J. Insect Biodivers. Syst. 11 (in press) *Paper in Press, Proofed, Available online 11 October, 2024* *https://jibs.modares.ac.ir*

OPEN ACCESS

Tarbiat Modares University Press | Research Article | ISSN: 2423-8112
Entomological Society of Iran | Faunistic | https://zoobank.org/urn:lsid:zoobank.org:36CE1DF6-3801-4A65-B784-5641542CD443

New records of genera and species of moth flies (Diptera, Psychodidae: Psychodinae) from Morocco

Imane Saidoun
LESCB URL-CNRST N°18, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco.
✉ *saidouniman@gmail.com* https://orcid.org/0009-0005-2809-5384

Mohamed Amin El Mouden
LESCB URL-CNRST N°18, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco.
✉ *ma.elmouden@gmail.com* https://orcid.org/0009-0002-6085-924X

Samia Boussaa
ISPITS- Higher Institute of Nursing Professions and Health Techniques, Ministry of Health and Social Protection, Rabat, Morocco.
✉ *samiaboussaa@gmail.com* https://orcid.org/0000-0002-5599-1097

Boutaïna Belqat
LESCB URL-CNRST N°18, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco.
✉ *bbelqat@uae.ac.ma* https://orcid.org/0000-0003-2857-7699

ABSTRACT. A survey of moth flies in mountainous and desert areas of Morocco revealed 20 species, five genera with 10 species which are recorded from the country for the first time, six of which (*Atrichobrunettia* (*Mirousiella*) *graeca* Ježek & Goutner, 1993, *Lepiseodina rothschildi* (Eaton, 1912), *Mormia revisenda* (Eaton, 1893), *Pericoma* (*Pachypericoma*) *fallax* Eaton, 1893, *Pericoma* (*Pericoma*) *trifasciata* (Meigen, 1804), and *Psychoda* (*Chodopsycha*) *divaricata* Duckhouse, 1968), alongside two genera, *Atrichobrunettia* Satchell, 1953 and *Lepiseodina* Enderlein, 1937), are new to North Africa. In addition, three species and one species are new to the Rif and the Beni Snassen mountains, respectively, seven species are cited for the first time in the Atlas region and one species is new to the Sahara region. Information on the habitats of the 20 species is provided. The survey increases the biodiversity of moth flies in Morocco to 37 species.

Keywords: Atlas, biodiversity, Beni Snassen, distribution, habitat, North Africa, Rif, Sahara

Received: May 14, 2024
Accepted: October 04, 2024
Available online: October 11, 2024
Subject Editor: Paul Beuk

Citation: Saidoun, I., El Mouden, M.A., Boussaa, S. & Belqat, B. (2025) New records of genera and species of moth flies (Diptera, Psychodidae: Psychodinae) from Morocco. *Journal of Insect Biodiversity and Systematics*, 11 (in press).

INTRODUCTION

Moth flies (Diptera: Psychodidae: Psychodinae) are a family of lower Diptera, diverse in form, with a broad range of ecological niches and worldwide distribution (Espíndola et al., 2012). The global fauna of Psychodinae consists of approximately 3000 recognized species belonging to over 100 genera (Pape et al., 2011). Adults are found in a variety of habitats, often resting in shaded places (Ježek & van Harten, 2009) near the larval habitats. They develop mostly in wet microhabitats, near springs and water containers (Ježek & Omelková, 2012; Afzan & Belqat, 2016).

Prior to 2016, there was no focused work on moth flies of Morocco, with the exception of a few scattered attempts between 1920 and 2012 resulting in records of 20 species distributed mainly in the High Atlas region. Subsequently, Afzan and Belqat (2016) published a faunistic and bibliographical inventory of the Psychodinae of North Africa adding seven new records to the Moroccan fauna, confirming 12 species from the literature and extending the distribution area of most species to the Rif Mountains; the region which shelters most species of Psychodinae (21 species), followed by the High Atlas Mountains with 16 species, two species from the Beni Snassen Mountains and one species from the Middle Atlas Mountains, while there was no insight on Psychodinae of the Sahara region. Summarizing

Corresponding author: Boutaïna Belqat, ✉ *bbelqat@uae.ac.ma*

the knowledge of the Moroccan and the North African fauna in the first checklist of the Psychodinae of North Africa, from which the checklist of the Psychodinae of Morocco was drawn in the recent catalogue of Moroccan Diptera (Kettani et al., 2022), only 49 species were currently known in North Africa, with 27 species in Morocco, 33 in Algeria, 18 in Tunisia, and five in Egypt (Afzan & Belqat, 2016). Our understanding of the taxonomy of moth flies and their distribution across various regions and habitats of Morocco remains quite limited. The main aim of this study is to reinforce the knowledge of the Psychodinae fauna and to provide further information on the ecology, diversity, and distribution of the Moroccan species within the biodiverse Moroccan regions, in order to support the long-term conservation of the species and their habitats.

MATERIAL AND METHODS

Collecting expeditions by the authors were made from 2013 to 2022, and included 30 sites (Fig. 1, Table 1) in mountainous areas (Rif, Middle Atlas, Anti-Atlas, High Atlas, and Beni Snassen) and the Sahara Region of Morocco. Twenty species in 13 genera were identified among 212 specimens (69 males and 143 females) of moth flies. Adults were collected by sweeping vegetation with entomological nets, Malaise traps, and aspirators. They were also reared in the laboratory from larvae and pupae collected with their substrate from lotic and lentic habitats. The laboratory conditions for rearing followed the technique of Afzan and Belqat (2016). All specimens were stored in 70% alcohol. Some species were identifiable at 40–80× magnification, whereas others were dissected and mounted on slides, primarily to view characters of the male genitalia. The methods followed those of Wagner (1997). All material collected by the authors is deposited in the Diptera Collection of the Faculty of Sciences, University Abdelmalek Essaâdi, Tétouan, Morocco (UAE-FST), with some specimens also in the Laboratory and Museum of Evolutionary Ecology, Department of Ecology, University of Presov, Slovakia (LMEE PO) and in the National Museum Prague, Czech Republic (NMPC).

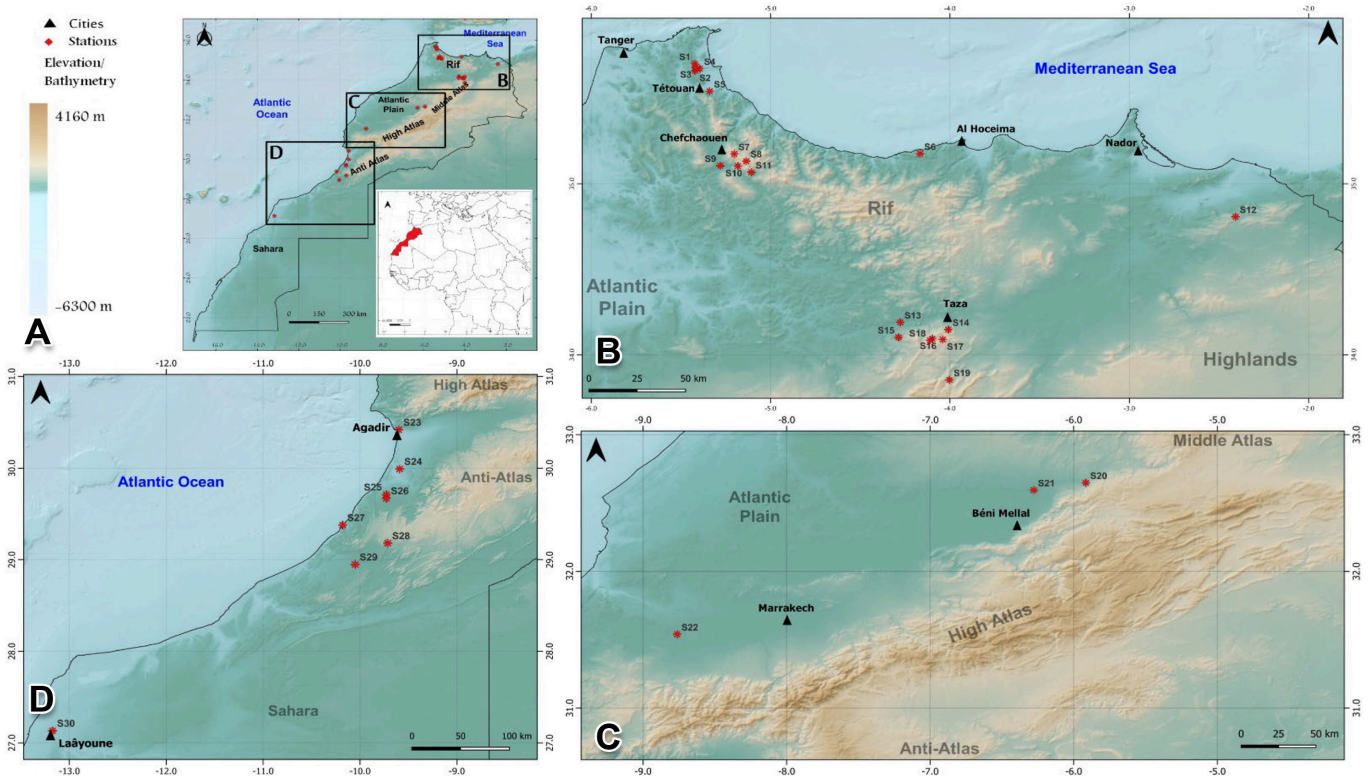


Figure 1. Sampling localities for moth flies collected in Morocco, 2013–2022; numbers correspond to those in Table 2. **A.** Moroccan map showing sampling regions. Collecting localities: **B.** The Rif Mountains, Beni Snassen Mountains and Middle Atlas Mountains; **C.** The High Atlas Mountains. **D.** The Anti-Atlas Mountains and Sahara region.

Table 1. Sampling sites (in alphabetical order within mountain ranges) for moth flies (Psychodinae) in Morocco.

Site	Province and/or locality	Geographical coordinates	Elevation (m)
RIF			
1. Auberge Belwazen	M'diq, Belwazen	35°40'26.6"N 5°25'09.8"W	150
2. Auberge Dardara	Chefchaouen	35°06'18.6"N 5°16'48.9"W	382
3. Cascade Chrafate	National Park of Talassemtane, Chefchaouen	35°03.997'N, 05°06.434'W	820
4. Douar Kitane	Tétouan	35°32.412'N, 05°20.393'W	52
5. Jbel Labyad	M'diq, Belwazen	35°40'40.0"N 5°25'21.7"W	256
6. Oued Aâyaden	Chefchaouen, Majjou village	35°06'11.2"N 5°10'56.1"W	799
7. Oued Adouz	Al Hoceima	35°10'31.0"N 4°10'00.0"W	600
8. Oued Azilane	National Park of Talassemtane, Chefchaouen	35°10'26.9"N 5°12'10.5"W	1343
9. Oued Belwazen	Mdiq, Belwazen	35°40'38.0"N 5°25'25.5"W	271
10. Oued El Kerak	M'diq, Belwazen	35°40'27.2"N 5°25'10.2"W	164
11. Ruisselet Guinnes	National Park of Talassemtane, Chefchaouen	35°07'54.2"N 5°08'09.4"W	1718
BENI SNASSEN			
12. Forêt Tafoughalt	Beni Snassen	34°48'26.6"N 2°24'28.8"W	845
MIDDLE ATLAS			
13. Affluant Oued Oum Er-rabie	Béni-Mellal, Kasbah Tadla	32°35'39.0"N 6°16'44.0"W	474
14. Aire de repos Zaouiat Cheikh	Béni-Mellal	32°38'51.4"N 5°54'54.7"W	730
15. Gouffre Izora	National Park of Tazekka, Taza	34°05'39.8"N 4°05'54.7"W	1430
16. Grotte Bouslama	National Park of Tazekka, Taza	34°05'07.7"N 4°06'40.6"W	1434
17. Oued Amlil	Taza	34°11'24.0"N 4°16'37.6"W	330
18. Oued Bab Lehri	National Park of Tazekka, Taza	34°05'24.0"N 4°02'25.4"W	1428
19. Oued El Bared	Taza	33°51'14.0"N 4°00'10.0"W	985
20. Oued Lagziri	National Park of Tazekka, Taza	34°06'09.5"N 4°17'13.1"W	650
21. Ras Lma	National Park of Tazekka, Taza	34°08'51.6"N 4°00'33.9"W	972
HIGH ATLAS			
22. Aire de repos Chichaoua	Chichaoua	31°32'20.6"N 8°45'47.9"W	359
ANTI-ATLAS			
23. Aire de repos Bab Lkhmis	Tiznit	29°42'38.8"N 9°43'42.1"W	225
24. Aire de repos Sidi Abou	Agadir	29°59'24.9"N 9°35'25.1"W	55
25. Aire de repos Tiznit	Tiznit	29°41'30.0"N 9°43'28.2"W	250
26. Hotel Atlas Saghir	Bouizakarne	29°10'48.2"N 9°42'51.0"W	580
27. Hotel Yasmina	Agadir	30°25'06.1"N 9°35'55.2"W	33
SAHARA			
28. Aire de repos El Filaha	Guelmim	28°56'51.9"N 10°02'58.7"W	257
29. Aire de repos Laayoune	Laayoune	27°07'55.0"N 13°10'26.6"W	72
30. Aire de repos Sidi Ifni	Sidi Ifni	29°22'39.2"N 10°10'42.7"W	51

An annotated list of the 20 species of moth flies identified in the present study is provided, following the classification of Vaillant (1990), Wagner (1990), Kvifte et al. (2011) and Kvifte (2018). Species new for North Africa are marked with three asterisks (***), those new for Morocco are marked with two asterisks (**), and those representing the first records for the Rif, Beni Snassen, Middle Atlas, Anti-Atlas, High Atlas Mountains, or Sahara Region are indicated with one asterisk (*) (Table 2). Moroccan, North African, and world distributions are given for the species inventoried, with notes on the habitat of each species.

RESULTS

Taxonomic hierarchy

Order Diptera Linnaeus, 1758

Suborder Brachycera Duméril, 1805

Family Psychodidae Newman, 1834

Subfamily Psychodinae Newman, 1834

Tribe Psychodini Newman, 1834

Genus *Psychoda* Latreille, 1796

Type species. *Tipula phalaenoides* Linnaeus, 1758 (monotypy).

Psychoda (*Logima*) *albipennis* Zetterstedt, 1850 **

Material examined. Rif: 1♂, Auberge Belwazen, 26.III.2021, Malaise trap, coll. Saidoun, UAE-FST.

General distribution. Widely distributed in Europe (Ježek & Yağci, 2005; Ježek et al., 2021), this cosmopolitan species is common from lowlands to mountains (Ježek et al., 2018b; Ježek et al., 2023). In North Africa, it is known from Algeria (Satchell, 1955) and Tunisia (Wagner, 1987).

Habitat. The only male we collected was in a small Malaise trap hanging on the outside wall of a barn (Figs 2, 3). It might have developed in a stream a few meters from the barn. The location was surrounded by *Arundo donax*, *Ficus carica, Olea europaea*, and *Vitis vinifera*.

Table 2. Species of moth flies (Psychodinae) from Morocco.

Species	Rif	Beni Snassen	Middle Atlas	High Atlas	Anti-Atlas	Sahara
Psychoda (*Logima*) *albipennis* Zetterstedt, 1850	X**					
Psychoda (*Chodopsycha*) *divaricata* Duckhouse, 1968	X***					
Philosepedon (*Philosepedon*) *humeralis* (Meigen, 1818)		X*	X*			
Atrichobrunettia (*Mirousiella*) *graeca* Ježek & Goutner, 1993	X***					
Clogmia albipunctata (Williston, 1893)			X*	X*	X*	X*
Clytocerus (*Boreoclytocerus*) sp.	X**					
Iranotelmatoscopus sp.	X**					
Lepiseodina rothschildi (Eaton, 1912)	X***		X***			
Paramormia (*Duckhousiella*) *ustulata* (Walker, 1856)			X*			
Mormia revisenda (Eaton, 1893)			X***			
Pericoma (*Pachypericoma*) *blandula* Eaton, 1893			X*			
Pericoma (*Pericoma*) *diversa* Tonnoir, 1920			X*			
Pericoma (*Pachypericoma*) *fallax* Eaton, 1893			X***			
Pericoma (*Pericoma*) *latina* Sarà, 1954			X*			
Pericoma (*Pericoma*) *modesta* (Tonnoir, 1922)	X*					
Pericoma (*Pericoma*) *pseudoexquisita* Tonnoir, 1940			X*			
Pericoma (*Pericoma*) *trifasciata* (Meigen, 1804)			X***			
Pneumia reghayana (Boumezzough & Vaillant, 1986)	X*					
Vaillantodes fraudulentus (Eaton, 1896)	X**					
Tonnoiriella paveli Ježek, 1999	X*					

Figures 2–12. Sampling areas and habitat of the moth flies in Morocco. **2.** Modified Malaise trap on the outside wall of the Belwazen barn; **3.** Inside the cow barn; **4.** Habitat of *Psychoda* (*Chodopsycha*) *divaricata*: Cascade Chrafate; **5.** Habitat of *Philosepedon* (*Philosepedon*) *humeralis*: forêt Tafoughalt; **6.** Moroccan habitat of *Atrichobrunettia* (*Mirousiella*) *graeca*: Douar Kitane; **7–9.** Habitat of *Clytocerus* (*Boreoclytocerus*) sp., **7.** Oued Belwazen. **8.** Oued Belwazen; **9.** Habitat of *Lepiseodina rothschildi*: Oued El Kerak; **10.** Habitat of *Lepiseodina rothschildi*: Grotte Bouslama; **11.** Habitat of *Paramormia* (*Duckhousiella*) *ustulata*: Oued Lagziri; **12.** Habitat of *Pericoma* (*Pachypericoma*) *blandula*: Ras Lma. (Photographs by the first author).

Figures 13–15. Habitats of the moth flies in Morocco. **13.** Habitat of *Pericoma* (*Pachypericoma*) *fallax*: Grotte Izora; **14.** Habitat of *Pericoma* (*Pericoma*) *trifasciata*: Bab Lehri; **15.** Habitat of *Tonnoiriella paveli*: Oued Azilane. (Photographs by the first author).

Psychoda (*Chodopsycha*) *divaricata* Duckhouse, 1968 ***

Material examined. Rif: 2♂♂, Cascade Chrafate, 24.V.2013, reared, coll. Saidoun, UAE-FST.

General distribution. Brazil (Duckhouse, 1968; Bravo et al., 2006; Bravo, 2008; Cordeiro & Bravo, 2008; Cordeiro, 2009; Cordeiro et al., 2011; Bravo & Araújo, 2013); France (Gibernau & Albre, 2022).

Habitat. We found the species in a forest where the waterfall Cascade Chrafate is located. Abundant vegetation included *Olea oleaster*, *Ficus carica*, *Rubus ulmifolius*, *Eucalyptus*, *Nerium oleander*, *Hedera maroccana*, and *Ricinus communis* (Fig. 4). The waterfall that supported larvae and pupae of *P. divaricata* was about 5 m wide, but the sections wetted at the time of capture were 0.2–2.6 m 2.6 wide. The water was cold (12.7 ºC), slightly mineralized (395 µS), with low salinity (0.2), a pH near neutral (7.5), and a strong to torrential current. Sunlight at the time of collection was medium. The substrate consisted of gravel, with scattered boulders and abundant riparian vegetation, submerged and floating mosses, and algae. Substrate, richer in mosses than algae, was removed from rocks, along with the soil, and transported to the laboratory to rear the aquatic stages.

Comment. A detailed description of the adult has been given by Cordeiro et al. (2011).

Genus *Philosepedon* Eaton, 1904

Type species. *Psychoda humeralis* Meigen, 1818 (original designation).

Philosepedon (*Philosepedon*) *humeralis* (Meigen, 1818) *

Material examined. Beni Snassen: 1♂, forêt Tafoughalt, 24.IV.2022, sweep net, coll. Saidoun, UAE-FST. Middle Atlas: 1♂, Affluant Oued Oum Er-rabie, 11.XII.2018, sweep net, coll. Group Belqat, UAE-FST.

General distribution. This species is common and widely distributed in Europe (Omelková & Ježek, 2012). In North Africa, it is known from Algeria (Satchell, 1955) and Morocco (Afzan & Belqat, 2016).

Habitat. The adults are found in damp places from lowlands to mountains. We collected the species in a forest of *Pinus halepensis*, with *Chamaerops humilis* and *Urginea maritima* (Fig. 5).

Comment. A description of the adult was given by Ježek (1985).

Tribe Brunettiini Vaillant, 1971

Genus *Atrichobrunettia* Satchell, 1953 ***

Type species. *Atrichobrunettia altemata* Satchell, 1953 (original designation).

Atrichobrunettia (*Mirousiella*) *graeca* Ježek & Goutner, 1993 ***

Material examined. Rif: 3♂♂, Douar Kitane, 24.IV.2017, Malaise trap, coll. Group Belqat, LMEE PO.

General distribution. This species is rare, known only from Greece, Albania, Czech Republic, Britain, and Ireland (Ježek, 2003; Ježek & Omelková, 2012; Oboňa et al., 2023a).

Habitat. *Atrichobrunettia graeca* (Figs 16, 17, 18) was collected in a Malaise tent near a small stream in a shaded habitat with fruit trees (especially citrus and medlars) and shrubby vegetation (Fig. 6).

Tribe Pericomaini Enderlein, 1935

Genus *Clogmia* Enderlein, 1937

Type species. *Psychoda albipunctata*, Williston, 1893 (original designation as *Psychoda albipennis* Williston, 1893).

Clogmia albipunctata (Williston, 1893) *

Material examined. Middle Atlas: 1♂, 11♀♀, Aire de repos Zaouiat Cheikh, 16.VI.2015, aspirator; 1♂, Oued Amlil, 23.V.2022, sweep net. High Atlas: 2♂♂, Aire de repos Chichaoua, 12.IV.2015, aspirator. Anti-Atlas: 5♂♂, 24♀♀, Aire de repos Sidi Abou, 11.V.2015, 11♀♀, 13.V.2015, aspirator; 7♀♀, Aire de repos Bab Lkhmis, 15.V.2015, aspirator; 14♂♂, 59♀♀, Hotel Atlas Saghir, 24.V.2015, aspirator; 7♀♀, Hotel Yasmina, 12.VI.2015, aspirator; 2♀♀, Aire de repos Tiznit, 13.VI.2015, aspirator. Sahara: 5♀♀, Aire de repos Laayoune, 15.IV.2015, aspirator; 4♂♂, 14♀♀, Aire de repos Sidi Ifni, 17.V.2015, aspirator; 1♂, 3♀♀, Aire de repos El Filaha, 18.V.2015, aspirator, coll. Belqat, UAE-FST.

General distribution. This widespread species occurs in tropical and subtropical countries (Oboňa & Ježek, 2012a; Ježek et al., 2012; Akhoundi et al., 2022). In North Africa, it is known from Algeria (Tonnoir, 1920; Satchell, 1955), Egypt (Tonnoir, 1920; El-Badry et al., 2014), and Morocco (Afzan & Belqat, 2016).

Habitat. Our new findings expand the known range of *C. albipunctata* in Morocco to the Sahara, passing through the Middle, High, and Anti-Atlas Mountains. We collected it from the stream Oued Amlil, whose banks were populated by vegetation, especially *Dittrichia viscosa, Juncus acutus, Nerium oleander*, and *Tamaris africana.* We also aspirated it from the walls of lobbies leading to bathrooms in rest areas and hotels.

Comment. This species is typically known as a mechanical vector and a sign of poor hygiene standards, particularly in hospitals; it is the cause of nasopharyngeal, intestinal, and urinary myiasis in humans worldwide (Zittra et al., 2020).

Genus *Clytocerus* Eaton, 1904 **

Type species. *Clytocerus africanus* Tonnoir, 1920 (subsequent monotypy).

Clytocerus (*Boreoclytocerus*) sp. **

Material examined. Rif: 1♂, Oued Belwazen, 28.IV.2022, sweep net, coll. Saidoun, FST-UAE.

General distribution. This genus has been found throughout Europe (Ježek et al., 2008; Ježek et al., 2017; Ježek et al., 2018a), In North Africa, the genus was previously known only from Algeria (Wagner, 1987) based on the species C. *kabylicus* Wagner, 1987 (Afzan & Belqat, 2016).

Habitat. The specimens were captured (Figs 19, 20) in a forested mountain environment with streams having strong current, submerged vegetation (e.g., algae and mosses), coarse substrate, and abundant riparian vegetation such as *Rubus ulmifolius* (Figs 7, 8).

Comment. This species remains unnamed because of an issue during the mounting procedure. Consequently, the shape of the hypandrium, which is a crucial morphological characteristic for distinguishing the species, was not visible.

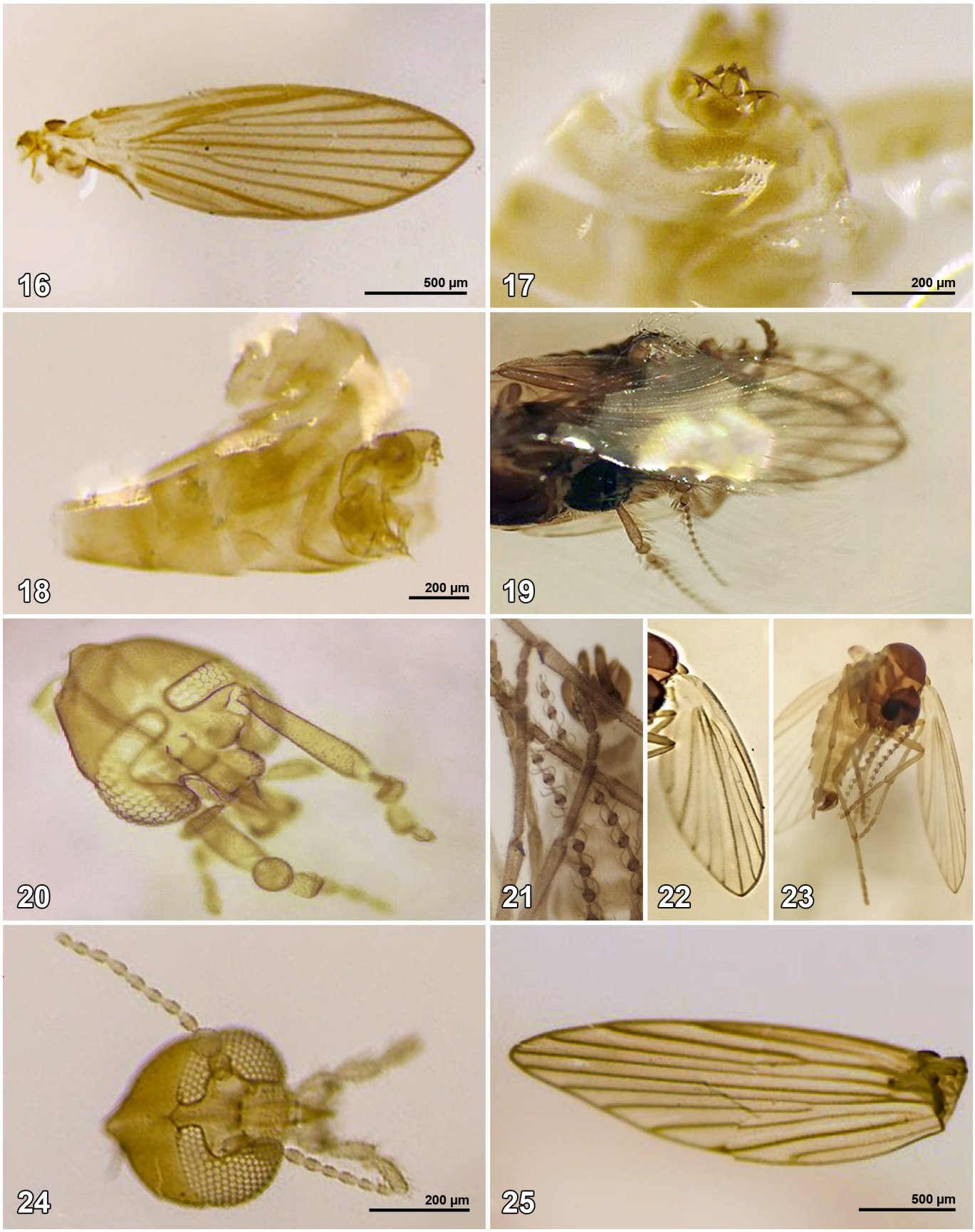
Genus *Iranotelmatoscopus* Ježek, 1987 **

Type species. *Iranotelmatoscopus hajiabadi* Ježek, 1988 (original designation).

Iranotelmatoscopus sp. **

Material examined. Rif: 2♀♀, Oued Adouz, 3.VI.2022-9.VI.2022, reared, coll. Saidoun, UAE-FST.

General distribution. At present this genus is known from five species: four Palaearctic species with *I. hajibadi* Ježek, 1987, whose distribution extends to the Saharan-Arabian region (Ježek & van Harten, 2009); and one Afrotropical species, *I. kenyensis* Ježek & Oboňa, 2019 (Ježek & Oboňa, 2019).



Figures 16–25. Habitus of moth flies of Morocco. *Atrichobrunettia* (*Mirousiella*) *graeca*: **16.** Male wing, **17.** Dorsal view of the male terminalia, **18.** Lateral view of the male terminalia; *Clytocerus* (*Boreoclytocerus*) sp.: **19.** Male habitus, **20.** Male head, frontal view; *Lepiseodina rothschildi*: **21.** Last antennal segments, **22.** Male wing, **23.** Male habitus; *Pericoma* (*Pachypericoma*) *fallax*: **24.** Male head, frontal view, **25.** Male wing.

Habitat. We reared the specimens at laboratory temperature. Adults emerged six days after the substrate was transported to the laboratory from the vicinity of the river Adouz, bordering a cultivated field.

Comment. We should state that the species remains as yet unnamed due to the fact that only females were collected and the specimens are not similar to any known species.

Genus *Lepiseodina* Enderlein, 1937 **

Type species. *Psychoda tristis* Meigen, 1830 (original designation).

Lepiseodina rothschildi (Eaton, 1912) ***

Material examined. Rif: 1♂, Oued El Kerak, 3.II.2022, sweep net, coll. Saidoun, UAE-FST; 1♂, Auberge Belwazen, 3.VI.2022, malaise trap, coll. Saidoun, NMPC; Middle Atlas: 1♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Saidoun UAE-FST.

General distribution. This European species has been recorded from Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Britain, Ireland, Italy, Lithuania, Mallorca, the Netherlands, and Slovakia (Withers, 1989; Salmela, 2010; Kvifte et al., 2016; Ježek et al., 2020; Oboňa et al., 2021).

Habitat. *Lepiseodina rothschildi* (Figs 21–23), was found in the mountains. Adults were collected in humid mountainous and forested environments, in lotic and lentic habitats in the Rif and the Middle Atlas, respectively. The lotic habitat is the environment of the river El Kerak (Fig. 9) flowing in the foothills (164 m) of the mountain Jbel Labyad (i.e., the white Mountain, so-called for its limestone) where our Malaise tent was placed. The lentic habitat, the Bouslama cave, is a beautiful cave in the heart of Tazekka National Park (one of 10 protected parks of Morocco) in a dense oak forest that covers Mount Bouslama. Its rocky entrance is covered with lichens and is rich in Rosaceae and *Rubus ulmifolius*, *Ficus carica*, *Hedera helix*, and other vegetation. *Lepiseodina rothschildi* was caught in flight at the entrance of the cave (Fig. 10) from among an immense movement of insects in the wetland shade of a dense tree cover where flying species and amphibians coexist near a pond a few meters from the cave entrance.

Comment. A detailed description of the adult was given by Ježek (2004a).

Genus *Paramormia* Enderlein, 1935

Type species. *Pericoma fratercula* Eaton, 1893 (original designation).

Paramormia (*Duckhousiella*) *ustulata* (Walker, 1856) *

Material examined. Middle Atlas: 1♂, Oued Lagziri, 23.V.2022, sweep net, coll. Group Belqat, LMEE PO.

General distribution. This widespread species occurs in the Holarctic region (Ježek & Yağci, 2005; Kvifte et al., 2016). In North Africa, it is known from Morocco in the High Atlas (Vaillant, 1955; 1972) and the Rif (Afzan & Belqat, 2016), and from Algeria (Satchell, 1955; Vaillant, 1955; 1972) and Tunisia (Wagner, 1987).

Habitat. We collected specimens by sweep-netting the abundant vegetation, mostly *Apium nodiflorum*, *Calamintha ascendens, Fraxinus angustifolia*, and *Salix alba*, along the banks of the river Lagziri (Fig. 11). The watercourse, which was shallow and shaded, flowed slowly over a stony substrate with scattered boulders.

Comment. A detailed description of the adult was given by Ježek (1990).

Genus *Mormia* Enderlein, 1935

Type species. *Pericoma revisenda* Eaton, 1893 (original designation).

Mormia revisenda (Eaton, 1893) ***

Material examined. Rif: 1♂, Cascade Chrafate, 28.IV.2015. Middle Atlas: 1♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Group Belqat, UAE-FST.

General distribution. *Mormia revisenda* is a rare European species (Vaillant, 1974; Ježek, 1995; Kroča & Ježek, 2015; Ježek et al., 2018a; Oboňa et al., 2023b).

Habitat. This species occupies disparate Moroccan habitats, similar to those in Europe, having been found in the forested lotic habitat of the cascade Chrafate (Fig. 4) and the lentic habitat of the cave Bouslama (Fig. 10).

Comment. Detailed descriptions of the adult were provided by Ježek & Goutner (1993).

Genus *Pericoma* Walker, 1856

Type species. *Pericoma funebris* Hutton, 1901 (original designation).

Pericoma (*Pachypericoma*) *blandula* Eaton, 1893*

Material examined. Middle Atlas: 1♂, Ras Lma, 19.V.2022, sweep net, coll. Group Belqat, NMPC.

General distribution. This species is widespread over Europe (Oboňa & Ježek, 2014; Morelli & Bruno Biscaccianti, 2021). In North Africa, it has been recorded from Morocco in the High Atlas (Boumezzough & Vaillant, 1986; Ježek, 2004b) and the Rif (Ježek, 2004b; Afzan & Belqat, 2016), in Algeria (Vaillant, 1979) and in Tunisia (Wagner, 1987; Ježek, 2004b).

Habitat. We captured *P. blandula* in the Middle Atlas near the river Ras Lma, mainly on the right side of the bridge that crosses the watercourse, in a damp corner where the waterfalls gather before continuing under the bridge shaded by trees (e.g., several species of Rosaceae); the site is difficult to access (Fig. 12).

Pericoma (*Pericoma*) *diversa* Tonnoir, 1920 *

Material examined. Middle Atlas: 1♂, Oued Bab Lehri, 21.V.2022, sweep net, coll. Group Belqat, NMPC; 1♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Group Belqat, LMEE PO; 2♂♂, Oued El Bared, 21.V.2022, sweep net, coll. Group Belqat, NMPC.

General distribution. This rare European species (Oboňa & Ježek, 2014) is found in North Africa in Morocco's High Atlas (Vaillant, 1978:229) and Rif mountains (Afzan & Belqat, 2016).

Habitat. This species in the Middle Atlas is associated with different habitats, such as cropland, especially of cereals, with sporadic trees and vegetation, far from a temporary watercourse that was almost dry (Oued Bab Lehri), and the stagnant water of the cave Bouslama.

Pericoma (*Pachypericoma*) *fallax* Eaton, 1893 ***

Material examined. Middle Atlas: 1♂, Grotte Izora, 19.V.2022; 1♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Group Belqat, LMEE PO.

General distribution. *Pericoma fallax* is a European, West-Siberian, and Caucasian species (Ježek et al., 2017; Kroča & Ježek, 2019; Ježek et al., 2021; Ježek et al., 2023).

Habitat. This species (Figs 24, 25, 26, 27) develops in mosses in shaded and unshaded habitats. Our data corroborate those in the literature; we found the species in mountainous habitats, heavily shaded and rich in mosses, with the only difference being that the captures were made at the entrances and a few meters from the entrances of caves (Bouslama (Fig. 10) and Izora (Fig. 13)) in the heart of the National Park of Tazekka, a protected area.

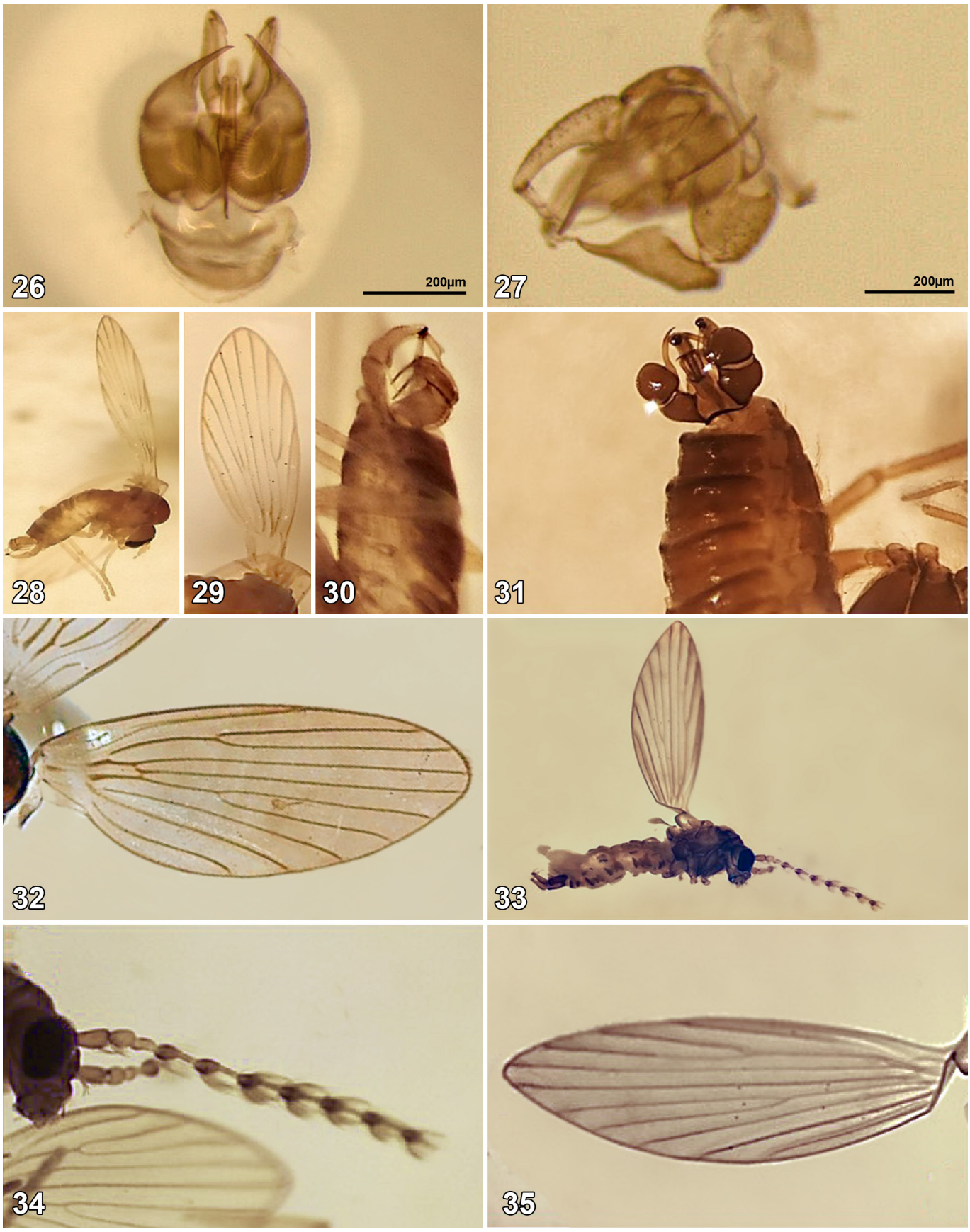
Comment. Male genitalia have been illustrated by Withers (1989:62).

Pericoma (*Pericoma*) *latina* Sarà, 1954 *

Material examined. Middle Atlas: 3♂♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Group Belqat, UAE-FST; 2♂♂, Oued El Bared, 21.V.2022, sweep net, coll. Group Belqat, NMPC.

General distribution. This West Mediterranean species (Vaillant, 1978) has been found in North Africa in Algeria (Vaillant, 1978) and Morocco in the High Atlas (Vaillant, 1955) and the Rif mountains (Afzan & Belqat, 2016).

Habitat. *Pericoma latina* was found for the first time in the Middle Atlas near the source of a large river (Oued El Bared), which issues from rocks, with a strong current as it approaches a wide riverbed. The second habitat differs from the others; three males were collected near stagnant water inside the Bouslama cave.



Figures 26–35. Habitus of moth flies of Morocco. *Pericoma* (*Pachypericoma*) *fallax*: **26.** Dorsal view of the male terminalia, **27.** Lateral view of male terminalia; *Pericoma* (*Pericoma*) *trifasciata*: **28.** Male habitus, **29.** Male wing, **30.** Lateral view of male terminalia; *Pneumia reghayana*: **31.** Dorsal view of the male terminalia, **32.** Male wings. *Vaillantodes fraudulentus*: **33.** Male habitus, **34.** Antennae, **35.** Wing.

Pericoma (*Pericoma*) *modesta* (Tonnoir, 1922) *

Material examined. Rif: 1♂, Jbel Labyad, 2.II.2022; 1♂, Ruisselet Guinnes, 11.V.2022, sweep net, coll. Saidoun, FST-UAE.

General distribution. *Pericoma modesta* has a wide Mediterranean distribution (Kvifte et al., 2016). In North Africa, it has been recorded from Morocco (Boumezzough & Vaillant, 1986) and Algeria (Vaillant, 1955, 1978).

Habitat. We collected the species for the first time in the Rif Mountains near the rivulet Ruisselet Guinnes surrounded by *Apium nodiflorum, Bellis sylvestris, Euphorbia characias,* and *Ranunculus macrophyllus* and in matorral habitat surrounded by *Cistus crispus*, *Mentha pulegium*, and *Pteridium aquilinum*.

Pericoma (*Pericoma*) *pseudoexquisita* Tonnoir, 1940 *

Material examined. Middle Atlas: 1♂, Grotte Bouslama, 19.V.2022, sweep net, coll. Group Belqat, UAE-FST.

General distribution. A widespread and rather common European species (Morelli & Bruno Biscaccianti, 2021), *P. pseudexquisita* has been found in Morocco in the Rif (Afzan & Belqat, 2016).

Habitat. Our capture of an adult, for the first time in the Middle Atlas, indicates an additional type of habitat for this species stagnant water in a cave (Fig. 10).

Pericoma (*Pericoma*) *trifasciata* (Meigen, 1804) ***

Material examined. Middle Atlas: 3♂♂, Ras Lma, 19.V.2022; 1♂, Bab Lehri, 21.V.2022, sweep net, coll. Group Belqat, NMPC.

General distribution. This species is widespread in Central and South Europe (Kvifte & Ivković, 2018).

Habitat. We captured *P. trifasciata* (Figs 28, 29, 30) in the Middle Atlas near flowing water, as described above (Fig. 12). We also collected a male of this species by sweeping over vegetation such as *Chrysanthemum coronarium, Hirschfeldia incana*, and *Papaver rhoeas* in Bab Lehri, an open and unshaded site (Fig. 14).

Genus *Pneumia* Enderlein, 1935

Type species. *Pericoma palustris* Meigen, 1804 (original designation).

Pneumia reghayana (Boumezzough & Vaillant, 1986) *

Material examined. Rif: 1♂, Auberge Dardara, 30.I.2019, sweep net, coll. Saidoun, UAE-FST.

General distribution. This Moroccan species has been recorded from the river Reghaya in the High Atlas (Boumezzough & Vaillant, 1986; Dakki, 1997).

Habitat. Our sampling record extends the distribution of *P. reghayana* (Figs 31, 32) to the north of Morocco. The unique adult was collected in the environment of the Inn Dardara, in the vicinity of the Dardara River (Oued Laou Basin). The vegetation was dominated by *Citrus* sp., *Cupressus sempervirens, Ficus carica, Morus alba, Olea europaea, Populus nigra, Prunus dulcis*, and *Vitis vinifera.*

Genus *Vaillantodes* Wagner, 2001 **

Type species. *Vaillantia margaretae* Wagner, 1988 (original designation).

Vaillantodes fraudulentus (Eaton, 1896) **

Material examined. Morocco, Rif: 2♂♂, Oued Aâyaden, 27.IV.2015, sweep net, coll. Group Belqat, NMPC; 3♂♂, Auberge Belwazen, 28.IV.2022, sweep net, coll. Saidoun, NMPC.

General distribution. *Vaillantodes fraudulentus* is known from the Iberian Peninsula (Cobo et al., 2002) and in North Africa, from Algeria (Satchell, 1955) and Tunisia (Wagner, 1987).

Habitat. We collected adults (Figs 33–35) near Oued Aâyaden, a high river, on limestone and mossy rock, by sweeping vegetation, mostly *Pistachia lentiscus*, *Cistus* sp., and *Nerium oleander*. The other habitat where we collected the species corresponds to that of Auberge Belwazen, described above.

Unplaced genera

Genus *Tonnoiriella* Vaillant, 1982 *

Type species. *Pericoma pulchra* Eaton, 1893 (indication).

Tonnoiriella paveli Ježek, 1999 *

Material examined. Rif: 2♂♂, Oued Aâyaden, 27.IV.2015; 1♂, Oued Azilane, 13.V.2022, sweep net, coll. Group Belqat, NMPC.

General distribution. Known only from Morocco, *T. paveli* has been found in the High Atlas and Anti-Atlas (Wagner & Withers, 2020; Ježek, 1999).

Habitat. We report the species for the first time in the Rif Mountains from two streams, confirming that it is a mountainous species. Oued Azilane (Fig. 15) was shallow and stony, with moderate to low current velocities, submerged aquatic vegetation rich in mosses, and abundant riparian vegetation such as *Apium nodiflorum, Bromus* sp., *Dittrichia viscosa*, *Mentha aquatica*, and *Phragmitis australis*. Oued Aâyaden, described above, was another lotic habitat of the species.

DISCUSSION

Knowledge of the Moroccan Psychodinae fauna is still modest. 27 species are known from previous studies. The number of species increases with our addition of 10 species in five genera. As a result, the total number of species of Psychodinae in Morocco is now 37. The majority of species in our study have a rather limited distribution. *Tonnoiriella paveli* Ježek, 1999 is endemic to Morocco, and *Vaillantodes fraudulentus* (Eaton, 1896) is known only from North Africa and the Iberian Peninsula. *Pericoma* (*Pericoma*) *latina* Sarà, 1954 and *P.* (*Pericoma*) *modesta* (Tonnoir, 1922) have a strictly West Mediterranean distribution, whereas *Clogmia albipunctata* (Williston, 1893) and *Paramormia* (*Duckhousiella*) *ustulata* (Walker, 1856) are present in North Africa, the Iberian Peninsula, and the Atlantic Islands, and their distributions are Holarctic, with *C. albipunctata* even found in tropical and subtropical countries; The only other tropical species, recorded from Brazil, is *Psychoda* (*Chodopsycha*) *divaricata* Duckhouse, 1968, a species also found in the West Palearctic (France). The other species in our study are widespread in Europe and the Mediterranean region. Seventeen species have a West Palearctic distribution, concentrated in Europe, more toward the southwest of the continent, but also in the eastern portion. About 6% are endemic to Morocco. More than half (53%) of the species are associated with an Iberian distribution: eight species are shared with Spain and one with Portugal. About 41% of our studied species are in common with other North African countries, especially Algeria and Tunisia, with only one species in common with Egypt, and no species shared with Libya. More species are expected to be found in common with North African countries as additional surveys in the region are conducted. Almost a third (30%) of the Moroccan species in our study are shared with the Atlantic islands, which is a high percentage, given that endemism is common for insular faunas. A total of 17.6% of the species are distributed not only in the Palaearctic Region but also in the Nearctic and Neotropical regions.

The two new generic records: *Clytocerus* (*Boreoclytocerus*) sp. and *Iranotelmatoscopus* sp., are both mainly distributed in the Palearctic region; among the subgenus *Boreoclytocerus*, only one of the 16 recorded species is widespread across Europe, 5 others are found in Central and Western Europe, while 8 species have a Mediterranean south European distribution (Pape et al., 2004). The two remaining species: *C.* (*B.*) *wollastoni* Satchell, 1955 and *C.* (*B.*) *grusinicus* Wagner, 1981, are respectively endemic to Madeira (Carles-Tolrá, 2002) and Caucasus (Ježek & Hájek, 2007; Oboňa & Ježek, 2014). The nominate subgenus *Clytocerus* is known from the Afrotropical region only. The genus *Iranotelmatoscopus* currently includes four species known from the Palearctic region, mainly from the Mediterranean: *I. squamifer* (Tonnoir, 1922) and *I. numidicus* (Satchell, 1955) from North Africa (Tonnoir, 1922; Satchell, 1955), *I. bartolii*

(Salamana, 1974) from southern Europe (Salamana, 1974) and *I. hajibadi* Ježek, 1987 from Iran (Ježek, 1987). Notably, *I. hajibadi* Ježek, 1987 has also been recorded in the Saharan-Arabian region, specifically in the United Arab Emirates (Ježek & van Harten, 2009). Additionally, the sole Afrotropical species within the genus is *I. kenyensis* Ježek & Oboňa, 2019, which is documented in Kenya (Ježek & Oboňa, 2019). The hypothesis based on the strong presence of both genera in the Euro-Mediterranean that they should be present in North Africa (and thus in Morocco) can now be accepted as a result of our findings. These new records for the region, or maybe even new species for science, despite the fact that our studies on Psychodinae in the region are still modest, show that the potential for novelties seems to be high.

Moth flies are present in a variety of habitats near water bodies (both stagnant and running), forests, croplands and even in caves, both in lowland and mountain areas and they are also frequently found in synanthropic conditions. Considering that the life cycle of Psychodinae is partly aquatic, it is undoubtedly clear that aquatic environments are considered to be the dominant habitat type. Thus, among the species of Psychodinae studied, 17 show a tendency to inhabit humid habitats near rivers, springs, streams, waterfalls, and stagnant waters. Shady (and thus often humid) habitats, such as forests and caves, form the second most inhabited ecosystem, with six species having the forest as their prevailing habitat and five having caves. According to our results and those reported in the literature (Wagner, 1977; Vaillant, 1978; Boumezzough & Vaillant, 1986; Ježek, 1990; Withers & O'Connor, 1992; Ježek, 1999; Ježek, 2003; Ježek, 2004a; Bravo et al., 2006; Bravo, 2008; Ježek et al., 2012; Ježek & Omelková, 2012; Oboňa & Ježek, 2012b; Omelková & Ježek, 2012; Bravo & Araújo, 2013; Kroča & Ježek, 2015; Afzan & Belqat, 2016; Ježek et al., 2018b; Oboňa et al., 2023a; Kroča & Ježek, 2019), three species occupy mountainous habitats, two others synanthropic habitats and a single species seems to prefer cropland and lowlands habitat. The habitat information is summarized in Table 3.

Table 3. Species with their habitats based on the new findings (*) and the literature (X).

Species	Cave	Cropland	Forest	Lowland	Mountains	Synanthropic habitat	Lentic ecosystems	Lotic ecosystems
Psychoda (*logima*) *albipennis* Zetterstedt, 1850						X, *		
Psychoda (*Chodopsycha*) *divaricata* Duckhouse, 1968			X					*
Philosepedon (*Philosepedon*) *humeralis* (Meigen, 1818)			*	X	X			
Atrichobrunettia (*Mirousiella*) *graeca* Ježek & Goutner, 1993			X		X			X, *
Clogmia albipunctata (Williston, 1893)						X, *		X
Clytocerus (*Boreoclytocerus*) sp.			*					*
Iranotelmatoscopus sp.								*
Lepiseodina rothschildi (Eaton, 1912)	*		*	X	X, *			X, *
Paramormia (*Duckhousiella*) *ustulata* (Walker, 1856)							X	X, *
Mormia revisenda (Eaton, 1893)	*		X, *				X, *	X, *
Pericoma (*Pachypericoma*) *blandula* Eaton, 1893								X, *
Pericoma (*Pericoma*) *diversa* Tonnoir, 1920	*	*					*	X, *
Pericoma (*Pachypericoma*) *fallax* Eaton, 1893	*				X, *			
Pericoma (*Pericoma*) *latina* Sarà, 1954	*						*	X, *
Pericoma (*Pericoma*) *modesta* (Tonnoir, 1922)								*
Pericoma (*Pericoma*) *pseudoexquisita* Tonnoir, 1940	*						*	X
Pericoma (*Pericoma*) *trifasciata* (Meigen, 1804)							*	
Pneumia reghayana (Boumezzough & Vaillant, 1986)							*	
Vaillantodes fraudulentus (Eaton, 1896)							*	
Tonnoiriella paveli Ježek, 1999								X, *

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: I. Saidoun: Writing the original draft, collecting the specimens in the field, taxonomic identification and revising the manuscript; M.A. El Mouden: collecting the specimens in the field and technical review of the manuscript; S. Boussaa: Reviewed the manuscript & B. Belqat: Conceptualized and supervised the work, reviewed and edited the manuscript. The authors read and approved the final version of the manuscript.

FUNDING

This research received no specific grant from any funding agencies.

AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Diptera Collection of the Faculty of Sciences, University Abdelmalek Essaâdi, Tétouan, Morocco (UAE-FST), the Laboratory and Museum of Evolutionary Ecology, Department of Ecology, University of Presov, Slovakia (LMEE PO) and in the National Museum Prague, Czech Republic (NMPC), and are available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

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

We deeply thank the High Commissioner for Water and Forests and the Fight against Desertification (Kingdom of Morocco, Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests) for authorizing a Scientific Permit (decision N°. 12//2018 HCEFLCD/DLCDPN/CFF) to collect Diptera in the field. We are very grateful to Professor Peter H. Adler (Clemson University) for having so kindly revised our text. We would like to thank Dr. Jan Ježek who helped with the identification of certain species and by providing constructive comments. We are also grateful to Dr. Jozef Oboňa who kindly collaborated the identification of some species and to Mr. Alessio Morelli for guiding us through the first identifications at the generic level.

REFERENCES

Afzan, H. & Belqat, B. (2016) Faunistic and bibliographical inventory of the Psychodinae moth-flies of North Africa (Diptera, Psychodidae). *ZooKeys*, 558, 119–145. https://doi.org/10.3897/zookeys.558.6593

Akhoundi, M., Ranorohasimanana, N.M., Brun, S., Kauffmann-Lacroix, C. & Izri A. (2022) *Clogmia albipunctata* (Nematocera; Psychodidae) as the Etiologic agent of myiasis: True or false?. *Diagnostics*, 12 (9), 2129. https://doi.org/10.3390/diagnostics12092129

Boumezzough, A. & Vaillant, F. (1986) Quelques Diptères Psychodidae Psychodinae du Grand Atlas marocain. *Entomologiste*, 42 (4), 237–239.

Bravo, F. (2008) Three new species of *Alepia* Enderlein (Diptera, Psychodidae, Psychodinae) from the Brazilian semi-arid region. *Zootaxa,* 1805, 52–60. https://doi.org/10.11646/zootaxa.1805.1.2

Bravo, F. & Araújo, M.X. (2013) Two new species of moth flies (Diptera, Psychodidae) from the semi-arid region of Brazil. *Zootaxa,* 3693 (1), 085–090. https://doi.org/10.11646/zootaxa.3693.1.6

Bravo, F., Cordeiro, D. & Chagas, C. (2006) Two new species and new records of *Psychoda* Latreille (Diptera: Psychodidae: Psychodinae) from Brazil, with comments on supraspecific classification of the genus. *Zootaxa*, 1298, 1–15. https://doi.org/10.11646/zootaxa.1298.1.1

Carles-Tolrá, M. (2002) Catálogo de los Diptera de España, Portugal y Andorra (Insecta). *Monografías Sociedad Entomológica Aragonesa, 8. Sociedad Entomológica Aragonesa (SEA)*, 8, 1–323.

Cobo, F., Soriano, Ó. & Báez, M. (2002) Catálogo de los Diptera de España, Portugal y Andorra. *Monografías Sociedad Entomológica Aragonesa*, 8, 66–67.

Cordeiro, D.P. (2009) *Taxonomia De Psychoda Latreille, 1796 (Diptera, Psychodidae, Psychodinae) No Brasil*. Ph.D Dissertation, Federal University of Paraná, Curitiba. 89 p.

Cordeiro, D. & Bravo, F. (2008) A new species of viviparous moth fly (Diptera, Psychodidae, Psychodinae) from the Brazilian Amazon. *Biota Neotropica*, 8 (2), 115–119. https://doi.org/10.1590/S1676-06032008000200013

Cordeiro, D., Bravo, F. & Carvalho, C.J.B.D. (2011) Taxonomy of Brazilian *Psychoda* Latreille, 1796 (Diptera, Psychodidae) with the description of thirteen new species. *Zootaxa*, 3101, 1–37. https://doi.org/10.11646/zootaxa.3101.1.1

Dakki, M. (1997) *Etude Nationale sur la Biodiversité, Faune Aquatique Continentale*. Rapport PNUE & Ministère d'environnement, Maroc. 117 p.

Duckhouse, D.A. (1968) Psychodidae (Diptera, Nematocera) collected by Mr. Plaumann in Southern Brazil. *Proceedings of the Royal Entomological Society of London. Series B, Taxonomy*, 37 (3–4), 29–40. https://doi.org/10.1111/j.1365-3113.1968.tb00193.x

El-Badry, A., Salem, H.Kh. & Edmardash, Y.A. (2014) Human urinary myiasis due to larvae of *Clogmia* (*Telmatoscopus*) *albipunctata* Williston (Diptera: Psychodidae) first report in Egypt. *Journal of Vector Borne Diseases*, 51, 247–249.

Espíndola, A., Buerki, S., Jacquier, A., Ježek, J. & Alvarez, N. (2012) Phylogenetic relationships in the subfamily Psychodinae (Diptera, Psychodidae). *Zoologica Scripta*. https://doi.org/10.1111/j.1463-6409.2012.00544.x

Gibernau, M. & Albre, J. (2022) First insights on the diversity of the genus *Psychoda* Latreille (Diptera: Psychodidae) in Corsica using DNA barcoding. *Annales de la Société Entomologique de France,* 58 (1), 81–91. https://doi.org/10.1080/00379271.2022.2037461

Ježek, J. (1985) Contribution to the knowledge of a new subtribe Trichopsychodina (Diptera, Psychodidae) from Czechoslovakia. *Acta Museu Nationalis Pragae*, 40, 65–92.

Ježek, J. (1987) Results of the Czechoslovak-Iranian Entomological Expedition S to Iran 1973-1987 *Iranotelmatoscopus hajiabadi* gen. n., sp. n. (Diptera, Psychodidae) from the Palaearctic region. *Acta Entomologica Musei Nationalis Pragae*, 42, 5–10.

Ježek, J. (1990) Contribution to the taxonomy of some genera of Paramormiine moth flies (Diptera, Psychodidae) with description of a new genus *Karakovounimerus*. *Acta Entomologica Musei Nationalis Pragae*, 43, 129–157.

Ježek, J. (1995) Psychodidae (Diptera) of Greece. *Acta Musei Nationalis Pragae, Series B, Historia Naturalis* 50 (1–4), 107–124.

Ježek, J. (1999) Rare and new Palaearctic *Tonnoiriella*-species (Diptera, Psychodidae). *Časopis Národního Muzea, Řada Přírodovědná*, 168, 7–18.

Ježek, J. (2003) New faunistic data and check list of non Phlebotomine moth flies (Diptera, Psychodidae) from the Czech and Slovak Republics. *Časopis Národního Muzea, Řada přírodovědná*, 172, 121–132.

Ježek, J. (2004a) New and interesting moth flies (Diptera, Psychodidae) from protected and underestimated natural areas of the Czech Republic. *Časopis Národního Muzea, Řada Přírodovědná*, 173, 113–128.

Ježek, J. (2004b) New Faunistic Data of non-phlebotomine moth Flies (Diptera, Psychodidae) from the Palaearctic region. *Dipterologica Bohemoslovaca*, 109 (11), 141–151.

Ježek, J. & Goutner, V. (1993) Two interesting species of moth flies (Diptera: Psychodidae) from Greece. *Aquatic insects*, 15 (3), 185–191. https://doi.org/10.1080/01650429309361516

Ježek, J. & Hájek, J. (2007) Psychodidae (Diptera) of the Orlické hory Protected Landscape Area and neighbouring areas with descriptions of two new species from the Czech Republic. *Acta Entomologica Musei Nationalis Pragae*, 47, 237–285.

Ježek, J. & van Harten, A. (2009) Order Diptera, family Psychodidae Subfamily Psychodinae (non-biting moth flies). *Arthropod fauna of the UAE. Dar Al Ummah Publishing*, Abu Dhabi, 2, 686–711.

Ježek, J. & Oboňa, J. (2019) Three new species of moth flies (Diptera, Psychodidae, Psychodinae) from the Afrotropical Region. *Zootaxa*, 4577 (1), 073–090. https://doi.org/10.11646/zootaxa.4577.1.4

Ježek, J. & Omelková, M. (2012) Moth flies (Diptera: Psychodidae) of the Bílé Karpaty Protected Landscape Area and Biosphere Reserve (Czech Republic). *Acta Musei Moraviae,* Scientiae biologicae (Brno), 96 (2), 763–802.

Ježek, J. & Yağci, Ş. (2005) Common non-biting moth flies (Insecta, Diptera, Psychodidae) new to the fauna of Turkey. *Acta Parasitologica Turcica*, 29, 188–192.

Ježek, J., Vonička, P. & Preisler, J. (2008) Psychodidae (Diptera) of the Jizerské hory Mts and Frýdlant region (northern Bohemia, Czech Republic). *Sborník Severočeského Muzea, Přírodní Vědy, Liberec*, 26, 129–151.

Ježek, J., Lukáš, J., Kvifte, G.M. & Oboňa, J. (2012) New faunistic records of non-biting moth flies (Diptera: Psychodidae) from the Czech Republic and Slovakia. *Klapalekiana*, 48, 121–126.

Ježek, J., Chvojka, P., Manko, P. & Oboňa, J. (2017) Faunistic and bibliographical inventory of moth flies from Ukraine (Diptera, Psychodidae). *ZooKeys*, 693, 109–128. https://doi.org/10.3897/zookeys.693.13652

Ježek, J., Grootaert, P., Lock, K., Manko, P. & Oboňa, J. (2018a) Moth flies (Diptera: Psychodidae) from the Belgian transition of the Atlantic to the Central European faunal zones. *Biodiversity & Environment*, 10 (2), 5–17.

Ježek, J., Manko, P. & Oboňa, J. (2018b) Checklist of known moth flies and sand flies (Diptera, Psychodidae) from Armenia and Azerbaijan. *ZooKeys*, 798, 109–133. https://doi.org/10.3897/zookeys.798.26543

Ježek, J., Oboňa, J., Grootaert, P., Lock, K., Manko, P. & Dekoninck, W. (2020) Review of two Tonnoir moth fly species, overlooked for a century (Diptera: Psychodidae: Psychodinae). *Acta Entomologica Musei Nationalis Pragae*, 60 (2), 517–526. https://doi.org/10.37520/aemnp.2020.034

Ježek, J., Manko, P. & Oboňa, J. (2021) Psychodidae (Diptera) of Azerbaijan and Georgia–faunistics with biodiversity notes. *ZooKeys*, 1049, 15–42. https://doi.org/10.3897/zookeys.1049.66063

Ježek, J., Oboňa, J. & Manko, P. (2023) Moth flies (Diptera: Psychodidae) of Abkhazia (western Caucasus, Georgia) with some additional faunistic data from Armenia, Georgia, and Russia. *Historia Naturalis Bulgarica*, 45 (4), 57–82. https://doi.org/10.48027/hnb.45.041

Kettani, K., Ebejer, M.J., Ackland, D.M., Bächli, G., Barraclough, D., Barták, M., Tolrá, M.C., Černý, M., Cerretti, P., Chandler, P. & Dakki, M.. (2022) Catalogue of the Diptera (Insecta) of Morocco an annotated checklist, with distributions and a bibliography. *ZooKeys*, 1094, 1–466. https://doi.org/10.3897/zookeys.1094.62644

Kroča, J. & Ježek, J. (2015) Moth flies (Diptera: Psychodidae) of the Moravskoslezské Beskydy Mts and the Podbeskydská pahorkatina Upland, Czech Republic. *Acta Musei Silesiae, Scientiae Naturales*, 64, 27–50. https://doi.org/10.1515/cszma-2015-0006

Kroča, J. & Ježek, J. (2019) Moth Flies (Diptera: Psychodidae) of the Moravskoslezské Beskydy Mts and Podbeskydská pahorkatina Upland, Czech Republic, II. *Acta Musei Silesiae, Scientiae Naturales*, 68 (3), 201–232. https://doi.org/10.2478/cszma-2019-0021

Kvifte, G.M. (2018) Molecular phylogeny of moth flies (Diptera, Psychodidae, Psychodinae) revisited, with a revised tribal classification. *Systematic Entomology*, 43 (3), 596–605. https://doi.org/10.1111/syen.12288

Kvifte, G.M. & Ivković, M. (2018) New species and records of the *Pericoma trifasciata* group from Croatia (Diptera: Psychodidae). *Zootaxa*, 4486 (1) 76–82. https://doi.org/10.11646/zootaxa.4486.1.5

Kvifte, G.M., Håland, Ø. & Andersen, T. (2011) A revised checklist of Norwegian moth flies (Diptera, Psychodidae). *Norwegian Journal of Entomology*, 58, 180–188.

Kvifte, G.M., Stokkan, M. & Wagner, R. (2016) Review of the Psychodinae from Mallorca, Spain, with description of *Pericoma unipennata*, sp. n. (Diptera, Psychodidae). *ZooKeys*, 577, 149–160. https://doi.org/10.3897/zookeys.577.7679

Morelli, A. & Bruno Biscaccianti, A. (2021) New records of moth flies (Diptera Psychodidae) mainly from protected areas of peninsular Italy. *Redia*, 104, 111–123. https://doi.org/10.19263/redia-104.21.12

Oboňa, J. & Ježek, J. (2012a) First records of dendrolimnetic moth flies (Diptera: Psychodidae) from Slovakia. *Klapalekiana*, 48, 279–287.

Oboňa, J. & Ježek, J. (2012b) Range expansion of the invasive moth midge *Clogmia albipunctata* (Williston, 1893) in Slovakia (Diptera: Psychodidae). *Folia faunistica Slovaca*, 17 (4), 387–391.

Oboňa, J. & Ježek, J. (2014) Prodromus of moth flies (Diptera: Psychodidae) from Slovakia. *Acta Musei Silesiae, Scientiae Naturales*, 63 (3), 193-251. https://doi.org/10.2478/cszma-2014-0020

Oboňa, J., Ježek, J., Kanašová, K. & Manko, P. (2021) Hiding in plain sight: new records and endangered flies (Diptera) from a tree-hole in an urban park (Prešov, Slovakia). *Acta Musei Silesiae, Scientiae Naturales*, 70 (1), 75–81. https://doi.org/10.2478/cszma-2021-0005

Oboňa, J., Pintilioaie, A.M., Topală, L.E. & Ježek, J. (2023a) First record of *Clogmia albipunctata* and *Atrichobrunettia* (*Mirousiella*) *graeca* (Diptera: Psychodidae) from Romania, with the updated checklist of non-Phlebotominae species. *Historia naturalis bulgarica*, 45 (5), 149–154. http://doi.org/10.48027/hnb.45.055

Oboňa, J., Pont, F.L., Goutorbe, J.M. & Ježek, J. (2023b) The moth flies (Diptera: Psychodidae) of different ecosystems of the karst Barrois plateau, France. *Biodiversity & Environment*, 15 (2), 11–16.

Omelková, M. & Ježek, J. (2012) A new species of the genus *Trichomyia* (Diptera: Psychodidae) and new faunistic data on non-phlebotomine moth flies from the Podyjí NP and its surroundings (Czech Republic). *Acta Entomologica Musei Nationalis Pragae*, *52* (2), 505–533.

Pape, T., Beuk, P. & Wagner, R. (2004) *EU-nomen: Clytocerus (Boreoclytocerus) Duckhouse, 1978*. Available from: https://www.eu-nomen.eu/portal/taxon.php?GUID=urn:lsid:faunaeur.org:taxname:141242 [Accessed December 15, 2023]

Pape, T., Blagoderov, V. & Mostovski, M.B. (2011) Order Diptera Linnaeus, 1758. In: Zhang Z-Q. (ed.) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa*, 3148, 222–229. https://doi.org/10.11646/zootaxa.3148.1.42

Salamana, G. (1974) *Le attuali conoscenze sugli Psycodidae della sardegna (Diptera Nematocera)*. Insituto di Zoologia dell'Università Genova, Via Balbi, 5. 16126, Genova, 715-722.

Salmela, J. (2010) Tahmelan lähteikön aikuiset semiakvaattiset sääsket ja muut vesihyönteiset lajisto ja suojeluarvo. *Diamina*, 19, 6–14.

Satchell, G.H. (1955) New and little known Algerian and Canary Islands Psychodidae. *Annals of the Natal Museum*, 13 (2), 101–120.

Tonnoir, A. (1920) Notes sur quelques Psychodidae africains. *Revue Zoologique Africaine*, 8, 127–147. https://doi.org/10.5962/bhl.part.22391

Tonnoir, A. (1922) Contribution à l'étude des Psychodidae d'Afrique (Dipt.). *Bulletin de la Société Entomologique d'Égypte*, pp. 81–112.

Vaillant, F. (1955) Recherche sur la faune Madicole de France, de Corse et d'Afrique du Nord. *Mémoire du National d'histoire Naturelle* Série A. *Zoologie*, 11 (1), 233–246.

Vaillant, F. (1971–1983) 9d. Psychodidae-Psychodinae (not finished). In: Lindner E (ed.) *Die Fliegen der palaearktischen Region*. Stuttgart. 287, (1971), 1–48; 291, (1972), 49–78; 292, (1972), 79–108; 305, (1974), 109–142; 310, (1975), 143–182; 313, (1977), 183–206; 317, (1978), 207–238; 320, (1979), 239–270; 326, (1981), 271–310; 328, (1983), 311–357.

Vaillant, F. (1990) Propositions pour une révision de la classification des Diptères Psychodidae Psychodinae. *Bulletin de la Société Vaudoise des Sciences Naturelles*, 80, 141–163.

Wagner, R. (1977) Zur kenntnis der Psychodiden fauna des Allgäus (Diptera, Nematocera). *Nachrichtenblatt der Bayerischen Entomologen*, 26, 23–28.

Wagner, R. (1987) Tunesische Psychodiden (Diptera, Psychodidae). *Entomofauna*, 8, 9–25.

Wagner, R. (1990) Family Psychodidae. In: Soós, Ã. & Papp, L. (eds) *Catalogue of Palaearctic Diptera. 2. Psychodidae-Chironomidae*. Akadémiai Kiadó, Budapest, pp. 1–499.

Wagner, R. (1997) Diptera Psychodidae, Moth Flies. In: Nilsson, A. (ed.) *The Aquatic Insects of North Europe 2*. Apollo Books Aps., Stenstrup, pp. 133–144.

Wagner, R. & Withers, P. (2020) The West-Palearctic species of the genus *Tonnoiriella* Vaillant, 1971 (Diptera: Psychodidae, Psychodinae). *Zootaxa*, 4728 (2), 183–210. https://doi.org/10.11646/zootaxa.4728.2.2

Withers, P. (1989) Moth flies. Diptera: Psychodidae. *Dipterists Digest*, 4, 85.

Withers, P. & O'Connor, J.P. (1992) A preliminary account of the Irish species of moth fly (Diptera: Psychodidae). *Proceedings of the Royal Irish Academy*. Section B, 92 (5), 61–77.

Zittra, C., Schoener, E.R., Wagner, R., Heddergott, M., Duscher, G.G. & Fuehrer, H.P. (2020) Unnoticed arrival of two dipteran species in Austria: the synanthropic moth fly *Clogmia albipunctata* (Williston, 1893) and the parasitic bird louse fly *Ornithoica turdi* (Olivier in Latreille, 1811). *Parasitology Research*, 119, 737–740. https://doi.org/10.1007/s00436-019-06563-9

گزارش جدید از جنس‌ها و گونه‌های دوبالان شب‌پره‌ای (Diptera, Psychodidae: Psychodinae) از مراکش

ایمان صیدون[1]، محمد الأمین المودن[1]، سامیهٔ بوساع[2]، بوثینهٔ بلقات[1]

۱ دانشکده علومف دانشگاه عبدالمالک اسعادی، تطوان، مراکش
۲ مؤسسه عالی علوم پرستاری و بهداشت، وزارت بهداشت و حمایت اجتماعی، رباط، مراکش.

* پست الکترونیک نویسنده مسئول مکـاتبه: *bbelqat@uae.ac.ma*

| **تاریخ دریـافت:** ۲۵ اردیبهشت ۱۴۰۳ | **تاریخ پذیرش:** ۱۳ مهر ۱۴۰۳ | **تاریخ انتشار:** در حال چاپ |

چکیـده: بررسی دوبالان شب‌پره‌ای در مناطق کوهستانی و بیابانی مراکش منجر به شناسایی ۲۰ گونه و پنج جنس شد که از بین آنها ۱۰ گونه برای اولین بار از این کشور ثبت می‌شوند. شش گونه شامل *Atrichobrunettia* *graeca* Ježek & Goutner, 1993 (*Mirousiella*)، *Lepiseodina rothschildi* (Eaton, 1912)، *Mormia* *revisenda* (Eaton, 1893)، *Pericoma* (*Pachypericoma*) *fallax* Eaton, 1893، *Pericoma* (*Pericoma*) *trifasciata* (Meigen, 1804) و دو جنس *Psychoda* (*Chodopsycha*) *divaricata* Duckhouse, 1968 و *Atrichobrunettia* Satchell, 1953 و *Lepiseodina* Enderlein, 1937 برای شمال آفریقا جدید هستند. علاوه بر این، سه و یک گونه به ترتیب برای منطقه ریف و کوه‌های بنی‌سنسن جدید هستند. همچنین، هفت گونه برای اولین بار در منطقه اطلس گزارش شده و یک گونه نیز برای منطقه صحرای بزرگ جدید است. اطلاعاتی در مورد زیستگاه‌های ۲۰ گونه ارایه شده است. با در نظر گرفتن نتایج این این بررسی، تعداد گونه‌های شناخته شدهٔ دوبالان شب‌پره‌ای در مراکش را به ۳۷ گونه افزایش یافت.

واژگـان کلیدی: اطلس، تنوع زیستی، بنی‌سنسن، توزیع، زیستگاه، شمال آفریقا، ریف، صحرا