

H. DIETER SCHREIBER

Faunal characterisation of Neogene and Pleistocene localities of the State Jalisco, Mexico

Abstract

The collection of the Museo de Paleontología de Guadalajara, Jalisco, Mexico (MPG) contains fossils of vertebrates from several localities in the State Jalisco, SW-Mexico. The localities are Miocene up to Pleistocene in age. Based on investigations during a visit at the MPG in 2003 a faunal list and a short characterisation of the faunal assemblage are presented in comparison to the localities Rancho la Brea (California, USA) and Mina (Nuevo León, NE-Mexico). Potential projects for further investigations on the fossil material and the localities are proposed.

Kurzfassung

Faunistische Charakterisierung von Neogenen und Pleistozänen Fundstellen des Staates Jalisco, Mexiko

Die Sammlung des Museo de Paleontología de Guadalajara, Jalisco, Mexico (MPG) umfasst Wirbeltierfossilien aus mehreren Fundstellen im Bundesstaat Jalisco, SW-Mexiko. Das Alter dieser Fundstellen reicht vom Miozän bis ins Pleistozän. Aufbauend auf den Untersuchungen während eines vierwöchigen Aufenthaltes in Guadalajara 2003 wird eine Faunenliste und kurze Charakterisierung der Faunenassoziation der Sammlung des MPG im Vergleich zu Rancho la Brea (Kalifornien, USA) und Mina (Nuevo León, NE-Mexico) präsentiert. Mögliche zukünftige Projekte zur weitergehenden Bearbeitung der Sammlung und Erforschung der Fundstelle werden formuliert.

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Introduction

The faunal characterisation based on the first visit at the Museo de Paleontología de Guadalajara, Jalisco, Mexico (MPG) in September and October 2003 concerning the agreement between the Museo del Desierto (Saltillo), Museo de Paleontología (Guadalajara), University of Karlsruhe (TH), and the State Museum of Natural History (Karlsruhe) for scientific exchange and support.

The objective of the visit to the MPG was the paleontological collection of Neogene and Pleistocene fossil remains from different localities in the State of Jalisco (Mexico). The aims were to meet colleagues and to check out potential future projects within the scientific framework and scientific support of the MPG.

The collection at the MPG (see fig. 1) contains fossil remains of vertebrates (Mammalia, Aves, Reptilia, Amphibia, Pisces) and plant remains (e.g. siliceous wood) from Miocene up to late Pleistocene localities. Unfortunately, precise coordinates of the localities or strata of most fossils are unknown. Whereas coordinates and stratum are reported for a skeleton of a recently excavated gomphotherid, the lack of precise details on the fossil sites and in consequence their ages is a result of the historic origin of the collection.

Origin of the collection

Fossil remains were always the special private interest of Federico A. Solórzano Barreto, an engineer of pharmacology and chemistry, who for 50 years collected fossil remains from Neogene and Quaternary in the State of Jalisco and especially Guadalajara. After a short time he became known as a person being interested in 'old bones', which occasionally were found by people in the countryside. Over the years most of the fossil material was donated to him. In these circumstances detailed information about the fossil sites, such as stratigraphic and taphonomic information, are largely lacking.

During the last decade, interest in the collection on the part of official institutions, especially the University of Guadalajara, has increased, but no decisions have been made for the future of the collection. Only the most complete material became a part of the exhibition in the Museo Regional de Guadalajara. Later on the City of Guadalajara offered Mr. Solórzano Barreto a building in the Parque Agua Azul to store the collection and to create a museum that would serve as an institution for educational and scientific work on the fossils from the region of Jalisco. This Museum was opened in February 2000 as the Museo de Paleontología de Guadalajara (MPG) with the support of the City of Guadalajara and the Instituto Nacional de Antropología e Historia (INAH). Diana Solórzano Perez, the daughter of Mr. Solórzano Barreto, became the first director.

Museo de Paleontología de Guadalajara (MPG)

During the last three years the Museo de Paleontología has established itself as a place for scientific education and paleontological research. In addition to the permanent exhibition, public services are enhanced by temporary exhibitions (e.g. an exhibition about osteopathological diseases in the prehispanic population of Jalisco). A recently excavated complete skeleton of a gomphotherid became a part of the collection. It will be described scientifically, published, and subsequently mounted in the exhibition.

The internal organisation of the museum at the time of the visit was divided in the curatorial (fig. 2), and educational departments, one graphic designer, technicians, and the administration. Director: Diana Solórzano Perez, curatorial staff: Javier Juárez (Curator), Ricardo Aguilar Alonso (working on Elephantidae), Óscar Rojas Santana (working on Equidae, Aves), Martha Castrejón (working on Camelidae), Juan Baez Corpuss (working on Tayassuidae).

Geology of the region and the fossil sites

The basement in the region of Guadalajara is a result of tectonic developments since the Cretaceous (see FERRARI et al. 2000). It is a composite of the Paleogene volcanic rocks of the Sierra Madre Occidental (SMO) in the north, of the mainly Mesozoic volcanic rocks of the Jalisco Block (JB) in the south, and of the Plio-Pleistocene volcanic rocks of the western Mexican Volcanic Belt (MVB) between them. As a result of tectonic movement in the continental crust, a graben system developed in the boundary area of the SMO,

the MVB, and the JB and filled with Plio-Pleistocene fluvial and lacustrine deposits. Today the lakes of Atonilco, Zacoalco, San Marcos, Chapala and Sayula are present indications that the widespread intramontane basin system was temporarily occupied by lakes. Most of the fossil sites, like Chapala, Zacoalco, Teocoltán, and Juchitlán, which yielded the main part of the assemblage in the MPG collection, are genetically associated with the graben system. Those deposits represent mainly palaeo-lakes connected by rivers, which existed at certain times in the basins.

Overview of the faunal assemblage in the collection Besides complete skeletons (*Mammuthus*, *Stegomastodon*, *Neochoceros*), isolated skulls, mandibles, isolated teeth, postcranial material and bone fragments occur in a huge range of stages of bone preservation. Additionally the material shows different colours from white, brown colours, reddish and yellowish to black. All together, a provisional summary allows the conclusion that the fossils very likely come from different sites in the region of Guadalajara which should be distinguishable by taphonomical reasons. There should be sites with low energy lacustrine, reducing environments yielding articulated dark coloured skeletons (e.g. Lake Chapala or Zacoalco), and higher energy, fluvial, more oxidising environments with isolated (disarticulated), light coloured bones (probably like Juchitlán).

The most detailed investigations on different material to achieve an overview and some details of the sample have started with tooth material of the Gomphotheridae (pl. 1a) and Elephantidae (pl. 1b), been continued with tooth material of Equidae (pl. 1c), Camelidae (pl. 1d), and finally with material of Rhinocerotidae (pl. 1e). A first unpublished faunal list

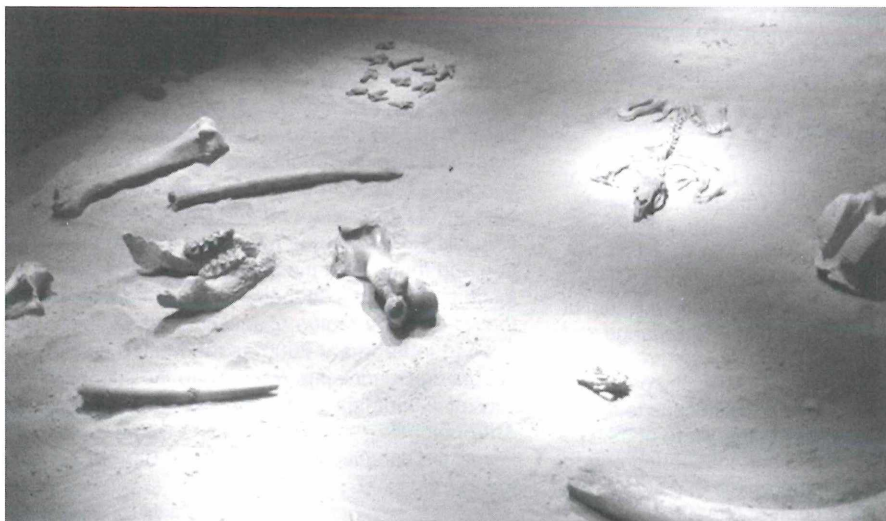


Fig. 1: Fossil sample from Chapala in the exhibition of the MPG. - All Photos D. SCHREIBER.

was made by Federico A. SOLÓRZANO BARRETO (1977) (taxa mentioned in his list are marked here with *). Additional information comes from the Museo Regional de Guadalajara (marked with **). Some taxa in the sample are assigned to localities (in the exhibition): Tecolotlán (Te), Juchitlán (Ju), Atotonilco el Bajo (At), Venustiano Carranza (Ve), Chapala, Zacoalco (CZ). Today the collection at the MPG contains the following taxa (known as of October 2003):

Marsupialia	? <i>Didelphis</i> sp.	
Insectivora	?	
Chiroptera		
Primates	<i>Homo sapiens</i> *	
Carnivora	<i>Felis</i> (= <i>Profelis</i>) <i>concolor</i> *	
	– <i>Felis panthera</i> *	
	<i>Smilodon</i> sp. (<i>californicus</i> *, **)	CZ
	<i>Lutra canadensis</i> *	
	<i>Conepatus mesoleucos</i> *	
	<i>Canis lupus</i> *	CZ
	<i>Canis latrans</i> *, **	
	<i>Osteoborus cyonoides</i>	Ju
	<i>Procyon lotor</i> *	
	<i>Arctodus pristinus</i> *, **	
Rodentia	<i>Cynomys mexicanus</i> *	
	? <i>Sigmodon hispidus</i> *	
	<i>Neochocerus</i> sp. *	At, CZ
Lagomorpha	<i>Sylvilagus</i> *	
	Leporidae indet.	
Artiodactyla	<i>Platygonus ticuli</i> *	CZ
	<i>Camelops</i> sp. *	
	<i>Camelops hesternus</i>	At, CZ
	<i>Camelops traviswhitei</i>	
	<i>Hemiauchenia</i> sp.	
	<i>Alforjas</i> sp.	
	? <i>Titanotylopus</i> sp.	
	<i>Megatylopus</i> sp.	
	<i>Lama</i> sp. *	
	<i>Tetrameryx</i> sp. (*, <i>conglinki</i> **)	CZ
	<i>Hexameryx</i> sp.	Ju
	<i>Hexobelomeryx</i> sp. *	
	<i>Odocoileus virginianus</i> *	CZ
	<i>Odocoileus hemionus</i> *	
	– <i>Cervus intertuberculatus</i> *	
	<i>Bison</i> sp. (<i>cheneyi</i> *, **)	At
Cetacea	indet.	
Perissodactyla		
	? <i>Tapirus tarijensis</i> *	
	<i>Teleoceras fossiger</i> *	Te, Ju
	<i>Nannippus</i> sp. (<i>minor</i> *)	Te
	<i>Astrohippus stockii</i>	Te
	<i>Dinohippus mexicanus</i>	Te
	<i>Equus</i> sp. CZ	
	? <i>Equus caballus</i> **	
	<i>Equus mexicanus</i> (<i>Asinus mexicanus</i> *)	At
	<i>Equus conversidens</i> *	
	<i>Equus simplicidens</i>	
	<i>Equus complicatus</i>	
Proboscidea	<i>Cuvieronius</i> sp.	CZ
	<i>Stegomastodon</i> cf. <i>primitivus</i>	
	<i>Stegomastodon</i> cf. <i>mirificus</i> (Chapala specimen)	
	<i>Mammuthus columbi</i> (<i>Elephas columbi</i> *) At, CZ	
	? – <i>Mastodon serridens</i> *	

Xenarthra		
	<i>Eremotherium laurillardii</i>	Ve
	<i>Glyptotherium cylindricum</i>	
	(<i>Brachyotracocon cylindricus</i> *) [pl. 1g]	CZ
	<i>Megatherium</i> sp. (<i>americanus</i> ? *)	
	<i>Glossotherium</i> sp. (<i>herlani</i> *, **) [pl. 1f]	
	? <i>Dasyops novemcinctus</i> *	
	? <i>Holmesina septentrionalis</i> *	
	? <i>Megalonyx jeffersoni</i> *	Ve
	? <i>Nothotherium shastense</i> *	Ve
Aves		
	<i>Pelecanus erythrorhynchos</i> *	
	– <i>Mycteria wetmorei</i> *	
	<i>Phalacrocorax</i> sp. *	
	<i>Phalacrocorax olivaceus</i> *	CZ
	<i>Phoenicopterus</i> sp. *	
	<i>Phoenicopterus ruber</i> *	
	– <i>Chen hyperborea</i> *	
	– <i>Buteogallus fragilis</i> *	
	– <i>Ptiliymbus baryosteus</i> *	
	<i>Ardea herodias</i> *	
	– <i>Anas acuta</i> *	
	– <i>Aythya affinis</i> *	
Chelonalia	<i>Chelonalia</i> indet.	Te
	<i>Chelone</i> sp. *	
	<i>Pseudemys</i> (= <i>Trachemys</i>) <i>scripta</i>	CZ
	<i>Pseudemys</i> (= <i>Trachemys</i>) sp.	
	<i>Kinosternon</i> sp.	
Squamata	<i>Natrix</i> sp. *	
Crocodylia	<i>Crocodylia</i> indet.	Te
	<i>Caiman</i> sp. *	
Amphibia	<i>Rana</i> sp. *	CZ
Osteichthyes	<i>Salmo</i> sp.	
	– <i>Maxostema poecilurum</i> *	
	– <i>Algansea tincella</i> *	
	– <i>Chirostoma lucius</i> *	
	– <i>Chapalichthys encaustus</i> *	
	<i>Micropterus relictus</i> *	
	<i>Ictalurus dugesi</i> *	CZ
	<i>Ictalurus spodioides</i>	CZ
	– <i>Tapatia occidentalis</i>	Amatitán, Miocene
Mollusca		indet.
Arthropoda	Crustacea indet. *	
Plantae	<i>Pinus</i> sp. *	
	– <i>Graminea</i>	
	<i>Quercus</i> *	
Ichnofossils	**	
	[~ unclear synonymy]	

Furthermore the collection contains a large number of vertebrate bone material with traces of animal actions (bite marks, gnawing traces) and certainly also by humans (cuttings, drillings and smashings). A vertebra of a whale found in the Chapala region was likely to have been dislocated by humans, because there are no marine deposits in that region.

The bulk of the fossils derives from the lake deposits of Chapala and Zacoalco, and is considered to be late Pleistocene in age. The asphalt deposits of Rancho la Brea in the region of Los Angeles yielded a huge number of late Pleistocene fossil remains and a rich record of biodiversity at that time slot (see STOCK 1992). Ran-



Figur 2: 'Visible' collection in the Curaduría of the MPG.

cho la Brea was selected to characterise the Rancholabrean Land Mammal Age (SAVAGE 1951). In comparison with the vertebrate fauna of Rancho la Brea, the collection at the MPG shows the following features.

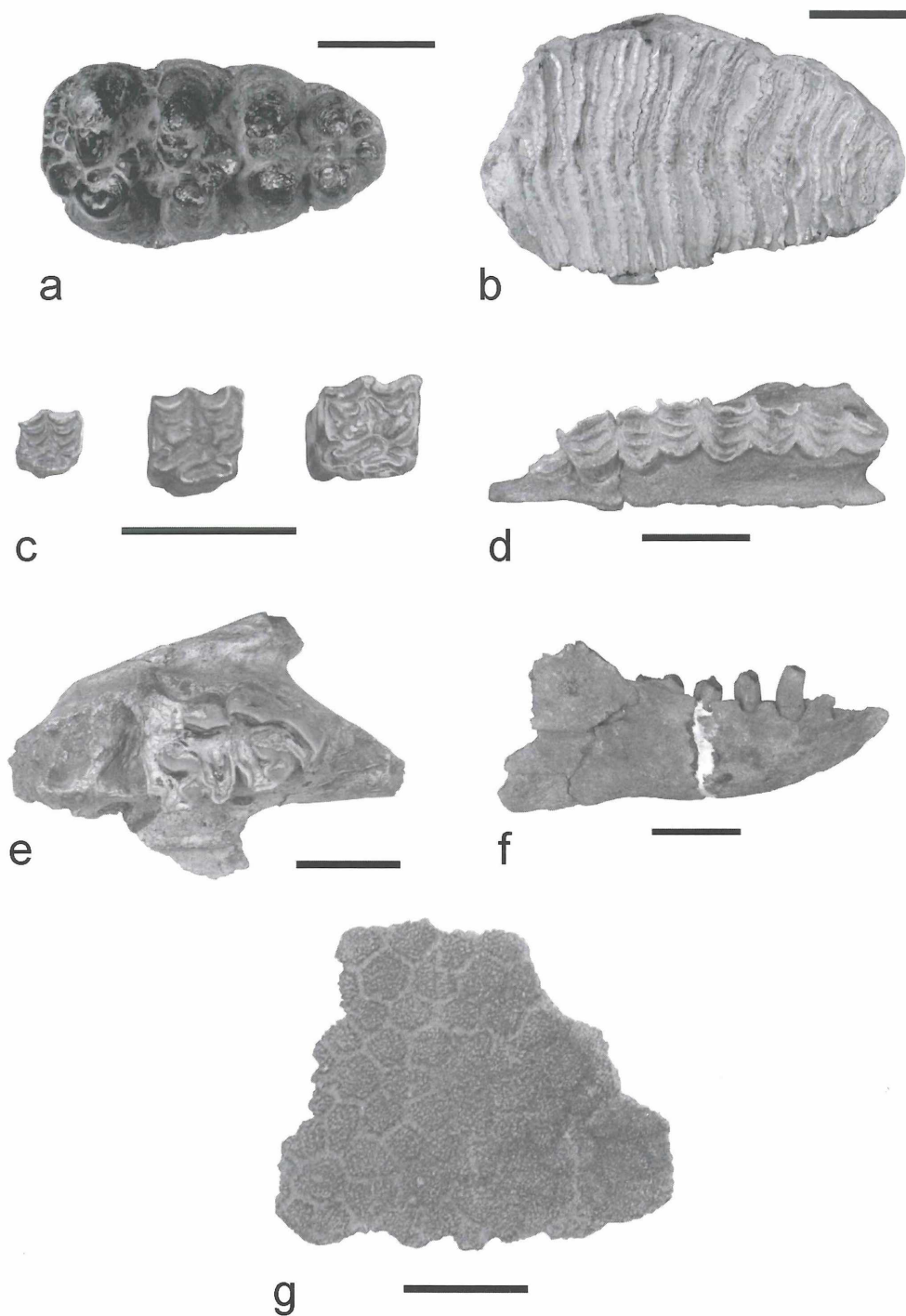
The taxa *Felis concolor*, *Canis lupus*, *Canis latrans*, *Procyon lotor*, *Sylvilagus*, *Camelops hesternus*, *Hemiauchenia*, *Odocoileus hemionus*, *Equus conversidens*, *Mammuthus columbi*, *Megalonyx jeffersoni*, *Nothrotheriops shastensis*, *Glossotherium herlani*, *Phalacrocorax*, and *Rana* occur at both fossil sites. The genera *Smilodon*, *Arctodus*, *Platygonus*, *Cervus*, *Bison*, *Tapirus* occur at both sites, but with different species. The taxa *Cynomys mexicanus*, *?Sigmodon hispidus*, *Neochoerus* sp., *Camelops traviswhitei*, *?Titanotylopus*, *Alforjas* sp., *Megatylopus* sp., *Odocoileus virginianus*, *Tetrameryx* sp., *Hexameryx* sp., *Nannipus minor*, *Astrohippus stockii*, *Dinohippus mexicanus*, *Equus mexicanus*, *Equus simplicidens*, *Equus complicatus*, *Teleoceras fossiger*, *Cuvieronius* sp., *Stegomastodon* cf. *primitivus*, *Stegomastodon* cf. *mirificus*, *?Dasypus novemcinctus*, *?Holmesia septentrionalis*, *Glyptotherium cylindricum*, and *Crocodylia* occur only in the collection of the MPG. This greater number of taxa which don't occur in Rancho la Brea suggests that the faunal assemblage of the MPG contains more than late Pleistocene taxa. In fact some of these taxa [*?Sigmodon hispidus* referred to the late

Pliocene (CARROLL 1993), *Alforjas*, *Megatylopus*, *Hexameryx*, *Nannipus* referred the Miocene (CARROLL 1993), *Teleoceras* from the early Pliocene (PROTHERO 1998), *Glyptotherium cylindricum* from the late Pliocene and early Pleistocene (CARROLL 1993)] verify the occurrence of older stratigraphical elements in the collection.

Of course a general taxonomic revision of the collection in the MPG is still pending, and a lot of nomenclatural differences could be the result of taxonomic problems. Also the many taxa, like Talpidae, Soricidae, Chiroptera, Lynx, Mustelidae, *Canis dirus*, *Canis familiaris*, *Ursus*, *Spermophilus*, Geomyidae, Heteromyidae, Cricetidae, *Lepus*, *Capromeryx*, *Antilocapra*, *Euceratherium*, *Ovis*, *Mammut (americanum)*, Lacertilia, Urodela, and Pisces, which occur at Rancho la Brea, but are not yet recognised in the Jalisco-sample, show that a revision of the assemblage at the MPG is certainly worthwhile. The comparison between both fossil sites promise a great potential of more detailed taxonomic and stratigraphic data in the MPG-collection.

In distinction to the MPG-collection *Mammuthus jeffersoni* occurs in the north Mexican locality Mina (NW Monterrey, Nuevo León, Mexico, Valley of Rio Salinas, near the ford of Paso de Lobo, see FRANZEN 1993) [by its tooth pattern a higher derived elephantoid species as *Mammuthus columbi* in North America]. The main faunal assemblage of Mina is similar or equivalent to

Plate 1: a. *Stegomastodon*, M3, sin., occlusal view; b. *Mammuthus columbi*, M3, sin., occlusal view; c. Equidae, M1 or M2, dex., occlusal view; d. Camelidae, fragmentary maxilla with P3-M3, sin., occlusal view; e. Rhinocerotidae, fragmentary maxilla with M2-M3, sin., occlusal view; f. *Glossotherium*, mandible, dex., buccal view; g. *Glyptotherium*, fragment of the carapax, dorsal view. Scale 50 mm.



the MPG-collection. Excluding taxonomic or nomenclatural problems, the difference seems to be an expression of either different stratigraphic position or different climatic conditions between northeast and southwest Mexico or both.

The faunal assemblage of the Jalisco region fills a gap in the faunal history of North America. It contributes decisive information to the understanding of the faunal history and the history of migration patterns in the New World, determined by the geographical position of Jalisco between North and South America with different climatic conditions today and in the past, with Neogene and Quaternary fossil sites yielding a fossil record before, during, and after the faunal interchange between North and South America in the late Pliocene. These aspects make the collection at the MPG and the fossil sites in Jalisco a crucial piece of the puzzle.

Potential projects

Future scientific objectives should comprise surveys to locate the fossil sites according to the preservation status as well as the investigation for precise geographical, geological and stratigraphical data in the different areas. The next step after the rediscovery of the probable sites should be excavations. The most promising regions for such a survey are:

- Chapala, and Zacoalco for Pleistocene material and
- Juchitlán, and Tecolotlán for Pliocene and Pleistocene material.

The aim of the excavations would be to get information about the geological and sedimentary setting of the fossil sites, stratigraphical data, samples for geochronological dating, stratified fossils, taphonomical data, and a model (composite hypothesis) for the preservation of fossils. Within that dataset, it should be possible to identify the probable localities of the fossil remains in the collection. In that case, a successful survey for potential localities would establish the scientific value of the fossil assemblage from the fossil sites of Jalisco.

Acknowledgements

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