

MORPHOLOGICAL MALFORMATIONS IN ADULTS OF *RHINOCLEMMYS ANNULATA* (REPTILIA, TESTUDINES), IN PANAMA

MALFORMACIONES A NIVEL MORFOLÓGICO EN ADULTOS DE *RHINOCLEMMYS ANNULATA* (REPTILIA, TESTUDINES), EN PANAMÁ

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Resumen.— Se reportan dos casos de malformaciones en *Rhinoclemmys annulata* adultas, en las provincias de Colón y Panamá Oeste.

Palabras clave.— Desarrollo embrionario, genética, malformaciones, tortuga.

Abstract.— Two cases of malformations are reported in adult *Rhinoclemmys annulata*, in the provinces of Colón and Panamá Oeste.

Keywords.— Embryonic development, genetics, malformations, turtle.

Malformations are abnormalities that are generally related to abnormal development, particularly congenital, of some limb or in some part of the body (Cruz-Pérez et al., 2009; Moreno, 2017). The causes where malformations can occur in turtles are generally in animals that are deep in the nest (Otto & Hernández, 2004), as well as embryonic anoxia at a certain moment of development (Frye, 1991), or be related to processes of agenesis of the limbs (Martínez et al., 1997).

It has been estimated that the malformations found may be due 10% to environmental factors, 25% to genetic factors and 65% to unpublished factors (Rojas & Walker, 2012). In this work we present two cases of malformations in *Rhinoclemmys annulata* (semiaquatic turtles) found in Panama. In both cases we used the generalized search method, for the observation of the individuals, a Canon SX60 SH camera to obtain the photographic evidence, a Garmin MAP 62 GPS for the georeferencing of the events.

Case 1. On March 25, 2018, during a tour in the Altos de Campana National Park, Panamá Oeste Province at 745 meters above sea level, which aimed to place camera traps to show the

presence of a jaguar (*Panthera onca*), we took an exploratory tour of a body of water near the provisional camp, when we observed an adult individual of *R. annulata* (female) that presented normal behavior for this species. It was at the edge of the stream, when it noticed our presence and it immediately hid inside its shell, it was not until we captured the individual, for its determination, that we noticed the absence of part of both forelimbs; It did not present visible wounds from attack or combat with a possible predator, nor scars that show that these limbs had been amputated, so we consider them to be genetic malformations that are appreciable at a morphological level (Fig. 1B and C).

Case 2. On March 15, 2020, during a tour to place camera traps in the Portobelo National Park, Colón Province at 834 meters above sea level, away from bodies of water (approximately 400 m), among the vegetation on the slope, we were able to observe an individual (Female) *R. annulata* adult with absence of the right hind limb (Fig. 1D and E).

Once photographed and the species determined, both turtles were released in the same place where they were found. The appearance of malformations may be due to intrinsic (genetic

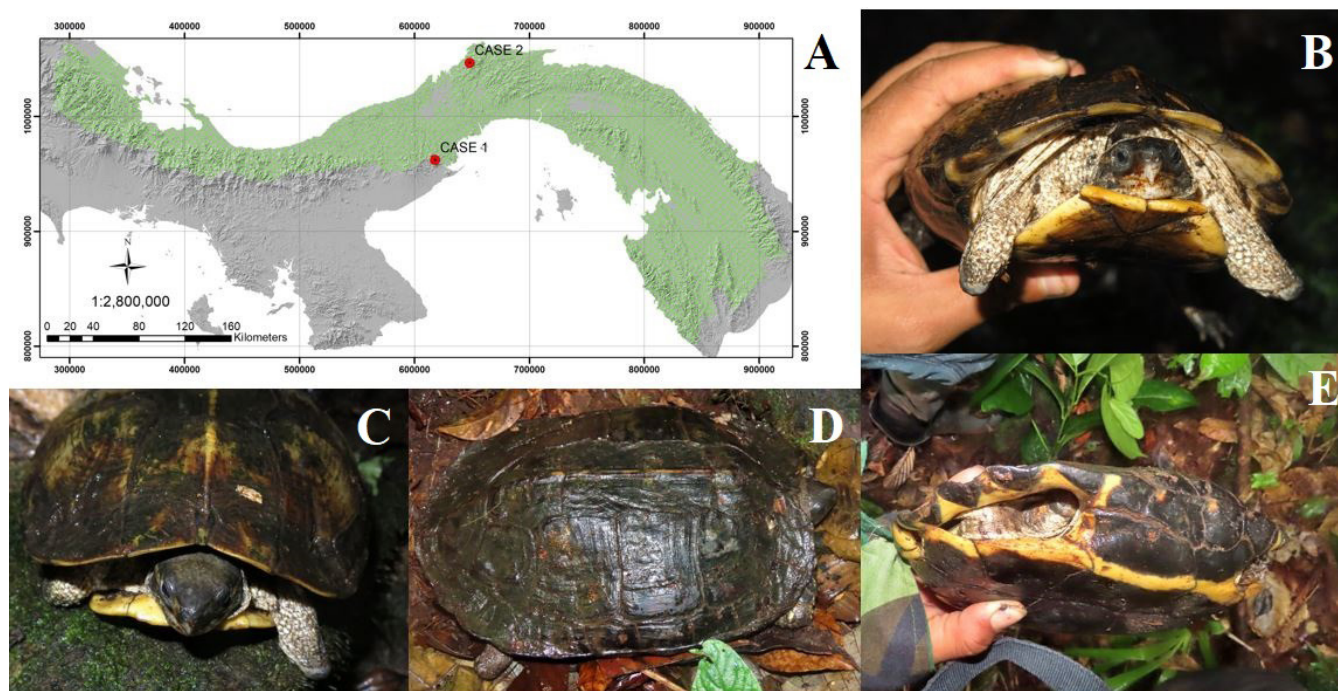


Figura 1. A) Mapa de distribución de *R. annulata* y casos reportados (1 y 2), en Panamá. Vistas de los individuos de *R. annulata*; B) y C) Caso 1 en la imagen frontal se aprecia la extensión de las extremidades; Caso 2, D) Dorsal, apreciamos el miembro incompleto, E) vista lateral.

Figure 1. A) Distribution map of *R. annulata* and reported cases (1 and 2), in Panama. Views of individuals of *R. annulata*; B) and C) Case 1 Frontal, the extension of the extremities is appreciated; Case 2, D) Dorsal, we appreciate the incomplete limb, E) lateral view.

and physiological) and extrinsic factors (chemical, physical, edaphological, among others.) which seriously affect embryonic development (Bárceñas-Ibarra & Maldonado, 2009). It should be noted that, due to anthropic pressure, pollutants and industrial activities introduced into the environment can also cause deformities in turtles (Van Meter et al., 2006).

Some intrinsic factors include intracellular anomalies such as in the *Kinosternon leucostomum* species (Hernández-Guzmán et al., 2015), causing repercussions on their progeny due to modifications of the genetic material. Similarly, the presence of malformations and deformities in the embryonic state, in some cases may be due to their homozygosity, as is the case of parthenogenic species that have low genetic variability (Booth et al., 2012). The little genetic variability in reproductive individuals can increase the appearance of anomalies in embryonic development, as is the case of parthenogenic species (Bellairs, 1981; Martínez et al., 1997).

Unlike their skin, the membrane of the eggs in reptiles is permeable and a little more susceptible to changes in the exterior (Ortiz-Santalisterra & Egea-Serrano, 2013). In amphibians, for example, malformations and inability to complete the

metamorphosis in larvae of *Lithobates vaillanti* have been reported due to the presence of sulphurous waters (Hernández-Guzmán et al., 2014) highlighting the disruptive role of extrinsic factors in the development of animals. The factors that could have induced the malformations in these chelonians are not known, therefore, we recommend more sampling and monitoring to know the possible causes of the appearance of these malformations. This is the first report, in Panama, of malformations in this species of turtle.

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