

The Tabanidae (Diptera) of the Greek islands and Cyprus: An annotated checklist with remarks on ecology, zoogeography, and new records on the East Mediterranean fauna

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Abstract

The horse-fly fauna of the East Mediterranean is poorly known and, in some geographical areas, has not been studied for decades. The present study summarizes the results of tabanid collections performed over 30 years in the Greek islands (the Cyclades, Dodecanese, North Aegean and Crete) and Cyprus. In total, 18 species were known from the study territory. The present study reports an additional 10 species. Previously, only 1 horsefly species was known from the Dodecanese islands, 1 from the North Aegean islands, and 2 from the Cyclades. This study has raised the number of species to 6, 7, and 9, respectively. The combined taxa for the three island groups have increased from 4 to 17 species. Specifically, the number of species has increased from 3 to 7 in Crete and from 11 to 19 in Cyprus. Additionally, we report 1 new record from the Greek mainland, 1 from the Levantine region, 2 from Lebanon, and 2 from Israel. Four Afrotropical–Palearctic vector species: *Atylotus agrestis* (Wiedemann, 1828); *Tabanus gratus* Löw, 1858b; *Tabanus sufis* Jaennicke, 1867; and *Tabanus taeniola* Palisot de Beauvois, 1806; are recorded for the first time from Cyprus, and *A. agrestis* from southern Italy. Their status as invasive species in Europe is discussed, the four species are illustrated.

Key words: Asia, *Atylotus agrestis*, Europe, invasive species, Italy, Israel, Lebanon, Levant, *Tabanus sufis*, *Tabanus taeniola*, *Tabanus gratus*.

Introduction

Tabanids (horseflies) are best known for their bloodsucking behavior. They persistently attack their hosts, mainly large ruminants and horses, but to a smaller extent also man (Kettle, 1984). They mechanically transmit a diverse array of infectious diseases, including viral equine anemia to horses, anaplasmosis to cattle, and trypanosomiasis, tularemia, anthrax and hemorrhagic septicemia to a variety of livestock, wild mammals, and man (Steyskal & El-Bialy, 1967; Dirie *et al.*, 1989; Chainey, 1993). Some deerflies (*Chrysops* spp.) are responsible for cyclical transmission of *Loa loa* filariasis to man (Padgett & Jacobsen, 2008).

Trypanosomiasis is a parasitic disease caused by flagellate protozoa dwelling in blood plasma, body fluids, and tissues of mammals, including man (Foil, 1989). The parasite *Trypanosoma evansi* Steel, 1884 (Trypanosomatidae), the causative pathogen of a disease called surra, is transmitted mechanically mainly by horseflies (Omer *et al.*, 1998) and is widespread in South and Central Asia, the Arab Peninsula, Saharan and Sahelian Africa (Diall *et al.*, 1993; Delafosse & Doutoum, 2004). In the Near and Middle East, *T. evansi* is primarily a camel parasite, but to a smaller extent, it may also affect horses, cattle, and dogs (Abo-Shehadeh *et al.*, 1999). Equines (Radostitis *et al.*, 2000) and dogs, in particular, are very susceptible with high mortality rates, while cattle, sheep, goats and gazelles can be asymptomatic reservoirs (Hasan *et al.*, 2006).

Though some pathogens remain infective on the mouthparts only for a short time, the painful bites of the horseflies cause defensive behavior of the attacked animals, resulting in rapid multiple feeding attempts and movements of the flies between hosts (Mullen & Durden, 2009).

In areas with large fly populations, tabanids can be of considerable importance, both medically and economically (Perich *et al.*, 1986). When present in large numbers, tabanids inflict persistent and painful bites, which can considerably irritate grazing animals, leading to weight loss and decreased milk production (Foil, 1989).

The family Tabanidae includes more than 4400 known species (Evenhuis & Pape, 2023). However not all species are blood feeders and many feed only on sugar. In fact, only females can pierce the skin and suck blood, while males have lost their mandibles and feed on nectar and pollen (Kniepert, 1980). Females of most species feed regularly on nectar as their sole source of energy, while blood meals are only needed for oogenesis (Hunter & Ossowski, 1999). Some genera of the tribe Pangoniini, which specialize in feeding from deep flowers, have developed a highly elongated proboscis unsuitable for blood meals (Downes, 1958). However, tabanids have received much less attention than other hematophagous Diptera (Baldacchino *et al.*, 2014).

Materials and Methods

During the long-term project “The ecology and zoogeography of the Lepidoptera of the Near East” (Müller *et al.*, 2005), horseflies were collected sporadically over the last 30 years in the entire southeastern Mediterranean, including the Greek islands, Cyprus and the Near East. Materials were obtained by the coauthors during multiple expeditions dedicated to general entomological collections with specific focuses on Lepidoptera, Coleoptera and biting flies. At several sites, the coauthors and their colleagues set up Malaise and automatic light traps to collect insects over extended periods. During multiple trips insects were additionally collected with sweep nets and entomological hand nets. The tabanid catches of these collections were generously presented to the authors and voucher specimens of the different taxa were kept in their collections.

Without attempting quantitative analysis, horseflies were sampled from all major types of habitats. In the following annotated checklist, the zoogeographical distribution of each species is summarized according to Leclercq (1960, 1966a), Chvála *et al.* (1972), Chvála (2013), and Evenhuis & Pape (2023). More recent records are separately cited. Voucher specimens of the discussed species are deposited in the private research collection of the first author and, in part, in the Bavarian State Collection for Zoology, Munich (ZSM), Germany and The Steinhardt Museum of Natural History, Tel Aviv (TAU), Israel. The tabanid specimens illustrated here are deposited in the Diptera collection in the Florida State Collection of Arthropods.

Annotated checklist

PANGONINAE

Pangonius Latreille, 1802

Histoire naturelle, generale et particuliere, des crustaces et des insectes, 3, 191.

1. *Pangonius (Pangonius) obscuratus* Löw, 1859

Program der Königlichen Realschule zu Meseritz, 27.

Type locality. Rhodes Greece and the opposite coast of Turkey.

Range. Palearctic, North Mediterranean. Known from Portugal, Spain, Corsica, Bulgaria, Rhodes Island and Turkey (Leclercq, 1960; Chvála, 2013).

New records. We recorded two males of this species for the first time on the Greek mainland in Vouno Kastorias Park near Koromilia, 890 m a.s.l., in early July 1992 feeding on nectar in a flowering meadow, collected by sweep net by G. Müller & A. Kotitsa (**new record for Greek mainland**). One male was collected on flowering Umbilifera and another male near an irrigation water puddle on the ground on Rhodes Island, in a park of the outskirts of Rhodes city, on 29 July 1991. The species was observed by us in Cyprus in the Troodos Mts., NW of Mylikouri, 900 m a.s.l., in early August 1995 (**new record for Cyprus**).

2. *Pangonius (Melanopangonius) funebris* Macquart, 1846

Memoires de la Société (Royale) des sciences, de l'agriculture et des arts à Lille, 1846, 133.

Type locality. Algeria.

Range. Palearctic, Mediterranean. Known from Algeria and from the Balkans to Greece, through Bulgaria to Turkey (Chvála, 2013; Evenhuis & Pape, 2023).

New records. A single male was collected from a Malaise trap by local collector on Lesbos Island, north of Agiásos, 450 m a.s.l., in early May (**new record for Northern Aegean islands**).

CHRYSOPSINAE

Chrysops Meigen, 1803

Magazin für Insektenkunde, 2, 267.

3. *Chrysops (Chrysops) caecutiens* (Linnaeus, 1758)

Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1, 602.

Type locality. England.

Range. Palearctic (in several subspecies). Wide spread through most of Europe including the Greek mainland, Cyclades, Dodecanese islands, Crete, eastwards to Turkey and Iran, Afghanistan to Central Asia, Russian Far East and Mongolia (Leclercq, 1960; Chvála *et al.*, 1972; Müller *et al.*, 2011a, 2012a; Chvála, 2013).

New records. We caught two males with a Malaise trap on Rhodes Island, Mt. Attavyros 900–1000m, south of Embonas, in early May 1989 and a male and female by hand net at the outskirts of Rhodes city in an irrigated garden, 50 m a.s.l., in early June 2005. Several males and females were collected from a Malaise trap on Lesbos Island, north of Agiásos, 450 m a.s.l. in April, and from June to September 2005 (**new record for the Northern Aegean islands**). The species was regularly observed in Crete (for several years from April to August), and most recently, three specimens were observed in mid-July 2023 on a window of a laboratory of Foundation for Research and Technology (FORTH) near Heraklion. Two specimens were collected on Cyprus in the northern outskirts of the village of Pano Panagia, 600 m a.s.l., from a Malaise trap at the edge of an old natural olive grove, one in early June, another in mid-September 1995. This species seems to be rare in Cyprus, no other specimens were seen or collected on numerous trips (**new record for Cyprus**). Two specimens were collected by V. Kravchenko in Israel, in the Upper Galilee, Mt. Meron, 800 m a.s.l., in mid-May 2017, in a light trap (**new record for Israel and the Levant**).

4. *Chrysops (Chrysops) flavipes* Meigen, 1804

Klassifikation und Beschreibung der europäischen zweiflügligen Insekten, 1 (2), 159.

Type locality. Belgium.

Range. Palearctic. From Morocco and Algeria through the northern Mediterranean Basin, southern Central Europe, through the Greek mainland, Cyprus, Turkey, the Levant (as far south as Sinai (Müller *et al.*, 2012b), Iran, Afghanistan to Central Asia, reaching the south of India (Leclercq, 1966a; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We caught two females on flowering Umbilifera in an olive grove on Naxos Island in mid-June 2016 (**new record for Cyclades**).

5. *Chrysops (Chrysops) italicus* Meigen, 1804

Klassifikation und Beschreibung der europäischen zweiflügligen Insekten, 1 (2), 158.

Type locality. Italy.

Range. Palearctic. Mediterranean, in Northern Africa from Morocco to Tunisia, through southern Europe eastwards to Turkey and Iran to the south to Cyprus and the Levant as far south as Lebanon (Leclercq, 1960; Chvála *et al.*, 1972; Müller *et al.*, 2012a; Chvála, 2013).

New records. We observed this species in Cyprus for several years, attacking man, horses, and cattle in the salt marshes surrounding Limassol Salt Lake from late April to early September. We have not recorded this species so far in the hills and mountains towards the center of the island. On Lesbos, we caught three males by sweeping vegetation and two females attacking the collector in the area surrounding the salt pans of Kalloni and Polichnitos (at sea level) in late April 1999 (**new record for Northern Aegean islands**).

***Silvius* Meigen, 1820**

Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten, 2, 27.

6. *Silvius algirus* Meigen, 1830

Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten, 6, 319.

Type locality. Algeria.

Range. Palearctic. Mediterranean, in Northern Africa from Morocco and Algeria, in Southern Europe from France and Italy through the Balkans to Greece, Bulgaria and Romania to Turkey (Chvála *et al.*, 1972; Chvála, 2013; Evenhuis & Pape, 2023) and the Levant (Müller *et al.*, 2011a).

New records. We found a single female on a Malaise trap in Andros Island in mid-May 2015 (**new record for Cyclades**).

TABANINAE

***Hybomitra* Enderlein, 1922**

Mitteilungen aus dem Zoologischen Museum in Berlin, 10, 347.

7. *Hybomitra decora* (Löw, 1858)

Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien, 8, 588.

Type locality. Syria.

Range. Palearctic. East Mediterranean, from Bulgaria to Turkey, absent from the Greek mainland but found on Crete, in the south, in the Levant, from Syria to the Sinai Peninsula (Chvála *et al.*, 1972; Müller *et al.*, 2012b; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We collected two females in a Malaise trap at the edge of oak maquis on a rocky slope in central Cyprus, west of Agros, 1000 m a.s.l., mid-June 2017 (**new record for Cyprus**).

***Atylotus* Osten Sacken, 1876**

Memoirs read before the Boston Society of Natural History, 2, 426.

8. *Atylotus agrestis* (Wiedemann, 1828)

(Figs 1, 5, 9)

Außereuropäische zweiflügelige Insekten, 1, 557.

Type locality. Egypt.

Range. Widespread in the Palearctic and Ethiopian regions, and the Indomalayan region in China, India, and Sri Lanka (Zhang & Yang, 2018; Evenhuis & Pape, 2023). According to Chvála *et al.* (1972), *A. agrestis* is restricted in the Palearctic to Egypt, new records show an extensive expansion to the north, to Saudi Arabia (Al Dhafer *et al.*, 2009), to the Sinai Peninsula (Müller *et al.*, 2012b) and to Israel. In Israel this species was first mentioned by Theodor (1965) from a single specimen collected in Eilat in 1962. Later, in the mid-1990's, we observed this species common along the Rift Valley up to the Sea of Galilee. It

established itself along the coast of Israel up to the Lebanese border within the last ten years and is fairly common now (unpublished data).

New records. The most northern record is one female from a Malaise trap catch from Lebanon, the Bequaa Valley, a farm south of Zahle, July 2007, stored in the collection of G. Müller (**new record for Lebanon**). In Cyprus, near the Limassol Salt Lake, we observed several specimens of this species feeding on horses, in mid-May 2015 and late June 2018; in early July 2019, two specimens were caught attempting to bite one of the coauthors. It is noteworthy that prior to 2015, we did not observe this species at this site (**new record for Cyprus and Europe**). It is worthwhile mentioning that we have recently obtained a single male from an automatic light trap catch during a Lepidoptera survey in Italy, Pantelleria, on 17 June 2019 (**new record for Italy**).

9. *Atylotus fulvus* (Meigen, 1804)

Klassifikation und Beschreibung der europäischen zweiflügligen Insekten, 1, 170.

Type locality. Germany.

Range. Palearctic, from Morocco through most of Europe, up to Scandinavia, eastwards through southern Siberia to the Russian Far East (Leclercq, 1966a; Chvála et al., 1972; Chvála, 2013). According to Chvála (2013), it is absent from the Greek mainland, the Greek islands, and Cyprus, but according to Evenhuis & Pape (2023), it was found in Turkey.

New records. We collected a single specimen with a Malaise trap on Rhodes Island, near the banks of the upper Gadoura River, in mid-May 2014 (**new record for Dodecanese**).

10. *Atylotus loewianus* (Villeneuve, 1920)

Annales de la Société entomologique de Belgique, 60, 65

Type locality. Spain.

Range. Palearctic and Afrotropical, from Morocco through the northern Mediterranean Basin, southern parts of Central and Eastern Europe through Greece to Turkey, Cyprus and the Levant, in the Afrotropical realm in Ethiopia and Kenya (Leclercq, 1966a; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We found several specimens in Malaise traps in the Cyclades Islands (Naxos, Tinos and Paros) in mid-June 2016 (**new record for Cyclades**).

11. *Atylotus pulchellus* (Löw, 1858)

Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien, 8, 597.

= *Tabanus cyprianus* Ricardo, 1911, *Records of the Indian Museum*, 4, 248.

Type locality. Asia minor (Turkey).

Range. East Palearctic, in the Mediterranean Basin in Algeria, Egypt, Sardinia and Cyprus, widely distributed in the Near East from Turkey to Iran, Iraq, in the Levant known from Jordan, and from southern Russia eastwards to Central Asia as far as China (Leclercq, 1966a; Chvála et al., 1972; Chvála, 2013; Evenhuis & Pape, 2023).

Taxonomic note. The species was described from Cyprus as *Tabanus cyprianus* Ricardo, 1911 (type locality: Kelopside). For several years, we observed it attacking men in May and September in Cyprus, in the salt marshes of Limassol Salt Lake.

12. *Atylotus quadrifarius* (Löw, 1874)

Zeitschrift für die gesamte Naturwissenschaft, 43, 414.

Type locality. Iran.

Range. Palearctic, in the western Mediterranean Basin in Morocco, Iberian Peninsula, France and again in the east in Greece, Turkey and the Levant, to Iraq, Iran and Afghanistan, in the north from Ukraine to southern Siberia and Central Asia (Leclercq, 1966a; Chvála *et al.*, 1972; Müller *et al.*, 2011a; Chvála, 2013). In Cyprus, *A. quadrifarius* was mentioned by Olsufjev (1937), but we did not observe it there.

New records. We caught 2 females while attacking men and donkeys in numbers on Lesvos, in the area surrounding the salt pans of Kalloni and Polichnitos (at sea level), in mid-May 2005 (**new Record for Northern Aegean islands**).

***Therioplectus* Kröber, 1925**

In: Lindner, E. (ed.), *Die Fliegen der Palaearktischen Region*, 4 (1), 131.

13. *Therioplectus tricolor* Zeller, 1842

Isis von Oken, 1842, 819

Type locality. Russia (“Sudrussland”).

Range. Palearctic. From Italy through the Balkans to mainland Greece and the Northern Aegean islands (Vóreion Aiyáion), through Bulgaria, Romania to Turkey and in southern Russia and South Caucasus (Leclercq, 1966a; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We caught one male in a Malaise trap on Rhodes Island, Mt. Attavyros 900–1000 m, south of Embonas, in early May 1989 (**new record for Dodecanese islands**).

14. *Therioplectus tunicatus* (Szilády, 1927)

Zoologischer Anzeiger, 74, 204.

Type locality. Greece, the Cyclades: Poros and Tinos.

Range. Palearctic, Central East Mediterranean. Known from Italy, Balkans to Transcaucasia, Turkey, Syria and Israel (Theodor, 1965; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We collected a single female in a Malaise Trap on the Cyclades, Naxos, at the edge of an olive grove, in early June 2016.

***Tabanus* Linnaeus, 1758**

Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1, 601.

15. *Tabanus autumnalis* Linnaeus, 1761

Fauna Svecica sistens animalia Sveciae regni: mammalia, aves, amphibia, pisces, insecta, vermes, 462.

Type locality. Sweden.

Range. Palearctic, from Northern Africa known from Morocco and Egypt, widespread in most of Europe, the Balears, Corsica, Sardinia, Sicily, Corfu and Cyprus, towards the east through southern Russia (southern Siberia), Greece, Turkey, Iran and Iraq to Central Asia, absent from Ireland, Finland and northern Russia (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013).

New records. We caught one female in central Lesvos in late May 2003 (**new record for Northern Aegean islands**), and two females in a Malaise trap and one male in an automatic light trap in Naxos in late June 2016 (**new record for Cyclades**).

16. *Tabanus bovinus* Linnaeus, 1758

Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1, 601.

Type locality. Europe.



Figures 1–4. Adults of Tabanidae, dorsal view. 1. *Atylotus agrestis*. 2. *Tabanus gratus*. 3. *Tabanus taeniola*. 4. *Tabanus sufis*. Scale bar – 5 mm

Range. Palearctic, from Northern Africa Morocco and Algeria through all of Europe (except Ireland), from Cyprus, through Turkey and South Caucasus eastwards as far as the Altai Republic in Russia (Leclercq, 1966a; Chvála *et al.*, 1972).

New records. We recorded this species only once feeding on a donkey on the Andros Islands in early July 2020 (**new record for Cyclades**).

17. *Tabanus bromius* Linnaeus, 1758

Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1, 602.

Type locality. Europe.

Range. Palearctic, from Morocco and Algeria widely distributed through most of Europe, so far not recorded from some Mediterranean Islands, east wards it is spread to Western Siberia, and Kazakhstan as far south as Turkey and the Levant in Israel (Theodor, 1965; Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013).

New records. We collected two females from horses in Crete, near Knossos, in late May 2022 (**new record for Crete**). We caught one female from a donkey in Thasos, in early July 2007 (**new record for Northern Aegean islands**).



Figures 5–8. Adults of Tabanidae, lateral view. 5. *Atylotus agrestis*. 6. *Tabanus gratus*. 7. *Tabanus taeniola*. 8. *Tabanus sufis*. Scale bar – 5 mm.

18. *Tabanus cordiger* Meigen & Wiedemann, 1820

In: Meigen, J.W., *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten*, 2, 47.

Type locality. Austria.

Range. Palearctic, from the Canary Islands to Morocco through most of Europe eastwards to the Ural Mts., in the East Mediterranean from the Greek mainland through Turkey to Iran (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013).

New records. We collected a single female feeding on a donkey in Crete, south of Anogia, 650 m a.s.l., in late May 2006. **New record for Crete.**

19. *Tabanus gratus* Löw, 1858

(Figs 2, 6, 10)

Öfversigt af Kongliga Vetenskapsakademiens Förhandlingar, 14, 340.

Type locality. South Africa.

Range. Afrotropical and Palearctic, widespread in Africa, penetrating the Palearctic realm through the East Mediterranean from Egypt, through Western Saudi Arabia and the Levant to Iran and Afghanistan (Oldroyd, 1954; Leclercq, 1966a; Müller *et al.*, 2012b, Evenhuis & Pape, 2023). Recently recorded in Israel. Two females were collected in a Malaise trap near Ashdod on 15 June 2008; one male near Afula in an automatic light trap in mid-July 2012, and four females from horses near Nazareth in mid-June 2022 (Schlein, Kravchenko, Revay & Müller, unpublished data, **new record for Israel**). We collected two females while feeding on horses at the outskirts of Limassol in Cyprus in July 2009, a single male in an automatic light trap 12 km east of Paphos in 2012, and two females in a Malaise trap near Stavrovouni Monastery in an old olive grove with grazing donkeys in early July 2017 (**new record for Cyprus**).

20. *Tabanus leleani* Austen, 1920

Bulletin of Entomological Research, 10, 312.

Type locality. Palestine.

Range. Palearctic and Oriental, in the Mediterranean Basin in Morocco, Algeria, the Greek mainland, Crete, Cyprus, Turkey and the Levant, to the Middle East, in the north from Romania to southern Russia and eastwards to Mongolia and Western China, penetrating the Oriental region into Pakistan and northern India (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013; Zhang & Yang, 2018; Evenhuis & Pape, 2023).

New records. We observed dozens of adults attacking horses in Cyprus near Káto Drys, in late July 2017; later, while leaving the place, several specimens followed the car, and two specimens entered the open window. We caught two females while feeding on a donkey on Rhodes Island, near Embonas, Mt. Attavyros, 700–800 m in mid-July 2001 (**new record for Dodecanese islands**).

21. *Tabanus regularis* Jaennicke, 1866

Berliner entomologische Zeitschrift, 10, 65.

Type locality. France.

Range. Palearctic, from Morocco, Algeria and Tunisia through southern Europe (including Greece) to Cyprus, Turkey, and the Levant, towards the east to South Caucasus, Iraq, Iran and in the north through southern Russia (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013). Variable specimens with paler brown color of the abdomen and entirely brownish antennae from Cyprus, Tunisia and Jerusalem were described by Szilády (1923) as a variety named *rufus*. Leclercq (1967) raised this form without justification to subspecific rank, according to Chvála (1972).

New record. We observed this species in Cyprus over several years, from late June to late August, from the coastal plain up to 1500 m a.s.l. in Malaise trap catches and feeding on donkeys and horses. We

recorded two females feeding on horses in Crete, on the northern foothills of the Idi Mts, 800 m in late July 2023, and we collected several females on Naxos Island not far from a pasture with horses in early August 2016 in a Malaise Trap (**new record for Crete and the Cyclades**).



Figures 9–12. Adults of Tabanidae, frontal view. 9. *Atylotus agrestis*. 10. *Tabanus gratus*. 11. *Tabanus taeniola*. 12. *Tabanus sufis*. Scale bar – 5 mm.

22. *Tabanus sufis* Jaennicke, 1867

(Figs 4, 8, 12)

Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 6, 332.

Type locality. Sudan.

Range. Afrotropical and Palearctic, widespread in Africa penetrating the Palearctic realm through the East Mediterranean from Egypt, Saudi Arabia and the Levant north and eastwards to Iraq, Iran, Pakistan and India, the species is absent from Turkey (Oldroyd, 1954; Leclercq, 1966a; Burger, 1984; Müller *et al.*, 2012b; El-Hassan *et al.*, 2013; Evenhuis & Pape, 2023).

New records. In the Levant the most northern record is from northern Lebanon, a female caught 10 km east of Tripoli in a Malaise trap in mid-June 2015. The specimen is deposited in the collection of G. Müller (**new record for Lebanon**). We collected three females feeding on a donkey in Cyprus, 10 km NW from Larnaca, in late May 2019 (**new record for Cyprus and Europe**).

23. *Tabanus taeniola* Palisot de Beauvois, 1806

(Figs 3, 7, 11)

Insectes recueillis en Afrique et en Amérique, dans les Royaumes d'Oware et de Benin, à Saint-Domingue et dans les États-Unis, pendant les années 1786–1797, 56.

Type locality. Nigeria.

Range. Afrotropical and Palearctic, widespread in Africa penetrating the Palearctic to the East Mediterranean coast through Egypt and the Levant eastwards to Saudi Arabia (Oldroyd, 1954; Leclercq, 1966a; Müller *et al.*, 2012b; El-Hassan *et al.*, 2013; Evenhuis & Pape, 2023).

New records. We caught a single female within a swarm of *T. leleani* attacking horses in Cyprus, near Káto Drys in late July 2017 (**new Record for Cyprus and Europe**).

24. *Tabanus tinctus* Walker, 1850

In: Saunders, W.W. (Ed.), *Insecta Saundersiana: or characters of undescribed insects in the collection of William Wilson Saunders, Esq., F.R.S., F.L.S., &c*, 1, 29.

= *Tabanus mixtus* Szilády, 1914, *Annales Historico-Naturales Musei Nationalis Hungarici*, 12, 672.

Type locality. Greece.

Range. Palearctic, in the Mediterranean Basin from Morocco to Tunisia, in Spain and from Italy through the Balkans to Greek mainland to Bulgaria, Romania as far east as Cyprus, Turkey, Caucasus and Azerbaijan (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013; Zhang & Yang, 2018; Evenhuis & Pape, 2023).

Taxonomic note. This species was described later as *Tabanus mixtus* Szilády, 1914 with the type localities Turkey, Cyprus, Tunisia. We did not collect it.

***Haematopota* Meigen, 1803**

Magazin für Insektenkunde, 2, 267.

25. *Haematopota coolsi* Leclercq, 1966b

Bulletin de l'Institut Agronomique et des Stations de Recherches de Gembloux, 1, 471.

Type locality. Turkey.

Range. Palearctic, East Mediterranean. Known from Turkey and Cyprus (Chvála *et al.*, 2013; Evenhuis & Pape, 2023). We did not encounter this species during our visits in Cyprus.

26. *Haematopota graeca* Szilády, 1923

Biologica Hungarica, 1 (1), 35.

Type locality. Greece, Poros Island.

Range. Palearctic, East Mediterranean. Known from the Greek mainland and Cyclades Islands (Chvála, 2013).

New records. We observed this species on Naxos and Tinos Islands readily attacking man in the late afternoon in shady ravines with some water puddles surrounded by oleander and willow thickets during early June 2016. The species was rather local and was not observed in nearby xeric habitats.

27. *Haematopota pandazisi* (Kröber, 1936)

Acta Instituti et Musei Zoologici Universitatis Atheniensis, 1, 43.

Type locality. Greece.

Range. Palearctic, in the Mediterranean Basin known from Morocco and Tunisia, in Mediterranean Europe from the Iberian Peninsula through Italy, the Balkans, Greece, Bulgaria and Romania to Turkey (Leclercq, 1966a; Chvála, 2013).

New records. We collected several females while persistently attacking men on Rhodes Island, near the banks of the Gadoura River dam in early July 2017 (**new record for Dodecanese islands**).

Dasyrhamphis Enderlein, 1922

Mitteilungen aus dem Zoologischen Museum in Berlin, 10, 346.

28. *Dasyrhamphis umbrinus* (Wiedemann, 1820)

In: Meigen, J.W., *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten*, 2, 35.

Type locality. Croatia and Slovenia.

Range. Palearctic, from Italy through the Balkans and Greece to Turkey, Iran and the Levant, towards the east from Transcaucasia to Turkmenistan (Leclercq, 1966a; Chvála *et al.*, 1972; Chvála, 2013; Evenhuis & Pape, 2023).

New records. We collected one female in Crete, in the northern outskirts of Heraklion, in an irrigated garden in early May 2022 and one male SW of Zaros on a bare rocky slope with an automatic light trap in mid-July 2023 (**new record for Crete**). We caught two females, one in late May and another in early June 2017, in Cyprus, south of the village Pano Panagia, 450 m a.s.l. in a dry ravine, in a Malaise trap operated from March 2017 to July 2018, (**new record for Cyprus**).

Discussion

The East Mediterranean is well known for its rich tabanid fauna (Leclercq, 1966a; Evenhuis & Pape, 2023), from the Greek mainland 74 species (Chvála, 2013) and from Turkey 171 species and 15 subspecies (Kılıç, 2006; Andreeva *et al.*, 2009; Altunsoy & Kılıç, 2010; Altunsoy, 2012, 2018; Altunsoy & Afacan, 2014) are known. The knowledge on the Levant is at best patchy, but overall, more than 60 species can be expected from Lebanon, Jordan and Israel (Leclercq, 1966a; Müller *et al.*, 2012a; Evenhuis & Pape, 2023; unpublished data).

The Greek islands are divided into six main groups: the Cyclades, the Ionian Islands, the Sporades, the Dodecanese, the Saronic Islands, and the North Aegean Islands (Fig. 13). Crete sits on its own, on the southern rim of the continental shelf, in an arc between the Peloponnese and the southern Dodecanese Islands. Cyprus is 550 km east of the Greek Islands, and zoogeographically belongs to the Levant (De Lattin, 1967; Por, 1975).

The biodiversity of islands is generally lower than in the nearby mainland and directly correlated to island size and isolation (Kier *et al.*, 2009; Gillespie & Kipling, 2018). The smaller Greek islands have high plant biodiversity with a high degree of endemism (Kougioumoutzis *et al.*, 2021), but insect biodiversity is low compared to the Greek mainland (Sfenthourakis & Legakis, 2001). Still, the scarcity of tabanid record is surprising in relation to other insect groups (Chvála, 2013; de Jong *et al.*, 2014). A major question is whether the lack of recorded tabanid species reflects the actual situation or a lack of research. Crete and Cyprus, on the other hand, are known for their rich insect biodiversity and a fairly high degree of endemism (Vogiatzakis *et al.*, 2020). Thus, it is surprising that few tabanid species have been found so far (Moucha & Chvála, 1957; Leclercq, 1967).

In total, 18 species were known from the studied territory until the present study added another 10 species (see Table 1). Only one horsefly species was known from the Dodecanese Islands, one from the North Aegean Islands, and two species were known from the Cyclades. This study has increased the number to six, seven, and nine, respectively. The combined taxa from the three island groups have increased from 4 to 17 species.

Three species were known in Crete, and the number of local species has increased to seven taxa. Eleven species were known in Cyprus, and this study added eight new records, resulting in nineteen species.

Additional new records are presented from the neighboring territories: one from the Greek mainland, two from Lebanon and two from Israel.



Figure 13. Map of the East Mediterranean islands and the neighboring territories considered in the study.

The most interesting records in this study are the four Afrotropical–Palearctic elements (*A. agrestis*, *T. sufis*, *T. taeniola*, and *T. gratus*) being for the first time recorded in Europe. All four species were found in Cyprus, with an additional record of *A. agrestis* from southern Italy. This is of specific interest because these species are efficient vectors for pathogens affecting the health and productivity of livestock. They deserve special attention in future surveys as potential invasive species (Keller *et al.*, 2011; Demetriou *et al.*, 2021).

Atylotus agrestis is widespread and common in African savannah habitats (Oldroyd, 1952, 1954, 1957; Leclercq, 1966a). In the Sahel, it is often abundant and a dominant species in many surveys (Goodwin, 1982; Dia *et al.* 1998). In the Palearctic, it was only known to be common along the Mediterranean shores of Egypt and Libya until the 1970s (Efflatoun, 1930; Leclercq, 1966a), with a single record in the early 1960s from Eilat, southern Israel by Theodor (1965). Recent records show an extensive expansion to the north, Saudi Arabia (Amoudi, 1989; Al Dhafer *et al.*, 2009), the Sinai Peninsula (Müller *et al.*, 2012b), and Israel. We found *A. agrestis* from the mid-1990s frequently along the Rift Valley up to the Sea of Galilee in Malaise and automatic light traps. In the last 10 years, this species has established itself along the coastal plain of Israel up to the Lebanese border and is now reasonably common (Y. Schlein, V. Kravchenko & G. Müller, unpublished data). The northernmost record of this species is from Lebanon in the Beqaa Valley.

A similar trend of expansion of this species to the north can be seen in Algeria. Until 1987, this species was absent here (Leclercq & Maldès, 1987), but it was recently recorded by Zeghouma *et al.* (2018) as the most common species in northeastern Algeria, accounting for almost a third of the total catch of horseflies. The single male of *A. agrestis* collected in 2019 from Pantelleria, the largest volcanic satellite island of Sicily located 60 km east of the Tunisian coast, is further evidence that this species is extending its distribution northwards. It will be interesting to see if this species will invade Sicily in the near future. The records from Cyprus over three years indicate that *A. agrestis* is already a part of the Cypriote fauna.

Table 1. Tabanidae of the East Mediterranean islands and their distribution in the neighboring territories. Asterisk (*) – new record, plus (+) – reference data, minus (–) – species is absent in the area.

№	Taxon	Greece	North Aegean	Cyclades	Dodecanese	Crete	Cyprus	Turkey	Levant
PANGONIINAE									
	<i>Pangonius</i> Latreille, 1802								
1	<i>Pangonius (Pangonius) obscuratus</i> Loew, 1859	*	–	–	+	–	+	+	–
2	<i>Pangonius (Melanopangonius) funebris</i> Macquart, 1846	+	*	–	–	–	–	+	–
CHRYSOPSINAE									
	<i>Chrysops</i> Meigen, 1803								
3	<i>Chrysops (Chrysops) caecutiens</i> (Linnaeus, 1758)	+	*	+	+	+	*	+	*
4	<i>Chrysops (Chrysops) flavipes</i> Meigen, 1804	+	–	*	–	–	+	+	+
5	<i>Chrysops (Chrysops) italicus</i> Meigen, 1804	+	*	–	–	–	+	+	+
	<i>Silvius</i> Meigen, 1820								
6	<i>Silvius algirus</i> Meigen, 1830	+	–	*	–	–	–	+	–
TABANINAE									
	<i>Hybomitra</i> Enderlein, 1922								
7	<i>Hybomitra decora</i> (Loew, 1858)	–	–	–	–	+	*	+	+
	<i>Atylotus</i> Osten Sacken, 1876								
8	<i>Atylotus agrestis</i> (Wiedemann, 1828)	–	–	–	–	–	*	–	+
9	<i>Atylotus fulvus</i> (Meigen, 1804)	–	–	–	*	–	–	+	–
10	<i>Atylotus loewianus</i> (Villeneuve, 1920)	+	–	*	–	–	+	+	+
11	<i>Atylotus pulchellus</i> (Loew, 1858)	–	–	–	–	–	+	+	+
12	<i>Atylotus quadrifarius</i> (Loew, 1874)	+	*	–	–	–	+	+	+
	<i>Therioplectus</i> Kröber, 1925								
13	<i>Therioplectus tricolor</i> Zeller, 1842	+	+	–	*	–	–	+	–
14	<i>Therioplectus tunicatus</i> (Szilády, 1927)	+	–	+	–	–	–	+	+
	<i>Tabanus</i> Linnaeus, 1758								
15	<i>Tabanus autumnalis</i> Linnaeus, 1761	+	*	*	–	–	+	+	+
16	<i>Tabanus bovinus</i> Linnaeus, 1758	+	–	*	–	–	+	+	+
17	<i>Tabanus bromius</i> Linnaeus, 1758	+	*	–	–	*	–	+	+
18	<i>Tabanus cordiger</i> Meigen, 1820	+	–	–	–	*	–	+	–
19	<i>Tabanus gratus</i> Loew, 1858	–	–	–	–	–	*	–	+
20	<i>Tabanus leleani</i> Austen, 1920	+	–	–	*	+	+	+	+
21	<i>Tabanus regularis</i> Jaennicke, 1866	+	–	*	–	*	+	+	+
22	<i>Tabanus taeniola</i> Palisot de Beauvois, 1806	–	–	–	–	–	*	–	+
23	<i>Tabanus suffis</i> Jaennicke, 1867	–	–	–	–	–	*	–	+
24	<i>Tabanus tinctus</i> Walker, 1850	+	–	–	–	–	+	+	–
	<i>Haematopota</i> Meigen, 1803								
25	<i>Haematopota coolsi</i> Leclercq, 1966	–	–	–	–	–	+	+	–
26	<i>Haematopota graeca</i> Szilády, 1923	+	–	+	–	–	–	–	–
27	<i>Haematopota pandazisi</i> (Kröber, 1936)	+	–	–	*	–	–	+	–
	<i>Dasyrhamphus</i> Enderlein, 1922								
28	<i>Dasyrhamphus umbrinus</i> (Meigen, 1820)	+	–	–	–	*	*	+	+

Tabanus gratus is common both in Africa and the Middle East; therefore, it is not a surprise that the species is also found in the Levant, which is a well-known crossroad of faunistic elements of the Palearctic, the Indomalayan and the Afrotropic realms (Furth, 1975). Recent records from the Sinai (Müller *et al.*, 2012b), Western Saudi Arabia (Müller *et al.*, 2011b) and Israel suggest that the species is indeed an integral part of the Levantine fauna. We found *T. gratus*, though in small numbers, in Cyprus in three different years (2009, 2012, and 2017) and therefore conclude that this species is an established element of the local fauna. It is not clear if it was overlooked in the past or if it recently arrived as an invasive species.

The single records of *T. taeniola* and *T. sufis* are a real surprise, especially because these two species seem not well established in the Levant.

Tabanus taeniola is a common African species that is also found in Saudi Arabia (Amoudi, 1989; Müller *et al.*, 2011b; Gadallah & Bosly, 2006). According to Efflatoun (1930), *T. taeniola* is the most common horsefly in Egypt, and it is found everywhere, especially in the Nile Valley and Delta, along the Mediterranean coast, and all major oases in the Eastern and Western Deserts. Also, in a more recent survey in the Sinai (Müller *et al.*, 2012b), the species was relatively common and regularly found. Towards the north, in Jordan and Israel, large numbers of flies were observed in single years to appear for a few days to sugar feed on *Acacia* flowers in oases and shortly after completely disappeared. In the years in between, the species was completely absent (Müller *et al.*, 2011a). Similar observations of suddenly appearing and vanishing swarms of hundreds of *T. taeniola* feeding on horses were made in Israel in late July 2016 along the coastal plain in Ashdod (V. Kravchenko, personal communication) and early September 2019 near Haifa Bay (E. Revay & G. Müller, unpublished data). Such behavior of *T. taeniola* in the northern Levant indicates that the species migrates from south to north possibly without establishing local populations.

The same behavior is known for other insect species, like the butterfly *Vanessa cardui* (Benyamini, 2017; Benyamini & Müller, 2020) and the mosquito *Anopheles pharoensis* (Garrett-Jones, 1962), and is suspected for the stable fly *Stomoxys calcitrans* (Müller *et al.*, 2012c; G. Müller & Y. Schlein, unpublished data). It is therefore possible that the single recorded female in Cyprus (near Káto Drys in late July 2017, see above) was part of a larger migrating population.

Oldroyd (1954) noted that *T. sufis* is not properly a species of the Afrotropical realm (former Ethiopian region) but rather an eremic species of the semi-desert belts south of the Sahara. This species penetrates the Palearctic through Egypt, Sinai, Saudi Arabia, Oman (Leclercq, 2000), as far north as Iran. In the Levant, it is known from Jordan, Israel, and Iraq. Efflatoun (1930) states that *T. sufis* is a common species with a wide distribution in the whole of Egypt, from Alexandria to Assouan, the Red Sea coast, and all the oases in the Western Desert. This is also true for the Sinai (Müller *et al.* 2012b) and Jordan (Al-Talafha *et al.*, 2004, 2005), but towards the north, this species is becoming increasingly uncommon. In Israel the species is rare and mainly confined to the Dead Sea area and Jordan Valley, with a few sporadic records (Theodor, 1965; Müller *et al.*, 2012b). Recently, in 2018, we found a single female in northern Israel near Nahariya (G. Müller & E. Revay, unpublished data) and a single male in an automatic light trap in northern Lebanon in 2015 (see above). In Iran, *T. sufis* is again widely spread and not uncommon (Abbassian-Lintzen, 1964). The distribution pattern and the records of *T. sufis* in the Levant suggest that it is most likely a rare element of the local fauna in Cyprus and not a migrant.

By summarizing the local horsefly fauna in the discussed region, the authors hope to encourage further studies of tabanids.

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