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**Composition of the Phlebotomine Fauna (Diptera: Psychodidae),
in Isfahan City, Central Iran: First Record of
Sergentomyia baghdadis, *S. clydei* and *S. dentata***

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Abstract: The aim of the present research was to determine the sand fly composition. The investigation was carried out from May to the end of November 2005 in this city of Isfahan, Central Iran. Sand flies were collected biweekly from indoors and outdoors using sticky paper traps. Sand flies were preserved, mounted and identified according to the conventional methods. In total, 2074 sand flies specimens were collected and identified. The following 10 species were found in Isfahan city. Among them, this is the first record of *Sergentomyia baghdadis*, *S. clydei* and *S. dentata* for Isfahan city. Most probably, *Phlebotomus sergenti* is the vector as 49.2% of indoor and 52.6% of total sand flies were of this species. If the present situation for breeding of the vector are changed (example setting up big gardens in different parts of the city and so forth) and the human with urban active lesions become spread therefore leishmaniasis probably become epidemic in this city.

Key words: First record, Sand fly, Phlebotomus, Sergentomyia, Iran

Introduction

Phlebotomine sand flies (Diptera: Psychodidae) are obligate vectors of leishmaniasis parasitic disease with a wide range of clinical symptoms: cutaneous, mucocutaneous and visceral leishmaniasis (Kravchenko *et al.*, 2004). Sand flies are distributed worldwide. Some 750 known species are distributed in all geographical regions extending from central Europe to South East Asia passing through the Middle East region and from the North to South American. In the old world, the genus *Sergentomyia* dominates the rain forests of Africa, while phlebotomus are found largely in arid and semiarid zones of the oriental and Ethiopian regions (Killick-Kendrick, 1990). Phlebotomine sand flies are small, blood-sucking dipterans insects. Only females feed on blood of various vertebrate animals such as reptiles and mammals including man and use the nutrients to develop eggs (Lane, 1987).

Leishmaniasis currently affects some 12 million people in 88 countries. It is estimated that 350 million people are exposed to the risk of infection by the different species of *Leishmania* parasite. The annual incidence of new cases is about 2 million (1.5 million of cutaneous leishmaniasis and 0.5 million of visceral leishmaniasis). Recently, the WHO has reported an increase in overlapping of visceral leishmaniasis (VL) and HIV infection due to the spread of the AIDS pandemic. *Leishmania*/HIV co-infection is considered to be a real emerging disease (WHO, 2004; Jacobson, 2003).

In some countries, sand flies also carry and transmit other zoonoses such as bartonellosis, phleboviruses certain flaviviruses, orbiviruses, vesiculoviruses and causing health problems for human (Desjeux, 2004; Alexander, 2003; Davies and Maroli, 2003). Some species of genus *Sergentomyia*

sometimes transmitting the protozoan *sauroleishmania*(Nadim and Seyedi-Rashti, 1971; Lane, 1993). Leishmaniasis has been a very old endemic disease in Isfahan city (Yaghoobi-Ershadi *et al.*, 2002). It is increasing public health problem in this city. Epidemiological studies of leishmaniasis begin with efforts to identify the vector.

Before the present study, several species of sand flies were caught and identified in this city (Zahraei-Ramazani, 1993). In order to contribute to a better knowledge of the phlebotominae fauna, which was poorly documented until now, therefore present survey was conducted to determine the sand fly composition in Isfahan city.

Materials and Methods

The investigation was carried out from May to the end of November 2005 in Isfahan city. The Isfahan city is geographically located at 32°38' N 51°29' E , in the lush Zayandeh-Rud plain, at the foothills of the Zagros mountain range. It is situated at 1590 m above sea level. The southern and western approaches of Isfahan are mountainous and it is bordered northward and eastward by fertile plains. Thus, Isfahan's climate is varied and occasionally rainy with a precipitation average varying between 100 and 150 mm and the temperature ranges between 2 and 28°C.

Sand flies were collected biweekly from indoors (bedrooms, warehouses, etc.) and outdoors (cracks in the walls, bird holes, etc.) using sticky paper traps (castor oil coated white papers) from the beginning to the end of the active season. Sand flies were processed, preserved, mounted and identified according to the conventional methods (Lane, 1987; Smart *et al.*, 1965; Theodor and Mesghali, 1964; Perfil'ev, 1968).

Specimens are housed with the Author's Collection of Sand flies, Isfahan Training and Health Researches Center a branch of Department of Medical Entomology and Vector Control School of Health and Institute of Public Health Research, Tehran University of Medical Sciences.

Results

In study previously conducted in Isfahan city, 5 phlebotomus and 2 sergentomyia species were identified. These were *P. sergenti*, *P. papatasi*, *P. caucasicus*, *P. kandelakii* and *P. alexandri*, *S. sintoni* (Pringle, 1953) was caught only in plan areas and *P. alexandri* Sinton, 1928; *S. pawlowskyi* (Perfil'ev, 1933) was caught only on mountain areas (Zahraei-Ramazani, 1993).

In total, 2074 sand flies specimens were collected during this study. The following 7 species were found in indoors: *P. sergenti* (49.2%), *P. papatasi* (29.7%), *P. caucasicus* (14.6%), *P. kandelakii* (2.4%), *P. alexandri* (2.2%), *Sergentomyia sintoni* (1.2%) and *S. pawlowskyi* (0.7%). Also 10 species were found in outdoors: *Phlebotomus sergenti* (56.4%), *P. papatasi* (28.9%), *P. caucasicus* (6.9%), *P. kandelakii* (2.0%), *P. alexandri* (2.1%), *S. sintoni* (2.0%), *S. pawlowskyi* (1.2%), *S. dentata* (0.3%), *S. clydei* (0.1%) and *S. baghdadis* (0.1%).

Phlebotomus sergenti is the predominant species in the total sand flies collected. Other predominant species are *P. papatasi* and *P. caucasicus*. The dominance of these three species have role in the transmission of cutaneous leishmaniasis and can be incriminated as the possible vectors in Isfahan city. The present data on abundance of these species in households located in old places and Sofeh mountain slope indicates their transmission capabilities. A higher abundance of female of *P. sergenti*, *P. papatasi* and *P. caucasicus* were observed in indoor and near the human residences. This result suggests the population of these sand flies display a remarkable endophily.

Among these species, this is the first record of *S. baghdadis* (one female specimen), *S. clydei* (one male specimen) and *S. dentata* (three female specimens) for Isfahan city. We captured these new species from outdoor among the houses in the Isfahan city. The females of *S. baghdadis* and *S. dentata* were dissected for leptomonad infection and none appeared to be infected. Details description of male and females of three new record sergentomyia are as follow:

Subgenus

Parrotomyia Theodor, 1958:

Female

Capsule of spermatheca round or elliptical, with smooth walls. Spermathecal ducts short partly fused, without striation. Boundary between ducts and capsule clearly marked.

- *Sergentomyia (Parrotomyia) baghdadis* (Adler and Theodor, 1929):

Female

Cibarium with concave angular row. Ventral plate of the cibarium with a deep notch, pigment patch broad, with anterior process. Spermatheca with rather hard distal part and soft base (Fig. 1).

Subgenus

Sintonius Nitzulescu, 1931:

Pharyngeal armature in both sexes consisting of a few folds or absent. Parameres hooked. Aedeagus markedly tapering with pointed apex.

- *Sergentomyia (Sintonius) clydei* Sinton, 1928:

Male

Buccal armature consisting of about 22 short, thin teeth in groups of 3-4, which stand some distance from each other on an almost straight or slightly curved line. A row of very small punctiform denticles anterior to buccal teeth. Pharynxes narrow, with slightly convex sides. Armature practically absent, consisting of a few thin lines. Four spines on terminalia apical. Ventral seta in middle of distal half of style. Parameres with narrow hooked end do not have any branching and nodule. Aedeagus tapering with pointed apex (Fig. 2).

Subgenus

Sergentomyia França and Parrot, 1920:

Female

Spermatheca tubular, its capsule represented by the curved, slightly widened end of the short, broad spermathecal ducts, which are fused at the base. No boundary between capsule and duct.

- *Sergentomyia (Sergentomyia) dentata* (Sinton, 1933):

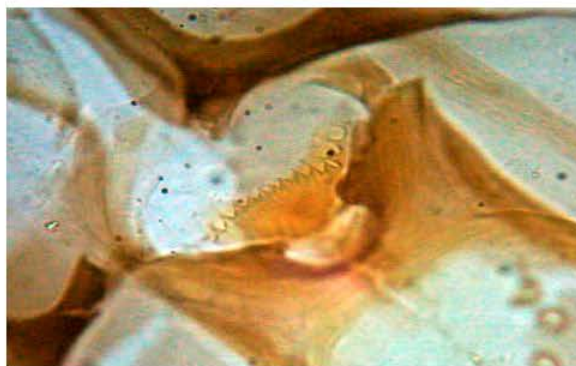


Fig. 1: Microphotography of buccal armature of *Sergentomyia (Parrotomyia) baghdadis* (Adler and Theodor, 1929), from Isfahan city. Cibarium of female (high magnification)

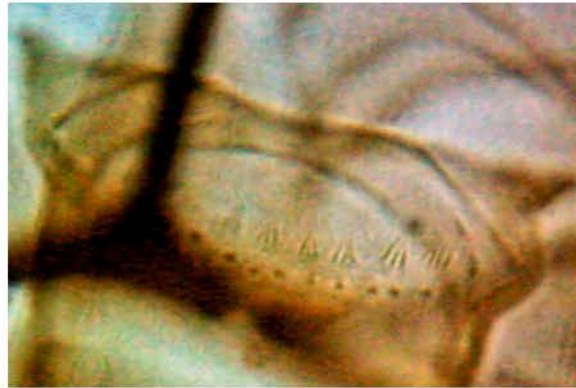


Fig. 2: Microphotography of buccal armature of *Sergentomyia (Sintonius) clydei* Sinton 1928, from Isfahan city. Cibarium of male (high magnification)



Fig. 3: Microphotography of buccal armature of *Sergentomyia (Sergentomyia) dentata* (Sinton, 1933), from Isfahan city. Cibarium of female (high magnification)

Female

Cibarium with 18 teeth, the central teeth much shorter than the lateral ones, pigment patch without anterior process. Pharynx rather narrow (length/width \approx 2.5), teeth of the pharyngeal armature do not reach lateral borders of the pharynx, hind border of the armature convex (Fig. 3).

Discussion

It can be suggested that after the present study, the number of sand fly species from Isfahan city rises up ten, though previously, AR Zahraei-Ramazani (1993) reported seven species from this city.

In the Mediterranean region, the principal vectors of leishmania include *P. sergenti* and *P. papatasi*, although others may play a role. *P. sergenti* is the recognized vector of *L. tropica*, whereas *P. papatasi* is considered the vector of *L. major*, *P. sergenti* is the probable vector of *L. tropica* in all Asia foci, except in Kenya. However, apparent abundance of a species of sand fly is not by itself sufficient to incriminate it as a vector (Killick-Kendrick, 1990; Toprak and Ozer, 2005).

Although *S. baghdadis* is already known from southern provinces, *S. clydei* already known from southern, eastern and northern provinces and *S. dentata* is appeared throughout Iran country, this is the first record of these sergentomyia species to be present in Isfahan city.

Sergentomyia species feed mainly on reptiles (Lane, 1993). Some species of sergentomyia (*S. sintoni* and *S. clydei*) are sometimes naturally infected with leishmaniasis. *Sergentomyia garnhami* (Heisch, Guggisberg and Teesdale, 1956) may also become infected by feeding on patients of visceral leishmaniasis in Kenya. Species like *S. clydei*, *S. schwetzi* and other species of the genus bite humans, but rarely. Statements that some species of sergentomyia possibly transmit disease to human have not been confirmed so far (Nadim and Syedi-Rashti, 1971; Perfil'ev, 1968; Mutinga and Kyai, 1985).

A definite answer to this question that these species of genus Phlebotomus and genus Sergentomyia can be transmit disease to human in Isfahan city obtained only by ecological identification and molecular characterization of these sand flies in future.

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