SLOVENSKI STANDARD
SIST EN 15110:2006

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Kakovost vode - Navodilo za vzorčenje zooplanktona v stoječih vodah

Water quality - Guidance standard for the sampling of zooplankton from standing waters

Wasserbeschaffenheit - Anleitung zur Probenahme von Zooplankton aus stehenden Gewässern

Qualité de l'eau - Guide pour l'échantillonnage du zooplancton dans les eaux stagnantes

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English Version

Water quality - Guidance standard for the sampling of zooplankton from standing waters

Qualité de l'eau - Guide pour l'échantillonnage du zooplancton dans les eaux stagnantes

Wasserbeschaffenheit - Anleitung zur Probenahme von Zooplankton aus stehenden Gewässern

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Foreword

This document (EN 15110:2006) 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of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

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

Introduction

Zooplankton community structure provides information on a range of physico-chemical and biotic causative variables. These include pH- and acidification-related variables, toxic chemicals, phytoplankton structure and abundance (i.e. lake productivity), and intensity of fish predation. The effects of size-selective predation are well known and the size-structure of zooplankton communities can give valuable information of the fish community.

Metazoan zooplankton (metazooplankton) constitute a large number of species within a range of total lengths of about 0,05 mm to 20 mm, but mostly < 2 mm. The main groups are the rotifers (Rotatoria), the cladocerans (Cladocera) and the copepods (Copepoda). Some shrimps (Natantia; e.g. Mysidae) and larvae of dipterans (Diptera, e.g. *Chaoborus*) may also be considered as part of the zooplankton fauna. Rotifers and crustaceans inhabiting the littoral of standing waters can also be grouped with the more strictly planktonic forms. Fish larvae, hemipterans (Heteroptera, e.g. Corixidae) and coleopterans (Coleoptera) are occasionally recorded in the plankton samples but are not considered as part of the zooplankton fauna. Procedures for sampling of protozooplankton (Protozoa) are not included in this standard.

Surveys of zooplankton have provided valuable information for the environmental monitoring of standing waters, because this group includes species which:

a) occur in a wide range of standing waters over a large geographical area and at the same time have specific environmental requirements;

b) are well known with regard to their geographical distribution and environmental requirements;

c) have a generally high capacity for dispersal enabling them to respond rapidly to remedial actions; while

d) sampling requires only a modest expenditure of time and equipment.

WARNING — Working in or around water is inherently dangerous. This 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.

NOTE According to the classification by Fryer [5] the assemblage long known as the Cladocera is split into four orders; Ctenopoda, Anomopoda, Onychopoda and Haplopoda. Cladocera is however used in this standard as a general descriptive term.

1 Scope

This guidance standard describes general procedures for surveying zooplankton in standing waters for the purposes of water quality assessment and determination of ecological status.

Guidance on sampling procedures and the subsequent steps for preservation and storage are given. The sampling procedures provide estimate for species occurrence and their abundance (relative or absolute), including spatial distribution and temporal trends, for a given body of water. Calculation of biomass and production is made possible.

This method is restricted to the sampling of multicellular zooplankton that inhabit the pelagic and littoral regions of lakes, reservoirs and ponds. The sampling procedure may be also employed in slow running waters and canals.

NOTE The field methods described are suitable for the collection of open-water plankton and littoral plankton species. They are inappropriate for the collection of littoral species that primarily live on or in the surface of sediments and on the surface of aquatic plants.

2 Normative references

The following referenced documents are indispensable for the application 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.

prEN 14996, *Water quality — Guidance on assuring the quality of biological and ecological assessments in the aquatic environment.*

EN 25667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes (ISO 5667-1:1980).*

EN ISO 5667-3, *Water quality - Sampling - Part 3: Guidance on the preservation and handling of water samples (ISO 5667-3:2003)*

3 Terms and definitions

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

3.1
anoxic
condition in which the concentration of dissolved oxygen is so low that certain groups of micro-organisms prefer oxidized forms of nitrogen, sulphur, or carbon as an electron acceptor

NOTE As the oxygen concentration approach zero the concentration of hydrogensulfide (H_2S), released by bacterial anaerobic (no oxygen present) activity, is increasing. The anoxic conditions markedly affect the cycling of other nutrients, ecosystem productivity, and the distribution of biota.

3.2
body of surface water
discrete and significant element of surface water such as a lake, reservoir, stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water [EC Directive 2000/60/EC]

3.3
dimictic lake
lake with spring and autumn turnovers (temperate lake)

3.4
epilimnion
water above the thermocline in a stratified body of water

3.5
fixation
protection from disintegration of the morphological structure of organisms

3.6
impact study
investigation of the physical, physico-chemical and biological consequences of a given intervention in a body of water

NOTE A study of consequences should be capable of forming a basis for the subsequent remedial measures.

3.7
habitat
locality in which a plant or animal naturally grows or lives

NOTE It can be either the geographical area over which it extends, or the particular station in which a specimen is found.

3.8
hypolimnion
water below the thermocline in a stratified body of water

3.9
littoral zone
shallow marginal zone of a body of water within which light penetrates to the bottom; usually colonised by rooted vegetation

3.10
metazoan
multicellular animals that develop from embryos

3.11
metazooplankton
multicellular zooplankton (see 3.21)

3.12
pelagic zone
free body of water beyond the littoral zone

3.13
plankton
organisms drifting or suspended in water, consisting chiefly of minute plants or animals, but including larger forms having only weak powers of locomotion

3.14
preservation
protection from (bio)chemical degradation of organic matter

3.15
sampling site (sampling station)
general area within a body of water from which samples are taken

NOTE A station is defined in terms of its location (geographical position, depth) and invariant conditions (e.g. type of bottom in shallow-water areas) and is delimited on the basis of the accuracy with which these are given. In cases of doubt when sampling stations have to be re-identified, most weight should be placed on depth and type of bottom.

3.16
stratified water
standing water with temperature gradients resulting in an upper, warmer, isothermal layer floating on cooler, denser, usually also isothermal water

NOTE Between the upper layer, the epilimnion, and the lower layer, the hypolimnion, is a transitional zone, the metalimnion (see thermocline). The thermal stratification may be very short-lived or persist for all of the warmer part of the year. Lakes with ice-cover during the cold season may show inverse stratification; an upper, cooler (< 4 ˚C) layer floating on warmer water. Water has its highest density at 4 ˚C and during stratification and inverse stratification the deeper water has a temperature of approximately 4 ˚C.

3.17
subsampling
collection of a sub-sample that consists of a known fraction of the total sample and that is representative of the quantity and species composition of the latter

3.18
thermocline (metalimnion)
layer in a thermally stratified body of water in which the temperature gradient is at a maximum

3.19
trend monitoring
study intended to reveal any changes in the ecological status of a body of water over time

3.20
turbidity
reduction of transparency of water caused by the presence of undissolved matter

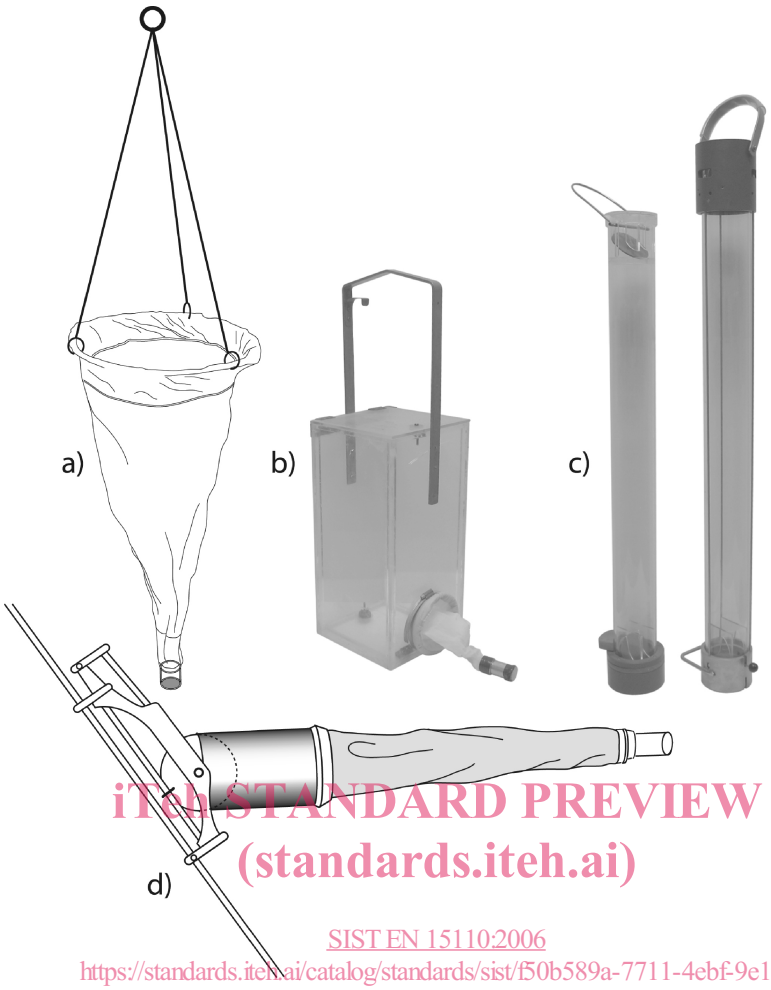
3.21
zooplankton
animals present in plankton

4 Principle

The sampling strategy adopted provides information on the current status of the metazooplankton community. The selection of sampling sites (numbers and location), sampling depth, time and frequency of sampling, size of samples and type of sampling gear is of great importance for the evaluation of the data collected. As a general guidance EN 25667-1 should be consulted.

5 Equipment

There exist several overviews of the most widely used zooplankton sampling techniques and their advantages and drawbacks (e.g. [1], [2], [3], [7], [8] and [13]). This standard provides some general recommendations.



Key

a conical plankton net
b Schindler trap
c modified Ramberg sampler
d Clarke-Bumpus sampler

Figure 1 — Examples of different zooplankton sampling equipment

5.1 Qualitative sampling

5.1.1 Nets

Nylon plankton nets of various dimensions and mesh sizes can be used for sampling (Figure 1a). It is important that nets should have a large filtering surface relative to their opening in order to ensure that filtering is as efficient as possible. A net with an opening diameter of 30 cm, for example, should have a length of about one metre as a minimum. A cylindrical net section above the conical part increase the filtering area compared with a conical plankton net with the same opening diameter and length.

If both rotifers and crustaceans are to be analysed, a net with a mesh of about 40 µm to 50 µm should be utilised. Nets with meshes smaller than 40 µm will readily become clogged and their use should normally be avoided, although they may be useful in oligotrophic waters. If only crustacean plankton are to be analysed a mesh of 90 µm (max. 100 µm) can be used. If both rotifers and crustaceans, including large predatory species, are to be sampled with a reasonable degree of efficiency, the use of three nets with different mesh sizes are

recommended: 45 µm for rotifers, 90 µm for most of the crustaceans, and 150 µm or more for the predatory species.

NOTE All the mesh sizes mentioned in this standard should be regarded as for guidance only. Mesh sizes will also vary somewhat from manufacturer to manufacturer.

5.1.2 Other field equipment

Winch with line-length counter or line with length markings fitted with a shackle or similar device to enable the line to be joined to the net.

Draining cup with nylon netting, which is capable of being attached to the net either by means of a tightening strip or tape sewn into the net. The netting of the draining cup should have the same mesh size as the net. A draining cup with hose and hose clamp can also be utilised.

Weight, e.g. a standard sounding lead weight.

Spray bottle with water for rinsing out the net and draining cup.

A small plastic funnel may be needed to transfer the sampled material to the sample bottle.

5.1.3 Optional equipment

Portable echo sounder or depth meter to estimate the water depth at a sampling site. The former may also be used to quantify large zooplankton species.

Global Positioning System (GPS) to define site location.

5.2 Quantitative sampling

5.2.1 Sampling equipment

For this purpose various types of volume samplers (bottles/traps/tubes) can be used (e.g. Schindler-Patalas trap or modified Ramberg sampler) (Figure 1b and 1c). Plankton nets with a closure mechanism and built-in water flow-through meter (e.g. Clarke-Bumpus sampler) (Figure 1d), plankton pumps (e.g. [10] or [14]) and flexible tubes (e.g. [9], [11]) can be used for obtaining vertically or horizontally integrated quantitative zooplankton samples. Echo sounder records can be used in the field to quantify large zooplankton species (e.g. *Chaoborus*). Several of the most widely used quantitative zooplankton samplers have been described in detail by [2] and [3].

Where volume samplers are concerned, a sampler should be chosen that allows a free flow of water when the sampler is not closed. It should also be possible to close the sampler rapidly, and the sampler should be as transparent as possible (plexiglas walls) in order to prevent avoidance by large plankton species with good vision and mobility. For the same reason, it is advantageous to use a sampler that is not too small (minimum 5 l). In locations with large populations of algae (nutrient-rich lakes), however, it may be advantageous to use a smaller model of volume sampler (e.g. a tube sampler of 3 l). Such samplers may also be suitable for use in lakes in locations that require equipment to be carried over long distances.

Motorised plankton pumps with continuous flow-through are recommended rather than hand-powered plankton pumps, because motorised pumps provide a regular flow, thus providing better estimates of the quantity and composition of the plankton. Large active plankton species are liable to be sampled less efficiently using a plankton pump than by other types of quantitative samplers. The opposite can be the case for small species. A large plastic funnel (diameter about 50 cm) at the end of the sampling tube may be useful in order to prevent escape of “jumping” copepods.

For practical and safety reasons, when deep lakes are being sampled, it may be more appropriate to use sampling equipment that allows efficient sampling of the whole water column (e.g. a plankton net with a closure mechanism or a plankton pump) rather than a volume sampler.