

RESULTS OF THE CZECHOSLOVAK-IRANIAN ENTOMOLOGICAL EXPEDITIONS TO IRAN

Diptera: Tabanidae. Larvae and pupae of two Persian *Tabanus* species

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Very much has been published about the economic importance of horse flies. They have been definitely incriminated both by the bites with the ingestion of the blood and by transmission of diseases of man and animals. Some 3500 species of horse flies are known throughout the world but we know very little about their life-histories. Little of a positive nature can be said about biological control of horse flies in Iran. Biological control with mass breeding of parasites of eggs, larvae and pupae of horse flies in the laboratory and with their liberating in breeding grounds of Tabanidae can not be established without knowledge of biology of immature stages of biting flies associated with the disease and without the location their habitats with mass occurrence in natural conditions in Iran. Interest in immature stages of the Tabanidae is steadily increasing in Asia, as evidenced by numerous references, often in recent years (e. g. Isaac, 1924, 1925; King, 1910; Kòno, Takahasi et Aoki, 1940a, b; Marchand, 1920; Maxwell et Howlett, 1909; Mitzmain, 1913; Nieschulz, 1927, 1929, 1931, 1936; Ogawa, 1959a, b; Patton et Cragg, 1913; Saito, 1965; Soboleva, 1970, 1971). In Iran 67 species of Tabanidae have been registered in the adult stage (Abbassian-Lintzen, 1964), while some descriptive details of the immature stages are known for 6 % of widely distributed species only:

Tabanus bromius Linné, 1761:

Larva- Beling, 1875; Marchand, 1920 sensu Beling, 1875; Stammer, 1924; Surcouf et Fischer, 1924; Skufin, 1967; Ivaniščuk, 1970.

Pupa — Beling, 1875; Surcouf et Ricardo, 1909; Marchand, 1920 sensu Beling, 1875; Surcouf et Fischer, 1924.

Tabanus cordiger Meigen, 1820:

Larva — Brauer, 1883; Marchand, 1920 sensu Brauer, 1883.

Pupa — Picard et LeBlanc, 1913; Marchand, 1920 sensu Picard et LeBlanc, 1913.

Tabanus miki Brauer, 1880:

Larva — Ivaniščuk, 1970.

Tabanus quatuornotatus Meigen, 1820:

Larva — Lécaillon, 1906; Marchand, 1920 sensu Lécaillon, 1906.

However, in many cases the older papers are of no use in the identification of the larvae and pupae. The present study is an attempt to partially rectify this situation in Iran.

Genus *Tabanus* L. is keyed in the generic keys to larvae and pupae published e. g. by Hennig, 1968; Chvála et Ježek, 1969.

Genus *Tabanus* Linné, 1767

Last instar larvae of *Tabanus* may be diagnosed as follows:

Larvae white to yellowish-white in colour. Length usually more than 16 mm. Anal segment usually with spots. The ventral edge of mandibles with 13 to 23 teeth on its whole length beneath. First segment to maxillary palps 2.5 to 3 times longer than the second. Third antennal segment shorter than second, four pairs of short or very long pseudopodia on each of first seven abdominal segments.

Pupae of *Tabanus* may be diagnosed as follows:

Length usually more than 13 mm, single pair of callus setae. Carinate tubercles between bases of antennal sheaths mostly divided laterally into two parts. Antennal sheaths straight and, at most, only slightly exceeding epicerianial suture. Head shield and thorax without stark pigmentation. Dorsal and lateral pair of preanal combs usually present, although sometimes vestigial. Dorsal prongs of anal aster as a rule distinctly longer than the ventral ones.

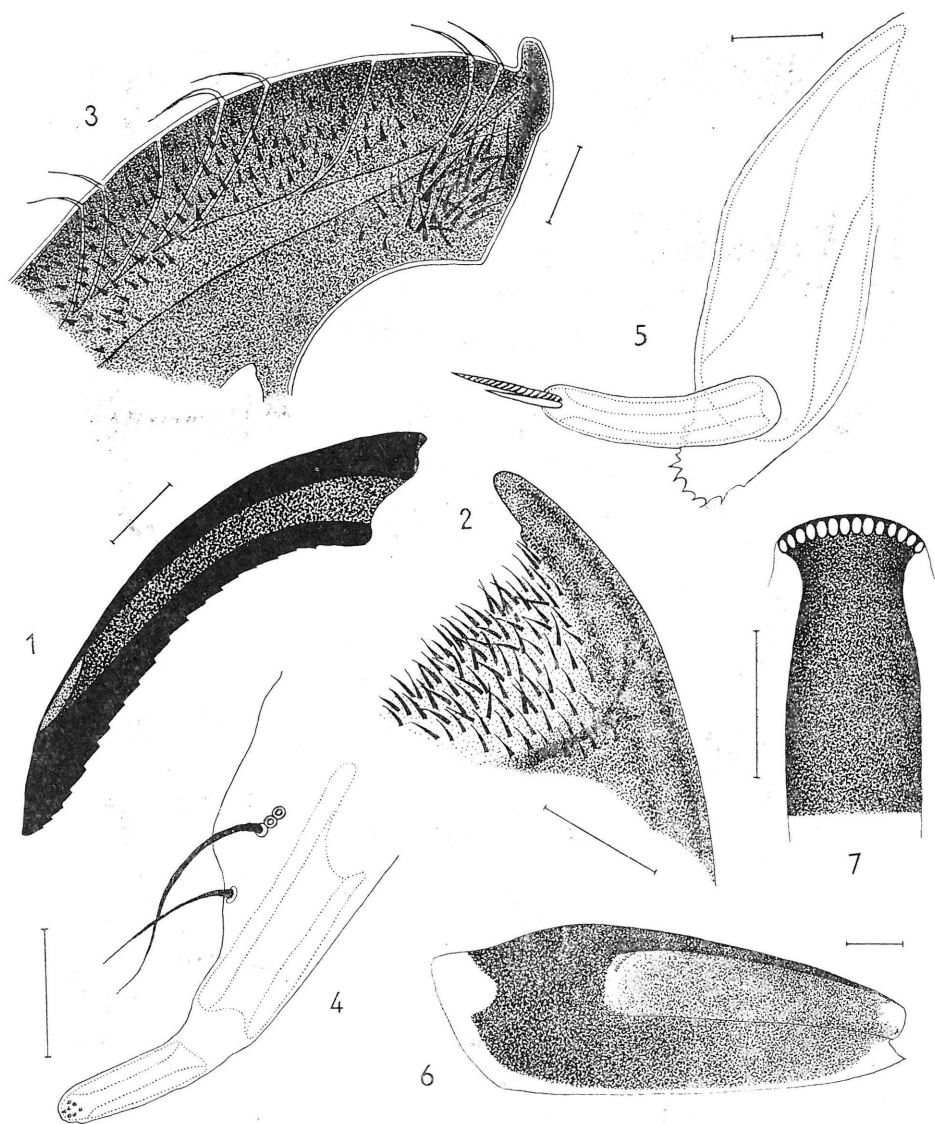
Tabanus leleani Austen, 1920

Last instar larvae (Figs. 8–13)

30–35 mm. long when extended, with very long prolegs, the coloration of living larvae white to creamy-white, with brown pubescent rings on all segments, very dark dorsally. Mandibles (Fig. 1) with teeth on whole part beneath. Basal segment of maxillary palps (Fig. 4) 2.5 times longer than apical segment. Glossae only with one spine apically, cephalic brush closely set branched strong bifurcate or trifurcate spines. First antennal segment (Fig. 5) with about 11 teeth on the inner side near apex. Maxilla, Clypeus and Labrum as figured (Fig. 2, 3). Lateral sclerite (Fig. 6) elliptical-shaped with two blunt teeth anteriorly, superior part of the lateral sclerite very chitinized, aperture rather indistinct. The striations present on usual aspects of all segments except dorsal and ventral area of pro-, meso- and metathorax. Stria on the abdominal segments ventrally in small part frequently missing, the striations a little narrower laterally than on the dorsal parts of the abdominal segments. Prothoracic pubescent annulus rather pale (Fig. 10) with five longitudinal stripes (2 dorsal, 2 lateral, 1 ventral), dorsal stripe widely connected with lateral one. Meso- and metathoracic annulus with the longitudinal stripes as broad as ventral prothoracic stripe (or rather broader). Anterior and posterior annuli with projections mostly joining on the abdominal segments dorsally and ventrolaterally. Anal segment as figured (Fig. 11). The largest spines of pre-anal ridge about 8 times longer than the length of transverse cuticular rods of posterior spiracle. The base of these spines is 8 times broader than the width of transverse cuticular rods. Siphon, when extended as long as the anal segment. Postanal ring very broad dorsally and very narrow ventrally; dorsally rather broader than the length of atrium of posterior spiracle. Atrium of anterior spiracle mushroom-shaped (Fig. 7), the largest width to the length as 1 : 2, in posterior spiracle 1 : 3.

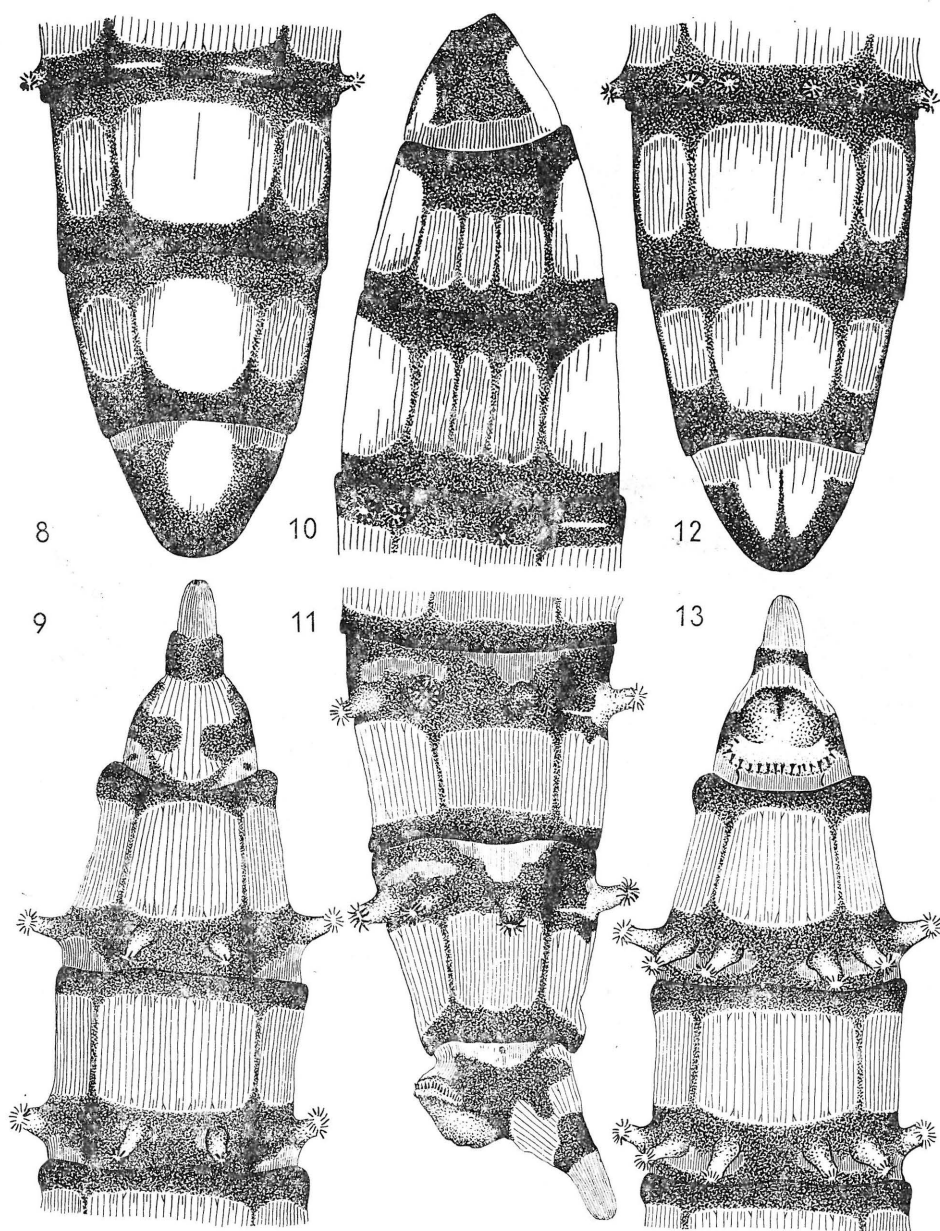
Pupa

Length of pupal case 16–20 mm., colour uniformly yellowish brown. The median cleft (Fig. 27) between frontal carinae wide, frontal carinae prominent and sharply crested dorsally, each bisected sublaterally by a transverse sulcus. Antennal sheaths



Figs. 1–7: *Tabanus leleani* Austen, 1920 — Last instar larvae.

1 — Mandible; 2 — Maxilla; 3 — Clypeus and labrum; 4 — Maxillary palp; 5 — Antenna; 6 — Lateral sclerite; 7 — Anterior spiracle. Scale lines 0,1 mm.



Figs. 8—13: *Tabanus leleani* Austen, 1920 — Last instar larvae (schematically).
8, 9 — Dorsal view; 10, 11 — Lateral view; 12, 13 — Ventral view. Scale line 10 mm.

very short, the tip not in the least exceeding the eclosian line. Frontal tubercles large, with irregular, often strongly sclerotized margin. Ventrally of them is tubercle with many rugosities and divided into two parts. The frontal part of the head shield without pigmentation, with some striations, as well as ventral part and the hind part of the head. The sheath of maxillary palps at base about three times broader than on the top. Mesonotal spiracle as figured (Fig. 28), with slight pigmentation dorsally, on one third of the ventral part with folds. The top of the spiracular mound on thorax usually overlaps anteriorly the end of rima with one or two strong folds apically and small ones subapically. Thorax without pigmentation. Spiracle on first abdominal segment hemispherical with slight rugosities, rima semicircular, hardly twice larger than on the following segment. Rima of abdominal spiracle 2–7 semicircular. Abdominal fringes on most sclerites biseriata (Fig. 29); spines of anterior series minute, of posterior series slender and acuminate, of larger basal diameter as adjacent anterior spines but about 4–8 times as long. Fringes practically uniseriate on sternites. Pleura of the 7th segment with about 24–35 spines. Dorsolateral combs rather minute with 4–9 spines, lateral comb with 2–6 short or long strong spines. Preanal fringe in male with about 22–23 spines, female with 6–9 spines on both sides. Anal aster as figured (Figs. 30, 31).

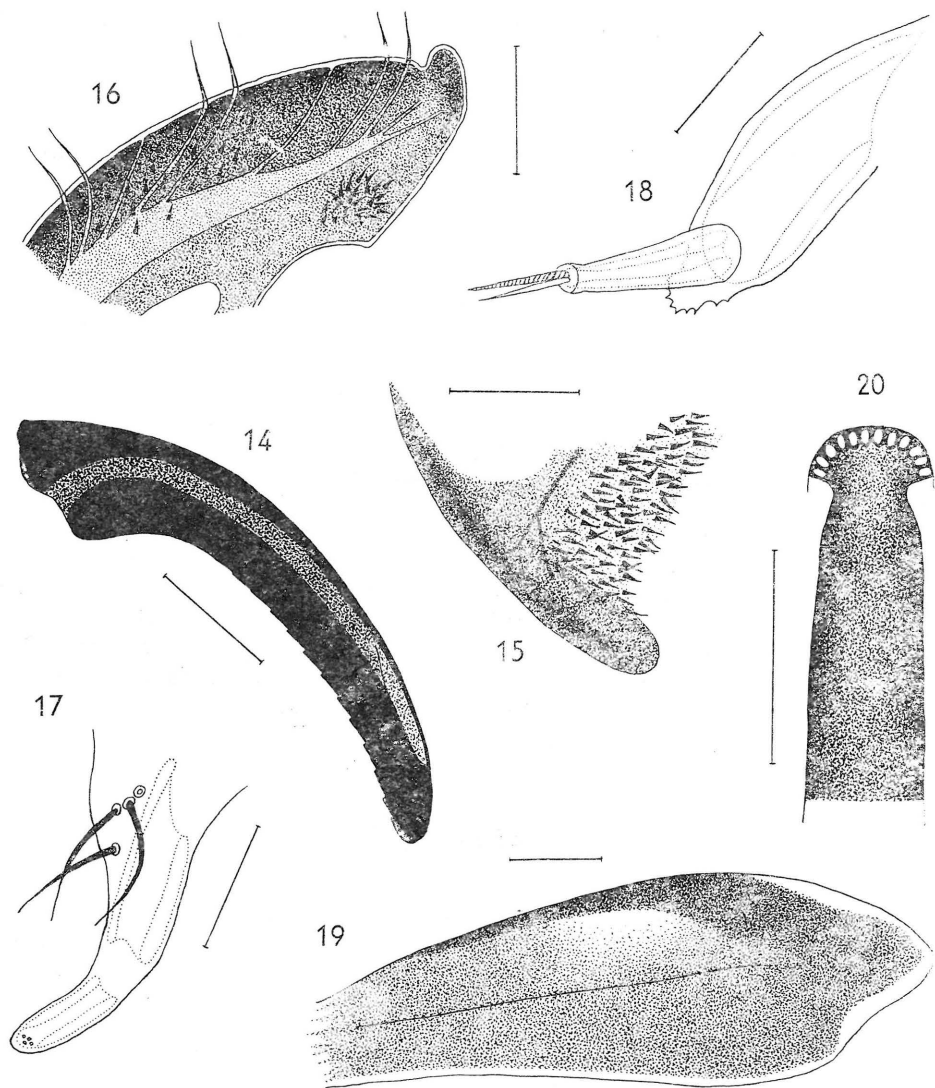
Material: 10 exuviae of last instar larvae, 17 last instar larvae, 11 pupal cases (5 ♂, 6 ♀).

The larvae were found by author 25.–26. 3. and 23.–24. 4. 1973 during Second Entomological Expedition of National Museum in Prague to Iran in the salt swamp area with *Tamarix* and *Phragmites* near Kahurak, commonly associated with *T. zimini* Ols., and 17.–20. 4. 1973 in the vulcan mountains Kúh-e Taftán in Tamandan valley (2100 m.) with stream habitat in waterweed cover between many stones, rather below surface of water (*Chara*, *Batrachium*) with *Veronica*, *Heleocharis*, *Juncus* and *Mentha* around. The larvae were reared at expeditional temperatures in our lorry Praga V3S.

***Tabanus zimini* Olsufjev, 1937**

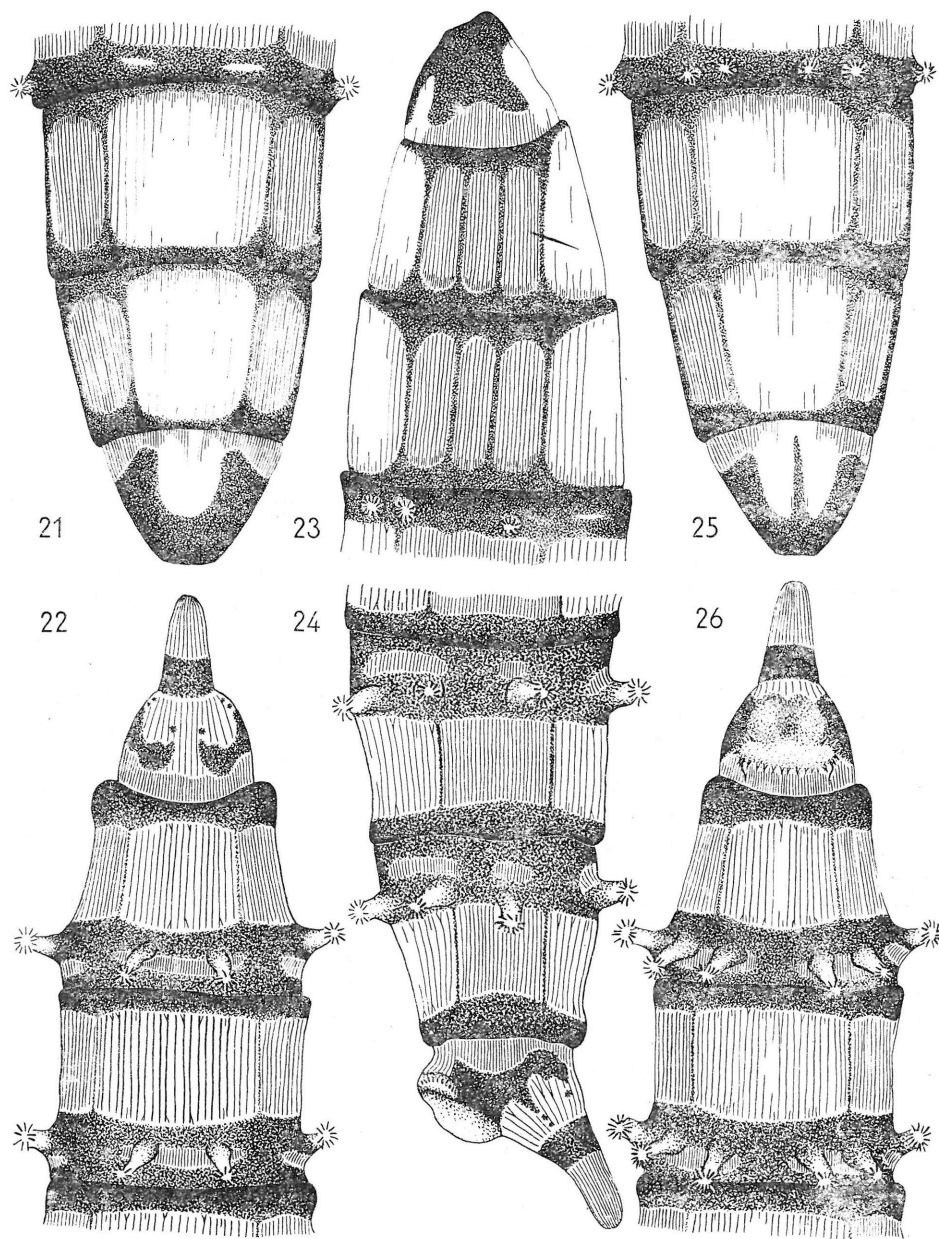
Last instar larvae (Figs. 21–26)

19–22 mm. long when extended, with long prolegs, the coloration of living larvae white to creamy-white, with brown pubescent rings on all segments. Mandibles (Fig. 14) with about 13 teeth on whole part beneath. Basal segment of maxillary palps (Fig. 17) more than twice longer than apical segment. Glossae with two very small teeth apically, cephalic brush closely set branched strong bifurcate spines. First antennal segment (Fig. 18) with about 9 teeth on the inner side near apex. Maxilla, Clypeus and Labrum as figured (Figs. 15, 16). Lateral sclerite (Fig. 19) elliptical-shaped with one huge tooth anteriorly, superior part of the lateral sclerite very chitinized, aperture rather distinct. The striations present on usual aspects of all segments except dorsal and ventral area of pro-, meso- and metathorax. Stria on the abdominal segments ventrally in small part frequently missing, the striations a little narrower laterally than on the dorsal parts of the abdominal segments. Prothoracic pubescent annulus rather pale (Fig. 23), with five longitudinal stripes (2 dorsal, 2 lateral, 1 ventral), dorsal stripe widely connected with lateral one. Meso- and metathoracic annulus with the longitudinal stripes as wide as ventral prothoracic stripe (or rather narrower). Anterior and posterior annuli with rather indistinct



Figs. 14–20: *Tabanus zimini* Olsufjev, 1937 — Last instar larvae.

14 — Mandible; 15 — Maxilla; 16 — Clypeus and labrum; 17 — Maxillary palp; 18 — Antenna;
19 — Lateral sclerite; 20 — Anterior spiracle. Scale lines 0,1 mm.



Figs. 21–26: *Tabanus zimini* Olsufjev, 1937 — Last instar larvae (schematically).
 21, 22 — Dorsal view; 23, 24 — Lateral view; 25, 26 — Ventral view. Scale lines 5 mm.

projections mostly joining on the abdominal segments dorsally and ventrolaterally. Anal segment as figured (Fig. 24). The largest spines of preanal ridge as long as the length of transverse cuticular rods of posterior spiracle. The base of these spines is twice as wide as the width of transverse cuticular rods. Siphon, when extended as long as the anal segment. Postanal ring as wide as the length of atrium of posterior spiracle. Atrium of anterior spiracle mushroom shaped (Fig. 20), the largest width to the length as 1 : 3, in posterior spiracle as well.

Pupa

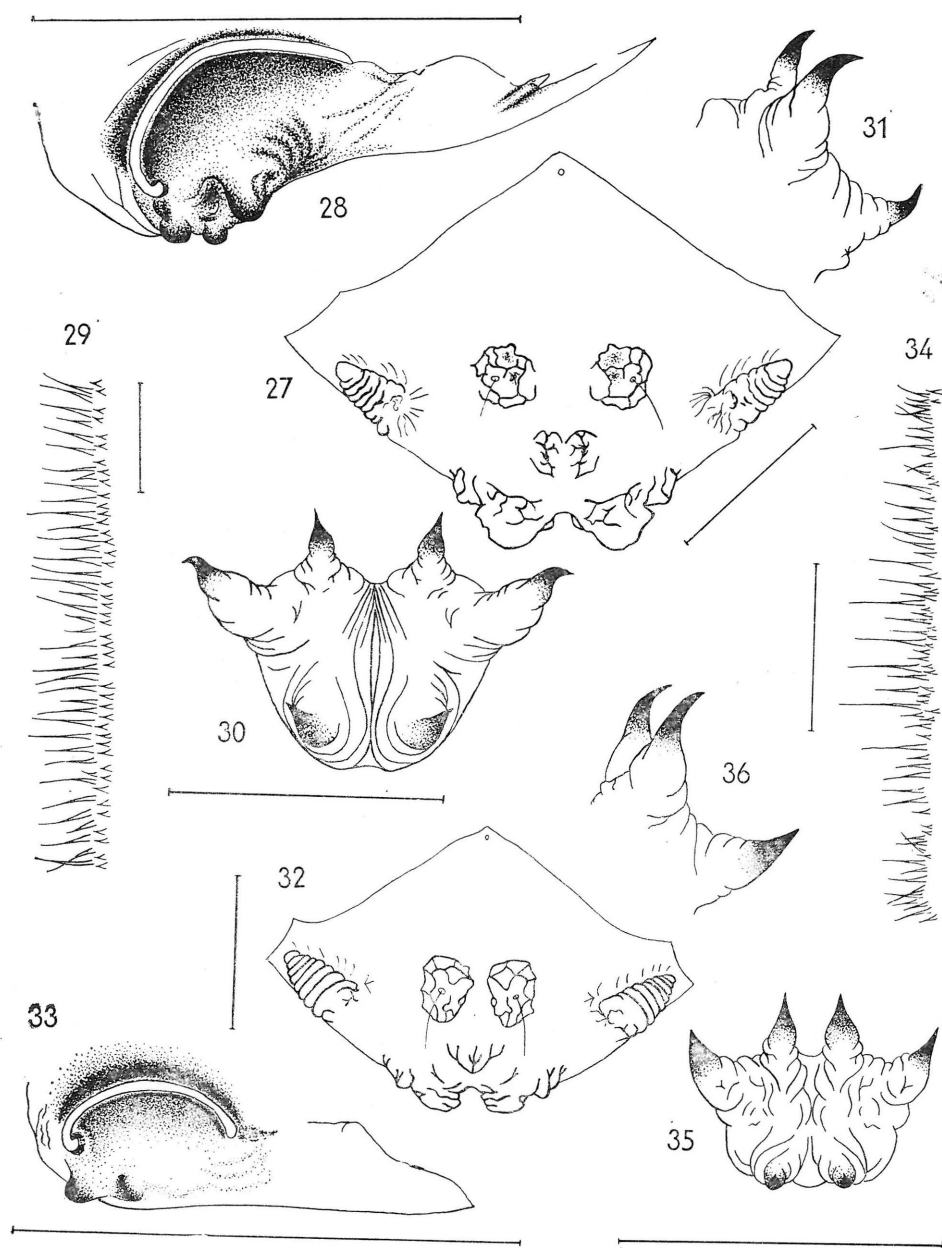
Length of pupal case 14—18mm., colour yellowish brown. The median cleft (Fig. 32) between frontal carinae wide, lateral pair of carinae partially divided sublaterally by a depression. Antennal sheaths not, or very slightly, exceeding the coronal suture. Frontal tubercles very prominent, rugose, irregular, strongly sclerotized. Ventrally of them additional distinct tubercle elevated above contour of front, with many rugosities. The ventral part almost without distinct transverse rugosities. Pigmentation above tentorial pits missing as well as on the hind part of the head. The sheath of maxillary palps at base about 2.5 times broader than on the top. Mesonotal spiracle (Fig. 33) rather flattened, on ventral part with one small transverse fold. The top of the spiracular mound with one prominent fold, which overlaps the end of rima anteriorly. The cleft behind rima with some rugosities dorsally and tending to have very slight pigmentation. Thorax and abdomen without pigmentation. Spiracle on first abdominal segment conical, about twice larger than on the other segments, with strong rugosities, rima on first segment semicircular, otherwise almost circular. Abdominal fringes rather uniseriate because anterior and posterior series of spines mostly indistinctly separated (Fig. 34). Fringes uniseriate on sternites, a little shorter than the length of adjacent spines on tergites. Fringe of pleura of the 7th segment biseriate with about 15—21 spines. Dorsolateral combs with 1—6 spines, lateral combs with 0—3 of that. Preanal fringe in male approximately with 14—17 spines, in female with about 8 spines on both sides. Anal aster as figured (Figs. 35, 36).

Material: 4 exuviae of last instar larvae, 4 last instar larvae, 11 pupal cases (5 ♂, 6 ♀).

The larvae were taken by author from wet silty soil of slow-moving stream and in mould bordering small stagnant pools with *Phragmites* and *Tamarix* around on the border of small salt swamp area near Kahúrak (25.—26. 3.; 23.—24. 4. 1973), surrounded by desert. The larvae were reared at normal expeditional temperatures (about 40 °C) in our lorry Praga V3S.

Figs. 27—31: Pupa of male of *Tabanus eleani* Austen, 1920:

27 — Head shield in frontal view; 28 — Mesonotal spiracle; 29 — Spinose fringe on the 4th abdominal tergite; 30 — Anal aster, caudal view; 31 — The same, lateral view.



Figs. 32—36: Pupa of male of *Tabanus zimini* Olsufjev, 1937:

32 — Head shield in frontal view; 33 — Mesonotal spiracle; 34 — Spinose fringe on the 4th abdominal tergite; 35 — Anal aster, caudal view; 36 — The same, lateral view. Scale lines 1 mm.

Chart of differential diagnoses

Tabanus zimini Ols.

Length of the last instar larvae 19 to 22 mm.

Apex of maxilla rounded (Fig. 15).

Branches of third antennal segment with the same length (Fig. 18).

Dorsal pseudopods with only slight patches laterally (Figs. 21–24).

Patches without pubescence before prolegs small laterally and large dorsally (Figs. 22, 24).

Characteristic pubescence of anal segment (Figs. 22, 24, 26). Postanal ring with the same width dorsally and ventrally.

The tip of pupal antennal sheaths very slightly exceeding the eclosian line (Fig. 32).

Mesonotal spiracle with one small transverse fold and one prominent more on ventral part (Fig. 33).

Abdominal fringes on most sclerites rather uniseriate (Fig. 34).

Pleura of the 7th segment with 15 to 21 spines.

Preanal fringe in male with 14–17 spines approximately.

Tabanus leleani Aust.

Length of the last instar larvae 30 to 35 mm.

Apex of maxilla pointed (Fig. 2).

Branches of third antennal segment with different lengths (Fig. 5).

Dorsal pseudopods with dark patches laterally (Figs. 8–11).

Patches without pubescence before prolegs large laterally and small dorsally (Figs. 9, 11).

Characteristic pubescence of anal segment (Figs. 9, 11, 13). Postanal ring very narrowed ventrally.

The tip of pupal antennal sheaths not in the least exceeding the eclosian line (Fig. 27).

Mesonotal spiracle with many strong folds ventrally (Fig. 28).

Abdominal fringes on most sclerites biseriate (Fig. 29).

Pleura of the 7th segment with 24 to 35 spines.

Preanal fringe in male with about 22–23 spines.

Summary

The author presents the descriptions of last instar larvae and pupae of two Persian *Tabanus* species (*T. leleani* Austen, 1920 and *T. zimini* Olsufjev, 1937) for the first time and gives diagnostic characters of both larvae and pupae. Many detailed differences were ascertained and figured both on the head capsule of larvae and on its appendages.

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