

Helminths from the red-eared slider *Trachemys scripta elegans* (Chelonia: Emydidae) in marshes from the eastern Iberian Peninsula: first report of *Telorchis attenuata* (Digenea: Telorchidae)

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The present work describes the presence of a digenean in the red-eared turtle *Trachemys scripta elegans* (Wied-Neuwied, 1839) in marshes of the Valencian Community. The faeces and intestinal tract of 105 animals were examined. Only one helminth species was found and identified as the digenean trematode *Telorchis atenuata* (Goldberger, 1911), present in the 7.6% of the animals analysed. This is the first report of the parasite in sliders from Spain. Although conclusions are preliminary due to the limited sampling, our results suggest that the presence of red-eared turtles in new habitats may increase the risk of introducing new microorganisms and new diseases with them, altering the sanitary status of the autochthonous terrapins *Mauremys leprosa* (Schweigger, 1812) and *Emys orbicularis* (Linnaeus, 1758).

Key words: helminths; parasites; *Telorchis atenuata*; terrapins; *Trachemys*.

Helmintos del galápagos *Trachemys scripta elegans* (Chelonia: Emydidae) en los marjales de la Comunidad Valenciana: primera cita de *Telorchis atenuata* (Digenea: Telorchidae). El presente trabajo describe la presencia de un digénido en la tortuga de Florida *Trachemys scripta elegans* (Wied-Neuwied, 1839) en los marjales de la Comunidad Valenciana. Se examinaron los tractos intestinales y excrementos de 105 animales. Solamente se encontró una especie de helminto, identificado como el trematodo digénido *Telorchis atenuata* (Goldberger, 1911), detectado en el 7,6% de los animales analizados. Se trata de la primera cita de este parásito en tortugas en España. Aunque las conclusiones son preliminares debido a lo reducido del muestreo, los resultados sugieren que la presencia de galápagos de Florida en hábitats nuevos puede aumentar el riesgo de introducción de microorganismos y enfermedades, alterando el estado sanitario de los galápagos autóctonos *Mauremys leprosa* (Schweigger, 1812) y *Emys orbicularis* (Linnaeus, 1758).

Key words: galápagos; helmintos; parásitos; *Telorchis atenuata*; *Trachemys*.

The red-eared slider *Trachemys scripta elegans* is an invasive species frequently treated as a pet (SALZBERG, 1995; TELECKY, 2001), that has become patent in the Spanish marshes in the last years (MARCO *et al.*, 2003). Natural reproduction of this species has been repeatedly observed in Europe under Mediterranean climatic conditions. Recent studies alert of the danger associated with

invasive species introduction due to the alteration of turtle resident communities through various processes including predation, competitive exclusion or parasites transfer (ARVY & SERVAN 1998; CADI & JOLY, 2003, 2004). Some authors have also reported weight loss and high mortality in the autochthonous European pond turtle (*Emys orbicularis*) when coexisting with *T. scripta*

(CADI & JOLY, 2004; PÉREZ *et al.*, 2006).

In Spain, two native species, the Mediterranean pond turtle (*Mauremys leprosa*) and *E. orbicularis* are currently sharing habitat with *T. scripta* (PLEGUEZUELOS, 2002; COX *et al.*, 2006). In 2005 the Valencian Community (east of Spain) reported the existence of twelve marshes in which native turtles coexisted with the slider turtle (BATALLER & FORTEZA, 2005). In 2008 this number decreased to eight, as a consequence of invasive species control programs (BATALLER *et al.*, 2008). Previous studies reported the presence of nematodes of the genera *Falcaustra*, *Serpinema*, *Physaloptera*, *Aplectana* and trematodes of the genus *Patagium* in *T. scripta* and native turtles in Spain (ESCH *et al.*, 1979; ROCA *et al.*, 2005; HIDALGO-VILA *et al.*, 2006, 2009; VILLARÁN & DOMÍNGUEZ, 2009; ALARCOS *et al.*, 2010).

The goal of this study was to analyse the existence of parasites in wild exotic turtles in Valencian Community's marshes. As a result of the survey we describe for the first time the presence of a digenean trematode *Telorchis attenuata* in wild red-eared slider populations from Spain.

Between July and October 2008, a total of 105 specimens of the subspecies *T. scripta elegans* from three marshes in the Valencian Community were examined: 32 from Peñíscola, 25 from Almenara and 48 from La Safor. In all those places *T. scripta elegans* is sharing territory with autochthonous species. Animals were captured with netting and floating traps and were carried in individual boxes to a necropsy room at the University CEU-Cardenal Herrera. Of the total number of animals examined, 73 were females and 32 males. Weight was recorded and grouped into three

categories. Forty-eight animals weighted less than 500 g; 33 between 500 and 1000 g, and the other (24) exceeded 1000 g. Individual faecal samples were collected and observed under a stereo microscope to assess for the presence of adult nematodes. Moreover, faeces were processed by a standard flotation concentration method, and the concentrate obtained was observed under the microscope in order to detect helminth eggs. Red-eared sliders were sacrificed by a sodium thiopental injection (Dolethal®, Vétoquinol, Lure, France) and digestive tracts were removed, opened and content diluted in Ringer's solution and observed under the stereo microscope. The recovered helminths were counted and preserved in formaldehyde 10% being fixed under pressure between two slides during 24 hours. Then, trematodes were stained with hematoxylin and mounted in lactophenol for posterior identification (HIDALGO-VILA *et al.*, 2009).

From all individuals examined, only eight turtles were parasitized, all of them infected with adult trematodes (prevalence: 7.6%). The only identified species was *Telorchis attenuata* (Goldberger, 1911) (Fig. 1). The mean intensity of parasitism was 11.3 helminths per host (min-max, 1-33). The parasitic burden found in the positive animals is shown in Table 1.

After processing faeces, no adults were found under the stereomicroscope; however, all the positive animals at the necropsy were simultaneously excreting eggs in faeces, which were observed by concentration. No other nematodes, cestodes or acantocephalans were observed in the coprological analysis or in necropsies.

All the positive turtles came from a single locality (Almenara), except one turtle coming from La Safor. From the infected turtles, six were determined as females and two as males.

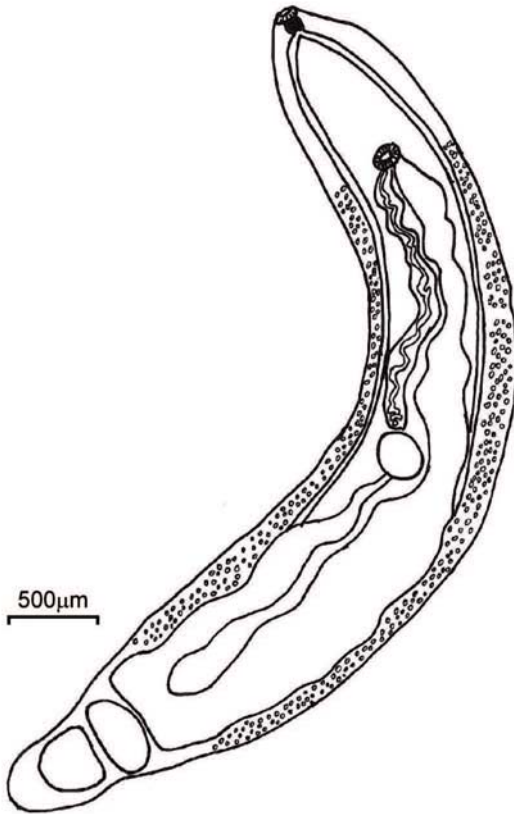


Figure 1: Adult specimen of *Telorchis attenuata* (Goldberg, 1911).

Regarding weight, three weighted less than 500 g, three between 500 and 1000 g, and the remaining two weighted more than 1000 g.

Previous studies carried out in Spain showed the presence of nematodes, trematodes and cestodes in the autochthonous turtles *M. leprosa* and *E. orbicularis* (LÓPEZ-NEYRA, 1947; LÓPEZ-ROMÁN, 1974; LLUCH *et al.*, 1987; CORDERO DEL CAMPILLO *et al.*, 1994; KIRIN, 2001; ROCA *et al.*, 2005; HIDALGO-VILA *et al.*, 2006; VILLARÁN & DOMÍNGUEZ, 2009; ALARCOS *et al.*, 2010). Regarding the invasive species *T. scripta*, a study in southwest Spain reported four nematode genera, but no trematodes (HIDALGO-VILA *et al.*, 2009). Our study, however, shows exclusively the presence

of trematodes. This lack of congruence between studies might be due to the fact that in many cases exotic traded turtles come from eggs originated in farms, and thus have not been previously in contact with natural habitats (WARWICK *et al.*, 2001; HIDALGO-VILA *et al.*, 2009).

ESCH & GIBBONS (1967) found an increment in parasitism intensity of nematodes and trematodes in turtles during the first four years of life, progressively decreasing between the five and ten years. Authors suggest that this variation might be related to changes in diet and sexual maturity. The basis for this generalization rests in the knowledge that in many turtle species, juveniles are obligate carnivores while adults are primarily herbivores (MOLL & LEGLER, 1971; PARMENTER & AVERY, 1990; ESCH *et al.*, 1993; DERSLICK 1999). In our study, the fact that all but one of the parasitized animals were captured in the same area might suggest a stronger relation to dietary habits than to age or sex. According to other authors, *T. scripta* can accidentally ingest intermediate hosts of trematodes, like snails, when feeding on vegetables (ESCH *et al.*, 1979; KENNEDY *et al.*, 1986).

Table 1: Sex, weight (in grams) and number of trematodes (Intensity) detected on the *T. scripta elegans* specimens included in this study.

Individual	Sex	Weight (g)	Intensity
1	Female	1200	1
2	Male	700	12
3	Female	500	1
4	Male	350	11
5	Female	800	18
6	Female	650	6
7	Female	300	33
8	Female	1800	8

The trematode *Telorchis* has been previously described in different parts of the world parasitizing water turtles. In Mexico, *T. attenuata* was found in the intestine of *T. scripta* (MORAVEC & VARGAS-VÁSQUEZ, 1998; PÉREZ-PONCE *et al.*, 2001); in Tunisia, *T. temimi* was identified in *E. orbicularis* (MISHRA & GONZÁLEZ, 1978), and in the same host three species of the genus (*T. assula*, *T. parvus* and *T. stossichi*) were detected in Austria (HASSL & KLEWEIN, 2010). In Spain, the species *T. solivagus* was found in *M. leprosa* (LÓPEZ-ROMÁN, 1974, LLUCH *et al.*, 1987). However, the species identified in this study, *T. attenuata*, was not previously cited in Spain, although it was in the original distribution range of the host species (MORAVEC & VARGAS-VÁSQUEZ, 1998). One possibility could be that *T. scripta elegans* individuals were already parasitized when they reached the marshes and that they could survive thanks to the presence of adequate intermediate hosts. Another possibility could be that *Trachemys* was not sampled previously in this region. The life cycle of *Telorchis* is not well known, but assuming a typical digenean cycle, the first intermediate host could be a freshwater snail and the second one, where the infective metacercaria develops, a hemipteral larvae (CHENG, 1978). The main snail genera acting as intermediate hosts in *Telorchis* infecting reptiles (*T. corti*) are *Lymnaea* spp., *Planorbis* spp. and *Physella* spp. (BARRAGÁN-SÁENZ *et al.*, 2009). All of them have been previously described in Spain. However, it seems that for *Telorchis* spp., survival depends on other resources rather than on intermediate hosts' availability (RADTKE *et al.*, 2002).

The introduction of *T. scripta* in new habitats may be accompanied with the arrival of new microorganisms and diseases (DASZAK

et al., 2001, POLO-CAVIA *et al.*, 2010). In order to assess this possibility, it would be necessary to extend the study to autochthonous turtles living in syntopy. Considering the presence of trematodes in autochthonous turtles in other areas from Spain, like the ones detected in *M. leprosa* from Castilla y León (ALARCOS *et al.*, 2010), or the species *Patagium pellucidum* in the same host from Extremadura (ROCA *et al.*, 2005), we do not discard the possibility that they might also be present in the study area.

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