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Discovery of the genera *Bolothrips* Priesner, 1926 and *Cephalothrips* Uzel, 1895 (Thysanoptera: Phlaeothripidae) from the Oriental region

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ABSTRACT. The thrips fauna of Jammu and Kashmir is known for 21 species of suborder Terebrantia, while there are no known species of suborder Tubulifera till now. Two Phaleothripid genera, *Bolothrips* Priesner of the subfamily Idolothripinae and *Cephalothrips* Uzel of the subfamily Phaleothripinae are reported for the first time from India as well as for the Oriental region. These include *Bolothrips dentipes* (Reuter) and *Cephalothrips monilicornis* Uzel, and were collected in the year 1984 from Jammu and Kashmir (J&K) on grasses. Detailed diagnostic notes, material examined, distribution, and illustrations for these new records are also provided. Furthermore, the thrips fauna of Jammu and Kashmir has not been thoroughly studied, necessitating additional surveys to identify thrips species in this unexplored region.

Key words: Idolothripinae, new record, Oriental, Phlaeothripinae, Thrips

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INTRODUCTION

The suborder Tubulifera of the order Thysanoptera comprises a single family Phlaeothripidae with approximately 3550 species in 460 genera (ThripsWiki, 2023) and is further classified into two subfamilies: Idolothripinae (744 species in 82 genera) and the Phlaeothripinae (3067 species in 387 genera) (ThripsWiki, 2023). Most of the members of the family Phlaeothripidae are mycophagous and a few are spore feeders (Mound & Palmer, 1983). The members of subfamily Idolothripinae can be distinguished from those of Phlaeothripinae by the width of the maxillary stylets (broad in Idolothripinae, narrow in Phaleothripinae); length of S2 setae on abdominal tergite IX of males in comparison to S1 setae (S2 setae as long as S1 in Idolothripinae; S2 shorter than S1 in Phaleothripinae); maxillary guides and pore areas in males (absent in Idolothripinae; present in Phaleothripinae) (Mound

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& Palmer, 1983). The Indian Thysanopteran fauna is represented by 739 species in 259 genera, of which, suborder Tubulifera encompasses 430 species under 143 genera (Tyagi & Kumar, 2016). The genus *Bolothrips* was originally described by Priesner in 1926 with the type species *Phloeothrips bicolor*. The genus *Bolothrips* Priesner is represented by 17 species and reported from Africa, the Atlantic Islands, China, the USA and a few European countries. The genus *Cephalothrips* was originally described by Uzel in 1895 with the type species *Phloeothrips monilicornis*. The genus *Cephalothrips* Uzel contains eight species and is reported from Europe, Morocco, Kyrgyzstan, China, South Africa, Cuba, California, and Qatar. More recently, Alavi and Minaei (2021) described two new species, *C. bicolor* and *C. corona* from Iran and provided remarkable notes on doubtful species along with the keys to species of the genus *Cephalothrips* from Iran.

The objective of this study is to report two genera of suborder Tubulifera, *Cephalothrips* Uzel 1895 with species *C. monilicornis* Uzel 1895 of the subfamily Phlaeothripinae and *Bolothrips* Priesner, 1926 with species *B. denticeps* (Reuter, 1880) of the subfamily Idolothripinae for the first time from India. The diagnostic characters of the genera and species along with the material studied and the distribution are also given.

MATERIAL AND METHODS

Specimens of these two species, *Bolothrips dentipes* (Reuter) and *Cephalothrips monilicornis* Uzel were collected on grasses by the beating method from Jammu & Kashmir by M.A. Lone and preserved in 70% ethanol. He sent these specimens for identification to Dr. J.S. Bhatti. The same specimens were recently, donated to the National Zoological Collections (NZC), Zoological Survey of India, Kolkata, by Dr. J.S. Bhatti. The specimens were mounted onto the glass slides using the natural Canada balsam for morphological identification. The identity of specimens was determined using the reliable identification keys (Mound, 1974a, 1974b; Mound & Palmer, 1983; Dang et al., 2014; Minaei & Mound, 2014; Mirab-Balou & Zaidi, 2014; Alavi & Minaei, 2021; Degabriele et al., 2023). The photography was carried out with the help of a LEICA® stereo microscope (LEICA DM-1000) and LEICA software application suite (LAS EZ). The identified slides were registered with a unique registration number. All the registered slides were deposited in the National Zoological Collections of the Zoological Survey of India, Kolkata.

RESULTS

Taxonomic hierarchy

Class Insecta Linnaeus, 1758

Order Thysanoptera Haliday, 1836

Suborder Tubulifera Haliday, 1836

Family Phlaeothripidae Uzel, 1895

Subfamily Idolothripinae Bagnall, 1908

Genus *Bolothrips* Priesner, 1926

Diagnosis. Head longer than broad, projected in front of eyes with well-developed postocular setae; compound eyes elongated ventrally; antennae 8-segmented, segment III with 1 or 2 sense cones, segment IV with 2 or 3 sense cones; pronotum with major setae blunt or pointed at apex; notopleural sutures complete; prosternal basantra present; mesopresternum boat-shaped; metathoracic sternopleural sutures absent; wings (if present) with duplicated cilia; pelta triangular, broad or rounded; tergites II–VII with a single pair of wing retaining setae, absent in apterous form; tergite X without prominent setae; anal setae as long as tube; female without tarsal tooth and male with strongly developed fore tarsal tooth.

Bolothrips denticeps (Reuter, 1880) (Figs 1–9)

Diagnosis: Both sexes apterous. Body brown including leg except yellow fore tibiae, basal and apical part of mid and hind tibiae and all tarsi; antennae brown, segment III yellow with brown shade apically.

Figures 1–9. *Bolothrips denticeps* (Reuter, 1880). **1.** Female; **2.** Male; **3.** Head and pronotum, female; **4.** Antenna, female; **5.** Meso- and metanotum, female; **6.** Abdominal tergites IX–X, female; **7.** Fore tarsal tooth, male; **8.** Pelta, female; **9.** Abdominal tergite II, female.

Head longer than broad with constriction at base, projected in front of the eyes; postocular setae pointed apically; antennal segment III with 2 and IV with 3 sense cones; segment VIII constricted basally. Maxillary stylets wide apart and retracting upto the postocular setae. Pronotum with 4 pairs of well-developed setae and pointed apically, anteromarginal setae smaller than others; prosternal basantra present; mesopresternum boat-shaped; metanotum with weak reticulations. Pelta triangular broad and rounded. Abdominal tergites II–VII without wing retaining setae; IX with S1 setae pointed at apex, more than half the length of tube. Male tergite IX with S1 and S2 setae almost sub-equal in length; sternite VIII without pore areas.

Material examined. India, Jammu and Kashmir, Srinagar, Dachigam National Park, (34°08'13"N 75°02'11"E), 1♀, 1♂, on dry grass, 09.iv.1984, leg. M.A. Lone (Registration No: 23178/H17 and 23179/H17).

Distribution. India **(New record)**, widespread across Europe south of Finland and Norway, also North America.

Subfamily Phlaeothripinae Uzel, 1895

Genus *Cephalothrips* Uzel, 1895

Diagnosis. Both sexes macropterous, micropterous or apterous. Head longer than broad; compound eyes elongated ventrally; macropterous form with ocelli; mouth cone rounded; maxillary stylets retracted far into the head; antennae 8-segmented, segment VII and VIII with pedicels broad, segment III with one sense cone and IV with 2 sense cones. Pronotal surface without median longitudinal thickening; major setae well-developed; prosternal basantra absent, ferna small, trapezoidal in shape. Wings parallel-sided, sparingly fringed and not much enlarged basally. Fore tarsus with sharp teeth in both sexes. Pelta D-shaped. Tergites without wing-retaining setae. Tube short, about 2/3 of the head; anal setae shorter than the tube.

Cephalothrips monilicornis Uzel, 1895 (Figs 10–17)

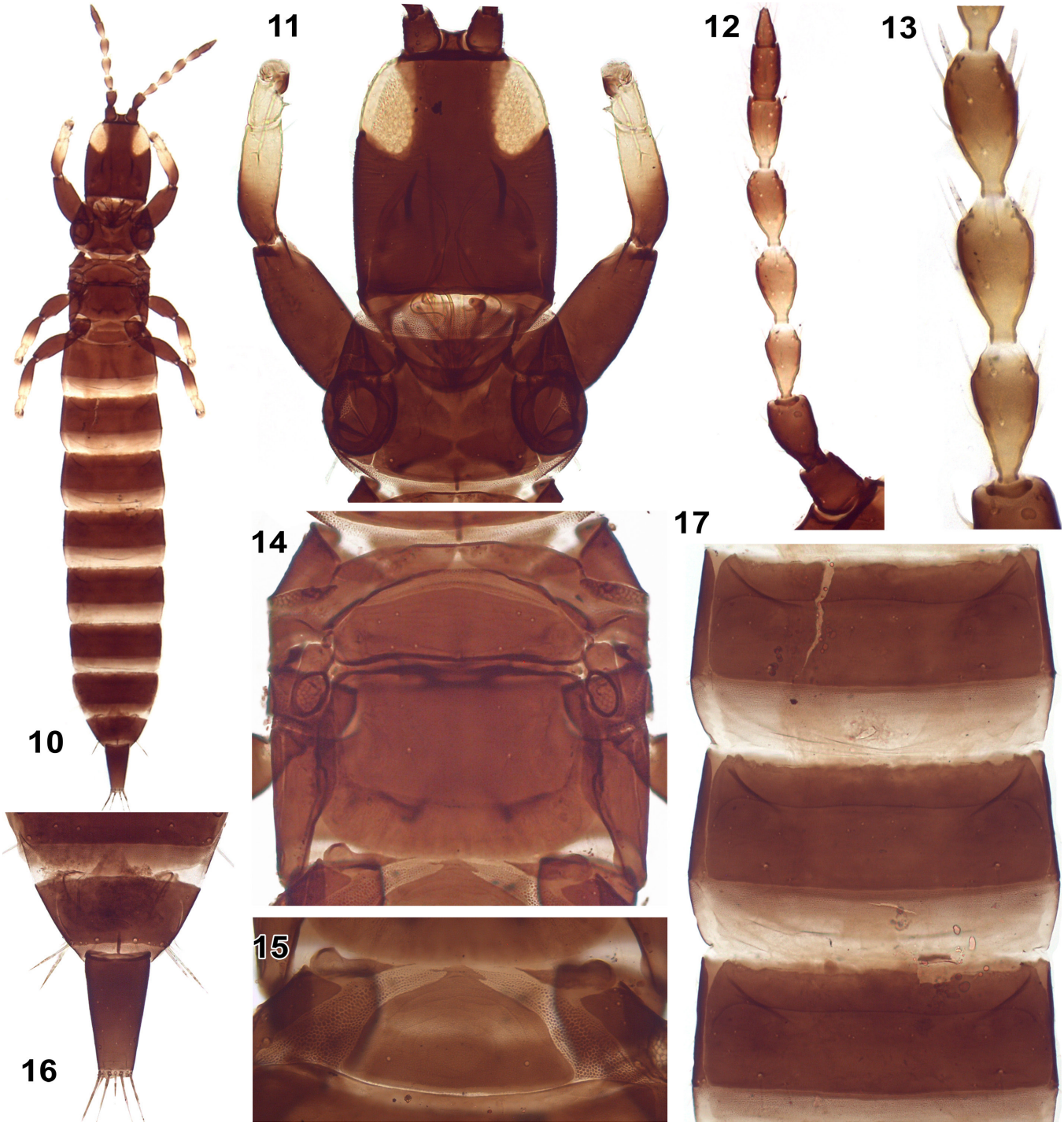
Diagnosis. Female apterous. Body brown including legs; tarsi and apical area of tibiae pale yellow. Antennae dark brown; III–VI pale brown, IV-VI yellow in basal half. Head longer than broad; mouth cone short and rounded; postocular setae small with blunt apex. Antennae 8-segmented, segment III with one and IV with two sense cones. Pronotum with epimeral setae expanded apically, posteroangular setae blunt apically; Fore tarsus with a small tooth. Pelta D-shaped, campaniform sensillia present. Tergites without wing-retaining setae, tergite IX with S1 and S2 setae weakly expanded apically; anal setae shorter than the length of tube.

Material examined. India, Jammu and Kashmir, Srinagar, Shankaracharya (34°04'41"N 74°50'38"E), 2♀♀, on grass, 23.v.1984, leg. M.A. Lone (Registration No: 23177/H17 and 23176/H17).

Distribution. India (**New record**), widespread across Europe from Siberia south to Iran and Qatar, also China and North America.

DISCUSSION

The Holarctic and Ethiopian genus *Bolothrips* with 17 species that are mainly associated with grass tussocks belongs to the subfamily Idolothripinae. This genus is a member of the Subtribe Compsothripina, whereas the genera *Gastrothrips* and *Nesothrips* in which species sometimes share the same habitat are members of the subtribes Gastrothripina and Diceratothripina (Mound & Palmer, 1983). Another Holarctic genus, *Cephalothrips,* although weakly defined belongs to the subfamily Phaleothripinae. These three groups are recognized in this subfamily based on their feeding behaviour and structural characteristics (Mound & Marullo, 1996). The members of the *Haplothrips*-lineage are associated with flowers; the *Liothrips*-lineage with leaves; and the *Phlaeothrips*-lineage with dead branches, leaf litter and fungus (Mound & Marullo, 1996; Minaei & Mound, 2008, Dang et al., 2014). However, the relationships of some genera remain doubtful, including *Cephalothrips*, whose position is unclear.



Figures 10–17. *Cephalothrips monilicornis* Uzel, 1895, female. **10.** Body; **11.** Head and pronotum; **13.** Antennal segment III–V; **14.** Meso- and metanotum; **15.** Pelta; **16.** Abdominal tergites IX–X; **17.** Abdominal tergites IV–VI.

Minaei and Mound (2014) and Hakimara et al. (2019) suggested that it should be considered in the *Liothrips*-lineage due to some structural similarities. The members of this genus may be a connecting link between the *Phlaeothrips* and *Liothrips* lineages, as they have one sense cone on antennal segment I, prosternal basantra absent, and fore wing parallel-sided (similar to *Liothrips* lineage), but in contrast, the forewing with duplicated cilia, and associated with dead branches, leaf litter and fungus (similar to *Phlaeothrips*). Some *Cephalothrips* species are associated with dead tissues but others are with the leaves of live plants; however, *C. monilicornis* is associated with grasses (Mound et al., 2019). Species of the

genus *Cephalothrips* can be distinguished from others by their elongated head with rather straight cheeks, ventrally prolonged eyes and one and two sense cones of antennal segments III and IV, respectively. However, the position in *Cephalothrips* is doubtful in a few species (*C. fuscus, C. hesperus*, *C. brachychaitus* and *C. merrilli*) (Alavi & Minaei, 2021).

Two phlaeothripid species, *Bolothrips dentipes* (Reuter) and *Cephalothrips monilicornis* Uzel, are new to the Indian as well as the Oriental region. The occurrence of these species, whether native or alien, needs to be investigated. The thrips fauna of Jammu & Kashmir is unexplored and known by 21 terebrantian (Tyagi & Kumar, 2016), while Akhtar & Azim (2013) reported 18 terebrantian and two tubuliferan from this region. Recently, Pal et al. (2023) added eight terebrantian species from this region. Furthermore, to explore the thrips fauna diversity of this area, more extensive surveys are required to identify additional species.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: S. Pal: photography and writing; A. Ghosh: photo editing in Adobe Photoshop, writing, V. Kumar: Writing, and reviewing; K. Tyagi: Identification, writing and reviewing. All authors approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the National Zoological Collections of the Zoological Survey of India, Kolkata 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.

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کشف جنس‌های *Bolothrips* Priesner, 1926 و *Cephalothrips* Uzel, 1895 (Thysanoptera: Phlaeothripidae) در منطقه اورینتال

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چکیده: در فهرست تریپس‌های جامو و کشمیر، تعداد ۲۱ گونه از زیررده Terebrantia مشخص شده است، در حالی که تاکنون هیچ گونه‌ای از زیررده Tubulifera از این منطقه گزارش نشده است. دو جنس متعلق به خانوادهٔ Phaleothripidae، به نام‌های *Bolothrips* Priesner (زیرخانوادهٔ Idolothripinae) و *Cephalothrips* Uzel (زیرخانواده Phaleothripinae) برای اولین بار از هند و منطقه شرق آسیا (خاورزمین) گزارش شدند. یافته‌های جدید شامل دو گونه به نام *Bolothrips dentipes* (Reuter) و *Cephalothrips monilicornis* Uzel هستند که نمونه‌های آنها در سال ۱۹۸۴ از روی گیاهان علفی در جامو و کشمیر جمع‌آوری شده بودند. خصوصیات افتراقی تشخیصی دقیق، فهرست نمونه‌های مورد بررسی، پراکنش و تصاویر هر یک از گونه‌های به تازگی گزارش شده، ارایه گردید. فون تریپس‌های جامو و کشمیر به طور کامل مطالعه نشده و بایستی بررسی‌های بیشتر برای شناسایی گونه‌های تریپس در این منطقه ناشناخته انجام شود.

واژگان کلیدی: Idolothripinae، گزارش جدید، خاورزمین، Phlaeothripinae، تریپس