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New Contribution to Information about Tabanidae (Diptera) Adult and Larvae from West Anatolia

V. Rimma Andreeva[1] A. Yavuz Kılıç[2] Ferhat Altunsoy[2]

[1]Institute of Zoology NAS of Ukraine, Bogdana Khmelnitskogo Street, 15 Kiev-30 01601, UKRAINE, e-mail: andreeva@i.com.ua

[2]Anadolu University, Faculty of Science, Department of Biology, 26470 Eskişehir, TURKEY, e-mail: tabanidae@msn.com

ABSTRACT

In this paper, the habitats of Tabanidae larvae in West Anatolia were studied for the first time. The larvae of 25 horse flies species and subspecies had been collected in several points differed by biotopical conditions and identified. Descriptions of new subspecies of *Haematopota pallens bozdagensis* ssp. nova, and its larva as well as unknown earlier larvae of *Tabanus portschinskii* Olsufjev, 1937, *Philipomyia graeca* Fabricius, 1794, *Dasyrhamphis carbonarius* Meigen, 1820 and *Nemorius abbassianae* Leclercq, 1960 were given.

Keywords: New subspecies, Descriptions, New Larvae, Tabanidae, Diptera, West Anatolia, Turkey

INTRODUCTION

It can be easily argued that the territory of Asia Minor, thanks to its geographical disposition may be one of the most interesting place in all Palearctic for studying the horse fly fauna. Being one of the most remote areas of the Eastern Mediterranean, Asia Minor is the place where a big number of faunistic elements congregate from the three main parts of Palearctic region, namely the Mediterranean, Asian and European. Almost all of these species could found a suitable living environment owing to the countless diversity of various landscape climatic conditions thanks to a combination of mountains with vertical zonation and plains alongside the rivers and seashores. Bigger part of Asia Minor is occupied by Turkey. By literature data Tabanidae fauna of this country include 164 species and 12 subspecies (Kılıç, 2006) - which represents almost third part of Palearctic fauna consisting of 610 species (Chvala, 1988; Andreeva, 2004). West Anatolia is a more essential territory for studying the horse flies fauna because it belongs to the Ancient Mediterranean and inhabited with species as with ancient origin as a lot of others with later formation, similar to the species migrated from the north. Since the special studying of the horse fly larvae habitats was not conduct there, it would be interesting from scientific point of view to obtain these data as for studying not known earlier larvae for systematic clarification, as for comparison with the conditions of the horse flies larvae developmental sites on adjacent Caucasus Minor territory.

MATERIAL AND METHODS

Near 400 larvae from Eskişehir district had been found in different habitat types as well terrestrial as alongside the banks of streams and rivers, also from its bottom. Aquatic larvae were collected with a special sift proposed by Andreeva (1990) method; terrestrial ones with hand trowel in the process of care digging a ground deep to 25 cm. The larvae were placed in individual box with substratum from the place of the finding. The time before pupation of the larvae is most suitable for its collection; mentioned larvae were collected at period 18.05 – 07.06.2007 and also 25. 05 – 15.06.2008. For description of adult insects were used "An atlas of insect morphology (Steinmann, Zomary, 1985) and specific for Tabanidae terminology (Cvala, Lyneborg, Moucha, 1972). Larvae were described by the terminology of Teskey (1969) and Burger (1977) The definitive identification of the larvae had been realized by reared adult flies.

RESULTS AND DISCUSSION

Collected larvae by number of species consists nearly 50 % of the specific faunal complex of Eskişehir (Kılıç, 1992). In accordance with morphological adaptations collected larvae corresponds to five morphoecological types (Andreeva, 1989).

Descriptions of the new subspecies and unknown earlier larvae

Haematopota pallens bozdagensis ssp.nova

The middle size gray species related to *H. pallens* Loew,1871 is easily distinguished from it by next characters: in female more broadest lower callus occupying about lover third part of frons and third segment of antennae, which are not narrower than the first segment whereas third segment of the nominative subspecies "much more slender than segment 1"(Chvala, and all, 1972), also by their coloration; in male - by big velvety triangle spot situated on subcallus and broadly touching with eye-margins, while subcallus of *H. p. pallens* "with only a small and narrow velvety black spot situated on the median line, broadly separated from the eye-margins". Segment 1 of antennae 2,5 times longer than wide with weak constrictions and 1,5 times longer than segment 3 while *H. p. pallens* have "antennal segment 1 rather stout, broadest on apical third, about twice as long as deep, mostly polished black"(Chvala, and all, 1972).

Female

Head: Eyes are nearly bare. Broad frons slightly broader at base, light gray colored with more dark brownish spots in middle and upper part. Lower callus brilliantly black colored occupying near 1/3 lower part of frons and touching the eye-margins at lower corners. Paired velvety black oval spots with diameter near the wide of the lower callus distinctly separated from callus and slightly have touch to eye-margin. Median spot small and black colored. Frons covered with black dots under which are rare long delicate silvery hairs. Face whitish with concolorous hairs on lower part, cheeks finely blackish spotted above (Fig. 1a). *Antennae:* First segment 3,7 time longer than wide with weak constrictions from middle part to the top, tomentose, grey with short black hairs above and some longer silvery hairs below. Second segment dark gray colored

Table 1. Characteristic of the particular habitat sites collected horse flies' larvae.

Species	Habitat Type	Morphoecological Type	N
Tabanus atropathenicus Olsufjev, 1937	Bottom of stream	Rheophil	7
Tabanus autumnalis autumnalis Linnaeus, 1761	Bank of stream	Hemihydrobiont	18
Tabanus bromius bromius Linnaeus, 1758	Bank of streams	Hemihydrobiont	21
Tabanus bromius flavofemoratus Strobl, 1909	Bank of streams	Hemihydrobiont	8
Tabanus canipalpis (Bigot, 1892)	Bottom of stream	Rheophil	9
Tabanus cordiger Meigen, 1820	Bottom of stream	Rheophil	46
Tabanus glaucopis Meigen, 1820	Forest glade	Edaphobiont	8
Tabanus golovi Olsufjev, 1936	Bottom of stream	Rheophil	11
Tabanus indrae Hauser, 1939	Moist places	Trans. form to edaphobiont	7
Tabanus laetetinctus Becker, 1913	Bank of stream	Hemihydrobiont	34
Tabanus miki Brauer, 1880	Bank of stream	Hemihydrobiont	12
Tabanus portschinskii Olsufjev, 1937	Forest glade	Edaphobiont	12
Tabanus prometeus Szilady, 1923	Moist places in forest	Trans. form to edaphobiont	18
Tabanus regularis Jaennicke, 1866	Bank or bottom of streams	Subrheophil	16
Tabanus rupium Brauer, 1880	Moist places near stream	Trans. form to edaphobiont	4
Tabanus unifasciatus Loew, 1858	Bank or bottom of streams	Rheophil	48
Haematopota pallens bozdagensis ssp. n.	Moist soil near stream	Trans. form to edaphobiont	3
Philipomyia aprica Meigen, 1820	Forest glade	Edaphobiont	7
Philipomyia graeca Fabricius, 1794	Forest glade	Edaphobiont	3
Nemorius abbasianae Leclercq, 1960	Bank or bottom of streams	Rheophil	3
Dasyrhamphis carbonarius Meigen, 1820	Moist places in forest	Edaphobiont	2
Chrysops caecutiens caecutiens Linnaeus, 1758	Bank of Streams, The Bottom	Subrheophil	63
Chrysops flavipes flavipes Meigen, 1804	Bank of Streams, The Bottom	Subrheophil	52
Silvius alpinus Scopoli, 1763	Moist places near forest	Edaphobiont	2
Therioplectes sp.	Open marshy places	Hemihydrobiont	3

Notes: N – number of collected larvae

with black bristle hairs. Third segment some broader than first segment, golden brown at basal part and on inner surface, other parts including annulate portion blackish colored (Fig 1,b). *Palpi:* second segment elongate with pointed apical top covered with not dense silvery and solitary black hairs (Fig 1c). *Thorax:* dark gray colored on mesonotum, side margins and narrow longitudinal strips light gray. Dark gray scutellum with mesonotum covered with rare whitish hairs. Wings light brownish-gray with colorless pattern, apical part without spots. Pale spots and streaks almost not form rosettes like there is in *H. p. pallens*, posterior wing margin with continuous pale strip. Legs: coxae and femora light gray, anterior tibia black with yellow basal quarter, tarsi black. Middle, back tibia and tarsi have yellow and almost black strips (Fig. 2).

Abdomen: very dark and almost black colored with sublateral paired oval gray spots from tergite II and slightly marked median elongated triangles on tergites IV-VI. All tergites with light gray posterior margin. Venter light gray colored and pale haired with a broad darker median strip on the three last sternites.

Lenght: 10 mm.

Male

Head: Eyes densely whitish haired, facets on the upper three quarters approximately 5 times larger than small facets and distinctly separated. Subcallus with large velvety black triangle, both upper vertex of which have been truncated with eye-margins and lower vertex found between base of antennae. Cheeks more distinctly black spotted, with black and silvery white hairs (Fig. 1,d). *Antennae*: First segment 2,5 times longer than wide with weak constrictions, covered with black bristle hairs. Third segment elongate pale brown, yellowish at base and beyond more gray velvety with some bristle black hairs above near base; annulate portion almost black (Fig 1e). *Palpi*: second segment are elongated, 2,25 times longer than wide covered at upper part with very long and delicate white hairs (Fig. 1f).

Thorax: Dark gray with rare silvery hairs and very delicate pale longitudinal strips. Wings with brownish-gray veins, the pattern of pale spots and streaks like on female. Legs: femora gray-yellowish to apical part with black and white hairs, anterior tibiae black with yellow basal part, tarsi black. Other tibia and tarsi black, with gray and yellow stripes. *Abdomen:* dorsum dark gray, almost black with large sublateral more light paired spots and delicate median stripe from second tergite, the same color like spots. Hind and side margins of tergites also more light colored. Tergites I-IV covered with gray hairs and others with whitish hairs and some dark-gray hairs on last sternite.

Lenght: 9 mm.

Three larvae of the *Haematopota pallens bozdagensis* ssp. nova were collected 06. 06.2007 in Bozdağ, in laboratory conditions reared both female and male and located in collection of Science Faculty of Anatolian University.

Mature larvae creamy-white, 14-16 mm long. Head capsule light-brown, length 1,9 mm. Integument of all segments are striated very densely 19-21 lines of mm. Pubescence of the segments pale gray weakly visible; on dorsal surface of prothoracal segment it covers anterior quarter, lateral projections descent down up to 2/3 of the segment length and converge on ventral surface being not interrupted like it's usually known for larvae of this genus in particular *H. p. pallens* (Andreeva, 1990). At middle level of ventral surface of pubescence are paired glossy spots similar to vertically elongated triangles (Fig. 1,g-h). Mesothorax pubescence cover a quarter of a segmentlength on dorsal and ventral surface, and four unusually broad lateral projections has descent down up to 3/4 of segment length. Metathoracal segment pubescence cover 1/10 of its length on dorsal and ventral surface and broad lateral projections descent down a little more than half of segment length. Pseudopodial pubescence narrowly encircling segments IV to IX, slightly connected to anterior pubescence dorso- and ventro-laterally on most of these segments.

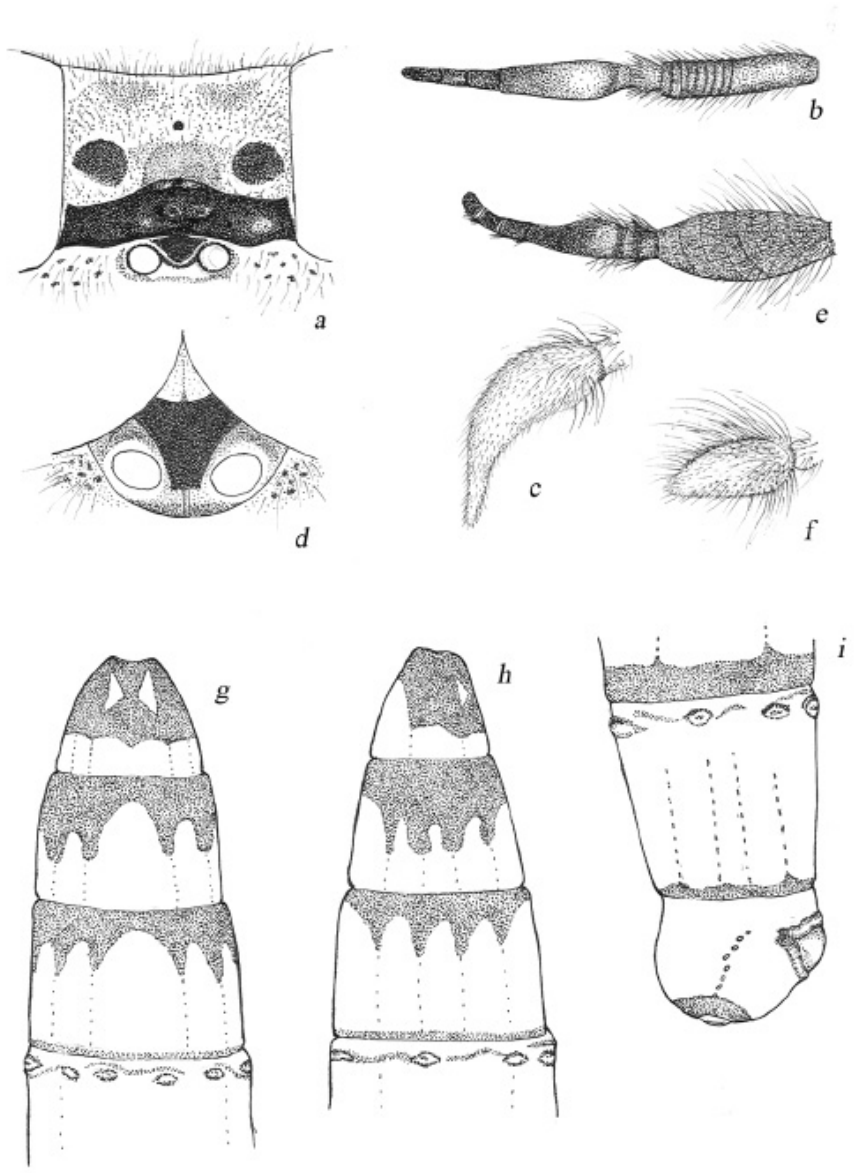

Fig. 1. *Haematopota pallens bozdagensis* ssp. nova, adult (a-f) and larva (g - i), a. female frons, b. female antenna, c. female palpus, d. male frons, e. male antenna, f. male palpus, g. thoracic segments, ventral view, h. thoracic segments, lateral view, i. two last segments, lateral view.

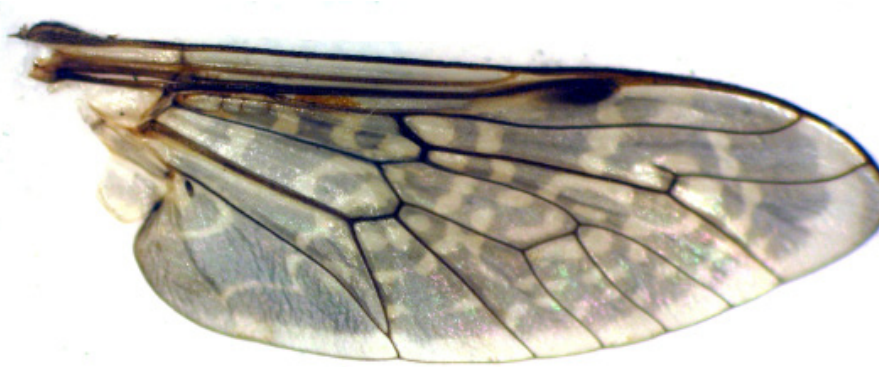

Fig. 2. *Haematopota pallens bozdagensis* ssp. nova, wing of female.

Posterior pubescences of the IX segment cover 1/6 of its length and on the X one - the band of pubescence are twice narrower. Length of caudal (anal) segment are 1,25 times more than width of its base, pubescence of annuli cover 1/6 part of its length, row of small spots on lateral surface are curved almost from upper border of annuli on the direction to anal ridges, last ones are also covered with a narrow band of pubescence. On the grounds the commonly held, the larvae of nominative species are similar with described larvae, excluding: the configuration of pubescence on ventral surface of prothoracal segment; very broad Lateral projections on meso- and metathoracal segments and the width of posterior pubescence of IX-X segments (Fig. 1, i).

It should be notice the fact that numerous larvae of nominative species had been found in different points of Crimea, Caucasus and Middle Asia mainly in sandy soil of plains not far from the banks of streams and rivers, while described larvae was found in dense soddy soil not far the stream in mountain conditions.

The name of the subspecies referes to the Bozdağ which is a mountain in Eskişehir, Turkey.

***Tabanus portschinskii* Ols. Larvae**

Larva creamy white colored, stout and 41-46 mm long, typically related to *T. bovinus* group. Head capsule from brown to dark brown, length 4,1 mm. Striation of integument are vary by the dense, being on lateral surface of the IX and X segments three time more thicker than on the other surface of segments. On central area of dorsal and ventral surface of prothoracal segment and ventral upper part of surface of mesothoracal segment striation are absent as well as between the basal border of caudal segment and lateral projection. Annuli pubescence covers anterior quarter of prothoracal segment, two wedge-shaped lateral projections have descent down up to 3/4 of segment length. Pubescence of anterior annuli cover 1/5 of the mesothoracal segment length and four wedge-shaped projections have descent down up to 4/5 segment length. On the metothoracal segment anterior annuli pubescence cover 1/5 of segment length and projections are very short – only 1/3 of the annuli width continue up to the border with the next segment, like row of small pits (Fig 3a).

Pseudopodial pubescence narrowly encircling segments IV – X slightly connected to anterior pubescence dorso- and ventrolaterally. Posterior pubescence of the X segment cover 1/5 part of lateral surface being on dorsal and ventral surface nearly three times more thinner. The width of caudal segment base is 1,42 more than the length, spiracular annuli pubescence cover a little less than 1/6 part of segment length, just from circumference of annuli a row of 3-4 small spots which are connected with wide angular-curved lateral projection, other side of which are connected with thin band of anal ridges pubescence (Fig 3, b).

12 larvae of this species have been found in different locality with a moist soil in Yarımca forest in Eskişehir.

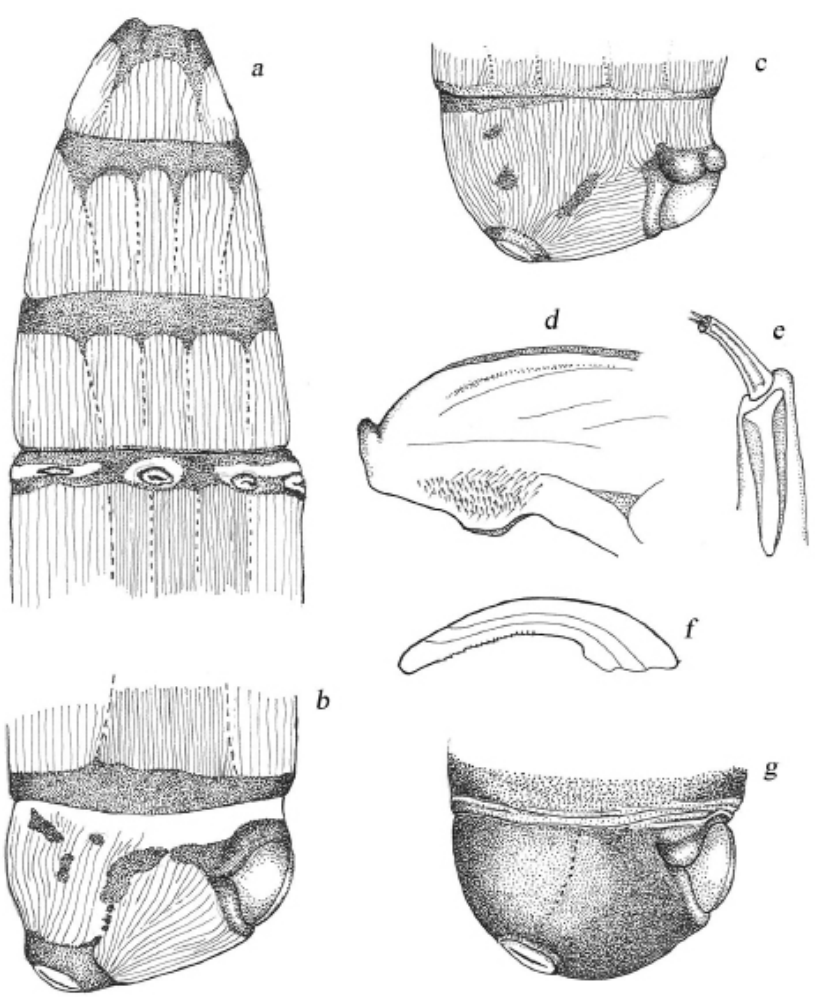

Fig. 3. Details of the larvae *Tabanus portschinskii* Ols. (a-b), *Philipomyia graeca* F. (c) and *Dasyrhamphis carbonarius* Mg. (d-g). a. thoracic segments, lateral view, b-c. caudal segments, lateral view, d. labrum, side view, e. antenna, f. mandible, lateral view, g. caudal segment, lateral view,

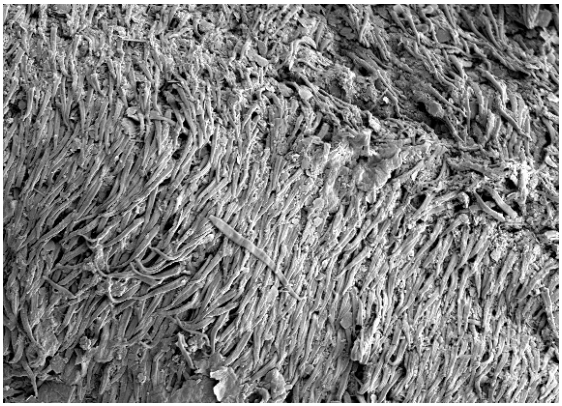

Fig. 4. Structure of larval integument of *Dasyrhamphis carbonarius* Mg. (SEM mag. 1.00 KX).

***Philipomyia graeca* F. Larvae**

Larva creamy-white, silky when touch, cylindrical, all segments uniformly striated, dense of striation 4-5 lines in mm at middle part of segments and 7-8 near intersegmental belts, 29 mm long. Head capsule brown, length 3,1 mm. Anterior annuli pubescence on prothoracal segment not more than 1/8- 1/9, and on meso- and metathoracal segments some less, than 1/10 of their length with small triangle near the base of dorsolateral and ventrolateral pits projections. Anterior, posterior and pseudopodial pubescences on segments IV-X are narrow and have interrupt on lateral surface. The width of caudal segment is nearly twice more than its length. Spiracular annuli cover 1/7-1/8 of the segment length, on lateral surface from the middle of segment descent down oblique narrow strips of pubescence, which finished on the height of 1,5 of its width not rich of annuli border. There are paired small spots situated dorsolaterally- the smaller are on the distance of 1/4 of the segment length from the base of segment and some larger in the middle of the segment (Fig. 3,e). On the whole all these details are similar with the *Ph. rohdendorfi* Ols. larva, but described larva possess features which are distinct from determinated larvae *Ph. aprica* Mg. and *Ph. rohdendorfi* Ols.(Andreeva, 1990). This is the strip of pubescence, situated on dorsal surface at the base of segment. This fact also supports the validity species status of *Ph. graeca* Fabr. and *Ph. aprica* Mg.

Two larvae of *Ph. graeca* Fabr. was found not far from the bank of small forest stream in Bozdag, at the end of May 2007.

***Dasyrhamphis carbonarius* Mg. Larva**

Mature larva. Stout, dark brown, velvety integuments, under strong magnification looks like microtrichiae, have covered all body segments without good visible structures on their surface (Fig 4). Length 41 mm. Head capsule 4,5 mm long, almost black. Second antennal segment slender elongate; third segment bifid short 5,5 time less than 3-rd (Fig. 3e). Labrum with good expressed tooth, almost black (Fig. 3d). Mandible has blunt small teeth along inner side and 10 times longer than its width in middle part. Four pairs of well developed moving appendages lacking of bristles present on first 7

abdominal segments. Caudal segment width a rounded, short, its width is nearly twice more than its length. The border of preanal ridge is close to intersegmental margin (Fig. 3g). Respiratory siphon very short and visible as a small tubercle like structure.

Two larvae were found near three meters higher of a stream bank, on the steep slope in a forestry place in village Bozdağ, at 29.05.2007 just before pupation.

***Nemorius abbassianae* Lecl. Adult, Larvae**

The find of the *Nemorius* genus larvae, which was unknown earlier have support of *N. abbassianae* Lecl. validity. Adult fly was reared from collected larva are coincide of this species description (Leclerg, 1960). A long time *N. abbassianae* lacks species status because it was considered as a form of very variable *N. vitripennis* Mg. (Chvala *et al.,* 1972; Olsufjev, 1977). However essential difference of some features of this species larva attract the interest due to its conspecifity. Also, some details condition of adult go out of the border enumerated by both indicated author's characters variability.

Female. Frontal callus on the frons well developed and its broad base by the width only a little not reach external border of antennae (Fig.5a), while frontal callus of N. vitripennis Meigen, 1820 have sharp triangle base. Paraantennal calli large without double angle or extractions. Second antennal segment at least three times longer of its width. The patterns on abdomen are distinguished from this one of N. vitripennis by size of black spots. First tergite almost fully dark, only narrow strips quite on sides are golden yellow, pale border on posterior margin scarcely visible. Paired black triangle spots cover larger parts of second tergite and not reach posterior margin nearly 1/5 of its length. On the next segment, dark gray paired triangles very small (Fig. 5b).

Mature larvae. Elongate creamy-white colored, body near 9 times longer of its width. Length 19 mm, head capsule 1,5 mm pale brown. All body segments cuticle completely regular striated except on pubescent areas, which are pale gray (Fig. 5c). Thoracic annuli encircling anterior 2/3 parts of prothoracal segment length; 2/5 of mesothoracal segment length and near 1/3 part of metathoracal segment length. Pseudopodial pubescence encircling without interruptions only first abdominal segment, on all further segments, everyone of it interrupted with striated area under locomotory appendages. Posterior pubescence like narrow band and covered near 1/4 part of the last abdominal segment. Three pairs of long locomotory appendages (length at least twice more than basal width) well developed laterally and ventrally and a little shorter dorsally, dorsal pair of them are absent on first abdominal segment. Apical surface of all appendages are armed with strong sclerotized hooks (Fig. 5d-e). Most weighty differ this species larva from *N. vitripennis* Mg. have bear caudal segment. By its elongated egg-like shape and preanal appendages it is similar to other Nemorius species (Andreeva, 1990). But instead of a pair of lateral spots characterized both *N. caucasicus* Olsufjev, 1937 and *N. vitripennis* Mg. by difference of their size the largest part of lateral surface on caudal segment of *N. abbassianae* Lecl. covered with pubescence from encircling respiratory siphon annuli up to 1/3 of segment length laterally and up to 1/4 - dorsally.

Three larvae were found as in bank soil of a small forest stream before pupation as at bottom substratum in the village Bozdağ, at late May 2007.

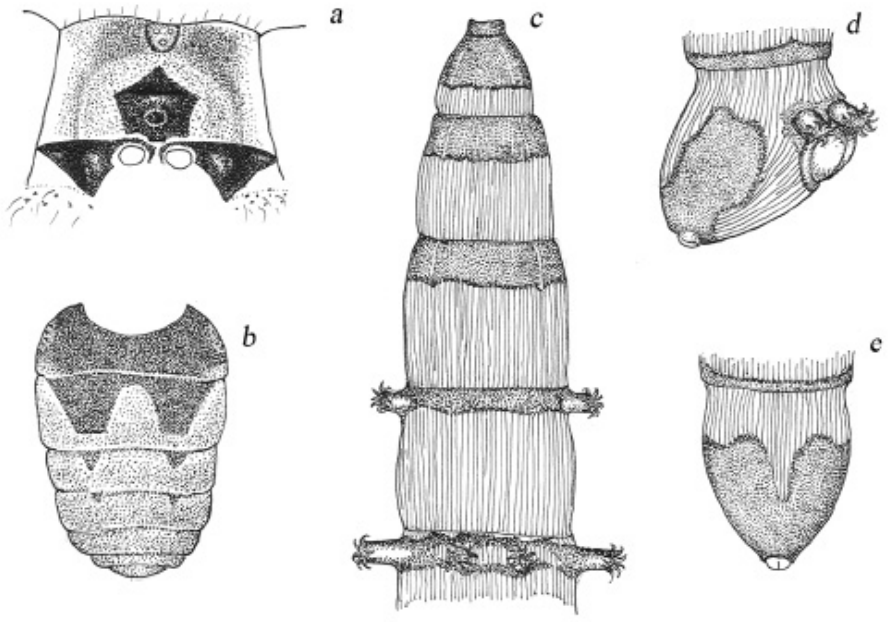

Fig. 5. *Nemorius abbassianae* Lecl. adult (a-b) and larva (c-e), a. female frons, b. female abdomen, c. thoracic and first abdominal segments, dorsal view, d. caudal segment, lateral view, e. caudal segment, dorsal view.

The Tabanidae is a worldwide insects of mainly blood-sucking flies which, because of their potential role in diseases-agents transmission, are of a great medico-veterinary importance. Horse fly fauna studied enough well in most parts of the world, but mainly by adult forms. The adults, being of conspicuous size and often showy when are concentrate near cattle have been favorites for collectors. An inadequate knowledge of Tabanidae immature stages is hampered of bionomic and phylogenetic research of this group.. Therefore, studies related to the immature Tabanidae are getting important. The life cycle of Tabanidae, like most of Lower Brachycera representatives can be characterized with such particular features of insect development as passive types of adaptations (Chernov, 1975) of the larvae. In temperate and subtropical zones, the longevity of horse flies larvae development consists of approximately 90% of their life cycle. Significant prevalence of larval stage in ontogenesis in comparison with adult life-span results in an increase of adaptive load on larval stage in the evolution under ever-changing environmental conditions. This dependence determines of the larval stage's role in historical formation of this family phylogenesis and substantiates the use of larval morphoecological characters for study of geographical distribution and taxonomic diversity (Andreeva, 1999). A rich potential for the solution of taxonomic problems lies on the use of larval characters. This is especially true for representatives of relatively close species (for example T. bromius-group), which sometime more distinguishable by their larvae ecology than with adult morphology. For a long time of family evolution exceptional plasticity of horse flies larvae of the most taxon worked

to the advantage of it's adaptive radiation in the wide spectrum of developmental sites ranging from the bottom of mountain streams and rivers up to dry desert. But evolutionary transformations had touched on mainly the structures bearing adaptive load such as the shape of the body, length of moving and prianal appendages and some physiological features, while taxonomic specific characters like antennal structure, configuration of pubescent area on thoracic and caudal segments, number of "pseudopodia", type of striation, character stage of the prianal bridges separation and some other remain relatively constant. Taking these significant taxonomic characters of larval morphology into consideration has resulted already in changes in status at specific, generic and tribal levels and in the description of four new species, reared from unknown larvae (Andreeva, 1990). Larval morphological characters are not such variable from systematic point of view because of current larvae development have occur in much more constant conditions by physical factors in comparison with adult flies, which are subject to changes of abiotic factors (insolation, temperature, humidity and other) what can to cause different morphological deflections up to polymorphism and to provoke misunderstanding for determination.

CONCLUSIONS

Take in account all discussed facts, there is an obvious the studying of the larval bionomy and morphology have a big significance contribution in knowledge of the family phylogenesis and could discover such necessary details of evolution and systematic, which are not possible obtain with the studying only adults.

Discovering of the 25 horse fly taxons larvae habitats in environs of Eskişehir have support the data about their selectivity as to developmental sites conditions in such not extent location, but display a plenty of different biotopes with diverse conditions of moist degree, connected with a level of soil water, structure of soil, composition of overland plants and other physico-geological peculiarities.

First time collected and described unknown earlier larvae of *D. carbonarius* Mg. are interesting by unusual structure of its integuments will be valuable object for further studying of family members relation. The rearing from larvae other representative of this tribe - *Ph. graeca* Fabr. have support the species validity both as named one as *Ph. aprica* Mg. by the presence of distinctive character in found larvae.

Significant taxonomic value of *Nemorius* genus larval characters have be substantially differ from already known of this genus larvae *N. caucasicus* Ols. and *N. vitripennis* Mg.; this taxonomic distinction much more value, than distinction between both known species. Also some characters of reared from the larvae adult, discussed in description, are support validity of this species and necessity of its restoration.

From *Haematopota* larvae with unusual for this genus shape of pubescent area on the first thoracic segment was reared a pair adult flies with the characters, which partially was more or less similar with *H. pallens* Lw., while other ones clearly not conformed neither with the description of this species nor with collected from different points of Crimea, Caucasus and Middle Asia numerous specimens. Quite enough by taxonomic value characters of both adult and larvae naturally was reason

for description of *H. p. bozdagensis* ssp. nova. especially since the larvae of both subspecies inhabit the sites are entirely different by conditions.

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