DIPTERA DANICA

GENERA AND SPECIES OF FLIES HITHERTO FOUND IN DENMARK

BY

WILLIAM LUNDBECK

PART I

STRATIOMYIIDAE, XYLOPHAGIDAE, COENOMYIIDAE, TABANIDAE, LEPTIDIDAE, ACROCERIDAE

WITH 47 FIGURES

PUBLISHED AT THE EXPENSES OF THE CARLSBERG FUND

G. E. C. GAD — COPENHAGEN
LONDON: WILLIAM WESLEY AND SON
1907

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INTRODUCTION.

The present paper is intended to form the first part of a work on the Danish Diptera fauna. The Danish flies never have been the object of any special work, reaching over the whole order, and hence we do not know what our country contains of this order; I therefore think that a work on them may be of some importance.

As it may be of some interest to learn what earlier has been published about Danish Diptera, and in order to show the standpoint, on which our knowledge to the Danish fauna of this order stands, as far as it has been published, I shall render a short account of the earlier literature in which Danish Diptera are concerned. In this way we get a view of the growth of the knowledge of our fauna during the times.

The earliest work known to me, in which is referred what at that time was known of Danish Diptera, is Kramer: Specimen Insectologiæ Danicæ, 1760. In this work 31 species are enumerated, no new are described. In the following year was published Brünniche: Prodromus Insectologiæ Siællandicæ, 1761; it enumerates 70 species of Diptera, of these one is described as new, but it is not named. The next work is Pontoppidan: Den danske Atlas, 1763; the list of the insects in this work is for the greatest part made by Brünniche, 91 species of Diptera are enumerated, no new are described, but the new species mentioned above is here named; the work is furnished with some plates on which among others some Diptera are figured and among these the new species mentioned (*Musca græca*). We then come to O. F. Müller, who published in 1764 his work: Fauna Insectorum Fridrichsdalina. In this 133 species are recorded, and in 1767 in the appendix to Flora Fridrichsdalina, entitled „Faunæ Fridrichsdalinæ Novicia", 23 species are added; of these 156 species 34 are described as new. Müller's work: Zoologiæ Danicæ Prodromus, 1776, cannot be drawn into consideration as it includes both Danish and Norwegian species, and no localities are given. To the year 1767 thus 156 Danish species of Diptera were known. With regard to all these species, both the new and known, it holds good, that they cannot be identified,

with exception of only a few species. There exsists no collections of insects from that time, not even O. F. Müller's, and the descriptions are so short and incomplete that it is not possible to identify the species without types. Whether O. F. Müller has ever had a collection of insects is not known as far as I am aware. There is a report of Hagen concerning the entomological collections in Denmark, Norway and Sweden (Stett. Ent. Zeit. V, 1844, 131) in which the following mention is made about this question: „Leider sind die sämmtlichen Sammlungen und Schriften Otto Friedrich Müllers, nach denen ich auf das Eifrigste geforscht habe, ganz verschwunden, und wahrscheinlich bei den grossen Feuersbrünsten Kopenhagens oder dem Bombardement untergegangen." I think that Hagen has got this information when he was in Copenhagen, but now nothing is known about it. We then see the curious case that while many of Müller's species of other animals are identified, it is not so with the Diptera, of which not one has been identified. The reason to this condition may be found in the fact that the following authors, and especially Fabricius, have paid no attention to Müller, and now nothing can be done.

The earliest work of Fabricius: Systema Entomologiæ, 1775, enumerates 18 species, to which the locality Denmark is given, but it must be remembered that a number of species are here recorded to occur over the whole of Europe, and when these species of them which must be taken as being known by Fabricius also as Danish, are taken in consideration, we get in all abt. 190 species. The number now increases steadily in the following works of Fabricius; in Entomologia Systematica, Vol. IV, 1794, is thus enumerated 55 species from Denmark, and in his last work: Systema Antliatorum, 1805, he has 73 species from Denmark, and with the European species which he has also certainly known from Denmark, the total number may be estimated at 274 species; this number thus represents what was known of Diptera in 1805 from Denmark.

Two works, about from this time, give some information about Danish flies from certain localities, but have otherwise chiefly interest as curiosities as the same holds good with regard to them, as was said about the works earlier than Fabricius, viz. that the determinations cannot be relied upon. The works are: Olavius: Oekonomisk-physisk Beskrivelse over Schagens Kjöbsted og Sogn, 1787, in which 5 species, all common, are recorded; and: Schade: Beskrivelse over Øen Mors, 1811, in which there are enumerated from this little island the relatively great number, for this time, of 83 species.

R. C. Stæger, the only author who has previously studied Danish Diptera systematically, was an eager collector of flies, and our know-

ledge of the Danish Diptera is based chiefly on his collection, now in our Museum; he published in 1839—40: Systematisk Fortegnelse over de i Danmark hidtil fundne Diptera (Naturhist. Tidsskr. II, III). He only reached through *Culicidæ, Tipulidæ* and *Mycetophilidæ*, and he established not so few new species. In the same periodical (IV, 1842) he published: Danske Dolichopoder, and here also he described some new species. His works to a high degree advanced the knowledge of the groups treated. All species enumerated by him are included in Zetterstedt's work.

Zetterstedt has, as is well known, in his great work: Diptera Scandinaviæ, Vol. I—XIV, 1842—60, also recorded the Danish species known at this time. He knew those species very well, as he had received from Stæger I think almost all species then known to our fauna, and he also included in his work the species mentioned by Stæger in his papers. He enumerates in all 1439 Danish species of which the last enumerated are found in Vol. XII, 1855, and this number thus represents the number of species then known. As will be seen the knowledge of the fauna had made a considerable step forwards since 1805, the year in which the last work of Fabricius was published.

We now have reached that point on which the knowledge of the Danish fauna of Diptera stands for the present as far as this knowledge is found in the literature of the subject. Still there are several papers on Danish flies or their larvæ, or in which Danish flies are mentioned; thus a series of papers by Stæger mostly dealing with single genera or species; these are all mentioned by Zetterstedt; moreover papers of F. V. S. Jacobsen, Chr. Drewsen, J. C. Schiödte, H. Löw, Fr. Meinert, H. Borries, J. E. V. Boas, R. C. Mortensen, E. Rostrup, S. Rostrup and J. C. Nielsen, but these add no or at all events only a few single species to our fauna.

The material I have worked out for the present paper consists, besides my own collection, of the collection of Danish Diptera in our museum. This collection is, as already mentioned, for the greatest part collected by Stæger and chiefly or exclusively in the environs of Copenhagen; to this however a small number of species are found in it from different parts of our country collected by Schiödte, Drewsen, Jacobsen, O. G. Jensen and a more important collection by H. J. Hansen. Danish species are also found in Westermann's collection and in the old collection of Tönder-Lund and Sehested, in which latter some Fabrician types are found. Further the following gentlemen have given me admission to their collections of Diptera: W. Schlick, C. Larsen,

R. H. Stamm and Axel Petersen in Silkeborg, and M. C. Godskesen has presented me with his collection of Diptera collected in the environs of Hilleröd. I shall especially mention Mr. Schlick's collection which, besides being rather large, has the advantage that it contents a great many breed flies together with their larvæ and pupæ. Mr. Schlick has also for many years breed Hymenoptera, and among these many species from Diptera; the most of what I say in my work about Hymenoptera parasitic on flies is due to Mr. Schlick. — To all the above named gentlemen I beg here to tender my sincerest thanks.

The terminology I use in my work is chiefly the common one. On the head the part at the top between the eyes is the vertex; it bears the ocelli when these are not absent. Below the vertex down to the antennæ, or in cyclorrhaphous flies, to the lunula, lies the front; when the eyes are touching, the vertex above and the front below both get a triangular shape and may then be termed vertical and frontal triangles. Below the antennæ down to the mouth-edge or near to it lies the epistoma; to each side of it, between it and the inner eye-margins are the cheeks, they are sometimes well separated by a furrow or a keel from the epistoma, especially in flies with a frontal bladder, but they may also be more or less confluent with the epistoma. Below the eyes, to each side of the oral aperture, lie the yowls which may be more or less produced below the eyes, or they may be horizontal and not at all extending below the eyes; they lie between the oral aperture and the lower eye-margin; sometimes they may be very narrow, only forming a narrow margin between the eye and the mouth opening, or the eyes may reach so near to the aperture that there are almost no cheeks. The front side of the head below the antennæ is sometimes spoken of as the face, this thus including the epistoma, the cheeks and sometimes also part of the yowls.

The mouth parts consist of the same parts as in Insecta mordentia, viz. mandibles, maxillæ and labium; mandibles and maxillæ, when present, are generally more or less elongated, somewhat lancet- or bristle-shaped; the mandibles are only present in the females of some orthorrhaphous flies, and the maxillæ are often short, rudimentary or quite wanting, as in most cyclorrhaphous flies; but maxillary palpi are almost always present consisting of one or more joints. The labium when normally developed is more or less semitubular, enclosing the other parts and terminating with a pair of lips, the labella, which may be very different in form and development, broad and somewhat swollen or long and narrow or of other forms, and sometimes very small. The labium itself may be of different lengths, from very short

to four times as long as the whole body. As belonging to the mouth parts are still two organs concerned, the hypopharynx and the labrum; the hypopharynx is a prolongation of the lower wall of the pharynx, and in it opens the salivary duct; it lies in the bottom of the canal in the labium and is often pointed triangular or sometimes more bristle-shaped, shorter or longer; it may be developed as a stinging apparatus, as in the *Asilidæ*. The labrum closes the labial canal above and is generally somewhat semitubular, with the hollow surface downwards, it may be of different lengths and also vary somewhat in form, but the length is generally in proportion to the length of the labium; in the *Culicidæ* it is used to sting with. All the parts mentioned form together the proboscis. The mouth parts are inserted at the mouth-aperture, but the case may here be somewhat different in an interesting way; in some flies as in many Orthorrhapha, f. inst. *Tabanidæ*, and in at all events most of the Nematocera the connecting membranes of the mouth parts are small and narrow, and the lower part of the head is well chitinised; the proboscis is then generally only slightly pro- and retractile. In other Diptera as in *Stratiomyiidæ* and, I think, in all Cyclorrhaphæ the lower part of the head is membraneous and not chitinised, and at the same time more or less prolonged; probably also the connecting membranes of the mouth parts enter into the formation of this part. I term this part, from the firm and chitinised mouth-edge to the base of the proboscis, the oral cone, and it is of importance to distinguish it from the proboscis itself with which it in earlier times has often been confounded, (stipes Latreille, Rüssel (Proboscis) Meigen); it is not a part of the mouth but the lower part of the head; it may sometimes be of considerable length. In the flies in which the lower part of the head is firm and chitinised as in the *Tabanidæ*, the clypeus is not, or not distinctly, separated from the epistoma; on the contrary in flies where an oral cone is present, the clypeus is separated and lies on the front side of the cone; it is generally elongated and reaches from the epistoma to the labrum, often, as in the *Syrphidæ*, it is deeply excised at the apex, and this excision may be so large that the clypeus becomes horseshoe-shaped as in most *Muscidæ*; also in flies without an oral cone, the clypeus may be excised at the apex, f. inst. in the males of the *Tabanidæ*. Often the membraneous part between the clypeus and the lower end of the epistoma is narrow, but sometimes broader. The clypeus may be divided in two parts as in some *Syrphidæ*, a small basal part being found, connected with the epistoma. In the interior of the head lies the pharynx with its lower end reaching down to the insertion of the mouth parts; its hinder wall is chitinised, and in flies

with no oral cone it sends, at its lower end, a pair of small processes forwards to the, in this case not separated, clypeus or it is at all events in some connection with it; when on the contrary an oral cone is present, these processes generally are large and strongly connected with the clypeus. Between these processes, stretching from the anterior wall of the pharynx to the clypeus, or in flies without an oral cone, to the clypeus and epistoma, lie the muscles which act as pumping muscles during the sucking. On account of the connection of the clypeus with the pharynx, the clypeus has sometimes been considered as a part of the pharynx, and pharynx together with clypeus has been termed fulcrum by Menzbier (Ueber das Kopfskelet und die Mundwerkzeuge der Zweiflügler, Bull. d. la Soc. imp. des nat. de Moscou, IV, 1880), and „Schlundgerüst" by Becker (Zur Kenntn. der Mundtheile der Dipteren, Denkschr. d. math. nat. Classe d. Kais. Akad. d. Wissensch., Wien, XLV, 1882). In reality it is only a chitinised part of the dermis, connected with the lateral wings of the pharynx, and answering to the clypeus in other orders. It has also been termed prælabrum. When an oral cone is developed the proboscis is highly pro- and retractile, the membraneous cone being folded in, or more strictly speaking, it is laid up backwards in the aperture, the connection between clypeus and epistoma acting as a hinge. The real oral aperture is naturally at the lower end of the oral cone, but it may be convenient to term the chitinised edge of the under side of the head to which the cone is attached, the mouth-edge, and speak of the aperture surrounded by this edge as the mouth-aperture.

With regard to the antennæ I generally count as many joints as are really present, so that I f. inst. count a two-jointed style or arista as two antennal joints, only using the terms complex, style and arista as merely descriptive; I expressly mention this partly because Wandolleck in a paper (Ueber die Fühlerformen d. Dipt., Zool. Jahrb., Abtheil. für Syst. VIII, 1895) seems to be of the opinion that dipterologists have not considered the actual number of the antennal joints what I still think scientific dipterologists have done in the last half century, but the terms mentioned are convenient in descriptions.

As to the thorax I use for the sterna and pleura the terms proposed by Osten Sacken (An Essay of comp. Chætotaxy, Transact. Ent. Soc. London, 1884); the terms are (fig. 1) a, mesopleura, b, pteropleura, c, sternopleura, d, hypopleura, e, metapleura. The terms are very convenient, I therefore use them; only the term metapleura is in so far inadæquate as I take this part as belonging to the mesothorax, but yet the term may be used. The part below or behind scutellum is termed the postscutellum, generally it is more or less vertical, but

it may also be horizontal and rather large, as f. inst. in the *Tipulidæ* and *Xylophagidæ*, especially *Xylophagus*. The thorax is thus chiefly formed of mesothorax, the prothorax is very small and also the metathorax; of the latter may sometimes be seen a narrow part behind the postscutellum and between the halteres; on the ventral side sometimes a narrow metathoracic part may also be distinguished. The spiracles I take to be prothoracic and mesothoracic.

Abdomen consists of a number of segments of which the last are generally more or less transformed; in the descriptions I give the number of not transformed segments; these are as a rule not difficult to see but sometimes one or more of the last may be small or the last may be more or less hidden. Also at the base of the abdomen the first segment may be narrow, and sometimes the first and second ventral segments may be coalesced, yet generally a suture marks the line of connexion.

The legs are somewhat uniform, only they may be relatively short or on the contrary relatively long, and they may be stronger or weaker. Generally the somewhat sluggish and not well flying Diptera have much stronger legs than those that fly well; the species with somewhat strong legs often bear bristles on them. The tarsi are five-jointed; the last joint bears a pair of claws which are generally simple, but sometimes may be serrated or otherwise specially formed. Besides the claws there are at the end of the last joint still three organs, which may be of some systematic importance; under the claws are attached two lobes, the pulvilli, these are generally organs of fastening; they may be of different, sometimes complicated, forms, and of different sizes, and sometimes they may be absent. Between the pulvilli is inserted a median organ, the empodium; this may also be very different in form, from quite uniform with the pulvilli to the form of a long bristle, and sometimes it is feathery or of other complicated form; it may sometimes be absent. — According to de Meijere (Ueber das letzte Glied der Beine bei den Arthropoden, Zool. Jahrb., Abth. für Anat. und Ont. XIV, 1901) the claws and organs mentioned are not inserted on the fifth joint itself but on a special small apical joint, the prætarsus. According to him the empodium in the Diptera is not always morphologically of the same origin; in the *Tipulidæ* f. inst. we have a real empodium, but in most of the other Diptera the

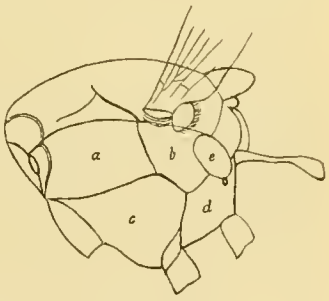


Fig. 1. Lateral view of thorax of *Dryomyza anilis*.

median organ is a prolongation of his „Strecksohle“ at the lower surface of the prætarsus; he terms it „Sohlenläppchen“ (Lobus plantaris), the pulvilli he terms „Seitenläppchen“ (Lobuli laterales). Yet I think we may here very conveniently term the organ empodium whatever may be its origin. Moreover I do not quite understand de Meijere when he (p. 434) says: „Die Streckplatte, die Gleitsohle und das Empodium lassen sich meistens ohne Mühe erkennen“; but on p. 436 says: „Indem dieser Sohlenlappen den meisten höheren Dipteren eigentümlich ist, daselbst aber das Empodium entweder ganz fehlt oder doch nur als kleines Rudiment vorkommt.“

The terminology of the venation of the wings is a question that has been much confused, and, as well known, different authors use up to this day different terms. After the works of Adolph, Brauer and Redtenbacher it now ought to be the time when a terminology with terms indicating the homolo gies for all orders should be used. It is, however, fortunate that the terms used f. inst. by Schiner and Van d. Wulp for a great deal are applied to veins really homologous in the different families, and only in relatively few cases this is not so, what I hope to point out in the particular places. The important observation of Adolph concerning the convexity or concavity of the veins must absolutely be taken into consideration. It seems to me that the way adopted by Redtenbacher (Vergleich. Stud. über das Flügelgeäder der Ins., Ann. d. K. K. naturh. Hofmuseums, Wien, I, 1886) is the correct and conforms with what really is found in nature, and he has also compared the wings of all orders. According to him the wings of all orders including Diptera, with regard to the veins, fall in five fields with convex veins: 1. the costal field with the vein I, 2. the radial field with vein III, 3. the medial field with vein V, 4. the cubital field with vein VII and 5. the anal field with vein IX; these five systems of convex veins are separated by systems of concave veins which he indicates by II, IV, VI, VIII and X. Between the branches of a convex vein concave branches may occur, and between the branches of a concave vein convex branches may occur; these are indicated by the arabic figures appended to the roman numerals, even numbers indicating the concave, uneven numbers indicating the convex branches. As said above, the terminology used by Schiner and van d. Wulp to a great degree indicates homological veins with the same names, and I shall therefore, in order to avoid confusion, chiefly use these terms. The figures (figs. 2 and 3) show the terms used here together with the indications of Redtenbacher; it will then always be possible, also with the terminology used here, to compare the wings with wings in other orders, when once a terminology uniform for all orders is introduced, and to find the homological veins. It is thus so

advantageous that by chiefly using well known terms we may avoid unnecessary confusion and at the same time be capable without difficulty to bring the wings of the Diptera under a general point of view. — The terminology used is the following: 1. the costal vein, stopping near the apex or extended all round, 2. the mediastinal vein which is concave, 3. the subcostal vein, convex, 4. the radial vein, concave, 5. the cubital vein, convex, 6. the discal vein, concave, 7. the postical vein, convex, 8. the anal vein, concave, 9. the axillary vein, convex.

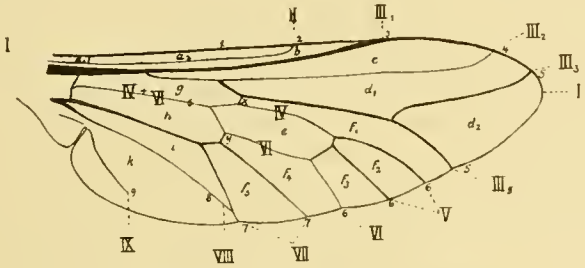


Fig. 2. Wing of *Tabanus tropicus*.

The cells are: a, the costal cell, b, the mediastinal cell, c, the subcostal cell, d, the cubital cell, e, the discal cell, f, posterior cells, g, the first basal cell, h, the second basal cell, i, the anal cell, and k, the axillary cell: x is the medial cross-vein, y, the postical cross-vein.

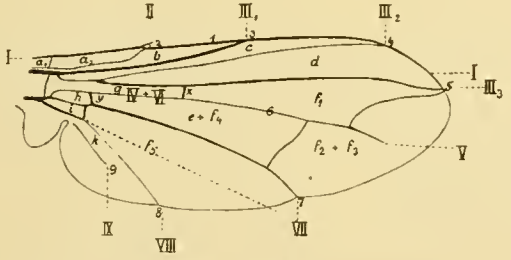


Fig. 3. Wing of *Dexia canina*.

The mediastinal vein is generally near to the base connected with the costal vein by a cross-vein, the basal cross-vein, and then there are two costal cells. The radial vein is often unbranched, but may be branched, and then there is more than one subcostal cell; the subcostal cell or cells lie between the convex subcostal vein and the concave radial vein, or between the branches of the latter. The cubital vein is generally branched and there may be up to three cubital cells; the cubital cells lie between the concave radial vein and the convex

cubital vein or between the branches of the latter. The discal vein in our terminology is in the basal part formed by the junction of two concave veins (IV and VI), it then divides, and the two veins enclose the discal cell, from this often some veins go to the wing margin; the discal vein is, as formed of two concave veins, concave itself; between the two veins forming it, should lie a convex vein, the vein V, but it is generally absent, or only some end branches are left. For convenience sake we use the name discal vein for the whole vein with its branches, but it must be born in mind that when there, among these latter, are convex veins, these originally belong to vein V, the rest of which has disappeared. The discal vein may also be simple and unbranched. Between the discal vein and the cubital vein lies the medial cross-vein, and between the discal and the postical veins lies the postical cross-vein; these cross-veins or one of them may sometimes be absent. The postical vein is almost always branched, the lower branch generally uniting with the anal vein for a shorter or longer distance. The anal vein is unbranched; the axillary vein is generally short and often absent or quite rudimentary, only in the *Tipulidæ* it reaches the margin. The first posterior cell lies between the convex cubital vein and the concave discal vein, and is bordered towards the base by the medial cross-vein; the other posterior cells lie between the branches of the discal vein, the fifth always in the fork of the postical vein and thus always bordered both above and below by convex veins (in the *Muscidæ* the lower branch of the postical fork is short, more or less vertical and uniting the anal vein rather near to its base, the fifth posterior cell is then bordered below by the concave anal vein). The anal cell lies between the convex postical vein and the concave anal vein; the space below the anal vein is termed the axillary cell. The two basal cells lie towards the base of the wing and are separated from one another by the basal part of the discal vein.

Many alterations, chiefly reductions, in the venation may take place, and these will be considered in the particular places; I shall only here point out some of the more important. F. inst. some veins may totally disappear; the vein V as mentioned is generally almost or quite wanting, and this is characteristic of the Diptera, yet in some flies, especially *Mycetophilidæ*, it is present to a greater degree. As already noticed the discal vein may be simple and unbranched (fig. 3), and then it does not enclose a discal cell; this is the case in all cyclorrhaphous and some orthorrhaphous flies; in this case there is no genuine discal cell but this is confluent with the fourth posterior cell, yet for convenience in the descriptions it may be termed the discal cell, but

its formation must be born in mind. In such cases the posterior cells are also more or less confluent, as the branches which should separate them are absent; generally the first, as usual, lies above the discal vein, the space outwards to the discal cell is answering to the second and third, the fourth is coalesced with the discal cell, the fifth on the contrary is always found in the convex postical fork, and ought always to be termed the fifth, notwithstanding the number of actually present posterior cells.

With regard to the squamulæ I quite follow the terms used by Girschner (Ueber die Postalar-Membran der Dipt., Illustr. Zeitschr. für Entom., 1897, 534); the squamula sitting on the base of the wing, and which in rest lies above the other, is the alar squamula, that sitting on thorax and in rest lying below the alar squamula, is the thoracic squamula; the angle formed between the two squamulæ when the wing is stretched horizontally out is the squamular angulus or short, the angulus.

Finally I shall remark here that the terms used in describing the mouth parts in the larvæ must not be taken as indicating sure homologies with the similarly termed parts in the imagines.

Concerning the system I intend to follow, chiefly at all events, that of Brauer such as it is given in the „Katalog der paläarktischen Dipteren von Becker, Bezzi, Kertész und Stein.“ — When I make the beginning with the Orthorrhapha brachycera, this is of a purely practical reason because our fauna of Nematocera requires renewed material before it can be worked out.

As mentioned above I have had material from all the important parts of Denmark; yet the material, as naturally must be expected, is for far the greatest part collected in the environs, nearer or more remote, of Copenhagen, or in the whole in North-Sealand. In order to avoid repeated explanations about the localities I shall here give a list of most of those in North-Sealand with some short explanations of the nature of the locality:

Frederiksberg Have. — A public garden with canals in the outskirts of Copenhagen.

Ladegaardsaaen. — A small stream at Copenhagen.

Leersø. — A former lake at Copenhagen now dried up and grown with Salix.

Damhusmosen. — A fen near Copenhagen, chiefly grown with Salix.

Utterslev Mose. — A fen near Copenhagen.

Amagerfælled. — A common near Copenhagen.

Vesterfælled. — A common at the seashore near Copenhagen.

Charlottenlund. — A small wood about 3 miles north of Copenhagen.

Dyrehaven. — A forest and deer park about 4 miles north of Copenhagen.

Ordrup Krat. — Ermelund. — Two small woods just to the south of Dyrehaven.

Ordrup Mose. — A peat bog between Dyrehaven, Ordrup Krat and Ermelund.

Fortundammen. — A pond in Ermelund.

Kildeso. — Fuglsangsø. — Two small lakes in Dyrehaven.

Raavad. — A locality right in the middle of Dyrehaven.

Skodsborg. — A locality in the northern part of Dyrehaven.

Bøllemose. — A fen and lake in the northern part of Dyrehaven.

Lyngby. — A small town about 5 miles north and a little west of Copenhagen.

Lyngby Mose. — A fen and lake near Lyngby chiefly grown with Alnus and Betula.

Frederiksdal. — A small forest to the west of Lyngby.

Hareskov. — A forest to the west of Frederiksdal and joining it.

Furesø. — Farum Sø. — Bagsværd Sø. — Lakes near Frederiksdal.

Geel Skov. — A small wood about 6 miles north and a little west of Copenhagen.

Ørholm. — A small wood near Geel Skov.

Fuglevad. — Brede. — Small woods between Ørholm and Lyngby with a little stream: Mølleaa.

Ruderhegn. — A wood about 8 miles north and a little west of Copenhagen.

Tokkekjøb Hegn. — A wood about 12 miles north and a little west of Copenhagen.

Donse. — A locality at Tokkekjøb Hegn with a pond: Donse Dam.

Hillerød. — A town more or less surrounded with woods in Northern Sealand.

Freerslev Hegn. — A small wood with fens, near Hillerød.

Grib Skov. — A forest to the North of Hillerød.

Esrom Sø. — A lake at the eastern side of Grib Skov.

Jægerspris. — A locality at the western coast of Roskildefjord with a Forest: Nordskoven, and a small wood: Færgelunden.

Tidsvilde. — A forest at the northern seacoast of Sealand.

Teglstrup Hegn. — A wood at the northern coast of Sealand, near Helsingør.

ORTHORRHAPHA BRACHYCERA.

PLATYGENYA.

HOMOEODACTYLA.

NOTACANTHA.

Stratiomyiidae.

Head generally rather short and somewhat semiglobular, flat or excavated behind, as broad as or a little broader than the thorax, and often broader than high. In front it is arched, and sometimes the face is somewhat prominent below the antennæ, or front and face are produced to a longer or shorter snout. Yowls slightly or not produced below the eyes. Antennæ placed near to each other, and in or near the middle of the head, or sometimes farther downwards on the lower side: they are seven- to ten-jointed in all; the two basal joints may be of different length, the following four to eight form an annulated, more or less globular, compressed part, or a more elongated fusiform part, the last or penultimate and last joints often form a more or less distinct style or a one- or two-jointed arista. Eyes generally touching in the male, but sometimes separated, in the females well separated. In the males the upper facets are in most of the genera larger than the lower. Eyes hairy or bare in both sexes, or hairy in the males and bare or nearly so in the females. Three ocelli present. The oral cone varies from very short to rather long; clypeus is more or less linear, lying on the front side of the cone reaching from the epistoma to the labrum; below, at the end of the cone, it is more or less connected with the chitinised pharynx. The proboscis is of different length, the basal part of the labium is short, the labella of different form, short and broad to rather long and narrow, often forming an angle with the basal part of the labium. Labrum generally of the length of the basal part of labium, relatively broad, more or less semitubular; hypopharynx shorter than the labrum, sometimes rudimentary, generally pointed, triangular. Maxillæ wanting or present, but often rudimentary, only consisting of a basal piece, rarely with a

short lacinia; maxillary palpi always present, but rather small, one- or two-jointed. Thorax more or less rectangular; scutellum with spines or unarmed. Abdomen more or less flat, as broad as or mostly broader than the thorax, generally short, sometimes more elongated; it consists of five to seven distinct segments. The legs are simple, not especially strong, strongest in the somewhat heavy and sluggish genera, weaker in the well flying genera as f. inst. *Sargus;* they are without bristles or apical spurs; the claws are simple, there are two pulvilli and a pulvilliform empodium quite resembling the pulvilli. Wings with the costal vein extending at most to the apex of the wing, radial vein present or sometimes wanting, cubital vein generally with a small fork, sometimes unforked, and thus one or two cubital cells present. Discal cell rather small, formed exclusively of the discal vein, or, in some genera, closed below by the anterior branch of the postical vein; in this case there is no postical cross-vein and the venation of this part of the wing to some degree recalls the venation characteristic for the cyclorrhaphous flies. From the discal or from this and the second basal cell there rise three or four veins, often not reaching the margin, generally very thin or some of them rudimentary; there are, in relation to the number of these veins, four or five posterior cells, some of which may be more or less fused. The basal cells are of equal length, and the anal cell nearly reaches the margin. The wings of the Stratiomyids are moreover characterised by the anterior veins being crowded towards the anterior margin, the small discal cell being placed above the middle of the wing, so that the part lying below the postical vein occupies about the half of the wing. The alula is well developed, often somewhat pointed; the alar squamula is distinct but small, the thoracal squamula wanting or more or less developed; the halteres are not covered. In rest the wings lie parallel over the abdomen, one quite covering the other, so that in forms with a somewhat broad abdomen, the sides of it are seen outside the wing-margins. Several of the above facts, among others the structure and venation of the wings, point towards the fact that the Stratiomyids are somewhat ancient forms.

The eggs are deposited in the earth, in dung or in similar localities, or when the larva lives in water, on water-plants. I have seen eggs of some species of *Stratiomyia* or *Odontomyia* deposited on a Phragmites at some distance above the surface of the water; they were deposited in a somewhat oval mass of a length of 13 mm.; the eggs were held together by some cementing substance; the individual eggs were whitish, elongate, about 2 mm. long; the whole mass was brownish. The larvæ are elongated, fusiform or with parallel sides, more or less

flattened. The head is conical: towards the apex, the body tapers more or less, or is rounded. The body consists of twelve segments including the head. The head is more or less cleft above in front, in three somewhat pointed lobes, the median lobe forms a vertical, somewhat hooked labrum, in front beset with hairs; to each side of it lie the mandibles and maxillæ as more or less scale-formed and somewhat hooked pieces, strongly beset with bristles and spines or teeth; they are moved together vertically in and out; mandibles and maxillæ are generally more or less connected, so that they may be difficult to discern as separate pieces. On each side of the head there is a more or less distinct eye, and the lateral lobes generally bear antennal papillæ at the point. The larvæ are generally described as peripneustic, and may also be termed so, in as far as there are spiracles on prothorax and (generally) on metathorax and on the first six to seven abdominal segments. Such is the case in several genera, but there seems to be some variation in other genera, and especially the metathoracic and one or perhaps more of the last abdominal spiracles may be wanting, but the spiracles are often so indistinct, and especially just on metathorax and towards the apex of the abdomen, that it may be very difficult to decide their actual number. The spiracles are in the whole small, those on prothorax being the largest, and they are probably not in function. On the other hand there always are terminal spiracles lying in a transverse split on the last segment, and, with the larvæ living in water, surrounded by a coronet of feathery hairs. Thus with regard to the function of the tracheal system the larvæ could be termed metapneustic. The pupa is lying in the larval skin, which becomes rigid, but otherwise does not alter its form. By the escape of the imago the larval skin opens with transverse splits on the third and fifth segments and a longitudinal split between these in the middle. — All larvæ of Stratiomyids show a peculiar structure of the skin; it is rather thick, solid and leathery; seen from the surface it is divided into small, somewhat hexagonal fields, large enough to be seen with a lens, each of these is the base of an inwardly conical calcareous nail, the whole forming a very solid and protective mail; the calcareous matter is present to so high a degree, that the skin bubbles strongly when laid in chloric acid.

The larvæ live in water, in earth, dung or in decaying vegetable matter. Some live probably of decaying vegetables, those found in water live, I think, on microorganisms; when held in captivity they are seen repeatedly to move the mouth parts in and out, and when such larvæ are taken, before they are full grown, they generally stop growing, I think for want of suitable food, when the microorganisms have disappeared.

The Stratiomyids are of small to middle size; they feed as imagines on vegetable juices and occur on plants and especially on flowers; most of the species chiefly occur near water. — From the palæarctic region about 232 species are known and from North America about 302; of these only five are common to both regions.

Only few cases of parasitic Hymenoptera on Stratiomyids are known. I am aquainted with the following from Denmark. From pupæ of a *Nemotelus* has been bred a little Ichneumonid. *Smicra sispes* L. has been bred from pupæ of *S. longicornis* and *furcata,* one from each pupa; the *Smicra* has once been taken stinging an egg-mass, it thus deposites its eggs in the eggs of the *Stratiomyia*. From *S. furcata* has been bred a Pteromaline, that came in great number from the pupa [1]). From *Chloromyia formosa* has similarly been bred a Pteromaline and from *Microchrysa polita* a *Tetrastichus* sp. in great numbers from each pupa. Finally from one of the *Sargus* sp. (*iridatus?*) has been bred a small Ichneumonid, of which there was one parasite in the pupa. — Moreover the following cases have been reported: From *S. chamæleon* has been bred *Phygadeuon dumetorum* Grav.; from *H. viridula Monodontomerus obscurus* Westw., and besides from the above mentioned *Stratiomyia* species *Smicra sispes* has also been bred from *S. chamæleon*.

Stratiomyids earlier recorded from Denmark. — Kramer in 1760 (Spec. Insectol. Dan.) enumerates two species: *Musca chamæleon* and *cupraria*. Brünniche, 1761 (Prodr. Insectol. Siælland.), has four: *Musca chamæleon, cupraria, polita* and a new species, not named; in Pontoppidan, Danske Atl. I. 1763, one more is enumerated, viz. *hydroleon*, and the new species is named *græca*. About these species can be said, that *chamæleon* is a *Stratiomyia,* and probably *chamæleon* or *furcata, cupraria* is a *Sargus,* and *polita* probably this species, *hydroleon* is an *Odontomyia*, and *græca* is *Oxycera trilineata* (see under this species). O. F. Müller, 1764 (Faun. Fridrichsd.), has four species: *Musca chameleon, hydroleon, pantherina* and *cupraria,* and in 1767 in the appendix to Flora Fridrichsd. he has two more species, *microleon* and *polita;* of these species is *chameleon* this species or *furcata, hydroleon* one of the green *Odontomyia* species, *pantherina* is a *Nemotelus* and *cupraria* a

[1]) It is evidently a similar case, that has mislead Knoch and induced him and Meigen to think, that the *Stratiomyia*-larva was a worm, because he had seen one of them bear 300 young; they took then the *Stratiomyia*-larva for a „Wasserwurm" and thought that the real, but unknown *Stratiomyia*-larva was parasitic in it. (Meig. Syst. Beschr. III, 133.) When Brauer (Denkschr. d. Kais. Akad. d. Wiss. Math. Nat. Classe, Wien, XLVII, 1883, 57) speaks of Knoch's fable, this is so far incorrect, as Knoch's observation certainly is right, only his conclusion is erroneous.

Sargus; of *microleon* can scarcely be said more than that it is a *Stratiomyia* or *Odontomyia,* and *polita* is probably this species. Fabricius in his first work 1775 (Syst. Ent.), has two species from Denmark, *Stratiomys tigrina* and *viridula,* both new; these two well known species are thus established on specimens from Denmark; in his following works he only enumerates the same two species from Denmark, but in his last work in 1805 (Syst. Antl.), he has moreover *Sargus cyaneus*, which is *Microchrysa polita.* Zetterstedt in 1842 (Dipt. Scand. I) enumerates, as sent him by Stæger: *Ber. clavipes, Str. chamæleon, strigata = longicornis, ornata, hydroleon, Ox. trilineata, formosa, Nem. bifasciatus = uliginosus, notatus, nigrinus, Chr. formosa, pallipes = flavicornis, Sarg. cuprarius, infuscatus = iridatus* and *flavipes.* In 1849, (VIII), he adds moreover *Str. potamida, argentata, ruficornis = angulata, Ox. hypoleon = Fallenii, Meigenii* and *Sarg. nitidus;* as the latter is the same as *iridatus* (see under this species) he thus knew in all 20 species. Of these Stæger had already in 1844 (Sett. Ent. Zeit. V.) recorded *O. Fallenii* and *Meigenii*, and Schiødte had in 1844 (Nat. Tidsskr. 2. I, 40) recorded *Od. argentata*, *Ox. Meigenii* and also *Ox. leonina*, which latter is overlooked by Zetterstedt. Thus there were known in all 21 species. — In the present work 34 species are enumerated.

Table of Subfamilies and Genera.

1. Abdomen consisting of seven segments, scutellum with more than two spines ..... 5. *Beridinae.*
— Abdomen consisting of five to six segments, scutellum unarmed or with two spines ..... 2.
2. From the discal cell rise three veins, anterior branch of the postical vein closing the discal cell below; four posterior cells ..... 1. *Pachygastrinae.*
— From the discal cell or from the discal and second basal cells rise four veins (one or two of which may be rudimentary or wanting); five posterior cells (some of which may be more or less fused) ..... 3.
3. Fifth posterior cell lying close to the discal cell, no cross-vein between discal cell and postical vein .... 2. *Cliteltariinae.*
— Fifth posterior cell not lying close to the dicsal cell, a cross-vein between the discal cell and the postical vein ..... 4.
4. Scutellum with two spines; not metallic coloured species ..... 3. *Stratiomyiinae.*
— Scutellum unarmed, metallic coloured species ..... 4. *Sarginae.*

1. Pachygastrinae.

Scutellum unarmed; abdomen consisting of five segments. From the discal cell rise three veins, the third is the anterior branch of the

postical vein and closes the discal cell below, there is thus no cross-vein between the discal cell and the postical vein; four posterior cells. Alula distinct, pointed; squamula alaris small, no squamula thoracalis; wing membrane not transversely corrugated.

Only one genus ..... 1. *Pachygaster*.

2. Clitellariinae.

Scutellum unarmed or with two spines; abdomen consisting of five to six segments. From the discal cell rise four veins, the fourth is the anterior branch of the postical vein, it lies close to the discal cell, there is thus no cross-vein between the discal cell and the postical vein; five posterior cells. Alula distinct, somewhat pointed; squamula alaris rather small, haired at the margin, squamula thoracalis distinct but narrow, long haired at the margin. Wing membrane somewhat (*Oxycera*), not transversely corrugated (*Nemotelus*).

1. Scutellum unarmed ..... 2. *Nemotelus*.
— Scutellum with two spines ..... 3. *Oxycera*.

3. Stratiomyiinae.

Scutellum with two spines; abdomen consisting of five segments. From the discal and second basal cell rise four veins, (of which the first and third may be more or less rudimentary or the third wanting) the fourth is the anterior branch of the postical vein; a cross-vein between the discal cell and the postical vein; five posterior cells (some of which may be more or less fused). Alula well developed; squamula alaris distinct, haired at the margin, squamula thoracalis rather large, with long hairs, sometimes curved at the ends, in the margin. Wing membrane transversely corrugated.

1. First joint of antennæ about four times as long as the second ..... 4. *Stratiomyia*.
— First joint of antennæ as long as, or at most twice as long as the second ..... 2.
2. Radial vein present, cubital vein generally forked..... 5. *Odontomyia*.
— Radial vein wanting, cubital vein short, not forked ... 6. *Hoplodonta*.

4. Sarginae.

Scutellum unarmed; abdomen consisting of five segments. From the discal and second basal cell rise four veins, the fourth being the anterior branch of the postical vein; a cross-vein between the discal cell and the postical vein; five posterior cells. Alula distinct, triangular, pointed; squamula alaris small, haired at the margin, squamula thoracalis narrow, somewat lingulate or slighty rounded, with long hairs, curved at the ends, at the margin. Wing membrane transversely corrugated.

1. Eyes bare, separated in both sexes, but mostly so in the female; eye-facets in the male of equal size; abdomen very elongated ..... 7. *Sargus.*
— Eyes touching in the male, widely separated in the female; eye-facets in the male of unequal size; abdomen moderately elongated ..... 2.
2. Eyes densely hairy ..... 8. *Microchrysa.*
— Eyes bare or nearly bare ..... 9. *Chloromyia.*

5. Beridinae.

Scutellum with six bristle-bearing spines (aberrantly four to eight); abdomen consisting of seven segments. From the discal cell rise three veins, the third is the anterior branch of the postical vein and closes the discal cell below, there is thus no cross-vein between the discal cell and the postical vein; four posterior cells. Alula small; squamula alaris distinct, haired at the margin, squamula thoracalis wanting. Wing membrane not transversely corrugated.

Only one genus ..... 10. *Beris.*

1. **Pachygaster** Meig.

Species of small size and of black colour. Head somewhat globular, as broad as thorax. Antennæ inserted near the lower side of the head, thus epistoma and cheeks are short; yowls not descending below the eyes, but on the contrary together with cheeks and epistoma bending a little upwards towards the mouth-edge, so that the head is somewhat hollowed beneath. Antennæ short, eight-jointed in all, the two basal joints very short, the four next forming a globular, somewhat compressed, annulated part, the two last joints forming an apical arista, the first joint of which is short and difficult to see. Eyes bare, touching in the male, separated in the female; in the male the upper facets are larger than the lower. The oral cone is small, and the proboscis itself is short, with relatively small labella, labrum and hypopharynx are short, maxillæ are present, but short, somewhat lancet-like with a small one-jointed palpus. Thorax is somewhat longer than broad, scutellum rather large, without spines. Abdomen short and broad, broader than thorax, consisting of five segments. Wings with the cubital vein forked, or, in one species, *P. minutissima,* not forked; the anterior branch of the postical vein forms the lower side of the discal cell, from this cell rise three veins, of which the third is the anterior branch of the postical vein, there are thus four posterior cells, the third and the fourth being confluent. In rest the wings are lying parallel over the abdomen, the one covering the other.

The larvæ (*P. tarsalis*) are elongated, slightly flattened, the body consists of twelve segments in all. The head is rather long, conical and somewhat pointed; on each side of the head, nearest to the base, there is a distinct eye-spot. Brauer says: „Augen fehlend (?)“, but in *P. tarsalis* they are distinct. The segments are broader than long, with the exception of the last, which is subquadrate, rounded behind, and on the ventral side it bears the anus as a longitudinal split. Each segment has on the sides a little knob-like dilatation and bears a girdle of strong bristles, consisting of four on the dorsal surface, six on the ventral surface, and one on each lateral dilatation, besides some smaller bristles. The bristles on the dorsal surface are longer than those on the ventral surface, those on the lateral dilatations are the longest. On the hind margin of the last segment there are eight long bristles. On the prothoracic segment there is a spiracle on each side, and on the last segment, above, near the apex, there is a small, horizontal split with terminal spiracles; on the other segments I could not detect spiracles, if they are there, they must be very small and inconspicuous.

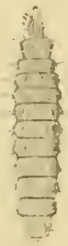


Fig. 4. Larva of *P. tarsalis*. × 4.

The larvæ live under the bark of trees or in decaying wood; they certainly hibernate, and the transformation and developement take place in summer.

The species of *Pachygaster* seem generally to be somewhat rare, perhaps chiefly on account of their small size. According to Schiner they are lively and merry and swarm in low herbage and around bushes.

Of the genus 5 (or 6) species belong to the palæarctic region, of these 2 have hitherto been found in Denmark.

Table of Species.

1. Wings quite hyaline, cubital vein not forked, no silver grey spot above the antennæ ..... 1. *minutissima*.
— Wings with the basal part slightly fumigated, cubital vein forked, front with silver grey spots above the antennæ ..... 2. *tarsalis*.

1. P. minutissima Zett.

1840. Zett. Ins. Lapp. 575, 1, nota. — 1842. Zett. Dipt. Scand. I, 153, 4, et 1849. VIII, 2961, 4, et 1852. XI, 4261, 4. — 1870. Loew, Zeitschr. gesammt. Naturwiss. XXXV, 269, 1. — 1903. Kat. paläarkt. Dipt. II, 2.

Male. Antennæ brownish black. Thorax black, shining, very finely and inconspicuously punctate and clothed with extremely short and inconspicuous pubescence. Abdomen quite glabrous and therefore

still more shining than the thorax. Legs with the femora black, pale at the tips, the trochanteres are also a little pale, tibiæ and tarsi yellowish white. Wings entirely hyaline, veins pale, the discal vein and the veins rising from the discal cell very inconspicuous; no distinct stigma; the radial and cubital veins rising about from the same point of the subcostal vein, cubital vein short, not forked. Halteres blackish.

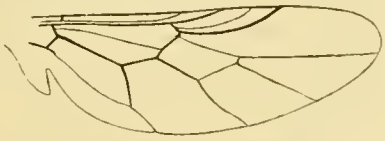


Fig. 5. Wing of *P. minutissima*.

Female. Antennæ yellow. Front broad, occupying more than one third of the breadth of the head, shining black with an impressed line, devided above and bordering each side of the ocellar tubercle. Halteres pale, knob white.

Lenght 2,5—3 mm.

This species is easily distinguished by its small size and shining black colour and especially by the cubital vein not being forked, this being unique in the genus.

P. minutissima seems to be very rare here, I only know a few specimens, one is taken in Mr. Drewsen's breeding house, bred from wood from Dyrehaven, and it has been bred of larvæ, taken in Bromme Plantage at Sorö (Meinert). The larva is said to live under bark of Pinus and Abies.

Geographical distribution: — Northern and middle Europe down into France.

2. **P. tarsalis** Zett.

1842. Zett. Dipt. Scand. I, 152, 2. — 1862. Schin. F. A. I, 3. — 1870. Loew, Zeitschr. gesammt. Naturwiss. XXXV, 270, 2. — 1903. Kat. paläarkt. Dipt. II, 3.

Male. Antennæ yellowish, the annulated complex sometimes a little darker, especially beneath, arista yellowish white. Frontal triangle silvergreyish, with an impressed median line. Thorax black, slightly shining, rather coarsely punctate, clothed with very short, brownish pubescence; pleura and sterna more glabrous and more shining. Abdomen with punctuation and pubescence as on thorax. Legs with the femora black or brownish black, tibiæ and tarsi yellowish white, the posterior tibiæ with the basal part blackish or brownish to greater or lesser extent, in the hind tibiæ nearly to the apex. Wings with the basal half sligthly fumigated, the veins in this part, except

the discal vein, brownish, in the apical half yellowish; stigma light yellow, just occupying the space between costa and the radial vein, the cubital vein forked at the apex. Halteres blackish brown, peduncle a little paler.

Female. Antennæ yellow, the annulated complex larger than in the male. Front moderately broad, not occupying one third of the

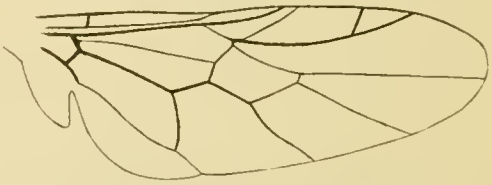


Fig. 6. Wing of *P. tarsalis*.

breadth of the head, shining black with a median longitudinal ridge; two silvergrey spots above the antennæ.

Lenght 3.5—4.5 mm.

The larva is brownish or greyish brown with two more or less indistinct, lighter, longitudinal lines on the dorsal and ventral surfaces, these lines being more conspicuous in the pupæ; the length of the larva is abt. 8 mm.

P. tarsalis seems also rather rare here, and it has only been bred; Charlottenlund, Dyrehaven and on Lolland at Maribo (W. Schlick). The larva was taken under bark and in decaying wood of beeches, oaks and apple-trees; it was taken from the beginning of June to the middle of July, and the imagines developed in the same months. Jaennicke (Berl. Ent. Zeitschr. 1866, X, 220) refers it to have been bred from beech (*robustus* Jaennicke = *tarsalis* Zett.)

Geographical distribution: — Northern and middle Europe, in north to southern Sweden and in south to middle Germany.

Of the genus *Pachygaster* there is thus hitherto known two species from Denmark. There is some reason to think that also *P. atra* Panz., *Leachii* Curt. and perhaps also *meromelas* Duf. may be found, as they occur both north and south of Denmark and also are found in Britain. They will be easily distinguished from the two species described. *P. atra* has the wings fumigated on the basal half, but the male has black antennæ, and both sexes want the silvergrey spots above the antennæ: *P. Leachii* has the wings entirely hyaline and the legs quite pale, only with a black ring at the tip of the hind femora; *P. meromelas* has the wings entirely hyaline but the femora are black.

2. **Nemotelus** Geoffr.

Species of rather small size, quite black or often black with more or less, often greatly extended white spots; the colouring is often different in the two sexes. Head roundish but the face more or less produced to a somewhat pointed snout on the upper side of which the antennæ are inserted. Yowls horizontal, not descending below the eyes; the mouth aperture forming a long, backwardly widened split, stretching to the end of the snout. Antennæ short, eight-jointed, joints three to six forming an annulated part, the two last joints forming a thin style. Eyes generally bare, rarely hairy, touching in the male, separated in the female; in the male the facets on the lower part are smaller than above. The oral cone is long and the clypeus on the front side of it long and narrow, hence the proboscis may be long and protruding; the basal part of the labium is short, but the labella are long and narrow, chitinised on their basal half; they are not cleft for their whole length, but only in the apical part. The labella differ somewhat in length in the different species, in *N. pantherinus* they are long, in *uliginosus* somewhat shorter, and in *nigrinus* still shorter, finally in *notatus* they are relatively short and broad. When the oral cone is retracted, the clypeus is laid backwards and retracted in the oral aperture, and kinks are then formed between the oral cone and the labium and between the basal part of labium and the labella, the latter then covering the oral aperture; also when the oral cone and proboscis are protruded, the labella are generally forming an angle with the basal part of the labium, the proboscis is then often described as kneeformed. Labrum and hypopharynx are short, no maxillæ are seen, but there are small one-jointed maxillary palpi. Thorax is longer than broad, scutellum without spines. Abdomen is broader than thorax, consisting of six segments, but the last is short and often more or less hidden under the foregoing one, especially in the male. The genitalia of the male are somewhat complicated with a median apparatus and more or less claw-shaped lateral pieces, and they seem to vary a good deal according to the species. Wings with the radial vein indistinct or wanting, the cubital vein forked or, in one species (*nigrinus*), unforked, from the discal cell rise four thin and pale veins, the fourth is the anterior branch of the postical vein; there are thus five posterior cells; no cross-vein is found between the discal cell and the postical vein. In rest the wings are lying parallel over the abdomen, one covering the other.

The larvæ are elongated, slightly flattened; the body consists of twelve segments in all. The head is longish, on each side, in the middle, there is a distinct eye, and somewhat in front of it a small two-jointed

antenna. The segments are broader than long; the last segment is somewhat longer, cleft behind and thus ending with two points, each of these points bears a somewhat feathery bristle. and a similar bristle is found on each side of the joint; below the joint the anus is found as a longitudinal split. (Brauer says that the last segment is „abgerundet", that is erroneus.) The segments above have some curious, short but strong bristles, being thickest towards the ends. On the ventral surface there is on each segment, laterally, a slightly elevated tubercle with some similar bristles, and inwardly to this, on each side, a long bristle, and between the latter, in the middle, each segment has a bed of depressed hairs. On the prothoracic segment there is a spiracle on each side, and then on the metathoracic and on the first seven abdominal segments, but these spiracles are very small. Above, near the apex, the last segment has the terminal spiracles lying in a transverse split, surrounded by a not very conspicuous, asteriformly arranged bundle of hairs. The larvæ live in water among plants and may in winter or early spring be found among the flood refuse at the borders of fens and lakes or on other humid localities. The larvæ hibernate, and the transformation to pupa and development of the imago take place in the following spring and summer.

Fig. 7. Larva of *N. pantherinus*. ×4.

The *Nemotelus* species are not very lively, they occur in the neighbourhood of water, in fens and similar localities, where they often are seen on the flowers of Umbelliferæ and Compositæ, sometimes in great numbers, and they are easely caught with the fingers. Some of them seem to prefer salt marshes.

Of the genus 50 species are known from the palæarctic region, most of which are southern forms; only 4 species have hitherto been found in Denmark.

Table of Species.

Males.

1. Abdomen white with black spots, cubital vein forked . . . . . 2.
— Abdomen black, cubital vein not forked . . . . . 4. *nigrinus.*
2. Venter white with black spots . . . . . 3.
— Venter black with white incisures and a white spot . . . 2. *uliginosus.*
3. Snout rather long, abdomen white with a basal and an apical black spot, venter white with a basal black spot 1. *pantherinus*
— Snout short, abdomen white, besides black basal and apical spots with a spot on the third segment, venter white with black marginal spots . . . . . 3. *notatus.*

Females.

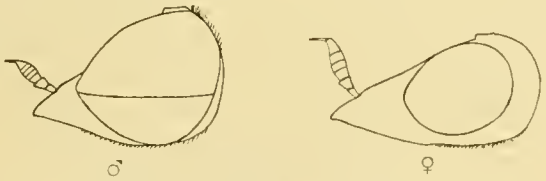
1. Abdomen with white spots, cubital vein forked . . . . . 2.
— Abdomen entirely black, cubital vein not forked . . . . . 4. *nigrinus.*

2. Snout long, without white spots above the antennæ . . . 1. *pantherinus.*
— Snout with white spots above the antennæ . . . . . 3.
3. Snout long, the white spots above the antennæ linear, oblique, nearly meeting in the middle . . . . . 2. *uliginosus.*
— Snout short, the white spots above the antennæ triangular, not oblique, widely separated in the middle . . . . 3. *notatus.*

1. N. pantherinus L.

1761. *Musca*, Linn. Fn. Suec. 1783. — 1842. Zett. Dipt. Scand. I, 150, 4. — 1846. Loew, Linn. Entom. I, 445, 9. — 1862. Schin. F. A. I, 4 et 5. — 1903. Kat. paläarkt. Dipt. II, 8.

Male. Snouth rather long and pointed; antennæ brownish black or black, inserted nearly in the middle of the snout; front, above the antennæ, white, with a fine impressed middle line. Eyes slightly elongated, longer than high, dark greenish, slightly metallic, unicolorous; they are bare, but the eye-suture is finely haired. Thorax shining



♂ ♀

Fig. 8. Head of *N. pantherinus*, male and female.

black, slightly bluish, with greyish white shining pubescense; humeral callus small, white, and from this to the wing-root on the side of thorax a narrow white stripe. Abdomen white, the first segment with a black spot in the middle, reaching nearly to the middle of the second segment, and generally somewhat pointed; fourth segment black at the hind part and fifth segment black on the front part, thus a black transverse spot is formed, not reaching the side margins; this spot varies a good deal in form and extent, often it is vaved on the front and hind margins, or it has a white triangle in the middle, at the hind margin of the fourth segment, or the hindmost margin of the fourth segment is white and the spot thus separated in two bands, often being more or less connected; sometimes the spot is large, going close to the front margin of the fourth segment. Venter white with a black spot at the base, and sometimes a little darkened near the apex. Abdomen is clothed with greyish white, shining hairs, especially distinct at the apex. Femora black with the tips broadly white, tibiæ and tarsi white, hind tibiæ black in the middle nearest to the apex, anterior tibiæ and the tarsi at the ends slightly darkened. Wings hyaline, veins white, stigma very slightly yellowish. Halteres white, the peduncle slightly darkened.

Female. Front and face broad and the snout long, the antennæ inserted near to the point; front without white spots, but instead with an oblique impression on each side, black, greyish white haired. Eyes long, longer than high and the whole head rather long. Abdomen black with a broad white triangle at the hind margins of the second, third and fourth segment, the last often very small, the hind margin of the fifth segment and all the side margins white. Venter black, sometimes with pale incisures of which that on the first segment may form a pale spot.

Length 4,5—5,5 mm.

The larva is brownish or greyish red with some darker longitudinal lines on the dorsal surface of the segments, especially a somewhat broad line is seen, running from the end to the hind margin of the first abdominal or the third thoracic segment and then dividing in two lines, running to the head. It has a length of 10 mm.

N. pantherius is not rare here in humid localities and near water; vicinity of Copenhagen, Damhusmosen, Utterslev Mose, Ordrup Mose, Bollemosen, Fureso, Donse and at Boserup and Lejre near Roskilde; on Funen at Odense; on Lolland at Nørreso near Maribo; in Jutland at Horsens and on Bornholm at Hasle and Allinge. It has been taken from $^{5}/_{6}$—$^{3}/_{8}$. The larvæ have been taken in Damhusmosen and Utterslev Mose on $^{25}/_{2}$ and $^{22}/_{4}$, and pupæ from $^{10}/_{6}$—$^{5}/_{7}$.

Geographical distribution: — Distributed and common in northern and middle Europe, in north to middle Sweden and in south to the southern parts of middle Furope.

2. N. uliginosus.

1767. *Musca*, Linn. Syst. Nat. Ed. XII. 982. 22. — 1842. Zett. Dipt. Scand. I, 146, 1. — 1846. Loew, Linn. Entom. I, 432, 4. — 1862. Schin. F. A. 1, 5 et 6. — 1903. Kat. paläarkt. Dipt. II, 9.

Male. Snout moderately long, somewhat hollowed above with the point distinctly bent down. Antennæ brownish black or black,

♂ ♀

Fig. 9. Head of *N. uliginosus* male and female.

inserted nearer to the base than in *pantherinus*. Eyes nearly round, dark greenish, slightly metallic, unicolorous; they are bare, but the eye-suture is finely hairy. Front above the antennæ white, the white

spot obcordate with a very fine middle line. Thorax shining black, slightly bluish; pubescence light yellowish, sometimes more greyish; humeral callus and a stripe from the callus to the wing-root white, the stripe considerably broadened behind: the callus is larger and the stripe is broader than in *pantherinus*. Abdomen white, the base with a black spot, produced almost to the middle of the second segment, fourth segment with a black transverse band at the front margin, nearly reaching the side margins, fifth segment black with the hind margin pale. The spot on the fourth segment varies a good deal in form, it is as a rule excised in the middle of the hind margin, sometimes including a white spot on each side, these spots may be connected with the white hind margin, or the band may be quite dissolved in three spots; sometimes there is a small black spot on each side on the third segment, and finally this segment may bear a little black spot in the middle at the front margin. Venter black with the front margin of the second and the hind margins of the third, fourth and fifth segments white, these margins may be broad in the middle, and the white front margin of the second segment may be enlarged to a subquadratic spot, reaching the hind margin. Femora brownish

Fig. 10. Wing of *N. uliginosus*.

black, with the tips broadly white, tibiæ and tarsi white, hind tibiæ brownish black in the middle, anterior tibiæ slightly darkened. Wings hyaline with white veins, stigma light yellowish. Halteres white, the peduncle slightly darkened.

Female. Front broad, snout moderately long, shorter than in *pantherinus*, antennæ inserted nearly in the middle; above the antennæ two oblique white stripes, going from the eye-margin to the base of the antennæ, and nearly meeting in front. Eyes nearly round, not longer than high. Thorax with shorter, somewhat depressed pubescence. Abdomen black, with a white triangle in the middle of the second, third and fourth segments, and the hind margins of the fifth and sixth segments white; the triangles may vary in size and especially in breadth. All the side margin is narrowly white, but widened to a triangular spot at the hind corners of the second, third and fourth segments. Venter black with very narrow pale hind margins of the segments; sometimes it is entirely black.

Length 5—6,5 mm.

This species is distinguished, in the male, from *pantherinus* by the black venter, and in the female by the white spots above the antennæ and the side spots on the dorsal surface of the abdomen which are never found in *pantherinus*; in both sexes it differs from *pantherinus* by having the white humeral callus larger and the white side stripe broader, and also the shape of the head is characteristically different. the snout being shorter, and the eyes not elongated.

N. uliginosus is common here; vicinity of Copenhagen, Vesterfælled, at Boserup near Roskilde, at Frederikssund, Bogenæs and Skelskør; on Funen at Hoffmansgave by Odensefjord; in Jutland at Horsens, and on Læso. All my dates are from July and the beginning of August. It seems to some degree to prefer salt marshes, f. inst. I have taken it on Vesterfælled in great numbers in the flowers of Crepis.

Geographical Distribution: — Distributed in northern and middle Europe, in north to middle Sweden and in south to northern France, but it seems rare farther south.

3. **N. notatus** Zett.

1842. Zett. Dipt. Scand. I, 148, 3. — 1846. Loew, Linn. Entom. I, 437, 6. — 1862. Schin. F. A. I, 5 et 6. — 1903. Kat. paläarkt. Dipt. II, 8.

Male. Snout short; antennæ black or blackish brown, inserted rather high on the snout. Eyes round, dark greenish, slightly metallic, unicolorous; they are bare but the suture is finely haired. Front,

♂ ♀

Fig. 11. Head of *N. notatus* male and female.

above the antennæ, with a somewhat obcordate white spot, divided by a fine black line. Thorax shining black, slightly bluish; the white humeral callus rather large, and the white stripe going to the wing-root distinct and broadened behind. Pubescence greyish white, shining. Abdomen white, the base with a black spot, nearly reaching the lateral margins of the first segment and produced over the middle of the second segment, here conically tapering; on the third segment a black spot, that is either roundish and isolated or more quadratic and with prolongations from the hind corners connected with the black

fourth segment, thus including a more or less triangular, white spot, the prolongations are generally produced somewhat to the sides; fourth segment black with a white, somewhat waved hind margin, fifth segment black with white hind margin. Venter white with black, generally more or less triangular spots at the side margins of the segments, these spots are somewhat varying in size, being smallest on the second segment, and here sometimes absent, on the fifth segment often, and sometimes also on the fourth produced inwardly along the front margin, making this black. Pubescence on abdomen greyish white, shining. Femora black with the tips broadly white, tibiæ white, hind tibiæ black in the middle, this colour going near to the apex, anterior tibiæ generally distinctly brownish in the middle; tarsi white, slightly darkened towards the ends. Wings hyaline with white veins, stigma light yellowish. Halteres white, peduncle brownish.

Female. Snout short, two small, triangular, not oblique spots above the antennæ, one at each eye-margin, widely separated in the middle. Eyes round. Thorax with the pubescence somewhat depressed. Abdomen black with a small triangular middle spot on the second, third and fourth segments, and with linear, transverse side spots at the hind margins of the same segments, fourth segment with white hind margin, connecting the side spots and reaching the side margins; all the side margin of the abdomen narrowly white, more or less connected with the transverse side spots on the second and third segments. Venter black with white hind margins of the segments, the margins often widened in the middle, and the second segment generally with a large white spot in the middle.

Length 5—6,5 mm.

This species in both sexes is easily distinguished from the preceeding ones by the design of the abdomen and by the short snout, and from *uliginosus* it is moreover easily distinguished in the female by the shape of the white spots above the antennæ. Zetterstedt l. c. refers it as *N. notatus* Stæger in litteris, so that the name originally is due to Stæger.

N. notatus is less common than the preceeding species, though it is not at all rare; vicinity of Copenhagen, Vesterfælled, Amager, Fortundammen, Jægerspris and at Skelskør; on Funen at Hoffmansgave by Odensefjord; in Jutland at Horsens, Nykøbing on Mors and on Læsø; finally on Bornholm at Allinge. My dates are $^{23}/_{6}$—$^{5}/_{8}$. It is well known to be a species that prefers salt marshes and other salt grounds (v. Heyden, Stet. Ent. Zeit. V, 202, and Jaennicke, Berl. Ent. Zeitschr., X, 225); I have taken it on Vesterfælled in the flowers of Crepis together with *uliginosus*, but not in so great numbers.

Geographical distribution: — Northern and middle Europe, from southern Sweden to the southern Germany and Austria.

4. **N. nigrinus** Fall.

1817. Fall. Dipt. Suec. Strat. 6, 3. — 1842. Zett. Dipt. Scand. I, 151, 5. — 1846. Loew, Linn. Entom. I, 454, 15. — 1862. Schin. F. A. I, 5. — 1903. Kat. paläarkt. Dipt. II, 7.

Male. Snout moderately long, pointed; antennæ blackish, inserted very high, near to the eye-margin. Snout and front bluish black,

♂ ♀

Fig. 12. Head of *N. nigrinus* male and female.

without spots. Eyes round, nearly touching above the frontal triangle, bare, dark greenish, slightly metallic, with a reddish violet band below the middle on the line dividing the large and small facets. Thorax black, shining, somewhat punctate, slightly and very short haired; the pale humeral callus small, and the stripe going to the wing-root, narrow, both brownish yellow. Abdomen black, more or less bluish, somewhat punctate and somewhat dullish in front but shining behind. Venter black. Femora black, broadly white at the tips, tibiæ

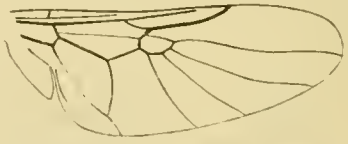


Fig. 13. Wing of *N. nigrinus*.

and tarsi whitish, hind tibiæ black in the middle, anterior tibiæ more or less darkened, and the tarsi distinctly darkened towards the ends. Wings hyaline with white veins, stigma yellowish, cubital vein not forked. Halteres white, the peduncle slightly darkened.

Female. Front broad, snout rather long, pointed, no spots above the antennæ. Eyes roundish, higher than long, coloured as in the male, but the band situated in the middle. All the rest as in the male.

Length 3,8—4,5 mm.

This species is at once recognised by the shape of its snout with its high inserted antennæ, and the absence of white spots, by its totally black colour and especially by the unforked cubital vein.

N. nigrinus is not very common, though it is not unfrequent, and it occurs all over Denmark; vicinity of Copenhagen, Lersø, Vangede Mose, Ordrup Mose, Dyrehaven, Esrom Sø, Lejre near Roskilde; on Lolland at Nørresø near Maribo; on Funen at Odense, Langensø and Faaborg; in Jutland at Frederikshavn and on Bornholm at Allinge. My dates are $^{27}/_{6}$—$^{7}/_{8}$.

Geographical distribution: — Distributed in northern and middle Europe from the northermost Scandinavia to southern Germany. It also occurs in North America in Canada.

3. **Oxycera** Meig.

Middle sized or small species, chiefly of black colour with yellow or greenish designs, sometimes the ground colour greenish. Head nearly semiglobular, as broad as or a little broader than thorax. Yowls not descending below the eyes, but horizontal or bending a little upwards, thus the head slightly hollowed beneath. Antennæ inserted below the middle of the head, eight-jointed in all, the two basal joints short, the four next forming a fusiform, annulated part, the last two forming an indistinctly two-jointed arista, inserted dorsally on the last joint of the annulated part; the basal joint of the arista is short, annuliform, and only to be seen microscopically. Eyes hairy or bare, touching in the male, separated in the female; in the male the upper facets are larger than the lower. The oral cone is short, and the proboscis is also short with a labrum of about the same length and a very small hypopharynx; maxillæ are not found, but small, two-jointed maxillary palpi are present; the labella are broad. Thorax is longer than broad, scutellum with two spines. Abdomen is short and broad, rounded, broader than thorax, consisting of five segments. Wings with the cubital vein forked, from the discal cell rise four veins, the first being the anterior branch of the postical vein, thus there are five posterior cells; the veins are often very indistinct, especially the third, which may be nearly wanting; there is no cross-vein between the discal cell and the postical vein. In rest the wings lie parallel over the abdomen, one covering the other.

The larvæ (*O. trilineata*) are elongated, somewhat flattened; the body consists of twelve segments in all. The head is conical, with small eye-spots in the anterior part, and in front of them small antennæ. The segments are considerably broader than long, only the last is a little longer than broad, rounded behind, with the anus as a longitudinal split on the ventral side. On the dorsal surface the thoracic segments bear some very short, thick bristles; the abdominal segments, except the last, bear some curious, strong bristles; which

are equally thickened to the point, and directed backwards, there are, especially in the middle on each segment four such bristles, and then a pair on each side, and again more laterally some short bristles of the same nature; besides there are some more, similar but short bristles, and finally there are some long bristles of common form, especially a pair on each segment on the lateral margin. Each segment has a transverse row on the ventral surface of some curious pencil-shaped bristles, intermingled with common bristles. There is a pair of prothoracic spiracles, and, as far as I could detect, six small abdominal spiracles, the last two segments being without such spiracles. In the apex there is a transverse split surrounded by a coronet of feathery hairs. The larvæ live in mud; they hibernate and the transformation to pupa and the development of the imago take place in spring or summer.

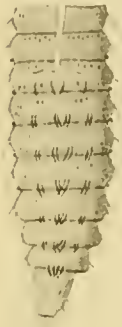


Fig. 14. *O. trilineata*, cast pupa skin × a little more than 4.

The *Oxycera* species are generally not common; they occur in the vicinity of water, at lakes and in the low herbage at the borders of brooks.

Of the genus 40 species are known from the palæarctic region, 7 species are hitherto found in Denmark.

Table of Species.

1. The ground colour green or yellowish green with black designs ..... 1. *trilineata*.
— The ground colour black with yellow designs ..... 2.
2. Abdomen black, only with a yellow spot at the base and one at the apex, or one at the apex alone ..... 3.
— Abdomen with yellow spots also on the middle segments ..... 4.
3. Abdomen black with a yellow spot at the base and one at the apex ..... 4. *leonina*.
— Abdomen with a yellow spot only at the apex ..... 5. *terminata*.
4. The yellow spots on the abdomen reaching near to the middle; species larger, not below 6,5 mm. ..... 5.
— The yellow spots on the abdomen confined to the sides, widely separated in the middle: species smaller, not above 4,3 mm. ..... 6.
5. The yellow stripes on the thoracic disc connected with the yellow humeral spot ..... 2. *Meigenii*.
— The yellow stripes on the thoracic disc not connected with the humeral spot ..... 3. *Fallenii*.
6. Scutellum quite yellow, legs all yellow; frontal triangle in the male black, vertex in the female black, and the thorax with two yellow stripes on the disc ..... 6. *formosa*.
— Scutellum and legs more or less black or blackish; frontal triangle in the male silver white, vertex in the female yellow and the thoracic disc black ..... 7. *pygmæa*.

1. **O. trilineata** Fabr.

1781. *Stratiomys*, Fabr. Spec. Ins. II, 418, 9. — 1842. Zett. Dipt. Scand. I, 142, 2. — 1857. Loew, Berl. Ent. Zeitschr. I, 22. — 1862. Schin. F. A. I, 9. — 1903. Kat. paläarkt. Dipt. II, 15.

Male. Eyes bare, the facets in the lower third smaller than above; the eyes greenish with a brownish red band on the dividing line between the large and small facets. Vertex black, yellow behind the ocelli. Frontal triangle and face greenish yellow, at the inner eye-margin a dark stripe, hidden under whitish hairs; yowls and occiput black. Antennæ reddish yellow, sometimes a little darker towards the apex. Thorax green or greenish yellow with three black stripes connected behind; scutellum green, the two spines black at the tips, postscutellum black; on the side of the thorax the green colour reaches somewhat down the pleura, the sterna are black; below the pteropleuron there is a somewhat clubshaped, oblique, green spot in the black coloured part. All the thorax is clothed with white, shining pubescence, which is yellowish on the median dorsal line. Abdomen green or greenish yellow with three transverse, black spots, all being somewhat curved and concave in front, connected on the sides with each other in such a way that two transverse green spots are included, one on the second, the other on the third segment; the hind margins of the segments are black; sometimes the spots are separate and only concave in front. Venter green or yellowish green. Legs all yellow. Wings hyaline, the anterior veins yellow, the stigma very slightly yellowish. Halteres green with a dark yellowish peduncle.

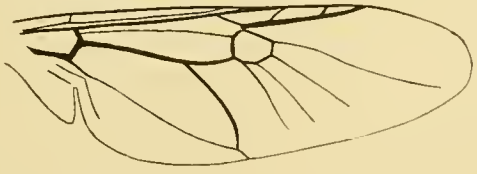


Fig. 15. Wing of *O. trilineata*.

Female. Eyes greenish with a brownish red band in the middle, not reaching the posterior margin. Front yellow or green with an impressed, black middle line and narrowly black at the eye-margins; vertex with a black, transverse band. Face white haired at the sides, orbita yellow or green; the back of the head black. The rest as in the male.

Length 5—6 mm.

The larva is greyish brown with some darker spots or stripes on the segments, more or less longitudinally arranged; it has a length of fully 10 mm.

This species cannot be confounded with any one of the following species, on account of its green or yellowish ground colour, the following all being black. It varies in being either green or greenish yellow; in the latter as a rule the black spots on the abdomen are separated, but they may also be connected in these specimens. The yellowish variety seems to be most common among the females, at all events I have only seen females of this variety. All the specimens I have seen living or in a fresh state had greenish eyes with a brownish red band; Löw says, (Isis 1840, 556) about the eyes: „. . . grün mit goldspielendem Wechselfleck." Macquart, (Suit. à Buffon, I, 250) says: „Jeux à ligne transversale pourpre." Whether the eyes may vary in colouring, or Löw may have made some mistake, I cannot say, but I think the latter the most probable.

This species has generally been recorded as founded by Fabricius in 1781, as there seems still to exist some doubt with regard to Linne's *Musca hypoleon*, which, as Löw has stated, is probably the yellow variety. But the species was for the first time established by Brünniche (Prodr. Insectol. Siælland. 1761, 29, 19), from Denmark, and the description leaves no doubt, but the species was not named. In Pontoppidan, Danske Atlas, I, 1763, 696, Tab. XXX, Fig. a, b, it is again enumerated and figured, and here it is given the name *græca* (on account of the black abdominal markings somewhat resembling the greek letter θ), but here there is no description. Under these circumstances I think it most correct to keep the name of Fabricius.

O. trilineata is the most common of our *Oxycera* species, though it is generally only caught in single specimens; it occurs in low herbage near water; vicinity of Copenhagen, Damhusmosen, Vesterfælled, Hellerup, Ordrup Mose, Ermelund, Ruderhegn, Donse, Hillerød and at Køge; on Lolland at Nørresø near Maribo; on Funen at Odense and in Jutland in Vejle Nørreskov. It has been taken from $^{18}/_{6}$—$^{11}/_{8}$. The larva was taken at Koge in mud in the middle of June, it developed the $^{1}/_{7}$.

Geographical distribution: — All Europe from middle Scandinavia to Sicily; it seems everywhere to be one of the most common species.

2. O. Meigenii Stæg.

1844. Stæg. Stet. Ent. Zeit. V, 410, 2. — 1849. Zett. Dipt. Scand. VIII, 2957, 1-2. — 1862. Schin. F. A. I, 12. — 1903. Kat. paläark. Dipt. II, 13. — 1781. *Stratiomys hypoleon*, Fabr. Spec. Ins. II, 418, 20. — 1842. *Oxycera hypoleon* p. p. Zett. Dipt. Scand. I, 142, 1. — 1844. *Oxycera hypoleon*, Schiødte, Nat. Tidsskr. 2, I, 40.

Male. Eyes rather long haired; the facets in somewhat more than the upper half somewhat larger than below; the eyes with a reddish

band on the dividing line. Frontal triangle and cheeks yellow, epistoma and yowls black. Antennæ reddish, the basal joints blackish. The hinder eye-margin with a yellow stripe on each side. Thorax black, humeral callus yellow, from this a yellow, somewhat crescent-shaped spot stretching up on the disc and going to the transverse furrow; it is very narrow in the middle and here sometimes interrupted; on the side of the thorax there is, in the middle, a yellow, oblique stripe, going down on the mesopleura just anterior to the wing-root; the postalar callus yellow. Scutellum yellow, the spines slightly darkened towards the tips; postscutellum black. Thorax with yellowish to brown pubescence, on the pleura and sterna with white pubescence. Abdomen black, on the second segment a triangular yellow spot on each side at the margin, on the third segment a somewhat club-chaped spot on each side, stretching obliquely forwards from the side margin somewhat inward on the segment, nearly reaching the front margin, on the fourth segment similar, but somewhat curved spots and on the fifth segment a triangular spot at the hind margin. Venter black, with a yellow, subquadratic spot on the middle of the second segment. Femora black, the apical third yellow; tibiæ and the posterior tarsi yellow, the latter brownish towards the ends; the front tarsi somewhat compressed, brownish black, brownish haired, the apex of the apical joint lighter. Wings somewhat yellowish with the anterior veins brownish. Halteres yellow, the peduncle slightly darkened.

Female. Eyes sparingly and short haired, with a reddish band in the middle. Front yellow with a black middle stripe, vertex black; cheeks yellow; epistoma and yowls black. Hinder eye-margin all yellow to the vertex, only with a black stripe at the eye-margin from the vertex for a short distance towards the sides, sometimes at the end connected with the black colour on the back of the head, and thus enclosing a yellow spot on each side of the vertex. On the sides of thorax, below the oblique spot, there is a little yellow spot. Venter generally with a pale spot also on the third segment.

Length 7—9 mm.

O. Meigenii is very rare here, only thirten specimens have been taken in all; Ordrup Mose (Jacobsen, Stæger), near Roskilde (Liebenberg), at Sorø (Schlick), northern Sealand (Schlick, Meinert); on Falster and on Lolland at Maribo (Schlick); finally on Funen at Odense (H. J. Hansen). It has thus only been taken in the southern parts of our country. My dates are from $^{15}/_{7}$ to August.

Geographical distribution: — The species occurs from Denmark down to northern France, but it seems not to occur farther north than southern Denmark. In Austria it is common.

3. O. Fallenii Stæg.

1844. Stæg. Stet. Ent. Zeit. V, 410, 3. — 1862. Schin. F. A. I. 12. — 1903. Kat. paläarkt. Dipt. II. 12. — 1817. *Stratiomys hypoleon*, Fall. Dipt. Succ. Strat. 10, 7. — 1842. *Oxycera hypoleon* p. p. Zett. Dipt. Scand. I. 142, 1. — 1849. *Oxycera hypoleon* Zett. ibid. VIII, 2955, 1.

Male. Eyes long haired; the facets in the upper two thirds larger than below, on the dividing line a reddish band. The eye-suture is longer than in *Meigenii*, the front not ascending over the middle of the head. Face and frontal triangle black, the latter at the apex with a yellow spot, which is silver-white haired. Antennæ reddish brown, the basal joints blackish. Thorax black, with two yellow stripes, which are pointed in front and not reaching the humeral spot, they reach backwards to the transverse furrow, or are produced over this as a small spot. Humeral callus and the margin of the thorax broadly yellow, sending an oblique yellow spot down on the pleura anterior to the wing-root; the postalar callus yellow. Scutellum yellow, the spines slightly darkened towards the tips; the postscutellum black. Thorax with brownish, below with whitish pubescence. Abdomen black with yellow spots, similar to those in *Meigenii*, but less clubshaped and generally less oblique. Venter black with more or less extended pale markings on the second and third segments. Legs yellow, the coxæ and the bases of the front femora black, tarsi with the last joints blackish, the front tarsi not compressed. Wings yellowish with the anterior veins brownish yellow. Halteres yellow, the peduncle slightly darker.

Female. Eyes less hairy than in the male, but more densely and longer haired than in the female of *Meigenii*, with a reddish band in the middle. Front yellow with a black middle line; vertex black; the hinder eye-margin yellow, white haired below. Thorax as in the male, but the dorsal stripes generally larger and produced a little more backwards, and below the yellow postalar callus another yellow spot on the metapleura. The rest as in the male.

Length 6.5—7 mm.

This species is easily distinguished from the preceding by the dorsal lines not being connected with the humeral spots. In the male it is distinguished by the black cheeks and front, the latter only with a yellow apical spot, and in the female by the quite yellow hinder eye-margin and the yellow spot on the metapleura; in both sexes it is moreover characterised by the front tarsi being simple, not compressed, and not quite dark, and finally the species is smaller.

O. Fallenii is, like the preceding one, very rare here, I only know of ten specimens taken in Denmark; Ordrup Mose (Stæger, Schlick), Dyrehaven (Schlick); in Jutland in Vejle Nørreskov (Schlick) and at

Horsens (H. J. Hansen). All the specimens are taken in the last part of July. Stæger l. c. mentions it as taken on the $^{25}/_{8}$.

Geographical distribution: — The species is distributed in the northern and middle Europe from southern Sweden down to Styria, but here it is rare.

4. **O. leonina** Panz.

1798. *Stratiomys*, Panz. Fn. Germ. LVIII, 21. — 1844. Schiødte, Naturh. Tidsskr. 2, 1, 40. — 1862. Schin. F. A. 1, 10. — 1903. Kat. paläarkt. Dipt. II, 12.

Male. Eyes hairy; the upper facets larger than the lower, a reddish band on the dividing line. Face and front black. Antennæ black. Thorax black, on the sides from the humeral callus to the wing-root a narrow yellow stripe, slightly broadened behind; the postalar callus with a small yellow spot. Scutellum yellow, except a narrow basal stripe extending over the sides; the spines blackish at the tips. Postscutellum black. Thorax with white pubescence. Abdomen black with a yellow spot at the base and one at the apex. Venter black. Femora black with the tips yellow; tibiæ yellowish, broadly black in the middle; the front tarsi brownish, the posterior tarsi yellow, brownish towards the ends. Wings with a faint yellowish tinge, the anterior veins dark yellow, the stigma yellow. Halteres whitish yellow, the peduncle slightly darker.

Female. Eyes less hairy than in the male with a reddish band above the middle; front and face black with a white haired stripe on each side along the inner eye-margins from the eye-band downwards; hinder eye-margin black, a yellow spot above on each side of the vertex. The rest as in the male.

Length 6—7 mm.

O. leonina seems to be very rare in our country, I only know of two specimens, both females, the one taken for many years ago between Roskilde and Ringsted (Jacobsen), the other taken in Ordrup Mose in July 1905 by J. P. Kryger. I do not know the male.

Geographical distribution: — Northern and middle Europe down to northern France; it seems to have its northern limit in Denmark.

5. **O. terminata** Meig.

1822. Meig. Syst. Beschr. III, 130, 9. — 1857. Loew, Berl. Ent. Zeitschr. I, 25. — 1862. Schin. F. A. 1, 10. — 1903. Kat. paläarkt. Dipt. II, 15.

Male. Eyes sparingly hairy, upper facets larger than the lower, a reddish band on the dividing line. Face and front black, front with some whitish hue. Antennæ with the basal joints yellow, the rest brown. Thorax black, partly blackish haired, on the sides with

a narrow yellow stripe from the humeral callus to the wing-root: postalar callus with a small, yellowish spot. Scutellum and spines yellow, the latter darkened at the tips. Postscutellum black. Abdomen black with a small semicircular spot at the apex. Venter black. Legs yellow, hind femora more or less darkened in the middle nearest to the apex. Wings hyaline, anterior veins brownish yellow, stigma very slightly yellowish. Halteres whitish yellow, peduncle a little darker.

Female. Eyes nearly bare with a reddish band a little above the middle. Front and face black, on each side of the lower part of the inner eye-margin, from the eye-band downwards, is a yellow, white haired stripe and above it a small yellow spot; hinder eye-margin broad, black; on each side of the vertex an oblique, yellow stripe from the upper eye-corner inwards to the back of the head; on the lower part of the hinder eye-margin is a yellow spot. Thorax with short, whitish pubescence.

Length 4,5—5 mm.

This species is easily distinguished from the closely related *O. leonina* by the design of the abdomen and the colouring of the head in the female, and also by the brown antennæ with yellow basal joints and the almost quite yellow legs.

O. terminata is very rare in Denmark as there has only been taken three specimens, all females, on Bornholm at Hasle on the $^{10}/_{6}$ 1870 by Mr. Schlick.

Geographical distribution: — Middle Europe down to Austria, it is not known farther north than Bornholm.

6. O. formosa Meig.

1822. Meig. Syst. Beschr. III, 127. 5. — 1842. Zett. Dipt. Scand. I. 145. 5. — 1857. Loew, Berl. Ent. Zeitschr. I, 26. — 1862. Schin. F. A. I, 10. — 1903. Kat. paläarkt. Dipt. II. 12.

Male. Eyes sparingly and very short haired, the facets in the lower part smaller than above, a reddish band on the dividing line. Front not ascending to the middle of the head, eye-suture rather long. Frontal triangle and face black. Antennæ black, sometimes slightly lighter at the base. Thorax shining black, sparingly pubescent; a large side spot, including the humeral callus, yellow, the spot reaching backwards, below the wing-root, towards the hind coxæ, and below it, on the pleura, a yellow spot; postalar callus largely yellow. Scutellum yellow, postscutellum black. Abdomen black, on the third and fourth segments more or less triangular side spots, connected with each other along the side margin and connected with the yellow hind margin of the fifth segment; the yellow colour may also reach forwards along

the side margins of the first and second segments. Venter black with the side margins and the hind margins of the segments yellow. Legs all yellow. Wings hyaline with yellowish veins and stigma. Halteres yellow.

Female. Eyes nearly bare with a reddish band about in the middle. Front yellow with a black middle line, vertex black; epistoma and yowls black; the hinder eye-margin yellow. Thorax black with all the sides broadly yellow, in front of the wing-root a black spot and below the wing-root a yellow spot; on the disc two yellow, longitudinal stripes, not reaching the scutellum, in front connected with the yellow sides. Abdomen as in the male but the yellow side margins on the first and second segments distinct and widened to a spot on the second segment.

Length 3,8—4,3 mm.

O. formosa seems, like the preceding, to be very rare in our country, only about ten specimens are known; neighbourhood of Copenhagen (Schlick), Dyrehaven (Stæger, H. J. Hansen); it has been taken in July.

Geographical distribution: — North and middle Europe down to the north of France; its northern limit lies in the south of Sweden.

7. **O. pygmæa** Fall.

1817. *Stratiomys*, Fall. Dipt. Suec. Strat. 11, 9. — 1842. Zett. Dipt. Scand. 1, 145, 6. — 1857. Loew, Berl. Ent. Zeitschr. 1, 31. — 1862. Schin. F. A. I, 10. — 1903. Kat. paläarkt. Dipt. II, 14.

Male. Eyes bare, lower facets smaller than the upper, a reddish band on the dividing line. Front more ascending and hence the eye-suture shorter than in *O. formosa*. Frontal triangle and cheeks silver haired, epistoma black. Antennæ black. Thorax black, dullish, with short brownish yellow pubescence, below with whitish pubescence; on the sides a narrow yellow stripe, reaching below the wing-root and farther back, and generally with a small spot farther downwards on the pleura. Scutellum black or with the apex more or less broadly yellow, the spines reddish yellow; postscutellum black. Abdomen black with yellow or whitish yellow side spots on the third and fourth segment, connected with each other along the side margin and with the yellow hind margin of the fifth segment. Venter black with yellow side margins and three more or less extended yellow middle spots. Femora blackish, yellowish at the bases and tips; front and hind tibiæ blackish, yellowish at the bases, middle tibiæ blackish in the middle; tarsi blackish, the posterior generally yellowish at the bases. Wings hyaline, the anterior veins yellow, the others white and very indistinct. Stigma yellowish. Halteres yellow.

Female. Eyes with a band about in the middle. Front yellow, with a black middle line, sometimes somewhat widened a little above

the antennæ, on the vertex including the ocelli; the vertex for the rest yellow; the inner eye-margin narrowly black, sometimes widened below, opposite to the widening of the middle stripe: cheeks black, silvery haired, epistoma black; hinder eye-margin yellow, broad, the impressed lines, separating the vertex and the hinder eye-margins, black. Thorax as in the male but the pale yellow spot on the pleura more distinct. Scutellum generally more yellow than in the male. Legs often much paler than in the male, femora and tibiæ being yellow with faint blackish rings, sometimes the femora nearly quite yellow; posterior tarsi often only darkened towards the tips.

Length 3—4.3 mm.

This species is distinguished from the preceding by the more or less black scutellum, and the darker to black legs; in the male the silverwhite frontal triangle, and in the female the yellow vertex and black thorax are characteristic. The species is generally smaller than *O. formosa*, but is may reach the same size; it is always broader and more robust.

O. pygmæa is, like the preceding, rare in Denmark: Dyrehaven (Stæger), Ermelund (C. Larsen), at Soro (Jacobsen) and in greater numbers on Bornholm at Allinge (H. J. Hansen). It has been taken in July.

Geographical distribution: — Northern and middle Europe, its northern limit lies in southern Sweden, and it goes down into Austria.

4. **Stratiomyia** Geoffr.

(Stratiomys).

Species of middle to rather large size, generally of black colour, with yellow designs on abdomen. Head about as broad as thorax, broader than high, somewhat hemispherical, but short, flat or a little concave. Antennæ inserted about in the middle of the front side, on the somewhat protruding front. Yowls only slightly descending below the eyes. Antennæ seven-jointed, first joint long, about four times as long as the second, the five last forming a somewhat fusiform, annulated part.[1]) Eyes bare

[1]) The annulated, fusiform part of the antennæ in *Stratiomyia* seems to be liable to some variation with regard to the number of joints actually present. In *S. longicornis* and *furcata* I always found five, but in *chamæleon* and *potamida* the last joint is subdivided in two, so that there are six joints in all. Becker has already pointed this out (Berl. Ent. Zeitschr. XXXI, 104), he says that he also saw a subdivision in *longicornis* and in *furcata*, but in the latter less distinct; perhaps there may be some individual variation on this point. I have examined an antenna of *furcata*, cleaned in potash, under the microscope, but the last joint was absolutely entire, and Wandolleck (Zool. Jahrb. Abtheil für Syst. VIII, Tab. 18, Fig. 21) also figures a similarly treated antenna of *longicornis* with the last joint not subdivided. According to this it would seem that *chamaleon* and *potamida* have the last joint subdivided, *longicornis* and *furcata* not.

or hairy in both sexes, or hairy in the male and almost bare in the female; they are touching in the male, separated in the female. In the male the upper facets are larger than the lower. The oral cone rather short, clypeus linear; proboscis short with broad labella; labrum as long as labium, semitubular; hypopharynx triangular, short, pointed; the maxillæ consisting of a basal piece with a very small lacinia and short, two-jointed palpi. Thorax slightly longer than broad, scutellum with two spines. Abdomen somewhat broader than the thorax, consisting of five segments. The male genitalia show a median apparatus and a somewhat claw-shaped lamella on each side. Wings with the radial vein very indistinct, the cubital vein forked; from the discal and second basal cell rise four veins, the fourth being the anterior branch of the postical vein, thus there are five posterior cells; between the discal cell and the postical vein a short postical cross-vein. At rest the wings lie parallel over the abdomen, one covering the other.

The larvæ are elongated, somewhat flattened, descreasing in breadth towards each end and thus fusiform, but with the greatest breadth before the middle. The body consists of twelve segments in all; there is a fold at the anterior corner of several of the middle segments at the side margin, that especially on some of the segments forms a spine-shaped protuberance; the segments are broader than long, except some of the last and sometimes the prothoracic; the last segment is long but of different length in the different species; it bears beneath the anus as a longitudinal split. The segments bear some bristles on the dorsal and ventral surfaces. The head is conical, above in front it is cleft in three lobes, the median forming a labrum, the lateral bearing at the point a small antennal papilla. At the base of the lateral lobes there is on each side a distinct eye. The maxillæ have one-jointed palpi. There is a small spiracle on the prothorax and then on the metathorax and on each of the first seven abdominal segments; in the apex of the last segment there is a transverse, spiracular split, surrounded by a coronet of feathery hairs.

The larvæ live in water or in mud, in the water they are often seen to hang at the surface by their tail coronet of hairs which then is spread out asteriformly. In late autumn or in early spring they may be found in flood refuse at the border of water. The larvæ hibernate, and the transformation to pupæ and development of the imago take place in summer. The pupæ may be found floating in the water, or at the border.

The species of *Stratiomyia* occur especially near water, in fens and similar localities, where they generally are seen on flowers of Umbelliferæ; they are not very lively, and are easily caught, only on

hot days in sun-shine they may become more active. Of the genus 49 species are known from the palæarctic region, most of which are southern species, 4 species have hitherto been found in Denmark.

Table of Species.

1. Abdomen with yellow spots: eyes bare or only hairy in the male . . . . 2.
— Abdomen quite black; eyes hairy in both sexes . . . . . 1. *longicornis.*
2. Venter yellow with black, transverse bands or spots; eyes bare in both sexes . . . . . 3.
— Venter black with yellow transverse bands; eyes hairy in the male, bare in the female . . . . . 2. *furcata.*
3. Abdomen with three pairs of rather broad, yellow side spots 3. *chamæleon.*
— Abdomen with the third and second pair of side spots narrow and both, or only the third pair, united to a narrow band . . . . . 4. *potamida.*

1. S. longicornis Scop.

1763. *Hirtea,* Scop. Entom. Carn. 367,999. — 1862. *Stratiomys,* Schin. F. A. I, 15. — 1903. *Hirtea,* Kat. paläarkt. Dipt. II, 16. — 1781. *Stratiomys strigata,* Fabr. Spec. Ins. II. 417, 4. — 1842. *Stratiomys strigata,* Zett. Dipt. Scand. I, 135, 3.

Male. Eyes with long, blackish brown hairs, upper facets larger than the lower, the dividing line not especially sharp; the eyes greenish, with the upper and lower part and a band below the middle, dark bluish, the bluish colour thus being extended to such a degree that the eyes may be described as bluish with two greenish bands. Face black, at the inner eye-margin a faint yellowish stripe; all the face clothed with long, yellowish pubescence. Antennæ black. Thorax black with long, yellowish red pubescence, below the pubescence is somewhat paler. Scutellum black, the spines, and sometimes a narrow margin between them, yellow. Abdomen black, with long but not dense, yellowish red pubescence, this being more dense on the side parts of the hind margins of the second, third and fourth segments, and thus, there, forming more or less distinct spots, most distinct on the second segment; the markings are sometimes very indistinct. Venter black with a small basal spot and the hind margins of the segments pale, broadest on the first segment and decreasing in breadth backwards; pubescence long, yellowish. Legs black, the extreme tips of the femora yellow; the hind tibiæ yellowish to brownish; the tarsi yellowish, darkened towards the ends. Legs densely clothed with greyish yellow pubescence. Wings with a distinct brownish tinge, most distinct on the middle and thus forming somewhat of a spot, the apex quite white and hyaline; the veins brownish. Halteres white with a darker peduncle.

Female. Eyes as densely hairy as in the male, similarly coloured, but with the bluish middle band a little above the middle. Face

broadly yellow on each side, this colour reaching upwards a little above the insertion of the antennæ; the back of the head has a yellow spot at the vertex on each side. The spots on the abdomen, formed by the pubescence, generally more distinct than in the male, and whitish grey; for the rest the pubescence on abdomen chiefly black. Venter with long, pale pubescence.

Length 12—14 mm.

The larva is brown, sometimes with some more or less distinct, longitudinally arranged, darker spots; the last segment is only slightly longer than the penultimate. There is a somewhat spine-shaped protuberance at the anterior corners of the four first abdominal segments, those on the first being indistinct. When full grown the larva has a length of 45 mm.

This species is at once recognised by the entirely black abdomen and the densely hairy eyes in both sexes; the coloration of the eyes is also charateristic, but I fail to find any generic character, and I therefore cannot follow the Kat. paläarkt. Dipt. in making it the representative for a separate genus. It may vary in the colour of the pubescence on thorax from yellowish red to grey, but the Danish specimens all have the pubescence yellowish red, only it may be slightly paler, thus becoming yellow.

S. longicornis is not at all common in Denmark, though it has been found in several localities: vicinity of Copenhagen, Vesterfælled; Falster; Lolland at Ryde and Maribo (Schlick). It is a somewhat early species, my dates are $^{27}/_{5}$—$^{30}/_{6}$. The larva was found in Vesterfælled in moist loam under stones on the $^{23}/_{10}$, they developed next year on $^{15}/_{5}$—$^{28}/_{5}$. The species seems to some degree to perfer salt marshes, the larvæ are recorded from salt ponds (Friedenfels, Mitth. Siebenb. Ver. f. Naturwissensch. in Hermannst., XXX. 164).

Geographical distribution: — Europe down to Italy, it has its northern limit in southern Sweden.

2. **S. furcata** Fabr.

1794. Fabr. Ent. Syst. IV, 264, 5. — 1842. Zett. Dipt. Scand. I, 135, 2. — 1862. Schin. F. A. I, 16. — 1903. Kat. paläarkt. Dipt. II, 20.

Male. Eyes long haired, the facets in the lower part considerably smaller than above, the dividing line sharp; the small facets stretching a little upwards at the hind margin; the colour dark greenish, the lower part, a band below the middle and the upper corner at the hind margin, dark bluish. Front and face black, yellow or greyish haired. Antennæ black. Thorax brownish black with dense, yellow to greyish pubescence. Scutellum yellow, broadly black at the base

or black with yellow apex. Abdomen black, second, third and fourth segments with a transverse yellow spot on each side of the hind margins, that on the first segment subtriangular, the others being broadest inwards, fifth segment with a triangular, apical spot, produced in front towards the anterior margin. Venter black with broad yellow hind margins of the segments, that on the second segment

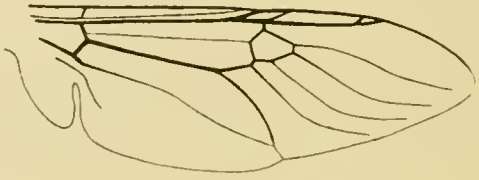


Fig. 16. Wing of *S. furcata*.

sometimes extended to the front margin. Abdomen above clothed with long, yellow pubescence, on the venter with long, paler yellow to greyish pubescence. Legs black; tibiæ with yellow bases; tarsi yellow, darkened towards the ends; the legs clothed with pale pubescence, which is rather long on the femora. Wings yellowish with yellow veins. Halteres yellow.

Fig. 17. Larva of *S. furcata*, about nat. size. The spine-like protuberances at the anterior corners of second and third abdominal segments are to be seen, but somewhat indistinct.

Female. Eyes practically bare, coloured as in the male, but the band situated a little above the middle, and the dark bluish lower part larger. Front and face black, with two yellow spots above the antennæ, and another pair of yellow spots at the vertex, on the back of the head; hinder eye-margin black. Pubescence on the thorax somewhat shorter than in the male, and sometimes being quite whitish grey, and in this case the pubescence on abdomen may also be grey. Scutellum generally more yellow than in the male.

Length. This species may vary considerably in size, the length being 13—18 mm.

The larva is lighter or darker brownish, generally with some darker, longitudinal stripes; it tapers much towards the apex, the last segment is long and slender, twice as long as the penultimate; the second and third abdominal segments have an indistinct, spine-shaped lateral protuberance at the anterior corners. When full grown the larva has a length of about 60 mm. The pupa has a curious form; when the skin gets rigid and forms

the pupa case, it becomes bent double in such a way that there is an angle with the point turned ventrally between the eight and seventh abdominal segments, and one turned dorsally between the sixth and fifth and generally again one turned ventrally between the fourth and third, the last sometimes more rounded.

S. furcata is the most common species of *Stratiomyia* in Denmark, and it is frequent in localities near water, on flowers of several Umbelliferæ; vicinity of Copenhagen, Utterslev Mose, Ordrup Mose, Fortundammen, Lyngby Mose, Furesø, Hillerød, Frerslev Hegn, Donse Dam, Jægerspris, Teglstrup Hegn and at Lejre near Roskilde; Langeland at Tranekær; Lolland at Langensø and Maribo and Funen at Odense, Vellinge and Lundeborg on the eastern coast. It has been taken from $^{13}/_{6}$—$^{16}/_{8}$. The larvæ have been taken in water in Utterslev Mose on $^{26}/_{4}$ and on Vesterfælled on $^{11}/_{6}$, small to half grown larvæ were taken in Fortundammen on $^{22}/_{5}$, and larvæ and pupæ were taken in water in Frerslev Hegn on $^{4}/_{7}$, and on this occasion there were many cast pupa-skins seen; the escape of the imago followed in the last case from $^{4}/_{7}$ to $^{1}/_{8}$. The pupæ floated on the water surface among Confervæ.

Geographical distribution: — Europe down into France, towards north to Finland and middle Sweden.

3. **S. chamæleon** L.

1761. *Musca,* Linn. Fn. Suec., 1780. — 1842. Zett. Dipt. Scand. I, 134, 1. — 1862. Schin. F. A. I, 16. — 1903. Kat. paläarkt. Dipt. II, 18.

Male. Eyes bare, unicolorous, facets below smaller than above, the dividing line moderately sharp, the small facets stretching a little upwards at the hind margin. Front and face black, with a yellowish stripe at the inner eye-margin; face yellowish grey haired. The hinder eye-margin rather broad at the sides, narrowly yellow at the eyes, whitish haired, the margin decreasing in breadth upwards and disappearing before the ocellar tubercle. Antennæ black. Thorax brownish black, with yellow or yellowish grey pubescence. Scutellum yellow with a black, triangular basal spot. Abdomen black with bright yellow side spots on the second, third and fourth segments, that on the second segment large, subtriangular, the other smaller, broadest inwardly; on the fifth segment a yellow, triangular apical spot. Venter yellow with a black basal spot and black front margins of the segments, not reaching the side margins and more or less interrupted in the middle, that on the second and also often on the third segment forming a rather small spot on each side. Abdomen above, long but somewhat sparingly, yellow haired, the pubescence being shorter but denser

and more conspicuous at the apex: venter with long, yellowish grey hairs. Femora black with yellow tips; tibiæ yellow with a more or less distinct, small, black ring in the middle; tarsi yellow. Wings yellowish with yellow veins. Halteres bright yellow with a darker peduncle.

Female. Face yellow with a broad, black middle line, vertex black; hinder eye-margin yellow, broad. Thorax a little shorter haired than in the male and with a more or less distinct, yellow spot on the pleura in front of the wing-root. Femora reddish yellow with blackish rings before the tips, the black colour especially extended on the under side.

Length 14—15,5 mm.

This species is distinguished from *S. furcata* by the eyes being bare and unicolorous in both sexes, and the venter being chiefly yellow; in the male it differs by the rather broad hind margin on the side of the eyes and the yellow stripe at the inner eye-margin, and in the female by the yellow face, the black vertex without yellow spots, and the yellow eye-margin.

S. chamæleon is not rare, though not so common as *furcata*; vicinity of Copenhagen, Ordrup Mose, Hillerød, Donse Dam, Jægerspris and at Svenstrup; Funen at Odense. My dates are $^{19}/_{6}$—$^{27}/_{7}$.

Geographical distribution: — Northern and Middle Europe, from middle Sweden down in France.

4. S. potamida Meig.

1822. Meig. Syst. Beschr. III, 136, 3. — 1849. Zett. Dipt. Scand. VIII, 2952, 1—2. — 1862. Schin. F. A. I, 15. — 1903. Kat. paläarkt. Dipt. II, 21.

Male. Eyes bare, the facets in the lower part considerably smaller than above, the dividing line sharp, the small facets stretching a little upwards at the hind margin. Eyes, as far as I have seen, unicolorous. Face black, the cheeks with yellow side spots; below the antennæ black or brown haired, farther downwards yellow haired. Antennæ black. Thorax black, densely, but somewhat short, yellow haired. Scutellum yellow with a semicircular, black, basal spot. Abdomen black, dull on account of the very short, dense pubescence; a subtriangular, bright yellow spot on each side on the second segment, and narrow transverse side stripes at the hind margin on the third, sometimes connected in the middle, thus forming a transverse band, on the fourth segment a yellow hind margin, being broadest at the sides, fifth segment with a yellow spot at the hind margin, somewhat produced in front. Abdomen sparingly clothed with long, chiefly dark pubescence. From the produced apical spot a faint trace of a reddish

middle stripe sometimes appears, stretching about to the hind margin of the third segment; it is caused by the short, dense pubescence being reddish here. Venter yellow, with broad, black front margins of the segments, these being broadly interrupted in the middle on the second and narrowly on the third segment; the venter is clothed with short, yellow hairs. Femora black with yellow tips; tibiæ yellow with small, often very indistinct or quite wanting, darkened rings or markings in the middle; tarsi yellow; the legs are clothed with short, yellow pubescence, being a little longer on the femora. Wings yellowish with yellow veins. Halteres pale yellowish with the base of the peduncle darker.

Female. Front and vertex black, face yellow with a black middle line, hinder eye-margin yellow. Thorax more sparingly and shorter pubescent than in the male, and the pubescence greyish. The short, dense pubescence on the abdomen is reddish on the fourth and fifth segments, and the black front margins on the ventral segments are generally narrower than in the male.

Length 14,5—15,5 mm.

This species differs from the foregoing by the design on abdomen and the very short pubescence of the venter. The structure and coloration of the head in the female resembles that of *S. chamæleon*, but the yellow hinder eye-margin is more narrow.

S. potamida is not rare but on the other hand it may not be termed common; vicinity of Copenhagen, Ermelund, Ørholm, Hillerød, Donse Dam, Esromsø; Jutland in Greisdalen at Vejle and on Bornholm in Almindingen.

Geographical distribution: — Europe down into France, in north to southern Sweden.

5. **Odontomyia** Meig.

Species of small to middle size, unicolorous, black, or with yellow or green designs on abdomen, or abdomen green with black spots; sometimes with metallic pubescence on abdomen. Head somewhat semiglobular, but broader than high, as broad as or a little broader than thorax, flat behind. Antennæ inserted in, or a little below, the middle of the front side of the head. Face more or less protruding below the antennæ; vowls slightly or not descending below the eyes, nearly horizontal. Epistoma often more or less crested, retreating. Antennæ eight-jointed, the two basal joints short, equal in length or the first somewhat longer, the rest forming a fusiform, annulated part, the two last small, forming a more or less distinct style. Eyes bare or hairy, touching in the males, separated in the females; in the males

the upper facets larger than below. The oral cone is longer or shorter; the clypeus linear, stretching from the epistoma to the labrum; proboscis rather short, but also shorter or longer; the labella likewise differing, being rather short and broad, or somewhat longer and narrower; they are directed forwards, and their longitudinal axis forms an angle with the basal part of the labium. — With regard to the length of the oral cone, labium and labella, which parts follow each other in this respect, the species form a series, beginning with *ornata* which has these parts shortest and in this respect is allied to *Stratiomyia*, and ending with *hydroleon* and *angulata* with longer proboscis and labella, and in this respect approaching *Hoplodonta*. — Labrum is as long as the basal part of labium, semitubular; hypopharynx of nearly the same length, slender and pointed; the maxillæ only represented of small basal pieces but there are distinct, two-jointed palpi. Thorax nearly quadratic or slightly longer, scutellum with two spines. Abdomen is generally somewhat broader than the thorax, more or less flat, consisting of five segments. The male genitalia show a median apparatus and somewhat hook-shaped lateral lamellæ. Wings with the radial vein present but more or less indistinct, the cubital vein forked, or sometimes unforked, four veins rising from the discal and second basal cell, the fourth being the anterior branch of the postical vein, the third of these veins is rudimentary or wanting, and the first may be more or less rudimentary, thus the number of actually present posterior cells may be different. Between the discall cell and the postical vein is a small postical cross-vein. In rest the wings lie parallel on the abdomen, one covering the other.

The larvæ are quite similar to those of the *Stratiomyia*, but the tail part is generally shorter and broader, and the segments have no spine-shaped protuberances. On the ventral side, in the middle of the hind margin of the tenth and eleventh, or only on the eleventh segment, there are a few, forwardly recurved, spines; when the larvæ are contracted the spines are more or less hidden between the segments, and they are very liable to be broken of and then it may be difficult or impossible to see their place, especially in the smaller larvæ. There is a girdle of curved spines also between the other segments, but these are exceedingly small, only in some species being more distinct. The head and mouth parts are quite as in the larvæ of *Stratiomyia*; the antennal papillæ are slightly longer and more easily seen; there is the same number of spiracles and a tail coronet of feathery hairs. The larvæ live in the same places as those of *Stratiomyia*, they hibernate and transform to pupæ and develop in spring or summer.

The species of *Odontomyia* are, like those of *Stratiomyia*, somewhat sluggish; they occur in the vicinity of water and are generally seen on flowers of Umbelliferæ or on rushes and reeds at the borders of lakes and ponds, sometimes in great numbers.

Of the genus 25 species are known from the palæarctic region mostly from the more southern parts, 6 species have hitherto been found in Denmark.

Table of Species.

1. First joint of antennæ twice as along as the second ..... 2.
— First joint of antennæ slightly longer than, or of equal lenght with, the second ..... 3.
2. Abdomen above with silvery shining pubescence (♂) or with golden shining transverse bands (♀) ..... 2. *argentata.*
— Abdomen black with whitish yellow, narrow, transverse side spots ..... 3. *microleon.*
3. Abdomen above entirely black ..... 1. *tigrina.*
— Abdomen above not entirely black, with yellow spots, or greenish with black designs ..... 4.
4. Abdomen black with yellow side spots, larger species .. 4. *ornata.*
— Abdomen green with a black middle band, smaller species ..... 5.
5. The black abdominal band laterally dilated at the front margin of the segments, thus tending to transverse bands; antennæ dark, not very short, head in the male not especially large, yowls in the female each with a black spot ..... 5. *hydroleon.*
— The black abdominal band only somewhat incised; antennæ reddish yellow, short, head in the male large, yowls in the female entirely yellow ..... 6. *angulata.*

1. O. tigrina Fabr.

1775. *Stratiomys,* Fabr. Syst. Ent. 760. — 1846. Loew, Linn. Entom. 1, 468, 1. — 1862. Schin. F. A. 1, 17. — 1903. Kat. paläarkt. Dipt. II, 27. — 1842. *Stratiomys nigrita,* Zett. Dipt. Scand. 1, 138, 7.

Male. Eyes greyish hairy, the facets in about the lower half smaller than above, the dividing line not very sharp; colour greenish with a bluish band on the dividing line. Front and face somewhat protruding, black with long blackish hairs, front with an impressed longitudinal line. Antennæ black, first joint somewhat longer than the second. Thorax bluish black, somewhat shining; pubescence rather long, yellowish on the middle of the disc, darker on the sides and beneath. Scutellum black, spines yellow. Abdomen bluish black, somewhat shining, with dark brownish or blackish pubescence. Venter yellow with black margin and yellow pubescence, sometimes with a pair of small black spots on the middle of the third and fourth segments. Femora brownish black with the extreme tips yellow; tibiæ

yellow with a blackish ring in the middle; tarsi yellow, darkened towards the ends. Femora with long, chiefly brownish hairs, tibiæ short haired. Wings hyaline with blackish veins, cubital vein forked, the first of the veins, rising from the discal cell, very indistinct, the third wanting. Halteres yellow with brown peduncle.

Female. Eyes very sparingly and short hairy, with a bluish band a little above the middle. Front and face black, greyish haired, the hairs forming a small spot on each side at the eye-margin behind the antennæ just in front of a pair of slightly elevated, shining tubercles;

Fig. 18. Wing of *O. tigrina*.

front with an impressed middle line; hinder eye-margin with white, shining pubescence. Thorax on the disc with short, depressed, greyish white shining pubescence. Pubescence on abdomen greyish.

Length 7,5—10,5 mm.

The larva is lighter or darker brown, sometimes almost black, with some, often indistinct, longitudinally arranged darker markings; it is rather densely, short haired on both surfaces; it has forwards curved spines on the hind margin of the ventral side of the seventh abdominal segment. When full grown its length is about 16 mm.

O. tigrina is common in Denmark in localities near water, where it occurs in rushes and low herbage; Damhusmosen, Utterslev Mose, Vangede Mose at Gentofte, Ermelund, Dyrehaven, Ruderhegn, Furesø, Lillerød, Hillerød, at Frederikssund and Roskilde; Lolland in Nørreskov at Maribo and at Ryde, and Funen at Assens. It is an early species, my dates are $^{28}/_{5}$—$^{10}/_{7}$. The larvæ and pupæ have been taken in water and flood refuse in Damhusmosen, Utterslev Mose, Furesø and several other localities on $^{12}/_{4}$—$^{25}/_{5}$, they developed to $^{10}/_{6}$.

Geographical distribution: — Common in the northern and middle Europe from middle Sweden down into France.

2. O. argentata Fabr.

1794. *Stratiomys*, Fabr. Ent. Syst. IV, 266, 15. — 1842. *Stratiomys*, Zett. Dipt. Scand. I, 137, 6. — 1844. *Stratiomys*. Schiødte, Nat. Tidsskr. 2, I, 40. — 1846. Loew, Linn. Entom. I, 476, 5. — 1862. Schin. F. A. I, 20. — 1903. Kat. paläarkt. Dipt. II, 23.

Male. Eyes bare, facets in about the lower fourth part smaller than in the larger upper part, the dividing line rather sharp; colour

greenish with a purplish band on the dividing line. Face somewhat protruding, black with a yellow middle line, yellow haired, along the inner eye-margin brownish haired; front more or less distinctly silver-grey haired. Antennæ black, first joint fully twice as long as the second. Thorax brownish black with long, yellow pubescence. Scutellum with very small spines. Abdomen rather broad, blackish, with yellow, transverse side spots on second, third and fourth segments, clothed with dense, depressed, silvershining pubescence, more or less hiding the yellow spots; the margin of the abdomen narrowly yellow and yellow haired. Venter yellow with yellow pubescence, generally with a pair of small black spots on the middle of the third and fourth segments. Femora blackish with yellow tips; tibiæ yellow with more or less distinct black rings in the middle; tarsi yellowish, brown towards the ends; femora with long, yellowish hairs, tibiæ short haired. Wings hyaline, anterior veins brownish yellow, cubital vein not forked, the third of the veins, rising from the discall cell, wanting. Halteres yellow.

Female. Eyes with the purplish band situated in the middle. Front black, densely clothed with depressed, golden pubescence; face yellow in the middle, cheeks and yowls black, clothed with long, greyish pubescence; hinder eye-margin with dense, golden pubescence. Thorax densely clothed with short, depressed, golden pubescence. Abdomen black, the hind parts of the segments densely clothed with short, depressed, golden pubescence, thus forming transverse, golden bands. Femora yellow with black rings near the tips; tibiæ yellow, sometimes an indistinct, dark ring on the hind tibiæ.

Length 7,7—9 mm.

The larva is similar to that of *tigrina* but it has much longer hairs on both surfaces, and in the side margins of the segments it has distinct brushes of hairs on somewhat protuberance like dilatations. It has a length of about 18 mm.

This beautiful species is at once distinguished by its whole exterior; it is recorded to have sometimes traces of a branching of the cubital vein, all the specimens I have seen, have the vein quite unbranched.

O. argentata is very rare in Denmark, I know only a score of specimens; Ordrup Mose (Jacobsen), Charlottenlund, Ørholm (Schlick); Falster (Shiødte); the species seems to be an early one, the specimens have been taken from the 6th to the last half of May; the larvæ were taken at Ørholm on $^{22}/_{4}$; they were sifted from flood refuse. — As said the species seems very rare, but Schiodte l. c. records that Jacobsen observed it on the sixth of May 1843 in Ordrup Mose in great numbers; the females sat on flowers of Salix, while the males sat on dead rushes, liking silver spots; he says that while the females were sluggish,

the males were extremely quick, and they were seen hovering in the air in small swarms. Thus the male of this species would seem much more lively than is the case with the other species.

Geographical distribution: — Northern and middle Europe down into France, its northern limit lies in the southern Sweden, and there it is rare.

3. O. microleon L.

1761. *Musca,* Linn. Fn. Succ. 1781. — 1842. *Stratiomys,* Zett. Dipt. Scand. I, 137, 5. — 1862. Schin. F. A. I, 20. — 1903. Kat. paläarkt. Dipt. II, 26.

Male. Eyes bare, facets in about the lower third much smaller than above, the dividing line sharp; colour greenish with a purplish band on the dividing line. Face somewhat protruding, epistoma crest-shaped; front and face black with long, yellow pubescence. Antennæ black, first joint twice as long as the second. Thorax blackish brown with long, yellow pubescence; beneath the pubescence is paler. Scutellum with yellow spines. Abdomen broad, black, on second, third and fourth segment a narrow, transverse, yellowish white stripe on each side, at the hind margin, the fifth segment with a narrow, pale hind margin. Venter pale yellow, often with a pair of small, black spots on the middle of the third and fourth segments. Abdomen sparingly clothed with yellow hairs, on the venter with shorter, pale hairs. Femora blackish with yellow tips; tibiæ blackish with the basal part yellow; tarsi blackish, paler

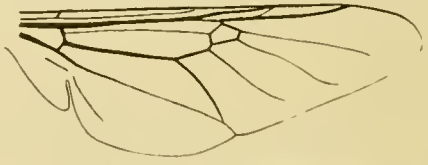


Fig. 19. Wing of *O. microleon.*

at the bases. Anterior femora with long, yellowish pubescence, hind femora and tibiæ short haired. Wings hyaline with yellow veins, cubital vein not forked, the first of the veins rising from the discal cell very thin, the third wanting. Halteres yellow.

Female. Eyes with the purplish band above the middle. Front and face black, front with two yellow stripes below the ocelli, close to the impressed, longitudinal line; hinder eye margin with golden pubescence. Thorax on the disc with short, depressed, golden pubescence. The rest as in the male.

Length 8—9,5 mm.

This species is also easily distinguished by its exterior, and the crest-shaped epistoma is likewise characteristic.

O. microleon is very rare in Denmark and has only been taken on three occasions; in Teglstrup Hegn by Fr. Meinert, eight specimens, and in Jutland at Dollerup near Viborg and at Funder near Silkeborg by Ax. Petersen, four specimens; on the latter locality it was taken on $^{15}/_{5}$ and $^{3}/_{6}$ 1906.

Geographical distribution: — Northern and middle Europe from the southern Sweden and Finland to northern France.

4. O. ornata Meig.

1822. *Stratiomys,* Meig. Syst. Beschr. III, 144, 13. — 1842. *Stratiomys,* Zett. Dipt. Scand. I, 136, 4. — 1846. Loew, Linn. Entom. I, 476, 6. — 1862. Schin. F. A. I, 18. — 1903. Kat. paläarkt. Dipt. II, 27.

Male. Eyes bare, unicolorous, facets in about the lower third smaller than above, the dividing line rather sharp. Fare moderately protruding, black with whitish grey hairs. Antennæ dark brownish, sometimes paler, first joint somewhat longer than the second. Thorax brownish black, clothed with dense, yellow pubescence; below the pubescence is paler. Scutellum yellow, black at the base, the spines with black tips. Abdomen black with large yellow side spots on second, third and fourth segments, and the side- and hind margins of the fifth segment yellow; sometimes the spots at the same side are connected and thus enclosing triangular, black spots at the margin. Venter pale yellow, often with a small, black spot, or a pair of spots on the middle of the third and fourth segments. (Quite fresh specimens are of a distinct greenish colour, but later on this colour changes.) Abdomen clothed with long, yellow or greyish hairs. Legs yellow, femora black at the basal half; tibiæ with a small, more or less indistinct, blackish ring in the middle; tarsi blackish brown towards the ends; femora long yellow haired, the dense ciliation at the tip of the middle femora especially distinct; tibiæ short haired. Wings hyaline with yellow veins, cubital vein forked, the third of the veins rising from the discal cell thin and abbreviated. Halteres pale yellow.

Female. Face black, the mouth edge and most of the yowls yellow; front black with a pair of yellow spots above the antennæ, another pair in the middle and a third pair on the vertex; hinder eye-margin yellow, connected with the spots on the vertex, clothed with golden hairs; the spots on the front sometimes more or less confluent. Thorax yellow on the sides, and with a yellow spot on the pleura below the wing-root, the disc clothed with erect hairs as in the male but a little shorter, and besides with depressed, golden pubescence. Abdomen as in the male but the side spots always separate. Legs all yellow, only the tarsi darkened towards the ends.

Length 13,5—15,5 mm.

The larva is reddish brown or dark brown, generally with some ongitudinal markings, but these are often indistinct or wanting; it is very sparingly haired; it has forwards curved spines on the ventral side on both the sixth and seventh abdominal segments (fig. 21):

Fig. 20.

Fig. 21.

Fig. 20. Larva of *O. ornata*, abt. nat. size.
Fig. 21. The three last segments of larva of *O. ornata*, lateral view, showing the forwards curved spines on the ventral hind margin of the tenth and eleventh segments. $\times 1^1/_2$.

it has a length of abt. 35 mm. — It is curious to see that while the present species and *S. furcata* as imagines are of equal size, the larva of the latter has nearly twice the length of that of the former.

This species is distinguished by its size and the colouring of the abdomen; the fact that the female has the thorax clothed with erect hairs as in the male is also characteristic.

O. ornata is not at all rare in localities near water, where it occurs in the herbage at the borders of lakes and ponds: Utterslev Mose, Ordrup Mose, Fortundammen, Virum Mose, Fureso, Bagsværd, Ørholm, Ruderhegn, Donse, Hillerod, Teglgaardsø: on Falster; Lolland at Lysemose near Maribo and at Christianssæde: Langeland at Tranekær, and Funen at Langenso. It is an early species, my dates are $^{22}/_5$—$^{18}/_6$. The larva has been taken in April in Fortundammen and Kildesøen, and the pupa in Fortundammen on $^{31}/_5$, on the latter date several cast pupa-skins were taken together with the pupæ; the pupæ developed in the following days. Both larvæ and pupæ were taken in the water, the latter floating on the surface.

Geographical distribution: — All Europe down to Sicily, towards north to middle Sweden but here referred to as rare.

5. O. hydroleon L.

1761. *Musca*, Linn. Fn. Suec. 1782. — 1842. *Stratiomys*. Zett. Dipt. Scand. I. 140, 10. — 1846. Loew, Linn. Entom. I. 481. 8. — 1862. Schin. F. A. I. 19. — 1903. Kat. paläarkt. Dipt. II. 25.

Male. Head not especially large, only slightly broader than the thorax in the middle. Eyes bare, the facets in somewhat more than the upper half larger than below, the dividing line sharp; eyes greenish, unicolorous. Face slightly protruding, black, greyish haired; epistoma somewhat crest-shaped. Antennæ black or dark brown, the two basal joints equal in length. Thorax brownish with erect, whitish grey pubescence and besides with short, depressed, golden hairs. Scutellum black, the apex and spines yellow. Abdomen green or yellowish green with a broad, black, longitudinal band in the middle; the band dilated to the sides at the front margins of the single segments, especially on the third and fourth, but not reaching the side margin. Venter yellowish green or green. Abdomen with very short and fine, greyish pubescence, on the dorsal side sparingly clothed with longer hairs. Legs all yellow, sometimes with faint traces of a darker ring on the hind tibiæ, sparingly yellow pubescent. Wings hyaline with the anterior

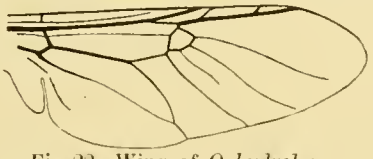


Fig. 22. Wing of *O. hydroleon*.

veins light yellow, cubital vein forked, the third of the veins rising from the discal cell rudimentary. Halteres greenish yellow.

Female. Front, face and yowls yellow, the latter with a black spot on each side; front with a dark, impressed middle line, and above with a pair of blackish or brownish spots lying in slight impressions; ocellar tubercle black; hinder eye-margin yellow, golden haired. Thorax with depressed, pale golden pubescence both on the disc, sterna and pleura. Abdomen as in the male, the band-like lateral dilatations of the black dorsal stripe especially distinct.

Length 9—10,5 mm.

This species is very like *O. felina* that has not hitherto been found in Denmark, but the latter has the abdominal dorsal stripe broader, and a black front with yellow spots in the female. — Schiner and Van d. Wulp says about *hydroleon* that the eyes in the male are hairy, but this is not correct as the eyes are bare or at all events only microscopically hairy.

O. hydroleon is not especially common; vicinity of Copenhagen, Ordrup Mose, Fuglsangsø, Ørholm, Jægerspris; Funen at Odense and Jutland in Greisdalen at Vejle; it occurs generally in low herbage with Umbelliferæ at the border of water. It is not an early species, my dates are $^{8}/_{7}$—$^{10}/_{8}$.

Geographical distribution: — Northern and middle Europe from the middle of Sweden to France.

6. O. angulata Panz.

1798. *Stratiomys*, Panz. Fn. Germ. LVIII, 19. — 1846. Loew, Linn. Entom. I, 483, 9. — 1862. Schin. F. A. I, 19. — 1903. Kat. paläarkt. Dipt. II, 23. — 1842. *Stratiomys ruficornis*, Zett. Dipt. Scand. I, 139, 9.

Male. Head large, much broader than the thorax. Eye-facets in the upper two thirds much larger than below, the dividing line sharp; eyes bare, greenish, unicolorous. Face very slightly protruding, black, yellowish haired; epistoma and mouth edge yellowish. Antennæ short, reddish yellow, the two basal joints of about equal length. Thorax blackish with rather short, yellow or greyish, erect pubescence, and besides with depressed, golden pubescence. Scutellum black with greenish hind margin, spines yellow. Abdomen green or yellowish green with a broad, black, dorsal line; on the second and third segments the black line is generally narrowed towards the hind margin of the segments. Venter green or yellowish green. Abdomen very short and finely pubescent, only in front on the dorsal side some longer hairs are found. Legs yellow, sparingly yellow pubescent. Wings hyaline, anterior veins pale yellow, the cubital vein forked, the third of the veins rising from the discal cell quite rudimentary. Halteres green.

Female. Face and front yellow, front with a dark, impressed middle line and a pair of brownish spots above the antennæ and another pair below the ocellar tubercle, lying in slight impressions; the spots may be larger or smaller and more or less distinct; hinder eye-margin yellow, golden haired. Thorax with depressed, golden pubescence, being very slightly longer beneath. The rest as in the male.

Length 9,5—10,5 mm.

The larva is brownish with some indistinct, darker longitudinal stripes; it is densely covered with somewhat longish hairs on both surfaces, but it is especially characterised by the fact that is has, besides a pair of curved spines on the ventral hind margin of the seventh abdominal segment, girdles of similar but smaller spines on the ventral hind margins of the first six abdominal segments. It has a length of 20 mm.

This species is distinguished from *hydroleon*, not only by the markings of the abdomen, but also by the short, yellowish antennæ; in the male by the large head and in the female by the very small, or quite wanting black spots on the yowls.

O. angulata is perhaps a little more common than *hydroleon* and occurs in the same localities; vicinity of Copenhagen, Ordrup Mose,

Fuglsangsø, Furesø. Hillerød, Frerslev Hegn; Lolland at Maribo, and Funen at Odense. It occurs in the same period as *hydroleon*, my dates are $^{1}/_{7}$—$^{14}/_{8}$. The larva was taken in Furesø on $^{11}/_{6}$, it transformed to pupa on $^{18}/_{6}$ and the imago escaped on $^{25}/_{6}$.

Geographical distribution: — Northern and middle Europe from the middle of Sweden to the north of France.

Remarks. — The species of *Odontomyia*, as seen, are different with regard to the period in which they occur; *argentata* seems to be the earliest with occurrence already first in May, then follow *tigrina* and *ornata* and I think also *microleon* occuring from the last part of May to about the end of June, and finally the species *hydroleon* and *angulata* occur later, chiefly in July and August.

6. **Hoplodonta** Rond.

(Oplodontha.)

The only species of this genus quite resembles the species of *Odontomyia*; it is a rather small species with a greenish, black marked, abdomen. The head is somewhat broader than the thorax, the face protruding knob-like below the antennæ; the yowls not descending below the eyes. Antennæ as in *Odontomyia*. Eyes bare, touching in the male, separated in the female; in the male the upper facets larger than the lower. The oral cone is rather long; clypeus linear, stretching from the epistoma to the labrum; the proboscis is long, the basal part of the labium moderately long, longer than in *Odontomyia*; the labella are longer than the basal part of the labium, rather narrow, compressed, somewhat blade-shaped, chitinised on the outer side; they protrude forwards and form an angle with the basal part; when the proboscis is retracted, the labella lie just in the oral aperture. Thorax and abdomen as in *Odontomyia*. Wings with the radial vein absent, cubital vein short, not forked, discal cell small, the first of the veins rising from it, rudimentary, the third wanting; between the discal cell and the postical vein is a postical cross-vein.

The larvæ quite resemble those of *Odontomyia* and have a pair of curved spines on the ventral hind margin of the seventh abdominal segment. They live in water.

The species occurs in the same localities as the species of *Odontomyia*.

This genus only comprises one species:

1. **H. viridula** Fabr.

1775. *Stratiomys*, Fabr. Syst. Ent. 760. — 1842. *Stratiomys*, Zett. Dipt. Scand. I, 140, 11. — 1846. *Odontomyia*, Loew, Linn. Entom. I, 491, 13. — 1862. *Odontomyia*, Schin. F. A. I, 19. — 1903. Kat. paläarkt. Dipt. II, 28.

Male. Eyes bare, facets in the upper two thirds much larger than below, the dividing line sharp: the colour greenish with a purplish band on the dividing line and small, round, purplish spots spread irregularly and unsymetrically on the eyes. Front and face black with some golden or whitish pubescence: mouth edge on the sides yellowish or brownish; face knob-like protruding below the antennæ. Antennæ blackish or yellowish brown, often with the basal joints lighter, the two basal joints of equal length. Thorax blackish with fine, golden, sometimes more greyish, pubescence. Scutellum blackish with yellow spines. Abdomen green or yellowish green with a black, longitudinal middle band, which is broadest on the fourth segment. Venter green or yellowish green. Abdomen short and finely, yellowish pubescent. Legs yellow except the blackish coxæ, with short and fine yellow

Fig. 23. Wing of *H. viridula*.

pubescence, only a little longer on the anterior femora. Wings hyaline with the anterior veins very slightly yellowish, the radial vein absent, the cubital vein not forked, the first of the veins rising from the discal cell rudimentary, the third absent. Halteres yellow to green.

Female. Eyes coloured as in the male, but the purplish band in the middle. Front and face black with golden pubescence, leaving some elevated spots bare, especially one on each side between the eye and the base of the antenna and one farther above. Hinder eye-margin black with dense golden pubescence. Thorax with dense, depressed, golden or pale golden pubescence. The black dorsal band on abdomen widened both on the third and fourth segments and generally more widened than in the male.

Length 6 to nearly 8 mm.

The larva is lighter or darker brownish with different longitudinal stripes or markings; on the dorsal side it is rather densely haired with short, depressed hairs, on the ventral side the middle space of the segments have somewhat longish hairs. The length is 16 mm.

This species may vary somewhat with regard to the breadth of the dorsal abdominal band, but all the specimens I have seen from Denmark belong to the variety *viridula* with an uninterrupted dorsal band; the other varieties, varying with regard to the dorsal band, which is sometimes quite absent, or only a basal spot present, or

a basal and an apical spot, the latter sometimes divided in two (var. *jejuna, interrupta, subvittata* and *bimaculata*), originally considered as distinct species, have not been found in our country. Girschner. (Berl. Ent. Zeitschr. XXXI, 1887, 160) says that the purplish spots on the eyes are only found in the male; this is not correct, however, as I have always found them in both sexes, but as they are quite irregularly spread they may perhaps sometimes be quite wanting, but I never found it so. It is also possible that the absence of the spots is only found in one or more of the above named varieties; if this should prove to be the case, this would go to prove it to be a separate species.

H. viridula is a common species and often occurs in great numbers, especially on ruhes and reeds at the border of water, f. inst. I have taken it in fens on Phragmites; vicinity of Copenhagen, Utterslev Mose, Ordrup Mose, Fuglsangsø, Bøllemosen, Fureso, Hillerød; Lolland at Maribo; Funen at Odense and Vellinge; Jutland in Greisdalen near Vejle, Hansted near Horsens, at Silkeborg and on Læsø; finally on Bornholm at Hasle and Allinge. It occurs in a rather long period of the summer, my dates are $^{1}/_{5}$—$^{6}/_{8}$. The larvæ have been taken in water in Utterslev Mose on $^{12}/_{4}$, they were of different sizes, some very small; larvæ and pupæ were taken in water in Fureso on $^{22}/_{5}$ and $^{14}/_{6}$, at this time cast pupa-skins were taken; the larvæ transformed to pupæ, and the imagines escaped to the $^{27}/_{6}$; on the $^{10}/_{7}$ I still saw larvæ in Furesø; thus the development takes place during a long period of the summer, but I do not think there is more than one generation.

Geographical distribution: — Europe and Asia minor, towards north to Jemteland in the northern part of middle Sweden.

7. **Sargus** Fabr.

Species of middle size and of somewhat elongate and slender form, metallic coloured. Head semiglobular but rather long, excavated behind, somewhat broader than the thorax. Antennæ inserted on the lower surface of the head, below the middle; epistoma short and retreating; there are no distinct yowls, only a very narrow margin between the eyes and the oral aperture. Antennæ short, seven-jointed in all, the two basal joints short, the others forming an annulated, compressed part bearing a dorsal, one-jointed arista. Eyes bare, separated in both sexes; the front narrow in the male, broader in the female; the eye-facets of the same or almost the same size. The anterior ocellus distant from the two posterior. The oral cone and the linear

clypeus short; proboscis very short; labrum and hypopharynx short and small, the first semitubular, the latter rudimentary; the labella broad, protruding somewhat forwards, generally of whitish colour; when spread out they form a disc; there are only small basal pieces of the maxillæ and small, one-jointed or indistinctly two-jointed maxillary palpi. Thorax is longish, broadest behind; scutellum without spines. Abdomen is long and rather narrow, at the base narrower than the thorax, broadest behind; it consists of five segments. The male genitalia have a pair of small styles in the middle and a thick lateral lamella on each side; the female genitalia show a pair of small, two-jointed styli. Wings rather long and broad; radial vein present cubital vein forked, from the discal and second basal cell rise four veins, the fourth being the anterior branch of the postical vein, thus there are five posterior cells; between the discal cell and the postical vein there is a postical cross-vein. In rest the wings lie parallel over the abdomen.

The larvæ are elongate with nearly parallel sides, not tapering behind, flattened; the head is conical and not distinctly cleft in lobes, it has a somewhat bulbous swelling with an eye on each side towards the base; the segments are much broader than long, the last segment is rounded behind, it is somewhat flat above with a shield-shaped impression, the incisure between the two last segments is curved; the last segment bears the anus on the under surface as a longitudinal split. The segments bear a transverse row of about six rather long bristles on each surface, and besides a few bristles at the margin; the last segment bears some bristles on the margin, and the head and prothorax bear several bristles. There are prothoracic and seven pairs of abdominal spiracles, but they are extremely small; I could detect no metathoracic spiracles; above at the apex of the last segment there is a transverse split with terminal spiracles.

Fig. 24. Larva of *S. iridatus* × 4.

The larvæ live in dung, in the earth in gardens and upon the whole in rich soil; they hibernate and develop in summer.

The species of *Sargus* are more lively than most of the other Stratiomyids, and they fly often and hower in the sunshine; they occur nearly everywhere and are often seen in gardens, hovering around flowers and in bushes.

Of the genus 13 species are known from the palæarctic region of which 3 hithertho have been found in Denmark.

Table of Species.

1. Legs chiefly blackish; front narrow, the white spots above the antennæ narrowly separated in the middle ..... 2.
— Legs chiefly yellowish; front rather broad, the whitish spots above the antennæ widely separated in the middle ..... 3. *flavipes.*
2. Wings with a distinct dark blotch from the stigma downwards ..... 1. *cuprarius.*
— Wings without any dark blotch ..... 2. *iridatus.*

1. S. cuprarius L.

1761. *Musca*, Linn. Fn. Suec. 1853. — 1842. Zett. Dipt. Scand. I, 157, 1. — 1855. Löw, Verh. Zool. bot. Ver. Wien. V, 131. — 1862. Schin. F. A. I, 21. — 1903. Kat. paläarkt. Dipt. II, 30.

Male. Eyes metallic greenish with an iridescent band in the middle, the inner end of which is going just to the white spot on the front. Front metallic green, above the antennæ a pair of white spots. Antennæ blackish brown. Thorax golden green, finely pale haired. Abdomen generally metallic green at the base, towards the apex being violet or copper-coloured. Venter greenish black. Abdomen finely, chiefly pale pubescent. Legs black or brownish black; the knees yellowish; the base of the posterior metatarsi generally more or less yellowish. Femora finely pubescent, tibiæ and tarsi densely clothed with short, yellow pubescence. Wings slightly yellowish at the base, at the apical half fumigated, with a blackish stigma and a distinct blackish fumigation reaching from the stigma downwards; the veins blackish brown. Halteres yellow.

Female. With exception of the broader front the female agrees quite with the male, also in the coloration of the eyes but the band is lying a little higher; the thorax has a shorter and more whitish pubescence, and abdomen is generally more violet.

Length 6—10,5 mm.

The larva is dirty whitish, it has a length of about 9—10 mm.

As the measurements show the species may very much in size, that is to say there may occur exceptionally small specimens. Zetterstedt has established a species, *S. nubeculosus,* in which the base of the hind tarsi should be quite dark, without any lighter colour, and for this species a smaller size was given, but the character is not valid, as *cuprarius* may have sometimes quite dark hind metatarsi and this may be found both in small and in larger specimens.

S. cuprarius is very common and known from many localities all over Denmark; it is very frequent in gardens. My dates are $^{3}/_{6}$—$^{13}/_{8}$.

Geograpical distribution: — Most parts of Europe, towards north to the northernmost Scandinavia; it also occurs in North America in Canada and New Jersey.

2. **S. iridatus** Scop.

1763. *Musca*, Scop. Ent. carn. 340, 914. — 1855. Löw, Verh. zool. bot. Ver. Wien, V, 133. — 1903. Kat. paläarkt. Dipt. II, 32. — 1842. *Sargus infuscatus*, Zett. Dipt. Scand. I, 158, 3. — 1862. Schin. F. A. I, 21.

Male. Eyes metallic greenish, with an iridescent band lying above the middle, on the upper part of the eye, its end thus reaching the front somewhat above the white spot above the antenna. Front metallic green, with a pair of white spots above the antennæ. Antennæ blackish brown. Thorax golden greenish, finely yellowish pubescent. Abdomen more or less copper-coloured or violet, especially towards the apex. Venter black. Abdomen with fine, pale pubescence. Legs black or brownish black with yellow knees; femora finely pubescent.

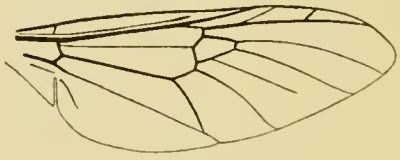


Fig. 25. Wing of *S. iridatus*.

tibiæ and tarsi with short, yellow pubescence. Wings somewhat fumigated, generally slightly lighter at the base, with a pale brownish stigma and blackish brown veins. Halteres yellow.

Female. Quite agreeing with the male, only the front is broader, and at the upper corner of the eye there is some violet colour; thorax has shorter and more whitish pubescence, and the abdomen is generally more or quite violet.

Length 6—11 mm.

The larva is dirty brownish or greyish brown; it has a length of about 10—12 mm.

This species very much resembles *cuprarius*, but it is distinguished by the wing stigma not being blackish and the absence of the blackish brown blotch on the wing; a good character is also the higher position of the band on the eye, but this is generally not to be seen in dried specimens. — As the measurements show, this species, like *cuprarius*, varies much in size; Meigen has established a species, *S. nitidus* (Syst. Beschr. II, 108, 4) which is very similar to *iridatus* but smaller, and is said to have no band on the eyes. Löw (Verhandl. zool. bot. Ver. Wien, V, 132) expresses some doubt about this species. Zetterstedt mentions the species in Dipt. Scand. I, 159, 6 but ibid. VIII, 2946, 6 he makes of the specimens mentioned in Vol. I the new species *minimus*, referring to *nitidus* some specimens which he had got, except one, from Stæger under the name „*S. infuscatus* var. *minutus*“. Zetterstedt says in the

description „Oculis non lineatis", but I think he had not seen the species alive, at all events certainly not those sent to him by Stæger, so that he only gives this character after Meigen. Now I found in the collection in our Museum some specimens, all small, labelled *S. nitidus* Meig, and these are certainly collected by Stæger and specifically identical with those sent to Zetterstedt. As I could find no character separating them from *iridatus*, I soaked them all in order to see the eye-coloration, and it then proved that they all had greenish eyes with an iridescent band lying far above quite as in *iridatus*. There is thus no doubt, that they are all small specimens of this species. According to this I think that *nitidus* is only a synonym to *iridatus*, and that Meigen has been mislead with regard to the eye-coloration; it must be borne in mind, that the band may disappear very soon after the death of the fly; at all events it is certain that all known Danish specimens, also those mentioned by Zetterstedt, are only small specimens of *iridatus*.

S. iridatus is as common as *cuprarius* and occurs together with it in the same localities and during the same period of the year.

Geographical distribution: — Europe down to Italy, but it seems in several places less common and less distributed than *cuprarius*; towards north it goes to northern Scandinavia.

3. S. flavipes Meig.

1822. Meig. Syst. Beschr. III, 108, 5, Tab. XXV, Fig. 14. — 1842. Zett. Dipt. Scand. I, 158, 4. — 1855. Löw, Verhandl. Zool. bot. Ver. Wien, V, 134. — 1862. Schin. F. A. I, 21. — 1903. Kat. paläarkt. Dipt. II, 32.

Male. Eyes greenish, unicolorous; the anterior ocellus nearer to the hinder pair than in the other species. Front metallic green, rather broad, especially downwards; two small, white spots above the antennæ which, on account of the broad front, are widely separated in the middle. Antennæ black. Thorax golden green, distinctly yellow pubescent. Abdomen metallic greenish at the base, towards the apex more copper-coloured. Venter black, slightly metallic. Abdomen yellow haired. Legs yellowish or brownish yellow; femora dark brown or blackish, except at the tips; the anterior tibiæ somewhat darkened towards the tips and the ends of the tarsi darkened. Femora finely pubescent, tibiæ and tarsi short and densely yellow haired. Wings distinctly fumigated with blackish brown veins; stigma only a little more fumigated. Halteres yellowish.

Female. Eyes greenish with an iridescent band lying above the middle in the upper part of the eye. Front black, very broad with parallel borders, the middle part elevated, metallic green, the white

spots above the antennæ widely separated, the hinder eye-margin on each side of the vertex broad. Thorax with short, white pubescence. Abdomen copper-coloured at the base, violet towards the apex, or quite violet. Legs quite yellow with the tarsi darkened towards the ends and also the front femora sligthly darkened in the middle.

Lenght 6.5—10 mm.

The larva is brownish white, of a length of 8—9 mm.

The species is very characteristic and easily distinguished by its pale legs and the broad front with the white spots widely separated, as also by the ocelli of which the anterior is placed nearer to the hinder pair than in the other species of *Sargus*. This is the species of *Sargus* which is most nearly related to *Chrysochroma* Willist. (*Chrysonotus* Löw). Meigen says nothing about the coloration of the eyes, but Zetterstedt and later authors say that the eyes have no band; this is, however, not correct, as the male has unicolorous eyes but in the female there is a band lying far above nearly as in *iridatus*.

S. flavipes is a somewhat rare species in Denmark; vicinity of Copenhagen, Lerso, Hillerød, Nykøbing, and on Lolland at Maribo. My dates are only $^{12}/_{8}$—$^{3}/_{9}$, it seems therefore to be a species that occurs somewhat late. Zetterstedt records it from $^{12}/_{7}$—$^{6}/_{9}$. A specimen of the larva was taken in Uttersley Mose in the earth on $^{22}/_{7}$.

Geographical distribution: — Northern and middle Europe from the northern Sweden to France.

8. **Chloromyia** Dunc.

Species of middle size and of metallic colour, much resembling *Sargus*, but more robust. Head nearly semiglobular, excavated behind, broader than high and a little broader than the thorax. Antennæ inserted in the middle of the head; face somewhat bulbous, yowls not descending below the eyes, horizontal, not narrow as in *Sargus* but distinct and rather broad. Antennæ seven-jointed, the first basal joint slightly longer than the second, the four following short, forming a compressed, annulated part, the last forming an unjointed, or, at all events, very indistinctly jointed arista with some long bristles at the somewhat thickened base, inserted in the dorsal side of the foregoing joint. Eyes long and densely hairy, touching in the male, broadly separated in the female; in the male the upper facets distinctly larger than the lower. The three ocelli equidistant from each other. The oral cone short; clypeus elongate, rectangular, stretching from the epistoma to the labrum, its anterior end is roundly excised; the proboscis is short, labrum short and semitubular; hypopharynx short,

rudimentary; the labella are rather broad, somewhat protruding forwards and of whitish or yellow colour; when spread out they from a disciform plate. The maxillæ are rudimentary, forming two small, chitinous staves, but there are distinct, two-jointed palpi. Thorax is short, nearly quadratic; scutellum unarmed. Abdomen is narrow at the base, narrower than thorax, somewhat broader behind and in the male as broad as, in the female broader than, the thorax; it consists of five segments. The male and female genitalia are similar to those in *Sargus*. Wings moderately long, rather broad, with a distinct radial vein and a forked cubital vein; from the discal and second basal cell rise four veins, the fourth being the anterior branch of the postical vein, thus there are five posterior cells and a postical cross-vein between the discal cell and the postical vein. In rest the wings lie parallel over the abdomen.

The larvæ are similar to those of *Sargus* but less flattened, and the last segment has an excision in the apex so that it terminates with two small points; the head is more elongate and narrower than in *Sargus*, and the eye-swellings are smaller. Each segment has on both surfaces a transverse row of six strong, somewhat flattened bristles and a few similar bristles on the margin, the last segment has eight bristles on the margin; the spiracles are as in the *Sargus* larva. — The larvæ live in the earth on moist places, especially in rich soil and in similar localities; they hibernate and the development takes place in spring or summer.

Fig. 26. Larva of *C. formosa*. × 4.

The species of *Chloromyia* occur in similar localities as those of *Sargus*, they are also rather lively and are often seen flying and howering.

The genus only includes two palæarctic species of which one occurs in Denmark.

1. C. formosa Scop.

1763. *Musca*, Scop. Ent. carn. 339, 910. — 1842. *Chrysomyia*, Zett. Dipt. Scand. I, 154, 1. — 1855. *Chrysomyia*, Löw, Verh. zool. bot. Ver. Wien, V, 138. — 1862. *Chrysomyia*, Schin. F. A. I, 23. — 1903. Kat. paläarkt. Dipt. II, 34.

Male. Eyes densely hairy, the facets in the upper half distinctly larger than below, the colour greenish with an iridescent band on the dividing line between the facets. Front and face black, with long, blackish or brownish hairs. Antennæ blackish brown. Thorax golden

green with yellow pubescence, pleura and sterna black. Abdomen brownish or somewhat greenish golden. Venter black. Abdomen densely yellow pubescent. Legs blackish or brown with the knees broadly yellow. Femora finely long haired, tibiæ and tarsi with rather dense, short, yellow pubescence. Wings brownish fumigated with yellow veins, stigma not darker. Halteres yellow.

Female. Eyes with the band placed above the middle. Front and face black, hinder eye-margin broad, black. Thorax generally more bluish than in the male, with short greyish white pubescence. Abdomen steel-blue, violet in the middle, shorter and paler haired than in the male.

Length 7,5—9 mm.

The larva is yellow to brownish; it has a length of 11—12 mm.

This beautiful fly is almost as common as the common *Sargus* species, and it has been taken in most parts of Denmark together with Læso and Bornholm, it also occurs in gardens but here, I think, less commonly. My dates are $^{22}/_{6}$—$^{25}/_{7}$. The larvæ have been taken on Vesterfælled and at Ladegaardsaaen in loamy earth on $^{25}/_{3}$ and $^{13}/_{4}$.

Geographical distribution: — Europe down to Italy, in north to middle Sweden.

9. **Microchrysa** Löw.

The species of this genus highly resemble those of the preceding, but they are of smaller size; they are likewise metallic coloured. The head is semiglobular, excavated behind, a little broader than high and broader than the thorax. The face is not protruding but in a level with the eyes. The antennæ are inserted a little below the middle of the head. Face and epistoma retreating; yowls very narrow, not descending below the eyes but on the contrary bent upwards. Antennæ short, seven-jointed in all, the two basal joints of equal length, the four following forming an annulated, compressed part, the last forming an arista, inserted in the dorsal side of the foregoing joint. Eyes bare or indistinctly hairy, touching in the male, widely separated in the female; in the male the upper facets larger than the lower. The oral cone and the proboscis are short, the labella rather broad, discform when spread out; for the rest the mouth parts as in *Chloromyia*. Thorax is somewhat longer than broad; scutellum unarmed. Abdomen is slightly broader than the thorax, consisting of five segments. The male and female genitalia similar to those in *Sargus*. The wings have a distinct radial vein and a forked cubital vein; four veins rise from the discal and second basal cell of which the first and third are generally weak, the fourth is the anterior

branch of the postical vein; between the discal cell and the postical vein is a postical cross-vein. In rest the wings lie parallel over the abdomen.

The larvæ quite resemble those of *Chloromyia* and *Sargus*; the last segment is rounded behind, only with a very inconspicuous incision; the head is conical with somewhat bulbous swellings at the base, it and prothorax bear several bristles; the other segments bear bristles as in *Sargus* and *Chloromyia*. — The larvæ live in dung, in decaying vegetable matter and in the earth; they hibernate and the development takes place in summer.

The species of *Microchrysa* occur in the same localities as those of *Chloromyia*, and they are, like these, rather lively.

The genus only comprises two palæarctic species which both occur in Denmark.

Table of Species.

1. Antennæ blackish; thorax without any yellow stripe on the sides ..... 1. *polita*.
— Antennæ yellowish or brownish with the basal joints yellowish; thorax with a narrow yellow stripe on the sides ..... 2. *flavicornis*.

1. **M. polita** L.

1761. *Musca*, Linn. Fn. Suec. 1854. — 1842. *Chrysomyia*, Zett. Dipt. Scand. I, 155, 2. — 1855. Löw, Verh. zool. bot. Ver. V, 139. — 1862. *Chrysomyia*, Schin. F. A. I, 22. — 1903. Kat. paläarkt. Dipt. II, 35.

Male. Eyes greenish, unicolorous, finely and short haired, facets in the upper two thirds larger than below, the dividing line sharp. Frontal triangle with grey, depressed pubescence, face greenish, metallic. Antennæ black. Thorax golden green, with very short and dense, blackish pubescence. Abdomen golden green, sometimes more copper-coloured. Venter black, somewhat metallic. Abdomen with very short, blackish pubescence; the venter with pale pubescence. Femora brownish black, yellow at the tips; tibiæ yellow, the hind tibiæ, except the base, and the anterior in the middle more or less darkened; tarsi pale yellow, darkened towards the ends. Legs finely pubescent in the ordinary way. Wings very slightly yellowish with brownish veins, stigma pale yellow. Halteres yellow.

Female. Eyes bare. Front broad, metallic green or blue, hinder eye-margin of the same colour, broad. Colour of the body often more bluish than in the male; pubescence on thorax pale and extremely short.

Lenght 4—5,5 mm.

The larva is lighter or darker brownish; of the eight bristles in

the margin of the last segment the two at the apex are short; it has a lenght of about 7 mm.

M. polita is very common here, it occurs nearly everywhere, generally in great numbers, and it has been taken in most parts of Denmark; it is common in gardens; my dates are $^{4}/_{6}$—$^{11}/_{9}$. The larvæ have been taken at Randers in decaying vegetable matter and in Damhusmosen in great numbers in dung, in the latter place on the $^{31}/_{10}$.

Geographical distribution: — Northern and middle Europe down into France, towards north to northern Scandinavia and Lapland; it occurs also in North America in Canada.

2. M. flavicornis Meig.

1822. *Sargus*, Meig. Syst. Beschr. III, 112. 10. — 1855. Löw, Verh. Zool. bot. Ver. Wien, V, 139. — 1862. *Chrysomyia*, Schin. F. A. I, 23. — 1903. Kat. paläarkt. Dipt. II, 34. — 1842. *Chrysomyia pallipes*. Zett. Dipt. Scand. I, 155, 3 and *Chrysomyia cyaneiventris* ibid. 156, 4.

Male. Eyes almost bare, greenish, unicolorous; facets in the two upper thirds larger than below, the dividing line sharp. Front and face metallic greenish, front with somewhat depressed pubescence. Antennæ yellowish or brownish with the basal joints yellowish. Thorax golden green with very short, dark brownish or blackish pubescence. On the sides the margin between the dorsum and the pleura is narrowly yellowish from the humerus to the wing-root, the yellowish stripe is slightly widened behind. Abdomen golden green or slightly copper-coloured, in single cases nearly black, with short, dark brownish pubescence. Venter dark, somewhat metallic greenish. Legs yellow; the posterior femora somewhat darkened in the middle; the hind tibiæ slightly darkened near the apex and the tarsi likewise towards the ends. Legs very finely pubescent in the ordinary way. Wings hyaline with brownish veins, the third of the veins rising from the discal cell very thin and inconspicuous; stigma pale yellowish. Halteres yellow.

Female. Eyes bare. Front broad, metallic bluish, hinder eye-margin broad, of the same colour. Thorax golden greenish or bluish, with extremely short, whitish pubescence. Abdomen generally metallic bluish, pubescence paler than in the male.

Length 3,5—4,5 mm.

This species is nearly related to *polita* but, besides by the distinctly smaller size, it is distinguished by the paler antennæ which have, at all events the basal joints yellowish, by the somewhat paler legs and the yellowish stripes on the sides of thorax.

M. flavicornis is not common in Denmark, but it has been taken

on several localities; vicinity of Copenhagen, Lersø, at Snekkersten and at Faxe; Lolland at Maribo; Funen at Faaborg and in Jutland at Søholt near Ebeltoft. I once have taken a specimen in a garden. My dates are $^{3}/_{6}$—$^{29}/_{7}$.

Geographical distribution: — Northern and middle Europe down into France, towards north to the middle of Sweden but here rare.

10. **Beris** Latr.

Species of rather small size, thorax black or metallic, abdomen black, brownish or yellowish red. Head semiglobular, somewhat flattened behind, broader than high, as broad as or very slightly broader than the thorax. Antennæ inserted nearly in the middle of the front side of the head. Face and epistoma broad, retreating, yowls not descending below the eyes, horizontal, but the mouth edge is, on the other hand, somewhat ringlike produced all round. Antennæ somewhat elongated, ten-jointed, the two basal joints of equal length, the rest forming an annulated, fusiform part, the first and last joints of which are the longest. Eyes hairy, unicolorous, touching in the male, widely separated in the female; in the male the upper facets are slightly larger than the lower, or the facets are almost equal. The oral cone is very short; clypeus small: proboscis also very short with a small labrum and hypopharynx; there are no maxillæ but small one-jointed maxillary palpi; the labella are not very broad, they protrude a little forwards and may be spread so as to form together a plate. Thorax a little longer than broad, scutellum with six bristle-bearing spines[1]). Abdomen somewhat elongated, as broad as or slightly broader than thorax, consisting of seven segments of which the last is, in the male, small and often hidden. The male genitalia show a median apparatus with two styles and a pair of hookformed lateral lamellæ with thick bases; the female genitalia have a pair of small styles. Legs with the hind metatarsi thickened. Wings with the radial vein distinct and the cubital vein forked; from the discal cell rise three veins of which the third is the anterior branch of the postical vein, this branch closes the discal cell beneath; there is thus no postical cross-vein; there are four posterior cells, the third and fourth being fused. In rest the wings lie parallel over the abdomen.

The larvæ of the genus are, as far as I am aware, not known; Walker (Dipt. Brit. I, 12) states that the pupa of *B. chalybeata* „has been found in moos“. Handlirsch (Verh. zool. bot. Gesellsch. Wien,

[1]) Individual aberrations with from four to eight spines are sometimes to be found.

XXXIII, 243) describes the larva of the somewhat nearly related *Chorisops tibialis* Meig. This larva resembles a *Sargus* larva what may probably also be the case with the *Beris* larva. The *Chorisops* larva was found in earth with much decaying vegetable matter.

The species of *Beris* are not very lively, they are especially found in low herbage and in bushes often near water.

The genus comprises 5 palæarctic species of which 4 have hitherto been found in Denmark.

Table of Species.

1. Abdomen red above ..... 2.
— Abdomen dull black or shining, dark brown above ..... 3.
2. Abdomen red above, without blackish transverse lines; wings in the male brownish, in the female clearer ..... 1. *vallata*.
— Abdomen red above with impressed, blackish, transverse lines: wings in both sexes brown ..... 2. *clavipes*.
3. Abdomen in the male dull black, in the female dark brown, shining: front in the female broad, occupying the third part of the breadth of the head ..... 3. *chalybeata*.
— Abdomen in both sexes dark brown, shining; front in the female narrow, only occupying the fifth part of the breadth of the head ..... 4. *Morrisii*.

1. **B. vallata** Forst.

1771. *Musca*, Forst. Nov. spec. Ins. I, 96. — 1842. Zett. Dipt. Scand. I, 133, 4. — 1846. Loew, Stett. Ent. Zeit. VII, 222, 1. — 1862. Schin. F. A. I, 24. — 1903. Kat. paläarkt. Dipt. II, 38.

Male. Eyes hairy, in the upper two thirds the facets larger than below. Antennæ brownish black, rather long, longer than the head. Thorax black with blackish brown pubescence. Abdomen red, brown at the base, with blackish brown pubescence that is long at the margin; the seventh segment generally brown. Venter yellowish red.

Fig. 27. Wing of *B. vallata*.

Legs yellow; tibiæ at the apical halves or two thirds, and the tarsi dark brown; the hind metatarsi much thickened. Legs with fine, yellow and brown pubescence. Wings brownish with brown veins, stigma only a little more brown than the wing. Halteres brownish.

Female. Eyes sparingly and short hairy. Front broad, black.

Thorax with greyish brown pubescence that is shorter than in the male. Abdomen not brown at the base, and the pubescence paler than in the male. Wings clearer than in the male, somewhat yellowish and thus the brown stigma much more conspicuous.

Length 5—6,3 mm.

B. vallata is the only species of *Beris*, which is to some degree common here, though it has generally only been taken in single or a few specimens; vicinity of Copenhagen, Utterslev Mose, Fortundammen, Dyrehaven, Ørholm, Hillerod, Boserup at Roskilde and Tidsvilde; Lolland at Maribo; Langeland in Aasoskov, a forest at Tranekær; Funen at Odense and Jutland at Laven, Frijsenborg and Horsens. My dates are $^{18}/_{6}$ to the first part of August.

Geographical distribution: — Northern and middle Europe down into France, towards north to southern Sweden.

2. **B. clavipes** L.

1767. *Musca*, Linn. Syst. Nat. XII, 981, 12. — 1842. Zett. Dipt. Scand. I, 132, 3. — 1846. Loew, Stett. Ent. Zeit. VII, 259, 2. — 1862. Schin. F. A. I, 24. — 1903. Kat. paläarkt. Dipt. II, 37.

Male. Eyes hairy, facets in about the upper two thirds larger than below. Antennæ black, the first joint longer than the second. Thorax black with blackish pubescence. Abdomen red with brownish pubescence, which is long at the margin; the base brown; on the second to sixth segment the transverse, impressed line just in front of the hind margin is more or less distinctly blackish; the seventh segment is not brown. Venter yellowish red. Legs yellow; the apical half of the anterior tibiæ, the hind tibiæ at the tips and all tarsi blackish; the hind metatarsi much thickened. Legs with fine, yellowish pubescence. Wings considerably brownish and more so than in *vallata*, especially towards the anterior margin, veins brown; stigma not conspicuous. Halteres brownish.

Female. Eyes sparingly and very short hairy. Front broad, black. Thorax with brown pubescence. Abdomen not brown at the base; wings nearly as brown as in the male.

Length 6—6,3 mm.

This species is very similar to, and very nearly related to *vallata*, yet I surely think it is a distinct species. The blackish, transverse lines on the abdomen are rather characteristic, to be sure something like may be found in *vallata*, but only in not well preserved specimens in which the whole abdomen is more or less darkened. Besides by this character it is also generally distinguished by the colour of the

legs, especially the hind tibiæ. The fumigation of the wings easily distinguishes the female and seems also to be darker in the male.

B. claripes is rare in Denmark and in all not many specimens have been taken: Hillerød (Godskesen): Lolland at Maribo and Nakskov (Schlick) and Jutland at Vejle and Silkeborg (O. G. Jensen). My dates are $^{18}/_{5}$—$^{19}/_{6}$. Zetterstedt l. c. says: „Dania fr." what may mean Dania frequens: but this may be due to some error as the species is rare here, and Zetterstedt does not mention that he has seen specimens, neither does he quote Stæger which he otherwise does.

Geographical distribution: — Northern and middle Europe down into France, towards north to middle Sweden.

3. **B. chalybeata** Forst.

1771. *Musca*, Forst. Nov. spec. Ins. I, 95. — 1862. Schin. F. A. I, 24. — 1903. Kat. paläarkt. Dipt. II, 36. — 1842. *Beris sexdentata*, Zett. Dipt. Scand. I, 132, 2. — 1846. *Beris sexdentata*, Loew. Stett. Ent. Zeit. VII, 261, 3.

Male. Eyes hairy, the facets in the upper part slightly larger than below, the dividing line slightly conspicuous. Antennæ black, short, shorter than the head: the annulated part short and stubby. Thorax dark metallic green, with blackish brown and somewhat longish pubescence. Abdomen dull black with blackish pubescence, being long at the margin. Venter brownish black, shining. Legs yellow; coxæ brownish black; tarsi, except the bases, brownish black: hind metatarsi yellow, much thickened: the four last joints of the hind tarsi are also slightly dilated. Legs with fine yellowish pubescence. Wings considerably brownish with brownish veins, stigma not conspicuous. Halteres blackish brown.

Female. Eyes sparingly and short hairy. Front broad, black. Thorax more greenish or bluish than in the male, with short, pale brown pubescence. Abdomen dark brown, shining. Wings not brown but distinctly yellowish, with light brown veins, stigma brown. Halteres yellow.

Length 5,5—5,8 mm.

B. chalybeata is, as the preceding species, very rare in Denmark. I know only a few specimens, all females: Hillerød (Godskesen), Jutland at Vejle (O. G. Jensen, Schlick); the specimens have been taken in June.

Geographical distribution: — Northern and middle Europe from the northern Sweden down into France.

4. **B. Morrisii** Dale.

1842. Dale, Entom. 175, 75. — 1855. Zett. Dipt. Scand. XII, 4552, 2—3. — 1862. Schin. F. A. I, 24. — 1903. Kat. paläarkt. Dipt. II, 38. — 1846. *Beris pallipes*, Loew, Stett. Ent. Zeit. VII, 284, 5.

Male. Eyes with rather short hairs, facets of the same or almost of the same size. Antennæ dark brown; the two basal joints long, almost as long as the rest, the annulated part has in the middle on the inner side a slight excision or impression which is yellowish, this excision gives the antennæ a peculiar appearance. Thorax bright greenish or bluish metallic with brownish, somewhat longish pubescence. Abdomen dark brown, shining, with yellowish brown pubescence which is long at the margin. Venter brown, shining. Legs long and slender, pale yellow; anterior metatarsi at the apex, and the last four joints blackish brown; hind metatarsi much thickened, longer than the four following joints, which are also slightly dilated, metatarsus brownish towards the apex, the four last joints blackish brown. Wings yellowish with brownish veins, stigma brown. Halteres yellow.

Female. Eyes short and sparingly hairy. Front black, rather narrow, only occupying the fifth part of the breadth of the head. Thorax with short, pale yellow pubescence. Wings slightly more hyaline than in the male.

Length 7 mm.

This species is easily distinguished from the preceding, in the male by the shining brown colour of the abdomen, in the female by the narrow front, and in both sexes the peculiar antennæ is a good character.

B. Morrisii is very rare in Denmark, only four specimens have been taken, two from earlier times with the locality Sealand, one on Lolland (Schiodte) and one in Jutland in Greisdalen near Vejle (H. J. Hansen); the dates are in June.

Geographical distribution: — Northern and middle Europe from southern Sweden down into Austria and Herzegowina; it occours also in North America in Canada.

As I have examined larvæ of all Danish genera of Stratiomyids with the exception of the unknown larva of *Beris* I shall try to give a synoptic table of them; in parenthesis I add the name of the species examined. Of *Stratiomyia* and *Odontomyia* I have examined the larvæ of several species, and I give a table of them, this, however, must be used with some caution as not all the species have been examined.

Table of larvæ of the Genera and of some Species.

1. A coronet of feathery hairs at the apex of the body ..... 2.
— No coronet of hairs at the apex of the body ..... 5.
2. The last segment cleft in the apex, terminating in two processes, the hair-coronet lying on the upper surface of the segment at the apex, not very conspicuous.. 2. *Nemotelus* (*pantherinus*).
— The last segment not cleft, the hair-coronet situated in the apex of the segment ..... 3.
3. Body relatively short and broad with rather strong bristles on the dorsal surface; last segment nearly quadratic.. 3. *Oxycera* (*trilineata*).
— Body more elongate; last segment longer than broad ..... 4.
4. Last segment much to very much longer than broad; anus near to its base; some of the middle segments with a spine-like protuberance at the anterior corners ..... 4. *Stratiomyia*.
— Last segment moderately longer than broad; anus about in the middle; ventral hind margin of sixth and seventh, or only of seventh segment, with curved spines ..... 5. *Odontomyia* and 6. *Hoplodonta*.
5. The last segment subquadratic; body with long bristles 1. *Pachygaster* (*tarsalis*).
— The last segment more or less semicircular ..... 6.
6. The last segment quite semicircular; the incisure between this and the penultimate segment much curved; head with rather large eye-swellings ..... 7. *Sargus* (*cuprarius*, *iridatus*, *flavipes*).
— The last segment with a small excision in the apex, incisure between this and the penultimate segment slightly curved; eye-swellings not especially large ..... 8.
8. Excision in the apex rather distinct; the two median, apical bristles of the last segment nearly as long as the others 8. *Chloromyia* (*formosa*).
— Excision in the apex very small; the two median apical bristles of the last segment smaller than the others ... 9. *Mierochrysa* (*polita*).

Stratiomyia.

1. Tail part long and slender; last segment very long and thin, about twice as long as the penultimate; only the second and third abdominal segments with a spine-shaped protuberance at the anterior corners ..... *S. furcata*.
— Tail part moderately long; last segment only slightly longer than the penultimate; the four first abdominal segments with a spine-shaped protuberance at the anterior corners ..... *S. longicornis*.

Odontomyia and Hoplodonta.

1. Sixth and seventh abdominal segments with curved spines at the ventral hind margins; body sparingly haired ..... *O. ornata*.
— Only seventh abdominal segment with curved spines at the ventral hind margin ..... 2.
2. The small spines between the segments rather distinct ..... *O. angulata*.
— The small spines between the segments indistinct ..... 3.

3. Body with short, somewhat depressed hairs . . . . . 4.
— Body with longer hairs, only the ventral segments with shorter hairs in front . . . . . *O. argentata.*
4. Almost the whole dorsal and ventral surface covered with short, depressed hairs . . . . . *O. tigrina.*
— The hairs on the ventral segments only occupying a somewhat narrow, transverse space in the middle, not quite depressed . . *H. viridula.*

Xylophagidae.

Head short, broader than high, as broad as thorax. Vowls very narrow, not descending below the eyes; epistoma retreating. Antennæ placed near to each other, in, or somewhat below, the middle of the head, ten-jointed. Eyes bare, equally separated in both sexes, or the front somewhat narrower in the male. Three ocelli present. The part of the head surrounding the mouth aperture not membranous, and thus no oral cone is formed; clypeus partly membranous, not distinctly separated from the epistoma; proboscis short, the labella rather broad, protruding forwards. Labrum of the length of the labium, hypopharynx slightly shorter; maxillæ present, with a shorter or longer lacinia, and two-jointed palpi. Thorax rectangular, scutellum unarmed, postscutellum rather large. Abdomen elongated, consisting of seven segments. Legs long, more or less slender, without bristles; all tibiæ with two apical spurs (*Xylophagus*), or the spurs absent on the front tibiæ (*Xylomyia*). Claws simple; two pulvilli and a pulvilliform empodium. Wings with the costal vein extending all round the margin, radial vein present, cubital vein forked; the discal cell formed exclusively of the discal vein, connected with the postical vein by a postical cross-vein; five posterior cells of which the fourth is open or closed; the basal cells of equal length and the anal cell almost or quite reaching the margin. Alula absent (*Xylophagus*), or small (*Xylomyia*); alar squamulæ present but small, thoracic squamulæ not developed, only the frenum present. In rest the wings lie parallel over the abdomen.

The larvæ of the two genera are somewhat different, and I refer with regard to them to the genera.

The Xylophagids are species of middle size and somewhat slender form; they occur in woods on or near hollow trees and trees or stubs with otherwise decaying parts, and their larvæ live on such places.

From the palæarctic region 9 species are known, and about three times as many from North America; none are common to both regions.

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

Of Xylophagids Zetterstedt (I, 1842) has recorded *X. ater* from Denmark, sent to him by Stæger, and Schiodte (Nat. Tidsskr. IV, 1842-43) communicates Drewsens observation on the larva of *X. ater*. Thus only one Xylophagid was known, while now two have been found in Denmark.

I have here retained *Xylophagus* and *Xylomyia* in the family *Xylophagidæ*. Not that I am convinced with regard to the natural formation of the family; Osten Sacken (Berl. Ent. Zeitschr. XXVI, 1882, 365) has divided the family and drawn *Xylomyia* to the *Beridinae*, and *Xylophagus* together with *Coenomyia* to the *Leptididae*. The author gives several reasons for this arrangement, and the larva of *Xylomyia* also much resembles those of certain Stratiomyids both in structure and mode of pupation. Austen (Ann. Mag. Nat. Hist. 7, III, 1899, 187) follows Osten Sacken, and perhaps this may be right, but yet the question cannot at this time be considered as solved.

Table of Genera.

1. First joint of antennæ much longer than the second; all tibiæ with apical spurs; fourth posterior cell open .. 1. *Xylophagus*.
— First and second joint of antennæ almost of equal length; front tibiæ without apical spurs; fourth posterior cell closed ..... 2. *Xylomyia*.

1. **Xylophagus** Meig.

Species of middle or somewhat large size of chiefly black colour. Head semiglobular, broader than high, as broad as the thorax, flat or slightly arched behind. Vowls narrow, not descending below the eyes, horizontal; epistoma retreating. Antennæ inserted slightly above the middle of the head, ten-jointed, the first basal joint long, the second short, the third somewhat longer, the rest short. Eyes bare, separated in both sexes, mostly so in the female. Front and vertex somewhat depressed, thus the eyes slightly prominent. The membrane connecting the mouth parts with the mouth edge small and a distinct oral cone not formed; clypeus broad, weakly chitinised, partly membranous; proboscis short; labrum of the length of labium, slightly semitubular; hypopharynx a little shorter; the maxillæ have a long, narrow lacinia, somewhat curved towards the apex, and two-jointed palpi; in the female the second joint is broad, somewhat compressed and pointed, in the male it is smaller; the labella are broad, protruding somewhat forwards. The thorax is longer than broad. Abdomen elongate, consisting of seven segments, in the male with parallel sides, truncate at the apex, the genitalia forming a knoblike part; in the female the abdomen is broadest at the middle, tapering towards the apex, ending

in a slender ovipositor with a pair of small lamellæ at the apex. Wings with the cubital vein forked; between the discal cell and the postical vein is a postical cross-vein; there are five posterior cells, all open.

The larva is elongate, cylindrical, whitish yellow; the body consists of twelve segments, including the head; at the anterior margin of each of the abdominal segments, except the last, there is, on the ventral and dorsal surface, a transverse swelling set with small spines in two rows; the swelling on the dorsal side of the penultimate segment is rudimentary. The segments bear some bristles on the sides. The head is long, conical, pointed, brownish black chitinised.

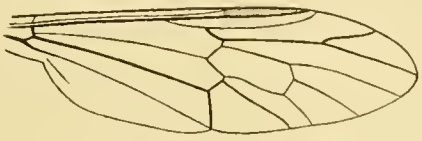


Fig. 28. Wing of *X. ater*.

The mouth parts are small, consisting of hookformed, not thooted, mandibles, and more scaleformed maxillæ with small palpi. The thoracic segments are, on the dorsal surface, reddish brown, strongly chitinised, on the third segment sometimes the chitinising forms only lateral plates. The last segment is rounded, somewhat bulbous, it bears the anus on the ventral side as a longitudinal split between a pair of swollen lips; the lips are surrounded by a circular groove with small spines, from each side of which a similar, v-shaped groove stretches out. On the dorsal surface of the segment there is, at the apex, a somewhat triangular, chitinised plate, ending in two dorsally curved spines, and in front of this plate there are two pairs of small plates. The larva is amphipneustic with a large prothoracic spiracle on each side of prothorax, and a pair of spiracles at the apex, in the terminal plate mentioned. The length of the larva is about 20 mm. The pupa is free; it is generally somewhat curved; the antennal sheaths are lying backwards to each side, and in front, between them, there is a pair of strong, outwardly curved spines; the abdominal segments have each a girdle of strong bristles near the hind margin, these bristles are longest on the sides of the segments; the last segment terminates in a pair of spines. There is a pair of prothoracic and seven pairs of abdominal spiracles. The length is about 14 mm.

The larvæ live in decaying wood in stems and stubs of different trees as fir, beech, poplar, birch and alder; they are carnivorous and rapacious creatures, and devour larvæ of various *Coleoptera* as *Pyrochroa coccinea* and *Tomicinæ* as also larvæ of Tipulids. They were originally

thought to be xylophagous, and Drewsen has first shown (Nat. Tidsskr. IV, 103. 1842-43) that they are carnivorous; when several larvæ are hold together in capitivity, some of them generally devour the others. The larvæ hibernate and develop in summer.

The species of *Xylophagus* occur, in accordance with the occurrence of their larvæ, in the outskirts of woods on stems and stubs, and they are rather lively; the seem to use their legs more than the wings.

Of the genus two palæarctic species are known one of which occurs in Denmark.

1. X. ater Meig.

1804. Meig. Klass. zweifl. Ins. I, 154, 1, T. IX, Fig. 2. — 1842. Zett. Dipt. Scand. I, 128, 1. — 1843. Schiødte, Naturh. Tidsskr. IV, 103. — 1862. Schin. F. A. I, 27. — 1903. Kat. paläarkt. Dipt. II, 41.

Male. Vertex somewhat impressed, front black above the antennæ, towards the vertex greyish pruinose, epistoma of the same colour; palpi with the first joint yellow, the second black. Eyes with the facets slightly larger towards the inner margin. Antennæ dark brownish or brownish black. Thorax black, somewhat shining in the middle, towards the sides dull and finely striated, sterna and pleura black, shining. The humeral and postalar calli somewhat prominent, brownish; scutellum often somewhat brownish, especially towards the sides. The disc of the thorax sparingly clothed with short, yellow hairs in the middle, the hairs forming two indistinct stripes. Abdomen black, shining, with somewhat longish, greyish hairs. Legs yellow; the hind tibiæ towards the tips and the tarsi towards the ends dark brown to blackish; the hind femora may also be somewhat darkened at the ends. Wings hyaline with a brownish stigma; from the base of the cubital vein and downwards on the postical cross-vein there is a slight fumigation, and a similar at the base of the cubital fork and at the apex of the discal cell; the veins brown. Halteres yellow.

Female. Thorax with three broad, greyish pruinose bands, between these two shining lines with short hairs. Abdomen longer and thicker than in the male, pointed, ending in a slender ovipositor. Wings yellowish with the fumigations more distinct and more extended than in the male.

Length. This species varies much in size, and moreover the females are larger than the males: length of male 7,5—10,5 mm., of female 10,5—14 mm.

X. ater is not rare but imagines are generally only taken in small numbers or single specimens: Ermelund, Dyrehaven, Bollemosen, at Sorø and at Thureby; Lolland at Maribo and Ryde; Langeland; Jutland

at Silkeborg. My dates are $^{25}/_{5}$—$^{22}/_{6}$. The larvæ have been taken in Ermelund, Dyrehaven and Böllemosen in beech on $^{11}/_{9}$ and $^{28}/_{11}$ and again on $^{18}/_{3}$—$^{1}/_{5}$.

Geographical distribution: — Northern and middle Europe from Lapland to northern France. Zetterstedt remarks that in southern Sweden he always found the larvæ in poplar, but in the northern parts always in birch.

2. **Xylomyia** Rond.

(*Subula* Meig.)

Species of middle size and of black colour, often with yellow designs. Head short, broader than high, as broad as thorax, flat behind. Yowls very narrow, only forming an upwards bent margin along the inner eye-margin; epistoma small, retreating. Antennæ inserted below the middle of the head, elongated, fusiform, ten-jointed; the two basal joints of nearly equal length; the others forming an annulated complex, the first joint of which is longer than the following, the complex terminating in a short and thin style. Eyes bare, equally separated in both sexes. Front and vertex slightly depressed. The membranous part around the mouth edge is small, and thus no real oral cone is formed; clypeus partly membranous, proboscis short, labrum semitubular, as long as labium; hypopharynx a little shorter, somewhat triangular; the maxillæ have a short lacinia and two-jointed palpi; in the female the second joint is somewhat thickened and pointed, in the male it is smaller. The labella are broad, protruding forwards. Thorax is longer than broad. Abdomen elongated, a little flattened, broadest at the middle; it consists of seven segments; the last segment is in the male small, often hidden. Genitalia in the male consisting of a broad median apparatus, and some complicated lateral appendages; in the female the abdomen terminates in two small lamellæ. Wings (Fig. 29) with the cubital vein forked; between the discal cell and the postical vein a postical cross-vein: the third of the veins rising from the discal cell unites near the apex with the postical vein; thus there are five posterior cells of which the fourth is closed.

The larvæ highly resemble those of some Stratiomyids, as f. inst. *Sargus*. They are broad, with parallel sides, of brown colour; the head is broadly conical and resembles in structure and with regard to the mouth parts the head of the larvæ of Stratiomyids. The body consists of twelve segments in all; the segments are broader than long, the last segment semicircular. The segments bear on each surface some long bristles in a transverse row, especially there are on the

dorsal surface six, on the ventral surface two bristles, and one on each side margin; besides these there are some smaller bristles. On the anterior margin of some of the ventral segments there is a transverse row of small warts; the last segment has the anus as a longitudinal split on the ventral surface, and in front of it a transverse row of short spines, directed backwards; at the apex the segment has a swelling with a transverse, terminal, spiracular split, and to each side of it a small spine; the segment has on the margin four bristles. The larva is generally considered as amphipneustic, as it has prothoracic and terminal spiracles, but I detected on the first seven abdominal segments very small and indistinct spiracular plates, lying on each side of the segments, somewhat inwardly to the base of the lateral bristle; these spiracles are certainly not in function. The small papillæ mentioned by Austen (Ann. Mag. Nat. Hist. 7, III, 1899, 185), certainly have nothing to do with spiracles, such papilla-like folds are found in several larvæ of Stratiomyids. — The skin of the larva is of the same leathery consistence as in the Stratiomyids and shows a similar structure. It is covered with oval or circular scales of calcareous matter, easily seen with a lens; the calcareous particles are not nail-shaped, as in the Stratiomyids, but plate-shaped, and do not reach far inwards. The skin bubbles strongly when laid in chloric acid. — The length of the larva is about 16 mm. The pupa has a thinner skin than that of *Xylophagus*; it has no spines between the antennæ; the abdominal segments, except the first and the last, have on the dorsal side, at the posterior margin, a transverse row of strong, very close standing, brown bristles, on the ventral side there are none; the apical segment terminates in two small lobes. There are prothoracic and seven pairs of abdominal spiracles. The length of the pupa is about 13 mm.

The pupa rests in the rigid larval skin, when emerging the skin splits with a transverse split at the suture between the pro- and mesothoracic segments, a similar split in the second abdominal segment and a longitudinal split between these; then the pupa works out, until only a part of the abdomen is in the larval skin, and the imago then escapes, leaving the pupal skin sticking in the puparium formed by the larval skin.

The larvæ live in decaying wood in old trees, especially in beech, oak, alder, poplar, horse-chestnut and maple, and they feed on the decaying matter. They libernate and develop in summer.

The species of *Xylomyia* occur in woods and are especially found on stems with decaying parts; they are not very lively.

Of the genus 6 species are known from the palæarctic region, one of which has hitherto been found in Denmark.

1. X. maculata Meig.

1804. *Xylophagus*, Meig. Klass. zweifl. Ins. I, 154, 2. — 1842. *Xylophagus*, Zett. Dipt. Scand. I, 129, 3. — 1862. *Subula*, Schin. F. A. I, 26. — 1903. Kat. paläarkt. Dipt. II, 42.

Male. Front with short greyish pubescence, a dark, transverse band somewhat above the antennæ; palpi yellow, sometimes the basal joint dark. Antennæ dark brown, yellow below on the inner side. Thorax black, the humeral callus yellow, the yellow colour stretching somewhat inwards on the disc; in the middle, just on the transverse furrow, there is a yellow, transverse stripe, widely interrupted in the middle, widened on the sides, and here connected with the yellow side band, and at the inner ends prolonged somewhat towards both ends, anteriorly sometimes so much as to form a narrow line, connected with the yellow anterior spot; the postalar callus yellow, this colour stretching forwardly somewhat in on the disc: on the upper margin of the pleura there is a yellow band, stretching from the humerus to the wing-root, and here much widened so that it reaches far down on the pleura. Scutellum yellow, only black at the base; metapleura yellow. Thorax with short, yellowish pubescence on the disc. Abdomen black with broad, yellow side spots on the first segment, the following

Fig. 29. Wing of *X. maculata*.

with yellow hind margins. Venter black with narrow, sometimes indistinct, yellow hind margins of the segments, except the first. Genitalia reddish yellow. Abdomen with short, dark pubescence, being pale on the yellow margins. Legs yellow; coxæ and trochanteres black; hind femora and tibiæ black at the tips; tarsi blackish or brown towards the ends, hind tarsi only to a slight degree. Legs very short haired, only the hind femora on the inner side, at the base, with some long hairs. Wings yellowish, the veins brown; the first of the veins rising from the discal cell curved. Halteres yellow.

Female. Quite agreeing with the male, only the hind femora without long hairs at the base.

Length: There is also in this species some difference in size between male and female; male: 8—9 mm., female: 8,5—10,5 mm.

X. maculata is rare in Denmark, and it has only been taken a few times, but it has been bred in greater numbers: vicinity of Copenhagen (Schiødte), Dyrehaven (Schlick), Frederiksdal (Lovendal); Lolland at Maribo (Schlick); the dates are in July; it was taken in copula on $^{11}/_{7}$. The larva has been taken in beech at Maribo on $^{24}/_{6}$.

Geographical distribution: — Northern and middle Europe from southern Sweden down into France.

Coenomyiidae.

Head not as broad as thorax, situated somewhat downwards on the front end of thorax. Antennæ placed near to each other, ten-jointed. Eyes hairy, touching in the male, separated in the female. Three ocelli present. Clypeus not separated from the epistoma. Mouth parts consisting of labrum, hypopharynx, maxillæ and labium with rather broad labella; proboscis rather short. Thorax rectangular; scutellum with two spines. Abdomen robust, consisting of seven segments. Legs rather strong, somewhat longish; front tibiæ with one, posterior tibiæ with two apical spurs. Claws simple, thickened at the base; two pulvilli and a pulvilliform empodium. Wings with the costal vein extending all round the margin, radial vein present, cubital vein forked; discal cell formed chiefly of the discal vein, but partly closed below by the anterior branch of the postical vein, thus there is no postical cross-vein; there are five posterior cells; the basal cells are of equal length, the anal cell reaches the margin. Alula well developed, alar squamula small, thoracic squamula extremely narrow, slightly broader towards the angulus. — The larvæ are amphipneustic; the pupæ are free.

The familiy includes three palæarctic genera, with one species each; from North America five species are known; one species, our *C. ferruginea*, is common to both regions. Only one genus with a single species occurs in Europe.

I am aware of no case of parasitic Hymenoptera on Coenomyids.

No Coenomyid has been recorded from Denmark before.

1. **Coenomyia** Latr.

Species rather robust and of large size. Head rather short and small, not as broad as thorax, flat behind, somewhat resembling the head of a Muscid. Yowls not descending below the eyes; epistoma impressed and separated from the cheeks by a dividing line. Antennæ inserted nearly in the middle of the head, ten-jointed; the first basal

joint longer than the second, the rest forming an annulated, pointed complex. Eyes hairy, touching in the male, somewhat separated in the female. Clypeus not separate from the epistoma; proboscis rather short, labrum semitubular, of the length of the labium; hypopharynx more slender; the maxillæ have a long, pointed lacinia, and palpi that are somewhat larger in the female than in the male; the labella are broad, somewhat protruding forwards[1]). Thorax a little longer than broad, somewhat arched above; scutellum with two spines. Abdomen robust, about as broad as the thorax, somewhat pointed, consisting of seven segments, the last small; the dorsal plate of the seventh may be hidden. The male genitalia show a median lobe and two hookformed, lateral appendages the basal joint of which is much thickened; in the female the abdomen terminates in two small lamellæ.

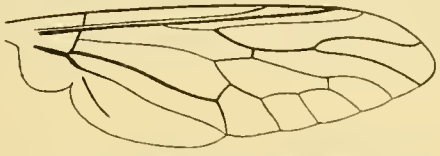


Fig. 30. Wing of *C. ferruginea*.

Wings with the cubital vein forked, the anterior branch of the postical vein partly closing the discal cell below, thus there is no postical cross-vein; there are five posterior cells. In rest the wings lie parallel over the abdomen.

I do not know the larva, but I borrow the following from Beling (Verhandl. zool. bot. Gesell. Wien, XXX, 1880. 343) and Brauer. It resembles the larva of *Xylophagus*; the body is cylindrical, of white colour, consisting of twelve segments in all; the head is conical, brown, chitinised, shorter than the following segment, it has on the ventral side, at the base, a soft wart; second segment has on the dorsal surface five chitinised longitudinal bands; the thoracic segments have some chitinised spots. The last segment is somewhat thickened, with a flattened part on the dorsal surface at the apex, and with two tomentose, longitudinal grooves at the base; at the apex it has two spines; the abdominal segments have, on the ventral surface, indistinct, transverse swellings (Kriechschwielen). The larva is amphipneustic

[1]) I have had only a couple of dried specimens for examination, and I therefore chiefly must rely upon earlier descriptions; with regard to the palpi Schiner says: „undeutlich gegliedert", van d. Wulp says „tweeledig" and Becher (Denkschr. Kais. Akad. d. Wissensch. Wien, Math. nat. Classe, XLV, 1882, 141, Tab. II, Fig. 13.) says: „ungegliedert". It appeared to me that the palpi in the male are two-jointed, in the female unjointed or indistinctly jointed.

with spiracles on the prothoracic and last abdominal segments. The length is about 40 mm.

The pupa is free, yellowish brown, the head with two spines in front; on the ventral side of the thorax there are five, pentagonally arranged, spines; the abdominal segments have, at the hind margins, a girdle of flat spines of unequal length; there is a pair of prothoracic, and seven pairs of abdominal spiracles: the apical segment bears spines. The length is about 30 mm.

The larva has been found in decaying wood of poplars, and in the earth, at the roots of trees, especially in forests of beeches, and pupæ have been found in the same places. The larvæ are carnivorous and rapacious as the *Xylophagus* larvæ. Beling suggests that the total development may last more than one year.

The species of *Coenomyia* occurs in woods and it is recorded to be rather slow and sluggish.

The genus only includes one palæarctic species, also occurring in Denmark.

1. C. ferruginea.

1763. *Musca*, Scop. Ent. Carn. 340, 913. — 1842. *Sicus*, Zett. Dipt. Scand. 1, 130, 1. — 1862. Schin. F. A. 1, 28. — 1903. Kat. paläarkt. Dipt. II, 44.

Male. Eyes hairy. Antennæ yellow. Cheeks, yowls and the lower part of the back of the head with long yellow hairs. Thorax brownish black with a pair of approximate, whitish pruinose stripes, abbreviated behind; the stripes are best seen when the thorax is wieved from behind and they are often indistinct; the thoracic disc is densely clothed with reddish yellow hairs, on the pleura are longer hairs. Abdomen reddish; first segment black, slightly bluish; a yellowish white spot on the second segment, on each side, at the hind margin, and a similar pair on the third segment, generally narrowly united along the hind margin; the following segments with the hind margins somewhat pale, in the middle of the second, third and fourth segments a somewhat indistinct, black spot. Venter chiefly reddish with the first, narrow, segment greyish black. Abdomen clothed with short, depressed, yellowish red hairs. Legs reddish; femora more or less brownish black; the legs short haired, coxæ and anterior femora with longer hairs. Wings yellowish, most distinctly towards the anterior margin, veins brown. Halteres yellow.

Female. More robust than the male, and generally quite ferrugineous, also the legs, and without or almost without any designs; eyes hairy, narrowly separated.

Length 16 to nearly 20 mm.

This species varies much in colour, the variation chiefly consisting in the abdomen being more, or quite, black, and the pale designs hence more pronounced and distinct; though the variation is in reality not great, yet the species may exhibit a very different aspect; the varieties have therefore also often been established as separate species. The description I have given above agrees with all Danish specimens I have seen. — The fly is recorded to emit a somewhat cheese-like smell which may continue long time after it is dried.

C. ferruginea is very rare in Denmark, only six specimens have been taken in all; at Hillerod (Miss Hannemann), at Boserup near Roskilde (Liebenberg, Schlick), and one specimen with locality Sealand (Stæger).

Geographical distribution: — Northern and middle Europe from southern Sweden to Italy; in middle Europe it seems to occur especially in the mountainous districts. It occurs also in North America.

TANYSTOMA.

Tabanidae.

Head rather short, semiglobular or transverse, arched in front, and in the males sometimes much so, somewhat concave behind, as broad as or a little broader than the thorax. Antennæ placed near to each other, six- to seven-jointed (in *Pangonia* ten-jointed), the three or four last joints as a rule forming an annulated style. Eyes touching in the males, well separated in the females and then leaving in the middle a more or less broad frontal band; in the male the facets in the upper part of the eye often larger than below. The eyes more or less hairy or bare; the colour often green or golden green with purplish or bluish bands or spots. Ocelli wanting or present in a number of three. The parts of the head surrounding the oral aperture not membranous, and thus there is no oral cone; clypeus is not separated from the epistoma, it is generally excised in the males on the front margin, the excision being membranous and the labrum connected to it; in the females this membrane is very small. Proboscis more or less protruding, generally subvertical, sometimes very long and directed more forwards, in some species even more than twice as long as the body (*Pangonia*). Mouth parts in the female consisting of a labrum, mandibles, maxillæ, hypopharynx and labium, the four first named parts forming long chitinous blades; in the male the

mandibles are wanting. The maxillary palpi are large, two-jointed: in the male porrect and with the second joint often short and thickened, in the female pendulous along the front side of the rostrum and with the second joint often longer, more or less curved, and pointed. As the mouth parts are connected with the mouth-edge of the head by a short connecting membrane, the proboscis is thus only slightly pro- and retractile. Thorax nearly quadratic or rectangular; scutellum without spines. Abdomen consists of seven not transformed segments. Legs of middle length, without bristles, the front coxæ somewhat lengthened, the posterior coxæ short; the posterior tibiæ, or the middle tibiæ alone, with two apical spurs; tarsi with simple claws; two pulvilli and a pulvilliform empodium, being quite uniform with the pulvilli. Most of the Tabanids show a curious structure on the front femora; while the femora otherwise are clothed with hairs and often pruinose, the front femora are shining and glabrous beneath and without hairs, and they show a fine, transverse striation: the significance of this structure I do not know, but I shall in this connection call attention to the fact, that the front tarsi of the Tabanids nearly always show a black coloration, that is only rarely the case with the posterior tarsi. When species of *Tabanus* are held in captivity, they are seen to use the front legs in a palpating manner. The above mentioned structure of the front femora I have observed in *Chrysops*, *Silvius*, *Hexatoma*, *Tabanus* and *Dichelacera* but not in *Pangonia* or *Hæmatopota;* thus it would seem, that the groups *Pangoniinæ* and *Tabaninæ* are not very natural, as already noticed by Hansen (Nat. Tidsskr. 3, XIV, 93). Wings with the costal vein extending all round the margin: the discal cell formed exclusively of the discal vein: the cubital vein forked, the upper branch sometimes with a recurrent veinlet: two cubital and five posterior cells; the discal cell nearly in the middle of the wing; the basal cells of equal length; the anal cell extending nearly to the margin. The squamulæ of equal or nearly equal size, distinct, but not covering the halteres, finely fringed along the margin, at the angulus long haired; alula distinct.

The eggs are deposited on plants in the water or in more or less humid localities. The larvæ are cylindrical, pointed towards the ends and finely striated longitudinally. They are metapneustic (or amphipneustic, *Hæmatopota?*) with a terminal vertical split leading to the spiracles. The head and the terminal segment are retractile. The body consists of twelve segments, including the head; it has, on most of the segments, swellings with fine spines. The mouth parts consist of a median vertical labrum, hookformed mandibles and maxillæ, the latter with two-jointed palpi; mandibles and maxillæ are moved vertically.

The antennæ are two-jointed; on each side of the head there is a small eye-spot. The pupa is free, it has no spines on head or thorax, but some tubercles with bristles; the abdominal segments bear girdles of bristles. The pupa has two large, somewhat ear-shaped prothoracic spiracles and seven abdominal spiracles.

The larvæ live in water or in more or less humid localities: they are carnivorous and feed on other larvæ and on snails. The pupæ are found in the earth.

The Tabanids are rather robust, middle sized or large flies. *T. sudeticus* being, I think, our largest fly; the females are often frequent on pastures, as they are blood-sucking and attack cattle, except perhaps some of the *Pangoniæ*. The species are distributed all over the world. It is interesting to notice, that of the rather large number of species described from the palæarctic region and from North America, about 200 and 300 respectively, only two, *Chrysops nigripes* and *sepulcralis*, are common to both regions, and with regard to *sepulcralis* the reference is doubtful.

I am aquainted with no case from Denmark of the occurrence of parasitic Hymenoptera on species of Tabanids. As far as is known two cases have been recorded. The Tabanids seem thus only to a small degree to be objects for parasitic Hymenoptera. The parasite is in both the known cases a Proctotrupid, infesting the eggs. The one is *Telenomus Tabani* Mayr, bred from eggs of an unknown *Tabanus* species in Austria (Mayr, Verh. zool. bot. Gesell. Wien, XXIX, 1880, 713), the other is *Phanurus tabanivorus* Ashm. (Hart, Bull. Ills. State Lab. Nat. Hist. IV) bred from eggs of the american species *T. atratus* Fabr. Gobert (Mém. de la Soc. Linn. du nord de la Fr. 1881) remarks, that he has seen *Bembex rostrata* take large Tabanids as prey. Wesenberg Lund, who has examined *Bembex rostrata* here (Ent. Medd. III. 1891-92. 19) found no Tabanids among its prey.

Tabanids earlier recorded from Denmark. Kramer, 1760 (Spec. Insectol. Dan.) has two species: *Tabanus bovinus* and *pluvialis;* Brünniche in 1761, (Prodr. Insectol. Siæl.), enumerates five: *Tabanus bovinus, bromius, tropicus, pluvialis* and *cæcutiens,* and the same are enumerated in 1763, in Pontoppidan, Dansk. Atl. I. About these species can only be said that the three first are *Tabani, pluvialis* a *Hæmatopota* and *cæcutiens* a *Chrysops,* but nothing can with certainty be said about the species. Müller, 1764 (Faun. Fridrichsd.), enumerates five species: *Tabanus bovinus, tropicus, pluvialis, caecutiens* and the new species *arcticus.* Of these *bovinus* seems to be correctly determined (see under this species), *tropicus* is a *Tabanus, pluvialis* a *Hæmatopota* and *caecutiens* a *Chrysops; T. arcticus* is the male of one of the *Hæmatopota*-species.

Fabricius has no species directly recorded from Denmark. Zetterstedt in Vol. I, 1842, has eight species, sent to him from Stæger: *T. bovinus, autumnalis, bromius, luridus, rusticus, C. cœcutiens, relictus* and *sepulchralis,* and in Vol. VIII, 1849 he adds one more, *H. longicornis* = *italica,* thus in all nine species; of these *T. bovinus* is uncertain with regard to which species is exactly meant. He thus knew nine species eight of which are sure. — In the present paper 23 species are enumerated.

Table of Subfamilies and Genera.

Hind tibiæ with apical spurs, ocelli present ..... *Pangoniinae.*
Hind tibiæ without apical spurs, no ocelli ..... *Tabaninae.*

Pangoniinae.

The only genus is ..... 1. *Chrysops.*

Tabaninae.

1. Antennæ six-jointed, third joint not compressed or excised ..... 2.
— Antennæ seven-jointed, third joint compressed, dilated at the base and with an excision on the upper margin, so that a protruding angle is formed ..... 4. *Tabanus.*
2. The joints of the antennæ all distinct and well separated, the three last not forming a style ..... 2. *Hexatoma.*
— The four last joints of the antennæ indistinctly separated, the three last joints forming an annulated style ..... 3. *Hæmatopota.*

1. **Chrysops** Meig.

Species of middle size, mostly of black colour with more or less extended yellow spots; the colouring generally somewhat different in the two sexes. Head somewhat semiglobular, slightly excavated on the posterior side, as broad as or a little broader than the thorax. Face somewhat arched, and somewhat descending below the eyes, with more or less extended, shining black callosities. Antennæ placed nearly in or a little above the middle of the front side of the head, seven-jointed; the three first joints rather long, the four last forming an annulated style. Eyes not hairy, the upper facets in the male as a rule larger than the lower; the eyes golden green with purplish spots. Three ocelli present. Proboscis as long as the head is high, the labella not reaching half the length of the proboscis, moderately broad. The mandibles and maxillæ are long, pointed, chitinous blades, the former are the broadest and as a rule a little serrated on the inside at the apex — in *C. rufipes* the mandibles are long and sharply pointed, very finely serrated only for a small part at a distance of about one third

from the apex —: the maxillary palpi generally lie down along the front side of the proboscis, two-jointed, the second joint a little curved. Labrum and hypopharynx lancet-like blades of the same length as the proboscis. In the male the proboscis is a little more slender, the mandibles wanting, and the second joint of the maxillary palpi porrect, nearly cylindrical or a little thickened, long pyriform. Thorax nearly quadratic; abdomen somewhat flat with seven distinct, not transformed segments. Posterior tibiæ with two apical spurs. Wings with dark spots, consisting as a rule of a long basal spot at the anterior margin, a middle cross-band and an apical spot; in the males the dark markings are as a rule more extended than in the females. When at rest the wings are borne half open, a little more so than in *Tabanus*.

With regard to the metamorphosis of *Chrysops* I must chiefly depend on the observations of others, as I only have examined the pupæ, and therefore take the descriptions of the larvæ and the eggs from other works. The larvæ of *C. coecutiens* L. is described by Beling (Verh. zool. bot. Gesell. Wien, XXXVIII, 1887, 1). It is elongated, cylindrical, greenish yellow; it is, as the *Tabanus* larva, finely striated longitudinally. The head is small. The body consists of twelve segments. On the ventral side the fifth to the eleventh segment bears each four strong, tubercular swellings placed in a transverse row (Kriechschwielen); together they form four longitudinal rows. The last segment is conical, truncate, narrower than the preceding with a very deep, longitudinal impression in the end in the center of which is a small, conical spiracle bearer, vertically cleft at the apex. On the ventral side, at the base of the last segment lies the anus as a longitudinal split. The length of the larva is 10 to about 14 mm. in relation to its contraction. — The pupæ are slightly curved, almost straight, the sheaths of the legs and wings reach to the posterior margin of the first abdominal segment. The abdominal segments, except the first, are each provided with a girdle of strong bristles at their hind margins, the bristles being largest on the posterior segments. The apex of the abdomen bears six spines, four placed in a curved line above, and two below, the two lateral above being the strongest, and the two median the smallest. At the anterior margin of the thorax there are two large, somewhat ear-shaped prothoracic spiracles, and on the sides of the abdomen there are seven small, the first lying just at the hind margin of the wing-sheath. On the head the sheaths of the antennæ are lying in front, directed outwards to each side; between the bases of these, a little downwards, there are four (sometimes only two) somewhat transverse tubercles lying in a curved line; behind the bases of the of antennal sheaths there are on each side two small

tubercles, placed a little obliquely, one behind the other; above the four transverse tubercles, just in front of the head, there are two rather large tubercles, and above these, somewhat behind the antennal sheaths, and behind the transvere fracture, formed by the escape of the imago, there are two small ones. The four transverse tubercles bear no bristles, but the others each bear a bristle with exception of the two foremost in front of the head, which in *Chrysops* (in contradistinction to *Tabanus* and *Hæmatopota*) each bear two bristles.

The ovipositing of the American species *C. aestuans* v. d. Wulp, *moerens* Walk. and *callidus* O. S. has been examined by Hart (Bull. of the Illn. state Laborat. of nat. hist. IV, 1895), and Hine (U. S. Departm. of Agricult. Miscell. Papers, 1906, Techn. Ser. No. 12, II). The eggs are deposited on stalks and leaves of aquatic plants as oval masses of about 10 mm. in length and 3—4 mm. in breadth, with the eggs in a single layer, in contradistinction to the manner followed by *Tabanus*. Hine l. c. gives an exellent description of the ovipositing of *C. moerens*, which I shall quote: „The female alights on the leaf with her head downward and begins the process by pushing the tip of her abdomen forward toward the under part of the thorax and placing the protruding end of an egg against the leaf. The end sticks fast in consequence of the glube-like substance which accompanies it, and she then moves the tip of her abdomen back to its normal position, thus freeing the egg. By similar movements one or two eggs are placed to one side of the first, and two or three to the other side of it. The unfinished end soon becomes V-shaped; she moves slowly forward and lifts the tip of her abdomen to one arm of the V and places eggs along down until the apex is reached; then changes to the other arm of the V and places eggs along down to the apex on this side. It was noted in specimens of this species observed that sometimes a female would place as many as three rows on one side, one after the other, before changing to the opposite side. It is only necessary to study a mass of these eggs in order to see the precision, in reference to one another, with which the different specimens are arranged." The eggs are shining black, but paler when just deposited. The ovipositing of this species took place in July and August. The female was not easily disturbed during the ovipositing. The incubation period of this species was rather short, only six days. The larvæ are said to live in water, mud or damp localities; this certainly holds good with regard to the Danish species, as I have seen pupæ of these found in the moist sand at the borders of lakes *(rufipes, quadratus, relictus)*. The eggs are deposited in summer, the larvæ hibernates and the transformation to

pupa and the development of the imago takes place in the following spring or summer.

The species of *Chrysops* are especially found in the vicinity of water, and sometimes abound there. The females attack cattle and also man. Of the genus 30 species are known from the palæarctic region of which 5 (6) hitherto have been found in Denmark.

As said the eyes of the *Chrysops*-species are golden green with purplish spots. The shape and arrangement of these spots bears some interest. In the four of our species, *sepulcralis, quadratus, relictus* and *coecutiens*, the arrangement is chiefly the same (Fig. 31). The

♂ ♀

Fig. 31. *C. coecutiens*, eye of male and female.

♂ ♀

Fig. 32. *C. rufipes*, eye of male and female.

females have a band along the hind- and under margin with an incision in the middle, three more or less roundish or oblong spots near the front margin and a more or less triangular spot in the middle between the excision and the middle front spot purplish. In the male the excision of the band lies more downwards, just at the

border between the large and small facets, and below this border, in the part with the small facets, there are three spots lying near to each other corresponding to the three lower spots in the female: in the upper part with the large facets, there are only two faint more or less longish spots. Some small individual variations may occur. In *rufipes* (Fig. 32) the arrangement is different; we find the same band along the the hind-margin, and in front there are also three spots, but in the middle there is a long, triangular spot with the apex downwards, and from the base of the triangle an elongation stretches upward; as a rule the middle front spot is in connection with the triangle. Then in the male we find the same arrangement, only the upper front spot is as a rule connected with the middle front spot. That in *rufipes* the arrangement is the same or nearly the same in both sexes evidently is due to the fact that in this species the male has the eye-facets of nearly equal size and without a sharp dividing line; as *rufipes* also showed another shape of the mandibles, this species thus seems to stand a little separate. It is interesting to see that the arrangement of the eye-spots found in *rufipes* is nearly the same as described and figured by Osten Sacken (Mem. of Boston Soc. of Nat. Hist. II, 4, 369) for most of the American species, and he also remarks that the arrangement is nearly the same in both sexes, only that in the male the lower part of the pattern is a little shortened and the upper part lengthened, a difference also seen in *rufipes*. Thus *rufipes* would seem related to the majority of the American species.

Table of Species.

1. The middle band of the wing with a little dentation produced to the base of the fork of the cubital vein, the outer margin of the band below the cubital vein concave; legs all black ..... 2. *sepulcralis.*
— The middle band of the wing not reaching the fork of the cubital vein, the outer margin below the cubital vein convex ..... 2.
2. Basal joint of antennæ thickened; femora more or less yellow ..... 1. *rufipes.*
— Basal joint of antennæ not thickened; femora black ..... 3.
3. Middle tibiæ yellowish ..... 4.
— Middle tibiæ brown to black ..... 5. *coecutiens.*
4. Second abdominal segment with a more or less quadratic black spot not excised behind (♂) or with a little roundish or subquadratic spot (♀) ..... 3. *quadratus*
— Second abdominal segment with a black spot, deeply excised in the hind margin (♂) or with two oblique spots connected in front (♀) ..... 4. *relictus.*

1. C. rufipes Meig.

1820. Meig. Syst. Beschr. II, 71, 6. — 1842. Zett. Dipt. Scand. I, 126, 6. — 1858. Löw, Verh. zool. bot. Gesell. VIII, 625, 13. — 1862. Schin. F. A. I, 41. — 1903. Kat. paläarkt. Dipt. II, 49.

Male. Eyes not quite contiguous but with a distinct separating line; facets in the larger upper part only slightly larger than the lower, the dividing line not sharp. The black calli on face and yowls large, united along the inner eye-margin. Antennæ black; the first joint thickened, sometimes yellow below; first and second joints with long black hairs. Palpi black, with long hairs, sometimes brown with a black stripe. Thorax brownish with two broad stripes and the side-margin greyish yellow pruinose, most distinct when thorax is seen from in front. The disc is clothed with yellow, pleura and sterna with blackish hairs. Abdomen black, second segment with a yellow orange triangle in the middle, and first and second segments yellow on the sides, the following segments with yellow hind-margins, that are broadest at the hind-corners, the middle triangles being indistinct or wanting. Venter black and yellowish, sometimes with a black middle line. Abdomen clothed with black and yellow hairs, the latter chiefly placed in the triangles and at the hind margins: sometimes the abdomen is almost quite black haired. Legs with the coxæ and the greater part of the femora towards the base black, the rest of the femora and the tibiæ yellowish, apical part of front tibiæ black; tarsi yellowish, black towards the ends, front tarsi nearly all black. Halteres brownish black.

Female. Frontal callus transverse; the calli on face and yowls as a rule separated by a narrow pruinose line reaching close to the eye-margins; epistoma yellow. Antennæ with the two first joints more or less yellow, often only with a dark stripe on the upper outer side; second joint of palpi yellowish with a black stripe. Abdomen as in the male, but the pale markings more extended and hence the triangles more distinct. Legs all yellow, only the posterior coxæ and the tarsi towards the ends blackish, sometimes the posterior femora more or less blackish at the base.

Lenght 7,5—9 mm.

The pupa is about 12 mm. long; it only shows the two middle of the transverse tubercles, between the bases of the antennal sheaths, and the two tubercles in front of the head are small.

This species is easily distinguished by its thickened basal joint of the antennæ, and its pale legs.

C. rufipes is common in several localities in Sealand and it is also found in Jutland. It sometimes abounds in the low herbage at

the border of lakes and ponds; Fortundam and Teglgaardsø, in great numbers, Lyngby Mose, Furesø, Donse, Hillerød, Grib Skov and Teglstrup Hegn; Funen at Odense and Jutland at Silkeborg. The pupa may be found in the earth near water. It occurs from the $^{22}/_{6}$ to $^{16}/_{8}$. A pupa found in Lyngby Mose developed the $^{18}/_{6}$.

Geographical distribution: — The species is distributed over most parts of Europe, in north to the middle of Sweden.

2. C. sepulcralis Fabr.

1794. *Tabanus*, Fabr. Ent. syst. IV, 374, 48. — 1842. Zett. Dipt. Scand. I, 127, 7. — 1858. Löw, Verh. zool. bot. Gesell. VIII, 622, 9. — 1862. Schin. F. A. I, 41. — 1903. Kat. paläarkt. Dipt. II, 49.

Male. Eye-facets in the upper two thirds larger than below, the small facets stretching somewhat upwards along the hind margin. The calli on face and yowls extending almost over the whole space between the antennæ, mouth and inner eye-margins, leaving as a rule only a narrow, pruinose middle stripe. Antennæ black; the two basal joints with long hairs. Palpi black or brownish black. Thorax black with black or brownish black hairs. Abdomen black, only the hind margins of the segments a little paler and sometimes with faint traces of middle triangles, most distinctly seen with the light falling in from behind. Venter with indistinctly paler margins of the segments. Pubescence all black, only at the hind margins of the segments somewhat paler. Legs entirely black; the hind tibiæ distinctly ciliated. Wings with the hyaline parts clearer than in *C. rufipes*; the middle band not reaching the hind margin, produced along the upper side of the cubital vein to the base of the fork, but not so below, and hence here a little indentated and the outer margin of the band, below the cubital vein, concave. Halteres brownish black.

Female. Not only the frontal callus but the whole front shining black, only with a little dust just above the antennæ. Palpi brownish black; second joint rather long and pointed. Thorax with two narrow, faint stripes; dark yellowish haired, especially on the sides. Abdomen as in the male, but distinctly yellowish haired at the hind margins of the segments, the yellow pubescense produced a little forwards in the middle of the segments, and hence the abdomen gives a slightly lighter impression than in the male.

Lenght 7—8 mm.

This species is easily recognized by its dark colour and entirely dark antennæ and legs; among the other Danish species the shape of the middle wing-band also is characteristic. *C. sepulcralis* seems

to be rare here, I only know it from Lersø, collected in earlier times but not more recently.

Geographical distribution: — Northern and middle Europe; perhaps also in North America (see Osten Sacken, Mem. Bost. Soc. of Nat. Hist. II, P. IV, 1875, 395.)

3. C. quadratus Meig.

1820. Meig. Syst. Beschr. II, 70, 5, ♂. — 1842. Zett. Dipt. Scand. I, 125, 5. — 1858. Löw, Verh. zool. bot. Gesell. VIII, 626, 14. — 1862. Schin. F. A. I, 41. — 1903. Kat. paläarkt. Dipt. II, 48. — 1820. *C. pictus* Meig. Syst. Beschr. II, 70, 4, ♀.

Male. Eye-facets in the upper two thirds larger than below, the dividing line sharp; the small facets stretching up some way along the hind margin. The black calli on the face rather large, those on the yowls smaller, the calli separated by a yellow pruinose band. Antennæ black; the two first joints with long, black hairs. The second joint of the palpi blackish, long, considerably longer than in the two preceding species. Thorax dark brownish, with two broad, approximate, greenish grey lines, and the margin of the same colour; pubescence yellowish brown or yellowish, especially a distinct yellow tuft in front of the wing-root; the pleura often more or less black haired. Abdomen black; the first, second and third segments yellow at the sides, and the second segment with a yellow hind margin, hence in the middle of this segment a transverse or somewhat quadratic black spot, connected with the black first segment, the spot is not excised on the hind margin; the following segments also with yellow, somewhat undulated hind margins; when the light falls from behind the hind margins shine greyish and show indistinct middle triangles. The venter is yellow with a middle line and last segments black. Abdomen is clothed with black and a few yellow hairs, the latter especially found in the dorsal middle line and at the hind margins of the ventral segments. Legs black; the middle tibiæ and the posterior tarsi except towards the tips yellow; the hind tibiæ with a distinct ciliation. Wings with the hyaline parts somewhat yellowish. Halteres brownish, the knob black.

Female. Frontal callus large, produced upwards in a point. The two basal joints of the antennæ and the base of the third joint generally yellowish. Second joint of palpi brown, rather long. Thorax brighter yellow haired than in the male. Abdomen as in the male, but the yellow colour more extended and thus the second segment quite yellow, with a small roundish or subquadratic spot in the middle, and the following segments besides the pale undulated margins

with distinct triangle-shaped spots. Venter with first and second segment quite yellow; the yellow pubescence on abdomen much more extended than in the male. Legs with the posterior tibiæ and base of tarsi yellowish, the apex of the posterior femora and the base of the front tibiæ are also often of the same colour.

Length 9—10.5 mm.

The pupa has a length of 12 mm.

This species somewhat resembles *C. relictus*, but may easily be distinguished by the spot on the second abdominal segment not being excised on the hind margin.

C. quadratus is not uncommon, and it occurs in nearly all parts of Denmark; Ermelund, Fureso, Hillerød, Frerslev Hegn, Tissø, Gurreso. Teglstrup Hegn; Funen at Faaborg; Jutland at Vejle. Silkeborg and Frijsenborg and on Bornholm in Ekkodalen. It occurs especially near water. I have seen it attack goats. I have records of it from $^{18}/_{6}$ to $^{6}/_{8}$. A pupa found $^{2}/_{6}$ developed $^{10}/_{6}$. The pupæ are found in moist sand near water.

Geographical distribution: — The species is distributed all over Europe to northern Italy.

4. C. relictus Meig.

1820. Meig. Syst. Beschr. II, 69, 3. — 1842. Zett. Dipt. Scand. I, 124, 2. — 1858. Löw, Verh. zool. bot. Gesell. VIII. 627, 15. — 1862. Schin. F. A. I. 42. — 1903. Kat. paläarkt. Dipt. II, 49.

Eye-facets in the upper two thirds larger than below, the small facets reaching some way up along the hind margin; the dividing line sharp. The facial calli moderately large, those on the yowls small, both widely separated. Antennæ black, first joint often yellow below on the inner side, the first two joints long haired. Second joint of palpi dark brown, rather long. Thorax dark brown, with two, often indistinct, broad, approximate greenish grey lines and the margin of the same colour; pleura and sterna greenish grey pruinose. Pubescence blackish brown to yellow. Abdomen black; the sides of the three first segments yellow, leaving on the second segment a broad black spot, which is rather deeply incised on the hind margin; the following segments with undulated, yellow hind margins which are especially widened at the sides and as triangles in the middle. Venter with the two first segments yellow with black spots in the middle, the following segments blackish with broad yellow hind margins. Pubescence black and yellow, the yellow hairs especially placed at the hind margins of the segments; on the dorsal side the pubescence may be nearly quite black. Legs black; posterior tibiæ and basal half of front tibiæ yellow;

posterior tarsi yellow, black towards the end; hind tibiæ distinctly ciliated. Wings with the hyaline parts clear. Halteres brown.

Female. Frontal callus transverse. Basal joint of antennæ more or less yellow beneath, sometimes nearly all yellow; second joint of palpi yellowish brown, rather long. Thorax with the stripes more distinct than in the male, and the pubescence more yellow. Abdomen as in the male, but the yellow parts more extended, the black spot on the second segment is so deeply incised, that it consists of two oblique spots, connected in front; the triangles in the middle line larger than in the male, and distinctly greyish, and the abdomen more yellow haired.

Lenght 8,5—11 mm.

The pupa is about 13 mm. long.

C. relictus is found in most parts of Denmark; vicinity of Copenhagen, Furesø, Geel Skov, Ruderhegn, Hillerød, Frerslev Hegn, Esromsø, Vordingborg; Lolland at Søholt near Maribo and Nørresø, a lake near Maribo; Funen near Odense and at Lundeborg on the eastern coast; Jutland in Nørreskov, a wood near Vejle, at Silkeborg and at Frederikshavn. The pupa was found in sand at Furesø. The species is recorded from $^{18}/_{6}$—$^{31}/_{7}$; pupæ developed $^{21}/_{6}$—$^{24}/_{6}$.

Geographical distribution: — All Europe.

5. C. coecutiens L.

1761. *Tabanus*, Linn. Fn. suec. 1888. — 1842. Zett. Dipt. Scand. I, 123, 1. — 1858. Löw, Verh. zool. bot. Gesell. VIII, 628, 16. — 1862. Schin. F. A. I, 42. — 1903. Kat. paläarkt. Dipt. II, 45.

Male. Eye-facets in the upper two thirds larger than below, the small facets stretching some way up along the hind margin. The calli rather large, but distinctly separated. Antennæ black, the first two joints long haired; second joint of palpi black, rather long. Thorax black, not striped; the disc with blackish and yellow hairs, the sides yellow haired, under the wing-root a tuft of yellow orange hairs. Abdomen black, second segment with small yellow side spots; venter black with larger yellow side spots extending over first and second segment; pubescence black on the front part of the dorsal side, the apical part with shining greyish hairs; venter with pale hairs at the hind margins of the segments and towards the apex. Legs black, only the base of the posterior tarsi as a rule brownish yellow; hind tibiæ distinctly ciliated. Wings fumigated to a great extent, the basal spot and the middle band united, only with a small hyaline spot at the base of the discal cell. Halteres black.

Female. Frontal callus black, rather large, transverse. First joint

of antennæ more or less yellowish beneath at the base; second joint of palpi blackish, rather long. Thorax a little lighter than in the male, with the stripes more distinct; yellow haired. Abdomen black, first and second segments broadly yellow on the sides, second segment with a triangular or subquadratic yellow spot in the black middle portion, the hind margins of the segments not pale. Venter with the two first segments yellow with a black middle spot, the five last segments black; pubescence mainly pale, the grey pubescence towards the apex especially distinct. Legs as in the male, but the middle tibiæ more or less brownish from the base some way outwards. Wings hyaline between the basal spot and the middle band.

Length 8,5—11 mm.

This species is easily recognised by its black or brownish middle tibiæ, and the black abdomen in the male; the design on the abdomen in the female is to some degree like that of *C. relictus*, but it is characteristically different however, for one thing by the absence of pale hind margins of the segments, that causes the yellow spot on the second segment to be quite isolated.

C. coecutiens seems to be not uncommon in most parts of Denmark; vicinity of Copenhagen; Funen near Odense; Jutland in Greisdalen near Vejle, at Silkeborg, Frijsenborg, Horsens and Frederikshavn, in the last place in great numbers; moreover it is found on Bornholm in Almindingen. I have records of it from $^{9}/_{6}$—$^{8}/_{7}$.

Geographical distribution: — All Europe, and Sibiria.

Besides the five species of *Chrysops* described we have still one other species in Denmark, but I am not able to determine it with certainty, as I have only the male, and it certainly belongs either to *nigripes* Zett. or *lapponicus* Löw, both species, however, only known in the female sex. My species agrees in nearly every respect with Löw's descriptions of the two species named. It has the upper eye-facets larger than below, the dividing line is sharp. The calli moderately large, those on the yowls small. Antennæ black. Thorax brown, with two grey, narrow, distant stripes and the side margin of the same colour. Pubescence yellow. Abdomen black, first and second segments yellow on the sides, this colour also stretching on the side margins of the third segment; the hind margins of all segments yellow, widening to triangles in the middle, with the light falling in from behind distinctly greyish. The yellow colour leaves on the second segment a black spot excised triangularly behind and concave on the sides, the outer hind corners stretching a little out. Venter with the three

first segments yellow with black middle spots, the four last segments black with yellow hind margins. Pubescence black and yellow, distributed in relation to the ground colour. Legs black; posterior metatarsi yellowish brown except the apex, on the hind tarsi also the base of the second joint brown. Wings closely agreeing with the discription of Löw; the apical spot with its apex just passing the anterior branch of the cubital vein at its outlet, the middle band above the cubital vein with a pointed projection reaching to the fork. Halteres black.

Length 11,5 mm.

The design on abdomen of this species somewhat resembles that of the female of *C. relictus*. The species certainly belongs to *nigripes* or *lapponicus*, and I strongly suspect it to be *lapponicus* on account of its quite black antennæ and as the coloration of both dorsal and ventral side of the abdomen agrees very well as also does the rather large size. The species can scarcely be confounded with any of the other Danish species, except perhaps *C. relictus*, but this has yellow tibiæ.

The species must be very rare here, I only know two specimens, both males, one taken at Hillerod $^3/_7$ (Godskesen), the other in Teglstrup Hegn (W. Schlick).

C. lapponicus is only known from Lapland.

2. **Hexatoma** Meig.

Middle sized, dark coloured species. Head a little broader than the thorax. Yowls only little descending below the eyes. Epistoma in the female flat in the male somewhat impressed. Antennæ rather long, placed in the middle of the front side of the head, six-jointed, the first joint somewhat longer than the second, the third very long, the three last short. Eyes distinctly hairy in the male, more sparingly so in the female; the upper facets in the male larger than below; the colour dark, in the male with two bluish violet bands below the large facets, in the female with four somewhat curved bands. Ocelli wanting. The mouth parts quite resemble those in *Hæmatopota* and *Tabanus*; in the male there is a membranous excision in the epistoma, and the second joint of the maxillary palpi is thick ovate, in the female it is longer, curved, and the palpi are pendulous. Thorax nearly quadratic; abdomen considerably longer than the thorax, with parallel sides, consisting of seven not transformed segments, the last very small, and in the male only six dorsal segments are to be counted; the first segment has a triangular excision in the dorsal middle line. Legs simple; middle tibiæ with two apical spurs. Wings hyaline;

when at rest they are borne nearly parallel, in a somewhat roof-shaped way.

According to Brauer (Denkschr. d. kais. Akad. d. Wissensch. XLVII, 42. Tab. II, Fig. 35—37, Tab. III, Fig. 38—40) the larva is cylindric, longitudinally striated, white, on the dorsal side with a design of greyish brown spots, caused by microscopic hairs. The body consists of twelve segments in all. On the ventral side there are several transverse swellings with small spines (Kriechschwielen); fourth to tenth segments (when the head is included fifth to eleventh) have each two spined swellings on the dorsal surface. The last segment has the anus on the ventral side, between a pair of swollen lips, and it bears on the end a conical, retractile process, with a vertical split in the apex, leading to the tracheæ; the larva is metapneustic. The mouth parts consist of a vertical labrum, hookformed mandibles with the convex front edge transversely furrowed and hence serrated, and maxillæ which are less chitinised, with two-jointed palpi; on each side at the base of the labrum there is a piece, beset with two-pointed spines, bearing the antennæ, which are two-jointed; the apical joint is longitudinally cleft in two parts, (I think the fact is, that there is besides the apical joint a process placed on the first joint). On each side of the head there is an eye-spot. The pupa has two tubercles above the base of the antennal sheaths, each with a bristle, (these may be the same tubercles, which in *Chrysops* bear two bristles, but in *Hæmatopota* and *Tabanus* one; the fact is not distinctly seen in Brauer's description), and some more small tubercles above and below. The prothoracic spiracles are placed on low, cylindrical protuberances. The larva lives in water, the pupa in the earth.

The single species, which on account of the northern position is very rare here, is said to be very bloodthirsty; it is especially found in the vicinity of water.

The genus only includes one species.

1. **H. pellucens** Fabr.

1776. *Tabanus*, Fabr. Gen. ins. Mantiss. 307. — 1862. Schin. F. A. I, 37. — 1903. Kat. paläarkt. Dipt. II, 54. — 1848. *H. bimaculata* Wahlberg, Öfvers. Kgl. Vet. Akad. Förh. V, 198.

Male. Eyes with two bluish bands below the part with the large facets. Face and palpi dark brown with grey hairs. Thorax black, pubescence yellow, grey beneath. Abdomen black, shining somewhat bluish, on the second segment with a bluish white, pruinose spot on each side, which is most distinctly seen, when the light falls in from behind. Venter blackish with bluish white transverse spots on each

side at the hind margins of the segments, the spots are large on the second segment. The two first segments on the dorsal side with yellow hairs, on the ventral side with gray hairs; the following segments on the dorsal side with black, at the apex with fulvous hairs, on the ventral side dark haired, only on the side spots with white hairs. Legs with the femora black; the posterior tibiæ white, black at the apex, the front tibiæ black, the basal half white on the front side; the front tarsi black, the posterior whitish, with the ends of the joints darkened; the front legs blackish haired, but with white hairs in the pale spots: the posterior femora with yellowish grey hairs; the posterior tibiæ white haired, on the hind tibiæ a white ciliation. Wings hyaline; halteres brownish with a paler knob.

Female. Eyes with four, somewhat curved bands. Front black, yellow haired; face whitish grey pruinose with yellow hairs. Palpi dark grey. Thorax more brownish than in the male, with two narrow, distinct, grey lines, reaching to the middle. The rest as in the male.

Length 12,5—13,5 mm.

This species had hithertho not been found in Denmark, and I therefore was somewhat astonished, when I caught on the $^{19}/_{7}$ 1906, a very hot day, a single female on a cow in Ordrup Mose together with specimens of *T. bovinus*, *solstitialis*, *bromius*, *H. pluvialis* and *italica*, but it must in consequence be very rare here.

Geographical distribution: — The species is distributed in the middle Europe, and seems to have its northern limit in southern Scandinavia. Wahlberg l. c. records the capture of only one specimen in East Götland; it is not known in Britain.

3. **Hæmatopota** Meig.

Species of middle size, of a somewhat slender form, and of greyish to greyish black colour, with greyish or whitish spots. Head low and broad, broader than the thorax and much broader than high, distinctly excavated behind. Face broad; yowls only very little descending below the eye margin; from the antennæ towards the mouth edge on each side of the epistoma a descending, impressed line, ending in a groove. Antennæ six-jointed, first and third joint long, the second small, the three last joints forming an annulated style; first joint often thickened, especially in the male. Eyes in the male densely hairy, in the female only slightly so; in the male the facets in about the upper two thirds larger than below, the dividing line sharp; colour of the eyes greenish, in the male the part with the small facets has two zigzag-bands and the lower margin bluish, while the female has on the whole eye three

zigzag-bands, the lower margin, and the upper corner bluish. Ocelli wanting. Both sexes have a velvet black spot just above the antennæ; the female has on the broad front a shining black, transverse band above the antennæ, and above this, on each side, a round spot, and in the middle a small spot, all velvet black. The mouth parts are chiefly as in *Chrysops*, but the proboscis is relatively shorter, the labella are of abouth half the length of the proboscis, moderately broad; the mandibles are microscopically serrated along their whole inner margin, but it requires a magnifying power of nearly 400 diam. to see it; the second joint of the maxillary palpi is long, somewhat curved, and lying down the front side of the proboscis; in the male there is a deep, membranous excision in the epistoma from the mouth edge and upwards, and the second joint of the palpi is short, thickened, slightly curved and somewhat pyriform with the apex outwards; the palpi are generally porrect. Thorax is rectangular; abdomen somewhat flat, as broad as or only a little broader but considerably longer than the thorax, consisting of seven, not transformed segments; the first has in the dorsal middle line a flat triangular excision. Legs simple; the middle tibiæ with two apical spurs. Wings fumigated, with a reticulation of hyaline, curved lines and spots; the anterior branch of the cubital fork with a veinlet. When resting the wings lie nearly parallel, or only very little open, but in a somewhat roof-shaped way.

I do not know the larva, but Brauer describes it [Verh. zool. bot. Gesell. XIX, 1869, 921, Tab. XIII, Fig. 7—8), and I quote the following from him. The larva is cylindric and resembles a *Tabanus*-larva, it has twelve segments in all; from the fourth to the tenth segment it bears laterally and ventrally small warts, four on each segment (when the head is included, it must be from the fifth to the eleventh segment, which is also shown in Brauer's figure, and what agrees with the fact in the *Tabanus*-larva); the last segment bears the anus, lying in a semiglobular swelling; this segment has on its tip a short, conical process with a vertical split, leading to the terminal spiracles; the small prothoracic spiracles are situated on the second segment, and the larva thus amphipneustic. (In comparison with the metapneustic *Tabanus*-larva, I think this not very probable, and it is to be remembered, that Brauer has only examined an exuvium.) The segments show the same curious, longitudinal striation as in *Tabanus*. The mouth parts resemble those of *Tabanus* and consist of a median labrum, hookformed mandibles, less chitinised maxillæ with a spined basal piece and a two-jointed palpus; the antennæ are two-jointed, the apical joint small; there are no spines at the base of the antennæ.

A little behind the middle of the head there is a small eye-spot on each side. Brauer thinks the larva lives in the earth, and compares it, with regard to the terminal segment, with the larva of *T. autumnalis*, that lives in water and is said to be able to stretch the terminal segment out telescopically; I fail, on examining the larva of *autumnalis*, to see any difference, and had Brauer examined the living larva. I think he should have found the structures quite similar. I think the larva lives in water or in humid localities, and I have had pupæ from moors and from the border of lakes. The larva is also recorded to penetrate into other larvæ f. inst. of beetles (Brauer). The larva certainly hibernates and develops in the following spring or summer. The pupa quite resembles that of *Chrysops*, it shows the same tubercles on the head, but the two tubercles just in front of the head, between the antennal sheaths, only bear one bristle each. On the terminal segment there are six spines, in form and arrangement quite as in *Chrysops*. Brauer l. c. says that the terminal segment „endigt mit einer dicken, wenig gespreitzten Gabel" and figures it so, which is quite erroneous. Beling (Arch. für Naturgesch. 41, I, 1875, 37) also describes the larva; he has found that there are six warts on each segment, forming together six longitudinal rows; he does not speak of prothoracic spiracles.

The species of *Hæmatopota* are generally common, and may be present in great numbers, especially on hot days, before and after rain; they often occur near water, but also in woods, especially on or near the roads. The females attack cattle, and I have seen them especially on horses; when sitting on a horse, they may easily be taken with the fingers; they also frequently attack man. When on hot days one walks on roads in woods, they fly on very obstinately, whence they have got the Danish name „Blindbremse" (blind hornet); their occurring before and after rain has given them the name „Regnklæg" (rain cleg). The males are said to hower in the air, especially in the morning and evening.

Of the genus 8 species occur in the palæarctic region, 3 of which are found in Denmark.

Table of Species.

Males.

1. The erect hairs on the vertex long, black; first joint of antennæ thick, more or less grey at the base ..... 1. *pluvialis.*
— The erect hairs on the vertex pale to rufous, moderately long ..... 2.
2. First joint of antennæ very thick, almost entirely black .. 2. *crassicornis.*
— First joint of antennæ moderately thick, long ovate, grey to or near to the apex ..... 3. *italica.*

Females.

1. First joint of antennæ long, cylindrical, not much thicker than the third, grey ..... 3. *italica*.
— First joint of antennæ more or less thickened, not entirely grey ..... 2.
2. First joint of antennæ moderately thickened, with an annuliform constriction at the apex ..... 1. *pluvialis*.
— First joint of antennæ more thickened, not constricted at the apex ..... 2. *crassicornis*.

1. H. pluvialis L.

1761. *Tabanus*, Linn. Fn. suec. 463, 1887. — 1842. Zett. Dipt. Scand. I, 122. 1. — 1862. Schin. F. A. I, 39. — 1903. Kat. paläarkt. Dipt. II, 55.

Male. Upper eye-margin with rather long hairs, which are for the most part black. Antennæ with the first joint thickened, ovate, the greatest thickness lying before the middle nearer to the base, shining black, more or less grey pruinose at the base on the inside; third joint rufous to dark brown; the style black. Frontal triangle grey, above the antennæ a velvet black spot. Face grey, on the cheeks with black points; pubescence grey, black on the cheeks. Thorax greyish black, with five grey stripes, the inner side stripes sometimes with the hind part dissolved in two cuneiform spots; the stripes sometimes very indistinct. Thorax clothed with long, brownish hairs, on the pleura and sterna with yellow hairs. Abdomen blackish, in front with an indistinct, reddish spot on each side; the dorsal middle line, the hind margins of the segments, and from the third or fourth segment a roundish spot on each side near the middle line, brownish grey; the design sometimes indistinct. Venter grey with a reddish side spot at the base. Pubescence yellow. Legs black, greyish pruinose; the posterior tibiæ with two yellow rings, the front tibiæ yellow at the base; front tarsi black, posterior tarsi yellow at the base; femora and middle tibiæ clothed with long, partly yellow, partly black, hairs; hind tibiæ with a black ciliation. Wings greyish to brownish with a reticulation of hyaline lines and spots. Halteres pale, the knob brownish with pale apex.

Female. First joint of antennæ moderately thick, distinctly constricted annuliformly at the apex, greyish pruinose to the middle or nearly to the apex; third joint yellowish to dark brown; style black. Front grey with a round, velvet black spot on each side, and a small one in the middle above; above the antennæ a rather broad, shining black band, more ore less produced triangularly backwards in the middle. Pubescence on thorax paler than in the male, sometimes whitish grey. Abdomen as in the male, but the reddish markings

wanting, and the design more distinct, as a rule beginning on the second segment, sometimes brownish but varying to whitish grey. Legs sometimes with the femora more or less yellowish.

Length 7,5—11 mm.

The length of the pupa is 13—14,5 mm.

H. pluvialis is rather common here, and may on hot days be very objectionable by its repeatedly attacking; especially it always occurs on sun-lit roads in woods. It occurs in all Denmark just from Skagen to the southernmost parts, and is also taken on Læsø and Bornholm; it has been taken from $^{4}/_{5}$ to $^{5}/_{8}$. The pupæ have been found in moist sand in Lyngby Mose, at Fureso and at Nyraad near Vordingborg; a pupa taken $^{19}/_{5}$ developed $^{29}/_{5}$, others developed $^{21}/_{6}$ and $^{4}/_{7}$ to $^{6}/_{7}$.

Geographical distribution: — The species is distributed over the whole of Europe, and in northern Africa.

2. **H. crassicornis** Wahlberg.

1848. Wahlberg, Öfvers. K. Sv. Vet. Akad. Förh. V, 200. — 1903. Kat. paläarkt. Dipt. II, 54.

This species to a high degree resembles *pluvialis*, so that I shall only compare it with the latter and give the differences.

Male. The erect hairs on the vertex and the upper eye-margin moderately long, shorter than in *pluvialis*, pale yellowish, only on the sides they may be darker. First joint of the antennæ very thick, short ovate, shining black, only with a grey pruinose spot at the base towards the inner side. Thorax with the inner lateral stripes abrupted a little behind the middle, as a rule ending in a triangular spot, and a similar spot at the hind margin. Reddish markings on abdomen small or almost wanting.

Female. The black shining band above the antennæ narrower than in *pluvialis*, not, or almost not, produced in the middle. First joint of antennæ considerably thicker than in *pluvialis*, not constricted at the apex, greyish pruinose only at the base, sometimes to the middle.

Lenght 7,5—10 mm.

This species much resembles *pluvialis*, but I think it is distinct. The character most to be relied upon is the shape of the first antennal joint in both sexes, and the mainly pale hairs on the vertex in the male. The shape of the shining band above the antennæ in the female, and the pattern of thorax are helping characters, but they are not absolutely to be relied upon. In my specimens the third antennal joint in both sexes is more or less yellowish at the base, sometimes in the whole lenght, only with the style dark.

H. crassicornis is not at all common here: I have seen some specimens presumably taken in the vicinity of Copenhagen, and in Jutland it has been taken in single specimens at Silkeborg (A. Petersen) and Frederikshavn (H. J. Hansen). My records date only from $^{9}/_{7}$ to ^{22} 7.

Geographical distribution: — The species occurs in northern and middle Europe, including Britain, down to Styria.

3. **H. italica** Meig.

1804. Meig. Klass. Zweifl. Ins. I, 163, 2, Tab. IX, Fig. 17. — 1862. Schin. F. A. I, 38. — 1903. Kat. paläarkt. Dipt. II. 55. — 1849. *H. longicornis*, Zett. Dipt. Scand. VIII, 2941, 2.

This species also much resembles *pluvialis* so that I shall content myself with describing it comparatively.

Male. The erect hairs on the vertex moderately long, yellowish, towards the sides they may be darker. Antennæ rather long, first joint moderately thickened, long ovate, grey pruinose. Thorax as in *pluvialis*, the pubescence more or less pale yellow, sometimes whitish. Abdomen is also quite as in *pluvialis*, with the same reddish markings, stretching over the sides of the three first segment. Legs often with the femora more or less yellow.

Female. Antennæ long; first joint long, cylindrical, not thickened as long as or longer than the third, indistinctly constricted at the tip, quite grey. The pubescence on thorax and abdomen pale grey or whitish.

Length 9—12 mm.

This species may be known in the male by the moderately thickened and somewhat long first joint of the antennæ, which is grey to, or near to, the apex, and by the pale hairs on the vertex: in the female it is easily recognised by the long, cylindrical, grey first joint of the antennæ.

H. italica is as common as *pluvialis* or nearly so, and it occurs often together with this species; Copenhagen, Dyrehaven, Ordrup Mose, Ørholm, Hillerod, Donse, Jægerspris; Funen at Hoffmansgave by Odensefjord, and from the little Eiland Endelave north of Funen; from Jutland I have not seen it. My records dates from $^{27}/_{6}$ to ^{8} 8.

Geographical distribution: — Europe, towards north to the middle of Sweden.

The species of *Hæmatopota* are not at all easy to distinguish, but I think the characters given above will prove to be sufficient. *H. variegata* Fabr., which was first described from Tangiers, I do not know, and the descriptions of it are not quite plain. On account of the reddish markings on the abdomen, and the often somewhat

yellowish femora of my specimens of *H. italica*, which are characters I have not seen mentioned for this species, it could be thought that this was *variegata*, but my females have a long, cylindrical, quite grey, first joint of the antennæ, without any tinge of yellow, and only with an indistinct constriction at the tip, and these characters do not at all agree with the descriptions of *variegata*. Moreover I think that Miss Ricardo is right, when she (Ann. Mag. Nat. Hist. 7, XVIII, 96) declares that she does not think *variegata* to be a good species but synonymous with *italica*.

4. **Tabanus** L.

Species of large to middle size, most frequently of blackish or greyish colour, as a rule with reddish markings on the abdomen, or with greyish spots or bands. Head a little broader than the thorax, semiglobular or more flat, often broader than high, a little concave behind. Face with an impressed line on each side, ending in a pit, these lines bounding a more or less quadratic epistoma; yowls only a little descending below the eyes. The frontal band in the females very often with a frontal callus between the inner eye-corners, and a linear middle callus. Antennæ placed considerably below the middle of the front side of the head, seven-jointed; the two first joints small, the third long, compressed, dilated at the base, and with an excision in the upper margin; the four last joints forming an annulated style. Eyes hairy or bare, often with purplish bands; the facets in the males of different sizes, or nearly equal. Ocelli wanting, but an ocellar tubercle often present. Mouth parts quite resembling those in *Hæmatopota*; the labella of about half the length of the proboscis, moderately broad; the mandibles lanceolate, microscopically serrated on the inner edge; the maxillary palpi two-jointed, the second joint in the female somewhat curved, often thickened at the base, going out in a longer or shorter point, and lying down the front side of the proboscis. In the male there is a more or less triangular, membranous excision in the epistoma; the maxillary palpi are porrect, and the second joint short, often swollen. Thorax nearly quadratic; abdomen as broad as or a little broader than the thorax, consisting of seven, not transformed segments; the first dorsal segment with a triangular excision in the middle line; in the males the abdomen is generally more pointed than in the females. The middle tibiæ with two apical spurs. Wings more or less hyaline, at most with a fumigated spot; the anterior branch of the cubital fork with or without a veinlet. When at rest the wings are borne a little open.

The larvæ are cylindrical, pointed towards each end, the head and the last segment are retractile. The segments are finely striated longitudinally. The body consists of twelve segments in all; there is a swelling all round the segments on the front margins of the fifth to the eleventh, more or less divided in separate knobs, and especially developed on the ventral side, the swellings bear very small, recurved spines. The last segment bears the anus on the ventral side, it forms a split between a pair of swollen lips, and the segment bears on the apex a conical projection, with a terminal vertical split, leading to the tracheæ, the larva being metapneustic. The mouth parts resemble those of *Hæmatopota*, in the median line there is a vertical labrum, with the upper edge convex; to each side of it is a hookformed, black mandible, with the inner concave edge serrated; outside to the mandibles lie the maxillæ, which are also somewhat hookformed, but less chitinised, with two-jointed palpi; above, to each side of the labrum, lies a piece, beset with curved spines, most of which are two-pointed; these pieces bear the antennæ, consisting of two joints, the apical joint being very small. On each side, about in the middle of the head, there is a small eye-spot. The pupa also resembles that of *Hæmatopota*; the sheaths of the wings and legs reach to the posterior margin of the first abdominal segment; all abdominal segments, except the first, bear a girdle of bristles at the hind margin, the bristles being longer towards the apex of the abdomen; the terminal segment bears six spines of the same form and arrangement as in *Hæmatopota*. There is a large, ear-shaped prothoracic spiracle, and seven abdominal spiracles. The head shows the same bristle-bearing tubercles as in *Hæmatopota*, the two, just in front, with one bristle each; besides, in most species, there are three small tubercles on the upper side, lying in a triangle and so that the rupture, which the imago makes by escaping, divides just in the middle of the triangle. Brauer mentions these tubercles, and calls them „Ocellenanlage“ what is perhaps correct, but it is to be remarked that they also exist in pupæ in which the imago has no ocellar tubercle as f. inst. *autumnalis*, and in others, in which the imago shows an ocellar tubercle, they may be very small.

The females of the Tabani deposite their eggs on stalks and other parts of plants; also sometimes on stones lying in water, and projecting above the surface; when on water plants the eggs are deposited above the surface of the water; but they are also deposited on plants in humid localities, and according to Lécaillon (Ann. Soc. Ent. de Fr. LXXIV, 1905, 20. *T. quatuornotatus*) in rather dry localities. The egg-mass is in some species symmetrical and broad conical,

in other species it is roundish, but always with the eggs in several layers. The eggs may be abt. 2,5 mm. long and 0,5 mm. broad; they are cylindrical, a little curved, brown or black. The eggs are deposited in summer, the larvæ hibernate and the transformation to pupæ and the development to imago take place in the following spring or summer. The larvæ live for a great part in water, but may also live in the earth on moist localities and perhaps also on relatively dry ones; when the time for the transformation to pupæ comes, the larvæ living in water leave it, coming to the earth in the vicinity of the water, and here they may rest for some time, before transforming to pupæ. The larvæ are carnivorous and feed upon other aquatic larvæ, they are also said to devour snails, earthworms and small Crustaceans.

The Tabani occur nearly everywhere, often in the vicinity of water, in woods, and in adjacent pastures. The females attack cattle, and they occur especially on hot days, then their bites may be a great torment for the cattle; sometimes an exudation of blood from the wound is seen. Packard refers cases from America in which horses and cattle have been killed by their biting, these, however, may be very rare cases. The males may also be seen to frequent flowers, especially umbelliferes, f. inst. *T. rusticus* may be found so in great numbers. Though the females may be very bloodthirsty, it seems not probable that they live of blood alone. Hine (Department of Agricult. Miscell. Papers, 1906, 25) states that the females of some American species take other food than blood, and he says: „I dont believe it vould be overstating the facts to say that specimens of this sex may pass the period of adult life without taking blood at all." He has often seen both sexes in foliage, and observed them sipping up water that forms as a dew on the leaves; he refers that he has observed a number of species of *Chrysops* and *Tabanus* of both sexes feeding on the honeydew produced by Aphids. Already Westermann (Germar. Magaz. Entomol. IV. 1821, 411—27) has an observation of the exotic species *Pangonia rostrata* L.; this species on account of its long proboscis stings cattle, when on the wing, and stings so that the blood runs from the wounds, but the species seems to like the nectar of flowers more than blood as he frequently saw them on flowers of Pelargonia; but unfortunately Westermann does not state, wether it is also the females that frequents flowers. The males may also be seen flying with great rapidity and hovering in the outskirt of woods, often in the evening and morning, perhaps watching the females; the copulation is said to take place in the air out of sight, at all events it is very rare to see Tabani in copula. Yet Hine l. c. has

observed copulation; the copulation always took place about 8 o'clock in the morning, before the insects had begun to fly. The male was sitting, while the female hung suspended. — The species are distributed all over the world, they seem to a certain degree to abound in mountain districts, going rather high, certainly on account of the forms of ruminants living here; the males then sometimes may be seen hovering on high mountain tops. This distribution is the cause that there are not many species occuring in Denmark, while there are more both north and south of us.

Of the genus 129 palæarctic species are known, of which 14 occur in Denmark.

Table of Species.

Males.

1.	Eyes hairy	2.
—	Eyes bare	9.
2.	Eye-facets equal or only slightly different in size	3.
—	Eye-facets of different sizes, the dividing line sharp	6.
3.	Second joint of palpi small, not swollen; eye-facets nearly equal, eyes with three bands	1. *montanus.*
—	Second joint of palpi more or less thickened or swollen	4.
4.	Eye-facets nearly equal, eyes with three bands	5.
—	Eye-facets distinctly of different sizes, eyes with two bands and one rudimentary	4. *Mühlfeldi.*
5.	Head low, eye-suture not much longer than the frontal triangle	3. *luridus.*
—	Eye suture about twice as long as the frontal triangle	2. *tropicus.*
6.	Upper eye-margin with long, erect hairs	6. *plebejus.*
—	Upper eye-margin without erect hairs	7.
7.	Femora black, or only the extreme tips yellow	8.
—	Femora yellow, only more or less black at the base	8. *fulvus.*
8.	Head large, eyes without bands, or with one dark band; second joint of palpi cylindrical; anterior branch of cubital vein nearly always with a veinlet	7. *rusticus.*
—	Eyes with two bands and one rudimentary; second joint of palpi swollen; dividing line between the eye-facets not very sharp	5. *solstitialis.*
9.	Eye-facets of equal sizes	9. *bovinus.*
—	Eye-facets of different sizes	10.
10.	Upper eye-margin without erect hairs	11.
—	Upper eye-margin with erect hairs	13.
11.	Small eye-facets sharply separated from the larger, ascending along the eye-margin to the ocellar tubercle as a band of nearly equal breadth	12. *autumnalis.*
—	Small eye-facets scarcely so sharply separated from the larger, ascending along the eye-margin in a band upwards decreasing in breadth	12.
12.	Large species; eyes without bands	10. *sudeticus.*

— Small species; eyes with one band ..... 11. *bromius.*
13. Ocellar tubercle prominent, the erect hairs at the upper eye-margin short; length 15 mm. ..... 13. *Miki.*
— Ocellar tubercle lying in a deep impression, the erect hairs longer; length 12—14 mm. ..... 14. *maculicornis.*

Females.

1. Eyes hairy ..... 2.
— Eyes bare ..... 9.
2. Ocellar tubercle present ..... 3.
— Ocellar tubercle wanting ..... 7.
3. Frontal band 4 to 5 times as high as broad below, front above the antennæ dusted ..... 4.
— Frontal band $2^1/_2$ to 3 times as high as broad below, front above the antennæ shining black; second joint of palpi much thickened ..... 3. *luridus.*
4. Frontal band about 4 to $4^1/_2$ times as high as broad below ..... 5.
— Frontal band 5 times as high as broad below and here narrowed, frontal callus higher than broad; second joint of palpi somewhat thickened ..... 5. *solstitialis.*
5. Second joint of palpi much thickened at the base; frontal callus nearly quadratic ..... 2. *tropicus.*
— Second joint of palpi not thickened, rather thin ..... 6.
6. Frontal callus shining, generally somewhat rounded above, præalar callus most frequently black ..... 1. *montanus.*
— Frontal callus generally quadratic, præalar callus most frequently reddish ..... 4. *Mühlfeldi?*
7. Upper eye-margin with long, erect hairs; second joint of palpi small; species pilose, with rather long hairs.. 6. *plebejus.*
— Upper eye-margin without erect hairs; second joint of palpi long; anterior branch of cubital vein as a rule with a veinlet ..... 8.
8. Femora grey to the tips ..... 7. *rusticus.*
— Femora reddish yellow, only grey at the base ..... 8. *fulvus.*
9. Large species, 19 mm. or still larger; eyes without bands ..... 10.
— Smaller speeies, not exceeding 15 mm. ..... 12.
10. Greyish black species with three rows of pale spots on abdomen; second joint of palpi pointed ..... 12. *autumnalis.*
— Species with black and yellow designs; second joint of palpi stubby ..... 11.
11. The triangles in the dorsal line on abdomen nearly reach the front margin of the segments, and are as a rule higher than broad at the base; third joint of antennæ nearly all black; eyes in the living specimen emerald green ..... 9. *bovinus.*
— The triangles in the dorsal line on abdomen not reaching the front margin of the segments, equilateral; third joint of antennæ mostly reddish; eyes in the living specimen dark copper coloured ..... 10. *sudeticus.*

12. Eyes without bands ..... 13. *Miki.*
— Eyes with one diagonal band ..... 13.
13. Upper margin of the head along the eyes very narrow, without erect hairs; second joint of palpi thickened at the base ..... 11. *bromius.*
— Upper margin of the head along the eyes broad, with erect but rather short, brownish hairs; second joint of palpi slightly thickened ..... 14. *maculicornis.*

Subgenus **Therioplectes** Zeller.

Eyes in both sexes hairy; ocellar tubercle present.

1. T. montanus Meig.

1820. Meig. Syst. Beschr. II, 55, 31. — 1880. Brauer. Denkschr. kais. Akad. Wissensch. XLII, 144, 8, Tab. I et V, Fig. 8. — 1903. Kat. paläarkt. Dipt. II, 68. — 1862. *T. tropicus*, Schin. F. A. I, 31.

Male. Eyes green, with three bands and the lower margin red, densely brownish hairy; eye-facets nearly of equal size. Frontal triangle, cheeks and epistoma grey; cheeks and vowls with greyish hairs, inclining to black at the outer margin. Antennæ brownish red, basal joint greyish; style more or less brownish black; the third joint considerably dilated at the base, with a nearly rectangular excision. Palpi (Fig. 33) with the second joint elongated ovate, not thickened, greyish to fulvous, with greyish and blackish hairs. Thorax blackish brown with five very indistinct whitish stripes, which are best seen, when the thorax is viewed from in front; the disc clothed with dark brown to black hairs; beneath the hairs are longer and paler, yellow to grey; scutellum with longer, often pale hairs; besides this pubescence there are on the disc shorter golden hairs. The præalar callus most frequently, but not always, black. Abdomen yellowish red with a moderately broad, black dorsal stripe, beginning broad on first segment and being narrowest on the third, the three last segments black; the reddish colour ending as a rule on the first segment. Venter yellowish red; first segment, a quadratic spot on the second segment, and the three last segments black; sometimes there is a more or less distinct dark middle line. Abdomen clothed with rather short, partly black, and partly yellowish golden hairs; the golden hairs form more or less distinct triangles in the middle line, and are found on each side at the hind margins of the segments, forming sometimes distinct golden spots; on the venter the pale hairs are found at the hind margins of the segments, making these distinctly pale. Along the side margins of the abdomen the black hairs are especially distinct. Legs with the femora black, only rufous at the extreme tip; front tibiæ

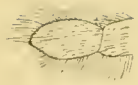


Fig. 33. *T. montanus.*

Fig. 34. *T. tropicus.*

Fig. 35 *T. luridus.*

Fig. 36. *T. Mühlfeldi.*

Fig. 37. *T. solstitialis.*

Fig. 38. *T. bromius.*

Fig. 39. *T. Miki.*

Fig. 40. *T. maculicornis.*

Maxillary palpi $\times$ 12. Fig. 39 ♀ after Brauer.

rufous, black at the apical half, posterior tibiæ rufous; front tarsi black, posterior tarsi rufous, slightly darkened towards the ends. The legs are clothed with dark brownish to blackish hairs, which are rather long on the under side of the femora and on the middle tibiæ; the hind tibiæ have a fringe of shorter ciliæ, especially on the outer side, and the front tibiæ are covered with short hairs; the front coxæ are covered with long, greyish hairs. Wings somewhat yellowish towards the anterior margin; veins yellow, frequently an indistinct yellowish spot at the base of the cubital fork. Halteres brown, apical half of the knob pale.

Female. Eyes green with three bands. Frontal band greyish yellow, slightly narrowed downwards, about four times as high as broad below; frontal callus shining, most frequently somewhat rounded above; middle callus more or less linear or spindle-shaped; ocellar tubercle brown, ovate. Second joint of palpi (Fig. 33) pale yellow, rather long, slightly curved, scarcely thickened and somewhat truncate at the apex, clothed with short withish hairs intermingled with black ones. Thorax more greyish than in the male, and the stripes often more distinct. Abdomen broader and more stubby, the reddish markings often smaller, and the venter frequently with a dark middle line; the pale hairs much more extended and the side margins not black haired.

Length 14—17 mm.

In the pupa the three tubercles, lying above in a triangle, are small; it has a length of 23 mm.

T. montanus seems to be one of the commonest species in Denmark; vicinity of Copenhagen, Dyrehaven, Gentofte, Frederiksdal, Hareskov, Geel Skov, Ruderhegn, Hillerod, Frerslev Hegn, Esrom So, Tidsvilde; Funen at Langenso; Jutland in Greisdalen near Vejle, and at Silkeborg. It occurs from $^{3}/_{6}$—$^{27}/_{7}$. A pair in copula were taken in Hareskov on $^{5}/_{6}$. The larva was taken at Donse in the earth near water on $^{14}/_{4}$, it transformed to pupa $^{1}/_{5}$ and emerged $^{19}/_{5}$.

Geographical distribution: — Northern and middle Europe down into France, and in Siberia.

2. T. tropicus Panz.

1794. Panz. Fn. germ. XIII, 22. — 1842. Zett. Dipt Scand. I, 111, 10, p. p. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 146, 9, Tab. I et V, Fig. 9. — 1903. Kat. paläarkt. Dipt. II, 73. — 1862. *T. luridus*, Schin. F. A. I, 31, p. p.

Male. Eyes with three bands, densely pale brownish hairy; eye-facets practically of equal size, only imperceptibly larger in the middle.

Frontal triangle, cheeks, and epistoma grey; cheeks with black hairs, lower down on the yowls yellowish haired. Antennæ reddish, the basal joints dark grey, style dark brown, third joint dilated at the base with an excision making the protruding angle rectangular. Palpi (Fig. 34) grey; second joint short ovate, much thickened, sometimes with an indistinct knobbed apex, the joint is beset with long black and whitish hairs. Thorax greyish black with five very indistinct stripes and clothed with greyish black hairs, being somewhat paler below. There are also some yellowish golden hairs on the disc, with a tendency to form three stripes. The præalar callus generally black. Abdomen yellowish red with a black dorsal stripe, the breadth of which is usually a little less than one third of that of abdomen; fourth segment to apex black. Venter yellowish red, first segment black, on the second a very short black basal triangle, being sometimes a short stripe, the last three segments black. Abdomen clothed with partly black, partly yellowish golden hairs, the latter forming small triangles in the middle line, and found on each side, at the hind part, especially of the second and third segments. On the venter the golden hairs form pale incisures at the hind margins of the segments; the side margins of the abdomen are distinctly black haired. Seen from behind the abdomen generally shows a silvergrey pruinosity forming more or less distinct median triangles and side spots. Legs with the femora black, reddish at the extreme apex: tibiæ reddish, front tibiæ with the apical half black; front tarsi black, posterior tarsi brownish black. The femora with long, black hairs on the under side, the front tibiæ with short hairs, a little longer on the outer side; the middle tibiæ long haired; the hind tibiæ long haired on the inner side, and with a dense fringe of shorter ciliæ on the outer side; front coxæ with long, pale hairs. Wings somewhat yellowish towards the anterior margin; the veins more or less dark yellow. Halteres brown.

Female. Eyes with three bands. Frontal band and triangle grey, the band distinctly narrowing downwards, more than four to nearly five times as high as broad below; frontal callus more or less quadratic; middle callus linear or somewhat spindle-shaped; ocellar tubercle brown, ovate. Second joint of palpi (Fig. 34) somewhat short, the basal part much thickened, the apex rather sharp; the joint clothed with short, black hairs and with somewhat longer, pale hairs at the base. Venter often with a more or less distinct dark middle line, and not seldom more or less darkened, or almost quite dark grey; the reddish markings on the upper side may also often be much restricted, or the abdomen may be quite grey.

Length 14—17,5 mm.

The pupa has a length of 20 mm.

This species differs from *montanus* chiefly by the shape of the palpi in both sexes, and in the female by the distinctly higher frontal band; the coloration of the venter is also rather characteristic for the males in the two species, viz. a quadratic spot on the second segment in *montanus* and a short triangle at the base in *tropicus*.

T. tropicus is not uncommon in Denmark; vicinity of Copenhagen, Utterslev Mose, Ruderhegn, Hillerød, Frerslev Hegn, Tidsvilde and Boserup at Roskilde; Funen at Odense and Jutland at Silkeborg. It has been taken from $^{10}/_{6}$—$^{9}/_{7}$. A pupa was taken in moss in Lyngby Mose on $^{5}/_{6}$ and developed $^{13}/_{6}$. The dark form of the female seems to be the most common here.

Geographical distribution: — Northern and middle Europe to northern France; and in Siberia.

3. **T. luridus** Fall.

1817. Fall. Dipt. suec. 5, 4. — 1842. Zett. Dipt. Scand. 1, 112, 11. — 1862. Schin. F. A. 1, 31, p. p. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 148, 10, Tab. I et V, Fig. 10. — 1903. Kat. paläarkt. Dipt. II, 66.

Male. Eyes densely covered with rather long brownish hairs, green, with three bands and the lower margin red; eye-facets practically of equal size. Head low; the eye-suture not much longer than the frontal triangle. Front and cheeks grey, the latter with black hairs, paler on the yowls. Antennæ reddish, the two basal joints dark grey, style dark brown, third joint somewhat dilated, with a rather deep excision. The palpi (Fig. 35) yellow, second joint thickened, short ovate, with long, whitish and black hairs. Thorax blackish brown, with faint traces of stripes, clothed with blackish brown hairs; on pleura and sterna the hairs are pale; on the disc there are some yellowish golden hairs. Præalar callus reddish brown to black. Abdomen brownish red, first segment black, second and third with a black middle line, occupying a third of the breadth; the four last segments black. The dorsal line is narrowest on the third and the last half of the second segment. Venter brownish red, first segment black, second with a quadratic or triangular, sometimes indistinct, spot, third or third and fourth segments red, the following black. Abdomen clothed with black and pale hairs in the ordinary way, the pale hairs forming more or less distinct, but small and sometimes inconspicuous triangles on the dorsal middle line. If viewed from behind the usual silvergrey pruinosity is generally seen. Legs with the femora black; tibiæ dark reddish, front tibiæ with the apical half.

or a still larger part, black; front tarsi black, posterior blackish brown; the legs are clothed with hairs quite in the common way. Wings with a yellowish tinge towards the anterior margin; veins dark yellow, the cross-veins and the base of the fork of the cubital vein often with a faint tinge. Halteres brown.

Female. Eyes green with three bands; frontal band grey, broad and low, very slightly narrowed downwards, about two and a half times as high as broad below. Frontal triangle shining black, only grey just above the antennæ; frontal callus low and broad, connected with the triangle; middle callus spindle-shaped. Ocellar tubercle ovate. Second joint of palpi (Fig. 35) rather short, much thickened, with a sharp point, the front edge very convex, the hinder edge nearly straight; the joint yellow, clothed with whitish silky hairs and a few black ones. Abdomen with the reddish markings much more restricted than in the male, generally only present as small side spots on the second and third segments, in which spots the pale hairs are distinctly seen. Venter as in the male, or with a dark middle line, or altogether grey. The hairs on the legs paler than in the male.

Length 12,5—14,5 mm.

This species is in the male characterised by the low head and the short eye-suture, as well as by the shape of the palpi; in the female it is at once recognised by the shining black front, and also the palpi are very characteristic; moreover the species is smaller than the two preceding ones. I can absolutely confirm Brauer's statement that the females have never a pollinose frontal triangle, but this is always shining.

T. luridus is less common than the two preceding species; vicinity of Copenhagen, Jyderup near Faxe; Jutland at Frijsenborg and Silkeborg and on Bornholm in Almindingen; it is usually only taken in single specimens. I have records of it from $^{16}/_{5}$ to the first half of July.

Geographical distribution: — Northern and middle Europe from Swedish Lapland to Bohemia.

4. **T. Mühlfeldi** Brauer.

1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 149, 11, Tab. V, Fig. 11. — 1903. Kat. paläarkt. Dipt. II, 68.

Male. Head rather small. Eyes green with two bands, and above these a rudimentary one or a faint red tinge on the border of the part with the larger facets, this part somewhat copper-coloured. The facets of different sizes, but the difference not great; from the suture and out in the larger part of the middle of the eye the facets are larger, the dividing line between the large and small facets not sharp.

Eyes densely greyish or light brownish hairy. Frontal triangle, epistoma, and cheeks grey; yowls grey haired, the outer part of the cheeks black haired. Antennæ yellowish red, style usually a little darker, first basal joint grey; third joint moderately dilated. Palpi (Fig. 36) grey, yellowish at the apex, second joint somewhat thickened, thickest at the apex, with a stubby point above, and generally with a little impression below this point; the palpi with pale and some darker hairs intermingled. Thorax brownish black with five indistinct, greyish stripes; pubescence brownish black, pleura and sterna with pale hairs; on the disc there are the usual yellowish golden hairs. Præalar callus as a rule reddish. Abdomen yellowish red with a rather narrow, black dorsal line, being narrowest on the third segment; the reddish markings ending, as a rule, on the fourth segment, the following segments black. Venter yellowish, with a small black basal triangle, extending somewhat over the second segment; the three last segments black. Abdomen clothed with black and pale hairs, chiefly in the usual way, the pale haired triangles on the dorsal middle line present as usual; on the venter the pale hairs are much extended, the black hairs being found chiefly on the middle line and on the black segments. Seen from behind, the abdomen is pollinose silvergrey. Legs with the femora grey or greyish black; tibiæ yellowish, front tibiæ black on the apical half or third part; posterior tarsi yellowish, front tarsi black. The legs clothed in the usual way with yellowish to blackish hairs. Wings with a faint yellow tinge towards the anterior margin; veins light brown. Halteres brown, apical part of the knob a little paler.

Female. Though the male of this species is not uncommon I am not at all sure with regard to the female. I possess only two specimens, which I refer with some doubt to this species. They have green eyes with three bands, a yellowish frontal band with almost parallel borders, and a low frontal callus, a little rounded upwards. The third joint of the antennæ is moderately dilated. The palpi are almost as in *montanus* or only very slightly thicker. The præalar callus is reddish. In both specimens the abdomen is mostly grey, with only some reddish markings on the second and third segments. The venter has a broad, dark middle line and the four last segments dark.

Length 13 to about 15 mm.

I was somewhat astonished in finding this species in Denmark on account of its hitherto known geographical range, and I thought I had committed some error in the determination. But by courtesy of Dr. Handlirsch and the museum in Wienna I was allowed to see

Brauer's type specimen; I was then able to identify my species with certainty, and I saw that my determination was correct. The species is in the male characterised by its eye-facets and the bands of the eyes, by the shape of the second joint of the palpi, (Brauer's figure is a little exaggerated), and also the colouring of the venter is characteristic. It will be seen that my doubtful females do not seem to agree with Brauer's description neither with his type. The female type specimen I have seen was quite immature and hence Brauer's description of the pale markings on the thorax: but I am not quite sure that Brauer's female is really the female of *Mühlfeldi*, chiefly because he describes the third joint of the antennæ as: „stark erweitert", that is also seen in the type, while with regard to the male he says: „wenig erweitert". I do not, however, wish to raise any doubt about Brauer's determination, as I am myself far from being certain with regard to the female. It may also be possible that my specimens are identical with Brauer's only having the abdomen much darkened (as appears to be common with the females of some of our species), and somewhat less dilated antennæ; at all events I think that the question about the female of *Mühlfeldi* still remains to be solved with certainty.

T. Mühlfeldi seems not at all rare here; at Copenhagen, Ermelund, Bagsværd Sø, Hillerod, Boserup at Roskilde, Svenstrup between Roskilde and Ringsted and at Køge; Funen at Odense; Jutland at Frijsenborg and Frederikshavn. My records only date from $^{13}/_{6}$—$^{7}/_{7}$.

Geographical distribution: — The species is hitherto only known from Siberia and Asia Minor; but I think it will prove to have a much wider range.

5. **T. solstitialis** Schin.

1862. Schin. F. A. I, 30. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien. XLII, 150, 12, Tab. I et V, Fig. 12. — 1903. Kat. palä-arkt. Dipt. II, 71. — ?1820. Meig. Syst. Beschr. II, 56, 33.

Male. Eyes green, somewhat copper-coloured above; with two bands and above these a rudiment on the border between the large and small facets; the facets of different sizes, in the upper two thirds, except the margin, somewhat larger than in the lower third part, the dividing line not sharp. Eyes densely pale brownish hairy. Frontal triangle yellowish grey, face grey, yellow haired, the outer margin of the cheeks with blackish hairs. Antennæ reddish, the basal joint only slightly greyish, the style more or less black; the third joint moderately dilated with the upper angle sharp. Palpi (Fig. 37) greyish yellow; the second joint much thickened, globular ovate with a little

point; it is clothed with long, pale and black hairs. Thorax blackish with five very indistinct stripes; pubescence blackish, on pleura and sterna fulvous; on the disc there are the usual golden hairs. Præalar callus generally reddish. Abdomen yellowish red, with a rather narrow, black dorsal line, the reddish markings stretching, as a rule, to the hind margin of the fourth segment. Venter yellowish red; on the first and the base of the second segment is a small, black middle spot, which is triangular or of indistinct form; the three last segments black. Abdomen clothed with black and golden hairs chiefly in the usual way, the golden hairs present to a great degree, on the venter black hairs only found on the black apical segments; the triangles in the dorsal line somewhat indistinct. Legs with the femora greyish black; tibiæ rufous, apical half of front tibiæ and front tarsi black, posterior tarsi rufous, darkened towards the ends. Legs clothed quite in the ordinary way with blackish and fulvous hairs. Wings with a distinct brownish tinge towards the anterior margin, and somewhat extended in the wing; veins brownish. Halteres brownish, apical half of the knob paler.

Female. Eyes green to copper-coloured, with three bands. Frontal band greyish yellow, high and narrow, much narrowed below, about five times as high as broad below; frontal callus small, higher than broad, prolonged upwards in the linear middle callus. Frontal triangle grey. Antennæ with the third joint somewhat more dilated than in the male. Second joint of palpi (Fig. 37) somewhat thickened at the base and somewhat curved, the apex rather sharp; the joint clothed with whitish and black hairs. The dorsal stripe on abdomen broader, and the pale triangles more distinct; the reddish markings sometimes considerably restricted, and also the venter with more extended dark colour.

Length 14—17 mm., according to Brauer it may reach a length of 18 mm.

The pupa has a length of 18—20 mm.

This species is in the male recognised by the size of the eye-facets and the two bands and one rudimentary; from *Mühlfeldi*, to which it bears some resemblance, it is distinguished by the larger head and the greater difference in the eye-facets; also the palpi are characteristic; the female bears resemblance to *tropicus*, but the palpi are a little longer, and the high, narrow frontal stripe and the high frontal callus distinguish it; finally in both sexes the hairs on the pleura and sterna are fulvous, and it is to be noticed that the first ventral segment seems always to be pale and not quite black, as

is the case in all the foregoing species, except sometimes in *Mühlfeldi*; only the recurved lateral parts of the dorsal plate has a black spot.

T. solstitialis is one of the more common species here: vicinity of Copenhagen, Ordrup Mose, Furesø, Bagsværd Sø, Hareskov, Ruderhegn, Hillerød, Fredensborg; Jutland at Dollerup near Viborg and at Mausing near Silkeborg. It occurs from $^{5}/_{6}$ to $^{1}/_{8}$. I have taken the larva in Bagsværd Sø on $^{22}/_{5}$, it transformed to pupa $^{1}/_{6}$, and the imago escaped $^{16}/_{6}$; another larva, taken in Furesø on $^{14}/_{6}$, transformed $^{8}/_{7}$, and the imago came $^{19}/_{7}$. The larva was very voracious, one devoured twelve larvæ of *Hoplodonta viridula* in a few days. Brauer l. c. says that the pupa is found in water, I do not think this is correct, my larvæ would not transform in the water, but when I put the fulgrown larvæ in earth they soon transformed. A larva, which I had in captivity for some time, but without feeding it, transformed at last to pupa, but this was small and the imago only measured 12,5 mm.

Geographical distribution: — Middle Europe to France, Siberia and Asia Minor; it occurs in Britain, but there is no sure record of it from Scandinavia.

Subgenus **Atylotus** Osten Sacken.

Eyes hairy in both sexes, sometimes only slightly so in the females. Ocellar tubercle wanting in the females.

6. **T. plebejus** Fall.

1817. Fall. Dipt. suec. 8, 9. — 1842. Zett. Dipt. Scand. 1, 121, 24. — 1862. Schin. F. A. I, 31. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 167, 30, Tab. II et V, Fig. 30. — 1903. Kat. paläarkt. Dipt. II, 69.

Male. Eyes with one band or unicolorous, densely and rather long yellowish hairy; eye-facets in the upper two thirds larger than in the lower third part, the dividing line sharp. At the upper eye-margin long, black, erect hairs. Frontal triangle greyish yellow. Face grey with whitish, on the cheeks chiefly black, hairs. Antennæ reddish yellow, third joint only slightly dilated, with an obtuse angle. Second joint of palpi moderately (more or less) thickened, whitish, with whitish and many black hairs. Thorax greyish black, clothed all over with long, woolly, whitish to grayish hairs. Abdomen rather narrow, dark grey, second and third segments with more or less distinct reddish side markings. Venter grey. Abdomen clothed with erect, blackish to grey hairs and with depressed whitish hairs, the latter arranged so as to leave an indistinct dark broad line in the middle,

interrupted at the hind margins of the segments of the pale hairs. Venter chiefly greyish haired, with short whitish hairs at the hind margins of the segments. Legs with the femora black, the tips yellow; tibiæ yellow, apical half of the front tibiæ and the tips of the posterior tibiæ brown; front tarsi brown, posterior tarsi yellow, but the tips of the joint brownish. Femora and front coxæ with long, whitish, tibiæ with shorter and more blackish hairs; on the outer side of the hind tibiæ no special ciliation. Wings hyaline with pale yellow veins; anterior branch of the cubital fork with or without a veinlet. Halteres pale brownish.

Female. Eyes with one band; shorter haired than in the male. Frontal band rather low with almost parallel borders, yellowish grey, quite pollinose or with very small frontal and middle calli. The erect hairs at the upper eye-margin much shorter than in the male. Palpi with the second joint very slightly curved and slightly thickened at the base, clothed with rather long whitish and black hairs. Thorax shorter haired than in the male. Abdomen grey, with some more or less indistinct, reddish markings on the sides of the basal segments. Legs variable in colour, sometimes as in the male, or being paler so that only the base of the femora and the front tarsi with the tips of the tibiæ are darker.

Length 10—11 mm.

This species is easily recognised among the Danish species, as it is the smallest of the species with hairy eyes. I have only examined four specimens, of which one had a distinct veinlet on the anterior branch of the cubital fork on one wing and a small one on the other, while the three other specimens had none; but there was always an angle on the vein, where the veinlet should have originated.

T. plebejus is a very rare species in Denmark, I only know of four specimens, taken many years ago in the vicinity of Copenhagen; one of them has been taken by J. C. Schiodte.

Geographical distribution: — Middle Europe, in north to the middle Sweden, in south to France; it is not recorded from Britain.

7. T. rusticus Fabr.

1781. Fabr. Spec. ins. II, 458, 17. — 1842. Zett. Dipt. Scand. I, 119. 21. — 1862. Schin. F. A. I, 32. — 1880. Brauer. Denkschr. kais. Akad. Wissensch. Wien, XLII, 168, 31, Tab. II et V, Fig. 31. — 1903. Kat. paläarkt. Dipt. II, 70.

Male. Head large, hemispherical. Eyes ligth greenish, sometimes with a narrow dark band. Eye-facets in somewhat more than the two upper thirds large, except along the hind margin, the dividing

line sharp; eyes densely yellowish haired. Frontal triangle whitish yellow; face whitish grey with pale hairs. Antennæ reddish yellow; third joint somewhat more dilated than in *plebejus*, the upper angle nearly in the middle of the joint; style longer than the third joint, apical joint long. Palpi with the second joint long elliptical, somewhat pointed, whitish yellow, with long, white and, towards the end, some shorter, black hairs. Thorax grey to dark grey, greyish yellow pollinose, densely clothed with more or less pale yellowish hairs. Abdomen is distinctly conically pointed; it is yellowish red, with a more or less broad dorsal middle line and apical segments dark. Venter yellowish red with a middle line and last segments dark. Abdomen densely clothed with short, somewhat depressed, pale yellow hairs, usually so arranged that the sides of the dark dorsal line shine through and form two narrow dark bands, converging towards the apex, on which bands there are black hairs; sometimes these bands are indistinct or wanting; some black hairs are also found on the sides of the anterior segments; the venter is chiefly, but less densely covered with pale hairs. Legs with the femora blackish grey, the tips yellow; front tibiæ blackish, yellow at the base, posterior tibiæ yellow with dark tips; front tarsi black, posterior tarsi brown, basal half of metatarsus yellow. Femora clothed with long, yellow hairs, all tibiæ with rather short hairs, on the outer side of the hind tibiæ there is a ciliation of partly yellow, partly black hairs, but the fringe is scarcely so dense as in other species. Wings hyaline, only with a faint yellow tinge quite near to the anterior margin; veins yellow; anterior branch of the cubital fork nearly always with a veinlet. Halteres yellow, knob very pale.

Female. Eyes unicolorous or sometimes with a narrow band, light greenish, very short and sparingly haired. Frontal band and triangle greyish yellow, the band with parallel borders, without calli or these very small. Third joint of antennæ somewhat more dilated than in the male. Second joint of palpi long, somewhat thickened a little below the base, especially on the inner side, and hence the apical third somewhat abruptly thinner; the joint clothed with pale and short black hairs. Abdomen much more truncate than in the male, the reddish markings much more restricted, frequently only seen on the second segment, the two dark dorsal bands always distinct; venter nearly always with a broad dark middle line or nearly quite dark grey.

Length 13—15 mm.

This species is easily recognised by its whole exterior. The head and eye-facets are characteristic in the male, and the palpi in the

female; in both sexes the two narrow black lines on abdomen, the absence of long hairs on the middle tibiæ, and, as a rule, the veinlet from the anterior branch of the cubital fork.

T. rusticus is a rather frequent species here, and sometimes it occurs in great numbers, but I have hitherto not seen it from Jutland. It seems to be a species which is more attracted by flowers than is commonly the case, and it is often seen on Umbelliferæ; vicinity of Copenhagen, Damhusmosen, Ordrup Mose, Hillerod, Frerslev Hegn, Grib Skov and Esromsø, in the latter place in very great numbers on Sonchus in the last half of July; Funen at Odense and on Bornholm at Hasle and Ronne. It seems to be a species occuring somewhat late, my records date from 4/7—7/8; Zetterstedt l. c. refers that he has seen it to the 1/9.

Geographical distribution: — All Europe; it seems to have its northern limit in southern Scandinavia.

8. **T. fulvus** Meig.

1820. Meig. Syst. Beschr. II, 61, 40. — 1842. Zett. Dipt. Scand. I, 120, 22. — 1862. Schin. F. A. I, 32. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 169, 65, Tab. III et V, Fig. 32. — 1903. Kat. paläarkt. Dipt. II, 63.

Of this species I have only seen the female, as to the male I quote the following from Brauer. Eyes densely and long, pale hairy; eye-facets of different sizes about as in *rusticus*; as a rule there is no band on the eye. Antennæ reddish yellow; the angle of the third joint near to the base, style somewhat shorter than the third joint, apical joint conical. Palpi with the second joint long elliptical, somewhat more ovate than in *rusticus* (Brauer's figure). Thorax densely covered with yellowish golden hairs. Abdomen much as in *rusticus*, the reddish markings, however, are more extended, and the pubescence more golden yellow. Legs mainly reddish yellow; coxæ and base of femora more or less blackish; tips of the front tibiæ, front tarsi entirely, and posterior tarsi towards the ends brownish. Femora with long hairs at the base, the remainder of the legs with depressed yellow silky hairs, intermingled with short black hairs on the tibiæ. Wings quite as in *rusticus*; halteres yellow.

Female. Eyes pale green with some nearly black, round spots, and a narrow dark band; more or less densely, short and sometimes indistinctly haired. Frontal band and triangle yellow. Palpi with the second joint long, somewhat thickened at the basal half, with pale and black hairs. Venter generally reddish; first segment grey.

second with a narrow, pointed middle line, sometimes stretching farther backwards; last segments black. Legs as in the male.

Length 13—14,5 mm.

When doubt arises, this species is recognised by having the protruding angle of the third antennal joint nearer the base than in *rusticus* and the femora pale to a large degree.

T. fulvus is very rare in Denmark, I have only seen two females, taken many years ago. This species is also said to frequent flowers.

Geographical distribution: — All Europe, towards north to middle Sweden; and in Asia Minor.

Subgenus **Tabanus** s. str.

Eyes in both sexes bare or microscopically haired. Ocellar tubercle wanting in the females.

9. T. bovinus Löw.

1858. Löw, Verh. zool. bot. Gesellsch. Wien, VIII, 606, 36. — 1842. Zett. Dipt. Scand. I, 105, 1, p. p. — 1862. Schin. F. A. I, 34, p. p. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 185, 44, Tab. III et VI, Fig. 44. — 1903. Kat. paläarkt. Dipt. II, 60.

Male. Eyes green, unicolorous; facets of equal size. Frontal triangle and face greyish yellow, with yellow hairs. Antennæ black, the basal joints and the extreme base of the third joint reddish; the upper corner of first basal joint much extended over the second. Second joint of palpi yellow, somewhat ovate, often with a little apex turned downwards, clothed with pale and black hairs. Thorax blackish brown with five indistinct greyish stripes; with short blackish brown and yellowish golden hairs on the disc; pleura and sterna yellow haired. Præalar callus generally somewhat rufous. Abdomen brownish red, with a black dorsal middle line, the fourth segment partly and the last three segments black, but with the side margins rufous, this colour reaching somewhat in along the hind margins; in the dorsal line pale whitish, or whitish grey triangles; abdomen clothed with black and yellow hairs, the black hairs clothing all the black and some of the reddish parts, the pale hairs cover the whitish triangles in the middle line and form more or less distinct spots on the sides near the hind margins; the triangles nearly reach the front margins of the segments and are as a rule longer than broad at the base. Venter yellowish with a black middle line, more or less interrupted at the incisures; clothed with yellow and black hairs, the latter only placed in the middle line. Seen from behind the dorsal triangles are silvergrey pruinose. Legs with the femora greyish black with pale

tips; tibiæ yellowish, front tibiæ more or less darkened at the tips; front tarsi black, posterior tarsi brownish; femora clothed with long, greyish or yellow hairs, hind tibiæ with a dense fringe of mostly black ciliæ on the outer side. Wings with a distinct yellowish tinge towards the anterior margin: the veins brown. Halteres brownish, peduncle paler, apical part of the knob whitish.

Female. Eyes green, unicolorous. Frontal band high and narrow; frontal callus high, narrowed upwards or more or less triangular, dentate below as a rule with four teeth, prolonged above in the linear middle callus. Antennæ as in the male. Second joint of palpi long, somewhat curved, front edge very convex, hind edge nearly straight, the outer side with short yellow and some black hairs. Thorax a little paler and more conspicuously striped than in the male. Abdomen flatter and more rounded at the apex, otherwise as in the male.

Lenght 19—22 mm.

The pupa has a length of 27 mm.

T. bovinus is common in all Denmark; it is frequently seen on cattle, and it is easily recognised when flying by the loud noise it produces. It has been taken in all parts of Denmark including Bornholm. I have records of it from $^4/_5$—$^1/_8$. A pupa, taken at Donse Dam, developed in June. — *T. bovinus* O. F. Müller, Fn. Fridrichsdal. 1784, 86, 767, is with great certainty this species, as he states of it: „oculis virescentibus“; this is thus the first somewhat sure record of the species from Denmark.

Geographical distribution: — The species is widely distributed and is known from all Europe, Siberia and Africa.

10. **T. sudeticus** Zeller.

1842. Zeller, Isis, 815, 2, Tab. I, Fig. 5—8. — 1862. Schin. F. A. I, 34. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 184, 43, Tab. III et VI, Fig. 43. — 1903. Kat. paläarkt. Dipt. II, 71.

Male. Eyes dark copper-coloured, unicolorous; eye-facets in the upper two thirds, except a narrow stretch along the hind margin, much larger than in the lower third, the small-facetted part at the hind margin above mentioned not reaching the ocellar tubercle. Frontal triangle, cheeks and yowls yellow, with yellow hairs, apex of the frontal triangle brown. Antennæ reddish, style and apical part of third joint dark; apical corner of the basal joint not as much produced as in *bovinus*. Second joint of palpi long ovate, with a little downturned point; yellow and black haired. Thorax blackish brown with five indistinct stripes; clothed with brown and yellow golden hairs, pleura and sterna in front with yellow, farther back with darker

hairs, except under the wing-root where there are golden hairs. Præalar callus rufous. Abdomen much as in *bovinus*, but the dark middle line is indistinct or wanting, all the segments being black at the front parts, with broad, whitish yellow hind margins, these being broadest at the sides; only on the first and second segments some dark brown ground-colour is found here, at the sides; the pale triangles in the dorsal line not reaching the front margins of the segments, and as a rule not longer than broad at the base. Venter brownish black, but the hind margins of the segments, except the first, broad yellowish white or white, these margins being broadest at the sides thus giving rise to a broad but indistinct dark middle line. Legs with the femora black or brown; tibiæ yellowish brown, front tibiæ slightly darkened at the apex; front tarsi black. The long hairs on the femora black, tibiæ with short yellow hairs, hind tibiæ on the outer side with a distinct fringe consisting of yellow hairs. Wings with a distinct yellowish tinge towards the anterior margin and brown veins. Halteres brownish with the apex of the knob paler.

Female. Eyes unicolorous, dark copper-coloured. Frontal band high and narrow, frontal callus as in *bovinus*, prolonged upwards in the linear middle callus. Second joint of palpi long, slightly curved, scarcely as thick as in *bovinus*. Thorax and abdomen chiefly as in the male, the pale triangles in the dorsal middle line somewhat larger.

Length 21—26 mm.

This is our largest species of *Tabanus*; it resembles in general appearance *bovinus* but is larger; the male is at once recognised by the eye-facets, and the female by the paler antennæ and the indistinct middle line on the venter, and also in both sexes the whole pattern on the dorsal side of the abdomen is, by a closer examination, characteristically different from that in *bovinus*.

T. sudeticus is much rarer than *bovinus*, but it is taken in most parts of Denmark; vicinity of Copenhagen, Ordrup Mose, Vordingborg; Funen at Lundeborg on the eastern coast; Lolland, and Jutland at Silkeborg and Hald. All my dates of capture are in July.

Geographical distribution: — Europe, but not with certainty recorded from the northern parts; in middle Europe it seems especially to occour in the mountains.

11. T. bromius L.

1761. Linné, Fn. suec. 463, 1885. — 1842. Zett. Dipt. Scand. I, 107 5. — 1862. Schin. F. A. I, 36. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 187, 45, Tab. III et VI, Fig. 45. — 1903. Kat. paläarkt. Dipt. II, 61.

Male. Eyes with one band; eye-facets in the two upper thirds much larger than below, the small facets not reaching the ocellar tubercle behind. At the upper eye-margin short yellow hairs, scarcely extending over the eye-margin. Frontal triangle grey, dark at the apex; face grey, greyish haired. Antennæ reddish, style dark; upper corner of first basal joint much produced over the second. Second joint of palpi (Fig. 38) yellowish grey, somewhat thickened especially beneath, ovate, apex somewhat truncate with a little point below; clothed with whitish and black hairs. Thorax grey with five pale stripes, on the disc clothed with longer brownish grey and shorter yellowish golden hairs; pleura and sterna pale haired. Præalar callus generally yellowish. Abdomen reddish with a broad dorsal line and apex black, or in other terms, black with reddish markings on the sides of the second and third segments; clothed with black and pale hairs, the latter forming triangles on the middle line and oblique spots on the sides; seen from behind the pale haired spots are silver grey pruinose. Venter reddish with a more or less interrupted middle line and the apex dark grey; the reddish markings may be restricted the venter then being more grey. Legs with the femora black; tibiæ rufous, apical half of front tibiæ black, posterior, especially hind, tibiæ darkened at the tips; front tarsi black, posterior tarsi dark brown; legs haired in the usual way with mostly pale hairs, on the outer side of the hind tibiæ with a not dense fringe of rather long, pale ciliæ intermingled with some black ones. Wings hyaline, veins brown. Halteres brown, peduncle a little paler.

Female. Eyes greenish with one diagonal band. Frontal band greyish yellow with parallel borders or slightly narrowed below; frontal callus quadratic, middle callus linear. The hind margin of the head along the upper eye-margin very narrow, with short yellow hairs. Second joint of palpi (Fig. 38) rather thick, very convex on the front side, with whitish and, on the outer side, black hairs. Abdomen with very small, reddish markings, or these sometimes wanting and hence the abdomen being dark grey with the three rows of pale haired spots very distinct.

Length 13—14,5 mm.

The pupa has a length of 18 mm.

T. bromius is a common species here and is frequently seen on cattle; vicinity of Copenhagen, Ordrup Mose, Donse, Frerslev Hegn, Jægerspris, Esrom Sø, Tiis Sø, Vordingborg; Funen at Lundeborg on the eastern coast; Lolland, and Jutland at Sveibæk near Silkeborg and at Silkeborg. My dates are $^{28}/_{6}$—$^{18}/_{8}$. The larva has been taken in Tiis Sø; the pupa developed on $^{4}/_{7}$.

Geographical distribution: — All Europe.

12. T. autumnalis L.

1761. Linn. Fn. suec. 462, 1883. — 1842. Zett. Dipt. Scand. I, 106, 2. — 1862. Schin. F. A. I, 35. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 192, 49. Tab. III et VI. Fig. 49. — 1903. Kat. paläarkt. Dipt. II, 59.

Male. Eyes dark, unicolorous; eye-facets in the upper part, from the apex of the frontal triangle, larger than below, the small facets forming a rather broad band along the hind margin to the ocellar tubercle. Face yellowish grey with pale yellow hairs, the cheeks with black hairs. Frontal triangle yellow, apex brown. Antennæ blackish brown to black, the basal joint has the upper corner much produced. Second joint of palpi long ovate, somewhat thicker towards the end and then pointed. Thorax blackish brown, slightly shining, with five greyish white stripes; clothed with blackish and yellowish golden hairs, the latter with a tendency to form stripes; pleura and sterna greyish haired. Præalar callus generally rufous. Abdomen brownish red with a broad, black dorsal line and, as a rule, the four last segments black, but sometimes the reddish markings reach farther back; a row of triangles in the dorsal middle line and a row of oblique spots on each side greyish white; abdomen clothed with black and yellow hairs, the latter clothing the triangles on the middle line and the oblique spots on the sides; the hind corners of the segments also pale and with pale hairs; seen from behind the pale haired spots are silvergrey pruinose. Venter reddish brown, greyish pruinose, with a black middle line and apex, the hind margins of the segments pale and with pale hairs. Legs with the femora black; tibiæ yellowish brown, the tips darkened, front tibiæ with the apical half or third part black; front tarsi black, posterior tarsi brownish. Femora clothed with long, brownish grey hairs, tibiæ with short, partly dark hairs, hind tibiæ with a fringe of black hairs on the outer side, sometimes intermingled with some pale ones. Wings hyaline with brown veins. Halteres with the peduncle brown and the knob whitish.

Female. Eyes unicolorous. Frontal band rather narrow, greyish yellow, frontal callus higher than broad, somewhat elliptical, prolonged upwards in the linear middle callus. Second joint of palpi somewhat thickened at the base, distinctly curved, produced in a rather long point, whitish with whitish and black hairs. Abdomen somewhat flat, black, the three rows of spots as in the male, but greyish white and much more distinct on the black ground. Venter grey with a black middle line. The tibiæ have more pale hairs than in the male, and the fringe on the hind tibiæ has often many pale hairs.

Length 17,5—19 mm.

The pupa has a length of 25—27 mm.

This species, which is intermediate in size between *bovinus* and the *Therioplectes*-species, is easily recognised by the eyes, the dark antennæ and also by the colour.

T. autumnalis is not an uncommon species here, though not as frequent as the preceding one; vicinity of Copenhagen, Frederiksdal, Fureso, Ruderhegn, Hillerød, Jægerspris, at Køge, Vemmetofte near Faxe and at Vordingborg; Lolland at Maribo; Langeland at Tranekær; Funen at Langensø, Odense and Lundeborg on the eastern coast, and Jutland at Horsens, Silkeborg and Hald. I have records of it from $^{4}/_{5}$ to $^{3}/_{8}$, the first date is, I think, exceptionally early. Pupæ have been taken in Ruderhegn in moist loam, and at Furesø; they developed from $^{25}/_{6}$ to $^{8}/_{7}$.

Geographical distribution: — All Europe to northern Sweden, in Syria and in northern Africa.

13. **T. Miki** Brauer.

1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 195, 52, Tab. IV et VI, Fig. 52. — 1903. Kat. paläarkt. Dipt. II, 67. — 1820. *T. græcus*, Meig. Syst. Beschr. II, 53, 30. p. p. (nec. Fabr.)

Eyes green with one band: eye-facets in the upper two thirds large, exept a band along the upper eye-margin reaching about to the ocellar tubercle; face yellow with yellow hairs, frontal triangle yellow, brownish below the apex. Upper eye-margin with rather short, black hairs, in the middle, at the ocellar tubercle, with yellow hairs. Antennæ reddish, style dark, basal joints dark grey; upper corner of first basal joint somewhat produced, third joint with the angle quite near to the base. Second joint of palpi (Fig. 39) ovate, pointed, yellow, with yellowish and black hairs. Thorax greyish black with five indistinct stripes, with blackish hairs intermingled with some golden; pleura and sterna yellow haired. Abdomen yellowish red, with a more or less broad, dorsal line and the last three segments black, clothed with black and yellow hairs in the usual way, the latter forming triangles in the middle and indistinct side spots; seen from behind the abdomen shows some silvergrey pruinosity. Venter yellowish red with greyish black apex, but without middle line, chiefly pale haired. Legs with the femora black; tibiæ yellowish, apical half of front tibiæ black; front tarsi black, posterior tarsi dark brown. Femora with long, yellow hairs, on the front femora more or less blackish; tibiæ with shorter, on the middle tibiæ yet rather long, yellow and black hairs; hind tibiæ with a fringe of rather long, black ciliæ on the outer

side. Wings hyaline with brown veins. Halteres brown with the apex of the knob pale.

Female. I do not know the female of this species, but I quote the following from Brauer. Eyes unicolorous. Frontal band high and narrow, frontal callus somewhat narrower than the band. Upper eye-margin with yellow and often at the sides some black hairs. Second joint of palpi (Fig. 39) slightly thickened and distinctly curved, sparingly whitish haired, with many short black hairs on the outer side. Venter reddish without middle line and with the apex grey.

Length 15 mm.

This species of which I only know the male, is in this sex characterised by the rather short but overhanging hairs on the upper eye-margin; the reddish venter without middle line seems to be a good character in both sexes. Brauer says in his discription of the male about the hairs at the upper eye-margin: „... lange schwarze nach vorne gekrümmte Haare". But his figure shows rather short hairs.

T. Miki is very rare in Denmark, and only three specimens have been caught in all, all males, one at Frederiksdal on 7/8 1903 (Larsen), one in Jutland at Horsens (H. I. Hansen) and one without locality (R. Stamm).

Geographical distribution: — The species has hitherto only been known from middle Europe, and it seems rare, but I think it has hitherto not always been recognised.

14. **T. maculicornis** Zett.

1842. Zett. Dipt. Scand. I, 117, 18. — 1849. ibid. VIII, 2939, 18. — 1880. Brauer, Denkschr. kais. Akad. Wissensch. Wien, XLII, 197, 53, Tab. IV et VI, Fig. 53. — 1903. Kat. paläarkt. Dipt. II, 67. — 1862. *T. glaucescens*, Schin. F. A. I, 36, p. p.

Eyes green with one band on the dividing line between the large and small facets; the facets in the upper two thirds larger than below, the small facets reaching as a band along the hinder eye-margin to the ocellar tubercle. The upper eye-margin with long, erect, overhanging black hairs. Frontal triangle greyish, with dark brownish apex; face light grey, with greyish white, on the cheeks brownish hairs. Antennæ yellowish red, basal joint somewhat grey with the upper corner somewhat produced. Second joint of palpi (Fig. 40) long ovate, with a distinct downturned point, yellowish white with pale and black hairs. Thorax brownish black, with five indistinct stripes, on the disc clothed with brownish hairs, which are paler on the front part, the scutellum and sometimes on the stripes; pleura

and sterna with long, greyish white hairs. Præalar callus most frequently dark. Abdomen short and somewhat narrow, black with small reddish side markings on second and third segments, and pale hind margins on the segments except the first, clothed with black and yellow hairs, the latter forming triangles in the middle line and more or less distinct spots on the sides; seen from behind the pale haired spots are more or less distinctly silvergrey pruinose. Venter grey with rather broad, pale hind margins of the segments, pale haired. Legs with the femora greyish black; tibiæ yellowish brown, front tibiæ with the apical half blackish, posterior tibiæ darkened at the tips; front tarsi black, posterior tarsi slightly brownish; posterior femora with long greyish, front femora with brownish hairs, tibiæ with short yellow and longer brown hairs, hind tibiæ with a fringe of brown ciliæ. Wings hyaline with brownish veins. Halteres brown, apex generally paler.

Female. Eyes green with one band, which is sometimes indistinct at the ends. Frontal band moderately high, grey, frontal callus a little higher than broad. Upper eye-margin broad, with erect, brownish hairs, which are, however, much shorter than in the male. Second joint of palpi (Fig. 40) somewhat thickened, considerably curved, with many black hairs at the outer side. Abdomen as in the male but generally quite brownish black, and the three rows of spots much more distinct.

Length 11—13,5 mm.

The pupa has a length of 17 mm, it has the two median of the four transverse tubercles somewhat distant; the tubercles lying above in a triangle are very small.

This species is in the male distinguished from *bromius* by the erect hairs along the upper eye-margin, and from *Miki* by the darker abdomen and the longer erect hairs at the eye-margins; in the female it is especially distinguished by the broad upper eye-margin, finally in both sexes it is distinguished from *Miki* by its dark venter and from both the above species by its smaller size.

T. maculicornis is not uncommon here, though scarcely as common as *bromius*; vicinity of Copenhagen, Dyrehaven, Søllerød, Hillerød, Esrom So, Tidsvilde and at Soro; Funen at Langensø; Jutland at Horsens and at Funder near Silkeborg. I have records of it from $^{3}/_{6}$—$^{11}/_{7}$. The larva was found at Søllerød in boggy soil on $^{3}/_{5}$, it transformed to pupa on $^{5}/_{5}$, and the imago emerged on $^{21}/_{5}$.

Geographical distribution: — Europe, in north to northern Sweden and in south to France.

Leptididae.

Head generally short, sometimes very short, more or less semi-globular, sometimes less so on account of the upper front part, or the face being flattened, as broad as or narrower than the thorax. Yowls very slightly, or not at all produced below the eyes. Antennæ placed near to each other in the middle of the head or generally lower down: they are three-jointed, the two basal joints are generally short, the third may be of different form, somewhat bulb-like, ending in a long arista, or oval and compressed with a thin style, or finally produced downwards, reniform, with an arista going out from the upper part of the front edge. I term the antennæ three-jointed, as I could in no case detect any separation between the arista or style and the basal part of the third joint, it seems that the third joint in all cases forms an undivided totality. Eyes bare, touching in the males, widely separated in the females. In the males the facets are either of equal, or almost equal size, or the upper facets are larger than the lower, and the dividing line sharp. Three ocelli present. The parts surrounding the mouth aperture are chitinised, and there is thus no oral cone; the epistoma is very distinctly separated from the cheeks by a deep impression on each side, the impressed lines thus formed unite above, below the antennæ; the epistoma itself is much arched; the clypeus is not separated. The proboscis is rather short (the genus *Lampromyia*, including southern species, has a long, slender proboscis); the labella are moderately broad, longer than the basal part of the labium, forming an oval plate when spread out. Labrum, hypopharynx and maxillæ are much similar to the same parts in the *Tabanidæ*; they are about of the length of the proboscis, the hypopharynx sometimes shorter; the maxillæ are semitubular; there are two-jointed maxillary palpi, the basal joint being sometimes small and indistinct. In the genera *Atherix* and *Symphoromyia* mandibles are also present in the females; these genera thus being very similar to the *Tabanidæ*. Thorax rectangular or quadratic, generally somewhat arched above; metapleura with long hairs. Abdomen more or less long and slender, as a rule nearly cylindrical, consisting of seven segments, truncate at the apex in the males, tapering in the females. Legs long, without bristles, coxæ long, front tibiæ without apical spurs (*Rhagio* and *Lampromyia* with one), the middle tibiæ with two, and the hind tibiæ with one or two apical spurs. The front tarsi sometimes with some long, fine hairs. Claws simple; two pulvilli and a pulvilliform empodium. Wings rather broad; costa extended all round the margin, this and the subcostal vein finely spinulous; radial vein

present; cubital vein forked: the discal cell formed exclusively of the discal vein, a postical cross-vein present; two cubital and five posterior cells; the basal cells of equal length, the anal cell produced to or near to the margin, open or closed. Alula distinct, rounded; squamulæ alares well developed, but not covering the halteres, roundish, with one ore more fine fringes at the edge or almost bare, squamulæ thoracales not developed, but the frenum distinct, especially towards the angulus. In rest the wings are borne half open.

The larvæ are elongated, the body consists of twelve segments; the abdominal segments have often transverse swellings on the ventral surface: the last segment generally with some teeth or spine-like warts on the apex. They are amphipneustic with prothoracic and terminal spiracles, the latter sometimes lying between a pair of transverse lips; in one case (*Atherix*) the larva is recorded to have tracheal gills. The pupa is free, it has generally some (6) spines on the apical segment. The larvæ are carnivorous and feed on other larvæ, earthworms and the like, or they penetrate into and devour beetles; they live in the earth or beneath the carpet of leaves in woods, or (*Atherix*) in water; the larva of *Rhagio* (southern species) forms funnels in the ground as the *Myrmeleon*-larva. The pupæ are found in the earth.

The Leptids are small to rather large flies; they are rapacious and feed on other Insects; they generally occur in woods in shady places where they are sitting on stems of trees, watching for prey, some species occur also in low herbage especially in damp places in thickets. It is recorded that the females of some species bite and suck blood like Tabanids. Thus Osten Sacken has recorded it with regard to an American species of *Symphoromyia*, and it is said of a South American species (*Trichopalpus obscurus*) and finally of *Leptis strigosa* and of both sexes of *L. scolopacea*. As the females of *Symphoromyia* have mandibles, it is not improbable that these may suck blood which then perhaps also holds good of *Atherix*, but I think it not very probable with regard to *Leptis*, and I never observed it in *L. scolopacea* which is a common species in Denmark.

Of the family about 90 species are known from the palæarctic region, and a similar number from North America; none are known to be common to both regions.

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

Leptids earlier recorded from Denmark — The first Leptid recorded from Denmark is *Musca tringaria*, found in the appendix to O. F. Müller: Flora Fridrichsdal., 1767; this common species was probably correctly determined. Then follows in 1794 Fabricius: Entom. Syst. IV. with *Rhagio vanellus* = *Leptis tringaria*, *R.*

tomentosus = *Chrysopilus auratus* and *R. lineola*. In Syst. Antl. 1805 he enumerates *Leptis vanellus* = *tringaria*, *Atherix aurata* and *tomentosa*, both = *Chrysopilus auratus*, and *A. lineola* = *L. lineola*. According to this the species *Ch. auratus* F. and *L. lineola* F. are originally established on Danish specimens. Zetterstedt has in Dipt. Scand. I, 1842, *Leptis scolopacea*, *tringaria*, *annulata*, *lineola*, *Chrysopila atrata* = *aurata*, *Atherix crassicornis*, *Ibis* and *Ptiolina nigra*. In VIII, 1849 he adds *Chrysopila diadema* = *aurea*, and in XII, 1855 he moreover adds *Ptiolina nigrina*. Now Zetterstedt has with great probability had only one species of *Ptiolina* from Denmark, and this is *P. obscura* Fall. (see under this species). Zetterstedt thus knew nine Danish species in all. — In the present paper 15 species are enumerated.

Table of Subfamilies and Genera.

1. Hind tibiæ with two apical spurs, front tarsi with some long, delicate hairs; eye-facets in the male of equal size or slightly different, without any dividing line ... 1. *Leptidinae.*
— Hind tibiæ with one apical spur, front tarsi without long hairs; eye-facets in the male of different size, the dividing line sharp ..... 2. *Chrysopilinae.*

1. Leptidinae.

1. Third joint of antennæ produced downwards, reniform; anal cell closed ..... 1. *Atherix.*
— Third joint of antennæ bulb-formed; anal cell open.. 2. *Leptis.*

2. Chrysopilinae.

1. Third joint of antennæ bulb-formed; palpi directed upwards; anal cell closed ..... 3. *Chrysopilus.*
— Third joint of antennæ not bulb-formed; palpi not directed upwards ..... 2.
2. Third joint of antennæ produced downwards, reniform; anal cell narrowly open ..... 4. *Symphoromyia.*
— Third joint of antennæ oval, compressed, with an apical, slender style; anal cell closed ..... 5. *Ptiolina.*

1. **Atherix** Meig.

Species of middle size or smallish, generally with spotted wings. Head somewhat small, as broad as thorax or almost so, somewhat semiglobular but flattened on the upper front side. Antennæ inserted below the middle; yowls only slightly descending below the eyes, the epistoma strongly impressed. Antennæ short, three-jointed, the two basal joints of equal length, the third produced downwards, somewhat

reniform with an arista going out from the upper part. Eyes bare, the facets in the male slightly unequal. With regard to the mouth parts I have not been able to examine these in any other way than with a lense and in situ, I therefore chiefly am obliged to refer to the description given by Becher, (Denkschr. d. Kais. Akad. d. Wissensch. Wien, Math. nat. Classe, XLV, 1882, 143, Taf. II, Fig. 20). The clypeus is not separated; the proboscis is rather short (longer in *marginata* than in *ibis*), the labella are long oval, not broad, longer than the basal part of the labium. There is a difference in the mouth between the sexes. The females have, as in the Tabanids, both mandibles and maxillæ, these are formed about as in the Tabanids; the labrum is of the length of the proboscis, pointed, the hypopharynx is shorter. In the males the mandibles are wanting, and Becher says: „Diesen (the males of *Atherix* and *Symphoromyia*) scheint aber noch ausserdem auch die Stechborste (hypopharynx) zu fehlen", this statement is, I think, not correct. (see about the question under *Symphoromyia*). There are two-jointed maxillary palpi, the second joint is long, somewhat curved. Thorax is nearly quadratic. Abdomen is somewhat elongated, consisting of seven segments. The male genitalia are somewhat knob-like with a pair of styles. The front tibiæ without apical spurs, the posterior tibiæ with two apical spurs; the front tarsi long with some curious, delicate, longish hairs on the under side. Wings with the anal cell closed.

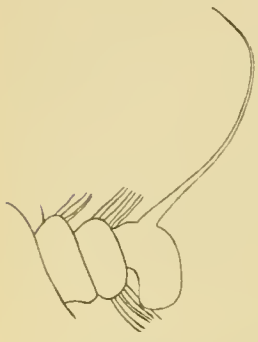


Fig. 41. Antenna of *Atherix ibis*.

The larva is described and figured by Dufour (Ann. de la Soc. Ent. de Fr. Sér. 4, II, 1862, 131, Pl. II, fig. 2) and Brauer (Denkschr. d. Kais. Akad. d. Wissensch. Wien, Math Nat. Classe, XLVII, 1883, Tab. III, Fig. 48—51). It is elongated, the body consists of twelve segments; on the ventral surface of each abdominal segment there is a pair of prolegs, which are spined at the ends. The head is small, it has a median, somewhat hooked labrum, mandibles which are serrated on the outer margin, and maxillæ with two-jointed palpi. The last segment terminates in a pair of longish, pointed, densely haired prolongations. On the sides of the segments there are slender, thread-like appendages. The larva is recorded to have no spiraeles but the thread-like appendages are declared to be tracheal gills. — The pupa has a girdle of eight bristles above on the abdominal segments.

The females deposite their eggs on dead branches at water, and they rest there and die; many females deposite their eggs on the

same branch so that the eggs together with the dead imagines form large incrustations, the whole held together by a glue-like substance. The larvæ live in water.

The species which are very rare here occur in the vicinity of water.

Of the genus 6 species are known from the palæarctic region, 2 have been found in Denmark.

Table of Species.

1. Legs more or less yellow, thorax blackish brown, slightly shining . . . . . 1. *ibis*.
— Legs black or brown, thorax shining black . . . . . 2. *marginata*.

1. **A. ibis** Fabr.

1798. *Rhagio*, Fabr. Suppl. Ent. Syst. 556. ♂. — 1805. *Leptis*, Fabr. Syst. Antl. 70, 5. — 1842. Zett. Dipt. Scand. I, 226, Obs. et 1848. ibid. VIII, 2990, Obs. — 1862. Schin. F. A. I, 179. — 1903. Kat. paläarkt. Dipt. II, 77.

Male. Eyes metallic green, reddish below; the facets sligthly larger above than below. Front dark grey or greyish brown, cheeks and yowls of the same colour, all cloted with long, brownish hairs. Antennæ greyish black. Thorax blackish brown, slightly shining, with the lateral margin and two longitudinal lines grey. Scutellum blackish brown. Pleura and sterna grey. Thorax clothed with somewhat longish, brownish or greyish hairs; a tuft of hairs on the mesopleura in front of the wing-root. Abdomen yellowish red, first segment black, on the second, third and fourth a more or less triangular or transversely rhomboidal, black spot in the middle, and small, triangular, black spots at the side margins; the median spot on the second segment is confluent with the black first segment, and sometimes it is produced along the front margin of the segment; on the fifth segment a broad, black, transverse band, widened in the middle, only leaving the front and hind margins narrowly yellow; the apical segments more or less black. Venter yellowish red; first segment black, second, third and fourth segments with black middle spots, on the following the front margins broadly black. Abdomen clothed with yellow hairs, those situated in the black parts are partly black. Legs rufous; coxæ dark grey; the anterior femora with the base darkened to a higher or lower degree; the tarsi brownish black towards the ends. The legs may vary considerably in colour, some specimens having all the femora nearly quite black, the hind tibiæ black except the base and the hind tarsi quite black. Legs with short, brownish black hairs, on the under side of the anterior femora longer hairs, the hind tibiæ on the outer side with a fringe of not long hairs. Wings hyaline

with brown or blackish brown spots, chiefly forming three more or less dissolved and towards the hind margin narrowed, transverse bands and generally two paler spots near the apex: veins blackish brown. Halteres dark greyish brown with a paler peduncle.

Female. Eyes brown, faintly iridescent. Abdomen grey, the segments with black, laterally tapering and pointed, transverse bands at the front margins, not reaching the side margins; the bands largest on the front part of the abdomen being smaller backwards, the last segments grey; the hind margins of all segments narrowly pale. Venter grey with broad, yellowish hind margins of the segments.

Length 8,5—10 mm.

A. ibis is very rare in Denmark, only nine specimens have been taken in all, and it has only been taken in the southern and middle Jutland; Holsted (Carl Møller), at Vejle (A. Petersen) and in Greisdalen near Vejle (Schlick), at Funder near Silkeborg (A. Petersen) and at Randers (Holstebro); the dates of capture are $^{3}/_{6}$—$^{6}/_{7}$.

Geographical distribution: — The species is widely distributed through Europe, in Siberia and in Japan; in the northern Europe it is very rare, but it goes far north, a specimen having been taken in Lapland.

2. A. marginata Fabr.

1781. *Bibio*, Fabr. Spec. Ins. tt. 413, 6. — 1842. Zett. Dipt. Scand. I. 225, 2. — 1862. Schin. F. A. I, 178. — 1903. Kat. paläarkt. Dipt. It. 77.

Male. Front black, with long, black hairs, face grey, with long, brownish grey or whitish hairs Antennæ brownish black. Thorax and scutellum black, shining, clothed with somewhat longish, brownish black hairs; pleura and sterna light grey, a tuft of hairs on the mesopleura in front of the wing-root. Abdomen dull black with the hind margins of the segments whitish grey; when seen with the light falling in from behind, the first two segments are almost quite grey except in the middle; the last two segments are entirely black. Venter grey. Abdomen clothed with pale, yellowish grey hairs, but with black hairs along the middle of the dorsal side. Legs brownish black or brown; anterior femora on the under side with longish, pale or brownish hairs, the hind femora with shorter, pale hairs both above and below; the hind tibiæ with a fringe of short, brown hairs on the outer side. Wings hyaline with brownish fumigation, chiefly forming three transverse bands, one occupying the base, the second lying outwards to the middle and the third occupying the apical part, the last is not so dark as the others; the bands are separated by somewhat narrow, hyaline parts, the inmost of these forming a hyaline spot at

the tips of the basal cells. Veins brown. Halteres brownish with somewhat paler peduncle.

Female. Front black in the middle, whitish grey at the sides. Thorax with four whitish grey stripes, the outer placed at the margins, the stripes often only to be seen on the anterior part. The basal part of the wings generally more hyaline than in the male.

Length 7,5—8 mm.

A. marginata is still rarer than the preceding species, only one Danish specimen exists but without particular locality.

Geographical distribution: — Europe; its northern limit is in southern Sweden.

2. **Leptis** Fabr.

Species of middle or rather large size, of somewhat slender form, the colour is yellowish with more or les extended black designs. The head is very short, otherwise somewhat semiglobular, narrower than, or as broad as, thorax. The antennæ are inserted near to each other, far below the middle. The yowls not descending below the eyes. Antennæ three-jointed, the apical joint somewhat bulb-shaped, terminating in a long arista not separated from the basal part of the joint. The eyes are bare with the facets of equal or nearly equal size. The mouth parts are not different in the two sexes; the proboscis is not long, the basal part of labium short, the labella somewhat broad and much longer than the basal part of labium, somewhat protruding; labrum nearly of the length of the proboscis, pointed, hypopharynx a little shorter and more slender than labrum, truncate at the apex; the maxillæ somewhat semitubular, pointed, as long as the labrum; the maxillary palpi are indistinctly two-jointed, the basal joint very small, the apical joint long, somewhat curved, pointed and densely haired; it is lying along the proboscis. Thorax rectangular, somewhat arched. Abdomen long, somewhat slender, nearly cylindrical, consisting of seven not transformed segments; in the males it is truncate at the end, the genitalia being somewhat knob-like with more or less hookformed lateral lamellæ; in the females the abdomen is somewhat more robust but tapering towards the apex, the last, transformed segments forming an ovipositor, terminating in two small lamellæ. The legs are long; the front tibiæ without, the posterior tibiæ with

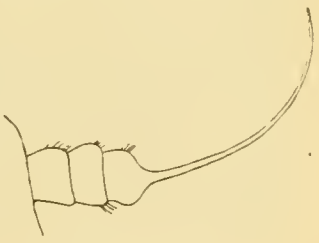


Fig. 42. Antenna of *L. tringaria*.

two apical spurs; the front tarsi have, as in *Atherix*, some delicate hairs on the under side. The wings are long and broad; the anal cell

Fig. 43. Wing of *L. tringaria*.

open. Squamulæ distinctly fringed at the margin with two fringes, turned more or less distinctly up and down.

The larvæ of several species have been described by Bouché (Naturgesch. der Ins. 1834, 44, Tab. IV, Fig. 11—15) and Beling (Archiv für Naturgesch. Jahrg. 41, 1875, 48—52, and Jahrg. 48, 1882, 190—93.) They are elongated, nearly cylindrical, of white or yellowish colour, with some brown fields and spots on the dorsal surface of the two first thoracic segments. The body consists of twelve segments. The mouth parts consists of a median labrum, rather strong mandibles, which are hookformed, truncate at the ends and somewhat diverging, and maxillæ which are somewhat scaleformed and less chitinised, with two-jointed palpi. There are two-jointed antennæ, sitting on a spined piece. The abdominal segments have each a transverse, furrowed swelling on the ventral surface at the anterior margin. The last segment terminates in four, conical, pointed warts. The larva is amphipneustic with small prothoracic spiracles and a pair of larger ones on the last segment between the warts. — The pupa has the antennal sheaths lying on the under side of the head, directed to each side; the sheaths of the wings and legs reach to the posterior margin of the second abdominal segment. There is a pair of small, round prothoracic and seven pairs of somewhat protruding abdominal spiracles. The abdominal segments have each, except the first, at the hind margin a girdle of short, strong spines, these being shortest on the ventral side; on the dorsal side there is a pair of stronger spines in the middle of the segments; the last segment terminates in six conical spines, four in a curved line above and two below.

The larvæ live in the earth, they are carnivorous and devour other larvæ or penetrate into beetles which they devour; they also feed on earth-worms as stated by Marchal with regard to *L. tringaria* (Bull. de la Soc. Ent. de Fr. 1903, 233). They hibernate and the transformation to pupæ and development of the imago take place in the following summer.

The species of *Leptis* are rather characteristic by their long, somewhat slender shape, short head and large wings. They occur especially in woods and are found sitting on stems of trees watching for prey such as small Diptera etc., and they are exclusively carnivorous; they may also be found in low herbage.

Of the genus 35 palæarctic species are known, of which 7 have hitherto been found in Denmark.

Table of Species.

1.	Wings spotted	1. *scolopacea.*
—	Wings unspotted	2.
2.	Stigma present	3.
—	Stigma absent (or at all events only a very slight trace present)	6.
3.	Stigma divided into two parts (when one of the parts is indistinct the stigma is in this case at all events very small)	4.
—	Stigma not divided, large and distinct	5.
4.	Thorax quite grey with greyish stripes, scutellum grey; abdomen with black middle spots	2. *maculata.*
—	Thorax grey on the disc with two yellow stripes, the sides more or less yellow, scutellum yellow; abdomen without black middle spots	3. *immaculata.*
5.	Scutellum grey, thorax distinctly striped; larger species	4. *notata.*
—	Scutellum yellow, thorax not, or indistinctly striped; smaller species	5. *lineola.*
6.	Thorax more or less yellowish, scutellum yellow; coxæ yellow	6. *tringaria.*
—	Thorax and scutellum grey; coxæ grey	7. *annulata.*

1. L. scolopacea L.

1761. *Musca*, Linn. Fn. Suec. 1788. — 1842. Zett. Dipt. Scand. I, 216, 1. — 1862. Schin. F. A. I, 172. — 1903. Kat. paläarkt. Dipt. II, 81.

Male. Front and face grey; the back of the head also grey, with longish, white hairs. Antennæ yellow, arista brown. Second joint of palpi yellow. Thorax grey, with two narrow, longitudinal stripes and the side margins whitish grey, and in the middle a narrow, whitish grey line; humeral callus yellow. Pleura and sterna grey. The thoracic disc with short, black hairs, the metapleura with long, white hairs; scutellum grey, sometimes a little yellowish at the extreme apex. Abdomen reddish yellow with somewhat triangular or rhomboidal, or sometimes almost roundish, black spots along the dorsal middle line, and longitudinal, black spots along each side, the latter often confluent to a black, marginal stripe; the last segment quite black. Venter yellow, the last two or three segments black. Abdomen with black hairs on the dorsal side, on the venter with pale hairs.

Legs yellow; the posterior coxæ grey; the tarsi brownish towards the ends; front and hind femora sometimes with a more or less distinct, blackish ring at the apex. The coxæ, especially the anterior, with long, white hairs, for the rest the legs with short, black hairs; the tibiæ finely spinulous. Wings hyaline, brownish spotted, all cross-veins, the base of the radial and of the fork of the cubital vein, a spot from the stigma downwards and the apex of the wing being brownish fumigated, the posterior margin also slightly fumigated; the veins and stigma brown. Halteres yellow.

Female. Front grey or brownish grey, ocellar tubercle blackish. Thorax often more brownish than in the male, and the grey stripes broader in such a way that the thorax may be termed grey with narrow, brownish stripes. Apex of scutellum a little more yellow than in the male. The pleura and the præalar and postalar calli more or less yellowish.

Length. The species varies very much in size, the length being 8—14 mm.

The pupa is brown, it has a length of 12—13 mm.

L. scolopacea is a common species, and it has been taken in nearly all parts of Denmark; it occurs especially in the herbage near water. My dates are $^{3}/_{6}$—$^{8}/_{7}$. The pupæ have been taken in Dyrehaven, Ruderhegn, Donse and Grib Skov in the earth and in decaying tree-stubs, they were taken on $^{11}/_{4}$, $^{5}/_{5}$, $^{27}/_{5}$ and $^{15}/_{6}$ and they developed respectively $^{28}/_{4}$, $^{14}/_{5}$, $^{1}/_{6}$ and $^{21}/_{6}$.

Geographical distribution: — All Europe, towards north to the northernmost Scandinavia.

2. **L. maculata** Deg.

1776. *Nemotelus*. Degeer, Ins. VI, 69, 3. — 1842. Zett. Dipt. Scand. I, 220, 7. — 1862. Schin. F. A. I, 173. — 1903. Kat. paläarkt. Dipt. II, 80.

Male. Front and face grey, the back of the head grey with longish, white hairs. Antennæ yellowish, arista brown. Second joint of palpi whitish yellow. Thorax grey, with two longitudinal stripes and the lateral margins whitish grey; sterna and pleura grey. Thorax with somewhat longish, black hairs on the disc, metapleura with long, white hairs. Scutellum grey with long, black hairs. Abdomen yellowish; first segment darkened at the base, the following segments with brown middle and side spots, from the fourth or fifth segment these spots are confluent, forming transverse, posteriorly sinuate bands, which are broader on the following segments; the last segment black. Venter yellow, apex black. Abdomen clothed with black hairs on the dorsal side, the venter with pale hairs. Legs yellow; the coxæ grey; front

and hind femora with broad, brownish rings nearest to the apex; tarsi somewhat darkened towards the ends, and the hind tibiæ also slightly darkened at the ends. Coxæ, especially the anterior, long haired, for the rest the legs are short haired; the tibiæ very finely spinulous. Wings slightly yellowish with brown veins, the stigma brownish, divided into two spots lying in the subcostal cell, one below the apex of the mediastinal vein, the other at the apex of the cubital vein. Halteres yellow.

Female. Abdomen with the middle and side spots confluent on all segments, forming, often rather broad, transverse, posteriorly sinuous bands.

Length 8,5—10 mm.

L. maculata is rare in Denmark, and I only know it hitherto from Langeland and Jutland; Langeland at Tranekær and in Aaso Skov (Schlick); Jutland in Greisdalen at Vejle, Rye Nørreskov at Himmelbjærget (Schlick) and at Silkeborg (A. Petersen). My dates are $^{3}/_{6}$—$^{6}/_{7}$.

Geographical distribution: — Northern and middle Europe from middle Sweden to northern France.

3. **L. immaculata** Meig.

1804. *Rhagio*, Meig. Klass. zweifl. Ins. 1, 301, 8. — 1862. Schin. F. A. 1, 173. — 1903. Kat. paläarkt. Dipt. II, 79. — 1842. *Leptis stigmatica*, Zett. Dipt. Scand. 1, 218, 4.

Male. Front and face grey; the back of the head grey with long, white hairs. Antennæ yellow, arista yellowish brown. Second joint of palpi yellow. Thorax grey on the disc, with two yellow, posteriorly disappearing stripes, and with the margin yellow; humeral, præalar and postalar calli yellow; pleura yellow; sterna for the most part grey. Scutellum yellow. Thorax sparingly and very short haired, and the scutellum also short haired; metapleura with rather few, not long, brown hairs. Abdomen yellowish red, without spots, only the two or three last segments with black front margins, and the recurved lateral parts of third, fourth and fifth dorsal segments with small, black spots. Venter yellow, apex black. Abdomen dorsally with short, black hairs, venter pale haired. Legs yellow; tarsi blackish towards the ends. The coxæ distinctly but shorter haired than in the preceding species, the legs for the rest short haired; tibiæ finely spinulous. Wings distinctly yellowish, especially at the base and the interior margin; the veins dark brown, rather thick; stigma brown, it is divided into two spots, lying as in *maculata*, but the spot below the apex of the mediastinal vein is generally indistinct. The wing membrane is strongly glistening. Halteres yellow.

Female. I do not know the female; it is described as having the yellow thoracic stripes much broader than in the male, the case, I think, being the same as in the two sexes of *scolopacea*.

Length 9,5—10 mm.

This species is of a somewhat robust shape; it and the preceding one are easily distinguished from the other species by the divided stigma; when the inner part of the stigma is indistinct, as in the present species, the species is still distinguished by the small stigma from the species with undivided stigma. The species *maculata* and *immaculata* are easily distinguished from one another by the colour of thorax and abdomen.

L. immaculata is very rare in Denmark, only two specimens have been taken many years ago, and no particular locality is recorded.

Geographical distribution: — Northern and middle Europe, but rare in the northern parts; its northern limit lies in southern Sweden.

4. **L. notata** Meig.

1820. Meig. Syst. Beschr. II, 95, 11. — 1862. Schin. F. A. I, 174. — 1903. Kat. paläarkt. Dipt. II, 81.

Male. Front and face grey, cheeks, yowls and the back of the head with long, whitish hairs. Antennæ and palpi blackish. Thorax blackish grey with two greyish white, longitudinal lines, and a similar, fine line in the middle, the margin is also pale grey; pleura, sterna and scutellum grey. Thorax clothed on the disc with long, black hairs, the metapleura with a tuft of yellow hairs. Abdomen reddish yellow; the first segment black, the three following segments with black middle spots and narrow, longitudinal side stripes, the latter confluent to a marginal stripe; the last segments black. Venter yellow with the last segments black. Abdomen clothed on the dorsal side with longish, black hairs, venter yellow haired. Legs yellow; the coxæ black and the femora black to a higher or lower degree, generally the front and hind femora black except the tips, the middle femora more or less black at the base; the hind tibiæ darkened towards the apex; the tarsi brownish black towards the tips. The coxæ clothed with long, whitish hairs, for the rest the legs are more, or less short haired with black hairs; the tibiæ distinctly spinulous. Wings yellowish, the veins blackish brown; the stigma long, distinct, brown. Halteres yellow.

Female. I do not know the female, it is recorded to resemble the male, sometimes with the middle femora more yellow.

Length 10,5—11,5 mm.

L. notata is, like the two preceding species, rare here, and it has

only been taken on Langeland and in Jutland; Langeland at Tranekær and in Aasø Skov (Schlick); Jutland in Greisdalen near Vejle (Schlick); all the specimens captured are males; the dates are only $^{7}/_{6}$—$^{23}/_{6}$.

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

5. L. lineola Fabr.

1794. *Rhagio*, Fabr. Ent. Syst. IV, 275, 17. — 1842. Zett. Dipt. Scand. I, 221, 8. — 1862. Schin. F. A. I, 174. — 1903. Kat. paläarkt. Dipt. II, 80.

Male. Front dark grey, face and the back of the head grey, cheeks, yowls and the back of the head with long, white hairs. Antennæ light brown; second joint of palpi brownish. Thorax grey, humeral callus small, yellowish, the præalar callus, when seen from in front, whitish grey; pleura and sterna grey, the metapleura greyish yellow, with long, yellowish white hairs. The thoracic disc with long, yellow hairs. Scutellum yellow. Abdomen yellow, from the second segment with large, triangular, brown or blackish brown middle spots, increasing in size towards the apex and hence on the fifth and sixth segments, sometimes also on the fourth, forming transverse bands; the seventh segment black. Venter yellow with the apex, or the apical half, black. Abdomen clothed with long, yellow hairs. Legs yellow; the posterior coxæ somewhat greyish at the base; the trochanteres brown; the tarsi brownish, towards the ends blackish brown; the front and hind femora with a, generally somewhat indistinct, brownish ring at the ends, and the tibiæ generally slightly darkened at the ends. The coxæ, especially the anterior, with long hairs, for the rest the legs are short haired, only the anterior femora with slightly longer hairs; the tibiæ finely spinulous. Wings yellowish with brownish veins; the stigma brown. Halteres yellow.

Female. Front grey; the abdominal spots generally somewhat larger than in the male, for the rest quite agreeing with it.

Length 6—8 mm.

This species is easily distinguished from the preceding one by its unstriped thorax, yellow scutellum and smaller size.

L. lineola is rather common here and it is known from almost all parts of Denmark; it occurs not so early as the preceding species, but it may be taken rather late, my dates are $^{27}/_{6}$—$^{18}/_{9}$. It occurs on meadows in low herbage and on bushes, but also in woods on stems of trees. It is not rarely found beset with developmental forms of a *Trombidium*, I once took it in great numbers on stems of spruce fir in Charlottenlund, all individuals highly infested with the *Trombidium*;

I think the *Trombidium* gets on just when the *Leptis* leaves its pupa skin.

Geographical distribution: — Northern and middle Europe, from the northernmost Scandinavia to France.

6. L. tringaria L.

1761. *Musca,* Linn. Fn. Suec. 1789. — 1842. Zett. Dipt. Scand. I, 217. 2. — 1862. Schin. F. A. I, 174. — 1903. Kat. paläarkt. Dipt. II, 82.

Front and face yellowish grey, the back of the head grey; cheeks, yowls and the back of the head with long, pale yellowish hairs. Antennæ yellow, greyish at the base, arista brown. Second joint of palpi yellow. Thorax greyish, more or less yellow pruinose, with two, lighter yellow, longitudinal lines, and often a similar coloured narrow line in the middle; the humeral and postalar calli yellow; sterna and pleura grey, pteropleura and metapleura often more or less yellowish. Scutellum yellow. The thoracic disc with short, sometimes yellowish, but generally black hairs, scutellum with longer, black hairs; metapleura with longish, yellow hairs. Abdomen reddish yellow, from the second segment with smallish, more or less roundish, black middle spots and narrow, longitudinal, marginal spots, the latter generally confluent, forming a black, marginal line; the last, or the last two segments black; the middle spots may diminish or be quite wanting, and the abdomen is then entirely reddish yellow, only with small marginal spots and more or less black apex (var. *vanellus*). The abdomen is clothed with black hairs. Legs yellow; tarsi brown, blackish brown towards the ends; sometimes the hind tibiæ brown at the apex. The coxæ, especially the anterior, with long, pale hairs, for the rest the legs are short haired; the tibiæ finely spinulous. Wings yellowish, at the base and the anterior margin yellow, veins brown; no stigma. Halteres yellow.

Female. Front yellowish. Thorax generally more yellowish than in the male, and the yellow stripes often broader, then thorax may be termed yellowish with three broad, dark lines, the middle one sometimes divided by a narrow, yellow line.

Length. This species, as *scolopacea*, may vary considerably in size, the length being 8.5—14 mm.

This species, as seen in the description, may vary somewhat in colour, but yet it is easily distinguished from all the preceding by the almost total absence of a stigma, and from the following by the colouring.

L. tringaria occurs very commonly all over Denmark. It is especially found in woods where it is seen sitting on stems, often in

somewhat shaded places, watching for prey, but it may also be seen in lower herbage. My dates are $^{29}/_{6}$—$^{22}/_{8}$.

Geographical distribution: — Europe, towards north to northern Sweden, but there rare.

7. **L. annulata** Deg.

1776. *Nemotelus*, Degeer, Ins. VI, 69, 2. — 1842. Zett. Dipt. Scand. I, 219, 5. — 1862. Schin. F. A. I, 175. — 1903. Kat. palăarkt. Dipt. II, 78.

Male. Front, face and the back of the head grey: the cheeks, yowls and back of the head with long, white hairs. Antennæ black, somewhat greyish, arista black. Second joint of palpi grey with long, white hairs. Thorax dark grey, with two longitudinal stripes and the lateral margin lighter grey, generally also with a narrow, light grey middle line. Scutellum, sterna and pleura grey. The thoracic disc clothed with somewhat longish, yellowish hairs, in front of the wing-root with somewhat longer and stronger, black hairs; the metapleura with long, pale hairs, intermingled with some black ones. Abdomen yellowish, first segment black, the following segments with large, longitudinal, black middle spots and narrow side spots, the latter confluent to a marginal line; the middle spots are only narrowly separated at the incisures; the fifth segment is black with a yellow hind margin, the two last segments are black. Venter yellow with black apex. Abdomen clothed with longish, yellowish hairs. Legs yellow; the coxæ grey; the trochanteres brownish black; the tarsi brownish, towards the ends blackish. The coxæ, especially the anterior, with long, pale hairs, for the rest the legs are short haired; the tibiæ distinctly spinulous. Wings yellowish, especially at the base and the anterior margin, veins brown; there is only a very faint trace of a yellowish stigma. Halteres yellow.

Female. Front greyish. The longitudinal thoracic lines slightly broader than in the male. The black abdominal spots large, the middle and side spots often confluent, and thus the segments quite greyish black, only with yellow hind margins, dilated near the sides. Venter greyish black.

Length 8—10 mm.

This species is distinguished from the preceding, with which it has the absence of the stigma in common, by its different coloration.

L. annulata is not common here; Ermelund, Dyrehaven (the author), Hillerød (Godskesen); Lolland in Merrits Skov (Schlick); all the specimens have been taken on $^{11}/_{6}$ and $^{13}/_{6}$.

Geographical distribution: — Middle and northern Europe, from

the middle of Sweden to Austria; in south it seems especially to occur in the mountains.

3. **Chrysopilus** Macq. (1826).

(Chrysopila Macq. 1834).

Middle sized or small species of slender form, generally more or less clothed with golden hairs which, however, are easily rubbed off. Head as broad as, or broader than, the thorax, somewhat semiglobular, but flattened or excavated on the lower front part. Antennæ inserted rather near to each other, a little below the middle. Face flat or somewhat excavated, but the epistoma much arched, the yowls not produced below the eyes. Antennæ three-jointed and of a shape quite as in *Leptis*. Eyes bare, the facets in the upper part larger than below, the dividing line sharp. The mouth parts chiefly as in *Leptis*; proboscis not long, the basal part of labium short, the labella moderately broad, much longer than the basal part of labium, somewhat protruding; labrum, hypopharynx and maxillæ as in *Leptis*, but the hypopharynx of the same length as labrum; the maxillary palpi indistinctly two jointed, the basal joint very small, the second joint long, slender and in contradistinction to the case in *Leptis* it is here curved upwards towards the epistoma and set with long and strong bristles. Thorax is rectangular, somewhat arched. Abdomen as in *Leptis*, consisting of seven segments. The legs long; the front tibiæ without apical spurs, the middle tibiæ with two and the hind tibiæ with one apical spur; the front tarsi without longer hairs. The wings with the anal cell closed; the squamulæ with one marginal fringe.

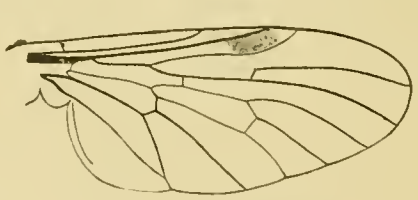


Fig. 44. Wing of *C. auratus*.

The larvæ and pupæ of several species have been described by Beling (Arch. für Naturgesch. Jahrg. 41, 1875, 52, and Jahrg. 48, 1882, 190—93). They chiefly resemble those of *Leptis*, and they are also amphipneustic. They live in the same way and on the same places as the *Leptis* larvæ, and they hibernate.

The species of *Chrysopilus* especially occur on humid meadows in or near woods or in the low herbage in open, damp places in woods and thickets.

Of the genus 24 species occur in the palæarctic region 4 of which have hitherto been found in Denmark.

Table of Species.

1. Wings without any fumigated spot; abdomen black or greyish black ..... 2.
— Wings with a fumigation, stretching from the stigma downwards (sometimes nearly disappearing in the female); abdomen more or less yellow ..... 3.
2. Legs with the femora black ..... 1. *auratus.*
— Legs entirely yellow ..... 4. *aureus.*
3. Apical joint of antennæ brownish black, apex of palpi brown; abdomen brown with yellow bands: stigma and fumigation distinct ..... 2. *nubecula.*
— Antennæ and palpi yellow; abdomen yellow; stigma and fumigation less distinct ..... 3. *luteolus.*

1. C. auratus Fabr.

1805. *Atherix*, Fabr. Syst. Antl. 73, 4. — 1903. Kat. paläarkt. Dipt. II, 84. — 1842. *Chrysopila atrata*, Zett. Dipt. Scand. I, 222, 1. — 1862. *Chrysopila atrata*, Schin. F. A. I, 176.

Male. Frontal triangle blackish, cheeks grey, epistoma blackish; yowls with brownish black or black hairs. Antennæ and palpi black. Thorax black, on the disc deeply black velvet pruinose, with long, black and more depressed, golden hairs, the latter very liable to fall off; in front of the mesopleura and on the metapleura there are tufts of golden hairs. Abdomen deeply velvet black, with long, chiefly yellow, hairs and somewhat depressed, golden hairs, the latter especially forming a fringe on the first segment. Venter black, slightly shining, with yellow hairs. Coxæ and femora black; tibiæ and tarsi brownish yellow, the latter blackish towards the ends. The anterior coxæ with long, black hairs, the hind coxæ with a small tuft of yellowish hairs, femora with somewhat longish, black hairs beneath and with depressed, golden hairs above, for the rest the legs are short haired; the tibiæ, especially the hind ones, very finely spinulous. Wings yellow, somewhat iridescent, the veins brownish black, a tuft of black hairs at the base of the costa; stigma brown. Halteres black, the base of the peduncle paler.

Female. Front broad, greyish. Antennæ blackish grey. Thorax grey with three black, longitudinal stripes, the middle narrow, but this design of thorax is in fresh or well preserved specimens more or less hidden under the covering of depressed, pale golden or brassy hairs. Abdomen on the dorsal side densely covered with similar hairs and thus pale golden or brassy; when the hairs fall off the abdomen becomes black, somewhat shining.

Length 6.5—8 mm.

This species cannot be confounded with any of the other Danish species. It seems nearly related to *splendidus* Meig. Schiner says l. c.: „Stirne des Weibchens schwarz", all the specimens examined by me had a greyish front.

C. auratus is common in Denmark in the low herbage in somewhat humid, open places in woods and thickets, and it also occurs in meadows; Ermelund, Bøllemosen, Furesø, Ørholm, Hillerød, Tidsvilde, Boserup near Roskilde and Skelskor; Lolland at Maribo; Funen at Faaborg and Jutland at Silkeborg and at Dollerup and Hald near Viborg. My dates are $^{5}/_{6}$—$^{29}/_{7}$.

Geographical distribution: — Europe from middle Sweden down into Italy.

2. C. nubecula Fall.

1814. *Leptis*, Fall. Dipt. Suec. Anthrac. 13, 9. — 1842. *Chrysopila*, Zett. Dipt. Scand. 1, 223, 2. — 1862. *Chrysopila*, Schin. F. A. 1, 176. — 1903. Kat. paläarkt. Dipt. II, 86.

Male. Front and cheeks grey, epistoma greyish yellow; yowls with yellow hairs. Antennæ yellowish, the apical joint and the arista brownish black. Palpi yellow, the apex brown. Thorax greyish brown or brown, with two approximate, indistinct, darker, longitudinal stripes: the disc densely covered with depressed, pale golden hairs. The pleura and sterna grey, somewhat reddish, metapleura with a small tuft of yellow hairs. Scutellum greyish yellow with longish, yellow hairs. Abdomen brown, the segments with broad yellow hind margins, these being narrower towards the apex and the last two or three segments entirely brown. Venter with the same colouring. Abdomen clothed with somewhat longish, yellow hairs. Legs yellow; the tarsi slightly brownish towards the ends. The coxæ, especially the anterior, with longish, yellow hairs, for the rest the legs are short haired, the femora above with depressed golden hairs. The tibiæ finely spinulous. The wings slightly yellowish, somewhat iridescent, the veins yellowish brown, a tuft of yellow hairs at the base of the costa. The stigma long, brown, a distinct, broad, brownish band from it and down over the outer end of the discal cell, also a fumigation along the lower branch of the postical vein. Halteres yellow, the knob somewhat darkened.

Female. Front broad, brownish; scutellum yellow; the yellow hind margins of the abdominal segments broader than in the male.

Length 6,5—8,5 mm.

C. nubecula is not common in Denmark: Ordrup Mose, Ermelund,

Boserup near Roskilde, Faxe and Soro; Jutland at Frijsenborg, and on Bornholm at Ronne. All the specimens have been taken in July; it occurs in similar localities as the preceding.

Geographical distribution: — Europe from northern Sweden to Italy; in the northern parts of Sweden it becomes rare.

3. C. luteolus Fall.

1814. *Leptis*, Fall. Dipt. Suec. Anthrac. 14, 10. — 1842. *Chrysopila*, Zett. Dipt. Scand. I, 223, 3. — 1903. Kat. paläark. Dipt. II, 86.

Male. Front and face grey, epistoma yellow; the cheeks with yellow hairs. Antennæ yellow, arista brownish. Palpi yellow. Thorax darker or lighter brown, posteriorly yellowish; densely covered with depressed, deeply golden hairs. Scutellum yellow, partly with depressed, at the apex with erect, golden hairs. Sterna and pleura yellowish, metapleura with a tuft of yellow hairs. Abdomen yellow or reddish yellow, slightly darkened at the apex. Venter yellow. Abdomen clothed with longish, yellow hairs. Legs yellow; the tarsi slightly darkened towards the ends. The coxæ with longish, yellow hairs, only on the hind coxæ forming a small tuft, for the rest the legs are short haired; the femora with depressed golden hairs above; tibiæ finely spinulous. Wings hyaline at the apex, yellow at the base and the anterior margin; the veins yellowish brown, a tuft of golden hairs at the base of the costa; the stigma long, pale brownish, an indistinct, pale fumigated band from it and down over the end of the discal cell, the band is especially indistinctly separated towards the yellowish basal part of the wing. Halteres yellow, the knob brownish.

Female. Front broad, yellowish. Thorax with two yellow, longitudinal stripes on the disc, and the lateral margins yellow, sometimes also a narrow, median stripe; thorax might be termed yellow with three broad, brown stripes. The covering hairs paler than in the male. The hairs on abdomen more depressed than in the male. The stigma faint, yellowish, and the fumigation very faint, sometimes nearly disappearing, the wings upon the whole clearer than in the male.

Length 6—8 mm.

This species is distinguished from the preceding one by the entirely yellow antennæ and palpi and the yellow abdomen, and also by the paler wing stigma and fumigation which both may be almost disappearing in the female. Though the measurements given are only slightly smaller than those given for *nubecula*, yet the species generally conveys the impression of being smaller, especially the males.

C. luteolus is rather rare in Denmark, and, as it seems, more

rare than *nubecula*: Ordrup Mose, Dyrehaven (Stæger), Odsherred (Schlick). I only know of its capture in June.

Geographical distribution: — Northern and middle Europe, from northern Sweden to France. Zetterstedt records it as occurring from $^{20}/_{6}$ to $^{28}/_{8}$.

4. C. aureus Meig.

1804. *Rhagio*, Meig. Klass. europ. Zweifl. I, 302, 9. — 1862. *Chrysopila*, Schin. F. A. I, 176. — 1903. Kat. palæarkt. Dipt. II. 84. — 1849. *Chrysopila diadema*, Zett. Dipt. Scand. VIII, 2988, 5.

Male. Front and face grey, the yowls with white hairs. Antennæ and palpi brown. The dividing line between the large and small eye-facets not very distinct. Thorax greyish black, densely covered with light golden, depressed hairs. Scutellum, sterna and pleura grey; metapleura with a small hair-tuft. Abdomen slender, grey or blackish, covered with depressed, light golden hairs, leaving narrow, black, transverse bands on the front margin of the segments. Venter blackish grey. Besides with the depressed hairs abdomen is sparingly clothed with long, yellow hairs. Legs yellow; tarsi slightly darkened towards the ends. The legs haired quite in the usual way; the tibiæ very finely spinulous. Wings quite hyaline, the veins yellowish brown, a small tuft of yellow hairs at the base of the costa; the stigma small but distinct, brown. Halteres yellow, the apical half of the knob brown.

Female. Front broad, greyish brown; abdomen without transverse bands, densely covered with pale golden hairs; the rest as in the male.

Lenght 5.5 mm.

This small species is easily distinguished by its size and its quite vitreous wings. According to Girschner (Berl. Ent. Zeitschr. XXXI, 1887, 159) the eyes are golden green in the species when alive.

C. aureus is very rare in Denmark, I only know a few specimens: Suserup near Tjustrup So; Langeland at Tranekær and in Aaso Skov (Schlick); the specimens were taken in July. Zetterstedt l. c. records it from Sorø as taken by Jacobsen, but only one specimen.

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

4. **Symphoromyia** Frauenf.

Species of middle size or small, and of dark colours. Head semiglobular but flattened on the lower front part, somewhat broader than the thorax. Antennæ inserted in the middle, near to each other.

Yowls not produced below the eyes, horizontal. Antennæ three-jointed, the basal joint sometimes large and thickened, the second small, the third produced downwards, somewhat reniform, with an arista going out from the upper part of the front edge. Eyes bare, the upper facets in the male larger than the lover, the dividing line moderately sharp. With regard to the mouth parts I have only been able to examine the male, and for the female I must depend on Becher's description; as in *Atherix* the mouth parts are different in the two sexes, the female being in possession of mandibles. The proboscis is not long, the basal part of labium short, the labella longer than the basal part, moderately broad, somewhat protruding; the labrum is nearly as long as the proboscis, the maxillæ of a similar length, pointed, somewhat semitubular; in the females the mandibles are rather strong chitinous blades; the hypopharynx is slender but as long as the labrum. As mentioned under *Atherix* Becher says that the males of *Atherix* and *Symphoromyia* seem to want the hypopharynx; this is incorrect, at all events with regard to the present genus, then I found a hypopharynx in the male that was easily seen but slender, and with a distinct salivary duct. I therefore think it certain that a hypopharynx is also present in *Atherix*; according to Becher this genus has a short hypopharynx in the female, perhaps then this organ in the male is short and slender and easily escapes observation; it is very improbable that the hypopharynx should be quite absent. The maxillary palpi are distinctly two-jointed, the basal joint fully half as long as the apical, this is slightly curved and densely clothed with long and strong hairs. Thorax is nearly quadratic. Abdomen is somewhat elongated, consisting of seven segments. The male genitalia are somewhat swollen, with thick lateral appendages, in the female the abdomen terminates in an ovipositor with two small lamellæ. The front tibiæ have no apical spurs, the middle tibiæ have two and the hind tibiæ one apical spur; the front tarsi without longer hairs. Wings with the anal cell narrowly open.

Fig. 45. Antenna of *S. crassicornis*.

The larva of *S. crassicornis* is described by Beling (Arch. für Naturgesch. Jahrg. 48, 1882, 193). It is cylindrical, somewhat fusiform, dirty white. The body consists of twelve segments; the last segment terminates in two open, horizontal lips, the upper lip has four small teeth, the lower has also four teeth but very small. On the inner side the lips are brown; between the lips lie the terminal spiracles; the larva

is amphipneustic. The length is 12 mm. — The pupa is yellowish brown, it has in front four small tubercles placed in a quadrate, the two upper bearing each a short, stiff hair. The antennal sheaths are directed to each side. The fourth to eight abdominal segments each with a girdle of bristle-shaped spines of unequal lengths at the hind margins, the spines being shortest on the first segments; on the dorsal side of the second and third abdominal segment there is a transverse row of similar but short spines. (Beling counts here, as he also does in his description of the pupa of *Leptis*, nine abdominal segments, he thus evidently considers the third thoracic segment as belonging to the abdomen; according to this interpretation it is in reality the third to seventh abdominal segments that bear girdles of spines, and the first and second that bear rows of small spines.) The last segment has a transverse row of spines above, disconnected in the middle, and two large spines below. The length is 10 mm. The larva was found in the earth in May, it thus hibernates.

The species seem generally to be rare.

Of the genus at most 6 species are known from the palæarctic region; one has hitherto been found in Denmark.

1. S. crassicornis Panz.

1807. *Atherix*, Panz. Fn. Germ. CV. 10. — 1842. *Atherix*, Zett. Dipt. Scand. I, 225, 1. — 1862. *Ptiolina*, Schin. F. A. I, 179. — 1903. Kat. paläarkt. Dipt. II, 87.

Male. Front blackish, face grey. Antennæ with the basal joint long and very thick, grey, clothed with long, black hairs; the apical joints brownish. Palpi black, black haired. Thorax greyish black, indistinctly striped, the disc with longish black hairs, the metapleura with a tuft of long, pale hairs. Abdomen greyish black, clothed with long, brownish hairs. Venter greyish black. Legs black or brownish, the knees narrowly yellow. The coxæ and femora with longish hairs; tibiæ and tarsi short haired, on the hind tibiæ a fringe of short hairs. Wings pale brownish fumigated, especially towards the anterior margin, the veins brown; the stigma faint, pale brownish. Halteres brown, the peduncle lighter.

Female. Front very broad, grey or brownish grey; first joint of the antennæ darker than in the male and less hairy. Palpi greyish brown, yellow haired. Thorax greyish with three more or less distinct, dark longitudinal stripes. Abdomen light brownish grey, clothed with short, golden yellow hairs, but not covered with them. Legs brown. Wings less fumigated than in the male.

Length 6,5—8 mm.

S. crassicornis is rare in Denmark, only about ten specimens have been taken; Dyrehaven (H. I. Hansen), at Sorö; Jutland at Frijsenborg (H. I. Hansen) and at Holstebro. The only date of capture I know is in July.

Geographical distribution: — Europe from the northernmost Sweden down into France. Zetterstedt records it as taken from ^{30} ♂—^{10} ♀.

5. **Ptiolina** Zett.

(Zett. 1842. — Stæger in litt. 1838.)

Species of rather small size and dark colour. Head as broad as or slightly broader than the thorax, semiglobular, with a flattened face. Antennæ inserted near to each other in the middle. Vowls horizontal, not produced below the eyes. Antennæ three-jointed, the two basal joints short, the third oval, compressed, terminating in a fine style. Eyes bare, in the male the upper facets larger than the lower, the dividing line sharp. About the mouth parts I can say only little, as I have not been able to dissect them; they seem to resemble those of *Leptis*; the proboscis is moderately short, the labella somewhat protruding; the maxillary palpi similar to those in *Leptis*. Thorax is nearly quadratic. Abdomen somewhat elongate, consisting of seven segments, truncate at the apex in the male on account of the somewhat knobbed genitalia; in the female terminating in an ovipositor with two lamellæ. Front tibiæ with no apical spurs, middle tibiæ with two, hind tibiæ with one apical spur; no longer hairs on the front tarsi. Wings with the anal cell closed.

Fig. 46. Antenna of *Pt. obscura*.

The larva of one species, *P. nigripes* Zett., has been described by Brauer (Denkschrift. d. Kais. Akad. d. Wiss. Math. Nat. Classe, Wien, XLVII, 1883, 43, Tab. III, Fig. 41—42). It is cylindrical, tapering towards the head, truncate at the hinder end, of emerald green colour. Mouth consisting of a median labrum with five teeth, flat, hooked mandibles, movable vertically, soft maxillæ with one-jointed palpi bearing a bristle on the apex; there are two-jointed antennæ on the sides farther back, and behind these lies the large, black pigmented eye-spot. The body consists of twelve segments; the first to seventh abdominal segments have on the ventral side each three to four transverse swellings. The last segment divides apically into an upper and a lower lip, the upper lip is the largest and has two recurved, chitinised hooks and six longitudinal swellings, the lower lip is formed of two conical warts; between the lips lie the terminal spiracles;

there are small spiracles on prothorax, and the larva is thus amphipneustic. It is 8—9 mm. long.

The larva was found in woods in the earth under Hypnum on rocks.

The species of *Ptiolina* seem rather rare; 10 species belong to the palæarctic region, only one has hitherto been found in Denmark.

1. **P. obscura** Fall.

1814. *Leptis*, Fall. Dipt. Suec. Anthrac. 14, 11. — 1842. Zett. Dipt. Scand. 1, 227. p. p. — 1900. Becker, Entom. Nachricht. XXVI, 111. — 1903. Kat. paläarkt. Dipt. II, 89.

Male. Front blackish, cheeks and yowls somewhat reddish brown, the latter brownish haired, the cheeks with a row of a few hairs. Antennæ brownish black, the basal joints with very short hairs; palpi brown. Thorax velvet black, unstriped or indistinctly striped; pleura

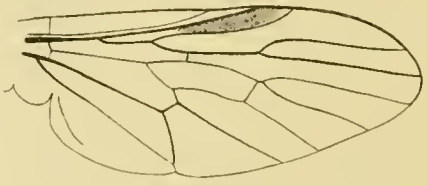


Fig. 47. Wing of *Pt. obscura*.

and sterna brownish; the thoracic disc clothed with somewhat longish, dark brown hairs. Abdomen velvet black or brownish black; venter brownish. Abdomen clothed with long, blackish brown hairs. Legs brown; femora and hind tibiæ rather long haired, the anterior tibiæ short haired. Wings brownish fumigated with brown veins; stigma long, brownish; the two first veins rising from the discal cell connected at the base. Halteres brown.

Female. Front broad, brown or greyish brown; the basal joints of the antennæ paler than in the male. Thorax brown with three darker, longitudinal stripes that are often indistinct. Abdomen brown, slightly shining.

Length 3,5—4,5 mm.

As said in the description the species has some few, but distinct hairs on the cheeks, and it is thus not conform with Becker's description l. c., as he says: „Wangen braun nackt", but in other respects it agrees well; I sent my species to Becker, and he determined it as *obscura* Fall. The original specimens he has seen have had, I think, the cheeks rubbed and *obscura* has in reality sparingly but distinctly haired cheeks. Zetterstedt does not record *obscura* from Denmark.

but in Vol. I, he records *nigra* Zett. and in Vol. XII, *nigrina* Wahlb., both sent to him by Stæger; it seems to me, however, most probable that Zetterstedt has committed some error, the specimens in our museal collection are from Stæger, and they all belong to *P. obscura*, therefore the specimens from Denmark mentioned by Zetterstedt under *P. nigra* and *nigrina* belong with great probability to *P. obscura*. There is also an indication of, that this is correct; in Vol. VIII, 2992, Zetterstedt says about *P. obscura*: „Mas oculis (in viva) dimidiate superiori purpurea, inferiori nigra; (observante D. Stæger)". Although Zetterstedt does not record *obscura* from Denmark he is seen to have been aware that the species occured here; he has therefore certainly committed some confusion with regard to this species.

P. obscura is rare in Denmark, only a few specimens have been taken; Dyrehaven, Frederiksdal, Bagsværd; Lolland at Maribo and in Merrits Skov (Schlick). My dates are in June.

Geographical distribution: — Northern and middle Europe, towards north to the northernmost Sweden, but rare. Zetterstedt records it from $^{1}/_{6}$—$^{8}/_{8}$.

BOMBYLIMORPHA.

Acroceridae.

Of this curious little family we have only two species in Denmark. As the members of the family, besides the family characters, common to all species, differ very much with regard to other structures, I must premise that the following remarks concern to some degree only our Danish species.

The head is small, globular, somewhat flattened behind; it is seated very deeply on the front end of the thorax. The eyes are bare, very large, almost occupying the whole head and touching in both sexes with a long suture. Two or three ocelli present. Face very small, cheeks narrow and the yowls not produced below the eyes. Antennæ inserted near to each other, either on the vertex, above the eye-suture, or far down on the under side of the head near the mouth and below the eye-suture. They are small, two jointed, with an apical arista. The mouth parts I have not been able to examine; in some species there is a long proboscis, lying backwards beneath the thorax and abdomen and longer than the body; in this

case there is, according to Erichson, (Entomographien, I, 1840, 136) a labrum and maxillæ present: in other species the proboscis is very short, and it may perhaps be quite absent. It is recorded that hypopharynx and maxillary palpi are never present in the family. Thorax is large and bulbous, nearly globular, the mesopleura are large, the metapleura much arched, clothed with a tuft of hairs; scutellum is rather large. Abdomen somewhat inflated, consisting of five to six observable segments; the first segment is small. Legs strong, without bristles; tibiæ without apical spurs; the claws are strong; there are two pulvilli and a pulvilliform empodium. Wings with the costal vein reaching to the apex; the venation very different and irregular, sometimes it is complete with a real discal cell formed by the discal vein, in other cases it is very incomplete. It would require a thorough study of the whole family to ascertain the certain homologies of the veins in the different genera; with regard to our species I refer to the descriptions of the genera. Squamulæ are very characteristic, the thoracic squamula is very large, roundish and arched, the margin is thickened and has a dense fringe of hairs, sometimes the squamula is finely haired on its upper surface; it covers the halter entirely; the alar squamula is small; the alula distinct, semicircular. In rest the wings are borne slightly open and in a roof-shaped way.

The larvæ live parasitically on Arachnids, in the egg-cocons or in the abdomen; species of *Acroceria*, *Oncodes* and *Astomella* have been bred. The young larva of an *Oncodes* species is described by König (see under *Oncodes*), and the young larva of a New Zealand species, *Henops brunneus* Hutt., is described by Maskell (Trans. and Proceed. New-Zealand Inst. XX, 1888, 106, pl. X). The only fully developed larva described is that of *Astomella Lindenii*, (Brauer: Verh. k. k. zool. bot. Gesellsch. Wien, XIX, 1869, 737, Tab. XIII, Fig. 1—6, and Denkschr. d. kais. Akad. d. Wissensch. Wien, math. nat. Classe, XLVII, 1883, Taf. V, Fig. 89—92). It is relatively short and thick, the body consists of twelve segments; the head is small, with small mandibles and maxillæ. The larva is amphipneustic with prothoracic and terminal spiracles (König describes the *Oncodes* larva as metapneustic). The pupa is free; it has a median, longitudinal row of spines on the dorsal side of thorax. The larva was lying in the abdomen of a *Cteniza ariana*, with the terminal spiracles in one of the lungs of the *Cteniza*. Before pupation the larva left the now dead Arachnid and transformed in the nest. According to the observations of Stein (Stett. Ent. Zeit. X, 118) and König the eggs are deposited on dead branches or on Equisetum; the young larvæ are

very agile and able to make springs in a similar way as the larva of *Piophila casei*; after hatching they then seek an Arachnid and penetrate into it.

The Acrocerids are very curious and characteristic flies on account of their small head, large, bulbous thorax, inflated abdomen and large thoracic squamulæ. They are sluggish and are often sitting on dead and dry branches; they are recorded also sometimes to hower in the air; they are generally rather rare.

From the palæarctic region 30 species of Acrocerids are described, and from North America 42 species; none are common to both regions.

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

No Acrocerid has previously been recorded from Denmark.

Table of Genera.

1. Antennæ inserted on the vertex, above the eye-suture; three ocelli ..... 1. *Acrocera.*
— Antennæ inserted near the mouth, below the eye-suture; two ocelli ..... 2. *Oncodes.*

Acrocera Meig.

Head small. Three ocelli present. Antennæ inserted above the eye-suture, near to the ocelli, they are small and short, two-jointed, with an apical arista. The proboscis is rudimentary or perhaps quite absent. Thorax is large, bulbous. Abdomen inflated, consisting of five observable segments. The male genitalia are seen in the apex of abdomen as a little knob; in the female the last segments, apically to the above mentioned five, form a little upwardly bent ovipositor, terminating in two lamellæ. The wings show an incomplete venation, which is somewhat different in different species; it seems to consist almost entirely of convex veins. I shall only speak of the species *globulus*; below the costa there is a dark vein which I take to be the mediastinal vein; then follows a thick vein, I think the united subcosta and radius, it forms a thickened apical part near to the apex; the next vein is forked and is probably the cubital vein; in the lower part of the wing lies a vein, forked almost from the base, this is perhaps the postical vein; finally there is a last vein, nearly reaching the margin; as it is convex it may be the axillary vein. According to this interpretation there are no discal or anal veins, and there is no discal cell.

The larvæ are parasitic on Arachnids; *A. sanguinea* Meig. and *trigramma* Löw, were bred from the cocons of *Tegenaria agilis* (see

Brauer: Denkschr. d. kais. Akad. d. Wissensch. Wien, math. nat. Classe, XLVII, 1883, 61).

The species of *Acrocera* are generally rare, they sometimes swarm in the air.

Of the genus 10 palæaretic species are known: one is found in Denmark.

1. A. globulus Panz.

1803. *Syrphus*, Panz. Fn. Germ. LXXXVI, 20. — 1840. Erichs. Entomogr. I, 165, 1. — 1842. Zett. Dipt. Scand. I, 229, 1. — 1903. Kat. palãarkt. Dipt. II, 93. — 1862. *A. globulus* p. p. Schin. F. A. I, 73.

Male. Antennæ yellow or brown; hinder eye-margin yellow haired. Thorax brownish or black, with short, reddish yellow pubescence; humeral and postalar calli pale yellow. Scutellum yellow, with a blackish, transverse stripe on each side at the base, and the sides of the same colour, sometimes it is blackish to a greater degree. Abdomen yellow, a broad, black, transverse band at the base, dilated at the sides and triangularly in the middle, thus the yellow hind margin of the segment is curved double; the following segments have black, transverse side spots at the front margins, and sometimes small, triangular middle spots, the spots on the first of these segments may sometimes form a band similar to the basal band. Venter black, with yellow hind margins of the segments, these being broadest on the first segments. Abdomen clothed with short, pale yellow hairs. Legs pale yellow, with the apex of the last tarsal joint and the claws black; they are clothed with short, pale yellow hairs. Wings hyaline, with yellowish veins. Halteres yellow.

Female. Abdomen black or brownish to a greater degree than in the male, the first observable segment quite dark, sometimes with a pair of small, yellow spots at the hind margin, the next segment generally with a double excised, dark band at the front margin and the following with triangular middle and side spots. Venter black with yellow hind margins of the segments, but often almost quite yellow. Legs yellowish, not so pale as in the male.

Length 3,5—5 mm.

A. globulus cannot be termed rare, yet it is, as the species of this family generally, only found now and then, but in most parts of our country: Bogenæs, at Soro, Tjustrup So and Karise; Lolland in Roden Skov; Jutland at Rye near Himmelbjærget, Silkeborg, Funder, Frijsenborg, Hald near Viborg and in Vang Skov near Hobro. My dates are $^{4}/_{7}$—$^{28}/_{7}$. It has generally been taken on Salix, and it may

be beaten down as beetles without flying away; it is said also sometimes to hower in the air.

Geographical distribution: — Northern and middle Europe from the middle of Sweden down into France.

2. **Oncodes** Latr.

(Ogcodes.)

Head small. Only two ocelli present. Antennæ inserted far down, below the eye-suture, on the under side of the head; they are short, two-jointed, the first joint thick, the second ovate with an apical arista. The proboscis is rudimentary or quite absent. Erichson, (Entomogr. I, 138) stated in 1840 that the proboscis is absent, and the oral aperture closed by a membrane, but in 1846 (Wiegmann's Arch. I, 288), he means to have seen a short proboscis in a living specimen, but it is not described more particularly. As far as I could observe with a lens the facts are as described by Becher (Denkschr. d. Kais. Akad. d. Wisssensch. Wien, math. nat. Classe, XLV, 1882, 144, Taf. III, Fig. 1). The oral aperture is seen covered by a membrane in which is a chitinous ring, somewhat widened in front and behind. Becher thinks that this formation answers to his „Schlundgerüst", that is to say the pharynx perhaps together with clypeus. The thorax is large and bulbous; the prothoracic spiracles are large and distinct, lying at the humerus. Abdomen is somewhat inflated, especially in the female, consisting of six observable segments. The venation of the wings is incomplete; in *gibbosus* there is a vein below the costa, probably the mediastinal vein; the following thick vein I take to be the united subcosta and radius; from the middle of this comes an unbranched vein, the cubital vein; the other veins are very weak, the first of them is concave, and may be the discal vein, then follows a convex, certainly the postical vein; the apical part of the discal vein is convex, and it is connected with the postical vein by a very indistinct cross-vein, I think the whole represents the anterior branch of the postical vein; below the postical vein there is a weak anal vein and a short axillary vein; there is no discal cell, but from the base of the cubital vein a cross-vein stretches downwards, and there are some faint end branches, showing a tendency to form a discal cell.

The larvæ are parasitic on Arachnids. *O. pallipes* Latr. has been bred from *Clubione putris*, in the abdomen of which it lives (Menge, Schrift. Danzig. Naturf. Gesellsch. n. Folg. I, 1866, 37), and *O. fumatus* Erich. from an undetermined Arachnid (see Brauer: Verh.

k. k. zool. bot. Gesellsch. XIX, 1869, 737). König (Verh. k. k. zool. bot. Gesellsch. XLIV, 1894, 163, Taf. VII) has described a young larva which he thinks belongs to either *O. gibbosus* or *zonatus* on account of these species being taken in the same place as the eggs. The eggs were found on dry branches, which were used to fence a road through a meadow in Austria. The smallest branches were covered with eggs, sitting in rows; in the same place were webs of small Arachnids. Some larvæ were found, fastened on Podurids. The body is elongated, somewhat flattened, beset with bristles. Only eleven segments were counted, but with the head it would be twelve. On the last segment there was a fixing apparatus, consisting of some hooks, and there were four strong spring-bristles; the larva can walk as a *Geometra* larva, but it is also able to make springs. The larva is described as metapneustic. Of mouth parts are mandibles and maxillæ described. — Stein records (Stett. Ent. Zeit. X, 1848, 118) that he found *O. varius* Latr. (*fuliginosus* Erichs.) depositing its eggs on Equisetum limosum on a humid meadow in a wood.

The species of *Oncodes* are sluggish, they occur especially near damp localities on leaves and dead branches. The genus includes 13 palæarctic species, one of which is found in Denmark.

1. O. gibbosus L.

1761. *Musca,* Linn. Fn. Suec., 1815. — 1840. Erichs. Entomogr. I, 170, 1. — 1842. *Henops,* Zett. Dipt. Scand. I, 231, 1. — 1862. Schin. F. A. I, 74. — 1903. Kat. paläarkt. Dipt. II, 95.

Male. Antennæ brownish black, arista paler. Thorax and scutellum shining black, rather densely clothed with yellowish grey hairs. Abdomen whitish, bone-coloured, the front margins of the segments more or less broadly black, thus forming black, transverse bands, which on the second and third segments are more or less widened triangularly in the middle and at the sides, in the following segments only at the sides; on the second segment the middle spot is often nearly quadratic. Venter bone-white, with small, black side spots on the front margins of the segments, the spots sometimes produced narrowly along the front margin. Abdomen clothed with yellowish grey or whitish hairs. Legs yellowish; coxæ and femora, except the tips, blackish brown or black; the legs clothed with short, yellowish hairs. Tibiæ and tarsi are sometimes somewhat browned. Wings hyaline, the anterior veins brownish yellow, the others white. Halteres yellow.

Female. The eye-suture slightly shorter and the hinder eye-

margin, though narrow, yet slightly broader than in the male. The abdomen is more black, the pale colour only forming narrow hind margins of the segments, broadest on the last segments.

Length 5—7 mm.

O. gibbosus is perhaps rarer than the preceding species; Jægerspris (Schlick), at Næstved and Vordingborg; Lolland and Falster (Schiødte); Jutland at Silkeborg (Esben Petersen); it has been taken from $^{29}/_{6}$—$^{9}/_{8}$. In habits it is chiefly similar to the preceding species; it has been taken on Salix and Alnus.

Geographical distribution: — Northern and middle Europe from the middle of Sweden to France.

Obs. On fig. 8 ♂ and fig. 11 ♀ an error in the drawing has occurred, the antennæ being drawn with a joint too many.

Page 112. Line 31. For „on the first segment" read „on the fourth segment".

INDEX.

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

Page

Acrocera Meig. 159
globulus Panz. 160
sanguinea Meig. *159*
trigramma Löw *159*
Acroceridae 157
Astomella Duf. *158*
Lindenii Erichs. *158*
Atherix Meig. 135
ibis Fabr. 137
marginata Fabr. 138
Atylotus Ost. Sack. 121

Beridinae 19
Beris Latr. 69
chalybeata Forst. 72
clavipes L. 71
Morrisii Dale 73
pallipes Loew. 73
sexdentata Fabr. 72
vallata Forst. 70
Bibio Fabr. 138
Bombylimorpha 157

Chloromyia Dunc. 64
formosa Scop. 65
Chorisops Rond. *70*
tibialis Meig. *70*
Chrysomyia Macq. 65. 67. 68
Chrysopilinae 135
Chrysopila Macq. 148
Chrysopilus Macq. 148
atratus Meig. 149
auratus Fabr. 149
aureus Meig. 152
diadema Fabr. 152
luteolus Fall. 151
nubecula Fall. 150
splendidus Meig. *150*
tomentosus Fabr. 135

Page

Chrysops Meig. 88
aestuans V. d. W. *90*
callidus O. S. *90*
coecutiens L. 97
lapponicus Löw. 98
moerens Walk. *90*
nigripes Zett. *98*
pictus Meig. 95
relictus Meig. 96
rufipes Meig. 93
sepulcralis Fabr. 94
quadratus Meig. 95
Clitellariinae 18
Coenomyia Latr. 82
ferruginea Scop. 84
Coenomyiidae 82

Dichelacera Macq. *86*

Henops 158. 162
Hexatoma Meig. 99
bimaculata Wahlb. 100
pellucens Fabr. 100
Hirtea Scop. 42
Homoeodactyla 13
Hoplodonta Rond. 57
viridula Fabr. 57
Hæmatopota Meig. 101
arcticus Müll. 87
crassicornis Wahlb. 105
italica Meig. 106
longicornis Macq. 106
pluvialis L. 104
variegata Fabr. *106*

Lampromyia Macq. *133*
Leptididae 133
Leptidinae 135

Page

Leptis Fabr. 139
annulata Deg. 147
immaculata Meig. 143
lineola Fabr. 145
maculata Deg. 142
notata Meig. 144
scolopacea L. 141
stigmatica Zett. 143
strigosa Meig. *134*
tringaria L. 146
vanellus Fabr. 134. 135. 146

Microchrysa Löw. 66
cyanea Fabr. 17
cyaneiventris Zett. 68
flavicornis Meig. 68
pallipes Meig. 68
polita L. 67

Nemotelus Geofr. 23
bifasciatus Meig. 17
nigrinus Fall. 30
notatus Zett. 28
pantherinus L. 25
ulignosus L. 26
Notacantha 13

Ogcodes Latr. 161
Oncodes Latr. 161
brunneus Hutt. *158*
fumatus Erichs. *161*
gibbosus L. 162
pallipes Latr. *161*
varius Latr. *162*
zonatus Erichs. *162*
Odontomyia Meig 47
angulata Panz. 56
argentata Fabr. 50
felina Panz. *55*
hydroleon L. 54
microleon L. 52
nigrita Fall. 49
ornata Meig. 53
ruficornis Zett. 56
tigrina Fabr. 49
Oxycera Meig. 31
Fallenii Stæg. 36
formosa Meig. 38
græca (Brünniche) 16. 34

Page

hypoleon Fabr. 34
hypoleon Fall. 36
leonina Panz. 37
Meigenii Stæg. 34
pygmæa Fall. 39
terminata Meig. 37
triliniata Fabr. 33

Pachygaster Meig. 19
atra Panz. *22*
Leachii Curt. *22*
meromelas Duf. *22*
minutissima Zett. 20
tarsalis Zett. 21
Pachygastrinae 17
Pangonia Latr. *85*
rostrata L. *109*
Pangoniinae 88
Platygenya 13
Ptiolina Zett. 155
nigra Zett. *135. 157*
nigrina Wahlb. *135. 157*
nigripes Zett. *155*
obscura Fall. 156

Rhagio Fabr. *133. 134*
Rhagio Fabr. . . . 137. 143. 145. 152

Sarginae 18
Sargus Fabr. 59
cuprarius L. 61
flavipes Meig. 63
infuscatus Meig. 62
iridatus Scop. 62
nitidus Meig. 62
nubeculosus Zett. 61
Sicus Latr. 84
Silvius Meig. *86*
Syrphus Fabr. 160
Stratiomyia Geoffr. 40
chamæleon L. 45
furcata Fabr. 43
longicornis Scop. 42
potamida Meig. 46
strigata Fabr. 42
Stratiomyiidae 13
Stratiomyiinae 18
Subula Meig. 79

	Page
Symphoromyia Frauenf.	152
crassicornis Panz.	154
Tabanidae	85
Tabaninae	88
Tabanus L.	107
atratus Fabr.	87
autumnalis L.	129
bovinus Löw.	125
bromius L.	127
fulvus Meig.	124
glaucescens Schin.	131
graecus Meig.	130
luridus Fall.	116
luridus Schin.	114
maculicornis Zett.	131
Miki Brauer	130
montanus Meig.	112
Mühlfeldi Brauer	117
plebejus Fall.	121
quatuornotatus Meig.	*108*
rusticus Fabr.	122
solstitialis Schin.	119
sudeticus Zell.	126
tropicus Panz	114
tropicus Schin.	112
Tabanus s. str.	125
Tanystoma	85
Therioplectes Zell.	112
Trichopalpus	*134*
obscurus Phil.	*134*
Xylomyia Rond.	79
maculata Meig.	81
Xylophagidae	75
Xylophagus Meig.	76
ater Meig.	78

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