



## A new species of the genus *Minthodes* Brauer & Bergenstamm (Diptera: Tachinidae) from Iran

**Ebrahim Gilasian**

Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection (IRIPP), Agricultural Research, Education and Extension Organization (AREEO), Tehran, 19395-1454, Iran.

✉ [gilasian@iripp.ir](mailto:gilasian@iripp.ir)

<https://orcid.org/0000-0002-8760-870X>

**Joachim Ziegler**

Museum of Natural History, Leibniz Institute for Research on Evolution and Biodiversity, Invalidenstraße 43, 10115 Berlin, Germany.

✉ [joachim.ziegler@mfj.berlin](mailto:joachim.ziegler@mfj.berlin)

<https://orcid.org/0000-0002-9376-2375>

**Farzad Jalilian**

Agricultural and Natural Resources Research and Education Center of Kermanshah, Agricultural Research, Education and Extension Organization (AREEO), Kermanshah, Iran.

✉ [fjalilian@areeo.ac.ir](mailto:fjalilian@areeo.ac.ir)

<https://orcid.org/0000-0003-2953-2783>

**Somaye Allahvaisi**

Plant Protection Research Department, Hamedan Agriculture and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Hamedan, Iran.

✉ [s.allahvaisi@areeo.ac.ir](mailto:s.allahvaisi@areeo.ac.ir)

<https://orcid.org/0000-0002-7162-4799>

**ABSTRACT.** *Minthodes oramanatae* Gilasian & Ziegler **sp. nov.** is described as new to science from western province of Kermanshah, Iran. This species is separated from other *Minthodes* species by its shiny black abdomen, narrow frons, long postpedicel, presence of basal scutellar marginal setae, short petiole of wing cell  $r_{4+5}$  and absence of marginal setae on abdominal tergite 2. Photographs of the male habitus and terminalia are given. The comparison of the morphological characters of *M. oramanatae* Gilasian & Ziegler **sp. nov.** with its closely related species *M. atra* (Kugler, 1971) and *M. rossica* (Mesnil, 1963) is provided. Photographs of the habitus and male terminalia of *M. atra* are presented for the first time. The identification key to the Iranian *Minthodes* species is provided.

**Key words:** Tachininae, Minthoini, *Minthodes oramanatae* **sp. nov.**, Kermanshah

**Received:**  
30 January, 2024

**Accepted:**  
24 February, 2024

**Published:**  
10 March, 2024

**Subject Editor:**  
Ali Asghar Talebi

**Citation:** Gilasian, E., Ziegler, J., Jalilian, F. & Allahvaisi, S. (2024) A new species of the genus *Minthodes* Brauer & Bergenstamm (Diptera: Tachinidae) from Iran. *Journal of Insect Biodiversity and Systematics*, 10 (2), 327–337.

### INTRODUCTION

The Old World genus *Minthodes* Brauer & Bergenstamm, 1889 (Tachinidae: Tachininae: Minthoini) consists of 12 Palaearctic and one Afrotropical species (Gilasian et al., 2016; O'Hara et al., 2020). In this paper, we describe the 13<sup>th</sup> Palaearctic species. This genus is distinguished from other Palaearctic Minthoini genera by the combination of the following characters: ocellar setae well developed; scutum with 1–2 postsutural intra-alar setae; scutellum with 2–3 pairs of marginal setae, lateral scutellar setae absent; postmetacoxal area membranous; tegula yellowish-orange; bend of vein M with an extension; petiole of wing cell  $r_{4+5}$  longer than 1/10 of section of vein M beyond bend; vein  $R_{4+5}$  setose at least halfway to crossvein r-m; preapical posteroventral seta on hind tibia about as long as preapical anteroventral seta; hind tibia with two preapical dorsal setae (Tschorsnig & Richter, 1998; Richter,

**Corresponding author:** Gilasian, E., ✉ [gilasian@iripp.ir](mailto:gilasian@iripp.ir)

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2009). The species of the genus *Minthodes* which are mostly distributed in Central Asia, Middle East and Mediterranean areas of Europe and North Africa, were originally described in two different genera, *Pseudomintho* and *Minthodes* s.str. by Brauer & Bergenstamm, 1889. The Palaearctic species were revised by Mesnil (1973), who wrote identification keys for the species and divided them into *Minthodes* and *Pseudomintho* too. Later, Tschorsnig & Richter (1998) treated the latter as a junior synonym of *Minthodes*, based on the occurrence of some intermediate morphological characters in *M. transiens* Herting, 1987. The species *M. atra* (Kugler, 1971) is the first Iranian record of this genus, previously known as *Pseudomintho atra* Kugler, collected in the Arjan Protected Area, Fars province (Gheibi & Ostovan, 2009). In their review of the genus *Minthodes* in Iran, Gilasian et al. (2016) described the species *M. susae* Gilasian & Ziegler, 2016 and reported both *M. pictipennis* Brauer & Bergenstamm, 1889 and *M. latifacies* Herting, 1983 for the first time. They also added some new data to elaborate on the intraspecific variation in *M. atra*.

This study is a part of our ongoing surveys on the fauna of the family Tachinidae in Iran and aims to improve the existing knowledge on the taxonomy of this family in the Palaearctic region.

## MATERIAL AND METHODS

The specimens were collected using Malaise traps in the western province of Kermanshah. In order to properly recover the material from ethanol, we followed the AXA method proposed by van Achterberg (2009). The digital images of the male terminalia were taken by a Canon® 650D camera and edited using Adobe® Photoshop CS2. The photographs of flies were taken by a Stonemaster Stack Unit equipped with an Olympus® OM-D digital camera and using Helicon Focus 7.6.4 for stacking the serial images. The specimens are deposited in the Hayk Mirzayans Insect Museum (HMIM), Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Tehran, Iran and in the Museum of Natural History Berlin (ZMHB), Leibniz Institute for Research on Evolution and Biodiversity, Berlin, Germany and also in the private collection of Joachim Ziegler (CZB), Bernau, Germany.

Measurements and ratios were calculated as proposed by Tschorsnig & Herting (1994) and Tschorsnig & Richter (1998). Statements given in square brackets in the description refer to paratypes. Overall lengths of specimens (in mm) were measured in lateral view from the anterior margin of the head, excluding the antenna, to the tip of the abdomen. The label data of holotype is given verbatim, with a forward slash separating different lines, a double forward slash separating different labels and descriptive information included in square brackets. The morphological terminology used in this paper follows Merz & Haenni (2000) (most external morphology), Stuckenberg (1999) (antenna), Sinclair (2000) (male terminalia) and Tschorsnig & Richter (1998) (wing).

## RESULTS

### *Taxonomic hierarchy*

**Class Insecta Linnaeus, 1785**

**Order Diptera Linnaeus, 1758**

**Suborder Brachycera Zetterstedt 1842**

**Superfamily Oestroidea Leach, 1815**

**Family Tachinidae Robineau-Desvoidy, 1830**

**Genus *Minthodes* Brauer & Bergenstamm, 1889**

*Minthodes* Brauer & Bergenstamm, 1889:136. Type species: *Minthodes pictipennis* Brauer & Bergenstamm, 1889, by monotypy.

*Pseudomintho* Brauer & Bergenstamm, 1889:136. Type species: *Pseudomintho brevipennis* Brauer & Bergenstamm, 1889, by monotypy.

***Minthodes oramanatae* Gilasian & Ziegler sp. nov. (Figs 1–2)**

<https://zoobank.org/urn:lsid:zoobank.org:act:478BFBA5-3729-46E4-946F-22158428F8E2>

**Type material.** **Holotype** ♂ (glued to a card point): “IRAN: Kermanshah Prov., / Paveh, Dodan, 1100 m / 35°00'25.5"N, 046°12'51.4"E / 05.VI. 2016, Malaise trap, / M. Zardouei // HOLOTYPUS ♂ / *Minthodes oramanatae* / Gilasian & Ziegler / 2023 [red label]; HMIM. **Paratypes:** 10 ♂♂ (glued to a card point), same data as holotype [HMIM]; 2 ♂♂ (glued to a card point), same data as holotype [CZB]; 1 ♂ (glued to a card point), same data as holotype [ZMHB].

**Etymology.** The name ‘oramanatae’ (latinized noun, genitive) refers to the Oramanat cultural landscape, where the material of the type series was collected. This region in western Iran is an UNESCO World Heritage Site and is also known as Uramanat or Hawraman.

**Diagnosis.** Male. Head without proclinate orbital setae; palpus brownish-orange; frons 0.20–0.25 times as wide as an eye in dorsal view; antenna as long as or longer than frons in lateral view; postpedicel 2.50–2.70 times as long as pedicel; scutellum with basal setae; petiole of wing cell  $r_{4+5}$  0.15–0.25 times as long as vein M beyond bend; legs entirely black; mid tibia with 1 strong and 2–(3) short anterodorsal setae; abdomen shiny black, without microtrichosity, abdominal tergite 2 without marginal setae, abdominal tergite 3 with a pair of discal setae.

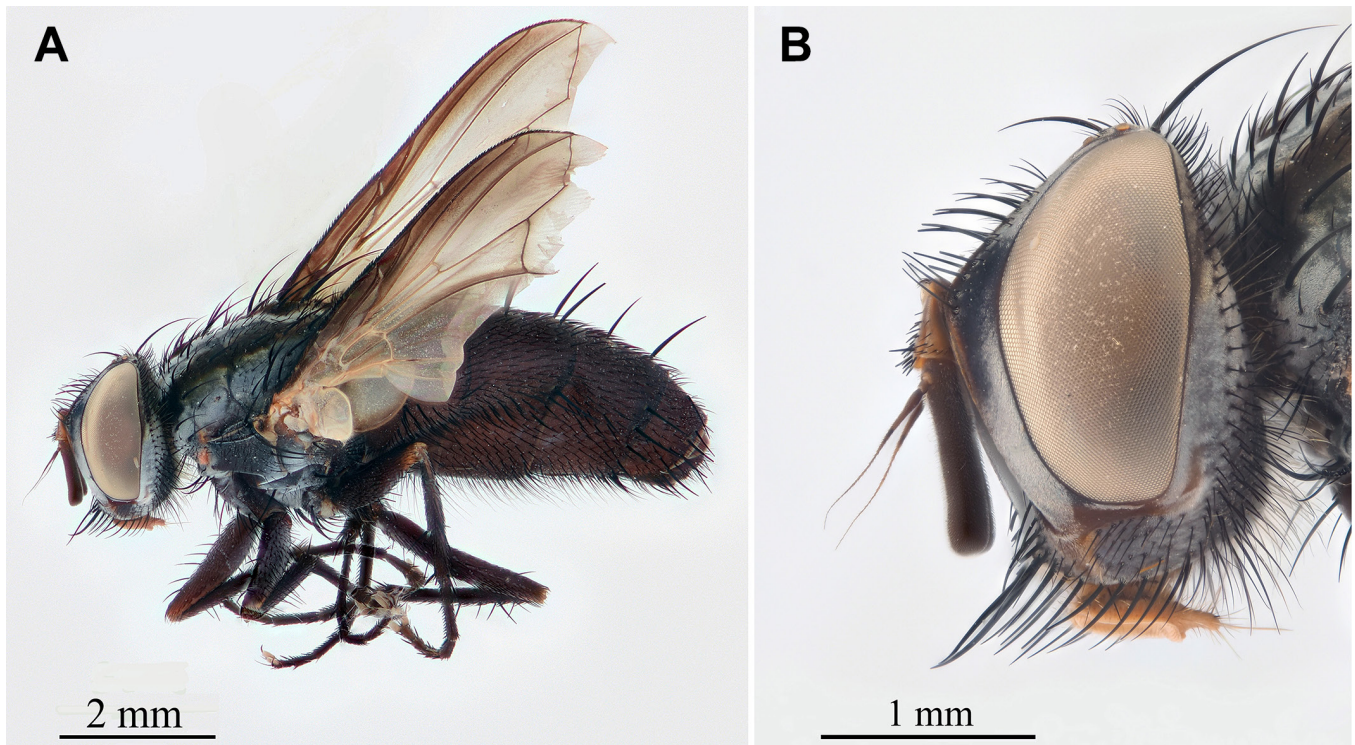
**Description.** — **Male** (holotype) (Fig. 1A). statements given in square brackets refer to the variation found among the paratypes). Overall length: 7.5 [6.7–8.5] mm.

**Colouration and microtrichosity.** Head predominantly dark brown to black; postgenal setulae black; frontal vitta brownish-black; lunule brown; face, gena, parafacial, fronto-orbital plate and occiput covered with grey microtrichosity; upper 1/3 of back of head with black setulae; occipital setulae black except pale posteroventral setulae; pedicel and narrow basal margin of postpedicel orange, other parts of antenna dark brown; prementum brown; palpus brownish-orange; thorax black, predominantly covered with grey microtrichosity, scutum with 2 lateral wide and 1 median narrow longitudinal black vittae extending to anterior margin of scutellum (in posterior view); postalar callus brownish-black; scutellum black, covered with light grey microtrichosity (in posterior view); wing hyaline, brownish-infuscated in anterior margin (cells  $c$ ,  $sc$  and  $r_1$ ); calypter white, outer margin of lower calypter dark brown; tegula and basicosta orange; halter brownish-orange; legs brownish-black; abdomen entirely shiny black, without microtrichosity; terminalia brown.

**Head** (Fig. 1B). Eye bare; genal dilation well developed, with black setulae; height of gena in lateral view about 0.18 [0.16–0.20] times as long as vertical diameter of eye; face 1.20 [1.10–1.20] times as long as frons in lateral view; frons at its narrowest point 0.22 [0.20–0.25] times as wide as an eye in dorsal view; frontal vitta medially almost 2 times as wide as fronto-orbital plate; medial vertical seta nearly 0.50 times as long as vertical diameter of eye, lateral vertical seta absent; ocellar setae proclinate; postocellar setae short, parallel; frons with 7–[9] frontal setae descending to middle of pedicel; facial ridge bare, parafacial bare; fronto-orbital plate with a few scattered setulae outside of frontal setae, without proclinate orbital setae; fronto-orbital plate at level of scape nearly 0.30 times as wide as transverse diameter of eye; parafacial at its narrowest point almost 0.15 times as wide as transverse eye diameter and nearly as wide as postpedicel in lateral view; vibrissa arising at level of lower facial margin and about 0.50–[0.60] times as long as face; lower facial margin not visible in lateral view; postpedicel 2.5–[2.7] times as long as pedicel and about 5.50 times as long as wide; arista thickened almost on basal 1/3, first aristomere very short, second aristomere almost as long as wide; prementum short, about 2.5 times as long as wide; palpus long, with only a few black setulae.

**Thorax.** Prosternum and proepisternum bare; postpronotum with 2 setae; scutum with 1+0 [1+1] acrostichal, 3+3 dorsocentral, 1+2 intra-alar, 2 notopleural, and 3 supra-alar setae; first postsutural supra-alar seta much shorter than notopleural setae; postalar callus with 2 setae; anatergite bare below lower calypter; katepimeron bare; katepisternum with 2 (1+1) setae; postmetacoxal area membranous; scutellum with 3 pairs of marginal setae, apical setae strong and crossed and nearly 0.70 times as long as divergent, subapical setae; lateral setae absent, basal setae about 1.15 times as long as apical setae.





**Figure 1.** *Minthodes oramanatae* Gilasian & Ziegler sp. nov., (paratype) **A.** Male, lateral view; **B.** Head, lateral view. Photos by J. Ziegler.

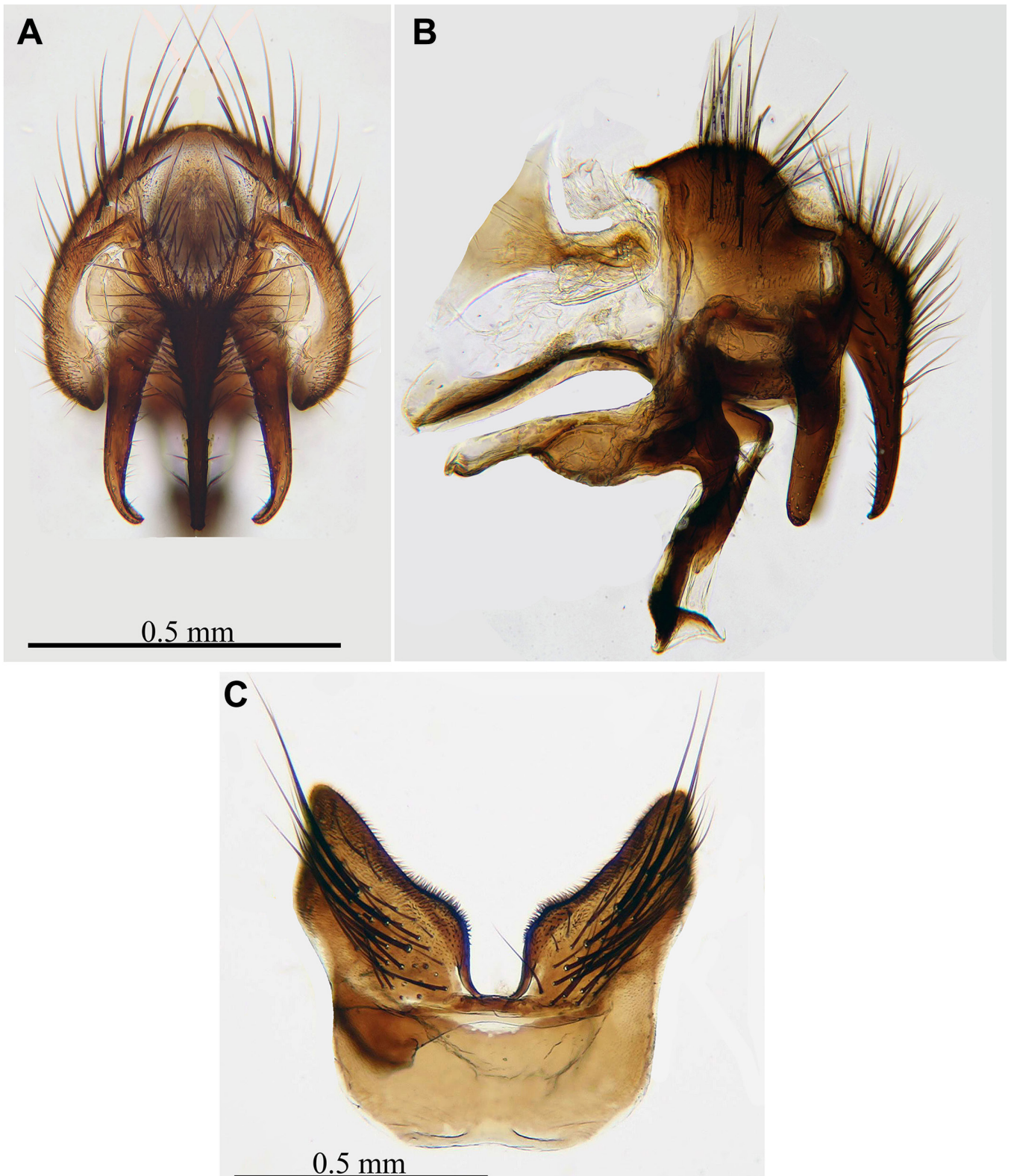
**Wing.** Second costal section bare ventrally; costal seta not differentiated; third costal section almost 2.5 times as long as fourth costal section; fourth costal section (between veins  $R_{2+3}$  and  $R_{4+5}$ ) about 1.30 [1.00–1.30] times as long as second costal section (between subcostal break and vein  $R_1$ ) and 2.25 [2.10–2.50] times as long as sixth costal section; vein  $R_{4+5}$  setose halfway to crossvein r-m dorsally and with 3 [2–5] basal setulae ventrally; cell  $r_{4+5}$  with a petiole 1.4–[1.6] times as long as crossvein r-m and [0.15]–0.25 times as long as section of vein M beyond bend; section of vein M between crossveins r-m and dm-cu about 2.3 times as long as section between dm-cu and bend of M; bend of M forming a right angle with [or without] a very short appendix; crossvein dm-cu nearly 5 times as long as crossvein r-m.

**Leg.** Fore leg: coxa bare on anterior and posterior surfaces; tibia with 1 posterior seta and two very short anterodorsal setae; preapical anterodorsal seta almost as long as preapical dorsal seta; tarsomere 1 nearly 1.8–[2.0] times as long as tarsomere 2 and 0.45–[0.50] times as long as tibia; claw long, 1.1–[1.2] times as long as tarsomere 5. Mid leg: tibia with 1 strong and 2–[3] short anterodorsal setae, 2 posterior and 1 ventral setae. Hind leg: tibia with a nearly complete row of irregular anterodorsal, 2 posterodorsal, 2 anteroventral and 2 distinct preapical dorsal setae.

**Abdomen.** Laterally compressed; middorsal depression of syntergite 1+2 not extending to posterior margin of that segment; syntergite 1+2 without median marginal setae, with 1 pair of lateral marginal setae and 3–4 pairs of lateral discal setae; tergite 3 with 1 pair of median marginal, 2 pairs of lateral marginal and 1 pair of dorsal discal setae; tergite 3 nearly as long as wide; tergites 4–5 each with an almost complete row of marginal setae; tergite 4 with a pair of dorsal discal setae and 2–[3] pairs of lateral discal setae; tergite 5 with irregular rows of discal setae, and 0.55 times as long as tergite 4.

**Terminalia** (Figs 2A–C). Sternite 5 (Fig. 2C) nearly as long as wide with a deep median apical U-shaped depression; syncercus hook-shaped in lateral view; surstylus slightly narrowing to apex, rounded at tip in lateral view (Fig. 2B) and turned internally in apical 1/4 in dorsal view (Fig. 2A).

**Female.** Unknown.



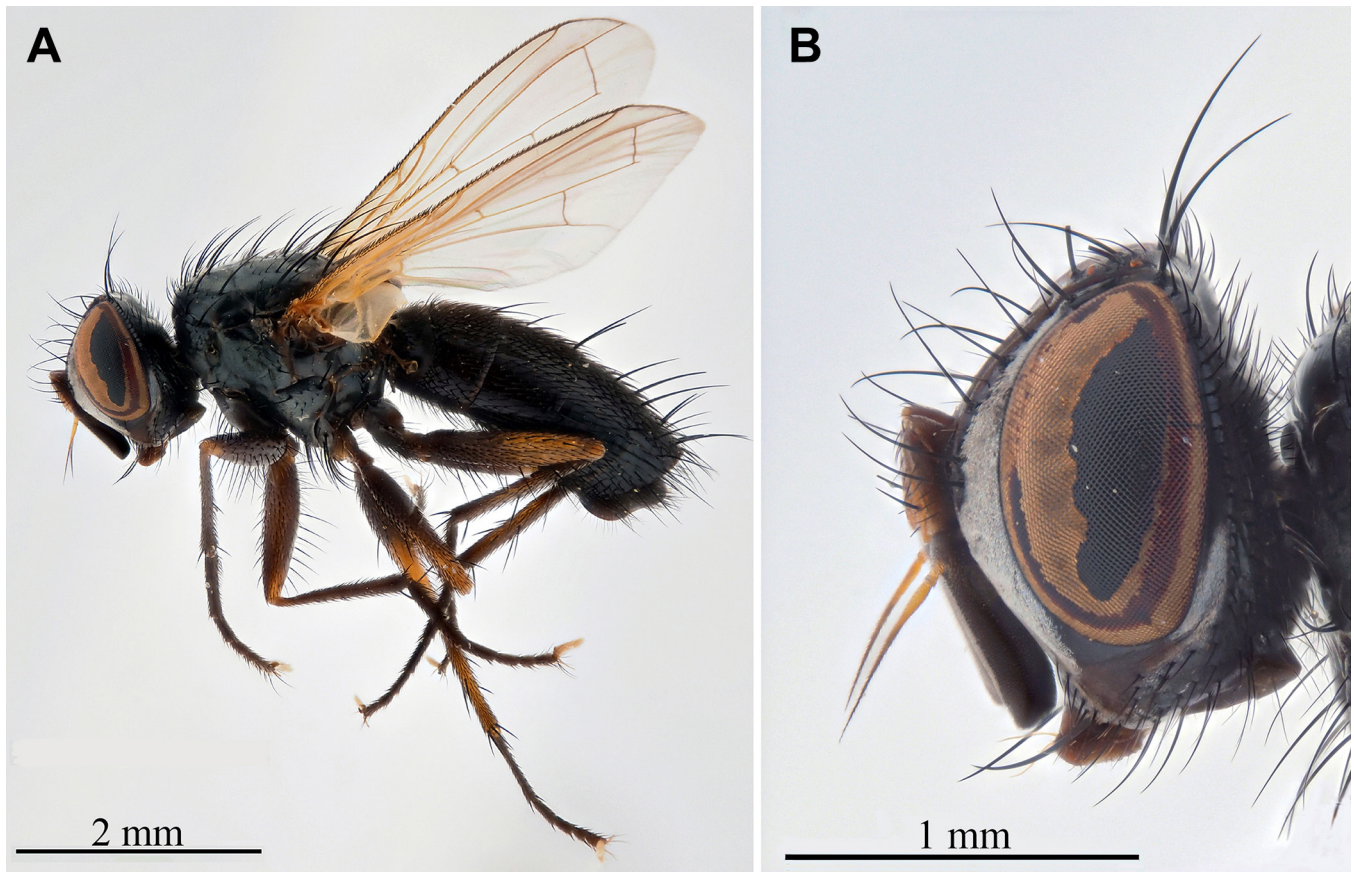
**Figure 2.** *Minthodes oramanatae* Gilasian & Ziegler **sp. nov.**, male terminalia (paratype) **A.** Dorsal view; **B.** Lateral view; **C.** Sternite 5. Photos by E. Gilasian.

***Minthodes atra* (Kugler, 1971) (Figs 3–4)**

*Pseudomintho ater* Kugler, 1971:74. Type locality: Quneitra, Syria.

*Pseudomintho pentheri* Bischof, 1906:176 (questionable). Type locality: Erciyes Dağı, Turkey. *Pseudomintho rufipes* Bischof, 1906:176 (questionable). Type locality: Erciyes Dağı, Turkey.



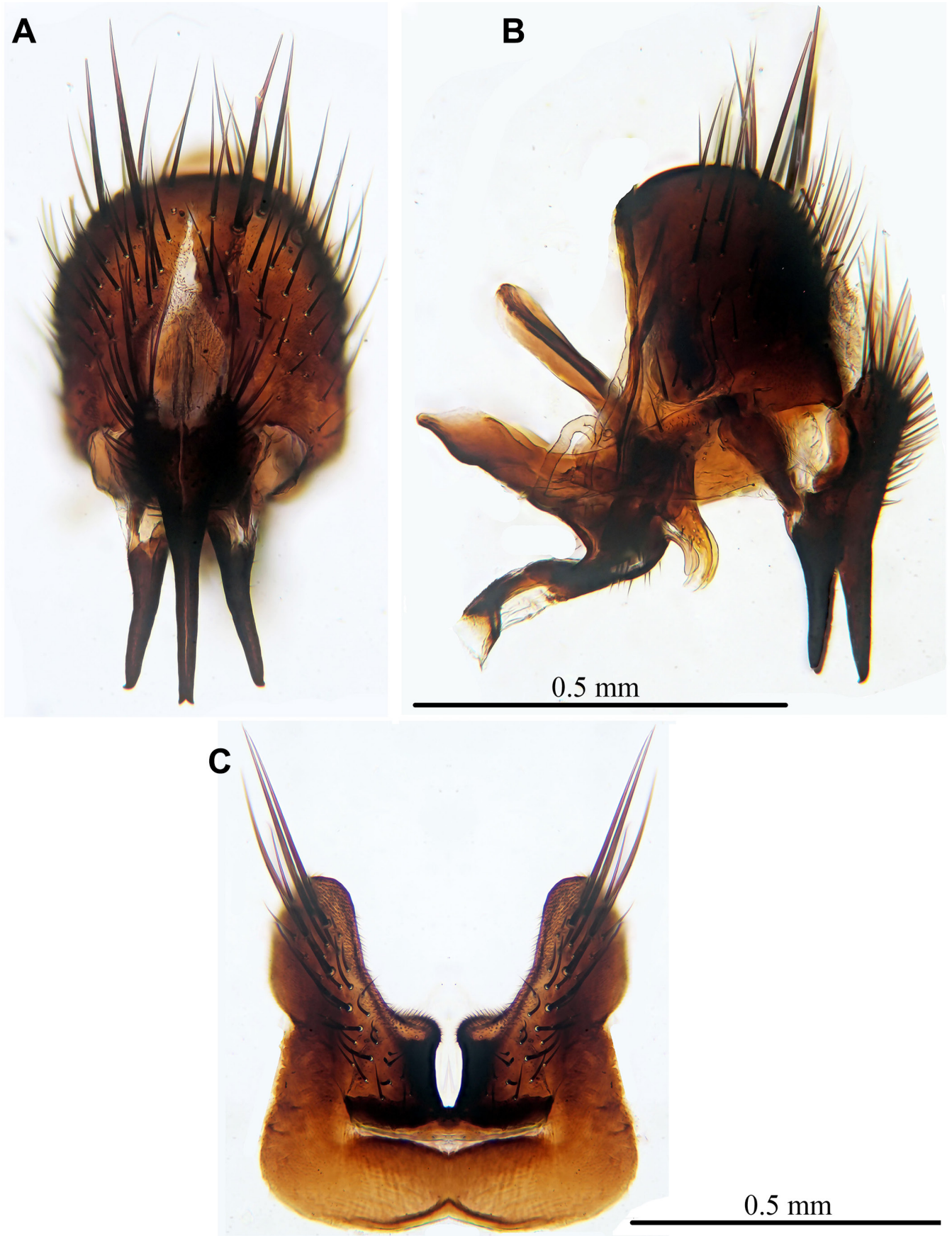


**Figure 3.** *Minthodes atra* (Kugler, 1971), male. **A.** lateral view; **B.** Head, lateral view.

**Additional material examined.** IRAN: Kermanshah Prov., 1♂ 1♀ (glued to a card point), Ghazanchi, 1310 m, 34°26'45"N, 047°01'23"E, 01.VII.2015, Malaise trap, M. Zardouei (HMIM); 1♂ (glued to a card point), Gheshlagh, 1544 m, 34°40'17"N, 047°06'41"E, 01.VII.2015, Malaise trap, M. Zardouei (HMIM).

#### Key to the Iranian species of *Minthodes* Brauer & Bergenstamm, 1889

- 1 Antenna about 1/2 as long as frons in lateral view; frons in male at its narrowest point distinctly narrower than postpedicel. .... 2
- Antenna as long as or longer than frons in lateral view; frons in male at its narrowest point wider than postpedicel, at least 1/5 as wide as an eye in dorsal view. .... 3
- 2 Face twice as long as distance between vibrissae; postpedicel about 1.3 (male) and 1.1 (female) times as long as pedicel; petiole of wing cell  $r_{4+5}$  0.6–0.7 times as long as section of vein M beyond bend; anepimeral seta absent or indistinct; abdominal syntergite 1+2 distinctly microtrichose lateroventrally; tergite 3 with a narrow anteromarginal band of grey microtrichosity, widely extending lateroventrally and detached from anterior margin of tergite; tergite 4 with only a dorsomedian longitudinal band of grey microtrichosity. .... *M. latifacies* Herting, 1983
- Face 1.5 times as long as distance between vibrissae; postpedicel about 1.9 (male) and 1.5 (female) times as long as pedicel; petiole of wing cell  $r_{4+5}$  almost 0.25 times as long as section of vein M beyond bend; anepimeral seta present; abdominal syntergite 1+2 without microtrichosity; tergites 3–4 each with a narrow anteromarginal band of grey microtrichosity widening lateroventrally close to anterior margin of tergites. .... *M. pictipennis* Brauer & Bergenstamm, 1889
- 3 Frons in male at its narrowest point 0.20–0.25 times as wide as an eye in dorsal view (female unknown); petiole of wing cell  $r_{4+5}$  0.15–0.25 times as long as section of vein M beyond bend; postpedicel in male 2.5–2.7 times as long as pedicel. .... *M. oramanatae* sp. nov.



**Figure 4.** *Minthodes atra* (Kugler, 1971), male terminalia. **A.** Dorsal view; **B.** Lateral view; **C.** Sternite 5. Photos by E. Gilasian.



- Frons in male and female at its narrowest point 0.5–1.0 times as wide as an eye in dorsal view; petiole of wing cell  $r_{4+5}$  0.75 times as long as section of vein M beyond bend; postpedicel in male shorter or longer than 2.5–2.7 times as long as pedicel. .... 4
- 4 Frons in male and female at its narrowest point 0.5–0.6 and 0.70–0.75 times as wide as an eye in dorsal view respectively; postpedicel 1.8–2.1 (male) and 1.55–1.65 (female) times as long as pedicel; scutellum without basal setae; petiole of wing cell  $r_{4+5}$  0.70–0.95 times as long as section of vein M beyond bend; abdomen shining black in male, orange-red lateroventrally in female. .... *M. atra* (Kugler, 1971)
- Frons in male and female at its narrowest point 0.85–1.00 times as wide as an eye in dorsal view; postpedicel 2.8–3.6 (male) and 2.2–2.4 (female) times as long as pedicel; scutellum with basal setae; petiole of wing cell  $r_{4+5}$  0.5–0.6 times as long as section of vein M beyond bend; abdominal tergites 2–4 orange-red lateroventrally in both sexes. .... *M. susae* Gilasian & Ziegler, 2016

## DISCUSSION

The males of *M. oramanatae* Gilasian & Ziegler **sp. nov.**, *M. atra* (Kugler, 1971) and *M. rossica* (Mesnil, 1963) are similar in having shiny black abdomens. A list of the male morphological characters is given in Table 1 to compare these three species. The species *M. oramanatae* **sp. nov.** differs strikingly from *M. atra* and *M. rossica* in its frontal and antennal indices, the length of the petiole of wing cell  $r_{4+5}$  and presence of basal scutellar setae. The colouration of legs in *M. oramanatae* **sp. nov.** and *M. rossica* are identical as having their legs almost entirely black, unlike *M. atra* whose apical 1/3–1/2 of femora and mid and hind tibiae are yellowish-orange. The absence of median marginal setae on tergite 2 shares in both *M. oramanatae* **sp. nov.** and *M. atra* and dorsal discal setae occur in *M. oramanatae* **sp. nov.** and *M. rossica*. Although the male terminalia of *M. oramanatae* **sp. nov.** and *M. atra*, in lateral view, show similar hook-shaped cercus and rounded surstylus apically (Figs 2B, 4B), in the dorsal view the terminalia appear significantly different in both species, especially in the shape of their surstyli (Figs 2A, 4A). Females of *M. atra* have reddish-orange abdomen lateroventrally, females of *M. oramanatae* **sp. nov.** and *M. rossica* remain unknown.

**Table 1.** Morphological characters of the males of *Minthodes oramanatae* Gilasian & Ziegler **sp. nov.**, *M. atra* (Kugler, 1971) and *M. rossica* (Mesnil, 1963).

Morphological characters	<i>M. oramanatae</i> sp. nov.	<i>M. atra</i> (Kugler, 1971)	<i>M. rossica</i> (Mesnil, 1963)
Width of frons/an eye (dorsal view)	0.20–0.25	0.5–0.6	0.5–0.6
Antennal index postpedicel/pedicel	2.5–2.7	1.8–2.1	1.5
Length of wing cell $r_{4+5}$ petiole/section of vein M beyond bend	0.15–0.25	0.75	0.75
Colouration of legs	entirely brownish-black	1/3–1/2 femora as well as mid and hind tibiae yellowish-orange; the other parts of the legs black	almost entirely black
Basal scutellar setae	present	absent	absent
Median marginal setae on syntergite 1+2	absent	absent or present	present
Sternite 5	without a distinct projection on inner side (Fig. 2C)	with a distinct projection on inner side (Fig. 4C)	lack of data
Surstylus in dorsal view	rounded at tip, turned internally in apical 1/4	with a small hook at tip, not turned internally	lack of data
Body size in male (mm)	6.7–8.5	4.0–5.5	4.5



With the inclusion of the newly described *M. oramanatae* Gilasian & Ziegler, sp. nov., the number of Iranian members of *Minthodes* rises to five species (Gilasian et al., 2016). The genus is considered endemic to the Palaearctic region, excluding *M. rhodesiana* Villeneuve, 1942 that has been described from Afrotropical region. Based on the available data, 10 species of *Minthodes* remain restricted to the Near East (Armenia, Azerbaijan, Cyprus, Georgia, Iran, Israel, Lebanon, Syria, Turkey) and *M. rossica* (Mesnil, 1963) occurs only in the Central Asia (Tajikistan, Uzbekistan). Given that *M. latifacies* Herting, 1983 is distributed mainly in the Palaearctic region, its reported occurrence in Yemen is an example of the known mixture of Afrotropical and Palearctic elements in the tachinid fauna there (Richter, 1971; Zeegers, 2007; O'Hara et al., 2020).

#### AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: E. Gilasian: Describing the new species, preparing the manuscript. J. Ziegler: Describing the new species, preparing the manuscript. F. Jalilian & S. Allahvaisi: Collaborating in the project. The authors read and approved the final version of the manuscript.

#### FUNDING

This research was funded by the Iranian Research Institute of Plant Protection.

#### AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in in the Hayk Mirzayans Insect Museum (HMIM), Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Tehran, Iran and in the Museum of Natural History Berlin (ZMHB), Leibniz Institute for Research on Evolution and Biodiversity, Berlin, Germany and also in the private collection of Joachim Ziegler (CZB), Bernau, Germany and are available from the curator, upon request.

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

#### CONSENT FOR PUBLICATION

Not applicable.

#### CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

#### ACKNOWLEDGMENTS

Our special thanks go to the Iranian Research Institute of Plant Protection for funding this research. We are also grateful to Dr M. Parchami-Araghi (CNC, Ottawa) for English language editing, the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI) for the opportunity to use a multifocus photo station and two reviewers for their constructive comments on the manuscript.

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## توصیف یک گونه جدید از جنس *Minthodes* Brauer & Bergenstamm (Diptera: Tachinidae) از ایران

ابراهیم گیلاسیان<sup>۱\*</sup>، یواخیم زیگلر<sup>۲</sup>، فرزاد جلیلیان<sup>۳</sup> و سمیه الهویسی<sup>۴</sup>

- ۱ بخش تحقیقات رده‌بندی حشرات، موسسه تحقیقات گیاه‌پزشکی کشور، سازمان تحقیقات، آموزش و ترویج کشاورزی (AREEO)، تهران، ایران.
- ۲ موزه تاریخ طبیعی، موسسه تحقیقات تکامل و تنوع زیستی لایبنیز، ۱۰۱۱۵ برلین، آلمان.
- ۳ مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی کرمانشاه، سازمان تحقیقات، آموزش و ترویج کشاورزی (AREEO)، کرمانشاه، ایران.
- ۴ مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی کرمانشاه، سازمان تحقیقات، آموزش و ترویج کشاورزی (AREEO)، همدان، ایران.

\* پست الکترونیک نویسنده مسئول مکاتبه: [gilasian@iripp.ir](mailto:gilasian@iripp.ir)

تاریخ دریافت: ۱۰ بهمن ۱۴۰۲ | تاریخ پذیرش: ۰۵ اسفند ۱۴۰۲ | تاریخ انتشار: ۲۰ اسفند ۱۴۰۲

**چکیده:** گونه *Minthodes oramanatae* Gilasian & Ziegler **sp. nov.** به‌عنوان یک آرایه جدید برای دنیا از استان کرمانشاه، ایران توصیف شد. این گونه به واسطه شکم کاملاً سیاه براق، پیشانی باریک، بلند بودن بند سوم شاخک، حضور موهای حاشیه‌ای در قاعده سپرچه، کوتاه بودن ساقه سلول  $T_{4+5}$  و غیبت موهای حاشیه‌های روی تریژیت دوم شکم از سایر گونه‌های جنس *Minthodes* جدا می‌شود. شکل اندام جنسی نر و حشره کامل آرایه شد. خصوصیات مرفولوژیک این گونه با گونه‌های نزدیک به آن شامل *M. atra* (Kugler, 1971) و *M. rossica* (Mesnil, 1963) مقایسه و شکل اندام جنسی نر در گونه *M. atra* برای اولین بار تهیه شد. کلید شناسایی گونه‌های جنس *Minthodes* در ایران آرایه شد.

**واژگان کلیدی:** کرمانشاه، Tachininae، Minthoini، *Minthodes oramanatae* sp. nov.