



## Beyond the last frontier: *Echidnophaga gallinacea* (Siphonaptera: Pulicidae) infestation in a Burrowing Owl, a novel southward host in Mexico

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The Burrowing Owl (*Athene cunicularia* Molina, 1782) is a small-sized ground-dwelling raptor distributed mostly throughout the American plains. This owl has been reported to be parasitized by fleas in several areas of North America, typically *Pulex irritans* (Linnaeus, 1758) the most common flea found on the species (Belthoff *et al.* 2015; Graham *et al.* 2016). A less common flea parasitizing this owl is the sticktight flea, *Echidnophaga gallinacea* (Westwood, 1875); this flea, also known as hen flea, has a wide host range, is a major pest of the domestic chicken, and can infest several species of mammals and birds (Harwood & James 1979). This flea was accidentally introduced to North America by humans along with their domestic animals (Gyimesi *et al.* 2007). The species is considered a potential vector of *Yersinia pestis* (= *Pasteurella pestis*) (Wheeler *et al.* 1941) and can co-occur with fowl pox (*Avipoxvirus*, type *Fowlpox virus*) in poultry (Gustafson 1997).

The aim of this short communication is to report a sticktight flea infestation on a Burrowing Owl in the Baja California peninsula in Mexico.

We captured a Burrowing Owl adult using a Bal–Chatri trap during the early morning of 26 March 2017 in Valle de Santo Domingo, an agricultural valley of the southern Baja California peninsula, Mexico (lat 25° 15' 20.7"; long 111° 48' 38.8"). The bird was located in a nesting burrow 2.2 km to the west of Ciudad Insurgentes in a native vegetation patch between the urban area and the agricultural valley. The bird was measured and weighed. We handled the bird for 10 minutes, looking systematically for ectoparasites by visual inspection on the superficial feathers and the interstitial space between epidermis and external feathers (Clayton & Drown 2001). Once detected, fleas were collected using tweezers and preserved in vials with 90% ethanol. Fleas were cleared for 18–48 hours in 10% KOH, rinsed in distilled water, dehydrated in a graded alcohol series, and were mounted on slides in Canada balsam. After slides were cured, specimens were observed under a compound microscope (Olympus Vanox-T microscope, Tokyo, Japan) and identified using the dichotomous key of Hopkins and Rothschild (1953). Fleas were deposited at the Colección de Siphonaptera, Museo de Zoología “Alfonso L. Herrera”, Facultad de Ciencias (MZFC-S), Universidad Nacional Autónoma de México. We found and collected more than 50 fleas identified as *E. gallinacea* (Figure 1), distributed on the chest, neck and head of the owl. The infestation was visible in areas around the neck and eyes, being hardly attached to these areas, especially to the eyelid. The capture was conducted during the incubation-early chick stage, considered as the most vulnerable stage for infestation by this flea (Marczak *et al.* 2018). These fleas are often found at locations where a host spends extended periods (e.g., nesting owls) because they need a blood meal to reproduce. After sub-cutaneous egg laying, flea larvae fall off and develop in the soil over the next weeks or remain dormant for months (Boughton *et al.* 2006).

Declines in body conditions of owls have been reported due to atypically high levels of fleas, but the owl captured in the current study was of average weight and size (257.4 g, wing chord 175 mm, tarsus 50.5 mm). However, when we visited the site one month later the burrow was abandoned, suggesting the breeding failure of the infested individual. This flea may be pathogenic in breeding owls; female fleas attach and feed at one site on their hosts for extended periods (up to 19 days), provoking debilitating disease, and/or death (Galloway *et al.* 2000). Attached females could cause tissue swelling and ulceration, this latter effect produced by lacerations from the mouthparts as well as resultant infections in response to the subcutaneously laid eggs during these periods (Loomis 1978).



**FIGURE 1.** A) *Echidnophaga gallinacea* female. B) Sensillum. C) Head and mouthparts. D) Spermatheca.

This flea species was first found in a specimen of the Burrowing Owl in southwestern USA near a bubonic plague epizootic area (Wheeler *et al.* 1941) and later in other regions in California (Hubbard 1947, Thomsen 1971), in some cases registering outbreak infestation levels (Marczack *et al.* 2018). In the same area, *E. gallinacea* collected from wild mammals was positive for murine typhus (Abramowicz *et al.* 2012). In Mexico the sticktight flea has been recorded from a confiscated Caracara, *Caracara cheriway* (de Oliveira *et al.* 2011). The current finding represents a novel host record on the Burrowing Owl in Mexican territory. The geographical proximity and connection between the western USA and the Baja California peninsula could explain in part the occurrence of this flea; the Burrowing Owl and other raptors have both resident and migratory populations in northwestern Mexico, increasing their abundance during the non-breeding season (Frixione & Rodríguez-Estrella 2020; Macías-Duarte & Conway 2021). Further studies should extend the research effort to include migratory raptors and the potential risk of new infestations of related vectors of medical importance in northwestern Mexico.

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