ECTOPARASITES OF WILD RODENTS FROM PARQUE ESTADUAL DA CANTAREIRA (PEDRA GRANDE NUCLEI), SÃO PAULO, BRAZIL

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Sixteen ectoparasite species were collected from 195 wild rodents, between February 2000 and January 2001, in an Ecological Reserve area of the Parque Estadual da Cantareira, in the municipalities of Caieiras, Mariporã and Guarulhos, State of São Paulo, Brazil. Fifty three percent of the captured rodents were found infested, with the highest prevalences observed for the mites *Gigantolaelaps gilmorei* and *G. oudemansi* on *Oryzomys russatus*; *G. wolffsohni*, *Lalelaps paulistanensis* and *Mysolaelaps parvispinosus* on *Oligoryzomys* sp. In relation to the fleas, *Polygenis* (*Neopolygenis*) *atopus* presented the highest prevalence, infesting *Oryzomys russatus*. The highest specificity indices were found for *Eubrachylaelaps rotundus/Akodon* sp.; *G. gilmorei* and *G. oudemansi/O. russatus*; and *Laelaps navasi/Juliomys pictipes*. When average infestation intensities were related to specificity indices, the relationship was only significant for *Brucepattersonius* sp. and *O. russatus* ($P<0.05$). *Craneopsylla minerva minerva* and *Polygenis* (*N.*) *pradoi* were found for the first time on *Blarinomys breviceps*; as well as *A. fahrenholzi*, *E. rotundus*, *G. wolffsohni*, *M. parvispinosus*, *C. minerva* and *P. atopus* on *Brucepattersonius* sp.; and *Androlaelaps fahrenholzi*, *E. rotundus*, *G. gilmorei*, *G. oudemansi*, *Ixodes loricatus*, *L. navasi*, *L. paulistanensis*, *M. parvispinosus* and *P. atopus* on *J. pictipes*. In addition, a new locality record is presented for *L. navasi*.

KEY WORDS: Ectoparasites, mites, fleas, wild rodents.

RESUMO

Dezesseis espécies de ectoparasitos foram coletadas sobre 195 roedores, entre Fevereiro de 2000 e Janeiro de 2001, no Parque Estadual da Cantareira, que compreende os municípios de Caieiras, Mairiporã e Guarulhos, Estado de São Paulo, Brasil. Cinqüenta e três por cento dos roedores capturados estavam infestados, e as maiores prevalências foram observadas para *Gigantolaelaps gilmorei* e *G. oudemansi* em *Oryzomys russatus*; *G. wolffsohni*, *Laelaps paulistanensis* e *M. parvispinosus* em *Oligoryzomys* sp. Em relação as pulgas, *Polygenis (Neopolygenis) atopus* foi a mais prevalente, infestando *O. russatus*. Os maiores índices de especificidade foram para *Eubrachylaelaps rotundus*/*Akodon* sp., *G. gilmorei* e *G. oudemansi*/ *O. russatus* e *Laelaps navasi*/*Juliomys pictipes.* A intensidade média de infestação está relacionada ao índice de especificidade, e somente foi significante para *Brucepattersonius* sp. e *O. russatus* ($p< 0,05$). Um novo registro de localidade foi assinalado para *L. navasi*, e as seguintes espécies, *Craneopsylla minerva minerva* e *Polygenis* (*N.*) *pradoi* foram encontradas pela primeira vez em *Blarinomys*

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breviceps; tanto quanto *A. fahrenholzi*, *E. rotundus*, *G. wolffsohni*, *M. parvispinosus*, *C. minerva* e *P. atopus* em *Brucepattersonius* sp.; e *A. fahrenholzi*, *E. rotundus*, *G. gilmorei*, *G. oudemansi*, *Ixodes loricatus*, *L. navasi*, *L. paulistanensis*, *M. parvispinosus* e *P. atopus* em *J. pictipes*.

PALAVRAS-CHAVE: Ectoparasitos, ácaros, pulgas, roedores silvestres.

INTRODUCTION

Mammals are considered preferential hosts for several species of ectoparasites and, of these, Rodentia is the most infested (WOOLEY, 1988). According to Botelho and Linardi (1996), this group can be considered one of the most important orders of mammals due to the fact that, taxonomically, it includes the largest number of species, many of which play an important epidemiological role. As reservoirs and intermediate hosts of disease causing agents on wild life, domestic animal and humans (GUIMARÃES et al., 2001).

Ectoparasites that commonly infest small wild mammals are included mostly in the Ixodida (Ixodidae and Argasidae) and Gamasida (Laelapidae and Macronyssidae) groups, in the Acari subclass and Siphonaptera (Rhopalopsyllidae) and Phthiraptera (Amblycera, Ischnocera and Hoplopleuridae) in Insecta class.

Studies dealing with rodent ectoparasites and their hosts relationship in Brazil stood out during the 80's and 90's, with several papers mainly from the state of Minas Gerais (BOTELHO et al., 1981; LINARDI, et al., 1984a; LINARDI, et al., 1984b; LINARDI, et al., 1985a; LINARDI, et al., 1985b; LINARDI et al., 1987; LOPES et al., 1989; BOTELHO; LINARDI, 1996). Other studies were also conducted in the states of Rio de Janeiro (GUITTON et al., 1986), Roraima (LINARDI et al., 1991a), Santa Catarina (LINARDI et al., 1991b) and Paraná (BARROS et al., 1993; BARROS-BATTESTI et al., 1998). Regarding to the ecology and host specificity of Laelapine mites, a recent study was conducted in the Atlantic Forest area from Ilha Grande, state of Rio de Janeiro by Martins-Hatano et al. (2002). Although several species of mites were described from the state of São Paulo by Fonseca (1935/36, 1939), there is only one recent paper, from the Estação Ecológica Juréia-Itatins (BOSSI et al., 2002), in the coast of São Paulo, that deals with the relationships among ectoparasites and rodents.

As such, the purpose of the present study was to investigate the ectoparasite fauna from wild rodents of the Parque Estadual da Cantareira, São Paulo, State of São Paulo, in an area that comprises the largest stretch of woodland in insular conditions within a metropolis.

MATERIAL AND METHODS

Study area and field procedures

The Parque Estadual da Cantareira (23º22'S and 46º36'W) consitutes a woodland reserve of 7.916.52 ha located in the northern part of the city of São Paulo, surpassing the municipality limits and including parts of Caieiras, Mairiporã and Guarulhos. It includes five administrative nuclei (Pedra Grande, Águas Claras, Engordador, Pinheirinho and Cabuçu), of which we used Pedra Grande to conduct the present study.

Rodents were captured between February 2000 and January 2001, with 150 "live-trap" cages and 160 "pitfall-traps" during nine consecutive days each month, totalling 33.480 trapping effort. The captured rodents were anesthetized with ether and combed over a white basin. The ectoparasites were collected by brushing. After preservation in 70% ethanol, they were mounted on slides according to the conventional techniques for Acari (FLECHTMANN, 1985) and Siphonaptera (LINARDI; GUIMARÃES, 2000).

Mites were identified using the original descriptions of Fonseca (1935/36, 1939), as well as by comparison of the material with the types deposited in the Instituto Butantan Acari collection. Nomenclature follows that updated by Botelho et al. (2002). Immature tick specimens were identified based on comparison with the chaetotaxy of laboratory reared larvae material. Nomenclature and identification of fleas follow Linardi and Guimarães (2000).

Data Analysis

The prevalence of hosts infested by Acari and Siphonaptera, was expressed in percentage of the number of infested hosts out of all examined hosts.

Specificity indices were calculated for each host species that presented more than 10 captured specimens, according to Marshall (1981), using the formula:

$$SI = \frac{r_i}{\sum_i r_i} \times 100$$

where r_i is the number of parasites per individual of a given host species (represented by the index *i*). Note that, in the denominator, the values of r_i calculated for each host species are added up for all species, and that the multiplication by a factor 100 implies that *SI* will vary between 0 and 100.

A linear regression analysis was used to verify the relationship between specificity indices (SI) and infestation mean intensity (MI) in the observed hosts. A linear model was considered, given by $Y = a + b\,X$, *where* represents the mean intensity, *X* the specificity index, and *a* and *b* are, respectively, the linear and angular fitting coefficients.

In addition, the adjusted determination coefficient was estimated. This coefficient measures the "goodness of fit" of a given regression model (ZAR, 1996), and can be interpreted as an expression of the proportion of the total variability observed in *Y* that can be explained by or attributed to a linear dependence of *Y* on all observed *X*-values in the fitted regression model. When the angular coefficient is significantly different from 0, given the *P*-value < 0.05, we can say that there is a linear relationship between *X* and *Y* (CHASE; BOWN, 1992).

Ectoparasite specimens were deposited in the Acari collection of the Instituto Butantan (IBSP) and in the Museu de Zoologia da Universidade de São Paulo (MZSP). Rodents'

skins and skulls were deposited in the mastozoology collection of the MZSP.

RESULTS

During the twelve month period, a total of 833 ectoparasites were collected on 104 rodents, totalling 53% of infested hosts among the total of captured animals (N=198). This percentage represents less that 1% capture success. Only Acari (n = 767; 92,07%) and Siphonaptera (n = 66; 7,92%) were found in the ectoparasite samples of the captured hosts.

The following species of rodents were captured: *Blarinomys breviceps* (Wing, 1887); *Juliomys pictipes* (Osgood, 1933); *Mus musculus* (Linnaeus, 1758); *Nectomys squamipes* (Brants, 1827); *Oryzomys russatus* Wagner, 1848; *Oxymycterus hispidus* Pictet, 1843; *Rhipidomys mastacalis*, (Lund, 1840) and *Thaptomys nigrita* (Lichtenstein, 1829). Four other species in the genera *Akodon* Meyen, 1833; *Brucepattersonius* Hershkovtiz, 1998; *Delomys* Thomas, 1917 and *Oligoryzomys* Bangs, 1900 were only identified to genera level due to the fact that they are cryptic species and were not karyotyped.

The ectoparasites collected from the hosts' were identified as: Acari Ixodidae - *Ixodes loricatus* Neumann, 1899, Laelapidae - *Androlaelaps* (*Haemolaelaps*) *fahrenholzi* (Berlese, 1911); *Eubrachylaelaps rotundus* Fonseca, 1936; *Gigantolaelaps gilmorei* Fonseca, 1939; *G. oudemansi* Fonseca, 1939; *G. wolffsohni* (Oudemans, 1910); *Laelaps castroi* Fonseca, 1959; *L. navasi* Fonseca, 1939; *L. paulistanensis* Fonseca, 1936; *L. thori* Fonseca, 1939; *Mysolaelaps heteronychus* Fonseca, 1959 and *Mysolaelaps parvispinosus* Fonseca, 1936; Siphonaptera: Stephanocircidae - *Craneopsylla minerva minerva* (Rothschild, 1903); Rhopalopsyllidae - *Polygenis* (*Neopolygenis*) *atopus* (Jordan e Rosthschild, 1922); *P.* (*N.*) *pradoi* (Wagner, 1937) and *P.* (*Polygenis*) *roberti roberti* (Rothschild, 1905).

With the exception of *R. mastacalis* (N=1) and *T. nigrita* (N=7), infested with only one specimen of *M. heteronychus* and 13 specimens of *E. rotundus*, respectively, all rodents were infested by two or more species of mites. The prevalence and abundance of mites are shown on Table I.

The most frequently collected species of mites were, in decreasing order of prevalence: *G. wolffsohni*, *A. fahrenholzi*, *L. paulistanensis*, *M. parvispinosus* and *E. rotundus* (Table 1), with the three first species infesting five out of the six examined host species. The most abundant species was *G. oudemansi*, accounting for 13.2% of the total number of collected mites. *Oligoryzomys* sp. was the most abundant and most infested rodent. Although *J. pictipes* was the second most abundant species, *O. russatus* was the second most infested rodent.

Exclusively for Siphonaptera, prevalence and abundance are shown on Table 2. The global prevalence for fleas (14,9) was almost 3.5 times lower than that of mites (Table 1).

A new locality record is given for *L. navasi*, and the

Table 1. Prevalence by two or more Acari species on wild rodents from the Parque Estadual da Cantareira, State of São Paulo, Brazil, from February 2000 to January 2001.

	Hosts						
CLIQUE AQUI PARA ERRATA	*Akodon* sp. (N=44)	*Brucepattersonius* sp. (N=11)	*Oligoryzomys* sp. (N=75)	*Oryzomys russatus* (N=17)	*Juliomys pictipes* (N=36)	*Nectomys squamipes* (N= 1)	Total* (N=184)
Acari	% (IH/N) n	% (IH/N) n	% (IH/N) n	% (IH/N) n	% (IH/N) n	% (IH/N) n	% (IH/N) n
Adrolaelaps ahrenholzi	15.90 (7/44) 14	9.09 (1/11) 1	17.33 (13/75) 47	11.76 (2/17) 4	25.00 (9/36) 29	-	17.39 (32/184) 95
Eubrachylaelaps rotundus	29.54 (13/44) 41	9.09 (1/11) 1	5.33 (4/75) 10	-	2.77 (1/36) 1	-	10.32 (19/184) 53
Gigantolaelaps gilmorei	2.27 (1/44) 2	-	1.33 (1/75) 10	23.52 (4/17) 16	2.77 (1/36) 3	100.00 (1/1) 16	4.34 (8/184) 47
G. oudemansi	4.54 (2/44) 3	-	2.66 (2/75) 8	35.29 (6/17) 124	2.77 (1/36) 18	100.00 (1/1) 68	6.52 (12/184) 221
G. wolffsohni	2.27 (1/44) 7	9.09 (1/11) 1	36.00 (27/75) 82	5.88 (1/17) 1	8.33 (3/36) 9	-	17.93 (33/184) 100
Ixodes loricatus	2.27 (1/44) 3	-	12.00 (9/75) 15	-	8.33 (3/36) 11	-	7.06 (13/184) 29
Lalelaps castroi	-	-	2.66 (2/75) 2	-	-	-	1.08 (2/184) 2
L. navasi	4.54 (2/44) 3	-	2.66 (2/75) 10	5.88 (1/17) 13	25.00 (9/36) 57	-	7.60 (14/184) 83
L. paulistanensis	2.27 (1/44) 6	-	28.00 (21/75) 51	5.88 (1/17) 1	8.33 (3/36) 6	-	14.13 (26/184) 64
L. thori	-	-	1.33 (1/75) 3	-	-	-	0.54 (1/184) 3
Mysolaelaps parvispinosus	4.54 (2/44) 2	9.09 (1/11) 3	20 (15/75) 42	11.76 (2/17) 3	11.11 (4/36) 6	-	13.04 (24/184) 56
Total	43.18 (19/44) 81	27.27 (3/11) 6	58.66 (44/75) 280	52.94 (9/17) 162	50.00 (18/36) 140	100.00 (1/1) 84	51.09 (94/184) 753*

N. number of hosts; IH. number of infested hosts; n. number of Acari specimens; *. total number of specimens with the exception of those with simple infestations.

Table 2. Prevalence of Siphonaptera species on wild rodents from the Parque Estadual da Cantareira, State of São Paulo. Brazil, from February 2000 to January 2001.

	Hosts								
Siphonaptera	*Akodon* sp. (N=44) % (IH/N) n	*Blarinomys breviceps* (N=3) % (IH/N) n	*Brucepattersonius* sp. (N=11) % (IH/N) n	*Juliomys pictipes* (N=36) % (IH/N) n	*Nectomys squamipes* (N=1) % (IH/N) n	*Oligoryzomys* sp. (N=75) % (IH/N) n	*Oryzomys russatus* (N=17) % (IH/N) n	*Rhipidomus mastacalis* (N=1) % (IH/N) n	Total (N=188) % (IH/N) n
Craneopsylla minerva	-	33.33 (1/3) 1	9.09 (1/11) 1	-	-	-	5.88 (1/17) 1	100 (1/1) 1	2.13 (4/188) 4
Polygenis (*Neopolygenis*) *atopus*	9.09 (4/44) 5	-	9.09 (1/11) 1	11.76 (2/17) 21	100 (1/1) 11	9.33 (7/75) 11	23.52 (4/17) 6	100 (1/1) 2	10.64 (20/188) 57
P. (*N.*) *pradoi*	-	33.33 (1/3) 1	-	-	-	1.33 (1/75) 1	-	-	1.07 (2/188) 2
P. (*P.*) *roberti*	-	-	-	-	100 (1/1) 1	-	11.76 (2/17) 2	-	1.07 (2/188) 3
Total	9.09 (4/44) 5	66.67 (2/3) 2	18.18 (2/11) 2	11.76 (2/17) 21	100 (1/1) 12	10.67 (8/75) 12	41.18 (7/17) 9	100 (1/1) 3	14.90 (28/188) 66

N. number of hosts; IH. number of infested hosts; n. number of Siphonaptera specimens.

Table 3. Average infestation intensities (MI) and values of ectoparasite specificity indices (SI) on wild rodents from the Parque Estadual da Cantareira, state of São Paulo, Brazil, from February 2000 to January 2001.

	Hosts									
	Akodon sp.		*Brucepattersonius* sp.		*Oligoryzomys* sp.		*Oryzomys russatus*		*Juliomys pictipes*	
Ectoparasites	MI	SI	MI	SI	MI	SI	MI	SI	MI	SI
Acari										
Androlaelaps fahrenholzi	2.00	15.32	1.00	4.37	3.62	30.18	2.00	11.33	3.23	38.79
Eubrachylaelaps rotundus	3.15	82.42	1.00	8.04	2.50	7.08	-	-	1.00	2.46
Gigantolaelaps gilmorei	2.00	3.77	-	-	10.00	11.08	4.00	78.22	3.00	6.93
G. oudemansi	1.50	0.85	-	-	4.00	1.33	20.70	91.53	18.00	6,27
G. wolffsohni	7.00	9.62	1.00	5.50	3.03	66.17	1.00	3.56	3.00	15.13
Ixodes loricatus	3.00	10.77	-	-	1.70	31.62	-	9.30	3.70	48.30
Laelaps castroi	-	-	-	-	1.00	100.00	-	-	-	-
L. navasi	1.50	2.67	-	-	5.00	5.23	13.00	29.99	6.40	62.10
L. paulistanensis	6.00	13.08	-	-	2.43	65.27	1.00	5.65	2.00	16.00
L. thori	-	-	-	-	3.00	100.00	-	-	-	-
Mysolaelaps parvispinosus	1.00	4.11	3.00	24.71	2.80	50.74	1.50	5.33	1.50	15.10
Siphonaptera										
Craneopsylla minerva minerva	-	-	1.00	-	-	-	1.00	39.29	10.50	60.71
Polygenis (N.) atopus	1.30	8.75	1.00	7.01	1.60	12.33	2.00	22.67	-	49.24
P. (N.) pradoi	-	-	-	-	1.00	100.00	-	-	-	-

following species *C. minerva* and *P.* (*N.*) *pradoi* were found for the first time on *B. breviceps*; as well as *A. fahrenholzi*, *E. rotundus*, *G. wolffsohni*, *M. parvispinosus*, *C. minerva* and *P. atopus* on *Brucepattersonius* sp.; and *A. fahrenholzi*, *E. rotundus*, *G. gilmorei*, *G. oudemansi*, *I. loricatus*, *L. navasi*, *L. paulistanensis*, *M. parvispinosus* and *P. atopus* on *J. pictipes*.

The average infestation intensity and specificity indices for five species of hosts are shown, for both mites and fleas, on Table 3. The relationships between the ectoparasite's specificity indices and average infestation intensities, statistically analyzed by means of linear regression considering only hosts that presented more that 10 capured individuals, are shown on Table 4.

Table 4. Values of linear regression coefficients, corresponding standard errors (SE). P-vallues for the tests that verify if the angular coefficient is or not different from zero, null hyphoteses (b=0), and the ajusted coefficient of determination (R^2a).

	Coefficients					
Hosts	a	SE(*a*)	b	SE(*b*)	P-vallue	R2a %
Akodon sp.	2.66	0.82	0.012	0.030	0.70	0.0
Brucepattersonius sp.	0.29	0.24	0.101	0.020	0.007	83.6
Juliomys pictipes	4.4	2.8	0.032	0.080	0.70	0.0
Oligoryzomys sp.	4.53	0.94	-0.030	0.016	0.094	16.4
Oryzomys russatus	0.07	2.38	0.150	0.056	0.028	40.8

a and *b* are, respectively, the linear and angular fitting coefficients.

DISCUSSION

That there a tendency towards the decrease in the percentage of global infestation from Southern to Northern Brazil (BARROS et al., 1993), it would be expected that the infestation observed in this study was lower than that observed in the Southern region as states of Santa Catarina and Paraná, respectively, Florianópolis (100%), and Tijucas do Sul (98%), and higher than that recorded in the state of Minas Gerais for the municipalities Juiz de Fora (82,3%), Belo Horizonte (76,1%), and Caratinga (72,8%). However, the ectoparasite global infestation percentage was significantly low (53%), when compared to those of other Brazilian regions. The abundance (4.20; 833/198) was, approximately, four times lower than those cited for Mandirituba and Foz do Iguaçu and Tijucas do Sul (BARROS-BATTESTI et al., 1998), in the state of Paraná, and Juiz de Fora (LINARDI et al., 1987), Belo Horizonte, (LINARDI et al., 1984a) and Caratinga (BOTELHO, 1978), in the state of Minas Gerais.

In relation to Acari, the genus *Gigantolaelaps* is associated to the genus *Oryzomys* (GETTINGER, 1987), and this association is considered quite common (LINARDI et al., 1991b; BARROS et al., 1993; BARROS-BATTESTI et al., 1997). Nevertheless, in addition to *O. russatus*, the three collected species of *Gigantolaelaps* were also observed infesting *Oligoryzomys* sp. and *J. pictipes* rodents, and with lower prevalence on *Akodon* sp.. Two species were also observed on *N. squamipes* and one on *Brucepattersonius* sp.

Eubrachylaelaps rotundus was strongly associated to *Akodon* sp. (Table 1), in accordance to the data available in literature (MARTINS-HATANO et al., 2004). In some areas of the state of Minas Gerais, *E. rotundus* was found more frequently associated to *Bolomys lasiurus* (Lund, 1841), especially if *Akodon* was not present (LINARDI et al., 1984a). Nevertheless, in areas in which both hosts occurred, the higher prevalence was observed for the genus *Akodon* (BOTELHO et al., 1981; LOPES et al., 1989). In the present study, specimens of *E. rotundus* were also found infesting other rodent species, although with low prevalence. This was also observed in the southern (LINARDI et al., 1991b; BARROS et al., 1993; BARROS-BATTESTI et al., 1998) and southeastern regions (BOTELHO et al., 1981; LINARDI et al., 1984a; BOTELHO; LINARDI, 1988).

In relation to flea infestations, the abundance is similar to that observed in previous studies (BOTELHO; WILLIAMS, 1980; BOTELHO et al., 1981; LINARDI et al., 1984a; GUITTON et al., 1986; WHITAKER; DIETZ 1987; BOTELHO; LINARDI, 1996; BARROS-BATTESTI et al., 1998). With the exception of those rodent species that were rarely captured (less than 10 individuals), the highest prevalence of fleas was observed for *O. russatus*, even though *Akodon* sp., *J. pictipes* and *Oligoryzomys* sp. were collected in higher numbers (Table 2).

The most abundant fleas was *P.* (*N.*) *atopus*, collected on seven of eight examined hosts. The remaining species, *C. m. minerva, P.* (*P.*) *roberti* e *P.* (*N.*) *pradoi*, were recorded on four, three and two hosts, respectively. Highest prevalences were obtained for *C. m. minerva* and *P. (N.) pradoi* on *B. breviceps*, *P. atopus* on *N. squamipes* and *O. russatus*, and *P. (P.) roberti* on *N. squamipes*.

Considering all collected ectoparasites with an average infestation of 10 or more parasites per host, the highest mean infestation intensities (MI) were observed for *G. gilmorei* on *Oligoryzomys* sp., *G. oudemansi* and *L. navasi* on *O. russatus*, and *G. oudemansi* and *C. minerva* on *J. pictipes*.

The highest specificity indices (SI), i.e. higher than 50%, were observed for *G. wolffsohni*, *L. castroi*, *L. thori*, *L. paulistanensis*, *M. parvispinosus* and *P. (N.) pradoi* on *Oligoryzomys* sp., followed by *G. gilmorei* and *G. oudemansi* on *O. russaltus* and *L. navasi* and *C. minerva* on *J. pictipes* (Table 3). In the State of São Paulo, *L. navasi* is known from the holotype, collected on a wild rodent, probably of the genus *Oryzomys*, captured in the vincinity of the Butantan Institute in 1937 (FONSECA, 1939). A second record of this species, on *N. squamipes* and *Oryzomys lamia* Thomas, 1901, is known from Ilha Grande, state of Rio de Janeiro (GUITTON et al., 1986). In the present study, although *L. navasi* was found on *O. russatus*, *Oligoryzomys* sp. and *Akodon* sp., the highest prevalence was observed on *J. pictipes*, with high specificity index (Tables 1 and 3). The presence of *L. navasi* in the Serra da Cantareira represents not only new host records but also the second record of this species in the state of São Paulo.

As rare as *L. navasi*, *L. thori*, with only three individuals collected on *Oligoryzomys* sp. (Tables 1 and 3), represents new locality and host records, since the type, described from Brasil, has no locality or host data (FONSECA, 1939). It's occurrence was later recorded in Panamá, infesting rodents of the genera *Oryzomys* and *Peromyscus* (WENZEL; TIPTON, 1966).

In relation to the fleas, with the exception of that of *C. m. minerva* on *J. pictipes* (Table 3), the low specificity indices were expected. According to Linardi (1985), there is no host specificity among the species of the family Rhopalopsyllidae, although feeding preferences for some host taxa can be observed.

A linear relationship, at a significance level of 5%, with *P*-values < 0.05, was observed only for *Brucepattersonius* sp. and *O. russatus* (Table 4). On the other hand, less than 50% of the variability (R^2a) was observed for *Akodon* sp., *Oligoryzomys sp.*, *O. russatus* and *J. pictipes*, even though, according to Marshall (1981), specificity indices are directly proportional to the number of infested hosts.

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