

Document heading

Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Disease



journal homepage:www.elsevier.com/locate/apjtd

First Report on *Sergentomyia sintoni* and *Sergentomyia clydei* (Diptera: Psychodidae) : Their Natural Promastigote Infection and Some Aspects of Biology in Sistan-Baluchistan Province, Southeastern Iran

Hamid Kassiri^{1*}, Elham Jahanifard¹

¹Department of Medical Entomology and Vector Control, School of Health, Ahwaz Jundishapur University of Medical Sciences, Ahwaz, Iran

ARTICLE INFO

Article history: Received 12 June 2012 Received in revised from 5 July 2012 Accepted 7 Octoberr 2012 Available online 28 October 2012

Keywords: Natural Promastigote Infection Sergentomyia sintoni Sergentomyia clydei Biology, Iran

ABSTRACT

Objective: To This paper has explained initial survey on two vectors of lizard leishmania promastigote in south–east of Iran. **Methods:** Totally 333 *S.sintoni* and 475 *S.clydei* were collected from rodent burrows by sticky traps in three villages of Chabahar County. Sand flies were dissected in a drop of normal saline. **Results:** Natural leptomonad infection rate involved %2.1 *S.sintoni* and %5 *S.clydei*. The finding about seasonal variation was showed the highest infection rate in two vectors in the first week of August. The highest population of gravid and semi–gravid of main vectors of Lizard leishmaniasis , *S.sintoni* and *S.clydei*, were observed in the last week of September and the lowest were in the last week of July. The examination of accessory glands showed that the maximum population of parous was observed in the last week of September and the last. This is the first report of leptomonad (promastigote) infection in *S.sintoni* and *S.clydei* in Sistan–Baluchistan Province, southeastern Iran. **Conclusions:** A further study with more focus on biology of *Sergentomyia* genus is suggested.

1. Introduction

Leishmanaiasis is a zoonotic disease with *Leishmania* agent *.Sauroleishmania* genus which is nonpathogenic for human, was found in reptiles ^[1,2]. The first lizard infection to *Leishmania* promastigote was observed in 1915, in addition, its agent was named *Leishmania tarentola* in 1920 ^[3]. Lizard leishmaniasis is spread in a host of countries such as Sudan, Lebanon, Italy and Saudi Arabia ^[4–7].

A number of studies carried out for investigation of natural host and vector of lizard leishmaniasis in Iran. Nadim et al. have found lizard leishmania promastigote in *Agama* in Khorassan Province [8]. Seyedi–Rashti et al. detected leptomonads in 3 species of lizard, *Agama agilis* and *Agama melanara* in north–East of Khorassan and *Agama* caucasia from Manjil area in Mid–North of Iran [2]. Seyedi– Rashti et al. have isolated *Leishmania* (*Sauroleishmania*) gymnodactyli from S.sintoni and Cyrtopdion caspius in

E-mail: Hamid.kassiri@yahoo.com

Tel:0098-611-3738269

Turkemen–Sahara [9]. Furthermore, lizard *Leishmania* promastigote form was observed in *S.sintoni* in Khuzestan [10]. However, far too little attention has been paid to study of the biology in the vector of lizard leishmaniasis. This essay will give an account of leptomonad infection rate and its monthly variation, gonotrophic cycle and age determination of vector of lizard leishmaniasis in Chabahar County, Sistan– Baluchistan Province, southeastern Iran for the first time.

2. Materials and Methods

2.1. Study area

The survey was carried out in Chabahar County where is located in Sistan – Baluchistan Province, south–east of Iran. Chabahar County is approximately 14927.85 km² in area with 25°17′ N and 60° 37′ E, latitude and longitude. This County is situated to the north of Iran–shahr and Nikshahr Counties and is bounded on the south by Oman Sea, on the east by Pakistan Country and from west by Kerman and Hormozgan Provinces. Chabahar has long and hot summer and also

^{*}Corresponding author: Dr Hamid Kassiri, Assistant Professor, Department of Medical Entomology and Vector Control, School of Health, Ahwaz Jundishapur University of Medical Sciences, Ahwaz, Iran.

Fax:0098-611-3738270

short and mild winter. The average of relative humidity was 50–70% in winter and 70–87% in spring and summer. The average temperature was 26–27.4 $\,^{\circ}$ C in this County. The mean of annual rainfall was 100 mm.

2.2. Methods

Sand flies were collected from Negor, Pollan and Nobandian Villages which were located in 50, 60 and 70 km from Chabahar County during 8 months.

A plethora of sticky traps, papers 10×15 cm covered by castor oil, were set in rodent burrows in the late afternoon and collected in the next morning before sunrise. The flies were transported to laboratory and removed by needle from sticky traps. A number of unfed blood–fed, half–gravid and gravid sand flies were dissected in a drop of normal saline for determining of natural leptomonad infection in all parts of gut. Some females were dissected for the age determination. It is worth mentioning that presence or absence of granules in the accessory glands assigned the age. Other specimens were mounted in Puri's medium then identified using the valid key [11]. in Negor, Pollan and Nobandian Villages during Jun to September .With regard to identification of specimens,333 *S.sintoni* and 475 *S.clydei* were found in these areas which were blood-fed, gravid, semi-gravid and unfed sand flies. On average, 2.1% *S.sintoni* and 5% *S.clydei* were presented natural leptomonad infection (Fig 1). By and large, all leptomonads were observed in gut. Semi-gravid female sand flies had the highest percentage of infection.



Fig 1: Leptomonad infection in *S. clydei* and *S.sintoni* of Chabahr district, southeast of Iran

3. Results

Totally 808 sand flies were collected from rodent burrows

In a nutshell, natural leptomonad infection rate of S.sintoni

Table1

Monthly variation of natural promastigote infection in *S.sintoni* collected from rodent burrows in three villages, Chabahar County, Sistan-Baluchistan Province, SE Iran, Jun –September .

Date	No.dissected	Age group			Gonotrophic cycle				No sand flies	т.С 1
		Parous	Nulliparous	Unknown	unfed	blood-fed	Semi-gravid	gravid	with leptomonad	Infected(%)
First week of Jun	19	7	12	_	10	2	3	4	_	_
Last week of Jun	17	5	11	1	11	1	2	3	-	-
First week of July	39	10	25	4	22	5	6	6	-	-
Last week of July	43	10	30	3	24	7	4	8	-	-
First week of Agust	18	6	11	1	10	2	2	4	1	5.5
Last week of Agust	65	28	25	12	24	9	10	22	2	3.1
Second week of September	69	37	22	10	22	11	9	27	2	2.9
Last week of September	63	40	19	4	18	8	8	29	2	3.2
Total	333	143	155	35	141	45	44	103	7	2.1

Table 2

Monthly variation of natural promastigote infection in *S.clydei* collected from rodent burrows in three villages, Chabahar County, Sistan – Baluchistan Province, SE Iran, Jun –September

Date	No.dissected	Age group			Gonotrophic cycle				No sand flies	S T C T Levy
		Parous	Nulliparous	Unknown	unfed	blood-fed	Semi-gravid	gravid	with leptomonad	Intected(%)
First week of Jun	18	6	10	2	10	2	2	4	-	-
Last week of Jun	25	7	17	1	15	3	3	4	-	_
First week of July	49	13	34	2	31	6	6	6	-	-
Last week of July	62	17	38	7	40	7	6	9	1	1.6
First week of August	21	8	13	-	11	3	2	5	2	9.5
Last week of August	50	22	23	5	23	6	6	15	2	4
Second week of September	96	52	36	8	36	13	11	36	5	5.2
Last week of September	154	91	54	9	54	17	18	65	14	9.1
Total	475	216	225	34	220	57	54	144	24	5

and *S.clydei* in Negor, Pollan and Nobandian Villages were 2.5%,1.9%,1.6%,3.6% ,4.7% and 7%,respectively.Chi–square test did not show any significant difference among infection rate of *S.sintoni* in the three villages and also about *S.clydei*. The assay showed that the maximum population of parous

was observed in the last week of September and the last week of July it was at least. Gonotrophic cycle and monthly variation of leptomonad infection rate of *S.sintoni* and *S.clydei* were shown in Tables 1 and 2.

The highest population of gravid and semi-gravid of *S.sintoni* and *S.clydei* were observed in the last week of September (58.7%) and (53.9%) also the lowest was in the last week of July (27.9%) and (24.2%), respectively.

4. Discussion

The studies to date have tended to focus on vectors of leishmaniasis and what we know about phlebotominae is largely based on empirical investigation in endemic foci [12,13]. However, there has been little research on Sergentomyia species on account of this fact that they cannot cause any diseases in mammalian and these parasites are specific to reptiles. Indeed, this survey suggested the first report of leptomonad (promastigote) infection in S.sintoni and S.clydei in Sistan-Baluchistan Province, southeastern Iran. Furthermore, we demonstrated gonotrophic cycle and age group in two vectors of lizard Leishmania promastigote. The finding of current essay showed natural leptomonad infection in S.sintoni and S.clydei, whilst in some research has been pointed to natural infection in S.sintoni which were collected from natural habitat of lizard in Bakran County, Turkemaen–Sahara County, Khuzestan Province and [1,5,7,9] . On the part of, natural infection have been observed in S.clydei and S.sintoni in Lotfabad County and S.dentata in Meshkinshahr County^[14]. In the present study, the highest infection rate were observed in the first week of August such as that conducted by Rashti and Colleagues in 1994 [9].

Although, *leishmania tropica* was found in *S.sintoni* it had been considered that this sand fly did not have any role as a vector of human leishmaniasis ^[15]. *S.sintoni* has a wide dispersion in Iran ^[16–22] and this species is one of the main vectors of lizard leishmaniasis in Iran owing to infected specimen and lizard involved the same geographical spread ^[8,23,24]. In 2008, Parvizi and Amirkhani published a paper in which they detected *L.major* and *L.gerbili* in *S.sintoni* by Nested–PCR of ITS–rDNA gene. In the light of vast distribution of this species in many Zoonotic Cutaneous Leishmaniasis foci, more research is needed for determining the vectorial role of *S.sintoni* in this area ^[25]. Furthermore, infection was observed in *S.schwetzi* ^[26]. *Phlebotomus* *duboscqi* and *S.darlingi* were reported as probable vectors of *L.major* complex in Mali [27].

The current study found that the most collected sand flies were unfed; it may be due to reduced activity or remain them after blood feeding in rodent burrows. The results of this study indicate that gravid sand flies were captured more than blood-fed specimens. A possible explanation for this might be that these females show more activity to find suitable place for oviposition. Another finding was that parous rate gradually was increased from the beginning to the end of activity season. This fact may explain increasing age of the sand flies population in the last season. The study has gone some way towards enhancing our understanding about some part of biology of two lizard leishmaniasis vectors. The controversial issue that some *Sergentomyia* species may transmit disease to human is needed further research.

Acknowledgement

We would like to express the deepest appreciation to the staff of Iranshahr Health Research Station. In addition, we must acknowledge the invaluable contributions the personal of Chabahar Health Care Center in this survey. This project has been supported by School of Health, Tehran university of Medical Sciences.

Conflict interest statement

We declare that we have no conflict of interest.

References

- Mesghali A, Seyedi-Rashti MA, Nadim A. Epidemiology of Cutaneous Leishmaniasis in Iran, B. Khorassan: Part II-Natural leptomonad infection of sand flies in Mashhad and Lotfabad areas. *Ibid* 1967; 60: 514-518.
- [2] Seyedi-Rashti MA, Nadim A, Naficy A. Further report on lizard leishmaniasis in the northern part of Iran. J Trop Med Hyg 1971; 74: 70–71.
- [3] Belova EM. Reptiles and their importance in the epidemiology of leishmaniasis. Bull Wld Hlth Org 1971; 44: 553-560.
- [4] Al Sadoon MK, El Bahraway AF. Blood parasites of five species of lizards trapped in Abha Province, Saudi Arabia. J Egypt Soc Parasitol 1998; 28: 899–905.
- [5] Edsond JF, Himo J. Leishmania sp. in the blood of lizard (Agama stellio) from Lebanon. Trans Roy Soc Trop Med Hyg 1973; 67: 27.
- [6] Elwasila, M. Leishmania tarentolae Wenyon, 1921 from the gecko

Tarentola annularis in the Sudan. Parasitol Res 1988; 74: 591-2.

- [7] Pozio E, Grarniccia M, Gradoni L, Maroli M. Hemoflagellates in *Cyrtodactylus kotschyi*(Steindachner, 1870) (Reptilia, Gekkonidae) in Italy. *Acta Trop* 1983; **40**: 399–400.
- [8] Nadim A, Seyedi-Rashti MA, Mesghali A. On the nature of leptomonads found in *Sergentomyia sintoni* in Khorassan, Iran and their relation to lizard leishmaniasis. *Ibid* 1968; 71: 240.
- [9] Seyedi-Rashti, MA, Agh-Atabay MD, Mohebali M. Natural promastigote infection of *Sergentomyia sintoni*, its seasonal variation and reservoir host in Turkemen-Sahara, Iran. *Iran J Publ Hlth* 1994; 23(1-4): 41-50.
- [10]Javadian E, Mesghali A. Studies on Cutaneous leishmaniasis in Khuzestan, Iran. PartI. The leptomonad infection of sand flies. *Bull Soc Path Exoth* 1974; 67: 513–516.
- [11]Theodor O, Mesghali A. On the phlebotominae of Iran. J Med Ent 1964; 1: 285–300.
- [12]Hamarsheh O. Distribution of *Leishmania major* zymodemes in relation to populations of *Phlebotomous papatasi* sand flies. *Parasit Vectors* 2011; 4(9):1–6.
- [13]Yaghoobi–Ershadi MR, Hakimiparizi M, Zahraei–Ramazani AR, Abdoli H, Akhavan AA, Aghasi M, Arandian MH, Ranjbar AA. Sand fly surveillance within an emerging epidemic focus of cutaneous leishmaniasis in southeastern Iran. *Iran J Arthropod–Borne Dis* 2010; 4(1):17–23.
- [14]Rassi Y, Javadian E, Nadim A, Tahvildare–Bidruni GH. Natural promastigote infection of sand flies and its occurrence in *Sergentomyia dentata* in Ardebile province, northwest of Iran. Iran. J Publ Hlth 1997; 26(1–2): 7–12.
- [15]Lewis DJ. Phlebotomid sand flies. Bull Wld Hlth Org 1971; 44: 535– 551.
- [16]Abdoli H, Hejazi SH, Akhavan AA, Zahraei-Ramazani AR,Yaghoobi-Ershadi MR, Jalali-Zand AR, Arandian MH, Piazak N, Jafari R, Alizadeh M. Some ecological aspects of phlebotomine sand flies in an endemic focus of cutaneous leishmaniasis in Iran. *Iran J Arthropod–Borne Dis* 2007; 1(2): 34–39.
- [17]Motevali Emami M, Yazdi M. Entomological survey of phlebotomine sand flies (*Diptera: Psychodidae*) in a focus of visceral leishmaniasis in central Iran. J Vector Borne Dis 2008; 45: 38–43.

- [18]Akhavan AA, Yaghoobi-Ershadi MR, Hasibi F, Jafari R, Abdoli H, Arandian MH, Soleimani H, Zahraei-Ramazani AR, Mohebali M, Hajjaran H. Emergence of cutaneous leishmaniasis due to *Leishmania major* in a new focus of southern Iran. *Iran J Arthropod-Borne Dis* 2007; 1(1):1–8.
- [19]Parvizi P, Ahmadipour F. Fauna, abundance and dispersion of sand flies in three endemic areas of cutaneous leishmaniasis in rural Fars province. J Shahid Sadoughi Univ Med Sci 2010; 19(2): 173–82.
- [20]Maleki N, Javadian E, Mohebali M, Dalimi–Asl AH, Sadraei J, Zarei Z, Oshaghi MA. Natural infection of *S.dentata* in Ardebil area to reptile leshmania. *J Modaress Med Sci* 2007; **10**(3,4): 65–73.
- [21]Kassiri H, Javadian E, Hanafi-Bojd AA. Faunistic survey of sand flies (dipteral:psychodidae) in Chabahar county, southeast of Iran. J Exp Zool India 2011; 14(2):663–666.
- [22]Parvizi P, Aleenovin E. Simultaneous detection of three *Leishmania* species in Kaleybar a focus of visceral leishmaniasis in northwest of Iran. J Ardebil Univ Med Sci 2011; 11(2):121–131.
- [23]Nadim A, Seyedi-Rashti MA. A brief review of the epidemiology of various types of leishmaniasis in Iran. Acta Medica Iranica 1971; 14: 99-106.
- [24]Nadim A, Seyedi-Rashti MA, Tahvildare-Bidruni Gh. Lizard leishmaniasis in Iran. Iran J Publ Hlth 1975; 4: 84-85.
- [25]Parvizi P, Amirkhani A. Mitochondrial DNA characterization of Sergentomyia sintoni populations and finding mammalian Leishmania infection in this sand fly by using ITS-rDNA gene. IJVR 2008; 9(1): 9-18.
- [26]W.Senghor M, N.Faye M, Faye B, Diarra K, Elguero E, Gaye O, Banuls AL, A.Niang A. Ecology of Phlebotomine sand flies in the rural community of Mont Rolland (Thies region, Senegal). Area of transmission of canine leishmainasis. *PLOS ONE* 2011; 6(3): e14773: 1–8.
- [27]Berdjane-Brouk Z, K.Kone A, A.Djimde A, N.Charrel R, Ravel C, Delaunay P, Giudice P, Z.Diarra A, Doumbo S, Goita S, A.Thera M, Depaquit J, Marty P, K.Doumbo O, Izri A. First detection of *Leishmania major* DNA in *Sergentomyia (Spelaeomyia)darlingi* from cutaneous leishmaniasis foci in Mali. *PLOS ONE* 2012; 7(1):e28266:1-5.