DIPTERA DANICA

GENERA AND SPECIES OF FLIES HITHERTO FOUND IN DENMARK

BY

WILLIAM LUNDBECK

PART II

ASILIDAE, BOMBYLIIDAE, THEREVIDAE, SCENOPINIDAE

WITH 48 FIGURES

PUBLISHED AT THE EXPENSE OF THE CARLSBERG FUND

G. E. C. GAD — COPENHAGEN
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(ORTHORRHAPHA BRACHYCERA.)

(PLATYGENYA.)

HETERODACTYLA.

PROCEPHALA.

Asilidae.

Head short, flat or slightly excavated behind; it is broad and nearly always broader than high; it is as broad as, or somewhat broader than, thorax. The vertex is strongly excavated in a saddle-shaped way, and thus the eyes are prominent above. The head is slightly arched in front and very often there is a smaller or larger callus on the epistoma, reaching more or less up towards the antennæ; this callus is set with strong, downwards curved bristles, the epistomal beard. Jowls small, generally only slightly descending below the eyes, rarely more. Antennæ nearly always inserted near to each other and more or less above the middle, sometimes very high and then the frons is very short; the antennæ are sometimes placed on an antennal tubercle; they are three- to five-jointed; when more than three-jointed the last or the two last joints form a blunt or pointed style, or an arista; when this is two-jointed the basal joint is short, and sometimes the style is indistinctly two-jointed. Eyes separated in both sexes, the face being more or less broad; the facets in the front part of the eye, from the inner eye-margin outwards, more or less enlarged in both sexes, sometimes only very slightly. Three ocelli present, situated on an ocellar tubercle on the excavated vertex. Ocellar bristles present or absent; a row of occipito-ocellar bristles along the posterior eye-margin. The parts of the head surrounding the oral aperture only slightly membranous, thus no oral cone is formed; on the occiput there is a membranous part below the occipital foramen in which part the united stipites of the maxillæ lie. The clypeus is marked off on the lower part of the epistoma; it is triangular or rounded upwards and flat or often impressed, below it has a small membranous part. The proboscis varies in length from

rather short to a half times longer than the head is high; it is straight or nearly so, only in *Xiphocerus* curved inwards towards the end; the proboscis is directed downwards or more or less forwards, truncate or more pointed at the apex. Labrum is short, generally of the length of the basal part of labium; hypopharynx is strong, semitubular and pointed at the apex; the upper edges of the semitube are beset with erect hairs over more or less of the apical part or nearly the whole length; the hypopharynx is used to sting with. The maxillæ are also rather strong with a long, pointed or truncate, sometimes semitubular lacinia and with one- or two-jointed palpi. Labium has the basal part occupying more or less of the length up to the half part; the apical part is more or less distinctly divided into two joints, sometimes undivided; this apical part answers to the labella but is not developed as such but strongly chitinised like the basal part, and below it is not divided in the middle line. Generally the division between the basal and the labellar part is somewhat distinct; at the apex the labellar part is more or less beset with hairs, and the basal part has long hairs below. Hypopharynx and maxillæ are about equal to the length of the labium. Thorax is high, more or less arched above; it is rectangular or nearly oval. It bears often macrochætæ and then generally præsutural, supraalar, postalar and also dorsocentral bristles, and on the scutellum marginal bristles. Sometimes macrochætæ are not developed. On the metapleura there is generally a vertical row of bristles or strong hairs, often also continued down the hypopleura. The prothorax is distinctly developed; it is narrow, and hence the head is free, not lying towards the front end of the thorax. The prothorax has a transverse row of hairs or bristles above. The metathorax is also rather distinctly developed, the dorsum is generally small but the metasternum is moderately large, and the space between it and the hind coxæ is filled up by a membrane. Abdomen is long and generally narrower than the thorax; sometimes it is very slender. It is generally cylindrical, sometimes more flattened or on the contrary somewhat compressed. It consists of eight segments, but often one or even more of the last are small or hidden. The first dorsal segment is always short and generally broader than the following one which is as a rule the longest; the first ventral segment, following after the metasternum, is nearly always very short. The male genitalia are large and projecting; they seem in all cases to be formed of parts of the segment or segments following after the eighth. I have not been able to work out in all cases the homologies in the different genera, but generally the genitalia consist of the upper forceps, and below this the lower forceps; between the arms of the upper forceps

lies a dorsal median lamella of a somewhat paired structure or it is divided into two styliform lamellæ; on the ventral side at the base of the lower forceps lies a ventral median lamella, sometimes very large. In the interior is the penis, generally curved upwards. The female abdomen terminates in a shorter or longer ovipositor, generally with a pair of lamellæ at the apex; often the eighth abdominal segment forms part of the ovipositor, and in some cases even the sixth and seventh. The legs are strong or more slender, sometimes very strong; in some cases they may be specially developed, e. g. have the hind metatarsi very elongated, or thickened, or there may be spines at the end of the front or the hind tibiæ. The legs are hairy and more or less bristly, the bristles being of different categories, very thin or stronger or very strong and spine-like. On the ventral[1] or antero-ventral side of the front tibiæ and on the posterior or postero-ventral side of the hind tibiæ there is a special, short, dense pubescence, and similarly on the under surface of the tarsi. All tibiæ have apical spurs. The claws are generally somewhat strong; there are two, generally rather large pulvilli, sometimes they may be rudimentary or even wanting (*Leptogaster*, *Acnephalum*, *Rhadinus*, *Psilinus*); the empodium is strong and claw-like or weaker and more bristle-shaped. Wings with the costal vein extending all round the margin; the subcostal cell open or closed; the cubital vein forked, sometimes (in non-Danish genera) the upper branch with a recurrent veinlet or a vein prolonged to the radial vein; thus there are two or three cubital cells. Discal cell formed exclusively of the discal vein; between it and the upper branch of the postical vein a postical cross-vein, or this cross-vein wanting and the postical vein uniting with the discal vein only at a point or for some distance, and in the latter case contributing to form the discal cell. There are five posterior cells, all open or the fourth often narrowed at the apex or closed at a shorter or longer distance from the margin. (In some non-Danish genera the first posterior cell may also be closed). The anal cell reaching the margin, open or closed. The basal cells of equal length or the second shorter than the first. The alula generally well developed, rarely

[1] With regard to the different sides of the legs and the arrangement of the bristles on them I use the method proposed by Mik (Dipt. Unters. Jahresber. d. k. k. akad. Gymnasiums, 1878) and later on by Grimshaw (Entom. Month. Mag. 2, XVI, 1905, 173). When we consider all three pairs of legs as stretched completely and horizontally out rectangularly to the body I term that side of both femora and tibiæ which is turned upwards the dorsal or upper, and the opposite the ventral or lower; the side which looks forwards is the anterior or front side, and the opposite the posterior or hind side.

rudimentary or wanting (*Leptogaster*). The alar squamula is small, more or less hairy at the margin; the thoracic squamula not developed but the frenulum distinct and often somewhat broad towards the angulus; the halteres not covered. In rest the wings lie parallel over the abdomen, one covering the other, then the squamula and frenulum generally point outwards somewhat process-like.

The larvæ are elongated, cylindrical, finely striated longitudinally. The body consists of thirteen segments including the head and when the segment-like part in front of the last segment is counted. The abdominal segments have sometimes transverse swellings, especially below, or they have warts. The head is small, retractile, and brown, chitinised. There are some bristles on the head and the last segment. The mouth parts consist of a median, hook-formed labrum, knife-shaped mandibles and large and broad maxillæ with a generally two-jointed palpus. The mandibles and maxillæ are movable up and down. There are small antennal papillæ but no eyes. The larva is amphipneustic with spiracles on prothorax and on the penultimate segment (or segment-like part); the spiracles are small. The pupa is free; on the front side of the head across the lower part of the eyes lie the antennal sheaths, directed to each side; they have a strong spine at the base and are compressed with some strong downwards inclined spines. At the bases of the sheaths of wings and legs there are generally small spines. The abdominal segments have each a girdle of spines above and a girdle of bristles below; at the apex of the body there are some spines.

The larvæ are carnivorous; they live in the earth or in sand and devour other larvæ, and they are recorded sometimes to penetrate into these and eat them quite empty. Some larvæ (*Laphria*) are found under bark and in stubs, here feeding on larvæ of bark-beetles and the like. The pupæ are likewise found in the earth or under bark and in stubs.

The Asilids are middle sized to large flies — *A. crabroniformis* being one of our largest flies —; they are characterised by their more or less long shape and the deeply excavated vertex causing the eyes to be prominent above. They are all rapacious and feed on other insects which they attack with great vigour, and the prey is often even as large as the attacker. From the difference in the venation of the wing the Asilids fall into two groups, those with an open and those with a closed subcostal cell, that is *Dasypogoninae* and *Laphriinae-Asilinae*. As already noticed by Löw (Ueber die eur. Raubfliegen, Linn. Entom. II, 1847, 386) the wing with the open subcostal cell is a less strong appliance for flight than the wing with a closed subcostal

cell, and the *Dasypogoninae* with a few exceptions also include the weaker, generally more slender forms with often less strong legs; these forms take weaker prey. The *Laphriinae* and *Asilinae* are stronger and generally more bristly, and they fly very well; they are therefore the strongest robbers, often attacking rather strong and large prey. — There is a work of Poulton (Trans. of the Ent. Soc. of London, 1906, 323) on the prey of Asilids which is of some interest. The author maintains that there is mimicry between Asilids and their prey, but I do not think this is correct, and I have not at all found it confirmed. In the following I shall give what is known to me about the prey of the single species. — As said before, the hypopharynx is used to sting with and it is used when the fly attacks. It may be plunged through rather hard chitin; it is thus recorded that an *Asilus* stuck it through the elytra of a lady-bird, and Asilids have been captured with species of *Hister* as prey. Whether the Asilids are in possession of a poison or not is not known, but it is recorded (f. inst. Poulton, l. c. 365, foot-note), that the prey collapse instantaneously, and I have made the same observation myself, so that the action of some poison is very probable. Zeller (Isis 1840, 34) says that they have a poisonous saliva but gives otherwise no definite information; he says also that they may use the mouth parts for defence and he continues: „Der Stich ist zwar empfindlich genug, verursacht aber wohl nie Geschwulst.“ Riley (First Rep. of the U. S. Ent. Comm. 317) remarks about the American species *Proctacanthus milberti* Macq. that they „have a sufficiently powerful beak to produce quite a severe sting on the human hand.“ — The species of Asilids occur in many different localities, both in woods, some especially in pine-woods, on fields, heaths, at the shore and in downs, but most species always seek dry and sandy districts; some generally prefer stems and piles, others the sandy ground. The weaker forms generally occur in herbage and high grass.

From the palæarctic region about 500 species are known and from North America about 550; I find only one, *Laphria gilva*, common to both regions.

I am aquainted with no case of parasitic Hymenoptera from Asilids, and so far as I am aware none is recorded in the literature.

Aslids earlier recorded from Denmark. — Kramer in 1760 (Spec. Insectol. Dan.) records two species: *A. crabroniformis* and *ater*. Brünniche in 1761 (Prodr. Insectol. Siælland.) has three: *A. crabroniformis*, *ater* and *forcipatus*. In 1763 (Pontoppidan, Dansk. Atl. I) he has 7: *A. crabroniformis*, *ater*, *gilvus*, *germanicus*, *forcipatus*, *tipuloides* and *oelandicus*. Noting more can be said about these species than that they are Asilids and identical with some of our species; probably

the easily recognised species *crabroniformis*, *gilvus*, *germanicus* and *oelandicus* are correctly determined; *ater* is I think *L. marginata*. O. F. Müller, 1764 (Faun. Fridrichsd.) has 8 species: *A. forcipatus*, *gibbosus*, *ater*, *tipuloides*, *oelandicus* and the three new: *maculatus*, *medius* and *ignavus*. In 1767 (Flor. Fridrichsd. App.) he enumerates moreover *germanicus* and *crabroniformis*. Of these species probably *crabroniformis*, *germanicus* and *oelandicus* are correct; *gibbosus* may be thought to be *L. ephippium* though the description may suggest some doubt, and *tipuloides* is perhaps a *Leptogaster*; *ater* is again I think *L. marginata*. With regard to the new species it is somewhat probable that *maculatus* and *ignavus* belong to *Leptis*; *medius* is so very insufficiently described that nothing can be said about it. — Fabricius has in 1787 (Mantiss. Insect.) one species from Denmark, *A. linearis*; in 1794 (Entom. Syst. II) he enumerates one more *A. hyalipennis*. He has in 1805 (Syst. Antl.) the same two species, now under *Dioctria*; both species are new, and these two species were thus originally established from Denmark. — Meigen records in 1830 (Syst. Beschr. VI, 334, 63) an *A. Domitor* to which the locality: „Im dänischen Seelande" is given and moreover there is said: „in von Winthems Museum." I wrote about this species to Prof. Handlirsch who kindly took the trouble to search for it, but finally informed me that the type was not to be found. After Meigens description I think with great probability that the species is *Dysmachus forcipula*, only he says about the colour of the legs „pechbraun", yet this is not rarely seen in not quite mature specimens. — Jacobsen records in 1843 (Nat. Tidsskr. IV, 315) *Dioctria Reinhardi* for the first time. — Zetterstedt has in 1842 (Dipt. Scand. I) 12 species: *Laphria ephippium*, *marginata*, *Asilus crabroniformis*, *germanicus*, *aestivus* = *cyanurus*, *atricapillus*, *forcipula*, *Dasypogon cinctus*, *Dioctria oelandica*, *flavipes* = *hyalipennis*, *Leptogaster cylindricus* and *guttiventris*. In 1849 (VIII) he enumerates moreover: *Laphria podagrica* = *marginata*, *Dioctria Reinhardi*, *cothurnata* = *Reinhardi* and *cingulata* = *linearis*. He thus knew in all 14 species from Denmark. In the present work 28 species are enumerated.[1]

Table of Subfamilies.

1. Subcostal cell open ..... 1. *Dasypogoninae.*
— Subcostal cell closed ..... 2.
2. Antennæ three-jointed, without style or arista ..... 2. *Laphriinae.*
— Antennæ five-jointed, with a two-jointed arista ..... 3. *Asilinae.*

[1] *Asilus danicus* Schranck (Fn. Boica, III, 1, 1803, 160, 2552) is not from Denmark what could be thought on account of the name; Schranck named it so, because he identified it with *A. oelandicus* var. (Müll. Prodr. 181, 2134); besides the species is unrecognisable.

1. Dasypogoninae.

Slender or more robust species. Antennæ four- to five-jointed, the third joint the longest, somewhat compressed; it has at the apex a one- or two-jointed style which is blunt or pointed; often the style is indistinctly two-jointed. Legs not specially strong. Wings with the subcostal cell open; two cubital cells; between the discal cell and the upper branch of the postical vein a postical cross-vein or in some genera (*Leptogaster*, *Stichopogon*) the postical vein lying close to the discal cell and thus no postical cross-vein present; five posterior cells, the fourth often somewhat narrowed or (in non-Danish genera) closed; also the first sometimes, but rarely, narrowed or closed (in non-Danish genera); anal cell open or closed.

Table of Genera.

1. Wings relatively short; no postical cross-vein; no pulvilli . . . 1. *Leptogaster.*
— Wings not short; a postical cross-vein present; two pulvilli . . . 2.
2. Antennal style blunt; hind femora and tibiæ with a fringe of short hairs on the ventral side . . . 2. *Dioctria.*
— Antennal style pointed; hind legs without a fringe . . . 3.
3. Front tibiæ with a spine at the apex; no distinct epistomal callus . . . 4.
— Front tibiæ without a spine at the apex; an epistomal callus present . . . 5.
4. Spine at the end of the front tibiæ large; epistomal beard reaching half way up towards the antennæ; anal cell open; large species . . . 3. *Dasypogon.*
— Spine at the end of the front tibiæ small; epistomal beard reaching to the antennæ; anal cell closed; smaller species . . . 4. *Leptarthrus.*
5. Epistomal callus not reaching the antennæ . . . 5. *Lasiopogon.*
— Epistomal callus reaching to the antennæ . . . 6. *Cyrtopogon.*

1. **Leptogaster** Meig.

Species of middle size and very slender shape, and of greyish or brownish colour. Head somewhat broader than thorax and considerably broader than high; it is short and slightly excavated behind. The eyes are large and the epistoma narrow, somewhat widened downwards, without any distinct callus; the epistomal beard is not dense. Antennæ inserted near to each other, considerably above the middle. Jowls small, only very slightly descending below the eyes. No ocellar bristles present. The antennæ consist of four joints, the two basal joints are short and of equal length, the third joint is oval, compressed,

with a narrow part in front on the apex of which is placed the last joint; this is at the end suddenly narrowed in a styliform way[1]. The eyes have larger facets just in front at the inner margin from the insertion of the antennæ downwards. The clypeus is indicated in the middle on the lower part of the epistoma. Proboscis is shorter than the head is high; it is straight, directed downwards and somewhat forwards; the basal and the apical part of the labium are of equal length; labrum is short, triangular, of the same length as the basal part of labium; the maxillæ have the united stipites lying on the posterior side of the head in a membranous part below the occipital foramen; the lacinia is pointed, slightly curved towards the apex; the maxillary palpi are short, slightly club-shaped, one-jointed; hypopharynx is long-pointed, rather thinly beset with erect hairs above over somewhat less than the apical half; maxillæ and hypopharynx are of equal length and as long as labium. Thorax is rectangular, very high and somewhat arched above; scutellum is small and directed obliquely downwards. There is one præsutural and one intraalar bristle, both strong; scutellum is without bristles, and on the metapleura no long hairs. Metathorax is rather distinct, the pleural parts bend down and unite on the ventral side behind the hind coxæ; the metasternum on the other hand is a small plate lying at the hinder end of the metathorax. The space on the ventral side between the downbent pleural parts and the metasternum is membranous. Abdomen is long and slender, consisting of eight segments; the features of the anterior segments are somewhat curious (Fig. 1); the first dorsal segment is very small, then follows a long second segment which has a transverse row of punctiform muscular impressions a little before the middle; the following segments decrease evenly in length and have the transverse row of muscular impressions lying near the front margin; on the ventral side the structure is different, the first ventral plate is only somewhat shorter than the second, thus it stretches some way in under the second dorsal segment, and the connection

[1] The antennæ in *Leptogaster* are generally ascribed a two-jointed style, but as shown by figs. 3 and 5 this is erroneous. Meigen who founded the genus in Illig. Mag. II, 1803 says in this place about the antennæ only: „dreigliederig ..... das letzte kegelformig, spitzig". In Klass. d. europ. Zweifl. 1804 he says: „dreigliedrig ..... das dritte ist kegelförmig, zusammengedrükt, an der Spizze mit einer Endborste." In Syst. Beschr. europ. zweifl. Ins. II, 1820 he says: „das dritte Glied .... an der Spizze mit einem zweigliederigen Griffel: das erste Glied sehr kurz, das zweite walzenförmig, haarig, spizzig„ and his figure (Tab. 21, 11) also shows such a style; but this is a mistake, the style is undivided and has no second joint, neither at the base nor at the apex.

between the first and second ventral plate lies just under the row of muscular impressions on the second dorsal segment; the second ventral plate reaches to the end of the second dorsal; the other

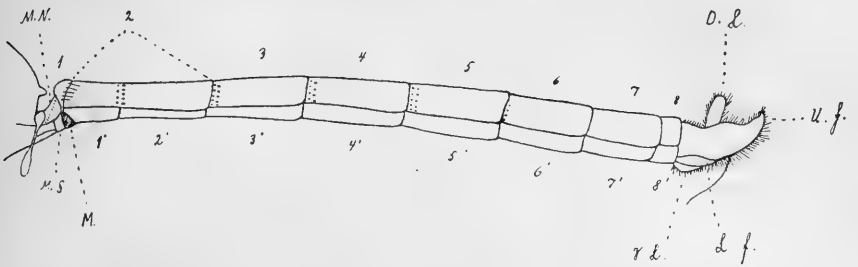

Fig. 1. *L. cylindrica.* Metathorax and abdomen. *1—8* the eight dorsal segments, *1'—8'* the eight ventral segments, *M. N.* metanotum, *M. S.* metastermum, *M.* membrane, *U. f.* upper forceps, *L. f.* lower forceps, *V. L.* ventral lamella, *D. L.* dorsal median lamella.

ventral plates are of the same length as the dorsal plates to which they belong. The last segment is short, especially in the male. The male genitalia are somewhat swollen; they consist of a large hook-formed upper forceps the arms of which are curved towards each other at the apex, so that they leave a space between them; in this lies the median dorsal lamella directed more or less upwards between the arms of the forceps; below the upper forceps lie the lower forceps; the arms of the latter are somewhat bulbous at the base with hook-formed, somewhat complicated apex which is hidden between the arms of the upper forceps; below the lower forceps at the base lies the somewhat arched ventral lamella; the lower forceps and the ventral lamella are connected at the base. In the interior lies the penis with a long, thread-like appendage which is generally (when not retracted) curved down along the ventral lamella. The female genitalia consist of a small, generally quite hidden ovipositor. Legs not especially strong, the hind legs relatively long; the femora have only a few bristles at the apex; the anterior tibiæ have some long, thin bristles on the posterior side and the hind tibiæ have some similar bristles on different sides; the tibiæ have moreover some apical spurs. The tarsi have strong bristles at the sides and short bristles on the lower surface. The front and hind tibiæ have a dense pubescence apically on the ventral side. The claws are relatively long and strong; there are no pulvilli and the empodium is claw-shaped. Wings relatively short; the subcostal cell open, the cubital vein with a long fork, the basal cells of nearly equal length, the upper branch of the postical vein lying close to the discal cell, thus there is no postical cross-vein; all

five posterior cells and the anal cell open. Alula not developed. Alar squamula small.

Fig. 2. *L. cylindrica*, hind leg. ×20.

I have not examined the larva and pupa but they are described by Beling (Arch. für Natgesch. Jahrgang 41, 41 et Jahrg. 48, 195); the larva has a length up to 12 mm. with a diameter of 2 mm.; it is cylindrical, white, finely striated longitudinally. Head small, brown, retractile, with some long hairs. A transverse row of small warts (Kriechschwielen), on the ventral side of the sixth to the eleventh segment. The larva is amphipneustic with spiracles on prothorax and on the penultimate segment (or the marked off front part of the last segment); the spiracles are small. The pupa is 6 mm. long, 2 mm. thick, yellowish white. The strongly diverging antennal sheaths lie on the under side of the head. Each of the first seven abdominal segments has on the dorsal side a row of six to eight brown spines directed backwards, and moreover the segments are all round, beset with erect, thin, brownish hairs, which are most dense towards the apex of the body. The wing-sheaths reach to the hind margin of the second and the sheaths of the legs to the hind margin of the fifth abdominal segment.

The larvæ live in the earth; they are found both in loamy soil on fields and in humous earth; they hibernate and the transformation to pupa and development of the imago take place in spring or summer.

The species of *Leptogaster* have a characteristic appearance from their long slender shape and the short wings; they occur both on open fields and in thickets as also on commons near the shore; they fly very dexterously in the high grass and herbage; when sitting the hind legs are generally stretched somewhat forwards so that all six tarsi are placed near to each other. I have never observed any *Leptogaster* with prey. Zeller (Isis 1840, 34) mentions that he finds a striking analogy between certain Asilids especially *Leptogaster* and the species of *Agrion*, so much more easy to observe as species of both often occur together in the same localities; this observation merits remembering as it is a very good one; there is in reality a striking resemblance in the manner of sitting, flying and to a certain degree in the whole behaviour of the species of *Leptogaster* and those of *Agrion*. Meigen already seems also to have had an eye for this resemblance in so far as in Klass. europ. Zweifl. he calls *Lepto-*

gaster „Libellenfliege“ which name in Syst. Beschr. he changes to „Schlankflige“.

Of the genus 22 species are known from the palæarctic region 2 of which have hitherto been found in Denmark.

Table of Species.

1. Abdomen with a dark, longitudinal line; hind femora with a longitudinal, black stripe on each side, the tarsi mainly black, only pale at the base; the peduncle of the second cubital cell from the medial cross-vein longer than the peduncle of the second posterior cell; the fourth posterior cell with a short peduncle ..... 1. *cylindrica.*
— Abdomen with dark transverse bands; hind femora with a black ring near the apex, the tarsi pale to a great extent; cubital and posterior cells rather long; the peduncle of the second cubital cell from the medial cross-vein not longer than the peduncle of the second posterior cell; the fourth posterior cell has no peduncle ..... 2. *guttiventris.*

1. **L. cylindrica** Deg.

1776. Degeer, Ins. VI, 99, 10, Tab. XIV, Fig. 13, (*Asilus*). — 1842. Zett. Dipt. Scand. I, 186, 1 et 1849. VIII, 2976, 1 et 1855. XII, 4581, 1. — 1847. Löw, Linn. Entom. II, 403, 7. — 1862. Schin. F. A. I, 118. — 1903. Kat. paläarkt. Dipt. II, 101.

Male. Epistoma yellowish to bright yellow, grey on the lowermost part; the epistomal beard white. Proboscis and palpi black. Front and vertex yellowish brown, the ocellar triangle dark. Occiput yellowish at the eye margin but greyish on the middle; the occipito-orbital bristles yellow. Antennæ black, the second joint rufofulvous. The eyes slightly dark greenish. Thorax greyish brown, the hinder

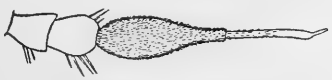

Fig. 3. Antenna of *L. cylindrica.* × 40.

part and the scutellum greyish; on the disc three broad, brown stripes, the lateral stripes abbreviated in front, all three pointed posteriorly and not reaching the scutellum, the middle stripe generally divided by an often indistinct median line. On the humerus a small, black shining spot and from here to the wing-root a narrow, black shining line. The præsutural bristle yellow, the intraalar bristle black. The pleura grey, especially downwards. Abdomen brownish grey with a dark brown line along the dorsal surface; venter brownish grey. Abdomen sparingly clothed with short, pale yellowish pubescence; at the apex of the first dorsal segment there are some longer, yellow bristles. The genital forceps black, shining, with somewhat long, pale

yellowish hairs, the median dorsal lamella ferrugineous to blackish. The legs yellow, the coxæ grey; the trochanters have a black point on the inside at the tip; the hind femora have a more or less distinct, longitudinal black stripe on each side which is broadest behind, the middle femora may show traces of a similar stripe and, more rarely, also the front femora; the hind tibiæ have a rather broad black stripe on each side which become broader on the apical part and here the two stripes unite, this part of the tibiæ thus being black; the anterior tibiæ have a black stripe along the front side. The tarsi and the claws are black, the larger basal part of the metatarsus and the utmost base of the second joint yellow. Legs clothed with short, yellowish hairs, and the front and hind tibiæ have the common dense pubescence apically on the ventral side. The longer bristles on the tibiæ are whitish to yellow; the bristles on the tarsi are pale at the base of the tarsus but black towards the end. The wings are somewhat

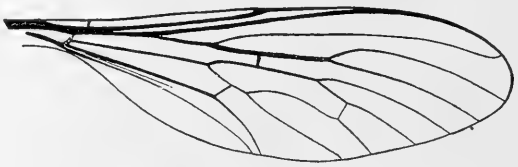

Fig. 4. Wing of *L. cylindrica*.

short, very slightly yellowish with dark brown veins; the branches of the cubital and discal veins are curved somewhat downwards; the peduncle of the second cubital cell from the medial cross-vein is longer than the peduncle of the second posterior cell; the fourth posterior cell has generally a short peduncle. The halteres are yellow, the knob often slightly darkened.

Female. With exception of the genital differences quite agreeing with the male, only the dorsal stripe on abdomen is narrower towards the end on account of the more pointed abdomen.

Length 7—14,5 mm.; individuals of the smallest size are less common; generally the females reach the greatest length.

L. cylindrica is common in herbage and high grass in nearly all localities, both in woods on somewhat open places, on fields and meadows and also on commons near the shore and along streams; Vesterfælled, Dyrehaven, Ruderhegn, Hillerød, Frerslev Hegn, Tisvilde, at Sorø and Skelskör; on Funen at Odense, Lundeborg on the eastern coast, Langensø and Faaborg; in Jutland in Nørholm Skov near Varde, at Haslund near Randers, on Læsø and finally on Bornholm at Rø and Hasle. My dates are $^{5}/_{6}$—$^{9}/_{8}$.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia; and in the east of Siberia.

2. **L. guttiventris** Zett.

1842. Zett. Dipt. Scand. I, 187, 2. et 1849. VIII, 2976, 2. — 1847. Löw, Linn. Entom. II, 397, 3. — 1862. Schin. F. A. I, 118. — 1903. Kat. paläarkt. Dipt. II, 102. — 1820. *L. cylindrica* Meig. (nec. Deg.) Syst. Beschr. II, 343, 1, Tab. XXI, Fig. 16.

Male. Epistoma white or greyish white, epistomal beard white. Proboscis and palpi black. Frons and vertex brownish grey; occiput grey, the occipito-orbital bristles blackish above but whitish lower down. Antennæ black, the second joint rufous; the style pubescent (requires a somewhat high magnifying power to be distinctly seen) (Fig. 5). Eyes slightly dark greenish. Thorax much as in *cylindrica*,

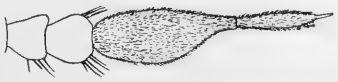

Fig. 5. Antenna of *L. guttiventris*. × 40.

brownish grey with three dark brown, broad stripes, the lateral stripes abbreviated in front, the middle stripe divided anteriorly by a grey line; scutellum grey; humeral and postalar calli more or less rufous; pleura grey; the præsutural and intraalar bristles black. Abdomen grey, the apical part of the segments lighter, in front of this part a broad, transverse, dark brown band, generally prolonged forwards in the middle. Not rarely the hind margin of the second and third segments is slightly yellowish. Venter mostly coloured like the dorsal surface. The abdomen is sparingly clothed with short, yellowish hairs, at the margin of the first segment there are longer bristles. The genitalia shining black, ferrugineous beneath, with pale hairs. Legs yellow to ferrugineous; the coxæ grey; the trochanters with a black point at the apex on the inside; the hind femora with a blackish ring near the tip and generally with a narrow blackish line nearer to the base on the anterior side, the middle femora often with a blackish patch near the apex on the front side; the middle tibiæ more or less dark along the front side, sometimes the front tibiæ with traces of the same, the hind tibiæ dark brown along the anterior and posterior sides, most distinctly on the anterior side; the tarsal joints yellow with the apex brown, but the tarsi on the whole darker towards the apex, the last joint quite dark. The legs are clothed with short, pale hairs, and the tibiæ and tarsi bear the ordinary bristles which are pale on the tibiæ and blackish on the tarsi. The

wings are considerably longer than in *cylindrica*; they are a little yellowish with brown veins; the branches of the cubital and discal veins are only slightly curved, the cubital and posterior cells are rather long; the peduncle of the second cubital cell from the medial

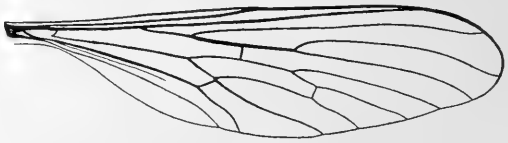

Fig. 6. Wing of *L. guttiventris.*

cross-vein is not longer than the peduncle of the second posterior cell; the fourth posterior cell has no peduncle. Halteres yellow, the knob may be slightly darkened.

Female. With exception of the genital differences quite agreeing with the male.

Length 8—13 mm.

This species is at the first glance somewhat like the preceding but on closer examination it differs in many points; especially the wings and the colour of the legs are good characters, further the pubescence of the antennal style and the colouration of the abdomen. Zetterstedt l. c. records it as *L. guttiventris* Stæger in litteris, so that the name is due to Stæger.

L. guttiventris is much less common in Denmark than the preceding species; Hillerød, Grib Skov; on Funen at Odense, Veflinge and Faaborg and in Jutland in Greisdalen, at Frijsenborg, Silkeborg, Gjessø near Silkeborg, Hald, and Fusingø near Randers. My dates are $^{16}/_{6}$ to August.

Geographical distribution: — The species is distributed in northern and middle Europe down into Austria; towards the north in southern Scandinavia; it seems everywhere to be more rare than *cylindrica.*

2. **Dioctria** Meig.

Species of middle to somewhat large size and of a more or less slender shape; the colours are dark or black, and the species are very slightly hairy, almost bare. Head somewhat broader than thorax and much broader than high; it is short and the posterior surface is flat. The eyes are large, the epistoma rather broad without any distinct or at all events only a small callus; the epistomal beard not dense. Antennæ inserted very high, near to each other on a more or less prominent tubercle. The frons on account of the high inser-

tion of the antennæ is very small and the ocellar triangle is placed farther back than usual. Jowls small, slightly descending below the eyes. No ocellar bristles. Antennæ four-jointed, the first joint longer than the second, the third the longest, the last is short and forms a blunt style; this last joint has a curious shape (Fig. 7), it is incised

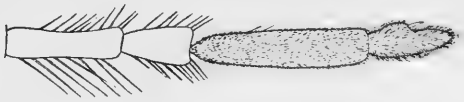

Fig. 7. Antenna of *D. atricapilla.* ×30.

on the upper side about the middle or nearer to the base, and at the base of the incision a spine is inserted[1]. Eyes with the facets in front from the inner eye-margin outwards distinctly enlarged. On the posterior side of the head below the occipital foramen there is a membraneous part in which the stipites of the maxillæ lie; the clypeus forms a triangular part below in the middle of the epistoma. Proboscis is shorter than the head is high, directed horizontally forwards. Labium has a characteristic shape, it is thick at the base, the lower edge slightly arched in the apical third, the upper edge obliquely cut so that the apex is tapering; the cut part is beset with erect hairs; the basal part occupies about one third of the length of the labium; — in *D. Reinhardi* the labium has a somewhat different shape, it is not pointed but truncate at the apex, and directed somewhat downwards, Genus *Methylla* Hans. (Nat. Tidsskr. 3, XIV, 145). — Labrum is triangular, short, of the length of the basal part of the labium; the maxillæ are longpointed, somewhat curved at the base, the maxillary palpi are indistinctly two-jointed, the basal joint short, the apical cylindrical. Hypopharynx is pointed, beset with erect hairs above over more than the apical half; maxillæ and hypopharynx are of the same length as labium. Thorax is rectangular, rather high, somewhat arched above; there are two præsutural and some supraalar bristles; scutel-

[1] The antennæ in *Dioctria* are generally described as having a two-jointed style, thus in all five-jointed. Meigen, the founder of the genus, says about the antennæ in Illig. Mag. 1803 and in Klass. eur. Zweigfl. 1804 that they are five-jointed, and the fourth joint he terms „becherförmig"; in Syst. Beschr. II, 1820 he says that the antennæ are three-jointed with a two-jointed style, the first joint of which is short; his figures which are rather small (Klass. Tab. XIII, Fig. 7—9; Syst. Beschr. II, Tab. 19, Fig. 17—18) show also a two-jointed style, yet the fig. 17 on Tab. 19 in Syst. Beschr. only shows this very indistinctly. Meigen has evidently only used a lens and then the antennæ may convey the impression that they have the style two-jointed, but under the microscope the above described structure and the fact that the style is undivided is clearly shown.

lum without bristles. On the pleura there is a hairy stripe from the humerus to the wing-root, and from this one goes down to the front coxæ, and another stretches down the hind margin of the mesopleura and then bends in an angle along the lower margin of the mesopleuron; the hairy stripes are sometimes not fully developed; the metapleura have long hairs and especially a vertical row of long, thin hairs; hypopleura without long hairs. Metathorax is rather distinct, on the dorsal side it is short, on the ventral side there is a large metasternum, the space between the latter and the hind coxæ is membranous. Abdomen is long and somewhat slender, generally more slender in the male than in the female; it consists of eight segments; the first dorsal segment is short; on the ventral side the first segment is also short and somewhat weakly chitinised; at the front of the second segment there is a small, transverse, chitinised plate on each side in the connecting membrane; the last dorsal segment is short, the last ventral segment is quite hidden and only represented by a very small chitinised plate, and in the female it is quite wanting so that there are only seven ventral segments. The male genitalia have a construction very different from that found in *Leptogaster*; above there is a large, somewhat cupshaped plate, formed like a ninth dorsal segment, its hind margin is excised, the hind corners thus forming two pointed prominences; in the excision are two small, free styles; below this plate are the lower forceps, the arms of which are thick at the base, hook-formed and of very complicated shape, they are two-branched with an inner styliform branch; between and below the forceps is a ventral plate, forming, like the dorsal plate, as a ninth ventral segment. The female genitalia resemble in some points the male genitalia; above there is a short dorsal plate which bends down on the sides, forming the half of a ring; at its slightly excised hind margin there are, as in the male, two small styles; below there is a somewhat clasp-shaped ventral plate (perhaps in reality the eighth ventral plate); at the apex, below the dorsal styles, there are two small styles, these four styles thus forming an ovipositor. Legs not strong, the hind legs the longest; the hind tibiæ often somewhat thickened at the apex, the hind metatarsi always large, sometimes considerably thickened. On the femora and tibiæ there are some strong, more or less spine-like bristles of different strength in the different species and sometimes wanting on the anterior femora; apical spurs are also present; further there are some scattered long and thin hairs on the ventral side of the femora and hind tibiæ and finally there is a dense fringe of short hairs along the ventral side of the hind femora and tibiæ; the pubescence of the legs is specially dense on the ventral apical part

of the front and hind tibiæ, less dense on the middle tibiæ. The tarsi have strong bristles, and are densely haired on the lower surface. The claws are strong; there are two pulvilli and a somewhat claw-shaped empodium. Wings somewhat long and broad, the subcostal cell open, the cubital vein forked, between the discal cell and the upper branch of the postical vein a postical cross-vein; five posterior cells, all open; the anal cell narrowly open, or closed. Alula developed but small. The alar squamula small, hairy at the margin especially towards the angulus.

Of the developmental stages I have only examined the pupa; the larva is described by Beling (Arch. f. Naturgesch. Jahrg. 48, 1882, 195—99). It is cylindrical, white, finely striated longitudinally. The head is retractile, with some long, stiff hairs. The front part of the first thoracic segment densely beset with small tubercles. The apex of the body more or less pointed. The second, third and fourth segments each with two bristles, and some similar bristles on the last segment. Prothorax and the penultimate (or the marked off front part of the last) segment each with a pair of small spiracles. The pupa is yellowish white; the antennal sheaths are in front of the head, directed to each side across the eyes; they have a strong, downwards curved spine at the base and are sharply compressed, on the lower side forming three strong spines. About at the base of the wing-sheath there is an obliquely placed small, sharply compressed tubercle. The abdominal segments have each a transverse row of long, at the apex recurved, brown spines alternating with small spines on the dorsal side; the last segment has on the dorsal side two long spines, at the apex a pair of spines curved slightly upwards and a pair of small spines beneath these. On the ventral side each segment has a transverse row of long, thin, white hairs, the rows going over the lateral margins a little up on the dorsal side to the dorsal rows of spines. There is a pair of prothoracic and seven pairs of abdominal spiracles, all small. The sheaths of the legs reach to the hind margin of the second abdominal segment.

The larvæ live in humous earth in woods and thickets; they hibernate and the transformation to pupa and escape of the imago take place in the following spring and summer.

The species of *Dioctria* are somewhat characteristic by their more or less slender shape and the generally rather long and broad wings. They occur in grass and herbage on fields, meadows and fens and both in and outside woods. The prey of this genus is generally smaller insects, though the larger species as *oelandica* may also take somewhat large prey; I have taken *D. rufipes* with a *Sphecodes* as prey.

Poulton l. c. records from England the following examples of prey: *D. oelandica*: different Ichneumonids (*Campoplex leptogaster* Holmgr., *Cratichneumon annulator* F.), *Panorpa* sp., a small moth (*Adela*?); *D. atricapilla*: *Meloboris rufiventris* Grav.; *D. rufipes*: *Blennocampa assimilis* Fln., *Empis pennipes* L., *Sphegina clunipes* Fln.

Of the genus 38 species are known from the palæarctic region 6 of which have hitherto been found in Denmark.

Table of Species.

1. Wings more or less blackish or brownish ..... 2.
— Wings hyaline or slightly yellowish ..... 3.
2. Wings quite brown; legs for the most part ferrugineous 2. *oelandica.*
— Wings hyaline at the apical part; legs black ..... 3. *atricapilla.*
3. The hairy stripes on the pleura not fully developed, only consisting of a stripe between the humerus and the wing-root; legs black to a great extent ..... 1. *Reinhardi.*
— The hairy stripes on the pleura fully developed; the anterior legs pale ..... 4.
4. Abdomen black without yellow markings; tarsi more or less blackish ..... 5.
— Abdomen with yellow, transverse bands; tarsi, at all events the anterior, pale ..... 6. *linearis.*
5 Antennal tubercle highly prominent; hind legs black except the bases of femora and tibiæ ..... 4. *rufipes.*
Antennal tubercle small, hind legs generally less black 5. *hyalipennis.*

1. **D. Reinhardi** Wied.

1817. Wied, Zool. Mag. I, 2, 37. — 1847. Löw, Linn. Entom. II, 412, 2, ♂. — 1849. Zett. Dipt. Scand. VIII, 2972, 2—3. — 1862. Schin. F. A. I, 120. — 1903. Kat. paläarkt. Dipt. II, 107. — 1820. *D. cothurnata* Meig. Syst. Beschr. II, 244, 6, ♀. — 1847. Löw, Linn. Entom. II, 420, 7, ♀. — 1849. Zett. Dipt. Scand. VIII, 2973, 2—3.

Male. Face below the antennæ somewhat arched, shining, black, finely striated, lower down brass-yellow or greyish white pruinose; epistomal beard pale yellow or whitish. Proboscis and palpi black, the former with ferrugineous hairs at the apex, the latter with black hairs. Antennal tubercle small; front and vertex black; occiput black with black hairs, along the posterior eye margin yellow pruinose when seen in certain directions. Antennæ black, the two first joints with black hairs, especially beneath; the first joint scarcely one and a half times as long as the second, the third as long as the two first together. Thorax black somewhat shining, the disc with two brownish pruinose stripes and between these with traces of a median stripe, at all events indicated by punctuation; scutellum rugose; the thoracic disc clothed with very short, black pubescence; the præsutural bristles yellow to

brown, the supraalar bristles short, generally black, sometimes brown. Pleura black, shining; the common hairy stripes wanting, only a small stripe between the humerus and the wing-root present; at the hind margin of the mesopleura some few hairs, the metapleura with long, whitish hairs. Abdomen black, shining, venter of the same colour, often with pale incisures. Abdomen sparingly clothed with short, black hairs, on the lateral margin of the first segment some longer, generally yellowish hairs; venter with somewhat long, pale hairs; genitalia with moderately long, brownish to blackish hairs. Legs with the coxæ black, femora pale yellow at the basal half, the apical half black, tibiæ black with the bases pale yellow, all tarsi black; the hind tibiæ slightly thickened at the apex, the hind metatarsi not distinctly thickened yet a little broader than the following joint. The coxæ have long, whitish hairs on the outside, otherwise the legs are clothed with short brownish or blackish hairs; the fringes on the hind legs are blackish brown. The long, thin hairs on the ventral side of the femora and hind tibiæ are yellowish or brownish. The strong spine-like bristles on the legs are yellow to brown. Wings slightly yellowish with dark brown veins. Halteres yellow to ferrugineous.

Female. The female differs somewhat from the male; the black space below the antennæ is smaller, the antennæ have brownish hairs, the hairs on the palpi are yellow and those on the occiput yellow to brown. The pruinose stripes on the thoracic disc are broader and the middle stripe more distinct, the stripes are somewhat confluent posteriorly. The pubescence on thorax and abdomen is yellow. The femora are quite ferrugineous, paler at the base, sometimes the hind femora are brownish or blackish brown at the apical half; also the pubescence on the legs is paler. The wings are more yellowish, especially at the base.

Length 11—13 mm.

This species is easily distinguished by the absence of the common hairy stripes on the pleura. It is evident that Löw l. c. 412 has had only the male and under *cothurnata* only the female; Zetterstedt has probably also described only the male under *Reinhardi* and the female under *cothurnata*; he says only about the sexual differences that the abdomen in the male is a little narrower than in the female, and this is not a safe distinction.

D. Reinhardi cannot be termed rare in Denmark, but it is hitherto only known from Funen and Jutland; Funen at Faaborg and Jutland in Greisdalen at Vejle, at Frijsenborg, between Holstebro and Struer and at Sæby; the dates are in July and August.

Geographical distribution: — Europe down into France; towards the north to northern Finland but here rare.

2. **D. oelandica** L.

1761. Linn. Fn. suec. 1916 (*Asilus*) — 1842. Zett. Dipt. Scand. I, 182, 1 et 1849. VIII, 2972, 1. — 1847. Löw, Linn. Entom. II, 410, 1. — 1862. Schin. F. A. I, 121. — 1903. Kat. paläarkt. Dipt. II, 106.

Male. Face with brassy yellow pruinosity, the middle line and the part below the antennæ black; antennal tubercle of middle size, it and the vertex black; epistomal beard yellow; jowls, proboscis and palpi black; proboscis with yellow hairs on the apical part, palpi with black hairs. Occiput black with black bristles, along the hinder eye-margin, especially below, greyish yellow pruinose, which is only seen in certain directions. Antennæ black, the two first joints with black hairs; the first joint about twice as long as the second, the third slightly shorter than the two first together. Thorax black, shining; the disc with two faint, narrow, distant stripes of a greyish brown pruinosity; otherwise the disc clothed with short, blackish hairs; the præsutural bristles black or brown, the supraalar bristles black. The hairy stripes on the pleura distinct, dark yellow to greyish yellow; there are some longer yellow hairs above the front coxæ and some darker ones at the hind margin of the mesopleura; the metapleura have long, yellow bristles. Abdomen black, shining; venter black, only the genitalia are partly ferrugineous beneath. Abdomen is sparingly clothed with short, blackish pubescence; at the lateral margins of the first segment there are longer, yellow hairs. Venter with longer hairs; the genitalia have somewhat long, ferrugineous hairs. Legs reddish yellow, the coxæ black, the hind trochanters generally brownish to blackish; all tibiæ brownish black towards the tips and the hind metatarsi likewise brownish black; the hind tibiæ are somewhat thickened at the apex, the hind metatarsi not thickened. The coxæ are greyish pruinose on the outer side and clothed with long, greyish hairs, for the rest the legs are short yellow pubescent; the fringe on the hind femora is whitish brown, that on the tibiæ pale brown; the long, thin hairs on the ventral side of the femora and hind tibiæ are whitish or yellowish. The strong, spine-like bristles on the legs are yellow to light brownish. Wings strongly brownish black fumigated, most at the basal part and along the anterior margin; often a clearer middle part in the posterior cells. Veins dark brown. The surface of the wing with a bluish violet reflex. Halteres yellowish to light brownish.

Female. Abdomen a little broader than in the male, for the rest quite agreeing with it.

Length 13—17 mm.

I possess a female specimen of this species with nearly quite pellucid wings, these being only slightly brownish at the anterior margin.

D. oelandica is rather common in Denmark though it does not belong to our most common species; Charlottenlund, Frederiksdal, Brede, Hillerød, Faxe, Thureby south of Köge; in Jutland in Nörholm Skov near Varde, at Silkeborg and at Stövring near Randers. My dates are $^{29}/_{5}$—$^{17}/_{7}$.

Geographical distribution: — Most parts of Europe down into France; towards the north to middle Scandinavia.

3. **D. atricapilla** Meig.

1904. Meig. Klass. eur. Zweifl. Ins. I, 256, 4. — 1847. Löw, Linn. Entom. II, 413, 3. — 1862. Schin. F. A. I, 120. — 1903. Kat. paläarkt. Dipt. II, 103. — 1842. *D. fuscipennis* Zett. Dipt. Scand. I, 184, 4.

Male. Eyes in the living specimens of a beautiful blue somewhat metallic colour. Face dark brown pruinose, somewhat silky, below the antennæ shining black; epistomal beard not dense, black. Proboscis and palpi black, the first with ferrugineous hairs at the apex, the latter with black hairs. Antennal tubercle moderately prominent. Frons and vertex shining black; occiput black with black hairs, silvergrey pruinose along the posterior eye-margin when seen in certain directions. Antennæ black, the first two joints with black hairs; first joint about one and a half times as long as the second, the third as long as the two first together. Thorax black, the disc densely punctate and hence only slightly shining; in the middle on the front half two somewhat elevated, glabrous stripes and on each side of them a very faint, narrow, brownish hoary stripe; the disc otherwise with short, black pubescence. Præsutural and supraalar bristles black. Scutellum rugose. Pleura black shining; the hairy stripes fully developed, brown; some longer hairs at the hind margin of the mesopleura; the long hairs on the metapleura black. Abdomen black, the hind margins of the segments narrowly pale; venter coloured in the same way; abdomen sparingly clothed with short, black pubescence, on the lateral margin of the first segment long, black hairs. Genitalia with rather short, partly pale hairs. Legs somewhat strong, entirely black; the hind tibiæ only slightly thickened at the apex, the hind metatarsi almost not thickened; coxæ slightly brownish pruinose on the outer side and clothed with long, brownish

black hairs which are nearly absent on the hind coxæ. The short pubescence on the legs is blackish to brownish, but the fringe on the ventral side of the hind femora is whitish, that on the hind tibiæ brownish white; as usual there are some long, thin hairs on the legs; the strong spine-like bristles are black. Wings relatively short, shorter

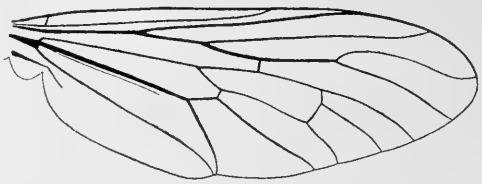

Fig. 8. Wing of *D. atricapilla.*

than in the other species; they are blackish brown on the basal half, yellowish at the apex; veins dark brown; the anal cell closed or very narrowly open. Halteres yellow to ferrugineous.

Female. This differs somewhat from the male; the eyes in the living specimens are bluish green. The face is whitish or brassy pruinose; the epistomal beard and the hairs on the palpi yellow, the hairs on the occiput brown or blackish brown. Thorax with three more or less distinct hairy stripes, uniting posteriorly and disappearing in the yellowish pubescence of the thorax; præsutural and supraalar bristles yellow; the hairy stripes on the pleura yellow. The pubescense on the abdomen is blackish but the long hairs on the first segment yellow. The hairs on the coxæ are greyish and the fringes on the hind legs paler than in the male; the strong bristles on the legs are brownish to yellow. The wings are relatively a little longer than in the male, they are paler, of a yellowish colour, somewhat brownish at the base especially towards the anterior margin. — Varieties of the female with paler legs I have not seen from Denmark.

Length 9—11 mm.

This species is easily distinguished by its dark legs and the dark, in the male rather short wings; also the somewhat strong legs are characteristic.

D. atricapilla is rather common in Denmark; it occurs in the herbage and high grass in fens, meadows and fields, sometimes in great numbers; Damhusmosen, Ordrup Mose, Ermelund, Dyrehaven, Hillerød, the small wood Tyvekrogen, Tisvilde, Boserup near Roskilde and at Skelskør; on Funen at Faaborg and at Lundeborg on the eastern coast; in Jutland at Vejle and Silkeborg. My dates are $^{29}/_{5}$—$^{26}/_{7}$.

Geographical distribution: — The whole of Europe; towards the north to southern Scandinavia where its northern limit seems to lie.

4. **D. rufipes** De Geer.

1776. De Geer, Ins. VI, 97, 6, Tab. XIV, Fig. 2. (*Asilus*) — 1842. Zett. Dipt. Scand. I, 183, 2, et 1849, VIII, 2972, 2, et 1855, XII, 4580, 2. — 1847. Löw, Linn. Entom. II, 425, 9. — 1862. Schin. F. A. I, 121. — 1903. Kat. paläarkt. Dipt. II, 107.

Male. Eyes in the living specimens greenish, slightly metallic. Face brassy to whitish pruinose, shining black just below the antennæ; epistomal beard yellowish. Proboscis and palpi black with yellow hairs. Antennal tubercle highly prominent; frons and vertex black; occiput black with dark yellow hairs which are paler downwards, it is yellow pruinose along the posterior eye-margin when seen in certain directions. Antennæ black, the two first joints with black hairs; the first joint twice as long as the second, the third slightly shorter than the two first together. Thorax black, somewhat shining, with three not very distinct narrow, yellow hairy stripes uniting posteriorly and confluent with the yellow pubescence on the disc; the median stripe most narrow and not rarely quite indistinct. Præsutural and supraalar bristles brownish or yellow. Pleura black, shining, the hairy stripes fully developed, yellowish to greyish; longer yellowish or greyish hairs are found above the front coxæ and at the hind margin of the mesopleura; the long hairs on metapleura yellow. Scutellum rugose with somewhat longish, yellow pubescence. Abdomen black with short, yellowish pubescence, which is slightly longer on the venter; at the lateral margins of the first segment there are longer hairs; genitalia with longish, yellowish hairs, especially beneath. Legs with the coxæ black, greyish or whitish pruinose on the outer side and with long, whitish hairs; anterior legs ferrugineous, the outermost apex of the tibiæ and the tarsi except the base of the metatarsus blackish brown; often a small black patch at the apex of the femora on the upper side; hind legs black, the base and apex of the femora and the base of the tibiæ very narrowly ferrugineous. The apex of the hind tibiæ only slightly thickened, and the hind metatarsi not thickened, only very slightly broader than the second joint. Pubescence on the legs yellowish, the fringe on the hind femora whitish, that on the tibiæ whitish brown; the usual long, thin hairs present; the stronger, spine-like bristles brownish or yellow, those on the hind tibiæ sometimes black; they are very small on the anterior

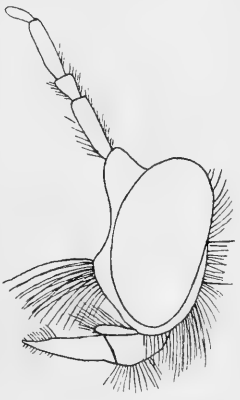

Fig. 9. Head of *D. rufipes*.

femora. Wings hyaline, slightly yellowish with blackish veins. Halteres yellow.

Female. Resembling the male but the pubescence on the thorax slightly shorter and hence the stripes, especially the two lateral, generally more distinct; the abdomen somewhat broader.

Length 11,5—14,5 mm.

This species is distinguished especially by the highly prominent antennal tubercle, and the colouring of the legs also distinguishes it from the other Danish species.

D. rufipes is a common species in Denmark; Ordrup Mose, Ermelund, Dyrehaven, Brede, Ørholm, Birkerød, Hillerød, the small wood Tyvekrog, at Boserup near Roskilde and Svenstrup between Roskilde and Ringsted; in Jutland at Silkeborg and Dollerup. My dates are $^{29}/_{5}$—$^{29}/_{6}$. It occurs in the herbage and high grass on meadows and fields and generally gregarious.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia.

5. **D. hyalipennis** Fabr.

1794. Fabr. Ent. Syst. IV, 388, 54 (*Asilus*) (nec. auct.) — *Dioctria flavipes*: 1804. Meig. Klass. eur. Zweifl. Ins. I, 257, 6. — 1842. Zett. Dipt. Scand. I, 183, 3 et 1849. VIII, 2974, 3 et 1855. XII, 4580, 3. — 1847. Löw, Linn. Entom. II, 426, 10. — 1862. Schin. F. A. I, 122. — 1903. Kat. paläarkt. Dipt. II, 104.

Male. Eyes in the living specimens greenish, slightly metallic. Face whitish pruinose, a little more yellowish above; just below the antennæ black; epistomal beard not dense, whitish. Proboscis and palpi black with yellow hairs. Antennal tubercle slightly prominent; frons and vertex black. Occiput black with brownish, downwards more yellowish, on the jowls whitish hairs; it is whitish pruinose along the posterior eye-margin when seen in certain directions, the whitish colour disappearing above. Antennæ black, the two first joints with black hairs; the first joint scarcely one and a half times as long as the second, the third as long as the two first together. Thorax black, slightly shining, punctate, with three faint, yellow hairy stripes on the disc, disappearing posteriorly; the disc otherwise with short, yellow pubescence; the two bare, shining stripes between the hairy stripes somewhat distinct. The præsutural and supraalar bristles brownish or yellow. Pleura black,

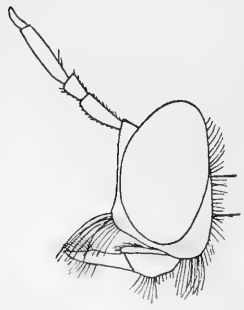

Fig. 10. Head of *D. hyalipennis*.

shining, the hairy stripes fully developed, broad aud distinct, greyish white; the hairs at the hind margin of the mesopleura and the long hairs on the metapleura whitish. Scutellum rugose with yellow pubescence. Abdomen black, sparingly clothed with short, yellow pubescence, at the lateral margin of the first segment longer hairs. Venter black, generally with somewhat pale incisures and slightly longer pubescence. Genitalia with longish, yellowish hairs. Legs yellow, the coxæ black, whitish pruinose on the outer side and with long, white hairs which are nearly wanting on the hind coxæ; anterior tibiæ blackish brown at the apex, and the tarsi, with exception of the base of the metatarsus, likewise blackish brown; anterior femora sometimes with a blackish patch above at the apex; the hind femora may be quite ferrugineous, but generally they are black above in the middle and the black colour may be extended nearly along the whole upper side and going downwards so that it reaches round the femora to a greater or lesser extent; hind tibiæ black with a larger or smaller basal part yellow; the hind tarsi quite black. The hind tibiæ are very distinctly thickened at the apex, and the hind metatarsi are somewhat thickened though only slightly broader than the following joint. The pubescence on the legs yellowish, the fringe on the hind femora whitish, that on the tibiæ pale brownish; the scattered long, thin hairs white; the stronger bristles which in this species are long and rather weak are brownish yellow, they are wanting on the anterior femora. Wings slightly yellowish, a little more at the base towards the anterior margin; the veins blackish brown. Halteres yellow.

Female. Quite agreeing with the male, only the abdomen is a little broader.

Length 9—12,5 mm.; the species is smaller than *rufipes*, but large females may exceed small males of *rufipes* in size.

The pupa has a length of 11—12 mm.

Remarks. This species is nearly related to *rufipes*, but it may easily be distinguished by the small antennal tubercle and the colour of the hind legs. The species has hitherto gone under the name of *flavipes* Meig. Meigen says (Syst. Beschr. VI, 330) that his *D. gracilis* is identical with *D. hyalipennis* in the collection of Fabricius. This may be so, but as already Löw has stated (l. c. 428), this does not make *gracilis* Meig. identical with *hyalipennis* F., since Fabricius described his *hyalipennis* after Danish specimens in the collection of Lund. Löw continues: „Fabricius beschrieb seine *Dioctr. hyalipennis* nach dänischen, in Lund'schen Museum vielleicht noch aufzufindenden Exemplaren; sie können nicht wohl einer andern Art als der in Dänemark nicht seltenen *Dioctr. flavipes* angehört haben;

mögen uns unsere Kopenhagener Nachbarn darüber Auskunft geben; fällt diese, wie ich zu glauben Grund habe, aus, so wird die Art künftig den Fabricius'chen Namen wieder erhalten müssen." This was written in 1847 and first now, sixty years later, Löw's opinion finds its confirmation, and I feel some pleasure in confirming it. In the collection of Lund two specimens are found, no doubt the typical specimens, and they are both identical with *flavipes* Meig. This species thus gets the name *hyalipennis* F., and the species now named so gets again the name *gracilis* given to it by Meigen. As already stated by Löw *gracilis* Meig. is moreover a more southern species, and it is not found in Denmark, while *hyalipennis* F. is common here. *D. hyalipennis* bears some resemblance to *gracilis*, but the latter has the hind metatarsi strongly thickened, and also the colour of the hind legs differs somewhat.

D. hyalipennis is perhaps still more common than *rufipes*, and it occurs together with this in the same localities often in great numbers; Ermelund, Dyrehaven, Lyngby Mose, Geel Skov, Ørholm, Hillerød, Tyvekrogen, Præstevang, Tisvilde; on Funen at Lundeborg on the eastern coast, at Odense, Veflinge, Hofmansgave, Faaborg, Middelfart and on Fænø; in Jutland at Horsens, Frijsenborg, Silkeborg, Funder and Støvring near Randers. My dates are $^{12}/_{6}$—$^{15}/_{8}$; it thus seems to be a less early species than *rufipes*. Mr. Stamm told me that he has once taken this species with an Arachnid as prey. The pupa was found in Geel Skov in the earth on $^{5}/_{6}$; it developed on $^{25}/_{6}$.

Geographical distribution: — Northern and middle Europe down into France and Dalmatia; towards the north to middle Scandinavia.

6. **D. linearis** Fabr.

1787. Fabr. Mantiss. II, 361, 38 (*Asilus*) et 1794. Ent. syst. IV, 389, 60 (*Asilus*) et 1805. Syst. Antl. 151, 10. — 1847. Löw, Linn. entom. II, 432, 12. — 1862. Schin. F. A. I, 122. — 1903. Kat. paläarkt. Dipt. II, 106. — 1849. *D. cingulata* Zett. Dipt. Scand. VIII, 2975, 3—4.

Male. Face whitish pruinose, a small black spot just below the antennæ; epistomal beard not dense, white. Proboscis and palpi black with yellow hairs. Antennal tubercle moderately prominent; frons and vertex black. Occiput black with the hairs yellow and thinner than in the other species, it is whitish pruinose along the hinder eye-margin when seen in certain directions. Antennæ black, the hairs on the two first joints brown; first joint nearly twice as long as the second, the third not quite as long as the two first together. Thorax black, shining, with slight yellow pubescence; three very distinct yellow or bronze coloured stripes on the disc, the middle one very narrow,

the lateral broadest in front; a similar pruinose stripe on each side at the margin; the pruinosity leaves in the middle two shining black lines not reaching the scutellum, and on each side a shining black space connected in front with the likewise shining humerus; the humeral and postalar calli generally more or less rufous. Scutellum with yellow hairs, especially at the margin. The præsutural and supraalar bristles yellow. Pleura shining black, the hairy stripes fully developed and very distinct, yellowish, downwards more whitish; the hairs at the hind margin of the mesopleura and the long hairs on the metapleura yellowish white. Abdomen shining black, from the third segment with yellow hind margins to the segments; at the lateral front margins of the third, fourth and fifth segment there are yellow spots which on the fourth and fifth and sometimes also on the third segment unite to a band which is confluent with the yellow hind margin of the preceding segment; thus the abdomen gets yellow transverse bands at the incisures, which bands are broad between the third and fourth and the fourth and fifth segment. Venter similarly coloured. Abdomen is sparingly clothed with short, yellow pubescence, which is slightly longer on the venter; at the lateral margins of the anterior segments there are long hairs. Genitalia partly yellow with moderately long yellow hairs. Legs pale yellow; coxæ whitish pruinose on the outer side and with long, whitish hairs which are nearly wanting on the hind coxæ; the anterior tarsi with a brown spot on the lower side of each joint, on the metatarsus the spot lying at the apex; the hind femora with a blackish brown spot above in the middle, this spot may be more or less extended, sometimes going all round the femora; also the outermost tip of the femora is brown; the hind tibiæ brownish except a more or less extended basal part, sometimes the brown colour is restricted to the outer and inner side; the hind tarsi with brown spots below and often brownish above except the base of the metatarsus. The hind tibiæ very distinctly thickened at the apex, but the hind metatarsi cannot be termed thickened. The legs have a short, pale yellowish pubescence; the fringes on the hind legs are whitish; the usual long, thin hairs present; the stronger spine-like bristles are in this species very long and thin, of yellow colour; they are wanting on the anterior femora. Wings very slightly yellowish with brownish veins. Halteres pale yellow.

Female. Quite agreeing with the male, only the abdomen is broader and the yellow bands generally narrower.

Length 9—11 mm.

This species which is the smallest (it is not shorter but much more

slender than *atricapilla*) of the Danish species is easily distinguished by the colouring of thorax and abdomen and by the very pale legs.

D. linearis is not common in Denmark; Svenstrup between Roskilde and Ringsted (H. I. Hansen), Faxe (Schlick), Tureby (Løvendal); on Lolland at Maribo (Schlick); on Funen at Odense and Hofmansgave (H. I. Hansen); in Jutland at Horsens (O. G. Jensen) and at Støvring near Randers (A. Petersen). My dates are $^{22}/_{6}$—$^{16}/_{8}$. Schiner says that this species does not sit in the grass but on leaves.

Geographical distribution: — Middle Europe down into Austria; its northern limit lies in southern Sweden and there it is rare, only one specimen having been taken.

3. **Dasypogon** Meig.

Species of rather large size and somewhat robust shape. Colour dark, generally blackish, more or less with pale designs. Head about as broad as thorax or slightly narrower, broader than high, short, and flat behind. Face rather broad, considerably arched but without any distinct callus; the epistomal beard reaches to the middle and is from here produced to the antennæ by shorter hairs. Antennæ inserted near to each other, considerably above the middle. Jowls slightly descending below the eyes. Two ocellar bristles present. The antennæ have the two first joints short and of nearly equal length, the third joint is long and somewhat compressed, it bears at the apex a small one-jointed or at all events indistinctly two-jointed style with a bristle-shaped apex. The eyes have the facets on the front part slightly larger than the others. There is a distinctly bounded clypeus at the lower end of epistoma. Proboscis is slightly shorter than the head is high, it is directed downwards and a little forwards; labium is curved slightly downwards towards the apex and is somewhat pointed, slightly hairy at the end; the basal part is slightly shorter than the apical part. Labrum is as long as the basal part of labium. The maxillæ are straight, not especially strong, with a little tooth at some distance from the apex; the maxillary palpi are indistinctly two-jointed. Hypopharynx is thin, beset with erect hairs over somewhat more than the apical half; maxillæ and hypopharynx are of the same length as the labium. Thorax is rectangular, somewhat oval, high and distinctly arched above; there is a group of præsutural, of supraalar and of postalar bristles, the latter on the postalar callus. In front of the scutellum the thoracic disc has two rows of about five dorsocentral bristles (præscutellar bristles Ost. Sack.). Scutellum without bristles. On the metapleura a row of long, thin hairs; on the hypopleura none. The

metathorax is rather distinct; on the ventral side there is a large metasternum, the space between it and the hind coxæ is membranous. Abdomen long, somewhat flat, consisting of eight segments; the first dorsal segment is short, the second the longest; on the ventral side the first segment is very small, the following of nearly equal length. The male genitalia I have only been able to examine in situ; so far as I could ascertain there is an upper, triangular plate, following after the eighth segment; below and to each side of this plate there is a large pair of forceps, each arm of which has an outer, rounded branch, and an inner branch which is longer than the outer and forked at the end, the upper arm of the fork being directed upwards, the lower

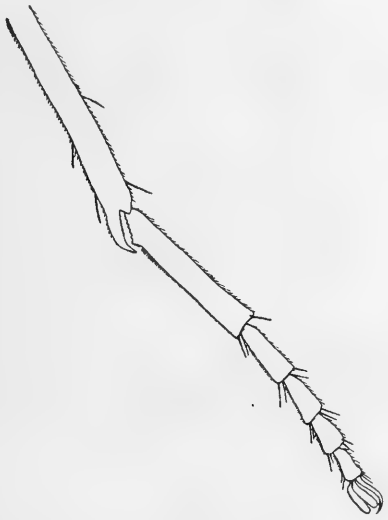

Fig. 11. *D. teutonus,* front leg. ×8.

downwards; I think this forceps answers to the lower forceps; below there is a long ventral lamella terminating in a pair of lamelliform styles. The female abdomen terminates in a pair of small lamellæ. Legs not especially strong; front tibiæ on the ventral side produced in a strong spine, the apex of which is bent strongly outwards; the base of the front metatarsi has an obliquely cut part turned towards the spine and this part and the inside of the spine are both serrated (Fig. 11). The legs have some strong, spine-like bristles which are short on the femora, longer on the tibiæ; the posterior tibiæ have apical spurs. The tarsi have strong spine-like bristles at the ends of the joints, the metatarsi over the whole length. Front and hind tibiæ have a short dense pubescence on the ventral side apically, it is most

extended on the front tibiæ; the middle tibiæ have a similar pubescence but only just at the apex; the tarsi show the same dense pubescence on the lower surface. The claws are somewhat strong; there are two pulvilli and a bristle-shaped empodium which is thick at the base but very thin outwards. Wings with the subcostal cell open, the cubital vein forked; a postical cross-vein between the discal cell and the upper branch of the postical vein; there are five posterior cells, these and the anal cell all open. Alula well developed. Alar squamula hairy at the margin.

So far as I am aware the larval and pupal stages of this genus are not known.

The species of *Dasypogon* are somewhat robust and heavy and with a somewhat slow flight. They are recorded especially to frequent sunny, dry localities often sitting on the ground or on leaves but not on stems.

Of the genus 5 species are known from the palæarctic region; one has hitherto been found in Denmark.

1. **D. teutonus** L.

1758. Linn. Syst. Nat. Ed. X (*Asilus*). — 1847. Löw, Linn. Entom. II, 448, 5. — 1862. Schin. F. A. I, 124. — 1903. Kat. paläarkt. Dipt. II. 108.

Male. Face bright yellow pruinose; epistomal beard yellow. Proboscis and palpi black, the latter with black hairs. The pruinosity of the face proceeding up above the antennæ on each side and thus the frons yellow on the sides but black in the middle. Vertex black. On the sides of the frons there are black hairs, and there are two black ocellar bristles. Occiput black with black hairs. Antennæ ferrugineous, the apex of the style darkened; the hairs on the two first joints and on the upper side of the third joint black. Thorax dull, dark brownish above, a broad marginal stripe golden yellowish pruinose, just in front of the scutellum the stripe is greyish; in the middle of the disc there are two closely placed, faint dark stripes uniting behind; when the thorax is viewed quite from in front other yellow reflections are seen. Scutellum black. Thorax is very sparingly clothed with short, blackish hairs; the bristles of the different categories are black. Pleura brownish black, slightly shining, with a small spot above the front coxæ, a large middle spot and the hinder part of the hypopleura golden yellow pruinose. The long hairs on the metapleura yellow or black. Abdomen black, somewhat shining, very short and sparingly black pubescent; at the lateral margins of the first segment long, ferrugineous hairs; at the hind margins of the second to sixth segments a grey pruinose spot on each side, smallest on the

second and sixth segment. Venter black with pale incisures and, seen from in front, with greyish pruinose hind margins of the segments; it is sparingly clothed with a little longer hairs than above which are yellow in front but darker backwards. Legs with the coxæ brownish black, at the outer side yellow pruinose and with long, yellow hairs; femora and tibiæ ferrugineous, the femora with a black spot at the outermost apex; the front tibiæ darkened towards the apex or to near the base; all tarsi black. The legs sparingly clothed with short, black hairs, the dense hairs on the apical ventral side of the tibiæ

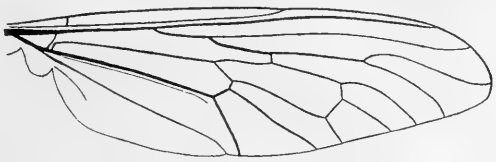

Fig. 12. Wing of *D. teutonus*.

and beneath the tarsi brownish; the stronger spine-like bristles black. Wings yellow at the basal part, at the apex somewhat brownish, especially along the veins; the veins yellow at the base, brownish outwards. Halteres yellow.

Female. With exception of the genital differences chiefly agreeing with the male; the wings yellow at the base, then a more hyaline part follows, the apex is slightly greyish.

Length 17—19 mm.

D. teutonus is very rare in Denmark, only two specimens have been found, both females, one with the locality North Sealand (Gosch), the other at Fuglevad.

Geographical distribution: — Middle and southern Europe; its northern limit lies in Denmark and it is not known from Scandinavia nor from Britain.

4. **Leptarthrus** Steph. (1829).

Isopogon Löw, 1847.

Species of middle size and blackish colour. Head slightly broader than the thorax and much broader than high; it is short and it is flat behind. The face is broad, somewhat arched, but without any distinct callus. The epistomal beard somewhat woolly and evenly extended over the whole face. Antennæ inserted near to each other somewhat above the middle. Jowls small, very slightly descending below the eyes. No ocellar bristles. Antennæ consisting of five joints, the two first short, of equal length, the third long, somewhat compressed,

bearing at the apex the two last joints which form a somewhat long, distinctly two-jointed style the first joint of which is short, the other long, terminating in a small bristly part. The eyes have the facets in front, on a small space in the middle up to the margin, considerably larger than the others. On the posterior side of the head

Fig. 13. Antennæ of *L. brevirostris.* × 40.

below the occipital foramen there is a membranous part with the united stipites of the maxillæ. Clypeus is distinctly marked off in the middle of the epistoma below, it is rounded upwards and strongly impressed. Proboscis is short, about half as long as the head is high; it is directed obliquely downwards and forwards; the basal part of labium not as long as the apical; labium truncate at the apex and here faintly hairy; labrum short, as long as the basal part of labium; the maxillæ are truncate at the apex and curved distinctly downwards, the maxillary palpi are short, two-jointed with a small, upwardly bent apical joint; hypopharynx pointed, beset with erect hairs over somewhat more than the apical half. Maxillæ and hypopharynx are about the length of the labium. Thorax is rectangular, high and distinctly arched above; there are no bristles on the disc but it is clothed with more or less long, somewhat woolly hairs. Scutellum without bristles. On the metapleura there are long, likewise woolly hairs; hypopleura without long hairs. Methathorax is distinct, there is a large metasternum, the space between it and the hind coxæ is membranous. Abdomen consists of eight segments; the first dorsal segment is rather long, longer than in the preceding genera and only somewhat shorter than the second; the first ventral segment is short; in the male the seventh segment is small and the eighth is quite hidden, forming a small annulus at the base of the genitalia. The male genitalia are rather small; they consist of the upper forceps with short and thick arms which seem to be united at the base; between the somewhat diverging apices there are two small lamellæ, answering to the median dorsal lamella; below the upper forceps are the lower forceps the arms of which are thick at the base, they are as usual two-branched at the apex and very complicated; at the base of the lower forceps there is a roundly triangular median ventral lamella. In the female the fifth abdominal segment is somewhat

pointed, the last three segments are narrow and form, together with a small apical appendage, an ovipositor. Legs somewhat strong; the front tibiæ have at the base on the ventral side a small spine which is curved strongly outwards; the femora are clothed with long hairs on the ventral side, the front and especially the middle tibiæ have many long, thin bristles; the tibiæ have on the dorsal side some stronger bristles; the front tibiæ have long, the posterior tibiæ short apical spurs which on the middle tibiæ are very thick, resembling a pair of spines; the tarsi have moderately long bristles; the front and hind tibiæ have a dense pubescence on the ventral side, it is longest on the hind tibiæ; the tarsi are densely pubescent on the lower surface. The hind metatarsus is in most species somewhat thickened, in one species (*brevirostris*) it is in the male very long and sharply compressed. There are two pulvilli and a small, bristle-shaped empodium. Wings with the subcostal cell open, the cubital vein forked; between the discal cell and the upper branch of the postical vein a postical cross-vein; there are five posterior cells, the fourth is somewhat narrowed at the margin; the anal cell is closed a little before the margin. Alula is small. The alar squamula small, distinctly hairy at the margin.

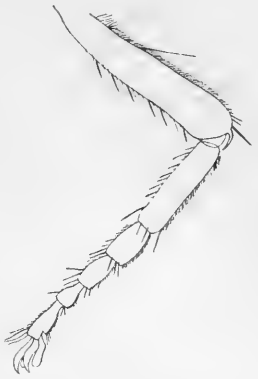

Fig. 14. *L. brevirostris* front leg. × 15.

Fig. 15. *L. brevirostris* middle leg. × 15.

The larval and pupal stages of this genus are, so far as I am aware, not known.

The species of *Leptarthrus* seem to some degree to be mountain forms. Poulton l. c. records from England the capture of *L. brevirostris* with *Meteorus obfuscatus* Nees as prey.

Of the genus 3 species occur in the palæarctic region; only one has hitherto been found in Denmark.

Fig. 16. *L. brevirostris*, hind leg. × 15.

1. **L. brevirostris** Meig.

1804. Meig. Klass. eur. Zweifl. I, 255, Tab. XIII, Fig. 16, 17 (*Dioctria*) et 1820. Syst. Beschr. II, 273, 24 (*Dasypogon*)

— 1842. Zett. Dipt. Scand. I, 179, 4 (*Dasypogon*). — 1857. Löw. Linn. Entom. II, 493, 28 (*Isopogon*). — 1862. Schin. F. A. I, 131 (*Isopogon*). — 1903. Kat. paläarkt. Dipt. II, 113.

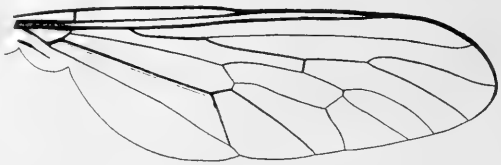

Fig. 17. Wing of *L. brevirostris.*

Male. Face distinctly arched, only slightly greyish just at the eye-margins; epistomal beard varying in colour from black with whitish ends of the hairs to quite whitish. Proboscis and palpi black. Frons and vertex black with brownish hairs. Occiput grey with whitish hairs. Antennæ black. Thorax black, somewhat shining, coarsely punctate; two narrow median lines glabrous. The disc clothed with long hairs which are black or brownish in front, paler to whitish backwards. Scutellum with white hairs. Pleura black, somewhat greyish pruinose; they are more distinctly hairy on a spot below the humerus, on the hind part of the mesopleura, on the pteropleura, the upper part of the sternopleura and on the hypopleura; there are long, white hairs on the metapleura and on the middle of the mesopleura. Abdomen black, coarsely punctate, clothed with somewhat short, depressed, silver-white pubescence; along the sides the hairs are longer and hang downwards like a fringe. Venter black, shining, with long, white hairs; on the last two segments there is a tuft of brownish to blackish hairs. — All the long hairs on the body are woolly, giving to the fly a somewhat woolly appearance. — Legs black; coxæ slightly pruinose, on the outer side with long, whitish hairs; tibiæ ferrugineous on the basal half, the front tibiæ to a less extent and often quite black. The hind tibiæ distinctly thickened from just below the base to the apex; the hind metatarsi as long as the tibiæ and sharply compressed with a short fringe on each margin (Fig. 16). The femora clothed with short, blackish hairs above, and with long, whitish hairs on the posterior side and below; the hairs on the tibiæ are for the most part whitish, the dense pubescence on the ventral side of the hind tibiæ is yellowish to white; there are some long, thin, white hairs, especially on the middle tibiæ. The somewhat stronger bristles are chiefly black but may be reddish on the ferrugineous parts of the legs. Wings slightly brownish at base and apex but hyaline in the middle; the fumigation is chiefly caused by broad seams at the veins; the veins are brown. Halteres yellow.

Female. Epistomal beard blackish brown to deep yellow. The hairs on the thoracic disc generally more yellow than in the male, often deep yellow on the hind part. Abdomen slightly broader and the pubescence whitish to yellowish; there is a whitish grey, pruinose spot on each side at the hind margins of the segments. The hairs on the legs are almost all whitish to yellow, and also the stronger bristles are chiefly yellow. On the whole the clothing varies in colour from being somewhat like that in the male through different variations to nearly all deep yellow. The hind metatarsi are of common form, as long as the other four joints together, slightly thickened. Wings more or less brownish at the basal part, but not, or very slightly, at the apex.

Length 7—10 mm.

This species is easily distinguished by its whole appearance; the curiously shaped hind metatarsi in the male at once prevent any mistake.

L. brevirostris is rather rare in Denmark and has only been caught on very few occasions: Ermelund (Schlick), Nordskoven at Jægerspris (the author), Skelskør (H. J. Hansen) and at Tuel Sø near Sorø (Schiødte), in the latter locality in great numbers. The dates are in June.

Geographical distribution: — Northern and middle Europe. Its northern limit lies in middle Sweden. After Schiner it chiefly occurs in the mountains.

5. **Lasiopogon** Löw.

Species of middle size and blackish or greyish colour. Head short, broader than thorax and broader than high, flat behind. Face moderately broad, it is narrowest just below the antennæ and gets broader downwards; there is a considerable callus, reaching near to the antennæ; the epistomal beard quite covers the callus. Antennæ

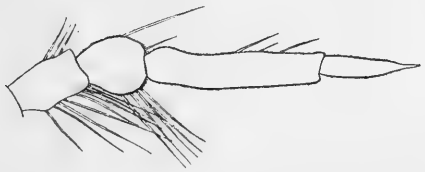

Fig. 18. Antenna of *L. cinctus*. × 45.

inserted near to each other, only slightly above the middle. Jowls slightly descending below the eyes, No distinct ocellar bristles. Antennæ consisting of four (five?) joints; the first two short, the third

longer, somewhat compressed, with a short one-jointed or very indistinctly two-jointed style, at the end with a bristle-shaped apex. The eyes have the facets in front, at the margin, only very slightly enlarged. Clypeus is distinctly marked off below in the middle of the epistoma. There is a membranous part on the back of the head below the occipital foramen in which lie the united stipites of the maxillæ. Proboscis short, directed downwards and a little forwards; it is truncate at the apex. The basal part of the labium occupies somewhat more than the half of the whole length; labrum short, scarcely as long as the basal part of the labium. The maxillæ are slightly curved towards the apex, the maxillary palpi short, cylindrical, one-jointed. Hypopharynx pointed, beset with erect hairs over somewhat more than the apical half. Maxillæ and hypopharynx as long as labium. Thorax rectangular, high and arched above; there are groups of præsutural, supraalar and postalar bristles; besides, there are two rows of rather distinct dorsocentral bristles which are longest and most distinct on the hinder part. The scutellum has long marginal bristles. The mesopleura have a vertical row of long and strong bristles; hypopleura without bristles or hairs. The metathorax is developed, but small, on the ventral side there is a rather short metasternum, the space between it and the hind coxæ is membranous. The abdomen consists of eight segments, the first dorsal segment is short, the second the longest; on the ventral side the first segment is likewise short, and it is nearly divided into two as it has a transverse membranous part in the middle, so that the two chitinized parts are only connected at the side margins. In the male the eighth segment is a small, quite hidden annulus at the base of the genitalia. The male genitalia are somewhat swollen, consisting of the upper forceps the arms of which are thick, curved towards each other at the apices and with a tooth on the upper inner margin at some distance from the apex; between the arms lies the dorsal median lamella, it is paired but connected in the middle by a membrane. Below the upper forceps lies the lower forceps, it is shorter than the upper with the arms very thick at the base and here broadly connected; they are as usual of very complicated shape, with spines inwardly. Quite hidden in the eighth segment there is a ventral piece which is paired, or widened on each side, it answers perhaps to the ventral median lamella. — I must here mention a curious fact which may easily cause a misunderstanding of the male genitalia in this genus; all the dried specimens I have examined (of *L. cinctus*) had the larger forceps turned down, even though somewhat obliquely, and at first I thought this was the lower forceps; but on examining specimens preserved in alcohol I was struck

by the fact that in this case the lower forceps would seem homologous with the upper forceps in other genera and vice versa with regard to the other forceps; I was therefore somewhat in doubt till I examined a quite mature pupa, and here the large forceps was lying dorsally thus proving beyond doubt that this is the upper forceps. It seems to me very curious that the forceps seem thus always to be turned upside down; (yet similar cases are found e. g. among the Anthracids.) — In the female the eighth ventral segment is excised in the hind margin and from the excision projects a short, compressed, somewhat knife-shaped ovipositor which quite fills out the excision and stretches a little beyond the hind margin of the segment; at the end of the eighth dorsal segment lies a semiannular piece, beset at the hind margin with spines which stretch out of the eighth segment above the ovipositor; ventrally to this piece there lies a small chitinous fork, but this is quite hidden and only to be seen by preparation. The legs are somewhat strong, the femora have long hairs below, and the tibiæ, especially the anterior, are long haired on the ventral side, among the hairs there are some long, thin bristles; there are some stronger bristles on the anterior side of the hind femora and apically on the anterior side of the middle femora, and similar but longer bristles are found on the tibiæ, on the front tibiæ especially on the posterior side. All tibiæ have apical spurs. The tarsi have long bristles at the apex of the joints. The front tibiæ have a dense pubescence on the ventral side over nearly the whole length, the hind tibiæ have a similar pubescence just at the apex. The tarsi are densely pubescent below. The claws are long; there are two pulvilli and a long, bristle-shaped

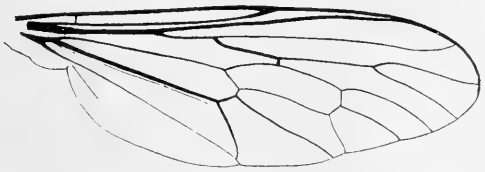

Fig. 19. Wing of *L. cinctus*.

or nearly claw-shaped empodium. Wings with the subcostal cell open, the cubital vein forked; between the discal cell and the upper branch of the postical vein a postical cross-vein; five posterior cells, the fourth narrowed at the margin; the anal cell closed slightly before the margin.

The larval and pupal stages have, so far as I am aware, not been described hitherto. The larva (*L. cinctus*) is cylindrical, yellowish white, finely striated longitudinally; it is about 11 mm. long and 1,5 mm.

in diameter. It is somewhat narrowed towards each end; the last segment is somewhat flattened, rounded at the apex. The body consists of twelve segments, including the head, but at the base of the last segment there is a short and indistinct, somewhat segment-like swelling, if this be counted for a segment we thus get thirteen segments. The head is very small and retracted into prothorax; it has a few long hairs; prothorax beset with small, spine-like warts at the front margin; the three thoracic segments have each a long thin bristle on each side somewhat ventrally; the last segment has eight bristles, four on the margin and four dorsal, the two near the apex, the two others more inwards. There is a low and not very distinct transverse swelling at the ventral front margin of each abdominal segment; they disappear on the last three segments. The larva is amphipneustic with a pair of prothoracic spiracles at the hind margin of prothorax, and a pair of posterior spiracles on the swelling mentioned at the front part of the last segment; the spiracles are very small and not easy to detect. The pupa is somewhat short and thick, yellowish white, but brownish when it is mature; it has a length of about 9 mm. The antennal sheaths lie to each side across the lower part of the eye, they have a strong, downwards curved spine at the base, and more apically three somewhat closely placed spines, directed downwards. At the base of the leg-sheaths there is a tubercle with two hook-formed, long and thin spines, directed downwards and backwards, and at the base of the wing-sheath there is a low tubercle with a small spine. On the under side of the head at the lower margin of the eye there is a small triangular process on each side of the mouth parts; this is a sheath enclosing the hairs which are found here in the imago. The sheaths of all the mouth parts, labrum, labium, hypopharynx and maxillæ with their palpi are distinctly seen. On each abdominal segment there is dorsally a girdle of long, erect bristles, alternating regularly with short spines, but on the first segment there is no alternation, the girdle here consisting of long spines recurved at the apex. Ventrally each segment has a girdle of long, backwards directed hairs, but the girdles are interrupted in the middle and near the lateral margins, so that each girdle is divided into four parts, two ventral and two lateral, each part consisting of about three hairs. The last segment has four spines at the apex, an upper pair of longer and a lower pair of shorter spines, the upper spines are somewhat feathery; between the upper and lower spine on the same side there is a vertical row of about three very small spines. There is a pair of prothoracic and seven pairs of abdominal spiracles, all small; the prothoracic spiracles are situated in front, near the eye,

and the abdominal at the front margins of the segments. The sheaths of the legs reach to the hind margin of the third, and the sheaths of the wings a little beyond the hind margin of the first abdominal segment.

The larvæ live in the ground on sandy localities, and the pupæ are found at the same places. The larvæ hibernate, and the transformation to pupa and the development of the imago take place in the following spring.

The species of *Lasiopogon* occur especially in or near woods on dry and more or less sandy localities. I have never succeeded in seeing any *Lasiopogon* with prey; Poulton l. c. records from England as prey for *L. cinctus*: *Pachyrrhina lineata* Scop. (*histrio* F.), the *Lasiopogon* being taken three times with the same prey.

Of the genus 6 species are known from the palæarctic region; one is found in Denmark.

1. **L. cinctus** Fabr.

1781. Fabr. Spec. Ins. II, 465, 29 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 177, 1, et 1849. VIII, 2970, 1, et 1855. XII, 4578, 1 (*Dasypogon*). — 1847. Löw, Linn. Entom. II, 509, 35. — 1862. Schin. F. A. I, 133, — 1903. Kat. paläarkt. Dipt. II, 122.

Male. Face greyish brown pruinose; epistomal beard black. Proboscis and palpi black, the former with whitish hairs. Frons and vertex dark brownish, with blackish hairs. Occiput brownish above, lower down greyish white, the hairs black above, white below. Antennæ black, the two first joints with black hairs. Thorax brownish pruinose, with two dark brown lines on the disc, widened and somewhat curved towards the humeri; between these lines a similar, narrow line in the middle, not reaching the scutellum. The thoracic disc with erect, black hairs; the bristles black and long, longest on the hind part; the scutellar bristles likewise black. Pleura brownish pruinose, a row of hairs along the hind margin of the mesopleura and the long hairs on the metapleura black. Abdomen black, shining, the hind margin of the segments narrowly ashgrey, the hind corners more broadly grey and this colour is produced forwards so that nearly all the side margin is more or less distinctly grey. Venter black, somewhat greyish pruinose, with more or less distinct pale hind margins of the segments. Abdomen on the dorsal side is clothed with very short, black hairs in the middle, and along the sides with long hairs which become shorter towards the apex; these hairs are yellow or greyish on the front part but become darker backwards and are black at the end. Venter sparingly clothed with

long, yellowish hairs, shorter and darker towards the end. The genitalia are shining black with short, black hairs. Legs black, tarsi sometimes more or less dark brownish; coxæ greyish pruinose on the outer side and with long, greyish or yellowish hairs. The upper side of the femora with short, black hairs, sometimes paler, especially towards the base; the ventral side with long, yellowish, towards the apex blackish hairs; tibiæ with long, black hairs; the bristles on the legs and tarsi black. The dense pubescence apically on the ventral side of the hind tibiæ black, on the front tibiæ yellow. Wings slightly greyish with blackish brown veins. Halteres dirty yellowish or rufous.

Female. Quite agreeing with the male with exception of the genital differences, only the abdomen is slightly broader and flat; the eighth segment is quite shining black, the hairs on it pale and erect.

Length 7,5—10 mm.

L. cinctus is rather common in Denmark; it occurs in woods, both in woods of foliferous trees and in pine-woods, on sandy places, thus often on sandy roads, and it is generally seen sitting on the sand; on such places also the larvæ and pupæ are found; vicinity of Copenhagen, Ørholm, Søllerød, Hillerød, Tyvekrogen, Tisvilde, Odsherred, Hellebæk and at Tjustrup Sø; in Jutland at Frijsenborg, Funder near Silkeborg, Nørholm near Varde and Nymindegab. It is an early occurring species, my dates are $^{7}/_{5}$—$^{14}/_{7}$. The larva has been taken at Ørholm on $^{27}/_{4}$, and pupæ in the same locality on $^{9}/_{4}$, $^{27}/_{4}$, $^{6}/_{5}$ and $^{14}/_{5}$; the pupæ taken on $^{9}/_{4}$ developed on $^{28-29}/_{4}$.

Geographical distribution: — Europe down into Italy and Dalmatia; towards the north it goes into Lapland.

6. **Cyrtopogon** Löw.

Species of middle or somewhat large size, and of black colour but generally with more or less pale pruinosity. Head slightly broader than thorax, broader than high; it is short, and flat behind. Face rather broad, slightly narrowed towards the insertion of the antennæ. There is a considerable callus, occupying the whole face right to the antennæ; the epistomal beard covers the whole callus. Antennæ inserted near to each other, somewhat above the middle. Jowls small, almost not descending below the eyes. No ocellar bristles are visible among the hairs clothing frons and vertex. The antennæ consist of five joints, the first two short, the third long and compressed, bearing a style which is very indistinctly two-jointed and terminates in a bristle-shaped apex. The eyes have the facets in the middle front part, from the inner eye-margin outwards, somewhat larger than the

others. Clypeus is distinct and broad, occupying the whole breadth of the epistoma, rounded upwards. I have only been able to examine the mouth parts in situ with a lens, but they are in all probability in the main like those in the nearly related *Lasiopogon*; the proboscis is short and thick, truncate at the apex and directed obliquely down and forwards. Thorax is rectangular, high and somewhat arched above. There are præsutural and postalar bristles whereas the supra-alar bristles are only slightly indicated among the common hairs. The scutellum has no bristles but the hairs at the apex are long and somewhat strong; the metapleura have long hairs; hypopleura without long hairs. Metathorax small with a short metasternum, the space between it and the hind coxæ membranous. Abdomen consists of eight segments; the first dorsal segment is short, the second the longest; on the ventral side the first segment is likewise very short; the eighth segment is small and quite hidden. The genitalia I have only examined in situ; the male genitalia resemble somewhat those in *Lasiopogon* but show some differences; there is an upper pair of forceps with thick, not hook-formed and nearly parallel arms between the apex of which there is a paired median dorsal lamella; below there is a lower pair of forceps the arms of which are, as usual, complicated and two-branched, they are thick at the base, and the outer or lower branch has a pointed apical part, reaching to the end of the upper forceps; at the base of the lower forceps there is a rounded median, ventral lamella. The female genitalia likewise resemble those in *Lasiopogon*; there is a dorsal piece, beset with spines, but the ovipositor formed of the eighth ventral segment is very small and indistinct. The legs are somewhat strong, especially the hind legs; the metatarsi are somewhat elongated; in some (non-Danish) species the front tarsi of the males are very elongated. The femora have long hairs on the ventral, and partly also on the posterior side. The tibiæ have some strong bristles on the dorsal and anterior sides, the front tibiæ on the posterior side; besides some long, thin bristles chiefly on the ventral side. All tibiæ have apical spurs. The tarsi have long bristles at the end of the joints. The front tibiæ have a dense pubescence on the ventral side at the apex, and the hind tibiæ have a very dense and rather long pubescence on the ventral and posterior sides nearly produced to the base and almost forming a fringe; the tarsi are densely pubescent below. There are two pulvilli and a short, bristle-shaped empodium. Wings with the subcostal cell open, the cubital vein forked; between the discal cell and the upper branch of the postical vein a postical cross-vein; five posterior cells, the fourth nar-

rowed at the margin; anal cell closed or nearly closed. Alula distinct; alar squamula small, hairy at the margin.

The larval and pupal stages of this genus are not known.

The species of *Cyrtopogon* occur mainly in mountainous regions; they are recorded often as found sitting on stems and similar places in contradistinction to most other *Dasypogoninæ*. I know nothing about the prey of this genus.

Of the genus 20 palæarctic species are known; one is found in Denmark.

1. **C. lateralis** Fall.

1814. Fall. Dipt. Suec. Asilid. 12, 2 (*Dasypogon*). — 1842. Zett. Dipt. Scand. I, 177, 2 et 1849. VIII, 2971, 2 et 1855, XII, 4578, 2 (*Dasypogon*). — 1847. Löw, Linn. Entom. II, 523, 41. — 1862. Schin. F. A. I, 134. — 1903. Kat. paläarkt. Dipt. II, 126.

Male. Face blackish, greyish white pruinose; epistomal beard black. Proboscis and palpi black. Frons black in the middle, somewhat shining, dark grey at the sides; frons and vertex with black hairs. Occiput dark grey, whitish along the posterior eye-margin; the hairs black above, whitish below. Antennæ black with the hairs on first and second segment black. Thorax black, dull, two approximate median lines, not reaching the scutellum, very deep black and slightly less dull; the margin of the disc brownish grey, the grey colour produced inwards with a pointed prominence at the humerus, and again at the transverse furrow, here continued more or less distinct to the inner end of the furrow, then the grey margin continues to the postalar callus and from here sends a prominence forwards; the postalar callus is ashgrey; there is a very faint dark brownish line in the middle between the median lines, and one outwards on each side of these, thus three in all; at the inner ends of the transverse furrow lies a whitish grey, distinct spot; finally the disc is ashgrey in front of the scutellum; thus the black colour forms two median stripes and two side spots which latter are rounded in front, more pointed backwards and divided by the transverse furrow. Scutellum ashgrey in the middle. The disc is clothed with longish, black hairs which are longest posteriorly, scutellum with long, black hairs, especially long at the margin. The bristles on thorax are black. Pleura brownish grey pruinose, meso- and sternopleura with longer hairs, on the first blackish, on the latter white; the long hairs on metapleura white. Abdomen black, shining; the second segment over somewhat more than the posterior half and the whole third segment yellowish grey pruinose with exception of the anterior corners which

remain black; generally a slight pruinosity is also seen on the front margin of the fourth segment; as mentioned the pruinosity at the lateral margins only occupies the hind corners, and on the fourth, fifth and sixth segments the hind corners are also occupied by a transverse, pruinose spot. Venter black, somewhat shining. Abdomen clothed with short hairs which are yellowish on the front part, but black towards the apex; the hairs are long at the side margins of the anterior segments, decreasing in length backwards. Venter with somewhat long, pale hairs. The genitalia have short, black hairs, slightly longer below; there are some reddish hairs just at the apex. Legs quite black; coxæ greyish pruinose on the outer side and with long, greyish hairs; the hairs on the dorsal side of the femora chiefly black, on the ventral side yellowish grey; the hairs and bristles on tibiæ and tarsi black; the dense pubescence apically on the ventral side of the front and hind tibiæ brown. Wings with rather strong, blackish fumigation, most pronounced on the apical half; the veins black. Halteres yellow.

Female. This is somewhat different from the male; the design on the thoracic disc is very distinct, all the pruinose lines being broader and grey and thus the two black, median lines and the two divided side spots very pronounced; the hairs on the disc are shorter than in the male. The abdomen has no pruinose band in the middle but the lateral margin of the first segment is grey and there is a transverse, whitish grey spot at the lateral hind corners of the second to sixth segments. Wings not blackish but slightly greyish.

Length 7,5—10,5 mm.

C. lateralis is very rare in Denmark and even but recently detected; only four specimens have been taken, all in the little wood called Tyvekrogen at the southern part of Grib Skov; one specimen was taken in 1906 (Larsen) and three in 1907 (the author). I took my specimens sitting on tree-stubs. It is an early occuring species, my dates are $^{12}/_{5}$—$^{13}/_{6}$.

Geographical distribution: — Northern and middle Europe down into France; towards the north to northernmost Scandinavia and here common; it occurs mainly in the mountainous districts.

2. Laphriinæ.

Somewhat robust species, generally more or less densely pilose. Abdomen relatively broad and not decreasing in breadth towards the apex. Antennæ three-jointed without style or arista (in the non-Danish genus *Laphystia* five-jointed, the third joint bearing a two-

jointed style). Legs more or less strong. Wings somewhat broad; the subcostal cell closed; two cubital cells (rarely, in non-Danish genera, three); between the discal cell and the upper branch of the postical vein a postical cross-vein; the fourth posterior cell closed at some distance from the margin, the first sometimes narrowed, or (in non-Danish genera as *Andrenosoma*, *Hoplistomerus*) closed; anal cell closed.

Only one genus ..... 7. *Laphria.*

7. **Laphria** Meig.

Large or middle sized species of black colour, sometimes with reddish markings; they are often strongly pilose and then the pile may give rise to pale designs. Head narrower than, or as broad as, thorax, broader than high; it is short and the posterior surface flat. Face rather broad with a large callus which does not reach the antennæ; the epistomal beard occupies the whole callus and there are shorter hairs continuing up to the antennæ. Antennæ inserted near to each other, considerably above the middle. Jowls a little descending below the eyes. A pair of ocellar bristles more or less distinct among the other hairs on the vertex. Antennæ consisting of three joints, the first about twice as long as the second, the third the longest, slightly compressed, blunt at the apex without style or arista. The eyes have the facets in the front part, from the inner margin outwards, somewhat enlarged. The united stipites of the maxillæ lie on the back of the head, below the occipital foramen, surrounded by a connecting membrane. Clypeus distinctly marked off, rounded upwards, and impressed. Proboscis about as long as the head is high, directed forwards and a little downwards; labium rather characteristic; it is straight, at the base thick and swollen but for the rest it has the upper and lower margin parallel and is strongly compressed; the apex is truncate; the basal part is very short, much shorter than the apical part, this latter shows no division into two joints; there are long hairs below at the base and short hairs at the apex. Labrum short, slightly longer than the basal part of the labium. The maxillæ are long, pointed and slightly curved towards the apex; the maxillary palpi are two-jointed. Hypopharynx rather long, straight and pointed, it is densely beset with somewhat short hairs above over more than the apical half. Maxillæ and hypopharynx equal in length to the labium. Thorax rectangular, moderately high, arched above. In some species no macrochætæ are discernible, in others præsutural, supraalar and postalar bristles are present; the

latter species also have scutellar marginal bristles. Metapleura have long bristles, hypopleura shorter hairs. Metathorax rather distinct, there is a considerable metasternum, the space between it and the hind coxæ membranous. Abdomen consists of eight segments, which are however not all visible; the first dorsal segment is a little shorter than the following; the first ventral segment is very short. In the male at most seven segments are visible, the eighth segment is very small and completely hidden; it is formed of a small ventral plate and a very short dorsal annulus. The male genitalia are very large; they consist, so far as I have been able to examine, of an upper pair of forceps with generally rather broad arms, but otherwise of different shape in the different species, and of a lower pair lying more inwards and very complicated with two-branched arms, but likewise of different shape in the different species; the upper and lower forceps are strongly connected, so that it would perhaps be correct only to speak of one pair of forceps. There is a large, arched ventral lamella, reaching to the apex of the upper forceps. In the interior is the penis with a thick base and an upwardly curved, three-pointed apex. There was no dorsal median lamella to be seen, but the ventral lamella has at the apex a pair of small styles, sitting on a basal piece which is articulated to the ventral lamella. In the female eight segments are visible; the eighth ventral segment has from the hind margin a shovel-shaped prolongation; the ninth segment forms a shorter or longer ovipositor terminating in a pair of small styles. Legs sómewhat strong, in some species stronger than in others and with club-shaped hind femora; they are more or less strongly haired, in some species also with stronger spine-like bristles. All tibiæ have apical spurs; the tarsi have strong bristles. The front tibiæ have a dense pubescence on the ventral side, and the hind tibiæ a similar pubescence at the apex; the tarsi are densely pubescent below. The claws are strong; there are two pulvilli and a somewhat claw-shaped empodium. Wings with the subcostal cell closed a little before the margin, the cubital vein branched; between the discal cell and the upper branch of the postical vein a postical cross vein; five posterior cells, the fourth closed somewhat before the margin; anal cell closed. Alula large; alar squamula small, hairy at the margin. When the wings in rest are lying parallel over the abdomen, the squamulæ point outwards in a somewhat process-like way.

The larva (*L. gilva*) is cylindrical, thickest at the front end, whitish, with distinctly marked segments; it is finely striated longitudinally. It consists of thirteen segments including the head and when the segment-like part bearing the posterior spiracles is counted as a segment.

The head has a shield-shaped, brown, chitinised plate above, and a small plate below; it is beset with several bristles above and below. The mouth parts consist of a short, hook-formed labrum; on each side of this is a small, very compressed, knife-shaped mandible, and externally to the latter a large and broad maxilla which is excised in the outer margin and has a two-jointed palpus. Brauer (Denkschr. d. Kais. Akad. d. Wiss. math. nat. Cl. XLVII, Taf. IV, 1883) on fig. 61 has indicated the maxilla with O?, which means Oberkiefer?, he has not seen the mandible which also is quite hidden and only seen by preparation; his text (p. 28) is also influenced by this mistake. The front margin of the three thoracic segments is finely chagrined; these segments have a bristle at each side on the ventral surface. The six first abdominal segments have each a girdle of six warts all round the segment, a pair at each side on the ventral surface and one at each side on the dorsal surface. The sixth and seventh abdominal segments are the longest. The blunt apex of the last segment points somewhat upwards and has a weakly chitinised plate with three small spines, two above and one larger below; besides the segment has eight long hairs. On the oblique lower side is the anus as a small split. The larva is amphipneustic with a pair of small spiracles at the hind margin of the prothoracic segment and of the mentioned penultimate segment-like part. The length is about 24 mm. with a diameter of about 3 mm. The pupa is brownish yellow; the antennal sheaths lie in front of the head, directed downwards and somewhat diverging, lying across the lower part of the eye; they have a strong spine at the base, and lower down a compressed tubercle produced in four spines. There is a small spine at the lower margin of the eye and more inwards a small, two-pointed spine; there is a compressed tubercle with three small spines at the base of the leg-sheaths and a small tubercle at the base of the wing-sheaths. On the dorsal side of each of the first seven abdominal segments there is a girdle of short spines, replaced by hairs laterally; on the seventh segment the spines get long and recurved; the eighth segment has four short spines dorsally. On the ventral side the segments have girdles of hairs which are longest towards the end of the body. The first four segments have two long and one short hair at each lateral margin, the fifth, sixth and seventh segment have three long hairs The last segment terminates in four spines, placed in a quadrate. There is a pair of thoracic spiracles at the front margin of the thorax behind the eyes, and seven pairs of abdominal spiracles. The sheaths of the legs reach a little beyond the front margin of the third segment. The length of the pupa is 16 mm.

The larvæ live under bark and in stubs, especially in pine-trees; they are carnivorous. Perris (Ann. Soc. Ent. Fr. 4, X, 1870, 212) records the larva of *L. gilva* as occurring together with larvæ of *Spondylus buprestoides* and *Criocephalus rusticus*. Beling (Arch. f. Naturgesch. Jahrg. 48, 199) records the same larva taken under the bark of *Pinus silvestris*. I have had the larva of *L. gilva* from stubs of pine-trees and pupæ of *L. marginata* from similar places. Zeller (Scholtz in Entom. Zeitschr. Breslau, 1848, 16) saw *L. flava* deposit its eggs in a cleft in the stem of a pine-tree. The larva hibernates and the transformation to pupa and development of the imago follow in the next summer.

The species of *Laphria* occur in woods and especially in pine-woods; they sit generally on the stems, watching for prey; the prey seems to some degree to consist of beetles; I have seen *L. gilva* take some Cerambycid, and I have records of it eating *Tomicus typographus* and *Trypodendron*. Poulton l. c. records from Spain *Buprestis flavomaculata* F. and another beetle as prey for *L. gibbosa*, and *Formica rufa* L. for *L. flava*.

Remarks. The genus *Laphria* is scarcely formed as narrow as most other Asilid genera, and therefore the species show some different characters. Thus the species fall in two groups: one comprising the more robust, densely pilose forms with strong, club-like hind femora and mostly with a spine at the apex of the hind tibiæ in the male; these species do not seem to have special individualised bristles on the thoracic disc or scutellum. The other group comprises the less robust forms with less strong legs, the hind femora not club-shaped and no spine at the apex of the hind tibiæ; these species seem always to have special bristles on the thoracic disc. Of the Danish species *L. ephippium* belongs to the first, *L. gilva* and *marginata* to the second group.

The genus comprises 38 palæarctic species; three have hitherto been found in Denmark.

Table of Species.

1. Thorax densely pilose, the hairs yellow on the hind part; robust, strongly pilose species ..... 1. *ephippium.*
— Thorax black, sparingly pilose; more slender, not densely pilose species ..... 2.
2. Abdomen with red markings, clothed with dense red pubescence..... 2. *gilva.*
— Abdomen black with yellow, not dense pubescence.... 3. *marginata.*

1. **L. ephippium** Fabr.

1776. Fabr. Gen. Ins. 308 (*Asilus*). — 1805. Fabr. Syst. Antl. 157, 3. — 1842. Zett. Dipt. Scand. I, 161, 3 et 1855. XII, 4559, 3. — 1847. Löw, Lin. Entom. II, 544, 5. — 1862. Schin. F. A. I, 1938. — 1903. Kat. paläarkt. Dipt. II, 132.

Male. Face blackish, narrowly yellowish at the inner eye-margin and somewhat brownish pruinose above the callus. Epistomal beard yellowish white, with black hairs in the upper part; the hairs below the antennæ and on the vertex yellowish to black. Proboscis black with short, yellow hairs at the apex and with long, whitish hairs below at the base. Palpi black, black haired. Occiput blackish, above with black, downwards with brownish hairs. Antennæ black, the hairs on the two first joints reddish. Thorax black, somewhat shining on the front part which is not seen on the hinder part on account of the dense pile; the larger front part is somewhat sparingly clothed with erect, black hairs, the hind part with very dense, somewhat longer, yellow to reddish hairs. Scutellum with long hairs of the same colour, especially at the margin; there are no special bristles discernible in the common clothing. Pleura with long, black hairs. Abdomen black, shining, clothed with blackish or brownish hairs which towards the apex get more reddish; the hairs are short on the middle of the dorsum, but longer towards the side margins, especially in front. Venter black, sparingly clothed with long, black or brownish hairs. The male genitalia are large, the arms of the upper forceps are somewhat shovel-shaped, broad at the end; they bend down somewhat on the sides; the arms of the lower forceps have an inner branch stretching out towards the apex, and an outer branch which is curved strongly upwards and backwards and is two-pointed at the apex. The genitalia have reddish hairs above, black hairs below. Legs black, densely hairy with shorter and longer hairs; hind femora bare and shining on the ventral side; no stronger bristles visible. The hind femora strongly club-shaped, the hind tibiæ curved, produced in a short, blunt spine on the ventral side at the apex. Front coxæ with long, yellowish white hairs; the hairs on the femora chiefly black, generally paler below, and at the apex of the hind femora somewhat reddish; the hairs on the tibiæ partly black, partly reddish, the longer hairs generally with whitish apex; the bristles on the tarsi reddish. The dense pubescence on the ventral side of the front tibiæ and on the posterior side at the apex of the hind tibiæ reddish; the pubescence below the tarsi of the same colour. The claws reddish at the base, black at the apex. Empodium reddish. Wings brownish yellow, more hyaline at the base; the veins brown, in the apical half of the

wing broadly seamed with brown and hence this part brownish. The costa has reddish or yellowish hairs at the base and some way out. Halteres brownish or reddish.

Female. Epistomal beard black, only with some reddish hairs below; the hairs on occiput and on the base of the proboscis black. Abdomen broader than in the male, with less parallel sides and thus more oval; it is almost quite black haired or the hairs somewhat paler towards the lateral margin. The ovipositor with yellowish hairs at the apex. The hind femora are not bare on the ventral side, and the hind tibiæ have no spine at the apex.

Length 15—22 mm.

This large, pilose species is at once recognised among the Danish species. It bears some resemblance to *L. flava* L. which is not found in Denmark, but this species has the abdomen densely reddish yellow haired.

L. ephippium is not common in Denmark but has yet been taken in several localities; Tyvekrogen, at Hørsholm and Ringsted; in Jutland at Vejle, Skanderborg, Frijsenborg, Gjessø near Silkeborg, Silkeborg and Skjørping. My dates are $^{2}/_{6}$—$^{13}/_{7}$. It occurs in woods, especially in districts with pine-trees, and is generally found sitting on the stems.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia; it is not found in Britain. In middle Europe it goes high up in the mountains.

2. **L. gilva** L.

1761. Linn. Fn. Succ. 1912 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 162, 4 et 1855. XII, 4559, 4. — 1847. Löw, Linn. Entom. II, 548, 8. — 1862. Schin. F. A. I, 139. — 1903. Kat. paläarkt. Dipt. II, 134.

Male. Epistomal callus black, the face above it somewhat whitish grey pruinose; epistomal beard consisting of thicker, black and thinner, white hairs; below the antennæ there are shorter, black hairs; vertex with black hairs. Proboscis black with long, white hairs at the base, and short, yellow hairs at the apex; palpi black and black haired. Occiput grey pruinose, the hairs black above, white downwards and on the jowls; a row of black hairs stretches down to the jowls just along the posterior eye-margin. Antennæ black with black hairs on the two first joints; the basal joint scarcely twice as long as the second, the third longer than the two basal together. Thorax black, very slightly pruinose and nearly dull; the disc is thinly clothed with erect, black hairs which are longest behind; anteriorly to the scutellum and generally also in the middle of the front margin there are whitish

or yellowish hairs; there is a præsutural bristle and a group of supra-alar and postalar bristles, all black. Scutellum with black hairs and long, black marginal bristles. Pleura black and chiefly black haired, only at the hind margin of the mesopleura and among the long hairs on the metapleura there are some pale hairs. Abdomen black, somewhat shining; the hind margin of the third segment and the middle of the fourth and fifth segments in the whole length red, the red colour produced laterally at the front and hind margins of the fourth and fifth segments; sometimes there is also a very narrow, red hind margin on the second segment and a small spot at the front margin of the sixth; the red colour is more or less completely hidden under the dense, red pubescence. Venter black, shining. Abdomen clothed in front with erect, whitish hairs which are long at the lateral margin, the middle part of the second segment and the following segments are clothed with bright red hairs which are depressed and directed from the median line to each side; the hairs may stop at the hind margin of the fifth segment or go as a little spot in on the sixth segment or finally they also clothe the whole sixth segment; the red hairs do not reach the lateral margin which, like the apex, is black haired; at the lateral hind corners of the third and fourth segments there are white hairs. Venter sparingly clothed with long, whitish hairs. The male genitalia are large, the arms of the upper forceps are somewhat shovel-shaped with broad ends; from the dorsal side, somewhat before the apex two flat, striated prolongations issue, a larger outer and a smaller inner; the arms of the lower forceps have two somewhat upwards curved branches; the large ventral lamella reaches the apex. The genitalia are black haired, the hairs are somewhat long above, short below, at the apex of the ventral lamella there are long, strong hairs; the small apical styles are pale haired. Legs black, not specially densely hairy, the hairs whitish and black intermingled, but chiefly pale on the femora and more black on the tibiæ; long and thin hairs are found especially on the ventral side of the femora, on the ventral and dorsal sides of the hind tibiæ, on all sides of the middle tibiæ and on the front tibiæ except on the anterior side; stronger spine-like bristles are found on the anterior and posterior sides of the hind femora downwards, and on the dorsal side of the hind tibiæ, on the anterior side of the middle femora and some long ones on the dorsal side of the middle tibiæ and finally on the dorsal side of the front tibiæ; they are all black as are also the strong bristles on the tarsi. The dense pubescence on the ventral side of the front tibiæ and at the apex on the posterior and ventral sides of the hind tibiæ is brown as is also the dense pubescence on

the lower surface of the tarsi. Claws black, reddish at the outermost base. Empodium reddish. Wings hyaline at the basal half, greyish at the apical half; veins blackish, costa with black hairs at the base. Halteres brown.

Fig. 20. Wing of *L. gilva*.

Female. With exception of the genital differences quite agreeing with the male.

Length 15—18 mm.

L. gilva is not rare in Denmark and has been found in not few localities; Fuglevad, Geel Skov, Ruderhegn, Grib Skov, Tisvilde, Bromme at Sorø; on Funen at Faaborg and in Jutland at Silkeborg and at Hald near Viborg. My dates are $^{3}/_{7}$—$^{1}/_{9}$. It occurs in woods in districts with pine-trees, especially on localities with high-stemmed trees, and it is here found sitting on the stems watching for prey. During a great invasion of *Tomicus typographus* in Grib Skov in 1900 the species was very common while it is otherwise somewhat rare there; it was sitting on the stems in great numbers, feeding on the typographs. The larva has been taken in Ruderhegn on $^{12}/_{4}$ under bark of fir and larvæ and pupæ in Geel Skov in a stub of fir on $^{5}/_{5}$.

Geographical distribution: — Northern and middle Europe; towards the north to northern Scandinavia; it is not found in Britain. It occurs also in North America in Canada.

3. **L. marginata** L.

1761. Linn. Fn. Suec. 1913 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 163, 6 et 1849. VIII, 2976, 6. — 1847. Löw, Linn. Entom. II, 556, 12. — 1862. Schin. F. A. I, 140. — 1903. Kat. paläarkt. Dipt. II, 135. — 1849. *L. podagrica* Zett. Dipt. Scand. VIII, 2976, 5—6.

Male. Epistomal callus black; face above the callus with white or yellowish hairs which are depressed and directed downwards, so that they cover the upper part of the callus; the face is greyish just below the antennæ. Epistomal beard black; above the antennæ and on the vertex there are black hairs. Proboscis black with long, blackish hairs at the base and short, yellow hairs at the apex; palpi black and black haired. Occiput black, at the eye-margins greyish pruinose; the hairs black above, yellow below. Antennæ black with black hairs on the

first two joints; the first joint four times as long as the second, the third slightly longer than the first two together. Thorax black, slightly shining and with a slight violet tinge; in front of the humerus a greyish pruinose spot. The thoracic disc is sparingly clothed with somewhat short, yellowish hairs and with longer, erect, blackish hairs which are longest behind. Scutellum with yellowish hairs and long, black marginal bristles. On the thoracic disc there is a præsutural bristle and a group of supraalar and postalar bristles, all black. Pleura black, slightly greyish pruinose and with somewhat long hairs which are blackish above, white farther dovn, above the coxæ; the long hairs on the metapleura are black above, yellowish below. Abdomen black, shining, like the thorax with a slight violet tinge. It is clothed with short, depressed, yellow hairs which give the impression of being somewhat denser at the hind margins of the segments, especially on the sides; they are long at the lateral margin of the first segment but decrease in length backwards; at the lateral margins of the first five segments there are some stronger, bristly hairs; on the sixth segment the hairs are blackish in the middle. Venter black, sparingly clothed with long, yellow hairs. The genitalia somewhat resemble those in *gilva*, but the upper forceps have not the flat prolongations; the ventral lamella is much arched; there are long, black hairs on the upper forceps and at the apex of the ventral lamella, the apical styles of the ventral lamella have pale hairs. Legs black, somewhat strong, the hind femora somewhat club-shaped; the legs are not densely hairy; the shorter hairs on the dorsal side of the femora are chiefly black, the longer hairs on the ventral side yellowish; the hairs on the hind tibiæ are blackish, on the anterior tibiæ yellowish; long, thin hairs are found especially on the ventral side of the hind tibiæ, on the middle tibiæ except on the dorsal side, and on the ventral and posterior sides of the front tibiæ; they are partly black, partly, especially on the middle tibiæ, yellowish; stronger spine-like bristles are found at the apex on the posterior side of the hind femora, on the anterior side of the middle femora, and on the dorsal side of the tibiæ; on tbe middle tibiæ they are long; they are generally all black. The strong bristles on the tarsi are reddish and black. The dense pubescence on the ventral side of the front tibiæ and at the utmost apex on the posterior side of the hind tibiæ is bright reddish yellow, as is also the dense pubescence on the under side of the tarsi. Claws black; empodium reddish. Wings yellowish hyaline on the basal half, brown on the apical half; veins brown, costa at the base clothed with white or yellowish hairs. Halteres yellow to reddish yellow.

Female. Chiefly agreeing with the male, only the wings less

hyaline on the basal half and hence more evenly brown, and the hairs at the base of the costa black.

Length. This species varies considerably in size, the length being 9—14 mm.

The pupa has a length of 12 mm.

L. marginata is not common in Denmark, but yet from time to time taken in not small numbers; Dyrehaven, Geel Skov; on Lolland at Maribo and Frejlev; on Funen at Lundeborg on the eastern coast and at Langensø; in Jutland at Frijsenborg and Støvring near Randers, finally on Bornholm in Ekkodalen. My dates are $^{19}/_{6}$—$^{8}/_{9}$. Pupæ have been taken in Dyrehaven in decaying wood and in Polyporus. The species occurs in woods of foliferous trees generally sitting on the stems.

Geographical distribution: — Northern and middle Europe down into France; towards the north to the northern parts of middle Scandinavia.

3. Asilinæ.

The genera of *Asilinæ*, enumerated in the following, were, as is well known, established as groups in Löw's valuable monograph; since then they have generally been treated as genera, yet they have been rejected by some authors, e. g. Pandellé (Rev. d'Entomol. publ. par la Soc. Franc. d'Entom. XXIV, 1905, 45), who consider them as one genus, *Asilus*. Though it cannot be denied that as genera they are far more closely allied and taken in a much more narrow sense than genera are commonly, I shall yet retain them here, chiefly because they are generally in use and at all events give valuable hints about the natural classification of the species; but I shall, on account of the narrow sense in which they are taken, give a common generic description under the heading of *Asilinæ*.

The species of the *Asilinæ* are of medium to large size and of a somewhat long, slender shape; they are generally of a dull, brownish to greyish colour, rarely more lively coloured. Head as broad as, or somewhat broader than thorax and somewhat broader than high, short, and flat on the posterior surface. The eyes are large, the face somewhat broad, or more narrow, somewhat widened below; there is a distinct and generally large epistomal callus above the clypeus, bearing a long and dense epistomal beard the hairs of which are curved downwards. Antennæ inserted near to each other, somewhat above the middle. Jowls somewhat but generally only slightly descending below the eyes. No individualised ocellar bristles. A row of occipito-orbital bristles along the upper part of the posterior eye-margin.

The antennæ consist of five joints, the first is longer than the second, the third is compressed, broadest at the base, somewhat pointed towards the apex, the two last form an arista with the first joint short. The eyes have the facets in front, from the inner eye-margin somewhat outwards, more or less enlarged in both sexes. On the back of the head, below the occipital foramen, there is a membranous part with the united stipites of the maxillæ. The clypeus is distinctly marked off below the epistomal callus, it is rounded upwards and impressed. Proboscis directed downwards and more or less forwards; it varies in length from half as long to slightly longer than the head is high; the basal part of the labium occupies about half the length; the apex is rounded or more pointed. Labrum as long as the basal part of labium, it is elongately triangular, rounded or truncate at the apex. The maxillæ have a long, semitubular lacinia which is either truncate (*albiceps*, *forcipula*, *trigonus*, *atricapillus*, *cyanurus*) or somewhat pointed at the apex (e. g. *crabroniformis*); the maxillary palpi are short, cylindrical, one-jointed. Hypopharynx likewise semitubular, it is strong, pointed at the apex; it is beset with erect hairs above over about the apical half. Maxillæ and hypopharynx equal in length to labium. Thorax high, more or less arched above; it is rectangular with rounded corners. There are præsutural, supraalar and postalar bristles, and on the middle of the disc there are two rows of dorsocentral bristles, generally only on the hind part (præscutellar bristles Ost. Sack.), more rarely continued longer forwards. Scutellum has long marginal bristles. On meta- and hypopleura there is a vertical row of more or less strong bristles. Metathorax distinct, there is a somewhat large metasternum, the space between it and the hind coxæ is membranous. Abdomen long, narrower than the thorax and generally decreasing in thickness towards the apex; it is cylindrical or somewhat compressed. It consists in the male of eight segments; the first dorsal segment is short and always broader than the following segments, the second is the longest; the first ventral segment is very short. The eighth segment is small and often more or less hidden, it has sometimes, in the male, on the ventral side a prolongation at the hind margin. The male genitalia consist of the upper forceps which may be of somewhat different shape in the different species; below the upper forceps is the lower pair of forceps the arms of which are complicated and two-branched; the inner branch varies not a little in shape in the different species; between the arms of the upper forceps lies the dorsal median lamella, it is membranous in the middle, but chitinised at the sides and hence somewhat paired. On the ventral side lies the ventral lamella at the base of the lower

forceps, it is semiannular and forms, as it were, a ninth ventral segment; it is either black and shining like the genitalia, or pruinose and then quite resembling a ventral segment. In the interior lies the penis which is curved upwards towards the apex, and here often three-branched. In the female the abdomen consists likewise of eight segments, but the eighth always forms part of the ovipositor, that is to say it is black, shining and otherwise indicating that it belongs to the ovipositor. The ovipositor consists of a basal part, the mentioned eighth segment, and of a second dorsal piece above; it is thus formed of two dorsal and one ventral piece, that is of the eighth segment and a dorsal part of the ninth; the ventral piece is generally so long that it stretches out to the end of the second dorsal piece. At the apex of the dorsal piece lie a pair of lamellæ which are either lamelliform and wedged into the apex of the dorsal piece, or they are more styliform and free. The ovipositor may be shorter or longer and it is either cylindrical and conical, or strongly compressed, in rare cases it is thick and swollen. In some cases not only the eighth but also the sixth and seventh segments form part of the ovipositor which is then long and compressed. Legs more or less strong and bristly; the hairs on the legs fall in different categories; there is a common clothing of short, somewhat depressed hairs, then on certain places long and thin, erect hairs some of which may be strong and bristly, e. g. often on the ventral side of the front femora; finally there are strong spine-like bristles to a different degree on femora and tibiæ; also apical spurs are present. On the ventral or antero-ventral side of the front tibiæ and on the posterior side of the hind tibiæ there is a special, dense, reddish pubescence, and a similar pubescence is found on the under side of the tarsi. The tarsi have strong spine-like bristles, especially at the apex of the joints. The claws are strong; there are two pulvilli and a claw- or bristle-shaped empodium. Wings

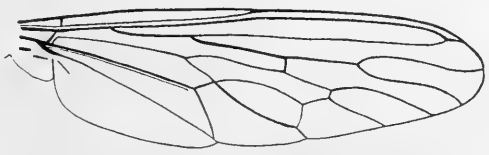

Fig. 21. Wing of *Neoitamus cyanurus*.

with the subcostal cell closed, the cubital vein forked; two cubital cells (in some non-Danish genera the upper branch of the cubital vein has a recurrent veinlet, and this may be prolonged to the radial vein, then there are three cubital cells); no postical cross-vein between the upper branch of the postical vein and the discal cell, but the

postical vein uniting with the discal vein at a point, rarely forming a very short postical cross-vein; five posterior cells, the fourth closed at a little distance from the margin (in some non-Danish genera the first may be narrowed towards the margin or closed); the anal cell closed; the first basal cell somewhat longer than the second. Alula well developed. Alar squamula small, thickened at the margin and with a long fringe.

The pattern of the thoracic disc in the *Asilinæ* is very uniform; it is, as in most other Diptera, caused by the large thoracic muscles or is at all events in some way dependent on these. The ground colour which is caused by a pruinosity is generally greyish or brownish; the markings are darker and consist of a middle stripe and to each side of it a side stripe; the middle stripe is generally broadest in front, decreasing in breadth backwards and here often pointed, it has often a fine, light middle line. The side stripes do not reach the front end but stop a little behind the humeri; they are divided in three spots each, the first disconnection follows the transverse furrow, the second lies inwards to the wing-root; the last spot is generally small and cuneiform. These are the common markings; besides there may sometimes be a more or less distinct, narrow line between the middle and the side stripes, and a small humeral spot or stripe.

I have only examined the pupa and a cast larval skin (of *N. cyanurus*) but the larva has been described by several authors, among others by Beling (*atricapillus* and *cyanurus*) (Arch. für Naturgesch. Jahrg. 48, 1882, 202—205). It is cylindrical, white, very finely striated longitudinally; the body consists of thirteen segments, including the head and when the segment-like part anterior to the last segment is counted. The head is small, brown chitinised, retractile; it is beset with some long hairs. The mouth parts consist of a short, hook-formed labrum; to each side of this is a small, compressed, knife-shaped mandible and outwards again a longer and broader maxilla with a palpus which has an apical joint sitting on a small basal joint; the maxilla has spines (movable?) on the inner, lower side. Fig. 54 by Brauer (Denkschr. d. Kais. Akad. d. Wiss. math. nat. Kl. XLVII, 1883) answers to my observations, but I think he has sometimes, figs. 55 and 56, confounded mandible and maxilla here as in *Laphria*; the mandibles are hidden and not seen without preparation. The three thoracic segments have a long hair on each side, and the last segment has some (8) long hairs. The larva is amphipneustic with small spiracles on prothorax and on the mentioned penultimate segment or segment-like part. The pupa (*forcipula*, *trigonus*, *cyanurus*) is brown; there are two strong spines in front, directed somewhat

downwards; the antennal sheaths lie over the lower part of the eyes, directed to each side, they are compressed and have three strong, downwards directed spines. At the base of the wing-sheath there is a low tubercle, generally with a small spine, and at the base of the leg-sheaths a pair of very small spines. On the dorsal side of each abdominal segment there is a transverse girdle of strong spines, short and somewhat longer alternating; each segment has a girdle of strong hairs on the ventral side; along the sides there is on each segment a somewhat tubercle-shaped elevation with an oblique row of hairs going over in the dorsal spines; the last segment has at the apex four spines, placed in a quadrate, each tapering to a bristly point, between the lowermost pair there are two small, short spines. There is a pair of thoracic and seven pairs of abdominal spiracles. The sheaths of the legs reach to the hind margin of the second or third abdominal segment in relation to the degree to which the pupa is curved.

The larvæ live in the earth, or sometimes below the carpet of leaves covering the ground in woods, and they may often be found in mole-casts; they were formerly thought to live on vegetable or decaying matter, but it is now clearly shown that they are carnivorous; they feed on other larvæ e. g. larvæ of different beetles; sometimes they penetrate quite into the larva which they attack and eat this quite empty before leaving it; they have been found in this way in the larva of an Elaterid (Brauer l. c. 28—29). Some species (*Erax*, *Asilus*) also prey upon locust-eggs (Riley, First Rep. U. S. Entom. Comm. 303). The larvæ hibernate and the transformation to pupa and development of the imago take place in the following summer. The pupæ are found in the earth at the same places as the larvæ.

The different species of *Asilinæ* occur in different places; some species occur in woods, often especially in pine-woods, on open, sunny places; these species are often seen sitting on the stems, watching for prey and they take then a curious position; they sink somewhat on the legs on one side while the legs on the other side are somewhat stretched out and thus they get a characteristic oblique position. Other species occur on sandy places in woods, on fields generally also on dry and sandy localities, on heaths or along the shore and in downs; these species are generally seen sitting on the sand. On the whole dry and sandy districts are the common localities for the species. The *Asilinæ* are strong robbers, they prey upon other insects of all orders, and often the prey may be very large in relation to the Asilid, even larger than this. Under each species I have given what I know about its prey.

Of *Asilinæ* about 236 species are known from the palæarctic region, of these 13 have hitherto been found in Denmark, and these all belong to the nearly related genera, formed by Löw as groups under *Asilus*.

Table of Genera.

1. No bristles at the hind margin of the abdominal segments, or if such bristles are present, with numerous spine-like bristles on the front side of the middle femora, or if not, with the epistomal callus small, not reaching half the length of epistoma; female ovipositor conical, not compressed, sometimes with spines at the end ..... 2.
— Bristles at the hind margin of the abdominal segments present; spine-like bristles on the front side of the middle femora not numerous; epistomal callus reaching more than half the length of epistoma; female ovipositor compressed ..... 6.
2. No bristles at the hind margin of the abdominal segments ..... 3.
— Bristles at the hind margin of the abdominal segments present ..... 5.
3. Colour lively, brown, black and yellow; legs all ferrugineous; large species ..... 10. *Asilus.*
— Colour not lively, brownish or greyish ..... 4.
4. Epistoma not shining black in the middle; wings brown at the apex, at the base milk-white in the male, hyaline in the female ..... 9. *Pamponerus.*
— Epistoma shining black in the middle; wings hyaline. 11. *Rhadiurgus.*
5. Male genitalia large; female ovipositor swollen; numerous spine-like bristles on the front side of the middle femora; tibiæ reddish ..... 12. *Antipalpus.*
— Male genitalia somewhat slender, the upper forceps with a large excision above; female ovipositor small, conical, with spines at the apex; very few spine-like bristles on the front side of the middle femora; tibiæ not reddish 8. *Philonicus.*
6. The bristles on the middle of the thoracic disc continued to or near to the front end ..... 13. *Dysmachus.*
— The bristles on the middle of the thoracic disc only continued to or slightly beyond the middle ..... 7.
7. The hairs on the venter strong, bristly; male genitalia small, eighth ventral segment without any prolongation. 17. *Epitriptus.*
— The hairs on the venter not bristly; male genitalia large, or the eighth ventral segment with a prolongation ..... 8.
8. Male genitalia somewhat swollen; eighth ventral segment in the male without any prolongation; sixth and seventh abdominal segments form part of the female ovipositor.. 16. *Neoitamus.*
— Male genitalia not swollen, eighth ventral segment in the male with a prolongation; sixth and seventh abdominal segments not forming part of the female ovipositor ..... 9.

9. The prolongation of the eighth ventral segment in the male rounded at the apex; female ovipositor with the lamellæ wedged in ..... 14. *Eutolmus.*
— The prolongation of the eighth ventral segment in the male roundly excised at the apex; female ovipositor with free, styliform lamellæ ..... 15. *Machimus.*

8. **Philonicus** Löw.

Species of medium or somewhat large size, only slightly hairy. Face somewhat broad; epistomal callus small, not reaching half the height of the epistoma. Antennæ placed somewhat above the middle; the hairs on the underside of the basal joints not long. The facets in the front part of the eyes somewhat enlarged. Dorsocentral bristles only present on the hind part of thorax. Scutellum with two marginal bristles. Bristles at the hind margin of the abdominal segments present. Legs somewhat slender; no spine-like bristles on the ventral side of the front femora. Male genitalia somewhat slender; the arms of the upper forceps with a large excision above at the apex; ventral lamella pruinose, resembling the ventral segments. The female ovipositor conical, with spines at the apex.

Of this genus 4 palæarctic species are known; one is found in Denmark.

1. **P. albiceps** Meig.

1820. Meig. Syst. Beschr. II, 310, 8 (*Asilus*). — 1849. Löw, Linn. Entom., IV, 145, 74. — 1862. Schin. F. A. I, 144 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 142. — 1842. *Asilus albibarbus* Zett. Dipt. Scand. I, 172, 7 et 1849. VIII, 2969, 7 et 1855. XII, 4570, 7.

Male. Eyes in the living specimen slightly metallic, brownish with a slight greenish cast. Face whitish hairy; epistomal beard white with some black hairs above. Frons and vertex grey. Palpi black with yellow hairs. Occiput grey with yellowish bristles above and white hairs below. Antennæ black. Thorax light yellowish grey, the stripes brown, the middle stripe the darkest, this is broad in front, narrowed posteriorly; it has on the front part an indistinct middle line which is generally cleft anteriorly; the side stripes large. Scutellum grey. The thoracic disc sparingly clothed with short, erect, black hairs. The bristles generally black but not rarely intermingled with pale ones; the scutellar bristles pale. Pleura greyish pruinose; some longish, whitish hairs on ptero- and sternopleura; the vertical rows of long hairs on meta- and hypopleura yellowish. Abdomen greyish brown with an indistinct, dark brown middle line; with the light from behind there are light grey hind margins on the segments.

Venter greyish brown. Abdomen clothed with short, yellowish, in the middle line blackish, hairs; at the hind margins of the segments there are long, yellow bristles which are longest on the anterior segments and towards the sides. Venter sparingly clothed with long, pale hairs. Genitalia black, the lower forceps greyish at the base, the ventral lamella greyish as the foregoing segments; the hairs black above, yellowish below and at the apex. The upper forceps with a large excision above. Legs black; coxæ grey with long, greyish white hairs, and with stronger bristles; the legs for the rest clothed with short, depressed, greyish hairs so that they appear grey; on the tarsi the hairs sometimes partly blackish. Only some few long hairs on the ventral side of the front femora and tibiæ. The front femora without spine-like bristles below, three or four above; the posterior femora with some few; the tibiæ with some long spine-like bristles; these bristles are very varying in colour, they are generally white with exception of most of those on the dorsal side of the front tibiæ and often some towards the apex of the posterior tibiæ which are black. The spine-like bristles on the tarsi mainly black, yet also some white posteriorly on the anterior tarsi. Wings yellowish, veins brown. Halteres yellow.

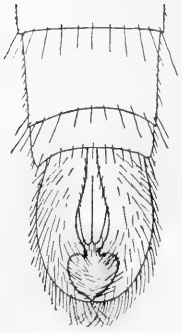

Fig. 22. *Ph. albiceps*, male forceps, from above.

Female. With exception of the genital differences agreeing with the male; the ovipositor shining black.

Length 13—20 mm.

This species is easily known by the small epistomal callus, the somewhat slight hairiness, the slender, strongly excised forceps and the characteristic female ovipositor.

P. albiceps is common in Denmark in suitable localities; Vedbæk, Tisvilde, Jægerspris; on Funen at Lundeborg on the eastern coast and at Faaborg; in Jutland at Frijsenborg, Silkeborg, Søndervig, Lønstrup, Frederikshavn, Skagen and on Læsø; finally on Bornholm at Hasle and Rønne. My dates are $^{7}/_{7}$—$^{2}/_{9}$. It occurs in sandy localities especially at the shore and in downs, as seen from the list of localities, and often in great numbers, but also on sandy places in woods, and it is generally found sitting on the sand. Poulton l. c. records from England as prey for this species: a Muscid (*Lucilia* or *Euphoria*), *Hyetodesia signata* Meig., *Fucellia maritima* Halid. and *Syrphus ribesii* L. On the shore I think *Fucellia* and Scatophagids are especially its prey.

Geographical distribution: — Most parts of Europe down into France; towards the north to middle Scandinavia; and in Siberia and Japan.

9. **Pamponerus** Löw.

Species of large size and rather densely hairy, especially on the abdomen. Face somewhat broad and widened downwards; epistomal callus large, reaching near to the antennæ. Antennæ placed somewhat above the middle, the hairs on the underside of the first joint long. The facets on the front part of the eye almost not enlarged. Dorsocentral bristles only on the hind part of thorax. The marginal bristles on scutellum, and the long hairs on meta- and hypopleura very weak. No bristles at the hind margins of the abdominal segments. Numerous spine-like bristles on the ventral side of the front femora at the base, and also on the front side of the middle femora. Male genitalia medium-sized, the arms of the upper forceps with a large excision at the apex; the ventral lamella not shining. The female ovipositor small, conical, with free lamellæ.

Of the genus only one palæarctic species is known, also occurring in Denmark.

1. **P. germanicus** L.

1767. Linn. Syst. Nat. XII, II, 1008, 12 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 166, 2 et 1849. VIII, 2969, 2 et 1855. XII, 4560, 2 (*Asilus*). — 1849. Löw, Linn. Entom. IV, 135, 69. — 1862. Schin. F. A. I, 144 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 144.

Male. Face yellowish below the antennæ and down the eye-margin,the callus grey; epistomal beard yellowish white to ferrugineous yellow, black above. Palpi black with yellow hairs. Frons and vertex black, slightly greyish pruinose, with black hairs. Occiput yellowish grey pruinose, the occipito-orbital bristles black, the other hairs, both above and below, whitish. Antennæ blackish, the base of the third joint narrowly reddish; the two first joints black haired. Thorax greyish brown, the stripes blackish brown; the middle stripe broad in front and here cleft, narrow behind; the side stripes relatively small; between the middle and the side stripes a less distinct, narrow stripe; a short humeral stripe; the disc is ash-grey behind. Thorax clothed with short, erect, blackish hairs, longer and brownish behind; the bristles are black, generally with paler ends. The scutellum ash-grey with longish hairs and long marginal bristles. Pleura brownish pruinose with sparse, long, yellowish hairs; the long hairs on meta- and hypopleura yellowish. Abdomen black with a steel-bluish tinge, somewhat shining; the hind margin of the segments somewhat brownish; with the light from behind there are greyish pruinose lateral spots at the hind margins of the second, third and fourth segments, the spots are produced upwards somewhat band-like. Venter blackish, some-

what brownish pruinose, the incisures sometimes brownish. Abdomen clothed with longish, yellowish hairs, in the dorsal middle line with black hairs which towards the end supersede the yellow hairs, so that the last segments get quite or nearly quite black haired; at the lateral hind margins of the segments there are longer hairs, but there are no real bristles. Venter clothed with long, yellowish hairs, the last ventral segments often with black hairs at the hind margins. Genitalia black, the hairs black at the base, paler at the apex; the upper forceps with a large excision at the apex, thus when it is closed there is an elliptical opening in front and a nearly circular opening behind; the median dorsal lamella is reddish; the ventral lamella black, not shining. Legs black, tibiæ, except the tips, reddish, tarsi reddish, the apex of the outer joints blackish, the last joint nearly black. Coxæ greyish pruinose with long, yellowish hairs; the short hairs on the legs are yellowish on the femora, black on the tibiæ and tarsi; the usual dense pubescence on the front and hind tibiæ is reddish. The front femora and tibiæ have long, thin hairs ventrally, and the middle tibiæ some few. The front femora have densely placed spine-like bristles ventrally near the base, the posterior femora ventrally and on the front side, and the middle femora also some on the posterior side near the apex; the tibiæ have some shorter, spine-like bristles. The spine-like bristles are chiefly black, only on the front side of the hind femora there is generally a row of pale ones. The strong bristles on the tarsi are black. Wings milk-white at the base, brownish on the apical half and along the front margin; veins brown. Halteres whitish yellow.

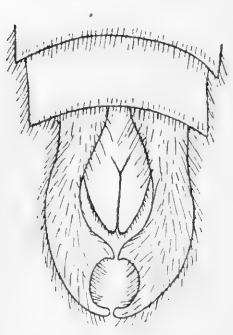

Fig. 23. *P. germanicus*, male forceps, from above.

Female. Abdomen not bluish but more brownish, the lateral spots also present on the last segments; wings not milky but hyaline at the base.

Length 16—20 mm.

This large species is easily knovn by the brownish wings with milky or hyaline base, and the red tibiæ.

P. germanicus is not rare in Denmark though it cannot be termed common; vicinity of Copenhagen, Brede, Odsherred, Tisvilde, Jægerspris, Hvalsø; on Møen; in Jutland at Mausing near Silkeborg and at Bangsbo. My dates are $^{23}/_{5}$—$^{28}/_{7}$. It occurs especially on fields, often in the vicinity of woods, and it is often seen sitting on the leaves of grass. Poulton l. c. records it from England with *Hoplia philanthus*

Füss. as prey. Zeller (Isis 1840, 53) mentions that it takes *Phylloperta horticola* L. and *Dolerus niger* L.

Geographical distribution: — Most parts of Europe down into France; towards the north to middle Scandinavia and southern Finland.

10. **Asilus** L.

Large species of lively colours, slightly hairy. Face broad, slightly widened downwards; epistomal callus not large, reaching little more than half the height of the epistoma. Proboscis rather long, somewhat pointed. Antennæ placed somewhat above the middle, the hairs on the under side of the basal joints short. The facets in the front part of the eye very slightly enlarged. The dorsocentral bristles only present on the hindmost part of thorax. No bristles at the hind margin of the abdominal segments. A row of spine-like bristles on the ventral side of the front femora. Male genitalia small, the arms of the upper forceps rounded at the apex; the ventral lamella not shining. The female ovipositor pointed conical with free lamellæ.

Of the genus three palæarctic species are known; one is found in Denmark.

1. **A. crabroniformis** L.

1761. Linn. Fn. Suec. 1908. — 1842. Zett. Dipt. Scand. I, 165, 1 et 1855. XII, 4560, 1. — 1849. Löw, Linn. Entom. IV, 132, 67. — 1862. Schin. F. A. I, 143. — 1903. Kat. paläarkt. Dipt. II, 145.

Male. Face and epistomal callus yellowish pruinose; epistomal beard yellow or reddish yellow. Proboscis black, reddish on the under side at the base; palpi reddish with reddish, at the apex black hairs. Frons and vertex brownish yellow with yellow hairs. Occiput yellow pruinose, occipito-orbital bristles yellow, the hairs somewhat paler downwards. Antennæ black with the two first joints ferrugineous; on the under side of the first joint short black, of the second short yellow hairs. Thorax yellowish brown, darkest behind, with a dark brown middle stripe, disappearing behind and divided by a narrow middle line; no side stripes. The disc has short, somewhat depressed hairs, being longer behind, they are black in the middle and behind, yellow at the sides; the bristles yellow. The scutellum dark brown with black, erect hairs; the marginal bristles yellow, generally with a couple of black intermingled. Pleura blackish, reddish pruinose, with some longer, generally black hairs; on the pteropleura, below the wing-root, there is a tuft of a few yellow or black bristles which are curved strongly forwards; the bristles in the vertical row on meta-

and hypopleura are very strong, black, sometimes a few yellow. Abdomen with the three first segments black, the rest bright yellow on account of a dense pruinosity; at the lateral hind margin of the second segment a grey pruinose spot and on the third a similar, but yellow spot; on the side margins of the yellow segments longitudinal, brown spots. The first three segments are clothed with black hairs which are short on the dorsum, longer at the side margins and here whitish at the hind corners; the yellow segments are clothed with short, yellow hairs, at the lateral hind corners of the first of them there are black hairs; the hairs are slightly longer at the hind margins, but there are no bristles. On the venter the first four segments are brown, the rest brownish yellow, the first segments clothed with long, yellowish hairs, on the other segments the hairs are short and there are short, black hairs along the middle of the venter. The genitalia small, ferrugineous, with yellow hairs; the base of the lower forceps bears bristles; the arms of the upper forceps are curved slightly downwards, rounded at the end; the ventral lamella brownish yellow, not shining. Legs ferrugineous, the tibiæ a little lighter and the tarsi reddish yellow; coxæ brownish pruinose, the anterior with long, yellowish hairs on the front side, the posterior with black and yellow spine-like bristles on the outer side and towards the apex; the legs clothed with somewhat longish, depressed hairs which are chiefly yellowish on the dorsal side of the femora, black on the ventral side and on the anterior side of the front femora; they are yellowish on the tibiæ, only black on the ventral side of the hind tibiæ and to a less degree on the ventral side of the middle tibiæ; long and thin hairs are found on the ventral side of the front femora and tibiæ, they are chiefly black on the femora, yellow on the tibiæ; spine-like bsistles are present on the ventral and on the postero-dorsal sides of the front femora, on the ventral and anterior sides of the posterior femora and a few dorsally at the apex of the posterior femora; on the front tibiæ they are found on the dorsal and posterior sides, on the posterior tibiæ on various sides; they are generally black on the ventral side of the posterior femora; the rest including all on the tibiæ yellow. The spine-like bristles on the tarsi are yellow, the shorter ones on the lower surface black. Wings brownish yellow, the axillary and all posterior cells have the centre darkened, the discal and the apices of the cubital cells are like-wise darkened but to a slighter degree; veins yellowish brown. Halteres yellowish with a darker knob.

Female. Quite agreeing with the male, the ovipositor brownish, black at the apex.

Length 18—26 mm.

This species is at once distinguished from all other Danish species by its bright colour.

A. crabroniformis is not rare in suitable localities; Ordrup Mose, Ermelund, Donse, Esrom Sø, Tisvilde, Jægerspris, at Helsingør and on Vallø Strand; on Funen at Odense, Veflinge and Faaborg; in Jutland at Horsens, Dollerup and Hald near Viborg and on Als Odde at Mariager Fjord. It is a somewhat late species, my dates are $^{12}/_{7}$—$^{8}/_{8}$. It occurs on dry fields and on heaths, often in no small numbers, and it is here often seen sitting on horse-dung. It is a very strong robber; its prey is often Acridiids which may be as large as itself; it also catches beetles and flies as recorded by Poulton l. c., f. inst. *Sermyla halensis* L., *Lucilia cæsar* L., *Sarcophaga carnaria* L., *Sericomyia borealis* Fall. and Asilids.

Geographical distribution: — Most of Europe down into Italy; towards the north to middle Scandinavia and southern Finland; also in North Africa.

11. **Rhadiurgus** Löw.

Species of rather small size and dark greyish colour. Face not broad, widened somewhat downwards, shining black in the middle; epistomal callus medium sized but very prominent, reaching somewhat more than half the height of the epistoma. Antennæ placed somewhat above the middle, the hairs on the under side of the first joint somewhat long. The eye-facets in the front part of the eye distinctly enlarged. Dorsocentral bristles present on the posterior half part of thorax. No bristles at the hind margin of the abdominal segments. Front femora without spine-like bristles below. Male genitalia of medium size, somewhat slender, the upper forceps with an incision above at the apex; the ventral lamella pruinose, resembling a ventral segment; penis with the median branch very long. The female ovipositor short, broadly conical with free lamellæ.

Of the genus only one palæarctic species is known, also occurring in Denmark.

1. **R. variabilis** Zett.

1840. Zett. Ins. Lapp. 506, 4 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 169, 5 et 1855. XII, 4565, 5 (*Asilus*). — 1849. Löw, Linn. entom. IV, 133, 68. — 1862. Schin. F. A. I, 157 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 145.

Male. Eyes, when the species is alive, slightly metallic, brownish with a slight greenish cast. Epistoma shining black in the middle, whitish pruinose at the eye-margins; the callus grey; epistomal beard white in the middle, black above with the black hairs going down

on each side. Jowls greyish in front, shining black behind. Palpi black, with black hairs. Frons and vertex black, on the sides and behind greyish pruinose, with black hairs. Occiput greyish pruinose, occipito-orbital bristles black, the hairs below white. Antennæ black, the first two joints with black hairs. Thorax grey, slightly brownish in front, ash-grey behind; the stripes blackish, the middle stripe broad in front, pointed posteriorly, divided by a fine line; the side stripes somewhat abbreviated anteriorly, distinctly divided into three spots. The disc with short and sparse, black hairs which are longer behind; scutellum white haired; the bristles on disc and scutellum black. Pleura brownish to greyish pruinose, almost without longer hairs; the bristles on meta- and hypopleura black, only some pale ones below. Abdomen brownish, in front more grey and with indistinct greyish front margins of the segments; with the light from behind it is black, slightly shining and with whitish grey hind margins of the segments. Venter grey. Abdomen sparingly clothed with short hairs which are whitish at the sides, black along the middle; at the sides of the first and second segment there are longer hairs. Venter sparingly clothed with long, pale hairs, being shorter towards the apex. Genitalia black, the arms of the upper forceps with an excision above at the apex; the hairs generally black at the base, pale at the apex; the ventral lamella is pruinose like the ventral segments. Legs black, posterior tibiæ ferrugineous with black tips, front tibiæ often ferrugineous at the base; metatarsi ferrugineous, the other tarsal joints blackish with the base ferrugineous; the posterior tibiæ sometimes blackish on the front side. Coxæ greyish pruinose, with long whitish hairs. The short hairs on the legs chiefly black, but somewhat varying and often more or less pale on the femora. Long, thin hairs are found on the ventral side of the front femora and tibiæ, they are black, only pale at the base of the femora; also on the ventral side of the middle legs there are some long hairs; some of the hairs are somewhat strong. Spine-like bristles are found on the dorsal side of the front femora, on the front side of the middle femora and on the ventral and front sides of the hind femora, moreover a few dorsally at the apex of the posterior femora; on the tibiæ they are longer and here found on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ except on the posterior side of the hind tibiæ; they are black with rare exceptions. The spine-like bristles on the tarsi are black. Wings greyish fumigated, more hyaline at the base; veins blackish brown. Halteres brownish yellow.

Female. Quite agreeing with the male; the ovipositor black, shining, black haired; the hairs are long at the side margin and below.

Length 11—14 mm.

This species is at once recognised in both sexes by the black, shining face which is white only along the eye-margins.

R. variabilis is rare in Denmark and first newly detected; in 1907 I caught ten specimens at Tisvilde and in the same year three specimens were caught in Jutland at Silkeborg (A. Petersen); it is a somewhat late occurring species, the dates of capture are $^{8}/_{7}$—$^{21}/_{8}$. It occurs on sandy localities generally sitting on the sandy ground.

Geographical distribution: — Northern and middle Europe; but it does not seem to go further towards the south than to Holland and northern Germany; towards the north it goes to northern Scandinavia and is found in Siberia; it is to some extent an alpine species.

12. **Antipalus** Löw.

Species of somewhat large size and of dark greyish colour. Face somewhat broad, distinctly widened downwards; the epistomal callus large, reaching more than two thirds of the height of epistoma. Antennæ placed somewhat above the middle, the hairs on the under side of the first joint long. The facets in the front part of the eye distinctly enlarged. Dorsocentral bristles present on the posterior half of the thorax; the marginal bristles on scutellum and the long hairs on meta- and hypopleura somewhat weak. Bristles at the hind margin of the abdominal segments present. Front femora with spine-like bristles below in the female (in the Danish species, in other species in both sexes); middle femora with numerous spine-like bristles on the front side. Male genitalia somewhat large, the upper forceps with a small excision at the apex; the ventral lamella black shining. The female ovipositor of a curious shape, very thick, the eighth segment black but otherwise quite segment-shaped, the second dorsal piece broad, semiannular, the lamellæ broad, directed downwards and meeting above in the middle, thus forming a roof-shaped part; the lower margin of the second dorsal piece and the lamellæ with dense, reddish hairs.

Of the genus 4 species are known from the palæarctic region; one is found in Denmark.

1. **A. varipes** Meig.

1820. Meig. Syst. Beschr. II, 328, 33 (*Asilus*). — 1849. Löw, Linn. Entom. IV, 136, 70. — 1855. Zett. Dipt. Scand. XII, 4567, 6—7 (*Asilus*). — 1862. Schin. F. A. I, 145 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 145.

Male. Eyes in the living specimens slightly metallic, brownish with a slight greenish cast. Face yellowish grey pruinose, callus greyish black; epistomal beard whitish, black above. Palpi black with long

yellowish white hairs. Frons and vertex brownish pruinose, black haired. Occiput whitish grey pruinose, occipito-orbital bristles black, the hairs whitish both above and below. Antennæ blackish brown, the hairs on the two first joints black, those on the under side of the first joint long. Thorax greyish brown, more ash-grey behind; the middle stripe blackish brown, narrowed behind and pointed, divided in the whole length by a narrow, more or less distinct line; the side stripes less dark than the middle stripe; a short humeral stripe present. The disc clothed with somewhat longish, erect, black hairs which are longer behind; the bristles on the sides generally pale, those in the middle black. Scutellum with whitish hairs and marginal bristles. Pleura greyish pruinose with long, yellowish hairs; the long hairs on meta- and hypopleura whitish. Abdomen yellowish or grey with a generally indistinct darker brown dorsal line; with the light from behind it is blackish, somewhat shining, with the hind margins of the segments grey. Venter grey. Abdomen clothed with yellowish hairs which are long at the sides of the first segments; sometimes the hairs along the middle are black; at the hind margins of the segments there are yellow bristles which are longest towards the sides. Venter with long, whitish hairs. Genitalia black, generally black haired but often yellowish haired at the apex and below; the arms of the upper forceps with nearly parallel edges, curved slightly downwards towards the apex; the apex truncate with a small excision; the lower forceps shorter than the upper; the ventral lamella black, shining but the hind margin broadly greyish so that the black colour is often not to be seen. Legs with the femora black, tibiæ ferrugineous with the tips black, tarsi black, metatarsus more or less ferrugineous and generally also the base of the following joints of the same colour. Coxæ greyish pruinose with long whitish hairs; the hairs on the legs chiefly yellowish on the femora and partly also on the anterior tibiæ, black on the dorsal side of the front tibiæ and the anterior side of the middle tibiæ, on the hind tibiæ and on all tarsi; long and thin, pale hairs are found on all sides of the anterior femora except the front side and on the ventral and posterior sides of the hind femora; they are longest below the front femora; moreover they are found on the ventral and posterior sides of the anterior tibiæ; strong spine-like bristles are found on the front side of the middle femora and on the front and ventral sides of the hind femora, then on the dorsal side of the anterior tibiæ and on all sides, except the posterior, of the hind tibiæ; as usually some few are found apically on the dorsal side of the posterior femora; there are no spine-like bristles on the ventral side of the front femora; the spine-like bristles are chiefly black with some few pale intermingled; they

are often pale basally on the ventral side and on the posterior side of the hind femora. The spine-like bristles on the tarsi almost all black. Wings almost hyaline or sometimes yellowish, greyish fumigated at the apex and the anterior margin; veins brown. Halteres pale yellow.

Female. Ovipositor thick and swollen, shining black, at the apex and below clothed with dense, bright ferrugineous hairs. The long, thin hairs on the femora are shorter and less dense than in the male, and they are not found on the tibiæ; at the base on the ventral side of the front femora there are three to five long spine-like bristles.

Length 16—19 mm.

This species is easily known by its somewhat thick-set shape; the female is at once recognised by its curious, bulbous ovipositor. On account of the shape of the ovipositor the female may at first glance be taken for a male, and this has also been done several times, e. g. by Ruthe (*A. xanthopygus*, Isis 1831, 1220) and Zeller (*A. auriflavus*, Isis 1840, 51, 4).

A. varipes is rare in Denmark; it was for the first time taken in 1904 at Tisvilde (Klöcker), two specimens; in 1906 I caught one specimen at Ørholm, and two specimens were taken at Tisvilde (Engelhart, Weiss), finally in 1907 I caught seven specimens at Tisvilde. The dates of capture are $^{15}/_{6}$ to the first days of September. It occurs on sandy places, especially in pine-woods.

Geographical distribution: — Northern and middle Europe down into France; its northern limit lies in southern Scandinavia.

13. **Dysmachus** Löw.

(*Lophonotus* Macqu.)

Species of medium or somewhat small size, densely bristly, of greyish or brownish colour. Face somewhat broad, slightly widened downwards; epistomal callus large, at all events occupying more than half the height of epistoma. Antennæ placed somewhat above the middle, the hairs on the under side of the first joint long. The facets in the front part of the eye distinctly enlarged. The dorsocentral bristles long, continued to or near to the front margin. Abdomen somewhat compressed, and somewhat wedge-shaped upwards, especially in the female; bristles at the hind margins of the segments present. Front femora without spine-like bristles on the ventral side. The male genitalia small or larger; the ventral lamella shining black. The female ovipositor compressed with the lamellæ not free, wedged in.

Of the genus 38 species are known from the palæarctic region; 2 have been found in Denmark.

Table of Species.

1. Abdomen more than twice as long as thorax, slightly wedge-shaped; male forceps long, female ovipositor with the lower margin straight, the upper slightly convex, the lamellæ very sparingly punctate ..... 1. *forcipula.*
— Abdomen scarcely twice as long as thorax, distinctly wedge-shaped; male forceps short, female ovipositor with the lower margin convex, the upper slightly concave, the lamellæ densely punctate ..... 2. *trigonus.*

1. **D. forcipula** Zeller.

1840. Zeller, Isis 1840, 68 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 174, 9 et nota, et 1855. XII, 4576, 9, et 1859. XIII, 4963, 9 (*Asilus*). — 1848. Löw, Linn. Entom. III, 438, 7 (*Lophonotus*). — 1862. Schin. F. A. I, 147 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 148. — ? 1830. *Asilus Domitor* Meig. Syst. Beschr. VI, 334, 63.

Male. Eyes in the living specimens greenish, slightly metallic. Face brownish yellow pruinose; epistomal beard black above and at the sides, yellow in the middle and below. Palpi black with yellow hairs. Frons and vertex brown with long, black hairs. Occiput brownish yellow pruinose; occipito-orbital bristles black; the hairs yellowish. Antennæ black, the two first joints with black hairs, the hairs below the first joint long. Thorax yellowish brown, the middle stripe blackish brown, broad in front, narrowed behind and pointed; it has a dividing line generally very indistinct; the side stripes not large, the space between them and the middle stripe rather broad with a more or less indistinct, brown stripe, most distinct in front. Thorax clothed with long, black hairs which only are shorter in front; the bristles black, those at the sides yellow. Scutellum with yellow hairs and yellow and black marginal bristles. Pleura brownish pruinose with some long, yellowish hairs; the long hairs on meta- and hypopleura yellow. Abdomen dark greyish brown with a slight indication of a middle line; with the light from behind it is darker and slightly shining, with grey hind margins of the segments which are widened at the hind corners. Venter grey. Abdomen clothed with short hairs which are black along the middle, for the rest yellow; at the hind margins of the segments there are long, yellow bristles which are wanting along the middle. Venter sparingly clothed with long, whitish, somewhat strong hairs, the eighth segment has a dense fringe of black hairs at the hind margin. The genitalia black, shining, black haired, at the lower side of the upper forceps there are generally some yellow hairs; the dorsal median lamella with ferrugineous hairs; the ventral lamella black, shining. The forceps long, the arms curved evenly downwards, with a slight and shallow excision above at the apex.

Legs black; coxæ greyish pruinose with long, whitish hairs; the short hairs on the legs varying in colour, generally yellowish on most parts but black on the dorsal side of the femora, especially the anterior femora, and on the dorsal side of the tibiæ; not rarely black to a higher degree, and sometimes on the contrary nearly all yellow; long and thin hairs are found on the ventral and posterior sides of the femora and on the ventral side of the front tibiæ, also a few on the ventral side of the middle tibiæ; some of them are rather strong and bristly, especially a row on the ventral side of the front femora; they are black on the ventral side of the front tibiæ and likewise the more bristly ones on the front femora, otherwise they are yellow; spine-like bristles are found on the ventral and anterior sides of the posterior femora, on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ except on the posterior side of the hind tibiæ; as usually there are some apically on the posterior femora; on the ventral side of the front femora none are found; the spine-like bristles vary in colour but are generally yellow on the anterior side of the posterior femora and on the posterior side of the anterior tibiæ, for the rest they are black with yellow intermingled. The spine-like bristles on the tarsi are black and yellow. Wings yellowish brown fumigated; veins brown. Halteres yellow.

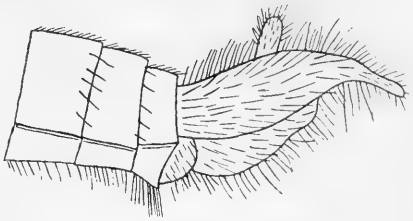

Fig. 24. *D. forcipula*, male forceps.

Female. Quite agreeing with the male; the ovipositor black, shining, longer than the two last segments; its upper margin is slightly convex, the lower margin straight; the second upper piece is more than one third of the first piece in length; the lower piece is strongly and rugosely punctate at the apex; the lamellæ are shining, with only a few points; the lower piece has long and strong hairs on the basal part.

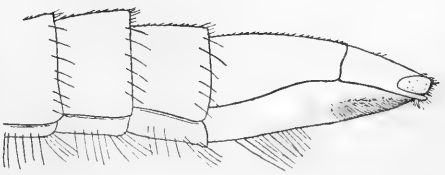

Fig. 25. *D. forcipula*, female ovipositor.

Length 12—16 mm.

The pupa has a length of 13 mm.; it has the spines on the first abdominal segment somewhat longer than on the following segments and recurved at the apex.

D. forcipula is common in Denmark; Ermelund, Ørholm, Hillerød,

Frerslev Hegn, Tyvekrogen, Tisvilde and at Skelskør; on Funen at Odense and Middelfart; in Jutland at Bangsbo and Frederikshavn. My dates are $^{2}/_{6}$—$^{13}/_{7}$. It occurs both in woods and on fields. Pupæ have been found in the earth in Dyrehaven on $^{20}/_{5}$ and in Ruderhegn; moreover at Ørholm in sandy ground on $^{23}/_{5}$; the first mentioned developed on $^{28}/_{5}$ and the latter on $^{6}/_{6}$.

Geographical distribution: — Northern and middle Europe down into France; towards the north to northernmost Scandinavia.

2. **D. trigonus** Meig.

1804. Meig. Klass. eur. Zweifl. Ins. I, 247, 7 (*Asilus*). — 1848. Löw, Linn. Entom. III, 443, 8 (*Lophonotus*). — 1862. Schin. F. A. I, 146 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 149. — 1842. *Asilus hispidus* Zett. Dipt. Scand. I, 176, 10 et 1855. XII, 4577, 10.

Male. Eyes in the living specimens greenish, slightly metallic. Face greyish white; epistomal beard white in the middle, black below, some black hairs continuing up the sides; above it is black or white or with hairs of both colours. Palpi black with whitish hairs. Frons and vertex greyish brown with black, posteriorly yellow, hairs. Occiput greyish pruinose; occipito-orbital bristles black above, yellow on the sides; the hairs yellowish, downwards whiter. Antennæ black, the two first joints with black and whitish hairs, the hairs below the first joint long. Thorax yellowish or greyish brown, the middle stripe dark brown, distinctly divided in the whole length; the side stripes not large, between the middle and the side stripes a distinct, rather broad, brownish stripe, somewhat confluent with the middle stripe. Thorax clothed with long, erect, black hairs, which are slightly longer behind; the bristles black, those at the sides yellow. Scutellum partly black, partly yellow, with erect hairs and many marginal bristles which are yellow. Pleura brownish pruinose with some longer, whitish hairs; the long hairs on meta- and hypopleura yellow. Abdomen greyish brown with an indistinct, darker middle line or a row of triangles which are more distinct with the light from behind; when lighted in this way abdomen shows a large, triangle-shaped dark spot on each segment, the hind margins and the hind corners being grey. Venter grey. Abdomen clothed with yellow, in the middle line with black, hairs; at the sides the hairs are rather long; at the hind margins of the segments there are very long, yellow bristles which are directed out to the sides. Venter sparingly clothed with long, whitish hairs; the eighth segment has no fringe. The abdomen is somewhat compressed and wedge-shaped towards the dorsal side. The genitalia are black; they are small, the arms of the upper forceps are slightly curved downwards, the apex is blunt and

there is no excision; the ventral lamella is black; the genitalia are clothed with somewhat strong, yellowish hairs. Legs black, only rufous at the outermost base of the tibiæ, but this colour is often indistinct or wanting; coxæ slightly brownish grey pruinose with long whitish hairs; the hairs on the legs somewhat long, pale yellowish and giving the black legs a greyish appearance. Long, thin hairs are found on the ventral and posterior sides of the femora and on the ventral side of the tibiæ; a row of them on the ventral side of the front femora are strong and bristly, and likewise some below the hind femora; they are to a great degree yellow, but the bristly ones on the front femora and below the hind femora as also most on the tibiæ are black. Spine-like bristles are found on the ventral and front sides of the posterior femora, on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ except on the posterior side of the hind tibiæ, finally as usual some apically on the posterior femora; on the ventral side of the front femora none are found; they are for the most part yellow, on the ventral side of the femora, especially the middle femora, and on the dorsal side of the tibiæ they are generally more or less black. The spine-like bristles on the tarsi are black and yellow intermingled. Wings hyaline, slightly yellowish, especially along the veins; veins brown. Halteres yellowish.

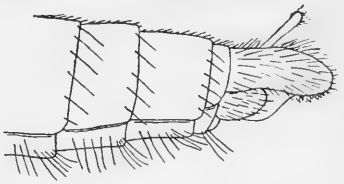

Fig. 26. *D. trigonus*, male forceps.

Female. Agreeing with the male but the abdomen still more compressed and wedge-shaped upwards. The ovipositor black, broad and strongly compressed; the upper margin is slightly concave, the lower margin very convex; the second dorsal piece is more than one third of the length of the first; the first dorsal piece is punctate on its apical half, the second is punctate all over, the lower piece is very densely punctate on its apical half; the lamellæ are almost rhomboidal, punctate; the ovipositor is sparingly clothed with short hairs, below there are some longer, yellowish hairs.

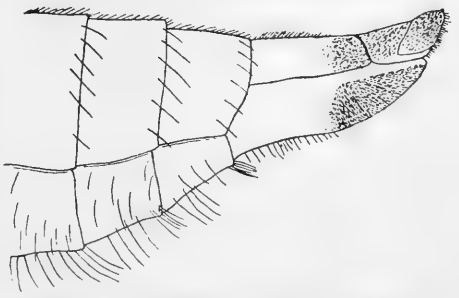

Fig. 27. *D. trigonus*, female ovipositor.

Length 10—16 mm.

The pupa has a length of 15 mm. (a large specimen); it quite

resembles the pupa of *forcipula* and has the spines on the first abdominal segment somewhat long and recurved at the apex.

This species is easily distinguished from *forcipula* by the dark triangles on abdomen and its compressed shape, by the small male genitalia and the ovipositor which is of quite a different shape from that in *forcipula*, also the species is more bristly.

D. trigonus is common in Denmark; Hillerød, Vedbæk, Tisvilde, Odsherred; on Funen at Langensø, Faaborg and Middelfart; in Jutland at Silkeborg, Svejbæk near Silkeborg, Søndervig, Nymindegab, Frederikshavn, Skagen and on Læsø; finally on Bornholm at Hasle. My dates are $^{23}/_{5}$—$^{5}/_{8}$. It occurs mainly on dry and somewhat sandy places, often together with *forcipula*. A pupa was found at Tisvilde in cowdung on $^{11}/_{6}$, it developed on $^{12}/_{6}$. Poulton l. c. records this species from England with the following prey: *Chloromyia formosa* Scop., *Mydæa urbana* M., *Hilara* sp., *Crambus pratellus* Clk., *Angitia fenestralis* Holmgr., *Ontophagus fracticornis* Preyss.

Geographical distribution: — Europe down into Italy; its northern limit lies in southern Scandinavia (Småland).

14. **Eutolmus** Löw.

Medium sized or somewhat large species of brownish colour. Face somewhat broad, widened downwards, vertex narrowed. Epistomal callus reaching more than half the height of epistoma. Antennæ inserted somewhat above the middle, the basal joint with long hairs below. The facets in front of the eye distinctly enlarged. Dorsocentral bristles reaching to the middle. Abdominal segments with bristles at the hind margin. Front femora without spine-like bristles on the ventral side (in the Danish species, while some other species have them). Male genitalia small, forceps simple; the ventral lamella shining; the eighth segment in the male with a tongue-shaped prolongation at the ventral hind margin (in the Danish species; some other species have no prolongation). Female ovipositor compressed, high, with the lamellæ not free, wedged in.

Of the genus 29 palæarctic species are known; one is found in Denmark.

1. **E. rufibarbis** Meig.

1820. Meig. Syst. Beschr. II, 311, 6 (*Asilus*). — 1848. Löw, Linn. Entom. III, 460, 13. — 1862. Schin. F. A. I, 148 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 151. — 1842. *Asilus melampodius* Zett. Dipt. Scand. I, 173, 8 p. p. et 1849. VIII, 2970, 8 et 1855. XII, 4571, 8.

Male. Epistoma yellowish or reddish yellow; epistomal beard black above, yellowish or ferrugineous in the larger lower part. Palpi

black with yellow hairs. Frons and vertex greyish, with black hairs. Occiput greyish yellow, the occipito-orbital bristles black; the hairs yellow. Antennæ black, narrowly reddish at the apex of the second and the base of the third joint; the two first joints with black hairs which are long below the first joint. Thorax light greyish or brownish, the middle stripe brownish black or blackish, broad in front, narrowed and pointed behind, with a very narrow median line in front; the side stripes large, somewhat lighter than the middle stripe, dark brownish or grey; no humeral stripes. The disc clothed with short, erect, black hairs which are longer behind, and yellowish at the hind and posterior lateral margins. The bristles black, sometimes some yellow posteriorly. Scutellum with yellowish hairs and long, generally black marginal bristles. Pleura grey or brownish pruinose with some longer, yellowish hairs; the long hairs on meta- and hypopleura yellow. Abdomen light brown, sometimes with indications of a dorsal line; with the light from behind the abdomen is dark brown or greyish, slightly shining, with yellowish brown or greyish hind margins of the segments, and with the side margins and the hind corners of the segments of the same colour. Venter grey. Abdomen clothed with depressed, yellowish hairs, sometimes a few in the middle line are black, and on the last two segments the hairs are generally black; at the hind margins of the segments there are moderately long, yellow bristles. Venter sparingly clothed with long, yellowish hairs; the eighth ventral segment is black, somewhat shining, the hind margin is produced in a long, tongue-shaped prolongation, rounded at the apex; it has a tuft of long hairs which are ferrugineous above, black below; in the middle of the hind margin of the seventh segment there are black hairs. The ventral lamella is black, shining. The genitalia are black, the arms of the upper forceps nearly straight, with about parallel margins, rounded at the end; the lover forceps reach only half the length of the upper, the inner branches are black (not ferrugineous as in most other *Asilinæ*); the genitalia are clothed with somewhat long, yellow hairs. Legs black; coxæ greyish or brownish pruinose with long,

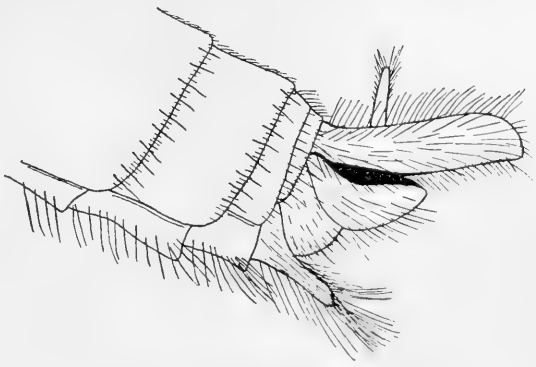

Fig. 28. *E. rufibarbis,* male forceps.

yellowish, sometimes ferrugineous hairs. The short hairs on the legs all yellowish or deeper yellow; long, thin hairs are found on the ventral and posterior sides of the femora, on the ventral side of the anterior tibiæ and a few on the ventral side of the hind tibiæ; they are yellowish on the femora, only dorsally on the posterior side of the front femora generally black; on the tibiæ they are blackish to a great extent. Spine-like bristles are found on the ventral and front sides of the posterior femora, but in small numbers; on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ except the posterior side of the hind tibiæ; finally some are found apically on the posterior femora; on the ventral side of the front femora none are found; the spine-like bristles are almost all black, only on the ventral side of the hind femora there are generally a few yellow; on the posterior side of the front tibiæ they are long. Wings hyaline at the base and in the middle, broadly greyish tinged along the anterior and hind margin and the apex. Veins brown, the subcostal vein ferrugineous. Halteres yellow.

Female. Ovipositor black, rather high, scarcely as long as the two last segments; the lower edge very convex, almost obliquely cut at the end; the second dorsal piece is more than half the length of the first, the connecting line between the two pieces is double curved; the lamellæ are rhomboidal, sparingly punctate; the apical part of the lower piece is obliquely striated. The ovipositor is sparingly hairy, below there are some longer hairs.

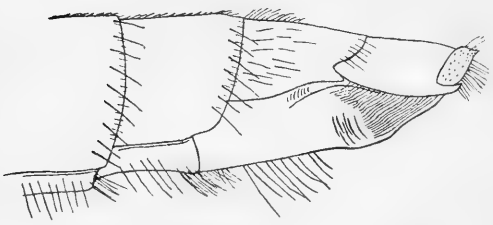

Fig. 29. *E. rufibarbis*, female ovipositor.

This species varies in colour, especially on the thorax, from more grey to more brown, and the hairs from yellowish towards ferrugineous.

Length 17—21 mm.

E. rufibarbis is not common in Denmark, but has yet been caught in most parts of the country; vicinity of Copenhagen, Tisvilde; on Funen at Odense and Middelfart and in Jutland at Silkeborg and Hald near Viborg. It is a somewhat late occurring species, my dates are $^{18}/_{7}$—$^{12}/_{8}$. It occurs especially in dry and sandy localities.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia.

15. **Machimus** Löw.

Species of medium size and greyish or brownish colour. Face somewhat broad, widened downwards; epistomal callus more than half the length of epistoma. Antennæ inserted somewhat above the middle, the basal joint with long hairs below. The facets in the front part of the eye distinctly enlarged. Dorsocentral bristles continued to the middle of thorax. Abdominal segments with bristles at the hind margins. Front femora without spine-like bristles on the ventral side (in the Danish species; a few of the foreign species have spine-like bristles either in the female or in both sexes). Male genitalia small, forceps simple; the ventral lamella not shining; the eighth ventral segment with a prolongation from the hind margin. Female ovipositor compressed, pointed, with free, styliform lamellæ. — The Danish species, *atricapillus*, has more slender legs and a somewhat narrower face than is otherwise the case in the genus.

Of the genus 26 palæarctic species are known; one has hitherto been found in Denmark.

1. **M. atricapillus** Fall.

1814. Fall. Dipt. Suec. Asil. 10, 5 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 168, 4 et 1855. XII, 4564, 4 et 1859. XIII, 4961, 4 (*Asilus*). — 1849. Löw, Linn. Entom. IV, 31, 30. — 1862. Schin. F. A. I, 150 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 152.

Male. Eyes in the living specimens slightly metallic, brownish with a slight greenish cast. Face greyish white, grey in the middle; epistomal beard black, in the lowermost part white or yellow. Palpi black with yellow, sometimes blackish hairs. Occiput grey; occipito-orbital bristles black, the hairs pale yellowish to snow-white. Frons and vertex grey with black hairs. Antennæ black, first and second joint with black, or black and jellow hairs which are somewhat long on the lower side of the first joint. Thorax light grey, the middle stripe blackish brown, broad in front, narrowed behind, with an indistinct middle line in front; the side stripes not large, grey and thus not differing much from the ground colour; between the middle stripe and the side stripes a narrow dark, distinct stripe; a curved humeral stripe visible. The disc clothed with short, erect, black hairs, longer behind; the bristles black. Scutellum with erect, yellowish hairs and a few black, marginal bristles. Pleura greyish pruinose with some longer, partly black, partly yellowish hairs; the long hairs on meta- and hypopleura black and ferrugineous or quite whitish. Abdomen greyish or brownish with an indistinct, darker brown middle line; with the light from behind it is blackish brown, slightly shining,

with whitish grey hind margins of the segments and similarly coloured hind corners and side margins. Venter grey. Abdomen clothed with short, depressed hairs which are yellowish, but black in the middle line, or all black and only the longer hairs at the side margins of the first segments yellow; the hairs on the last segment are always black. At the hind margins of the segments there are somewhat weak bristles, they are yellow, sometimes with some black intermingled. Venter sparingly clothed with long, pale hairs, black at the apex. Genitalia rather small, black; the arms of the upper forceps curved very slightly down towards the apex, with nearly parallel margins, rounded at the end and very slightly excised above; the lower forceps reaching two thirds of the length of the upper; the eighth ventral segment has in the middle of the hind margin a broad prolongation which is more or less roundly excised in the hind margin, and here bearing long, black hairs; the ventral lamella is brownish pruinose like the segments. The genitalia are generally yellowish haired above, black haired below, there are especially strong, black hairs on the lower forceps. Legs black and ferrugineous; coxæ greyish pruinose with long, pale yellowish hairs; femora black, the apex and a dorsal, somewhat backwards lying stripe ferrugineous, the stripe generally occupies more or less of the apical half of the posterior side on the anterior femora; tibiæ generally rufous with exception of the ventral side and the apex; sometimes they are nearly quite rufous; metatarsi and the base of the next joint ferrugineous, the other joints black; the ferrugineous colour often much more restricted, and often very dark. The short hairs on the legs yellowish, only black on the dorsal side of the tibiæ, but varying to being nearly all black; long, thin hairs are found on the ventral and posterior sides of the front femora, on the ventral side of the posterior femora and on the ventral side of the anterior tibiæ; they also vary in colour from pale to more or less black, but on the tibiæ they are generally black. Spine-like bristles are found on the postero-dorsal side of the front femora towards the apex, on the ventral and front sides of the posterior femora, on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ with exception of the posterior side of the hind tibiæ, finally some are found apically on the posterior femora; on the posterior side of the front tibiæ they are long; all the spine-like

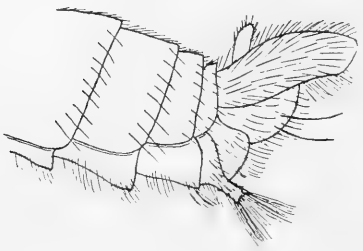

Fig. 30. *M. atricapillus*, male forceps.

bristles, also those on the tarsi, are black. Wings hyaline, broadly greyish fumigated along the apical part of the front margin, the apex and the hind margin; the bordering of the fumigation distinct; veins brownish black. Halteres yellow to yellowish brown.

Female. Ovipositor shining black, somewhat longer than the two last segments.

Length 11—15 mm.

As seen from the description this species may vary somewhat in colour from brighter to darker especially as regards the legs and the hairs.

M. atricapillus is common in Denmark Ordrup Mose, Ermelund, Dyrehaven, Geel Skov, Hillerød, Tyvekrogen, Slagelse, Bogenæs; on Lolland at Lysemose near Maribo; on Funen at Odense, Veflinge and Hofmansgave; in Jutland at Horsens, Laven, Frijsenborg, Silkeborg, Sæby and Lønstrup, and on Bornholm at Hasle. It is a late occurring species, my dates are $^{3}/_{7}$—$^{8}/_{9}$. It occurs generally in woods, especially on open and somewhat dry or sandy places, often in great numbers, and it is generally found sitting on the stems, watching for prey and in the well known characteristic oblique position, but it may also be found sitting on the ground. I have once taken it with a *Homalomyia scalaris* Fabr. as prey. Poulton l. c. records from England the following prey: *Chrysops cæcutiens* L., *Dolichopus ungulatus* L., *Melanostoma scalare* Fabr., *Sarcophaga* sp., *Hylemyia* sp., *Athysanus* sp.

Geographical distribution: — Northern and middle Europe down into France; towards the north it goes into Lapland.

16. **Neoitamus** Ost. Sack.

Medium sized to somewhat large species of grey colour. Face narrow, widened downward. Epistomal callus not large and not reaching much more than half the height of the epistoma. Antennæ inserted somewhat above the middle; the two first joints with long hairs below. The facets in the front part of the eye considerably enlarged. Dorsocentral bristles continued a little over the middle of thorax. The abdominal segments with bristles at the hind margin. Front femora without spine-like bristles, but with rather strong bristles on the ventral side. Male genitalia large and more or less swollen; the ventral lamella shining. Female ovipositor compressed, long, the sixth and seventh abdominal segments forming part of it (in the Danish species, in some foreign species this is not the case); the lamellæ free.

Of the genus 11 species are known from the palæarctic region; 2 have hitherto been found in Denmark.

Table of Species.

1. The spine-like bristles on the tibiæ black; sixth and seventh abdominal segments in the male steel-blue ..... 1. *cyanurus.*
— The spine-like bristles on the posterior side of the front tibiæ and on the anterior and posterior sides of the middle tibiæ yellow; sixth and seventh abdominal segments in the male not steel-blue ..... 2. *cothurnatus.*

1. **N. cyanurus** Löw.

1849. Löw, Linn. Entom. IV, 84, 49, (*Itamus*) — 1862. Schin. F. A. I, 155, (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 155. — 1842. *Asilus aestivus* Zett. Dipt. Scand. I, 167, 3, p. p. et 1855. XII, 4561, 3.

Male. Eyes in the living specimens greenish, slightly metallic. Face yellow or greyish white; epistomal beard black above, yellow or white below. Palpi black with black and whitish hairs. Frons and vertex dark grey with black hairs. Occiput grey, the occipito-orbital bristles black, curved strongly forwards; the hairs white. Antennæ black, the two first joints black haired, the hairs below somewhat long. Thorax grey, ash-grey or nearly bluish grey behind; the stripes blackish, the middle stripe with a distinct median line; the side stripes large, distinctly divided into three spots. The disc clothed with longish, erect, black hairs which are longer behind; the bristles black, the dorsocentral rows continued a little beyond the middle. Scutellum with erect, pale hairs and black marginal bristles. Pleura grey pruinose with longer, yellowish hairs; the long hairs on meta- and hypopleura yellow. Abdomen blackish; with the light from behind slightly shining with light grey hind margins of the segments and the anterior corners of the second segment of the same colour; the three last segments somewhat narrowed, steel-blue, shining. Venter grey, the three last segments shining black. Abdomen clothed with somewhat longish, yellow hairs, along the middle line the hairs are black; the hairs are long at the side margins of the anterior segments; at the hind margins of the segments there are pale bristles which are short along the middle, long towards the sides. Venter sparingly clothed with long, yellowish hairs. Genitalia large, black; the arms of the upper forceps broad, rounded at the apex; the lower forceps only reaching half the length of the upper, the inner branch longer than the outer, crescent-shaped with a convex lower and a concave upper edge; the ventral lamella black, shining; the genitalia clothed with longish, black hairs. Legs

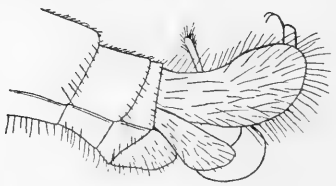

Fig. 31. *N. cyanurus,* male forceps.

with the coxæ greyish pruinose with long, whitish hairs; femora black, tibiæ yellowish ferrugineous with black tips, tarsi black, only the extreme base of the metatarsi, and sometimes of some of the following joints, reddish. The hairs on the femora yellowish, only black above just at the apex, on the tibiæ chiefly black, but intermingled with yellow, especially on the anterior tibiæ; long, thin hairs are found on the ventral side of the femora, on the hind femora also on the posterior side, on the ventral side of the front tibiæ and a few on the ventral side of the middle tibiæ; they are for the most part yellow, but on the anterior femora there is a row of stronger, black ones, and on the hind femora a similar row of yellow; spine-like bristles are found on the ventral and anterior sides of the posterior femora, on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ with exception of the posterior side of the hind tibiæ, finally as usual a few apically on the femora; they are nearly all black, only generally yellow on the front side of the hind femora. The spine-like bristles are relatively weak, not much stronger than the strong hairs. The spine-like bristles on the tarsi are black. Wings hyaline, slightly greyish at the apex but the border of the greyish fumigation not sharp; veins brown. Halteres yellow.

Female. Ovipositor shining black, the sixth and seventh segments take part in its formation; the lamellæ free; the ovipositor is clothed with black hairs which are long, especially below.

Length 12—17 mm.

The pupa has a length of 15 mm.; the spines on the first abdominal segment are not longer than those of the following segments, and they are only slightly recurved at the apex.

This species is easily known by its blue last abdominal segments (see below about the nearly related *N. socius*).

N. cyanurus is common in Denmark; Ermelund, Bøllemosen, Frederiksdal, Geel Skov, Hillerød, Tyvekrogen, Grib Skov, Tisvilde, Svenstrup between Roskilde and Ringsted; on Lolland at Maribo; on Funen at Odense, Langensø and Veflinge; in Jutland in Greisdalen at Vejle, at Horsens, Frijsenborg, Silkeborg, Støvring near Randers and Frederikshavn; finally on Bornholm at Hasle. My dates are $^{29}/_{5}$—$^{8}/_{9}$. It occurs in woods, often, but not exclusively, on dry localities and often in rather great numbers; it is generally seen sitting on the stems. A larva was found in Bøllemosen in a mole-cast on $^{5}/_{6}$, it pupated $^{6}/_{6}$ and developed on $^{22}/_{6}$, other larvæ were found in Geel Skov in the earth on $^{29}/_{4}$, they pupated $^{2}/_{5}$ and developed $^{17}/_{5}$. Pupæ have been found in Bøllemosen in mole-casts on $^{5}/_{6}$, they developed on $^{14}/_{6}$, and in Geel Skov in the earth on $^{3}/_{5}$ developing on $^{17}/_{5}$. — I once

found a female of this species with another female of the same species as prey, and another time with an Ichneumonid which was as large as itself. Poulton l. c. records from England as prey for this species: *Aphodius fimetarius* L., *Polydrosus cervinus* L., *Hepialus hectus* L., *Tipula scripta* Meig., *Empis punctata* Meig., *Syrphus nitidicollis* Meig., *Myopa buccata* L., *Varichæta nemorum* Meig., *Acanthocoris sylvestris* L.

Geographical distribution: — Northern and middle Europe down into northern Italy; towards the north to Lapland.

2. **N. cothurnatus** Meig.

1820. Meig. Syst. Beschr. II, 317, 16 (*Asilus*). — 1849. Löw, Linn. Entom. IV, 88, 50 (*Itamus*). — 1855. Zett. Dipt. Scand. XII, 4562, 3—4 (*Asilus*). — 1862. Schin. F. A. I, 155 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 154.

Male. Face yellowish white; epistomal beard black above, white below, the black hairs continuing down the sides. Palpi black with black and yellow hairs. Frons and vertex dark grey with long, black hairs. Occiput grey; occipito-orbital bristles black, curved strongly forwards; the hairs white. Antennæ black, the first two joints with black hairs which are long below. Thorax grey, the stripes blackish, the middle stripe with a distinct median line; the disc clothed with relatively long, black hairs which are longer behind; the bristles black, the dorsocentral rows continued beyond the middle. Scutellum with erect, pale hairs and long, black marginal bristles. Pleura greyish pruinose with somewhat long hairs which are black above, whitish downwards; the long hairs on meta- and hypopleura yellowish. Abdomen blackish; with the light from behind slightly shining with the hind margins of the segments grey and with indistinct, grey side margins; the last segments not bluish. Venter dark grey. Abdomen clothed with longish, yellowish hairs, along the middle line and to some degree on the front parts of the segments the hairs are black; there are long, pale yellow bristles at the lateral hind margins of the segments. Venter sparingly clothed with long, pale hairs, on the two last segments the hairs are black. The genitalia black; the upper forceps short but broad, the arms with a protruding knob at the apex; the lower forceps very short, also the inner, crescent-shaped branch; the ventral lamella black, shining. The hairs on the genitalia black, below some yellow hairs. Legs with the coxæ greyish pruinose

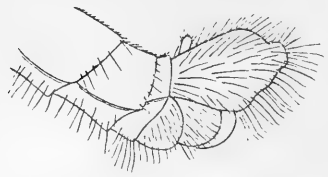

Fig. 32. *N. cothurnatus*, male forceps.

with long whitish hairs; femora black, tibiæ yellowish ferrugineous with black tips; tarsi blackish, the basal half or more of the metatarsi and the base of the following joints yellowish. The hairs and bristles of the different categories present as in *cyanurus* but with the following differences: on the posterior side of the front femora there are some spine-like bristles which are yellow; those on the front side of the middle femora, on the posterior side of the front tibiæ and on the front and posterior sides of the middle tibiæ are yellow; also some on the tarsi may be yellow. Wings hyaline with the apex and the posterior margin greyish fumigated, the border of the fumigation somewhat distinct; veins brown. Halteres yellow.

Female. Ovipositor black, shining, the sixth and seventh segments take part in its formation; the lamellæ are somewhat long.

Length 12—17 mm.

This species is in the male easily distinguished from *cyanurus* by the not bluish last abdominal segments and by the shape of the genitalia; in both sexes the colour of the spine-like bristles and of the tarsi are good characters.

N. cothurnatus is very rare in Denmark; only one specimen, a male, has been caught at Skelskør (H. J. Hansen).

Geographical distribution: — Northern and middle Europe down to France; towards the north to middle Scandinavia and Finland.

Remarks. There is some reason to believe that a third species of *Neoitamus*, *N. socius* Löw, should also be found in Denmark as it is found both in Sweden and Germany; it is very nearly related to *cyanurus* and the male has like this the sixth and seventh abdominal segments bluish, but in this sex it is easily known by the genitalia, the inner branch of the lower forceps not being crescent-shaped and being truncate at the apex. The female is very similar to *cyanurus*, but among other characters the tarsi are generally paler, the metatarsus being reddish except the apex and the other tarsal joints having a reddish base; also the tips of the tibiæ are generally black to a somewhat greater extent.

17. **Epitriptus** Löw.

Species of medium or somewhat small size and of yellowish grey colour. Face broad, widened downwards; epistomal callus not large, occupying little more than half the height of the epistoma. Antennæ inserted somewhat above the middle, the first joint with long hairs below. The facets in the front part of the eyes somewhat enlarged. Dorsocentral bristles scarcely continued to the middle. The abdominal segments with bristles at the hind margin; venter with strong, bristly

hairs. Front femora with strong bristles or long, thin hairs below. Male genitalia small; the ventral lamella black, shining, or pruinose. Female ovipositor compressed with free lamellæ.

Of the genus about 12 species are known from the palæarctic region; 2 are found in Denmark.

Table of Species.

1. Legs black, only the base of the tibiæ ferrugineous . . . . . 1. *arthriticus.*
— Legs with femora, tibiæ and tarsi more or less ferrugineous 2. *cingulatus.*

1. **E. arthriticus** Zeller.

1840. Zeller, Isis 1840, 64, 16 (*Asilus*). — 1849. Löw, Linn. Entom. IV, 118, 61. — 1855. Zett. Dipt. Scand. XII, 4566, 6—7 (*Asilus*). — 1862. Schin. F. A. I, 156 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 159.

Male. Face yellowish brown; epistomal beard black above, yellowish below, but here with a row of black hairs towards each side of clypeus. Palpi black, black haired. Frons and vertex yellowish brown with black hairs; occiput brownish pruinose, occipito-orbital bristles black; the hairs whitish, down on the jowls yellowish. Antennæ black, the two first joints with black hairs which are longish below. Thorax greyish brown, the middle stripe dark brown, broad in front, narrowed behind, without any median line; the side stripes greyish brown, not very distinct. The disc with very short, erect, black hairs, which are considerably longer behind; the dorsocentral and præsutural bristles generally black, the other bristles pale yellow. Scutellum with short, erect hairs which are black or yellow or both intermingled and the same is the case with the long marginal bristles. Pleura greyish brown pruinose with some few longer, whitish hairs; on the pteropleura, below the wing-root a couple of yellow or black bristles; the long bristles on meta- and hypopleura yellow. Abdomen greyish brown; with the light from behind it is much darker with the hind margins of the segments grey and the hind corners and side margins of the same colour, and moreover with an indistinct, blackish middle line. Venter greyish brown. Abdomen clothed with short, yellow hairs, in the middle line they are black, and the black hairs may be extended much towards the sides; generally the last segments are black haired; there are long, yellow bristles at the hind margin of the segments towards each side; venter very sparingly clothed with yellow, long and strong, bristly hairs and besides with short, depressed yellow hairs. Genitalia small, black; the arms of the upper forceps curved slightly down, rounded at the apex; the lower forceps short, not reaching much more than half the length of the upper; the ventral lamella black, shining; the genitalia have black hairs above, yellow

below. Legs black, the tibiæ reddish at the base; coxæ greyish pruinose with somewhat long, whitish hairs; the hairs on the legs yellowish grey hence giving the legs a greyish appearance; on the dorsal side of the front tibiæ and on the tarsi the hairs are black; long, thin hairs are found on the ventral side of the front femora, on the posterior side of the hind femora, and on the ventral side of the tibiæ, on the hind tibiæ only a few; they are nearly all pale; on the ventral side of the front femora there is a row of about five strong bristles, nearly as strong as the spine-like bristles; they are generally pale; spine-like bristles are found on the dorsal side of the front femora, but here only a few, on the ventral and anterior sides of the posterior femora, on the dorsal and posterior sides of the front tibiæ and on the various sides of the posterior tibiæ except the posterior side of the hind tibiæ, finally a few at the apex on the femora. They are for the most part yellow, on the dorsal side of the front femora and tibiæ and some on the dorsal side of the middle tibiæ generally black. The spine-like bristles on the tarsi are partly black, partly yellow. Wings yellowish, there is a very broad greyish fumigation round along the margin, so that only a narrow middle part of the wing is hyaline; the inner boundary of the fumigation is distinct; veins brown. Halteres yellow.

Female. Ovipositor black, shining, the ventral piece irregularly striated on the apical half.

Length 14—16 mm.

This species is best known among the Danish species by the strong, bristly hairs on the venter and the bristles on the pteropleura, as also by the colour of the legs.

E. arthriticus is very rare in Denmark, only five specimens have been caught; at Hald near Viborg (J. C. Nielsen), at Silkeborg (A. Petersen) and on Bornholm at Hasle (H. J. Hansen). The dates are in July. It is recorded to occur especially in deserted and dry localities.

Geographical distribution: — Northern and middle Europe down into Austria; towards the north to middle Scandinavia.

2. **E. cingulatus** Fabr.

1781. Fabr. Spec. Ins. II, 464, 25 (*Asilus*) et 1805. Syst. Antl. 172, 36 (*Asilus*). — 1842. Zett. Dipt. Scand. I, 170, 6 et 1855. XII, 4565, 6 (*Asilus*). — 1849. Löw, Lin. Entom. IV, 109, 57. — 1862. Schin. F. A. I, 157 (*Asilus*). — 1903. Kat. paläarkt. Dipt. II, 159.

Male. Face yellowish grey, along the eye-margins yellow; epistomal beard black above and down the sides, whitish yellow in the middle, on each side of clypeus a row of black hairs. Palpi black

and black haired. Frons and vertex yellowish, the hairs black but some yellow hairs in front. Occiput yellow pruinose, occipito-orbital bristles black above, yellow downwards; the hairs on the lower part and on the jowls white. Antennæ black, the first joint with short, yellow hairs above, long, black hairs below. Thorax yellowish brown, the middle stripe dark brown, broad in front, narrow behind, with a somewhat broad middle line in front; the side stripes light brown, somewhat indistinct and between the middle and side stripes a likewise indistinct line. The disc with short, erect, black hairs, on the hind part the hairs are longer and yellow; the bristles black. Scutellum with longish, yellow hairs. Pleura greyish brown with whitish hairs; the bristles on meta- and hypopleura yellow. Abdomen yellowish brown; with the light from behind it is dark brown with the hind margins of the segments greyish and with the hind corners of the segments and lateral margins similarly coloured, moreover a blackish middle line is seen. Venter yellowish brown. Abdomen clothed with short, yellowish, in the middle line black, hairs, the last segments are more or less black haired; at the hind margin of the segments there are moderately long, somewhat weak bristles which are longest towards the sides; they are generally black in the middle, yellow towards the sides. Venter with sparse, whitish yellow, bristly hairs, intermingled with some few black ones, besides, the venter has short hairs which are yellow in front, black towards the apex. Genitalia small, ferrugineous, the arms of the upper forceps curved down towards the apex and somewhat pointed, without excision; the ventral lamella brownish pruinose. The genitalia with yellow hairs. Legs with the coxæ greyish pruinose, with long, whitish hairs; the anterior femora black on the front side, ferrugineous on the posterior side, hind femora black with the postero-dorsal side ferrugineous and all femora with ferrugineous tips; tibiæ ferrugineous with a ring in the middle, and the apex black, the ring often not going quite round the tibiæ; on the hind tibiæ the ring and the black apex coherent on the anterior side; tarsi ferrugineous with the apex of the joints black, the last joints quite black. The hairs on the legs yellowish grey, giving the legs a somewhat greyish appearance; long and thin, yellow hairs are found on the ventral side of the anterior femora, and here they are especially long, on the posterior side of the hind femora and on the ventral side of the anterior tibiæ; on the front tibiæ some of them are black; there are no strong bristles on the ventral side of the front femora; spine-like bristles are found on the anterior side of the middle femora, on the ventral and anterior sides of the hind femora, on the dorsal and posterior sides of the front tibiæ and on the various sides

of the posterior tibiæ except the posterior side of the hind tibiæ; finally there are a few at the apex of the posterior femora. The spine-like bristles are all black, and those on the tarsi are likewise black. Wings yellowish, the apex and the posterior margin broadly greyish fumigated as in *arthriticus* so that only the base and a narrow middle part are hyaline; the inner boundary of the fumigation distinct; veins brown. Halteres yellow.

Female. With exception of the genital differences quite agreeing with the male.

Length 10—12 mm.

This species is easily distinguished from *arthriticus* by the ferrugineous legs; it is moreover smaller and much less bristly, also the colouring of the thorax is different.

E. cingulatus is very rare in Denmark, only one specimen, a male, is known; it is found in the collection of Westermann and is labelled „Sealand, July 1819." — Poulton l. c. records from England as prey for this species: *Simaethis fabriciana* L. and *Musca corvina* Fabr.

Geographical distribution: — All Europe; towards the north to middle Scandinavia.

Bombyliidae.

Head as broad as, or narrower than, thorax, nearly globular or shorter and broader than high; behind it is either very deeply excavated, or it is slightly arched. Jowls small, generally only slightly or not at all descending below the eyes. Antennæ inserted near to each other, or more distant; placed at or somewhat above the middle; they are short or somewhat longer, consisting of three to five joints; the two basal joints more or less short or the first longer; the third is the longest, of various shape, cylindrical, or somewhat compressed, or bulb-like tapering to a styliform part; at its apex there may be a more or less distinct, small, one- or two-jointed style sometimes with a pencil of hairs at the apex. Eyes large, sometimes separated in both sexes but most in the female, or touching in the male, separated in the female, or in rare cases touching in both sexes (*Systropus*); sometimes the upper facets in the male slightly larger than in the female. Three ocelli present. The mouth aperture large; there is a well developed oral cone on the front side of which lies the clypeus represented by two chitinous lists, or often horseshoe-shaped; on the posterior side of the oral cone lie the stipites of the maxillæ. Proboscis varies much

in length from not half as long as the head is high to nearly as long as the body; in rest it is retracted (when short) or protruding (when long). Labium has the basal part short when the proboscis is short, but when this is long the basal part is much longer than the labella; these latter are in the short proboscis more or less broad and disciform when spread out, in the long proboscis they are narrow, not broader than the basal part, but cleft to their base. Labrum generally as long as the basal part of labium or slightly longer; hypopharynx and maxillæ of a similar length; hypopharynx forming a longpointed, chitinous blade, the maxillæ of a similar form, or, when the proboscis is long, very thin, nearly thread-like; the maxillary palpi shorter or longer, one-jointed. Thorax generally nearly quadrate, slightly or somewhat more arched above. Of macrochætæ some bristles are generally found, which on account of their being placed on the præalar callus may I think be termed notopleural; moreover postalar and more or less weak scutellar marginal bristles are generally present; sometimes the bristles are hidden in the clothing fur. Metapleura generally with a vertical tuft of hairs, sometimes bare (*Argyramoeba*, *Phthiria*). Abdomen somewhat flat, or more arched, with more or less parallel sides, or short and ovate; it consists of seven not transformed segments. Genitalia formed of the eighth and ninth segments. Legs slender, generally with bristles which are however not strong; the front legs sometimes smooth. Apical spurs present on all tibiæ or only on the posterior; they are generally small. Claws not strong; pulvilli generally present but of different size, sometimes very small and sometimes quite absent. Empodium lobe-shaped, small or rudimentary, in rare cases it is larger and then similar to the pulvilli (*Cyrtosia*). Wings with the costal vein extending all round the margin; the venation sometimes shows some curious appearances, the cubital vein either issuing in a normal way from the radial vein, or the radial and cubital veins united for a distance at their basal part and then the radial vein suddenly rising from the cubital vein with an angularly bent base; thus the radial vein apparently rising from the cubital vein; the cubital vein branched, two cubital cells (in non-Danish genera there may be up to five cubital cells on account of the presence of surnumerary cross-veins or branches, or on the contrary the cubital vein is unbranched, and there is then only one cubital cell); the discal cell formed by the discal vein but below for a shorter or longer distance closed by the upper branch of the postical vein, there is thus no postical cross-vein; (in *Cyrtosia* there is no closed discal cell). Four posterior cells (on account of the third and fourth being confluent to one; sometimes there is a veinlet at the

lower hind corner of the discal cell, indicating incipient division into two cells); (in some non-Danish genera there are only three posterior cells); the first posterior cell is often narrowed at the apex or closed at a shorter or longer distance from the margin. The anal cell reaching to or near to the margin, narrowly open or closed. Alula well developed. Alar squamula present, generally fringed at the margin, often with somewhat scaly hairs; thoracic squamula not developed; the frenulum distinct, sometimes somewhat broad towards the angulus, generally with long hairs, rarely bare (*Phthiria*). At the base of the costa there is often a hook, (the præalar hook Osten Sacken; this name is not good as the hook is in fact situated on the costa). In rest the wings are borne half open and directed slightly downwards, they are generally open to such a degree that the anterior margins of the two wings are almost rectangular, sometimes they are more spread. The wing-membrane of the Bombyliids is of a characteristic stiff consistency, but somewhat fragile.

The larvæ are cylindrical or somewhat flattened; the body consists of thirteen segments; the head is small, retractile; the mouth parts consist of a median labrum, knife-shaped, compressed, often somewhat serrated mandibles and larger and broader maxillæ with a palpus; the mandibles and maxillæ are movable up and down. Small antennal papillæ are present. There are no eyes. The larvæ are amphipneustic with spiracles on prothorax and on the penultimate segment. — The pupæ are free; they have characteristically arranged spines on the head at the base and at the end of the antennal sheaths; the abdominal segments on the dorsal side are armed with characteristic chitinous hooklets, formed as small staves or more or less semicircular; moreover there are some spines at the apex of the body, and the abdominal segments have girdles of shorter or longer bristles or hairs. The pupa has prothoracic and seven pairs of abdominal spiracles.

The larvæ live parasitically on larvæ of solitary bees and wasps or fossorial wasps (*Argyramoeba*, *Toxophora* [Ost. Sack. Bull. U. S. Geol. and Geogr. Surv. of the Terr. III, 265]), on larvæ of Ichneumonids and Tachinids parasitical on Lepidopterous larvæ (*Hemipenthes* and some species of *Anthrax*), on larvæ of *Noctuidæ* (some species of *Anthrax*), in the egg-cases of Locustids (some species of *Anthrax*, *Collostoma* [Saunders, Transact. Ent. Soc. Lond. 1881, Tab. XIV, Proceed. XIV], *Mulio* [Stépanoff, Verh. Nat. Ges. Charkow, XV, 1881] *Aphoebantus* [Riley, Sec. Rep. U. S. Ent. Commis. for 1878—79, 1880, pl. XVI and Amer. Nat. XV, 439, pl. VI] and *Systoechus*), on larvæ of solitary bees (*Bombylius*) and on Lepidopterous larvæ of the familly *Limacodidæ* (*Systropus* [Künckel

d'Herculais. Bull. sc. de la Fr. et de la Belg. XXXIX, 141]). Some of the larvæ (*Argyramoeba*, *Bombylius*) are known to pass through different stages during growth, altering their shape by the moultings, and are in the first stage rather active and provided with bristles on the thoracic segments and at the apex of abdomen; this will probably prove to be the case with all Bombyliid larvæ. In most cases the full-grown larva hibernates and pupation and development of the imago follow next summer[1] but sometimes it seems to be the egg or the young larva that hibernates (see under *Bombylius*). When the larvæ live in bee-cells, they devour and destroy the host larva, but when they live on Ichneumonids, Tachinids and Lepidopterous larvæ the host larva seems always to reach to pupation before being destroyed; yet the *Systropus* larva devours the larva of the *Sibine* and rests lying in the strong cocoon of this form. The larvæ hibernate in the bee-cell or the cocoon or in the Lepidopterous pupa or the Locust egg-case, and here the pupa is formed. When the time for the escape of the imago comes, the pupa works through the hard wall of the bee-cell or of the cocoon or egg-case out to the surface, often some way through the ground, by aid of its armature; on escaping the pupa-skin remains sticking in the hole in the bee-cell or the ground.

The egg-deposition has only been observed in a single case. Algernon Chapman (Ent. Month. Mag. XIV, 1878, 196) saw a small *Bombylius* deposit its eggs; it was on the wing and then approached the ground within an inch or so jerking the eggs singly on the ground. Fabre (Souvenirs Ent. III, 1886, 197) saw *Argyramoeba anthrax* (*sinuata*) flying in a similar way, probably also depositing the eggs. It is very probable that the eggs are always laid on the ground, and it is then the larva in its first, active stage which arrives at the host.

The Bombyliids are small to somewhat large flies; they are of a very characteristic appearance; some are clothed with a dense fur (*Bombylii*) and hence more or less bee-like, others are less densely clothed with long hairs, but are covered with depressed, scaly hairs (*Anthracinae*). They occur especially on sandy localities, (as in our country such localities are for the most part found at the shore, the Bombyliids are with us especially found there), and they fly very quickly in the hottest sunshine though also often seen sitting on the ground.

[1] About retardation of the larval stage, this being prolonged over more than one year, see Riley l. c. 444.

Of the genus about 530 species are known from the palæarctic region, and from North America about 450 species; I find 6 species common to both regions, and among these the two common species *Hemipenthes morio* L. and *Bombylius major* L.

I am aquainted with no case of Hymenoptera parasitic on Bombyliids.

Bombyliids earlier recorded from Denmark: — Kramer in 1760 (Spec. Insectol. Dan.) records one species, *Bombylius major*. Brünniche, 1761 (Prodr. Insectol. Siælland.) has three, *Musca morio*, *Bombylius major* and *B. medius*, and in 1763 (Pontoppidan, Danske Atl. I) he enumerates the same three. O. F. Müller, 1764 (Faun. Fridrichsd.) enumerates two, *Musca hottentotta* and *Bombylius major*. About these species it can only be said that *B. major* is probably this species and certainly so in Müller; *Musca morio* is probably *Hemipenthes morio*, and *B. medius* probably *B. minor* or *Systoechus sulphureus*. *Musca hottentotta* seems to be one of the clear-winged species of *Anthrax*, perhaps *A. paniscus*. Fabricius has no Bombyliid directly recorded from Denmark. Zetterstedt in 1842 (Dipt. Scand. I) enumerates two, *Bombylius major* and *pumilus* = *minor* (at all events the Danish specimen is *minor*); in 1849 (ibid. VIII) he further remarks under *Lomatia lateralis* "In Dania quoque obvia fuerit, significante Löwio". Loew (Linn. Entom. I, 1846, 380) also says that this species occurs in Denmark, but this must certainly be due to some error, though its occurrence in Denmark is not improbable, as it occurs in Germany and in southern Scandinavia, but here it is rare; should it be found it will be easily recognised; it is a representative of a special subfamily, *Lomatiinae*, otherwise not represented by us, and it may be known by the characters: it has the cubital vein issuing from the radial vein as in *Bombyliinae*, but in contrast to this subfamily it has a short proboscis; the male has the hind margins of the abdominal segments yellow, the female has the first three abdominal segments broadly yellow at the sides. — Finally, Nielsen (Zool. Jahrbüch. Abtheil. für Syst. Geogr. und Biol. XVIII, 1903, 647) mentions *B. pumilus* = *minor* from Denmark. Thus, two species, *B. major* and *minor*, were hitherto known with certainty, and probably also *Hemipenthes morio* and one of the clear-winged species of *Anthrax*. In the present work 14 species are enumerated.

Table of Subfamilies and Genera.

1. Antennæ distant at the base; eyes separated in both sexes, most so in the females ..... 1. *Anthracinae.*
— Antennæ approximate at the base; eyes touching or very approximate in the male, well separated in the female ..... 2. *Bombyliinae.*

1. Anthracinae.

1. Antennæ four-jointed, the styliform part being divided, at the apex with a pencil of hairs; metapleura bare.. 1. *Argyramoeba.*
— Antennæ three- or four-jointed, the styliform part with a small bristle at the apex; metapleura with long hairs..... 2.
2. Pulvilli well developed; antennæ three-jointed..... 2. *Hemipenthes.*
— Pulvilli wanting or at all events very small; antennæ three- or four-jointed..... 3. *Anthrax.*

2. Bombyliinae.

1. First posterior cell closed, anal cell open; metapleura with long hairs..... 2.
— First posterior cell open, anal cell closed; metapleura bare..... 6. *Phthiria.*
2. Medial cross vein almost at the middle of the discal cell, thus the first basal cell longer than the second.. 4. *Bombylius.*
— Medial cross-vein near the base of the discal cell, thus the basal cells of about equal length ..... 5. *Systoechus.*

1. **Argyramoeba** Schin. (*Argyromoeba*).

(*Anthrax* Scopoli 1763.)

Species of medium size and of deep black colour, generally with silvery spots; the wings more or less variegated with black, rarely quite hyaline. Head nearly globular but cut off behind and very deeply excavated, about as broad as thorax; at the hind edge of the excavation there is a dense fringe of hairs. Eyes large, higher than broad, separated in both sexes, but more so in the female than in the male; the posterior eye-margin is emarginate at the sides and from the top of the emargination an incipient dividing line stretches some way forwards, but the facets are of equal size. Antennæ inserted in the middle, somewhat distant. Jowls very small, not descending below the eyes, only consisting of a narrow margin. Antennæ four-jointed, the first joint short, cylindrical, the second disciform, the third with a globular, somewhat flattened base suddenly tapering into a thin, styliform part which bears at the apex the last joint, forming a short style with a pencil of hairs at the apex; in the middle of this pencil there is a small style (perhaps a fifth joint). Epistoma short, the mouth aperture large, oblong, stretching up towards the antennæ and pointing somewhat forwards. There is a distinct and not small oral

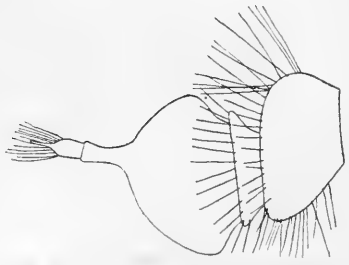

Fig. 33. Antenna of *Argyramoeba anthrax*. × 50.

cone on the front side of which lies the clypeus, stretching from the front edge of the epistoma to the labrum; it is somewhat weakly chitinised and more or less divided into two chitinous lists; inwardly it is connected with the pharynx. The stipites of the maxillæ lie on the posterior side of the oral cone. Proboscis not half as long as the head is high; labrum pointed triangular, broad at the base, somewhat longer than the basal part of labium; the maxillæ have a long, pointed, somewhat curved lacinia, and a short, club-shaped, one-jointed palpus; hypopharynx pointed, slightly longer than labrum. The basal part of labium short, not much more than half as long as the labella; these are large and show an indication of a division into two joints, they are stretched forwards, but in use they may be bent angularly towards the basal part and they form a disciform plate when spread out. When the mouth parts are not in use, the oral cone is quite withdrawn, and then the proboscis lies vertically in the oral aperture with the labella pointing forwards. Thorax almost quadrate; prothorax distinct, very narrow, forming a peduncle stretching into the deep concavity of the head; at the front end of mesothorax the clothing hairs form a dense fringe. Of bristles there are some above the wing-root which may, I think, be termed notopleural bristles on account of their position on the præalar callus, moreover there are postalar bristles and somewhat weak scutellar marginal bristles; the metapleura have no bristles or hairs. Abdomen somewhat flat, consisting of seven distinct, not transformed segments. The male genitalia are symmetrical, they consist of a small eighth segment which is hidden in the foregoing one but is normally shaped; at its apex there is a small, somewhat triangular piece above, which has a longitudinal suture in the middle and terminates in two small, somewhat diverging styliform processes; below there is a somewhat arched plate with two small lamellæ at the apex; in the interior is a short, somewhat upwardly curved penis. The female genitalia form an ovipositor, consisting of a large but quite hidden eighth segment, and at the apex of this a small ninth segment which has above on each side a comb of densely placed, straight spines which are recurved just at the apex; the aperture leading to the ovipositor is covered by converging hairs. Legs with bristles on the ventral side of the femora, on the front femora they are small; all tibiæ with bristles which are likewise smallest on the front tibiæ; the posterior tarsi have bristles and are densely pubescent below, the front tarsi have no bristles but have short, erect, delicate hairs above and below. All tibiæ have apical spurs, but they are small on the front tibiæ. The claws are of medium size; there are distinct pulvilli, but the empodium is present

only as a very small lobe, not to be seen unless by the aid of the microscope. Wings with the radial vein apparently issuing from the cubital vein, with a veinlet at the basal angle; the cubital vein branched, the upper branch angularly bent at the base and with a veinlet (one or both of the veinlets mentioned may be absent in foreign species); two cubital cells; four posterior cells, on account of the third and fourth being confluent, the first somewhat narrowed at the apex; anal cell narrowly open. At the base of the costa a small hook (præalar hook Osten Sacken). Alula distinct; the alar squamula fringed at the margin; frenulum with a tuft of long hairs.

Of the developmental stages I have examined larvæ and a pupa, taken in Sicily in nests of *Megachile muraria* and certainly of *A. trifasciata* Meig.[1]. The full grown larva is cylindrical or somewhat flattened, especially on the ventral side, of white colour. The body consists of thirteen segments and it tapers slightly towards each end. The head is very small and quite retracted; the mouth parts are not of the typical construction, but much reduced, I could only detect two small and slender hooks, probably the mandibles; they are directed downwards, and seem to be united in the middle by a small, chitinous piece (perhaps the labrum). The segments of the body have a slight swelling on each side; the twelfth segment is suddenly somewhat narrower than the preceding, the last segment is again considerably smaller and it is not situated in the middle, but on the lower part of the posterior surface of the twelfth segment, this latter thus getting a free, backwards looking posterior surface above; the last segment has the anus lying at the end. The larva is amphipneustic with prothoracic spiracles at the hind margin of prothorax, and posterior spiracles at the hind margin of the penultimate segment on the posterior surface mentioned. — The larva is described and figured by Fabre (Souv. Entom. III, 1886, 129), but he has made the curious mistake of taking the anal end for the head, and in accordance herewith he declares that the larva has no mouth parts at all. Verhoeff (Verh. d. naturf. Ver. Westfal. XLVIII, 1891, 54, Fig. 64, 65) describes and figures the larva of *A. anthrax* (*sinuata*); he has in this species, besides the small, hook-formed mandibles, found very small maxillary palpi and antennal papillæ. — The larva passes during growth through different stages; the young larva is described and figured by Fabre (l. c. 205); it is slender and has a long bristle on

[1] The material was collected in March this year (1908) at Taormina in Sicily by my friend Mr. J. C. Nielsen; it was labelled: „From *Megachile muraria*, nidificating in the right eye of the statue of St. Pancratius in Taormina."

each side of the three thoracic segments, and a pair of similar bristles at the apex of the body. — The pupa is also figured by Fabre, and the pupa of *A. anthrax* (*sinuata*) is described and figured by Laboulbène (Ann. Soc. Ent. Fr. 3, V, 1857, 781, Pl. 15, II, fig. 1—5), and it is described by Ritter v. Stein (Entom. Nachricht. XI, 1885, 306), and finally described and figured by Verhoeff (l. c. Fig. 66, 67). It (*A. trifasciata*) is brownish yellow; on the head there are six strong spines, placed in an arched line and somewhat connected at the base, the whole being somewhat like a crown; the spines of the middle pair are the largest, and they are all directed forwards; on the lower surface of the head there is a pair of spines in the middle line. The second to fifth abdominal segments have each on the dorsal side a transverse row of curious hooklets, they are almost semiannular and each point projects as a more or less erect spine, thus in all forming two parallel, transverse rows of spines on each segment; on the following segments the hooklets are weaker and less developed. Moreover each segment has a transverse row of long bristles, both on the dorsal and on the ventral surface; at the lateral margin the bristles are placed somewhat tuft-like. In *A. anthrax* there are bristles on the dorsal side only of the first and the last two segments. The last segment is attenuated towards the apex and has eight spines. There is a pair of prothoracic and seven pairs of abdominal spiracles.

The larvæ live parasitically on larvæ of solitary bees and fossorial wasps; cases have often been recorded; van Roser records *A. anthrax* Schr. (*sinuata*) from nests of *Anthophora* (Würtemb. Correspondenzbl. I, 1840, 52) and Jacqu. Duval from *Megachile muraria* (Bull. Soc. Ent. Fr. 2, IX, 1851, LXXX); Laboulbène records the pupa of the same from *Megachile muraria* (Ann. Soc. Ent. Fr. 3, V, 1757, 781, tab. 15, II, fig. 1—5) and in nests of *Hoplomerus spinipes* (Bull. Soc. Ent. Fr. 3, VI, 1858, CXII); Frauenfeld bred *A. trifasciata* M. (*leucogaster*) from nests of *Cemonus* sp. in deformed reeds (Ver. zool. bot. Gesell. XIV, 1864, 688); Fabre (Souv. Ent. III, 1886, 129) records *A. trifasciata* M. from nests of *Megachile muraria*, and *A. anthrax* Schr. (*sinuata*) (l. c. 191) from *Osmia tricornis*; Frauenfeld (l. c. 689) bred *A. binotata* M. (*subnotata*) from nests of *Megachile muraria*; *A. tripunctata* Wied. was bred from nests of bees in snail-shells (*Osmia andrenoides*) (Brauer, Denkschr. Kais. Akad. Wiss. Wien., math. nat. Cl. XLVII, 1883, 62); Ritter v. Stein (Entom. Nachricht. XI, 1885, 306) bred *A. anthrax* Schr. (*sinuata*) from nests of *Osmia uncinata* and *A. varia* F.? from *Osmia* sp., and Verhoeff (l. c.) bred *A. anthrax* (*sinuata*) from *Hoplomerus spinipes*. Osten Sacken records (Bull. U. S. Geol. and Geogr. Survey of the Terr. III, 243) that the American species

A. cephus F. and *fur* O. S. were bred from the nest of a mud-wasp in Texas[1]. These are, I think, the chief references about the larval habits of *Argyramoeba*; sometimes the pupæ have been recorded as found under stones, they have then evidently come from bee-nests. The young *Argyramoeba* larva seems to get into the bee-cell at a time when the bee-larva is fullgrown; it then eats this out in a relatively short time, so that only the empty skin is left, but the bee-larva seems to be alive during the whole or almost the whole time; Fabre declares that this is possible because the bee-larva is in the lethargic stage just before the pupation and its whole inner body is to some degree dissolved on account of the transformation, and I think this may be correct. When the larva has eaten the bee-larva it is fullgrown, and it hibernates in this stage, the transformation to pupa and the development of the imago following the next summer. — Verhoeff (l. c.) on the other hand declares that he found the young larva of *A. anthrax* in the cell of *Hoplomerus spinipes* sucking at a Lepidopterous larva stored by the wasp; the egg of the wasp was destroyed, and he thinks this had been done by the *Argyramoeba* larva; he found the larva on $^{23}/_{6}$ at a size of 2—2,5 mm. and it pupated on $^{6}/_{7}$; in this case the larva would seem to feed upon the food stored by the wasp and to pass through its whole development in the spring and summer, and consequently the egg or the young larva must hibernate (see below under *Bombylius*). With regard to Verhoeff's observations I must however remark that they probably to some degree need confirmation; the fact that *A. anthrax* has been bred from the nests of burrowing bees besides from those of fossorial wasps seems to indicate beyond doubt, that it is a true parasite and feeds on the larva of the host; (such is also the case with the larvæ of *Chrysis ignita* about which Verhoeff states that it is a Cuckoo). The pupa works its way out through the often very hard and strong wall of the bee-cell, forming a cylindrical hole or canal; for this work it uses the spines on the head, but that it is able to do so hard a work is astonishing. When the pupa has reached out to the surface, the escape of the imago follows, the pupa skin being left sticking in the hole.

The eggs are certainly deposited on the ground or on other places near the nests of the bees; Fabre (l. c. 197 and 201) observed *A. anthrax* (*sinuata*) and *trifasciata* approaching the ground when flying and touching it with the end of the abdomen, certainly depositing the eggs; the young, somewhat agile larva has then to penetrate into

[1] Osten Sacken thought the wasp to be a *Pelopaeus* but Riley (Amer. Nat. XV, 1881, 443) states that it is a *Trypoxylon*.

the bee-cell. The species of *Argyramoeba* have several times been observed flying together with such bees as their larvæ are parasitic upon.

The species of *Argyramoeba* are beautiful flies with their black, generally silver-spotted body and their generally blackish variegated wings; they occur on dry, sunny places; most of the species are southern forms; of the genus 23 species belong to the palæarctic region, only one has been found in Denmark.

Remarks. Bezzi (Zeitschr. für syst. Hymenopterol. und Dipterol. II, 1902, 192, and VIII, 1908, 34) declares that *Argyramoeba anthrax* Schranck is identical with *Anthrax morio* Scopoli, 1763, and that therefore the present genus should have the name of *Anthrax* with the type *morio* Scopoli; this may perhaps be correct, yet I shall here retain the name *Argyramoeba* in accordance with the Kat. paläarkt. Dipt. II (written by Bezzi himself), and also because I must confess, that I am to some degree a partizan of the idea of continuity advocated by Osten Sacken (Wien. Ent. Zeit. I. 1882, 191).

1. **A. anthrax** Schranck.

1781. Schranck, Ins. Austr. 439, 893 (*Musca*). — 1903. Kat. paläarkt. Dipt. II, 170. — 1761. *Musca morio* Linn. p. p. Fn. Suec. 1784. — 1842. *Anthrax sinuata* Zett. Dipt. Scand. I, 199, 6. — 1862. *Argyromoeba sinuata* Schin. F. A. I, 53.

Male. Black; frons with short, erect, black hairs; epistoma bare just below the antennæ, at the lower margin with projecting, black hairs; both on frons and epistoma some shorter, whitish hairs. The inner eye-margins running parallel from the upper corner a little way out. Antennæ black, the basal joints with longish, black hairs. Occiput slightly haired with depressed, whitish hairs. At the hind margin of the occiput a dense fringe of dark brown hairs. Thorax and scutellum slightly shining, with erect, black hairs which are longest behind and on the scutellum; they are most dense at the front end of thorax and form here a fringe all round, the foremost hairs in this fringe are white; at the apex of scutellum a small, silverwhite spot. Pleura and sterna black haired. Abdomen slightly shining, with erect black hairs, placed more or less distinctly as a transverse row on each segment; the hairs are specially dense and tuft-like at the side margins, they are white at the side margin of the first segment. At the hind margin of the second and third segments there are four silverwhite spots, formed of scaly hairs, one on each side and two in the middle; they may in some cases be somewhat confluent to a band; sometimes there are similar spots also on the fourth and fifth

segments; at the hind margin of the sixth segment there is a similar, silverwhite band, divided in the middle. Venter black haired. Legs black or brownish black; the hairs, both the scaly and the other ones, as well as the bristles, black; the scaly hairs on some places with a more or less whitish reflex. Wings brownish black, only clear at the apex and partly at the hind margin; the border of the blackish

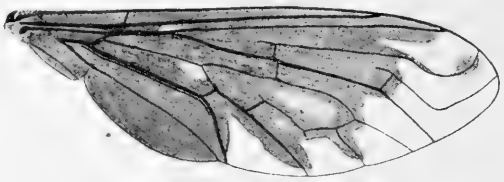

Fig. 34. Wing of *A. anthrax.*

part goes about from the apex of the subcostal vein somewhat outwards to the base of the fork of the cubital vein and then very undulating or in a zigzag to the apex of the anal cell; the undulation is caused by the blackish colour stretching more or less out along the veins towards the hind margin; at the apex of the radial vein there is a small, isolated spot; at the posterior upper corner of the discal cell there is a somewhat pronounced clear spot. The costa is black haired at the base; squamulæ with white hairs at the margin. Halteres black.

Female. Agreeing with the male, only the frons slightly broader, and the inner eye-margins diverging just from the upper corner.

Length 7—12 mm.

A. anthrax is very rare in Denmark; we have only three specimens from earlier time, and without particular locality.

Geographical distribution: — Europe down into Italy; towards the north to northernmost Scandinavia, and it seems most common in the north.

2. **Hemipenthes** Löw.

Species of medium size and black colour with black marked wings. The genus agrees in most respects with *Argyramoeba.* The head is globular, cut off behind and deeply excavated, about as broad as thorax. The eyes large, higher than broad, separated in both sexes, mostly so in the female; the posterior eye-margin is emarginate and from the middle of the emargination an incipient dividing line stretches forward; the facets are of equal size. Antennæ inserted in the middle, somewhat distant at the base. Jowls small, yet somewhat, but very slightly, descending below the lower eye-margin.

Antennæ three-jointed, the first joint short, cylindrical, the second shorter, globular, the third bulb-like, tapering to a long, narrow style with a small, bristly part at the apex; the styliform part is not divided; whether the small, bristly part at the apex is a separate joint or not, it is difficult to decide, there is at all events no distinct articulation to be seen, not even with a high magnifying power, yet it is possible, that the bristly part should be considered as a distinct joint, or at all events as answering to a joint; in favour of its being a separate joint it is to be remarked, that this part is easily broken off and is therefore not rarely wanting. Epistoma short, the mouth aperture large, oblong, reaching up towards the antennæ and looking downwards and slightly forwards. There is a well developed oral cone, on the front side of which lies the weakly chitinised clypeus stretching from the epistoma towards the labrum; it is chiefly represented by two chitinous lists; on the posterior side of the oral cone lie the stipites of the maxillæ. Proboscis about half as long as the head is high; labrum pointed triangular, nearly as long as labium; the maxillæ have a thin, pointed lacinia, about as long as labrum; the maxillary palpi are one-jointed, long, nearly thread-like, beset with hairs; hypopharynx thin, long-pointed, somewhat longer than labrum; by judging the length of the mouth parts in relation to the length of the labium it is to be remarked that labrum and maxillæ are inserted somewhat basally on the cone because there is a relatively long connecting membrane between the place of insertion of these parts and the insertion of the labium at the end of the cone. The labium has the basal part somewhat longer than the labella, these latter are relatively short and broad, and form a disciform plate when spread out. In rest the proboscis lies withdrawn quite as in *Argyramoeba*. Thorax nearly quadrate, narrower at the front end; prothorax as in *Argyramoeba*, and there are the same hair-fringes at the posterior margin of the head and at the front end of mesothorax. Notopleural and postalar bristles present, and likewise weak scutellar marginal bristles; metapleura have a vertical tuft of hairs. Abdomen somewhat flat, consisting of seven not transformed segments. The male genitalia are unsymmetrical, turned to one side; they consist of an eighth, quite hidden segment at the apex of which there is above a somewhat triangular piece, with a furrow in the middle line, and below a piece which is bent upwards at the sides and has the hind

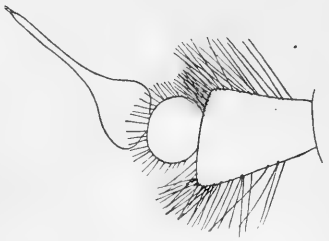

Fig. 35. Antenna of *H. morio*. × 45.

corners drawn out in a small, lobe-shaped point; the upper piece lies thus between the upward bent sides of the lower. The genitalia are not unsymmetrical in construction, but they are turned in such a way that the ventral side may be looking nearly upwards; both the eighth segment and the apical parts take part in the turning, first the eighth segment being turned somewhat in relation to the seventh, and then again the apical parts being turned in relation to the eighth segment. It is not possible to decide from the position what is the dorsal and what the ventral side of the genitalia, but by considering the way in which the eighth dorsal segment overlaps the ventral, and by comparison with *Argyramoeba* the fact may be ascertained. The female genitalia resemble those in *Argyramoeba*, only the spine-combs are here placed just on each side and not dorsally; there are the same converging hairs as in *Argyramoeba*, but they are here more concealed. Legs with bristles on the ventral side of the posterior femora and on all tibiæ, but very small on the front tibiæ; the posterior tarsi have bristles, the front tarsi delicate, erect hairs on both surfaces; the posterior tibiæ have apical spurs. The claws are small; there are distinct pulvilli and a very small empodial lobe. Wings as in *Argyramoeba*, but there is no veinlet at the angular bend of the radial vein; the upper branch of the cubital vein may in the same species (*morio*) be rounded or angular at the base, and with or without a short veinlet; also the lower hind corner of the discal cell may be without a veinlet or with a small veinlet, representing the branch otherwise dividing the third and fourth posterior cells. Costa at the base with a somewhat large hook. Alula developed, fringed with somewhat scaly hairs; frenulum with long hairs.

As far as I am aware the larva of *Hemipenthes* is not described. I have myself only examined the pupa; it is yellow; on the front of the head, at the base of the antennal sheaths there are two strong, flat, straight spines which are longitudinally striated, and at the end of each of the sheaths there is a low, triangular pyramidal spine; on the lower side of the head at the base of the proboscis there are two low, triangular spines. At each side of the proboscis, about at the base of the leg-sheaths, the integument forms a triangular protuberance. On head and thorax there are some bristles. In the middle of the first abdominal segment, and in the whole breadth of the following segments there is on the dorsal side a transverse row of chitinous staves parallel arranged with the hind points protruding; there are moreover on the first dorsal segment very long and strong, at the apex curved hairs, and on the following segments weaker and shorter hairs which are shortest in the middle of the segments; on

the ventral side there are similar hairs and they are tuft-like placed at the lateral margins. The last segment terminates in two compressed, three-pointed spines, the upper point of which is the largest and curved somewhat upwards. The sheaths of the hind metatarsi stretch out beyond the wing-sheaths and are divergent at the tips. There are prothoracic and seven pairs of abdominal spiracles.

The biology of the larva is rather curious as it lives as parasite on parasitic *Hymenoptera* and also on parasitic *Diptera*; the parasites which the *Hemipenthes* larva infests seem all to live in Lepidopterous larvæ. The above described pupa was found in the cocoon of an *Ophion* which it left before the imago escaped. Réaumur (Mém. VI, Pl. 27, fig. 13) mentions *H. morio* "d'un nid creusé dans le bois"; the author thought that it was stored as food by a fossorial wasp, but it is most probable that it had come from some Ichneumonid; v. Roser bred it from a pupa of *Banchus*? (Würtemb. Correspondenzbl. I, 1840, 52); Portchinshy (Les parasites des criquets nuisibles en Russie, St. Petersb. 1895, 14) bred it from cocoons of *Ophion* and *Banchus* which infested *Panolis piniperda*, and Wassiliew (Zeitschr. f. wiss. Insektenbiol. I, 1905, 1874) bred it from the pupa of *Masicera silvatica*, parasitic on *Dendrolinus pini*. The larva hibernates in the cocoon, and the pupation and development of the imago take place in the following summer. It does not seem to be known in what a way the *Hemipenthes* larva gets on to the parasitical Hymenopterous or Dipterous larva.

The species of *Hemipenthes* occur on dry and sandy places, flying in bright sunshine. Of the genus only one species is known from the palæarctic region, and it also occurs in Denmark (see below).

Remarks. Löw founded the genus *Hemipenthes* in 1869 and based it on the presence of pulvilli; he knew only one European species, *H. morio*. Osten Sacken (Biol. Centrali-Americana, 1887, Dipt. 129) declares that besides *morio*, *A. velutinus* Hoffm. (as already stated by Schiner) also has pulvilli and that small pulvilli are also found in *A. maurus* L. and in some American species; he thinks therefore that *Hemipenthes* cannot stand as a genus. Also Bezzi (Zeitschr. f. syst. Hymenopterol. und Dipterol. VIII, 1908, 34) declares that *Hemipenthes* cannot stand, as a generic distinction from the pulvilli is not possible. (Bezzi uses the name *Hemipenthes* for *Anthrax* auct. becauses he uses *Anthrax* for *Argyramoeba* Schin., see above under *Argyramoeba*.) Perhaps the genus will prove not to be valid, but for the present I retain it here, because it seems to me, that the parasitic habit on *Hymenoptera* and *Diptera* may be of some importance in contrast to that of *Anthrax*. Now it is interesting to see that the species

A. velutinus and *maurus*, about which Osten Sacken says that they have pulvilli, are also parasitic on *Hymenoptera* and *Diptera* (see under *Anthrax*). It is therefore possible that these species should be placed under *Hemipenthes*, and that this genus may prove natural, but I shall make no changes here but follow the Kat. paläarkt. Dipt.

1. **H. morio** L.

1761. Linn. Fn. Suec. 1784, p. p. (*Musca*). — 1842. Zett. Dipt. Scand. I, 198, 4 et 1855. XII, 4584, 4 (*Anthrax*). — 1862. Schin. F. A. I, 49 (*Anthrax*). — 1903. Kat. paläarkt. Dipt. II, 173. — 1820. *Anthrax semiatra* Meig. Syst. Beschr. II, 157, 25, Tab. XVII, Fig. 14.

Male. Black; frons and epistoma with short, erect, black hairs and with some depressed, golden hairs; occiput greyish black with sparse, depressed, golden hairs, at the hind margin with a dense fringe of black hairs. Thorax dull, with erect, black hairs, at the front end forming a fringe all round, the hairs of this fringe are yellow or reddish yellow above, black below; on the disc there are moreover some sparse, depressed, golden hairs. Pleura and sterna clothed with longish black hairs. Abdomen with long, black and yellow intermingled hairs; at the lateral margins of the first segments the hairs are yellow, on the rest of the lateral margins black and forming a fringe; abdomen moreover clothed with short, depressed, scaly hairs which are black with some golden intermingled. Venter with long, black and depressed, golden hairs. The golden, scaly hairs may sometimes be more reddish copper-coloured, both on thorax and abdomen. Legs black, tibiæ more or less dark brownish; all the hairs and bristles black, only on the tibiæ, especially on the hind tibiæ, the scaly hairs may be golden to a greater or less extent. Wings black at the base, hyaline at the apex, the cross-veins with a somewhat lighter seam; the border of the black part goes zigzag obliquely

Fig. 36. Wing of *H. morio*.

over the wing from the apex of the subcostal vein to the apex of the anal cell, thus when the wings in rest are in their natural position the border forms a straight line across both wings; costa with

black hairs at the base. Squamula alaris with a blackish fringe; frenulum with long, yellow hairs. Halteres black, the knob snow-white.

Female. Quite agreeing with the male, only the vertex and frons are broader, the inner eye-margins diverging from the upper corner.

Length 5,5—12 mm.

H. morio is rather common in Denmark in suitable localities; Tisvilde, Teglstrup Hegn, Rørvig; in Jutland at Kandestederne south of Skagen and on Læsø. My dates are $^{13}/_{6}$—$^{26}/_{7}$. It occurs on sandy places both in woods and outwards, with us especially at or near the shore; it may be present in great numbers, and it flies in the hottest sunshine and is often seen sitting on the sand; I have seen it on flowers of Hieracium and of Sedum acre.

Geographical distribution: — One of the most common species all over Europe, down into Italy; towards the north to middle Scandinavia; it occurs also in North America.

3. **Anthrax** Fabr. (Scop.).

Species of smallish to somewhat large size; the colours are black or, on account of the dense fur, yellow, generally with yellow or whitish, hairy bands on abdomen, and sometimes longitudinal bands on thorax; the wings are clear or more or less blackish or brownish variegated. The genus agrees in all chief respects with *Hemipenthes*, and I shall only describe it comparatively. Head and mouth parts quite as in *Hemipenthes*, only the labella generally a little longer, about as long as the basal part of labium. The posterior eye-margin emarginate as in *Hemipenthes* and with an incipient dividing line. Epistoma sometimes somewhat protruding (*fenestratus*). Antennæ three- to four-jointed, the first joint cylindrical, the second more or less globular; the third joint various in form, from bulb-like with a long, styliform part to the form of a long, tapering cone; it is generally undivided (when of a bulb-like shape) and the antennæ are thus three-jointed; but in some species (e. g. *afer*) an articulation is present, a somewhat short, apical part being divided off as a separate joint, and the antennæ are then four-jointed; in all cases there is a small, thin or bristly part at the apex which, as in *Hemipenthes*, perhaps answers to a joint[1]. Thorax as in *Hemipenthes*, with more

[1] Meigen (Syst. Beschr. II, 142) says, that the third joint is: „entweder zwiebelförmig mit verlängertem Griffel welcher ... noch eine kleine besondere Spizze hat — oder das dritte Glied ist kegelförmig mit einem zweigliedrigen Griffel." The first is correct, but the latter not, as the style, when present, is not two-jointed. Schiner ascribes to *Anthrax* a two-jointed style. Osten Sacken (Biol. Centrali-Amer. Dipt.) says, that *Anthrax* has three-jointed antennæ in contrast

or less distinct notopleural and postalar bristles, and somewhat strong scutellar marginal bristles; metapleura likewise with a vertical tuft of long hairs. Abdomen quite as in *Hemipenthes*, and the male and female genitalia of the same shape, the male genitalia likewise unsymmetrically turned. Legs with bristles on the ventral side of the posterior femora and on the posterior tibiæ, front tibiæ smooth or with small bristles; posterior tarsi with bristles, front tarsi with delicate, erect hairs on both surfaces; posterior tibiæ with apical spurs. Claws of medium size, smallest on the front tarsi; pulvilli wanting, or rudimentary (*maurus*), or at all events small (*velutinus*). Empodium very small and rudimentary. Wings as in *Hemipenthes*; the upper branch of the cubital vein may be with or without a veinlet, even in the same species. Costa with a hook at the base; in some species (the clear-winged) with a fan-shaped, patagium-like piece of scaly hairs at the base, concealing the hook. Alula and alar squamula fringed with somewhat scaly hairs; frenulum with long hairs.

Of the developmental stages I have examined the larva and pupa of *A. fenestratus* (from Algeria). The larva is almost cylindrical, slightly flattened on the ventral side, and tapering somewhat abruptly towards each end. The body consists of thirteen segments. The head is small and retractile; the mouth parts consist of a rather broad, somewhat triangular labrum, small, compressed mandibles which are hidden under the labrum, and large and broad maxillæ, each with a palpus. Above, at each side of the labrum, there is an exceedingly small antennal(?) papilla. Along the lateral margins of the body each segment has a slight swelling. The larva is amphipneustic with small spiracles on prothorax and on the penultimate segment. — Larvæ of species of *Anthrax* are figured by Westwood (Introd. to the modern Class. of Ins. II, 546, Fig. 129, 1) and Riley (*A. hypomelas*, Insect Life II, 354, fig. a); after these figures the larvæ in question agree with the above description. Brauer (Denkschr. Kais. Akad. Wiss. Wien, Mat. Nat. Cl. XLVII, 1883, Taf. V, Fig. 104—105) figures the head of a larval skin of *A. hottentottus* (*flavus*); he figures and describes a hooked labrum, somewhat hook-shaped mandibles, maxillæ with a small palpus?, and at each side above a small antennal papilla. — The pupa to a high degree resembles the pupa of *Hemipenthes*, showing more or less similar

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to *Argyramoeba*, and Bezzi (Zeitschr. f. syst. Hymenopterol. und Dipterol. VIII, 31) says with regard to *Anthrax* (his *Hemipenthes*) about the third joint: „mit nicht abgeschnittenem Endgriffel." As seen above this is not correct, as it does not hold good with regard to all species. Bezzi says also (l. c. 34) that the genus is „ein Gemisch von verschiedenen Formen", which is certainly correct.

spines on the head, the same armature with chitinised staves on the dorsal abdominal segments, but it has long hairs only on the first dorsal segment, the other segments wanting these hairs. — The pupa of *hottentottus* (*flavus*) is figured by Künckel d'Herculais (Bull. sc. de la Fr. et de la Belg. XXXIX, 143), the pupa of *fenestratus* by the same author (Invas. des Acrid. vulgo Sauterelles en Algérie, I, 633, fig. 1—3), and the pupa of the American species *A. hypomelas* is figured by Riley (l. c. fig. b—c). The armature of spines, especially on the head, shows some difference according to the species, certainly in accordance with the different materials which the pupa has to work through before the escape of the imago, but otherwise the pupæ agree in all chief respects.

The biology of the larva is somewhat different in the different species; some are parasitic on *Lepidoptera*; *A. hottentottus* (*flavus*) was breed from the pupa of *Mamestra brassicæ* (Wahlb. Kgl. Sv. Vet. Akad. Handl. 1838, 12), from the pupa of *Dichronia aprilina* (Mulsant, Opusc. Entom. 1er cah. 1852, 178), from *Agrotis porphyrea* (Westmaas, Vollenh. Niederl. Ins. 2, II, 1861, 195, Tab. XLVII, Fig. a, b, and Ritsema, Tijdschr. v. Entom. XII, 1869, 192, Tab. VII, Fig. 2), from *Agrotis segetum* and *forcipula* (Brauer, Denkschr. Kais. Akad. Wiss. Wien, Math. Nat. Cl. XLVII, 1883, 61), from Noctuid pupæ not determined (Künckel d'Herculais, Bull. sc. de la Fr. et de la Belg. XXXIX, 143), and finally from pupæ of *Panolis piniperda* (Vassiliew, Zeitschr. f. wiss. Insektenbiol. I, 1905, 174). The American species *A. hypomelas* was bred from *Agrotis herilis*; *A. alternatus* (*scrobiculatus*) from some Agrotid pupa and *A. molitor* from *Taeniocampa rufula*? (Riley, Insect Life, II, 1889—90, 353). Other species feed upon locust eggs, thus *A. fenestratus* has been bred from the egg-cases of *Stauronotus maroccanus* (Künckel d'Herculais, Invas. des Acrid. vulgo Sauterelles en Algérie, 1893, and Compt. Rend. Acad. Sc. CXVIII, 1894, 926) and from egg-cases of the mentioned *Stauronotus* and of *Stetheophyma flavicosta* (Portchinsky, Les parasites des criqu. nuis. en Russie, St. Petersb. 1895, 9). Finally some species infest *Hymenoptera* and *Diptera* parasitic on *Lepidoptera*; *A. maurus* was bred from cocoons of *Ophion* and *Banchus*, parasitic on *Panolis piniperda* (Portchinsky, l. c. 14); *A. velutinus* was bred from pupæ of *Masicera silvatica*, parasitical on *Dendrolinus pini* (Vassiliew, l. c.). (About these two species possibly belonging to *Hemipenthes* see under this genus). In all cases the larva, after having devoured the host or the egg-mass, hibernates resting as full grown, the pupation and development taking place the following summer. In the cases where the *Anthrax* larva lives in other larvæ, these latter pupate before they are destroyed, and the

Anthrax pupa lies in the pupa of the host; before the escape of the imago the pupa works out by aid of its head and body armature.

About the deposition of the eggs Brauer (l. c. 28) says that they are laid in globules of sand glued together with slime from the female genitalia, but I do not know where this observation is otherwise mentioned. The species are often seen sitting on the sand with the apex of the abdomen curved downwards, perhaps in egg-deposition.

Remarks. Osten Sacken (Biol. Centrali-Americana, Dipt. 1886, 111) proposes some subgenera; *Thyridanthrax* for the species with wings like *A. fenestratus* and *Hyalanthrax* for the clear-winged species related to *hottentottus*. Künckel d'Herculais (l. c.), evidently not aware of the subgenera of Osten Sacken, founded the genus *Aspiloptera* for the clear-winged species, laying stress on their parasitism on *Lepidoptera*; should this latter, in fact natural, group stand as a genus, it must get the name *Villa* Lioy 1863 which has priority. Already Zetterstedt formed a group of these species (Dipt. Scand. I, 1842) saying that the eggs are deposited in Lepidopterous larvæ, while about the other species he says: „Ova in arenosis deponentur". Zetterstedt thus also draws the mode of parasitism into consideration; his expression, of course, only indicates, that he knew, that the species mentioned are parasitic on *Lepidoptera*, since certainly all species deposite their eggs on the ground.

Considering the biology of the larvæ it is in fact also possible, that the clear-winged, generally yellow species, parasitic on *Lepidoptera*, may form one genus, the species with variegated wings, feeding on locust-eggs, another genus, and the species parasitic on *Hymenoptera* may be placed under *Hemipenthes*.

The species of *Anthrax* occur on sandy places, both in woods and outside, often at or near the shore, and they fly in bright sunshine.

Of the genus 103 species are known from the palæarctic region, the most being southern forms; 7 species have hitherto been found in Denmark.

Table of Species.

1. Wings with more or less extended blackish or brownish markings ..... 2.
— Wings hyaline, only narrowly light brownish or yellowish along the anterior margin ..... 5.
2. Wings with hyaline spots in the brown part ..... 1. *fenestratus.*
— Wings without hyaline spots in the dark part ..... 3.
3. Wings with the border of the dark part distinct and sharp ..... 4.
— Wings without a sharp border between the dark and the hyaline part, the colours of the two parts merging evenly into one another ..... 4. *occultus.*

4. Wings blackish on more than the half part, the black colour sending a prolongation down towards the posterior margin, outwards to the end of the discal cell .... 2. *maurus*.
— Wings blackish only on the basal half towards the anterior margin ..... 3. *afer*.
5. Abdomen in both sexes with five distinct, transverse bands, the bands on fifth and sixth segments rather broad and distinct; the black hair tufts at the sides of the fifth and sixth segments small ..... 5. *circumdatus*.
— Abdomen in the male without bands or these indistinct and hidden under the fur; in the female with distinct bands on second, third and fourth segments, that on the third segment very narrow; on the fifth and sixth segments very narrow or indistinct bands; the black hair tufts at the sides of the fifth and sixth segments somewhat large and distinct ..... 6.
6. Male with no bands on abdomen, the hair tufts on the seventh segment white; the patagium-like piece at the base of the wing silverwhite; female with the band on the third segment generally very narrow; not especially broad species ..... 6. *paniscus*.
— Male with indistinct, hidden bands on abdomen, the hair tufts on the seventh segment yellow; the patagium-like piece at the base of the wing yellow or somewhat brownish; female with the band on the third segment generally more distinct than in *paniscus*; large and broad species .... 7. *hottentottus*.

1. **A fenestratus** Fall.

1814. Fall. Dipt. Suec. Anthracid. 8, 4. — 1842. Zett. Dipt. Scand. I, 199, 7, et 1855. XII, 4584, 7. — 1862. Schin. F. A. I, 49. — 1903. Kat. paläarkt. Dipt. II, 176.

Male. Black or brownish black. Frons with short, erect, black hairs, and with scaly, golden or more silvery hairs; epistoma somewhat protruding, with yellow and black hairs and with silvery, scaly

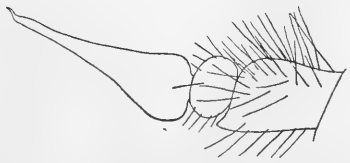

Fig. 37. Antenna of *A. fenestratus*. × 45.

hairs. Jowls yellow haired, the ground colour yellow; occiput greyish, covered with scaly, silvery hairs, especially along the eye-margin; at the hind margin of the occiput a short, whitish fringe. Antennæ black, the basal joint reddish; the two first joints with black hairs;

the third joint elongated conical. Thorax more or less densely covered with golden and silvery, scaly hairs; moreover it is clothed with erect, black or brownish hairs; at the front end the hairs are reddish yellow and form a dense fringe; along the lateral margin there are reddish hairs, and on the postalar callus white hairs; the notopleural and postalar bristles are yellow or whitish. The pleura have long, yellow hairs, there is a tuft of snow-white hairs in front of the wing-root below; the metapleura have a vertical tuft of hairs which are white above, yellow below. Scutellum with the ground colour red, black at the base, covered with silvery, scaly hairs, at the base in the middle a spot of black scales; the marginal bristles yellowish red. The ground colour of abdomen black, at the sides of the second and third segments a red spot; it is covered with black, scaly hairs, at the front margin of the second and at the hind margin of the fourth, fifth and sixth segments there are yellow or golden, scaly hairs, and also otherwise on the second and third segments there are some yellow hairs, especially in the middle; on the third and fourth segments there are white, transverse bands which are narrowed or interrupted in the middle, the posterior band most broadly interrupted; the sixth segment has a spot of white hairs in the middle, and the seventh has long, white hairs at the hind margin; besides, abdomen is clothed with erect, black hairs which form a fringe at the lateral margin, at the sides of the first segment there are white hairs, and likewise at the sides of the fourth segment; the hairs towards the apex of abdomen are somewhat strong and bristly. Venter black with the hind margins of the segments more or less broadly reddish; it is clothed with long, pale yellowish, towards the end more or less black, hairs, and with depressed hairs of the same colour or more yellow, on the sides of the third and fourth segments the hairs are whitish or white. Legs with the femora blackish at the basal part, the apical part and the tibiæ yellowish brown or brown, the tarsi black or brownish; the hairs and bristles black, the covering of scaly hairs yellow or golden; the front tibiæ smooth. Wings with the basal part brown, the boundary line stretching from the apex of the mediastinal vein in a sinuous course backwards about to the alula, leaving the apical part and the whole hind margin hyaline; there are three transverse, hyaline spots in the brown part, going out from the subcostal vein, one down over the medial cross-vein, the second over and inwards to the basal corner of the discal cell, and the third from the basal cross-vein to the alula; also round the base of the postical fork there is a clearer spot. Costa is black haired at the base on the margin and has black and

yellow scales above. Squamulæ blackish with a white fringe; frenulum white haired. Halteres yellowish, the knob yellowish white.

Female. Agreeing with the male but the vertex and frons considerably broader, the eye-margins diverging just from the upper corner.

Length 8—12 mm. The species seems to vary less in size than most other species.

The full grown larva has a length of 10—12 mm., and the pupa has a similar length; the latter has a very strong armature on the front side of the head, consisting of four tubercles, placed in a quadrate, each produced in three strong spines; on the lower surface of the head there are two spines in the middle.

This beautiful species is easily recognised both by the spotted wings and by the colouring of the abdomen.

A. fenestratus is not rare in Denmark; Tisvilde, Rørvig; on Funen at Faaborg; in Jutland at Silkeborg, Hald, Kandestederne south of Skagen and on Læsø; finally on Bornholm at Rønne and Hasle. My dates are $^{7}/_{7}$—$^{5}/_{9}$. It flies in the sunshine on sandy places, especially near the shore, and often in pine-woods; it is generally seen sitting on the sand.

Geographical distribution: — All Europe and down into North Africa; towards the north to Lapland but there rare.

2. **A. maurus** L.

1761. Linn. Fn. Suec. 1785, p. p. (*Musca*). — 1842. Zett. Dipt. Scand. I, 198, 5 et 1855. XII, 4584, 5. — 1862. Schin. F. A. I, 49. — 1903. Kat. paläarkt. Dipt. II, 178. — 1820. *A. bifasciatus* Meig. Syst. Beschr. II, 156, 24, Tab. XVII, Fig. 15.

Male. Black; frons and epistoma with erect, black hairs, and with some depressed, golden hairs; occiput greyish black with depressed, golden hairs, a short fringe of black hairs along the posterior margin. Antennæ black, the basal joints with black hairs; the third joint with a short basal part and a long, styliform part. Thorax black, velvet pruinose and with some depressed, golden hairs; besides, it is sparingly clothed with erect, blackish or brownish hairs which at the front end form a dense fringe, this is reddish yellow above, blackish downwards; at the lateral margins of the thoracic disc there are two longitudinal bands of whitish or yellowish white hairs. The pleura have long, black hairs, more or less intermingled with yellow hairs; the metapleura have a tuft or vertical row of somewhat long, yellow hairs. Abdomen likewise velvet black and with depressed, golden, or more copper coloured hairs; at the base there is a fringe of erect, yellow

hairs; it has two transverse, snow-white, bands of somewhat long, depressed hairs, one at the hind margin of the first, the other at the front margin of the fourth segment, the latter is the broadest; the bands are sometimes more or less interrupted in the middle; the fifth segment is yellow haired at the hind margin, and the sixth and seventh segments have a white haired hind margin; for the rest, the abdomen is sparingly haired with erect, blackish hairs, and fringed with black hairs at the lateral margin; the first segment has yellow and white hairs at the lateral margins in connection with the mentioned yellow fringe and white band. Venter sparingly clothed with long, black, and more densely with depressed, golden hairs. Legs black, the tibiæ, especially the anterior, brownish; the hairs and bristles black, the scaly hairs golden to a greater or less extent; the front tibiæ with exceedingly small bristles. Wings black at the base, hyaline at the apex; the border of the black colour stretches very obliquely across the wing, beginning at the apex of the upper branch of the cubital vein, then going inwards and bending downwards, thus reaching the anal cell somewhat before its apex; the black colour sends a prolongation down outwards to the apex of the discal cell, this prolongation varies in size, and sometimes, but rarely, it may reach the hind margin. The cross-veins on the blackish part are lighter seamed. Costa with black hairs at the base. Squamula alaris blackish or brownish fringed; frenulum with yellow hairs. Halteres black, the apical part of the knob white.

Female. Quite agreeing with the male, only the vertex and frons slightly broader, the eye-margins diverging from the upper corner, so that this corner is more abruptly curved than in the male.

Length 4—10,5 mm.

A. maurus is not rare in suitable localities; Vedbæk, Odsherred, Tisvilde; in Jutland at Søndervig, Harboøre, Kandestederne south of Skagen and at Skagen; on Bornholm at Rønne and Hasle. My dates are $^{14}/_{6}$—$^{4}/_{9}$. It occurs in sandy districts flying in the bright sunshine, and as seen from the list of localities, it occurs especially at or near the shore, both in pine woods and outside. Zeller (Isis 1840, 31.) records, that he has seen it on flowers of Sedum acre.

Geographical distribution: — Europe down into Italy; towards the north to Lapland.

3. **A. afer** Fabr.

1794. Fabr. Ent. Syst. IV, 258, 7 et 1805. Syst. Antl. 122, 15. — 1842. Zett. Dipt. Scand. I, 199, nota. — 1862. Schin. F. A. I, 50. — 1903. Kat. paläarkt. Dipt. II, 174. — 1820. *A. fimbriata* Meig. Syst. Beschr. II, 154, 21, Tab. XVII, Fig. 13.

Male. Ground colour black or greyish black; frons and epistoma with short, erect, blackish or dark brownish hairs and covered with depressed, golden, scaly hairs; epistoma somewhat protruding. Occiput with depressed, white hairs, and with a short fringe of yellow hairs at the hind margin. Antennæ black or brownish black, the basal joints with short, black hairs; the third joint elongated conical, the distal part separated and the antennæ thus four-jointed. Thorax

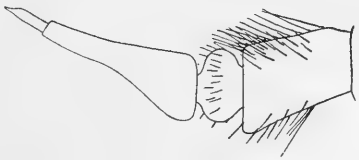

Fig. 38. Antenna of *A. afer*. × 45.

more or less densely clothed with scaly, golden or whitish hairs, and sparingly also with short, yellowish brown hairs which are denser at the front end and here form the common fringe which is yellow, but intermingled with black hairs below; at the hind part of thorax there are some stronger, black hairs; along each lateral margin of the disc there is a longitudinal stripe of white or slightly yellowish hairs. Pleura with longish hairs which are reddish yellow above, darker farther down; the metapleura have a vertical tuft of pale or reddish yellow hairs. There are strong postalar bristles on the postalar callus, and the bristles on the scutellum are also somewhat strong. Abdomen covered with scaly hairs which are black on the front parts of the segments but yellow at the hind margins, the second segment on the contrary is chiefly yellow haired with black hind margin; on the third and sixth segments there is a broad, white, transverse band on the front part, nearly covering the whole segment; the band on the sixth segment is interrupted in the middle; also the seventh segment is whitish haired. Abdomen also sparingly clothed with longer, black hairs which are denser at the lateral margins; the first segment has erect, white hairs at the sides, reaching like a fringe nearly to the middle. Venter with long, chiefly whitish, towards the apex more or less black, hairs, and depressed yellow or golden hairs. Legs blackish or brown; the hairs and bristles black, the scaly hairs to a great extent yellow or golden; the front tibiæ smooth. Wings hyaline, only blackish at the base and along the front margin; the blackish colour begins at the apex of the mediastinal vein, then stretches towards the base to the medial cross-vein which it follows,

then over the outermost base of the discal cell to end at the alula. Costa with black hairs at the base, and with yellow, scaly hairs above. Squamulæ with a whitish fringe; frenulum yellow haired. Halteres brown, the knob whitish yellow.

Female. Agreeing with the male, but the vertex and frons considerably broader.

Length 4—10 mm.

A. afer is very rare in Denmark, I only know of seven specimens, one from an earlier date, without particular locality, and six taken on Bornholm at Hasle in July (H. I. Hansen, Schlick.).

Geographical distribution: Europe down into Spain and Italy; it seems to have its northern limit in Denmark.

4. **A. occultus** Meig.

1820. Meig. Syst. Beschr. II, 153, 19. — 1840. Löw, Isis 1840, 533. — 1862. Schin. F. A. I, 51. — 1903. Kat. paläarkt. Dipt. II, 179.

Male. Shape somewhat slender. Black; frons with erect, black, and some depressed golden hairs; epistoma with black and yellow hairs; occiput with sparse, depressed yellow hairs, a short, yellow fringe at the hind margin. Antennæ black, the basal joints with black hairs; the third joint tapering evenly into a thin, styliform part. Thorax on the disc with black, scaly hairs, and sparingly clothed with erect, black hairs; at the front end the hairs are yellow and form a somewhat dense fringe all round which is blackish brown below. Pleura with long, yellow hairs which are dense above; metapleura with a vertical tuft of yellow hairs. Abdomen with parallel sides; covered with black, scaly hairs and some yellow hairs, especially at the front margin of the third and at the hind margin of the fifth and sixth segments; it has two white or whitish yellow, transverse hair bands, one at the front margin of the second, the other at the front margin of the fourth segment; the seventh segment is also whitish yellow haired; in addition the abdomen is clothed with somewhat long, black hairs; the hairs at the margin longer and somewhat fringe-like, at the sides of the first segment white, and likewise at the side of the second and fourth segments in connection with the white bands. Venter with long, black hairs, at the base some pale, and covered with black, scaly hairs; the fourth segment more or less covered with white, scaly hairs. Legs black or brownish, all hairs and bristles black; the front tibiæ with bristles. Wings blackish brown on the anterior half, about to the apex, but the border towards the posterior, hyaline part quite effaced. Costa with black hairs at the

base. Squamulæ blackish, yellowish fringed; frenulum with yellow hairs. Halteres blackish brown, the knob somewhat paler.

Female. Quite agreeing with the male, only the frons slightly broader.

Length 8—8,5 mm.

This species is of a somewhat more slender shape than most other species; the above description is made from four Danish specimens, one male and three females which are all quite similar. It agrees also rather well with Löw's description l. c.; Löw describes the halteres with a white knob, this may probably be so in fresh specimens.

A. occultus is very rare in Denmark, only four specimens have been caught, all in Jutland; Frijsenborg (H. I. Hansen) and in the vicinity of Silkeborg (A. Petersen); the dates are in July and to $^{17}/_{8}$.

Geographical distribution: — Middle Europe down into Germany, it seems to have its northern limit in Denmark; the species seems on the whole to be somewhat rare.

5. **A. circumdatus** Meig.

1820. Meig. Syst. Beschr. II, 143, 2. — 1842. Zett. Dipt. Scand. I, 196, 2 et 1849. VIII, 2980, 2. — 1903. Kat. paläarkt. Dipt. II, 175. — 1862. *A. hottentottus* Schin. F. A. I, 51.

Male. Black; frons with short, erect, black hairs, and with some depressed, yellow hairs, especially on the anterior part; epistoma and jowls with yellow hairs, in the middle of epistoma a few black hairs; occiput with silvery, above and backwards more golden hairs, a short, whitish fringe at the hind margin. Antennæ black, the two first joints black haired; the third joint tapering into a long styliform part. Thorax more or less covered with black, shining, scaly hairs, behind with short, depressed, yellow hairs over a part almost triangular with the base towards the scutellum; the middle part of the disc is clothed with erect, blackish hairs; in front they are more dense and yellow, forming at the front end the common fringe; there are yellow hairs along the lateral margins and likewise, but less dense, in front of the scutellum. Pleura with long, yellow hairs, specially dense above; on the metapleura a vertical tuft of yellow hairs. Scutellum covered with black scales, and with depressed yellow hairs at the hind margin. The postalar bristles yellow, the marginal scutellar bristles partly black, partly yellow. Abdomen with the ground colour black, at the sides on the first and second segments a reddish spot; the dorsal surface is covered with black scaly hairs; at the front margin of the second, third and fourth segments and at the hind margin of

the fifth and sixth segments there are transverse bands of yellow, scaly hairs; the band on the third segment is the narrowest, those on the fifth and sixth segments aré often somewhat doubled; abdomen further clothed with long, yellow hairs which are very dense and fringe-like at the sides; on the fifth and sixth segments they are intermingled with some black hairs; at the sides of the fifth and sixth segments there are black hairs, forming two black tufts, but these tufts are rather small and inconspicuous; the seventh segment has at each hind corner a tuft of white or pale yellow hairs; at the apex of abdomen there are some black, bristly hairs on the hind margin of the segments. Venter with short, depressed and with long hairs, all yellow. Legs black; the hairs and bristles black, the scaly hairs on the femora more or less yellow; the front tibiæ with bristles. Wings hyaline, the mediastinal and subcostal cells greyish or brownish tinged; the veins brownish black; costa black haired at the base and has at the root a fan-shaped patagium-like piece, covered with bright silverwhite scales. Squamulæ brownish with a bright pale reddish-yellow fringe; frenulum yellow haired. Halteres pale yellow.

Female. Agreeing with the male, but the frons considerably broader, the eye-margins diverging right from the upper corner; the patagium-like piece at the base of the wing blackish with a few yellow scales and the hair tufts at the seventh segment yellow.

Length 9—12 mm.

A. circumdatus is somewhat rare in Denmark and hitherto only found at Tisvilde and Odsherred (Schlick, the author) and in Jutland at Bulbjerg (Th. Mortensen.) My dates are $^{11}/_{7}$—$^{3}/_{9}$. It occurs together with *A. fenestratus* in the same localities as this, flying in the sunshine, but it is generally present in smaller numbers.

Geographical distribution: — Europe down into Spain and Italy; towards the north to middle Scandinavia.

6. **A. paniscus** Rossi.

1790. Rossi, Faun. Etr. II, 276, 1433 (*Bibio*). — 1820. Meig. Syst. Beschr. II, 152, 17. — 1851. Scholtz, Zeitschr. Entom. Breslau, V, 41. — 1862. Schin. F. A. I, 50. — 1820. *A. cingulatus* Meig. p. p. ♀, Syst. Beschr. II, 145, 3. — 1842. Zett. Dipt. Scand. I, 197, 3. p. p. — 1820. *A. modestus* Meig. Syst. Beschr. II, 146, 5.

Male. Black; frons with short, erect, black hairs and with some depressed, yellow hairs; epistoma and jowls with pale yellow hairs, some black just in the middle of the epistoma; occiput greyish black, along the eye-margin with silvery, above and backwards more yellow hairs, at the hind margin with a short, yellowish fringe. Antennæ

black, the first two joints with black hairs; the third joint tapering evenly into a styliform part. Thorax more or less covered with black, in the middle with golden yellow, scaly hairs, and clothed with long hairs which are mainly yellow, only just in the middle blackish or brownish; in front they are denser and form the common fringe at the front end; they are also somewhat dense at the lateral and hind margins. Pleura with long, yellowish hairs, which are whitish further down; metapleura with a vertical tuft of yellow hairs. Scutellum with black, along the hind margin with yellow, scaly hairs. The postalar bristles yellow, the scutellar marginal bristles black and yellow. Abdomen with the ground colour blak, at the sides of the first and second segments a reddish spot; the dorsal surface is covered all over with black, scaly hairs, only at the sides on the second, third and fourth segments there may be some yellow, scaly hairs, but they form no bands; at most they may stretch somewhat inwards on the second segment and they are nearly quite hidden by the long hairs; the abdomen is further densely clothed with long, yellow hairs which are, to a more or less extent intermingled with black hairs on the fifth and sixth segments, and sometimes these segments are very extensively black haired; at the lateral margin of the abdomen the hairs are fringe-like, on the fifth and sixth segments black, thus forming two distinct, black tufts; at each corner of the seventh segment there is a large, white hair tuft. Venter covered with black and, especially towards the hind margins of the segments, yellow, scaly hairs and clothed with long, yellow hairs. Legs black; the hairs and bristles black, the scaly hairs, especially on the femora, more or less yellow, or sometimes whitish. The front tibiæ with small bristles. Wings hyaline, brownish at the anterior margin. Costa with strong, black hairs at the base, and at the root a fan-shaped patagium-like piece covered with bright silverwhite scales. Squamulæ yellowish with a pale yellow fringe; frenulum with yellow hairs. Halteres pale yellow, the knob nearly white.

Female. The female differs somewhat from the male; the vertex and frons are somewhat broader; the patagium-like piece at the base of the wing is blackish or brownish, more or less intermingled with white or yellowish hairs; but the greatest difference lies in the colouring of the abdomen; this is, as in the male, covered with black, scaly hairs, but there are transverse bands of yellow, scaly hairs at the front margin of the second, third and fourth segments; the bands are generally somewhat narrowed in the middle, and that on the third segment is the narrowest and sometimes somewhat indistinct; at the

hind margin of the sixth segment there are also yellow hairs, and sometimes slight traces may also appear on the fifth segment.

Length 10—13 mm.

This species varies somewhat in the colour of the clothing of long hairs, especially on the abdomen, from deep yellow to pale, nearly whitish yellow.

A. paniscus is not rare in Denmark and may be present in all suitable localities; Vedbæk, Tisvilde, Rørvig, Jægerspris, Faxe; in Jutland at Søndervig and Skagen, and on Bornholm at Rønne and Hasle. My dates are $^{2}/_{7}$—$^{15}/_{9}$. It occurs in similar localities to the preceding species, flying in the sunshine, and often sitting on the sand; there seems to be some marked difference between the sexes with regard to the period of occurrence; I have sometimes caught the species in not small numbers, but only males, and this is also shown by the collections of our Museum; probably the males appear some time before the females.

Geographical distribution: — Europe down into Italy; towards the north to middle Scandinavia.

7. **A. hottentottus** L.

1761. Linn. Fn. Suec. 1787. (*Musca*). — 1903. Kat. paläarkt. Dipt. II, 177. — *A. flavus* 1820. Meig. Syst. Beschr. II, 143, 1. — 1842. Zett. Dipt. Scand. I, 195, 1 et 1849. VIII, 2980, 1 et 1855. XII, 4583, 1. — 1862. Schin. F. A. I, 51.

This species resembles *paniscus* to a high degree, so that a description by comparison is sufficient.

Male. The depressed, yellow hairs on the frons are generally present to a greater degree than in *paniscus*. The yellow, scaly hairs on the abdomen are more distinct, forming more or less distinct bands on the second, third and fourth segments; the bands are broadest at the sides, narrowed in the middle and here often interrupted, they are on the whole only slightly visible, being nearly quite hidden under the clothing of long hairs; the black hairs on the last segments are less pronounced than in *paniscus*; the hair tuft at each corner of the seventh segment is yellow. The scaly hairs on the legs are yellow to a greater degree than in *paniscus* and also more or less yellow on the tibiæ; the front tibiæ with small bristles as in *paniscus*. The patagium-like piece at the base of the wing is not silverwhite but yellow, often with some brown scales. The wings seem to be more hyaline, the brownish fumigation not going beyond the subcostal vein.

Female. The bands on the abdomen as in *paniscus*, that on the third segment a little more distinct.

Length. This species is distinctly larger, especially broader, than *paniscus*, the length is 13—15 mm.

After Künckel d'Herculais the pupa has the armature on the front side of the head very different from that in *A. fenestratus*; the two upper spines are almost united, the lover are separated, but small, and those on the lover side of the head are very small, wart-like.

A. hottentottus is very rare in Denmark, I only know four specimens, all females, taken at Vedbæk.

Geographical distribution: — All Europe and down into Algeria; towards the north to middle Scandinavia.

Remarks: The three species *A. circumdatus, paniscus* and *hottentottus* are very nearly related and very similar, and they have often been confused. *A. circumdatus* is in the male easily known by its banded abdomen, and the female also is distinguished without difficulty by the distinct bands on the fifth and sixth segments; finally, in both sexes the black hair tufts at the sides of the fifth and sixth segments are small and inconspicuous. *A. paniscus* is in the male distinguished from *circumdatus* by the want of bands on the abdomen, in the female by the very small bands or abscence of these on the fifth and sixth segments, and in both sexes the black hair tufts at the sides of fifth and sixth segments are somewhat larger and distinct. *A. hottentottus* is in the male distinguished from *paniscus* by the hair tufts on the seventh segment being yellow, by the patagium-like, scaly piece at the base of the wing being yellow or even somewhat brownish, not silwerwhite; generally it also has the frons more covered with yellow, depressed hairs and the wings clearer; in the female this species is very difficult to distinguish with certainty from *paniscus*; generally the band on the third abdominal segment is a little more distinct, but a good helping character is the size, the species being larger, especially broader than *paniscus*; thus in the female of *paniscus* the breadth of the abdomen generally measured 5 mm or slightly more, the fringe included, while in *hottentottus* it was nearly 7 mm.

The characters given by Schiner (F. A.) for *hottentottus* (*flava*) "Hinterer Augenrand rothgelbhaarig" and for *paniscus* "Augenhinterrand silberweiss", I have not found correct. The analytical table of Schiner gives one the impression that *paniscus* and *hottentottus* (*flava*) should be different by *hottentottus* having distinct and visible bands on the abdomen which are supposed to be absent in *paniscus*, while, as seen from the above descriptions and as already pointed out by Kowarz (Wien Ent. Zeit. 168) the two species are very similar in this respect, the bands in the male of *hottentottus* being only very

slightly visible and both females having the bands quite similar. Generally the female of *paniscus* is described as having no band on the third segment, e. g. by Scholtz, Schiner and Kowarz (l. c.); I have always found this band present, but very narrow, not only in all Danish specimens I have seen but also in specimens from other regions. Though Schiner states in the generic description that the abdomen has seven segments, he yet says with regard to the white or yellow hair tufts at the apex in all three species: "am vorletzten Ringe", but this is not correct as the hair tufts are sitting on the seventh segment.

4. **Bombylius** L.

Species of smallish to somewhat large size, densely hairy with erect hairs; the ground colour blackish or brownish, but generally

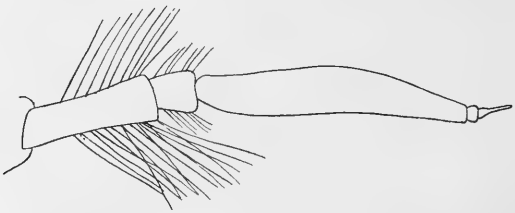

Fig. 39. Antenna of *B. major* × 25.

appearing yellowish on account of the pile; more rarely the pile is more or less black. Head somewhat small, narrower than thorax and situated somewhat downwards at the front end of thorax; it is broader than high, and slightly arched behind. Frons and epistoma somewhat, more or less, protruding. The eyes much narrower than high, more or less reniform, touching in the male, well separated in the female; in the male the upper facets are somewhat larger than the lower. Antennæ inserted near to each other, somewhat above the middle. Jowls small, not or very slightly descending below the eyes. Antennæ five-jointed, the first joint long, cylindrical, the second short, the third the longest, the two last forming a small style the first joint of which is short, the last terminating in a short, bristly part.[1] Epistoma somewhat short; the mouth aperture large and looking forwards. There is a distinct oral cone; clypeus broad, chitinised above with a prolongation stretching down on each side, but membranous in the middle below and thus horseshoe-shaped. On the

[1]) Schiner ascribes to *Bombylius* a three-jointed style, perhaps counting the bristly apical part as a joint.

posterior side of the oral cone lie the stipites of the maxillæ. Proboscis more than half as long as the body, directed forwards and more or less downwards; labrum as long as the basal part of labium, pointed at the apex; the maxillæ are long, chitinous threads, and likewise hypopharynx which is slightly broader towards the base; the maxillary palpi are small, one-jointed, beset with hairs; hypopharynx and maxillæ a little longer than labrum, hypopharynx the longest; labium long and thin, strongly chitinised; the basal part is long, twice as long as the labella; these latter are narrow, not broader than the basal part, chitinised; they are indistinctly two-jointed, and they are able to be spread out and recurved. In rest the oral cone is infolded, but the proboscis protrudes. Thorax short, almost quadrate; postalar and scutellar marginal bristles may sometimes be visible in the clothing; metapleura with long hairs. Abdomen short, pointed behind, consisting of seven not transformed segments. The male genitalia resemble those in *Argyramoeba,* but they are asymmetrically turned; they consist of an eighth, small but normally shaped segment, at the apex of this, above there is a somewhat triangular plate, divided longitudinally by a suture; its two halves are somewhat divergent at the end, and each has a two-pointed apex, the outer point being the longest; at the ventral side there is a somewhat semiannular plate with two small lamellæ at the apex. The female genitalia also resemble those in *Argyramoeba* and *Anthrax* and there are the same two combs of spines, but they are quite withdrawn, and the opening leading to them is closed by dense, converging hairs. Legs with shorter or longer, strong bristles on the ventral side of the posterior femora, or only on the hind femora, and on the tibiæ, those on the front tibiæ small; all tibiæ with apical spurs, on the front tibiæ they are very small. Claws of middle size. There are two well developed pulvilli; the empodium is very small, lobe-shaped. Wings with the cubital

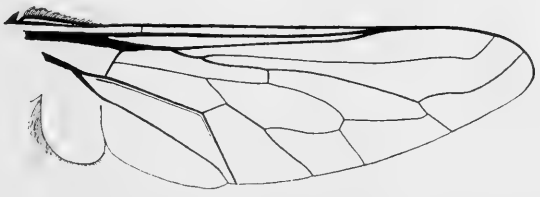

Fig. 40. Wing of *B. minor*.

vein issuing in a normal manner from the radial vein, it is forked and there are two cubital cells; four posterior cells as in the Anthracids, the first closed at some distance from the margin; anal cell narrowly open; the first basal cell longer than the second. At the

base of the costa there is a small, triangular prominence (answering to the præalar hook). Alula large, hairy at the margin towards the base; alar squamula fringed at the margin; frenulum with long hairs.

The larva and pupa of *B. minor* (determined as *pumilus* Meig.) have been thoroughly described and figured by Nielsen (Zool. Jahrb. 18, 1906, 647, Taf. 28), and I am indebted to Mr. Nielsen for examining his material. The larva was found in the cells of *Colletes daviesana*. The full grown larva is white, cylindrical or somewhat flattened, consisting of thirteen segments. The head is small and retractile; the mouth parts consist of a median, somewhat hook-formed labrum, knife-shaped, somewhat serrated mandibles, and large, lobe-shaped maxillæ with a one-jointed palpus; at each side of the labrum above there is a small, one-jointed antenna. The larva is amphipneustic with a pair of spiracles on prothorax and another pair on the penultimate segment. According to Nielsens investigations the larva moults three times during growth and alters its shape on each moulting. The young larva is slender, the three thoracic segments have each a pair of long bristles; there is a pair of tubercles (Fussstummel) at the anterior margin of the second to sixth abdominal segments on the ventral side, the penultimate segment has a pair of larger tubercles, and at the apex of the body there are two long bristles. The larva is in this stage metapneustic, having only the posterior spiracles. In this stage the larva eats the pollen stored in the bee-cell. When the larva has reached a length of 2 mm., it attacks the *Colletes* larva; having fixed itself on the host it moults, and its shape changes; it is now relatively thick, without bristles or tubercles, and it has acquired the anterior spiracles. When the larva has reached a length of 8—9 mm. it moults again and passes to the third stage; it is now broader, the segments have somewhat dilated margins, and the body is not quite cylindrical but somewhat flattened. The mouth parts also are a little altered during the growth. When the larva is full grown it has a length of 10—12 mm., it now rests about fourteen days and then pupates. — The pupa resembles the Anthracid pupæ; it has on the front of the head at the base of the antennal sheaths two strong, downwards curved spines which are triangular in section, at the end of each antennal sheath there is a pair of similar spines, and on the ventral side at the base of the proboscis another pair, thus in all eight spines; behind the pair at the end of the antennal sheath there is a curious, movable, palp-like organ with a pencil of hairs at the apex. There are some long hairs on the head. On the dorsal side of the second to sixth abdominal segments there is a transverse row of somewhat semiannular, chitinous hooklets, arranged

parallel to each other, with the points protruding upwards; on the last segments they are weaker with only the posterior point protruding; there is a row of long bristles on the first segment, and similarly on the following segments between the hooklets; each segment has on the ventral side a transverse row of long bristles. The last segment has at the apex above a chitinous edge with two small spines, and below a three-pointed spine at each side. The sheaths of the hind metatarsi stretch out about at the end of the proboscis, and they diverge somewhat.[1] There are prothoracic and seven pairs of abdominal spiracles. — The larva and pupa of *B. major* are described by Algernon Chapman (Entom. Month. Mag. XIV, 1878, 196); they agree in the main with the above descriptions, and the pupa also shoved the curious palp-like organ. — Before the escape of the imago the pupa works out of the cell and through the earth, to the surface, by aid of its head and body armature; the cast pupa-skin may be found sticking out of the ground.

The egg-deposition was not observed by Nielsen, but it has been observed by Algernon Chapman (l. c.) in a small, brown species and I may quote what he says: "The fly would approach the bank within an inch or so, and carefully examine it, and, if satisfied, would make a little sudden swoop, bringing the extremity of the body close to the bank, by passing from a horizontal to a sloping attitude, yet not touching it, the small white egg being seen to be thrown with a short jerk against the bank."

The larvæ live parasitically on the larvæ of solitary bees. Already Latreille (Gen. Crust. et Ins.) thought, that the larvæ lived parasitically, while Macquart (Suit. a Buff. I, 1835, 376) believed, that they lived in the earth and Zetterstedt (Ins. Lap. 510) that they fed upon roots

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[1] Brauer (Denkschr. Kais. Akad. Wiss. Wien, Math. Nat. Cl. XLVII, 1883, 27) describes the mouth parts of the larvæ (Bombylina) somewhat erroneously, and he has not found mandibles; he thinks these are wanting or connected with the maxillæ; in *Anthrax* on the contrary he found the mandibles. — In describing the pupa of *B. major* he says: "Die Spitze der Rüsselscheide erscheint wie der Fuss eines Zweihufers und steht mit den zwei Spitzen mehr nach hinten." and p. 28 he says about the Asilid pupa: "Die Rüsselscheide ragt jedoch nie als stark chitinöse, braune gabelig getheilte Platte vor, wie das bei Bombyliden der Fall ist." I have not seen such a structure in *B. minor*, and it is not described nor figured with regard to *B. major*; it is not clear what Brauer's statements mean; one would be inclined to think that in the first quoted place he has considered the sheaths of the hind metatarsi which stretch out just at the end of the proboscis and are somewhat divergent as belonging to the proboscis; in the latter place he seems to refer to the two spines on the under side of the head which are placed on the base of the proboscis.

of plants. Imhoff (Isis, 1834, 536) found the pupa in a situation which pointed towards their living on *Andrena humilis*. Mac Leay (Ann. Nat. Hist. II, 1838, 12) declares that some tropical Bombyliids live on bees. Morelet (Bull. Soc. Ent. d. Fr. 1854, XXIV) bred a *Bombylius* from the nest of *Halictus succinctus*. Léon Dufour (Ann. Soc. Ent. de Fr. VI, 1858, 505, pl. 13, fig. 3) found pupa skins of *B. major* sticking out of the ground, together with newly hatched imagos, at places much frequented by Andrenids. Westwood (Trans. Ent. Soc. Lond. 1876, 498) found *B. medius* flying in association with species of *Andrena*, and found pupa-skins protruding from the ground. Schmidt-Goebel (Stett. Ent. Zeit. 1876, 393) bred a *Bombylius* from *Colletes fodiens*. Algernon Chapman (l. c.) bred *B. major* from cells of *Andrena labialis*. Finally Nielsen (l. c.) bred *B. minor* from cells of *Colletes daviesana* as mentioned above[1]. The hibernation seems to be different in the different species; Algernon Chapman (l. c.) found larvæ of *B. major* in the winter; thus these probably hibernate. Nielsen (l. c.) on the contrary found the newly hatched larvæ of *B. minor* in the *Colletes* cells in April, and they developed to imagines in the same summer, in this latter case the egg or the young larva must hibernate, the larva not getting into the *Colletes* cell before the spring, as Nielsen expressly states, having examined many *Colletes* cells in the winter without finding eggs or larvæ.

The species of *Bombylius* are rather characteristic flies, by their dense fur being somewhat similar to humble-bees. They occur on sandy places at the outskirts of woods and similar localities; they fly very well and are able to stay hovering in the air; they frequent flowers and while sucking they generally only touch the flower with the legs, without sitting, but using the wings which are in constant vibration as already observed by Zeller (Isis 1840, 14); the same author states that they rest on straws and flowers in the night; on being disturbed they move the wings but are unable to fly. While flying they produce a somewhat loud sound.

Of the genus about 100 species are known from the palæarctic region, the majority being southern forms; 2 species have hitherto been found in Denmark.

Table of Species.

1. Wings with a sharply bounded blackish tinge on the anterior part; occiput with long hairs at the posterior eye-margin; costa without spinulous hairs at the base ..... 1. *major*.

[1] Nielsen mentions that the *Bombylius* larva was also found on the larva of *Epeolus productus*, which is parasitic on the *Colletes* in that it eats the pollen stored up by this. It also happened that the *Bombylius* larva devoured two *Colletes* larvæ or even, besides the *Colletes* larva, a larva of its own.

— Wings with a slight, brownish, not distinctly bounded tinge towards the anterior margin; occiput without long hairs at the posterior eye-margin; costa with spinulous hairs at the base.. 2. *minor*.

1. **B. major** L.

1761. Linn. Fn. Suec. 1918. — 1842. Zett. Dipt. Scand. I, 188 et 1849. VIII, 2977, 1. — 1855. Loew, Neue Beitr. III, 14, 21. — 1862. Schin. F. A. I, 60. — 1903. Kat. paläarkt. Dipt. II, 195.

Male. Ground colour black. Vertex with black hairs; frons with some short, yellow, and with long, blackish or brownish hairs; face and cheeks with long, reddish brown hairs; occiput with short, yellow, and with long, erect, brownish to reddish hairs, those along the posterior eye-margin the longest, somewhat strong and brown. Antennæ black, the first two joints with long, black hairs. Thorax and scutellum densely clothed with long, erect, yellow or pale greyish yellow hairs. Pleura and sterna with pale reddish hairs, at the sides from the humerus to the wing-root a broad, dark reddish brown stripe; below the wing-root white hairs; metapleura with long, yellow hairs. Abdomen densely clothed with long hairs of the same colour as those on thorax but somewhat pale to whitish at the margin towards the apex. Venter densely clothed with long, white hairs; about in the middle there is a black, transverse band, reaching the sides and thus forming a black spot in the middle of the lateral margin; the band is somewhat widened in the middle and reaches the apex. Above the segments have black, bristly hairs over about the apical half part of the abdomen, placed in transverse rows and more or less visible in the clothing; they are most numerous at the apex. The whole clothing of the body shines quite whitish when seen from the side. Legs yellow or brownish, the tarsi black towards the apex, the femora blackish at the base; the femora at the basal part clothed with long, brownish or blackish hairs, stretching nearly to the apex below; the hind femora on the ventral side with a row of long, strong bristles anteriorly and a row of shorter bristles posteriorly; all the bristles black; the depressed, somewhat scaly hairs whitish yellow. Wings hyaline, blackish at the anterior margin, the bordering line sharp, it stretches with some incisions from the alula which is quite blackish to the apex of the radial vein; below the radial vein near the apex there is a small spot, continuous with the other black part. Veins blackish brown. Squamulæ blackish with a yellow fringe. Halteres light brown, the peduncle paler.

Female. Quite agreeing with the male, only the frons is broad and yellow haired.

Length 7—12 mm.

Remarks: Loew l. c. mentions a form which he wishes to consider as a variety under the name *australis*; it is distinguished by a tuft of black hairs in the middle at the front margin of the thorax; I have never found such a tuft in the males, but on the contrary in all females I have seen, I therefore think it is a character always found in the females and only in these; the females also have as a rule the pile somewhat deeper yellow in contrast to the more greyish yellow colour of the male.

B. major is not rare in Denmark in several localities, but it has hitherto only been taken on Sealand and Lolland; Ermelund, Dyrehaven, Bøllemosen, Donse, Hillerød and on Lolland at Lysemose near Maribo and at Bremersvold. It is an early species; my dates are $^{15}/_{4}$—$^{8}/_{5}$. It occurs at the outskirts of woods and thickets; I have seen it on flowers of Salix, and it is also recorded to frequent species of Lamium; not rarely it is seen sitting on the ground.

Geographical distribution: — All Europe and in northern Africa; towards the north to Lapland, but here somewhat rare; it occurs also in North America.

2. **B. minor** L.

1761. Linn. Fn. Suec. 1919. — 1842. Zett. Dipt. Scand. I, 189, 2 et 1849. VIII, 2978, 2. — 1855. Loew, Neue Beitr. III, 12, 13. — 1862. Schin. F. A. I, 62. — 1903. Kat. paläarkt. Dipt. II, 196.

Male. Ground colour blackish or brownish grey, generally with two lighter stripes on the thorax which are visible through the pile. Face with yellow or whitish hairs which are curved downwards; jowls with white hairs. Occiput with depressed, yellow to silvery hairs and with erect, not long, yellow hairs. Antennæ black, the first joint grey with yellowish hairs. Thorax densely clothed with erect, yellow or more greyish yellow hairs, shining somewhat whitish at the front end; postalar and scutellar marginal bristles visible, yellow. Pleura and sterna with pale yellowish or, farther down, white hairs; metapleura with long, pale hairs. Abdomen densely clothed with long hairs of the same colour as on thorax but more or less whitish towards the apex; at the hind margin of the second segment a transverse row of numerous black bristles, and some few on the following segments; they are sometimes (in small specimens) less numerous and less visible. Venter clothed with long, pale yellow or whitish hairs. Legs yellow, the tarsi darkened towards the ends; femora at the base with moderately long, yellowish hairs; hind femora on the ventral side anteriorly with a row of long, strong bristles; the bristles on the legs black, the scaly hairs yellowish white. Wings slightly greyish, at the

base and some way out along the anterior margin brownish or blackish tinged, the colour may be more or less saturated and more or less extended; veins brown or blackish, the medial cross-vein situated on the middle of the discal cell or slightly before the middle. Costa at the base with blackish brown, strong hairs at the margin and depressed, yellow hairs above. Squamula yellowish with a yellow fringe. Halteres yellow.

Female. Agreeing with the male but the front broad, yellow haired, the inner eye-margins parallel; the wings more hyaline, only slightly tinged at the anterior margin, sometimes nearly quite hyaline.

Length 6—11 mm.

B. minor is not rare in Denmark, and has been taken in several localities; Dyrehaven, Hillerød, Tisvilde, Rørvig, on the last locality in great numbers; in Jutland at Søndervig and Skagen, and on Bornholm at Rønne. My dates are $^{15}/_{7}$—$^{5}/_{8}$. The species occurs in woods, on open sandy places and at the shore. I have especially taken it on the flowers of Thymus serpyllum, Succisa praemorsa and Jasione montana, but also on others flowers. The young larvæ were taken at Hillerød in April in the cells of *Colletes daviesana*.

Geographical distribution: — All Europe; towards the north to middle Scandinavia. Zetterstedt records that it frequents flowers of Thymus serpyllum and other low plants.

Remarks: — Zetterstedt (l. c. I, 190, 4) has a *B. pumilus* which is not identical with *pumilus* Meig. and is as yet not recognised; he records one specimen of this species as taken "in Jutlandia boreali", and sent to him by Stæger; in the collection in our Museum there are specimens from Skagen which, so far as I know, originate from Stæger's collection, and I think that Zetterstedt's *pumilus* is identical with *minor*; Wahlgren (Entom. Tidskr. Upsala, Årg. 28, 1907, 185) also identifies *pumilus* Zett. with *minor* L.

5. **Systoechus** Loew.

Species of somewhat small size, generally with a dense yellowish pile which on the abdomen is often somewhat serially arranged. The genus agrees in all main respects with *Bombylius*. The head as in *Bombylius*, the eyes not so narrow, touching or somewhat separated in the male, well separated in the female. Antennæ inserted near to each other, above the middle; their shape is as in *Bombylius*, but they are only three- (or four-) jointed, the terminal part being indistinctly separated off, so that I could not assertain whether it is really a separate joint or not. Mouth parts as in *Bombylius*, proboscis relatively longer, the maxillary palpi shorter. Thorax and abdomen

as in *Bombylius*, notopleural, postalar and scutellar marginal bristles present, the first generally hidden in the pile; metapleura with a vertical tuft of hairs. Male and female genitalia quite similar to those in *Bombylius*. Legs with bristles on the ventral side of the posterior femora and on the tibiæ, on the front tibiæ they are small; all tibiæ

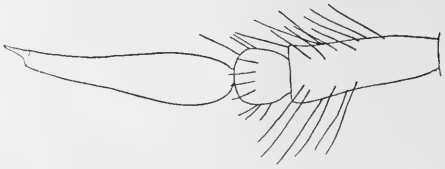

Fig. 41. Antenna of *S. sulphureus*. × 60.

with apical spurs. Claws small; the pulvilli well developed; the empodium rudimentary. Wings as in *Bombylius*, but the medial crossvein situated near the base of the discal cell, thus the basal cells of equal length. Alula well developed, fringed at the margin. Alar squamula fringed at the margin; frenulum with long hairs.

The larva and pupa I have not examined; they are described and figured (*S. oreas*) by Riley (Sec. Rep. of the U. S. Ent. Comm. for 1878 and 79, 1880, 261, pl. XVI, and Amer. Nat. XV, 1881, 445, pl. VI, fig. 1—3), and those of *S. autumnalis* and *S. (Anastoechus) nitidulus* by Portchinsky (Les parasites des criquets nuis. en Russie, St. Petersb. 1894). The larva is whitish, cylindrical or somewhat flattened with slight swellings along the lateral margins. The body consists of thirteen segments. The head is small, retractile; the mouth parts are quite like those in *Bombylius*, and there are likewise small antennal papillæ. The larva is amphipneustic with spiracles on prothorax and on the penultimate segment. The pupa also resembles that of *Bombylius*; it is yellow and has two strong spines on the head at the base of the antennal sheaths, and at the end of each sheath two other spines somewhat connected at the base, and finally there is a pair of spines at the base of the proboscis, thus eight spines in all. The armature of the abdomen is similar to that in *Bombylius*, but there seem to be no long bristles on the first dorsal abdominal segment. Riley gives mesothoracic and eight pairs of abdominal spiracles, but I think this is erroneous and his figure only shows prothoracic and seven abdominal pairs of spiracles.

The larvæ live in the egg-cases of locusts; *S. oreas* was bred from *Oedipoda atrox* (Riley, l. c.), *S. autumnalis* and *leucophaeus* from *Stauronotus maroccanus* (Stépanof, Verh. Nat. Gess. Charkow, XIII, 1880 and XV, 1881) and *S. (Anastoechus) nitidulus* from the same (Chimkewitch, Horæ Ent. Ross. XVIII, 1883), finally Portchinsky (l. c.)

bred *autumnalis* and *nitidulus* from the same *Stauronotus*. The larva hibernates as full grown and it pupates and develops to imago in the following summer.

The species of *Systoechus* occur in the same way and at the same places as the Bombylii.

Of the genus 19 species are known from the palæarctic region; one has hitherto been found in Denmark.

1. **S. sulphureus** Mikan.

1796. Mikan, Mon. Bomb. Bohem. 52, 11, Tab. III, Fig. 11 (*Bombylius*). — 1855. Loew, Neue Beitr. III, 39, 69. — 1862. Schin. F. A. I, 64. — 1820. *B. fulvus* Meig. Syst. Beschr. II, 205, 25. — 1842. *B. minimus* Zett. Dipt. Scand. I, 193, 7.

Male. Ground colour blackish or brownish black. Frons and face with depressed, yellow hairs and with long hairs which are yellow and blackish intermingled, mainly blackish outwards and yellow inwards towards the mouth aperture. Occiput with depressed, yellow hairs which are nearly hidden by dense, erect, yellow hairs; downwards, behind the mouth aperture, the hairs are white. Antennæ black, the first joint with black hairs. Thorax densely clothed with erect, bright yellow to pale yellow hairs. Sterna and pleura likewise with long, yellow hairs; metapleura with a vertical tuft of specially long hairs; postalar and scutellar marginal bristles yellow. Abdomen clothed with long, erect hairs of the same colour as on thorax; the hairs are arranged on the segments in such a way, that they to some degree form transverse rows; there are long, more or less distinctly visible bristles at the hind margin of the segments; these bristles may be blackish or brownish, but they are most often yellow, though darker than the hairs. Venter with long, yellow hairs. Legs blackish or sometimes dark brownish, the outermost base of the femora and the basal part of the tibiæ often lighter to yellowish; the bristles chiefly black, more or less yellow on the hind femora; the femora somewhat yellowish haired below towards the base, the de-

Fig. 42. Wing of *S. sulphureus*.

pressed hairs yellowish. The number of bristles on the ventral side of the hind femora 3 to 5 and on the antero-ventral side of the hind tibiæ 3 to 4. Wings somewhat greyish, slightly brownish towards

the anterior margin; veins brown; costa at the base with black spinules in the margin and yellow haired above. Squamulæ light brownish with a yellow fringe at the margin. Halteres brownish with the knob white or yellowish white.

Female. Agreeing with the male but the frons broad; the legs generally lighter.

Length 4—6,5 mm.

Remarks: The bristles at the hind margin of the abdominal segments are generally described as black; in all the Danish specimens I have seen they are nearly always yellow to light brownish.

S. sulphureus is common in Denmark in suitable localities; Tisvilde, Rørvig; on Funen at Faaborg; in Jutland at Villebølle north of Ribe, Silkeborg, Kandestederne south of Skagen and Skagen. My dates are $^{15}/_{6}$ to the first half of August. It occurs in sandy districts and especially on heaths, often in great numbers. I generally found it on the heaths at places where the Calluna was scattered, with the sand somewhat open and covered by Lichens; it flies very dexterously and is not easily caught. As already noticed by Zeller (Isis 1840, 14, 16) the fly produces a faint humming when flying.

Geographical distribution: — Europe down into Italy; towards the north to middle Scandinavia; also in parts of Asia and in the northern Africa.

6. **Phthiria** Meig.

Species of small size and of greyish or blackish colour, moderately hairy; sometimes the females have yellow markings. Head somewhat broader than thorax and broader than high, slightly arched behind; frons and face more or less protruding. Eyes touching in the male, broadly separated in the female. Antennæ inserted near to each other in the middle on the protruding face. Jowls somewhat de-

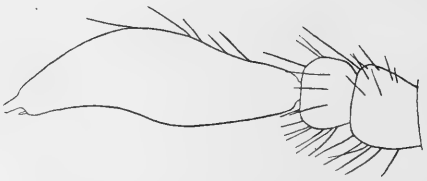

Fig. 43. Antenna of *P. pulicaria*. × 90.

scending below the eyes. Antennæ three-jointed, the two basal joints short, cylindrical, the third long, somewhat compressed, at the apex terminating in a thinner, short, styliform part, and below this part is

inserted a small spine (perhaps answering to a fourth joint).[1] Epistoma very small, the mouth aperture large and nearly reaching the antennæ; it looks downwards and somewhat forwards. The oral cone well developed; clypeus horseshoe-shaped with long arms stretching nearly from the antennæ to the labrum. The mouth parts resembling those in *Bombylius*; on the posterior side of the oral cone lie the stipites of the maxillæ; proboscis long, more than half as long as the body, directed forwards and somewhat downwards. Labrum triangular, longpointed, reaching to the end of the second joint of the labella; hypopharynx a chitinous blade as long as the labrum; the maxillæ are very thin, thread-like and likewise as long as the labrum; the maxillary palpi small, one-jointed. Labium long, the basal part about four times as long as the labella; these latter are narrow, distinctly two-jointed. Thorax almost quadrate; no macrochætæ visible; metapleura bare. Abdomen consisting of seven not transformed segments, in the male it is somewhat narrow, narrower than thorax, in the female it is shorter and broader, as broad as thorax. The genitalia, so far as I could ascertain by examining with a lens, seem to resemble somewhat those in *Bombylius*. Legs without bristles or with some very small ones on the hind tibiæ; the apical spurs likewise small. Claws small; pulvilli distinct, empodium rudimentary. Wings with the first posterior cell open, the anal cell closed at a little distance before the margin; otherwise the wings as in *Bombylius*. Alula well developed; alar squamula with a short fringe at the margin; frenulum without long hairs.

So far as I am aware the developmental stages of this genus are not known.

The species of *Phthiria* occur especially on sandy places, and they frequent flowers which they suck with the long proboscis.

Of the genus 15 species are known from the palæarctic region, 2 have hitherto been found in Denmark.

Table of Species.

1. Face and frons very prominent in the male, with long, mainly black hairs; the cubital fork somewhat long ..... 1. *pulicaria.*
— Face and frons slightly prominent in the male, with short, white hairs; the cubital fork shorter ..... 2. *canescens.*

1. **Ph. pulicaria** Mikan.

1796. Mikan, Mon. Bomb. Bohem. 58, 14, Tab. IV, Fig. 14 (*Bombylius*). — 1842. Zett. Dipt. Scand. I, 194, 1, p. p. et 1849. VIII, 2979, 1. — 1846.

[1] This structure of the antennæ fully agrees with Meigen's statement (Syst. Besch. II, 217) that they have a small, double style of unequal thickness, because it appears so when seen with a lens.

Loew, Linn. Entom. I, 384, 1. — 1862. Schin. F. A. I, 67. — 1903. Kat. paläarkt. Dipt. II, 204.

Male. Frons transverse, strongly protruding, together with face and occiput grey, whitish along the anterior eye-margins; frons and face with long, erect black hairs, at the mouth aperture whitish hairs; posterior eye-margin with yellow or brownish hairs which are long and erect above. Antennæ black. Thorax dark grey or blackish, with two indistinct, lighter, longitudinal stripes in front; it is somewhat sparingly clothed with erect, whitish or pale yellowish hairs. Pleura clothed in the same way, there are long hairs especially on the posterior part of the mesopleura; metapleura without hairs. Abdomen dull black, clothed with long, erect hairs which are more whitish than on thorax; they are somewhat indistinctly arranged in transverse rows; at the apex there are a few dark or blackish hairs. Venter grey with long, whitish hairs. Legs blackish or dark brown, the femora with longish, white hairs below. Wings hyaline, the mediastinal cell yellowish tinged; veins pale brown; the cubital fork somewhat long and thus the base of the fork lying over the cross-

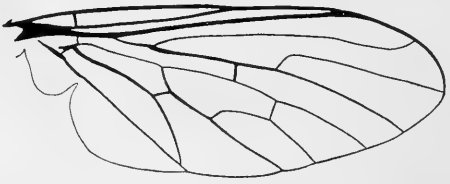

Fig. 44. Wing of *P. pulicaria*.

vein closing the discal cell apically, or nearer the base of the wing; the two posterior branches issuing from the discal cell somewhat converging. Halteres yellowish, the knob more or less darkened.

Female. Ground colour lighter grey than in the male, and the two lighter stripes on thorax broader, thorax thus being nearly light grey with a dark middle line. Jowls and the lower part of occiput whitish yellow, on the latter a dark middle stripe stretching to the posterior edge of the mouth aperture; on each side of the face from the base of the antenna to the eye a dark brown spot which stretches somewhat downwards along the eye; frons broad, grey, the inner and posterior eye-margins whitish yellow to a greater or less degree, the whitish yellow margin being broader or narrower, sometimes somewhat indistinct; frons with depressed and some erect, yellow hairs, cheeks and jowls with whitish hairs, on the dark spots at each side of the antennæ blackish or brownish hairs. Occiput with erect, not long, yellow hairs. Thorax with the humeral callus, a stripe from

this to the wing-root, the postalar callus and a larger or smaller spot at the apex of scutellum yellowish, the spot on scutellum sometimes so large that it only leaves the anterior corners of scutellum grey; on the pleura a spot above the front coxæ, the upper part of sternopleura, the metapleura and hypopleura yellowish. Thorax densely clothed with depressed and with somewhat erect, yellowish hairs. Abdomen likewise densely clothed with depressed, yellowish hairs, completely hiding the ground colour; at the hind margin of the segments erect, yellowish hairs; at the apex some blackish hairs. Halteres quite yellowish white.

Length 2,5—4 mm.

Ph. pulicaria is somewhat common in Denmark; Charlottenlund, Tisvilde, Odsherred; on Funen at Faaborg; in Jutland at Villebølle north of Ribe, Sæby and Frederikshavn, and on Bornholm at Hasle. My dates are from the last part of June to the end of July. It occurs in sandy places and it is recorded as frequenting flowers of Hieracium especially.

Geographical distribution: — Most parts of Europe; towards the north to middle Scandinavia; also in northern Africa.

2. **Ph. canescens** Loew.

1846. Loew, Linn. Entom. I, 390, 3. — 1849. Zett. Dipt. Scand. VIII, 2979, 2. — 1862. Schin. F. A. I, 67. — 1903. Kat. paläarkt. Dipt. II, 203. — *Ph. pulicara* p. p. Zett. Dipt. Scand. I, 195, 1.

This species in most respects so greatly resembles the preceding that I shall only treat it comparatively. Male. Frons and face slightly protruding, much less than in *pulicaria*, the hairs all white and much shorter than in *pulicaria*, especially those on the frons. The hairs on occiput are white or whitish, likewise much shorter than in *pulicaria*, and curved forwards at the tips. Wings with the cubital fork shorter than in *pulicaria* and thus the base of the fork lying nearer to the apex of the wing than the cross-vein closing the discal cell apically; the two posterior branches issuing from the discal cell slightly converging.

Female. Differing from the male in quite the same way as in *pulicaria*; the yellowish spot on the scutellum somewhat incised on the front margin.

Length 4 mm.

Ph. canescens is very rare in Denmark, only one specimen, a male, has been caught on Bornholm at Allinge in July (H. J. Hansen); it will probably be found to be more widely distributed in our country.

Geographical distribution: — Northern and middle Europe down into France; towards the north to southern Scandinavia.

POLYTOMA.

Therevidae.

Head about as broad as thorax, broader than high, slightly arched behind; it is somewhat flattened in front below, the face looking somewhat downwards. Epistoma short, retreating; frons and epistoma sometimes protruding. Jowls small, broader or narrower, slightly descending below the eyes. Antennæ inserted near to each other, about in the middle; they consist of four to five joints, the first joint long, cylindrical, sometimes large and thickened, the second joint short, the third long, the two last forming a short style terminating in a small bristle (in *Xestomyza* the style is one-jointed).[1] Eyes touching in the male, well separated (more or less) in the female. In the male the upper facets are somewhat larger than the lower, the dividing line more or less sharp. The eyes are generally greenish or bright green, somewhat metallic; in some cases (*Xestomyza*, *Th. poecilopa*) they show a purplish line. Three ocelli present. Weaker or stronger occipito-orbital bristles along the posterior eye-margin. No distinct oral cone. Clypeus more or less horseshoe-shaped, lying about horizontally from the epistoma to the labrum. Proboscis short (in *Xestomyza* the proboscis is elongated, as long as or longer than the head). Labrum, maxillæ and hypopharynx of equal length, about half as long as the proboscis; labrum and hypopharynx truncate at the end; the maxillæ thin, pointed, the maxillary palpi rather long, one-jointed; labium with a short basal part and large, somewhat broad labella. Thorax almost rectangular, longer than broad; of macrochætæ strong notopleural, supraalar and postalar bristles are present, further one or two dorsocentral bristles and finally scutellar marginal bristles.

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[1] Mik says (Verh. zool. bot. Gesell. Wien, XXXI, 1882, 329) that the antennæ of *Thereva* are four-jointed (the style not considered); he continues: "man wird auch bei jenen Formen, bei welchen das kurze dritte Glied mit dem langen viertem Gliede innig verwachsen ist, eine Abgrenzung desselben wahrnehmen können." It is thus the basal part of the third joint he considers as a separate joint, but I have never found the basal part separated, and Wandellock (Zool. Jahrb. VIII, 784, Tab. 18, Fig. 30) also considers the third joint as undivided.

Metapleura with long hairs. Abdomen consisting of seven not transformed segments; it is generally somewhat long, conical (*Exapata* has a short, broad abdomen). Legs somewhat long, slender, provided with stronger or weaker bristles. All tibiæ with apical spurs. Claws not strong; two pulvilli but no empodium. Wings with the costal vein extending all round the margin; the cubital vein forked, thus two cubital cells; the discal cell formed exclusively of the discal vein, between it and the upper branch of the postical vein a postical cross-vein; three veins issuing from the discal cell; five posterior cells, the fourth more or less narrowly open or closed near the margin. Alula well developed; squamula alaris developed with a short fringe at the margin, squamula thoracalis not developed but the frenulum distinct, broad towards the angulus. In rest the wings are borne somewhat, more or less open, in some species very slightly open, nearly parallel.

The larvæ are elongate, vermiform, cylindrical and pointed towards each end. The body apparently consists, with the head included, of twenty segments on account of a number (7) of segment-like parts formed by the chitinised connecting membrane — intermediate segments — interpolated between the abdominal segments. The head is small, chitinised, not retractile; the mouth parts consist of a median labrum, small, hook-shaped mandibles and somewhat soft maxillæ with a palpus; there are small antennal papillæ, but no eyes. The larvæ are amphipneustic with prothoracic spiracles and a posterior pair lying apparently on the last segment but two. — The pupa is free; it has the antennal sheaths lying on the front side of the head, directed to each side. The thorax has on each side a strong bristle or thin spine, and the abdominal segments have girdles of long bristles; the last segment terminates in a somewhat long, thin, at the apex bifid spine.

The larvæ live in the earth or sand, sometimes also in dung, in decaying wood or in fungi; they are carnivorous and devour other larvæ; the pupæ are found at the same places as the larvæ.

The Therevids are medium sized flies; they occur in thickets and bushes and in low herbage; they are most often seen sitting on the leaves. They are generally thought to be predaceous.

Of the family 89 species are known from the palæarctic region and 76 species from North America; none is known to be common to both regions.

I am acquainted with no case of parasitic Hymenoptera on Therevids.

Therevids earlier recorded from Denmark: — Kramer (Spec. Insectol. Dan. 1760) records one species, *Musca plebeja*; Brünniche (Prodr.

Insectol. Siælland. 1761) has the same, and it is again recorded in 1763 (Pontopp. Danske Atl.). Müller (Flor. Fridrichsd. App. 1767) again has only the same. About this species can only be said that it is a *Thereva*, and probably our most common species, *T. nobilitata*. Fabricius in 1775 (Syst. Entom.) has the new species *Bibio nobilitata*; in his following works he has only the same, but in 1805 in his last work (Syst. Antl.) he has further *Bibio annulata*, also a new species. These two common species were thus originally founded on Danish specimens. Zetterstedt in 1842 (Dipt. Scand. I) records one species, *nobilitata*, from Denmark and no more in the following volumes. Finally Loew in 1847 (Dipt. Beitr. II) records *bipunctata* from Denmark. Thus in all three species were known. In the present work 10 species are enumerated.

Only one genus, *Thereva*, occurs in Denmark.

1. **Thereva** Latr.

Species of medium size, more or less hairy, generally the males somewhat long haired, the females shorter and more sparingly haired. The colours greyish or yellowish to blackish, sometimes silverwhite. Head as broad as thorax, broader than high; it is somewhat arched in front, but the face which looks forwards and downwards is somewhat flattened; the head is slightly arched behind; the frons is sometimes more or less protruding. Eyes in the male somewhat reniform, touching, in the female well separated, the vertex being more or less

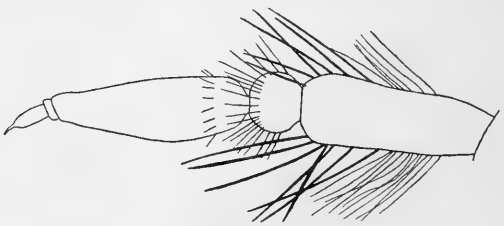

Fig. 45. Antenna of *T. nobilitata*. × 35.

broad; in the female the frons very often has a black, shining callus, sometimes divided into two. The eye-facets are in the male larger in the upper part than below. The colour of the eyes is more or less dark greenish, slightly metallic, in some species as *anilis* and *annulata* bright green; along the posterior eye-margin there is a row of weaker or stronger occipito-orbital bristles, they are generally stronger in the females than in the males; also farther down on the occiput there are some bristles. Antennæ inserted near to each other, in or a little below the middle. Jowls small, slightly descending below the eyes. Antennæ consisting of five joints, the first somewhat long,

the second short, globular, the third generally the longest, at the apex with a small, two-jointed style the first joint of which is short, the second terminating in a bristly apex; sometimes the antennæ have the first joint thickened; the first joint has long hairs on the basal part and stronger bristles on the apical part, the second joint has shorter bristles. There is no real oral cone, only small connecting membranes; epistoma somewhat short, retreating; clypeus represented by two chitinous lists, connected above, or it is more or less horseshoe-shaped; it reaches almost horizontally from the epistoma to the labrum and is separated from the cheeks and jowls by a membrane. Proboscis short, scarcely half as long as the head is high. Labrum elongate triangular, truncate and triangularly emarginate at the apex; the maxillæ have a thin, pointed lacinia and one-jointed palpi which are long, longer than the lacinia and with long hairs; the stipites of the maxillæ are small, lying laterally on the posterior side of the membrane connecting the labium with the oral aperture. Hypopharynx slightly narrower than labrum; with parallel sides, truncate at the apex. Labium with a short basal part and large and broad labella which are twice as long as the basal part. Labrum, maxillæ and hypopharynx of equal length and somewhat longer than the basal part of labium, about half as long as the whole labium. Thorax rectangular, somewhat longer than broad, slightly arched above. There are four strong bristles in front of the wing-root which may, on account of their position on the præalar callus (which is here large, the præsutural depression in which the callus lies being extended, but faint) be termed notopleural bristles, further generally two supra-alar bristles, one postalar bristle on the postalar callus, and one or two dorsocentral bristles in front of the scutellum (the number is not quite constant and may be one or two in the same species, yet some regularity prevails and I shall therefore mention the number in the specific descriptions); finally there are four scutellar marginal bristles. The metapleura have a tuft of long hairs. Abdomen almost cylindrical, at the base about as broad as thorax, but it is pointed towards the apex and thus conical; it consists of seven not transformed segments.[1]

[1] In earlier descriptions, especially those by Loew, the hind margins of the segments are often mentioned and their colour and breadth are used as characters. These hind margins are seen as more or less narrow posterior borders to the segments of a colour more or less pale than the segment itself; this border belongs in reality to the connecting membrane and forms the somewhat chitinised front part of this membrane (as in many other Diptera); it is capable of being folded in under the edge of the segment, and when the abdomen is strongly contracted this is always the case, and then the borders are not seen, but generally they are more or less visible. The borders are

The male genitalia consist of a small and hidden eighth segment both the dorsal and ventral plates of which are excised in the middle of the hind margin, the dorsal plate most; then follows above a plate which is likewise excised in the hind margin and in the excision are inserted two smal lamellæ; below there lie two pieces which together may be termed a pair of forceps, they are thick and swollen at the base and with a hook-shaped, somewhat complicated, upwards curved apex. The shape of the single pieces of the genitalia may differ somewhat in the different species. The female genitalia consist of an ovipositor formed by a long eighth, generally visible segment with some small, spiny appendages at the end, not unlike the spine-combs found in the Bombyliids. The legs are somewhat slender, the femora more or less long haired, more so in the male than in the female; tibiæ and tarsi short haired; there are rather strong bristles on the front side of the coxæ towards the apex, on the ventral side of the femora and on the tibiæ; the tarsi also have some bristles; all tibiæ with apical spurs. Claws not strong; there are two pulvilli but no empodium. Wings with the cubital vein forked, the fourth posterior cell open or closed, the anal cell closed. Alula well developed; squamula alaris likewise well developed, with a short fringe at the margin, squamula thoracalis not developed, frenulum distinct, broad towards the angulus. In rest the wings are borne somewhat open, in some species (*annulata*, *anilis*) only slightly open, nearly parallel.

The larvæ are very characteristic; they are vermiform, long, cylindrical, pointed towards each end and of a hard consistence; the colour is white. The body consists apparently of twenty segments, the head included; we get this number because behind each of the first six abdominal segments there is a somewhat shorter, segment-like part or intermediate segment, and further one of the following segments, I think the one bearing the posterior spiracles, must be considered as belonging to the same category; in this way we get thirteen genuine segments. The head is small, chitinised, brown; the mouth parts consist of a hooked labrum, likewise hook-shaped mandibles, and less chitinized maxillæ, each with a palpus. There is a small antennal papilla above on the front part, but there are no eyes. The head has some bristles; the three thoracic segments each

not found between the first and second segments, but between all the following, and they decrease in breadth towards the apex; they are very narrow between the fifth and sixth and between the sixth and seventh segments, and they are often not seen here. Their presence or absence and their breadth cannot therefore be used as characters, but on the other hand their colour may be somewhat sharacteristic.

have a pair of bristles on the ventral side. The first seven abdominal segments have on each side a curious pattern formed by impressed lines and almost resembling two crosses, placed one above the other; on the intermediate segments this pattern is not present, but there are here some lines formed by punctiform muscular impressions. The last segment has the apical part marked off, so that it seems divided into two; it has six bristles and terminates in two small, styliform warts. The larva is amphipneustic with spiracles on prothorax and on the part which apparently is the last segment but two. — The pupa is dirty yellowish; on the front side of the head lie the antennal sheaths, directed to each side; at the base of the wing-sheath there is a tubercle terminating in a thin spine. The second to sixth abdominal segments each have a girdle of strong bristles, intermingled with short spines, all round near the hind margin; on the sides they are placed somewhat tuft-like on a slight protuberance also bearing the spiracle; on the first segment there is only one such bristle on each side on the protuberance mentioned. The last segment terminates in a long, blackish brown, thin, bifid spine. The sheaths of the legs reach to the middle of the second abdominal segment. There are prothoracic and seven pairs of abdominal spiracles, all somewhat tube-shaped.

The larvæ live in the earth in woods, in hollow trees or in fungi. They are carnivorous and devour other larvæ; when they are kept in captivity several together, they attack and devour each other. They move very quickly in the earth by serpent-like movements of the body. They hibernate and the transformation to pupa and development of the imago take place in spring or summer. — The developmental stages of several species are known. Meigen (Syst. Beschr. II, 1820, 17) bred *T. nobilitata* from larvæ found in decaying stubs; Beling (Arch. für Naturgesch. Jahrg. 41, 1875, 43) bred the same species from larvæ found in the earth, especially in pine-woods, in cow-dung and in decaying wood. Letzner (Arbeit. schles. Ges. Vaterl. Kult., 1854, 99) bred *T. subfasciata*. Zetterstedt (Dipt. Scand. I, 1842, 210) mentions the pupa of *T. annulata* found under a stone. *T. plebeja* was bred by Frisch (Beschr. allerl. Ins. I, 1720, 34, T. IX) from a larva found in rich soil, and by Bouché (Naturgesch. d. Ins. 1834, 45, T. IV, Fig. 16—20) from larvæ found in the soil in gardens. The larva of *T. anilis* (Bouché l. c.) was found in pine-woods under decaying leaves and moss, and by Scholtz (Zeitschr. Entom. Bresl. 1848, I—III, 20) in Polyporus. Beling (l. c. 46) found larvæ and pupæ of *T. oculata* in cow-dung. The same author bred *T. circumscripta*? (l. c. 47) from larvæ found in the earth, under leaves and in decaying

wood. Mr. Schlick and I have bred *T. bipunctata* from a pupa found in sand, *T. nobilitata* from larvæ and pupæ found in earth and in decaying wood in an oak and *T. circumscripta* from larvæ and pupæ found in earth and also in a decaying oak. Finally *Psilocephala melaleuca* was bred (Frauenfeld, Verh. zool. bot. Gesell. XVI, 1866, 449) from a larva found in decaying wood. Westwood (Proc. entom. Soc. London, 1859, 59) mentions the larva of an undetermined species which attacked the pupæ of *Aleucis pictaria* and *Sphinx ligustri.*

The species of *Thereva* are very characteristic flies on account of their whole shape and appearance; they occur in the herbage on the outskirts of woods and in similar localities, some species especially on dry, sandy places often at the shore; several species are especially found on Urtica. Schiner records that he has seen the males of *T. anilis* swarming in sunshine around bushes. The species are generally considered as predaceous, though I am not avare that any direct observation has been made. I am inclined, however, to think this correct, as their whole behaviour seems to point in this direction; they are for example often seen sitting on the leaves in a way which gives the impression that they are watching for prey; I think the prey is small flies and the like. I may here mention the fact that, during the last summer (1907) which was very cold and rainy, the species of *Thereva* were very common and present in great numbers in contrast to what is generally the case; both I myself and also my entomological friends made this observation.

Of the genus 66 species are known from the palæarctic region; 10 have hitherto been found in Denmark.

The *Thereva* species are generally, and also here, divided into two groups in accordance with the fourth posterior cell being closed or open (the latter group forming the genus *Dialineura* Rondani), but it must be remarked, that in the group with the cell closed individual aberrations, with an open cell, are found, and not even rarely, sometimes only one wing shows the aberration, or the extent of the opening is different in the two wings; generally it will not give rise to confusion. — The species are somewhat difficult to distinguish, especially the males of the species grouping round *T. nobilitata*, as there are no plastic characters and the colour of the pilosity is somewhat variable; by carefull use of the following analytical table and descriptions I think it possible to determine the Danish species with certainty.

Table of Species.

1. Fourth posterior cell closed ..... 2.
— Fourth posterior cell open ..... 8.

2. Silvery haired species; female without frontal callus . 7. *annulata.*
— Not silvery haired species; female with a frontal callus . . . . . 3.
3. Abdomen in both sexes quite yellowish; seventh segment in the female of the same colour . . . . . 1. *subfasciata.*
— Abdomen with black markings or nearly quite black; seventh segment in the female shining black . . . . . 4.
4. Wings without any blackish blotch . . . . . 5.
— Wings with a blackisk blotch running from the medial cross-vein in a curve above the discal cell and down over the cross-vein closing this apically . . . . . 3. *arcuata.*
5. Abdominal segments more or less yellow with black triangles or more semicircular spots; the hind margins yellow; body more or less yellow haired above; frontal callus in the female not reaching the ocellar tubercle . . . . . 2. *nobilitata.*
— Abdominal segments in the male withouth triangular or semicircular spots; frontal callus in the female either reaching the ocellar tubercle or very short or divided into two tubercles . . . . . 6.
6. Abdominal segments in the male nearly quite black, only slightly brownish towards the hind margin; the hind margins yellow; body chiefly black haired above; frontal callus in the female very short, transverse . . . 5. *circumscripta.*
— Abdominal segments in the male with smaller or larger greyish or greyish yellow markings; frontal callus in the female not short and transverse . . . . . 7.
7. Abdominal segments in the male with greyish triangular spots at the hind corners, the spots more or less connected in the middle; hind margins yellowish white or whitish; body chiefly black haired above; frontal callus in the female large, reaching the ocellar tubercle . . . . . 4. *plebeja.*
— Abdominal segments in the male with a greyish or greyish yellow, indefinitely bounded transverse band on the apical half, more or less triangularly incised in the middle; hind margins yellow to whitish yellow; body more or less yellow haired above; frontal callus in the female divided into two tubercles . . . . . 6. *bipunctata.*
8. Female with a frontal callus (only the female known) 8. *microcephala.*
— Female without frontal callus . . . . . 9.
9. Antennæ with the first joint thickened, longer than the second and third together . . . . . 9. *anilis.*
— Antennæ with the first joint not thickened, shorter than the second and third together . . . . . 10. *fuscipennis.*

1. **T. subfasciata** Schum.

1838. Schum. Arb. schles. Ges. vaterl. Kult. 1838, 58. — 1847. Loew, Dipt. Beitr. II, 4, 2. — 1849. Zett. Dipt. Scand. VIII, 2982, 1—2. — 1862. Schin. F. A. I, 165. — 1903. Kat. paläarkt. Dipt. II, 211.

Male. Frons and face yellowish pruinose; the hairs on the frons for the most part black and down the cheeks and on the jowls of the same colour, inwards, towards the mouth aperture, yellow. Occiput yellow pruinose with yellow hairs; occipito-orbital bristles black, the hairs on the vertex black. Antennæ blackish, first joint somewhat greyish yellow pruinose, the third joint more or less reddish at the outermost base; first and second joint with black and some yellow hairs. Thorax ashgrey or more brownish or yellowish, the lighter stripes only faintly discernible; the disc is more or less sparingly clothed with long, erect, black hairs, and densely with more decumbent, yellow hairs. There are nearly always four distinct dorsocentral bristles, in one or two cases I found six, and once five (three on one side). Sterna and pleura grey with pale yellow hairs. Abdomen yellow or greyish yellow, the hind margins of the segments more or less bright yellow; it is densely clothed with yellow hairs which may be of paler or deeper colour, sometimes nearly reddish yellow; along the hind margin of each segment there is a row of black hairs. Venter grey with the hind margins of the segments pale yellow, sparingly clothed with pale yellow to whitish hairs. Genitalia more or less reddish below. Legs with coxæ and femora blackish grey, tibiæ yellow, more or less blackish just at the apex, tarsi yellow, the tips of the joints black and the two or three last joints quite black. Coxæ and anterior femora with long, pale yellow hairs, more or less intermingled with black towards the apex of the femora; hind femora with depressed, pale yellow hairs. Wings hyaline, slightly yellowish towards the anterior margin, with a yellow stigma; veins brown or yellowish brown; the fourth posterior cell closed. Halteres brown, the peduncle yellowish.

Female. Vertex and frons yellowish pruinose; the frontal callus transverse, reaching from one eye to the other, distinctly incised triangularly in the middle of the lower margin, slightly arched above and far from reaching the ocellar tubercle. The hairs on frons and face shorter than in the male, yellow, only some black on the frons. The black and yellow hairs on the thoracic disc much shorter than in the male, and the yellow hairs quite depressed; the two lighter stripes distinctly visible. The hairs on abdomen shorter and generally paler than in the male; they are depressed on the dorsum of the four first segments and only erect at the sides; on the last segments they are erect and very short, hence the front part of abdomen is brighter and more shining yellow than the apical part; on the fourth segment there are both depressed and short, erect hairs; there are no black hairs at the hind margins. The seventh segment is coloured

quite as the preceding, the eighth is shining black. Venter with long, pale hairs on the three first segments, and with short, erect, yellow hairs on the rest. Legs as in the male, but the hairs on the femora shorter.

The species may vary somewhat in colour especially in the male, this being sometimes quite ashgrey and the hairs then being very pale.

Length 7,5—10,5 mm.

This species is easily known by the quite unicolorous abdomen, and in the female by the seventh segment being of the same colour as the other abdominal segments and not black.

T. subfasciata is not rare in Denmark; Hornbæk, Tisvilde, Odsherred; on Falster at Stubbekøbing; in Jutland at Ribe, Søndervig and Frederikshavn. My dates are $^{28}/_{7}$—$^{16}/_{8}$. It occurs on sandy places on or near the shore. I caught it especially on Urtica urens, often in great numbers.

Geographical distribution: — Northern and middle Europe down into France; towards the north to southern Scandinavia.

Remarks: This species was found in the collection of foreign Diptera in our Museum under the name *hybrida* Loew, with locality Posen, sent by Loew to Stæger, but Loew has then evidently changed the name before publication.

2. **T. nobilitata** Fabr.

1775. Fabr. Syst. Entom. 757, 5 (*Bibio*) et 1805. Syst. Antl. 67, 7 (*Bibio*). — 1842. Zett. Dipt. Scand. I, 203, 1 et 1849. VIII, 2982, 1. — 1847. Loew, Dipt. Beitr. II, 7, 4. — 1862. Schin. F. A. I, 164. — 1903. Kat. paläarkt. Dipt. II, 209.

Male. Frons and face yellowish pruinose; the hairs on the frons chiefly black, above the antennæ more or less intermingled with yellow; the black hairs continuing downwards along the eye-margin to the jowls; for the rest the hairs on the face yellow. Occiput with yellow hairs, the occipito-orbital bristles black; the hairs on the vertex black. Antennæ black, the first joint yellowish or greyish pruinose; the first two joints with black hairs, intermingled with some yellow. Thorax yellowish brown or darker brown, with two brighter yellow stripes; the disc somewhat sparingly clothed with erect, black hairs, and more densely with decumbent, yellow hairs. There are generally two dorsocentral bristles, sometimes four and then the anterior generally weaker than the posterior. Pleura and sterna grey with yellow hairs which may be more or less pale. Abdomen black, the first segment almost all yellowish; at the hind part of the following segments a broad, yellowish, transverse band which is narrow in the

middle, broad at the sides and here reaching nearly or quite over the whole segment, thus each segment has a transverse, triangular or more rounded black spot lying towards the front margin; the yellowish bands become broader on each successive segment towards the apex, and thus the black spots become smaller; the last two segments are nearly quite yellowish. The hind margins of the segment are bright yellow. Abdomen clothed with long, bright yellow or more reddish yellow hairs, along the middle line there are black hairs to a greater or less extent; towards the apex of the abdomen the black hairs prevail. Venter grey with yellow hind margins of the segments, somewhat sparingly clothed with long, yellow or pale yellow hairs. Genitalia dark above, more or less ferrugineous below. Legs with the coxæ grey, femora blackish grey, tibiæ yellow, more or less blackish at the apex, tarsi yellow, black towards the apex. Coxæ and anterior femora with long, yellow or pale yellow hairs which on the femora may be more or less intermingled with black, sometimes to a great extent; hind femora with somewhat depressed, yellow hairs. Wings

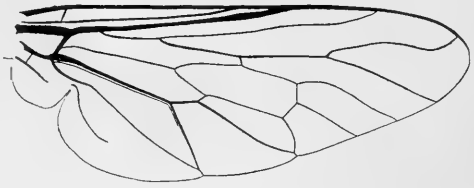

Fig. 46. Wing of *T. nobilitata*.

somewhat greyish yellow; stigma yellow; veins yellow to brown; fourth posterior cell closed. Halteres dark brown, the peduncle yellow.

Female. Vertex and frons yellow pruinose; the frontal callus reaching from one eye to the other, it has a triangular excision in the middle of the lower margin, the upper margin is produced upwards in the middle, but it does not reach the ocellar tubercle. The hairs on frons and face shorther than in the male, those on the frons black. The hairs on thorax much shorter than in the male, they are black, erect and golden yellow, depressed. Abdomen as in the male, but the black spots often somewhat hidden under the depressed hairs, and then appearing smaller on the first segments. The first four segments with depressed, golden yellow hairs, only somewhat erect at the sides, the last segments with short, erect, yellow hairs, which on the sixth segment are partly or quite black; on the fourth segment there are both erect and depressed hairs; the seventh segment shining black, with black hairs. Venter with long hairs on the basal part, shorter towards the apex. The hairs on the femora short.

This species may in the male vary greatly in the extent of the black hairs, these sometimes occupying nearly the whole dorsal side of the abdomen, and the hairs on the anterior femora may also be black to a great extent and in this case the species has a dark appearance; in the female the colour of the hairs may vary from pale brassy yellow to deeper, nearly reddish yellow; the somewhat dark form of the male and the paler form of the female are by far the commonest with us.

Length 9—12 mm.

The full grown larva has a length of about 30 mm., the pupa of 13—14 mm.

Remarks: In this species I have sometimes found the fourth posterior cell somewhat open in the female; Loew l. c. also mentions a female with the cell open.

This species is recognized by the distinct, triangular or more semicircular spots on abdomen. In its brighter forms it is a very beautiful species.

T. nobilitata is common in Denmark; vicinity of Copenhagen, Vester Fælled, Damhusmosen, Ordrup Mose, Dyrehaven, Bøllemosen, Ørholm, Hillerød, Tisvilde; on Funen at Svendborg, Odense, Hofmansgave, Veflinge, Langensø and Middelfart; in Jutland at Ribe, Frijsenborg, Silkeborg and Støvring near Randers, and finally on Bornholm at Hasle. My dates are $^{11}/_{6}$—$^{28}/_{8}$. The larva was found in mole-casts in Dyrehaven on $^{7}/_{5}$, the imago came from $^{21-28}/_{6}$. The pupa was found in sand at Furesø on $^{19}/_{5}$, it developed on $^{7}/_{6}$, finally it was found at Christianssæde on Lolland in a decaying oak. The species occurs on the outskirts of woods, in fens and on similar localities, especially on Urtica.

Geographical distribution: — Europe down into France; towards the north to northernmost Scandinavia.

3. **T. arcuata** Loew.

1847. Loew, Dipt. Beitr. II, 9, 5. — 1862. Schin. F. A. I, 167. — 1903. Kat. paläarkt. Dipt. II, 208.

Male. Face and frons dark yellowish pruinose; the hairs on the frons chiefly black with some yellow; on the face yellow and black intermingled, the black especially at the outer margin. Occiput with black and yellow hairs, the occipito-orbital bristles black; the hairs on vertex black. Antennæ black, the first joint somewhat pruinose, the first two joints with black hairs. Thorax greyish or brownish black, with two, somewhat faint, yellowish stripes. The disc sparingly clothed with erect, black and more densely with somewhat decumbent,

yellow hairs. The six specimens I have examined had all four dorsocentral bristles. Pleura and sterna greyish, with pale yellow and blackish hairs intermingled. Abdomen black, at the apical part of the segments slightly brownish; the hind margin of the segments yellow. Abdomen clothed with deep yellow or reddish yellow hairs, in the middle line and towards the hind margin of the segments there are black hairs; the black hairs may be more or less extended, sometimes occupying the whole dorsal side; at the apex of abdomen the hairs are all black. Venter blackish grey with the hind margins of the segments yellow, it is clothed with long, yellow or pale yellow hairs. Genitalia blackish above, ferrugineous beneath, with ferrugineous hairs. Legs with the coxæ and femora greyish black, tibiæ yellow, black just at the apex, tarsi yellow; black towards the end. Coxæ and anterior femora with long, yellow hairs, more or less intermingled with black on the front femora; hind femora with depressed, yellow hairs. Wings yellowish brown tinged, with a blackish blotch passing in a curve from the medial cross-vein above the discal cell and down over the veins closing the discal cell apically; the base of the cubital fork, the basal part of the upper branch of the postical vein and the postical cross-vein also blackish fumigated; the stigma yellowish brown; veins yellow to brown; the fourth posterior cell closed. Halteres blackish brown.

Female. Frons and face yellowish pruinose, down the cheeks white; frontal callus cordate, strongly excised below, truncate above, reaching to the ocellar tubercle; the hairs short, black on vertex and frons, white on the face; a tuft of black hairs on the jowls. Thorax with short, erect, black, and with quite depressed, yellow hairs; the longitudinal stripes somewhat broad and distinct. Sterna and pleura light grey with whitish hairs. Abdomen black, at the hind margins of the segments a transverse, greyish spot on each side, on the second and third segments the spots are somewhat connected along the hind margin; the first four segments sparingly clothed with depressed, black, and at the hind margin with yellow hairs, the last three segments with short, erect, black hairs; the fourth segment has both erect and depressed hairs; the seventh segment quite shining black. Venter shining black with the hind margins of the segments pale; it is clothed with long, pale hairs basally, and with short, black hairs on the four last segments. Femora with short hairs.

Length 8,5—10,5 mm.

This species is easily recognised among the Danish species by the blackish, curved blotch on the wing; it is also characterised by

the black, not marked abdomen in the male, and by the spots on the abdomen in the female.

T. arcuata is very rare in Denmark, I detected it first in 1907 when I caught 6 specimens at Copenhagen on the wall at Christianshavn, on the 22nd and 29th August; the specimens were taken on Urtica.

Geographical distribution: — Europe down to southern Italy; it seems to have its northern limit in Denmark.

4. **T. plebeja** L.

1761. Linn. Fn. Suec. 1779 (*Musca*). — 1842. Zett. Dipt. Scand. I, 204, 2 et 1849. VIII, 2983, 2. — 1862. Schin. F. A. I, 166. — 1903. Kat. paläarkt. Dipt. II, 210. — *T. lugens*, 1847. Loew, Dipt. Beitr. II, 15, 9.

Male. Frons and face brownish yellow pruinose; the hairs on the frons and to a great extent down the cheeks black, towards the mouth aperture yellow or greyish yellow to whitish. Occiput yellowish with yellow or dark greyish hairs; occipito-orbital bristles black; the hairs on the vertex brownish black. Antennæ blackish, the first joint somewhat greyish, the first two joints with black and some yellowish hairs. Thorax black, sometimes slightly brownish; two slightly lighter stripes are generally just visible as very faint traces, in the middle there is as a rule a narrow stripe of a very deep black colour. The disc densely clothed with erect, black hairs and less densely with somewhat decumbent hairs of a dirty yellowish or more greyish colour, the clothing of the disc thus on the whole of a dark appearance; more rarely the decumbent hairs are bright yellow. I always found two dorsocentral bristles. Sterna and pleura grey with yellow hairs, or the hairs are blackish yellow above, paler or whitish below. Abdomen black, the second and following segments at the hind margin with a narrow, ashgrey, transverse band which is broadened towards the sides and thus almost forms a transverse triangle at each side meeting in the middle. The hind margins of the segments bright yellowish white or nearly white, especially with the light from behind. Abdomen on the dorsal side clothed with chiefly blackish hairs, only towards the sides and at the hind margin of the first segment the hairs may be more or less yellow, but they are often all black. Venter dark grey with broad, pale yellow hind margins to the segments; it is somewhat sparingly clothed with long hairs which are more or less deep yellow to greyish white or whitish. Genitalia chiefly black with ferrugineous hairs at the apex. Legs with the femora blackish, tibia yellow with brownish black tips, tarsi yellow, brownish black towards the end. Coxæ, anterior femora and the

hind femora at the base with long hairs which vary from yellow to whitish grey; on the femora they are more or less intermingled with black hairs, sometimes quite black, especially on the front femora. Wings somewhat yellowish brown tinged, especially towards the anterior margin; veins dark yellow to brown, the base of the cubital fork, the medial cross-vein, the part of the discal vein from the cross-vein to the end of the discal cell, the veins closing the cell apically and the basal part of the upper branch of the postical vein more or less brownish seamed, but generally only to a slight degree; the fourth posterior cell closed. Stigma yellow. Halteres brownish black.

Female. Vertex and frons yellow pruinose with black hairs, cheeks and jowls whitish pruinose with white hairs; on the jowls, at the lower eye-margin a tuft of black hairs; all the hairs shorter than in the male. Frontal callus large, somewhat convex, of a cordate shape, it is incised below, somewhat truncate above and reaches the ocellar tubercle. The erect, black and depressed, yellow hairs on thorax short; the two longitudinal stripes generally distinctly visible; the hairs on sterna and pleura white. Abdomen black, the first segment somewhat greyish; at the hind margin of the following segments a distinct, whitish grey, on the anterior segments sometimes more yellowish, transverse band, narrowest in the middle; the seventh segment shining black. The first four segments clothed with depressed hairs which are black on the black parts, yellow to whitish on the grey bands; the hairs are somewhat longish at the hind margin of the first segment; the last segments have short, erect, black hairs, the fourth segment both depressed and erect hairs. Venter with long, pale hairs on the first three segments and with short, black hairs on the last four segments. The hairs on the femora shorter than in the male.

This species, as seen from the description, varies somewhat in the colour of the hairs; firstly, the yellow hairs vary from deep yellow to greyish yellow or whitish, and secondly, the clothing on the dorsal side of abdomen may be quite black, or yellower at the sides; also, the hairs on the anterior femora may be more or less intermingled with black so as to appear quite black. In spite of this variation it is recognized especially by the pale yellowish or whitish hind margins of the segments and the grey, transverse bands; the female is distinguished by the large frontal callus.

Length 8—12 mm.

Remarks: In this species I have sometimes found the fourth posterior cell more or less open in both sexes; in a single case the cell was rather broadly open.

T. plebeja is not common in Denmark; Ordup Mose, Dyrehaven, Hillerød, Søllerød; in Jutland at Frijsenborg, at Mausing near Silkeborg and at Støvring near Randers. It is this species of *Thereva* which occurs earliest; my dates are $^{24}/_{5}$—$^{15}/_{8}$. It occurs at the same places as *nobilitata*, but it is much less common. Scholtz (Zeitschr. für Entom Bresl. Jahrg. V, 1851, 40) mentions that it (*lugens*) frequents Euphorbia especially.

Geographical distribution: — Europa down into France; towards the north to northern Scandinavia.

5. **T. circumscripta** Loew.

1847. Loew, Dipt. Beitr. II, 19, 11. — 1862. Schin. F. A. I, 166. — 1903. Kat. paläarkt. Dipt. II, 208.

Male. Frons and face yellow pruinose; frons with black hairs, above the antennæ a few yellow hairs; the black hars stretching down the outer margin of the cheeks; towards the mouth-aperture the hairs are yellow. Occiput yellowish with dark yellow hairs; occipito-orbital bristles black; the hairs on the vertex black. Antennæ black, the first joint somewhat greyish; the first two joints with black and a few yellow hairs. Thorax black or brownish black, two rather broad, dark yellowish stripes more or less visible, and in the middle a narrow line of a deep black colour. The disc densely clothed with erect, black hairs and sparingly with somewhat decumbent, yellow hairs. According to the small material I have examined the number of dorsocentral bristles seems to vary between two and four. Pleura and sterna grey with yellow to greyish yellow hairs. Abdomen black, the segments somewhat brownish yellow towards the hind margin, but the black and brownish colours confluent without any distinct boundary; the hind margin of the segments bright yellow. The dorsal side clothed with black hairs, only towards the sides sometimes reddish yellow. Venter grey with the hind margins of the segments yellow; it is somewhat sparingly clothed with long, pale or more reddish yellow hairs. Genitalia black with ferrugineous hairs at the apex. Legs with the femora black, tibiæ yellow, somewhat broadly black at the apex, especially the front tibiæ; tarsi black, the posterior yellow at the base. Coxæ with yellowish hairs; anterior femora and the hind femora at the base with long hairs which are yellowish intermingled with black, sometimes nearly quite black, especially on the front femora. Wings somewhat greyish yellow tinged; veins yellowish to dark brown; the fourth posterior cell closed; stigma brown. Halteres brown, the base of the peduncle paler.

Female. Vertex and frons yellowish pruinose, cheeks more whitish

grey; the hairs on vertex and frons black, those on the cheeks pale yellow, all the hairs shorter than in the male; no black hairs on the jowls. Frontal callus transverse, reaching from one eye to the other; it is excised below in the middle but straight above, thus almost forming a transverse stripe, sometimes nearly divided in the middle. Thorax greyish brown, the two longitudinal lines generally distinct; the erect, black and the quite depressed, yellow hairs are short. Abdomen black with yellowish grey, transverse bands at the hind margins of the segments; the bands are somewhat broad towards the sides, especially on the first segment; the seventh segment shining black. The first four segments are clothed with short, depressed hairs which are black on the black parts, yellow on the transverse bands; they are somewhat longish at the hind margin of the first segment; the last segments have short, erect, black hairs; on the fourth segment there are both depressed and erect hairs. Venter sparingly clothed with long, pale hairs on the first three segments, and with short, erect, black hairs on the last four segments. The hairs on the femora shorter than in the male.

Length 10—12,5 mm.

The full grown larva has a length of 33 mm., the pupa of 14—16 mm.

Remarks: In this species I have not rarely found the fourth posterior cell somewhat open in the female.

This species is similar to *nobilitata*, especially to the darker forms of this species, but it is in the male distinguished by the darker hairs and by the brownish colouring on the hind parts of the abdominal segments being indefinite and thus no distinct, dark, triangular or rounded spots being formed; in the female it is distinguished by the narrow, transverse frontal callus. From *plebeja* it is distinguished in the male by not having grey bands on the abdomen and by the hind margins of the abdominal segments being deeply yellow.

T. circumscripta is rare in Denmark; only nine specimens have been caught; Ordrup Mose, Bøllemosen (the author), at Slagelse (Th. Mortensen) and at Nyraad (J. C. Nielsen); in Jutland at Restrup near Aalborg (the author) and at Sæby (H. J. Hansen). My dates are $^{7}/_{6}$—$^{25}/_{8}$. The larva was found in Bøllemosen in mole-casts on $^{5}/_{6}$, they pupated soon after and the imagos came on ^{26}—$^{28}/_{6}$; the pupa was found in Dyrehaven, likewise in a mole cast, on $^{11}/_{6}$, it developed on $^{21}/_{6}$, and finally a pupa was found at Christianssæde on Lolland in a decaying oak on $^{21}/_{6}$.

Geographical distribution: — Europe down to southern France; its northern limit seems to be in Denmark.

6. T. bipunctata Meig.

1820. Meig. Syst. Beschr. II, 121, 9. — 1842. Zett. Dipt. Scand. I, 205, 4 et 1859. XIII, 4971, 4. — 1847. Loew, Dipt. Beitr. II, 26, 15. — 1862. Schin. F. A. I, 169. — 1903. Kat. paläarkt. Dipt. II, 208.

Male. Frons and face yellowish pruinose; frons with black and above the antennæ with yellow hairs, cheeks with pale yellow to whitish hairs, the black hairs on the frons only extending a little downwards, not reaching the jowls. Occiput yellowish with yellow hairs, occipito-orbital bristles black; the hairs on the vertex black. Antennæ blackish, the first joint greyish pruinose; the first two joints with black hairs and on the basal part of the first joint pale hairs. Thorax brownish to dark brown, with two lighter, faint stripes. The disc is sparingly clothed with erect, blackish, and more densely with somewhat more decumbent, yellow hairs. There are as a rule two dorsocentral bristles. Sterna and pleura grey with long, yellow, farther down, paler hairs. Abdomen blackish, at the hind margin of the segments a broad, but somewhat indistinctly bounded, greyish or greyish yellow, transverse band which is not broader towards the sides; on the second and third segments the black colour is often prolonged triangularly backwards in the middle, the greyish band thus being triangularly incised, but somewhat indefinitely; the last segments are quite or nearly quite greyish. The hind margins are yellow to whitish yellow. Abdomen clothed with long, yellow hairs, in the middle line there are black hairs to a more or less extent. Venter grey with yellow hind margins of the segments; it is sparingly clothed with long, pale yellow hairs. Genitalia ferrugineous beneath. Legs with the femora greyish black, tibiæ yellow, brownish or blackish just at the apex, tarsi yellowish, towards the ends brownish black. Coxæ and anterior femora with long, pale yellowish hairs, on the front femora more or less intermingled with black hairs. Wings slightly yellowish; veins yellow to brown; the fourth posterior cell closed. Stigma yellow. Halteres blackish, the peduncle paler, yellowish brown.

Female. Vertex and frons yellowish pruinose, with black hairs; cheeks white with white hairs; no black hairs on the jowls or only very few; the hairs somewhat shorter than in the male. Frontal callus divided into two large, round, somewhat convex tubercles. Thorax with the two stripes more or less distinct; the erect, black, and depressed, yellow hairs short. Pleura and sterna grey with white hairs. Abdomen with the greyish, transverse bands much more definitely bounded than in the male; the seventh segment black but with the hind margin and the sides more or less greyish pruinose.

The first four segments with short, depressed hairs which are partly black on the black parts, yellowish on the bands; the first segment has somewhat longish hairs at the hind margin; the last segments have short, erect, yellow hairs; the fourth segment has both depressed and erect hairs. Venter with long, white hairs on the first three segments, and with short, erect, yellow hairs on the last four segments. Femora with the hairs shorter than in the male.

There is a variety of the species, which is much greyer than the ordinary form, all the yellow colour in the latter being here grey; the hairs are likewise much greyer or whitish, (var. *canescens* Zett. Dipt. Scand. XIII, 4971, 4, var. b).

Length 7—9 mm.

The pupa has a length of 10 mm.

Remarks: In this species I have found the fourth postorior cell narrowly open in rare cases, but in both sexes.

This species is in the female at onze recognised by its frontal callus forming two tubercles; in the male it is distinguished by the indefinitely bounded greyish yellow or greyish, transverse bands on the abdominal segments, and by its small size.

T. bipunctata is not common in Denmark; Charlottenlund, Tisvilde, Rørvig, Refsnæs; on Funen at Odense; in Jutland at Villebølle north of Ribe, at Silkeborg, Himmelbjærget, Struer, Frederikshavn, Skagen and on Læsø. My dates are $^{10}/_{7}$ to the first half of August. It occurs often in somewhat sandy places on Urtica. The pupa was found at Refsnæs in sand on $^{1}/_{8}$, it developed on $^{4}/_{8}$.

Geographical distribution: — Europe and down into Egypt; towards the north in southern Scandinavia.

7. **T. annulata** Fabr.

1805. Fabr. Syst. Antl. 68, 11 (*Bibio*). — 1892. Zett. Dipt. Scand. I, 210, 10 et 1855. XII, 4589, 10. — 1847. Loew, Dipt. Beitr. II, 35, 20. — 1862. Schin. F. A. I, 165. — 1903. Kat. paläarkt. Dipt. 207. — 1805. *Bibio anilis* Fabr. (non L.), Syst. Antl. 68, 13 (et op. præc.).

Male. Somewhat silvery shining; frons and face greyish white with white hairs; occiput coloured and haired in the same way; occipito-orbital bristles somewhat strong, black, but only present over a short distance. The hairs on vertex yellowish. Antennæ greyish pruinose, the first joint with black, and at the base with white hairs. Thorax grey with two whitish stripes, densely clothed with white hairs on the disc and the sides. Four dorsocentral bristles. Abdomen greyish white with long, silver-white hairs. Venter whitish grey, sparingly clothed with white hairs. Legs with the coxæ and femora

grey, tibiæ yellow with brownish black tips, tarsi yellow, brownish black towards the ends. Coxæ and anterior femora with long, hind femora with depressed, white hairs. Wings hyaline with yellow veins; fourth posterior cell closed. Stigma yellow. Halteres yellowish white, the base of the knob blackish.

Female. Vertex somewhat narrow, this and the posterior part of the frons brown with brown hairs, the anterior part of the frons and the face white with white hairs which are only slightly shorter than in the male; no frontal callus. Thorax with depressed, white or pale yellowish hairs and short, erect, blackish hairs. Abdomen whitish grey, somewhat silvery, at the base of the second, third and fourth segment a broad triangular or somewhat rounded brownish black spot, on the following segments traces of similar spots, sixth and seventh segments generally quite grey; the first four segments with depressed, white or pale yellowish hairs intermingled with some dark hairs on the blackish spots; at the margin of the first segment there are somewhat longish hairs; the last segments with short, erect, black hairs, the fourth segment both with depressed and erect hairs. Venter with pale hairs on the first three segments, and on the last four with short, erect, black hairs. The hairs on the femora somewhat shorter than in the male.

Length 9—11,5 mm.

Remarks: In very rare cases the fourth posterior cell may be found narrowly open also in this species.

This beautiful species is easily recognised by its silvery appearance.

T. annulata is somewhat common in Denmark in suitable localities; Charlottenlund, Vedbæk, Hellebæk, Tisvilde, Odsherred; in Jutland at Silkeborg, Søndervig, Nymindegab, Frederikshavn and Skagen. My dates are $^{29}/_{5}$—$^{8}/_{8}$. It occurs on sandy fields and at the shore, generally in great numbers, and it is seen especially on sunny days.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia.

8. **T. microcephala** Loew.

1847. Loew, Dipt. Beitr. II, 40, 24. — 1862. Schin. F. A. I, 168. — 1903. Kat. paläarkt. Dipt. II, 209.

Of this species I know only the female; also Loew had only this sex and I have seen no description of the male.

Female. Vertex and frons greyish brown pruinose with short, black hairs; frontal callus large, somewhat cordate, reaching to the anterior ocellus, slightly incised below. Face greyish white with white hairs, a tuft of black hairs on the jowls at the lower eye-margin.

Occiput grey with greyish white, farther down white, hairs; occipito-orbital bristles black, somewhat strong. Antennæ blackish, first joint somewhat greyish pruinose, with black, and beneath at the base some white hairs. Thorax blackish with two, somewhat broad, distinct, bright yellow stripes; the disc clothed with short, depressed, whitish and erect, black hairs. Sterna and pleura grey with long, white hairs. Abdomen black, slightly shining, the segments with whitish yellow hind margins; the first segment greyish at the sides, the second, third and fourth segments with silvergrey, somewhat triangular spots laterally at the hind margin; on the fifth and sixth segments a transverse band, somewhat incised in the front margin; the seventh segment black, shining. The first four segments are sparingly clothed with depressed hairs which are black on the black parts, white on the spots; the first segment has somewhat longish, white hairs at the sides; the last segments have short, erect black hairs, the fourth segment with both depressed and erect hairs. Venter greyish black with yellow incisures; the first three segments with longish, white hairs, the last four with short, erect black hairs. Legs with the femora greyish black, tibiæ yellow, black at the apex, tarsi yellowish, blackish towards the ends. Wings hyaline, the veins dark brown; the fourth posterior cell open; stigma grey. Halteres blackish, the peduncle pale towards the base.

Length 12 mm.

My only specimen is somewhat immature; it has the legs somewhat pale and the wing stigma grey, but otherwise it agrees rather well with Loew's description, as also in the fact, that the head is somewhat narrow; I feel certain therefore with regard to the determination.

T. microcephala is very rare in Denmark, only one specimen has been caught; it was taken in Dyrehaven on $^{10}/_{7}$ (Rosenberg) in a hollow tree, and it was somewhat immature, the pupa has probably been lying in the tree.

Geographical distribution: — Middle Europe.

9. **T. anilis** L.

1761. Linn. Fn. Suec. (*Musca*). — 1842. Zett. Dipt. Scand. I, 209, 9 et 1849. VIII, 2984, 9 et 1855. XII, 4519, 9. — 1847. Loew. Dipt. Beitr. II, 36, 21. — 1862. Schin. F. A. I, 161. — 1903. Kat. paläarkt. Dipt. II, 207.

Male. Frons somewhat protruding, brownish, at the eye-margins whitish; epistoma strongly retreating; at each side of the antennæ a brownish band reaching from the base of the antennæ to the eye-margin; the hairs on the frons brownish, those on the jowls pale

yellowish. Occiput yellowish grey with yellow hairs; the occipito-orbital bristles somewhat strong, black, overhanging the eyes; the hairs on the vertex blackish. Antennæ with the first joint thickened, longer than the second and third together; they are brown or blackish, the first joint light brownish pruinose with black and beneath with some yellow hairs. Thorax grey, slightly yellowish, with two more or less distinct, light grey stripes. The disc is very sparingly clothed with erect, black or brownish hairs, and densely clothed with less erect, yellowish hairs. There are four dorsocentral bristles, in single cases I found six. Pleura grey with pale yellowish hairs. Abdomen much as in *annulata*, the ground colour blackish grey, but silvery pruinose; it is clothed with long, silvery hairs. Venter greyish, sparingly clothed with white hairs. Legs with the coxæ and femora grey or blackish grey, the apex of the femora and the tibiæ yellow, the latter narrowly blackish just at the tips; tarsi yellow, blackish brown towards the ends. Coxæ and the anterior femora with somewhat long, white hairs. Wings hyaline, slightly yellowish tinged; veins

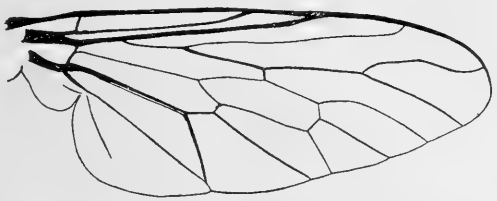

Fig. 47. Wing of *T. anilis*.

yellow at the base, brown towards the apex, the different cross-veins slightly blackish seamed; the fourth posterior cell open; stigma slightly yellowish. Halteres yellowish white, the knob blackish at the base.

Female. Vertex and frons brownish yellow pruinose with short, black hairs; no frontal callus; the hairs on the first joint of the antennæ and the occipito-orbital bristles shorter than in the male. Thorax greyish or yellowish brown, sparingly clothed with very short, depressed, yellow, and with some black, erect hairs. Abdomen grey, the three or four last segments yellow at the hind margin; the hind margins whitish or whitish yellow; the first four segments with depressed, yellow or pale yellow hairs, the last segments with very short, erect, yellow hairs; on the fourth segment also some erect hairs. Venter grey, sparingly clothed with yellowish hairs which are somewhat long at the base, short towards the apex. Legs yellow, coxæ and trochanters grey, tarsi brownish black towards the apex; the hairs on the femora very short. Wings more yellowish than in the male,

the base of the cubital fork and the cross-veins more strongly seamed than in the male, so that the wings have a spotted appearance.

Length 7—10 mm.

This species is at once recognised by the structure of the antennæ; the somewhat spotted wings in the female are also characteristic.

T. anilis is common in Denmark; Charlottenlund, Ordrup Mose, Bøllemosen, Geel Skov, Ørholm, Brede, Birkerød, Hillerød, Tyvekrogen and at Tjustrup Sø; on Funen at Odense and Faaborg; in Jutland at Holsted near Kolding, at Nørholm near Varde, at Vejle, Silkeborg, Dollerup near Viborg, Ringkøbing, Bangsbo, Frederikshavn and on Læsø. My dates are $^{23}/_{5}$—$^{5}/_{7}$. It occurs in the herbage on fields on dry and sandy places, I caught it especially on Carduus and Urtica.

Geographical distribution: — Europe down into Italy; towards the north to northern Scandinavia.

10. **T. fuscipennis** Meig.

1820. Meig. Syst. Beschr. II, 127, 18. — 1862. Schin. F. A, I, 162, 167. — 1903. Kat. paläarkt. Dipt. II, 209.

Male. Frons and face blackish grey; the hairs on the frons blackish; the cheeks nearly bare, the hairs on the jowls somewhat short, white. Occiput with white hairs, the occipito-orbital bristles black. Antennæ greyish black, the first joint thick, with black bristles. Thorax blackish grey with two indistinct stripes. The disc clothed with erect, black hairs and somewhat decumbent, greyish white hairs. There are generally four dorsocentral bristles. Pleura with white hairs. Abdomen greyish black with a somewhat silvery reflex, clothed with somewhat depressed, white or silvery hairs. Venter greyish black with pale yellow incisures, sparingly clothed with longish, whitish hairs. Legs with the coxæ and femora grey, the apex of the femora and the tibiæ yellow, tarsi yellow, blackish brown towards the ends. Coxæ and anterior femora with long, white hairs, hind femora with depressed, white hairs. Wings hyaline with yellowish brown veins; the fourth posterior cell open. Stigma yellow. Halteres yellow, the base of the knob black.

Female. Vertex narrow; this and the posterior part of the frons brown, with short, black hairs; the anterior part of the frons and the cheeks silvery, without hairs. No frontal callus. Antennæ more slender than in the male, the first joint not thickened. Thorax dark grey with two stripes and the lateral margin whitish grey, so that it may be termed whitish grey with three broad, dark grey stripes, the lateral stripes somewhat divided at the transverse furrow. Thorax with depressed, whitish hairs and some erect, black ones. Abdomen

black, the first segment more or less grey, the second to fourth with triangular, grey or silverwhite lateral spots, the fifth and sixth segment with more transverse spots rounded inward, the seventh quite shining black; the first four segments with depressed hairs which are black at the black parts, white on the spots, the last three segments with short, erect, black hairs. Venter with the first four segments blackish grey, slightly pruinose, with short, pale hairs, the last three segments shining black, with short, erect, black hairs; the segments with yellow hind margins. Femora with the tips more broadly yellow than in the male.

Length 11—12 mm.

T. fuscipennis is very rare in Denmark, only one specimen, a female, is known, taken at Horsens (O. G. Jensen).

Geographical distribution: — Middle Europe; its northern limit is in Denmark; it seems everywhere to be a rare species, and it is probably a mountain species.

Scenopinidae.

Head as broad as thorax, broader than high. Eyes touching or separated in the male, separated in the female. In the male the facets in the upper part sometimes larger than below. Three ocelli present. Jowls small, not descending below the eyes. Antennæ inserted near to each other, below the middle, somewhat pendulous; they are three-jointed, the first two joints small, the third somewhat elongated without any style. Epistoma short, retreating, almost horizontal. No oral cone developed; clypeus somewhat horseshoe-shaped, lying horizontally. Proboscis short; the mouth parts consisting of a triangular labrum, thin, pointed maxillæ with a somewhat long, one-jointed palpus, a weak hypopharynx and a labium with a short basal part and rather large labella. Thorax rectangular, longer than broad, somewhat arched. No macrochætæ present. Metapleura bare. Abdomen flat above, with more or less parallel sides, consisting of seven segments. Legs somewhat strong, without bristles but with small apical spurs on all tibiæ. Two pulvilli bot no empodium. Wings with the costa only reaching to the apex; the cubital vein forked, two cubital cells; the discal vein not branched and hence no genuine discal cell, but this formed below in its whole length by the upper branch of the postical vein; only three posterior cells, that is the second and third are united, lying outwards to the discal cell, the fourth being confluent with the discal cell; the first posterior cell nar-

rowed at the apex (in the American genera *Metatrichia* and *Pseudatrichia* the first posterior cell closed); the anal cell closed at some distance from the margin; the first basal cell longer than the second. Alula developed. Squamula alaris present, squamula thoracalis not developed; frenulum distinct. In rest the wings lie parallel over the abdomen.

The larvæ quite resemble those of *Thereva*, the body likevise apparently consisting of twenty segments; they are amphipneustic. The pupa is free, and it also resembles a *Thereva* pupa.

The Scenopinids are in appearance very curious, small flies; the common *S. fenestralis* is found in houses on windows, other species occur in the open on flowers.

Of the family only one genus with 14 species occurs in the palæarctic region; in North America three genera with 12 species occur; two species are common to both regions.

No case of parasitic Hymenoptera on Scenopinids is known to me.

Scenopinids earlier recorded from Denmark: — Brünniche, 1763 (Pontopp. Danske Atl.) records *Musca fenestralis*. Müller has no *Scenopinus* nor has Fabricius any species directly recorded from Denmark. Zetterstedt in 1842 (Dipt. Scand. I) records *S. fenestralis* and in the following volumes no other species, thus one species has been known hitherto. In the present work two species are enumerated.

Scenopinus Latr.

Species of rather small size, very slightly hairy, and of black or blackish colour, in the male generally with white incisures between some of the abdominal segments. Head as broad as thorax and broader than high, arched in front, slightly excavated behind. Eyes either touching in the male, well separated in the female, or separated in both sexes and with only a slight difference in the breadth of the frons according to the sex; the eye-facets in the male are in the first case larger above than below with a distinct dividing line, in the second case they are of equal size. Antennæ inserted near to each other, below the middle. Jowls not descending below the eyes, very small, forming only a narrow rim. Antennæ three-jointed, the first two joints small, the third large. Epistoma very short and retreating. There is no oral cone; clypeus somewhat horseshoe-shaped, stretching horizontally from the epistoma to the labrum. Proboscis short; labrum triangular, truncate, short, as long as the basal part of labium; the maxillæ have a pointed lacinia which is slightly longer than the labium, and one-jointed, slightly club-shaped palpi which are somewhat long,

longer than the lacinia; hypopharynx weak; labium with a short basal part and rather large and broad labella about twice as long as the basal part; in rest the proboscis is quite withdrawn. Thorax rectangular, considerably longer than broad; no macrochætæ present. Abdomen somewhat long, flattened above, with nearly parallel sides, as broad as thorax; it consists of seven visible, not transformed segments, the second being the longest; the segments have transverse impressions on the dorsal side. The genitalia I have only examined in situ with a lens; they consist in the male, so far as I could ascertain, of two broad lamellæ above and a considerably arched plate below which is cleft in the hind margin; the female genitalia consist of an eighth, normally developed segment and a small terminal part. Legs somewhat strong, without bristles, but small apical spurs are present on the tibiæ; sometimes the hind tibiæ are thickened. Claws small; two pulvilli, but no empodium. Wings with the cubital vein

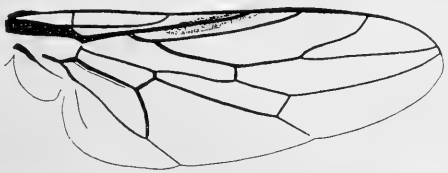

Fig. 48. Wing of *S. fenestralis.*

branched and thus two cubital cells; the discal vein not branched, the apical part curved up towards the end of the cubital vein, thus the first posterior cell narrowed at the margin; as the discal vein is not branched there is no real discal cell, but this is formed below in its whole length by the upper branch of the postical vein; the discal cell is long; the first basal cell longer than the second; the anal cell is closed at a considerable distance from the margin. Alula developed; alar squamula slightly fringed at the margin, no thoracic squamula, but frenulum distinct. In rest the wings lie parallel over the abdomen, one quite covering the other, and they are also inclined somewhat downwards on the sides, the fly thereby having a curious appearance.

I have not examined the developmental stages, but they have been described several times. Bouché (Naturgesch. d. Ins. 1834, 46, Tab. IV, Fig. 21—25) describes larvæ and pupæ of *fenestralis* (*senilis*); the larvæ were found in Polypori on Salix and other trees. Léon Dufour described the pupa of *fenestralis* (Anal. d. la Soc. Ent. de Fr. II, 8, 1849, 493, Pl. 16, fig. IV). Frauenfeld (Verh. k. k. zool. bot. Gesell. Wien, XIV, 1864, 65) bred *fenestralis* from larvæ found in a

mattress among horse-hair. He mentions (p. 68) three larvæ of which Löw had spoken (ibid. XI, 1861, 395) and which were found in the nest of a swallow and were by Löw recorded as *Thereva* larvæ, but which Frauenfeld, probably correctly, thinks are larvæ of *Scenopinus*. *S. niger* was bred by Damianitch (Verh. k. k. zool. bot. Gesell. Wien. XV, 1865, 237) from a pupa found in an elm-tree in a cocoon of *Saturnia pyri* which contained the remains of the *Saturnia* pupa. Jaennicke mentions (Berl. Ent. Zeitschr. 1867, 78) the same species bred from decaying wood. Packard (Proc. Essex Inst. 1867, 93) mentions and figures a *Scenopinus* larva about which it is stated, that it was feeding on carpets. Perris (Ins. du pin marit. Ann. de la Soc. Ent. de France, 1870, 226) found larvæ and pupæ of *S. fenestralis* in a branch of Cratægus which contained larvæ of *Ptinus germanus*, and in pine boards with larvæ of *Hylotrupes bajulus*; he observed a *Scenopinus* larva devouring a pupa of *Hylotrupes*; he also mentions a pupa of *Lucilia dispar* found in a swallow's nest and containing a *Scenopinus*. Waterhouse (Proc. Ent. Soc. Lond. 1881; Ent. Month. Mag. 1882) bred *S. fenestralis* from the root of Aconitum. Hagen (Canad. Entom. XVIII, 129) mentions the larva of *S. fenestralis* (*pallipes*) found under a carpet near the empty case of a *Tinea*. — The larva very much resembles the larva of *Thereva*. It is elongated, cylindrical, hard to the touch and likewise apparently consisting of twenty segments; the head is small, brown; at the apex of the body there are two small styles. The larva moves with serpent-like movements. The pupa also resembles that of *Thereva*, it is somewhat slender, on the front side of the head lie the antennal sheaths as two spines directed to each side. The abdominal segments have girdles of spines and bristles and along the sides on each segment there is a protuberance with bristles; the apex terminates in two conical projections each with a bristle.

The larvæ are certainly carnivorous; according to the statements recorded above the larva of *S. fenestralis* seems to live in houses, probably feeding on larvæ of moths, on Psocids and the like; this is in accordance with the common occurrence of *fenestralis* on the windows; but according to Bouché the larva seems also to live in the open as he found it in tree-fungi, this also is not improbable, the larva then feeding on other larvæ present there. A record by Assmus (Stett. Ent. Zeit. 1863, 401) that he had found the larva of *fenestralis* in overripe strawberries ist most probably due to an error as he describes the pupa as enclosed in a light cocoon. The larva of *niger* seems to live in the open. According to the records the larva seems to hibernate, the development to pupa and imago taking place in spring.

Of the genus 14 species are known from the palæarctic region; 2 species have hitherto been found in Denmark.

Table of Species.

1. Eyes touching in the male, separated in the female; legs ferrugineous ..... 1. *fenestralis.*
— Eyes separated in both sexes; legs black or blackish, only the tarsi yellow; hind tibiæ in the male thickened..... 2. *niger.*

1. S. fenestralis L.

1761. Linn. Fn. Suec. 1845 (*Musca*). — 1844. Zett. Dipt. Scand. III, 895, 1 et 1849. VIII, 3197, 1 et 1859. XIII, 6044, 1. — 1862. Schin. F. A. I, 159. — 1903. Kat. paläarkt. Dipt. II, 216.

Male. Eyes touching, dark brownish, slightly metallic, with the facets on the upper two thirds larger than below, on the dividing line a purplish band. Frons greenish black, slightly metallic, with sparse, depressed hairs; in the middle an impressed, longitudinal line. Antennæ black. Thorax brownish metallic, rugosely punctate, clothed with short, depressed, greyish yellow hairs; on the front part traces of two dull stripes; the humeral callus often more or less brownish yellow. The hind part of the pleura glabrous and shining. The hind margin of the scutellum on the under side often more or less brownish or even whitish. Abdomen black, somewhat shining, finely punctate and sparingly clothed with very short, dark hairs; in the middle of the large second segment there are two curious, more or less round, rugosely punctate impressions; at the hind margin of the third, fourth and fifth segments a white, transverse stripe (the connecting membrane), often more or les hidden. The genitalia with yellow hairs. Venter black, somewhat shining, finely punctate. Legs ferrugineous, the hind femora and tibiæ often more or less darkened in the middle, the tarsi darkened towards the ends. Wings hyaline slightly brownish tinged, broadly brown along the subcostal vein; veins blackish brown. Halteres with the peduncle brown, the knob white.

Female. Eyes with the purplish band lying in the middle. Frons rugosely punctate, along the eye-margins glabrous and shining, and with an impressed middle line; along the posterior edge of the eye a broad margin. The abdominal incisures brown, not white.

Length 4—6 mm.

This species varies somewhat and varieties have been described as separate species many times and under many names. As seen from the description it varies somewhat in colour; it varies a good deal also with regard to the venation of the wing, the radial vein sometimes stopping suddenly before the margin; the upvards bent

apical part of the discal vein may be differently situated, the transverse vein closing the discal cell may be wanting and other differences may be present.

S. fenestralis is rather common in Denmark; it occurs in houses on windows; Copenhagen, Hellerup; on Lolland in Maribo; on Funen in Odense and Faaborg and in Jutland in Vejle and Aalborg. My dates are $^{28}/_{6}$—$^{2}/_{8}$.

Geographical distribution: — Most parts of Europe; towards the north it is known to middle Scandinavia and in southern Finland; it also occurs in North America.

2. **S. niger** De Geer.

1782. De Geer, Ins. VI, 76, 10, Tab. XI, Fig. 5 (*Nemotelus*). — 1844. Zett. Dipt. Scand. III, 898, 3 et 1849. VIII, 3198, 3. — 1862. Schin. F. A. I, 159. — 1903. Kat. paläarkt. Dipt. II, 217.

Male. Black; eyes well separated, the facets of equal size. Antennæ blackish. Thorax rugosely punctate, sparingly clothed with very short, brownish hairs. Abdomen with the same white incisures as in *fenestralis*, clothed with very short, dark brownish hairs. Legs black or brownish black, tarsi yellow; the hind tibiæ considerably thickened. Wings strongly brownish fumigated with brown veins. Halteres blackish or brown.

Female. Frons very slightly broader than in the male, the inner eye-margins parallel; the frons has a depression anteriorly and a faint impressed middle line, along the inner eye-margins it has broad, but somewhat shallow impressed margins; along the posterior edge of the eyes there is a moderately broad margin. The abdominal incisures are brown.

Length about 5 mm.

S. niger is very rare in Denmark, I only know of three specimens, taken many years ago in the nighbourhood of Copenbagen (Drewsen). Zetterstedt mentions that it frequents Umbelliferæ such as Aegopodium, and moreover Syringa, Rosa and Carpinus, but is also found on windows.

Geographical distribution: — Northern and middle Europe down into France; towards the north to middle Scandinavia.

INDEX.

Synonyms are given in italics. References to Genera and Species which are not Danish have the page in italics.

Addenda et Corrigenda.

Part I.

Page 4 Line 27 for "cheeks" read "jowls"
— 19 — 7 and 8 for "8. *Microchrysa*" and "9. *Chloromyia*" read "8. *Chloromyia*" and "9. *Microchrysa*"
— 40 — 26 after "concave" add "behind"
Finally in Part I "yowls" appears unfortunately everywhere for „jowls".

Part II.

In the present Part I use "frons" instead of "front", as I think the latter may cause confusion.
Page 37 Line 31 add "Alula very small, distinctly haired at the margin. The alar squamula small, hairy at the margin".
— 58 — 30 for "*Antipalpus*" read "*Antipalus*"
— 87 — 16 *Epitriptus cingulatus*: In this year (1908) three specimens, one male and two females, were caught on Bornholm at Rönne on $^{25}/_{7}$ by Esben Petersen.
— 89 — 37 for "*Collostoma*" read "*Callostoma*"
— 91 — 1 for "genus" read "family"