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On the status of red-eared slider, *Trachemys scripta elegans* (Wied, 1838) (*Testudines, Emydidae*) with evidences of its reproduction in the wild, Chile

Abstract

The presence of the nonnative turtle species *Trachemys scripta elegans* in central southern Chile, Vichuquén and Valdivia was investigated. The methods involved information gathered from field surveys as well as interviews with local inhabitants. Field surveys confirmed the presence of *T. s. elegans* in both areas. In addition, embryonated eggs, juvenile, and nesting attempts, suggest that the species is well established under environmental conditions in central-southern Chile, and could perform successful reproduction in the wild. As this allochthonous turtle get there in the result of illegal introduction into nature by their owners, education of population on the dangers of releasing pet turtles into the wild are needed. Moreover, we suggest that import and trade of *T. s. elegans* should be forbiddanced in Chile.

Keywords: *Trachemys scripta elegans*, exotic species, biodiversity, Chile

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Introduction

Trachemys scripta elegans (Wied 1838), commonly known as "Red-eared Slider" is a medium sized freshwater turtle native to the southeastern United States and northeastern Mexico.[1] Since the 1950s when this turtle was used in the animal pet trade, this species has been introduced in Africa, Asia, Oceania, Europe and South America.[2–5] Given that *T. s. elegans* is a generalist species with a broad ecological niche, feeding on a variety of items such as filamentous algae, macrophites, snails, insects, crustaceans and small vertebrates[6,7] there is a concern for its effect on aquatic species and ecosystem conservation. In fact, different studies have demonstrated the negative impact of this species on other native turtle species through competition for food, egg-laying sites, or basking places,[8] threat to endangered species,[9] disease transmission,[10] and predation.[11] Another major problem is disease propagation to humans and other animals through direct and indirect contact. In fact, *T. scripta* can carry and transmit *Salmonella* causing typhoid, paratyphoid, gastroenteritis and other diseases.[12,13]

Recognizing its invasiveness and to prevent new escapes or introductions, the European Union banned the import of *T. s. elegans* in 1997, however, increased imports of other exotic turtle species or subspecies, forced correcting this issue during late 2011 by prohibiting the sale of any subspecies of *T. scripta*. In South America this species has been introduced in Argentina, Brazil, Chile, Colombia, Ecuador, and Guyana.[14–16] The import and trade of this species is forbidden only in Brazil since 1998[17] and Colombia since 2013.[18]

In Chile, *T. s. elegans* has been massively commercialized in pet shops for over four decades. As in most other countries where it is imported, people don´t realize that adults can behave voraciously and may reach up to 1kg.[14] This species was verified for the first time in natural environments in 2002 in El Toyo (33°35'30.68"S; 70°23'32.62"W), located on the upper third of the Maipo River, which borders Santiago city, central Chile; it corresponded to an adult female of 19cm carapace-length.[19] Ibarra-Vidal,[20] recorded *T. s. elegans* for the second time in wild stage in a wetland of Concepción (36°47'32.11"S; 73°4'23.38"W), and discussed as a possible invading species in Chile's Mediterranean zone. Here, we describe the occurrence and update the distribution status of *T. s. elegans* in Chile, and present evidences of its reproduction in the wild. In addition, some recommendations are given to prevent or decrease releasing of turtles into the wild.

Methods

Field surveys were conducted during the austral summer of 2012-2016 in two different regions for the presence of *T. s. elegans* as anecdotal records: Saval Park, Valdivia (39°48'12.76"S;73°15'36.27"W) and Vichuquén lake, Vichuquén (34°50'18.46"S; 72°2'27.39"W) (Figure 1).

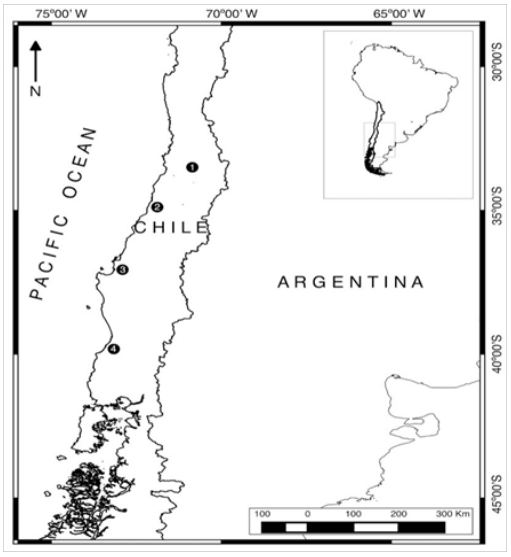

Figure 1 Geographic distribution map of records of *Trachemys scripta elegans* in Chile. 1. Cajón del Maipo.[19] 2. Vichuquén (this study). 3. Concepción.[20] 4. Valdivia (this study).

The field method was a combination of direct observations as well as interviewing with local inhabitants. Direct observations and reconnaissance were conducted in accordance with survey parameters (distribution and abundance, observations of behavior, evaluations of habitat use, and censuses of spawning nests) and field techniques[21] between 10:00–16:00hrs, using binoculars (Nikon Monarch 10x42) and a digital cam (Canon Rebel XTi, zoom 75-300). Confirmed turtle species were geo-located with a handheld Garmin Geographic Positioning System (GPS) unit for mapping purposes. Representative photos of these observations are included herein. The stomach content of a captured turtle was obtained by using stomach dissection and preservation in 70% ethanol for further identification. Each food item was determined to the lowest taxon, as possible[22]. The specimen was deposited in the Herpetological Collection of Institute of Marine and Limnological Sciences, Austral University of Chile. The methods for identify and interview local people followed O'Haire et al.[23]

Results

Field surveys confirmed the presence of *T. s. elegans* in both areas. The individuals belonged to the subspecies *T. s. elegans* has the following combined characters: the design of a red headset band on each side of the head, parallel striations longitudinal throat rather than circular spots like the South American forms of the genus.[19] Four individuals were found in Saval Park (Los Lotos lagoon; Figure 2a) and at least four resting sites used by the turtles during sunny days were located. In December 2013, a female *T. s. elegans* was captured in land near to the lagoon. After anesthetizing and sacrificing this specimen, we determined it contained 25 embryonated eggs, some of them are showed in the Figure 2b. Stomach content of this individual showed items mainly relative to *dragonflies* (*Odonata*), *crayfishes* (*Parastacidae*), *beetles* (*Carabidae*), and plants.

Between December, 2012 and February, 2014 in Vichuquén lake, several interviews with local stakeholders were conducted. According to them, juvenile and adult turtles are commonly seen in small ponds as well as in the main lake. We are confident they correctly determined the species because there are no native freshwater turtles in Chile. According to stakeholders, turtles have been observed in the area for more than a decade and mainly during December and January, late spring and early summer in southern Hemisphere. In fact, records of several adults and one wild juvenile (Figure 2c) were made during the research period. Three female records captured on land, and the first attempt to nesting was obtained (Figure 2d). Based on interviews, on November 25, 2010 the first female was captured by local people about 130meters from the lake in a sunny open slope. Three years later, on December 1, 2013 another female was observed in the same site when preparing the nest, however, in the presence of people, the specimen abandoned the site without laying the eggs. On December 25, 2013 a third female was captured in the northern area of the lake, ca. 85meters from the water body, probably searching for a nesting place. In addition, embryonated eggs, juvenile, and nesting attempts, suggest that the species is well established under environmental conditions in central-southern Chile, and could perform successful reproduction in the wild.

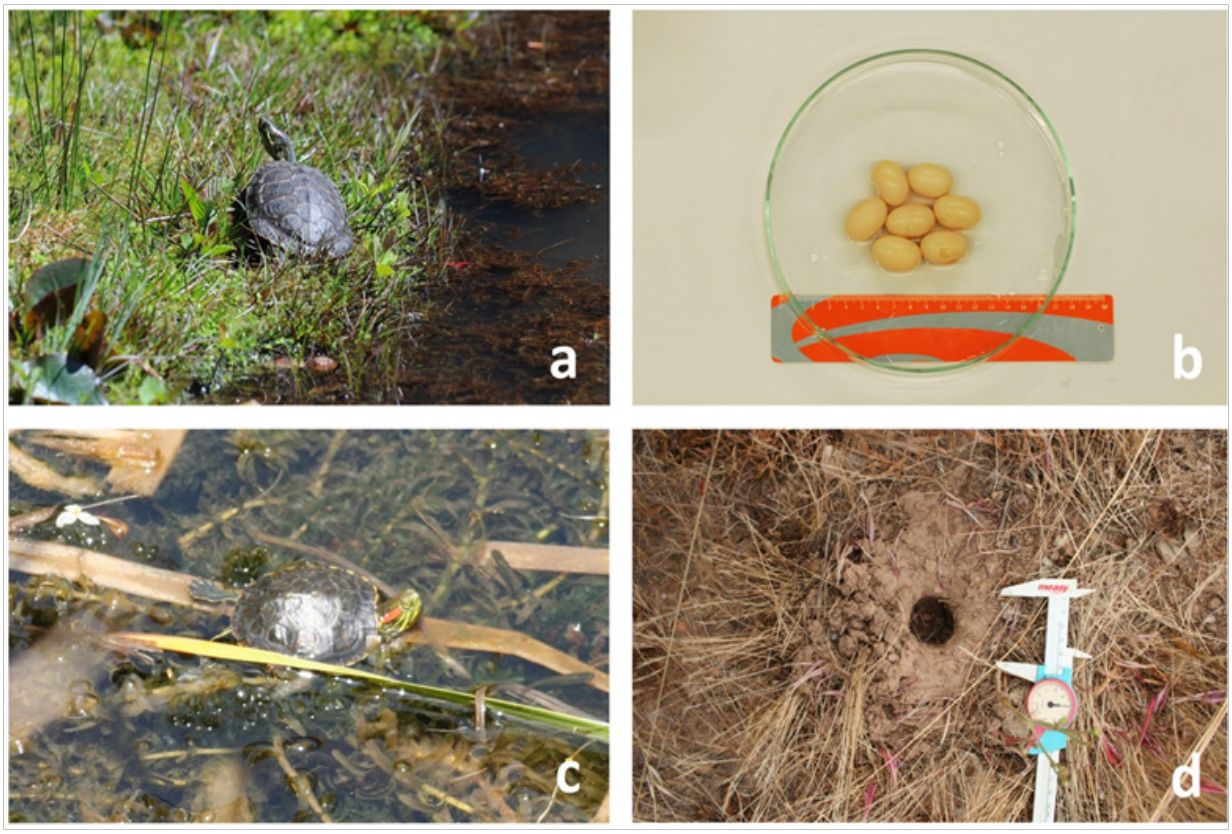

Figure 2 (a) Specimen of *Trachemys scripta elegans* from Los Lotos lagoon, Saval Park, Valdivia. (b) Embryonated eggs from one specimen *Trachemys scripta elegans* from Los Lotos lagoon. (c) Juvenile of *Trachemys scripta elegans* from Vichuquén lake. (d) Nest of *Trachemys scripta elegans* from Vichuquén lake.

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Discussion

Currently, two exotic non-marine turtles have been referred to Chile, *Chelonoidis chilensis* (Gray, 1870),[24–26] and *T. s. elegans*.[14,19,20] Information of previous authors, indicates that *C. chilensis* has never been found in wild environments. Respect to *T. s. elegans*, the presence of this species in four wild areas (Figure 1) is due probably to its great ecological versatility, making it a potential threat to local biodiversity, adding to the impact of the presence African clawed frog *Xenopus laevis* (Daudin, 1802), an amphibian species of great ecological flexibility.[27]

Imports and sale of *T. s. elegans* in Chile is regulated by various government agencies such as the National Marine Fisheries Service (SERNAPESCA) and the Agricultural and Livestock Service (SAG). Despite current regulations seem to be effective on pet trade control and safety of imported animals, little is known on distribution, dispersion, colonization, and ecological impact of this introduced species. As in many countries, habitat destruction and introduction of alien species are also among the greatest threats to the native species in Chile. The omnivorous diet of *T. s. elegans*, their ability to adapt to various habitats, and the evidences of reproduction, gives it great potential for impacting indigenous habitats.

The biodiversity of Chile has unique characteristics, maybe not comparable with the richness of the tropics, but with high endemic value.[28] Invasive alien species are one of the most immediate danger for biological conservation in Chile, and the presence of *T. s. elegans*, and possibly it's reproduction in the wild near to Carlos Anwandter Nature Sanctuary (a Ramsar site), could represent a threat to local species such the big Chilean frog *Calyptocephalella gayi*, endemic freshwater fishes, and crustaceans.

Conclusion

The presence of *T. s. elegans* in the wild probably may be the result of escape from pet-lovers, or illegal introduction into nature by their owners. So, research and environmental education programs on the dangers of releasing pet turtles are needed. Control and eradication plans to prevent turtles to be released into the wild should be implemented. On the other hand, the improvement of the control of internal turtle trade or assess its forbiddance should be prioritized.

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Conflict of interest

Author declares that there is no conflict of interest.

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