The Swedish Invertebrate Method (SIS Method)

Monitoring type: lake littorals, streams and watercourses – timeseries

Aim and scope with the monitoring type:
The monitoring of benthic fauna in lake littorals and running waters aims at describing the status and detecting changes in the benthic fauna communities. Species composition generally reflects environmental perturbation and the method can therefore be used to assess the effects of air pollution, land use and other encroachments or measures within the catchment area. The analysis of benthic fauna in lake littorals and running waters is especially suited for assessing the acidification status of a site.

The monitoring type – Benthic fauna timeseries is primarily aimed at detecting temporal changes in benthic fauna and secondarily for comparing different localities or sites. The benthic fauna samples should always be taken from a well defined substratum type to minimise variation and attain the goal of the time series monitoring.

Features which should be considered:
Benthic fauna here is defined as the macroscopic fauna that is retained in a net with a 0.5 mm mesh (Swedish EPA Report 3075, European standard EN 27 828).

The species composition and number of individuals of the benthic fauna varies considerably during the year because of the normal life cycles of the organisms. The variation caused by seasonal variation should be minimised as much as possible when sampling is done for time series purposes. Life cycles differ between different organisms and these are often only partly overlapping, so when sampling is confined to a certain period of the year, some species will be underrepresented or not recorded at all. The summer period is the time of the year when most animals reproduce and grow, and is accordingly the time of the year when number of individuals and biomass changes most rapidly. Summer sampling is therefore considered to be less suited in environmental monitoring programs.

Running waters and the lake littoral zones are composed of a heterogeneous mix of different habitats, and the benthic fauna composition can vary considerably between these habitats. Sampling is done at defined sites (stratified sampling) to minimise the variation caused by habitat type. Stratification of sampling effort increases the probability to statistically detect changes in the benthic fauna composition through time and

also facilitate comparisons between different lakes or running waters. The sampled habitat may constitute only a small part of the littoral zone or water course and the sampled habitat need not be characteristic of the sampled lake or running water, if the aim of the monitoring is to detecting temporal changes and/or to facilitate regional comparisons.

Standardised kick-sampling is for a number of reasons confined to small streams. The catchment area for each sampled site should be determined, since the size of the catchment area is of importance for the benthic fauna composition.

It is important to be aware of the risk of spreading diseases such as crayfish plague if several sampling sites are visited in the course of a day. The signal crayfish is regularly a carrier of the cray-fish plague and is one of the most important distributors of this disease. It is therefore important to disinfect all sampling equipment that has been in contact with the water (e.g., by using technical alcohol), before visiting lakes or streams that contain noble crayfish.

Strategy

Sampling of benthic fauna is preferably done in spring (in the beginning of April or within two weeks after ice-out) and/or in autumn (during circulation). Sampling should be located in the autumn if sampling is done annually for national or regional monitoring. However, it is important that sampling is done during the same season.

The samples should be taken from well defined *sampling sites.* A sampling site is defined as the whole wetted width of the stream, along a ten-meter stretch along that is as homogeneous as possible regarding substratum composition, vegetation, water depth, and water velocity. The water depth should not exceed one meter and the water velocity should preferably be greater than 10 cm/s. Sampling should not be done is areas that dry out for parts of the year and should be placed at a distance of at least 100 m from a lake-outlet. Sampling should primarily be restricted to riffle areas and hard bottom substratum, since it is the preferred habitat for kick-sampling. Sampling should take place downstream of a 50 m long homogeneous sampling area that do not differ considerably from the sampling site regarding substratum, vegetation and water velocity, to minimise the effects of habitats not represented in the sampling site.

A minimum of five replicate samples should be taken from each sampling site with a hand-net according to the kick-sampling method as described in the European standard SS-EN 27 828 (see below). Each sample is stored and analysed separately. The samples should be spatially distributed over the entire sampling site, but sampling near the shore should be avoided to minimise the effects of different habi-

tats. Sampling contain the whole area from 0-1 m depth and assessment of substratum composition and vegetation should be done from this whole area.

METHODS

The sampling methodology and necessary equipment for sampling benthic fauna using a hand-net is described in the European standard (SS-EN 27 828). The net is held against the bottom substratum, perpendicular to the stream, and the sampler disturbs the loose substratum upstream of the opening of the net using the foot at an area as wide as the net. The net is placed close enough to the foot, for the animals to be moved into the net by the current, but far enough away, that most gravel and sand particles settles before entering the net. The net is then moved upstream and the procedure is repeated at a stretch of 1 m during 1 minute. The net is removed from the stream after the sample has been taken and the material is collected at the bottom of the net, before being transferred to a sieve or plastic container. Organic material and phytobenthos is scrubbed off stones, twigs and the like and this large material is then discarded.

The bottom substratum is disturbed and the loose material is the collected by moving the net through the water column in those cases where the stream velocity is so low that the disturbed animals do not enter the net with the help of the current. Disturbance of the substratum of movement of the net is done at a total stretch of 1 m during 1 minute and then treated as above.

A total of five samples should be taken at each sampling site and transferred to separate containers where they are conserved with 96% EtOH to a final concentration of ca 70%. Samples should not be sorted in the field, but sorting and identification should be done in the laboratory. The samples should be marked both within (on a piece of paper with a pencil) and outside of the container.