The Journal of Basic and Applied Zoology

RESEARCH

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Three genera and species of Tephritidae (Insecta: Diptera) newly recorded from the Arabian Peninsula

Magdi S. El-Hawagry[1*], Mahmoud S. Abdel-Dayem[2] and Hathal M. Al Dhafer[3]

Abstract

Background Previous studies have documented 64 confirmed tephritid fruit fly species in 38 genera in Saudi Arabia. The majority of these species and genera exhibit a primarily Afrotropical distribution, though some species are also found in the Palaearctic and Oriental Regions.

Results This study reports the first occurrence of three tephritid genera, *Perilampsis*, *Pliomelaena*, and *Coelotrypes*, in Saudi Arabia, marking their first documented presence in the Arabian Peninsula and the broader Middle East, thereby providing significant contributions to the understanding of the biodiversity of the region. These genera belong to the subfamilies Dacinae, Tephritinae, and Trypetinae, respectively. The study documents the first occurrence of the genus *Perilampsis*, specifically *Pe. pulchella* (Austen), and the species *Pliomelaena brevifrons* (Bezzi) and *Coelotrypes pulchellus* (Bezzi) outside their known range, which was previously thought to be restricted to Sub-Saharan Africa, significantly expanding their known geographical distribution. Unlike many tephritids, these species aren't considered agricultural pests; instead, they seem to have some beneficial aspects, associated with plants in the families Loranthaceae, Acanthaceae, and Convolvulaceae, which include parasitic and epiphytic plant species. The study provides detailed diagnoses, synonymies, type localities, global and regional distribution data, collection details, high-resolution color photographs, and distribution maps for these newly recorded genera and species.

Conclusions This study broadens the documented tephritid fruit fly fauna in Saudi Arabia by adding the genera *Perilampsis*, *Pliomelaena*, and *Coelotrypes*, with the Afrotropical species *Pe. pulchella* (Austen), *Pl. brevifrons* (Bezzi), and *C. pulchellus* (Bezzi), increasing the total number to 41 genera and 67 confirmed species. These findings reinforce the perspective that the southwestern Arabian Peninsula, including Saudi Arabia's provinces of Al-Baha, Asir, Jazan, and Najran south of the Tropic of Cancer, aligns with the Afrotropical biogeographical region.

Keywords New records, Saudi Arabia, Afrotropical region, Fruit flies, Distribution, Diagnoses

*Correspondence:
Magdi S. El-Hawagry
elhawagry@cu.edu.eg
[1]Department of Entomology, Faculty of Science, Cairo University, Giza, Egypt
[2]College of Food and Agricultural Sciences, King Saud University, Riyadh, Saudi Arabia
[3]Chair of Date Palm Research, Department of Plant Protection, College of Food and Agricultural Sciences, King Saud University, Riyadh 11451, Saudi Arabia

Background

Tephritidae is one of the largest families in the order Diptera. It is included in the superfamily Tephritoidea, comprising about 5,000 described extant species worldwide (Pape et al., 2011). A total of 64 confirmed species in 38 genera has been documented in Saudi Arabia, in addition to some uncertain species that could not be definitively identified (Merz & Dawah, 2005; Dawah & Abdullah, 2019). Most of these species and genera are predominantly of Afrotropical distribution, with some species also occurring in the Palaearctic and Oriental Regions.

The family Tephritidae is classified into six subfamilies: Blepharoneurinae, Dacinae, Phytalmiinae, Tachiniscinae, Tephritinae and Trypetinae; all of which occur in the Afrotropical Region (Korneyev, 1999). Within this region, the subfamily Dacinae comprises three tribes and 15 valid genera, the subfamily Tephritinae comprises twelve tribes and 114 valid genera, and the subfamily Trypetinae comprises six tribes and 25 valid genera (Hancock et al., 2021).

Contrary to common belief, not all tephritids are destructive agricultural pests. Some species are parasitic on Lepidoptera, others are saprophagous, and certain species have been intentionally introduced in various countries as biocontrol agents to manage invasive weeds and harmful plants. Additionally, some tephritids appear to play a role in pollination (Hancock et al., 2021). On the other hand, several species, particularly in the genera *Dacus*, *Bactrocera* and *Ceratitis* constitute enormous threats to fruit and vegetable production throughout the world, infesting a wide range of fruits and fleshy vegetables throughout tropical and sub-tropical areas, resulting in direct damage and substantial both quantitative and qualitative yield losses (Vargas et al., 2008, 2015; Chiluwal et al., 2022). In Saudi Arabia, approximately 10 of all recorded fruit fly species are regarded as destructive pests (Merz & Dawah, 2005).

In the present study, three different genera, *Perilampsis*, *Pliomelaena*, and *Coelotrypes*, representing the subfamilies Dacinae, Tephritinae, and Trypetinae, respectively, are reported for the first time from Saudi Arabia. These records represent significant faunistic discoveries, constituting the first documented occurrences of these genera in the Arabian Peninsula and the Middle East, thereby contributing novel insights to the regional biodiversity.

The study documents the first occurrence of the genus *Perilampsis*, specifically *Pe. pulchella* (Austen), the species *Pliomelaena brevifrons* (Bezzi), and *Coelotrypes pulchellus* (Bezzi) outside Africa.

Methods

Samples in the present study were collected either through aerial sweeping nets (SW) or incidentally via pheromone traps (PH) originally intended for other well-known fruit fly species. Collection details outlined in the "Material Examined" section for each species. Collections were carried out by the research team of the King Saud University Museum of Arthropods, Riyadh, Saudi Arabia (KSMA) as part of a comprehensive research project to survey the entire fruit fly fauna in Saudi Arabia. The specimens were pinned and preserved at the same museum.

Identifications were performed by the first author, relying on keys and diagnoses from De Meyer (2009) for *Perilampsis pulchella*, Bezzi (1924a) for *Pliomelaena brevifrons*, and Hancock (1986) for *Coelotrypes pulchellus*, supplemented by original descriptions.

Data for species distribud from the Global Biodiversity Information Facility (GBIF, 2025) and occurrence data from the prestion maps were compiled from cited literature listed after each species' distribution section, supplemented by data retrieveent study.

Terminology used in diagnoses follows Cumming and Wood (2017).

In this study, we adopt the regional boundaries delineated by Kirk-Spriggs and Sinclair (2017) for the Afrotropical Region, and applied the broader definition of the region proposed by El-Hawagry et al. (2020) and Roberts and El-Hawagry (2024). This broader delineation extends the northern boundary to the Tropic of Cancer, encompassing much of the Arabian Peninsula, including the southwestern provinces of Saudi Arabia, specifically Asir and Jazan, where the taxa under investigation were recorded.

We provide detailed diagnoses for the newly recorded genera and species, accompanied by information on synonyms, type localities, global and regional distributions, and collection details. Additionally, high-resolution color photographs of the recorded species are included to facilitate identification and documentation.

Photographic documentation was conducted using a Leica MZ 125 stereo microscope (Leica Microsystems Ltd, St. Gallen, Switzerland) equipped with a Q-imaging Micro Publisher 5.0 RTV digital camera (Zerene Systems LLC, Richland, WA, USA) at the Plant Protection Department, College of Food and Agriculture Sciences, King Saud University. Image auto-montage was performed using Zerene Stacker version 1.04 (Innovative Solutions, Bucharest, Romania) to ensure clarity and precision in the visual representation of morphological characters.

Results

Family **Tephritidae**.

Subfamily **Dacinae**.

Tribe **Ceratitidini**.

Genus ***Perilampsis***.

Perilampsis Bezzi, 1920: 233. Type species: *Carpophthoromyia pulchella* Austen, 1910.

Diagnosis

Flies of the genus *Perilampsis* can be distinguished by the following characters: arista often with long pubescence; with broad, diagonal, oblique, yellow or white band along the postpronotal lobe and anepisternum; scutum with dark brown to black ground color, usually marked with one or more transverse bands of silvery pubescence; scutellum flattened, usually entirely yellow or white, rarely black apically; the wing's brown to dark brown banding pattern consists of four distinct bands: anterior apical, posterior apical, discal, and subapical bands; in some species anterior half of wing completely brown.

Notes: This Afrotropical genus is reported in this study outside Africa for the first time, broadening its known range. +It was previously considered endemic to East, Southern, and West Africa, with 17 described species. Further research is needed to understand its biology and early life stages, which remain understudied (De Meyer, 2009; Hancock et al., 2021). Nonetheless, species within this genus are known to be associated with flowering plants in the family Loranthaceae, with *Pe. pulchella* specifically recorded on plant species of the genera *Agelanthus*, *Loranthus*, and *Phragmanthera*, which are distributed in Africa and the Arabian Peninsula (Copeland et al., 2009; De Meyer, 2009).

***Perilampsis pulchella* (Austen, 1910).**

Carpophthoromyia pulchella Austen, 1910: 72. Type locality: Uganda (Entebbe).

Distribution (Fig. 1): AF: Cameroon, D.R. Congo, Ethiopia, Ivory Coast, Kenya, Nigeria, Saudi Arabia [as "South-western part"] (first record), Tanzania, Uganda, Zimbabwe. [Sources: Norrbom et al. (1999), De Meyer (2009), GBIF (2025), and present study]

Material examined: 1 male, Asir, Belqarn, Sabt Al Alayah, Mashhoor Ahmed Alqarni F., 19.5537194"N 41.95177"E, Alt. 2028 m, 29.IV.2024, PH-BO, Olive, collected 29.IX.2024, Ali Fahad Alshahrani, leg., KSMA.

Note: This specimen was caught using a pheromone trap targeting *Bactrocera oleae* within an olive plantation.

Diagnosis

Male (Fig. 2): About 4.5 mm in length; antennae fulvous, with arista pubescent; frons with upper half orange-brown, lower half yellow-white; two frontal setae placed parallel to eye margin; face yellow-white, slightly brown in upper half near antennae; scutum shining dark brown to black in ground color, with two transverse bands of silvery pubescence, one anterior to the transverse suture, and a second one posterior to the transverse suture; scutellum entirely white; anatergite and katatergite white; legs white-yellow, with femora dark yellow to brown; wing with basal part dark brown, with subbasal irregular spots and streaks; wing bands brown to dark brown, well developed, with anterior apical band filling the entire cells r_1 and r_{2+3}, posterior apical band touching anterior apical band, subapical band separating from discal band, discal band extending to posterior wing margin and touching anterior apical band; abdomen dark brown, with 2nd and 4th tergites more orange anteriorly and grayish posteriorly forming two grayish transverse bands; 5th tergite with orange-brown line at middle.

Subfamily **Tephritinae**.

Tribe **Pliomelaenini**.

Genus ***Pliomelaena***.

Pliomelaena Bezzi, 1918a: 220. Type species: *Euaresta brevifrons* Bezzi, 1918b.

Diagnosis

Flies of the genus *Pliomelaena* can be distinguished by the following characters: setae on head and thorax pale, usually white-yellow with a faint brown tint; wing with dark brown pattern, with hyaline indentations and maculae or spots; r_1 with two hyaline indentations at the middle, forming a V-shaped pattern with a hyaline spot in cell r_{2+3}; cell r_{2+3} with another small hyaline spot at margin below apex of vein R_{2+3}; cell r_{4+5} with a hyaline spot at margin, which is larger than marginal r_{2+3} spots and not completely crossing cell r_{4+5}; cell m_1 with three hyaline indentations; scutum with tiny, brownish-white microtrichia; abdomen shiny black and/or yellowish-brown to reddish, without coarse pale microtrichia.

Notes: With only 10 described species, this small genus is likely more diverse, as several undescribed species have been found in the Afrotropical, Australasian, and Oriental regions. The larvae of these species develop within the flower heads of various genera of the flowering plant family Acanthaceae. However, other aspects of its biology and the characteristics of its immature stages remain unknown. (Hancock et al., 2021).

***Pliomelaena brevifrons* (Bezzi, 1918b).**

Euaresta brevifrons Bezzi, 1918b: 30. Type locality: South Africa (Natal: Durban, Umbilo).

Pliomelaena brevifrons var. *aspila* Bezzi, 1924a. Type locality: Malawi (Ruo).

Pliomelaena xyphosiina Bezzi, 1924a: 129. Type locality: Ethiopia (Harar: Dire-Daua).

Pliomelaena brevifrons var. *rufiventris* Bezzi, 1924b. Type locality: South Africa (Natal: Zululand, M'fongosi).

Pliomelaena brevifrons ssp. *perspicua* Munro, 1947. Type locality: Kenya (slopes of Mt. Kenya, Nanyuki).

Pliomelaena brevifrons ssp. *regressa* Munro, 1947. Type locality: Uganda (Ruwenzori Range, Namwamba Valley).

Distribution (Fig. 3): AF: Ethiopia, Kenya, Malawi, Saudi Arabia [as "South-western part"] (first record),

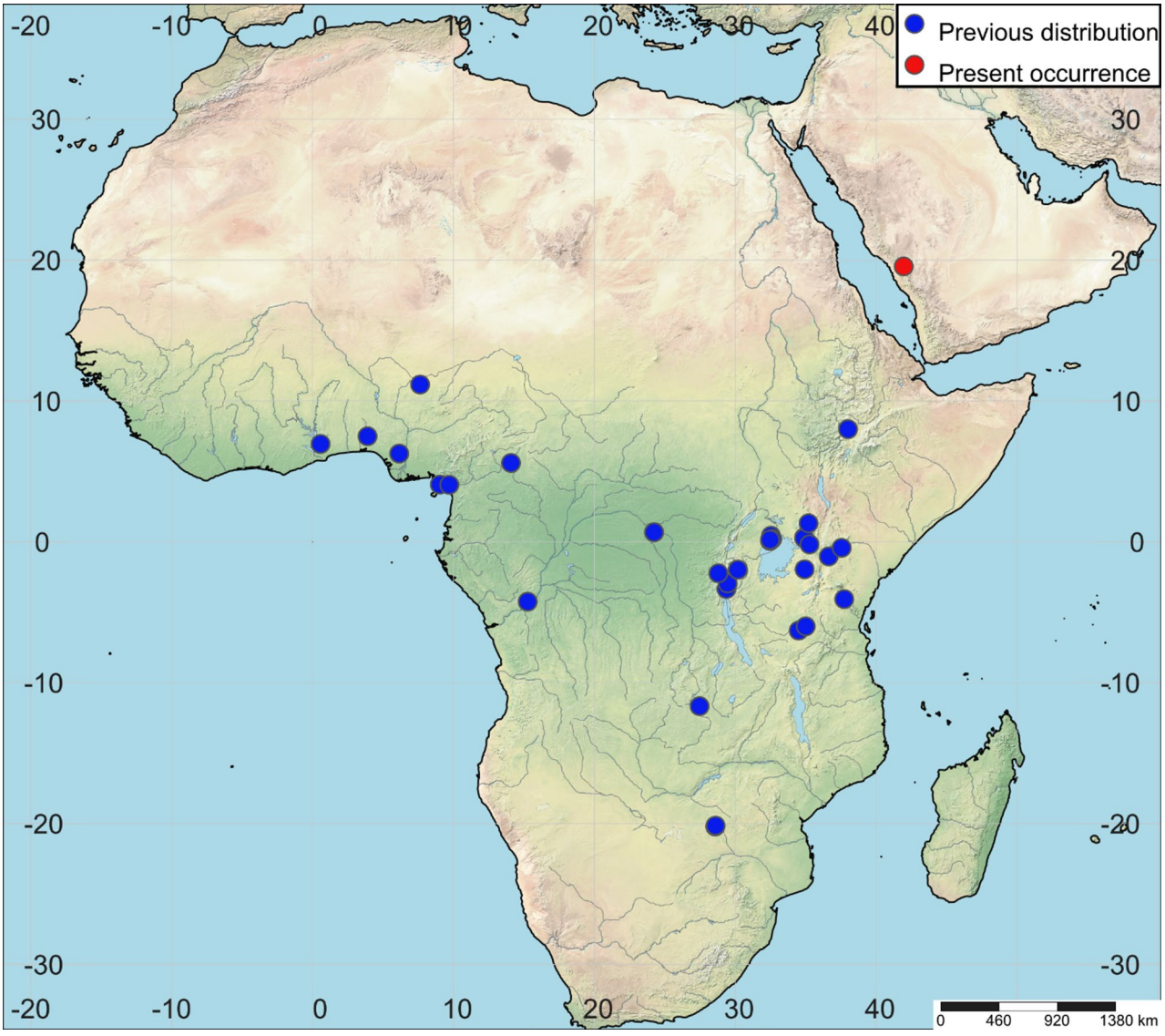

Fig. 1 Distribution map of *Perilampsis pulchella* (Austen)

South Africa, Tanzania, Uganda. [Sources: Norrbom et al. (1999), GBIF (2025), and present study]

Material examined: 1 male, KSA: Jazan, Al-A'aridah, Jabal Sala, Al-Arqah, Muthana Jaber Al-Wada'ani F., 17°02'14.7"N 43°08'32.5"E, Alt. 981 m, 7.I.2024, SW, Coffee, Soliman A, leg., KSMA.

Note: This specimen was collected by sweeping grasses within coffee plantations.

Diagnosis

This species exhibits slight individual variations, particularly in wing pattern and abdominal coloration, leading to the description of several varieties, subspecies, and synonyms. However, these varieties and subspecies are currently not recognized as taxonomically valid taxa and are instead considered synonymous with the original species *Pl. brevifrons* (Bezzi).

This species shares some similarities with *Pliomelaena zonogastra* (Bezzi, 1913) but is distinguishable by the following combination of characters (Fig. 4):

Male: About 4.2 mm in length; head brownish-yellow to brown; antennae brownish-yellow, with 1st flagellomeres more brownish; arista nearly bare; palpi and proboscis yellowish; setae white-yellowish to brownish; scutellum triangular, black, brownish-yellow at margins and apical tip, with tiny, brownish-white microtrichia on disc, with 4 long marginal setae inserted on black dots; halteres whitish; wing with vein R_{4+5} bare, or with only a few scattered setulae at base; cell r_1 with a hyaline spot apically, besides the two larger hyaline indentations medially; cell m_1 with three hyaline indentations, a

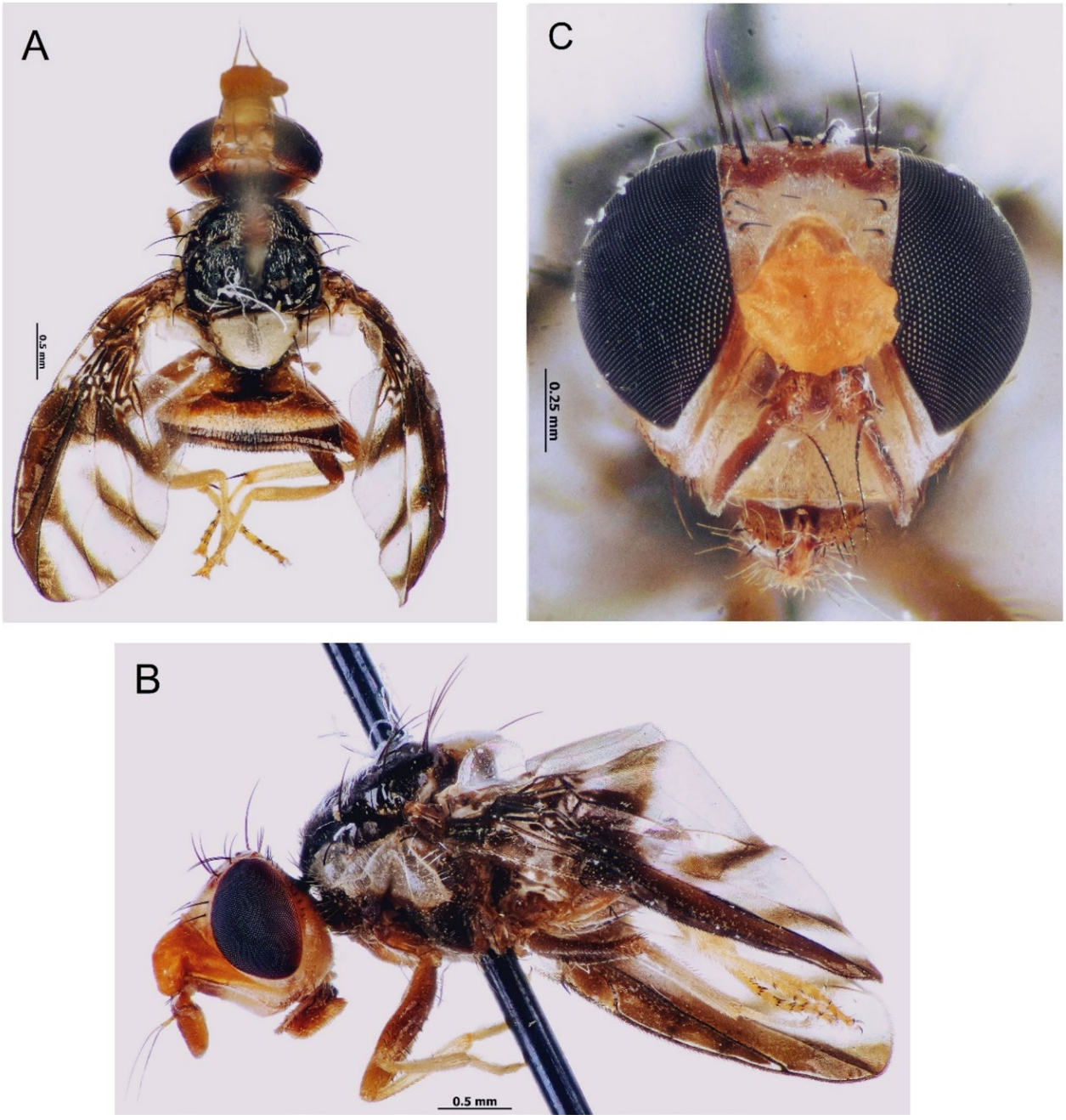

Fig. 2 *Perilampsis pulchella* (Austen): **A** habitus, dorsal view. **B** habitus, lateral view. **C** head, frontal view

small anterior roughly quadratic one, and two posterior indentations broader in height than the anterior one and mainly connecting at the upper end; cell *dm* with two hyaline spots, one at the apical quarter, and the other at the middle; cell m_4 and anal lobe with about 10 adjacent to sub-adjacent hyaline spots; abdomen shiny black, with yellowish-brown or reddish markings at lateral margins of tergites, especially on 2nd to 4th tergites.

Subfamily **Trypetinae**.

Tribe **Adramini**.

Genus ***Coelotrypes***.

Coelotrypes Bezzi, 1924b: 494. Type species: *Coelotrypes vittatus* Bezzi, 1923.

Diagnosis

Flies of the genus *Coelotrypes* can be distinguished by the following characters:

antennae longer than face, with arista short plumose; head with 2–3 pairs of frontal setae, with the uppermost one placed close to the orbital seta; scutum with

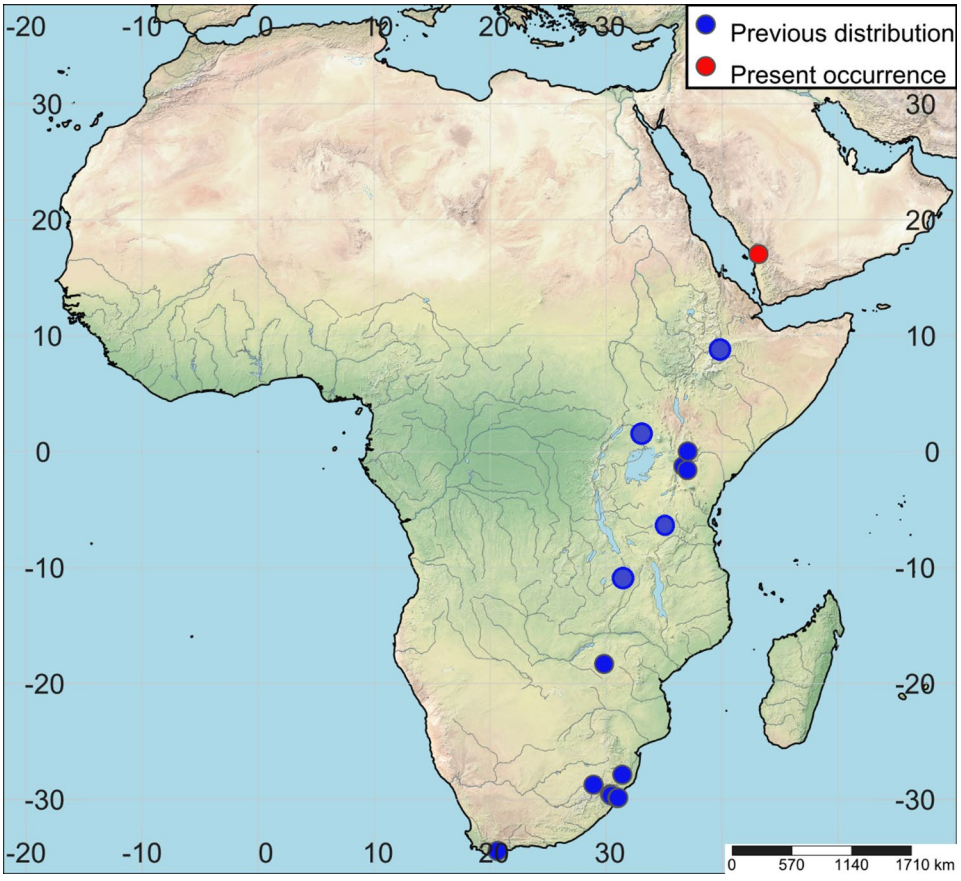

Fig. 3 Distribution map of *Pliomelaena brevifrons* (Bezzi)

dorsocentral setae present and presutural supra-alar setae absent; scutum and scutellum with a medial yellowish vitta; anatergite with long fine pale hairs; thorax with a distinct anepisternal seta and 2 pairs of marginal scutellar setae; mid tibia with a single black ventro-apical spur; hind femur with a row of dorsal setae; fore and mid femora not spined ventrally; vein M_4 bare.

Notes: This genus comprises 19 described species that are distributed across the Afrotropical, Oriental, and Australasian regions. Larvae develop in the flower buds of plants of the genus *Ipomoea* (Convolvulaceae). However, other aspects of its biology and the characteristics of its immature stages remain unknown (Hancock et al., 2021).

Coelotrypes pulchellus (Bezzi, 1920).

Rhacochlaena pulchella Bezzi, 1920: 239. Type locality: Ghana (Accra).

Rhacoclaena pulchella var. *deleta* Munro, 1933: 31. Type locality: South.

Africa (Transvaal: Rosslyn).

Distribution (Fig. 5): AF: Ethiopia to South Africa, Ghana, Rwanda, Saudi Arabia [as "South-western part"] (first record). [Sources: Norrbom et al. (1999), GBIF (2025), and present study]

Material examined: 1 female, Jazan, Ad-Da'eir, Jabal Atwan, Jabal Atwan 2 F., 17.33647"N 43.19328"E, Alt. 1426 m, 6.IX.2024, PH-CC, Coffee, Soliman A., Rasool, I., & Al Ansi, A., leg., KSMA.

Notes: This specimen was caught using a pheromone trap targeting *Ceratitis capitata* within coffee plantations.

Diagnosis

This species is identified as such according to its original description and the key of Hancock (1986); however, the specimen in the present study exhibits a slight difference, with the abdomen not completely black, but rather the basal three segments are predominantly dark reddish-brown.

Female (Fig. 6): About 5 mm in length; head reddish-brown in general color, with upper part and sides of frons, fronto-orbital plate and parafacials slightly darker; antennae reddish-brown, with 1st flagellomere slightly infuscated at dorsal surface and apically, with arista short pubescent; scutum black, with brownish-yellow or reddish-yellow median vitta, this vitta occupies majority of scutellum with middle and apical parts of scutellum slightly paler; pleura with whitish stripe along notopleural line, from postpronotal lobe to root of wing; halteres

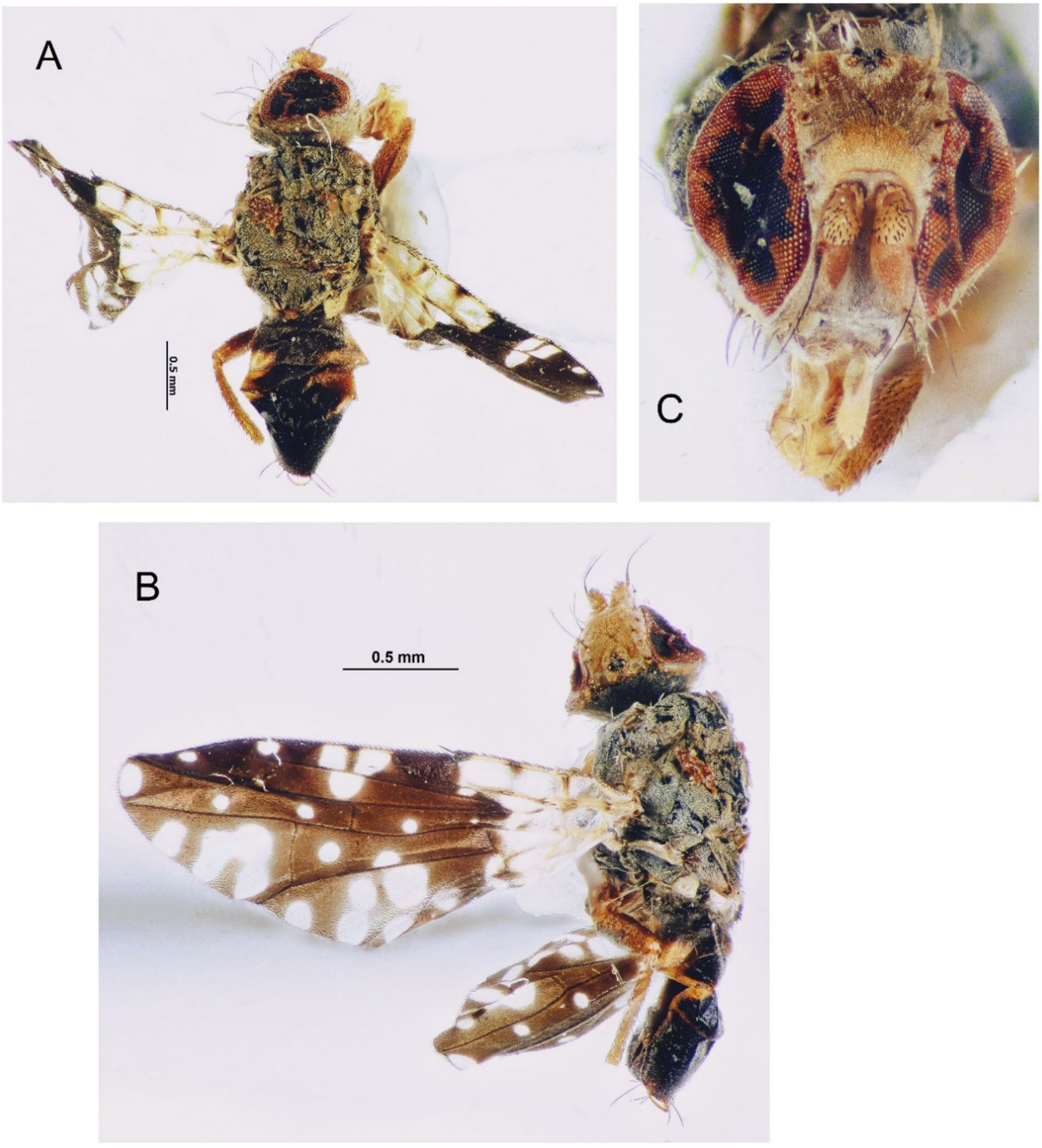

Fig. 4 *Pliomelaena brevifrons* (Bezzi): **A** habitus, dorsal view. **B** habitus, lateral view. **C** head, frontal view

whitish; wing with more or less distinct transverse bands: first band less developed and short, ending near the upper corner of cell *bm*, second band longer, reaching the middle of cell m_4, and third band narrower, ending at vein R_{4+5}; apical hyaline spot extends symmetrically above in cell r_{2+3} and below in cell m_1; the hyaline dot or spot at end of vein R_{2+3} small and faintly developed; legs entirely yellowish; ovipositor reddish-brown, with oviscape slightly longer than tergites IV to VI.

Discussion

In the context of global dipteran biodiversity, the family Tephritidae encompasses approximately 5,000 described extant species, exhibiting a significant presence across diverse biogeographical regions (Pape et al., 2011). The

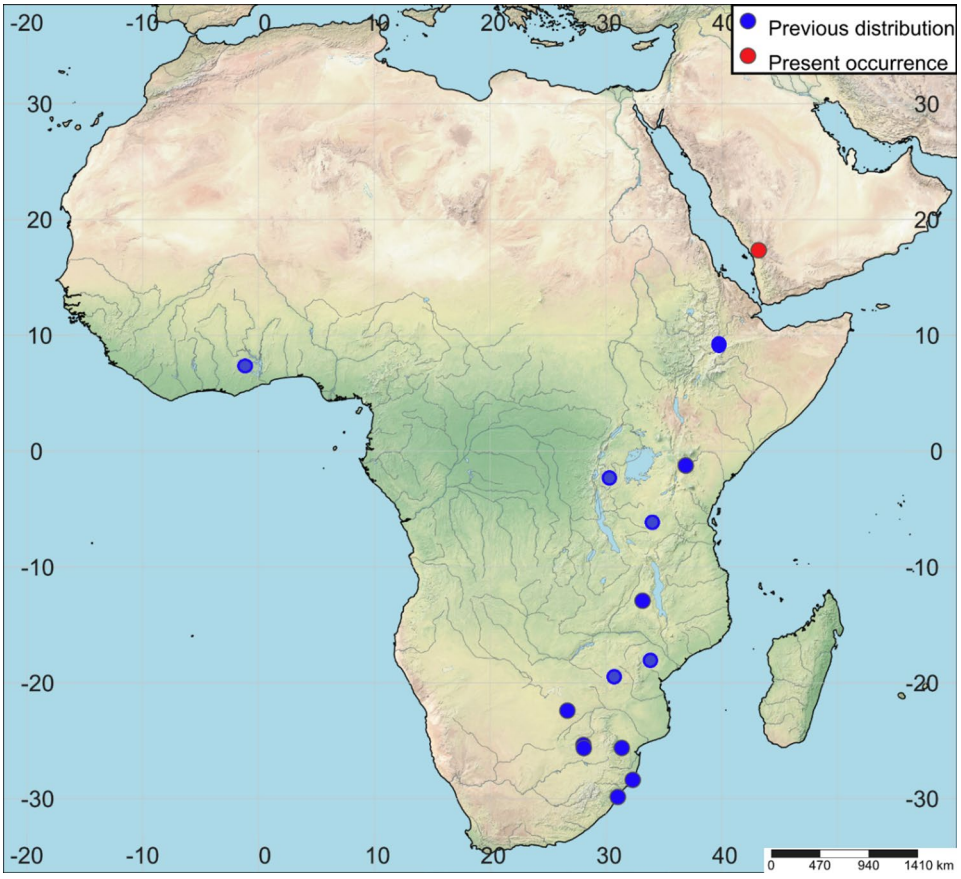

Fig. 5 Distribution map of *Coelotrypes pulchellus* (Bezzi)

greatest species diversity is observed in tropical areas, with a notable decline in temperate zones and a complete absence in the high Arctic and Antarctic (El-Hawagry, 2017). Notably, over 60% of Tephritids are distributed across the Old World, specifically within the Afrotropical, Palaearctic, and Oriental regions (Norrbom et al., 1999). This distribution underscores the family's ecological adaptability and highlights the need for further research into the evolutionary and environmental factors driving their global diversification patterns.

The present taxa are treated here only because they represent new records for Saudi Arabia's fauna. Notably, some of these taxa are also documented outside their known African range for the first time. These species were collected among other fruit fly species previously documented in Saudi Arabia, as listed in Merz and Dawah (2005) and Dawah and Abdullah (2019). Consequently, the findings presented here supplement and expand upon the species lists provided in these earlier studies, contributing to a more comprehensive understanding of the region's biodiversity. These findings confirm that Saudi Arabia has the second-largest fruit fly fauna in the Middle East, and questionably surpassing a major agricultural country like Egypt (65 species) (Merz & Dawah, 2005; El-Hawagry, 2017).

The current study reports the first documented occurrence of the genus *Perilampsis*, specifically *Pe. pulchella* (Austen), alongside two species, *Pliomelaena brevifrons* (Bezzi) and *Coelotrypes pulchellus* (Bezzi), beyond their previously recognized native range, which was considered confined to the Afrotropical Region in Sub-Saharan Africa. These findings contribute to the ongoing discourse on biogeographical boundaries between the Afrotropical and Palaearctic Regions, aligning with many researchers such as Sclater (1858), Wallace (1876), El-Hawagry et al. (2019), and El-Hawagry et al. (2022). These studies have consistently identified the south-western provinces of Saudi Arabia, including Al-Baha, Asir, Jazan, and Najran, south of the Tropic of Cancer, as part of the Afrotropical Region. This delineation is supported by the region's subtropical to tropical climate, characterized by spring and summer rainfall, and its xeromesic tropical flora of palaeotropical origin (Ghazanfar & Fisher, 1998; El-Hawagry et al., 2017). The presence of these species in this region underscores the influence of climatic and floristic factors on faunal distributions, suggesting potential

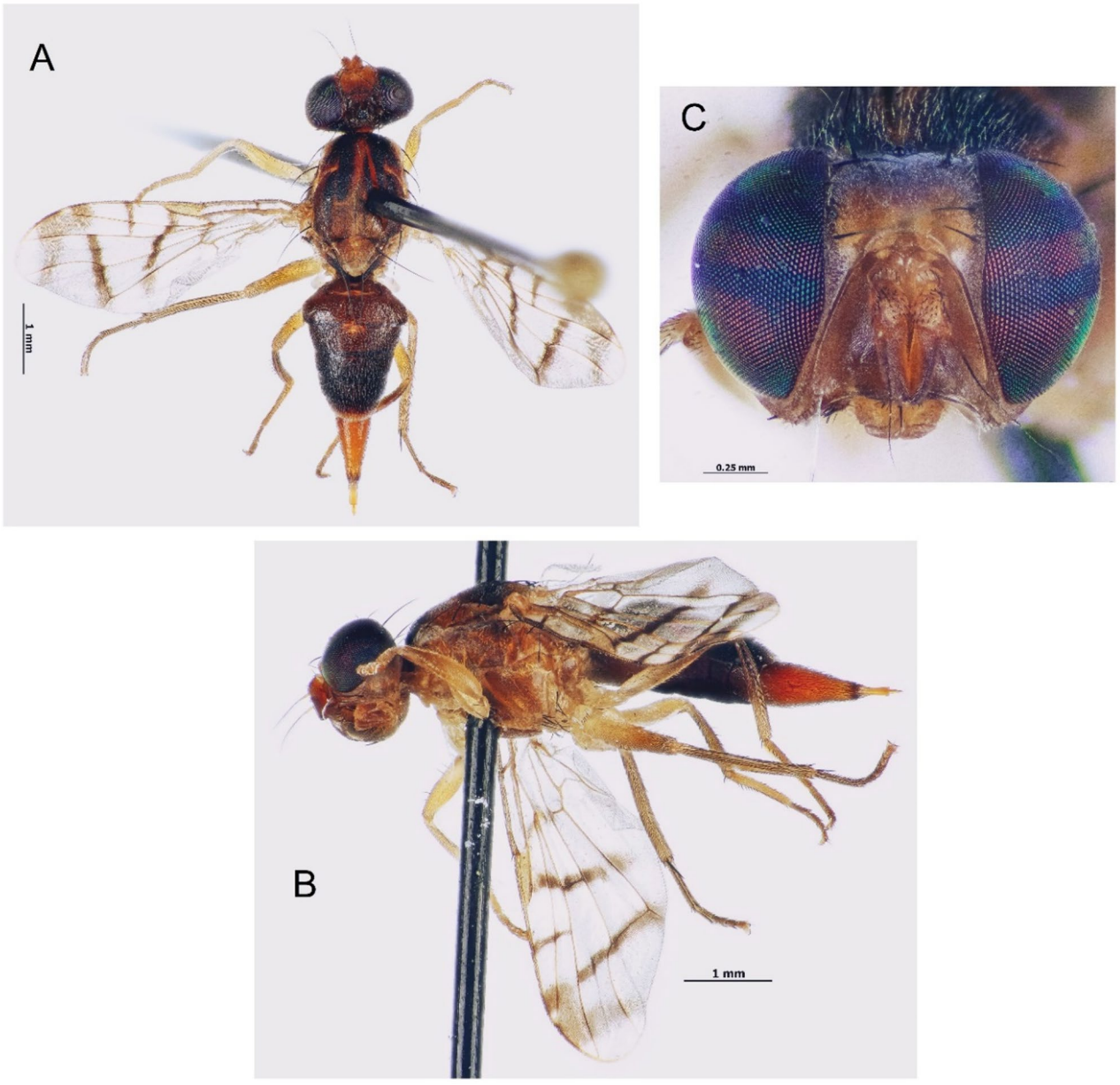

Fig. 6 *Coelotrypes pulchellus* (Bezzi): **A** habitus, dorsal view. **B** habitus, lateral view. **C** head, frontal view

range expansions or previously unrecognized ecological connectivity between these biogeographical zones.

In the context of small fruit fly genera, the taxonomic treatment reveals a limited number of described species across the genera *Perilampsis*, *Pliomelaena*, and *Coelotrypes*, with 17, 10, and 19 described species documented, respectively. Notably, the diversity within these genera, particularly *Pliomelaena*, appears to be underrepresented, as evidenced by the discovery of several undescribed species across the Afrotropical, Australasian, and Oriental biogeographic regions (De Meyer, 2009; Hancock et al., 2021). These findings suggest a potentially greater species richness that warrants further taxonomic exploration and documentation.

Conclusions

In this study, the fruit fly fauna (family Tephritidae) of Saudi Arabia is supplemented with the genera *Perilampsis*, *Pliomelaena*, and *Coelotrypes*, along with their respective species *Pe. pulchella* (Austen), *Pl. brevifrons* (Bezzi), and *C. pulchellus* (Bezzi), which are documented for the first time in the region. Consequently, the total number of Tephritidae genera recorded in Saudi Arabia increases to 41, with the total number of confirmed species reaching 67.

Acknowledgements
The present study was funded by the Ongoing Research Funding Program - Research Chairs (ORF-RC-2025-3800), King Saud University, Riyadh, Saudi Arabia. Many thanks go to Valery Korneyev, Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv, Ukraine for providing critical comments on photographs of Coelotrypes pulchellus (Bezzi). Thanks also go to the research team of the KSMA for their assistance throughout the study.

Author contributions
MSE identified flies, conceptualized the study, and drafted the manuscript; MSA collected flies, participated in editing the manuscript; HMA collected and photographed flies, participated in conceptualizing the study, reviewing, and editing the manuscript; all authors participated in the study design and coordination, interpreted the data, read, and approved the manuscript.

Funding
No funding.

Data availability
All data generated or analysed during this study are included in this published article.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 9 October 2025 / Accepted: 19 November 2025
Published online: 24 November 2025

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