

NARG Steering Meeting

Delft - 18th September 2019

Jurassic and Cretaceous integrated biostratigraphy of NW Africa. State of the art and progress.

Dr. Luc G. Bulot

with scientific contributions of

Meghan Jenkinson (MSc student, UoM)

*Prof. Moussa Masrour (Univ. Agadir), Prof. Mohssine Ettachfini (Univ. Marrakesh),
Prof. Jens Lehmann (Univ Bremen), Prof. Mohamed Fouad Aly (Univ. Cairo)
and Prof. Miguel Company (Univ. Granada)*

Who is the the Leader of Narg Biostratigraphy Team

30 years spent at insulting dead animals in latin (with special refence to ammonoids)

30 years of good and loyal service to the cause of biostratigraphy and applied palaeontology

About 400 sections logged and sampled bed by bed

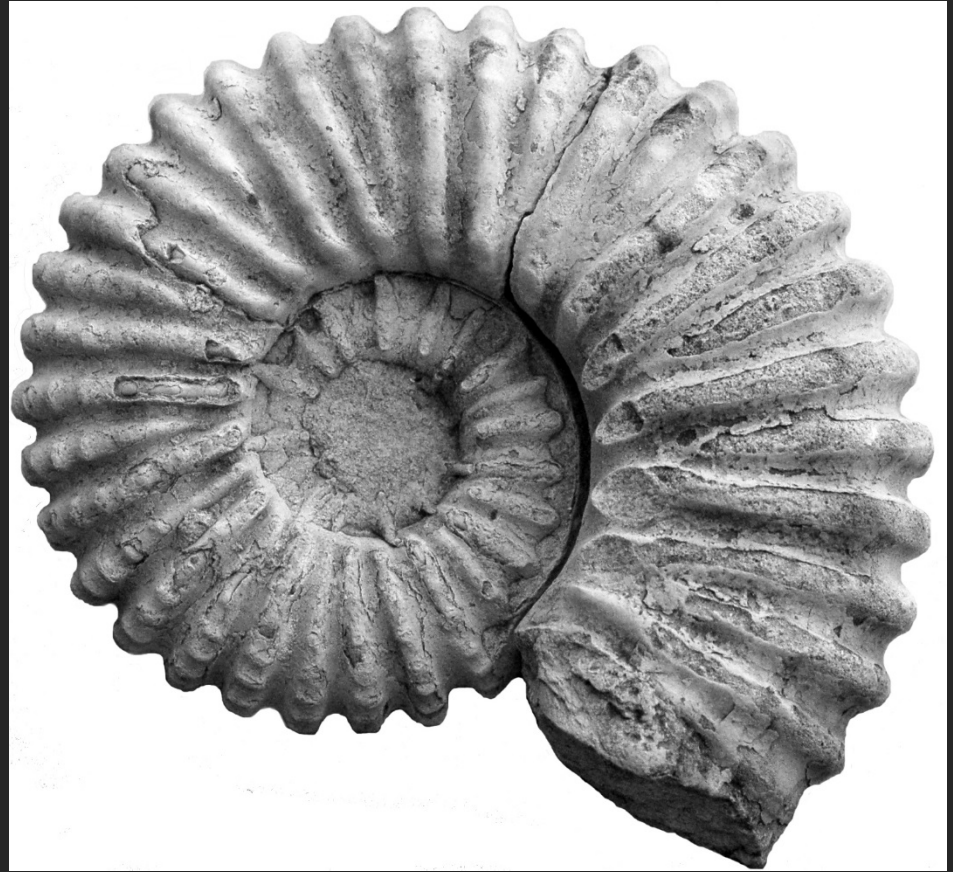
Likely more than 100.000 specimens extracted from the rock (and a few loose ones as well)

Field work in Africa, Europe, the Middle East, North and South America

Celebrating today the 100th paper published

Still no medal !

but some archives...



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**PRELIMINARY AMMONITE ZONATION FOR THE LOWER CRETACEOUS
OF THE MEDITERRANEAN REGION**

Lower Cretaceous Cephalopod Team
Working Group of IGCP Project 262

Report by **Philip J. Hoedemaeker (1)** and **Luc Bulot (2)**



Who is the Narg Biostratigraphy Team

A team of international experts that constantly grows up since 2014...

Dr. Jason Jeremiah – Calcareous Nannofossils

Dr. Mike Simmons & Mike Bidgood - Foraminiferas

Prof. Dr. Daniela Rehakova (Univ. Bratislava) – Calpionellids

Prof. Dr. Moussa Masrour (Univ. Agadir) – Echinoids

Prof. Dr. Mohamed Aoutem (Univ. Agadir) – Cretaceous Brachiopods

Dr. Roberto Gatto & Prof. Dr. Stefano Monari (Univ. Padova) – Bivalves and Gastropods

Prof. Dr. Christina Ifrim (Univ. Heidelberg) – Upper Cretaceous Ammonites

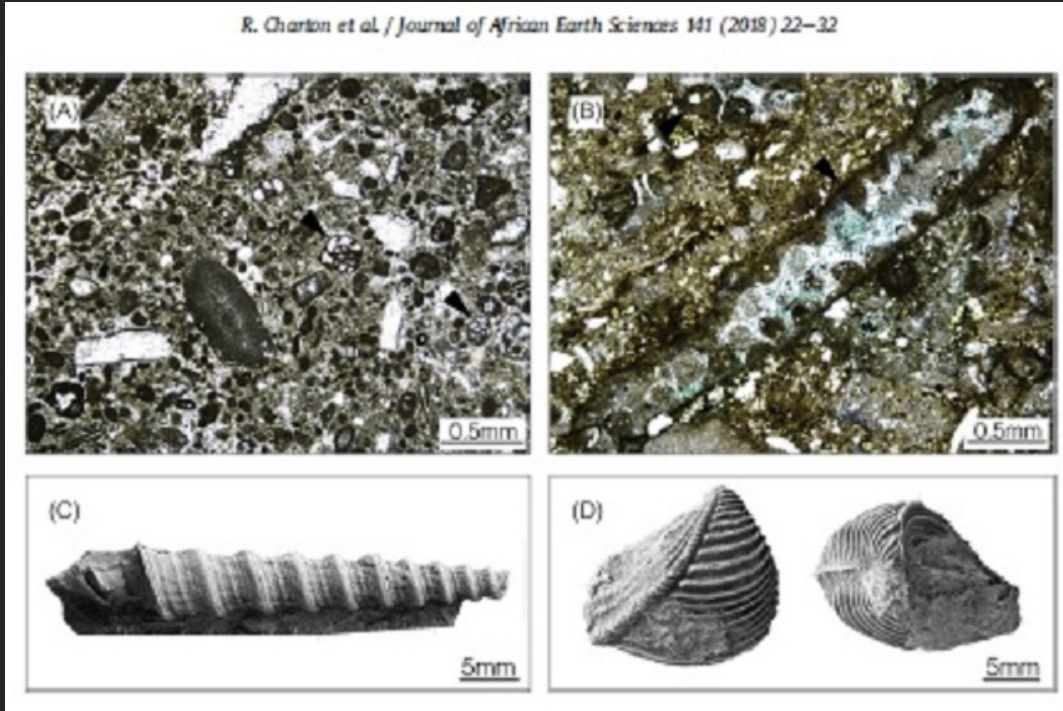
New collaborators...

Dr. Alain Bonnot (Univ. Dijon) – Jurassic Ammonites

Prof. Dr. Mohssine Ettachfini (Univ. Marrakech) – Lower Cretaceous Ammonites

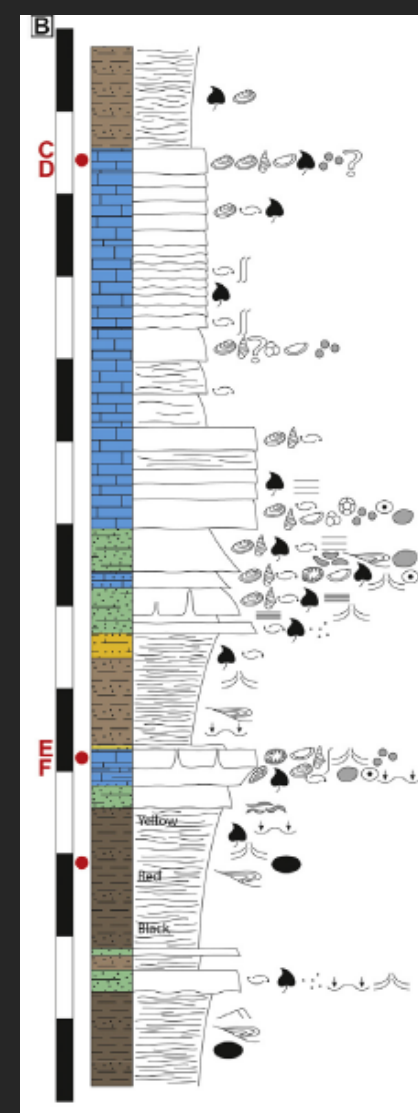
Prof. Dr. Miguel Company (Univ. Granada) – Lower Cretaceous Ammonites

1. Published work: highlights

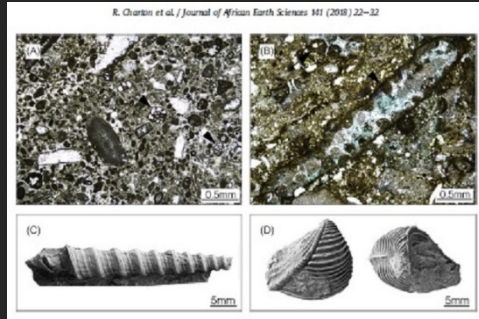


This guys were believed to be Lower Cretaceous (? Albian)
they turned out to be Middle Jurassic (upper Bathonian)

...and therefore 55My older than originally thought...

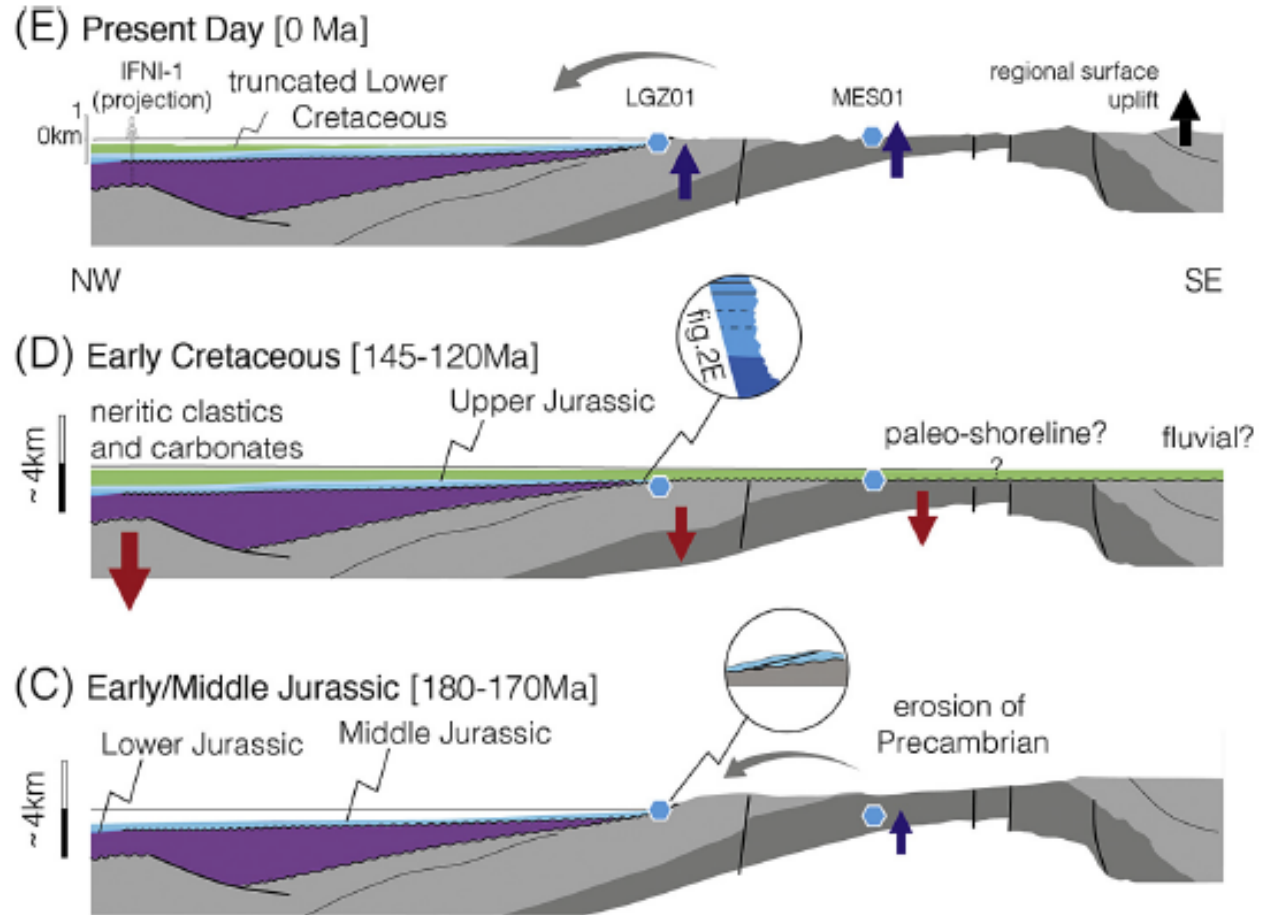


1. Published work: highlights

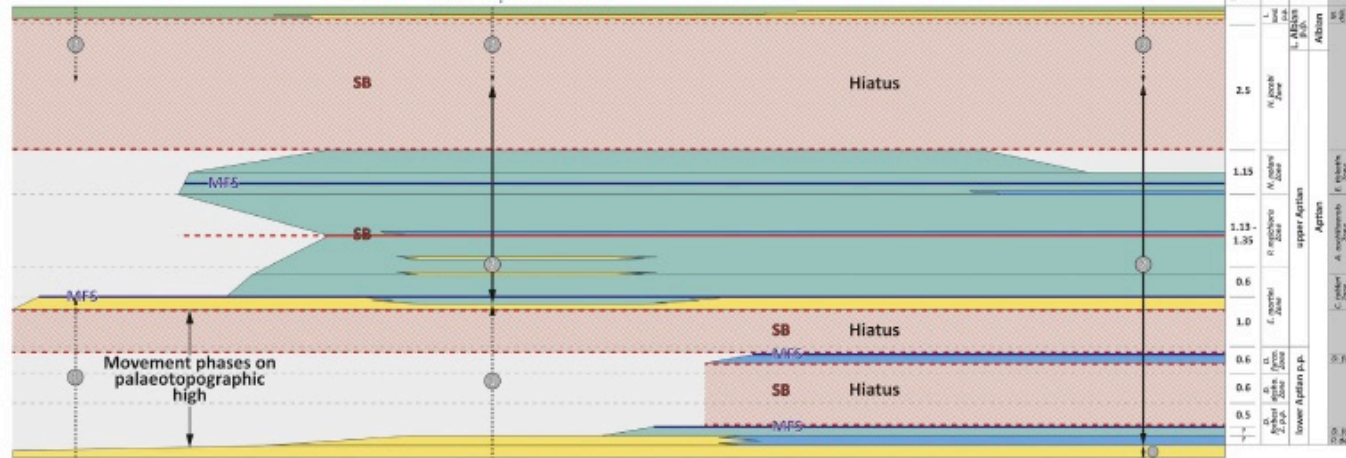
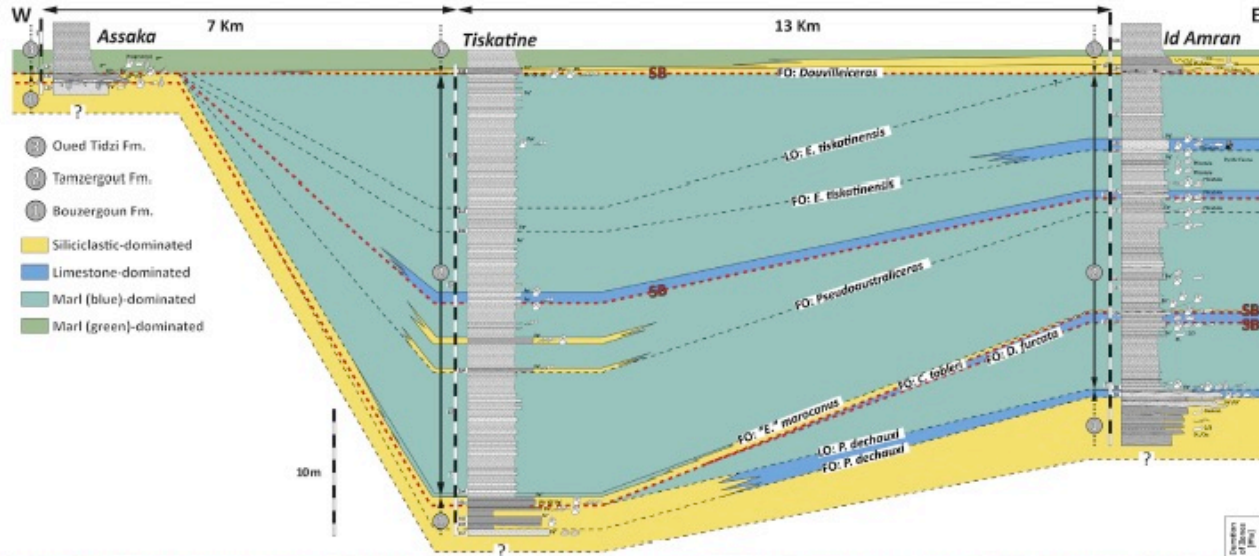


And since they are 55 My older...

...this new age "slightly" affected the model of the geological evolution of the Sidi Ifni Transect...



1. Published work: highlights



Luber et al. 2019, CR

METHODOLOGY

Integrate all available biostratigraphic markers with special reference to:

- Ammonites
- Planktic Foraminiferas
- Calcareous Nannofloras

Combine with Isotope stratigraphy for correlations with SMAS:

C13/O18

CONCLUSIONS

APTIAN OAE
SEDIMENTS ARE
LACKING

EVIDENCE OF MAJOR
HIATUS AND
UNCOMFORMITIES AT
THE MARGIN SCALE

1. Published work: highlights

METHODOLOGY

Integrate all available biostratigraphic markers with special reference to:

Ammonites

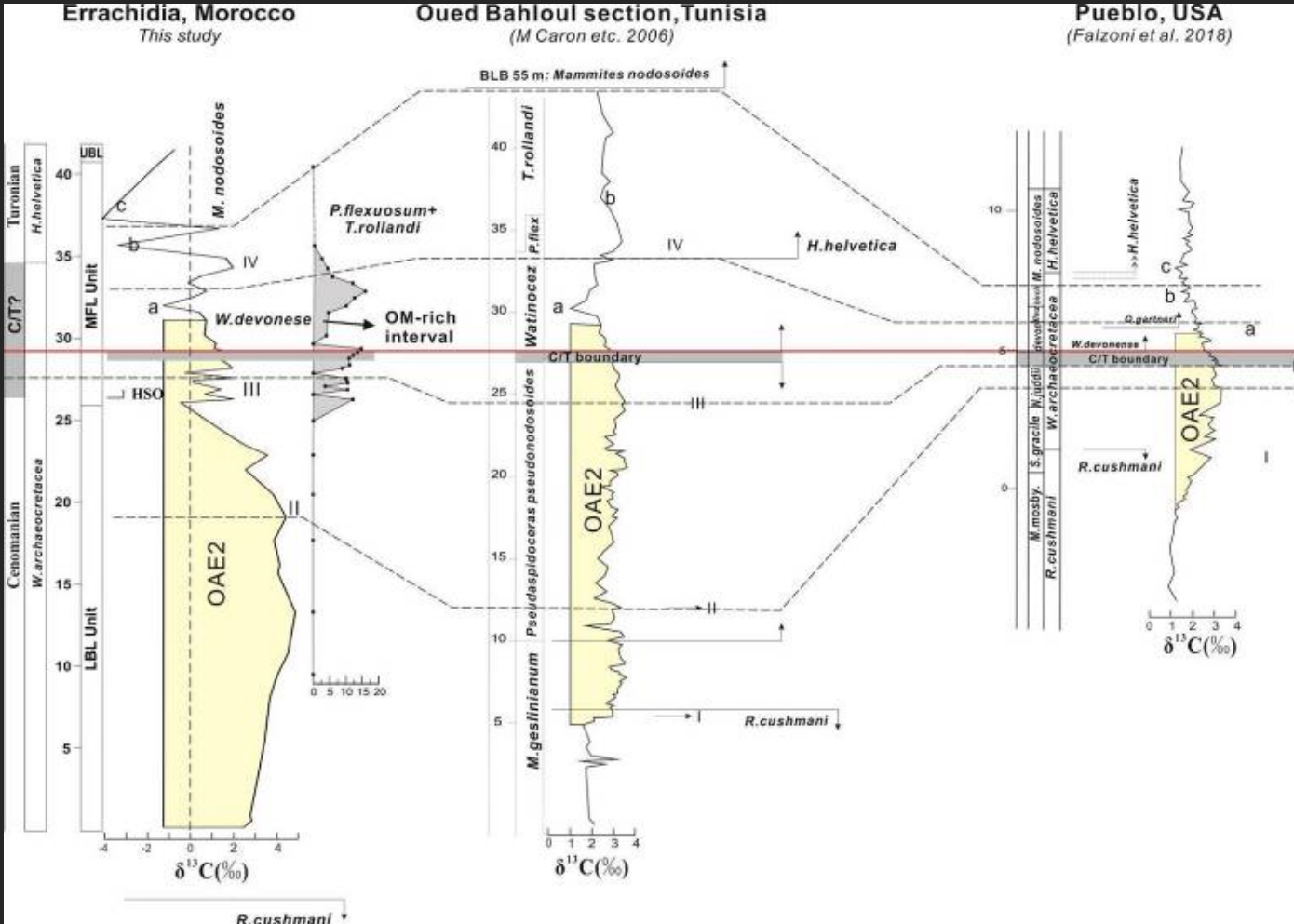
Planktic Foraminiferas

Combine with Isotope stratigraphy for inter-regional correlations:

C13/O18

CONCLUSIONS

EVIDENCE OF DIACHRONISM OF OM-rich SHALES AT THE SCALE OF NORTH AFRICA



2. In progress

Orrin Bryers, Jason Jeremiah

Confirm results on J/K boundary and characterisation of Middle Berriasian Unconformity
In the EAB

Estimate duration and origin of HG and hiatus in the Valanginian of EAB

Establish integrated stratigraphy framework to the Be – Va – Ha interval

Max Casson, Jason Jeremiah

Integrate EAB framework with DSD/ODP legs

2. In progress

The late Aptian adaptive radiation of the Acanthohoplitidae in the Essaouira-Agadir-Basin of Morocco.

Meghan Jenkinson

OBJECTIVES

Catalogue and reference all late Aptian ammonoids collected in the EAB (Tim Luber PhD)

Investigate potential new taxa (genus and species level)

Evaluate local vs. global evolution of the ammonoids

Study population dynamics of the assemblages (abundance, diversity, endemism, cosmopolitanism).

2. In progress

The late Aptian adaptive radiation of the Acanthohoplitidae in the Essaouira-Agadir-Basin of Morocco.

Meghan Jenkinson

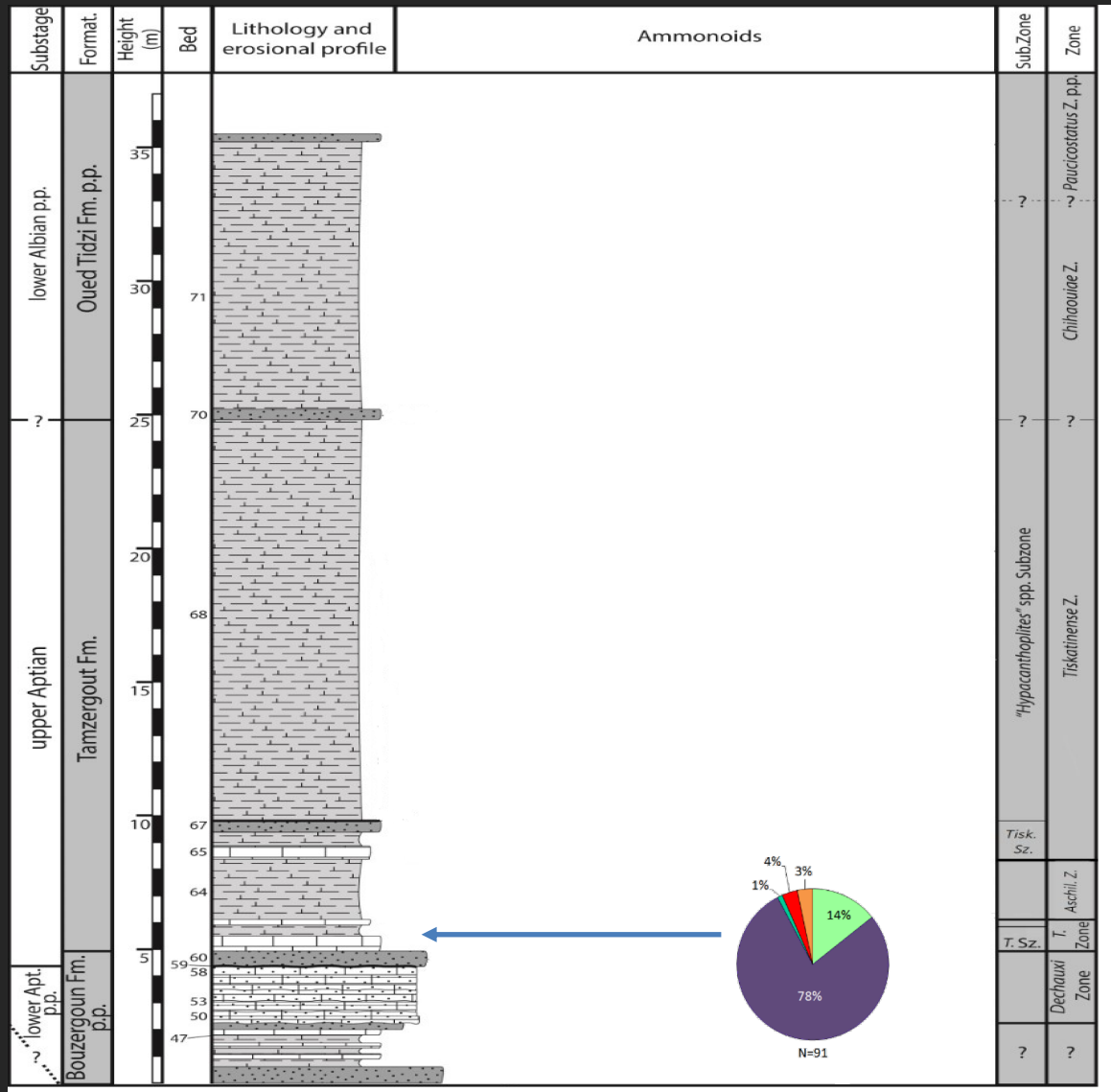
Main results

1 new genus and 1 new species described. Both endemic

2 new genera and 3 new species suspected. At least one of the genus and one of the species are endemic

Local evolution of the family from a Caucasian-Mediterranean rootstock during the early late Aptian established.

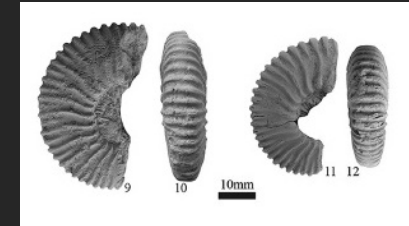
Population dynamics shows three short phases of immigration followed by in situ evolution of the fauna. Local evolution reflects 3rd order cycles.



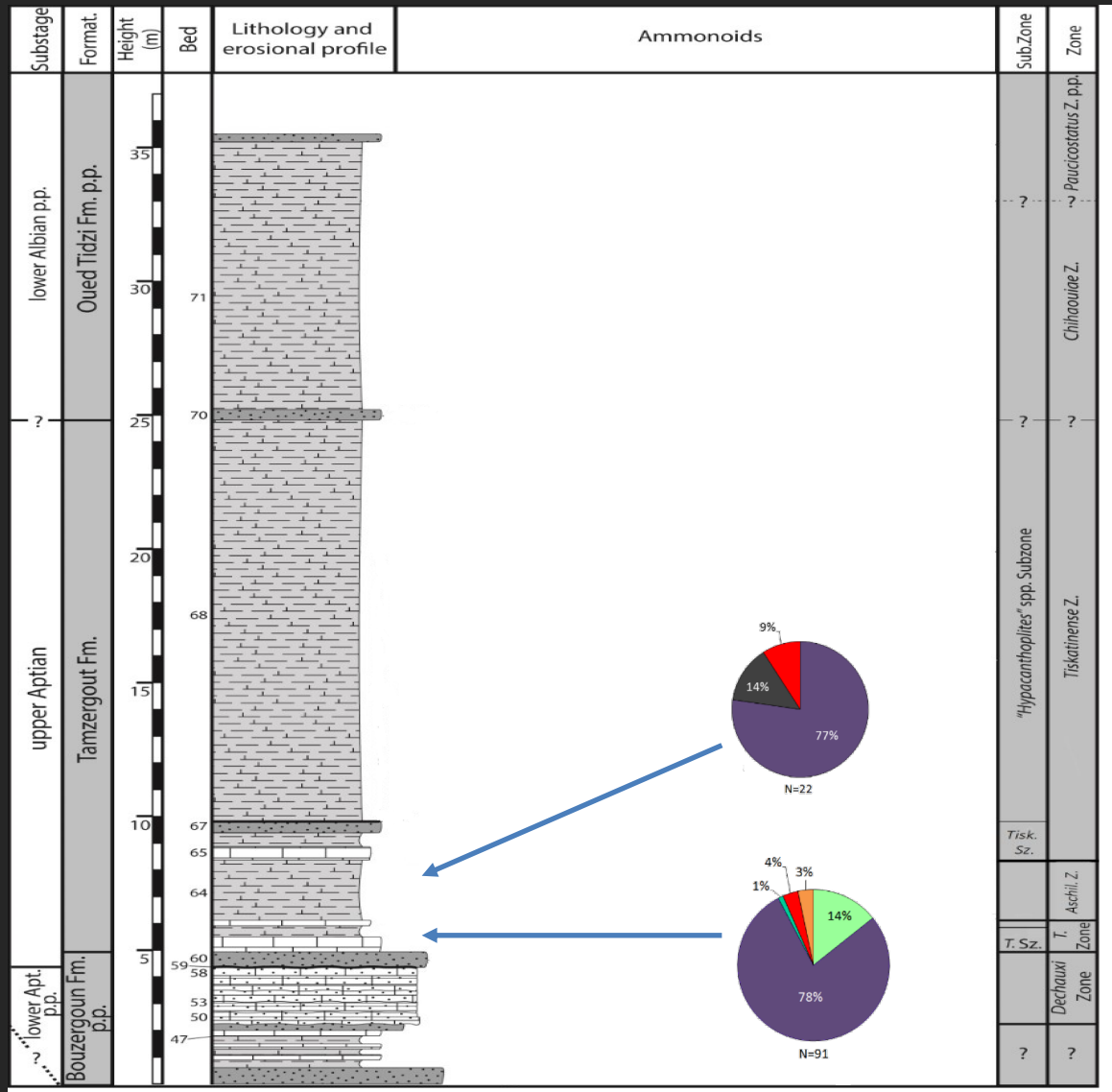
Fauna dominated by *Acanthohoplitidae*.

High diversity. Onset of the first radiative adaption.

Phase 2.



Colombiceras tobleri

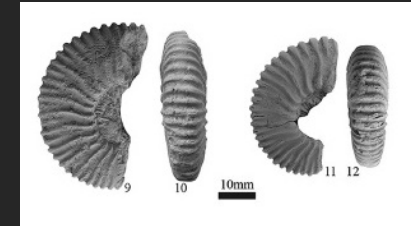


Fauna dominated by Acanthoplitidae.

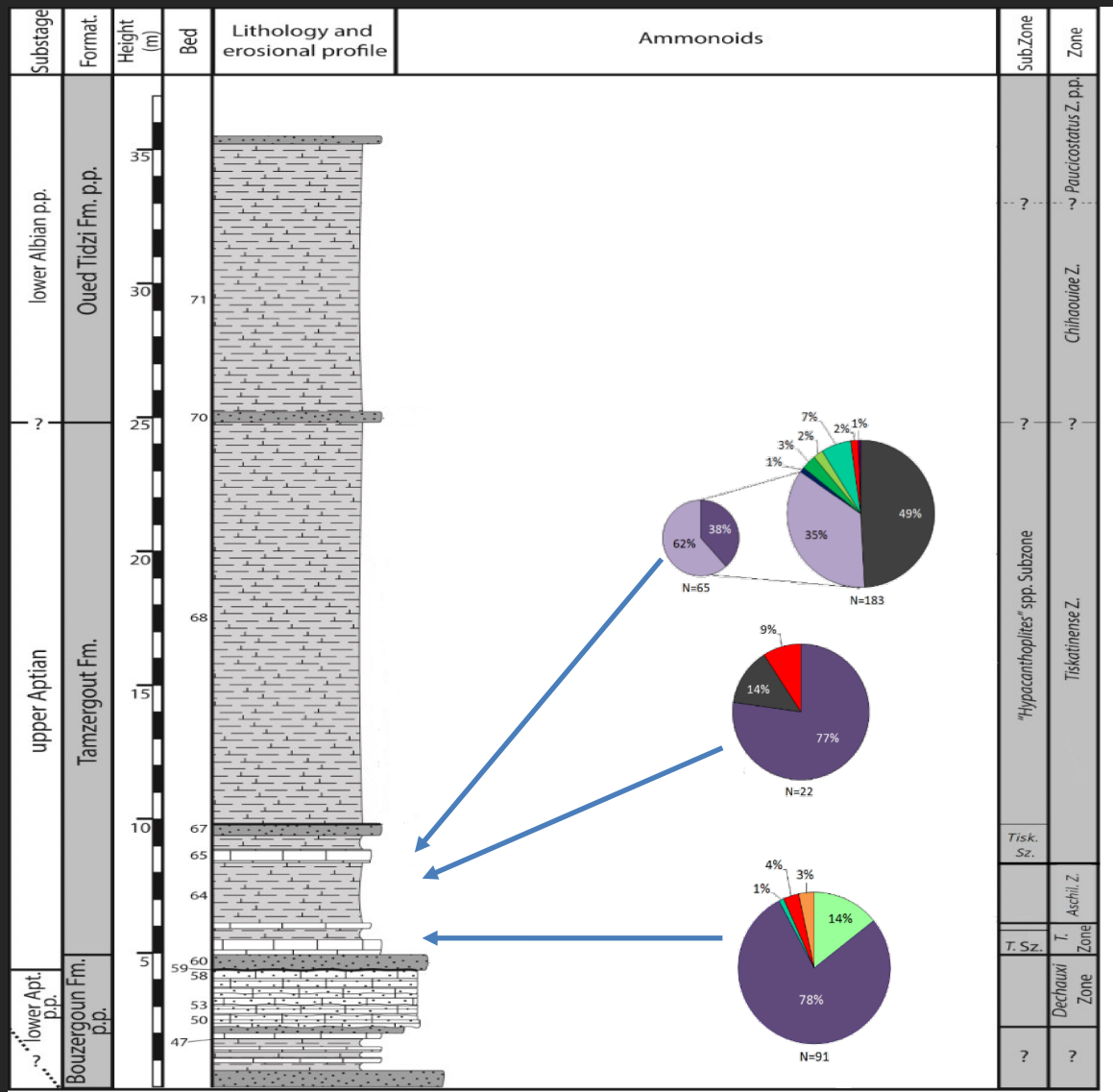
Low diversity. First endemic species.

Phase 2a. New *Elsaisabellia* species

Phase 2.



Colombiceras tobleri

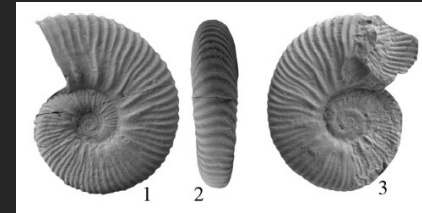


Fauna dominated by *Acanthoplitidae*.

High diversity. Mixed endemic and cosmopolitan assemblages.

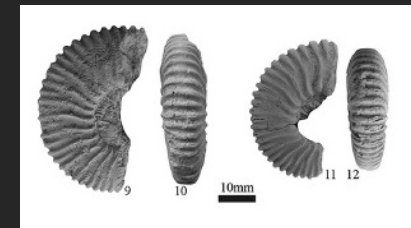
Onset of the second radiative adaption phase.

Phase 3.



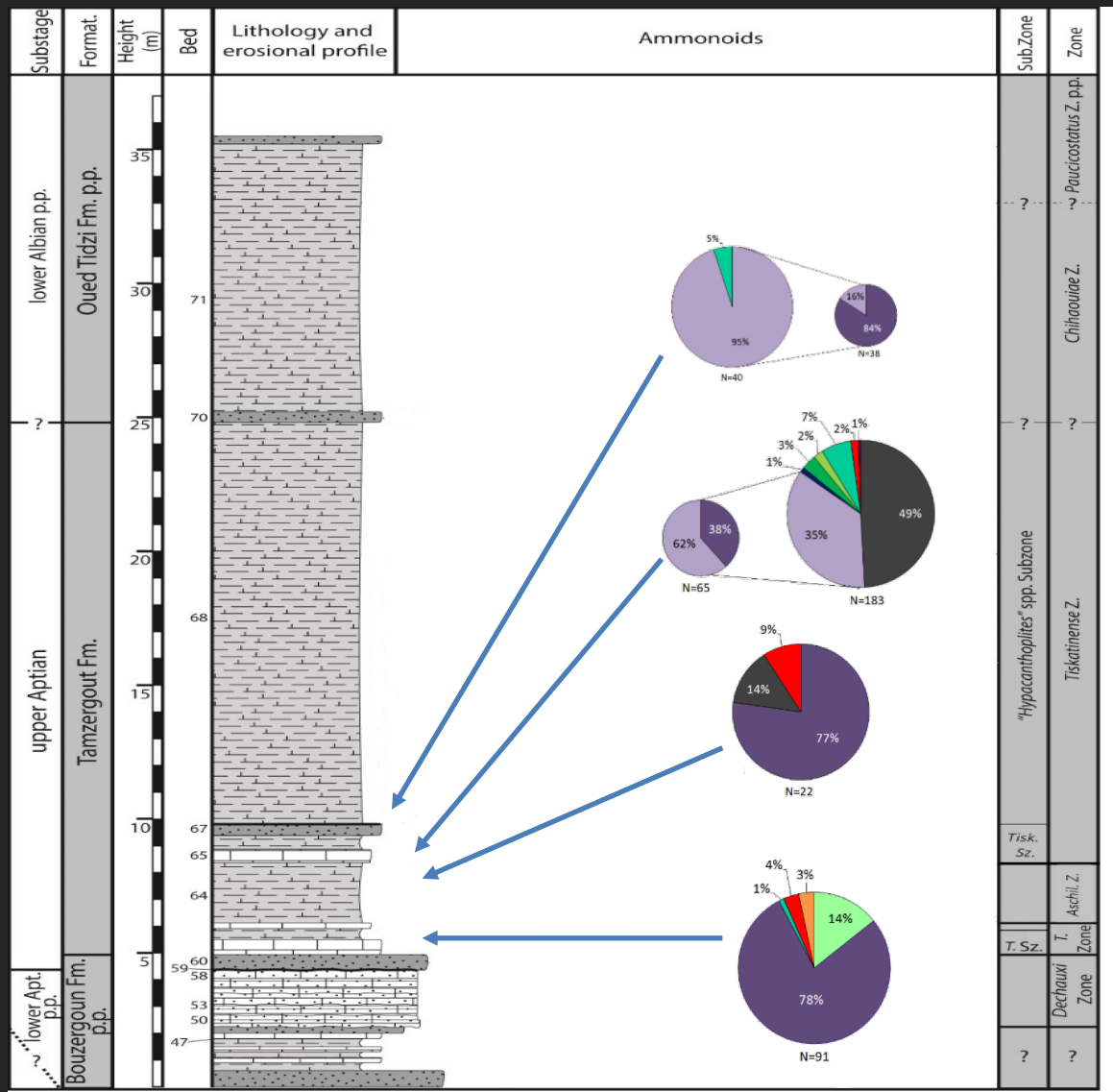
Elsaisabellia tiskatinensis

Phase 2a. New *Elsaisabellia* species



Phase 2.

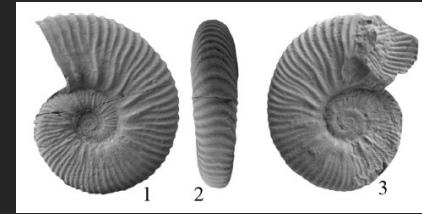
Colombiceras tobleri



Fauna dominated by *Acanthoplitidae*.

Low diversity. Second endemic speciation.

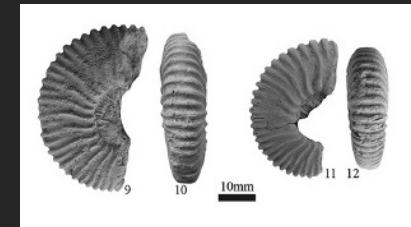
Phase 3a. New Acanthoplitid genus



Phase 3.

Elsaisabellia tiskatinensis

Phase 2a. New *Elsaisabellia* species



Phase 2.

Colombiceras tobleri

U. Tiskatinensis

L. Tiskatinensis

Aschiltaensis

Upper Tobleri

Lower Tobleri



Furcata

New Acanthoplitid genera

Endemic "Diadochoceras"

Elsaisabellia tiskatinensis

Speciation Phase 2

Elsaisabellia sp. nov.

Endemic Mathoceratidae

Immigration Phase 3

Speciation Phase 1

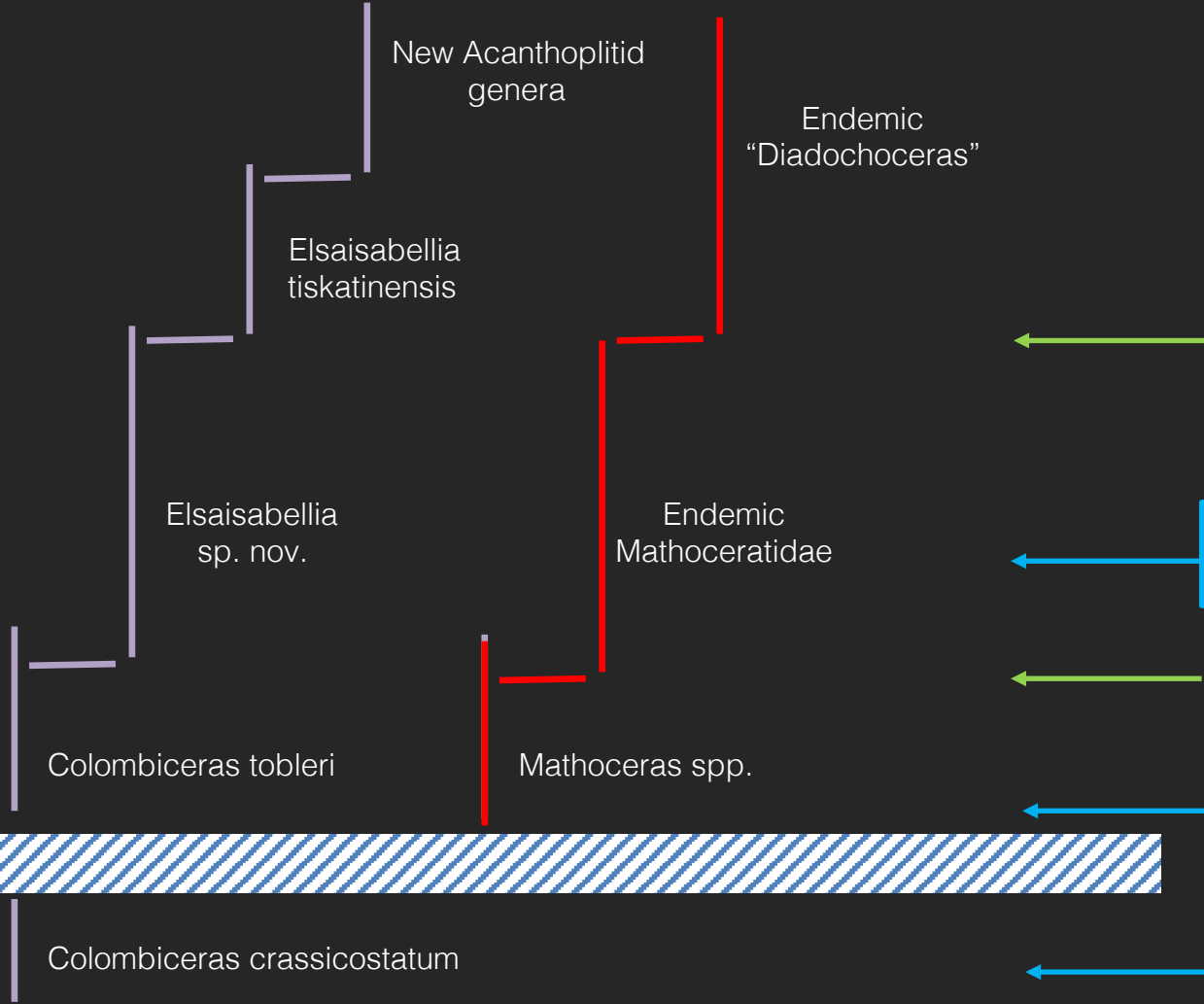
Colombiceras tobleri

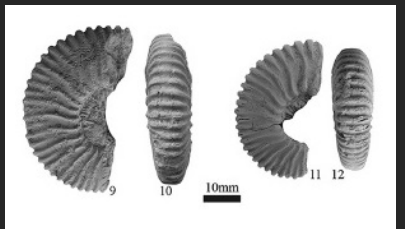
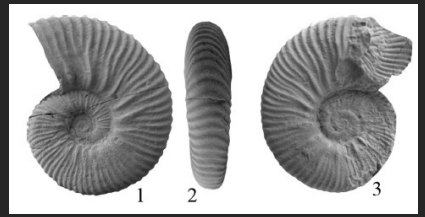
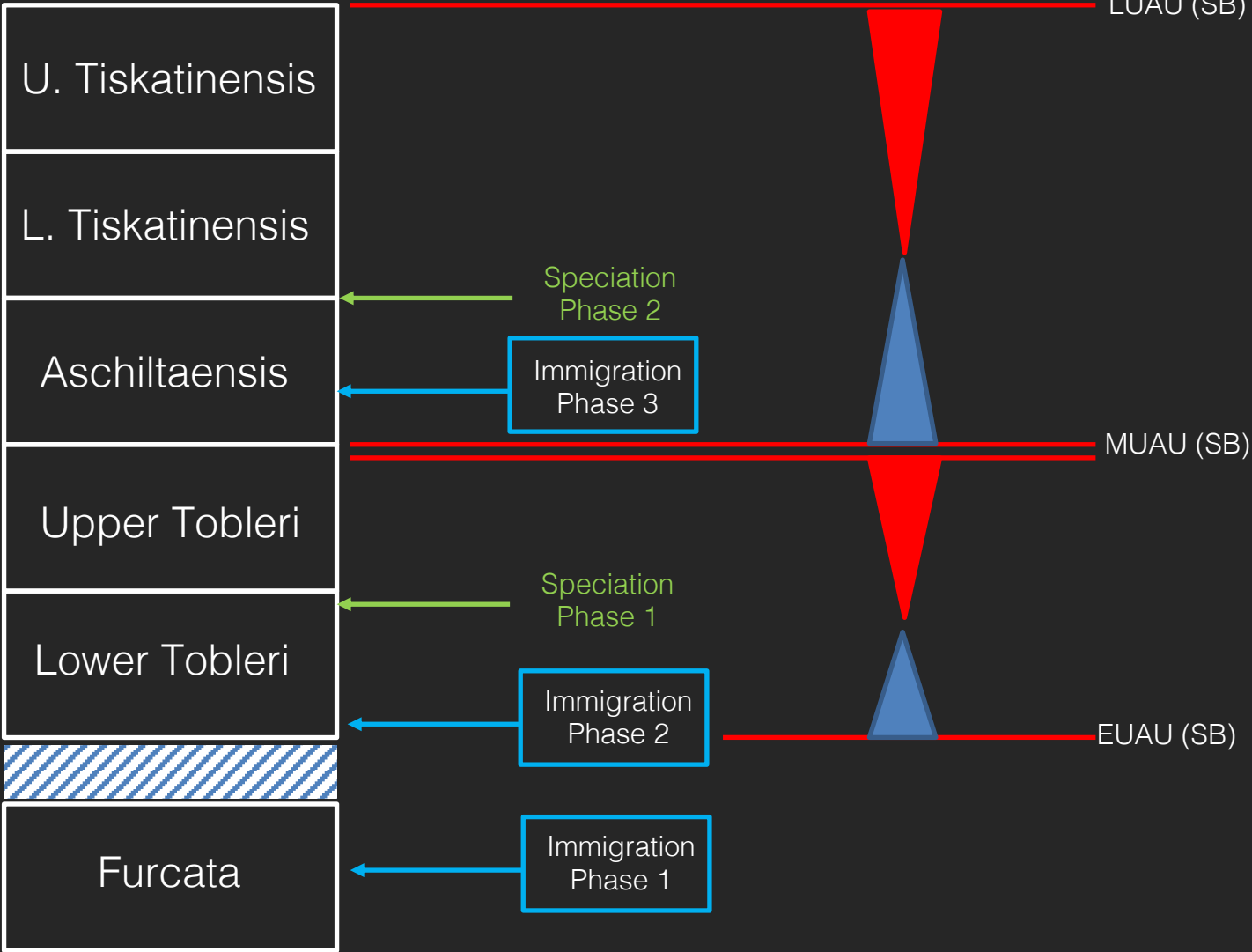
Mathoceras spp.

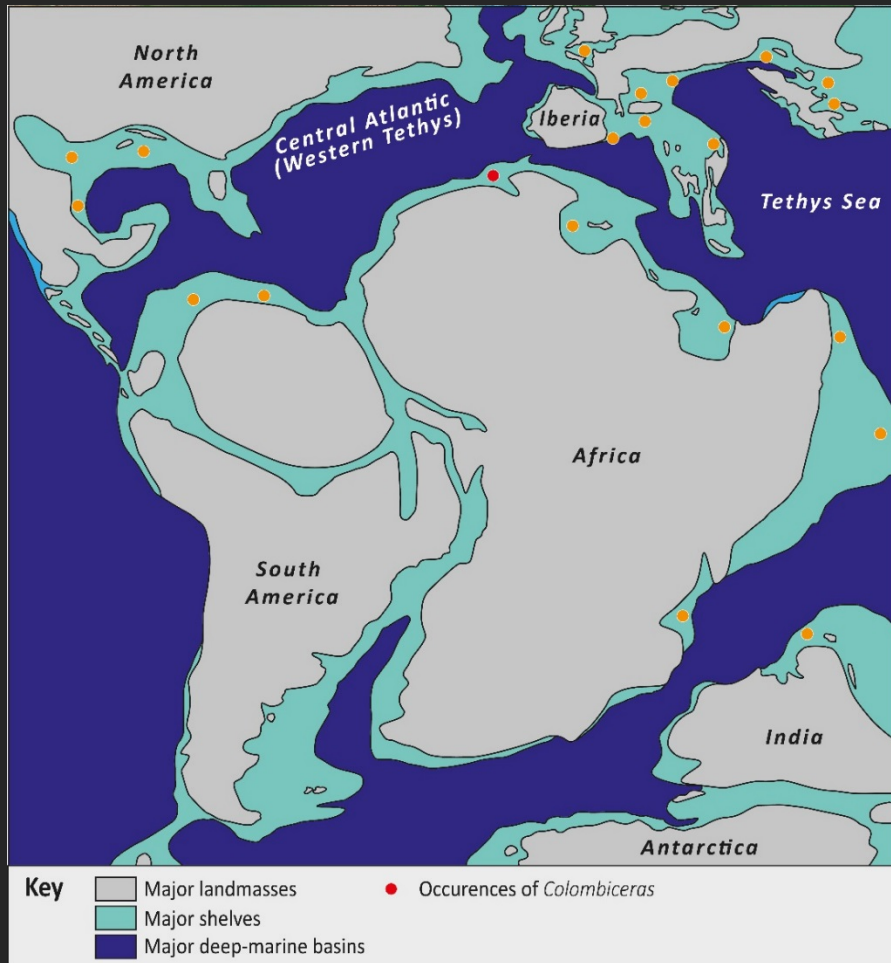
Immigration Phase 2

Colombiceras crassicoatum

Immigration Phase 1







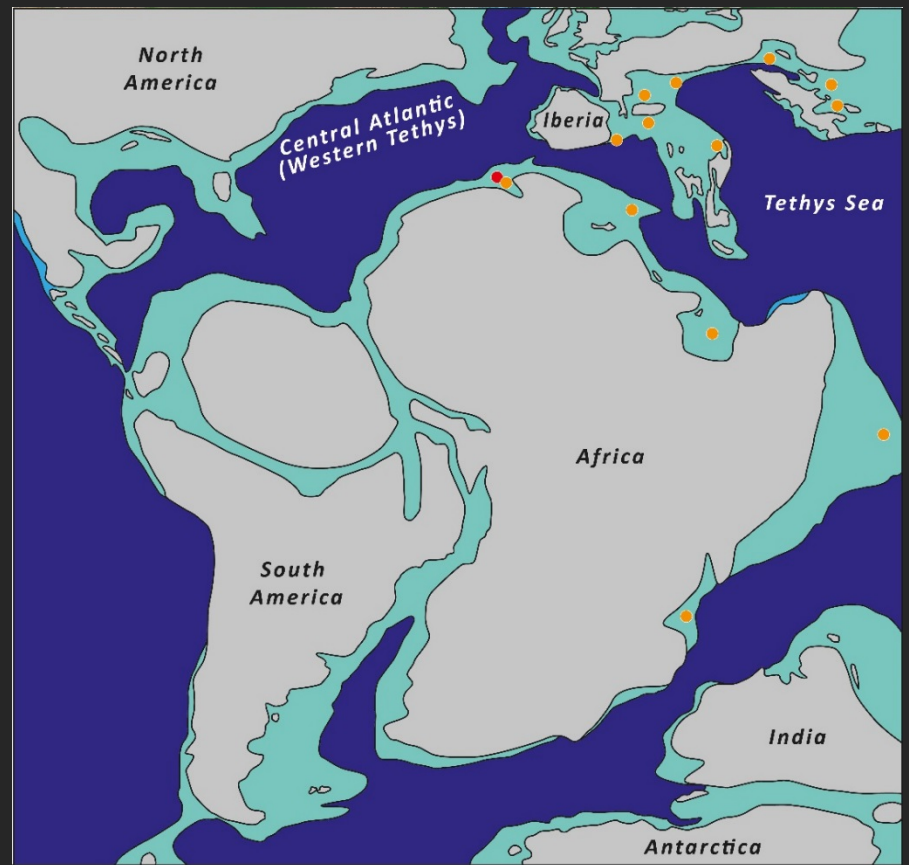
Aptian palaeogeography showing major landmasses, shelves, and deep-marine basins. Modified after Arai (2014) and adopted from Scotese (2001).

Phase 1. early upper Aptian



Aptian palaeogeography showing major landmasses, shelves, and deep-marine basins. Modified after Arai (2014) and adopted from Scotese (2001).

Phase 1. early upper Aptian



Aptian palaeogeography showing major landmasses, shelves, and deep-marine basins. Modified after Arai (2014) and adopted from Scotese (2001).

Phase 2. middle upper Aptian



- Key**
- Major landmasses
 - Major shelves
 - Major deep-marine basins
 - Occurrences of *Elsaisabellia*
 - Occurrences of *Acanthohoplites*

Aptian palaeogeography showing major landmasses, shelves, and deep-marine basins.
 Modified after Arai (2014) and adopted from Scotese (2001).

Phase 2. middle upper Aptian



- Key**
- Major landmasses
 - Major shelves
 - Major deep-marine basins
 - Occurrences of *Elsaisabellia*
 - Occurrences of "*Nolaniceras*"
 - Occurrences of *Immuticoceras*
 - un-named genus

Aptian palaeogeography showing major landmasses, shelves, and deep-marine basins.
 Modified after Arai (2014) and adopted from Scotese (2001).

Phase 3. late upper Aptian



New Project: DAFCOAE (Dynamics of Ammonoid Faunas during Cretaceous Oceanic Anoxic Events)

Leader: Dr. Luc Georges Bulot

External collaborators: Prof. Mohamed Fouad Aly (Cairo University, Egypt) and Prof. Jens Lehmann (University of Bremen, Germany)

Studied area. Iran, Egypt, Morocco and (hopefully Tunisia)

3. Perspectives

The study of the Iranian faunas (Lurestan, Khuzestan and coastal Fars) gives a good picture of the diversity of faunas of the Arabian Platform for the Aptian-Turonian interval because of the abundance of available material (more than a thousand of specimens collected in situ) (Bulot, 2007, 2010).

The Moroccan fauna collected during the PhD theses of Tim Luber and Jianpeng Wang (NARG) remain to be formally documented (in particular C / T of the Tarfaya basin) but represent a plentiful and easy database to complete under the agreements between Ohnym and NARG.

In contrast, the outcrops of the Cretaceous of northern Egypt are currently very difficult to access (impossible for Sinai). Abundant collections, well constrained stratigraphically were made independently by Prof. Jens Lehmann and Prof. Mohamed Aly. They make it possible to overcome this problem and to use Egyptian fauna as a milestone between Atlantic Morocco and the Middle East. The systematic analysis of the faunas is in progress (MSc Narg, MSc Univ Cairo, MSc Univ Aswad) or in project (subject of MSc Univ Bremen).

Tunisian faunas are known thanks to an abundant bibliography can be approached on the basis of published data. Complements might be needed

In the longer term, the aim of the project is to compare local expressions of faunal dynamics under the influence of palaeogeographic and paleo-oceanographic changes related to the establishment of successive stages of Cretaceous AEOs (Barremian to Turonian).

WITH THANKS

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Symposium

La Réserve géologique à l'ombre de l'UNESCO



We found him... !!!!



TOTAL

