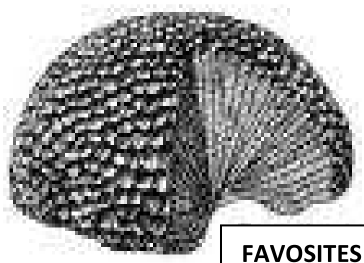
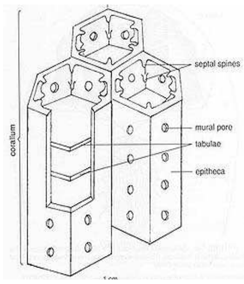
TABULATE CORALS (TABULATA)

- These are extinct compound corals.
- They have slender corallites, which are crossed transversely by tabulae.
- They have a calcareous skeleton with usually small individual corallites although the whole colony can be large.
- The septa are not always present, but there may be septal spines.
- Tabulae are very numerous and occur horizontally although some appear domed.
- Mural pores: small holes that connect the corallites.

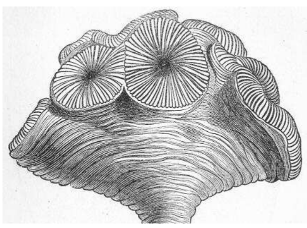


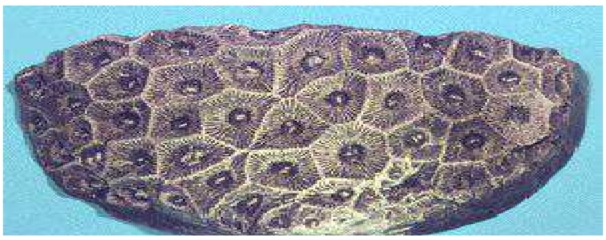
FAVOSITES



feature	tabulate	rugose	scleractinian
range	Ordoician-Permian	Cambrian-Permian	Triassic - today
solitary	No	Yes	Yes
colonial	Yes	Yes	Yes
tabulae	Yes	Yes	Yes
septa	Spines only	Yes	Yes
dissepiments	No	usually	always
symmetry	radial	bilateral	radial
Mural pores	some	None	None
Columella	No	Yes	usually
EG.	Favosites	Lithostro-tian	Thecosmilia

COMPARISON OF CORAL TYPES (WHICH IS WHICH?)





RUGOSE CORALS (RUGOSA)

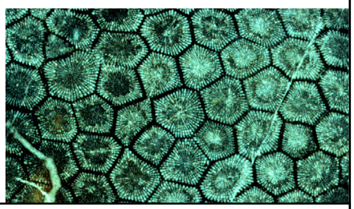
- Middle Ordovician - Permian.
- Occur as solitary or compound forms.

SOLITARY RUGOSE CORALS:

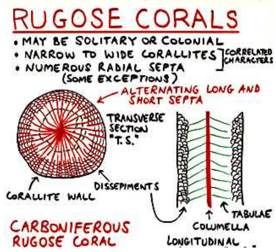
- Coralite is conical in shape.
- The skeleton grew upwards from a narrow base.
- The whole structure can be straight or curved (horn shaped).

COLONIAL RUGOSE CORALS:

- In colonial rugose corals there are often a large number of septa.
- TABULAE: These represent former levels of the calice floor, secreted by the polyp to seal off the lower area of the corallum.
- They are best seen if longitudinal sections are cut.

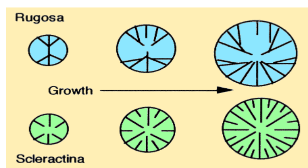


LITHOSTROTIAN



SCLERACTINIAN CORALS (SCLERACTINIC)

- Solitary or compound corals.
- Still alive today.
- Their originally aragonitic skeletons have dissepiments, tabulae, and septa just as in the rugosa.
- Scleractinian corals also have six primary septa, but in contrast to rugose corals, subsequent septa are added in all six of the resulting spaces
- Therefore have a repeated radial symmetry and so different from the Rugosa.
- Middle Triassic to Recent.
- In the present they form important reef building animals in the tropics and sub tropics around islands and large land masses



geographyjohn

GEOLOGY

CASE STUDY REVISION BOOKLET

CORALS AND GRAPTOLITES

CORALS

Phylum: Cnidaria:

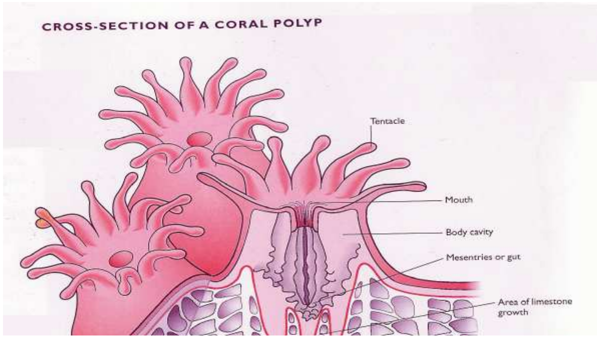
Sub-Classes:

<u>Rugosa (rugose)</u> (extinct)

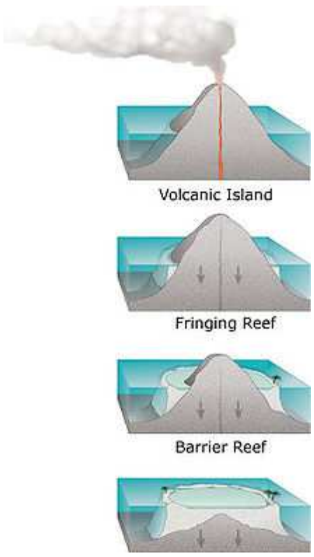
<u>Tabulata (tabulate)</u> (extinct)

<u>Scleractina (scleractinian)</u> (reef building, still exist.)

- The animal portion of the reef is called a polyp
- The polyp absorbs calcium carbonate out of the water
- The calcium carbonate is used to build the reef
- Tentacles release stinging cells when something brushes by them
- At night polyps come out to catch plankton floating by



- Inside polyps live zooxanthellae, which are algae
- Coral polyps protect the zooxanthellae, release CO_2, and provide it with necessary nutrients from their own waste
- Since algae are plants, they use sunlight and CO_2 to make food (the process known as photosynthesis).and produce oxygen
- Two organisms living together is called ***symbiosis***

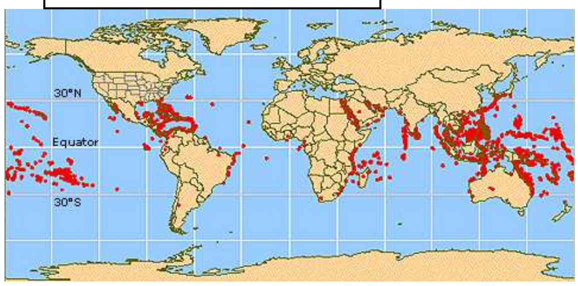


Corals can build three types of reefs:

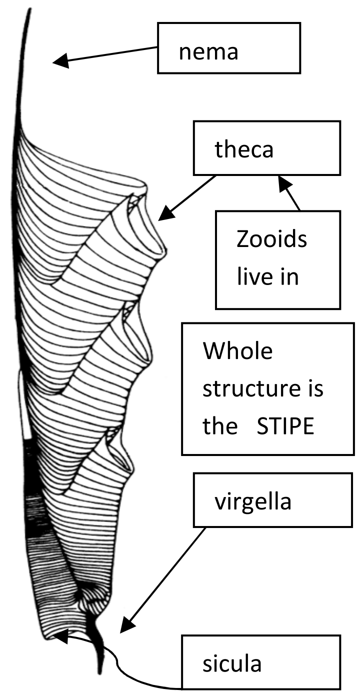
- ☐ Fringing: grows close to shore
- ☐ Barrier: also grows close to shore but has a lagoon separating it from the shore
- ☐ Atoll: a ring of coral that surrounds a lagoon, often grows on a submerged mountain or volcano

- Very specific habitats:
  - ☐ Temperature: 25-29°C
  - ☐ Depth: Less than 20 to 50 metres
  - ☐ Salinity: Normal salt levels (35ppt)
  - ☐ Light: Zooxanthellae need light to survive
  - ☐ Sedimentation: Being covered with silt interferes with photosynthesis
  - ☐ Desiccation: being exposed to air. The corals will die if exposed too long
- Coral likes areas with lots of waves:
  - ☐ They are strong enough to withstand the pressure
  - ☐ Freshwater means more food
  - ☐ Waves remove silt
  - ☐ New water brings more oxygen

Palaeo-climatic indicators



GRAPTOLITES

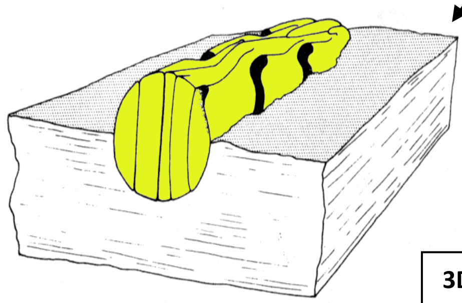


Graptolites are commonly found in organic rich dark **shales** or **mudrocks, which are believed to have been deposited in deep water.** O_2 levels would have been low on the seafloor and, as a consequence, generally no other fossils are found with them.

Two types of preservation are encountered when working with graptolite fossils:

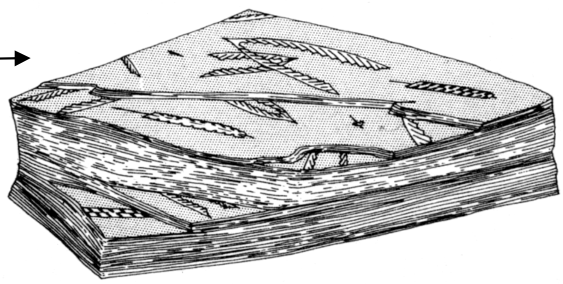
Graptolites are an **extinct** group of **colonial creatures** which were abundant in the seas of the Lower Palaeozoic and which formed **organic walled, stick-like colonies**. They became extinct in the Carboniferous, however prior to this they had been extremely important components of the **plankton** of the worlds oceans. They are exceptionally useful in biostratigraphy and many sub divisions of the Ordovician and Silurian are based on graptolite data.

Graptoloids appeared in the **Early Ordovician** and persisted until the **Early Devonian**. They bore a superficial similarity the dendroids, the planktonic forms which they are believed to have evolved from. In contrast to dendroids, graptoloids were more **diverse morphologically** and their **rhabdosome** was much **lighter** and **simpler in construction:**



Anoxic = no oxygen present in water

3D Preservation
(rare)



Anaerobic = no oxygen present in sediments

Flattened Preservation
(vast majority)

A GOOD ZONE FOSSIL ? **YES** **or** ? **NO**

Palaeozoic only

Marine

Planktonic (widespread)

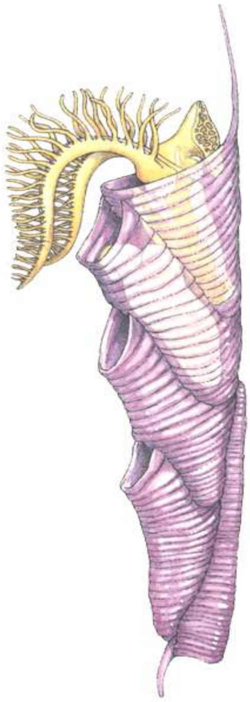
Well fossilised in fine, deep ocean sediments

Made of a protein that does not dissolve at great depth as carbonates do

Calm conditions and lack of scavengers promotes good fossilisation at great depth

Rapid evolution and short range of each species

Recognisable features and predictable evolution

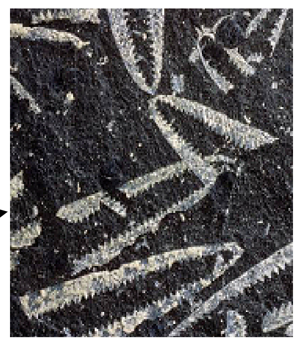


What zooids may have looked like in place in the theca.

A filter feeder like corals.

Probably made of a delicate chitin/protein substance. Easily destroyed in shallow high energy environments

Typical graptolite fossils: marks or organic film on shales or slates



Graptoloids were **exclusively planktonic and thus had a wide geographic distribution**. This makes them excellent for correlating and dating rock sections over a wide areas.
Recent research has focused on reconstructing how graptoloid colonies might have moved through the water column. There are **two possibilities**:

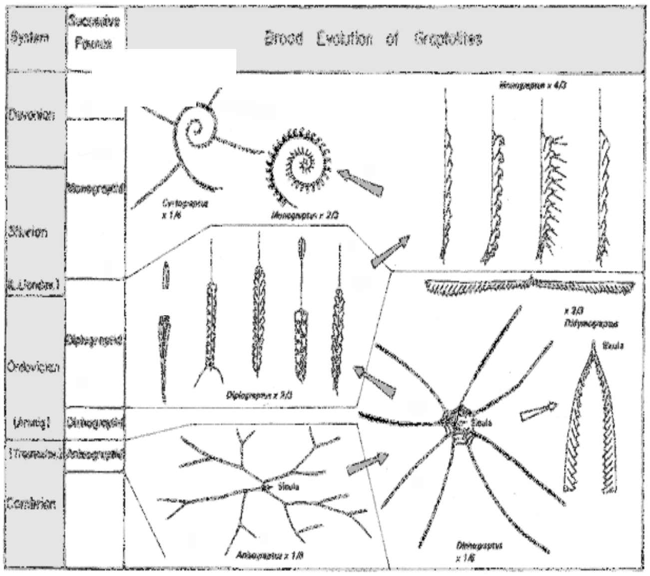
* Graptolites simply drifted along with currents
* Graptoloid colonies actively moved themselves around

EVOLUTION OF GRAPTOLITES

The 4 main evolutionary changes of Graptolites from the Ordovician period through the Silurian to the lower Devonian make them a very useful ZONE FOSSIL

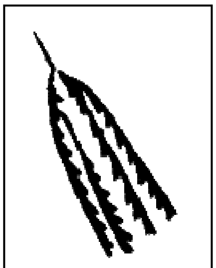
The evolutionary changes are:-

1. Reduction in the number of STIPE
2. Change in the attitude of the STIPE
3. Change Iin the arrangement of the THECAE
4. Change in the shape, complexity and spacing of THECAE



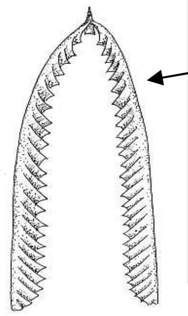
1. The numbers of stipe changed from many to one over time.

TETRAGRAPTUS had 4
(lower Ordovician)
DIDYMOGRAPTUS had 2
(upper Ordovician)
MONOGRAPTUS had 1
(Silurian)



Link the species names to the images

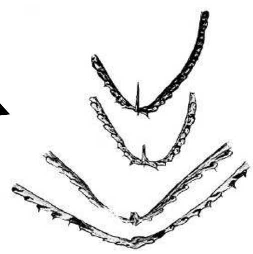
2. The stipe changed from PENDANT to SCANDENT over time.

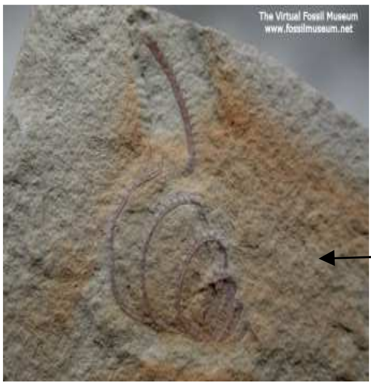


The earlier pendant varieties hung down with thecae on the inside

The later scandent forms grew upwards with thecae on the outside

Other intermediate forms were Horizontal and reclined.
Over time some species showed evolution from horizontal to reclined to scandent.

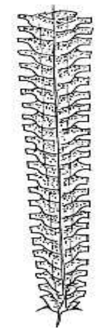




Other odd spiral froms have been found that may have helped the graptolite float in the water or move up and down in the water column to feed.

3. The arrangement of the thecae on the stipe changes from UNISERIAL to BISERIAL.

Uniserial forms have thecae on one side of the stipe, Biserial on both sides. Unfortunately later Silurian forms were UNISERIAL! This is hard to explain in evolutionary terms and less useful for biostratigraphic correlation



4. The THECAE became more complex.

This caused less competition between zooids and allowed more efficient filter feeding.

Thecae became curved or hooked to help feeding and perhaps protect the zooids.

Early froms had Thecae close together, later forms were ISOLATE with more space between the Thecae