Abstract
All known taxa of the family Oestridae (superfamily Oestroidea) in both Egypt and Saudi Arabia are systematically catalogued herein. Three oestrid subfamilies have been recorded in Saudi Arabia and/or Egypt by six genera: *Gasterophilus* (Gasterophilinae), *Hypoderma*, *Przhevalskiana* (Hypodermatinae), *Cephalopina*, *Oestrus*, and *Rhinoestrus* (Oestrinae). Five *Gasterophilus* spp. have been recorded in Egypt, namely, *G. haemorrhoidalis* (Linnaeus), *G. intestinalis* (De Geer), *G. nasalis* (Linnaeus), *G. nigricornis* (Loew), and *G. pecorum* (Fabricius). Only two of these species have also been recorded in Saudi Arabia, namely: *G. intestinalis* (De Geer) and *G. nasalis* (Linnaeus). The subfamily Hypodermatinae is represented in the two countries by only four species in two genera, namely, *H. bovis* (Linnaeus) and *H. desertorum* (Brauer) (in Egypt only), and *H. lineatum* (Villers) (in Saudi Arabia only) and *Przhevalskiana silenus* (Brauer) (in both countries). The subfamily Oestrinae is represented by two widely distributed species in both countries, namely, *C. titillator* (Clark) and *O. ovis* (L.), in addition to another species represented in Egypt only, *R. purpureus* (Brauer). For each species, synonymies, type localities, distribution, Egyptian and Saudi Arabian localities with coordinates, and collection dates are presented.

Keywords
Activity periods, bot flies, distribution, gad flies, heel flies, hosts, localities, parasites, warble flies
Introduction

The Oestridae are a family within the superfamily Oestroidea, together with the families Calliphoridae, Rhiniidae, Sarcophagidae, Mystacinobiidae, Tachinidae, and Rhinophoridae (Pape et al. 2011). These families, except for Calliphoridae, are monophyletic, and the concept of Oestridae as a monophyletic family within the Oestroidea has been clearly established (Pape 1992; Pape 2001; Pape and Arnaud Jr 2001; Marinho et al. 2012).

Flies of the family Oestridae are large robust flies, with hair-like setae or soft setulae, without stout setae, mostly bee- or wasp-like, without vibrissae, and with reduced mouthparts (Marshall et al. 2017). They are commonly known as bot flies, warble flies, heel flies, and gad flies (Mote 1928; Saini and Sankhala 2015). Several species of these flies have significant medical and veterinary importance because of their mammal-parasitizing habits; thus, they receive substantial attention from applied entomologists, wildlife ecologists, and assuredly from taxonomists (Pape 2001).

Bot flies were formerly classified into four families: Cuterebridae, Gasterophilidae, Hypodermatidae, and Oestridae. However, they are conveniently treated now as a single family, Oestridae, including the former families as subfamilies, namely: Cuterebrinae, Gasterophilinae, Hypodermatinae, and Oestrinae (Wood 1987; Pape 1992; Pape 2001). All these subfamilies, except the first, are represented in Saudi Arabia and/or Egypt by six genera (Table 1): *Gasterophilus* (Gasterophilinae), *Hypoderma*, *Przhevalskiana* (Hypodermatinae), *Cephalopina*, *Oestrus* and *Rhinoestrus* (Oestrinae) (Steyskal and El-Bialy 1967; Büttiker and Zumpt 1982).

Larvae of the genus *Gasterophilus* are common obligatory endoparasites of the alimentary tract of equines (*Equus* spp.) including horses, donkeys, and zebras in the family Equidae (Abdel Rahman et al. 2018). They can also affect other animals, such as rhinoceroses, lions, cows, sheep, goats, and even were recorded in a human infant (Royce et al. 1999). These larvae cause gastrointestinal myiasis leading to gastrointestinal ulcerations, gut obstructions or volvulus, rectal prolapses, anemia, diarrhea, and other digestive disorders (Hoseini et al. 2017). Species of the genus *Gasterophilus* have become near cosmopolitan because their distribution coincides with that of their domesticated hosts (Li et al. 2019a). Six *Gasterophilus* spp. have been recorded from the Old World (Zumpt 1965; Soós and Minar 1986a). Five of these have been recorded in Egypt, namely, *G. haemorrhoidalis* (Linnaeus), *G. intestinalis* (De Geer), *G. nasalis* (Linnaeus), *G. nigricornis* (Loew), and *G. pecorum* (Fabricius) (Steyskal and El-Bialy 1967, Soós and Minar 1986a). Only two have also been recorded from Saudi Arabia, namely: *G. intestinalis* and *G. nasalis* (Abu-Thuraya 1982; Büttiker and Zumpt 1982; Abu-Zoherah et al. 1993; Al-Ahamdi and Salem 1999).

The subfamily Hypodermatinae is represented in both Egypt and Saudi Arabia by only four species in two genera, namely, *H. bovis* (Linnaeus) and *H. desertorum* Brauer (in Egypt only), and *H. lineatum* (Villers) and *P. silenus* (Brauer) (in both Egypt and Saudi Arabia) (Steyskal and El-Bialy 1967; Büttiker and Zumpt 1982; Soós and Minar 1986b; El-Azzazy 1997; Morsy et al. 1998). The common and best
The Oestridae in Egypt and Saudi Arabia

Table 1. Oestrid species recorded from Egypt and Saudi Arabia (* = recorded, x = not recorded).

| Subfamily Gasterophilinae | Egypt | Saudi Arabia |
|---------------------------|-------|--------------|
| Gasterophilus haemorrhoidalis (Linnaeus, 1758) | * | x |
| Gasterophilus intestinalis (De Geer, 1776) | * | * |
| Gasterophilus nasalis (Linnaeus, 1758) | * | * |
| Gasterophilus nigricornis (Loew, 1863) | * | x |
| Gasterophilus pecorum (Fabricius, 1794) | * | x |

| Subfamily Hypodermatinae | Egypt | Saudi Arabia |
|--------------------------|-------|--------------|
| Hypoderma bovis (Linnaeus, 1758) | * | x |
| Hypoderma desertorum Brauer, 1897 | * | x |
| Hypoderma lineatum (Villers, 1789) | x | * |
| Przhevalskiana silenus (Brauer, 1858) | * | * |

| Subfamily Oestrinae | Egypt | Saudi Arabia |
|--------------------|-------|--------------|
| Cephalopina titillator (Clark, 1816) | * | * |
| Oestrus ovis (Linnaeus, 1758) | * | * |
| Rhinoestrus purpureus (Brauer, 1858) | * | x |

known subcutaneous myiasis in domesticated and wild ruminants called bovine hypodermosis is caused by larvae of *Hypoderma* species across the Old World (Boulard 2002). This disease is endemic in livestock, including cattle, buffaloes, goats, sheep, and deer. Hypodermosis results in a severe decline in the production of meat and milk and depreciation in hide quality from holes and other flaws caused by *Hypoderma* larvae (Hall and Wall 1995). The larvae of *P. silenus* (goat warble fly) are known to cause subcutaneous myiasis distinguished by nodules on the back of goats and sheep. This myiasis causes severe economic problems to the livestock industry, including abortion and reduction in the body weight, fertility, and dairy production of the infested animals, in addition to a reduction in the quality of the hides and wool of the animal (Liakos 1986; El-Azzazy 1997).

Flies in the subfamily Oestrinae are known as nasopharyngeal bot flies; they are host specific and cause obligatory myiasis in many animal species. Their obligatory parasitic larvae are known to cause nasopharyngeal myiases giving rise to respiratory problems, rhinitis, irritation, purulent mucous exudates, and nasal discharge (Catts and Mullen 2002; Otranto et al. 2003). Two oestrine species are widely distributed in both Egypt and Saudi Arabia, namely, *O. ovis* (sheep nasal bot fly) and *C. titillator* (camel nasal bot fly), which cause economic damage in the animal husbandry industry (Abu-Thuraya 1982; Büttiker and Zumpt 1982; Zayed 1998; Alahmed 2002). Another oestrine species, *R. purpureus* (equine nasal bot fly), is represented in Egypt and causes a parasitic disease in horses and donkeys called rhinoestrosis, which is characterized by clinical signs ranging from inflammation to coughing, sneezing, and dyspnea (Otranto 2004; Hilali et al. 2015).

Egypt and Saudi Arabia are two neighboring Middle Eastern countries separated by the Red Sea and the Gulf of Aqaba (Fig. 1). They are biogeographically comparable being located at the junction of the Palearctic and the Afrotropical Realms (Wallace 1876; Hölzel 1998; El-Hawagry and Gilbert 2014).
Figure 1. A satellite map of Egypt and Saudi Arabia.

An arid desert climate prevails in both countries, with the exception of small strip of the Mediterranean coastline in Egypt and the Asir Highlands along the Red Sea coast of Saudi Arabia. The climate in both countries is characterized by hot summer and a mild winter. From north to south across Egypt, three general climatic zones may be distinguished (Ullrich 1996): The Mediterranean coast zone with 70–200 mm annual precipitation and mean temperature ranging from 9.4 °C in January to 29.7 °C in July; the middle zone with 29N as its latitudinal boundary, with less than 1 mm (Siwa Oasis) to 35 mm (Cairo) annual precipitation, and has only slightly higher temperature than the Mediterranean coast zone and the third zone is the upper Egypt, where rainfall is scant and capricious, ranging from 3 mm (Aswan) to none, with mean temperature (at Aswan) ranging from 9.3 °C in January to 41.8 °C in July. In general, the rainfall is low in the most Egyptian areas and deserts (<80 mm annually). Only the Mediterranean coastal strip from Salloum to Alexandria, Gebel Elba in the extreme southeast, and the mountains of southern Sinai receive higher and less erratic rainfall (ca 200 mm annually). In Saudi Arabia, the average annual temperature is 25.2 °C, the average high temperature is about 37.8 °C during summer (June to August) and is about 11.1 °C during winter (December to February). It is cool, with frost and snow may occur in the Asir Highlands during winter. The precipitation is also low throughout the country (<100 mm). It is more than 480 mm in the highlands of Asir; however, a decade may pass with no precipitation at all in the Rub’ al Khali (Empty Quarter) in the southeastern Saudi Arabia (Almazroui 2011).

Efflatoun Bey, often called the “father of Egyptian entomology”, comprehensively surveyed the Diptera of Egypt and established big collections of flies pinned and pre-
served in three Egyptian museums in Cairo University, Ministry of Agriculture, and Entomological Society of Egypt. The oestrid specimens in these collections are considered in the present study.

During the nineteenth century, two species of subfamily Oestrinae, *Oestrus macroculus* Wiedemann, 1830 and *O. libycus* Clark, 1843, originally described from Egypt have been later synonymized with *Cephalopina titillator*. Then Brauer (1897) has described *Hypoderma desertorum* from Helwan (Cairo), Egypt.

No systematic studies on bot flies have been previously conducted in Egypt. Only a list of species of dipterous families in Egypt was published by Steyskal and El-Bialy (1967), where 1,339 species have been listed, including 10 oestrid species (treated as Gasterophilidae and Oestridae). The list involved only family names with a list of species within each family, without any other taxonomic or faunistic data. Subsequently, between 1987 and 2018, the species prevalence and infestation by oestrids have been received attention by entomologists and veterinarians, but no study has been carried out to explore the national prevalence of this group. The infestation of donkeys by *Gastrophilus* and *Rhinoestrus* species has been investigated in the slaughterhouse of the National Cairo Circus and in Giza Zoo abattoir by Hilali et al. (2015) and Attia et al. (2018). In sheep, the infestation by maggots of *Oestrus ovis* in Cairo and *Przewalskiana silenus* in Sinai has been studied by Amin et al. (1997) and Morsy et al. (1998), respectively. Two studies have been conducted to illustrate the morphological characterization of larval stage of *Gastrophilus* species infest stomach of donkeys (El-Bakry and Fadly 2014, Abdel Rahman et al. 2018).

Although documentation of biological diversity in Saudi Arabia began in the second half of the 1960s, the first traces of the Saudi Arabian oestrid flies are found in a work dated 1982, as five species, *Cephalopina titillator*, *Gasterophilus intestinalis*, *G. nasalis*, *Hypoderma lineatum*, and *Oestrus ovis* have been mentioned from Riyadh Region (Büttiker and Zumpt 1982). In the same year, a book on the agricultural pests in the Kingdom of Saudi Arabia has been published (Abu Thuraya 1982). This book has documented four species *C. titillator*, *G. intestinalis*, *G. nasalis*, and *O. ovis*. El-Azzazy (1997) reported the larvae of the goat warble fly, *Przewalskiana silenus*, on the backs of goat carcasses at the Jeddah abattoir (Makkah Region) for the first time. Between 1988–2018, entomological, medical and veterinary works have been published, but most of these studies were carried out at provincial scale. The ocular myiasis in man caused by the sheep bot fly *O. ovis* has been firstly reported in Saudi Arabia from Abha (Asir Region) by Omar et al. (1988). The prevalence variation of *C. titillator* infesting dromedary camels has been studied in the Eastern Province (Fatani and Hilali 1994), Jeddah (Gadallah and Bosly 2006) and Riyadh (Alahmed 2002). Also, the prevalence of *O. ovis* infesting sheep has been investigated in Asir (Kenawy et al. 2014), Jazan (Bosly 2013), Jeddah (Alikhan et al. 2018) and Riyadh (Alahmed 2000). Akhter et al. (2000) report two cases of cutaneous infestation in a man and a woman caused by *Dermatobia hominis* in Taif, Saudi Arabia. This record is doubtful as *D. hominis* is native to the Americas, and the species was identified only from larvae.
This study is one in a series of studies planned to catalogue the superfamily Oestroidea in Egypt and Saudi Arabia. Two papers in this series have already been published (El-Hawagry 2018; El-Hawagry and El-Azab 2019).

**Materials and methods**

The present data were gathered from some adult specimens collected and pinned by the authors from different Egyptian and Saudi Arabian localities, in addition to adult specimens pinned and preserved in Efflatoun Bey's collection, Department of Entomology, Faculty of Science, Cairo University, Egypt (EFC); the Ministry of Agriculture Collection, Plant Protection Research Institute, Dokki, Giza, Egypt (PPDD), and the King Saud University Museum of Arthropods, Riyadh, Saudi Arabia (KSMA). A great deal of biological, faunistic, and taxonomic information, including synonymies, distribution, collection localities, and dates were also obtained from relevant literature.

This study catalogues all known taxa of the family Oestridae recorded from Egypt and Saudi Arabia. Subfamilies are arranged phylogenetically according to Pape (2001). Genera and species within subfamilies are arranged alphabetically. Synonyms comprised all available and unavailable names of genera and species are listed chronologically.

Family-group and genus-group names are written in bold uppercase letters and left-justified, with the genus-group names italicized. The genus-group names are listed again and left-justified under the headings, and written in bold italicized letters, with the first letter in uppercase and the remaining letters in lowercase, followed by the author, year, journal, and pages. Type species for each genus is given at the end, followed by the method by which it was fixed. Species names are left-justified as well, and written in bold italicized letters. Names of taxonomically valid species (senior synonyms) are listed again, combined with their original genera and left-justified under the headings followed by the author, year, journal, and pages. Synonyms of genera and species are listed in chronological order and written in regular italicized letters, followed by the author, year, journal, and pages as in senior taxa. The type locality for each species, including both senior and junior synonyms, is provided from the original descriptions. World distribution of each species based on relevant literature is listed alphabetically. The concept of Kirk-Spriggs and Sinclair (2017) regarding the boundaries between the Palearctic and Afrotropical realms is considered herein. Exceptions are the southwestern part of Saudi Arabia, south to the Tropic of Cancer and Gebel Elba, the southeastern triangle of Egypt, which are considered herein as Afrotropical (Sclater 1858; Wallace 1876; Ghazanfar and Fisher 1998; El-Hawagry and Gilbert 2014; Al Dhafer and El-Hawagry 2016; El-Hawagry 2017; El-Hawagry et al. 2018). The collection localities and dates in both Egypt and Saudi Arabia are given in tables to provide the local distribution and activity periods of oestrid flies. Localities within each Egyptian ecological zone and Saudi Arabian region are arranged in alphabetical order. The recording method, e.g., literature, museum material, and collected material are provided. Coordinates of each locality are mostly given, and distribution maps for species are provided using ArcMap 10.4.
Catalogue of the family Oestridae in Egypt and Saudi Arabia

Order: Diptera
Suborder: Cyclorrhapha
Superfamily: Oestroidea
Family Oestridae
Subfamily Gasterophilinae

Genus Gasterophilus Leach, 1817

Gasterophilus Leach, 1817: 2. Type species: Oestrus equi Clark, 1797 (= Oestrus intestinalis De Geer, 1776), by subsequent designation of Curtis, 1826: 146.

Gastrus Meigen, 1824: 174. Type species: Oestrus intestinalis De Geer, 1776, by subsequent designation of Coquillett, 1910: 546.

Gastrophilus Agassiz, 1846: 160. Invalid emendation of Gasterophilus.

Enteromyza Rondani, 1857: 20. Unnecessary replacement name for Gasterophilus.

Rhinogastrophilus Townsend, 1918: 152. Type species: Oestrus nasalis Linnaeus, 1758, by original designation.

Enteromyia Enderlein, 1934: 425. Type species: Oestrus haemorrhoidalis Linnaeus, 1758, by original designation.

Stomachobia Enderlein, 1934: 425. Type species: Oestrus pectorum Fabricius, 1794, by original designation.
**Gasterophilus haemorrhoidalis** (Linnaeus, 1758)

*Oestrus haemorrhoidalis* Linnaeus, 1758: 584. Type localities: Probably Sweden, Germany, and France (see Li et al. 2019b).

*Oestrus salutiferus* Clark, 1816: 3. Type locality: England.

*Oestrus duodenalis* Schwab, 1840: 35. Type locality: Europe.

*Gastrophilus pallens* Bigot, 1884: 4. Type locality: Sudan (Suakin).

*Gasterophilus pseudohaemorrhoidalis* Gedoelst, 1923: 272. Type localities: Eritrea (Asmara); Republic of the Congo, Katanga Province (Biano), and Zambia.

*Oestrus hemorrhoidalis* Clark, 1815: 71. Incorrect subsequent spelling of *haemorrhoidalis* Linnaeus, 1758.

*Oestrus hemorroidalis* Guérin-Méneville, 1827: 96. Incorrect subsequent spelling of *haemorrhoidalis* Linnaeus, 1758.

*Oestrus aemorrhoidalis* Rondani, 1857: 21. Incorrect subsequent spelling of *haemorrhoidalis* Linnaeus, 1758.

Common name. Nose bot fly or Lip bot fly.

**Distribution.** AF: Burkina Faso, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Namibia, Republic of the Congo, Senegal, South Africa, Sudan, Tanzania, Zambia.

AU: Australia, Hawaii, New Zealand, Tasmania.

NE: Canada (Alberta, British Columbia, Manitoba, Saskatchewan), Mexico, USA (widespread).

NEO: Argentina, Venezuela.

OR: India.

PA: Widespread. (see Soós and Minar 1986a; Kettle 1995; Li et al. 2019b).

**Localities, hosts, and dates of collection.** See Table 2 and Figure 3.

**Gasterophilus intestinalis** (De Geer, 1776)

Fig. 2a

*Oestrus intestinalis* De Geer, 1776: 292. Type locality: Sweden.

*Oestrus equi* Clark, 1797: 298. Preoccupied by Fabricius, 1787. Type locality: England.

*Oestrus gastricus major* Schwab, 1840: 31. Unavailable name.

*Oestrus bengalensis* Macquart, 1843: 182. Type localities: Bangladesh and India.

*Oestrus gastrophilus* Gistel, 1848: 153. Type locality: Probably Germany.

*Oestrus schwabianus* Gistel, 1848: 153. Type locality: Probably Germany (Bavaria).

*Gastrophilus equi var. asininus* Brauer, 1863: 71. Type localities: Egypt and Sudan (“Egypten” & “Nubien”).

*Gastrophilus aequi*: Brauer 1863: 28. Incorrect subsequent spelling of *equi* Clark, 1797.

*Gasterophilus magnicornis* Bezzi, 1916: 29. Type locality: Eritrea.
Table 2. Localities, hosts, and dates of collection of *G. haemorrhoidalis*.

| Country   | Zone or Region | Locality | Coordinates       | Host/s                  | Months of collection | Reference                        |
|-----------|----------------|----------|-------------------|-------------------------|----------------------|----------------------------------|
| Egypt     | Coastal Strip  | Alexandria | 31.20358N, 29.917285E | mules and donkeys (from stomachs) | from October to April | El-Bakry and Fadly (2014)        |

**Figure 2.**

- **a** *Gasterophilus intestinalis* (habitus, dorsal)
- **b** *G. nasalis* (habitus, dorsal)
- **c** *G. nigricornis* (habitus, dorsal)
- **d** *Cephalopina titillator* (habitus, lateral).

**Common name.** Horse bot fly.

**Distribution.** AF: Burkina Faso, Chad, Eritrea, Ethiopia, Ghana, Kenya, Morocco, Nigeria, Republic of the Congo, Senegal, South Africa, St. Helena, Sudan, Tanzania, United Arab Emirates. AU: Australia (New South Wales, Norfolk Is, Tasmania), Hawaii, New Zealand. NE: Canada (Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Quebec, Saskatchewan), Mexico (Aguascalientes, Chiapas), USA (widespread). NEO: Argentina, Brazil (Rio Grande do Sul), Chile (Bío Bío Region), Jamaica, Venezuela. OR: India. PA: Widespread. (see Soós and Minar 1986a; Kettle 1995; Li et al. 2019b).

**Localities, hosts, and dates of collection.** See Table 3 and Figure 3.
Table 3. Localities, hosts, and dates of collection of *G. Intestinalis*.

| Country   | Zone or Region       | Locality                  | Coordinates                  | Host/s                                      | Months of collection | Reference                                      |
|-----------|----------------------|---------------------------|------------------------------|---------------------------------------------|----------------------|------------------------------------------------|
| Egypt     | Coastal Strip        | Alexandria                | 31.203358N, 29.917285E       | mules and donkeys (from stomachs)           | from October to April| El-Bakry and Fadly (2014)                       |
|           | Lower Nile Valley & Delta | Cairo (at slaughterhouse of the National Cairo Circus) | 30.12246N, 31.360598E | donkeys                                     | throughout the year  | Hilali et al. (1987)                           |
|           |                      | Cairo (at Cairo Manure Co.) | 30.102160N, 31.253994E       | mules and donkeys (from stomachs)           | April to December    | museum material (see material examined)        |
|           |                      | Cairo (abattoir)          | 30.040022N, 31.244248E       | donkeys (from stomachs)                     | June                 | museum material (see material examined)        |
|           |                      | Giza (Giza Zoo)           | 30.027973N, 31.215963E       | donkeys (from stomachs)                     | throughout the year  | Abdel Rahman et al. (2018); Attia et al. (2018)|
| KSA       | widespread in all regions, especially abundant in Al-Ehsaa, El-Kharj and Riyadh | Al-Ehsaa | 25.388528N, 49.596223E | donkeys and horses (from stomachs)          | March to September   | Abu-Thuraya (1982)                            |
|           |                      | El-Kharj                  | 24.148402N, 47.305011E       | donkeys and horses (from stomachs)          | March to September   | Büttiker and Zumpt (1982)                      |
|           |                      | Riyadh (near slaughterhouse) | 24.578977N, 46.736175E      | from dead domestic horse                    | March                |                                                 |

Figure 3. Distribution map of *G. haemorrhoidalis* and *G. intestinalis*. 
Material examined. Egypt • 1 male; Cairo Manure Co.; 30.102160N, 31.253994E; 13.Nov.1924; from the stomach of a donkey; EFC • 1 male; same data as for preceding; 22.Apr.1930 • 1 male; same data as for preceding; 23.Nov.1930 • 1 female; same data as for preceding; 29.Oct.1924; PPDD • 1 ?male; same data as for preceding; Cairo abattoir; 30.040022N, 31.244248E; 7.Jun.1924.

*Gasterophilus nasalis* (Linnaeus, 1758)

Fig. 2b

*Oestrus nasalis* Linnaeus, 1758: 584. Type locality: Sweden.

*Oestrus equi* Fabricius, 1787: 321. Type locality: Probably Europe.

*Oestrus veterinus* Clark, 1797: 312. New replacement name for *Oestrus nasalis* Linnaeus, 1758.

*Oestrus salutaris* Clark, 1815: pl. 1. *Nomen nudum*.

*Gasterophilus clarkii* Leach, 1817: 2. Type locality: England (Bantham).

*Gastrus jumentarum* Meigen, 1824: 179. Type locality: Probably Denmark.

*Oestrus stomachinus* Gistel, 1848: 153. Type locality: Probably Germany (Bavaria).

*Gasterophilus crossi* Patton, 1924: 963. Type locality: India (Punjab).

*Gastrophilus albescens* Pleske, 1926: 228. Type locality: Egypt (Cairo).

*Gastrophilus nasalis* var. *nudicollis* Dinulescu, 1932: 28, 32. Type locality: Unknown.

*Gastrophilus veterinus* var. *aureus* Dinulescu, 1938: 315. Type locality: Unknown.

*Gastrus jumentorum*: Brauer, 1863: 87, 280. Incorrect subsequent spelling of *jumentarum* Meigen, 1824.

*Oestrus nasulis*: Fabricius, 1787: 321. Incorrect subsequent spelling of *nasalis* Linnaeus, 1758.

Common name. Throat bot fly or Horse nasal bot fly.

Distribution. Cosmopolitan.

Localities, hosts, and dates of collection. see Table 4 and Figure 4.

Material examined. Egypt • 1 male; Abu-Rawash; 30.045837N, 31.091406E; 18.May.1935; EFC • 1 female; Cairo Manure Co.; 30.102160N, 31.253994E; 11.Jun.1924; from the stomach of a mule; EFC • 1 male; Helwan; 29.839022N, 31.300160E; 18.May.1934 • 1 female; Maadi; 29.961203N, 31.266910E; 9.Apr.1916; EFC.

*Gasterophilus nigricornis* (Loew, 1863)

Fig. 2c

*Gastrus nigricornis* Loew, 1863: 38. Type locality: Moldova (Bessarabia).
### Table 4. Localities, hosts, and dates of collection of *G. nasalis.*

| Country | Zone or Region                | Locality            | Coordinates                    | Host/s                                      | Months of collection          | Reference                                      |
|---------|-------------------------------|---------------------|--------------------------------|---------------------------------------------|--------------------------------|------------------------------------------------|
| Egypt   | Coastal Strip                 | Alexandria         | 31.203358N, 29.917285E         | mules and donkeys (from stomachs)           | from October to April          | El-Bakry and Fadly (2014)                      |
|         | Lower Nile Valley & Delta     | Abu-Rawash         | 30.045837N, 31.091406E         | not given                                   | May                            | museum material (see material examined)        |
|         | Cairo (at slaughter           | 30.122446N, 31.360598E | donkeys                       | throughout the year                        | Hilali et al. (1987)          |                                                 |
|         | house of the National Cairo   |                     |                               |                                             |                                |                                                 |
|         | Circus)                       |                     |                               |                                             |                                |                                                 |
|         | Cairo (no further data)       | –                   | –                             | –                                          | Li et al. (2019b)              |                                                 |
|         | Cairo (at Cairo              | 30.102160N, 31.253994E | mules (from stomachs)        | June                                        | museum material (see material examined) |                                                 |
|         | Manure Co.)                   |                     |                               |                                             |                                |                                                 |
|         | Helwan                        | 29.839022N, 31.300160E | not given                     | April and December                         | museum material (see material examined) |                                                 |
|         | Maadi                         | 29.961203N, 31.266910E | not given                     | April                                       | museum material (see material examined) |                                                 |
| KSA     | Widespread in all regions,    | Al-Ehsaa            | 25.388528N, 49.596223E        | donkeys and horses (from stomachs)          | March to September             | Abu-Thuraya (1982)                            |
|         | especially abundant in Al-    |                     |                               |                                             |                                |                                                 |
|         | Ehsaa, El-Kharj and Riyadh   | El-Kharj            | 24.148402N, 47.305011E        | donkeys and horses (from stomachs)          | March to September             |                                                 |
|         | Riyadh (near slaughterhouse) | 24.578977N, 46.736175E | from dead domestic horse      | March                                       | Büttiker and Zumpt (1982)      |                                                 |
|         |                               |                     |                               |                                             |                                |                                                 |

*Gastrophilus viridis* Sultanov, 1951: 41. Type locality: Kazakhstan.

*Gasterophilus migricornis*: Colwell, 2006: 291. Incorrect subsequent spelling of *nigricornis* Loew, 1863.

**Common name.** Horse stomach bot fly.

**Distribution.** PA: China, Egypt, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan (see Soós and Minar 1986a; Kettle 1995; Li et al. 2019b).

**Localities, hosts, and dates of collection.** See Table 5 and Figure 4.

**Material examined.** Egypt • 1 female; Helwan; 29.839022N, 31.300160E; 13.Apr.1935; EFC.
Table 5. Localities, hosts, and dates of collection of *G. nigricornis*.

| Country  | Zone or Region         | Locality  | Coordinates       | Host/s    | Months of collection | Reference                      |
|----------|------------------------|-----------|-------------------|-----------|----------------------|--------------------------------|
| Egypt    | Lower Nile Valley & Delta | Helwan    | 29.839022N, 31.300160E | not given | April                | museum material (see material examined) |

Figure 4. Distribution map of *G. nasalis, G. nigricornis*, and *G. pecorum*.

*Gasterophilus pecorum* (Fabricius, 1794)

*Oestrus pecorum* Fabricius, 1794: 230. Type locality: Probably Europe.

*Oestrus vituli* Fabricius, 1794: 231. Type locality: Not given, probably Sweden and France.

*Gastrus jubarum* Meigen, 1824: 179, 180. Type locality: Austria.

*Gastrus lativentris* Brauer, 1858b: 465. Type locality: Latvia (Curland).

*Gastrus ferruginatus* Zetterstedt, 1844: 978. Type locality: Sweden (Skåne, Tranås socken, Esperöd).

*Gasterophilus pecorum* var. *zebrae* Rodhain & Bequaert, 1920: 181. Type localities: Kenya and Tanzania.

*Gastrophilus vulpecula* Pleske, 1926: 227. Type locality: China (Inner Mongolia, Alxa League).

*Gastrophilus gammeli* Szilády, 1935: 140. Type locality: Hungary.

*Gastrophilus hammeli*: Paramonov, 1940: 34, 46. Incorrect subsequent spelling of *gammeli* Szilády, 1935.

*Gastrus selysi* Walker, 1849: 687. *Nomen nudum*.

Common name. Dark-winged horse bot fly.
**Table 6.** Localities, hosts, and dates of collection of *G. pecorum.*

| Country | Zone or Region | Locality | Coordinates       | Host/s                        | Months of collection | Reference       |
|---------|----------------|----------|-------------------|-------------------------------|----------------------|-----------------|
| Egypt   | Coastal Strip  | Alexandria| 31.203358N, 29.917285E | mules and donkeys (from stomachs) | from October to April | El-Bakry and Fadly (2014) |

**Distribution.** AF: Burkina Faso, Kenya, Namibia, Senegal, South Africa, Tanzania, Uganda, Zambia. OR: India. PA: Belgium, China (Heilongjiang, Inner Mongolia, Xinjiang), Czech Republic, Denmark, Egypt, France, Germany, Hungary, Iran, Italy, Latvia, Lithuania, Mongolia, Poland, Romania, Sweden, Switzerland, The Netherlands, Turkey, Ukraine, United Kingdom (see Soós and Minar 1986a; Kettle 1995; Li et al. 2019b).

**Localities, hosts, and dates of collection.** See Table 6 and Figure 4.

**Subfamily Hypodermatinae**

**Genus *Hypoderma* Latreille, 1818**

*Hypoderma* Latreille, 1818: 272. Type species: *Oestrus bovis* Linnaeus, 1758, by monotypy. *Marmaryga* Gistl, 1848: 9. Unjustified name for *Hypoderma*. *Atelecephala* Townsend, 1916: 617. Type species: *Hypoderma diana* Brauer, 1858a, by monotypy.

**Hypoderma bovis** (Linnaeus, 1758)

*Oestrus bovis* Linnaeus, 1758: 584. Type locality: Not given (? Sweden). *Oestrus ericetorum* Clark, 1815. *Nomen dubium.* *Oestrus subcutaneus* Greve, 1818: 2. Type locality: Not given. *Oestrus bovinus* Schwab, 1840: 43. Type locality: Not given. *Hypoderma heteroptera* Macquart, 1843: 181. Type locality: Algeria (Oran). *Hypoderma bellieri* Bigot, 1862: 113. Type locality: France (Corsica).

**Common name.** Ox warble fly.

**Distribution.** AU: Hawaii, New Zealand. NE: Widespread. PA: Widespread. **Localities, hosts, and dates of collection.** Unknown. **Notes.** This species is known to be recorded in Egypt only from the list of Steyskal and El-Bialy (1967), but no specimens of this species were collected or found in the Egyptian museums.

**Hypoderma desertorum** Brauer, 1897

*Hypoderma desertorum* Brauer, 1897: 377. Type locality: Egypt (Helwan).
The Oestridae in Egypt and Saudi Arabia

Table 7. Localities, hosts, and dates of collection of *H. desertorum*.

| Country | Zone or Region          | Locality | Coordinates              | Host/s | Months of collection | Reference     |
|---------|-------------------------|----------|--------------------------|--------|----------------------|---------------|
| Egypt   | Lower Nile Valley & Delta | Helwan   | 29.839022N, 31.300160E    | not given | April                | Brauer (1897) |

Figure 5. Distribution map of *C. titillator*, *H. desertorum*, and *H. lineatum*.

Common name. No specific common name.

Distribution. PA: Egypt.

Localities, hosts, and dates of collection. See Table 7 and Figure 5.

Notes. Steyskal and El-Bialy (1967) listed this species as a junior synonym of *Hypoderma bovis* (Linnaeus, 1758); however, Soós and Minar (1986b) catalogued it as a valid species. No specimens are available to confirm its validity. Grunin (1965) keyed the *Hypoderma* spp. in the Palaearctic Region and used the colour of hairs on mesonotum, shape of antennal segments and body length to differentiated between *H. desertorum* and *H. bovis*. Holotype is deposited in Naturhistorisches Museum Wien, Wien, Austria (NMW).

*Hypoderma lineatum* (Villers, 1789)

*Oestrus lineatum* Villers, 1789: 349. Type locality: Not given (Europe).

*Hypoderma bonassi* Brauer, 1875: 75. Type locality: USA (Colorado).

*Oestrus supplens* Walker, 1849: 685. Type locality: Canada (Nova Scotia).

Common name. Lesser cattle warble fly.

Distribution. Cosmopolitan.

Localities, hosts, and dates of collection. See Table 8 and Figure 5.
Table 8. Localities, hosts, and dates of collection of *H. lineatum*.

| Country | Zone or Region | Locality | Coordinates | Host/s | Months of collection | Reference |
|---------|----------------|----------|-------------|--------|----------------------|-----------|
| KSA     | Riyadh         | Dhurma   | 24.613516N, 46.151759E | a dairy cow air-shipped from Canada | unknown | Büttiker and Zumpt (1982) |
|         | Makkah         | Wadi Qatan | 22.200883N, 41.556635E | domestic goat | November | Büttiker and Zumpt (1982) |

**Genus Przhevalskiana** Grunin, 1948

*Przhevalskiana* Grunin, 1948: 469 (as subgenus of *Hypoderma* Latreille, 1818). Type species: *Hypoderma orongonis* Grunin, 1948, by monotypy.

*Crivellia* Grunin, 1956: 716. Type species: *Hypoderma corinnae* Crivelli, 1862, by original designation.

**Przhevalskiana silenus** (Brauer, 1858)

*Hypoderma silenus* Brauer, 1858b: 460. Type localities: Italy (Sicily, Palermo); Egypt (Sinai).

*Hypoderma aegagri* Brauer, 1863: 134, 281. Type locality: Greece (Crete).

*Hypoderma gazellae* Gedoelst, 1916: 263. Type locality: Tanzania (Massai).

*Hypoderma crossi* Patton, 1922: 573. Type locality: India (Punjab).

*Hypoderma aeratum* Austen, 1931: 423. Type locality: Cyprus (Tillyria, Kyrenia).

*Hypoderma capreum* Gauser, 1940: 38. Type locality: Azerbaijan.

**Common name.** Goat warble fly.

**Distribution.** AF: East Africa, Saudi Arabia [as “South western part”]. OR: India.

PA: Central Asia, Middle East, North Africa, southern Europe.

**Localities, hosts, and dates of collection.** See Table 9 and Figure 6.

**Material examined.** SAUDI ARABIA • 1 female; Al-Mekhwa; 19.759526N, 41.428219E; 3.Feb.2009; El-Hawagry leg.; sweeping net; MCCB.

**Subfamily Oestrinae**

**Genus Cephalopina** Strand, 1928

*Cephalopina* Strand, 1928: 48 (replacement name for *Cephalopsis*).

*Cephalopsis* Townsend, 1912: 53. Type species: *Oestrus maculatus* Wiedemann, 1830 (= *Oestrus titillator* Clark, 1816), by original designation. Preoccupied by Fitzinger, 1873 in Pisces.
### Table 9. Localities, hosts, and dates of collection of *P. silenus*.

| Country | Zone or Region | Locality | Coordinates | Hosts and/or methods of collection | Months of collection | Reference |
|---------|----------------|----------|-------------|------------------------------------|----------------------|-----------|
| Egypt   | Sinai          | Al Arish (abattoir) | 31.131795N, 33.795749E | goats (larvae from slaughtered goats, and adults by baited traps) | throughout the year | Morsy et al. (1998) |
|         | Bir Al Abd     | 31.005486N, 33.111721E | goats (larvae from slaughtered goats, and adults by baited traps) | throughout the year | Morsy et al. (1998) |
|         | Hasanah        | 30.800220N, 33.815971E | goats (larvae from slaughtered goats, and adults by baited traps) | throughout the year | Morsy et al. (1998) |
| KSA     | Al-Baha        | Al-Mekhwa | 19.759526N, 41.428219E | sweeping net by El-Hawagry | February | collected specimen (see material examined) |
|         | Makkah         | Jeddah (Jeddah Abattoir) | 21.483464N, 39.201734E | goats (nodules caused by larvae are noticed on the backs of goat carcasses) | December to April | El-Azzazy (1997) |

**Figure 6.** Distribution map of *O. ovis*, *P. silenus*, and *R. purpureus*.

**Cephalopina titillator** (Clark, 1816)
Fig. 2d

*Oestrus titillator* Clark, 1816: 4. Type locality: Syria.

*Oestrus maculatus* Wiedemann, 1830: 256. Type locality: Egypt.

*Oestrus libycus* Clark, 1841: 100. *Nomen nudum*.

*Oestrus libycus* Clark, 1843: 93. Type locality: Egypt.

*Pharyngobalus cameli* Steel, 1887: 27. Type localities: Sudan, ?Afghanistan.
Common name. Camel nasal bot fly.

Distribution. AF: East Africa, Saudi Arabia [as “South western part”]. AU: Australia. OR: India. PA: Widespread in association with camels, particularly, Afghanistan, Middle East, Mongolia, North Africa, South Europe.

Localities, hosts, and dates of collection. See Table 10 and Figure 5.

Material examined. Egypt • 1 male; Cairo abattoir; 30.040022N, 31.244248E; 6.Jun.1924; Efflatoun leg.; from nose of camel; EFC • 1 male; same data as for preceding; 2.Jul.1924 • 1 female; same data as for preceding; 19.Nov.1929 • 1 male; Kerdassa;

Table 10. Localities, hosts, and dates of collection of C. titillator.

| Country | Zone or Region | Locality | Coordinates | Hosts and/or methods of collection | Months of collection | Reference |
|---------|----------------|----------|-------------|-----------------------------------|----------------------|-----------|
| Egypt   | Lower Nile Valley & Delta | Abu-Rawash | 30.045837N, 31.091406E | dromedary camels (from the nasal cavities) | May | museum material (see material examined) |
|         | Birqash | 30.162842N, 31.039242E | sweeping, by El-Hawagry | June | collected specimens (see material examined) |
|         | Cairo (Cairo abattoir) | 30.040022N, 31.244248E | dromedary camels (from the nasal cavities) | throughout the year | museum material (see material examined) |
|         | El-Bassatin (abattoir) | 29.995917N, 31.276171E | camels | not given | Hendawy et al. (2012) |
|         | El-Warrak (abattoir) | 30.110544N, 31.210915E | camels | not given | Hendawy et al. (2012) |
|         | Kerdassa | 30.025663N, 31.113349E | dromedary camels (from the nasal cavities) | May | museum material (see material examined) |
|         | Sinai | W. El-Sheikh | 28.56568N, 33.96525E | not given | April | museum material (see material examined) |
| KSA     | all regions | widespread | – | dromedary camels (nasal cavities) | throughout the year | Abu-Thuraya (1982); Alahmed (2002) |
| Riyadh | Riyadh (slaughterhouse) | 24.578977N, 46.736175E | dromedary camels | March to May | Büttiker and Zumpt (1982) |
| Makkah | Jeddah (Jeddah abattoir) | 21.483464N, 39.201734E | dromedary camels | throughout the year | Gadallah and Bosly (2006) |
The Oestridae in Egypt and Saudi Arabia

30.02566N, 31.11335E; 19.May.1924; R.M. leg.; from nose of camel; EFC • 1 male, 1 female; Sinai, W. El-Sheikh; 28.56568N, 33.96525E; 21–27.Apr.1939; B.C.E. leg.; EFC • 1 female; Cairo abattoir; 30.040022N, 31.244248E; 20.Jan.1924; H.C.E. leg.; from the nose of a camel; PPDD • 1 female, 1 male; Birqash; 30.162842N, 31.039242E; 21.Jun.1999; El-Hawagry leg.; sweeping net; MSHC.

SAUDI ARABIA • 2 females; Riyadh, slaughterhouse; 24.578977N, 46.736175E; 30.Oct.1999; Azzam Alahmed leg.; from dromedary camels; KSMA.

Genus Oestrus Linnaeus, 1758

Oestrus Linnaeus, 1758: 584. Type species: Oestrus ovis Linnaeus, 1758, by original designation of Curtis, 1826: 106.

Cephalomyia Latreille, 1818: 273. Type species: Oestrus ovis Linnaeus, 1758, by monotypy.

Cephalomyia Agassiz, 1846: 71. Unjustified emendation of Cephalomyia.

Oestrus ovis (Linnaeus, 1758)

Oestrus ovis Linnaeus, 1758: 585. Type locality: Not given (? Sweden).

Oestrus argalis Pallas, 1776: 29. Type locality: Not given (? Middle Asia).

Oestrus perplexus Hudson, 1892: 63. Type locality: New Zealand. Nomen nudum.

Common name. Sheep nasal bot fly.

Distribution. Cosmopolitan (introduced with sheep in most parts of the world, see Papavero (1977)).

Localities, hosts, and dates of collection. See Table 11 and Figure 6.

Material examined. EGYPT • 1 male; Burg; 30.916760N, 29.533268E; 16.Mar.1935; H.C.E & M.T leg.; EFC • 3 males, 3 females; Cairo, Cairo abattoir; 30.040022N, 31.244248E; 5Jun.1929; Efflatoun leg.; from sheep's nose; EFC • 1 male, 1 female; same data as for preceding; 23.Dec.1929 • 2 males; same data as for preceding; 26.Nov.1929 • 1 male, same data as for preceding; 2.Jul.1924 • 1 male, same data as for preceding; 2. Apr.1924 • 1 female, same data as for preceding; 5. Apr.1924 • 1 female; Kerdassa; 30.025663N, 31.113349E; 18.Mar.1924; from the nose of sheep; EFC • 1 female; same data as for preceding; 22.May.1924; R. M. leg. • 1 female; Wadi Hoff; 29.880357N, 31.312991E; 14.Apr.1921; Efflatoun leg.; EFC • 1 female; Wadi Rishrash; 29.41666N, 31.51666E; 16.Apr.1932; ET & R leg.; EFC • 1 female; Wadi Rishrash; 29.41666N, 31.51666E; 29.Mar.1935; H.C.E. & M.T. leg.; EFC • 1 male; Ashmoun Gereiss; 30.325046N, 30.925513E; Wardan; 30.321045N, 30.905128E; 23.Mar.1924; H.C.E. leg.; reared from larvae from the nose of sheep; PPDD • 1 female; El-Mallah, East of Helwan; 3.May.1926; Farag leg.; PPDD • 1 female; El-Katta; 30.225859N, 30.970563E; 20.Sep.1924; PPDD • 1 male; Kerdassa; 30.025663N, 31.113349E; 15.May.1938; Mabrouk leg.; PPDD.
Table 11. Localities, hosts, and dates of collection of *O. ovis*.

| Country          | Zone or Region   | Locality         | Coordinates                  | Hosts and/or methods of collection                           | Months of collection | Reference                                      |
|------------------|------------------|------------------|------------------------------|--------------------------------------------------------------|----------------------|-------------------------------------------------|
| Egypt            | Coastal Strip    | Burg             | 30.916760N, 29.533268E       | not given                                                    | March                | material (see material examined)                |
|                  | Eastern Desert   | Wadi El-Mallah   | –                            | not given                                                    | May                  | material (see material examined)                |
|                  |                  | Wadi Hoff        | 29.880357N, 31.312991E       | not given                                                    | April                | material (see material examined)                |
|                  |                  | Wadi Rishrash    | 29.41666N, 31.51666E         | not given                                                    | November to April    | material (see material examined)                |
| Lower Nile Valley & Delta | Ashmoun Gereiss | –                | 30.325046N, 30.925513E       | sheep (reared from larvae from nose)                         | March                | material (see material examined)                |
|                  | Cairo, Cairo (abattoir) | –            | 30.040022N, 31.244248E       | sheep (from nose)                                            | April to December    | museum material (see material examined)         |
|                  |                  | El-Hager         | 30.282066N, 30.913711E       | sweeping net by El-Hawagry                                   | April                | collected specimens (see material examined)     |
|                  |                  | El-Katta         | 30.225859N, 30.970563E       | not given                                                    | September            | museum material (see material examined)         |
|                  |                  | Kerdassa         | 30.025663N, 31.113349E       | sheep (from nose)                                            | March and April      | museum material (see material examined)         |
|                  |                  | Wardan           | 30.321045N, 30.905128E       | sheep (reared from larvae from nose)                         | March                | material (see material examined)                |
| KSA              | all regions      | widespread       | –                            | sheep and goats (from the nasal cavities and head sinuses)   | March to June        | Abu-Thuraya (1982)                              |
|                  | Asir             | widespread (slaughterhouses) | – | not given | throughout the year | Kenawy et al. (2014) |
|                  | Jazan            | Abu Arish        | 16.9595N, 42.8348E           | Sheep (heads)                                                | throughout the year  | Bosly (2013)                                    |
|                  | Riyadh           | Riyadh (slaughterhouse) | 24.578977N, 46.736175E       | sheep and goats                                             | May                  | Büttiker and Zumpt (1982)                       |

Genus *Rhinoestrus* Brauer, 1886

*Rhinoestrus* Brauer, 1886: 300. Type species: *Cephalomyia purpurea* Brauer, 1858, by monotypy.

*Hippoestrus* Townsend, 1933: 447. Type species: *Rhinoestrus hippopotami* Grünberg, 1904, by original designation.
**Table 12.** Localities, hosts, and dates of collection of *R. purpureus*.

| Country | Zone or Region       | Locality       | Coordinates          | Hosts and/or methods of collection | Months of collection | Reference                        |
|---------|----------------------|----------------|----------------------|-----------------------------------|----------------------|----------------------------------|
| Egypt   | Lower Nile Valley & Delta | Cairo          | 29.999896N, 31.270483E | Donkey (from head)              | May                  | museum material (see material examined) |
|         |                      | El-Magadlah    | –                    | not given                         | April                | museum material (see material examined) |
|         |                      | Giza           | 30.015432N, 31.207837E | not given                         | May                  | museum material (see material examined) |
|         |                      | Giza, Giza zoo abattoir (donkeys originally obtained from four governorates: Giza, Monofa, Fayoum, and Bani Sweif) | 30.027973N, 31.215963E | donkeys throughout the year | Hilali et al. (2015) |

*Rhinoestrus purpureus* (Brauer, 1858)

*Cephalomyia purpurea* Brauer, 1858b: 457. Type locality: Austria (Bisamberg).
*Rhinoestrus nasalis*: Brumpt, 1913: 700. Misidentification.

**Common name.** Equine nasal bot fly.

**Distribution.** AF, OR: Widespread (introduced with horses, see Papavero (1977)). PA: Widespread.

**Localities, hosts, and dates of collection.** See Table 12 and Figure 6.

**Material examined.** EGYPT • 1 male; Cairo; 29.999896N, 31.270483E; 10.May.1922; Efflatoun leg.; from donkey's head; EFC • 1 male; El-Magadlah; 27.Apr.1924; R. Mabrouk leg.; EFC • 1 female; Giza; 30.015432N, 31.207837E; 2.May.1907; EFC.

**Discussion**

Egypt and Saudi Arabia are biogeographically comparable being located at the junction of the Palearctic and the Afrotropical Realms. In Egypt, the Afrotropical Realm is thought to involve the southeastern triangle of the country, which known as the Gebel Elba ecological zone. This is the only ecological zone in Egypt, which has an Afrotropical faunal affiliation. However, the faunal affiliation of the other seven ecological zones is mostly Palearctic, namely, the Coastal Strip, Eastern Desert, Western Desert, Fayoum, Lower Nile Valley, and Delta, Sinai, and Upper Nile Valley (Fig. 1) (El-Hawagry and Gilbert 2014; El-Hawagry 2017; El-Hawagry et al. 2018; El-Hawagry et al. 2020). In Saudi Arabia, many biogeographers agree that the border of the Afrotropical Realm should be extended up to Taif City, i.e., up to the Tropic of Cancer, covering the
southwestern part of the country (Wallace 1876; Hölzel 1998; El-Hawagry et al. 2017; El-Hawagry and Al Dhafer 2019; El-Hawagry et al. 2019). All these biogeographic facts undoubtedly reflects on the distribution of oestrid species treated in the present study as all reported species, except three, are of both Palaeartic and Afrotropical affinities. Only Gasterophilus nigricornis and Hypoderma bovis are Palaeartic, and Hypoderma desertaorm is endemic to Egypt. Some of the reported species are also known as cosmopolitan and should be widespread in both Egypt and Saudi Arabia; however, the majority of species were reported only from some restricted regions. Surprisingly, no records of oestrid flies were reported from Upper Nile Valley, Western Desert and Gebel Elba in Egypt. This is most likely due to the fact that most collections were focused predominantly in Alexandria, Greater Cairo (slaughterhouses, circus, Giza Zoo, Manure Co., near pyramids and wadies southwestern to Cairo) and Sinai Peninsula. The same situation is in Saudi Arabia as few records were reported especially from Al-Baha, Eastern Province, Makkah, and Riyadh regions (Abu-Thuraya 1982).

Oestrid flies in Egypt and Saudi Arabia, as far as is known, infest domesticated animals and in some cases humans. Infections with Cephalopina titillator larvae have been reported in the dromedary camel (Family Camelidae) (Abu-Thuraya 1982, Büttiker and Zumpt 1982, Hussein et al. 1982, Fatani and Hilali 1994, Alahmed 2002, Hendawy et al. 2012). Attacks by larvae of different Gasterophilus species have been reported in donkeys and horses (family Equidae) (Abu-Thuraya 1982, Büttiker and Zumpt 1982, Hilali et al. 1987, El-Bakry and Fadly 2014, Abdel Rahman et al. 2018, Attia et al. 2018) and Rhinestrus purpureus (Hilali et al. 2015). The goats and sheep (Family Bovidae) have been reported as hosts for the larvae of Hypoderma lineatum (Büttiker and Zumpt 1982), Oestrus ovis (Abu-Thuraya 1982, Büttiker and Zumpt 1982, Amin et al. 1997, Bosly 2013), and Przhevalskiana silenus (El-Azzazy 1997, Morsy et al. 1998). Ophthalmomyiasis infestation of human eye with larvae of O. ovis was documented from Saudi Arabia (Omer et al 1988). Two cases of gastric myiasis with larvae of unidentified Oestrus sp. were reported from Egypt, Minia Governorate (Ahmad et al. 2011).

The low abundance and diversity of species in both Egypt and Saudi Arabia should be taken with caution, since the family seems to lack sampling efforts in both countries. We think that the distributional data of these economically important flies within Egypt and Saudi Arabia is still scanty, and more efforts would be highly desirable in the future. Nevertheless, the present catalogue presented some new locality records especially for Gasterophilus intestinalis, Gasterophilus nasalis, Gasterophilus nigricornis, Przhevalskiana silenus, Cephalopina titillator, Oestrus ovis and Rhinestrus purpureus. This catalogue undoubtedly will act as a baseline for further study in both countries.

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