

Environmental Degradation of the Black Sea: Challenges and Remedies

NATO Science Series

A Series presenting the results of activities sponsored by the NATO Science Committee. The Series is published by IOS Press and Kluwer Academic Publishers, in conjunction with the NATO Scientific Affairs Division.

- | | |
|--|----------------------------|
| A. Life Sciences | IOS Press |
| B. Physics | Kluwer Academic Publishers |
| C. Mathematical and Physical Sciences | Kluwer Academic Publishers |
| D. Behavioural and Social Sciences | Kluwer Academic Publishers |
| E. Applied Sciences | Kluwer Academic Publishers |
| F. Computer and Systems Sciences | IOS Press |
| | |
| 1. Disarmament Technologies | Kluwer Academic Publishers |
| 2. Environmental Security | Kluwer Academic Publishers |
| 3. High Technology | Kluwer Academic Publishers |
| 4. Science and Technology Policy | IOS Press |
| 5. Computer Networking | IOS Press |

NATO-PCO-DATA BASE

The NATO Science Series continues the series of books published formerly in the NATO ASI Series. An electronic index to the NATO ASI Series provides full bibliographical references (with keywords and/or abstracts) to more than 50000 contributions from international scientists published in all sections of the NATO ASI Series.

Access to the NATO-PCO-DATA BASE is possible via CD-ROM "NATO-PCO-DATA BASE" with user-friendly retrieval software in English, French and German (WTV GmbH and DATAWARE Technologies Inc. 1989).

The CD-ROM of the NATO ASI Series can be ordered from: PCO, Overijse, Belgium



Environmental Degradation of the Black Sea: Challenges and Remedies

edited by

Sükrü T. Beşiktepe

Institute of Marine Sciences, METU,
Erdemli, İçel, Turkey

Ümit Ünlüata

Institute of Marine Sciences, METU,
Erdemli, İçel, Turkey

and

Alexandru S. Bologa

Romanian Marine Research Institute,
Constanta, Romania



Springer Science+Business Media, B.V.

Proceedings of the NATO Advanced Research Workshop on
Environmental Degradation of the Black Sea: Challenges and Remedies
Constanta-Mamaia, Romania
6–10 October 1997

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 978-0-7923-5676-9 ISBN 978-94-011-4568-8 (eBook)

DOI 10.1007/978-94-011-4568-8

Printed on acid-free paper

All Rights Reserved
© 1999 Springer Science+Business Media Dordrecht
Originally published by Kluwer Academic Publishers in 1999

No part of the material protected by this copyright notice may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage and retrieval system, without written permission from the copyright owner.

TABLE OF CONTENTS

Preface	vii
Origin of the Black Sea <i>N. Görür</i>	1
Geochemistry of the Late Pleistocene-Holocene Sediments of the Black Sea: An Overview <i>M. N. Çağatay</i>	9
Importance of Sedimentary Processes in Environmental Changes: Lower River Danube - Danube Delta - Western Black Sea System <i>N.Panin, D.C. Jipa, M.T. Gomoiu, D. Secieru</i>	23
Characteristic Chemical Features and Biogeochemical Cycles in the Black Sea <i>Ö. Baştürk, E. Yakushev, S. Tuğrul , İ. Salihoğlu</i>	43
Eutrophication: A Plausible Cause for Changes in Hydrochemical Structure of the Black Sea Anoxic Layer <i>S.K. Konovalov, L.I. Ivanov, J.W. Murray, L.V. Eremeeva</i>	61
The Suboxic Zone of the Black Sea <i>J. W. Murray, B. Lee, John Bullister, George W. Luther, III</i>	75
An Approach to Modelling Anoxic Conditions in the Black Sea <i>E. V. Yakushev</i>	93
Temporal (Seasonal and Interannual) Changes of Ecosystem of the Open Waters of the Black Sea <i>M.E. Vinogradov, E. A. Shushkina, A.S. Mikaelyan, N.P. Nezlin</i>	109
Distribution of Planktonic Primary Production in the Black Sea <i>A. S. Bologa, P. T. Frangopol, V. I. Vedernikov, L. V. Stelmakh, O. A. Yunev, A. Yilmaz, T. Oguz</i>	131
Fluctuations of Pelagic Species of the Open Black Sea during 1980-1995 and Possible Teleconnections <i>U. Niermann, A. E. Kideys, A.V. Kovalev, V. Melnikov, V. Belokopytov</i>	147
Status and Evolution of the Romanian Black Sea Coastal Ecosystem <i>Petranu, M. Apas, N. Bodeanu, A. S. Bologa, C. Dumitrache, M. Moldoveanu , G. Radu, V. Tiganus</i>	175

Modeling the Black Sea Pelagic Ecosystem and Biogeochemical Structure: A Synthesis of Recent Activities <i>T. Oguz, U. Unluata, H. W. Ducklow, P. Malanotte-Rizzoli</i>	197
Satellite Altimetry Observations of the Black Sea <i>G.K. Korotaev, O. A. Saenko, C. J. Koblinsky, V. V. Knysh</i>	225
Hydro-Optical Studies of the Black Sea: History and Status <i>V.L. Vladimirov, V.I. Mankovsky, M.V. Solov'ev, A.V. Mishonov, S. T. Besiktepe</i>	245
Influence of Anthropogenic Impact on the Physiology of Some Black Sea Fish Species <i>G. E. Shulman, A. YA. Stolbov, E. V. Ivleva., V. YA. Shchepkin, G. S. Minyuk</i>	257
International Mussel Watch (UNESCO/IOC) in the Black Sea: A Pilot Study for Biological Effects and Contaminant Residues <i>M. N. Moore, D. M. Lowe, R. J. Wedderburn, T. Wade, G. Balashov, H. Büyükgüngör, Y. Daurova, Y. Denga, E. Kostylev, P. Mihnea, S. Moncheva, S. Tabagari, C. Ciocan, H. Özkoc, M. H. Depledge</i>	273
Database and Database Management System of the TU-Black Sea Project <i>V.L. Vladimirov, S. T. Besiktepe, D. G. Aubrey</i>	291
GIS for Regional Seas Programmes: A Case Study: the Black Sea <i>V. O. Mamaev, D. G. Aubrey, O. Musin</i>	303
Towards Development of an Operational Marine Services System in the Black Sea <i>V. Ryabinin, M. Popova, J. Poitevin, P. Daniel, A. Frolov, G. Kortchev</i>	317
Oil Contingency Plans for Naval Activities <i>P. Hankins, F. Touchstone, B. Hanion</i>	337
The Black Sea Contingency Planning for Marine Oil Spills <i>L. Stoyanov, D. Dorogan, S. Jelescu</i>	351
Romanian Contributions to ongoing Black Sea Research and Management Programmes <i>A. S. Bologa</i>	367
Working Groups Reports	377
List of Participants	387

PREFACE

The Black Sea presently faces severe ecological disequilibrium due primarily to eutrophication and other types of contaminants, from atmospheric, river and landbased sources. Major contaminants include nutrients, pesticides, hydrocarbons and heavy metals. Among the most critical contemporary concerns are eutrophication and associated deterioration of water quality, plankton blooms, hypoxia and anoxia, loss of biodiversity and decline of living resources.

A better understanding of conditions leading to eutrophication and of the associated changes during the last four decades, is being carried out at national, regional and international levels. High quality scientific research has been conducted in all Black Sea riparian countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey, Ukraine). In addition, several successful regional research programmes (e.g., CoMSBlack, NATO-TU Black Sea, NATO-TU Waves, EC-EROS 2000 Phase III, IOC-Black Sea Regional Center with Pilot Projects 1/2) and one major environmental management program (GEF-BSEP) have been successfully launched.

New international efforts like the Black Sea Commission, the Black Sea Program Coordination Unit, the Black Sea Economic Cooperation (all situated in Istanbul), together with the Convention for the Protection of the Black Sea against Pollution (Bucharest, 1992) and the Odessa Interministerial Declaration (1993) attest to the economic and political importance of these problems and the attention presently paid to this endangered sea.

The purpose of the ARW was to synthesize the present knowledge based on the past and the ongoing research, technology and management programs, the most recent field and laboratory results, and the progress achieved in regional communication, networking and the creation of data base management systems for the Black Sea. The transboundary environmental issues were highlighted by the key speakers who reviewed the most relevant environmental questions, sharing data and approaches, and discussed ways to promote interdisciplinary and international efforts for identifying remedies for the near future. The ARW identified future research needs and a framework for a continuous ocean observing system and forecast capabilities for the Black Sea in parallel with developments in modern ocean science.

Each presentation have focused on different aspect of the Black Sea oceanography and therefore wide range of topics from oil spills to geology, from observational ecological processes to modeling were covered. Papers presented in the workshop can be divided into two groups as scientific papers addressing environmental degradation of the Black Sea and reports on the achievements of the existing international programs

Thanks are expressed to all participants of the workshop and the contributors to this volume. All ao the participants contributed to the working group discussions and prepared reports at the end of this book. We thank the NATO Science Committee for giving us opportunity to carry out this Workshop. We should like to express our sincere appreciation to Dr. L. Veiga da Cunha, Director for the Priority Area on Environment of the Scientific and Environmental Affairs Division of the NATO, for his support

The editors