SLOVENSKI STANDARD
oSIST prEN 16150:2025

01-april-2025

Kakovost vode - Navodilo za vzorčenje bentoških nevretenčarjev v sorazmerju z zastopanostjo habitatov v rekah in potokih

Water quality - Guidance on pro-rata multi-habitat sampling of benthic macroinvertebrates from rivers and streams

Wasserbeschaffenheit - Anleitung für die pro-rata Multi-Habitat-Probenahme benthischer Makroinvertebraten in Flüssen geringer Tiefe (watbar)

Qualité de l'eau Lignes directrices pour léchantillonnage des macroinvertébrés benthiques en cours deau peu profonds au prorata des surfaces de recouvrement des habitats présents

Ta slovenski standard je istoveten z: **prEN 16150**

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13.060.10	Voda iz naravnih virov	Water of natural resources
13.060.70	Preiskava bioloških lastnosti vode	Examination of biological properties of water

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EUROPEAN STANDARD

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English Version

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 16150:2025) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16150:2012.

prEN 16150:2025 includes the following significant technical changes with respect to EN 16150:2012:

— provide more complete guidance about the standard’s application, aims and purpose;

— updated and enlarged list of normative references;

— revised list of terms and definitions reflecting the revised content of the main document and transfer of description of STAR-AQEM method to an Annex;

— major revision, replacing the description of the STAR-AQEM method by a description of the pro-rata multi-habitat approach;

— new part describing features common to all methods based on pro-rata multi-habitat sampling;

— new part describing the most widely used methods based on pro-rata multi habitat sampling;

— this part has been reduced to a description of common procedures with detailed description of the STAR-AQEM method transferred to A.1;

— A.1: Description of STAR-AQEM method, transferred from Part 5 of the previous version;

— A.2: New part describing the Austrian method for large rivers;

— A.3: New part describing the RIVPACS method;

— A.4: New part describing the French method for shallow rivers; and

— Annex B: New part listing methods based on pro-rata multi-habitat sampling.

Introduction

This document sets out the fundamental principles of pro-rata multi-habitat sampling, its objectives and the circumstances in which it should be applied. Whereas, EN 16150:2012 described one of the possible techniques among the existing pro-rata multi-habitat sampling techniques. The aim of this revision is to provide a better understanding of the rationale for this approach, describing more than one technique, including that described in the previous version of this document as examples in the Annexes.

Pro-rata multi-habitat sampling can be applied to all surface waters, including small streams, large rivers, springs, subterranean streams, temporary and intermittent streams. Standard sampling methods for some of these types of habitats are still in development and not all these habitats are included in national monitoring schemes.

It is suitable for national and regional monitoring networks for classifying ecological status under the European Water Framework Directive (WFD). All water bodies in all EU member states are classified under this Directive.

In contrast to small streams, large rivers cannot be inspected on foot, even at low flow. Deeper water with relatively poor visibility sometimes makes the habitats invisible to the observer and prevents the selective collection of samples. Where water depth varies through the year, sessile and less mobile macroinvertebrates are more commonly found below the low-flow water level. For these reasons, representative sampling from the banks is restricted to low-flow periods, but the water level of large rivers is often too high for very long periods to get representative samples from the bank. In such cases, it is advisable to survey with a sampling technique independent of the water level; for example, using a grab, air-lift sampler, or dredge. Deployed from a boat or ship, samples should be taken across large rivers to cover the main habitat gradients of flow and depth even if they are not visible. In all cases, the sampling method should not be changed within one water body.

The pro-rata multi-habitat sampling technique does not replace other techniques. If the same habitat is present at all monitoring sites, pro-rata multi-habitat sampling is not necessary because samples can always be collected from this habitat and both reference values and samples associating different environmental qualities will also be based on samples from that habitat. Results will be more directly comparable between sites. Sampling from one habitat type reduces variation and, therefore, provides a more consistent overall assessment. It also avoids variation caused by observer bias in the assessment of habitat cover. The training burden is also reduced. The best habitat for practical and biological reasons are shallow riffles with gravel substrates.

If the same type of habitat is not present at every site, it may be necessary to sample from a selection of habitats. This approach is only practicable if at least one of the few habitats chosen to use are found in all monitoring sites. The steps that can be taken to make data comparable across samples taken by this approach are the same as for pro-rata MHS, such as expressing results as a proportion of their reference value, which can be based on reference sites or models covering the same combinations of habitats. Because not every habitat is sampled, this approach is not covered by this documents.

1 Scope

This document gives guidance on procedures for the pro-rata multi-habitat sampling of benthic macroinvertebrates in rivers and streams. The term “pro-rata” reflects the intention to sample all the main riverine habitats present at a monitoring site according to the proportion of the site that it covers. It is an objective way to divide sampling effort among the different habitats.

This guidance is applicable to all flowing waters, both artificial, modified and natural. This design enables comparable samples to be collected from any type of river, regardless of the habitats present.

The pro-rata multi-habitat sampling is an overall approach rather than a specific method.

This document is designed to:

— support environmental and conservation agencies to meet the monitoring requirements of the WFD (Article 8, Annex II, and Annex V);

— generate data sets appropriate for monitoring and reporting of sites designated under the Habitats Directive and the Birds Directive ensure that samples for comparing the overall composition of invertebrates from different stream types are comparable;

— ensure samples for environmental quality assessments across different stream types are comparable even when sampled by different people; and

— support river management and restoration initiatives.

The pro-rata multi-habitat sample (MHS) provides:

— a consistent way of sampling sites that is not dependent on the presence of particular types of habitat; and

— guidance on a user-friendly strategy for collecting biological data depending on the distribution of substrate type.

It is also ideal for:

— understanding the distribution of biological community types across different physical river types; and

— quality assessments based on deviation from reference, as adopted in the European Water Framework Directive.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 10870, *Water quality — Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters (ISO 10870)*

EN 17136, *Water quality - Guidance on field and laboratory procedures for quantitative analysis and identification of macroinvertebrates from inland surface waters*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp/ui/
- IEC Electropedia: available at https://www.electropedia.org/

3.1
airlift
sampling device that uses compressed air to dislodge macroinvertebrates from the stream bed and raise them into a collecting net

3.2
AQEM-STAR
development and testing of an integrated assessment system for the ecological quality of streams and rivers throughout Europe using benthic macroinvertebrates and standardization of river classifications, and the European Union's 4th and 5th framework research projects in which the AQEM-STAR sampling protocol was developed

3.3
dredge
sampling device that comprises a collecting net on a heavy frame that is dragged along the riverbed on the end of a rope or cable to collect macroinvertebrates

3.4
grab
sampling device with strong jaws that bite into the riverbed and enclose the sample, which can then be raised to the surface on a cable or rope

3.5
habitat
in the context of this document, it is a visibly distinct area of the stream of a specific grain size of the stream bed, plant community, debris, current speed and/or depth, in which different assemblages of macroinvertebrates are found

3.6
hand-net
sampling device comprising a collecting net on a rigid frame mounted on the end of a pole

3.7
heavily modified water body
HMWB
body of surface water which, as a result of physical alterations by human activity, is substantially changed in character

Note 1 to entry: Water bodies designated as HMWB in accordance with WFD have environmental quality objectives that accommodate the degradation in biological quality caused by the physical modification that is deemed desirable (for navigation, flood defence or other use).

3.8
Hess sampler
sampling device comprising a metal or plastic cylinder that can be driven into the riverbed to separate it, with a collecting net on one side and a screen on the opposite (front) side, which allows macroinvertebrates to flow into the collecting net when the stream bed within the cylinder is disturbed

3.9
macroinvertebrate
for the purposes of this document, it is an invertebrate animal that is retained on a 500 µm mesh, including insects, shrimps, snails and worms

3.10
microhabitat
for the purpose of this document, it is a habitat that cannot be distinguished visually

3.11
multi-habitat sample
MHS
a sample collected from more than one type of habitat; methods described in this document comprise sample units from all habitats present at a site

3.12
pro-rata
for the purpose of this document, proportional to the area of stream bed at the sampling site

3.13
reference value
the value of a metric or biotic index that a rive type has

Note 1 to entry: Minimally impacted WFD reference quality [10].

3.14
River Invertebrate Classification and Prediction System
RIVPACS
mathematical model to predicting reference values

3.15
sampling site
location, usually but not always a defined length or area of river, from which sampling units are collected

3.16
sampling unit
for the purposes of this document, a sub-ample from a specific habitat; multi-habitat samples usually comprise several sampling units; in STAR-AQEM samples, they are individual 0,25 × 0,25 m Surber sub-samples

3.17
Surber sampler
collecting net on a rigid frame with another frame at right angles that delimits an area (0,25 × 0,25 m) of the stream bed from which the sample is collected

3.18
type, river type
group of rivers characterized by geographical, natural chemical conditions that supports a particular type of macroinvertebrate assemblage

3.19
water body
stretch, stream or river of the same type, with similar risks of environmental pressure and requiring the same management actions to maintain or restore its quality

Note 1 to entry: This is the smallest geographical unit for management under WFD [11].

4 Description of the sampling approach

4.1 General

Samples shall be collected in a consistent way so that data from them is comparable. If sampling is not consistent, it is not possible to know if differences are because of variation in sampling or because of differences in the biological assemblages. Different biological results with different environmental conditions can only be associated by comparing them with results from comparable samples where a relationship has been established. Where environmental quality is measured by the deviation of a metric from its reference value (the value that it would have in reference conditions), monitoring samples shall be collected in exactly the same way as the reference samples against which they are to be compared.

Pro-rata multi-habitat sampling provides the greatest flexibility and allows any site to be used, provided it is adequately covered by reference sites or models.

The regional or national river monitoring networks in most countries shall cover diverse river types that have different combinations of habitats, and no single habitat type is present at every monitoring site from which samples could be collected. Here, pro-rata multi-habitat sampling enables the effects of differences in combinations of habitat to be taken into account in reference values as an integral part of typology. This is a fundamental requisite of some multi-metric assessment approaches used to evaluate the ecological status of running waters.

Pro-rata MHS is adopted almost universally for national and regional standard methods for river quality management and ecological status assessment. The pro-rata MHS methodology is based on Rapid Bioassessment Protocols [1], the RIVPACS procedures of the United Kingdom [2], the Austrian Guidelines for the Assessment of the Saprobiological Water Quality of Rivers and Streams [3], the AQEM sampling manual [4], the AQEM and STAR site protocol [5], the Austrian Standards M 6232 and M 6119-2 [6], [7], the German Standard DIN 38410-1 [8] and the French Standard NF T90-333 [9].

The concept of sampling all major habitats in proportion to their cover is simple to understand, so it is easy to give the same instruction to many different ecological surveyors with confidence that they will collect samples correctly, although they may use different techniques in different habitats. The use of this common concept increases comparability of samples collected by different observers.

This document also describes in a detailed manner how to sample different habitats that might be suitable for sampling approaches other than multi-habitat sampling.

4.2 Features common to all methods based on pro-rata multi-habitat sampling

4.2.1 Sampling site

The area or length of river that constitutes a sampling site shall be standardized. This affects the number of different habitats that will be sampled. At any particular site, it shall not be extended so that an additional habitat can be sampled.

4.2.2 Comparable size samples

This can be standardized by the total area sampled or sampling effort. Where different devices are used to collect samples from different types of sites (for example, Surber samples from shallow streams and airlift samples from deep rivers), they should, as far as practicable, be used in a way that collects samples of similar size (standardized by volume, area or effort). Small differences can be accommodated by the type-specific reference values being based on samples collected by the same device. However, if they are minimized, there are fewer problems of borderline sites being sampled by either method and this also helps ensure that they can be subject to the same data analysis.

4.2.3 Sampling device

Ideally, the sampling devices should be simple and quick to use to reduce cost and should be capable of sampling effectively from the majority of habitat and site types. All devices shall have collecting nets of the same mesh size specified by EN ISO 10870.

4.2.4 Sampling units

These are similar to sub-samples, but they are physically pooled on-site to create a single sample rather than being analysed separately. The sampling units are the minimum size sample that can be collected. It may be a single quadrat. When sample size is determined by sampling effort, there is still a minimum time that can be sampled that constitutes a sampling unit. For hand-nets, sampling units are usually a 10 to 15 s burst with a practicable minimum of about 5 s.