



New species and records of springsnails (Caenogastropoda: Cochliopidae: *Tryonia*) from the Chihuahuan Desert (Mexico and United States), an imperiled biodiversity hotspot

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Abstract

We describe 13 new, narrowly localized species of the aquatic gastropod genus *Tryonia* from springs in the Chihuahuan Desert (Chihuahua and Texas): *T. allendae* n. sp., *T. angosturiae* n. sp., *T. chuviscarae* n. sp., *T. contrerasi* n. sp., *T. julimesensis* n. sp., *T. metcalfi* n. sp., *T. minckleyi* n. sp., *T. molinae* n. sp., *T. oasiensis* n. sp., *T. ovata* n. sp., *T. peregrina* n. sp., *T. taylori* n. sp. and *T. zaragozae* n. sp.. These novelties are distinguished by shell and other morphologic characters and are well differentiated genetically from each other and from other congeners (mtCOI sequence divergence $\geq 1.9\%$). We also provide two new records for *T. seemani* (Frauenfeld, 1863), which is distributed near the southern limit of the Chihuahuan Desert (Durango State) and previously had been thought to be possibly extinct. Bayesian analysis of a mtCOI dataset resolved two clades composed of novelties described herein: one (containing four species) is distributed in several drainages in Chihuahua, the other (containing three species) is a local species flock in the Río Conchos basin (also in Chihuahua) that lives in the warmest waters yet recorded for *Tryonia* (41–44°C). (The phylogenetic relationships of the other new species were not well supported.) Both of these clades contain sympatric species pairs; co-occurrence of *Tryonia* congeners previously had been reported only in Ash Meadows (southern Nevada). Some of the species described herein are from previously unsurveyed localities and may help delineate new areas of endemism within the Chihuahuan Desert. One of the new species (*T. julimesensis*) became extinct between 1991 and 2001 and another (*T. oasiensis*) disappeared from its single known locality shortly after it was first discovered in 2009 and also may be extinct. The other species treated herein are at risk of extirpation owing to the declining extent and condition of their unprotected habitats.

Key words: springs, Mexico, Texas, gastropods, mitochondrial DNA, endemism, taxonomy, conservation

Introduction

The Chihuahuan Desert (Mexico and United States) is considered a globally significant freshwater biodiversity hotspot based on its large endemic biota, which includes a flagship assemblage in the Cuatro Ciénegas basin and numerous species that are scattered among other insular habitat patches within this large region (Olson *et al.* 1998, Dinerstein *et al.* 2001, Olson & Dinerstein 2002). Freshwater habitats are rapidly disappearing from the Chihuahuan Desert owing to groundwater withdrawal, urbanization and other anthropogenic activities, resulting in the decline or extinction of many endemic species (e.g., Williams *et al.* 1985, Contreras-Balderas *et al.* 2003, Howells 2003). Viewed within this context, the still incomplete process of discovery and taxonomic description of regional aquatic biota (as a necessary prelude to implementation of conservation initiatives) may be likened to a race against time. Here we contribute to the inventory of this remarkable biota by describing new species and records of narrowly localized springsnails from the region.

The genus *Tryonia* (Caenogastropoda: Cochliopidae) is composed of tiny, narrow-shelled snails which brood their young in the female genital duct; have glandular, papillae-like lobes on the edges of the penis; and typically live in springs. This genus was recently revised by Hershler (2001), who recognized 16 species in western North America, one species in Florida, and one species in Guatemala. One additional (western North American) species,