

MIDDLE TRIASSIC AMMONITES FROM SONORA, MEXICO

John W. Estep^{1,2},
Spencer G. Lucas¹ and
Carlos M. González-León³

ABSTRACT

Middle Triassic ammonites identified as cf. *Paracrochordiceras* sp. and *Paranevadites* cf. *P. furlongi* (Smith) are documented from a 180-m-thick interval of sandstone, siltstone and limestone in the lower part of the Antimonio Formation in the Sierra del Álamo Muerto, in northwestern Sonora, Mexico. Cf. *Paracrochordiceras* is a characteristic ammonite of earliest Anisian time and *Paranevadites* is regarded in North America as of late Anisian age. Some European authors however, consider *Nevadites* as of early Ladinian age. These are the first Middle Triassic ammonites from Mexico, and they confirm that the Antimonio Formation encompasses much of Triassic time.

Key words: Middle Triassic, ammonites, Antimonio Formation, Sonora, Mexico.

RESUMEN

En este artículo se documenta la presencia de amonites del Triásico Medio que fueron recolectados de un intervalo de 180 m de espesor, formado por areniscas, limolitas y calizas de la parte inferior de la Formación Antimonio, en la sierra del Álamo Muerto, en el noroeste de Sonora, México. Fueron identificados dos tipos de amonites que corresponden a cf. *Paracrochordiceras* y *Paranevadites* cf. *P. furlongi* (Smith). Cf. *Paracrochordiceras* es característico del Anisiano temprano, mientras que *Paranevadites* se considera en América del Norte como del Anisiano tardío. Sin embargo, algunos autores en Europa colocan a *Nevadites* dentro del Ladiniano temprano. Éste constituye el primer registro de amonites del Triásico Medio de México y su presencia dentro de la Formación Antimonio confirma que esta unidad representa gran parte del tiempo Triásico.

Palabras clave: Triásico Medio, amonites, Formación Antimonio, Sonora, México.

INTRODUCTION

Keller (1928) and Burckhardt (1930) first reported Triassic ammonites from Mexico. They identified a late Carnian ammonite fauna from red beds in northwestern Sonora that crop out at the now abandoned mining town of El Antimonio (Figure 1). González-León (1980) named the Antimonio Formation for a 3.4-km-thick section of mostly siliclastic red beds that encompass the late Carnian ammonite-bearing strata. The Antimonio Formation has long been assigned a Late Triassic–Early Jurassic age based on its ammonite faunas and has also been considered to disconformably overlie the middle Permian (Guadalupian) Monos Formation (e.g., Cooper 1953; Alencáster, 1961; González-León, 1980; Tozer, 1982; Lucas and González-León, 1994, 1995; Stanley *et al.*, 1994; Stanley and González-León, 1995). Recent work has extended the stratigraphic range of the Antimonio Formation to include strata of the Spathian Stage of the Lower Triassic (Lucas, Estep *et al.*, 1997) and the Guadalupian Series of the middle Permian (Lucas, Kues *et al.*, 1997). Here, the authors document Middle Triassic (early to late

Anisian or early Ladinian) ammonites from the Antimonio Formation, thus confirming that it includes Lower, Middle and Upper Triassic strata.

All fossils described here are in the collection of the Estación Regional del Noroeste, Instituto de Geología, Universidad Nacional Autónoma de México, Hermosillo, Sonora, Mexico, and bear ERNO catalogue numbers.

STRATIGRAPHY

Just south of the Monos Hills (Figure 1), an interval of extensive intrusives and alluvium (Figure 2, units 1–2) separates Spathian strata of the lower part of the Antimonio Formation from the next exposed stratigraphic interval of the Antimonio Formation (Figure 2). This post-Spathian interval (Figure 2) is approximately 670-m thick and composed mostly of red-bed siltstone, mudstone and thin micritic limestone. A distinctive black-chert-pebble conglomerate (Figure 2, unit 7) forms cuestas near the base of this interval, which we judge to be an unconformity. The overlying red-bed siltstone and yellow/gray limestone produce the ammonites herein reported throughout 180 m of section. A quartzite-cobble conglomerate (Figure 2, unit 15) overlies the ammonite-bearing strata at what the authors of this paper judge to be a second unconformity. Strata above the conglomerate produce unidentifiable ammonite impressions, vertebrae of shastasaurid ichthyosaurs and the bivalve *Halobia*, the latter two of which are indicative of a Carnian age.

¹New Mexico Museum of Natural History and Science, 1801 Mountain Road N.W., Albuquerque, New Mexico 87104-1375, U.S.A.

²E-mail address: pppjwe@unm.edu

³Estación Regional del Noroeste, Instituto de Geología, Universidad Nacional Autónoma de México, Apartado Postal 1039, 83000 Hermosillo, Sonora, México.

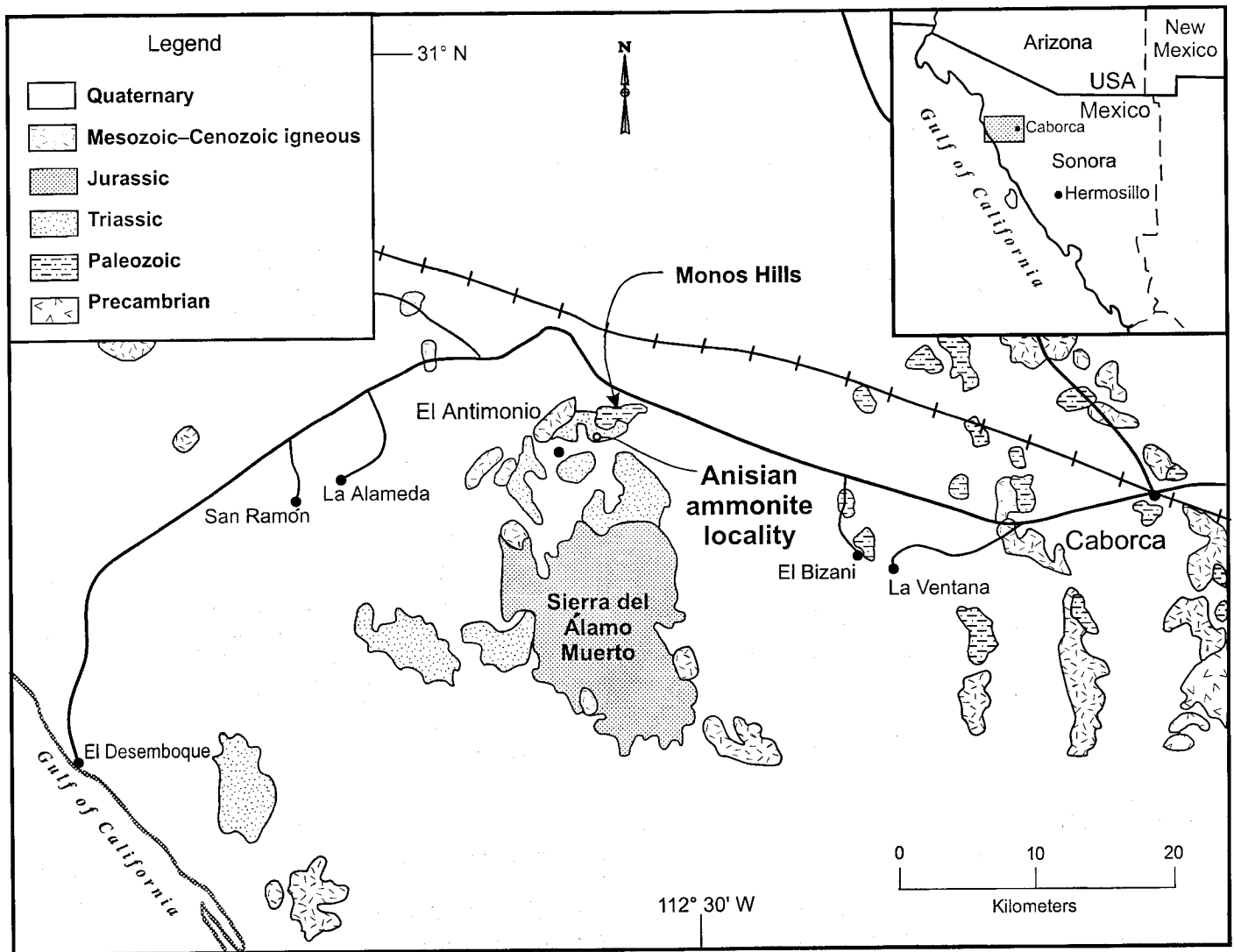


Figure 1. Geologic map of the northern Sierra del Álamo Muerto-Monos Hills area, Sonora, Mexico. Geology based, in part, on González-León (1980).

AMMONITES

Numerous ammonites were collected from the 180-m-thick interval of the middle part of the Antimonio Formation (Figure 2), all preserved as compressions. They were identified as cf. *Paracrochordiceras* sp. and *Paranevadites* cf. *P. furlongi* (Smith). All the cf. *Paracrochordiceras* specimens occur in a 50-m-thick interval of strata (Figure 2, unit 9) well below the 60-m-thick interval that produces all the *Paranevadites* (Figure 2, unit 11). The lowermost portion of unit 11 also contains packstone with abundant aulacoceratid coleoids.

Specimens provisionally identified as *Paracrochordiceras* sp. (e.g., Figure 3A–F) have evolute coiling, an open umbilicus, and smooth, rectiradiate, moderately bifurcated ribbing that is completely lacking in tuberculation. Whereas no specimens show a venter view, in profile the extremely straight ribbing is perpendicular to the axis of coiling and continues undiminished at the ventrolateral shoulder, appearing to continue across the venter. Measurements of umbilical (U) and whorl

height (H) as a percentage of total shell diameter (D) for these specimens are also in close agreement with those for *Paracrochordiceras*. The three best preserved specimens are 18 mm in diameter, and have a U/D of 33% and H/D of 44%, comparable to those of Spath's (33 and 42% for a specimen 29 mm in diameter). All these features are consistent with previous descriptions of *Paracrochordiceras* (e.g., Welter, 1915; Spath, 1934).

The evolute form of ERNO-846 (Figure 3G–H) well represents specimens identified as *Paranevadites* cf. *P. furlongi*. Although crushed and lacking suture lines, ERNO-846 accurately preserves several key features of the fairly distinctive taxon *Paranevadites furlongi* (Smith, 1914; Silberling and Nichols, 1982). The quadrituberculate sculpture consists of four rows of nodes that occur on branching falcoid ribs—the umbilical nodes occur at the intersection of each pair of ribs, the mid-flank nodes occur on alternating ribs, and both the outer-flank and ventral nodes occur on each rib. The ventral nodes are staggered between the outer-flank nodes. The sharp, ovoid mid-

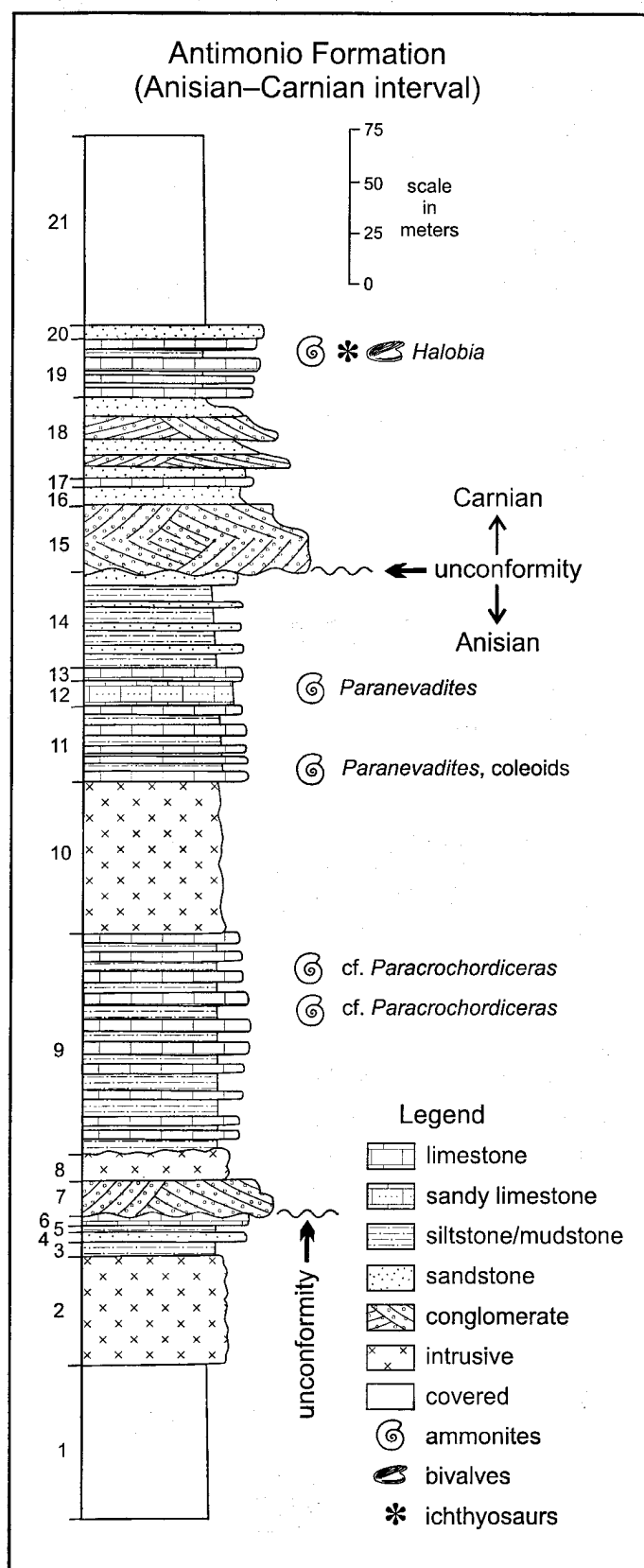


Figure 2. Measured stratigraphic section of Anisian–Carnian interval of Antimonio Formation. See Figure 1 for location of section.

flank nodes are most pronounced, with their long axis apically inclined at about 45°. This combination of characters is unambiguously associated with *Paranevadites furlongi*.

AGE

Paracrochordiceras is a characteristic earliest Anisian ammonite of the *Silberlingites mulleri* and *Lenotropites caurus* Zones of Tozer (1994a). Indeed, in some biostratigraphic schemes of Anisian time, a *Paracrochordiceras anodosum* Zone is equivalent to the early Anisian (“Aegean”) (cf. Silberling and Nichols, 1982, p. 12). Although the identification of *Paracrochordiceras* is only provisional, this Anisian ammonite locality in the Antimonio Formation may supplement the relatively scarce record of lower Anisian marine deposits at low paleolatitudes noted by Bucher (1989).

Silberling and Nichols (1982) placed *Paranevadites furlongi* in the *Frechites occidentalis* Zone, with which Tozer (1994b) correlates part of the late Anisian *Frechites chischa* Zone. Although regarded as late Anisian in North America, some European authors (e.g., Mantrin and Mietto, 1995) advocate placing all occurrences of *Nevadites* in the early Ladinian. Thus, the presence of cf. *Paracrochordiceras* sp. and *Paranevadites* cf. *P. furlongi* (Smith) indicates a probable early to late Anisian or early Ladinian age for the Middle Triassic interval of the Antimonio Formation.

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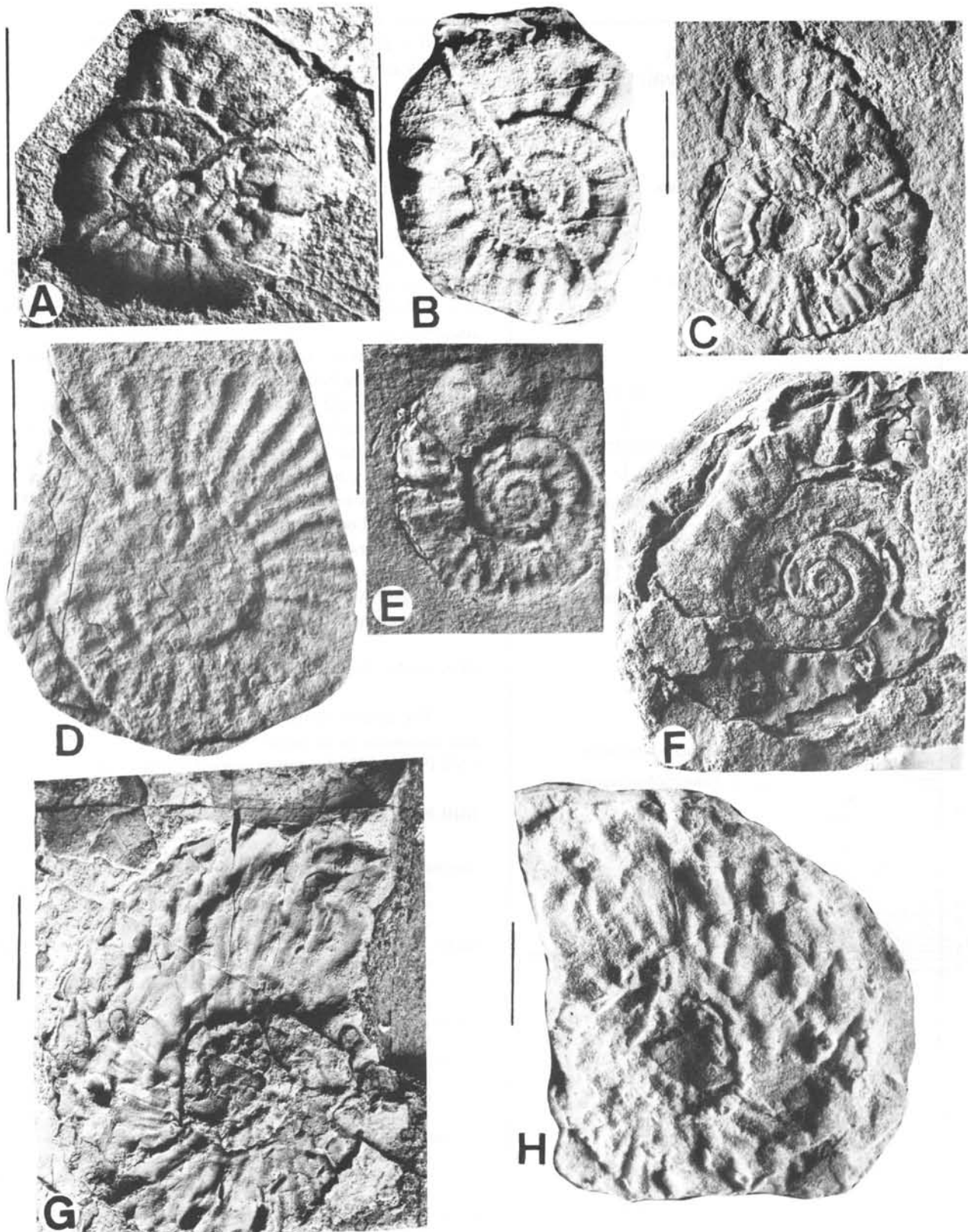


Figure 3. Selected Anisian ammonites from the Antimonio Formation. A–F: cf. *Parachordiceras* sp. from unit 9. A, B: ERNO-800, natural mold (A) and rubber peel (B) from mold; C: ERNO-840; D: ERNO-793; E: ERNO-790; F: ERNO-799. G, H: *Paranevadites* cf. *P. furlongi* (Smith) from unit 12, ERNO-846, natural mold (G) and rubber peel (H) from mold. All scale bars = 10 mm.

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