

Suideo Bonarelli

«Il significato geologico
del Livello Bonarelli»

Prof. Rodolfo Coccioni

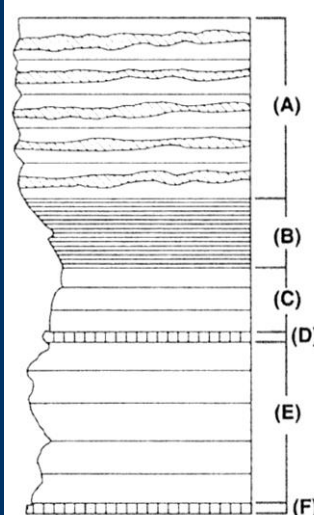
Università degli Studi di Urbino



1891: l'inizio di affascinanti ricerche geologiche

Secondo **BONARELLI** (App. Centr. in genere)

CRETACEO pr. d.		CRETACEO pr. d.	
INFRACRETACEO	superiore	DANIANO?	Bisciario inferiore. Spessore medio m. 7.
		SENONIANO sup. DORDONIANO	Scaglia cinerea. Spessore medio m. 50.
		CAMPANIANO	Scaglia rosata. Spessore medio m. 100.
		SENONIANO inf.	Calcere rosato. Spessore medio m. 200.
	medio	TURONIANO superiore	
		TURONIANO inferiore	<u>Scisto nero bituminoso. Spessore massimo m. 1.</u>
	inf.	CENOMANIANO	Calcere ippuritico (CANAV.). Spessore massimo m. 100.
	sup.	ALBIANO o Gault	Scisti policromi a Fucoidi. Spessore massimo m. 30. (Cretaceo medio auct.).
	inferiore	APTIANO	Maiolica infracretacea. Spessore medio m. 250.
		BARREMIANO	
		NEOCOMIANO	



Un banco di scisto nero bituminoso dello spessore, al massimo, d'un metro circa, segna il limite fra il Cenomaniano ed il Cretaceo superiore. Questo banco è formato da una serie di esilissimi straterelli prevalentemente argilloso-selciferi di colore intensamente nero con macchie rugginose frequenti, dovuto alla idrossidazione di numerosi noccioli piritici che vi sono contenuti. Il tenore di sostanze bituminoidi che si possono estrarre da questo scisto rappresenta al massimo il 17% del peso totale.

Questo banco si riscontra quasi dovunque nell'Appennino Centrale compreso in una serie di strati calcarei che presentano dovunque la medesima successione secondo lo schema dalla qui unita figura.

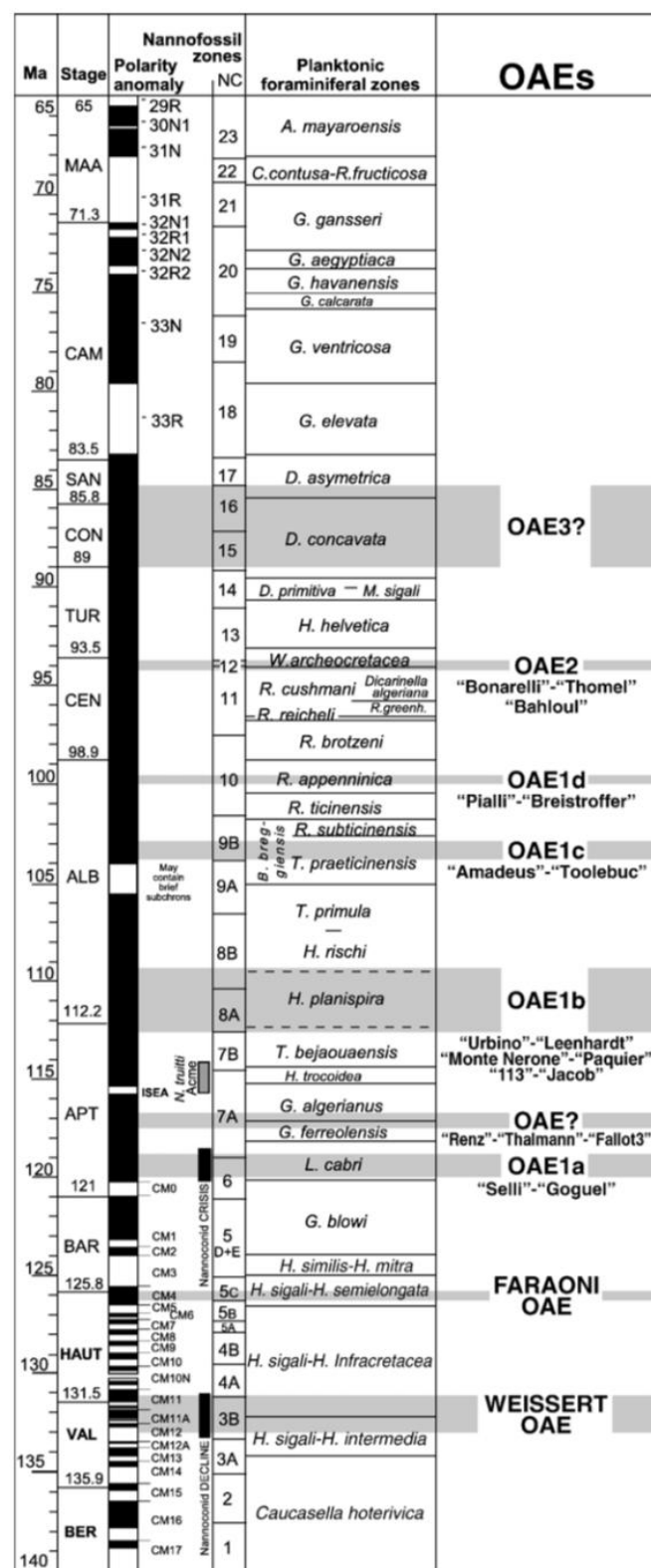
Al di sopra dello scisto bituminoso si hanno generalmente cinque o sei strati di calcare biancastro con liste e noduli di selce verdastra occupanti la parte mediana di ciascuno strato per modo che la parte silicea sfuma gradatamente nella porzione calcarea di essi strati (A). Invece al di sotto del banco bituminoso (B) riposano due o tre strati di calcare bianco (C), sotto questi un esilissimo straterello di selce nera punteggiata di bianco (D) quindi, nuovamente altri strati di calcare bianco (E) al di sotto dei quali, a circa un metro e mezzo dallo scisto bituminoso si ha un altro esile straterello di selce nera punteggiata di bianco (F) identica al precedente.

«...the so-called Livello Bonarelli...»

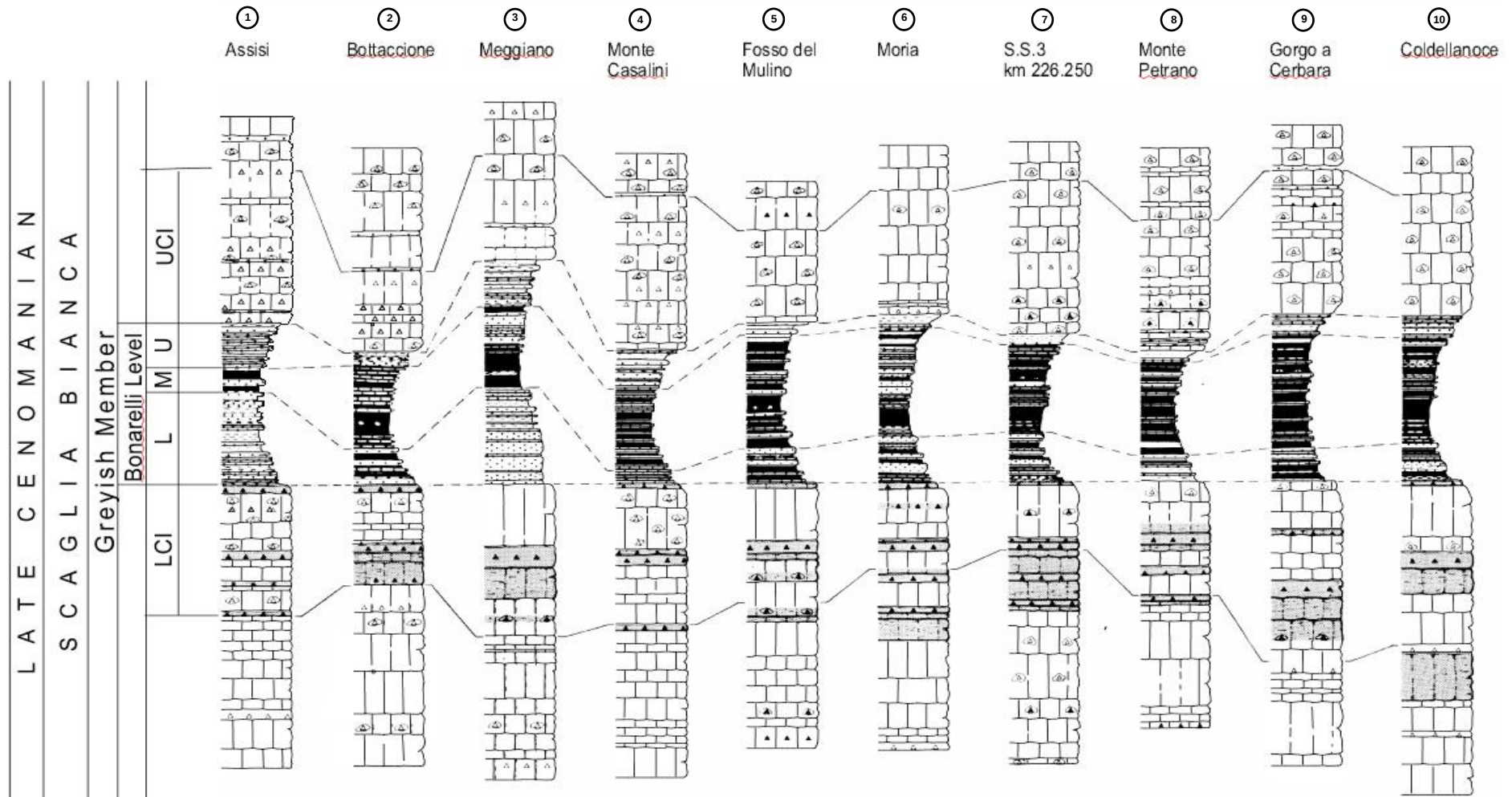
OAEs: Oceanic Anoxic Events

Drammatici e relativamente rapidi cambiamenti oceanografici

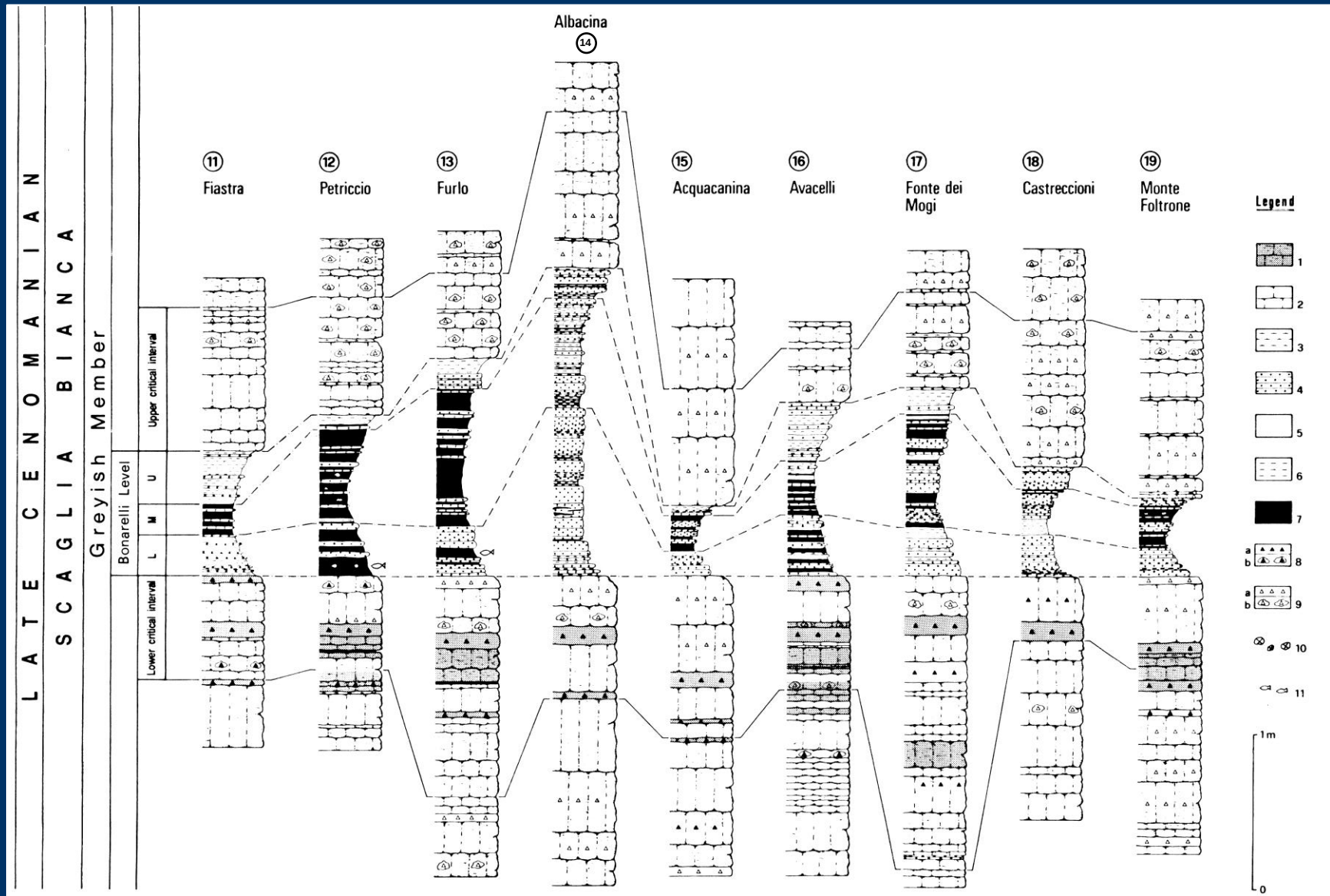
← 94 Ma



Il Livello Bonarelli dell'Appennino umbro-marchigiano

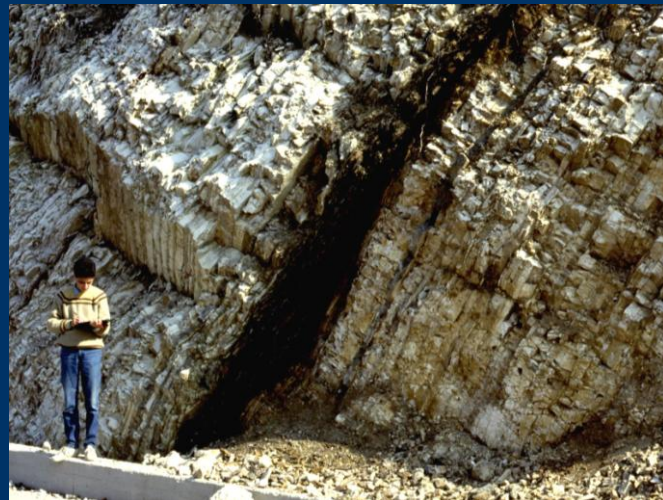
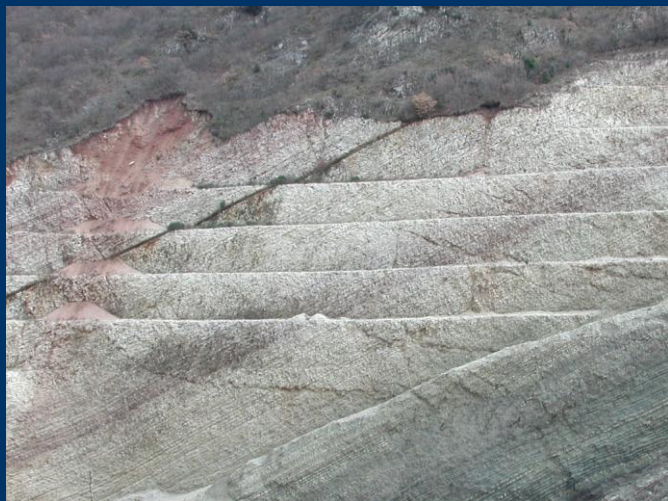


Il Livello Bonarelli dell'Appennino umbro-marchigiano

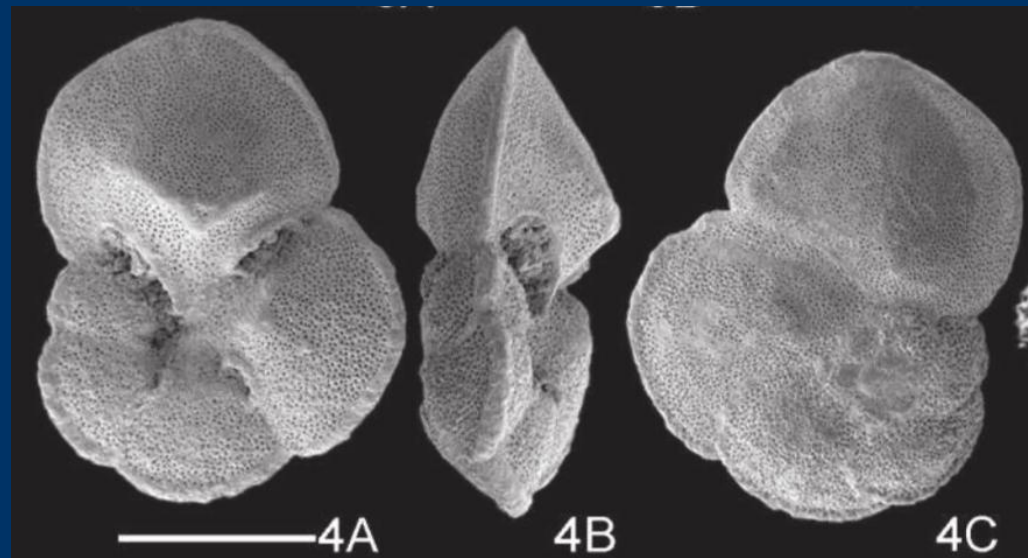
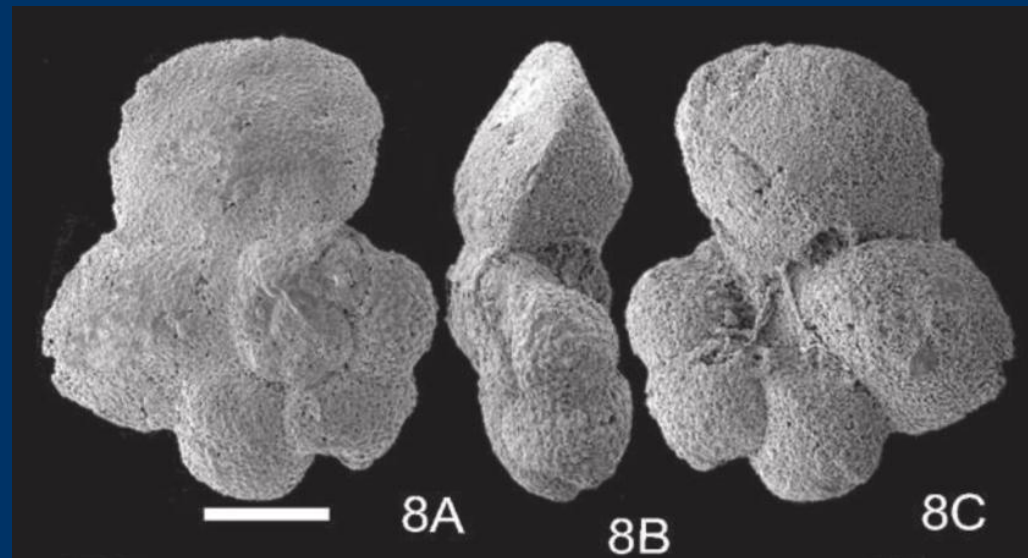
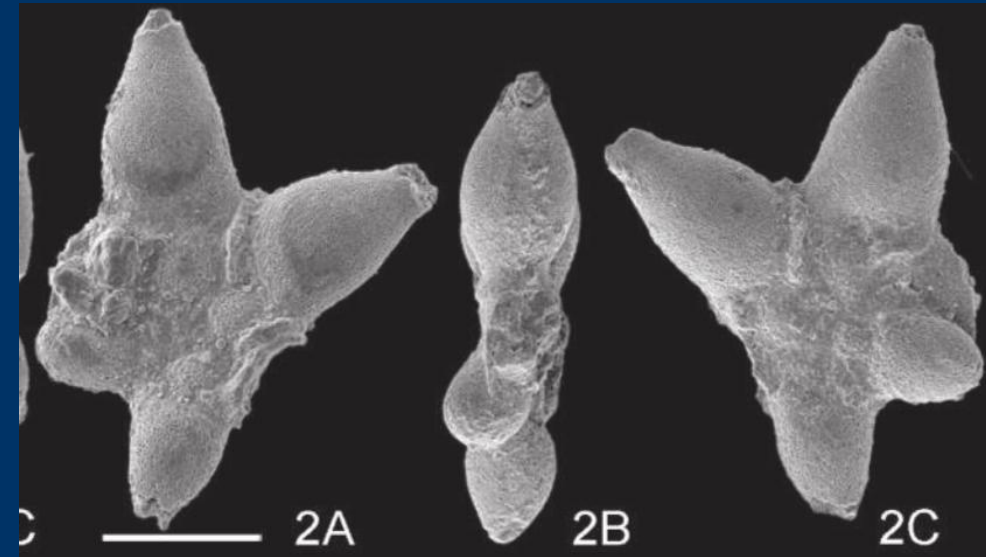
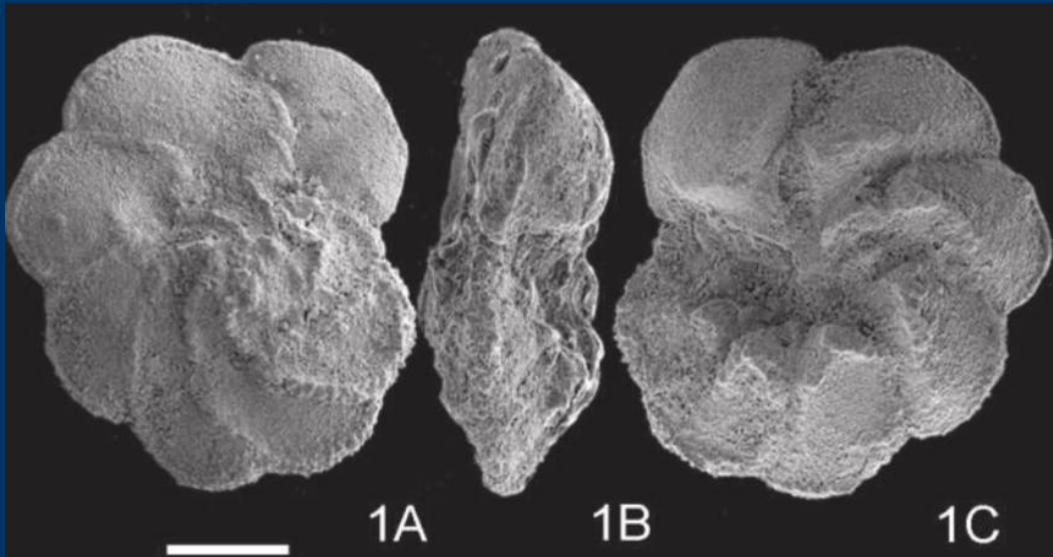


Una vita per la Geologia del Petrolio

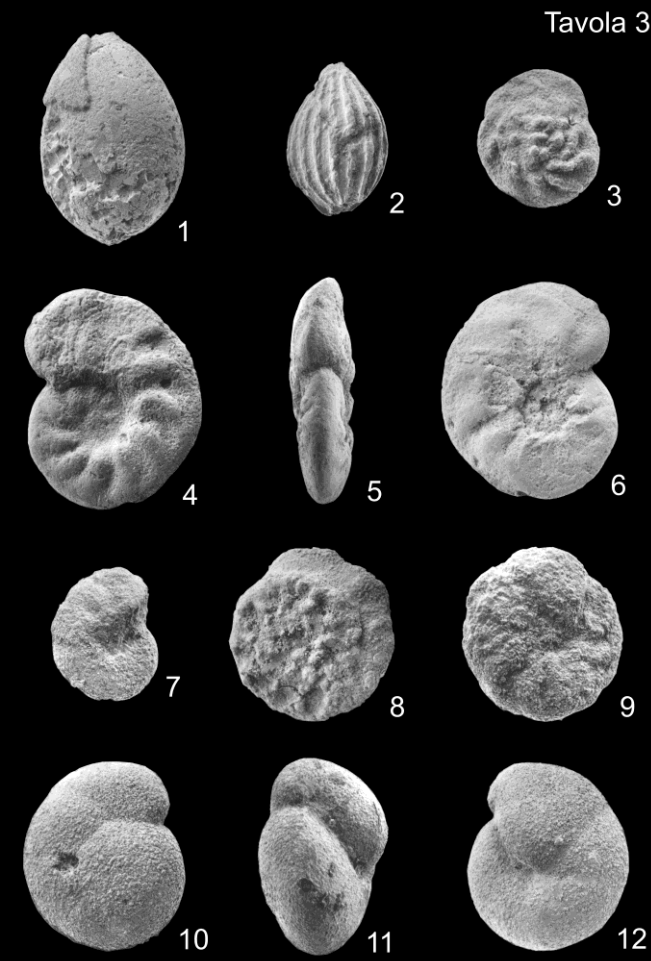
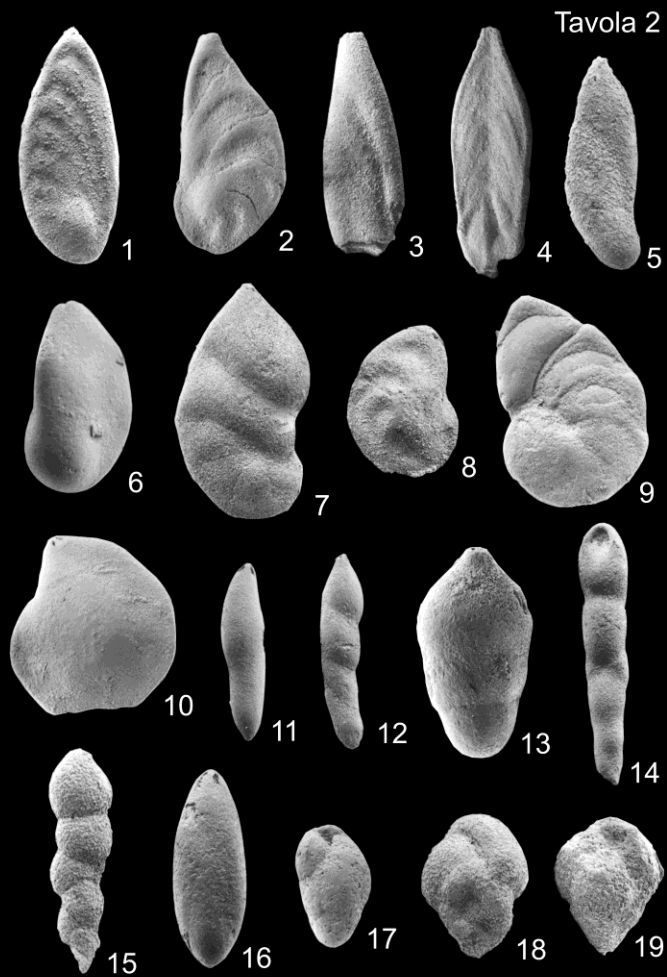
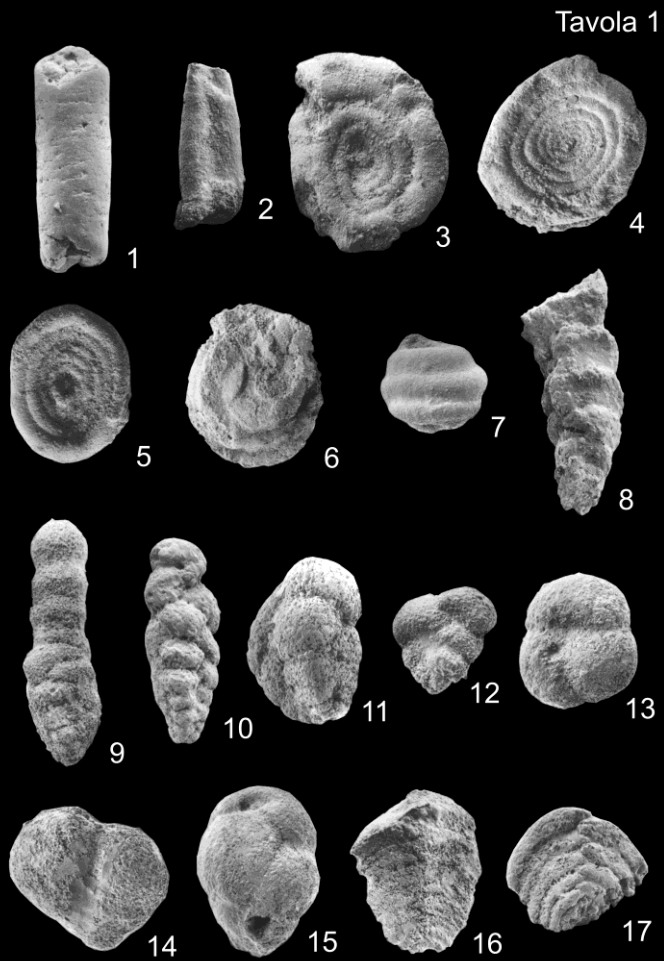




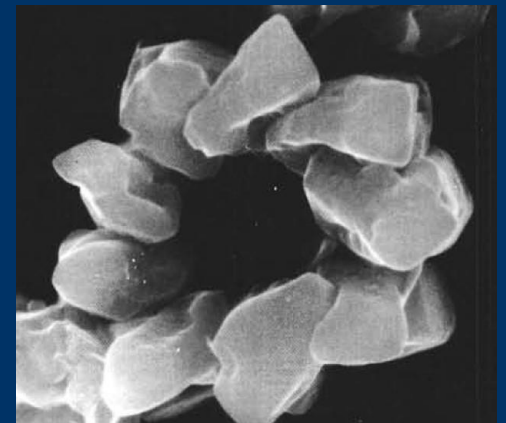
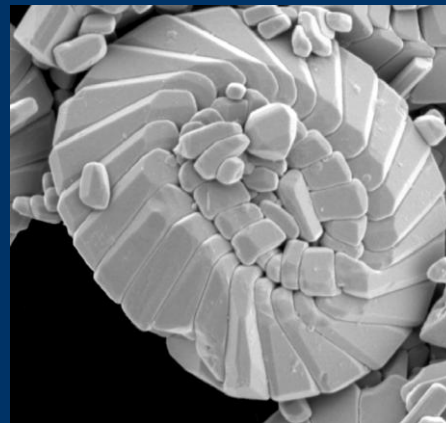
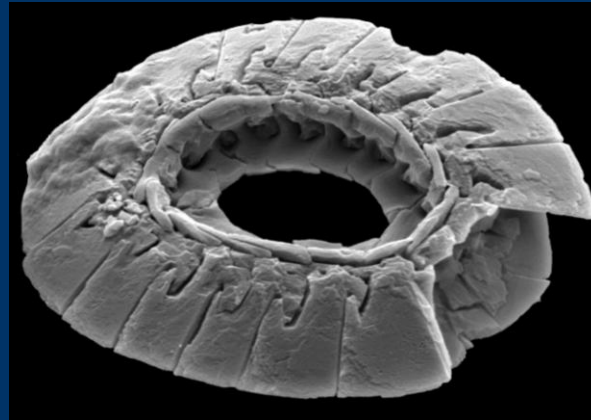
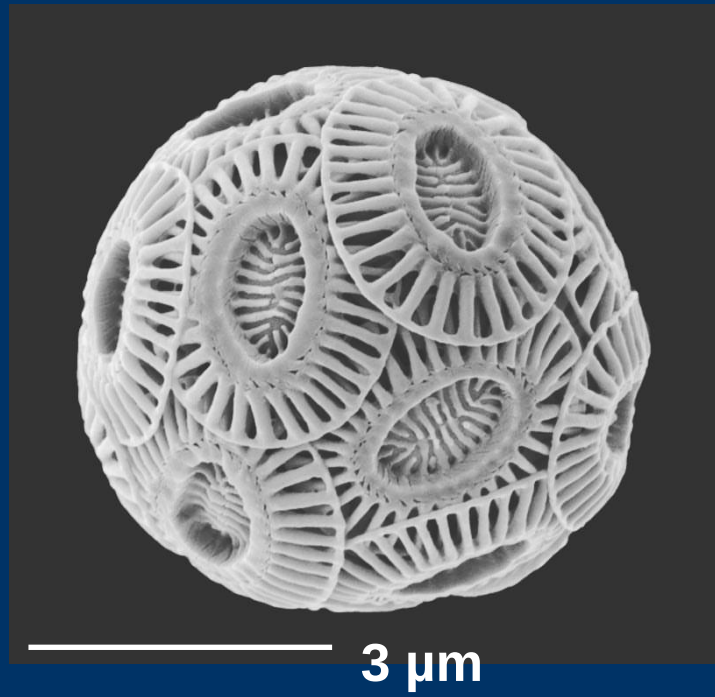
Foraminiferi planctonici



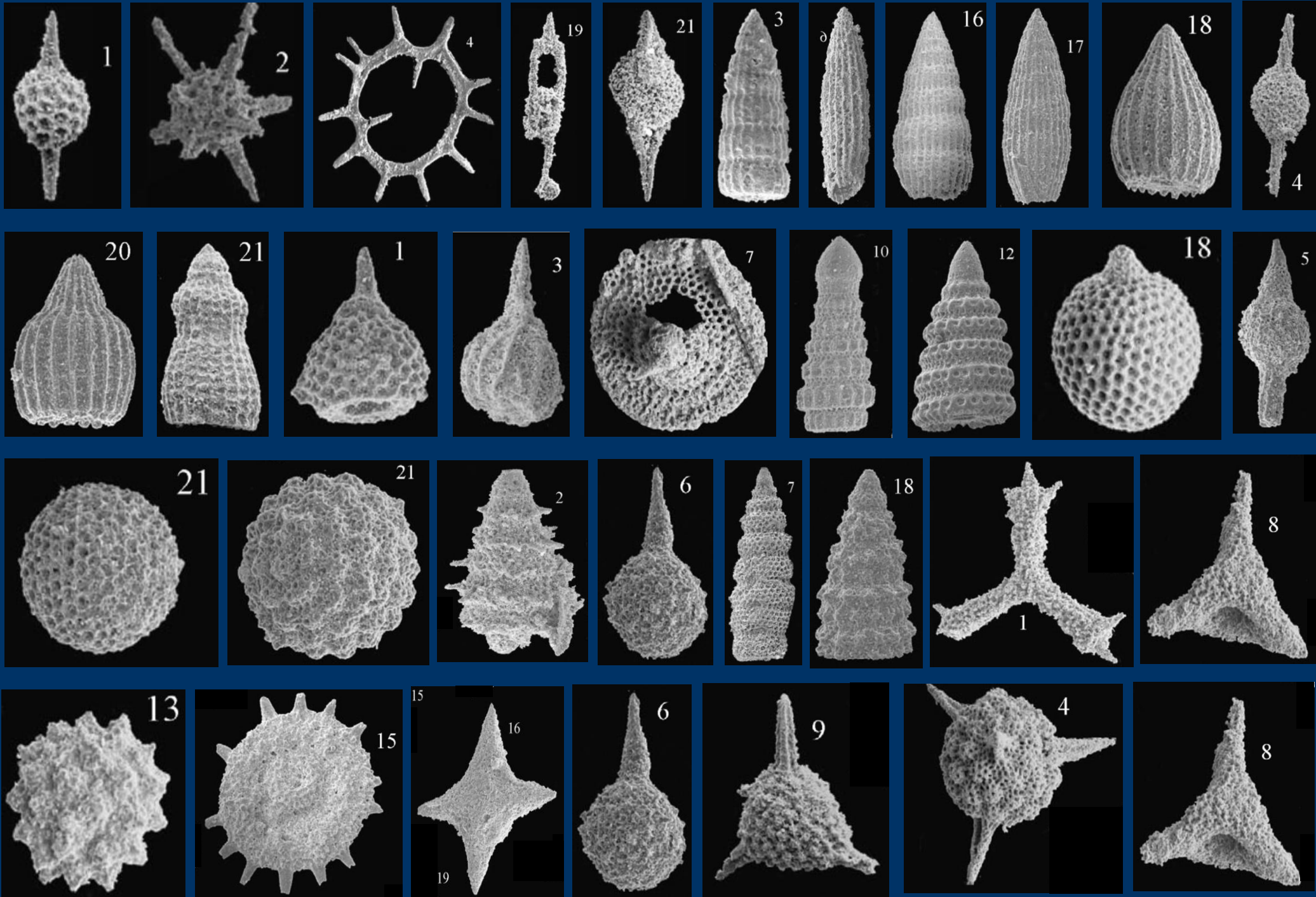
Foraminiferi bentonici



Nannofossili calcarei



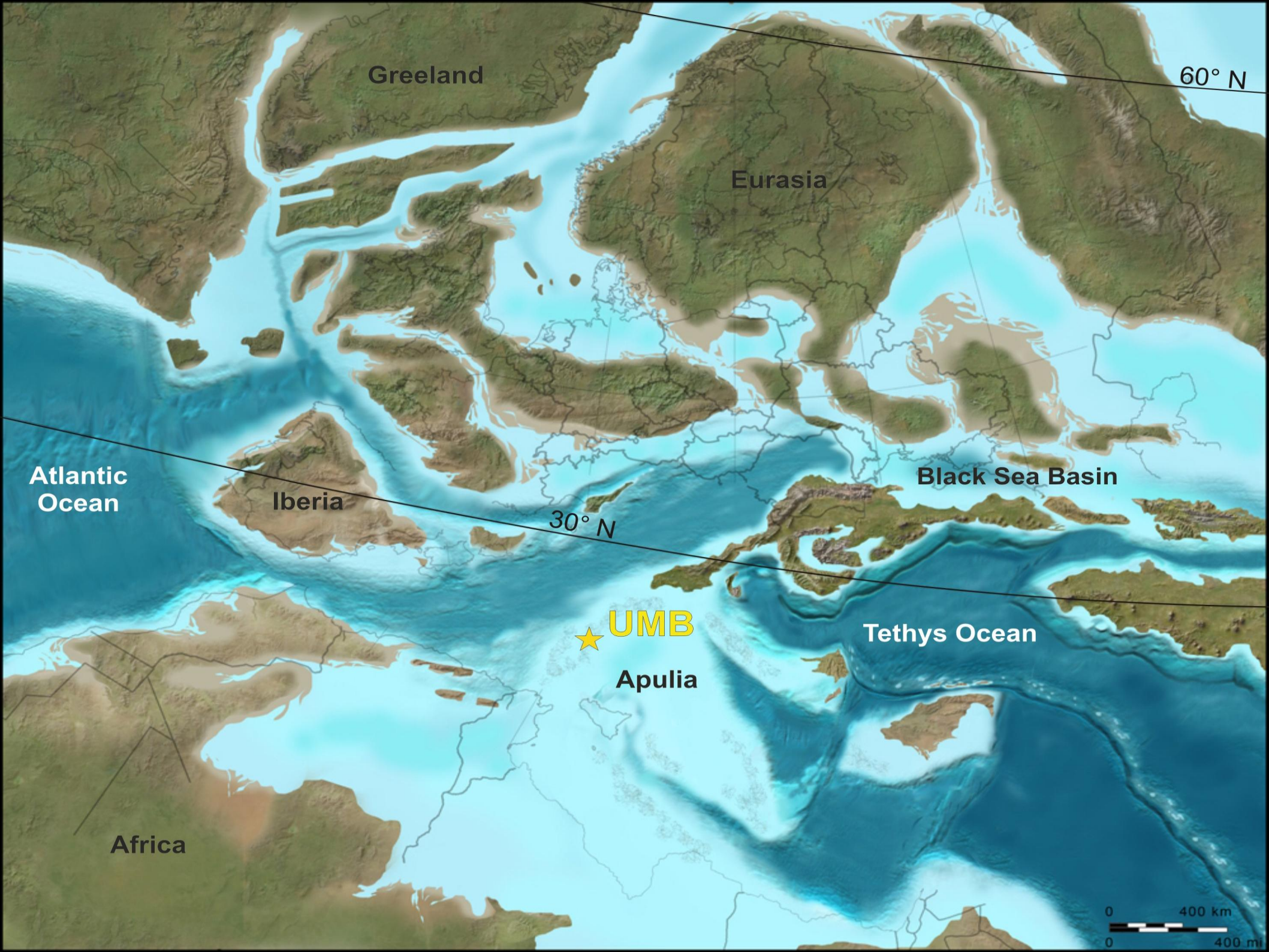
Radiolari



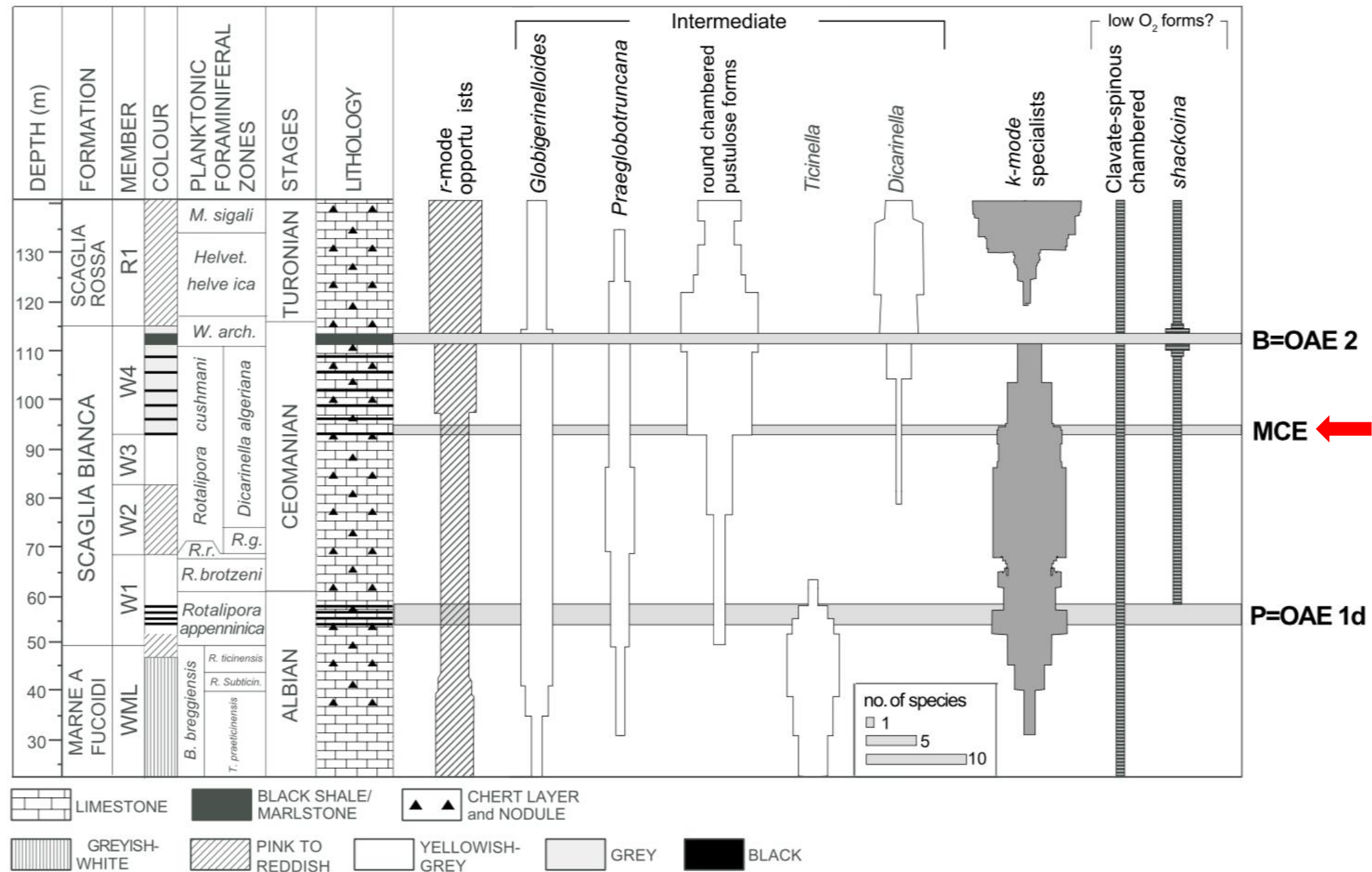
Pesci tropicali!

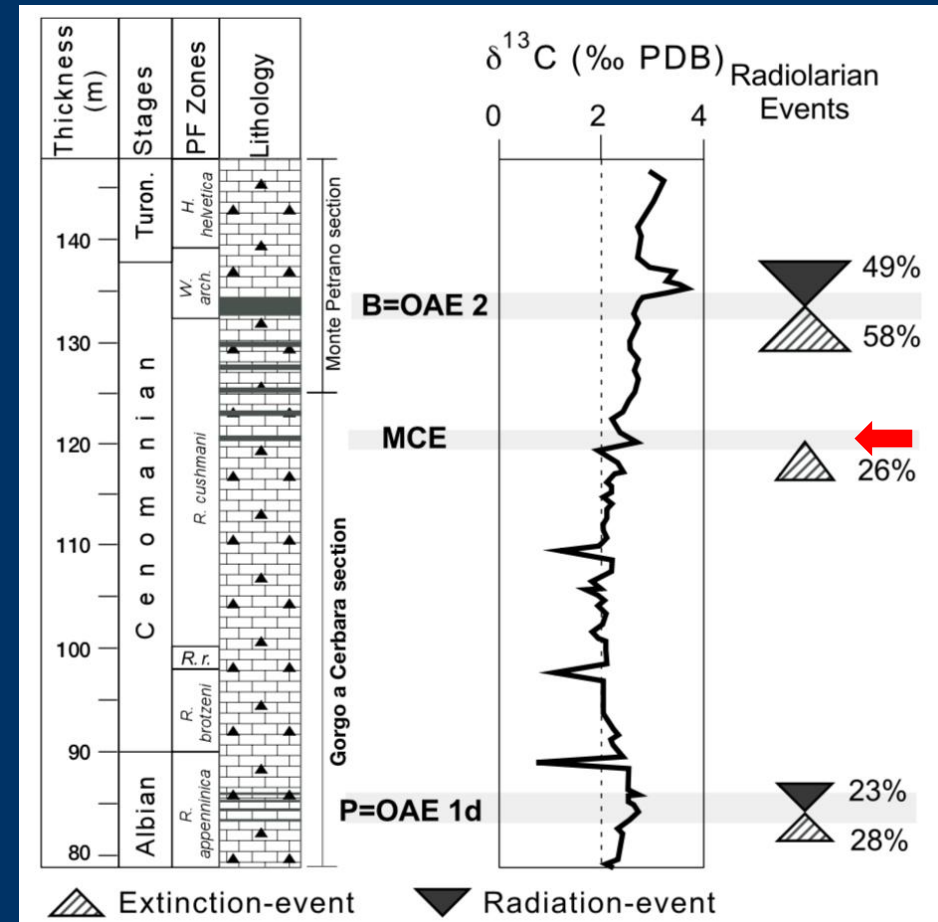
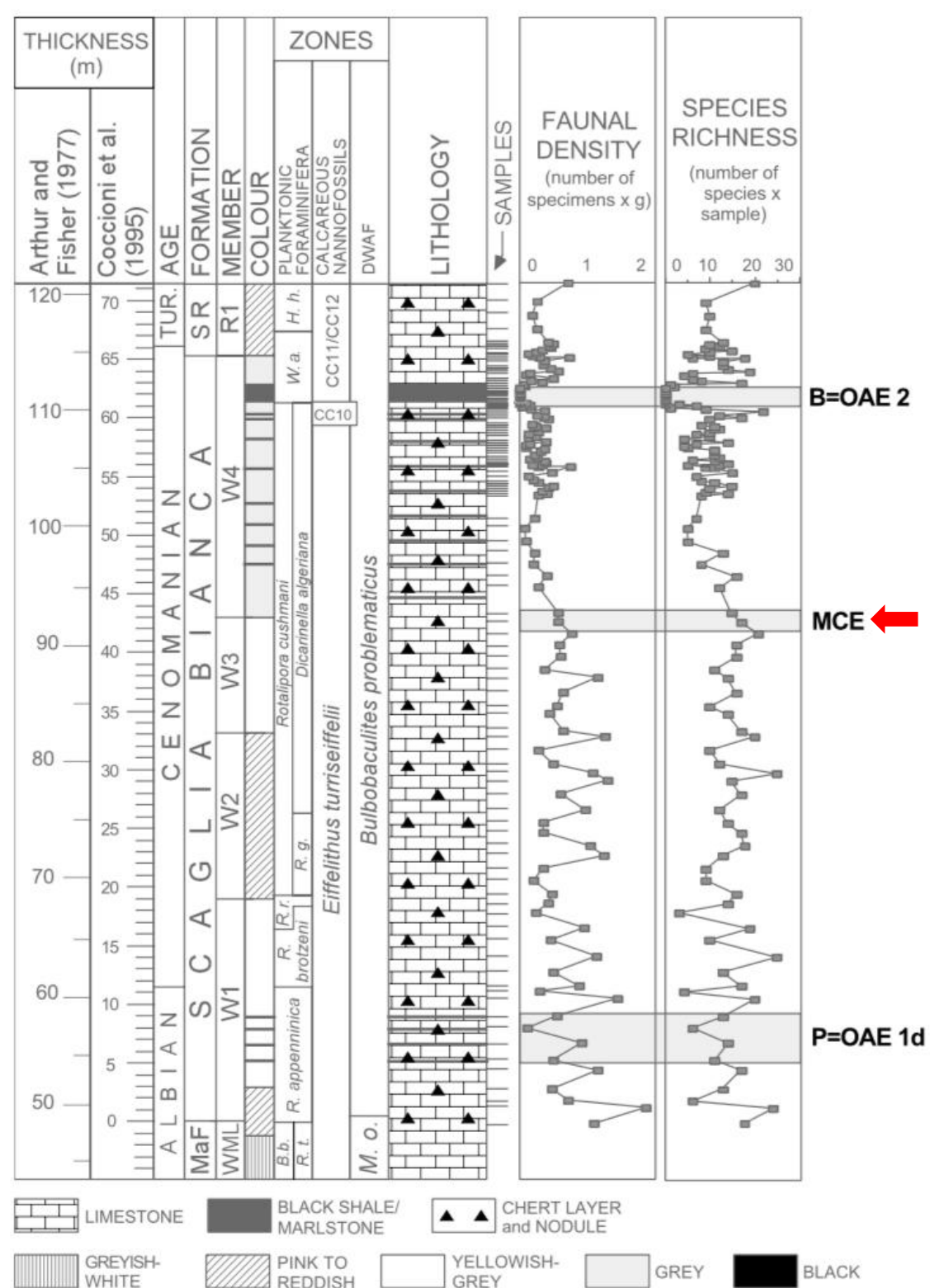


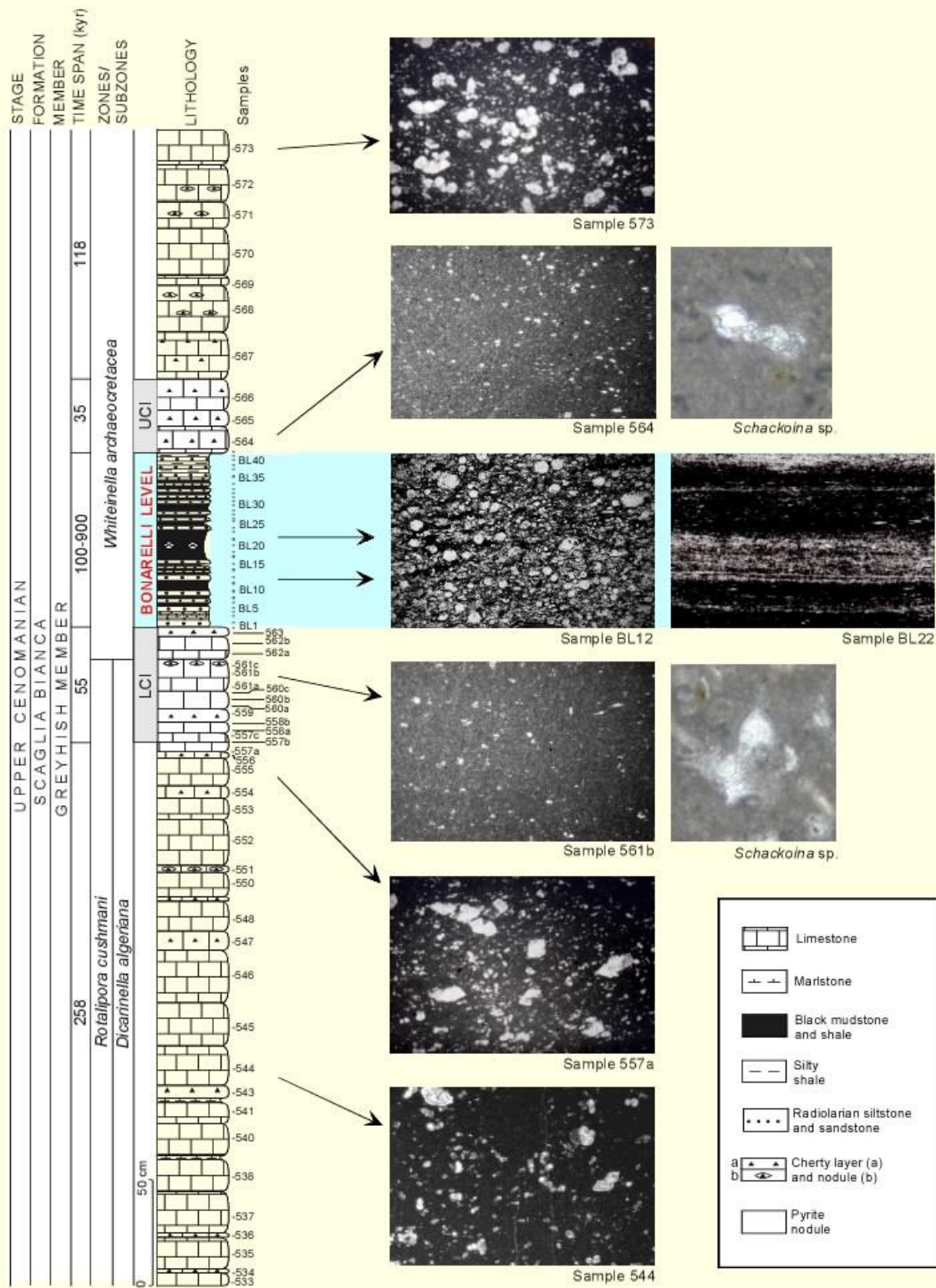
Tselfatia formosa



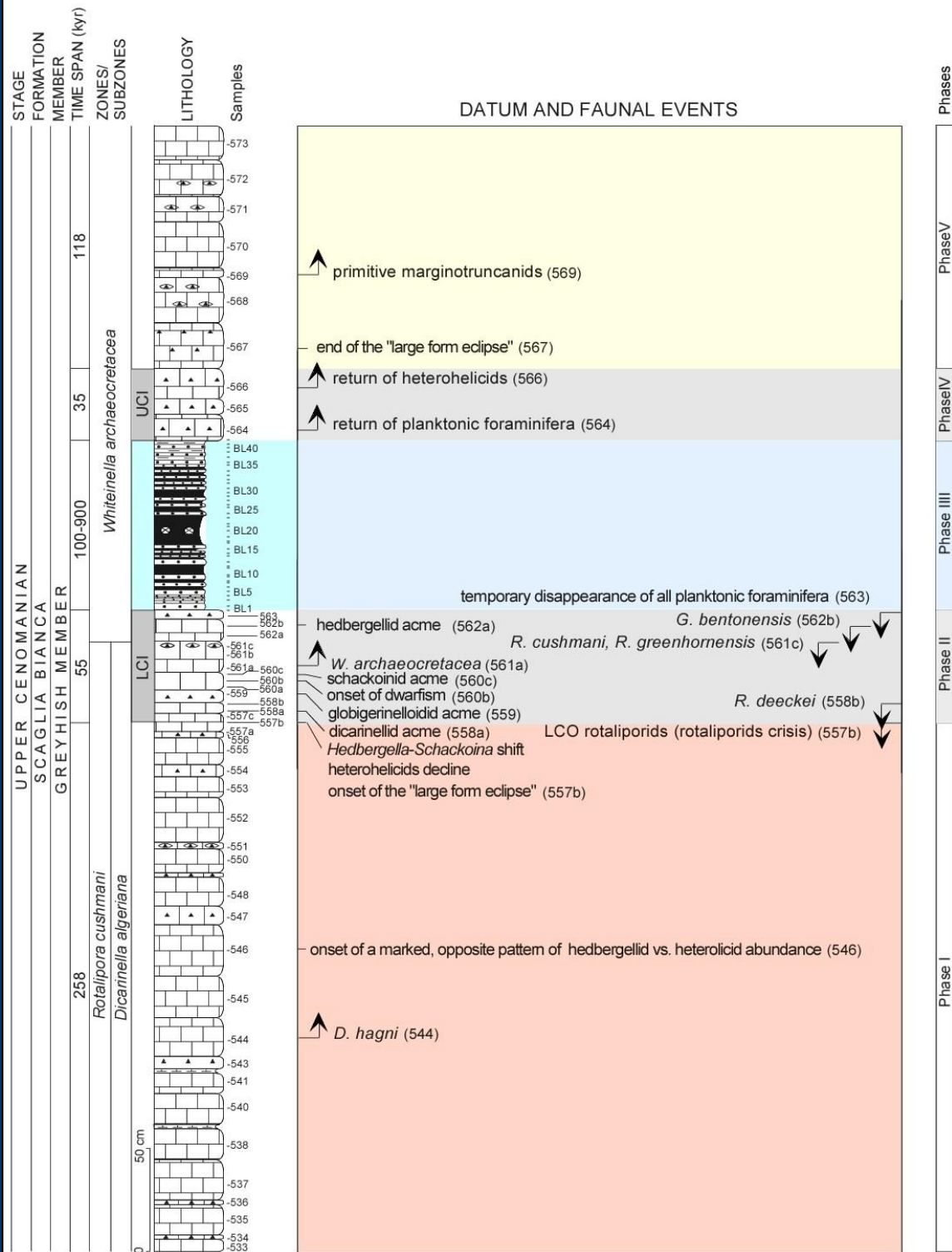
Mid-Cenomanian Event: preludio al Livello Bonarelli

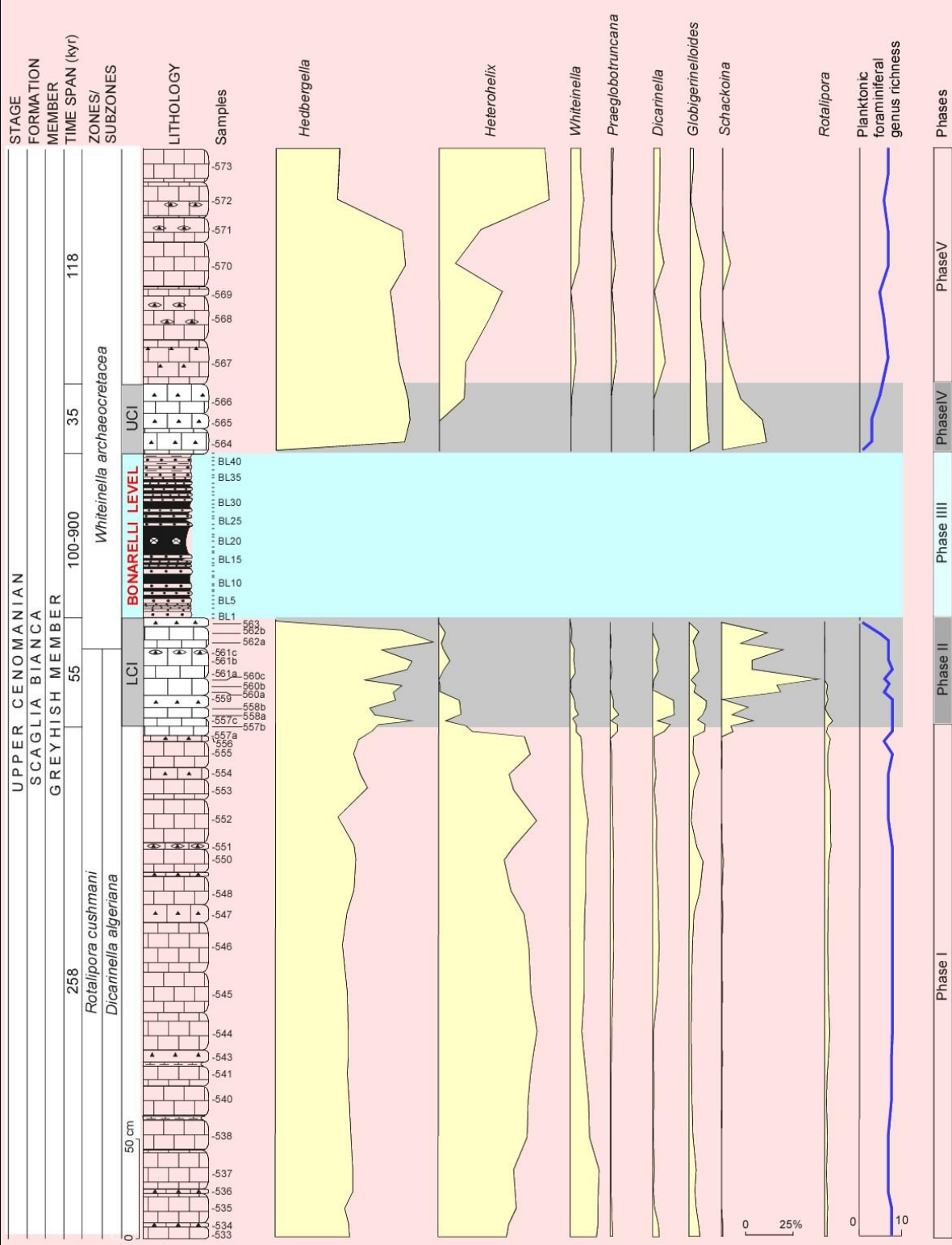
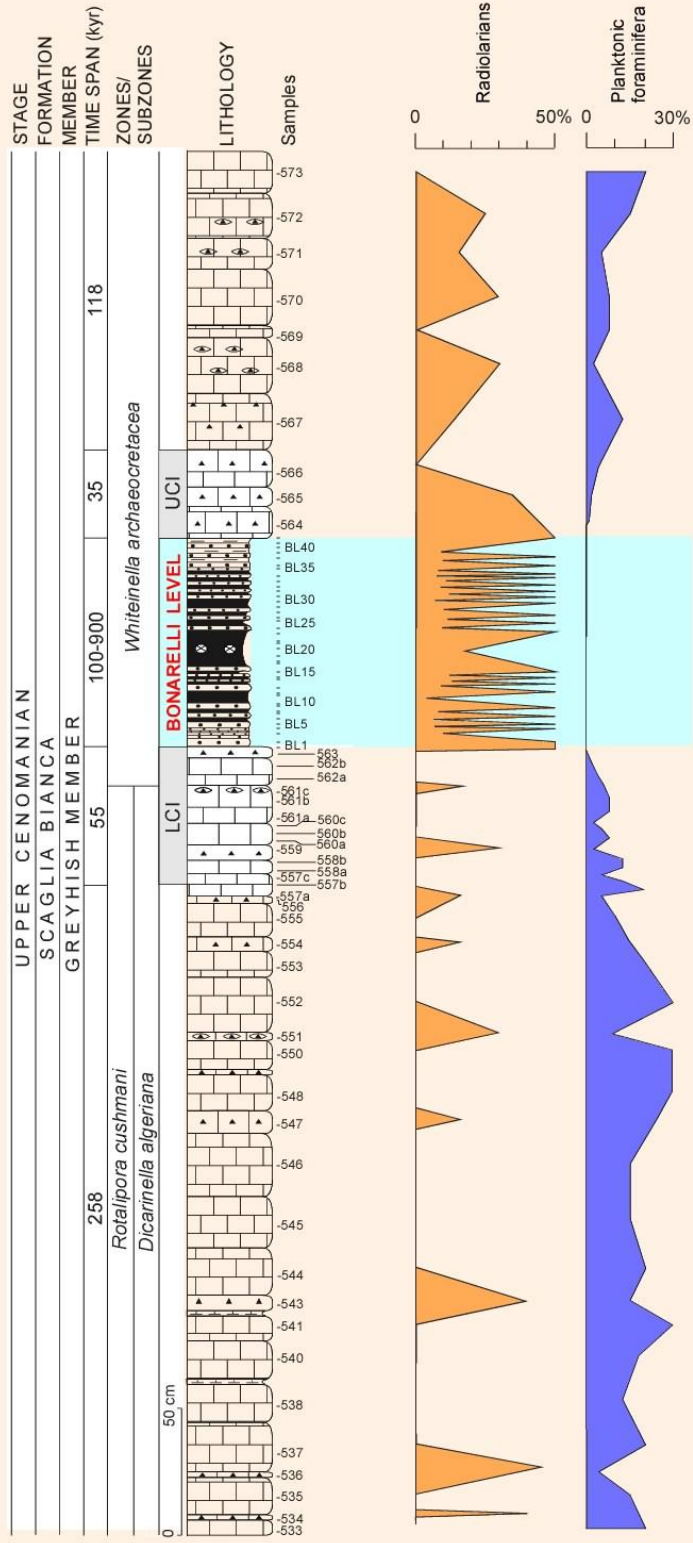






Foraminiferi planctonici





BONARELLI EVENT (OAE2, latest Cenomanian)

Habitat

K-mode specialists	r/K-mode intermediate forms	r-mode opportunists
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Highly Oligotrophic	Oligotrophic	Mesotrophic	Eutrophic	Highly Eutrophic
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<i>R. deecke</i>		<i>D. algeriana</i>	<i>Hb. delrioensis</i> ⁽¹⁾
<i>R. cushmani</i>		<i>D. canaliculata</i>	<i>Hb. simplex</i> ⁽¹⁾
<i>R. greenhomensis</i>		<i>D. hagni</i>	<i>Hb. planispira</i> ⁽¹⁾
		<i>D. imbricata</i>	<i>Hx. moremani</i> ^(1,2)
		<i>P.gibba</i>	<i>Hx. reussi</i> ^(1,2)
		<i>P.stephani</i>	<i>Schackoina</i> sp. ⁽²⁾
	primitive marginotruncanids	<i>G. bentonensis</i>	
		<i>G. caseyi</i>	
		<i>G. ultramicrus</i>	
		<i>W. archaeocretacea</i> ⁽¹⁾	
		<i>W. aprica</i> ⁽¹⁾	
		<i>W. aumalensis</i> ⁽¹⁾	
		<i>W. baltica</i> ⁽¹⁾	
		<i>W. praehelvetica</i> ⁽¹⁾	
		<i>W. brittonensis</i> ⁽¹⁾	
		<i>W. inomata</i> ⁽¹⁾	
		<i>W. paradubia</i> ⁽¹⁾	

Deep dwellers (below thermocline)	Intermediate dwellers (thermocline)	Surface dwellers (surface mixed layer)
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<i>R. cushmani</i> *	<i>G. bentonensis</i>	<i>Hb. delrioensis</i> *
<i>R. deecke</i>	<i>G. caseyi</i>	<i>Hb. planispira</i> *
<i>R. greenhomensis</i> *	<i>G. ultramicrus</i>	<i>Hb. simplex</i> *
	<i>Schackoina</i> sp.	<i>W. aprica</i>
	<i>Hx. moremani</i>	<i>W. archaeocretacea</i> *
	<i>Hx. reussi</i>	<i>W. aumalensis</i>
	<i>D. algeriana</i>	<i>W. baltica</i>
	<i>D. canaliculata</i>	<i>W. brittonensis</i>
	<i>D. hagni</i> *	<i>W. inomata</i>
	<i>D. imbricata</i>	<i>W. paradubia</i>
	<i>P.gibba</i>	<i>W. praehelvetica</i>
	<i>P.stephani</i> *	

Grado di tolleranza allo stress ambientale

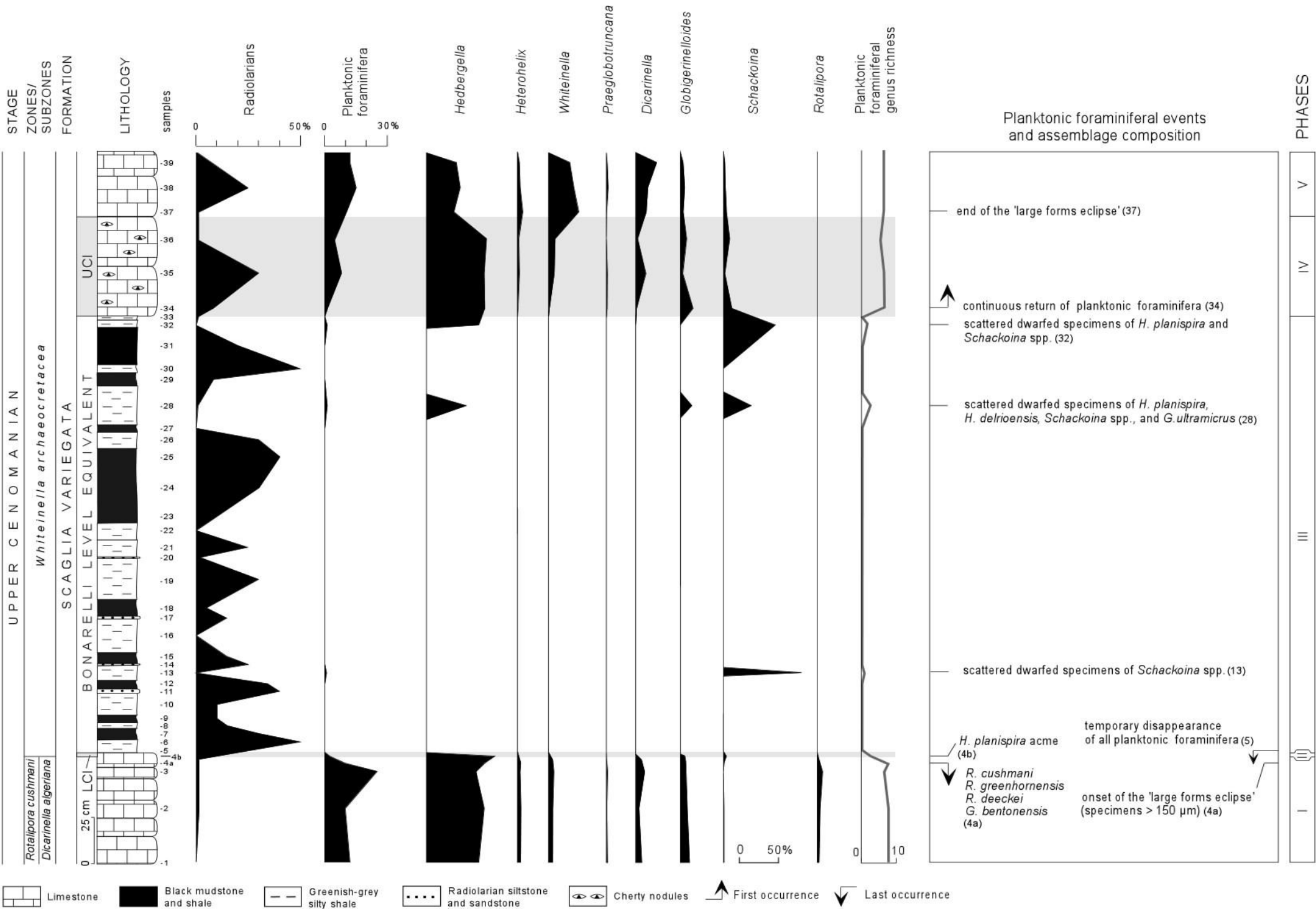
Low

R. deecke
R. cushmani
R. greenhornensis
G. bentonensis
G. caseyi
G. ultramicrus
D. algeriana
D. canaliculata
D. hagni
D. imbricata
P. gibba
P. stephani
W. aprica
W. aumalensis
W. baltica
W. praehelvetica
W. paradubia
W. brittonensis
W. inornata
primitive marginotruncanids

High

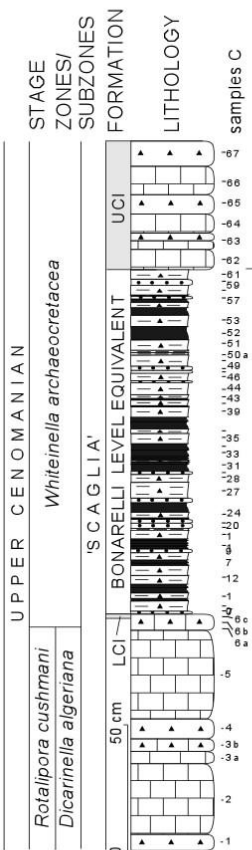
Hb. simplex
Hb. delrioensis
Hb. planispira
Hx. moremani
Hx. reussi
Shackoina sp.

W. archaeocretacea

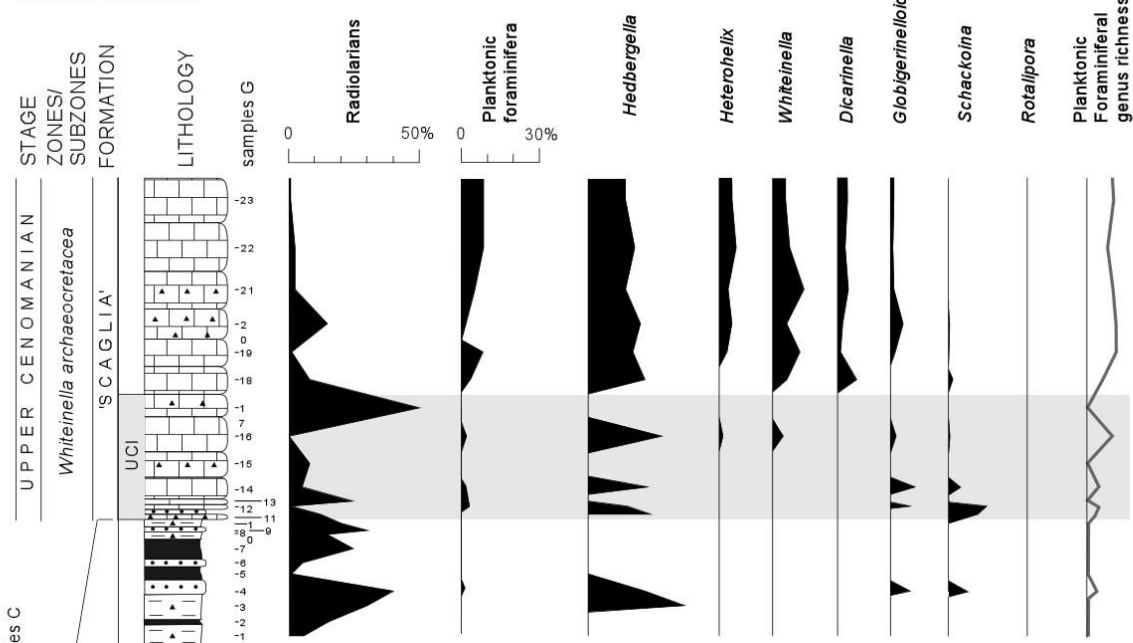


Fug. 4 - Coccioni & Luciani

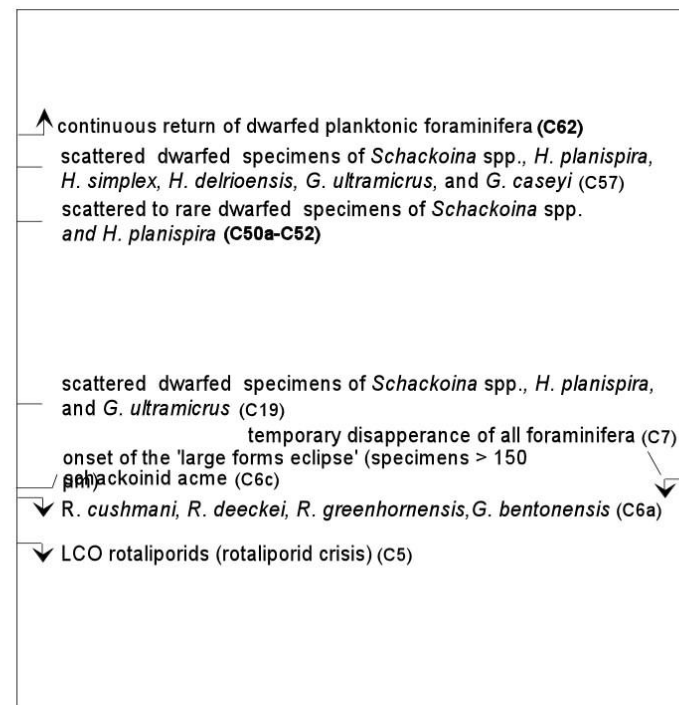
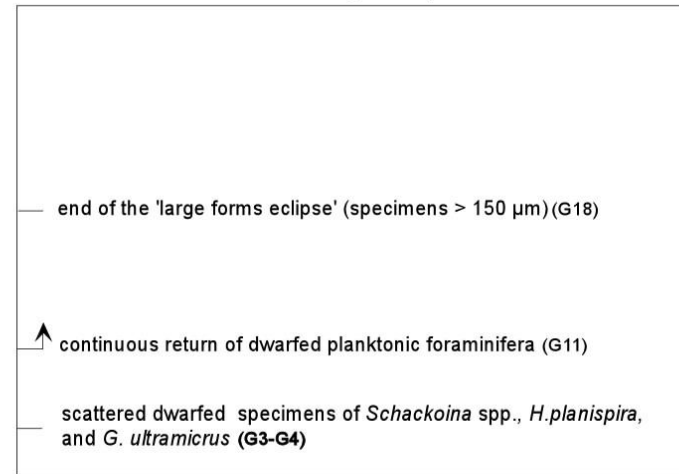
CALABIANCA



GUIDALOCA



Planktonic foraminiferal events and assemblage composition



PHASES

V

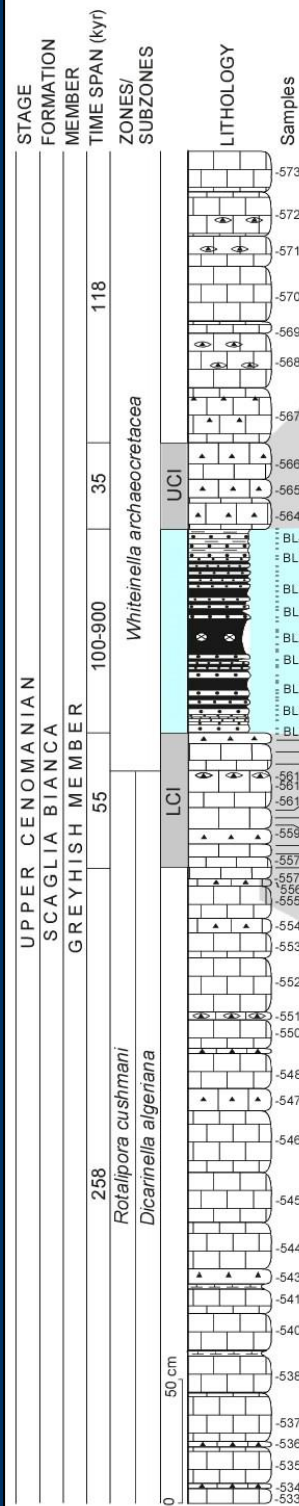
IV

III

IV

III

I



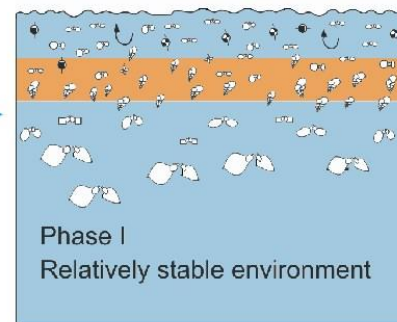
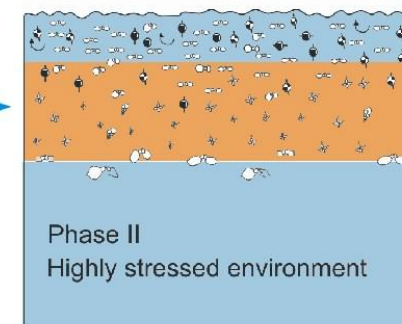
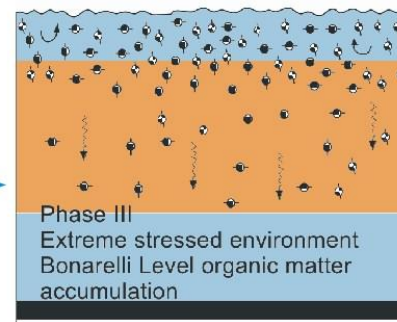
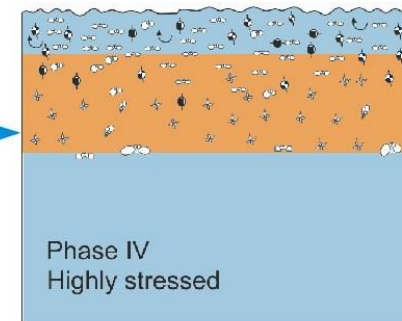
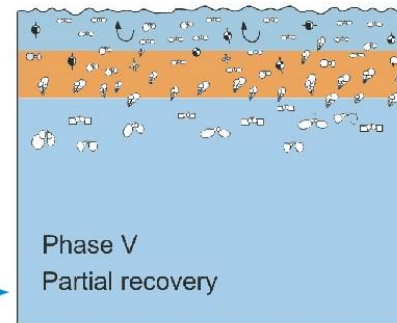
Abundance and diversity return to values comparable to those of Phase I showing the recovery of the ecosystem is acting. High numbers of hedbergellids and heterohelicids suggest the environmental perturbation is not yet ended.

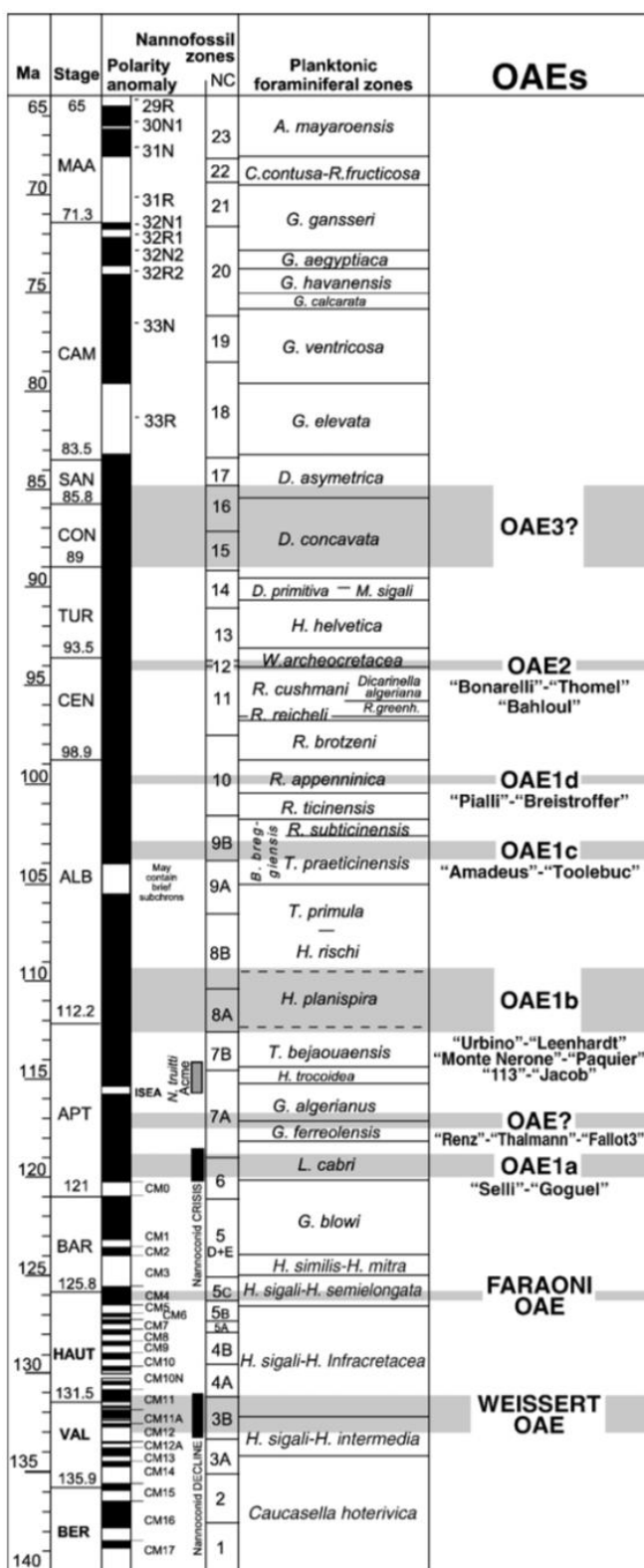
Low diversity, dominance of surface dwellers and schackoinids, dwarfed species, and high percentages of radiolarians indicate increased surface productivity, enhanced oxygen minimum zone and marked and rapid changes of ecological parameters.

Radiolarians thrive testifying highly eutrophic conditions.

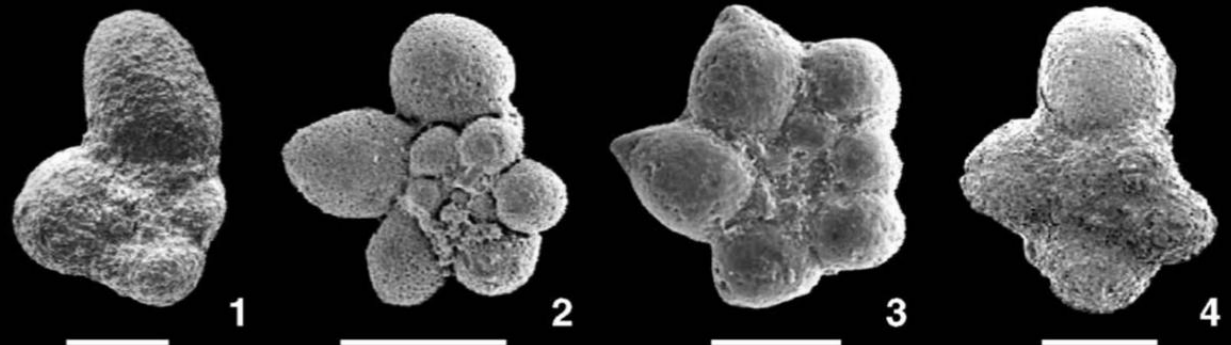
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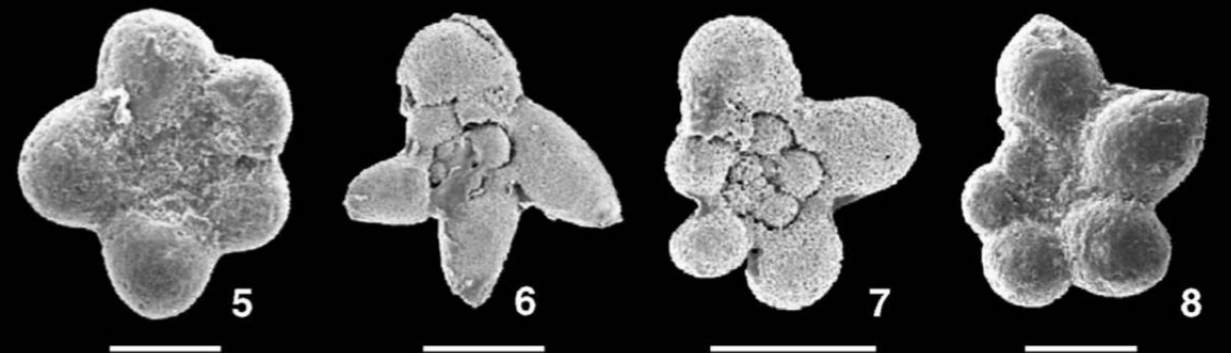




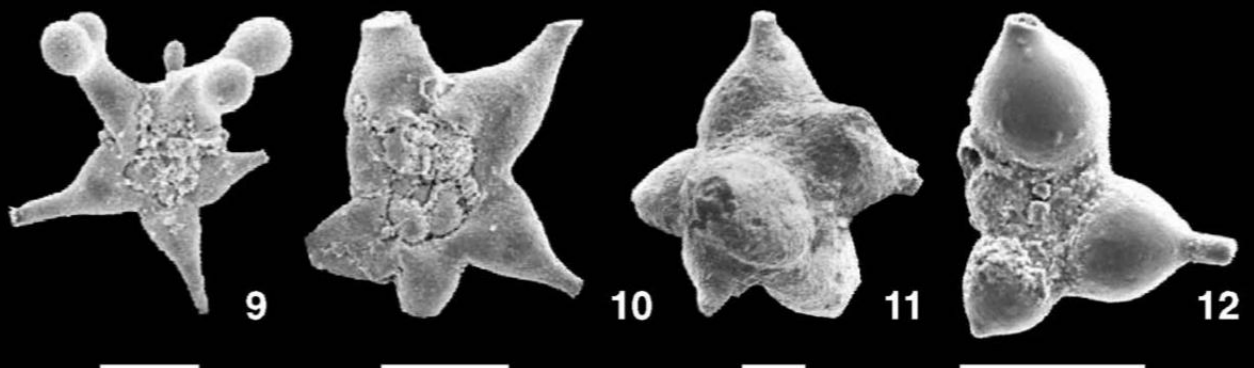
hedbergellids and muricohedbergellids



globigerinelloidids and pseudoschackoinids

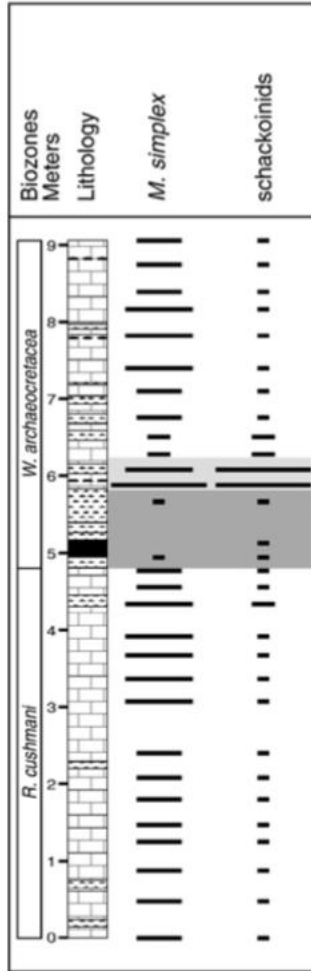


leupoldinids and schackoinids

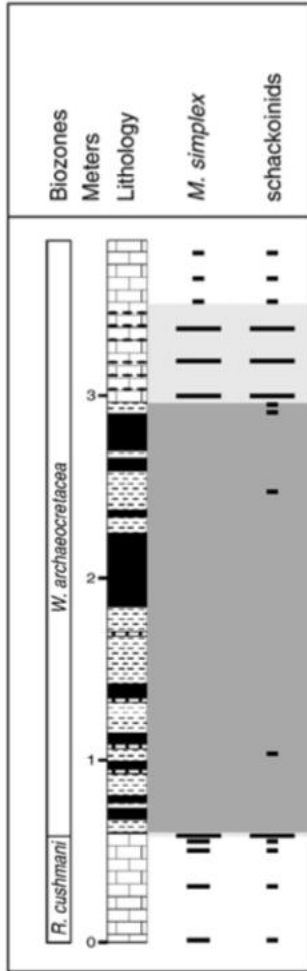


BONARELLI EVENT (OAE2)

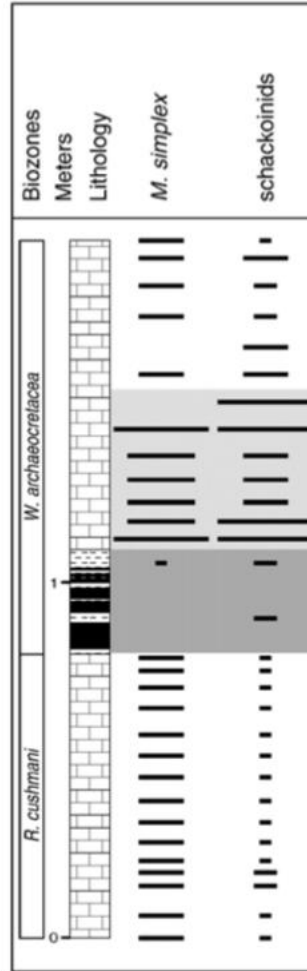
Monte Velo



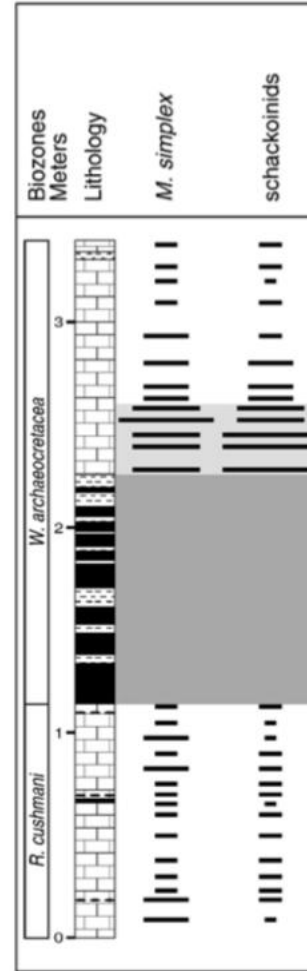
Valdagno



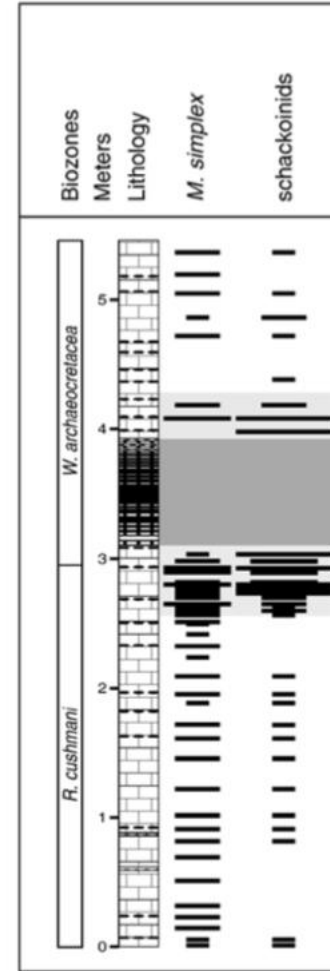
Cismon



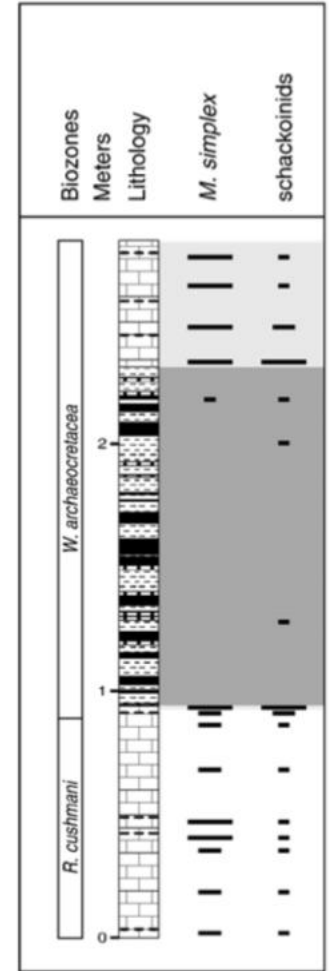
Segusino-Vas



Bottaccione



Calabianca

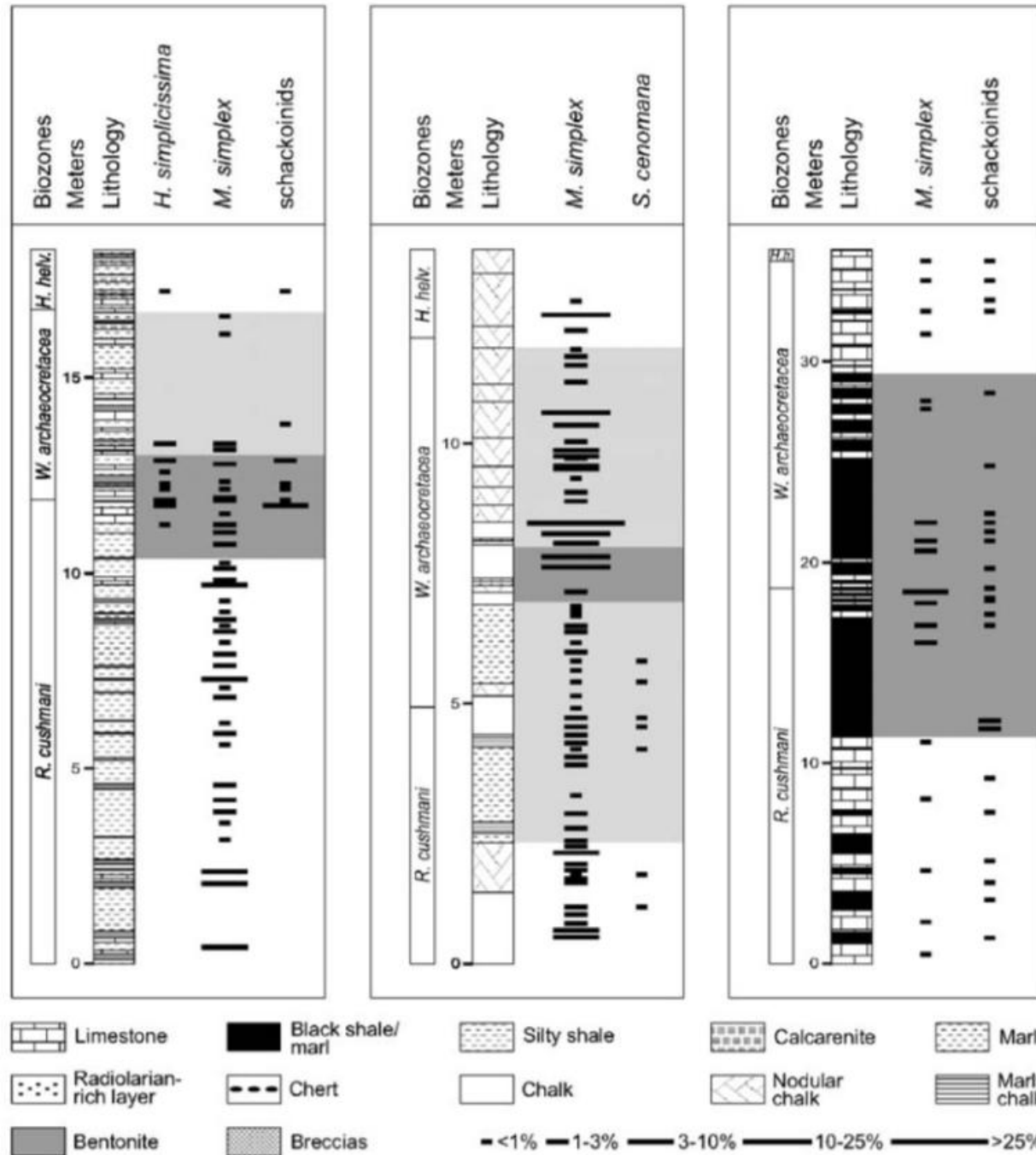


BONARELLI EVENT (OAE2)

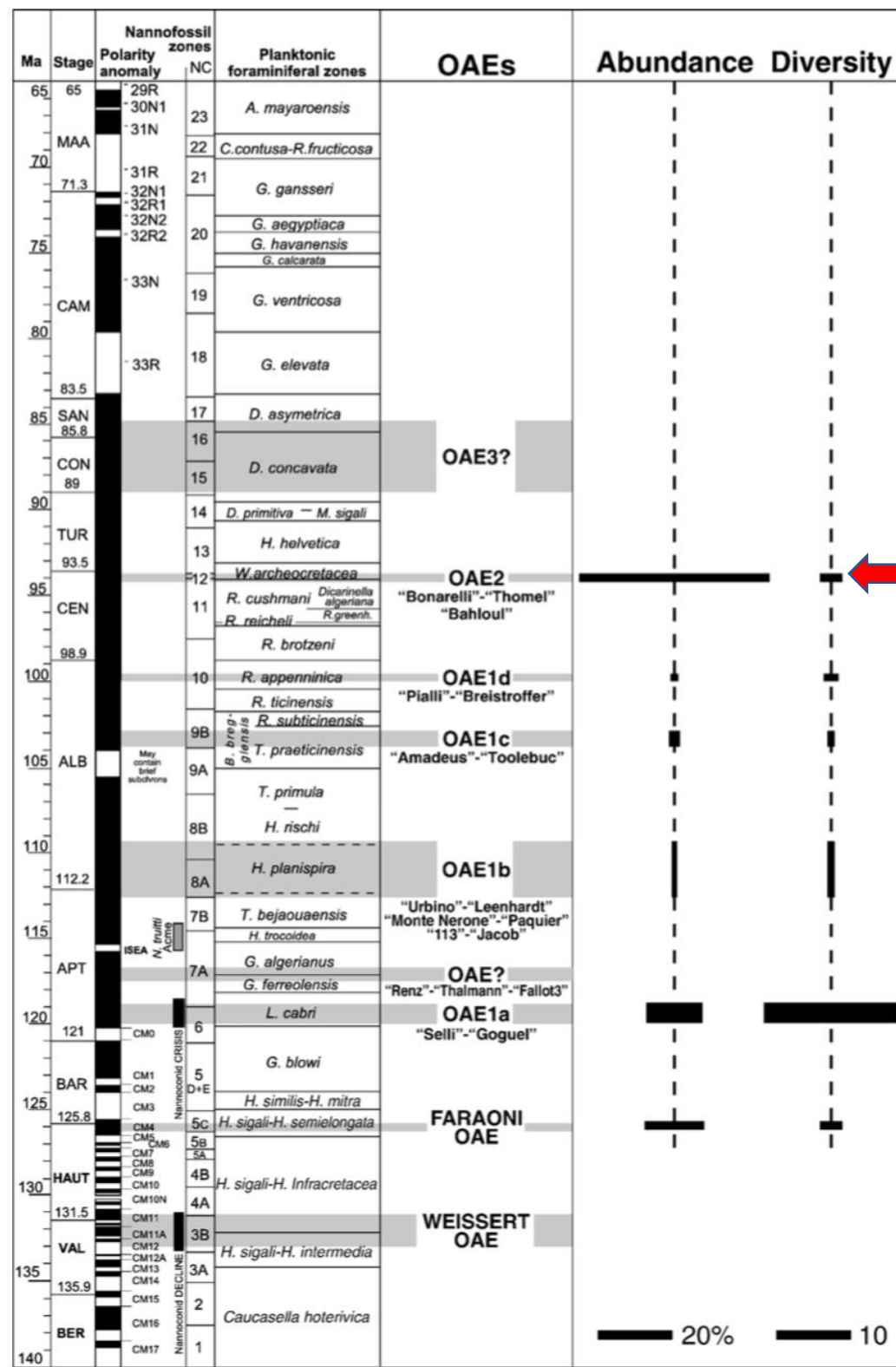
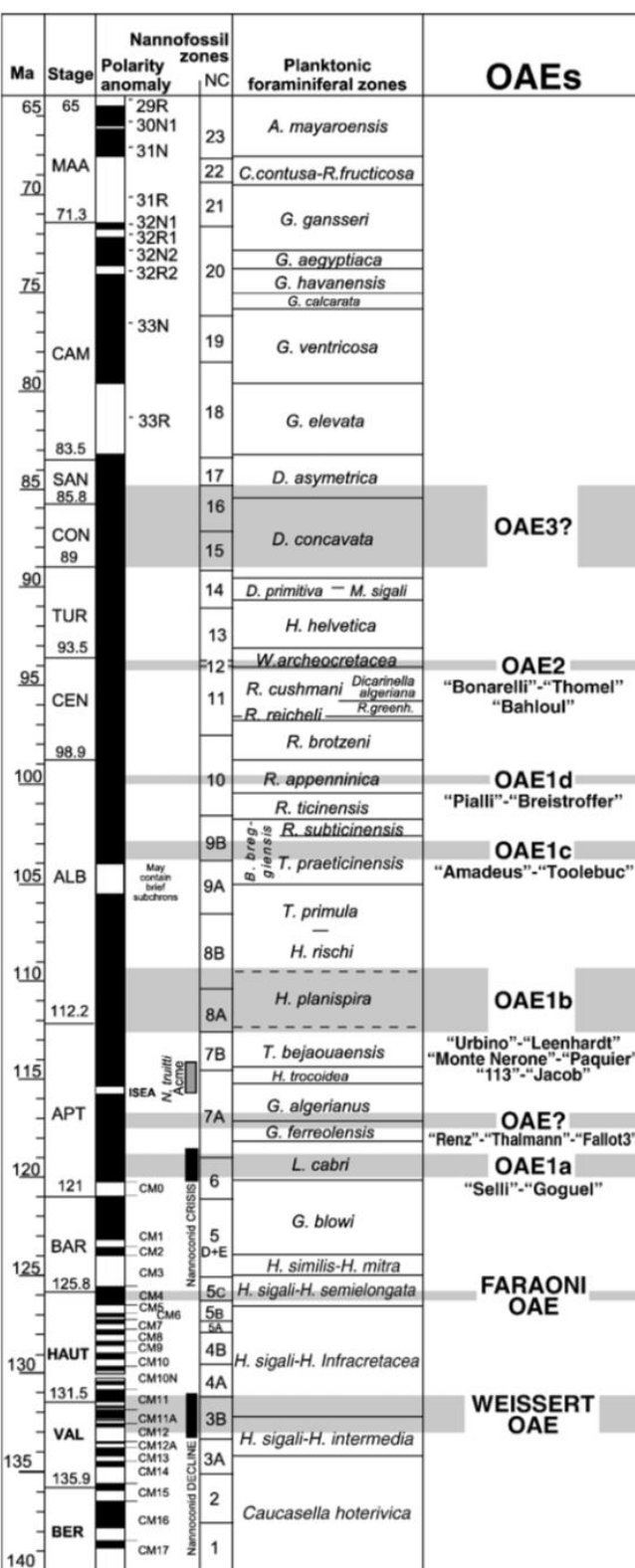
Pueblo

Eastbourne

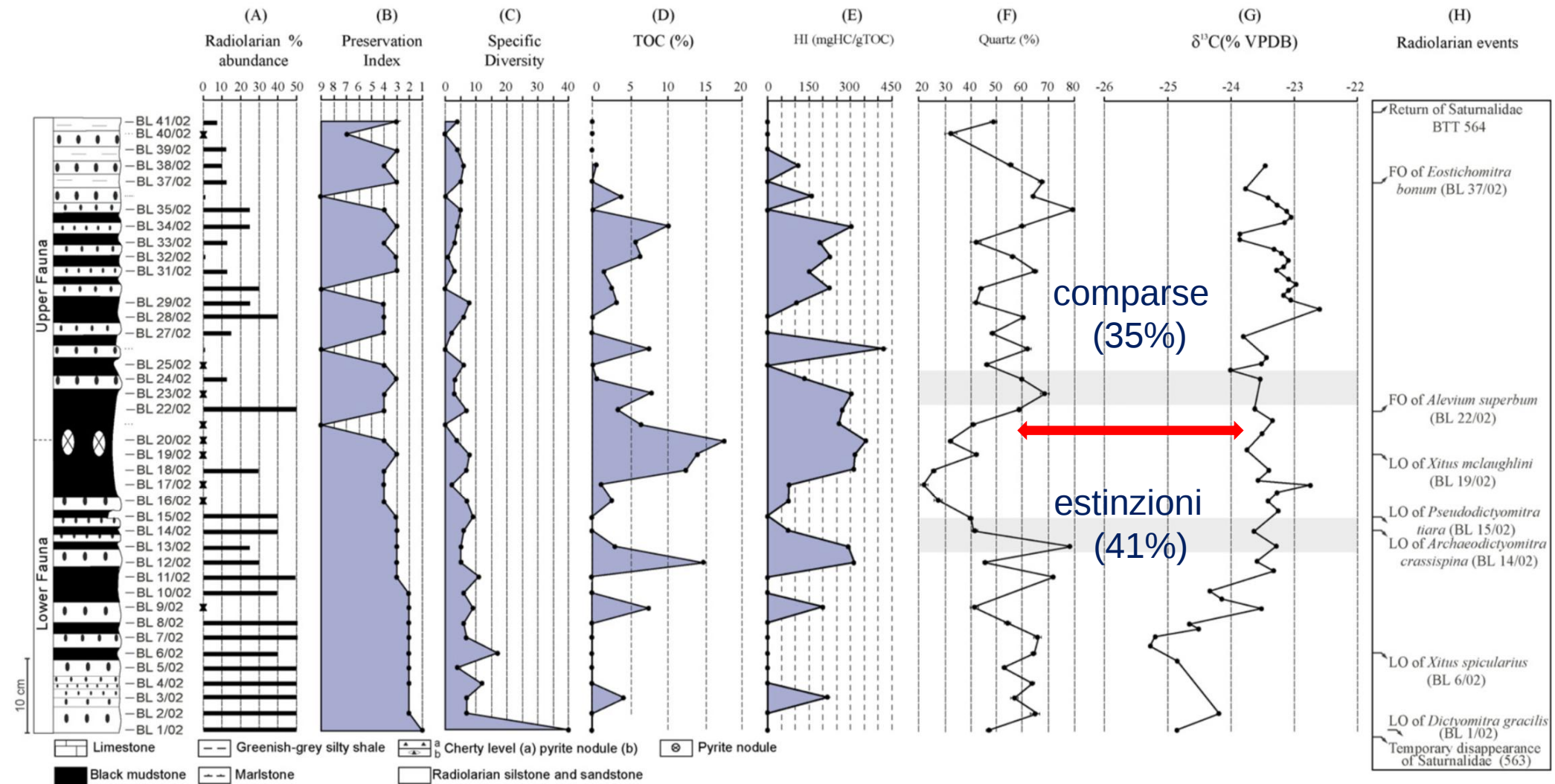
Pont d'Issole

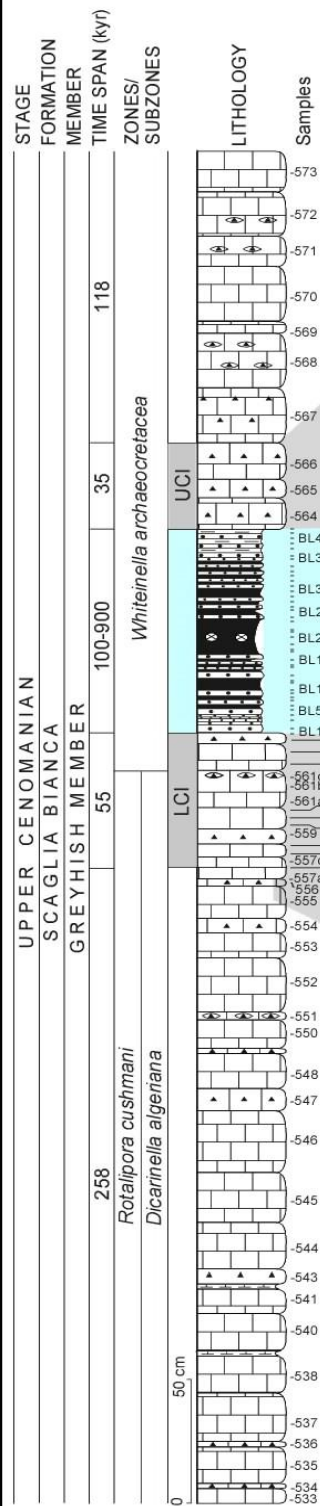


La
perturbazione
oceanografica
e climatica
più severa
del periodo
Cretacico!



Turnover dei radiolari





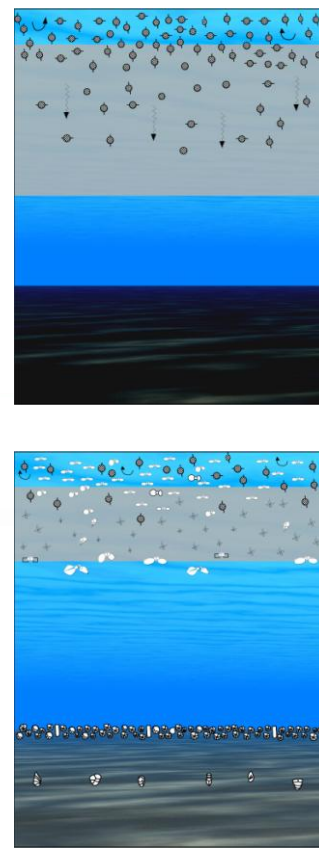
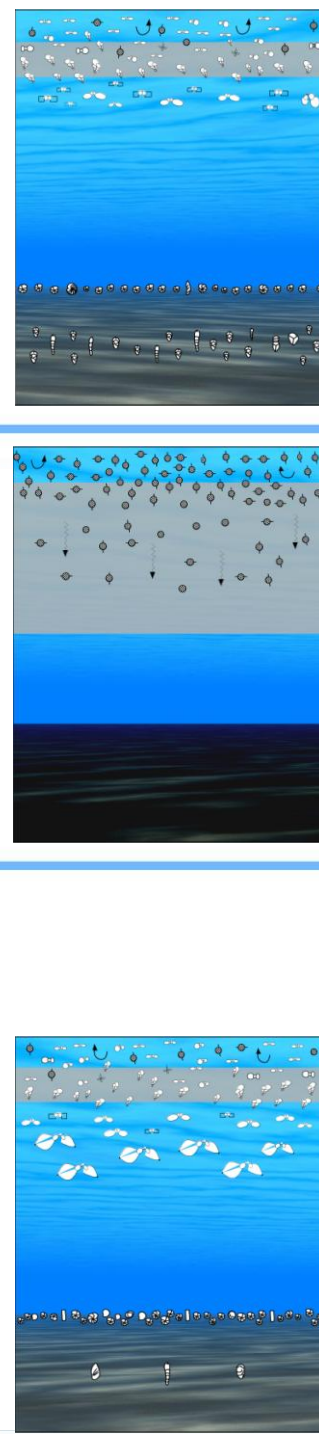
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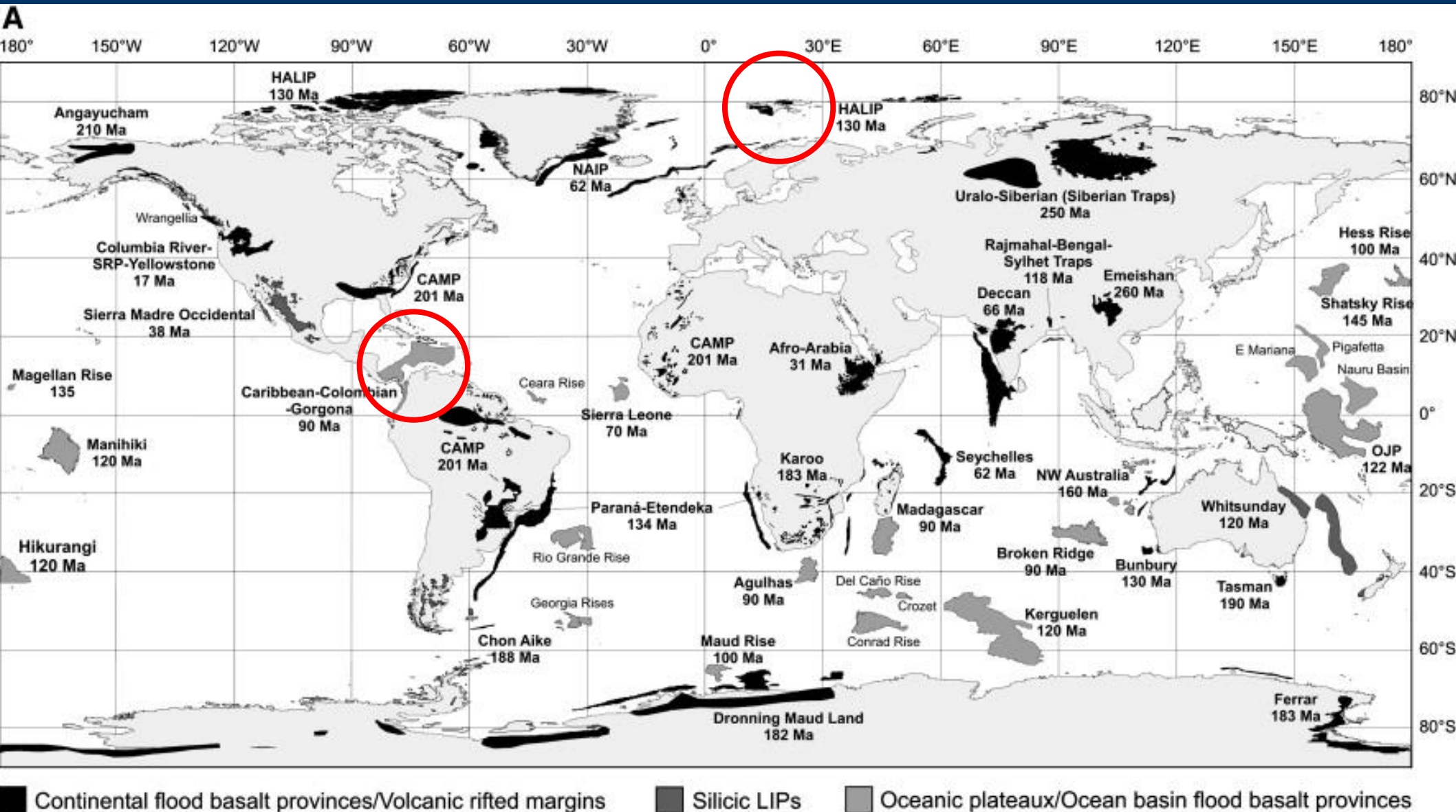
Radiolarians thrive testifying highly eutrophic conditions.

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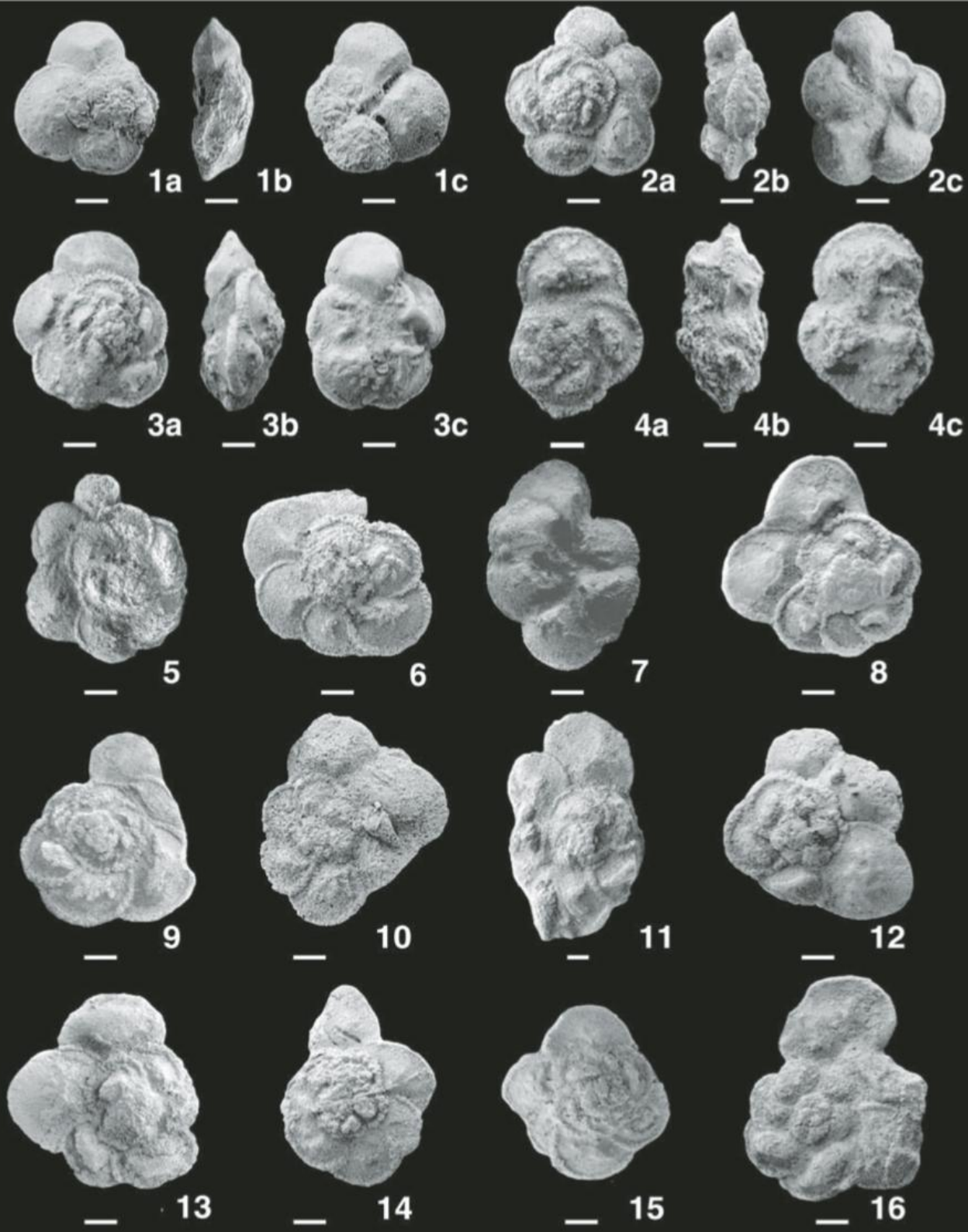


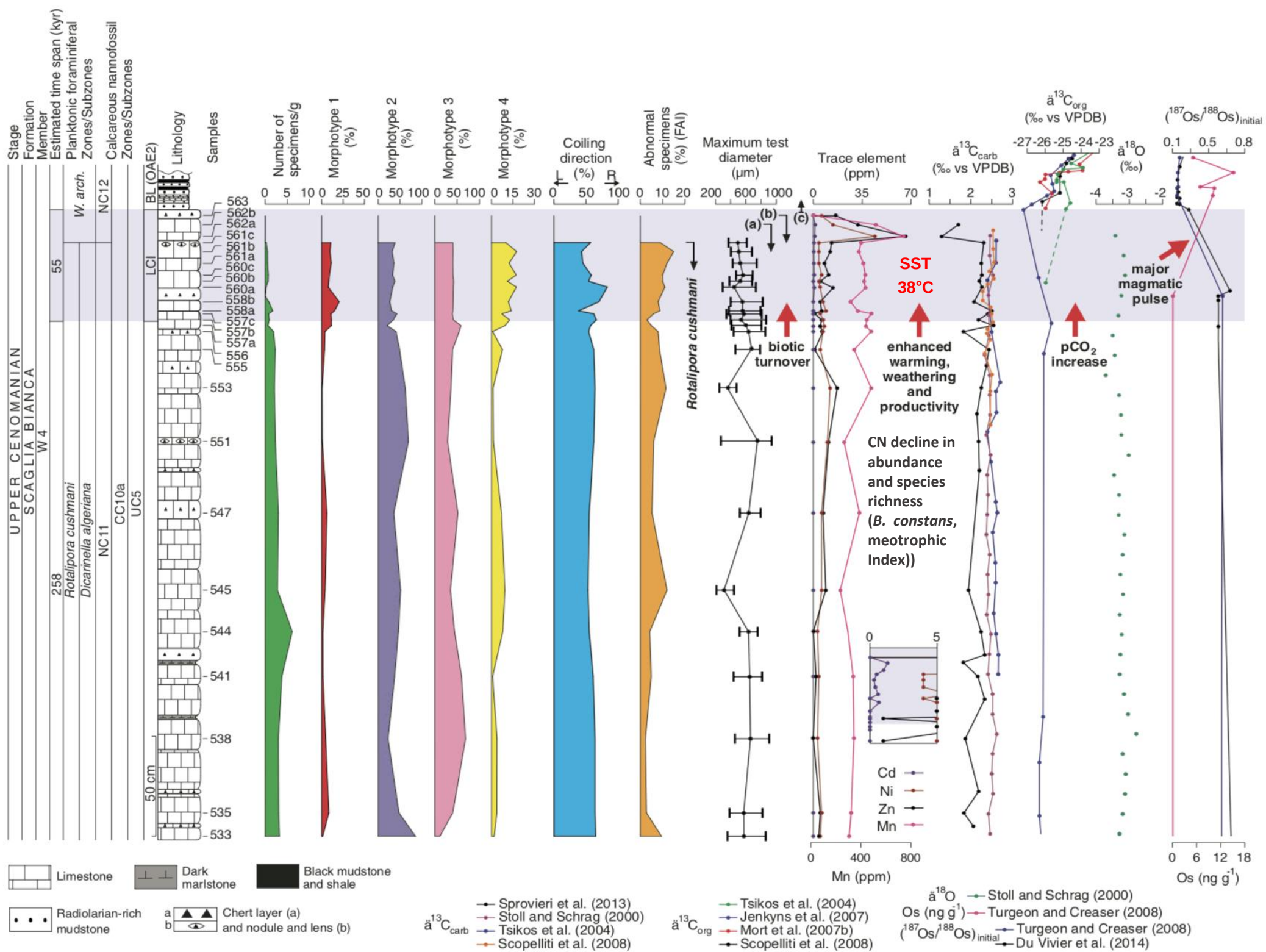
Large igneous province (LIPs)



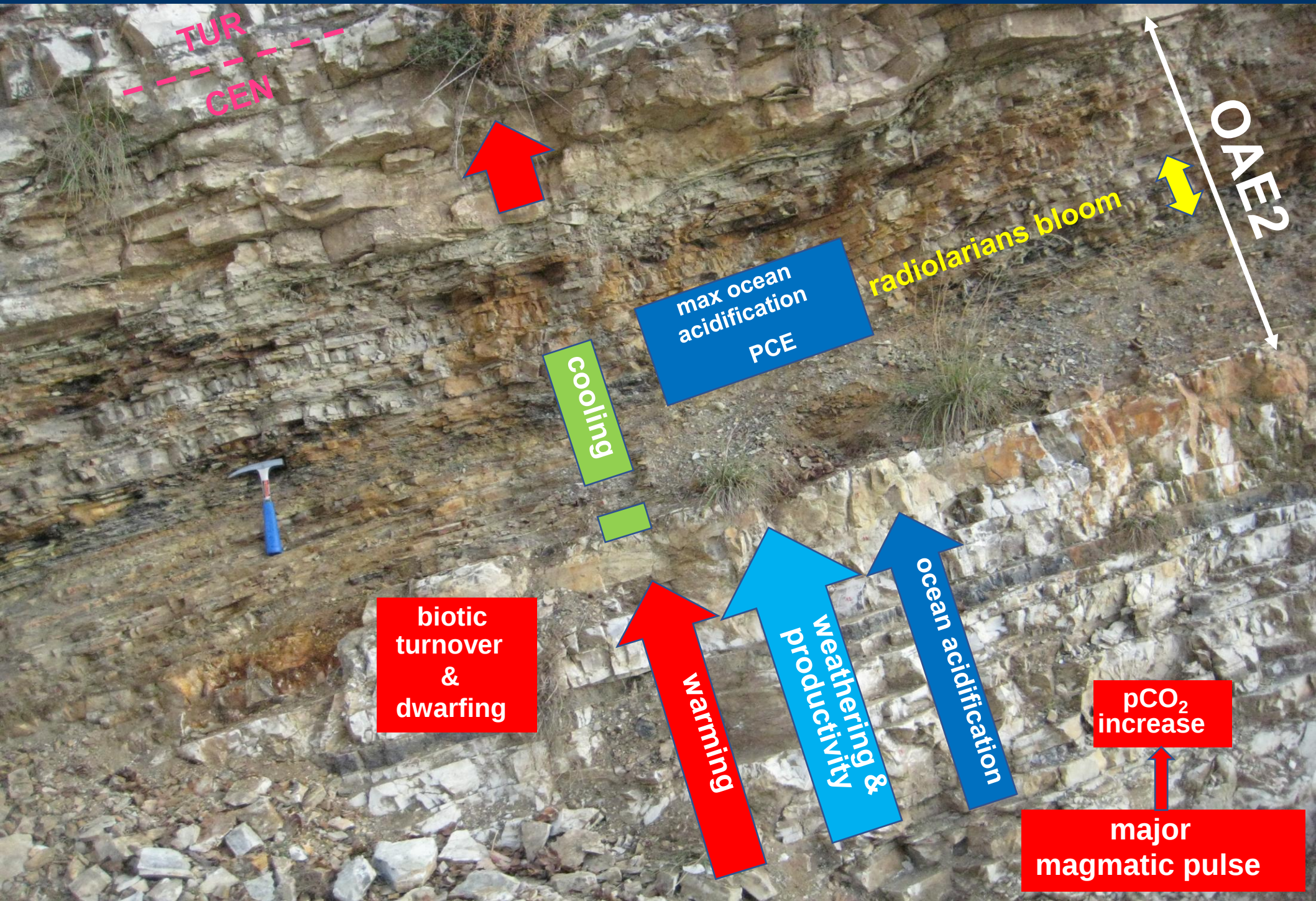


*Rotalipora
cushmani*





Livello Bonarelli = OAE2



Lo sviluppo del Livello Bonarelli, e quindi dell'OAE2, è accompagnato da profondi cambiamenti del sistema oceano-atmosfera.

Verosimilmente la deposizione del Livello Bonarelli, che abbraccia circa 400 mila anni, è il risultato straordinario dell'interazione di processi magmatici, sedimentari, biologici e geochimici che 94 milioni di anni fa si sono evoluti attraverso una eccezionale perturbazione del ciclo globale del carbonio e del clima.

e il meglio deve ancora venire...

A sepia-toned portrait of a man with a full, dark beard and mustache, wearing a light-colored shirt. He is looking slightly to the right of the camera. The background is a plain, light-colored wall.

Suido Bonarelli

«Il significato geologico
del Livello Bonarelli»

Prof. Rodolfo Coccioni

Università degli Studi di Urbino

Grazie per l'attenzione!



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grotte di Frasassi
Rai Uno - Meraviglie (da 0.
40'12" a 1.13'20")
Mar, 02/04/2019

Intervista a Rodolfo Coccioni
Radio3 Scienza - Internet per
gli animali
Mer, 17/10/2018

Intervista a Silvio Seno
Radio Marconi
Mar, 16/10/2018

[Vedi tutti](#)

ORGANIZZA UN GEOEVENTO

Partecipa alla settima edizione
del festival scientifico
Settimana del Pianeta Terra.
Organizza un Geoevento nella tua zona.

[ISCRIVI IL TUO GEOEVENTO](#)

Le iscrizioni saranno aperte
fino a **DOMENICA 7 LUGLIO 2019**.

VIDEO SPOT

"Il nostro Pianeta è in continua
evoluzione.
La crosta terrestre e gli oceani si
rimodellano senza sosta.
Questo pensiero mi ha affascinato fin da
ragazzo e la passione per quello che le
rocce possono raccontare non mi ha mai
abbandonato..."

Cesare Bocci



Poiché il **2019 è l'Anno del turismo lento** sono particolarmente sollecitate le proposte di Geoeventi, di qualsiasi tipo, che mostrano un legame con questo approccio. Turismo lento vuol dire vivere, o far vivere, un'esperienza che porta ad interagire con le comunità ospitanti, valorizzare le particolarità del territorio, minimizzare l'impatto ambientale, scoprire e promuovere i prodotti locali e le tipicità, spostarsi in modo sostenibile. In altre parole, significa approfittare di una occasione di visita per immergersi, con lentezza, nelle mille sfaccettature di un intero territorio. Insomma, non dovrete far altro che continuare a raccontare lo spirito della "Settimana del Pianeta Terra".

2019
ANNO
DEL TURISMO
LENTO

CON IL PATROCINIO DI

