

UDC 57:61

CODEN PDBIAD

ISSN 0031-5362

# PERIODICUM BIOLOGORUM



Period biol, Vol 113, Suppl 2

P 1-61, Zagreb, September, 2011

four issues yearly

# PERIODICUM BIOLOGORUM

An Interdisciplinary International Journal of the Societas Scientiarum Naturalium Croatica established 1885

## Published by

Croatian Society for Natural Sciences  
Ruđer Bošković Institute  
LASERplus

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# **KEY TO THE HORSE FLIES FAUNA OF CROATIA (DIPTERA, TABANIDAE)**

Stjepan Krčmar, Davorka K. Hackenberger, Branimir K. Hackenberger





# Key to the horse flies fauna of Croatia (Diptera, Tabanidae)

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## Abstract

**Background and Purpose:** The aim of the present paper is to presentation of a key for subfamilies, genera and species of Croatian horse flies (Tabanidae) fauna.

**Material and Methods:** A key to the horse flies (Tabanidae) occurring in the Croatian fauna include both all available literary records and the all faunistical data of our study from the nineties of last century to first ten years of 21st century. The most of sampled species are deposited in the collections of the Department of Biology, J. J. Strossmayer University of Osijek. Horse flies were collected using various methods: with the entomological net, by the hand around livestock on pasture, by Malaise traps and by modified canopy traps.

**Results and Conclusions:** The horse flies (Tabanidae) fauna of Croatia consists of 78 species belonging to 10 genera and 2 subfamilies. The most numerous is the genus *Tabanus* with 30 species, while other genera are represented as follows: *Hybomitra* with 17 species, *Haematopota* with 9 species, *Chrysops* 7 species, *Atylotus* 5 species, *Dasyrhamphus* 3 species, *Silvius*, *Theriopectes*, *Philipomyia* with two species each and *Heptatoma* with one species

**Key words:** Fauna, Diptera, Tabanidae, horse flies, Croatia

## INTRODUCTION

Insects (Insecta) are the most numerous group of animals on the Earth (1). As they can be found in almost all habitats wherever life is possible and as they are so numerous, insects are the most important members of different biocenosis, where they participate in managing the balance of different ecosystems. Horse flies (Tabanidae) belong to true flies (Diptera) and emerge in various terrestrial habitats. Female horse flies mostly suck blood and take part in transmission of different pathogens such as viruses, bacteria and protozoa (2, 3). They molest livestock on pasture while taking the blood meal during summer. Their sting is painful and swelling persists for several days attracting other groups of true flies and increase the possibility of developing secondary infections. Besides that, horse flies are characterized with exceptional speed of flight which enables them to transmit pathogens on large distances. Therefore, researches of specific horsefly species fauna and biology are very important from the view of veterinary and medical entomology, particularly from the second half of June until the end of August. Species present during the whole summer season demand special attention. Croatian horse flies fauna, as well as entire entomofauna, was in the beginning researched by foreign entomologists (4). First written data on Croatian horse flies' species can be found in works of Brauer (5), Mik (6), Strobl (7, 8, 9, 10), Zerny (11), Surcouf (12), and Kröber (13). That period was the bloom of entomological research on Croatian territory, especially Dalmatia, which irresistibly attracted naturalists from various European countries with the beauty of its nature, coast and islands, but also with insufficiently explored fauna in contrast to fauna of middle Europe. Furthermore, data on Croatian horse flies' species could be found immediately after II World War in works of Baranov (14), followed by foreign entomologists: Coe (15, 16), Moucha (17, 18), Leclercq (19, 20, 21, 22), Danielova (23), Chvála et al. (2); Majer (24). With the effort of above mentioned foreign entomologists, except Baranov, total of 71 horsefly species

were determined for Croatian fauna. However that number is not definitive which is proven with the results of our systematic faunistic and ecological research conducted during the nineties and first years of 21st century. Croatian horse flies' fauna has both Mediterranean and continental elements that indicate the need for further entomological research.

## I. COLLECTING EQUIPMENT

Horse flies (Tabanidae) were collected using various methods. They were mostly collected with the entomological net or by the hand around livestock on pasture. Besides that large number of horse flies was collected by Malaise and modified canopy traps (Figure 1, 2). Malaise traps were homemade according to the design of Townes (25). The height of the trap is 2 m, and it is made of cotton fabric, hand painted with aniline color. Traps consist of 4 wings cross-shaped that guide from the ground to the collecting part of the trap (tent) which is 100 cm from the ground. Lower opening of collecting part of the trap (tent) is 80×80 cm and ends up with the round opening 10 cm in radius, on top of which collecting cap, where horse flies fly in, is placed. Collecting cap is round, made from stiff wire in the shape of coop, which narrows towards the apex, into which horse flies fly in easily but can not get out (Figure 2a). Construction of collecting cap is covered with transparent, white cloth net-like, with openings radius of 1 mm. On the upper part of the collecting cap is an opening that can easily and rapidly be closed, and open while emptying it. Collecting cap is 35 cm high, with the radius 2 cm wider than the outer opening of the collecting part of the trap (tent). During emptying, collecting cap is taken off from the outer opening of the collecting part of the trap (tent), then the opening of the collecting cap is opened and specimens are taken out by the hand. After emptying the collecting cap, opening is closed again and collecting cap is placed back on top of the outer opening of the collecting part of the trap (tent). Inside the tent, 30 cm below the outer opening, a bottle with the attractant is placed. Modified canopy trap is also homemade according to the design of Hribar *et al.* (26). Canopy traps are black and white, made of synthetic fiber (98% polyester, 2% viscose). The trap is in the shape of four-sided pyramid. Lower part is black- to the height of 80 cm, and upper part is white, also 80 cm high. Total height of collecting tent is 160 cm. The base of every side of collecting tent is 110 cm, so the area of lower entrance of the collecting tent is 120 cm<sup>2</sup> the entrance is placed 80 cm above the ground. The collecting part of the trap (tent) ends with a round exit opening 20 cm in radius, on top of which, same as in Malaise traps, a collecting cap is placed. The collecting cap is 2 cm wider than the exit opening radius and therefore can be easily taken on and off the top of the collecting part of the trap (tent). The collecting cap is made exactly as Malaise' trap. The carrier with the attractant is placed 30 cm below the exit opening of the collecting part of the trap (tent). In both type of traps the center pole was made from an aluminium pipe.



Figure 1. Malaise trap

## II. THE HORSE FLIES (TABANIDAE) MORPHOLOGY

Horse flies are insects (Insecta) with the average body length ranging from 6 to 30 mm (27), (Figure 3). They are characterized with stout body, membranous wings and head, more or less attached to the thorax, occupied mainly by large facet-eyes. On the ventral side of the thorax they have relatively short legs, while on the dorsal side there is a pair of wings (Figure 3). The abdomen is broad and consists of seven clearly visible segments (28) (Figure 3). The major part of the intestines is situated in the abdomen (2, 29). The chitin cover is thin, except of the thorax and front part of the head where it is slightly thickened. The body pubescence is moderate. It is more expressed in mountainous and boreal species than in southern and particularly desert species where it is minute. The color of the body varies from light brown, grayish-brown, yellow to black. Boreal and particularly mountainous species are darker when compared to southern and desert species that are mostly lighter colored. Almost all Mediterranean species from genera *Dasyrhamphis*, *Pangonius* and *Haematopota* are extremely dark, sometimes even carbon black. The sexual dimorphism is very expressed. The most visible difference between males and females is in the position of their eyes; the frons is reduced in males so the eyes are



Figure 2. Modified canopy trap.



Figure 2a. Collecting cap of the modified canopy trap.

touching or are only narrowly separated, while the females have widely separated eyes (2, 29). The head in the horse flies is large, convex in the front while the back of the head is the same width or wider than the thorax. The males have hemispherical head usually larger than the females. The facet-eyes occupy the large part of the head and are variously colored: green, blue, brown and grayish-green. A few dark spots or transversal bands are often visible on the eyes and are a significant taxonomic feature. These spots and bands, including the eye color disappear in dead specimens; therefore the eyes become dark grey or black. The eyes of the *Atylotus* genus species are usually pale grayish or green and gelatinous in appearance; the color disappears in dry specimens. The sexual dimorphism is also present in the eye construction as the facets in the female eye are equal in size, while in the male eye the facets in the upper part are considerably larger compared to the facets in the lower part. The difference in the size of the facets is greater in species from southern areas compared to the species from northern or high mountainous areas where the difference is very small (29). Some horsefly species have bare eyes in contrast to the others that have eyes covered with short dense pubescence. The hairs are situated vertically between the facets. The eye pubescence is more expressed in males than in females (2). Besides the facet-eyes, many *Chrysops*, *Silvius* and *Pangonius* species have three simple ocelli on the vertex, while in the *Hybomitra* genus those eyes are reduced and replaced with oval or triangular eye tubercle (Figure 4), (29). The species from *Haematopota* and *Tabanus* genera do not have ocelli or eye tubercle on their vertex. The female eyes are separated with the frons which is limited with the frontal triangle or subcallus and the vertex (2). In the males, the eyes are connected so the sexes can be

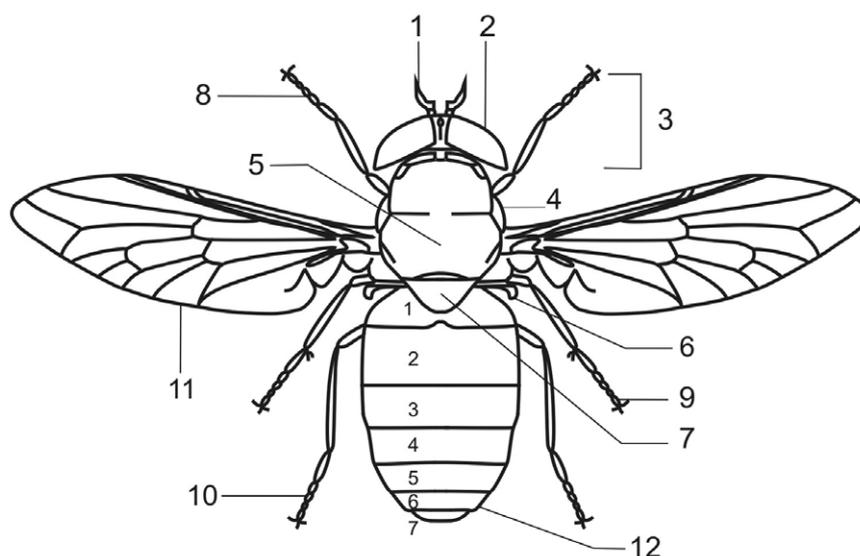
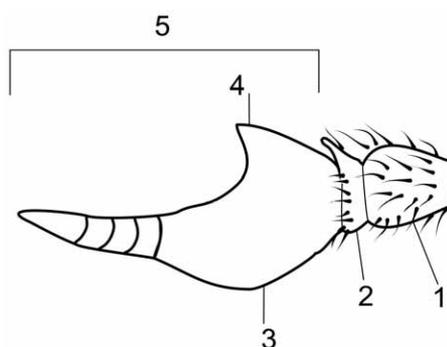


Figure 3. Schematic description of the female horse flies (Tabanidae). 1 – antenna, 2 – eye, 3 – head, 4 – notopleural lobes, 5 – thorax, 6 – halter, 7 – scutellum, 8 – fore leg, 9 – mid leg, 10 – hind leg, 11 – wing, 12 – abdomen.

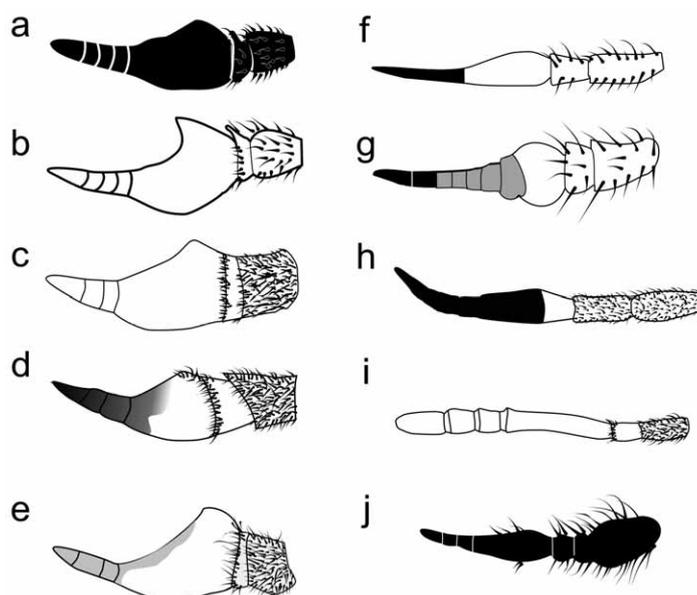
easily distinguished. The protuberant polished chitinized raised areas, so-called frontal calli, are visible on the female frons (2). So-called lower callus is situated in the lower part of the frons and can strongly vary in shape. The upper callus is often present in the middle of the frons, it can be large and separated from the lower calli as it is the case in some species from the *Tabanus* genus, or can be linearly connected with the lower callus as in other species from *Tabanus* and *Hybomitra* genera (Figure 4), (2, 29). The species from *Dasyrhamphis* and *Atylotus* genera have upper and lower calli either reduced or absent. The species from the *Pangonius* and *Stonemyia* genera also do not have frontal calli (2). The shape and the color of frontal calli differ in the majority of species and are therefore considered to be a significant taxonomic feature. The antennae are connected with the head in the front middle part of the head in small antennal sockets. The apical part of the antennal socket is mostly narrow, except in some species from *Tabanus* and *Hybomitra* genera where it is considerably widened. The antennal length can vary. Although they are more often short, the species from *Heptatoma* genus have elongated antennae. The antennae consist of three segments: scape, pedicel and flagellum (2) (Figure 5). The scape, first antennal segment, is constant in the species from *Tabanus*, *Pangonius* and *Heptatoma* genera. The pedicel, second antennal segment, is very short, and is only elongated in the species from *Chrysops* and *Nemorius* genera (2). The flagellum is a third antennal segment which consists of several segments. The basal segment of flagellum so called the third antennal segment is longer and wider than the rest of the segments (2). The antennal shape is significant for the classification for all systematic categories of horseflies (2), (Figure 6). The species from the Pangoniinae subfamily have third antennal segment – flagellum which is divided into eight segments that gradually become smaller towards the apex (29). On the other hand, the flagellum from the species of Chrysopsinae and Tabaninae subfamilies consists of five segments where the basal segment (or so called third antennal segment) is longer and wider than the other segments (29). The flagellum of *Tabanus* genus species has basal segment broadened and flattened and the species from *Haematopota* genus have shortened basal segment fused with the first elongated terminal segment. The point of fusion can be recognized in many species by the presence of hairs on that place (29). The antennae from the species of *Heptatoma* genus are ribbon like since the flagellum is divided into the four segments which are sharply separated so the antennae look like they are six-segmented (30). When compared to males, the antennae in females are always better developed. Besides, the hairs on the first and the second segment of male antenna are a little bit longer. The frontal triangle is placed above the antennae and occupies the area between the antennae and the frons (2). It is formed by fusion of antennal sockets and is shown by the presence of a suture dividing the subcallus (2, 29). The face occupies the area below the antennae reaching down to the proboscis. The central part of the face is occupied by the convex clypeus and laterally by the cheeks separated by the deep grooves (2). The face is mostly dark without shine and covered with pu-



**Figure 4.** Schematic description of the head of female horse flies (Tabanidae). 1 – vertex, 2 – ocellar swelling (ocelli), 3 – frons, 4 – facet eyes, 5 – upper callus, 6 – lower callus, 7 – subcallus, 8 – scape, 9 – flagellum, 10 – genae, 11 – clypeus, 12 – palpi, 13 – proboscis.



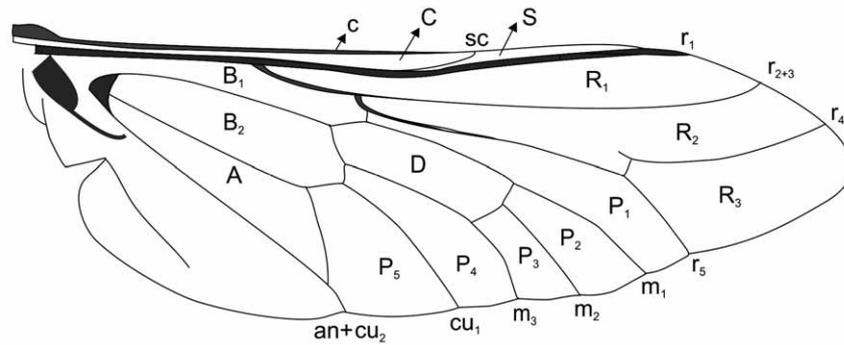
**Figure 5.** Schematic description of the antenna of female horse flies (Tabanidae). 1 – scape, 2 – pedicel, 3 – basal flagellar segment or antennal segment, 4 – dorsal tooth of basal flagellar segment or antennal segment, 5 – flagellum.



**Figure 6.** Schematic description of the antenna of female horse flies (Tabanidae) from genera: a) *Dasyrhamphis*, b) *Philipomyia*, c) *Atylotus*, d) *Tabanus*, e) *Hybomitra*, f) *Silvius*, g) *Pangonius*, h) *Chrysops*, i) *Heptatoma*, j) *Haematopota*.

bescence. In some species of *Chrysops*, *Silvius* and *Pangonius* genera the parts of convex shiny chitin are also present. Few species have a completely pale and shiny face (29). The mouthparts in horse flies are stabbing and sucking type. They are placed on the lower part of the head in the proboscis. The length of proboscis mostly does not exceed the head length, except in the species of Pangoniinae subfamily where the proboscis is almost half the body length (29). The mouthparts consist of the following basic parts: a labium with two lobes apically and the half-open tubes (*pseudotrachae*) and labrum with epipharynx that covers the proboscis from the above. The inner part of the proboscis contains a pair of mandibles, a pair of maxillae with palpi and hypopharynx (2). The mouthparts are basically identical in males and females, even though they are somewhat altered due to the feeding mode. The female mouthparts are placed in the proboscis formed by the labium. All males and females of exotic genera species have rudimentary mandibles (2).

Thorax is very broad, consisting of three segments: prothorax, mesothorax and metathorax (29). Mesothorax with large triangular plate-scutellum is the most developed thoracic segment. The stigmatae are visible laterally on prothorax and mesothorax. The wings are inserted into the mesothorax between tergum and pleurae (29). Only the anterior pair of wings is well-developed in the horse flies, as in the other true flies (Diptera), whereas the posterior pair is reduced to halteres. The wings are wide, clear or with various dark spots and have many veins (2) (Figure 7). The anterior wing margin is strengthened with costa (c), followed by the subcosta (sc) that can be with or without pubescence. Moreover, there are four radial veins ( $r_1$ ,  $r_2 + r_3$ ,  $r_4$ ,  $r_5$ ) (29). Veins  $r_4$  and  $r_5$  are widely separated and terminate on the apex of the

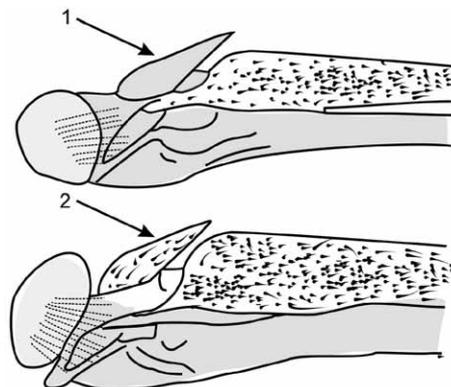


**Figure 7.** Schematic description of the wing of horse flies (Tabanidae). c – vein costa, C – costal cell, sc – vein subcosta, S – subcostal cell,  $r_1$ ,  $r_2$  +  $r_3$ ,  $r_4$ ,  $r_5$  – radial veins,  $R_1$ - $R_3$  – radial cells,  $P_1$ - $P_5$  – marginal cells, D – discal cell,  $B_1$  $B_2$  – basal cells, A – anal cell,  $m_1$  $m_3$  – medial veins,  $cu_1$ - $cu_2$  – cubital veins, an – anal vein.

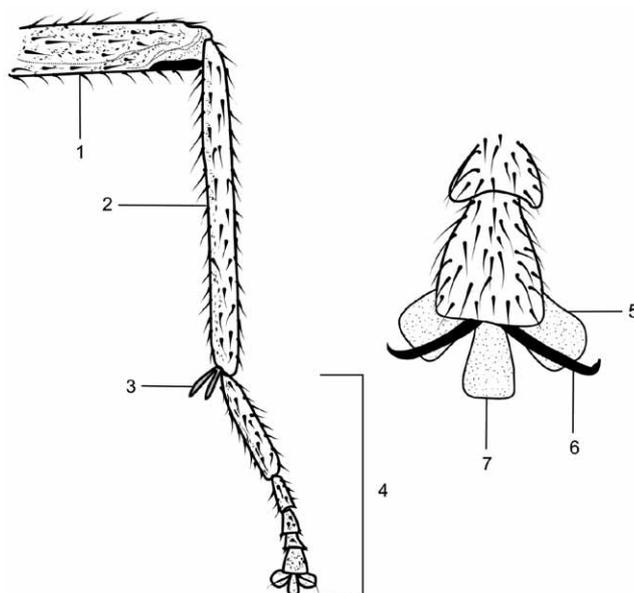
wing (2). There are three medial veins ( $m_1$  $m_3$ ) through the middle of the wing and two cubital veins ( $cu_1$ - $cu_2$ ) and anal vein (an) below them (29). Next, there is a short transverse radiomedial vein (rm) between the fifth radial ( $r_5$ ) and the first medial vein ( $m_1$ ). Many species have a small appendix directed towards the basis of the wing on the fourth radial vein ( $r_4$ ). This vein can be used for determination of some species. Sometimes, even on the same specimen, the appendix on the  $r_4$  can exist on one wing but not on the other (29). The wing cells are also important taxonomic feature for horse-fly species determination. These cells form barriers between main veins. There is one costal (C), one subcostal (S), three radial ( $R_1$  $R_3$ ), two basal ( $B_1$  $B_2$ ), one discal (D), five marginal on the posterior wing margin ( $P_1$ - $P_5$ ) and one anal cell (A) (29). There is a small humeral sclerite (*basicosta*) on the beginning of costal vein (Figure 8). The presence of pubescence on the basicosta is an important taxonomic feature (29). The species of Pangoniinae and Chrysopsinae subfamilies do not have pubescence on basicosta, while the most of the species of Tabaninae subfamily have visible pubescence on basicosta (29). The wings are attached to thorax with small sclerite (*tegula*). There are alulae and a pair of squamae underneath the wing-base (29).

Three pairs of legs are attached ventrally to the thorax. The legs are of medium size and covered with pubescence. The coxa connects leg with the thorax and is followed by trochanter and femur, which is a considerably longer part of the leg, and is connected with tibia by a little joint of genus. The leg ends with a five-segmented foot (*tarsus*) (29), (Figure 9). The last foot segments end with firm claws (*ungues*) and three well-developed pulvilli with empodium in the middle (29), (Figure 9). Besides the mentioned parts, the middle tibia has apical spurs (*calcarium*). In some species apical spurs also exist on the hind tibia, which is an important taxonomic feature of Pangoniinae and Chrysopsinae subfamilies (2), (Figure 9).

The abdomen (*abdomen*) in horse flies is broadly built; it can be variously colored and consists of seven distinctly visible segments (2). The apical part of the abdomen from eighth to eleventh segment is built in the seventh segment (29). The major part of the intestines is situated in the abdomen. The abdominal segments, same as thoracic segments, consist

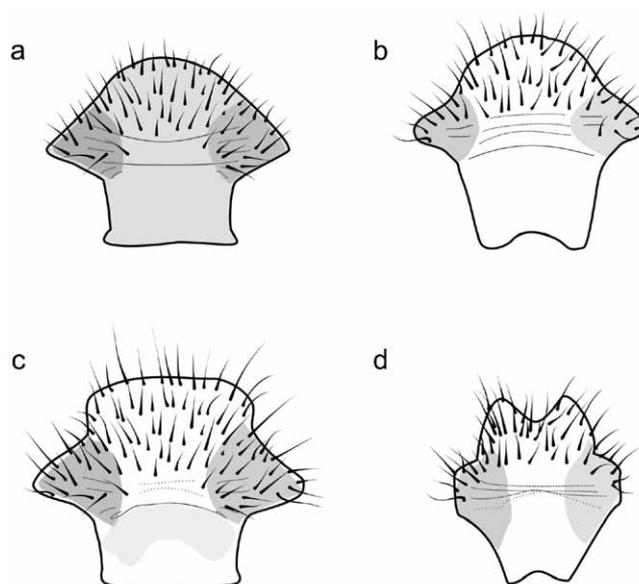


**Figure 8.** Schematic description of the basicosta. 1 – basicosta without setulae (bare basicosta), 2 – basicosta with setulose.



**Figure 9.** Schematic description of the leg of horse flies (Tabanidae). 1 – femur, 2 – tibia, 3 – apical spurs, 4 – tarsus, 5 – pulvili, 6 – claws, 7 – empodium.

of tergum, sternum and pleurae. Stigmae are situated on the pleurae, one on each side of the segment (29). The abdominal color is a significant taxonomic feature. The abdomen is mostly black with pale yellow or pale grey patterns of different shape and is covered with pubescence. The abdomen of males is darker than female. The color of abdomen in some species is constant, as in *Chrysops* genus, while in others color may vary. The apical end of the abdomen is conically shaped in males and rounded in females (29). The genitalia in horse flies are situated in the terminal part of the abdomen. They are mostly invisible and dorsoventrally flattened in females and conspicuous in males. Tergite 8 with two small paired sclerites and tergites 9 and 10, longitudinally divided in two parts are situated on the dorsal side of genitalia (29). In the Pangoniinae subfamily the tergite 9 is integral and ends with paired cerci. The paired sclerites of the tergite 9 are often widely separated, and if so the sclerites of the tergite 10 are touching. The tergite 11 is connected with abdomi-



**Figure 10.** Schematic description of the female subgenital plate of: a) *Hybomitra bimaculata*, b) *Hy. ciureai*, c) *Hy. distinguenda*, d) *Hy. muehlfeldi*

nal cerci and is not morphologically expressed. The abdominal cerci close the anal aperture from above (29). The sternite 8 or subgenital plate is situated on the ventral side of the genitalia and it covers the genitalia from underneath (Figure 10). The sternite 8 is rounded, chitinized and covered with firm hairs. On the top of the sternite 8 and the sternite 9 – a genital fork is situated (2, 29). The sternite 9 is small and irregularly shaped and covered with hairs (2). The sternite 9 covers the genitalia and bursal sac from the above (29). The genital furca probably helps in laying eggs and uniform smearing with adhesive substance in the time of lying (29). Some entomologists think that the hairs help in holding the male penis during the copulation (29). Males have a more efficient mechanism, so called gonostyle, for attaching gonopod during the copulation (2). Three seminal receptacles lie at the level of the sixth and the seventh abdominal segment (2). The species of *Philipomyia* genus have reaching the third or the second abdominal segment (29). The seminal receptacle ducts are very long, slender and lightly pigmented (2). They are entering the genital chamber on the dorsal area of the furca. Apart of the duct, before entering the genital chamber, is strengthened with chitinized rings (2). On the terminal part of the sternite 9 a subanal plate, i.e. the sternites 10 and 11, are situated (29). The build of sternite 8 and cerci is significant for species-level taxonomy (29). Male genitalia consist of the same parts as female but only differently shaped (29). Therefore, the tegite 8 is in the shape of narrow transversally bended plate, while the tergites 9 and 10 are transversally divided as in females. The sclerites of the tergite 9 are attached to tergite 10 and together make an epandrium (2, 29). The species of Pangoniinae subfamily have integrated the tergites 9 and 10 and create a shield, but can be divided into two separated sclerites as in other two subfamilies (2). On the ventral side of the genitalia trapezoidal shaped sternite 8 is situated, followed by the gonopod (29). The gonopod is chitinized and modified sternite 9 (29). There are two attachments called gonocoxites on the basal part of this sternite. Every gonocoxit has a short gonostyle on its end (29). The gonostyle in pairs forms a pliers and clasps female abdomen during the copulation. A penis is dorsally situated in the middle part of the gonopodite, it is chitinized and shaped as a small dagger (29). There is a pair of long firm setae attached on the side of the penis. The penis and its attachments are covered with large chitinized shield (*aedegus*) conically shaped (29). There is an oblong subanal plate, i.e. the sternites 10 and 11 above the gonopodite. The subanal plate is formed by the fusion of a pair of the elongated sclerites (29). The analysis of male genitalia is mostly used in the taxonomy of levels higher than species and genus (2, 29).

## III. LIST OF HORSE FLIES (DIPTERA: TABANIDAE) IN CROATIA

TABLE 1.

Systematical list of horse flies (Diptera: Tabanidae) in Croatia.

Subfamily	Genus	Species / Subspecies
Chrysopsinae	<i>Silvius</i> Meigen, 1820	<i>Silvius algirus</i> Meigen, 1830 <i>Silvius alpinus</i> (Scopoli, 1763)
	<i>Chrysops</i> Meigen, 1803	<i>Chrysops caecutiens</i> (L., 1758) <i>Chrysops flavipes</i> Meigen, 1804 <i>Chrysops italicus</i> Meigen, 1804 <i>Chrysops parallelogrammus</i> Zeller, 1842 <i>Chrysops relictus</i> Meigen, 1820 <i>Chrysops rufipes</i> Meigen, 1820 <i>Chrysops viduatus</i> (Fabricius, 1794)
Tabaninae	<i>Atylotus</i> Osten – Sacken, 1876	<i>Atylotus flavoguttatus</i> (Szilády, 1915) <i>Atylotus fulvus</i> (Meigen, 1804) <i>Atylotus latistriatus</i> (Brauer, 1880 <i>in</i> Brauer and Bergenstamm, 1880) <i>Atylotus loewianus</i> (Villeneuve, 1920) <i>Atylotus rusticus</i> (L., 1767)
Tabaninae	<i>Theriopectes</i> Zeller, 1842	<i>Theriopectes gigas</i> (Herbst, 1787) <i>Theriopectes tunicatus</i> (Szilády, 1927)
	<i>Hybomitra</i> Enderlein, 1922	<i>Hybomitra acuminata</i> (Loew, 1858) <i>Hybomitra aterrima</i> (Meigen, 1820) <i>Hybomitra bimaculata</i> (Macquart, 1826) <i>Hybomitra ciureai</i> (Séguy, 1937) <i>Hybomitra distinguenda</i> (Verrall, 1909) <i>Hybomitra expollicata</i> (Pandellé, 1883) <i>Hybomitra kaurii</i> Chvála et Lyneborg, 1970 <i>Hybomitra lundbecki</i> Lyneborg, 1959 <i>Hybomitra lurida</i> (Fallén, 1817) <i>Hybomitra micans</i> (Meigen, 1804) <i>Hybomitra montana</i> (Meigen, 1820) <i>Hybomitra muehlfeldi</i> (Brauer <i>in</i> Brauer and Bergenstamm, 1880) <i>*Hybomitra nitidifrons confiformis</i> Chvála et Moucha, 1971 <i>Hybomitra pilosa</i> (Loew, 1858) <i>Hybomitra solstitialis</i> (Meigen, 1820) <i>Hybomitra tropica</i> (L., 1758) <i>Hybomitra ukrainica</i> (Olsufjev, 1952)
	<i>Tabanus</i> L., 1758	<i>Tabanus autumnalis</i> L., 1761 <i>Tabanus promesogaeus</i> Mally, 1987 <i>Tabanus bovinus</i> L., 1758 <i>Tabanus briani</i> Leclercq, 1962 <i>Tabanus bromius</i> L., 1758

Tabaninae	<i>Tabanus</i> L., 1758	<i>Tabanus cordiger</i> Meigen, 1820 <i>Tabanus darimonti</i> Leclercq, 1964 <i>Tabanus eggeri</i> Schiner, 1868 <i>Tabanus exclusus</i> Pandellé, 1883 <i>Tabanus fraseri</i> Austen, 1925 <i>Tabanus glaucopsis</i> Meigen, 1820 <i>Tabanus indrae</i> Hauser, 1939 <i>Tabanus lunatus</i> Fabricius, 1794 <i>Tabanus maculicornis</i> Zetterstedt, 1842 <i>Tabanus marianii</i> (Leclercq, 1956) <i>Tabanus miki</i> Brauer <i>in</i> Brauer and Bergenstamm, 1880 <i>Tabanus nemoralis</i> Meigen, 1820 <i>Tabanus obsolescens</i> Pandellé, 1883 <i>Tabanus paradoxus</i> Jaennicke, 1866 <i>Tabanus quatuornotatus</i> Meigen, 1820 <i>Tabanus regularis</i> Jaennicke, 1866 <i>Tabanus rousselii</i> Macquart, 1839 <i>Tabanus rupium</i> Brauer <i>in</i> Brauer and Bergenstamm, 1880 <i>Tabanus shannonellus</i> Kröber, 1936 <i>Tabanus spectabilis</i> Loew, 1858 <i>Tabanus spodopterus</i> Meigen, 1820 <i>Tabanus sudeticus</i> Zeller, 1842 <i>Tabanus tergestinus</i> Egger, 1859 <i>Tabanus tinctus</i> Walker, 1850 <i>Tabanus unifasciatus</i> Loew, 1858		
	<i>Heptatoma</i> Meigen, 1803	<i>Heptatoma pellucens</i> (Fabricius, 1776)		
	<i>Haematopota</i> Meigen, 1803	<i>Haematopota bigoti</i> Gobert, 1880 <i>Haematopota crassicornis</i> Wablberg, 1848 <i>Haematopota grandis</i> Meigen, 1820 <i>Haematopota italica</i> Meigen, 1804 <i>Haematopota ocelligera</i> (Kröber, 1922) <i>Haematopota pandazisi</i> (Kröber, 1936) <i>Haematopota pluvialis</i> (L., 1758) <i>Haematopota scutellata</i> (Olsufjev, Moucha et Chvála, 1964) <i>Haematopota subcylindrica</i> Pandellé, 1883		
	<i>Dasyrhamphis</i> Enderlein, 1922	<i>Dasyrhamphis anthracinus</i> (Meigen, 1820) <i>Dasyrhamphis ater</i> (Rossi, 1790) <i>Dasyrhamphis umbrinus</i> (Meigen, 1820)		
	<i>Philipomyia</i> Olsufjev, 1964	<i>Philipomyia aprica</i> (Meigen, 1820) <i>Philipomyia graeca</i> (Fabricius, 1794)		
	Σ	2	10	78

#### IV. KEY TO SUBFAMILIES AND GENERA OF HORSE FLIES (TABANIDAE) ACCORDING TO Chvála *et al.* (1972)

- 1 Hind tibiae with apical spurs. Functional ocelli on ocellar tubercle present on vertex, (Figure 11) → 2
- No apical spurs on hind tibiae. No ocelli present, usually only ocellar swelling on vertex. Subfamily Tabaninae (Figure 12, 13) → 6
- 2(1) Antennal flagellum composed of 7 or 8 segments, basal segment of antennal flagellum (or antennal segment 3) not much differentiated from the following segments. Labella very small and narrow. Proboscis conspicuously long, longer than head in height. Subfamily Pangoniinae (Figure 14, 15) → 3
- Antennal flagellum composed of only 5 segments, terminal four segments distinctly shorter and narrower than basal segment (or antennal segment 3). Labella rather large and protuberant, occupying about 1/3 of proboscis length. Proboscis much shorter. Subfamily Chrysopsinae → 4
- 3(2) First posterior wing cell always open. Labrum slightly longer than head in height. Ocelli absent → [\**Stonemyia* Brennan, 1935]
- First posterior wing cell closed. Labrum longer than head in height. Ocelli present (Figure 15) → [*Pangonius* Latreille, 1802]
- 4(2) First two antennal segments very long and narrow, nearly equal in length. Facial and genal calli distinct, or sometimes slightly developed. Wings with brownish-black colored pattern (Figure 16, 17) → *Chrysops* Meigen, 1803
- Second antennal segment distinctly shorter than first segment. Face without calli, wings (*alae*) colorless and clear → 5
- 5(4) First antennal segment long and slender, second segment shorter but about twice as long as wide. Mostly grayish species, eyes with spot or band in the middle → [*Nemorius* Rondani, 1856]
- First antennal segment shorter and wider, while the second segment is very short, as long as wide. Mostly yellow or yellowish-brown species (Figure 18) → *Silvius* Meigen, 1820
- 6(1) Antennal flagellum composed of 5 segments, basal flagellar segment (or 3rd antennal segment) with more or less developed dorsal tooth, sometimes strongly bended → 7
- Antennal flagellum composed of 4 segments, basal segment (or 3rd antennal segment) slender and without dorsal tooth (except *Glaucops* genus) → 12
- 7(6) Basicosta bare – without hairs. Rather robust species with flat, broad abdomen. Ocellar tubercle absent → 8
- Basicosta strongly pubescent. Species of various sizes, abdomen rather elongated (except for *Theriopectes*). Ocellar tubercle sometimes present → 9
- 8(7) Eyes bare, frontal calli of female fused into a single uniform vertical line. Wings always clear, abdomen yellow-brown to dark brown (Figure 19) → *Philipomyia* Olsufjev, 1964
- Eyes always with microscopical pubescence, frontal calli always well developed. Mostly blackish species with more or less shaded wings (Figure 20) → *Dasyrbampbis* Enderlein, 1922
- 9(7) Eyes in living specimens light yellowish to pale greenish-grey, usually with one incomplete narrow band, or unbanded; in dry specimens eyes light reddish-brown. Frontal calli in female reduced, very small or absent. Generally smaller, light grey or yellowish-brown species (Figure 13, 21) → *Atylotus* Osten-Sacken, 1876
- Eyes in living specimens bright green to dark reddish-brown, with 1 to 4 bands or unbanded; in dry specimens eyes blackish. Frontal calli in female well developed various size and shape. Dark or light species of various size → 10
- 10(9) Posterior four tibiae very stout and densely covered with whitish hairs. Eyes pubescent, unbanded. Large shiny blackish species, densely covered with black, pale and rusty brown hairs on thorax and abdomen, resembling bumble bee (Figure 22, 23) → *Theriopectes* Zeller, 1842
- Posterior four tibiae slender, never conspicuously covered with whitish hairs. Smaller or larger in size, usually uniformly black, grey or reddish-brown species, rarely shiny → 11

\* The genera marked with square brackets haven't been determined in Croatian horse flies (Tabanidae) fauna.

11(10) Vertex always with well developed shiny ocellar tubercle. Eyes more or less haired, always with 3 bands. Mostly blackish species, often with conspicuous reddish-brown side markings on anterior tergites (Figure 24, 25, 26) → *Hybomitra* Enderlein, 1922

- Ocellar tubercle on vertex absent, eyes bare (except for the *quatuornotatus*-group, Figure 27) with 1 to 4 bands or without bands. Usually grayish or brownish species of various size (Figure 28, 29) → *Tabanus* Linnaeus, 1758

12(6) Wings with grey-brown spots or small pattern. Basal antennal segment (or 3rd antennal segment) slender but distinctly differentiated from three terminal flagellar segments (Figure 30, 31) → *Haematopota* Meigen, 1803

- Wings clear, without any spots or pattern → 13

13(12) Antennae very long and slender, more than twice as long as head is wide. Flagellar basal segment not clearly differentiated from the three terminal flagellar segments. Antennae appear to consist of 6 segments. Eyes with 4 blue bands (Figure 32, 33) → *Heptatoma* Meigen, 1803

- Antennae short, resemble *Tabanus* species, basal part of first flagellar segment (or 3rd flagellar segment) with a distinct dorsal tooth; terminal flagellar segments short, stout and indistinctly separated → [*Glaucops* Szilády, 1923]

## V. KEY TO SPECIES OF CROATIAN TABANIDAE

Subfamily: Pangoniinae

Tribe: Pangoniini

Genus: *Pangonius* Latreille, 1802

Generally large species with long proboscis that is always much longer than the head is high. Eyes are bare, not covered with hairs, frons always without frontal calli. Vertex with three ocelli. Antennae are long, flagellum always consisting of eight segments. Legs are long and thin with spurs on hind tibiae. Wings are often clouded with long appendix on vein R<sub>4</sub>, while first posterior wing cell is closed (2). *Pangonius micans* species is reported for Croatian fauna but without date, place, number of sampled specimens, sex of the sampled specimens and therefore this report is very doubtful. This species is not included in the Tabanidae list of Croatia (31). Species described below are sampled in neighboring countries (Hungary and Montenegro), (30, 32, 33) therefore species in square brackets are expected in Croatia as well.

### Key to species of *Pangonius* genus

1 Antennal flagellum is basally broadened; basal segments are distinctly broader than following segments. First two basal flagellar segments are also short, wider than longer, sometimes round-shaped distinctly separated from other flagellar segments. Generally black species, abdomen entirely black, with brown margins on anterior segments. Large species: 15–21 mm (subgenus *Melanopangonius* Szil.) → 2

- Antennal flagellum is not distinctly broad at the base, basal two flagellar segments long at least as wide and not separated from following segments. Abdomen is mostly brownish, covered with dark gray to silvery-gray hairs. Anterior two tergites are laterally brown. Face is entirely shiny black or blackish-brown. Legs bicolorous, femora shiny black or at least darker than tibiae. Wings are distinctly brownish. Males are smaller with anterior four tergites mostly orange to reddish-brown with very small blackish spot in the middle. All facets in males are the same size (subgenus *Pangonius* S. Str), (Figure 34) → [*pyritosus* Loew]

2(1) Wings are yellowish-brown clouded or almost clear, veins are brown, squamae are yellowish. Antennae are mostly reddish-brown. Lower part of the head, thorax and part of the abdomen covered with pale gray hairs. Femora in females are brown. Males are very similar to females, except femora are distinctly darker. Facets are almost same in size → [*micans* Meigen]

- Wings are clouded darkly brown with dark brown veins. Antennae are black, only third segment can be slightly brownish at base. Femora are black in both sexes → 3

3(2) Lower part of head, thorax including mesonotum and part of abdomen mostly covered with pale yellowish-gray pubescence. Legs bicolorous, tibiae dark brown to blackish-brown. Males are very similar to females except hairs on thorax are always more yellowish-gray. All facets are almost of the same size → [*baustellatus* (F.)]

- Pubescence on head, thorax and abdomen are uniformly blackish-brown, only posterior three or four tergites are covered with short reddish hairs. Legs including tibiae are entirely black. Males very closely resembling females, all facets are almost of the same size → [*funebri* Macquart]

### Subfamily: Chrysopsinae

#### Tribe: Chrysopsini

#### Genus: *Silvius* Meigen, 1820

Mostly medium-sized species, yellow to brownish with clear wings. Frontal calli always well developed. Antennae rather short. Eyes mostly metallic green to greenish-yellow with dark spots. Six species and one subspecies of this genus are determined for European fauna, while in Croatian fauna this genus is represented with two species (2, 31).

#### Key to species of *Silvius* genus

1 Eyes bare in both sexes. Abdomen uniformly yellowish-brown, wings sometimes with very small appendix on R<sub>4</sub> vein. Frons is narrow, about twice as long as wide. Antennae short, yellowish-brown. Terminal flagellar segments are shorter than basal flagellar segment (or 3rd antennal segment) and mostly blackish-brown. Male with a row of rather long pale to dark hairs on vertex. Generally medium-sized species, 9–13 mm in length (Figure 35, 36, 37) → *alpinus* (Scopoli)

- Eyes bare in both sexes. Abdomen is dorsally covered with short dark hairs, giving it a darker appearance and forming distinct yellow median triangles. Wings sometimes with very small appendix on R<sub>4</sub> vein. Frons is narrow, twice as high as wide. Antennae are long, pale brown. Terminal flagellar segments together at least as long as basal flagellar segment (3rd antennal segment), blackish. Males with a row of very long black hairs on vertex. Generally medium-sized species (9–13 mm), (Figure 38) → *algirus* Meigen

#### Genus: *Chrysops* Meigen, 1803

Small to medium-sized horse flies, always yellow and black, or entirely black. Wings with black or dark brown pattern. Rather broad frons in females. Frontal calli rounded or oval in shape. Antennae very long and slender, much longer than head width, all segments nearly equal in size. Eyes emerald green or golden yellow with dark spots in live specimens. Fifteen species of this genus are determined for European fauna, while in Croatian fauna this genus is represented with seven species (2, 31). The findings of three more species are expected in Croatian fauna. The species not yet determined in Croatian fauna are marked with square brackets.

#### Key to species of *Chrysops* genus

##### **Females**

1 Legs (*pedes*) including tibiae are entirely black (*sepulcralis*-group) → 2

- Legs (*pedes*) are brownish, at least on posterior part of tibiae → 4

2(1) Frons and face uniformly shiny black, abdomen mostly black → [*sepulcralis* (F.)]

- Frons and face yellow to yellowish-gray. Second tergite yellow with distinct black pattern or spots. Second sternite yellow, always with one small black spot → 3

3(2) Apical spot on wing very narrow, reaching only to R<sub>4</sub> vein. Second tergite with black pattern in the shape of inverted widely open letter »V«, not connected with third tergite. Following tergites with distinct yellow border on posterior margins → [*divaricatus* Loew]

- Apical spot on wing large, occupying nearly 3/4 of R<sub>4</sub> vein. Second tergite with black pattern in the shape of inverted narrow letter »V«, connected with third tergite. Following tergites mostly black without pale margins (Figure 39, 40) → *caecutiens* (L.)

- 4(1) Discal cell clear in the middle (*italicus*-group), (Figure 41) → 9
- Discal cell clouded, mostly barely transparent in the middle (Figure 42) → 5
- 5(4) Second tergite yellow with one black patch or two black patterns in the middle. Anal cell on wing closed, wings transparent with distinct brown pattern (*relictus*-group) (Figure 43, 44) → 6
- Second tergite with yellowish-gray median triangles, except anterior black margins. Anal cell open, wings brown with undefined brown pattern (*rufipes*-group) → 8
- 6(5) Second tergite with small square or oval black patch in the middle near anterior margin. Apical spot on wing very large, occupying nearly 3/4 of R<sub>4</sub> vein (Figure 45, 46) → *viduatus* (F)
- Second tergite with two large triangular black patterns in the middle → 7
- 7(6) Two black patterns on second tergite merged on the anterior part, reaching to anterior tergite margin. Apical spot on wing large, occupying nearly the whole R<sub>4</sub> vein (Figure 43,44) → *relictus* Meigen
- Two black elongated triangular patterns in the middle of second tergite are rather close to one another and not reaching tergite anterior margin. Apical spot on wing not so large, occupying at most apical half of R<sub>4</sub> vein. Femora dark brown to black (Figure 47, 48) → *parallelogrammus* Zeller
- 8(5) Small black to dark brown species with brownish-yellow legs, basal part of femora are darker. Facial and genal calli are large. Genal calli are touching eye margins, and are always connected with facial calli → *rufipes* Meigen
- More yellowish species with mostly yellow legs. Mesonotum with three long and broad, shiny black stripes. Calli on head small, genal calli separated from eye margins and not connected with facial calli → [*melicharii* Mik]
- 9(4) Apical spot on wing small, occupying 1/3 to 1/2 of R<sub>4</sub> vein. Two black patterns on second tergite smaller, vertically descending towards posterior margin of tergite. Smaller species, 6–9 mm (Figure 49, 50) → *flavipes* Meigen
- Apical spot on wing large, occupying 3/4 of R<sub>4</sub> vein. Two black patterns on second tergite large, transversely directed to posterior corners of the tergite. Larger species, 8.5–10 mm (Figure 51, 52) → *italicus* Meigen

### Males

- 1 Legs uniformly black (*sepulcralis*-group) → 2
- Legs bicolored, at least posterior parts of tibiae are brownish → 4
- 2(1) Face entirely shiny black, without paler areas. Abdomen is black → [*sepulcralis* (F.)]
- Face with distinctly separated shiny black calli on yellowish to grayish background → 3
- 3(2) Second tergite yellow with distinct black patterns in the shape of an inverted and widely open letter »V«. Apical spot on wing very narrow, of the same width as R<sub>1</sub> cell and reaching only to R<sub>4</sub> vein → [*divaricatus* Loew.]
- Abdomen completely black, always with small lateral spot on second tergite. Apical spot on wing large, occupying 3/4 of R<sub>4</sub> vein (Figure 53, 54) → *caecutiens* (L.)
- 4(1) Discal cell clear, colorless in the middle part (*italicus*-group) → 9
- Discal cell brown, only slightly paler in the middle part → 5
- 5(4) Eyes are touching on frons. Second tergite yellow with large black median spot. Anal cell closed (*relictus*-group) → 6
- Eyes narrowly separated on frons. Abdomen mostly black, all tergites with yellow posterior margins. First and second tergite with small yellowish spot laterally. Anal cell open (*rufipes*-group) → 8
- 6(5) Apical spot on wing broadly connected with median cross-band, whole R<sub>1</sub> cell clouded. Palpi very short with blunt ends, shorter than half length of proboscis. Second tergite with two black triangular spots broadly anteriorly connected (Figure 55) → *relictus* Meigen
- Palpi long and pointed, much longer than half length of proboscis → 7
- 7(6) Second tergite with large square median spot which is only narrowly separated from posterior margin. Third and fourth tergite black with yellow stripe at posterior margins (Figure 56) → *viduatus* (F)
- Second tergite with two black triangular spots in the middle which are connected anteriorly, third and fourth tergites with similar black design → *parallelogrammus* Zeller

8(5) First antennal segment broad, thickened but rather short, as long as 2/3 of head width. Mesonotum indistinctly striped. Legs extensively darkened (Figure 57, 58) → *rufipes* Meigen

- First and second antennal segments are long and very broad; first segment about as long as head is wide. Mesonotum distinctly striped. Legs mostly yellowish → [*melichari* Mik]

9(4) Eyes narrowly separated on frons. Abdomen yellow with black pattern. Antennae mostly black, subcallus dark. Apical spot on wing rather small, occupying about half length of R<sub>4</sub> vein → *flavipes* Meigen

- Eyes touching on frons even a little bit. Antennae black. Abdomen black, second tergite or also first tergite with a very small yellow spot laterally, second and following tergites with small grayish median triangles at posterior margins → *italicus* Meigen

## Subfamily: Tabaninae

### Tribe: Tabanini

#### Genus: *Atylotus* Osten – Sacken, 1876

Small to medium sized horse flies, always grayish, yellowish or yellowish-brown. Characterized with large head, bare or pubescent eyes, sometimes with one narrow band. Males have sharply separated area of small facets from the area of large facets from the upper part of the eyes. Frontal calli in female are always very small, round and reduced, or sometimes absent. Wings are clear with very long appendix to vein R<sub>4</sub>. Twelve species of this genus is determined for European fauna, and five species for Croatian fauna (2, 31). Species absent from Croatian fauna are marked in square brackets.

### Key to species of *Atylotus* genus

#### Females

1 Eyes distinctly pubescent with short hairs → 2

- Eyes bare, some minute hairs can sometimes be seen only with large magnification → 3

2(1) Small grayish species, at most 11 mm in length. Frons broad, index 1: 2.3–2.5; palpi stout, about 2.5 times as long as wide. Vertex with a row of long black hairs → [*sublunaticornis* (Zetterstedt)]

- Larger species, up to 18 mm in length. Frontal calli small, circular, often absent. Palpi are long, more than three times as long as wide. Vertex with very short pale hairs. First antennal segment with short black hairs (Figure 59) → *latistriatus* (Brauer in Brauer and Bergenstamm)

3(1) Vertex only with a row of short pale hairs → 4

- Vertex with a row of long pale hairs. Femur grayish, apically slightly yellowish. A broad, black median stripe dorsally on abdomen. Terminal flagellar segments darker than 3rd antennal segment. Larger species, 11.5–16 mm in length on average (Figure 60, 61) → *flavoguttatus* (Szilády)

4(3) Yellowish to yellowish-brown species with golden-yellow to yellowish-brown pubescence → 5

- Grayish species, with silvery-gray to gray pubescence. Femur mostly grayish-black, only apically yellowish. Frons broader, index 1:3.5–4 (Figure 62, 63) → *rusticus* (L.)

5(4) Yellow-brown to light brown colored species; frontal calli very small, sometimes hardly visible. 3rd antennal segment or basal flagellar segment about as long as wide (Figure 64, 65) → *fulvus* (Meigen)

- Mostly golden-yellow species with relatively large, well developed frontal calli. 3rd antennal segment or basal flagellar segment at least 1.5 times as long as wide (Figure 66, 67) → *loevianus* (Villeneuve)

#### Males

1 Small species, 9.5–11 mm in length, with long grayish hairs. Abdomen is ventrally entirely grayish. Vertex with a row of very long black hairs → [*sublunaticornis* (Zetterstedt)]

- Larger, yellowish to grayish colored species. Abdomen is always at least somewhat yellowish in ventral anterior part → 2

2(1) Vertex with a row of long whitish-gray hairs. Eyes with short gray hairs. A broad, dark median stripe dorsally on abdomen. Larger species, 13–14 mm in length → *flavoguttatus* (Szilády)

- Vertex with a row of short hairs → 3

3(2) A darker, black pubescent median stripe dorsally on abdomen. Femur black-gray at least on basal part → *latistriatus* (Brauer in Brauer and Bergenstamm)

- Abdomen is dorsally pale pubescent with some black hairs, darker median stripe absent → 4

4(3) Orange-yellowish species, abdomen golden-yellow pubescent, sometimes with few black hairs → 5

- Yellowish-gray to grayish species with grayish pubescence. Abdomen mostly grayish with broad yellow margins on anterior 3 tergites, mostly covered with grey hairs. Femur gray, apically yellowish (Figure 68, 69) → *rusticus* (L.)

5(4) Head large, eyes with short pubescence. Yellowish-brown species with grayish notopleural lobes → *fulvus* (Meigen)

- Head smaller, eyes with long hairs. Golden-yellow species with yellowish notopleural lobes, (Figure 70, 71) → *loewianus* (Villeneuve)

### Genus: *Theriopectes* Zeller, 1842

Very large species, more than 20 mm in length, densely haired resembling bumble-bees. Eyes unstriped, rather pubescent, all facets of same size in both sexes. Antennae rather slender, 3rd antennal segment or basal flagellar segment with only slightly developed dorsal tooth. Legs stout and densely haired. Wings always more or less clouded in the middle. Males closely resemble females. In the past, much value has been given to the colouration of the hairs on the cheeks, thorax and abdomen, being either predominantly light or predominantly black. This feature has especially been used to separate *Th. tunicatus* from *Th. gigas* (34). Instead of these the use of two new morphological features was proposed: colouration of hairs on hind coxa and colouration of hairs on backside of front femur (34). Three species and 2 subspecies of this genus are determined for European fauna, while in Croatian fauna this genus is represented with two species (2, 31).

### Key to species of *Theriopectes* genus

1 Coxa 3 lateral completely or predominantly black haired. Hairs on posterior surface of femur 1 all black or predominantly black. Second tergite mostly with pale hairs in the middle or along the posterior margin. Face covered with black pubescence, only some hairs are pale. Whole mesonotum, including anterior third, with yellow-gray hairs. Posterior two abdominal segments with rusty colored pubescence (Figure 72, 73) → *gigas* (Herbst)

- Coxa 3 completely or predominantly light haired. Hairs on posterior surface of femur 1 often completely or predominantly light, seldom with slightly more black hairs. Face with grayish-yellow to yellowish-brown pubescence. Thorax and anterior two tergites with distinct pale gray-yellow hairs (Figure 74, 75) → *tunicatus* Szilády

### Genus: *Hybomitra* Enderlein, 1922

Medium-sized to large species, thorax and abdomen always densely pubescent. Mostly species with yellowish-brown margin on the abdomen or grayish-black to completely black species. Eyes are greenish always pubescent, usually with three bands, very rarely unbanded or with one or two bands. Ocellar tubercles always present in both sexes. Wings are clear, slightly pale brown clouded at base of the wing. Altogether 37 species of this genus are determined for European fauna (2) and 15 species and 1 subspecies for Croatian fauna (31). Species that are expected to be found in Croatia are marked within square brackets.

### Key to species of *Hybomitra* genus

#### Females

1 Legs unicolorously black. Medium sized, blackish species (*aterrima*-group) → 2

- Legs bicoloured, at least posterior tibiae brownish. Reddish-brown or blackish-gray species → 4

2(1) Subcallus shiny black. Antennae and palpi blackish. Abdomen black with indefinite grayish pattern, tergite 2 laterally mostly grayish (Figure 76) → *micans* (Meigen)

- Subcallus dull grayish-black. Abdomen with pale hairs at posterior margins to all tergites or entirely black, without grayish sublateral spots → 3

3(2) Abdominal tergites more or less distinctly golden-yellow pubescent on posterior margins (Figure 77, 78) → *aterrima* var. *auripila* (Meigen), (35).

- Abdomen entirely black with concolorous hairs, or with indistinct grayish median triangles or grayish laterally and at posterior margins. Palpi blackish with black hairs, rather equal in width. Face black haired, antennal bows high. A distinct darker patch on wing at the base of vein R<sub>4</sub> (Figure 79) → *aterrima* (Meigen)

4(1) Halterae whitish-yellow. Eyes covered with minute hairs, sometimes almost naked; if densely pubescent, than abdomen is pointed at tip. Reddish-brown species. Ocellar tubercles rudimentary, antennae extensively black → 21

- Halterae blackish-brown to brownish or paler at the tip. Eyes more or less densely pubescent. Reddish-brown to blackish-gray species → 5

5(4) Apical segment of palpi long and slender, more than 3.5 times longer than wider; whitish-yellow or dark brown → 6

- Apical segment of palpi distinctly stout at base, at most 3 times as long as wide, always whitish-yellow to light brown → 7

6(5) Palpi long and slender dark brown covered with short black hairs or at least with some black hairs. Eyes densely covered with short grayish to brown hairs, always with three bands. Subcallus bare. Abdomen shiny black, extensively chestnut-brown laterally on anterior three tergites. Antennae brown to reddish-brown, except for black terminal flagellar segments, basal antennal segment or 3rd segment broad with rectangular dorsal tooth. Frons narrower, index about 1:3.5. Generally medium-sized species, 13–16 mm in length (Figure 80) → *kaurii* Chvála & Lyneborg

- Palpi extensively dark brown, almost 4 times as long as wide. Antennae chestnut-brown, with large dorsal tooth on basal antennal segment (3rd antennal segment). Lower callus shiny brown to black separated from eye-margins, but connected with medium callus. Notopleural lobe light brown. First three to four tergites are reddish-brown laterally → [*arpadi* (Szilády)]

7(5) Frons broad, index about 1: 2.5–4, with rather parallel sides. Lower callus large, unicolorous and shiny (except *nitidifrons confiformis*) (*montana*-group) → 8

- Frons narrow, index 1: 4–6, always distinctly widened above. Lower callus usually small and distinctly wrinkled, not shiny (*bimaculata*-group) → 15

8(7) Abdomen dorsally entirely blackish-gray, without reddish-brown sidemarkings → 9

- Abdomen largely reddish-brown laterally, brownish sidemarkings at least on tergite 2 → 10

9(8) Frons very broad, index about 1:2.5, lower callus very large. Abdomen with distinct light gray pattern, tergite 2 largely grayish laterally (Figure 81, 82) → *pilosa* (Loew)

- Frons narrower, index 1: 3.5 → 11

10(8) Subcallus distinctly convex and entirely shiny black to blackish-brown. Lower callus usually shiny black. Generally small species, 11.5–15 mm in length (Figure 83) → *lurida* (Fallén)

- Subcallus blackish-brown to shiny brown at middle and on the upper part, not convexed. Lower callus brownish or blackish, slightly shiny and mostly distinctly wrinkled. Generally large species, 14–18 mm in length → 11

11(10) Apical segment of palpi very stout and rather short, less than 2.5 times longer than wider. Lower callus wrinkled → 12

- Apical segment of palpi not so stout, almost three times as long as wide. Lower callus unicolorous and shiny → 13

12(11) Subcallus shiny brown in the middle and on the upper part. 3rd antennal segment reddish-brown, terminal antennal segments black. Eyes with reddish pubescence. Lower callus only distinctly wrinkled and slightly shining (Figure 84, 85) → *nitidifrons confiformis* Chvála & Moucha

- Subcallus shiny black to blackish-brown. Eyes covered with short reddish hairs. Lower callus shiny dark brown to black. (Figure 83) → *lurida* (Fallén)

13(11) 3rd antennal segment broad, usually reddish-brown. Notopleural lobes blackish (Figure 86, 87) → *lundbecki* Lyneborg

- 3rd antennal segment relatively slender and more or less darkened. Notopleural lobes brownish → 14

14(13) 3rd antennal segment relatively slender, always brownish at the base, but antennae are mostly blackish. Thorax laterally and abdomen are mostly covered with golden-yellow hairs. Generally large species, 15.5–18 mm in length (Figure 88, 89) → *tropica* (L.)

- 3rd antennal segment conspicuously slender, often brownish at the very base. Antennae usually black. Thorax laterally and abdomen covered with black and gray hairs. Generally small species, 12.5–16 mm in length (Figure 90, 91) → *montana* (Meigen)

15(7) Abdomen dorsally unicolorous: blackish-gray with gray pattern, anterior two tergites mostly brown laterally (Figure 92) → *bimaculata* (Macquart) var. *bisignata* (Jaenicke)

- Abdomen with reddish-brown margin at least on anterior two tergites → 16

16(15) Large species, 17–19 mm in length. Palpi whitish-yellow, apical segment broad at the base and covered only with white hairs. Abdomen yellow-brown laterally on anterior four tergites, tergite 2 only pale haired laterally (Figure 93, 94) → *ukrainica* (Olsufjev)

- Generally small species, usually 15–16 mm in length. Apical segment of palpi not distinctly stout at base, covered with at least some black hairs → 17

17(16) Reddish-brown sidemarkings on anterior three tergites, or if small sidemarkings are also present on tergite 4, then scapus and pedicelus, 1st and 2nd antennal segments are distinctly grayish → 18

- Reddish-brown sidemarkings on anterior four tergites, or if only on anterior three tergites, then scapus and pedicelus, 1st and 2nd antennal segments and notopleural lobes are light brown → 20

18(17) Notopleural lobes brown. Dark median stripe dorsally on abdomen narrow, occupying at most 1/3 of tergite. Cerci distinctly longer than wider, subgenital plate very narrow with a deep excision on the upper side (Figure 95, 96) → *mueblfeldi* (Brauer in Brauer and Bergenstamm)

- Notopleural lobes blackish. Cerci short and broad, subgenital plate broad, apically rounded → 19

19(18) First two antennal segments grayish-black. Dark median stripe dorsally on abdomen is broad, occupying more than 1/3 of tergites. Margins are yellowish-brown and not sharply separated from the median stripe (Figure 97, 98) → *bimaculata* (Macquart)

- First two antennal segments are lighter, always grayish, but basic brown coloration is visible. Dark median stripe dorsally on abdomen is narrow, occupying less than 1/3 of tergites. Margins are pale usually yellowish-brown and sharply separated from the median stripe (Figure 99) → *solstitialis* (Meigen)

20(17) First two antennal segment and notopleural lobes yellowish-brown, lower callus often brown to black. Tergite 2 covered with light and black hairs laterally (Figure 100, 101) → *ciureai* (Séguy)

- First two antennal segment grayish-black, notopleural lobes dark brown or blackish; lower callus black. Tergite 2 covered with unicolorous golden-yellow hairs without additional black hairs laterally (Figure 102, 103) → *distinguenda* (Verrall)

21(4) Posterior abdominal segments conspicuously laterally compressed, abdomen distinctly pointed when viewed from above. Postocular margin on vertex broad. Eyes covered with short, but dense hairs (*acuminata*-group) → 22

- Posterior abdominal segments not laterally compressed, abdomen usually shaped, broad and apically rounded. Postocular margin is narrow. Eyes very indistinctly haired, almost bare (*erberi*-group). Reddish-brown margin at mostly on anterior three tergites. Anterior sternites with broad black median stripe (Figure 104, 105) → *expollicata* (Pandellé)

22(21) Frons narrow, index about 1:4.5, median callus present, connected with lower callus. Posterior three abdominal segments distinctly laterally compressed. Basal antennal segments, scapus and pedicelus, dark gray (Figure 106, 107) → *acuminata* (Loew)

- Frons wider, index 1:3.5. Only two posterior abdominal segments laterally compressed. Median callus absent. Lower callus reddish-brown square-shaped. Basal antennal segments, scapus and pedicelus reddish → [*media* (Kröber)]

**Males**

1 Black species, with unicolorously black legs and shiny black abdomen ventrally. Anterior tergites often dark brown laterally (*aterrima*-group) → 2

- Red-brown to gray-black species, legs brown at least on posterior tibiae. Anterior part of abdomen ventrally brownish, only exceptionally uniformly blackish-gray (*pilosa*) or posterior margins are distinctly whitish → 4

2(1) Anterior tarsi covered with long, black straight hairs. Subcallus sometimes slightly blackish on the upper part. Facets always equal in size. Abdomen slightly bluish-gray when viewed from behind, anterior tergites with grayish patches laterally → *micans* (Meigen)

- Anterior tarsi covered with short hairs, subcallus entirely grayish. Upper facets slightly larger. Abdomen uniformly black-brown when viewed from behind → 3

3(2) Abdomen with more or less distinctly golden-yellow hairs on posterior margins of tergites and sternites. Posterior tibiae often covered with short hairs → *aterrima* var. *auripila* (Meigen), (35).

- Abdomen covered with black hairs, with more or less distinct silver-gray median triangles. Posterior tibiae anteriorly covered with long black hairs → *aterrima* (Meigen)

4(1) Halterae whitish-yellow → 19

- Halterae blackish-brown to brown → 5

5(4) Apical segment of palpi narrow, rather cylindrically shaped, blackish-brown to brown → 6

- Apical segment of palpi very stout, rounded or if elongated whitish-gray to yellowish-brown → 7

6(5) Palpi rather light brown. Facets almost equal in size, only in the upper parts indistinctly larger. Red-brown on the margins of 3–5 anterior tergites, dark median stripe occupying 1/4 to 1/3 of the tergite 3 → [*arpadi* (Szilády)]

- Palpi blackish-brown to dark brown. Facets in the upper eye parts very large and sharply separated from smaller facets. Anterior three tergites dark brown laterally, dark median stripe occupying around 1/3 of tergite 3. All tergites with narrow whitish-gray stripe on the posterior margin, abdomen ventrally uniformly blackish-gray. Larger species, 14–16 mm in length → *kaurii* Chvála & Lyneborg

7(5) Eyes shortly connected on frons, connection is equal to 1.5 height of subcallus → 8

- Eyes connected on frons for a longer distance, equal to twice the height of subcallus → 11

8(7) 3rd antennal segment blackish-brown, slightly brown at the base → 9

- 3rd antennal segment reddish-brown, apical flagellar segments are mostly black. All facets almost equal in size → 10

9(8) Facets in the middle of the eyes are larger, without sharp separation. Eyes covered with long whitish-brown hairs. Palpi stout and covered with long black hairs. On the tergite 2 and 3 less distinct dark chestnut-brown sidemarkings. Abdomen ventrally is uniformly blackish-gray (Figure 108, 109) → *pilosa* (Loew)

- Not as above, larger yellowish-brown species → 18

10(8) Dark median stripe on abdomen broad, occupying 1/3 to 1/5 of the tergite 3, slightly broadened on the posterior region or parallel. Scutellum covered with black hairs. Smaller species, 12–14 mm in length → *lurida* (Fallén)

- Dark median stripe on abdomen narrower, occupying 1/8 to 1/5 of the tergite 3, posteriorly narrower. Scutellum apically covered with light hairs. Larger species 14–17 mm in length → *nitidifrons confiformis* Chvála & Moucha

11(7) Upper side of 1st antennal segment covered with long black hairs equal in length or longer than first two antennal segments, scapus and pedicelus, together. Palpi very stout, almost round. Vertex with a tuft of long hairs behind ocellar tubercle. Antennal bows of the same width (*bimaculata*-group) → 14

- Upper side of 1st antennal segment covered with short black hairs that are much shorter than first two antennal segments, scapus and pedicelus, together. Palpi rather oval, not very stout. Vertex usually with some short hairs. Antennal bows broader in the middle part (*montana*-group) → 12

12(11) 3rd antennal segment reddish-brown except terminal flagellar segments, rather broad, with distinct dorsal tooth. Notopleural lobes blackish → *lundbecki* Lyneborg

- 3rd antennal segment distinctly blackish and rather slender, dorsal tooth less developed. Notopleural lobes brown → 13

13(12) 3rd antennal segment rather narrow, slightly brownish mostly on basal half, dorsal tooth less developed. Abdomen covered mostly with golden-yellow hairs. Generally larger species, 15.5–17 mm in length → *tropica* (L.)

- 3rd antennal segment very narrow and almost black, dorsal tooth indistinct. Abdomen covered mostly with grayish and black hairs. Generally smaller species, 13–15 mm in length → *montana* (Meigen)

14(11) Facets are almost equal in size; middle facets are slightly larger than the lower facets. Notopleural lobes blackish. Anterior three tergites brown laterally, dark median stripe broad, occupying 1/5 to 1/3 of the tergite 3 → 15

- Upper facets considerably enlarged. Brown margins on anterior four tergites, if only on anterior three than notopleural lobes brownish; dark median stripe narrow, occupying around 1/8 of the tergite 3 → 16

15(14) Thorax, especially on pleurae, covered with light gray hairs. Dark median stripe rather narrow, occupying around 1/5 of the tergite 3. Brown margins on the abdomen are very pale, without grayish shadows → *solstitialis* (Meigen)

- Thorax covered with dark gray to black hairs. Dark median stripe broadened, occupying 1/4 to 1/3 of the tergite 3. Brown margins of the abdomen with grayish shadows (Figure 110, 111) → *bimaculata* (Macquart)

16(14) Upper facets considerably enlarged and sharply separated from the lower smaller facets. First two antennal segments, scapus and pedicelus, brownish. Notopleural lobes brown (see 18) (Figure 112, 113) → *ciureai* (Séguy)

- Upper facets less strongly enlarged and gradually decreasing downwards. First two antennal segments, scapus and pedicelus, gray or grayish-black → 17

17(16) Dark median stripe on abdomen with broad and low whitish-gray median triangles sharply separated from the brown margins. Tergite 1 covered with golden-yellow hairs on the posterior margin. Notopleural lobes blackish, only sometimes brownish (Figure 114, 115) → *distinguenda* (Verrall)

- Dark median stripe on abdomen with less distinct and higher paler median triangles, not very sharply separated from the brown margins. Tergite 1 covered with golden-yellow hairs on posterior margin. Usually anterior three tergites brown laterally, notopleural lobes brownish (Figure 116, 117) → *mueblfeldi* (Brauer in Brauer and Bergenstamm)

18(9) First two antennal segments, scapus and pedicelus, yellowish-brown, mostly covered with long black hairs. Abdomen with yellowish-brown margin laterally of anterior four tergites. Dark median stripe on abdomen very narrow, occupying around 1/8 of the tergite 3. Smaller species, 14–16 mm in length (Figure 112, 113) → *ciureai* (Séguy)

- Large species, 17–19 mm in length. Eyes covered with long pale hairs. Palpi large and round mostly covered with long pale hairs. Abdomen with broad yellowish-brown margins laterally on anterior four tergites, while 4th tergite ends with narrow black margin. Dark median abdominal stripe with small pale triangles, rather narrow occupying less than 1/8 of the tergite 3. (Figure 118, 119) → *ukrainica* (Olsufjev)

19(4) Head large, semiglobular. Abdomen more or less laterally compressed and pointed at the end. Usually smaller species, about 13 mm in length → *acuminata* (Loew)

- Head not very large, about as broad as thorax. Abdomen not laterally compressed on the posterior segments and not conspicuously pointed apically. Usually larger species, about 15 mm in length. Abdomen ventrally with broad, black median stripe on the anterior sternites, occupying 1/3 of the sternites. Black median stripe dorsally on abdomen is wider, occupying 1/4 of the tergite 2 and 3. → *expollicata* (Pandellé)

### Genus: *Tabanus* Linnaeus, 1758

Medium-sized to large, mostly black to blackish-gray, or chestnut brown species. Abdomen with pale median triangles and sublateral patches, or more or less distinct brown sidemarkings. Eyes are bare or pubescent, without bands or with one to four bands. Females with well developed, large frontal calli specifically shaped and positioned. Frons size varies from broad to very narrow, without ocellar swelling. Wings are mostly clear. Antennae with more or less distinct dorsal tooth to 3rd antennal segment, and the terminal part of the flagellum consists of four segments. Basicosta covered with short hairs. Genus *Tabanus* is represented with 47 species in European fauna (2) and 30 species in Croatian fauna (31, 36, 37). Species that are expected to be found in Croatia are marked within square brackets.

## Key to species of *Tabanus* genus

### Females

- 1 Eyes pubescent. Small to medium-sized species. Always with three eye-bands (*quatuornotatus*-group) → 2
- Eyes bare, without hairs. If present, the hairs are microscopic (not visible under 25 x magnification) → 9
- 2(1) Abdomen black-gray or silvery-gray → 3
- Abdomen olive-gray or with brownish or paler blackish hairs → 5
- 3(2) Subcallus polished black, frons with three separated black spots nearly equal in size. Eyes with three bands (Figure 120,121) → *quatuornotatus* Meigen
- Subcallus mostly grayish → 4
- 4(3) Median frontal callus linearly connected with large lower callus. Antennae black, eyes unbanding or with one, sometimes incomplete, band (Figure 122, 123) → *rupium* Brauer in Brauer and Bergenstamm
- Frontal calli separated, median callus oval-shaped. Lower callus broad, touching the eye-margins. Frons broad, index 1: 3–4. Eyes with three bands. Abdomen completely black with grayish pattern. Third antennal segment black or reddish-brown (Figure 124) → *nemoralis* Meigen
- 5(2) Eyes with one band. Femur reddish-brown on apical third (Figure 125) → *rousseii* Macquart
- Eyes with three bands. Femur blackish-gray → 6
- 6(5) Palpi stout, about three times as long as wide and pointed. Abdomen always brown on 3 to 4 anterior tergites at sides. Lower callus polished black or blackish-brown (Figure 126) → *lumatus* F.
- Palpi long and slender, about four times as long as wide. Lower callus yellowish-brown → 7
- 7(6) Palpi covered with black hairs. Frontal index 1:4–5 (Figure 127, 128) → *marianii* (Leclercq)
- Palpi covered with pale hairs → 8
- 8(7) Frons narrow, index 1:5–5.5. Palpi sometimes blunt at the ends, covered with pale, sometimes black hairs. Abdomen with median pale triangles on tergites and oval lateral patches (Figure 129, 130) → *promesogaeus* Mally
- Frons broad, index 1:4. Palpi very pointed, covered only with pale hairs. Abdomen covered with black hairs and linear patches arranged in four longitudinal lines → [*tenuicornis* (Enderlein)]
- 9(1) Small to medium-sized species, mostly 18 mm in length. Eyes with or without bands → 10
- Large species, 20 mm in length, eyes unbanded → 25
- 10(9) Median callus oval-shaped or rectangular, completely separated from lower callus → 11
- Median callus more or less linearly connected with lower callus (*bromius*-group) → 18
- 11(10) Subcallus grayish. Lower callus large, distinctly wider than longer, touching subcallus. Eyes with bands or unbanded (*cordiger*-group) → 12
- Subcallus polished, at least on the upper part. Frons narrow. Lower callus always longer than wider, separated from subcallus. Eyes always with three bands (*glaucoptis*-group) → 14
- 12(11) Eyes unbanded → 13
- Eyes with one band. Frons narrow, index 1:3.5–4. Median callus present, usually black. Wings are clear, without appendix to R<sub>4</sub> vein (Figure 131, 132) → *unifasciatus* Loew
- 13(12) Frons narrow, index 1: 5. Posterior femora yellowish-brown. Abdomen with brownish sidemarkings on anterior tergites → [*cuculus* Szilády]
- Frons rather broad, index: 1: 2.5 – 3.3. Subcallus grayish. Wings clear, dark species.  
Palpi very broad at base, twice as long as wide. Notopleural lobes yellowish-brown (Figure 133, 134) → *cordiger* Meigen
- 14(11) Large species 15.5–18 mm. Subcallus completely polished black or blackish-brown above antennae (Figure 135, 136) → *glaucoptis* Meigen
- Small species, at most 15 mm in length → 15

15(14) Subcallus completely polished black or brown above antennae → 16

- Subcallus more or less polished on the upper part or with small polished patch in the upper part → 17

16(15) Scutellum whitish-gray very pale in contrast to darker mesonotum. Abdomen very dark brown with yellowish-brown sidemarkings and very large light gray median triangles on tergites 3–5 (Figure 137, 138) → *sbannonellus* Kröber

- Scutellum darker, same color as mesonotum. Median triangles small, equally sized on all tergites. Abdomen brown with yellowish-brown sidemarkings. Frons narrow, index 1:5, apically distinctly broader (Figure 139, 140) → *obsolescens* Pandellé

17(15) Abdomen mostly blackish-gray with gray or brown sidemarkings (Figure 141, 142) → *exclusus* Pandellé

- Abdomen intensively reddish-brown on anterior tergites (Figure 143) → *fraseri* Austen

18(10) Eyes unbanded → 19

- Eyes with bands → 23

19(18) Frons broad, index 1:3. Large species, 16–18 mm in length. Median callus elongated, rather broad, not linear (Figure 144, 145) → *briani* Leclercq

- Frons not so broad, generally small species. Median callus only in the shape of a vertical line → 20

20(19) Frons very narrow, index 1: 5–6 → 21

- Frons broad, index at most 1:5 → 22

21(20) Femora dark gray. Antennae black to reddish-brown (Figure 146, 147) → *regularis* Jaenicke

- Femora reddish-yellow except apical part. Antennae light, mostly reddish-yellow (Figure 148, 149) → *darimonti* Leclercq

22(20) Vertex covered with long black or light hairs. Frons narrow, index 1:4–5. Abdomen always reddish-brown laterally and ventrally, dorsally resembling *Tabanus bromius* or abdomen is darkened (Figure 150, 151) → *miki* Brauer in Brauer and Bergenstamm

- Vertex covered mostly with short pale hairs. Frons narrow, index 1: 4.5–5. Abdomen always more or less reddish-brown laterally and ventrally, while dorsally with light gray pattern. Antennae brownish at least on the base of 3rd segment (Figure 152) → *indrae* Hauser

23(18) Eyes with three bands. Frons very narrow, index 1:6. Large species, mostly 15–18 mm in length. Abdomen laterally reddish-brown (Figure 153, 154) → *tergestinus* Egger

- Eyes with one band. Frons broad, index 1:4–4.5, mostly small species → 24

24(23) Vertex narrow and covered only with a row of short pale hairs. Black hairs along the antennal base absent. Abdomen covered with small sublateral patches, always brownish laterally. Notopleural lobes brownish (Figure 155, 156) → *bromius* L.

- Vertex broad and covered with a row of long pale hairs. Black hairs along the antennal base. Abdomen blackish with rather indistinct grayish patches, except laterally where they are large. Antennae unicolorous brownish. Notopleural lobes gray (Figure 157, 158) → *maculicornis* Zetterstedt

25(9) Posterior tibiae black, mostly brownish on the inner side → 26

- Posterior tibiae brown at least on the basal half → 27

26(25) Frons narrow, index 1:5. Palpi covered with black hairs. Abdomen black with pale median triangles. Posterior tibiae completely black. Antennal bows very high, occupying lower part of subcallus (Figure 159, 160) → *paradoxus* Jaenicke

- Frons broad, index 1:4. Palpi covered with pale and black hairs, abdomen dark chestnut-brown. Posterior tibiae brownish on the inner side → [*spodopterooides* Olsufjev, Moucha & Chvála]

27(25) Abdomen silvery-gray, pink to reddish-gray laterally, with one black median line, without pale median triangles (Figure 161, 162) → *spectabilis* Loew

- Pale median triangles always more or less distinct. If present, lateral patches on abdomen are never linearly connected → 28

28(27) Abdomen with three rows of light gray patches. Mostly blackish-gray species → 29

- Abdomen only with a row of pale median triangles, mostly brown to reddish-brown laterally → 30

29(28) Abdomen with whitish pattern on posterior margins of tergites. Palpi covered with black hairs, notopleural lobes blackish → [*rectus* Loew]

- Abdomen grayish-black, lateral oval patches do not reach posterior margins of tergites. Palpi mostly covered with pale hairs and notopleural lobes are yellowish-brown (Figure 163, 164) → *autumnalis* L.

30(28) Palpi gray to brown, densely covered with short black or grayish hairs. Antennae black or blackish-brown with black terminal flagellar segments. Femora black or grayish. Abdomen ventrally with distinct and sharply separated dark brown to reddish-brown median line, margins are silvery and covered with lighter hairs. Dorsally on abdomen pale median triangles with straight sides, very distinct. Triangles on tergite 2 and 3 occupy at least lower part of the tergite (Figure 165, 166) → *spodopterus* Meigen

- Palpi whitish-yellow or yellowish-brown, covered with pale and black hairs. Basal antennal segments brown to yellowish-brown, exceptionally antennae are black → 31

31(30) Lower callus more or less triangular. Abdomen is ventrally blackish-brown with broad pale margins on the posterior part of all sternites. Dorsally on abdomen median triangles are more or less with straight sides and not reaching margins of preceding tergites. Palpi yellowish-brown, densely covered with black hairs (Figure 167, 168) → *sudeticus* Zeller

- Lower callus mostly triangular, broadest at the base. Abdomen is ventrally brownish to yellowish-brown, with distinct dark brown median line. Median triangles with rather concave sides always reaching margins of preceding tergites (Figure 169, 170) → *bovinus* L.
- Lower callus elongated and oval-shaped, broadest in the middle. Abdomen is ventrally reddish-yellow or light brown. If median line present than reddish or brownish → 32

32(31) Third antennal segment reddish-brown, terminal flagellar segments darker. Palpi whitish-yellow (Figure 171, 171a.) → *tinctus* Walker

- Third antennal segment black, sometimes slightly brownish at the base, while two basal antennal segments are brown. Abdomen laterally more reddish-yellow. Median triangle on tergite 2 elongated, with very short base. Mesonotum brownish. Palpi whitish-yellow, occasionally covered with a few black hairs (Figure 172, 173) → *eggeri* Schiner

## Males

1 Eyes pubescent (*quatuornotatus*-group) → 2

- Eyes bare or covered with minute hairs visible only under larger magnification → 9

2(1) Subcallus polished black at least on the upper part (Figure 174, 175) → *quatuornotatus* Meigen

- Subcallus grayish → 3

3(2) Eyes unbanded or with one, often incomplete, band → 4

- Eyes with two bands. Posterior tibiae brownish → 5

4(3) Posterior tibiae blackish, femora blackish-gray → *rupium* (Brauer in Brauer and Bergenstamm)

- Posterior tibiae yellowish-brown. Posterior femora yellowish-brown, at least apically → *rousseii* Macquart

5(3) Antennae black, third segment sometimes brownish at base. Palpi long and pointed. Eyes covered with long light brown hairs. Facets on upper 2/3 of the eye slightly larger. Vertex covered with long black hairs → *nemoralis* Meigen

- Antennae reddish-brown to orange-yellow, terminal flagellar segments usually darker → 6

6(5) Upper part of the eye with larger facets slightly differentiated from the lower part of the eye with small facets, upper facets twice as large as lower. Palpi distinctly oval-shaped, twice as long as wide, blunt on apex. Eyes covered with long whitish hairs. Vertex covered with long black hairs → *lunatus* F.

- Upper part of the eye with large facets distinctly separated from lower part with small facets, upper facets usually more than four times larger than lower → 7

7(6) Palpi rather short, ovoid and covered with black and white hairs. Vertex covered with long black and white hairs. Abdomen blackish-gray with three rows of whitish patches, tergite 2 and 3 with large reddish patch laterally (Figure 176, 177) → *marianii* (Leclercq)

- Palpi longer, three times as long as wide, mostly covered with pale hairs. Abdomen olive-gray → 8

8(7) Palpi elongated, oval-shaped, slightly pointed apically. Eyes covered with sparse minute hairs. Abdomen brownish laterally on tergite 2 and 3, dorsally with pale median triangles and marginal patches. Vertex covered with long dark hairs (Figure 178, 179) → *promesogaesus* Mally

- Palpi slender and very pointed apically. Eyes densely covered with short pale hairs. Abdomen with four rows of patches covered with black hairs. Vertex covered with long pale hairs → [*tenuicornis* Enderlein]

9(1) Small to medium-sized species, 18 mm length, eyes mostly with bands → 10

- Large species, about 20 mm, eyes always unbanded → 21

10(9) Facets on upper 2/3 or 3/4 of eyes extremely large and sharply separated from lower part with small facets. Head large or small → 11

- Facets almost equal in size, sharp separation between large and small facets absent. Head always smaller → 20

11(10) Subcallus mostly more or less polished in the upper part. Eyes with two bands (*glaucopis*-group) → 12

- Subcallus completely grayish. Eyes unbanded or with bands (*cordiger* and *bromius*-group) → 15

12(11) Large species more than 15 mm in length. Subcallus completely polished black or dark brown (Figure 180, 181) → *glaucopis* Meigen

- Small species, smaller than 14 mm → 13

13(12) Subcallus only apically polished. Vertex mostly covered with long pale and dark hairs (Figure 182, 183) → *exclusus* Pandellé

- Subcallus completely polished black or brown → 14

14(13) Scutellum distinctly whitish-gray, tergites 3 and 4 with large pale median triangles. Vertex covered with long dark hairs (Figure 184, 185) → *shannonellus* Kröber.

- Scutellum dark, same color as mesonotum. All median triangles less distinct and almost equal in size. Vertex covered with short pale hairs → *obsolescens* Pandellé

15(11) Vertex with a row of long hairs on postocular margin → 16

- Vertex covered only with short hairs on postocular margin → 18

16(15) Eyes with one band → 17

- Eyes unbanded. Head very large and semiglobular. Palpi very stout, almost globular (Figure 186, 187) → *cordiger* Meigen

17(16) Head rather small, not wider than thorax. Vertex covered with black and pale hairs. Palpi mostly covered with dark hairs. Usually rather brownish species (Figure 188, 189) → *miki* Brauer in Brauer and Bergenstamm

- Head very large, broader than thorax. Vertex covered with pale hairs. Palpi mostly pale pubescent. Extensively blackish-gray species (Figure 190, 191) → *maculicornis* Zetterstedt

18(15) Head very large, much broader than thorax. Vertex covered with short pale hairs. Palpi mostly covered with pale hairs. Eyes with one band → *regularis* Jaennicke

- Head smaller, slightly broader than thorax. Vertex covered with short dark hairs, palpi with pale and black hairs → 19

19(18) Eyes with one band. Abdominal patches grayish, rather indistinct, anterior margin brown (Figure 192, 193) → *bromius* L.

- Eyes unbanded. Abdominal patches whitish-gray with distinct reddish-brown patches marginally → *indrae* Hauser

20(10) Vertex mostly covered with long black hairs. Palpi short and stout. Eyes with one band. Posterior tibiae brownish. Generally larger species 14–16 mm in length → *unifasciatus* Loew

- Vertex covered with short pale hairs. Palpi oval-shaped, not very stout. Larger brownish species, 15–18 mm in length. Eyes with two bands. (Figure 194, 195) → *tergestinus* Egger

21(9) Facets on upper 2/3 or 3/4 of the eye rather larger than in lower part (at least 3 or 4 times). Antennae with rather small and rectangular dorsal tooth (*bovinus*-group) → 22

- All facets almost equal in size, facets in upper part twice as large than facets in lower part → 29

22(21) Posterior tibiae black, inner side slightly brownish → 23

- Posterior tibiae brownish at least on basal half → 24

23(22) Antennal bows very high, occupying lower half of subcallus. Abdomen mostly black, tergite 2 slightly brownish on margins. Tibiae completely black (Figure 196, 197) → *paradoxus* Jaennicke

- Antennal bows narrow. Abdomen brown, with narrow black median line on anterior 4 tergites. Posterior tibiae brownish on the inner side → [*spodopterooides* Olsufjev, Moucha & Chvála]

24(22) Abdomen silvery-gray to reddish-gray on marginal parts, only median line black, pale median triangles absent → *spectabilis* Loew

- Pale median triangles always more or less visible → 25

25(24) Abdomen with three rows of light gray patches → 26

- Abdomen with only one row of pale median triangles, without marginal patches. Abdomen mostly brown laterally → 27

26(25) Blackish species, abdomen with distinct whitish pattern. Notopleural lobes blackish → *rectus* Loew

- Abdomen brownish at margins, abdominal pattern grayish, notopleural lobes yellowish-brown (Figure 198, 199) → *autumnalis* L.

27(25) Area with large facets sharply separated from the area with small facets. Large facets 5 to 6 times larger than small. Abdomen chestnut brown laterally. Abdomen is ventrally blackish-brown with more or less distinct yellowish to whitish line on posterior margin of all sternites. Posterior femora black (Figure 200, 201) → *sudeticus* Zeller

- Area with large facets indistinctly separated from area with small facets, large facets 3 to 4 times larger than small. Abdomen reddish-brown to reddish-yellow laterally → 28

28(27) Third antennal segment black, sometimes brownish at base. Tergites reddish-yellow laterally (Figure 202, 203) → *eggeri* Schiner

- Third antennal segment reddish-brown, terminal flagellar segments darker. Tergites reddish-brown laterally → *tinctus* Walker

29(21) Abdomen yellowish-brown laterally. Pale median triangles rather narrow with more or less concave sides. Abdomen is ventrally brownish to yellowish-brown, median line dark brown (Figure 204, 205) → *bovinus* L.

- Abdomen reddish-brown laterally. Pale median triangles broader, mostly equilateral, with even sides. Abdomen is ventrally reddish-brown, silvery-gray laterally, while median line is reddish to yellowish-brown. Palpi yellowish-brown to grayish, covered with long black hairs (Figure 206, 207) → *spodopterus* Meigen

### Tribe: Haematopotini

#### Genus: *Heptatoma*, Meigen 1803

Medium-sized horseflies species resembling honey-bees. Eyes in females with four bands. Frons very broad, shiny, pubescent, ocellar tubercle absent. Antennae are black, very long and slender, 3rd antennal segment more than twice as long as first two antennal segments together. Wings are clear without appendix to vein R<sub>4</sub> (2). This genus is represented in Europe with only one species. This species – *Heptatoma pellucens* is also determined for Croatian fauna (31).

## Key to species of *Heptatoma* genus

### Females

Blackish species, head, thorax and anterior two tergites are covered with golden-yellow to yellowish-brown hairs. Antennae are black, very long and slender. Frons is shiny black covered with yellowish pubescence. Wings are clear. Eyes with four bands (Figure 208, 209) → *pellucens* (F.)

### Males

Eyes covered with short brownish hairs. Facets on the upper 2/3 of the eye are slightly larger and indistinctly separated from smaller facets. Subcallus shiny black. Antennae are the same as in females, except two basal segments of scapus and pedicel are covered with long black hairs on the upper side. Palpi are blackish, very short and stout, mostly covered with short black hairs. Thorax, wings and abdomen are the same color as in females (Figure 210, 211) → *pellucens* (F.)

## Genus: *Haematopota* Meigen, 1803

Generally small slender grayish species, 7–13 mm in length. Frons mostly square-shaped, with paired velvety black spots laterally and a very small median spot. Anterior frontal callus is large and shiny, occupying lower quarter of frons. Antennae are always long and narrow without developed dorsal tooth on the third segment and with three terminal flagellar segments. Wings are brownish-grayish with whitish spots and patterns. Abdomen blackish-gray with more or less developed paired sublateral spots on tergites (2). Genus *Haematopota* is represented with 20 species in European (2) and 9 species in Croatian fauna (31). Species marked in square brackets are expected to be found in Croatia.

## Key to species of *Haematopota* genus

### Females

1 1st antennal segment long, cylindrical and rather slender, at least 4 times longer than wider, when viewed from above long as frons is high (*italica*-group), (Figure 212) → 2

- 1st antennal segment shorter, usually conical to oval-shaped, at most three times longer than wider, more or less shiny, when viewed from above visibly shorter than frons is high (*pluvialis*-group), (Figure 213) → 4

2(1) Grayish sublateral spots from tergite 2 to tergite 6, sometimes small spot also on tergite 1. 1st antennal segment very long with only one subapical constriction, 3rd segment as wide as 1st. Antennae mostly brownish. Palpi grayish to light brown, covered with pale and black hairs. Apical line on wing very narrow and indistinct. Larger species 11.5 to 13.5 mm (Figure 214, 215) → *grandis* Meigen

- Grayish sublateral spots from tergite 3 to tergite 6, usually on posterior two or three tergites or absent. Frons narrower, about 1/3 of head width → 3

3(2) 1st antennal segment yellowish-brown, without subapical constriction, or with only very small one. Mostly brownish species with distinctly narrow frons (Figure 216, 217) → *pandazisi* (Kröber)

- 1st antennal segment blackish-gray, with more or less distinct subapical constriction, 4 times as long as wide. 3rd antennal segment sometimes brownish at the base. Frons slightly longer than wider, with large circular and paired velvety black spots. Mostly blackish-gray species (Figure 218, 219) → *italica* Meigen

4(1) 1st antennal segment entirely brownish, with more or less distinct subapical constriction. Femora yellowish-brown, sublateral gray spots on abdomen absent or indistinct on posterior tergites → [*gallica* Szilády]

- 1st antennal segment entirely shiny black, or at least shiny on tip → 5

5(4) 1st antennal segment dusty grayish at least on upper basal quarter or yellowish-gray → 6

- 1st antennal segment entirely shiny black. Frons always broad, broader than higher, 1st antennal segment without constriction. Antennae entirely black. Wings dark brown, posterior margins clouded. All femora blackish-gray, anterior two tergites without gray sublateral spots (Figure 220) → *crassicornis* Wahlberg

6(5) Frons broad, distinctly broader than higher. Antennae entirely black, 3rd segment broad. 1st antennal segment cylindrical, more than twice as long as wide, dusty grayish on upper basal half. Femora blackish-gray (Figure 221, 222) → *ocelligera* (Kröber)

- Frons narrower, distinctly higher than wider or at least square-shaped, 3rd antennal segment slightly brown at the base → 7

7(6) 1st antennal segment irregularly shaped with deep constriction before apex. Mostly olive-green species. Wings brown to dark brown, femora blackish-gray (Figure 213, 223, 224) → *pluvialis* (L.)

- 1st antennal segment rather oval to cylindrical in shape, mostly with a small constriction before apex. Mostly blackish or light gray species → 8

8(7) Usually blackish species, scutellum with large whitish-gray spot. Paired velvety black spots on frons are large, usually touching lower callus and eye margins. Wings dark brown. 1st antennal segment shiny black, at least on apical half (Figure 225, 226, 227) → *scutellata* (Olsufjev, Moucha & Chvála)

- Mostly light grayish species; scutellum without light spot, same color as mesonotum. Paired velvety black spots on frons small, separated from lower callus and eye margins. Wings light gray, 1st antennal segment shiny black only on apical quarter → 9

9(8) 1st antennal segment blackish-gray, femora blackish-gray. Abdomen with distinct but rather small gray sublateral spots from tergite 3 to tergite 7, sometimes small spot also on tergite 2, (Figure 228, 229, 230) → *subcylindrica* Pandellè

- 1st antennal segment more or less brownish or yellowish-gray at the base, femora distinctly yellowish-brown. Abdomen with large, whitish-gray sublateral spots on all tergites, rarely absent on tergite 1, (Figure 231, 232) → *bigoti* Gobert

## Males

1 1st antennal segment entirely dusty grayish, elongated oval-shaped, about twice as long as wide or longer. Generally large species about 10 mm long. 3rd antennal segment narrow → 2

- 1st antennal segment shiny black, at least on apical third. Subcallus with large velvety black spot touching or almost touching eye margins → 3

2(1) 1st antennal segment brown, elongated oval-shaped and stout, usually twice as long than wide → *pandazisi* (Kröber)

- 1st antennal segment black or dusty grayish, elongated oval-shaped, more than twice longer than wider → *grandis* Meigen

3(1) 1st antennal segment elongated, long oval-shaped, more than twice longer than wider → 4

- 1st antennal segment shorter, usually egg-shaped, mostly twice as long as wide → 5

4(3) 1st antennal segment mostly shiny black, dusty whitish-gray on upper basal third. Wings brownish-gray → *italica* Meigen

- 1st antennal segment dusty whitish-gray from half or above half of basal part. Wings are light gray (Figure 233 and 234) → *subcylindrica* Pandellè

5(3) Antennae entirely black including 3rd segment. 1st antennal segment entirely shiny. Wings dark brown → *crassicornis* Wahlberg

- 3rd antennal segment brownish at least at the base, also 1st segment at least slightly whitish-gray on basal part → 6

6(5) Scutellum with distinct whitish-gray median spot. Wings dark brown → *scutellata* (Olsufjev, Moucha & Chvála)

- Scutellum without grayish spot, same color as mesonotum → 7

7(6) Femur blackish-gray, wings dark brown, gray sublateral spots on tergites rather indistinct → *pluvialis* (L.)

- Femur distinctly yellowish-brown. Wings gray, whitish-gray sublateral spots on tergites rather large and distinct → *bigoti* Gobert

### Tribe: Diachlorini

#### Genus: *Dasyrhamphis* Enderlein, 1922

Medium-sized to large black species with more or less clouded wings. Frons in females is narrow with well developed frontal calli. Third antennal segment with more or less well developed dorsal tooth. Eight species of this genus are determined for European fauna (2), and three species for Croatian fauna (31). Species of *Dasyrhamphis* genus in Croatia are distributed along the Adriatic coast.

#### Key to species of *Dasyrhamphis* genus

1 3rd antennal segment with distinct excision and a very long, pointed dorsal tooth directed forward. Legs black unicolorous, palpi black covered with black hairs → 2

- 3rd antennal segment less developed, slender; mostly with rectangular dorsal tooth, without any excisions (*Efflatounanus* Phil.). Subcallus shiny black or blackish-brown, dusty grayish laterally. Wings clear with distinct dark brown spot near the middle of the anterior margin and near the base of discal cell. Smaller species, 11–14.5 mm in length (Figure 235, 236, 237, 238) → *umbrinus* (Meigen)

2(1) Subcallus is entirely shiny black in females, sometimes distinctly dusted in males. Wings dark brown uniformly clouded; squamae dark with very darkened margin covered with black fringes. Generally large species, 14–18.5 mm in length (Figure 239, 240, 241, 242) → *ater* (Rossi)

- Subcallus in both sexes shiny black only in the middle. Wings brown, clouded, middle area from base to the apex and discal cell are hyaline. Squamae are sometimes yellowish covered with pale fringes. Generally smaller species, 14–16.5 mm in length (Figure 243, 244, 245, 246, 247, 248) → *antbracinus* (Meigen)

#### Genus: *Philipomyia* Olsufjev, 1964

Medium-sized, rather robust *Tabanus*-like species. Eyes are bare and unbanded. Frons in females is moderately broad with frontal calli joined into keel-shaped callus. Antennae with a well developed dorsal tooth on the 3rd segment. Wings are clear, without appendix to vein R<sub>4</sub>, basicosta bare. Genus *Philipomyia* is represented with three species in European fauna (2) and with two species in Croatian fauna (31). One is distributed along the Adriatic coast and the other in mountainous region.

#### Key to species of *Philipomyia* genus

1 3rd antennal segment with large pointed dorsal tooth, directed forward, orange-yellow in color. Apical segments darker. Male antennae narrower, same color as female. Anterior three tergites yellowish-brown laterally with narrow median black line. Abdomen is mostly covered with golden-yellow hairs. Halterae are yellowish. Facets always of the same size in males. Male abdomen yellowish-brown on anterior three or four tergites with very narrow median black line often intermittent on posterior margin of each tergite (Figure 249, 250, 251, 252, 253) → *graeca* (F.)

- 3rd antennal segment is dark reddish-brown with small rectangular dorsal tooth, not directly directed forward. Abdomen with anterior tergites rather dark chestnut brown with wide black median line. Halterae are brownish-yellow. Males: all facets of almost the same size, 3rd antennal segment very narrow, generally darker than in females with distinct small dorsal tooth, 1st antennal segment – scapus mostly blackish-gray, abdomen rather narrow, same color as in females (Figure 254, 255, 256, 257) → *aprica* (Meigen)

*Acknowledgments:* We thank to Prof. Dr. Milan Chavála for all improvements in this manuscript.

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Figure 11. Genus *Silvius*



Figure 12. Genus *Hybomitra*



Figure 13. Genus *Atylotus*

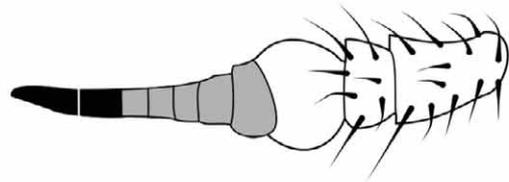


Figure 14. Genus *Pangonius*

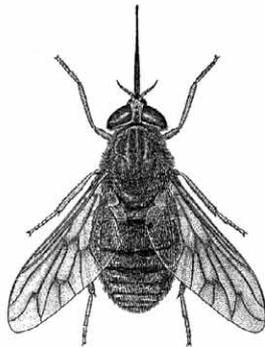


Figure 15. Genus *Pangonius*



Figure 16. Genus *Chrysops*



Figure 17. Genus *Chrysops*



Figure 18. Genus *Silvius*



Figure 19. Genus *Philpomyia*



Figure 20. Genus *Dasyrhamphis*



Figure 21. Genus *Atylotus*



Figure 22. Genus *Theriopectes*



Figure 23. Genus *Theriopectes*



Figure 24. Genus *Hybomitra*



Figure 25. Genus *Hybomitra*



Figure 26. Genus *Hybomitra*



Figure 27. Genus *Tabanus*



Figure 28. Genus *Tabanus*



Figure 29. Genus *Tabanus*

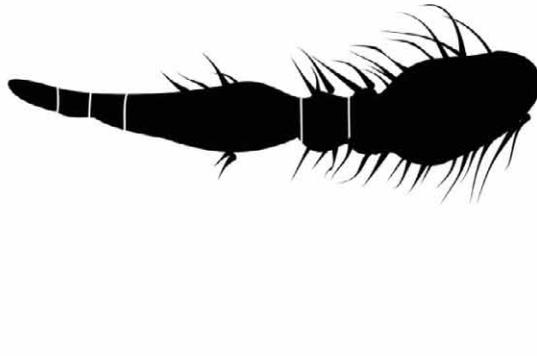


Figure 30. Genus *Haematopota*



Figure 31. Genus *Haematopota*



Figure 32. Genus *Heptatoma*



Figure 33. Genus *Heptatoma*

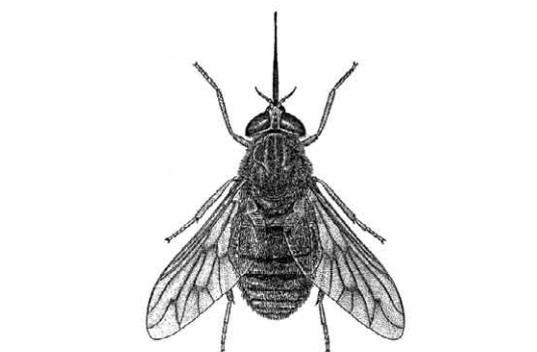


Figure 34. *Pangonius pyritosus*, ♀



Figure 35. *Silivius alpinus*, ♀



Figure 36. *S. alpinus*, ♀



Figure 37. *S. alpinus*, ♀

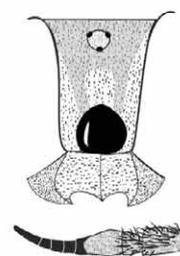


Figure 38. *S. alpinus*, ♀



Figure 39. *Chrysops caecutiens*, ♀



Figure 40. *C. caecutiens*, ♀



Figure 41. *C. italicus*, ♀



Figure 42. *C. relictus*, ♀



Figure 43. *C. relictus*, ♀



Figure 44. *C. relictus*, ♀



Figure 45. *C. viduatus*, ♀



Figure 46. *C. viduatus*, ♀



Figure 47. *C. parallelogrammus*, ♀



Figure 48. *C. parallelogrammus*, ♀



Figure 49. *C. flavipes*, ♀



Figure 50. *C. flavipes*, ♀



Figure 51. *C. italicus*, ♀



Figure 52. *C. italicus*, ♀



Figure 53. *C. caecutiens*, ♂



Figure 54. *C. caecutiens*, ♂

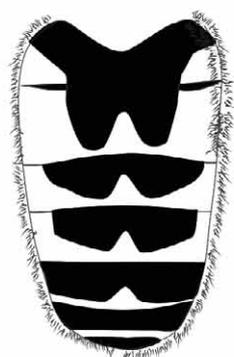


Figure 55. *C. relictus*, ♂



Figure 56. *C. viduatus*, ♂



Figure 57. *C. rufipes*, ♂



Figure 58. *C. rufipes*, ♂

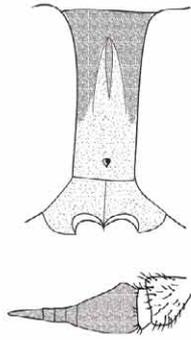


Figure 59. *Atylotus latistriatus*, ♀



Figure 60. *A. flavoguttatus*, ♀



Figure 61. *A. flavoguttatus*, ♀



Figure 62. *A. rusticus*, ♀



Figure 63. *A. rusticus*, ♀



Figure 64. *A. fulvus*, ♀



Figure 65. *A. fulvus*, ♀



Figure 66. *A. loewianus*, ♀



Figure 67. *A. loewianus*, ♀



Figure 68. *A. rusticus*, ♂



Figure 69. *A. rusticus*, ♂



Figure 70. *A. loewianus*, ♂



Figure 71. *A. loewianus*, ♂



Figure 72. *Therioplectes gigas*, ♀



Figure 73. *Th. gigas*, ♀



Figure 74. *Th. tunicatus*, ♀



Figure 75. *Th. tunicatus*, ♀



Figure 76. *Hybomitra micans*, ♀



Figure 77. *H. aterrima* var. *auripila*, ♀



Figure 78. *H. aterrima* var. *auripila*, ♀

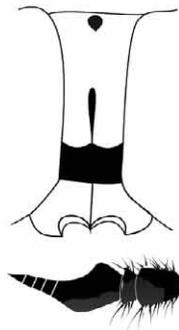


Figure 79. *H. aterrima*, ♀

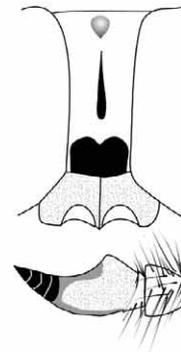


Figure 80. *H. kaurii*, ♀



Figure 81. *H. pilosa*, ♀



Figure 82. *H. pilosa*, ♀



Figure 83. *H. lurida*, ♀



Figure 84. *H. nitidifrons conformis*, ♀



Figure 85. *H. nitidifrons conformis*, ♀



Figure 86. *H. lundbecki*, ♀



Figure 87. *H. lundbecki*, ♀



Figure 88. *H. tropica*, ♀



Figure 89. *H. tropica*, ♀



Figure 90. *H. montana*, ♀



Figure 91. *H. montana*, ♀



Figure 92. *H. bimaculata* var. *bisignata*, ♀



Figure 93. *H. ukrainica*, ♀



Figure 94. *H. ukrainica*, ♀



Figure 95. *H. muehlfeldi*, ♀



Figure 96. *H. muehlfeldi*, ♀



Figure 97. *H. bimaculata*, ♀



Figure 98. *H. bimaculata*, ♀



Figure 99. *H. solstitialis*, ♀



Figure 100. *H. ciureai*, ♀



Figure 101. *H. ciureai*, ♀



Figure 102. *H. distinguenda*, ♀



Figure 103. *H. distinguenda*, ♀



Figure 104. *H. expollicata*, ♀



Figure 105. *H. expollicata*, ♀



Figure 106. *H. acuminata*, ♀



Figure 107. *H. acuminata*, ♀



Figure 108. *H. pilosa*, ♂



Figure 109. *H. pilosa*, ♂



Figure 110. *H. bimaculata*, ♂



Figure 111. *H. bimaculata*, ♂



Figure 112. *H. ciureai*, ♂



Figure 113. *H. ciureai*, ♂



Figure 114. *H. distinguenda*, ♂



Figure 115. *H. distinguenda*, ♂



Figure 116. *H. muehlfeldi*, ♂



Figure 117. *H. muehlfeldi*, ♂



Figure 118. *H. ukrainica*, ♂



Figure 119. *H. ukrainica*, ♂



Figure 120. *Tabanus quatuornotatus*, ♀



Figure 121. *T. quatuornotatus*, ♀



Figure 122. *T. rupium*, ♀



Figure 123. *T. rupium*, ♀

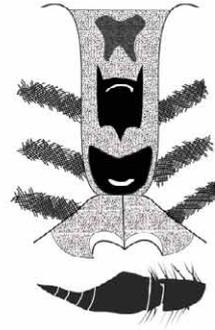


Figure 124. *T. nemoralis*, ♀

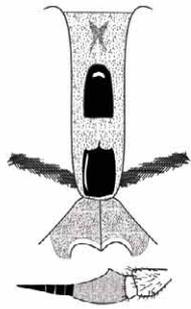


Figure 125. *T. roussellii*, ♀



Figure 126. *T. lunatus*, ♀



Figure 127. *T. marianii*, ♀



Figure 128. *T. marianii*, ♀



Figure 129. *T. promesogaeus*, ♀



Figure 130. *T. promesogaeus*, ♀



Figure 131. *T. unifasciatus*, ♀



Figure 132. *T. unifasciatus*, ♀



Figure 133. *T. cordiger*, ♀



Figure 134. *T. cordiger*, ♀



Figure 135. *T. glaucopsis*, ♀



Figure 136. *T. glaucopsis*, ♀



Figure 137. *T. shannonellus*, ♀



Figure 138. *T. shannonellus*, ♀



Figure 139. *T. obsolescens*, ♀



Figure 140. *T. obsolescens*, ♀



Figure 141. *T. exclusus*, ♀



Figure 142. *T. exclusus*, ♀

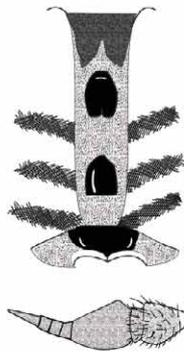


Figure 143. *T. fraseri*, ♀



Figure 144. *T. briani*, ♀



Figure 145. *T. briani*, ♀



Figure 146. *T. regularis*, ♀



Figure 147. *T. regularis*, ♀



Figure 148. *T. darimonti*, ♀



Figure 149. *T. darimonti*, ♀



Figure 150. *T. miki*, ♀



Figure 151. *T. miki*, ♀

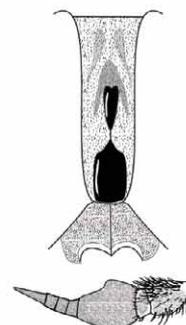


Figure 152. *T. indrae*, ♀



Figure 153. *T. tergestinus*, ♀



Figure 154. *T. tergestinus*, ♀



Figure 155. *T. bromius*, ♀



Figure 156. *T. bromius*, ♀



Figure 157. *T. maculicornis*, ♀



Figure 158. *T. maculicornis*, ♀



Figure 159. *T. paradoxus*, ♀



Figure 160. *T. paradoxus*, ♀



Figure 161. *T. spectabilis*, ♀



Figure 162. *T. spectabilis*, ♀



Figure 163. *T. autumnalis*, ♀



Figure 164. *T. autumnalis*, ♀



Figure 165. *T. spodopterus*, ♀



Figure 166. *T. spodopterus*, ♀



Figure 167. *T. sudeticus*, ♀



Figure 168. *T. sudeticus*, ♀



Figure 169. *T. bovinus*, ♀



Figure 170. *T. bovinus*, ♀



Figure 171. *T. tinctus*, ♀



Figure 171a. *T. tinctus*, ♀



Figure 172. *T. eggeri*, ♀



Figure 173. *T. eggeri*, ♀



Figure 174. *T. quatuornotatus*, ♂



Figure 175. *T. quatuornotatus*, ♂



Figure 176. *T. marianii*, ♂



Figure 177. *T. marianii*, ♂



Figure 178. *T. promesogaeus*, ♂



Figure 179. *T. promesogaeus*, ♂



Figure 180. *T. glaucopsis*, ♂



Figure 181. *T. glaucopsis*, ♂



Figure 182. *T. exclusus*, ♂



Figure 183. *T. exclusus*, ♂



Figure 184. *T. shannonellus*, ♂



Figure 185. *T. shannonellus*, ♂



Figure 186. *T. cordiger*, ♂



Figure 187. *T. cordiger*, ♂



Figure 188. *T. miki*, ♂



Figure 189. *T. miki*, ♂



Figure 190. *T. maculicornis*, ♂



Figure 191. *T. maculicornis*, ♂



Figure 192. *T. bromius*, ♂



Figure 193. *T. bromius*, ♂



Figure 194. *T. tergestinus*, ♂



Figure 195. *T. tergestinus* ♂



Figure 196. *T. paradoxus*, ♂



Figure 197. *T. paradoxus*, ♂



Figure 198. *T. autumnalis*, ♂



Figure 199. *T. autumnalis*, ♂



Figure 200. *T. sudeticus*, ♂



Figure 201. *T. sudeticus*, ♂



Figure 202. *T. eggeri*, ♂



Figure 203. *T. eggeri*, ♂



Figure 204. *T. bovinus*, ♂



Figure 205. *T. bovinus*, ♂



Figure 206. *T. spodopterus*, ♂



Figure 207. *T. spodopterus*, ♂



Figure 208. *Heptatoma pellucens*, ♀



Figure 209. *He. pellucens*, ♀



Figure 210. *He. pellucens*, ♂



Figure 211. *He. pellucens*, ♂



Figure 212. *Haematopota italica*, ♀

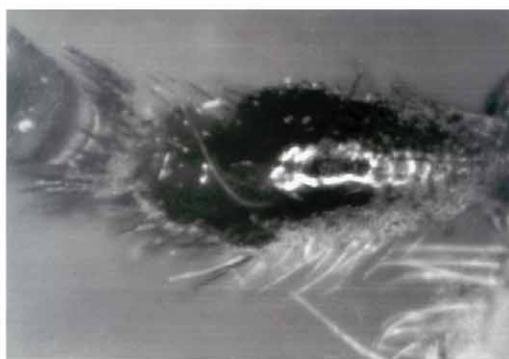


Figure 213. *Hae. pluvialis*, ♀



Figure 214. *Hae. grandis*, ♀



Figure 215. *Hae. grandis*, ♀



Figure 216. *Hae. pandazisi*, ♀



Figure 217. *Hae. pandazisi*, ♀



Figure 218. *Hae. italica*, ♀



Figure 219. *Hae. italica*, ♀

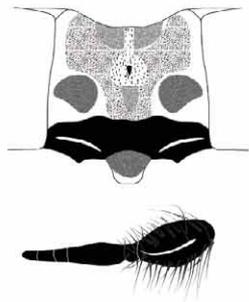


Figure 220. *Hae. crassicornis*, ♀



Figure 221. *Hae. ocelligera*, ♀



Figure 222. *Hae. ocelligera*, ♀



Figure 223. *Hae. pluvialis*, ♀



Figure 224. *Hae. pluvialis*, ♀



Figure 225. *Hae. scutellata*, ♀

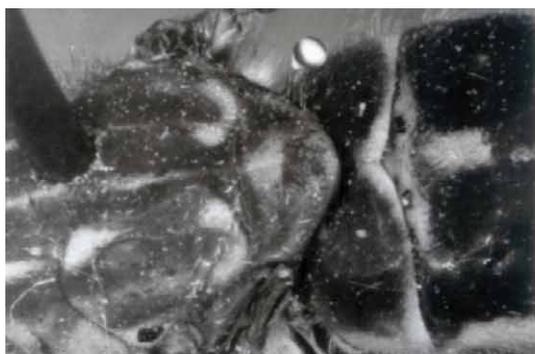


Figure 226. *Hae. scutellata*, ♀



Figure 227. *Hae. scutellata*, ♀



Figure 228. *Hae. subcylindrica*, ♀



Figure 229. *Hae. subcylindrica*, ♀



Figure 230. *Hae. subcylindrica*, ♀



Figure 231. *Hae. bigoti*, ♀



Figure 232. *Hae. bigoti*, ♀



Figure 233. *Hae. subcylindrica*, ♂



Figure 234. *Hae. subcylindrica*, ♂



Figure 235. *Dasyrhamphis umbrinus*, ♀



Figure 236. *D. umbrinus*, ♀



Figure 237. *D. umbrinus*, ♂



Figure 238. *D. umbrinus*, ♂



Figure 239. *D. ater*, ♀



Figure 240. *D. ater*, ♂



Figure 241. *D. ater*, ♀



Figure 242. *D. ater*, ♂



Figure 243. *D. anthracinus*, ♀



Figure 244. *D. anthracinus*, ♀



Figure 245. *D. anthracinus*, ♀



Figure 246. *D. anthracinus*, ♂



Figure 247. *D. anthracinus*, ♂



Figure 248. *D. anthracinus*, ♂



Figure 249. *Philipomyia graeca*, ♀



Figure 250. *Ph. graeca*, ♀



Figure 251. *Ph. graeca*, ♀



Figure 252. *Ph. graeca*, ♂



Figure 253. *Ph. graeca*, ♂



Figure 254. *Ph. aprica*, ♀



Figure 255. *Ph. aprica*, ♀



Figure 256. *Ph. aprica*, ♂



Figure 257. *Ph. aprica*, ♂

