Rates of bacterial protein production at Lake Tiefwaren 2003-2020

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Data origin Data were collected by IGB from 2003-04-10 onwards (Elke Mach).

Data

Sampling site

Lake Tiefwaren is a dimictic meso-eutrophic hardwater lake located on the northeastern perimeter of the town of Waren (Müritz) in the district of Mecklenburgische Seenplatte, Mecklenburg-Vorpommern, Germany (53°31‘40“N 12°41‘30“E). The lake has a maximum depth of 23.6 m, a mean depth of 9.7 m, a surface area of 1.38 km^2 and a volume of 13.41 x 10^6 m^3 (Morphometric data from Umweltministerium M-V, calculation base 2015). The catchment area has a size of 21.9 km^2 and is dominated by agriculture, forests, and gardens in direct vicinity of the lake (Nixdorf et al. 2004). Due to the discharge of communal, agricultural and and industrial sewage waters into the lake, Lake Tiefwaren became more and more hypertrophic in the 1980s. To enhance water quality, $NaAl(OH)_4$ and $Ca(OH)_2$ were introduced into the hypolimnion in the years 2001-2005 to provoke the precipitation of nutrients. After the restoration measure, the phosphorus release from the sediments was almost completely eliminated for several years and the phosphorus concentrations in the water body drastically decreased, while secchi depth increased (Gonsiorczyk et al. 2015).

Time span 2003-2020

Sampling method

Samples were taken monthly in the mixed upper layer in a mixed water sample taken in depths between 0 m and 10 m depending on epilimnion depth. From May to September fortnightly samples have sometimes been taken.

Rates of bacterial protein production (BPP) were determined by incorporation of 14[C]-leucine (14C-Leu, Simon and Azam, 1989). Triplicates and a formalin-killed control were incubated with 14C-Leu (1.15×10^{10} Bq $mmol^{-1}$, Amersham, England) at a final concentration of 50 nmol l^{-1}, which ensured saturation of uptake systems of both free and particle-associated bacteria. Incubation was performed in the dark at in situ temperature (4-25°C) for 1 h. After fixation with 2% formalin, samples were filtered onto 5.0 µm (attached) and 0.2 µm (total isotope incorporation) nitrocellulose filters (Sartorius, Germany) and extracted with ice-cold 5% trichloroacetic acid (TCA) for 5 min. Thereafter, filters were rinsed twice with ice-cold 5% TCA, once with ethanol (96% v/v), and dissolved with ethylacetate for measurement by liquid scintillation counting. Standard deviation of triplicate measurements was usually <15%. BPP of free bacteria was calculated by subtraction of attached BPP from total BPP. The amount of incorporated 14C-Leu was converted into BPP by using an intracellular isotope dilution factor of 2. A conversion factor of 0.86 was used to convert the protein produced into carbon (Simon and Azam, 1989). The protocol was modified after Allgaier et al. 2008 including the separation between free-living and particle-associated bacteria (see above).

Parameters

- `date` – date of measurement [`YYYY-MM-DD`]
- `depth` – depth of measurement [m]
- `leucine` – type of leucine that was used when processing the samples
- `light/dark` – indication whether measurements were performed at light or dark conditions
- `BPP-C_particle_hour` – particle-associated bacterial production [µg $l^{-1}h^{-1}$]
- `BPP-C_particle_day` – particle-associated bacterial production [µg $l^{-1}d^{-1}$]
- `BPP-C_water_hour` – free water bacterial production [µg $l^{-1}h^{-1}$]
- `BPP-C_water_day` – free water bacterial production [µg $l^{-1}d^{-1}$]
- `BPP-C_total_hour` – total bacterial production [µg $l^{-1}h^{-1}$]
- `BPP-C_total_day` – total bacterial production [µg $l^{-1}d^{-1}$]
- `comment_raw` – comments in the raw data by technician
- `comment_dm` – comments by the data manager

References

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Simon M, Azam F. 1989. Protein content and protein synthesis rates of planktonic marine bacteria. Marine Ecology Progress Series 51: 201-213.

Umweltministerium M-V, calculation base 2015, Abteilung Integrierter Umweltschutz und Nachhaltige Entwicklung - Seenprojekt, 2002: Mathes, J. & Korczynski, I. Pampower Str. 66/68, 19061 Schwerin.

Change log

- 2020/2021 Silke R. Schmidt: Data were compiled from raw data files from single measurement dates. Values from beginning until end of 2010 were corrected with factor 0.86, which was not included in the raw data. Negative values were deleted.