SLOVENSKI STANDARD
SIST EN 14407:2014

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Nadomešča:
SIST EN 14407:2005

Kakovost vode - Navodilo za identifikacijo in štetje vzorcev bentoških kremenastih alg rek in jezer

Water quality - Guidance for the identification and enumeration of benthic diatom samples from rivers and lakes

Wasserbeschaffenheit - Anleitung zur Bestimmung und Zählung von benthischen Kieselalgen in Fließgewässern und Seen

Qualité de l'eau - Guide pour l'identification et le dénombrement des échantillons de diatomées benthiques de rivières et de lacs

Ta slovenski standard je istoveten z: **EN 14407:2014**

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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

Water quality - Guidance for the identification and enumeration of benthic diatom samples from rivers and lakes

Qualité de l'eau - Guide pour l'identification et le dénombrement des échantillons de diatomées benthiques de rivières et de lacs

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

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Contents

Page

Foreword

This document (EN 14407:2014) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14407:2004.

This document contains the following technical changes compared with the previous edition:

— This European Standard is now also applicable for the identification, enumeration and interpretation of benthic diatoms in lakes, i.e. not only rivers.

— Informative Annex A “Example for quality assurance of diatom analyses from the UK” was added.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Diatoms are an important component of aquatic ecosystems and constitute a water quality monitoring tool where the primary objective is either a measure of ecological status or the impact of specific components of water quality (e.g. eutrophication, acidification). The requirement for the monitoring of such processes is inherent in the Water Framework Directive (2000/60/EC) and Urban Waste Water Treatment Directive (91/217/EEC) in addition to other EU Directives and international agreements. This European Standard covers aspects of identification and enumeration of the relative abundance of diatom taxa on prepared slides and of data interpretation relevant to assessment of water quality.

The use of diatoms as indicators of river and lake quality is widely accepted both in Europe and the USA. The methodology is based on the fact that all diatom species have tolerance limits and optima with respect to their preference for environmental conditions such as nutrients, organic pollution and acidity. Polluted waters will tend to support an increased abundance of those species whose optima correspond with the levels of the pollutant in question. Conversely, certain species are intolerant of elevated levels of one or more pollutants, whilst others can occur in a wide range of water qualities.

Methods using diatoms to assess water quality have been developed in several European countries (recent work is summarized in the proceedings of three symposia [4] to [6]. The methodologies for evaluating the diatom data vary but the sampling and preparation processes are similar [1].

According to the precise usage to which this European Standard is to be put it is essential for specifiers and users to mutually agree on any necessary variations or optional procedural details prior to use.

All numerical values given in this standard are approximate.

WARNING — Persons using this European Standard should be familiar with usual laboratory practice. This European Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory conditions.

1 Scope

This European Standard specifies methods for the identification and enumeration of relative proportions of diatom taxa on prepared slides and of data interpretation relevant to assessments of water quality in rivers and lakes. It is suitable for use with indices and assessment methods based on the relative abundance of taxa. The methods for identification and enumeration may also be applied to the study of benthic diatoms in other habitats provided that data interpretation methods appropriate to these habitats are used.

2 Terms and definitions

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

2.1
benthic diatoms
diatoms living on natural or artificial substrata, rather than suspended in the water column

2.2
ecological status
measure of the structure and functioning of aquatic communities

2.3
expected natural assemblage
assemblage present at a site when only natural stresses (e.g. floods) occur and man-made stress is not significant

2.4
eyepiece graticule
measuring device, inserted into one eyepiece of a microscope, permitting measurements of the size of objects

Note 1 to entry: The relationship between each division on the eyepiece graticule and the actual size of the object will depend upon the magnification of the microscope.

2.5
frustule
cell wall of diatoms, composed of silica and consisting of two valves linked by two or more girdle bands

2.6
habitat
specific environment in which an organism lives

2.7
prepared slide
slide plus coverslip on which has been mounted a sub-sample of diatoms

2.8
stage micrometer
special graticule in the form of a scale carried at natural size on a microscope slide which is used as an absolute standard of length for calibrating microscope measuring systems

[SOURCE: ISO 10934-1:2002, 2.96.1]

2.9
taxon (pl. taxa)
taxonomic units, for example families, genera or species

2.10
unit
either diatom valves or intact frustules

Note 1 to entry: The use of the term is depending upon the conventions adopted in 5.2.

2.11
valve
structural component of the diatom frustule

2.12
vernier scale
measuring device associated with the mechanical stage of a microscope, permitting the relative transverse and longitudinal position of a slide to be noted with a typical precision of about 0,1 mm

3 Principle

Benthic diatoms, cleaned of cell contents and mounted in a medium with a high refractive index, are identified and counted using a high power light microscope until an appropriate sample size has been obtained. These data are then interpreted using one or more indices or other assessment methods.

4 Apparatus

4.1 Light microscope, equipped with a mechanical stage and high power (e.g. 100 × magnification) oil-immersion lens.

Use of a phase contrast or differential interference (Nomarski) condenser is recommended. The microscope should incorporate facilities for measurements (e.g. an eyepiece graticule) with a scale division of at least 1 µm. Apparatus for photomicroscopy or video capture are useful for documentation of difficult specimens and can also assist with measurement of striae density, etc.

4.2 Floras, identification guides and iconographs, appropriate to the habitats under consideration (see 5.1).

4.3 Immersion oil and dispenser

4.4 Lens tissue

4.5 Facility for recording data as they are collected.

This may be a *pro forma* count sheet with a list of taxon names and space beside each on which the counts can be made or a laboratory notebook organized in such a way that taxon identities and numbers can be clearly recorded, or a computer program with facilities for direct entry of data.

The design of the count sheets or programs should take into account the requirements of any Quality Assurance programmes that are in place.

4.6 Facility for verifying the identity of difficult specimens

This can take several forms: drawings, high quality photomicrographs or captured video images may suffice. However, it is also useful to be able to relocate actual specimens. If taxonomic assistance is available “in house”, noting coordinates on the microscope’s Vernier scale may be sufficient. If another microscope is likely to be used, then a facility to record the absolute position of the specimen may be necessary.

5 Determining analytical strategy

5.1 Determining taxonomic criteria for analysis

Recent debates about the fundamentals of diatom taxonomy have led to the co-existence of parallel systems of nomenclature. It is important, when using diatoms for water quality assessments to ensure that any scope for confusion about the correct name to apply to a diatom is eliminated.

The minimum level of taxonomy that is acceptable for a study will be determined by the intended uses of the data. Most pollution indices require species-level identification, although some can be used with genera, or a mixture of genera and species.

Adopting the nomenclature of a comprehensive flora relevant to the study area is recommended; however, it is also possible to use a national or regional checklist of diatoms. When taxonomic conventions of the index and the checklist differ, the conventions of the index should be adjusted to those of the checklist. This should be done in advance and the correct nomenclature recorded in standard operating procedures. Taxonomic authorities along with the names of taxonomic reference works consulted should be cited in all cases where there is any potential for nomenclatural confusion.

5.2 Determining units for enumeration

Different conventions have evolved for enumeration of diatoms, either using valves or frustules as the basic unit, or not distinguishing between valves and frustules. It is important that the convention is specified and documented in advance.

Because of the distinct definition, the use of valves or frustules (two valves are the equivalent of one frustule) as basic units guarantees the universal comparability between studies and enables further analysis, e.g. the calculation of biomass considering reference data.

In the case of small diatoms, such as e.g. some *Achnanthes* and naviculoid species, it may not be possible to distinguish between intact frustules and isolated valves with certainty on all occasions. The effects of this uncertainty on the enumeration, the relative proportions of diatom taxa and further analysis is likely to be small.

If other definitions which do not distinguishing between valves and frustules (e.g. “objects”), are used as basic units it is essential to define the treatment of colonies and only partly separated frustules precisely. The comparability of such method specific enumeration techniques to other studies may be limited.

5.3 Determining sample size

The number of units necessary to compute diatom-based pollution indices will depend upon the uses to which the data are put. A typical count size is 300 units to 500 units, although lower or higher numbers may be appropriate for some purposes. Lower numbers may lack the statistical rigour necessary for some applications. The minimum and maximum number of units should be appropriate to the objectives of the study and should be specified in advance. Details of studies with a range of objectives may be found in references [4] to [7].

5.4 Determining approach to enumeration

The eyepiece graticule, or other measuring equipment, should be calibrated against a stage micrometer regularly. The results of this calibration should be displayed in a position where users of the microscope can consult them. A resolution of 1 µm is adequate for routine analyses. Imaging software connected to video capture equipment may also be used.

The second eyepiece may be equipped with a separate graticule to aid enumeration. This can take several forms: including a square grid, H-shape, Whipple field, etc. Options for enumeration are: