

PHOTOSYNTHESIS AND PHOTORESPIRATION OF MARINE ANGIOSPERMS

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ABSTRACT

Beer, S., 1989. Photosynthesis and photorespiration of marine angiosperms. *Aquat. Bot.*, 34: 153–166.

The marine angiosperms, or seagrasses, constitute a small but important plant group, common to many coastal habitats. In spite of their high productivity within near-shore ecosystems, the photosynthetic mechanisms of these plants have received relatively little investigation.

The exogenous inorganic carbon form utilized by seagrasses is either CO_2 and HCO_3^- or, according to another view and/or depending on species, CO_2 only. In both cases, ambient CO_2 concentrations limit photosynthetic rates at saturating light. In species using HCO_3^- , this is owing to a rather ineffective HCO_3^- -utilization system; although seawater contains sufficient HCO_3^- to saturate photosynthesis, photosynthetic rates are strongly enhanced by additional CO_2 .

Seagrasses are characterized by relatively high $^{13}\text{C}/^{12}\text{C}$ ratios, and net photosynthetic rates do not appear to be strongly influenced by photorespiration. However, photosynthetic C_4 acid metabolism is not common within this plant group; most species investigated show a more or less typical C_3 incorporation pattern of inorganic carbon. Such an apparently contradictory behaviour could be explained by the photosynthetic carbon assimilation system being "enclosed" by the unstirred water layer surrounding the leaves and/or by an alternate CO_2 concentrating mechanism. This would lead to efficient refixation of photorespired CO_2 and alleviate the ability of ribulose biphosphate carboxylase-oxygenase both to act as an oxygenase and to discriminate against ^{13}C .

Effects of environmental parameters such as light and temperature on biochemical pathways can presently not be evaluated; instead, these parameters are discussed only as affecting photosynthetic rates and productivity. Many species feature low light compensation and saturation levels such as are found in shade-adapted plants. Others show higher saturation levels suggestive of light limitations even at shallow depths. It seems that most seagrasses have temperature optima for both photosynthesis and growth at around 30°C . High ambient salt concentrations are reduced in the metabolically active epidermal cells by compartmentalization into underlying cell layers. In cases where light is not a limiting factor for growth, high hydrostatic pressure at increasing depths may limit growth by deviating the flow of photosynthetically derived O_2 out of the lacunae rather than downwards to sustain root growth.

Photorespiration In Marine Plants

C. B. Osmond, N. Edward Tolbert



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Photorespiration in Marine Plants Great Barrier Reef Photorespiration expedition, 1973,1976 Reported from members of the Great Barrier Reef Photorespiration Expedition of 1973 Photorespiration in Marine Plants N. Edward Tolbert,Charles Barry Osmond,1976 Reported from members of the Great Barrier Reef Photorespiration Expedition of 1973

Photorespiration in Marine Plants C. B. Osmond,N. Edward Tolbert,1976 **Photorespiration in Marine Plants** John Edward Burris,1976 **Aquatic Photosynthetic Organisms under Global Change** Benoit Schoefs,Justine Marchand,2025-02-05 Like land photosynthetic organisms aquatic photosynthetic organisms constitute the base of most food chains and therefore provide essential ecosystem services the production of oxygen fixation of carbon dioxide re cycling of nutrients among many others Unfortunately these ecosystems are not immune to the upheavals induced by human activities eutrophication acidification and rising temperatures which jeopardize the performance of these services though crucial Many data in the literature identify and describe in detail these modifications However disentangling involved in the degree of sensitivity to variations in environmental factors linked to climate change remains a difficult task **Marine Research, 1973** United States. National Oceanic and Atmospheric Administration,1973 **Marine Research** ,1973

Photorespiration in Marine Plants ,1976 **Systems Biology of Marine Ecosystems** Manoj Kumar,Peter Ralph,2017-10-17 This book describes the latest advances in systems biology in four plant based marine ecosystems seaweeds seagrasses microalgae and corals Marine organisms that inhabit the oceanic environment experience a diverse range of environmental fluctuations anthropogenic stress and threats from invasive species and pathogens System biology integrates physiology genomics transcriptomics proteomics and metabolomics into numerical models and is emerging as an important approach to elucidate the functional adaptations of marine organisms to adverse environmental conditions This book focuses on how ecophysiology omics platforms their integration a systems biology perspective and next generation sequencing tools are being used to address the stress response of marine seaweeds seagrasses corals marine microbe diversity and micro and macroalgae corals bacterial interactions to global climate change and anthropogenic activities The contents of the book are of special interest to graduate and postgraduate marine biology students and marine biology researchers particularly those interested in marine ecology stress physiology of marine macrophytes corals phytoplankton and environmental microbiology This book would also be of interest to marine engineers engaged in the management and conservation of our valuable marine resources The Biology of Aquatic and Wetland Plants Gary N. Ervin,2023-04-26 Aquatic plants play a critically important role in maintaining ecosystem health They are natural biological filters in freshwater and estuarine wetlands they contribute to the reproductive success of many organisms some of which are harvested for food they assist in flood control and they are prominent elements in the aesthetics and recreational use of freshwater and estuarine habitats Despite this globally recognized importance wetlands have faced and continue to face

threats from the encroachment of human activities The Biology of Aquatic and Wetland Plants is a thorough and up to date textbook devoted to these plants and their interactions with the environment The focus is on botanical diversity from the perspective of evolutionary relationships emphasizing the role of evolution in shaping adaptations to the aquatic environment By incorporating recent findings on the phylogeny of green plants with special emphasis on the angiosperms the text is broadly useful for courses in plant biology physiology and ecology Additionally a chapter on population biology and evolutionary ecology complements the evolutionary backdrop of hydrophyte biology by examining the details of speciation and applications of modern genetic approaches to aquatic plant conservation Key Features Synthesizes recent and seminal literature on aquatic and wetland plants Emphasizes evolutionary history as a factor influencing adaptations to the wetland environment Provides a global perspective on plant diversity and threats facing wetland ecosystems Highlights research needs in the field of aquatic and wetland plant biology Includes 280 figures with more than 300 color photographs and 41 tables to provide ease of access to important concepts and information

The Biosaline Concept Alexander Hollaender, 2012-12-06 There are many areas on this world which might lend themselves to agricultural development and which are at the present not used for this purpose Two of the most obvious are desert areas where the salt concentration is very high both land and water areas With the development of new approaches and careful research considerably more productive capability could be developed in these This volume points out some of the possible approaches as well as results obtained by a combination of creative research practical understanding of the problems involved and inventive ways to overcome some of the handicaps of utilizing biosaline areas This volume grew out of the International Workshop on Biosaline Research organized by Mr Gilbert Devey of the Division of International programs of the National Science Foundation and directed by Dr Anthony San Pietro of the Department of Biology of Indiana University Since the proceedings of the workshop appeared somewhat limited it was thought to broaden the spectra of chapters and include several topics briefly discussed at the Kiawah workshop

Photorespiration and Release of Organic Carbon in Submersed Aquatic Vascular Plants Richard Anton Hough, 1973 Nitrogen and Carbon Metabolism J. Derek Bewley, 2012-12-06 This book results from a symposium on the theme of The Physiology and Biochemistry of Plant Productivity which was held at the University of Calgary from July 14 18 1980 and was jointly sponsored by the Canadian Society of Plant Physiologists and the International Association of Plant Physiologists The subject matter of the book deals with various aspects of nitrogen and carbon metabolism their interrelationships and interdependence The topics covered in the chapters highlight various interesting and important lines of research that are in progress There is no attempt to provide a comprehensive coverage of the basic physiological knowledge upon which this research depend important references are to be found at the end of each chapter however and the reader will be able to pursue these as necessary An introductory chapter by Dr R G S Bidwell winner of the C S P P Gold Medal in 1979 considers some implications of plant physiological research and the aims and responsibilities of plant

physiologists In the next two chapters Drs J Rigaud and L E Schrader with R J Thomas elaborate on current research on nitrate metabolism and nitrogen fixation and how an understanding of these phenomena might be usefully applied towards the manipulation of plants to improve productivity Dr J S *Primary Productivity in the Sea* Paul Falkowski, 2013-03-09 Primary productivity in the sea accounts for 30% of the total global annual production Holistic understanding of the factors determining marine productivity requires detailed knowledge of algal physiology and of hydrodynamics Traditionally studies of aquatic primary productivity have been conducted by workers in two major schools experimental laboratory biology and empirical field ecology Here an attempt was made to bring together people from both schools to share information and concepts each author was charged with reviewing his field of expertise The scope of the Symposium is broad which we feel is its strength We gratefully acknowledge financial support from the Department of Energy the United States Environmental Protection Agency the National Oceanic and Atmospheric Administration including the NMFS Northeast Fisheries Center and the MESA New York Bight Project Thanks are due to Mrs Margaret Dienes without whose editorial skills this volume could not have been produced and to Mrs Helen Kondratuk as Symposium Coordinator Finally we wish to record our indebtedness to Dr Alexander Hollaender for his tireless efforts and valuable advice in supporting all aspects of this Symposium

University of California Sea Grant College Program Directory, 1974 - 1975 University of California (System). Sea Grant College Program, 1974 *Brookhaven Symposia in Biology* Brookhaven National Laboratory, 1980 Includes bibliographies Annual Report - Institute of Marine Resources University of California (System). Institute of Marine Resources, 1978

Review of Existing Information on Fishes in the Deep Ocean Mining Environmental Study (DOMES) Area of the Tropical Pacific Maurice Blackburn, 1976 **The Biology of Seaweeds** Christopher S. Lobban, Michael James Wynne, Lobban, 1981-01-01 Vegetation of inland waters J. J. Symoens, 2012-12-06 By 1988 the Handbook of Vegetation Science is well on its way to completion With 7 volumes in circulation 3 volumes in the press and most of the remaining volumes in preparation it appears that the total task can be completed in the early nineties I am especially thankful to Professor Symoens for accepting the task of editing the volume on aquatic vegetation The main emphasis of work in phytosociology is devoted to land plants yet the landscape analysis remains incomplete without the consideration of rivers and lakes A volume on inland aquatic vegetation must therefore be most helpful to the land vegetation analyst and not only to the specialist on aquatic vegetation Professor Symoens succeeded in drafting the most competent team for his task I am sure that all colleagues working in vegetation analysis will be grateful to them that they have taken the time and energy to complete their chapters Handbook articles are not easy to write and certainly not easy to edit in the landscape are treated The major aquatic components vegetation analysts will welcome the fact that certain physiological and ecological processes of water plants are covered for which otherwise they would have to consult the limnological literature This volume together with the forthcoming volume on wetlands should completely cover the inland aquatic vegetation problematic

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