



How is the paleontological heritage of Mexico and other Latin American countries protected?

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Abstract

The paleontological heritage of Mexico consists of the fossil specimens housed in scientific collections (movable heritage), as well as those found in fossiliferous localities throughout the country's territory (immovable heritage). Since 1986, as stated in the Federal Law on Monuments and Archaeological, Artistic and Historical Zones, the National Institute of Anthropology and History is in charge of protecting fossils discovered in Mexico. Fossils are considered cultural heritage by law in several Latin American countries, such as Argentina, Chile, El Salvador, Peru, and Mexico. However, this classification is not the most adequate because it does not guarantee its comprehensive protection. In other countries, such as Spain, discussions have emerged as to whether paleontological heritage could be considered natural heritage, with all its legal implications. There is no law in Mexico defining the criteria for considering fossil sites as objects of protection; however, there are various instruments that allow their registration and therefore, a proposal for their long-term management and protection. Nonetheless, paleontologists working on Mexican territory must be committed to comply with the requirements already established by the law for the registration of paleontological movable and immovable property. With this, it is possible to improve and adapt the instruments and legal processes that allow the safeguarding of Mexico's paleontological heritage.

Keywords: INAH, fossil protection, fossil record, legislation, Mexico.

Resumen

El patrimonio paleontológico de México consta de los ejemplares de fósiles resguardados en colecciones (bienes muebles), así como las localidades fosilíferas que existen en el territorio nacional (bienes inmuebles). Desde 1986, tal y como se declara en la Ley Federal sobre Monumentos y Zonas Arqueológico, Artístico e Histórico, el Instituto Nacional de Antropología e Historia es el encargado de la protección de los fósiles descubiertos en México. Legalmente, los fósiles se consideran como patrimonio cultural en varios países de América Latina, como Argentina, Chile, El Salvador, Perú y México. Esta clasificación no es la más satisfactoria ya que no garantiza su protección integral. En otros países, como España, se ha discutido si se considera como patrimonio natural, con sus implicaciones legales. Por otro lado, en México no hay una ley que defina los criterios para considerar a los sitios fosilíferos como sujetos de protección, empero, existen diversos instrumentos que permiten su registro y con ello, proponer su manejo y protección a largo plazo. Sin embargo, es necesario el compromiso de los paleontólogos que trabajan en territorio mexicano para cumplir con los requisitos ya establecidos en la ley para el registro de bienes muebles e inmuebles paleontológicos. Con ello, se podrán mejorar y adecuar los instrumentos y procesos legales que permitan salvaguardar el patrimonio paleontológico mexicano.

Palabras clave: INAH, legislación, México, protección de fósiles, registro fósil.

1. Introduction

The importance of paleontological record is undeniable; fossils can be appreciated for their scientific, social, aesthetic, or educational values. Some countries have focused their efforts to guarantee the long-term preservation of their paleontological resources. However, these procedures are frequently ambiguous and unclear, hindering the primary objective of granting protection to fossil resources for the long term.

In Mexico, the legal framework around fossil specimens and fossiliferous localities protection is set by the National Institute of Anthropology and History (INAH, Instituto Nacional de Antropología e Historia, in Spanish), a bureau created in 1939. The institute is the national agency in charge of research, conservation and promotion of Mexico's archaeological, anthropological, historical, and paleontological heritage. Despite the vast fossil diversity across the Mexican territory, it seems that legal protection of this paleontological heritage is not enough to guarantee the safety of these resources.

In an effort to initiate an academic and fruitful discussion of the strengths and weakness of the legal situation of Mexican fossils resources, the objectives of this text are: 1) to review the background related to worldwide protection of paleontological resources as a cultural or natural heritage, 2) to review the paleontological heritage legislation in some Latin American countries (whose eligibility was established by the availability of information and personal interviews), and 3) to discuss the advances and setbacks in legislation regarding the protection and preservation of Mexican fossil resources.

2. The dichotomy of paleontological heritage as cultural and natural heritage

The concept of "heritage" has its origins in Roman law; heritage implies "a set of heritable goods from parents, in a wide sense. It must be preserved for present and future persons, which impose loads and duties, and restricts its availability" (García Pimienta, 2018). Recognition of heritage implies that values and relevant meaning for the development of society are imputed to these goods (Giles Pacheco and Mata Almonte, 2018). Under this consideration, paleontological heritage involves long-term preservation, involving future generations as stewards in its management, use and achievement.

Paleontological heritage is composed of two elements: a set of fossiliferous outcrops (immovable heritage) and a set of collections of specimens, museums and exhibitions with paleontological material used for research, educational, or social popularization purposes (movable heritage) (Prado, 2008) (Figure 1).

"Cultural heritage" and "Natural heritage" represent two basic definitions for understanding the legal status of

fossil resource protections worldwide. A historical review of how the concept of "heritage" came about can be found in Endere (2008). According to UNESCO (2017), the term cultural heritage encompasses several main categories of heritage: tangible cultural heritage (movable and immovable cultural heritage) and intangible cultural heritage. Fossil specimens are considered cultural heritage and natural heritage. Morales (2019) discussed this topic extensively; however, we highlight the main issues of this dichotomy.

The first article of the UNESCO Convention of the Means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property -from 1970- states that "cultural heritage" includes "rare collections and specimens of fauna, flora, minerals, and anatomy, and objects of "palaeontological interest". The concept "paleontological interest" is mentioned in this text, without a proper definition. However, it is defined in other texts as the "capacity of a fossil or a fossil set to provide scientific information" (Ministerio de Cultura de Perú, 2014).

On the other hand, the term "natural heritage" includes "natural sites with cultural aspects such as cultural landscapes, physical, biological or geological formations" (UNESCO, 2017). Since the fossil record is inseparable from the geological environment, it can be argued that the protection of fossil resources could be framed as part of the natural heritage because fossils are natural objects, not created by humans (Prado, 2008).

Stemming from statements within UNESCO's Convention of the Means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property, the existing legislation in many countries considers that paleontological heritage is included in "cultural heritage". For this reason, in legal terms, paleontological resources are equated to objects with non-similar origin and nature, like archaeological and historical artifacts.

The omission of the paleontological heritage in several definitions and procedures is a significant gap in subsequent documents produced by UNESCO after 1970. The concept is not mentioned in key documents, such as the "Convention Concerning the Protection of the World Cultural and Natural Heritage" (UNESCO, 1972) or the manuals "Managing Cultural World Heritage" (UNESCO, 2014a) and "Managing Natural World Heritage" (UNESCO, 2014b). In this text, fossils are only mentioned when they are part of a geological formation or site.

As mentioned, legal protection of fossil records is similar in many countries, like Argentina, Chile, and Mexico. In other countries, like Spain, an academic debate has begun, namely whether paleontological heritage must be included either as part of a cultural or of natural heritage (e.g. Martín-González, 2014; Aranda Quirós, 2018; Fernández Martínez and García-Ortiz de Landaluce, 2018; Leñero Bohórquez, 2018), and the administrative and legal implications of this designation.

In the last few years, alternative concepts have emerged with the objective of creating a comprehensive vision of

fossil resources in nature. For example, “Earth Heritage” encompasses geological and geomorphological heritage of the Earth (Glasser, 2001). A more popular concept is “Geoheritage”, referred to as the diversity of minerals, rocks and fossils, and petrogenetic features that indicate the origin and/or alteration of minerals, rocks and fossils. It also includes landforms and other geomorphological features that illustrate the effects of present and past effects of climate and Earth forces (Brocx and Semeniuk, 2007). Although these concepts are frequently mentioned in academic texts worldwide, they do not transcend to the legal domain. As we will discuss below, the predominant criteria for legislation in many countries is to consider paleontological heritage as “cultural heritage”.

3. Paleontological legislation in Argentina

Paleontology has a long tradition in Argentina, mainly vertebrate paleontology (Endere and Prado, 2014; Fernández *et al.*, 2014). Efforts for legal safeguards of the paleontological and archaeological heritage of Argentina’s legal system date back to the mid-nineteenth century. They include specific laws as well as regulations in the Argentinean Constitution and Civil Code (Fernández *et al.*, 2014).

Fernández *et al.* (2014), and the references therein, present a concise and complete synthesis of the legislative framework in Argentina and its historical development. Argentinean heritage legislation not only jointly regulates archaeological and paleontological heritage (Law 25.743/2003) but also considers them as part of the public domain of the state (Civil Code from 1968, Article 2339 inc. 9 and Article 2340). This means that any fossil of scientific interest is eligible for protection, no matter its size, abundance, completeness, or any other criteria. In practice, all fossils are considered public property, because even if some specimens might be regarded as irrelevant –under the current scientific perspective- nowadays, they may become significant in the future.

In Argentina, the site-based conservation approach has traditionally been adopted by legislation. Under National Law 25.743 and the Civil Code (Articles 2339 and 2340), the federal government conferred legal protection to paleontological sites of scientific interest. Fossil sites may also be protected in national parks and natural reserves under the jurisdiction of the National Park Administration created by Law 22.351/1980.

Electronic archives regarding legislation and administrative processes related to the protection of fossil resources are available in the electronic page of Bernardino Rivadavia Argentinian Museum of Natural Sciences (Museo

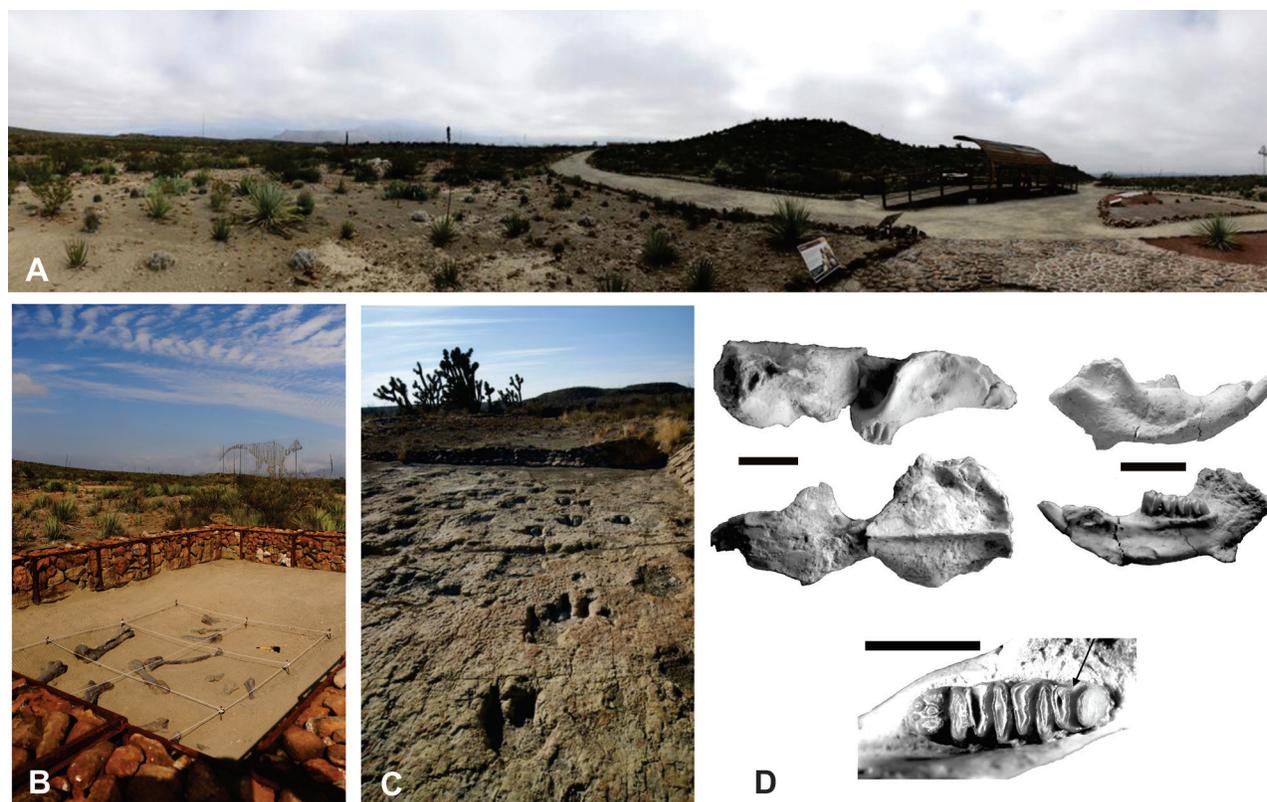


Figure 1. Examples of movable and immovable heritage. A) Panoramic view of Rincón Colorado, Coahuila (immovable heritage); B) Paleontological excavation in the protected site of Rincón Colorado, Coahuila; C) Panoramic view of Las Águilas, Coahuila (immovable heritage); D) Holotype of *Gregorymys veloxikua*, housed at Universidad del Mar (movable heritage). Figures 1B and 1C, authorship of Mauricio Marat.

Argentino de Ciencias Naturales Bernardino Rivadavia, or MACN) (<http://www.macnconicet.gob.ar/el-museo/autoridad-de-aplicacion-nacional-aan-de-la-ley-25-743-en-materia-paleontologica/>). This branch of government is the National Application Authority regarding the protection of paleontological and archeological heritage. According to Argentinian law, no fossil specimen from Argentina can be transported outside the territory without a permit from MACN. Moreover, non-Argentinian fossils can be introduced into this country but not without a permit. Administrative processes are detailed in the same electronic page of the MACN.

The 200-year old main repository of fossil specimens in Argentina belongs to MACN. Nowadays, every province has its own paleontological collections. It is mandatory for any person who extracts a fossil from any province to deposit the specimen in a collection of the same province. Laws regarding the preservation, protection and conservation in every province are available online in the electronic page of MACN (<http://www.macnconicet.gob.ar/el-museo/autoridad-de-aplicacion-nacional-aan-de-la-ley-25-743-en-materia-paleontologica/>).

These laws have protected not only the fossiliferous heritage within Argentina territory. Antarctic fossiliferous specimens are deposited in several collections around the world (Reguero, 2019), including museums and institutes in Argentina and Chile. The Repositorio Antártico de Colecciones Paleontológicas y Geológicas (Antarctic Repository of Paleontological and Geological Collections) was created in 2015, for the purpose of meeting legal requirements of National Legislation 25.743. This repository is the responsibility of the Instituto Antártico Argentino (Argentinian Antarctic Institute; IAA, for its acronym in Spanish) through disposition DNA N° 9" T"/15 from October 1st, 2015 (Dirección Nacional del Antártico, 2019). Argentina's legislation protects Antarctic fossil specimens housed in collections within its territory.

4. Paleontological legislation in Chile

Several pieces of legislation regulate the protection and conservation of paleontological heritage in Chile. There are three main instruments regarding fossil record legal protection: Law 17.288 from National Monuments, Supreme Decree 484 of 1990, Regulation about Archaeological, Anthropological, and Paleontological Excavations and/or Prospections, and Pascua Las 16.441 of 1996. Laws archives, electronic documents and formats of administrative processes are available on the electronic page of National Monuments of Chile Council (Consejo de Monumentos Nacionales de Chile, or CMN) (<https://www.monumentos.gob.cl/servicios/tramites/tramites-patrimonio-paleontologico>).

Archaeological and paleontological items are covered under the same legislation, with no distinction between

them. Paleontological artifacts are considered national monuments, as it is mandated in Law 17.288. Regulations on excavations and/or archaeological, anthropological and paleontological surveys are contained in the Supreme Decree No. 484 of 1990 of the Ministry of Education, published in the Official Gazette April 2nd, 1991.

As far as international agreements under UNESCO's convention related to the import and export of Cultural Items of 1970, Chile did not ratify the convention until recently (April 14th, 2014).

As an additional measure, Chile has tasked the National Monuments Council (Consejo de Monumentos Nacionales, in Spanish) with the "effective" protection of fossil and archaeological records. Recently, this agency presented a project focused on the development of cartography to be used in the protection of prehistoric heritage from industrial and urban spread (González Isla, 2016).

5. Paleontological protection in Peru

As is the case in other countries in Latin America, paleontological resources in Peru have been recognized since the intervention of foreign naturalists (mainly Europeans) during the XIX century (Chacaltana, 2019). In spite of this historical development, paleontological heritage legislation is limited. Vildoso Morales (2012) mentions the lack of an effective law for the protection of fossils as a major problem; theoretically, Peru has had a law giving formal protection to fossils and fossil sites starting in 2002.

As in many other countries, paleontological heritage in Peru is considered cultural heritage. It is mentioned in the first article of Law 26576: "General Law of Cultural Heritage of the Nation" (Ley General del Patrimonio Cultural de la Nación, in Spanish) stating that paleontological goods belong to this category. This law forbids the sale of fossils (specially vertebrates) (Ministerio de Cultura de Perú, 2014).

Law 28296 adds fossils to the cultural heritage of the nation as a good with "importance, value and paleontological significance", without further explanation of the term. The Culture Ministry (Ministerio de Cultura) is the entity responsible for the cultural heritage of Peru (Ministerio de Cultura de Perú, 2014).

Even when there are many institutions with scientific groups focused on the study of fossils, like the Universidad Nacional Mayor de San Marcos and the Museo de Historia Natural of the same university, Peru lacks a major institution in charge of paleontological heritage management and legislation (Chacaltana, 2019).

A great weakness in the Peruvian legal system was the lack of a database of institutions holding paleontological collections (Alleman and Benavente, 2006). Regarding immovable heritage, paleontological sites are identified, registered and declared as a Cultural Heritage of the Nation. Nowadays, there are 239 paleontological sites in all of

the Peruvian territory: five have been declared as cultural heritage of the Nation, eleven sites are registered, 85 sites are in the identification phase, and 138 sites are in the initial phase of identification (Ministerio de Cultura de Perú, 2020).

At this time, there is a proposal for a General Law of Paleontological Heritage of the Nation and the Paleontological Outcrops (*Ley General del Patrimonio Paleontológico de la Nación y de los Yacimientos Paleontológicos*, in Spanish) (Available at: https://leyes.congreso.gob.pe/Documentos/2016_2021/Proyectos_de_Ley_y_de_Resoluciones_Legislativas/Proyectos_Firmas_digitales/PL05994.pdf). There is no more information available about the advances of this initiative.

6. Paleontological protection in El Salvador

The Special Law of the Cultural Heritage of El Salvador (*Ley Especial al Patrimonio Cultural de El Salvador*, in Spanish) mentions in its second and third articles that paleontological goods are considered part of its cultural heritage.

The Museo de Historia Natural de El Salvador is the main repository of national collections of Paleontology, Zoology and Botany. The institution has the faculty for administration, rescue, research, recognition, identification, conservation, promotion, development, outreach and evaluation of movable and immovable goods as Cultural Heritage of Natural Origin of El Salvador (Ministerio de Cultura de El Salvador, 2020).

In this country, a figure known as “monitor” is the person responsible for monitoring the conservation and protection states of paleontological sites declared cultural heritage (Ministerio de Cultura de El Salvador, 2020). Through the processes of Cultural Valuation application, the registration of paleontological sites has been increased from nine to 48, throughout El Salvador’s territory (Molina Leddy, 2019). Two sites are declared Cultural Heritage of El Salvador (Alvarenga Láinez, 2019).

7. Paleontological protection in Mexico

Paleontological heritage legislation in Mexico is regulated by the National Institute of Anthropology and History (INAH, in Spanish; Aguilar-Arellano and Alvarado-Mendoza, 2020).

Regarding paleontological movable heritage, the article 28 Bis of the Federal Law of Archaeological, Artistic, and Historical Monuments and Zones (*Ley Federal sobre Monumentos y Zonas Arqueológicas, Artísticas e Históricas*) states that fossil remains within the Mexican territory are under the legal care and custody of INAH. Specifically, the article’s language states that “For the effects of this Law and their Regulation, the provisions regarding archaeological monuments and zones will be applicable to

fossil vestiges or remains of organic beings (“meaning fossil specimens”) that inhabited our national territory in the past, and their research, conservation, restoration, recovery or utilization are of paleontological interest...”

Mexican legislation about immovable paleontological heritage is precarious. Rincón Colorado (located in Coahuila de Zaragoza, northern Mexico) is the only protected fossiliferous site in Mexico (Figures 1A and 1B). However, its official recognition has been long and difficult. Since the figure of “fossiliferous site” is not included in the present legislation, its registration was made through a card for archaeological sites. One of the requirements is to have a delimited area, which is not always easy to establish in fossiliferous sites. Considering all the technical aspects involved in the polygonal delimitation of archaeological zones: 1) locality choice, 2) definition of the paleontological area within the polygonal contours, 3) the technical file compilation, and 4) the elaboration of the declaratory proposal (Escartín Adam, 2009; Aguilar-Arellano, 2015), Rincón Colorado was decreed to be a Natural Protected Area with character of paleontological zone by the state government of Coahuila (Estado de Coahuila, 2013). Other fossiliferous sites are registered in the Single System of Public Registry of Archaeological and Historical Monuments and Zones, a database described below. These sites have not been given protected status, unlike Rincón Colorado.

An essential tool to regulate the management of the cultural heritage of Mexico is the database Single System of Public Registry of Archaeological and Historical Monuments and Zones (*Sistema Único de Registro Público de Monumentos y Zonas Arqueológicas e Históricas*, in Spanish). This database contains information related to the Mexican movable and immovable heritage, including paleontological heritage. The Department of Public Registry of Archaeological and Historical Monuments and Zones (DRPMZAH, Dirección de Registro Público de Monumentos y Zonas Arqueológicas e Históricas, in Spanish) is responsible for hosting and keeping this database. Movable heritage must be identified, described and recorded with an official number to be included in the database. Geological and physical characteristics of the fossiliferous outcrops or localities (immovable heritage) are also registered in the database (Figure 1C). Registry of the paleontological heritage allows their legal protection in several circumstances, including robbery, involuntary or voluntary destruction.

In order to reinforce the criteria and procedures for the protection of the Mexican fossil record, the Council of Paleontology (*Consejo de Paleontología*, in Spanish) was created in 1994. This council coordinated several efforts to organize the actions and procedures to regulate the protection of Mexican fossil resources (Aguilar-Arellano and Alvarado-Mendoza, 2020). The council was dissolved in 2000, but it was recently reactivated, in 2017. At this time, the regulations and documents proposed by the members

of the council are under review by the Internal Regulatory Improvement Committee (Comité de Mejora Regulatoria Interna, in Spanish) of INAH. This Committee is in charge of reviewing the current provisions regarding regulatory documents for their future approval and application, before their official publication. Once the documents are published by the Council of Paleontology, the regulation can be put into practice.

8. A reflection about the ongoing protection of paleontological heritage in Mexico

Few attempts have been made to establish binding international agreements in an effort to control or manage paleontological heritage (Page, 2018). For example, to take international cooperation, the International Institute for the Unification of Private Law (UNIDROIT) -an independent intergovernmental organization- was asked by UNESCO to develop the Convention on Stolen or Illegally Exported Cultural Objects (1995), as a complementary instrument to the 1970 Convention. In the UNIDROIT Convention, States commit to a uniform treatment for restitution of stolen or illegally exported cultural objects and allow restitution claims to be processed directly through the national courts (<http://www.unesco.org/new/en/culture/themes/illicit-trafficking-of-cultural-property/1995-unidroit-convention/>). Unfortunately, Mexico is not part of this convention.

After the Convention of the Means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property adoption at world level in 1972, a World Heritage List was proposed (natural, cultural, or mixed sites) (Available in <https://whc.unesco.org/>). Several sites with fossiliferous outcrops were declared as a part of this compendium, like Joggins Fossil Cliffs in Canada, and Chengjian Fossil Site in China. Sites included in this list have a degree of protection that allows their long-term conservation. Unfortunately, no Mexican site by its fossiliferous richness has been included in this list, despite the great potential of paleontological localities in Mexico.

Paleontological heritage protection in Mexico is restricted to the Federal Law of Archaeological, Artistic, and Historical Monuments and Zones. Also, fossils are considered national heritage into the General Law of National Goods (Ley General de Bienes Nacionales, in Spanish). It would be highly appropriate for individual Mexican states to also protect their fossils, similar to the efforts contained in Argentinean legislation.

Despite efforts by DRPMZAH, the registry of many fossil specimens and fossiliferous sites are scanty. There are only three scientific collections in Mexican educative institutions with paleontological movable heritage registered in the Single System of Public Registry of Archaeological and Historical Monuments and Zones: the National Paleontological Collection (housed at the Geology Institute, UNAM), an ichnofossil specimens collection

(housed at the Engineering Faculty, UNAM), and the Paleontological Collection (housed at the Paleobiology Laboratory, Universidad del Mar) (Cano, 2020; personal communication) (Figure 1D). Despite the interest and enthusiasm of many paleontologists, administrative issues or indifference of the collections managers delay the registry of other scientific collections housed in Mexican universities.

Another couple of non-academic collections, like the Paleontological Collection at the Paleontology Museum of Guadalajara, and some Chiapas museums, have registered their fossil specimens as movable heritage. Some amber collections managed by private individuals, are also registered. This meager inventory impedes the scientific evaluation and the protection of the universe of paleontological fossils across the Mexican territory.

Regarding fossiliferous sites, besides Rincón Colorado, there are approximately 113 registered localities with paleontological specimens. It is reasonable to consider that these sites are not representative of the vast Mexican territory with fossiliferous outcrops. The registry depends on researches support: a co-responsibility is established by the DRPMZAH and the paleontologists, who are responsible for registering their study areas. It is important to encourage Mexican researchers to register their localities in order to obtain a database. This database will be useful in future studies, as in archaeological localities.

The diverse and significant geological heritage in many states of Mexico has been examined in academic journals (*e.g.* Gaitán Morán and Álvarez Arellano, 2009; Palacio-Prieto, 2014; Silva-García *et al.*, 2019). These studies demonstrate the richness and abundance of the geological and geomorphological features of the Mexican lithology. However, the natural correlation of geological and paleontological resources has not permeated to administrative levels, guarantying the whole preservation of both heritages.

Laws to Mexican paleontological heritage are insufficient to protect this resource; the little that exists does not allow its adequate execution. An academic discussion about the management and long-term preservation of the Mexican paleontological heritage is urgently needed, both at practitioner and at a legislation level. Moreover, Mexico needs legislative authorities with capacity, knowledge, and sensibility to face paleontological heritage protection's complex scene. As many other countries, like Chile or El Salvador, the academic initiatives for the protection of paleontological heritage in Mexico have been paused when they have been presented to federal authorities for their approval.

A small number of efforts and the good will of Mexican paleontologists may be not enough to guarantee the safeguarding of fossils. Nowadays, several bureaucratic actions of the current federal government include considerable funding reductions to INAH's operating budget and economic resources for scientific research in Mexico. This surely will have a devastating influence in the short-

or even, mid- term in meeting adequate protection needs of Mexico's paleontological heritage.

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