

Aquatic Sciences in the Tropics

Inland Waters, Domain and Nutrient Geochemistry

B.B. Jana

Former Professor and Head of the Department of Zoology
Emeritus Fellow, UGC and AICTE, Coordinator of Microbiology
Vice-Chairman, International Centre for Ecological Engineering
University of Kalyani, Kalyani
West Bengal, India

and

Adjunct Professor
Indian Institute of Technology
Kharagpur, West Bengal, India



CRC Press

Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business
A SCIENCE PUBLISHERS BOOK

Contents

<i>Preface</i>	v
1. Anatomy of Waters	1
1.1 Water as a Substance	3
1.2 Water as a Medium	17
1.3 Fundamentals of Global Water Distribution and Hydrologic Cycle	26
1.4 Economics of Water and Challenges	36
2. The Horizon of Tropical World	51
2.1 The Environment	53
2.2 Tropical Environment	58
2.3 Concept of Biosphere and Aquatic Biome	66
2.4 Tropical Aquatic Bionetwork	73
2.5 Tropical Limnology	79
3. Inland Water Resources	87
3.1 Origin of Lakes	89
3.2 General Classification of Lakes	97
3.3 Tropical Lakes	102
3.4 Lake Morphometry	106
3.5 Morpho Edaphic Index (MEI)	114
3.6 Trophic State Index of Lakes	121
3.7 Wetlands	127
3.8 Mangroves	148
4. Lotic Environment	159
4.1 Concept of Stream Order	161
4.2 Streams and Rivers	173
4.3 The River Continuum Concept (RCC)	185
4.4 Physico-chemical and Biological Features of Streams	188
4.5 Adaptations of Hill Stream Fishes	196
5. Light and Temperature Domain	205
5.1 Light as an Entity	207
5.2 Thermal Regime	222
5.3 Thermal Stratification	232
5.4 Lake Mixing, Turnover and Circulation	237
6. Inorganic Carbon Complex and Buffer System	245
6.1 Sources of CO ₂ in Inland Waters	247
6.2 Hydrogen Ion Concentration	253
6.3 The CO ₂ -CO ₃ -HCO ₃ System	261
6.4 Alkalinity	267
6.5 Hardness	280

7. Dissolved Oxygen Complex	287
7.1 Dissolved Oxygen	289
7.2 Oxidation and Reduction Potential	303
8. Major Ions	313
8.1 Total Dissolved Solids (TDS)	315
8.2 Dissolved Organic Carbon (DOC)	322
9. Nutrient Geochemistry	333
9.1 Origin of Atmospheric Gases	335
9.2 Carbon and Carbon Cycle	342
9.3 Nitrogen	348
9.4 Nitrogen Fixation	352
9.5 Ammonification	366
9.6 Nitrification and Comammox	378
9.7 Denitrification and Anammox	393
9.8 Phosphorus	406
9.9 Sulphur	424
References	437
<i>Index</i>	491
<i>Author's Biography</i>	541