
Preface

Respiration, in its various biochemical manifestations, is the process by which all organisms obtain vital energy from a variety of reduced compounds, and represents the largest sink of organic matter in the biosphere. Although respiration is at the center of the functioning of ecosystems, much of contemporary ecology has chosen to focus attention and research on the productive processes rather than on catabolism. Almost certainly, respiration represents a major area of ignorance in our understanding of the global carbon cycle. We decided to embark on this project during the 2000 ASLO meeting in Copenhagen, right after a session on aquatic respiration organized by Erik Smith and one of us. To our knowledge, it was among the first sessions entirely devoted to aquatic respiration at an international meeting, and although we had hoped to attract some interest, we never expected to fill the largest room in the conference center! It became clear that there was a tremendous interest in the topic within the aquatic scientific community, and that there was a need for synthesis and direction in this area of research. No textbook that had reviewed and synthesized the extant information on respiration in natural aquatic systems, independent of production or other traditional areas of focus. In spite of its obvious ecological and biogeochemical importance, most oceanographic and limnological textbooks usually deal with respiration superficially and only as an extension of production. We set out to fill this gap and provide the first comprehensive review of respiration in aquatic systems, with the help of an outstanding and diverse group of researchers who laid down a biochemical basis, examined the patterns and scales of respiration in diverse aquatic ecosystems. The result is a synthesis that spans the major aquatic ecosystems of the biosphere, and an in-depth analysis of the current state of understanding of respiration in aquatic systems. It is our hope that this collective effort will help establish the main scientific questions and challenges that face this particular field, and more important, help bring respiration into focus as a priority area of future research.

The book is mainly directed to respiration occurring in the water column of aquatic systems, because there are other excellent textbooks that extensively discuss sediment metabolism. Sediment respiration is discussed in the broader context in individual chapters, as part of the specific aim of integrating water column and benthic metabolic processes. We first (Chapters 1-5) lay down a basis to understand respiration within major categories of organisms, the photoautotrophs, the bacteria, the protozoa and the planktonic metazoa. We then (Chapters 6-12) consider the process in a series of aquatic ecosystems and the current status of attempts to model respiration in various plankton groups (Chapter 13). As the book progresses we shall seek to assess the current state of knowledge concerning respiration in aquatic ecosystems, and to address a series of questions that are key to understanding this process at the ecosystem and biospheric level.

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