European Mountain lake Ecosystems: Regionalisation, diaGnostics & socio-economic Evaluation

EMERGE

07

PLANKTON FOOD WEB

Sampling protocol

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WP-4 Plankton food web
Sampling protocol

Aims and rationale:
Major aims are to characterize plankton food web and its health in relation to environmental gradients. 10 – 50 lakes in each district will be sampled for the assessment of bacterial biomass (BAC), chlorophyll concentration (CHL) and zooplankton species and abundance (ZOO). Optional: preserved sample for semiquantitative determination of phytoplankton abundance and main taxa (PHY).
Sampling will be performed in the second half of ice-free season, when the complete development of all plankton components is expected. Except of CHL, all samples are preserved and could be elaborated within two months or later. To save time and physical effort, only one layer (selected according to an expected maximum CHL concentration) in each lake is sampled for CHL, PHY and BAC. All samples are small (in total about 300 ml to be carried from each lake). The elaboration of PHY and ZOO in lab is semiquantitative, no measurements of biomass are necessary. The biomass of PHY will be estimated from CHL concentration, biomass of large ZOO will be estimated roughly from abundance of species. Small ZOO is analyzed only for an occurrence of taxa. Optional sampling for semiquantitative assessment on the occurrence and relative abundance of main PHY taxa is recommended.

List of materials and equipment necessary (at the site):
At the boat
- boat (inflatable), anchor, line
- sampler (van Dorn type) with a rubber tube discharge, plankton net # 40 μm, quantitative plankton net # 200 μm
- thermometer, Secchi disc
- bottle with filtered formaldehyde for BAC (1 per lake, ~60 – 100 ml)
- bottles for ZOO (2 per lake, ~100 ml)
- 40% formaldehyde
- bottle for CHL and (optional) PHY (for fluorometrical determination 100 ml bottle for spectrophotometrical determination 1-20 l)
- bottle for chemistry (see relevant protocoles)

At the shore
- equipment for CHL filtration, pump, GFF filters, forceps,
- plankton net # 5 μm, narrow, elongated, with a discharge, used for concentration of PHY, bottle (1 per lake, ~100 ml), 40% formaldehyde

Sampling (responsibility of site operators):
Sampling surveys will be performed in the ice-free season in 2000 (Greenland in 2001), **late summer or autumn, not early after ice-melt!** Sampling in one lake district should be preferentially done within three weeks and should be harmonized with the sampling for lake water chemical classification.
Sampling depth:
For BAC and CHL (optional: for PHY), sample one layer from each lake with a sampler:
- in lakes of maximum depth 5 m or less, and in all lakes during autumnal mixing, sample with the top end of sampler 0.5 m below the surface.
- in deeper thermally stratified lakes, first measure the transparency with the Secchi disc. In case of Secchi disc reading 1 m or less above the bottom, sample with bottom end of

sampler 0.5 m above bottom. In other cases, sample at the depth of 1.5x Secchi disc reading, but not deeper than 0.5 m above the bottom.

For ZOO use vertical and horizontal net hauls.

For chemistry use surface sample.

Other characteristics needed:

lake morphometry, altitude, catchment characteristics, surface layer and sampling layer temperature, transparency, lake water chemistry from the surface layer (major ions, total phosphorus, total nitrogen, total organic carbon, pH, alkalinity). Are there fish – YES or NO?

Sampling.

Use a boat and anchor in the supposed maximum lake depth. Measure surface water temperature and Secchi disc transparency. Use plastic (PET, polyethyelne) tight screw-cap bottles. Take a sample in appropriate depth with a sampler, measure the water temperature and pour 60-100 ml to a bottle with 3-5 ml of 40% formaldehyde (pre-filtered through 0.2 μm pore filter) for BAC. Final concentration of formaldehyde should be 2% v/v. From the same depth store about 0.1 l or 1-20 l of water for CHL filtration (optional: another 3 – 5 l for PHY).

Take a surface sample for lake water chemistry.

Sample ZOO with a quantitative net mesh # 200 μm by vertical hauls. (For more dertail see also the protocol "Sampling zooplankton"). Try to get as close to the bottom as possible but avoid contamination of samples with thesediment . The towing speed should be about 0.3 m per second (time in seconds = length in m x 3). After each haul, the inner surface of the net must be rinsed carefully, the contents of the bucket emptied into a sampling bottle (~100 ml) and preserved with formaldehyde to the final concentration 4% v/v. Then take another sample with qualitative net mesh # 40 μm (vertical and horizontal hauls) and preserve. Label: lake name, mesh size, towing length, number of hauls per sample.

Direct filtration of water for CHL on the shore is only suggested if sample is to heavy to be transported to the lab and/or if filtration could not be performed the same day. In such case filter two parallel samples trough Whatman GF/F and store filters in tightly closed glass tubes in 90% aceton (for details of procedure see description of chlorophyll-a determination.) Tubes with filters must be kept in dark cool place and stored in freezer as soon as possible.

Optional: for PHY, filter 3 to 5 l of water through a long narrow net, mesh # 5 μm, rinse the inner surface of the net carefully, collect the concentrate into ~50 ml bottle and preserve with formaldehyde to a final concentration 2 % v/v.

Handling of samples before final elaboration.

Samples for BAC, PHY should not be stored in sunshine and warm place, preferentially placed into refrige Samples for ZOO should stored in room temperature. Site operators deliver samples to their labs or send them to specialized labs for final elaboration – this should be agreed for each lake district.

Laboratory elaboration (principle).

BAC – microscoping counting and sizing by image analysis, total biomass and cell volumes.

CHL – acetone extraction and fluorimetric (preferable) or spectrophotometric determination.

PHY– microscopic counts of the most abundant taxa in an inverted microscope. ZOO – species determination and their abundance in # 200 μm sample, occurrence of small species in # 40 μm sample. For details see lab protocole.

Sample for BAC – attached information.

Site operators will attach the following information to BAC samples delivered for final elaboration (sampling depth = the depth of the top of sampler):

Lake district	Lake name	Sampling date	Surface water temper.	Secchi disc transp.	Sampling depth	Temp. of sampling depth	Max. depth	Vertical length of sampler
		DD.MM.YY	° C	m	m	° C	m	M