



BOOK REVIEWS

Saltmarshes, Morphodynamics, Conservation and Engineering Significance, J.R.L. Allen and K. Pye (eds), 1992. Cambridge: Cambridge University Press, 184p. ISBN 0-521-41841-0.

Saltmarshes grow in coastal areas, which support a diverse community of salt-tolerant plants, submerged daily during high tides. They grade seaward into mudflats. In recent years, attitudes toward saltmarshes have changed considerably from the traditional view of a wasteland fit only for reclamation. There is a growing appreciation of the ecological importance of saltmarshes as breeding sites and feeding grounds for a wide variety of migrating birds, water fowl and other wildlife. Furthermore, saltmarshes serve as defense zones to buffer the impacts of storm waves and surges, a role of increasing importance in view of anticipated sea level rise. Saltmarshes occupy some 44,400 ha in Great Britain, covering around 20% of the coastline, predominantly in estuaries of east-southeast and northwest England. Although around 80% of British saltmarshes are protected by environmental legislation, they are threatened on the seaward side by increased erosion and submergence, and on the landward side, by land development.

This book is based on a workshop on "Morphodynamics, Conservation and Engineering Significance of Saltmarshes," held at the University of Reading, England, on April 24, 1991. The workshop was held to review existing knowledge, recommend further research, and present the findings, chiefly from Great Britain to a wider international audience.

While the horizontal extent of mudflats, and saltmarshes is governed by the wind-wave climate, their vertical growth is largely controlled by sea level and tidal range. These interactions form a major theme of this book. Tooley reviews the recent instrumental and geological record of Holocene sea level change, and briefly outlines stratigraphic techniques, with examples from northwest England and Brazil. He points out that

the post-glacial transgression was marked by several pulses of rapid sea level rise between 15,000 and 7,800 years BP, attributed to catastrophic discharge of meltwater from retreating glaciers. Pethick illustrates an inverse relation between the growth of saltmarshes and mudflats, and the temporary reversal of longer-term growth trends by major storm events. During periods of rising sea level, as expected in the near-future, the recurrence interval for a given surge level will decrease, and marsh recovery from storm events may not be sufficiently rapid to prevent permanent recession.

Gray discusses plant species zonation and competition; Doody provides a historical overview of saltmarsh ecology, historical reclamation and conservation priorities; and Brampton examines the role of marshes as a coastal defense against flooding. Allen provides a simple model of marsh growth under changing sea levels, based on field studies from the Bristol channel and Severn estuary, while Pye describes the Holocene and recent evolution of the north Norfolk marshes. Land reclamation schemes, particularly since the disastrous 1953 floods, have greatly curtailed the natural sediment supply, contributing to the erosion problems presently encountered. In the face of higher rates of sea level rise and/or increased frequency of major storm events, landward migration of barrier islands and spits will accelerate. Storm breaching and washover of barriers will recur more frequently and may become permanent.

This book contains a timely summary of information on a vulnerable ecosystem, which will interest coastal geomorphologists, ecologists, resource managers and engineers. While the book is clearly written, and accessible to a broad range of potential readers, the significance of its findings could have been strengthened by more comparisons with saltmarsh occurrences from other temperate climate locations. Local or typically British expressions could have been better defined, for example, cradge, salting, carr and roddon; also more precise definitions of particular habitats such as fen, reedswamp, raised bog could have been

provided. Aside from these minor shortcomings, the book is both useful and readable.

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Expected Effects of Climate Change on Marine Coastal Ecosystems, J.J. Beukema, W.J. Wolff, and J.J.W.M. Brouns (eds.), 1988. Dordrecht, The Netherlands: Kluwer Academic Publishers, *Developments in Hydrobiology* 57, 221p. ISBN 0-7923-0697-X.

Coastal ecosystems are particularly vulnerable to future climate change because they face inundation or increased salinity as well as exposure to increased levels of CO₂, UV-B radiation (due to stratospheric ozone depletion by chlorofluorocarbons), and higher temperatures. The potential consequences of these climate changes on coastal ecosystems formed the theme of a workshop held in Texel, The Netherlands, from 11 to 15 November, 1988, attended by a group of 30 scientists from 13 countries, covering the fields of biology, ecology, geology and climatology.

The Expected Effects of Climatic Change on Marine Coastal Ecosystems constitutes a collection of 23 papers, representing the proceedings of this workshop. The book begins with an overview of the causes of climate change (Hekstra), and reviews various anticipatory approaches, for example: General Circulation Models (GCM's), construction of regional scenarios, and studies of past climates as analogs (see papers by DeBoois, also Goodess and Palutikof). The book is further divided into several sections dealing with ecosystems responses to elevated carbon dioxide levels (3 papers), to temperature changes (6 papers), sea level rise (9 papers), and UV-B radiation increases (2 papers). Long utilizes mathematical models to investigate light interception and conversion efficiency in salt-marsh grasses. Field studies and geographical or historical analogs are more common anticipatory approaches. Field observations have been made on winter temperature responses of benthic animals (Beukema), thermal tolerance limits of bivalves (Wilson), salinity changes on salt-marsh zonation (Huiskes), and on accretion rates (Dijkema *et al.*). Potential consequences of UV-B radiation on aquatic coastal ecosystems are reviewed by Kramer, and on salt-marsh vegetation by Van de Staaij *et al.*

Past and present latitudinal ranges of seaweed species are utilized to project future climate responses (Van Hoek *et al.*). A similar study, but more focused on Western Europe is summarized by Breeman. A regional scenario of temperature increase equivalent to that now existing between The Netherlands and France is used to predict eventual bottom faunal changes in Holland (De Vooy).

Historical rises in sea level, both during the Holocene post-glacial transgression, and the last few centuries are explored in a series of papers. Day and Templet cite the Mississippi Delta, with its nearly 6–10 times global average sea level rise, as an analog for the future of other vulnerable coastal areas. The situation in Louisiana may be somewhat unique, because subsidence and wetlands losses have been aggravated by other anthropogenic activities, such as sediment deprivation due to construction of upstream dams, and reduction of seasonal sediment influx during floods, by dikes, canal and jetty construction. Morphological changes associated with sea level rise are detailed in papers by Christiansen and Bowman, Misdorp *et al.*, and Westerhoff and Cleveringa. Siefert presents evidence for recent sea level rise along the German Atlantic coast, and a marked increase in the tidal range in recent decades, possibly due to dredging.

The papers presented in this book are largely drawn from studies in Western Europe, particularly The Netherlands, thus possibly limiting the global applicability of the findings. While there may be a dearth of coastal data, the relevance of agricultural studies to coastal ecosystems (*e.g.*, Overdieck) may be questioned. Tables are often reduced beyond easy legibility. Typographical errors are not uncommon. Nevertheless, this series of papers present useful results that can be added to the growing literature on the potential impacts of climate change, especially in the coastal zone.

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World Atlas of Holocene Sea-Level Changes, P.A. Pirazzoli, assisted by J. Pluet, 1991. Amsterdam: Elsevier Science Publishers, B. V., *Oceanography Series*, 300p. ISBN 0-444-8906-6.

Until the late 1970's, Holocene sea-level studies were directed towards establishing a single uni-