PUBLIC HEALTH

New Data on the Morphology of *Polygenis* (*Polygenis*) *rimatus* (Jordan) (Siphonaptera: Rhopalopsyllidae)

MARCELA LARESCHI[1] AND PEDRO M. LINARDI[2]

[1]*Centro de Estudios Parasitológicos y de Vectores (CEPAVE). Calle 2 n° 584, 1900 La Plata, Argentina. CONICET*
mlareschi@cepave.com.ar
[2]*Depto. Parasitologia, ICB/UFMG, Av. Antônio Carlos 6627, Pampulha, 31270-901, Belo Horizonte, MG, Brazil*
linardi@icb.ufmg.br

Neotropical Entomology 34(1):121-125 (2005)

Novos Dados Relativos à Morfologia de *Polygenis* (*Polygenis*) *rimatus* (Jordan) (Siphonaptera: Rhopalopsyllidae)

RESUMO - O estudo baseou-se em 208 espécimes, coletados em uma ampla faixa geográfica situada entre os centros do Brasil e da Argentina. Morfologicamente, as características utilizadas para a identificação de *Polygenis* (*Polygenis*) *rimatus* (Jordan) foram estudadas, tais como a presença ou ausência do duto da espermateca com margens espessadas e a forma da margem posterior do esternito VII, entre as fêmeas, bem como o ângulo entre os braços proximal e distal do tubo interno do aedeagus e o número de suas circunvoluções, nos exemplares machos. Os resultados obtidos são importantes para subsidiarem o reconhecimento da espécie. A variabilidade de algumas características entre exemplares de localidades disjuntas no Brasil e Argentina é também noticiada.

PALAVRAS-CHAVE: Argentina, Brasil, pulga

ABSTRACT - The study was carried out on the basis of 208 specimens of both sexes from a wide geographical range, from central Brazil to central Argentina. The morphology of diagnostic features of *Polygenis* (*Polygenis*) *rimatus* (Jordan) including the presence or absence of the ductus of the spermatheca with a thick wall, the shape of the posterior margin of seventh sternum in females, and the size of the angle between the distal and the proximal arms of the basal part of the aedeagal tubus, and the number of convolutions made by the coil of the aedeagal tubus interior in males, have been studied. The results obtained are important in clarifying some difficulty in species recognition. Besides, the variability of some characteristics between specimens from disjoint localities in Brazil and Argentina is also noticed.

KEY WORDS: Argentina, Brazil, flea

There are 44 species and subspecies described from the genus *Polygenis* Jordan (Linardi & Guimarães 2000) and most of them are South American (Lewis 1973). *Polygenis* (*Polygenis*) *rimatus* (Jordan) has been recorded from Paraguay and Peru, though most of the records are from Brazil and Argentina (Smit 1987). In Brazil it has been recorded from the central and southern region of the country (Barros-Battesti *et al*. 1998, Lima Bicho *et al.* 1999, Carvalho *et al.* 2001), while in Argentina principally from Buenos Aires Province (Autino & Lareschi 1998). In both countries *P*.(*P*.) *rimatus* coexists with other species and subspecies of *Polygenis* which are very similar in their morphology (Linardi *et al.* 1987, Lareschi *et al*. 2003, Nava *et al.* 2003). When studying specimens from Brazil, Linardi (1981) noticed the difficulty in the recognition of specimens of *P*.(*P*.) *rimatus* from those of *Polygenis tripus* (Jordan) and mentioned the importance of the length of the oblique break line of the mid coxa, which was almost complete in *P.* (*P*.) *rimatus.* The variability of the shape and chaetotaxy of the distal arm of the ninth sternum of the male was also noticed (Linardi 1984). Subsequently, Hastriter and Peterson (1997) reported a characteristic ductus of the spermatheca with a thick wall in specimens of *P*.(*P*.) *rimatus* from northeastern Brazil (Bahia State); these authors also noticed the absence of this structure in specimens from northern Argentina.

In the present study, we report new morphological features of diagnostic importance for *P*.(*P*.) *rimatus*, which may clarify difficulties in the recognition of similar species. However, we

report that the variability of some characteristics may difference specimens from disjoint localities from Brazil and Argentina.

Materials and Methods

Specimens from Brazilian localities deposited in the Flea Collection of the Departmento de Parasitologia of the Instituto de Ciências Biológicas (Universidade Federal de Minas Gerais, UFMG) in Belo Horizonte, Brazil, were examined. Fleas deposited in the Collection of the Departmento de Entomologia of the Museo de La Plata (MLP), as well as those belonging to the Eduardo Del Ponte collection, deposited in Instituto National de Microbiologia "Dr. Carlos G. Malbran" (CGM) (Argentina), were also examined with comparative purpose. Only the main differences among specimens are given following the terminology of Smit (1987). Drawings were made with the aid of a camera lucida. The list of female and male fleas studied, including the locality, collection number (Coll. No.) and institution where they are deposited, are given below. When available, host species, collection date (month/day/year), and collector name, are also given.

Polygenis (*Polygenis*) *rimatus* (Jordan)

Females.

Specimens Studied. BRAZIL: ESPÍRITO SANTO: Reserva Duas Bocas: Coll. No. 63-DB-1 and 63-DB-2, UFMG, on *Didelphis marsupialis* (Linnaeus). MINAS GERAIS: Caratinga: Coll. No. R41, UFMG; Coll. No. T37, T81, R65-2 and T56, UFMG, on *Akodon arviculoides* Wagner; Coll. No. R1-1, R1-2, R1-3, UFMG, on *Oxymycterus hispidus* Pictet; Coll. No. T101, UFMG, on *Euryzygomatomys guiara* (Brandt); Coll. No. R52, UFMG, on *Nectomys squamipes* (Brants) VI/1976, J.R. Botelho; Juiz de Fora: Coll. No. R56-1, R40, R56-2, R56-3, R47-2, R48-1, R44-1, R65-1-1, R64-1-2, R63-3, R63-1, R55-15, R55-15, R55-6, R55-4, R51-1, R49-8, R49-7, R49-5, R40-6, R40-4, R40-2, R40-1, R35-2, R25-1, R17-2, R12-1 and R9-2, UFMG; Coll. No. R41, UFMG, on *Calomys expulsus* Lund, III/25/1982, V.P. Teixeira. Ouro Preto: Coll. No. 54/913, 57/913, 57/890 and 57/914, UFMG, G. Trinidade. Medina: Coll. No. 835, UFMG. Serra de Caparaó: Coll. No. ARP43/PH10296-3, RI5-1, RI5-3, PH10320, 10290 and ARP10-3, UFMG, on *Akodon cursor* (Winge); Coll. No. PH10302, UFMG, on *A. serrensis* (Thomas); Coll. No. PH10331, UFMG, on *Thaptomys nigrita* (Lichtenstein); Coll. No. PRC19-1 and PRC19-2, UFMG, on *Oryzomys ratticeps* (Hensel); Coll. No. PCR4 and 10-2, UFMG, on *Philander opossum* (Linnaeus); Coll. No. CR33-1 and 0-1, UFMG, on *Oxymycterus* sp., X/7/1992, P.M. Linardi. RIO DE JANEIRO STATE: Rio de Janeiro: Coll. No. RJ2, RJ3, RJ6, RJ7, RJ8, RJ9, RJ10, RJ11 and RJ12, UFMG, R. Carvalho. SANTA CATARINA: Florianópolis: Coll. No. SC-64-1 and SC10, UFMG, 1987, A. Ximenez. SÃO PAULO STATE: Salesópolis: Coll. No. MHN1586/910 and MHN1544/900, UFMG, on *A. arviculoides*; Coll. No. 920, UFMG, on *A. cursor*; Coll. No. MHN495, UFMG, on *T. nigrita*; Coll. No. MHN1493/897, MHN555/885/1392, MHN5120/887R and 1472/894, UFMG, on *Oryzomys angoya* (Hensel); Coll. No. MHN1545/901, UFMG, on *Delomys dorsalis* (Hensel), 1972, E. Dente. Itapetininga: Coll. No. 442, UFMG; Coll. No. 922, UFMG, on *Oryzomys* sp., 1973, E. Dente. Itapevi: Coll. No. DR37, UFMG, on *Akodon* sp., IX/26/1995, D. Barros-Battesti; Coll. No. DR38, UFMG, on *Oryzomys* sp., D. Barros-Battesti; Coll. No. DR23, UFMG, on *Oxymycterus* sp., D. Barros-Battesti. São Paulo: Coll. No. 17995/9884, 18011/9910, 18011/9910, 18005/9893 and 18011/9910, UFMG, L.R. Guimarães. UNKNOWN LOCALITY: Coll. No. MHN1576/9062, UFMG. ARGENTINA: BUENOS AIRES PROVINCE: Arroyo La Matanza: Coll. No. 9038, CGM, on *Lutreolina crassicaudata* (Desmarest), R. Mauri; Parque Provincial Pereyra Iralola: Coll. No. 9047, 9048, 9049, 9051 and 9055, CGM, on *Oxymycterus rufus* (Fischer), II/?/1966, R. Mauri; Pergamino: Coll. No. 8785 and 8789, CGM, on *Oligoryzomys flavescens* (Waterhouse), VI/?/1965; Coll. No. 8901-1 and 8901-2, CGM, on *Necromys obscurus* (Waterhouse), VIII/6/1965; Coll. No. 8800, 8803, 8807, 8809 and 8799, CGM, on *L. crassicaudata*, VII/09/1965, J.J. Capri.

Description. Modified abdominal segments. Specimens from Brazil with the ductus of the spermatheca with a thick wall, which appears as a distinctly sclerotized broadly U-shaped region (Fig.1). Specimens from Argentina without the structure mentioned above. Shape of the spermatheca similar in all specimens (Fig. 1), and posterior margin of seventh sternum variable, from rounded to truncated independently of the locality.

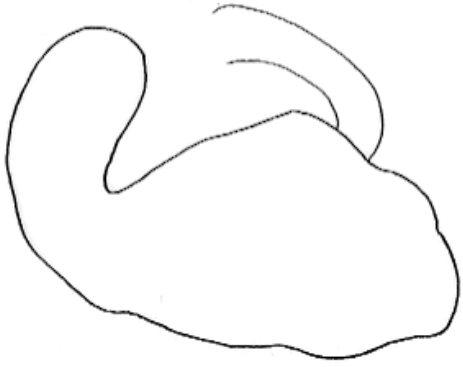

Figure 1. *P.* (*P.*) *rimatus* from São Paulo State, Brazil. Female: spermatheca.

Males.

Specimens Studied. BRAZIL: MINAS GERAIS: Belo Horizonte: Coll. No. P26, UFMG, 1984, P.M. Linardi. Caratinga: Coll. No. T81, T37 and R65-1, UFMG, on *A. arviculoides*; Coll. No. T91, UFMG, on *E. guiara*; Coll. No. T11, UFMG, on *O. hispidus*, VI/1976, J.R. Botelho; Juiz de Fora: Coll. No. R7, R41-1, R49-1, R65-2, R63-2, R55-16, R55-14, R55-13, R55-11, R55-10-R55-9, R55-8, R55-7, R55-5, R55-3, R55-2, R55-1, R49-6, R49-4, R49-3, R40-3, R39-1, R34-1, R15-1, R17-1, R12-2, R7-1, R6-1, R5-2 and R5-1, UFMG, III/25/1982, V.P. Teixeira. Serra de Caparaó: Coll. No. PH10308, UFMG; ARP43/PH10296-1,

ARP43/PH10296-2, PH10309, ARP10-1, ARP10-2, ARP-3, RI5-2, PH10309-2 and PH10292, UFMG, on *A. cursor*; Coll. No. PRC19-3 and PCR19, UFMG, on *O. ratticeps*; Coll. No. PCR33-2, S/N1, S/N2, S/N3, PRM10-1 and PCR33-3, UFMG, on *Oxymycterus* sp., X/7/1992, P.M. Linardi. PARÁ: Itaituba: Coll. No. 2156, UFMG, on *Didelphis* sp., IV/9/1938. RIO DE JANEIRO STATE: Rio de Janeiro: Coll. No. RJ4 and RJ5, UFMG, R.W. Carvalho. SANTA CATARINA: Florianópolis: Coll. No. SC-64-2, UFMG, 1987, A. Ximenez. SÃO PAULO STATE: Salesópolis: Coll. No. MHN1576/9062, MHN1576/907, MHN1576/908 and MHN1536, UFMG; MHN1586/911, MHN1559/905, MHN1558, MHN1559, MHN1556, MHN5120/887 and MHN1586/910, UFMG, on *A. arviculoides*; Coll. No MHN479/1390 and MHN1486/895, UFMG, on *A. cursor*; Coll. No. MHN495, UFMG, on *T. nigrita*; Coll. No. MHN1493/898R, MHN1486/896 and MHN556/1357/888, UFMG, on *O. angoya*; Coll. No. MHN563/1352, UFMG, on *D. dorsalis*, 1972, E. Dente. Itapetininga: Coll. No. 1407/892, UFMG, on *A. arviculoides*; Coll. No. MHN536/891, UFMG, on *A. arviculoides*, 1972, E. Dente. Itapevi: Coll. No. DR26, UFMG, on *Oxymycterus* sp., D. Barros-Battesti. São Paulo: Coll. No. 17977, UFMG. UNKNOWN LOCALITY: Coll. No. 921, UFMG. ARGENTINA: BUENOS AIRES PROVINCE: Arroyo La Matanza: Coll. No. 8999, CGM, on *L. crassicaudata*, XII/20/1965, R. Mauri; Capital Federal: Coll. No. 8820 and 8821, CGM, on *Calomys* sp., VI/22/1964, E. Massoia, A. Fornes and R. Mauri; Delta del Paraná: Coll. No. 8454, CGM, on *Deltamys kempi* Thomas, IX/26/1964, E. Massoia and A. Fornes; Hudson Natural Reserve: Coll. No. H039, UFMG, on *O. flavescens*, IV/12/1995, M. Lareschi; Magdalena: Coll. No. T2, S2, R020, MLP, on *O. flavescens*, IV/19/1999, A. Abba; Pergamino: Coll. No. 8779, CGM, on *O. flavescens*, VI/?/1965; Coll. No 9332, CGM, on *Akodon azarae* (Fischer), VII/24/1967; Ramallo Reserve: Coll. No. R015, MLP, on *O. flavescens*, VII/?/2000, S. Nava.

Description. *Modified abdominal segments*. Distal arm of ninth sternum laterally with chaetotaxy variable. Mostly with setae extending two-thirds the distance from the apex in specimens from Argentina, and one-third the distance in those from Brazil.

Aedeagus. Angle between distal and proximal arms of basal part of aedeagal tubus broader in Brazilian specimens than in those from Argentina. Coil of aedeagal tubus interior making from 1.5 to 2 convolutions in specimens from Brazil (Fig. 2), and 2.5 convolutions in those from Argentina (Fig. 3).

Discussion

Polygenis (*Polygenis*) *rimatus* was originally described as *Pulex bohlsi* Wagner from female specimens collected in Paraguay. Subsequently, it was transferred by Jordan & Rothschild (1908) to *Rhopalopsyllus bohlsi* based on female specimens collected from Paraguay and Argentina, as well as from only one male (holotype) from Paraguay. Afterwards, Jordan (1932) recognized that specimens previously thought to be *R. bohlsi* were new species, which he described as *Rhopalopsyllus rimatus*. Then the species was included in the genus *Polygenis* as *P. rimata* by Guimarães (1942), and later renamed as *P. rimatus* (Costa Lima & Hathaway 1946,

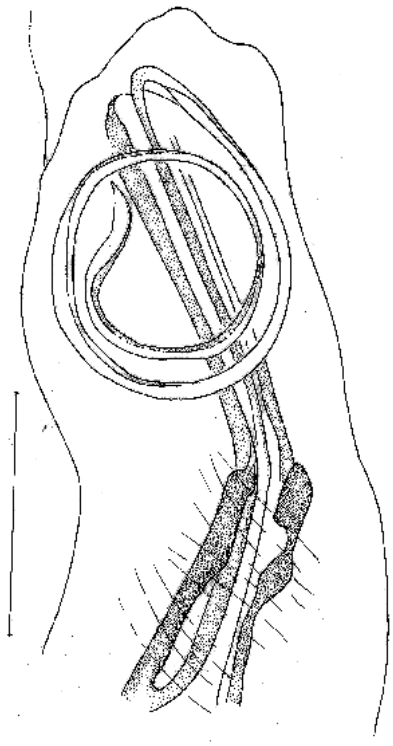

Figure 2. *P.* (*P.*) *rimatus* from São Paulo State, Brazil. Male: aedeagus.

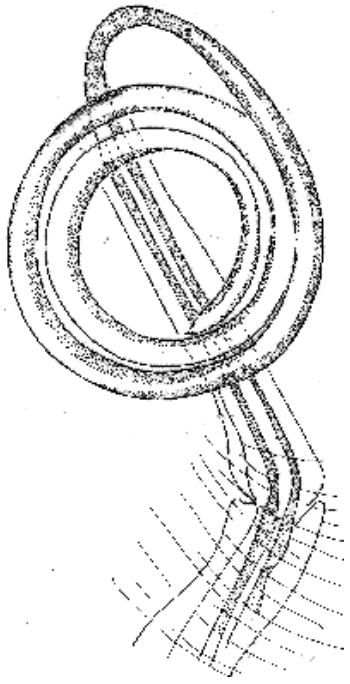

Figure 3. *P.* (*P.*) *rimatus* from Buenos Aires Province, Argentina. Male: aedeagus.

Guimarães 1948, Capri & Capri 1960, Del Ponte 1963, Gomes 1969). Johnson (1957) used the subspecific status to include *Polygenis atra* Guimarães, defining *P. rimatus rimatus* and *P. rimatus atra*, but later *atra* was found to be an aberration of *rimatus* (Linardi 1984). Subsequently, the species was included in the subgenus *Polygenis* Jordan, 1939 and renamed as it is now known, *P.* (*P.*) *rimatus* (Smit 1987).

The results obtained in the present study show that the structure of the spermatheca of both Argentinean and Brazilian specimens fits the description and figure given by Smit (1987). However the thick wall of the ductus which was present only in Brazilian specimens, closely conforms the figure and the description given by Hastriter and Peterson (1997). These authors have mentioned this structure only for specimens collected in Bahia, Brazil. In the present study we support the diagnostic importance of this characteristic, which may allow the recognition of *P.* (*P.*) *rimatus* from similar species which coexist with it, such as *P.* (*P.*) *tripus* (Linardi 1981). Besides, we report the presence of a thick wall of the ductus of the spermatheca in specimens, not only from Bahia State, but from the central and southern region of the country. On the other hand, in agreement with Hastriter and Peterson (1997), we support the absence of this structure in specimens from Argentina. The shape of the posterior margin of the seventh sternum was rounded in some females from Argentina and Brazil in accordance with a figure of a specimen collected in Chivilcoy (Buenos Aires Province) presented by Smit (1987). However, other specimens from the same localities showed truncated shape. Thus, because of the variability of this characteristic we support that the shape of the seventh sternum of the female may not be considered of diagnostic importance as it actually is (Smit 1987, Linardi & Guimarães 2000).

Male specimens showed a great variability in the extension of the lateral setae on the distal arm of the ninth sternum, in accordance with previous studies on specimens collected in Brazil (Linardi 1984). However, most of the Argentinean males fit figures and descriptions given by Jordan & Rothschild (1908) on the basis of a specimen collected from Paraguay, which constitutes the first description of the male sex of *P.* (*P.*) *rimatus*. They are similar to figures and descriptions from Paraguay and Argentina presented by Jordan & Rothschild (1923). The structure of the aedeagus differed consistently between specimens from Argentina and Brazil. Those from Argentina closely conform to the original figures and descriptions given by Smit (1987) on the basis of the male paratype, which was collected in Los Ingleses (Buenos Aires Province). They differed from all specimens collected in Brazil in the number of convolutions of the tubus interior of the aedeagus and in the width of the angle between its distal and proximal arms.

The new morphological features for *P.* (*P.*) *rimatus* reported in the present study are of diagnostic importance since they may clarify difficulties in the recognition of similar species. Considering that 93 males and 115 females have been studied, and taking into account that they have been collected from a wide geographical range, from central Brazil to central Argentina, new morphological data obtained are also important to the knowledge of the species. Since it is involved in the perpetuation of diseases among wild small mammals such as plague, the result is also important from a epidemiological viewpoint (Linardi & Guimarães 2000). Besides, considering that there are no records in the literature of *P.* (*P.*) *rimatus* from intermediate areas involving Rio Grande do Sul (Brazil) and Misiones, Corrientes and Entre Rios (Argentina) (Smit 1987, Autino & Lareschi 1998, Linardi & Guimarães 2000), the morphological differences observed between specimens from these countries are related to the disjoint distribution of the species.

Acknowledgments

We are grateful to Juan Carlos Mariluis (Instituto National de Microbiologia “Dr. Carlos G. Malbran” (CGM) (Buenos Aires, Argentina) for the loan of specimens, to María Cristina Estivariz (CEPAVE, Argentina) for the illustrations of this paper, and to Laura Gorostordoy for the critical revision of the English. To CONICET (Argentina) for financial support to M. Lareschi.

Literature Cited

Autino, A. & M. Lareschi. 1998. Siphonaptera, p.279-290. In J.J. Morrone & S. Coscarón (eds.), Biodiversidad de artrópodos argentinos. Una perspectiva biotaxonómica. La Plata, Editorial Sur, 599p.

Barros-Battesti, D., M. Arzua, P.M. Linardi, J.R. Botelho & I.J. Sbalqueiro. 1998. Interrelationship between ectoparasites and wild rodents from Tijucas do Sul, State of Paraná, Brazil. Mem. Inst. O. Cruz 93: 719-725.

Capri, J.J. & N.A.R. Capri. 1960. Suctoria. Prim. J. Entom. Argent. 2: 581-586.

Carvalho, R.W., N.M. Serra-Freire, P.M. Linardi, A.B. Almeida & J.N. Costa. 2001. Small rodents fleas from the bubonic plague focus located in Serra dos Órgãos mountain range, State of Rio de Janeiro, Brazil. Mem. Inst. O. Cruz 96: 603-609.

Costa Lima, D.A. & C.R. Hathaway. 1946. Pulgas. Bibliografía, catálogo e animais por elas sugados. Mon. Inst. O. Cruz 4: 522p.

Del Ponte, E. 1963. Notas sobre Suctoria argentinos V. Nuevos datos sobre Rhopalopsyllidae, Rhopalopsyllinae. Rev. Soc. Entomol. Argent. 26: 75-87.

Gomes, A.C. 1969. Pulgas colhidas em residências e sobre pequenos animais de algumas áreas do Brasil. Rev. Brasil. Malariol. D. Trop. 21: 775-779.

Guimarães, L.R. 1942. Sôbre algumas espécies de pulgas brasileiras. Pap. Av. Dep. Zool. S. Paulo 2: 197-203.

Guimarães, L.R. 1948. Sôbre algumas espécies do gènero

Polygenis Jordan, 1939 (Pulicidae-Suctoria). Arq. Zool. Est. S. Paulo 5: 539-552.

Hastriter, M.W. & N.E. Peterson. 1997. Notes on some fleas (Siphonaptera) from Amazonas and Bahia States, Brazil. Entomol. News 108: 290-296.

Johnson, P.T. 1957. A classification of the Siphonaptera of South America, with descriptions of new species. Mem. Ent. Soc. Wash. 5: 1-299.

Jordan, K. 1932. Notes on Siphonaptera. Nov. Zool. 38: 291-294.

Jordan, K. & N.C. Rothschild. 1908. Revision of the non-combed eyed Siphonaptera. Parasitology 1: 1-100.

Jordan, K. & N.C. Rothschild. 1923. On the Genera *Rhopalopsyllus* and *Parapsyllus*. Ectoparasites 1: 320-351.

Lareschi, M., J. Notarnicola, G. Navone & P.M. Linardi. 2003. Arthropod and filarioid parasites associated with wild rodents in the northeast marshes of Buenos Aires, Argentina. Mem. Inst. O. Cruz 98: 673-677.

Lewis, R.E. 1973. Notes on the geographical distribution and host preferences in the Order Siphonaptera. Part 2. Rhopalopsyllidae, Malacopsyllidae and Vermipsyllidae. J. Med. Entomol. 10: 255-260.

Lima Bicho, C., P.B. Ribeiro, A.P. Nascimento & I.J. Sbalqueiro. 1999. Siphonaptera de roedores silvestres em Guaraquecaba, Paraná, Brasil. Entomol. Vect. 6: 53-62.

Linardi, P.M. 1981. Utilização de algumas estruturas na caracterização de espécies da ordem Siphonaptera. I. A fratura da mesocoxa na separação de espécies de *Polygenis* Jordan 1939. Revta. Bras. Ent. 25: 27-29.

Linardi, P.M. 1984. Utilização de algumas estruturas na caracterização de espécies da ordem Siphonaptera. III. A variabilidade do braço ventral do esternito IX em *Polygenis rimatus* e suas implicaçoes taxonômicas. Revta. Bras. Ent. 28: 261-262.

Linardi, P.M. & L.R. Guimarães. 2000. Sifonápteros do Brasil. São Paulo: Ed. MZUSP, FAPESP, 291p.

Linardi, P.M., V.P. Texeira, J.R. Botelho & L.S. Ribeiro. 1987. Ectoparasitos de roedores em ambientes silvestres do Município de Juiz de Fora, Mina Gerais. Mem. Inst. O. Cruz 82: 137-139.

Nava, S., M. Lareschi & D. Voglino. 2003. Interrelationship between ectoparasites and wild rodents from northeastern Buenos Aires province, Argentina. Mem. Inst. O. Cruz 98: 45-49.

Smit, F.G.A.M. 1987. An Illustrated catalogue of the Rothschild Collection of fleas (Siphonaptera) in the British Museum (Natural History). 7. Malacopsylloidea (Malacopsyllidae and Rhopalopsyllidae). London: Oxford University, 380p.

Received 19/VI/04. Accepted 03/XI/04