



RESEARCH ARTICLE

**The *Dolichopus plumipes* species group (Diptera, Dolichopodidae) in the Palaearctic Region with the description of a new species from Iran**

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**Abstract:** The *Dolichopus plumipes* species group in the Palaearctic Region is redefined. It comprises eleven species including one new species, *Dolichopus malekii* **sp. nov.**, from the East Azerbaijan province in north-western Iran. The species group is differentiated from other *Dolichopus* by the modified male mid tibia and/or mid basitarsus (except *D. simplex*). The mid tibia is often thin, having a longitudinal narrow dark streak (*D. plumipes*) or clear whitish yellow dorsal area in distal third, rarely simple or inconspicuously modified (*D. discifer*). Mid basitarsus is pennate or bearing elongate setae or simple. Other tarsomeres are usually simple (except *D. discifer*). A revised key to the species group is provided, as well as remarks on its geographical distribution.

**Key words:** Dolichopodidae, *Dolichopus*, Iran, new species, key, zoogeography.

## Introduction

The *Dolichopus* Latreille, 1796, comprises about 630 species worldwide, being the largest genus of the family Dolichopodidae (Grichanov 2003–2013). It occurs predominantly in the Holarctic Realm with about 290 species known from the Palaearctic region.

The *D. plumipes* group was for the first time outlined by Smirnov (1948), who included here *D. plumipes* (Scopoli, 1763), *D. parvicaudatus* Zetterstedt, 1843, *D. wahlbergi* Zetterstedt, 1843, *D. cinctipes* Wahlberg, 1850, and *D. pectinitarsis* Stenhammar, 1851, along with his new species *D. albicinctus* Smirnov, 1948 and *D. leucopus* Smirnov, 1948.

Ringdahl (1949) later classified *D. parvicaudatus* and *D. pectinitarsis* males as gynandromorphs or aberrant forms of *D. plumipes* and considered them as demasculinised forms due to the effect of parasitic nematodes on the secondary sexual diagnostic features (Kahanpää 2008) and confirmed the synonymy of both species with *D. plumipes*. Meuffels & Grootaert (1989) described a new species *D. polleti* from that group; the group was defined by the presence of long black flattened setae on mid basitarsus (present in *D. plumipes*, *D. wahlbergi* and *D. polleti*). Recently Grichanov (2012) described a new species *D. zaitzevi*, related to *D. cinctipes*, considering it a member of the *D. plumipes* species group, and *D. soldatovi* was described as a new species related to *D. albicinctus* (Negrobov *et al.* 2013).

Using molecular data (Bernasconi *et al.* 2007; Pollet *et al.* 2010; & Germann *et al.* 2010) proved that *D. discifer* Stannius, 1831 (= *D. nigricornis* Becker, 1917, nec Meigen, 1824) and *D. simplex* Meigen, 1824 convincingly belong to the *D. plumipes* species group, both lacking the peculiar plumose mid tarsus and thin mid tibia. *Dolichopus simplex* is remarkable in absence of any male secondary sexual characters (MSSC), which are used usually in keys, otherwise the species is quite similar to *D. plumipes* in morphology including genital structures. *Dolichopus discifer* (at present) is the only species in the group having modified fore tarsus; it has weakly modified mid leg, with 1-2 strictly ventral setae on mid tibia in male and a row of 3-4 ventral setae on the same tibia in female, and with elongate simple setae on ventral side of mid basitarsus. Other *Dolichopus* species bear usually some anteroventral and posteroventral bristles on mid tibia, often reduced to one anteroventral, sometimes entirely absent.

The last key to males of Palearctic species of the *D. plumipes* group was incorporated into the key of the genus published by Negrobov *et al.* (2005). Females of closely related species are often not easily discernible. Here we describe a new species from the East Azerbaijan province in north-western Iran and define the limits of the *D. plumipes* species group, which comprises eleven Palearctic species.

## Material and methods

The material was collected by standard net sweeping during a recent expedition of the Tabriz University in the Chichakli region, East Azerbaijan province of Iran. The holotype and paratypes of the new species described in this study are deposited in the collection of the Insect Museum of Tabriz University (IMTU). Some paratypes will be deposited in the All-Russian Institute of Plant Protection (VIZR). The material is preserved in 75% ethanol in glass vials. Morphological terminology and abbreviations generally follows (Cumming & Wood 2009; Grichanov 2012). Body length is measured from the base of the antenna to the tip of abdominal segment 7. Wing length is measured from the base to the wing apex. The relative lengths of the tarsomeres should be regarded as representative ratios and not measurements. Male genitalia were macerated in 10% KOH. Figures showing the male genitalia in lateral view are oriented as they appear on the intact specimen (rotated 180° and lateroflexed to the right), with the morphologically ventral surface of the genitalia facing up, dorsal surface down, the morphologically anterior end facing right and posterior end facing left. Information on world distribution for known species follows (Grichanov 2003–2013).

## Results

### Taxonomy

#### *Dolichopus plumipes* group of species

**Diagnosis.** Size 3–5 mm. The *D. plumipes* species group differs distinctly from all other *Dolichopus*, first of all, in male mid tibia and/or mid basitarsus modified (except *D. simplex*). Mid tibia often thin, with longitudinal narrow dark streak (*D. plumipes*) or with clear whitish yellow dorsal area in distal third, rarely simple or inconspicuously modified (*D. discifer*). Mid basitarsus pennate or bearing elongate setae or simple. Other tarsomeres usually simple (except *D. discifer*). The *D. plumipes* species group shares the following characters with some other groups of the genus. Lower postocular setae pale. Lower calypter with black cilia. Femora usually yellow, sometimes (*D. zaitzevi*) mainly black. Mid and hind femora usually with 1 preapical anterior bristle. Fore tibia without long apicoventral seta. Hind basitarsus with at least 2 dorsal bristles. Male cercus elongate-ovate, incised in distal half; each process bearing long curved black bristles.

#### Key to the Palearctic species of the *D. plumipes* group (males)

1. Femora mainly black; mid tibia brownish yellow except black base and apex, with clear whitish yellow dorsal area in distal third; 4.7 ..... *zaitzevi* Grichanov  
– Femora yellow, sometimes hind femur black at apex; mid tibia yellow; mid tibia yellow, with or without clear whitish yellow dorsal area in distal third ..... 2
2. Mid basitarsus pinnate anterodorsally and posteroventrally with long black flattened setae ..... 3  
– Mid basitarsus simple, at most with elongate simple setae ..... 5
3. Mid tibia thin, yellow, whitish at apex, with longitudinal narrow dark streak anterodorsally; apex of hind tibia and whole hind basitarsus black or brownish black; plumage of mid basitarsus shorter than double diameter of basitarsus; 4.5-5.0 ..... *plumipes* (Scopoli)  
– Mid tibia without dark streak; plumage of mid basitarsus about 2 times longer than diameter of basitarsus; other features various ..... 4
4. Apex of hind tibia blackish brown to yellowish brown; whole hind basitarsus black or brownish black; postpedicel brownish yellow, usually paler at base; 4.6-4.9 ..... *polleti* Meuffels et Grootaert  
– Hind tibia and basal half of hind basitarsus yellow; postpedicel dark-brown to blackish brown on at least apical third; 5.0 ..... *wahlbergi* Zetterstedt
5. Antenna mainly black; scape and sometimes pedicel yellow ventrally or entirely ..... 6  
– Antenna yellow, sometimes postpedicel dark dorsally at apex ..... 10
6. Fore tarsus with 5th segment slightly enlarged; 4th segment of fore tarsus more than twice as long as 5th; 5.0-6.5 ..... *discifer* Stannius  
– Fore tarsus simple ..... 7
7. Mid tibia simple side; 4.0-5.0 ..... *simplex* Meigen  
– Mid tibia with preapical dorsal flattening ..... 8
8. Mid tibia with 1 anteroventral and 2 posteroventral bristles; face white, with yellowish tinge; 4.0 ..... *cinctipes* Wahlberg  
– Mid tibia with 1 anteroventral; face yellow ..... 9

9. Hind femur black at apex; fore tibia with 3 posteroventrals; mid tibia black at apex, with preapical dorsal flattening covered with rows of minute setulae; phallus without dorsal tooth; 3.8 ..... *malekii* sp. nov.  
 – Hind femur and mid tibia entirely yellow; fore tibia with 1 posteroventral; mid tibia with clear white dorsal area in distal third devoid of setulae; phallus with dorsal tooth; 3.7 ..... *soldatovi* Negrobov et al.
10. Mid tibia without clear white dorsal area in distal third; mid basitarsus with more or less elongate setae anterodorsally and posteroventrally; hypopygium small, with more or less reduced appendages, with cercus reaching only abdominal segment III; 4.0-4.5 ..... *plumipes* (Scopoli) [demasculinized form]  
 – Mid tibia with clear white dorsal area in distal third; mid basitarsus with short setulae; hypopygium large, with normal appendages ..... 11
11. Wing with strong bend of  $M_{1+2}$ , bearing short stub-vein (rudiment of  $M_2$ ); postpedicel more than 1.5 longer than high; face silvery white; 3.0-4.0 ..... *leucopus* Smirnov  
 – Both bends of  $M_{1+2}$  normal, smoothly rounded and without trace of stub-vein; postpedicel as long as high; face golden yellow; 4.0-4.5 ..... *albicinctus* Smirnov

***Dolichopus malekii* Grichanov, Khaghaninia & Gharajedaghi sp. nov.** (Figs 1–4)

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**Type material:** Holotype male in 75% ethanol in glass vial: Iran: East Azerbaijan province, Chichakli region, 38°41.05' N; 46°31.85' E, h 1790m a.s.l., 29.VII.2009, Gharajedaghi and Khaghaninia [IMTU]. Paratypes: 2♂, Chichakli region, 4♂, Kandovan, 37°46' N, 46°15' E, 2340 m a.s.l., 19.VII.2013, with same data as holotype. Some paratypes will be deposited in the All-Russian Institute of Plant Protection (VIZR).

**Diagnosis:** This species is similar to *D. cinctipes* and *D. soldatovi* (see key above). For differences, see the identification key.

**Description**

Male: Body length: 3.8 mm, wing length: 3.7 mm, wing width: 1.4 mm, antenna length: 1 mm, hypopygium length: 1.54 mm. General coloration of body metallic blackish-green (Fig. 1).

Head: Antenna mainly black; scape black dorsally and yellow ventrally, with dorsal setae; pedicel mainly black, reddish ventrally; postpedicel ovate, 1.5 times longer than high, with distinct apex; stylus mid dorsal, with dense and short pubescence (Fig. 2B). Ratio of postpedicel length to its width to stylus length, 55/36/125. Frons black, weakly pollinose. Face yellow pollinose, narrowed towards clypeus, under antennae about as wide as height of postpedicel. Clypeus with black hairs, not reaching lower margin of eyes, with straight margin. Upper most postocular setae black, lower ones pale yellow. Ventral postcranium with several white setae. Eyes finely haired.

Thorax: Pronotum pubescent, with black hairs; mesonotum weakly pollinose; 6 dorsocentral setae, 7 ac, short, biserial. Upper and lower part of propleuron with fine pale hairs, lower part with 1 strong black prothoracic seta. Scutellum with 2 strong setae, 2 short fine lateral setae and some dorsal hairs, marginal hairs in two rows.

Legs: Mainly yellow; fore leg: coxa mainly yellow, blackish-brown on basal 2/3 posteroventrally, with some black hairs dorsally and strong setae apically; femur yellow with one subapical posterior seta; tibia yellow, with 2 anterodorsal, 3 posterodorsal, 3

posteroventral setae; no long apicoventral seta; tarsus mainly blackish-brown, basitarsus yellow in basal half (Fig. 3A). Mid leg: coxa mainly black, yellow at apex, with some black hairs and setae; trochanter with large seta; femur yellow, with 2 anterior subapical setae. Mid tibia thin, with long white area on subapical dorsal flattening, blackish at apex, with 4 anterodorsal, 3 posterodorsal, 1 anteroventral and 3 apical setae (Fig. 3B). Mid tarsus black, basitarsus thickened, covered with thickened simple setulae, somewhat longer on ventral side (Fig. 3D). Hind leg: coxa black, with one seta; femur yellow, with black spot at apex, with one subapical anterior seta and some posterodorsal subapical cilia; tibia mainly yellow, blackish in apical 1/3, with about 7 anterodorsal, about 7 posterodorsal, 1-2 ventral setae and row of elongated ventral hairs; tarsus black, basitarsus with 2 dorsal setae (Fig. 3C). Femur, tibia and tarsomere (from first to fifth) length ratio: fore leg: 123/128/71/32/25/17/19, mid leg: 152/194/70/41/33/21/19, hind leg: 160/190/73/70/42/29/23.

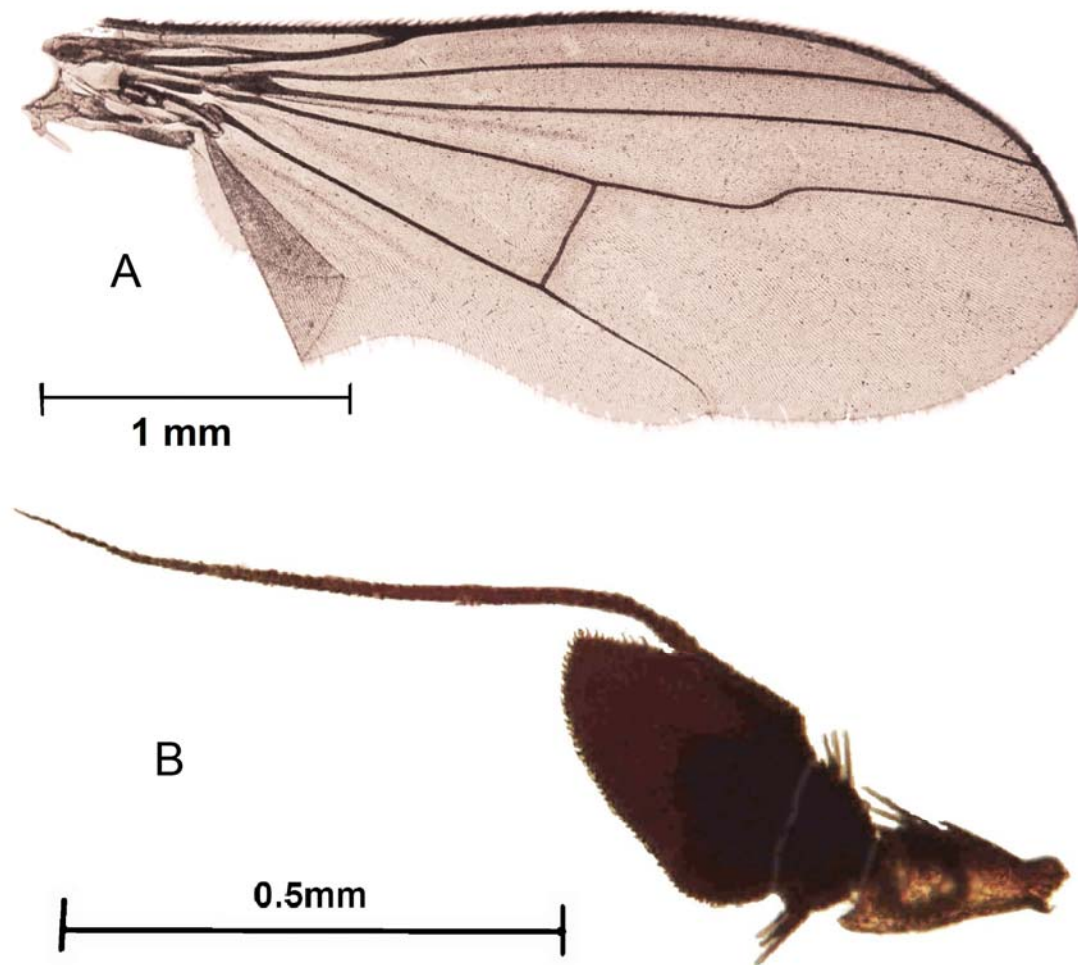


**Figure 1.** *Dolichopus malekii* sp. nov., ♂ (Holotype), total view, left.

Wings: Evenly brownish; veins brown, costal vein inconspicuously thickened at tip of R<sub>1</sub>, R<sub>2+3</sub> and R<sub>4+5</sub> almost straight, slightly curved anteriorly, M<sub>1+2</sub> in distal part with gentle flexion at 2/5, then almost straight and parallel to R<sub>4+5</sub>, joining costal vein right before wing apex. Ratio of part of costa between R<sub>2+3</sub> and R<sub>4+5</sub> to that between R<sub>4+5</sub> and M<sub>1+2</sub>: 38/23.



Distal part of CuA<sub>1</sub> longer than *dm-cu* (71/41). Crossvein *dm-cu* straight, posterior wing margin broadly emarginated before CuA<sub>1</sub>; anal lobe enlarged; anal vein distinct; lower calypter yellow, with black cilia (Fig. 2A). Halter yellow.



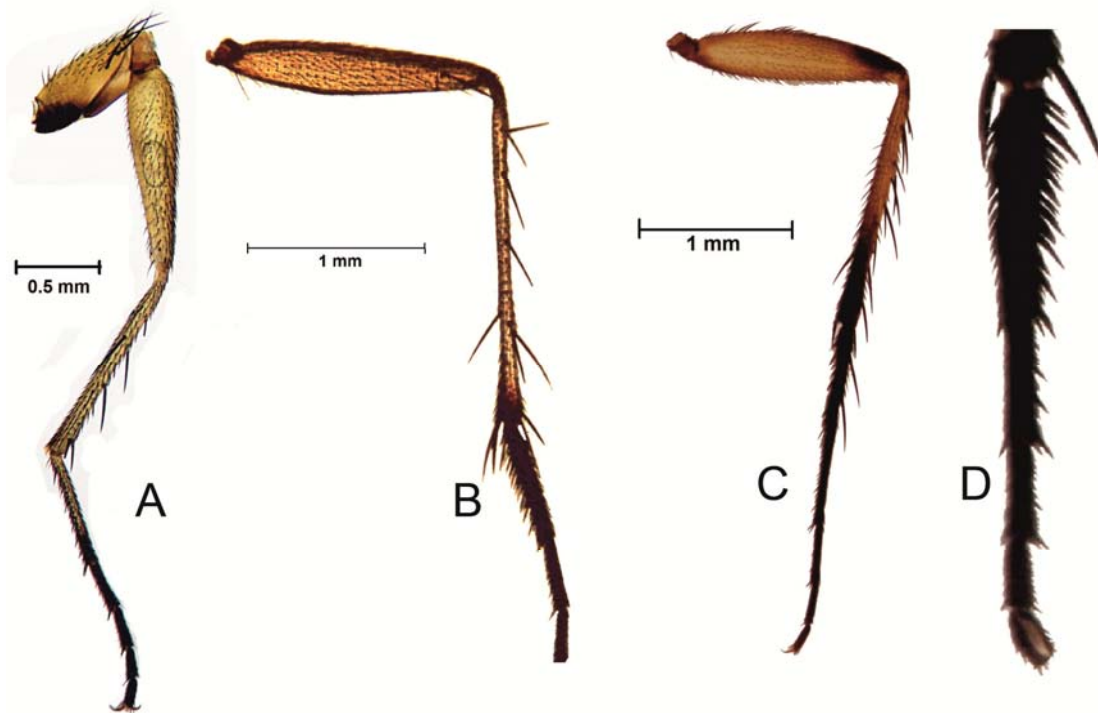
**Figure 2.** *Dolichopus malekii* sp. nov., **A**, wing; **B**, antenna.

Abdomen: Blackish-green and shiny, with black hairs and marginal setae; 8<sup>th</sup> segment black, with black cilia.

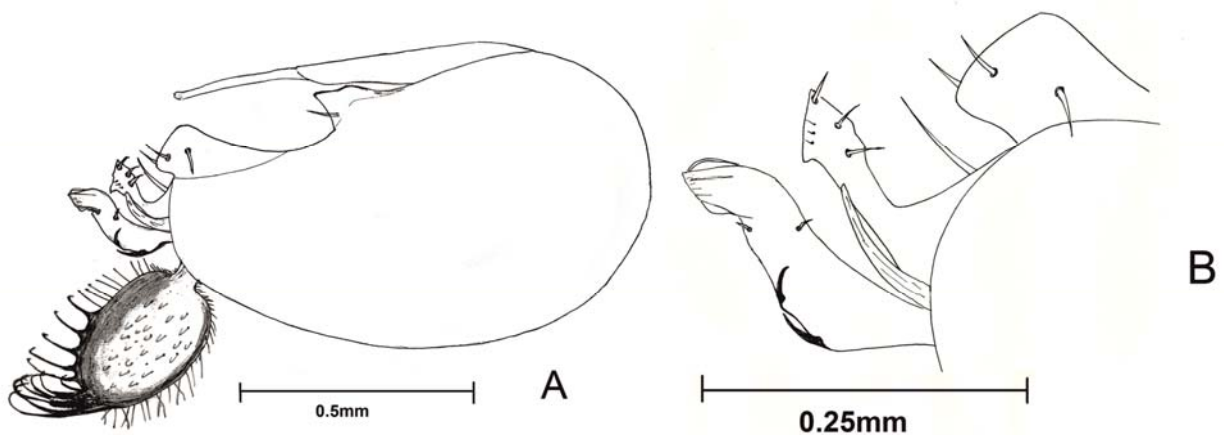
Male genitalia: Epandrium black, elongate-triangular, as long as 4<sup>th</sup>-6<sup>th</sup> terga combined; basiventral epandrial lobe moderately developed, triangular; basiventral epandrial seta present; apicoventral epandrial lobe well-developed, prominent, thin in lateral view, with keel-like dorsoapical extension, with 2 apical setae; aedeagus thin and simple; two pairs of surstylus, covered with sparse setae; ventral lobe digitiform and curved ventrally, without dorsal hump, with 1 long seta at base and 3 strong setae dorsally; dorsal lobe moderately thin, with 2 dorsal spines at middle, with dorsal surface notched preapically; postgonite narrow, pointed; cercus dirty-yellow, broadly blackish along margin; elongate-ovate, incised in distal half; each process bearing 2 long curved black bristles (Fig. 4).

Female: Unknown.

**Etymology:** Named after Professor Hasan Maleki Milani, retired staff member of Plant Protection Department, Tabriz University.



**Figure 3.** *Dolichopus malekii* sp. nov., legs, lateral view. **A**, fore leg; **B**, mid leg; **C**, hind leg; **D**, mid tarsus.



**Figure 4.** *Dolichopus malekii* sp. nov., **A**, hypopygium, left lateral view; **B**, surstylus and epandrial lobe, left lateral view.

## Discussion

Using molecular markers, some recent papers (Bernasconi *et al.* 2007, Pollet *et al.* 2010 and Germann *et al.* 2010) found that MSSC are not always phylogenetically relevant in the genus *Dolichopus*. Therefore, it can be assumed that more Palaearctic species without the peculiarly modified mid tarsus and mid tibia might belong to the *D. plumipes* species group, while the association of *D. cinctipes* and allied species with the group must be confirmed by

molecular data. From a scientific point of view, these facts should not be ignored in future phylogenetic investigations. Nevertheless, they are not the purpose of the present paper.

### Distribution of the *Dolichopus plumipes* species group

Most species of the *D. plumipes* species group occur in the Palaearctic Region. Nevertheless, *D. plumipes* itself and *D. discifer* are very common across the Holarctic Realm; *D. plumipes* is reported also from adjacent territories of the Orient and Neotropics. *D. simplex* is a Trans-Palaearctic species, and *D. wahlbergi* is widely distributed in Europe from the West to the Russian Caucasus. Arctoboreal *D. cinctipes* is widespread from Scandinavia across boreal Russia to the Russian Far East. The other species of the group seem confined to some local regions of Eurasia. *D. albicinctus*, *D. leucopus* and *D. soldatovi* are known from some territories of the Russian Far East, *D. polleti* – from Belgium, *D. zaitzevi* – from Turkey, and *D. malekii* sp. nov. – from Iran.

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