

Environmental Science

Series Editors: R Allan • U. Förstner • W. Salomons

M.C. Th. Scholten, E.M. Foekema,
H.P. Van Dokkum, N.H.B.M. Kaag and
R.G. Jak

Eutrophication Management and Ecotoxicology

With 75 Figures

 Springer

MARTIN C.TH. SCHOLTEN
EDWIN M. FOEKEMA
HENNO P. VAN DOKKUM
NICOLAAS H.B.M. KAAG
ROBBERT G. JAK
TNO-MEP
P.O. BOX 57
1780 AB, DEN HELDER

THE NETHERLANDS

E-MAIL:
H.VANDOKKUM@MEP.TNO.NL

ISSN 1431-6250
ISBN 3-540-22210-3 **Springer Berlin Heidelberg New York**

Library of Congress Control Number: 2004114232

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media
springeronline.com
© Springer-Verlag Berlin Heidelberg 2005
Printed in Germany

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Cover design: E. Kirchner, Heidelberg
Production: A. Oelschläger
Typesetting: Camera-ready by PTP-Berlin
Printing: Mercedes-Druck, Berlin
Binding: Stein + Lehmann, Berlin

Printed on acid-free paper 30/2132/AO 5 4 3 2 1 0

Table of Contents

1 Eutrophication and the Ecosystem	1
1.1 Background.....	1
1.2 Eutrophic and Eutrophicated Waters.....	2
1.3 Trophic Cascades in Freshwaters	5
1.4 Eutrophicated Waters: Disturbed Trophic Cascades	13
2 Daphnid Grazing Ecology	21
2.1 Daphnids and Their Ecological Role.....	21
2.2 Daphnid Grazing Effectiveness – Concept and Measurement	38
2.3 Modelling Daphnid Grazing Effectiveness	49
3 Toxic Reduction of Daphnid Grazing Effectiveness	57
3.1 Daphnid Ecotoxicology	57
3.2 Observations from Mesocosm Studies	62
3.3 Daphnid Grazing Effectiveness in Response to Toxicant Exposure	72
4 Field Observations of Daphnid Grazing	81
4.1 Two Different Lakes in Holland	81
4.2 The Plankton Dynamics in Lake Geestmerambacht	82
4.3 The Plankton Dynamics in Lake Amstelmeer	89
4.4 What Can Be Learned from These Lakes?	91
5 New Perspectives for Eutrophication Management.....	97
5.1 A New Dimension in Lake Eutrophication Management	97
5.2 How to Address Ecotoxicology in Eutrophication Management.....	102
5.3 Epilogue	108
Acknowledgements	111
References	113