Calculating Fossil Biomass

Biomass can allow researchers to assess the relative importance of different taxonomic families within a fossil community. The biomass of fossil organisms is often estimated using mathematical models that account for variations in biomass across different environments and time periods. Below are some key terms and concepts involved in calculating fossil biomass:

- **Biomass**: the amount of carbon held by each taxon in a study area.
- **Carbon**: the primary element used to estimate biomass in fossil records. Carbon content is often estimated by analyzing organic carbon (Corg) and total carbon (TC).
- **Fossil**: a preserved remnant of an organism, representing a significant fraction of its original biomass.
- **Organic Carbon (Corg)**: the carbon-containing materials that are preserved in sediments. It is an important component in biomass estimation because it indicates the fraction of biomass that is preserved.
- **Total Carbon (TC)**: the total amount of carbon in a sample, including organic carbon and inorganic carbon.
- **Shell Weight (Shell wt)**: the weight of the fossil shell, which is an important factor in biomass estimation for shelly fossils.
- **Tissue Weight (Org wt)**: the weight of the organism's soft tissues. It is often estimated as the difference between the total weight and the shell weight.
- **Wet Weight (Org wrt)**: the weight of the organism with its soft tissues intact. It is related to the tissue weight.
- **Ash Free Dry Weight (AFDW)**: the weight of the tissue after ashing, which removes inorganic components.

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#### A New Method for Estimating Fossil Biomass

We can estimate fossil biomass using the following equation:

$$ C_{org} = \frac{\alpha}{\beta + \epsilon} \times Shell\ wt $$

Where:
- **C_{org}** is the biomass of the fossil species (gC/taxon).
- **α** is the proportion of organic carbon in the fossil (in gC/gCorg).
- **β** is the proportion of shell weight in the fossil (in gC/gC_shell).
- **ε** is the proportion of fossil material present relative to the whole fossil (in gC/gC_fossil).
- **Shell wt** is the weight of the fossil shell (in g).

### Evaluating Dominance

This equation allows us to estimate the biomass of fossil species from their shell weights and organic carbon contents. By applying this method, we can compare the biomass of different fossil species and understand the relative importance of each in the fossil record.

The diagram above illustrates the calculation process. The biomass of fossil species can be estimated using the relative proportions of organic carbon, shell weight, and fossil material. The method helps in understanding the biological community dynamics and the impact of environmental changes on the fossil record.