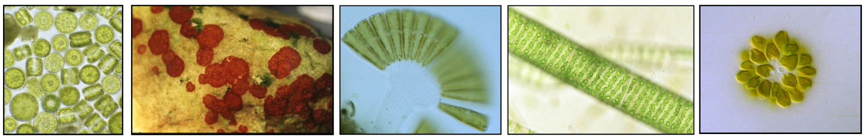
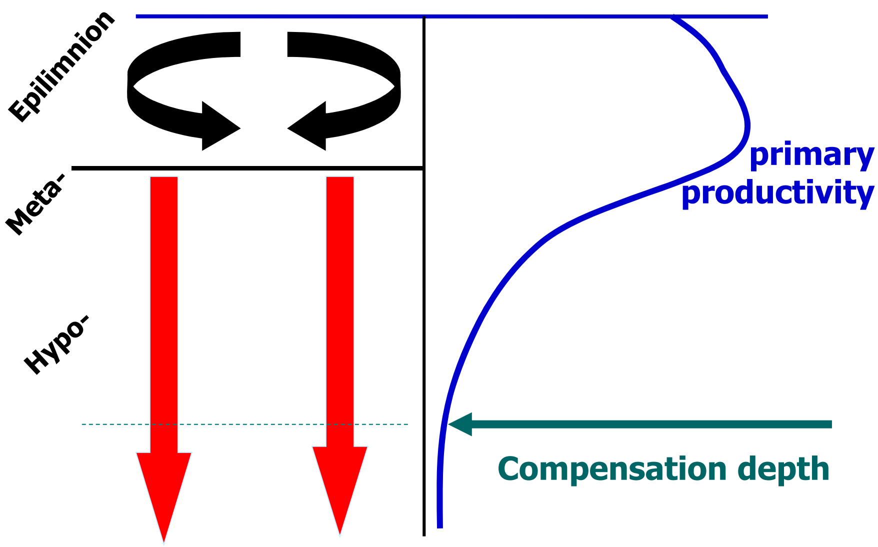
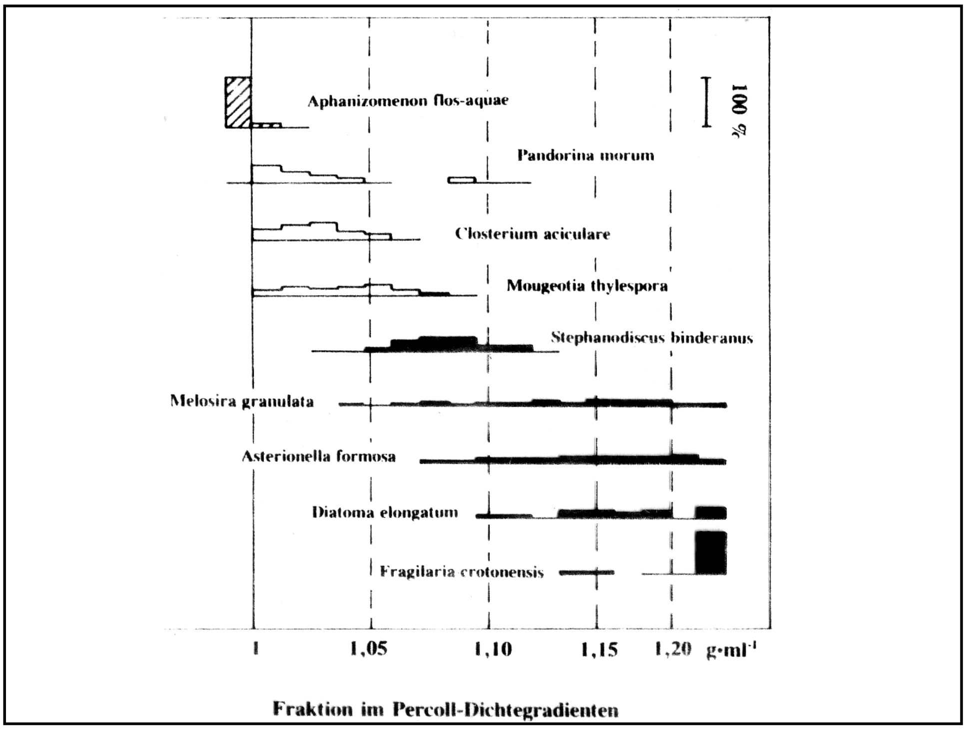
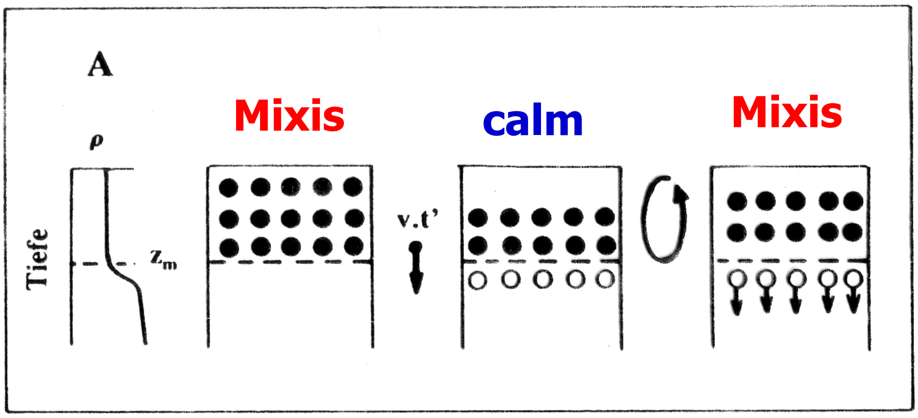


Phytoplankton

Freshwater Biodiversity
Univ. Prof. Dr. Michael Schagerl




Aphanizomenon flos-aquae
Pandorina morum
Closterium aciculare
Mougeotia thylespora
Stephanodiscus binderanus
Melosira granulata
Asterionella formosa
Diatoma elongatum
Fragilaria crotonensis
100 %
1
1,05
1,10
1,15
1,20
g·ml⁻¹
Fraktion im Percoll-Dichtegradienten


A
Mixis
calm
Mixis
ρ
Tiefe
z_m
v.t'

$$v = \frac{2}{9} g r^2 \frac{\varphi' - \varphi}{\mu F}$$

constant

v = sinking velocity
g = acceleration due to gravity

can be modified by algae

r = radius
F = form resistance
φ´ = density alga

temperature controlled

φ = density water
μ = viscosity water

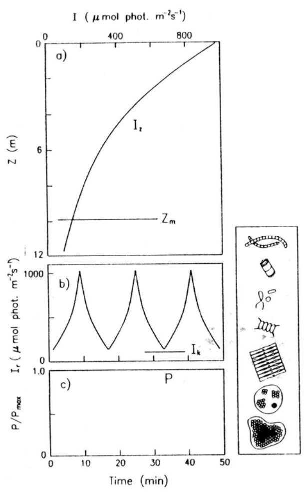


Fig. 1. (a) Representation of the underwater light field in a hypothetical stratified water column mixed to $z_m = 10$ m by a wind of 8.4 m s^{-1} against a buoyancy-generating heat flux of 464 W m^{-2}, and through which the coefficient of incident light attenuation with depth is 0.2 m^{-1}; (b) the light instantaneously received by a single entrained cell (I_z) during a fifty-minute exposure to the field in (a), assuming it to be transported smoothly and evenly through the entire mixed depth but, because it is never transported beyond the light level saturating photosynthesis (I_k), the photosynthetic rate (P) a fraction of the maximum (P_{max}) never falls below 1.0 (c). The inset shows some common types of algae which could be expected to grow while the above conditions persisted: (viz *Oscillatoria*, small centric diatoms, nanoplankton, unicellular and coenobial Chlorococcalean green algae, large or coenobial diatoms, palmelloid Chlorophytes and bloom-forming Cyanobacteria).

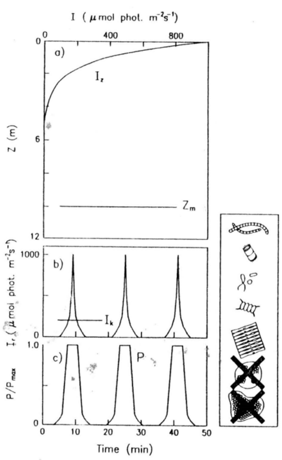


Fig. 2. Representation of the (a) light field and (b) light reception of an entrained cell in a water column, subject to mixing identical to that in Fig. 1, but in which the coefficient of incident light attenuation is increased to 1.0 m^{-1}, so that a substantial part of the mixed layer is (a) in effective darkness and the entrained cell (b) spends more than half the period in light intensities well below I_k, and (c) the relative photosynthetic rate, P/P_{max}, responds accordingly. These conditions are not favoured by colonial chlorophytes and bloom-forming cyanobacteria.

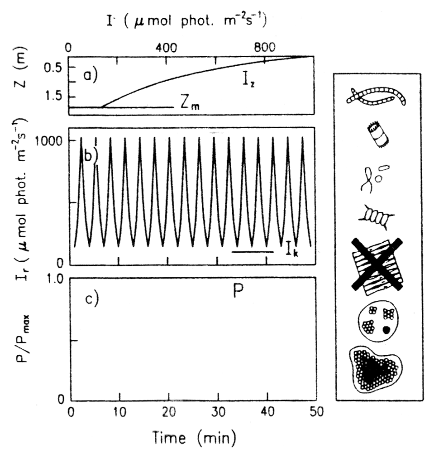


Fig. 3. (a) Representation of the underwater light field in a 2-m water column, mixed as in Fig. 2 by a wind of 8.4 m s^{-1} and subject to a heat flux of 464 W m^{-2}; although the coefficient of light extinction is also as in Fig. 2, the depth of the water column ensures that (b) the algae continue to receive irradiance intensities $> I_k$ throughout the period, but the energy dissipation rate in a confined column forces a greater frequency of oscillation. P/P_{max}, however, remains at 1.0. The shallowness of the column discriminates against the heavy, non-motile large diatoms.

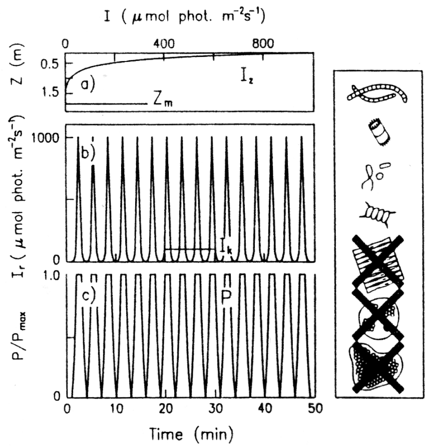


Fig. 4. Representations of (a) the light field and (b) the light reception of an entrained alga in a water column subject to mixing identical to that in Fig. 3, but in which the incident light attenuation is increased to 5.0 m^{-1}, so that a substantial part of the 2.0-m mixed layer is in effective darkness and the entrained cells (b) spend more than half the period at intensities below I_k, with (c) appropriate responses of the photosynthetic rate. This regime effectively discriminates against large diatoms, colonial chlorophytes and bloom-forming cyanobacteria.

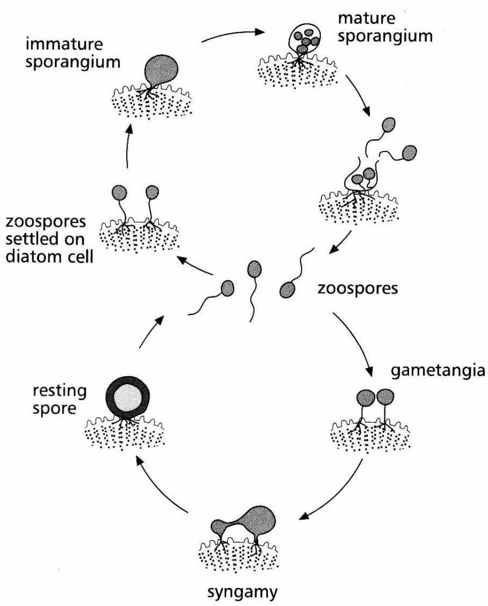


Figure 22–23 Life cycle of the chytrid *Zygorhizidium planktonicum*. (Adapted from van Donk and Ringelberg, 1983 by permission of Blackwell Science, Ltd.)

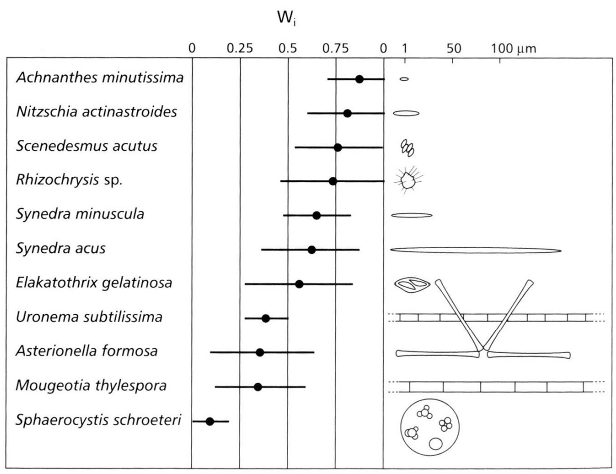
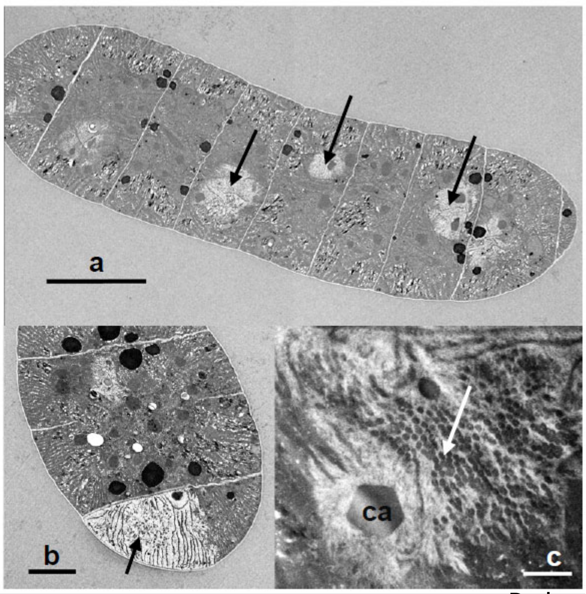


Figure 22–40 Selectivity coefficients (w_i) for various phytoplankton fed on by *Daphnia magna*. Note that large species and those with gelatinous sheaths are not grazed upon well. (After Lampert and Sommer, 1997 ©Georg Thieme Verlag)

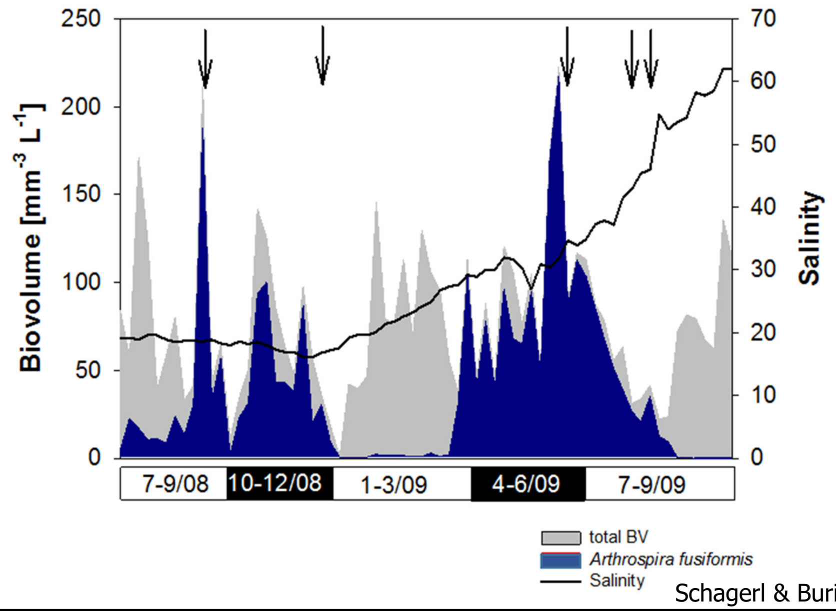
The selectivity coefficient W provides information of the grazing efficiency compared to optimal food

Arthrospira breakdowns



Peduzzi, Schagerl et al. 2014

Arthrospira breakdowns



Schagerl & Burian 2016