

THE PHLEBOTOMINE SANDFLIES OF PORTUGAL. XIII – OCCURRENCE OF *PHLEBOTOMUS SERGENTI* PARROT, 1917 IN THE ARRABIDA LEISHMANIASIS FOCUS

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Summary:

In a survey carried out during the summer in 2002 and 2003, in the canine and vulpine leishmaniasis focus of Arrabida, 665 phlebotomine sandflies were caught. 13.83 % were *P. ariasi*, 58.65 % *P. perniciosus*, 0.45 % *P. sergenti* and 27.07 % *S. minuta*. Despite the low abundance, the finding of the three adults *P. sergenti* (two males in Aldeia Grande and one female in Quinta da Ramada) confirm the colonization of the Arrabida leishmaniasis focus by this species, which presence had been previously reported but thought accidental. The abundance of *P. ariasi* observed at this time is significantly different from that in previous years (Pires, 1984 and Fernandes pers. com., 1994). The occurrence of *P. sergenti* in this region, in association with the decrease in abundance of *P. ariasi*, may reflect an increased aridness of this region, a consequence of current climate and environmental changes.

KEY WORDS : phlebotomine sandflies, *P. sergenti*, *P. ariasi*, leishmaniasis, aridness, Arrabida, Portugal.

Résumé : LES PHLÉBOTOMES DU PORTUGAL. XIII – OCCURRENCE DE *PHLEBOTOMUS SERGENTI* PARROT, 1917 DANS LE FOYER LEISHMANIOTIQUE D'ARRABIDA

Lors une enquête effectuée en 2002 et 2003 dans le foyer de leishmaniose canine et vulpine d'Arrábida, 665 phlébotomes ont été capturés : *P. ariasi* - 13,83 % (92/665); *P. perniciosus* - 58,65 % (390/665); *P. sergenti* - 0,45 % (3/665) et *S. minuta* - 27,07 % (180/665). Les trois *P. sergenti* capturés à Aldeia Grande (deux mâles) et à Quinta da Ramada (une femelle) sont la première référence de cette espèce dans le foyer. On a vérifié que l'abondance de *P. ariasi* trouvée par Pires (1984) et Fernandes (pers. com., 1994) est significativement différente de celle que nous rapportons ici. Il est possible que l'occurrence de *P. sergenti* et la diminution progressive de *P. ariasi* soient la conséquence d'un début d'aridification dans la région.

MOTS CLÉS : phlébotome, *P. sergenti*, *P. ariasi*, leishmaniose, aridification, Arrábida, Portugal.

Parrot (1917) described *Phlebotomus sergenti* from a male caught in Constantine, in Algeria. Later, França (1918a) reported, for the first time in Europe, the presence of this species in Colares (Sintra, Portugal) and in the same year described the female, caught in copula (França, 1918b). *P. sergenti* is the proven vector of *Leishmania tropica* (Wright, 1903) in Saudi Arabia (Al-Zaharin *et al.*, 1988) and Morocco (Guilvard *et al.*, 1991). *P. sergenti* has a more widespread distribution than the parasite (Depaquit *et al.*, 2002), being found from Madeira and Canary Islands to India and from the south of France to Kenya. The abundance of *P. sergenti* in Portugal is low, except in the south of Portugal (Algarve and Evora regions) (Alves-Pires *et al.*, 2001; Semião-Santos *et al.*, 1995; Alves-Pires *et al.*, submitted) (Table I, Fig. 1). In the Arrabida leishmaniasis focus, only *P. ariasi* and *P. perniciosus* were found by Pires (1984), with some

infected with *Leishmania* sp. promastigotes. *L. infantum* MON-1 were isolated by Abranches *et al.* (1984; 1986) from dogs and foxes. In 1994, however, Fernandes (personal communication) identified a single male *P. sergenti*, in a total of 2,177 phlebotomine sandflies (0.05 %). The Arrabida region has a flora composed of stone pinus (*Pinus pinea*), maritime pinus (*Pinus pinaster*), portuguese oak (*Quercus faginea*), shrub tree (*Phillyrea media* and *P. latifolia*), strawberry tree (*Arbustus unedo*), holly oak (*Quercus coccifera*), mastic tree (*Pistacea lentiscus*) locust tree (*Ceratonia siliqua*) and fan palm (*Chamaerops humilis*) (Franco, 1994; Ribeiro, 1955; Ribeiro *et al.*, 1996). According to Ribeiro (1955), the Arrabida's mountain in the Arrabida Natural Park preserves the remains of a preglacial vegetation from the South of Europe. We have conducted a survey of phlebotomine sandflies during the transmission season in 2002 and 2003 and found that the sandfly population had changed.

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MATERIAL AND METHODS

Phlebotomine sandflies were collected in the Arrabida region from June to September, during 2002 and 2003, using CDC miniature light traps

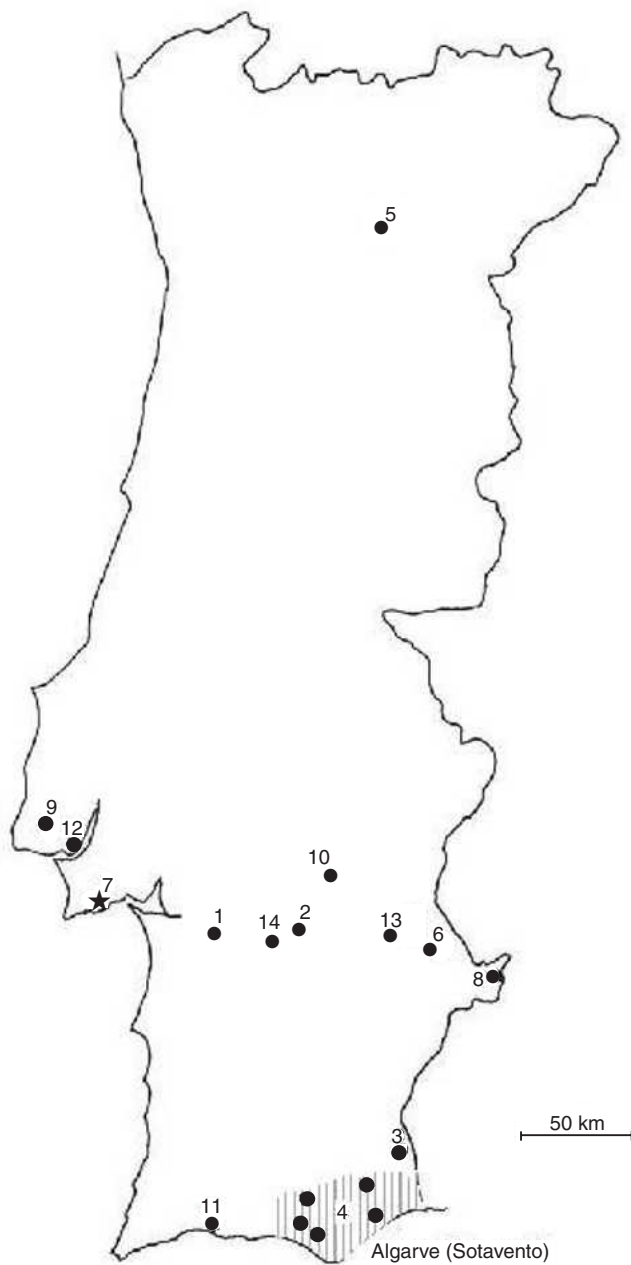


Fig. 1. – Distribution of *P. sergenti* Parrot, 1917 in Portugal (see Table I).

located at a height of 150 cm or less. The identification of the imago was carried out according to entomological keys (Pires, 2000). 99 biotopes were investigated in total.

RESULTS

We collected a total of 665 sand flies of two genera, *Phlebotomus* and *Sergentomyia*, three subgenera and four species (Table II). The three *P. sergenti* were caught in Aldeia Grande (two males) and Quinta da Ramada (one female). This is only the second report of *P. sergenti* in Arrabida (Table I).

DISCUSSION AND CONCLUSIONS

The comparative abundance of *P. ariasi* observed by us (13.83 %) is significantly different ($p < 0.001$) from the one found by Pires (1984) 41.88 % (696/1,662) and the one found by Fernandes (pers. com., 1994) 31.33 % (682/2,177). A trend towards a lower frequency is thus observed.

We have now confirmed the occurrence of *P. sergenti* in the Arrabida Natural Park, which Fernandes (pers. com.) had considered accidental.

The occurrence of *P. sergenti* in the Arrabida leishmaniasis focus associated with the decrease in abundance of *P. ariasi* may reflect an increased aridness in this region, according to the data observed in other western mediterranean countries (Rioux *et al.*, 1986, 1997; Rioux, 2001). Climatic and environmental changes may also contribute to the observed results.

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Months Species*	June		July		August		September		Total		Total	%
	MM	FF	MM	FF	MM	FF	MM	FF	MM	FF		
<i>P. ariasi</i>	0	0	15	13	9	11	32	12	56	36	92	13.83
<i>P. perniciosus</i>	4	2	17	0	99	18	224	26	344	46	390	58.65
<i>P. sergenti</i>	0	0	2	0	0	0	0	1	2	1	3	0.45
<i>S. minuta</i>	0	0	14	9	11	4	76	66	101	79	180	27.07
Total	4	2	48	22	119	33	332	105	503	162	665	100.00

* MM: males; FF: females.

Table II. – Abundance of *P. ariasi*, *P. perniciosus*, *P. sergenti* and *S. minuta* observed in Arrabida (2002-2003).

Number	Localities	<i>P. sergenti</i> number	Sandflies number	%	References
1	Alcácer do Sal	4	136	22.9	Azevedo, 1946
2	Alcáçovas	7	196	3.6	Azevedo, 1946
3	Alcaria (between Castro Marim-Mértola)	1	264	0.4	Alves-Pires & Afonso (not published)
4	Algarve (Sotavento)	12	1,710	1.5	Schrey <i>et al.</i> , 1989;
		268	3,093	8.7	Alves-Pires <i>et al.</i> , 2001 ¹
5	Alto Douro	1	5,767	0.02	Rés, 1957
6	Amareleja	2	172	1.2	Rés, 1957
7	Arrabida	1	2,177	0.05	Fernandes (pers. com);
		3	665	0.5	Afonso <i>et al.</i>*
8	Barrancos	2	208	1.0	Alves-Pires & Afonso (not published)
9	Colares	75	102	73.5	França, 1919;
		1	8	12.5	Meira & Ferreira, 1944
10	Évora	533	798	66.8	Semião-Santos <i>et al.</i> , 1995; Alves-Pires <i>et al.</i> (submitted)
11	Ferragudo/Carvoeiro	3	135	2.2	Pires, 1979
12	Lisbon (city)	289	8,576	3.4	Meira & Ferreira, 1944; Azevedo, 1946; Rés, 1957
13	Mourão	32	113	28.3	Rés, 1957
14	Torrão	1	12	8.3	Azevedo, 1946

¹ Included Bordeira, Loulé, Magoito, Querença and Sítio do Marco.

* Present study (2002-2003).

Table I. – Distribution of *P. sergenti* Parrot, 1917 in Portugal.

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REFERENCES

- ABRANCHES P., CONCEIÇÃO-SILVA F.M. & SILVA-PEREIRA M.C.D. Kala-azar in Portugal. V. The sylvatic cycle in the enzootic endemic focus of Arrabida. *Journal of Tropical Medicine and Hygiene*, 1984, 87, 197-200.
- ABRANCHES P., CONCEIÇÃO-SILVA F.M. & SILVA-PEREIRA M.C.D. La leishmaniose viscérale dans la région de Lisbonne. Identification enzymatique. Interprétation structurale du foyer. In: *Leishmania*. Taxonomie et phylogénèse. Applications éco-épidémiologiques. Rioux J.A. (Ed.), IMEEE, Montpellier, 1986, 426-432.
- ALVES-PIRES C., AFONSO M.O., JANZ J.G. & SEMIÃO-SANTOS S.J. The phlebotomine sandflies of Portugal. XII. The phlebotomine of the Evora leishmaniasis focus (1999-2000), (submitted).
- ALVES-PIRES C., CAMPINO L., AFONSO M.O., SANTOS-GOMES G., DEDET J.P. & PRATLONG F. Les Phlébotomes du Portugal. X. Infestation naturelle de *Phlebotomus perniciosus* par *Leishmania infantum* MON-1 en Algarve. *Parasite*, 2001, 8, 374-375.
- AL-ZAHRANI M.A., PETERS W., EVANS P.A., CHING-CHIN I., SMITH V. & LANE R.P. *Phlebotomus sergenti*, a vector of *Leishmania tropica* in Saudi Arabia. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1988, 82, 416.
- AZEVEDO J.F. Novos dados sobre a biologia das espécies de *Phlebotomus* de Lisboa e arredores. *Anais do Instituto de Medicina Tropical*, 1946, 3, 7-20.
- DEPAQUIT J., FERTÉ H., LÉGER N., LEFRANC F., ALVES-PIRES C., HANAFI H., MAROLI M., MORILLAS-MARQUES F., RIOUX J.A., SVO-
- BODOVA M. & VOLF P. ITS 2 sequences heterogeneity in *Phlebotomus sergenti* and *Phlebotomus similis* (Diptera, Psychodidae): possible consequences in their ability to transmit *Leishmania tropica*. *International Journal of Parasitology*, 2002, 32, 1123-1131.
- FRANÇA C. Apontamentos para o estudo dos “*Phlebotomus*” portugueses. *A Medicina Moderna*, 1918a, 295, 67-68.
- FRANÇA C. Notes sur les espèces portugaises du genre *Phlebotomus*. *Bulletin de la Société de Pathologie Exotique*, 1918b, 11, 730-733.
- FRANÇA C. Notes de Zoologie Médicale – Observations sur le genre *Phlebotomus*. *Brotéria (Série Zoológica)*, 1919, 17, 102-160.
- FRANCO J.A. Zonas fitogeográficas predominantes de Portugal Continental. *Anais do Instituto Superior de Agronomia*, 1994, 44, 39-56.
- GUILVARD E., RIOUX J.A., GALLEGO M., PRATLONG F., MAHJOUR J., MARTINEZ-ORTEGA E., DEREURE J., SADDIKI A. & MARTINI A. *Leishmania tropica* au Maroc. III. – Rôle vecteur de *Phlebotomus sergenti*. *Annales de Parasitologie Humaine et Comparée*, 1991, 66, 96-99.
- MEIRA M.T.V. & FERREIRA T.G. Espèces de phlébotomes de Lisbonne et de ses environs. *Anais do Instituto de Medicina Tropical*, 1944, 1, 269-287.
- PARROT L. Sur un nouveau phlébotome algérien *Phlebotomus sergenti*. *Bulletin de la Société de Pathologie Exotique*, 1917, 10, 564-567.
- PIRES C.A. Contribuição ao conhecimento da distribuição e bioecologia dos flebotomos em Portugal (Diptera, Psychodidae). *Boletim da Sociedade Portuguesa de Ciências Naturais*, 1979, 19, 197-210.
- PIRES C.A. Les phlébotomes du Portugal. I. – Infestation naturelle de *Phlebotomus ariasi* Tonnoir, 1921 et *Phlebotomus perniciosus* Newstead, 1911, par *Leishmania* dans le foyer

- zoonotique de Arrábida (Portugal). *Annales de Parasitologie Humaine et Comparée*, 1984, 59, 521-524.
- PIRES C.A. Os flebotomos de Portugal (Insecta, Diptera, Psychodidae). II. – Distribuição, variação anual e altitudinal dos flebotomos do foco zoonótico da Arrábida. Actas II Congresso Ibérico de Entomologia, 1985, Lisboa, (suppl. 1), 83-94.
- PIRES C.A. Os flebotomos (Diptera, Psychodidae) dos focos zoonóticos de leishmanioses em Portugal, PhD thesis, Universidade Nova de Lisboa, Portugal, 2000, 228 p.
- RÉS J.F. Contribuição para o conhecimento da leishmaniose em Portugal. *Anais do Instituto de Medicina Tropical*, 1957, 14, 527-545.
- RIBEIRO O. Portugal. In: Geografia de España y Portugal. Montaner y Simón, S.A. (Ed.), Barcelona, 1955, 5, 290 p.
- RIBEIRO H., PIRES C.A & RAMOS H.C. Os mosquitos do Parque Natural da Arrábida (Insecta, Diptera, Culicidae). *Garcia de Orta, Série Zoológica*, 1996, 21, 81-110.
- RIOUX J.A. Trente ans de coopération franco-marocaine sur les leishmanioses : dépistage et analyse des foyers. Facteurs de risque. Changements climatiques et dynamique noso-géographique. *Association des Anciens Élèves de L'Institut Pasteur*, 2001, 168, 90-101.
- RIOUX J.A., AKALAY O., PÉRIÈRES J., DEREURE J., MAHJOUR J., LE HOUÉROU H.N., LÉGER N., DESJEUX P., GALLEGO M., SADDIKI A. BARKIA A. & NACHI H. L'évaluation écoépidémiologique du "risque leishmanien" au Sahara atlantique marocain. Intérêt heuristique de la relation "Phlébotomes-bioclimats". *Ecologia mediterranea*, 1997, 23, 73-92.
- RIOUX J.A., LANOTTE G., PETTER F., DEREURE J., AKALAY O., PRATLONG F., VELEZ I.D., FIKRI N.B., MAAZOUN R., DENIAL M., JARRY D.M., ZAHAF A., ASHFORD R.W., CADI-SOUSSI M., KILLICK-KENDRICK R., BENMANSOUR N., MORENO G., PÉRIÈRES J., GUILVARD E., ZRIBI M., KENNOU M.F., RISPAIL P., KNECHTLI R. & SERRES E. Les leishmanioses cutanées du bassin Méditerranéen occidental. De l'identification enzymatique à l'analyse éco-épidémiologique. L'exemple de trois "foyers", tunisien, marocain et français. In: *Leishmania*. Taxonomie et phylogénèse. Applications éco-épidémiologiques. Rioux J.A. (Ed.), IMEEE, Montpellier, 1986, 365-395.
- SCHREY C.F., PIRES C.A. & MACVEAN D.W. Distribution of phlebotomine sandflies and the rate of their infection with *Leishmania* promastigotes in the Algarve, Portugal. *Medical and Veterinary Entomology*, 1989, 3, 125-130.
- SEMIÃO-SANTOS S.J., EL HARITH A., FERREIRA E., PIRES C.A., SOUSA C. & GUSMÃO R. Evora district as a new focus for canine leishmaniasis in Portugal. *Parasitological Research*, 1995, 81, 235-239.

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