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The fossil fishes of the archaeological site of Palenque, Chiapas, southeastern Mexico

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ABSTRACT

Since the end of the nineteenth century, different remains of fossilized fishes had been observed or recovered from the Mayan City of Palenque. Although some efforts had been made to identify these objects, their taxonomical nature and possible origin within the geological environment of this archaeological site are poorly understood. In this work, we review these fossils recovered in Palenque and other two Mayan cities, Agua Clara and the El Lacandón, which are deposited into the collections of the Instituto Nacional de Antropología e Historia (Mexico); we describe the morphological characteristics that allow us to identify them taxonomically. This research also reports the results of a paleontological exploration through the different Paleocene-Miocene sedimentary geological units in the surroundings of Palenque; the fossils thus collected belong to the same groups of those found within the archaeological Maya context. These results suggest that such geological units are the sources of all these fossils. In this exercise, three types of anthropogenic features produced by the Maya people were discovered on the fossils. Paint stains and plaster spots suggest that these fossils were painted. The pronounced differential wearing marks in some regions along the cutting edges of shark teeth and ray tail spines show that these fossils were used as cutting tools. Besides, the surfaces excavated around fossils preserved in slabs demonstrate that some Maya people intended on discovering and recognizing these objects, as modern paleontologists do.

1. Introduction

At the end of the nineteenth century, Sapper (1896) reported the occurrence of "fossil fish remains in a very fine-grained limestone which resembles the lithographic stone of Solenhofen… used in the construction of Palenque". Fifty-five years later, Mulleried (1951) provided a superficial description of two fossils bearing rocks collected in this Maya site into the Chiapas State, southeastern Mexico. He recognized the Sapper's sample in a slab carrier of fish remains that "probably" belongs to the fossil genus *Pycnodus* Agassiz, 1833, as well as other unidentified fishes and some undetermined foraminifera. In concordance with the geological occurrence of *Pycnodus* known at that time, the Eocene age was suggested for this slab. The second Mulleried's sample, collected in an unreported building of Palenque site, bears "macro and micro-foraminifera (*Orbitollites*), gastropods, bivalves, and echinoid spines" that suggested the Middle Oligocene–Early Miocene age.

The authors of the present paper unsuccessfully tried to locate the specimens referred above. Our search included the collections of the Instituto Nacional de Antropología e Historia (INAH), Instituto de Geología (Igl, UNAM), and Instituto de Biología (IB, UNAM). Hence, now it is not possibly to analyze those samples because neither Sapper (1896) nor Mulleried (1951) provided data about the final deposit of such materials.

Since the firsts archaeological field investigations on Palenque, Ruz-Lhuillier (1958a–d, 1959) [under the advisement of Dr. Roberto Llamas, then Director of the IB, UNAM] and other authors reported the occurrence of fossil shark teeth and stingray spines from different primary (offerings and tombs) and secondary (building debris and ceremonial dumps) deposits in this ancient city (Borhegyi, 1961; Acosta, 1976; Fernández, 1991; González-Cruz, 1993; Olvera-Carrasco, 1997; López Bravo et al., 2003; Venegas-Duran, 2005). According to Cuevas-García (2008), the fossil nature of these materials was not originally recognized in some of these reports; hence, the possible patterns in the use of fossil elements in Maya rituals of Palenque had not been the target of accurate researches. The studies of these elements have implications for our understanding on the Mayan cosmology. The discovery of these fossils should encourage the launch of new research

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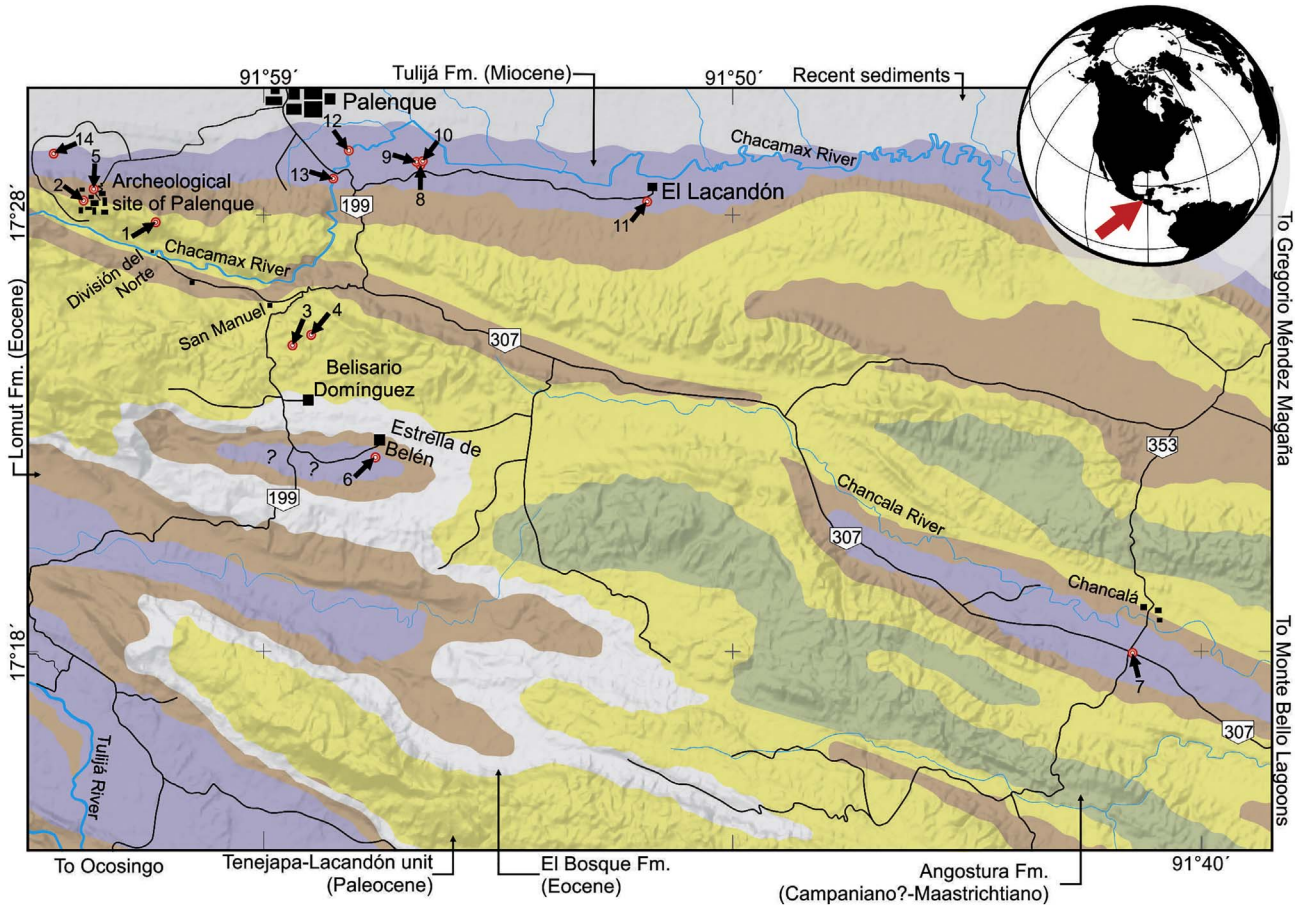

Fig. 1. Geologic map of the northern are of Chiapas showing the Sedimentary geological units around the archeological Paleque City and the paleontological sites prospected during in the present research. 1, División del Norte quarry (IGM-loc 3869); 2, Small ravine near Building XXVI of Palenque; 3, Gilberto Meneses quarry; 4, Belisario Domínguez (IGM-loc 3870); 5, Motiepá; 6, Estrella de Belén (IGM-loc 3900); 7, Chancalá (IGM-loc 3963); 8–10, El Gato (IGM-loc 3636); 11, Sánchez site; 12, Luis site (IGM-loc 3899); Río Chacamax (IGM-loc 3880); Don Eber site (IGM-loc 3879).

lines, so far overshadowed by the undue recognition of these paleontological materials found in surrounding Maya region of Chiapas.

In 2008, a joint INAH-UNAM research program was launched. The challenges of this archaeological-paleontological project were: 1) Discovering the taxonomical identity of the fossils recovered from Palenque and two surrounding archeological sites, the El Lacandón and Agua Clara, located to 20 km to the west and 26 km to the south of Palenque, respectively (Fig. 1); 2) Identifying the possible source of these fossils within the geological framework in northern Chiapas (Fig. 2); 3) Describing the archeological context associated to the findings of this fossils; and 4) Exploring the possible meaning of these objects within the different activities and beliefs recorded in the archaeological remains of this emblematic Maya site. The aim of the present manuscript is to provide the descriptions of these fossil remains collected in these archeological sites (Figs. 3–10, Table 1), update their taxonomical identity, and identify their possible source within the surrounding geological environment of Palenque.

1.1. The geological survey

Here, the geologic setting of Palenque is described to emphasize the possible geological source of those fossils referred in this study. In this section we also report, name, and provide the characteristics of the paleontological sites discovered in the present research.

Palenque is between the coordinates 17°29′21″-17°28′46″ N and 92°03′00″-92°02′46″ W. Its altitude is 105–223 masl. This pre-Hispanic Maya city is on the north side of the "El Mirador" hill, which represents the fold in the northwestern corner of the "Zona Sola" anticline, as well as the northern edge of "Sierra Madre Oriental de Chiapas" (Dengo, 1968) and the Reverse-Fault Province defined by Meneses-Rocha (2001). Thus, probably the most emblematic building of this archaeological site, the Temple of the Inscriptions looks northeast towards the Gulf Coastal Plain.

The geological environment of Palenque area involves outcrops of the Tenejapa-Lacandón unit; as well as the Lomut and Tulijá formations (Figs. 1, 2). The paleontological prospection performed along the present research included all these geological units. Fourteen paleontological sites were identified; now, some of them are recorded as IGM-loc (Table 1).

1.1.1. Tenejapa–Lacandón Unit (L-TU)

This sedimentary unit was informally named by Alvarado-Ortega et al. (2015), when they report the fossil fishes from the Belisario Domínguez and División del Norte quarries. These authors could not recognize the geological formation to which the sediments of these sites belong. This is because these sites share characteristics that previously were described for the Lacandón Formation or for Tenejapa Formation. Also, the limits of these coeval formations are not seen in the available geological maps (Servicio Geológico Mexicano, 2006a, 2006b).

Vinson (1962) named the Lacandón Formation based on a sequence of limestone sediments exposed at the west of Petén, Guatemala. Although, Quezada-Muñetón (1987) reported this formation in Chiapas; he named the Tenejapa Formation based on a sequence of cream-yellow brownish marls, limestones, and calcareous breccias with small bioclasts, flint bands and nodules. Based on lithological, paleontological, and structural data, Quezada-Muñetón (1987) concluded that these