FISH (PISCES)

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Definition

- **Fish**-aquatic vertebrates, preserving gills throughout his life. Their limbs are paired and unpaired fins, internal skeleton cartilaginous or bony, the body is covered with scales of different structures.

- **Fish fossils** and associated data are useful to estimate conditions in *paleoenvironments* because living fish respond directly to chemical and physical parameters as well as geological processes. Known habitat restrictions of fish and other organisms yield environmental evidence in the fossil record.

Ages

- There were fish **at the end of the Silurian in Devon**, they quickly conquered the vast territory, displacing them from the jawless. Therefore, the Devonian period is often called the "age of fish".
- It is about **420** mln years ago.

Types of sediments

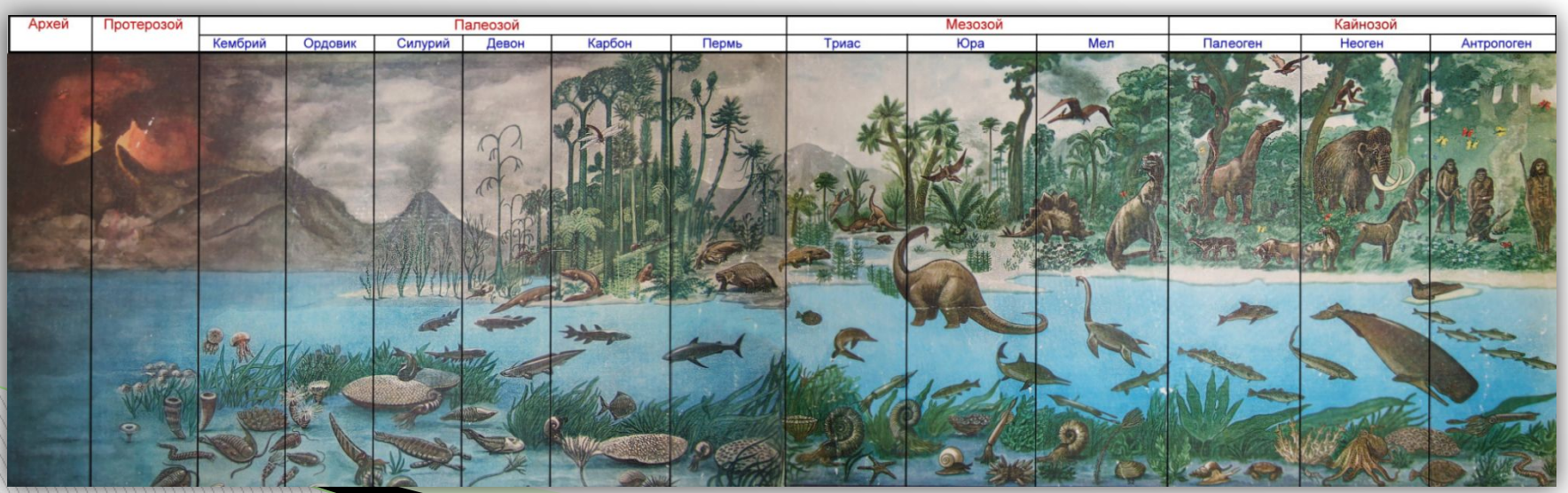
- The habitat of the fish:
- **1) marine** and **freshwater** pools,
- 2) many fish live in and are often restricted to habitats that are distinctive depositional environments, as observed by fishermen everywhere. As fossils, species and higher taxonomic groups may provide ecological and environmental **evidence about ancient bodies of water**.

State Colorado

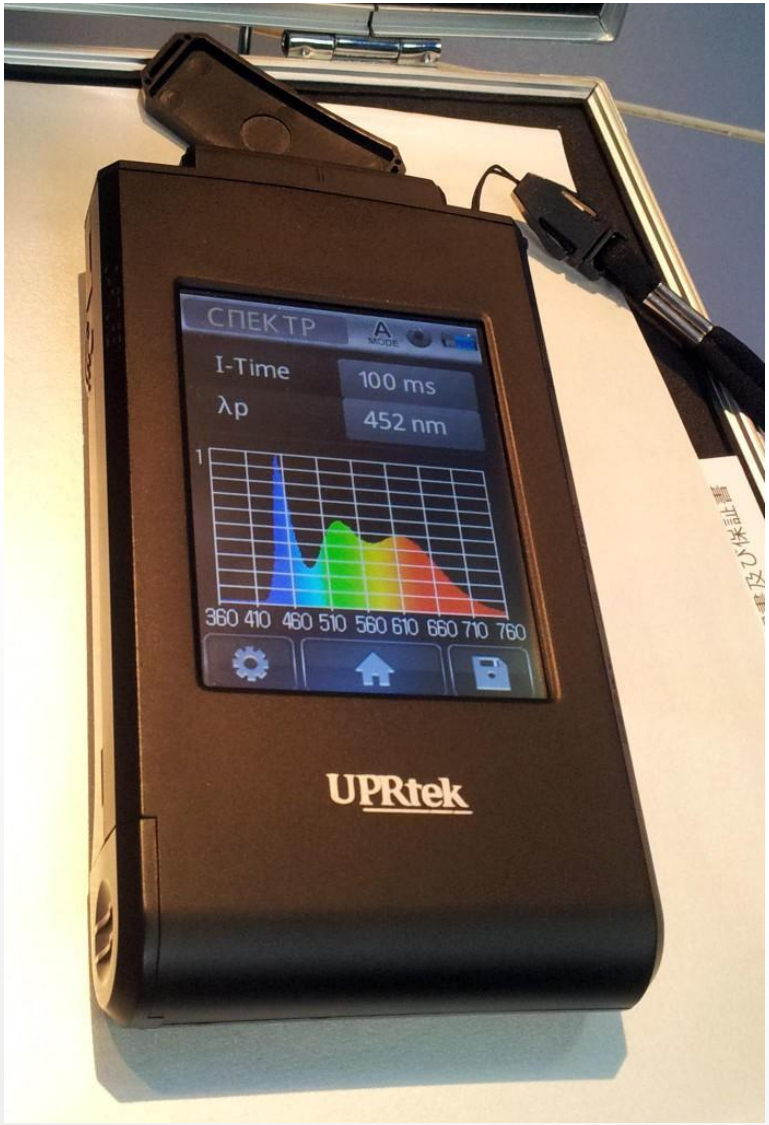
Paleoreconstruction

Taphonomic and taxonomic data from fishes are used to identify physical, chemical, and ecological conditions in ancient environments.

- 1) **Temperatures** of ancient environments are estimated by oxygen isotopic ratios in aragonitic otoliths or apatite of bone, as well as by presence or absence of fish that belong to known warm-water or cold-water groups.
- 2) Analysis of the **conditions of death**, scavenger disturbance, and carcass decay may enable identification of cold, stratified lakes and estimation of oxygen, water chemistry, and sedimentation patterns.

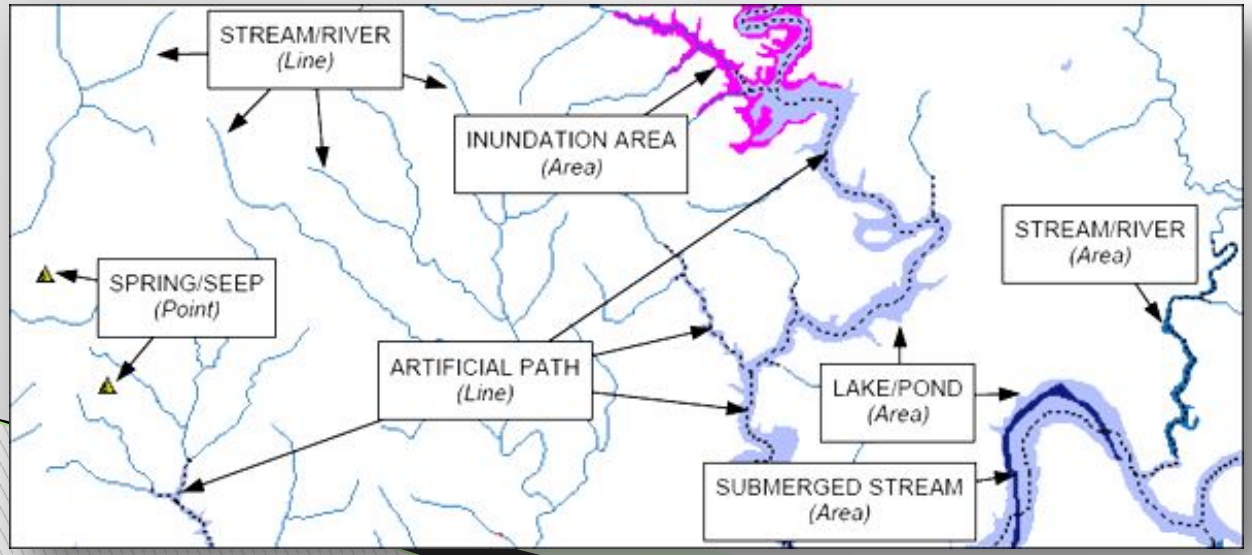


- 3) **Climatic seasonality** can be analyzed as temperatures recovered by isotopic analysis of aragonite or apatite growth rings representing different seasons. The growth bands in these accretionary structures are micromilled from growth rings and analyzed in a mass spectrometer.
- 4) **Salinity** is indicated by presence or absence of fish with narrow salinity tolerance (stenohaline) in contrast with fish that are broadly tolerant of salinity (euryhaline fish).



Spectrometer

- 5) **Migrations** are determined by microsampling different years of life, as represented in oxygen isotopes in otoliths or bone, and recovering evidence of travel to distinctive chemical environments.
- 6) **Current energy and elevation** may be indicated by fish body-shapes and taxon-diagnostic adaptations. Deep-bodied fishes are restricted to waters with low current or wave energy.
- 7) **Hydrographic connections, lake spillovers, and stream** captures are indicated by biogeographic patterns of species distributions. Fish in adjacent but separate hydrographic basins indicate former continuous fish habitat between the basins.



Hydrographic connections