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A Simplified Identification key of Egyptian Sandfly Species

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ABSTRACT

The main objective of this study is to simplify the identification of sandflies of Egypt so that, a simple illustrated key was prepared for 9 Phlebotomus and 13 Sergentomyia species representing the sandfly fauna of Egypt.

INTRODUCTION

Phlebotomine sandflies are small blood sucking insects belonging to order Diptera, suborder Nematocera, family Psychodidae and subfamily Phlebotominae. Sandflies are known as vectors of a viral disease (Sandfly fever or three-day fever), a bacterial disease (Carrión’s disease or Bartonellosis) and protozoal diseases (Cutaneous leishmaniasis, CL and Visceral leishmaniasis, VL).

In Egypt the medical importance of sandflies is significant because some of them are vectors of CL or VL. Phlebotomus langeroni is the proven vector of VL (L. infantum) in El Agamy and Northern west coast of Egypt (El Sawaf et al., 2012; Doha and Shehata, 1992). In Sinai Peninsula, two forms of CL are present “wet and dry sore “. P. papatasi is the proven vector of L. major and P. sergenti, P. alexandri and P. bergerotí are potential vectors of L. tropica (Doha et al., 1994; 2014). P. langeroni and P. papatasi were recorded from El Agamy, Alexandria Governorate (El .Sawaf et al., 1984) and P bergerotí from Sinai (El Sawaf et al., 1987). Lane (1986) reviewed the sandfly fauna of Egypt and described eight Phlebotomus species: P. papatasi, P. bergerotí, P. alexandri, P. sergenti, P. kazeruni, P. orientalis, P. arabicus and P. major and 13 Sergentomyia species namely S. tiberiádis , S. adleri , S. clydei , S. schwetzi , S. palestinensis , S. minuta, S. antennata, S. taízt, S. fallax, S. squamípleurus, S. christophersi, S. cincta and S. theodori. With P. langeroni, it is considered that 22 sandfly species are identified till now in Egypt (9 belonging to genus Phlebotomus and 13 to genus Sergentomyia).
The identification of sandfly species requires skilled personnel due probably to their minute size and great similarities in their taxonomic characters. The objective of this work is to design a key that is simple and easy to use for identification of the different sandfly species of Egypt.

**MATERIALS AND METHODS**

The illustrations of Lewis (1982), Lane (1986) and El Sawaf et al. (1985) were used in design and preparation of the present key.

**RESULTS**

The designed key is presented in Figures 1 (Plates A1-A7 for genus *Phlebotomus*) and 2 (Plates B1-B9 for genus *Sergentomyia*).

**DISCUSSION**

In Egypt Phlebotomine sandflies are vectors of sandfly fever virus and two forms of leishmaniases (CL and VL), for this reason the correct identification of the sandfly species is crucial and plays an important role in the course of the epidemiology of the disease transmission and the development of control programs. In the present study, the designed key simply illustrates the morphological characters that are used in sandfly identification. Detailed characters of the *P. langeroni* female were illustrated (El Sawaf et al., 1985) since the identification of this particular species was based on the male characters in previous keys (Nitzulescu and Nitzulescu, 1933). This key can be of help in the species identification of all sandflies recorded in Egypt.

**CONCLUSION**

We have produced an illustrated key that is accessible to the non-taxonomist interested in the field of diseases transmitted by sandflies. In this key the horizontal presentation of the sandfly species facilitates comparison between the different 9 *Phlebotomus* and 13 *Sergentomyia* species present in Egypt.

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**REFERENCES**


**Fig. 1: Key to the species of Phlebotominae in Egypt**

**A Genus Phlebotomus**

- In *Phlebotomus* the chitinum is unarmed (no teeth) or with scattered spicules without a pigment patch.

- In *Phlebotomus* hairs (setae) on the posterior margins of the abdominal tergites 2-6 are erect, and their sockets are large and round as on abdominal tergite 1. In *Phlebotomus* hairs (setae) on the posterior margins of the abdominal tergites 2-6 are erect, and their sockets are large and round as on abdominal tergite 1.

**Plate A1**

**B Genus Sergentomyia**

- In *Sergentomyia* the chitinum has one or more rows of teeth pigment patch is usually present.

- In *Sergentomyia* generally, hairs (setae) on the posterior margins of abdominal tergites 2-6 are recumbent, their sockets are much smaller than abdominal tergite 1, and they are tear shaped. However, there are few Sergentomyia species with erect hairs.

**In male Sergentomyia the spines on the style are terminal and may vary in number from 4 to 5.**

**Plate A5**

**Plate A2**

**Plate A3**

**Plate A4**

**Plate A1 (Genus Phlebotomus)**

**Male Phlebotomus**

- **P. papatasii**
  - Style with five short tooth-like spines.
  - Surstyle with spines apically.
  - Paramere with three lobes.
  - Eye appearing small because head relatively short.
  - Small basal tubercle on coxite with non-deciduous hairs.
  - Distance between basal and middle spines less than that between middle and distal spines.
  - Surstyle with only 2 spatulate spines at tip.

- **P. bergeroti**
  - Style with five long spines.
  - Surstyle without spines apically.
  - Paramere simple.
  - Cositite with basal lobe bearing long hairs.

**Female Phlebotomus**

- **Plate A5**
  - Style with five long spines.
  - Surstyle without spines apically.
  - Paramere simple.
  - Cositite with basal lobe bearing long hairs.
Plate A4

**P. tangeroni**
- Germ pump
- 4th antennal segment
- Aedeagus
- Style

**P. orientalis**
- 4th antennal segment
- Aedeagus
- Cibarium pharynx
- Genitalia, lateral view

**P. major**
- Sinai form

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Plate A5

- Spermathecae with single segmented capsule, its body about as long as wide.
- Mesonotum brown.
- Pharynx narrow, with scale-like armature, posterior margin of hind scales minutely serrated.

**P. kazemani**

- Spermathecae delicate elongated, ovoid and incompletely striated with small terminal knob and thick individual duct.
- Pharynx narrowing after posterior beak, rounded posteriorly, armature a series of long backward-pointed teeth.
- A3 slender, as long as labrum.

- Spermathecae distinctly segmented

**P. arabicus**

- Spermathecae segmented with long neck
- Spermathecae segmented without neck

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Plate A6

- Spermatheca
- Pharynx

Plate A7

- Spermatheca
- Pharynx
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Plate A6

- Spermathecae with segments unequal in size, middle segments larger than others, apical segment long.
- Ascoïds on A4 more than 0.5 length of segment.

P. langeroni

- Ascoïds on A4 less than 0.4 length of segment.
- Spermathecae with 10 (8-12) segments.
- Ascoïds paired on segments 3-15.
- Pharyngeal armature consisting of irregular rows of 9 pin-like teeth.
- Pharynx with indistinct posterior margin.

P. orientalis

- Pharyngeal armature composed of rows of minute teeth or ridges.
- Pharyngeal armature extending to half length of pharynx.

P. major "Sinai form"

Plate A7

- Pharyngeal armature composed of rows of minute teeth or ridges and not extending beyond posterior third of pharynx.
- Spermathecae with segments subequal, apical segment short.
- Pharyngeal armature composed of rows of minute teeth or ridges and not extending beyond posterior third of pharynx.
- Spermathecae with segments subequal, apical segment short.

P. papatasi

- Most pharyngeal scaly teeth arranged obliquely and pointing backward.

P. bergeroti

- Pharyngeal armature composed of broad scale-like teeth.
- Pharynx intesned posteriorly; ascoïds on A3 and A4 long and slender, almost reaching end of segment, combined length of A3+A4 longer than labrum.
- Spermathecae with four or five segments

P. sergenti

- Pharyngeal armature composed of broad scale-like teeth.
- Pharynx triangular, lateral and posterior margins straight.
- Ascoïds on A3 and A4 short and stout, combined length of A3+A4 shorter than labrum.

P. alexandri

4th antennal segment

4th antennal segment
Fig. 2: Genus *Sergentomyia*

**Male**
- Aedeagus finger-shaped, with blunt

**Female**
- Aedeagus with straight tapering sides, pointed.

**Plate B1**
- Spermatheca clearly segmented ducts long and narrow.
- Abdominal tergites 2-6 with large setal sockets (erect hair sockets).

**Plate B2**
- Aedeagus curved downwards towards surstyle
- Style with two apical and two subapical spines.
- Cibarial teeth irregular, outer teeth only slightly larger than central teeth. Pharyngeal armature series of fine transverse ridge.

**S. schwerzi**
- Aedeagus slightly curved, with tip under cut
- Outer cibarial teeth scale-like, vary much larger than central teeth.
- Style with all spines terminal.

**S. taiji**
- All cibarial teeth small, outer teeth same size as central teeth.
- Aedeagus fingershaped, tapering.
- Style with four terminal spines, distance from accessory seta to terminal spine greater than length of seta.

**Plate B3**
- Spermatheca net segmented but sometimes indistinctly striated ducts not long and narrow.
- Abdominal tergites 2-6 without large setal sockets (recumbent hair sockets).

**Plate B5**
- Spermatheca

**Plate B6**
- Spermatheca

**Plate B1**
- Aedeagus straight or curved upwards

**Plate B2**
- Style with all spines apical.
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**Plate B2**

- Cibarium with 16-18 subequal teeth.

**S. theodori**
- Cibarium with 18-22 teeth, the central teeth distinctly smaller than lateral teeth.
- Style slender, five to seven times as long as wide, accessory setae on style close to apical spines.

**S. fallax**
- Style stout, four times as long as wide, accessory setae at about 0.75 style length.

**S. antennata and S. cincta**

**Plate B3**

- Aedeagus truncated, style with two subterminal and two terminal spines.
- Cibarium with straight row of 12 teeth.

**S. palesimensis**

- Aedeagus tapering to pointed tip, all spines on style terminal.

**Plate B4**

- Cibarium with small process in front of teeth, mesonepimeron with setal sockets, aedeagus short and gently tapering.

**S. squamipleuris**
- Cibarium without any process, mesonepimeron without setal sockets, aedeagus otherwise.
- Mesonotum very pale.
- Cibarium with convex row of uneven-sized, curved horizontal teeth (12-14).
- Surstyes only slightly longer than parameres.

**S. tiberiados**

- Cibarium with straight horizontal teeth.
- Cibarium with 3-4 horizontal teeth and some denticles and large cornua.

**S. christophersi**

- Cibarium with 16-26 fine horizontal teeth, cornua small (not wider than long).

- Cibarium with single row of vertical (fore) teeth, horizontal (hind) teeth usually comprising 25-35 denticles in small groups, occasionally discrete teeth.

**S. clydei**

- Cibarium with two or three rows of vertical (fore) teeth, six in each. Horizontal (hind) teeth usually well developed. (always discrete).

**S. adleri**

- Cibarium with 4-5 long slender, widely spaced horizontal teeth (numerous spicules may also be present).

**S. christophersi**

- Cibarium with strong, curved horizontal teeth, those at the sides longer than central teeth.

**S. tiberiados**

- Cibarium with 12-14 closely packed horizontal teeth.

**S. adleri**

- Cibarium with 12-30 vertical teeth in one or two rows, 12-13 horizontal teeth.

**S. clydei**

- Cibarium with 40-80 vertical teeth in 3-5 rows, more than 20 horizontal teeth.
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**Plate B6**

- Spemathea with capsule covered in numerous small spicules, cibarial teeth in convex row.

- Spemathea smooth, without spicules, cibarial teeth in straight or concave row.

**S. squamipleuris**

- Cibarium with capsule, well-developed cibarial teeth in straight row.
- Pharyngeal teeth stout.

**S. palestinensis**

- Spemathea simple, tubular.
- Cibarial teeth not straight and palisade-like.

- Cibarium with 50-60 equal-sized, horizontal cibarial teeth in a comb-like row or row concave.

**S. minuta**

- Cibarium with central horizontal teeth at least half size of lateral horizontal teeth.

**Plate B7**

- Cibarium with all horizontal teeth subequal or lateral teeth only slightly larger than medial teeth.

**Plate B8**

- Cibarium with lateral horizontal teeth scale-like, very much larger than medial horizontal teeth.

**S. taiži**

- Cibarium with lateral horizontal teeth same shape as medial horizontal teeth.

**S. theodori**
ARABIC SUMMARY

مفتاح بسيط لتشخيص أنواع ذباب الرمل المصري

ستار عبد النور 1- ضحاى شعيبان المصري 1- بهيرة الصواف
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