Revision of the cluster-flies of the *Pollenia vagabunda* species-group (Diptera: Calliphoridae)

KNUT ROGNES

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Within *Pollenia* Robineau-Desvoidy, a *vagabunda* species-group is defined and described. It consists of three species new to science: *P. bezziana* sp. n., *P. stigi* sp. n. and *P. verneri* sp. n. and two redescribed species: *P. contempta* Robineau-Desvoidy and *P. vagabunda* (Meigen). It is monophyletic on the basis of synapomorphies in the male cerci and the number of the inner posthumeral setae. Its sister-group is believed to be the *viatica* species-group. A key is provided and terminalia of both sexes illustrated for all species as far as these are known. A neotype is designated for *Pollenia contempta* Robineau-Desvoidy, 1830. A lectotype is designated for *Pollenia hasei* Séguy, 1928b. *P. contempta* is widely distributed in the western Mediterranean region and is the sister species of *P. vagabunda* with a much wider distribution in Europe. *P. vagabunda* is also reported from the U.S.A. for the first time. *P. bezziana* is described from Italy, *P. verneri* from Spain and Portugal, and *P. stigi* from high altitude in the Moyen Atlas mountains of Morocco. *Musca varians* Meigen in Morge (1975), nomen nudum, is established as a new synonym of *Musca vagabunda* Meigen, 1826.

K. Rognes, Stavanger Lærerhøgskole, Postboks 2521 Ullandhaug, N-4004 Stavanger, Norway.

Introduction

Members of the genus *Pollenia* Robineau-Desvoidy are commonly known as cluster-flies due to the habit of some of the species of clustering in crevices and corners of dark parts of buildings. The genus is of considerable biological interest as members of some of its species-groups, in the larval stages, are known to be parasites or predators of earthworms (Rognes 1987b, 1991c).

The present paper is a sequel to earlier ones revising various species-groups in *Pollenia* (Rognes 1987a, 1987b, 1988, 1991c; cf. also 1991a). Its purpose is to define a *vagabunda* species-group within this genus, discuss its monophyly and revise its species.

Material and methods

The study is based primarily on material in the following collections (followed by the depository acronym used in the text): Canadian National Collection, Ottawa; Institut für Pflanzenschutzforschung Kleinmachnow, Bereich Eberswalde (Deutsches Entomologisches Institut, Eberswalde-Finow) (DEI); private collection of Dr. H. Franz, Mödling; author's private collection (KR); private collection of Dr. M. Barták, Pecky; Muséum National d'Histoire Naturelle, Paris (MNHN); Museo Zoologico de 'La Specola', Florence (MZFLS); Staatliches Museum für Naturkunde, Stuttgart (SMNK); United States National Museum, Smithsonian Institution, Entomology, Washington D.C. (USNM); Universitetets Zoologiske Museum, Copenhagen (ZMUC); Lund University, Museum of Zoology and Entomology, Lund. Morphological terms and abbreviations follow Rognes (1991a).

Genus *Pollenia* Robineau-Desvoidy

Pollenia Robineau-Desvoidy, 1830: 412. Type species: *Musca rudis* Fabricius, by original designation. For a comprehensive list of generic synonyms and a diagnosis of the genus see Rognes (1991a).

Description of the *vagabunda* species-group

♂ ♀. Face rather short. Facial keel low, rather broad, mostly sharp edged. Lower facial margin well below level of large vibrissae. Distance from tip of first antennal flagellomere to lower facial margin about as long as length of first flagellomere itself. Large vibrissae midway between lower facial margin and tip of first flagellomere, or closer to the latter. Facial ridge sometimes strongly concave in profile. Occiput with 0–6 rows of black setulae behind postocular row of setae, otherwise clothed with pale or yellow hairs. Palpi black. Thorax in *contempta*,

stigi and *vagabunda* with a distinct undusted stripe of variable width in front of suture between *prst acr* setae. Always 2 inner and 1 outer *ph* setae, the front inner setae about half as long as the hind one. (I have seen only 2 aberrant specimens lacking the anteriormost inner *ph* seta). In most species (not *bezziana*) a broad undusted stripe passes forwards on the lateral parts of thorax medial to the humeral lobe from about the *prst ia* seta to the anterior slope of thorax, usually enclosing the bases of the *prs* and *ph* setae, this stripe is particularly well developed in the females. 2–4 strong supplemental setae are usually present on the humeral callus in front of the usual 3 *h* setae (not very conspicuous in *bezziana* or *verneri*, conspicuous in the other species). Scutellum with 3 strong marginals, without or with a weak additional seta in lateral position. Lappets of posterior spiracle yellow or orange. Coxopleural streak present. Basicosta black. Stem vein bare above and below. Cell R_{4+5} usually open, sometimes closed in margin. Lower calypter more or less infuscate in ♂ (except in *bezziana*), white in ♀. Wing base also often very dark. Haltere yellow. Legs normally slender, not thick and stout as in *amentaria*-group (*amentaria* Scopoli, *vera* Jacentkovský, *leclercqiana* Lehrer). Front tibia with 1–2 *pv* setae. Mid tibia with 1–3 *ad* and 1–2 *v* setae. Hind tibia with 2–4 *av* setae. Abdomen with weak bluish sheen (except *bezziana*) and strongly dusted with shifting pattern on each side. In some lights the broad transverse bands of dusting are occupying the entire anterior half of dorsal part of tergites, as figured by Mihályi (1976: 329, fig. 3; 1979: 33, fig. 22A). In some species a distinct brownish stripe visible middorsally on abdomen in some views.

♂. Frons narrow, from about as narrow as anterior ocellus to wider than distance between outer edges of the posterior ocelli. Hind tarsus longer than hind tibia. Abdomen with unmodified ventral vestiture in males (although usually rather erect also in females), except in male *bezziana* which has the ventral vestiture on the abdominal tergites fine, erect and yellow on T1–2, T3 and anterior part of T4. Cerci narrow, narrowest in middle part, distal part conspicuously upturned when seen in profile. An apical incision present which reaches back at most to middle of line separating the two cerci. Cerci ending in sharp points on each side of incision, these points without distal brush of small hairs. Aedeagus without median hypophallic lobe. Ventral plate long, its distal edge transverse or more or less irregular. Proximal end of mesohypophallus well defined, blunt and, like proximal end of hypophallic lobes, rather close to anteroventral end of ventral plate. Paraphallic processes unarmed at tip, except in *vagabunda*. Hypophallic lobes distally with or without a prominent pointed projection.

♀. Frons with 1 lateroclinate and 2–3 proclinate orbitals. No spines on any ovipositor sclerites. Cerci devoid of microtrichiae. Epiproct usually with at least a few microtrichiae, sometimes absolutely without, sometimes with rather dense cover. All other sclerites without microtrichiae, except hind margin of T6, ST6 and hypoproct. T7 variously invaded from in front by unsclerotized membrane clothed with microtrichiae. T8 marginals well in front of hind margin. Pleural membrane 8 usually without microtrichiae (slightly microtrichiose in *stigi*). Hypoproct rather elongate, long and narrow. Lateral sacs unsclerotized tubes (small and short in *stigi*). Spermathecae circular to slightly elongate.

At present five species are known in the *vagabunda* group: *P. bezziana* sp. n., *P. stigi* sp. n., *P. verneri* sp. n., *P. contempta* Robineau-Desvoidy and *P. vagabunda* (Meigen).

As the species-group is defined here two objectively synonymous genus-group names are available for it: *Trichopollenia* Enderlein, 1936: 211 (type-species: *Musca vagabunda* Meigen, 1826: 72, by monotypy) and *Seguyiomyia* Lehrer, 1963: 293 (as subgenus of *Sachtlebeniola* Lehrer, 1963: 291, nomen nudum) (type-species: *Musca vagabunda* Meigen, by original designation). I would not recommend the revival of any of these names.

Monophyly and relationships of the *vagabunda* species-group

The *vagabunda* group is possibly a monophyletic group supported by the following three ground plan apomorphies which also seem to be unique among *Pollenia*: (1) ♂ cerci bent backwards in distal 2/5, not straight when seen in profile; (2) presence of 2 (not 1) inner *ph* setae; (3) a tendency to develop supplemental setae in front of the normal 3 *h* setae.

Three other characters, viz. (1) cerci in female ovipositor devoid of microtrichiae; (2) elongate ovipositor sclerites; and (3) an elongate ventral plate of the aedeagus, are probably symplesiomorphic at the level of *vagabunda* species-group. However, they seem to be synapomorphic at a higher level, corroborating the monophyly of the composite group *vagabunda* + *viatica* group (cf. Rognes 1991c).

If the *viatica* group is accepted as the sister-group of the *vagabunda* group (cf. Rognes 1991c), it is most parsimonious to assume that the presence of only a single *pv* seta on the front tibia also belongs to the ground plan of the *vagabunda* group, since this character is universal in the *viatica* group. Possibly this character is a fourth ground-plan apomorphy of the composite *vagabunda* + *viatica* group. The presence of 2 *pv* setae on the front tibia may then be interpreted as an apomorphy defining a subgroup of the *vagabunda*-group consisting of the species *stigi* + *contempta* + *vagabunda*. Interestingly the members of this group also share the presence of a well defined presutural middorsal undusted stripe on the thorax, apparently also a synapomorphy for these species.

Pollenia haeretica Séguy, 1928b and *Pollenia ibalia* Séguy, 1930 from North Africa are sometimes regarded as belonging to the *vagabunda* species-group (Séguy 1934; Zumpt 1956; Lehrer 1963, 1967). I do not accept this and will present my reasons in a forthcoming paper on these species.

Biology of the *vagabunda* species-group

Very little is known of the biology of this group. Some adults of *vagabunda* have been captured indoors and may overwinter in buildings. Séguy (1928b, 1934, 1941) reports the find of '[P]upes et adultes [of *vagabunda*, as *hasei*] dans un tige de maïs occupée par le *Sesamia nonagrioides*', and suggests that the larvae may be parasites of organisms other than lumbricids. Nothing is known of the life-cycle of the other species.

Key to species of the *vagabunda* species-group

[Note that females of *Pollenia bezziana* and males of *Pollenia stigi* are unknown. These species have been incorporated in the key on the assumption that the unknown sex matches the known in the selected key characters.]

1. Front tibia with 1 *pv* seta; no middorsal presutural undusted stripe on thorax, but sometimes an indistinct brownish dusted area in this position; occiput with at most 1 row of black setulae behind postocular row of cilia, the black setulae usually absent in medial half of occiput; ♂: hypophallic lobes of aedeagus with prominent pointed projection distally 2
- Front tibia with 2 *pv* setae (very rarely only 1 on one side); middorsal presutural undusted stripe present on thorax and very distinct; occiput with at least 2, usually several, rows of black setulae behind the postocular row of cilia; ♂: hypophallic lobes of aedeagus without a prominent projection distally 3
2. Pale species, abdomen densely greyish white dusted; femora with pale ground vestiture on *p* and *pv* surface; facial carina broad, rounded on top; ♂: frons narrower than distance between outer edges of posterior ocelli, fronto-orbital plates touching (Fig. 1); ventral vestiture on abdominal tergites mostly yellow and fine ..... *bezziana*
- Dark species, abdomen bluish black with silvery white dusting; femora with black ground vestiture on *p* and *pv* surface; facial carina sharp on top; ♂: frons broader than distance between outer edges of posterior ocelli, fronto-orbital plates usually separated (Fig. 2); ventral vestiture on abdominal tergites black and not particularly fine ..... *verneri*
3. Katepisternal ground vestiture all black; a distinct supplemental presutural undusted stripe on thorax between *acr* and *dc* rows of setae on each side; wing with cell R_{4+5} closed in margin; mid tibia with 2–3 *ad* setae; postgena strongly swollen, its upper boundary forming a pronounced swelling on occiput not far below postocular row of setae; profrons strongly projecting, in profile almost as long as shortest diameter of eye; ♀: frontal setae very long; most often 3 proclinate orbital setae ..... *stigi*
- Katepisternal ground vestiture usually all yellow; usually no distinct presutural undusted stripe on thorax between *acr* and *dc* rows of setae; wing with cell R_{4+5} widely open; postgena normal, no swelling on occiput below postocular row of setae; profrons not projecting; ♀: most often 2 proclinate orbital setae 4
4. Males 5
- Females 6
5. Paraphallus without any trace of small teeth distally on underside (Fig. 22); mid tibia with 1 or 2–3 *ad* setae; in profile view of aedeagus distal edge of ventral plate usually reaching proximal end of the mesohypophallic rod; clear area ('window') between mesohypophallus and paraphallus (x in Fig. 22) usually narrow and more restricted ..... *contempta*
- Paraphallus armed distally on underside with small teeth forming a minute 'saw-blade' (Fig. 30, inset) (requires careful inspection under high magnification); mid tibia with 1 *ad* seta; in profile view of aedeagus distal edge of ventral plate usually well separated from the proximal end of the mesohypophallic rod; clear area ('window') between mesohypophallus and paraphallus (x in Fig. 30) usually rather extensive ..... *vagabunda*
6. Mid tibia with 2–3 *ad* setae ..... *contempta*
- Mid tibia with 1 *ad* seta .. *contempta* or *vagabunda* (females with 1 *ad* not reliably separable in areas where both species occur)

Pollenia bezziana sp. n.

(Figs 1, 3–8)

Diagnosis. – ♂. A pale species with whitish dust. Frons 0.043 times head-width (n = 1). Fronto-orbital plates touching. Frontal vestiture not reaching narrowest part of frons, uppermost hairs widely separated from anterior ocellus. Lunula waxy yellow. Behind the postocular row of setae a single row of black setulae present only in the outer half of occiput. Genal dilation with yellow vestiture except for a single row of black setulae along upper edge of its anterior half and several black setulae on the disc of its anterior 1/6. No middorsal presutural undusted stripe on thorax. Some long slender setae in front of the ordinary *h* setae, but hardly different from the ground vestiture. Front tibia with 1 *pv* seta. Mid tibia with 1 *ad*, 2 *pd*, 2 *p* and 1 *v* setae. Hind tibia with 2 short *av* setae in distal half (upper *av* seta small). Paraphallic processes strikingly long, much longer than in *verneri*. Mesohypophallus very weakly sclerotized in the only known specimen. Seta on postgonite stronger than in *verneri*.

♀. Unknown.

Length. 10 mm.

Type material. – Holotype ♂, ITALY, Novara province, Masera commune ['a place near Novara', C. Leonardi in litt. 5.iii.90], Rogna hamlet, 351m, 25. vii. 1891 (Bezzi) (dissected, T1–5 glued to card on pin, postabdominal parts in glycerol in glass micro-vial on pin) (USNM). [Labels: (1) 'Rogna / 25.vii.91' (Bezzi's hand); (2) Coll Shannon / and Shannon (printed); (3) 'Pollenia / vagabunda (det. Bezzi)' (ink script, not the same as on label 1); (4) my red holotype label].

Etymology. – I have named this species after the Italian dipterist Mario Bezzi (1868–1927) who collected the specimen.

Biology. – Unknown.

Distribution. – So far *Pollenia bezziana* is only known from northern Italy.

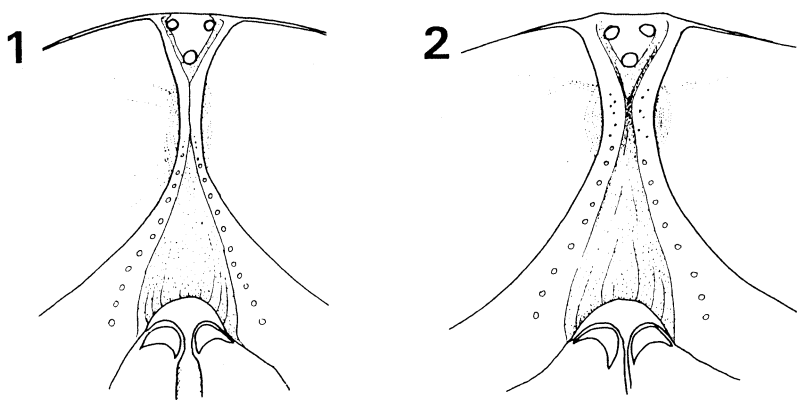
Discussion. – Apart from the pale overall impression, *bezziana* is easily recognised in the male sex on the narrow frons in combination with pale yellow vestiture both on the *p* and *pv* surface of the femora and on the ventral surface of the abdominal tergites. The latter features are surprising, as they are found elsewhere in *Pollenia* only in some species of the *rudis* species-group (cf. Rognes 1987b). The facial carina is broad and rounded along the top ridge, ressembling *paupera* Rondani (= *longitheca* Rognes) of the *rudis* species-group in this respect.

Pollenia verneri sp. n.

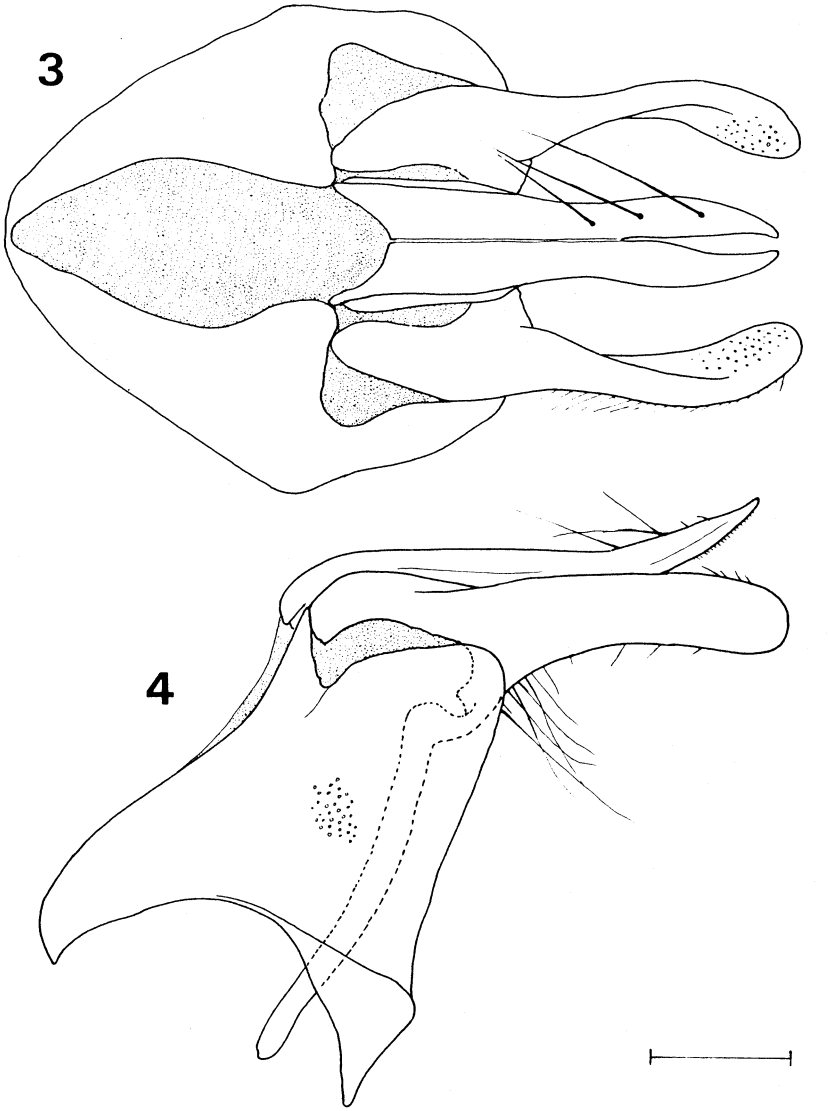
(Figs 2, 9–16)

Diagnosis. – ♂ ♀. No presutural undusted stripe on thorax between *prst acr* setae. 1 row of black setulae behind postocular row. Cell R_{4+5} open. Front tibia with 1 *pv* seta. Mid tibia with 1 *ad*, 1–2 *pd*, 2 *p* and 1 *v* setae. Hind tibia 2–3 short *av* setae in distal half (upper *av* seta small). Pedicel dark brown to blackish with a reddish apex, first flagellomere reddish with darkened apex and anterior edge. Abdomen bluish black. Dark species.

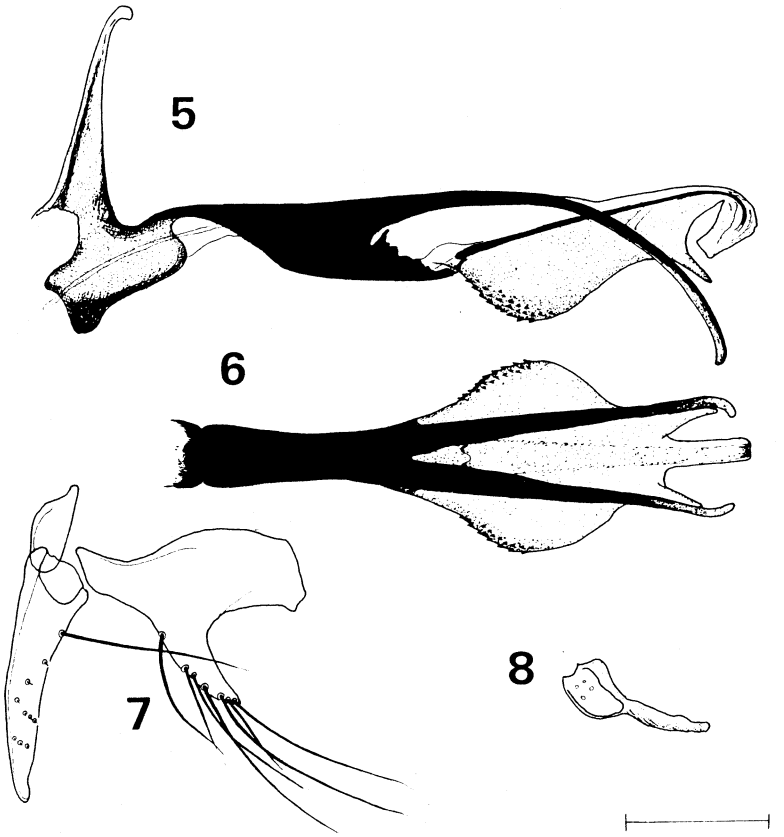
♂. Frons at narrowest 0.064–0.097 times head



Figs 1–2. ♂ frons: (1) *Pollenia bezziana* (holotype); (2) *Pollenia verneri* (holotype).



Figs 3–4. *Pollenia bezziana* (holotype), ♂ terminalia: (3) cerci, surstyli and epandrium, posterior view; (4) cerci, surstylus, epandrium and bacilliform sclerite, lateral view. Scale 0.2 mm.

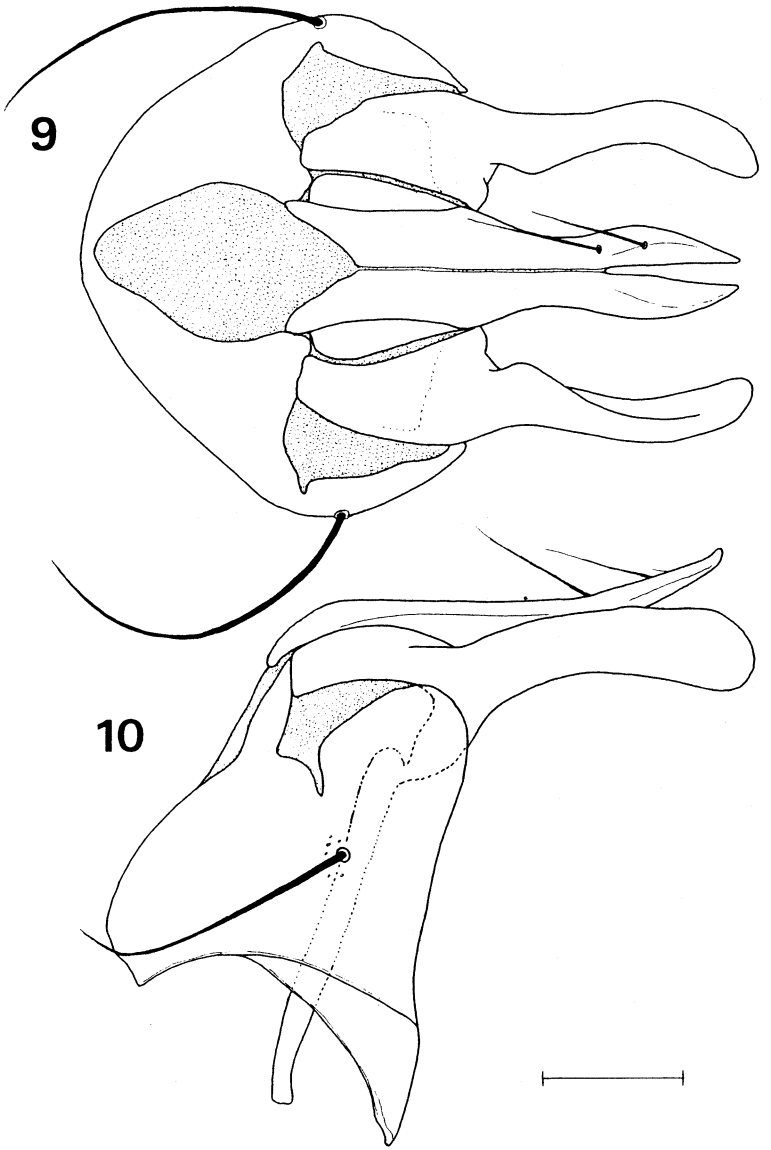


Figs 5-8. *Pollenia bezziana* (holotype), ♂ terminalia: (5) aedeagus, lateral view; (6) distiphallus, posterior view; (7) post- and pregonites; (8) ejaculatory sclerite. Scale 0.2 mm.

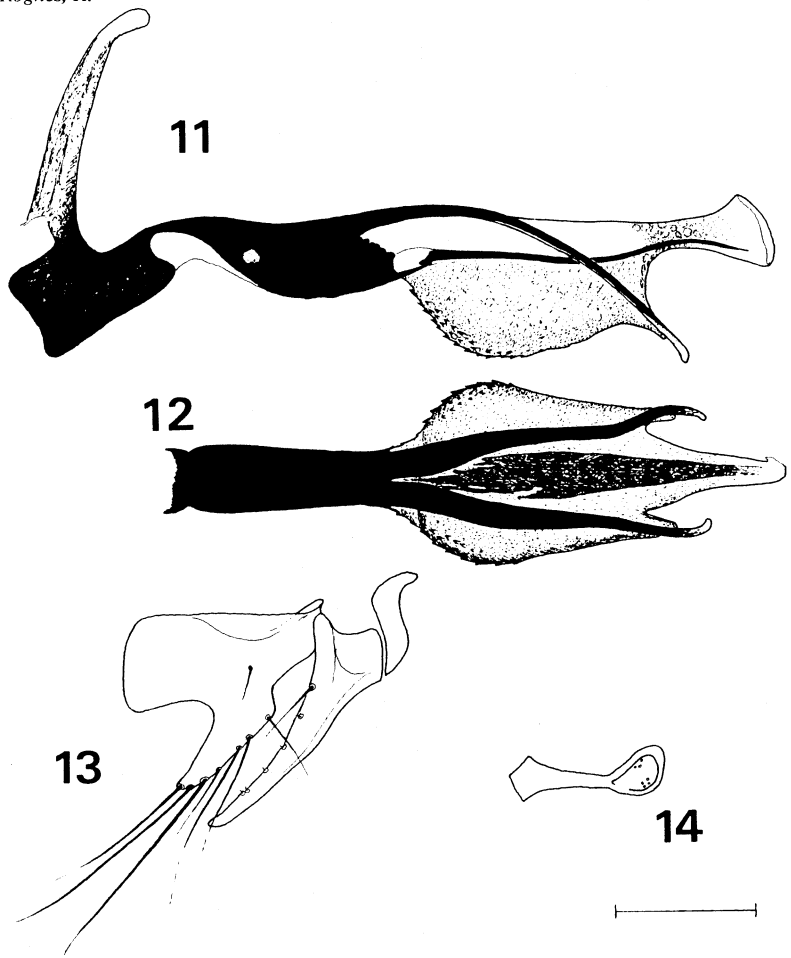
width (mean 0.081, n=8). Fronto-orbital plates rather broad and not quite touching, erect vestiture reaching slightly above narrowest part of frons, uppermost hairs separated from anterior ocellus by a distance of only 1-2 times diameter of anterior ocellus. Aedeagus with distal pointed projection on hypophallic lobe, acrophallus short. Epandrium laterally with a bundle of several long setae, in holotype only a single seta much stronger than those immediately surrounding it (Figs 9-10). Seta on postgonite small.

♀. Frons at at vertex 0.309-0.316 times head width (mean 0.313, n=4). T6 entire, no zone of weak sclerotization middorsally. T6 rather long, length/width ratio 0.56. ST6 rather long, length/width ratio 1.81. The strongly sclerotized halves of T7 becoming narrower in posterior half. ST6 dusted only along posterior edge and along posterior half of lateral edge, almost no dusting on disk. ST7 weakly sclerotized in posterior half, its length/width ration is 1.78. Epiproct with minute amounts of microtrichiae. Cerci and epiproct appearing more 'spiny' than in the other *vagabunda* species-group females. (1 ovipositor slide examined, G.pr. 246).

Length. 7.5 - 12 mm.

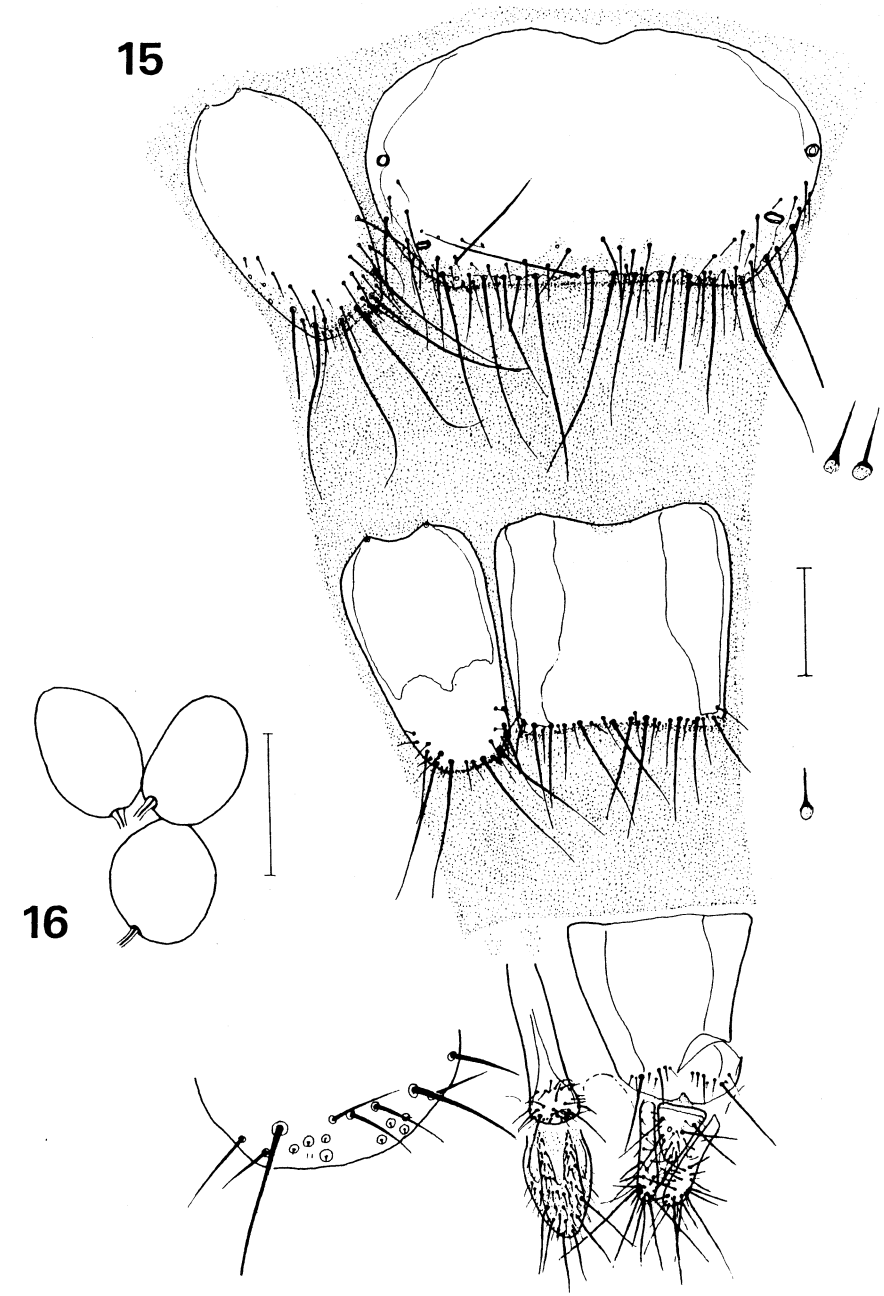


Figs 9-10. *Pollenia verneri* (holotype), ♂ terminalia: (9) cerci, surstyli and epandrium, posterior view; (10) cerci, surstylus, epandrium and bacilliform sclerite, lateral view. Scale 0.2 mm.



Figs 11-14. *Pollenia verneri* (holotype), ♂ terminalia: (11) aedeagus, lateral view; (12) distiphallus, posterior view; (13) pre- and postgonites; (14) ejaculatory sclerite. Scale 0.2 mm.

Type material. - Holotype ♂, SPAIN, Jaen, 10 km W La Carolina, 3.vii.1986 (Michelsen) (dissected, dissected parts in glycerol in vial on pin, T1-5 glued to card on pin) (ZMUC). Paratypes, 7♂ 4♀ as follows: PORTUGAL: 2♂, Guarda, Figueira, 16.vii.1990 (Michelsen) (ZMUC); 3♂, Portalegre, Sierra Sao Mamede, 20.vii.1990 (Michelsen) (1♂ dissected) (ZMUC). SPAIN: 1♀, same data as holotype; 1♂ 2♀, Caceres, 20 km NW Guadalupe, 11.vii.1986 (Michelsen) (1♀ dissected, T1-5 glued to carton on pin, uterus and spermathecae in glass micro-vial on pin, ST1-5 and ovipositor on slide no. G.pr. 246) (ZMUC); 1♂ 1♀, Salamanca, Villar de Ciervo, 15.ix.1986 (Tschorsnig) (♂ dissected) (SMNK).



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Figs 15-16. *Pollenia verneri* (paratype), ♀ terminalia (G. pr. 246): (15) ovipositor (stipple indicates extent of microtrichiae; insets: microtrichiae enlarged, tip of ST8); (16) spermathecae. Scales 0.4 mm (15), 0.2 mm (16).

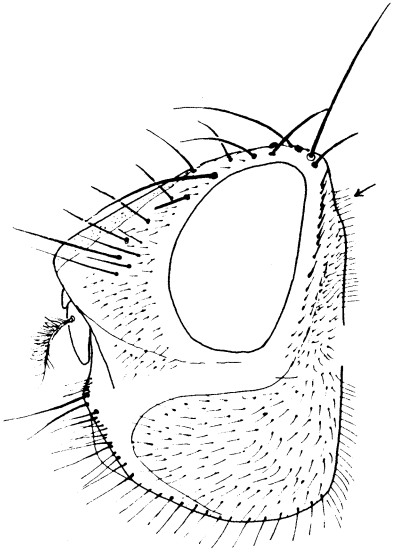

Fig. 17. *Pollenia stigi* (holotype): ♀ head, lateral view. (Arrow - see text for explanation).

Etymology. - I have named this species after my friend Verner Michelsen, Copenhagen, who collected most of the specimens.

Biology. - Unknown.

Distribution. - *Pollenia verneri* is only known from Spain and Portugal.

Discussion. - A good species well defined in both sexes. Best separated from *bezziana*, with which it shares a single *pv* seta on the front tibia and absence of presutural middorsal undusted stripe, on the broad frons, black ventral abdominal and *pv* femoral vestiture and bluish abdomen with thin glistening silvery dusting.

Pollenia stigi sp. n.

(Figs 17-19)

Diagnosis. - ♂. Unknown.

♀. Frons at vertex 0.330-0.375 (mean 0.351, n=4), thus broader than an eye as seen from above. Frontal setae long. 3 proclinate orbital setae, although two specimens have only 2 on one side. Profrons strongly projecting and the parafacialia very broad. Face very short. Eye small, in profile view of head about as high as gena. Genal dilation with only black vestiture. Postgena strongly swollen and forming a prominent bulge on the occiput below the postocular row of setae (arrow on Fig. 17). 5-6 rows of black setulae behind postocular row. Antenna black, exept for a narrow reddening of the pedicel and first flagellomere near their junction. First flagellomere short, 1.25-1.5 times length of pedicel. Arista with rather densely set hairs, sometimes giving it a 'bushy' appearance, often very few hairs on underside. A broad distinct presutural middorsal undusted stripe on thorax, encompassing the bases of the *acr* setae. An equally distinct but much narrower presutural undusted stripe on each side of thorax between the *acr* and *dc* rows of setae. This latter stripe is sometimes fused with the hind parts of the middorsal stripe. Katepisternum with long black ground vestiture. The cell R_{4+5} in wing closed in margin. Front tibia with 2 *pv* setae. Mid tibia with 2-3 *ad*, 1 *pd*, 2-3 *p* and 1 large *v* setae accompanied by a smaller supplemental *v* seta above it in three specimens. Hind tibia with 2-3 strong *av* setae, longer than tibial diameter. Femora with black *p* and *pv* ground vestiture. Ventral vestiture of abdominal tergites black. Ovipositor sclerites very elongate. T7 invaded from in front by microtrichiae middorsally. Epiproct with some microtrichiae. Traces of microtrichiae on pleural membrane 8 and on cerci (1 ovipositor slide examined, G. pr. 309).

Length. 8 - 9.5 mm

Type material. - Holotype ♀, MOROCCO, Azrou - Ifrane area, 1400-2000m, 17-19.iv.1989 (Zool. Mus. Copenh. Exp.) (dissected, T1-5 glued to carton on pin, uterus and spermathecae in glass micro-vial on pin, ST1-5 and ovipositor on slide no. G. pr. 309) (ZMUC).

Paratypes, 3 ♀ as follows: MOROCCO: 1 ♀, same data as holotype; 2 ♀, Itzer area, 2100m, 16.iv.1989 (Zool. Mus. Copenh. Exp.) (ZMUC).

Etymology. - I have named this species after my friend Stig Andersen, Copenhagen.

Biology. - *Pollenia stigi* is a high altitude insect captured from 1400-2100m above sea level.

Distribution. - *Pollenia stigi* is only known from Morocco.

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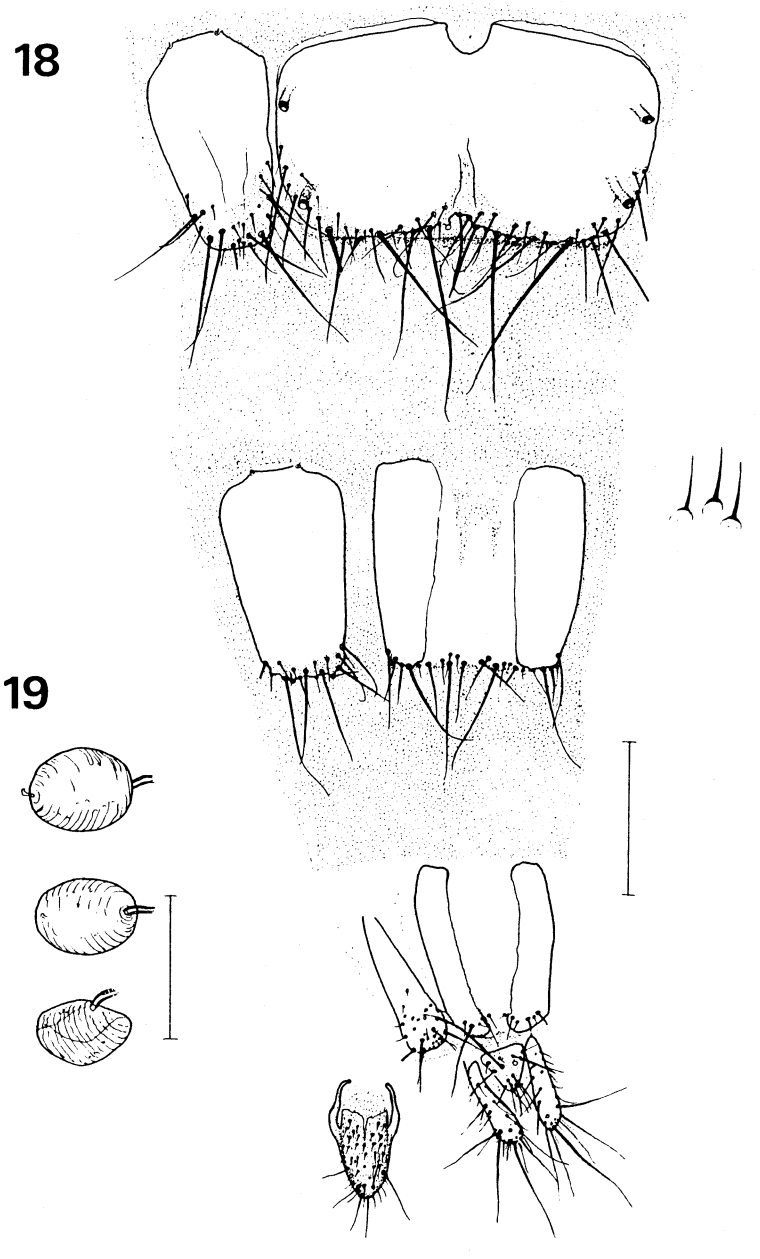
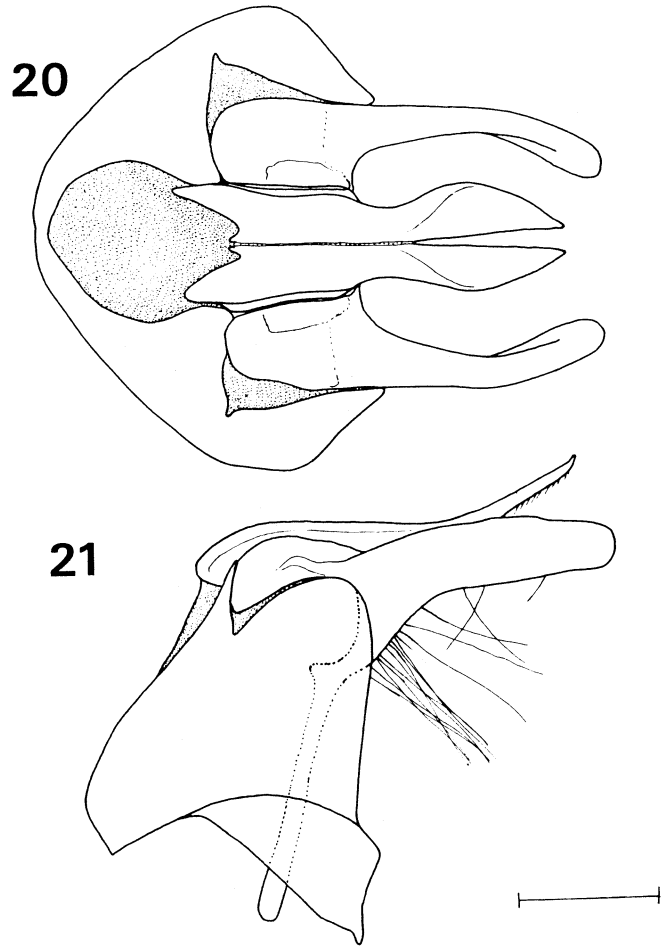


Figs 18-19. *Pollenia stigi* (holotype), ♀ terminalia (G. pr. 309): (18) ovipositor (stipple indicates extent of microtrichiae; inset: microtrichiae enlarged); (19) spermathecae. Scales 0.5 mm (18), 0.2 mm (19).



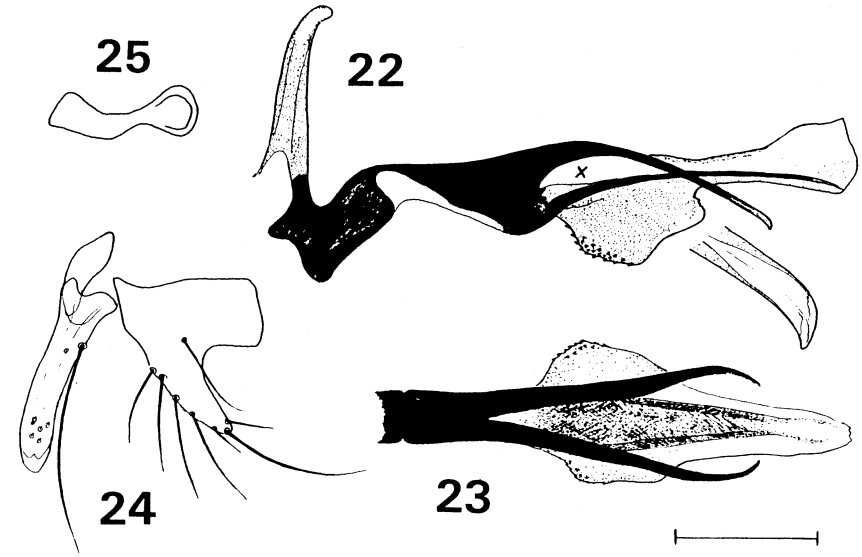
Figs 20–21. *Pollenia contempta* (Tunisia, ZMUC), ♂ terminalia: (20) cerci, surstyli and epandrium, posterior view; (21) cerci, surstylus, epandrium and bacilliform sclerite, lateral view. Scale 0.2 mm.

Discussion. - *Pollenia stigi* is most easily recognised among the *vagabunda* group species on the triple presutural middorsal stripe, only black katepisternal vestiture, strongly projecting profrons, small eyes, short face and the swollen postgena. The male sex, at present unknown, should also be recognisable on these features. The presence of a few microtrichiae on the pleural membrane 8 and the cerci in the female may suggest that it does not belong in the *vagabunda* species-group. However, I interpret these features as apomorphic derivations from the bare condition in the ground-plan.

Pollenia contempta Robineau-Desvoidy

(Figs 20–27)

Pollenia contempta Robineau-Desvoidy, 1863 (2): 676
Séguy 1928a; 1928b; 1930; 1934; 1941; Zumpt 1956: 71



Figs 22–25. *Pollenia contempta* (Tunisia, ZMUC), ♂ terminalia: (22) aedeagus, lateral view (inset: tip of paraphallus, enlarged); (23) distiphallus, posterior view; (24) post- and pregonites; (25) ejaculatory sclerite. Scale 0.2 mm.

Syntypes ♂ ♀, FRANCE ('Nice'), lost. Neotype ♂, here designated, FRANCE (MNHN) (examined) (see below for details).

Sachtlebeniola contempta (Robineau-Desvoidy); Lehrer 1963.

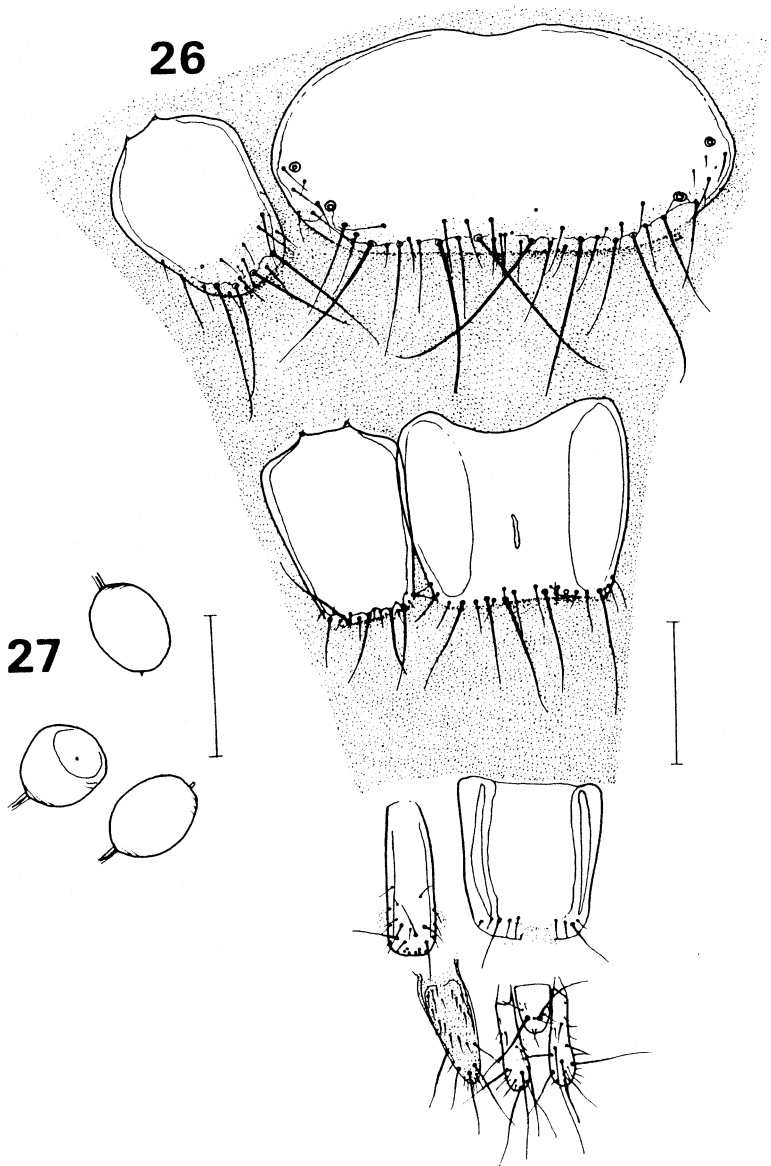
Nitellia contempta (Robineau-Desvoidy); Lehrer 1967.

Diagnosis. - ♂ ♀. 2–4 rows of black occipital setae behind postocular row. Presutural middorsal stripe present on thorax between *prst acr*. Usual no lateral presutural stripe between *acr* and *dc* rows of setae, but sometimes an indistinct one suggested. Cell R_{4+5} open, very rarely closed in margin. Front tibia with 2 *pv* setae. Mid tibia with 1 or 2–3 *ad* setae. Hind tibia with 2–3 *av* setae. Abdomen with shifting pattern and middorsal narrow brownish stripe, brownish colour extending laterally in some views. Colour very variable. The darkest specimens have almost all black pedicel and first flagellomere, all black genal vestiture, a considerable admixture of black hairs dorsally among the yellow katepisternal ground vestiture and a very dark lower squama and wing base. Normal specimens have a pale first flagellomere darkened only along front edge, yellow hairs in posterior third of gena, all yellow katepisternal vestiture and not so strongly infuscate or almost white lower squama.

♂. Frons 0.032–0.060 times head-width (mean 0.047, n = 20). Vestiture on fronto-orbital plates not quite reaching narrowest point of frons and separated from anterior ocellus by more than length of ocellar triangle in specimens with the narrowest frons, but reaching narrowest point in specimens with broader frons. Paraphallic processes distally slender and unarmed, usually straight, though sometimes curving weakly inwards distally. Proximal end of mesohypophallic sclerotization reaching lower distal part of ventral plate sclerotization or almost. 'Window' in central area of distiphallus not extensive in profile. Hypophallic lobes roughly triangular, sometimes (as in Fig. 22) with a slightly protruding 'corner' distally when seen in profile.

♀. Frons at vertex 0.308–0.342 times head width (mean 0.321, n = 9). T6 rather short, sometimes a weakly sclerotized area middorsally in posterior half. The minute area with microtrichiae on the pleural membrane 8 (Fig. 26) is absent from the other ovipositors examined. Some microtrichiae on epiproct. Cerci without microtrichiae. (5 ovipositor slides examined: G.pr. 249, 250, 294, 320, 321).

Length. 5.5 - 10.5 mm.



Figs 26–27. *Pollenia contempta* (Tunisia, ZMUC), ♀ terminalia (G. pr. 249): (26) ovipositor (stipple indicates extent of microtrichiae); (27) spermathecae. Scales 0.4 mm (26), 0.2 mm (27).

Type material. – Syntypes ♂ ♀, 'pris dès le mois de Février dans les environs de Nice [FRANCE]', presumably lost. No specimens remain in Robineau-Desvoidy's collection in Paris (MNHN). Neotype ♂, FRANCE, Var, Callian, ix.1926 (Berland) (genitalia on slide no. 149 in Séguy slide collection) (MNHN). The specimen is in rather poor condition: the distal four tarsal segments of the left front tibia, both mid tibiae, the left hind tibia and tarsus and the right hind tarsus are lost. It was selected by Séguy to serve as neotype, as witnessed by a green label with 'Néotype' in his handwriting. I have also given it a red neotype label.

Other material examined. – 101 specimens from the following countries: ALGERIA (2), ITALY (1), MOROCCO (24), PORTUGAL (1), SPAIN (57) (G. pr. 250, 294, 320, 321), TUNISIA (16) (G. pr. 249).

Biology. – Examined material has been captured from March to October, with peaks in number in March–April and September–October. In Spain it has been taken from sea level to about 2300 m. The single specimen from Portugal was taken at 1700 m. In Morocco it has been taken from sea level to 2000 m in the Haut Atlas Mountains.

Distribution. – *Pollenia contempta* is known from Morocco, Algeria, Tunisia, Portugal, Spain, southern France and the 'heel' of Italy. I have seen females belonging to either *contempta* or *vagabunda* also from Greece (ZMUC).

Discussion. – Séguy (1928a, 1928b, 1934, 1941) gave the diagnostic characters for the ♂ of this species and assigned a Robineau-Desvoidy name to it. Zumpt (1956) was very much in doubt as to its status, and apparently misunderstood it as a species with shining very weakly dusted abdomen. He seemingly overlooked the character most important to Séguy, namely the unarmed paraphallic processes. He referred to a specimen from North Africa which he at first regarded as *contempta*, but whose hypopygium showed the specimen to belong to *vagabunda*. However, Zumpt did not describe which features of the hypopygium he found decisive. In my opinion *contempta* is a good species, although safely recognisable only in the male sex by the characters given in the key. It is rather variable in size and colour characters, specimens appearing from very dark to rather pale. Interestingly, specimens with 2–3 *ad* on the mid tibia have only been captured in Spain (Gerona and Zaragoza provinces).

Pollenia vagabunda (Meigen)

(Figs 28–35)

Musca vagabunda Meigen, 1826: 72; Meigen *in* Morge 1975: 480 [in 'Alphabetisches Verzeichniss der Gattungen und Arten' referring to '118, 7']; Meigen *in* Morge 1976 [plate CXVIII, fig. 7, which shows a ♀]. Lectotype ♀ [WEST] GERMANY, [assumed, not stated] designated by Rognes (1991a) (MNHN), examined.

Pollenia vagabunda (Meigen); Lundbeck 1927; Wainwright 1928; Séguy 1928a; 1928b; 1934; Wainwright 1940; Séguy 1941; Ringdahl 1952; Emden 1954; Zumpt 1956; Shewell 1961; Hall 1965; Grunin 1970; Draber-Mońko 1971; Mihályi 1976; Pont 1976; Mihályi 1979; Draber-Mońko 1978; 1985; Rognes 1985; Draber-Mońko 1986; Schumann 1986; Gregor 1987; Hedström 1988; Franz 1989; Rognes 1991a.

Trichopollenia vagabunda (Meigen); Enderlein 1936; Jacentkovský 1942.

Pollenia pulvillata Rondani, 1862: 195, 198. Lectotype ♂ ITALY, designated by Rognes (1991b) (MZLSF), examined.

Pollenia hasei Séguy, 1928b: 370; 1930; 1934; 1941. Lectotype ♂ SPAIN, here designated (DEI), examined.

Musca varians Meigen *in* Morge, 1975: 418 [in 'Erklærung der Figuren', in legend (as '♀') to Plate CXVIII, fig. 7, which shows a ♀; this figure also referred to under *Musca vagabunda*, see above]. Nomen nudum [A manuscript name of Meigen that first appeared with the published plates; no taxonomic characters stated in words, no reference to such a statement; cf. Code [13 (a)]; **syn. n.**

[*Pollenia contempta*: Séguy 1930: 147 (record from Morocco 'de M'Rirt à El Hadjeb', Benoist leg. (MNHN)); misidentification, not Robineau-Desvoidy, 1830. The genitalia of this ♂ specimen is on Séguy slide no. 127, which clearly shows a dentate paraphallic tip. Séguy himself has rubbed off the original label text and replaced it with 'Hasei' in pencil script.]

Diagnosis. – ♂ ♀. Adequately described by e.g. Séguy (1928b), Mihályi (1976) and Rognes (1991a). It is rather variable in colour. The most important diagnostic characters are mentioned in the key.

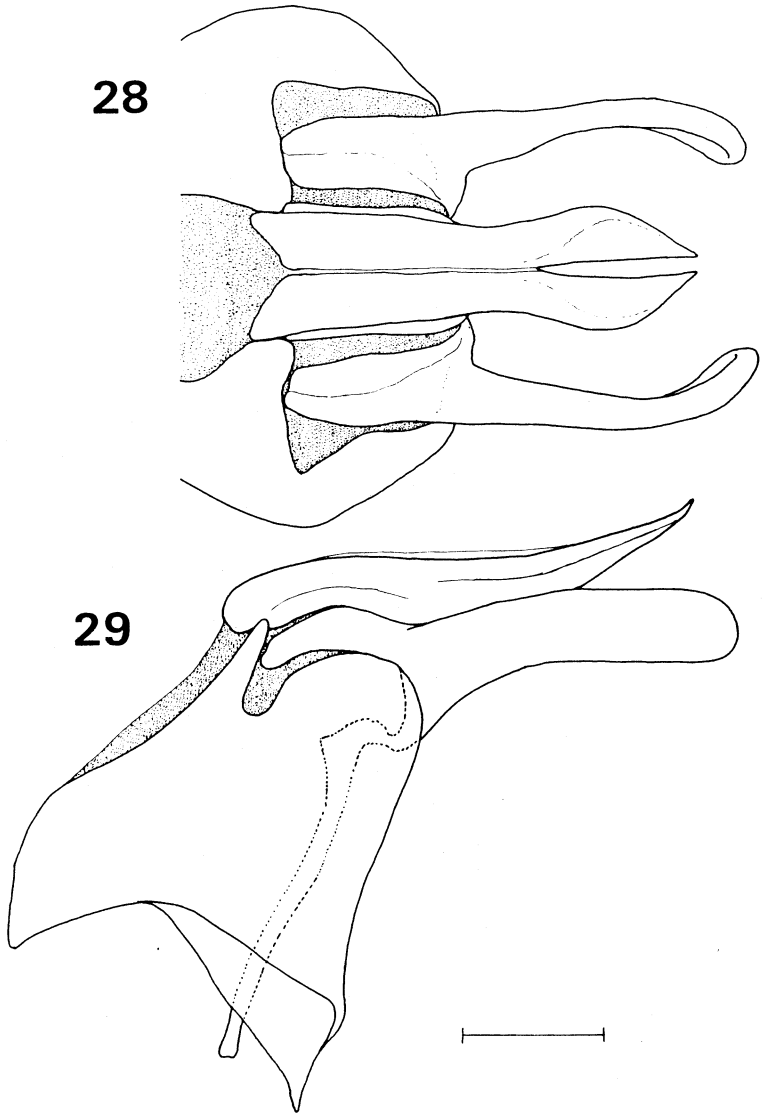
♂. Frons at narrowest point 0.038–0.092 times head width (mean 0.054, n=21). Paraphallic processes rather thick apically, armed with numerous minute teeth on underside of tip like the edge of a saw-blade. Clear 'window' in middle of distiphallus rather extensive in profile.

♀. Frons at vertex 0.304–0.333 times head width (mean 0.324 n=6). T6 entire and rather long, no zone of weak sclerotization middorsally, although such a zone is suggested in one specimen (G.pr. 251). ST6 also rather long. ST7 evenly sclerotized. Epiproct with or without microtrichiae. Cerci without microtrichiae. (5 ovipositor slides examined, G.pr. 93, 94, 251, 295, 296, 299).

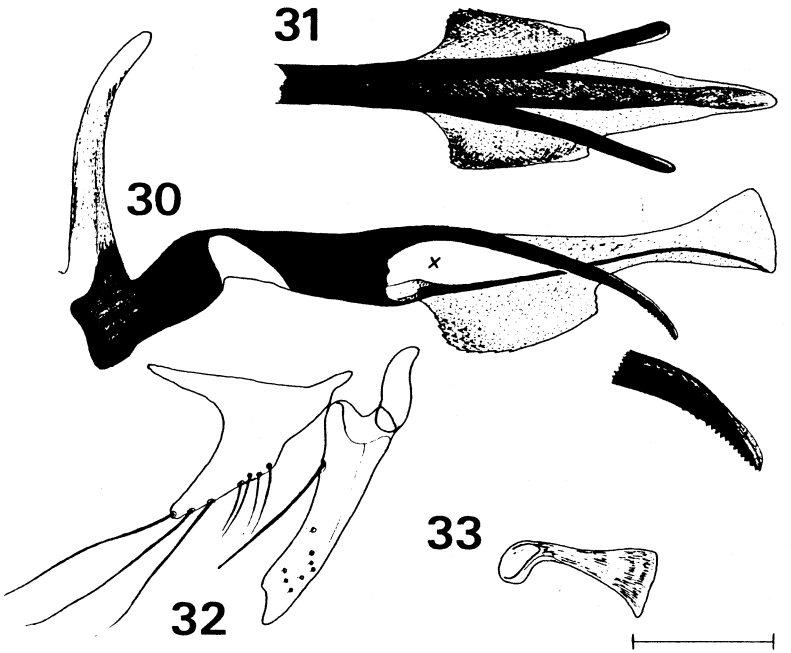
Length. 6 – 11 mm.

Type material. – *Musca vagabunda* Meigen, 1826: 72. Lectotype ♀, [WEST] GERMANY, probably Stolberg, see Rognes (1991a) for details, (MNHN).

Pollenia pulvillata Rondani, 1862: 195. Lectotype ♂,



Figs 28–29. *Pollenia vagabunda* (Norway, KR), ♂ terminalia: (28) cerci, surstyli and parts of epandrium, posterior view; (29) cerci, surstylus, epandrium, bacilliform sclerite, lateral view. Scale 0.2 mm. (From Rognes 1991a: figs 662–663).



Figs 30–33. *Pollenia vagabunda* (Norway, KR), ♂ terminalia: (30) aedeagus, lateral view; (inset: tip of paraphallus, enlarged); (31) distiphallus, posterior view; (32) pre- and postgonites; (33) ejaculatory sclerite. (From Rognes 1991a: figs 664–667).

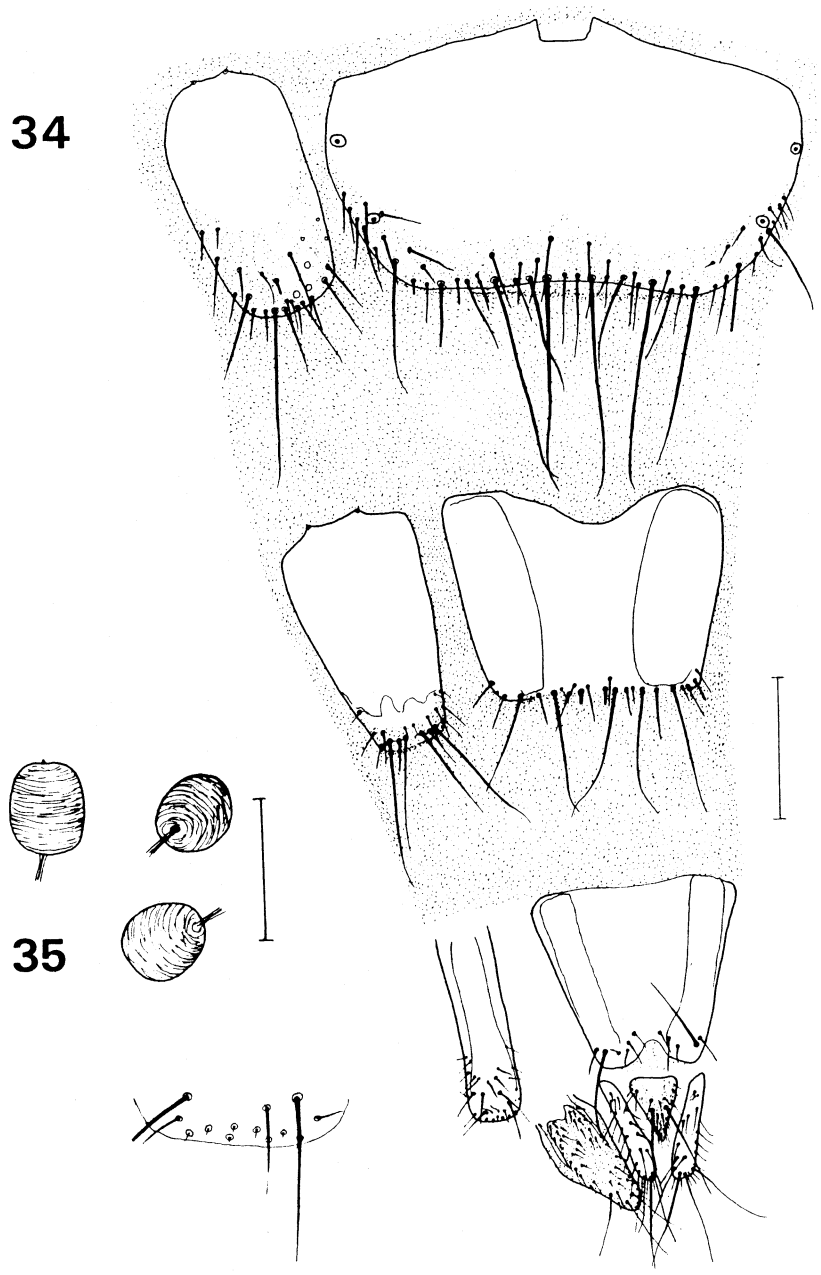
ITALY, 'in collibus agri parmensis [in the hills of the Parma countryside]', see Rognes (1991b) for details, (MZLSF).

Pollenia hasei Séguy, 1928b: 370. Lectotype ♂, SPAIN, Guadarrama, Cercedilla, ix. 1927 (Hase) (DEI), here designated. The specimen is labelled 'Type' by Séguy and also carries red labels reading 'TYPE' and 'Lectotypus'. It lacks the terminalia, but on the pin is a reference to a slide with a preparation of the ♂ genitalia. I have not seen this slide, but Séguy's detailed figures are probably based on it. Paralectotypes, 4♂ 3♀, all with same data as lectotype, as follows: 2♂ 1♀ (1♂ dissected by Heinz, with terminalia on piece of card on pin) (DEI); 2♂ 2♀ (1♂ 1♀ dissected by Séguy) (MNHN). All are labelled 'Cotype' by Séguy; the DEI specimens also carry red labels reading 'Paralectotypus'.

Other material examined. – 412 specimens form the following countries: AUSTRIA (4), CANADA (B.C., P.E.I.) (3), CZECHOSLOVAKIA (4), DENMARK (NEZ, NWZ) (64), FINLAND (Ab, Al, Ka, N, Ta) (66), FRANCE (8), MOROCCO (3), NORWAY (AAY, AK, HES, HOI, MRI, OS, RI, RY, VAI, VAY, VE, Ø) (97) (G. pr. 93, 94, 251, 295, 296), SPAIN (5) (G. pr. 299), SWEDEN (Bl., Dlr., Gtl., Hall., Jmt., Sdm., Sk., Sm., Upl., Vg., Vrm., Ög.) (117), TUNISIA (4), U.S.A. (Maine) (1), U.S.S.R. (Leningrad Obl.) (6), [WEST] GERMANY (30).

Biology. – Pupae and adults were taken in a stem of *Zea mais* occupied by *Sesamia nonagrioides* (Lepidoptera) (Séguy 1928b, 1934, 1941). At present there seems to exist no positive evidence that *P. vagabunda* is biologically associated also with earthworms, although it is likely that such will eventually turn up. It has been captured indoors. In central Europe captured from March to October (Mihályi 1979). It has been captured all through the year in Fennoscandia and Denmark. Some specimens overwinter indoors (Rognes 1991a).

Distribution. – *Pollenia vagabunda* occurs all over the western Palaearctic Region from Spain in the west to Byelorussian S. S. R. in the east, from North Africa in the south to the central parts of Norway and Sweden in Scandinavia in the north. Also in the British Isles. Introduced in Canada and U.S.A. I



have seen females belonging to either *contempta* or *vagabunda* also from Greece (ZMUC).

Discussion. – *Pollenia vagabunda* is apparently a good species, but only in the male sex reliably separable from its closest relative *contempta* in areas where both species occur. It also occurs in Great Britain (Pont 1976), Hungary (Mihályi 1976), Poland (Draber-Mońko 1971, 1978, 1985, 1986) and Byelorussian S.S.R. of the U.S.S.R. (Grunin 1970). These records are based on specimens I have not seen, but I accept all of them as *vagabunda*. The record from Yugoslavia by Coe (1960) (cf. Mihályi 1980) was based on a misidentifed and missexed specimen of *Pollenia pseudintermedia* Rognes (Rognes 1987a). It was first reported as introduced into Canada by Shewell (1961). The record from U.S.A. is the first reported [1♂, Maine, Weld, Franklin Co., 8.viii.1967 (*Stone*) (USNM)]. Séguy (1928a) described *vagabunda* correctly as having a '[t]horax à trois lignes noires', but in later publications (1928b, 1934, 1941) he treated *hasei* and *vagabunda* as two different species, and, curiously, seems neither to have remarked the presutural mid-dorsal stripe in *hasei*, nor the one in *contempta*. The record from Morocco (Casablanca, Benoist leg.) by Séguy (1930: 147; 1934: 40; 1941: 23, as *hasei*) is based on a misidentified female specimen of a species of the genus *Bellardia* Robineau-Desvoidy (in MNHN, examined). The specimen reported by Séguy (1928a: 178) from France, Saint-Lyé (Royer leg.) (as *vagabunda*) is a female *Pollenia fulvipalpis* Macquart (in MNHN, examined). Séguy's (1928a: 178) record from Algeria (as *vagabunda*, Surcouf leg.) is based on a female specimen of either *vagabunda* or *contempta*, so it is still not known whether *vagabunda* occurs in Algeria. Séguy's (1928a: 178) record from France, Montmorency (as *vagabunda*, Dumont leg., Séguy genital slide no. 125) belongs to *Pollenia labialis* Robineau-Desvoidy = *Pollenia intermedia*: authors) (specimen and slide in MNHN, examined). Séguy's (1934: 49 fig. 13; 1941: 20 fig. 15, 24 fig. 29) erroneous illustrations of the aedeagus of *vagabunda* is possibly based on this specimen. Most of Séguy's (1928a: 178; 1934; 1941) remaining records from France have been traced in MNHN (under a Séguy label reading *Pollenia vagabunda*) and probably belong to *vagabunda*, but I have not dissected them, so it cannot be excluded that some are *contempta*, e.g. the ♂ from Iles d'Hyères at the Mediterranean coast (in MNHN). Zumpt's records (1956: 71, 77f) from North Africa are most likely a mixture of *vagabunda* and *contempta* as he reports the mid tibiae to have 1–3 *ad* setae. I have never seen *vagabunda* with more than a single *ad* seta on the mid tibia.

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References

Coe, R. L. 1960. Diptera taken in Jugoslavia from May to July, 1955, with localities and notes. *Bulletin du Museum d'Histoire Naturelle, Belgrade* (B) 15: 168–178.

Draber-Mońko, A. 1971. Niektóre Calyptrata (Diptera) Bieszczadów. *Fragmenta Faunistica Warszawa* 17: 483–543.

– 1978. Scathophagidae, Muscinae, Gasterophilidae, Hippoboscidae, Calliphoridae, Sarcophagidae, Rhinophoridae, Oestridae, Hypodermatidae i Tachinidae (Diptera) Pienin. *Ibidem* 22: 51–229.

– 1985. Parasitoids of earthworms of the genera *Pollenia* R.-D. and *Sarcophaga* Meig. in the urban green of Warsaw and in some habitats of the Mazovian Lowlands. *Ibidem* 29: 311–375.

– 1986. Synantropijne *Calyptrata* w wybranych srodowiskach na terenie polski [Synanthropic *Calyptrata* in selected habitats in Poland]. *Wiadomosci Parazytologiczne* 32: 411–418.

Emden, F. I. van. 1954. Diptera Cyclorrhapha Calyptrata (I) section (a) Tachinidae and Calliphoridae. *Handbook for the Identification of British Insects* 10 (4) (a), 133 pp. London.

Enderlein, G. 1936. 22. Ordnung: Zweiflügler, Diptera. *In* Brohmer et al. (Eds): *Tierwelt Mitteleuropas*. Band VI, Insekten. 3. Teil. Abt. XVI, 259 pp. Leipzig.

Franz, H. 1989. Die Nordost-Alpen im Spiegel ihrer Landtierwelt. Eine Gebietsmonographie umfassend: Fauna, Faunengeschichte, Lebensgemeinschaften und Beeinflussung der Tierwelt durch den Menschen. Band VI/2 Diptera Cyclorapha. 445 pp. Innsbruck.

Gregor, F. 1987. Calliphoridae. *Acta Faunistica Entomologica Musei Nationalis Pragae* 18: 291–293.

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Figs 34–35. *Pollenia vagabunda* (Norway, KR), ♀ terminalia (G. pr. 94): (34) ovipositor (stipple indicates extent of microtrichiae); (35) spermathecae. Scales 0.4 mm (34), 0.2 mm (35). (From Rognes 1991a: figs 668–669).

Grunin, K. Ya. 1970. 108. Sem. Calliphoridae - Kalliforidy. Pp. 607-624 *in* Bei-Bienko (Ed): Opredelitel' nasekomýkh evropeiskoi chasti SSSR, V, Dvukrýlýe, Blokhi. Leningrad.

Hall, D. G. 1965. Family Calliphoridae. Pp. 922-932 *in* Stone et al. (Eds): A catalog of the Diptera of America north of Mexico. *Agriculture Handbook* 276. Washington D.C.

Hedström, L. 1988. Svenska insektfynd - rapport 4 [Swedish insect records, 4th report]. *Entomologisk Tidskrift* 109: 139-149.

Jacentkovský, D. 1942. Beitrag zur Kenntnis der Gattung *Pollenia* R.D. *Zapiski Nauchno-Issledovatel'skogo Ob'edineniya Russkii Svobodyi Universitet v Prage* [*Abhandlungen der russischen Forschungsgesellschaft in Prag*] 11(16) 84: 193-225 [1-33].

Lehrer, A. Z. 1963. Études sur les Diptères Calliphorides. I. - La classification des Polleniinae palearctiques et leur dispersion en Roumanie. *Bulletin et Annales de la Société Royale d'Entomologie de Belgique* 99: 285-310.

- 1967. Études sur les Diptères calliphorides. II. Revision de la nomenclature de la tribu Polleniini. *Ibidem* 103: 255-259.

Lundbeck, W. 1927. Diptera Danica. Part VII. Platypezidae, Tachinidae. 560 + 11 pp. København.

Meigen, J. W. 1826. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. 5, xii + 412 pp. Hamm.

Mihályi, F. 1976. Contribution to the knowledge of the genus *Pollenia* R.-D. (Diptera, Calliphoridae). *Acta Zoologica Academiae Scientiarum Hungaricae* 22: 327-333.

- 1979. Fémeslegyek - húslegyek Calliphoridae - Sarcophagidae. *Fauna Hungariae* 135, 152 pp. Budapest.

- 1980. Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Institutes. *Beiträge zur Entomologie* 30: 333-341.

Morge, G. 1975. Dipteren-Farbtafeln nach den bisher nicht veröffentlichten Original-Handzeichnungen Meigens: 'Johann Wilhelm Meigen: Abbildung der europaeischen zweiflügeligen Insecten, nach der Natur'. Pars I. Vorwort der Herausgegebers - Faksimiles von Original-Legenden und -Index: 'Erklaerung der Fig.' und 'Alphabetisches Verzeichniss der Gattungen und Arten' - Farbtafeln I-LXXX. *Beiträge zur Entomologie* 25: 383-500, pls. 1-80.

- 1976. Dipteren-Farbtafeln nach den bisher nicht veröffentlichten Original-Handzeichnungen Meigens: 'Johann Wilhelm Meigen: Abbildung der europaeischen zweiflügeligen Insecten, nach der Natur'. Pars II: Farbtafeln LXXXI-CLX. *Ibidem* 26: 441, pls. 81-160.

Pont, A. C. 1976. 81. Calliphoridae. Pp. 107-108 *in* Kloet & Hincks (Eds): A check list of British insects. Second edition. Part 5: Diptera and Siphonaptera. *Handbooks for the Identification of British Insects* 11 (5), ix + 139 pp. London.

Ringdahl, O. 1952. Catalogus Insectorum Sueciae. - XI. Diptera Cyclorrapha: Muscaria Schizometopa. *Opuscula entomologica* 17: 129-186.

Robineau-Desvoidy, A. J. B. 1830. Essai sur les Myodaires. *Mémoires Présentés par Divers Savants à l'Académie de l'Institut de France* 2: 1-813.

- 1863. Histoire naturelle des Diptères des environs de Paris. Oeuvre posthume du Dr Robineau-Desvoidy publiée par les soins de sa famille, sous la direction de M. H. Monceaux. 2, 920 pp. Paris, Leipzig & London.

Rognes, K. 1985. A check-list of Norwegian blowflies. *Fauna Norvegica* (B) 32: 89-93.

- 1987a. A new species in the *intermedia*-group and a new synonymy in the genus *Pollenia* Robineau-Desvoidy, 1830 (Diptera: Calliphoridae). *Systematic Entomology* 12: 381-388.

- 1987b. The taxonomy of the *Pollenia rudis* species-group in the Holarctic Region (Diptera: Calliphoridae). *Ibidem* 12: 475-502.

- 1988. The taxonomy and phylogenetic relationship of the *Pollenia semicinerea* species-group (Diptera: Calliphoridae). *Ibidem* 13: 315-345.

- 1991a. Blowflies (Diptera, Calliphoridae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* 24, 272 pp. Leiden etc.

- 1991b. Revision of the species of *Pollenia* Robineau-Desvoidy described by Camillo Rondani (Diptera: Calliphoridae). *Entomologica Scandinavica* 22: 365-367.

- 1991c. Revision of the cluster-flies of the *Pollenia viatica* species-group (Diptera, Calliphoridae). *Systematic Entomology* 16: 439-498.

Rondani, C. 1862. Dipterologiae Italicae Prodromus, 5. Species italicae ordinis dipterorum in genera characteribus definita, ordinatim collectae, methodo analitica distincta et novis vel minus cognitis descbiptis. Pars Quarta. Muscidæ Phasiinæ - Dexinæ - Muscinæ - Stomoxidinæ. 239 pp. Parmae [=Parma].

Schumann, H. 1986. Family Calliphoridae. Pp. 11-58 *in* Soós & Papp (Eds): Catalogue of Palaearctic Diptera, 12. Calliphoridae - Sarcophagidae. Budapest, Amsterdam etc.

Séguy, E. 1928a. Études sur les mouches parasites. Tome I Conopides, Oestrides et Calliphorines de l'Europe occidentale. Recherches sur la morphologie et la distribution géographique des Diptères à larves parasites. *Encyclopédie Entomologique* (A) 9: 1-251.

- 1928b. Étude sur *Pollenia Hasei*. *Zeitschrift für Angewandte Entomologie* 14: 369-375.

- 1930. Contribution à l'étude des Diptères du Maroc. *Mémoires de la Société des Sciences Naturelles du Maroc* 24: 1-207.

- 1934. Contribution à l'étude du genre *Pollenia* R.-D. *Revue Française d'Entomologie* 1934: 44-51.

- 1941. Études sur les mouches parasites. Tome II. Calliphorides. Calliphorines (suite), Sarcophagines et Rhinophorines de l'Europe occidentale et méridionale. Recherches sur la morphologie et la distribution géographique des Diptères à larves parasites. *Encyclopédie Entomologique* (A) 21: 1-436.

Shewell, G. E. 1960. Notes on three European Diptera recently discovered in Canada. *Canadian Entomologist* 93: 1044-1047.

Wainwright, C. J. 1928. The British Tachinidae (Diptera). *Transactions of the Entomological Society of London* 76: 139-254.

- 1940. The British Tachinidae (Diptera): Second supplement. *Transactions of the Royal Entomological Society of London* 90: 411-448.

Zumpt, F. 1956. 64i. Calliphorinae. *Fliegen der palaearktischen Region* 11 (Lief. 190, 191, 193): 1-140. Stuttgart.

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