Chapter 2. Continental environment and characteristic biological components

There are various sedimentary environments:

1 – The Saharan environment : wind is the main transport agent, creating very fine aeolian sand that forms ripples and giant dunes.

2 – The fluvial environment : at high altitude at the confluence of rivers, the torrential current causes erosion and the deposition of large, angular elements; downstream, erosion continues, causing the riverbed to become deeper and deeper; Sedimentation occurs on the banks; downstream, the decrease in the speed of the current allows fine elements to be deposited. There is horizontal grain sorting along the river.

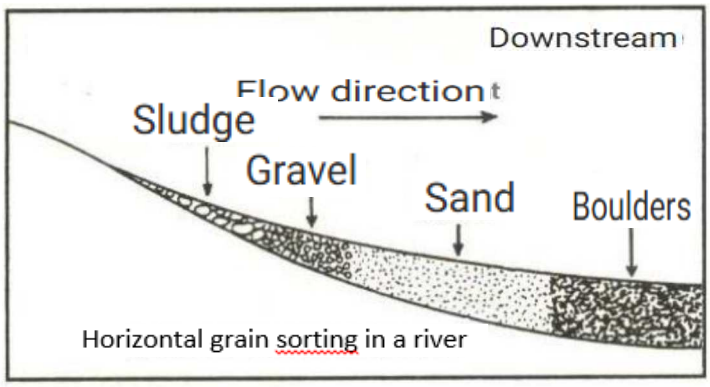

Figure 1. Horizontal grain sorting in a river.

3- The lake environment : in addition to the vertical sorting of detrital elements received by the lake, lacustrine sedimentation is characterised by calcareous deposits resulting from the photosynthetic activity of aquatic plants, which use water-soluble hydrogen carbonate (HCO_3) to extract carbon dioxide (CO_2), resulting in calcium carbonate ($CaCO_3$) that sediments in the form of travertine, often rich in shells.

Sedimentation in stagnant waters

In lakes, where the water current is weak or non-existent, sedimentation depends solely on the size of the debris, resulting in vertical gnano-classification (the largest particles at the bottom, the finest at the top).

Figure 2. Vertical Gnanoclassification

Figure 3. Lake Tonga freshwater lake in Algeria.

Lake Tonga is a freshwater lake located in El-Kala National Park in the wilaya of El Taref in Algeria. Its average depth varies from 1 to 1.5 m, with a maximum depth of 3 m.

Lakebed sedimentation depends on climatic conditions, depth and the amount of detritus received.

Travertine is a continental limestone sedimentary rock with a concretionary appearance, roughly bedded, white in colour when pure, or tending towards grey, yellowish, reddish or brown, depending on the impurities it contains. The rock is characterised by small cavities (vacuoles) that are unevenly distributed. This carbonate rock is deposited at the emergence points of certain springs and in shallow watercourses with small waterfalls.

Figure 4. Travertines in north-eastern Algeria

Figure 4. Travertine at Hammam Debagh
in the wilaya of Guelma in north-eastern Algeria

Limestone tuff, which is sedimentary in origin and comes from carbonate ions dissolved in water that has precipitated in a continental environment (stream, spring rich in dissolved carbonate, etc.), often including traces of plants or shells.

$$CaCO_3 + CO_2 + H_2O \leftrightarrow Ca^{2+} + 2(HCO_3^-)$$

(The word travertine refers to rock produced in thermal conditions (naturally heated water), while calcareous tufa refers to rock produced in cold water).

A peat bog is a wetland characterised by the fact that the synthesis of organic matter is greater than its degradation due to water saturation. As vegetation dies, it gradually accumulates to form peat, a soil characterised by its high content of organic matter, which is little or not at all decomposed. Peatland ecosystems cover 3% to 5% of the Earth's land surface, but they are highly biodiverse and store carbon very efficiently.

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Figure 5. Lac à la Tortue peat bog, Canada

Peat bogs are wetlands that differ from marshes, ponds and most swamps in that they form layers of peat. Peat is a fossilised plant material that is low in oxygen, where the decomposition of organic matter is slowed down. In peat bogs, the accumulation of plant debris over the years produces peat: a brownish rock used as fuel, mainly formed from moss remains. Core samples are used to collect increasingly older peat samples using the same principle as in ice caps.

Figure 6. Freshly extracted peat

Peat stock (Scotland)

Example of fossils typical of lake environments: Diatoms

Diatoms (or Bacillariophyceae) are microscopic single-celled algae (ranging from two micrometres (2µm) to one millimetre (1mm) in size) characterised by an external siliceous shell called a frustule. They live in water, either suspended (plankton) or on the bottom, free-floating or attached to various substrates.

Pelagic forms belong to phytoplankton, while benthic forms belong to microphytobenthos.

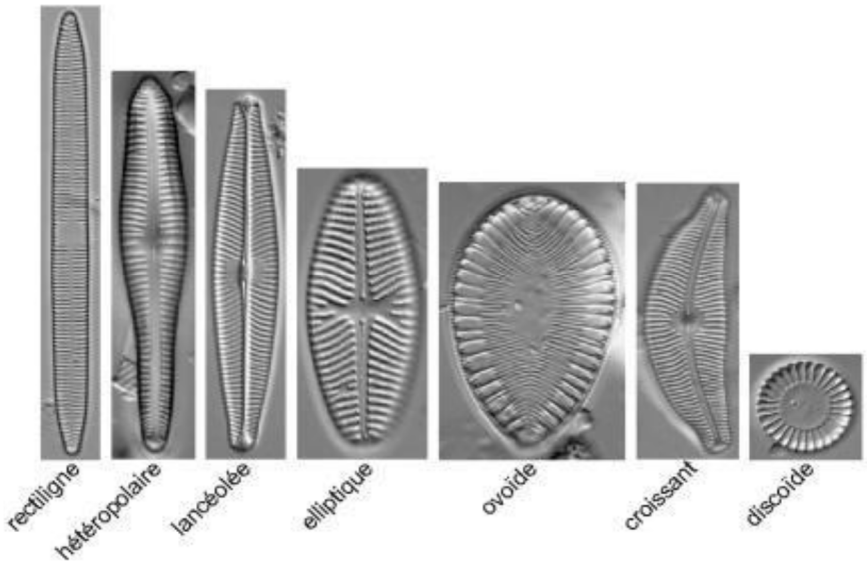


Figure 7. Bacillariophyta

Some species of modern diatoms

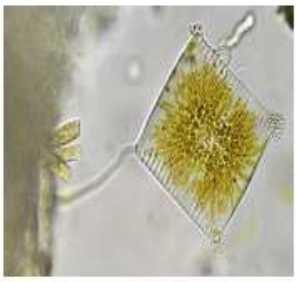
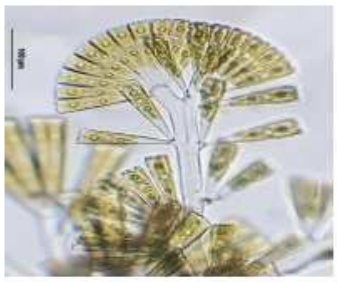
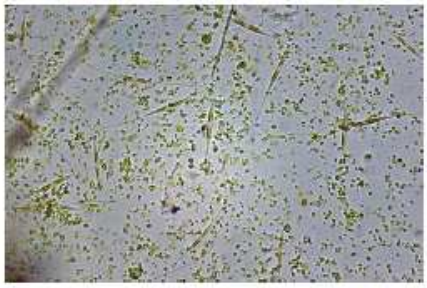


Figure 8. Fragilaria



Licmophora flabellata



Nitzschia longissima

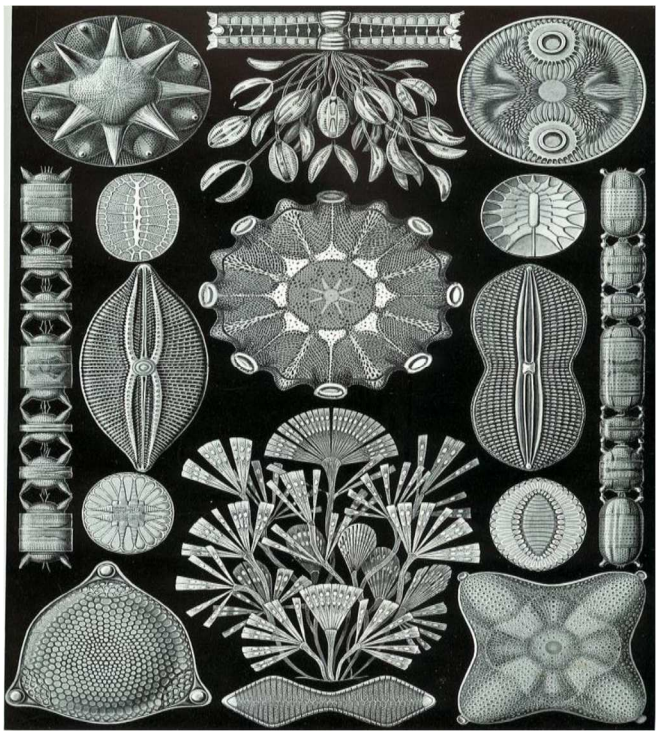


Figure 9. Different species of diatoms

The ecological interpretation of diatoms is based on knowledge of the autoecology of each species from the literature.

Diatoms (planktonic algae) are used as bioindicators in continental aquatic environments.

- Example of fossils typical of the continental environment

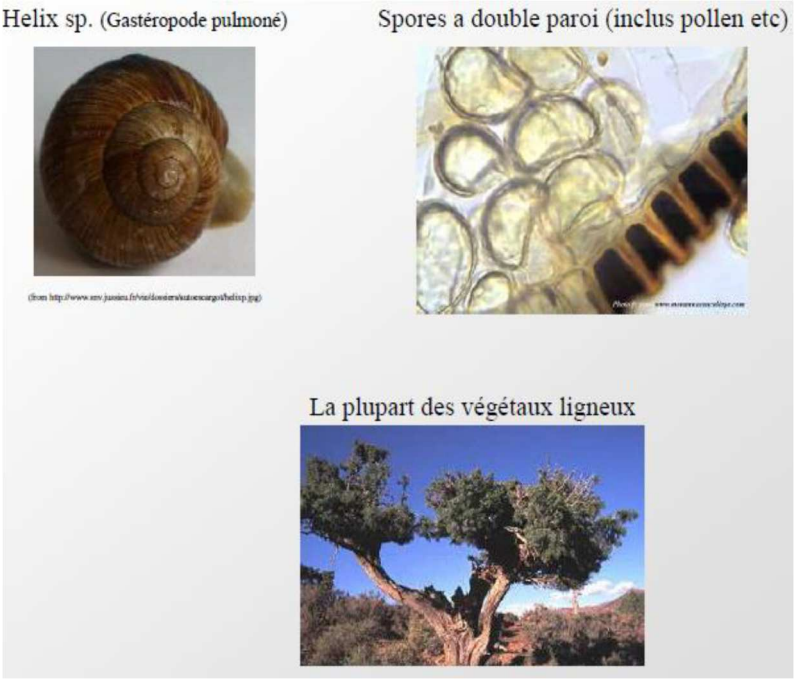


Figure 10. Example of typical fossils from the continental environment

- Examples of fossils typical of freshwater environments

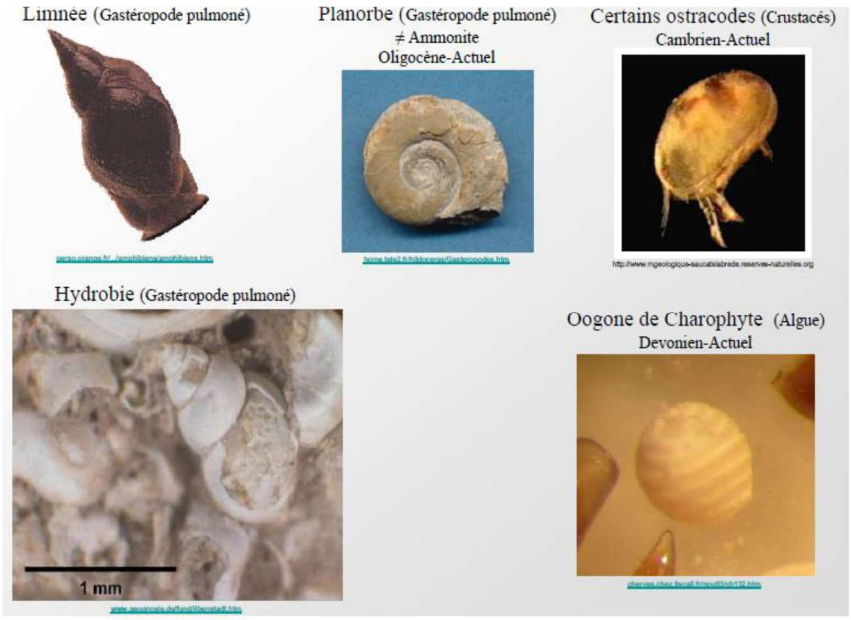


Figure 10. Examples of fossils typical of freshwater environments

Charophyte

These plants are all aquatic. Most live in fresh water, but Chara baltica lives in brackish water.

Figure 12. Chara sp- Charophyte

Freshwater

Figure 13. Chara baltica- Charophyte

Brackishwater