3 Inter-specific scaling of phytoplankton production and cell size in the field.

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Recommendations:

Average rating:

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It seems that life in the real world is different from what it may be in the laboratory, as shown here in the case of phytoplankton cell size and photosynthetic rate. Usually, large organisms tend to have lower size-specific metabolic rates than their smaller counterparts.

This too is the rule for phytoplankton isolates that are cultured in the laboratory.

However, this study found that under natural conditions in oceans, estuaries, lakes and rivers, phytoplankton at the larger end of the size spectrum (notably the diatoms and dinoflagellates) are able to photosynthesize at rates higher than predicted by the general rule. Possible explanations include unbalanced growth under fluctuating supply of resources such as nutrients and light, vertical migration, and taxonomic diversity. In nature, strategies of nutrient uptake, light absorption, respiration, exudation, cell lysis, sedimentation and grazer avoidance shape the size dependence of phytoplankton metabolism.

Disclosures
None declared

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According to the author, the 3/4-power scaling law does not apply to phytoplankton populations in nature.

One means of compressing the variability across phytoplankton species is to use allometric models, where metabolic rates are scaled according to measures of mass or volume.

Allometric models rely strongly on laboratory data on metabolic rates measured as a function of cell volume. The results in this publication caution against applying laboratory-derived measures to field populations. The reasons for the differences between lab and field data, the authors say, likely comes from the constant changes occurring in natural ecosystems, such that other, non-metabolic processes may dominate. For natural populations, environmental conditions are more ephemeral. The challenge, therefore, will be in how to apply laboratory data to the field, and how to use field data in constructing models of plankton dynamics.

Disclosures
None declared

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