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Original Research Article

New Record of Endoparasites Nematodes (Nematoda: Ascarididae, Ancylostomatidae, Physalopteridae, Trichuridae) For Turtles *Trachemys venusta venusta* (Testudines: Emydidae)

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Abstract: The record of endoparasitic nematode species in turtles *Trachemys venusta venusta* from urban and captivity water bodies was evaluated in Xalapa and Poza Rica Veracruz cities. Four water bodies, 2 urban (Tecajetes´s ecological park and CAD-UV) and 2 in captivity (private homes) with at least 5 individuals of the *Trachemys venusta venusta* species were considered. The identification of chosen individuals was carried out with a plastic ring on the rear marginal scales of the carapace for later recapture. The samples were analyzed using smears, lugol staining and flotation with 33% zinc sulfate, subsequent microscope observation with a 100X objective. Four taxa at the genus level were recorded for *Trachemys venusta venusta* (*Ascaris* sp., *Ancylostoma* sp., *Physaloptera* sp. and *Trichuris* sp.) not reported for this species. The presence of these parasites suggests a "spill effect" of other species of wild and exotic vertebrates that share the habitat. Future studies identifying possible endoparasitic nematodes transmission are a priority due to their zoonotic nature.

Keywords: Endoparasitic nematodes, Exotic animals, Freshwater turtles, Management strategies, Shared habitat, urban water bodies.

INTRODUCTION

The turtle *Trachemys venusta venusta* is a freshwater species endemic to the southeast of Mexico and Central America under the category of special protection in NOM-059-SEMARNAT-2010 due to its high extraction, exploitation and commercialization as a pet [1]. They are also one of the most abandoned organisms in urban water bodies when they are adults, generating environment ecological imbalances [2, 3]. When these animals are associated with poor management practices in captivity, they can act as intermediate hosts for various endoparasitic nematodes [4]. These are implicated in various intestinal, immunosuppressive and metabolic diseases [5, 6] that can promote the death of organisms [7] and the diseases spread in other species. However, in hicotea turtles *Trachemys venusta venusta* that live under captive conditions as well as in urban water bodies, studies on endoparasites are still scarce [8], with reports of acantocephalus such as *Neoechinorhynchus schmidti* parasitizing this species [9].

Some works with turtles of the genus *Trachemys* in urban water bodies in Brazil and French Guyana document the presence of nematodes such as *Polystomoides* sp., *Spiroxys* sp. and *Camallanus* sp [10, 11], which can affect the productivity of populations or turn them into potential disease vectors [6]. For *Trachemys scripta*, nematodes such as *Falcaustra* sp., *Camallanus* sp., *Serpinema trispinosum*, *Gnathostoma binucleatum*, *Gnathostoma* sp., *Spiroxys contortus* and *Spiroxys* sp. [9]. Similarly, for *Trachemys dorbigni* in urban water bodies in Brazil to *Camallanus emydidius* and *Spiroxys contortus* [10, 12], in *Trachemys scripta elegans* in southwestern Spain to *Serpinema microcephalus* [13] and in *Trachemys scripta* under captive conditions in Colombia to *Filaroides* sp., *Dracunculus* sp. y *Hastospiculum* sp. [14].

For Mexico, a study in Yucatán with *Trachemys ornata* recorded *Serpinema trispinosum*, *Spiroxys contortus* and *Falcaustra affinis* [8] and in Tabasco and Veracruz for *Trachemys scripta* worms such as *Neoechinorhynchus schmidti* and

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Neoechinorhynchus emydis [15]. The management plan for freshwater turtles of the genus *Trachemys* edited by SEMARNAT in Mexico documents the common record of *Enterobius* sp. and *Trichostrongylus* sp. as well as trematodes and cestodes [16]. Thus, studies on the parasitological knowledge of little-studied species such as *Trachemys venusta venusta* are a priority because they allow increasing knowledge about their biology and visualizing their potential as a vector of zoonotic diseases, as well as to identify endoparasites new species not reported. In this short communication, we document four new taxa at the genus level of endoparasites nematodes not recorded for the mesoamerican slider turtle *Trachemys venusta venusta* (*Ascaris* sp., *Ancylostoma* sp., *Physaloptera* sp. and *Trichuris* sp.).

MATERIALS AND METHODS

Four water bodies (2 urban and 2 captivity) with at least 5 specimens of hicotea turtles *Trachemys venusta venusta* were selected as study sites in the cities of Xalapa and Poza Rica, Veracruz, Mexico (Figure 1). The urban water bodies corresponded to ponds in Los Tecajetes ecological park 19° 31' 56.02 " N, 96° 55' 50.25" W considered a recreation site where the ponds are surrounded by trails for athletes and visitors, where other species such as Koi Carp (*Cyprinus carpio*),turtles such as *Trachemys scripta*, *Cryptochelys herrerai* and *Staurotypus triporcatus* share the habitat and the Campus for culture, arts and sports Xalapa (CAD) of the Universidad Veracruzana 19° 30' 51.07" N, 96° 54' 57.32" W where the ponds are surrounded by trails for sportsmen, they protect other species of turtles such as *Trachemys scripta elegans*, *Cryptochelys herrerai*, *Staurotypus triporcatus* and in this site the presence of feral dogs is common [17]. Captive sites corresponded to ponds in two private homes, the first in Xalapa, Veracruz 19° 32' 52.3" N, 96° 56' 3.5" W with a concrete pond 40 cm deep and 2 meters in diameter, standing water without any filter and contact with domestic dogs and the second in Poza Rica city, Veracruz, Mexico 20° 34' 36.5" N, 97° 25' 54.9" W, with a pond divided into two sections (aquatic and sun) of 7 x 1.5 meters where *Trachemys venusta venusta* coexists with other species of turtles such as *Trachemys scripta elegans*, *Graptemys pseudographica* and *Chelydra serpentina*.

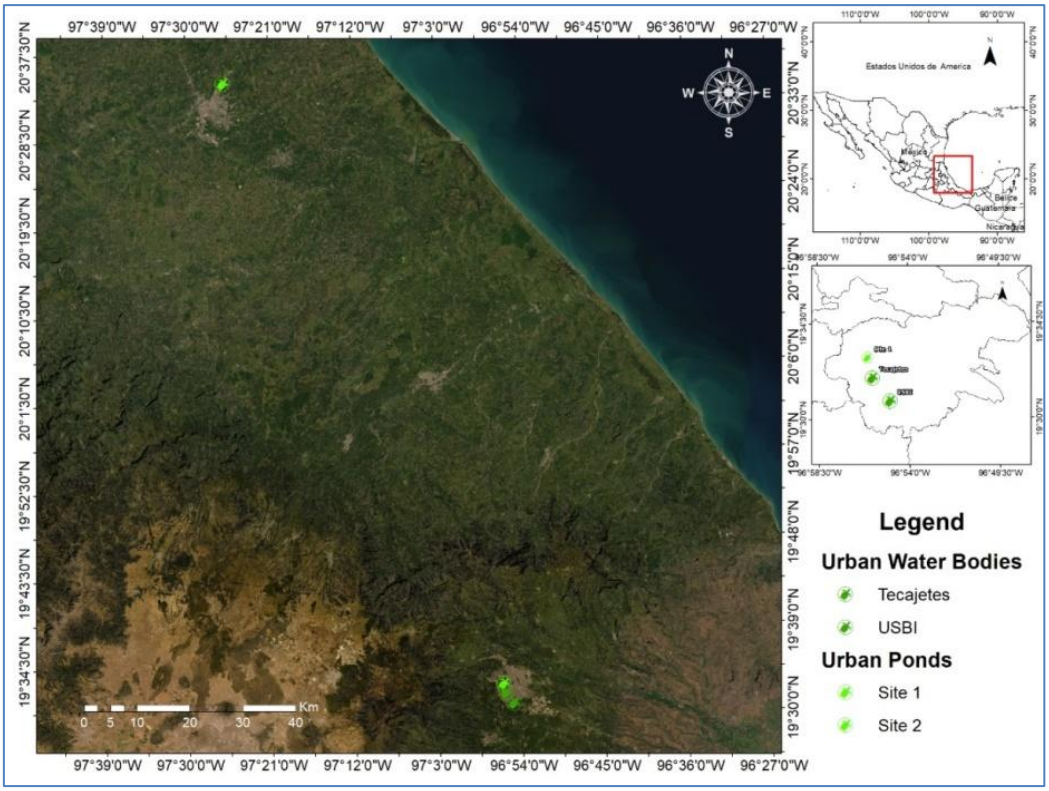

Fig-1: Study sites. The urban water bodies correspond to Los Tecajetes ecological park and the Campus for Culture, the arts and sports (CAD) of the Veracruzana University and the bodies of water in captivity to private homes in Xalapa and Poza Rica Veracruz, Mexico.

At each site, five *Trachemys venusta venusta* turtles were captured with the help of plastic mesh nets, insolation traps [18] and a Sevylor inflatable boat. The five chosen individuals were identified by placing a plastic ring on the rear marginal scales of the carapace for later recapture. During May-July 2018, 80 fecal samples (40 from urban specimens and 40 from specimens under captivity conditions) were obtained by cloacal swabbing [19]. The fecal swabs corresponded to the five different individuals and were placed in sterile test tubes with PBS solution (phosphate buffer solution) and refrigerated in a cooler at 4° C [20]. The samples

were analyzed in the parasitology laboratory of the Faculty of Veterinary Medicine and Zootechnics of the Universidad Veracruzana using smears, lugol staining and microscopy with a 100X objective and by the flotation technique following the Faust method o 33% zinc sulfate to observe eggs [21, 22]. For identification, we used the illustration tables from Thienpont *et al*. [23] in addition to the Foreyt [24] and Goater *et al*. [25] reference manuals to observe specific structures.

RESULTS AND DISCUSSION

Four taxa at the genus level of endoparasites nematodes (*Ascaris* sp., *Ancylostoma* sp., *Physaloptera* sp. and *Trichuris* sp.) were recorded in *Trachemys venusta venusta* turtle feces from urban water bodies and captivity conditions not reported for this species (Figure 2). Other studies have documented nematodes such as *Ascaris* sp., in *Kinosternon scorpioides* turtles from free life in El Salvador [26], larvae of *Physaloptera* sp. in the intestines of turtle *Trachemys scripta elegans* in Spain [27], *Physaloptera retusa* in specimens of *Mesoclemmys tuberculata* and *Phrynops geoffroanus* turtles from northwestern Brazil from urban water bodies [28] as well as eggs of *Ancylostoma* sp. in feces of *Gopherus flavomarginatus* from captivity in Mexico [19].

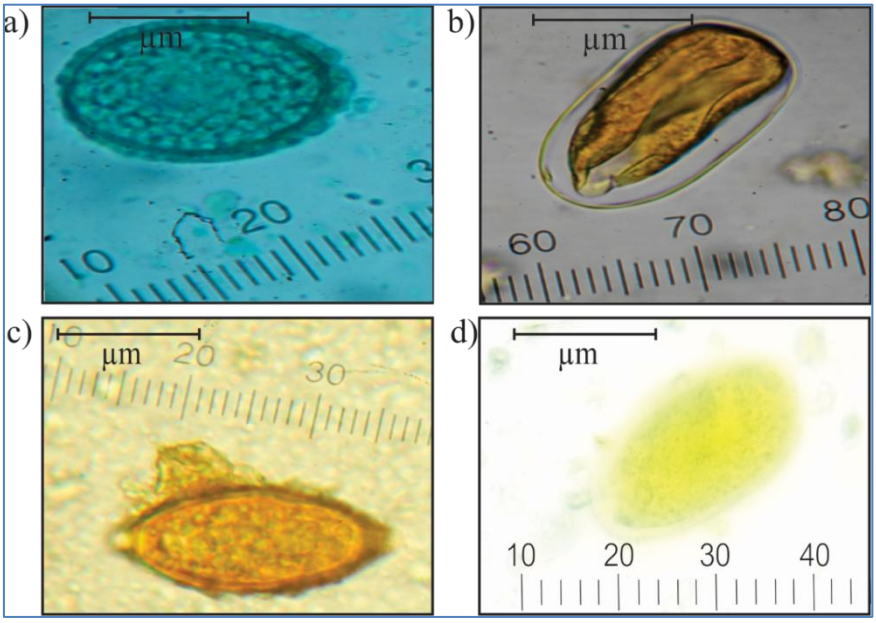

Fig-2: Endoparasites at the genus level recorded by microscopy (objective 100X) in the feces of *Trachemys venusta venusta* of urban water bodies and captivity conditions in Xalapa and Poza Rica, Veracruz, Mexico. a) *Ascaris* egg; b) *Ancylostoma* egg; c) *Trichuris* egg; d) *Physaloptera* egg.

These parasites have great sanitary importance because they cause damage to the gastric mucosa, intestinal infections, pancreatitis, perforations of intestinal and pulmonary cavities [29], which can cause short and medium term the death of organisms affecting the development and recruitment of their populations and can be transmitted to humans [30, 6]. In the same way, they reveal the high possibility of contagion of these parasites in freshwater turtles and the need for more studies on parasitosis and its vectors.

Commonly parasites of the genus *Ascaris* and *Ancylostoma* have a high potential for dispersal and contagion and are common in wild mammals as well as in exotic animals such as cats and dogs present in urban areas or that coexist within family environments [31, 32]. In this environments, the poor sanitary management conditions, proximity of ponds with mammalian feces such as dogs and cats, very small confinement spaces, poor cleaning or water change, and poor control of climatic variables such as temperature and humidity can cause immunosuppression of the animals and the increase in the reproductive cycles of these parasites [32], something common in study sites. *Ascaris* sp. for example, it is conceived as a genus of nematode with high potential for eggs dispersal, which are highly resistant to the environment and rapid incubation and hatching, their eggs are spread by water and / or wind, infecting their hosts mainly by ingesting these [31].

Similarly, those of the genus *Trichuris* have been recorded in humans, cattle, dogs and cats but not in freshwater turtles [31] which suggests a "spill effect", understood as the movement and dispersal of parasites by host animals that share habitat [33, 34] as happens with the presence of feral and domestic dogs in the study areas. Meyer et al. [35] also argue that when invasive turtles share the same habitat, the parasites transference between species is common. Also, those turtles born and raised in captivity are more prone to the nematode endoparasites contagion when they are released to the nature and coexist with parasitized individuals [36] something common in water bodies of

Natura and Tecajetes ecological parks where the abandonment of these animals is usual.

One of the most abandoned turtle species in urban water bodies is the american red-eared turtle *Trachemys scripta elegans* [37, 38] considered within the 100 worst exotic species in the world [39] which is abundant in both urban and captive water bodies studied. Being a highly adaptable and abundant species, it can be a vector of diseases and parasites that negatively impact the other species populations [40]. Therefore, it is necessary to carry out future studies that consider the identification of possible vectors [41] in our case dogs, wild vertebrates, insects, other species of turtles and humans, since contagion can be associated with poor sanitary management conditions or even the consumption of parasitized animals, as has been reported for the genus *Physaloptera* present in insects (crickets, grasshoppers, cockroaches, beetles) that act as intermediate hosts [42], as well as in fish, frogs, amphibians and domestic animals that coexist with freshwater turtles [43- 45].

CONCLUSIONS

We record 4 taxa at the genus level not reported for the species *Trachemys venusta venusta* (*Ascaris* sp., *Ancylostoma* sp., *Physaloptera* sp. and *Trichuris* sp.) common to parasitize to wild vertebrates, exotic animals such as dogs and cats, humans, and insects. These results are useful to promote future research that identify the main vectors to establish contagion reduction strategies and future zoonoses.

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