Vertebrados Marinos Fósiles en Panamá

Carlos De Gracia, M.Sc.
Centro de Paleontología y Arqueología Tropical, STRI

Smithsonian

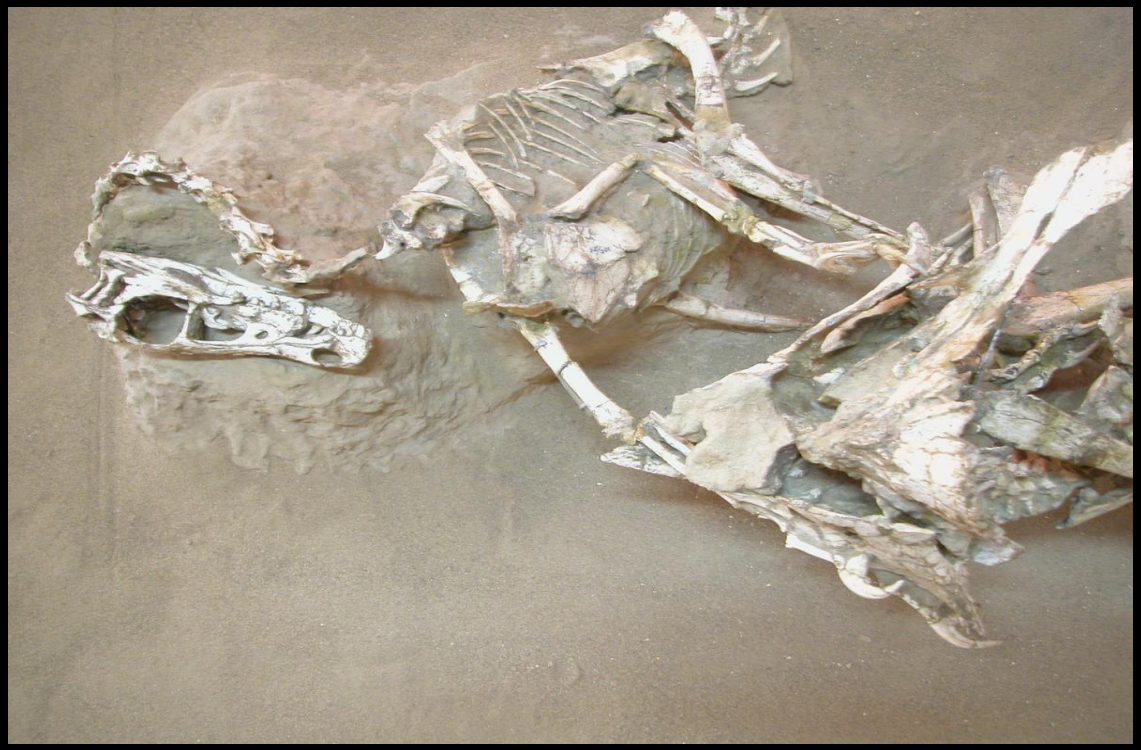
Paleontología

Paleontología

Paleos = antiguo

Ontos = vida

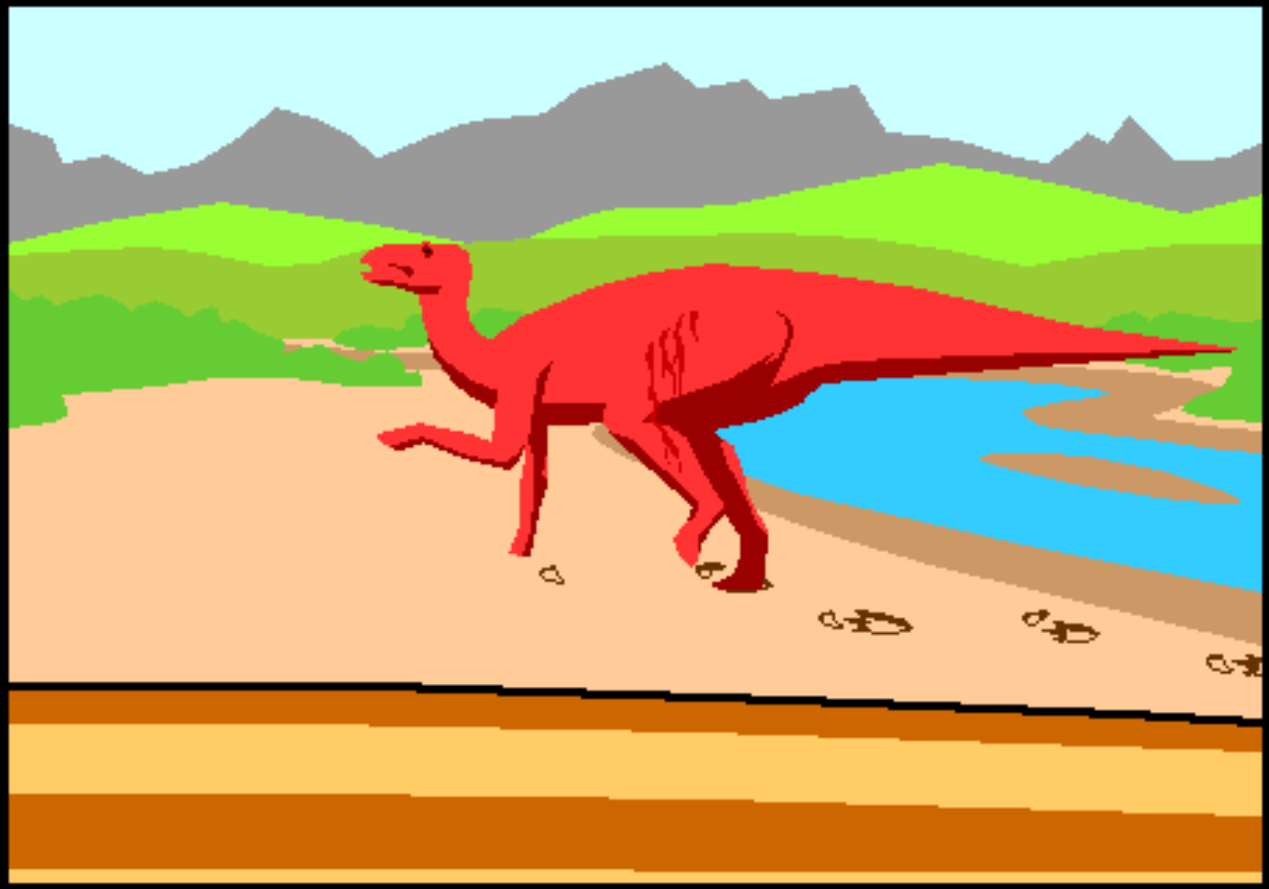
Logo = estudio

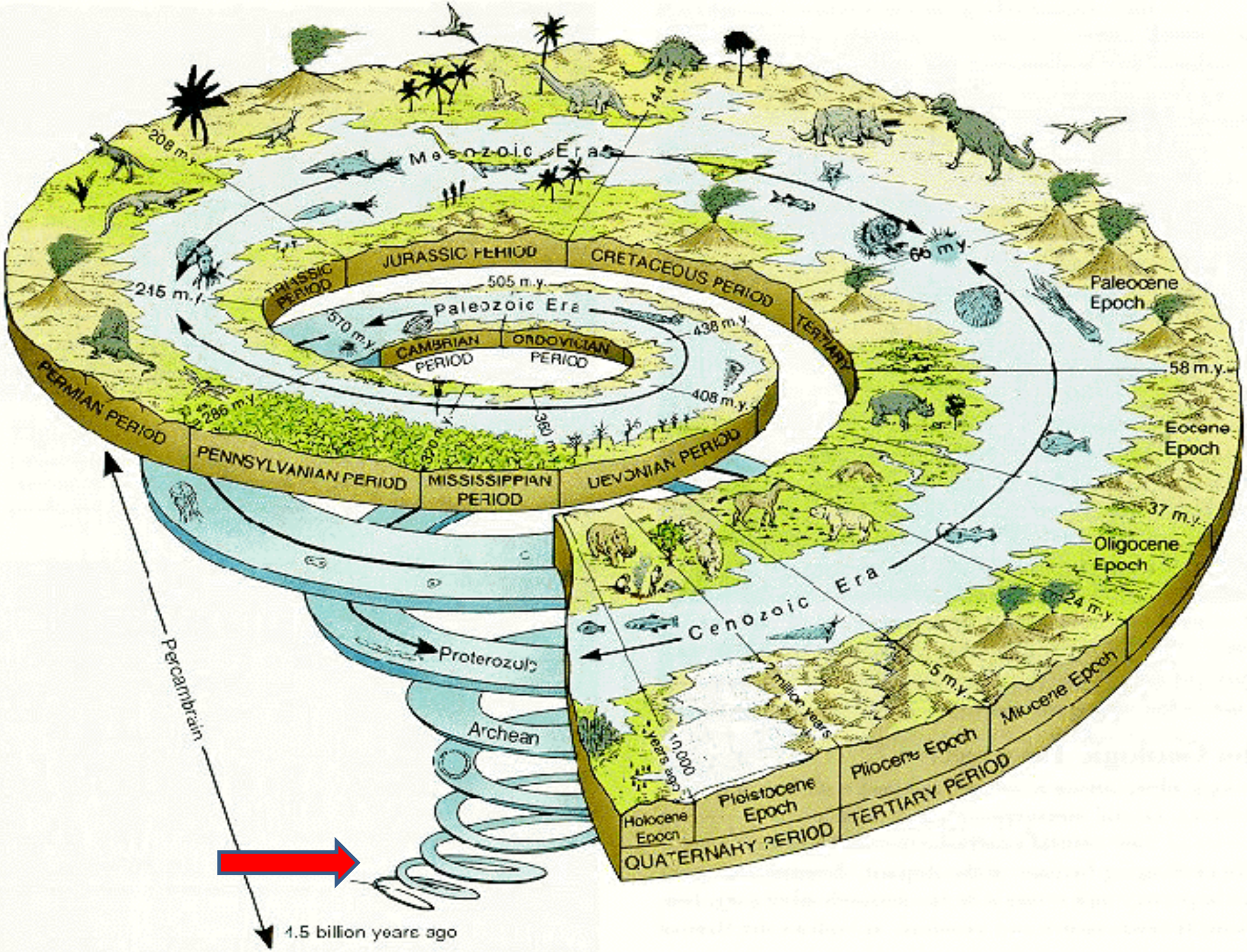


El par luchador, Barsbold 1974

Es la ciencia que estudia e interpreta el pasado de la vida sobre la Tierra a través de los fósiles. Se encuadra dentro de las Ciencias Naturales, posee un cuerpo de doctrina propio y comparte fundamentos y métodos con la Geología y la Biología, con las que se integra estrechamente.

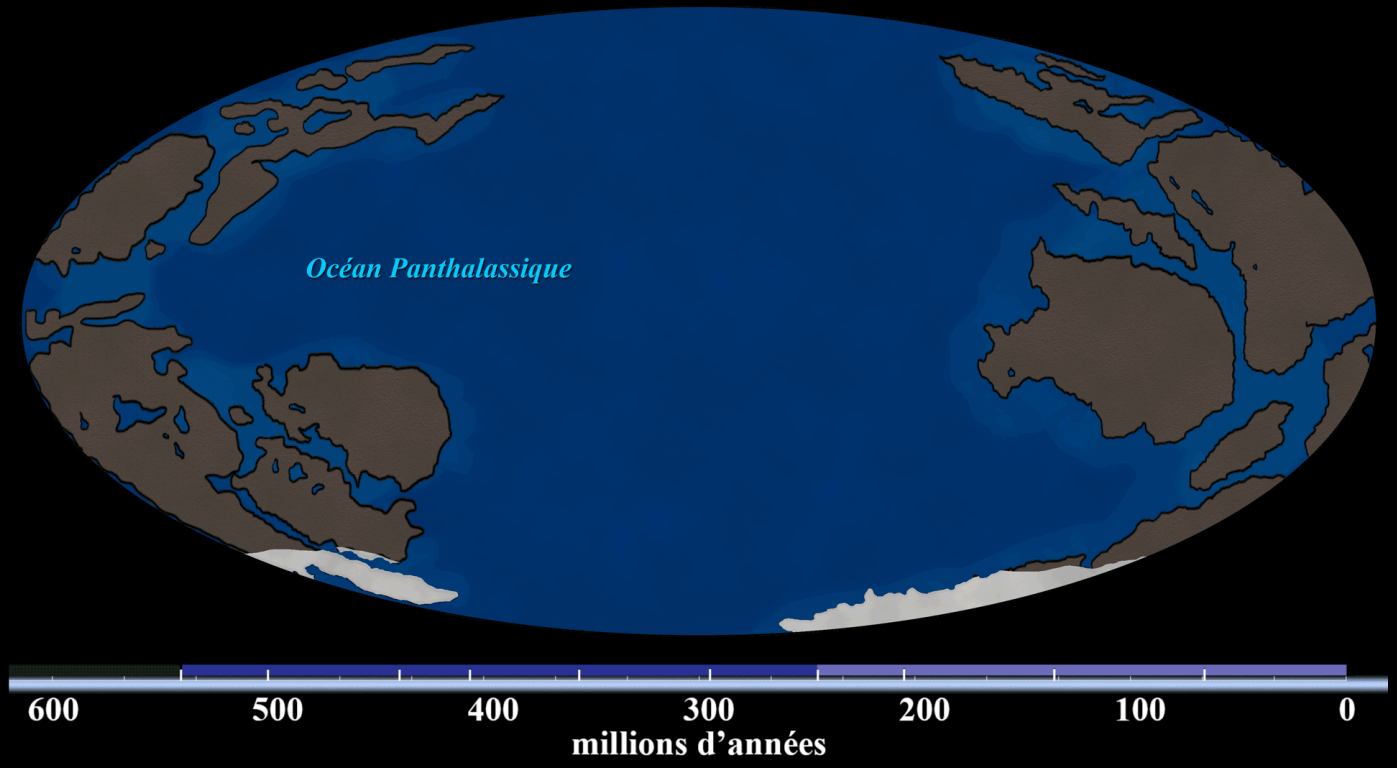
El proceso de fosilización




Mesozoic Era
208 m.y.
144 m.y.
66 m.y.
215 m.y.
505 m.y.
Paleozoic Era
570 m.y.
438 m.y.
408 m.y.
360 m.y.
320 m.y.
286 m.y.
TRIASSIC PERIOD
JURASSIC PERIOD
CRETACEOUS PERIOD
TERTIARY
CAMBRIAN PERIOD
ORDOVICIAN PERIOD
PERMIAN PERIOD
PENNSYLVANIAN PERIOD
MISSISSIPPIAN PERIOD
DEVONIAN PERIOD
Paleocene Epoch
58 m.y.
Eocene Epoch
37 m.y.
Oligocene Epoch
24 m.y.
Cenozoic Era
5 m.y.
Miocene Epoch
Pliocene Epoch
TERTIARY PERIOD
million years
10,000 years ago
Holocene Epoch
Pleistocene Epoch
QUATERNARY PERIOD
Proterozoic
Archean
Precambrian
1.5 billion years ago

Movimientos de la tierra

Tectónica de Placas



Paleontología en el trópico

Canal de Panamá

Bosque Tropical en Colombia

En zonas tropicales la historia es diferente

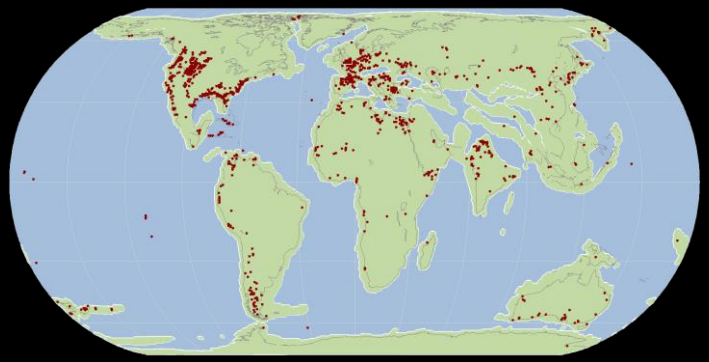
Reconocer la oportunidad

2009

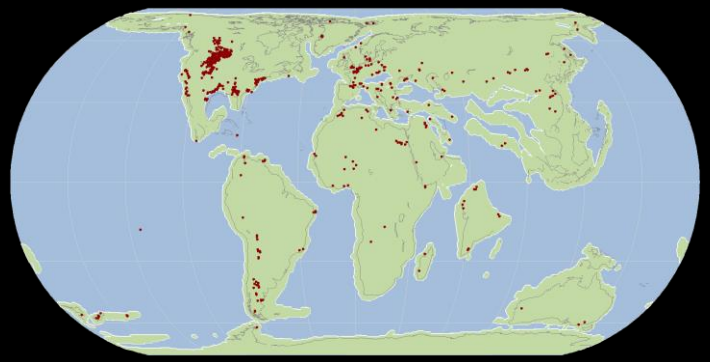
2013

¡Las exposiciones de roca fresca desaparecen rápidamente!

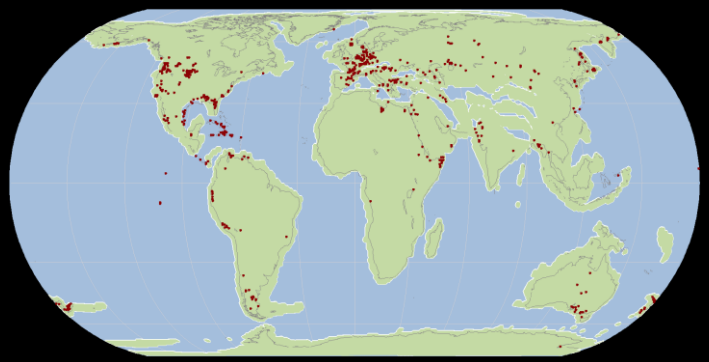
Ocurrencia de colecciones de fósiles en el Cenozoico en la base de datos de paleobiología 2013



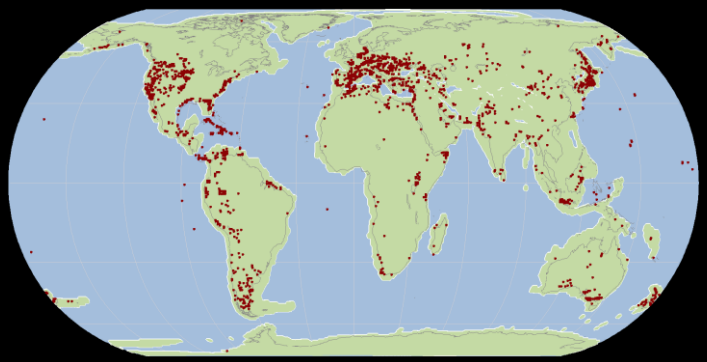
Paleoceno (66-56 Ma)



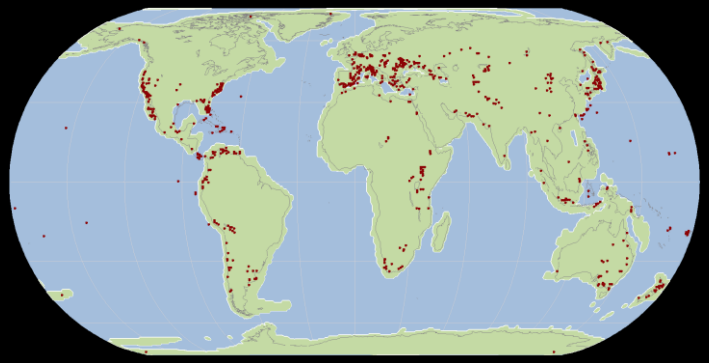
Eoceno (56-33.9 Ma)



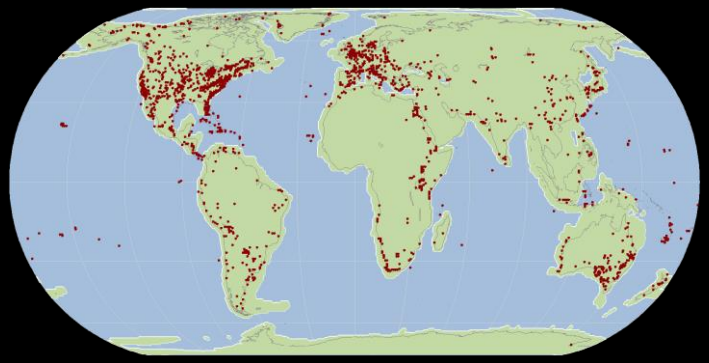
Oligoceno (33-23 Ma)



Mioceno (23-5.3Ma)



Plioceno (5.3 -2.5Ma)



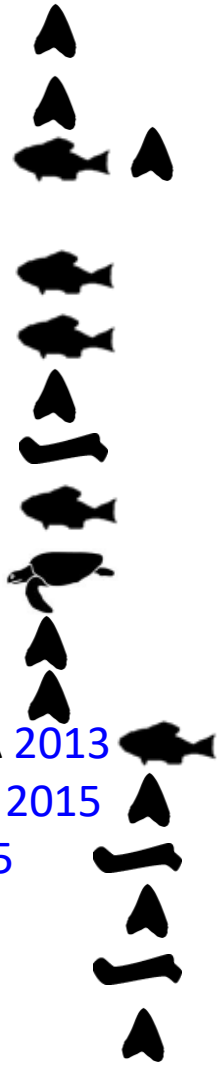
Pelistoceno (+2.5Ma)

PALEONTOLOGÍA DE VERTEBRADOS MARINOS

REGISTROS Y NUEVOS AVANCES EN PANAMÁ

PUBLICACIONES SOBRE VERTEBRADOS MARINOS FÓSILES EN PANAMÁ

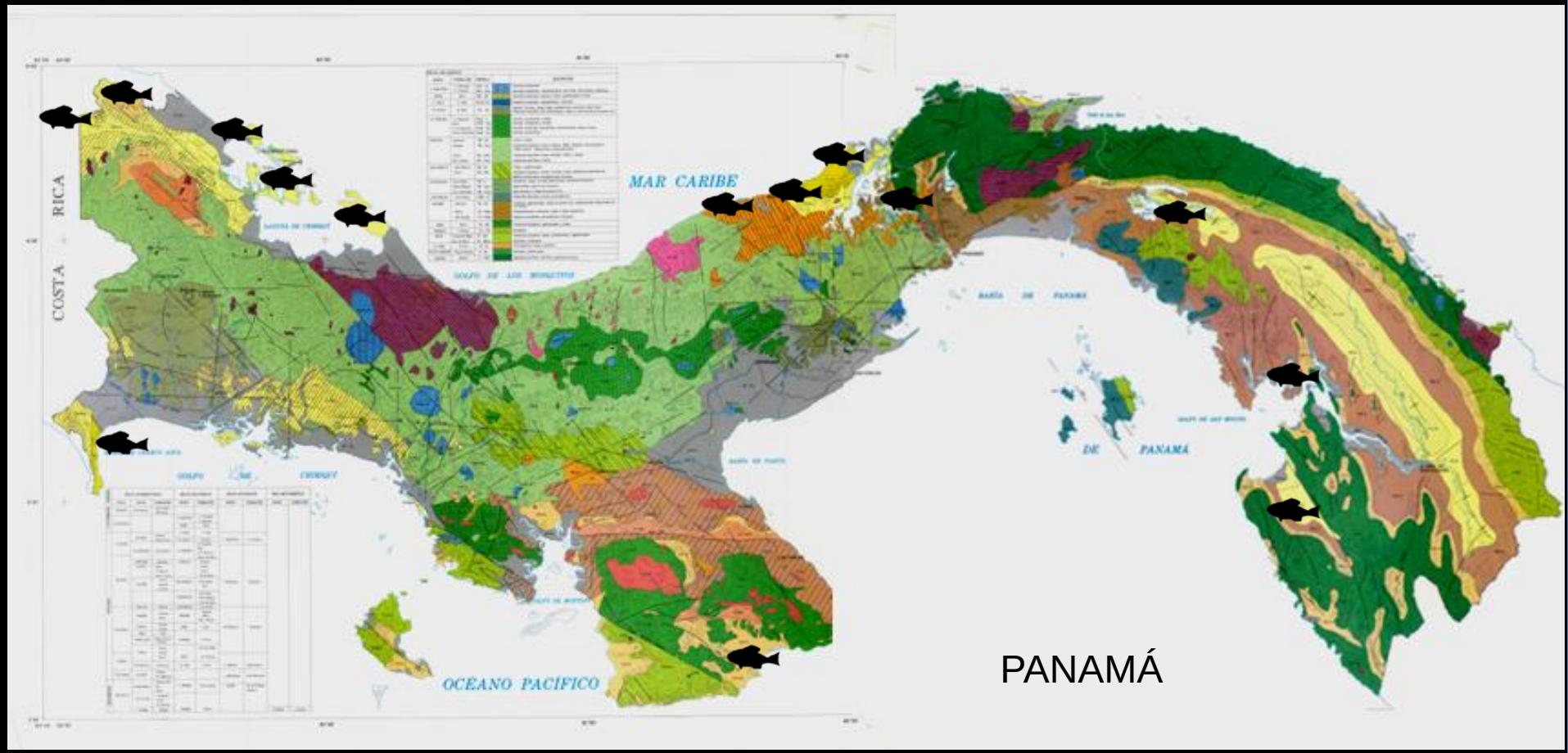
1. BLAKE, 1862
2. GILLETTE, 1984
3. AGUILERA Y RODRIGUES DE AGUILERA, 1999
4. COLLINS *ET AL*., 1999
5. MARTÍN Y DUNN, 2000
6. PIMIENTO *ET AL*., 2010
7. UHEN *ET AL*., 2010
8. AGUILERA *ET AL*., 2011
9. CADENA *ET AL*., 2012
10. PIMIENTO *ET AL*., 2013A
11. PIMIENTO *ET AL*., 2013B
12. SCHWARZHANS Y AGUILERA 2013
13. CARRILLO – BRICEÑO *ET AL*. 2015
14. VELEZ – JUARBE ET AL., 2015
15. Vasquez & Pimiento, 2015
16. PYENSON ET AL., 2015
17. PEREZ *ET AL.,* 2017.



Mioceno Temprano (Tuira y Culebra)
Mioceno Medio (Chucunaque y Valiente)
Mioceno Medio a Mioceno Tardío (Gatún)
Mioceno Tardío (Nancy Point, Chagres y Uscari)
Mioceno tardío a Plioceno
Temprano (Shark Hole Point y Tobabe)
Plioceno (Cayo Agua y escudo de Veraguas)
Pleistoceno Tardío (Isla Pájaros)

Culebra (Canal de Panamá)
Gatún (Colón)
Burica, Bocas del Toro, Gatún y Chagres

Fósiles de vertebrados marinos



Historia de los vertebrados del Chagres

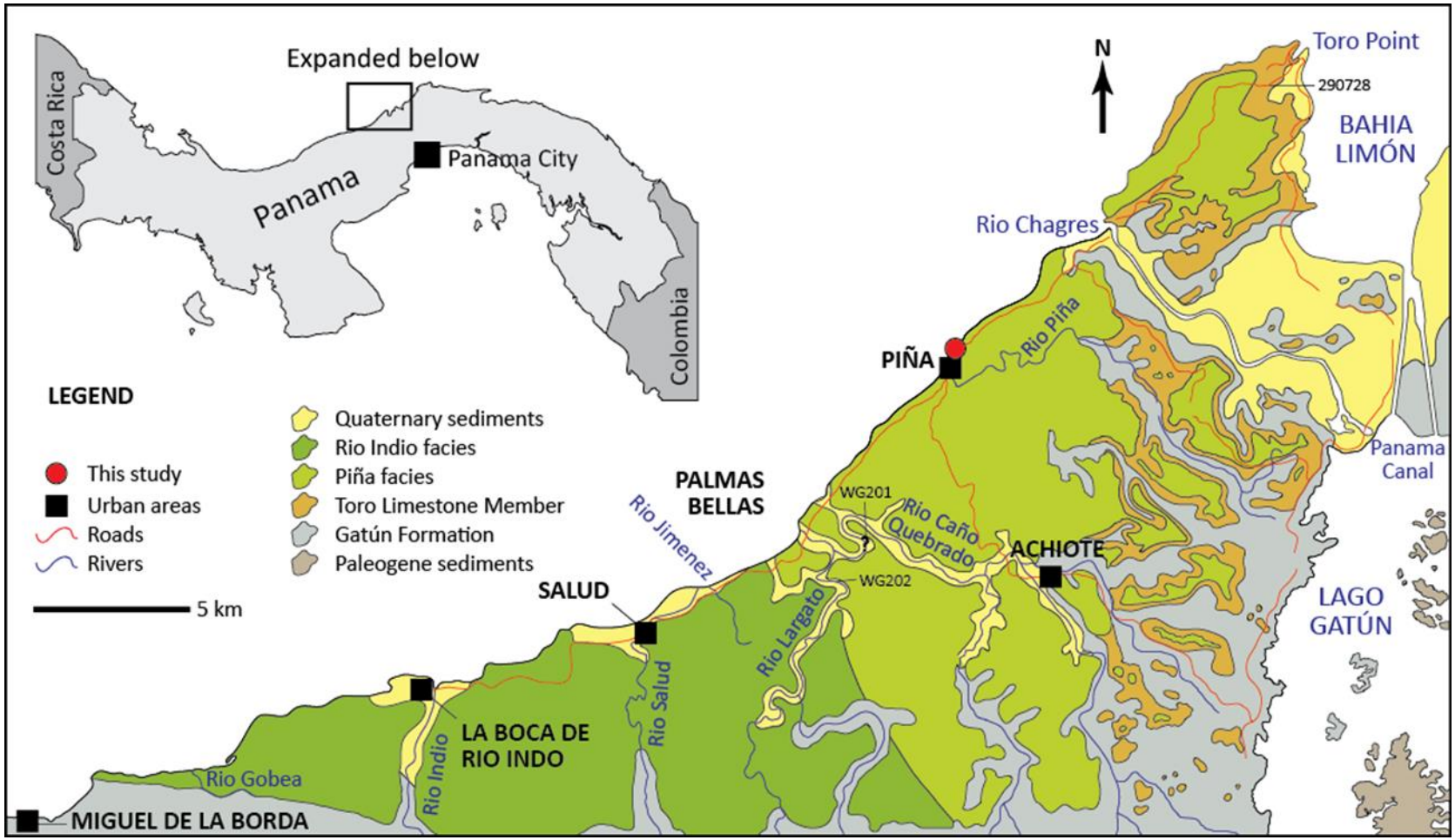
SEPTIEMBRE 2008

Fuertes y continuas lluvias provocaron la crecida de los ríos en Costa Abajo Colón causando inundaciones y la caída del puente sobre Río Indio.

Marzo 2009: Nuevas exposiciones de roca fresca,
presencia de abundantes invertebrados y evidencia de vertebrados

Istiophoridae gen sp. indt.

El siguiente paso: revisar el mapa geológico



Formación Chagres (McDonals 1913)

Mioceno Tardío (8.3 -5.3 Ma) - Piña facies 5.3Ma

1978 No. 1 **COPEIA** February 10

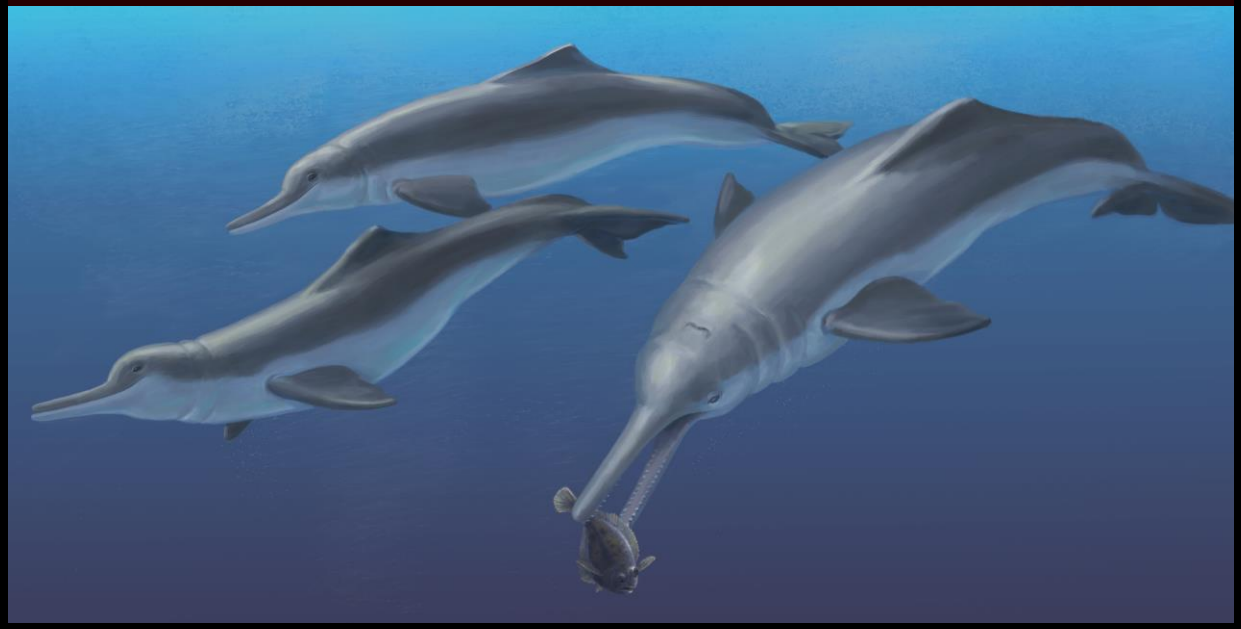
A New Marlin, *Makaira panamensis*, from the Late Miocene of Panama

HARRY L. FIERSTINE

Makaira panamensis **new sp. is described from a single neurocranium found in the Chagres Sandstone (Late Miocene) of the Atlantic coast of Panama. The new species is closely related to and possibly ancestral to the extant *M. indica* (black marlin) and *M. nigricans* (blue marlin). It differs from both by possessing a triangular rather than elongate basioccipital foramen, large nutrient canals in the rostrum and probably a more elongate orbit. The fossil is compared to all known fossil istiophorids as well as to the living marlins. It is suggested that the black marlin is a more recent derivative (than the blue marlin) that was unable to thrive in the Atlantic Ocean because of a temperature barrier.**


A
scapula
N
cranium
rostrum
right naris
squamosal

Descubrimiento en el año 2010



Isthminia panamensis Pyenson 2015

Toma de muestras de bulto y manual

Chagres sandstone outcrop

Small bone collection

Marlin skull excavation. Photo: J. Velez - Juarbe, PhD. Los Angeles Museum curator

Marlin skeleton excavation
Photo: J. D. Carrillo, PhD. Zurich University

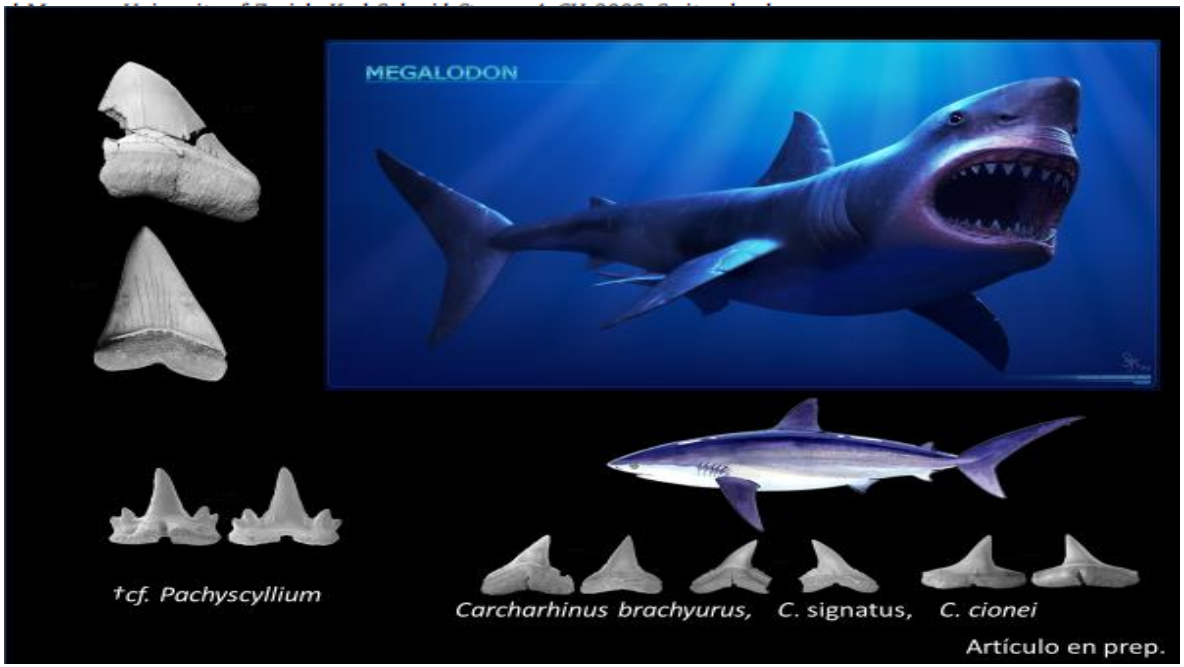
Contents lists available at ScienceDirect

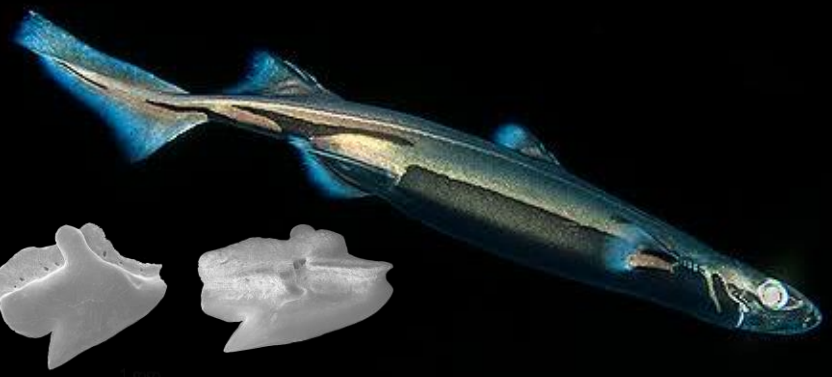
Journal of South American Earth Sciences

journal homepage: www.elsevier.com/locate/jsames

A new Late Miocene chondrichthyan assemblage from the Chagres Formation, Panama

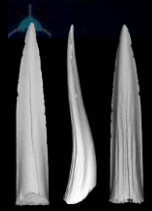
Jorge D. Carrillo-Briceño [a], Carlos De Gracia [b, *], Catalina Pimiento [b, c, d], Orangel A. Aguilera [e], René Kindlimann [a], Patricio Santamarina [f], Carlos Jaramillo [b]





Squalus sp.

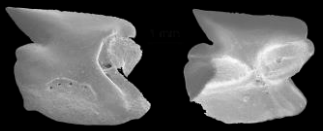
Dalatias licha.



Trigonognathus sp.

Pristiophorus sp

†*Isistius* cf. *triangulus*



Centrophorus cf. granulosus

Artículo en prep.

Cachalote pigmeo descubierto en 2012

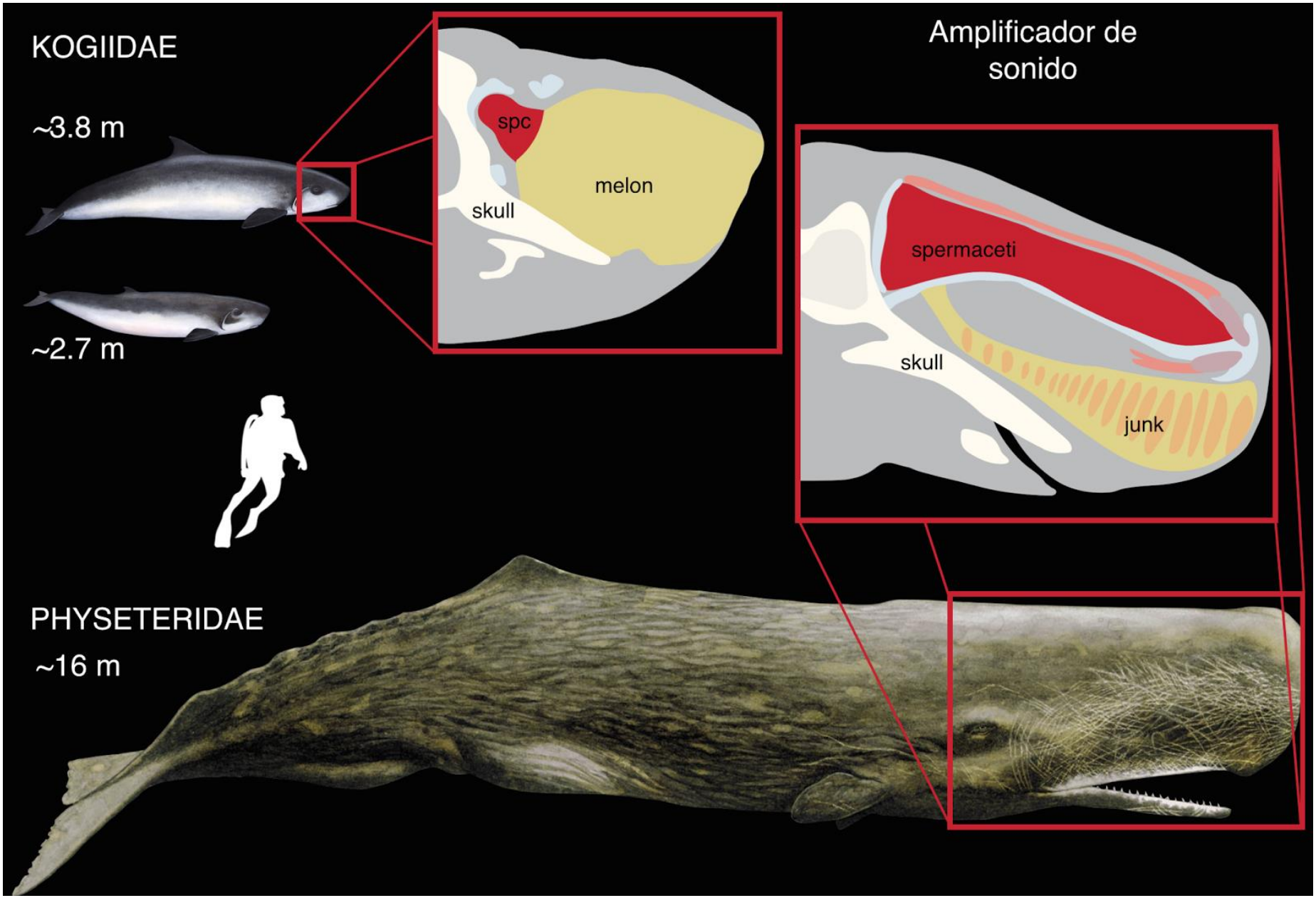
PLOS ONE

RESEARCH ARTICLE

Evolutionary Patterns among Living and Fossil Kogiid Sperm Whales: Evidence from the Neogene of Central America

Jorge Velez-Juarbe[1,2]*, Aaron R. Wood[3], Carlos De Gracia[4], Austin J. W. Hendy[5]

Nanokogia isthmia Vélez Juarbe *et al.* 2015


KOGIIDAE
~3.8 m
~2.7 m
spc
melon
skull
Amplificador de sonido
spermaceti
skull
junk
PHYSETERIDAE
~16 m

Cetaceans

Cachalote primitivo

Cetaceans
cachalote

Huesos fragmentados y articulados de marlin

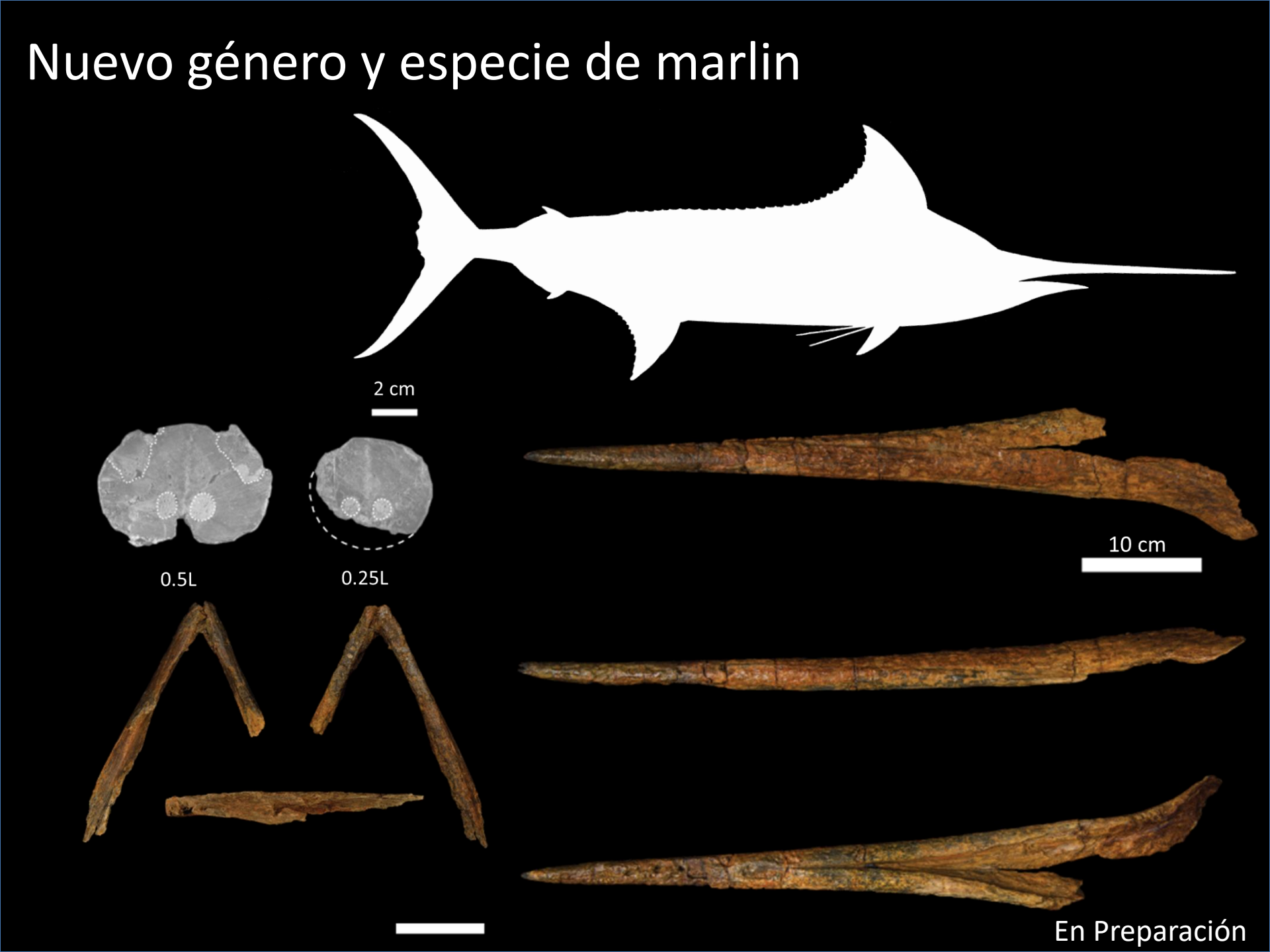
Peces enormes:

Pez espada (*Xiphias* sp.)

Fig. 4. Xiphidae (swordfish) vertebrae, genus and species indeterminate. (A) lateral view. (B) dorsal view. (C) centrum view.

En Preparación

Nuevo género y especie de marlin



En Preparación

Specimen STRI 31291 excavation, September – November 2011

Day 1 of 15

Day 10 of 15

Day 5 of 15

Day 11 of 15

STRI 31291: género y especie nueva

20cm

En Preparación

El fósil de marlin mas completo y major preservado descubrierto

MUSEOS DE HISTORIA NATURAL

Centros vitales para la investigación

museo

nombre masculino

1. Institución dedicada a la adquisición, conservación, estudio y exposición de objetos de valor relacionados con la ciencia y el arte o de objetos culturalmente importantes para el desarrollo de los conocimientos humanos.
   "museo oceanográfico; museo del ferrocarril; museo de la ciencia y la tecnología"

- Son centros de estudio e investigación que han contribuido poderosa y eficazmente al desarrollo de las ciencias así como a la creación de lugares importantes para la formación de intelectuales que han colocado en un alto rendimiento estos institutos.

Museo de Historia Natural de la Florida


BONE VALLEY FM.
GARDINIER MINE
Waldens Creek

Museo Nacional de Historia Natural, Smithsonian Washington DC

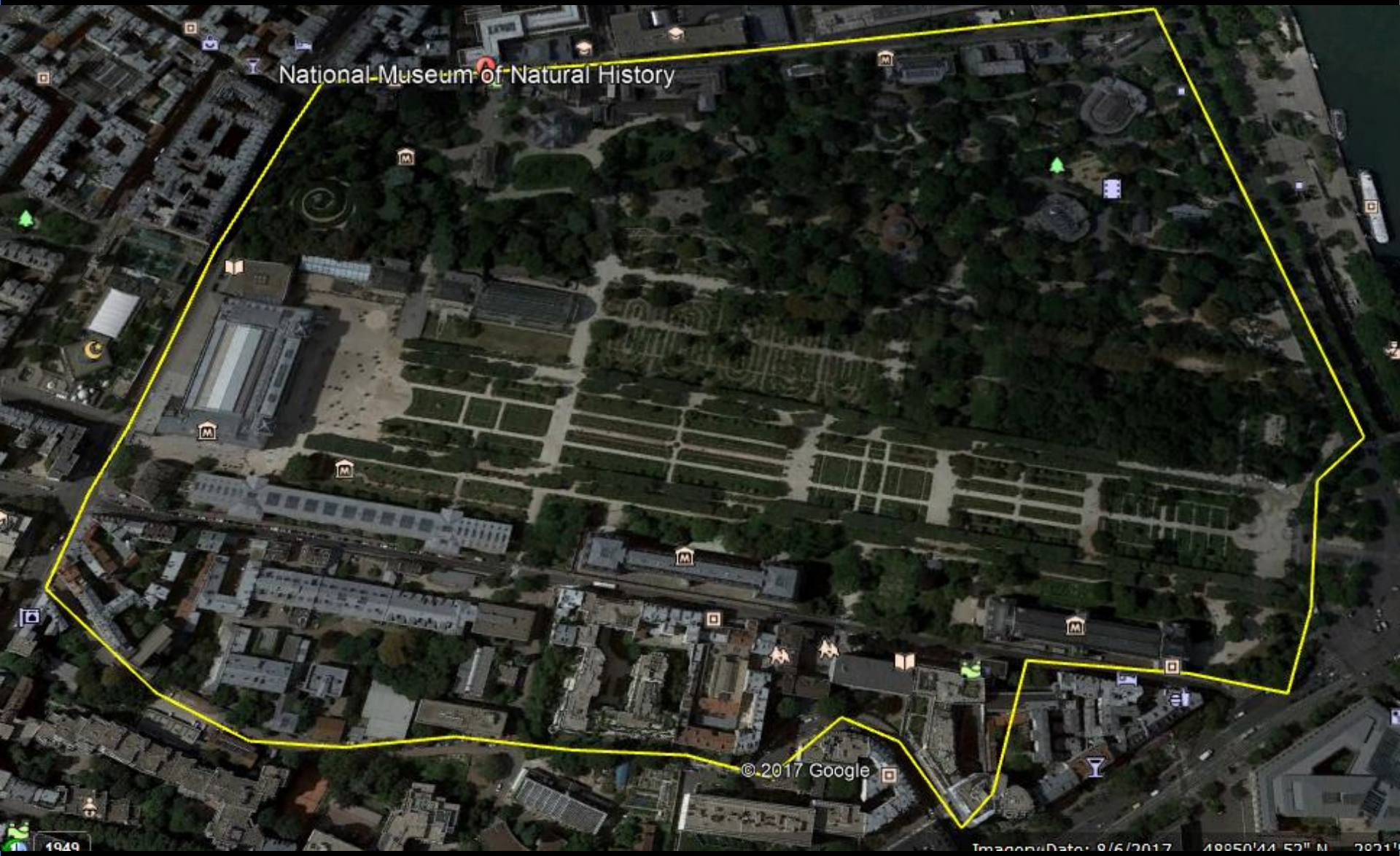

HAMMERMILL

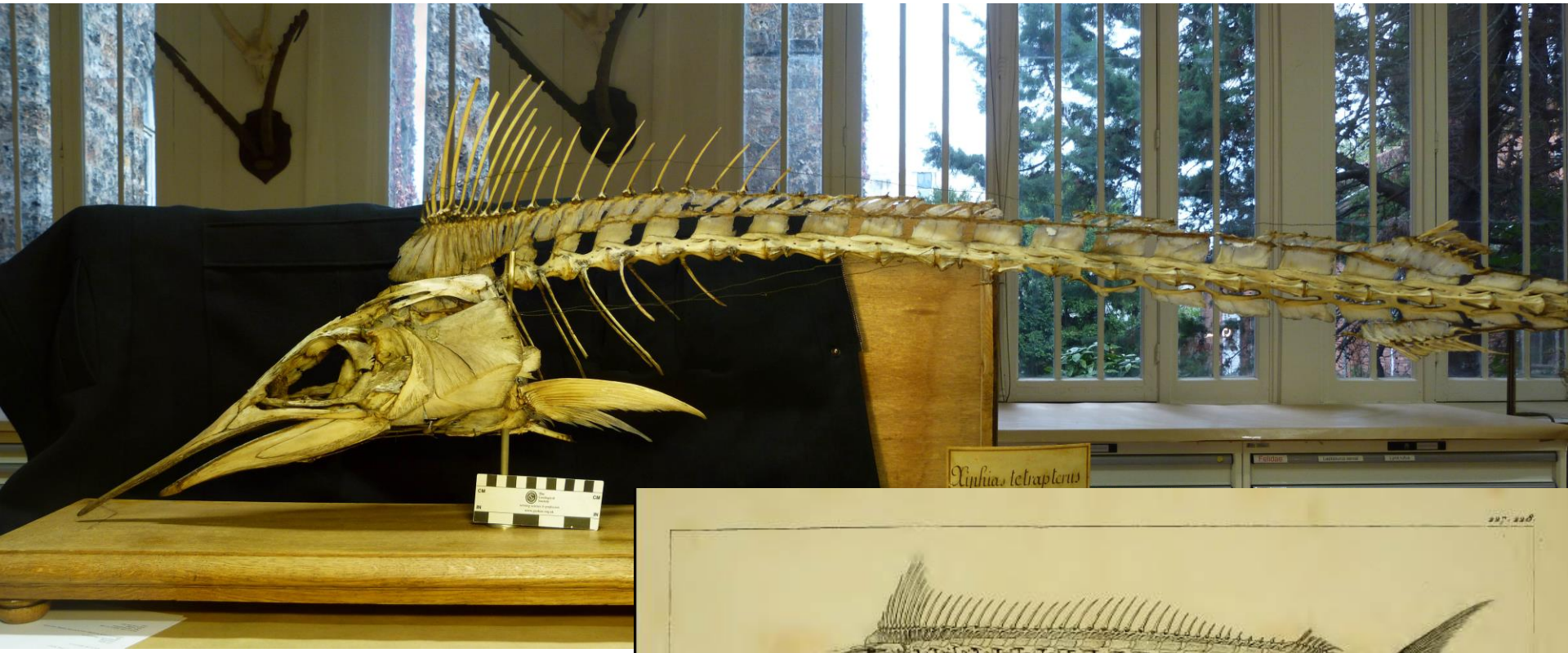
Institut Royal des Sciences Naturelles de Belgique

Iguanodon bernissartensis 130-120 Ma


60 PISC. TERT. I type
Nom Brachyrhynchus belgicus
Terr NEOGÈNE
Etage GISEMENTS INDÉT.
Loc. Anvers.
Dét. Leriche 1924
10445 [P. 1117]
Ambres, Belgien
35mm

Muséum National d´Historie Naturelle, París FRA

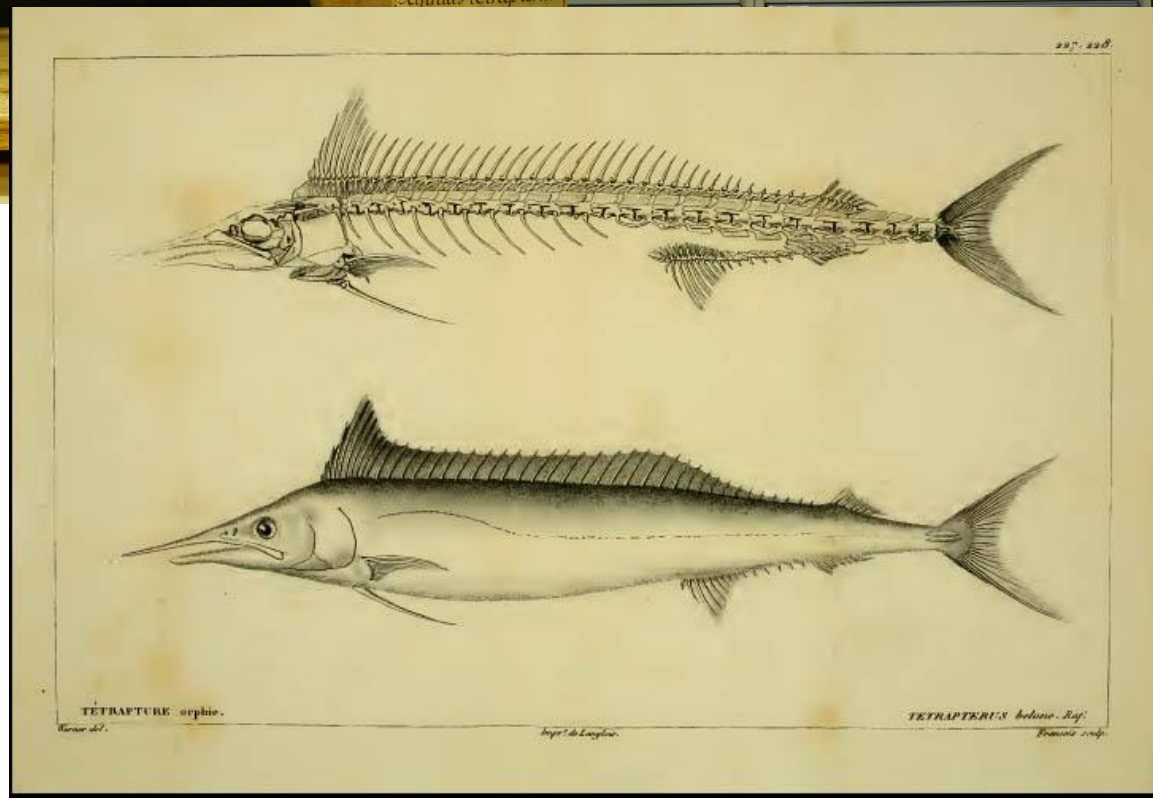

National Museum of Natural History
© 2017 Google
1949



Tetrapturus Belone

Rafinesque 1810

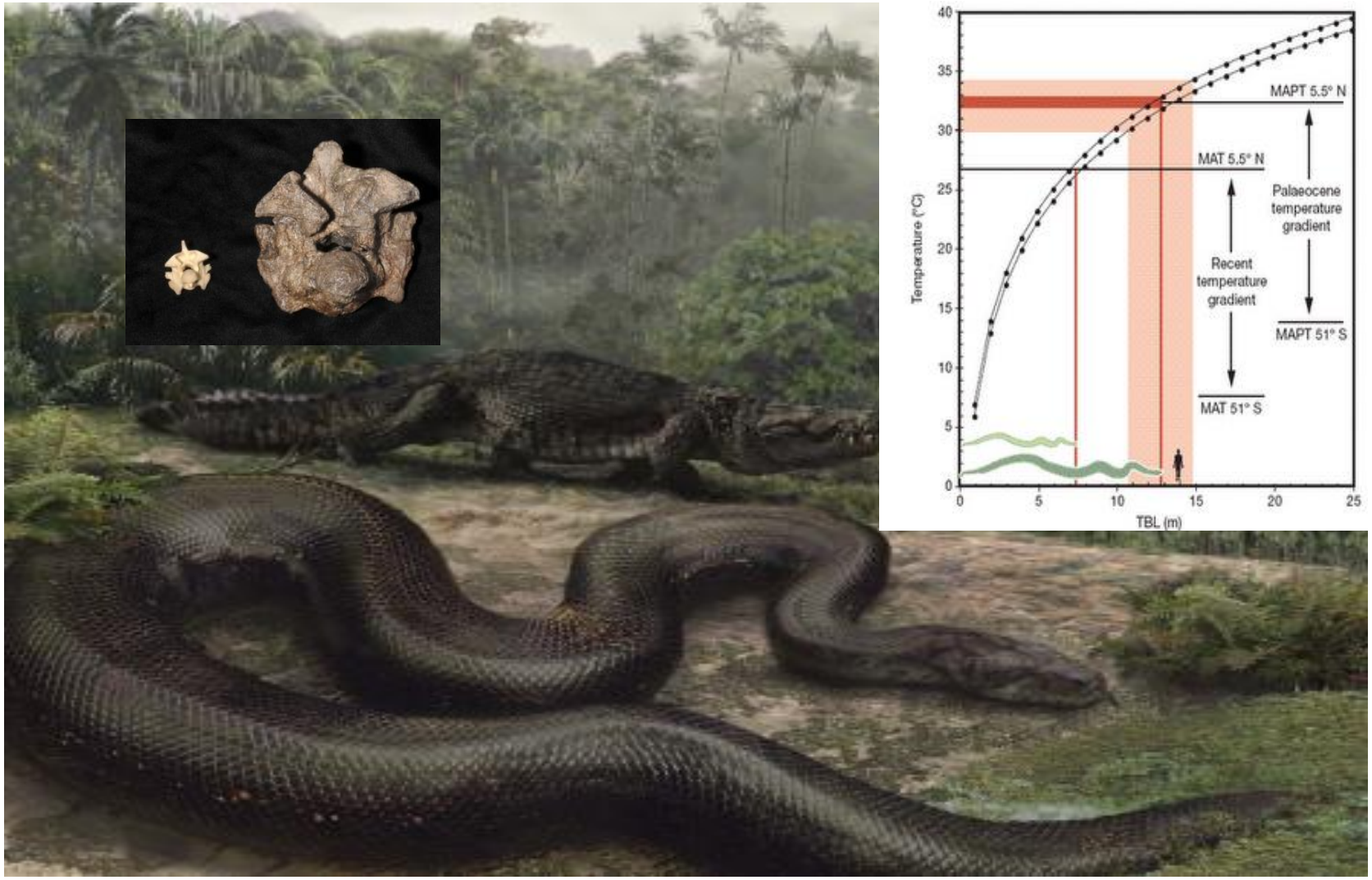
Cuvier 1831



FÓSILES, ECOLOGÍA Y CONSERVACIÓN

CALENTAMIENTO GLOBAL EN EL PALEOCENO 65Ma

Máximo Térmico del Paleoceno-Eoceno (65-55Ma)



Titanoboa cerrejonensis es mas antigua que el MTPE (Head *et al.* 2009, Nature)

Son los bosques tropicales mas antiguos conocidos (Jaramillo *et al.* 2006, Science)

Caribbean Reef Development Was Independent of Coral Diversity over 28 Million Years

Kenneth G. Johnson,[1*] Jeremy B. C. Jackson,[2,3] Ann F. Budd[4]

The relationship between natural variations in coral species diversity, reef development, and ecosystem function on coral reefs is poorly understood. Recent coral diversity varies 10-fold among geographic regions, but rates of reef growth are broadly similar, suggesting that diversity is unimportant for reef development. Differences in diversity may reflect regional differences in long-term biotic history in addition to environmental conditions. Using a combination of new and published fossil and stratigraphic data, we compared changes in coral diversity and reef development within the tropical western Atlantic over the past 28 million years. Reef development was unrelated to coral diversity, and the largest reef tracts formed after extinction had reduced diversity by 50%. High diversity is thus not essential for the growth and persistence of coral reefs.

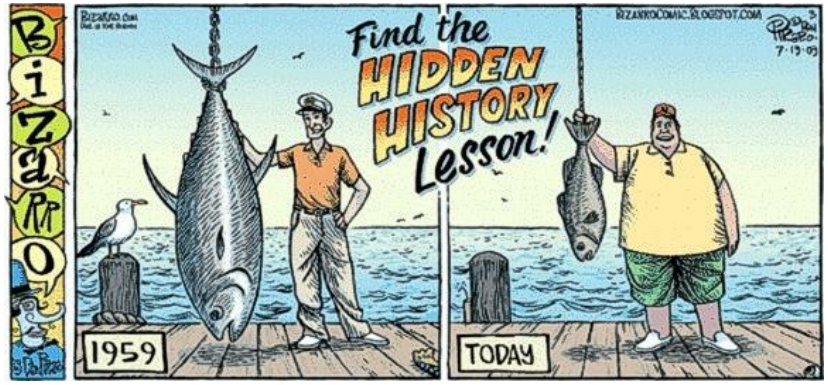
Grandes escalas de tiempo Ma

Science, 2008

Historical Overfishing and the Recent Collapse of Coastal Ecosystems

Jeremy B. C. Jackson,[12*] Michael X. Kirby,[3] Wolfgang H. Berger,[1] Karen A. Bjorndal,[4] Louis W. Botsford,[5] Bruce J. Bourque,[6] Roger H. Bradbury,[7] Richard Cooke,[2] Jon Erlandson,[8] James A. Estes,[9] Terence P. Hughes,[10] Susan Kidwell,[11] Carina B. Lange,[1] Hunter S. Lenihan,[12] John M. Pandolfi,[13] Charles H. Peterson,[12] Robert S. Steneck,[14] Mia J. Tegner,[1†] Robert R. Warner[15]

Ecological extinction caused by overfishing precedes all other pervasive human disturbance to coastal ecosystems, including pollution, degradation of water quality, and anthropogenic climate change. Historical abundances of large consumer species were fantastically large in comparison with recent observations. Paleoecological, archaeological, and historical data show that time lags of decades to centuries occurred between the onset of overfishing and consequent changes in ecological communities, because unfished species of similar trophic level assumed the ecological roles of overfished species until they too were overfished or died of epidemic diseases related to overcrowding. Retrospective data not only help to clarify underlying causes and rates of ecological change, but they also demonstrate achievable goals for restoration and management of coastal ecosystems that could not even be contemplated based on the limited perspective of recent observations alone.



Grandes escalas de tiempo: Miles de años

Pimiento *Evo Edu Outreach* (2015) 8:19
DOI 10.1186/s12052-015-0046-3

Evolution: Education and Outreach
a SpringerOpen Journal

CURRICULUM AND EDUCATION Open Access

Engaging students in paleontology: the design and implementation of an undergraduate-level blended course in Panama

Catalina Pimiento[1,2,3,4*]

Abstract

Despite the fact that Latin-American countries present ideal environments to train young scientists, most of these countries lack local scientific capacity. Here I describe the design and implementation of an undergraduate-level blended course on paleontology. The course was taught in 2012 to 10 biology majors from the University of Panama and it had three main foci: (1) a design grounded in a theoretical framework that supports meaningful learning; (2) the application of concepts and skills to the region where the students live, making the learning experience relevant and authentic; and (3) a strong research and science-communication component that allowed students to experience real-life situations (i.e. those commonly faced by scientists throughout their careers). These components contributed synergistically to engage students with paleontology, a field not formally taught in their country. This work can be applied to different disciplines in science and to different levels in students' scientific training.

Keywords: Geology, Nature of science, Online learning, Role-playing

Estudiantes y la paleontología

Paleontología del Neógeno de América Tropical
3-7 agosto 2009

Primer curso de paleontología hecho en Panamá

THANKS TO:

- Carlos Jaramillo
- Orangel Aguilera
- Félix Rodríguez

- Werner Schwarzhans
- Bruce McFadden
- Catalina Pimiento
- Jorge Carrillo
- Chanika Symister

- Aaron Wood
- Abraham Osorio
- Aldo Rincón
- Federico Moreno
- Jorge Moreno
- Juan David Carrillo
- Alexis Rojas
- Ludwic Jiménez
- Austin Heindy
- Carlos D'apolito
- María Camila Vallejo
- Héctor Zamora
- Jeff Martin
- Hannah Ridgel
- Eduardo Leiva

- Jilma Ríos
- María García
- Juan Martínez
- Jorge Lezcano
- Sebastián Zapata
- Gustavo Ballén
- Pilar Lopera
- Andrés Cárdenas
- Enrique Moreno

- PIÑA PEOPLE

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