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Research note

Primer registro de Cuterebra sp. (Diptera: Oestridae) en roedores (Rodentia: Cricetidae) del noreste de México

First record of Cuterebra sp. (Diptera: Oestridae) in rodents (Rodentia: Cricetidae) in Northeastern Mexico

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Abstract

The *Cuterebra* genus (Diptera: Oestridae) includes species of dermic parasites infecting wild rodents and lagomorphs. In Mexico, 14 species of this parasite have been recorded and most of the reports of this interaction are from southern Mexico. This study describes the first record of *Cuterebra* sp. parasitizing three rodent species from Tamaulipan Thorny Scrub (TTS) in northeastern Mexico. From March to October 2020 and March to September 2021, rodents were captured within a preserved TTS fragment in *Linares* municipality, *Nuevo Leon*. Four rodent species were recorded: *Heteromys irroratus*, *Onychomys leucogaster*, *Neotoma albigula* and *Peromyscus leucopus*. Infected individuals were detected exclusively in the last three species. One male of *O*. *leucogaster* was captured with one *Cuterebra* sp. larva in the genital area, while from 12 *N*. *albigula* individuals were captured, only one adult female presented a larva in the pectoral region. From 86 captured individuals of *P*. *leucopus*, 15 were infected: five females (four adults and one juvenile) and 10 males (seven adults and three juveniles). The highest number of infected individuals was detected in October: four individuals of *P*. *leucopus* and one *O*. *leucogaster*. Although they are usually specific in their interaction, these parasites can also affect the natural predators of their hosts, domestic animals (cattle or pets) and humans. These new records provide relevant information on parasite-rodent interactions and their incidence and distribution in Mexico.

Key words: Host, myiasis, botfly, *Nuevo León*, parasitism, rodents.

Resumen

El género *Cuterebra* (Diptera: Oestridae) incluye especies de parásitos dérmicos que infectan a roedores y lagomorfos silvestres. En México, se han registrado 14 especies de dicho parásito y la mayoría de los datos de esta interacción provienen del sur del país. El presente estudio describe el primer registro de *Cuterebra* sp. en tres especies de roedores del Matorral Espinoso Tamaulipeco (MET) en el noreste de México. De marzo a octubre de 2020 y de marzo a septiembre de 2021 se capturaron roedores dentro de un fragmento conservado de MET en Linares, Nuevo León. Se identificaron cuatro especies de roedores: *Heteromys irroratus*, *Onychomys leucogaster*, *Neotoma albigula* y *Peromyscus leucopus.* Exclusivamente en las tres últimas especies se detectaron individuos infectados. Se capturó un macho adulto de *O*. *leucogaster* con una larva de *Cuterebra* sp. en el área genital, mientras que de 12 individuos de *N*. *albigula*, solo una hembra adulta presentó una larva en la región pectoral. Se capturaron 86 individuos de *P*. *leucopus* de los cuales 15 resultaron infectados (17.44 %): cinco hembras (cuatro adultas y una juvenil) y 10 machos (siete adultos y tres juveniles). En octubre se detectó el

mayor número de individuos infectados: cuatro de *P*. *leucopus* y uno de *O*. *leucogaster*. Aunque suelen ser específicos en su interacción, estos parásitos pueden también afectar a los depredadores naturales de sus hospederos, a los animales domésticos (ganado o animales de compañía) y al humano. Estos nuevos registros brindan información relevante sobre las interacciones parásito-roedor y su distribución en México.

Palabras clave: *Hospedero, miasis, moscardón, Nuevo León, parasitismo, roedores.*

Parasitic interactions known as myiasis occur between living vertebrates and the larval stages of some dipteran species (Francesconi and Lupi, 2012; Páez and Villa, 2017; Salazar-Saavedra and Medina-Fitoria, 2021, Kaufman and Wood, 2015). These larvae can feed on live or dead tissue of the host, which causes an injury in the affected area (Colwell *et al*., 2006; Francesconi and Lupi, 2012; Orduña-Sumarán *et al*., 2022).

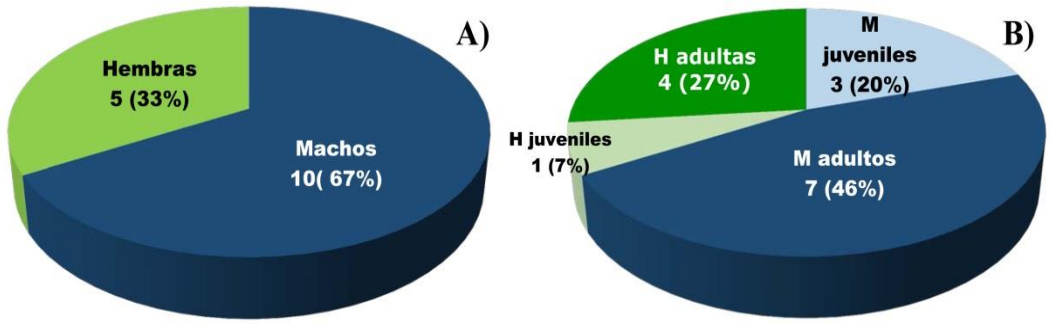
Botfly larvae (Diptera: Oestridae) are parasites of the skin tissue of wild vertebrates that cause myiasis in their hosts (Colwell *et al*., 2006; Lara-Lagunes *et al*., 2017; Orduña-Sumarán *et al*., 2022). Within this family is the *Cuterebra* genus, which includes species of skin parasites in mammals from the New World. They infect mainly wild rodents and lagomorphs (Manrique-Saide *et al*., 2000; Slansky *et al.*, 2008). This genus has been recorded infecting species of six genera of rodents (Sabrosky, 1986) and 14 species of this parasite have been found in Mexico (Guimarães and Papavero, 2009).

Studies on myiasis by *Cuterebra* species in Mexico include the group of rodents in the states of *Yucatán* (Manrique-Saide *et al*., 2000) and *Baja California Sur* (Arnaud *et al.*, 2016), in some lagomorphs from *Puebla* (Ramírez and Hernández-Ortiz, 2016) and *Sonora* (Orduña-Sumarán *et al.*, 2022), a species of primate (Cristobal-Askarate *et al.*, 2012) and a canid (Lara-Lagunes *et al.*, 2017) described in *Veracruz*. This indicates the lack of publications on this parasite-host interaction to know and understand the causes and effects of the presence and incidence of these parasitic infections at national level.

From March to October 2020 and March to September 2021, the rodent community of a preserved fragment of Tamaulipan Thorny Scrub (TTS) (24°47'50" N and -99°32'19" W) was studied monthly. The fragment is part of the "*Efraím Hernández Xolocotzi*" Botanical Garden, which is registered as a Management Unit for the Conservation of Wildlife (PVSNL-UMA-IN-1270-NL) that belongs to the *Facultad de Ciencias Forestales* of the *Universidad Autónoma de Nuevo León* (UANL), *Linares* municipality, *Nuevo León* State, Mexico. The study area has an altitude of 350 m (Estrada and Marroquín, 1988), a warm sub-humid climate with rains present in summer (García, 2004) and an average annual rainfall of 805 mm (Martínez-Adriano *et al.*, 2021). The annual average temperature is 21 °C, with an extreme maximum temperature in summer greater than 40 °C and less than 0 °C in winter (Martínez-Adriano *et al*., 2021).

The rodents were captured with 87 Sherman-type traps (23×8×9 cm), baited with a mixture of sunflower seeds and oats, which were placed at an equidistance of 10 m. From the captures of the rodents and their processing and release *in situ*, some rodents infected with *Cuterebra* sp. larvae were detected by direct observation. All parasitized individuals presented a single larva, the location of the infection was recorded, and some specimens were extracted (*in situ*) directly from the hole caused by the parasite by means of dissecting forceps, which were preserved in round-bottom microtubes model 111568 Globe Scientific® with 70% alcohol. The taxonomic identification of the rodents was carried out by field guides and taxonomic keys (Jiménez-Guzmán *et al.*, 1999; Álvarez-Castañeda *et al.*, 2015), and in the case of the larvae, they were identified with specialized literature at the time they were extracted in the field and their subsequent corroboration in the laboratory (Stojanovich *et al*., 1966; Lara-Lagunes *et al.*, 2022).

Four species of rodents were recorded: *Heteromys irroratus* (J. E. Gray, 1868) (family Heteromyidae), *Peromyscus leucopus* (Rafinesque, 1818), *Neotoma albigula* (Hartley, 1894), and *Onychomys leucogaster* (Wied-Neuwied, 1841), (family Cricetidae); parasitized individuals were found exclusively in the last three species. Eighty-six specimens of *P. leucopus* were captured, of which 15 were infected (17.44 %): five were females (four adults and one juvenile) and 10 males (seven adults and three juvenile) (figure 1A and 1B).



A) Infected population by sex; B) Population classified by age between males (M) and females (H); *Hembras* = Females; *Machos* = Males; *H adultos* = Adults females; *M adultos* = Adults males; *H juveniles* = Juvenile females; *M juveniles* = Juvenile males.

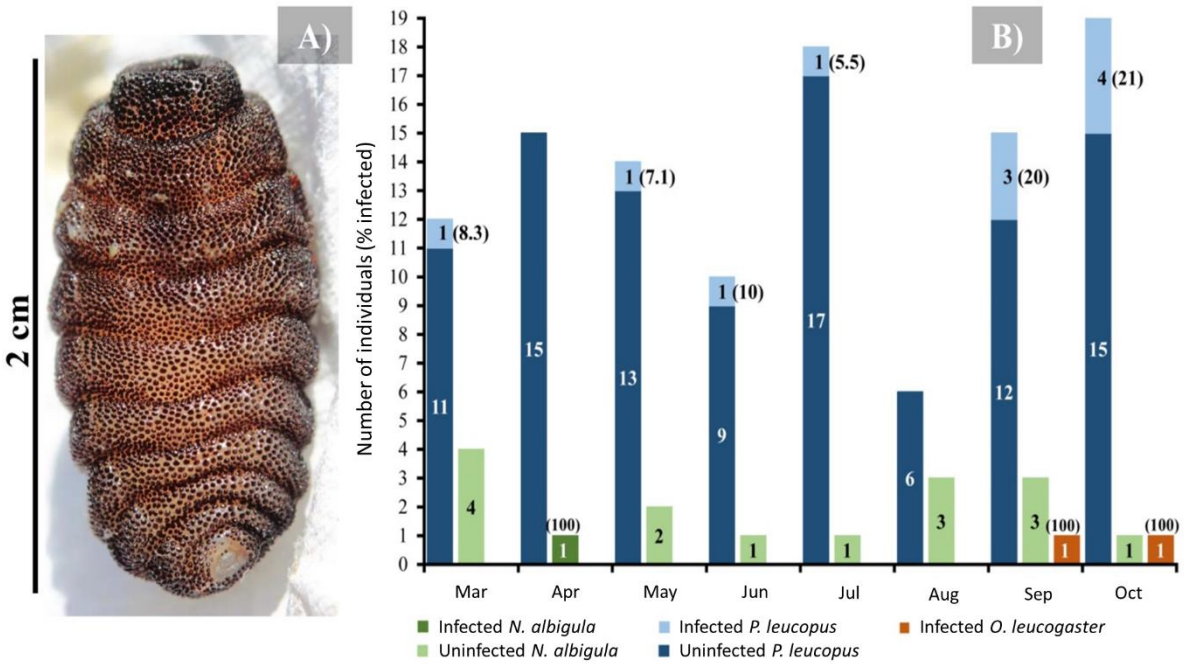
Figure 1. Incidence of infection of *Cuterebra* sp. in *Peromyscus leucopus* (Rafinesque, 1818).

Most of the larvae found in *P. leucopus* were located in the genital area (Figure 2A). Of 12 *N. albigula* individuals captured, an adult female presented a larva in the pectoral region (8.3 %, Figure 2B). Only one adult male of *O. leucogaster* with a larva in the genital area was recorded (100 % incidence of infection, Figure 2C). A total of seven larvae were extracted, which were labeled with the date and the

individual of the host mouse and deposited in the Wildlife Laboratory of the *Facultad de Ciencias Forestales* of the UANL (Figure 3A).

A) *Peromyscus leucopus* (Rafinesque, 1818) with a larva in the genital region; B) *Neotoma albigula* (Hartley, 1894) with a larva in the pectoral zone; C) *Onychomys leucogaster* (Wied-Neuwied, 1841) with a larva in a testicle.

Figure 2. Infection by *Cuterebra* sp. in three species of rodents from the Tamaulipan Thorny Scrub.



A) Larva of *Cuterebra* sp. extracted from a male *Peromyscus leucopus* (Rafinesque, 1818); B) Incidence of infection by *Cuterebra* sp. (numbers in parentheses) in the three species parasitized during the sampling months of 2020. The numbers within the bars represent infected and uninfected individuals.

Figure 3. Presence of *Cuterebra* sp. in three species of wild rodents.

The largest number of rodents with myiasis occurred in October: four individuals of *P. leucopus* and one of O. *leucogaster* (Figure 3B). A reinfection was recorded in a *P. leucopus* adult male and it was observed that the incidence of infection was common in this species, since infected examples were obtained in most of sampled months of the year 2020 (Figure 3B). It should be noted that in 2021, only in March and April parasitized rodents were found, which corresponded to *P. leucopus*, which were four adult males, one juvenile female and one adult.

This study describes the first records of *Cuterebra* sp. parasitizing TTS rodents in northeastern Mexico. Likewise, the first findings of this interaction in *P. leucopus*, *N. albigula* and *O. leucogaster* in Mexico are referred and it is the third work that documents myiasis in mammals from the northern region of the country (Arnaud *et al*., 2016; Orduña-Sumarán *et al*., 2022).

From the direct observations of the infected mice, it was highlighted that the areas with highest predisposition to infection were the lower abdomen and hind limbs, which is consistent with what was observed for other rodent species in Mexico and Panama (Manrique-Saide *et al*., 2000; Bermúdez *et al.*, 2010).

Most of the individuals infected with *P. leucopus* were adults, which is consistent with the prevalence observed by Jaffe *et al.* (2005), who also emphasize that in *Peromyscus maniculatus* (Wagner, 1845) the prevalence is similar between juvenile and adults.

Derived from the scarcity of works on parasite-host interactions in Mexico (Lara-Lagunes *et al.*, 2022), there is a need to carry out more research on the presence of *Cuterebra* sp. in other species of the country, both wild and domestic, to know the impact of this parasite on the affected species. Because these parasites, although they tend to be specific in their interaction (Ramírez and Hernández-Ortiz, 2016), can also parasitize the natural predators of their hosts (Lara-Lagunes *et al.*, 2017), domestic animals (livestock or pets), and humans (Colwell *et al*., 2006; Slansky *et al.*, 2008; Orduña-Sumarán *et al*., 2022). These new records provide relevant information on the distribution and importance of parasite-rodent interactions in Mexico.

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Conflict of interests

The authors declare no conflict of interest.

Contribution by author

Elisa Paulina Zaragoza Quintana: research development, field work, data analysis and writing the manuscript; Mauricio Cotera Correa: coordination of the work, revision and correction of the manuscript; Cristian Adrian Martínez Adriano: field work, data analysis and writing the manuscript; Laura Magdalena Scott Morales: correction of the manuscript.

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