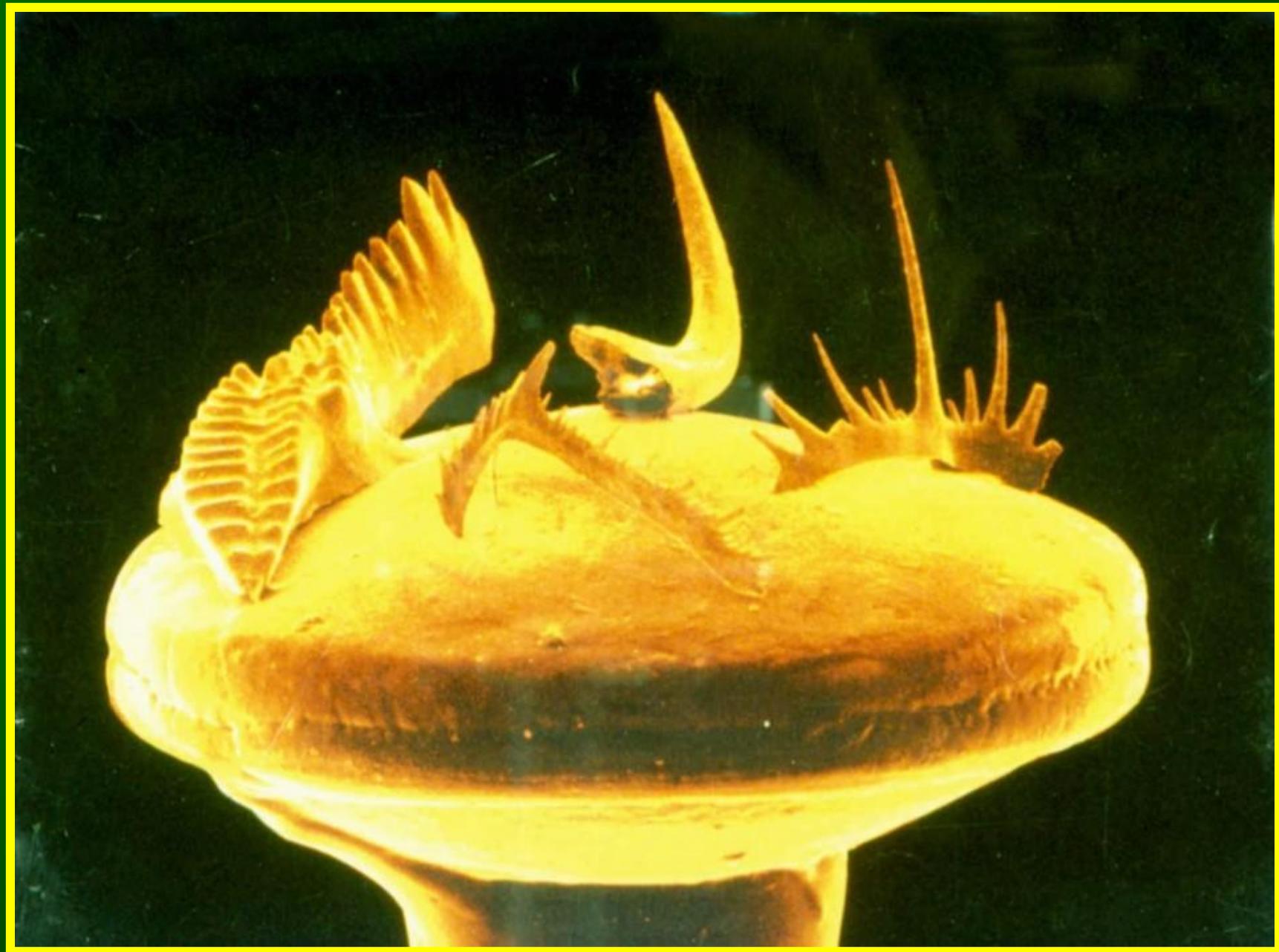


# CONODONTI



# Conodonti



# Diverse morfologie di Conodonti



# Distribuzione stratigrafica

Cambriano sup. - Triassico

# Composizione mineralogica

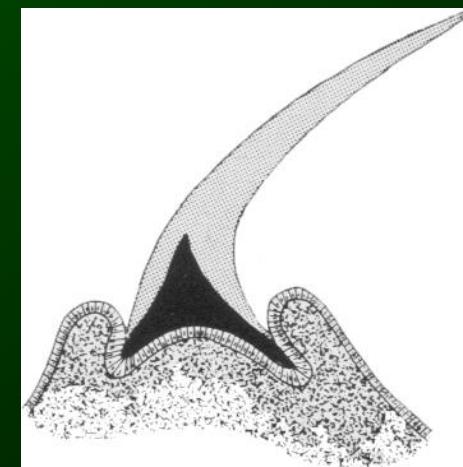
Apatite

# Struttura del dente

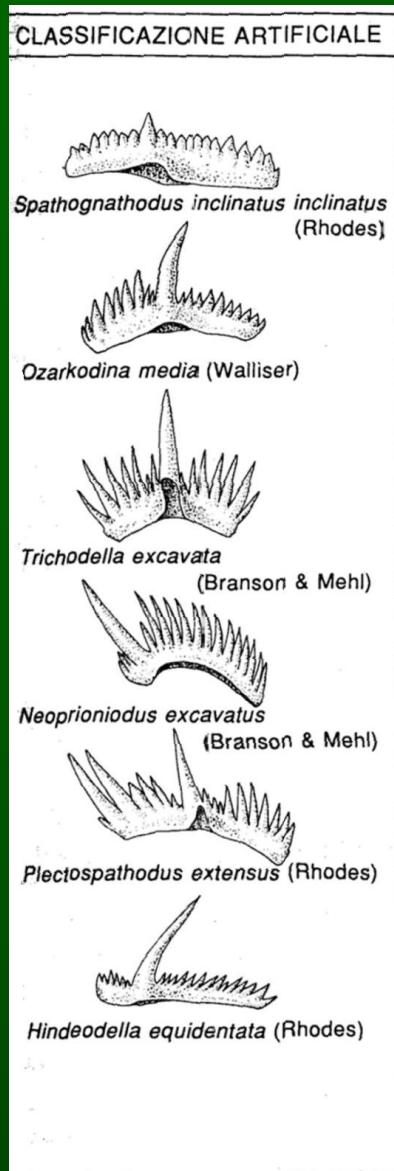
Cartilagine basale

Smalto

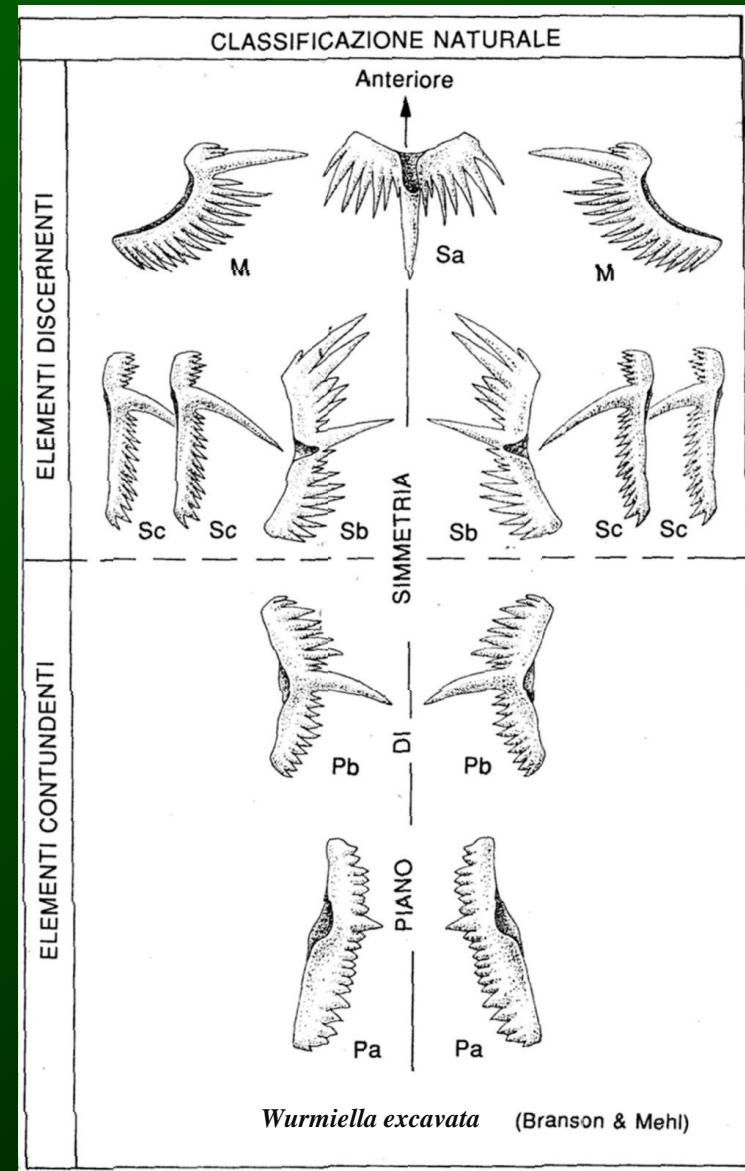
Dentina



# MORFOELEMENTI APPARATO

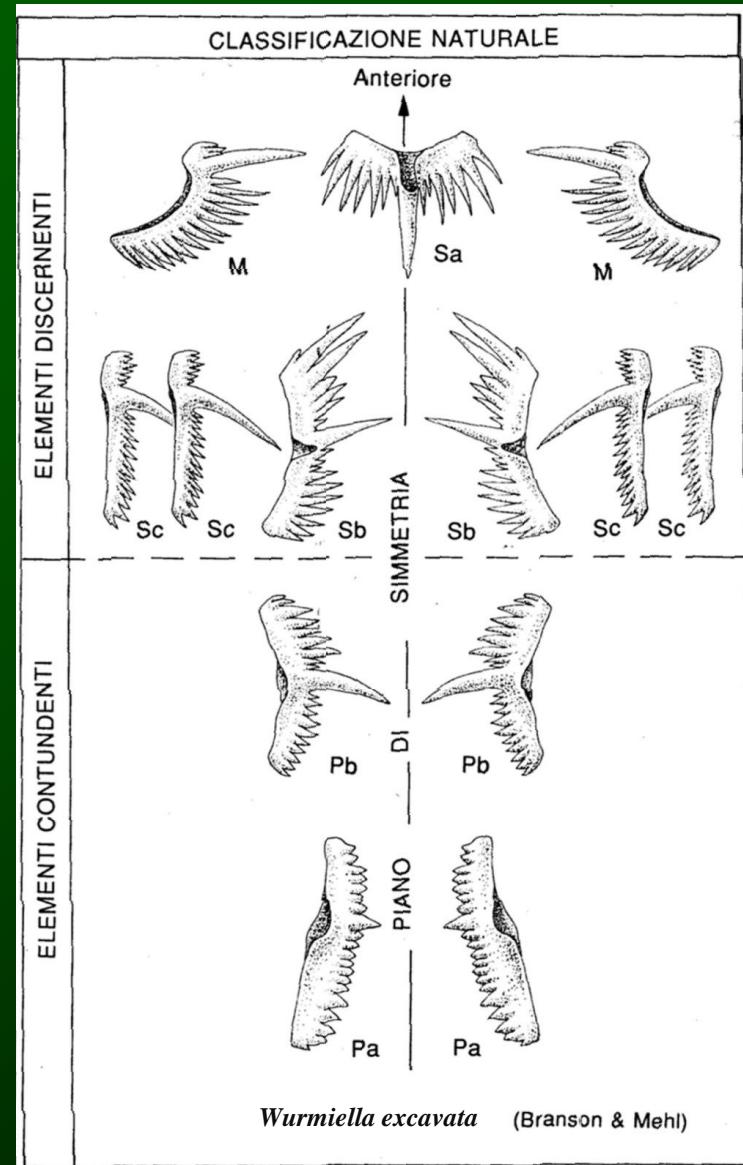


## A P P A R A T O



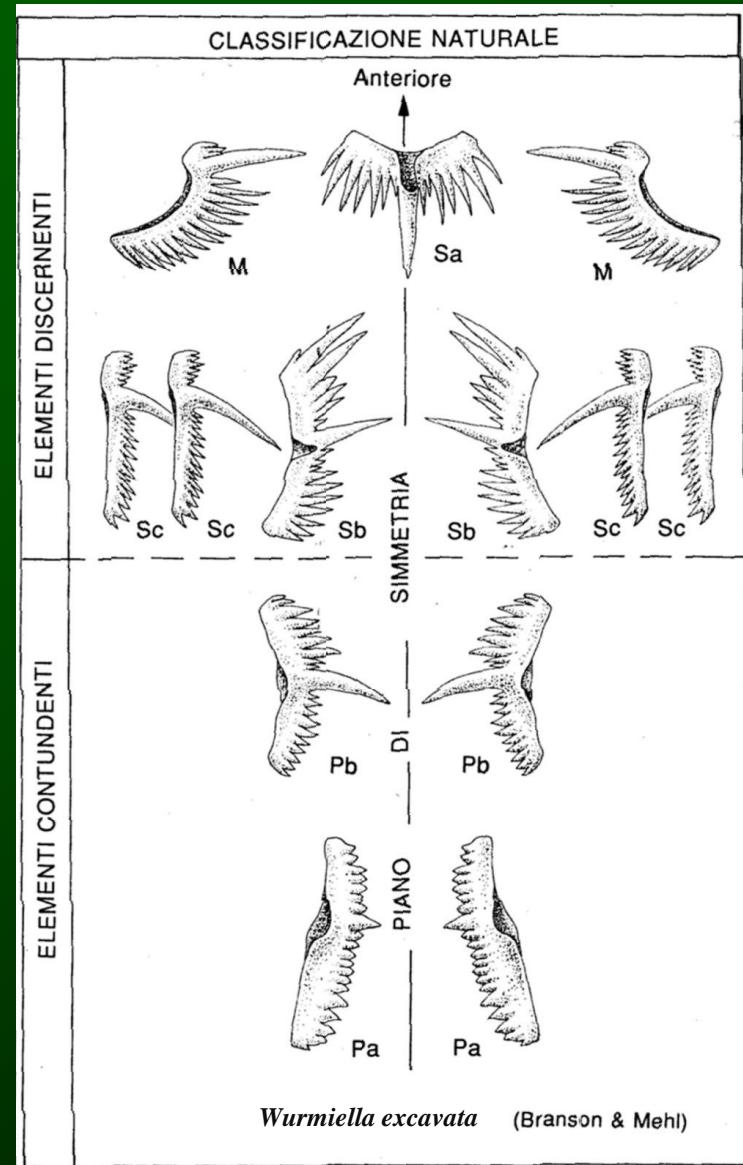
Ogni elemento ha una posizione specifica entro l'apparato in cui si distinguono tre zone contraddistinte dalle lettere P, M, S

A  
P  
P  
A  
R  
A  
T  
O

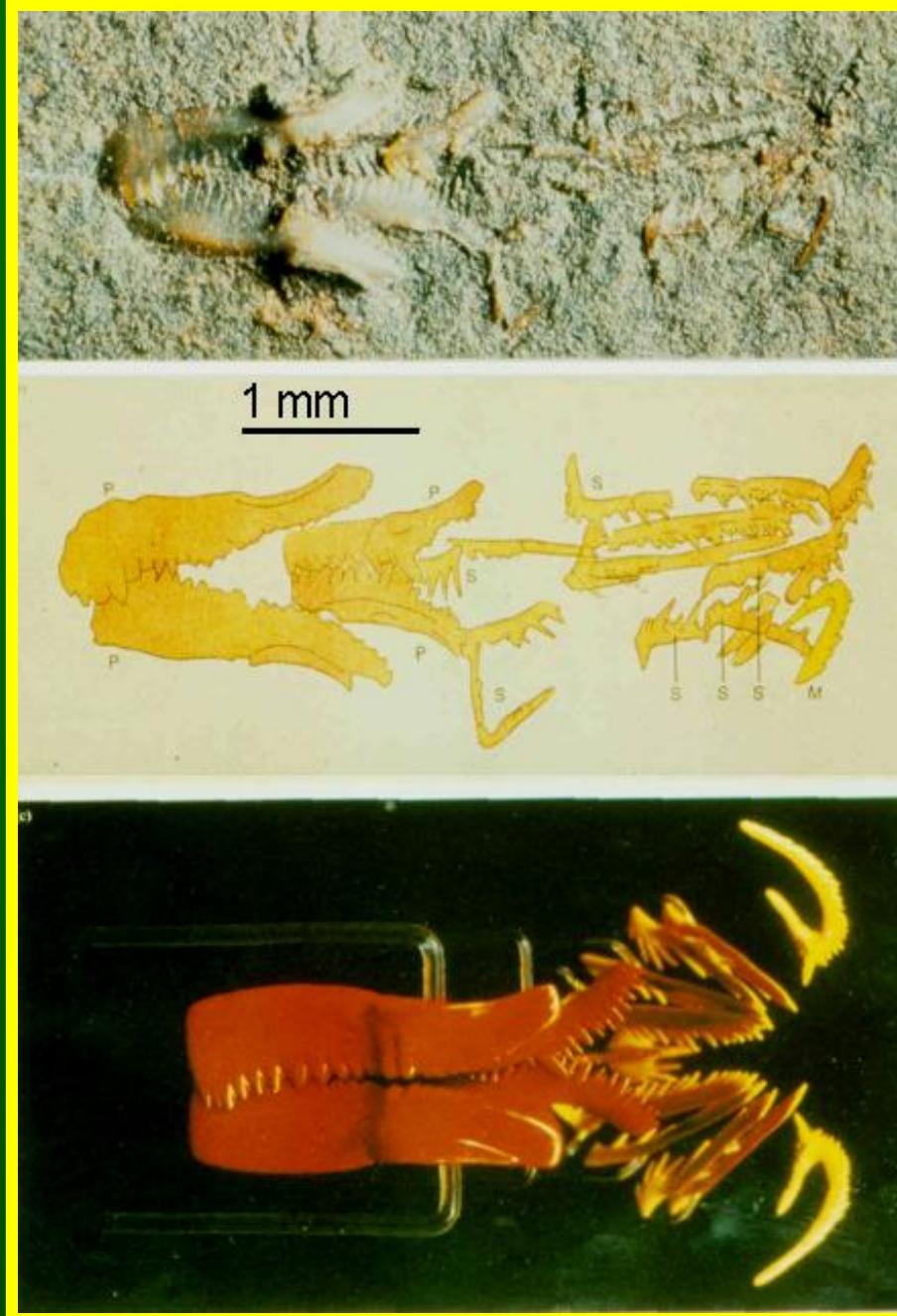


Ogni elemento ha una posizione specifica entro l'apparato in cui si distinguono tre zone contraddistinte dalle lettere P, M, S

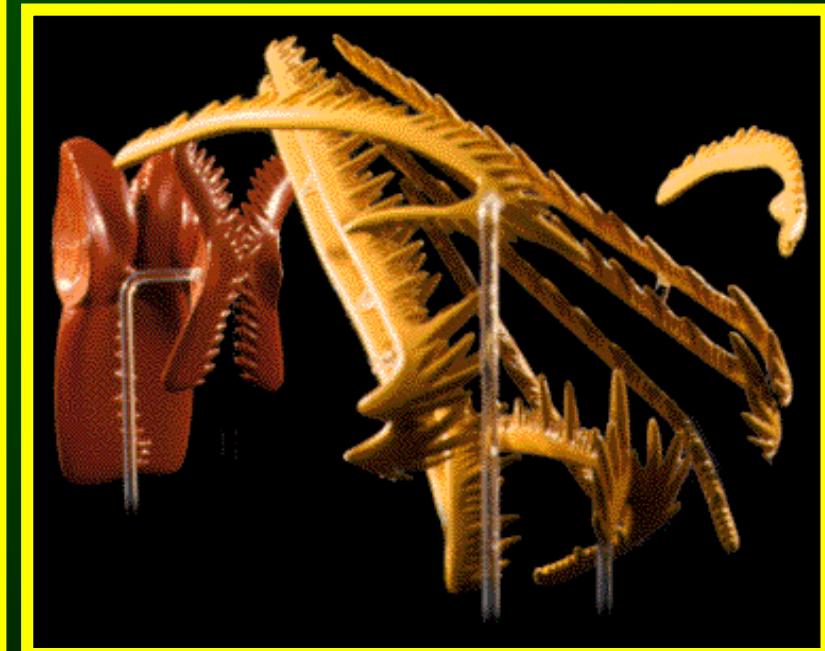
A  
P  
P  
A  
R  
A  
T  
O



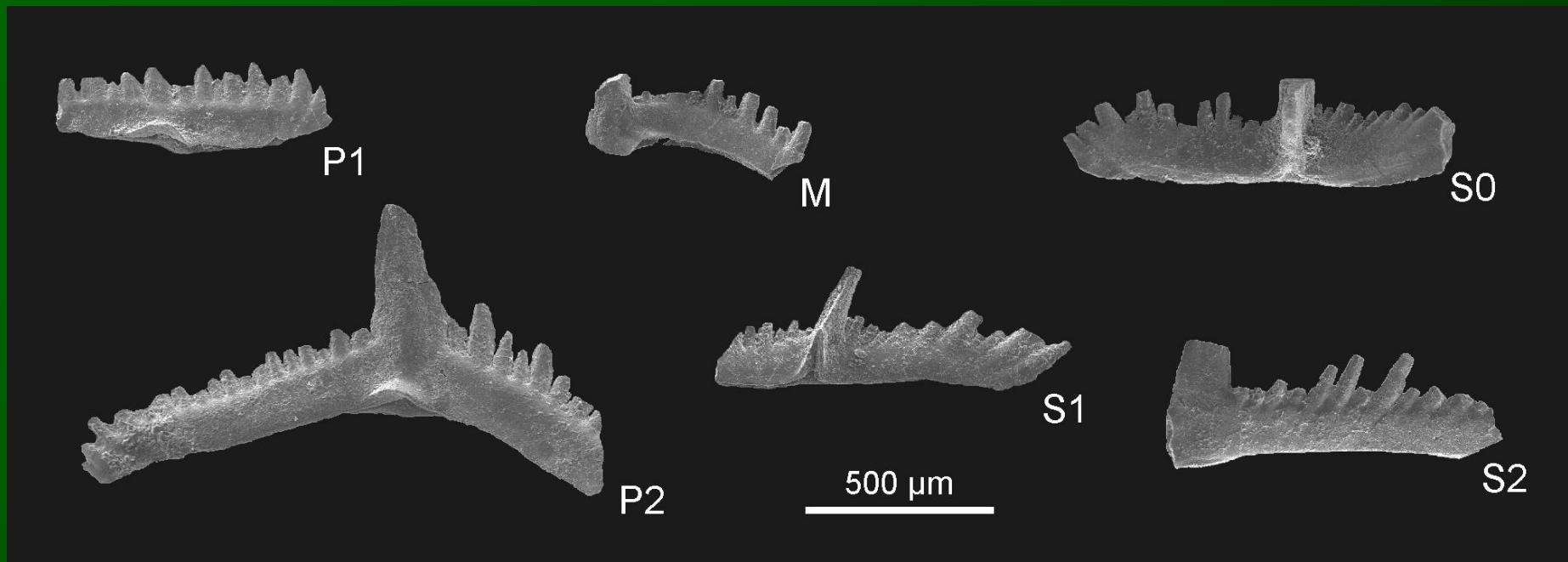
# Conodonti



*Idiognathodus* sp.  
Carbonifero sup. - USA



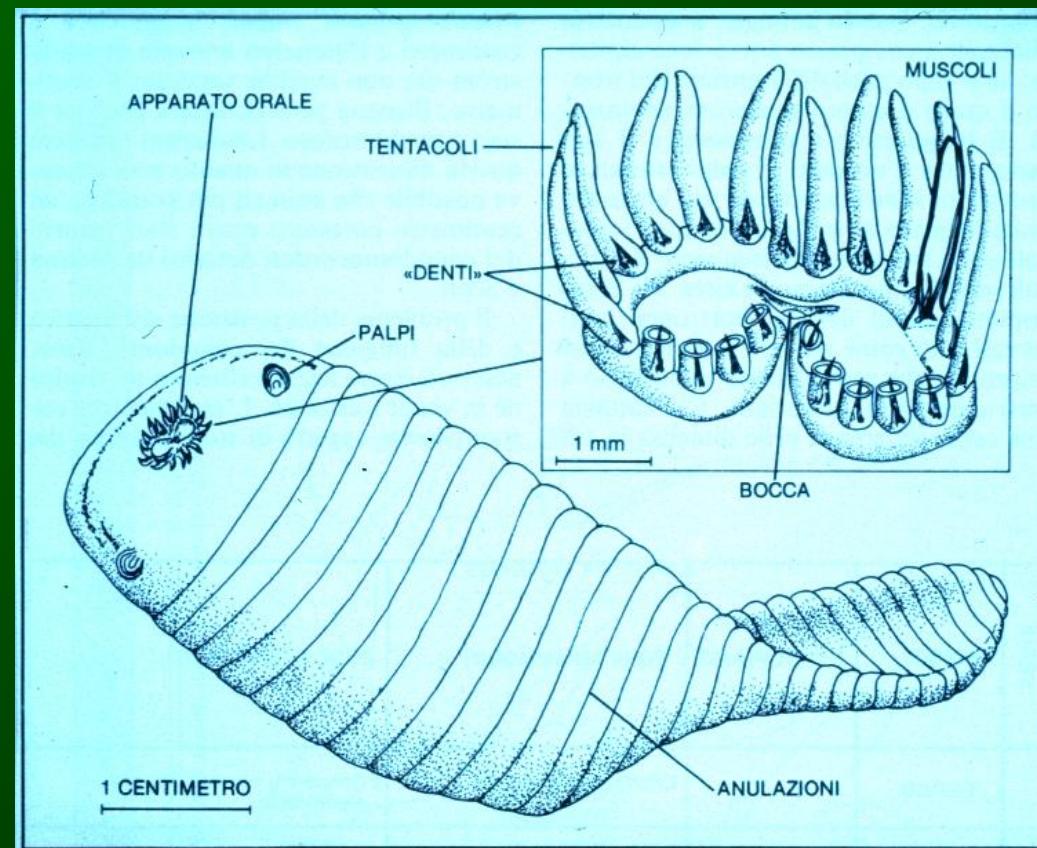
*Conodonti*



*Wurmiella alternata* Corradini & Corriga, 2010

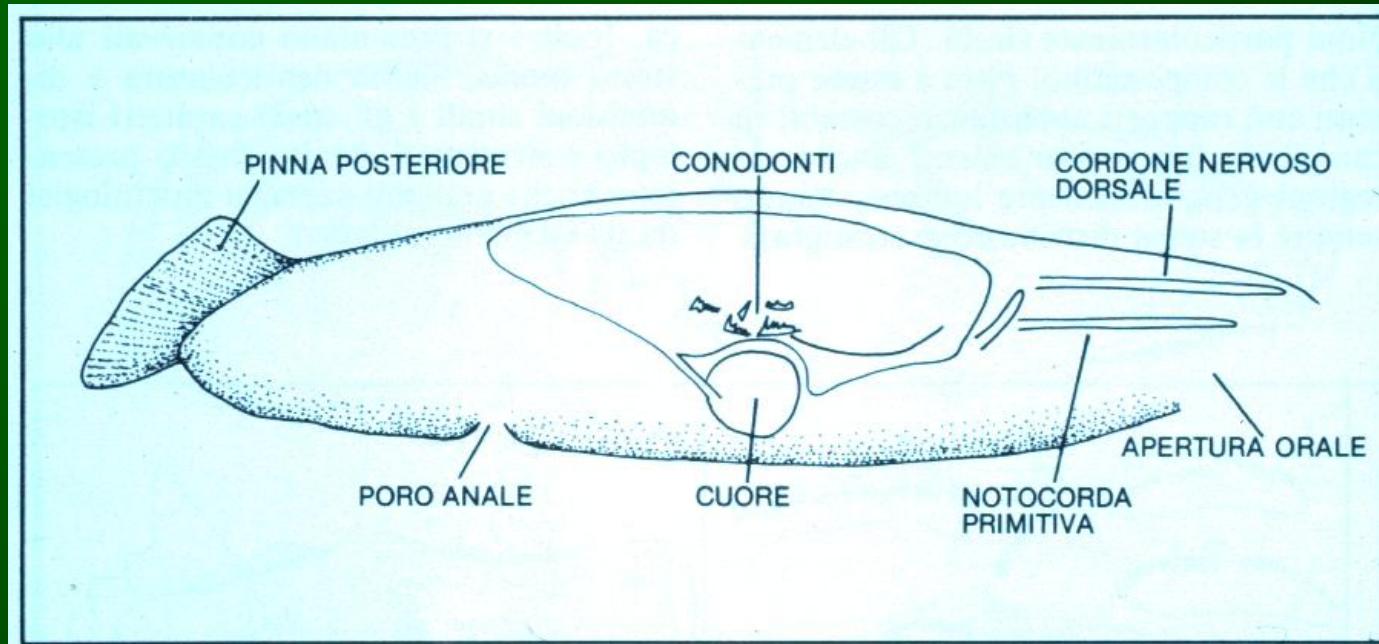
"Il problema delle affinità zoologiche di questo gruppo di organismi rimane ... uno dei problemi più affascinanti e di difficile soluzione della paleozoologia" (F.H.T. Rhodes, 1954)

## Ipotesi errate



"Il problema delle affinità zoologiche di questo gruppo di organismi rimane ... uno dei problemi più affascinanti e di difficile soluzione della paleozoologia" (F.H.T. Rhodes, 1954)

## Ipotesi errate



Ricostruzione e interpretazione della morfologia di *Lochriea wellsi* eseguita da W. Melton e H.W. Scott nel 1973. Questo animale, interpretato come conodontoforo, contiene singoli conodonti disposti irregolarmente all'interno di un probabile apparato digerente. Gli autori della ricostruzione hanno lavorato su materiale proveniente da formazioni carbonifere del Montana.

# Ipotesi sulla affinità biologica

COELENTERATA	Bischoff (1973)
TENTACULATA	Lindström (1973), Conway Morris (1976)
ARTHROPODA	Harley (1861), Barrande <i>et al.</i> (1867)
MOLLUSCA	Owen (1861), Owen (1967), Morse (1975), Stimpson (1875), James (1894), Woodward (1898), Loomis (1936), Pilsbury (1937), Tiller & Cuif (1986)
ANNELIDA	Owen (1861), Owen (1967), Ulrich (1878), Zittel & Rohon (1886), Woodward (1898), Scott (1934), Dubois (1934), Rhodes (1952)
ASCHELMINTHES	Denham (1944), Missarzhevsky (1973), Hofker (1974)
CHETOGNATHA	Rietschel (1973), Szaniawski (1982)
GNATHOSTOMULIDA	Durden (1969), Ochielli & Cailleux (1969), Rodgers (1969)
PLANTS	Fahlbusch (1964), Nease (1969)
CHORDATA	Pander (1856), Newberry (1875), Agassiz (1875), Hinde (1879), Rolle (1882), Clarke (1885), Bryant (1921), MacFarlane (1923), Ulrich & Bassler (1926), Holmes (1928), Kirk (1929), Stauffer & Plummer (1932), Schmidt (1934), Branson & Mehl (1936), Delmanet (1939), Beckmann (1949), Schmidt (1950), Gross (1954), Rhodes (1954), Rhodes & Wingard (1957), Schmidt (1964), Halstaed (1968), Scott (1969), Melton & Scott (1973), Aldridge <i>et al.</i> (1986), Nowlan & Carlisle (1987), Kreisa <i>et al.</i> (1990), Aldridge <i>et al.</i> (1993, 1998), Long (1995), Purnell <i>et al.</i> (1995), Janvier (1995), Kemp & Nicoll (1996), Bergstroem <i>et al.</i> (1998)
PHYLUM INDIPENDENTE	Clark (1981), Briggs <i>et al.</i> (1983), Gould (1983), Clark (1987), Sweet (1988)

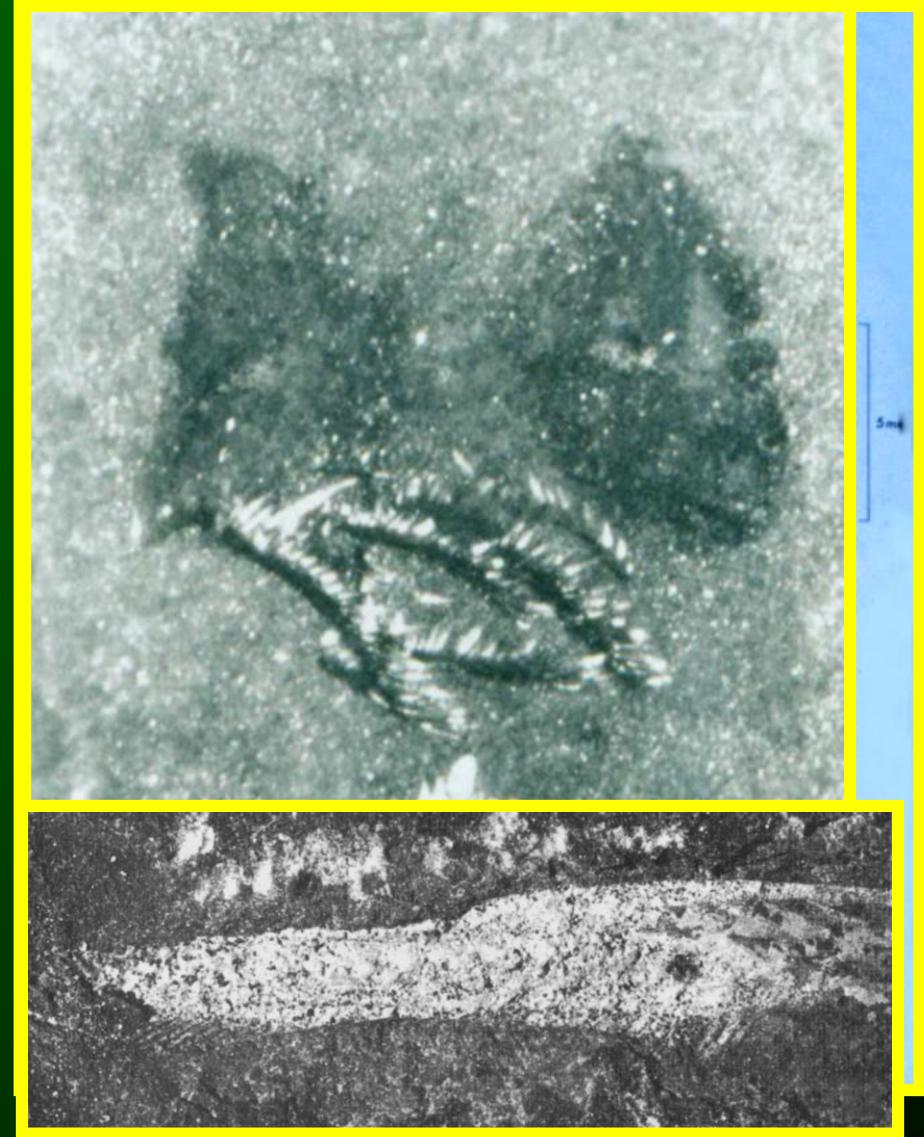
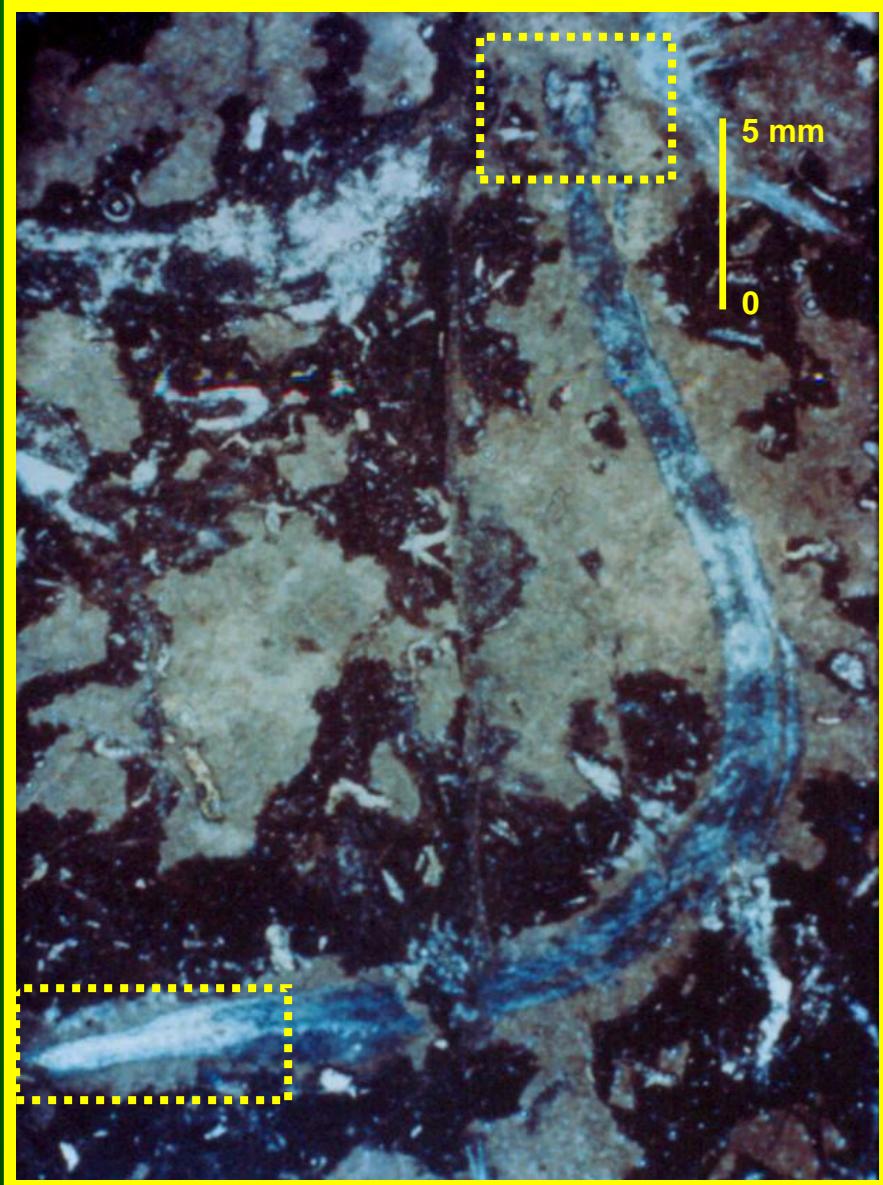
Conodonti



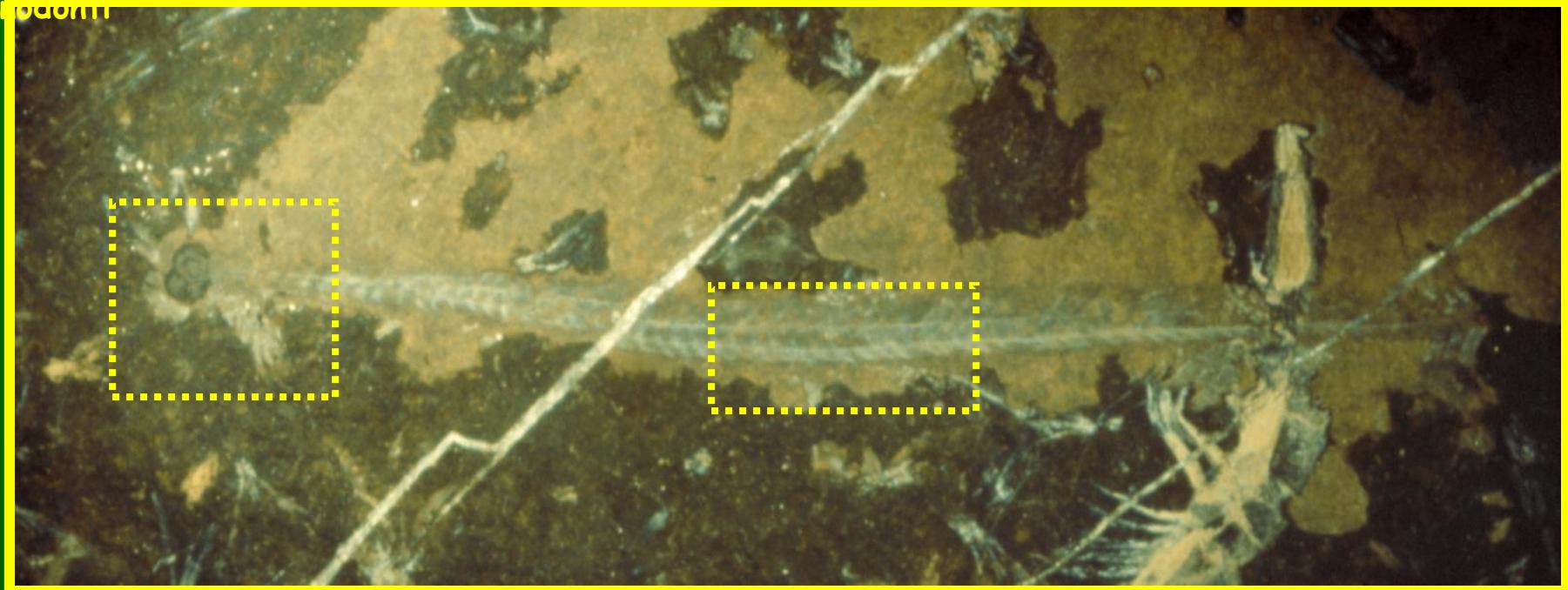
Conodonti

# *Clydagnathus windsorensis*

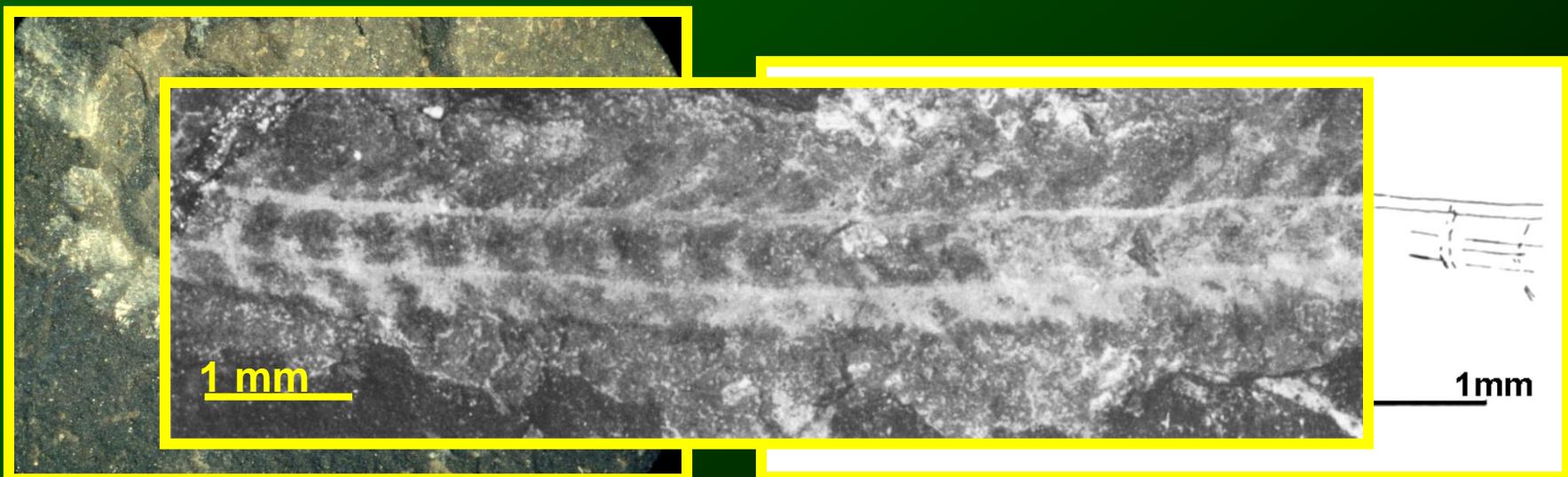
(esemplare 1) Carbonifero inf. - Scozia



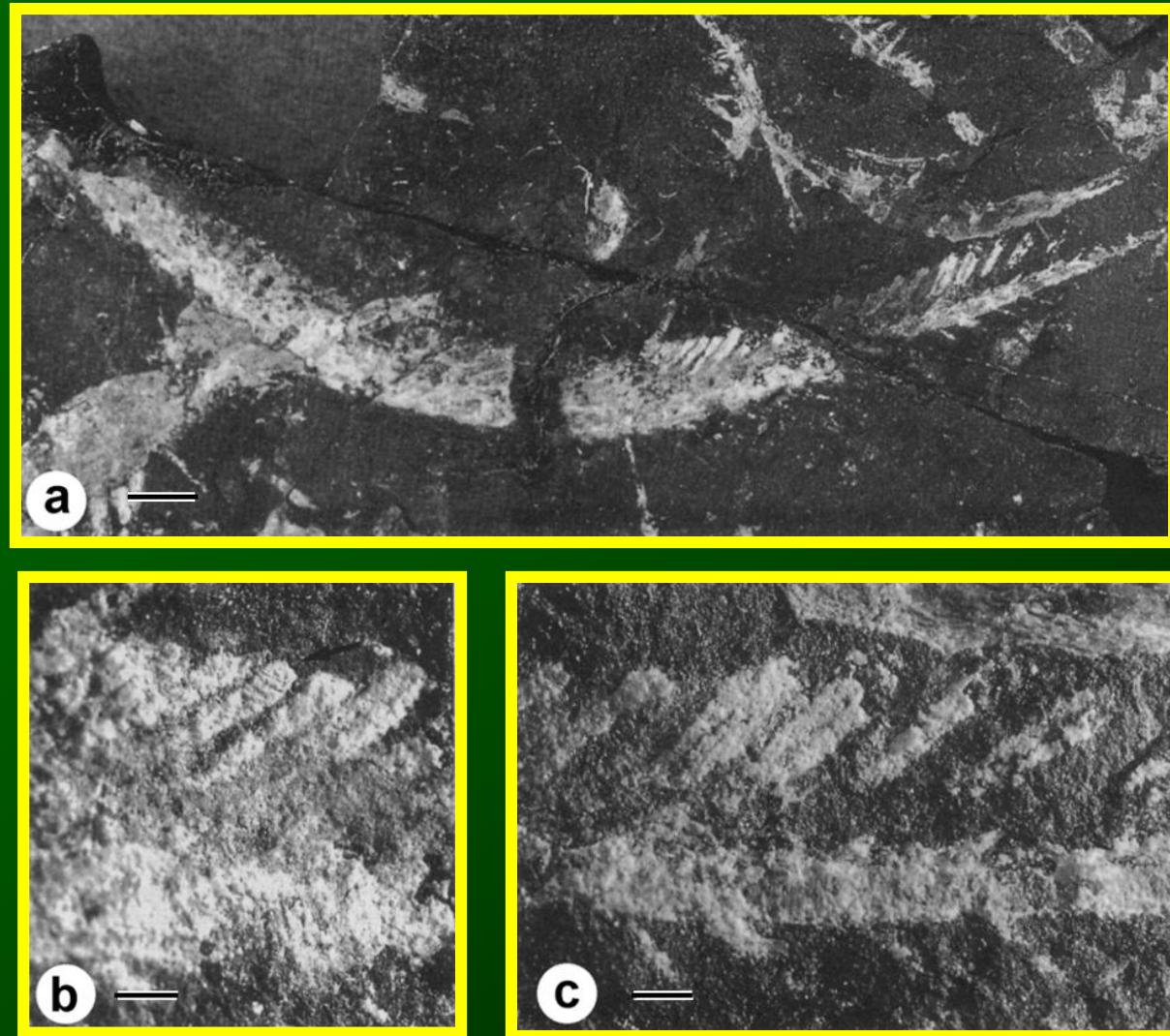
Clydagnathus



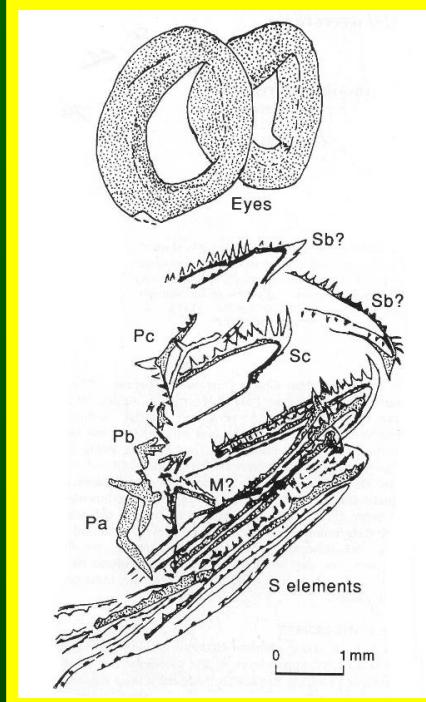
*Clydagnathus windsorensis* - (esemplare 5), Carbonifero inf. - Scozia



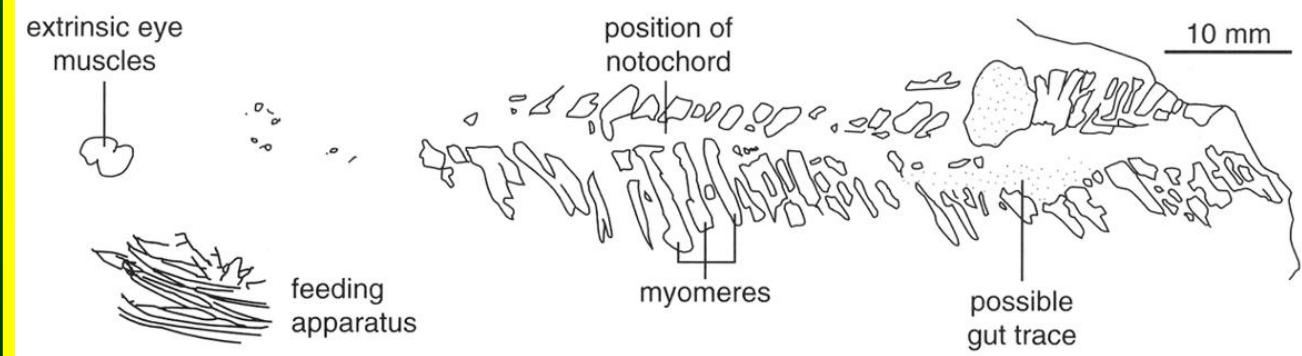
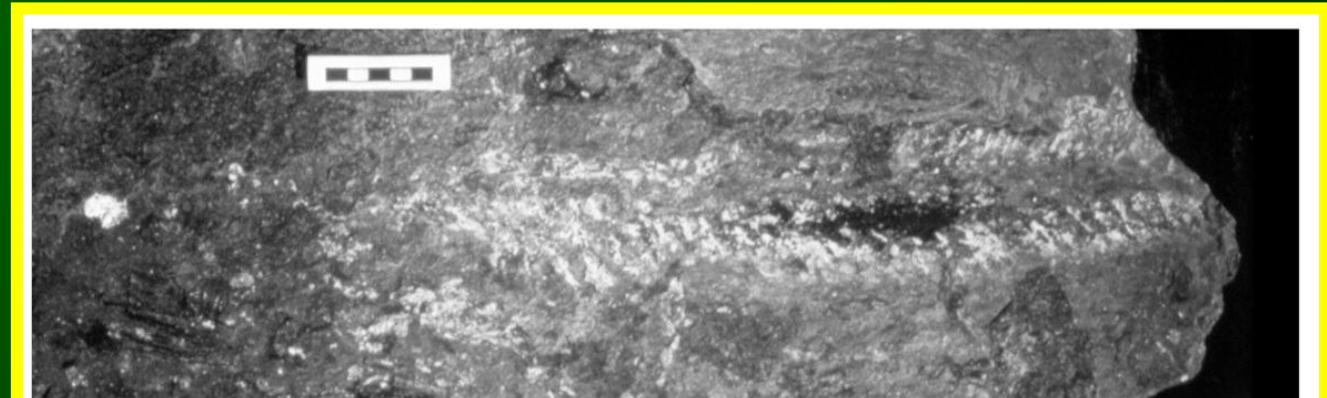
# Conodonti



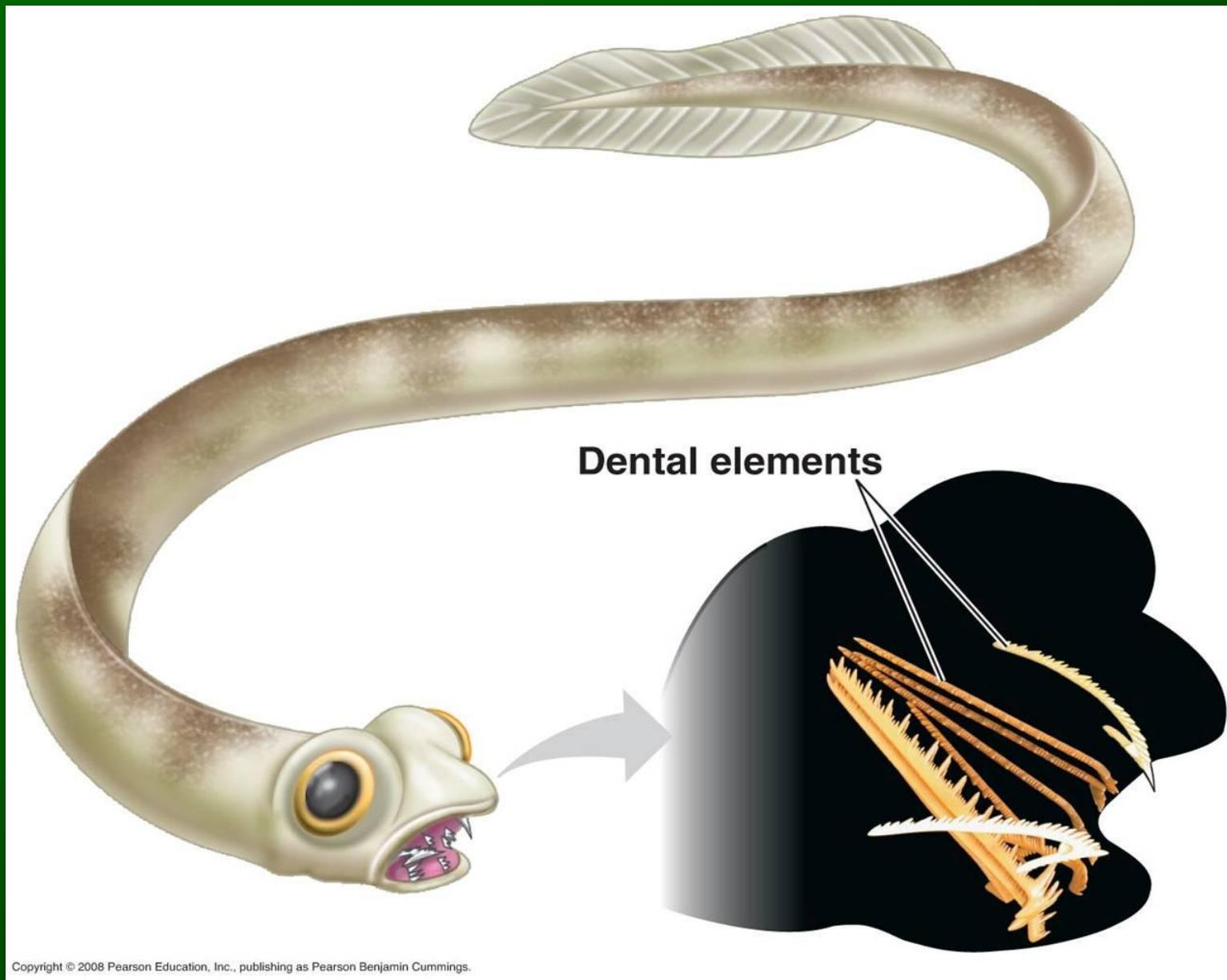
*Clydagnathus windsorensis* - (esemplare 7), Carbonifero inf. - Scozia.  
Lunghezza delle barre: a) 2 mm; b, c) 0.5 mm



## *Promissum pulchrum* Ordoviciano sup. - Sud Africa

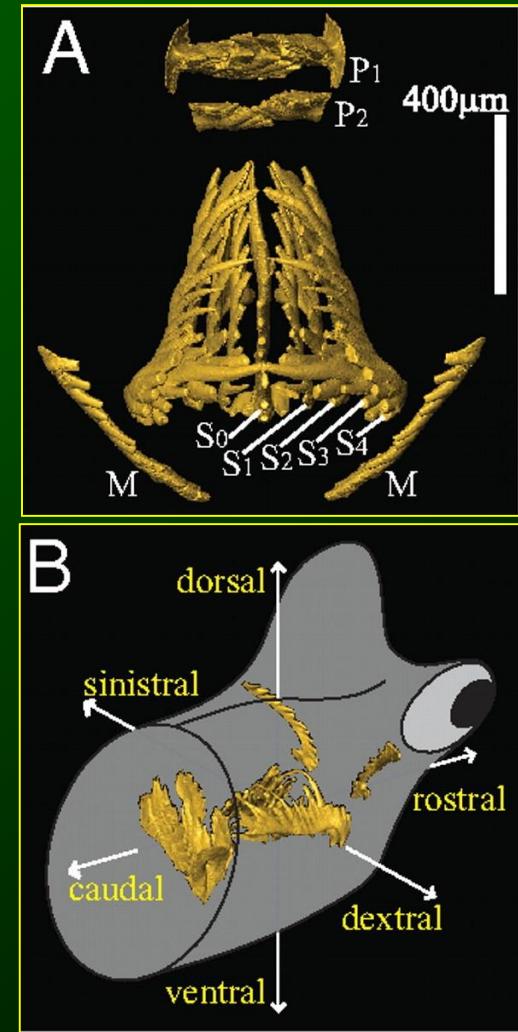


# Conodonti

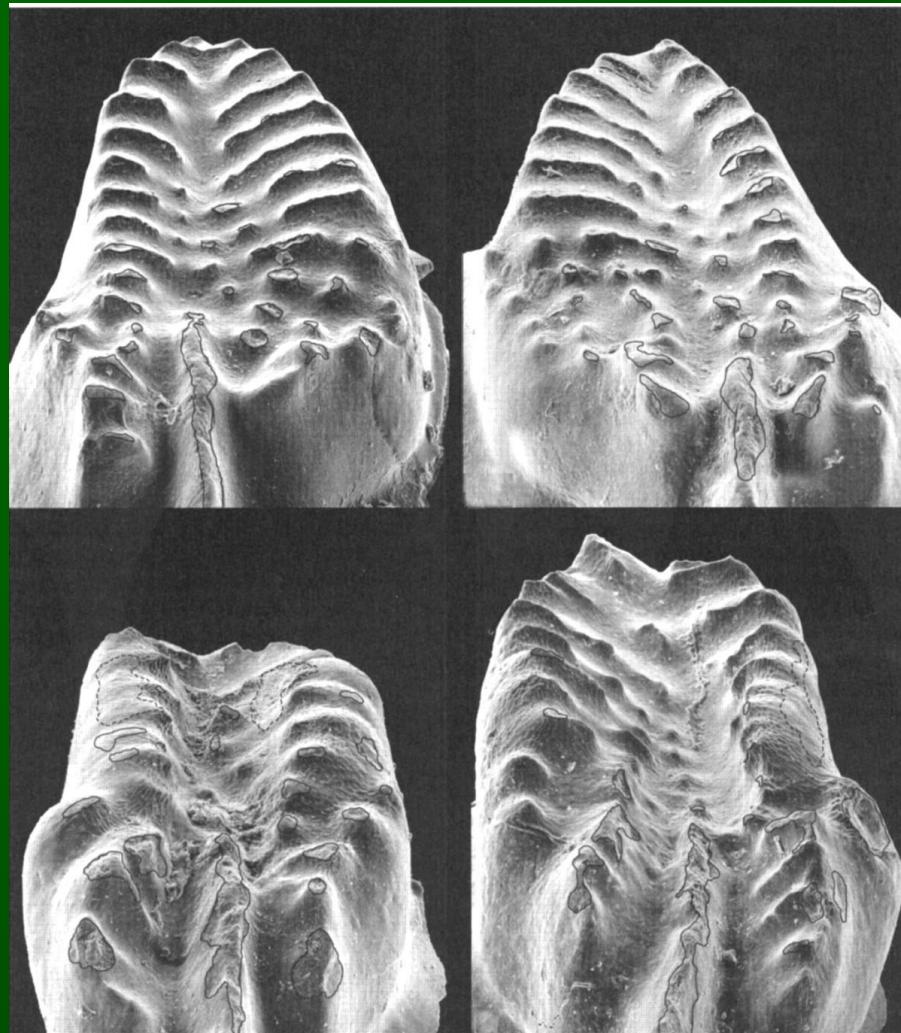


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# Conodonti

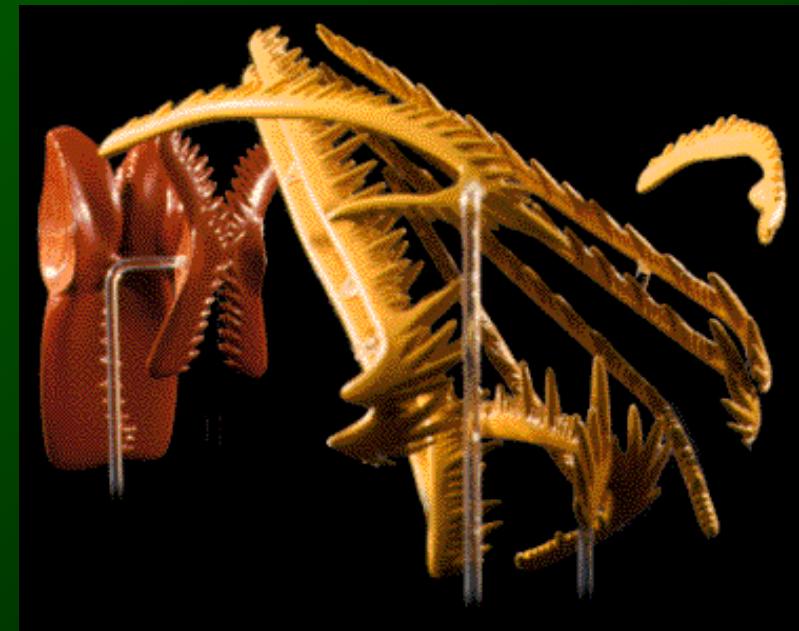


# Conodonti



Segni di usura sulla superficie di elementi P1 (sinistri e destri). Purnell et al. (1998)

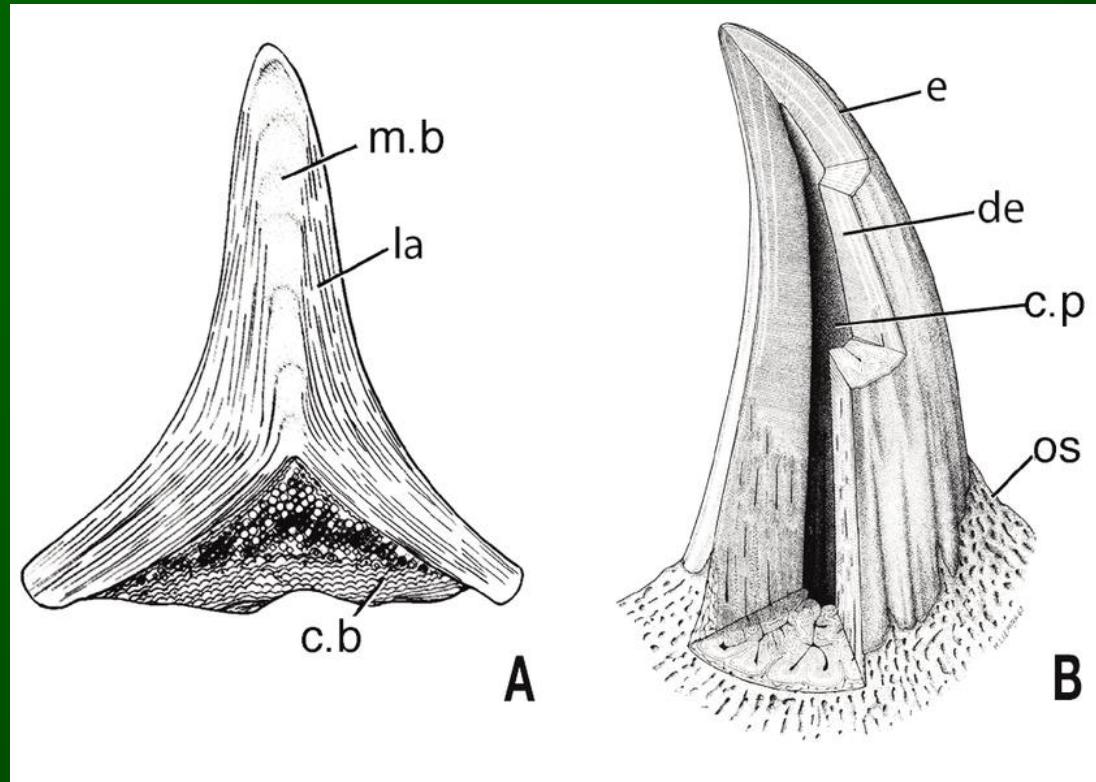
Ulteriore conferma che si tratti di denti



*Idiognathodus* sp.  
Carbonifero sup. - USA

## Conodonti

La struttura interna dei conodonti è composta da due parti:  
la corona (crown)  
Il riempimento basale (basal filling)

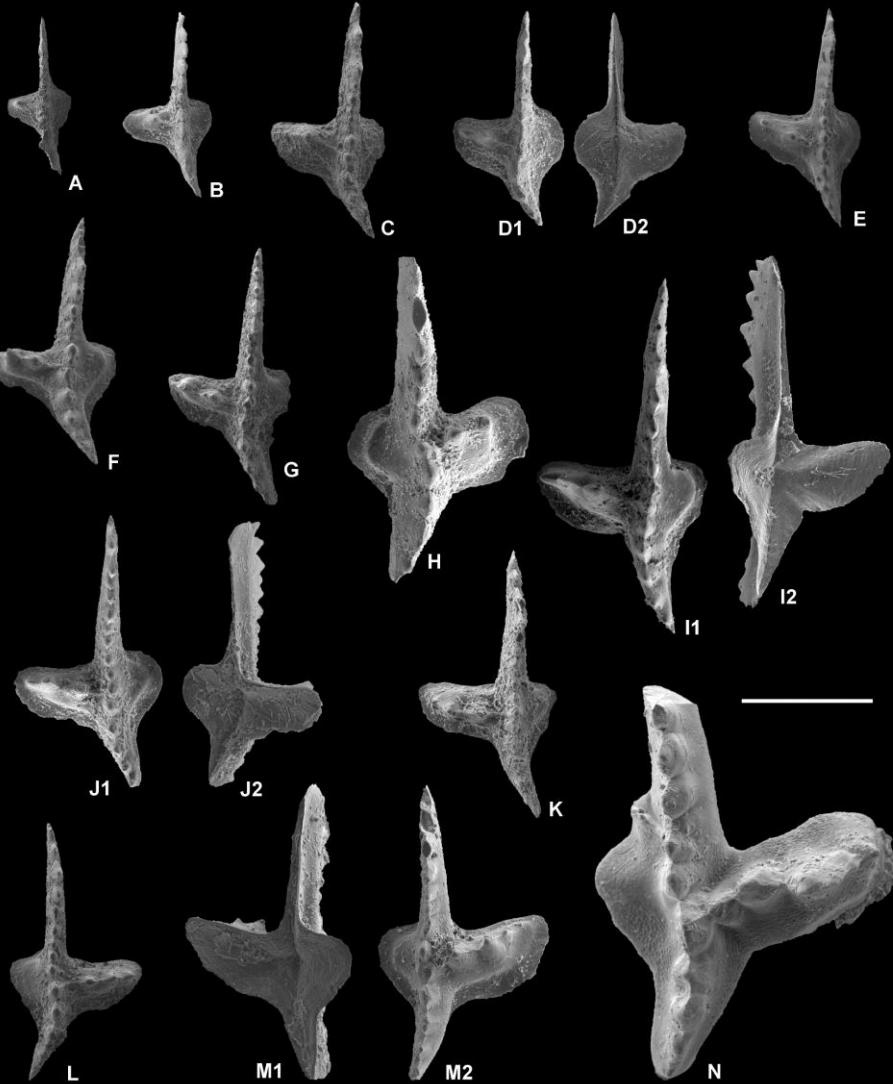


L'accrescimento della struttura avviene mediante sovrapposizione esterna di lamelle dalla corona al riempimento basale.

La lamella è costituita da un impalcatura di materiale organico sulla quale si appongono i cristalli di apatite che si orientano parallelamente alla direzione di crescita dell'elemento.

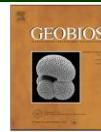
# Ontogenesi

I denti dei conodonti si accrescevano per tutta la vita dell'animale.



Available online at  
**ScienceDirect**  
[www.sciencedirect.com](http://www.sciencedirect.com)

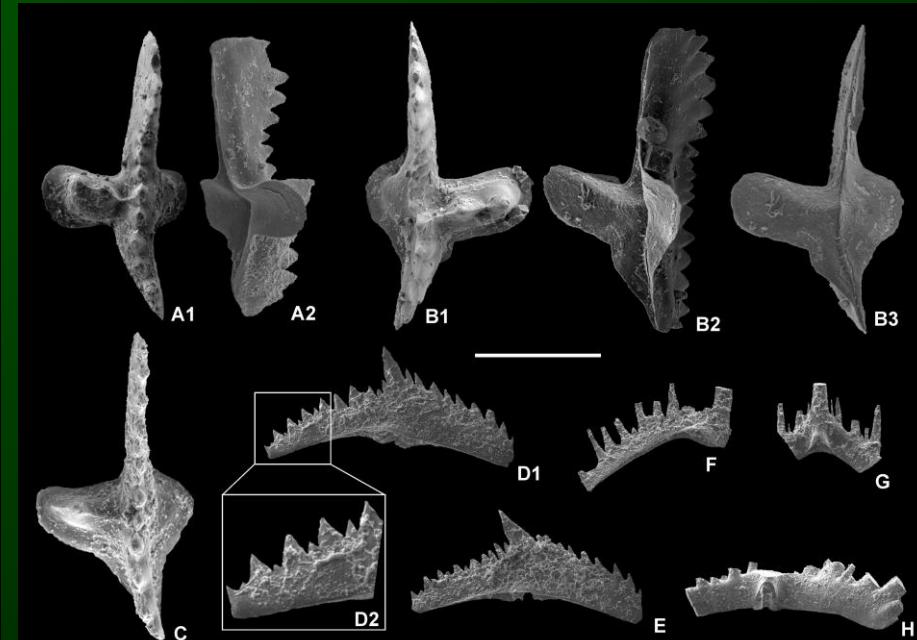
Elsevier Masson France  
**EM|consulte**  
[www.em-consulte.com](http://www.em-consulte.com)



Original article

Ontogeny of *Ancyrodelloides carlsi* (Boersma) and comments on its generic attribution (Conodonta, Lower Devonian)<sup>☆</sup>

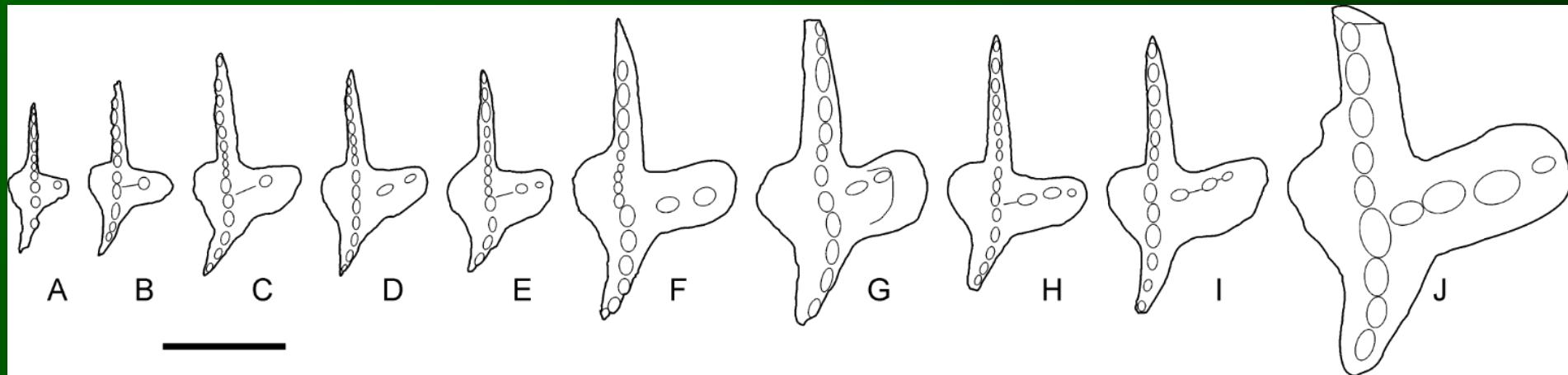
Maria G. Corriga<sup>a</sup>, Carlo Corradini<sup>a,b,\*</sup>



*Ancyrodelloides carlsi* (Boersma)  
Lochkoviano (Devoniano Inferiore)

# Ontogenesi

I denti dei conodonti si accrescevano per tutta la vita dell'animale.



Corriga & Corradini (2019)

*Ancyrodelloides carlsi* (Boersma)  
Lochkoviano (Devoniano Inferiore)

# Caratteristiche dei conodonti sono:

- la notocorda;
- la muscolatura divisa in miomeri a forma di V;
- la coda con una pinna;
- la simmetria bilaterale del corpo.



Queste sono anche le caratteristiche dei  
**CORDATI**

Quindi:

“i Conodonti sono certamente dei Cordati”.

Il phylum Chordata

comprende tre subphyla:

1. Gli Urochordata (Tunicata);
2. I Cephalochordata;
3. I Craniata (meglio noti come Vertebrati).

I Conodonti vanno collocati tra i Vertebrati (Craniata) per una serie di caratteri tra i quali:

- la testa posta anteriormente alla notocorda;
- la pinna caudale con supporti seriali;
- la presenza di una coppia di occhi ben sviluppati;
- la muscolatura esterna dell'occhio;
- la presenza di capsule otiche;

(strutture relative ai sensi della vista e dell'udito presuppongono che essi avessero anche un cervello di complessità sufficiente per "processare" le informazioni raccolte da queste strutture)

- la presenza di denti (in apatite);
- il modo di crescita del tessuto osseo e della dentina;
- l'istologia delle parti dure mineralizzate.

I Vertebrati sono un gruppo estremamente ampio e quindi la domanda successiva è:

**“dove si collocano i Conodonti all'interno dei Vertebrati?”**

I Vertebrati si dividono in:

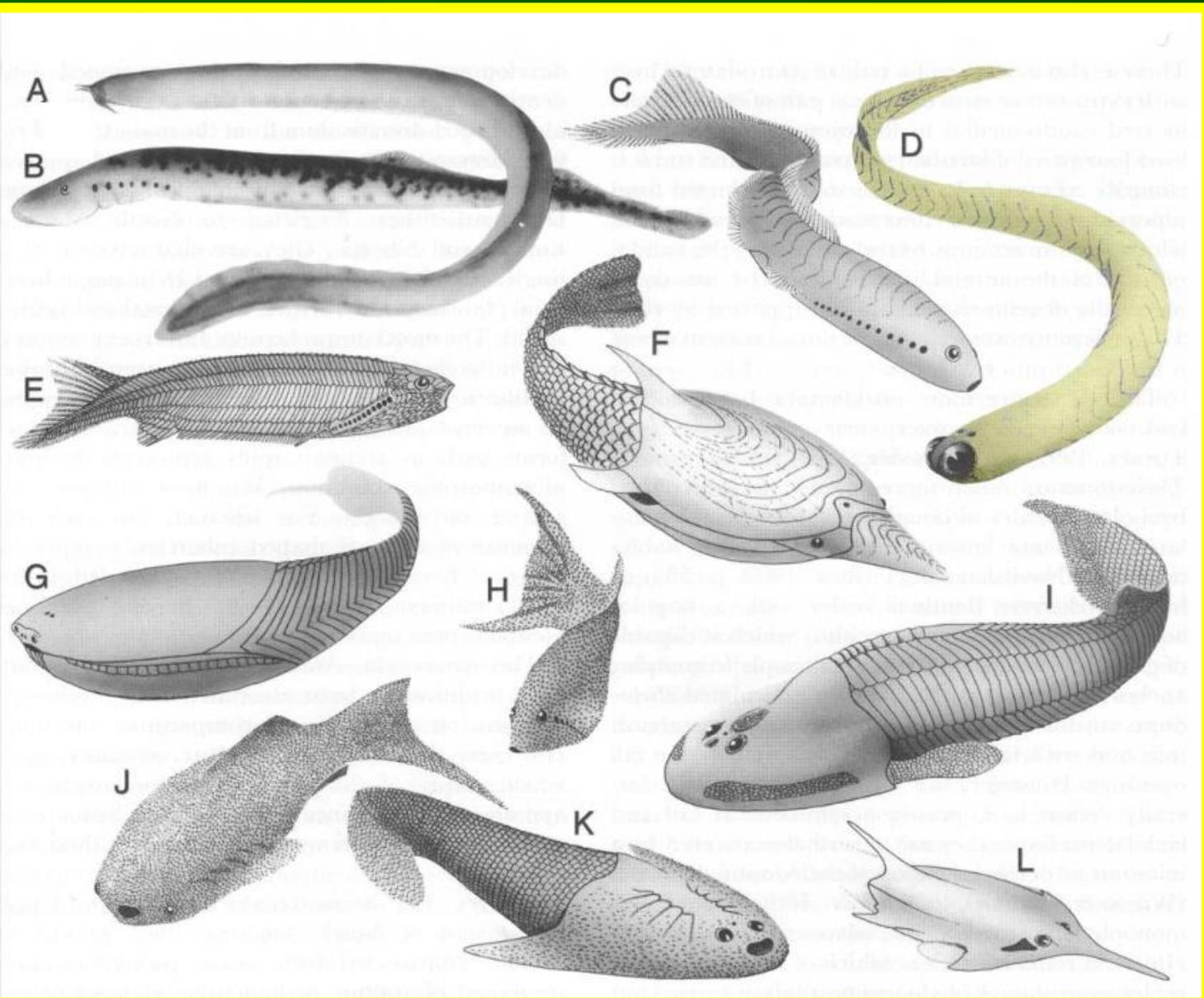
- Agnati (senza mandibole)
- Gnatostomi (dotati di una mandibola mobile)

possiamo subito escludere la loro appartenenza agli Gnatostomi in quanto i denti dei Conodonti “lavoravano” lateralmente invece che verticalmente.

I Conodonti erano quindi degli “Agnati”

il gruppo parafiletico che comprende i pesci primitivi senza mandibola.

# VERTEBRATI PRIMITIVI



Conodonti

C  
H  
O  
R  
D  
A  
T  
A

UROCHORDATA (Ascidie)  
(TUNICATA)

CEPHALOCHORDATA (Anfiosso)

AGNATHA  
(pesci senza mandibole)

VERTEBRATA  
(CRANIATA)

GNATHOSTOMATA  
(con mandibola mobile)

MYXINOIDEA  
(Missine)

PETROMYZONTOIDEA  
(Lamprede)

**CONODONTA**

"OSTRACODERMATA"  
(Anaspida, Heterostraci,  
ecc.)

PESCI con  
mandibole

Condroitti  
(squali)

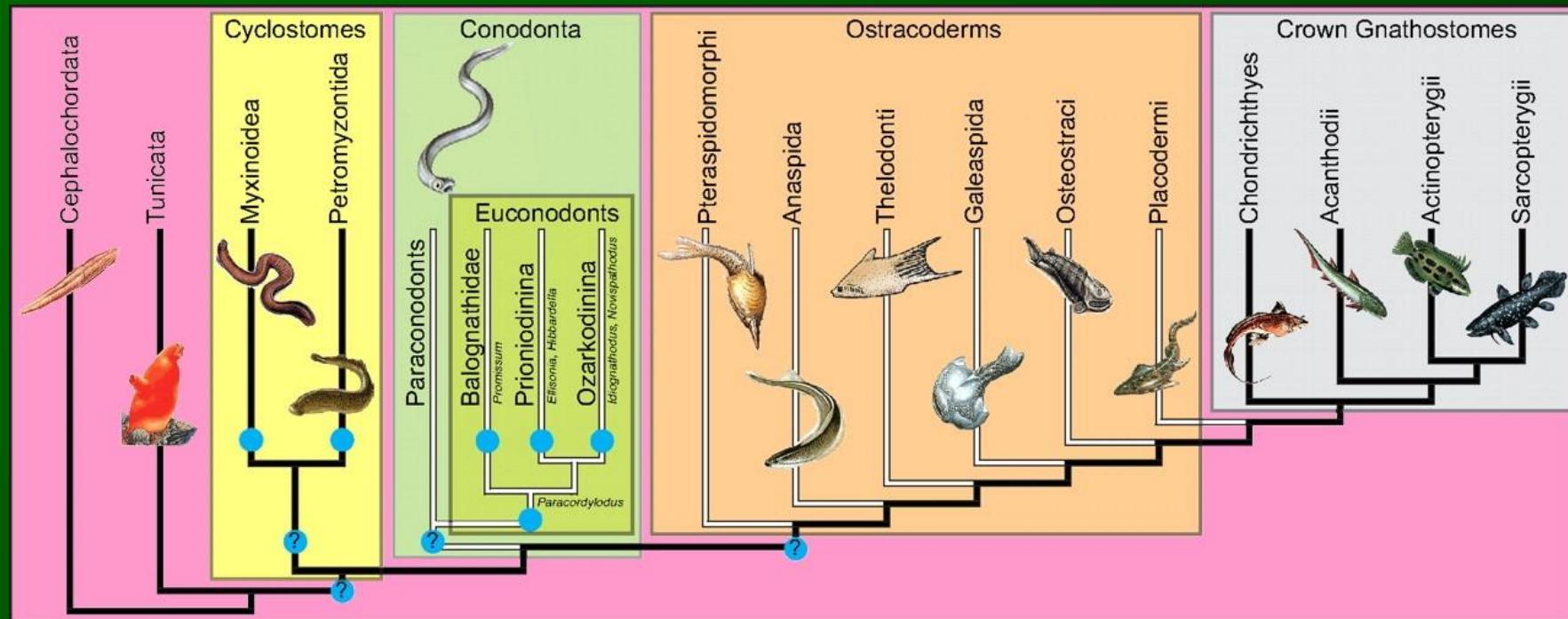
Osteitti

TETRAPODA

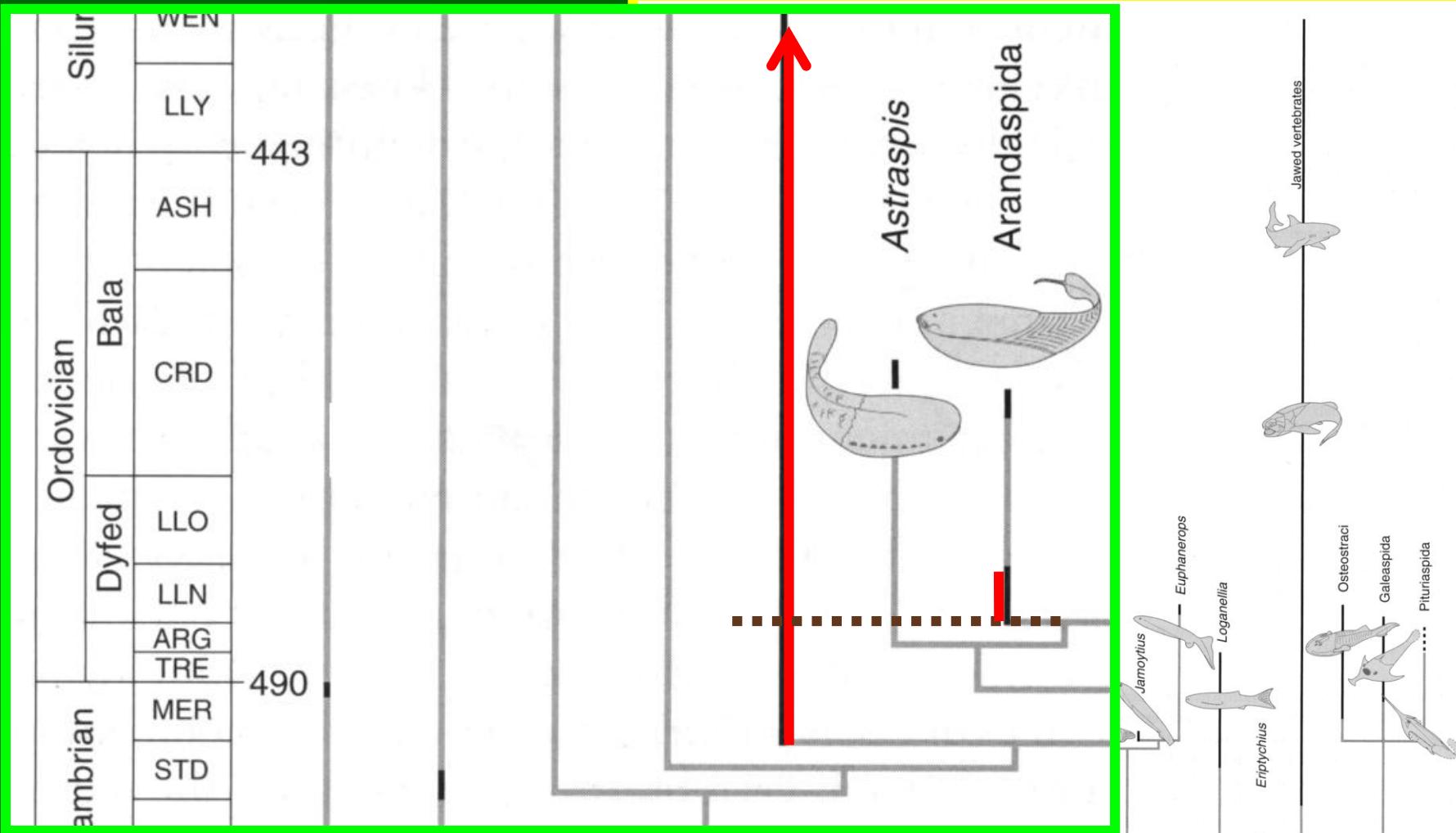
Rettili  
Anfibi  
Mammiferi  
Uccelli



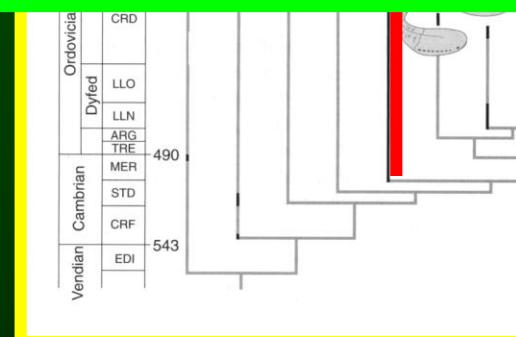
# Conodonti



# Conodonti



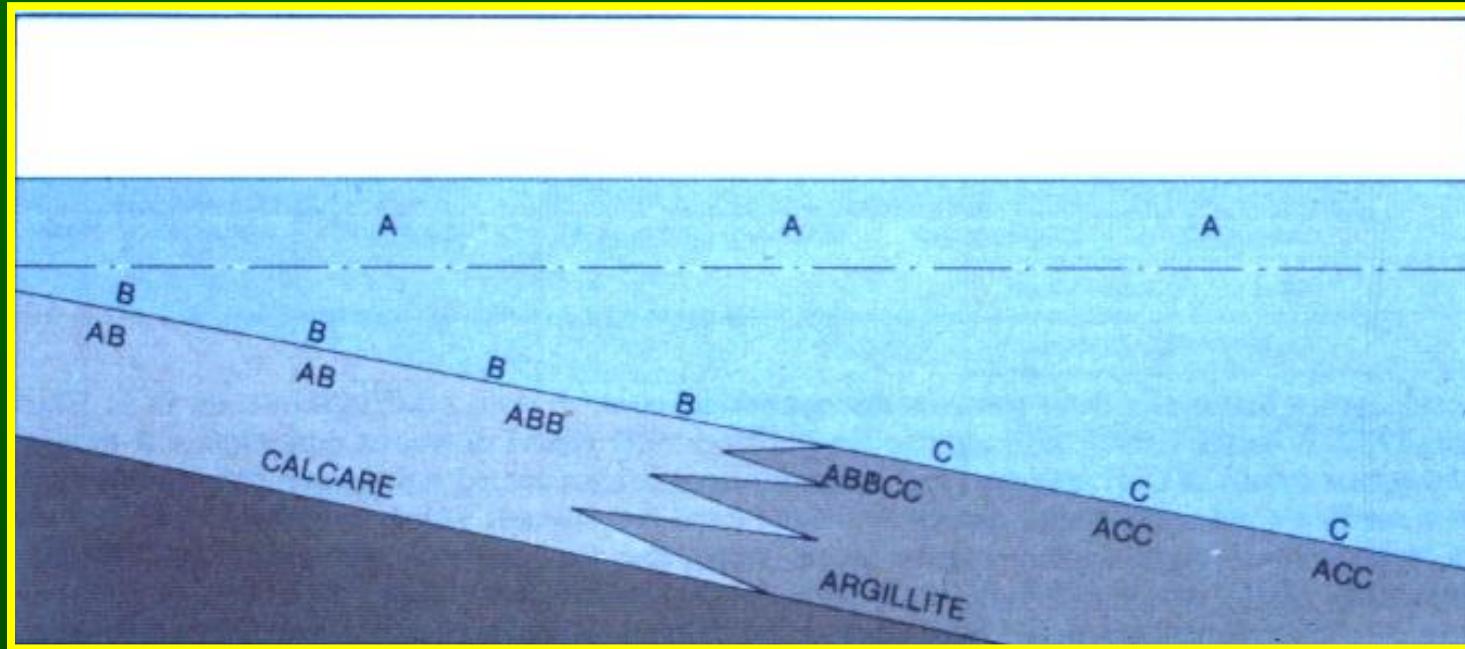
I più antichi Conodonti sono  
più vecchi di almeno 30  
milioni di anni dei primi  
Agnati certi;



Ricostruzione filogenetica dei Cordati  
(linee grigie) e distribuzione stratigrafica  
dei principali gruppi (tratto nero).

# modo di vita

Animali esclusivamente marini



nectobentonico

# Provincialismi

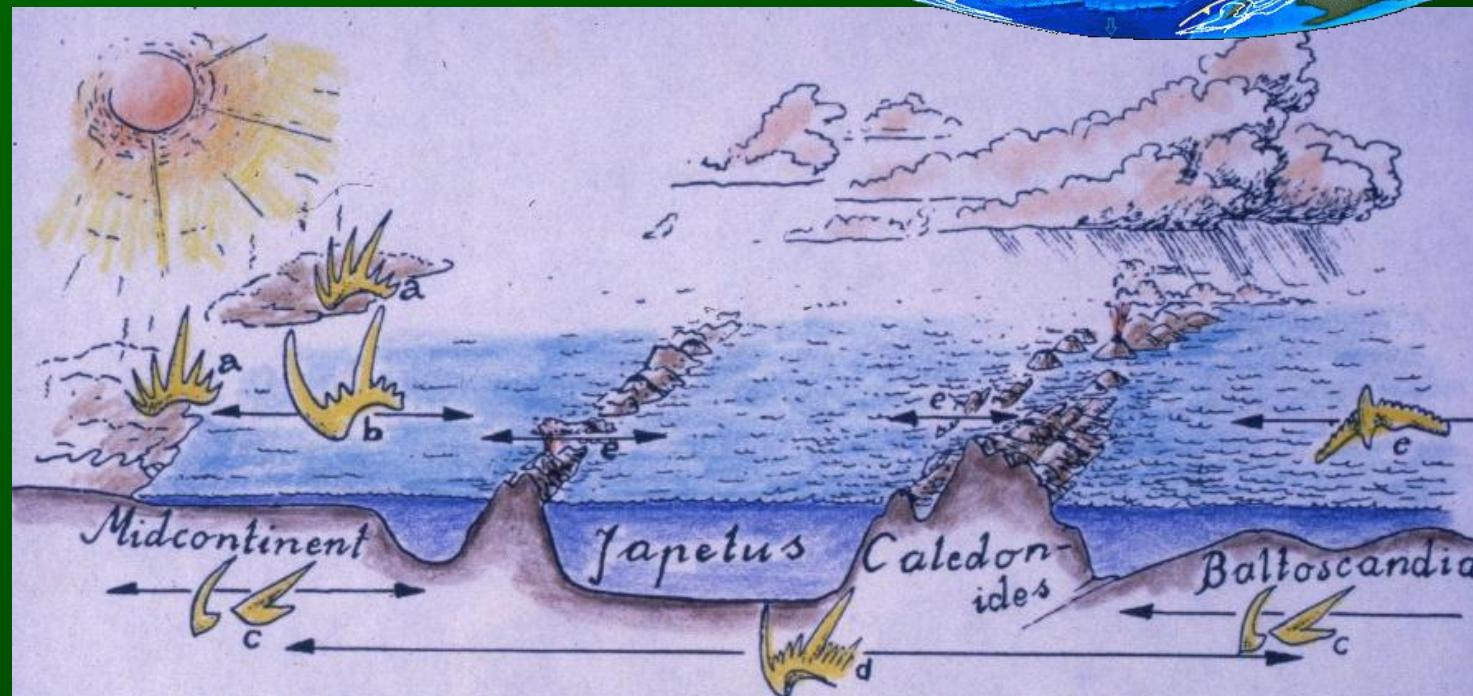
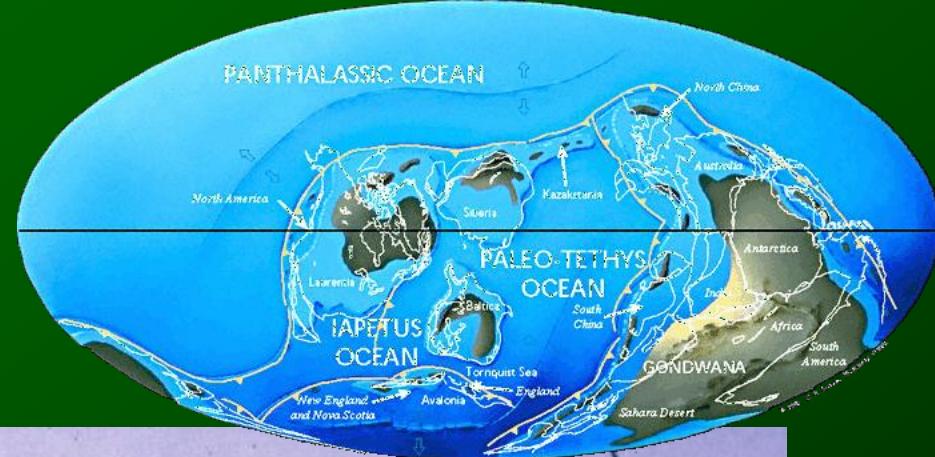


Figure 6. Occurrence of certain conodonts in seas adjacent to the Ordovician Iapetus Ocean: a, neurodonta (nearshore); b, *Phragmodus*; c, *Drepanoistodus*; d, *Periodon*; e, *Baltoniodus*. The sketch essentially refers to the Early to Middle Ordovician. Note that in this reconstruction Baltoscandia has major shoals consisting of basement rises and that several conodont genera might have thrived over (or on!) these shoals.

# APPLICAZIONI NELLE SCIENZE DELLA TERRA

- BIOSTRATIGRAFIA
- PALEOECOLOGIA
- GEOLOGIA REGIONALE
- RICERCHE PETROLIFERE

# BIOSTRATIGRAFIA

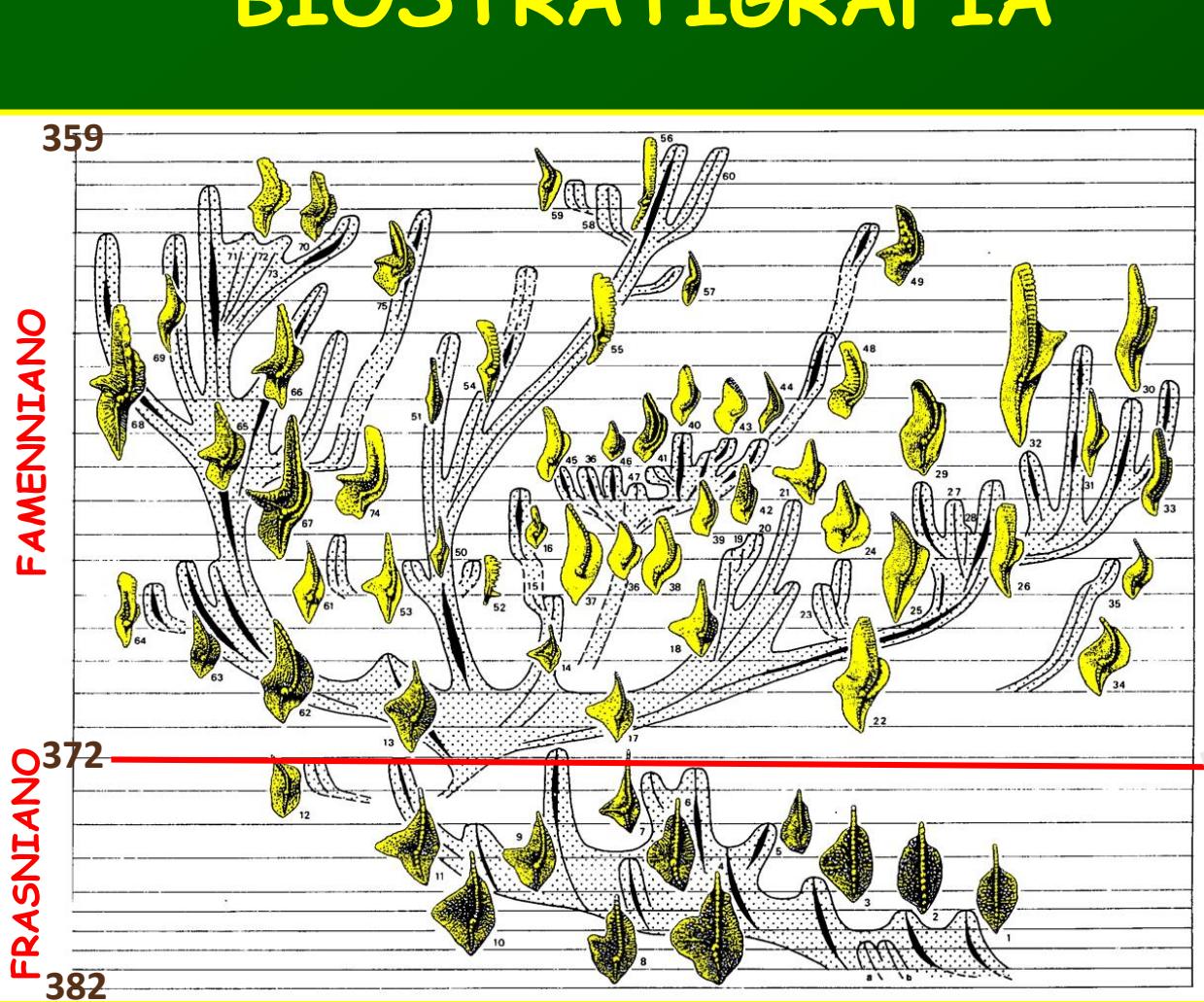
**DEVONIANO SUPERIORE**

**359**

**FAMENNIANO**

**372**

**382**



**Genere *Pamatolepis***

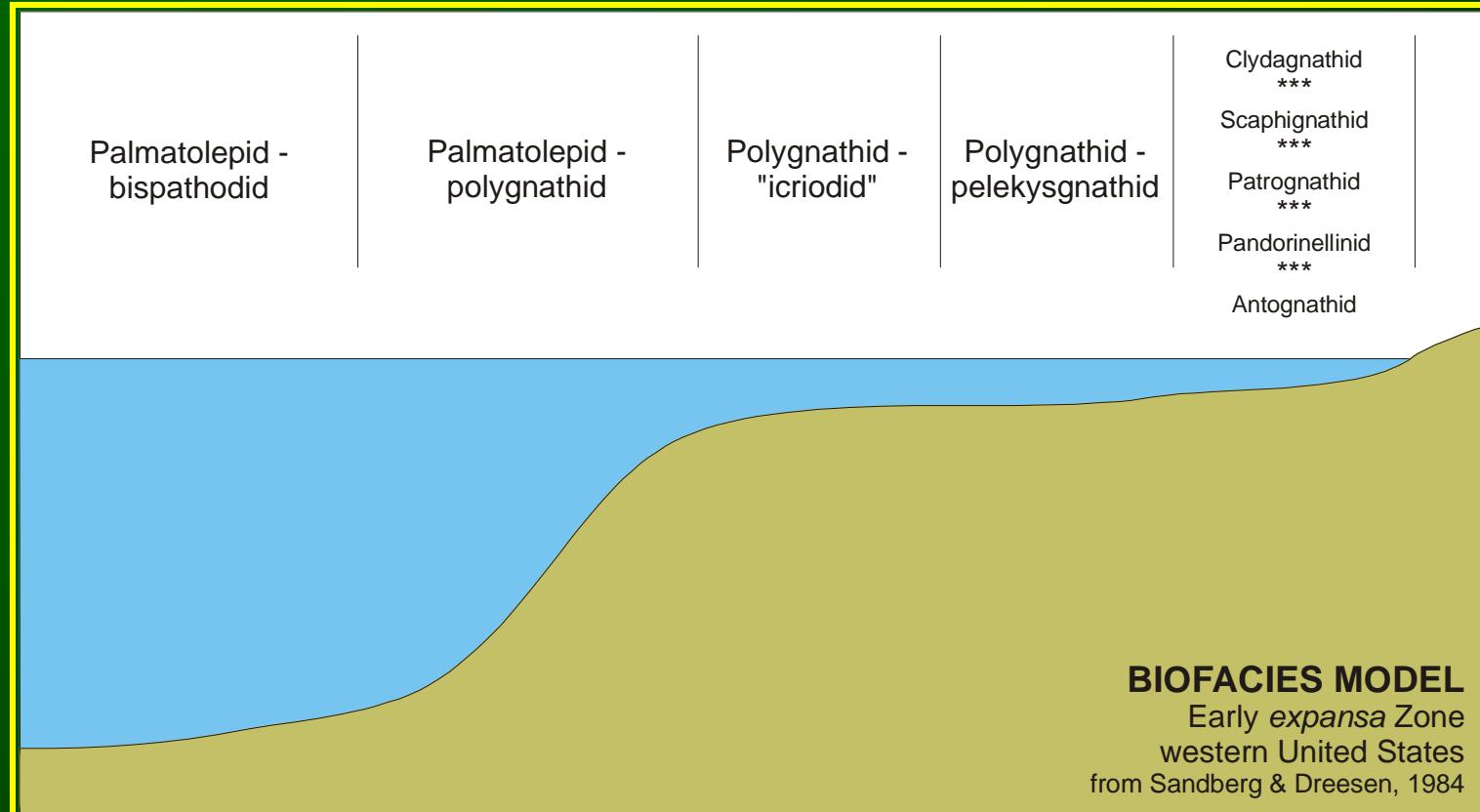
## FAMENNIAN CONODONT ZONATION

- Protognathodus kockeli
- Bispathodus ultimus
- Bispathodus costatus
- Bispathodus ac. aculeatus
- Palmatolepis gr. expansa
- Palmatolepis gr. manca
- Polygnathus styriacus
- Pseudopolygnathus granulosus
- Palmatolepis r. trachytera
- Scaphignathus v. velifer
- Palmatolepis m. utahensis
- Palmatolepis m. marginifera
- Palmatolepis gr. gracilis
- Palmatolepis rhomboidea
- Palmatolepis gl. pectinata
- Palmatolepis gl. prima
- Palmatolepis termini
- Palmatolepis crepida
- Palmatolepis m. minuta
- Palmatolepis del. platys
- Palmatolepis triangularis
- Palmatolepis subperlobata

# CRONOESTRATIGRAFIA

	Upper	Famennian	<p>FAD <i>Palmatolepis subperlobata</i></p> <p>FAD <i>Ancyrodella rotundiloba pristina</i></p> <p>FAD <i>Polygnathus hemiansatus</i></p> <p>FAD <i>Polygnathus partitus</i></p> <p>FAD <i>Polygnathus kitabicus</i></p> <p>FAD <i>Eognathodus sulcatus sulcatus</i></p>	<p>Rhaetian</p> <p>Norian</p> <p>Carnian</p> <p>Ladinian</p> <p>Anisian</p> <p>Olenekian</p> <p>Induan</p> <p>Changhsingian</p> <p>Wuchiapingian</p> <p>Capitanian</p> <p>Wordian</p> <p>Roadian</p> <p>Kungurian</p> <p>Artinskian</p> <p>Sakmarian</p> <p>Asselian</p>	<p>FAD <i>Misikella postfernsteini</i></p> <p>FAD <i>Chiosella timorensis</i></p> <p>FAD <i>Novispaphodus waageni</i></p> <p>FAD <i>Hindeodus paryus</i></p> <p>FAD <i>Clarkina wangi</i></p> <p>FAD <i>Clarkina postbitteri</i></p> <p>FAD <i>Jinogondolella postserrata</i></p> <p>FAD <i>Jinogondolella aserrata</i></p> <p>FAD <i>Jinogondolella nankingensis</i></p> <p>FAD <i>Neostreptognathus pnevi</i></p> <p>FAD <i>Sweetognathus asymmetricus</i></p> <p>FAD <i>Mesogondolella monstra</i></p> <p>FAD <i>Streptognathodus isolatus</i></p> <p>FAD <i>Idiognathodus simulator</i></p> <p>FAD <i>Idiognathodus heckeli</i></p> <p>FAD <i>Diplognathodus ellesmerensis</i></p> <p>FAD <i>Declinognathodus noduliferus</i></p> <p>FAD <i>Lochreia ziegleri</i></p>				
		Frasnian							
	Middle	Givetian							
		Eifelian							
	Lower	Emsian							
		Pragian							
		Lochkovian							
	Pridoli								
		Ludfordian							
	Ludlow	Gorstian							
		Homerian							
	Wenlock	Sheinwoodian							
		Telychian							
Llandovery	Aeronian								
	Rhuddanian								
	Hirnantian								
Upper	Katian								
	Sandbian								
Middle	Darriwilian								
	Dapingian								
Lower	Floian								
	Tremadocian								
	Stage 10								
		Jiangshanian							
	Furongian	Paibian							
<span style="color: blue;">blue: candidate criterion</span>									
<span style="color: blue;">FAD Siphonodella sulcata</span>									

# Ricostruzioni paleoambientali

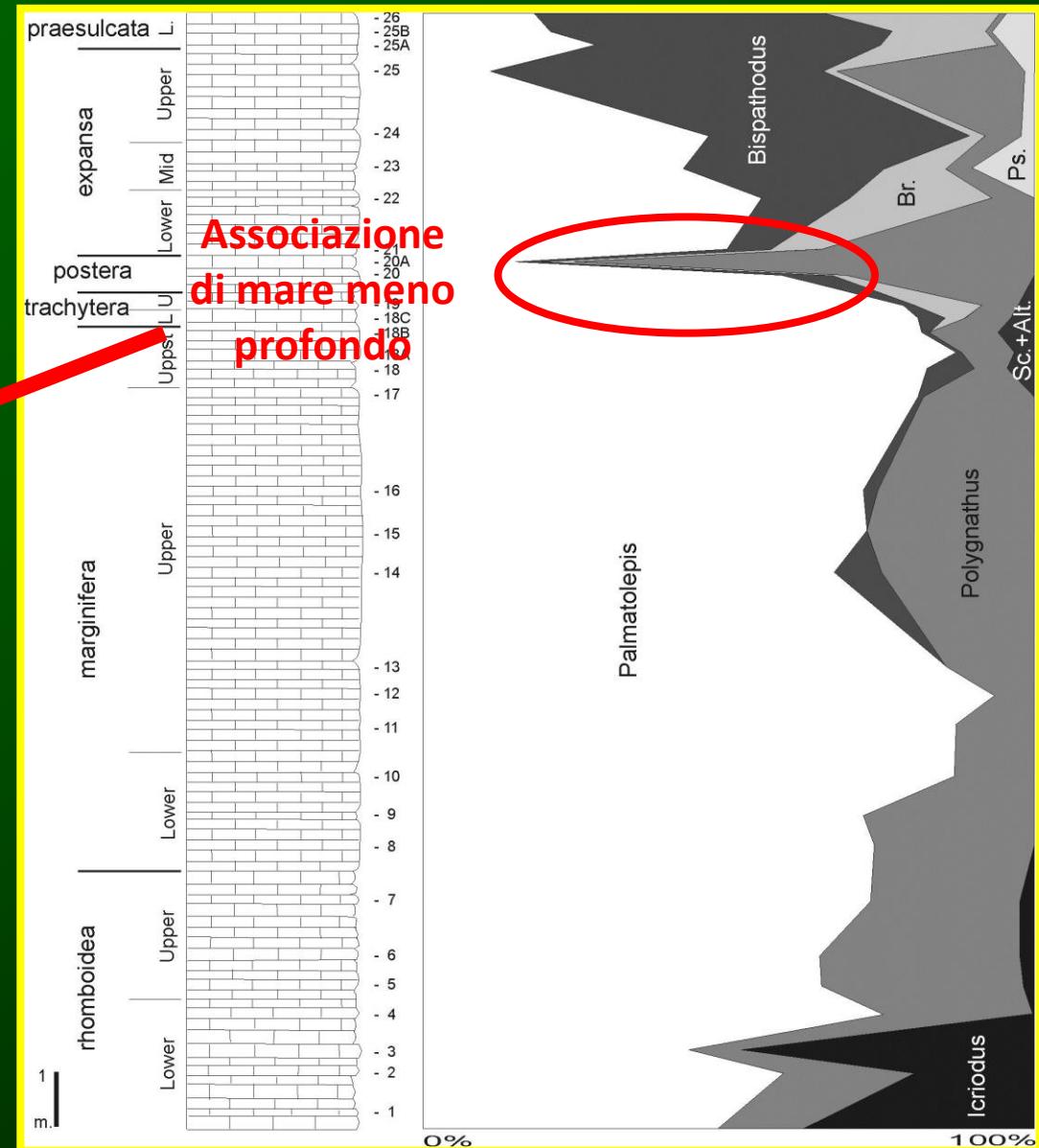


# Ricostruzioni paleoambientali

Sezione Corona Mizziu I

Devoniano Sup. – Sardegna

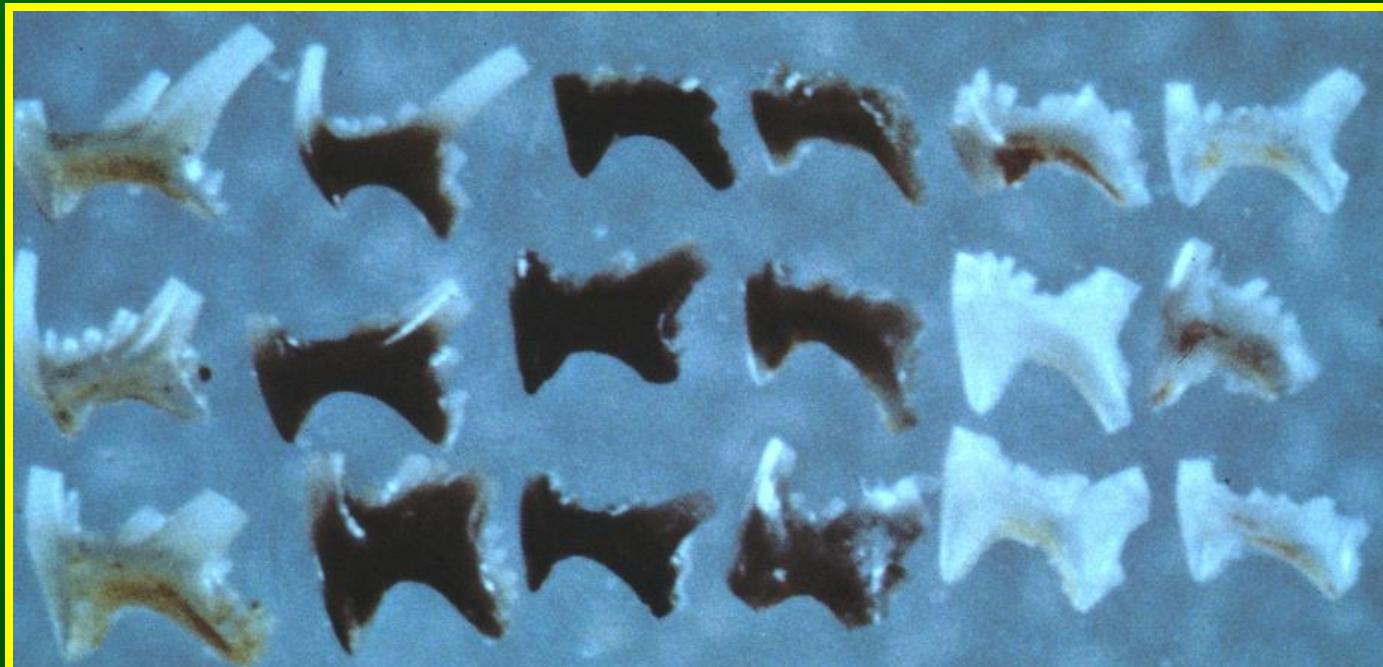
Abbassamento  
del livello del  
mare





La variazione di colore è dovuta ad alterazione di materia organica presente in tracce nei singoli conodonti

# Conodonti



Temperatura

L'alterazione di colore nei conodonti dipende dal TEMPO e dalla TEMPERATURA

La variazione di colore è dovuta ad alterazione di materia organica presente in tracce nei singoli conodonti

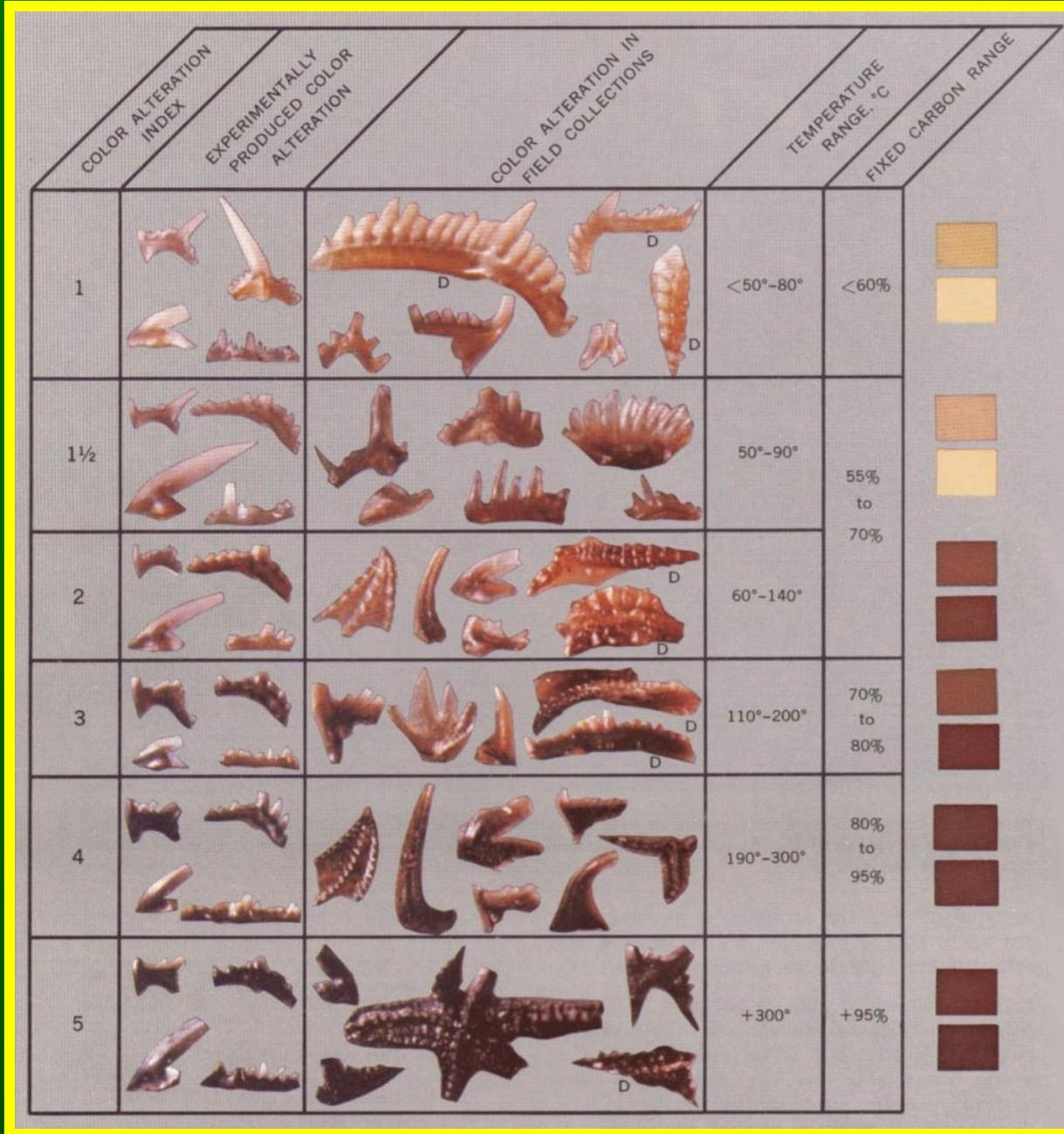
L'alterazione di colore è PROGRESSIVA, CUMULATIVA e IRREVERSIBILE

La pressione non accelera né ritarda il processo di alterazione di colore

Possono essere distinti otto livelli di alterazione di colore.

A.G. Epstein, J.B. Epstein & L.D. Harris (1977): Conodont Color Alteration - an Index to Organic Metamorphism. Geological Survey Professional Paper, 995, 27 pp.

# Conodonti



# C.A.I

(Color Alteration Index)

# Conodonti

C.A.I.

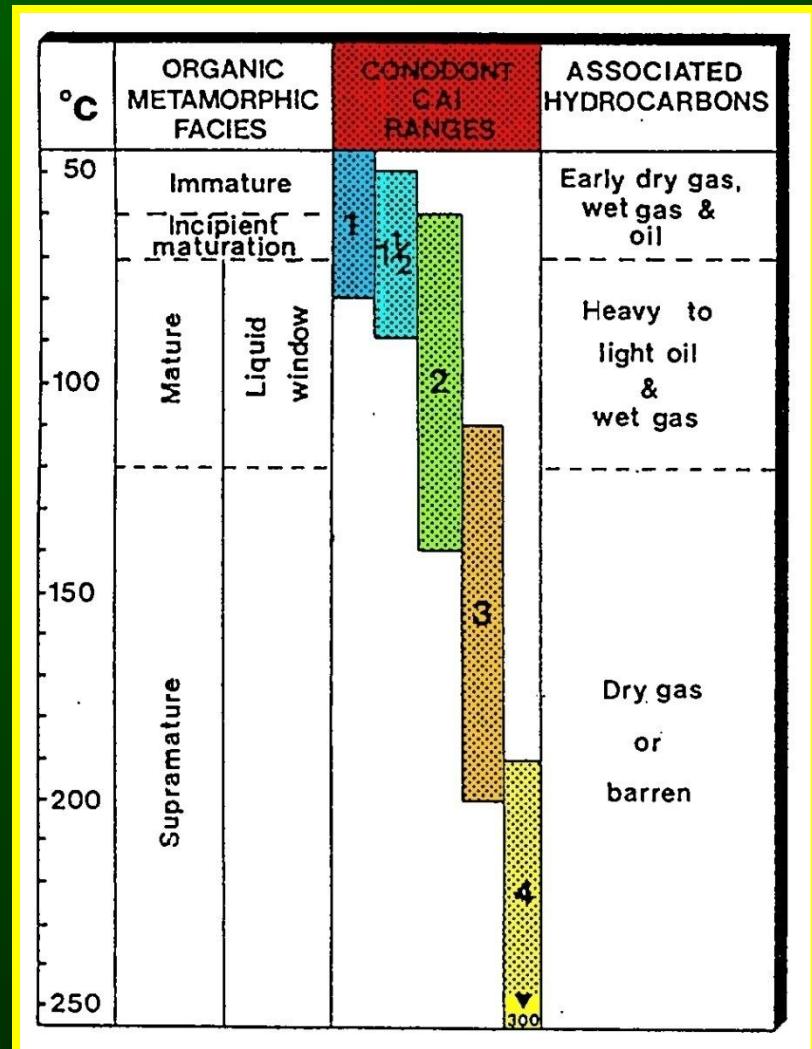
COLOR ALTERATION INDEX (CAI)	EXPERIMENTALLY INDUCED COLOR ALTERATION	NATURAL COLOR ALTERATION FROM FIELD COLLECTIONS	TEMPERATURE RANGE, °C	MUNSELL ROCK COLOR
5			300° - 480°	BLACK (N1)
6			360° - 550°	MEDIUM DARK GRAY TO MEDIUM GRAY (N4-N5)
6½			440° - 610°	MEDIUM LIGHT GRAY TO LIGHT GRAY (N6-N7)
7			490° - 720°	VERY LIGHT GRAY TO WHITE (N8-N9)
8			> 600°	COLORLESS OR CRYSTAL CLEAR

# APPLICAZIONI

Conoscere la storia termica di un bacino sedimentario, fornendo informazioni sulle aree e sugli intervalli stratigrafici che potrebbero contenere idrocarburi.

Identificare intrusioni localizzate, e quindi contribuire all'individuazione di depositi minerari.

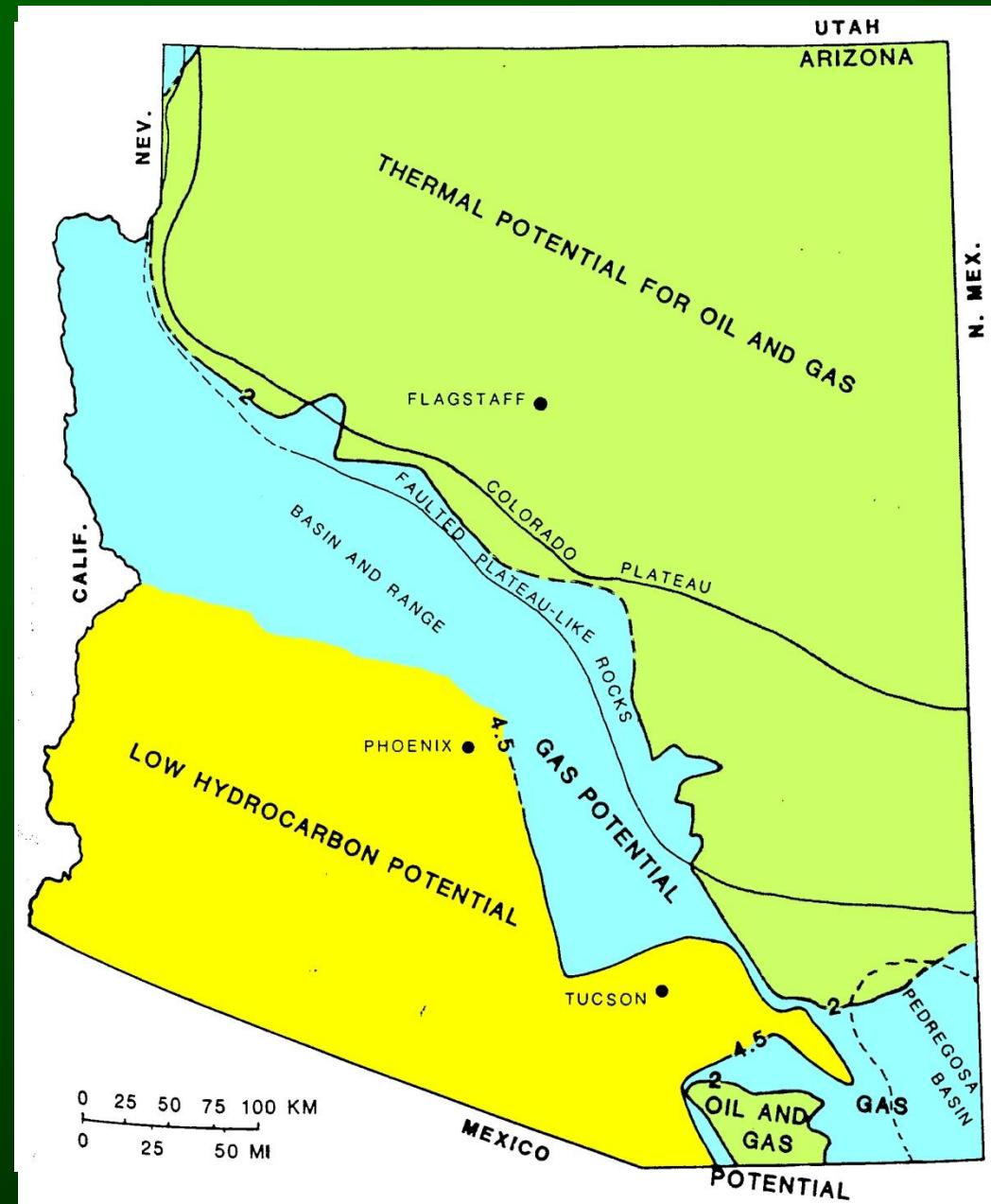
Identificare effetti tettonici locali, che hanno provocato flussi di calore (grandi sovrascorimenti o rifting).



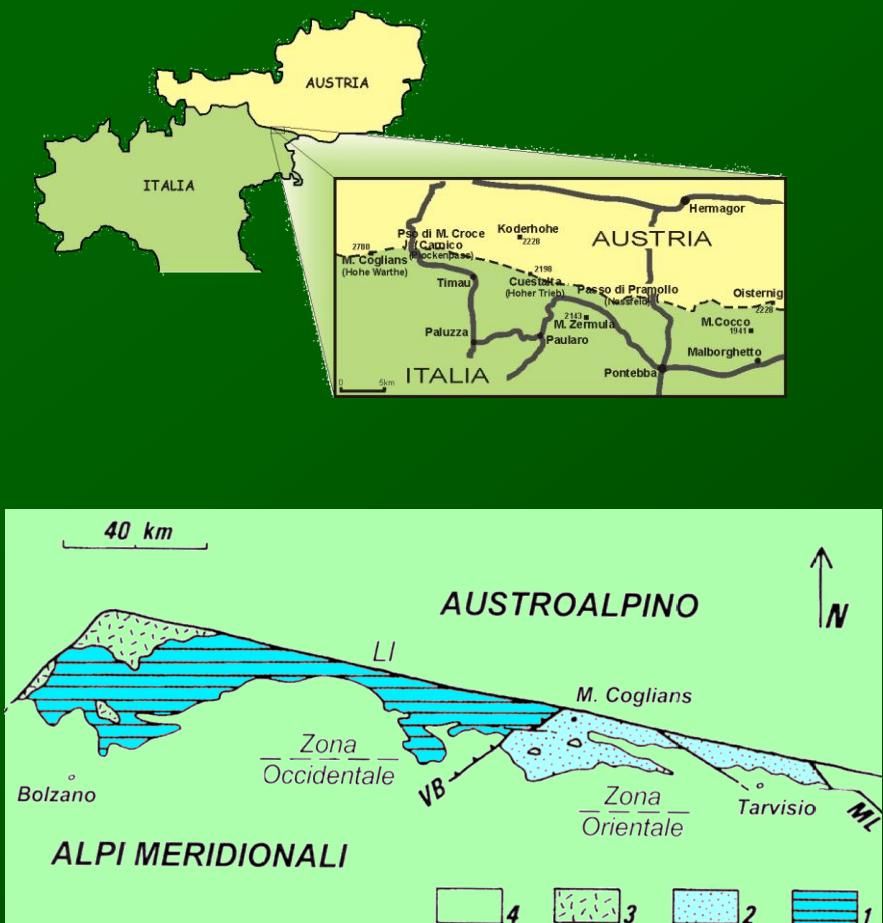
# Conodonti

## ARIZONA

Wardlaw & Harris, 1984

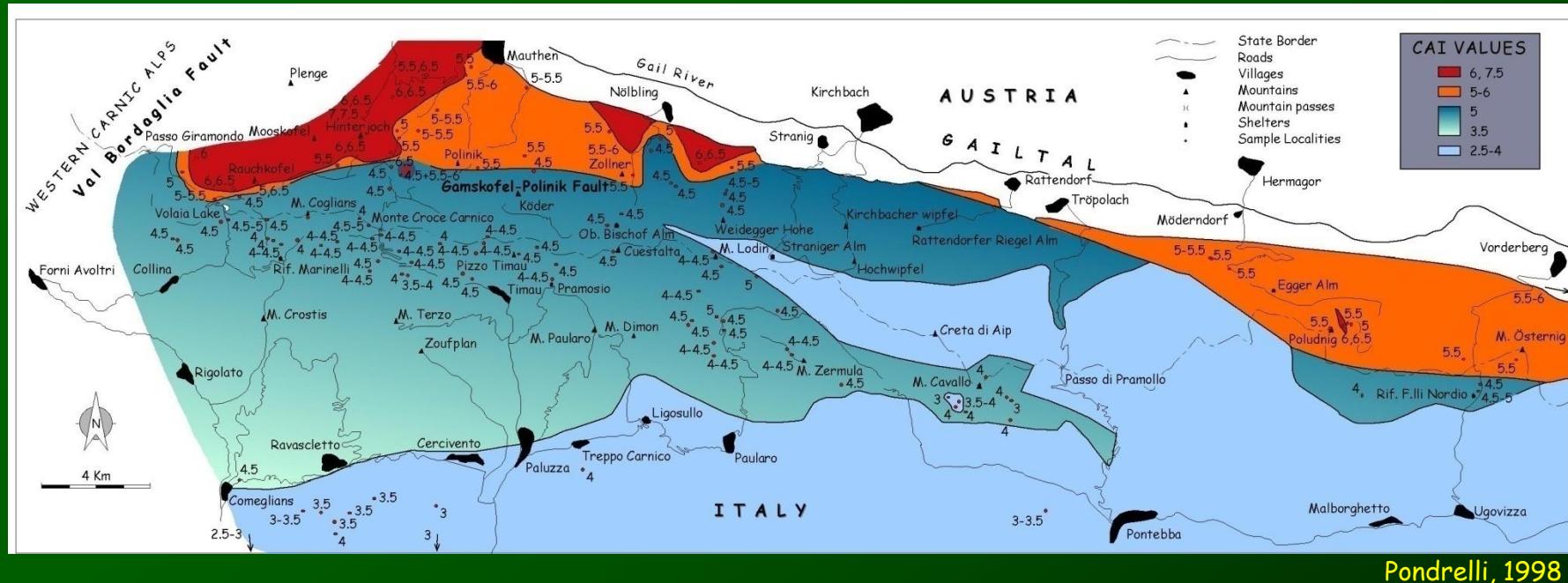


# Conodonti



TRIASSIC	Norian	DP
	Camian	R DU VD DC SC WG
	Ladinian	S BU
	Anisian	BR SR
	Glenekian	
	Induan	W
	Changhsingian	B
	Wuchiapinian	VG
	Capitanian	
	M	
PERMIAN	Wordian	
	Roadian	
	Kungurian	
	Artinskian	T
	Sakmarian	R
	Asselian	P
	Gzhelian	D
	Kasimovian	HW
	Moscovian	KB
	Bashkirian	PR
CARBONIFEROUS	Serpukhovian	
	Visean	C
	Tournaisian	F
	Mississippian	PG
	Prismenian	CU
	Famennian	B
	Frasnian	O
	Givetian	G
	Eifelian	
	Emsian	
DEVONIAN	Pragian	
	Lochkovian	RK
	Pridolian	
	Ludlow	
	Wenlock	
	Llandovery	
	Ordovician	
	Ashgill	U
	Caradoc	
<b>DP = Dolomia Principale:</b> Massive and stromatitic dolostones and lime dolostones. Tidal-flat environments. Late Triassic (Norian).		
<b>R = Rallid Fm:</b> Red dolostones and shales followed by laminated gypsum and cataclastic dolostones and by cataclastic wavy dolostones, many dolostones, marls and polymictic shales. Tidal-flat to shallow marine environments. Late Triassic (late Camian).		
<b>DU = Durrenstein Fm:</b> Red dolostones and shales interbedded with limestones and marls passing into dolomitic limestones and marls. Basin environments. Late Triassic (early Camian).		
<b>VD = Val Degane Fm:</b> Dark bioluminescent marls with rare layers of green tuffaceous arenites, siliceous mudstones and coals passing into bluish-green laminated marlites, marls and terrogenous turbidites. Lagoon and deep basin environments. Late Triassic (early Camian).		
<b>DC = Cassian Dolomite:</b> Grey dolomitic limestones, poorly bedded limestones and calcarenous breccias. Backreef, reef and forereef environments. Middle-Late Triassic (latest Ladinian-early Camian).		
<b>SC = San Cassiano Fm:</b> Coarse, black block-calcareous turbidites (packstone and wackestone) interbedded with grey to black marls. Basinal environments. Middle-Late Triassic (latest Ladinian-early Camian).		
<b>WG = Wengen Fm:</b> Dark turbiditic sandstones and shales made with marl, limestones and marlites. Basinal environments. Middle-Late Triassic (late Ladinian-early Camian).		
<b>BU = Buchenstein Fm:</b> Limestones, cherty limestones, siliceous shales and, locally, pyroclastic breccias and tufts ('pedra verde'). Turbiditic sandstones and shales (Zonok Sandstone). Calcarenous (packstone/wackestone) interbedded with marly layers and, locally, volcanics (Acquafonza Fm.). Basinal environments. Middle Triassic (Ladinian).		
<b>B = Sella (or Schiera) Dolomite:</b> Massive white reefal dolostones and dolomitic limestones. Middle Triassic (latest Anisian-early Camian).		
<b>VG = Val di Peres Fm:</b> Conglomerates with subordinate sandstones and shales overlain by basinal marlstones passing into turbiditic sandstones and many pellets. Eight formations: Pliz da Peres Fm (base), Val di Peres and Richenthal Conglomerates, Mortarite Limestone, Doni Fm., Mt. Bivera Fm., Ambata Fm., Aufa Turbidites. Middle Triassic (Anisian-Bediyan-early Ladinian-Fassanian).		
<b>SR = Serfa Dolomite:</b> (Lower and Upper units). Stromatolites and wavy dolomites overlain by massive dolomites and dolomitic limestones. Shallow marine environments. Middle Triassic (Anisian-Eigen-Pelsonian).		
<b>W = Werfen Fm:</b> Light grey marly limestones with thin dark grey dolitic interbeds, passing up-section to red shales and shales interbedded with blockyarenous layers. Calcarenous levels present. Shallow marine environments. Latest Permian-Early Triassic (late Changhsingian-Colenekian).		
<b>B = Bellanofer Fm:</b> Grey to dark grey limestones and dolomitic limestones interbedded with laminated sabkha gypsum. Shallow marine environments. Late Permian (Changhsingian).		
<b>VG = Val Gardena Sandstone:</b> Red sandstones and shales with calcareous and thin dolomitic layers and, at the base, calcareous breccias and conglomerates (Tarsis Breccias) and reddish polymictic nubitas (Sesto Conglomerate). Nearshore (non-marine and marine) environments. Late Permian.		
<b>Paraconformity or low-angular unconformity</b>		
<b>T = Trogkofel Group:</b> Upper part of Pontebba Supergroup. Light grey and pink limestones and massive dolomites. Shallow marine. Early Permian (Sakmarian-Artinskian).		
<b>R = Rattendorf Group:</b> Middle part of Pontebba Supergroup. Massively bedded biocalcareous and dolomite marls of the Lower and Upper Paudschwagener Fms separated by grey and red shales with sandstones and quartz-conglomerates of the Val Dolce Fm. Shallow marine environments. Late Carboniferous-Early Permian (Gzhelian-Sakmarian).		
<b>P = Pramollo Group:</b> Lower part of Pontebba Supergroup. Quartz-sandstones and quartz-conglomerates with interbedded shales with dolomitic and fossiliferous limestones (Valda). Five formations: Pramollo Fm., Pizzal Fm., Corina Fm., Asmig Fm., and Camizza Fm. Backshore and nearshore environments. At the very base immature conglomerates and lithic arenites (Bomporto Fm.). Late Carboniferous (late Moscovian-Asselian).		
<b>Angular unconformity</b>		
<b>D = Dimon Fm:</b> Deep sea volcanoclastic turbidites and alkali-olivine basaltic volcanics: grey dolomitic sandstones, grey to greenish, red and green shales, hyaloclastites, dolibases, pillow lavas and explosive volcanic breccias. Late Carboniferous (Bashkirian).		
<b>HW = Hochwipfl Fm:</b> Shallow lacustrine: grey-green quartzsandstones and shales. Calcareous dolostones, dolostomes and metadolostic rudites in the lower part. Locally low grade metamorphic facies. Deep-sea fan environments. Carboniferous (Middle Visean-Bashkirian).		
<b>RC = Rio Chiavetta Radiolarites:</b> Basinal thick radiolarian cherts interbedded with brown pellets; rare calcareous layers. Early Devonian-Early Carboniferous (Fragian-Visean).		
<b>B = Banderitska:</b> Low-grade metamorphic facies of Stolni-early Visean calcareous succession (equates with Orthoceras Limestone through to Prismense Limestone).		
<b>PR = Prismense Limestone:</b> Light grey, pink to light brown biomicrites (mudstones, wackestones and packstones) interbedded with rare mm-cm calcarenous and calcilithic layers. Shallow to basin environments. Late Devonian-Early Carboniferous (Frasnian-early Visean).		
<b>CU = Cuesta Fm:</b> Reddish nodular biomicrites (wackestones and packstones) rich in tentaculids, sometimes with interbedded grey calcarenous, Mm-cm dark reddish to greyish marly layers. Inner shelf environments. Early-Middle Devonian (Lochkovian-Givetian).		
<b>PG = Pala Grande Calcarenite:</b> Grey calcarenites and calcilithes (packstones and grainstones) interbedded with dolomites and rudstones. Distal transitional facies. Early-Late Devonian (Pragian-Frasnian).		
<b>F = Freikofel Rudstone:</b> Grey calcarenites and calcarenites (packstones and grainstones) interbedded with rare mudstones. Brachiopod coquines in the upper part (Collina Fm.). Proximal transitional facies. Early-Late Devonian (Pragian-Frasnian).		
<b>C = Coglians Limestone:</b> Massive, light grey fossiliferous limestones - with predominance of stromatoporoids (including Amphipora) and corals - and bioclastic limestones. Backreef, reef and forereef environments. Early-Late Devonian (Lochkovian-Frasnian).		
<b>RK = Rauchkofel Limestone:</b> Dark grey to black dolostones, calcarenites and dolomites, partly dolomitised. Shoreface to offshore environments. Early Devonian (Lochkovian).		
<b>G = Graptolite Shales:</b> Dark grey to black shales rich in graptolites, interbedded with micritic limestones and rare nodulestones. Outer shelf to basin environments. Locally low grade metamorphic facies. Silurian-Early Devonian (Llandovery-Lochkovian).		
<b>O = Orthoceras Limestone:</b> Reddish, ferruginous, nodular micritic limestones (with orthoceras cephalopods) and calcarenous marls. Offshore environments. Silurian (Llandovery-Pridolian).		
<b>U = Uqua Fm:</b> Quartz dolstones and sandstones interbedded, in the upper part, with nodular bioclastic limestones. Coastal to offshore environments. Late Ordovician (Cambrico-Ashgill).		

## Conodonti



Pondrelli, 1998

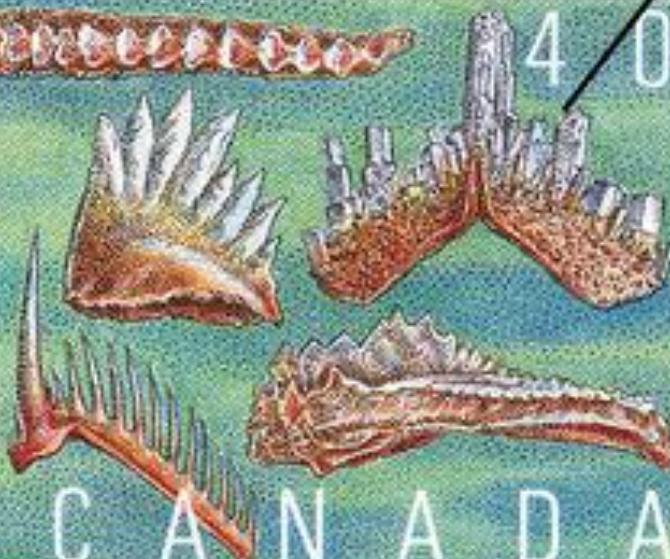
Progressivo aumento del C.A.I. verso le zone interne della catena.

Nella parte occidentale mancano valori intermedi tra 4.5 e 5-5.5, cioè un salto nelle temperature di circa 70-100°C. Si spiega con metamorfismo regionale con aumento dello spessore crostale di circa 2-3 Km.

I valori molto alti nel settore NW sarebbero dovuti ad aumento di carico litostatico durante l'orogenesi alpina e a circolazione di fluidi idrotermali generati dalle intrusioni oloceniche (in alcuni campioni riscontrati anche valori diversi)

Conodonts / Conodontes  
Microfossils / Microurbans  
Palaeozoic Era / Ère paléozoïque

40



CANADA