

Taxonomic Notes on the Soldier Fly Genus *Odontomyia* Meigen, 1803 (Diptera: Stratiomyidae) from Pakistan with a New Country Record

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ABSTRACT

The soldier fly genus *Odontomyia* Meigen, 1803 (Diptera: Stratiomyidae) is revised from Pakistan. Two species are re-described and illustrated: *Odontomyia ochropa* Thomson, 1869 and *Odontomyia solennis* Walker, 1851. Of these, *Odontomyia solennis* is newly recorded for Pakistan. An illustrated key and a distributional map of these two species in Pakistan are provided.

Keywords: Oriental Region, re-description, morphology, Northern Area.

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INTRODUCTION

The genus *Odontomyia* Meigen, 1803, belongs to the subfamily Stratiomyinae (Diptera: Stratiomyidae) and is one of the most species-rich genera in the tribe Stratiomyini, with approximately 219 species distributed worldwide, except Antarctica: Afrotropical (46), Australian (59), Nearctic (30), Neotropical (25), Oriental (27) and Palearctic realms (41) (Woodley, 2001; 2011; Wang, Perng, & Ueng, 2007; Rozkošný & Woodley, 2010; Yang, Zhang, & Li, 2014; Hauser, Woodley, & Fachin, 2017; 2022; Yang & Yang, 2021). To date, 10 species of the genus *Odontomyia* have been recorded from Indonesia, nine from India, three from Sri Lanka, two from Philippines and Malaysia, and one species each from Myanmar, Japan, Singapore, and Pakistan within the Oriental region (Woodley, 2001; Hassan, Bodlah, Iqbal, & Jabeen, 2017). So far, only 12 species under seven genera in four subfamilies: Clitelliinae (1 genus, 1 species), Hermetiinae (1 genus, 1 species), Sarginae (3 genera, 6 species), and Stratiomyinae (3 genera, 5 species), and have been recorded from Pakistan (Woodley, 2001; Hassan et al, 2017; Hassan, Bodlah, Malik, & Gull-E-Fareen, 2019).

In this study, we revised the genus *Odontomyia* Meigen, 1803 from Pakistan and recorded *Odontomyia solennis* Walker, 1851 as a new addition to the stratiomyid fauna of the country, thus recorded two species of the genus *Odontomyia* from Pakistan.

MATERIAL AND METHODS

The adult specimens were collected during 2016 to 2019 by means of sweep-netting in the Himalayan regions of Pakistan. The taxonomic study was conducted using a Nikon SMZ 745 stereomicroscope and images for adult habitus were taken with a Nikon D800 digital camera with a Nikon MICRO NIKKOR 105 mm lens, while the genital photographs were taken with a Canon 7D Mark II digital camera attached with a Nikon SMZ18 microscope. The species were identified by using the following available source of literature: Brunetti (1920, 1923), Nerudová-Horsáková, Kovac, & Rozkosný (2007), and Hassan et al (2017), and compared with the available type photographs of *Odontomyia solennis* Walker. Species distribution map is created using ArcGIS 10.4.1 software. The studied specimens are deposited at National Insect Museum Islamabad, Pakistan (NIM).

RESULTS

Taxonomy

Family Stratiomyidae

Subfamily Stratiomyinae Latreille, 1802

Genus *Odontomyia* Meigen, 1803

Eulalia Meigen, 1800: 21. Type species: *Musca hydroleon* Linnaeus, 1758 (by designation of Coquillett, 1910: 541). Suppressed by ICZN, 1963: 339.

Odontomyia Meigen, 1803: 265. Type species: *Musca hydroleon* Linnaeus, 1758 (by designation of Westwood, 1840: 130).

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Trichacrostyilia Enderlein, 1914: 607. Type species: *Stratiomys angulata* Panzer, 1978. Original designation.

Orthogoniocera Lindner, 1951: 187. Type species: *Odontomyia hirayamae* Matsumura, 1916. Monotypy.

Cyrtopus Bigot, 1883: 132. Type species: *Cyrtopus fastuosus* Bigot, 1883. Monotypy. Synonymized by Rozkošný & Weedley, 2010: 291.

Scapanocnema Enderlein, 1914: 610. Type species: *Scapanocnema spathulipes* Enderlein, 1914 (by original designation). Synonymized by Rozkošný & Weedley, 2010: 291.

Diagnostic note

Adult *Odontomyia* species exhibit a remarkable morphological diversity, including a large variety of color pattern and sizes, but can be distinguished by the following characters: head with eyes bare or pilose, contiguous in males, widely separated in females; antennae with scape and pedicel nearly subequal, ratio of scape to pedicel usually not more than 1.5: 1; flagellum with six flagellomeres, last two flagellomeres forming a short stylus; scutellum with a distinct pair of lateral spines; wing vein R2+3 present; veins M1 and M2 present, M3 vestigial or absent; vein M4 arising from M-cell (Yang 1995; Wang et al, 2007; Nerudová-Horsáková et al, 2007; Rozkošný & Woodley 2010; Rozkošný & Kovac 2014; Hauser et al, 2017).

Key to species of the genus *Odontomyia* from Pakistan

1. Face and frons yellow in both male and female (Fig. 1c-d); scutellum yellow, slightly black at base (Fig. 1a-b) *O. ochropa* Thomson
- Face and frons black, except mouth edge yellow (Fig. 4e, f), frons in female with a pair of dark brown markings above antennae (Figs 4e, f); scutellum black, slightly yellow at apex (Figs 4a, b) *O. solennis* Walker

Odontomyia ochropa Thomson, 1869

(Figs 1a-h, 2a-h, 6)

Odontomyia ochropa Thomson, 1869: 456. Type locality: Philippines (Luzon: Manila).

Odontomyia dorsoangulata Brunetti, 1920: 68. Type locality: India. Synonymized by Nerudová-Horsáková et al, 2007: 112.

Distribution: **Oriental.** **Thailand:** Muak Lek, Bangkhen, Lang Suan; **India:** Bihar, Karnataka (Bengaluru), Tamil Nadu, West Bengal (Sundarban); **Pakistan:** Punjab, Shakargarh; **Philippines:** Luzon, Manila; **Singapore:** Lim Chu Kang; **Australian:** USA (Hawaii) (Brunetti, 1920; Majumder & Parui, 2001; Woodley, 2001; Nerudová-Horsáková et al, 2017; Hassan et al, 2017; Roy, Chakraborty, Parui, & Mitra, 2018).

Material examined. Pakistan: Gilgit-Baltistan, Baltistan Division, District Shigar, Hashu pi Bagh, 22.07.2017, 1♀ leg M.A. Hassan (NIM), District Skardu, Kresmathang Olding, 12.07.2019, 1♂ 1♀, leg M.A. Hassan (NIM).

Re-description: Male. Body length (excluding antennae): 12 mm; wing length: 8.5 mm.

Head rounded, slightly wider than thorax in dorsal view (Fig. 1a, b). Ocellar triangular prominent, shining black, ocelli brownish yellow. Eyes bare, dark brown to black. Compound eyes contiguous for a distance equal to between the upper frons and anterior ocellus. Face, frons, and vertex reddish yellow to pale brown. Antenna (Fig. 1c, d) ochre yellow, brownish at apex; scape longer than pedicel; flagellum with six flagellomeres, each flagellomeres longer than wide, last two flagellomeres forming a short stylus. Face with a distinct median tubercle, covered with short pale hairs on either sides, middle part almost bare. Ventral parts of head and gena yellow.

Thorax black (Fig. 1a, b), but postpronotal callus, scutellum and scutellar spines yellow; scutum black, densely punctate and finely pale, whitish to golden haired, lateral marginal hairs longer than in center; scutellum yellow but its narrow base at lateral margins black. Pleura yellow, except on upper part of propleura above fore coxa, broad upper and posterior margin of anepisternum, posterior corner of katepisternum, outer part of laterotergite, and lower part blackish, covered with densely and finely pale, whitish to golden haired (Fig. 1g, h). Legs yellow, except basal part of fore and hind coxa slightly blackish, covered with short pale hairs. Wing membrane hyaline, veins and pterostigma pale yellow. Vein M3 virtually absent, its short basal part being barely visible as an indistinct fold. Thoracic squama yellowish, with long marginal fringe. Halter pale brown, knob pale yellow.

Abdomen: Tergites yellow with a median triangular to broad blackish markings. Abdominal pile pale, mostly appressed, longer and erect only on anterolateral parts. Sternites yellow, and bare (Fig. 1a, b).

Terminalia: Epandrium subquadrate, with both proximal corners pointed; epiproct subtriangular, covered with short yellow hairs; cerci relatively short, subquadrate, slightly narrow at base, covered with short yellow hairs; synstenites subtrapezodial, with a pair of distinct medial process; gonostylus curved inwards and pointed apically; phallic complex tripartite (Fig. 2a-g).

Female. Body length (excluding antennae): 9.5 mm; wing length: 7.2 mm. Similar to male, except the following characters. *Head:* Eyes broadly dicoptic; face, frons, vertex, occiput, and gena yellow; ocellar triangle black, with a distinct fine dark median groove between anterior ocellus and base of antennae; frons wide, slightly narrower than face, margins parallel-sided in dorsal view; occiput wide, distinctly visible in lateral view. *Thorax:* Scutellum yellow, except proximal 1/3 blackish. *Abdomen:* Tergites yellow, black markings usually broader than in male and sometimes with regular or even irregular small pale spots in the dark areas (Fig. 1b).

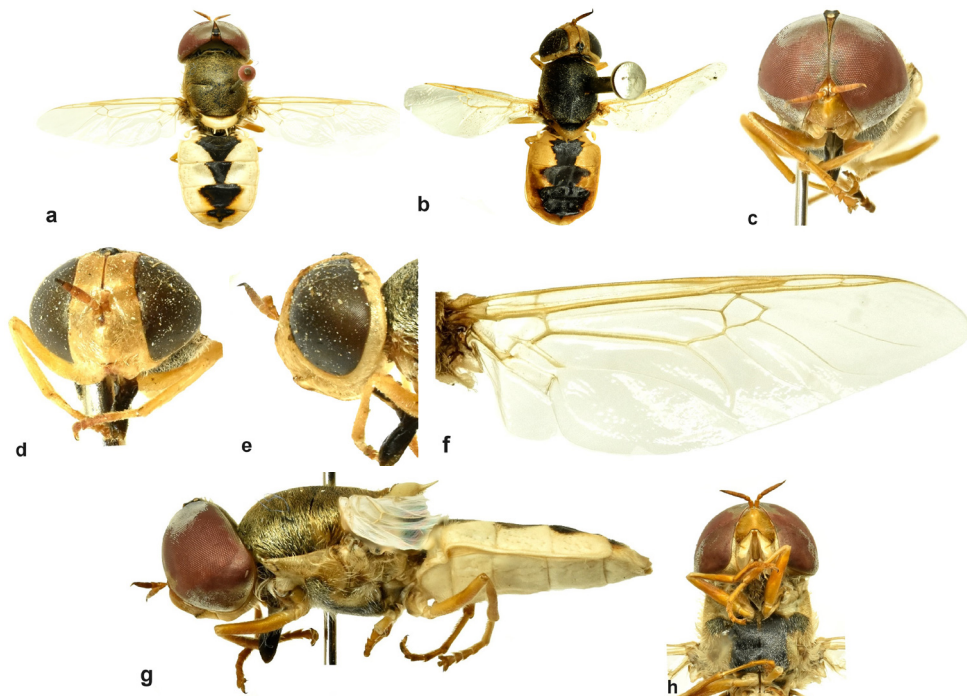


Figure 1. *Odontomyia ochropa* Thomson. a) male dorsal habitus; b) female dorsal habitus; c) male frontal view; d) female frontal view; e) female head in lateral view; f) wing; g) male lateral view; h) male ventral view.

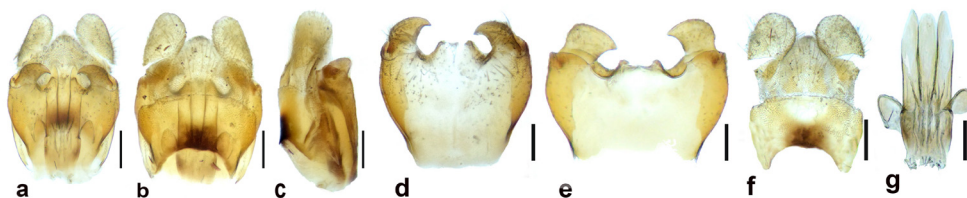


Figure 2. *Odontomyia ochropa* Thomson. Male genitalia: a) ventral habitus; b) dorsal habitus; c) lateral habitus; d) synsternum, dorsal habitus; e) synsternum, ventral habitus; f) epandrium, dorsal view; g) phallic complex.

Odontomyia solennis Walker, 1851

(Figs 3a-e, 4a-h, 5a-g, 6)

Odontomyia solennis Walker, 1851: 79. Type locality: India.

Distribution: **India:** Bihar, Odisha, Uttar Pradesh, West Bengal (Brunetti, 1920; Woodley, 2001). **Pakistan:** New country record (present study).

Material examined. Pakistan: Azad Kashmir, Poonch division, District Poonch, Banjosa Lake, 14.04.2016, 1♀, leg M.A. Hassan (NIM), 20.04.2016, 1♂ 1♀, leg M.A. Hassan (NIM), 23.04.2016, 1♂, leg M.A. Hassan (NIM).

Re-description. Male. Body length (excluding antennae): 11.2 mm; wing length: 8.5-8.8 mm.

Head: rounded, slightly wider than thorax in dorsal view (Fig. 3a, b). Ocellar triangular prominent, shining black, ocelli brownish yellow. Occiput indistinct. Eyes bare, dark brown to black. Compound eyes contiguous for a distance equal to between the upper frons and anterior ocellus. Face, frons, and vertex black. Antenna (Fig. 3a-b) dark brown to brownish yellow; scape and pedicel subequal in length; flagellum with six flagellomeres, first four flagellomeres punctuated, last two flagellomeres forming a short stylus. Face with a distinct median tubercle, covered with short pale hairs on either sides, middle part almost bare (Fig. 3b). Area around the mouth yellow. Gena black, covered with short pale hairs (Fig. 3d).

Thorax: black (Figs. 3a, d, 4a-d), but hind margin of scutellum narrowly yellow, scutellar spines yellow or green with dark apex; scutum black, finely covered with short whitish to golden haired, lateral marginal hairs longer than in center. Pleura black, covered with whitish to golden haired (Figs. 3d, 4d). Legs yellow, except basal part of fore and hind coxa slightly blackish, covered with short pale hairs. Tarsi brownish, fore and mid tarsi slightly brownish, hind tarsi dark brown towards apex (Figs. 3d-e, 4c-d). Wing membrane hyaline, veins and pterostigma brownish yellow. Vein M3 virtually absent, vein M1 indistinct at proximal half. Thoracic squama yellowish, with long marginal fringe. Halter dark brown, knob green or pale yellow (Fig. 3a).

Abdomen: Tergites green to brownish yellow, with a narrow median longitudinal blackish marking on tergites 1-3. Abdominal pile pale, indistinct, mostly appressed. Sternites greenish to pale yellow, with indistinct pale hairs (Fig. 3e).

Terminalia: Epandrium subquadrate, with both proximal corners pointed; epiproct subtriangular, covered with short yellow hairs; cerci relatively short, subquadrate, slightly narrow at base, covered with short yellow hairs (Fig. 5f); synstenites subtrapezoidal, with a median rounded process slightly invaginated in center; gonostylus rounded, curved inwards and pointed apically (Fig. 5d-e); phallic complex tripartite (Fig. 5g).

Female. Body length (excluding antennae): 9.0-10.5 mm; wing length: 8.0-8.3 mm. Similar to male, except the following characters: **Head:** Eyes broadly dichoptic; face, frons, vertex, occiput, and gena black; ocellar triangle black, ocelli dark brown; frons wide, slightly narrower than face, with a pair of median dark brown markings above antennae, lateral margins parallel-sided in dorsal view, covered with short pale and golden hairs; face black, with the area around the mouth yellow, gradually widening at lateral margins in lower half, densely covered with pale hairs, more prominent at lower half in lateral margins; occiput indistinct. **Thorax** black (Figs. 3a, 4a-b), but hind margin of scutellum narrowly yellow, scutellar spines yellow or green with dark apex; scutum black, finely covered with short whitish to golden haired, lateral marginal hairs longer than in center. **Abdomen** (Figs. 3a, 4a-b): Tergites 1 and 2 green to brownish yellow, tergites 3-5 mostly black, but the lateral margins of tergites 3 and 4, and hind margin of tergite 5 green to brownish yellow. Abdominal pile pale, indistinct, mostly appressed. Sternites green to brownish yellow, with indistinct pale hairs (Fig. 3e).

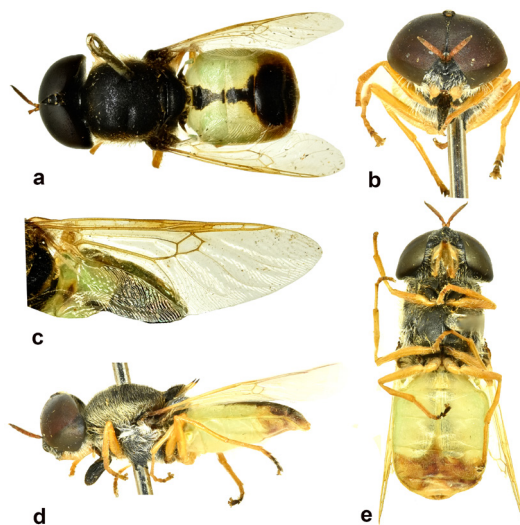


Figure 3. *Odontomyia solennis* Walker. Male: a) dorsal habitus; b) frontal view; c) wing; d) male lateral view; e) ventral view.

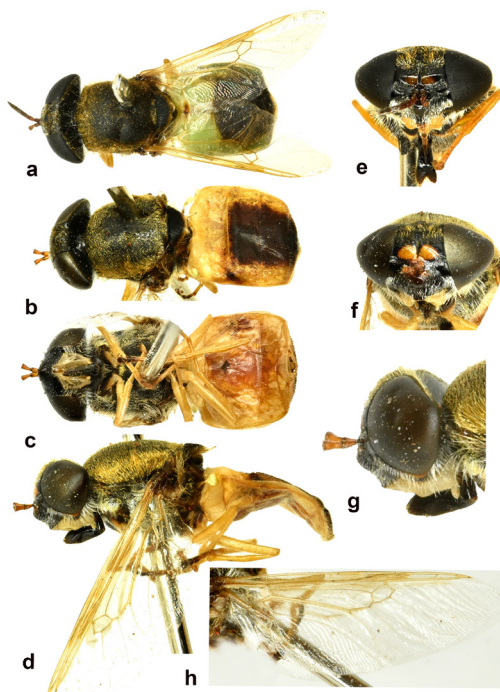


Figure 4. *Odontomyia solennis* Walker. Female: a-b) dorsal habitus; c) ventral view; d) lateral view; e-f) head in frontal view; g) head in lateral view; h) wing.

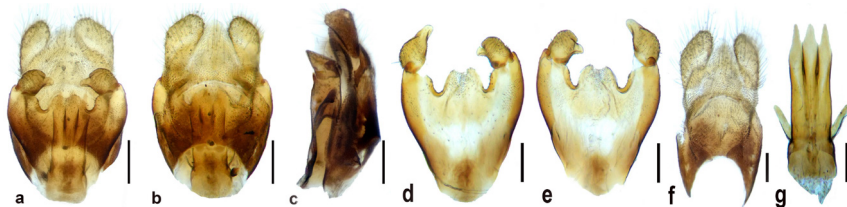


Figure 5. *Odontomyia solennis* Walker. Male genitalia: a) ventral habitus; b) dorsal habitus; c) lateral habitus; d) synsternum, dorsal habitus; e) synsternum, ventral habitus; f) epandrium, dorsal view; g) phallic complex.

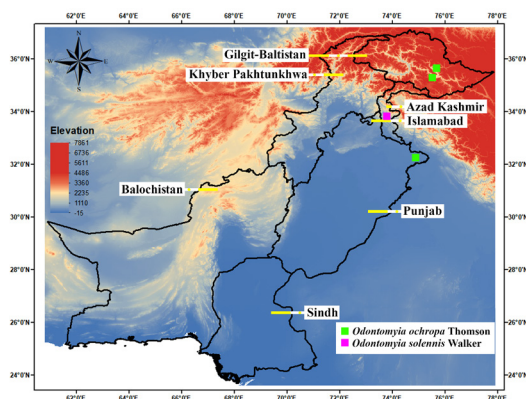


Figure 6. Distribution map of *Odontomyia* species in Pakistan.

DISCUSSION

The taxonomic history of the Pakistani soldier flies dates back to 1920 when Brunetti described *Oxycera albomicans* Brunetti, 1920 and *Stratiomyia fulvescens* Brunetti, 1920 from Abbottabad and Peshawar Districts of the Khyber Pakhtunkhwa province, respectively, in the present territory of Pakistan. Thereafter, in the world catalog of the Stratiomyidae, Woodley (2001) provided the distribution of seven species in Pakistan: *Adoxomyia heminopa* (Wiedemann, 1819), *Oxycera albomicans* Brunetti, 1920, *Ptecticus melanurus* (Walker, 1848), *Sargus flaviventris* Wiedemann, 1824, *Sargus gemmifer* Walker, 1849, *Sargus mactans* Walker, 1859, and *Stratiomyia fulvescens* Brunetti, 1920. The soldier fly of Pakistan has received less attention, with only a few papers have been published in recent years. Recently, Hassan et al (2017) and Hassan et al (2019) added five new additions to the soldier fly fauna of Pakistan: *Odontomyia ochropa* Thomson, 1869, *Oplodontha minuta* (Fabricius, 1794), *Oplodontha rubrithorax* (Macquart, 1838), *Ptecticus kerteszi* De Meijere, 1924, and *Ptecticus vulpianus* (Enderlein, 1914). At present, the stratiomyid fauna of Pakistan has not yet been thoroughly studied, as many areas are still unexplored and need comprehensive investigations in the future studies. This study is one in a series on the taxonomic studies on the stratiomyid fauna of Pakistan aiming to present a review on the genus *Odontomyia* with a new record from Pakistan.

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REFERENCES

- Brunetti, E. (1920). *The fauna of British India, including Ceylon and Burma. Diptera Brachycera. Vol. I.* Taylor & Francis, London, ix + 401 pp. <https://doi.org/10.5962/bhl.title.8962>
- Brunetti, E. (1923). Second revision of the Oriental Stratiomyidae. *Records of the Indian Museum*, 25, 45-180. <https://doi.org/10.26515/rzsi/v25/i1/1923/162683>
- Coquillett, D.W. (1910). The type-species of the North American genera of Diptera. *Proceedings of the United States National Museum*, 37(1719), 499-647.
- Hassan, M.A., Bodlah, I., Iqbal, Z., & Jabeen, R. (2017). New record of subfamily Stratiomyinae (Diptera: Stratiomyidae) from Pakistan. *Journal of Threaten Taxa*, 9(10), 10831-10834. <https://doi.org/10.11609/jott.3562.9.10.10831-10834>
- Hassan, M.A., Bodlah, I., Malik, M.F., & Gull-E-Fareen, A. (2019). New records of genus *Ptecticus* Loew, 1855 (Diptera: Stratiomyidae) from Pakistan. *The Journal of Animal and Plant Sciences*, 29(1), 358-362.
- Hauser, M., Woodley, N.E., & Fachin, D.A. (2017). Stratiomyidae (soldier flies). In: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.). *Manual of Afrotropical Diptera. Vol. 2. Nematocerous Diptera and lower Brachycera. Suricata 5*. Pretoria, South African National Biodiversity Institute. p. 919-979.
- Hauser, M., Woodley, N.E., & Fachin, D.A. (2022). Diptera: Stratiomyidae, Soldier flies. In: Goodman S. M. (ed.) *The New Natural History of Madagascar*: 1114-1120. Princeton University Press, United States.
- International Commission on Zoological Nomenclature. (1957). Opinion 442. Validation under the Plenary Powers of the generic name *Stratiomys* Geoffroy, 1762 (Class Insecta, Order Diptera). *Opinions and Declarations Rendered by the International Commission on Zoological Nomenclature*, 15, 121e162.
- Linnaeus, C. (1758). *Systema naturæ per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Tomus I. Editio decima, reformata. Laurentii Salvii, Holmiæ [=Stockholm]. [4], 1-823, [1].
- Majumder, S.C. & Parui, P. (2001). Diptera (Insecta) from Sundarban, West Bengal. *Records of the Zoological Survey of India*, 99(1-4), 171-199. <https://doi.org/10.26515/rzsi/v99/i1-4/2001/159642>
- Meigen, J.W. (1800). *Nouvelle classification des mouches a deux ailes, (Diptera L.), d'après un plan tout nouveau*. Paris: Perronneau.
- Meigen, J.W. (1803). Versuch einer neuen Gattungs Eintheilung der europäischen zweiflügligen Insekten. *Magazin der Insektenkunde* 2: 259e281.
- Nerudová-Horsáková, J., Kovac, D., & Rozkošný, R. (2007). Identity, larva and distribution of the Oriental soldier fly, *Odontomyia ochropa* (Diptera: Stratiomyidae). *European Journal of Entomology*, 104, 111-118. <https://doi.org/10.14411/eje.2007.017>
- Roy, S., Chakraborty, S.K., Parui, P., & Mitra, B. (2018). Taxonomy of Soldier Flies (Diptera: Stratiomyidae) of Sunderban Biosphere Reserve, India. In *Proceedings of the Zoological Society*, 71, 121-126.
- Rozkošný, R. & Kovac, D. (1994). A new species of *Odontomyia* Meigen (Insecta: Diptera: Stratiomyidae) from Sabah, Borneo. *The Raffles Bulletin of Zoology*, 42, 859-867.
- Rozkošný, R. & Woodley, N.E. (2010). A new genus and three new species of Oriental Oxycerini (Diptera: Stratiomyidae: Stratiomyinae) with notes on new generic synonyms in two other Stratiomyinae genera. *Insect Systematics & Evolution*, 41, 27-294.
- Wang, W.C., Perng, J.J., & Ueng, Y.T. (2007). A new species of *Odontomyia* Meigen (Diptera: Stratiomyidae) from Taiwan. *Aquatic Insects*, 29(4), 247-253.

- Westwood, J.O. (1840). Synopsis of the genera of British insects. In: *An introduction to the modern classification of insects; founded on the natural habits and corresponding organisation of the different families*, vol. II. London: Longman: Orme, Brown, Green, & Longmans.
- Woodley, N.E. (2001). A world catalog of the Stratiomyidae (Insecta: Diptera). *Myia*, 11, 1-475.
- Woodley, N.E. (2011). A World Catalogue of the Stratiomyidae (Insecta: Diptera): A Supplement with Revisionary Notes and Erata. *Myia*, 12, 485-521.
- Yang D. 1995. The Chinese *Odontomyia* (Diptera: Stratiomyidae). *Entomotaxonomia* 17: 58-72.
- Yang, D., Zhang, T.T., & Li, Z. (2014). *Stratiomyoidea of China*. China Agricultural University Press, Beijing, 870pp.
- Yang, Z.H. & Yang, M.F. (2021). One new species of soldier fly (Diptera: Stratiomyidae) from Guizhou, China. *Entomotaxonomia*, 43(1), 27-31. <https://doi.org/10.11680/entomotax.2021008>