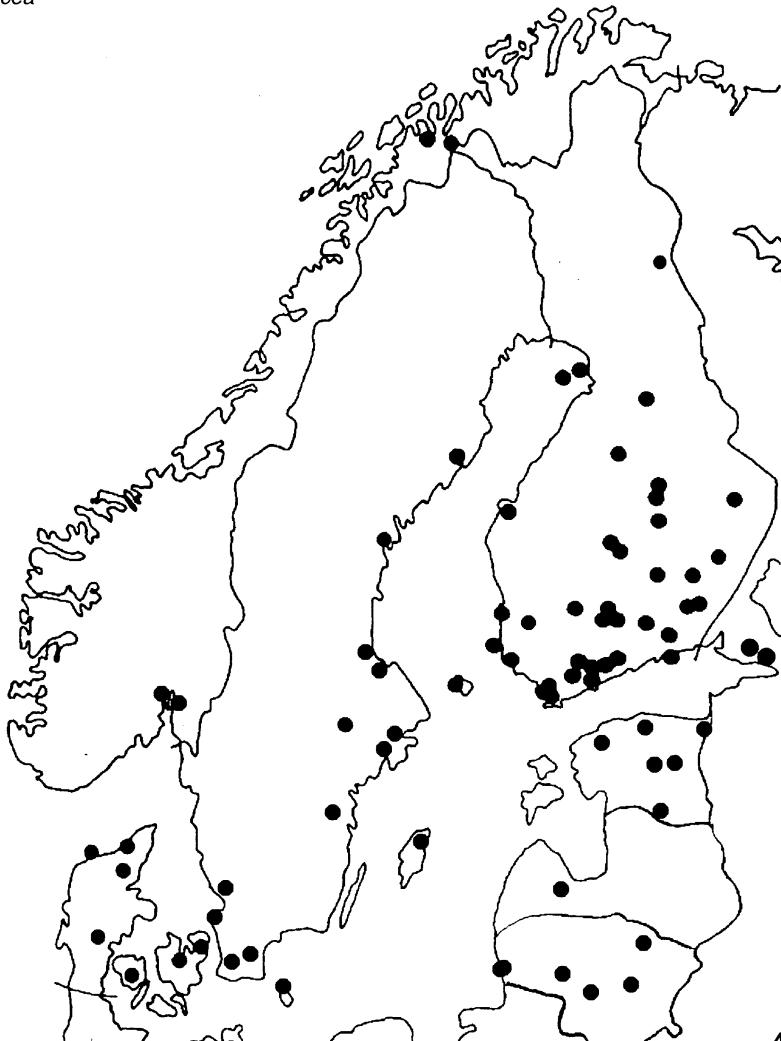


463

Figs. 461-463. Left oviscap valves, lateral view.

9 inner and 4 outer setae. Decasternum as in Fig. 542. Hypandrium as long as epandrium, anterior margin convex; posterior hypandrial process absent, dorsal arch present, medially membranous and projecting backwards; gonopod linked to paraphysis by membranous tissue, with one seta medially near inner margin. Aedeagus fused to aedeagal apodeme, straight, dorsoventrally flattened, becoming gradually flatter from submedian region on, laterally ex-

panded and marginally serrate apically, with acute corners, and more or less straight at tip in ventral view. Aedeagal apodeme slightly shorter than aedeagus, rod-shaped. Ventral rod shorter than width of adjacent aedeagal apodeme. Paraphysis relatively large, linked to gonopod by membranous tissue, distally with 2 setulae near dorsal margin, anteriorly expanded and connected to distal margin of aedeagal apodeme by membranous tissue.



464

Fig. 464. Known distribution pattern of *Drosophila testacea* von Roser in Scandinavia.

♀. Differences from male: Abdominal bands (Figs 357, 358) usually not increasing in width towards tip of abdomen, but rather decreasing, and also laterally and ventrally very narrow. In dark specimens, with only narrow pale areas at base of tergites.

Measurements: Frontal length 0.28 (0.27-0.29) mm; frontal index = 0.78 (0.76-0.80), top to bottom width ratio = 1.23 (1.14-1.30). Frontal triangle about 75-88% of frontal length; ocellar triangle about 44-50 % of frontal length. Orbital plates about 75-81% of frontal length. Distance

of or3 to or1 = 50-57% of or3 to vtm, or1 / or3 ratio = 0.71 (0.64-0.79), or2 / or1 ratio = 0.26 (0.22-0.33), postocellar setae = 67 (63-75)%; ocellar setae = 96 (94-100)% of frontal length; vibrissal index = 0.92 (0.80-1.17). Cheek index about 6-8. Eye index = 1.15 (1.12-1.17). Thorax length 1.05 (0.99-1.11) mm. h index = 0.60 (0.55-0.67). Transverse distance of dorsocentral setae 190-263% of longitudinal distance; dc index = 0.57 (0.48-0.64). Distance between apical scutellar setae about 82-92% of that between apical and basal one; scut index = 1.00

(0.98-1.01), sterno index = 0.62 (0.52-0.67), median katepisternal seta about 43-64% of anterior one. Wing length 2.60 (2.41-2.70) mm, length to width ratio = 2.22 (2.16-2.28). Indices: C = 3.32 (3.00-3.79), ac = 2.20 (2.00-2.43), hb = 0.31 (0.29-0.33), 4C = 0.69 (0.58-0.77), 4v = 1.52 (1.43-1.60), 5x = 1.22 (1.00-1.43), M = 0.42 (0.38-0.45), prox. x = 0.44 (0.39-0.50).

♀ Terminalia (Fig. 461). Valve of oviscapt apically rounded, subapically expanded dorsad, ventrally convex, with ca. 6 discal, and 17-19 marginal, peg-like, roundish-tipped outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, straight, subterminal.

Distribution. – (Fig. 464). A widespread Palaearctic species, also found in the Near East and East Asia. Recorded in all the Scandinavian and Baltic countries, northernmost locality: Ollila (Finland).

Biology. – The larvae are mushroom breeders and can be cultured on a malt medium, which suggests that, at least partly, they utilize microorganisms present on the decaying fungi.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Zürich, 1974), 4 ♀♀ (SWITZERLAND: Aargau, 1973).

Comments. – Because of its variability, *D. testacea* may be confused with species of the *quinaria* group.

***virilis* species group Patterson, 1941**

Diagnosis. – Blackish-brown flies; carina longitudinally grooved; basal scutellar setae divergent; crossvein dM-Cu clouded; sterno index 0.8-0.9; gena broad (cheek index about 2-5).

Taxa included. – 12 species which are mainly recorded from the northern Holarctic along river banks etc. Only *Drosophila virilis* Sturtevant, 1916, has been recorded worldwide in wine production areas as well as indoors in some breweries. Several phylogenetic studies have been undertaken e.g. by Throckmorton (1982), Spicer (1992), and Spicer & Bell (2002).

Comments. – Females are almost indistinguishable; the following characters of males and females are taken from specimens of strains in culture (on a malt medium). The native species

are waterside dwellers, with larvae most probably living under the bark of willows (*Salix* spp.; Salicaceae) etc., and overwintering as larvae.

***Drosophila ezoana* Takada & Okada, 1958**

(Figs 465-469)

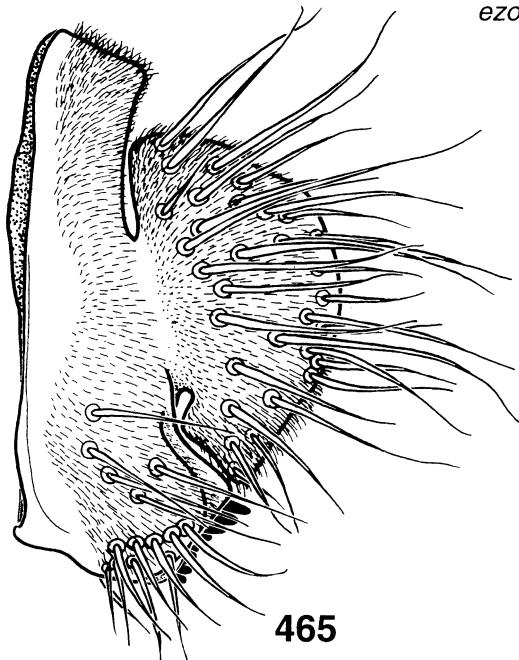
Drosophila ezoana Takada & Okada, 1957: 164
(nomen nudum).

Drosophila ezoana Takada & Okada, 1958: 134.

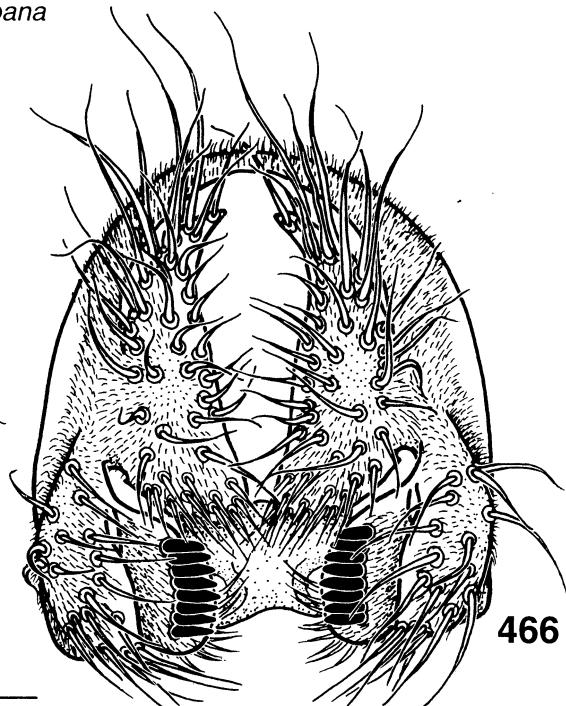
Diagnosis. – The group characters apply, but see the male terminalia; tip of aedeagus rounded-triangular, without sharp, apical processes.

Redescription. – ♂. Head. Frons dark brown, dull, convex, frontal length 0.34 (0.32-0.34) mm; frontal index = 0.85 (0.80-0.95), top to bottom width ratio = 1.28 (1.20-1.39). Frontal triangle yellowish-brown, not very distinct, about 68-80% of frontal length; ocellar triangle dark brown, slightly prominent, about 40-50% of frontal length. Frontal vittae brown. Orbital plates broad, yellowish, slightly shining, apically divergent from eye margin, about 75-90% of frontal length. Orbital setae black, or2 just outside of or1, distance of or3 to or1 = 62-71% of or3 to inner vtm, or1 / or3 ratio = 0.70 (0.66-0.74), or2 / or1 ratio = 0.61 (0.57-0.62), postocellar setae = 72 (65-75)%, ocellar setae = 103 (95-111)% of frontal length; vibrissal index = 0.62 (0.53-0.71). Face brown, dull. Carina broad, nose-like, divergent downwards, with a distinct longitudinal groove. Cheek index about 2-5, distinctly broader in hind part. Eye index = 1.10 (1.07-1.12). Occiput dark brown, with a narrow yellowish margin. Antennae brown, lower margin of pedicel yellowish. Arista with 4 dorsal, 2 ventral, and about 6-8 small inner branches, plus terminal fork. Proboscis pale brownish. Palpus with one short terminal seta and several fine setulae.

Thorax length 1.44 (1.39-1.48) mm. Scutum dark brown, with an even darker, broad, somewhat diffuse median stripe, not very shining, 6 rows of acrostichal setulae. h index = 1.31 (1.25-1.36). Transverse distance of dorsocentral setae 193-227% of longitudinal distance; dc = index 0.74 (0.67-0.80). Scutellum brown, with paler margin, distance between apical scutellar setae about 85% of that between apical and basal

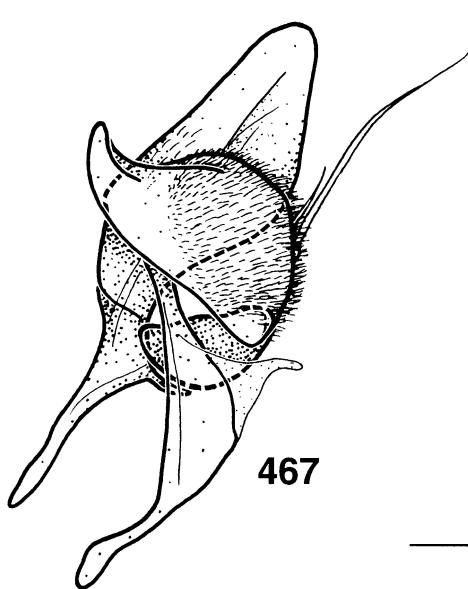


465



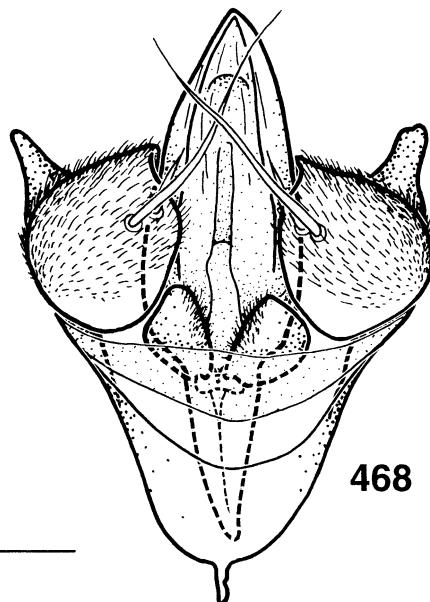
466

0.1 mm



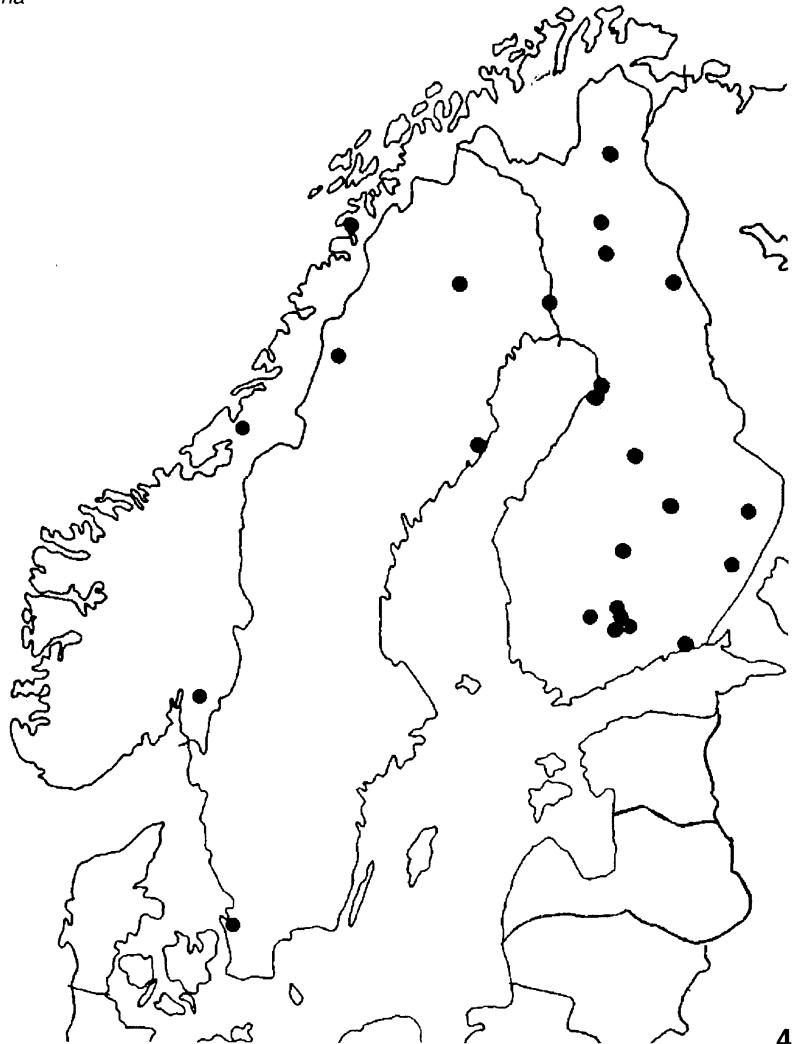
467

0.1 mm



468

Figs. 465-468. *Drosophila ezoana* Takada and Okada. 465: epandrium, cerci, and surstyli, left lateral view; 466: idem, plus decasternum, posterior view; 467: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 468: idem, posterior view.



469

Fig. 469. Known distribution pattern of *Drosophila ezoana* Takada and Okada in Scandinavia.

one, basal setae more or less parallel; scut index = 1.03 (0.89-1.09). Pleura brown, subshining, sterno index = 0.84 (0.81-0.89), median katepisternal seta about 35-45% of anterior one. Haltere white. Legs pale brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins pale brown, both cross-veins brown, dM-Cu with distinct brown shadow, length 3.30 (3.22-3.36) mm, length to width ratio = 2.35 (2.29-2.44). Indices: C = 3.12 (3.05-3.25), ac = 2.26 (2.22-2.33), hb = 0.55 (0.50-0.60), 4C = 0.76 (0.74-0.78), 4v = 1.52 (1.48-

1.54), 5x = 1.10 (1.00-1.22), M = 0.42 (0.41-0.44), prox. x = 0.59 (0.58-0.59).

Abdomen dark brown, subshining; some tergites basally and at extreme lateral margins slightly paler.

♂ Terminalia (Figs 465-468). Epandrium mostly microtrichose, with ca. 19 lower and no upper setae; ventral lobe roundish at tip, mostly microtrichose and covering surstylus. Cercus anteromedially fused to epandrium, microtrichose, without ventral lobe. Surstylus microtrichose, with a slightly convex row of ca. 8 large, peg-like, roundish-tipped prensisetae, ca. 10 in-

ner and no outer setae. Decasternum as in Fig. 466. Hypandrium shorter than epandrium, anterior margin convex, medially protruding forwards; posterior hypandrial process and dorsal arch absent; gonopod mostly microtrichose, linked to paraphysis by membranous tissue, with one large outer and one small inner seta medially near inner margin. Aedeagus without apical processes, fused to aedeagal apodeme, short, medially expanded and apically rounded in ventral view, dorsolaterally slightly microtrichose in the median area. Aedeagal apodeme shorter than aedeagus, rod-shaped. Ventral rod shorter than adjacent aedeagal apodeme width. Paraphysis triangular, slightly microtrichose on inner side, linked both to posterior margin of ventral rod, and to gonopod, by membranous tissue, without setulae.

♀. Measurements: Frontal length 0.35 (0.32-0.37) mm; frontal index = 0.80 (0.73-0.85), top to bottom width ratio = 1.22 (1.19-1.27). Frontal triangle about 74-82% of frontal length; ocellar triangle about 41-47% of frontal length. Orbital plates about 80-94% of frontal length. Distance of or3 to or1 = 62-75% of or3 to vtm, or1 / or3 ratio = 0.68 (0.62-0.78), or2 / or1 ratio = 0.64 (0.57-0.69), postocellar setae = 77 (68-85)%, ocellar setae = 105 (95-121)% of frontal length; vibrissal index = 0.60 (0.58-0.65). Cheek index about 2-4. Eye index = 1.09 (1.07-1.15). Thorax length 1.55 (1.50-1.60) mm. h index = 1.22 (1.18-1.27). Transverse distance of dorsocentral setae 160-200% of longitudinal distance; dc index = 0.76 (0.72-0.78). Distance between apical scutellar setae about 79-93% of that between apical and basal one; scut index = 1.06 (1.00-1.11), sterno index = 0.85 (0.83-0.86), median katepisternal seta about 36-42% of anterior one. Wing length 3.44 (3.32-3.57) mm, length to width ratio = 2.36 (2.21-2.51). Indices: C = 3.11 (3.05-3.15), ac = 2.24 (2.10-2.44), hb = 0.55 (0.52-0.57), 4C = 0.77 (0.74-0.79), 4v = 1.68 (1.50-1.89), 5x = 1.16 (1.10-1.22), M = 0.42 (0.39-0.44), prox. x = 0.56 (0.44-0.64).

Distribution. – (Fig. 469). A Palaearctic species, mainly recorded from northern areas. Found in Norway, Sweden and Finland (northernmost locality: Inari).

Additional specimens examined. – 4 ♂♂ and 5 ♀♀ (FINLAND: Kemi, ex-stock E20, no date).

Drosophila littoralis Meigen, 1830

(Figs 462, 470-474)

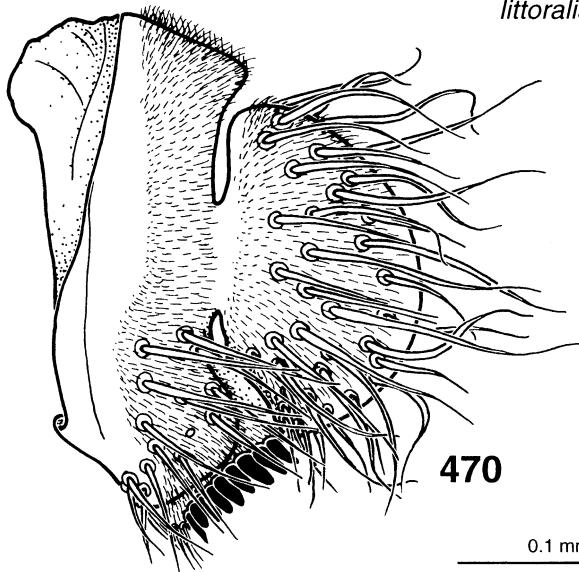
Drosophila littoralis Meigen, 1830: 87.
Drosophila parenti Villeneuve, 1921: 159.
Drosophila lugubrina Duda, 1924: 224.
Drosophila imeretensis Sokolov, 1948: 1007.

Diagnosis. – The group characters apply, but see the male terminalia; aedeagus broad, medially remarkably expanded, with a pair of short, apical, dorsad directed processes; paraphysis apically somewhat blunt.

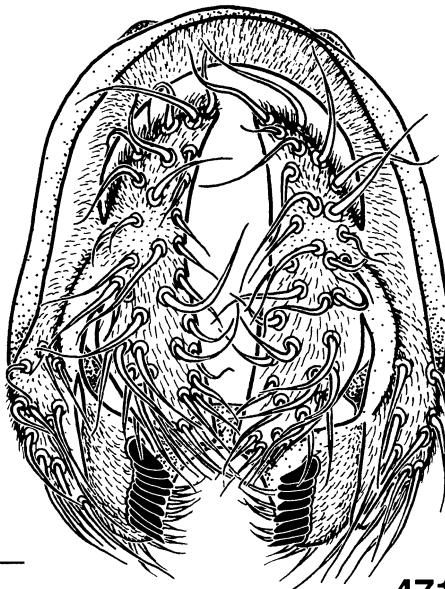
Redescription. – ♂. Head. Frons dark brown, dull, convex, frontal length 0.31 (0.29-0.34) mm; frontal index = 0.78 (0.77-0.79), top to bottom width ratio = 1.27 (1.23-1.32). Frontal triangle yellowish-brown, not very distinct, about 68-79% of frontal length; ocellar triangle dark brown, slightly prominent, about 35-47% of frontal length. Frontal vittae brown. Orbital plates broad, yellowish, slightly shining, apically divergent from eye margin, about 74-76% of frontal length. Orbital setae black, or2 just outside of or1, distance of or3 to or1 = 50-86% of or3 to inner vtm, or1 / or3 ratio = 0.71 (0.67-0.76), or2 / or1 ratio = 0.54 (0.46-0.67), postocellar setae = 72 (63-88)%, ocellar setae = 100 (94-106)% of frontal length; vibrissal index = 0.55 (0.33-0.67). Face brown, dull. Carina broad, nose-like, divergent downwards, with a distinct longitudinal groove. Cheek index about 3-4. Eye index = 1.14 (1.10-1.19). Occiput dark brown, with a narrow yellowish margin. Antennae brown, lower margin of pedicel yellowish. Arista with 3-4 dorsal, 2 ventral, and about 4-6 small inner branches, plus terminal fork. Proboscis pale brownish. Palpus with one short terminal seta and several fine setulae.

Thorax length 1.31 (1.09-1.38) mm. Scutum dark brown, with an even darker, broad, somewhat diffuse median stripe, not very shining, 6 rows of acrostichal setulae. h index = 1.16 (1.07-1.31). Transverse distance of dorsocentral setulae 173-185% of longitudinal distance; dc index = 0.68 (0.66-0.70). Scutellum brown, with paler margin, distance between apical scutellar setae about 91-118% of that between apical and basal one, basal setae more or less parallel; scut index = 1.08 (1.03-1.16). Pleura brown, sub-

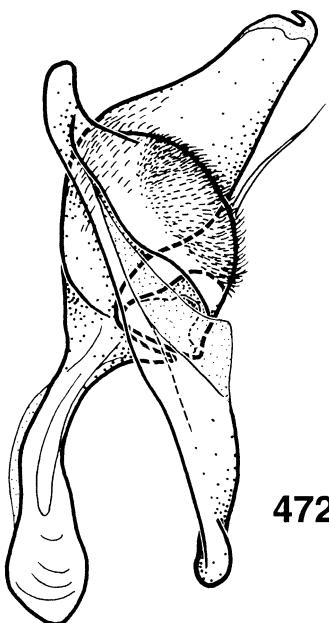
littoralis



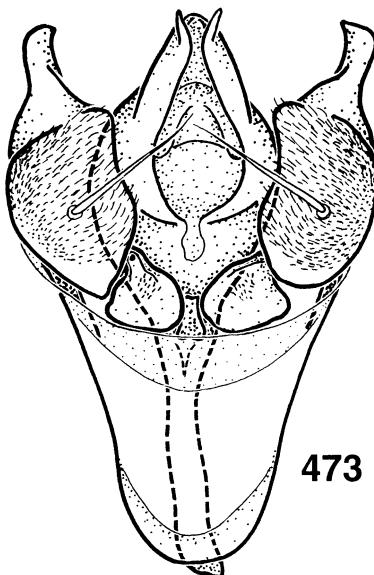
470



471

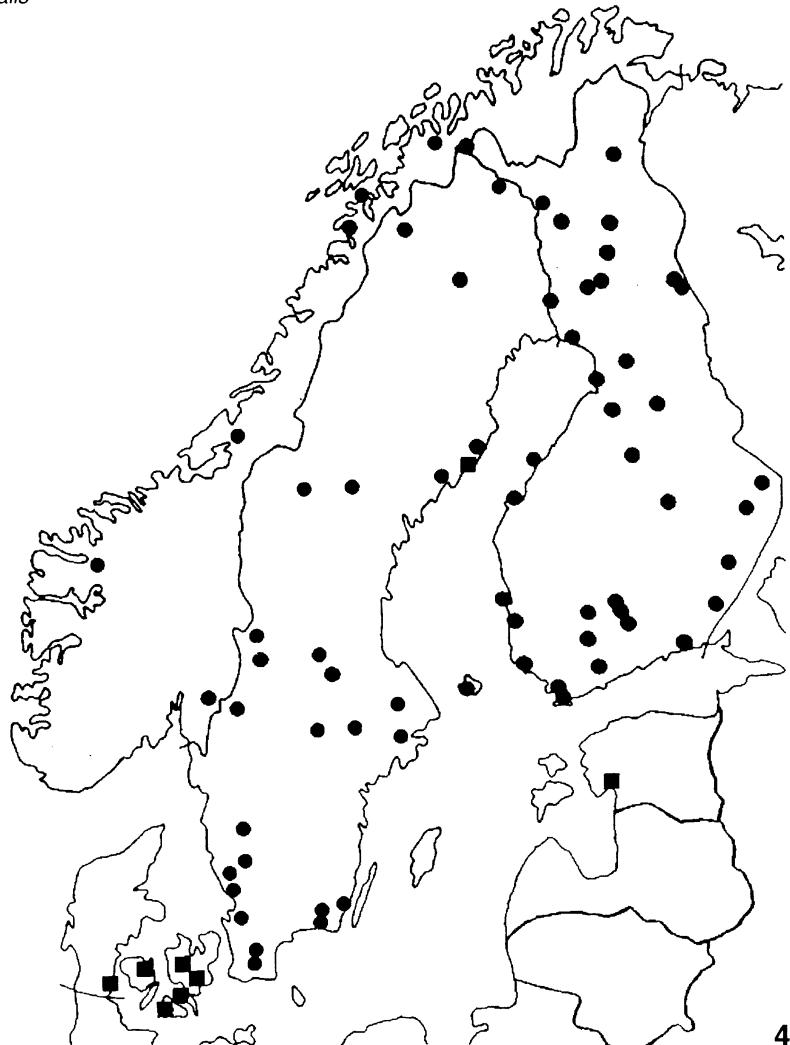


472



473

Figs. 470-473. *Drosophila littoralis* Meigen. 470: epandrium, cerci, and surstyli, left lateral view; 471: idem, plus decasternum, posterior view; 472: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 473: idem, posterior view.



474

Fig. 474. Known distribution pattern of *Drosophila littoralis* Meigen in Scandinavia. Squares refer to records of females only.

shining, sterno index = 0.83 (0.78-0.85), median katepisternal seta about 30-41% of anterior one. Haltere white. Legs pale brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins pale brown, both cross-veins brown, dM-Cu with distinct brown shadow, length 2.86 (2.69-3.01) mm, length to width ratio = 2.25 (2.16-2.34). Indices: C = 2.96 (2.82-3.06), ac = 2.08 (1.89-2.25), hb = 0.61 (0.58-0.65), 4C = 0.77 (0.75-0.81), 4v = 1.57 (1.50-1.64), 5x = 1.30 (1.22-1.38), M = 0.46 (0.43-0.50), prox. x = 0.51 (0.48-0.55).

Abdomen dark brown, subshining; some tergites slightly paler basally and at extreme lateral margins.

♂ Terminalia (Figs 470-473). Epandrium mostly microtrichose, with ca. 15 lower and no upper setae; ventral lobe roundish at tip, mostly microtrichose and covering surstyli. Cercus anteromedially fused to epandrium, microtrichose, without ventral lobe. Surstyli microtrichose, with a slightly convex row of ca. 9 peg-like, roundish-tipped prensisetae, ca. 11 inner and no outer setae. Decasternum as in Fig. 471. Hypandrium as long as epandrium, anterior

margin convex; posterior hypandrial process and dorsal arch absent; gonopod mostly microtrichose, linked to paraphysis by membranous tissue, with 1 large seta medially near inner margin. Aedeagus fused to aedeagal apodeme, short, medially remarkably expanded, dorsolaterally microtrichose in the median area and apically with a pair of sharply pointed, small processes which are projecting dorsad in lateral view, slightly divergent in ventral view. Aedeagal apodeme slightly shorter than aedeagus, bent, slightly flattened laterally. Ventral rod longer than width of adjacent aedeagal apodeme. Paraphysis broad, apically somewhat blunt, distally roundish, slightly microtrichose on inner side, linked both to posterior margin of ventral rod, and to gonopod, by membranous tissue, with 1 setula near median dorsal margin.

♀. Measurements: Frontal length 0.32 (0.31-0.34) mm; frontal index = 0.77 (0.73-0.83), top to bottom width ratio = 1.19 (1.08-1.26). Frontal triangle about 80-89% of frontal length; ocellar triangle about 40-47% of frontal length. Orbital plates about 75-89% of frontal length. Distance of or3 to or1 = 62-86% of or3 to vtm, or1 / or3 ratio = 0.70 (0.63-0.80), or2 / or1 ratio = 0.59 (0.54-0.67), postocellar setae = 71 (63-84)%, ocellar setae = 100 (89-106)% of frontal length; vibrissal index = 0.54 (0.19-0.79). Cheek index about 3-4. Eye index = 1.15 (1.12-1.20). Thorax length 1.29 (1.12-1.48) mm. h index = 1.09 (1.03-1.14). Transverse distance of dorsocentral setae 177-200% of longitudinal distance; dc index = 0.70 (0.69-0.71). Distance between apical scutellar setae about 83-100% of that of apical to basal one; scut index = 1.09 (1.03-1.14), sterno index = 0.81 (0.73-0.86), median katepisternal seta about 27-56% of anterior one. Wing length 2.83 (2.62-3.12) mm, length to width ratio = 2.32 (2.27-2.38). Indices: C = 2.89 (2.37-3.28), ac = 2.17 (1.89-2.71), hb = 0.66 (0.63-0.71), 4C = 0.83 (0.71-1.06), 4v = 1.68 (1.50-1.89), 5x = 1.26 (1.11-1.50), M = 0.50 (0.42-0.60), prox. x = 0.58 (0.54-0.72).

♀ Terminalia (Fig. 462). Valve of oviscapta apically rounded, ventrally almost straight, with ca. 3 discal (dorsalmost larger) and 14-19 marginal, peg-like, outer ovisensilla, which are roundish-tipped, except for the most anterior ones which are sharp; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, straight, subterminal.

Distribution. – (Fig. 474). A Holarctic species, recorded along rivers, from Scandinavia across Europe to the Mediterranean countries. Northernmost locality: Kilpisjärvi (Finland).

Biology. – A larval diapause has been observed which can be broken by daylight regimes (Lankinen & Lumme, 1984; Lankinen, 1986).

Additional specimens examined. – 4 ♂♂ (SPAIN: Calanas, 2 ♂♂, 1982. SERBIA AND MONTENEGRO: Popovica, 1 ♂, 1980; Goć, 1 ♂, 1980), 4 ♀♀ (BULGARIA: Varna, 1 ♀, 1985. FRANCE: Lauzon, 1 ♀, 1981. SPAIN: Calanas, 1 ♀, 1982. SWITZERLAND: Zürich, 1 ♀, 1984).

Drosophila lummei Hackman, 1972

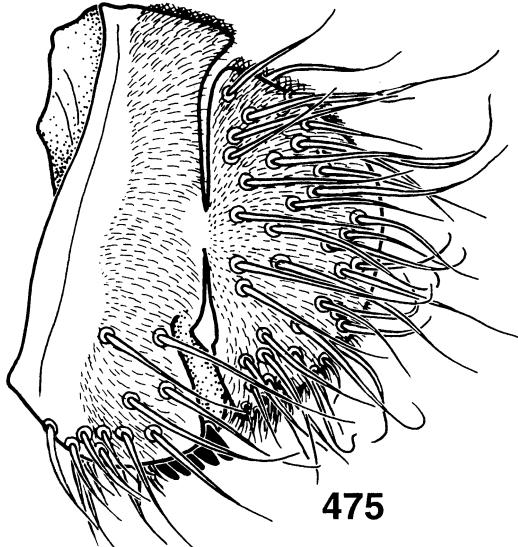
(Figs 475-479)

Drosophila lummei Hackman, 1972: 89.

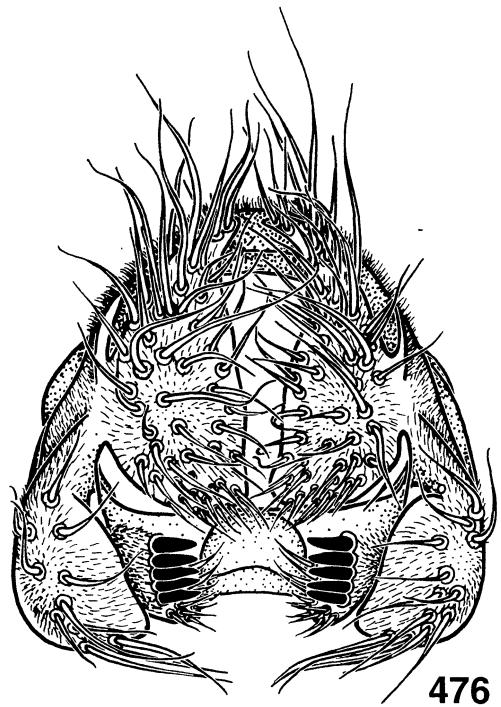
Drosophila littoralis: Sokolov (misid.).

Diagnosis. – The group characters apply, but see the male terminalia; aedeagus curved, narrow, slightly expanded medially, with a pair of apical, backwardly-directed processes.

Redescription. – ♂. Head. Frons dark brown, dull, convex, frontal length 0.33 (0.32-0.34) mm; frontal index = 0.87 (0.77-1.19), top to bottom width ratio = 1.46 (1.25-2.06). Frontal triangle yellowish-brown, not very distinct, relatively short, about 50-58% of frontal length; ocellar triangle dark brown, slightly prominent, about 37-47% of frontal length. Frontal vittae brown. Orbital plates broad, yellowish, slightly shining, apically divergent from eye margin, about 75-84% of frontal length. Orbital setae black, or2 just outside of or1, distance of or3 to or1 = 50-71% of or3 to inner vtm, or1 / or3 ratio = 0.68 (0.63-0.72), or2 / or1 ratio = 0.49 (0.46-0.58), postocellar setae = 67 (63-70)%, ocellar setae = 102 (100-105)% of frontal length; vibrissal index = 0.60 (0.53-0.69). Face brown, dull. Carina broad, nose-like, divergent downwards, with a distinct longitudinal groove. Cheek index about 3-5. Eye index = 1.16 (1.15-1.19). Occiput dark brown, with a narrow yellowish margin. Antennae brown, lower margin of pedicel yellowish. Arista with 3-4 dorsal, 2 ventral, and about 4-6 small inner branches, plus terminal fork. Proboscis pale brownish. Palpus with one short terminal seta and several fine setulae

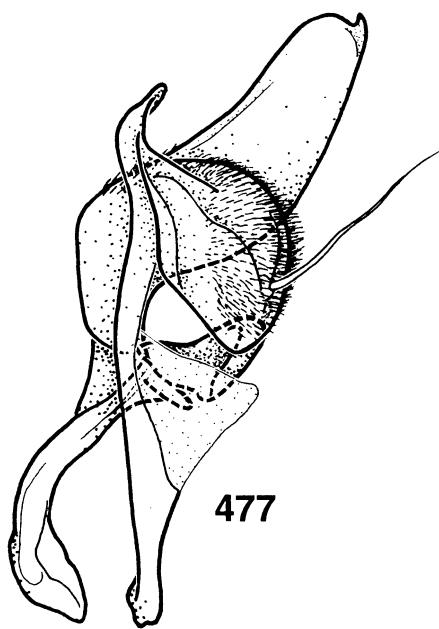


475

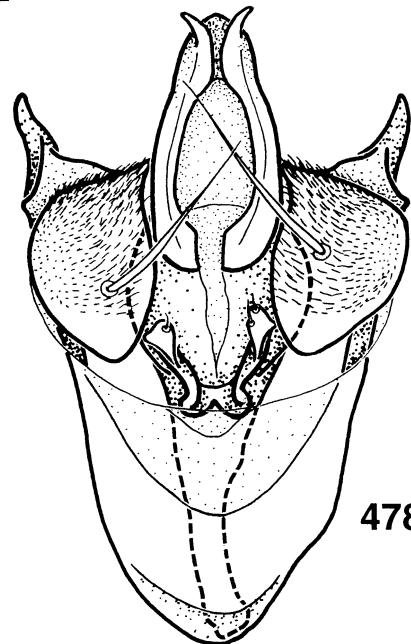


476

0.1 mm

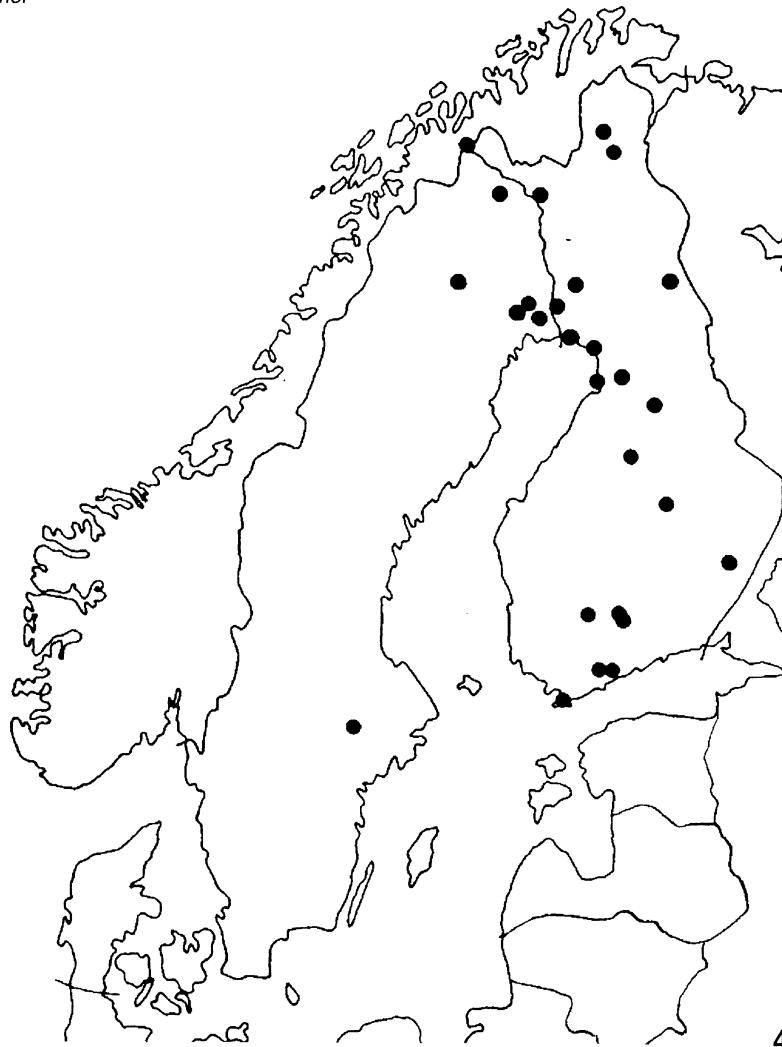


477



478

Figs. 475-478. *Drosophila lummei* Hackman. 475: epandrium, cerci, and surstyli, left lateral view; 476: idem, plus decasternum, posterior view; 477: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 478: idem, posterior view.



479

Fig. 479. Known distribution pattern of *Drosophila lummei* Hackman in Scandinavia.

Thorax length 1.31 (1.27-1.36) mm. Scutum dark brown, with an even darker, broad, somewhat diffuse median stripe, not very shining, 6 rows of acrostichal setulae. h index = 1.21 (1.18-1.25). Transverse distance of dorsocentral setae 209% of longitudinal distance; dc = index 0.66 (0.61-0.72). Scutellum brown, with paler margin, distance between apical scutellar setae about 92-109% of that between apical and basal one, basal setae more or less parallel; scut index = 1.04 (1.03-1.06). Pleura brown, subshining, sterno index = 0.84 (0.81-0.85), median

katepisternal seta about 30-45% of anterior one. Haltere white. Legs pale brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins pale brown, both cross-veins brown, dM-Cu with distinct brown shadow, length 2.86 (2.76-2.98) mm, length to width ratio = 2.27 (2.22-2.31). Indices: C = 3.19 (2.71-3.38), ac = 2.27 (2.00-2.63), hb = 0.58 (0.48-0.63), 4C = 0.76 (0.73-0.88), 4v = 1.58 (1.54-1.64), 5x = 1.39 (1.25-1.57), M = 0.48 (0.45-0.50), prox. x = 0.58 (0.57-0.59).

Abdomen dark brown, subshining; some tergites slightly paler basally and at extreme lateral margins.

♂ Terminalia (Figs 475-478). Epandrium mostly microtrichose, with ca. 17 lower and no upper setae; ventral lobe roundish at tip, mostly microtrichose and covering surstylus. Cercus anteromedially narrowly fused to epandrium, microtrichose, without ventral lobe. Surstylus microtrichose, with a short, straight row of ca. 5 large, peg-like, roundish-tipped prensisetae, ca. 11 inner and no outer setae. Decasternum as in Fig. 476. Hypandrium as long as epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod mostly microtrichose, linked to paraphysis by membranous tissue, with 1 large seta submedially near inner margin. Aedeagus fused to aedeagal apodeme, narrow, slightly sinuate, medially slightly expanded, dorsolaterally slightly microtrichose in median area, apically with a pair of sharply pointed, small processes which are projected posterad in lateral and slightly divergent in ventral view. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod longer than width of adjacent aedeagal apodeme. Paraphysis apically roundish, not microtrichose, linked both to posterior margin of ventral rod, and to gonopod, by membranous tissue, with ca. 2 setulae near median dorsal margin.

♀. Measurements: Frontal length 0.35 (0.34-0.37) mm; frontal index = 0.81 (0.77-0.85), top to bottom width ratio = 1.26 (1.20-1.35). Frontal triangle about 55-67% of frontal length; ocellar triangle about 38-45% of frontal length. Orbital plates about 71-81% of frontal length. Distance of or3 to or1 = 62-71% of or3 to vtm, or1 / or3 ratio = 0.68 (0.60-0.76), or2 / or1 ratio = 0.50 (0.46-0.58), postocellar setae = 62 (57-67)%, ocellar setae = 94 (86-100)% of frontal length; vibrissal index = 0.51 (0.47-0.56). Cheek index about 3-4. Eye index = 1.12 (1.07-1.19). Thorax length 1.37 (1.17-1.45) mm. h index = 1.18 (1.11-1.25). Transverse distance of dorsocentral setae 185-200% of longitudinal distance; dc index = 0.69 (0.67-0.72). Distance between apical scutellar setae about 85-100% of that between apical and basal one; scut index = 1.04 (1.00-1.09), sterno index = 0.83 (0.79-0.88), median katepisternal seta about 29-45% of anterior one. Wing length 2.90 (2.73-2.98) mm, length to width ratio = 2.21 (2.10-2.29). Indices: C =

3.57 (3.44-3.73), ac = 2.12 (1.88-2.29), hb = 0.68 (0.63-0.73), 4C = 0.68 (0.65-0.70), 4v = 1.61 (1.54-1.70), 5x = 1.40 (1.22-1.71), M = 0.51 (0.48-0.55), prox. x = 0.61 (0.59-0.63).

Distribution. – (Fig. 479). A Palaearctic species, recorded along rivers in Northern and Eastern Europe (Czech Republic to Russia and Moldavia) as well as in East Asia. Found in Sweden and Finland (northernmost locality: Inari).

Additional specimens examined. – 4 ♂♂ and 5 ♀♀ (JAPAN: Hokkaido, ex-stock, no date).

Drosophila montana Patterson & Wheeler, 1942

(Figs 480-484)

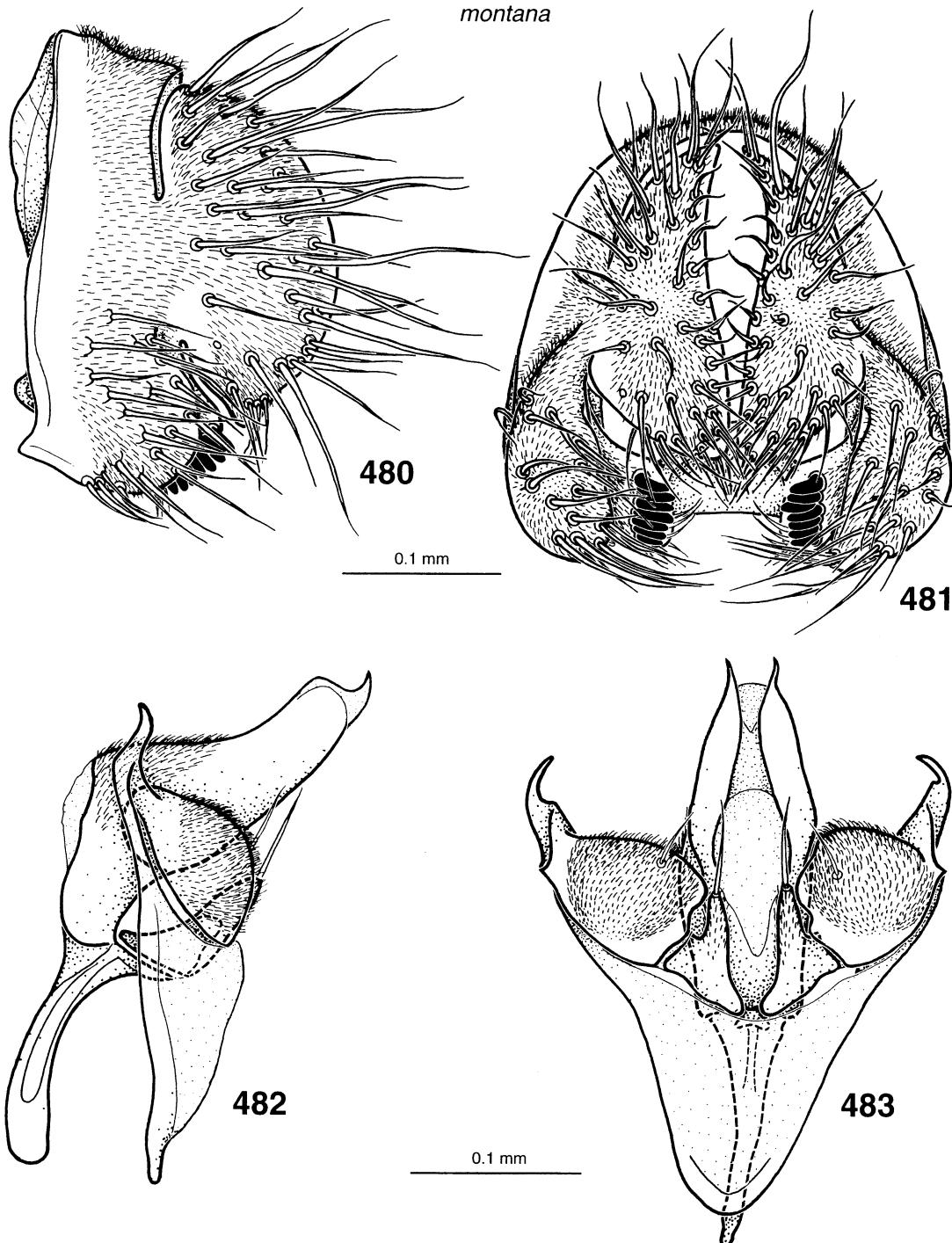
Drosophila montana Patterson & Wheeler, 1942: 75.

Drosophila lakovaarai Lakovaara, Lumme & Oikarinen, 1973: 149 (nomen nudum).

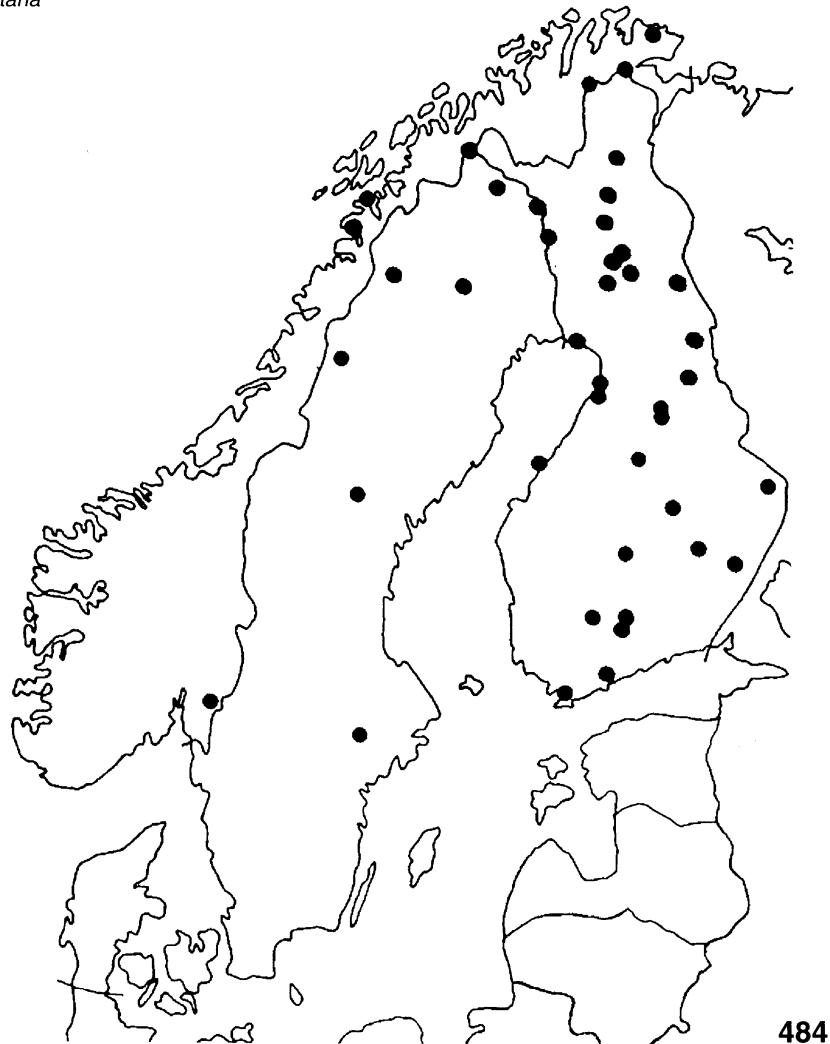
Drosophila ovivororum Lakovaara & Hackman, 1973: 167.

Diagnosis. – The group characters apply, but see themale terminalia; aedeagus hunchbacked, distally somewhat square, with a pair of long, distally sharp, backwardly-pointed, apical processes; paraphysis longer than wide, with an unusually long seta apically.

Redescription. – ♂. Head. Frons dark brown, dull, convex, frontal length 0.34 (0.32-0.36) mm; frontal index = 0.80 (0.73-0.83), top to bottom width ratio = 1.28 (1.21-1.33). Frontal triangle yellowish-brown, not very distinct, about 55-70% of frontal length; ocellar triangle dark brown, slightly prominent, about 40-43% of frontal length. Frontal vittae brown. Orbital plates broad, yellowish, slightly shining, apically divergent from eye margin, about 80-89% of frontal length. Orbital setae black, or2 just outside of or1, distance of or3 to or1 = 40-56% of or3 to inner vtm, or1 / or3 ratio = 0.69 (0.63-0.74), or2 / or1 ratio = 0.48 (0.43-0.50), postocellar setae = 79 (71-90)%, ocellar setae = 104 (95-121)% of frontal length; vibrissal index = 0.55 (0.50-0.67). Face brown, dull. Carina broad, nose-like, divergent downwards, with a distinct longitudinal groove. Cheek index about 3-4. Eye index = 1.10 (1.07-1.14). Occiput dark brown, with a narrow yellowish margin. Antennae brown, lower margin of pedicel yellowish.



Figs. 480-483. *Drosophila montana* Patterson and Wheeler. 480: epandrium, cerci, and surstyli, left lateral view; 481: idem, plus decasternum, posterior view; 482: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 483: idem, posterior view.



484

Fig. 484. Known distribution pattern of *Drosophila montana* Patterson and Wheeler in Scandinavia.

Arista with 3-4 dorsal, 2 ventral, and about 4-6 small inner branches, plus terminal fork. Proboscis pale brownish. Palpus with one short terminal seta and several fine setulae.

Thorax length 1.38 (1.29-1.48) mm. Scutum dark brown, with an even darker, broad, somewhat diffuse, median stripe and, in some specimens, with diffuse, paler, lateral stripes and postpronotal areas, not very shining, 6 rows of acrostichal setulae. h index = 1.20 (1.06-1.33). Transverse distance of dorsocentral setae 177-208% of longitudinal distance; dc = index 0.75 (0.73-0.77). Scutellum brown, with paler

margin, distance between apical scutellar setae about 92-100% of that between apical and basal one, basal setae more or less parallel; scut index = 1.01 (1.00-1.03). Pleura brown, subshining, sterno index = 0.84 (0.82-0.86), median katepisternal seta about 48-64% of anterior one. Haltere white. Legs pale brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, veins pale brown, both cross-veins brown, $dM-Cu$ with distinct brown shadow, length 3.13 (2.97-3.29) mm, length to width ratio = 2.27 (2.24-2.30). Indices: C = 3.44 (3.11-3.76), ac = 2.06 (1.89-2.25), hb = 0.56 (0.53-

0.61 , $4C = 0.65$ (0.61 - 0.69), $4v = 1.38$ (1.36 - 1.43), $5x = 0.99$ (0.91 - 1.11), $M = 0.37$ (0.36 - 0.39), prox. $x = 0.55$ (0.50 - 0.58).

Abdomen dark brown, subshining; some tergites slightly paler basally and at extreme lateral margins.

♂ Terminalia (Figs 480-483). Epandrium mostly microtrichose, with ca. 21 lower and no upper setae; ventral lobe roundish at tip, mostly microtrichose and covering surstyli. Cercus anteromedially fused to epandrium, microtrichose, without ventral lobe. Surstyli microtrichose, with a straight row of ca. 7 large, peg-like, roundish-tipped prensisetae, ca. 7 inner and no outer setae. Decasternum as in Fig. 481. Hypandrium slightly shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod mostly microtrichose, linked to paraphysis by membranous tissue, with one small seta medially near inner margin. Aedeagus fused to aedeagal apodeme, short, hunchbacked, medially expanded and apically with a pair of sharply pointed, small processes, projected backwards in lateral view, slightly divergent in ventral view, dorsolaterally microtrichose in median area. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod longer than width of adjacent aedeagal apodeme. Paraphysis longer than wide, slightly microtrichose on inner side, linked both to posterior margin of ventral rod, and to gonopod, by membranous tissue, with 1 unusually long seta near median dorsal margin.

♀. Measurements: Frontal length 0.36 (0.32 - 0.37) mm; frontal index = 0.84 (0.79 - 0.88), top to bottom width ratio = 1.23 (1.17 - 1.27). Frontal triangle about 55 - 59% of frontal length; ocellar triangle about 36 - 41% of frontal length. Orbital plates about 77 - 86% of frontal length. Distance of or3 to or1 = 50 - 60% of or3 to vtm, or1 / or3 ratio = 0.70 (0.65 - 0.75), or2 / or1 ratio = 0.47 (0.43 - 0.50), postocellar setae = 74 (68 - 79%), ocellar setae = 101 (95 - 105%) of frontal length; vibrissal index = 0.53 (0.47 - 0.69). Cheek index about 3 - 4 . Eye index = 1.13 (1.11 - 1.14). Thorax length 1.39 (1.29 - 1.48) mm. h index = 1.22 (1.17 - 1.31). Transverse distance of dorsocentral setae 173 - 192% of longitudinal distance; dc index = 0.78 (0.74 - 0.79). Distance between apical scutellar setae about 85 - 92% of that between apical and basal one; scut index = 1.02 (1.00 - 1.03), sterno index = 0.85 (0.82 - 0.92), median katepisternal seta about 50 - 67% of anterior

one. Wing length 3.13 (2.94 - 3.26) mm, length to width ratio = 2.24 (2.21 - 2.28). Indices: C = 3.39 (3.32 - 3.50), ac = 2.07 (2.00 - 2.13), hb = 0.61 (0.59 - 0.63), $4C = 0.66$ (0.64 - 0.70), $4v = 1.46$ (1.42 - 1.48), $5x = 1.02$ (1.00 - 1.10), M = 0.39 (0.37 - 0.42), prox. x = 0.52 (0.50 - 0.56).

Distribution. – (Fig. 484). A Holarctic species, recorded from Norway across Russia to northern North America. Northernmost locality: Utsjoki (Finland).

Additional specimens examined. – 4 ♂♂ and 6 ♀♀ (FINLAND: Kemi, ex-stock M01, no date).

Subgenus *Sophophora* Sturtevant, 1939

Sophophora Sturtevant, 1939: 139 (subgenus).

Type species: *Drosophila melanogaster* Meigen, 1830.

Diagnosis. – Gena relatively narrow; vibrissa and first genal seta of almost equal length; sterno index 0.6 or less; prescutellar and proepisternal setae absent; males usually with sex combs of various shapes and sizes on protarsus; second to fifth abdominal tergites completely dark, or with dark marginal bands which are never broken or narrowed on mid-dorsal line; ventral receptacle not coiled or twisted; eggs usually with two paddle-shaped filaments, anterior spiracle and its stalk not over $1/5$ length of puparium.

Taxa included. – More than 400 species, arranged in 9 species groups.

Comments. – The European species belong to the *melanogaster*, *obscura*, and *populi* groups. *Drosophila schmidti* Duda, 1924, which has been recorded in Hungary and Serbia and Montenegro, seems best placed in the subgenus *Sophophora* although it does not fit into any species group. This subgenus, containing the best studied species of *Drosophila*, has attracted the interest of many drosophilists. Phylogenetic analyses show that it may occupy a position which is basal to most other genera of the Drosophilinae (e.g. Remsen & DeSalle, 1998; Remsen & O'Grady, 2002).

With few exceptions, the species can be kept in culture using a standard medium.

melanogaster species group

Sturtevant, 1927

Diagnosis. — Yellowish flies; usually with remarkable sexual dimorphism, sex combs present; sterno index 0.5 to 0.6; basal scutellar setae convergent; male abdomen often much darker at tip than female abdomen; medium long spiralled testes; rather long ventral receptacle; epandrium and cerci without microtrichia, not fused; gonopods fused to each other and completely fused to hypandrium; aedeagus linked to aedeagal apodeme by membranous tissue in most species, and flanked by two pairs of paraphyses.

Taxa included. — Almost 180 species, which are arranged into eight subgroups (Lemeunier & al., 1986).

Comments. — The *melanogaster* species group is apparently native to tropical and subtropical regions of the Old World, most probably East Africa, but several species have a more or less cosmopolitan distribution. Some species are endemic on certain islands.

In addition to the widespread *Drosophila melanogaster* and *D. simulans* discussed below, *D. ananassae* Doleschall, 1858, has been recorded in the Mediterranean countries. It is also possible that *D. malerkotliana* Parshad and Paika, 1964, originally described from India but subsequently recorded also from the Afrotropical and Neotropical regions, may occur in the Mediterranean countries.

Drosophila melanogaster Meigen, 1830

(Figs 286, 287, 289, 485-489)

Drosophila melanogaster Meigen, 1830: 85.

Drosophila fasciata Meigen, 1830: 84.

Drosophila nigriventris Macquart, 1843: 416.

Drosophila approximata Zetterstedt, 1847: 2557.

Drosophila immatura Walker, 1849: 1108.

Drosophila ampelophila Loew, 1862: 231.

Drosophila uvarum Rondani, 1875: 86.

Drosophila pilosula Becker, 1908: 156.

Drosophila emulata Ray-Chaudhuri & Mukherjee, 1941: 216.

Diagnosis. — Gena broad, about 1/6 eye length; ventral lobe of epandrium divided into ventral

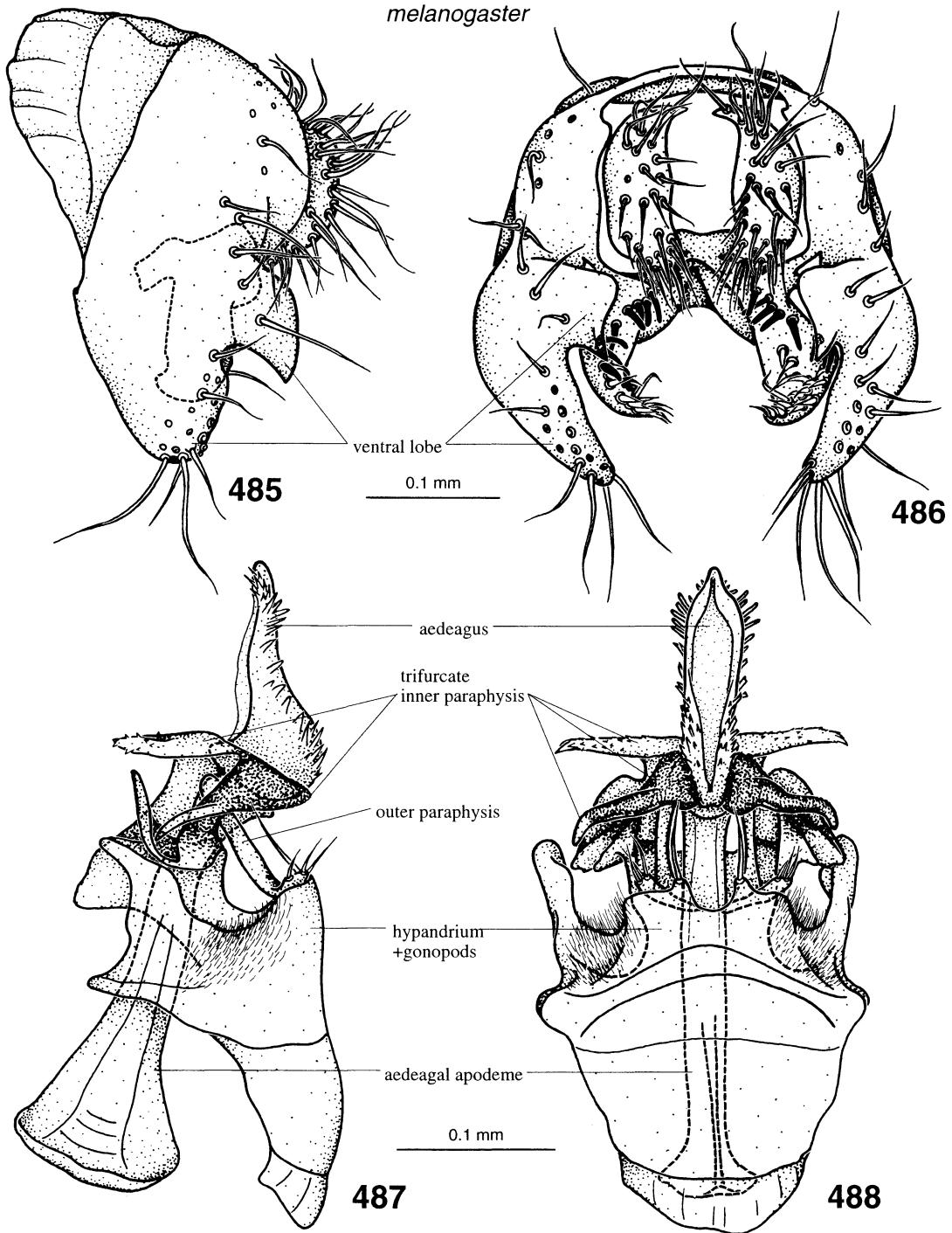
and dorsal branches; dorsal branch protruding backwards and triangular in lateral view; aedeagus distally narrow in posterior view.

Redescription. — ♂. Head (Fig. 289). Frons yellowish, dull, frontal length 0.26 (0.25-0.29) mm; frontal index = 0.70 (0.65-0.85), top to bottom width ratio = 1.13 (1.09-1.25). Frontal triangle yellow, very narrow, about 80-88% of frontal length; ocellar triangle prominent, shining, with brown spots on inner side of ocelli, about 41-47% of frontal length. Orbital plates broad, shining, apically slightly diverging from eye margin, about 80-88% of frontal length. Orbital setae black, distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.94 (0.90-1.00), or2 / or1 ratio = 0.53 (0.50-0.60), postocellar setae = 63 (53-67)%, ocellar setae = 81 (71-87)% of frontal length; vibrissal index = 1.06 (1.00-1.14). Face whitish-yellow. Carina nose-like, slightly prominent, dorsally flat. Cheek index about 5-7. Eye index = 1.24 (1.23-1.25). Occiput yellowish, slightly darker above foramen. Antennae yellowish. Arista with 4-5 dorsal, 2-3 ventral, and about 6 small inner branches, plus terminal fork. Proboscis yellow. Palpus with about 5 fine setae along lower margin.

Thorax length 0.94 (0.90-0.97) mm. Scutum yellowish, shining, usually brownish before scutellum and showing a "trident pattern", i.e. 3 faint stripes, one median and two paramedian ones on dorsocentral region, 6 rows of acrostichal setulae. h index = 0.92 (0.81-1.00). Transverse distance of dorsocentral setae 189-225% of longitudinal distance; dc index = 0.68 (0.65-0.74). Distance between apical scutellar setae about 80-90% of that between apical and basal one, basal setae slightly convergent; scut index = 0.85 (0.81-0.91). Pleura pale yellowish, shining, sterno index = 0.55 (0.50-0.58), median katepisternal seta about 50-73% of anterior one. Haltere yellowish. Legs yellowish, sex comb on protarsomere 1 (Fig. 286), with about 12 peg-like setae, preapical setae on all tibiae, apical seta on mesotibia.

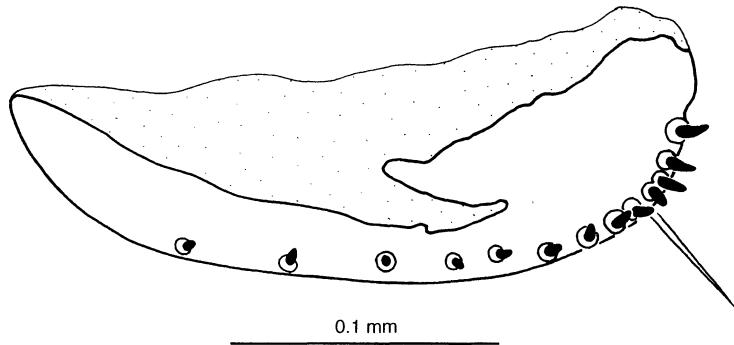
Wing hyaline, length 1.95 (1.89-2.14) mm, length to width ratio = 2.05 (2.00-2.08). Indices: C = 2.26 (2.12-2.40), ac = 2.38 (2.14-2.50), hb = 0.34 (0.29-0.40), 4C = 1.21 (1.07-1.36), 4v = 2.30 (2.14-2.55), 5x = 2.10 (1.80-2.50), M = 0.82 (0.71-0.92), prox. x = 0.61 (0.59-0.67).

Abdomen (Fig. 287) yellowish, shining, particularly at apex, tergites 2-4 with a brown mar-



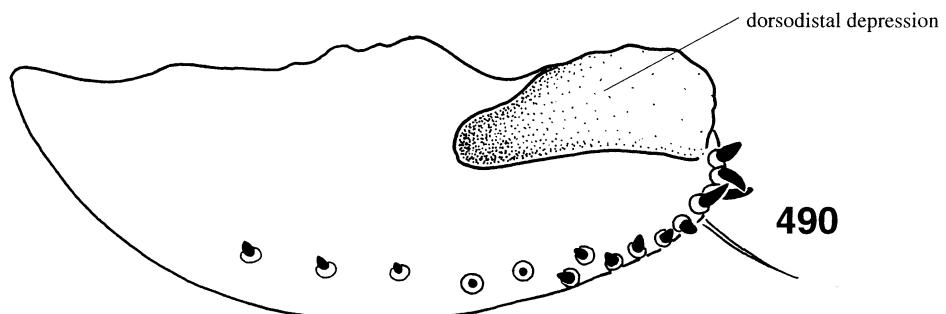
Figs. 485-488. *Drosophila melanogaster* Meigen. 485: epandrium, cerci, and surstyli, left lateral view; 486: idem, plus decasternum, posterior view; 487: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 488: idem, posterior view.

melanogaster



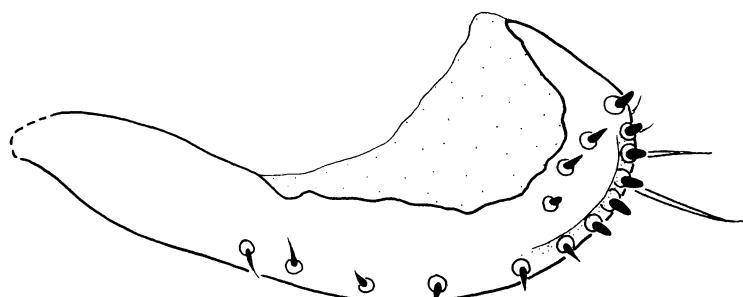
489

simulans



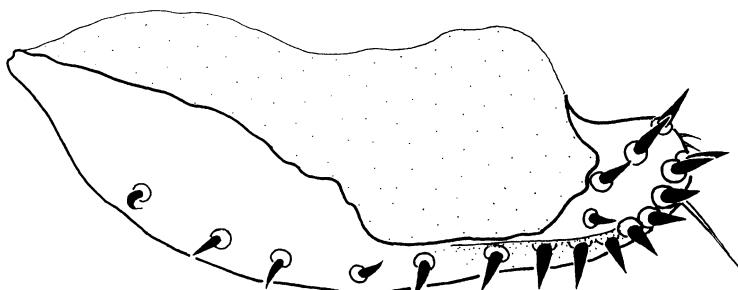
490

alpina



491

ambigua



492

Figs. 489-492. Left oviscapt valves, lateral view.

ginal band which is medially triangularly extended, tergites 5-6 completely black.

♂ Terminalia (Figs 485-488). Epandrium not microtrichose, with 22 lower, and 8 upper setae; ventral lobe bifurcate, dorsal branch distally square in posterior view, somewhat triangular in lateral view, ventral branch very long, pointed inwards in posterior view, not microtrichose, covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstyli not microtrichose, with an irregular row of ca. 9 long peg-like prensisetae, ca. 16 inner and no outer setae. Decasternum as in Fig. 486. Hypandrium as long as epandrium, in lateral view remarkably expanded dorsoanteriorly, anterior margin convex, distolaterally microtrichose; posterior hypandrial process and dorsal arch absent; gonopod indistinct, completely fused to hypandrium, but recognisable because of its connection to outer paraphysis, and its submedian seta on mediodistal margin of hypandrium, which is submedially projecting posterad; projections somewhat square. Aedeagus anteriorly connected to aedeagal apodeme by membranous tissue, and expanded ventrad in lateral view, ventrally and dorsally membranous, ventrolaterally covered with a fringe-like, irregular row of long and blunt scales; apically narrowed and roundish; flanked by two pairs of paraphyses. Inner paraphysis trifurcate, anteriorly connected to distal margin of aedeagal apodeme by membranous tissue; inner surface of median branch with a texture similar to gooseflesh and that of dorsal one covered with tiny scales; median branch well-developed and distally, beneath connection gonopod-outer paraphysis, fused to the former subproximal inner surface of the gonopod by means of a long, ribbon-shaped, sclerotised process; embracing aedeagus, and both pairs of paraphyses, as a dorsal arch. Outer paraphysis distally with 3 setulae, connected both to distal margin of aedeagal apodeme anteriorly, and posteriorly to gonopod, by membranous tissue. Aedeagal apodeme twice as long as aedeagus, rod-shaped, anterior half widely expanded dorsoventrally. Ventral rod absent.

♀. Differences from male: No sex combs. Abdominal tergites 5-6 with marginal bands as on tergites 2-4, but broader and darker, the one on tergite 6 almost covering the whole area.

Measurements: Frontal length 0.29 (0.25-0.32) mm; frontal index = 0.70 (0.63-0.73), top to bottom width ratio = 1.13 (1.04-1.23). Frontal triangle about 81-89% of frontal length; ocellar triangle about 44-50% of frontal length. Orbital plates about 78-87% of frontal length. Distance of or3 to or1 = 50-57% of or3 to vtm, or1 / or3 ratio = 0.86 (0.82-0.91), or2 / or1 ratio = 0.56 (0.50-0.67), postocellar setae = 62 (58-67)%, ocellar setae = 89 (83-100)% of frontal length; vibrissal index = 1.07 (1.00-1.25). Cheek index about 5-7. Eye index = 1.22 (1.18-1.25). Thorax length 0.99 (0.95-1.02) mm. h index = 0.86 (0.80-0.93). Transverse distance of dorsocentral setae 190-211% of longitudinal distance; dc index = 0.74 (0.70-0.81). Distance between apical scutellar setae about 75-91% of that between apical and basal one; scut index = 0.81 (0.75-0.87), sterno index = 0.55 (0.52-0.60), median katepisternal seta about 50-64% of anterior one. Wing length 2.35 (2.03-2.56) mm, length to width ratio = 2.12 (2.06-2.16). Indices: C = 2.43 (2.18-2.61), ac = 2.41 (2.13-2.67), hb = 0.37 (0.29-0.44), 4C = 1.15 (1.06-1.23), 4v = 2.26 (2.15-2.38), 5x = 2.02 (1.83-2.25), M = 0.74 (0.69-0.81), prox. x = 0.64 (0.59-0.69).

♀ Terminalia (Fig. 489). Valve of oviscapts mediadorsally mostly membranous, apically rounded, slightly concave ventrally, with no discal, and 12-13 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, tiny, distally positioned, hardly visible in lateral view, even under high magnification, but recognisable by their alveoli in dorsal view (refer to Tsacas, 1975, for further details), and 1 long, straight, subterminal.

Distribution. – A cosmopolitan, domestic species recorded almost everywhere, rare or absent in cold areas; northernmost locality: Oxnadal (Iceland).

Biology. – The larvae are predominantly fruit breeders. The flies are common indoors, attracted by fruit and fermented drinks.

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Graubünden, 1974), 4 ♀♀ (SWITZERLAND: Graubünden, 2 ♀♀, 1974; Uri, 2 ♀♀, 1973).

Comments. – *D. melanogaster* is the best known of all pluricellular organisms and its importance as a model organism exceeds that of genetics, as it has been used in almost all fields of biological

activity and has given rise to tens of thousands of publications since its introduction as a laboratory animal, about 100 years ago (Morgan, 1910).

Drosophila simulans Sturtevant, 1919

(Figs 290, 490, 493-496)

Drosophila simulans Sturtevant, 1919: 153.

Diagnosis. — Gena narrow, about 1/10 eye length; ventral lobe of epandrium bifurcate, dorsal branch large, protruding backwards, amber-coloured, distally rounded in lateral view; aedeagus distally expanded laterally in posterior view; dorsodistal area of oviscapts valve conspicuously depressed, basally deeper, apically shallower.

Redescription. — ♂. Head. Frons yellowish, dull, frontal length 0.27 (0.25-0.27) mm; frontal index = 0.81 (0.76-0.84), top to bottom width ratio = 1.19 (1.14-1.26). Frontal triangle yellow, very narrow, about 80-94% of frontal length; ocellar triangle prominent, shining, with brown spots on inner side of ocelli, about 44-50% of frontal length. Orbital plates broad, shining, apically slightly diverging from eye margin, about 80-81% of frontal length. Orbital setae black, distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.87 (0.82-1.00), or2 / or1 ratio = 0.53 (0.45-0.60), postocellar setae = 66 (60-69%), ocellar setae = 81 (75-88)% of frontal length; vibrissal index = 1.10 (1.00-1.14). Face whitish-yellow. Carina nose-like, slightly prominent, dorsally flat. Cheek index about 8-13. Eye index = 1.23 (1.17-1.30). Occiput yellowish, slightly darker above foramen. Antennae yellowish. Arista with 4-5 dorsal, 2-3 ventral, and about 6 small inner branches, plus terminal fork. Proboscis yellow. Palpus with about 5 fine setae along lower margin.

Thorax length 0.85 (0.76-0.88) mm. Scutum yellowish, shining, usually brownish before scutellum and showing a "trident pattern", i.e. 3 faint stripes, one median and two paramedian in dorsocentral region, 6 rows of acrostichal setulae. h index = 0.83 (0.75-0.86). Transverse distance of dorsocentral setae 180-212% of longitudinal distance; dc index = 0.72 (0.68-0.80). Distance between apical scutellar setae about 73-90% of that between apical and basal one, basal setae slightly convergent; scut index =

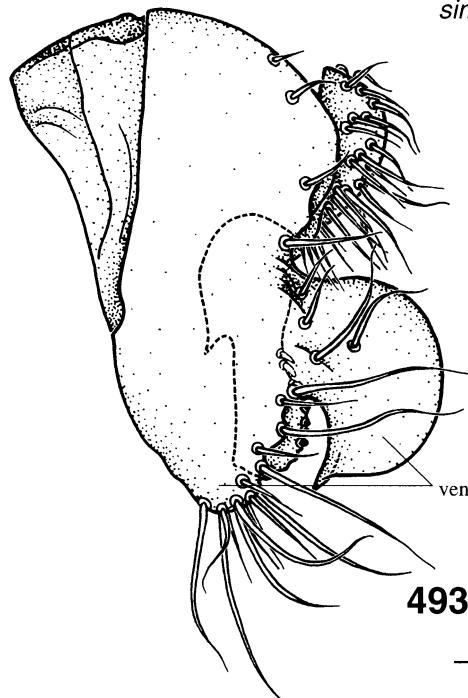
0.85 (0.81-0.89). Pleura pale yellowish, shining, sterno index = 0.63 (0.60-0.65), median katepisternal seta about 54-64% of anterior one. Haltere yellowish. Legs yellowish, sex comb on protarsomere 1 with about 12 peg-like setae, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 1.90 (1.75-2.03) mm, length to width ratio = 2.06 (1.97-2.12) Indices: C = 2.32 (2.19-2.43), ac = 2.50 (2.29-2.80), hb = 0.43 (0.40-0.46), 4C = 1.28 (1.25-1.33), 4v = 2.45 (2.36-2.50), 5x = 2.09 (2.00-2.25), M = 0.90 (0.82-1.00), prox. x = 0.84 (0.73-0.92).

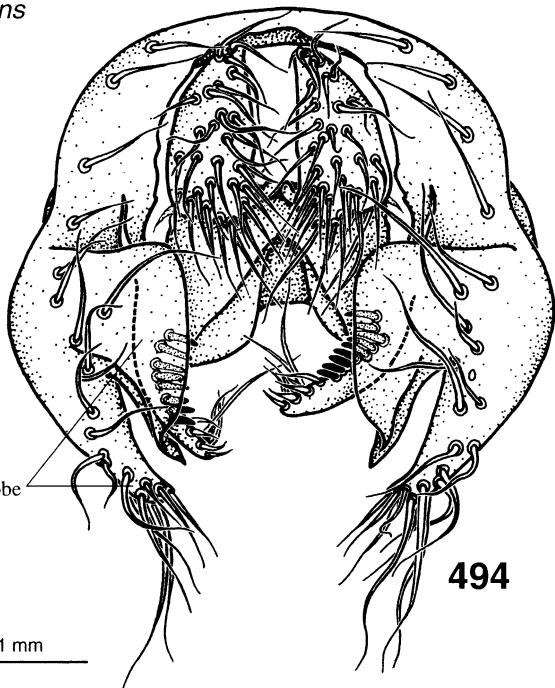
Abdomen yellowish, shining, particularly at apex, tergites 2-4 with a brown marginal band which is medially triangularly extended, tergites 5-6 completely black.

♂ Terminalia (Figs 493-496). Epandrium not microtrichose, with 21 lower, and 3 upper setae; ventral lobe bifurcate, dorsal branch protruding backwards, distally extremely enlarged, amber-coloured, and crescent-shaped, ventral branch very long, pointed inwards in ventral view, not microtrichose, covering surstyli. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, with a row of ca. 9 long, peg-like prensisetae, ca. 9 inner and no outer setae. Decasternum as in Fig. 494. Hypandrium shorter than epandrium, in lateral view remarkably expanded dorsoanteriorly, posterior margin w-shaped, medially concave, distolaterally microtrichose; posterior hypandrial process and dorsal arch absent; gonopods indistinct, completely fused to each other and to arms of hypandrium, recognisable because of the distal connection to outer paraphysis, and the submedian seta on distal margin of hypandrium which is submedially projecting posteriad; projections cone-shaped. Aedeagus anteriorly connected to aedeagal apodeme by membranous tissue, ventrally and dorsally membranous, anteriorly expanded ventrad in lateral view, and subapically conspicuously expanded laterally in ventral view, ventrolaterally covered with a fringe-like, irregular row of long and blunt scales; apically slightly narrowed and roundish, completely flanked by two pairs of paraphyses. Inner paraphysis trifurcate, anteriorly connected to distal margin of aedeagal apodeme by membranous tissue; inner surface of median branch with a texture similar to gooseflesh and that of dorsal one covered with tiny scales; median branch well-developed and, beneath con-

simulans

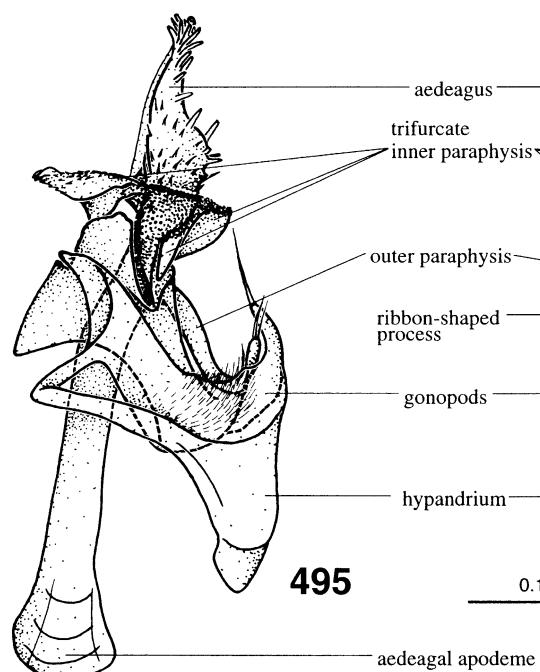


493



494

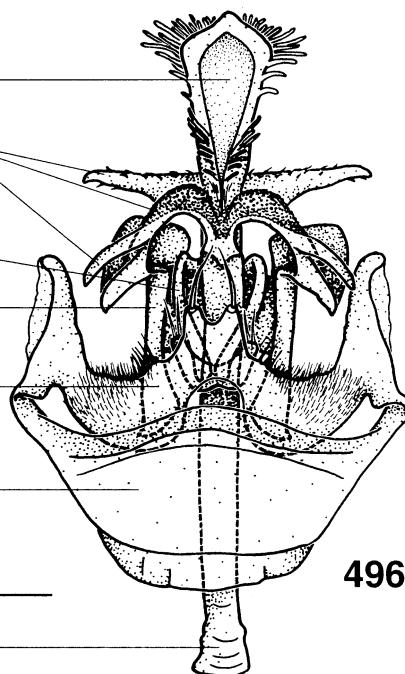
0.1 mm



495

0.1 mm

aedeagal apodeme



496

Figs. 493-496. *Drosophila simulans* Sturtevant. 493: epandrium, cerci, and surstyli, left lateral view; 494: idem, plus decasternum, posterior view; 495: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 496: idem, posterior view.

nection gonopod-outer paraphysis, fused to the former subproximal inner surface of the gonopod by means of a long, ribbon-shaped, sclerotised process; additionally fused to each other dorsally by means of a long, ribbon-shaped, sclerotised process, the pair of processes additionally fused to each other dorsally, thereby embracing aedeagus and both pairs of paraphyses, as a dorsal arch. Outer paraphysis distally with 2 setulae, connected both to gonopod and to distal margin of aedeagal apodeme by membranous tissue. Aedeagal apodeme twice as long as aedeagus, rod-shaped, anterior half expanded dorsoventrally. Ventral rod absent.

♀. Differences from male: No sex combs. Abdominal tergites 5-6 with marginal bands as on tergites 2-4, but broader and darker, the one on tergite 6 almost covering the whole area.

Measurements: Frontal length 0.26 (0.24-0.29) mm; frontal index = 0.80 (0.71-0.88), top to bottom width ratio = 1.19 (1.09-1.25). Frontal triangle about 76-86% of frontal length; ocellar triangle about 41-50% of frontal length. Orbital plates about 82-93% of frontal length. Distance of or3 to or1 = 57-83% of or3 to vtm, or1 / or3 ratio = 0.83 (0.82-0.85), or2 / or1 ratio = 0.58 (0.55-0.64), postocellar setae = 68 (64-71)%, ocellar setae = 95 (93-100)% of frontal length; vibrissal index = 0.98 (0.89-1.00). Cheek index about 8-10. Eye index = 1.22 (1.16-1.26). Thorax length 0.89 (0.76-1.00) mm. h index = 0.86 (0.75-0.92). Transverse distance of dorsocentral setae 200-243% of longitudinal distance; dc index = 0.76 (0.74-0.78). Distance between apical scutellar setae about 89-100% of that between apical and basal one; scut index = 0.85 (0.83-0.88), sterno index = 0.58 (0.53-0.61), median katepisternal seta about 57-78% of anterior one. Wing length 1.81 (1.64-2.00) mm, length to width ratio = 2.08 (2.04-2.18). Indices: C = 2.37 (2.23-2.57), ac = 2.86 (2.60-3.25), hb = 0.46 (0.43-0.50), 4C = 1.20 (1.17-1.30), 4v = 2.32 (2.18-2.50), 5x = 1.96 (1.80-2.00), M = 0.80 (0.73-0.83), prox. x = 0.77 (0.64-0.91).

♀ Terminalia (Fig. 490). Valve of oviscap distally rounded, strongly concave ventrally, dorsodistally conspicuously depressed, basally deeper, apically shallower, forming a kind of pouch [which probably harbours the huge dorsal branch of the ventral lobe of the male epandrium during copulation], with no discal and 15-18 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3

thin, distally positioned, tiny, hardly visible in lateral view, even under high magnification, but recognisable by their alveoli in dorsal view as in *D. melanogaster*, and 1 long, slightly curved, subterminal.

Distribution. – A cosmopolitan, domestic species, less widely distributed than *D. melanogaster* and generally recorded much later; absent in cold areas, Northernmost locality: Oulu (Finland).

Biology. – The larvae are predominantly fruit breeders. The flies are common indoors, attracted by fruit and fermented drinks.

Additional specimens examined. – 5 ♂♂ (BULGARIA: Pleven, 1 ♂, 1985. SWITZERLAND: Zürich, 4 ♂♂, 1985), 4 ♀♀ (SWITZERLAND: Jura, 1 ♂, 1974; Zürich, 3 ♂♂, 1987, 1987, 1991).

obscura species group Sturtevant, 1942

Diagnosis. – Generally dark flies; two pairs of sex combs present but indistinct in some species; first genal seta short; anterior reclinate orbital seta large; sterno index about 0.6; basal scutellar setae convergent, preapical seta on protibia unusually long; epandrium and cerci without microtrichia, not fused; ventral lobe of epandrium divided into outer and inner branches; inner branch encircling surstylos anteriorly, except in *D. alpina*; aedeagus linked to aedeagal apodeme by membranous tissue and flanked by two pairs of paraphyses.

Taxa included. – A total of 39 species, arranged into several subgroups:

- *obscura* subgroup: At least 3 peg-like setae in the distal sex comb; carina broad and flat; acrostichal setulae in eight rows, testes elliptical; ventral receptacle short. This subgroup includes 26 species, of which nine occur in Europe. Some authors place the American species in the *pseudoobscura* subgroup, the Afrotropical species in the *micro-labis* subgroup, and *Drosophila subobscura*, *D. guanche*, and *D. madeirensis* in the *subobscura* subgroup.
- *sinobscura* subgroup: Three species recorded in Southern China and Taiwan: *Drosophila*

sinobscura Watabe, 1996, *D. hubeiensis* Sperlich and Watabe, 1997, *D. luguensis* Gao, Watabe, Toda, Zhang and Aotsuka, 2003.

- *affinis* subgroup: One (at most 2) peg-like setae in the distal sex comb; carina narrow, not flat; acrostichal setulae in six rows, testes rather short, but still spirally coiled; ventral receptacle long. Nine species of this subgroup occur in America, and one, *D. inexpectata* Tsacas, in Africa.
- *D. alpina* and *D. helvetica*, discussed below, do not fit into any of these three subgroups.

Comments. – Almost all the species of the *obscura* group were originally recorded in the temperate Holarctic. However, a few species have been described from mountains in the Oriental and Afrotropical regions, and *D. pseudoobscura*, *D. tolteca* have been recorded in South America. In spite of various studies, e.g. by Lakovaara & Saura (1982), Barrio & Ayala (1997), Gleason et al. (1997) and O'Grady (1999), the phylogenetic relationships are not well understood.

Two of the *obscura* group species, namely *D. guanche* Monclús, 1976, and *D. madeirensis* Monclús, 1984, are endemic to the Canary Islands and Madeira Island, respectively.

Drosophila alpina Burla, 1948

(Figs 299, 491, 497-501)

Drosophila alpina Burla, 1948: 274.

Diagnosis. – Brownish flies with yellowish pleura and base of abdomen; male protarsomeres 1 and 2 almost equal in length; both sex combs large, each with more than 10 peg-like setae; hb-index about 0.45; ventral lobe of epandrium distally slightly bifurcate; surstyli conspicuously without peg-like prensisetae and mostly fused to epandrium; oviscapt yellowish, broadly rounded at tip.

Redescription. – ♂. Head. Frons dark brownish, with a broad, yellowish-brown area above antennae, dull, frontal length 0.29 (0.25-0.31) mm; frontal index = 0.88 (0.83-0.95), top to bottom width ratio = 1.35 (1.30-1.42). Frontal triangle pale brownish, subshining, about 83-89% of frontal length; ocellar triangle prominent, dark brown, subshining, about 47-50% of frontal

length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 83-88% of frontal length. Orbital setae black, distance of or3 to or1 = 62-83% of or3 to vtm, or1 / or3 ratio = 0.76 (0.73-0.85), or2 / or1 ratio = 0.60 (0.45-0.73), postocellar setae = 82-87%, ocellar setae = 93-100% of frontal length; vibrissal index = 0.50 (0.42-0.56). Face brownish-yellow. Carina prominent, rather flat, divergent downwards, yellowish. Cheek index about 6-7. Eye index = 1.20 (1.14-1.27). Occiput dark brown. Pedicel brownish. Flagellomere 1 dark brown. Arista with 3-4 dorsal, 2 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus brownish. Palpus with 1 apical, and 1 very small ventral seta.

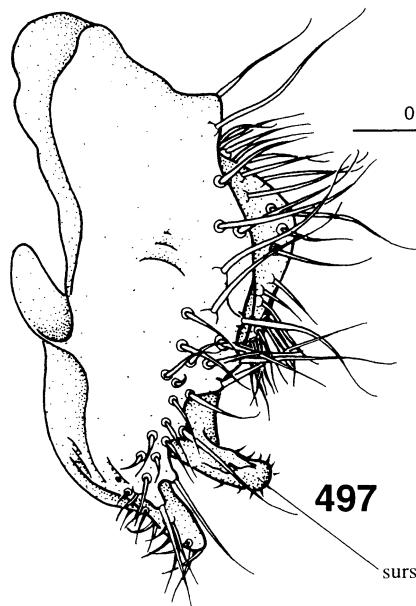
Thorax length 0.93 (0.85-1.02) mm. Scutum dark brown, shining, 8 rows of acrostichal setulae. h index = 1.22 (1.08-1.40). Transverse distance of dorsocentral setae 178-222% of longitudinal distance; dc index = 0.66 (0.64-0.68). Scutellum pale brownish, less shining, distance between apical scutellar setae about 75-90% of that between apical and basal one, basal setae parallel; scut index = 0.96 (0.92-1.00). Pleura brownish-yellow, more and more yellowish downwards, shining, postpronotum yellowish, sterno index = 0.48 (0.43-0.58), median katepisternal seta about 27-40% of anterior one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2 (Fig. 299), with 13-16 and 11-15 peg-like setae respectively, length ratio of respective tarsomeres = 1.00-1.17, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline length 2.37 (2.13-2.56) mm, length to width ratio = 2.18 (2.10-2.26). Indices: C = 2.43 (2.18-2.59), ac = 2.76 (2.57-3.00), hb = 0.48 (0.47-0.50), 4C = 1.08 (1.00-1.13), 4v = 2.19 (2.06-2.31), 5x = 1.97 (1.83-2.20), M = 0.70 (0.67-0.73), prox. x = 0.57 (0.53-0.63).

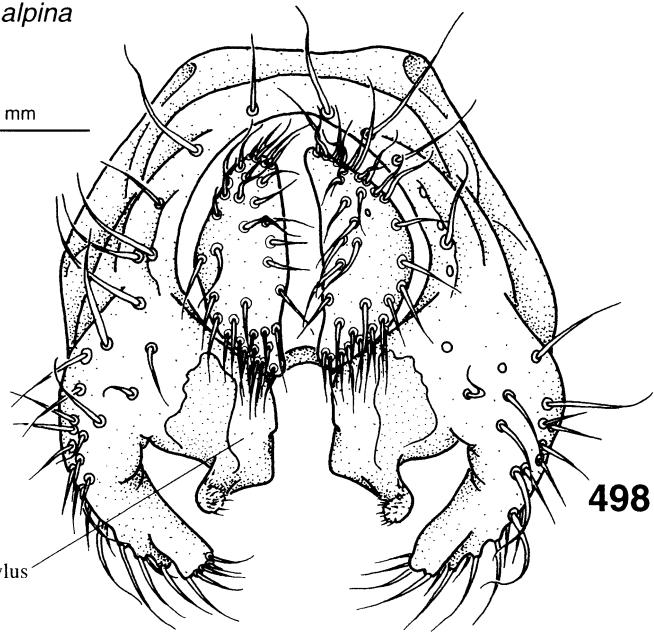
Abdomen generally dark brownish, shining, tergites 1-3 distinctly paler, yellowish.

♂ Terminalia (Figs 497-500). Epandrium not microtrichose, with ca. 37 lower, and ca. 6 upper setae; ventral lobe subapically slightly bifurcate, pointed inwards in posterior view, not microtrichose, not covering surstylus. Cerci anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, anteriorly mostly fused to epandrium, medially membranous, ventrodistally with a finger-shaped,

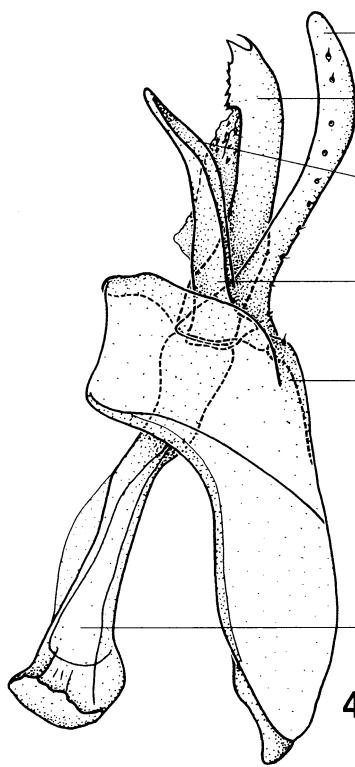
alpina



497



498



499

outer paraphysis

aedeagus

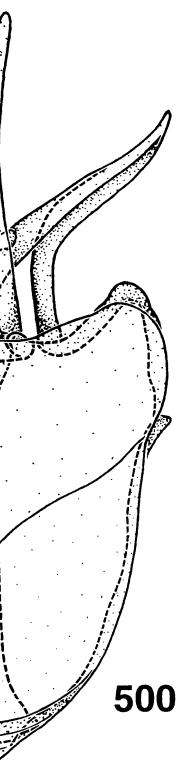
inner paraphysis

ribbon-shaped process

hypandrium+gonopods

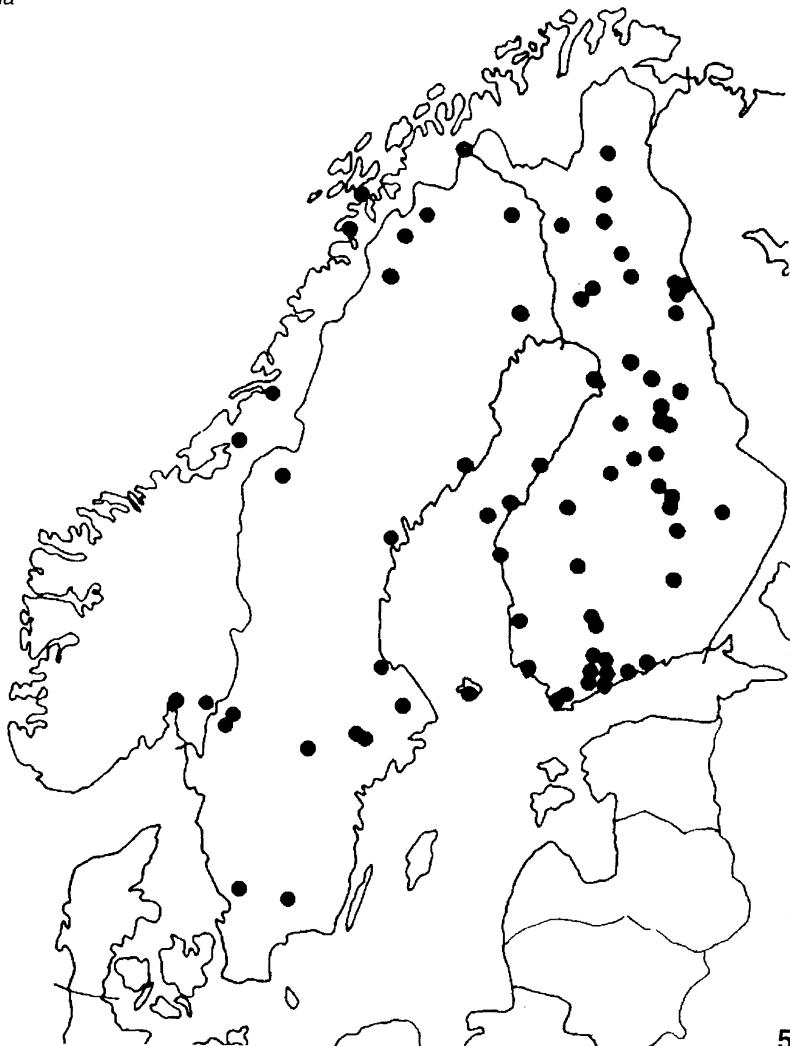
0.1 mm

aedeagal apodeme



500

Figs. 497-500. *Drosophila alpina* Burla. 497: epandrium, cerci, and surstyli, left lateral view; 498: idem, plus decasternum, posterior view; 499: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 500: idem, posterior view.



501

Fig. 501. Known distribution pattern of *Drosophila alpina* Burla in Scandinavia.

inwardly-curved, apically microtrichose projection, and conspicuously without prensisetae, and inner and outer setae. Decasternum very narrow, as in Fig. 498. Hypandrium shorter than epandrium, in lateral view expanded dorsoposteriorly, anterior margin convex, posterior margin straight; posterior hypandrial process and dorsal arch absent; gonopods indistinct, completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphysis, and their submedian setulae on distal margin of hypandrium. Aedeagus subapi-

cally slightly expanded in lateral view and marginally serrate dorsally, apically with a pair of thin dorsad-directed projections, ventrally and dorsally entirely membranous, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphyses sinuate, proximally fused to each other beneath

aedeagus, each laterally with a sinuate row of ca. 10 setulae, tip roundish and not narrowed, anteriorly connected both to distal margin of aedeagal apodeme and to median area of distal margin of hypandrium ("gonopods") by membranous tissue. Aedeagal apodeme longer than aedeagus, rod-shaped, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.75.

Measurements: Frontal length 0.31 (0.27-0.34) mm; frontal index = 0.79 (0.70-0.91), top to bottom width ratio = 1.31 (1.19-1.38). Frontal triangle about 87-90% of frontal length; ocellar triangle about 45-50% of frontal length. Orbital plates about 75-89% of frontal length. Distance of or3 to or1 = 62-86% of or3 to vtm, or1 / or3 ratio = 0.69 (0.67-0.71), or2 / or1 ratio = 0.64 (0.54-0.75), postocellar setae = 94-106%, ocellar setae = 95-119% of frontal length; vibrissal index = 0.35 (0.25-0.44). Cheek index about 6-8. Eye index = 1.18 (1.15-1.24). Thorax length 1.20 (1.14-1.29) mm. h index = 1.18 (1.13-1.21). Transverse distance of dorsocentral setae 200-218% of longitudinal distance; dc index = 0.70 (0.69-0.74). Distance between apical scutellar setae about 71-87% of that between apical and basal one; scut index = 0.96 (0.94-0.97), sterno index = 0.56 (0.52-0.58), median katepisternal seta about 27-33% of anterior one. Wing length 2.83 (2.76-2.94) mm, length to width ratio = 2.21 (2.16-2.27). Indices: C = 2.64 (2.40-2.79), ac = 2.38 (2.11-2.71), hb = 0.47 (0.45-0.50), 4C = 0.95 (0.90-1.05), 4v = 1.94 (1.81-2.05), 5x = 1.97 (1.86-2.00), M = 0.65 (0.62-0.67), prox. x = 0.53 (0.48-0.58).

♀ Terminalia (Fig. 491). Valve of oviscapts dorsomedially mostly membranous, distally rounded, strongly convex ventrally, with 4-5 discal and ca. 11 marginal, outer ovisensilla, proximal ones trichoid-like, distal ones peg-like and roundish-tipped; trichoid-like inner ovisensilla: 3 distally positioned, the 2 dorsalmost ones small and thin, followed by an unusually large one (probably an aberration as in the right valve of the same specimen the three inner sensilla are of equal size), and 1 long, straight, subterminal.

Distribution. – (Fig. 501). A Palaearctic species with a boreo-alpine distribution type. In southern areas, the flies are rare at lower altitudes. Recorded from Norway (northernmost locality: Hamaroy), Sweden, and Finland.

Biology. – Larvae in cultures go into a diapause which cannot be broken. This suggests that there is only one generation per year (Lumme et al., 1978).

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Glarus, 1970), 4 ♀♀ (SWITZERLAND: Graubünden, 1 ♀, 1974; Uri, 3 ♀♀, 1973).

Comments. – All the phylogenetic studies show that this species is an outlier in the *obscura* group; this is also corroborated by its morphological peculiarities.

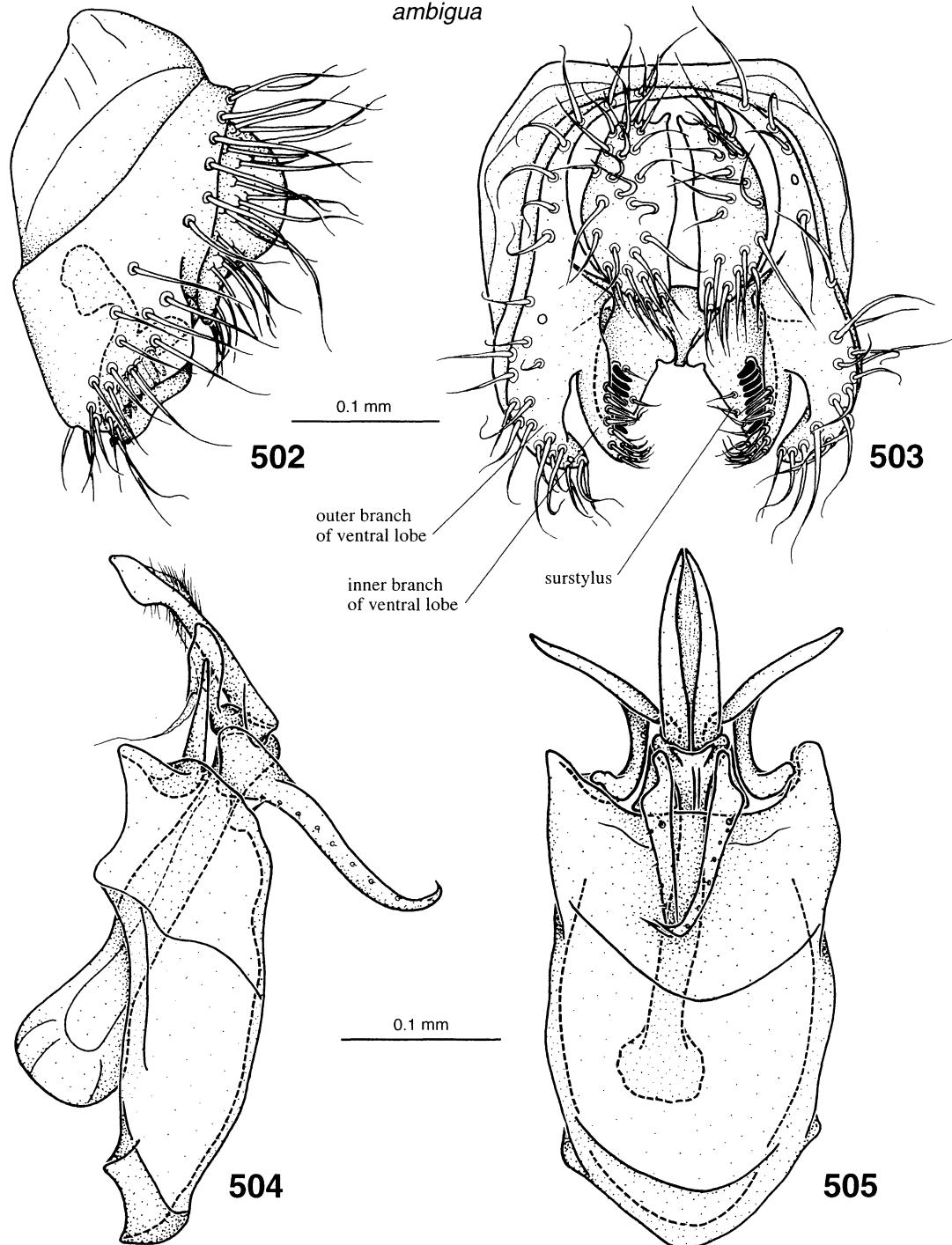
Drosophila ambigua Pomini, 1940

(Figs 492, 502-506)

Drosophila ambigua Pomini, 1940: 157.

Diagnosis. – Dark brown flies; male protarsomeres 1 and 2 almost equal in length; both sex combs large, each with more than 7 peg-like setae; hb-index about 0.40; cercus with a brush of longer setae ventrally; tip of aedeagus shaped like a telephone receiver; outer paraphysis apically curved and very sharp; oviscapts pale yellowish, apically pointed, with strong ovisensilla, discal ones separated by a gap from marginal ones.

Redescription. – ♂. Head. Frons dark brownish, yellowish-brown above antennae, dull, frontal length 0.35 (0.32-0.37) mm; frontal index = 0.96 (0.86-1.00), top to bottom width ratio = 1.36 (1.27-1.43). Frontal triangle brownish, apically very narrow, about 59-70% of frontal length; ocellar triangle prominent, dark brown, about 36-42% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 71-82% of frontal length. Orbital setae black, distance of or3 to or1 = 62-87% of or3 to vtm, or1 / or3 ratio = 0.73 (0.71-0.75), or2 / or1 ratio = 0.55 (0.46-0.67), postocellar setae = 70 (63-80)%, ocellar setae = 78 (73-81)% of frontal length; vibrissal index = 0.50 (0.42-0.60). Face dark brown. Carina prominent, distinctly diverging downwards, pale brown. Cheek index about 5-8. Eye index = 1.17 (1.11-1.24). Occiput blackish-brown. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3-4 dorsal, 2 ventral and about 8 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus

ambigua

Figs. 502-505. *Drosophila ambigua* Pomini. 502: epandrium, cerci, and surstyli, left lateral view; 503: idem, plus decasternum, posterior view; 504: hypandrium, gonopods, paraphyses, aedeagal apodeme, left lateral view; 505: idem, posterior view.

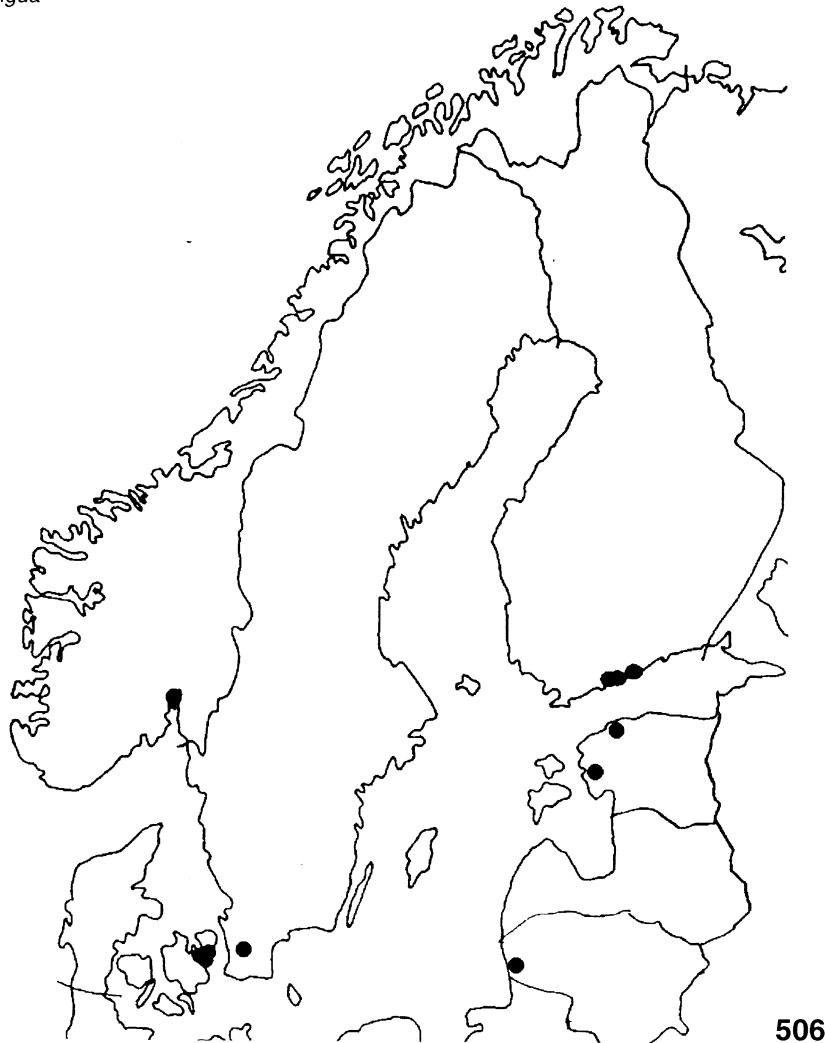


Fig. 506. Known distribution pattern of *Drosophila ambigua* Pomini in Scandinavia.

dark brown. Palpus with 1 apical, and 1 distinct but small ventral seta.

Thorax length 1.11 (1.05-1.16) mm. Scutum brownish-black, shining, 8 rows of acrostichal setulae. h index = 1.06 (1.00-1.15). Transverse distance of dorsocentral setae 169-185% of longitudinal distance; dc index = 0.76 (0.69-0.80). Scutellum less shining, distance between apical scutellar setae about 77-92% of that between apical and basal one, basal setae parallel; scut index = 0.92 (0.88-0.96). Pleura dark brown, shining, sterno index = 0.57 (0.52-0.60), median katepisternal seta about 23-33% of anterior

one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2, with 9-12 and 8-10 peg-like setae respectively, length ratio of respective protarsomeres = 1.10, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.73 (2.62-2.80) mm, length to width ratio = 2.22 (2.19-2.24). Indices: C = 2.95 (2.78-3.13), ac = 2.30 (2.25-2.43), hb = 0.43 (0.38-0.47), 4C = 0.86 (0.80-0.95), 4v = 1.80 (1.65-2.00), 5x = 1.56 (1.43-1.71), M = 0.54 (0.48-0.60), prox. x = 0.62 (0.57-0.68).

Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of each

tergite, if fully visible. On some tergites, extreme terminal margin of tergites pale yellowish.

♂ Terminalia (Figs 502-505). Epandrum not microtrichose, with ca. 31 lower (ca. 19 on outer, and ca. 12 on inner branch of ventral lobe; the latter arranged in a row), and ca. 6 upper setae; ventral lobe long, bifurcate, outer branch pointed inwards in ventral view, not microtrichose and covering surstylus, which is almost completely encircled by its inner branch. Cercus anteriorly connected to epandrum by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, with a row of ca. 8 peg-like, roundish-tipped prensisetae, ca. 5 inner and no outer setae. Decasternum as in Fig. 503. Hypandrium longer than epandrum, anterior margin convex, posterior margin concave; posterior hypandrial process and dorsal arch absent; gonopods indistinct, completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses and their submedian setulae on distal margin of hypandrium. Aedeagus in lateral view apically slightly expanded, shaped like a telephone receiver, expansion somewhat triangular, ventrally and dorsally entirely membranous and distally covered with thin and dense microtrichia, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis sinuate, apically gradually bent dorsad, sharp at tip, laterally with a sinuate row of ca. 8 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, rod-shaped, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.40.

Measurements: Frontal length 0.34 (0.29-0.37) mm; frontal index = 0.83 (0.74-0.89), top to bottom width ratio = 1.27 (1.19-1.35). Frontal triangle about 67-71% of frontal length; ocellar triangle about 36-41% of frontal length. Orbital plates about 67-82% of frontal length. Distance of or3 to or1 = 71-87% of or3 to vtm, or1 / or3 ratio = 0.73 (0.70-0.75), or2 / or1 ratio = 0.49

(0.40-0.55), postocellar setae = 80 (76-86)%; ocellar setae = 92 (82-106)% of frontal length; vibrissal index = 0.42 (0.31-0.50). Cheek index about 4-7. Eye index = 1.14 (1.08-1.22). Thorax length 1.20 (0.99-1.41) mm. h index = 1.02 (0.92-1.13). Transverse distance of dorsocentral setae 164-209% of longitudinal distance; dc index = 0.69 (0.65-0.75). Distance between apical scutellar setae about 73-91% of that between apical and basal one; scut index = 0.91 (0.85-0.97), sterno index = 0.60 (0.57-0.65), median katepisternal seta about 27-38% of anterior one. Wing length 2.79 (2.13-3.33) mm, length to width ratio = 2.19 (2.11-2.26). Indices: C = 3.02 (2.72-3.35), ac = 2.45 (2.00-3.00), hb = 0.44 (0.41-0.46), 4C = 0.88 (0.74-1.00), 4v = 1.91 (1.67-2.17), 5x = 1.65 (1.33-2.14), M = 0.61 (0.48-0.83), prox. x = 0.64 (0.57-0.71).

♀ Terminalia (Fig. 492). Valve of oviscapts dorsomedially mostly membranous, apically rounded, convex ventrally, with 3-4 discal and 14-16 marginal, well-developed, peg-like outer ovisensilla, which are sharply pointed at tip; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, straight, subterminal.

Distribution. – (Fig. 506). A widespread Palaearctic species, more common in warmer areas, also found in the Mediterranean countries, introduced into north-eastern North America. Recorded from all Scandinavian countries, Estonia and Lithuania. Northernmost locality: Helsinki (Finland).

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Aargau, 1973), 4 ♀♀ (SWITZERLAND: Graubünden, 2 ♀♀, 1974; Schwyz, 1 ♀, 1975; Zürich, 1 ♀, 1975).

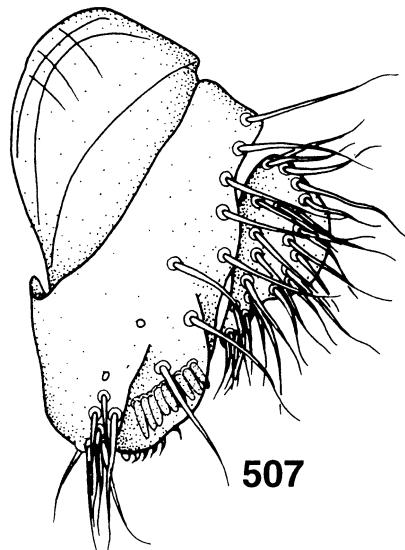
Drosophila bifasciata Pomini, 1940

(Figs 507-511, 515)

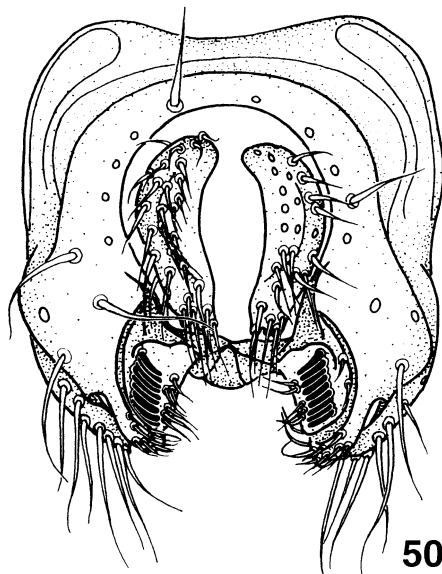
Drosophila bifasciata Pomini, 1940: 155.

Diagnosis. – Dark brownish flies; male protarsomere 1 distinctly longer than protarsomere 2; both sex combs small, set obliquely on the tarsomere, each with less than 10 peg-like setae; hb-index about 0.40; lateroventral corners of abdominal tergites of female dark; epandrum somewhat square in posterior view;

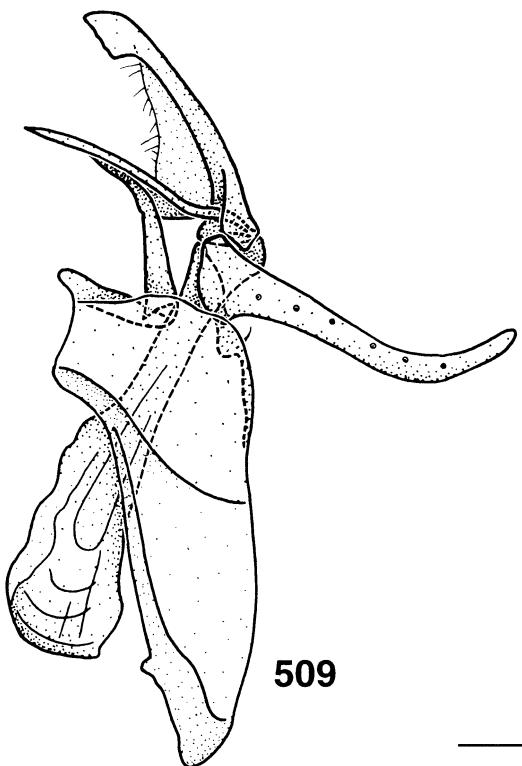
bifasciata



507

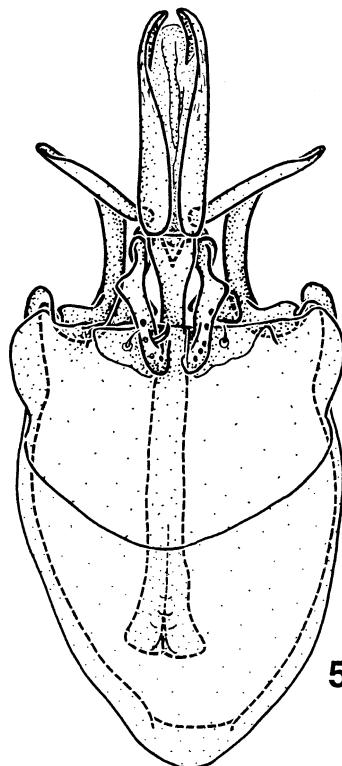


508



509

0.1 mm

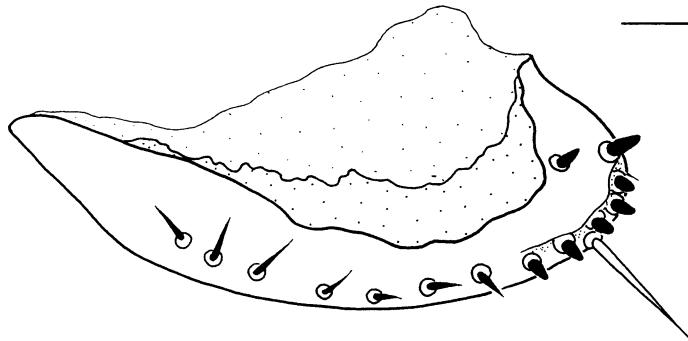


510

Figs. 507-510. *Drosophila bifasciata* Pomini. 507: epandrium, cerci, and surstyli, left lateral view; 508: idem, plus decasternum, posterior view; 509: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 510: idem, posterior view.

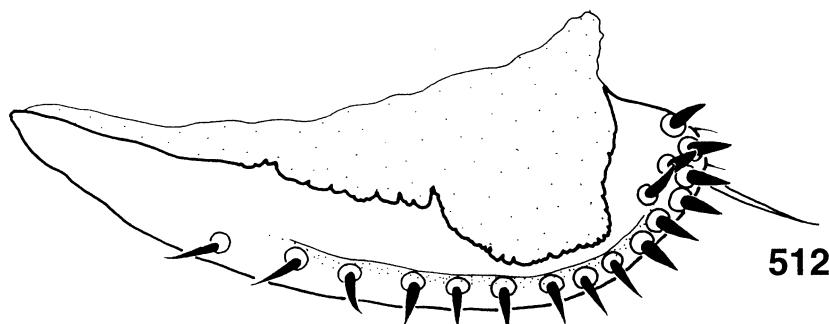
0.1 mm

bifasciata



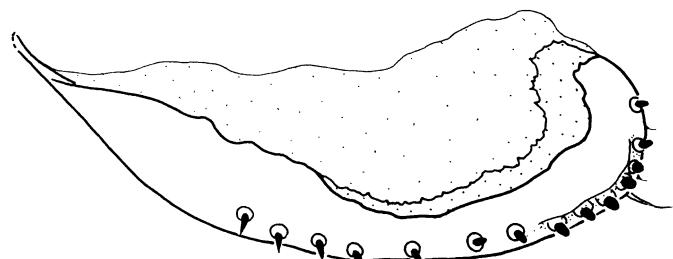
511

eskoi



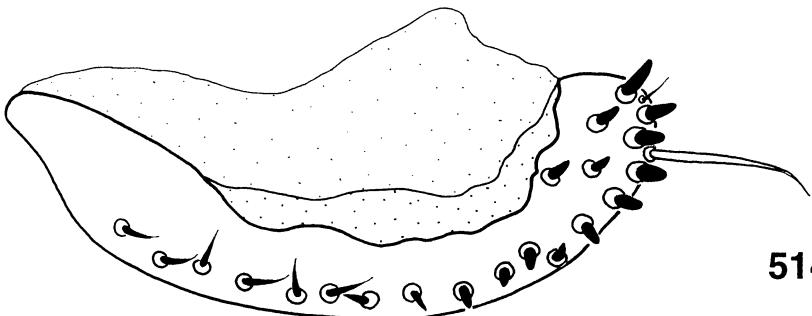
512

helvetica



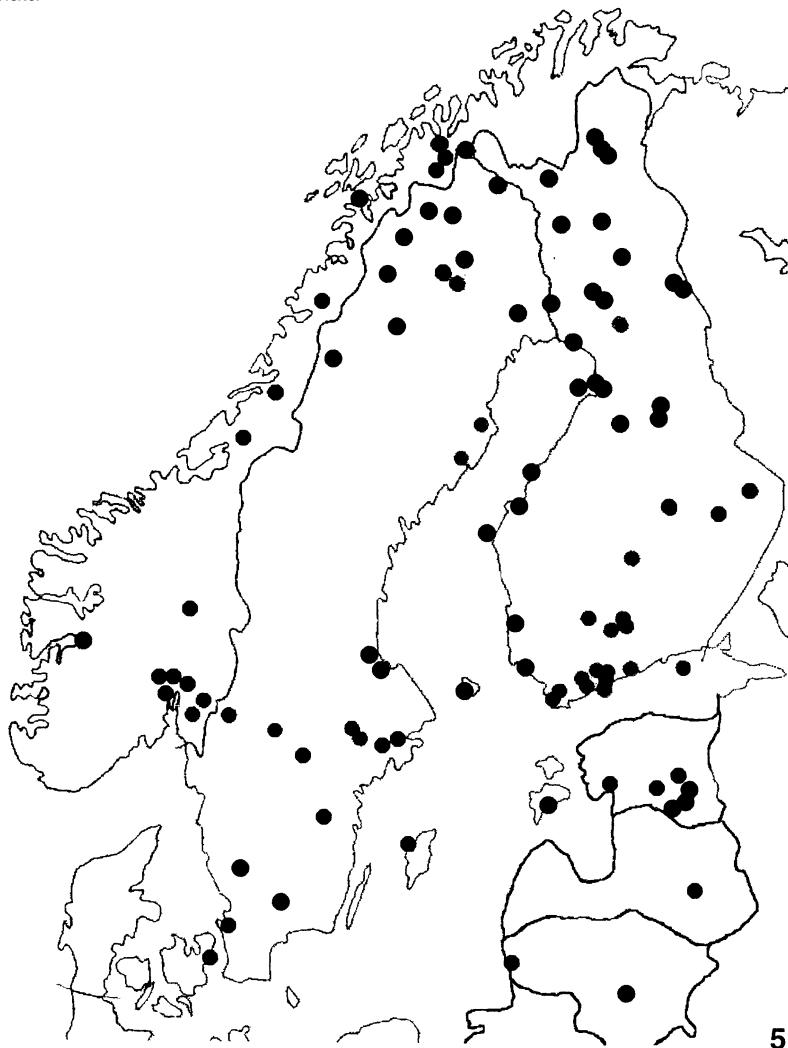
513

obscura



514

Figs. 511-514. Left oviscapts valves, lateral view.



515

Fig. 515. Known distribution pattern of *Drosophila bifasciata* Pomini in Scandinavia.

aedeagus shaped like a telephone receiver in lateral view; outer paraphysis submedially bent, apically roundish; oviscapt yellowish, rounded at tip.

Redescription. — ♂. Head. Frons brownish, yellowish-brown above antennae, dull, frontal length 0.28 (0.25-0.32) mm; frontal index = 0.97 (0.79-1.19), top to bottom width ratio = 1.41 (1.16-1.57). Frontal triangle brownish, apically very narrow, about 59-75% of frontal length; ocellar triangle prominent, about 35-47% of frontal length. Orbital plates broad, apically

slightly diverging from eye margin, subshining, about 76-88% of frontal length. Orbital setae black, distance of or3 to or1 = 67-100% of or3 to vtm, or1 / or3 ratio = 0.67 (0.64-0.81), or2 / or1 ratio = 0.56 (0.46-0.60), postocellar setae = 77 (68-82), ocellar setae = 86 (68-94)% of frontal length; vibrissal index = 0.43 (0.29-0.64). Face dark brown. Carina prominent, nose-like, slightly divergent downwards, pale brown. Cheek index about 5-9. Eye index = 1.13 (1.09-1.18). Occiput blackish-brown. Pedicel dark brown. Flagellomere 1 blackish. Arista

with 3-4 dorsal, 2 ventral, and about 7 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus with 1 apical and 1 very small ventral seta.

Thorax length 0.88 (0.71-1.00) mm. Scutum dark brown, usually with a darker median stripe, shining, 8 rows of acrostichal setulae. h index = 0.98 (0.90-1.18). Transverse distance of dorsocentral setae 158-200% of longitudinal distance; dc index = 0.69 (0.65-0.76). Scutellum less shining, distance between apical scutellar setae about 88-100% of that between apical and basal one; basal setae parallel; scut index = 0.85 (0.80-0.89). Pleura dark brown, shining, sterno index = 0.55 (0.50-0.59), median katepisternal seta about 31-50% of anterior one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2, with 7-11 and 7-9 peg-like setae respectively, length ratio of respective protarsomeres = 1.29-1.57, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.06 (1.75-2.38) mm, length to width ratio = 2.19 (2.14-2.27). Indices: C = 2.84 (2.67-3.00), ac = 2.48 (2.33-2.67), hb = 0.43 (0.42-0.46), 4C = 1.03 (0.94-1.20), 4v = 2.23 (1.88-2.50), 5x = 2.08 (1.67-2.25), M = 0.69 (0.59-0.80), prox. x = 0.72 (0.65-0.80).

Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of each tergite, if completely visible.

♂ Terminalia (Figs 507-510). Epandrium not microtrichose, with ca. 19 lower setae (ca. 10 long ones on outer, and ca. 9 short ones on inner branch of ventral lobe), and ca. 6 long upper setae; ventral lobe long, bifurcate, pointed inwards in ventral view, not microtrichose, covering surstylos, which is almost completely encircled by inner branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylos not microtrichose, with a straight row of ca. 9 peg-like roundish-tipped prensisetae, ca. 6 inner and 2 outer setae. Decasternum as in Fig. 508. Hypandrium as long as epandrium, anterior margin convex, posterior margin straight; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses, their submedian setulae and fusion lines on mediolateral area of hypandrium. Aedeagus distally shaped like a telephone receiver in lateral view, apically slightly expanded and marginally subtly

serrate (expansion somewhat square), ventrally and dorsally entirely membranous, distally covered with thin and sparse microtrichia, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis sinuate, submedially gradually bent dorsad, roundish at tip, laterally with a sinuate row of ca. 6 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anterior half dorsally expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.20.

Measurements: Frontal length 0.32 (0.27-0.34) mm; frontal index = 0.87 (0.80-0.95), top to bottom width ratio = 1.33 (1.24-1.40). Frontal triangle about 63-81% of frontal length; ocellar triangle about 35-44% of frontal length. Orbital plates about 74-88% of frontal length. Distance of or3 to or1 = 62-75% of or3 to vtm, or1 / or3 ratio = 0.73 (0.71-0.78), or2 / or1 ratio = 0.60 (0.50-0.67), postocellar setae = 83 (79-85)%, ocellar setae = 94 (84-100)% of frontal length; vibrissal index = 0.44 (0.36-0.53). Cheek index about 4-8. Eye index = 1.14 (1.08-1.20). Thorax length 1.15 (1.00-1.26) mm. h index = 1.03 (1.00-1.08). Transverse distance of dorsocentral setae 183-220% of longitudinal distance; dc index = 0.68 (0.64-0.74). Distance between apical scutellar setae about 83-118% of that between apical and basal one; scut index = 0.85 (0.72-0.96), sterno index = 0.56 (0.52-0.59), median katepisternal seta about 31-40% of anterior one. Wing length 2.58 (2.34-2.87) mm, length to width ratio = 2.16 (2.09-2.23). Indices: C = 3.03 (2.87-3.21), ac = 2.35 (2.14-2.50), hb = 0.38 (0.33-0.43), 4C = 0.95 (0.86-1.07), 4v = 2.13 (1.90-2.36), 5x = 1.85 (1.50-2.20), M = 0.70 (0.60-0.79), prox. x = 0.71 (0.57-0.86).

♀ Terminalia (Fig. 511). Valve of oviscapit dorsomedially mostly membranous, apically rounded, convex ventrally, with 2 discal and ca. 12 marginal outer ovisensilla, proximal ones trichoid-like, distal ones peg-like and roundish-tipped; trichoid-like inner ovisensilla: 3 thin,

distally positioned, and 1 long, straight, subterminal.

Distribution. – (Fig. 515). A widespread Palaearctic species with a complex distribution: very abundant in northern areas, recorded at higher altitudes in Central Europe, clearly rare in the south but found in the mountains of Taiwan. Northernmost locality: Malselv (Norway).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Genève, 1 ♂, 1972; Ticino, 3 ♂♂, 1970), 4 ♀♀ (SWITZERLAND: St. Gallen, 1 ♀, 1973; Ticino, 1 ♀, 1970. RUSSIA: Zvenigorod, 2 ♀♀, 1984).

Drosophila eskoi Lakovaara & Lankinen, 1974

(Figs 512, 516-520)

Drosophila eskoi Lakovaara & Lankinen, 1974: 121.

Diagnosis. – Dark brown flies; male protarsomeres 1 and 2 almost equal in length; both sex combs large, each with more than 9 peg-like setae; hb-index about 0.50; aedeagus distally shaped like a telephone receiver and proximally broad in lateral view; outer paraphysis sword-shaped in lateral view; oviscapt yellowish, rounded at tip, discal ovisensilla very close to marginal ones.

Redescription. – ♂. Head. Frons dark brown, yellowish-brown above antennae, dull, frontal length 0.34 (0.30-0.37) mm; frontal index = 0.91 (0.82-1.00), top to bottom width ratio = 1.29 (1.18-1.36). Frontal triangle brownish, apically very narrow, about 55-80% of frontal length; ocellar triangle prominent, about 36-44% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 77-95% of frontal length. Orbital setae black, distance of or3 to or1 = 62-77% of or3 to vtm, or1 / or3 ratio = 0.69 (0.69-0.70), or2 / or1 ratio = 0.64, postocellar setae = 73 (61-91)%, ocellar setae = 91 (78-105)% of frontal length; vibrissal index = 0.55 (0.47-0.63). Face dark brown. Carina prominent, nose-like, slightly divergent downwards, pale brown. Cheek index about 5-7. Eye index = 1.18 (1.12-1.23). Occiput blackish-brown. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3(-4) dorsal, 2 ventral, and about 12 small inner branches,

plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus with 1 distinct apical and a few very small ventral setae.

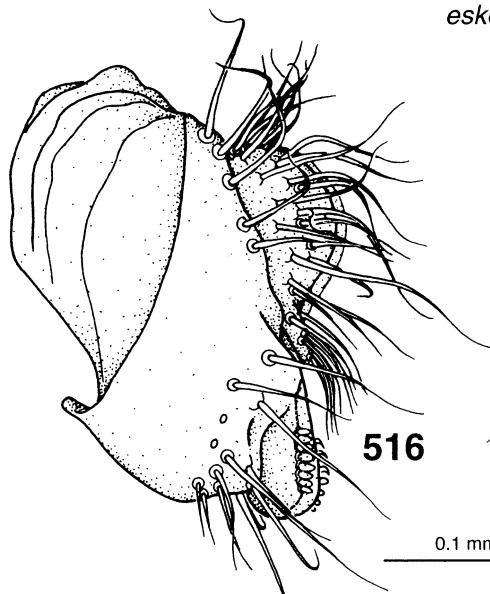
Thorax length 1.11 (0.95-1.28) mm. Scutum blackish-brown, in some specimens paler laterally, shining, (6)-8 rows of acrostichal setulae. h index = 1.00. Transverse distance of dorsocentral setae 163-200% of longitudinal distance; dc index = 0.74 (0.72-0.75). Scutellum less shining, distance between apical scutellar setae about 73-79% of that between apical and basal one, basal setae parallel; scut index = 1.00. Pleura dark brown, shining, sterno index = 0.62. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2, with 9-10 and 9-10 peg-like setae, respectively, length ratio of respective protarsomeres = 1.11-1.37, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.62 (2.38-2.98) mm, length to width ratio = 2.24. Indices: C = 2.81 (2.33-3.11), ac = 2.78 (2.57-3.00), hb = 0.50, 4C = 0.94 (0.89-0.96), 4v = 2.03 (1.84-2.21), 5x = 1.73 (1.63-1.83), M = 0.63 (0.58-0.68), prox. x = 0.59 (0.53-0.68).

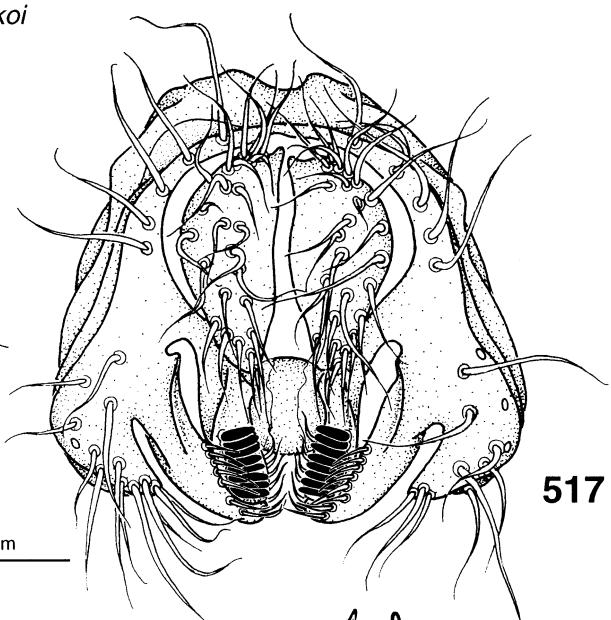
Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of each tergite, if completely visible.

♂ Terminalia (Figs 516-519). Epandrium not microtrichose, with ca. 23 lower setae (ca. 14 long ones on outer, and ca. 9 short ones on inner branch of ventral lobe; the latter arranged in a row), and ca. 5 long upper setae; ventral lobe long, bifurcate, pointed inwards in ventral view, not microtrichose and covering surstyli, which is almost completely encircled by inner branch, which is unusually positioned lower in relation to outer branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, with a straight row of ca. 9 peg-like, roundish-tipped prensisetae, ca. 5 inner and no outer setae. Decasternum as in Fig. 517. Hypandrium longer than epandrium, anterior margin convex, posterior margin slightly concave; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses, and paramedian setulae on mediodistal area of hypandrium. Aedeagus (hatched in Figs 518, 519) distally shaped like a telephone receiver in lateral view, apically slightly expanded and marginally straight (expansion somewhat triangular), ven-

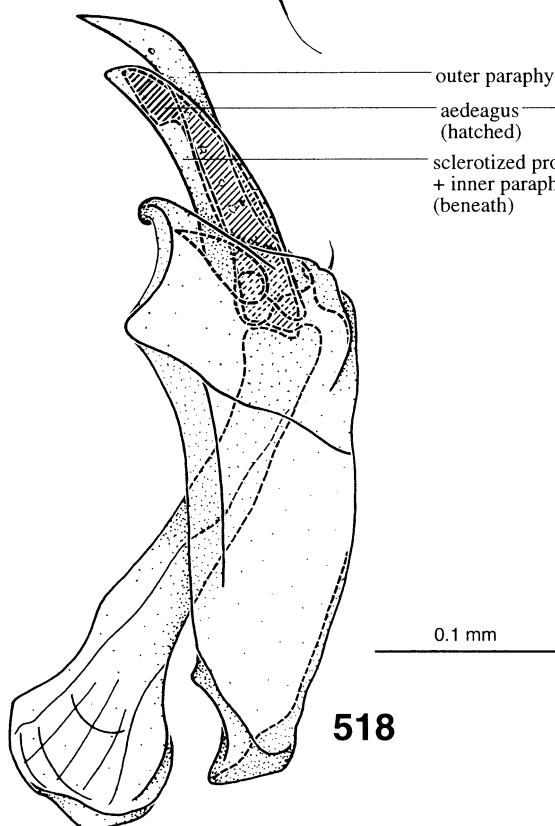
eskoi



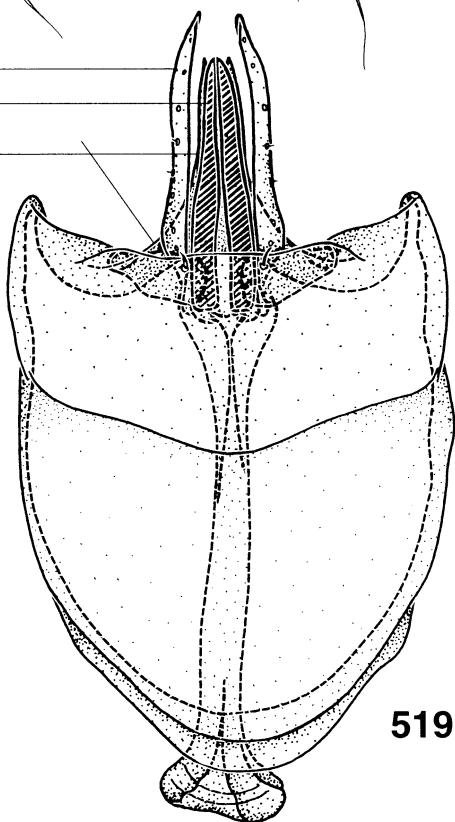
516



517

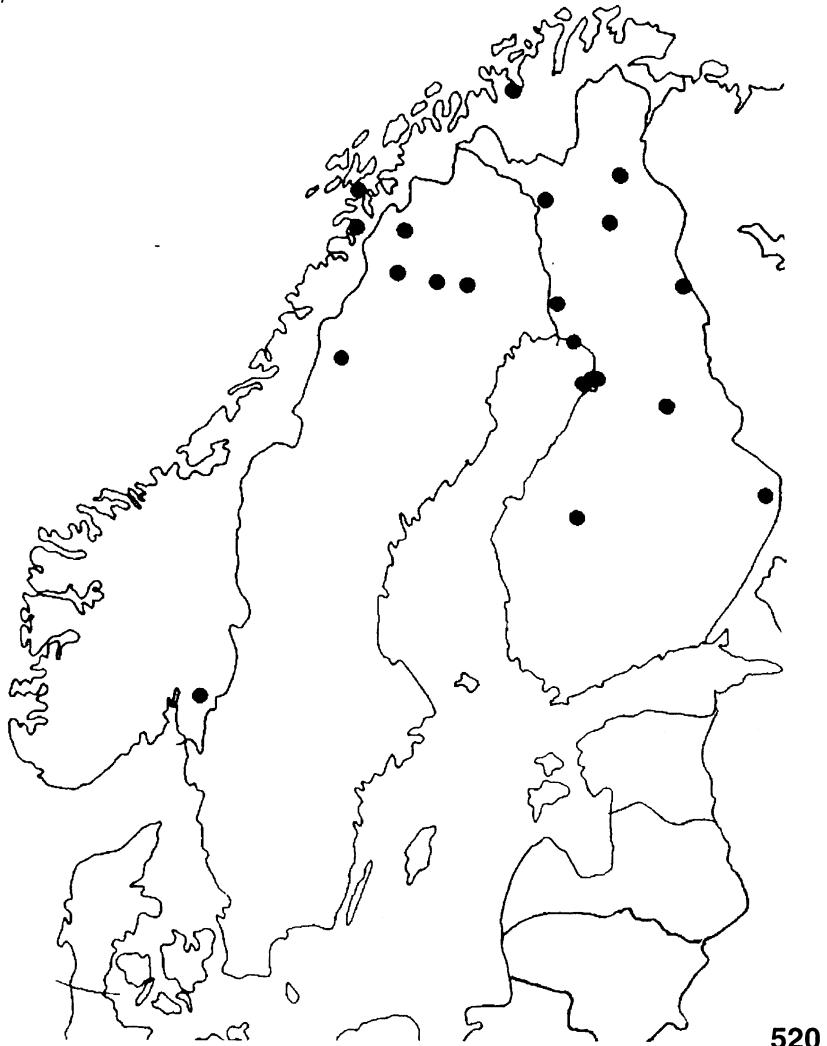


518



519

Figs. 516-519. *Drosophila eskoi* Lakovaara and Lankinen. 516: epandrium, cerci, and surstyli, left lateral view; 517: idem, plus decasternum, posterior view; 518: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 519: idem, posterior view.



520

Fig. 520. Known distribution pattern of *Drosophila eskoi* Lakovaara and Lankinen in Scandinavia.

trally and dorsally entirely membranous, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a dorsal, wide, long, ribbon-shaped, sclerotised process. Outer paraphysis sword-shaped in lateral view, anteriorly almost straight, subapically abruptly bent dorsad, apically sharp, laterally with a sinuate row of ca. 8 setulae, anteriorly connected

both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.55.

Measurements: Frontal length 0.37 (0.34-0.41) mm; frontal index = 0.87 (0.81-0.91), top to bottom width ratio = 1.35 (1.26-1.45). Frontal triangle about 64-67% of frontal length; ocel-

lar triangle about 36-40 % of frontal length. Orbital plates about 75-82% of frontal length. Distance of or3 to or1 = 56-67% of or3 to vtm, or1 / or3 ratio = 0.68 (0.65-0.71), or2 / or1 ratio = 0.68 (0.67-0.70), postocellar setae = 84 (65-95)%, ocellar setae = 107 (104-109)% of frontal length; vibrissal index = 0.54 (0.50-0.58). Cheek index about 5-8. Eye index = 1.12 (1.11-1.13). Thorax length 1.38 (1.24-1.50) mm. h index = 0.99 (0.97-1.00). Transverse distance of dorsocentral setae 164-208% of longitudinal distance; dc index = 0.75 (0.71-0.79). Distance between apical scutellar setae about 79-81% of that of apical to basal one; scut index = 0.99 (0.97-1.00); sterno index = 0.74, median katepisternal seta about 30% of anterior one. Wing length 3.43 (3.18-3.67) mm, length to width ratio = 2.45 (2.39-2.50). Indices: C = 3.08 (2.95-3.20), ac = 2.36 (2.22-2.50), hb = 0.38 (0.35-0.40), 4C = 0.87, 4v = 1.87 (1.83-1.91), 5x = 1.69 (1.63-1.75), M = 0.59 (0.57-0.61), prox. x = 0.65 (0.61-0.70).

♀ Terminalia (Fig. 512). Valve of oviscapt dorsomedially mostly membranous, dorsal sclerotised margin serrate, apically rounded, with 3-4 discal and 14-15 marginal, long, peg-like, sharp-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, slightly curved, subterminal.

Distribution. – (Fig. 520). A Scandinavian species, recorded from Norway (northernmost locality Alta; southernmost locality: Oslo), Sweden, Finland.

Additional specimens examined. – 4 ♂♂ (FINLAND: Oulanka, 1982), 2 ♀♀ (FINLAND: Oulanka, 1 ♀, 1982; Oulu, 1 ♀, no date).

Comments. – A continuous laboratory culture has not been successful.

Drosophila helvetica

Burla, 1948

(Figs 304, 305, 513, 521-524)

Drosophila helvetica Burla, 1948: 276.

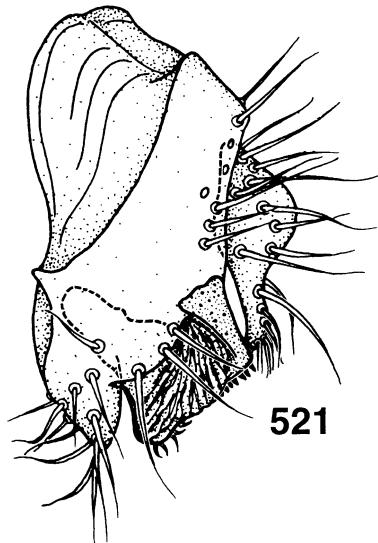
Diagnosis. – Dark brownish flies; male protarsomere 1 distinctly longer than protarsomere 2; both sex combs very small, set obliquely on tarsomere, each with less than 5 peg-like setae, distal one with at most 3 peg-like setae; hb-index about 0.35; lateroventral corners of abdominal

tergites dark; inner branch of ventral lobe of epandrium well-developed, dorsally membranous and mostly rugose; oviscapt brownish, rounded at tip;

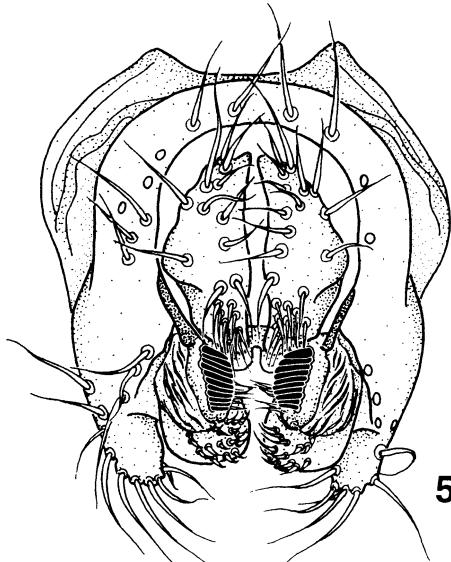
Redescription. – ♂. Head. Frons brownish-black, yellowish-brown above antennae, dull, frontal length 0.27 (0.25-0.29) mm; frontal index = 0.94 (0.89-1.00), top to bottom width ratio = 1.32 (1.18-1.44). Frontal triangle brownish, subshining, about 53-69% of frontal length; ocellar triangle prominent, subshining, about 37-50% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 76-87% of frontal length. Orbital setae black, distance of or3 to or1 = 83-120% of or3 to vtm, or1 / or3 ratio = 0.88 (0.75-0.92), or2 / or1 ratio = 0.76 (0.64-0.80), postocellar setae = 73 (67-81)%; ocellar setae = 82 (76-88)% of frontal length; vibrissal index = 0.67. Face dark brown. Carina (Fig. 304) prominent in upper half, flattened in lower half, slightly divergent downwards, pale brown. Cheek index about 7-9. Eye index = 1.14 (1.09-1.19). Occiput blackish-brown. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3 dorsal, 2 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus with 1 apical and 1 very small ventral seta.

Thorax length 0.87 (0.81-0.95) mm. Scutum brownish-black, shining, 6 rows of acrostichal setulae. h index = 1.06 (0.92-1.20). Transverse distance of dorsocentral setae 187-212% of longitudinal distance; dc index = 0.62 (0.55-0.65). Scutellum less shining, distance between apical scutellar setae about 70-90% of that between apical and basal one, scut index = 0.88 (0.83-0.92). Pleura dark brown, shining, sterno index = 0.54 (0.53-0.55), median katepisternal seta minute. Haltere yellowish. Legs pale brownish, small sex combs on protarsomeres 1 and 2 (Fig. 305), with 3-4 and 2 peg-like setae respectively, length ratio of respective protarsomeres = 1.43-1.66, preapical setae on all tibiae, apical seta on mesotibia.

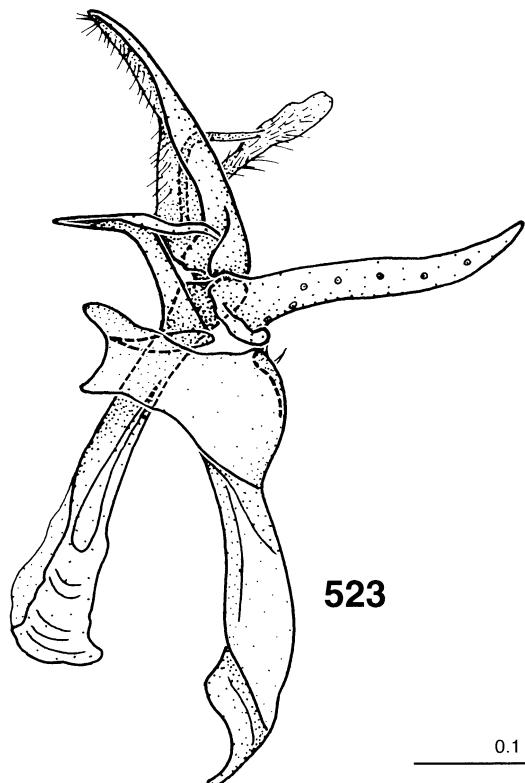
Wing hyaline, length 1.97 (1.89-2.14) mm, length to width ratio = 2.15 (2.04-2.24). Indices: C = 2.33 (2.13-2.60), ac = 2.99 (2.67-3.50), hb = 0.41 (0.36-0.44), 4C = 1.18 (1.08-1.25), 4v = 2.32 (2.15-2.46), 5x = 2.07 (1.80-2.50), M = 0.75 (0.69-0.83), prox. x = 0.61 (0.59-0.64).



521

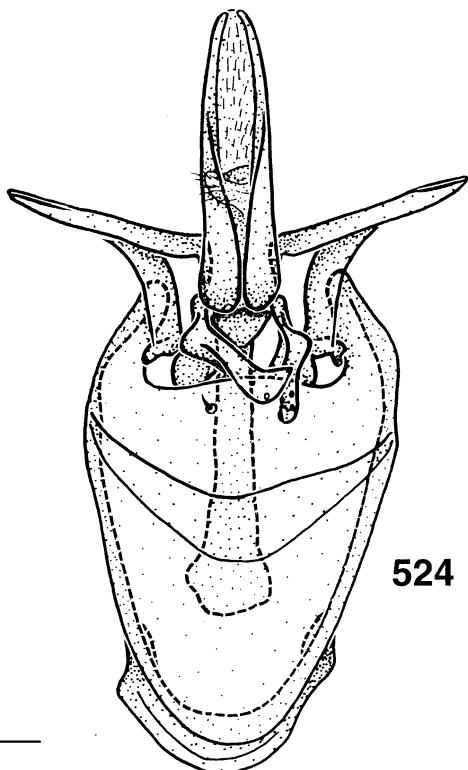


522



523

0.1 mm



524

Figs. 521-524. *Drosophila helvetica* Burla. 521: epandrium, cerci, and surstyli, left lateral view; 522: idem, plus decasternum, posterior view; 523: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 524: idem, posterior view.

Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of each tergite, if completely visible.

♂ Terminalia (Figs 521-524). Epandrium not microtrichose, with ca. 32 lower setae (ca. 15 long ones on outer and ca. 17 short ones on inner branch of ventral lobe), and ca. 6 long upper setae; ventral lobe long, bifurcate, pointed inwards in ventral view, not microtrichose and covering surstylus, which is almost completely encircled by its inner, dorsally membranous and mostly rugose branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus not microtrichose, with a straight row of ca. 11 peg-like, roundish-tipped prensisetae, ca. 6 inner and no outer setae. Decasternum as in Fig. 522. Hypandrium shorter than epandrium, in lateral view remarkably expanded dorsad posteriorly, anterior margin convex, posterior margin slightly sinuate; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses and their paramedian setulae on mediolateral area of hypandrium. Aedeagus in lateral view gradually narrowing from anterior margin to tip, ventrally and dorsally entirely membranous and covered with thin and relatively dense microtrichia, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis almost straight, sharp at tip, laterally with a sinuate row of ca. 7 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, rod-shaped, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 about 2.

Measurements: Frontal length 0.28 (0.25-0.32) mm; frontal index = 0.90 (0.73-1.00), top to bottom width ratio = 1.28 (1.14-1.39). Frontal triangle about 62-81% of frontal length; ocellar triangle about 41-47% of frontal length. Orbital plates about 80-88% of frontal length. Distance of or3 to or1 = 80-100% of vtm, or1 / or3

ratio = 0.82 (0.75-0.92), or2 / or1 ratio = 0.68 (0.60-0.78), postocellar setae = 74 (68-76)%, ocellar setae = 71 (63-80)% of frontal length; vibrissal index = 0.43 (0.33-0.50). Cheek index about 7-10. Eye index = 1.16 (1.13-1.22). Thorax length 0.98 (0.85-1.04) mm. h index = 1.04 (1.00-1.09). Transverse distance of dorsocentral setae 189-243% of longitudinal distance; dc index = 0.63 (0.59-0.68). Distance between apical scutellar setae about 70-91% of that between apical and basal one; scut index = 0.89 (0.85-0.93); sterno index = 0.59 (0.55-0.67). Wing length 2.16 (1.92-2.31) mm, length to width ratio = 2.27 (2.23-2.29). Indices: C = 2.29 (2.00-2.56), ac = 2.71 (2.50-3.00), hb = 0.42 (0.40-0.44), 4C = 1.13 (1.00-1.25), 4v = 2.20 (2.00-2.33), 5x = 2.23 (2.00-2.33), M = 0.73 (0.63-0.83), prox. x = 0.68 (0.60-0.75).

♀ Terminalia (Fig. 513). Valve of oviscapts with broad, brown margin, dorsomedially mostly membranous, apically rounded, ventrally convex, with 1 discal and 12-13 very short, marginal, peg-like, mostly roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 very thin, distally positioned, and 1 relatively longer, slightly curved, subterminal.

Distribution. – A widespread Palaearctic species, absent from Scandinavia but recorded from North Germany, the Netherlands, and Great Britain. Northernmost locality: Newcastle-on-Tyne (Great Britain).

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Jura, 3 ♂♂, 1974. RUSSIA: Goryatchiy Klyuch, 2 ♂♂, 1979), 4 ♀♀ (SWITZERLAND: Jura, 1974).

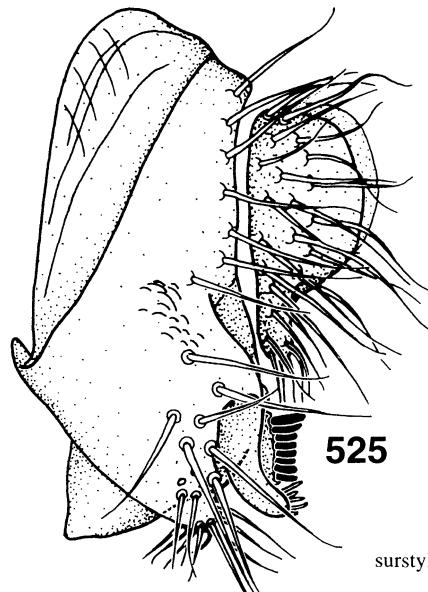
Comments. – Laboratory culture is difficult. This species was originally considered to be a member of the *affinis* subgroup, and in fact the well-developed, dorsally membranous, mostly rugose, inner branch of the ventral lobe of the epandrium is very similar to that of *Drosophila tolteca* for instance. However, as phylogenetic analyses and its morphological peculiarities show, it is not related to any of the subgroups.

Drosophila obscura Fallén, 1823

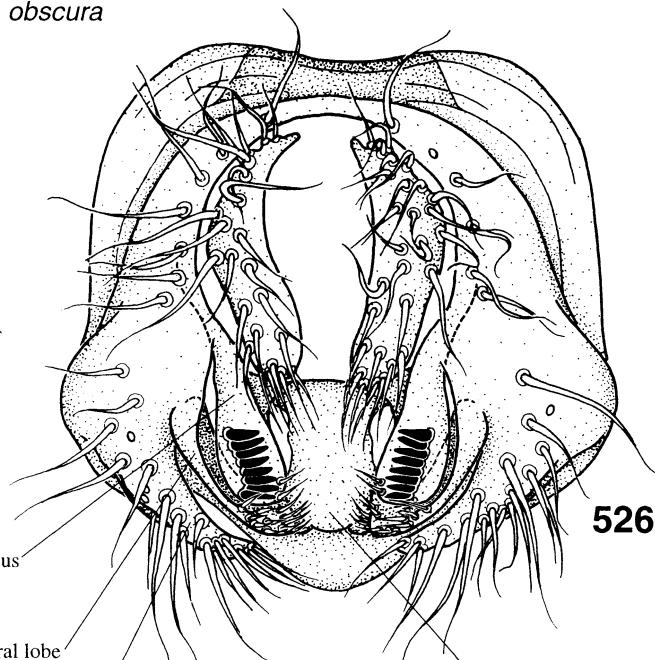
(Figs 300, 317, 514, 525-529)

Drosophila obscura Fallén, 1823: 6.

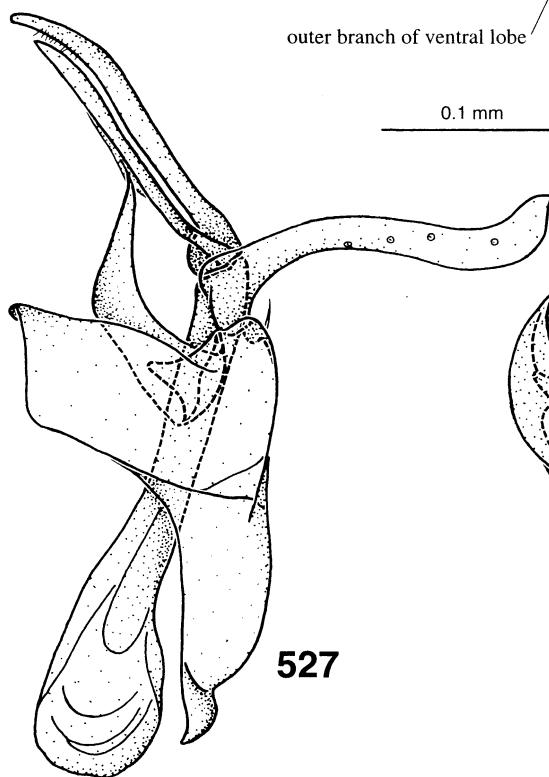
Drosophila obscuroides Pomini, 1940: 149.

obscura

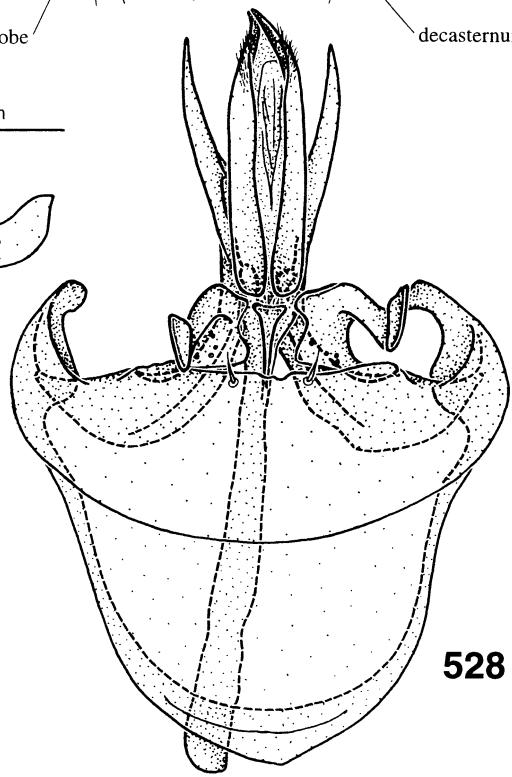
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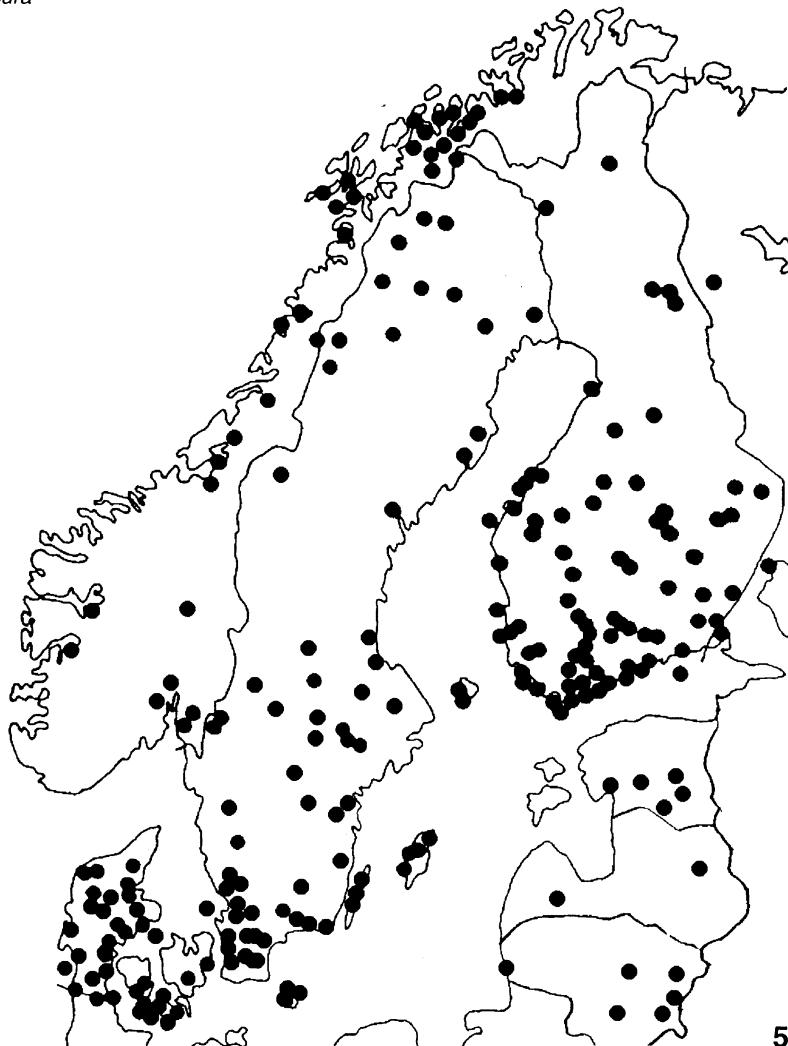


527



528

Figs. 525-528. *Drosophila obscura* Fallén. 525: epandrium, cerci, and surstyli, left lateral view; 526: idem, plus decasternum, posterior view; 527: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 528: idem, posterior view.



529

Fig. 529. Known distribution pattern of *Drosophila obscura* Fallén in Scandinavia.

Diagnosis. — Dark brownish flies; male protarsomere 1 distinctly longer than protarsomere 2; both sex combs small, set obliquely on protarsomere, each with less than 9 peg-like setae; hb-index about 0.45; lateroventral corners of some abdominal tergites of female pale yellowish; aedeagus narrow, except basally, subapically microtrichose ventrally; posterior paraphysis uniformly broad, apically blunt; oviscapt yellowish.

Redescription. — ♂. Head. Frons brownish-black, yellowish-brown above antennae, dull,

frontal length 0.30 (0.25-0.34) mm; frontal index = 0.87 (0.79-0.95), top to bottom width ratio = 1.33 (1.22-1.42). Frontal triangle dark brown, about 59-73% of frontal length; ocellar triangle dark brown, prominent, about 40-47% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 75-88% of frontal length. Orbital setae black, distance of or3 to or1 = 62-86% of or3 to vtm, or1 / or3 ratio = 0.74 (0.67-0.79), or2 / or1 ratio = 0.55 (0.46-0.64), postocellar setae = 82 (74-93)%, ocellar setae = 95 (85-120)% of frontal length; vibrissal in-

dex = 0.51 (0.45-0.64). Face dark brown. Carina prominent, distinctly divergent downwards, pale brown. Cheek index about 5-8. Eye index = 1.16 (1.08-1.25). Occiput blackish-brown. Pedicel brownish. Flagellomere 1 blackish. Arista with 3 dorsal, 2 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus with 1 apical and 1 distinct, short, ventral seta.

Thorax length 1.06 (0.95-1.12) mm. Scutum brown, medially and/or paramedially faintly darker, striped, shining, 8 rows of acrostichal setulae. h index = 1.05 (1.00-1.15). Transverse distance of dorsocentral setae 162-200% of longitudinal distance; dc index = 0.66 (0.54-0.75). Scutellum less shining, distance between apical scutellar setae about 77-92% of that between apical and basal one, basal ones parallel; scut index = 0.96 (0.93-0.97). Pleura brown, shining, sterno index = 0.61 (0.56-0.63), median katepisternal seta about 38-62% of anterior one. Haltere yellowish. Legs pale brownish, sex combs (Fig. 300) on protarsomeres 1 and 2, with 3-5 and 5-8 peg-like setae respectively length ratio of respective protarsomeres = 1.33-1.77, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.56 (2.38-2.73) mm, length to width ratio = 2.16 (2.06-2.24). Indices: C = 2.81 (2.61-3.25), ac = 2.64 (2.29-3.00), hb = 0.42 (0.38-0.44), 4C = 0.96 (0.76-1.06), 4v = 2.05 (1.81-2.25), 5x = 1.69 (1.57-1.83), M = 0.62 (0.52-0.69), prox. x = 0.62 (0.52-0.71).

Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of all other tergites, if completely visible.

♂ Terminalia (Figs 525-528). Epandrium not microtrichose, medially slightly rugose, with ca. 34 lower setae (ca. 22 long ones on outer, and ca. 12 short ones on inner branch of ventral lobe), and ca. 5 long upper setae, laterally expanded ventrally in posterior view; ventral lobe long, slightly rugose dorsally, bifurcate, pointed inwards in ventral view, not microtrichose, covering surstyli, which is almost completely encircled by its inner branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstyli very long, not microtrichose, subdistally with a straight row of ca. 8 peg-like, roundish-tipped prensisetae, ca. 2 inner and no outer setae. Decasternum as in Fig. 526. Hypandrium shorter than epandrium, in lateral view remarkably expanded dorsad posteriorly, anterior

margin convex, posterior margin almost straight; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium, but recognisable because of their connection to outer paraphyses and their submedian setulae on mediodistal area of hypandrium. Aedeagus narrow, basally broader, ventrodistally microtrichose, ventrally and dorsally entirely membranous, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a weak connection to one long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis uniformly broad, sinuate, apically blunt, laterally with a sinuate row of ca. 5 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.67. Tergites 3-5 (Fig. 317) laterally close to ventral margin, usually with a small, pale yellowish, triangular area.

Measurements: Frontal length 0.30 (0.26-0.34) mm; frontal index = 0.82 (0.77-0.85), top to bottom width ratio = 1.24 (1.15-1.35). Frontal triangle about 61-76% of frontal length; ocellar triangle about 41-47% of frontal length. Orbital plates about 67-82% of frontal length. Distance of or3 to or1 = 57-83% of or3 to vtm, or1 / or3 ratio = 0.70 (0.67-0.73), or2 / or1 ratio = 0.56 (0.45-0.67), postocellar setae = 87 (82-94)%, ocellar setae = 92(71-100)% of frontal length; vibrissal index = 0.34 (0.31-0.38). Cheek index about 5-7. Eye index = 1.12 (1.11-1.14). Thorax length 1.05 (0.82-1.22) mm. h index = 1.00 (0.85-1.13). Transverse distance of dorsocentral setae 167-222% of longitudinal distance; dc index = 0.71 (0.67-0.76). Distance between apical scutellar setae about 75-80% of that between apical and basal one; scut index = 0.97 (0.91-1.03), sterno index = 0.60 (0.56-0.64), median katepisternal seta about 29-38% of anterior one. Wing length 2.52 (1.95-2.91) mm, length to width ratio = 2.17 (2.11-2.26). Indices: C = 2.91 (2.57-3.05), ac = 2.49 (2.25-2.80), hb = 0.43 (0.35-0.50), 4C = 0.94 (0.82-1.08), 4v =

2.05 (1.73-2.18), $5x = 1.99$ (1.83-2.25), $M = 0.64$ (0.59-0.69), prox. $x = 0.64$ (0.59-0.67).

♀ Terminalia (Fig. 514). Valve of oviscapts dorsomedially mostly membranous, apically rounded, strongly convex ventrally, with 4-5 distal and 17-18 marginal outer ovisensilla, proximal ones trichoid-like, distal ones peg-like and roundish-tipped; dorsalmost distal ovisensillum longer than preceding ones; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal.

Distribution. – (Fig. 529). A widespread Palaearctic species, more abundant in the North but also recorded from the Mediterranean countries. Northernmost locality: Alta (Norway).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Aargau, 3 ♂♂, 1973; Zürich, 1 ♂, 1974), 4 ♀♀ (SWITZERLAND: Aargau, 3 ♀♀, 1973; Jura, 1 ♀, 1974).

Drosophila subobscura

Collin in Gordon, 1936

(Figs 295, 301, 530-534, 538)

Drosophila subobscura Collin in Gordon, 1936: 60.

Diagnosis. – Blackish flies; male protarsomeres 1 and 2 almost equal in length; both sex combs large, each with more than 9 peg-like setae; hb-index greater than 0.50; epandrium somewhat sinuate in lateral view; cercus with a patch of short densely set setae on the ventral margin, which is straight; aedeagus somewhat triangular; outer paraphysis abruptly narrowed apically; oviscapts yellowish, rounded at tip; outer branch of epandrial ventral lobe apically sharp in lateral view.

Redescription. – ♂. Head. Frons brownish-black, yellowish-brown above antennae, dull, frontal length 0.29 (0.27-0.31) mm, frontal index = 0.84 (0.78-0.89), top to bottom width ratio = 1.29 (1.24-1.33). Frontal triangle brownish, apically very narrow, about 67-81% of frontal length; ocellar triangle prominent, about 39-44% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, subshining, about 75-83% of frontal length. Orbital setae black, distance of or3 to or1 = 62-100% of or3 to vtm, or1 / or3 ratio = 0.79 (0.71-0.85), or2 / or1 ratio = 0.62 (0.55-0.73), postocellar

setae = 84 (65-94)%, ocellar setae = 85 (67-94)% of frontal length; vibrissal index = 0.52 (0.50-0.54). Face dark brown. Carina prominent, nose-like, slightly divergent downwards, pale brown. Cheek index about 6-10. Eye index = 1.18 (1.15-1.20). Occiput blackish-brown. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3-4 dorsal, 2 ventral, and about 7 short inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus (Fig. 295) with 1 apical and 1 distinctly smaller ventral seta.

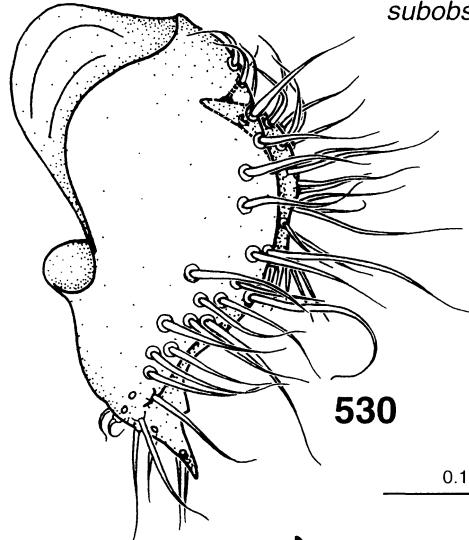
Thorax length 1.06 (0.98-1.22) mm. Scutum charcoal-grey to black, shining, 8 rows of acrostichal setulae. h index = 1.08 (1.00-1.17). Transverse distance of dorsocentral setae 189-237% of longitudinal distance; dc index = 0.75 (0.68-0.79). Scutellum less shining, distance between apical scutellar setae about 67-92% of that between apical and basal one, basal setae parallel; scut index = 0.94 (0.89-1.04). Pleura dark brown, shining, sterno index = 0.55 (0.48-0.62), median katepisternal seta about 29-36% of anterior one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2, with 10-13 and 8-11 peg-like setae, respectively, length ratio of respective protarsomeres = 1.00-1.19, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 301) hyaline, with a faint, narrow shadow along costa from middle of C-II to wing tip, length 2.44 (2.31-2.66) mm, length to width ratio = 2.18 (2.13-2.24). Indices: C = 2.62 (2.26-2.87), ac = 2.63 (2.28-3.00), hb = 0.56 (0.53-0.63), 4C = 0.93 (0.90-0.95), 4v = 1.84 (1.52-2.00), 5x = 1.72 (1.43-2.00), M = 0.59 (0.53-0.69), prox. x = 0.58 (0.43-0.69).

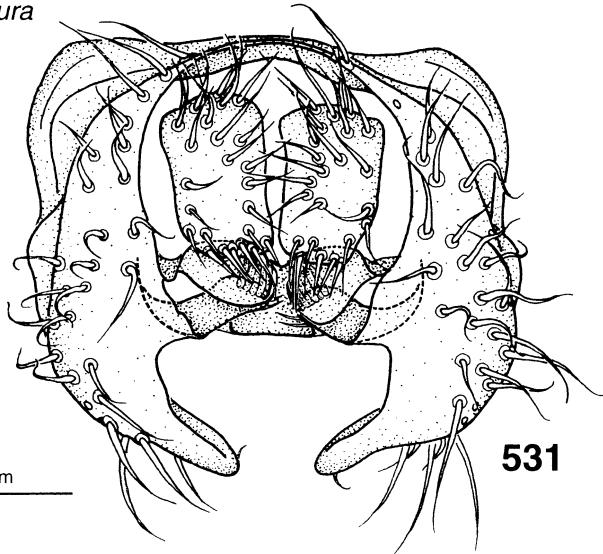
Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of all other tergites, if completely visible.

♂ Terminalia (Figs 530-533). Epandrium somewhat sinuate in lateral view, not microtrichose, with ca. 32 lower setae (ca. 26 long ones on outer, and ca. 6 short ones on inner branch of ventral lobe), and ca. 10 long upper setae; ventral lobe long, bifurcate, pointed inwards in ventral view, not microtrichose, covering surstyli, which is almost completely encircled by its inner branch; outer branch apically sharp in lateral view. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe, ventrally covered by a patch of dark, short setae. Surstyli

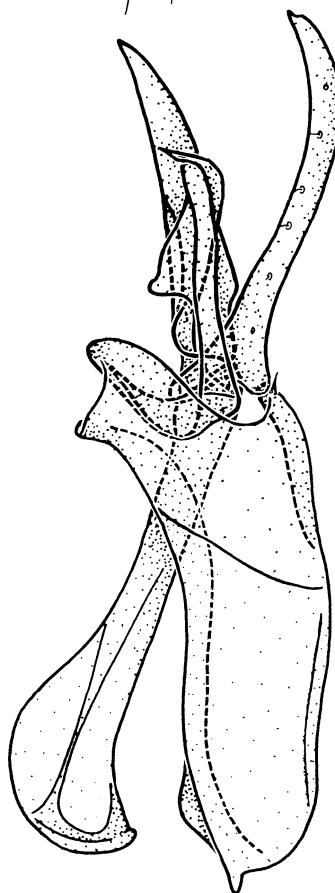
subobscura



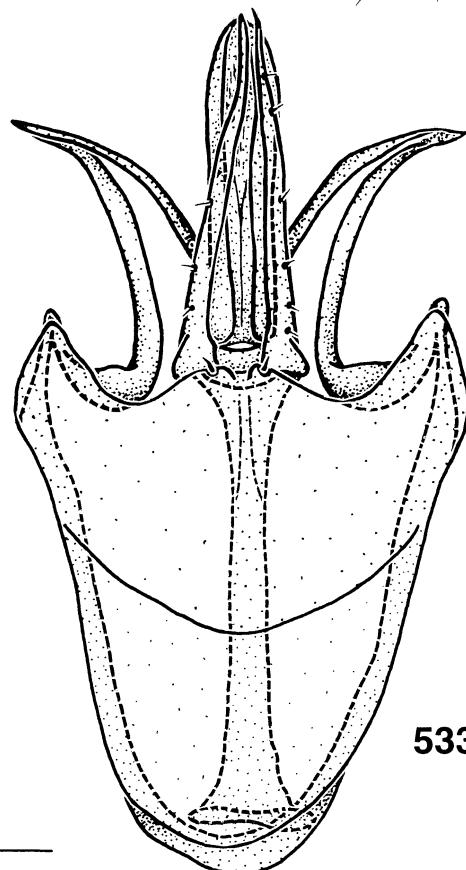
530



531

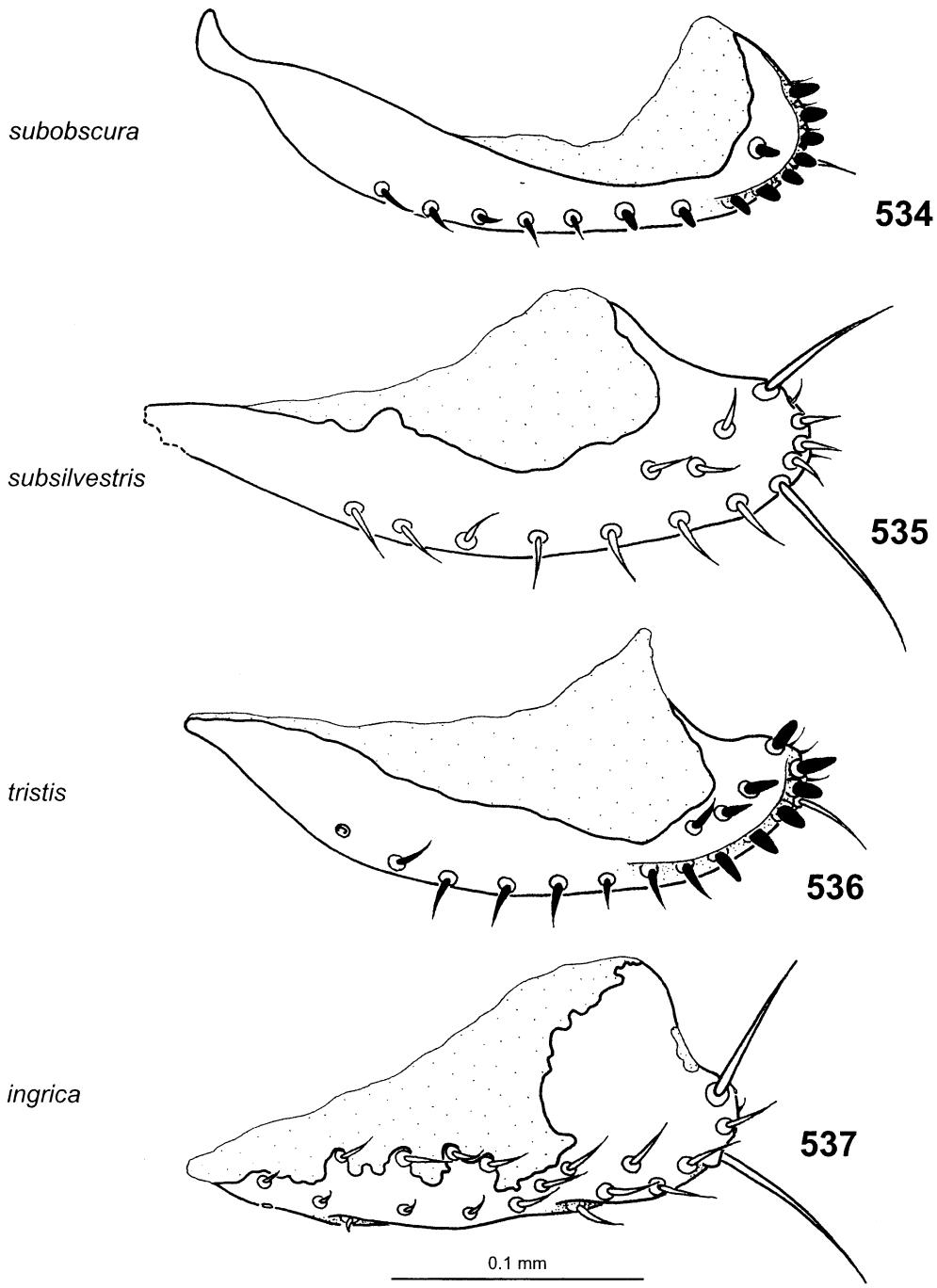


532

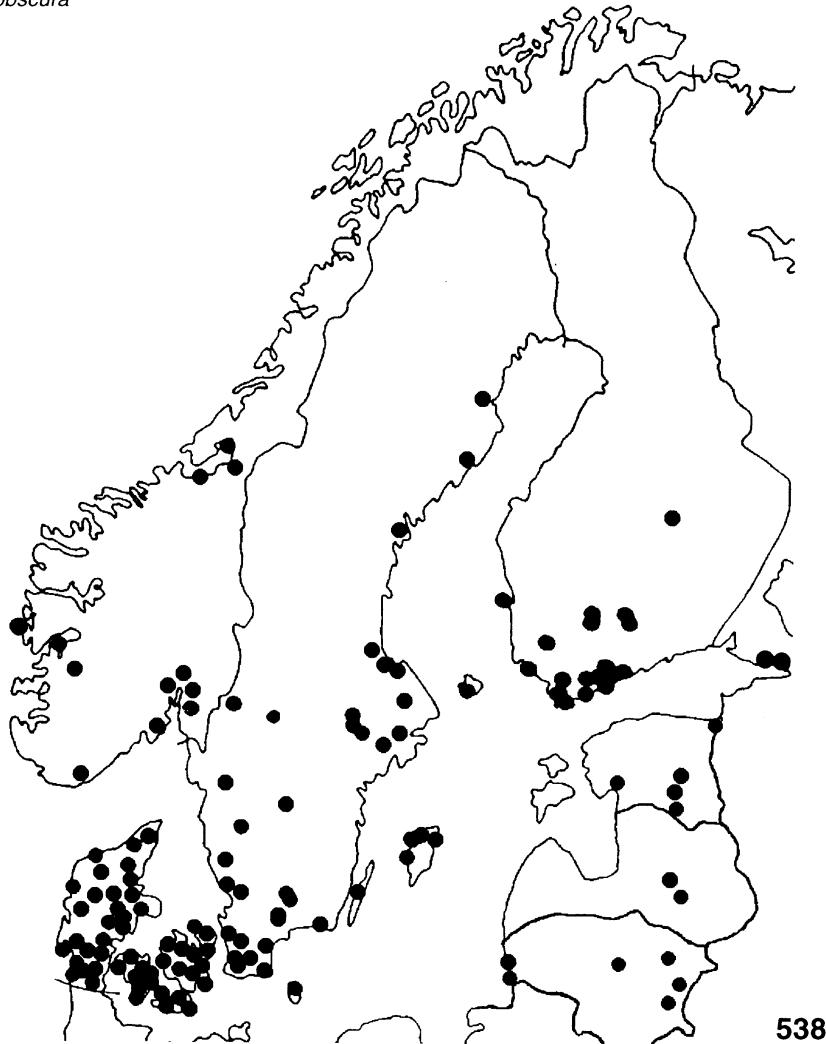


533

Figs. 530-533. *Drosophila subobscura* Collin. 530: epandrium, cerci, and surstyli, left lateral view; 531: idem, plus decasternum, posterior view; 532: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 533: idem, posterior view.



Figs. 534-537. Left oviscap valves, lateral view.



538

Fig. 538. Known distribution pattern of *Drosophila subobscura* Collin in Scandinavia.

not microtrichose, subdistally with a straight row of ca 6 peg-like roundish-tipped prensisetae, ca. 2 inner and no outer setae (shown on inner wall in Fig. 531, as it is abnormally contracted in the illustrated specimen). Decasternum as in Fig. 531. Hypandrium as long as epandrium, anterior margin convex, posterior margin sinuate; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium, but recognisable because of their connection to outer paraphyses and the pair of setulae on mediodistal area of hypandrium. Aedeagus in lateral view somewhat triangular,

pointed at tip, ventrally and dorsally entirely membranous, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis sinuate, narrower than aedeagus, abruptly narrowed at tip, laterally with a sinuate row of ca. 6 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal

margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, rod-shaped, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Length ratio of protarsomeres 1 and 2 = 1.56.

Measurements: Frontal length 0.32 (0.31-0.36) mm; frontal index = 0.87 (0.83-0.91), top to bottom width ratio = 1.27 (1.23-1.30). Frontal triangle about 71-89% of frontal length; ocellar triangle about 39-43% of frontal length. Orbital plates about 74-83% of frontal length. Distance of or3 to or1 = 75-86% of or3 to vtm, or1 / or3 ratio = 0.72 (0.67-0.76), or2 / or1 ratio = 0.61 (0.54-0.67), postocellar setae = 89 (74-100)%, ocellar setae = 87 (71-100)% of frontal length; vibrissal index = 0.50 (0.38-0.59). Cheek index about 6-8. Eye index = 1.23 (1.20-1.27). Thorax length 1.17 (1.12-1.22) mm. h index = 1.05 (0.90-1.07). Transverse distance of dorsocentral setae 185-200% of longitudinal distance; dc index = 0.74 (0.70-0.81). Distance between apical scutellar setae about 69-92% of that between apical and basal one; scut index = 0.96 (0.90-1.00), sterno index = 0.56 (0.54-0.61), median katepisternal seta about 29-46% of anterior one. Wing length 2.80 (2.66-2.87) mm, length to width ratio = 2.19 (2.05-2.29). Indices: C = 2.76 (2.55-3.06), ac = 2.71 (2.43-3.00), hb = 0.57 (0.50-0.60), 4C = 0.91 (0.82-1.00), 4v = 1.89 (1.76-2.05), 5x = 1.85 (1.57-2.17), M = 0.61 (0.52-0.68), prox. x = 0.63 (0.62-0.65).

♀ Terminalia (Fig. 534). Valve of oviscapte pale yellowish, somewhat darker along margin, dorsomedially mostly membranous, apically rounded, slightly convex ventrally, with 1 discal and 14-16 marginal, outer ovisensilla, proximal ones trichoid-like, distal ones peg-like and roundish-tipped; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 relatively longer, straight, subterminal.

Distribution. – (Fig. 538). A widespread West Palaearctic species, less abundant in the north, recorded also from the Mediterranean countries and from across Central Asia to western China; introduced in northwestern North America and southwestern South America. Northernmost locality: Skellefteå (Sweden).

Additional specimens examined. – 5 ♂♂ and 4 ♀♀ (SWITZERLAND: Zürich, 1974).

Comments. – This is the best studied species of the *obscura* group, particularly as regards the polymorphism of natural populations.

Drosophila subsilvestris Hardy & Kaneshiro, 1968

(Figs 306, 314, 535, 539-543)

Drosophila obscura-X Burla, 1951: 89 (nomen nudum).

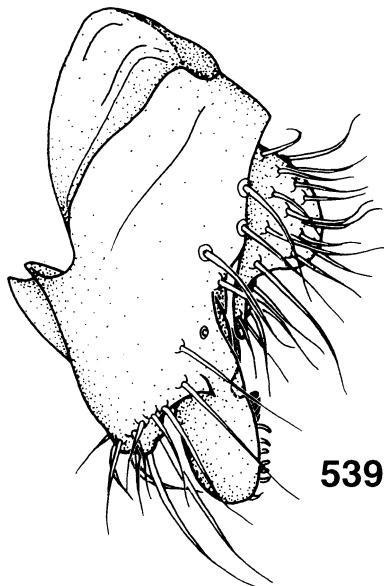
Drosophila silvestris Basden, 1954: 618, 630 (preocc.).

Drosophila subsilvestris Hardy & Kaneshiro, 1968: 261.

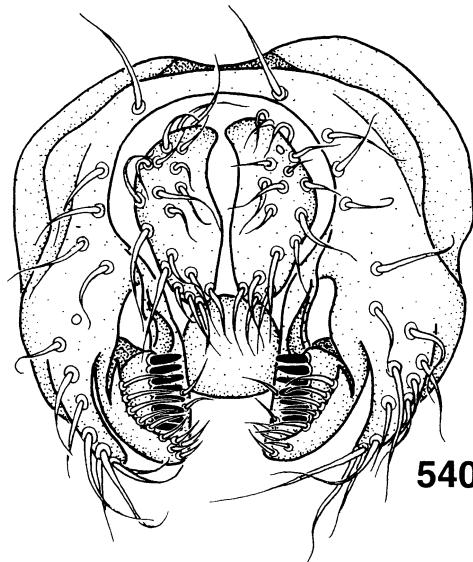
Diagnosis. – Dark brownish flies; male protarsomere 1 distinctly longer than protarsomere 2; both sex combs small, set obliquely on protarsomere, each with less than 7 peg-like setae, which are divergent at both ends; hb-index about 0.45; lateroventral corners of abdominal tergites 4-6 of female distinctly yellowish; aedeagus pestle-shaped in lateral view; inner paraphysis basally membranous; outer paraphysis well-developed, with a sinuate anterior margin, broad basally, gradually narrowing to a sharp tip; oviscapte yellowish.

Redescription. – ♂. Head. Frons brownish-black, yellowish-brown above antennae, dull, frontal length 0.31 (0.27-0.34) mm; frontal index = 0.99 (0.89-1.11), top to bottom width ratio = 1.42 (1.33-1.50). Frontal triangle brownish, shining, about 56-84% of frontal length; ocellar triangle prominent, brownish, subshining, about 41-50% of frontal length. Frontal vittae blackish. Orbital plates broad, apically slightly diverging from eye margin, yellowish-brown, subshining, about 75-85% of frontal length. Orbital setae black, distance of or3 to or1 = 71-100% of or3 to vtm, or1 / or3 ratio = 0.68 (0.63-0.73), or2 / or1 ratio = 0.60 (0.50-0.70), postocellar setae = 83 (70-106)%, ocellar setae = 85 (80-89)% of frontal length; vibrissal index = 0.45 (0.36-0.55). Face dark brown. Carina prominent, nose-like, slightly divergent downwards, brown. Cheek index about 7-8. Eye index = 1.17 (1.12-1.30). Occiput blackish-brown, with narrow yellowish-brown border. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3(4) dorsal, 2 ventral, and about 7 small inner branches, plus terminal fork. Proboscis yellow-

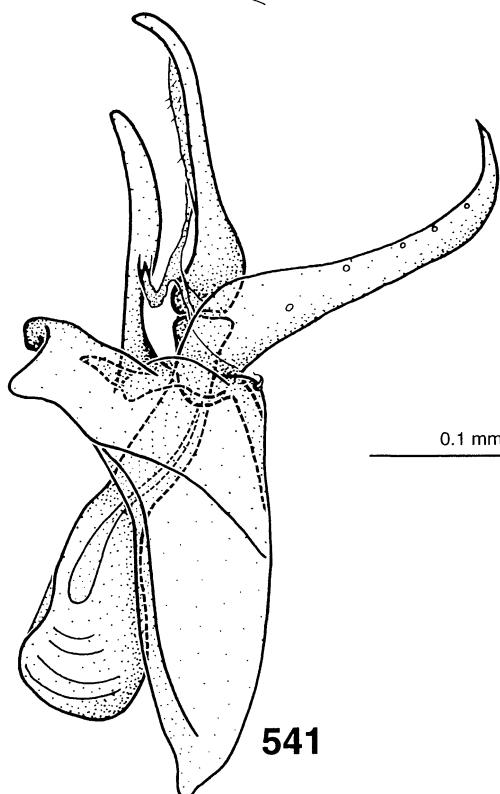
subsilvestris



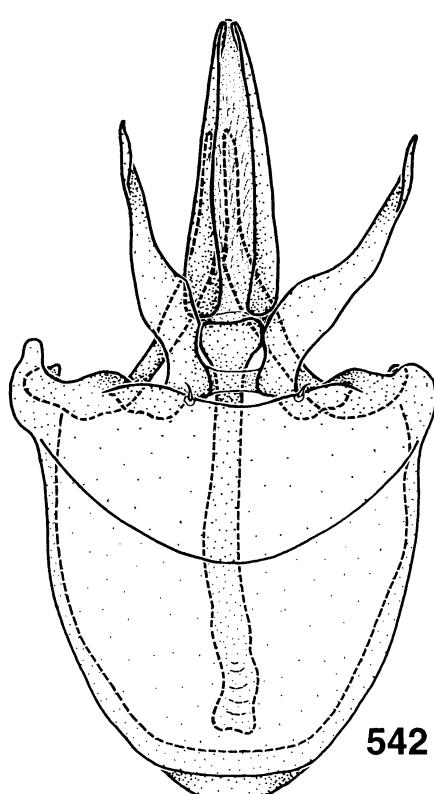
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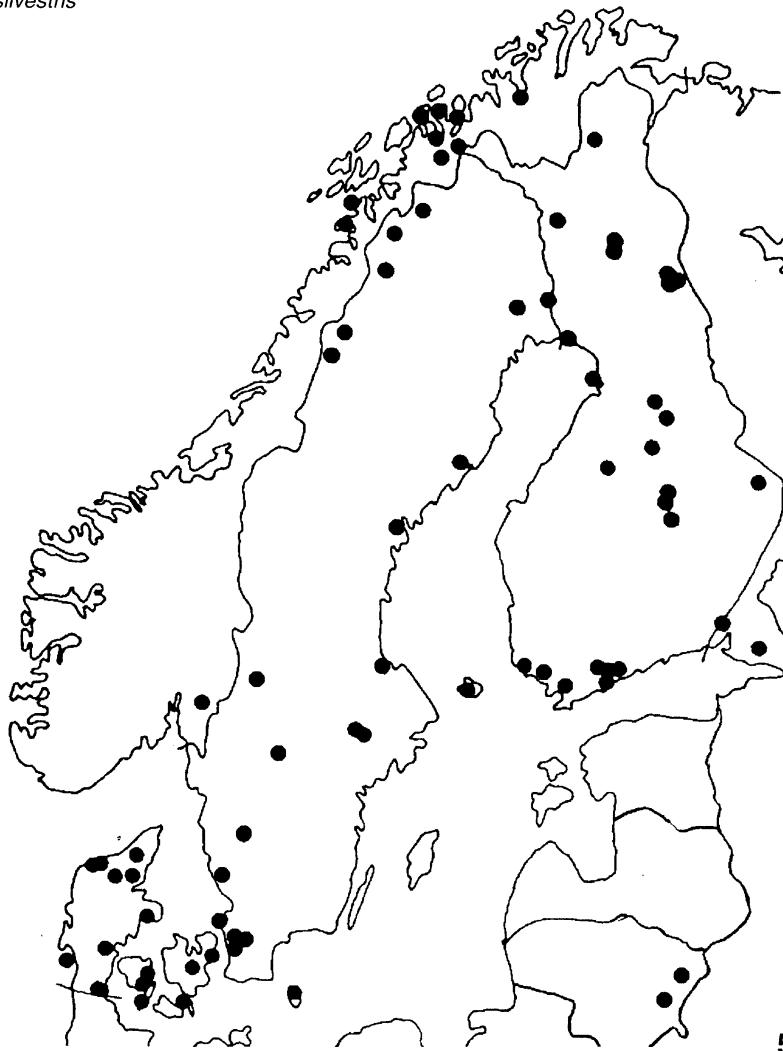


541



542

Figs. 539-542. *Drosophila subsilvestris* Hardy and Kaneshiro. 539: epandrium, cerci, and surstyli, left lateral view; 540: idem, plus decasternum, posterior view; 541: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 542: idem, posterior view.



543

Fig. 543. Known distribution pattern of *Drosophila subsilvestris* Hardy and Kaneshiro in Scandinavia.

ish. Clypeus dark brown. Palpus with 1 apical and 1 ventral seta, length ratio about 0.70.

Thorax length 0.94 (0.85-1.00) mm. Scutum blackish-brown, shining, lateral border, particularly postpronotum, yellowish-brown, 8 rows of acrostichal setulae. h index = 1.06 (1.00-1.14). Transverse distance of dorsocentral setae 182-220% of longitudinal distance; dc index = 0.67 (0.63-0.70). Scutellum brownish, laterally yellowish-brown, less shining, distance between apical scutellar setae about 75-91% of that between apical and basal one, basal setae paral-

lel; scut index = 0.93 (0.85-1.00). Pleura brown, with some more yellowish areas, shining, sterno index = 0.57 (0.55-0.59), median katepisternal seta about 31-33% of anterior one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2 (Fig. 306), with (4)-5 and 3-5 peg-like setae respectively, length ratio of respective protarsomeres = 1.37-1.57, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.25 (2.06-2.35) mm, length to width ratio = 2.16 (2.07-2.27). Indices: $C = 2.70$ (2.40-2.80), $ac = 2.54$ (2.50-2.67), $hb =$

0.41 (0.38-0.47), $4C = 1.01$ (0.88-1.15), $4v = 2.08$ (1.82-2.23), $5x = 1.82$ (1.60-2.00), $M = 0.67$ (0.59-0.80), prox. $x = 0.61$ (0.50-0.69).

Abdomen generally brownish-black, shining, tergite 1 slightly paler, as well as base of all other tergites, if completely visible.

♂ Terminalia (Figs 539-542). Epandrium not microtrichose, with ca. 24 lower setae (ca. 14 long ones on outer- and ca. 10 short ones arranged in a row on inner branch of ventral lobe), and ca. 5 long upper setae; ventral lobe long, bifurcate, pointed inwards in posterior view, not microtrichose, covering surstylius, which is almost completely encircled by its inner branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylius not microtrichose, with a straight row of ca 8 peg-like roundish-tipped prensisetae, ca. 3 inner and no outer setae. Decasternum as in Fig. 540. Hypandrium as long as epandrium, in lateral view remarkably expanded dorsoposteriorly, anterior margin convex, posterior margin sinuate; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium, but recognisable because of their connection to outer paraphyses and the pair of setulae on mediodistal area of hypandrium. Aedeagus in lateral view somewhat pestle-shaped, distally slightly bent dorsad, roundish at tip, ventrally and dorsally entirely membranous and covered with sparse, thin microtrichia, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly unusually membranous and by that part connected to distal margin of aedeagal apodeme and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis with a sinuate anterior margin, wider than aedeagus, gradually narrowing from proximal to distal end, sharp at tip, laterally with a sinuate row of ca. 5 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anterior half expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Tergites (Fig. 314) slightly yellowish at ventral edge, particularly tergites 4-6 which have

a large, triangular, yellowish to whitish patch. Length ratio of protarsomeres 1 and 2 = 1.50.

Measurements: Frontal length 0.31 (0.28-0.34) mm; frontal index = 0.85 (0.80-0.95), top to bottom width ratio = 1.30 (1.23-1.42). Frontal triangle about 58-71% of frontal length; ocellar triangle about 40-47% of frontal length. Orbital plates about 76-85% of frontal length. Distance of or3 to or1 = 50-75% of or3 to vtm, or1 / or3 ratio = 0.74 (0.60-0.86), or2 / or1 ratio = 0.55 (0.45-0.67), postocellar setae = 82 (78-88)%; ocellar setae = 93 (89-100)% of frontal length; vibrissal index = 0.36 (0.33-0.39). Cheek index about 5-8. Eye index = 1.15 (1.12-1.23). Thorax length 1.08 (1.02-1.28) mm. h index = 1.00 (0.93-1.06), Transverse distance of dorsocentral setae 200-244% of longitudinal distance; dc index = 0.69 (0.67-0.72). Distance between apical scutellar setae about 75-90% of that between apical and basal one; scut index = 0.90 (0.83-0.94), sterno index = 0.59 (0.55-0.62), median katepisternal seta about 21-33% of anterior one. Wing length 2.53 (2.34-2.77) mm, length to width ratio = 2.21 (2.15-2.28). Indices: $C = 2.68$ (2.47-3.06), $ac = 2.59$ (2.43-2.83), $hb = 0.43$ (0.41-0.47), $4C = 1.05$ (0.94-1.13), $4v = 2.18$ (2.06-2.33), $5x = 1.91$ (1.71-2.20), $M = 0.68$ (0.63-0.73), prox. $x = 0.67$ (0.63-0.73).

♀ Terminalia (Fig. 535). Valve of oviscapts submedially expanded dorsad, dorsomedially mostly membranous, apically rounded, ventrally convex, with ca. 4 discal and ca. 10 marginal, trichoid-like, outer ovisensilla, dorsalmost discal one unusually long; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 very long, slightly curved, subterminal, which is abnormally inserted in outer instead of the usual inner surface and included in the row of marginal ovisensilla.

Distribution. – (Fig. 543). A widespread European species, less abundant in northern and southern areas. Recorded from all the Scandinavian countries and from Lithuania. Northernmost locality: Alta (Norway).

Additional specimens examined. – 5 ♂♂ (SWITZERLAND: Zürich, 1 ♂, 1959, 4 ♂♂, 1989), 4 ♀♀ (SWITZERLAND: Aargau, 2 ♀♀, 1973; Genève, 1 ♀, 1973; Jura, 1 ♀, 1974).

Comments. – The laboratory culture needs a malt medium. Females need water and honey for oviposition; the larvae should be allowed to pu-

pate in sand, since otherwise the emerging flies become stuck in the medium.

Drosophila tristis

Fallén, 1823

(Figs 293, 294, 296, 320, 536, 544-548)

Drosophila tristis Fallén, 1823: 7.

Drosophila spurca Zetterstedt, 1847: 2550.

Drosophila tinctipennis Strobl, 1901: 240.

Diagnosis. – Dark brown flies; male protarsomeres 1 and 2 almost equal in length; both sex combs large, each with more than 7 peg-like setae; hb-index about 0.45; aedeagus distally shaped like a telephone receiver in lateral view, outer paraphysis sinuate and apically very sharp; oviscapts yellowish.

Redescription. – ♂. Head. Frons brownish-black, yellowish-brown above antennae, dull, frontal length 0.30 (0.27-0.32) mm; frontal index = 0.88 (0.85-0.94), top to bottom width ratio = 1.31 (1.25-1.35). Frontal triangle brownish, subshining, apically very narrow, about 67-82% of frontal length; ocellar triangle prominent, blackish, shining, about 44-47% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, dark brown, subshining, about 78-88% of frontal length. Orbital setae black, distance of or3 to or1 = 57-86% of or3 to vtm, or1 / or3 ratio = 0.83 (0.73-1.00), or2 / or1 ratio = 0.51 (0.46-0.55), postocellar setae = 76 (63-83%), ocellar setae = 82 (75-88%) of frontal length; vibrissal index = 0.43 (0.33-0.50). Face dark brown. Carina prominent, nose-like, distinctly divergent downwards, pale brown. Cheek index about 5-8. Eye index = 1.17 (1.15-1.20). Occiput blackish-brown, paler along eye margin. Pedicel dark brown. Flagellomere 1 blackish. Arista with 3-4 dorsal, 2 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellowish. Clypeus dark brown. Palpus (Fig. 294) with 1 apical and 1 ventral seta of same size, both convergent.

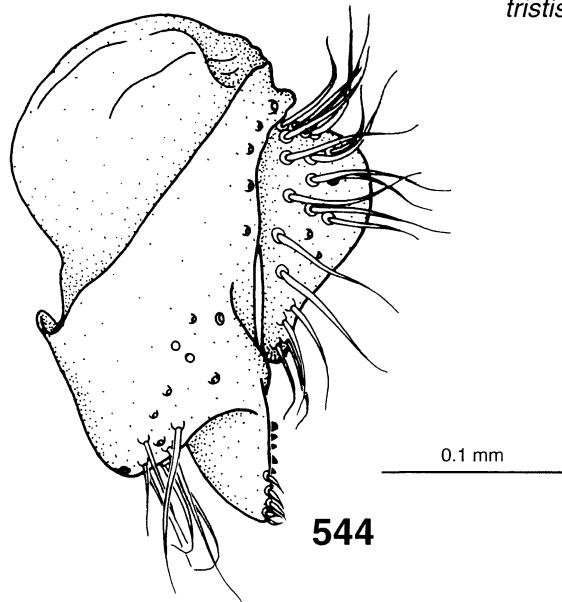
Thorax length 1.03 (0.87-1.16) mm. Scutum blackish-brown, shining, 8 rows of acrostichal setulae. h index = 1.02 (0.94-1.15). Transverse distance of dorsocentral setae 173-222% of longitudinal distance; dc index = 0.72 (0.64-0.76). Scutellum less shining, distance between apical scutellar setae about 77-83% of that between apical and basal one, basal setae parallel; scut

index = 0.92 (0.90-0.94). Pleura dark brown, shining, sterno index = 0.63 (0.57-0.67), median katepisternal seta about 25-36% of anterior one. Haltere yellowish. Legs pale brownish, sex combs on protarsomeres 1 and 2 (Fig. 296), with 9-11 and 9-12 peg-like setae respectively, length ratio of respective protarsomeres = 1.00-1.29, preapical setae on all tibiae, apical seta on mesotibia.

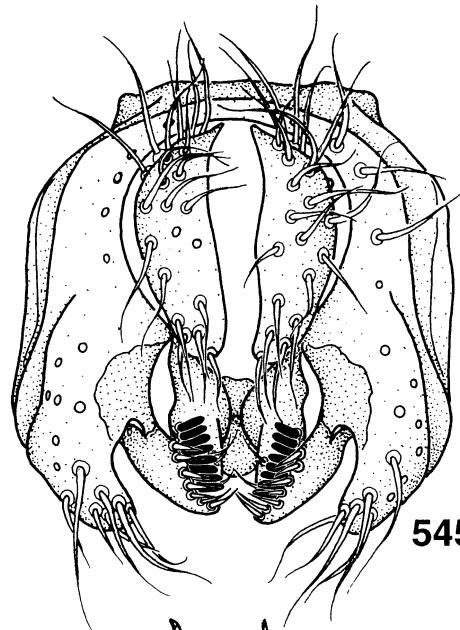
Wing (Fig. 293) hyaline but with a dark shadow beginning at middle of anterior margin and covering wing tip until end of M, crossvein dM-Cu also with a small shadow, length 2.34 (2.03-2.52) mm, length to width ratio = 2.19 (2.12-2.31). Indices: C = 2.67 (2.56-2.87), ac = 2.69 (2.50-2.83), hb = 0.44 (0.41-0.47), 4C = 0.99 (0.94-1.08), 4v = 2.02 (1.88-2.23), 5x = 1.89 (1.80-2.00), M = 0.65 (0.59-0.69), prox. x = 0.65 (0.59-0.75).

Abdomen (Fig. 320) generally brownish-black, shining, tergite 1 slightly paler, as well as base of all other tergites, if completely visible.

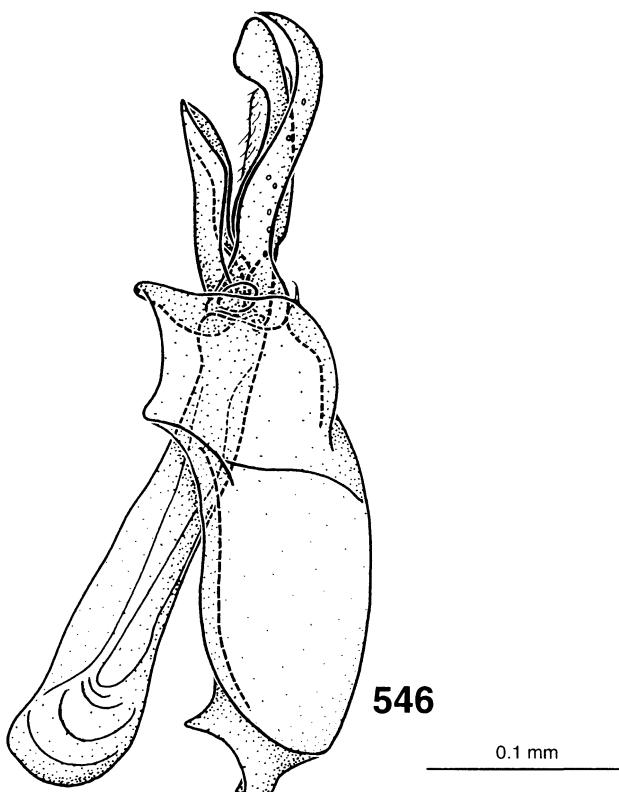
♂ Terminalia (Figs 544-547). Epandrium not microtrichose, with ca. 23 lower setae (ca. 16 long ones on outer and ca. 7 short ones on inner branch of ventral lobe), and ca. 5 long upper setae; ventral lobe long, bifurcate, pointed inwards in posterior view, not microtrichose, covering surstylius, which is almost completely encircled by its inner and anteriorly membranous branch. Cercus anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylius not microtrichose, with a straight row of ca. 8 peg-like roundish-tipped prensisetae, ca. 3 inner and no outer setae. Decasternum as in Fig. 545. Hypandrium as long as epandrium, anterior margin convex, posterior margin straight; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses and the setulae on mediodistal area of hypandrium. Aedeagus distally shaped like a telephone receiver in lateral view, apically slightly expanded and marginally straight, expansion somewhat triangular, ventrally and dorsally entirely membranous and dorsally covered with thin and sparse microtrichia, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to distal margin of aedeagal apodeme by membranous tissue and fused



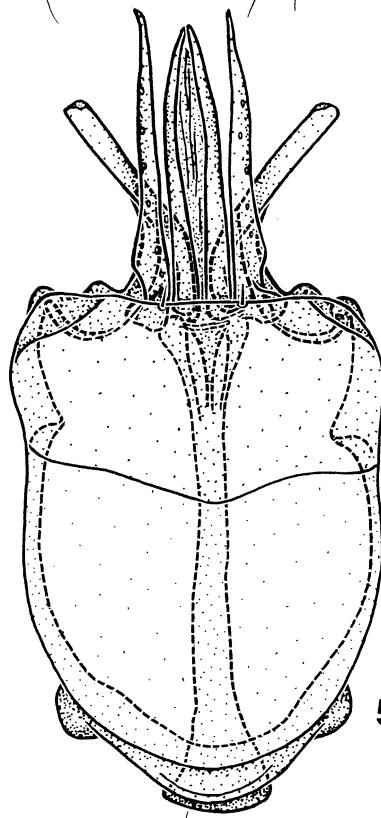
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545

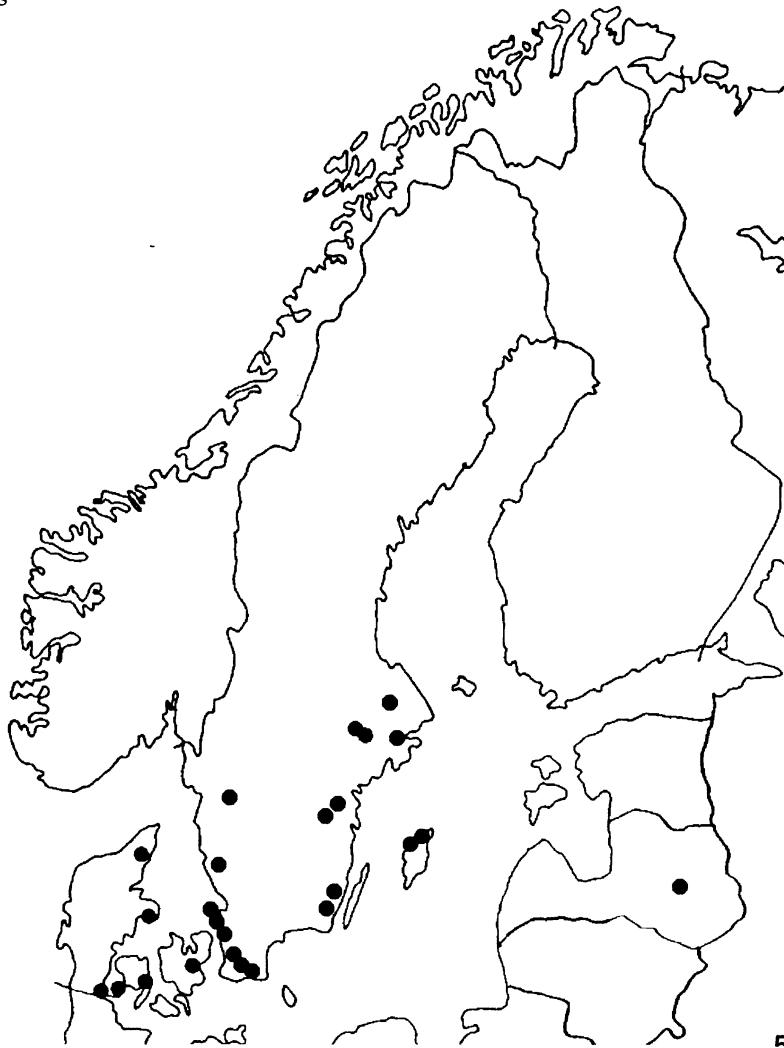


546



547

Figs. 544-547. *Drosophila tristis* Fallén. 544: epandrium, cerci, and surstyli, left lateral view; 545: idem, plus decasternum, posterior view; 546: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 547: idem, posterior view.



548

Fig. 548. Known distribution pattern of *Drosophila tristis* Fallén in Scandinavia.

to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis in lateral view sinuate, apically gradually bent dorsad, sharp at tip, laterally with a sinuate row of ca. 7 setulae, slightly narrower than aedeagus, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anteriorly expanded. Ventral rod absent.

♀. Differences from male: No sex combs. Wing hyaline except for a faint shadow along crossvein dM-Cu. Length ratio of protarsomeres 1 and 2 = 1.50.

Measurements: Frontal length 0.31 (0.29-0.32) mm; frontal index = 0.86 (0.81-0.95), top to bottom width ratio = 1.29 (1.23-1.33). Frontal triangle about 65-78% of frontal length; ocellar triangle about 41-47% of frontal length. Orbital plates about 76-84% of frontal length. Distance of or₃ to or₁ = 57-86% of or₃ to vtm, or₁ / or₃ ratio = 0.73 (0.68-0.86), or₂ / or₁ ratio = 0.52

(0.50-0.54), postocellar setae = 83 (83-84)%, ocellar setae = 93 (83-106)% of frontal length; vibrissal index = 0.42 (0.38-0.46). Cheek index about 5-7. Eye index = 1.13 (1.08-1.17). Thorax length 1.14 (1.07-1.19) mm. h index = 1.00 (0.94-1.07). Transverse distance of dorsocentral setae 177-210% of longitudinal distance; dc index = 0.72 (0.67-0.76). Distance between apical scutellar setae about 69-83% of that between apical and basal one; scut index = 0.96 (0.93-0.97), sterno index = 0.58 (0.54-0.60), median katepisternal seta about 27-31% of anterior one. Wing length 2.60 (2.52-2.73) mm, length to width ratio = 2.16 (2.11-2.21). Indices: C = 2.67 (2.42-2.89), ac = 2.95 (2.57-3.40), hb = 0.46 (0.39-0.53), 4C = 0.97 (0.90-1.06), 4v = 1.97 (1.89-2.06), 5x = 1.95 (1.71-2.40), M = 0.63 (0.58-0.67), prox. x = 0.62 (0.55-0.67).

♀ Terminalia (Fig. 536). Valve of oviscapts dorsomedially mostly membranous, apically rounded, ventrally convex, with 4 discal ovisensilla and 12-13 marginal outer ovisensilla, proximal ones trichoid-like, distal ones peg-like and roundish-tipped; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal.

Distribution. – (Fig. 548). A widespread European species, abundant in Central and South Europe, also recorded from Latvia and the Near East, absent from Northern Scandinavia. Northernmost locality: Uppsala (Sweden).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Zürich, 2 ♂♂, 1984, 2 ♂♂, 1986), 4 ♀♀ (SWITZERLAND: St. Gallen, 1 ♀, 1973; Jura, 1 ♀, 1974. SERBIA AND MONTENEGRGRO: Priština, 2 ♀♀, 1979).

Comments. – This species is more abundant in canopy traps than above fruit bait placed on the ground. The laboratory culture needs a malt medium.

populi species group

Lemeunier & Ashburner, 1976

Diagnosis. – Blackish flies; legs completely pale yellow; pleura pale yellow in lowest third; males without sex combs; aedeagus basally broad, distally sharp, mostly microtrichose; inner paraphysis well-developed, triangular in lateral view; outer paraphysis boomerang-shaped

in lateral view; oviscapts with long trichoid-like, instead of the usual peg-like, outer ovisensilla.

Taxa included. – *Drosophila populi* Wheeler and Throckmorton, 1960, from Alaska and *D. ingrifica* Hackman, 1957, from Scandinavia.

Comments. – *D. ingrifica* was considered to be rather related to *Hirtodrosophila duncani* Sturtevant, 1921, by Hackman (1957); however, its male and female terminalia are extremely similar to those of *D. populi*, and it is therefore best placed in the *populi* species group. Both species have a subarctic distribution.

Drosophila ingrifica Hackman, 1957

(Figs 537, 549-552)

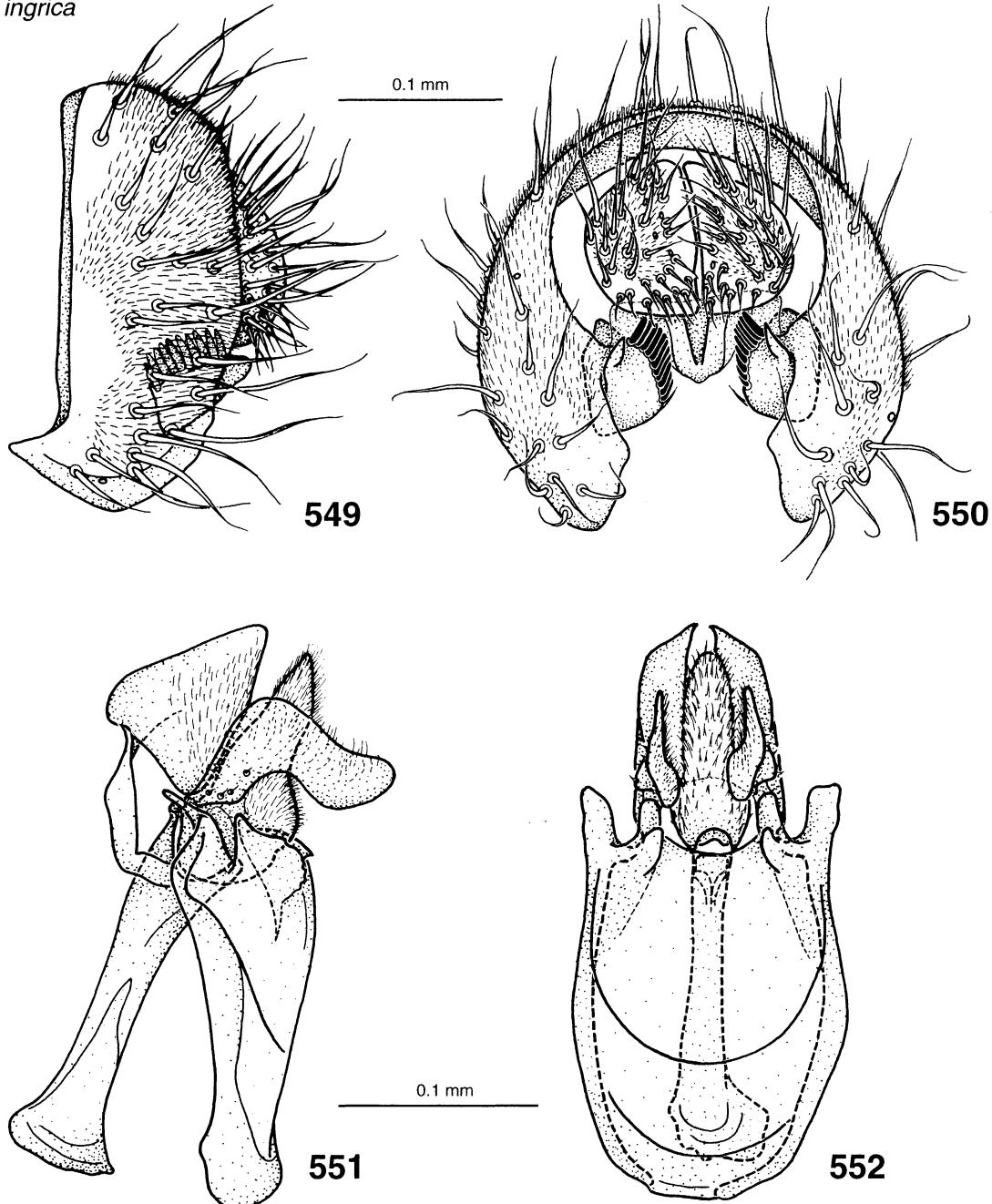
Drosophila ingrifica Hackman, 1957: 17.

Diagnosis. – The characters of the group apply, but see the male terminalia.

Redescription. – ♂. Head. Frons brown, dull, frontal length 0.28 (0.25-0.31) mm; frontal index = 0.93 (0.83-1.07), top to bottom width ratio = 1.15 (1.11-1.20). Frontal triangle indistinct, about 62% of frontal length; ocellar triangle prominent, blackish, about 44-53% of frontal length. Orbital plates relatively broad, apically only slightly diverging from eye margin, about 73-78% of frontal length. Orbital setae black, or2 outside and almost at level of or1, distance of or3 to or1 = 50% of or3 to vtm, or1 / or3 ratio = 0.81 (0.73-0.90), or2 / or1 ratio = 0.42 (0.38-0.45), postocellar setae = 51 (44-56)%, ocellar setae = 69 (63-73)% of frontal length; vibrissal index = 0.54 (0.50-0.63). Face brown. Carina short, narrow, visible only between pedicels. Gena yellow, cheek index about 9-12. Eye index = 1.25 (1.23-1.26). Occiput flat, blackish-brown. Flagellomere 1 with slightly elongated marginal setulae, about one fourth width of flagellomere, length to width ratio about 1.00-1.20. Arista with 3-4 short dorsal, 2 ventral and about 7 small inner branches, plus terminal fork. Proboscis brownish. Palpus yellowish.

Thorax length 0.85 (0.71-1.04) mm. Scutum blackish-brown, subshining. 6 (4-8) rows of acrostichal setulae. h index = 1.17 (1.13-1.22). Transverse distance of dorsocentral setae 200-225% of longitudinal distance; dc index = 0.67 (0.59-0.71). Scutellar setae almost equidistant;

ingrica



Figs. 549-552. *Drosophila ingrica* Hackman. 549: epandrium, cerci, and surstyli, left lateral view; 550: idem, plus decasternum, posterior view; 551: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 552: idem, posterior view.

basal setae parallel; scut index = 0.74 (0.67-0.80). Pleura brown, sterno index = 0.61 (0.58-0.63), median katepisternal seta about 44-50% of anterior one. Haltere pale brownish-yellow. Legs brownish-yellow, minute preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 1.97 (1.75-2.28) mm, length to width ratio = 2.26 (2.14-2.41). Indices: C = 2.10 (1.88-2.20), ac = 2.57 (2.13-2.83), hb = 0.39 (0.35-0.47), 4C = 1.08 (1.00-1.21), 4v = 1.83 (1.73-1.88), 5x = 1.98 (1.60-2.25), M = 0.60 (0.53-0.69), prox. x = 0.56 (0.47-0.62).

♂ Terminalia (Figs 549-552). Epandrium mostly microtrichose, with ca. 13 lower and ca. 12 long upper setae; ventral lobe distally subtly concave in posterior view, slightly microtrichose, not covering surstylus. Cercus anteriorly connected to epandrium by membranous tissue, mostly microtrichose and without ventral lobe. Surstylus not microtrichose, dorsally with a finger-shaped process, and medially a convex row of ca. 11 peg-like roundish-tipped prenissetae, 1 inner and no outer seta. Decasternum as in Fig. 550. Hypandrium as long as epandrium, anterior margin convex, posterior margin sinuate; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognisable because of their connection to outer paraphyses on the posteriorly and ventrally protruding posterior margin of hypandrium. Aedeagus mostly microtrichose, broad basally, narrow apically, in lateral view somewhat triangular, anteriorly connected to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis unusually large, somewhat triangular in lateral view, partially microtrichose, anteriorly connected to dorsodistal margin of aedeagal apodeme by membranous tissue and fused to laterodistal inner surface of hypandrium by means of a long, dorsal, ribbon-shaped, sclerotised process. Outer paraphysis boomerang-shaped in lateral view, partially microtrichose on the inside, abruptly bent medially, roundish at tip, laterally with a sinuate row of ca. 4 setulae, anteriorly connected both to distal margin of aedeagal apodeme, and to median area of distal protruding margin of hypandrium ("gonopods"), by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anteriorly expanded. Ventral rod absent.

♀. Measurements: Frontal length 0.28 (0.23-0.31) mm; frontal index = 0.88 (0.82-0.95), top

to bottom width ratio = 1.17 (1.14-1.24). Frontal triangle about 72-86% of frontal length; ocellar triangle about 37-44% of frontal length. Orbital plates about 78-86% of frontal length. Distance of or3 to or1 = 57-67% of or3 to vtm, or1 / or3 ratio = 0.81 (0.77-0.85), or2 / or1 ratio = 0.42 (0.36-0.45), postocellar setae = 52 (50-56)%, ocellar setae = 75 (72-79)% of frontal length; vibrissal index = 0.58 (0.50-0.71). Cheek index about 7-13. Eye index = 1.09 (1.00-1.17). Thorax length 0.90 (0.78-1.04) mm. h index = 1.09 (0.89-1.22). Transverse distance of dorsocentral setae 200-225% of longitudinal distance; dc index = 0.69 (0.65-0.74). Distance between apical scutellar setae about 90-100% of that between apical and basal one; scut index = 0.77 (0.74-0.79), sterno index = 0.59 (0.55-0.65), median katepisternal seta about 36-50% of anterior one. Wing length 2.23 (1.96-2.45) mm, length to width ratio = 2.27 (2.12-2.48). Indices: C = 2.04 (1.94-2.17), ac = 3.10 (2.47-3.60), hb = 0.36 (0.33-0.39), 4C = 1.17 (1.06-1.24), 4v = 1.96 (1.76-2.13), 5x = 1.95 (1.67-2.25), M = 0.62 (0.59-0.65), prox. x = 0.57 (0.47-0.65).

♀ Terminalia (Fig. 537). Valve of oviscapt subapically expanded dorsad, dorsomedially mostly membranous, dorsal sclerotised margin remarkably sinuate, apically rounded, ventrally slightly convex, with 7-8 discal and an irregular row of 11-12 marginal, trichoid-like outer ovisensilla, dorsalmost marginal one unusually long; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 very long, curved, subterminal, which is abnormally inserted marginally instead of on the inner surface as usual.

Distribution. – This species has been recorded in Sweden, Finland and Russia (St. Petersburg area). Northernmost locality: Tyresta National Park (Sweden).

Additional specimens examined. – 5 ♂♂ (RUSSIA [ZMSP]: Kartashevka, 1 ♂ paratype, no date. SWEDEN: Tyresta NP, 4 ♂♂, 2000), 4 ♀♀ (FINLAND: Helsinki, 1 ♀, no date. SWEDEN: Tyresta NP, 3 ♀♀, 2000).

Comments. – There are only subtle differences between the male terminalia of *D. ingrata* and those of *D. populi* (as illustrated by Takada, 1960), which could just be individual variability. However, as we have not studied any American specimens identified as *D. populi*, we postpone further decisions regarding the status of these two taxa.

Genus *Hirtodrosophila* Duda, 1923

Hirtodrosophila Duda, 1923: 41. Type species: *Drosophila latifrontata* Frota-Pessoa, 1954. *Dasydrosophila* Duda, 1925: 152.

Diagnosis. – Flagellomere 1 often relatively long, covered with sparse and unusually long setulae (3 to 4x length of denser ground-setulae), particularly along margin; arista usually with one ventral branch behind terminal fork; ocellar triangle small; carina often narrow, short, almost absent on lower part of face; first genal seta relatively short; anterior reclinate orbital seta usually very fine; prescutellar and proepisternal setae absent; anterior and median katepisternal setae usually very fine, anterior seta usually less than half length of posterior seta; preapical setae on protibia and mesotibia reduced or absent; tergites with rather diffuse marginal bands; ventral receptacle in form of loops folded flat against ventral surface of vagina; eggs with four thick filaments; larvae fungivorous.

Taxa included. – There are about 150 described species, many of which are arranged into ten species groups. The European species belong to three groups. The majority of species are known from tropical and subtropical areas around the world.

Comments. – This former subgenus of *Drosophila* was raised to generic status by Grimaldi (1990). The genus is, however, paraphyletic because clearcut synapomorphies are obviously absent and many species have been included for want of a better solution. Although certain of the species do share at least one feature (in part ecological and/or behavioural features) with other included species, the majority of their characters do not suggest a close relationship. A phylogenetic analysis is badly needed.

Because of the general difficulties in separating *Hirtodrosophila* and *Drosophila*, they have both been included in the same species identification key.

Most probably, as has already been corroborated for many species, *Hirtodrosophila* species are fungus breeders. A few species can be kept in culture by using the special malt food.

There is a close relationship with *Mycodrosophila* and *Zygothrica* (Throckmorton, 1975; Grimaldi, 1990).

hirticornis species group

Burla, 1956

Diagnosis. – Flagellomere 1 with elongated and sparse marginal setulae (3 to 4x length of denser ground-setulae); aedeagus apically simple; ovipositor valve ventrodistally with a straight row of tiny, outer ovisensilla, ventroapically protruding backwards and with about 2 stout (innermost stronger), peg-like, horizontally positioned, outer ovisensilla, which are separated by a gap from the vertical row of peg-like outer ovisensilla on the dorsoapical margin.

Taxa included. – About 70 species, divided into two subgroups; the two European species belong to the *hirticornis* subgroup.

Comments. – In the two European species discussed below and unlike most species belonging to the *hirticornis* group, the typical marginal setulae of the flagellomere 1 are only slightly elongated.

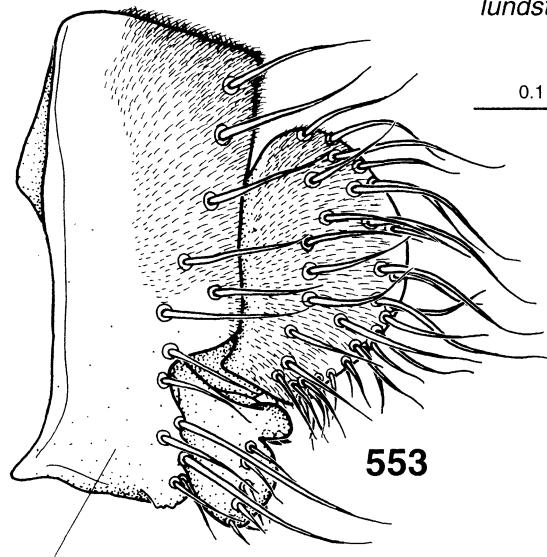
Hirtodrosophila lundstroemi (Duda, 1935)

(Figs 279, 553-557)

Drosophila lundstroemi Duda, 1935: 72.

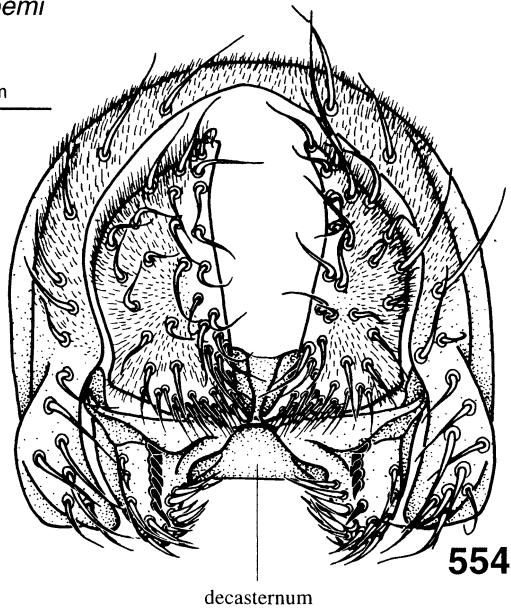
Diagnosis. – Mesonotum with a diffuse, brownish, broad, median stripe; pleura more or less brownish; tergites with broad marginal bands, medially diffuse and laterally broad; aedeagus remarkably sinuate and apically blunt in lateral view.

Redescription. – ♂. Head. Frons yellowish-brown, pale yellowish in lower fifth, frontal length 0.38 (0.37-0.39) mm; frontal index = 0.90 (0.88-0.92), top to bottom width ratio = 1.18 (1.16-1.20). Frontal triangle pale brown, shining, not very distinct, about 70-73% of frontal length; ocellar triangle prominent, dark brown, subshining, about 39-41% of frontal length. Frontal vittae brownish, dull. Orbital plates brown, shining, broad, apically diverging from eye margins, about 73-83% of frontal length. Orbital setae black, distance of or3 to or1 = 78% of or3 to vtm, or1 / or3 ratio = 0.90 (0.87-0.93), or2 / or1 ratio = 0.42 (0.28-0.46), postocellar setae = 49 (43-55)%, ocellar setae = 67 (65-68)% of frontal length; vibrissal index = 0.20. Face



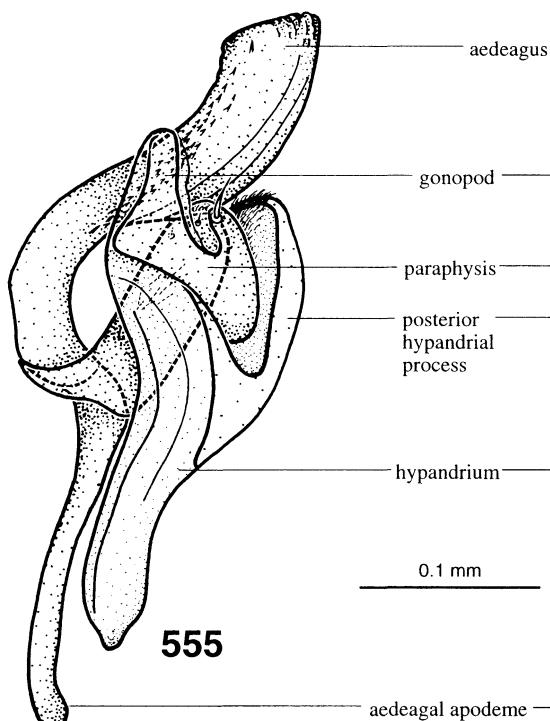
553

ventral lobe



554

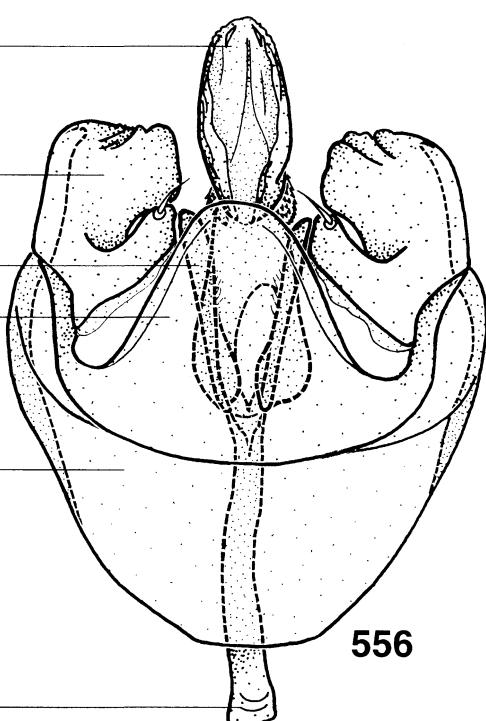
decasternum



555

aedeagal apodeme

0.1 mm

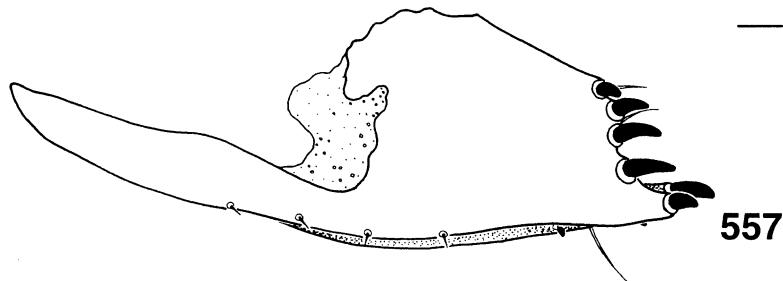


556

Figs. 553-556. *Hirtodrosophila lundstroemi* (Duda). 553: epandrium, cerci, and surstyli, left lateral view; 554: idem, plus decasternum, posterior view; 555: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 556: idem, posterior view.

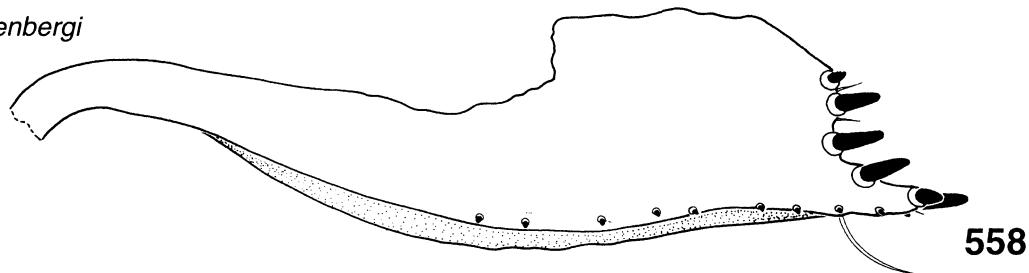
0.1 mm

lundstroemi



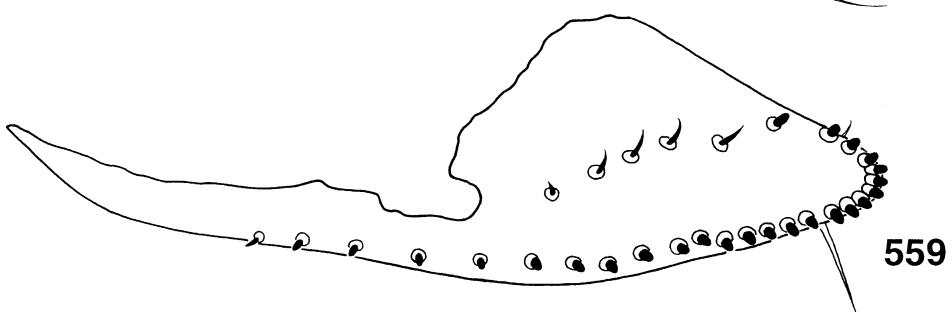
557

oldenbergi



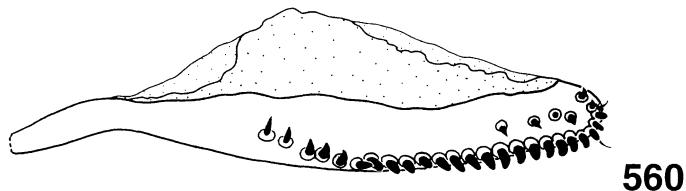
558

confusa



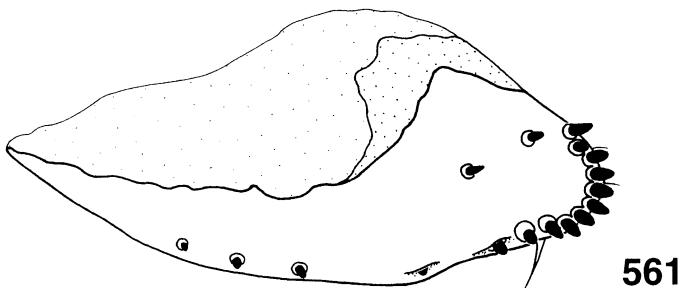
559

trivittata



560

cameraria



561

Figs. 557-561. Left oviscapts valves, lateral view.

brownish, almost flat, parafacialia yellowish. Carina very short, small, visible only between pedicels. Cheek index about 4-5. Eye roundish, index = 1.07. Occiput slightly convex, brownish. Pedicel brown. Flagellomere 1 dark brown, as long as face, covered with sparse, elongated setulae (2 to 3x length of denser ground-setulae) along margin; length to width ratio = 1.80. Arista with 5-6 rather short dorsal, 1 (rarely 2) ventral, and about 6 small inner branches, plus terminal fork. Proboscis brownish.

Thorax length 1.20 (1.19-1.22) mm. Scutum yellowish-brown, shining, usually with a dark median stripe which is broadened towards scutellum. 8 rows of acrostichal setulae. h index = 1.56 (1.50-1.62). Transverse distance of dorsocentral setae 175-230% of longitudinal distance; dc index = 0.62 (0.61-0.64). Scutellum brownish. Scutellar setae nearly equidistant, basal ones divergent; scut index = 0.90 (0.88-0.92). Pleura brownish-yellow, with a faint brownish stripe from above procoxa to base of haltere, sterno index = 0.58 (0.57-0.59), median katepisternal seta minute, about 15-25% of anterior one. Haltere whitish-yellow. Legs brownish-yellow, preapical seta on metatibia, apical seta on mesotibia.

Wing hyaline, veins R_{4+5} and M apically slightly convergent, length 2.85 (2.76-2.94) mm, length to width ratio = 2.12 (2.08-2.15). Indices: C = 2.59 (2.57-2.60), ac = 3.18 (2.86-3.50), hb = 0.46 (0.43-0.50), 4C = 0.80, 4v = 1.49 (1.48-1.50), 5x = 1.38, M = 0.43 (0.42-0.44), prox. x = 0.37 (0.36-0.38).

Abdomen (Fig. 279) yellowish, shining, tergites 2-5 with brown marginal bands of variable width and intensity, laterally covering whole area and medially usually parallel, but sometimes narrowed.

σ Terminalia (Figs 553-556). Epandrium dorso-distally microtrichose, with ca. 7 lower and ca. 6 upper setae; ventral lobe narrow, neither microtrichose nor covering surstylus. Cercus anteriorly linked to epandrium by membranous tissue, microtrichose, without ventral lobe. Surstylus not microtrichose, dorso-anteriorly strongly sclerotised, with a straight row of ca. 7 peg-like sharp-tipped prensisetae, ca. 11 inner and ca. 5 outer setae. Decasternum as in Fig. 554. Hypandrium as long as epandrium, anterior margin convex; posterior hypandrial process large, anteriorly much wider, inner wall microtrichose distally, dorsal arch absent;

gonopod linked to paraphysis by membranous tissue, with one seta medially near inner margin. Aedeagus fused to aedeagal apodeme, strongly sinuate and distally blunt in lateral view, dorso-laterally covered with tiny scales on distal half. Aedeagal apodeme shorter than aedeagus, rod-shaped. Ventral rod absent. Paraphysis anteriorly widely expanded, slightly microtrichose in medial inner surface, distally with 2 setulae near dorsal margin, and linked both to distal margin of aedeagal apodeme and to gonopod by membranous tissue.

φ . Measurements: Frontal length 0.37 (0.34-0.39) mm, frontal index = 0.87 (0.81-0.92), top to bottom width ratio = 1.31 (1.23-1.41). Frontal triangle about 61-76% of frontal length, ocellar triangle about 41-45% of frontal length. Orbital plates about 74-90% of frontal length. Distance of or3 to or1 = 67-78% of or3 to vtm, or1 / or3 ratio = 0.89 (0.81-1.00), or2 / or1 ratio = 0.45 (0.38-0.54), postocellar setae = 64 (57-65)%, ocellar setae = 83 (78-86)% of frontal length, vibrissal index = 0.14 (0.11-0.19). Cheek index about 3-5. Eye index = 1.09 (1.07-1.12). Thorax length 1.24 (1.13-1.29) mm. h index = 1.49 (1.40-1.62). Transverse distance of dorsocentral setae 220-267% of longitudinal distance; dc index = 0.61 (0.58-0.63). Distance between apical scutellar setae about 110-120% of that between apical and basal one; scut index = 0.85 (0.82-0.93), sterno index = 0.57 (0.45-0.62), median katepisternal seta minute, about 19-30% of anterior one. Wing length 2.99 (2.87-3.08) mm, length to width ratio = 2.18 (2.10-2.28). Indices: C = 2.69 (2.52-2.81), ac = 3.00, hb = 0.44 (0.43-0.48), 4C = 0.85 (0.81-0.91), 4v = 1.67 (1.54-1.83), 5x = 1.60 (1.57-1.62), M = 0.49 (0.42-0.52), prox. x = 0.43 (0.42-0.44).

φ Terminalia (Fig. 557). Valve of oviscapit somewhat L-shaped in posterior view, distally double-walled, ventrodistally slightly protruding backwards, ventrally slightly convex with a marginal row of 3-4 tiny, trichoid-like, and 2-3 small, peg-like ovisensilla, without discal outer ovisensilla, with two sets of large, marginal, peg-like, roundish-tipped, outer ovisensilla: the 4 dorsalmost ones in a vertical row, and separated by a gap from the 2 horizontally positioned ventralmost ones (innermost stouter); trichoid-like inner ovisensilla: 2 thin, dorsodistally positioned, 1 thin, adjacent to innermost peg-like ovisensilla (not seen in Fig. 557), and ventrally 1 slightly longer, curved, subterminal.

Distribution. – There are few records, but it is clearly widespread in Europe; more common in the north than the species treated below. Known also from Sweden, Finland (northernmost locality: Oulanka) and Russia.

Biology. – It has been reared from fungus (*Auricularia* sp.; Basidiomycetes, Auriculariaceae) by J. Ševčík (J. Máca, pers. comm.).

Additional specimens examined. – 1 ♂ (FINLAND [ZMUH]: Tuovilanlaks, holotype, no date), 4 ♀♀ (FINLAND [ZMUH]: Koli, 1 ♀, 1966. GERMANY: Schöngeising, 1 ♀, 1991. SWEDEN [ZMUL]: Breared, 1 ♀, 1974. SWITZERLAND: Graubünden, 1 ♀, 1999).

Hirtodrosophila oldenberghi (Duda, 1924)

(Figs 275, 276, 278, 558, 562-565)

Drosophila oldenberghi Duda, 1924: 204.

Diagnosis. – Mesonotum and pleura almost unicoloured; tergites with broad marginal bands, triangularly broadened medially and broad laterally; aedeagus rod-shaped, marginally serrate in ventral view.

Redescription. – ♂. Head. Frons almost brown, pale yellowish in lower fifth, frontal length 0.37 (0.35-0.39) mm; frontal index = 0.90 (0.84-0.96), top to bottom width ratio = 1.30 (1.23-1.41). Frontal triangle pale, shining, not very distinct, about 62-78% of frontal length; ocellar triangle prominent, blackish, subshining, about 35-48% of frontal length. Orbital plates brown, shining, broad, apically diverging from eye margins, about 76-81% of frontal length. Orbital setae black, in a row, or2 slightly closer to or1 than to or3, distance of or3 to or1 = 87-112% of or3 to vtm, or1 / or3 ratio = 0.91 (0.86-1.00), or2 / or1 ratio = 0.51 (0.46-0.58), postocellar setae = 59 (52-67)%, ocellar setae = 79 (71-86)% of frontal length; vibrissal index = 0.40 (0.33-0.43). Face brownish, almost flat, parafacialia yellowish. Carina short, small, visible only in upper half of face. Cheek index about 4-5. Eye somewhat longish, index = 1.18 (1.14-1.23). Occiput slightly convex, blackish. Pedicel brown. Flagellomere 1 (Fig. 276) dark brown, covered with sparse elongated setulae (2 to 3x length of denser ground-setulae) along margin; length to

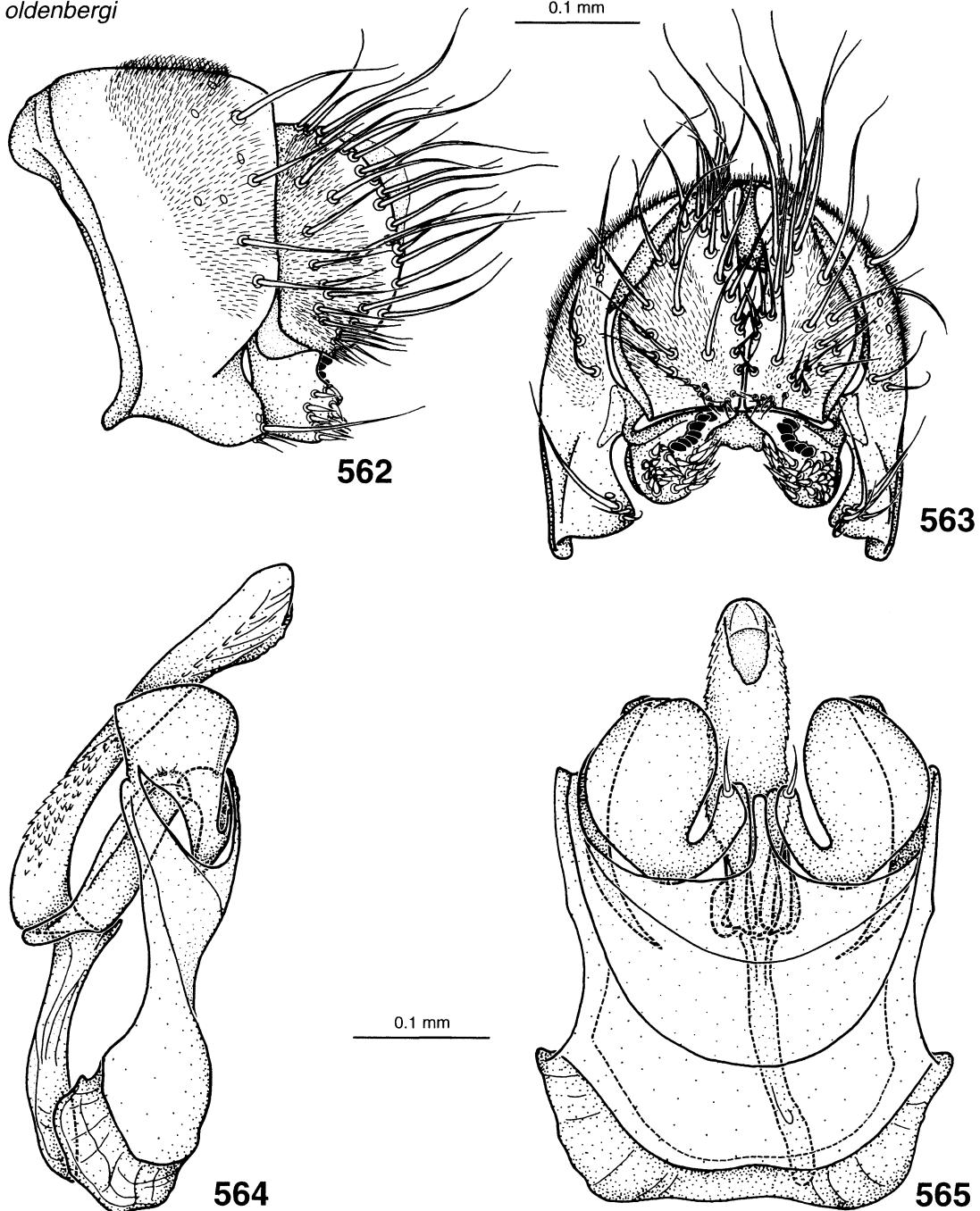
width ratio = 1.50-1.90. Arista with 3 (rarely 4) dorsal, 1 ventral, and about 8 small inner branches, plus terminal fork. Proboscis brownish, clypeus black, palpus with 1 prominent apical seta and several very fine setae along lower margin.

Thorax length 1.32 (1.24-1.36) mm. Scutum yellowish-brown, shining, in some specimens with a faint medial stripe, broadened towards scutellum. 6 (rarely 8) rows of acrostichal setulae. h index = 1.07 (1.00-1.14). Transverse distance of dorsocentral setae 209-240% of longitudinal distance; dc index = 0.64 (0.60-0.71). Scutellum brownish, shining. Distance between apical scutellar setae about 85-100% of that between apical and basal one, basal setae divergent; scut index = 0.86 (0.81-0.90). Pleura brownish, with diffuse yellowish areas, mostly along sutures, sterno index = 0.58 (0.54-0.60), median katepisternal seta about 27-50% of anterior one. Haltere whitish-yellow. Legs brownish-yellow, preapical seta on metatibia, apical seta on mesotibia.

Wing hyaline, veins R₄₊₅ and M apically slightly convergent, length 3.22 (3.01-3.54) mm, length to width ratio = 2.20 (2.10-2.30). Indices: C = 2.32 (2.07-2.55), ac = 3.25 (2.75-3.57), hb = 0.58 (0.48-0.63), 4C = 1.00 (0.92-1.13), 4v = 1.85 (1.76-1.92), 5x = 1.84 (1.44-2.00), M = 0.56 (0.54-0.58), prox. x = 0.43 (0.38-0.54).

Abdomen (Fig. 278) yellowish, shining, tergites 2-6 with brown marginal bands of variable width and intensity, medially triangularly elongated to basal margin; in ventral parts, a yellowish area of variable size may be present.

♂ Terminalia (Figs 562-565). Epandrium dorsodistally microtrichose, with ca. 5 lower and ca. 9 upper setae; ventral lobe neither microtrichose nor covering surstyli. Cercus anteriorly linked to epandrium by membranous tissue, microtrichose, without ventral lobe. Surstyli not microtrichose, dorsoanteriorly strongly sclerotised, with a high positioned, oblique, sinuate row of ca. 7 peg-like roundish-tipped prensistae, ca. 16 inner and ca. 10 outer setae. Decasternum as in Fig. 563. Hypandrium longer than epandrium, anteriorly expanded laterally, anterior margin medially almost straight; posterior hypandrial process thin, rod-shaped, dorsal arch absent; gonopod linked to paraphysis by membranous tissue, with one seta medially at tip of a finger-shaped expansion, near inner margin. Aedeagus fused to aedeagal apodeme



Figs. 562-565. *Hirtodrosophila oldenbergi* (Duda). 562: epandrium, cerci, and surstyli, left lateral view; 563: idem, plus decasternum, posterior view; 564: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 565: idem, posterior view.

and anteriorly slightly curved; marginally serrate in ventral view; in lateral view distally rounded and covered dorsolaterally on anterior half, and mediolaterally on posterior half, with tiny scales. Aedeagal apodeme half as long as aedeagus, rod-shaped, bent. Ventral rod vestigial. Paraphysis three times as long as wide, linked to gonopod by membranous tissue, distally with 3 setulae near dorsal margin, anteriorly widely expanded and connected to distal margin of aedeagal apodeme by membranous tissue.

♀. Measurements: Frontal length 0.39 (0.34-0.43) mm, frontal index = 0.85 (0.79-1.00), top to bottom width ratio = 1.22 (1.18-1.35). Frontal triangle about 61-75% of frontal length; ocellar triangle about 36-45% of frontal length. Orbital plates about 71-82% of frontal length. Distance of or3 to or1 = 86-112% of or3 to vtm, or1 / or3 ratio = 0.95 (0.88-1.00), or2 / or1 ratio = 0.51 (0.43-0.57), postocellar setae = 62 (55-68)%, ocellar setae = 79 (75-86)% of frontal length; vibrissal index = 0.33 (0.19-0.46). Cheek index about 3-5. Eye index = 1.18 (1.13-1.23). Thorax length 1.44 (1.19-1.62) mm. h index = 1.10 (1.00-1.20). Transverse distance of dorsocentral setae 200-260% of longitudinal distance, dc index = 0.60 (0.52-0.66). Distance between apical scutellar setae about 79-109% of that between apical and basal one, scut index = 0.89 (0.81-0.94), sterno index = 0.56 (0.50-0.61), median katepisternal seta about 31-50% of anterior one. Wing length 3.52 (2.98-3.71) mm, length to width ratio = 2.23 (2.08-2.33). Indices: C = 2.27 (2.13-2.41), ac = 3.29 (3.00-3.50), hb = 0.59 (0.52-0.64), 4C = 0.96 (0.93-1.00), 4v = 1.71 (1.64-1.75), 5x = 1.72 (1.50-2.00), M = 0.52 (0.43-0.58), prox. x = 0.45 (0.33-0.66).

♀ Terminalia (Fig. 558). Valve of oviscap somewhat L-shaped in posterior view, distally double-walled, ventrodistally strongly projecting backwards, ventrally slightly convex with a marginal row of 10 tiny peg-like ovisensilla, without discal outer ovisensilla, with two sets of large marginal, peg-like, roundish-tipped, outer ovisensilla: 4-5 dorsalmost ones in a vertical row (dorsalmost smaller), separated by a gap from the 2 horizontally positioned ventralmost ones (innermost stouter); trichoid-like inner ovisensilla: two thin, dorsodistally positioned, 1 thin, ventrally, adjacent to innermost ventral peg-like ovisensilla (not seen in Fig. 558) and ventrally 1 long, curved, subterminal; bridge anteriorly con-

necting valves narrow, long and perpendicular to them.

Distribution. – Widespread in Europe but rarely collected. More common in the south than the preceding species. Northernmost record: Tolmachevo (Russia).

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Graubünden, 1 ♂, 1999; Zürich, 2 ♂♂, 1970. GERMANY: Schöneising, 1 ♂, 1991), 5 ♀♀ (RUSSIA: Luga, 1 ♀, 1935. SWITZERLAND: Graubünden, 2 ♀♀, 1999; Uri, 1 ♀, 1973; Zürich, 1 ♀, 1970).

melanderi species group

Wheeler, 1949

Diagnosis. – Arista with only one ventral branch just behind terminal fork; epandrium very broad dorsally and narrow ventrally in lateral view, ventral lobe finger-shaped; cercus positioned low and more or less perpendicular to epandrium, ventrally with long setae or a few stout peg-like setae; surstyli projecting ventrad beyond ventral lobe of epandrium, distally bifid; hypandrial apodeme much broader than long.

Taxa included. – This Holarctic species group contains nine species which are thought to be strict fungus-breeders.

Comments. – This species group was originally established for two American species of the subgenus *Drosophila*. However, as already suggested by Wheeler (1957) and Máca (1982), it is better included in the genus *Hirtodrosophila*.

Hirtodrosophila cameraria (Haliday, 1833)

(Figs 274, 280, 282, 561, 566-569)

Drosophila cameraria Haliday, 1833: 174.

Drosophila unistriata Strobl, 1898: 580.

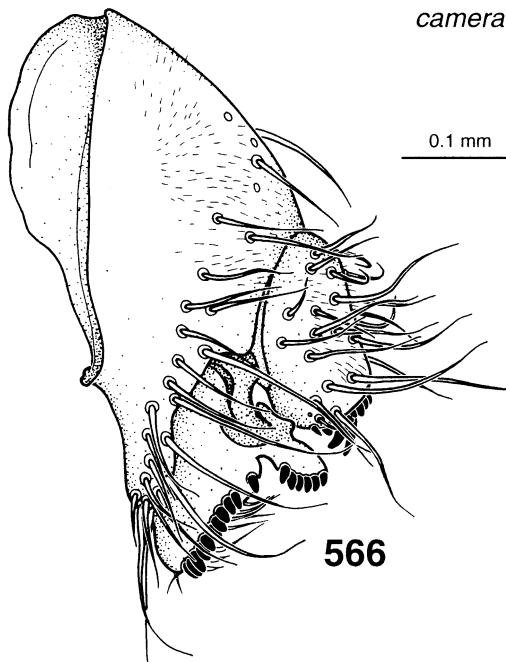
Drosophila latestriata Becker, 1908: 157.

Drosophila fungicola Villeneuve, 1921: 160.

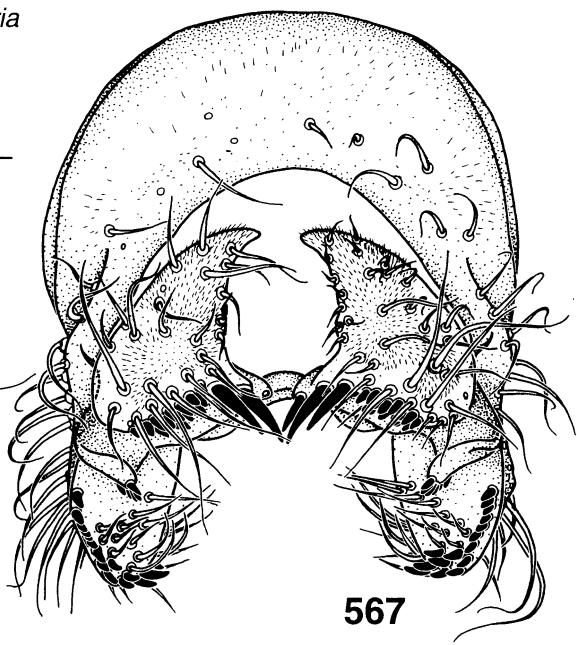
Diagnosis. – Mesonotum with a diffuse, broad, dark brown, median stripe; tergites with very broad, dark, marginal bands, medially narrowly interrupted on basal tergites, medially narrowed or indented on apical tergites; cercus ventrally expanded laterad and with a stripe of ca. 15

cameraria

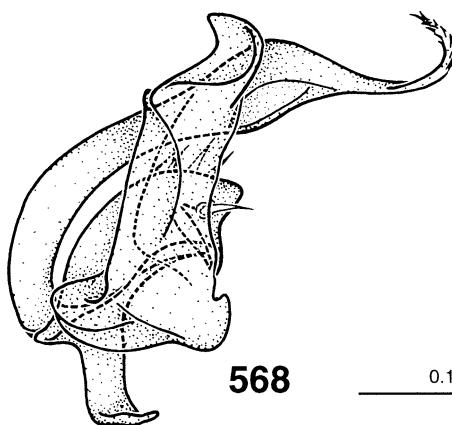
0.1 mm



566

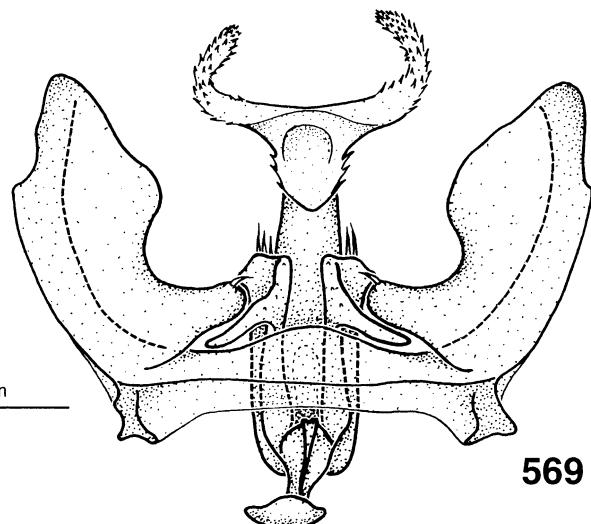


567



568

0.1 mm



569

Figs. 566-569. *Hirtodrosophila cameraria* (Haliday). 566: epandrium, cerci, and surstyli, left lateral view; 567: idem, plus decasternum, posterior view; 568: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 569: idem, posterior view.

peg-like setae, which are stronger on inner corner; aedeagus apically bifurcate with two horn-shaped branches which are long, narrow, scaled, and curved dorsad in lateral view and inwards in posterior view; oviscapt valves relatively short, brownish, apically roundish.

Redescription. – ♂. Head. Frons brownish, broadly yellow above antennae and on a narrow midline, dull, frontal length 0.33 (0.28-0.36) mm; frontal index = 1.19 (1.00-1.31), top to bottom width ratio = 1.48 (1.39-1.56). Frontal triangle indistinct, pale, microtrichose, about 62-76% of frontal length; ocellar triangle prominent, dark brown along inner sides of ocelli, about 37-47% of frontal length. Orbital plates narrow, subshining, slightly diverging from eye margin, about 76-94% of frontal length. Orbital setae black, distance of or3 to or1 = 75-100% of or3 to vtm, or1 / or3 ratio = 0.89 (0.83-0.92), or2 / or1 ratio = 0.41 (0.33-0.45), postocellar setae = 62 (53-76)%, ocellar setae = 72 (62-79)% of frontal length; vibrissal index = 0.36 (0.27-0.42). Face yellowish, darker towards mouth margin. Carina narrow, rather small, slightly prominent but not nose-like. Cheek index about 5-8. Eye index = 1.14 (1.12-1.17). Occiput brown, with narrow yellowish margin. Antennae yellowish. Flagellomere 1 (Fig. 274) with diffuse brownish margin, with 4(-5) relatively short upper branches, one short lower branch just behind terminal fork, and about 5 rather long inner branches, plus small terminal fork. Proboscis yellow. Palpus with 2 black and several pale setae.

Thorax (Fig. 280) length 1.08 (1.00-1.21) mm. Scutum brownish-yellow, shining, with a more or less diffuse brownish median stripe, which is narrow in frontal half and distinctly broadened and darkened towards scutellum, 6 rows of acrostichal setulae. h index = 1.42 (1.29-1.60). Transverse distance of dorsocentral setae 173-190% of longitudinal distance; dc index = 0.58 (0.53-0.65). Scutellum brownish, microtrichose, distance between apical scutellar setae about 77-92% of that between apical and basal one; basal setae divergent; scut index = 1.02 (0.97-1.06). Pleura yellowish-brown, shining, sterno index = 0.70 (0.59-0.79), median katepisternal seta about 41-67% of anterior one. Haltere yellowish-white. Legs yellowish, preapical setae on mesotibia and metatibia, ventral apical seta on mesotibia.

Wing hyaline, relatively long, apically slightly pointed, length 2.70 (2.59-2.80) mm, length to width ratio = 2.37 (2.29-2.42). Indices: C = 3.42 (3.25-3.53), ac = 2.42 (2.29-2.67), hb = 0.39 (0.33-0.44), 4C = 0.67 (0.63-0.70), 4v = 1.48 (1.42-1.62), 5x = 1.70 (1.57-1.83), M = 0.48 (0.46-0.52), prox. x = 0.51 (0.46-0.58).

Abdomen (Fig. 282) yellow, shining, tergites 1-6 with variable, dark brown, not well defined marginal bands, which are medially interrupted, or at least narrowed, and lateroventrally usually broadened; many specimens show a pale area close to ventral margin of tergites.

♂ Terminalia (Figs 566-569). Epandrium very broad dorsally and narrow ventrally in lateral view, dorsodistally sparsely microtrichose, with ca. 17 lower and ca. 8 upper setae; ventral lobe finger-shaped, neither microtrichose nor covering surstylos. Cercus slightly triangular in posterior view, anteriorly linked to epandrium by membranous tissue, distally microtrichose, without ventral lobe, ventrally expanded laterad and with a stripe of ca. 15 peg-like setae, the innermost three remarkably larger and stronger. Surstylus not microtrichose, strongly developed, protruding ventrad beyond ventral lobe of epandrium, partially covering ventral lobe of epandrium in posterior view, dorsoanteriorly strongly sclerotised, dorsodistally slightly bifurcate, dorsally protruding backwards, with two curved rows of peg-like prensisetae, which are roundish-tipped and separated by a gap: upper row horizontal with ca. 6 prensisetae and lower one vertical with ca. 15 prensisetae, the lower half of which are arranged in an irregular row, and, in addition, ca. 12 inner and no outer setae. Decasternum as in Fig. 567. Hypandrium conspicuously wider than long, shorter than epandrium, anteriorly narrowed, anterior margin medially almost straight; posterior hypandrial process and dorsal arch absent; gonopod mostly fused to hypandrium, linked to paraphysis by membranous tissue, with one seta submedially near inner margin. Aedeagus fused to aedeagal apodeme, curved, submedially expanded dorsoventrally in lateral view, apically strongly bifurcate with two thin, horn-shaped branches which are covered with tiny scales and bent inwards in ventral, and dorsad in lateral view; submedian expansion marginally serrate in posterior view. Aedeagal apodeme short, ca. 1/5 length of aedeagus, laterally flattened, anteriorly expanded. Ventral rod longer than

width of adjacent aedeagal apodeme. Paraphysis broad, distally with ca. 3 setulae near dorsal margin, linked both to distal margin of aedeagal apodeme, and to gonopod, by membranous tissue.

♀. Measurements: Frontal length 0.35 (0.32-0.37) mm; frontal index = 1.02 (0.95-1.06), top to bottom width ratio = 1.30 (1.24-1.35). Frontal triangle about 64-68% of frontal length; ocellar triangle about 38-43% of frontal length. Orbital plates about 74-81% of frontal length. Distance of or3 to or1 = 67-100% of or3 to vtm, or1 / or3 ratio = 0.81 (0.77-0.86), or2 / or1 ratio = 0.48 (0.42-0.55), postocellar setae = 63 (58-67)%, ocellar setae = 78 (73-81)% of frontal length; vibrissal index = 0.35 (0.27-0.45). Cheek index about 5-8. Eye index = 1.14 (1.09-1.25). Thorax length 1.16 (1.07-1.22) mm. h index = 1.32 (1.27-1.38). Transverse distance of dorsocentral setae 167-200% of longitudinal distance; dc index = 0.63 (0.59-0.66). Distance between apical scutellar setae about 77-85% of that between apical and basal one; scut index = 1.03 (1.00-1.07), sterno index = 0.69 (0.65-0.79), median katepisternal seta about 40-53% of anterior one. Wing length 2.76 (2.48-2.94) mm, length to width ratio = 2.37 (2.25-2.47). Indices: C = 3.68 (3.43-3.87), ac = 2.49 (2.14-2.80), hb = 0.42 (0.38-0.47), 4C = 0.63 (0.60-0.67), 4v = 1.42 (1.38-1.48), 5x = 1.60 (1.38-1.83), M = 0.46 (0.43-0.48), prox. x = 0.50 (0.48-0.52).

♀ Terminalia (Fig. 561). Valve of oviscapts relatively short, brownish, apically rounded, ventrally convex, with 3-4 discal and ca. 13 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal.

Distribution. – Recorded almost all over Europe, also in Lithuania, Latvia, North Africa and the Near East. Much more common in southern areas (Shorrocks, 1977). Northernmost locality: Tyresta N.P. (Sweden).

Biology. – A fungus breeding species (Buxton, 1954).

Additional specimens examined. – 4 ♂♂ and 4 ♀♀ (SWITZERLAND: Uri, 1973).

Comments. – Due to a misinterpretation by Duda, some authors have referred to this species as *Drosophila pallida* Zetterstedt.

quadrivittata species group

Okada, 1967

Diagnosis. – Flagellomere 1 without elongated marginal setulae; arista with two ventral branches behind terminal fork; cercus with or without stout setae ventrally; surstylus usually much broader than long; oviscapts valve relatively long, apically rounded.

Taxa included. – The 10 species are arranged in three subgroups; *Hirtodrosophila confusa* (Staeger) and *H. toyohiokadai* (Sidorenko) belong to the *confusa* subgroup, and *H. trivittata* to the *trivittata* subgroup.

Comments. – *H. toyohiokadai* Sidorenko, 1990, originally described from Far East Russia in the genus *Lordiphosa*, has been recorded in Slovakia (Máca, 1991).

Hirtodrosophila confusa (Staeger, 1844)

(Figs 281, 283, 559, 570-573)

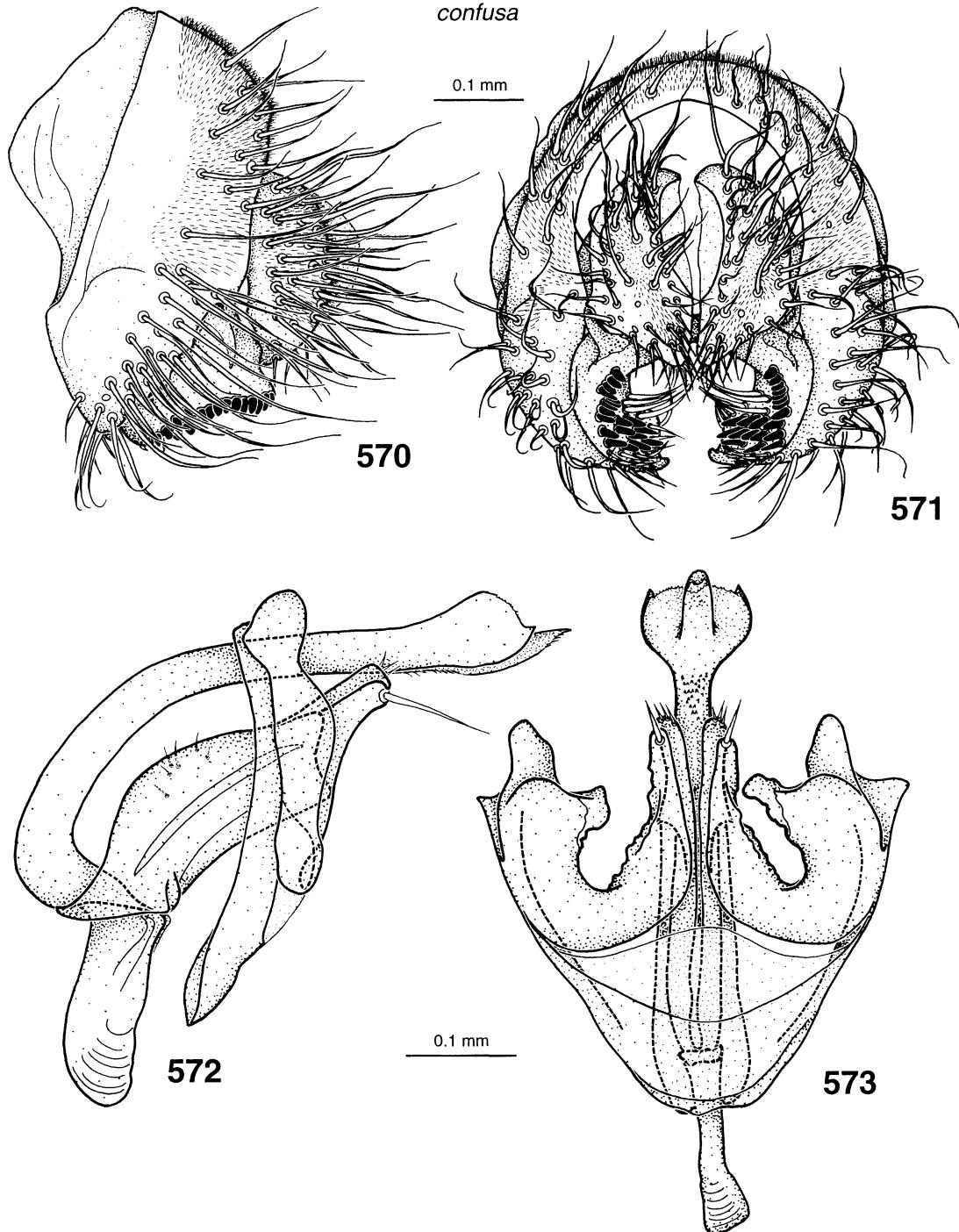
Drosophila confusa Staeger, 1844: 18.

Drosophila vibrissina Duda, 1924: 219.

Drosophila grischuna Burla, 1951: 620.

Diagnosis. – Generally large yellowish flies; wings yellowish; tergites with medially interrupted, laterally narrowed, dark, marginal bands, which are variable in width and intensity; oviscapts valves triangular, yellowish.

Redescription. – ♂. Head yellowish, dull. Frontal length 0.39 (0.34-0.41) mm; frontal index = 0.86 (0.82-0.89), top to bottom width ratio = 1.31 (1.25-1.38). Frontal triangle pale yellow, subshining, about 54-78% of frontal length; ocellar triangle prominent, brownish along inner sides of ocelli, about 38-45% of frontal length. Frontal vittae dark golden-yellow. Orbital plates pale yellow, subshining, narrow, and diverging from eye margin, about 74-83% of frontal length. Orbital setae black, distance of or3 to or1 = 67-88% of or3 to vtm, or1 / or3 ratio = 0.85 (0.76-0.94), or2 / or1 ratio = 0.45 (0.29-0.54), postocellar setae = 72 (65-78)%, ocellar setae = 87 (79-91)% of frontal length; vibrissal index = 0.42 (0.31-0.50). Face yellow, laterally whitish-yellow. Carina prominent, nose-like, slightly diverging downwards, dorsally flat. Cheek index about 5-9. Eye index = 1.22 (1.17-1.28).



Figs. 570-573. *Hirtodrosophila confusa* (Staeger). 570: epandrium, cerci, and surstyli, left lateral view; 571: idem, plus decasternum, posterior view; 572: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 573: idem, posterior view.

Occiput yellowish, brownish above foramen. Antenna (Fig. 281) yellow. Arista with 4-6 dorsal, 2-3 ventral, and about 7 rather long inner branches, plus terminal fork. Proboscis yellow. Palpus with 1 apical, 1 prominent ventral, and several smaller setae.

Thorax length 1.37 (1.27-1.51) mm. Scutum brownish-yellow, subshining, 8-10 rows of acrostichal setulae. h index = 1.27 (1.11-1.50). Transverse distance of dorsocentral setae 215-250% of longitudinal distance; dc index = 0.62 (0.59-0.65). Scutellum pale yellow, slightly microtrichose; distance between apical scutellar setae about 80-100% of that between apical and basal one; basal setae convergent; $scut$ index = 0.97 (0.94-1.00). Pleura pale yellow, shining, sterno index = 0.67 (0.62-0.71), median katepisternal seta about 30-40% of anterior one. Haltere whitish-yellow. Legs yellowish, preapical setae on protibia (small) and metatibia, apical seta on mesotibia.

Wing hyaline, slightly yellowish tinged, length 3.61 (3.46-3.71) mm, length to width ratio = 2.27 (2.21-2.30). Indices: C = 3.66 (3.40-3.95), ac = 2.25 (2.00-2.50), hb = 0.47 (0.45-0.50), $4C$ = 0.63 (0.59-0.67), $4v$ = 1.45 (1.43-1.47), $5x$ = 1.19 (1.09-1.30), M = 0.41 (0.38-0.43), prox. x = 0.50 (0.48-0.50).

Abdomen (Fig. 283) pale yellow, shining, tergites 2-5 usually with a medially interrupted, parallel, brown, marginal band and a brown spot close to ventral margin, the pattern very variable in density and size; there are specimens without a distinct pattern and others with a very complete banding: i.e. the dorsal band is narrowly connected to the ventral spot. Tergite 6 usually completely dark brown.

♂ Terminalia (Figs 570-573). Epandrium dorsodistally microtrichose, with ca. 32 lower and ca. 12 upper setae; ventral lobe neither microtrichose nor covering surstyli. Cerci anteriorly linked to epandrium by membranous tissue, distally microtrichose, without ventral lobe. Surstyli not microtrichose, dorsoanteriorly strongly sclerotised, with a high positioned, irregular row of ca. 8 peg-like prensisetae adjacent to a lower patch of ca. 23 larger, roundish-tipped, peg-like prensisetae which are not arranged in a row, ca. 14 inner setae (uppermost ones thicker and longer), and no outer setae. Decasternum as in Fig. 571. Hypandrium as long as epandrium, anteriorly narrowed, anterior margin convex; posterior hypandrial process

and dorsal arch absent; gonopod linked to paraphysis by membranous tissue, with one seta medially, near inner margin, at the tip of a finger-shaped expansion. Aedeagus long, fused to aedeagal apodeme, in lateral view remarkably curved, dorsodistally blunt and marginally finely serrate, ventroapically projecting backwards and finely serrate marginally, in ventral view apically expanded laterad and submedially covered with tiny scales ventrally. Aedeagal apodeme ca. 1/3 length of aedeagus, rod-shaped, bent. Ventral rod absent. Paraphysis well-developed, anteriorly and submedially expanded dorsad, four times longer than wide, distally with 3 setulae near dorsal margin, linked both to distal margin of aedeagal apodeme and to gonopod by membranous tissue.

♀. Differences from male: Abdominal pattern usually darker und well defined, but tergite 6 mostly yellow.

Measurements: Frontal length 0.38 (0.34-0.41) mm; frontal index = 0.80 (0.72-0.87), top to bottom width ratio = 1.31 (1.28-1.35). Frontal triangle about 65-80% of frontal length; ocellar triangle about 39-46% of frontal length. Orbital plates about 70-87% of frontal length. Distance of or3 to or1 = 71-100% of or3 to vtm, or1 / or3 ratio = 0.85 (0.81-0.89), or2 / or1 ratio = 0.42 (0.35-0.50), postocellar setae = 82 (75-96)%, ocellar setae = 93 (85-104)% of frontal length; vibrissal index = 0.40 (0.39-0.44). Cheek index about 4-8. Eye index = 1.17 (1.13-1.21). Thorax length 1.53 (1.36-1.73) mm. h index = 1.25 (1.14-1.31). Transverse distance of dorsocentral setae 215-260% of longitudinal distance; dc index = 0.64 (0.57-0.69). Distance between apical scutellar setae about 83-93% of that between apical and basal one; $scut$ index = 0.94 (0.91-0.97), sterno index = 0.73 (0.68-0.77), median katepisternal seta about 30-38% of anterior one. Wing length 3.56 (3.22-3.85) mm, length to width ratio = 2.21 (2.14-2.29). Indices: C = 3.40 (3.10-3.62), ac = 2.32 (2.10-2.71), hb = 0.53 (0.52-0.55), $4C$ = 0.66 (0.62-0.74), $4v$ = 1.40 (1.35-1.48), $5x$ = 1.12 (1.00-1.22), M = 0.37 (0.34-0.41), prox. x = 0.49 (0.46-0.52).

♀ Terminalia (Fig. 559). Valve of oviscapt relatively long, yellow, triangular, submedially expanded dorsad, distally rounded, slightly convex ventrally, with 7-8 discal outer ovisensilla (5 anterior ones trichoid-like, and posterior two peg-like) and 24 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla:

3 thin, dorsoapically distally positioned, and 1 long, straight, subterminal.

Distribution. – A widespread Palaearctic species but rare in northern areas. Known also from Denmark, Sweden and Finland (northernmost locality: Helsinki).

Biology. – A fungus breeding species.

Additional specimens examined. – 4 ♂♂ (SERBIA AND MONTENEGRO: Priština, 3 ♂♂, 1979. SWITZERLAND: Zürich, 1 ♂, 1995), 4 ♀♀ (SWITZERLAND: Zürich, 1984, 1986, 1986, 1987).

Hirtodrosophila trivittata (Strobl, 1893)

(Figs 277, 560, 574-577)

Drosophila trivittata Strobl, 1893: 282.

Diagnosis. – Generally yellowish flies; frontal triangle large, blackish; scutum with 3 contrasting blackish stripes which are fused in front of scutellum; scutellum blackish with pale margins; tergites with narrow, brown, medially interrupted, marginal bands; ventral margin of cercus medially with three abruptly narrowed, sharp-tipped, peg-like setae; dorsal arch of hypandrium conspicuously straight; oviscapit valve with a remarkably compact row of marginal peg-like outer ovisensilla.

Redescription. – ♂. Head. Frons yellowish, with blackish upper corners and a blackish, apically rounded median triangle, narrowly pale yellow along frontal margin, dull, frontal length 0.35 (0.30-0.41) mm; frontal index = 0.94 (0.87-1.09), top to bottom width ratio = 1.13 (1.10-1.17). Frontal triangle (Fig. 277) black, subshining, about 46-65% of frontal length; ocellar triangle prominent, black, shining, about 33-44% of frontal length. Frontal vittae golden-yellow. Orbital plates pale yellow, shining, narrow, diverging from eye margin, about 58-80% of frontal length. Orbital setae black, distance of or3 to or1 = 71-120 % of or3 to vtm, or1 / or3 ratio = 0.75 (0.64-0.83), or2 / or1 ratio = 0.61 (0.50-0.67), postocellar setae = 52 (46-57)%, ocellar setae = 66 (58-75)% of frontal length; first genal seta minute. Face yellowish-brown. Carina prominent, highest and broadest just below middle, pale yellow in upper half, brownish

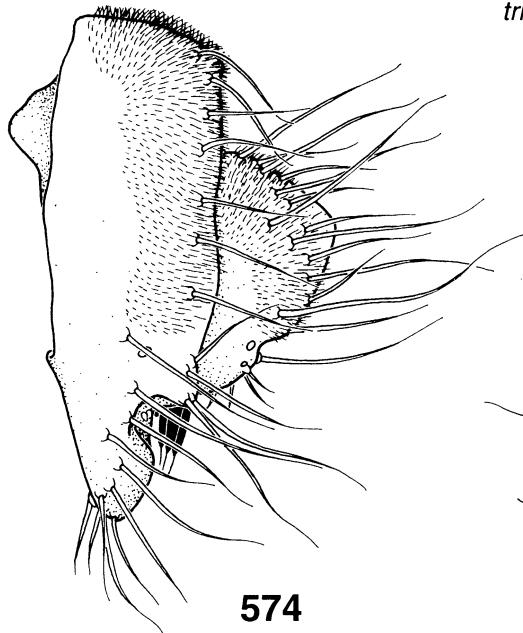
below. Gena pale yellow, broad, index about 3. Eye roundish, index = 1.20 (1.13-1.27). Occiput black, with yellowish stripes as a continuation of orbital vittae. Pedicel yellowish. Flagellomere 1 brownish, length to width ratio = 2.20; without elongated marginal setulae. Arista with 3-5 rather short dorsal, 1-2 ventral, and about 5 relatively long inner branches, plus terminal fork. Proboscis yellow. Clypeus brownish. Palpus yellow, broad, with a distinct, black apical seta and several pale, small setulae.

Thorax (Fig. 277) length 1.15 (1.04-1.22) mm. Scutum yellowish-brown, shining, with 3 blackish stripes, one in median and 2 in dorsocentral lines, all 3 confluent in front of scutellum, forming a blackish patch; size and intensity of blackish pattern variable, (4-)6 rows of acrostichal setulae. h index = 1.31 (1.22-1.44). Transverse distance of dorsocentral setae 180-238% of longitudinal distance; dc index = 0.62 (0.59-0.65). Scutellum blackish, subshining, with more or less large yellowish, lateral corners, distance between apical scutellar setae about 90-110% of that between apical and basal one; basal setae convergent; scut index = 0.69 (0.61-0.75). Pleura whitish-yellow, shining, some specimens with diffuse brown areas at anepimeron and katepisternum, sterno index = 0.81 (0.77-0.84), median katepisternal seta absent. Haltere whitish. Legs pale yellow, preapical setae on all tibiae, ventral apical seta on mesotibia.

Wing hyaline, length 2.70 (2.52-2.80) mm, length to width ratio = 2.24 (2.14-2.32). Indices: C = 2.76 (2.44-2.89), ac = 2.59 (2.25-3.00), hb = 0.49 (0.44-0.56), 4C = 0.92 (0.89-1.00), 4v = 1.83 (1.76-1.89), 5x = 1.79 (1.57-2.00), M = 0.58 (0.55-0.63), prox. x = 0.65 (0.63-0.67).

Abdomen (Fig. 277) pale yellow, shining, tergites 2-5 each with 4 brownish-black spots, 2 paramedian ones and 2 lateroventral ones, which are variable in size and may be narrowly connected along hind margin, tergite 1 usually with paramedian spots, tergite 6 usually without spots.

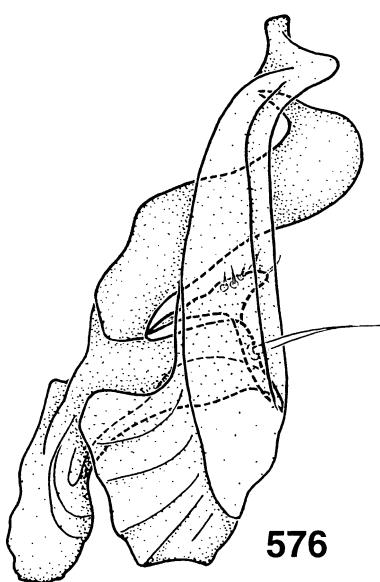
♂ Terminalia (Figs 574-577). Epandrium dorsodistally microtrichose, with ca. 18 lower and ca. 7 upper setae; in posterior view submedially angular; ventral lobe not microtrichose, covering surstylos. Cercus anteriorly linked to epandrium by membranous tissue, dorsally microtrichose, without ventral lobe; on median ventral margin conspicuously with a set of three



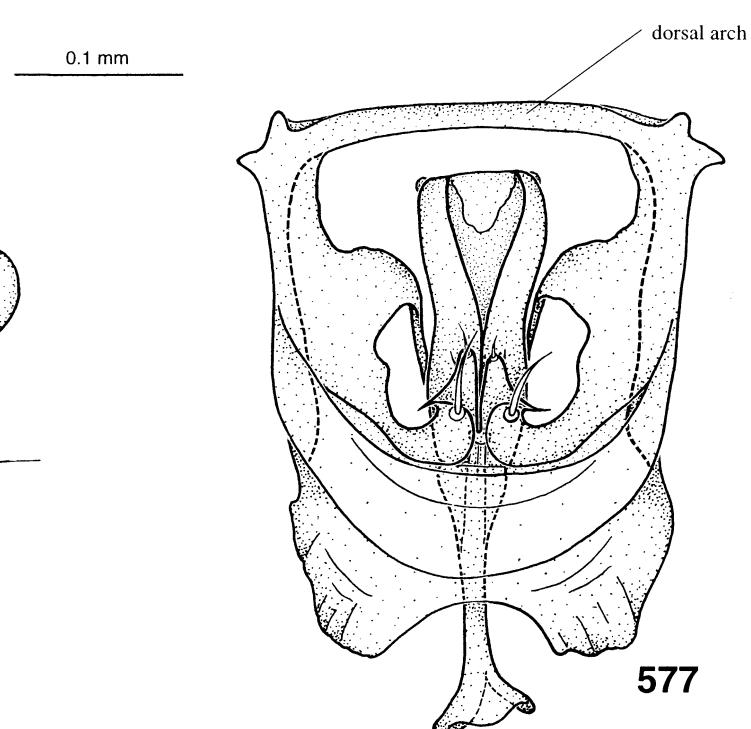
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Figs. 574-577. *Hirtodrosophila trivittata* (Strobl). 574: epandrium, cerci, and surstyli, left lateral view; 575: idem, plus decasternum, posterior view; 576: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 577: idem, posterior view.

abruptly sharpened peg-like setae, with an unusually long, thin tip. Surstylus distally strongly concave and ventrally narrowed in posterior view, inwardly-directed, not microtrichose, with a row of ca. 11 peg-like, roundish-tipped prensisetae, ca. 12 inner, and no outer setae. Decasternum positioned high as in Fig. 575. Hypandrium longer than epandrium, slightly square, anterior margin medially concave; posterior hypandrial process absent; dorsal arch conspicuously straight; gonopod bifurcate, linked to paraphysis by membranous tissue, with one seta medially, near inner margin, at tip of a finger-shaped expansion, dorsal branch slightly encircling aedeagus. Aedeagus fused to aedeagal apodeme, apically abruptly curved and sharply pointed dorsad in lateral view. Aedeagal apodeme slightly shorter than aedeagus, laterally flattened. Ventral rod wide, as long as width of adjacent aedeagal apodeme, anteriorly expanded. Paraphysis distally with ca. 5 setulae near dorsal margin, posteriorly widely expanded outwards, linked both to ventrodistal corner of aedeagal apodeme, and to gonopod, by membranous tissue.

♀. Measurements: Frontal length 0.33 (0.30-0.34) mm; frontal index = 0.88 (0.83-0.95), top to bottom width ratio = 1.16 (1.08-1.22). Frontal triangle about 67-78% of frontal length; ocellar triangle about 39-45% of frontal length. Orbital plates about 70-78% of frontal length. Distance of or3 to or1 = 71-83% of or3 to vtm, or1 / or3 ratio = 0.71 (0.64-0.79), or2 / or1 ratio = 0.60 (0.44-0.71), postocellar setae = 52 (44-56)%, ocellar setae = 70 (56-90)% of frontal length. Cheek index about 3. Eye index = 1.17 (1.13-1.21). Thorax length 1.20 (1.07-1.36) mm. h index = 1.35 (1.18-1.44). Transverse distance of dorsocentral setae 192-256% of longitudinal distance; dc index = 0.59 (0.54-0.63). Distance between apical scutellar setae about 85-100% of that between apical and basal one; scut index = 0.66 (0.62-0.70), sterno index = 0.76 (0.71-0.82). Wing length 2.80 (2.48-3.05) mm, length to width ratio = 2.33 (2.19-2.49). Indices: C = 2.74 (2.61-2.84), ac = 2.75 (2.57-3.00), hb = 0.53 (0.47-0.57), 4C = 0.96 (0.90-1.06), 4v = 1.85 (1.74-1.94), 5x = 1.88 (1.71-2.00), M = 0.60 (0.52-0.67), prox. x = 0.64 (0.57-0.67).

♀ Terminalia (Fig. 560). Valve of oviscapt long and narrow, distally rounded, slightly convex ventrally, with 6 discal, and ca. 24 marginal, peg-like, outer ovisensilla, which are roundish-

tipped and conspicuously positioned very close to one another; trichoid-like inner ovisensilla: 3 thin, apically positioned, and 1 long, ventral, unusually positioned more inwards and very anteriorly, near the 10th of the frontalmost marginal ovisensilla (not seen in Fig. 560); anterior bridge connecting valves narrow, very long and perpendicular to them.

Distribution. – A widespread Palaearctic species, more common in the south. Recorded also in Sweden and Russia (northernmost locality: Petrozavodsk).

Biology. – A fungus breeding species.

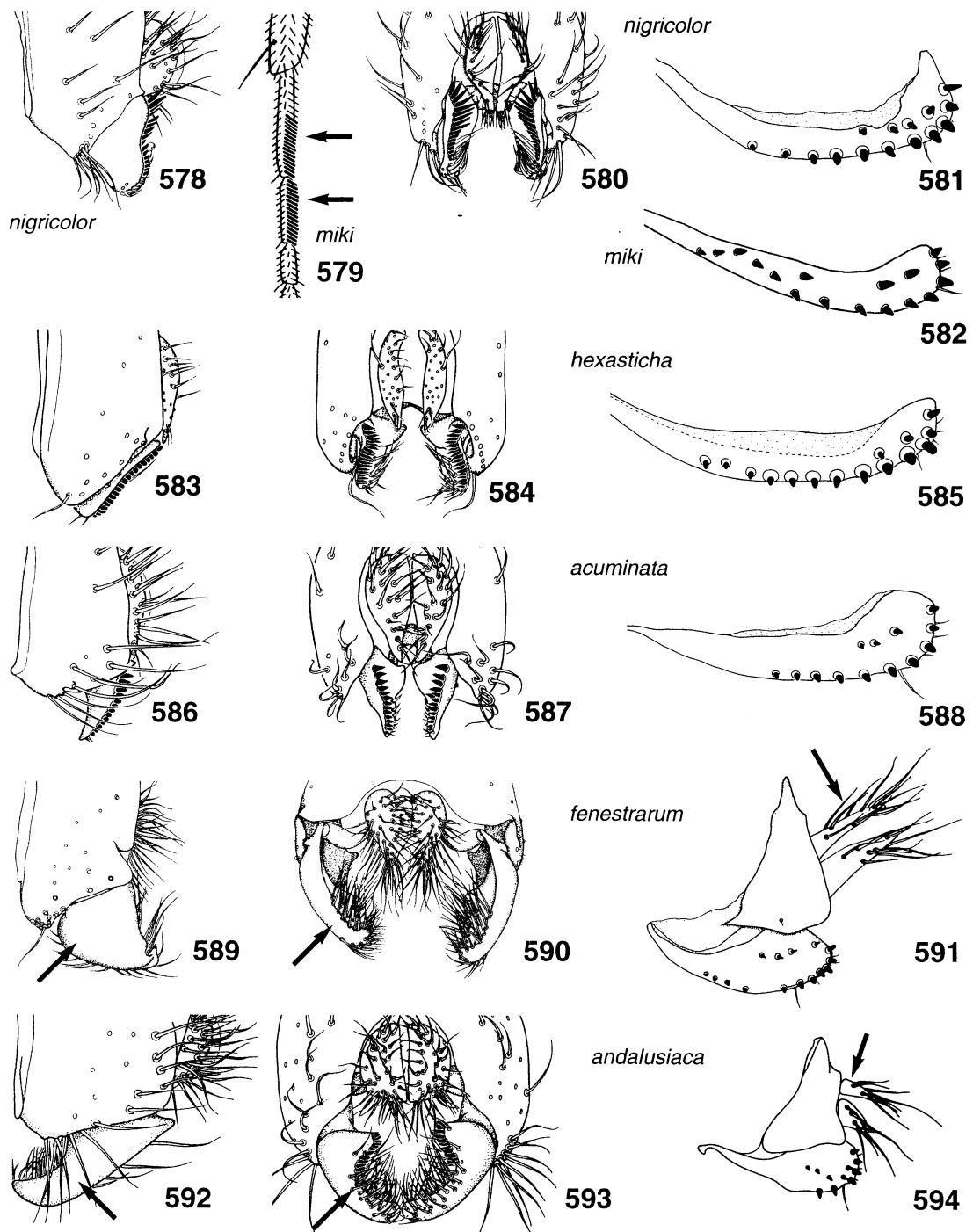
Additional specimens examined. – 4 ♂♂ and 4 ♀♀ (CZECH REPUBLIC: Hluboka, 1998).

Genus *Lordiphosa* Basden, 1961

Lordiphosa Basden, 1961: 186. Type species: *Drosophila fenestrarum* Fallén, 1823.

Diagnosis. – Relatively small, slim flies (less than 2.5 mm length): face flat, carina absent or very small, narrow and confined to uppermost part of face; arista with 2(-3) ventral branches, one of them in basal half; acrostichal setulae relatively long, usually in 4 rows; 3 katepisternal setae, increasing in length from anterior to posterior one; dorsal area of pleura with dark spots or a dark stripe; protarsus of male usually modified; cercus reduced; aedeagus reduced, or completely membranous, or absent; surstylus enlarged and/or distinctly modified; two pairs of parapyses present; dorsal arch strongly developed and usually complex medially; epiproct and hypoproct of female longish, covered with long setae; oviscapt valve with strong outer ovisensilla.

Taxa included. – The 52 Holarctic species (only one of them Nearctic) are arranged in 4 species groups, of which the largest, the Asian *denticeps* group, is not represented in Europe. The Palaearctic *miki* species group, characterised by long sex combs in males, contains 4 species, among them *Lordiphosa miki* (Duda, 1924), recorded from Austria, the Czech Republic (Moravia), Switzerland, and Serbia and Montenegro.



Figs. 578-594. *Lordiphosa* spp. 578, 583, 586, 589, 592: lower part of external male terminalia, left lateral view; 580, 584, 587, 590, 593: idem, posterior view; 579: protarsomeres 1 and 2 with sex combs; 581, 582, 585, 588: left oviscapt valves, lateral view; 591, 594: female terminalia, left lateral view.

Comments. – The European species of *Lordiphosa* have been revised by Laštovka & Máca (1978). A phylogenetic analysis has been made by Hu & Toda (2001).

The species of *Lordiphosa* are not readily attracted by fruit bait: almost all records are based on collections made by net sweeping over grass, and the larvae are thought to breed in decaying plant material. Their distribution is certainly underestimated.

Key to European species of *Lordiphosa*

- 1 Ground-colour blackish, legs pale yellowish. Thorax and abdomen shining. Acrostichal setulae in 4 rows. Male: surstyli dorsally with long, divergent and apically pointed prensisetae (Figs 578, 580). Female: oviscapt valve Fig. 581
..... *L. nigricolor* (Strobl)
- Ground-colour usually yellowish-brown. If ground-colour dark, then thorax and abdomen faintly microtrichose and acrostichal setulae in at least 6 rows
..... 2
- 2(1) Male: protarsomeres 1 and 2 with long sex combs of black peg-like setae (Fig. 579). Female: oviscapt valve Fig. 582
..... *L. miki* (Duda)
(recorded in some Central/South European countries)
- Male: no sex combs on protarsomeres 1 and 2. Female: oviscapt valve Figs. 581, 585, 591, 594
..... 3
- 3(2) Acrostichal setulae in 6 rows. Male: anterior margins of epandrium remarkably parallel in posterior view (Figs 583, 584). Female: oviscapt valve Fig. 585
..... *L. hexasticha* (Papp)
- Acrostichal setulae in 4 rows
..... 4
- 4(3) Lower postpronotal seta much longer and stronger than upper one. Male: surstylus ventrally sharp, directed ventrad (Figs 586, 587). Female: oviscapt valve Fig. 588
..... *L. acuminata* (Collin)
- Both postpronotal setae almost equal in length
..... 5

- 5
- 5(4) Male: surstylus ventrally very broad in lateral view; cerci partially fused, heart-shaped (Figs 589, 590). Female: epiproct/hypoproc more than twice as long as adjacent tergite 8 is wide (Fig. 591)
..... *L. fenestrarum* (Fallén)
 - Male: surstylus narrowed ventrad and protruding anterad in lateral view, crescent-shaped in posterior view; cerci not fused (Figs 592, 593). Female: epiproct/hypoproc as long as adjacent tergite 8 is wide (Fig. 594)
..... *L. andalusiaca* (Strobl)

fenestrarum species group

Basden, 1954

Diagnosis. – Arista with 2-3 ventral branches; acrostichal setulae relatively long, in 4-6 rows; dorsal area of pleura with dark spots or a dark stripe; protarsus of male usually with stronger setae.

Taxa included. – This group contains 8 species, subdivided into the *acuminata* and *fenestrarum* subgroups. *Lordiphosa acuminata* (Collin, 1952) and *L. hexasticha* (Papp, 1971) belong to the former, *L. andalusiaca* (Strobl, 1906) and *L. fenestrarum* Fallén, 1823 to the latter.

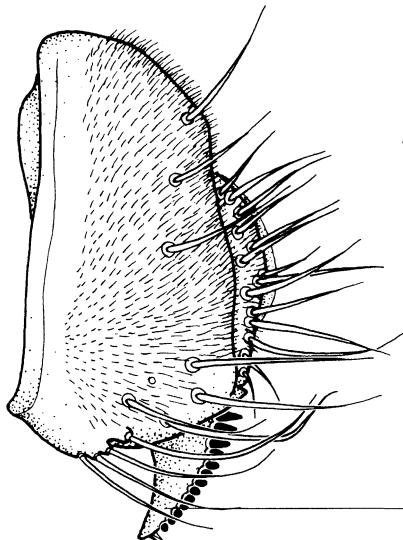
Remarks. *Lordiphosa variopicta* (Becker, 1908), described from the Canary Islands, was considered by Duda (1924) to be a synonym of *L. fenestrarum*. However, as the identity of the latter species was not known to him, *L. variopicta* may be a good species or may be a synonym of another European species.

Lordiphosa acuminata (Collin, 1952)

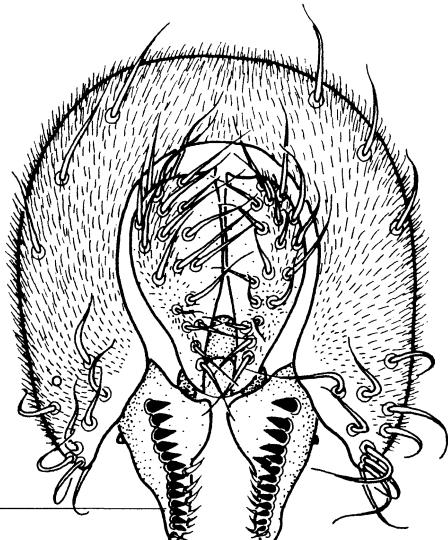
(Figs 595-599)

Drosophila acuminata Collin, 1952: 199.

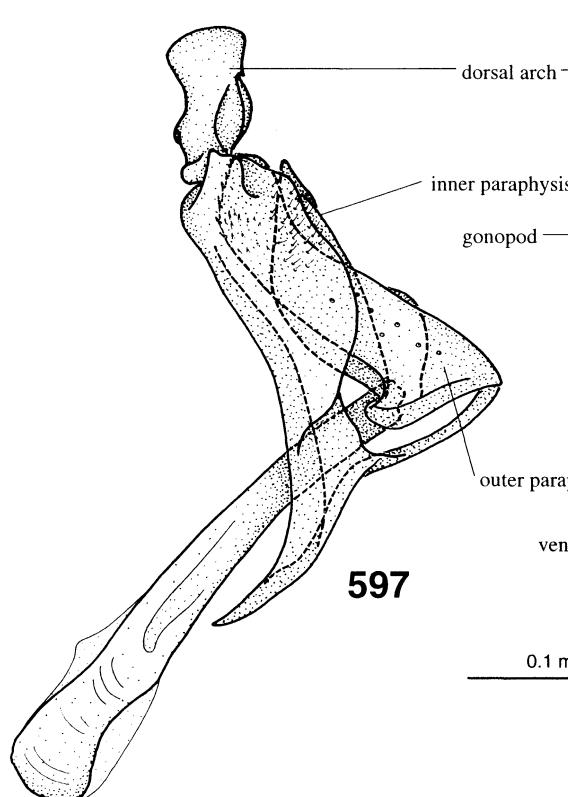
Diagnosis. – Generally yellowish flies; acrostichal setulae in 4 rows; h index about 0.5; tergites completely dark brown or with dark marginal bands; surstylus slightly triangular and ventrally sharp in lateral view; hypandrium submedially acutely projecting ventrad in lateral view.

acuminata

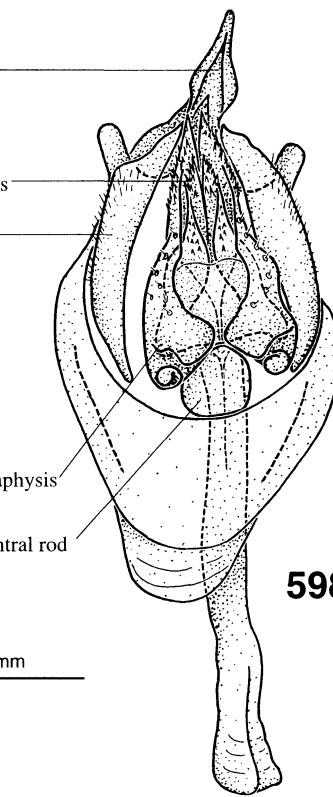
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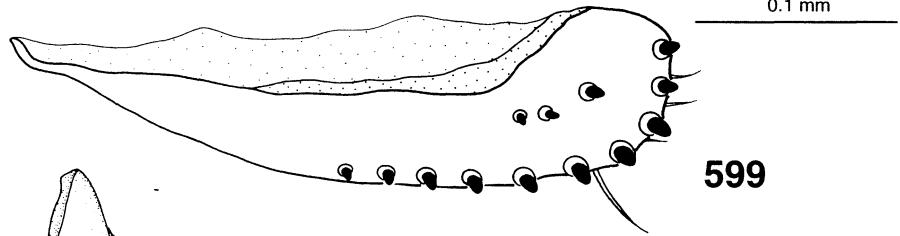
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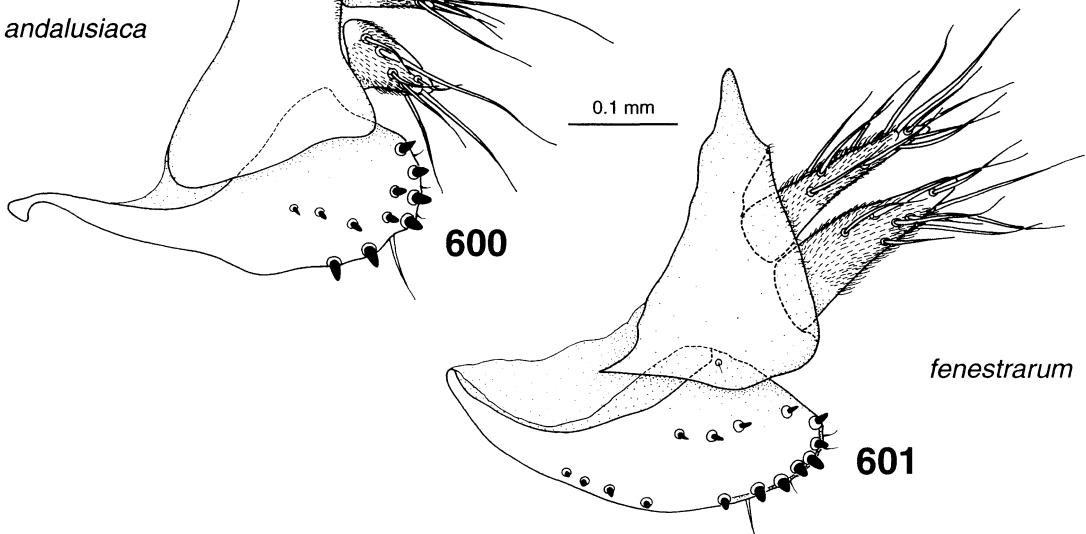
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Figs. 595-598. *Lordiphosa acuminata* (Collin). 595: epandrium, cerci, and surstyli, left lateral view; 596: idem, plus decasternum, posterior view; 597: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 598: idem, posterior view.

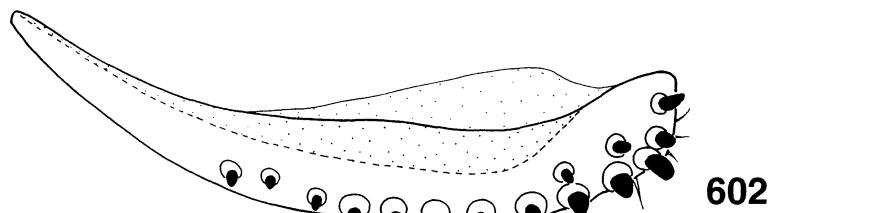
acuminata



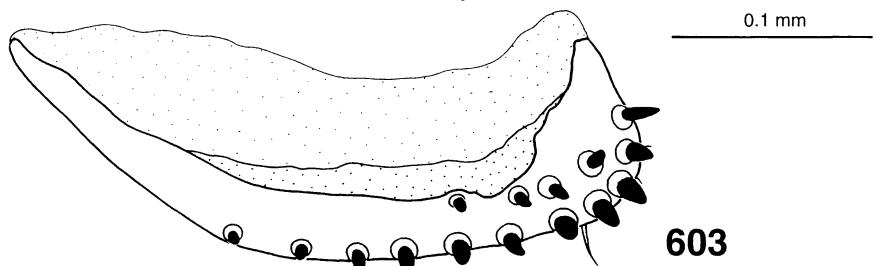
andalusiaca



hexasticha



nigricolor



Figs. 599-603. *Lordiphosa* spp., females. 599, 602, 603: left oviscapta valves, lateral views; 600, 601: female terminalia, left lateral view.

Redescription. – ♂. Head. Frons yellowish, pale above antennae, dull, frontal length 0.27 (0.25-0.29) mm; frontal index = 0.90 (0.83-1.00), top to bottom width ratio = 1.27 (1.22-1.38). Frontal triangle indistinct, subshining, about 71-81% of frontal length; ocellar triangle slightly prominent and elongated, brownish along inner margins of ocelli, about 40-56% of frontal length. Frontal vittae golden-yellow. Orbital plates apically slightly diverging from eye margin, shining, about 80-94% of frontal length. Orbital setae black, distance of or3 to or1 = 37-57% of or3 to vtm, or1 / or3 ratio = 0.89 (0.83-0.92), or2 / or1 ratio = 0.31 (0.27-0.33), postocellar setae = 62 (60-65)%, ocellar setae = 84 (80-88)% of frontal length; vibrissal index = 0.70 (0.63-0.78). Face whitish-yellow. Carina short, flat, hardly visible. Cheek index about 11-13. Eye roundish, index = 1.12 (1.09-1.21). Occiput convex, brownish-yellow, brownish above foramen. Antennae yellowish-brown. Flagellomere 1 with slightly elongated marginal setula. Arista with 4-6 dorsal, 2-3 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellow. Clypeus yellowish. Palpus brownish, at least at tip, with 1 black, stronger, apical, and several smaller setae.

Thorax length 0.91 (0.86-1.00) mm. Scutum usually yellowish, shining, in some specimens brownish in front of scutellum or even with a more or less distinct, brown, median stripe, 4 rows of acrostichal setulae. h index = 0.50 (0.47-0.54) Transverse distance of dorsocentral setae 140-175% of longitudinal distance; a few short, additional setae may be present in front of the anterior dorsocentral seta, dc index = 0.63 (0.57-0.73). Scutellum subshining, distance between apical scutellar setae about 70-80% of that between apical and basal one, basal setae parallel; scut index = 1.33 (1.26-1.43). Pleura shining, brownish in upper half, with a dark brown stripe from above procoxa to base of haltere, pale yellowish in lower half, sterno index = 0.36 (0.33-0.42), median katepisternal seta about 150-157% of anterior one. Haltere whitish. Legs pale yellow, protarsomeres with elongated setae along upper side, preapical setae on all tibiae (very small on protibia), apical seta on mesotibia.

Wing hyaline, relatively narrow, slightly pointed apically, length 2.24 (2.17-2.38) mm, length to width ratio = 2.39 (2.33-2.43). Indices: C = 3.13 (2.86-3.38), ac = 2.04 (2.00-2.17). hb =

0.31 (0.29-0.38), 4C = 0.79 (0.72-0.88), 4v = 1.73 (1.63-1.82), 5x = 1.62 (1.50-1.82), M = 0.53 (0.47-0.59), prox. x = 0.43 (0.39-0.50).

Abdomen usually blackish-brown, shining, pale yellowish at base, all tergites with a very narrow, whitish, marginal band, tergites may have a larger or smaller pale, yellowish area at bases.

♂ Terminalia (Figs 595-598). Epandrium mostly microtrichose, with about 10 lower, and 3 upper setae; ventral lobe indistinct, mostly microtrichose, not covering surstyli. Cercus ventrally narrow, anteriorly connected to epandrium by membranous tissue, medially microtrichose and without ventral lobe. Surstylus triangular and sharply pointed ventrad in lateral view, not microtrichose, with an almost straight row of ca. 14 peg-like, sharp-tipped prensisetae, ca. 9 small inner, and no outer setae. Decasternum positioned high, as in Fig. 596. Hypandrium longer than epandrium, submedially acutely projected ventrad in lateral view, anterior margin convex; posterior hypandrial process absent; dorsal arch medially projected posterad, laterally flattened and distally blunt in lateral view; gonopod without seta, dorsolaterally partially microtrichose, linked to paraphysis by membranous tissue. Aedeagus reduced, not recognisable, apparently completely membranous or even absent. Two pairs of well-developed paraphyses: outer ones dorsodistally covered with tiny scales, laterally with a row of ca. 7 setulae medially, linked both to gonopod and to distal margin of aedeagal apodeme by membranous tissue, inner paraphyses flame-shaped in lateral view, laterally covered with tiny scales, completely encircling aedeagus, linked to aedeagal apodeme by membranous tissue. Aedeagal apodeme well-developed, 3x as long as inner paraphysis, rod-shaped. Ventral rod twice as long as width of adjacent aedeagal apodeme.

♀. Differences from male: Protarsus usually not completely dark except at tip; all tergites with a marginal band, which may be triangularly extended medially, and covers the whole area laterally. In some specimens, the bands may be either very faint or cover the whole width of tergites.

Measurements: Frontal length 0.28 (0.27-0.29) mm; frontal index = 0.81 (0.80-0.84), top to bottom width ratio = 1.20 (1.15-1.24). Frontal triangle about 75-81% of frontal length; ocellar triangle about 41-50% of frontal length. Orbital

plates about 81-88% of frontal length. Distance of or3 to or1 = 37-50% of or3 to vtm, or1 / or3 ratio = 0.80 (0.77-0.83), or2 / or1 ratio = 0.31 (0.27-0.40), postocellar setae = 71 (69-76)%, ocellar setae = 97 (94-100)% of frontal length; vibrissal index = 0.78 (0.75-0.80). Cheek index about 6-12. Eye index = 1.10 (1.09-1.14). Thorax length 1.05 (0.95-1.16) mm. h index = 0.49 (0.47-0.51). Transverse distance of dorsocentral setae 145-180% of longitudinal distance; dc index = 0.62 (0.60-0.64). Distance between apical scutellar setae about 75-83% of that between apical and basal one; scut index = 1.36 (1.27-1.45), sterno index = 0.41 (0.36-0.47), median katepisternal seta about 133-138% of anterior one. Wing length 2.49 (2.31-2.77) mm, length to width ratio = 2.36 (2.31-2.39). Indices: C = 3.21 (3.00-3.44), ac = 2.18 (2.00-2.43), hb = 0.36 (0.29-0.43), 4C = 0.78 (0.73-0.82), 4v = 1.69 (1.60-1.82), 5x = 1.51 (1.38-1.67), M = 0.52 (0.50-0.59), prox. x = 0.47 (0.44-0.53).

♀ Terminalia (Fig. 599). Valve of oviscapta apically blunt, ventrally convex, with 3-4 discal and 9-10 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal.

Distribution. – A few scattered records in Europe and the Caucasus area. Also found in Sweden and Russia (northernmost locality: Vaasen).

Additional specimens examined. – 3 ♂♂ (ITALY: Lazio, 1 ♂, no date; Florence, 1 ♂, 1925; Marmirolo, 1 ♂, 2001. SWEDEN [ZMUL]: Stenoffa, 1 ♂, 1969), 4 ♀♀ (GERMANY: Berlin, 1 ♀, 1907. ITALY: Marmirolo, 2 ♀♀, 2001. SERBIA AND MONTENEGRÖ: Apatin, 1 ♀, 1989).

Lordiphosa andalusiaca (Strobl, 1906)

(Figs 600, 604-607)

Drosophila andalusiaca Strobl, 1906: 372.

Drosophila forcipata Collin, 1952: 198.

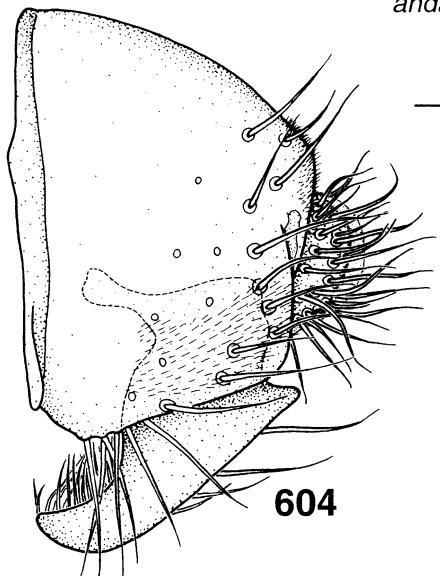
Diagnosis. – Generally yellowish flies; acrostichal setulae in 4 rows; h index about 1.0; tergites completely dark brown or with dark marginal bands; surstyli protruding anterad in lateral view, crescent-shaped in posterior view, basally broad, slightly narrowed apically; epiproct/hypoproc as long as width of adjacent tergite 8 in lateral view.

Redescription. – ♂. Head. Frons yellowish, dull, frontal length 0.31 (0.30-0.32) mm; frontal index = 1.04 (0.95-1.12), top to bottom width ratio = 1.39 (1.32-1.47). Frontal triangle indistinct, subshining, about 63-79% of frontal length; ocellar triangle elongated, slightly prominent, brownish along inner margins of ocelli, about 42-50% of frontal length. Frontal vittae golden-yellow. Orbital plates apically slightly diverging from eye margin, shining, about 78-89% of frontal length. Orbital setae black, distance of or3 to or1 = 40-56% of or3 to vtm, or1 / or3 ratio = 0.82 (0.75-0.92), or2 / or1 ratio = 0.45 (0.40-0.50), postocellar setae = 58 (50-63)%, ocellar setae = 75 (68-78)% of frontal length; vibrissal index = 0.68 (0.56-0.80). Face whitish-yellow. Carina short, narrow, hardly visible. Cheek index about 5-9. Eye roundish, index = 1.12 (1.09-1.17). Occiput convex, brownish-yellow, brownish above foramen. Antennae yellowish. Pedicel slightly darker, flagellomere 1 with distinctly elongated marginal setulae. Arista with 4-5 dorsal, 2-3 ventral, and about 8 small inner branches, plus terminal fork. Proboscis yellow. Clypeus yellowish-brown. Palpus with 1 stronger, black, apical, and several smaller yellowish setae.

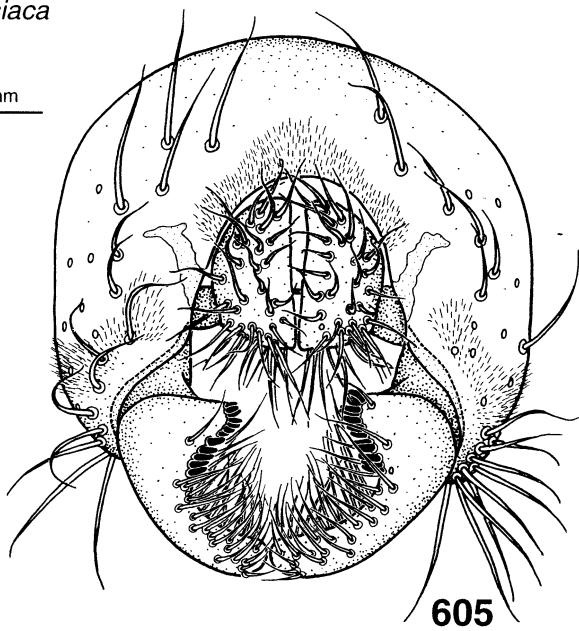
Thorax length 1.02 (0.95-1.10) mm. Scutum yellowish, shining, in some specimens brownish in front of scutellum or even with a more or less distinct, brown, median stripe, 4 rows of acrostichal setulae. h index = 0.95 (0.86-1.00). Transverse distance of dorsocentral setae 131-160% of longitudinal distance; a few additional, short, dorsocentral setae may be present in front of the anterior one; dc index = 0.68 (0.67-0.69). Scutellum yellowish to brown, subshining, distance between apical scutellar setae about 82-100% of that between apical and basal one, basal setae parallel; scut index = 1.42 (1.32-1.60). Pleura shining, brownish in upper half, usually in the form of a dark stripe, pale yellowish in lower half, sterno index = 0.33 (0.27-0.38), median katepisternal seta about 150-186% of anterior one. Haltere whitish. Legs pale yellow, protarsomeres with elongated setae along upper side, tip of protarsomere 1 with a short brush, preapical setae on all tibiae (very small on protibia), apical seta on mesotibia.

Wing hyaline, apically slightly pointed, length 2.50 (2.38-2.70) mm, length to width ratio = 2.38 (2.27-2.54). Indices: C = 3.24 (3.06-3.50), ac = 2.38 (2.29-2.50), hb = 0.44 (0.36-0.53),

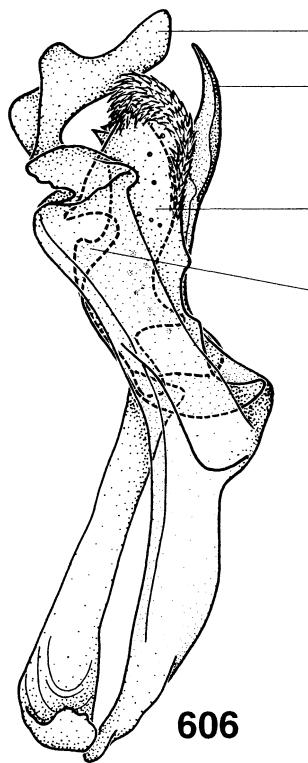
andalusiaca



604



605



606

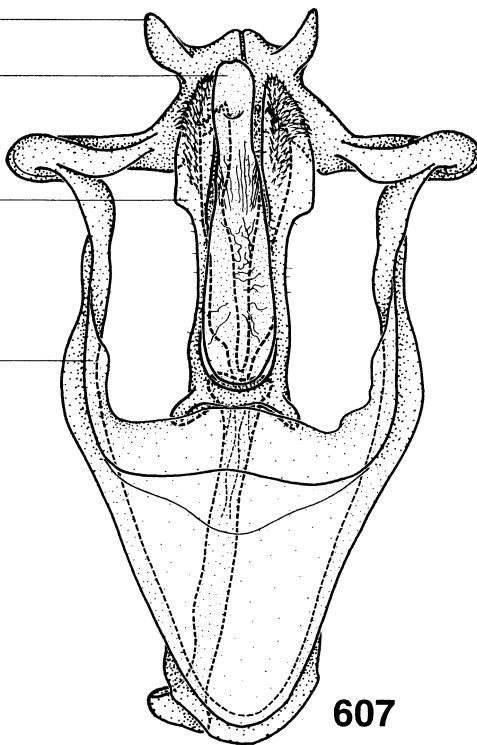
dorsal arch

aedeagus

outer paraphysis

inner paraphysis

gonopod



607

Figs. 604-607. *Lordiphosa andalusiaca* (Strobl). 604: epandrium, cerci, and surstyli, left lateral view; 605: idem, plus decasternum, posterior view; 606: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 607: idem, posterior view.

$4C = 0.78$ (0.74-0.84), $4v = 1.73$ (1.52-1.89),
 $5x = 1.94$ (1.83-2.20), $M = 0.58$ (0.48-0.63),
prox. $x = 0.47$ (0.43-0.50).

Abdomen usually blackish-brown, shining, pale yellowish at base, all tergites with a very narrow, whitish marginal band, some tergites may have a pale yellowish area at base.

♂ Terminalia (Figs 604-607). Epandrium broad in lateral view, ventrally and dorsodistally slightly microtrichose, with 17 lower and 8 upper setae; ventral lobe indistinct, mostly microtrichose, not covering surstylus. Cercus reduced, anteriorly connected to epandrium by membranous tissue, not microtrichose and without ventral lobe. Surstylus crescent-shaped in posterior view, dorsally slightly pointed backwards and ventrally slightly pointed forwards in lateral view, not microtrichose, with a high positioned, slightly sinuate, row of ca. 12 peg-like, roundish-tipped prensisetae, ca. 20 long inner, and 20 long, lower positioned, outer setae. Decasternum positioned high, as in Fig. 605. Hypandrium longer than epandrium, curved in lateral view, anterior margin convex; posterior hypandrial process absent; dorsal arch well-developed, laterally expanded outwards, straight, and medially bifurcate in posterior view, projecting posterad and distally slightly blunt in lateral view; gonopods reduced to lateral strips, anteriorly fused to each other and without setae, linked to outer paraphysis by membranous tissue. Aedeagus reduced, apically sharply pointed in lateral view, blunt in ventral view, dorsally and ventrally membranous, linked to aedeagal apodeme by membranous tissue. Two pairs of well-developed paraphyses: outer ones ventroproximally fused, ventrodistally densely covered with tiny scales, laterally with an irregular row of ca. 13 setulae medially, completely encircling and mostly covering aedeagus in lateral view, linked both to gonopod and to distal margin of aedeagal apodeme by membranous tissue, inner paraphyses bare, distally serrate, subproximally pointed ventrad, subdistally pointed backwards. Aedeagal apodeme longer than aedeagus, anteriorly slightly expanded, rod-shaped. Ventral rod twice as long as width of adjacent aedeagal apodeme.

♀ Differences from male: Protarsus with normal setae only. Abdomen usually not completely dark, except at tip; all tergites with a more or less parallel marginal band (medially sometimes with a triangular projection), laterally covering

whole area. In some specimens, bands may either be very faint or cover whole width of tergites.

Measurements: Frontal length 0.31 (0.28-0.32) mm; frontal index = 0.84 (0.77-0.86), top to bottom width ratio = 1.25 (1.22-1.29). Frontal triangle about 72-84% of frontal length; ocellar triangle about 47-53% of frontal length. Orbital plates about 78-89% of frontal length. Distance of or3 to or1 = 50-62% of or3 to vtm, or1 / or3 ratio = 0.83 (0.80-0.85), or2 / or1 ratio = 0.40 (0.36-0.42), postocellar setae = 70 (68-76)%, ocellar setae = 89 (88-89)% of frontal length; vibrissal index = 0.69 (0.58-0.80). Cheek index about 6-9. Eye index = 1.11 (1.04-1.17). Thorax length 1.08 (1.02-1.11) mm. h index = 1.00 (0.94-1.07). Transverse distance of dorsocentral setae 131-142% of longitudinal distance; dc index = 0.69 (0.67-0.72). Distance between apical scutellar setae about 85-100% of that between apical and basal one; scut index = 1.40 (1.39-1.41), sterno index = 0.38 (0.35-0.42), median katepisternal seta about 133-189% of anterior one. Wing length 2.62 (2.55-2.73) mm, length to width ratio = 2.39 (2.35-2.43). Indices: C = 3.42 (3.18-3.67), ac = 2.21 (2.13-2.33), hb = 0.48 (0.43-0.53), $4C = 0.78$ (0.74-0.84), $4v = 1.87$ (1.75-1.95), $5x = 1.98$ (1.71-2.17), $M = 0.62$ (0.57-0.68), prox. $x = 0.46$ (0.45-0.48).

♀ Terminalia (Fig. 600). Tergite 8 slightly triangular in lateral view, ventrally bare, mediodistally slightly microtrichose, epiproct and hypoproct in lateral view as long as tergite eight is wide adjacent to epiproct. Valve of oviscapta relatively short, apically roundish, ventrally irregularly convex, with 4-6 discal and 5-6 marginal, peg-like, mostly roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal; bridge connecting valves very narrow and perpendicular to them, valves widely separated anteriorly in ventral view.

Distribution. – Widespread in Europe and the Caucasus region, more common in the Mediterranean countries. Recorded also from Denmark, Norway and Sweden (northernmost locality: Dalby).

Biology. – A common species in greenhouses in The Netherlands (Beardmore, 1967).

Additional specimens examined. – 4 ♂♂ (CROATIA: Cres, 1 ♂, 1981. FRANCE: Plan-de-la-Tour, 1 ♂, 1982. GREECE: Kos, 2 ♂♂,

1982), 4 ♀♀ (CROATIA: Motovun, 1 ♀, 1981. GREECE: Kos, 3 ♀♀, 1982).

Comments. – Beardmore (1967) has analysed the genetic background of the abdominal colour polymorphism.

Lordiphosa fenestrarum

(Fallén, 1823)

(Figs 601, 608-611)

Drosophila fenestrarum Fallén, 1823: 6.

Drosophila nitidiventris Macquart, 1835: 551.

Drosophila virginea Meigen, 1839: 84.

Diagnosis. – Generally yellowish flies; acrostichal setulae in 4 rows; h index about 1.0; tergites almost completely dark brown; surstyli strongly developed, very broad in lateral view, inner surface ventrally densely setose, with just one peg-like prensisetae in inner corner; cerci partially fused, heart-shaped; female epiproct/hypoproct more than twice as long as width of adjacent tergite 8 in lateral view.

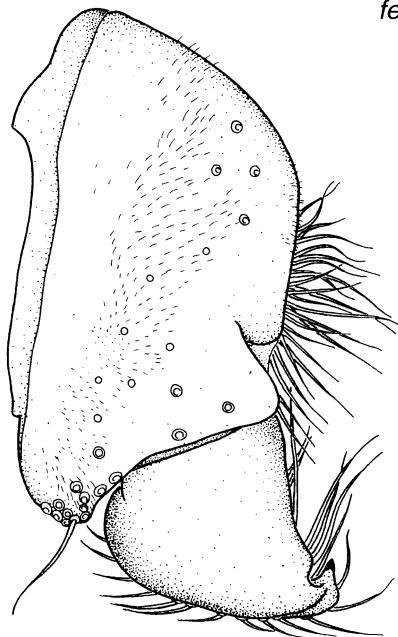
Redescription. – ♂. Head. Frons yellowish, dull, frontal length 0.29 (0.28-0.31) mm; frontal index = 1.02 (1.00-1.06), top to bottom width ratio = 1.39 (1.33-1.56). Frontal triangle indistinct, subshining, about 65-83% of frontal length; ocellar triangle slightly prominent, elongated, brownish along inner margins of ocelli, about 44-47% of frontal length. Frontal vittae golden-yellow. Orbital plates apically slightly diverging from eye margin, shining, about 76-88% of frontal length. Orbital setae black, distance of or3 to or1 = 44-56% of or3 to vtm, or1 / or3 ratio = 0.81 (0.77-0.85), or2 / or1 ratio = 0.39 (0.36-0.40), postocellar setae = 57 (53-59)%, ocellar setae = 78 (71-82)% of frontal length; vibrissal index = 0.67 (0.40-0.89). Face whitish-yellow. Carina short, narrow, hardly visible. Cheek index about 8-13. Eye roundish, index = 1.13 (1.09-1.19). Occiput convex, brownish-yellow, brownish above foramen. Antennae yellowish. Pedicel slightly darker, flagellomere 1 with slightly elongated marginal setulae. Arista with 4-5 dorsal, 2-3 ventral and about 7 small inner branches, plus terminal fork. Proboscis yellow. Clypeus yellowish-brown. Palpus with 1 stronger, black, apical, and several smaller yellowish setae.

Thorax length 0.92 (0.90-0.97) mm. Scutum yellowish, shining, in some specimens brownish in front of scutellum or even with a more or less distinct, brown, median stripe, 4(-6) rows of acrostichal setulae. h index = 1.00 (0.86-1.09). Transverse distance of dorsocentral setae 115-160% of longitudinal distance; a few short additional dorsocentral setae sometimes present in front of anterior one; dc index = 0.72 (0.68-0.75). Scutellum yellowish to brown, subshining, distance between apical scutellar setae about 100-112% of that between apical and basal one, basal setae parallel; scut index = 1.51 (1.43-1.63). Pleura shining, brownish in upper half, in some specimens in the form of a dark stripe, pale yellowish in lower half, sterno index = 0.36 (0.33-0.41), median katepisternal seta about 111-171% of anterior one. Haltere whitish. Legs pale yellow, protarsomeres with elongated setae along upper side, tip of protarsomere 1 with a short brush, preapical setae on all tibiae (very small on protibia), apical seta on mesotibia.

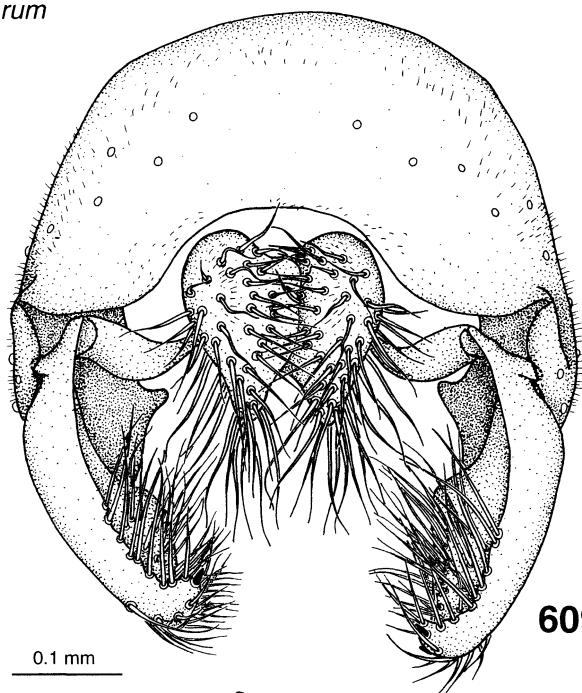
Wing hyaline, apically slightly pointed, relatively narrow, length 2.36 (2.24-2.45) mm, length to width ratio = 2.49 (2.41-2.56). Indices: C = 3.20 (3.00-3.69), ac = 2.49 (2.14-3.00), hb = 0.57 (0.53-0.60), 4C = 0.75 (0.68-0.79), 4v = 1.66 (1.55-1.74), 5x = 1.83 (1.67-2.00), M = 0.53 (0.50-0.58), prox. x = 0.48 (0.44-0.58).

Abdomen usually blackish-brown, shining, pale yellowish at base, all tergites with a very small, whitish, marginal band, some tergites sometimes with a pale yellowish area at their base.

♂ Terminalia (Figs 608-611). Epandrium medially slightly microtrichose, with ca. 21 lower and 6 upper setae; ventral lobe ventrally curved inwards, behind surstylus, medially microtrichose, not covering surstylus. Cerci reduced, partially fused and heart-shaped, ventrally pointed, left plate partially covering right one, anteriorly connected to epandrium by membranous tissue, slightly microtrichose and without ventral lobe. Surstylus well-developed, very broad in lateral view, protruding ventrad, inner surface ventrally heavily setose, strongly concave in posterior view, loosely connected to epandrium by membranous tissue, ventrally directed inwards, not microtrichose, with a row of long, trichoid-like prensisetae instead of the usual peg-like ones, (except for the lowermost, at the tip of the ventral inner corner, which is

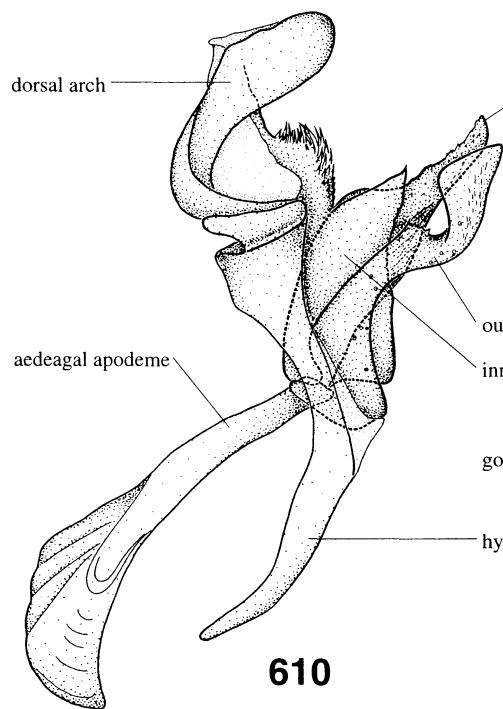
fenestrarum

608

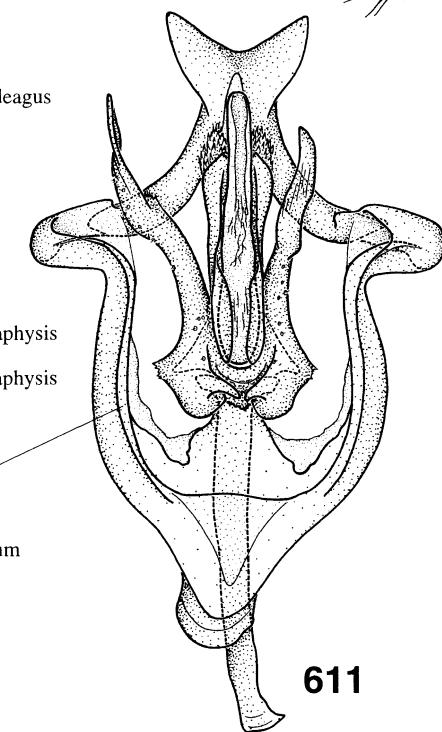


609

0.1 mm



610



611

Figs. 608-611. *Lordiphosa fenestrarum* (Fallén). 608: epandrium, cerci, and surstyli, left lateral view; 609: idem, plus decasternum, posterior view; 610: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 611: idem, posterior view.

peg-like), in addition to a dense brush of an undetermined number of long, inner setae, and no outer setae. Decasternum positioned high as in Fig. 609. Hypandrium as long as epandrium, anterior margin narrow, convex; posterior hypandrial process absent; dorsal arch well-developed, laterally expanded outwards, and medially bifurcate in posterior view, projecting posterad and distally roundish in lateral view, ventrally linked to inner paraphysis by means of a marginally fringed process; gonopods reduced to lateral strips, anteriorly fused to each other and without seta, linked to outer paraphysis by membranous tissue. Aedeagus reduced, apically sharply pointed in lateral view, rounded in posterior view, marginally slightly serrate dorsodistally in lateral view, covered with tiny scales laterally, dorsally and ventrally membranous, linked to aedeagal apodeme by membranous tissue. Two pairs of well-developed paraphyses: outer ones ventroproximally fused, apically blunt in lateral view, submedially bent dorsad, laterally with an irregular row of ca. 11 setulae ventrolaterally, linked both to gonopod and to distal margin of aedeagal apodeme by membranous tissue, inner paraphyses bare, anteriorly broad, apically pointed, distally connected to dorsal arch by a sclerotised sclerite, medially covered with tiny scales. Aedeagal apodeme longer than aedeagus, anteriorly expanded dorsoventrally, rod-shaped. Ventral rod twice as long as width of adjacent aedeagal apodeme.

♀. Differences from male: Protarsus with normal setae only. Abdomen usually not completely dark, except at tip; all tergites with a more or less parallel marginal band (medially sometimes with a triangular projection), laterally covering whole area. In some specimens, bands may be very faint or cover whole width of tergites.

Measurements: Frontal length 0.30 (0.27-0.33) mm; frontal index = 0.82 (0.78-0.86), top to bottom width ratio = 1.22 (1.17-1.25). Frontal triangle about 72-84% of frontal length; ocellar triangle about 39-47% of frontal length. Orbital plates about 83-88% of frontal length. Distance of or3 to or1 = 44-71% of or3 to vtm, or1 / or3 ratio = 0.75 (0.69-0.80), or2 / or1 ratio = 0.40 (0.36-0.45), postocellar setae = 69 (65-75)%, ocellar setae = 93 (88-100)% of frontal length; vibrissal index = 0.71 (0.55-0.90). Cheek index about 4-9. Eye index = 1.09 (1.04-1.14). Thorax length 1.07 (1.02-1.14) mm. h index = 0.94 (0.85-1.00). Transverse distance of dorsocentral

setae 121-138% of longitudinal distance; dc index = 0.70 (0.63-0.79). Distance between apical scutellar setae about 91-110% of that between apical and basal one; scut index = 1.40 (1.27-1.55), sterno index = 0.35 (0.29-0.43), median katepisternal seta about 133-186% of anterior one. Wing length 2.54 (2.34-2.66) mm, length to width ratio = 2.40(2.30-2.55). Indices: C = 3.38 (2.94-3.64), ac = 2.21 (2.00-2.67), hb = 0.49 (0.47-0.50), 4C = 0.72 (0.64-0.80), 4v = 1.60 (1.50-1.67), 5x = 1.69 (1.57-1.83), M = 0.51 (0.50-0.52), prox. x = 0.46 (0.41-0.50).

♀ Terminalia (Fig. 601). Tergite 8 triangular in lateral view, medioventrally with 1 setula, mediolaterally slightly microtrichose, epiproct and hypoproct remarkably protruding backwards, twice as long as tergite 8 is wide adjacent to median area of epiproct in lateral view. Valve of oviscap relatively short, strongly sclerotised, apically roundish, ventrally convex, with 5 distal and two sets of ca. 6 (distal) and 3-4 (proximal) marginal, peg-like, mostly roundish-tipped, outer ovisensilla, the two sets separated by an unusual gap; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 long, curved, subterminal; bridge connecting valves extremely narrow and perpendicular to them, valves widely separated anteriorly in ventral view.

Distribution. – Widespread in Europe; old records may refer to other *Lordiphosa* species. Found in all the Scandinavian countries, Latvia, Lithuania, the Faroe Islands and Russia. Northernmost locality: Balsfjord (Norway).

Additional specimens examined. – 5 ♂♂ (AUSTRIA: Stams, 3 ♂♂, 1975. FINLAND [ZMUH]: Joutseno, 1 ♂, 1957. GERMANY: Gödfeldteich, 1 ♂, 1985), 6 ♀♀ (GERMANY: Bielefeld, 1 ♀, 1986; Gödfeldteich, 1 ♀, 1985; Hochfelder See, 2 ♀♀, 1986. LATVIA: Engure, 2 ♀♀, 2001).

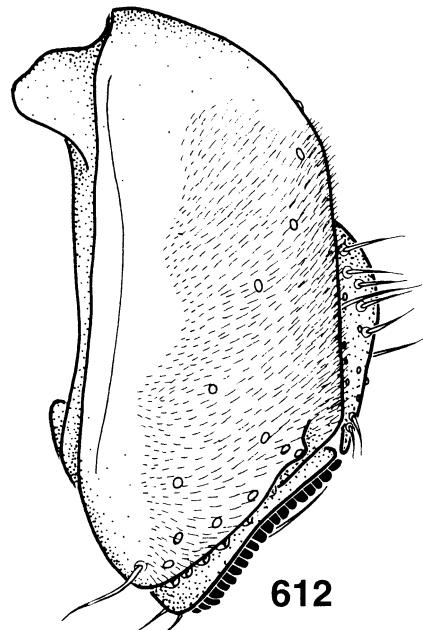
Lordiphosa hexasticha (Papp, 1971)

(Figs 602, 612-615)

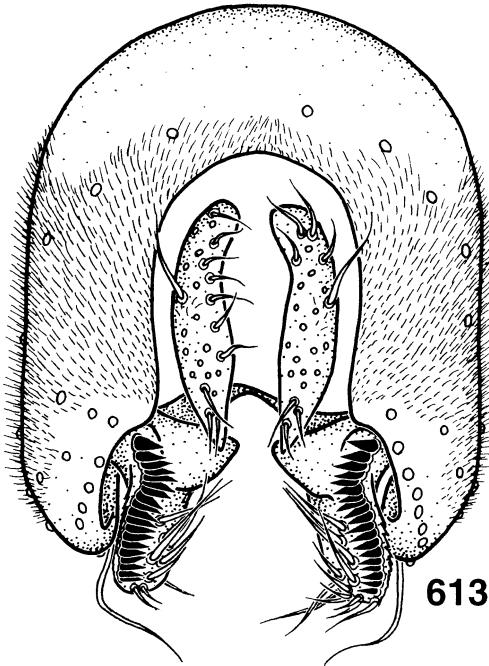
Drosophila hexasticha Papp, 1971: 333.

Diagnosis. – Generally yellowish flies; acrostichal setulae in 6 rows; h index about 1.0; tergites almost completely dark; anterior margins of epandrium remarkably parallel in posterior view; surstylus marginally serrate in lateral

hexasticha

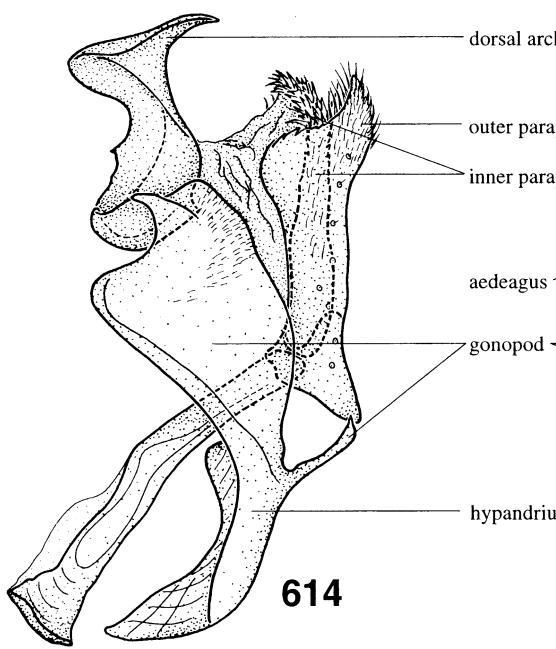


612

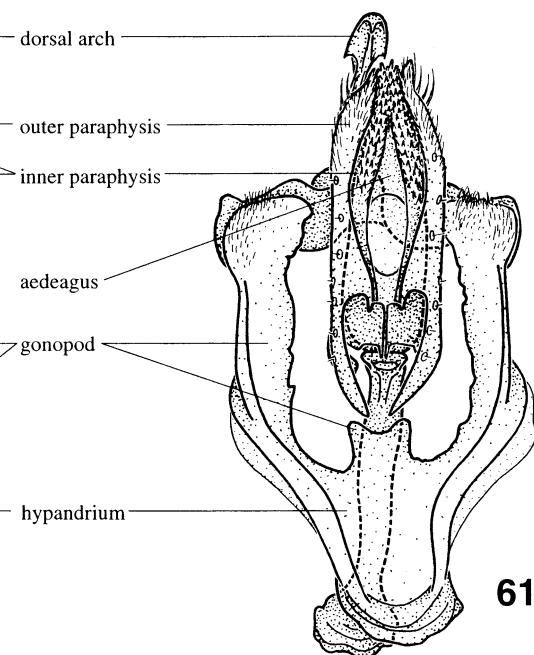


613

0.1 mm



614



615

Figs. 612-615. *Lordiphosa hexasticha* (Papp). 612: epandrium, cerci, and surstyli, left lateral view; 613: idem, plus decasternum, posterior view; 614: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 615: idem, posterior view.

view, bent, prensisetae in a sinuate row; dorsal arch shaped like the head of a coot in lateral view.

Redescription. – ♂. Head. Frons yellowish, dull, frontal length 0.26 (0.23-0.27) mm; frontal index = 0.94 (0.88-1.00), top to bottom width ratio = 1.31 (1.24-1.40). Frontal triangle slightly elongated, indistinct, subshining, about 71-97% of frontal length; ocellar triangle slightly prominent, brownish along inner margins of ocelli, about 47-50% of frontal length. Frontal vittae golden-yellow. Orbital plates apically slightly diverging from eye margin, shining, about 86-88% of frontal length. Orbital setae black, distance of or3 to or1 = 43-57% of or3 to vtm, or1 / or3 ratio = 0.81 (0.75-0.90), or2 / or1 ratio = 0.38 (0.30-0.56), postocellar setae = 51 (44-56)%, ocellar setae = 84 (80-93)% of frontal length; vibrissal index = 0.84 (0.80-0.90). Face whitish-yellow. Carina short, narrow, hardly visible. Cheek index about 10-12. Eye roundish, index = 1.09 (1.05-1.14). Occiput convex, brownish-yellow, brownish above foramen. Antennae yellowish. Pedicel slightly darker, flagellomere 1 with elongated setulae along margin. Arista with 4-6 dorsal, 2-3 ventral, and about 7 small inner branches, plus terminal fork. Proboscis yellow. Clypeus yellowish-brown. Palpus usually slightly brownish at tip, with 1 stronger, black, apical, and several smaller yellowish setae.

Thorax length 0.82 (0.76-0.85) mm. Scutum yellowish, shining, in some specimens brownish in front of scutellum or even with a more or less distinct, brown median stripe, 4-6 rows of acrostichal setulae. h index = 1.10 (1.00-1.20). Transverse distance of dorsocentral setae 127-162% of longitudinal distance; a few short, additional setae sometimes present in front of anterior dorsocentral seta, dc index = 0.66 (0.60-0.70). Scutellum yellowish to brown, subshining, distance between apical scutellar setae about 78-100% of that between apical and basal one, basal setae parallel; scut index = 1.47. Pleura shining, brownish in upper half, in some specimens in the form of a dark stripe, pale yellowish in lower half, sterno index = 0.41 (0.38-0.42), median katepisternal seta about 100-113% of anterior one. Haltere whitish. Legs pale yellow, protarsomeres with elongated setae along upper side, tip of protarsomere 1 with a short brush, preapical setae on all tibiae (very small on protibia), apical seta on mesotibia.

Wing hyaline, apically slightly pointed, relatively narrow, length 1.81 (1.71-1.89) mm, length to width ratio = 2.53 (2.41-2.68). Indices: C = 2.74 (2.67-2.83), ac = 2.72 (2.40-3.00), hb = 0.65 (0.58-0.69), 4C = 0.95 (0.92-1.00), 4v = 2.02 (1.92-2.15), 5x = 1.72 (1.50-2.00), M = 0.55 (0.46-0.62), prox. x = 0.46 (0.43-0.50).

Abdomen usually blackish-brown, shining, pale yellowish at base, all tergites with a very small, whitish, marginal band, some tergites sometimes with a pale yellowish area of variable size at their base.

♂ Terminalia (Figs 612-615). Epandrium medially microtrichose, with ca. 15 lower, and 4 upper setae; ventral lobe slightly indistinct, partially covering surstyli. Cercus extremely reduced, very narrow, anteriorly connected to epandrium by membranous tissue, slightly microtrichose and without ventral lobe. Surstyli narrow and ventrolaterally serrate in posterior view, not microtrichose, with a sinuate row of peg-like, sharp-tipped prensisetae, ca. 11 inner, and no outer setae. Decasternum positioned high as in Fig. 613. Hypandrium as long as epandrium, anterior margin narrow, convex; posterior hypandrial process absent, but ventral part of gonopod, which is fused to hypandrium, simulates it; dorsal arch well-developed, medially sharply pointed, and projecting backwards, shaped like the head of a coot in lateral view; gonopod dorsally microtrichose, fused to arms of hypandrium and without seta, linked ventromedially to outer paraphysis by membranous tissue. Aedeagus extremely reduced, apparently mostly membranous, linked to aedeagal apodeme by membranous tissue. Ventral rod absent. Two pairs of well-developed paraphyses: outer ones ventroproximally expanded and convergent, apically sharp, distally expanded and covered with tiny scales laterally, with a sinuate row of ca. 8 setulae ventrolaterally, linked both to fused gonopods and to distal margin of aedeagal apodeme by membranous tissue, inner paraphyses completely encircling aedeagus, distally covered with dense tiny scales, dorsodistally connected to dorsal arch by membranous tissue. Aedeagal apodeme longer than aedeagus, anteriorly expanded, rod-shaped.

♀. Differences from male: Protarsus with normal setae only. Abdomen usually not completely dark, except at tip; all tergites with a marginal band, which is medially narrowed and covers the whole area laterally. In some specimens, bands

either very faint or covering whole width of tergites.

Measurements: Frontal length 0.26 (0.24-0.27) mm; frontal index = 0.79 (0.73-0.84), top to bottom width ratio = 1.20 (1.14-1.28). Frontal triangle about 67-86% of frontal length; ocellar triangle about 44-57% of frontal length. Orbital plates about 81-93% of frontal length. Distance of or3 to or1 = 38-50% of or3 to vtm, or1 / or3 ratio = 0.74 (0.63-0.85), or2 / or1 ratio = 0.36 (0.27-0.44), postocellar setae = 71 (67-75)%, ocellar setae = 99 (94-107)% of frontal length; vibrissal index = 0.69 (0.58-0.75). Cheek index about 7-12. Eye index = 1.11 (1.09-1.14). Thorax length 0.87 (0.80-1.05) mm. h index = 1.00. Transverse distance of dorsocentral setae 118-190% of longitudinal distance; dc index = 0.69 (0.67-0.71). Distance between apical scutellar setae about 78-91% of that between apical and basal one; scut index = 1.41 (1.21-1.56), sterno index = 0.39 (0.35-0.43), median katepisternal seta about 100-150% of anterior one. Wing length 2.04 (1.85-2.48) mm, length to width ratio = 2.45 (2.22-2.71). Indices: C = 2.79 (2.56-3.27), ac = 2.87 (2.40-3.60), hb = 0.65 (0.50-0.75), 4C = 0.86 (0.73-0.93), 4v = 1.71 (1.67-1.80), 5x = 1.49 (1.40-1.60), M = 0.52 (0.47-0.60), prox. x = 0.45 (0.40-0.47).

♀ Terminalia (Fig. 602). Valve of oviscapts relatively narrow, apically blunt, ventrally convex, with 3-4 discal and ca. 12 marginal, peg-like, roundish-tipped, outer ovisensilla (second dorsalmost marginal one the largest); trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 only slightly larger, curved, subterminal.

Distribution. – A few scattered records in Europe and Far East Russia. Northernmost locality: Vaaseni (Russia).

Additional specimens examined. – 4 ♂♂ (GERMANY: Beilngriess, 1 ♂, 1988; Rappersdorf, 1 ♂, 1988; Berching, 2 ♂♂, 1988), 4 ♀♀ (GERMANY: Beilngriess, 1988).

***nigricolor* species group** Laštovka & Máca, 1978

Diagnosis. – Generally shining blackish flies; acrostichal setulae in 4 rows; h index about 0.6; legs unicolourous yellowish.

Taxa included. – *Lordiphosa anchoroides* (Zhang, 1993), *L. coei* (Okada, 1966), *L. forcipata* (Zhang, 1993), *L. mommai* (Takada and Okada, 1960), *L. nigricolor* (Strobl, 1898), *L. penicilla* (Zhang, 1993) and *L. ramipara* (Zhang and Liang, 1992). All the species are Palaearctic; only *L. nigricolor* has been recorded in Europe.

Lordiphosa nigricolor **(Strobl, 1898)**

(Figs 603, 616-619)

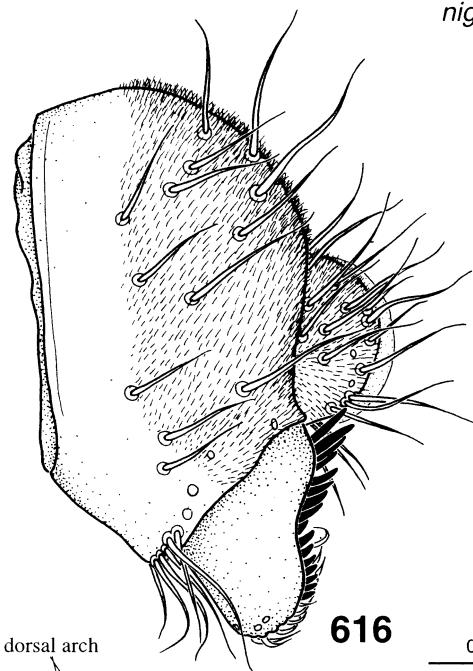
Drosophila nigricolor Strobl, 1898: 266.

Diagnosis. – The group characters apply, but see the male terminalia: surstyli dorsally with large, divergent, peg-like prensisetae in a convex row; dorsal arch ventromedially with a dense fringe of finger-shaped, curved, backwardly-projecting processes.

Redescription. – ♂. Head generally black. Frons dull, frontal length 0.24 (0.22-0.26) mm; frontal index = 0.74 (0.68-0.78), top to bottom width ratio = 1.19 (1.11-1.22). Frontal triangle indistinct, subshining, about 71-87% of frontal length; ocellar triangle prominent, about 43-57% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, shining, about 86-93% of frontal length. Orbital setae black, distance of or3 to or1 = 37-57% of or3 to vtm, or1 / or3 ratio = 0.59 (0.53-0.67), or2 / or1 ratio = 0.36 (0.20-0.50), postocellar setae = 72 (53-77)%, ocellar setae = 96 (86-115)% of frontal length; vibrissal index = 0.57 (0.33-0.75). Face pale brownish-black. Carina short, narrow, hardly visible. Cheek index about 5-8. Eye roundish, index = 1.14 (1.14-1.15). Occiput convex, subshining. Antennae dark brown, rarely slightly paler. Flagellomere 1 with slightly elongated marginal setulae. Arista with 3-5 dorsal, 2 ventral, and about 6 small inner branches, plus terminal fork. Proboscis brown. Clypeus blackish. Palpus with one stronger apical and several smaller setae.

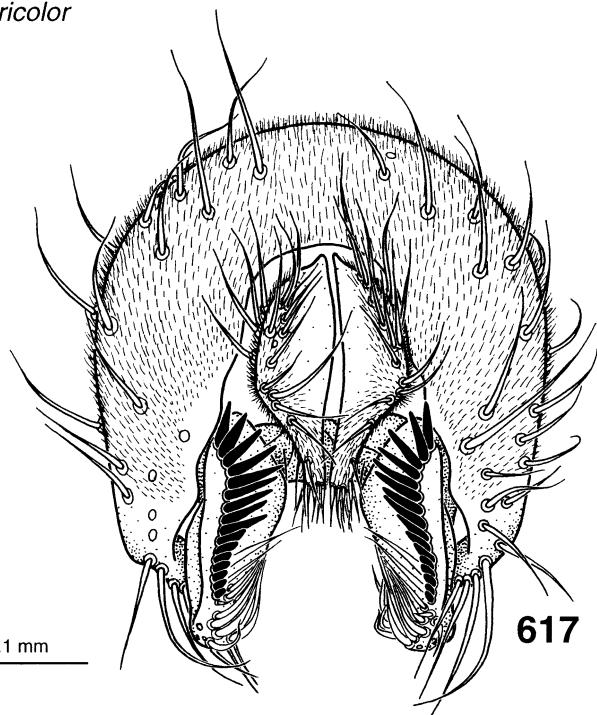
Thorax blackish, shining, length 0.85 (0.80-0.88) mm. 4 rows of acrostichal setulae. h index = 0.65 (0.58-0.73). Transverse distance of dorsocentral setae 160-189% of longitudinal distance; dc index = 0.66 (0.58-0.76). Scutellar setae virtually equidistant, basal ones parallel; scut index = 1.51 (1.45-1.58). Sterno index = 0.34 (0.30-0.38), median katepisternal

nigricolor



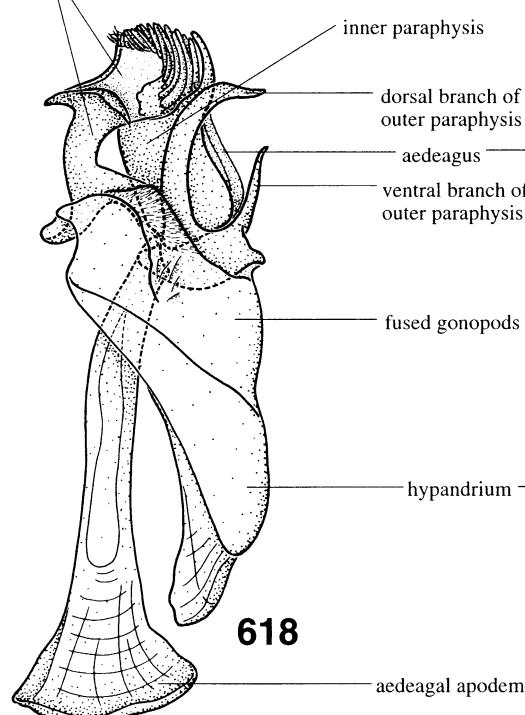
616

0.1 mm



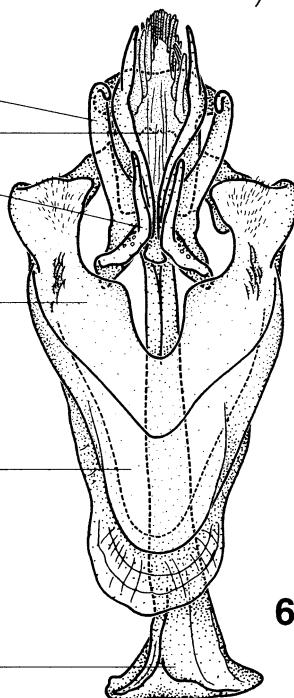
617

dorsal arch



618

aedeagal apodeme



619

Figs. 616-619. *Lordiphosa nigricolor* (Strobl). 616: epandrium, cerci, and surstyli, left lateral view; 617: idem, plus decasternum, posterior view; 618: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 619: idem, posterior view.

seta about 113-129% of anterior one. Haltere whitish-yellow. Legs contrasting pale yellow, fore leg: length of protarsomere 1 about 233% of protarsomere 2, preapical setae on all tibiae (very small on protibia), apical seta on mesotibia.

Wing hyaline, relatively narrow, length 2.21 (2.13-2.31) mm, length to width ratio = 2.27 (2.20-2.35). Indices: C = 2.63 (2.50-2.69), ac = 2.45 (2.29-2.67), hb = 0.35 (0.27-0.40), 4C = 0.91 (0.88-0.94), 4v = 1.87 (1.82-1.94), 5x = 1.71 (1.33-2.40), M = 0.55 (0.50-0.67), prox. x = 0.41 (0.35-0.44).

♂ Terminalia (Figs 616-619). Epandrium distally microtrichose, with ca. 15 lower and 11 upper setae; ventral lobe ventrally narrowed and pointed inwards, beneath surstyli, which is not covered. Cercus extremely reduced, narrow, anteriorly connected to epandrium by membranous tissue, mostly microtrichose and without ventral lobe. Surstylus broad in lateral view, narrow in posterior view, not microtrichose, with a convex row of peg-like prensisetae, which are remarkably divergent dorsally, and from dorsal through ventral gradually change from long and sharp, to short and roundish-tipped, and ca. 12 inner and 3 outer setae. Decasternum upper positioned, as in Fig. 617. Hypandrium longer than epandrium, anterior margin narrow, convex; posterior hypandrial process absent; dorsal arch well-developed, ventromedially covered with a dense fringe of finger-shaped, curved, backwardly-projecting processes; gonopod dorsally slightly microtrichose, medially slightly rugose, fused to arms of hypandrium and without seta, inner margin linked medially to outer paraphysis by membranous tissue. Aedeagus extremely reduced, apparently mostly membranous, linked to aedeagal apodeme by membranous tissue. Ventral rod absent. Two pairs of well-developed paraphyses: outer ones ventroproximally expanded, bifurcate with two apically sharp branches, dorsal one larger, bare, curved, and distally bent ventrad, ventral branch shorter, straight and ventromedially with ca. 4 setulae, ventrolaterally linked both to gonopod, and to distal margin of aedeagal apodeme, by membranous tissue, inner paraphyses slightly rectangular, completely encircling aedeagus, ventrodistally with a finger-shaped, curved, backwardly-directed process, dorsodistally connected to dorsal arch by membranous tissue. Aedeagal apodeme

longer than aedeagus, rod-shaped, bent, anteriorly expanded.

♀. Measurements: Frontal length 0.27 (0.25-0.27) mm; frontal index = 0.74 (0.68-0.80), top to bottom width ratio = 1.19 (1.14-1.25). Frontal triangle about 67-80% of frontal length; ocellar triangle about 44-50% of frontal length. Orbital plates about 75-93% of frontal length. Distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.59 (0.50-0.67), or2 / or1 ratio = 0.47 (0.36-0.56), postocellar setae = 77 (69-81)%, ocellar setae = 99 (94-107)% of frontal length; vibrissal index = 0.67 (0.60-0.75). Cheek index about 4.6. Eye index = 1.16 (1.14-1.20). Thorax length 0.97 (0.95-0.99) mm. h index = 0.56 (0.50-0.62). Transverse distance of dorsocentral setae 158-182% of longitudinal distance; dc index = 0.68 (0.65-0.71). Scut index = 1.46 (1.39-1.52), sterno index = 0.35 (0.33-0.41), median katepisternal seta about 111-129% of anterior one. Wing length 2.43 (2.20-2.56) mm, length to width ratio = 2.27 (2.10-2.43). Indices: C = 2.73 (2.56-2.94), ac = 2.91 (2.67-3.40), hb = 0.42 (0.35-0.47), 4C = 0.88 (0.81-1.00), 4v = 1.88 (1.67-2.11), 5x = 1.65 (1.43-1.83), M = 0.56 (0.52-0.61), prox. x = 0.42 (0.38-0.44).

♀ Terminalia (Fig. 603). Valve of oviscapts apically roundish, ventrally convex, with 7 discal and 9-10 marginal, peg-like, roundish-tipped, outer ovisensilla; trichoid-like inner ovisensilla: 3 thin, distally positioned, and 1 slightly larger, curved, subterminal.

Distribution. – A Palaearctic species with a few scattered records. Also found in Estonia, Finland and Russia.

Additional specimens examined. – 4 ♂♂ (SWITZERLAND: Zürich, 3 ♂♂, 1997, 1 ♂, 1998), 4 ♀♀ (SWITZERLAND: Zürich, 2 ♀♀, 1995, 2 ♀♀, 1997).

Genus *Microdrosophila* Malloch, 1921

Microdrosophila Malloch, 1921: 312. Type species: *Drosophila quadrata* Sturtevant, 1916. *Oxystyloptera* Duda, 1924: 192 (subgenus). *Incisurifrons* Duda, 1924: 202. *Hopkinsomyia* Malloch, 1934: 289.

Diagnosis. – Usually minute flies; arista plumose; frons short, about half as long as broad,

with a more or less distinct oblique line or band on vittae; orbital plate large, anteriorly much broadened; anterior reclinate orbital seta minute or indistinguishable, other head setae typically large; vibrissa typically very large, followed by small subgenal setae; ocellar seta inside ocellular triangle; carina short, narrow, but high; gena relatively narrow, at most 1/10 eye length; acrostichal setulae in 6-8 rows; one postpronotal seta; 2 pairs of large dorsocentral setae, anterior pair situated close to transverse suture; prescutellar seta absent; anterior katepisternal seta fine, median one very small; wing tip more or less pointed; second costal break deep; costal index typically smaller than 1.5; 4v-index about 4.0; surstylus linked by membranous tissue, or completely fused, and then not clearly recognisable, to ventral margin of epandrium, without peg-like prensisetae; oviscapt typically weakly developed, triangular or oblong, with about 3 setae.

Taxa included. – Two subgenera are recognised: *Microdrosophila* Malloch, with 55 species, among them *Microdrosophila congesta* Zetterstedt, and *Oxystyloptera* Duda, containing 24 species, including *M. zetterstedti* Wheeler.

Comments. – Both species found in Europe were originally described from Sweden. Adults of *Microdrosophila* species are rarely attracted to bait, but can be netted above the ground; because of their small size, they may often have been overlooked.

Key to European species of *Microdrosophila*

- 1 Second costal break standard, i.e. at most as long as breadth of vein R_1 below. Wing tip rounded. Arista with 2 ventral branches. Proclinate orbital seta nearer to eye margin than posterior reclinate one *M. congesta* (Zetterstedt)
- Second costal break very deep, i.e. more than 3 times as long as breadth of R_1 below. Wing tip pointed. Arista with only 1 ventral branch. Posterior reclinate orbital seta nearer to eye margin than proclinate one *M. zetterstedti* Wheeler

Microdrosophila congesta (Zetterstedt, 1847)

(Figs 45, 46, 620-623)

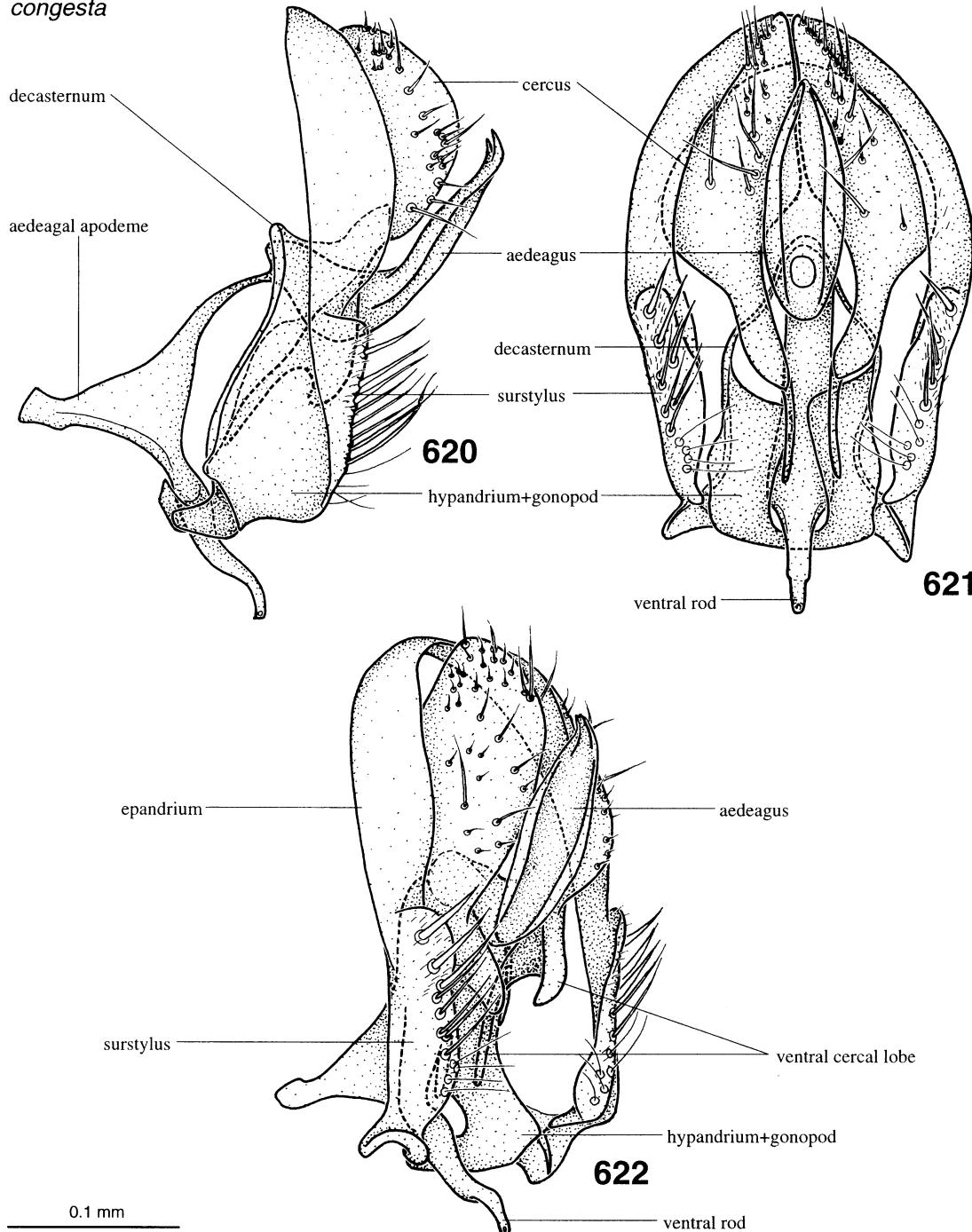
Microdrosophila congesta Zetterstedt, 1847:
2556.

Diagnosis. – Arista with 2 ventral branches; or1 closer to eye margin than or3; wing tip hardly pointed; surstylus positioned low, narrow, long, without prensisetae, completely fused to ventral margin of epandrium; aedeagus strongly bent submedially, distally protruding dorsad; ventral rod remarkably protruding ventrad beyond hypandrium; oviscapt valve not well differentiated, proximal part horizontally, distal part vertically positioned.

Redescription. – ♂. Head. Frons (Fig. 45) yellowish, frontal length 0.18 (0.17-0.19) mm; frontal index = 0.57 (0.53-0.61), top to bottom width ratio = 1.22 (1.11-1.39). Frontal triangle very large, subshining, as long as frons; ocellar triangle slightly prominent, brownish on inner sides of ocelli, about 40-45% of frontal length. Frontal vittae very narrow, dull. Orbital plates pale yellowish, shining, very broad, longer than frons. Orbital setae brownish, close together, distance of or3 to or1 = 43% of or3 to vtm, or1 / or3 ratio = 0.56 (0.54-0.58), or2 / or1 ratio = 0.33 (0.25-0.43), postocellar setae = 86 (80-91%), ocellar setae = 110 (100-120)% of frontal length; vibrissal index = 0.32 (0.20-0.40). Face yellowish. Carina prominent, sharp, flat below, not nose-like. Gena very narrow, index about 11-21. Eye roundish, index = 1.17 (1.10-1.24). Occiput brownish. Antennae yellowish. Flagellomere 1 slightly paler, with slightly elongated marginal setulae, length to width ratio = 1.50. Arista with 4-6 dorsal, 2 ventral, and about 10 small inner, branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark apical setae.

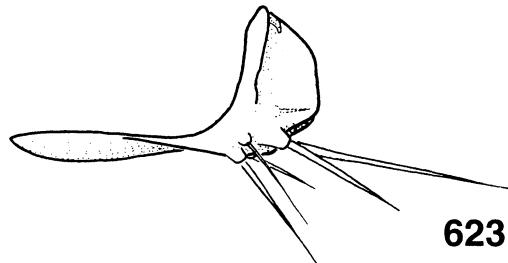
Thorax length 0.82 (0.71-0.87) mm. Scutum and scutellum brownish-yellow, subshining, 6-8 rows of acrostichal setulae. h index = 4.30 (3.33-5.00). Transverse distance of dorsocentral setae = 100-123% of longitudinal distance; dc index = 0.66 (0.64-0.72). Distance between apical scutellar setae about 125-129% of that between apical and basal one; basal setae convergent; scut index = 0.57 (0.54-0.59). Pleura yellowish, sterno index = 0.47 (0.44-0.54), median

congesta



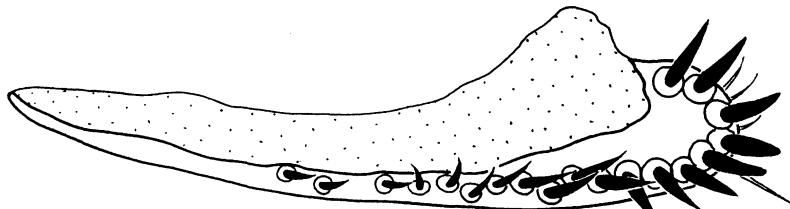
Figs. 620-622. *Microdrosophila congesta* (Zetterstedt). 620: male terminalia, left lateral view; 621: idem, posterior view; 622: idem, oblique posterior view.

congesta



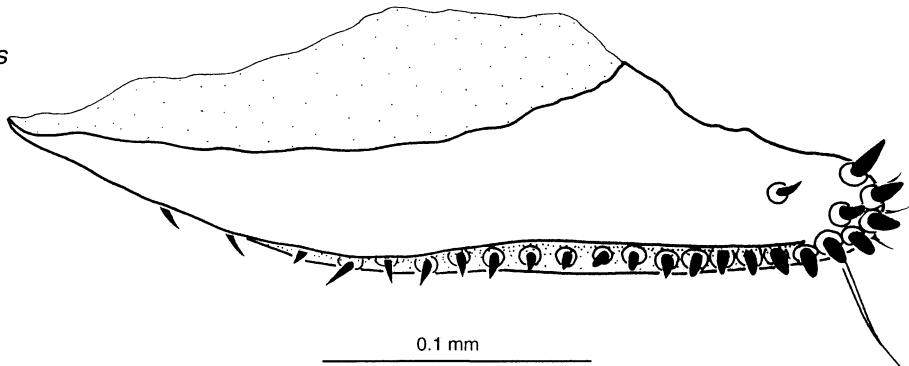
623

deflexa



624

rufifrons



625

0.1 mm

Figs. 623-625. Left oviscap valves, lateral view of: 623: *Microdrosophila congesta*; 624: *Scaptodrosophila deflexa*; 625: *Scaptodrosophila rufifrons*.

katepisternal seta about 25-44% of anterior one. Haltere whitish-yellow. Legs yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 46) hyaline, length 2.06 (1.89-2.17) mm, length to width ratio = 2.18 (2.14-2.25), Indices: C = 1.43 (1.29-1.52), ac = 4.47 (4.20-4.80), hb = 0.75 (0.68-0.82), 4C = 2.62 (2.44-2.71), 4v = 4.37 (3.89-4.86), 5x = 6.77 (5.00-8.00), M = 1.92 (1.78-2.14), prox. x = 1.05 (1.00-1.14).

Abdomen brownish-yellow, tergites usually with very diffuse, brownish, uninterrupted marginal bands.

♂ Terminalia (Figs 620-622). Epandrium not microtrichose, without setae. Cercus very long,

anteriorly connected to epandrium by membranous tissue, not microtrichose, with a long, distally very narrow, ventral lobe. Surstyli completely fused to ventral margin of epandrium, positioned low, narrow, long, slightly microtrichose dorsally, devoid of peg-like prensisetae but with ca. 11 long setae (uppermost three thicker, lowermost four very thin, hardly visible). Decasternum encircling hypandrium ventrolaterally and aedeagus dorsoanteriorly as in Figs 620, 621. Hypandrium reduced, apparently fused laterally to surstyli; posterior hypandrial process absent; gonopod bare, weakly sclerotised, fused to arms of hypandrium. Aedeagus narrowly fused to aedeagal apodeme, anteriorly

bent, distally protruding dorsad, dorsoventrally flattened and apically sharply pointed. Aedeagal apodeme anteriorly triangular in lateral view, longer than aedeagus, laterally flattened. Ventral rod very long, protruding ventrad beyond hypandrium, linked to gonopods by membranous tissue. Paraphysis absent, probably fused to ventral rod.

♀. Measurements: Frontal length 0.19 (0.15-0.20) mm; frontal index = 0.50 (0.45-0.55), top to bottom width ratio = 1.13 (1.09-1.18). Ocellar triangle about 45-58% of frontal length. Distance of or3 to or1 = 25-43% of or3 to vtm, or1 / or3 ratio = 0.53 (0.50-0.57), or2 / or1 ratio = 0.29 (0.25-0.43), postocellar setae = 91 (82-122)% , ocellar setae = 125 (108-156)% of frontal length; vibrissal index = 0.25 (0.21-0.31). Cheek index about 7-15. Eye index = 1.16 (1.14-1.22). Thorax length 0.89 (0.83-0.94) mm. h index = 3.87 (3.33-5.00). Transverse distance of dorsocentral setae 106-131% of longitudinal distance; dc index = 0.70 (0.67-0.76). Distance between apical scutellar setae about 122-137% of that between apical and basal one; scut index = 0.58 (0.54-0.65), sterno index = 0.47 (0.44-0.53), median katepisternal seta about 33-62% of anterior one. Wing length 2.23 (2.17-2.31) mm, length to width ratio = 2.22 (2.10-2.30). Indices: C = 1.49 (1.38-1.75), ac = 4.25 (3.67-5.00), hb = 0.80 (0.76-0.85), 4C = 2.62 (2.20-3.00), 4v = 4.49 (3.70-5.00), 5x = 5.63 (5.33-6.00), M = 2.03 (1.60-2.44), prox. x = 1.00 (0.90-1.12).

♀ Terminalia (Fig. 623). Valve of oviscapta flattened, not well differentiated, horizontally positioned proximally, vertically positioned distally, reminiscent of a medially folded standard sternite, apically blunt, subapically with 3 long (1 longer) and thick, and 3 small (1 longer), thin, seta-like ovisensilla, neither organized in rows nor in discal and marginal positions.

Distribution. – Probably widespread in the Palaearctic, but mostly overlooked. Also recorded in Sweden and Finland (northernmost locality: Finström).

Additional specimens examined. – 5 ♂♂ (SWEDEN [ZMUL]: Enslöv, 1 ♂, 1965. SWITZERLAND: Aargau, 4 ♂♂, 1965/1966), 4 ♀♀ (SWITZERLAND: Aargau, 3 ♀♀, 1965/1966; Zürich, 1 ♀, 1990).

Microdrosophila zetterstedti

Wheeler, 1959

(Figs 626-628)

Drosophila nigritrix Zetterstedt, 1847: 2557
(preocc.).

Microdrosophila zetterstedti Wheeler, 1959: 184.

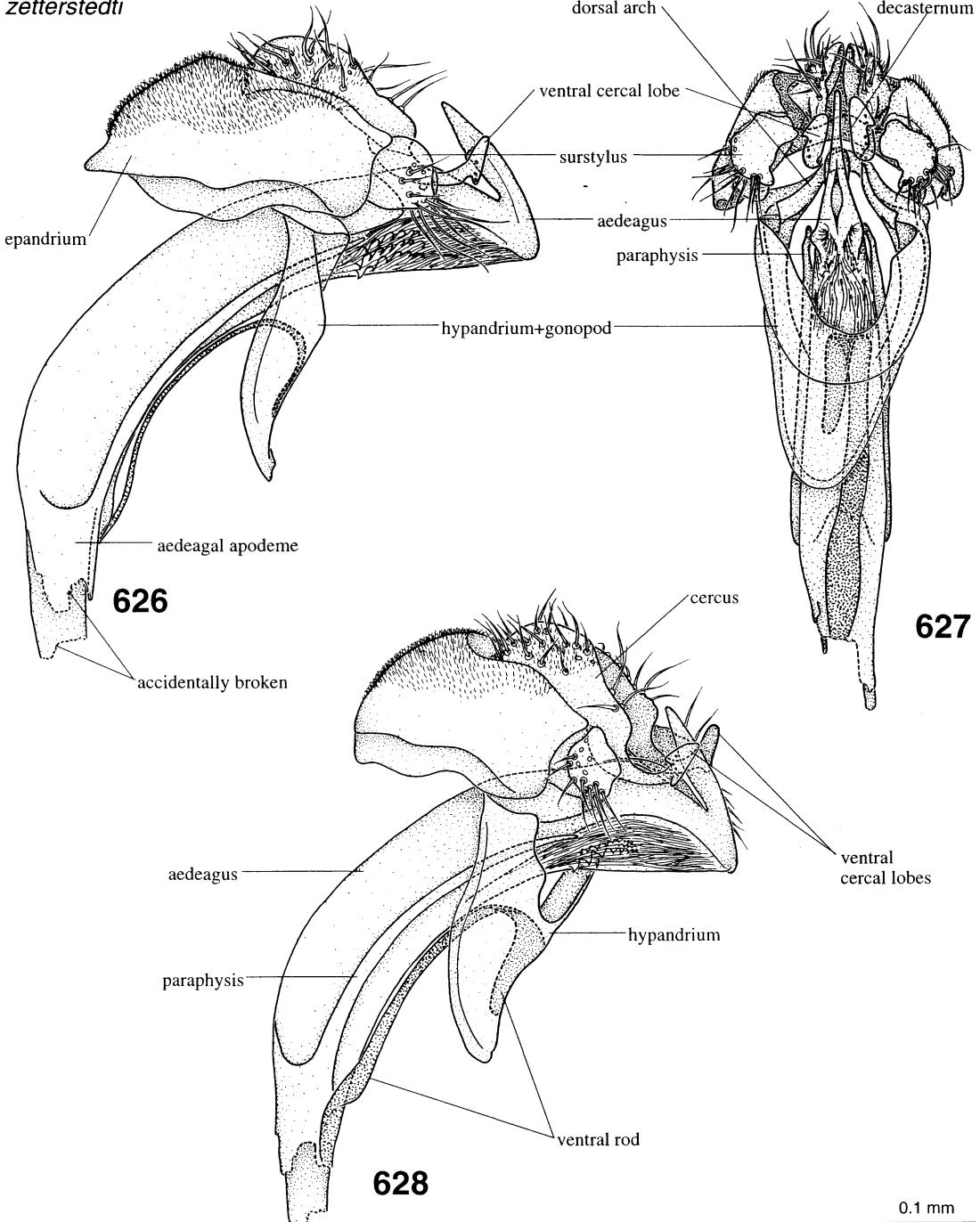
Diagnosis. – Arista with 1 ventral branch; or1 more distant from eye margin than or3; wing tip slightly pointed; aedeagus conspicuously huge, apically shaped like a rabbit head in lateral view; ventral rod very long, ribbon-shaped, flexible.

Redescription. – ♂. Head. Frons brownish-yellow, frontal length 0.24 (0.22-0.27) mm; frontal index = 0.72 (0.65-0.75), top to bottom width ratio = 1.25 (1.20-1.32). Frontal triangle very large, subshining, about 79-87% of frontal length; ocellar triangle slightly prominent, brownish on inner sides of ocelli, about 46-57% of frontal length. Frontal vittae very narrow, dull. Orbital plates pale brownish, shining, very broad, longer than frons. Orbital setae black, or2 outside and slightly behind or1, distance of or3 to or1 = 40-67% of or3 to vtm, or1 / or3 ratio = 0.55 (0.50-0.60), or2 / or1 ratio = 0.33 (0.25-0.43), postocellar setae = 89 (86-93)% , ocellar setae = 92 (87-100)% of frontal length; only 1 vibrissal seta. Face yellowish. Carina prominent, sharp, flat below, convex but not nose-like. Gena narrow, index about 8-13. Eye roundish, index = 1.11 (1.08-1.14). Occiput brownish. Antennae yellowish. Flagellomere 1 slightly paler, with slightly elongated marginal setulae, length to width ratio = 1.20. Arista with 4-5 short dorsal, 1 ventral (just behind terminal fork), and about 8 inner branches. Proboscis yellowish. Palpus with 2 dark apical setae.

Thorax length 0.91 (0.86-0.97) mm. Scutum and scutellum brown, subshining, 6 rows of acrostichal setulae. Only 1 postpronotal seta. Transverse distance of dorsocentral setae = 100-120% of longitudinal distance; dc index = 0.72 (0.68-0.74). Distance between apical scutellar setae about 78-87% of that between apical and basal one; basal setae divergent; scut index = 1.30 (1.26-1.35). Pleura yellowish-brown, sterno index = 0.51 (0.44-0.60), median katepisternal seta tiny. Haltere whitish-yellow. Legs yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.02 (1.92-2.14) mm, length to width ratio = 2.20 (2.15-2.26). Indices:

zetterstedti



Figs. 626-628. *Microdrosophila zetterstedti* Wheeler. 626: male terminalia, left lateral view; 627: idem, posterior view; 628: idem, oblique posterior view.

$C = 1.63$ (1.47-1.78), $ac = 3.13$ (2.57-3.80), $hb = 0.92$ (0.84-1.00), $4C = 2.10$ (1.80-2.38), $4v = 3.43$ (3.10-3.88), $5x = 3.35$ (3.25-3.50), $M = 1.47$ (1.30-1.63), prox. $x = 0.94$ (0.80-1.00).

Abdomen basally brownish, becoming blackish-brown towards tip.

♂ Terminalia (Figs 626-628). Epandrium dorsodistally microtrichose, with neither lower nor upper setae; ventral lobe not recognisable. Cercus long, anteriorly connected to epandrium by membranous tissue, dorsally microtrichose, with a long, curved, backwardly-protruding, apically arrowhead-shaped ventral lobe in lateral view, with ca. 4 setulae ventrodistally. Surstylus roundish not microtrichose, without prensisetae, with ca. 17 outer, low-positioned setae (lowermost ones very long), anteriorly linked to epandrium by membranous tissue. Decasternum reduced to a strip as in Fig. 627. Hypandrium shorter than epandrium; posterior hypandrial process absent; gonopod fused to arms of hypandrium, bare; dorsal arch bow-shaped, fused to hypandrial arms. Aedeagus huge, bent, fused to aedeagal apodeme, medioventrally membranous, strongly pleated, with ca. 6 serrate blades between the pleats, subapically abruptly bent dorsad and apically sharp in lateral view, reminiscent of the profile of a rabbit's head. Aedeagal apodeme possibly long, but of undetermined size as anterior part is missing in the lectotype [broken and lost during dissection, probably made by Basden]. Ventral rod very long, flexible, ribbon-shaped, fused both to distoventral region of aedeagal apodeme proximally and distally to medial area of hypandrium. Paraphysis long, narrow, curved, without setae, pressed to lateroventral surface of aedeagus and apparently fused anteriorly to aedeagal apodeme.

♀. Measurements: Frontal length 0.25 mm; frontal index = 0.71, top to bottom width ratio = 1.24. Ocellar triangle about 47% of frontal length. Distance of or3 to or1 = 50% of or3 to vtm, or1 / or3 ratio = 0.53, or2 / or1 ratio = 0.38, postocellar setae = 87%, ocellar setae = 93% of frontal length. Cheek index about 8-9. Eye index = 1.00. Thorax length 1.00 mm. dc index = 0.78. Scutellar setae almost equidistant; scut index = 1.32, sterno index = 0.44. Wing length 2.03 mm, length to width ratio = 2.23. Indices: $C = 1.50$, $ac = 3.33$, $hb = 0.85$, $4C = 2.22$, $4v = 3.44$, $5x = 3.00$, $M = 1.33$, prox. $x = 1.00$.

Distribution. – Norway, Sweden, Finland and Central Europe; rarely collected.

Additional specimens examined. – 4 ♂♂ (GERMANY: Ferein-Alm, 1 ♂, 1999, 3 ♂, 2000), and 1 ♂ (SWEDEN [ZMUL]: Smolandia, paralectotype, no date).

Genus *Mycodrosophila* Oldenberg, 1914

Mycodrosophila Oldenberg, 1914: 4. Type species: *Amiota poecilogastra* Loew, 1874.

Promycodrosophila Okada, 1986: 291 (subgenus).

Diagnosis. – Frons usually strongly silvery, in particular medially, when viewed at very acute angles; arista large, plumose, usually with only 1, rarely 2, ventral branches; carina usually well-developed; vibrissa strong, followed by smaller genal setae; eyes bare; or2 minute, other head setae large; mesonotum and uppermost part of pleura usually dark brown to blackish, shining, pleura abruptly changing to pale yellowish below; scutellum broadly rounded, dark, velvety or subshining; anterior dorsocentral seta minute; prescutellar seta absent; basal scutellar seta short, fine, apical one large, convergent; wing predominantly hyaline, with a prominent, usually darkened, costal lappet.

Taxa included. – There are 121 described species, arranged in two subgenera. Only one species is known in Europe: *Mycodrosophila poecilogastra* (Loew, 1874), with a scattered distribution throughout the Palaearctic. Not recorded from Scandinavia; the northernmost locality is in Central Germany.

Comments. – All the species are thought to be fungus breeders. There is a close relationship with *Hirtodrosophila* and *Zygothrica* (see Throckmorton, 1975; Grimaldi, 1990).

Genus *Scaptodrosophila* Duda, 1923

Scaptodrosophila Duda, 1923: 37. Type species: *Scaptodrosophila scaptomyzoidea* Duda, 1923.

Spuriostyloptera Duda, 1923: 38.

Paradrosophila Duda, 1923: 43.

Tanygastrella Duda, 1924: 192, 254.

Pugiodrosophila Duda, 1924: 203.

Xiphidiochaeta Duda, 1925: 200.
Tarudrosophila Duda, 1926: 114 (lapsus).
Adrosophila Séguy, 1938: 344.
Pholadoris Sturtevant, 1942: 28.

Diagnosis. – Mostly shining dark flies; first genal seta relatively small; frons with a V-shaped shining area with 2 rows of slightly prolonged interfrontal setulae; arista with 3-4 dorsal and 2 ventral rather short branches in addition to terminal fork; prescutellar seta present, in some specimens as long as anterior dorsocentral seta; one small proepisternal seta usually present; 3 subequal katepisternal setae, median one usually only slightly shorter than anterior one; testis short, sac-like, not coiled; gonopods completely fused to hypandrium; two pairs of paraphysis; outer paraphyses usually elongate and with more than 4 setulae; ejaculatory apodeme basally forked, branches largely expanded and oval-shaped; ventral receptacle short, curved, not coiled or kinked; eggs usually with six to eight curved filaments; skipping larvae.

Taxa included. – More than 320 species have been described, and many of them are distributed among the 13 species groups. The majority of the species are described from South Asia and Australia. One species, *Scaptodrosophila latifasciaeformis* Duda, has become almost cosmopolitan, clearly originating from South Asia but in the last decades recorded in many other tropical areas.

Comments. – This former subgenus of *Drosophila* has been raised to generic status by Grimaldi (1990). However, it appears to be paraphyletic as clearcut synapomorphies are obviously absent. Many species do not have the typical diagnostic characters; in particular, the prescutellar setae may be inconspicuous and the median katepisternal seta may vary in length.

Three species, *Scaptodrosophila rufifrons* (Loew, 1873), *S. lebanonensis* (Wheeler, 1949), and *S. deflexa* (Duda, 1924), have been recorded in Europe, all of them previously considered to belong to the *victoria* species group. The case was reconsidered by Papp et al. (1999), who established the *rufifrons* species group for the former two, to which they also added *S. abdita* Papp, Rácz and Bächli from Hungary. The status of *S. pattersoni* (Pipkin, 1956) and *S. stonei* (Pipkin, 1956), recorded in the Near East, is still open. In some species, a colour polymorphism has been observed; changes may involve

the whole body or some parts such as the postpronotum or areas of the tergites.

Certain species are attracted to fruit baits, whilst others can be collected at slime fluxes on trees; the majority of species have been collected by netting above the ground.

A few species (e.g. *S. lebanonensis*) can easily be kept in culture, whilst there are problems with others due to diapause and for other reasons.

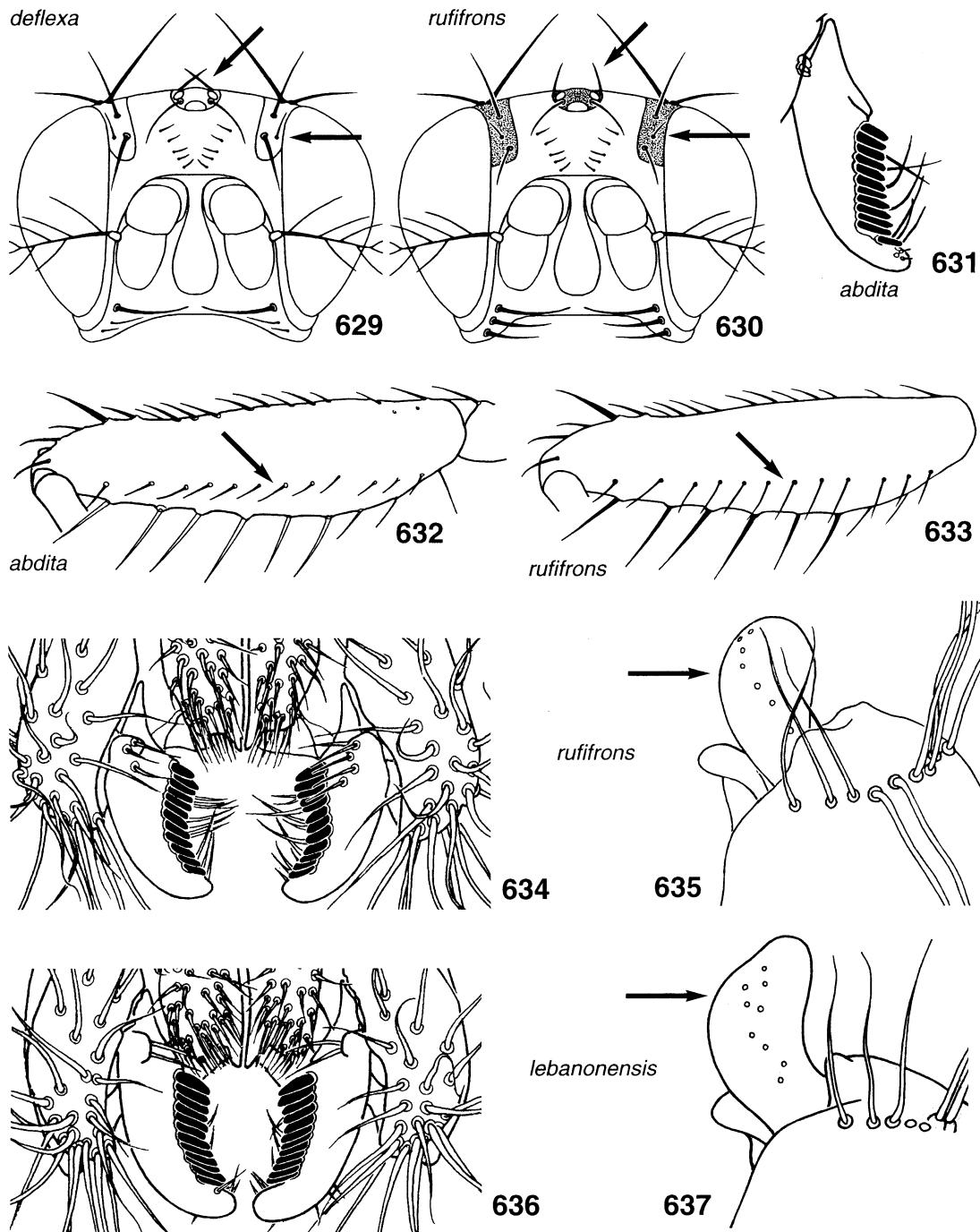
Key to European species of Scaptodrosophila

- | | |
|---|---|
| <p>1 anterior reclinate orbital seta just outside proclinate one (Fig. 629). Postocellar setae cruciate. Frons unicolourous brownish</p> <p>..... <i>S. deflexa</i> (Duda)</p> | 2 |
| <p>– Anterior reclinate orbital seta distinctly behind proclinate one (Fig. 630). Postocellar setae convergent but not cruciate. Frons reddish-brown with much darker orbital plates. Males only; females are virtually indistinguishable</p> <p>..... 2</p> | 2 |
| <p>2(1) Profemur with a row of short and weak anteroventral setulae (Fig. 632). Surstylus Fig. 631</p> <p>..... <i>S. abdita</i> Papp, Rácz and Bächli (Hungary)</p> | 2 |
| <p>– Profemur with a row of prolonged anteroventral setulae (Fig. 633)</p> <p>..... 3</p> | 3 |
| <p>3(2) Wild species. Terminalia: outer paraphysis distally spatulate (Figs 634, 635)</p> <p>..... <i>S. rufifrons</i> (Loew)</p> | 3 |
| <p>– Domestic species. Terminalia: outer paraphysis distally boomerang-shaped (Figs 636, 637)</p> <p>..... <i>S. lebanonensis</i> (Patterson and Wheeler) (widespread in South Europe)</p> | 3 |

***rufifrons* species group**

Papp, Rácz & Bächli, 1999

Diagnosis. – Frons almost equal in length and width; all orbital setae in a row; orbital plates reddish, not silvery; decasternum with distal margin notched; hypandrium with more than 7 setae on each side; aedeagus membranous, globose and completely embraced by hypandrium.



Figs. 629-637. 629, 630: head, frontal views; 631: left surstylos, lateral view; 632, 633: right profemur, frontal views; 634, 636: external male terminalia, posterior views; 635, 637: outer paraphysis and adjoining parts, lateral views.

Taxa included. – *Scaptodrosophila rufifrons* (Loew), *S. lebanonensis* (Wheeler, 1949), *S. patersoni* (Pipkin, 1956), *S. stonei* (Pipkin, 1956) and *S. abdita* Papp, Rácz and Bächli, 1999.

Comments. – There are only subtle differences in the male terminalia between the five species; the females are indistinguishable.

Scaptodrosophila rufifrons (Loew, 1873)

(Figs 56, 625, 630, 633, 638-641)

Drosophila rufifrons Loew, 1873: 50.

Drosophila nitens Buzzati-Traverso, 1943: 38.

Diagnosis. – The group characters apply, but see the male terminalia.

Redescription. – ♂. Head. Frons (Fig. 630) reddish-brown, dull, frontal length 0.32 (0.29-0.36) mm; frontal index = 1.01 (0.94-1.11), top to bottom width ratio = 1.12 (1.06-1.16). Frontal triangle pale brown, subshining, about 71-84% of frontal length; ocellar triangle prominent, dark brown on inner sides of ocelli, microtrichose, about 33-57% of frontal length. Interfrontal setulae distinct, arranged in V-shaped rows. Orbital plates with distinctive darker colour, microtrichose, narrow, apically not divergent from eye margin, about 67-79% of frontal length. Orbital setae black, or2 behind or1, distance of or3 to or1 = 62-83% of or3 to vtm, or1 / or3 ratio = 0.90 (0.82-1.00), or2 / or1 ratio = 0.37 (0.33-0.44), postocellar setae convergent but not cruciate, about 29 (21-35%), ocellar setae = 75 (67-84)% of frontal length; vibrissal index = 0.51 (0.50-0.56). Face dark brown. Carina pale brown, nose-like, bulbous. Cheek index about 7-12. Eye index = 1.29 (1.22-1.37). Occiput brown, with narrow yellowish margin. Antennae pale brown. Arista with 3-4 rather short dorsal, 2 ventral and about 9 rather long inner branches, plus terminal fork. Proboscis brownish-yellow. Clypeus dark brown. Palpus with about 3 dark and several fine, pale setae.

Thorax length 1.00 (0.78-1.12) mm. Scutum dark brown, shining, postpronotum yellowish-brown, 6 rows of acrostichal setulae. h index = 1.10 (1.08-1.14). Transverse distance of dorsocentral setae 175-200% of longitudinal distance; dc index = 0.54 (0.46-0.59). Prescutellar

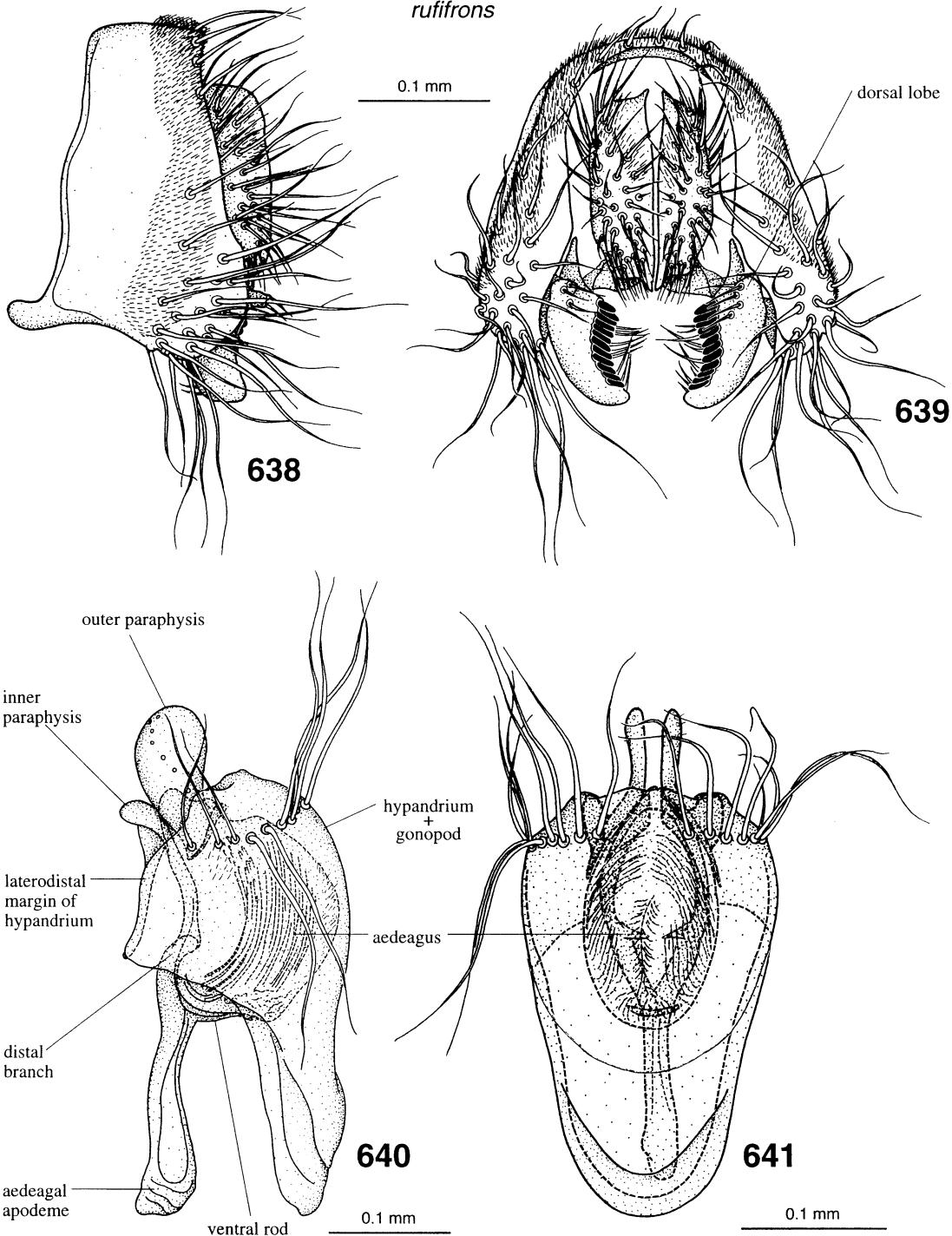
setae prolonged, length about 60-80% of anterior scutellar setae. Scutellum subshining, distance between apical scutellar setae about 120-150% of that of apical to basal one; basal ones divergent; scut index = 0.94 (0.90-1.00). Pleura brownish, shining, sterno index = 0.79 (0.68-0.87), median katepisternal seta about 54-88% of anterior one (Fig. 56). Haltere pale yellow.

- Legs pale brownish, femora distinctly thickened, profemur (Fig. 633) about twice as wide as antennae, with a row of prolonged anteroventral setae which are about as long as 1/4 width of femur; tibiae slightly paler apically, preapical setae on all tibiae, apical seta on mesotibia.

Wing relatively short, apically slightly roundish, hyaline, veins pale brownish, length 1.93 (1.61-2.10) mm, length to width ratio = 2.10 (2.07-2.14). Indices: C = 1.97 (1.79-2.25), ac = 3.12 (2.67-3.50), hb = 0.72 (0.69-0.75), 4C = 1.35 (1.33-1.40), 4v = 2.41 (2.33-2.50), 5x = 2.18 (1.80-2.67), M = 0.78 (0.75-0.83), prox. x = 0.74 (0.69-0.83).

Abdomen dark brown, shining, some tergites, at least tergites 2-4, may be yellowish basally.

♂ Terminalia (Figs 638-641). Epandrium ventroanteriorly expanded and sharply pointed forwards, ventrolaterally folded inwards (fold oblique, triangular and apically linked to lateral margin of decasternum by membranous tissue), distally mostly microtrichose, with ca. 23 remarkably long lower setae, and ca. 7 upper setae, which are conspicuously very long and distally waved; ventral lobe medially microtrichose, partially covering surstylos. Cercus narrow, anteriorly connected to epandrium by membranous tissue, dorsally slightly microtrichose, ventral margin folded anterad, without ventral lobe although inner corner of ventral margin slightly pointed. Surstylos slightly crescentic, not microtrichose, with a concave row of ca. 12 peg-like prensisetae, roundish at tip, ca. 10 inner and 4 outer setae, mostly on or near a small anterodorsal lobe, just anteriorly and above uppermost prensisetae. Decasternum rectangular, laterally membranous, horizontally positioned, distal margin medially notched, where it matches the expanded inner ventral margin of cerci, anterior margin linked by membranous tissue medially to lateral margins of hypandrium, which are anteriorly positioned (Fig. 639). Hypandrium longer than epandrium, laterally expanded dorsad, completely embracing aedeagus and laterodistally linked



Figs. 638-641. *Scaptodrosophila rufifrons* (Loew). 638: epandrium, cerci, and surstyli, left lateral view; 639: idem, plus decaстernum, posterior view; 640: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 641: idem, posterior view.

victoria species group
Wheeler, 1949

by membranous tissue to apical region of inner paraphysis, anterior margin convex, posterior margin slightly sinuate; posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognised because of their connection to outer paraphyses on laterodistal margin of hypandrium, distally with a row of ca. 9 long, distally sinuate setae on each side. Aedeagus hidden by hypandrium, mostly membranous, bag-shaped, globose when inverted, laterally flattened when everted, mostly rugose, each wrinkle ending as a tiny scale, ventrally slightly microtrichose, linked to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis strongly sclerotised, bare, roundish at tip, laterally linked to aedeagus, distally linked to laterodistal margin of hypandrium, and anteriorly connected to dorsodistal branch of aedeagal apodeme by membranous tissue. Outer paraphysis well-developed, upper-positioned, distally spatulate, medially with a sinuate row of ca. 7 setulae, anteriorly connected both to laterodistal margin of aedeagus and to median area of distal, protruding margin of hypandrium ("gonopods") by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, distally bifurcate and curved ventrad. Ventral rod anteroposteriorly flattened, longer than adjacent aedeagal apodeme width and shorter than ventroproximal margin of aedeagus.

♀ Terminalia (Fig. 625). Valve of oviscapit distally rounded, apically almost straight, with ca. 3 discal and ca. 22 marginal, peg-like, outer ovisensilla, proximal most ones being sharply pointed, distalmost ones roundish at tip; inner trichoid-like ovisensilla: 3 thin, distally positioned and 1 long, curved, subterminal.

Distribution. – Widespread in Europe, and recorded in East Asia as well. The females of *S. rufifrons* and *S. lebanonensis* cannot be separated, and the identification of the males is also difficult, and so some records may refer to *S. lebanonensis* (or even *S. abdita*).

Biology. – Flies have been recorded at slime fluxes and the larvae are thought to live at such spots.

Additional specimens examined. – 5 ♂♂ (FRANCE: Ste-Foy-les-Lyon, 4 ♂♂, 1989. SWITZERLAND: Zürich, 1 ♂, 1990).

Diagnosis. – Frons broader than long; orbital plates not differentiated in colour from frontal vitta; anterior reclinate orbital seta outside of proclinate one; hypandrium with at most 3 long setae on each side.

Taxa included. – At present, 5 species are included. Their status as well as their relationships with the *rufifrons* group species are unclear.

***Scaptodrosophila deflexa*
(Duda, 1924)**

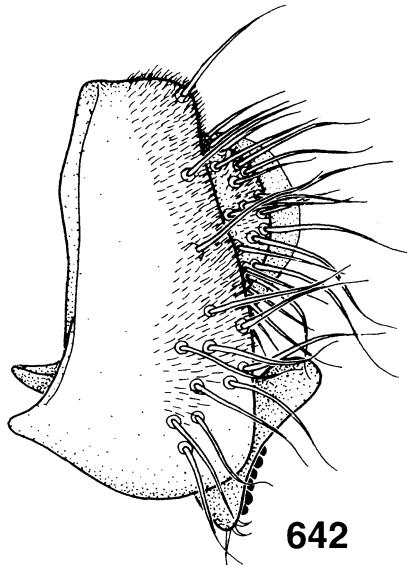
(Figs 624, 629, 642-646)

Drosophila deflexa Duda, 1924: 22.
Drosophila guyenoti Burla, 1948: 277.

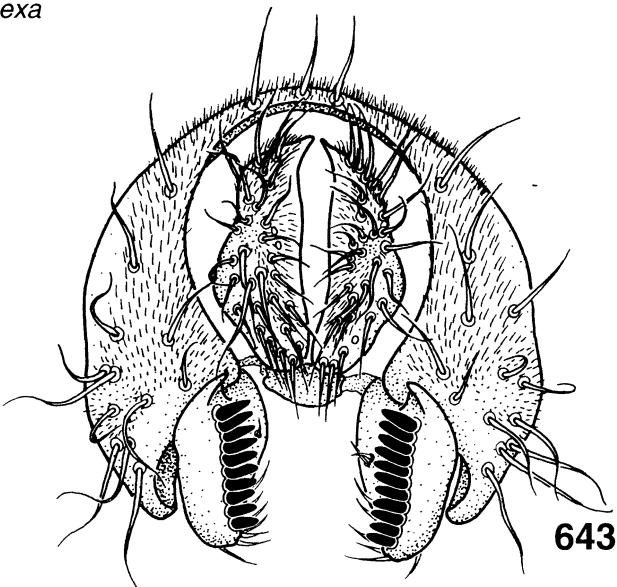
Diagnosis. – The group characters apply, but some details of the terminalia are diagnostic: hypandrium laterodistally strongly microtrichose; outer paraphysis distally densely covered with tiny scales.

Redescription. – ♂. Head. Frons (Fig. 629) brown, dull, frontal length 0.29 (0.27-0.29) mm; frontal index = 0.81 (0.73-0.89), top to bottom width ratio = 1.20 (1.14-1.30). Frontal triangle pale brown, microtrichose, about 41-50% of frontal length; ocellar triangle prominent, dark brown on inner sides of ocelli, microtrichose, about 65-76% of frontal length. Interfrontal setulae distinct, arranged in two V-shaped rows. Orbital plates pale brown, microtrichose, broad, apically slightly divergent from eye margin, about 82-94% of frontal length. Orbital setae black, or2 outside and at level of or1, distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.77 (0.71-0.83), or2 / or1 ratio = 0.55 (0.50-0.60), postocellar setae cruciate, about 54 (47-59)%, ocellar setae = 93 (0.88-1.00)% of frontal length; vibrissal index = 0.50 (0.42-0.55). Face dark brown. Carina pale brown, nose-like, bulbous. Cheek index about 5-7. Eye index = 1.29 (1.25-1.33). Occiput brown. Antennae pale brown. Arista with 3-4 dorsal, 2 ventral rather short and about 7 rather long inner branches, plus terminal fork. Proboscis brownish-yellow. Clypeus brown. Palpus with about 4 dark and several fine, pale setae.

deflexa



642



643

inner paraphysis

outer paraphysis

inner paraphysis

aedeagus

0.1 mm

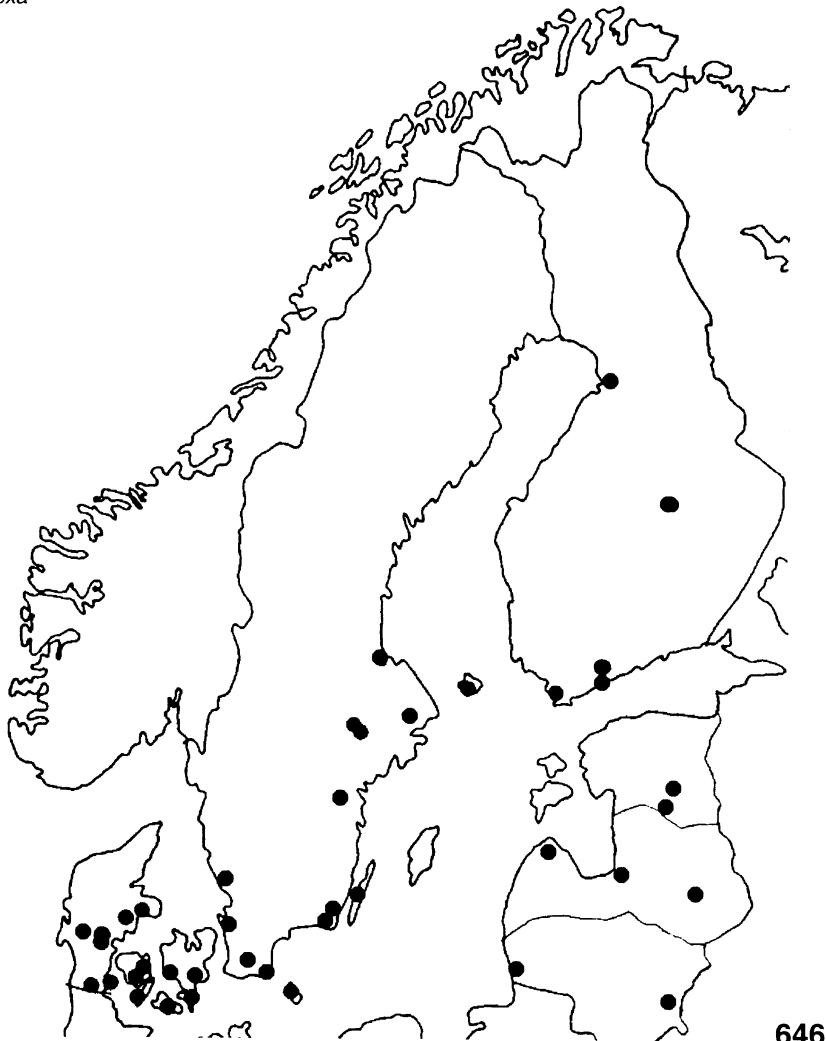
hypandrium+gonopods

644

aedeagal apodeme

645

Figs. 642-645. *Scaptodrosophila deflexa* (Duda). 642: epandrium, cerci, and surstyli, left lateral view; 643: idem, plus decasternum, posterior view; 644: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 645: idem, posterior view.



646

Fig. 646. Known distribution pattern of *Scaptodrosophila deflexa* Duda in Scandinavia.

Thorax length 0.92 (0.87-0.99) mm. Scutum dark brown, shining, postpronotum yellowish-brown, 6 rows of acrostichal setulae. h index = 0.99 (0.89-1.14). Transverse distance of dorsocentral setae 150-170% of longitudinal distance; dc index = 0.65 (0.62-0.68). Prescutellar setae prolonged, length about 33-50% of anterior scutellar setae. Scutellum subshining, distance between apical scutellar setae about 90-112% of that of apical to basal one; basal ones divergent; scut index = 1.14 (1.07-1.20). Pleura pale brownish, shining, sterno index = 0.57 (0.40-0.67), median katepisternal seta about 33-

63% of anterior one. Haltere whitish. Legs pale brownish, femora distinctly thickened, profemur about twice as wide as antennae, tibiae slightly paler apically, preapical setae on all tibiae, apical seta on mesotibia.

Wing relatively short, apically slightly roundish, hyaline, veins pale brownish, length 1.95 (1.85-2.10) mm, length to width ratio = 2.09 (2.00-2.15). Indices: C = 2.37 (2.29-2.43), ac = 2.33 (2.14-2.50), hb = 0.48 (0.44-0.50), $4C$ = 1.21 (1.15-1.27), $4v$ = 2.21 (2.08-2.33), $5x$ = 1.84 (1.50-2.25), M = 0.74 (0.67-0.82), prox. x = 0.82 (0.77-0.85).

Abdomen dark brown, shining, some tergites sometimes pale brown basally.

♂ Terminalia (Figs 642-645). Epandrium dorsally narrow, and ventroanteriorly expanded forwards in lateral view, dorsodistally microtrichose, with ca. 9 lower and ca. 6 upper setae; ventral lobe broad, anteroventrally protruding anterad, slightly microtrichose, partially covering surstylus. Cercus anteriorly connected to epandrium by membranous tissue, without ventral lobe, and dorsodistally microtrichose. Surstylus not microtrichose, with a straight row of ca. 11 peg-like prensisetae, roundish at tip, ca. 8 inner and no outer setae, laterally remarkably expanded as a lobe, narrow ventrally, gradually broadening dorsad and covering row of prensisetae in lateral view. Decasternum horizontally positioned, laterally membranous, as in Fig. 643. Hypandrium as long as epandrium, anterior margin convex, posteriorly somewhat square-shaped and partially embracing aedeagus and paraphyses, posterior hypandrial process and dorsal arch absent; gonopods completely fused to each other and to hypandrium but recognised because of their connection to outer paraphyses on paramedian region of posterior margin of hypandrium, which is medially expanded backwards; laterodistally microtrichose, with 2 long, sinuate setae on each side. Aedeagus reduced, membranous, proximally globose, linked to aedeagal apodeme by membranous tissue, and flanked by two pairs of paraphyses. Inner paraphysis anteriorly connected to dorsodistal margin of aedeagal apodeme by membranous tissue, apparently trifurcate, ventral branches fused to each other, fusion area being serrate in lateral view reaching posterior margin of hypandrium medially, medial branch embracing aedeagus and dorsal branch blunt at tip and dorsad directed in lateral view. Outer paraphysis well-developed, distally densely covered with seta-like scales in lateral view, proximally with a sinuate row of ca. 7 setulae, anteriorly connected both to distal margin of aedeagal apodeme and to median area of distal, protruding margin of hypandrium ("gonopods") by membranous tissue. Aedeagal apodeme longer than aedeagus, laterally flattened, anteriorly expanded. Ventral rod short.

♀. Measurements: Frontal length 0.31 (0.29-0.34) mm; frontal index = 0.83 (0.74-0.89), top to bottom width ratio = 1.18 (1.11-1.23). Frontal triangle about 44-47% of frontal length; ocellar

triangle about 80-85% of frontal length. Orbital plates about 75-88% of frontal length. Distance of or3 to or1 = 57-71% of or3 to vtm, or1 / or3 ratio = 0.73 (0.69-0.75), or2 / or1 ratio = 0.61 (0.50-0.78), postocellar setae = 49 (35-59)%, ocellar setae = 93 (80-100)% of frontal length; vibrissal index = 0.44 (0.38-0.47). Cheek index about 4-6. Eye index = 1.23 (1.14-1.39).

- Thorax length 1.02 (0.89-1.14) mm. h index = 0.96 (0.89-1.11). Transverse distance of dorsocentral setae 150-183% of longitudinal distance; dc index = 0.69 (0.63-0.72). Distance between apical scutellar setae about 91-125% of that of apical to basal one; scut index = 1.12 (1.03-1.19), sterno index = 0.68 (0.60-0.74), median katepisternal seta about 25-50% of anterior one. Wing length 2.16 (1.86-2.34) mm, length to width ratio = 2.00 (1.91-2.07). Indices: C = 2.18 (1.82-2.41), ac = 2.53 (2.43-2.71), hb = 0.49 (0.47-0.53), 4C = 1.25 (1.19-1.42), 4v = 2.07 (1.88-2.29), 5x = 1.85 (1.60-2.00), M = 0.76 (0.67-0.86), prox. x = 0.82 (0.75-0.92).

♀ Terminalia (Fig. 624). Valve of oviscapit distally rounded, apically slightly convex, with 2-3 stout, discal, and 17-18 mostly stout, marginal, peg-like, outer ovisensilla, proximalmost ones sharply pointed, distalmost ones roundish at tip; inner trichoid-like ovisensilla: 3-4 thin, distally positioned and 1 long, straight, subterminal.

Distribution. – (Fig. 646). Widespread in Europe, and also recorded in Estonia, Latvia, Denmark, Sweden, Finland and the Near East.

Additional specimens examined. – 5 ♂♂ (SERBIA AND MONTENEGRO: Avala, 3 ♂♂, 1977. SWITZERLAND: St. Gallen, 1 ♂, 1973. TURKEY: Karaovabeli, 1 ♂, 1997), 4 ♀♀ (SWITZERLAND: Jura, 1 ♀, 1974; St. Galen, 1 ♀, 1973. RUSSIA: Krasnodar, 2 ♀♀, 1983).

Genus *Scaptomyza* Hardy, 1849

Scaptomyza Hardy, 1849: 361. Type species: *Drosophila graminum* Fallén, 1823.

Scaptomyzella Hendel, 1928: 290 (also as *Scaptomyzetta*, lapsus).

Bunostoma Malloch, 1932: 218 (subgenus).

Rosenwaldia Malloch, 1934: 195 (subgenus).

Tantalia Malloch, 1938: 53 (subgenus).

Euscaptomyza Séguin, 1938: 346 (subgenus).

Trogloscaptomyza Frey, 1954: 21 (subgenus).

Ctenoscaptomyza Frey, 1954: 22.

- Macroscaptomyza* Frey, 1954: 27 (subgenus).
Tristanomyia Frey, 1954: 31.
Mesoscaptomyza Hackman, 1959: 17 (subgenus).
Metascaptomyza Hackman, 1959: 17 (subgenus).
Alloscaptomyza Hackman, 1962: 37 (subgenus).
Dentiscaptomyza Takada, 1965: 43 (subgenus).
Exalloscaptomyza Hardy, 1965: 604 (subgenus).
Boninoscaptomyza Okada, 1973: 86 (subgenus).
Lauxanomyza Tsacas & Cogan, 1976: 90 (subgenus).
Elmomyza Hackman, 1982: 99 (subgenus).

Diagnosis. – Rather slender, small flies with relatively narrow wings, rarely much more than 2 mm long; arista plumose, with 1-2 ventral branches in addition to terminal fork; carina often reduced; mesonotum of most species with microtrichosity forming diffuse stripes; acrostichal setulae in 2-4 rows; prescutellar setae absent; usually just one pair of paraphyses; many species with leaf-mining larvae.

Taxa included. – There are about 300 described species, assigned to 17 subgenera. Most species have only a small distribution area, but some are cosmopolitan or at least widespread within a region.

Comments. – In addition to the species mentioned below, the following species are found in the Mediterranean countries: *S. atlantica* Hackman, 1955, in the Canary Islands, the Azores, and Greece, *S. vittata* (Coquillett, 1895) in the Canary Islands, and *S. adusta* (Loew, 1862) in the Canary Islands, the Azores, Italy, Malta and Greece. The latter two species have clearly been introduced from the New World. Three additional nominal species are mentioned below under *Parascaptomyza*.

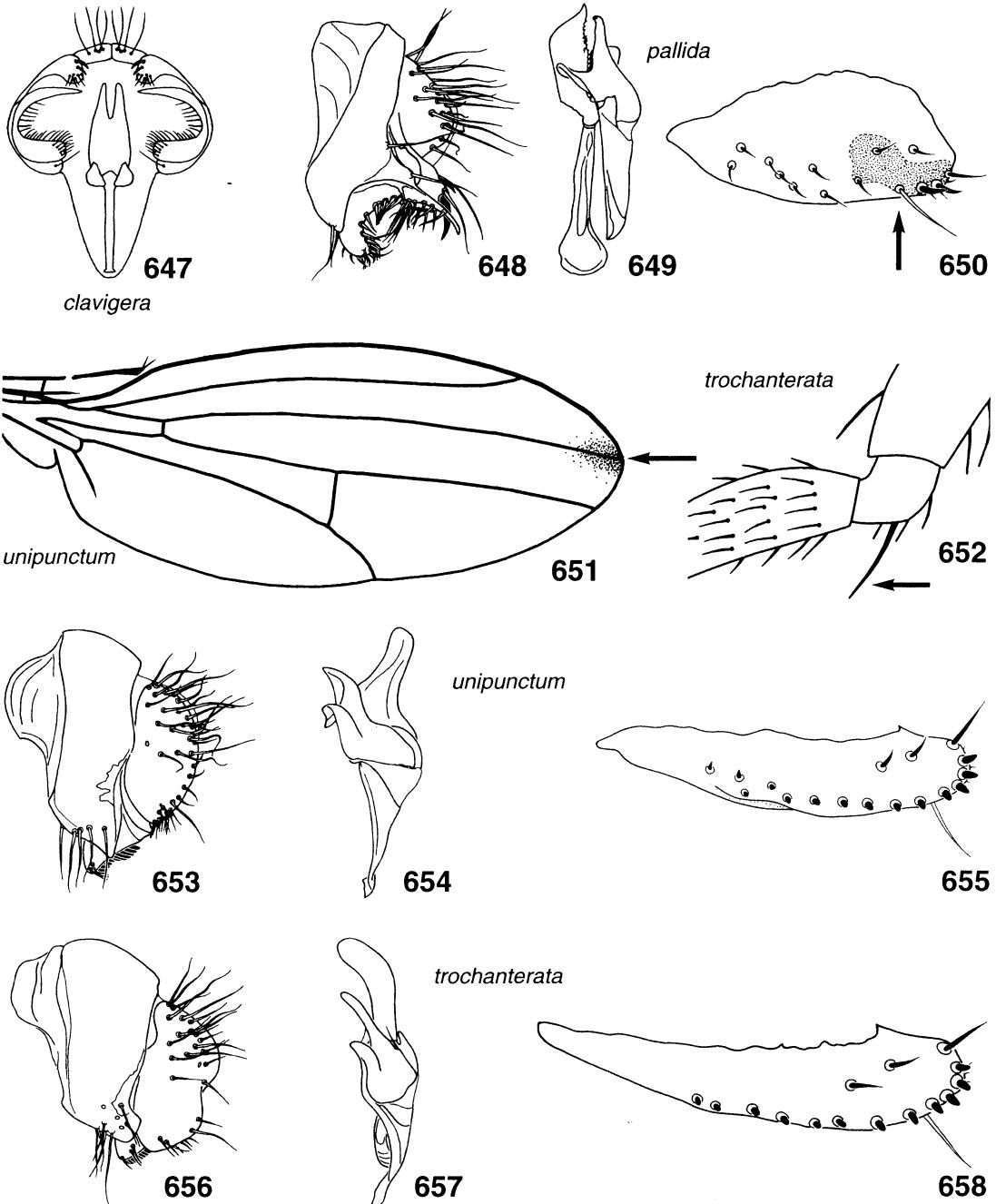
Basden (pers. comm.) recorded some *Scaptomyza* specimens from northern Great Britain which he considered to belong to an undescribed species.

Many *Scaptomyza* species have leaf-mining larvae. *S. pallida* can, with difficulty, be kept in a laboratory culture. This may be one of the reasons why a modern phylogenetic analysis is lacking. In particular, the evolution of the large group of Hawaiian “scaptoids” is not yet understood, and different views of their relationships have been published (Carson et al., 1970; Hackman, 1982; Remsen & O’Grady, 2002).

Due to misidentifications and inadequate keys, earlier records of *S. graminum*, particularly in the Nearctic, refer mostly to *S. pallida*.

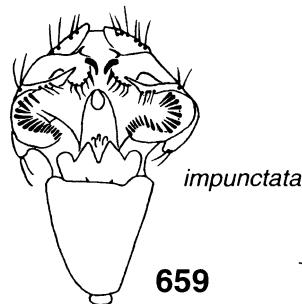
Key to European species of *Scaptomyza*

- | | | |
|------|--|--|
| 1 | 2 rows of acrostichal setulae. Female: oviscapt blackish, short, broad, and obliquely, not vertically positioned, with 2-3 marginal peg-like outer ovisensilla; inner wall ventrodistally strongly sclerotised (Fig. 650) | 2 |
| – | 4 rows of acrostichal setulae; 2 external rows often incomplete. Female: oviscapt protruding, long, narrow, vertically positioned, with numerous large, peg-like outer ovisensilla (Fig. 655) | 3 |
| 2(1) | Scutum yellow, rarely with dark stripes. Male: terminalia Fig. 647 | <i>S. clavigera</i> Frey
(Azores; females not distinguishable
from pale specimens of <i>S. pallida</i>) |
| – | Scutum variable greyish to yellow, if dark then with a distinct median stripe. Male: terminalia Figs 648, 649; oviscapt valve (Fig. 650) relatively short, broad and obliquely, not vertically, positioned, ventrodistally with a strongly sclerotised area of inner wall, and with trichoid-like, not peg-like, outer ovisensilla | <i>S. pallida</i> (Zetterstedt) |
| 3(1) | Upper postpronotal seta prominent; lower one usually very short and weak (h index > 1.5) | 4 |
| – | 2 postpronotal setae of almost equal length (h index < 1.5) | 7 |
| 4(3) | Metatrochanter with a strong, dark, inner, curved seta (Fig. 652). Males only; females virtually indistinguishable | 5 |
| – | Metatrochanter without such a strong seta | 6 |
| 5(4) | Wing with a dark spot at apex (Fig. 651); male terminalia Figs 653, 654: posterior | |



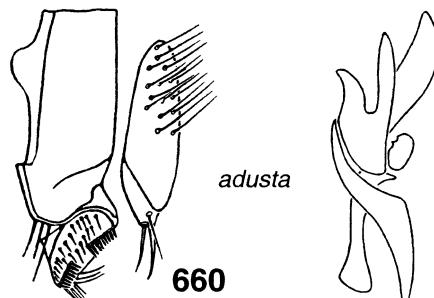
Figs. 647-658. 647: male terminalia, posterior view; 648, 653, 656: external male terminalia, left lateral views, 649, 654, 657: internal male terminalia, left lateral views; 651: right wing, dorsal view; 652: metatrochanter, posterior view; 650, 655, 658: left oviscapt valves, outer lateral views.

- margin of cercus not medially notched, aedeagus relatively short, apically blunt and slightly pointed backwards, anteriorly broad and posteriorly narrow in lateral view; oviscapt Fig. 655
..... *S. unipunctum* (Zetterstedt)
- Wing without such an apical spot; male terminalia Figs 656, 657; aedeagus relatively long, subdistally bent, apically roundish and pointed dorsad, not narrowing towards tip; oviscapt Fig. 658
..... *S. trochanterata* Collin
- 6(4) Arista with 1 ventral branch behind terminal fork. Wing without an apical spot. Male: terminalia Fig. 659: ventral cercal lobe apically with 1 strong, spur-like seta; surstylos crescentic with just one row of long, spaced, peg-like prensisetae
..... *S. impunctata* Frey
- Arista with 2 ventral branches behind terminal fork. Wing with an apical spot. Male: terminalia Figs 660, 661: ventral cercal lobe apically without a strong, spur-like seta, surstylos not crescentic, expanded slightly outwards, with 2 rows of compacted, peg-like prensisetae, separated by a gap
..... *S. adusta* (Loew)
(Nearctic species; recorded in the Mediterranean area)
- 7(3) A minute setula between upper reclinate orbital seta and medial vertical seta (Fig. 662), which may be absent in some pale yellow specimens. Ground-colour pale yellow or dark greyish. Tips of basal scutellar setae ending before tips of apical ones (Fig. 663). Female: oviscapt valve apically remarkably blunt, marginal peg-like setae stout, with a large gap between mesal and apical discal peg-like ovisensilla (Fig. 668)
..... 8
- Usually, no such additional setula present (Fig. 664). Mature specimens dark greyish. Tips of basal scutellar setae ending at same level as tips of apical ones (Fig. 665). Female: oviscapt valve apically rounded, one ventroapical stout seta
- larger than adjacent ones, with a small gap between mesal and apical discal peg-like ovisensilla (Fig. 673)
..... 9
- 8(7) Male terminalia Figs 666, 667: cercus broad, ventrally rounded; oviscapt valve apically remarkably blunt and with stout, marginal outer ovisensilla Fig. 668
..... *S. flava* (Zetterstedt)
- Male terminalia Figs 669, 670: cercus narrow, remarkably long, strongly pointed ventrad
..... *S. montana* Wheeler
- 9(7) Palpus with only 1 strong black apical seta. Male terminalia Figs 671, 672: cercus reduced, upper positioned, with a large tuft of long setae on inner ventral corner, aedeagus anteriorly expanded laterally, embracing dorsodistal region of aedeagal apodeme; oviscapt Fig. 673
..... *S. consimilis* Hackman
- Palpus with at least 2 strong apical setae of almost equal length
..... 10
- 10(9) Male terminalia Figs 674, 675: aedeagus long, slightly curved, apically expanded dorsoventrally, dorsoapically strongly flattened laterally, conspicuously covered anteriorly with a loose, pleated membranous sheath; oviscapt Fig. 676
..... *S. teinoptera* Hackman
- Male terminalia Figs 677, 678, 680, 681, 683, 684: aedeagus not as above; oviscapt Figs 679, 682, 685
..... 11
- 11(10) Male terminalia (Figs 677, 678): cercus ventrally very broad, remarkably roundish, bag-shaped and pointed ventrad in lateral view; oviscapt Fig. 679
..... *S. graminum* (Fallén)
- Male terminalia (Figs 680, 683): cercus not as above
..... 12
- 12(11) Male terminalia (Figs 680, 681): dorsal margin of aedeagus submedially slightly projecting anterodorsad in lateral view. Female: Oviscapt valve apically slightly blunt (Fig. 682)



impunctata

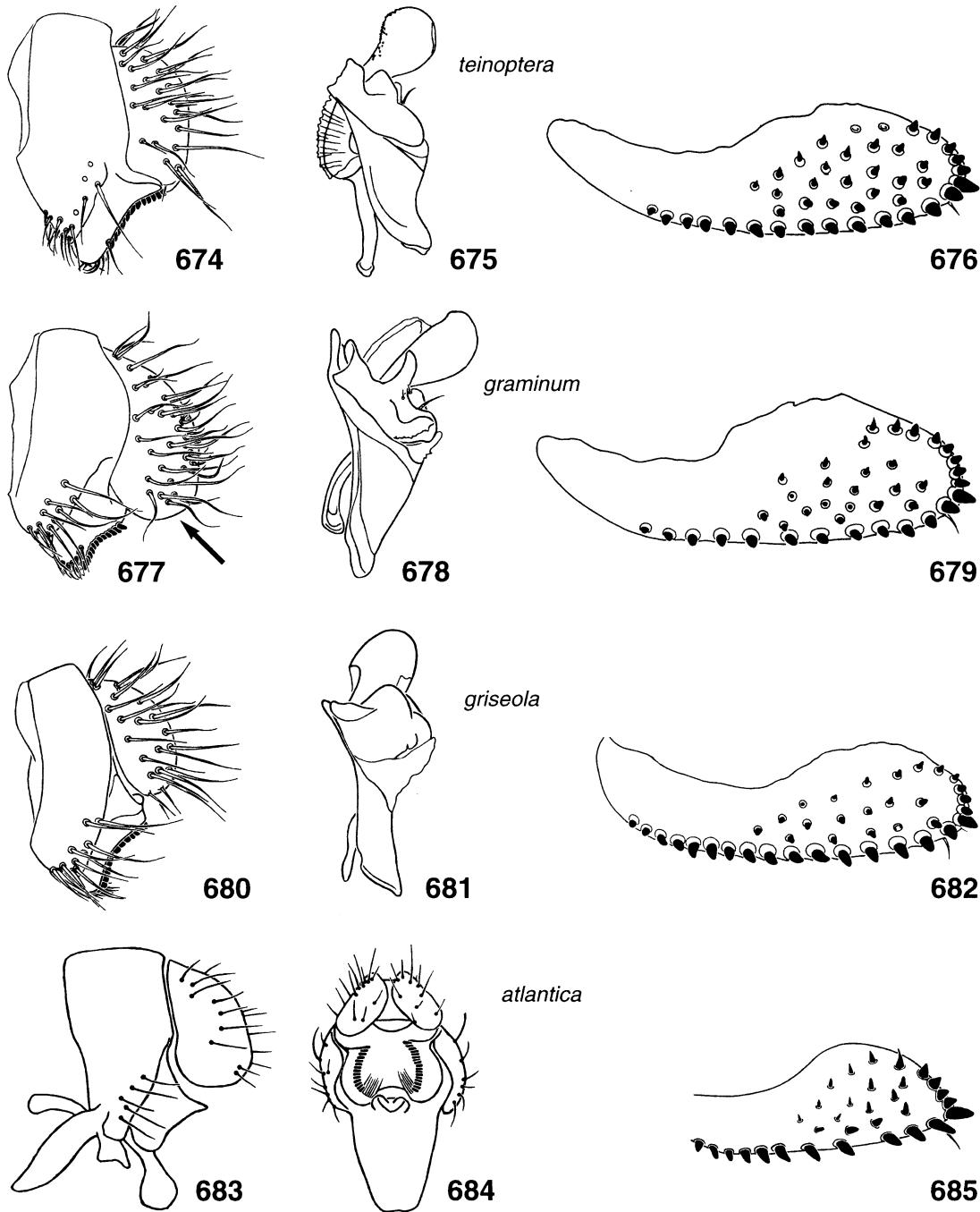
659



adusta

660





Figs. 674-685. 674, 677, 680: external male terminalia, left lateral views; 675, 678, 681: internal male terminalia, left lateral views; 676, 679, 682, 685: left oviscapt valves, outer lateral views; 683, 684: male terminalia, left lateral and posterior views.

- *S. griseola* (Zetterstedt)
- Male terminalia (Figs 683, 684): dorsal margin of aedeagus not projecting anterodorsad. Female: oviscapt valve apically somewhat triangular (Fig. 685) ...
..... *S. atlantica* Hackman
(recorded in the Canaries, Azores, and
the Mediterranean area)

Subgenus *Hemiscaptomyza* Hackman, 1959

Hemiscaptomyza Hackman, 1959: 19 (subgenus). Type species: *Geomyza unipunctum* Zetterstedt, 1847.

Diagnosis. – Arista with 1-2 ventral branches in addition to terminal fork; mesonotum more or less dark greyish-brown; two postpronotal setae, upper one about twice as long as lower one; apical scutellar seta more than half as long as basal one; acrostichal setulae usually in four rows (rarely in two); metatrochanter beneath with a downwardly-directed, strong, black seta; wings usually with an apical spot in males, accidentally also in females; just 1 pair of paraphyses (outer paraphyses); oviscapt valve relatively narrow, apically roundish, with ca. 3 trichoid-like, discal, outer ovisensilla, dorsalmost longest; the larvae are leaf-miners.

Taxa included. – 15 species have been described which are recorded mainly in the northern Holarctic.

Comments. – Some of the characters mentioned above may be absent or modified in many species. In particular, females without wing spots may be indistinguishable.

Scaptomyza trochanterata Collin, 1953

(Figs 652, 686-690)

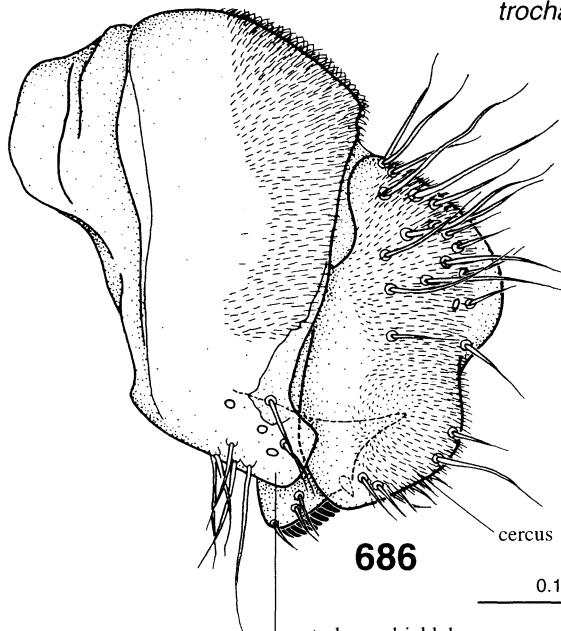
Scaptomyza trochanterata Collin, 1953: 150

Diagnosis. – Greyish flies; apical wing spot absent; cercus long, broad, with a notched mediolateral margin and a ventral margin positioned below epandrial ventral lobe in lateral view; surstyli with a short, straight row of peg-like prensisetae and an isolated one above;

aedeagus relatively long, not narrowing towards tip, laterally flattened, subdistally bent dorsad.

Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, brownish below, yellow above antennae, frontal length 0.27 (0.25-0.31) mm; frontal index = 1.04 (1.00-1.13), top to bottom width ratio = 1.41 (1.35-1.47). Frontal triangle greyish, dull, about 72-81% of frontal length. Ocellar triangle slightly prominent, prolonged, blackish, about 44-53% of frontal length. Frontal vittae brownish-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 83-100% of frontal length. Orbital setae blackish-brown, or2 outside and slightly behind or1, distance of or3 to or1 = 62-87% of or3 to vtm, or1 / or3 ratio = 1.04 (1.00-1.11), or2 / or1 ratio = 0.59 (0.50-0.63), postocellar setae = 47-63%, ocellar setae originating at lateral margins of ocellar triangle, about 60-73% of frontal length; vibrissal index = 0.76 (0.60-0.89). Face, parafacalia and gena yellowish-white. Carina small, narrow, nose-like. Cheek index about 5-9. Eye roundish, main axis oblique, index = 1.16 (1.09-1.21). Occiput blackish-brown, greyish above foramen. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 3-4 dorsal, 1 ventral and about 7 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

Thorax length 0.89 (0.78-0.95) mm. Scutum pale greyish, greyish microtrichose, usually with brownish stripes, a narrow one between innermost rows of acrostichal setulae and two broad, lateral ones, a narrow, faint stripe may occur along dorsocentral setae, 4 rows of acrostichal setulae. h index = 2.09 (1.86-2.33). Transverse distance of dorsocentral setae 109-150% of longitudinal distance; dc index = 0.78 (0.72-0.85). Scutellum pale greyish, distance between apical scutellar setae about 75-89% of that of apical to basal one; basal ones divergent and apically surpassing apical ones; apical ones slightly upright, scut index = 1.39 (1.26-1.53). Pleura pale greyish-brown, sterno index = 0.52 (0.42-0.59), median katepisternal seta about 46-91% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, tarsomeres 4-5 (1-5 on fore leg) with 2-3 irregular rows of prolonged setae, their length about twice width of tarsomeres, metacoxa (Fig. 652) with a downwardly-directed, strong seta on inner-

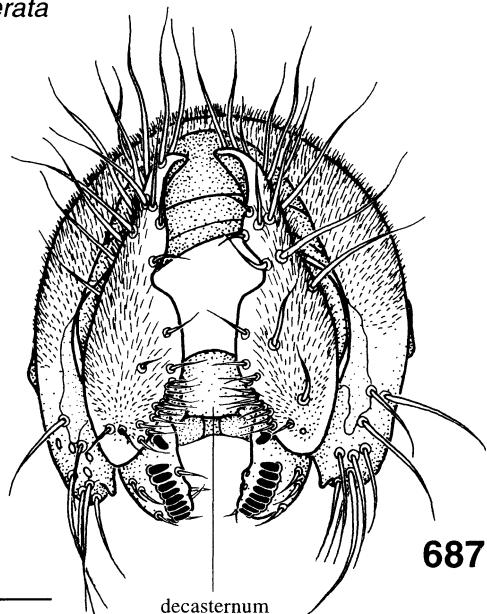
trochanterata

686

0.1 mm

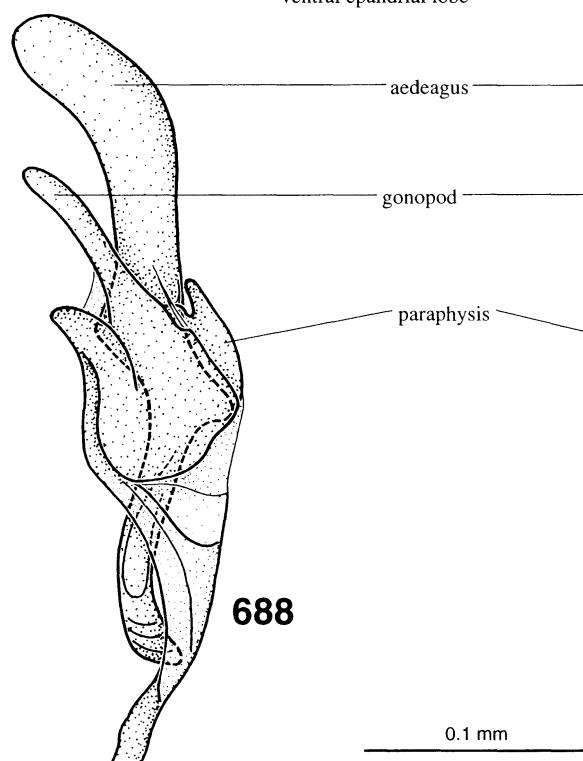
cercus

ventral epandrial lobe



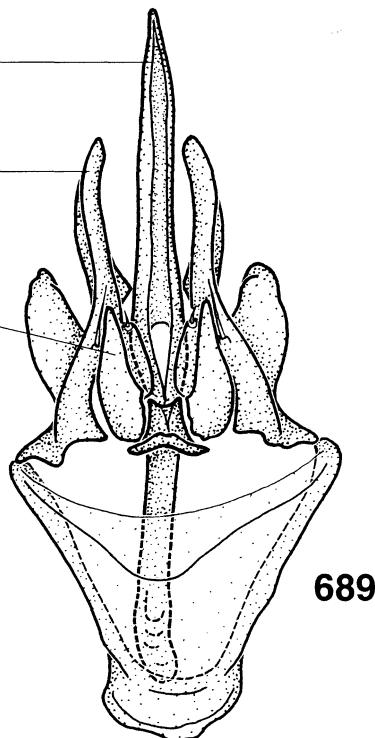
687

decasternum



688

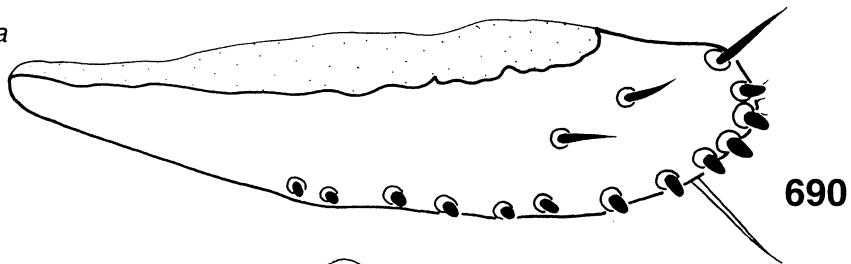
0.1 mm



689

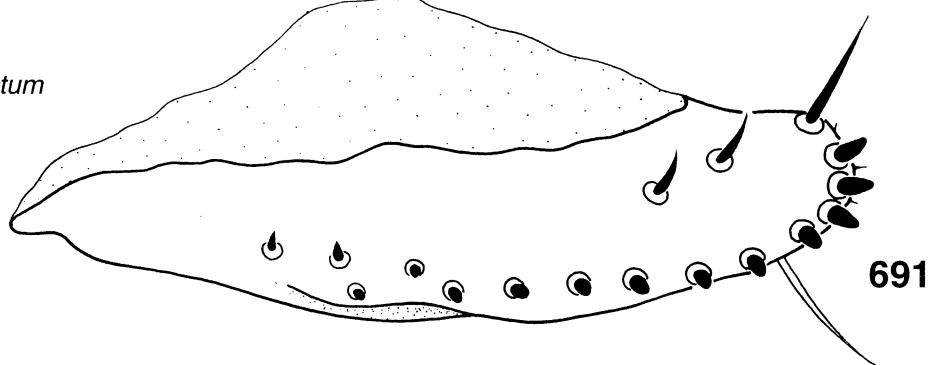
Figs. 686-689. *Scaptomyza trochanterata* Collin. 686: epandrium, cerci, and surstyli, left lateral view; 687: idem, plus decasternum, posterior view; 688: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 689: idem, posterior view.

trochanterata



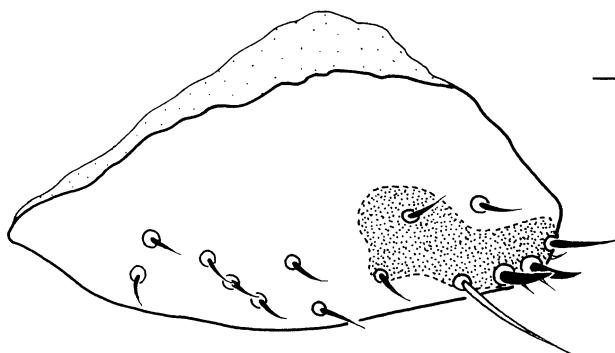
690

unipunctum



691

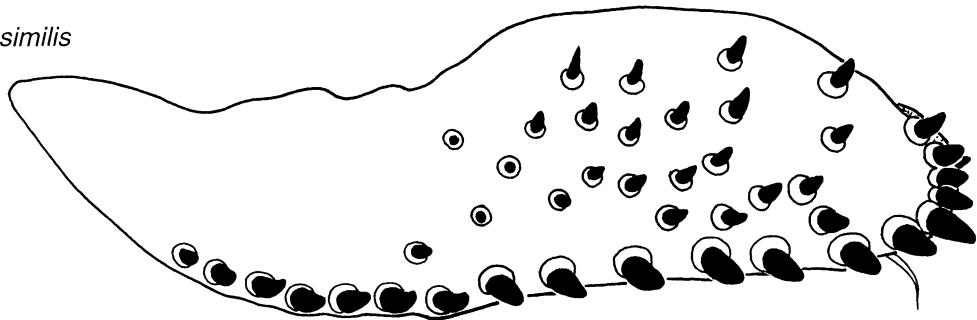
pallida



692

0.1 mm

consimilis



693

Figs. 690-693. *Scaptomyza* spp., females – Left oviscapt valves, lateral views.

ventral side, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.07 (1.92-2.28) mm, length to width ratio = 2.36 (2.23-2.58). Indices: C = 2.94 (2.00-3.50), ac = 2.39 (2.17-2.60), hb = 0.51 (0.46-0.54), 4C = 0.73 (0.65-0.81), 4v = 1.51 (1.40-1.69), 5x = 1.45 (1.14-1.80), M = 0.42 (0.38-0.50), prox. x = 0.39 (0.35-0.44).

Abdomen longish, blackish-brown, subshining.

♂ Terminalia (Figs 686-689). Epandrium dorsoposteriorly microtrichose, with ca. 10 lower, and no upper setae; ventral lobe dorsoapically with a small finger-shaped process, neither microtrichose nor covering surstylus. Cercus long, broad, lower-positioned, anteriorly connected to epandrium by membranous tissue, distally microtrichose, partially covering surstylus; distal margin medially notched, ventral margin positioned below epandrial ventral lobe; ventral lobes absent. Surstylus not microtrichose, with a straight row of ca. 9 peg-like prensisetae on mesal surface, dorsalmost one separated from second dorsalmost by a long gap, ca. 4 thin inner and 3 outer setae. Decasternum as in Fig. 687. Hypandrium as long as epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopods widely separated from each other, linked to paraphysis by membranous tissue, bifurcate, with branches finger-shaped and roundish at tip, dorsalmost one twice as long, embracing aedeagus dorsally, with one seta near median inner margin. Aedeagus not narrowing towards tip, fused to aedeagal apodeme, laterally flattened, subdistally bent dorsalwards, roundish at tip in lateral view. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme, distally expanded and dorsoventrally flattened. Paraphysis linked to gonopod by membranous tissue, with 1 setula, connected to distal margin of ventral rod by membranous tissue.

♀. Measurements: Frontal length 0.28 (0.25-0.31) mm; frontal index = 0.92 (0.83-1.06), top to bottom width ratio = 1.26 (1.11-1.35). Frontal triangle about 67-80% of frontal length; ocellular triangle about 41-50% of frontal length. Orbital plates about 87-89% of frontal length. Distance of or3 to or1 = 50-71% of or3 to vtm, or1 / or3 ratio = 0.81 (0.69-1.00), or2 / or1 ratio = 0.77 (0.67-0.90), postocellar setae = 50-71%, ocellar setae = 85-100% of frontal length;

vibrissal index = 0.60 (0.45-0.73). Cheek index about 4-8. Eye index = 1.18 (1.10-1.25). Thorax length 0.93 (0.88-0.99) mm. h index = 1.66 (1.43-1.88). Transverse distance of dorsocentral setae 125-136% of longitudinal distance; dc index = 0.77 (0.67-0.83). Distance between apical scutellar setae about 64-112% of that of apical to basal one; scut index = 1.32 (1.29-1.35), sterno index = 0.57 (0.50-0.61), median katepisternal seta about 50-73% of anterior one. Wing length 2.17 (1.95-2.35) mm, length to width ratio = 2.40 (2.14-2.54). Indices: C = 2.95 (2.38-3.21), ac = 2.53 (2.17-2.80), hb = 0.53 (0.50-0.64), 4C = 0.74 (0.67-0.89), 4v = 1.47 (1.37-1.56), 5x = 1.41 (1.14-1.80), M = 0.41 (0.37-0.44), prox. x = 0.37 (0.28-0.50).

♀ Terminalia (Fig. 690). Valve of oviscapt relatively narrow, apically rounded, ventrally convex, with 3 discal, long, trichoid-like, dorsalmost longest, and 12-13 marginal, peg-like outer ovisensilla, which are roundish at tip; inner trichoid-like ovisensilla: 3 thin, distally positioned and 1 long, straight, subterminal.

Distribution. – Recorded in Scotland, Sweden, Norway, Finland, Siberia and North America; clearly a subarctic distribution.

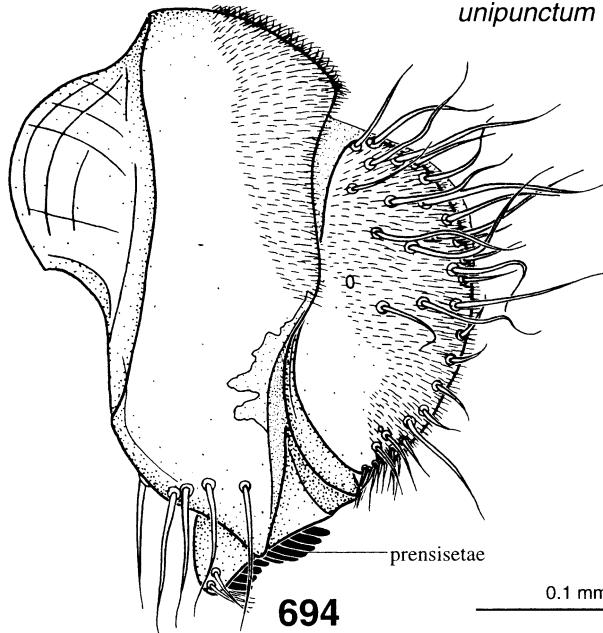
Additional specimens examined. – 5 ♂♂ (FINLAND [ZMUH]: Esbo, 1 ♂, no date; Hailuoto, 1 ♂, no date; Urjala, 1 ♂, 1950. SWEDEN [ZMUL]: Råneå, 1 ♂, 1965; Gällivare, 1 ♂, 13.VII, 6 ♀♀ (FINLAND [ZMUH]: Rajala, 1 ♀, 1910. SWEDEN [ZMUL]: Råneå, 1 ♀, 1963, 2 ♀♀, 1965; Rätansbyn, 1 ♀, 1960; Ulricehamn, 1 ♀, 1945).

Scaptomyza unipunctum (Zetterstedt, 1847)

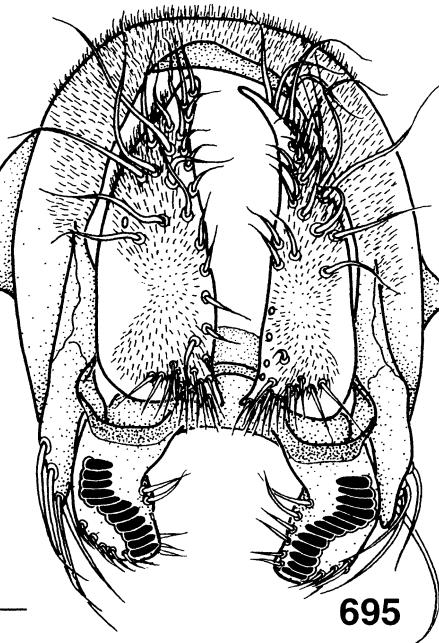
(Figs 651, 691, 694-697)

Geomyza unipunctum Zetterstedt, 1847: 2533.
Scaptomyza unipunctum bocharensis Hackman, 1959: 58.

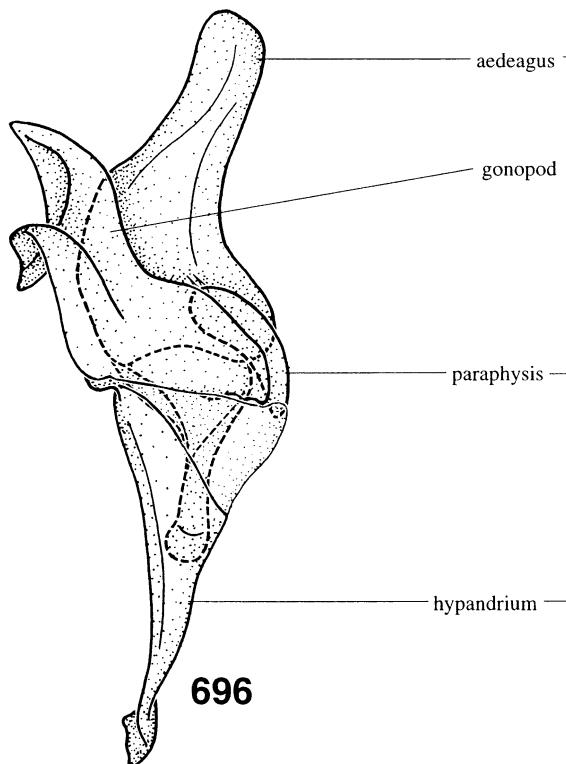
Diagnosis. – Greyish flies; apical wing spot present in male only; cercus of standard size, distal margin not notched, ventral margin positioned above ventral margin of ventral lobe of epandrium in lateral view; surstylus with a sinuate row of large, peg-like prensisetae; aedeagus relatively short, apically blunt at tip, pointed backwards, anteriorly broad and posteriorly narrow in lateral view.

unipunctum

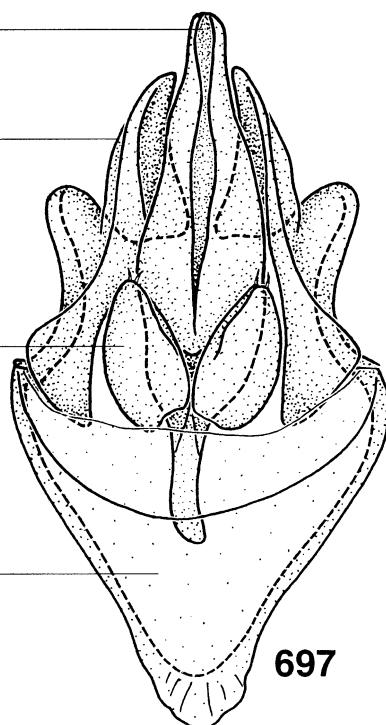
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Figs. 694-697. *Scaptomyza unipunctum* (Zetterstedt), 694: epandrium, cerci, and surstyli, left lateral view; 695: idem, plus decasternum, posterior view; 696: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 697: idem, posterior view.

Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, brownish below, yellow above antennae, frontal length 0.27 (0.25-0.29) mm; frontal index = 1.04 (0.94-1.13), top to bottom width ratio = 1.39 (1.25-1.47). Frontal triangle greyish, dull, about 75-87% of frontal length. Ocellar triangle slightly prominent, prolonged, blackish, about 47-53% of frontal length. Frontal vittae brownish-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 81-94% of frontal length. Orbital setae blackish-brown, or2 outside and slightly behind or1, distance of or3 to or1 = 50-62% of or3 to vtm, or1 / or3 ratio = 1.03 (1.00-1.13), or2 / or1 ratio = 0.53 (0.40-0.60), postocellar setae = 61 (56-67)%, ocellar setae originating at lateral margins of ocellar triangle, about 65 (56-75)% of frontal length; vibrissal index = 0.60 (0.45-0.70). Face, parafacialia and gena yellowish-white. Carina narrow, somewhat nose-like. Cheek index about 5-8. Eye roundish, main axis oblique, index = 1.18 (1.14-1.26). Occiput blackish-brown, greyish above foramen. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 4 dorsal, (1-)2 ventral and about 6 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

Thorax length 0.91 (0.88-0.94) mm. Scutum pale greyish, greyish microtrichose, usually with brownish stripes, a narrow one between innermost rows of acrostichal setulae, two broad, lateral ones across postpronotal area; sometimes a narrow, faint stripe along dorsocentral setae. 4 rows of acrostichal setulae. h index = 1.73 (1.50-2.14). Transverse distance of dorsocentral setae 107-136% of longitudinal distance; dc index = 0.79 (0.73-0.86). Scutellum pale greyish, paler along lateral margins, distance between apical scutellar setae about 67-89% of that of apical to basal one; apical ones slightly upright, basal ones divergent and apically surpassing apical ones; scut index = 1.46 (1.25-1.60). Pleura pale greyish-brown, darker along upper third, sterno index = 0.57 (0.50-0.74), median katepisternal seta about 42-80% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, tarsomeres 3-5 with 2-3 irregular rows of prolonged setae, their length about twice width of tarsomeres, metacoxa with a downwardly-directed, strong seta on inner-ventral side, preapical setae on all tibiae, apical seta on mesotibia.

Wing (Fig. 651) hyaline, tip of R₄₊₅ with a roundish-oblong brown spot, length 2.18 (2.10-2.28) mm, length to width ratio = 2.42 (2.31-2.52). Indices: C = 3.03 (2.93-3.38), ac = 2.87 (2.33-3.50), hb = 0.48 (0.43-0.53), 4C = 0.73 (0.68-0.78), 4v = 1.56 (1.50-1.63), 5x = 1.55 (1.33-1.67), M = 0.44 (0.40-0.53), prox. x = 0.36 (0.30-0.40).

Abdomen longish, blackish-brown, subshining, pale brownish towards base.

♂ Terminalia (Figs 694-697). Epandrium dorsoposteriorly microtrichose, with ca. 5 lower, and no upper setae; ventral lobe medially pointed ventrad in lateral view, not microtrichose, partially covering surstyli. Cercus slightly linked to epandrium by membranous tissue, microtrichose, except for anteroventral area, inner ventral margin with a tuft of small, stiff setae; ventral lobes absent. Surstylus dorsoventrally elongate, ventrally curved inwards, dorsally with a strongly sclerotised strip, not microtrichose, with a sinuate row of ca. 12 long, peg-like prensisetae, roundish at tip, on mesal surface, ca. 7 thin inner and 5 outer setae; surstyli widely separated from each other. Decasternum as in Fig. 695. Hypandrium as long as epandrium, anteriorly weakly sclerotised, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopods without seta, dorsally bifid and projecting backwards, lateral branch fused to hypandrium arm, inner branch posteriorly sharply pointed in lateral view and subapically linked to each other dorsally by membranous tissue, embracing aedeagus as a sort of dorsal arch, anteriorly widely separated from one another in posterior view, inner margin ventrally linked to paraphysis by membranous tissue. Aedeagus laterally flattened, dorsoapically slightly membranous, fused to aedeagal apodeme, relatively short, apically slightly pointed ventrad, blunt at tip, anteriorly broad and posteriorly narrow in lateral view. Aedeagal apodeme shorter than aedeagus, and upper positioned as regards anterior margin of hypandrium, distally expanded, bent, rod-shaped. Ventral rod absent. Paraphysis remarkably perpendicular, not parallel, to aedeagus, dorsodistally with ca. 3 setulae, linked both to gonopod and to ventrodistal margin of aedeagal apodeme by membranous tissue.

♀. Differences from male: wing tip without brown spot.

Measurements: Frontal length 0.28 (0.25-0.31) mm; frontal index = 0.92 (0.88-0.95), top to bottom width ratio = 1.32 (1.29-1.35). Frontal triangle about 78-87% of frontal length; ocellar triangle about 44-56% of frontal length. Orbital plates about 87-100% of frontal length. Distance of or3 to or1 = 56-62% of or3 to vtm, or1 / or3 ratio = 0.75, or2 / or1 ratio = 0.77 (0.67-0.88), postocellar setae = 65 (60-69)%, ocellar setae = 88% of frontal length; vibrissal index = 0.61 (0.55-0.67). Cheek index about 5-6. Eye index = 1.11 (1.09-1.14). Thorax length 0.96 (0.90-1.02) mm. h index = 1.96 (1.78-2.14). Transverse distance of dorsocentral setae 121-125% of longitudinal distance; dc index = 0.62. Distance between apical scutellar setae about 78-90% of that of apical to basal one; scut index = 1.59 (1.58-1.60), sterno index = 0.60, median katepisternal seta about 67% of anterior one. Wing length 2.24 (2.13-2.35) mm, length to width ratio = 2.41 (2.35-2.48). Indices: C = 3.11 (3.07-3.15), ac = 2.34 (2.17-2.50), hb = 0.47 (0.46-0.47), 4C = 0.72 (0.68-0.75), 4v = 1.54 (1.47-1.60), 5x = 1.24 (1.14-1.33), M = 0.41 (0.40-0.42), prox. x = 0.38 (0.37-0.40).

♀ Terminalia (Fig. 691). Valve of oviscap narrow, apically rounded, ventrally somewhat convex, with 3 discal, trichoid-like, dorsalmost longer, and 14-15 marginal, peg-like outer ovisensilla, mostly roundish at tip; inner trichoid-like ovisensilla: 3 thin, distally positioned and 1 long, curved, subterminal.

Distribution. – Recorded in Norway, Sweden, Finland, Estonia, northwestern Russia, Central Asia (subspecies *bocharensis*), East Asia, North America.

Additional specimens examined. – 7 ♂♂ (FINLAND [ZMUH]: Helsinki, 1 ♂, no date; Kangasala, 1 ♂, no date; Kuusamo, 1 ♂, no date; Nykarleby, 1 ♂, 1955; Paltamo 1 ♂, 1941; Tammerfors, 1 ♂, no date. SWEDEN [ZMUL]: Pajala, 1 ♂, no date), 2 ♀♀ (FINLAND [ZMUH]: Nykarleby, 1 ♀, 1954; Tuovilanlaks, 1 ♀, no date).

Comments. – The male terminalia of the dissected specimen (Paltamo, Finland) that we used in the redescription of *S. unipunctum* are virtually identical with those illustrated by Hackman (1959: 21, fig. 48) for a specimen that was also collected in Finland. However, the terminalia of a specimen from the USA (Alaska,

Bethel), as illustrated by Wheeler & Takada (1966: 45, Figs 16-20), although sharing many features with the specimen from Paltamo, shows some remarkable differences both in the aedeagus shape and the relative size of the aedeagal apodeme in lateral view; this could indicate that it belongs to a different but closely related species. On the other hand, the subspecies *Scaptomyza unipunctum bocharensis* from Tajikistan probably deserves specific status because of the unique shape of its aedeagus, which is virtually identical with that of two specimens from Turkey (Aras Valley, deposited in ZMuz) that we have studied.

Subgenus *Parascaptomyza* Duda, 1924

Parascaptomyza Duda, 1924: 203 (subgenus).

Type species: *Drosophila pallida* Zetterstedt, 1847.

Diagnosis. – Ventral branches of arista varying from 0 to 2 (usually one or two); one prominent postpronotal seta; apical scutellar seta long, not bent upright; 2 dorsocentral setae, or an additional one in front of suture; acrostichal setulae in 2 or 4 rows; male cercal ventral lobe protruding inwards; oviscap valve weakly developed, rarely with numerous outer ovisensilla.

Taxa included. – 24 species have been described, some of them widespread or cosmopolitan, others endemic to certain islands.

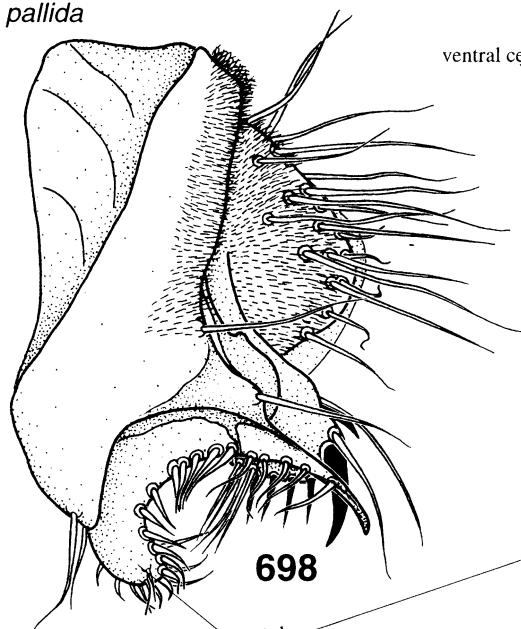
Comments. – The following three nominal species have been described from the Canary Islands as belonging to the subgenus *Parascaptomyza*: *S. chopardi* Séguin, 1936, *S. impunctata* (Frey, 1945) and *S. clavigera* Frey, 1954. There are serious doubts about the status of these nominal species; the descriptions and/or illustrations are ambiguous and could all refer to the very variable species *S. pallida* (Zetterstedt). A revision would clarify the situation.

Scaptomyza pallida (Zetterstedt, 1847)

(Figs 50, 51, 692, 698-701)

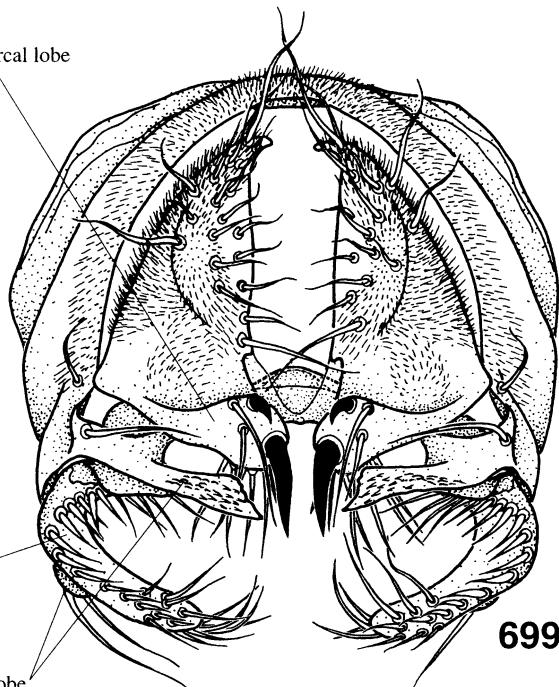
Drosophila pallida Zetterstedt, 1847: 2571.
Drosophila disticha Duda, 1921: 64.

pallida

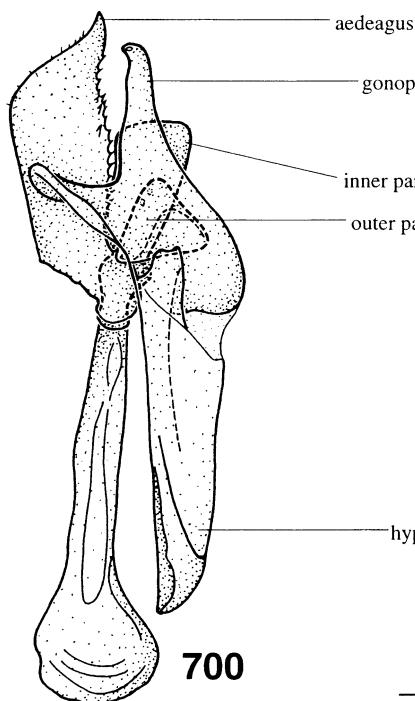


698

ventral cercal lobe



699



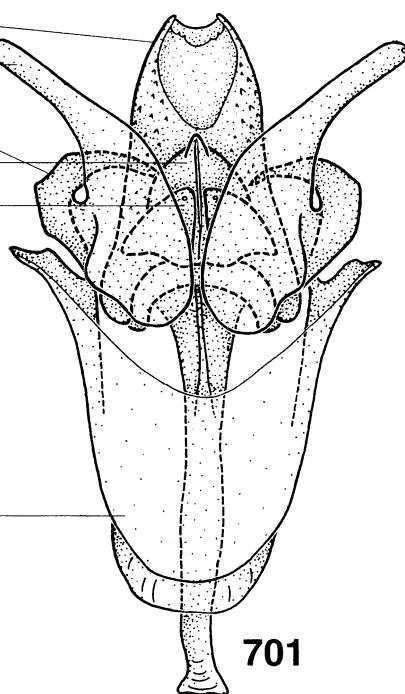
700

hypandrium

0.1 mm

—

0.1 mm



701

Figs. 698-701. *Scaptomyza pallida* (Zetterstedt). 698: epandrium, cerci, and surstyli, left lateral view; 699: idem, plus decasternum, posterior view; 700: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 701: idem, posterior view.

Diagnosis. – Greyish or partially to completely yellowish flies; epandrial ventral lobe bifurcate; ventral lobe of cercus (“secondary surstylus”) with one stout apical and one short dorsoapical spur-like seta; surstylus remarkably crescentic; gonopod medially bifurcate; aedeagus dorsoventrally flattened laterally, ventrally covered with tiny scales; two pairs of paraphyses, inner ones anteriorly parallel and adpressed to ventral surface of aedeagus, posteriorly fused to each other, keel-shaped, perpendicular to aedeagus and situated between outer paraphyses; oviscap valve blackish, relatively short, broad and obliquely, not vertically, positioned, ventrodis tally depressed over an adjacent, equivalent and strongly sclerotised area of inner wall, with trichoid-like, not peg-like, outer ovisensilla.

Redescription. – ♂. Head. Frons usually dull greyish microtrichose, pale yellowish above antennae, in pale specimens predominantly yellowish, frontal length 0.24 (0.20-0.27) mm; frontal index = 1.10 (0.86-1.40), top to bottom width ratio = 1.48 (1.25-1.90). Frontal triangle pale greyish, apically pointed, about 69-92% of frontal length; ocellar triangle slightly prominent, prolonged, blackish, about 33-44% of frontal length. Orbital plates broad, apically slightly diverging from eye margin, about 69-92% of frontal length. Orbital setae blackish, or2 outside and more or less at level of or1, distance of or3 to or1 = 37-57% of or3 to vtm, or1 / or3 ratio = 0.85 (0.75-0.90), or2 / or1 ratio = 0.40 (0.30-0.50), postocellar setae = 67 (60-77%), ocellar setae originating at lateral margins of ocellar triangle, about 106 (100-121)% of frontal length; vibrissal index = 0.53 (0.33-0.78). Face, parafacalia and gena yellowish. Carina prominent, nose-like, narrow. Cheek index about 4-8. Eye roundish, index = 1.17 (1.15-1.21). Occiput brownish-black. Arista (Fig. 50) with 4 dorsal, 1 ventral and about 8 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 1 dark, distinct seta at tip.

Thorax length 0.78 (0.73-0.87) mm. Scutum usually greyish, subshining, with brownish stripes, one narrow median inside of innermost rows of acrostichal setulae and two broad lateral ones; in pale specimens ground-colour yellowish and stripes more or less pale brownish, 2 rows of acrostichal setulae (Fig. 51). h index = 2.35 (1.83-2.75). Transverse distance of dor-

socentral setae 115-144% of longitudinal distance; dc index = 0.81 (0.71-0.92). Scutellum slightly prolonged, usually pale greyish, yellowish in pale specimens, distance between apical scutellar setae about 50-70% of that of apical to basal one; basal ones convergent; scut index = 1.09 (1.00-1.14). Pleura usually dark brownish, in pale specimens yellowish in lower half, sterno index = 0.63 (0.58-0.72), median katepisternal seta about 40-77% of anterior one. Haltere whitish-yellow. Legs usually brownish-yellow, pale yellowish in pale specimens, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.42 (2.24-2.52) mm, length to width ratio = 2.40 (2.25-2.56). Indices: C = 3.24 (3.00-3.75), ac = 2.62 (2.40-3.20), hb = 0.38 (0.33-0.44), 4C = 0.73 (0.63-0.76), 4v = 1.61 (1.52-1.70), 5x = 1.77 (1.50-2.00), M = 0.51 (0.45-0.55), prox. x = 0.44 (0.40-0.50).

Abdomen apically rather blunt, usually blackish-brown, in pale specimens yellowish, tergites 1-4 slightly greyish microtrichose, tergites 5-6 shining, some tergites with very narrow, yellow hind margins, tergite 6 with a small, median, yellowish triangle.

♂ Terminalia (Figs 698-701). Epandrium dorsoposteriorly microtrichose, with ca. 2 lower and 2 upper setae; ventral lobe neither microtrichose nor covering surstylus, bifurcate, dorsally conspicuously blade-shaped, projecting posterad, bent inwards, apically blunt and serrate, distally covered with tiny scales, fused to apicodorsal region of surstylus, submedially fused to posterior margin of decasternum by means of a narrow, sclerotised strip. Cercus linked to epandrium by membranous tissue, mostly microtrichose, dorsally setose only near inner margin, laterally flattened, ventrally expanded outwards; ventral lobes well-developed, not microtrichose, horizontally positioned, ventrally with a row of ca. 4 smaller setae marginally, in addition to ca. 3 longer, more anterior and mesally, and dorsodistally with two long setae and a pair of conspicuous spur-like setae, apical one huge and subapical one much smaller. Surstylus well-developed, not microtrichose, conspicuously crescentic, dorsally protruding backwards in lateral view and fused to dorsal branch of epandrial ventral lobe, ventrally curved inwards in posterior view, with a strongly curved row of ca. 18 long, trichoid-like prensisetae, on the mesal surface, ca. 6 inner and 4 outer setae; surstyli widely sepa-

rated from each other. Decasternum horizontally positioned, laterally slightly fused anteriorly to surstylus and posteriorly to dorsal branch of ventral lobe by means of a long, sclerotised, narrow strip, as in Fig. 699. Hypandrium weakly sclerotised, as long as epandrium, anterior margin convex, arms short, distally slightly bifurcate and pointed outwards; posterior hypandrial process and dorsal arch absent; gonopod bifurcate, ventral branch large, remarkably projecting outwards, apically blunt and with a setula, dorsal branch slightly embracing aedeagus dorsally, linked to paraphysis by membranous tissue, without seta. Aedeagus ventrally remarkably flattened, fused to aedeagal apodeme, anterior margin 2.5× wider than posterior one, concave and embracing distal margin of aedeagal apodeme, ventrally covered with tiny scales distally, apically pointed in lateral view, blunt and slightly bifid at tip, medioapically with a membranous crescentic area dorsally in ventral view. Aedeagal apodeme longer than aedeagus, rod-shaped, anteriorly expanded. Ventral rod absent. Two pairs of paraphyses, inner ones antero-laterally membranous, posteriorly sclerotised and expanded laterally, parallel and adpressed to ventral surface of aedeagus, inner margins fused to each other and forming a keel-shaped blade perpendicular to aedeagus and situated between outer paraphyses. Outer paraphysis triangular, dorsodistally with 2 setulae, linked by membranous tissue to gonopod and to ventrodistal margin of aedeagal apodeme.

♀. Differences from male: Abdomen more slender, apically conical.

Measurements: Frontal length 0.26 (0.25-0.27) mm; frontal index = 0.90 (0.84-0.94), top to bottom width ratio = 1.30 (1.26-1.35). Frontal triangle about 81-94% of frontal length; ocellar triangle about 37-40% of frontal length. Orbital plates about 81-87% of frontal length. Distance of or3 to or1 = 37-71% of or3 to vtm, or1 / or3 ratio = 0.78 (0.69-0.82), or2 / or1 ratio = 0.50 (0.38-0.56), postocellar setae = 62 (53-75)%, ocellar setae = 97 (81-113)% of frontal length; vibrissal index = 0.61 (0.50-0.67). Cheek index about 5-8. Eye index = 1.19 (1.10-1.33). Thorax length 0.91 (0.85-0.97) mm. h index = 2.35 (2.00-3.25). Transverse distance of dorsocentral setae 115-131% of longitudinal distance; dc index = 0.84 (0.81-0.88). Distance between apical scutellar setae about 33-64% of that of apical to basal one; scut index = 1.10 (1.07-1.14), sterno

index = 0.51 (0.43-0.56), median katepisternal seta about 50-75% of anterior one. Wing length 2.67 (2.55-2.91) mm, length to width ratio = 2.36 (2.29-2.44). Indices: C = 3.10 (2.59-3.53), ac = 3.13 (3.00-3.40), hb = 0.35 (0.29-0.47), 4C = 0.76 (0.63-0.86), 4v = 1.54 (1.38-1.76), 5x = 1.75 (1.43-2.40), M = 0.44 (0.38-0.57), prox. x = 0.46 (0.42-0.50).

♀ Terminalia (Fig. 692). Valve of oviscap blackish, relatively short, broad and obliquely, not vertically, positioned, ventrodistally depressed over an adjacent, equivalent and strongly sclerotised inner wall [the depression probably harbours both the huge dorsal branch of epandrial ventral lobe and the adjacent cercal ventral lobe during copulation], ventrally convex, distally blunt, with 11 discal, trichoid-like, and ca. 2 marginal, peg-like outer ovisensilla, sharp at tip; inner trichoid-like ovisensilla: 3 thin, unusually ventrodistally positioned and 1 long, curved, subterminal, unusually inserted on outer surface.

Distribution. – A cosmopolitan species, recorded almost everywhere, very abundant among grasses. Northernmost locality: Torsvag (Norway).

Biology. – This is one of the exceptional species of *Scaptomyza*, without mining larvae; the larvae are instead common in decaying plant material. Detailed information on the biology of this species is given by Máca (1972).

Additional specimens examined. – 4 ♂♂ (AUSTRIA: Glockner, 1978), 4 ♀♀ (SWITZERLAND: Uri, 2 ♀♀, 1973; Aargau, 2 ♀♀, 1974).

Comments. – For a long time the identity of this species was not clear, and so records of *S. graminum* often refer to this species.

Subgenus *Scaptomyza* Hardy, 1849

Diagnosis. – Arista usually with one or two ventral branches in addition to terminal fork; 2 postpronotal setae of almost equal length; acrostichal setulae as a rule in four rows; wings never with spots; cercus usually long, prominent, without ventral lobes; one pair of paraphysis (outer paraphysis); gonopods usually bent medially, posterior half perpendicular to anterior half; oviscap valve apically slightly pointed or blunt, usually densely covered with ovisensilla; leaf-mining species.

Taxa included. – 36 species have been described, many of them widespread.

Comments. – Many species have been described mainly on the basis of colour characters. As there is considerable variability in colour (ground-colour brownish to greyish or even yellow, combined with grades of microtrichosity) as well as in other characters, identifications are difficult. This is particularly true for females.

Scaptomyza consimilis Hackman, 1955

(Figs 696, 702-705)

Scaptomyza consimilis Hackman, 1955: 82.
Scaptomyza monticola Okada, 1956: 71.

Diagnosis. – Greyish flies; palpus with one strong apical seta; cercus reduced, upper positioned, ventrally densely setose; surstylus huge, slightly crescentic with a concave row of peg-like prensisetae, upper ones compacted, lower ones spaced.

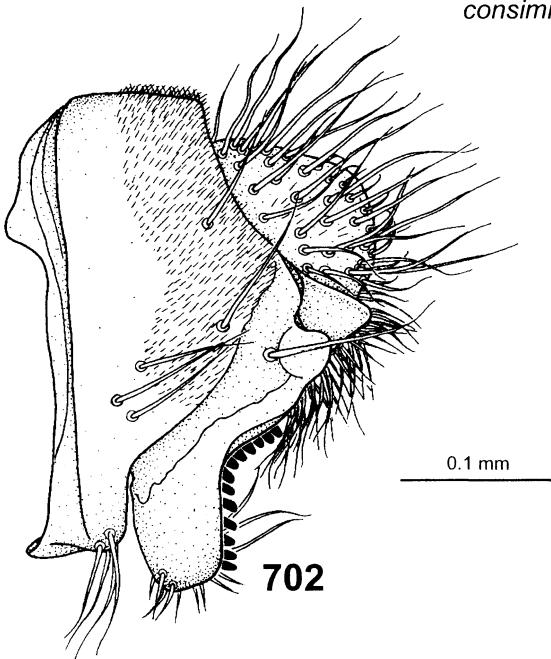
Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, brownish-yellow below, yellow above antennae, frontal length 0.27 (0.25-0.29) mm; frontal index = 1.05 (0.94-1.25), top to bottom width ratio = 1.41 (1.25-1.75). Frontal triangle greyish, dull, about 69-82% of frontal length. Ocellar triangle slightly prominent, blackish, about 44-47% of frontal length. Frontal vittae brownish-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 80-87% of frontal length. Orbital setae blackish-brown, or2 outside and slightly behind or1, distance of or3 to or1 = 57-86% of or3 to vtm, or1 / or3 ratio = 0.80 (0.73-0.90), or2 / or1 ratio = 0.74 (0.56-1.00), postocellar setae = 61 (56-67%), ocellar setae about 75 (63-87)% of frontal length; vibrissal index = 0.59 (0.50-0.67). Face, parafacialia and gena yellowish-white. Carina small, narrow, nose-like. Cheek index about 5-7. Eye roundish, slightly oblique, index = 1.20 (1.16-1.24). Occiput blackish-brown, greyish above foramen. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 3-4 dorsal, 1 ventral and about 7 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 1 dark seta at tip.

Thorax length 0.94 (0.86-0.97) mm. Scutum pale greyish, greyish microtrichose, usually with brownish stripes, a narrow one between innermost rows of acrostichal setulae and two broad, lateral ones, 4 rows of acrostichal setulae. h index = 1.35 (1.27-1.44). Transverse distance of dorsocentral setae 125-140% of longitudinal distance; dc index = 0.76 (0.73-0.78). Scutellum pale greyish, distance between apical scutellar setae about 55-64% of that of apical to basal one; basal ones apically not surpassing apical ones which are slightly upright; scut index = 1.18 (1.08-1.27). Pleura pale greyish-brown, sterno index = 0.58 (0.52-0.60), median katepisternal seta about 36-55% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, tarsomeres dorsally with 2-3 irregular rows of prolonged setae, their length about twice width of tarsomeres, preapical setae on all tibiae, apical seta on mesotibia.

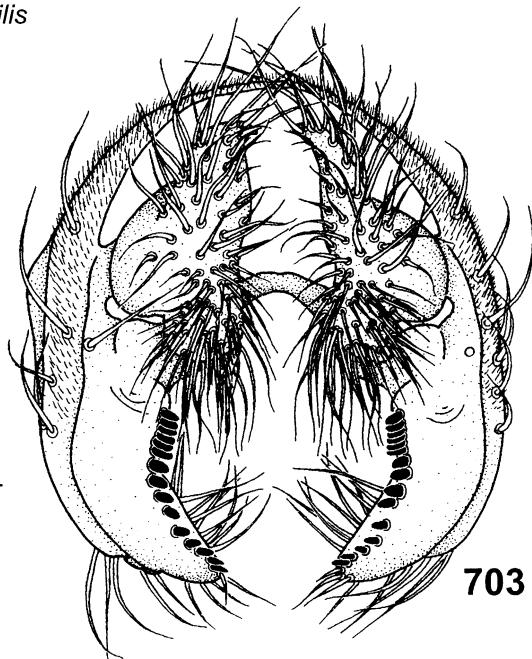
Wing hyaline, length 2.53 (2.41-2.63) mm, length to width ratio = 2.37 (2.32-2.43). Indices: C = 3.27 (3.06-3.57), ac = 2.57 (2.33-2.67), hb = 0.31 (0.25-0.38), 4C = 0.69 (0.61-0.73), 4v = 1.47 (1.39-1.59), 5x = 1.64 (1.43-1.83), M = 0.46 (0.43-0.52), prox. x = 0.42 (0.39-0.45).

Abdomen longish, blackish-brown, subshining.

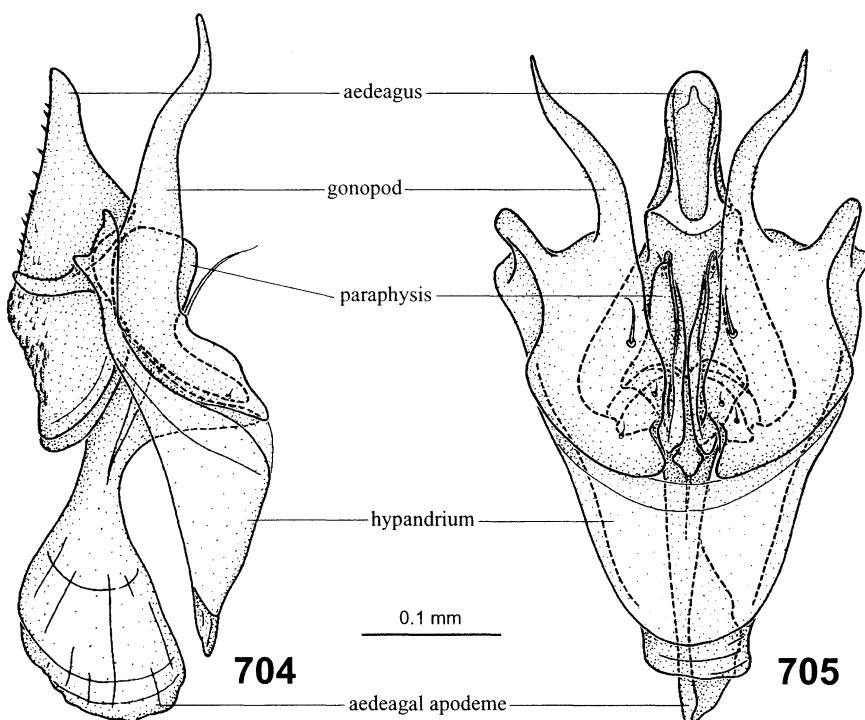
♂ Terminalia (Figs 702-705). Epandrium dorsoposteriorly microtrichose, with ca. 9 lower, and 1 upper setae; ventral lobe neither microtrichose nor covering surstylus. Cercus reduced, upper positioned, medially expanded laterally, where it is partially fused to epandrium by a weakly sclerotised bridge, slightly microtrichose, inner ventral margin narrow, with a conspicuous, large tuft of long setae; ventral lobes absent. Surstylus huge, slightly crescentic, dorsoventrally very elongate, ventrally curved inwards, not microtrichose, with a concave row of ca. 15 peg-like prensisetae on the mesal surface, upper ones compacted, lower ones spaced, roundish at tip, ca. 14 inner and 4 outer setae, uppermost one unusually long and situated above ventral margin of cercus; surstyli widely separated from each other. Decasternum reduced, horizontally positioned, triangular and laterally weakly sclerotised, as in Fig. 703. Hypandrium anteriorly weakly sclerotised, longer than epandrium, anterior margin narrow, straight; posterior hypandrial process and dorsal arch absent; gonopod linked to paraphysis by membranous tissue, with 1 seta near median inner mar-

consimilis

702



703



Figs. 702-705. *Scaptomyza consimilis* Hackman. 702: epandrium, cerci, and surstyli, left lateral view; 703: idem, plus decasternum, posterior view; 704: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 705: idem, posterior view.

gin, and 2 setulae below; inner margin with a long, sharp, sinuate, finger-shaped, backwardly-directed process. Aedeagus anteriorly expanded laterally, with a strongly sclerotised anterior margin, dorsoventrally flattened, embracing dorsodistal region of aedeagal apodeme, fused to aedeagal apodeme, dorsally covered with tiny scales, submedially slightly expanded ventrad in lateral view; dorsal cleft half of its length. Aedeagal apodeme as long as aedeagus, laterally flattened, medially strongly narrowed. Ventral rod as long as width of adjacent aedeagal apodeme. Paraphysis anterodorsally expanded, basally very long, with 2 setulae, linked both to gonopod and to ventrodistal margin of aedeagal apodeme by membranous tissue.

♀. Differences from male: dorsal rows of upright setae on tarsomeres almost absent.

Measurements: Frontal length 0.31 mm; frontal index = 0.95 (0.90-1.00), top to bottom width ratio = 1.27 (1.20-1.33). Frontal triangle about 72-83% of frontal length; ocellar triangle about 39-44% of frontal length. Orbital plates about 83-89% of frontal length. Distance of or3 to or1 = 50% of or3 to vtm, or1 / or3 ratio = 0.72 (0.64-0.79), or2 / or1 ratio = 0.61 (0.55-0.67), postocellar setae = 64 (61-67)%, ocellar setae = 91 (83-100)% of frontal length; vibrissal index = 0.49 (0.42-0.55). Cheek index about 4-7. Eye index = 1.12 (1.09-1.14). Thorax length 1.08 (1.05-1.11) mm. h index = 1.08. Transverse distance of dorsocentral setae 121-160% of longitudinal distance; dc index = 0.70 (0.64-0.77). Distance between apical scutellar setae about 54-69% of that of apical to basal one; scut index = 1.38, sterno index = 0.62 (0.56-0.70), median katepisternal seta about 29-62% of anterior one. Wing length 2.92 (2.87-2.98) mm, length to width ratio = 2.45 (2.43-2.48). Indices: C = 3.41 (3.35-3.47), ac = 2.48 (2.43-2.57), hb = 0.30 (0.29-0.33), 4C = 0.67 (0.64-0.71), 4v = 1.50 (1.36-1.71), 5x = 1.69 (1.50-1.86), M = 0.48 (0.43-0.54), prox. x = 0.40 (0.38-0.42).

♀ Terminalia (Fig. 693). Valve of oviscapt well-developed, apically rounded, ventrally slightly sinuate, with ca. 27 discal, and ca. 17 marginal, strong, peg-like outer ovisensilla, mostly roundish at tip; inner trichoid-like ovisensilla: 3 thin, ventrodistally positioned (not seen even under high magnification, but recognisable by their alveoli seen from above) and 1 small, curved, subterminal.

Distribution. – A Palaearctic species, found in Finland (northernmost locality: Joutseno) but also rarely in Central Europe, Latvia, northwestern Russia and East Asia.

Additional specimens examined [ZMUH]. 4 ♂♂ (FINLAND: T:e [Tvärminne], 1 ♂, 1956 [holotype, 1955 ?]. LATVIA: Riebezers, 1 ♂, 1991. RUSSIA: Bolscheryetsk, 1 ♂ paratype, 1917, 1 ♂ non-paratype, 1917; 1 ♂, no locality, 1956), 2 ♀♀ (RUSSIA: Bolscheryetsk, 1 ♀ paratype, 1917, 1 ♀ non-paratype, 1917).

Comments. – The male specimen from Tvärminne listed above has been previously dissected, most certainly by Hackman. Below the specimen there is a plastic rectangle, with the non-disarticulated terminalia in a posterior position, and with the following labels: “*Scaptomyza* n. sp. [illegible handwriting] T:e [Tvärminne] 5.6.56 / Mus. Zool. H:fors [Helsingfors], Spec. typ. No 8225, *Scaptomyza* ♂ *consimilis* Hackm / Mus. Zool. Helsinki loan Nr. D01 – 201”. Although the collection date is written as 5.6.56 on the label and is cited as 5.6.1955 in the original description (Hackman, 1955: 82), the difference in the year is certainly due to a lapsus during the labelling process. We consider that this specimen is obviously the holotype and have added to it a red label “HOLOTYPE”.

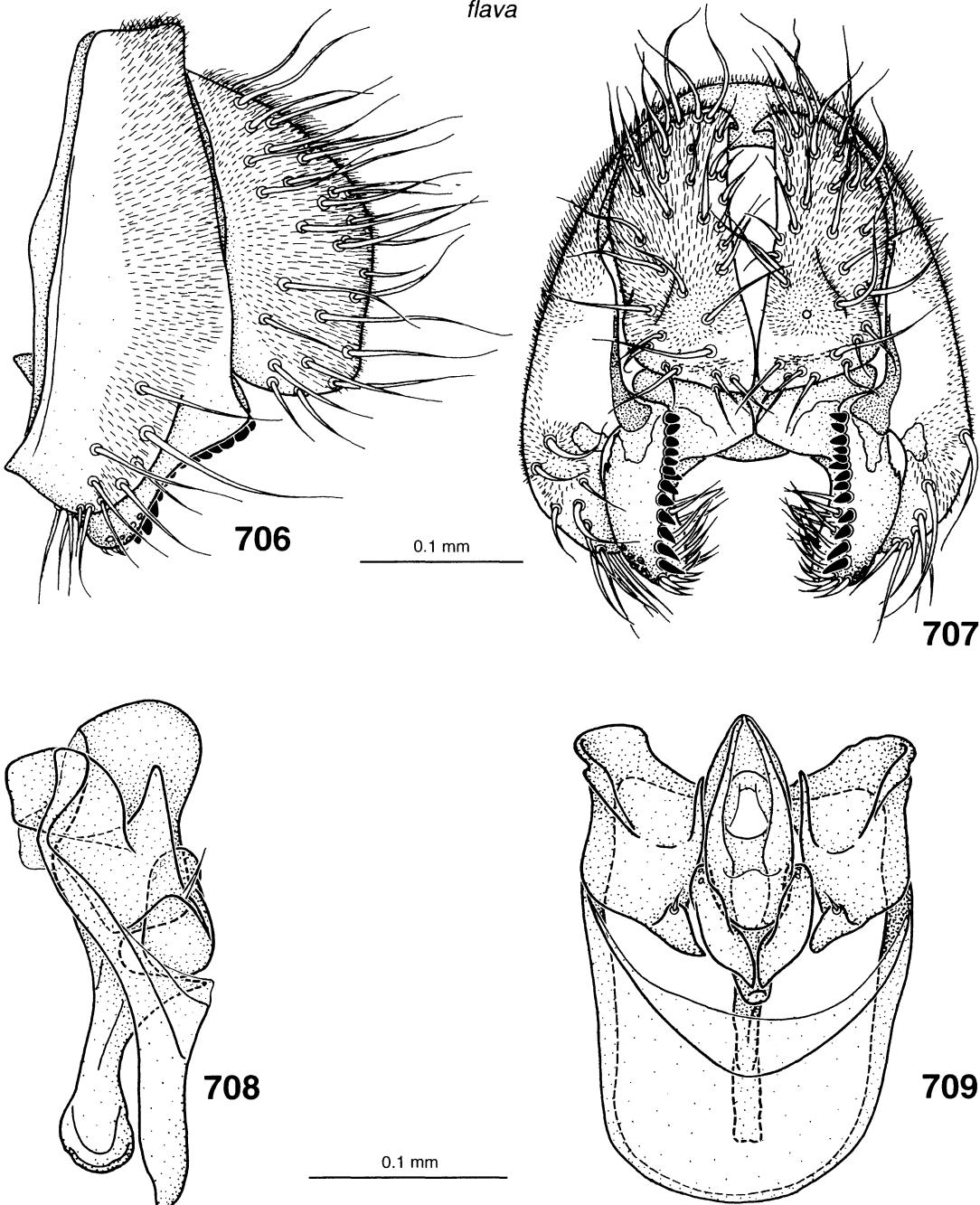
Scaptomyza flava (Fallén, 1823)

(Figs 662, 663, 706-710)

Drosophila flava Fallén, 1823: 7.
Drosophila flaveola Meigen, 1830: 66.
Drosophila ruficeps von Roser, 1840: 62.
Scaptomyza apicalis Hardy, 1849: 362.

Diagnosis. – Greyish or yellowish flies; a minute seta present between posterior reclinate orbital and medial vertical setae; cercus broad, ventral margin slightly folded inwards, somewhat straight; surstylus with a long, straight row of prensisetae, upper ones compacted, lower ones spaced; oviscapt valve apically remarkably blunt, with marginal, stout, outer ovisensilla.

Redescription. – ♂. Head. Frons usually yellowish, dull greyish microtrichose, in dark specimens at least upper half greyish-brown, frontal length 0.33 (0.28-0.37) mm; frontal index = 1.16 (1.06-1.25), top to bottom width ratio =



Figs. 706-709. *Scaptomyza flava* (Fallén). 706: epandrium, cerci, surstyli, and anterior region of decasternum (left), left lateral view; 707: idem, plus decasternum, posterior view; 708: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 709: idem, posterior view.

1.26 (1.16-1.33). Frontal triangle pale, apically pointed, about 63-88% of frontal length; ocellar triangle slightly prominent, prolonged, blackish, about 39-42% of frontal length. Frontal vitiae golden-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 80-94% of frontal length. Orbital setae brown, or2 outside and slightly behind or1, usually with a minute, additional seta between or3 and vtm (Fig. 662), distance of or3 to or1 = 50-62% of or3 to vtm, or1 / or3 ratio = 0.98 (0.85-1.11), or2 / or1 ratio = 0.45 (0.40-0.50); a minute, isolated seta between or3 and vtm; postocellar setae = 48 (45-50)%, ocellar setae originating at lateral margins of ocellar triangle, about 55 (48-61)% of frontal length; vibrissal index = 0.52 (0.36-0.70). Face, parafacialia and gena whitish-yellow. Carina absent. Cheek index about 5-8. Eye index = 1.17 (1.10-1.21). Occiput slightly convex, brownish, black above foramen. Arista with 3(-4) dorsal, 1 ventral and about 6 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

Thorax length 0.94 (0.88-1.05) mm. Scutum usually yellowish, subshining, in dark specimens with greyish-brown stripes, one narrow median and two broad lateral ones, 4 rows of acrostichal setulae, two external rows not reaching scutellum. h index = 1.27 (1.20-1.44). Transverse distance of dorsocentral setae 117-133% of longitudinal distance; dc index = 0.71 (0.65-0.78). Scutellum (Fig. 663) slightly prolonged, pale brownish, distance between apical scutellar setae about 60-80% of that of apical to basal one; basal ones convergent; scut index = 1.15 (1.13-1.19). Pleura usually brownish-yellow, in dark specimens brownish in lower half, sterno index = 0.57 (0.47-0.69), median katepisternal seta about 33-46% of anterior one. Haltere whitish-yellow. Legs yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.34 (2.17-2.66) mm, length to width ratio = 2.29 (2.26-2.32). Indices: C = 3.06 (2.80-3.36), ac = 2.68 (2.29-3.00), hb = 0.45 (0.33-0.53), 4C = 0.73 (0.64-0.83), 4v = 1.56 (1.32-1.83), 5x = 1.72 (1.43-2.20), M = 0.44 (0.40-0.58), prox. x = 0.40 (0.32-0.44).

Abdomen usually pale yellowish, in dark specimens brownish, subshining, tergites 5-6 shining, all tergites with narrow, yellow hind margins.

♂ Terminalia (Figs 706-709). Epandrium posteriorly microtrichose, with ca. 12 lower, and no upper setae; ventral lobe dorsoposteriorly weakly sclerotised, posteriorly microtrichose and partially covering surstylos. Cercus slightly pointed ventrad, linked to epandrium by membranous tissue, mostly microtrichose, slightly rugose medially, ventral margin slightly folded inwards and "inner wall" with some small setae near inner corner as shown in Fig. 707; ventral lobes absent. Surstylus anterodorsally strongly sclerotised, not microtrichose, with a straight row of ca. 13 sharp, peg-like prensisetae on mesal surface, upper ones compacted, lower ones spaced, ca. 16 inner and ca. 6 outer setae; surstyli widely separated from each other, dorsally expanded and fused to decasternum, inner wall concave. Decasternum triangular, horizontally positioned, as in Fig. 707. Hypandrium anteriorly weakly sclerotised, shorter than epandrium, anterior margin convex; posterior hypandrial process absent, dorsal arch almost complete; gonopods medially bent, posterior half perpendicular to anterior half, linked to paraphysis by membranous tissue, with one small seta near median inner margin on a small process; inner margin prolonged backwards as a blade embracing aedeagus ventromedially. Aedeagus fused to aedeagal apodeme, slightly flattened laterally, distally roundish at tip in lateral view, dorsal margin sinuate. Aedeagal apodeme shorter than aedeagus, laterally flattened, ventrally concave. Ventral rod longer than width of adjacent aedeagal apodeme. Paraphysis distally with 2 setulae, linked both to gonopod and to ventrodistal margin of aedeagal apodeme by membranous tissue.

♀. Measurements: Frontal length 0.37 (0.27-0.39) mm; frontal index = 1.16 (0.94-1.21), top to bottom width ratio = 1.24 (1.18-1.32). Frontal triangle about 61-68% of frontal length; ocellar triangle about 35-45% of frontal length. Orbital plates about 82-86% of frontal length. Distance of or3 to or1 = 40-60% of or3 to vtm, or1 / or3 ratio = 0.92 (0.86-1.00), or2 / or1 ratio = 0.59 (0.46-0.75), postocellar setae = 55 (50-63)%, ocellar setae = 72 (57-81)% of frontal length; vibrissal index = 0.63 (0.42-0.80). Cheek index about 3-6. Eye index = 1.16 (1.09-1.24). Thorax length 1.08 (0.88-1.19) mm. h index = 1.17 (1.08-1.25). Transverse distance of dorsocentral setae 115-138% of longitudinal distance; dc index = 0.73 (0.55-0.82). Distance between apical

scutellar setae about 75-100% of that of apical to basal one; scut index = 1.18 (1.10-1.50), sterno index = 0.55 (0.50-0.59), median katepisternal seta about 46-67% of anterior one. Wing length 2.81 (2.76-2.87) mm, length to width ratio = 2.38 (2.34-2.47). Indices: C = 3.10 (2.75-3.44), ac = 2.62 (2.29-2.86), hb = 0.47 (0.39-0.56), 4C = 0.68 (0.57-0.83), 4v = 1.42 (1.25-1.63), 5x = 1.43- (1.13-1.57), M = 0.39 (0.35-0.46), prox. x = 0.36 (0.32-0.38).

♀ Terminalia (Fig. 710). Valve of oviscapt well-developed, distally conspicuously blunt, ventrally slightly convex, with ca. 13 discal (8 medially and 5 marginally positioned), and ca. 21 marginal, stout, peg-like outer ovisensilla, roundish at tip, in addition to ca. 15 tiny scales ventrodistally; inner trichoid-like ovisensilla: 3 thin, ventrodistally positioned, dorsalmost between 5th and 6th apical setae [from dorsal to ventral] (not seen even under high magnification, but recognisable by their alveoli seen from above) and 1 small (just slightly longer than adjacent peg-like seta), curved, subterminal.

Distribution. – A widespread Holarctic species. Recorded in Estonia, Latvia, and all the Scandinavian countries. Northernmost record: Stalojokk (Sweden).

Biology. – The leaf-mining larvae have been found in various plants, particularly in Brassicaceae. Detailed information on the biology of this species is given by Máca (1972).

Additional specimens examined. – 5 ♂♂ (LATVIA: Engure, 1 ♂, 2001. TURKEY: Semdinli, 4 ♂♂, 1983), 4 ♀♀ (AUSTRIA: Gleirsch: 1 ♀, 1976. [Country ?]: no locality, 1 ♀, 1976, 2 ♀♀, 1977).

Scaptomyza graminum (Fallén, 1823)

(Figs 52, 664, 665, 711, 714-717)

Drosophila graminum Fallén, 1823: 8.

Drosophila incana Meigen, 1830: 86.

Drosophila rufipes Meigen, 1830: 87.

Drosophila flavipennis Zetterstedt, 1838: 777.

Drosophila sordida Zetterstedt, 1838: 777.

Scaptomyza tetrasticha Becker, 1908: 158.

Drosophila semiatricornis Duda, 1935: 69.

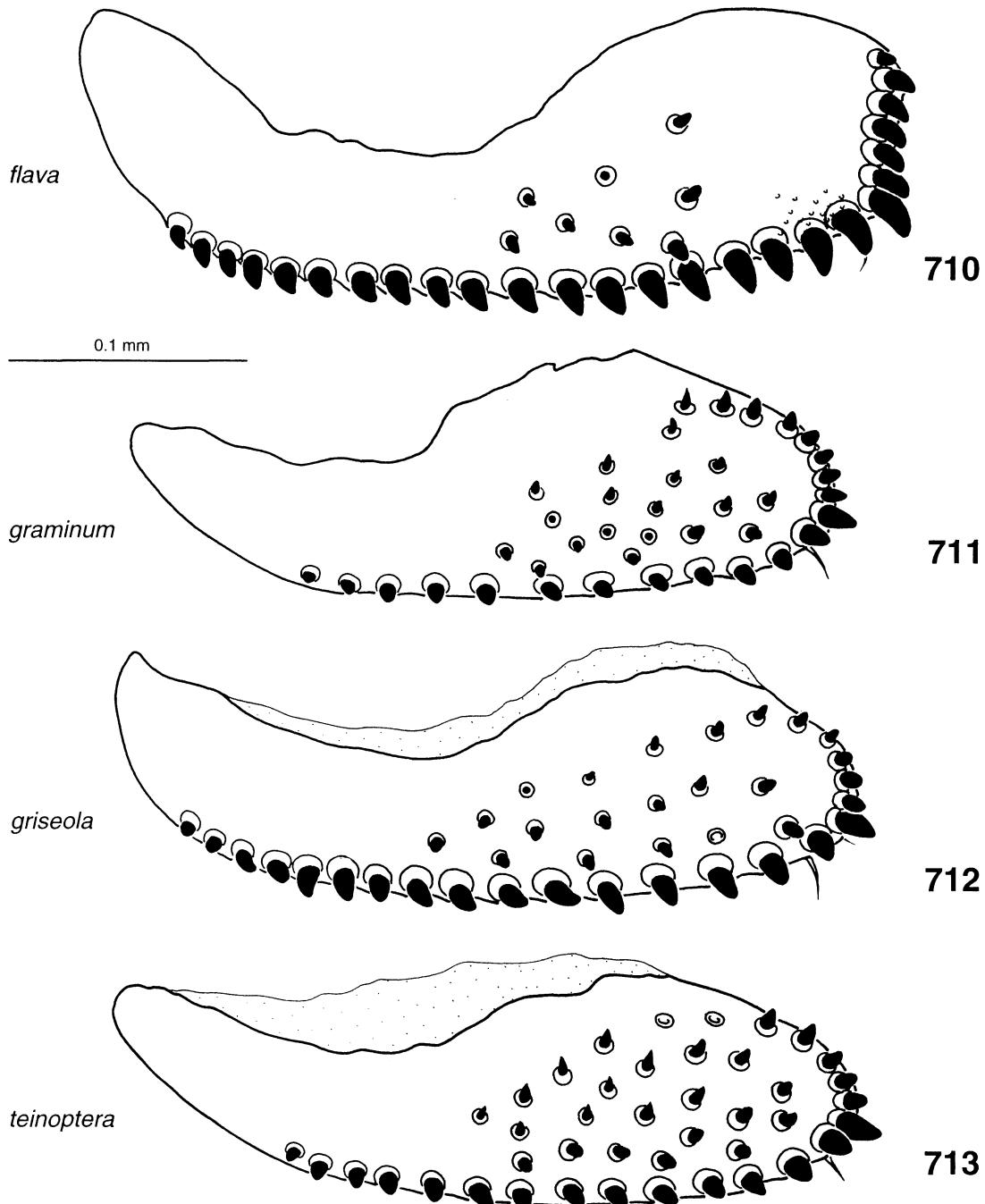
Scaptomyza borealis Wheeler, 1952: 204.

Scaptomyza norica Hackman, 1955: 86.

Diagnosis. – Greyish flies; no minute seta present between posterior reclinate orbital and medial vertical setae; cercus ventrally very broad, remarkably roundish ventrad and bag-shaped in lateral view, ventrally without setae and microtrichia, but slightly microtrichose on inner, horizontally positioned, membranous area; anterior margin medially with a strong, sclerotised knob-shaped process; surstylus with a long, straight row of compacted, peg-like prensisetae; aedeagus very flattened laterally, dorsally membranous; paraphysis anteriorly membranous; oviscapt valve roundish apically.

Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, yellowish below, dull greyish microtrichose, frontal length 0.28 (0.23-0.31) mm; frontal index = 1.07 (0.93-1.29), top to bottom width ratio = 1.32 (1.16-1.50). Frontal triangle greyish, dull, about 56-76% of frontal length; ocellar triangle slightly prominent, prolonged, blackish, about 39-60% of frontal length. Frontal vittae brownish-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 81-100% of frontal length. Orbital setae blackish-brown, or2 outside and more or less at level of or1, distance of or3 to or1 = 37-71% of or3 to vtm, or1 / or3 ratio = 1.01 (0.83-1.13), or2 / or1 ratio = 0.63 (0.50-0.75), postocellar setae = 59 (47-71)%, ocellar setae originating at lateral margins of ocellar triangle, about 62 (53-69)% of frontal length; vibrissal index = 0.58 (0.45-0.78). Face, parafacilia and gena yellowish-white. Carina absent. Cheek index about 3-8. Eye roundish, slightly oblique, index = 1.13 (1.00-1.22). Occiput blackish-brown, greyish above foramen. Arista with 3(-4) dorsal, 1 ventral and about 7 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

Thorax length 0.86 (0.78-0.94) mm. Scutum pale greyish, greyish microtrichose, usually with brownish stripes, a narrow one between innermost rows of acrostichal setulae and two broad, lateral ones, 4 rows of acrostichal setulae (Fig. 52). h index = 1.70 (1.18-4.50). Transverse distance of dorsocentral setae 108-156% of longitudinal distance; dc index = 0.66 (0.58-0.76). Scutellum (Fig. 665) pale greyish, distance between apical scutellar setae about 67-89% of that of apical to basal one; basal ones convergent; scut index = 1.59 (1.44-1.72). Pleura pale



Figs. 710-713. *Scaptomyza* spp., females – Left oviscapts valves, lateral views.

greyish, sterno index = 0.55 (0.40-0.71), median katepisternal seta about 38-70% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.24 (1.85-2.42) mm, length to width ratio = 2.40 (2.21-2.56). Indices: C = 3.27 (2.64-4.09), ac = 2.64 (1.83-3.25), hb = 0.47 (0.42-0.57), 4C = 0.69 (0.52-0.81), 4v = 1.47 (1.42-1.58), 5x = 1.49 (1.00-2.00), M = 0.44 (0.36-0.53), prox. x = 0.41 (0.32-0.53).

Abdomen longish, blackish-brown, subshining, tergites 4-6 more shining, some tergites with narrow, yellowish hind margins.

♂ Terminalia (Figs 714-717). Epandrium anteriorly straight and medially expanded backwards, posteriorly microtrichose, with ca. 12 lower, and no upper setae; ventral lobe narrow, posteriorly microtrichose, not covering surstyli. Cercus very broad, ventrally conspicuously bag-shaped in lateral view, mostly microtrichose, linked to epandrium by membranous tissue; plates ventrally linked to each other by a pale, wide, slightly microtrichose membrane (intentionally omitted from Fig. 715); anterior margin medially with a short, strongly sclerotised, projecting anterad, knob-shaped process (not seen in Figs 714, 715) just above ventral lobe of epandrium, adjacent to its fusion to surstylus; ventral lobes absent. Surstylus anterodorsally strongly sclerotised, not microtrichose, with a slightly sinuate row of ca. 13 compacted, peg-like prensisetae on mesal surface, ca. 16 long, inner, and ca. 6 outer setae; surstyli widely separated from each other. Decasternum as in Fig. 715. Hypandrium shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopods medially bent, posterior half perpendicular to anterior half, posteriorly with a finger-shaped, backwardly-directed process on inner margin, with 1 small seta near median inner margin on a small, rugose, strongly sclerotised lobe, linked to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, anterior 1/4 less sclerotised than posterior 3/4, dorsally entirely membranous, narrowing towards tip in posterior view, dorsal cleft occupying lower 3/4 and conspicuously with a loose membrane, expanded dorsad and as broad as base of aedeagus in lateral view, roundish at tip, with a sinuate ventral margin in lateral view. Aedeagal apodeme shorter than aedeagus, bent,

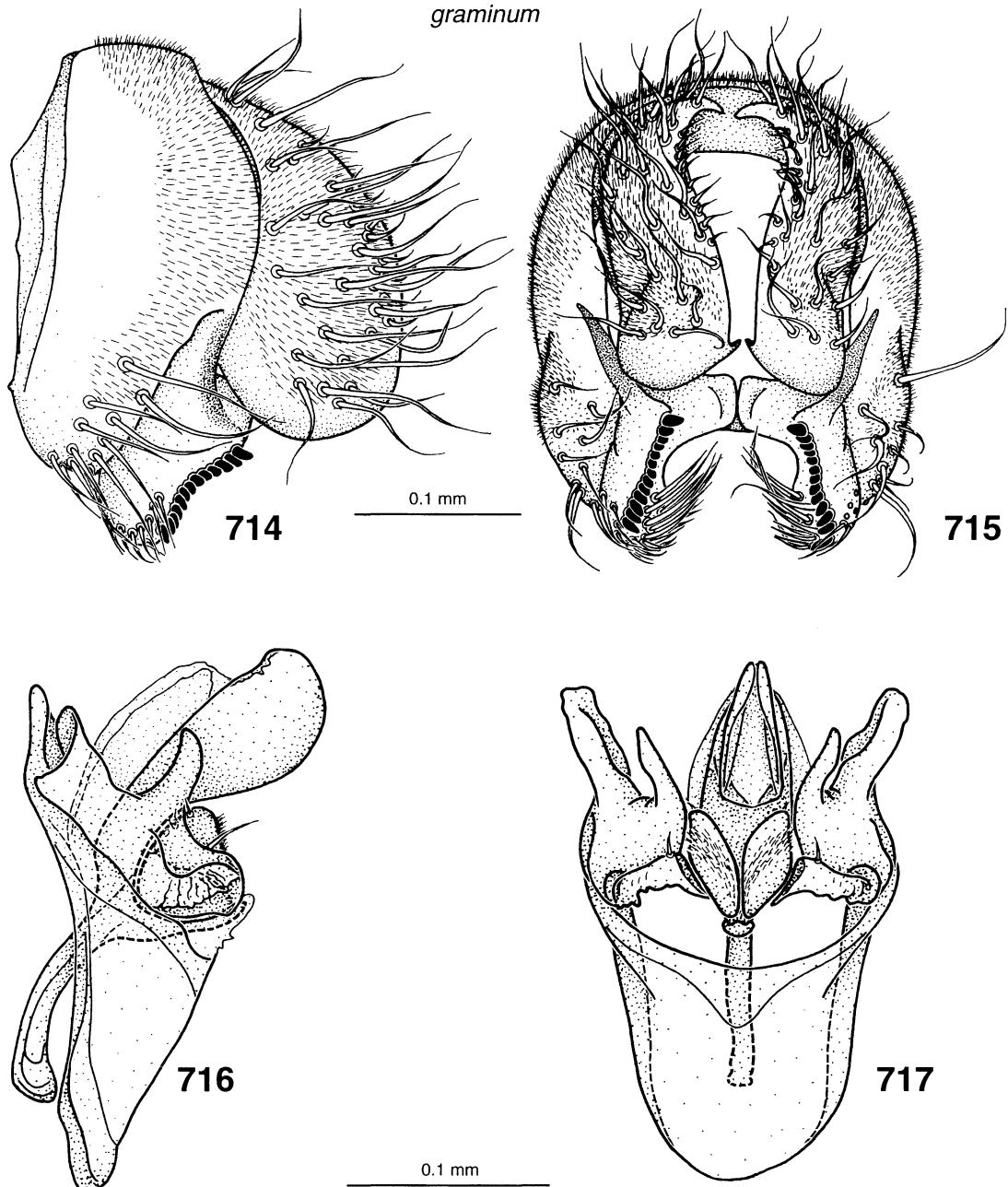
rod-shaped. Ventral rod 4x as long as width of adjacent aedeagal apodeme. Paraphysis somewhat triangular in lateral view, conspicuously membranous dorsoanteriorly and sclerotised posteriorly, distally microtrichose on inner wall, dorsodistally with ca. 3 setulae, linked by membranous tissue to both, gonopod and posterior margin of ventral rod.

♀ Measurements: Frontal length 0.31 (0.27-0.33) mm; frontal index = 1.00 (0.94-1.13), top to bottom width ratio = 1.25 (1.16-1.33). Frontal triangle about 68-78% of frontal length; ocellar triangle about 37-47% of frontal length. Orbital plates about 81-94% of frontal length. Distance of or3 to or1 = 44-71% of or3 to vtm, or1 / or3 ratio = 0.79 (0.67-0.92), or2 / or1 ratio = 0.72 (0.60-0.90), postocellar setae = 66 (53-74)%, ocellar setae = 85 (72-95)% of frontal length; vibrissal index = 0.54 (0.36-0.73). Cheek index about 4-7. Eye index = 1.15 (1.10-1.20). Thorax length 0.95 (0.85-1.02) mm. h index = 1.31 (1.00-1.78). Transverse distance of dorsocentral setae 117-167% of longitudinal distance; dc index = 0.71 (0.64-0.77). Distance between apical scutellar setae about 64-90% of that of apical to basal one; scut index = 1.12 (0.59-1.64), sterno index = 0.52 (0.48-0.55), median katepisternal seta about 38-73% of anterior one. Wing length 2.43 (2.20-2.73) mm, length to width ratio = 2.44 (2.31-2.53). Indices: C = 3.58 (3.20-4.00), ac = 2.48 (2.14-3.00), hb = 0.53 (0.47-0.60), 4C = 0.63 (0.55-0.71), 4v = 1.43 (1.27-1.50), 5x = 1.58 (1.25-2.00), M = 0.41 (0.36-0.45), prox. x = 0.39 (0.35-0.45).

♀ Terminalia (Fig. 711). Valve of oviscapt well-developed, apically rounded, ventrally almost straight, with 21-25 discal, and 14-15 marginal, peg-like outer ovisensilla, mostly roundish at tip; inner trichoid-like ovisensilla: 3 thin (not seen even under high magnification, but recognisable by their alveoli seen from above) ventrodistally positioned and 1 small (just slightly longer than adjacent peg-like seta), curved, subterminal.

Distribution. – A widespread Holarctic species. Recorded in Estonia, Latvia, all the Scandinavian countries and Iceland. Northernmost locality: Torsvåg (Norway).

Biology. – The larvae are leaf-miners in various plant species. Detailed information on the biology of this species is given by Máca (1972).



Figs. 714-717. *Scaptomyza graminum* (Fallén). 714: epandrium, cerci, and surstyli, left lateral view; 715: idem, plus decasternum, posterior view; 716: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 717: idem, posterior view.

Additional specimens examined. – 4 ♂♂ (AUSTRIA: Stams, 1 ♂, 1974-1975. SWITZERLAND: Glarus, 3 ♂♂, 1974), 4 ♀♀ (SWITZERLAND: Aargau, 2 ♀♀, 1965/1966, 1973; Ticino, 2 ♀♀, 1970).

Scaptomyza griseola (Zetterstedt, 1847)

(Figs 712, 718-721)

Drosophila griseola Zetterstedt, 1847: 2562.
Drosophila grisecens Duda, 1921: 67 (lapsus?).
Drosophila grisescens Duda, 1924: 211.

Diagnosis. – Greyish flies; no minute seta present between posterior reclinate orbital and medial vertical setae; cercus positioned above surstyli, roundish at tip in lateral view; surstylus microtrichose with a long, curved row of short, peg-like prensisetae, dorsal margin of aedeagus submedially slightly projecting anterodorsad in lateral view; oviscapit valve apically slightly blunt.

Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, brownish below, yellow above antennae, in some specimens fully blackish except a brownish band above antennae, frontal length 0.28 (0.23-0.31) mm; frontal index = 0.95 (0.88-1.00), top to bottom width ratio = 1.32 (1.17-1.53). Frontal triangle greyish, dull, about 60-76% of frontal length. Ocellar triangle slightly prominent, prolonged, blackish, about 39-57% of frontal length. Frontal vittae brownish-yellow to dark brown. Orbital plates broad, apically slightly diverging from eye margin, about 87-100% of frontal length. Orbital setae blackish-brown, or2 outside and more or less in front of or1, distance of or3 to or1 = 33-62% of or3 to vtm, or1 / or3 ratio = 0.92 (0.82-1.00), or2 / or1 ratio = 0.62 (0.44-0.88), postocellar setae = 60 (50-71)%, ocellar setae originating at lateral margins of ocellar triangle, about 72 (50-88)% of frontal length; vibrissal index = 0.59 (0.50-0.70). Face, parafacalia and gena yellowish-white. Carina virtually absent. Cheek index about 4-6. Eye roundish, main axis oblique, index = 1.14 (1.10-1.18). Occiput blackish-brown, greyish above foramen. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 3-4 dorsal, 1 ventral and about 7 relatively long inner branches, plus ter-

mal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

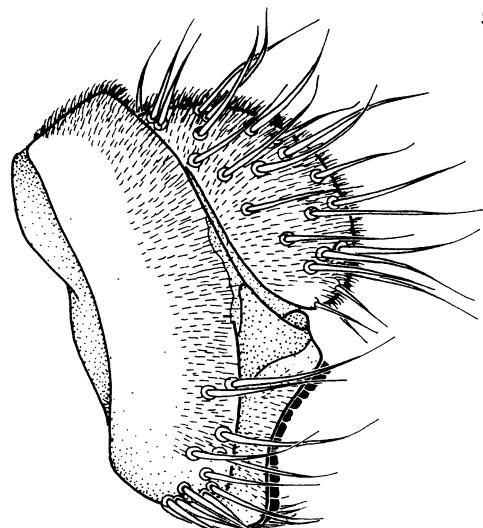
Thorax length 0.79 (0.71-0.85) mm. Scutum brownish-black, greyish microtrichose, in some specimens with brownish stripes, a narrow one between innermost rows of acrostichal setulae and two broad, lateral ones, 4 rows of acrostichal setulae. h index = 1.11 (1.00-1.25). Transverse distance of dorsocentral setae 120-156% of longitudinal distance; dc index = 0.71 (0.62-0.82). Scutellum pale greyish, distance between apical scutellar setae about 67-87% of that of apical to basal one; basal ones divergent and apically surpassing apical ones; apical ones slightly upright, scut index = 1.39 (1.24-1.47). Pleura pale greyish-brown, sterno index = 0.50 (0.44-0.56), median katepisternal seta about 50% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, tarsomeres 3-5 dorsally with 2-3 rows of prolonged setae, their length about twice width of tarsomeres, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 1.93 (1.78-2.14) mm, length to width ratio = 2.33 (2.04-2.44). Indices: C = 2.85 (2.47-3.36), ac = 2.88 (2.20-3.75), hb = 0.49 (0.46-0.58), 4C = 0.74 (0.65-0.88), 4v = 1.43 (1.32-1.53), 5x = 1.55 (1.20-1.80), M = 0.44 (0.38-0.53), prox. x = 0.38 (0.35-0.41).

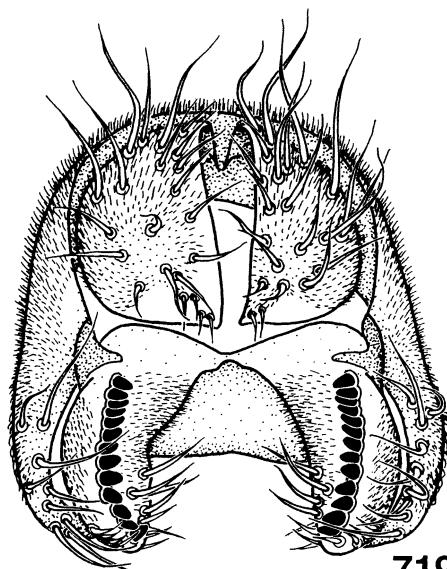
Abdomen longish, blackish-brown, subshining, tergites 4-6 more shining, some tergites with narrow, yellowish hind margins.

♂ Terminalia (Figs 718-721). Epandrium posteriorly microtrichose, with ca. 13 lower, and no upper setae; ventral lobe narrow, posteriorly microtrichose, not covering surstylus. Cercus linked to epandrium by membranous tissue, ventrally roundish at tip in lateral view, inner corner with 2 small setae; ventral lobes absent. Surstylus anterodorsally strongly sclerotised, distally microtrichose on inner and mostly microtrichose on outer surface, with a concave row of ca. 13 short, peg-like prensisetae on mesal surface, roundish at tip, ca. 8 inner, and ca. 5 outer setae; surstyli widely separated from each other. Decasternum well-developed, as in Fig. 719. Hypandrium weakly sclerotised, shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod without seta, medially bent, posterior half perpendicular to anterior half, linked to paraphysis by membranous tissue; inner margin dorsally with a small, laterally flattened, backwardly-directed lobe, slightly embracing

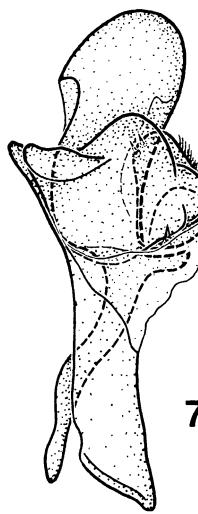
griseola



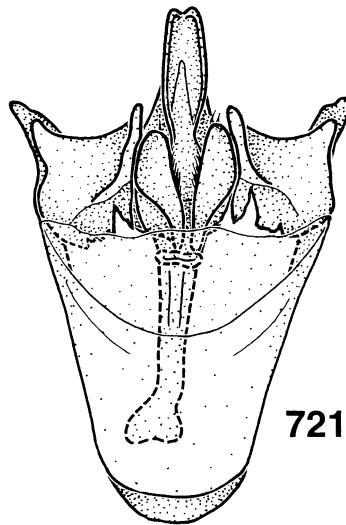
718



719



720



721

0.1 mm

Figs. 718-721. *Scaptomyza griseola* (Zetterstedt). 718: epandrium, cerci, and surstyli, left lateral view; 719: idem, plus decasternum, posterior view; 720: hypandrium, gonopods, paraphyses, and aedeagal apodeme, left lateral view; 721: idem, posterior view.

aedeagus ventromedially. Aedeagus fused to aedeagal apodeme, distally flattened laterally, roundish at tip and submedially slightly projecting anterodorsad in lateral view. Aedeagal apodeme as long as aedeagus, bent, rod-shaped. Ventral rod as long as width of adjacent aedeagal apodeme. Paraphysis mostly microtrichose on inner surface, dorsodistally with ca. 2 setulae, linked by membranous tissue to both, gonopod and posterior margin of ventral rod.

♀. Measurements: Frontal length 0.29 (0.27-0.32) mm; frontal index = 0.91 (0.85-1.00), top to bottom width ratio = 1.31 (1.21-1.50). Frontal triangle about 69-76% of frontal length; ocellar triangle about 44-47% of frontal length. Orbital plates about 75-94% of frontal length. Distance of or3 to or1 = 33-57% of or3 to vtm, or1 / or3 ratio = 0.88 (0.75-0.91), or2 / or1 ratio = 0.70 (0.60-0.89), postocellar setae = 65 (59-75)%, ocellar setae = 85 (79-88)% of frontal length; vibrissal index = 0.51 (0.42-0.64). Cheek index about 3-5. Eye index = 1.14 (1.11-1.21). Thorax length 0.90 (0.81-0.94) mm. h index = 1.17 (1.00-1.50). Transverse distance of dorsocentral setae 127-144% of longitudinal distance; dc index = 0.72 (0.68-0.77). Distance between apical scutellar setae about 64-80% of that of apical to basal one; scut index = 1.41 (1.32-1.53), sterno index = 0.49 (0.42-0.57), median katepisternal seta about 40-50% of anterior one. Wing length 2.15 (1.92-2.21) mm, length to width ratio = 2.36 (2.29-2.42). Indices: C = 3.14 (2.87-3.31), ac = 2.46 (2.17-2.60), hb = 0.44 (0.38-0.54), 4C = 0.68 (0.65-0.71), 4v = 1.41 (1.33-1.45), 5x = 1.32 (1.17-1.60), M = 0.38 (0.33-0.44), prox. x = 0.38 (0.33-0.45).

♀ Terminalia (Fig. 712). Valve of oviscapt well-developed, apically slightly blunt, ventrally slightly convex, with 22-27 discal, and 17-18 marginal, peg-like outer ovisensilla, roundish at tip; inner trichoid-like ovisensilla: 3 thin, ventrodistally positioned (hardly seen, two of them on lower corner just behind largest marginal, peg-like outer ovisensilla) and 1 small, curved, subterminal.

Distribution. – A widespread West Palaearctic species; found in Estonia, Latvia, and all the Scandinavian countries; northernmost record: Tromsö (Norway). In view of the problems with identification, some of the records may refer to other *Scaptomyza* species.

Biology. – Information on the biology of this species is given by Máca (1972).

Additional specimens examined. – 9 ♂♂ (FINLAND [ZMUL]: Evo, 1 ♂, no date; Muonio, 1 ♂, no date; Pargas, 1 ♂, no date; Vichtis, 1 ♂, no date. LATVIA: Engures [Engure], 2 ♂♂, 1997, 1998. SWEDEN [ZMUL]: Norr Kranksjön, 1 ♂, 1973; Klostersågen, 1 ♂, 1962; Kullaberg, 1 ♂, 1963), 7 ♀♀ (FINLAND [ZMUH]: Borga, 1 ♀, no date; Kuusto, 1 ♀, no date; Padasjoki, 1 ♀, no date. LATVIA: Engures [Engure], 2 ♀♀, 1997, 1998. LITHUANIA: Vilnius, 1 ♀, 1988. RUSSIA: Petrograd, 1 ♀, 1932).

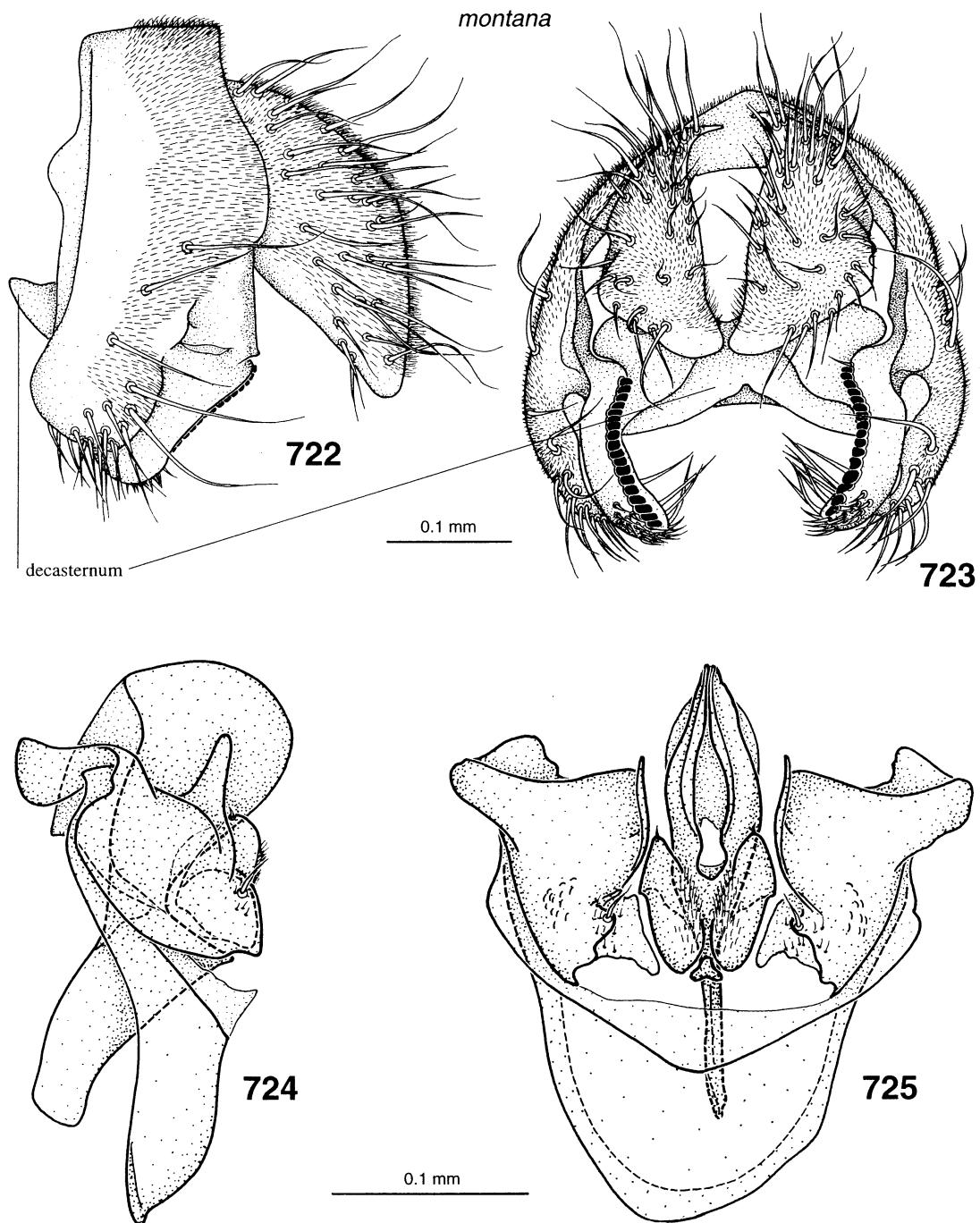
Scaptomyza montana Wheeler, 1949

(Figs 722-725)

Scaptomyza montana Wheeler, 1949: 166.

Diagnosis. – Greyish or yellowish flies; a minute seta present between posterior reclinate orbital and medial vertical setae; cercus narrow, remarkably long, and strongly pointed ventrad; surstyli with a long, concave row of compacted, peg-like prensisetae, blunt at tip; aedeagus roundish at tip, apically slightly projecting dorsad in lateral view; aedeagal apodeme anteriorly narrow, posteriorly broad, strongly flattened laterally; paraphysis microtrichose on inner surface.

Redescription. – ♂. Head. Frons generally yellowish, partially greyish microtrichose, frontal length 0.33 (0.30-0.36) mm; frontal index = 1.04 (1.00-1.12), top to bottom width ratio = 1.25 (1.19-1.35). Frontal triangle pale yellowish, about 58-86% of frontal length; ocellar triangle slightly prominent, prolonged, blackish, about 44-48% of frontal length. Frontal vittae golden-yellow. Orbital plates broad, apically slightly diverging from eye margin, about 81-94% of frontal length. Orbital setae brown, or2 outside and slightly behind or1, usually with an additional seta between or3 and vtm, distance of or3 to or1 = 44-62% of or3 to vtm, or1 / or3 ratio = 0.91, or2 / or1 ratio = 0.61 (0.50-0.70); a minute, isolated seta between or3 and vtm; postocellar setae = 62 (57-67)%, ocellar setae originating at lateral margins of ocellar triangle, about 64 (61-67)% of frontal length; vibrissal index = 0.67



Figs. 722-725. *Scaptomyza montana* Wheeler. 722: epandrium, cerci, surstyli, and anterior region of decasternum (left), left lateral view; 723: idem, plus decasternum, posterior view; 724: hypandrium, gonopods, paraphyses, aedeagus, and aedeagal apodeme, left lateral view; 725: idem, posterior view.

(0.64-0.73). Face, parafacialia and gena whitish-yellow. Carina absent. Cheek index about 3-8. Eye index = 1.16 (1.14-1.20). Occiput slightly convex, brownish, black above foramen. Arista with 3 dorsal, 1 ventral and about 6-7 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpus with 2 dark, subequal setae at tip.

Thorax length 1.02 (0.96-1.07) mm. Scutum yellowish, subshining, with faint greyish-brown stripes, one narrow median and two broad lateral ones, 4 rows of acrostichal setulae, two external rows not reaching scutellum. h index = 1.13 (1.00-1.30). Transverse distance of dorsocentral setae 127-167% of longitudinal distance; dc index = 0.68 (0.58-0.73). Scutellum slightly prolonged, pale brownish, distance between apical scutellar setae about 55-82% of that of apical to basal one; basal ones divergent and apically not surpassing apical ones; scut index = 1.18 (1.14-1.23). Pleura brownish, at least in lower half, sterno index = 0.52, median katepisternal seta about 46% of anterior one. Haltere whitish-yellow. Legs yellowish, preapical setae on all tibiae, apical seta on mesotibia.

Wing hyaline, length 2.58 (2.55-2.59) mm, length to width ratio = 2.46 (2.31-2.55). Indices: C = 2.95 (2.67-3.13), ac = 2.81 (2.57-3.20), hb = 0.42 (0.33-0.50), $4C$ = 0.70 (0.67-0.75), $4v$ = 1.39 (1.33-1.42), $5x$ = 1.36 (1.20-1.50), M = 0.38, prox. x = 0.38 (0.33-0.42).

Abdomen usually pale yellowish, in dark specimens brownish, subshining, tergites 5-6 shining, all tergites with narrow, yellow hind margins.

♂ Terminalia (Figs 722-725). Epandrium posteriorly microtrichose, with ca. 19 lower, and no upper setae; ventral lobe dorsoposteriorly weakly sclerotised, posteriorly microtrichose, not covering surstyli. Cercus narrow, remarkably long and pointed ventrad, mostly microtrichose, devoid of setae and microtrichia on tip, ventral margin folded inwards, preceded by some small setae near inner corner, linked to epandrium by membranous tissue; ventral lobes absent. Surstyli very long, anterodorsally strongly sclerotised, not microtrichose, dorsally expanded, with concave inner wall and partially fused to decasternum, with a concave row of ca. 18 peg-like prensisetae on mesal surface, dorsal ones roundish and ventral ones blunt at tip, ca. 12 short, outer and ca. 9 inner, mostly long, setae; surstyli widely separated from each

other. Decasternum triangular, horizontally positioned, as in Fig. 723. Hypandrium anteriorly weakly sclerotised, shorter than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopods medially strongly bent, posterior half perpendicular to anterior half, widely separated from each other, with 1 seta surrounded by ca. 10 setulae and adjacent to a slightly rugose area (not seen in Fig. 712, 713) near median inner margin, linked to paraphysis by membranous tissue; inner margin dorsally with a small, laterally flattened, backwardly-directed process. Aedeagus fused to aedeagal apodeme, dorsally membranous, laterally strongly flattened, roundish at tip and submedially slightly projecting dorsad in lateral view. Aedeagal apodeme anteriorly narrow, distally broad, as long as aedeagus, slightly bent, strongly flattened laterally. Ventral rod indistinct. Paraphysis microtrichose on inner surface, dorsodistally with 1 setula, linked both to gonopod and to posterior margin of ventral rod by membranous tissue.

♀. Measurements: Frontal length 0.34 (0.32-0.36) mm; frontal index = 0.98 (0.95-1.00), top to bottom width ratio = 1.32 (1.29-1.35). Frontal triangle about 67-68% of frontal length; ocellar triangle about 42-43% of frontal length. Orbital plates about 81-89% of frontal length. Distance of or_3 to or_1 = 44-50% of or_3 to vtm , or_1 / or_3 ratio = 0.82 (0.79-0.85), or_2 / or_1 ratio = 0.64, postocellar setae = 68 (62-74)%, ocellar setae = 80 (76-84)% of frontal length; vibrissal index = 0.69 (0.64-0.73). Cheek index about 5-6. Eye index = 1.11 (1.08-1.14). Thorax length 1.12 (1.09-1.16) mm. h index = 1.08. Transverse distance of dorsocentral setae 142-154% of longitudinal distance; dc index = 0.68 (0.67-0.68). Distance between apical scutellar setae about 62-75% of that of apical to basal one; scut index = 1.14, sterno index = 0.59 (0.58-0.60), median katepisternal seta about 50-87% of anterior one. Wing length 2.71 (2.66-2.77) mm, length to width ratio = 2.35 (2.32-2.38). Indices: C = 2.86 (2.72-3.00), ac = 2.78 (2.57-3.00), hb = 0.38 (0.33-0.44), $4C$ = 0.72, $4v$ = 1.42 (1.40-1.44), $5x$ = 1.54 (1.25-1.83), M = 0.42 (0.40-0.44), prox. x = 0.38 (0.36-0.40).

Distribution. – A widespread but rarely recorded Holarctic species, often confused with other *Scaptomyza* species. Found in Finland (northernmost locality: Inari), northwestern Russia, Lithuania.

Additional specimens examined. – 2 ♂♂ (USA: Pasadena, 1949, 1950), 2 ♀♀ (LITHUANIA: Merkinė, 1 ♀, 1981. USA: Pasadena, 1 ♀, 1949).

Scaptomyza teinoptera Hackman, 1955

(Figs 713, 726-729)

Scaptomyza teinoptera Hackman, 1955: 82.

Diagnosis. – Greyish flies; no minute seta present between posterior reclinate orbital and medial vertical setae; cercus of standard size; surstyli with a long, concave row of peg-like prensisetae, longer and sharper towards lower end; aedeagus long, slightly curved, laterally flattened, even more dorsoapically, distally expanded dorsoventrally in lateral view, dorsodistally covered with tiny scales, anteriorly conspicuously covered with loose, pleated membranous sheath; oviscap valve apically roundish, laterally mostly covered with discal, peg-like outer ovisensilla.

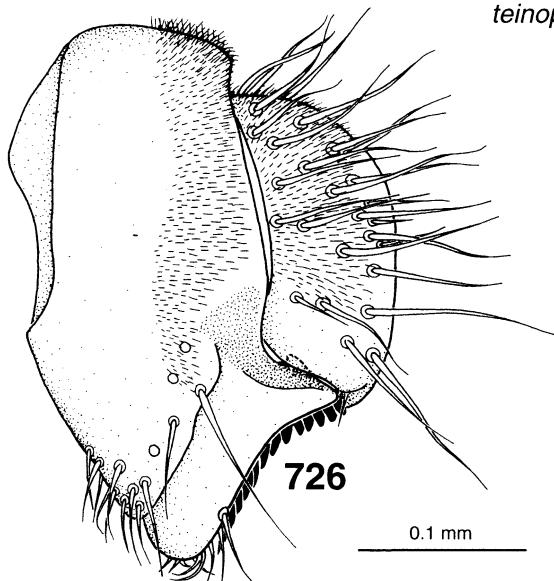
Redescription. – ♂. Head. Frons predominantly greyish-brown in upper half, brownish below, yellow above antennae, frontal length 0.32 (0.31-0.34) mm; frontal index = 1.13 (1.05-1.29), top to bottom width ratio = 1.34 (1.28-1.43). Frontal triangle greyish, dull, about 61-80% of frontal length. Ocellar triangle slightly prominent, prolonged, blackish, about 39-53% of frontal length. Frontal vittae brownish-yellow to dark brown. Orbital plates broad, apically slightly diverging from eye margin, about 78-85% of frontal length. Orbital setae blackish-brown, or2 outside and at level of or1, distance of or3 to or1 = 50-71% of or3 to vtm, or1 / or3 ratio = 1.00, or2 / or1 ratio = 0.58 (0.50-0.64), postocellar setae = 57 (53-58)%, ocellar setae originating at lateral margins of ocellar triangle, about 56 (50-63)% of frontal length; vibrissal index = 0.57 (0.50-0.67). Face, parafacialia and gena yellowish-white. Carina virtually absent. Cheek index about 4-8. Eye roundish, main axis oblique, index = 1.11 (1.05-1.20). Occiput blackish-brown, greyish above foramen. Flagellomere 1 with slightly prolonged marginal setulae. Arista with 3-4 dorsal, 0-1 ventral and about 7 relatively long inner branches, plus terminal fork. Proboscis yellowish. Palpi with 2 dark, subequal setae at tip.

Thorax length 0.94 (0.81-1.00) mm. Scutum yellowish-brown, greyish microtrichose, usually with 3 brownish stripes, a narrow one between innermost rows of acrostical setulae and two broad, lateral ones, 4 rows of acrostical setulae. h index = 1.17 (1.08-1.25). Transverse distance of dorsocentral setae 133-150% of longitudinal distance; dc index = 0.73 (0.64-0.79). Scutellum pale greyish, distance between apical scutellar setae about 58-78% of that of apical to basal one; basal ones divergent and apically surpassing apical ones; apical ones slightly upright, scut index = 1.47 (1.36-1.58). Pleura pale greyish-brown, sterno index = 0.62 (0.55-0.65), median katepisternal seta about 31-38% of anterior one. Haltere whitish-yellow. Legs yellowish-brown, tarsomeres dorsally with 2-3 rows of prolonged setae, their length about twice width of tarsomeres, preapical setae on all tibiae, apical seta on mesotibia.

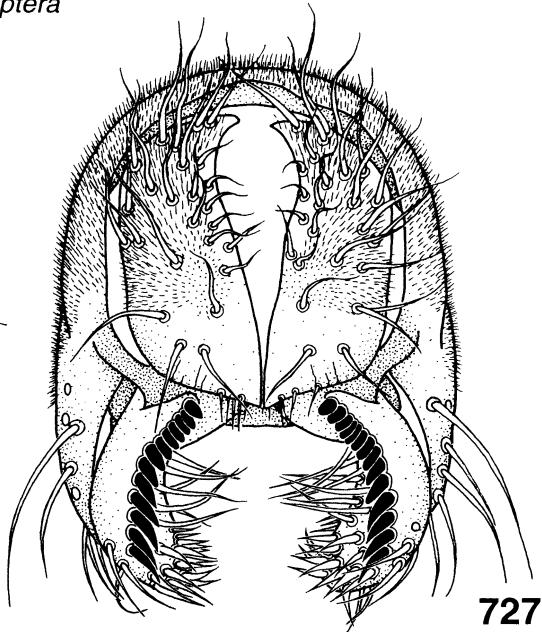
Wing hyaline, length 2.58 (2.27-2.77) mm, length to width ratio = 2.37 (2.24-2.55). Indices: C = 3.29 (2.94-3.40), ac = 2.49 (2.14-3.00), hb = 0.46 (0.31-0.54), 4C = 0.65 (0.62-0.72), 4v = 1.41 (1.35-1.46), 5x = 1.53 (1.43-1.57), M = 0.44 (0.40-0.46), prox. x = 0.39 (0.38-0.44).

Abdomen longish, blackish-brown, subshining.

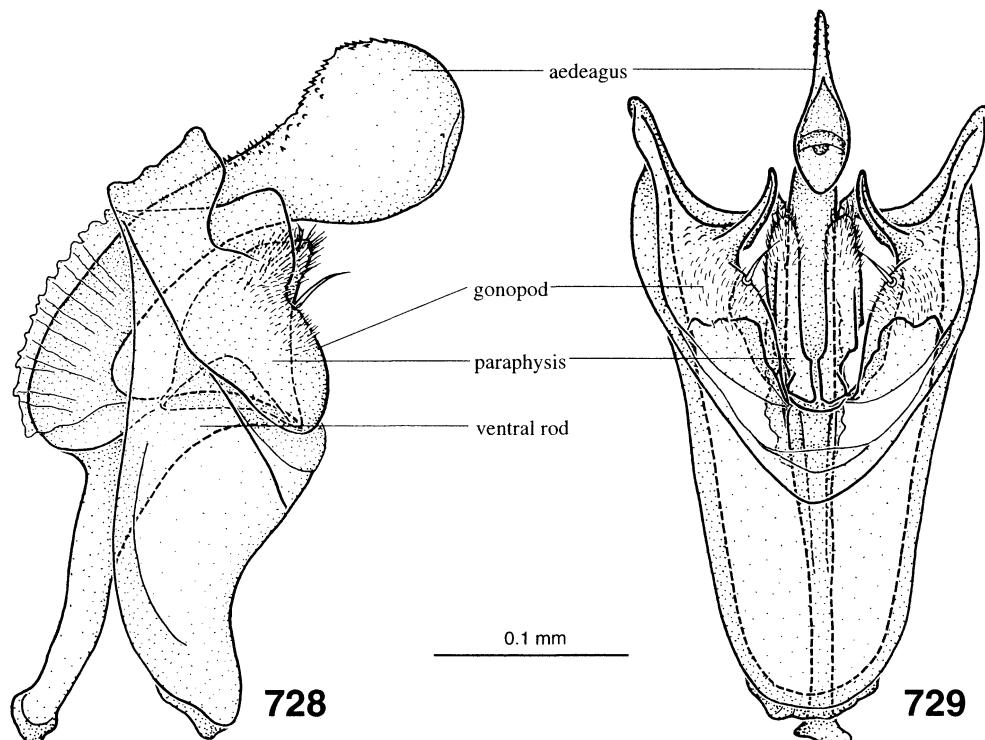
♂ Terminalia (Figs 726-729). Epandrium posteriorly microtrichose, with ca. 15 lower, and no upper setae; ventral lobe dorsoposteriorly slightly microtrichose, not covering surstyli, pointed ventrad in lateral view. Cercus microtrichose, except ventrally, ventral margin folded inwards, preceded by some small setae near inner corner (not seen in Figs 722, 723), linked to epandrium by membranous tissue; ventral lobes absent. Surstyli long, anterodorsally strongly sclerotised, not microtrichose, with a concave row of ca. 14 peg-like prensisetae on mesal surface, dorsal ones small and roundish, ventral ones long and sharp at tip, ca. 40 inner setae, dorsal ones longer and thinner, ventral ones shorter and stouter, and ca. 3 outer setae; surstyli widely separated from each other. Decasternum triangular, horizontally positioned, as in Fig. 727. Hypandrium longer than epandrium, anterior margin convex; posterior hypandrial process and dorsal arch absent; gonopod medially bent, posterior half perpendicular to anterior half, partially microtrichose medially, with 1 seta near median inner margin, linked to paraphysis by mem-

teinoptera

726



727



Figs. 726-729. *Scaptomyza teinoptera* Hackman. 726: epandrium, cerci, and surstyli, left lateral view; 727: idem, plus decasternum, posterior view; 728: hypandrium, gonopods, paraphyses, aedeagal apodeme, left lateral view; 729: idem, posterior view.

braneous tissue; inner margin dorsally with a short, laterally flattened, backwardly-directed lobe. Aedeagus long, slightly curved, fused to aedeagal apodeme, laterally flattened, dorsoapically even more, distally expanded, roundish at tip, and dorsodistally covered with tiny scales, anteriorly conspicuously covered with a loose, pleated membranous sheath, apparently linked laterodistally to posterior margin of gonopods. Aedeagal apodeme shorter than aedeagus, anteriorly slightly bent dorsad, rod-shaped. Ventral rod longer than width of adjacent aedeagal apodeme. Paraphysis somewhat triangular in lateral view, partially microtrichose, dorsodistally with ca. 2 setulae, linked both to gonopod and to posterior margin of ventral rod by membranous tissue.

♀. Measurements: Frontal length 0.32 (0.30-0.34) mm; frontal index = 0.99 (0.95-1.05), top to bottom width ratio = 1.29 (1.26-1.32). Frontal triangle about 74-89% of frontal length; ocellar triangle about 45-50% of frontal length. Orbital plates about 80-94% of frontal length. Distance of or3 to or1 = 44-62% of or3 to vtm, or1 / or3 ratio = 0.80 (0.69-0.87), or2 / or1 ratio = 0.67 (0.62-0.78), postocellar setae = 68 (60-78)%, ocellar setae = 83 (75-89)% of frontal length; vibrissal index = 0.52 (0.46-0.58). Cheek index about 4-7. Eye index = 1.14 (1.09-1.18). Thorax length 1.05 (1.00-1.11) mm. h index = 1.23 (1.15-1.31). Transverse distance of dorsocentral setae 142-163% of longitudinal distance; dc index = 0.70 (0.68-0.73). Distance between apical scutellar setae about 58-73% of that of apical to basal one; scut index = 1.54 (1.48-1.58), sterno index = 0.61 (0.58-0.62), median katepisternal seta about 29-54% of anterior one. Wing length 2.78 (2.52-2.87) mm, length to width ratio = 2.32 (2.28-2.35). Indices: C = 3.66 (3.06-4.83), ac = 2.29 (1.71-2.67), hb = 0.40 (0.31-0.50), 4C = 0.59 (0.44-0.67), 4v = 1.35 (1.29-1.42), 5x = 1.56 (1.43-1.71), M = 0.42 (0.39-0.44), prox. = 0.38 (0.32-0.38).

♀ Terminalia (Fig. 713). Valve of oviscapt well-developed, apically rounded, ventrally slightly convex, with 26-27 discal, and 16-17 marginal, peg-like outer ovisensilla, roundish at tip; inner trichoid-like ovisensilla: 3 thin (hardly seen, two of them on lower corner just behind largest marginal peg-like ovisensilla), ventrodistally positioned and 1 small, as long as adjacent peg-like outer ovisensilla, straight, subterminal.

Distribution. – A Scandinavian species, found in Sweden, Finland (northernmost locality: Utsjoki), northwestern Russia; the southernmost record is in Latvia.

Additional specimens examined. – 6 ♂♂ (FINLAND [ZMUH]: Karislojo, 1 ♂ paratype, no date; Paanajärvi, 1 ♂, no date; Pallastunturi, 1 ♂, no date; Pisavaara Naturpark, 1 ♂, 1951. LATVIA: Engures [Engure], 1 ♂, 1997. RUSSIA [ZMSP]: Petrograd, 1 ♀, 1953), 4 ♀♀ (FINLAND [ZMUH]: Birkkala, 1 ♀ paratype, no date; Kittilä, 1 ♀ paratype, no date; Kuusamo, 1 ♀, no date; Nykarleby, 1 ♀, 1955).

Comments. – Most details of the male terminalia of *Scaptomyza teinoptera*, such as the presence of microtrichiae on gonopods and paraphyses, the relative sizes and shapes of prensistae, and the general shape of epandrium, hypandrium, cerci, surstyli and aedeagus, are similar to those of the male terminalia of *Scaptomyza baechlii* as depicted by Sidorenko (1993: 266, figs. 3-7) in the original description and subsequently, with some corrections, by Toda et al. (1996: 463, fig. 7), which indicates the close but previously overlooked relationship between these two species.

Genus *Zaprionus* Coquillett, 1901

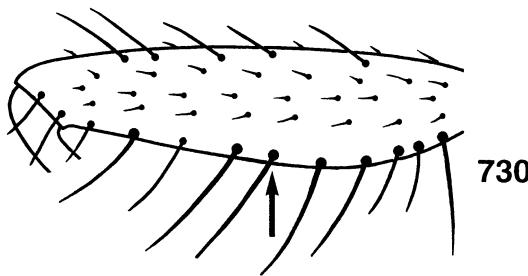
Zaprionus Coquillett, 1901: 31. Type species: *Zaprionus vittiger* Coquillett, 1901.

Aprionus Okada & Carson, 1983: 545 (preocc.). *Anaprionus* Okada, 1990: 154 (subgenus).

Diagnosis. – Arista plumose; orbital plate silvery-white; carina very large; vibrissa strong, followed by small subgenal setae; all head setae developed; orbital setae in line, posterior reclinate orbital seta closer to inner vertical than to proclinate one; mesonotum pale yellowish, with 4 (6 in a few species) silvery-white stripes, each bordered by a narrow black stripe on both sides; prescutellar seta reduced; posterior katepisternal seta large; male profemur usually with tubercles and/or strong setae on lower side.

Taxa included. – A mainly Afrotropical genus; 12 species are included in the subgenus *Anaprionus*, and 44 species in the subgenus *Zaprionus*.

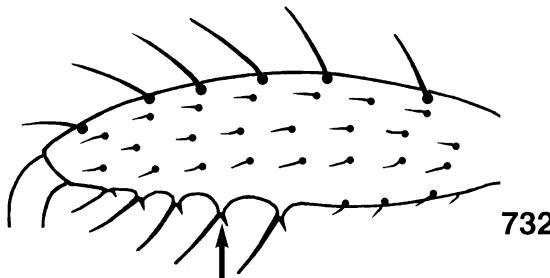
Comments. – Two species groups are recognised in the subgenus *Zaprionus*: the *armatus* and the *inermis* groups. *Zaprionus indianus* Gupta, 1970

ghesquierei

730

tuberculatus

731

indianus

732

Figs. 730-732. *Zaprionus* spp., left profemur, posterior views.

belongs to the former (earlier misidentified as *Z. vittiger* Coquillett, 1901), a domestic species which seems to be on the way to becoming worldwide in distribution. In addition to several records in the Mediterranean area (Italy) and the Canary Islands, the northernmost locality in Europe is Hadersdorf/Vienna, Austria. *Z. tuberculatus* Malloch, 1932, has been recorded in Cyprus, Malta, and the Canary Islands. *Z. ghesquierei* Collart, 1937, of the *inermis* group, has been found in Cyprus.

Key to European species of Zaprionus

1 Profemur simple, without any ventral extensions (Fig. 730).....

..... *Z. ghesquierei* Collart
(recorded from the eastern Mediterranean
area)

- Profemur with distinct tubercle(s), each with a strong seta..... 2
- 2(1) Profemur with a single, prominent, ventral tubercle apically with a strong seta and followed by a smaller, adjacent one (Fig. 731)..... *Z. tuberculatus* Malloch
(recorded from the eastern Mediterranean area and the Canaries)
- Profemur with a row of about five characteristic strong setae, each adjacent to and

divergent with 1 stiff setula, both arising from a small tubercle (Fig. 732).....
..... *Z. indianus* Gupta
(recorded as *Z. vittiger* in the Canaries,

also found near Venice, Italy, and Vienna,
Austria)

Ecology

Drosophilids have long been used as model organisms in ecological studies that aim to understand the special living conditions of selected species, as well as to produce insights into basic questions in ecological research.

Because of the particular climatic conditions in Scandinavia, the study of certain aspects which are important for explaining the local living conditions has been given priority; examples of the characteristics of certain northern populations are given below.

First, an overview is presented of the broad field across which ecological studies on drosophilids have been undertaken. It should be emphasized that the results obtained are extremely interesting, but it must be recognised that even for the best studied species our knowledge of the living conditions is very sparse, and there is much scope for research.

Even though the larvae and adults have many features of their life history in common, ecological studies are usually restricted to just one of these two stages. Many facts of the larval ecology, particularly of the breeding sites, have been reviewed and summarised by Carson (1971), and in the years since then some special aspects connected with larval strategies have been worked out, e.g. the breeding sites in temperate woodlands by Shorrocks (1982), Afrotropical species by Lachaise & Tsacas (1983), and a survey of flower-breeding species by Brncic (1983). These authors have shown that a large number of *Drosophila* species are associated as larvae with decaying and fermenting fruits and that the adults of these species are attracted both by such fruits and by their fermentation by-products, such as CO₂ and ethanol. For this reason, vernacular names such as vinegar flies, pomace flies, fruit flies are widely used, although the latter term is better applied to the Tephritidae, the true fruit flies.

It may be thought that the yeasts occurring in ripening or decaying fruits etc. may be the one dominant larval food (Begon, 1982). However, there are good reasons for believing that the microorganisms developing in decaying yeast cells

may be a more important resource. This view is also based on the hypothesis that microorganisms are the basic food source for the majority of drosophilid species which are obviously not fruit-related. Such microorganisms are also present on decaying plants, decaying bark, slime fluxes on trees, etc.

A second important larval breeding site is the extensive world of fungi. Species of e.g. *Hirtodrosophila*, and *Mycodrosophila*, but also certain species belonging to several groups of *Drosophila*, appear to be specialized mushroom feeders, where adults have been recorded, either as females laying eggs or as males displaying particular mating behaviour, including lekking. As many mushrooms are ephemeral, microorganisms in the decaying material may again be important.

Many species of the large genus *Scaptomyza* have leaf-mining larvae, occurring particularly in Brassicaceae, Caryophyllaceae etc. A review of additional, very bizarre food resources for certain species is given by Ashburner (1981).

Adults are in part biologically connected with the larval breeding sites, and so they are important transporters of yeasts, bacterial and fungal spores to new sites, analogous to the transport of pollen by pollinating insects. Particular aspects of free-moving flies have enabled various features to be studied, e.g. dispersal rates (by release-recapture experiments), associations between species and also between species and plants, heterogeneity in attraction to baits, guilds, abundance differences, and these have been discussed by Barker (1983) and Heed & Mangan (1986).

For species which can be kept in cultures, a series of tests, reviewed by David et al. (1983), have been devised to evaluate the influence of some, particularly abiotic factors on the living conditions of certain drosophilids, factors which may be important for their survival and productivity in nature. Furthermore, laboratory experiments on the competition between species enable hypotheses about features in their distribution to be formulated.

Based on ecological and biogeographical facts, a small number of species have been recorded as cosmopolitan, as reviewed by Dobzhansky (1965) and Parsons & Stanley (1981). Among them are about 20 species which are directly (or indirectly) dependent on human activities, often living indoors. They are called "domestic species", in contrast to the vast majority of species which are called "wild species". The worldwide distribution of some of them is mostly due to the accidental transport of the flies and/or the larvae, the latter usually together with their breeding substrates. Based on the label data of specimens preserved for almost two centuries in museum collections, it can be shown that species like *Drosophila melanogaster* have been recorded for more than a century in almost all biogeographical regions, whereas others, e.g. *Drosophila malerkotliana* and *Zaprionus indianus*, have only spread more recently and at most within the last two decades. There is a chance that further generalist (polyphagous) species will also disperse, particularly in tropical-subtropical areas where comparable environmental conditions enable the species to become easily established once they are introduced.

It should be mentioned that larval parasitoids, reviewed by Carton et al. (1986), may have a powerful influence on the abundance of drosophilids.

Economic aspects

Historically, some species of *Drosophila* have long been known as invaders of homes, wine cellars, and as spoilers of cultivated fruits, and it is of value to survey the harmful and beneficial balance-sheet of the family, as reported by Fitz-Earle & Holm (1983).

Medically, some species are of direct concern (Basden, 1957; Daniel, 1992). Although records of myiasis have not been substantiated, larvae of *Drosophila funebris* were reported from man in the USA, and those of *Drosophila phalerata* in Egypt. Other *Drosophila* larvae are reliably reported as being accidentally ingested with ripe fruit. Of more positive concern are those species reared from human excrement (*Drosophila repleta* and *Drosophila ananassae*). Both species are cosmopolitan, the dark *D. repleta* also being often reported in urinals and toilets as well as a nuisance in adjoining restaurants and hospitals,

where it breeds in the kitchens and is easily seen in large numbers against the white surfaces of bread, plates, tablecloths and wall tiles.

The males of species of *Phortica* cause annoyance by buzzing around peoples' faces and entering the ears and eyes.

A subject of frequent complaint by householders (and of legal proceedings) is the occurrence of puparia of *Drosophila funebris* and *Drosophila busckii* inside bottles of milk.

A further source of domestic vexation are the invasions of swarms of *D. busckii*, *D. funebris*, and *D. hydei* that have bred in nearby clumps of decaying potatoes or in dumps of spoiled fruits, the flies swarming into houses and shops up to 1 km from the larval breeding sites. From dumps of fruit, legions of *D. melanogaster*, *D. immigrans*, *D. hydei* and others are reported as constant nuisances in houses, farmhouses, and grocery stores.

To the industrialist, drosophilids are most likely to be a pest where the country's laws against food contamination are most stringent. In the USA, for example, seizure of food products has taken place because they contained eggs and larval fragments of species of *Drosophila*. The expenditure on research, control, and modification of plant and premises to exclude "vinegar flies" has cost the fruit and food-processing, the canning, and the wine industries many millions of dollars. The fig industry considers species of *Drosophila* to share top place among the major pests and has spent tremendous sums to fight them.

D. melanogaster and *D. subobscura* feed on grapes and cause problems in wineries. The larvae infest the fermenting mash of any alcoholic drink and cause problems in breweries and distilleries. On the positive side, the flies transfer wild yeasts that give fine wines their bouquet.

The leaf-miners (*Scaptomyza* spp.) have for long been reported as damaging crucifer crops (cabbages, swedes, turnips etc.) in various parts of the world.

The transmission of various plant diseases is clearly another important activity of drosophilids. They are vectors of watery rot (peaches), souring (figs), bunch rot (grapes), *Geotrichum* sp. and other rots (tomatoes), and stem rot (melons) in the USA; of sorbose bacteria to cultures (France), acetic organisms to cocoa beans (Jamaica), "bacteria" (Japan), soft rot of celery (England, USA) and wilt fungus of oak (USA).

The preceding records concern the harmful and nuisance aspects of drosophilids. However, many species of *Drosophila* often play a secondary but important role by infesting fruits already damaged by other insects, by birds, storms etc. and they thus contribute to the more efficient completion of the break-down. Some species will also breed readily in plant tissues damaged by other pests, e.g. maize stems attacked by borers have yielded *D. repleta* and *D. busckii*.

Additionally, some species are considered beneficial since the larvae are predaceous on homopterous and other pests, mainly feeding upon their pupal stage, e.g. *Acletoxenus formosus* Loew on *Siphoninus phillyreae* (Haliday) (Homoptera, Aleyrodidae), and *Cacoxenus perspicax* (Knab) on various mealy-bugs (*Pseudococcus* spp.; Homoptera, Pseudococcidae) in the sugar-cane producing areas. This latter species is considered a very effective predator.

Ecology and ethology of northern drosophilids

Routine collecting of drosophilids yields ecological data that are, in part, reflected in the patterns of distribution. We may here briefly mention a focused project to study the structure of a boreal drosophilid community, at Oulanka National Park ($66^{\circ}22'N$, i.e. at about the Arctic Circle in Finland). Flies were trapped along a transect, and a pattern emerged that was used to make an ecological profile of each species (Lumme et al., 1979). Of particular interest were the sympatric species of the *D. virilis* group.

Hoikkala (1986) studied the factors that maintain sexual isolation among four sympatric species of the *virilis* group, namely *Drosophila ezoana*, *D. littoralis*, *D. lummei* and *D. montana*, at Kemi, Finland. The male courtship sounds of the four species are distinctly different. During courtship, males produce sounds mainly by wing vibration which help maintain sexual isolation among sympatric species. The females exert a stabilising selection on the male sounds. This is seen in the very small amount of genetic variation as well as in the lack of geographical variation in male courtship sounds.

Hoikkala & Aspi (1995) and Hoikkala et al. (1998) developed these ideas further. Females tend to mate with males that produce songs with short and dense pulses. This trait is connected with the health (e.g. parasite load) of the male, but may also be associated with an adverse effect

during overwintering. The loci that determine species differences in male courtship song have been localized (Hoikkala et al., 2000), the pattern of inheritance of these characters is known (Huttunen & Aspi, 2003), and nucleotide variation has been described in one of the loci responsible for this variation (Huttunen et al., 2002a, b).

In the early 1970s allozymes were used to describe levels of genetic variation among species of the *obscura* group (*Drosophila obscura*, *D. subobscura*, *D. bifasciata*) and of the *virilis* group (Lakovaara & Saura, 1971; Saura, 1974; Saura et al., 1973; and Lankinen, unpublished, respectively). The latter data should be made available, since the population sizes of the *D. virilis* group species have collapsed, not only in northern Europe but also elsewhere. *D. lummei* has become exceedingly rare, while *D. montana* populations seem to have survived, even though population sizes have declined. *D. subobscura* populations collapsed in 1994 following a steady northward push, but they have also recovered. We have a set of genetic load and population size estimates on these populations (Saura et al., 1998). Finally, Vieira & Hoikkala (2001) have used nucleotide diversity to measure population size and structure in *D. montana* populations.

Seasonality and diapause

Wild drosophilids are adapted to the harsh conditions of the northern Europe winter. They exhibit a set of adaptations, the most prominent of which may be diapause. This characteristic has been extensively studied in economically important insects such as agricultural pests. However, these may not be the best species for the study of genetic or molecular phenomena. In this section, some of the work done on northern European drosophilids is discussed. These flies combine the power of *Drosophila melanogaster* genetics with the ecological knowledge of wild drosophilids.

Animals and plants living in northern Europe are adapted to a year that is made up of a summer, favourable for reproduction and growth, followed by a winter that kills unprepared individuals. However, drosophilids that are commensals of human life (e.g. *Drosophila melanogaster*) can go on reproducing indoors throughout the year (Kimura, 1988). A frost of

–10°C kills drosophilids that are not in diapause (Lumme, 1978). Diapause is characterised by reproductive arrest (in adult flies) or general metabolic arrest (in other stages of development).

To be an effective overwintering strategy, diapause must be accompanied by an inducible cold hardiness. It has been taken to be self-evident that diapause and cold hardiness induction are a single process. However, this is not necessarily the case (e.g. Woude & Verhoef, 1988; Shimada & Riihimaa, 1990; Sinclair et al., 2003). Diapause is typically induced by photoperiod, while cold hardiness is induced by low temperature. When the temperature approaches 0°C, complex carbohydrates are converted into low molecular weight compounds that lower the freezing point; again, when the temperature rises, the low molecular weight cryoprotectants such as glycerol or sugar alcohols are reconverted into complex storage compounds. Such changes in carbohydrate metabolism may be independent of the control of diapause (Riihimaa, 1996).

Temperature changes are, as such, an unreliable predictor of the future. The length of the day is an astronomical clock that is a reliable messenger of events to come. Animals and plants “measure” the length of the day through a circadian rhythm (that is, an endogenous, internally maintained rhythm) with a period of about one day. These rhythms are in general temperature compensated and continue under conditions of constant darkness and constant temperature. The circadian clock is coupled to metabolic, physiological and behavioural rhythms. The clock keeps time or is entrained through several oscillators.

The nature of these oscillators is better understood in species of *Drosophila* than in any other animal or plant. *Drosophila melanogaster* has a gene, *period* or *per* for short, that seems to have a leading function in the circadian pacemaker. Single amino acid differences in the gene product can lengthen or shorten the circadian period of adult activity or pupal eclosion rhythms in constant darkness (Vaz Nunes & Saunders, 1999). A non-functional product coded by a null allele of that gene abolishes rhythmicity altogether.

Jaakko Lumme and his colleagues at the University of Oulu (Finland) have done the primary work to clarify the genetics of the clock-based photoperiodic induction of diapause in species

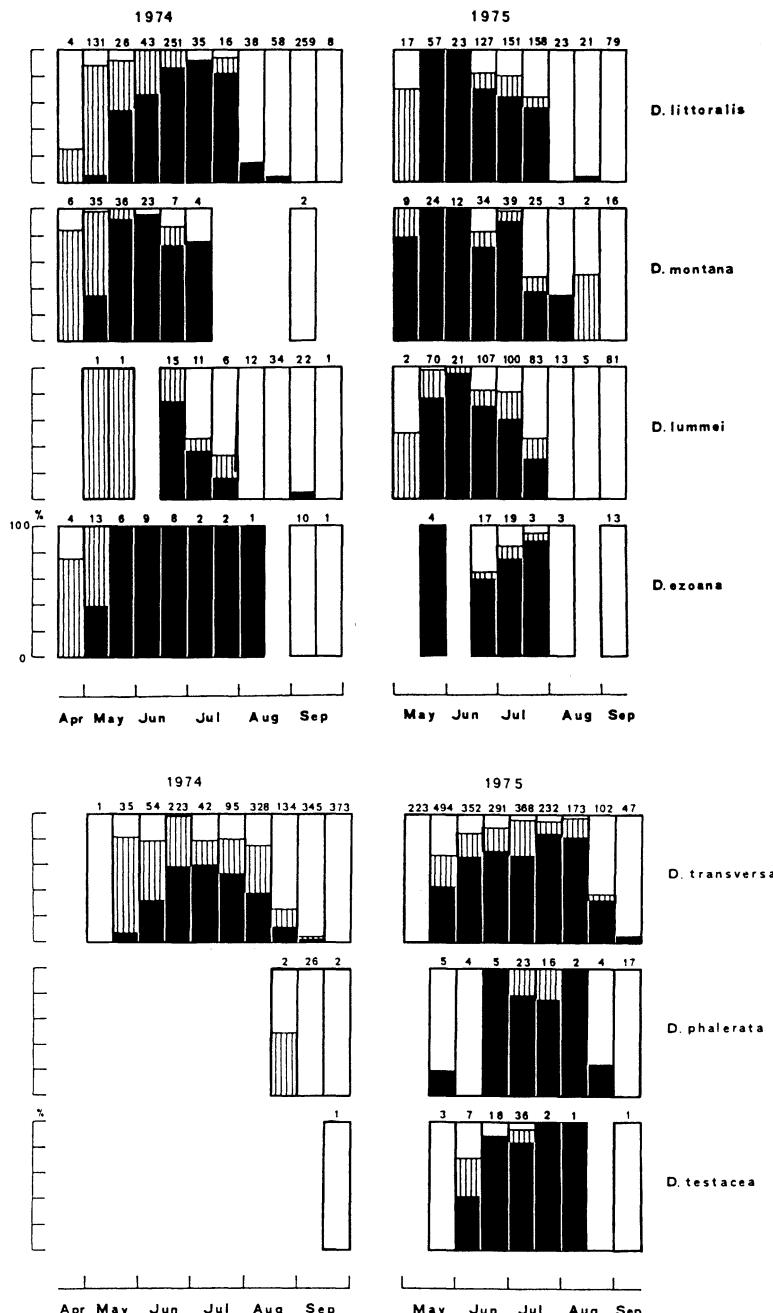
of the *quinaria*, *testacea* and *virilis* groups of *Drosophila* (reviewed in Lumme & Lakovaara, 1983). Enomoto, Kimura & Riihimaa in Sapporo, Japan, and Oulu, Finland, have studied both diapause and cold hardiness induction in *Chymomyza costata* (reviewed in Riihimaa, 1996).

Life patterns of species of Drosophila in northern Europe

In the environs of Oulu, Finland (65°N), the average growing season (5°C or more) begins on May 6th and continues until October 3rd. The daily mean temperature falls below 0°C on October 21st. In late October the night frosts fall below –10°C, a temperature that kills all *Drosophila* individuals not in the overwintering stage.

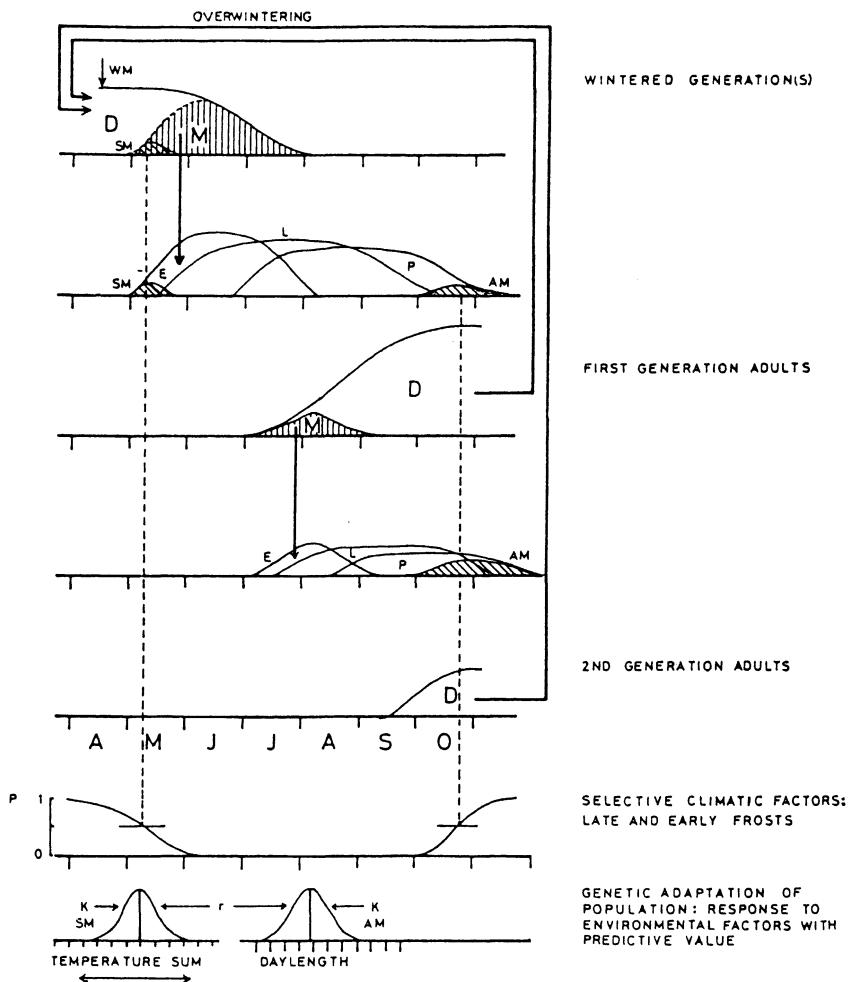
The seasonal variation in the reproductive state of four *D. virilis* group representatives (*D. ezoana*, *D. littoralis*, *D. lummei*, *D. montana*) and three fungivorous *Drosophila* populations (*D. transversa*, *D. phalerata*, *D. testacea*) in Oulu at latitude 65°N (Lumme, 1978; Lumme et al., 1978) is shown in Fig. 733. The first individuals come to the traps on warm days in late April, when there is snow on the ground. Severe night frosts are still common at that time. The females have undeveloped ovaries at first, but the proportion of developing and mature ovaries increases towards the summer. The males are active at the same time as the females and the proportion of inseminated females in the population rises rapidly. The males of *D. subarcuata* seem to die early in the season; otherwise drosophilid males live as long as the females. In July and later on, the proportion of females with undeveloped ovaries rises. Finally, all females have undeveloped ovaries. The fungivores show a similar pattern, albeit with some shifting towards the autumn. This slight delay can be explained by the major fungal crop that emerges in late summer.

The photoperiodic induction of diapause in *D. littoralis* has been extensively studied (e.g. Lumme & Oikarinen, 1977; Lumme & Lakovaara, 1983). In a sample from Oulu, Finland, the critical daylength for diapausing at a constant temperature of 16°C was about 18 hours. The critical daylength is the number of hours of light per day that stimulates 50% development and initiates or maintains 50% diapause in a population.



733

Fig. 733. Reproductive status of populations of species of *Drosophila* belonging to the *virilis* (*D. ezoana*, *D. littoralis*, *D. lummei*, *D. montana*), the *quinaria* (*D. transversa* and *D. phalerata*) and the *testacea* (*D. testacea*) groups, in 1974 and 1975. In each column the black area represents the proportion of females with mature ovaries, the hatched area that of females with developing ovaries and the white area that of females with undeveloped ovaries. The number of females assessed for reproductive status is given above each column (Lumme et al., 1978). The absence of a column means absence of data for the month concerned.



734

Fig. 734. The seasonal development of drosophilids diapausing as prereproductive adults at the latitude 65°N, e.g. Oulu, Finland. D stands for diapausing adults, M for mature adults, E for eggs, L for larvae, P for pupae, AM for autumn mortality, WM for winter mortality, SM for spring mortality, K for K-selection and r for r-selection (Lumme et al., 1978).

Northern drosophilids commonly overwinter as prereproductive adults. The life cycle of such species in northern Europe at latitude 65°N can be summarised as shown in Fig. 734 (Lumme et al., 1978). The differences in timing between species are small, and differences between years are also rather slight. The important variables of the summer included the date and distribution of the spring temperature sum critical for each species and population, the frequency and distribution of spring frosts, and the frequency and distribution of autumn frosts. There are, of course, many more climatic factors that affect the phenology of each year. Nevertheless, there

is only a single environmental factor which is invariable from year to year at any given locality: the change of daylength.

Many of the overwintered individuals live until July and the wintered generation overlaps and interbreeds with the first generation. The proportion of the first generation individuals reproducing in the same summer varies among species according to the developmental time. There is also variation among years, depending on temperatures in early summer. In early August the photoperiodically controlled diapause prevents the maturation of newly emerged flies after a species-specific critical date.

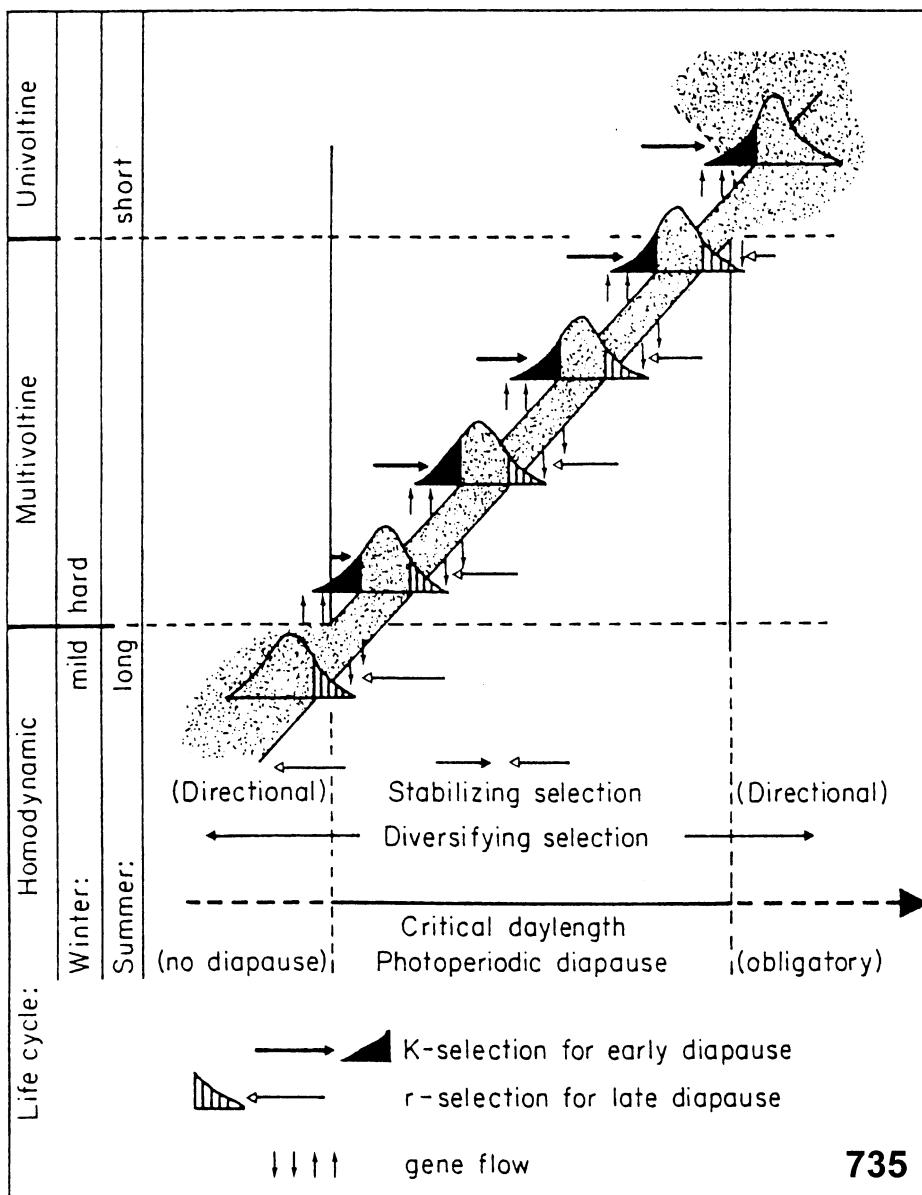


Fig. 735. The cline of the critical daylength of *Drosophila littoralis* (Lumme, 1978).

735

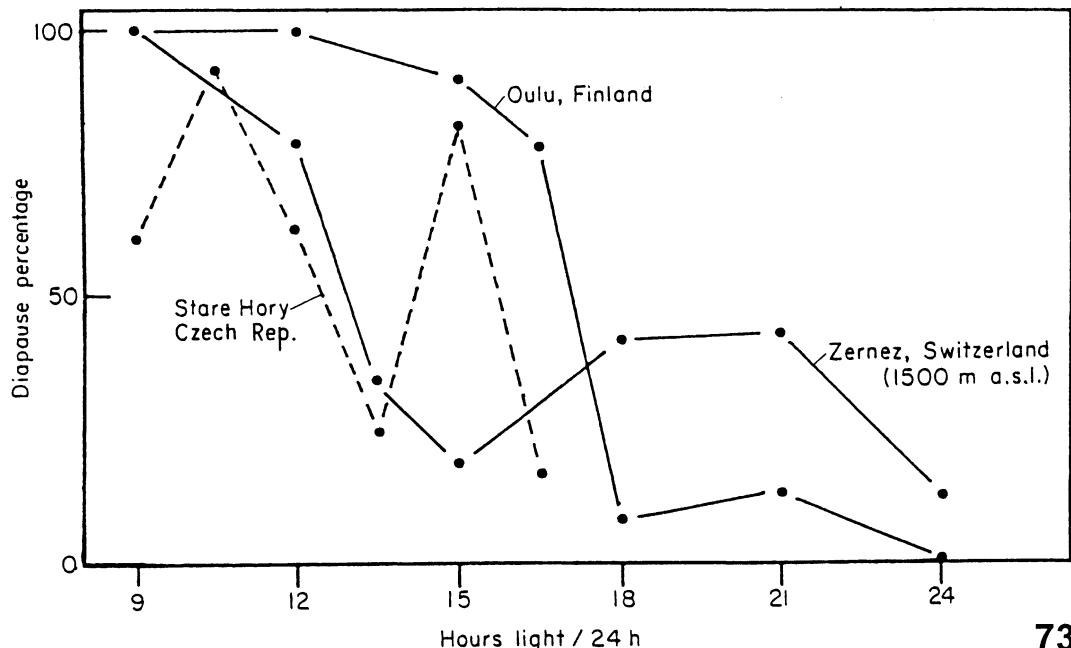
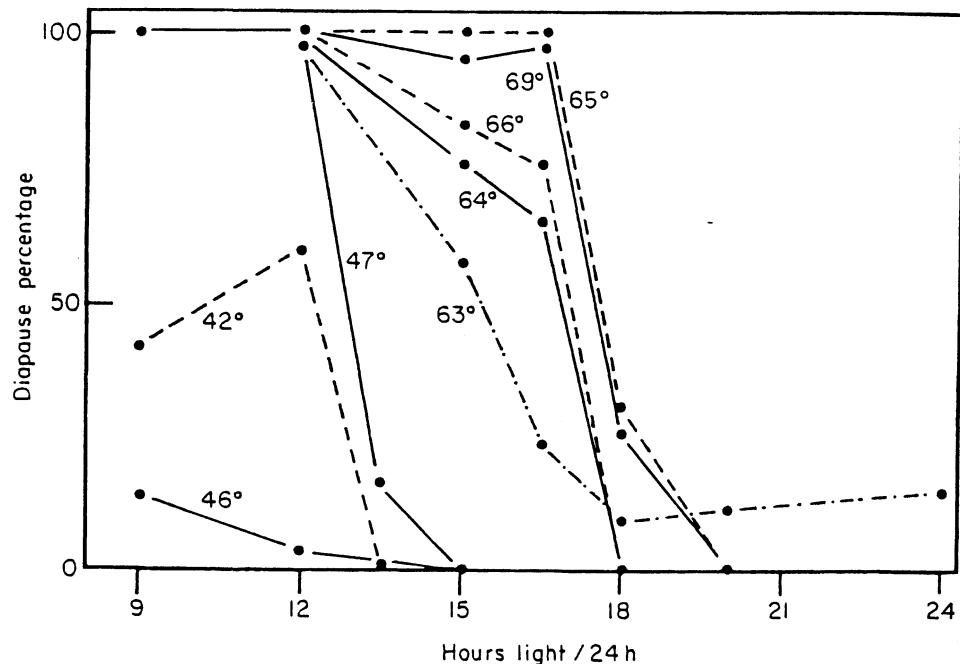


Fig. 736. Above: photoperiodic reaction curves of 8 inbred lines of *Drosophila littoralis* originating from flies collected in different northern latitudes (simplified from Lumme & Oikarinen, 1977). Below: photoperiodic reactions in three strains of *Drosophila phalerata*, obtained from flies collected at different latitudes and altitudes (simplified from Muona & Lumme, 1981).

Natural selection tends to maximise the long-term growth of a population. This represents the combined effect of survival and reproduction. These two are often mutually contradictory. Selection increasing survival is often called K-selection and that increasing reproduction is called r-selection. These two forces act simultaneously on any organism, often on different aspects of its life cycle. The optimal timing of diapause is a model example of the stabilising selection effected by these two forces. The fitness of an individual fly with an onset of diapause that is too early is lowered in comparison with later reproducers; such a selection has characteristics of r-selection. Again, late reproducers and their offspring are killed by autumn frosts. This is K- or hard selection. It is completely independent of frequency or density.

The optimal time to terminate reproduction varies among the populations of any species. The growing period is longer in lower latitudes or in low areas, as contrasted with higher latitudes or altitudes. Optimally adapted populations must have variable critical daylengths. Again, the daylength is longer in higher latitudes in comparison with latitudes closer to the equator. This factor is absent from populations living at higher altitudes. An insect having a photoperiodic diapause must be able to adjust the response to both the latitudinal and altitudinal variation in the critical daylength. Accordingly, the stabilising selection optimising the genetic response of local populations leads to diversifying selection along a climatic gradient (Fig. 735). At the ends of the cline, the conditions are quite different. When the summer is so short that there is never time for a second generation to develop, the r-selection component is relaxed and the evolution of complete diapause is possible. At the other end, at lower latitudes, the winter can be so mild that there is no need for diapause. The K-selection component vanishes, diapause disappears and a homodynamic life cycle is pos-

sible, albeit with a reservation that there is a need for summer diapause, as is the case with fungus feeders (Muona & Lumme, 1981).

Photoperiodic response curves for inbred strains of *Drosophila littoralis* and *D. phalerata* from different localities in Europe (Lumme & Oikarinen, 1977; Muona & Lumme, 1981, respectively) are shown in Fig. 736. In a set of crossing experiments (Lumme & Oikarinen, 1977; Lumme, 1981) it has been shown that alleles of a single genetic locus determine the photoperiodic reaction to critical daylength in *D. littoralis*. The locus is called *Cdl* (*Critical daylength*).

In a set of experiments, Lankinen (e.g. Lankinen & Lumme, 1984) has shown that there is a photoperiodically controlled circadian adult emergence rhythm in *D. littoralis* and that this response has elements in common with the induction of diapause.

Drosophilids can have diapause at any stage of development (Lumme & Lakovaara, 1983). *Chymomyza costata* has a larval diapause which has been studied by Riihimaa (e.g. Riihimaa, 1996; Riihimaa et al., 1996). Diapause is induced through two mechanisms, a temperature-dependent induction and a photoperiodic response. As in the case of the adult diapause discussed above, there is geographical and clinal variation in both mechanisms. Critical photoperiods increase northwards at 1 hour 9 minutes per 5° of latitude. The cline relaxes at a latitude of 65°N and any increase of daylength beyond that does not appreciably affect the response. The critical temperature measured under long-day conditions does not vary in populations to the south of 63°N, but increases from 13°C at that latitude to 17°C at 65°N and to 24°C at 68°N. There is extensive variation among populations in both characteristics. Selection experiments show that directional changes in these characteristics can be effected.

Zoogeography

More than 3800 species of Drosophilidae have been described worldwide (Bock & Parsons, 1981; Hardy & Kaneshiro, 1981; Okada, 1981; Tsacas et al., 1981; Val et al., 1981; Wheeler 1981a, b, 1986) and the number of West Palaearctic species thus seems to be relatively small. Indeed, the majority of species are known from tropical-subtropical areas, where the bulk of further undescribed species is expected to be found. An extraordinary case is the extremely diverse drosophilid fauna of the Hawaii Islands with more than 800 described (and hundreds of undescribed) species, almost all of them endemic and living in rather small, local woodland patches.

The West Palaearctic region contains about 140 drosophilid species. This is less than half the number of species in the entire Palaearctic region, and about 55 species are found in common (Bächli & Rocha-Pit , 1981). In the Nearctic region, about the same total number of species as in the West Palaearctic have been recorded, and both regions have about 30 species in common.

As already mentioned, a number of species are known to have an almost cosmopolitan distribution. The following seven species belonging to this category have been collected in the West Palaearctic: *Drosophila melanogaster*, *D. simulans*, *D. hydei*, *D. repleta*, *D. immigrans*, *D. busckii*, and *Scaptomyza pallida*. Furthermore, in addition to the cold-adapted (circumtemperate) *D. funebris*, the following widespread species have been recorded several times and at various sites, predominantly in the areas with a warmer climate: *Drosophila ananassae*, *D. buzzatii* (in areas containing patches of the prickly pear (mainly *Opuntia ficus-indica* (L.) Mill.; Cactaceae)), *D. mercatorum* and *D. virilis*.

Almost all the cosmopolitan species are of interest as regards their evolutionary background. They are members of species groups (*melanogaster* group, *repleta* group etc.) of which the majority of species have a rather restricted distribution range, which is usually considered to be the evolutionary centre of their respective groups. Whereas these locally recorded species are obviously restricted ecologically to their ex-

isting habitats, the one or several other species, as ecological generalists, were able disperse whenever the possibility arose and have become cosmopolitan.

A number of non-European species have occasionally been recorded in Europe but most probably have not settled; we consider that they are accidental introductions, in some cases probably on more than one occasion: e.g. the Nearctic *Chymomyza procnemis* and *C. procnemoides*, the widespread tropical *Dettopsomyia nigrovittata* and *Drosophila polychaeta*, the Afrotropical *Drosophila hirtipes* Burla, *Zaprionus indianus*, *Z. tuberculatus* and *Z. ghesquierei*, and the Nearctic *Scaptomyza vittata* and *S. adusta*.

Two special cases deserve to be mentioned: the Nearctic *Chymomyza amoena*, once introduced into Europe, seems to be established now, and the East Palaearctic *Drosophila curvispina* has recently been found in large numbers in South Switzerland.

A number of widespread species have a restricted distribution area: some cosmopolitan species are rare in the cooler North, whereas *Drosophila eskoi*, *D. ingrica*, *D. subarctica*, *D. vireni* and *Scaptomyza unipunctum* have restricted northern distribution areas. In addition, the boreo-alpine distribution type is represented by *Drosophila alpina*, *D. bifasciata* and *D. transversa*; all of them widespread but more abundant in the North and at higher altitudes in the Central European mountains.

At least two species can be considered as endemic: *Drosophila guanche* in the Canary Islands and *D. madeirensis* on Madeira Island. For other species with restricted distribution areas and once considered to be endemic, e.g. *Drosophila schmidti* in Hungary and *Lordiphosa miki* in Austria and Hungary, additional collecting efforts have shown that the distribution area is much wider.

The distribution pattern is given under each species in the descriptive part.

The Fennoscandian area is of a particular interest because a number of drosophilid species were first described from this area, e.g. by

Linnaeus, Fabricius, Fallén, Zetterstedt, and Staeger. In addition, many local dipterists have contributed to the study of the drosophilid fauna, e.g. H. Andersson, C.H. Boheman, R. Frey, O. Frydenberg, W. Hackman, S. Lakovaara and his students, S. Pakalniškis, O. Ringdahl, H. Siebke, A.A. Stackelberg, and P.F. Wahlberg, building

private and public collections. They discovered species with a particular subarctic or boreo-alpine distribution type, and studied their harsh living conditions. Even the northernmost fauna of Iceland and Spitsbergen Island (Norway) has been studied.

Genetics

The sciences of genetics and evolutionary biology are largely based on the study of species of *Drosophila*. While genetics is the core science of biology, the theory of evolution binds together not only the natural sciences but also sections of the humanities. *Drosophila melanogaster* was used in the first third of the 20th century to establish the chromosome theory of inheritance, by demonstrating how traits are transmitted from one generation to another, and, among other things, that X-rays and ionizing radiation cause mutations. Again, the groundwork of the synthetic theory of evolution is based on wild *Drosophila* species.

Drosophila melanogaster has several advantages as an experimental organism. It is easy to culture, a single female can produce several hundred offspring, the generation time is short, the chromosome number is low, the larvae have giant salivary gland chromosomes, i.e. bundles of more than one thousand chromatids held together through somatic conjugation, the genome is small, etc. The most essential factor explaining the power of *Drosophila* genetics is the ease with which mutants can be obtained and isolated, which is a direct consequence of fast breeding and large numbers of offspring. An additional advantage is that *D. melanogaster* belongs to a large family, the members of which show all kinds of ecological adaptations and chromosome configurations. The only weakness of *Drosophila melanogaster* is that as a commensal of human culture it does not possess much ecological complexity.

Around the middle of last century it seemed as if microbes and fungi were superior to *Drosophila melanogaster* in the service of genetics. They were simpler, easier to culture and could have shorter generation times than *Drosophila*. All of these are useful attributes in molecular genetics. However, it soon became apparent that a complex organism was needed in the study of individual development. In the first half of the century, *Drosophila* genetics had reached a level of sophistication that now bore fruit in discoveries such as the role that homeotic genes

have in determining the individual development of flies. The same genes act in us in the same way. In short, *Drosophila* has become an indispensable tool in the study of gene function. It is a model organism of the genome project that has contributed enormously to the understanding of human biology, disease and development. The genome of *Drosophila melanogaster* was sequenced in 2000 (Adams et al., 2000).

The history of *Drosophila melanogaster* as an experimental organism began around the year 1900, when the entomologist Woodworth was seen with rotten bananas in the laboratory of William Castle at Harvard University. Many people started working with the little flies that could be bred so easily. The first to publish was Carpenter in 1905, on behaviour. Then followed two papers by Castle and his colleagues on inbreeding, crossbreeding and fertility in 1906; Lutz recommended the flies as experimental animals to school teachers in 1907; Nettie Stevens, a former student of T.H. Morgan, described the mitotic chromosomes in 1908, etc. Allen (1975) has described this relatively little-known early history, whilst Sturtevant (1965) and Kohler (1994) have documented later developments.

Drosophila melanogaster entered the mainstream of biology in 1910. In short succession, Morgan and his students demonstrated the linkage of genes on the X-chromosome and then on the autosomes, and constructed the first linkage maps. The publication of "The mechanism of Mendelian heredity" (1915) by Morgan, Sturtevant, Muller and Bridges was the first milestone of *Drosophila* genetics. Morgan received the Nobel prize in physiology and medicine in 1933 in recognition of his leading role in establishing the chromosome theory of inheritance. Using a complex strain, H.J. Muller succeeded in 1927 in demonstrating that X-rays cause mutations. He received the second Nobel prize based on *Drosophila* work in 1946. The discovery of salivary gland chromosomes in the early 1930s made it possible to locate genes directly to the chromosomes, in particular after C.B. Bridges had compiled a set of reference maps. Now sali-

vary gland chromosome maps are available for hundreds of *Drosophila* species. Morgan and his students believed in the free exchange of strains and ideas among scientists. This spirit still lives on, and it is probably one of the main reasons underlying the success of *Drosophila* genetics.

A.H. Sturtevant undertook a study of the *Drosophila* fauna of North America in the 1910s and described not only many new species but also several aspects of their biology. Th. Dobzhansky, who joined the Morgan group in 1927, carried this work further. He used the new salivary gland method as well as standard *Drosophila* genetics to study the interrelationships among natural populations of *Drosophila pseudoobscura*. This study resulted in Dobzhansky's "Genetics and the origin of species" (1937), the first clear exposition of the synthetic theory of evolution. Interest in *Drosophila* other than *melanogaster* became widespread, and several groups in Russia, Japan, Texas, etc. embarked on studies of natural populations and comparative cytology.

Drosophila genetics had a Scandinavian pre-history with Fabricius' *Musca funebris* and Fal-lén's *Drosophila*. In a popular scientific article in 1917, Richard Frey gave *Drosophila melanogaster* the name *bananflugan*, "banana fly", which was used in the Nordic countries. His colleague Holger Klingstedt encouraged two students, Walter Hackman and Tarvo Oksala, to study *Drosophila*. Oksala founded *Drosophila* genetics in Finland, while Hackman became a *Drosophila* taxonomist and ecologist and, together with Seppo Lakovaara, founded a school of ecological genetics. Otto and Tove Mohr visited Morgan's laboratory in 1919 (Mohr 1919). They took many strains back to Oslo and continued working with these. Otto Mohr lectured on *Drosophila* at a Scandinavian agricultural research conference in 1921; a translation of the lecture was published in Swedish as a book "Bananflugan" in 1922. Gert Bonnier contacted both Mohr and Sturtevant directly and started working with *Drosophila* in Stockholm (Bonnier, 1922). Bonnier and his students (K.G. Lüning, Claës Ramel, Bertil and Marianne Rasmussen) founded the school of *Drosophila* genetics in Sweden. Ove Frydenberg visited Dobzhansky's laboratory in the 1940s. Consequently, the Danish *Drosophila* research first had an ecological direction. The founder of *Drosophila* research

in Iceland, Einar Árnason, has his roots in Harvard University.

In the 1930s G.W. Beadle and B. Ephrussi developed a technique for studying gene action. They transplanted imaginal discs of eye colour mutants and worked out the succession of reactions responsible for eye pigments that led to wild type eye colour. The microbiologist E.L. Tatum joined Beadle; after working for some time with *Drosophila*, they turned to *Neurospora* which had a longer generation time but was easier than *Drosophila* to culture on defined media. Molecular genetics was born in the 1940s and dominated the scene until the 1970s with experimental organisms such as bacteriophages, bacteria and yeasts. It was, however, not all one-way traffic to microbes. S. Benzer, among others, left a career in phage genetics and started analysing *Drosophila* behaviour.

Transposons, "the jumping genes", were first found in maize and then in bacteria. It was, however, first in *Drosophila* that they were found to give rise to mutations. Very many different classes of mobile elements are known. P elements cause a phenomenon called hybrid dysgenesis. Crossing a male carrying P elements with a female lacking them (M) results in progeny with reduced fertility; the survivors carry P elements inserted into their genome. Laboratory strains collected in nature earlier than 1940 are all M and strains younger than 1940 are all P. This means that the elements have spread throughout the natural populations within a short time. G. Périquet, Margaret Kidwell and others (e.g. Kidwell, 1985) showed that P elements crossed the species boundary probably from *Drosophila nebulosa* in the Caribbean through the intermediacy of the mite *Proctolaelaps regalis*.

P elements have proved to be a highly useful vector for introducing cloned DNA into flies. Recombinant plasmids containing the P element plus the desired piece of genomic DNA are injected into M strain females. The P element then transposes itself into the recipient germ line DNA with a high frequency. The technique has proved to be immensely successful. One application, *enhancer trapping*, is widely used in detecting genes that are activated in specific tissues of *Drosophila*. It involves the fusion of the *lacZ* (coding for beta galactosidase of *Escherichia coli*) with P. If the P element inserts near an enhancer in the *Drosophila* genome, the beta-

galactosidase gene is expressed and the expression can be detected using a specific staining reaction.

Drosophila genetics has led to an understanding of the development of animals. The genes responsible for development have in general been first found in *Drosophila*. Thereafter they have, in some instances, been observed to function all the way from Coelenterates to humans. These studies have also helped us to understand the molecular and genetic basis of many diseases.

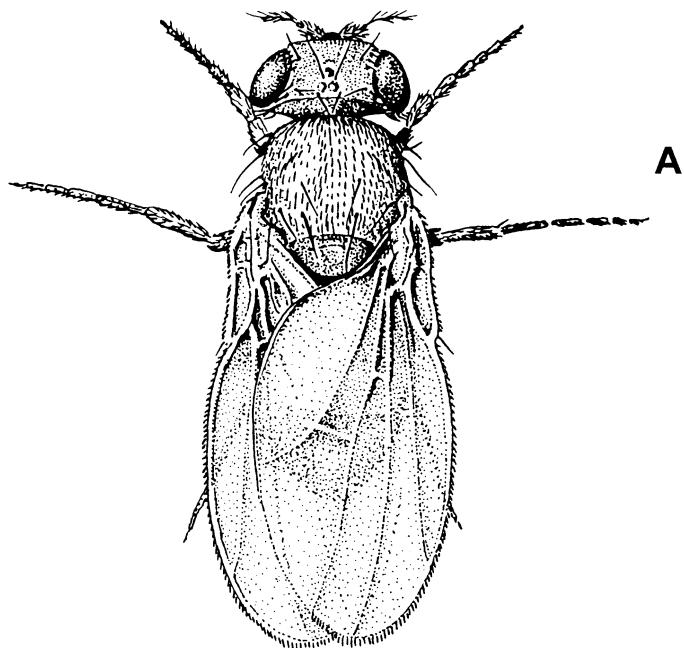
The early development of *Drosophila* begins with the action of a group of genes collectively called segmentation genes. They subdivide the embryo into more or less identical body segments. Another set, the homeotic genes, gives each segment its own identity along the anterior-posterior axis. The genes act in a hierarchy, so that the mother deposits the first important gene products in the egg. These gene products turn on the segmentation genes: Gap genes, the first set transcribed through the embryo, to pair-rule genes that divide the body into units two segments long, finally through segment polarity genes to homeotic genes. Bridges described the first homeotic gene in *Drosophila* in 1915: *Bithorax* gives rise to a fly in which the third thoracic segment develops as if it were the second thoracic segment. Consequently the resulting fly has four wings (Fig. 1) instead of one pair of wings and one pair of halteres. In *Drosophila melanogaster*, the homeotic genes form two clusters, collectively called *HOM-C* (homeotic gene complex), on the third chromosome. Edward B. Lewis, Christiane Nüsslein-Volhard and Eric Wieschaus received the Nobel prize in 1995 for their work on this system. The structure and function of these homeotic genes are conserved throughout the animal kingdom (Fig. 2), although in mammals they are called *HOX* genes, combined in four instead of two clusters.

We should mention here some areas of ongoing research where *Drosophila* is actively used.

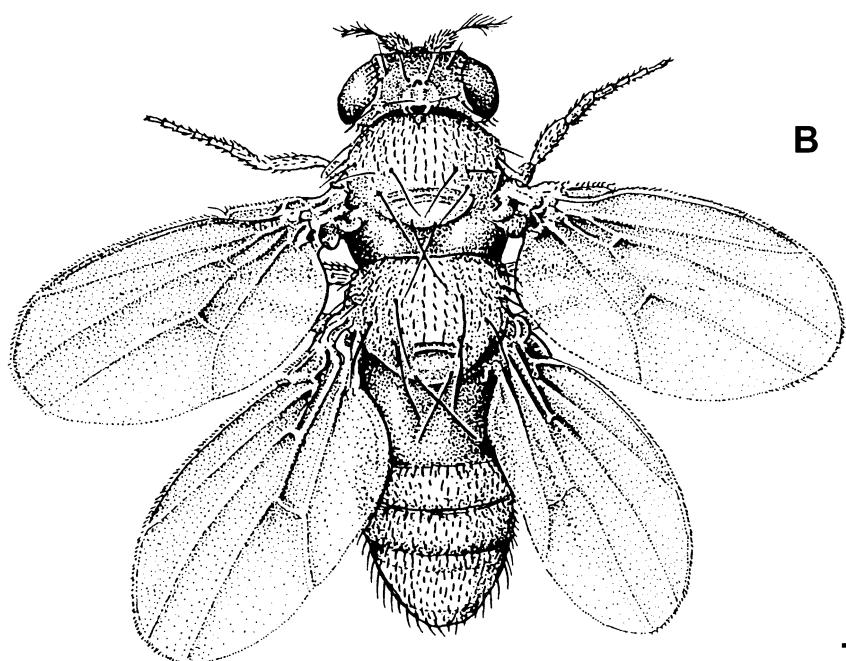
Hans Boman and Bertil Rasmuson at Umeå University found in the 1960s that *Drosophila* has an immune response. Quite unexpectedly, most of the genes involved in *Drosophila* host defence are homologous to the genes of mammalian innate immunity (Hoffman, 2003). Since the days of Castle and his students, *Drosophila* has been a model in the study of the genetics of aging, a field reviewed by Helfand & Rogina (2003). A systems biology modelling of multicellular organisms using the protein interaction map of *Drosophila* will attempt to elucidate all known metabolic pathways (Giot et al., 2003).

Species other than *Drosophila melanogaster* have proved to be most useful in the growth of *Drosophila* genetics. A self-evident use is in the reconstruction of molecular, morphological and chromosomal phylogenies. Salivary chromosome and linkage maps are available for many species. To mention one example, crossing *Drosophila virilis* has been successfully used in analysing the courtship songs of its wild relatives (Pääälysaho et al., 2003). Larsson et al. (2001) have used *Drosophila busckii* as a model in the study of *POF* (painting of fourth in *Drosophila melanogaster*); in *busckii* the fourth chromosome is translocated into the X chromosome.

The sequenced *Drosophila* genome proved to have a lower number of genes than expected, of the order of 15,000 according to some estimates in the year 2004. The human genome is far less dense, but the number of genes appears to be about twice the number that *Drosophila* possesses. On the other hand, most of the extra human genes seem to be duplication products. Undoubtedly, species of *Drosophila* will continue to be an indispensable tool in the study of gene function in the foreseeable future.



A



B

737

Fig. 737. Habitus of *Drosophila melanogaster*. A, Wild type. B, Flies homozygous for double mutants at the Bithorax complex have the third thoracic segment transformed into the second. Such flies have four wings.

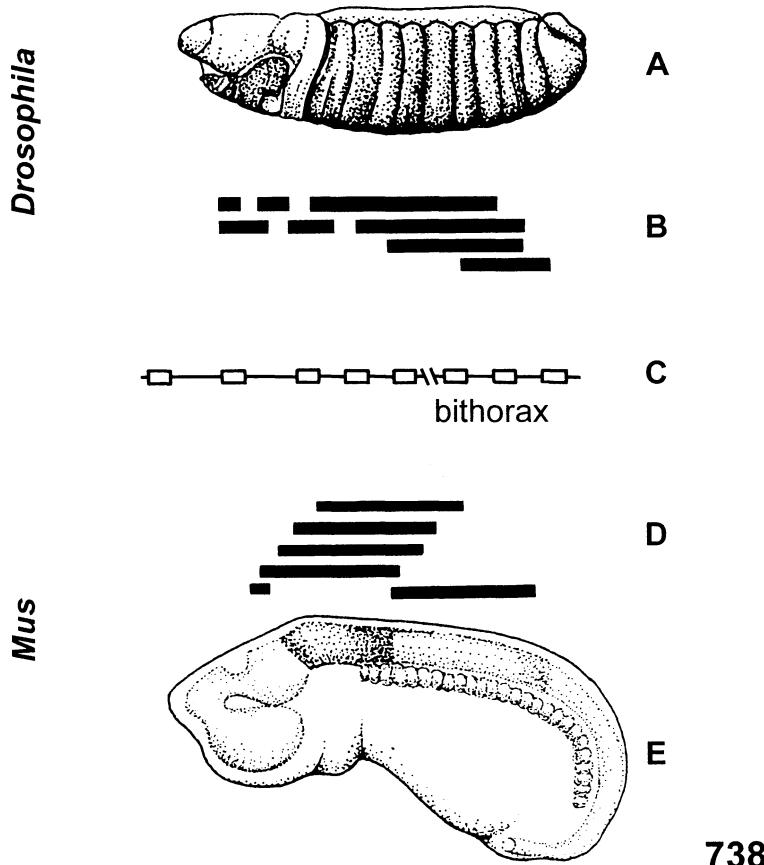


Fig. 738. The *Drosophila* embryo (A) looks very different from a mouse embryo (E), but the expression patterns of the homeotic genes (B) and (D) are similar and the genes are largely homologous. The mouse *HOX* gene family contains multiple homologs of each member of the *Drosophila* homeotic gene family (C).

Table 1. Label data “in quotation marks”, followed by depositary acronyms (in parentheses), of the specimens dissected and from which the illustrations of the terminalia have been made. A double slash indicates a label change, and commas have been added for clarity. Explanatory notes [in brackets] are included whenever needed.

Species	Male	Female
<i>Acletoxenus formosus</i>	“Israel, K. Meiron 10.VI.1982, A. Freidberg // ♂ // Acletoxenus formosus L., G. Bächli det.” (ZMUC)	
<i>Amiota albilabris</i>	“Tjentište (YU) [Serbia], 22.-25.7.1984, G. Bächli leg. // ♂ // Amiota albilabris R., G. Bächli det.” (ZMUC)	-
<i>Amiota alboguttata</i>	“Aucelon / Drôme / F [France], VIII.1988, R. Allemand leg. // ♂ // Amiota alboguttata W., G. Bächli det.” (ZMUC)	“Zernez GR [Switzerland], 15.-18.8.1978, G. Bächli coll. // ♀ // Amiota alboguttata W., G. Bächli det.” (ZMUC)
<i>Amiota basdeni</i>	“Biel BE [Switzerland], 27.-31.7.73, G. Bächli coll. // ♂ // Amiota basdeni F., G. Bächli det.” (ZMUC)	“Dietikon ZH [Switzerland], 16.-20.VII.1994 G. Bächli leg. // ♀ // Amiota basdeni F., G. Bächli det.” (ZMUC)
<i>Amiota flavopruinosa</i>	“CH: Finges VS [Switzerland], VI-VII.1995 / can.[canopy], C. Besuchet leg. // ♂ // Amiota flavopruinosa D., G. Bächli det.” (ZMUC)	
<i>Amiota rufescens</i>	“PNS [Parc National Suisse] (GR) [Switzerland], Dethier, M. / Suc 180 [on label verso: Drosophilidae] // ♂ // Amiota rufescens O., G. Bächli det.” (ZMUC)	
<i>Amiota subtusradiata</i>	“Tvärminne // R. Frey // 802 // Amiota alboguttata var. subtusradiata Duda, ♂ d. Duda [Finland] / HOLOTYPE unpublished [red label] / Mus. Zool. Helsinki, Loan No. D 3871 // Zool. Mus. Helsinki Loan No., D 89-1809/ Mus. Zool. Helsinki, Loan No. D 90-237”. Terminalia in a separate pin: “Zool. Mus. Helsinki loan No. D. 3871 // Zool. Mus. Helsinki, Loan No. D 01-182” (ZMUH)	
<i>Cacoxenus argyreator</i>	“CH: Pfynwald VS [Switzerland], 19.7.-7.8.1993 / C [canopy], G. Bächli leg. // ♂ // Cacoxenus argyreator F., G. Bächli det.” (ZMUC)	
<i>Cacoxenus indagator</i>	“Israel, N. Fazael, 17.VII.83, Y. Zvik // ex. III-V.84, in nest of ? Scelipheron // ♂ // Cacoxenus indagator L., G. Bächli det.” (ZMUC)	
<i>Chymomyza amoena</i>	“Dietikon ZH [Switzerland], 16.-20.VII.1992, G. Bächli leg. // ♂ // Chymomyza amoena L., G. Bächli det.” (ZMUC)	
<i>Chymomyza caudatula</i>	“CH: Someo TI [Switzerland], 25.-29.VII.1997, Bächli & Haring leg. // ♂ // Chymomyza caudatula O., G. Bächli det.” (ZMUC)	“Arcegno TI [Switzerland], 8.-11.8.70 G. Bächli leg. // ♀ // Chymomyza caudatula O., G. Bächli det.” (ZMUC)
<i>Chymomyza costata</i>	“CH: Il Fuorn GR [Switzerland], VII.-VIII.1995 / C. [canopy], C. Besuchet leg. // ♂ // Chymomyza costata Z., G. Bächli det.” (ZMUC)	“Lavorgo TI [Switzerland], 21.-31.8.1981 G. Bächli leg. // ♀ // Chymomyza costata Z., G. Bächli det.” (ZMUC)
<i>Chymomyza distincta</i>	“ex strain from Faido TI [Switzerland], Bächli / 1981 // ♂ // Chymomyza distincta E., G. Bächli det.” (ZMUC)	“ex strain from Faido TI [Switzerland], Bächli / 1981 // ♀ // Chymomyza distincta E., G. Bächli det.” (ZMUC)
<i>Chymomyza fuscimana</i>	“Faido TI [Switzerland], 24.-31.8.1981, G. Bächli leg. // ♂ // Chymomyza fuscimana Z., G. Bächli det.” (ZMUC)	“Klöntal GL [Switzerland], 11.-14.9.1974, G. Bächli coll. // ♀ // Chymomyza fuscimana Z., G. Bächli det.” (ZMUC)

Table 1. (Continued).

Species	Male	Female
<i>Drosophila alpina</i>	D. alpina ♂, Les Reussilles [Switzerland], IX.56, H. Burla coll. // <i>Drosophila alpina</i> B., G. Bächli det." (ZMUZ)	"Seelisberg UR [Switzerland], 4.-7.8.73, G. Bächli coll. // ♀ // <i>Drosophila alpina</i> B., G. Bächli det." [head missing] (ZMUZ)
<i>Drosophila ambigua</i>	"Geeren ZH [Switzerland], // ♂ // <i>Drosophila ambigua</i> F., G. Bächli det." (ZMUZ)	"Purgstall (A) [Austria], 16.-31.7.1977, E. Hüttinger leg. // ♀ // <i>Drosophila ambigua</i> P., G. Bächli det." (ZMUZ)
<i>Drosophila bifasciata</i>	"Arcegno TI [Switzerland], 1.-3.10.70, G. Bächli leg. // ♂ // <i>Drosophila bifasciata</i> P., G. Bächli det." (ZMUZ)	"Arcegno TI [Switzerland], 8.-11.8-70, G. Bächli leg. // ♀ // <i>Drosophila bifasciata</i> P., G. Bächli det." (ZMUZ)
<i>Drosophila busckii</i>	"Rheineck SG [Switzerland], 14.-17.8.73, G. Bächli coll. // ♂ // <i>Drosophila busckii</i> C., G. Bächli det." (ZMUZ)	"Würenlingen AG [Switzerland], 6.-11.6.73 G. Bächli coll. // <i>Drosophila busckii</i> C., G. Bächli det. // ♀" (ZMUZ)
<i>Drosophila eskoi</i>	"D. eskoi, Oulu / F.[Finland] / ♂" (ZMUZ)	"D. eskoi, Oulu / F. [Finland] // ♀" (ZMUZ)
<i>Drosophila ezoana</i>	"SF: Kemi [Finland] stock E20 // ♂ // <i>Drosophila ezoana</i> T.O., G. Bächli det." (ZMUZ)	
<i>Drosophila funebris</i>	"Seelisberg UR [Switzerland], 4-7.8.73, G. Bächli coll. // ♂ // <i>Drosophila funebris</i> F., G. Bächli det." (ZMUZ)	"Landquart GR [Switzerland], 9.-12.8.74 G. Bächli coll. // ♀ // <i>Drosophila funebris</i> F., G. Bächli det." (ZMUZ)
<i>Drosophila helvetica</i>	"Dietikon ZH [Switzerland], 3.-10.8.1984, G. Bächli leg. // <i>Drosophila helvetica</i> B., G. Bächli det." (ZMUZ)	"Delémont BE [Switzerland, JURA], 2.-6.8.74, G. Bächli coll. // ♀ // <i>Drosophila helvetica</i> B., G. Bächli det." (ZMUZ)
<i>Drosophila histrio</i>	"Rheineck SG [Switzerland], 14.-17.8.73, G. Bächli coll. // ♂ // <i>Drosophila histrio</i> M., G. Bächli det." (ZMUZ)	"Krasnodar (USSR) [Russia], VIII.1983 Ubinskaya leg. // ♀ // <i>Drosophila histrio</i> M., G. Bächli det." (ZMUZ)
<i>Drosophila hydei</i>	"Alexandria, Egypt, 31.3-2.4.1978, G. Bächli coll. // ♂ // <i>Drosophila hydei</i> S., G. Bächli det." (ZMUZ)	"Zürichberg ZH [Switzerland], 30.-31.VII.1986, M. Gosteli leg. // ♀ // <i>Drosophila hydei</i> S., G. Bächli det." (ZMUZ)
<i>Drosophila immigrans</i>	"Gomel (USSR) [Belarus], III./IV.1983, G. Goncharenko leg. // ♂ // <i>Drosophila immigrans</i> S., G. Bächli det." (ZMUZ)	"Gorjatchij Klutch, Aug. 1979 (USSR) [Russia] V.G. Mitrofanov leg. // ♀ // <i>Drosophila immigrans</i> S., G. Bächli det." (ZMUZ)
<i>Drosophila ingrica</i>	"Suistamo [Karelia, Russia] // Tuomikoski // 0101 // Mus. Zool. Helsinki Loan Nr. D 4596 // Mus. Zool. Helsinki Loan Nr. D 01-184" (ZMUZ)	"SWEDEN: SÖ: Tyresta NP: Natuv. verkets dok. program: Malaise-trap over Populus log: GPS N 59 10 758 E 18 18 630: 28VII-20IX2000: Viklund B Wikars L-O & Ahnlund H leg. // ♀" (ZMUZ)
<i>Drosophila kuntzei</i>	"Würenlingen AG [Switzerland], 6-11.6.73, G. Bächli coll. // <i>Drosophila kuntzei</i> D., G. Bächli det. // ♂" (ZMUZ)	"Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // <i>Drosophila kuntzei</i> D., G. Bächli det. // ♀" (ZMUZ)
<i>Drosophila limbata</i>	"Stams (A) [Austria], 22.9.74-8.2.75, K. Thaler leg. // Stams (A) // ♂ // <i>Drosophila limbata</i> R., G. Bächli det." (ZMUZ)	"Rheineck SG [Switzerland], 14.-17.8.73, G. Bächli coll. // ♀ // <i>Drosophila limbata</i> R., G. Bächli det." (ZMUZ)
<i>Drosophila littoralis</i>	"Popovica (YU) [Serbia and Montenegro], 1.-3.8.1980, G. Bächli leg. // ♂ // <i>Drosophila littoralis</i> M., G. Bächli det." (ZMUZ)	"Dietikon ZH [Switzerland], 14.-19.VII.1988, G. Bächli leg. // ♀ // <i>Drosophila littoralis</i> M., G. Bächli det." (ZMUZ)
<i>Drosophila lummei</i>	"Japan: Hokkaido, ex-Stock // ♂ // <i>Drosophila lummei</i> H., G. Bächli det." (ZMUZ)	
<i>Drosophila melanogaster</i>	"Hönggerberg ZH [Switzerland], 16.-20.VII.1986, G. Bächli leg. // ♂ // <i>Drosophila melanogaster</i> M., G. Bächli det." (ZMUZ)	"Riederpalp VS [Switzerland], 31.7.-8.8.76, G. Bächli coll. // ♀ // <i>Drosophila melanogaster</i> M., G. Bächli det." (ZMUZ)
<i>Drosophila montana</i>	"SF: Kemi [Finland], Stock M01 // ♂ // <i>Drosophila montana</i> S., G. P., G. Bächli det." (ZMUZ)	
<i>Drosophila obscura</i>	"Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // <i>Drosophila obscura</i> F., G. Bächli det. // ♂" (ZMUZ)	"Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // <i>Drosophila obscura</i> F., G. Bächli det." (ZMUZ)

Table 1. (Continued).

Species	Male	Female
<i>Drosophila phalerata</i>	“Dietikon ZH [Switzerland], Mai 1974, G. Bächli coll. // Drosophila phalerata M., G. Bächli det. // ♂” (ZMUZ)	“Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // Drosophila phalerata M., G. Bächli det. // ♀” (ZMUZ)
<i>Drosophila picta</i>	“ex strain from Bordils / E. [Spain], Prevosti / 1982 // ♂ // Drosophila picta Z., G. Bächli det.” (ZMUZ)	“CH: Ruppoldsried BE [Switzerland], IV.-X.1987, P. Duelli leg. // ♀ // Drosophila picta Z., G. Bächli det.” (ZMUZ)
<i>Drosophila repleta</i>	“Bachs ZH [Switzerland], 5.IX.1988, R.-Haigis leg. // ♂ // Drosophila repleta W., G. Bächli det.” (ZMUZ)	“Varna BG [Bulgaria], 25.IX.1985 K. Ralchev leg. // ♀ // Drosophila repleta W., G. Bächli det.” (ZMUZ)
<i>Drosophila simulans</i>	“Rheineck SG [Switzerland], 14.-17.8.73, G. Bächli coll. // ♂ // Drosophila simulans S., G. Bächli det.” (ZMUZ)	“Hönggerberg ZH [Switzerland], 19.-23.VII.1990, G. Bächli leg. // ♀ // Drosophila simulans S., G. Bächli det.” (ZMUZ)
<i>Drosophila subarctica</i>	“D. subarctica, Kuusamo / F. [Finland] // ♂” (ZMUZ)	“D. subarctica, Kuusamo / F. [Finland] // ♀” (ZMUZ)
<i>Drosophila subobscura</i>	“Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // Drosophila subobscura C. / G. Bächli det. // ♂” (ZMUZ)	“Dietikon ZH [Switzerland], Mai 1974, G. Bächli coll. // ♀ // Drosophila subobscura C., G. Bächli det.” (ZMUZ)
<i>Drosophila subsilvestris</i>	“Niesen u. [unten] [Switzerland] // ♂ // Drosophila subsilvestris H., G. Bächli det.” (ZMUZ)	“Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // Drosophila subsilvestris H., G. Bächli det. // ♀” (ZMUZ)
<i>Drosophila testacea</i>	“Dietikon ZH [Switzerland], Mai 1974, G. Bächli coll. // Drosophila testacea R., G. Bächli det.” (ZMUZ)	“Dietikon ZH [Switzerland], Mai 1974, G. Bächli coll. // Drosophila testacea R., G. Bächli det. // ♀” (ZMUZ)
<i>Drosophila transversa</i>	“Delémont BE [Switzerland], 2.-6.8.74, G. Bächli coll. // ♂ // Drosophila transversa F., G. Bächli det.” (ZMUZ)	“Klöntal GL [Switzerland], 11.-14.9.1974, G. Bächli coll. // ♀ // Drosophila transversa F., G. Bächli det.” (ZMUZ)
<i>Drosophila tristis</i>	“Dietikon ZH [Switzerland], 27.8.-1.9.1984, G. Bächli leg. // ♂ // Drosophila tristis F., G. Bächli det.” (ZMUZ)	“Seelisberg UR [Switzerland], 4.-7.8.73, G. Bächli coll. // ♀ // Drosophila tristis F., G. Bächli det.” (ZMUZ)
<i>Drosophila vireni</i>	“SF: Oulanka [Finland], 10.VI. 1986, S. Lako-vaara leg.” (ZMUZ)	
<i>Gitona distigma</i>	“Gyón, Kertész // Gitona distigma Mg, det. O. Duda // Gitona distigma Mg., det. Aradi // ♂” (ZMUZ)	
<i>Hirtodrosophila cameraria</i>	“Seelisberg UR [Switzerland], 4.-7.3.73, G. Bächli coll. // ♂ // Drosophila cameraria H., G. Bächli det.” (ZMUZ)	“Seelisberg UR [Switzerland], 4.-7.8.73, G. Bächli coll. // ♀ // Drosophila cameraria H., G. Bächli det.” (ZMUZ)
<i>Hirtodrosophila confusa</i>	“Bergdietikon AG [Switzerland], 16.-21.7.1979, G. Bächli coll. // ♂ // Drosophila confusa S., G. Bächli det.” (ZMUZ)	“Popovica (YU) [Serbia and Montenegro] 1.-3.8.1980, G. Bächli leg. // ♀ // Drosophila confusa S., G. Bächli det.” (ZMUZ)
<i>Hirtodrosophila lundstroemi</i>	“Gödöllő [Hungary] ♂ 1966.VII.23 Kelt. VII.12 // Auricularia auricula-judae 601 // ♂ // D. lundstroemi G. Bächli det. 1983” (ZMUZ)	“Börszöny hg [mountain]. Magyarkút [Hungary] // erdő // 1973.IX.16, leg. Papp L. // ♀ // D. lundstroemi G. Bächli det. 1983” (ZMUZ)
<i>Hirtodrosophila oldenbergi</i>	“CH: Hönggerberg ZH [Switzerland], 3.-7.VII.2000, G. Bächli leg. // ♂ // Drosophila oldenbergi D., G. Bächli det.” (ZMUZ)	“CH GR [Switzerland] 1000-1150m, Brienz-Surava, 25:VII.1999, Leg B. Merz // ♀ // Drosophila oldenbergi D., G. Bächli det.” (ZMUZ)
<i>Hirtodrosophila trivittata</i>	“CZ [Czech Republic]: Hluboka n. V. [nad Vltava], 20.VIII.1998, G. Bächli leg. // ♂ // Drosophila trivittata S., G. Bächli det.” (ZMUZ)	“CZ [Czech Republic]: Hluboka n. V. [nad Vltava], 20.VIII.1998, G. Bächli leg. // ♀ // Drosophila trivittata S., G. Bächli det.” (ZMUZ)
<i>Leucophenga maculata</i>	“Seelisberg UR [Switzerland], 4.-7.8.73, G. Bächli coll. // ♂ // Leucophenga maculata D., G. Bächli det.” (ZMUZ)	

Table 1. (Continued).

Species	Male	Female
<i>Leucophenga quin-quemaculata</i>	"CH: Someo TI [Switzerland], 25.-29.VII.1997, Bächli & Haring leg. // ♂ // Leucophenga quinquemaculata S., G. Bächli det." (ZMUZ)	
<i>Lordiphosa acuminata</i>	"Pichelsbg. [Germany] // [black label] // col. Oldenberg // fenestrarum Fall. // ♂ // Drosophila acuminata C., G. Bächli det. 1982" (ZMUZ)	"LAZIO, Settecamini Monte Cello [Italy] XXI [?] [handwritten over printed label] // ♀ // Drosophila acuminata C., G. Bächli det." (ZMUZ)
<i>Lordiphosa andalusiaca</i>	"Varegös (TR) [Turkey], 4.-8.8.1983, W. Schacht leg. // ♂ // Drosophila andalusiaca S., G. Bächli det." (ZMUZ)	"Kos (GR) [Greece], 4.-7.IV.1982, coll. M.v. Tschirnhaus // ♀ // Drosophila andalusiaca S., G. Bächli det." (ZMUZ)
<i>Lordiphosa fenes-trarum</i>	"Stams (A) [Austria], 22.9.74-8.2.75, K. Thaler leg. // ♂ // Drosophila fenestrarum F., G. Bächli det." (ZMUZ)	"Dietikon ZH [Switzerland], 10.-14.9.1985, G. Bächli leg. // ♀ // Drosophila fenestrarum F., G. Bächli det." (ZMUZ)
<i>Lordiphosa hexasticha</i>	"D [Germany], Oberpfalz, NM, Main-Donau-Kanal, Rappersdorf I MF 9.-20.6.1988 (Proj. Warncke) // ♂ // Drosophila hexasticha P., G. Bächli det." (ZMUZ)	"Motovun (YU) [Croatia], 19.IV.1981, Coll. M.v. Tschirnhaus // ♀ // Drosophila hexasticha P., G. Bächli det." (ZMUZ)
<i>Lordiphosa nigri-color</i>	"Helv. ZH [Switzerland], 500m Zürich-Albisgütl 2.IV.1997, leg. B. Merz // ♂ // Drosophila nigricolor S., G. Bächli det." (ZMUZ)	"CH: Dietikon ZH [Switzerland], 13.-17.VII.1996, G. Bächli leg. // ♀ // Drosophila nigricolor S., G. Bächli det." (ZMUZ)
<i>Microdrosophila con-gesta</i>	"Aarau AG [Switzerland], 1965/1966, V. Schmid leg. // ♂ // Microdrosophila congesta Z., G. Bächli det." (ZMUZ)	"CH: Sihlwald ZH [Switzerland], 16.VIII.1997, G. Bächli leg. // ♀ // Microdrosophila congesta Z., G. Bächli det." (ZMUZ)
<i>Microdrosophila zetterstedti</i>	"[head, one leg, thorax together with wings glued on a cardboard] // D. nigriventris ♂ Smol. [Smolandia, Sweden] // LECTOTYPE of Drosophila nigriventris Ztt. Selected by EB Basden 1960 [red label] // 94 [green label] // Ztt 94 Drosophila nigriventris Z. Lectotype ♂ G. Bächli det. 1989 [red border] // ZML 2001 406 [green label]" and on a separated pin: "[terminalia and remains of abdomen were originally on a Canada balsam drop over a plastic rectangle, laterally scratched = Ztt 94" [Basden label], now they are in a microvial filled with glycerin, attached below original plastic] (ZMUL)	
<i>Phortica semivirgo</i>	"Arcegno TI [Switzerland], 8.-11.8.70, G. Bächli leg. // ♂ // Amiota semivirgo M., G. Bächli det." (ZMUZ)	
<i>Phortica variegata</i>	"Popovica (YU) [Serbia and Montenegro], 1.-3.8.1980, G. Bächli leg. // ♂ // Amiota variegata F., G. Bächli det." (ZMUZ)	
<i>Scaptodrosophila deflexa</i>	"Veyrier GE [Switzerland], X.1973, H. Beck leg. // ♂ // Drosophila deflexa D., G. Bächli det." (ZMUZ)	"Rheineck SG [Switzerland], 14.-17.8.73, G. Bächli coll. // ♀ // Drosophila deflexa D., G. Bächli det." (ZMUZ)
<i>Scaptodrosophila rufifrons</i>	"CH: Visp VS [Switzerland], VI-VII.1996 / C [canopy], C. Besuchet leg // ♂ // Drosophila ru-fifrons L., G. Bächli det." (ZMUZ)	"CH: Gordola TI [Switzerland], 16.-20.VI.1995 / C [canopy]. Merz & Bächli leg. // ♀ // Drosophila rufifrons L., G. Bächli det." (ZMUZ)
<i>Scaptomyza consimilis</i>	"Fennia Joutseno Sa. E. Thuneberg [Finland] // Scaptomyza consimilis // Sc. consimilis Hack., W. Hackman det. // Mus. Zool. Helsinki Loan Nr. D 01-202" (ZMUH)	"Kamtschatka: Bolscherjetsk [Russia], 20.-27.VI.1917, Y. Wuorentaus. // Mus. Zool. Helsinki Loan Nr. D 01 219" (ZMUH)

Table 1. (Continued).

Species	Male	Female
<i>Scaptomyza flava</i>	"Bielefeld (D) [Germany], coll. M. v. Tschirnhaus // ♂ // Scaptomyza flava F., G. Bächli det." (ZMUZ)	"CH: Ardez GR [Switzerland], 6.VIII.1996 Merz & Bächli leg. // ♀ // Scaptomyza flava F., G. Bächli det." (ZMUZ)
<i>Scaptomyza graminum</i>	"Klöntal GL [Switzerland], 11.-14.9.1974, G. Bächli coll. // ♂ // Scaptomyza graminum F., G. Bächli det." (ZMUZ)	"Dietikon ZH [Switzerland], 6.-9.9.1974, G. Bächli coll. // ♀ // Scaptomyza graminum F., G. Bächli det." (ZMUZ)
<i>Scaptomyza griseola</i>	"Eičiai Tauragė distr. LT [Lithuania] 30.07.1994, S. Pakalniškis" (ZMUZ)	"Helsinki / Tuomikoski [Finland] // 541// Mus. Zool. Helsinki Loan Nr. D 01-208" (ZMUH)
<i>Scaptomyza montana</i>	"Merkinė 1063 Varena distr. LT [Lithuania] 02.08.1981, S. Pakalniškis ex Roripa amphibia imago 17.8.1981" (ZMUZ)	
<i>Scaptomyza pallida</i>	"Glockner: Hochtor [Austria] ~2500m, XII 11.8.-11.9.78 // 19 // ♂ // Scaptomyza pallida Z., G. Bächli det." (ZMUZ)	"Würenlingen AG [Switzerland], 6.-11.6.73, G. Bächli coll. // Scaptomyza pallida Z., G. Bächli det. // ♀" (ZMUZ)
<i>Scaptomyza teinoptera</i>	"Messuby [Finland] // R. Frey // 540 // Paratypus Scaptomyza teinoptera Hack. [red label] // Mus. Zool. Helsinki loan Nr. D 01-223" (ZMUH)	"Utsjoki [Finland] // R. Frey // 1890 // Mus. Zool. Helsinki Loan Nr. D 01-229." (ZMUH)
<i>Scaptomyza trochanterata</i>	"Urjala // Raikko [Finland], 26.5.1960, W. Hackman // Mus. Zool. Helsinki Loan Nr. D 01-223" (ZMUH)	"Urjala // Raikko [Finland], 26.5.1960, W. Hackman // Mus. Zool. Helsinki Loan Nr. D 01-234" [head missing] (ZMUH)
<i>Scaptomyza unipunctum</i>	"Fennia Kn: Paltamo [Finland], 7.VI.1941, L. Tiensuu // Scaptomyza unipunctum Zett. // Mus. Zool. Helsinki Nr. D 01-241" (ZMUH)	"4847 // Finland 705:25 Om Nykarleby 25.5.1954, R. Storåleg. // Mus. Zool. Helsinki Loan Nr. D 01-239" (ZMUH)
<i>Stegana baechlii</i>	"Aarau [Switzerland] '66 / HOLOTYPE Stegana ♂ baechlii Lašt. & Máca, P. Laštovka det. 1981 [red label] // Steganal ♂ baechlii Lašt. & Máca, P. Laštovka det. 1981" (ZMUZ)	
<i>Stegana coleoptrata</i>	"167 // Karisalo // Finland 9.7.1934 R. Storåleg. // Mus. Zool. Helsinki Loan Nr. D 01-255" (ZMUH)	
<i>Stegana furta</i>	"CH: VS [Switzerland], Sierre F. [Foret] de Finges, 18.V.1996, Merz & Bächli leg. // ♂ // Stegana furta, G. Bächli det." (ZMUZ)	
<i>Stegana hypoleuca</i>	"♂ 12/625, Dyrehaven [plus illegible handwriting] // [illegible handwriting] // Stegana hypoleuca M., G. Bächli det." (ZMUC)	
<i>Stegana longifibula</i>	"CH: Biasca TI [Switzerland], 16.-20.VI.1995, Merz & Bächli leg. // ♂ // Stegana coleoptrata S., G. Bächli det. // Stegana longifibula T., G. Bächli det." (ZMUZ)	
<i>Stegana mehadiae</i>	"AU: Baram, Ostiya, Malaisefelle B, 1-24.7.1984, leg. F. Midtgård // ♂ // Stegana mehadiae D., G. Bächli det. 1985" (ZMUC)	
<i>Stegana nigrithorax</i>	"Dietikon ZH [Switzerland], 19.-23.VII.1990, G. Bächli leg. // ♂ // Stegana nigrithorax S., G. Bächli det." (ZMUZ)	
<i>Stegana similis</i>	"Hönggerberg ZH [Switzerland], 13.-17.VII.1996, G. Bächli leg. // ♂ // Stegana longifibula T., G. Bächli det. // Stegana similis L.M., G. Bächli det." (ZMUZ)	

Catalogue

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HR	●		
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VS			
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SO	●		
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DS			
BO			
VG			
OG	●		
GS			
GO			
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SM	●		
HA	●		
BL			
SK	●	●	
DENMARK			
B			
NEZ			
NWZ			
SZ			
LFM			
F			
ZEJ			
NWJ			
WJ			
EJ			
SJ			
Gr. Britain	●		
Netherlands	●		
Germany	●		
Poland	●		
Aclerixenus formosus (Loew, 1864)			
<i>Amiota albilabris</i> (Roth in Zetterstedt, 1860)	●		
<i>Amiota alboguttata</i> (Wahlberg, 1839)	●		
<i>Amiota flavorufinosa</i> Duda, 1934			
<i>Amiota subnudriana</i> Duda, 1934	●		
<i>Amiota basdeni</i> Fonseca, 1965		●	
<i>Amiota rufescens</i> (Oldenberg, 1914)	●		
<i>Cacoxenus indagator</i> Loew, 1858	●		
<i>Cacoxenus argyreator</i> Frey, 1932	●		
<i>Gitiona distigma</i> Meigen, 1830	●		
<i>Leucophenga maculata</i> (Dufour, 1839)	●		
<i>Leucophenga quinquemaculata</i> Strobl, 1893			
<i>Phoritica semivirgo</i> (Macá, 1977)	●		
<i>Phoritica variegata</i> (Fallén, 1823)	●	?	?
<i>Stegana flurta</i> (Linnaeus, 1767)			
<i>Stegana baechlii</i> Lašovka & Máca, 1982	●		

	NORWAY	FINLAND	RUSSIA
<i>Aclerixenus formosus</i> (Loew, 1864)			Lithuania
<i>Amicta albilabris</i> (Roth in Zetterstedt, 1860)		●	Latvia
<i>Amicta alboguttata</i> (Wahlberg, 1839)			Estonia
<i>Amicta flavopruinosa</i> Duda, 1934	●		Latvia
<i>Amicta subusradata</i> Duda, 1934	●	●	Latvia
<i>Amicta basdeni</i> Fonseca, 1965			Latvia
<i>Amicta rufescens</i> (Oldenberg, 1914)		●	Latvia
<i>Cacoxenus indagator</i> Loew, 1858		●	Latvia
<i>Cacoxenus argyreator</i> Frey, 1932		●	Latvia
<i>Gitiona distigma</i> Meigen, 1830			Latvia
<i>Leucophenga maculata</i> (Dufour, 1839)		●	Latvia
<i>Leucophenga quinquemaculata</i> Strobl, 1893		●	Latvia
<i>Phortica semivirgo</i> (Máca, 1977)			Latvia
<i>Phortica variegata</i> (Fallén, 1823)		?	Latvia
<i>Stegana furta</i> (Linnaeus, 1767)		●	Latvia
<i>Stegana baechillii</i> Lašťovka & Máca, 1982		●	Latvia

	Gr. Britain	Netherlands	Germany	Poland	Denmark	Sweden
<i>Siegana coleoptrata</i> (Scopoli, 1763)	●	●	●	●	●	●
<i>Siegana hypoleuca</i> Meigen, 1830	●	●	●	●	●	●
<i>Siegana longifibula</i> Takada, 1968	●	●	●	●	●	●
<i>Siegana mehadiae</i> Duda, 1924	●	●	●	●	●	●
<i>Siegana similis</i> Čaštovka & Máča, 1982	●	●	●	●	●	●
<i>Siegana nigrihorax</i> Strobl, 1898	●	●	●	●	●	●
<i>Chymomyza caudatula</i> Oldenberg, 1914	●	●	●	●	●	●
<i>Chymomyza costata</i> Zetterstedt, 1838	●	●	●	●	●	●
<i>Chymomyza amoena</i> Loew, 1862	●	●	●	●	●	●
<i>Chymomyza distincta</i> Egger, 1862	●	●	●	●	●	●
<i>Chymomyza fuscimana</i> Zetterstedt, 1838	●	●	●	●	●	●
<i>Drosophila busckii</i> Coquillett, 1901	●	●	●	●	●	●
<i>Drosophila funebris</i> (Fabricius, 1787)	●	●	●	●	●	●
<i>Drosophila histrio</i> Meigen, 1830	●	●	●	●	●	●
<i>Drosophila immigrans</i> Sturtevant, 1921	●	●	●	●	●	●
<i>Drosophila subarctica</i> Hackman, 1969	●	●	●	●	●	●

	NORWAY	FINLAND	RUSSIA	LITHUANIA
<i>Drosophila vireni</i> Bächli, Vilela & Haring, 2002				
<i>Drosophila picta</i> Zetterstedt, 1847		●	●	
<i>Drosophila kantzei</i> Duda, 1924	●	●	●	
<i>Drosophila limbata</i> von Roser, 1840		●	●	
<i>Drosophila phalerata</i> Meigen, 1830		●	●	
<i>Drosophila transversa</i> Fallén, 1823	●	●	●	
<i>Drosophila hydei</i> Sturtevant, 1921	●	●		
<i>Drosophila repleta</i> Wollaston, 1858		●	●	
<i>Drosophila testacea</i> von Roser, 1840		●		
<i>Drosophila ezoana</i> Takada & Okada, 1958	●			
<i>Drosophila littoralis</i> Meigen, 1830				●
<i>Drosophila lummiei</i> Hackman, 1972				●
<i>Drosophila melanogaster</i> Meigen, 1830		●		●
<i>Drosophila simulans</i> Sturtevant, 1919				●
<i>Drosophila alpina</i> Burla, 1948		●		●
Ø + AK				
HE + s+n				
Ø s+n				
B Ø+v				
VE				
AA Y+i				
TE Y+i				
V A Y+i				
S F Y+i				
M R Y+i				
N T Y+i				
N S Y+i				
N n Ø+v				
T R Y+i				
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L e				
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E s t o n i a				
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L i t h u a n i a				

	DENMARK	SWEDEN	
<i>Drosophila ambigua</i> Pomini, 1940	●		TO
<i>Drosophila bifasciata</i> Pomini, 1940	●	●	LU
<i>Drosophila estroi</i> Lakovara & Lankinen, 1974	●	●	PI
<i>Drosophila helvetica</i> Burla, 1948	●	●	LY
<i>Drosophila obscura</i> Fallén, 1823	●	●	AS
<i>Drosophila subobscura</i> Collin in Gordon, 1936	●	●	NB
<i>Drosophila subsilvestris</i> Hardy & Kaneshiro, 1968	●	●	VB
<i>Drosophila tristis</i> Fallén, 1823	●	●	AN
<i>Drosophila ingrica</i> Hackman, 1957	●	●	JA
<i>Hirtodrosophila lundstroemi</i> (Duda, 1935)		●	HR
<i>Hirtodrosophila oldenbergi</i> (Duda, 1924)	●	●	ME
<i>Hirtodrosophila cameronia</i> (Haliday, 1833)	●	●	HS
<i>Hirtodrosophila confusa</i> (Staeger, 1844)	●	●	GA
<i>Hirtodrosophila trivittata</i> (Strobl, 1893)		●	DR
<i>Lordiphosa acuminata</i> (Collin, 1952)	●		VS
<i>Lordiphosa andalusiaca</i> (Strobl, 1906)	●		UP
Gr. Britain	●		VR
Netherlands	●		SO
Germany	●		NA
Poland	●		DS
BO			BO
VG			VG
OG			OG
GS			GS
GO			GO
OL			OL
SM			SM
HA			HA
BL			BL
SK			SK
B			B
ZEN			ZEN
NWZ			NWZ
LFM			LFM
E			E
WJ			WJ
SJ			SJ
SI			SI
SE			SE
NWJ			NWJ
SZ			SZ
NEZ			NEZ
GR			GR
Bentheim			Bentheim
DENMARK			DENMARK
SWEDEN			SWEDEN
TO			TO

	FINLAND	RUSSIA
$\emptyset + \text{AK}$	●	
$\text{HE} + \text{H}$	●	
$\text{O} + \text{H}$	●	
$\text{B} \oplus \text{V}$	●	
VE		
$\text{TE} \gamma_{+1}$	●	
$\text{AA} \gamma_{+1}$	●	
$\text{VA} \gamma_{+1}$		
$\text{R} \gamma_{+1}$	●	
$\text{HO} \gamma_{+1}$	●	
$\text{SF} \gamma_{+1}$		
$\text{MR} \gamma_{+1}$	●	
$\text{ST} \gamma_{+1}$	●	
$\text{NT} \gamma_{+1}$	●	
$\text{NS} \gamma_{+1}$	●	
$\text{NN} \emptyset + \text{A}$	●	
$\text{TR} \gamma_{+1}$	●	
$\text{F} \gamma_{+1}$	●	
$\text{E} \emptyset + \emptyset$	●	
AI	●	
Ab	●	
Ka	●	
St	●	
Ta	●	
Sa	●	
Qa	●	
Tb	●	
Sb	●	
Kb	●	
Qk	●	
$\text{OB} \emptyset$	●	
$\text{OB} \text{S}$	●	
$\text{OB} \text{N}$	●	
$\text{LK} \text{W}$	●	●
$\text{LK} \text{E}$	●	●
Lk	●	●
Le	●	●
Vb	●	●
Kr	●	●
Lr	●	●
Estonia	●	●
Latvia	●	●
Lithuania	●	●

		DENMARK		SWEDEN			
		Gr. Britain	Netherlands	Gr. Britain	Netherlands	Gr. Britain	Netherlands
<i>Lordiphosa fenestraria</i> (Fallén, 1823)	●						
<i>Lordiphosa hexasticha</i> (Papp, 1971)	●						
<i>Lordiphosa nigricolor</i> (Strobl, 1898)	●						
<i>Microdrosophila congesta</i> (Zetterstedt, 1847)				●		●	
<i>Microdrosophila zetterstedii</i> Wheeler, 1959				●		●	
<i>Scaptodrosophila rufifrons</i> (Loew, 1873)	●	●	●	●	●	●	●
<i>Scaptodrosophila deflexa</i> (Duda, 1924)				●		●	
<i>Scaptomyza trochanterata</i> Collin, 1953				●		●	
<i>Scaptomyza unipunctum</i> (Zetterstedt, 1847)				●		●	
<i>Scaptomyza pallida</i> (Zetterstedt, 1847)				●		●	
<i>Scaptomyza consimilis</i> Hackman, 1955				●		●	
<i>Scaptomyza flava</i> (Fallén, 1823)				●		●	
<i>Scaptomyza graminum</i> (Fallén, 1823)				●		●	
<i>Scaptomyza montana</i> Wheeler, 1949				●		●	
<i>Scaptomyza teinoptera</i> Hackman, 1955				●		●	
T0	●						
LU							
PI							
LY	●						
AS							
NB	●						
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SM	●			●			
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NEZ				●			
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SZ				●			
LFM				●			
F				●			
NEJ				●			
NWJ	●			●			
WJ				●			
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SJ	●			●			
Poland				●			
Germany				●			
Netherlands	●	●	●	●	●	●	●
Gr. Britain	●	●	●	●	●	●	●

	NORWAY	FINLAND	RUSSIA
Ø + AK	●	●	●
HE S+u	●	●	●
O S+u	●	●	●
B Ø+v	●	●	●
VE	●	●	●
TF Y+i	●	●	●
AA Y+i	●	●	●
V A Y+i	●	●	●
R Y+i	●	●	●
HO Y+i	●	●	●
SF Y+i	-	●	●
MR Y+i	●	●	●
NT Y+i	●	●	●
NS Y+i	●	●	●
NU Ø+v	●	●	●
TR Y+i	●	●	●
F V+i	●	●	●
F U+i	●	●	●
Ab	●	●	●
A1	●	●	●
Ka	●	●	●
St	●	●	●
Ta	●	●	●
Sa	●	●	●
Qa	●	●	●
Tb	●	●	●
SB	●	●	●
Kb	●	●	●
QE	●	●	●
OK	●	●	●
OB S	●	●	●
OB N	●	●	●
KS	●	●	●
LK W	●	●	●
LK E	●	●	●
Le	●	●	●
LJ	●	●	●
Vib	●	●	●
Kr	●	●	●
Lr	●	●	●
Latvia	●	●	●
Estonia	●	●	●
Lithuania	●	●	●
Lordiphosa fennestratum (Fallén, 1823)	●	●	●
Lordiphosa hexasticha (Papp, 1971)	●	●	●
Lordiphosa nigricolor (Strobl, 1898)	●	●	●
Microdrosoiphila congesta Zetterstedt, 1847)	●	●	●
Microdrosoiphila zetterstedti Wheeler, 1959	●	●	●
Scapiodrosoiphila rufifrons (Loew, 1873)	●	●	●
Scapiodrosoiphila deflexa (Duda, 1924)	●	●	●
Scaptomyza trochanterata Collin, 1953	●	●	●
Scaptomyza unipunctum Zetterstedt, 1847)	●	●	●
Scaptomyza pallida Zetterstedt, 1847)	●	●	●
Scaptomyza consimilis Hackman, 1955	●	●	●
Scaptomyza flava (Fallén, 1823)	●	●	●
Scaptomyza gramineum (Fallén, 1823)	●	●	●
Scaptomyza griseola Zetterstedt, 1847)	●	●	●
Scaptomyza montana (Wheeler, 1949)	●	●	●
Scaptomyza reitnoueri Hackman, 1955	●	●	●

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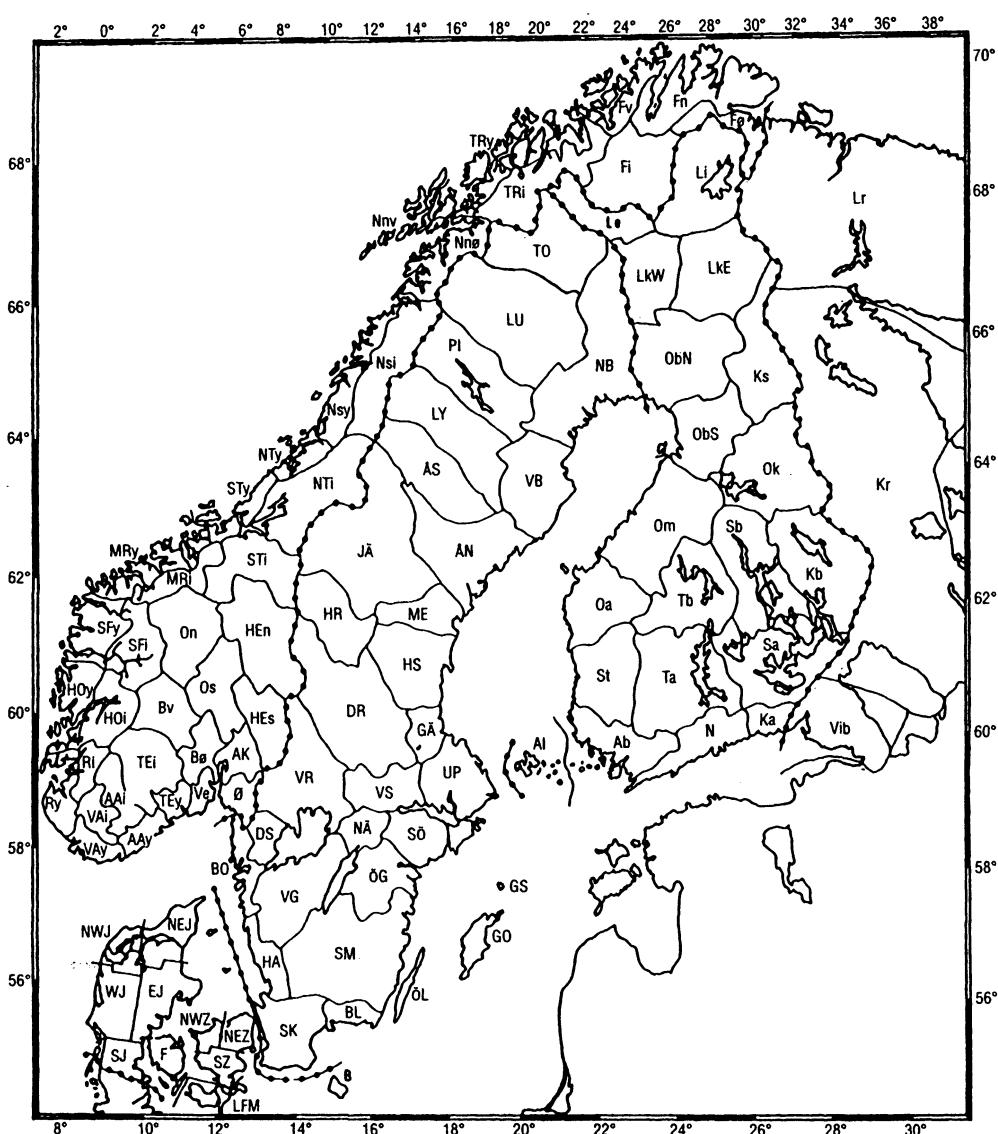
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List of abbreviations for the provinces used throughout the text, on the map and in the following tables.

DENMARK

SJ	South Jutland	LFM	Lolland, Falster, Møn
EJ	East Jutland	SZ	South Zealand
WJ	West Jutland	NWZ	North West Zealand
NWJ	North West Jutland	NEZ	North East Zealand
NEJ	North East Jutland	B	Bornholm
F	Funen		

SK	Skåne	VR	Värmland
BL	Blekinge	DR	Dalarna
HA	Halland	GA	Gästrikland
SM	Småland	HS	Hälsingland
ÖL	Öland	ME	Medelpad
GO	Gotland	HR	Härjedalen
GS	Gotska Sandön	JÄ	Jämtland
ÖG	Östergötland	ÅN	Ångermanland
VG	Västergötland	VB	Västerbotten
BO	Bohuslän	NB	Norrbotten
DS	Dalsland	ÅS	Åsele Lappmark
NÄ	Närke	LY	Lycksele Lappmark
SÖ	Södermanland	PI	Pite Lappmark
UP	Uppland	LU	Lule Lappmark
VS	Västmanland	TO	Torne Lappmark

NORWAY

Ø	Østfold	HO	Hordaland
AK	Akershus	SF	Sogn og Fjordane
HE	Hedmark	MR	Møre og Romsdal
O	Oppland	ST	Sør-Trøndelag
B	Buskerud	NT	Nord-Trøndelag
VE	Vestfold	Ns	southern Nordland
TE	Telemark	Nn	northern Nordland
AA	Aust-Agder	TR	Troms
VA	Vest-Agder	F	Finnmark
R	Rogaland		
n	northern	s	southern
		ø	eastern
		v	western
		y	outer
		i	inner

FINLAND

Al	Alandia	KB	Karelia borealis
Ab	Regio aboensis	Om	Ostrobothnia media
N	Nylandia	Ok	Ostrobothnia kajanensis
Ka	Karelia australis	ObS	Ostrobothnia borealis, S part
St	Satakunta	ObN	Ostrobothnia borealis, N part
Ta	Tavastia australis	Ks	Kuusamo
Sa	Savonia australis	LkW	Lapponia kemensis, W part
Oa	Ostrobothnia australis	LkE	Lapponia kemensis, E part
Tb	Tavastia borealis	Li	Lapponia inarensis
Sb	Savonia borealis	Le	Lapponia enontekiensis

RUSSIA

Vib Regio Viburgensis

Kr Karelia rossica

Lr Lapponia rossica