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Turtles from the Late Cretaceous (Campanian) of El Gallo Formation, Baja California, Mexico

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ABSTRACT

Turtles are typically important members of Late Cretaceous vertebrate assemblages throughout North America, and are considered a useful tool to define biogeographic patterns. In Mexico, Cretaceous turtles have been recorded in the states of Baja California, Chiapas, Chihuahua, Coahuila, Nuevo León, Puebla, and Sonora; specifically the state of Coahuila shows so far, the highest diversity of turtles. In this paper, the diversity of Late Cretaceous turtles from the El Gallo Formation (Baja California) is reviewed. Previously, only *Naomichelys speciosa* was recognized in this Formation. Based on fragments with distinctive sculpture patterns four additional taxa are recognized, *Compsemys victa*, *Basilemys* sp., Trionychidae indet., and cf. Chelydridae. With the recognition of these new taxa, the knowledge of Cretaceous turtles diversity of the El Gallo Formation is increased. This assemblage is unusual compared to other North American turtle assemblages because it suggests the presence of previously unrecognized biogeographic patterns. Here we report the first record of *Basilemys* sp. from the Late Cretaceous of Mexico and the presence of cf. Chelydridae on the western side of Laramidia.

1. Introduction

The Mesozoic fossil record of turtles from Mexico is important regarding their taxonomical and biogeographical implications. Mexico has the southern-most Cretaceous localities in North America, so these localities are a milestone for establishing latitudinal patterns of distribution (Brinkman, 2014). The first fossil record of a turtle recovered in Mexico was found in the Late Cretaceous (Turonian) sediments in the locality "División de Peyotes" (Parras, Coahuila) reported by Aguilera (1896). Among the specimens collected in this locality, there were shell elements that Aguilera (1896) identified as Trionychidae. Subsequently, Mesozoic turtles from several Mexican localities ranging in age from the Late Jurassic to the Late Cretaceous were reported (see Appendix).

Now a days, the oldest fossil turtles known from Mexico are Jurassic in age and are represented by the platychelyid *Notoemys tlaxiacoensis*, recently discovered in the Sabinal Formation (Oaxaca) (López-Conde et al., 2015, 2016; López-Conde and Alvarado-Ortega, 2017). The Early Cretaceous turtles from Mexico are known from only one locality, the Tlayúa quarry, near Tepexi de Rodriguez (Puebla), which include well-preserved and complete specimens that represent at least two species (Reynoso et al., 2000). The Late Cretaceous fossil turtles have been collected mostly in formations located in Northern Mexico, including the Corral de Enmedio and Packard Shale formations of the Cabullona Group in Sonora (Lucas et al., 1995), the Agua Nueva Formation in Nuevo León (Ifrim, 2006), Aguja, Austin, Cañón del Tule, Cerro del Pueblo, Eagle Ford, Indidura, Javelina, and Olmos formations in Coahuila, the San Carlos Formation in Chihuahua (Brinkman, 2014; López-Conde and Alvarado-Ortega, 2017), and the El Gallo Formation in Baja California (Rodríguez-de la Rosa and Aranda-Manteca, 2000; López-Conde and Alvarado-Ortega, 2017). The southernmost record of Late Cretaceous turtles in Mexico are from a Maastrichtian locality in the Ocozocoautla Formation in Chiapas (Carbot-Chanona and Than-Marchese, 2013; Brinkman, 2014). All the Cretaceous turtle records from Mexico are summarized in the Appendix.

In this paper, the turtle assemblage from El Gallo Formation (Baja

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California) is reviewed and new occurrences are reported. This fossil assemblage is of particular biogeographic interest because it is one of the most Southwestern Late Cretaceous vertebrate assemblages that is known for North America and is one of the few localities from the western side of Laramidia. Previously, the only fossil turtle known from this Formation was *Naomichelys speciosa* (Rodríguez-de la Rosa and Aranda-Manteca, 2000; Romo de Vivar, 2011; García-Alcantara, 2016). This turtle is widely distributed in Canada and the USA (Joyce, 2017); but in Mexico it has only been reported in Baja California. In order to understand the turtle assemblage of the El Gallo Formation and its biogeographic significance, all available fragments of turtles that have been collected in the Formation, were examined. Even if they are poorly preserved, small turtle shell fragments with or without ornamentation could be sufficiently informative and lead to a precise taxonomic identification.

2. Geological setting

The El Gallo Formation described by Kilmer (1963) is a rich fossiliferous geological unit that extends for about 7.5 km west of the town El Rosario de Arriba (Baja California, México). Kilmer (1963) divided the El Gallo Formation into La Escarpa, El Disecado, and El Castillo members. This Formation is a deposit of 500–1300 m thick that covers the La BocanaRoja Formation and overlies the Rosario Formation. All three Formations are a part of the Late Cretaceous Peninsular Range forearc basin complex (Renne et al., 1991). The stratigraphy of the Formation indicates that the depositional environment was extremely active; it has a retrogradational sequence of deposits from braided fluvial systems, to a tidal subenvironment followed by a marine transgression (Schile, 1974; Fulford and Busby, 1993; Fastovsky et al., 2014). Currently, some studies are being carried out in order to describe the depositional environment of this Formation, and to understand the taphonomical processes that affected the fossils in this area (Fastovsky personal communication).

The age of El Gallo was determined by high-resolution 40Ar/39Ar coming from four rhyolite tuffs from the La Escarpa and El Disecado members. This analysis suggests an age of 74.87 ± 0.05 Ma to 73.59 ± 0.09 Ma, corresponding to the Late Campanian (Renne et al., 1991). This Formation is the major outcrop of Cretaceous non-marine rocks on the Pacific edge of North America (Morris, 1974a, 1976; Renne et al., 1991; Fulford and Busby, 1993; Busby, 2004; Peecook et al., 2014). Micro and macro vertebrate fossils have been recovered from El Disecado member (Morris, 1974b, 1976; Renne et al., 1991; Romo de Vivar, 2011; García-Alcantara, 2016; Chavarría-Arellano, 2014, 2017; Chavarría-Arellano et al., 2018). Fiesta de Huesos, Motherload, OK, ROS 51, and Tortugario are the sites within the El Gallo Formation where the turtle shell remains studied herein were collected (Fig. 1).

3. Materials and methods

The majority of the fossil material studied here was collected in different field seasons between 2004 and 2018, organized by the Universidad Autónoma de México, an institution that has research projects in order to collect, identify, and preserve fossils from the El Gallo Formation. Previous collections were conducted by other institutions as well. For example, the staff of The Museum of Natural History Los Angeles County (California) carried out a series of paleontological expeditions in the area of Baja California. As a result of these expeditions, an important collection of fossil vertebrates was obtained, among which turtles are mentioned (Lillegraven, 1976). After the prospecting by paleontologists from The Museum of Natural History Los Angeles County (California) the work in this area was suspended, except for sporadic expeditions by the staff of the Universidad Autónoma de Baja California (Rodríguez-de la Rosa and Aranda Manteca, 2000).

The collection technique is simple; most of the shell fragments are picked up from the surface and added to a collection bin. Generally, sediment is collected in sacks from different localities, and in the laboratory, through a sieving technique, the shell fragments are recovered.

3.1. Institutional abbreviations

FMNH, Field Museum of Natural History, Chicago, U.S.A.; IGM, Colección Nacional de Paleontología "María del Carmen Perrillat", Instituto de Geología, Universidad Nacional Autónoma de México, Ciudad de México; LSUMNS, Louisiana State University Museum of Natural Science; SECCP, Secretaría de Educación y Cultura, Colección Paleontológica, Coahuila, México; SMP, The State Museum of Pennsylvania, Harrisburg, Pennsylvania, USA; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.

3.2. Material reviewed

Ten shell fragments were reviewed: IGM-11165, IGM-11166, IGM-11167, IGM-11168, IGM-11169, IGM-11170, IGM-11171, IGM-11172, IGM-11173, and IGM-11174.

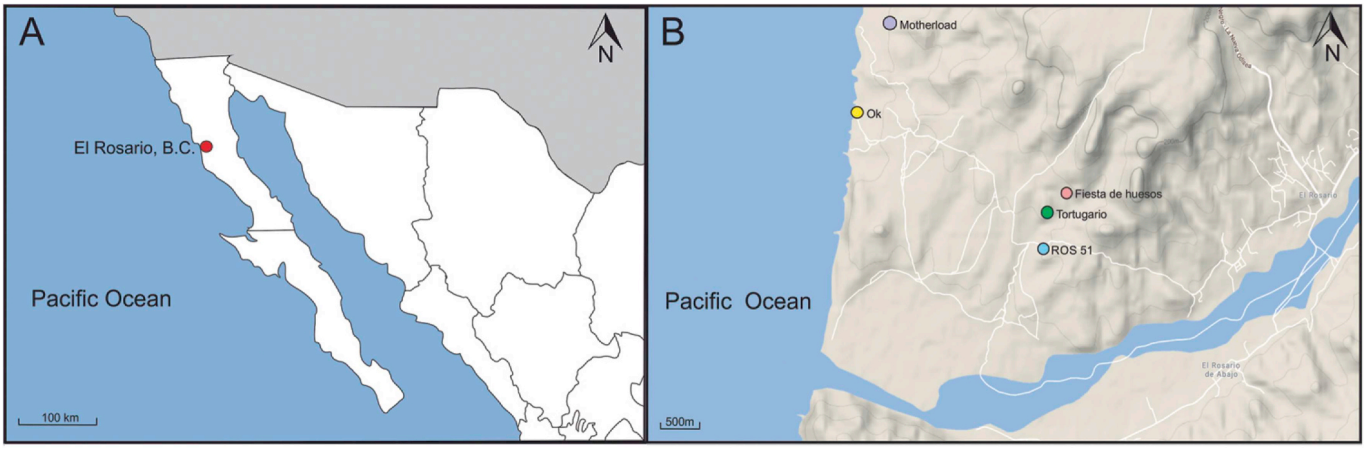

Fig. 1. A: Map of the northwest of Mexico where the town of El Rosario (Baja California) is located. B: Localities in the El Gallo Formation where turtle shell fragments were collected.

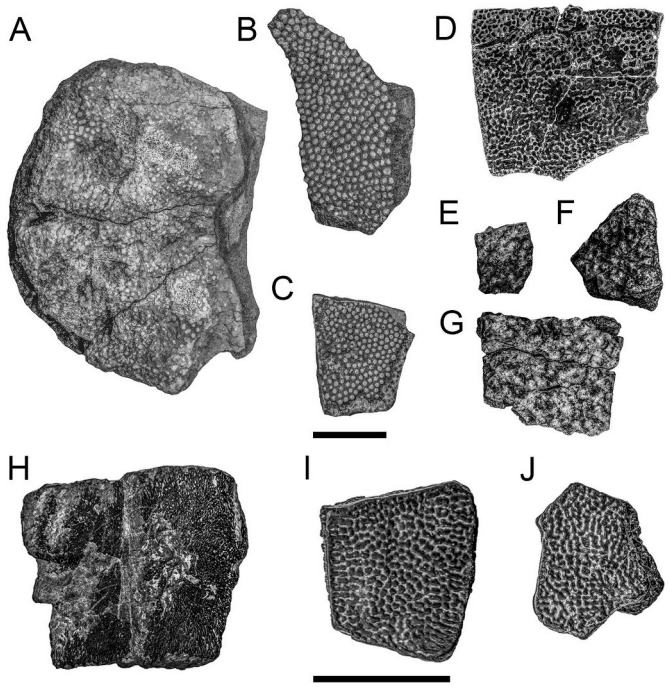

Fig. 2. Fragments of turtle shell remains from the El Gallo Formation (Baja California). All specimens in dorsal view: A-C, *Naomichelys speciosa*, three shell fragments; A, IGM 11165; B, IGM 11166; C, IGM 11167. D, Trionychidae indet., one shell fragment; D, IGM 11168. E-G, *Basilemys* sp., three shell fragments; E, IGM 11169; F, IGM 11170; G, IGM 1117. H, cf. Chelydridae, fragment of peripheral plate; H, IGM 11172. I-J, *Compsemys victa*, two shell fragments; I, IGM 11173; J, IGM 11174. Scale bar represents 20 mm.

3.3. Comparative materials

The materials used for the comparison correspond to those published by: Rodríguez-de la Rosa and Cevallos-Ferriz (1998), Stankey (2006), Sullivan et al. (2013), Brinkman (2014), and Joyce et al. (2014).

4. Systematic paleontology

TESTUDINATA Klein, 1760
PERICHELYDIA Joyce, 2017
HELOCHELYDRIDAE Nopcsa, 1928
NAOMICHELYS Hay, 1908
Naomichelys speciosa Hay, 1908

Referred specimen — IGM-11165 (Fig. 2A); IGM-11166 (Fig. 2B) and IGM-11167 (Fig. 2C), three shell fragments.

Occurrence — Locality Motherload (30°04′35″ N-115°46′49″ W), near El Rosario town, Baja California, México. El Gallo Formation, Late Cretaceous (Campanian).

Description — Due to the nature of the preservation of the plates, it has not been possible to determine to which part of the carapace or plastron they belong. They are three fragments of the shell with the characteristic ornamentation of tubercles observed in *N. speciosa*. The average size of the tubercules described here are 1–2 mm in height and 2 mm in length, and dislocate easily from the surface. This fragments were compared with the materials FMNH PR273 (Joyce et al., 2014). At the El Gallo Formation the fragments belonging to *N. speciosa* are abundant in many different localities, with *N. speciosa* being the most abundant turtle in this Formation. Hence, it had been considered as the only type of turtles recorded in this Formation.

Remarks — The North American helochelydrid record is restricted to *Naomichelys speciosa*, which has been reported from the Aptian to Campanian. But a relatively wider diversity for this lineage is recognized in the Cretaceous of Europe (Joyce et al., 2011; Joyce, 2017). The geographical distribution of this clade is restricted to North America and Europe, so in a way it demonstrates the faunal connection between these continents during the Mesozoic (Hirayama et al., 2000). *Naomichelys speciosa* differs from other members of Helochelydridae by a series of unique characters in the skull and shell. *Naomichelys speciosa* has an ornamented shell with tubercles high and delineated that shed easily, those tubercles are 0–72 to 2 mm in diameter (Joyce et al., 2011). In the center of the shell the tubercles are low, narrow and spaced, and sometimes are fused among them in chains of up four tubercles (Joyce et al., 2014). The costals are mostly covered with large, widely spaced tubercles that only fused with one another occasionally towards the center of the carapace in pairs of two (Joyce et al., 2014). The peripherals are covered with small, but widely spaced tubercles (Joyce et al., 2014).

PAN-TRIONYCHIDAE Joyce et al., 2004
TRIONYCHIDAE Fittzinger, 1826
TRIONYCHIDAE indet.

Referred specimen — IGM-11168 (Fig. 2D), a single fragment of shell.

Occurrence — Locality ROS 51 (30°03′13″ N-115°45′ 34″ W), near El Rosario town, Baja California, México. El Gallo Formation, Late Cretaceous (Campanian).

Description — The presence of a member of Trionychidae is documented by a shell fragment that displays the characteristic ornamentation of the carapace surface of the group, which consists of a sculpturing pattern that can range from pits, to vermiculating ridges (Danilov and Vitek, 2012; Vitek and Joyce, 2015). In the specimen from the El Gallo Formation, the thin connected ridges display a honey comb-like network pattern. This ornamentation pattern is similar to some specimens that have been described from other formations in the southern US and northern Mexico including the Fruitland/Kirland formations (specimen SMP VP-1717 of Sullivan et al., 2013), the Agua Formation (specimen LSUMNS 842:17736 of Stankey, 2006), and the Cerro del Pueblo Formation (specimen SECCP 28/2431 of Brinkman, 2014). However, it has been recognized that in most cases the ornamentation is not a reliable character for the diagnosis of different species in Trionychidae (*e.g.*, Gardener and Russell, 1994). Thus, it is not possible to assign this trionychid shell fragment from the El Gallo Formation to a taxon below the level of Trionychidae.

Remarks — The shell fragments of trionychid turtles are the most abundant in the different fossil assemblages in the Late Cretaceous localities in North America. Due to the pattern observed in the ornamentation of the materials from the El Gallo Formation, it is possible to assign it to Trionychidae. The presence of trionychid shell fragments in the western side of Laramidia has been documented in a specimen from Vancouver Island (Canada) reported by Vavrek and Brinkman (2018). The specimen from the El Gallo Formation extends the biogeographic distribution of the Trionychidae to the state of Baja California.

NANHSIUNGCHELYIDAE Yeh, 1966
BASILEMYS Hay, 1908
Basilemys sp.

Referred specimen — IGM-11169 (Fig. 2E); IGM-11170 (Fig. 2F) and IGM-11171 (Fig. 2G), three shell fragments.

Occurrence — Locality Tortugario (30°03′25″ N - 115°45′37″ W), near El Rosario town, Baja California, México. El Gallo Formation, Late Cretaceous (Campanian).

Description — Three shell fragments are identified as being from *Basilemys* on the basis of the ornamentation, which consists of linearly arranged shallow pits with small pyramidal elevations between them. As in specimens of *Basilemys* from the Aguja Formation described by Stankey (2006), the depressions are shallow and oval, about 1 mm deep

and up to 4 mm in diameter; there are approximately 4 depressions per/cm. The position of these fragments on the shell is uncertain because of their fragmentary nature. This is the first record of *Basilemys* sp. for Mexico. The comparison material corresponds to LSUMNS 834: 17706 and LSUMNS 746: 17618 (Stankey, 2006) and USNM 11084 (Sullivan et al., 2013).

Remarks — The genus *Basilemys* is the only North American representative of the clade Nanhsiungchelyidae (Joyce and Norell, 2005). This turtle genus is restricted to the Late Cretaceous (Hutchison and Archibald, 1986).

PAN - CHELYDRIDAE Joyce et al., 2004
CHELYDRIDAE Swainson, 1839
c.f. CHELYDRIDAE

Referred specimen — IGM-11172 (Fig. 2H), a single fragment of a peripheral plate.

Occurrence — Locality Fiesta de huesos (30°03′32″ N-115°45′28″ W), near El Rosario town, Baja California, México. El Gallo Formation, Late Cretaceous (Campanian).

Description — The presence of a possible Chelydridae in the El Gallo Formation is documented by a fragment of peripheral plate showing a deep, well-marked sulcus with a change in elevation across the sulcus and plications extending posteriorly from the sulcus (Hutchison and Archibald, 1986). These features were considered characteristic of Cretaceous members of the Chelydridae by Rodríguez-de la Rosa and Cevallos-Ferriz (1998), and Brinkman (2014) because the first three peripherals with these features show a deep groove for the cruciate process of the nuchal. The sculpture in some Cretaceous kinosternoids is similar but it tends to be more strongly developed. Although this fragment of peripheral plate of the El Gallo Formation is damaged, the development of sculpturing on its surface is comparable to the elements that have been identified as chelydrid, such as the examples from the Cerro del Pueblo Formation (Brinkman, 2014). The comparison materials from the Cerro del Pueblo Formation are in the collections of the Secretaria de Educación y Cultura, Colección Paleontológica (Coahuila) and in the Museo del Desierto, Saltillo (Coahuila). This material was presented by Brinkman (2014).

Remarks — Chelydrids are widely distributed in Late Cretaceous localities of North America. However, they have a disjunct distribution in this area. They are present in the Cañón de Tule and Cerro del Pueblo formations of Coahuila, Mexico (Rodríguez de la Rosa and Cevallos-Ferriz, 1998) and in the Kirkland Formation of Utah (Brinkman, 2014). Chelydridae have not been identified in the well documented assemblages of the Aguja Formation (Stankey, 2006) nor in the Fruitland/Kirkland formations of Utah (Sullivan et al., 2013). The specimen from the El Gallo formation could provide an additional record of the group in the southern part of North America and it could correspond, in that case, to the first evidence of the group on the western side of Laramidia.

TESTUDINES Batsch, 1788
PARACRYPTODIRA Gaffney, 1975
COMPSEMYDIDAE Pérez-García et al., 2014
COMPSEMYS Leidy, 1856
Compsemys victa Leidy, 1856

Referred specimen — IGM-11173 (Fig. 2I) and IGM-11174 (Fig. 2J), two fragments of shell.

Occurrence — Locality OK (30°04′02 N-115°47′05W), near El Rosario town, Baja California, México. El Gallo Formation, Late Cretaceous (Campanian).

Description — According to the type of ornamentation, these two fragments could correspond to two fragments of peripherals plates. The tubercles of the shell are small and low, and the shell ornamentation pattern is composed of compactly arranged small tubercles in a vermicular pattern. Moreover, here we are providing the first record of *Compsemys victa* in the westernmost side of Laramidia. The comparison material corresponds to IGM-7695, IGM-7696, IGM-7697, IGM-7698, IGM-7699 (Rodríguez-de la Rosa and Cevallos-Ferriz, 1998), LSUMNS 842: 17736 (Stankey, 2006), SMP VP-1717 (Sullivan et al., 2013), and SECCP 28/2431 (Brinkman, 2014).

Remarks — Compsemydidae is the sister clade of Baenoidea and has two representatives, *Compsemys victa* and *Berruchelus russelli* (Pérez-García, 2012). *Compsemys victa* is restricted to the Late Cretaceous (Campanian) to Paleocene of North America (Gaffney, 1972; Hutchison et al., 1998; Brinkman and Rodríguez-de la Rosa, 2006; Lyson and Joyce, 2011) and *Berruchelus russelli* to the Paleocene (Thanetian) of France (Pérez-García, 2012). In the Campanian of North America, it has a distinctly southern distribution and is often abundant in localities in which it occurs. Leidy (1856) described *C. victa* on the basis of shell fragments that have a peculiar ornamentation consisting of small, glazed, and closely spacedtubercles that may form sinuous strands. Specimens of *Compsemys victa* from the Cerro del Pueblo Formation showing this ornamentation were illustrated by Brinkman (2014). This kind of ornamentation is unknown in other turtles, and its presence allows even small fragments to be confidently identified. Previously, *C. victa* was only known in Mexico from the Ramos Arizpe and General Cepeda regions of Coahuila (Rodríguez-de la Rosa and Cevallos-Ferriz, 1998). Thus, the presence of *C. victa* in the El Gallo Formation extends its geographic range to Baja California, Mexico.

5. Conclusions

Although fragmentary remains of turtle shells contribute little to the understanding of the evolutionary relationships of turtles, they can often be identified to family or lower taxonomic group based on surface texture and thus provide data about the diversity and relative abundance of turtles present in fossil assemblages. The turtles from the El Gallo Formation are particularly significant in this regard because of its geographic location. The El Gallo Formation vertebrate assemblage is located further south compared to other well-known Late Cretaceous vertebrate assemblage and this is the only diverse assemblage of terrestrial Late Cretaceous vertebrates from the western side of Laramidia. In order to evaluate the biogeographic significance of the El Gallo assemblage, it was compared with the turtle assemblages from the Cerro del Pueblo, Aguja, and Fruitland/Kirkland formations. The age of the El Gallo Formation, which has been dated between 74.87 ± 0.05 Ma to 73.59 ± 0.09 Ma, is equivalent to the Fruitland/Kirkland Formation, which is approximately 75 to 72.8 Ma. (Sullivan et al., 2013), and is slightly older than the Cerro del Pueblo Formation, which has a maximum age of 72.5 Ma (Eberth et al., 2004).

Previously, the only record of Testudinata in the El Gallo Formation was *Naomichelys speciosa* (Rodríguez-de la Rosa and Aranda-Manteca, 2000). This is the most abundant turtle in the assemblage, occurring in all localities from which vertebrate remains have been collected. A notable difference between El Gallo Formation and other Late Campanian assemblages of the Western Interior is the presence of *Naomichelys speciosa*. Elsewhere in North America, this taxon last occurs in the lower half of the Foremost Formation of Alberta, which is approximately 79 Ma. Although the sample size is small, four other taxa have been recognized in the assemblage. This is the first report of *Basilemys* sp. for Mexico. In addition, we present evidence that expands the geographic distribution of *Compsemys victa* and Trionychidae and we provide the first possible evidence of Chelydridae on the western side of Laramidia (Fig. 3).

The turtle assemblage of the El Gallo Formation is similar to that of the Cerro del Pueblo and Fruitland/Kirkland formations with the presence of *Compsemys victa*, a taxon that Brinkman (2003) identified as having a southern distribution. A significant difference from the turtle assemblage of the Cerro del Pueblo Formation is the presence of *Basilemys* sp. This turtle is widely distributed in Laramidia during the Late Campanian, extending from the Dinosaur Park and Horseshoe Canyon

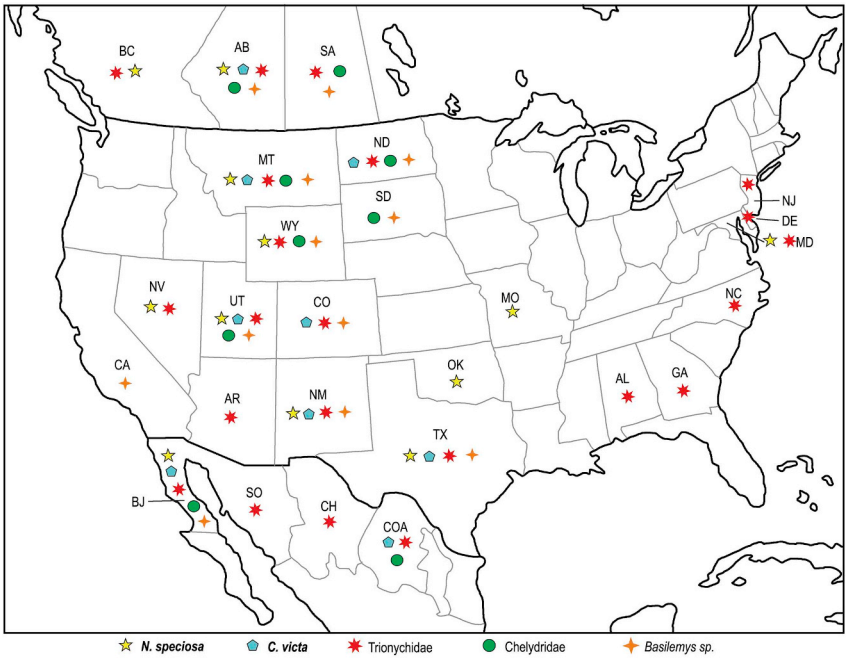

Fig. 3. Geographic distribution of the five taxa identified in the El Gallo Formation (Late Cretaceous) in North America (only the states where those taxa appear are marked): AB, Alberta; AL, Alabama; AR, Arizona; BJ, Baja California; BC, British Columbia; CA, California; CH, Chihuahua; COA, Coahuila; CO, Colorado; DE, Delaware; GA, Georgia; MD, Maryland; MO, Missouri; MT, Montana; NC, North Carolina; ND, North Dakota; NJ, New Jersey; NM, New Mexico; NV, Nevada; OK, Oklahoma; SA, Saskatchewan; SD, South Dakota; SO, Sonora; TX, Texas; UT, Utah and WY, Wyoming.

formations in Alberta (Canada) to the Aguja Formation in Texas (USA), but it has not been recovered from the Cerro del Pueblo Formation in Coahuila (Mexico). Its presence in the El Gallo Formation suggests that its absence in the Cerro del Pueblo Formation could be a result of local and ecological factors, rather than caused by broad geographic patterns. However, the effect of sample size cannot be ruled out.

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Appendix

Known record of Cretaceous turtles from Mexico (modified from López-Conde et al., 2016).

Taxa	State	Age	Formation	Reference
cf.Araripemydidae	Puebla	Albian	Tlayúa	Reynoso et al. (2000)
Turtle sp. indet.	Puebla	Albian	Tlayúa	Reynoso et al. (2000)
Turtle sp. indet	Nuevo León	Turonian	Agua Nueva	Ifrim (2006)
cf. Trionychidae	Coahuila	Turonian	Indidura	Brinkman (2014)
cf. Protostegidae	Coahuila	Turonian	Eagle Ford	Unpublished
cf. Protostegidae	Coahuila	Turonian	Eagle Ford	Unpublished
cf. Trionychidae	Coahuila	Turonian	Cerro del Pueblo	Aguilera (1896)
cf. Protostegidae	Coahuila	Santonian-Campanian	Austin	Unpublished
cf. Trionychidae	Chihuahua	Campanian	San Carlos	Reynoso (2006), Brinkman (2014)
cf. Trionychidae	Chihuahua	Campanian	Javelina	Reynoso (2006), Brinkman (2014)
Turtle sp. indet.	Chihuahua	Campanian	Aguja	Reynoso (2006), Brinkman (2014)
Naomichelys speciosa	Baja California	Campanian	El Gallo	Rodríguez-de la Rosa and Aranda-Manteca (2000), López-Conde and Alvarado-Ortega (2017)
Compsemys victa	Baja California	Campanian	El Gallo	This study
Basilemys sp.	Baja California	Campanian	El Gallo	This study

Trionychidae indet.	Baja California	Campanian	El Gallo	This study
cf. Chelydridae	Baja California	Campanian	El Gallo	This study
cf. Trionychidae	Sonora	Campanian	Corral de Enmedio	Lucas et al. (1995)
cf. Trionychidae	Sonora	Campanian	Packard	Lucas et al. (1995)
cf.*Bothremys* sp.	Coahuila	Campanian	Olmos	Unpublished
Mexichelys coahuilensis	Coahuila	Campanian	Cerro del Pueblo	Brinkman et al. (2009), Parham and Pyenson (2010)
cf.*Bothremys* sp.	Coahuila	Campanian	Cerro del Pueblo	Brinkman and Rodríguez-de la Rosa (2006)
cf.*Chedighaii* sp.	Coahuila	Campanian	Cerro del Pueblo	Brinkman and Rodríguez-de la Rosa (2006)
Compsemys victa	Coahuila	Campanian	Cerro del Pueblo	Brinkman (2014)
cf.*Neurankylus* sp.	Coahuila	Campanian	Cerro del Pueblo	Brinkman (2014)
cf. Chelydridae	Coahuila	Campanian	Cerro del Pueblo	Brinkman (2014)
cf. *Hoplochelys* sp.	Coahuila	Campanian	Cerro del Pueblo	Rodríguez-de la Rosa and Cevallos-Ferriz (1998), Brinkman and Rodríguez-de la Rosa (2006)
cf. Kinosternidae	Coahuila	Campanian	Cerro del Pueblo	Brinkman (2014)
cf.*Adocus* sp.	Coahuila	Campanian	Cerro del Pueblo	Brinkman (2014)
cf. Trionychidae	Coahuila	Campanian	Cerro del Pueblo	Reynoso (2006), Brinkman and Rodríguez-de la Rosa (2006), Brinkman (2014)
Yelmochelys rosarioae	Coahuila	Campanian	Cerro del Pueblo	Brinkman et al. (2016)
Yelmochelys rosarioae	Coahuila	Maastrichtian	Cañón del Tule	Brinkman et al. (2016)
cf. Trionychidae	Coahuila	Maastrichtian	Cañón del Tule	Reynoso (2006), Brinkman and Rodríguez-de la Rosa (2006), Brinkman (2014)
cf. Kinosternidae	Coahuila	Maastrichtian	Cañón del Tule	Brinkman, 2014
cf. *Hoplochelys*sp.	Coahuila	Maastrichtian	Cañón del Tule	Rodríguez-de la Rosa and Cevallos-Ferriz (1998)
cf.Chelydridae	Coahuila	Maastrichtian	Cañón del Tule	Rodríguez-de la Rosa and Cevallos-Ferriz (1998), Brinkman (2014)
Turtle sp. indet.	Chiapas	Maastrichtian	Ocozocoautla	Carbot-Chanona and Than-Marchese (2013)

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jsames.2018.10.005.

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