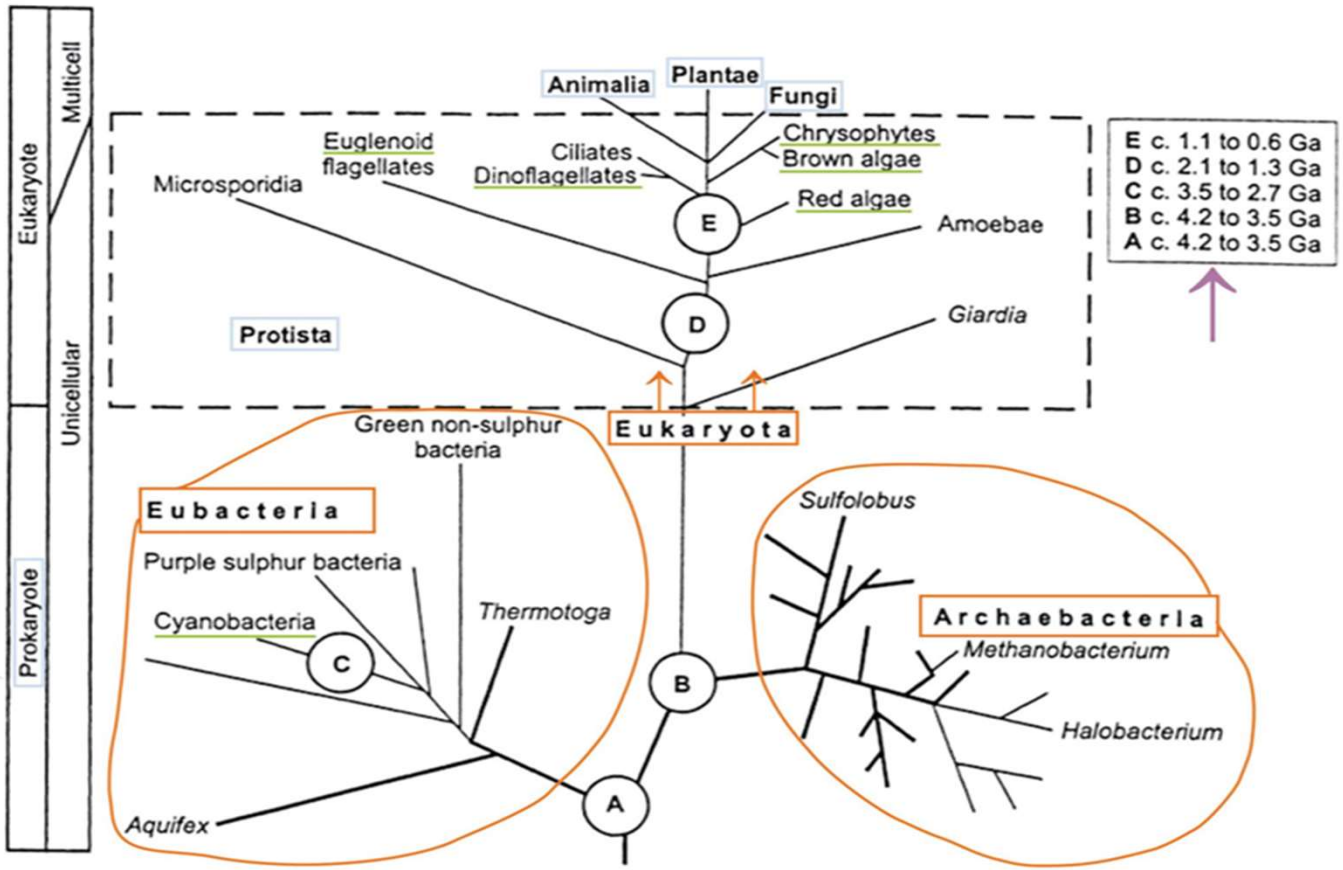
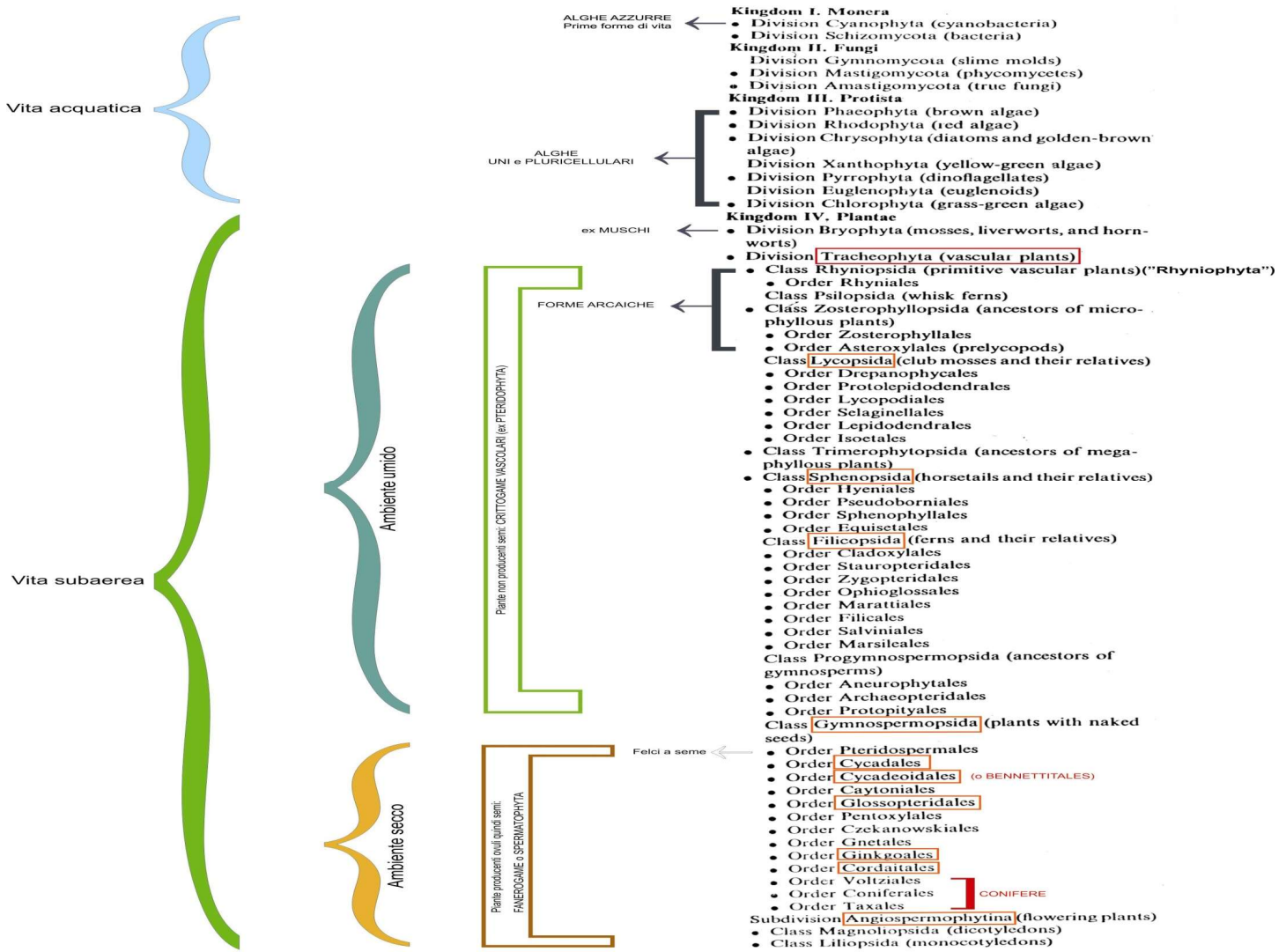
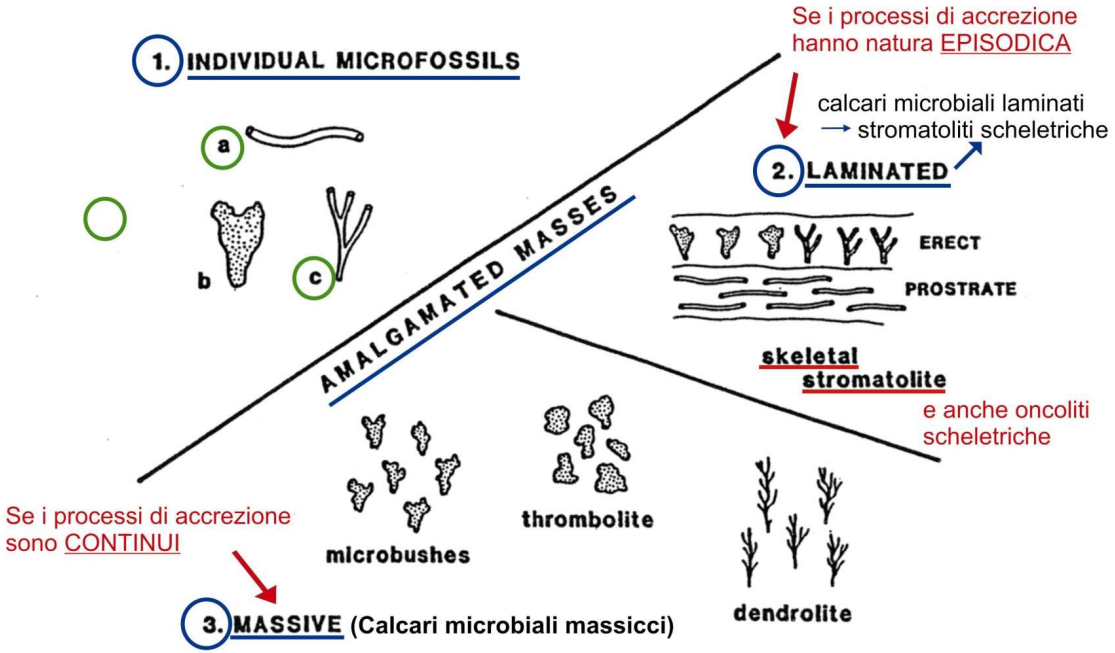


Fig. 6.4 The threefold branches of the tree of life, in which all the deep seated branches are taken by hyperthermophilic bacteria (shown in bold). The approximate times of branching are shown. Time increases along the branches, but not necessarily in a linear fashion nor at the same rate in each branch. Longer branches relate to faster evolution. The times of branching are speculative and are hotly contested. (Adapted from Woese *et al.* 1990, Sogin 1994 and Nisbet & Fowler 1996; Brasier 2000.)


Vita acquatica
Vita subaerea
Ambiente umido
Ambiente secco
ALGHE AZZURRE
Prime forme di vita
ALGHE
UNI e PLURICELLULARI
ex MUSCHI
FORME ARCAICHE
Piante non producenti semi: CRITTOGAME VASCOLARI (ex PTERIDOPHYTA)
Piante producenti ovuli quindi semi:
FANEROGAME o SPERMATOPHYTA
Felci a seme
CONIFERE
Kingdom I. Monera
Division Cyanophyta (cyanobacteria)
Division Schizomycota (bacteria)
Kingdom II. Fungi
Division Gymnomycota (slime molds)
Division Mastigomycota (phycomycetes)
Division Amastigomycota (true fungi)
Kingdom III. Protista
Division Phaeophyta (brown algae)
Division Rhodophyta (red algae)
Division Chrysophyta (diatoms and golden-brown algae)
Division Xanthophyta (yellow-green algae)
Division Pyrrophyta (dinoflagellates)
Division Euglenophyta (euglenoids)
Division Chlorophyta (grass-green algae)
Kingdom IV. Plantae
Division Bryophyta (mosses, liverworts, and hornworts)
Division Tracheophyta (vascular plants)
Class Rhyniopsida (primitive vascular plants)("Rhyniophyta")
Order Rhyniales
Class Psilopsida (whisk ferns)
Class Zosterophyllopsida (ancestors of microphyllous plants)
Order Zosterophyllales
Order Asteroxylales (prelycopods)
Class Lycopsida (club mosses and their relatives)
Order Drepanophycales
Order Protolepidodendrales
Order Lycopodiales
Order Selaginellales
Order Lepidodendrales
Order Isoetales
Class Trimerophytopsida (ancestors of megaphyllous plants)
Class Sphenopsida (horsetails and their relatives)
Order Hyeniales
Order Pseudoborniales
Order Sphenophyllales
Order Equisetales
Class Filicopsida (ferns and their relatives)
Order Cladoxylales
Order Stauropteridales
Order Zygopteridales
Order Ophioglossales
Order Marattiales
Order Filicales
Order Salviniales
Order Marsileales
Class Progymnospermopsida (ancestors of gymnosperms)
Order Aneurophytales
Order Archaeopteridales
Order Protopityales
Class Gymnospermopsida (plants with naked seeds)
Order Pteridospermales
Order Cycadales
Order Cycadeoidales (o BENNETTITALES)
Order Caytoniales
Order Glossopteridales
Order Pentoxylales
Order Czekanowskiales
Order Gnetales
Order Ginkgoales
Order Cordaitales
Order Voltziales
Order Coniferales
Order Taxales
Subdivision Angiospermophytina (flowering plants)
Class Magnoliopsida (dicotyledons)
Class Liliopsida (monocotyledons)

Se si ha **calcificazione** nei Cyanobatteri i risultati saranno:



Modes of occurrence of calcified cyanobacteria. *1* Discrete individual microfossils (e.g. *a* *Girvanella*; *b Angulocellularia* *c Ortonella*). *2* and *3* Amalgamated masses, which may be either *2*, laminated (skeletal stromatolites) or *3*, massive (microbushes, thrombolite, dendrolite). Skeletal stromatolites may, within their layers, have either erect or prostrate fabrics, depending upon the orientation of the calcified microfossils. Examples of massive amalgamated masses include, for microbushes, Lower Ordovician *Angulocellularia* ("*Epiphyton*, *Renalcis*", Riding and Toomey 1972), and Upper Devonian "fenestral renalcid micrite" (Mountjoy and Riding 1981); for thrombolite, Lower Cambrian *Renalcis* and *Tarthinia* thrombolites (Latham and Riding 1988); and for dendrolite, Lower Cambrian *Epiphyton-Renalcis-Angulocellularia* fabrics (Riding, this Vol.)

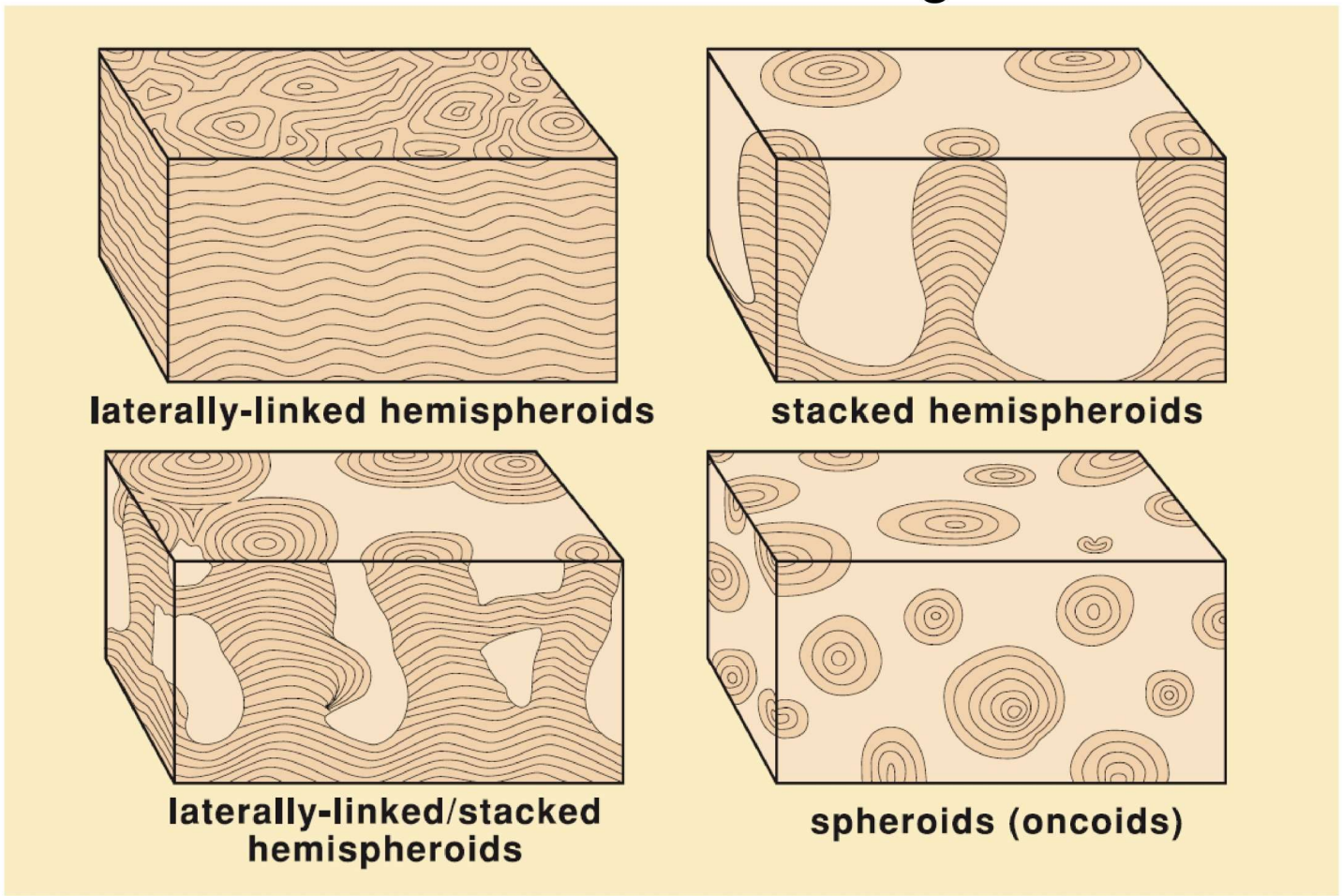
Le stromatoliti sono molto importanti perché sono il primo resto fossile INDIRETTO che abbriamo dal precambriano.
Si chiama fossile INDIRETTO perché non contiene parti dell'organismo... tutte le evidenze che abbiamo (da 3 Ganni fa) sono solo le calcificazioni di un tappeto algale non più preservato.
E' probabili che la maggior parte delle stromatoliti abbiano una struttura di tipo aragonitica.

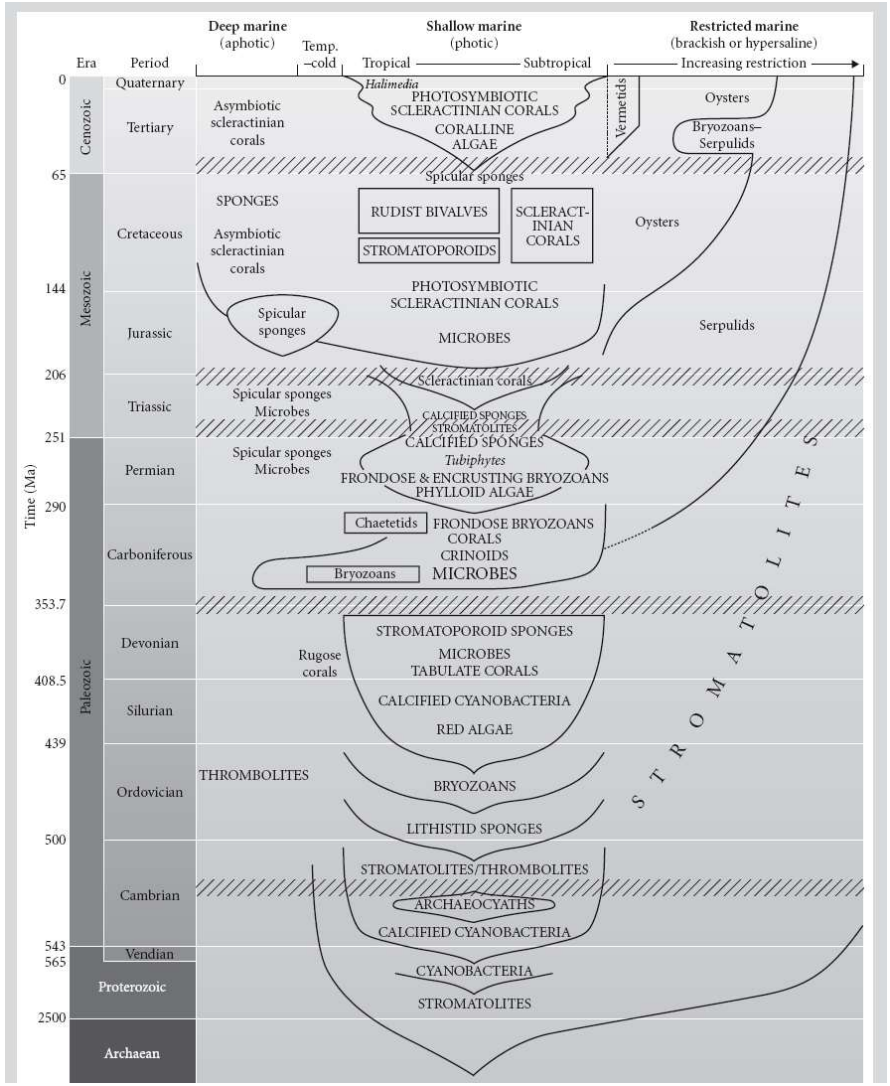
Lamination

Size: Stromatolites are cm to meters in height; laminae are mm- to cm-sized.

Stromatolites can have an abundance of trapped grains, especially pellets/peloids but also clastic terrigenous materials in many cases.

Common microbial stromatolite growth forms




Deep marine
(aphotic)
Temp.
–cold
Shallow marine
(photic)
Tropical
Subtropical
Restricted marine
(brackish or hypersaline)
Increasing restriction
Era
Period
Time (Ma)
0
65
144
206
251
290
353.7
408.5
439
500
543
565
2500
Cenozoic
Mesozoic
Paleozoic
Proterozoic
Archaean
Quaternary
Tertiary
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Vendian
Halimedia
PHOTOSYMBIOTIC SCLERACTINIAN CORALS
CORALLINE ALGAE
Asymbiotic scleractinian corals
Vermetids
Oysters
Bryozoans–Serpulids
Spicular sponges
SPONGES
Asymbiotic scleractinian corals
RUDIST BIVALVES
STROMATOPOROIDS
SCLERACT-INIAN CORALS
Oysters
PHOTOSYMBIOTIC SCLERACTINIAN CORALS
Spicular sponges
MICROBES
Serpulids
Scleractinian corals
Spicular sponges
Microbes
CALCIFIED SPONGES
STROMATOLITES
CALCIFIED SPONGES
Spicular sponges
Microbes
Tubiphytes
FRONDOSE & ENCRUSTING BRYOZOANS
PHYLLOID ALGAE
Chaetetids
FRONDOSE BRYOZOANS
CORALS
CRINOIDS
Bryozoans
MICROBES
STROMATOPOROID SPONGES
Rugose corals
MICROBES
TABULATE CORALS
CALCIFIED CYANOBACTERIA
RED ALGAE
THROMBOLITES
BRYOZOANS
LITHISTID SPONGES
STROMATOLITES/THROMBOLITES
ARCHAEOCYATHS
CALCIFIED CYANOBACTERIA
CYANOBACTERIA
STROMATOLITES
STROMATOLITES

Archaeplastida
Rhodophyta

- Phylum Rhodophyta: Cambrian - Recent
  - Family Corallinaceae: Jurassic-Holocene
  - Family Solenoporaceae: Cambrian-Paleocene
  - Family Squamariaceae: Pennsylvanian?-Holocene
  - Family Gymnocodiaceae: Permian-Cretaceous

Alghe Rosse Calcaree

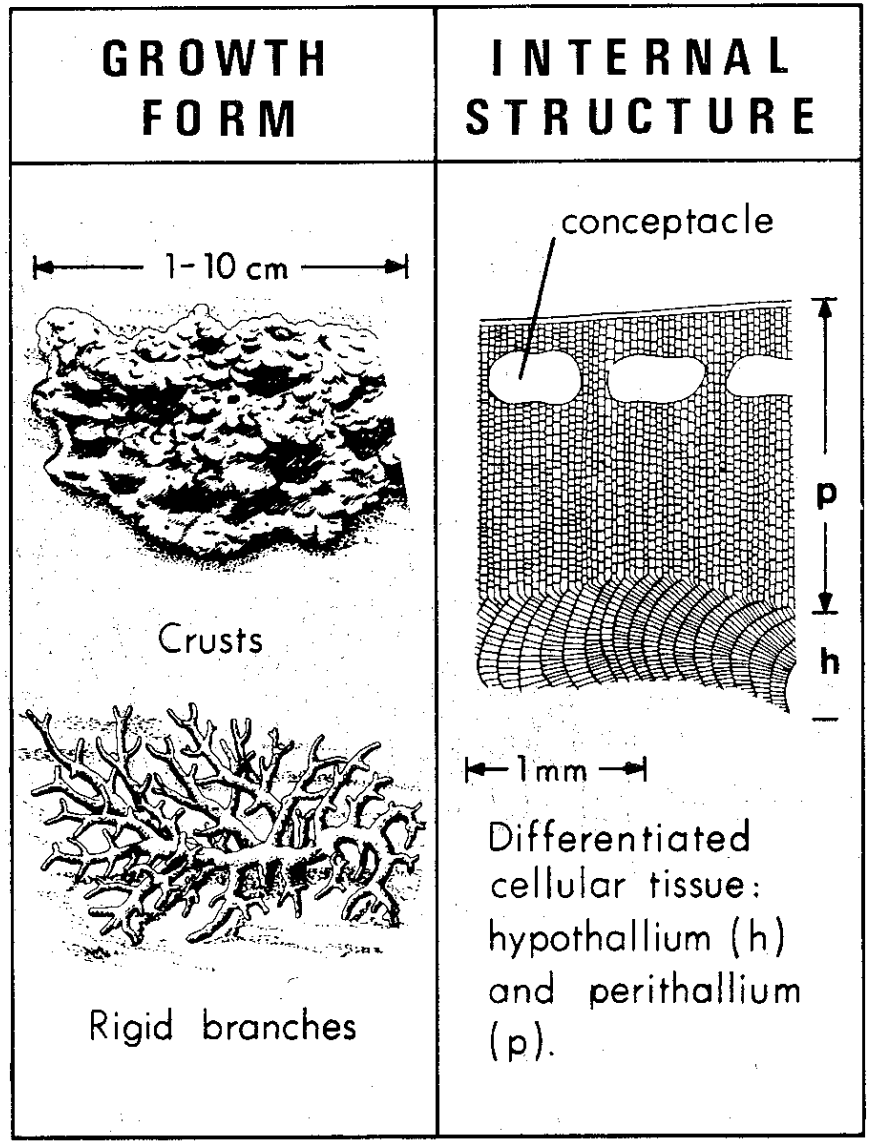
Caratteristiche: Organismi costituiti da filamenti pluricellulari variamente organizzati, in cui le singole cellule hanno la parete impregnata da carbonato di calcio. Costituiscono strutture erette o crostose/nodulari. Possono dare luogo a rilevanti depositi calcarei fossili, sia da sole (per es. algal reef) sia in associazione con Coralli.
Habitat: Marino.
Distribuzione: Cambriano-Recente (con diversi Ordini e Famiglie)

CARATTERISTICHE

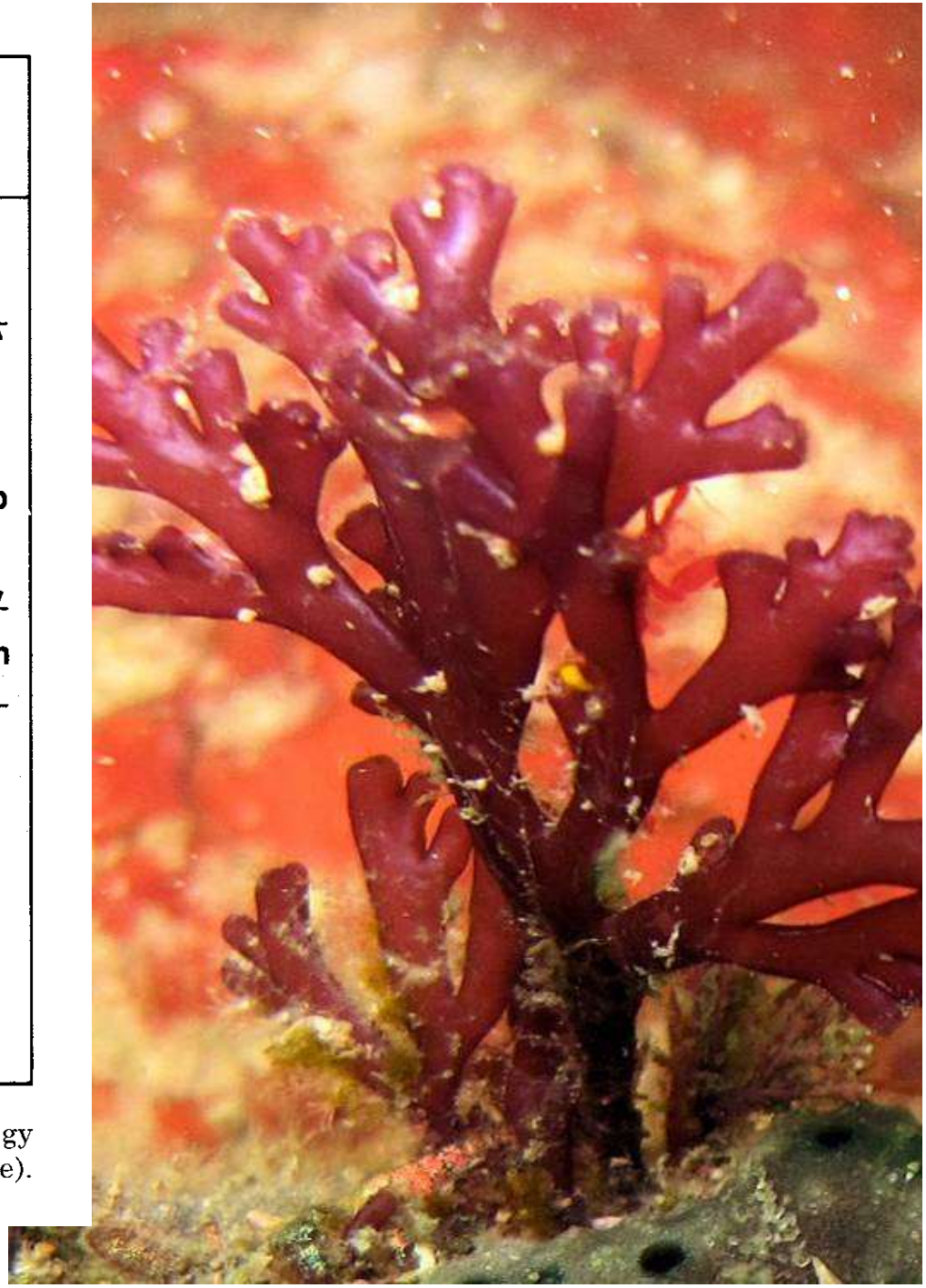
* pluricellulari: filamenti pluricellulari strettamente ravvicinati
* calcificazione. nella parete di ogni cellula (microcristalli di calcite)
* dimensioni
  - totali: centimetriche
  - di 1 cellula: 4-30µ (in media 7-10µ di diametro)
* marine bentoniche
* forme
  - incrostanti (Sporolithales e Corallinales)
  - erette segmentate (= Articolate) (Corallinales)
    - cellule NODALI NON calcificate
    - cellule INTERNODALI con parete calcificata

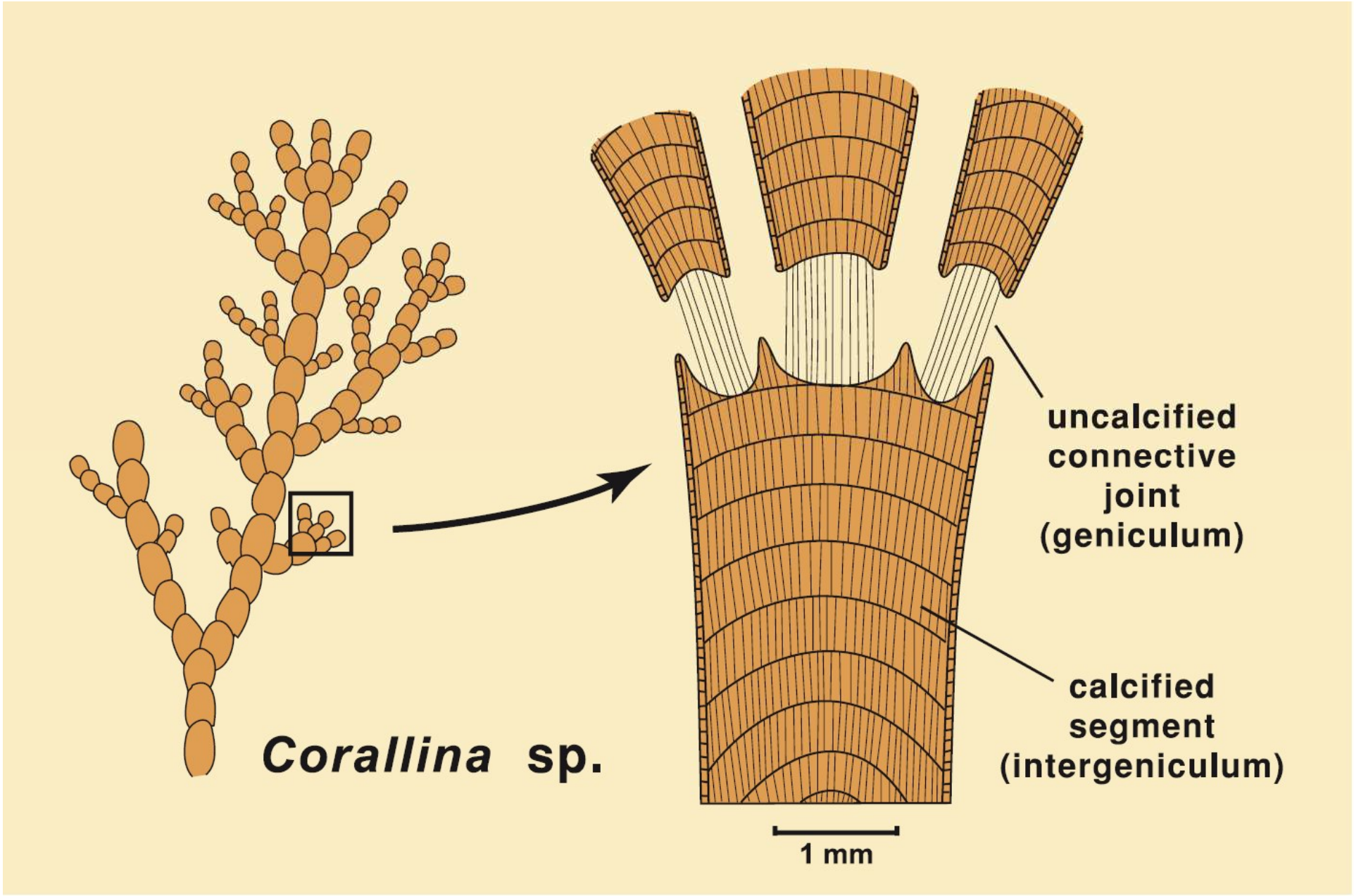
Le forme <u>incrostanti</u>

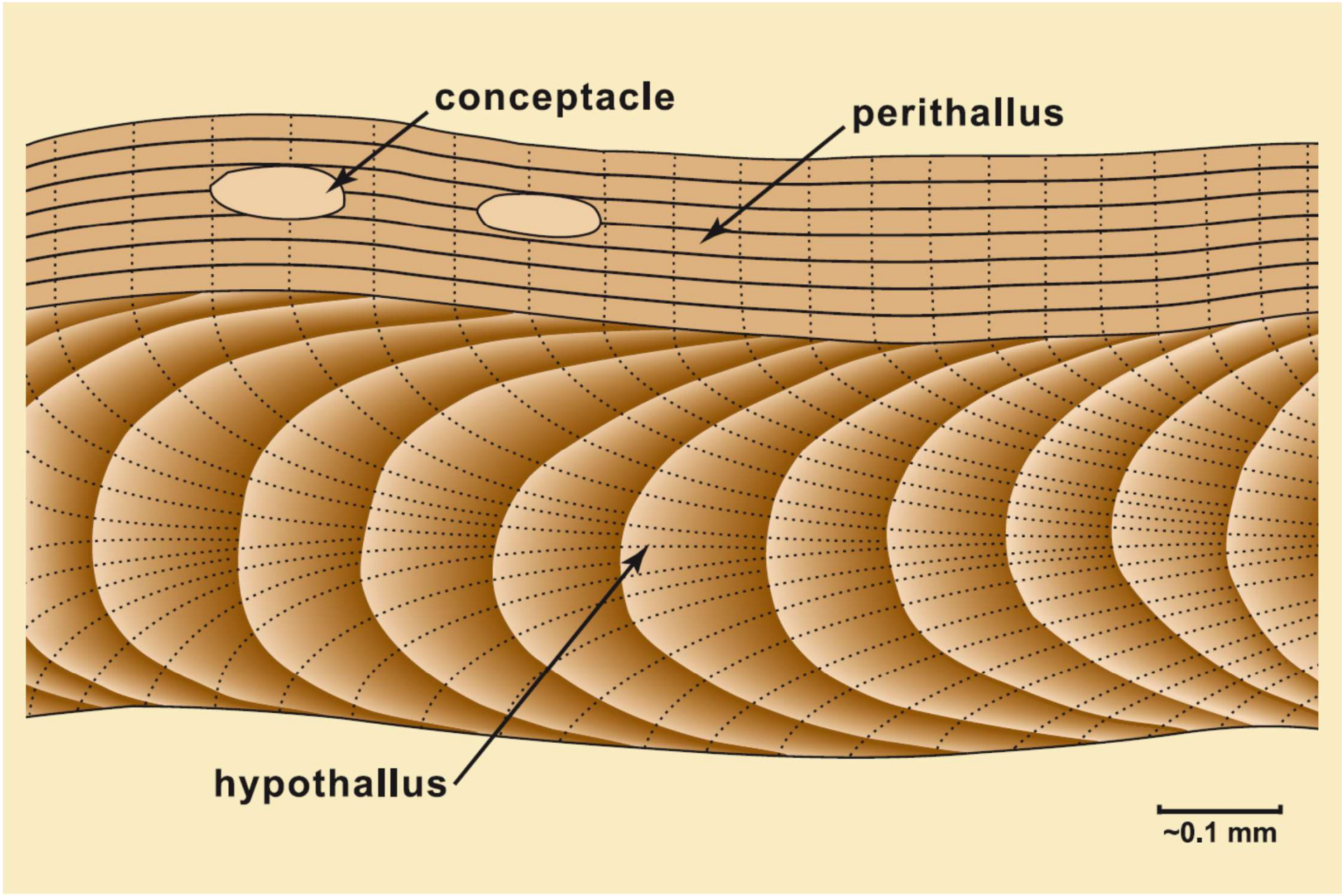
- incrostano il substrato (o ciò che funge da substrato) <u>stabile</u>
- forme mobili sul fondo (RODOLITI): incrostano un "nucleo" mobile sul substrato

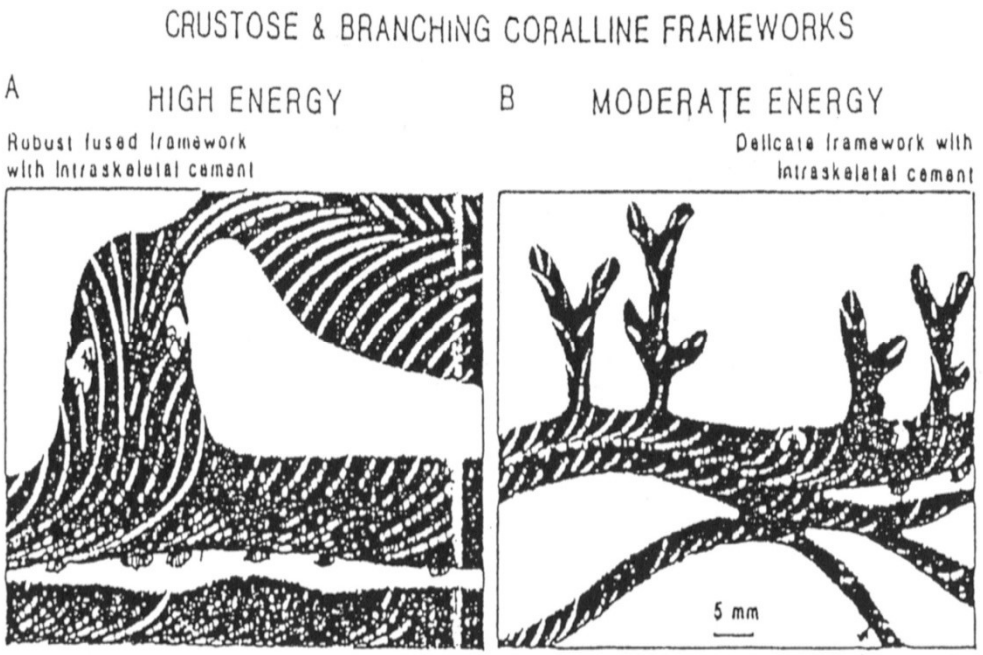


Typical growth forms and internal morphology of crustose coralline algae (subfamily Melobesieae).



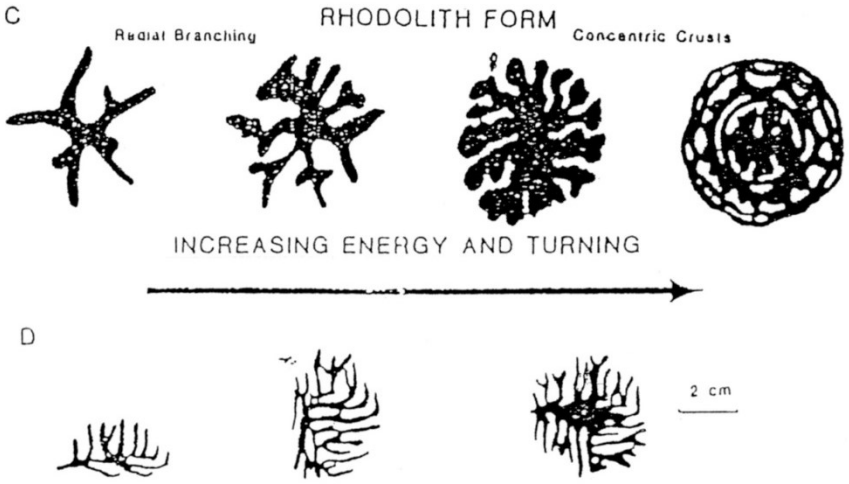

uncalcified
connective
joint
(geniculum)
calcified
segment
(intergeniculum)
1 mm
Corallina sp.


conceptacle
perithallus
hypothallus
~0.1 mm



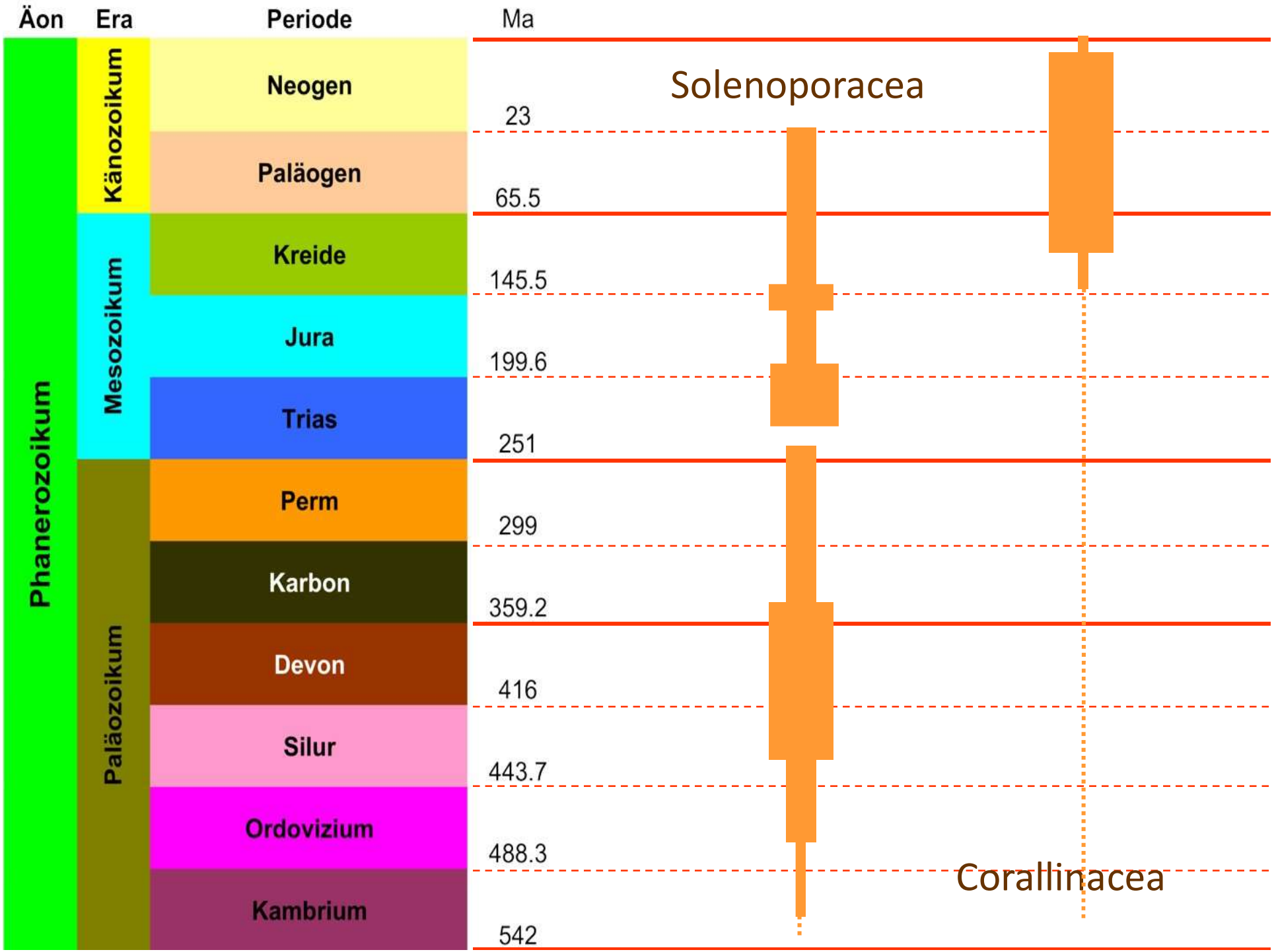
idrodinamismo: in forme incrostanti attaccate al substrato

idrodinamismo: in forme mobili sul substrato (= RODOLITI)



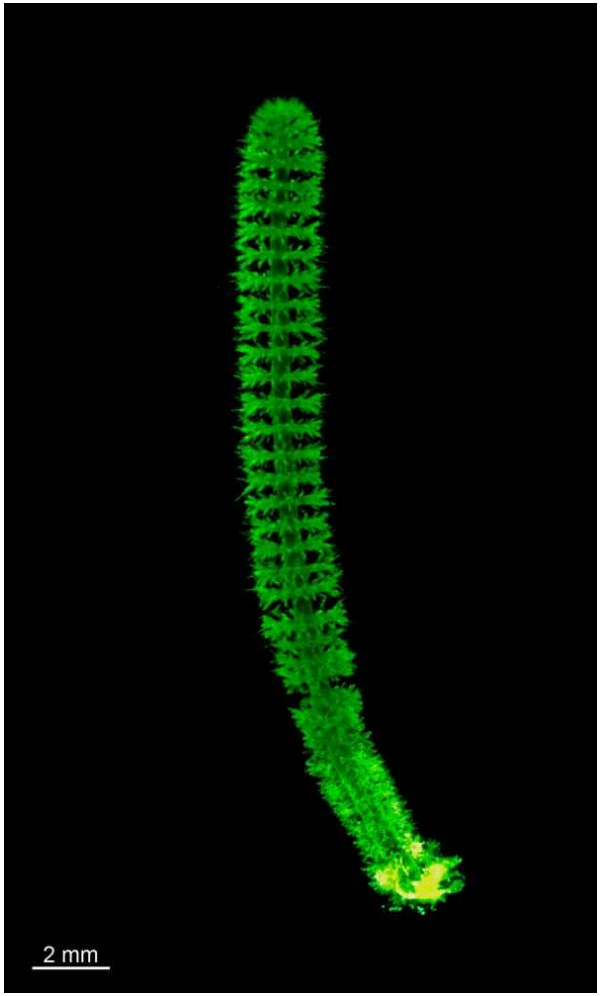
Relationships between water energy and coralline thallus. A Typical growth forms of crusts and branches in high energy coralline reef frameworks. B Typical growth forms of crusts and branches in coralline reef frameworks in moderate energy settings (after Bosence 1985). C Increase in lateral growth of branches and density of branching of rhodoliths with increasing turbulence and development of dense concentric crusts (after Bosence 1976). D Increase in numbers of branching

Solenoporacea: without Conceptacles

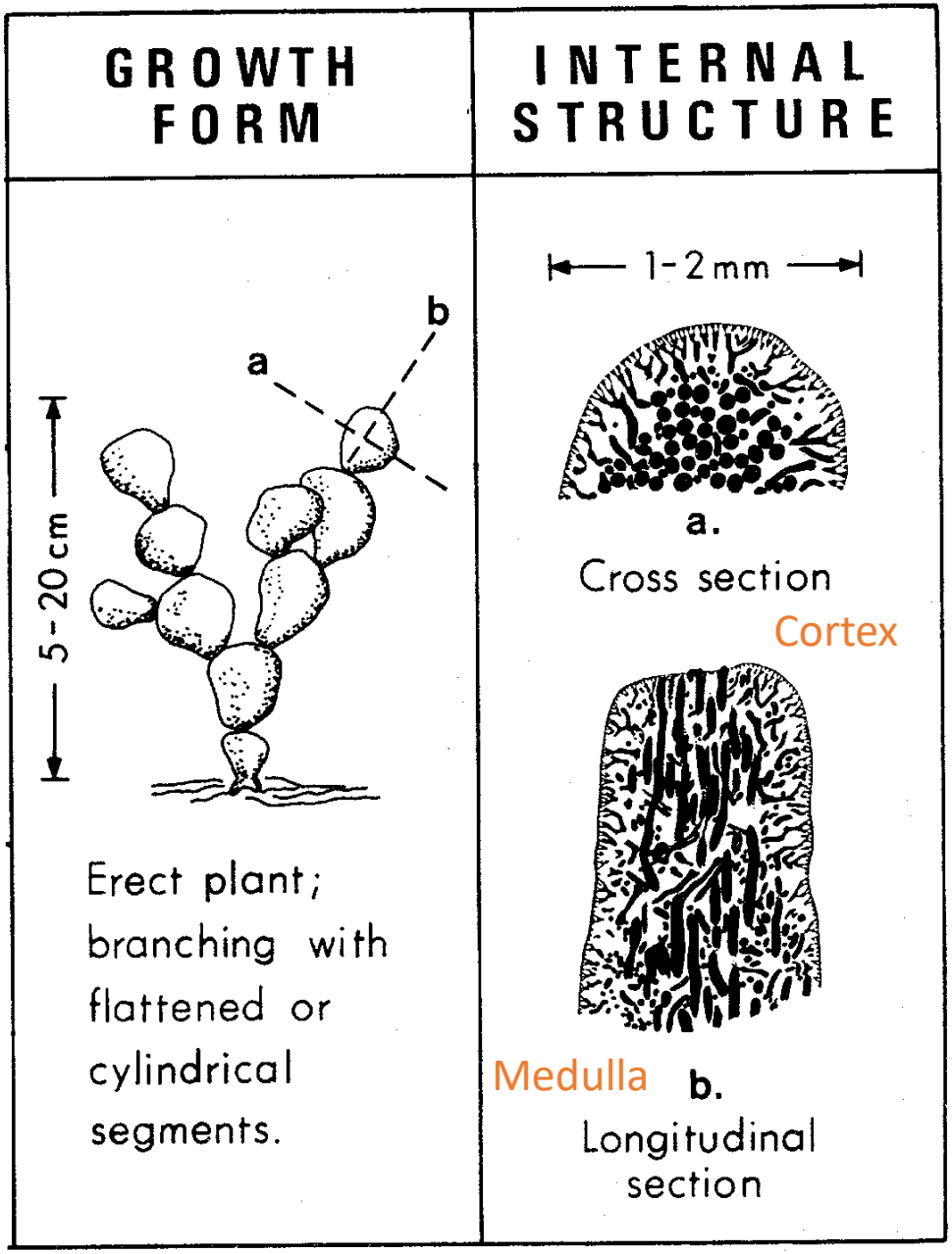

Äon
Era
Periode
Ma
Phanerozoikum
Känozoikum
Mesozoikum
Paläozoikum
Neogen
Paläogen
Kreide
Jura
Trias
Perm
Karbon
Devon
Silur
Ordovizium
Kambrium
23
65.5
145.5
199.6
251
299
359.2
416
443.7
488.3
542
Solenoporacea
Corallinacea

Archaeplastida
Chloroplastida
Chlorophyta
Ulvophyceae

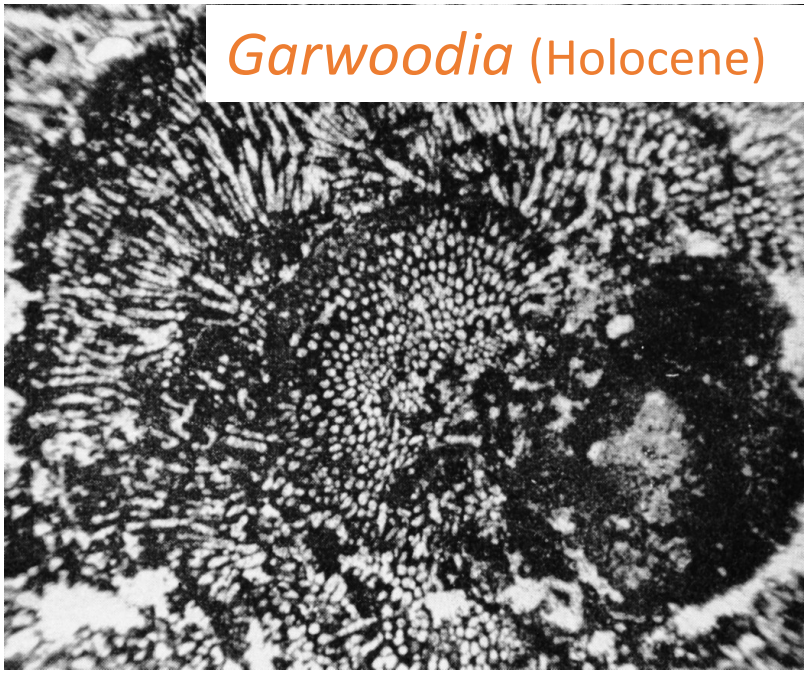
Udoteacea

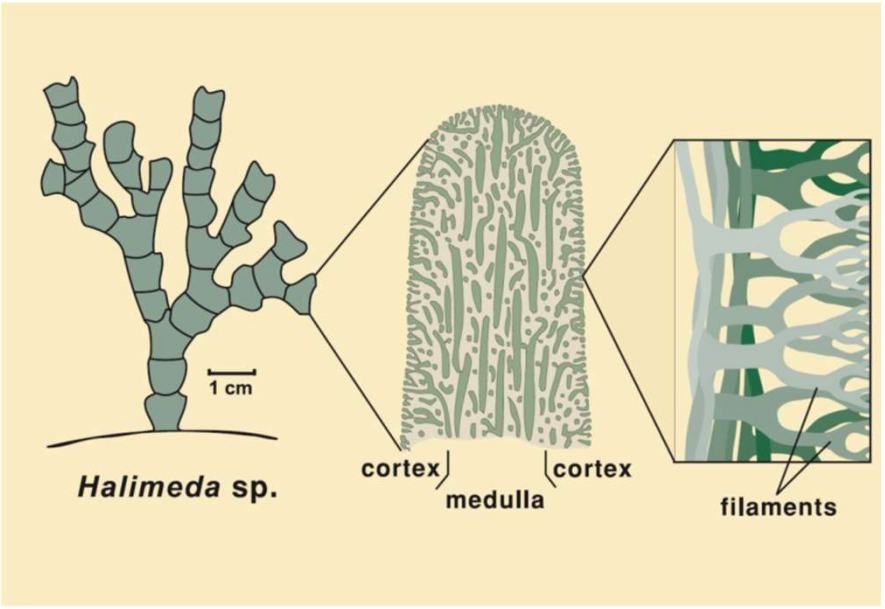


Dasycladacea

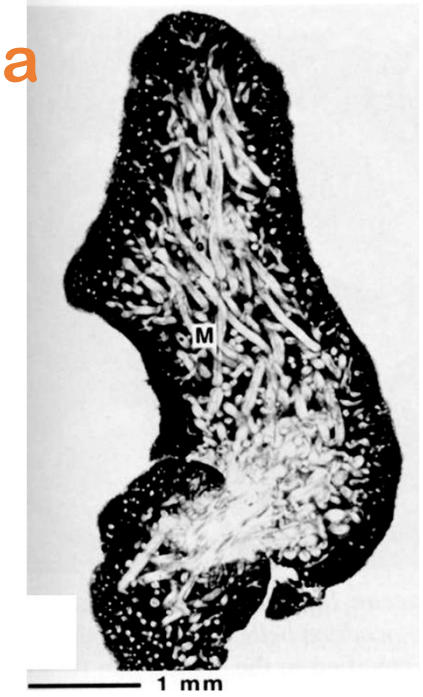


Typical growth form and internal structure of erect calcareous Codiaceae (green algae).

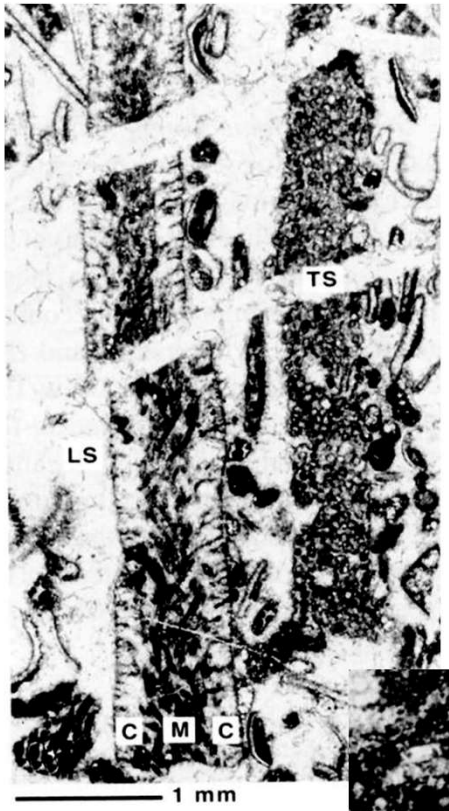




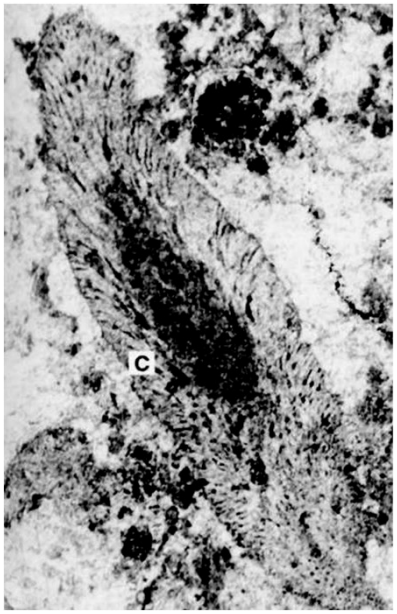
Udoteacea
fossil



Halimeda (recent)

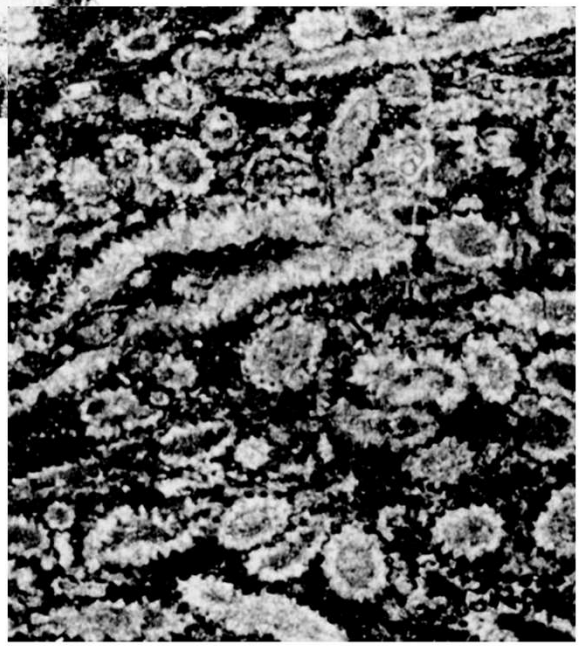


Boueina
above: Aptian
left: Norian

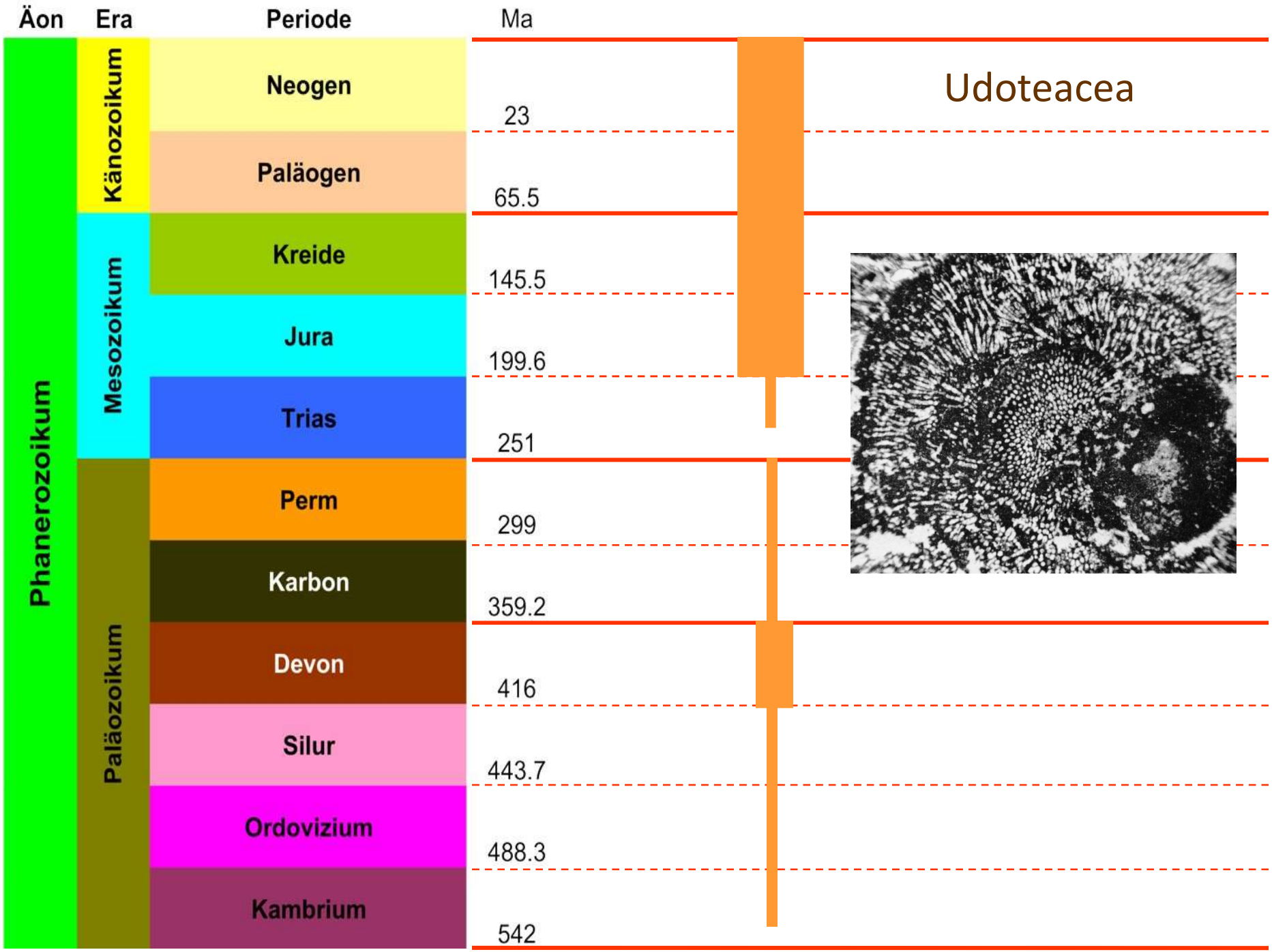


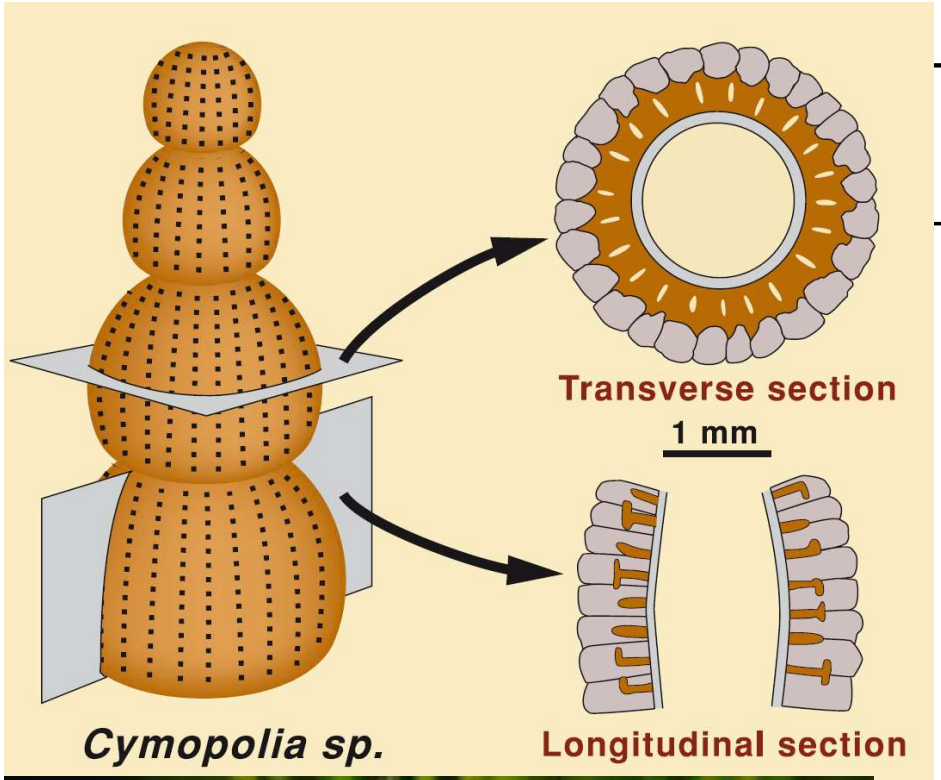
Pseudopalaeoporella (Devonian)

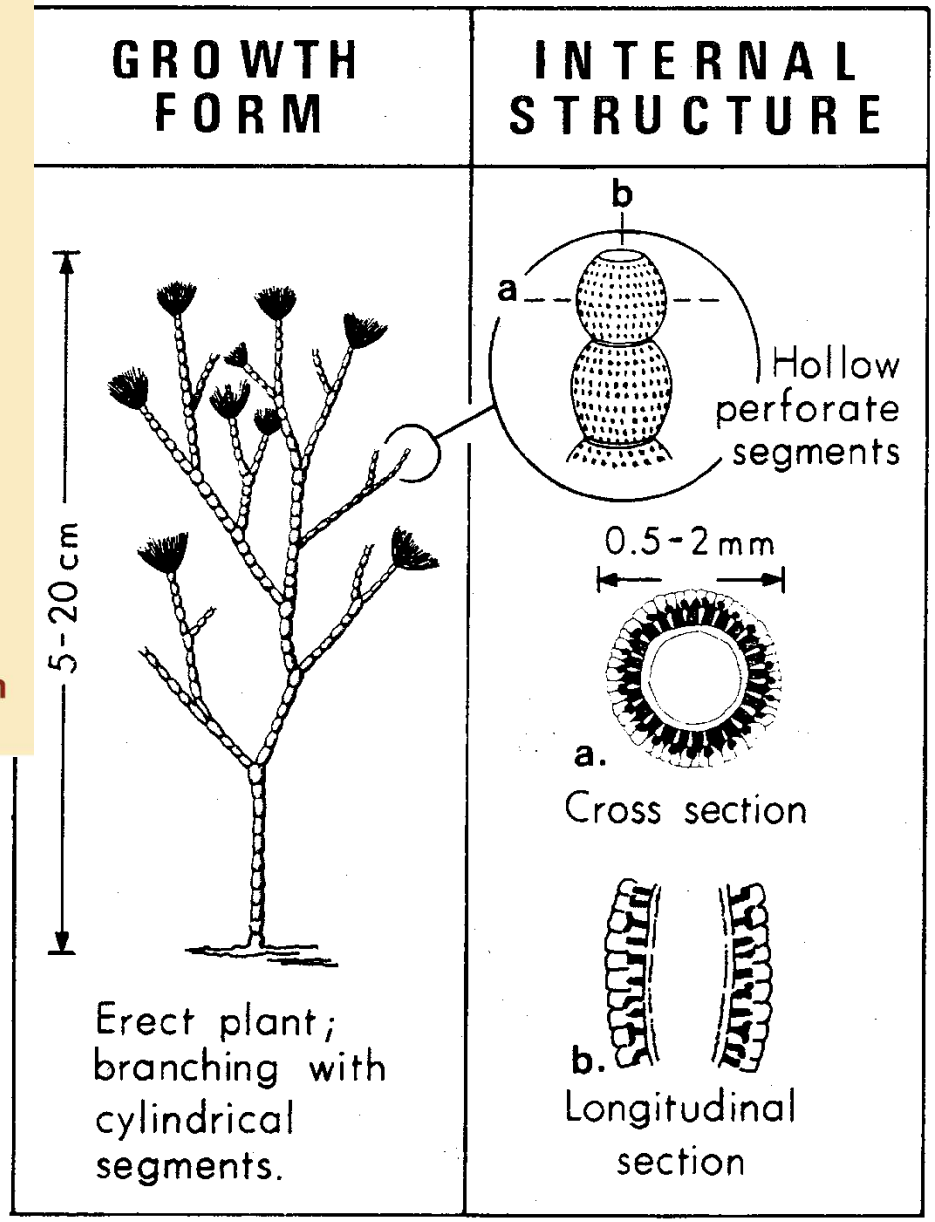
Litanaia (Devonian)



Gymnocodium (Upper Perm)


Äon
Era
Periode
Ma
Phanerozoikum
Känozoikum
Mesozoikum
Paläozoikum
Neogen
Paläogen
Kreide
Jura
Trias
Perm
Karbon
Devon
Silur
Ordovizium
Kambrium
23
65.5
145.5
199.6
251
299
359.2
416
443.7
488.3
542
Udoteacea





Typical growth form and internal structure of calcareous Dasycladaceae (green algae).

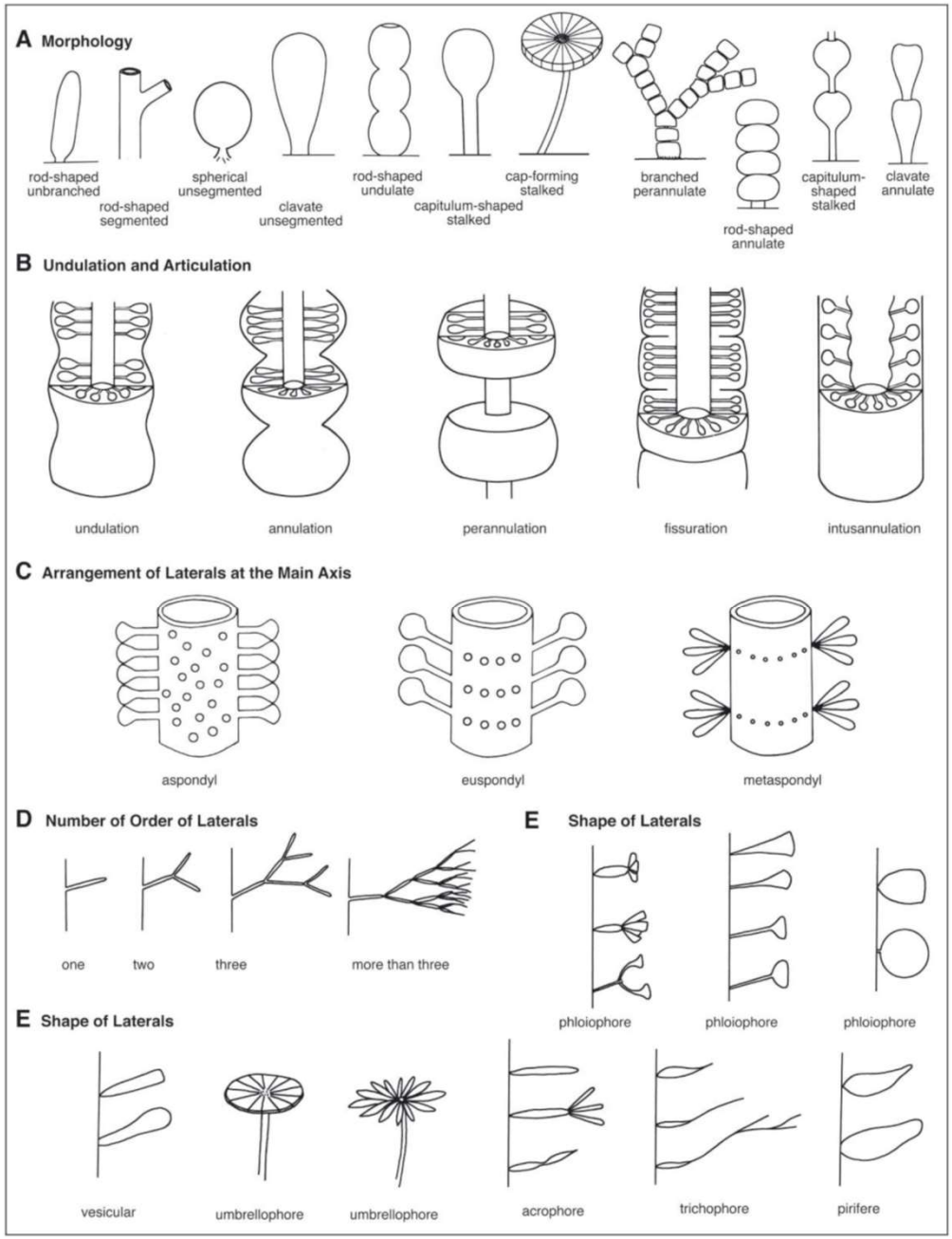


Fig. 10.14. Major diagnostic criteria of dasyclad green algae. After Berger and Kaever (1992).

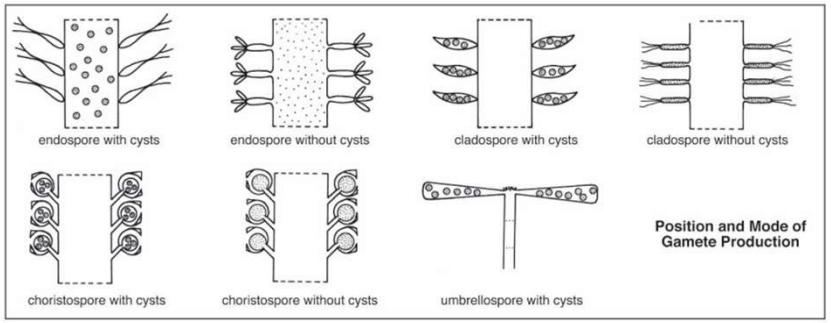
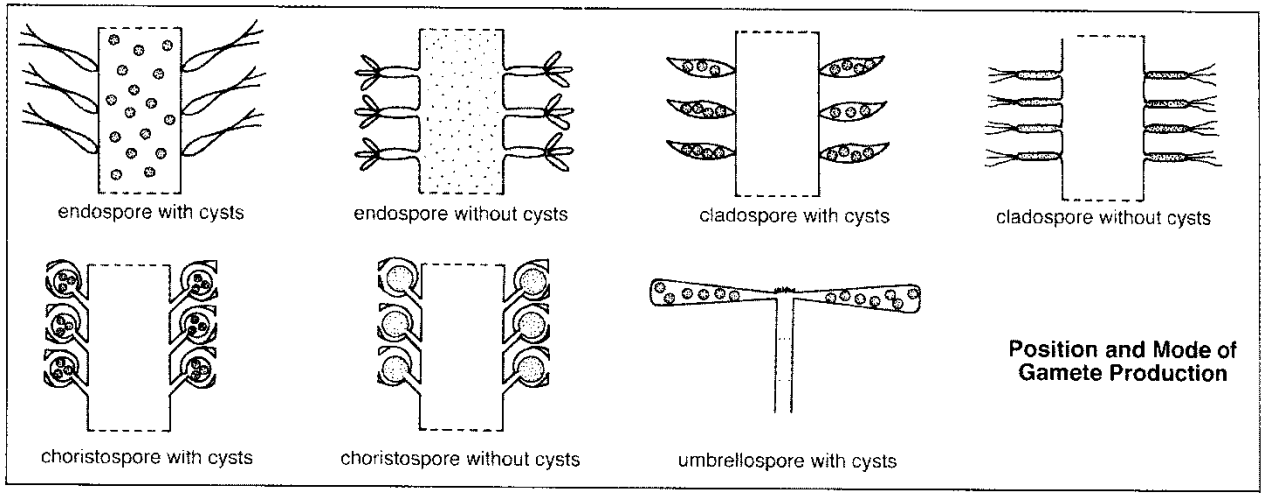
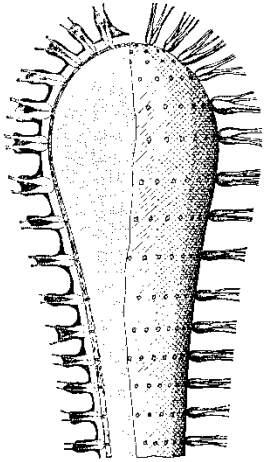
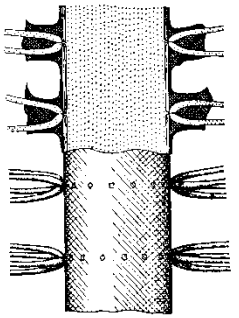


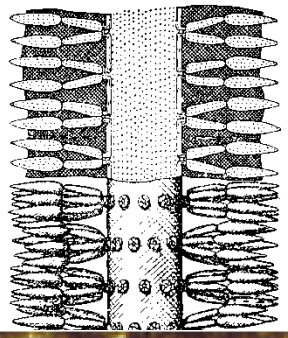
Fig. 10.15. Position of the reproductive organs in dasyclad algae. After Berger and Kaever (1992).

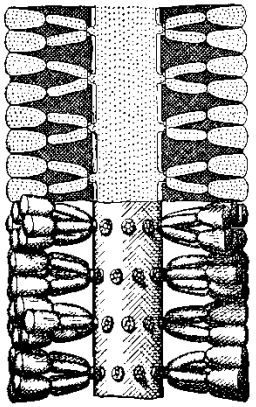


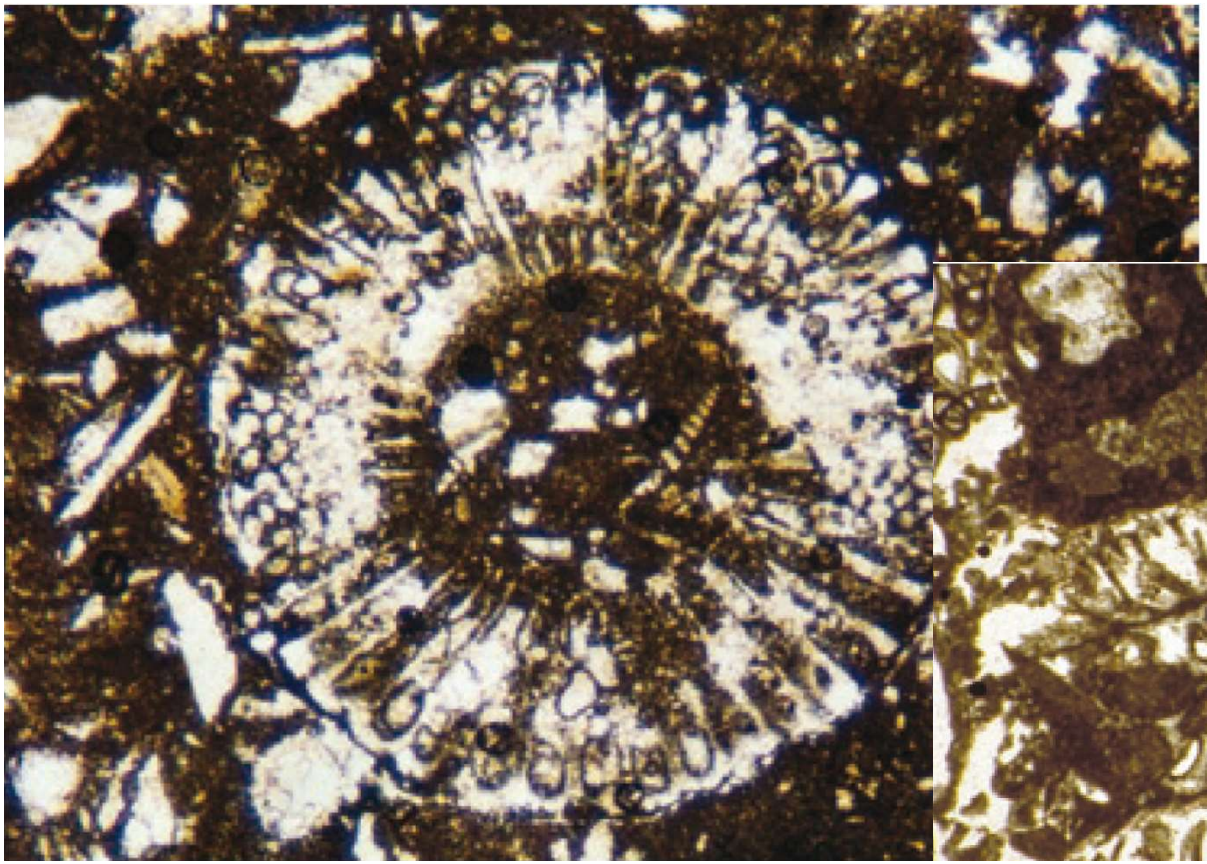
Position of the reproductive organs in dasyclad algae. After Berger and Kaever (1992).

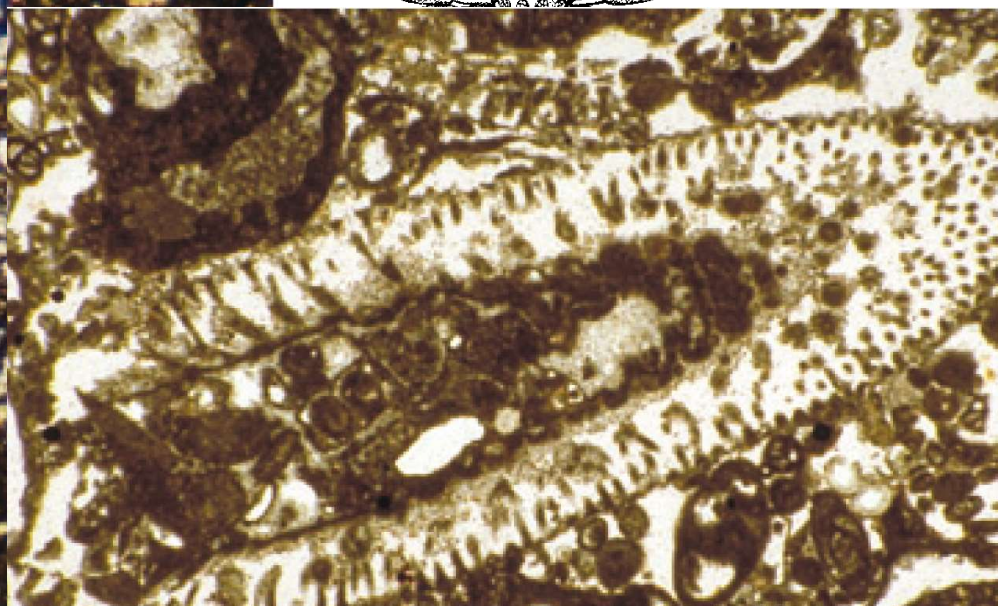




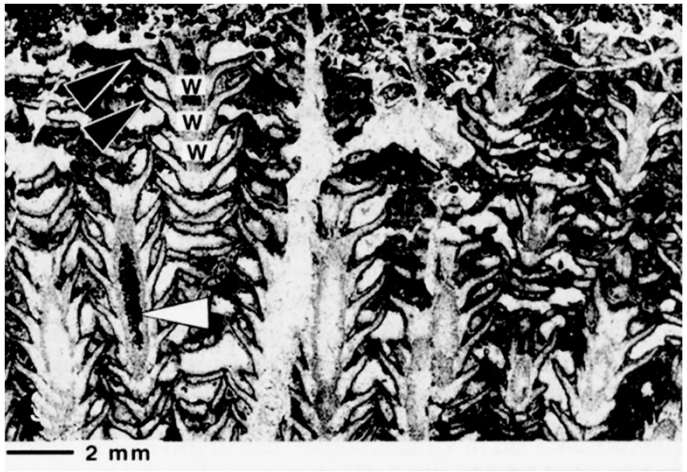




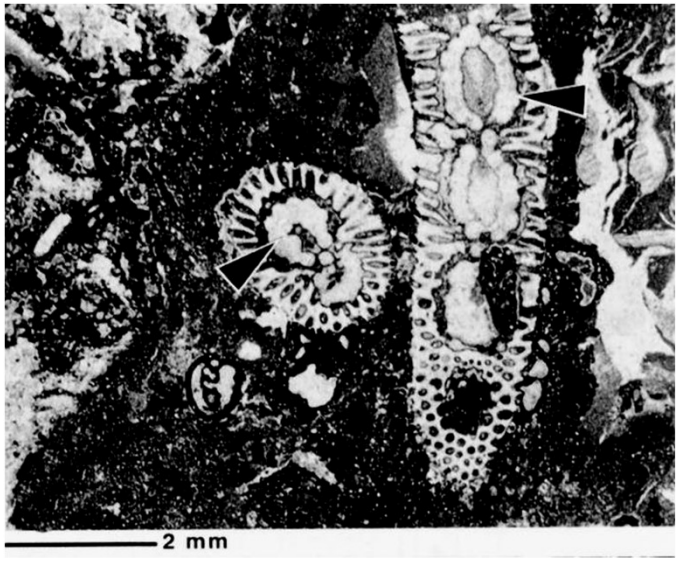




Dasycladacea
fossil

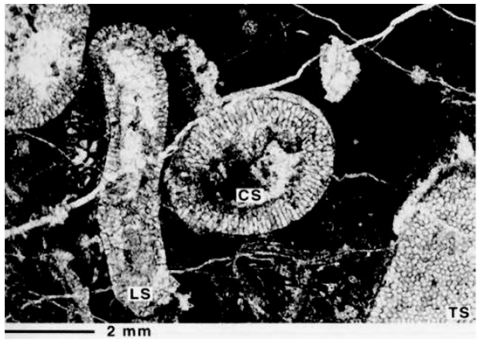


Neoteutloporella
(Upper Jurassic)

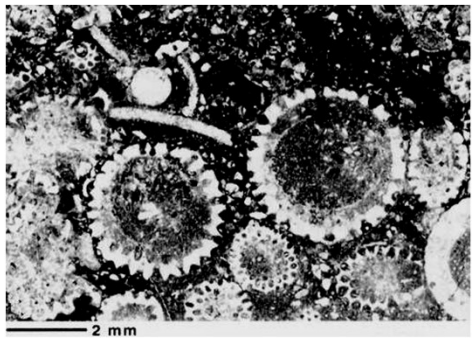


Diplopora
(Upper Triassic)

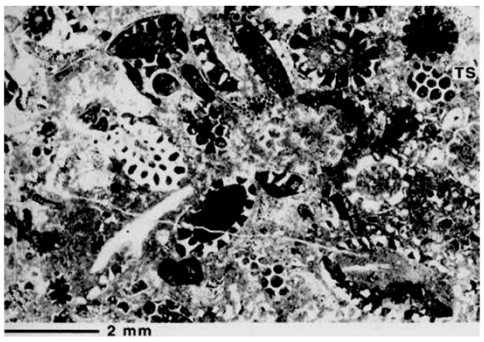
Eovelebitella (Lower Carbon.)

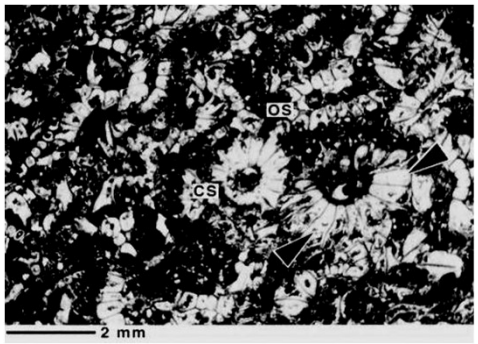


Anthracoporella
(Devonian)

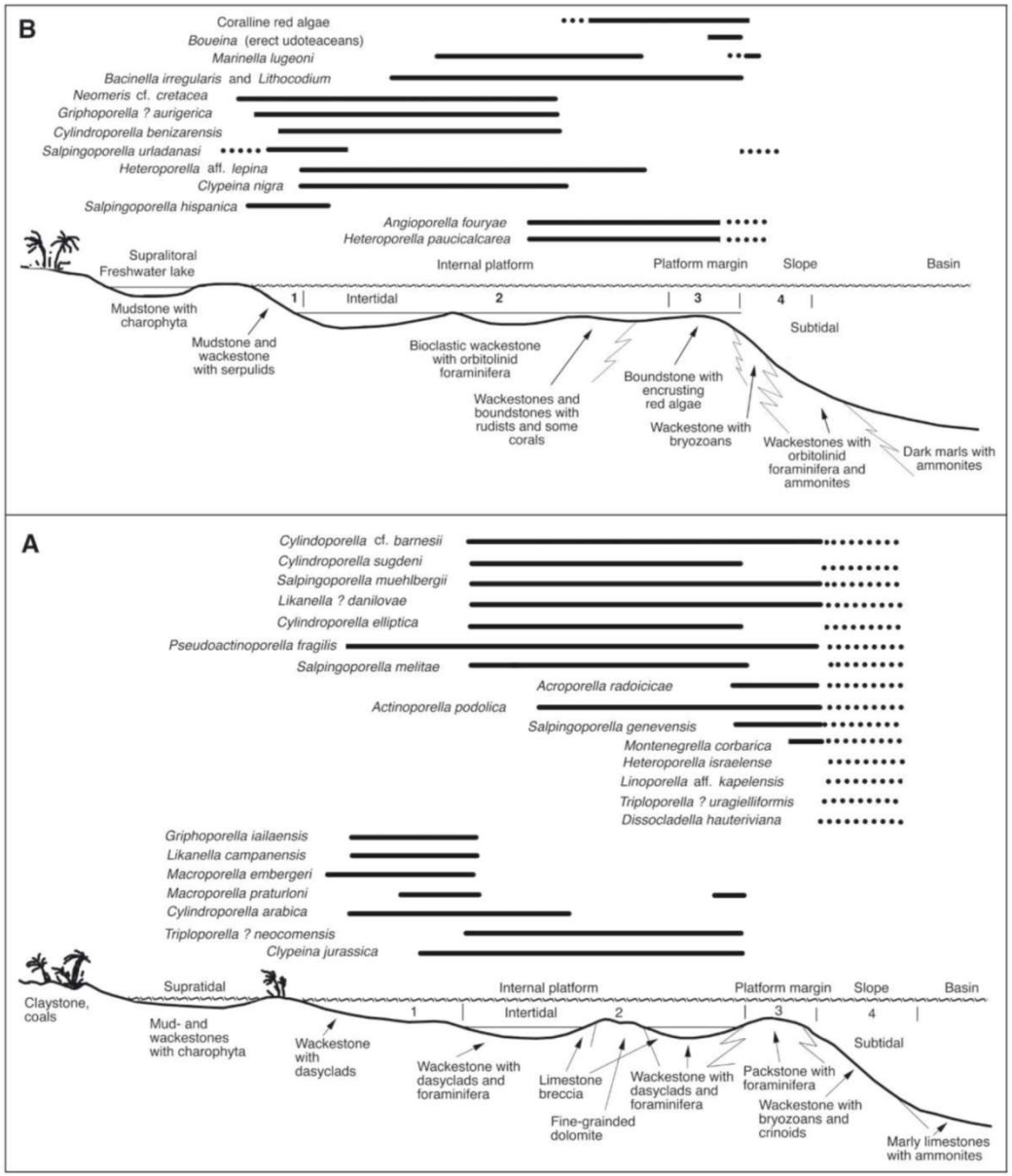


Mizzia
(Upper Permian)





Clypeina
(Jurassic)



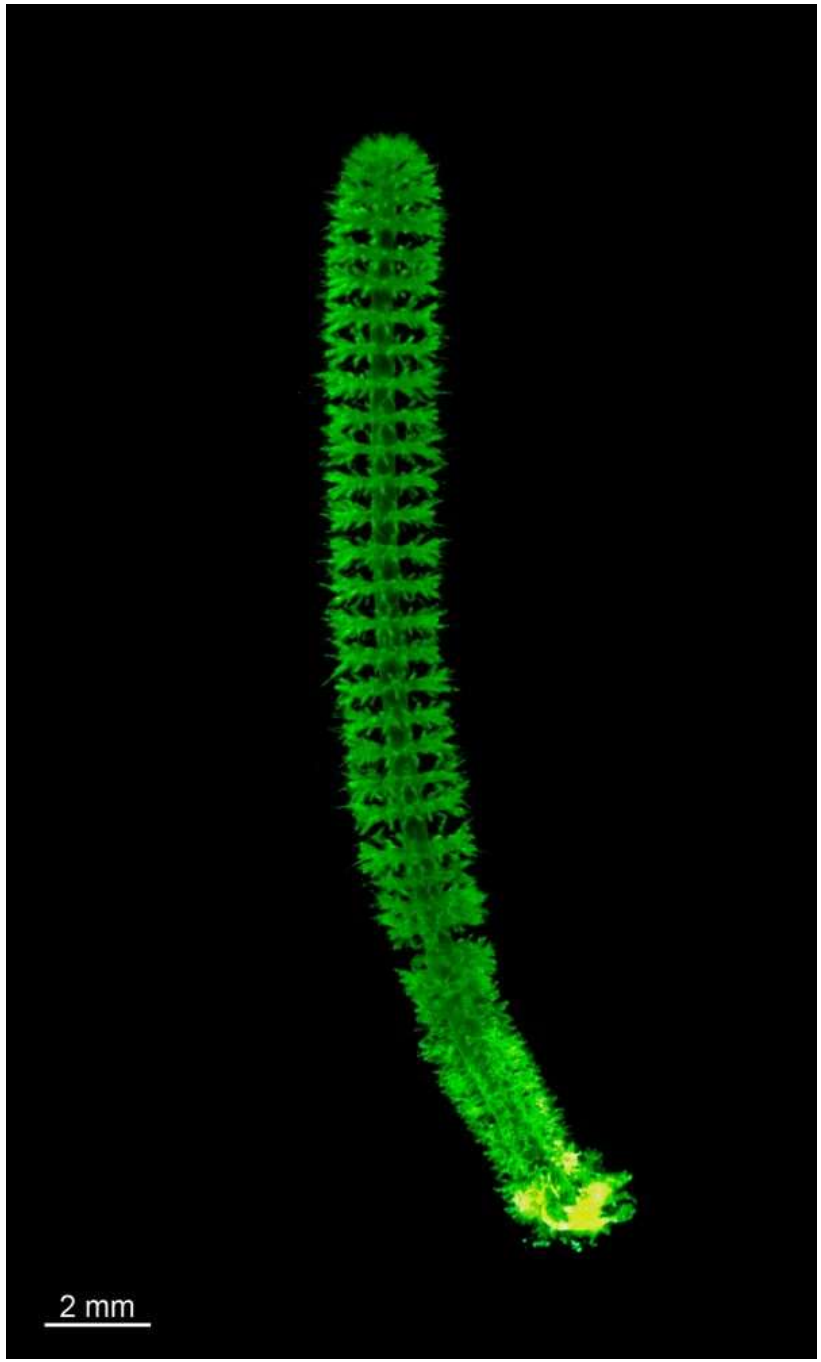
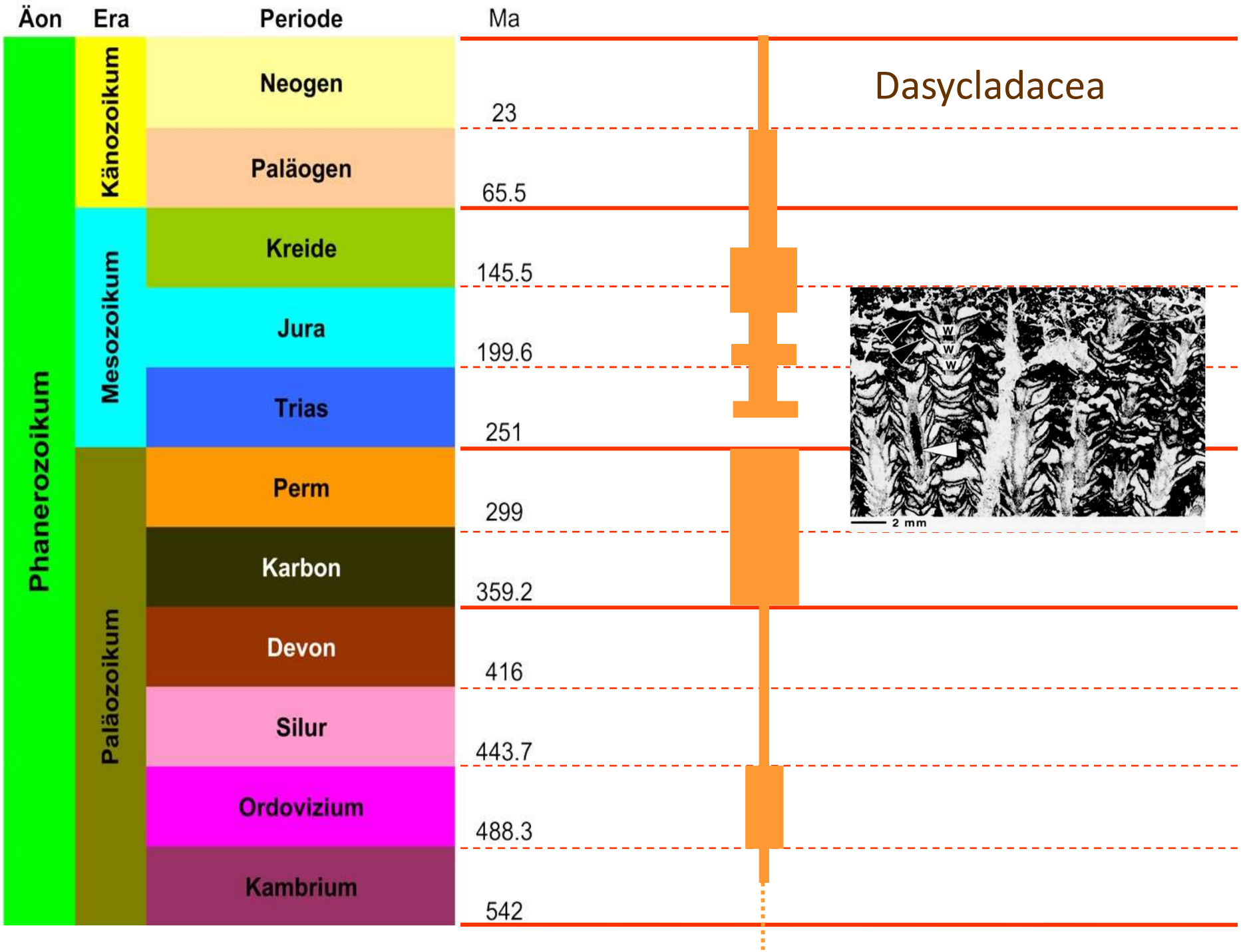
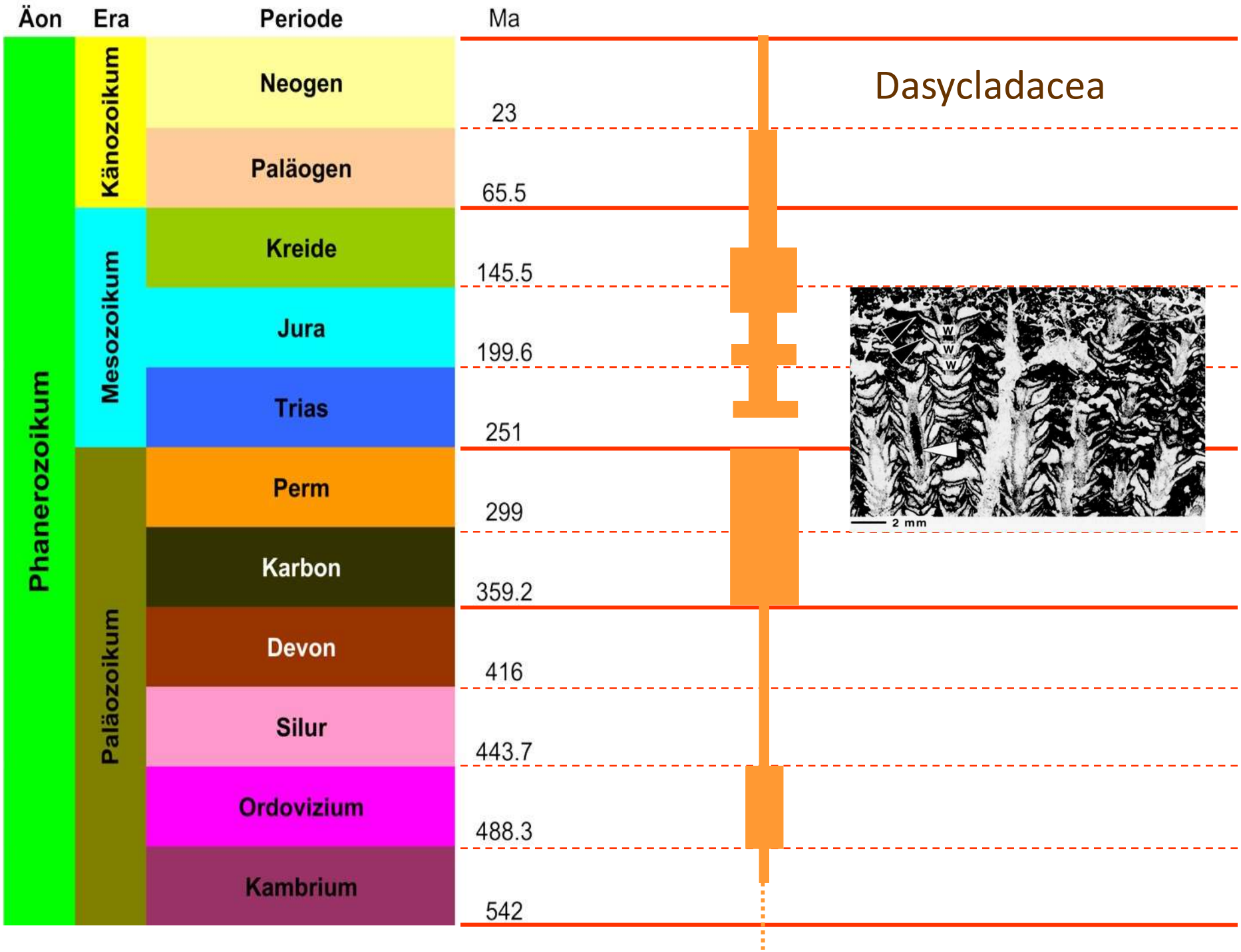


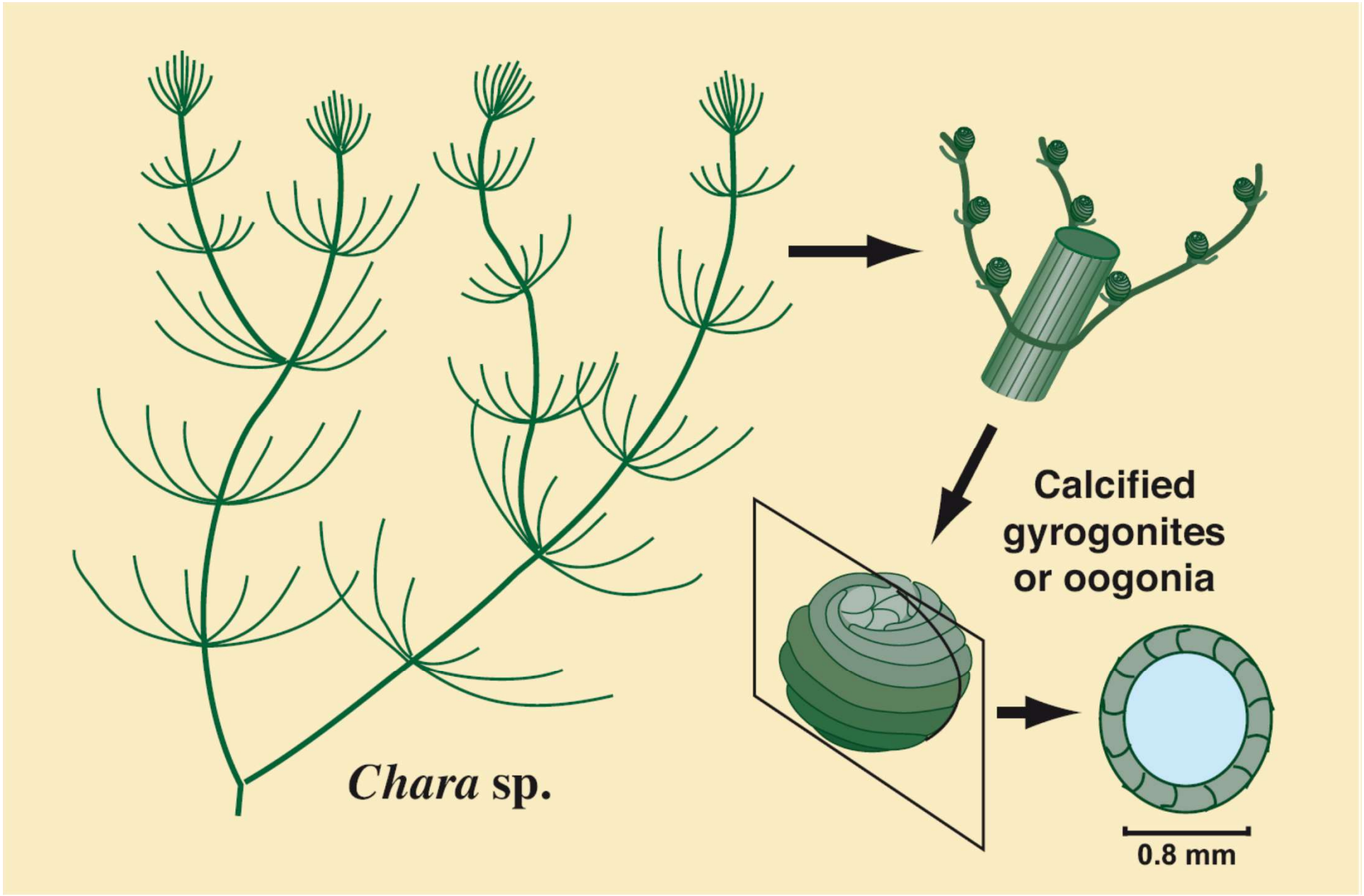
Fig. 10.19. *Distributional patterns of dasyclad associations* on Early Cretaceous carbonate platforms in the French and Spanish Pyrenees Mountains. Species composition of the association differs significantly in the various parts of the tidal and shallow subtidal shelf environments. **A**: Berriasian and Valanginian. **B**: Barremian to Aptian (Urgonian facies). Based on Peybernes (1979). See Masse (1993) for a discussion of facies development during time and the biostratigraphical value of dasyclad species associations. Dotted lines indicate rare occurrences.


Äon
Era
Periode
Ma
Phanerozoikum
Känozoikum
Mesozoikum
Paläozoikum
Neogen
Paläogen
Kreide
Jura
Trias
Perm
Karbon
Devon
Silur
Ordovizium
Kambrium
23
65.5
145.5
199.6
251
299
359.2
416
443.7
488.3
542
Dasycladacea
2 mm


Äon
Era
Periode
Ma
Phanerozoikum
Känozoikum
Mesozoikum
Paläozoikum
Neogen
Paläogen
Kreide
Jura
Trias
Perm
Karbon
Devon
Silur
Ordovizium
Kambrium
23
65.5
145.5
199.6
251
299
359.2
416
443.7
488.3
542
Dasycladacea
2 mm

Archaeplastida
Chloroplastida
Chlorophyta
Ulvophyceae

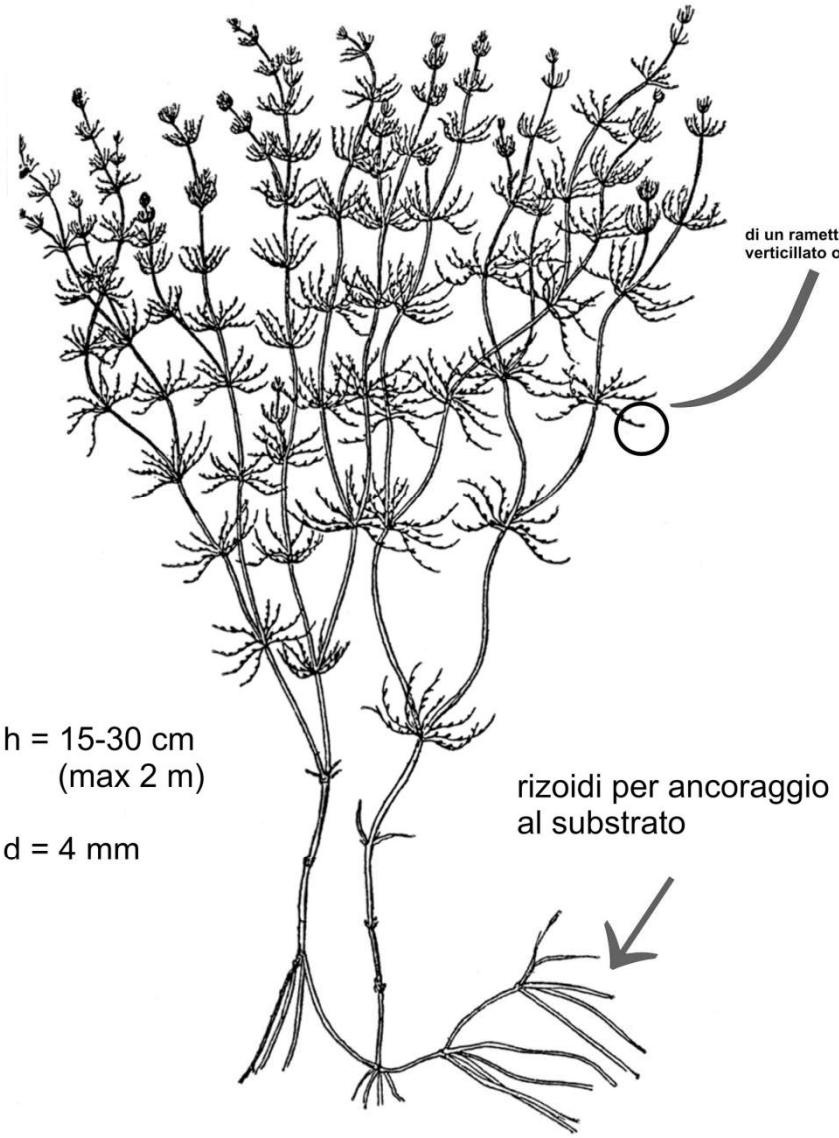
- Chlorophyta
- Chlorodendrales
- Prasinophyta
- Charophyta



Chara sp.

CHAROPHYTA { Siluriano - Recente

Acque dolci o salmastre



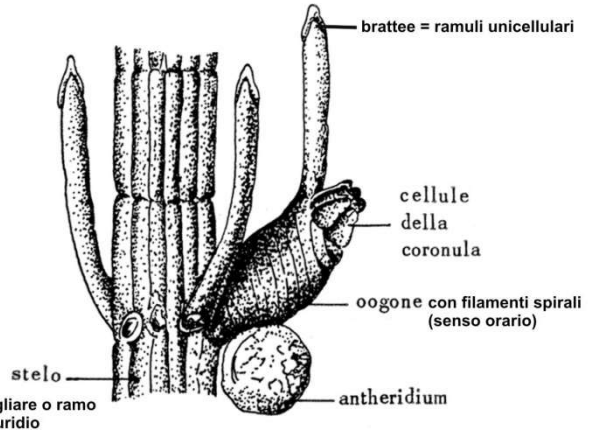
h = 15-30 cm
(max 2 m)

d = 4 mm

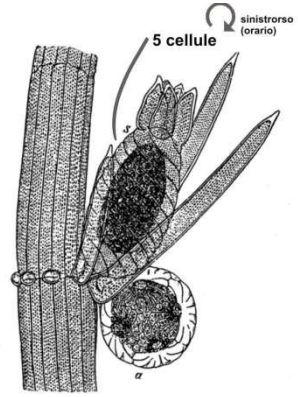
rizoidi per ancoraggio al substrato

di un rametto fogliare o ramo verticillato o pleuridio

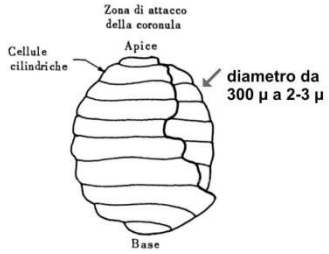
Chara vulgaris L. (*Ch. fœtida* Br.) (d'après Migula).



Schema di uno stelo di *Chara*. Da *Jones* 1956.



Chara fragilis Desv., organes reproducteurs; *a*, anthéridie; *s*, oogone.



Schema di un oogone di Carofita. Da *Matthes* 1956.

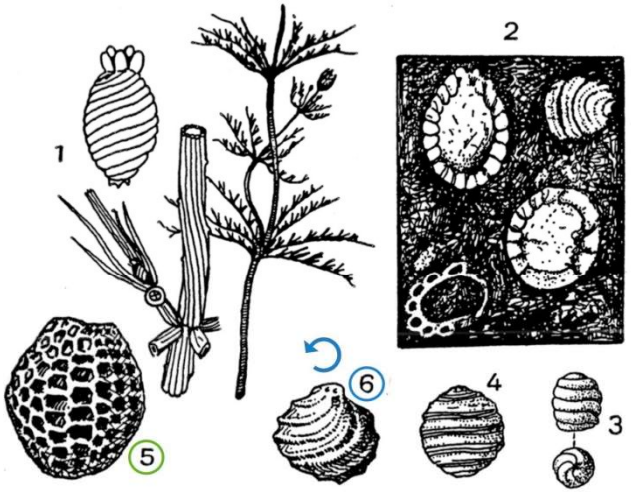
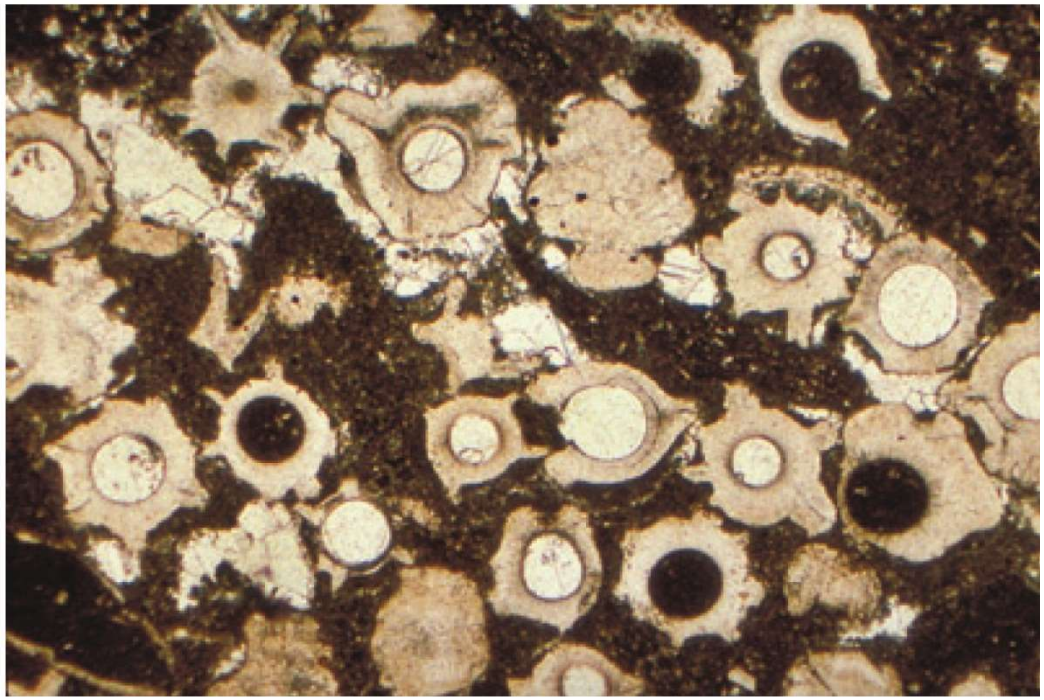
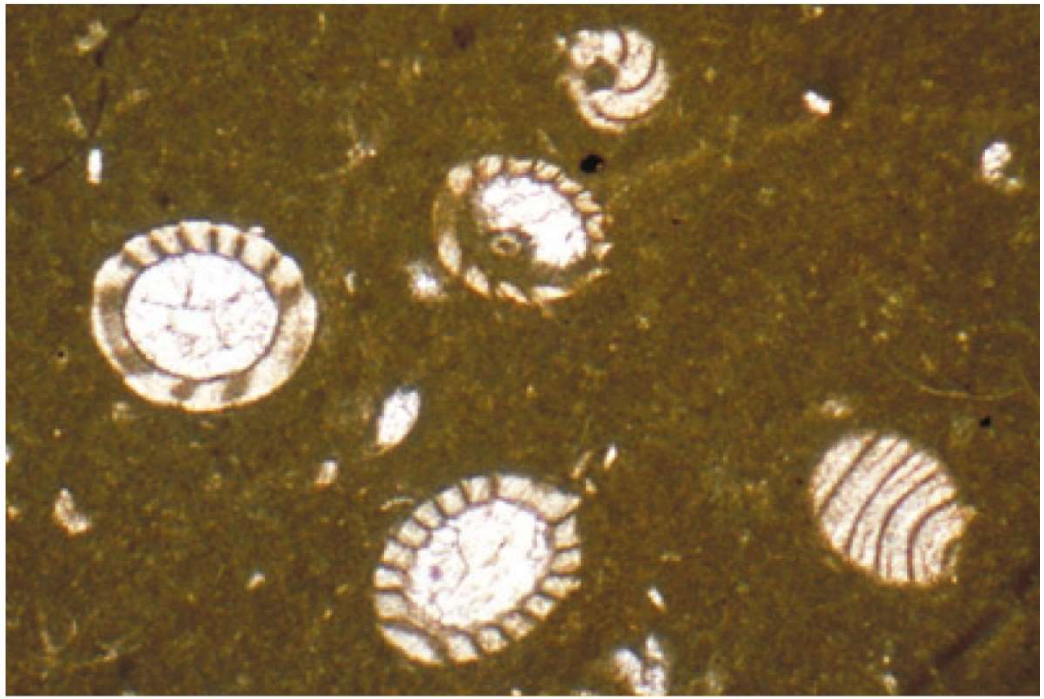


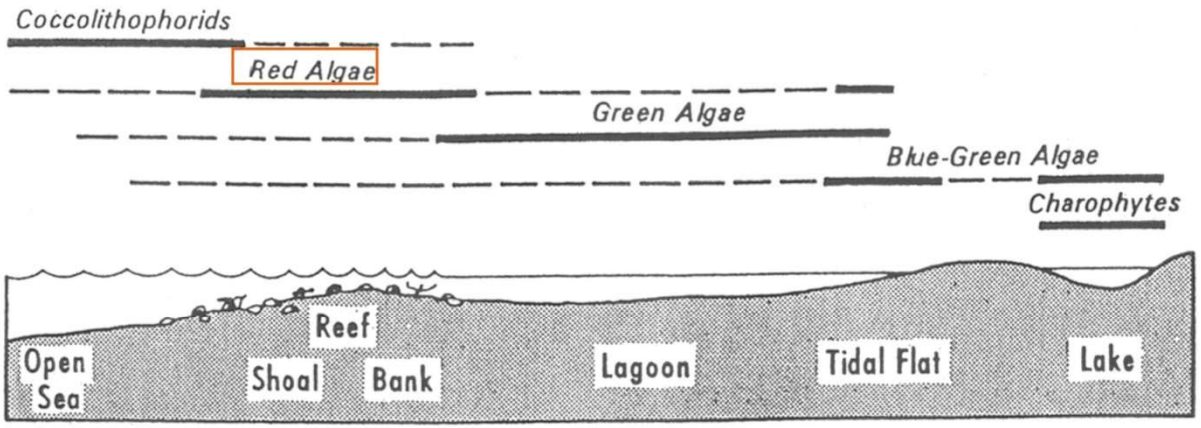
Fig. 24. — *Charophytes.*

Organisation du *Chara vulgaris* : fragment de la tige avec verticilles de rameaux ; un sporange grossi. — **2**, Calcaire à *Chara* (*Clavator*) du Purbeckien de la Buisse (Isère) ; coupes de sporanges, en bas, à gauche, coupe de tige (× 60). — **3**, *Chara lemani*, Eocène du Bassin de Paris (très grossi). — **4**, *Chara* (*Gyrogonites*) *medicaginula*, Eocène du Bassin de Paris (× 25). — **5**, *Sycidium Panderi*, Dévonien de Russie (× 45) (Pia). — **6**, *Trochiliscus bulbiformis*. Dévonien

8-18 cellule destrorse







Distribution of living skeletal and nonskeletal calcareous algae (including calcareous plankton) across an idealized profile of a carbonate shelf and adjacent lacustrine environments in a low-latitude region.