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Water quality - Guidance on methods for sampling invertebrates in the hyporheic zone of rivers

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

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EUROPEAN STANDARD

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NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

## Water quality - Guidance on methods for sampling invertebrates in the hyporheic zone of rivers

Qualité de l'eau - Lignes directrices relatives aux  
méthodes d'échantillonnage des invertébrés dans la  
zone hyporhéique des rivières

Wasserbeschaffenheit - Anleitung zu Methoden für die  
Probenahme von Invertebraten (Wirbellosen) in der  
hyporheischen Zone von Flüssen

This European Standard was approved by CEN on 20 February 2016.

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<b>Contents</b>	<b>Page</b>
European foreword.....	3
Introduction .....	4
1 Scope.....	6
2 Terms and definitions .....	6
3 Survey objectives .....	8
4 Sampling strategy.....	9
5 Sampling methods .....	10
5.1 General.....	10
5.2 Karaman-Chappuis pit .....	10
5.2.1 Description and operation.....	10
5.2.2 Species sampled.....	11
5.2.3 Environmental variables .....	11
5.3 Bou-Rouch pump.....	11
5.3.1 Description and operation.....	11
5.3.2 Species sampled.....	12
5.3.3 Environmental variables .....	13
5.4 Vacuum pump.....	13
5.4.1 Description and operation.....	13
5.4.2 Species sampled.....	15
5.4.3 Environmental variables .....	15
5.5 Standpipe trap.....	15
5.5.1 Description and operation.....	15
5.5.2 Species sampled.....	15
5.5.3 Environmental variables .....	15
5.6 Williams corer .....	16
5.6.1 Description and operation.....	16
5.6.2 Species sampled.....	16
5.6.3 Environmental variables .....	16
5.7 Colonization devices .....	17
5.7.1 Description and operation.....	17
5.7.2 Species sampled.....	19
5.7.3 Environmental variables .....	19
5.8 Freeze coring .....	19
5.8.1 Description and operation.....	19
5.8.2 Species sampled.....	20
5.8.3 Environmental variables .....	20
6 Sample processing .....	20
Annex A (informative) Examples of sampling strategies for three different types of investigation .....	21
A.1 Case Study 1 – Assessing regional biodiversity and species richness.....	21
A.2 Case Study 2 – Assessing impacts on fish spawning sites .....	21
A.3 Case Study 3 – Assessing the impacts of pollution .....	21
Bibliography.....	22

## European foreword

This document (EN 16772:2016) 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 October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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## Introduction

**WARNING — Safety issues are paramount when surveying rivers. Surveyors should conform to EU and national Health and Safety legislation, and any additional guidelines appropriate for working in or near rivers.**

The term “hyporheic” is derived from two Greek words: *hypo* (under) and *rheos* (flow), and was first used by Orghidan in 1959 [1] to delineate the area of saturated subsurface sediments beneath and lateral to the wetted channel that contains a mix of surface water and groundwater. In the past 50 years, scientific understanding of the hyporheic zone has improved [2] and the term has been modified and expanded by hydrologists, hydrogeologists, chemists and biologists to reflect the importance of:

- the upwelling and downwelling of water into and out of the stream bed and the mixing ratio of surface water and groundwater;
- the nature and rate of biogeochemical processes resulting from upwelling of interstitial water or downwelling of surface water;
- the ecotonal nature of the hyporheic zone which provides important habitat for benthic taxa, specialist hyporheic organisms and groundwater fauna, including macroinvertebrates, meiofauna and microorganisms. Meiofauna includes microcrustaceans, rotifers and nematodes as well early instars of many aquatic insects.

In this standard the hyporheic zone is defined as the spatio-temporally dynamic ecotone between the surficial benthic substrate and the underlying aquifer. Within the hyporheic zone, water, solutes and biota are exchanged with the stream above, the groundwater below and the saturated sediments lateral to the channel. The term “hyporheic zone” is applied to the physical habitat while the term “hyporheos” coined by Williams and Hynes in 1974 [3] is used to describe the faunal community inhabiting it.

Over the past few decades, the importance of the hyporheic zone has been increasingly recognized, with the vertical dimension added to spatial concepts of lateral and longitudinal connectivity. Together with the temporal dimension this has created a four-dimensional understanding of river ecosystems [4, 5, 6]. As the hyporheic zone is an ecotone between surface water and groundwater, abiotic conditions may reflect a transition between the two. Table 1 provides a general comparison of the physical characteristics of each environment.

**Table 1 — Physical characteristics of typical groundwater and hyporheic environments compared with surface waters**

Physical characteristic	Groundwater	Hyporheic
Light	Constant darkness	Constant darkness
Current velocity	Much lower	Lower
Annual and daily temperature range	Much smaller	Smaller
Substrate stability	Much higher	Higher

Approaches to river conservation and management recognize the need for a better understanding of the interactions between surface water and groundwater when undertaking investigations in the field. As the ecotone between the two, the hyporheic zone plays a vital part in ecosystem functioning in many rivers, including a critical role in the flow of energy, cycling of nutrients and organic compounds, as well as pollution attenuation. The hyporheic zone contributes to overall river biodiversity. It also provides a nursery for young life-stages of some fish and invertebrates and a potential refuge for benthos during adverse environmental conditions, such as flooding, low flows, chemical pollution, stream-bed drying or freezing. The hyporheic zone may therefore enhance the recovery of the benthic community following disturbance.

An increased interest in the hyporheic zone has resulted, in part, from international legislation, such as EC directives: the Habitats Directive [7], the Water Framework Directive [8], the Groundwater Directive [9] and the Nitrates Directive [10]. Although investigations into the hyporheic zone are not explicit within these directives, they do require national regulatory authorities to adopt a more integrated approach to the management of river catchments as a whole. Consequently, an understanding of the hyporheic zone, including its functions and the potential threats to these, is vital in order to comply fully with the requirements of these directives.

Investigations of the hyporheic zone may also be needed more generally for catchment management, river restoration, site-based investigations or for research. Consequently, the purpose of any study should be carefully considered when selecting the most appropriate method for sampling the hyporheos, especially if the collection of water quality and associated sediment data is also required. In addition, the methods described in this standard may require modification to reflect local conditions.

## 1 Scope

This European Standard provides guidance on methods for sampling invertebrates in the hyporheic zone of wadable rivers. It describes each method, including details of the equipment involved and its use in the field. Guidance is given on developing a sampling strategy and selecting an appropriate survey technique for the purpose of investigation.

NOTE Benthic macroinvertebrate sampling is covered by other published standards (see Bibliography). Selected literature with references in support of this document is given in the Bibliography

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