

***Tachydromia* Meigen, 1803 (Diptera: Hybotidae) from Morocco: Description of two new species with notes on ecology and a key to Moroccan species**

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ABSTRACT. Two species of the genus *Tachydromia* Meigen, 1803 are illustrated and described from the western Moroccan Rif as new for science: *Tachydromia moroccensis* sp.n. and *Tachydromia rifensis* sp.n. *Tachydromia arrogans* (Linnaeus, 1761) is reported here from several new localities, thus expanding its distribution area within the country. Ecological data of the three species are provided. A key to Moroccan species of *Tachydromia* is given. How to cite this article: Zouhair L., Grootaert P., Kettani K. 2026. *Tachydromia* Meigen, 1803 (Diptera: Hybotidae) from Morocco: Description of two new species with notes on ecology and a key to Moroccan species // *Invert. Zool.* Vol.23. No.1. P.160–174. doi: 10.15298/invertzool.23.1.10

KEY WORDS: dance flies, Empidoidea, North Africa, Tachydromiinae, taxonomy, identification key.

***Tachydromia* Meigen, 1803 (Diptera: Hybotidae) в Марокко: описания двух новых видов с заметками по их экологии и ключ для определения марокканских видов рода**

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РЕЗЮМЕ. Даны иллюстрированные описания двух новых для науки вида мух-толкунчиков рода *Tachydromia* Meigen, 1803 из западной части хребта Эр-Риф: *Tachydromia moroccensis* sp.n. и *Tachydromia rifensis* sp.n. *Tachydromia arrogans* (Linnaeus, 1761) отмечен в нескольких новых местонахождениях, что расширяет его ареал в Марокко. Приведены данные по экологии всех трех видов. Дан ключ для определения марокканских видов рода *Tachydromia*.

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КЛЮЧЕВЫЕ СЛОВА: мухи-толкунчики, Empidoidea, Северная Африка, Tachydromiinae, таксономия, определительный ключ.

Introduction

Tachydromia Meigen, 1803 is a genus affiliated to the subfamily Tachydromiinae and the tribe Tachydromiini, encompassing a group of small-bodied ant-like flies, typically measuring from 1.0 to 3.5 mm in length (Plant, Deeming, 2006; Shamshev, Grootaert, 2010). *Tachydromia* species are considered as one of the most attractive flies in the family Hybotidae, due to their distinctive external appearance (Grootaert, Shamshev, 2012) which can be recognized by the following combination of characters: eyes bare, dichoptic in both sexes, broadly separated on frons and contiguous on face; palpus usually narrow; thorax slender, largely shining, precoxal bridge present, postpronotal lobe well differentiated, scutum usually distinctly longer than broad, thoracic setation usually greatly reduced; legs slender but fore femur often thickened; wing with distinct anal lobe, usually brown banded, clouded or spotted, with veins A1 and CuA2 absent and cell cup absent (Shamshev, Grootaert, 2010; Grootaert, Shamshev, 2012; Sinclair, Cumming, 2017). The degree of sexual dimorphism within the genus is most apparent in males, which often exhibit special modifications (color pattern, spines, tubercles, etc.) on the fore or mid legs (Grootaert, Shamshev, 2012). The genus *Tachydromia* was historically divided by Chvála (1970, 1975) into eight species groups (*annulimana*, *arrogans*, *calcanea*, *connexa*, *interrupta*, *ornatipes*, *punctifera* and *terricola*), a morphological classification that remains widely used to this day. More recently, Stark, Doczkal (2017) proposed a ninth group, the *acklandi* group, also based on distinctive morphological characters. However, in a more phylogenetic approach, Shamshev, Grootaert (2018) provisionally proposed a new division of the genus into six main lineages (*T. papuana*, *T. arrogans*, *T. fuscinervis*, *T. connexa*, *T. terricola* and *T. annulimana*). This classification based on a cladistic analysis of morphological characters.

Like other Tachydromiinae genera, adults of *Tachydromia* are known for their predatory activity, but they are not so highly predacious as for instance *Platypalpus* Macquart, 1827 or *Chersodromia* Walker, 1849 species (Chvála, 1975), due to their limited flight capabilities, with some species being brachypterous or completely apterous (Plant, Deeming, 2006; Gonçalves *et al.*, 2021). On the other hand, they can run very rapidly for short distances to catch their prey on vertical surfaces such as tree-trunks, palings or walls, and on horizontal surfaces on the ground, logs, stones, ground vegetation, large leaves of lower herbage, microhabitats that can occur both in forests and in open or semi-open environments (Chvála, 1970, 1975; Gonçalves *et al.*, 2021). Some other species are typical of sandy or coastal habitats, while others have been recorded in agricultural fields, where they likely act as natural biocontrol agents against certain pests (Chvála, 1975; Kühne, Schrameyer, 1994; Steinborn, Meyer, 1994; Weber *et al.*, 1997; Rodríguez-Rodríguez, Gómez-Ramos, 2005; Alcázar, Alba, 2014; Goula, Mata, 2014; Gitzel *et al.*, 2025). Their prey mainly consists of small, soft-bodied Nematocera (e.g. Sciaridae, Cecidomyiidae) (Chvála, 1970; Gonçalves *et al.*, 2021). So far, nothing is known about the larvae of *Tachydromia*.

The genus *Tachydromia* is worldwide in distribution and currently includes 108 species (Shamshev, Grootaert, 2018). However, the majority of these species were found in the Palearctic realm, which likely reflects the intensity of the research conducted in this region and future discoveries may correct this statement (Shamshev, Grootaert, 2005), as recently demonstrated by the description and recording of several species from the Nearctic realm by Shamshev, Grootaert, 2024. In North Africa, the genus is reported in Algeria, Morocco and Tunisia (Vaillant, 1952; Shamshev, Grootaert, 2009; Kettani *et al.*, 2022). As for Morocco which constitutes the area of the present study,

Table 1. Localities with respective protected areas, altitudes and Coordinates of the studied sites.

Site	Protected area, locality	Province	Altitude	Geographical coordinates
1. Khandak Mellouka	MIBR, Aïn Lahcen	Tétouan	313 m	35.5601 N, −5.578017 W
2. Rmel	Fahs-Anjra	Fahs-Anjra	372 m	35.792777 N, −5.698333 W
3. Oued El Kelaa	NPTL, Akoumi	Chefchaouen	449 m	35.238389 N, −5.175486 W
4. Adrou	NPBH, Tazrout	Larache	556 m	35.225638 N, −5.323430 W
5. Mchichouen	NPBH, Tazrout	Larache	640 m	35.3274761 N, −5.4741889 W
6. Chellal Akchour	NPTL, Akchour	Chefchaouen	860 m	35.244398 N, −5.163595 W
7. Lac Bouhachem	NPBH, Bouhachem	Larache	1096 m	35.273888 N, −5.493888 W
8. Riba	NPBH, Tazrout	Larache	1421 m	35.155000 N, −5.433000 W
9. Oued Talassemtane	NPTL, Talassemtane	Chefchaouen	1645 m	35.143336 N, −5.139960 W

only three species of *Tachydromia* are recorded so far, represented by *T. annulimana* Meigen, 1822, *T. arrogans* (Linnaeus, 1761) and *T. undulata* Strobl, 1906 (Ebejer *et al.*, 2019; Kettani *et al.*, 2022). Consequently, we aim by the present paper to address existing gaps in the study of the genus *Tachydromia* in Morocco, by describing two new species and expanding the known distribution range of the species *T. arrogans* Linnaeus within the country. The two new species are described and illustrated. Ecological notes of the three species are given, besides an identification key for Moroccan species.

Material and Methods

Study area

All the specimens under study here were collected by the third author and her students during surveys on Moroccan flies between the years 2016 and 2025, from nine sites in the Western Rif (Table 1, Fig. 1). The Rif consists of a prominent mountainous chain occupying the northernmost part of Morocco, extending from the Strait of Gibraltar to the valley of Moulouya, bordered by the Mediterranean Sea to the north and the Atlantic Ocean to the west. This unique geographical position gives it a diverse array of bioclimates ranging from semi-arid to humid. The interplay of orographic, geological, and climatic fac-

tors enhances the region's biodiversity, resulting in a wide variety of terrestrial and aquatic ecosystems with diverse habitats.

In the western part of the Rif, which constitutes our study area, the landscape is notably rugged and mountainous. The region's exposure to humidity of both the Atlantic and Mediterranean climates promotes the growth of lush and dense forests, dominated by fir, oak, pine, and cedar formations, which thrive across large areas (Rhattas *et al.*, 2015), favoring the existence of an outstanding fauna. The ecological particularities of the Western Rif have led to the inclusion of part of this region in the Mediterranean Intercontinental Biosphere Reserve (MIBR), making it the only Moroccan area represented in this transcontinental reserve, which constitutes the first of its kind in the world to connect two continents (Morocco and Spain) and to include parts of the international waters. Its main objective is to preserve the most emblematic natural areas of northern Morocco and southern Spain. The Western Rif is also home to two main protected areas: the National Park of Talassemtane (NPTL) and the Natural Park of Bouhachem (NPBH), which encompass most of the studied sites. These parks play a critical role in conserving the region's biodiversity and protecting endemic species.

Methodology

The specimens of *Tachydromia* were collected using Malaise traps and sweep net. The samples are preserved in alcohol and deposited at the Laboratory

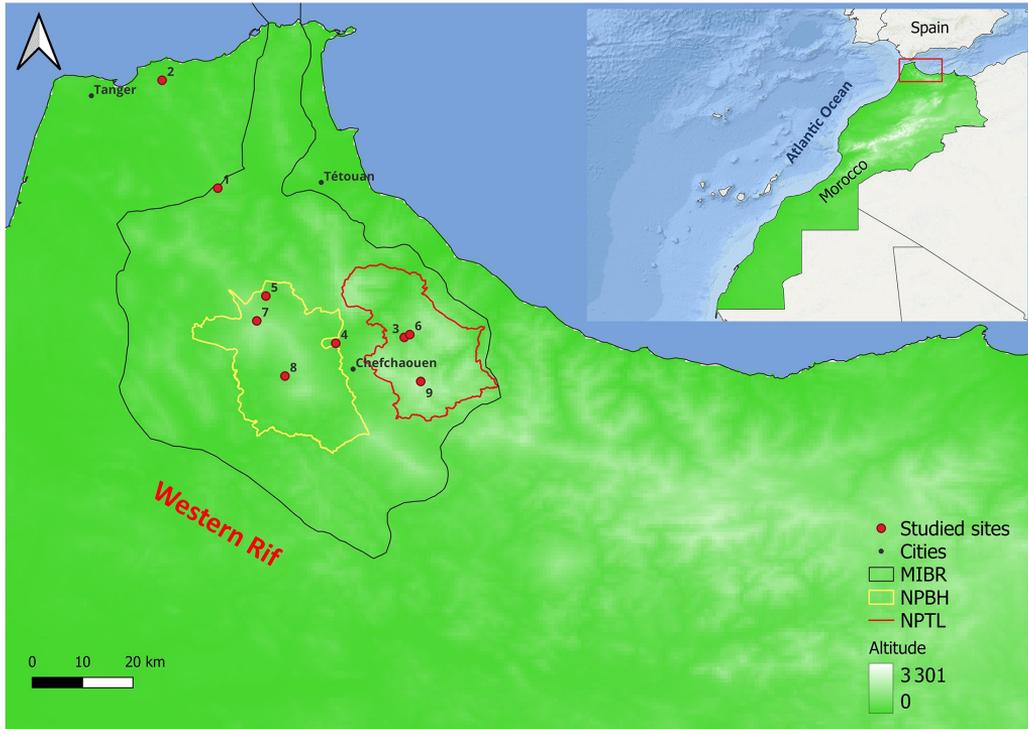


Fig. 1. Location of the studied sites within the Moroccan Western Rif.

of Ecology, Systematics and Conservation of Biodiversity at the University Abdelmalek Essaadi in Tétouan (LESCB). Holotypes of new species are deposited in the collections of the Royal Belgian Institute of Natural Sciences in Brussels, Belgium (RBINS).

All species identification was conducted based on their external morphology and male terminalia. To facilitate detailed observations, male terminalia were macerated in 10% KOH for 24 h.

All illustrations of male terminalia given in this paper are made by the second author, using a camera lucida attached to a compound microscope. The specimens were identified and photographed using a Kern ODC-2-BA-e-1910 camera attached to a Kern OZO 553 stereo microscope.

Species were identified using the keys provided by Chvála (1970, 1975). The terminology and descriptive format of the new species used herein follow Grootaert & Shamshev (2011). The classification of the species groups follows Chvála (1970).

The following abbreviations are used in some illustrations of the male terminalia of new species: ap — appendices; hy — hypandrium; lc — left cercus; lel — left epandrial lamella; ls — left surstylus; rc — right cercus; rel — right epandrial lamella; rs — right surstylus.

Results

Tachydromia moroccensis Zouhair et Grootaert **sp.n.** Figs 2–3.

TYPE MATERIAL. Holotype: Rif. ♂; Mchichouen; 11.v. – 11.vi.24; Malaise trap; K. Kettani leg (RBINS).

DIAGNOSIS. Blackish brown species of *terricola*-group, with lower part of occiput densely greyish pollinose, palpus whitish transparent, slender and elongate, bearing long black subapical seta. Thorax almost entirely shining. Legs mainly yellow, mid femur with a shallow round excision near base beneath. Wings almost entirely faintly brown clouded, leaving only base, apex of wing, along the vein Cu1 above and a long spot at marginal cell hyaline. Halteres whitish.

DESCRIPTION. Male (Fig. 2A). Length. Body: 2.5 mm; wing: 2.1 mm.

Head black in ground color. Eyes with posterior margin produced far beyond ocellar tubercle. Post-ocular margins broadly polished including vertex and ocellar tubercle, lower part of occiput densely greyish pollinose, with pale setae around neck and near

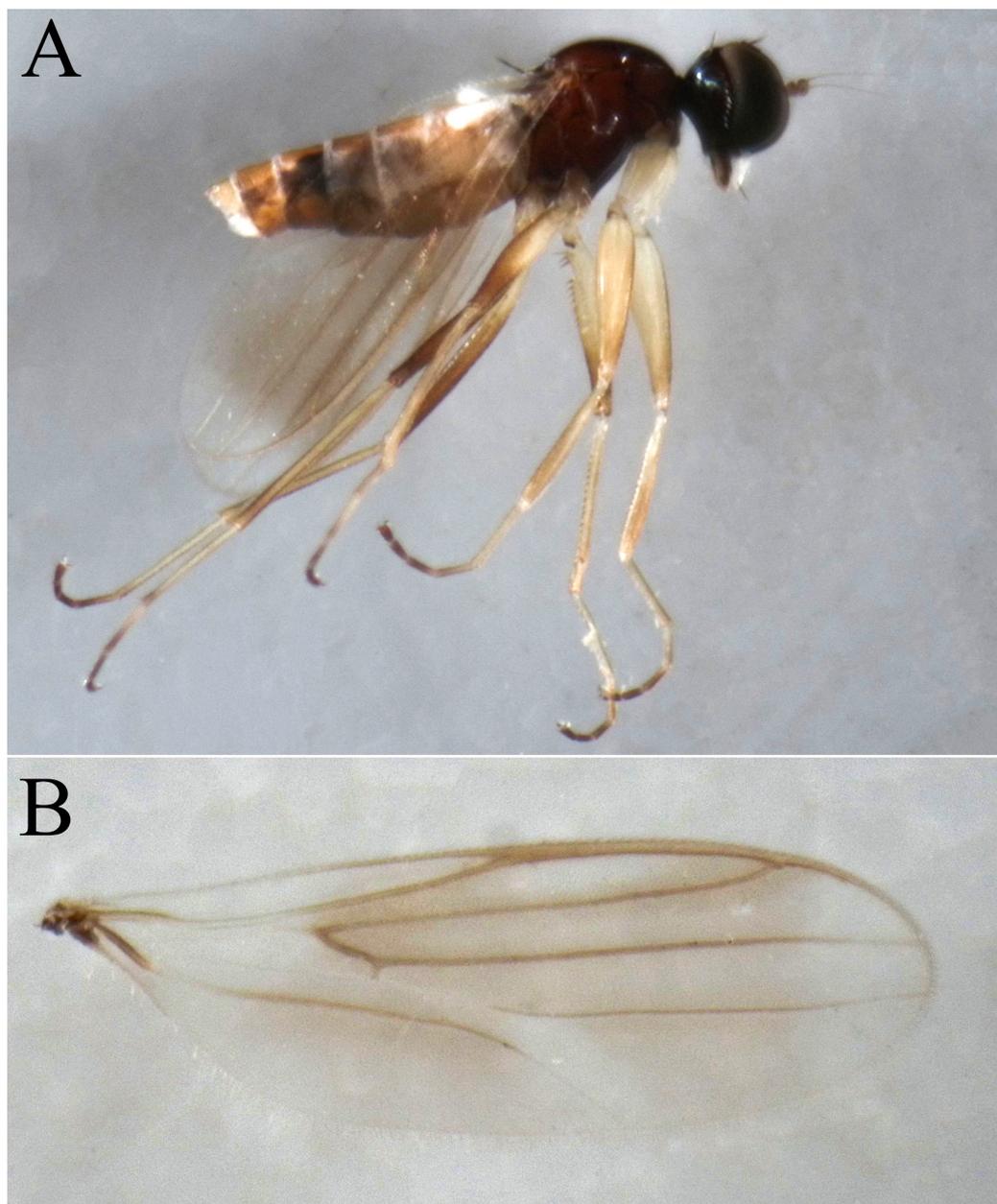


Fig. 2. *Tachydromia moroccensis* sp.n. A — habitus male; B — wing. Scale 0.1 mm.

mouth-opening and row of pale minute postoculars, a pair of long, black, inclinate verticals. Ocellar tubercle with two moderately long, black, latero-clinate setae. Frons polished in upper part, somewhat long, widened, about 2x as pedicel is deep, parallel-sided. Antenna with pedicel dark yellow, postpedicel and stylus brownish, postpedicel very small, spherical, stylus very long about 4x as long as rest of antenna.

Proboscis blackish brown. Palpus whitish transparent, slender, elongate, slightly shorter than proboscis; with silvery pale setae and long, black, subapical seta.

Thorax shining blackish brown, leaving propleuron densely silvery dusted, postalar callus and scutellum dull greyish dusted. Postpronotal lobe large, lacking conspicuous setae, with some minute pale setulae. Mesonotum with 1 black notopleural, 1

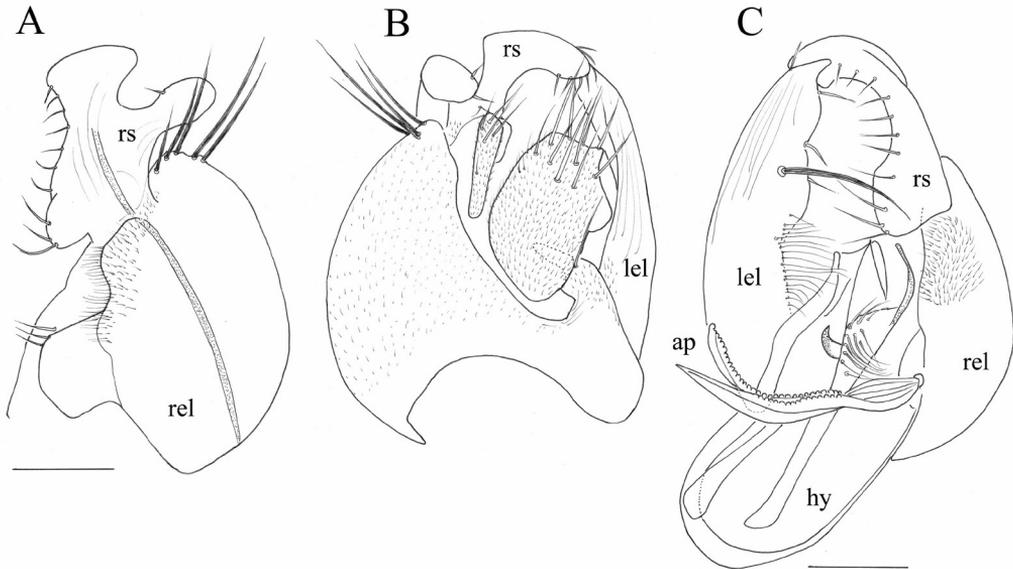


Fig. 3. *Tachydromia moroccensis* sp.n. A — right epandrial lamella with right surstylus, lateral; B — epandrium, dorsal; C — epandrium, ventral. Scale 0.1 mm.

short black postalar and two pairs of scutellars (the inner long black and thick, outer very minute and pale). Acrostichals and dorsocentrals uniserial pale and very minute, prescutellar pair somewhat longer. Legs very long, slender, mainly yellow, except of hind four coxae, anterior four femora dorsally and basal third of hind femora brownish, tibiae mainly brownish, tarsi brownish with last three segments darker. Coxae with pale unmodified setae; upper part of fore coxa densely silvery dusted. Fore femur thickened, with a row of fine, pale, anteroventral and posteroventral setulae becoming longer towards base. Fore tibia spindle-shaped, clearly stouter than long, slender mid and hind tibiae. Mid femur with 2 rows of brown spinules becoming shorter and disappearing towards apex, with a shallow round excision near base beneath, bearing 1 black spine and some (3–4) short, thick, black bristles towards base. Mid tibia beneath before tip with hardly indicated round swelling, bearing 1 distinct, nearly triangular, brown spine before it, row of black, hardly prominent spinules and a very short pointed apical spur. Hind leg long and slender, femur with a row of longer dark setae beneath toward tip. Tarsi slender, hind tarsus longer. Wings (Fig. 2B), long and rather narrow, rounded at apex, with unmodified venation; almost entirely faintly brown clouded, leaving only base, apex of wing, along the vein Cu1 above and a long spot at marginal cell hyaline. Vein R_{2+3} straight, and not sharply upturned to costa, ending gradually. Veins R_{4+5} and M_{1+2} parallel toward wing-apex. Crossveins r-m and bm-cu separated. Cell

bm distinctly longer and narrower than br. Squama brownish. Haltere whitish.

Abdomen yellowish brown in ground color, polished. Terminalia with cerci enclosed between epandrial lamellae (Fig. 3). Right cercus about as long as left cercus (hardly surpassing the left cercus) and weakly club-shaped. Left cercus much wider than right cercus, with left margin protruding (Fig. 3B). Right epandrial lamella with forked surstylus (Fig. 3A), bent over right cercus. Ventral margin of right epandrial lamella bearing a basal lobe set with at least 2 long appendages. These appendages have their margins entirely or partly set with small rounded knobs (Fig. 3C). In basal view, four insertion points are visible but it is not clear if there are effectively four separate appendages. Left epandrial lamella as long as right lamella and also encompassing cerci. One strong bristle present at apical third while a number of short bristles present on basal half of left side.

Female. Unknown.

ETYMOLOGY. The species is named “*moroccensis*” after the country where it was found (Morocco).

COMMENTS. The genitalia of the new species resemble those of *T. alteropicta* Becker, 1889 though there are many differences in the shape of the different structures as well as the bristling. The cerci in *T. alteropicta* are not enclosed between the epandrial lamellae (see Chvála, 1970 fig. 10). Chvála (l.c.) mentions that there are four appendages on the right margin of the right epandrial lamella above. In the new species, the appendages are present at the base



Fig. 4. Type habitat of *Tachydromia moroccensis* sp. n., in the “Mchichouen” locality (Photo: K. Kettani, 11.v.2024).

of the right epandrial lamella. There are probably also four appendages in the new species because there are four insertion points visible when the genital capsule is observed from below. However, only two appendages are distinctly visible in lateral view. Hence this character is not reliable to use to distinguish both species. Important is that the appendages are inserted at the base of the hind margin of the right epandrial lamella and not at the hind margin above as quoted and imaged by Chvála (1970) in *T. alteropicta*. In the new species, the appendages have their margins entirely or partly set with small rounded knobs. This feature is distinct and not mentioned in Chvála (1970). Chvála (op.cit.) further mentions a strong spine between the cerci seen in dorsal view. This spine surpasses the right cercus. No such spine is present in the new species. The left epandrial lamella seems to have a basal spine-like basal appendage on the right margin in *T. alteropicta*. No such structure is present in the new species (Fig. 3B, C). Further there is a long bristle in a subapical position in *T. alteropicta* while a similar strong bristle is present on the apical third of the left epandrial lamella (Fig. 3C). The two species also differ in several morphological characters, mainly in the number of scutellars (one pair in *T. alteropicta*

vs two pairs in the new species), acrostichals and dorsocentrals are biserial in *T. alteropicta* while are uniserial in the new species, and mid femur simple in *T. alteropicta*, while it is with a shallow round excision near base beneath in the new species.

ECOLOGICAL NOTES. The new species was collected using a Malaise trap deployed during the spring season (from May 11th to June 11th) at the “Mchichouen” site (Fig. 4) in the Natural Park of Bouhachem. The site is represented by a matorral with thermo-Mediterranean vegetation since the altitude is less than 1000 m, represented by *Quercus coccifera* L., 1753, some fruit trees and dense herbaceous ground covers such as *Cistus* spp., *Cynara* spp., *Mentha* sp., *Thymus vulgaris* L., 1753, *Dittrichia viscosa* (L.) Greuter, 1973, and *Rubus ulmifolius* Schott, 1818. The prevailing bioclimate at the site is temperate subhumid to locally humid.

Tachydromia rifensis Zouhair
et Grootaert **sp.n.**
Figs 5–6.

TYPE MATERIAL. Holotype: Rif. ♂; Adrou; 29.iv.19–22.v.19; Malaise trap; K. Kettani leg (RBINS).

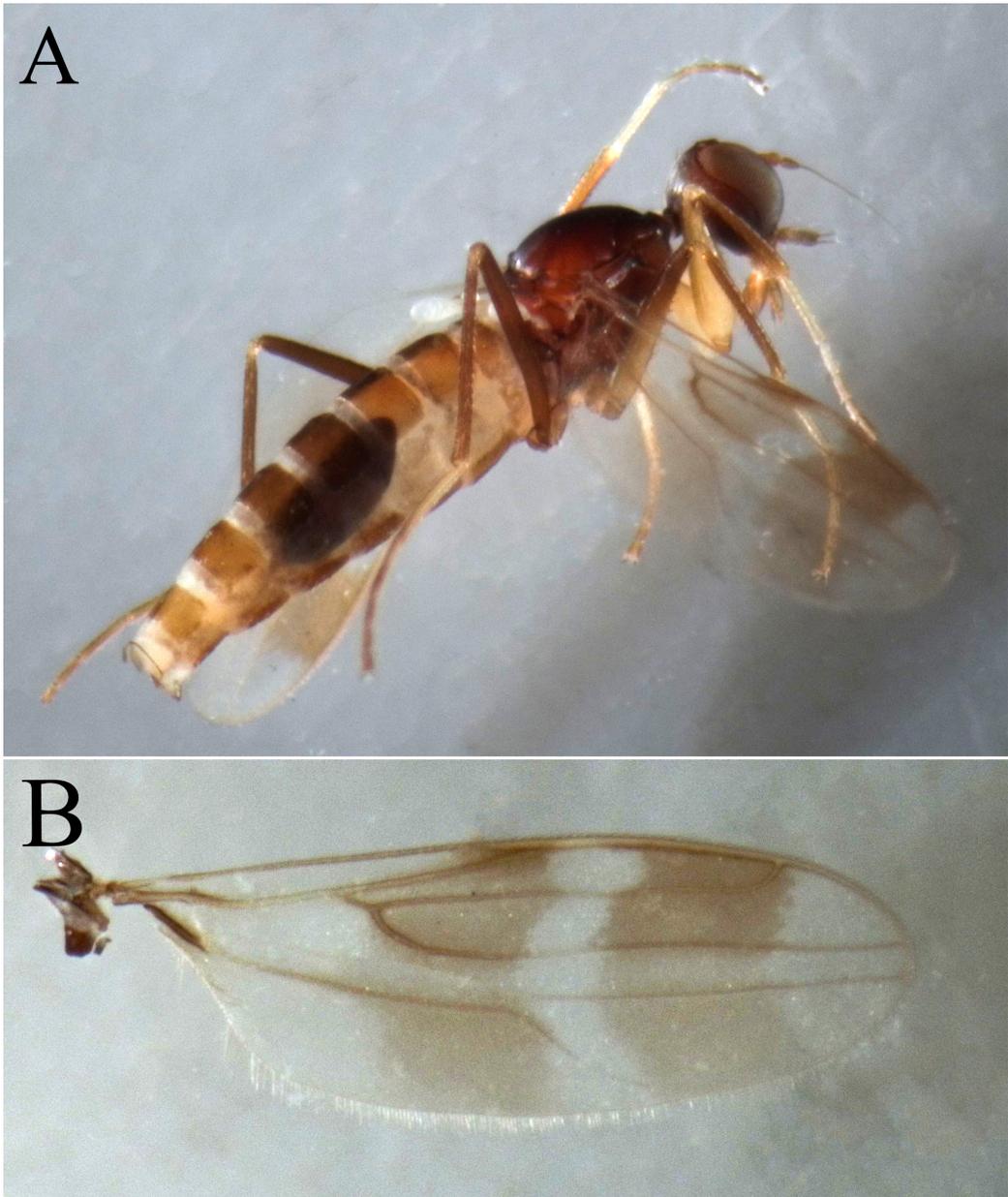


Fig. 5. *Tachydromia rifensis* sp.n. A — habitus male; B — wing. Scale 0.1 mm.

Paratypes: Rif. 2 ♀♀; same data as holotype. 1 ♂; Riba; 29.iv.19–22.v.19; Malaise trap; K. Kettani leg (LESCB). 1 ♂; Riba; 22.v.19–25.vi.19; Malaise trap; K. Kettani leg (LESCB). 2 ♂♂, 1 ♀; Rmel; 24.ii.2020; sweep net; M. Nourti leg (LESCB). 1 ♂; Lac Bouhachem; 25.iv.24; K. Kettani leg (LESCB). 1 ♂; Oued Talassemtane; 16.v.25; K. Kettani leg (LESCB).

DIAGNOSIS. Brown to blackish brown species of the *arrogans*-group, with occiput greyish pollinose,

palpus brown, slender and elongate, bearing long black subapical seta. Thorax almost entirely shining. Legs mainly brown to dark brown, mid femur simple, mid tibia with short but pointed projection at tip. Wings with two brown bands entirely separated along the whole length from costa to hind margin. Vein R₂₊₃ with very slight curve at middle. Halteres whitish.

DESCRIPTION. **Male** (Fig. 5A). Length. Body: 3.3 mm; wing: 2.2 mm.

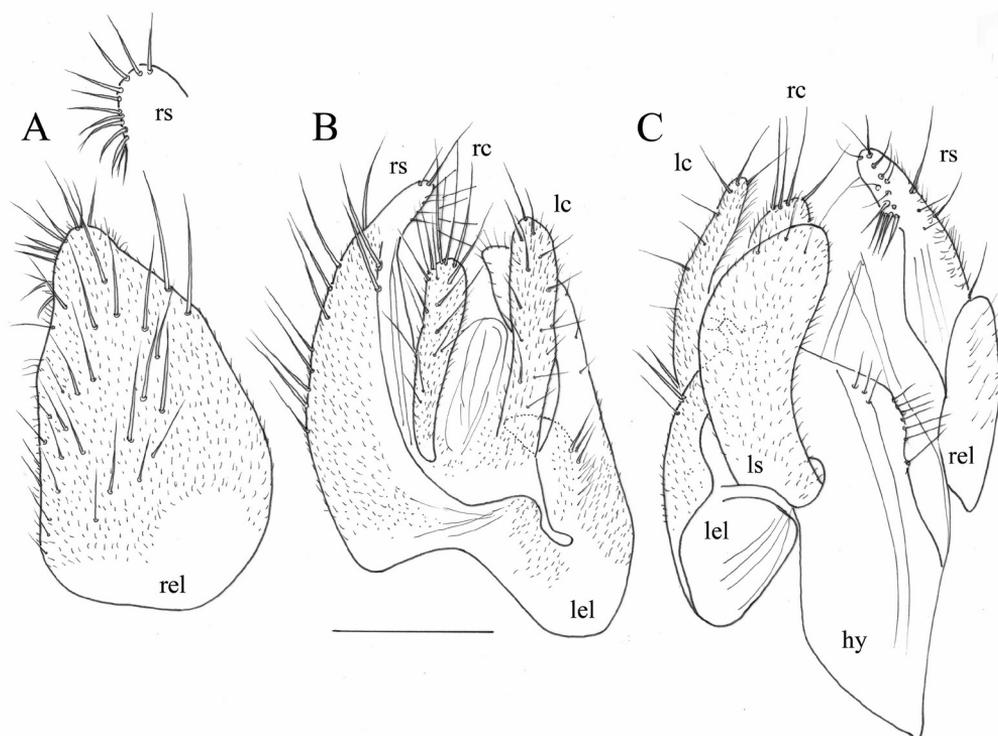


Fig. 6. *Tachydromia rifensis* sp.n. A — right epandrial lamella, lateral; with a detail of the right surstylus; B — epandrium, dorsal; C — epandrium, ventral. Scale 0.1 mm.

Head black in ground color. Eyes with posterior margin slightly produced beyond ocellar tubercle. Occiput grey pollinose, with pale setae around neck and near mouth-opening, bearing row of pale postoculars, with a pair of blackish brown verticals. Ocellar tubercle, including vertex, shining, with two moderately long, black, latero-clinate setae. Frons polished with a small greyish pollinose patch just above antennae, somewhat long, as wide as pedicel is deep but slightly widened toward ocellar tubercle. Antenna entirely brownish, pedicel as long as deep, postpedicel ovate, stylus very long, about 4x as long as rest of antenna. Proboscis blackish. Palpus blackish, slender, elongate, longer than half of proboscis, with silvery pale setae and long black subapical seta.

Thorax shining blackish brown, leaving propleuron densely silvery dusted, postalar callus including scutellum dull greyish dusted. Postpronotal lobe large, lacking conspicuous setae, with some minute pale setulae. Mesonotum with 1 black notopleural, 1 short black postalar and two pairs of black scutellars (inner setae long and thick, outer shorter). Acrostichals and dorsocentrals uniserial, short and pale, prescutellar pair pale, somewhat long but very fine. Legs long, slender, mainly brown to blackish brown on dark specimens, except of fore coxae yellow with only a brownish spot

at base, fore femora yellow with dorsal brown stripe, mid femora ventrally yellowish in basal 2/3, fore and mid knees yellowish, tarsi with 1–2 segments brownish apically, 3–5 almost entirely dark brown. Fore femur thickened, with two rows of spinules disappearing towards base; fore tibia with a row of spine-like setulae. Mid femur simple, with two rows of spinules (one more prominent); mid tibia with a row of very minute spinules, with short but pointed projection at tip. Hind legs slender and only covered with short setulae. Wing (Fig. 5B) somewhat narrow with rounded tip, and with two brown bands, entirely separated along their length. Vein R_{2+3} nearly straight, only very slightly curved at middle and not so sharply upturned to costa. Veins R_{4+5} and M_{1+2} parallel toward wing-apex. Crossveins r-m and bm-cu separated. Cell bm distinctly longer and narrower than br. Squama brownish. Haltere whitish.

Abdomen polished, brown to blackish brown. Terminalia (Fig. 6) with both cerci long and digitiform. Apex of the right cercus with numerous long setae. Left cercus a little stronger and longer than right cercus, with fewer and shorter apical setae (Fig. 6B). Right surstylus fused with right epandrial lamella, apex with a few stronger bristles (Fig. 6A inset, C). Left epandrial lamella bearing a large lobe considered as the left surstylus (Fig. 6C).

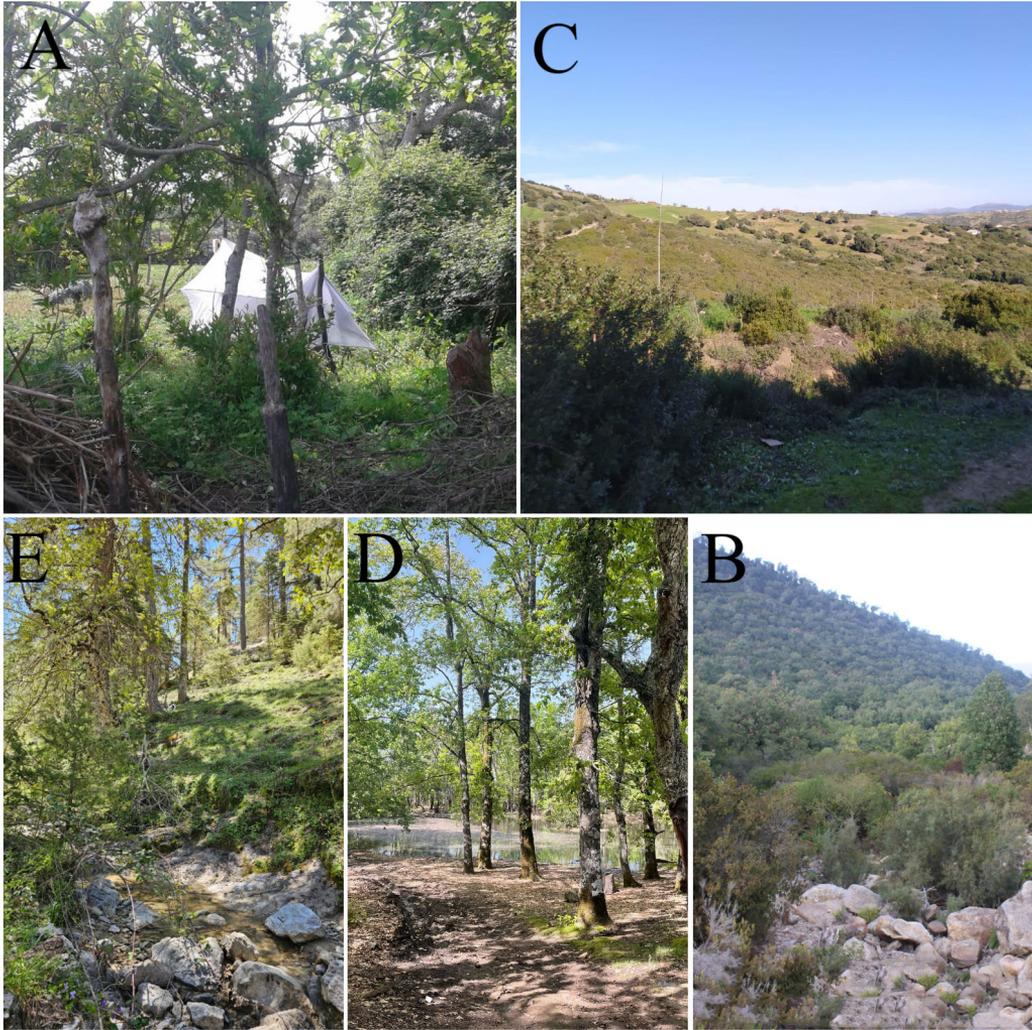


Fig. 7. Type habitats of *Tachydromia rifensis* sp.n. A — locality of “Adrou” (Photo: K. Kettani, 29.iv.2019); B — locality of “Riba” (Photo: K. Kettani, 29.iv.2019); C — locality of “Rmel” (Photo: M. Nourti, 24.ii.2020); D — locality of “Lac Bouhachem” (Photo: K. Kettani, 25.iv.2024); E — locality of “Oued Talassemtane” (Photo: K. Kettani, 16.v.2025).

Female. Resembling male.

ETYMOLOGY. The species is named after the Moroccan Rif region, where it was collected.

COMMENTS. In the key to Palearctic species (Chvála, 1970) the new species would run to *T. productipes* Strobl, 1910 known from the Alps. They share many principal morphological characters, including the shining frons and vertex, greyish pollinose occiput, very long stylus, dark palpus bearing a long subapical seta, almost entirely shining thorax, same thorax setation, the presence of pointed projection in mid tibiae and same wings pattern. However, these species differ in several characters, especially on the colour of legs, which is predominantly yellow

in *T. productipes*, while the legs are mainly brownish in the new species, and the colour of antennae, which is entirely brown in the new species, while in *T. productipes* both basal antennomeres are yellow. But the main difference to hold is the presence of the rows of spinules on the fore femora, fore tibiae and mid femora in the new species, instead of hairs in *T. productipes*, as described by Chvála (1970). There is also a slight difference in the vein R_{2+3} of the wing, which has a very slight curvature in the new species, whereas it is completely straight in *T. productipes*. Terminalia of both species appear similar in general shape, but they differ mainly in the right surstylus, which is distinctly longer in *T. productipes*, and the

left epandrial lamella, which is somewhat longer in the new species.

ECOLOGICAL NOTES. The new species was found in five different sites: “Adrou”: The sampling at this site was performed using a Malaise trap set up in the spring season (from April 29th to May 22th) within a mixed forest (Fig. 7A) of *Quercus ilex* L., 1753, *Quercus suber* L., 1753, *Pinus pinaster* Aiton, 1789, with an undergrowth dotted by *Cistus* spp., *Ditrichia viscosa* (L.) Greuter, 1973, *Rubus ulmifolius* Schott, 1818, and *Pistacia lentiscus* L., 1753. The forest is located at the Natural Park of Bouhachem and characterized by a perhumid bioclimate, favoring the Méso-Mediterranean vegetation.

“Riba”: In this site (Fig. 7B), the collection was realized using a Malaise trap set up in spring time on 29th April, but the samples were recuperated on two rounds, the first in 22th May and the second in 25th June. The site is located at the Natural Park of Bouhachem, corresponding to a mixed forest with thermo-Mediterranean vegetation since the altitude is less than 1000 m, composed mainly of *Quercus faginea* Lam., 1785, *Quercus suber* L., 1753, and *Pinus pinaster* Aiton, 1789, while the shrub layer is dominated by *Pistacia lentiscus* L., 1753. The bioclimate reigning on the site is then temperate subhumid to locally humid.

“Rmel”: In this locality (Fig. 7C), the sweep netting was performed in winter (24th February), in a scrubland with rocky clay-calcareous soil crossed by a small stream and bordered by a thermo-Mediterranean vegetation (altitude less than 1000 m), mainly composed of *Pistacia lentiscus* L., 1753, *Carlina racemosa* L., 1753, *Conyza conodensis* Sennen, 1936, *Erica arborea* L., 1753, and *Cistus monspeliensis* L., 1753. Further away, fruit trees grow, such as *Olea europaea* L., 1753, and *Ficus carica* L., 1753. The bioclimate type prevailing there is of temperate subhumid to locally humid.

“Lac Bouhachem”: This site consists to an oak forest dominated by *Quercus pyrenaica* Willd., 1805 forming a dense canopy around to a small lake (lac Bouhachem), within the Natural Park of Bouhachem. The vegetation belongs to the supra-Mediterranean zone, while the dominant bioclimate is humid to subhumid. Sampling was carried out on 25th April in spring, using the sweep net.

“Oued Talassemntane”: The sweep netting was conducted in this site in spring (16th May) within Talassemntane National Park, at the level of the Oued Talassemntane. The sampling was conducted along the banks of a small stream (Oued Talassemntane). The streambanks were characterized by a forest dominated by fir, mainly composed of *Abies maroccana* Trab., 1926, a species endemic to Morocco. This dominant conifer is accompanied by other tree species such as *Cedrus atlantica* (Endl.) Manetti ex Carrière, 1855, and *Quercus rotundifolia* Lam., 1785, as well as various shrubs, including *Cistus salviifolius* L., 1753,

Galium rotundifolium L., 1753, *Euphorbia characias* L., 1753, and *Juniperus oxycedrus* L., 1753.

The new species has been observed in spring and winter, suggesting its ability to adapt to different climatic conditions. However, it appears to prefer wooded habitats, ranging from dense forests, where it has been collected four times, to scrubland.

New records

Tachydromia arrogans Linnaeus, 1761

MATERIAL EXAMINED. Rif. 2 ♀♀; Oued El Kelaa; 16.iv.2016; sweep net; K. Kettani leg. 1 ♂, 1 ♀; Chellal Akchour; 25.iv–6.vi.2016; Malaise trap; K. Kettani leg. 1 ♂, 1 ♀; Khandak Mellouka; 10.iv.2021; sweep net; K. Kettani leg.

DISTRIBUTION. Palearctic: Europe, Asia, North Africa including Morocco (Shamshev, 2016; Ebejer *et al.*, 2019; Kettani *et al.*, 2022).

ECOLOGICAL NOTES. *Tachydromia arrogans* was found in three different localities: “Oued El Kelaa”: The sampling was carried out in the spring time (16th April) on the bank of the Kelaa watercourse (one of the tributaries of the Akchour waterfall), in the National Park of Talassemntane (Fig. 8A). The vegetation growing in the site is thermo-Mediterranean since it is situated under 1000 m. The bioclimate is then temperate subhumid to locally humid. The netting was performed mainly in the shrub layer dominated by *Nerium oleander* L., 1753. The herbaceous layer is characterized by the presence of species such as *Plantago major* L., 1753, *Agrostis castellana* Boiss. & Reut., 1852, *Mentha rotundifolia* (L.) Huds., 1762, *Galium scabrum* L., 1753, *Menhaviollosa* Huds., 1762, and *Malva parviflora* L., 1753.

“Chellal Akchour”: The sampling was performed in this site using a Malaise trap, set up in the spring time (from April 25th to May 6th) at the edge of one of the famous waterfalls (the middle waterfall) of Akchour (Fig. 8B), located at the bottom of the Talembote valley in the Talassemntane National Park. The site is characterized by a thermo-Mediterranean vegetation since its altitude does not exceed 1000 m, known for its great specific richness. Among the most remarkable woody formations within this locality, we find *Tetraclinis articulata* (Vahl) Mast., 1892, and *Laurus nobilis* L., 1753, which grow at the edge of the waterfalls, as well as *Quercus rotundifolia* Lam., 1785, along the track leading to the waterfalls. The environment is also recognized for its richness in medicinal plants such as *Origanum grosii* Pau & Font Quer, 1924, *Rosmarinus officinalis* L., 1753, and *Mentha suaveolens* Ehrh., 1792. The bioclimate is then temperate subhumid to locally humid. It should be noted that the site represents a tourist destination, experiencing a great anthropic activity.

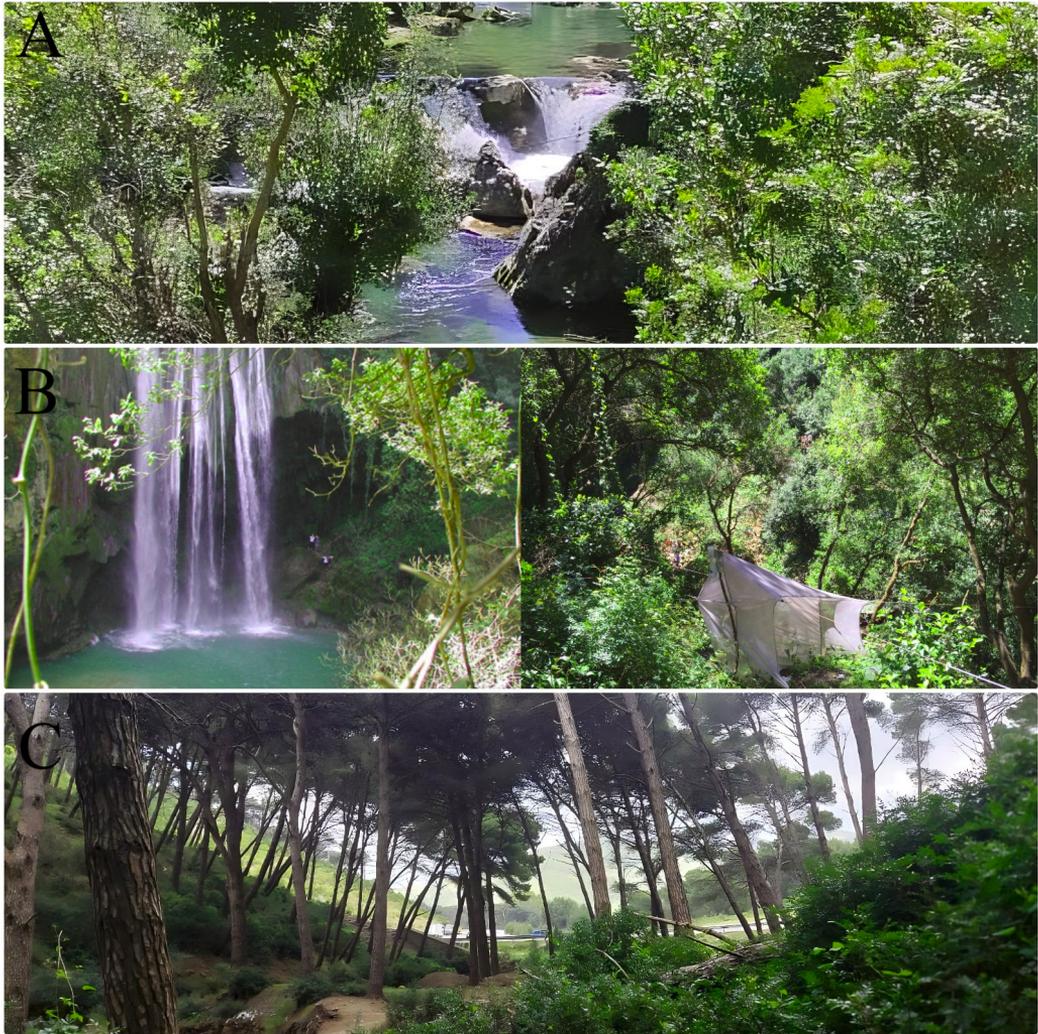


Fig. 8. Type habitats of *Tachydromia arrogans* Linnaeus. A — locality of “Oued El Kelaa” (Photo: K. Kettani, 16.iv.2016); B — locality of “Chellal Akchour” (Photo: K. Kettani, 25.iv.2016); C — locality of “Khandak Mellouka” (Photo: K. Kettani, 10.iv.2020).

“Khandak Mellouka”: The sampling was carried out in the spring time (10th April), on the edge of a large *Pinus halepensis* Mill., 1768 forest, with a shrub layer dominated by *Pistacia lentiscus* L., 1753. (Fig. 8C). The altitude being less than 1000 m, the site is part of the thermo-Mediterranean zone, with a temperate subhumid to locally humid bioclimate.

Prior to our findings, the species *T. arrogans* was found in the country by Ebejer *et al.* (2019), in April in a maquis. Our results further confirm the phenology of the species, as we found it three times during the same month. As for habitat preferences, the species seems to prefer inhabiting humid microhabitats such

as branches of trees along edges of watercourses or waterfalls, and shaded forests or maquis. According to Chvála & Kovalev (1989) in the Catalogue of Palaearctic Diptera, *T. arrogans* has also been reported in North Africa from Tunisia, but no ecological data have been provided to allow comparison. Outside North Africa, Grootaert *et al.* (2023) recorded the species mainly from humid forest habitats and along river banks during a survey campaign in Corsica. Similarly, Barták, Kubík (2018) reported the species from riverbank in Turkey. These patterns are consistent with our findings.

KEY TO *TACHYDROMIA* SPECIES OF MOROCCO

This key is compiled based on the descriptions of the new species provided in this paper, supplemented by Chvála's (1970) descriptions of species previously recorded in the country.

1. Palpi whitish yellow. Mid femur with round excision beneath, bearing a black spine and thick setae. Wings almost entirely brown clouded leaving margin and wing base. Ventral margin of right epandrial lamella with at least two long appendages *T. moroccensis* sp.n.
- Palpi dark. Mid femur simple, without excision or spines. Wings with two brown crossbands separated or narrowly connected in marginal cell. No long appendages on ventral margin of epandrial lamella 2
2. Wing bands entirely separated along their length; vein R_{2+3} nearly straight 3
- Wing bands at least narrowly connected in marginal cell or near hind margin; vein R_{2+3} sharply curved at middle to costa 4
3. Mid femur with black setae on the whole length beneath. Vein R_{2+3} of wing straight and sharply upturned to costa *T. arrogans* Linnaeus
- Mid femur with rows of spinules instead of long pale setae. Vein R_{2+3} of wing slightly curved at middle and slightly upturned to costa *T. rifensis* sp.n.
4. Fore femur with distinct yellow ring at middle; mid tibia with large apical projection; mid femur with only several short setae on small and hardly visible tubercle beneath *T. annulimana* Meigen
- Fore femur entirely blackish; mid tibia without apical projection; mid femur with two rows of fine pale setae beneath *T. undulata* Strobl

Discussion

The present work enhances the current understanding of the Palaearctic hybotid fauna by adding two new species of the genus *Tachydromia*, thereby complementing the numerous recent additions described for the region (Kanavalová *et al.*, 2021; Grootaert *et al.*, 2021, 2023, 2024a, b; Jonassen *et al.*, 2021; Sinclair *et al.*, 2022; Zouhair *et al.*, 2022, 2024, 2025; Grootaert, 2023; De Bree, Grootaert, 2023; Barták, Grootaert, 2024; Grootaert, Brice, 2024). However, while most of these studies have focused on Europe and neighboring regions, North Africa remains comparatively understudied and poorly documented in this context, particularly for less commonly

encountered genera such as *Tachydromia*.

In Morocco, the genus *Tachydromia* is notably underrepresented. As already mentioned in the introduction, only a few records of the genus were documented in the country prior to our research. This scarcity may be attributed to limited sampling efforts and the genus's ecological requirements, which may not align with the habitats commonly targeted, since the genus prefers to inhabit specific microhabitats within forested or riparian zones, either due to inadequate sampling coverage in previous studies, or the use of less suitable collection methods. The description of two new species from the Moroccan Rif, in particular *T. moroccensis* sp.n., with special appendages in the right epandrial lamella, characters that so far only exists in the species *T. alteropicta*, described from the territory of the former Yugoslavia, further confirms the interest of the Rif region as a biodiversity hotspot within the country, suggesting the discovery of additional interesting species when more extensive and varied entomological surveys are carried out and various sampling methods are adopted.

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

References

- Alcázar Alba M.D.A. 2014. Leafminers management // J.C. Tello Marquina, F. Camacho Ferre (eds.). *Organisms for the control of pathogens in protected crops: Cultural practices for sustainable agriculture*. El Ejido, Almería, Spain: Fundación Cajamar. P.303–328.
- Barták M., Grootaert P. 2024. Description of twelve new species of *Platypalpus* Macquart from Europe and the Middle East (Diptera, Empidoidea, Hybotidae) // *Zootaxa*. Vol.5443. No.2. P.161–185. <https://doi.org/10.11646/zootaxa.5443.2.2>
- Barták M., Kubík Š. 2018. Hybotidae (Diptera) from Turkey, with descriptions of seven new species // *Zootaxa*. Vol.4410. No.1. P.453–482. <https://doi.org/10.11646/zootaxa.4410.3.2>
- Chvála M. 1970. Revision of Palaearctic species of the genus *Tachydromia* Meig. (= *Tachista* Loew) (Diptera, Empididae) // *Acta Entomologica Musei Nationalis Pragae*. Vol.38 (for 1969). P.415–524.
- Chvála M. 1975. The Tachydromiinae (Dipt. Empididae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica*. Klampenborg, 336 p.
- Chvála M., Kovalev V.G. 1989. Hybotidae // M. Chvála, V.G. Kovalev (eds.). *Catalogue of Palaearctic Diptera*. Vol. 6. Therevidae – Empididae. Amsterdam: Elsevier Science Publishing: P.174–227.
- De Bree E., Grootaert P. 2023. New species of *Stilpon* (Diptera: Hybotidae) // *Bulletin de la Société royale belge*

- d'Entomologie/ Bulletin van de Koninklijke Belgische Vereniging voor Entomologie. Vol.158. P.261–267.
- Ebejer M.J., Kettani K., Gatt P. 2019. First records of families and species of Diptera (Insecta) from Morocco // Boletín de la Sociedad entomológica aragonesa. Vol.64. P.143–153.
- Gitzel J., Kampen H., Stark A., Sellmann J., Hoffmann L.M., Schwarz J., Ulrichs C., Werner D., Kühne S. 2025. Community composition of predatory Hybotidae (Diptera: Empidoidea) in winter wheat management systems // Insects. Vol.16. No.12. Art.1263. <https://doi.org/10.3390/insects16121263>
- Gonçalves A.R., Grootaert P., Andrade R., Paulo O.S., Mengual X. 2021. Revision of the morphology, phylogenetic relationships, behaviour and diversity of the Iberian and Italian ant-like *Tachydromia* Meigen, 1803 (Diptera: Hybotidae) // European Journal of Taxonomy. Vol.732. P.1–56. <https://doi.org/10.5852/ejt.2021.732.1213>
- Goula M., Mata L. 2014. Predatory arthropods in agroecosystems in Almería // J.C. Tello Marquina, F. Camacho Ferre (eds.). *Organisms for the control of pathogens in protected crops: Cultural practices for sustainable agriculture*. Almería, Spain: Fundación Cajamar. P.349–370.
- Grootaert P. 2023. Hybotidae (Diptera) of the Botanic Garden Jean Massart (Brussels-Capital Region, Belgium) with description of two new *Platypalpus* species and comments on the Red Data List // Belgian Journal of Entomology. Vol.134. P.161–186.
- Grootaert P., Brice D. 2024. New data on flies from salt-marshes from the Reserva natural de s'Albufereta and the Natural Park of s'Albufera, (Mallorca, Balearic Islands, Spain) with the description of a new species of *Drapetis* Meigen (Diptera: Hybotidae, Tachydromiinae) // Bolletí de la Societat d'Història Natural de les Balears. Vol.67. P.135–143.
- Grootaert P., Shamshev I.V. 2011. The genus *Tachydromia* Meigen (Diptera: Hybotidae) from Australia // Records of the Australian Museum. Vol.63. No.1. P.103–112.
- Grootaert P., Shamshev I.V. 2012. The fast-running flies (Diptera, Hybotidae, Tachydromiinae) of Singapore and adjacent regions // European Journal of Taxonomy. Vol.5. P.1–162. <https://doi.org/10.5852/ejt.2012.5>
- Grootaert P., Van De Velde I., Barták M. 2024a. New *Drapetis* Meigen from Bulgaria (Diptera: Hybotidae) // Belgian Journal of Entomology. Vol.153. P.1–18.
- Grootaert P., Van de Velde I., Pollet M. 2023. The Hybotidae of the Our Planet Reviewed in Corsica 2019–2021 survey, with the description of three new species of *Platypalpus* and *Tachydromia* (Diptera, Empidoidea) // Bulletin de la Société entomologique de France. Vol.128. P.533–560. https://doi.org/10.32475/bsef_2301
- Grootaert P., Zouhair L., Kettani K. 2021. New species of the genus *Stilpon* Loew, 1859 from Morocco (Diptera: Empidoidea, Hybotidae) // Belgian Journal of Entomology. Vol.113. P.1–12.
- Grootaert P., Zouhair L., Kettani K. 2024b. *Crossopalpus* Bigot, 1857 (Diptera: Hybotidae) from Morocco: description of four new species with new data and some key highlights on ecology // Caucasian Entomological Bulletin. Vol.20. No.2. P.193–215. <https://doi.org/10.5281/zenodo.13934019>
- Jonassen T., Andersen T., Salmela J., Suuronen A., Vaesoja M. 2021. Six new species of Empididae and Hybotidae (Diptera, Empidoidea) from Fennoscandia // Norwegian Journal of Entomology. Vol.68. P.174–186.
- Kanavalová L., Grootaert P., Kubík Š., Barták M. 2021. Four new West Palaearctic species and new distributional records of Hybotidae (Diptera) // ZooKeys. Vol.1019. P.141–162. <https://doi.org/10.3897/zookeys.1019.61496>
- Kettani K., Ebejer M.J., Ackland D.M., Bächli G., Barraclough D., Barták M., Carles-Tolrà M., Černý M., Cerretti P., Chandler P., Dakki M., Daugeron C., De Jong H., Dils J., Disney H., Droz B., Evenhuis N., Gatt P., Graciolli G., Grichanov I.Y., Haenni J.-P., Hauser M., Himmi O., MacGowan I., Mathieu B., Mouna M., Munari L., Nartshuk E.P., Negrobov O.P., Oosterbroek P., Pape T., Pont A.C., Popov G.V., Rognes K., Skuhrová M., Skuhrový V., Speight M., Tomasovic G., Trari B., Tschorsnig H.-P., Vala J.-C., von Tschirnhaus M., Wagner R., Whitmore D., Woźnica A.J., Zatwarnicki T., Zwick P. 2022. Catalogue of the Diptera (Insecta) of Morocco – an annotated checklist, with distribution and bibliography // ZooKeys. Vol.1094. P.1–466. <https://doi.org/10.3897/zookeys.1094.62644>
- Kühne K.-St., Schrammeyer K. 1994. Zum Vorkommen räuberischer Fliegen aus der Familie Hybotidae (Diptera, Empidoidea) in Gewächshäusern sowie zur prädatatorischen Leistung zweier Fliegenarten der Gattung *Platypalpus* Macquart // Journal of Applied Entomology. Vol.118. No.3. S.209–216.
- Plant A.R., Deeming J.C. 2006. An apterous species of *Tachydromia* Meigen, 1803 (Diptera: Hybotidae) from Italy // An International Journal of Dipterological Research. Vol.17. No.1. P.13–16.
- Rhatts M., Zidane L., Douira A. 2015. Écotourisme dans le parc naturel de Talassemtane (Nord du Maroc) // Journal of Animal & Plant Sciences. Vol.2. P. 3752–3767.
- Rodríguez-Rodríguez M.D., Gómez-Ramos M.M. 2005. La familia Hybotidae (Diptera: Empidoidea), dípteros de la entomofauna hortícola almeriense // Phytoma. No.174. P.29–38.
- Shamshev I.V. 2016. An annotated checklist of empidoid flies (Diptera: Empidoidea, except Dolichopodidae) of Russia // Proceedings of the Russian Entomological Society. Vol.87. P.3–183. https://doi.org/10.47640/1605-7678_2016_87_5
- Shamshev I.V., Grootaert P. 2005. The genus *Tachydromia* Meigen (Diptera: Hybotidae) from South East Asia, with the description of three new species // Studia dipterologica. Vol.12. P.109–117.
- Shamshev I.V., Grootaert P. 2009. A new species of the genus *Tachydromia* Meigen (Diptera: Hybotidae) from Israel // Bulletin de la Société royale belge d'Entomologie / Bulletin van de Koninklijke Belgische Vereniging voor Entomologie. Vol.145. P.43–44.
- Shamshev I.V., Grootaert P. 2010. The genus *Tachydromia* Meigen (Diptera: Hybotidae) from the Afrotropics // African Invertebrates. Vol.51. No.1. P.207–218.
- Shamshev I.V., Grootaert P. 2018. Proposed changes in systematics and status of some genera of Tachydromiini (Diptera: Hybotidae: Tachydromiinae), with description of a new species of *Tachypeza* Meigen from Canada and USA // Russian Entomological Journal. Vol.27. No.4. P.425–434. doi: 10.15298/rusentj.27.4.10
- Shamshev I.V., Grootaert P. 2024. Revision of the described Nearctic species of the genus *Tachydromia* Meigen (Dip-

- tera: Hybotidae) // Zootaxa. Vol.5403. No.4. P.151–196. <https://doi.org/10.11646/zootaxa.5403.2.1>
- Sinclair B.J., Cumming J.M. 2017. Hybotidae (hybotid dance flies) // A.H. Kirk-Spriggs, B.J. Sinclair (eds.). Manual of Afrotropical Diptera. Vol.2. Nematocerous Diptera and Lower Brachycera. Suricata. Pretoria: South African National Biodiversity Institute. P.1237–1250.
- Sinclair B.J., Cumming J.M., Shamshev I.V. 2022. New genus of Tachydromiinae from South Africa and Turkmenistan (Diptera: Empidoidea: Hybotidae) // Insects. Vol.13. No.171. P.1–10. <https://doi.org/10.3390/insects13020171>
- Stark A., Doczkal D. 2017. *Tachydromia wendti* spec. nov. (Diptera, Empidoidea, Hybotidae) from riverbeds at the Northern slope of the Alps and its forelands in Germany // Mauritiana (Altenburg). Vol.34. P.481–498.
- Steinborn H.-A., Meyer H. 1994. Einfluss alternativer und konventioneller Landwirtschaft auf die Prädatorenfauna in Agrarökosystemen Schleswig-Holsteins (Araneida, Coleoptera: Carabidae, Diptera: Dolichopodidae, Empididae, Hybotidae, Microphoridae) // Faunistisch-Ökologische Mitteilungen. Bd.6. S.409–438.
- Vaillant F. 1952. Quelques Empididae Nouveaux pour l'Algérie // Revue de Françaises d'Entomologie. Vol.19. No.1. P.64–67.
- Weber G., Franzen J., Büchs W. 1997. Beneficial Diptera in field crops with different inputs of pesticides and fertilizers // Entomological Research in Organic Agriculture. P.109–122.
- Zouhair L., Grootaert P., Kettani K. 2022. First records of *Trichina* Meigen, *Euthyneura* Macquart and *Oedalea* Meigen (Diptera, Hybotidae) from North Africa, with descriptions of two new species // ZooKeys. Vol.1124. P.43–58. <https://doi.org/10.3897/zookeys.1124.90077>
- Zouhair L., Grootaert P., Kettani K. 2024. Twelve new species of *Platypalpus* Macquart (Diptera: Hybotidae) from Morocco, with additional new records // European Journal of Taxonomy. Vol.951. No.1. P.1–53. <https://doi.org/10.5852/ejt.2024.951.2645>
- Zouhair L., Grootaert P., Gençer L., Kettani K. 2025. Turkish Hybotidae (Diptera: Empidoidea): description of six new species with additional data // Zootaxa. Vol.5609. No.4. P.503–524. <https://doi.org/10.11646/zootaxa.5609.4.3>

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