SCIENTIFIC NOTE

First Record of *Megaselia scalaris* (Loew) (Diptera: Phoridae) Infesting Laboratory Colonies of *Triatoma brasiliensis* Neiva (Hemiptera: Reduviidae)

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Primeiro Registro de *Megaselia scalaris* (Loew) (Diptera: Phoridae) Infestando Colônias de *Triatoma brasiliensis* Neiva (Hemiptera: Reduviidae) em Laboratório

RESUMO - *Megaselia scalaris* (Loew) é uma mosca cosmopolita, sinantrópica e eclética quanto aos seus hábitos alimentares, tendo sido descrita como detritívora, parasita, parasita facultativa e parasitóide. Nesta nota, registra-se pela primeira vez, *M. scalaris* infestando colônias de laboratório de *Triatoma brasiliensis* Neiva, o mais importante vetor da doença de Chagas no semi-árido brasileiro. Larvas de *M. scalaris* foram encontradas alimentando-se dos órgãos internos dos triatomíneos; pupas foram encontradas na região intestinal e esofagiana de exemplares de *T. brasiliensis* dissecados. Outras informações relevantes sobre o achado são descritas nesta nota, bem como medidas preventivas para evitar infestações por *M. scalaris* em colônias de triatomíneos.

PALAVRAS-CHAVE: Forídeo, infestação, triatomineo

ABSTRACT- *Megaselia scalaris* (Loew) is a cosmopolitan and synanthropic scuttle fly, eclectic in its feeding habits and acts as detritivore, parasite, facultative parasite, and parasitoid. Here we report for the first time *M. scalaris* infesting laboratory colonies of *Triatoma brasiliensis* Neiva, the most important Chagas disease vector in semiarid areas of Brazil. *M. scalaris* larvae were found feeding inside bugs; pupae were found in the esophagus and intestinal regions of *T. brasiliensis* through dissection. Other relevant information about this finding is also described in this note, including some preventive measures to avoid laboratory colonies infestations.

KEY WORDS: Phorid, infestation, triatomine

Phorids are small flies (1-6 mm) found worldwide, which are most diverse in the tropics. They are known as "scuttle fly" because they move in rapid bursts with short pauses. The genus *Megaselia* includes around 1,400 species distributed in tropical and subtropical areas. *Megaselia scalaris* (Loew) is cosmopolitan and synanthropic. The brown spots on its humped thorax, the dark eyes, and its white eggs presenting the upper side covered by thorns are some important distinctive characteristics (Furukawa & Kaneko 1981, Brown 1996). It is capable of exploring a large variety of environments and ecological niches. It has already been recorded as a polyphagous species acting as saprophagous, sarcophagous and necrophagous. It has also been described as an important detritivore species that consumes both animal and plant material (Tumrasvin *et al.* 1997, Koller *et al*. 2003, Disney 2007).

Macieira *et al*. (1983) and Rocha *et al.* (1984) emphasized the possibility of *M. scalaris* to act as a parasitoid in beehive of the subfamily Meliponinae and colonies of the European honey bee, *Apis mellifera* L. (Hymenoptera: Apidae), respectively.

Rocha *et al*. (1984) found well fed cattle-tick females, known as "carrapato-do-boi" (*Boophilus microplus*) infested by *M. scalaris*. They concluded that the flies were attracted by both dead and live ticks. Later, additional records of *M. scalaris* acting as a parasitoid of *B. microplus* in Brazil were presented (Veríssimo 1995, Andreotti *et al*. 2003).

The occurrence of *M. scalaris* acting as a parasitoid of insects of agronomic importance, was reported by several authors, such as: (i) grasshoppers *Zonocerus variegatus* (L.) by Gregorio & Leonide (1980), (ii) pre-pupae of the butterfly *Peridroma saucia* (Hb.) by Ulloa & Hernandez (1981), (iii) adults of the *Curculio caryae* (Coleoptera: Curculionidae) by Harrison & Gardner (1991), and (iv) the beetle *Macrodactylus marinus* (Coleoptera: Scarabaeidae) by Arredondo-Bernal & Trujillo-Arriaga (1994).

A case of animal myiasis caused by *M. scalaris* in *Crotalus durissus terrificus* (Serpentes: Viperidae) was reported in Brazil (Silva *et al*. 1999). The finding of this species on myiasis in nasopharyngeal, intestinal, and leg wound in hospitalized patients in Kuwait and Egypt was recorded by several authors. However, most of the cases were considered as facultative and accidental (Singh & Rana 1989, Hira *et al.* 2004, Mazayad & Rifaat 2005).

In addition, according to Miller *et al*. (1994), specimens of *M. scalaris* obtained from corpses might be useful in forensic investigations to evaluate the post mortem interval and in toxicological analysis by using their puparium.

In this note, we present the first report of *M. scalaris* infesting colonies of *Triatoma brasiliensis* Neiva, the most important Chagas disease vector in the semiarid zones of northeastern Brazil (Costa *et al.* 2003).

The triatomine bugs were identified according to Lent & Wygodzinsky (1979) and the samples of *M. scalaris* were identified according to Disney (1994). Specimens of *M. scalaris* invaded the quadrangular plastic containers (10×10×10 cm) with perforated lids where two years-old colonies of *T. brasiliensis* (X = 40 samples) were being reared under laboratory conditions (temperature: min. 21.5ºC, max. 32ºC, X = 27.63ºC, relative humidity: min. 52%, max. 96%, X = 77.5%). Two weeks later, some triatomines with atypical darker color with stretched out proboscis and legs, were found moving slowly at the bottom of the containers. All the developmental stages of *M. scalaris* were found inside the containers of the triatomine colonies. Dead insects with these symptoms presented a strong putrid odor.

Eleven insects (two fifth-instar nymphs and nine adults) displaying the symptoms described above were isolated until death and then dissected, and internally observed using stereoscopic microscope Zeiss SV11, (X20). This procedure confirmed that larvae of *M. scalaris* were feeding inside *T. brasiliensis*. Two nymphs and four adults had their internal organs destroyed and no viscera could be found. Two other adults had semi-destroyed viscera where two pupae were found along the remains of the post mesenteric part of both specimens. Another adult had partial damage at the promesenteric portion, trachea, Malphigian tubules and rectal ampoule. Two pupae were found between the thoracic and abdominal portion where the connection between the esophagus and promesenteries should be seen. The remaining two specimens examined presented only a portion of the digestive system destroyed, and no pupae were found. All specimens had their thoracic muscles destroyed, even the specimens presenting visceral remains. This finding corroborates the supposition that insects infested by *M. scalaris* present difficulty to move due to the progressive loss of muscle tissue. Fig. 1 shows one of the specimens found at the bottom of the container after being infested by *M. scalaris*.

Due to the wide geographic distribution and ecologic plasticity of this phorid we suppose that *M. scalaris* specimens occurring naturally in the surroundings of the laboratory have invaded the colonies. As observed by Garris (1983) in tick colonies and also in our triatomine colonies, the presence of a double layer of organdy cloth did not prevent larvae of *M. scalaris* from invading the containers with the colonies. Eggs of *M. scalaris* were deposited through the cloth by penetration of the female ovipositor. In addition, this phorid has a short life cycle, 20 days or less in average, depending on temperature conditions (Rits 1997).

Because *M. scalaris* life cycle requires considerable levels of moisture to larval development (Trumple & Pienkowsky 1979) it is possible that the high density colonies of triatomines,

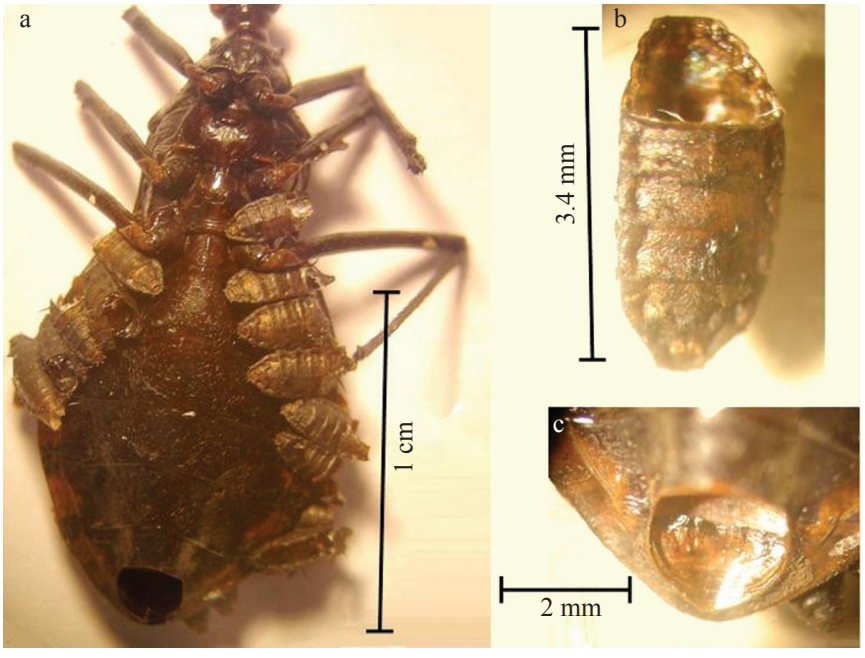

Fig. 1. A *T. brasiliensis* specimen with several pupae attached (a), one pupa detached (b), and the abdominal orifice of *T. brasiliensis* made by the larvae of *M. scalaris* to go out of the triatomine specimen (c).

presenting urine and bug excrements in the bottom of the container, may be an attractive condition and suitable for females to lay their eggs, as already indicated by Garris (1983). Here we suggest keeping the triatomine colonies in low population density and in drier conditions in order to impair *M. scalaris* infestations. Daily observation is required to avoid loss of large number of specimens from the triatomine colonies.

Thus, the finding of *M. scalaris* infesting colonies of *T. brasiliensis* brings up relevant aspects that must be investigated such as: (i) a surveillance to evaluate whether this phorid could also infest colonies of other triatomine species; (ii) the eventual possibility of *M. scalaris* to vehicle *T. cruzi*, the causative agent of Chagas disease; and (iii) the originator's factor responsible for the infestation of the colonies of *T. brasiliensis* by *M. scalaris.*

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References

Andreotti, R., W.W. Koller, W.J. Tadei, A.P. Prado, J.C. Barros, F. Santos & A. Gomes. 2003. Ocurrence of the *Megaselia scalaris* (Loew, 1866) (Diptera, Phoridae) as a parasitoid of *Boophilus microplus* in Campo Grande, MS, Brazil. Rev. Bras. Parasitol. 12: 46-47.

Arredondo-Bernal, H.C. & J. Trujillo-Arriaga. 1994. Primer report de *Megaselia scalaris* (Diptera: Phoridae) como parasitoide de *Macrodactylus murinus* (Coleoptera: Scarabaeidae). Vedalia 1: 27.

Borgmeier, T.A. 1968. Catalogue of the Phoridae of the world (Diptera, Phoridae). Stu. Entomol. 11: 1-367.

Brown, B.V. 1996. Review of "scuttle flies: The Phoridae". Proc. Entomol. Soc. Wash. 98: 166-167.

Costa, J., C.E. Almeida, E.M. Dotson, A. Lins, M. Vinhaes, A.C. Silveira & C.B. Beard. 2003. The epidemiologic importance of *Triatoma brasiliensis* as a Chagas disease vector in Brazil: A revision of domiciliary captures during 1993-1999. Mem. Inst. Oswaldo Cruz 98: 443-449.

Disney R.H. 2007. Natural history of the scuttle fly, *Megaselia scalaris*. Annu. Rev. Entomol. 53 (doi: 10.1146/annurev.ento.53.103106.093415)

Furukawa, E. & K. Kaneko. 1981. Studies on Phorid flies (Phoridae, Diptera) in Japan. Part IV. Scanning electron microscopic observations of eggs of two *Megaselia*. Jpn. J. Sanit. Zool. 32: 78-81.

Garris, G.I. 1983. *Megaselia scalaris* (Diptera: Phoridae) infesting laboratory tick colonies. J. Med. Entomol. 20: 688.

Harrison, R.D. & W.A. Gardner. 1991. Parasitism of the pecan weevil (Coleoptera: Curculionidae) by *Megaselia scalaris* (Diptera: Phoridae). J. Entomol. Sci. 26: 301-302.

Hira, P.R., R.M. Assad, G. Okasha, F.M. Al-Ali, J. Iqbal, K.E. Mutawali, R.H. Disney & M.J. Hall. 2004. Myiasis in Kuwait: Nosocomial infections caused by *Lucilia sericata* and *Megaselia scalaris*. Am. J. Trop. Med. Hyg. 70: 386-389.

Koller, W.W., R. Andreotti, A.M. Zanon, A. Gomes & J.C. Barros. 2003. Mosca *Megaselia scalaris* (Loew) (Diptera: Phoridae), parasita do carrapato bovino *Boophilus microplus* (Canestrini): Uma revisão. Campo Grande, Embrapa Gado de Corte, 34p. (Embrapa Gado de Corte. Documentos, 142).

Lent, H. & P. Wygodzinsky. 1979. Revision of Triatominae (Hemiptera, Reduviidae) and their significance as vectors of Chagas' disease. Bull. Am. Mus. Nat. Hist. 163: 125-520.

Macieira, O.J.D., J. Chaud Neto & A.M. Zanon. 1983. Oviposition rate and relative viability of descendants from couples of *Megaselia scalaris* (Diptera: Phoridae) reared in different experimental conditions. Rev. Bras. Biol. 43: 223-228.

Mazayad, S.A. & M.M. Rifaat. 2005. *Megaselia scalaris* causing human intestinal myiasis in Egypt. Egypt. Soc. Parasitol. 1: 331-340.

Miller, M.L., W.D. Lord, M.L. Goff, B. Donnelly, E.T. McDonough & J.C. Alexis. 1994. Isolation of amitryptilline and nortryptilline from fly puparia (Phoridae) and beetle exuviae (Dermestidae) associated with mummified remains. J. Forensic Sci. 39: 1305-1313.

Rits, F.R.C. 1997. Padrão de esterases em *Megaselia scalaris*. Tese de doutorado. Instituto de Biociências, Letras e Ciências Exatas, UNESP, São Paulo,128p.

Rocha, U.F., M. Belo, J.R. Morais, A. Sogorb & A. Baruch. 1984. Ecologia de carrapatos. VI. Influência da umidade ambiente sobre a invasão de fêmeas de *Boophilus microplus* (Canestrini) (Acari, Ixodidae) por larvas de *Megaselia scalaris* Loew (Díptera, Phoridae) e sobre a prolificidade desses artrópodes. Naturalia 9: 93-100.

Silva, R.J., A.P. Prado, R.R. Rodrigues, C.A. Lopes & W.A.C. Godoy. 1999. *Megaselia scalaris* (Diptera: Phoridae) causing myiasis in *Crotalus durissus terrificus* (Serpentes: Viperidae) in Brazil. J. Med. Entomol. 36: 630.

Singh, T.S. & D. Rana. 1989. Urogenital myiasis caused by *Megaselia scalaris* (Diptera: Phoridae): A case report. J. Med. Entomol. 26: 228-229.

Ulloa, P. &. M. Hernandez. 1981. Biologia y control natural de *Peridroma saucia*, praga de la flor de la curuba. Rev. Colomb. Entomol. 7: 47-53.

Veríssimo, C.J. 1995. Inimigos naturais do carrapato parasita dos bovinos. Agropec. Catarin. 8: 35-37.

Trumple, J. & R.L. Pienkowsky. 1979. Developmental and survival of *Megaselia scalaris* (Diptera: Phoridae) at selected temperatures and photoperiods. Proc. Entomol. Soc. Wash. 81: 207-210.

Tumrasvin, W., S. Sucharit & S. Vutikes. 1997. Studies on the life history of *Megaselia scalaris* (Loew) in Thailand. Southeast Asian J. Trop. Med. Public Health 8: 74-76.

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